

ALTERNATOR TECHNICAL DESCRIPTION
LSA 53.2 ZL14 / 4p

Nidec ACIM Germany GmbH
Electric Power Generation
Eschborner Landstrasse 166 - 60489 Frankfurt am Main

Main data				C	1
Generator type:	LSA 53.2 ZL14 / 4p				1
Power:	2 820 kVA	2 256 kWe	2 339 kWm		1
Voltage:	11000 V	Star serial			1
Rated voltage range:	+5/-5%				1
Power factor - Lagging:	0,8				1
Frequency:	50 Hz				1
Speed:	1500 rpm				1
Nominal current:	148 A				1
Winding type:	p5/6				1
Classes (Insulation / Temperature Rise):	H / H				1
Ambient Temperature:	40 °C				1
Altitude:	1000 m				1
					-
Installation					1
Client:	MTU Friedrichshafen GmbH				1
Project:	Projekt Supernap				1
Site:	to define				1
Prime mover:	Reciprocating engine				1
Manufacturer:	MTU				1
Type:	20V4000G24F				1
Duty:	Base Rating				1
Industry:	Construction				1
					-
Mechanical Construction				IM1101	1
Type of construction:	Two bearing				1
Mounting arrangement:	Horizontal Axis				1
Direction of rotation:	Clockwise (seen when facing the drive end - DE)				1
Bearing type:	Anti-friction				1
Bearing Lubrication:	Regreasable				1
Bearing insulation:	Not insulated				1
Shaft end type:	Cylindrical with keyway				1
Balancing - Class (ISO 1940/1):	Half key - G2,5 (std)				1
Flange:	None / without				1
Shaft height:	500 mm				1
Width:	1150 mm				1
					-
Additional specificities					1
Stabilized Runaway speed:	1800 rpm - 2 min.				1

ALTERNATOR TECHNICAL DESCRIPTION
LSA 53.2 ZL14 / 4p

LS Reference: MB342-10-2020-2 1

Cooling Method		IC01	1
Degree of protection:	IP23		1
Coolant:	Air / Temperature: 40 °C		1
Air quality:	Clean		1
Ventilation (internal):	Self-ventilated		1
Filters:	Without		1
Ducting for air inlet:	No		1
Ducting for air outlet:	No		1
Connection, Excitation & Regulation			1
Parallel operation:	With mains (3F) - use of measuring CT		1
Excitation:	Self-excited - Brushless - Type: PMG		1
Sustained 3-phase Isc:	> 3 x FLC for 10s.		1
AVR type:	Leroy Somer - D550 - Digital		1
AVR location:	In terminal box		1
Alternator Voltage sensing:	Terminal box mounted voltage sensing VTs		1
Additional features:	Three-phase sensing		1
	Diode failure detector		1
Terminal box			1
Power connection:	4 connectors (brought out neutral)		1
Main Terminal box location:	1 terminal box on the top		1
Line side outlet:	Left hand side (seen when facing the drive end - D)		1
Gland plate:	Non magnetic - Cable gland plate not drilled		1
	-		1
Protection and measurement accessories			1
Temperature detection			1
Stator windings:	6 x 3-wire Pt100 RTDs		1
Combined guide and thrust bearing - DE:	1 x 3-wire Pt100 RTD		1
Guide bearing - NDE:	1 x 3-wire Pt100 RTD		1
Anti-condensation heating			1
	Voltage: 230 V - 1Ph / Power: 500 W		1
Transformers (Client use)			1
LS Supply			1
Set of 3 x CTs (measuring and/or protection):	I Primary / I Secondary / Power / Class		1
<i>Preliminary</i> Neutral side	S1 150 / 5A / 10VA / Cl. 0,5 FS5		2
	S2 150 / 5A / 10VA / Cl. 5P10		2
			1
Various items			1
Paint:	C3M-P - Polyurethane - RAL acc. MTU request		1
Documentation:	PDF manual		1
Documentation Language:	English		1

