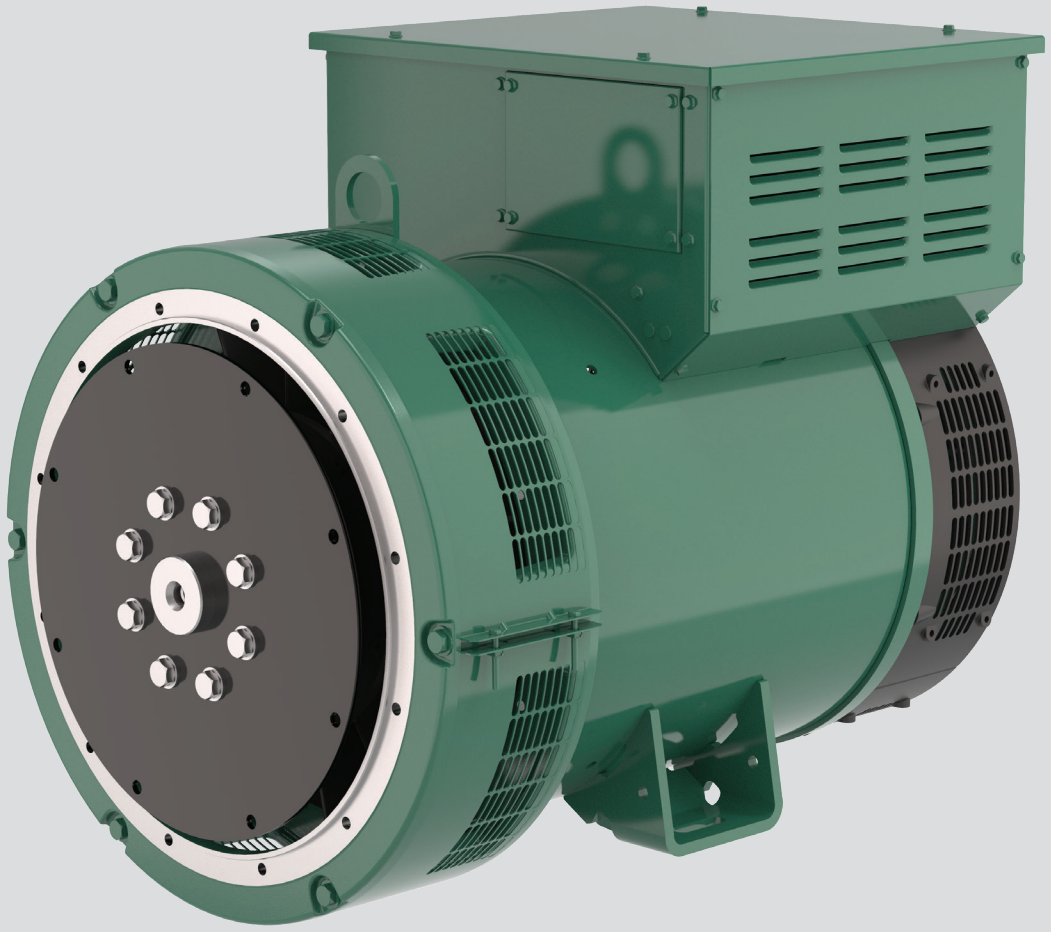


LSA 46.3

Low Voltage Alternator - 4 pole

230 to 365 kVA - 50 Hz / 288 to 456 kVA - 60 Hz
Electrical and mechanical data

LEROY-SOMER™

Nidec
All for dreams

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 EC 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)
- Complies with EN 61000-6-3, EN 61000-6-2, EN 55011, group 1 class B for European zone (EC marking)

Excitation and regulation system suited to the application

Excitation system				Regulation options			
Volage regulator	**SHUNT**	**AREP** (option)	**PMG** (option)	**C.T.** Current transformer for paralleling	Mains paralleling	3-phase sensing	Remote voltage potentiometer
R250	**Standard**	**-**	**-**	**-**	**-**	**-**	√
D350	**-**	**Standard**	**Standard**	√	**-**	√	√
D550	**Option**	**Option**	**Option**	√	√	√	√

√ : Possible option

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)
- Direction of rotation: clockwise and anti-clockwise (without derating)

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

General characteristics

Insulation class	H
Winding pitch	2/3 (winding 6)
Number of wires	12
Protection	IP 23
Altitude	≤ 1000 m
Overspeed	2250 min^{-1}
Air flow	0.48 m^3/s (50Hz) / 0.58 m^3/s (60Hz)

Excitation system	SHUNT	AREP / PMG
AVR type	R250	D350
Voltage regulation (*)	± 0.5%	± 0.25%
Short-circuit current	-	300% (3 IN) : 10s
Total Harmonic Distortion THD (**)	no load < 2.5% - on load < 2.5%	
Waveform: NEMA = TIF (**)	< 50	
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

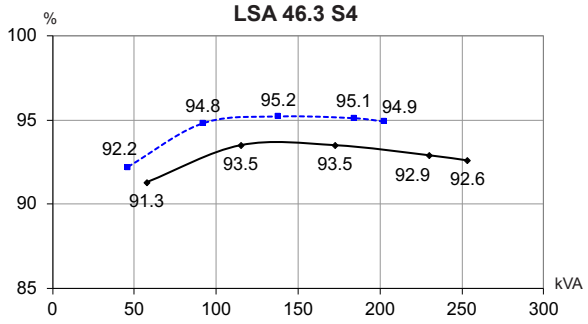
Duty/T°C		Continuous duty/40°C					Continuous duty/40°C					Stand-by/40°C					Stand-by/27°C				
Class/T°K		H/125°K					F/105°K					H/150°K					H/163°K				
Phase		3 ph.				1 ph.	3 ph.				1 ph.	3 ph.				1 ph.	3 ph.				1 ph.
Y		380V	400V	415V	440V	ΔΔ	380V	400V	415V	440V	ΔΔ	380V	400V	415V	440V	ΔΔ	380V	400V	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	
LSA 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*
LSA 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*
LSA 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*
LSA 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*
LSA 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*
LSA 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*

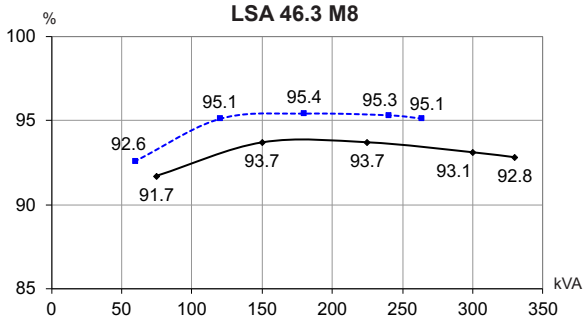
Ratings 60 Hz - 1800 R.P.M.

