



EMERSONTM
Industrial Automation



1860...2360 kVA - 50 Hz
2230...2832 kVA - 60 Hz

4164 en - 2010.12 / d



PARTNER ALTERNATORS

LSA 51.2 - 4 pole

Electrical and mechanical data

SPECIALLY ADAPTED FOR GENSET APPLICATIONS

The LSA 51.2 alternator is designed to be suitable for typical generator set applications, such as: backup, base production, cogeneration, marine applications, rental, telecommunications, etc.

COMPLIANT WITH INTERNATIONAL STANDARDS

The LSA 51.2 alternator conforms to the main international standards and regulations:

IEC 60034, NEMA MG 1.22, ISO 8528/3, CSA, UL 1446, UL 1004B on request, marine regulations, etc.

It can be integrated into a CE marked generator.

The LSA 51.2 is designed, manufactured and marketed in an ISO 9001 and ISO 14001 environment.

TOP OF THE RANGE ELECTRICAL PERFORMANCE

- Class H insulation.
- Standard 6-wire winding, 2/3 pitch, type no. 6S.
- Voltage range 50 Hz : 380V - 400V - 415V - 440 V.
- Voltage range 60 Hz : 380V - 416V - 440V - 480V.
- Ability to reconnect : 50 Hz : 220V - 230V - 240V / 60 Hz : 220 V - 240 V : consult factory.
- Other voltages are possible with optional adapted windings :
 - 50 Hz : 440 V (no. 7S), 500 V (no. 9S), 600 V (no. 22S or 23S), 690 V (no. 10S or 52S)
 - 60 Hz : 380 V and 416 V (no. 8S), 600 V (no. 9S).
- High efficiency and motor starting capacity.
- Total harmonic content < 3,5 %.
- R 791 interference suppression conforming to standard EN 55011 group 1 class B standard for the European zone (CE marking).

EXCITATION AND REGULATION SYSTEM SUITED TO THE APPLICATION

The LSA 51.2 can be supplied with AREP or PMG excitation system, according to the alternator specification.

Standard excitation system is AREP with R 449 A.V.R.

Excitation system			Regulation options				
Volage regulator	AREP	PMG	C.T. Current transformer for paralleling	R 726 Mains paralleling	R 731 3 Phase sensing	R 734 3 Phase sensing for unbalanced mains paralleling	P Remote voltage potentiometer
R 449	Std	Option	√	√	√	√	√
D 510	Option	Option	√	included	included	consult factory	√

Voltage regulator accuracy $\pm 0.5\%$. - √ : adaptation possible

PROTECTION SYSTEM SUITED TO THE ENVIRONMENT

- The LSA 51.2 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 8%.
 - Winding protections for harsh environments and relative humidity greater than 95%.
 - Space heaters.
 - Thermal RTD protection for winding.

REINFORCED MECHANICAL STRUCTURE USING FINITE ELEMENT MODELLING

- Compact and rigid assembly to better withstand genset or engine vibrations.
- Steel frame.
- Cast iron flanges and shields.
- Twin-bearing and single-bearing versions designed to be suitable for most engines on the market.
- Half-key balancing.
- Regreasable bearings.

ACCESSIBLE TERMINAL BOX PROPORTIONED FOR OPTIONAL EQUIPMENT

- Easy access to the voltage regulator and to the connections.
- Possible incorporation of accessories for paralleling, protection and measurement.

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Common data

Insulation class	H	Excitation system	A R E P + PMI or PMG
Winding pitch	2/3 (n° 6S)	A.V.R. model	R 449
Terminals	6	Voltage regulation (*)	± 0,5 %
Drip proof	IP 23	Sustained short-circuit current	300% (3 IN) : 10s
Altitude	≤ 1000 m	Total Harmonic Distortion (THD) (**)	< 3.5 %
Overspeed	2250 min-1	Waveform : NEMA = TIF - (* *)	< 50
Air flow	1,8 m³/s (50 Hz) - 2,2 m³/s (60 Hz)		

(*) Steady state duty. (**) 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								Stand-by / 40 °C			
Class / T° K		H / 125° K				F / 105° K				H / 150° K			
Phase		3 ph.				3 ph.				3 ph.			
Y		380V	400V	415V	440V	380V	400V	415V	440V	380V	400V	415V	440V
Δ*		220V	230V	240V		220V	230V	240V		220V	230V	240V	
LSA 51.2 S55	kVA	1860		1674		1696		1527		1953		1758	
	kW	1488		1339		1357		1222		1562		1406	
LSA 51.2 M60	kVA	2050		1845		1870		1683		2153		1937	
	kW	1640		1476		1496		1346		1722		1550	
LSA 51.2 L70	kVA	2160		1944		1970		1773		2268		2041	
	kW	1728		1555		1576		1418		1814		1633	
LSA 51.2 VL90	kVA	2360		2124		2152		1937		2502		2251	
	kW	1888		1700		1722		1550		2002		1801	