ALTERNATOR TECHNICAL DESCRIPTION
LSA 53.2 ZL14 / 4p

LS Reference: MB342-10-2020-2 1

Controls		
QUAL/INES/006 001	Measurement of winding resistance	1
QUAL/INES/006 021	Insulation check on sensors (when fitted)	1
QUAL/INES/006 002	Voltage balance and phase order check	1
QUAL/INES/006 007	Overspeed test (according to test bench limitation)	1
QUAL/INES/006 009	High potential test	1
QUAL/INES/006 010	Insulation resistance measurement	1

ALTERNATOR ELECTRICAL DATA
LSA 53.2 ZL14 / 4P

LS Reference: MB342-10-2020-2

Date: 22.10.2020

V5.07 - 08/2020

Main data:

C

Power:	2 820 kVA	2 256 kWe	2 339 kWm	1
Voltage:	11000 V	Frequency:	50 Hz	1
Rated voltage range:	+5% / -5%	Speed:	1500 rpm	1
Power factor - Lagging:	0,8	Phases	3	1
Nominal current:	148 A	Connexion	Star serial	1
Insulation / Temperature rise:	H / H	Winding type:	p5/6	1
Cooling:	IC01	Winding:	- 6 Wires	1
Ambient Temperature:	40 °C	Overspeed (rpm)	1800	1
Altitude:	1000 m	Total Harmonic Distortion (THD) < 5%		1
Duty: Base Rating				1

Efficiency (Base 2256 kWe)

IEC

	25%	50%	75%	100%	110%	
Power factor - Lagging: 0,8	93,5	95,9	96,4	96,5	96,4	1
Power factor - Lagging: 1	93,9	96,4	97,1	97,3	97,3	1

Reactances (%) - (Base 2820 kVA)

Unitary impedance (1 per unit) = 42,907801 ohms

	Unsaturated		Saturated		Unsaturated		Saturated	
	Direct axis				Quadrature axis			
Synchronous reactance	Xd	244	217	Xq	124	111		1
Transient reactance	X'd	24,3	20,7	X'q	124	111		1
Subtransient reactance	X''d	12,8	10,9	X''q	13,5	11,5		1
Negative sequence reactance	X2	13,2	11,2					
X0	10,0	Zero sequence reactance						1
XI	6,4	Stator leakage reactance						
Xr	19,4	Rotor leakage reactance						
Kc	0,46	Short-circuit ratio						1

Time constants (s)

	Direct axis		Quadrature axis	
Open circuit transient time constant	T'do	3,20	T'qo	NA
Short-circuit transient time constant	T'd	0,319	T'q	NA
Open circuit subtransient time constant	T''do	0,036	T''qo	0,157
Subtransient time constant	T''d	0,019	T''q	0,017
Ta	0,037	Armature time constant		

Resistances (%)

Ra	1,1	Armature resistance	R0	3,3	Zero sequence resistance	1
X/R	9,6	X/R ratio (without unit)	R2	2,6	Negative sequence resistance	

Voltage accuracy: 0,25%

Maximum inrush current for a voltage dip of 15%: 2273 kVA
when starting an AC motor having a starting power factor between 0 and 0.4

rating is provided for the specified temperature rise, by resistance measurement according to IEC60034-1

According to: I.E.C. 60034.1 - 60034.2 - NEMA MG 1-32

Products and materials shown in this catalogue may, at any time, be modified in order to follow the latest technological developments,

