LEROY SOMER®

3819 en - 07.2009 / e

Alternators
LSA 43.2 - 4 Pole

Electrical and mechanical data

SPECIALLY ADAPTED FOR APPLICATIONS

The LSA 43.2 alternator is designed to be suitable for typical generator applications, such as: backup, standard production, cogeneration, marine applications, rental, telecommunications, etc.

COMPLIANT WITH INTERNATIONAL STANDARDS

The LSA 43.2 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 incorporated into a CE marked generator.
The LSA 43.2 is designed, manufactured and marketed in an ISO 9001 environment.

TOP OF THE RANGE ELECTRICAL PERFORMANCE

- Class H insulation.
- Standard 12-wire re-connectable winding, 2/3 pitch, type no. 6 .
- Voltage range: 220 V - 240 V and 380 V - 415 V (440 V) - 50 Hz / 208 V - 240 V and 380 V - 480 V - 60 Hz.
- High efficiency and motor starting capacity.
- Other voltages are possible with optional adapted windings:
  - 50 Hz: 440 V (no. 7), 500 V (no. 9), 600 V (no. 22 or 23), 690 V (no. 10 or 52)
  - 60 Hz: 380 V and 416 V (no. 8), 600 V (no. 9).
- Total harmonic content < 2%.
- R 791 interference suppression conforming to standard EN 55011 group 1 class B standard for European zone (CE marking).

EXCITATION AND REGULATION SYSTEM SUITED TO THE APPLICATION

Excitation system				Regulation options				
Voltage regulator	**SHUNT**	**AREP**	**PMG**	**T.I.** Current transformer for paralleling	**R 726** Mains paralleling	**R 731** 3-phase sensing	**R 734** 3-phase sensing on mains paralleling unbalanced	**P** Remote voltage potentiometer
R 250	**Std**	**-**	**-**	**-**	**-**	**-**	**-**	√
R 438	**-**	**Std**	**Std**	√	√	√	√	√
R 448	**optional**	**-**	**-**	√	√	√	√	√
D 510	**-**	**optional**	**optional**	√	**included**	**included**	**NA**	√

Voltage regulator accuracy +/- 0.5%. - √ : possible adaptation - NA : not possible.

PROTECTION SYSTEM SUITED TO THE ENVIRONMENT

- The LSA 43. 2 is IP 23.
- Standard winding protection for clean environments with relative humidity ≤ 95 %, including indoor marine environments.

Options:
Filters on air inlet and air outlet (IP 44).
Winding protections for harsh environments and relative humidity greater than 95%.
Space heaters.
Thermal protection for windings 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.
- Greased for life bearings.

ACCESSIBLE TERMINAL BOX PROPORTIONED FOR OPTIONAL EQUIPMENT

- Easy access to the voltage regulator and to the connections.
- Possible clusion of accessories for paralleling, protection and measurement.
- 8 way terminal block for reconnecting voltage reconnection.

Option :
D 510 digital AVR fitted in the terminal box.

Common data

Insulation class	H	Excitation system	SHUNT	A R E P or PMG
Winding pitch	2/3 (bob 6)	A.V.R. model	R 250	R 438
Terminals	12	Voltage regulation (*)	± 0,5 %	± 0,5 %
Drip proof	IP 23	Sustained short-circuit current	-	300% (3 IN) : 10s
Altitude	≤ 1000 m	Total harmonic TGH / THC (**)	at no load < 2 % - on load < 2 %	
Overspeed	2250 min^{-1}	Waveform : NEMA = TIF	< 50	
Air flow	0,27 m^3/s (50Hz)/ 0,32 (60Hz)	Wave form : I.E.C. = THF	< 2 %	

(*) Steady state duty. (**) Total harmonic content line to line, at no load or full rated linear and balanced load.

Ratings 50 Hz - 1500 R.P.M.

kVA / kW - Power factor = 0,8

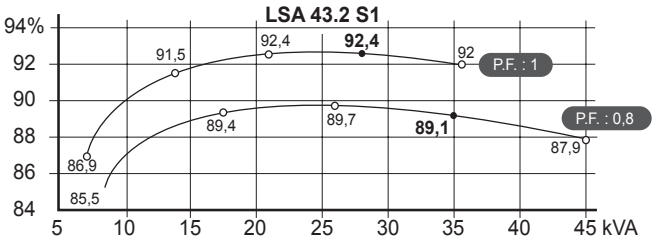
Duty T°C		Continuous duty 40°C					Continuous duty 40°C					Stand-by / 40 °C					Stand-by / 27 °C				
Class / T° K		H / 125° K					F / 105° K					H / 150° K					H / 163° K				
Phase		**3 ph.**				1 ph.	**3 ph.**				1 ph.	**3 ph.**				1 ph.	**3 ph.**				1 ph.
Y		380V	400V	415V	440V	ΔΔ	380V	400V	415V	440V	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	
43.2 S1	kVA	35	**35**	35	35	24	33	**33**	33	33	22	40	**40**	40	40	26	45	**45**	45	45	27
	kW	*28*	***28***	*28*	*28*	*19*	*26*	***26***	*26*	*26*	*18*	*32*	***32***	*32*	*32*	*21*	*36*	***36***	36	*36*	*22*
43.2 S15	kVA	40	**40**	40	40	28	36	**36**	36	36	26	44	**44**	44	44	30	47	**47**	47	47	31
	kW	32	***32***	32	*32*	*22*	*29*	***29***	*29*	*29*	*21*	*35*	***35***	*35*	*35*	*24*	*38*	***38***	*38*	*38*	*25*
43.2 S25	kVA	45	**45**	45	45	31	43	**43**	43	43	29	49	**49**	49	49	33	52	**52**	52	52	34
	kW	36	***36***	36	*36*	*25*	*34*	***34***	*34*	*34*	*23*	*39*	***39***	*39*	*39*	*26*	*42*	***42***	*42*	*42*	*27*
43.2 S35	kVA	50	**53**	52	47	33	45	**48**	47	42	30	53	**56**	55	50	35	55	**58**	57	53	36
	kW	40	***42***	*42*	*38*	*26*	*36*	***38***	*38*	*34*	*24*	*42*	***45***	*44*	*40*	*28*	*44*	***46***	*45*	*42*	*29*
43.2 M45	kVA	56	**60**	60	60	35	51	**53**	53	53	32	59	**63**	63	63	37	62	**66**	66	66	38
	kW	45	***48***	*48*	*48*	*28*	*41*	***42***	*42*	*42*	*26*	*47*	***50***	*50*	*50*	*30*	*50*	***53***	53	53	*30*
43.2 L65	kVA	67	**70**	69	68	41	61	**62**	63	62	38	71	**74**	73	73	43	74	**77**	76	75	45
	kW	53	***56***	*55*	*55*	*33*	*49*	***50***	*50*	*50*	*30*	*57*	***59***	*58*	*58*	*34*	*59*	***62***	61	60	*36*
43.2 L8	kVA	78	**80**	78	76	48	71	**73**	71	70	45	83	**84**	83	83	53	86	**88**	86	84	54
	kW	62	***64***	*63*	*61*	*38*	*57*	***58***	*57*	*56*	*36*	*66*	***67***	*66*	*66*	*42*	*69*	***70***	69	67	*43*

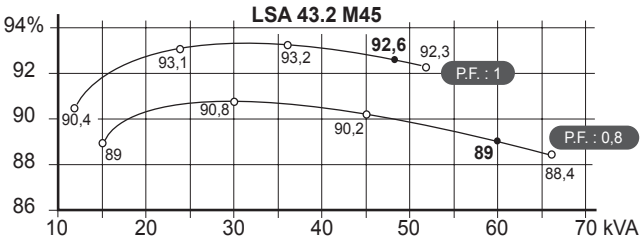
Ratings 60 Hz - 1800 R.P.M.