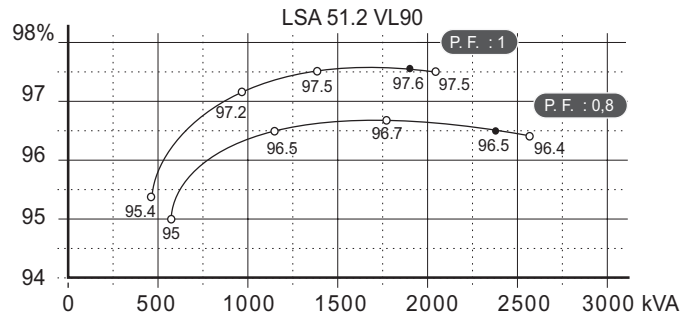
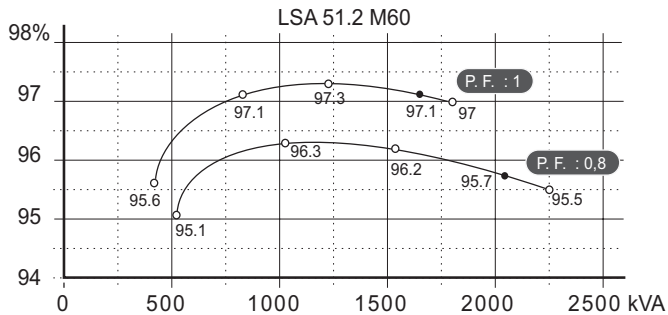
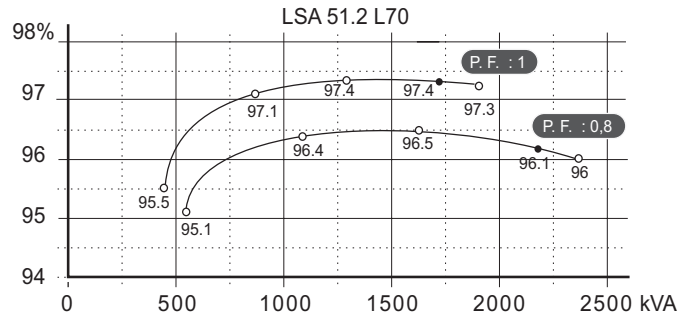
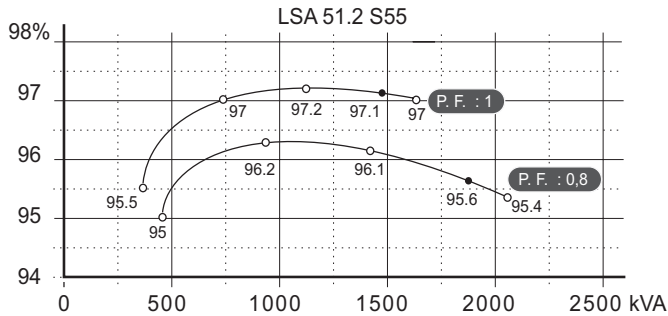
Δ* : Consult factory

Ratings 60 Hz - 1800 R.P.M.

kVA / kW - P.F. = 0,8																	
Duty / T° 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.				3 ph.				3 ph.				3 ph.			
Y		380V	416V	440V	480V	380V	416V	440V	480V	380V	416V	440V	480V	380V	416V	440V	480V
Δ*		220V	240V			220V	240V			220V	240V			220V	240V		
LSA 51.2 S55	kVA	1860	2019	2135	2230	1696	1841	1947	2034	1953	2119	2242	2342	2046	2220	2348	2453
	kW	1488	1615	1708	1784	1357	1473	1558	1627	1562	1695	1794	1874	1637	1776	1878	1962
LSA 51.2 M60	kVA	2050	2225	2353	2460	1870	2029	2146	2244	2153	2336	2471	2583	2255	2447	2588	2706
	kW	1640	1780	1882	1968	1496	1623	1717	1795	1722	1869	1977	2066	1804	1958	2070	2165
LSA 51.2 L70	kVA	2160	2344	2479	2590	1970	2138	2261	2362	2268	2461	2603	2720	2376	2578	2727	2849
	kW	1728	1875	1983	2072	1576	1710	1809	1890	1814	1969	2082	2176	1901	2062	2182	2279
LSA 51.2 VL90	kVA	2360	2442	2583	2832	2152	2227	2355	2583	2502	2564	2712	3002	2596	2686	2841	3115
	kW	1888	1954	2066	2266	1722	1782	1884	2066	2002	2051	2170	2402	2077	2149	2273	2492

