

## LSA 46.3

### Low Voltage Alternator - 4 pole

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

**LEROY-SOMER**<sup>™</sup>

***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 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 (option)	PMG (option)	C.T. Current transformer for paralleling	Mains paralleling	3-phase sensing	Remote voltage potentiometer
R250	Standard	-	-	-	-	-	√
D350	-	Standard	Standard	C.T.	-	√	√
D510 C	Option	Option	Option	C.T.	√	√	√

√: Possible option

## Protection system suited to the environment

- The LSA 46.3 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%
  - 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	Excitation system	SHUNT	AREP / PMG
Winding pitch	2/3 (winding 6)	AVR type	R250	D350
Number of wires	12	Voltage regulation (*)	± 0.5%	± 0.25%
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 <sup>-1</sup>	Waveform: NEMA = TIF (**)	< 50	
Air flow	0.48 m <sup>3</sup> /s (50Hz) / 0.58 m <sup>3</sup> /s (60Hz)	Waveform: I.E.C. = THF (**)	< 2%	

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

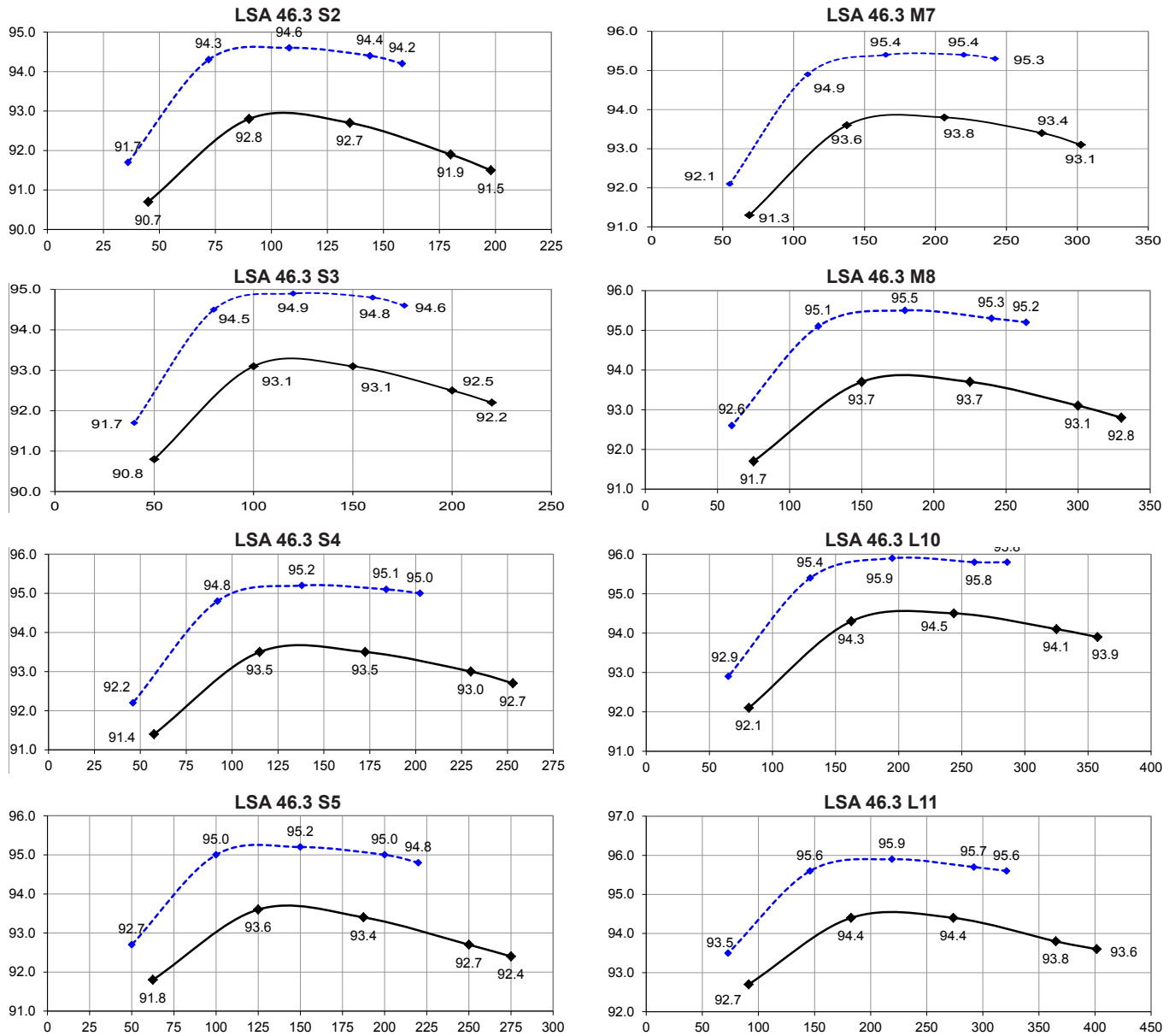
### Ratings 50 Hz - 1500 R.P.M.