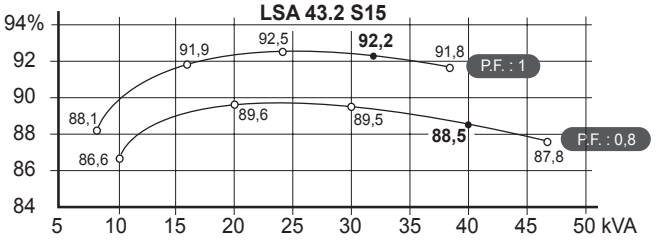
kVA / kW - Power factor = 0,8

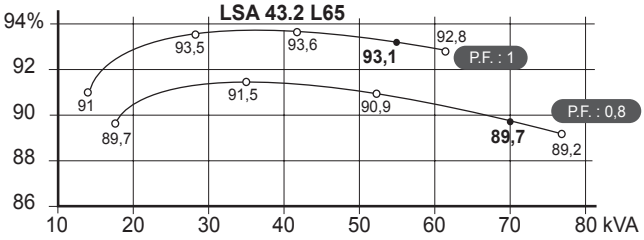
Duty T°C		Continuous duty 40°C					Continuous duty 40°C					Stand-by / 40 °C					Stand-by / 27 °C				
Class / T° K		H / 125° K					F / 105° K					H / 150° K					H / 163° K				
Phase		**3 ph.**				1 ph.	**3 ph.**				1 ph.	**3 ph.**				1 ph.	**3 ph.**				1 ph.
Y		380V	416V	440V	480V	ΔΔ	380V	416V	440V	480V	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	
43.2 S1	kVA	44	44	44	**44**	28	40	40	40	**40**	25	50	50	50	**50**	29	56	56	56	**56**	30
	kW	*35*	*35*	*35*	***35***	*22*	*32*	*32*	*32*	***32***	*20*	*40*	*40*	*40*	***40***	*23*	*45*	*45*	*45*	***45***	*24*
43.2 S15	kVA	50	50	50	**50**	31	45	45	45	**45**	28	54	55	55	**55**	33	56	59	59	**59**	34
	kW	*40*	*40*	*40*	***40***	*25*	*36*	*36*	*36*	***36***	*22*	*43*	*44*	*44*	***44***	*26*	*45*	*47*	*47*	***47***	*27*
43.2 S25	kVA	51	54	56	**56**	35	47	50	50	**50**	32	54	58	59	**59**	37	56	60	62	**62**	38
	kW	*41*	*43*	*45*	***45***	*28*	*38*	*40*	*40*	***40***	*26*	*43*	*46*	*47*	***47***	*30*	*45*	*48*	*50*	***50***	*30*
43.2 S35	kVA	53	58	60	**66**	36	49	53	55	**59**	34	57	61	64	**69**	39	59	63	66	**73**	40
	kW	*42*	*46*	*48*	***53***	*29*	*39*	*42*	*44*	***47***	*27*	*46*	*49*	*51*	***55***	*31*	*47*	*50*	*53*	***58***	*32*
43.2 M45	kVA	57	62	64	**71**	39	53	57	59	**64**	36	62	66	69	**75**	42	64	68	71	**78**	43
	kW	*46*	*50*	*51*	***57***	*31*	*42*	*46*	*47*	***51***	*29*	*50*	*53*	*55*	***60***	*34*	*51*	*54*	*57*	**62**	*34*
43.2 L65	kVA	67	72	75	**83**	45	62	66	69	**74**	42	72	77	80	**87**	48	74	80	84	**91**	50
	kW	*54*	*58*	*60*	***66***	*36*	*50*	*53*	*55*	***59***	*34*	*58*	*62*	*64*	***70***	*38*	*59*	*64*	*67*	**73**	*40*
43.2 L8	kVA	80	85	88	**95**	53	73	78	81	**87**	49	86	91	95	**102**	57	88	95	99	**107**	59
	kW	*64*	*68*	*70*	***76***	*42*	*58*	*62*	*65*	***70***	*39*	*69*	*73*	*76*	***82***	*46*	*70*	*76*	*79*	**86**	*47*

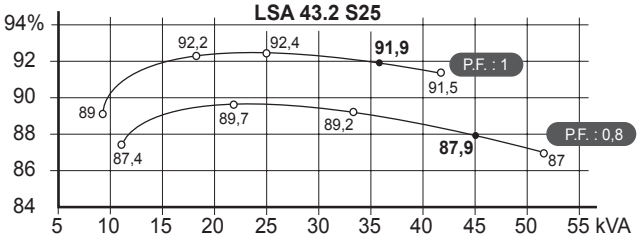
Efficiencies 50 Hz - P.F. : 1 / P.F. : 0,8

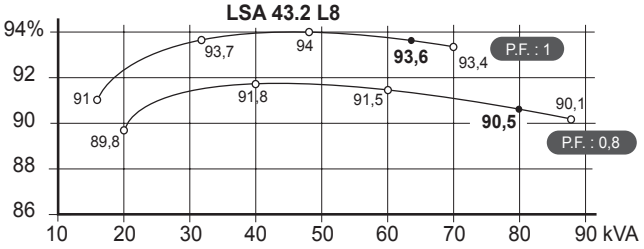


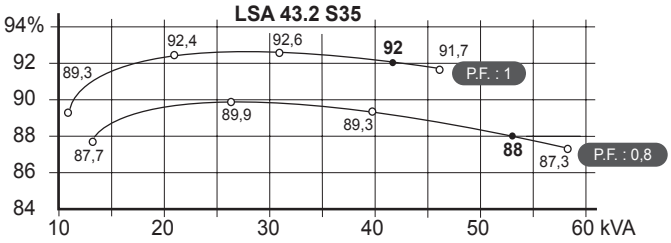












Reactances (%) . Time constants (ms) - Class H / 400 V

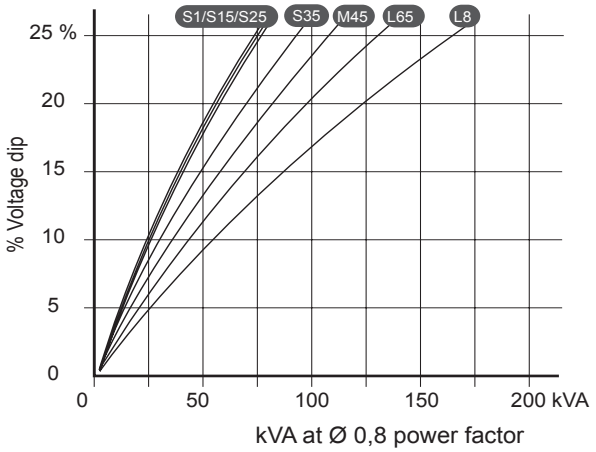
		S1	S15	S25	S35	M45	L65	L8
Kcc	Short-circuit ratio	0,54	0,48	0,42	0,43	0,39	0,37	0,41
Xd	Direct axis synchro.reactance unsaturated	223	255	287	292	304	310	284
Xq	Quadra. axis synchr.reactance unsaturated	134	153	172	175	182	186	170
T'do	Open circuit time constant	1131	1131	1131	1177	1270	1354	1431
X'd	Direct axis transient reactance saturated	9,8	11,2	12,6	12,4	11,9	11,4	9,9
T'd	Short-Circuit transient time constant	50	50	50	50	50	50	50
X"d	Direct axis subtransient reactance saturated	4,9	5,6	6,3	6,2	5,9	5,7	5
T"d	Subtransient time constant	5	5	5	5	5	5	5
X"q	Quadra. axis subtransient reactance saturated	6,1	7	7,9	7,7	7,4	7,1	6,3
Xo	Zero sequence reactance unsaturated	0,5	0,8	0,1	0,7	0,5	0,8	0,1
X2	Negative sequence reactance saturated	5,6	6,3	7,1	7	6,7	6,4	5,7
Ta	Armature time constant	8	8	8	8	8	8	8