Δ* : Consult factory

Efficiencies 50 Hz - P.F. : 1 / P.F. : 0,8



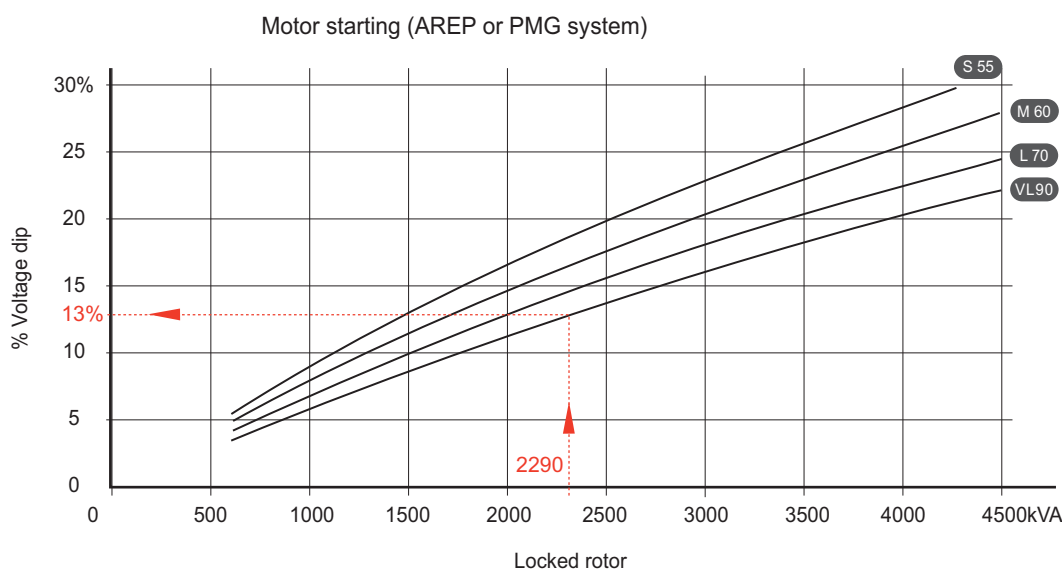
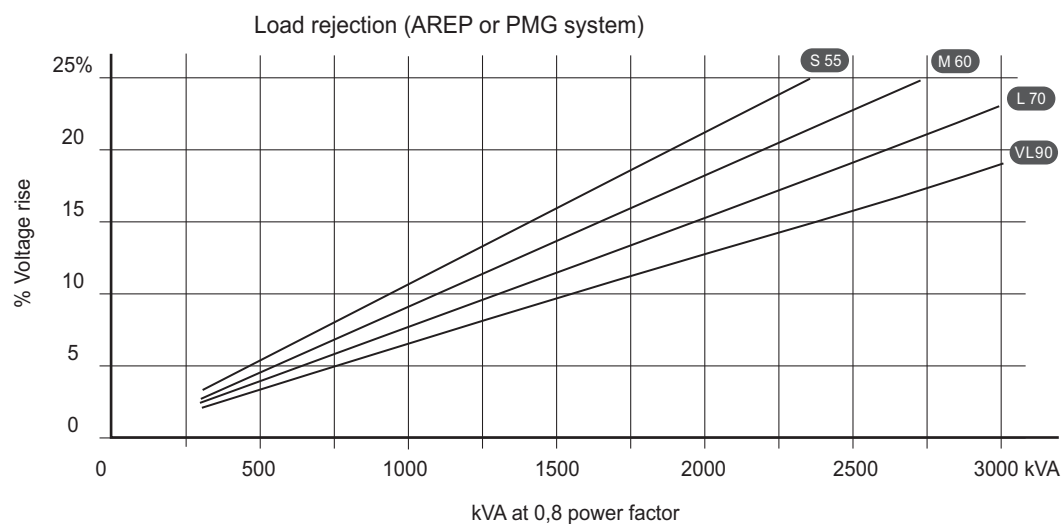
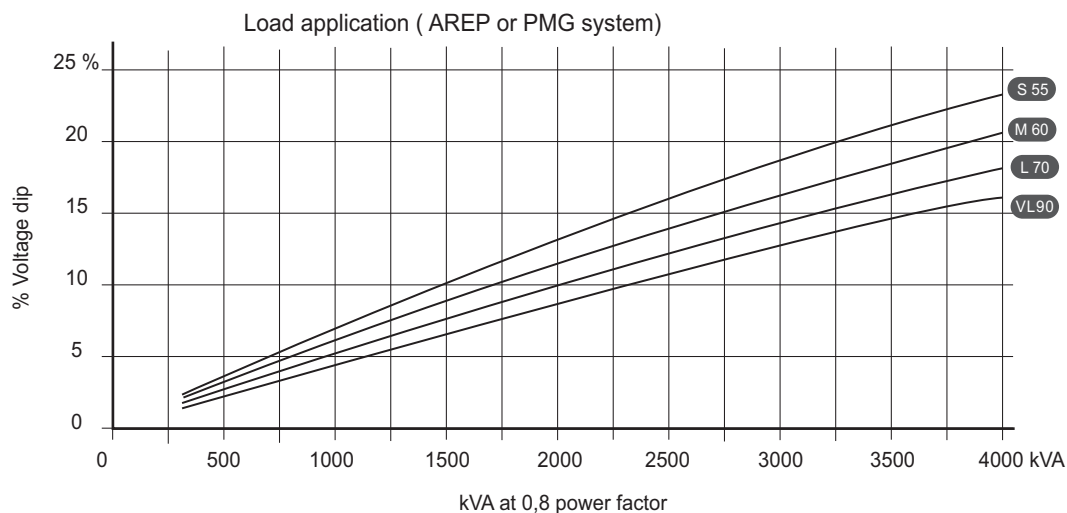
Reactances (%) . Time constants (ms) - Class H / 400 V

	S55	M60	L70	VL90
Kcc Short-circuit ratio	0.33	0.35	0.39	0.43
Xd Direct axis synchro.reactance unsaturated	374	357	321	291
Xq Quadra. axis synchr.reactance unsaturated	224	214	193	174
T'do Open circuit time constant	2660	2770	2910	3390
X'd Direct axis transient reactance saturated	28.4	26.8	23.9	21.4
T'd Short-Circuit transient time constant	237	245	254	294
X»d Direct axis subtransient reactance saturated	14.8	14	12.5	11,1
T»d Subtransient time constant	22	23	24	26
X»q Quadra. axis subtransient reactance saturated	18.5	17.5	15.6	13,9
Xo Zero sequence reactance unsaturated	3.5	3.3	2.9	2,6
X2 Negative sequence reactance saturated	16.6	15.7	14	12,5
Ta Armature time constant	39	41	45	49