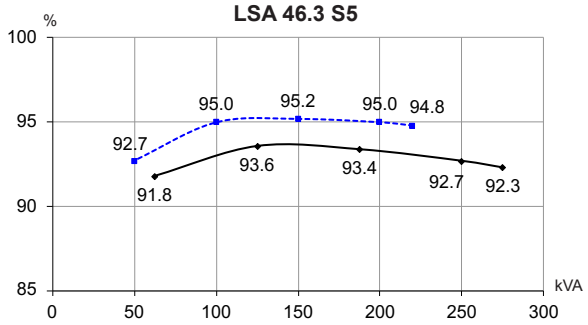
kVA / kW - P.F. = 0.8

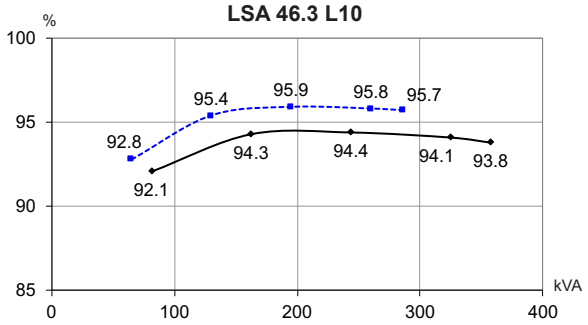
Duty/T°C		Continuous duty/40°C					Continuous duty/40°C					Stand-by/40°C					Stand-by/27°C				
Class/T°K		H/125°K					F/105°K					H/150°K					H/163°K				
Phase		3 ph.				1 ph.	3 ph.				1 ph.	3 ph.				1 ph.	3 ph.				1 ph.
Y		380V	416V	440V	480V	ΔΔ	380V	416V	440V	480V	ΔΔ	380V	416V	440V	480V	ΔΔ	380V	416V	440V	480V	ΔΔ
Δ		220V	240V	240V		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	
LSA 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*
LSA 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*
LSA 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*
LSA 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*
LSA 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*
LSA 46.3 L11	kVA	360	393	419	**456**	231	328	358	381	**415**	210	382	417	444	**483**	250	396	432	461	**502**	254
	kW	*288*	*314*	*335*	*365*	*185*	*262*	*286*	*305*	*332*	*168*	*305*	*333*	*355*	*386*	*200*	*317*	*346*	*369*	*402*	*203*

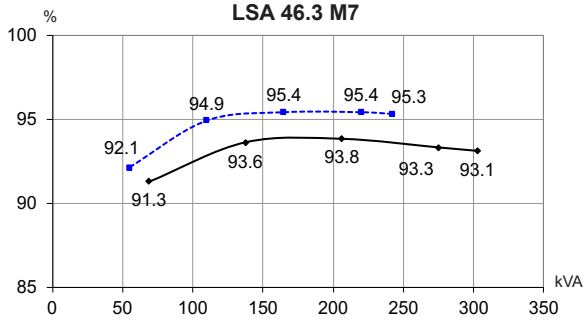
Efficiencies 400V - 50 Hz (····· P.F.: 1) (— P.F.: 0.8)

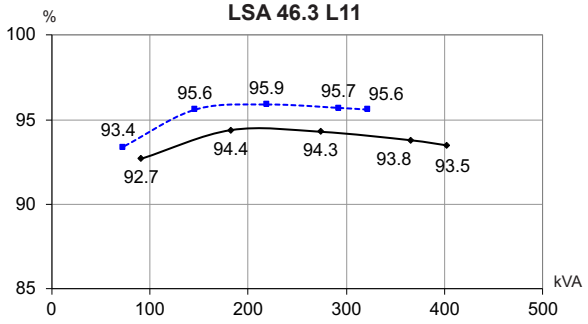








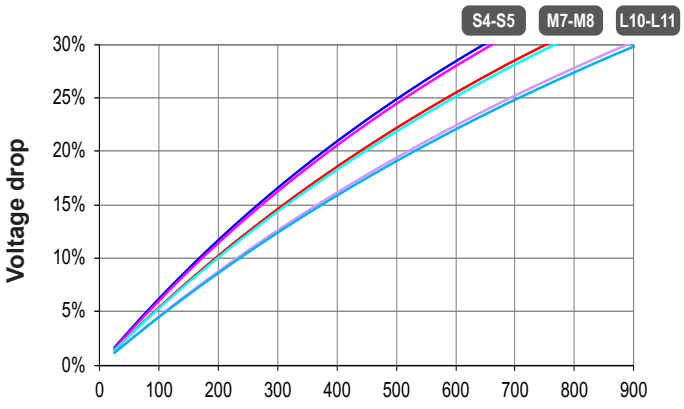




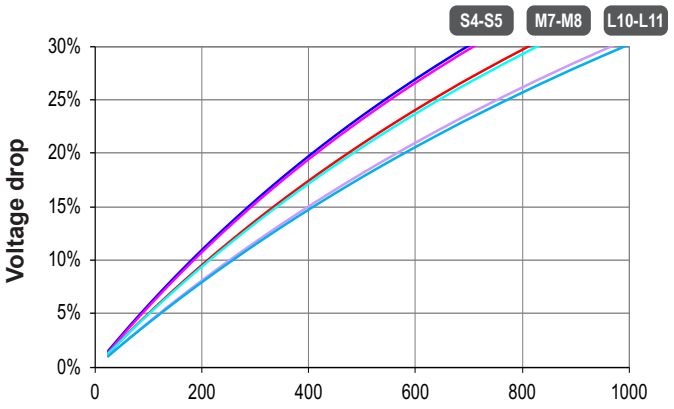
Reactances (%). Time constants (ms) - Class H / 400 V