Others data - Class H / 400 V

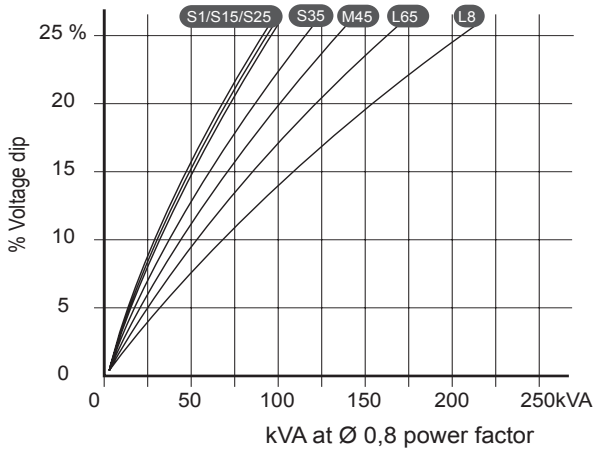
io (A)	No load excitation current (SHUNT / AREP or PMG)	0,5/1	0,5/1	0,5/1	0,5/1	0,4/0,8	0,4/0,8	0,4/0,8
ic (A)	Full load excitation current (SHUNT / AREP or PMG)	1,3/2,6	1,5/3	1,6/3,2	1,8/3,6	1,6/3,2	1,6/3,2	1,6/3,2
uc (V)	Full load excitation voltage (SHUNT / AREP or PMG)	24/12	27/13	30/15	32/16	30/15	29/15	29/14
ms	Recovery time (ΔU = 20 % trans.)	500	500	500	500	500	500	500
kVA	Motor start. (ΔU = 20% sust.) or (ΔU = 50% trans.) SHUNT	120	120	120	128	156	184	213
kVA	Motor start. (ΔU = 20% sust.) or (ΔU = 50% trans.) AREP	135	135	135	150	176	200	240
%	Transient dip (rated step load) SHUNT / PF : 0,8 LAG	13,6	14,9	16,1	15,8	15,5	15	13,9
%	Transient dip (rated step load) AREP / PF : 0,8 LAG	11,4	12,3	13,3	13,1	12,8	12,5	11,6
W	No load losses	980	980	980	1110	1120	1210	1410
W	Heat rejection	3410	4120	4920	5770	5890	6370	6640

Transient voltage variation 400 V - 50 Hz

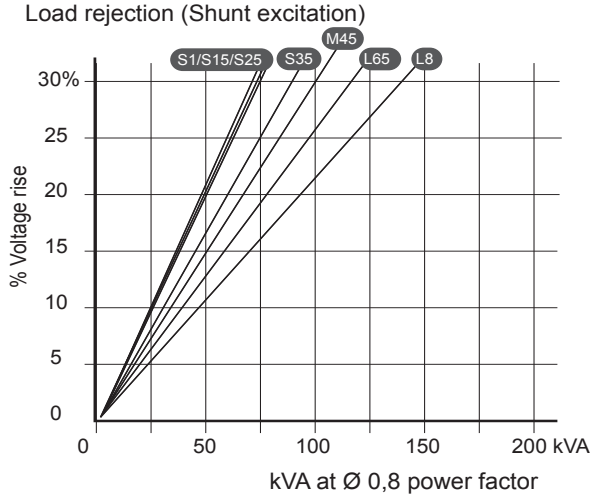
Load application (Shunt excitation)



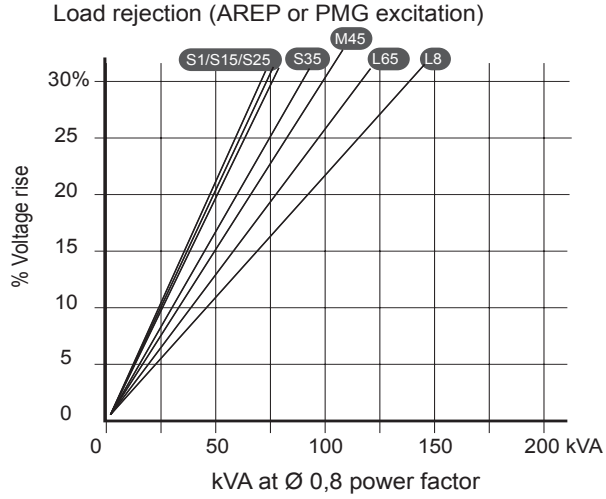
Load application (AREP ou PMG excitation)



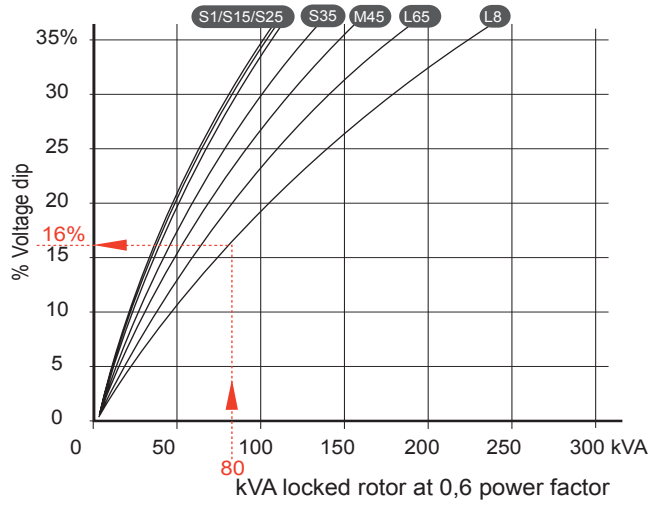
Load rejection (Shunt excitation)



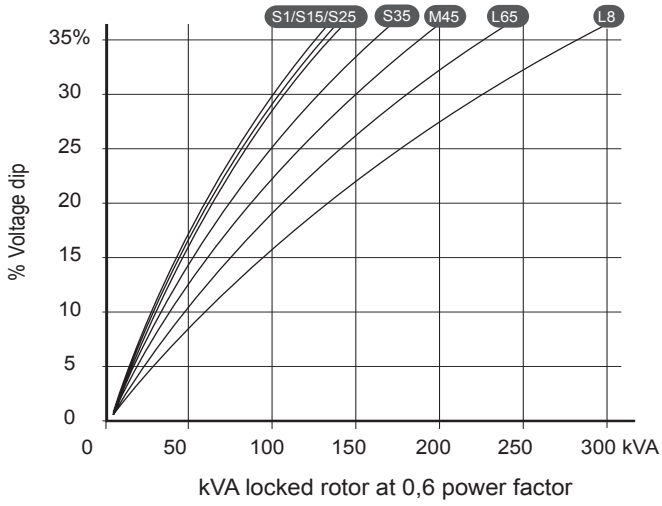
Load rejection (AREP or PMG excitation)