Other data - Class H / 400 V

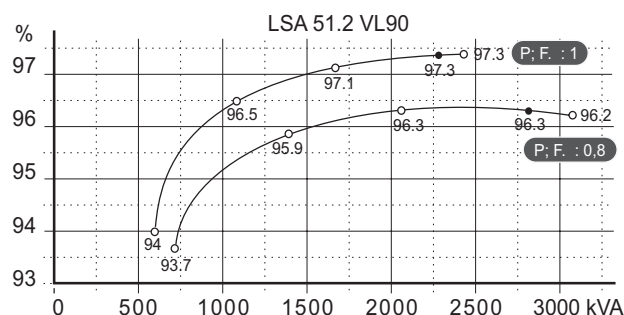
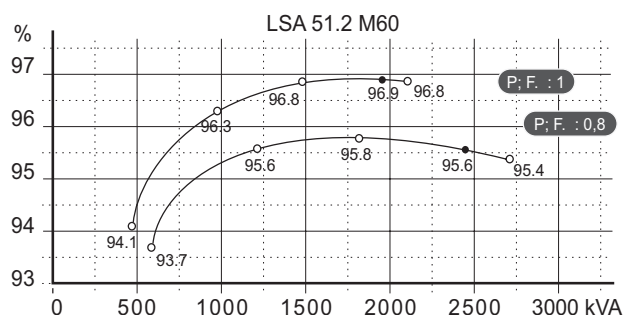
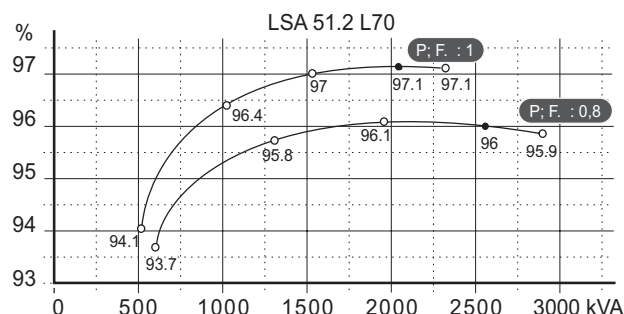
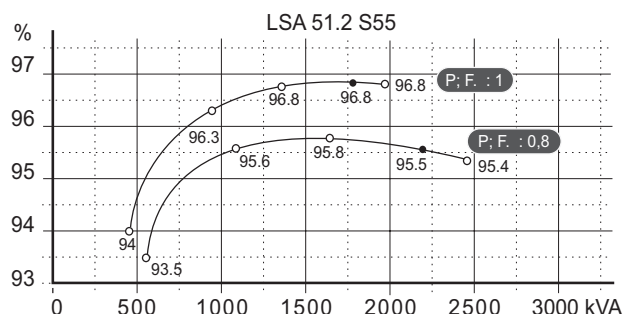
io (A) No load excitation current	1.3	1.4	1.3	1,4
ic (A) Full load excitation current	5.6	5.5	5.2	4,6
uc (V) Full load excitation voltage	64	63	59	48
ms Recovery time ($\Delta U = 20\%$ trans.)	700	700	700	700
kVA Motor start. ($\Delta U = 20\%$ sust.) or ($\Delta U = 50\%$ trans.)	3720	4100	4320	4500
% Transient dip (rated step load) - PF : 0,8 LAG	14.5	13.9	12.5	10.2
W No load losses	15300	16600	18200	20400
W Heat rejection	68000	73000	71000	68000

Transient voltage variation 400V - 50 Hz



- 1) For a starting P.F. other than 0,6 , the starting kVA must be multiplied by $K = \sin \phi / 0,6$
 Calculation example for a different P.F. : Starter motor kVA calculated at 0.4 P.F. = 2000 kVA
 $\sin \phi 0,4 = 0,9165$ $\rightarrow K = 1,145$ $\rightarrow$ kVA corrected = 2290 kVA $\rightarrow$ Voltage dip corresponding to VL90 = 13 %.
- 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 60 Hz - P.F. : 1 / P.F. : 0,8