		S4	S5	M7	M8	L10	L11
Kcc	Short-circuit ratio	0.4	0.36	0.49	0.44	0.44	0.39
Xd	Direct-axis synchro. reactance unsaturated	339	369	316	344	316	355
Xq	Quadrature-axis synchro. reactance unsaturated	173	188	161	175	161	181
T'do	No-load transient time constant	2452	2452	2543	2543	2686	2686
X'd	Direct-axis transient reactance saturated	13.8	15	12.4	13.5	11.7	13.2
T'd	Short-circuit transient time constant	100	100	100	100	100	100
X"d	Direct-axis subtransient reactance saturated	11	12	9.9	10.8	9.4	10.5
T"d	Subtransient time constant	10	10	10	10	10	10
X"q	Quadrature-axis subtransient reactance saturated	14.6	15.9	13.1	14.3	12.6	14.1
Xo	Zero sequence reactance	0.57	0.62	0.51	0.56	0.49	0.55
X2	Negative sequence reactance saturated	12.86	13.98	11.57	12.62	11.01	12.37
Ta	Armature time constant	15	15	15	15	15	15
Other class H / 400 V data							
io (A)	No-load excitation current (SHUNT/AREP)	0.78	0.78	0.94	0.94	0.81	0.81
ic (A)	On-load excitation current (SHUNT/AREP)	3.06	3.32	3.14	3.41	2.94	3.29
uc (V)	On-load excitation voltage (SHUNT/AREP)	41.4	44.6	46.2	49.7	42.8	47.5
ms	Response time (ΔU = 20% transient)	500	500	500	500	500	500
kVA	Start (ΔU = 20% cont. or 30% trans.) SHUNT	554	557	667	664	791	790
kVA	Start (ΔU = 20% cont. or 30% trans.) AREP	639	640	736	738	876	880
%	Transient ΔU (on-load 4/4) SHUNT - P.F.: 0.8_{LAG}	13.2	14	13.6	14.4	13.6	14.7
%	Transient ΔU (on-load 4/4) AREP - P.F.: 0.8_{LAG}	12.4	13.1	12.7	13.5	12.6	13.7
W	No-load losses	3660	3660	4449	4449	4775	4775
W	Heat dissipation	13869	15662	15583	17615	16271	19169

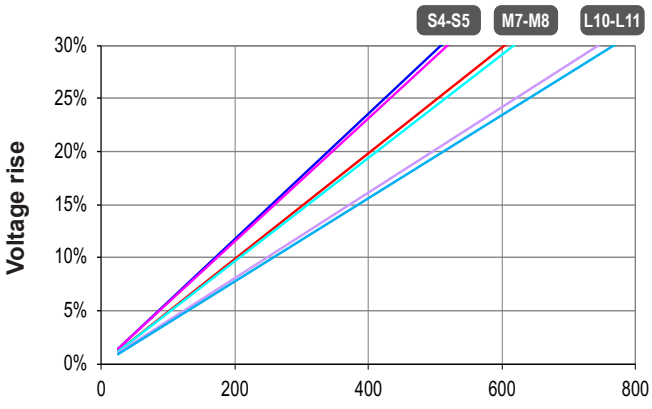
Transient voltage variation 400V - 50 Hz



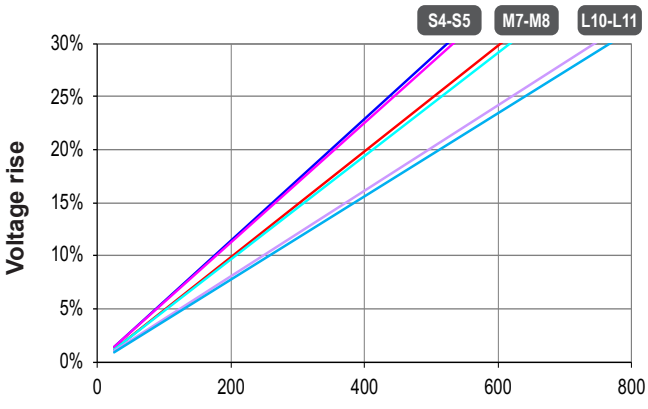
Phase loading (SHUNT) - kVA at P.F. = 0.8



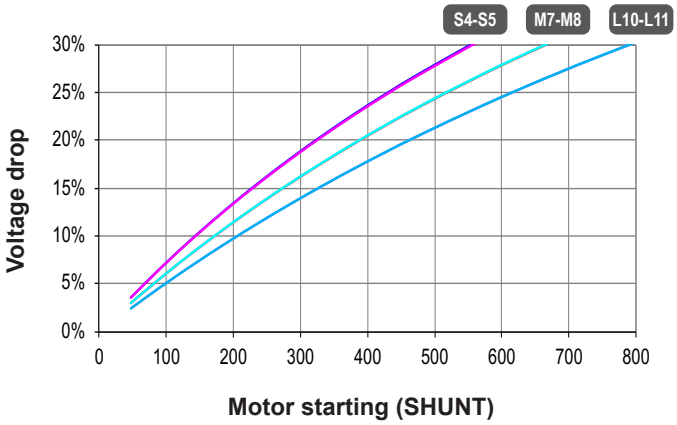
Phase loading (AREP/PMG) - kVA at P.F. = 0.8



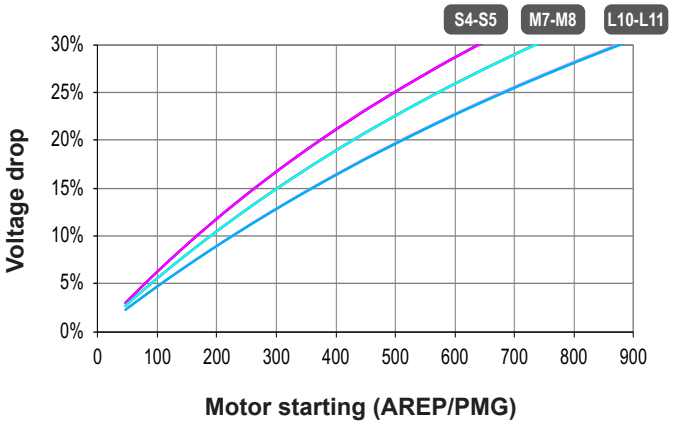
Load shedding (SHUNT) - kVA at P.F. = 0.8