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°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.	
<b>Y</b>	380V	400V	415V	440V	Δ	380V	400V	415V	440V	Δ	380V	400V	415V	440V	Δ	380V	400V	415V	440V	Δ
Δ	220V	230V	240V		230V	220V	230V	240V		230V	220V	230V	240V		230V	220V	230V	240V		230V
YY				220V					220V					220V					220V	
<b>46.3 S2</b>	kVA 180	<b>180</b>	180	171	108	164	<b>164</b>	164	156	98	191	<b>191</b>	191	181	114	200	<b>200</b>	200	188	120
	kW 144	144	144	137	86	131	131	131	124	78	153	153	153	145	91	160	160	160	150	96
<b>46.3 S3</b>	kVA 200	<b>200</b>	200	190	120	182	<b>182</b>	182	173	109	212	<b>212</b>	212	201	127	220	<b>220</b>	220	209	132
	kW 160	160	160	152	96	146	146	146	138	87	170	170	170	161	102	176	176	176	167	106
<b>46.3 S4</b>	kVA 230	<b>230</b>	230	219	138	209	<b>209</b>	209	200	126	244	<b>244</b>	244	232	146	253	<b>253</b>	253	240	152
	kW 184	184	184	175	110	167	167	167	160	101	195	195	195	186	117	202	202	202	192	122
<b>46.3 S5</b>	kVA 240	<b>250</b>	250	238	150	218	<b>228</b>	228	216	137	254	<b>265</b>	265	252	159	264	<b>275</b>	275	261	165
	kW 192	200	200	190	120	174	182	182	173	110	204	212	212	202	127	211	220	220	209	132
<b>46.3 M7</b>	kVA 275	<b>275</b>	275	261	165	250	<b>250</b>	250	238	150	292	<b>292</b>	292	277	175	303	<b>303</b>	303	287	182
	kW 220	220	220	209	132	200	200	200	190	120	234	234	234	222	140	242	242	242	230	146
<b>46.3 M8</b>	kVA 290	<b>300</b>	300	285	180	264	<b>273</b>	273	259	164	307	<b>318</b>	318	302	191	319	<b>330</b>	330	313	200
	kW 232	240	240	228	144	211	218	218	207	131	246	254	254	242	153	255	264	264	250	160
<b>46.3 L10</b>	kVA 325	<b>325</b>	325	309	195	300	<b>300</b>	300	281	177	345	<b>345</b>	345	327	207	358	<b>358</b>	358	340	215
	kW 260	260	260	247	156	240	240	240	225	142	276	276	276	262	166	286	286	286	272	172
<b>46.3 L11</b>	kVA 350	<b>365</b>	365	347	210	319	<b>332</b>	332	316	191	371	<b>387</b>	387	368	225	385	<b>400</b>	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.	
<b>Y</b>	380V	416V	440V	480V	Δ	380V	416V	440V	480V	Δ	380V	416V	440V	480V	Δ	380V	416V	440V	480V	Δ
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	
<b>46.3 S2</b>	kVA 180	195	210	<b>225</b>	120	164	177	191	<b>205</b>	108	191	207	223	<b>239</b>	126	200	215	229	<b>250</b>	131
	kW 144	156	168	180	96	131	142	153	164	86	153	166	178	191	101	160	172	183	200	105
<b>46.3 S3</b>	kVA 200	215	230	<b>250</b>	132	182	196	209	<b>228</b>	120	212	228	244	<b>265</b>	140	220	237	253	<b>275</b>	145
	kW 160	172	184	200	106	146	157	167	182	96	170	182	195	212	112	176	190	202	220	116
<b>46.3 S4</b>	kVA 226	250	262	<b>288</b>	152	206	227	238	<b>262</b>	138	240	264	278	<b>305</b>	161	250	274	288	<b>316</b>	167
	kW 181	200	210	230	122	165	182	190	210	110	192	211	222	244	129	200	219	230	253	134
<b>46.3 S5</b>	kVA 245	265	280	<b>313</b>	165	223	241	255	<b>284</b>	150	260	281	297	<b>331</b>	175	270	292	308	<b>344</b>	182
	kW 196	212	224	250	132	178	193	204	227	120	208	225	238	265	140	216	234	246	275	146
<b>46.3 M7</b>	kVA 275	300	315	<b>344</b>	182	250	273	287	<b>313</b>	165	292	318	334	<b>364</b>	192	303	330	347	<b>378</b>	200
	kW 220	240	252	275	146	200	218	230	250	132	234	254	267	291	154	242	264	278	302	160
<b>46.3 M8</b>	kVA 290	315	340	<b>375</b>	200	264	287	309	<b>337</b>	180	307	334	360	<b>395</b>	210	319	347	375	<b>412</b>	218
	kW 232	252	272	300	160	211	230	247	270	144	246	267	288	316	168	255	278	300	330	174
<b>46.3 L10</b>	kVA 315	345	365	<b>406</b>	215	287	314	332	<b>370</b>	195	334	366	387	<b>431</b>	227	347	380	402	<b>447</b>	236
	kW 252	276	292	325	172	230	251	266	296	156	267	293	310	345	182	278	304	322	358	189
<b>46.3 L11</b>	kVA 360	393	419	<b>456</b>	231	328	358	381	<b>415</b>	210	382	417	444	<b>483</b>	250	396	432	461	<b>502</b>	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**

