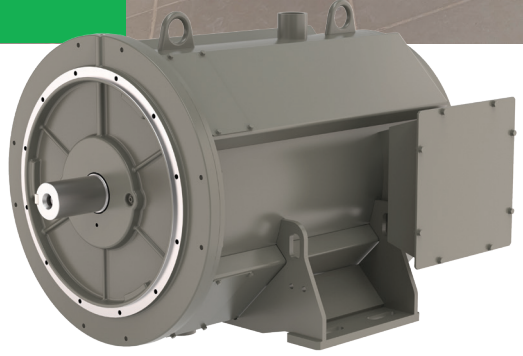
LSAH Cogeneration Range



Low Voltage Alternators - 4 pole

50 to 94 kVA - 50 Hz / 62 to 117 kVA - 60 Hz
Electrical and mechanical data

LEROY-SOMER™

Nidec
All for dreams

MAIN FEATURES & OPTIONS

Built to heat

The LSAH range of alternators has been designed to maximize efficiency of cogeneration installations.

Thanks to its specific built-in coolant circuit, heat recovery is optimized and directly fed into the larger installation.

LSAH alternators are also perfectly suited for continuous service connected to the national grid.

The various design elements and construction features of LSAH machines make them highly performant and durable.

Standards

The LSAH 44.3 alternator complies with 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).

It can be integrated into a EC marked generator.

The LSAH 44.3 is designed, manufactured and marketed in an ISO 9001 environment and ISO 14001.

Electrical features & performances

- Class H insulation
- Standard 6 wire re-connectable winding, 2/3 pitch, type no. 6S
- Voltage range:
  - 50 Hz: 220 V - 240 V and 380 V - 415 V (440 V)
  - 60 Hz: 208 V - 240 V and 380 V - 480 V

  Other voltages: consult us
- High efficiency and motor starting capacity
- Complies with EN 61000-6-3, EN 61000-6-2, EN 55011 group 1 class B for European zone (EC marking)

Mechanical construction

- Compact rigid assembly to better withstand generator vibrations
- Steel frame and terminal box
- Cast iron flanges and shields
- Two-bearing and single bearing mounting
- Half-key balancing
- Ball bearings greasable 40,000h
- Direction of rotation: clockwise and anti-clockwise (without derating)
- Noise level 67 dB

Terminal box design

- Remote voltage regulator
- Terminal block for voltage reconnection

Protection system & options

- Designed for an operating environment up to 80°C and a maximum cooling liquid temperature of 75°C
- Water flow: 3 to 10 m^3/h
- Degree of protection: IP 44
- Enclosed machine cooled by heat transfer fluid
- Options:
  - Bearing sensors
  - Thermal protection for stator windings (PT100 sensors)
  - Shaft height: adapted on request

EXCITATION AND REGULATION SYSTEM

Excitation system		Regulation options			
Voltage regulator	**AREP**	**C.T.** Current transformer for paralleling	Mains paralleling	3-phase sensing	Remote voltage potentiometer
D350	**Standard**	√	**-**	√	√
D550	**Option**	√	√	√	√

√ : Possible option

GENERAL CHARACTERISTICS

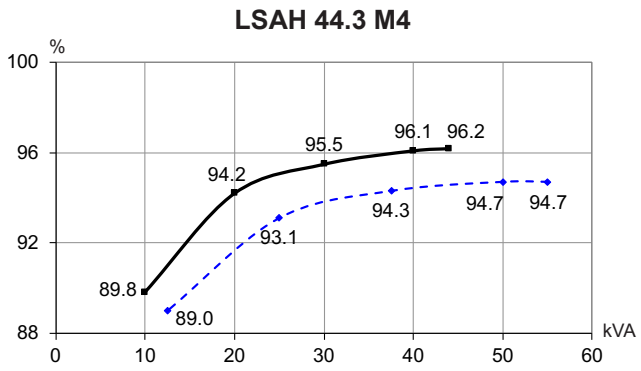
Insulation class	H	Excitation system	AREP
Winding pitch	2/3 (winding 6S - 6-wire)	AVR type	D350
Number of wires	6	Voltage regulation (*)	± 0.25 %
Protection	IP 44	Short-circuit current	300 % (3 IN) : 10s
Cooling - Code	Water - IC7A1W7	Total Harmonic Distortion THD (**) in no-load	< 2 %
Altitude	≤ 1000 m	Total Harmonic Distortion THD (**) in linear load	< 5 %
Overspeed	2250 R.P.M.	Waveform: NEMA = TIF (**)	< 50
Water flow	3 to 10 m^3/h	Waveform: I.E.C. = THF (**)	< 1.5 %

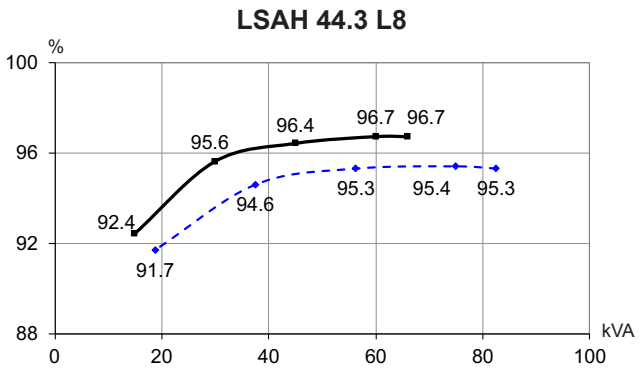
(*) Steady state (**) Total harmonic distortion between phases, no-load or on-load (non-distorting)