Load shedding (AREP/PMG) - kVA at P.F. = 0.8



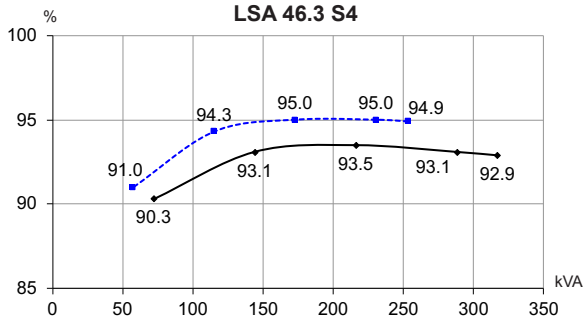
Motor starting (SHUNT)
Locked rotor kVA at P.F. = 0.6

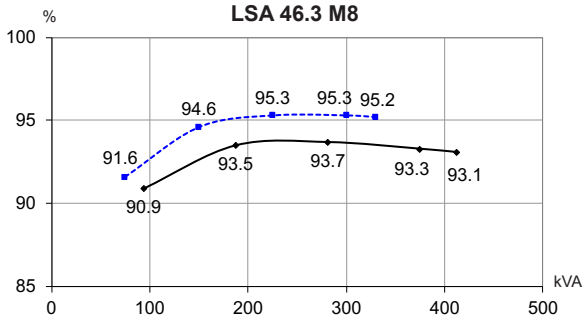


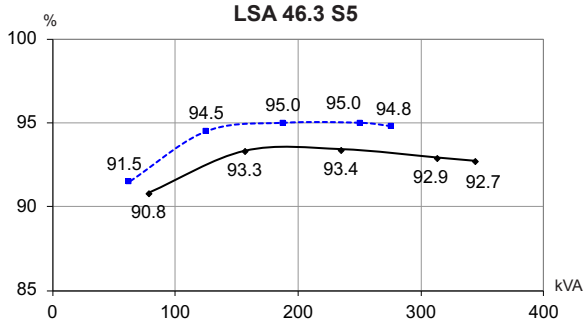
Motor starting (AREP/PMG)
Locked rotor kVA at P.F. = 0.6

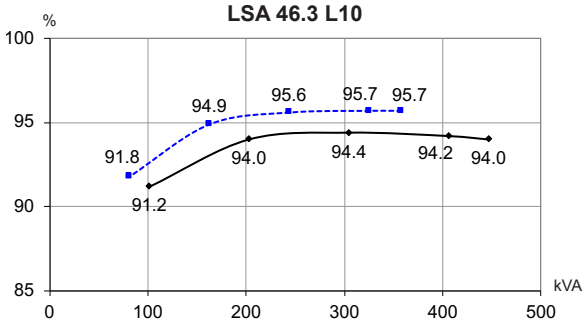
1) For a starting P.F. other than 0.6, the starting kVA must be multiplied by K = Sine P.F. / 0.8
2) For voltages other than 400V (Y), 230V (Δ) at 50 Hz, then kVA must be multiplied by $(400/U)^2$ or $(230/U)^2$.

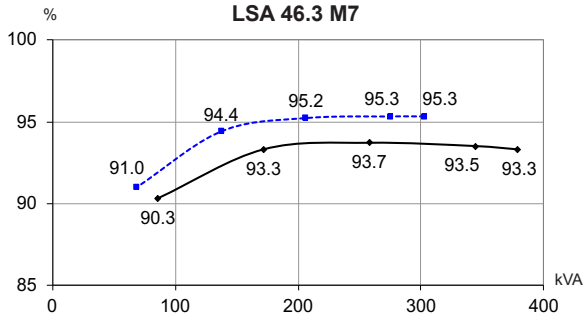
Efficiencies 480V - 60 Hz (····· P.F.: 1) (— P.F.: 0.8)

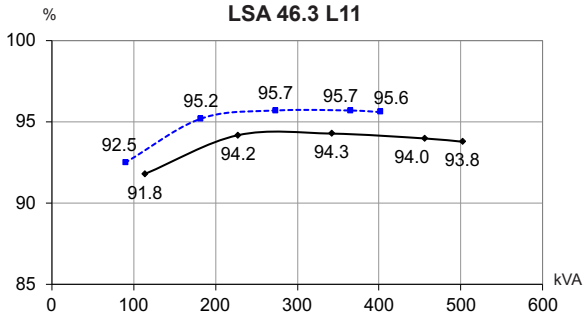












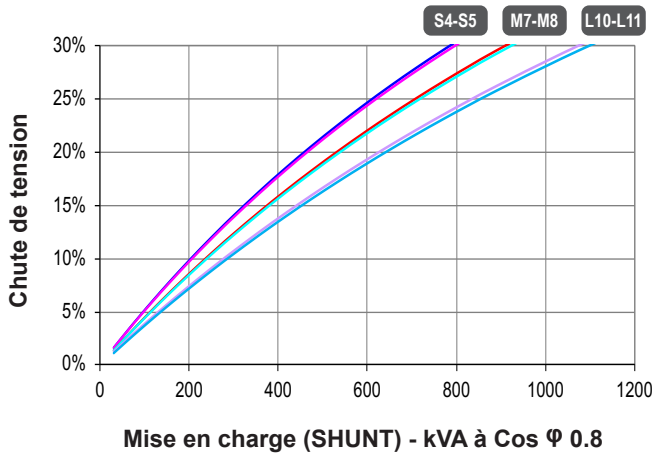
Reactances (%). Time constants (ms) - Class H / 480 V