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

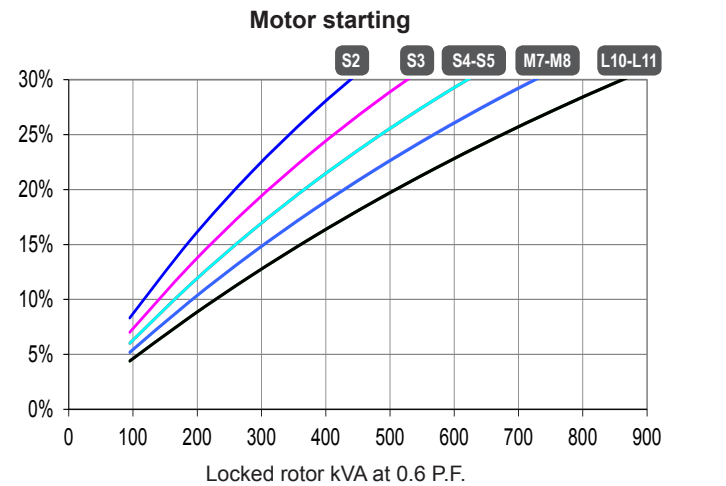
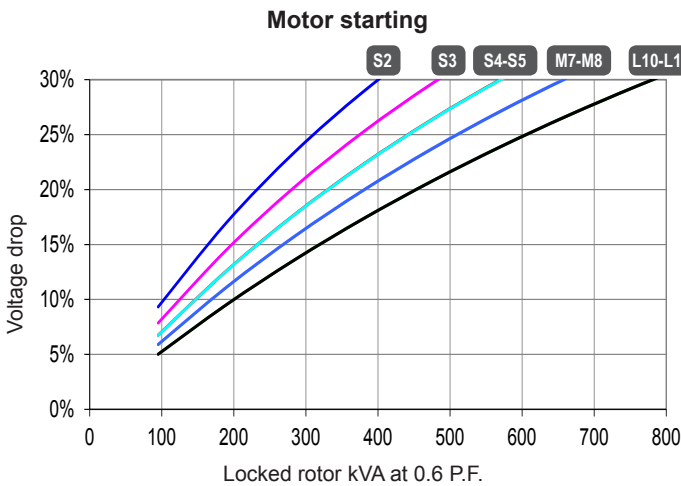
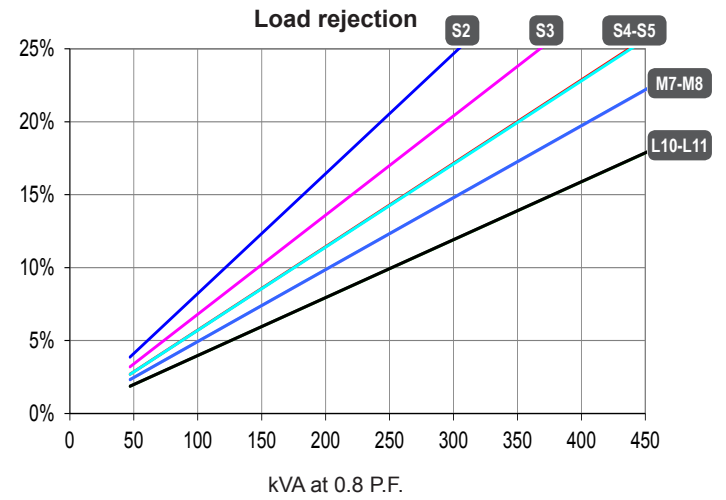
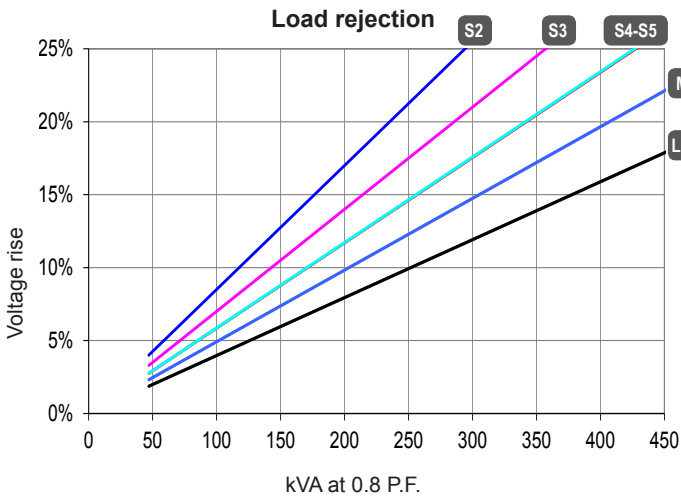
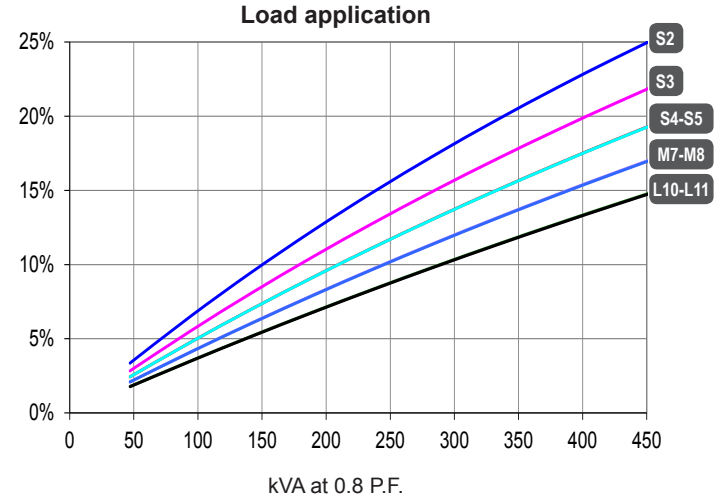
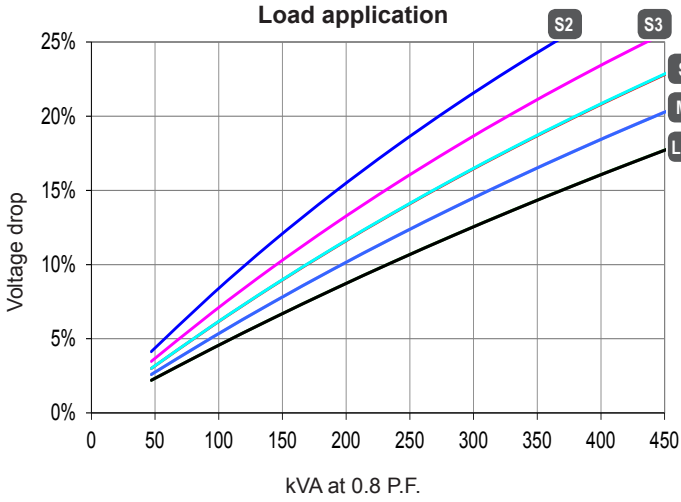
**Other class H / 400 V data**