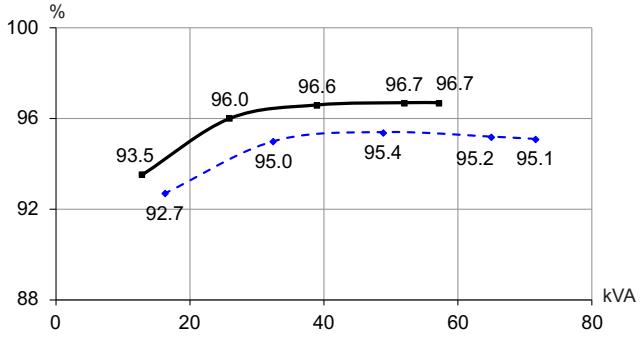
RATINGS / EFFICIENCIES

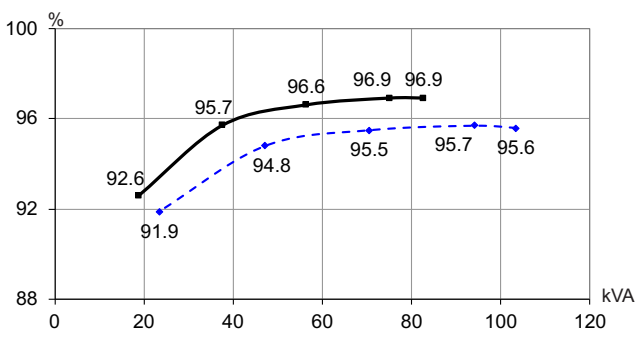
	400V - 50Hz - 1500 R.P.M.				480V - 60Hz - 1800 R.P.M.			
Duty max. / T° C	Continuous / 80°C (environment) - 75°C (liquid)				Continuous / 80°C (environment) - 75°C (liquid)			
Class / T° K	F / 105° K				F / 105° K			
Phase	3 ph.				3 ph.			
	P.F. 1		P.F. 0.8		P.F. 1		P.F. 0.8	
Type	kVA kW	η (%) 4/4	kVA kW	η (%) 4/4	kVA kW	η (%) 4/4	kVA kW	η (%) 4/4
LSAH 44.3 M4	**40**	*96.1*	**50**	*94.7*	**50**	*96.1*	**62**	*94.7*
	40		40		50		50	
LSAH 44.3 M6	**52**	*96.7*	**65**	*95.2*	**62**	*96.7*	**78**	*95.2*
	52		52		62		62	
LSAH 44.3 L8	**60**	*96.7*	**75**	*95.4*	**75**	*96.7*	**94**	*95.4*
	60		60		75		75	
LSAH 44.3 VL12	**75**	*96.9*	**94**	*95.7*	**94**	*96.9*	**117**	*95.7*
	75		75		94		94	

EFFICIENCIES 400 V - 50 HZ (····· P.F.: 0.8) (— P.F.: 1)









REACTANCES (%). TIME CONSTANTS (MS) - CLASS H / 400 V - P.F. 1

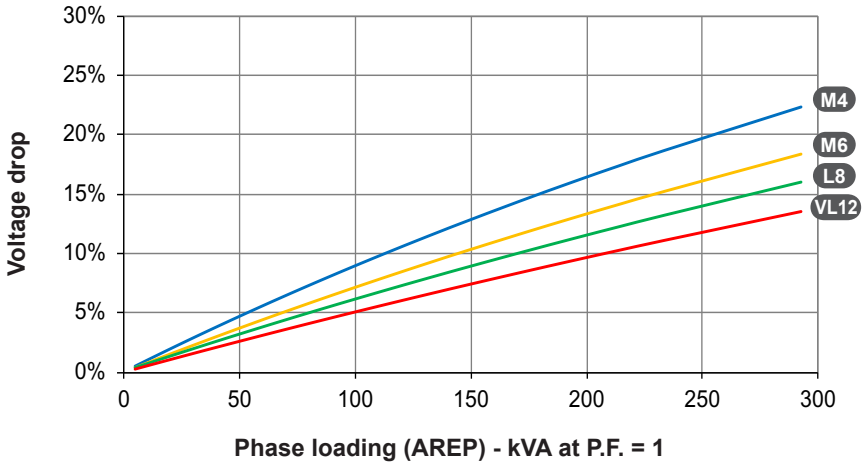
		M4	M6	L8	VL12
Kcc	Short-circuit ratio	1.28	0.67	0.93	0.99
Xd	Direct-axis synchro. reactance unsaturated	119	179	150	140
Xq	Quadrature-axis synchro. reactance unsaturated	61	91	76	71
T'do	No-load transient time constant	1802	1921	2024	2253
X'd	Direct-axis transient reactance saturated	6.6	9.3	7.4	6.2
T'd	Short-circuit transient time constant	100	100	100	100
X"d	Direct-axis subtransient reactance saturated	3.9	5.5	4.4	3.7
T"d	Subtransient time constant	10	10	10	10
X"q	Quadrature-axis subtransient reactance saturated	6.9	9.8	7.8	6.7
Xo	Zero sequence reactance	0.27	0.38	0.3	0.26
X2	Negative sequence reactance saturated	5.47	7.73	6.16	5.25
Ta	Armature time constant	15	15	15	15