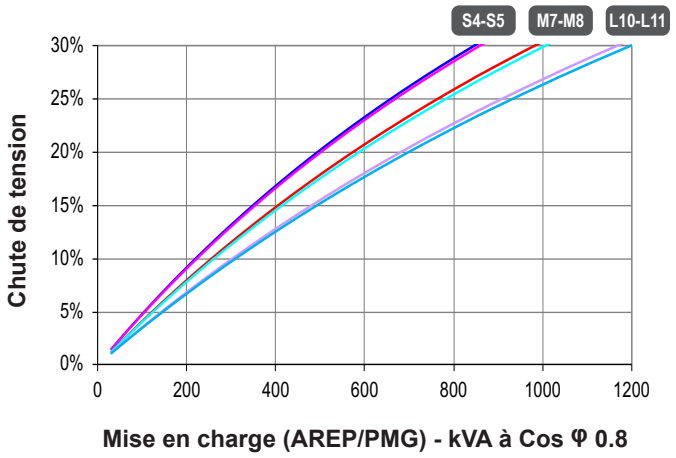
		S4	S5	M7	M8	L10	L11
Kcc	Short-circuit ratio	0.38	0.35	0.47	0.43	0.42	0.37
Xd	Direct-axis synchro. reactance unsaturated	354	385	329	359	329	370
Xq	Quadrature-axis synchro. reactance unsaturated	180	196	168	183	168	188
T'do	No-load transient time constant	2452	2452	2543	2543	2686	2686
X'd	Direct-axis transient reactance saturated	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
X"d	Direct-axis subtransient reactance saturated	11.5	12.5	10.3	11.2	9.8	11
T"d	Subtransient time constant	10	10	10	10	10	10
X"q	Quadrature-axis subtransient reactance saturated	15.2	16.6	13.7	14.9	13.1	14.1
Xo	Zero sequence reactance	0.6	0.65	0.53	0.58	0.51	0.57
X2	Negative sequence reactance saturated	13.42	14.58	12.06	13.14	11.46	12.87
Ta	Armature time constant	15	15	15	15	15	15

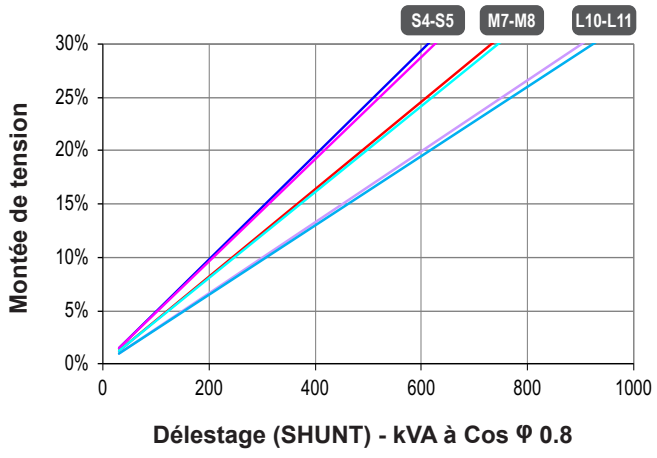
Other class H / 480 V data

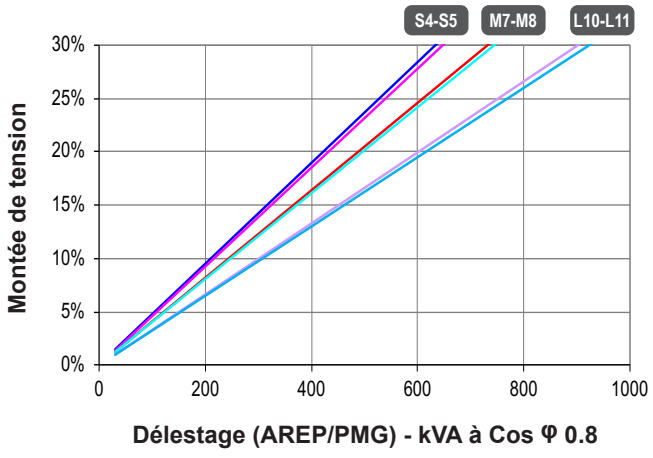
io (A)	No-load excitation current (SHUNT/AREP)	0.78	0.78	0.94	0.94	0.81	0.81
ic (A)	On-load excitation current (SHUNT/AREP)	3.05	3.3	3.13	3.38	2.92	3.26
uc (V)	On-load excitation voltage (SHUNT/AREP)	41.7	44.9	46.5	50	43.1	47.7
ms	Response time (ΔU = 20% transient)	500	500	500	500	500	500
kVA	Start (ΔU = 20% cont. or 30% trans.) SHUNT	699	695	799	800	947	945
kVA	Start (ΔU = 20% cont. or 30% trans.) AREP	765	766	887	883	1055	1053
%	Transient ΔU (on-load 4/4) SHUNT - P.F.: 0.8_{LAG}	13.6	14.4	14	14.9	13.9	15.1
%	Transient ΔU (on-load 4/4) AREP - P.F.: 0.8_{LAG}	12.8	13.5	13.1	13.8	13	14
W	No-load losses	5549	5549	6617	6617	7115	7115
W	Heat dissipation	16897	18905	18951	21212	19891	23158

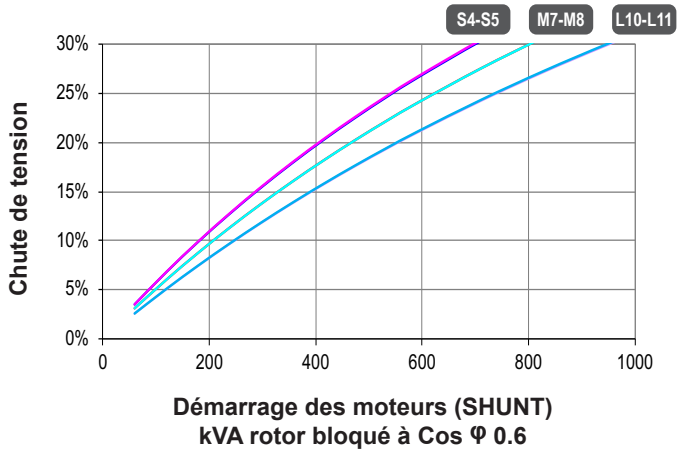
Transient voltage variation 480V - 60 Hz