Motor starting (SHUNT excitation)



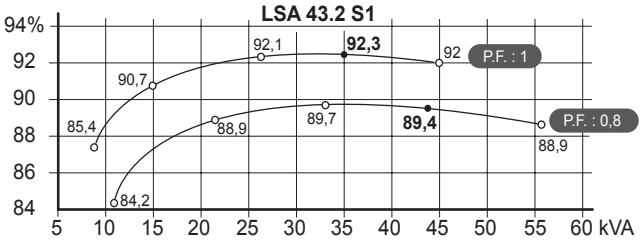
Motor starting (AREP or PMG excitation)

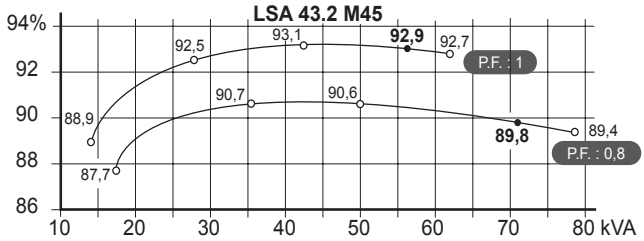


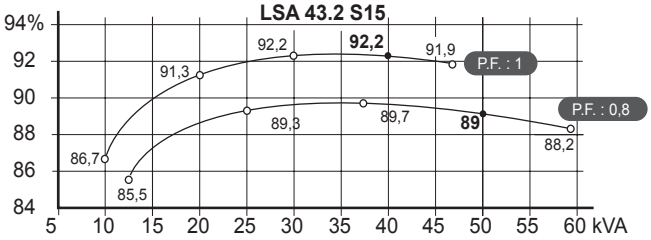
1) For a starting P.F. other than 0,6 , the starting kVA must be multiplied by K = Sine Ø /0,8
Calculation example for a different P.F. : Starter motor kVA calculated at 0.4 P.F. = 70 kVA
► *Sin Ø 0,4 = 0,9165* ► *K = 1,145* ► *kVA corrected = 80 kVA* ► *Voltage dip corresponding to L8 = 16 %.*

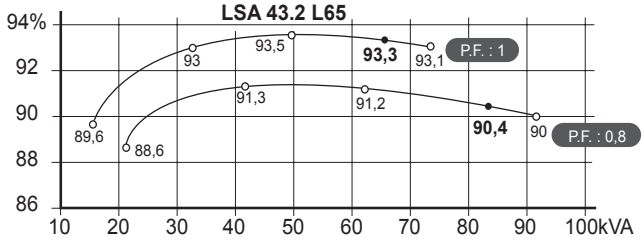
2) For voltages other than 400V (Y) , 230V (△) at 50 Hz, then kVA must be multiplied by $(400/U)^2$ or $(230/U)^2$.

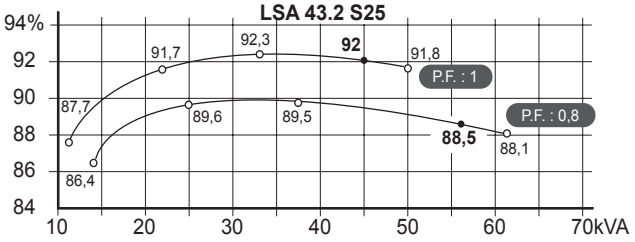
Efficiencies 60 Hz - P.F. : 1 / P.F. : 0,8

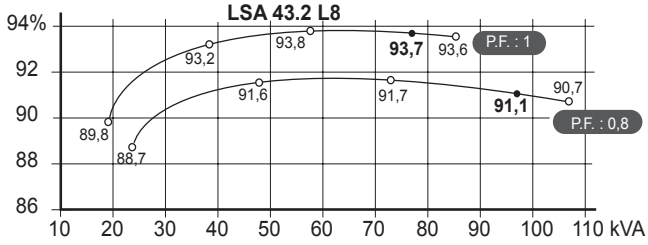


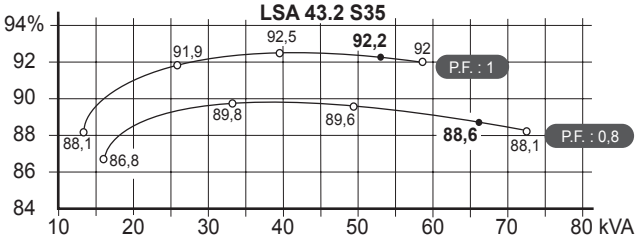












Reactances (%) . Time constants (ms) - Class H / 480 V

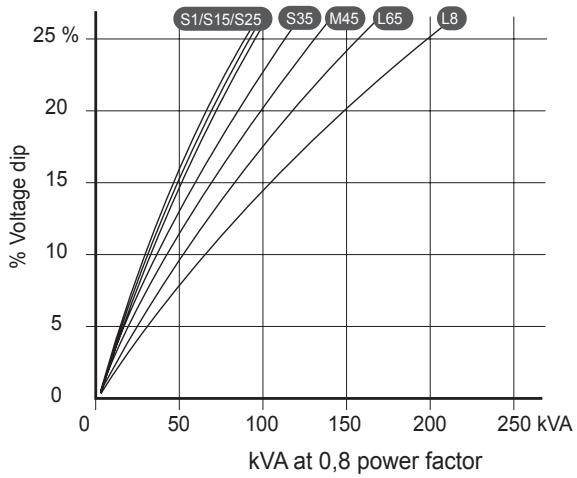
		S1	S15	S25	S35	M45	L65	L8
Kcc	Short-circuit ratio	0,52	0,46	0,41	0,42	0,39	0,38	0,4
Xd	Direct axis synchro.reactance unsaturated	234	265	297	303	300	306	293
Xq	Quadra. axis synchr.reactance unsaturated	140	159	178	181	180	184	176
T'do	Open circuit time constant	1131	1131	1131	1177	1270	1354	1431
X'd	Direct axis transient reactance saturated	10,3	11,7	13,1	12,8	11,8	11,3	10,2
T'd	Short circuit transient time constant	50	50	50	50	50	50	50
X"d	Direct axis subtransient reactance saturated	5,1	5,8	6,5	6,4	5,9	5,6	5,1
T"d	Subtransient time constant	5	5	5	5	5	5	5
X"q	Quadra. axis subtransient reactance saturated	6,4	7,3	8,2	8	7,3	7	6,3
Xo	Zero sequence reactance unsaturated	0,4	0,7	0,8	0,4	0,1	0,5	0,8
X2	Negative sequence reactance saturated	5,8	6,6	7,4	7,2	6,6	6,3	5,8
Ta	Armature time constant	8	8	8	8	8	8	8