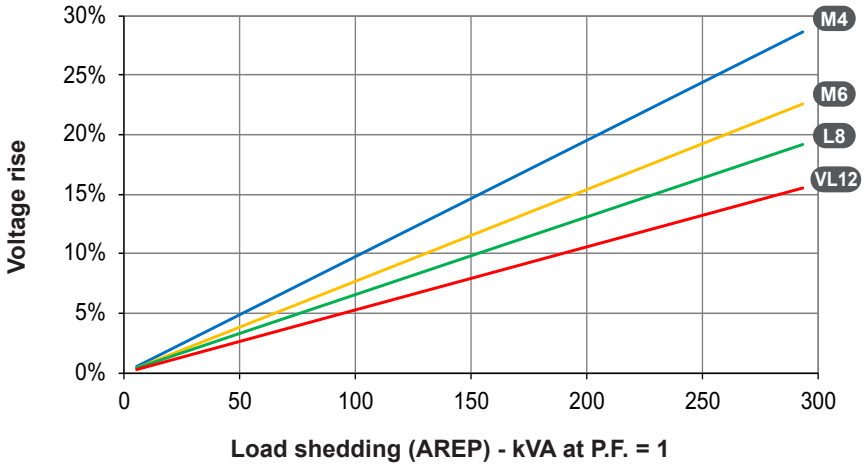
Other class H / 400 V data

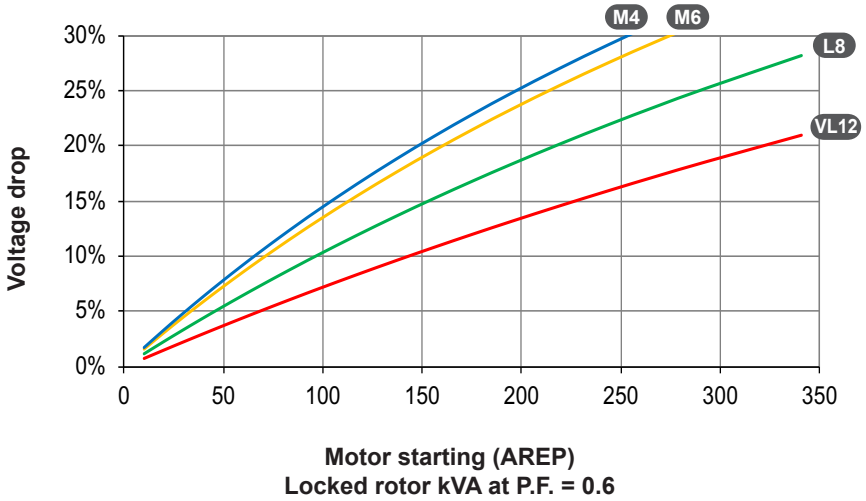
io (A)	No-load excitation current AREP	1.08	0.74	0.94	0.94
ic (A)	On-load excitation current AREP	1.4	1.35	1.42	1.39
uc (V)	On-load excitation voltage AREP	11.2	10.8	11.4	11.1
ms	Response time (ΔU = 20% transient)	500	500	500	500
kVA	Start (ΔU = 20% cont. or ΔU = 30% transient) AREP*	275	255	371	550
%	Transient ΔU (on-load 4/4) AREP - P.F.: 1 $_{LAG}$	4.8	4.8	4.8	4.8
W	No-load losses	1212	947	1289	1598
W	Heat dissipation	1602	1740	2006	2374