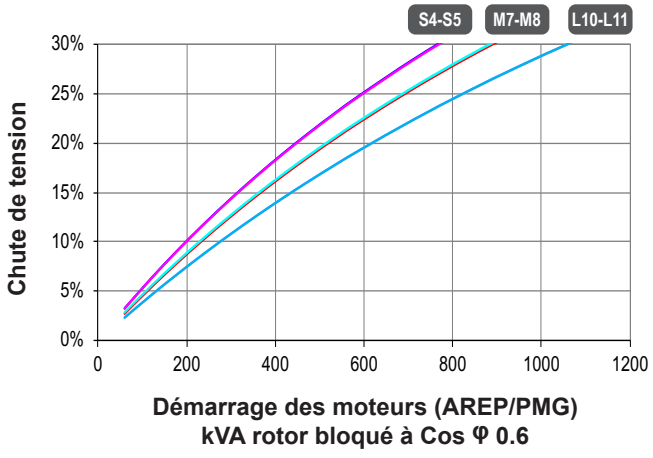










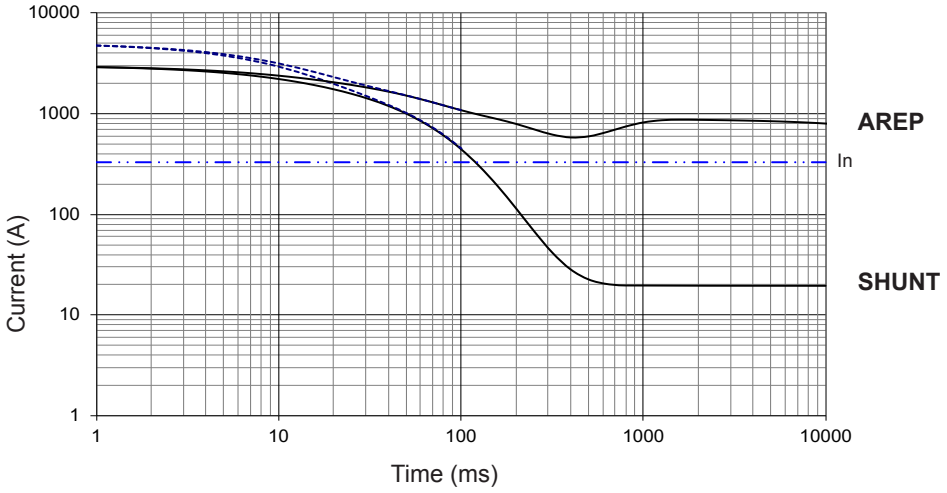


1) For a starting P.F. other than 0.6, the starting kVA must be multiplied by K = Sine P.F. / 0.8
2) For voltages other than 480V (Y), 277V (Δ), 240V (YY) at 60 Hz, then kVA must be multiplied by $(480/U)^2$ or $(277/U)^2$ or $(240/U)^2$.