Others data - Class H / 480 V

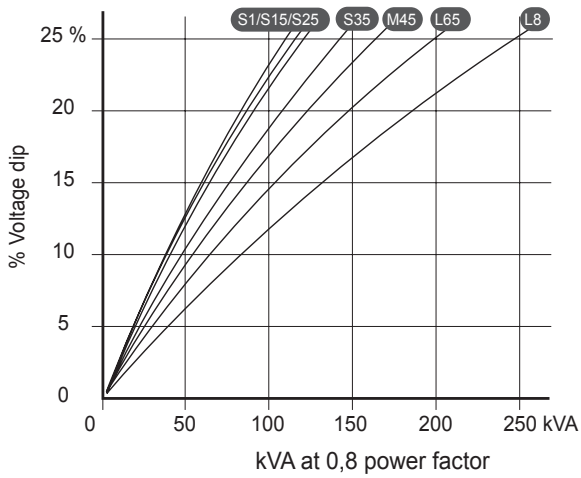
io (A)	No load excitation current (SHUNT / AREP or PMG)	0,5/1	0,5/1	0,5/1	0,5/1	0,4/0,8	0,4/0,8	0,4/0,8
ic (A)	Full load excitation current (SHUNT / AREP or PMG)	1,4/2,8	1,5/3	1,6/3,2	1,8/3,6	1,6/3,2	1,6/3,2	1,6/3,2
uc (V)	Full load excitation voltage (SHUNT / AREP or PMG)	25/12	27/14	30/15	33/16	29/14	29/14	29/14
ms	Recovery time (ΔU = 20 % trans.)	500	500	500	500	500	500	500
kVA	Motor start. (ΔU = 20% sust.) or (ΔU = 50% trans.) SHUNT.	151	151	151	162	198	233	269
kVA	Motor start. (ΔU = 20% sust.) or (ΔU = 50% trans.) AREP	175	175	175	190	225	265	310
%	Transient dip (rated step load) SHUNT / PF : 0,8 LAG	14	15,3	16,5	16,2	15,3	14,9	14
%	Transient dip (rated step load) AREP / PF : 0,8 LAG	11,7	12,7	13,6	13,4	12,7	12,4	11,6
W	No load losses	1440	1440	1440	1630	1640	1770	2060
W	Heat rejection	4150	4910	5760	6730	6420	6970	7570

Transient voltage variation - 480 V - 60 Hz

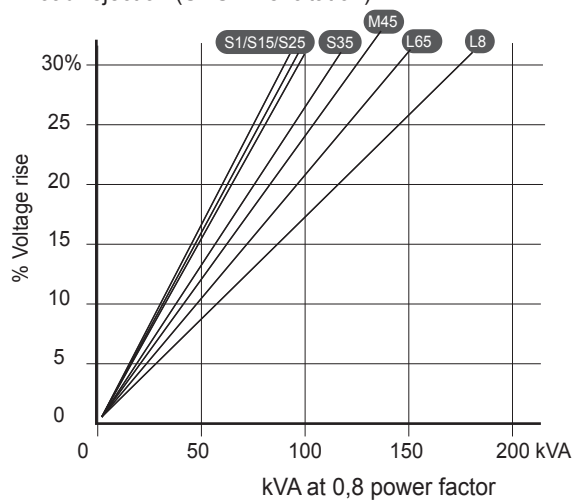
Load application (SHUNT excitation)



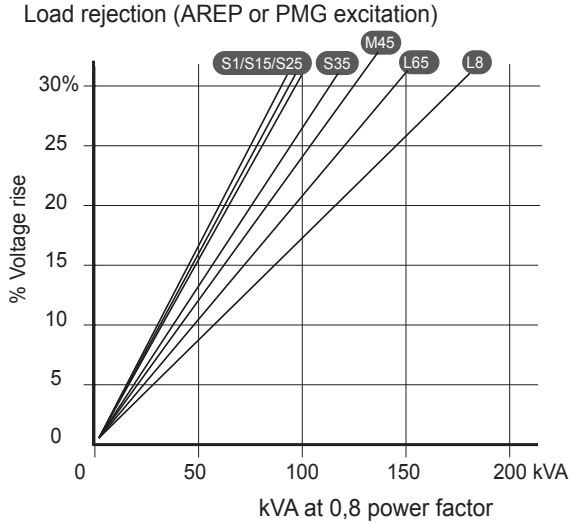
Load application (AREP or PMG excitation)



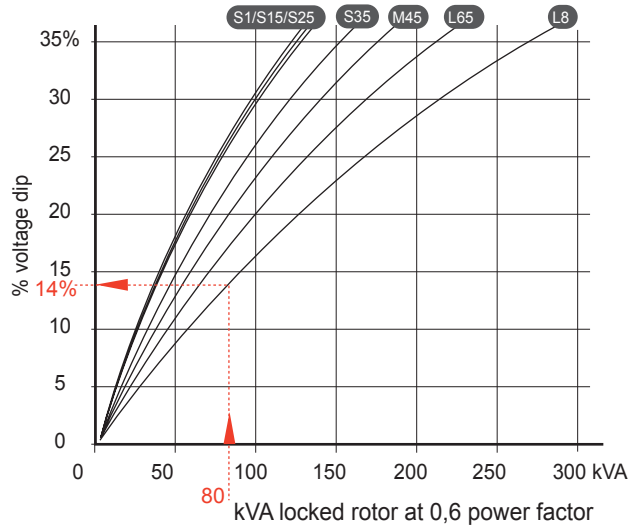
Load rejection (SHUNT excitation)



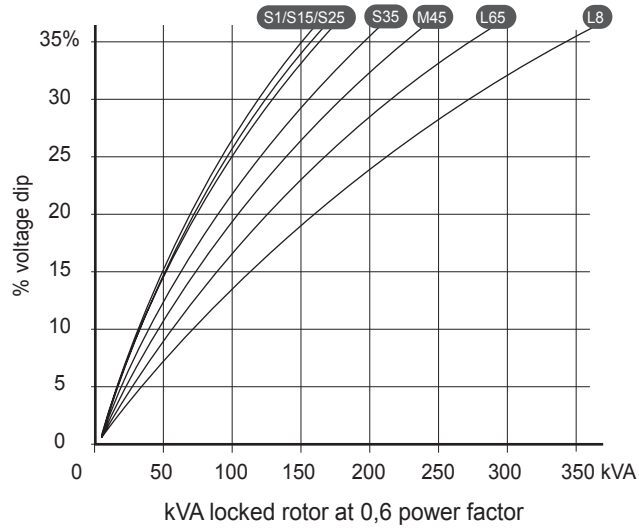
Load rejection (AREP or PMG excitation)



Motor starting (SHUNT excitation)



Motor starting (AREP or PMG excitation)

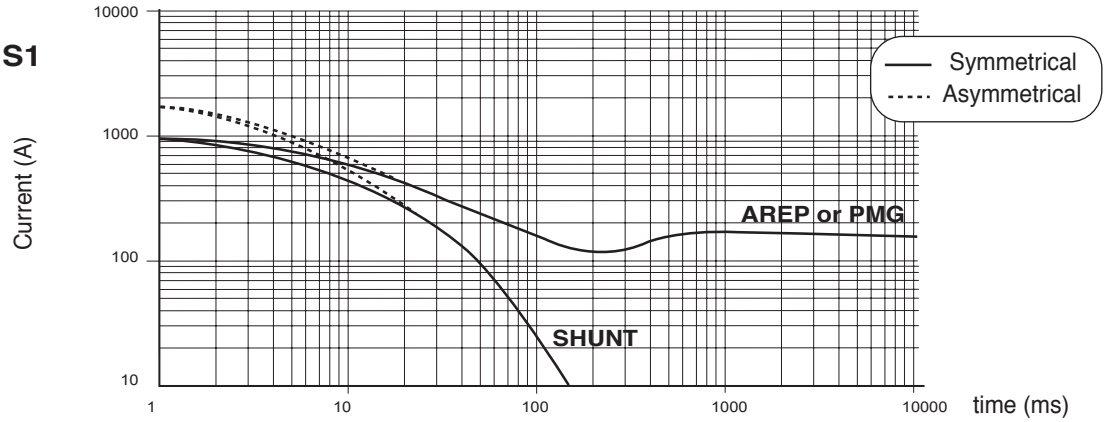


1) For a starting P.F. other than 0,6 , the starting kVA must be multiplied by K = Sine Ø /0,8
Calculation example for a different P.F. : Starter motor kVA calculated at 0.4 P.F. = 70 kVA
► Sin Ø 0,4 = 0,9165 ► K = 1,145 ► kVA corrected = 80 kVA ► Voltage dip corresponding to L8 = 14 %.