<b>io (A)</b> No-load excitation current (SHUNT/AREP)	0.68	0.76	0.75	0.75	0.9	0.9	0.78	0.78
<b>ic (A)</b> On-load excitation current (SHUNT/AREP)	2.73	2.75	2.75	2.97	2.86	3.08	2.64	2.92
<b>uc (V)</b> On-load excitation voltage (SHUNT/AREP)	38.2	38.4	38.3	41.1	43	46.2	39.6	43.7
<b>ms</b> Response time ( $\Delta U = 20\%$ transient)	500	500	500	500	500	500	500	500
<b>kVA</b> Start ( $\Delta U = 20\%$ cont. or 30% trans.) SHUNT	409	498	580	581	667	664	791	790
<b>kVA</b> Start ( $\Delta U = 20\%$ cont. or 30% trans.) AREP	448	549	638	639	740	741	873	877
<b>%</b> Transient $\Delta U$ (on-load 4/4) SHUNT - P.F.: 0.8 <sub>LAG</sub>	14.2	13.3	13.2	14	13.6	14.4	13.6	14.7
<b>%</b> Transient $\Delta U$ (on-load 4/4) AREP - P.F.: 0.8 <sub>LAG</sub>	11.8	11.1	11	11.6	11.2	11.9	11.2	12.1
<b>W</b> No-load losses	3035	3401	3658	3658	4443	4443	4767	4767
<b>W</b> Heat dissipation	12584	12868	13811	1593	15499	17516	16145	19014