* P.F. = 0.6

TRANSIENT VOLTAGE VARIATION 400 V - 50 HZ

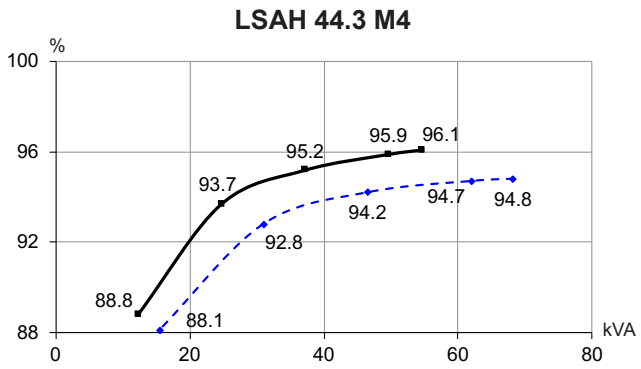


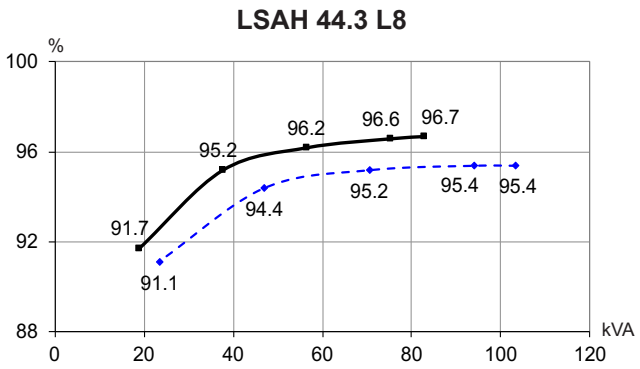


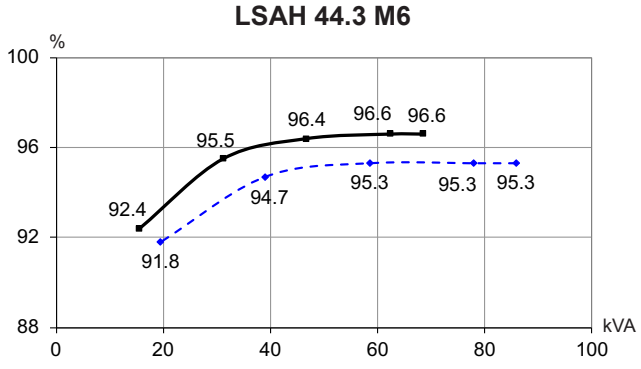


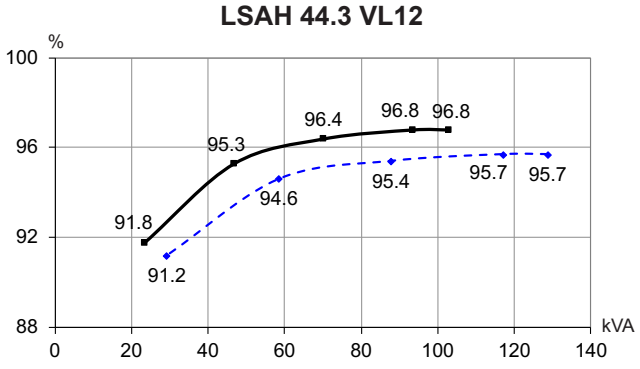
- For a starting P.F. other than 0.6, the starting kVA must be multiplied by K = Sine P.F. / 0.8
- For voltages other than 400V (Y), 230V (Δ) at 50 Hz, then kVA must be multiplied by $(400/U)^2$ or $(230/U)^2$.

EFFICIENCIES 480 V - 60 HZ (····· P.F.: 0.8) (— P.F.: 1)









REACTANCES (%). TIME CONSTANTS (MS) - CLASS H / 480 V - P.F. 1

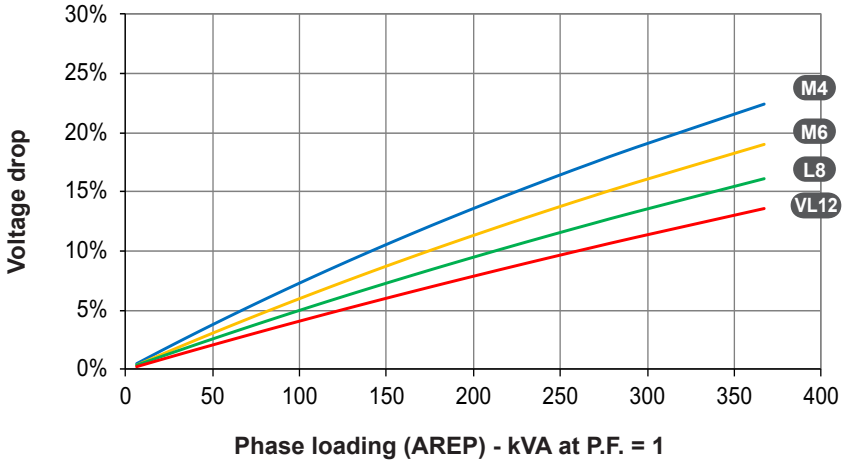
		M4	M6	L8	VL12
Kcc	Short-circuit ratio	1.24	0.67	0.89	0.96
Xd	Direct-axis synchro. reactance unsaturated	123	179	156	146
Xq	Quadrature-axis synchro. reactance unsaturated	63	91	79	74
T'do	No-load transient time constant	1802	1921	2024	2253
X'd	Direct-axis transient reactance saturated	6.8	9.3	7.7	6.4
T'd	Short-circuit transient time constant	100	100	100	100
X"d	Direct-axis subtransient reactance saturated	4.1	5.5	4.6	3.8
T"d	Subtransient time constant	10	10	10	10
X"q	Quadrature-axis subtransient reactance saturated	7.1	9.8	8.2	7
Xo	Zero sequence reactance	0.28	0.38	0.32	0.27
X2	Negative sequence reactance saturated	5.65	7.73	6.43	5.44
Ta	Armature time constant	15	15	15	15