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

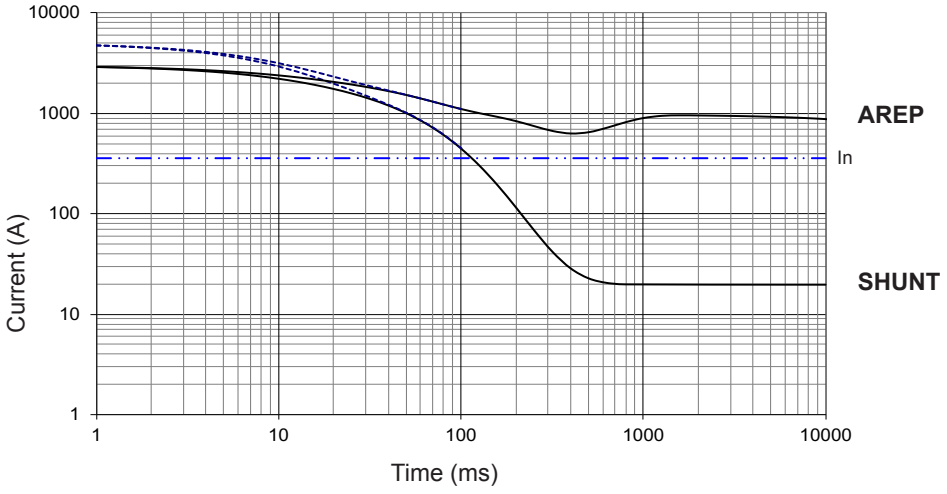
LSA 46.3 S4

Symmetrical ——
Asymmetrical - - -



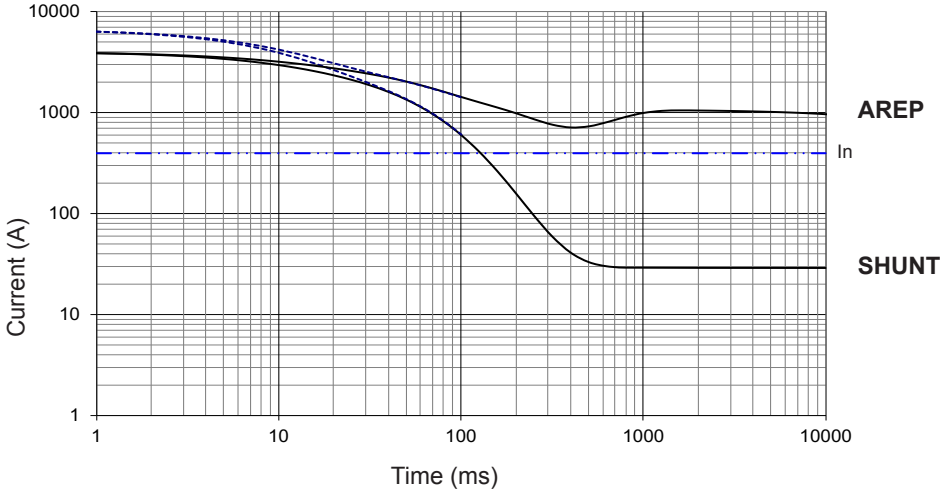
LSA 46.3 S5

Symmetrical ——
Asymmetrical - - -



LSA 46.3 M7

Symmetrical ——
Asymmetrical - - -

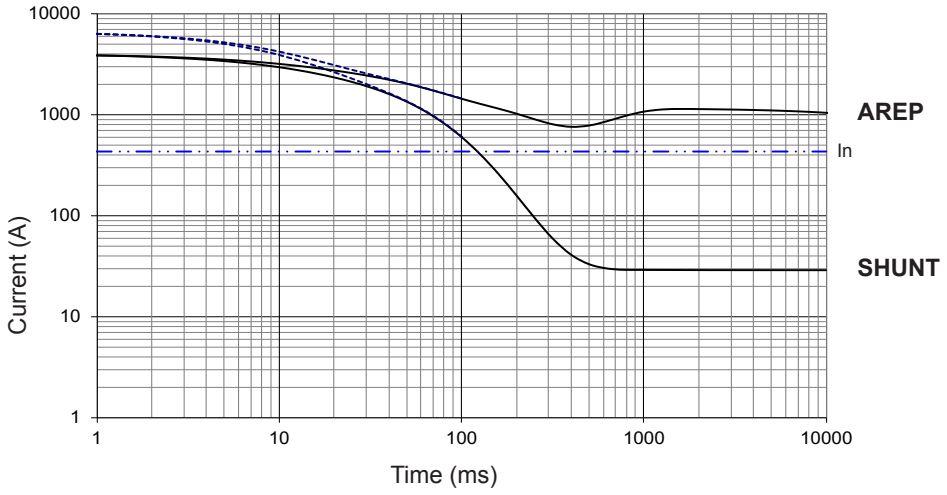


Influence due to connection
Curves shown are for star (Y) connection.
For other connections, use the following multiplication factors:
- Series delta : current value x 1.732 - Parallel star : current value x 2

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

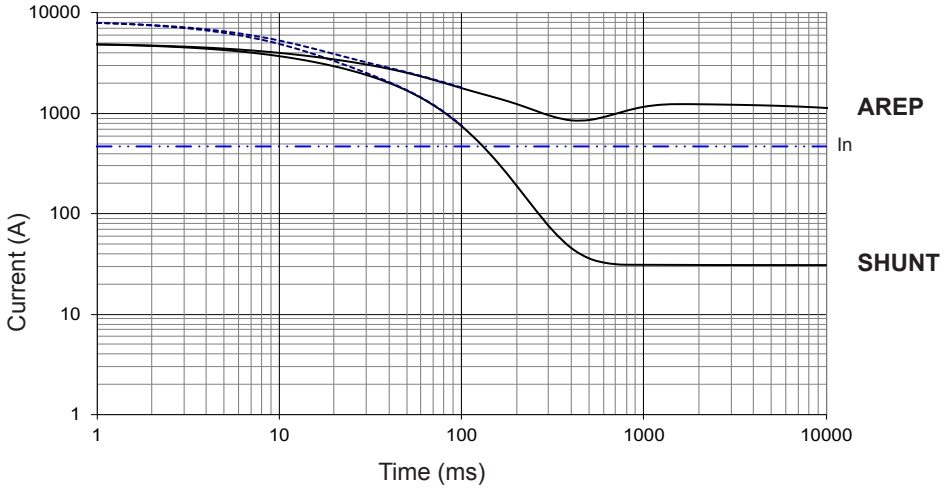
LSA 46.3 M8

Symmetrical ——
Asymmetrical - - -



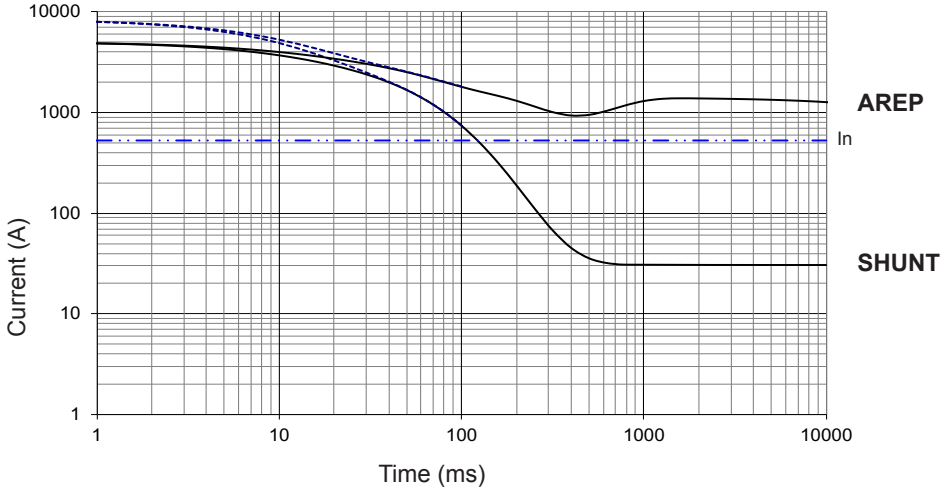
LSA 46.3 L10

Symmetrical ——
Asymmetrical - - -



LSA 46.3 L11

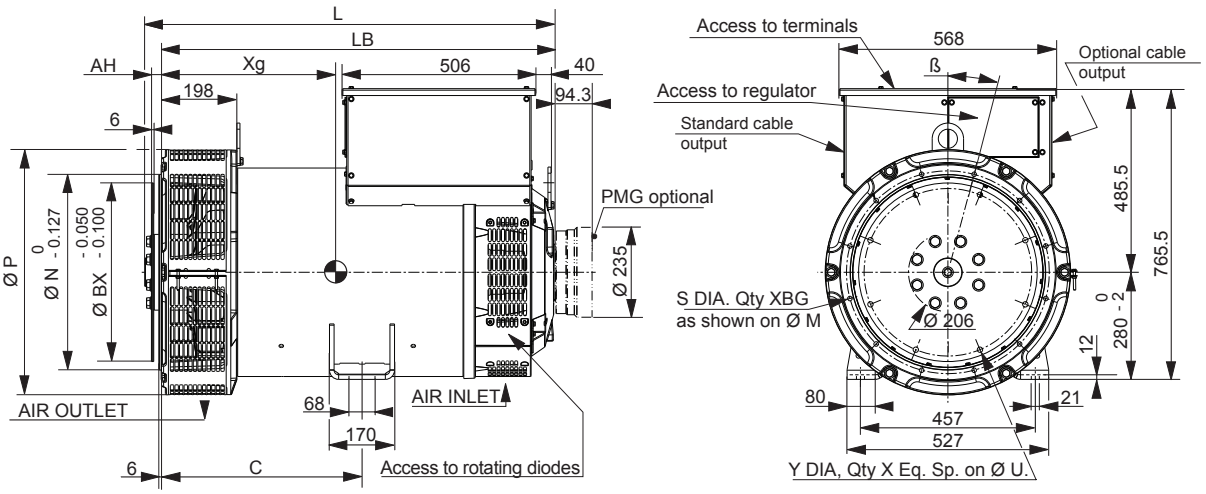
Symmetrical ——
Asymmetrical - - -



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 without PMG maxi*	LB	Xg	C	Weight (kg)
LSA 46.3 S4	944	892	423	429	674
LSA 46.3 S5	944	892	423	429	682
LSA 46.3 M7	989	937	445	429	754
LSA 46.3 M8	989	937	445	429	754
LSA 46.3 L10**	1084	1032	493	525	888
LSA 46.3 L11**	1084	1032	493	525	888