Transient voltage variation 400V - 50 Hz

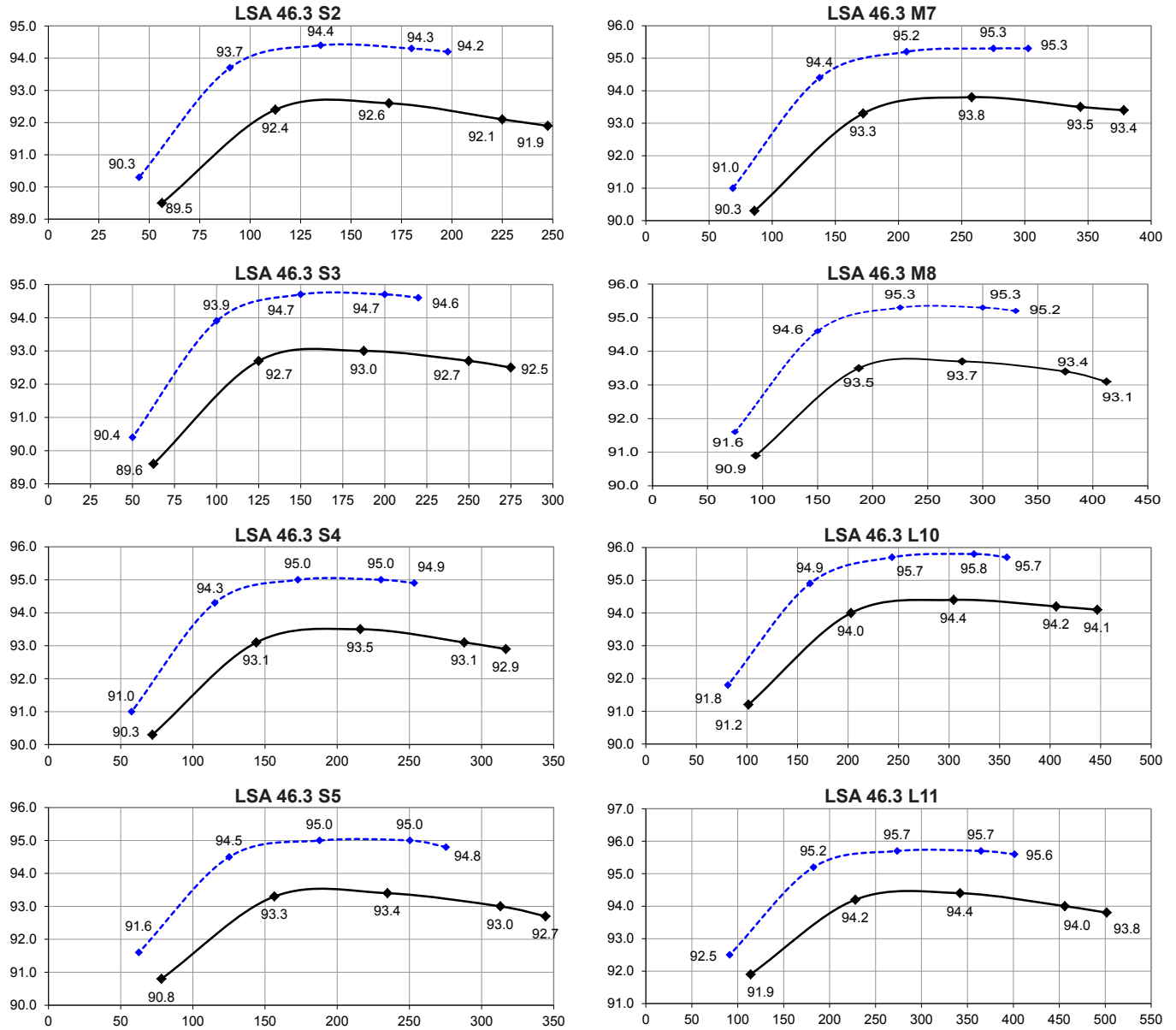
SHUNT system

AREP/PMG system



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

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

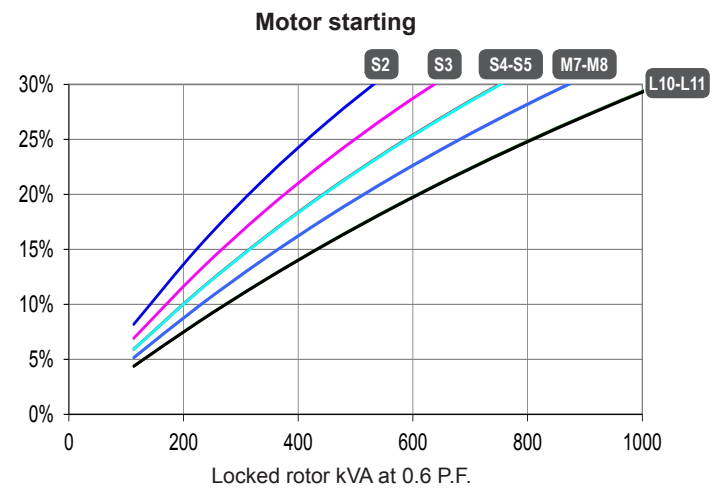
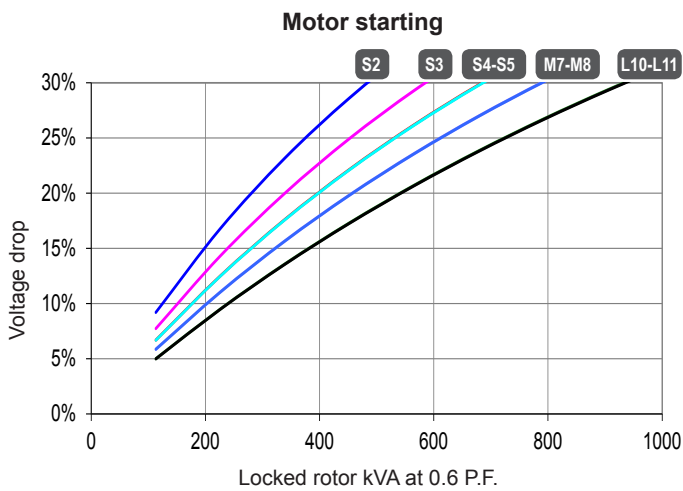
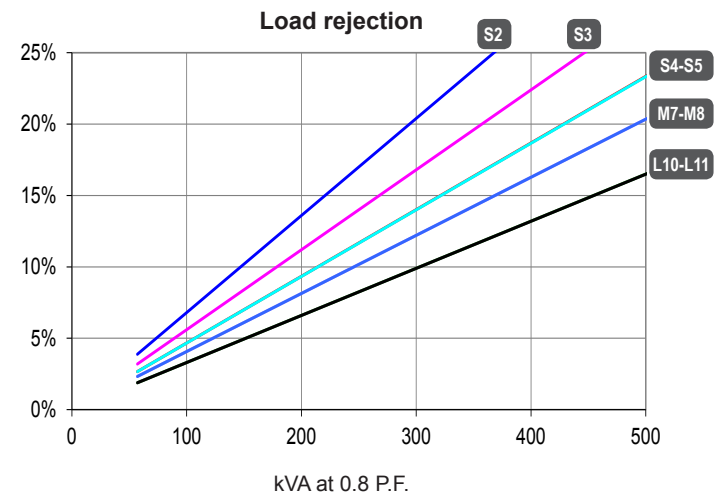
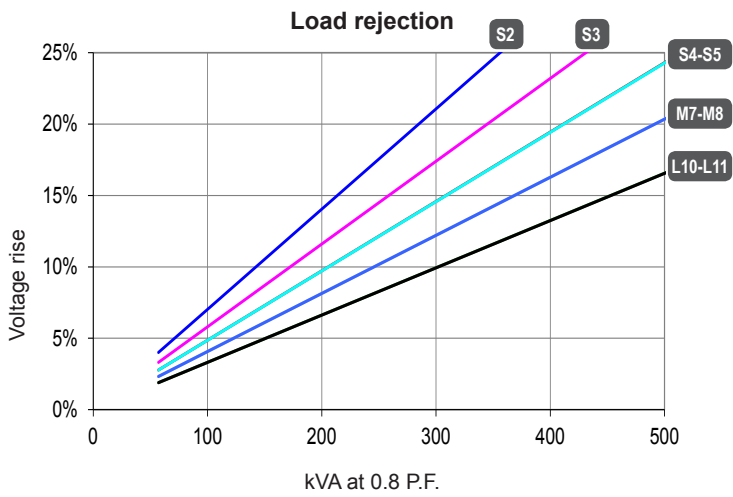
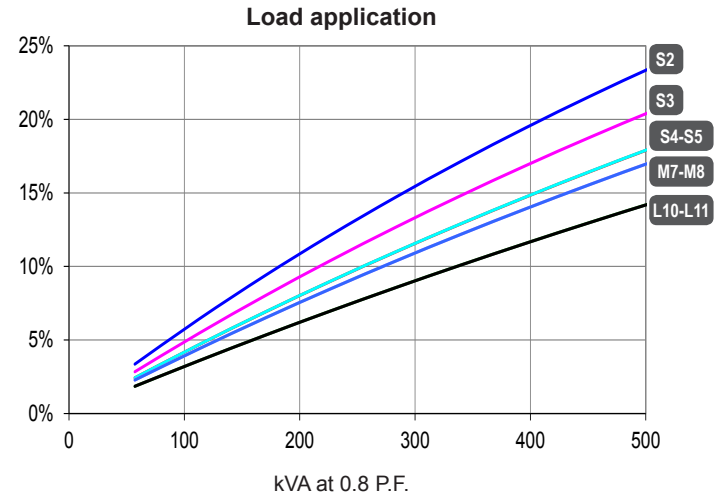
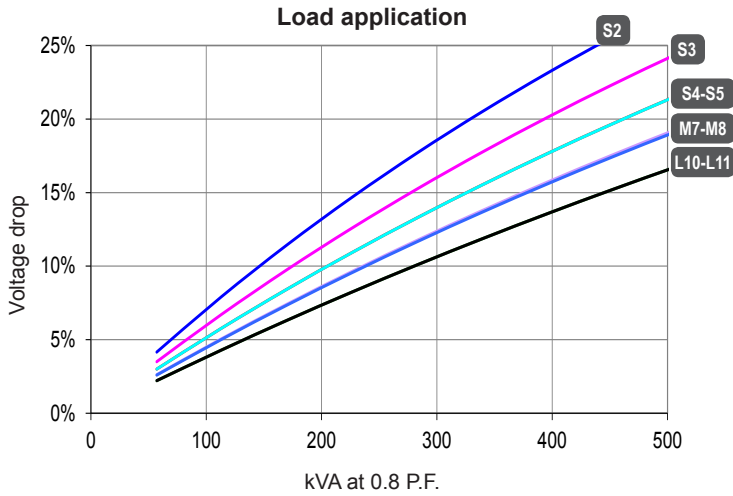
**Other class H / 480 V data**