ALTERNATOR MAIN CURVES
LSA 53.2 ZL14 / 4P

LS Reference: MB342-10-2020-2

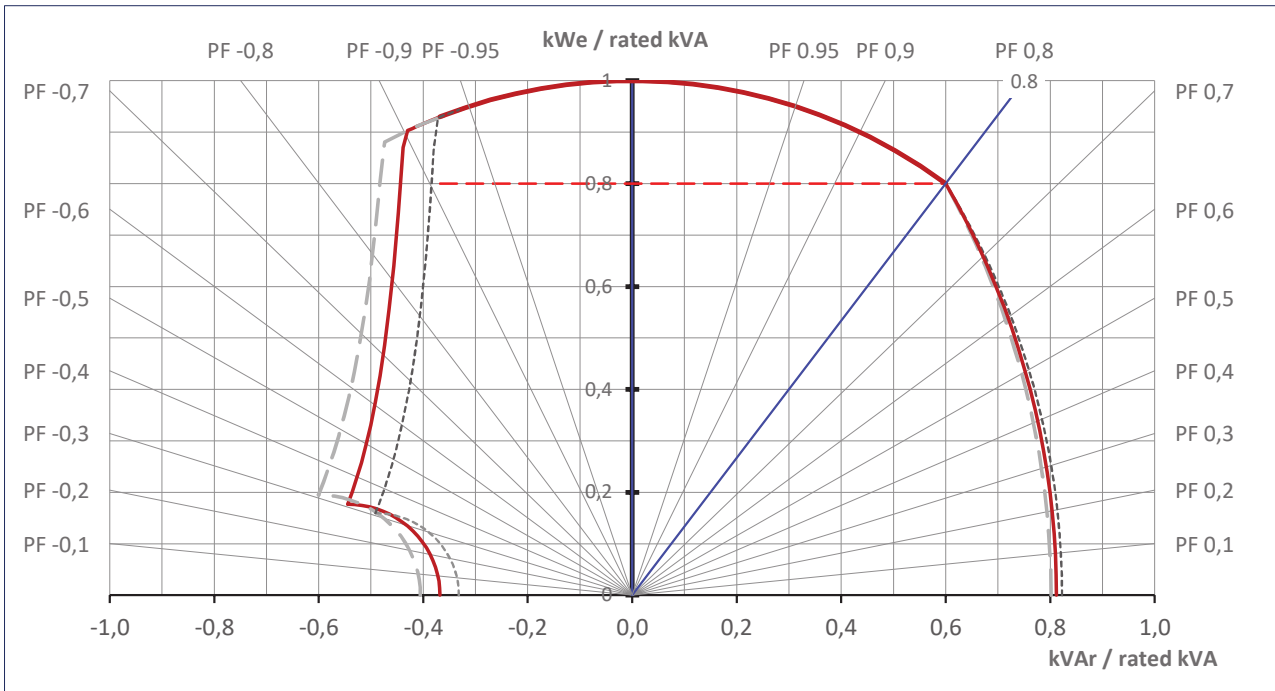
Date: 22.10.2020

2820kVA - 11000V - 50 Hz

V5.07 - 08/2020

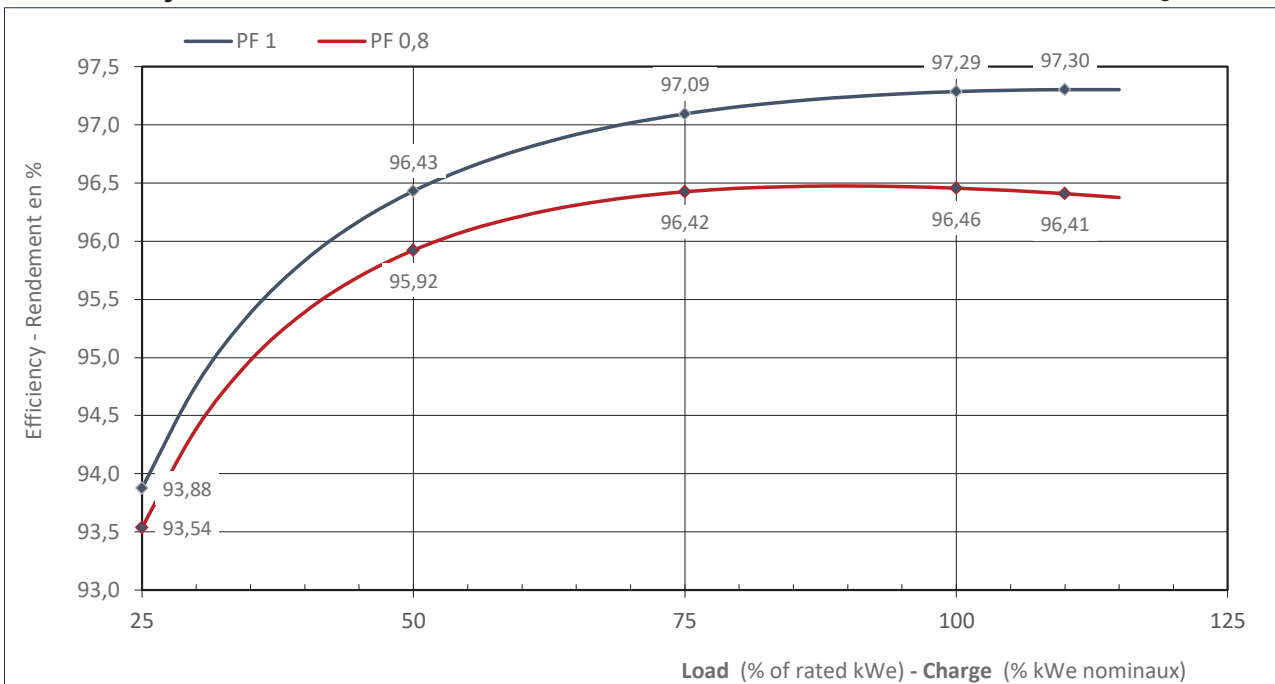