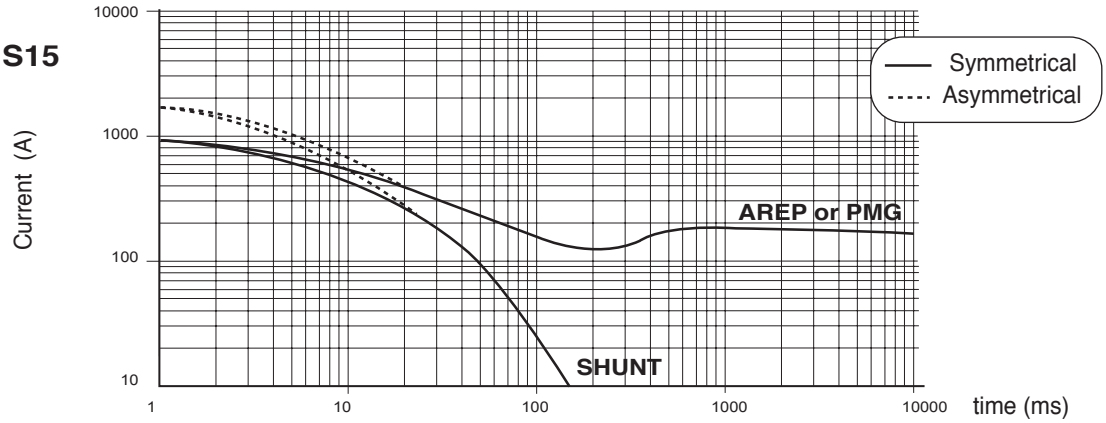
2) For voltages other than 480V (Y), 277V (△), 240V (YY) at 60 Hz ,
then kVA must be multiplied by $(480/U)^2$ or $(277/U)^2$ or $(240/U)^2$.