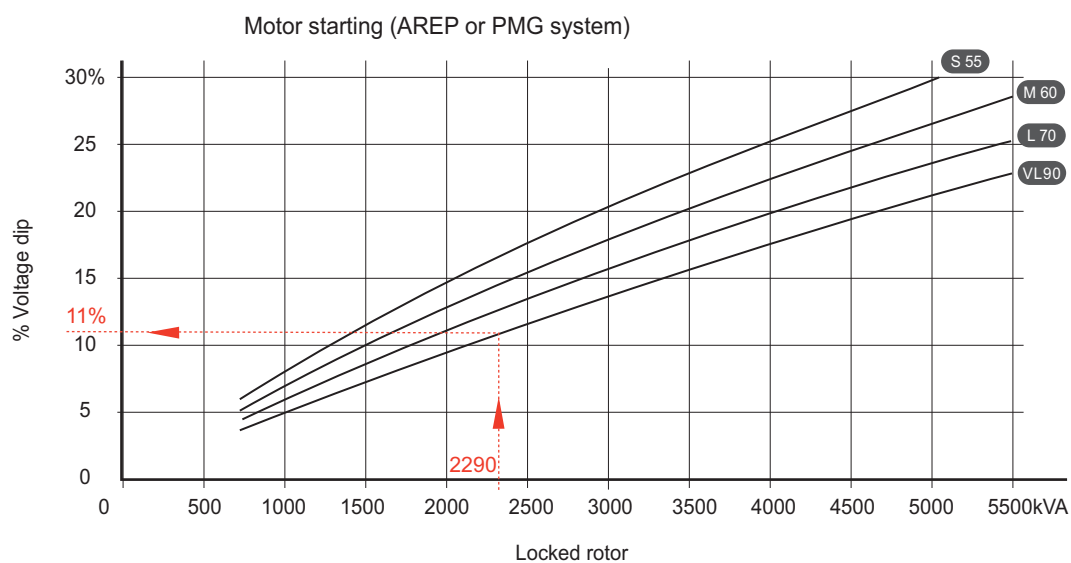
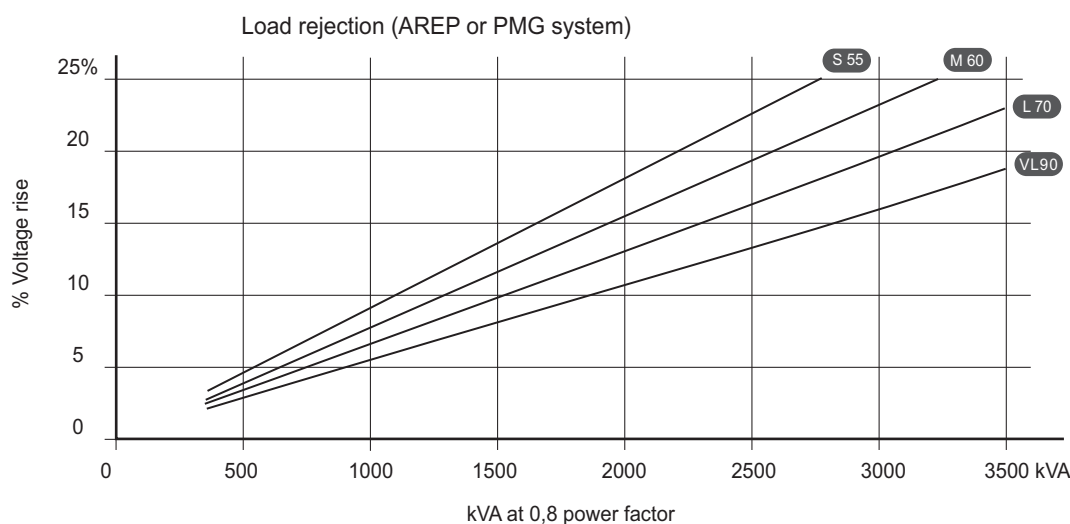
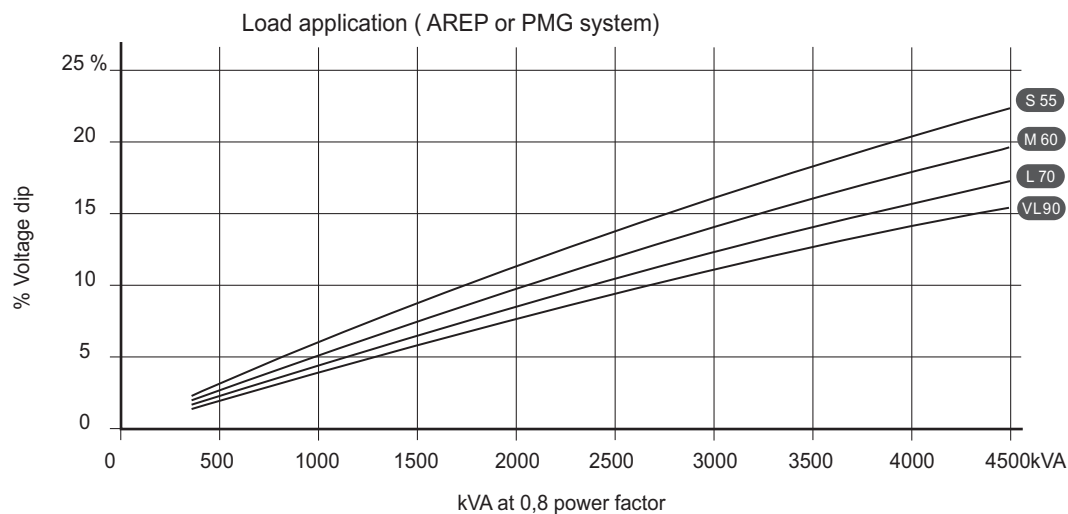
Reactances (%) . Time constants (ms) - Class H / 480 V

	S55	M60	L70	VL90
Kcc Short-circuit ratio	0.33	0.35	0.39	0.43
Xd Direct axis synchro.reactance unsaturated	374	357	326	291
Xq Quadra. axis synchro.reactance unsaturated	224	214	195	174
T'do Open circuit time constant	2660	2770	3230	3390
X'd Direct axis transient reactance saturated	28.3	26.8	24.4	21.4
T'd Short-Circuit transient time constant	237	245	284	294
X»d Direct axis subtransient reactance saturated	14.8	14	12.7	11.1
T»d Subtransient time constant	22	23	24	26
X»q Quadra. axis subtransient reactance saturated	18.4	17.5	15.9	13.9
Xo Zero sequence reactance unsaturated	3.5	3.3	3.0	2.6
X2 Negative sequence reactance saturated	16.6	15.7	14.3	12.5
Ta Armature time constant	39	41	45	49