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

Transient voltage variation 480V - 60 Hz

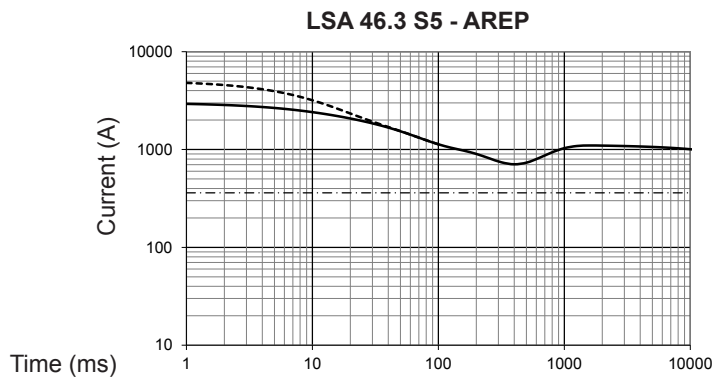
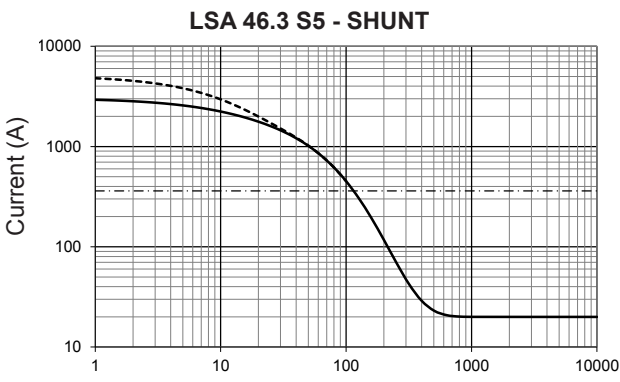
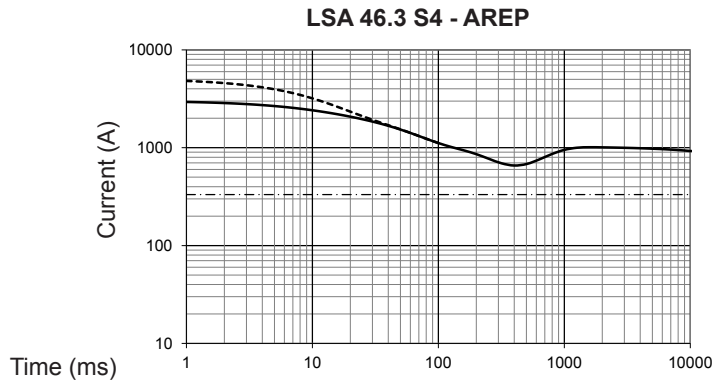
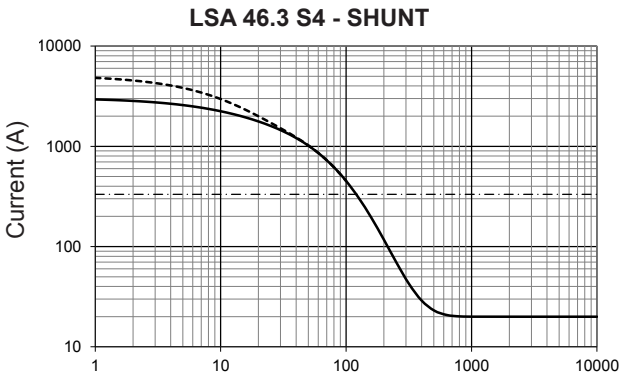
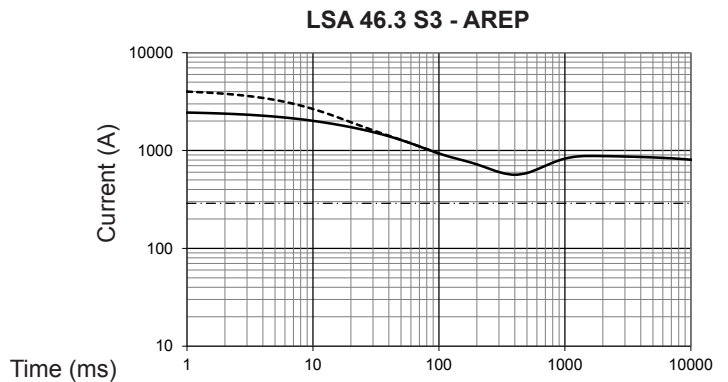
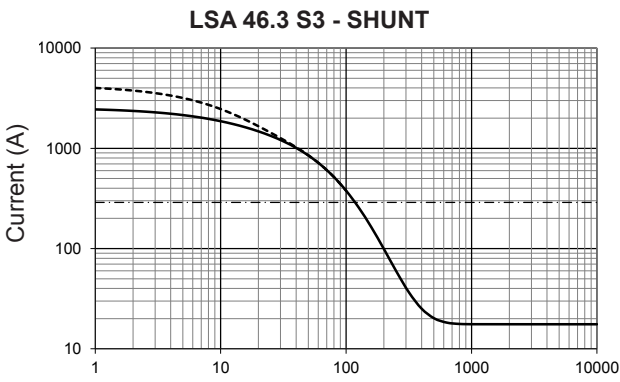
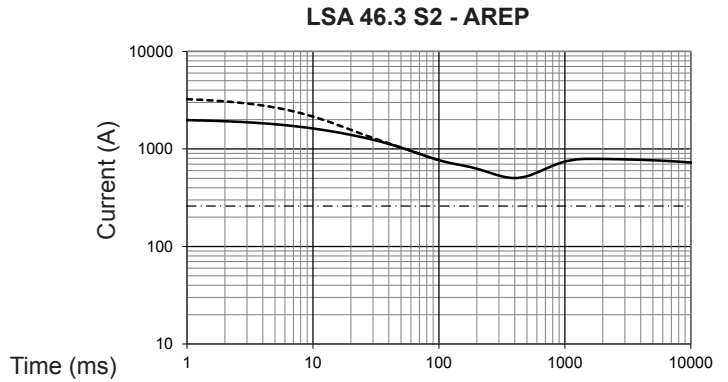
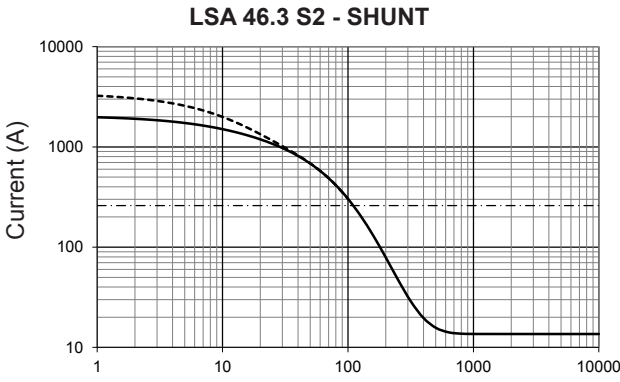
SHUNT system