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

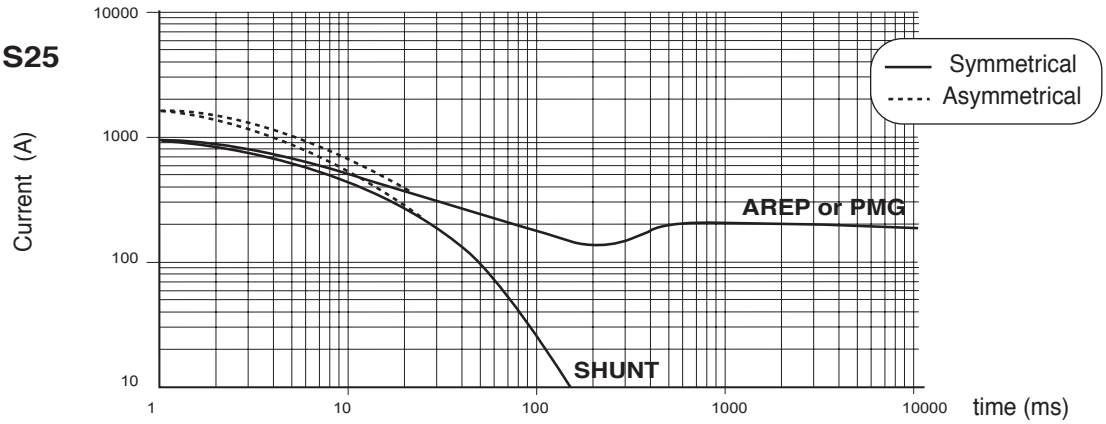
LSA 43.2 S1



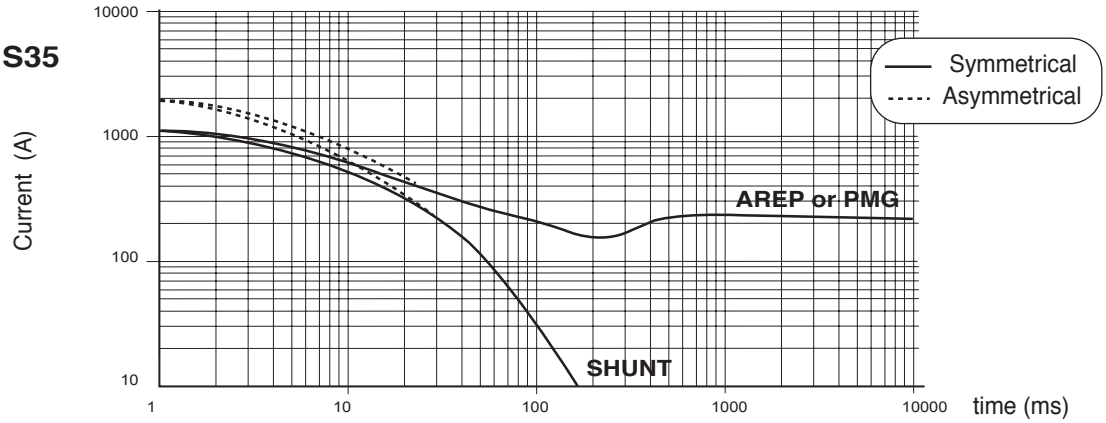
LSA 43.2 S15



LSA 43.2 S25

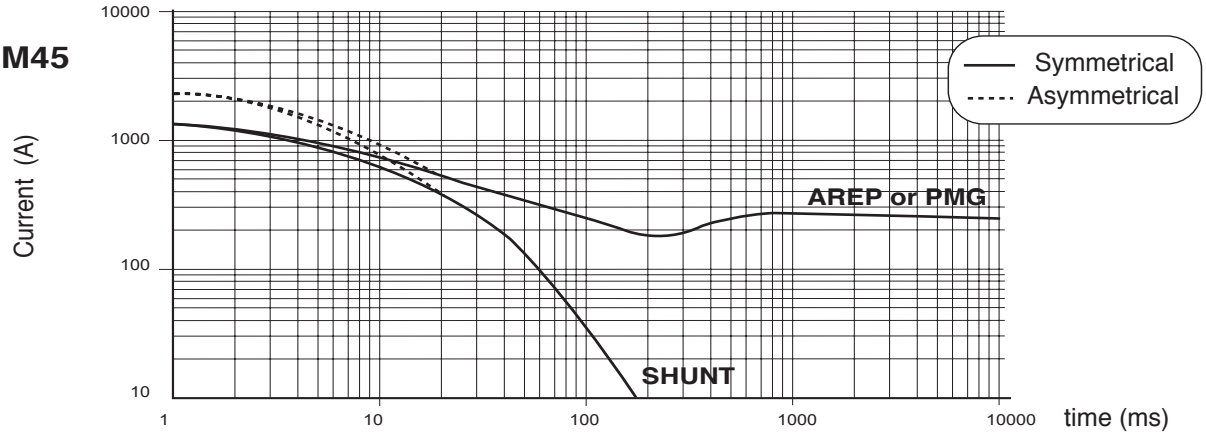


LSA 43.2 S35

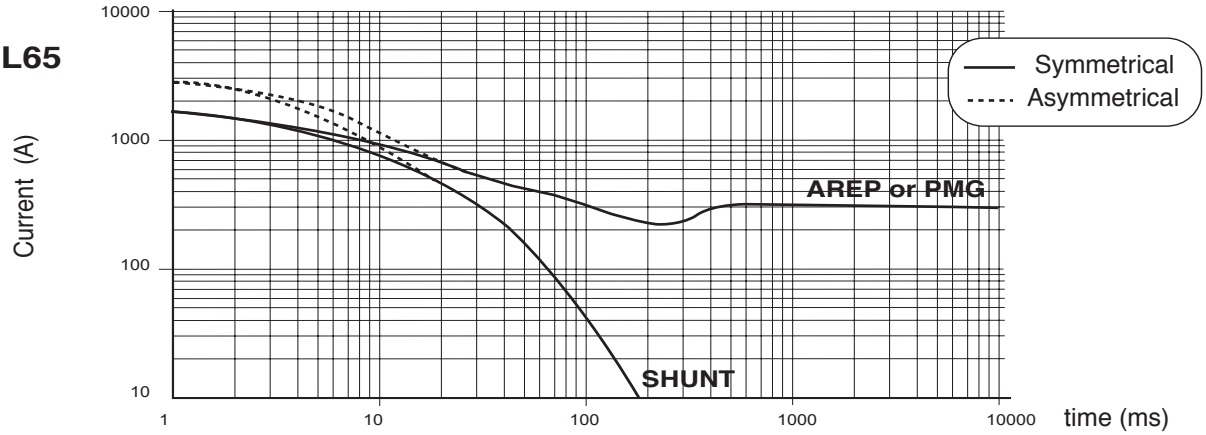


3 phase short-circuit curves at no load and rated speed (star connection Y)

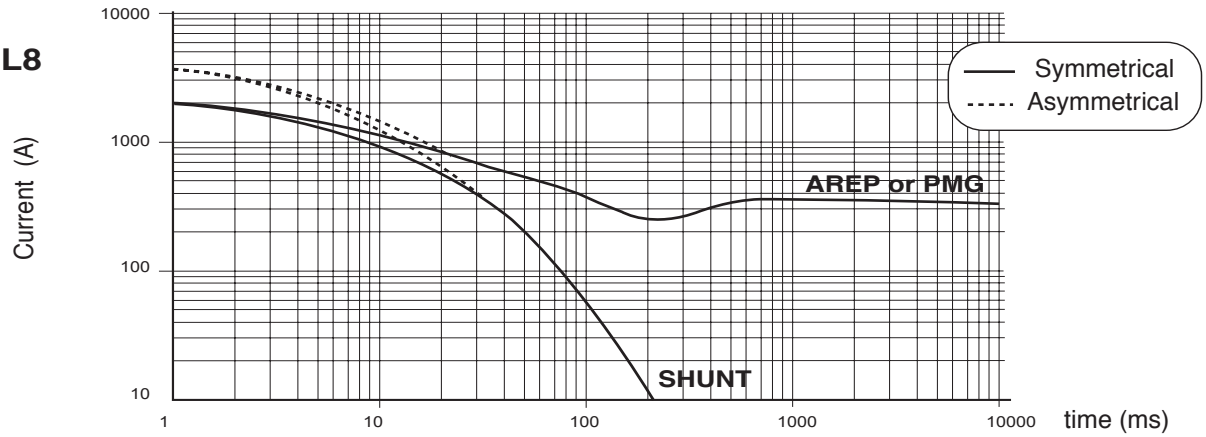
LSA 43.2 M45



LSA 43.2 L65



LSA 43.2 L8



Influence due to connexion.

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

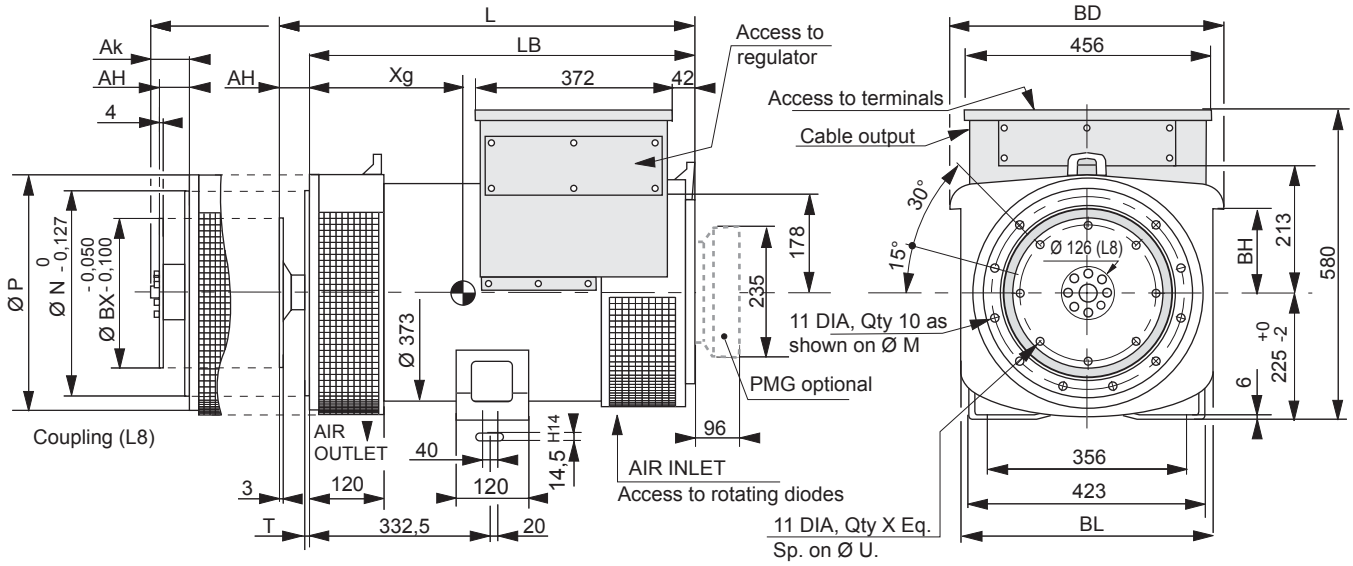
Influence due to short-circuit.