Autres caractéristiques classe H / 480 V

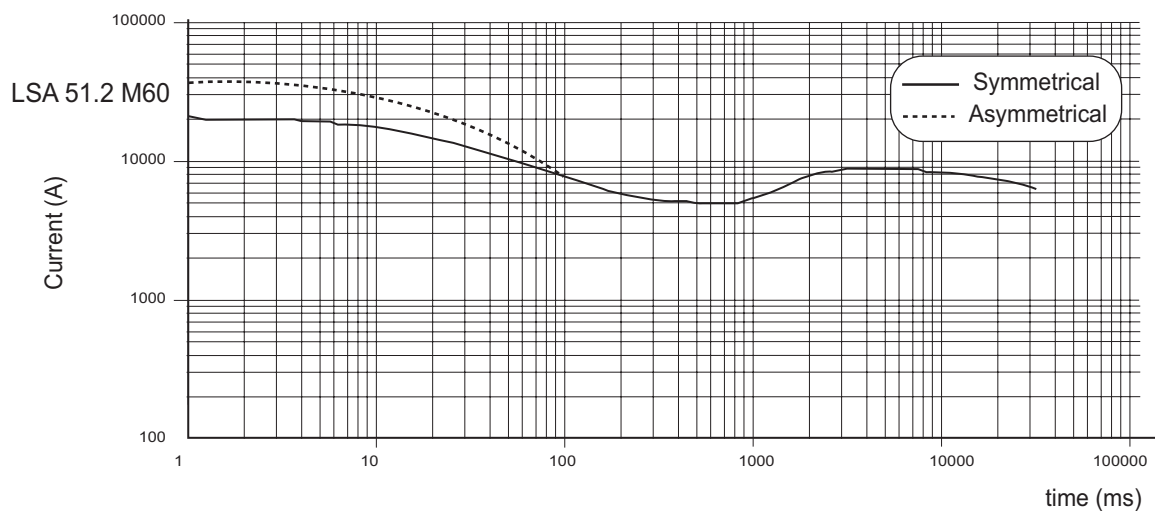
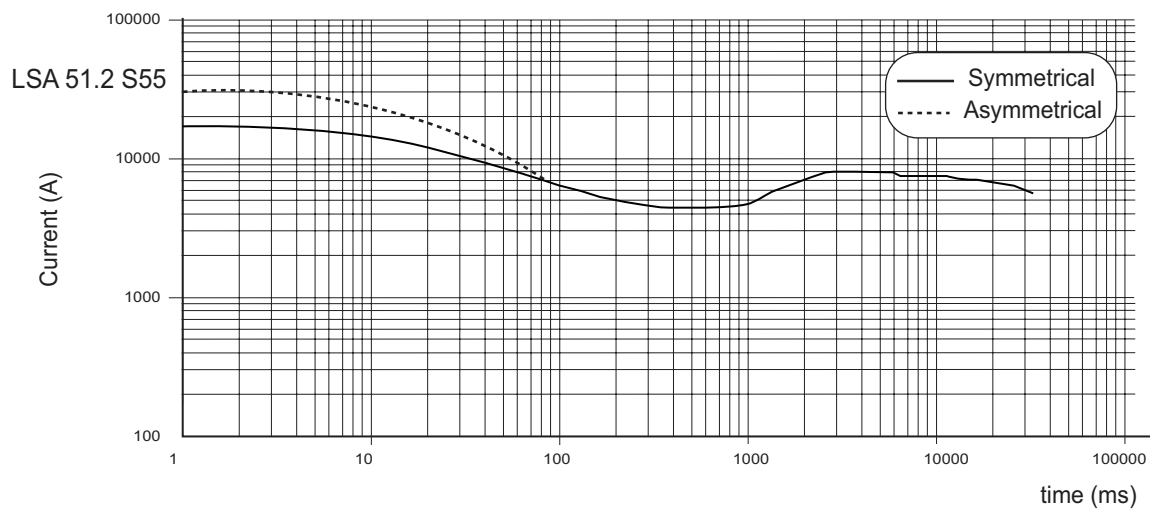
io (A) No load excitation current	1.3	1.4	1.4	1.4
ic (A) Full load excitation current	5.6	5.5	5.0	4.6
uc (V) Full load excitation voltage	64	63	53	48
ms Recovery time ($\Delta U = 20\%$ trans.)	700	700	700	700
kVA Motor start. ($\Delta U = 20\%$ sust.) or ($\Delta U = 50\%$ trans.)	4460	4920	5180	5400
% Transient dip (rated step load) - PF : 0,8 LAG	12.4	11.8	11.4	10.2
W No load losses	27100	28800	31100	34200
W Heat rejection	83000	91000	89000	87000

Variation de tension transitoire 480V - 60 Hz



- 1) For a starting P.F. other than 0,6 , the starting kVA must be multiplied by $K = \text{Sine } \varnothing / 0,8$
 Calculation example for a different P.F. : Starter motor kVA calculated at 0.4 P.F. = 2000 kVA
 $\text{Sin } \varnothing 0,4 = 0,9165 \rightarrow K = 1,145 \rightarrow \text{kVA corrected} = 2290 \text{ kVA} \rightarrow \text{Voltage dip corresponding to VL90} = 11 \%$
- 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)



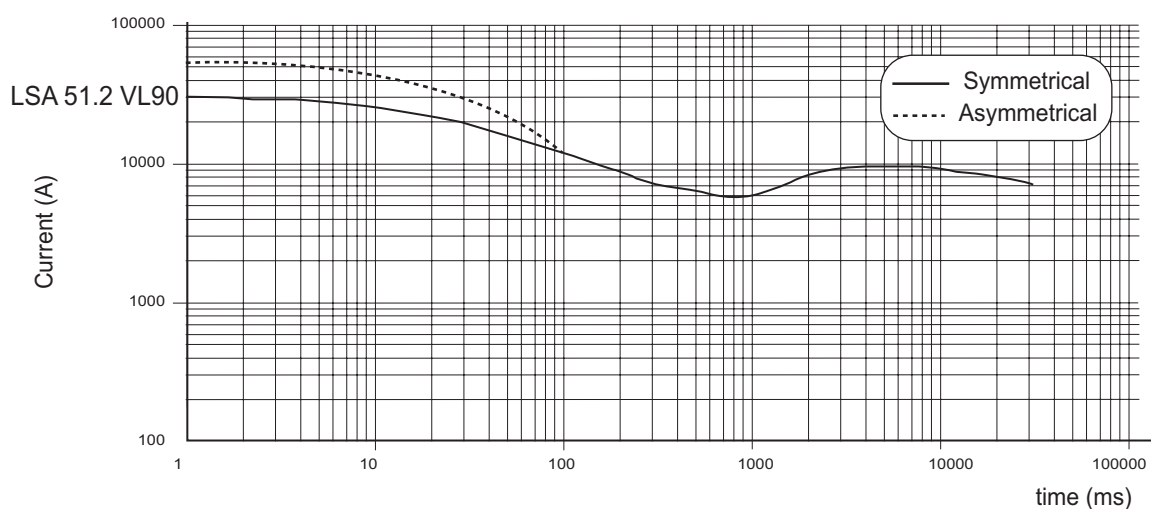
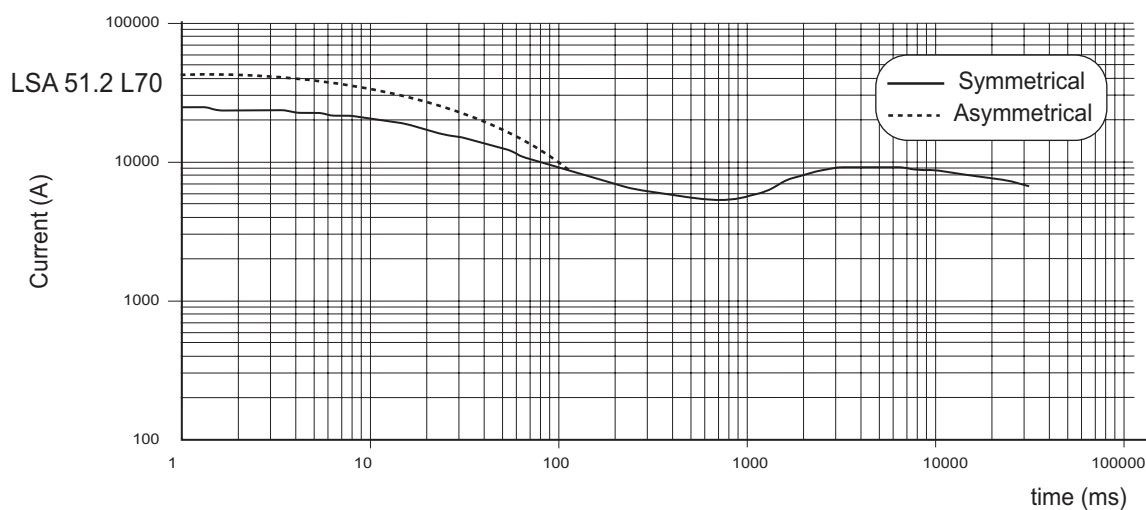
Influence due to connexion