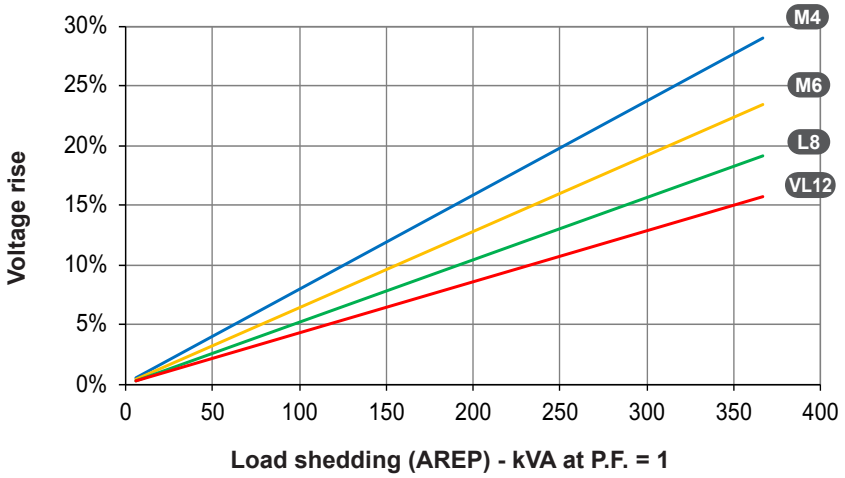
Other class H / 480 V data

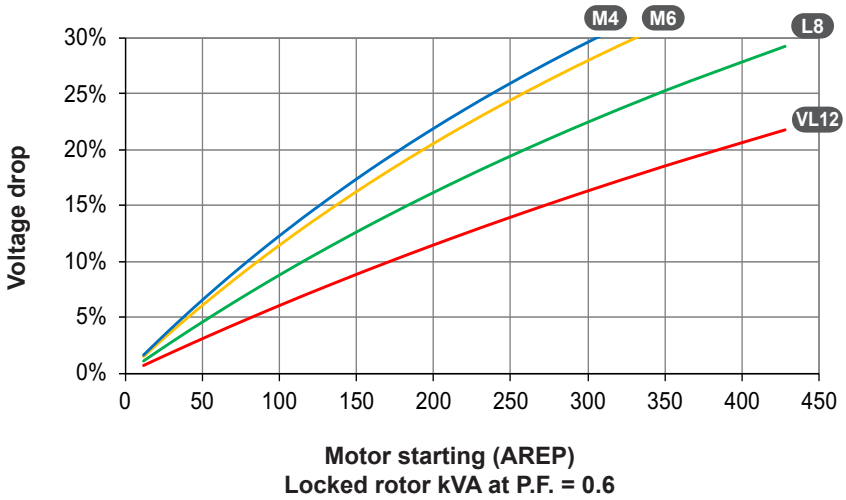
io (A)	No-load excitation current AREP	1.08	0.74	0.94	0.94
ic (A)	On-load excitation current AREP	1.41	1.34	1.45	1.4
uc (V)	On-load excitation voltage AREP	11.3	10.8	11.6	11.2
ms	Response time (ΔU = 20% transient)	500	500	500	500
kVA	Start (ΔU = 20% cont. or ΔU = 30% transient) AREP*	331	306	443	657
%	Transient ΔU (on-load 4/4) AREP - P.F.: 1 $_{LAG}$	4.8	4.8	4.8	4.8
W	No-load losses	1696	1373	1823	2253
W	Heat dissipation	2083	2163	2601	3081

* P.F. = 0.6

TRANSIENT VOLTAGE VARIATION 480 V - 60 HZ





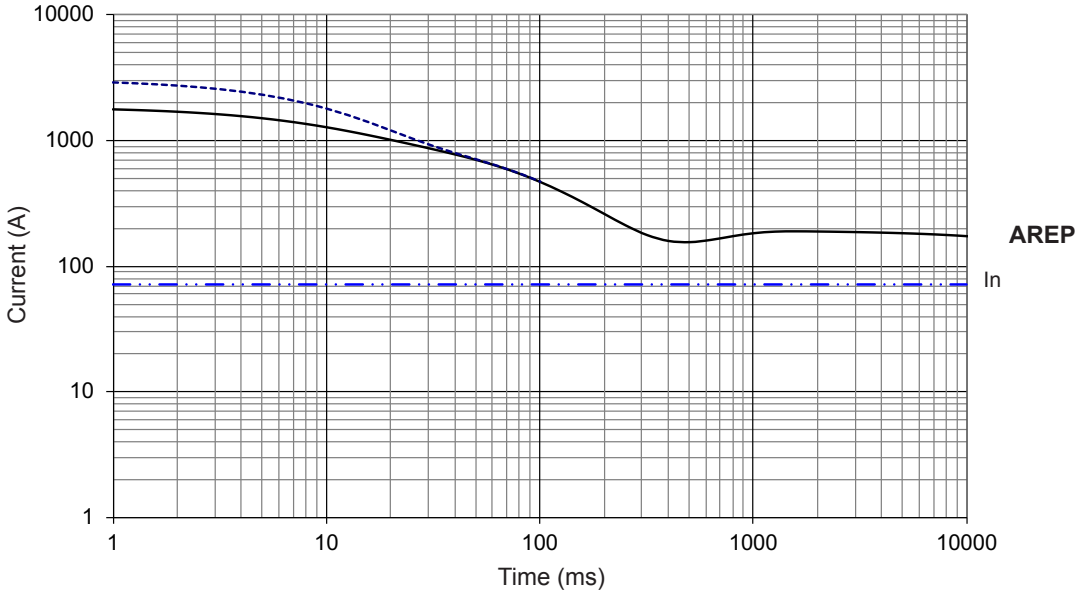


- For a starting P.F. other than 0.6, the starting kVA must be multiplied by K = Sine P.F. / 0.8
- For voltages other than 480V (Y), 277V (Δ), 240V (YY) at 60 Hz, then kVA must be multiplied by $(480/U)^2$ or $(277/U)^2$ or $(240/U)^2$.