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



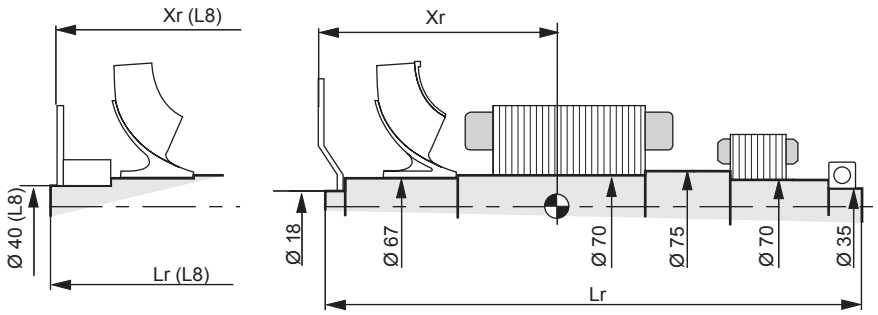
Frame dimensions				
TYPE	L max without PMG	LB	Xg	Weight (kg)
LSA 43.2 S1	627	565	270	210
LSA 43.2 S15	627	565	270	210
LSA 43.2 S25	627	565	270	210
LSA 43.2 S35	627	565	278	230
LSA 43.2 M45	662	600	295	260
LSA 43.2 L65	747	685	315	280
LSA 43.2 L8	754	685	340	320

Coupling			
Flex plate	8	10	11 1/2
Flange S.A.E 4	X	X	
Flange S.A.E 3	X	X	X
Flange S.A.E 2		X	X

Flange (mm)							
S.A.E.	BD	BL	BH	P	N	M	T
4	474	452	146	413	361,95	381	5
3	474	452	165	450	409,575	428,625	6
2	514	492	165	490	447,675	466,725	6

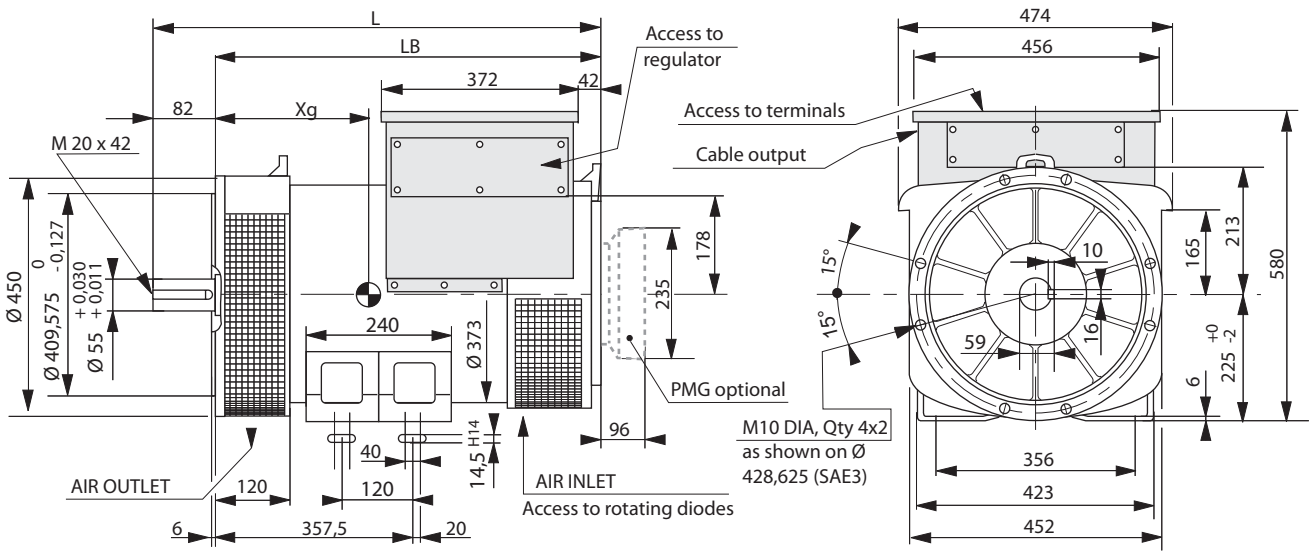
Flex plate (mm)					
S.A.E.	BX	U	X	AH	Ak
11 1/2	352,42	333,38	8	39,6	69
10	314,32	295,28	8	53,8	73.2
8	263,52	244,48	6	62	81.4

Torsional analysis data



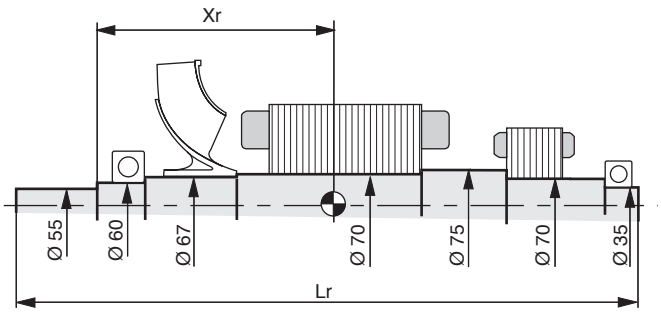
Gravity center : Xr (mm), Rotor length Lr (mm), Weight : M (kg), Moment of inertia : J (kgm²) : (4J = MD²)												
	Flex plate S.A.E. 8				Flex plate S.A.E. 10				Flex plate S.A.E. 11 1/2			
TYPE	Xr	Lr	M	J	Xr	Lr	M	J	Xr	Lr	M	J
LSA 43.2 S1	338	590	74,5	0,3446	328	590	75	0,3524	312	590	75,5	0,3634
LSA 43.2 S15	338	590	74,5	0,3446	328	590	75	0,3524	312	590	75,5	0,3634
LSA 43.2 S25	338	590	74,5	0,3446	328	590	75	0,3524	312	590	75,5	0,3634
LSA 43.2 S35	341	590	78,1	0,3653	331	590	78,6	0,3731	315	590	79,1	0,3841
LSA 43.2 M45	358	625	87,7	0,4141	348	625	88,2	0,4219	332	625	88,7	0,4329
LSA 43.2 L65	386	710	100,3	0,4711	376	710	100,8	0,4789	360	710	101,3	0,4899
LSA 43.2 L8	400	742	118,1	0,5546	392	742	118	0,5666	367	742	117,8	0,5826

Two bearing dimensions

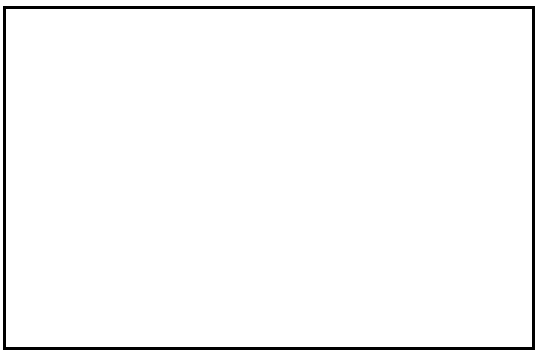


Frame dimensions				
TYPE	L max without PMG	LB	Xg	Weight (kg)
LSA 43.2 S1	672	590	295	220
LSA 43.2 S15	672	590	295	220
LSA 43.2 S25	672	590	295	220
LSA 43.2 S35	672	590	303	240
LSA 43.2 M45	707	625	320	270
LSA 43.2 L65	792	710	340	290
LSA 43.2 L8	792	710	365	330

Torsional analysis data



Gravity center : Xr (mm), Rotor length Lr (mm), Weight : M (kg), Moment of inertia : J (kgm²) : (4J = MD²)				
TYPE	Xr	Lr	M	J
LSA 43.2 S1	301	661	74,2	0,3367
LSA 43.2 S15	301	661	74,2	0,3367
LSA 43.2 S25	301	661	74,2	0,3367
LSA 43.2 S35	305	661	77,8	0,3573
LSA 43.2 M45	321	696	87,5	0,4062
LSA 43.2 L65	349	781	100,1	0,4632
LSA 43.2 L8	362	781	110,9	0,525



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