Curves shown are for star connection (Y).

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)



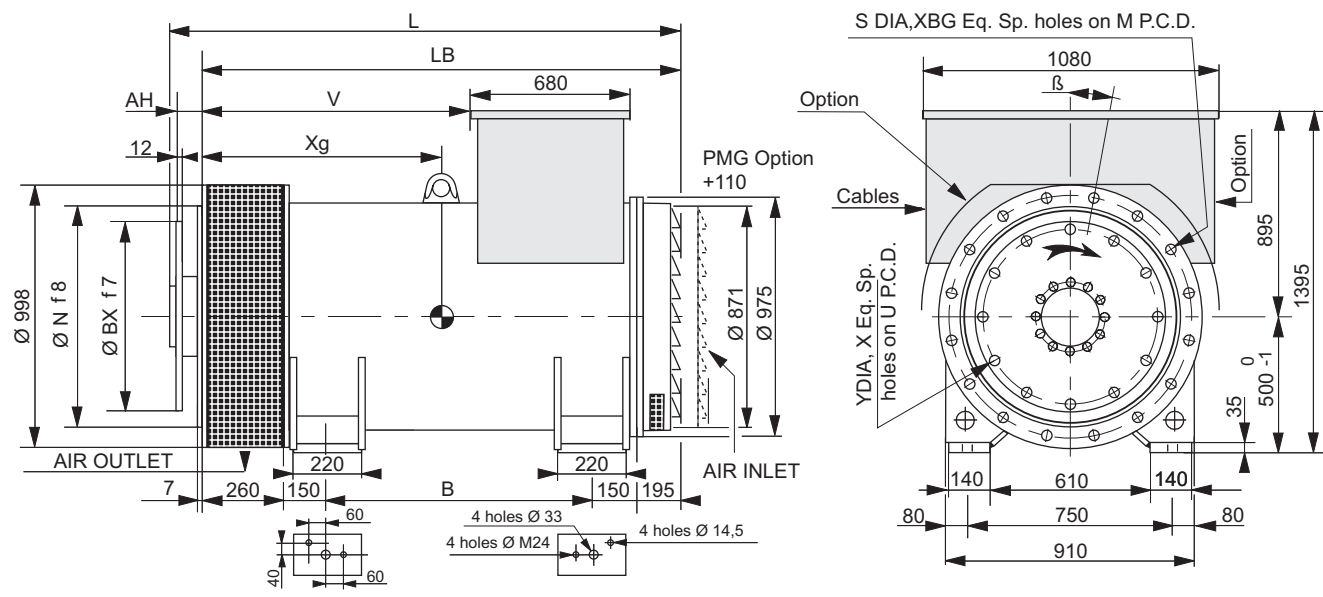
Influence due to short-circuit.

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
Sustained	1	1,5	2,2
Max sustained duration (AREP/ PMG)	10 sec.	5 sec.	2 sec.

Single bearing dimensions

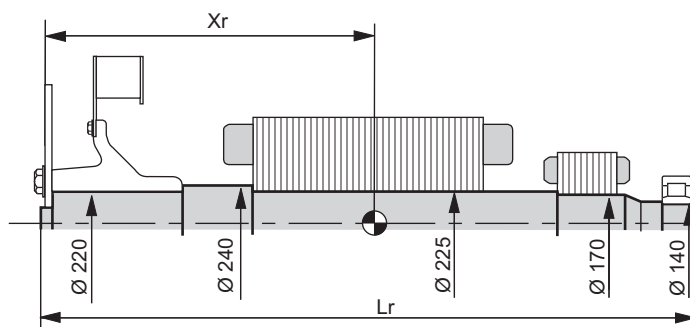


Frame dimensions (mm) and weight (kg)							Coupling		
TYPE	L without PMG	LB	B	V	Xg	Weight (kg)	Flange	0	00
LSA 51.2 S55	1677	1655	900	744	735	3745	Flex plate S.A.E 24		X
LSA 51.2 M60	1777	1755	1000	844	770	4040	Flex plate S.A.E 21		X
LSA 51.2 L70	1877	1855	1100	944	825	4445	Flex plate S.A.E 18	X	X
LSA 51.2 VL90	1977	1955	1200	1044	885	4995			