AREP/PMG system



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

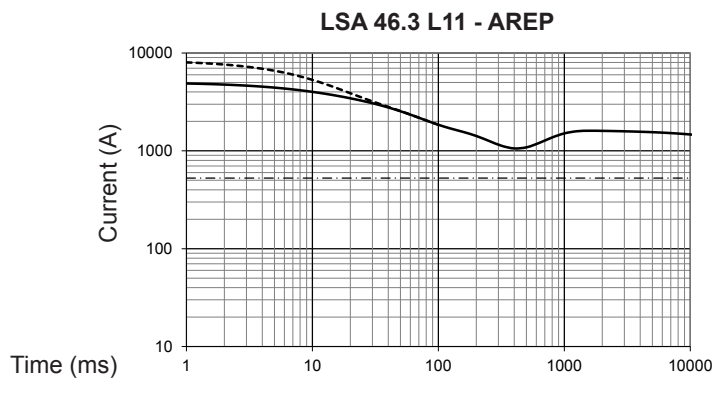
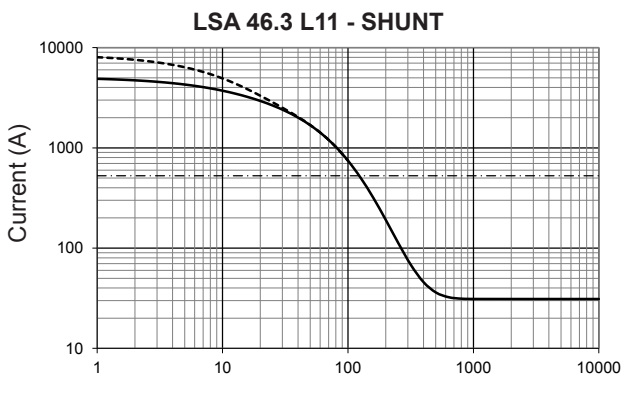
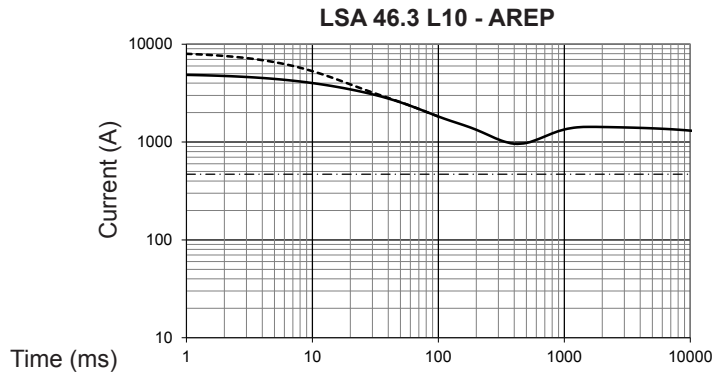
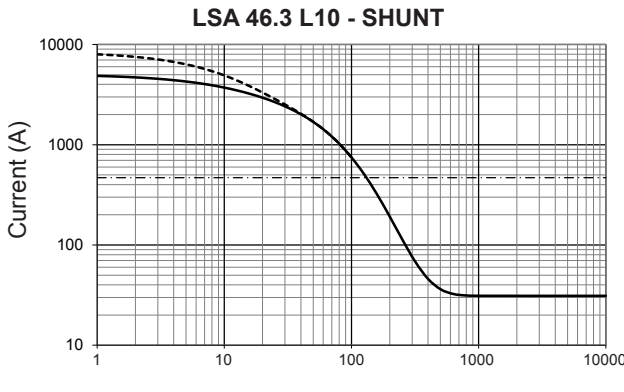
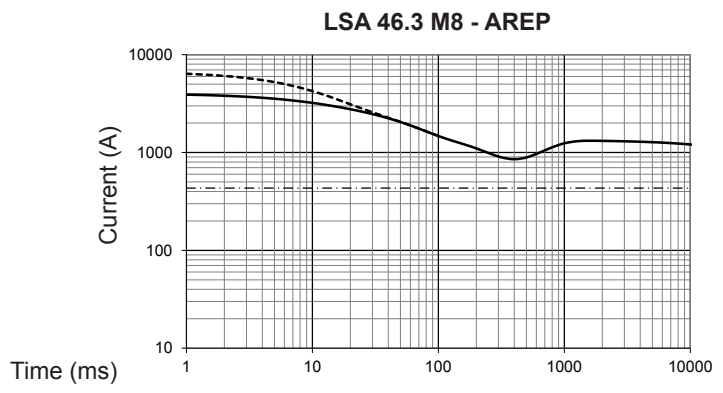
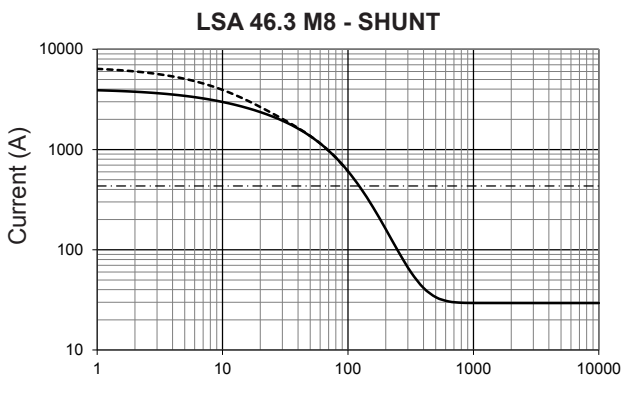
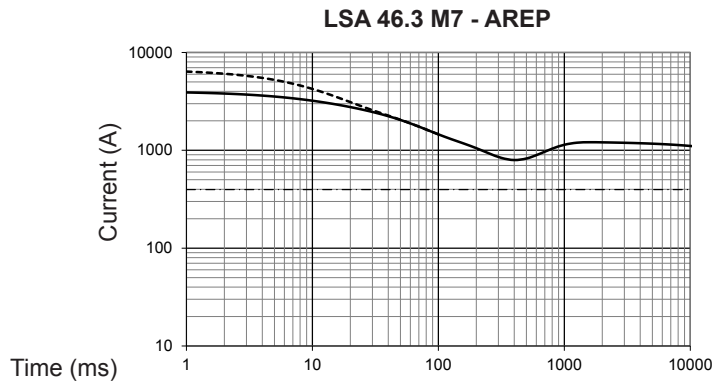
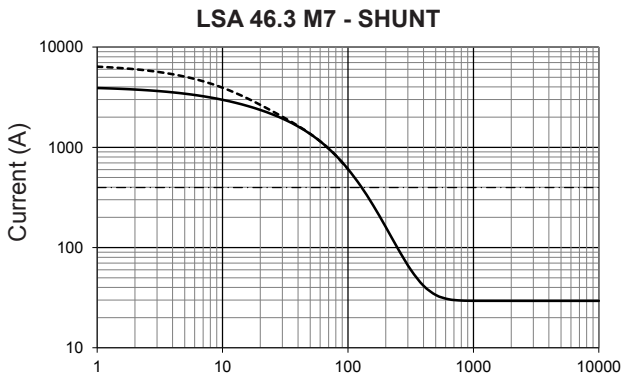
Symmetrical