Coupling			
Flex plate	**11 ½**	**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

* L maxi = LB + AH maxi + 12.4 (only for SAE 11 ½) ** Shaft height = 355 mm optional

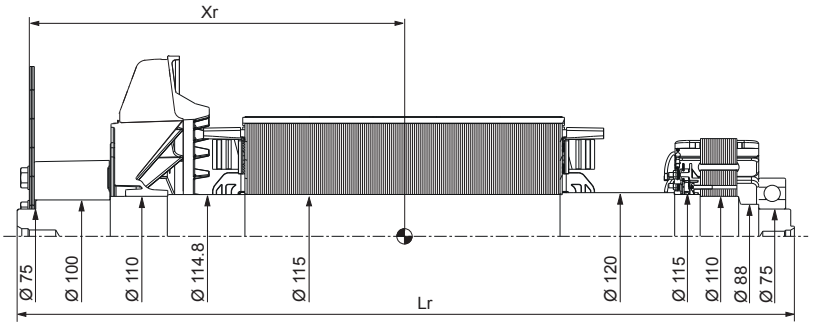
Flange (mm)						
S.A.E.	P	N	M	XBG	S	β°
3	600*/641	409.575	428.625	12	11	15°
2	600*/641	447.675	466.725	12	11	15°
1	600*/641	511.175	530.225	12	12	15°
½	713	584.2	619.125	12	14	15°
0	713	647.7	679.45	16	14	11° 15'

* Specific dimension LSA 46.3 S4

Flex plate (mm)					
S.A.E.	BX	U	X	Y	AH
11 ½	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

* Option

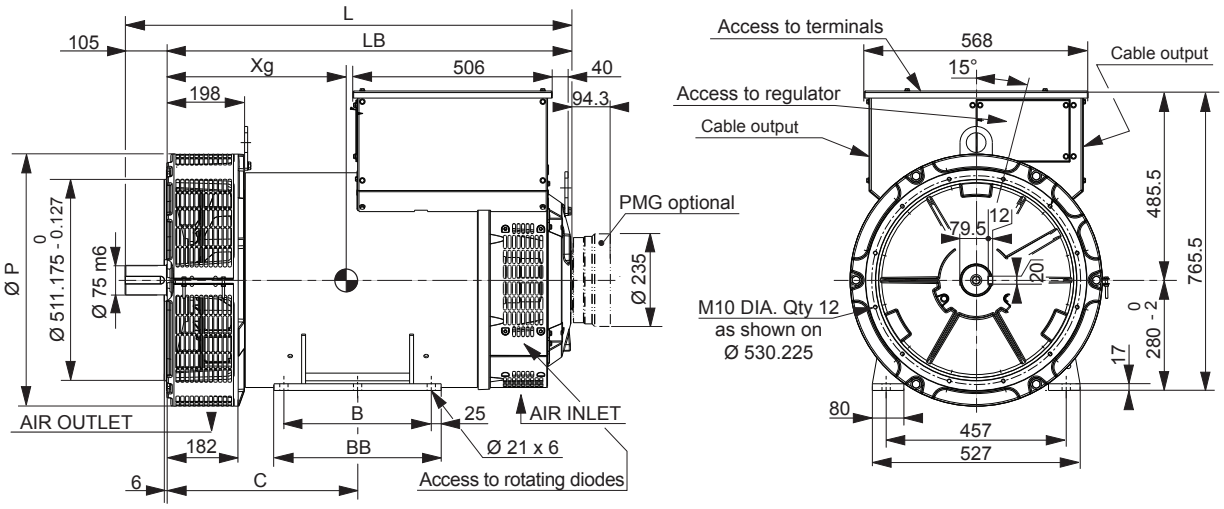
Torsional analysis data



Centre of gravity: Xr (mm), Rotor length: Lr (mm), Weight: M (kg), Moment of inertia: J (kgm²): (4J = MD²)								
Flex plate	S.A.E. 11 1/2				S.A.E. 14			
Type	Xr	Lr	M	J	Xr	Lr	M	J
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

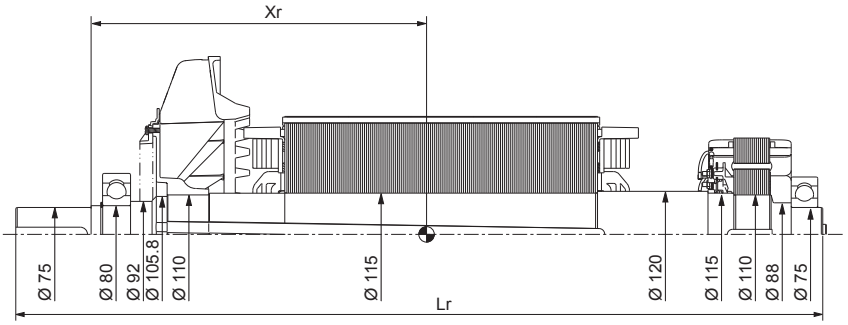
NOTE : Dimensions are for information only and may be subject to modifications. Contractual 2D drawings can be downloaded from the Leroy-Somer site, 3D drawing files are available upon request.
The torsional analysis of the transmission is imperative. All values are available upon request.

Two bearing dimensions



Dimensions (mm) and weight								
Type	L without PMG	LB	C	BB	B	P	Xg	Weight (kg)
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 S4	430	990	250	2.76
LSA 46.3 S5	430	990	250	2.76
LSA 46.3 M7	456	1035	280	3.09
LSA 46.3 M8	456	1035	280	3.09
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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