Flange dimensions (mm)					
S.A.E.	N	M	XBG	S	β
0	647.7	679.5	16	14	11°15'
00	787.4	850.9	16	14	11° 15'

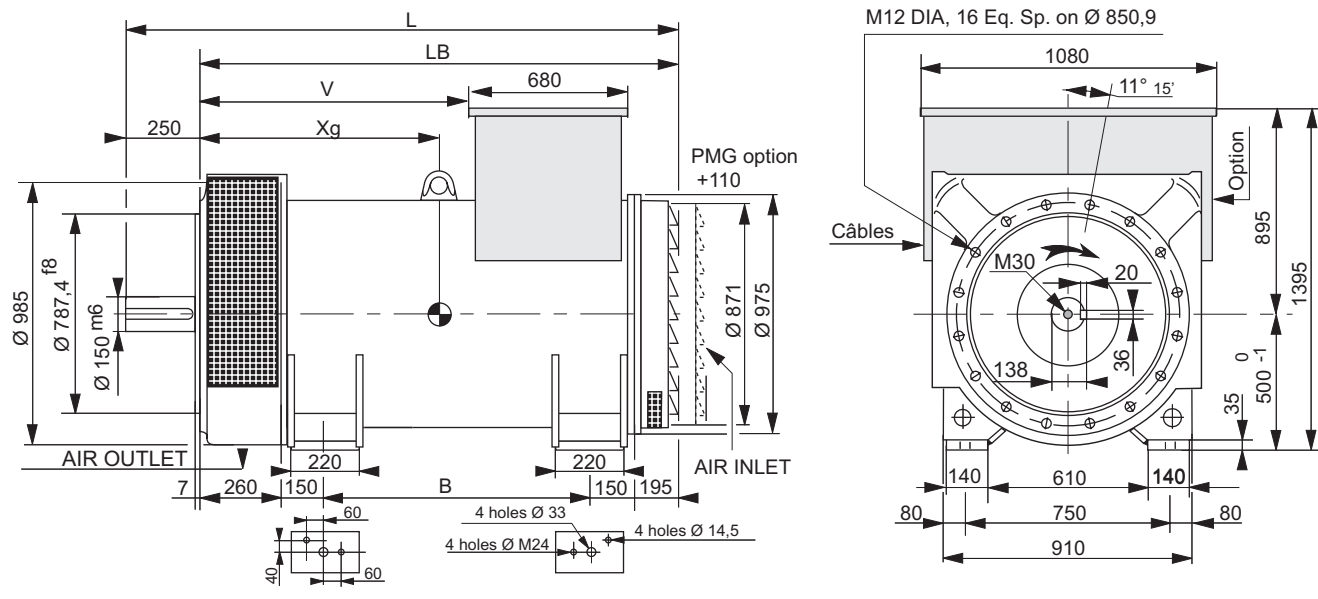
Flex plate dimensions (mm)					
S.A.E.	BX	U	X	Y	AH
24	733.4	692.1	12	21	0
21	673.1	641.3	12	18	0
18	571.5	542.9	6	18	15.8

Torsional analysis data



Centre of gravity : Xr (mm), rotor length Lr (mm), Weight : M (kg), Moment of inertia : J (kgm²) : (4J = MD²)												
TYPE	Flex plate S.A.E. 18				Flex plate S.A.E. 21				Flex plate S.A.E. 24			
	Xr	Lr	M	J	Xr	Lr	M	J	Xr	Lr	M	J
LSA 51.2 S55	661	1555.5	1357	41.1	643	1555.5	1359	41.9	640	1555.5	1365	42.6
LSA 51.2 M60	703	1655.5	1475	44.8	685	1655.5	1479	45.6	682	1655.5	1483	46.3
LSA 51.2 L70	754	1755.5	1630	50	736	1755.5	1632	50.8	734	1755.5	1638	51.6
LSA 51.2 VL90	819	1855.5	1833	57.2	801	1855.5	1835	58	799	1855.5	1841	58.8

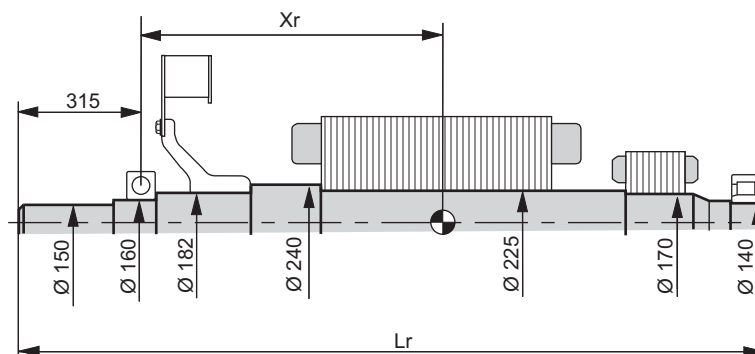
Two bearing dimensions



Frame dimensions (mm) and weight (kg)

TYPE	L without PMG	LB	B	V	Xg	Weight (kg)
LSA 51.2 S55	1905	1655	900	744	735	3725
LSA 51.2 M60	2005	1755	1000	844	770	4020
LSA 51.2 L70	2105	1855	1100	944	825	4425
LSA 51.2 VL90	2205	1955	1200	1044	885	4975

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 51.2 S55	610.8	1783.5	1279	38.9
LSA 51.2 M60	652.6	1883.5	1396	42.6
LSA 51.2 L70	703.7	1983.5	1551	47.8
LSA 51.2 VL90	765.5	2083.5	1753	55.1