Asymmetrical

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

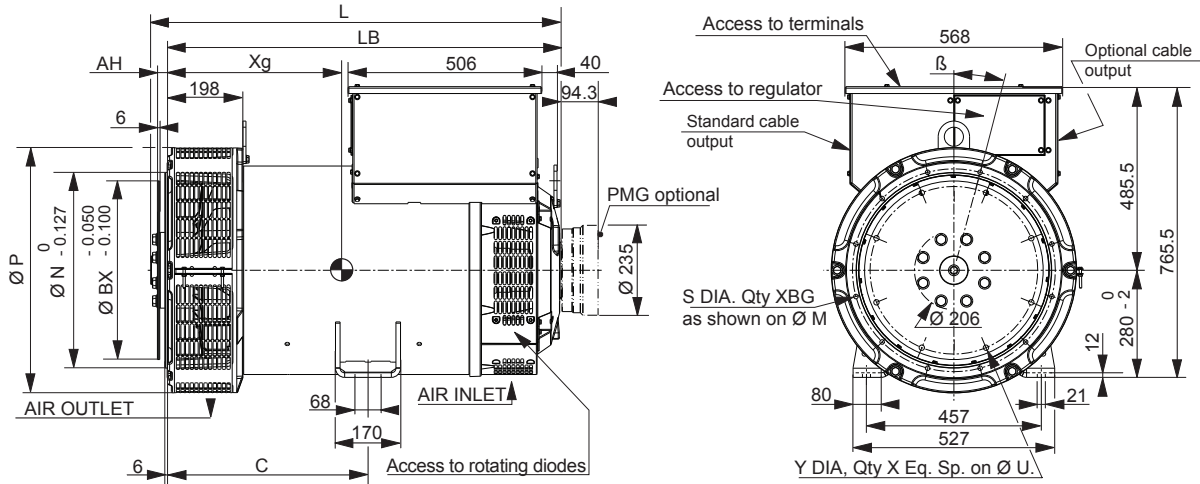


**Influence due to short-circuit**  
 Curves are based on a three-phase short-circuit.  
 For other types of short-circuit, use the following multiplication factors.

	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  
 - - - - -

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

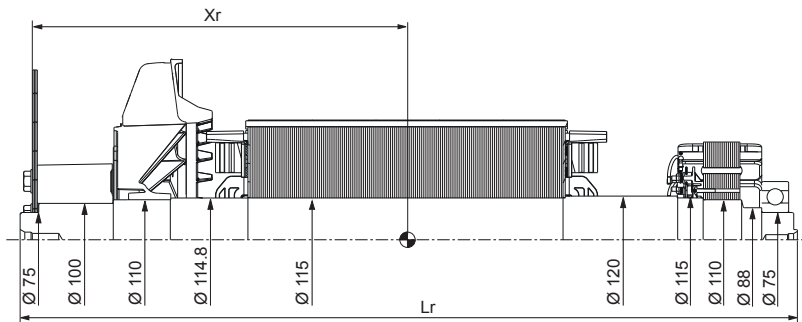
Coupling			
Flex plate	11 1/2	14	18
Flange S.A.E 3	X		
Flange S.A.E 2	X		
Flange S.A.E 1	X	X	
Flange S.A.E 1/2		X	
Flange S.A.E 0		X	X

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 463 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)								
Flex plate	S.A.E. 11 1/2				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.



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