3-PHASE SHORT-CIRCUIT CURVES AT NO LOAD AND RATED SPEED (STAR CONNECTION Y)

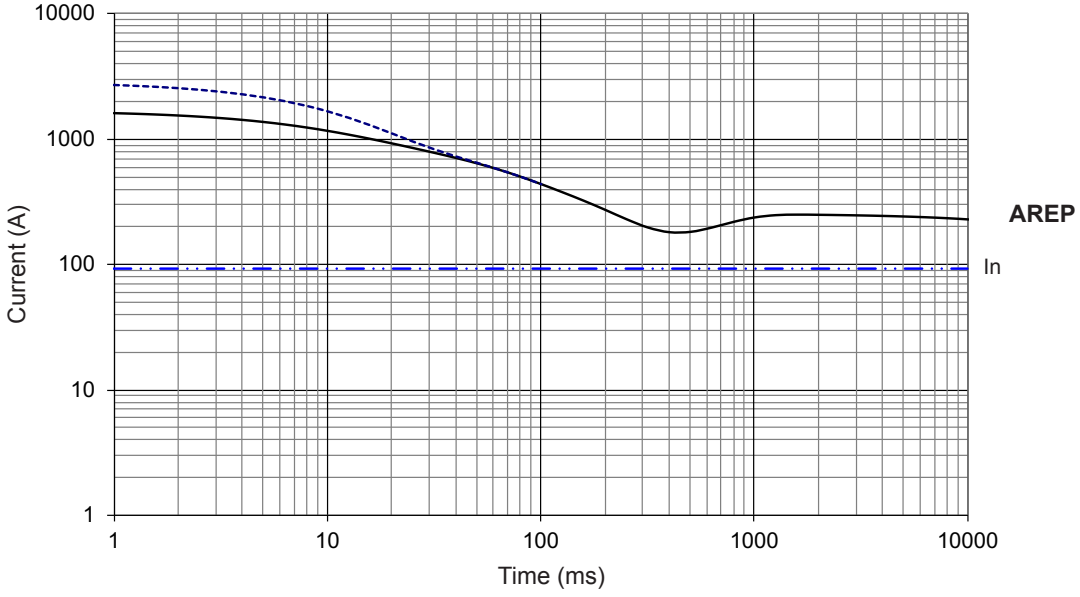
LSAH 44.3 M4

Symmetrical ——
Asymmetrical - - -



LSAH 44.3 M6

Symmetrical ——
Asymmetrical - - -

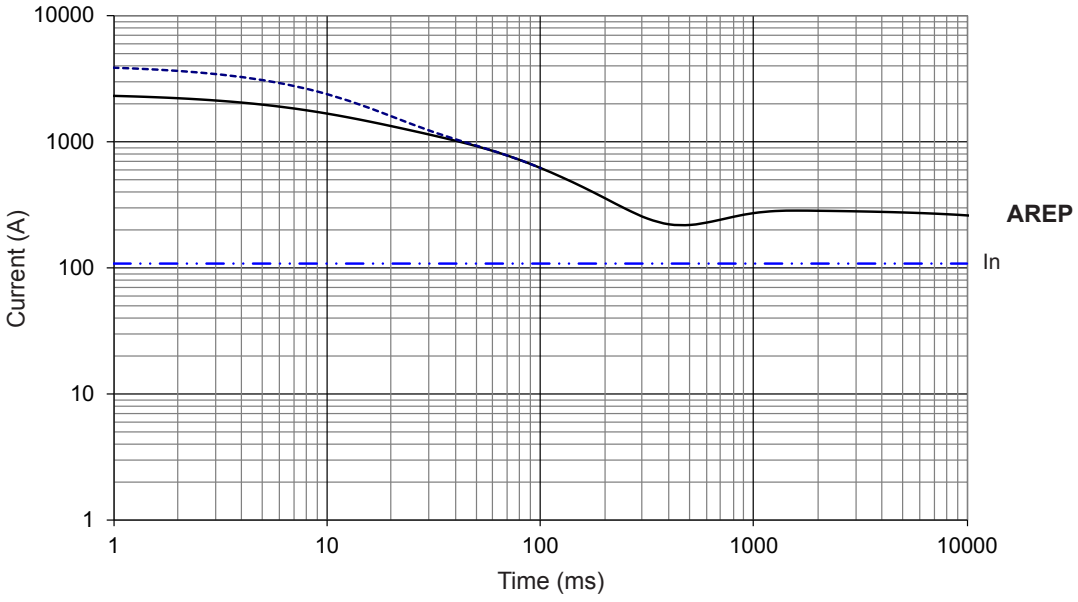


Influence due to connection
For (Δ) connection, use the following multiplication factor:
- Current value x 1.732.

3-PHASE SHORT-CIRCUIT CURVES AT NO LOAD AND RATED SPEED (STAR CONNECTION Y)

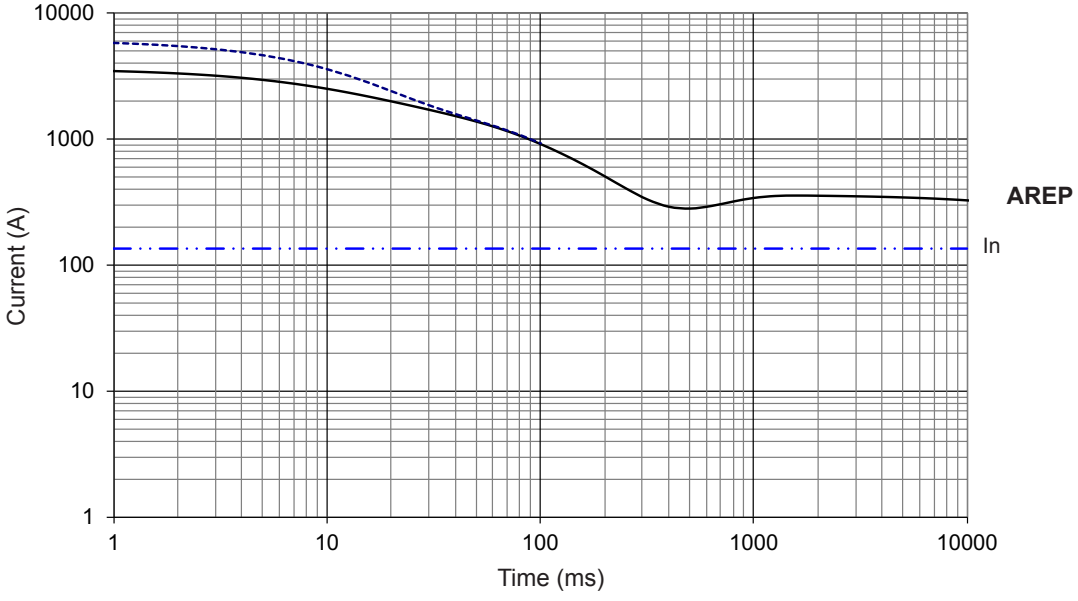
LSAH 44.3 L8

Symmetrical ——
Asymmetrical - - -



LSAH 44.3 VL12

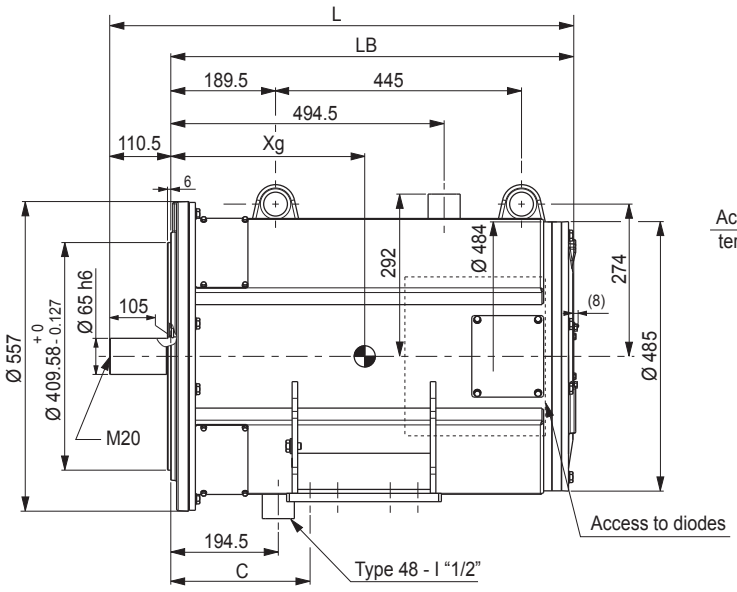
Symmetrical ——
Asymmetrical - - -

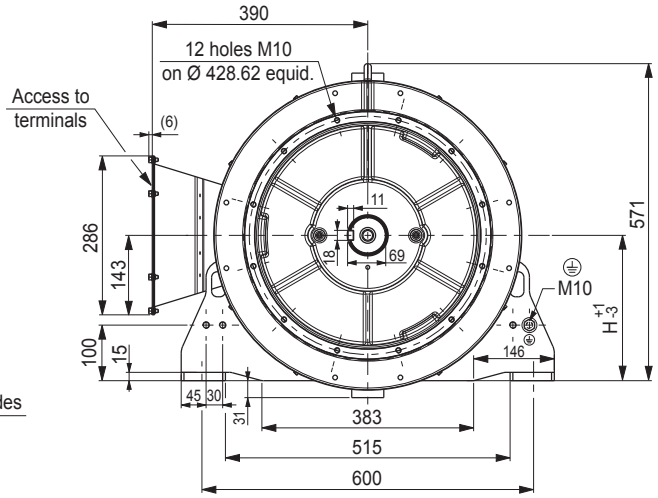


Influence due to short-circuit
Curves are based on a three-phase short-circuit.
For other types of short-circuit,
use the following multiplication factors.

	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)	10 sec.	5 sec.	2 sec.

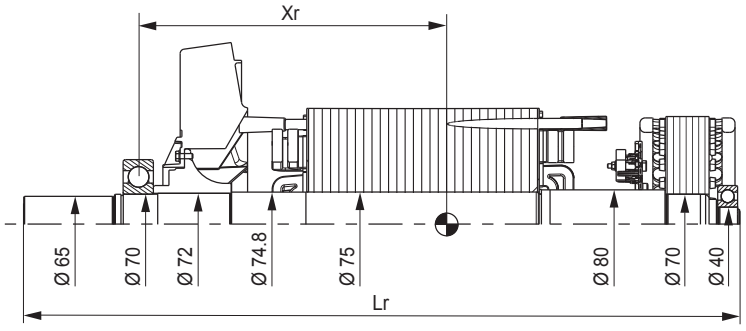
TWO-BEARING DIMENSIONS - STANDARD





Dimensions (mm) and weight						
Type	L	LB	Xg	C	H	Weight (kg)
LSAH 44.3 M4	840	729	330	252	262	545
LSAH 44.3 M6	840	729	345	252	262	580
LSAH 44.3 L8	875	764	360	252	262	622
LSAH 44.3 VL12	975	864	370	252	262	750

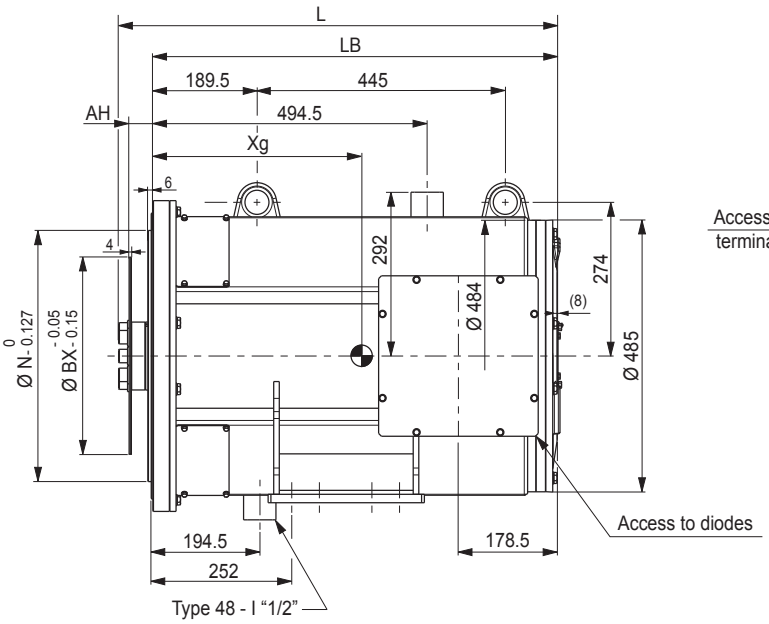
TORSIONAL ANALYSIS DATA

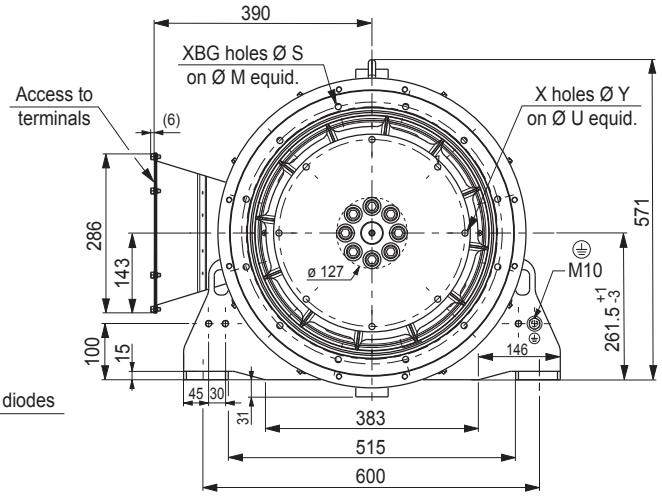


Centre of gravity: Xr (mm), Rotor length: Lr (mm), Weight: M (kg), Moment of inertia: J (kgm²): (4J = MD²)				
Type	Xr	Lr	M	J
LSAH 44.3 M4	332.5	828	135.5	0.984
LSAH 44.3 M6	347	828	147	1.098
LSAH 44.3 L8	364	863	160.5	1.206
LSAH 44.3 VL12	413	963	206	1.592

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.

SINGLE BEARING DIMENSIONS - OPTION





Dimensions (mm) and weight				
Type	L maxi*	LB	Xg	Weight (kg)
LSAH 44.3 M4	810	729	330	545
LSAH 44.3 M6	810	729	345	580
LSAH 44.3 L8	845	764	360	622
LSAH 44.3 VL12	945	864	370	750

Coupling			
Flange	**2**	**3**	**4**
Flex plate			
11 1/2	x	x	-
10	x	x	x
8	-	x	x

* L maxi = LB + AH maxi + 19

Flange (mm)				
S.A.E.	N	M	S	XBG
4	361.95	381	11	12
3	409.58	428.62	11	12
2	447.68	466.72	11	12

Flex plate (mm)					
S.A.E.	BX	U	X	Y	AH
11 1/2	352.42	333.38	8	11	39.6
10	314.32	295.28	8	11	53.8
8	263.52	244.48	6	11	62

For torsional analysis data or other request: consult us.

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.

LEROY-SOMER™

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Capital social : 65 800 512 €, RCS Angoulême 338 567 258.

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