Capability Curve

---	Umax	+ 5%	11 550	V
—	Un		11 000	V
- - -	Umin	- 5%	10 450	V



Efficiency Curves

According to: IEC

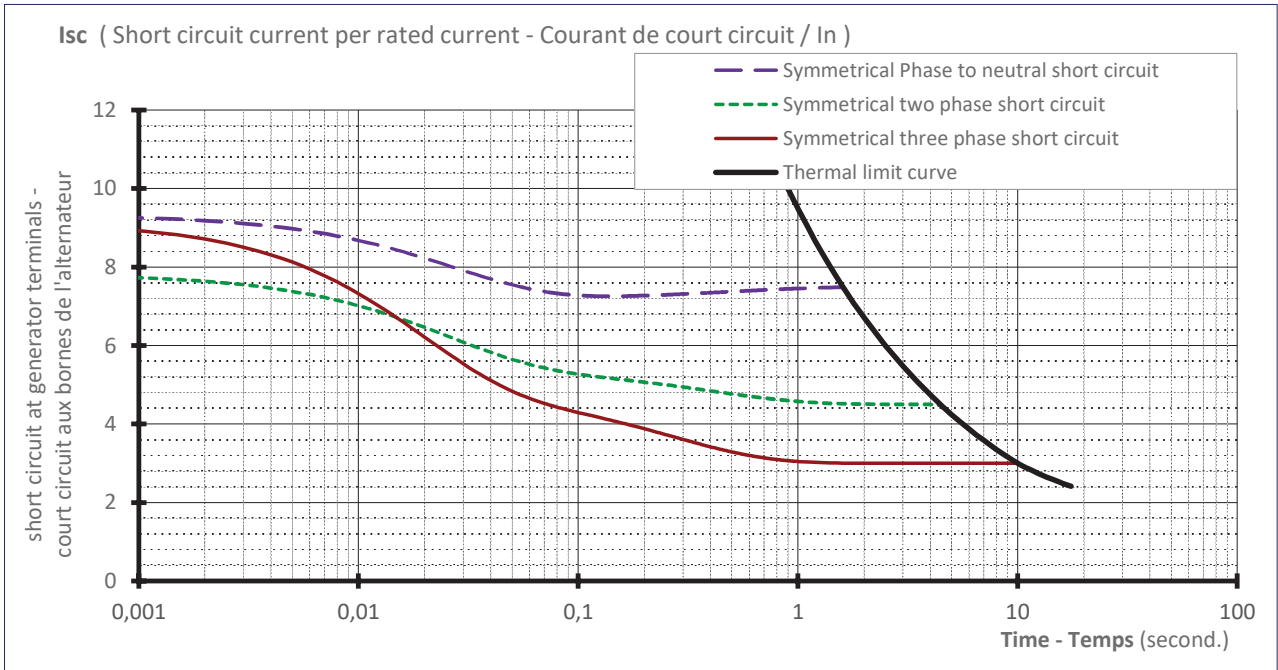


ALTERNATOR MAIN CURVES
LSA 53.2 ZL14 / 4P

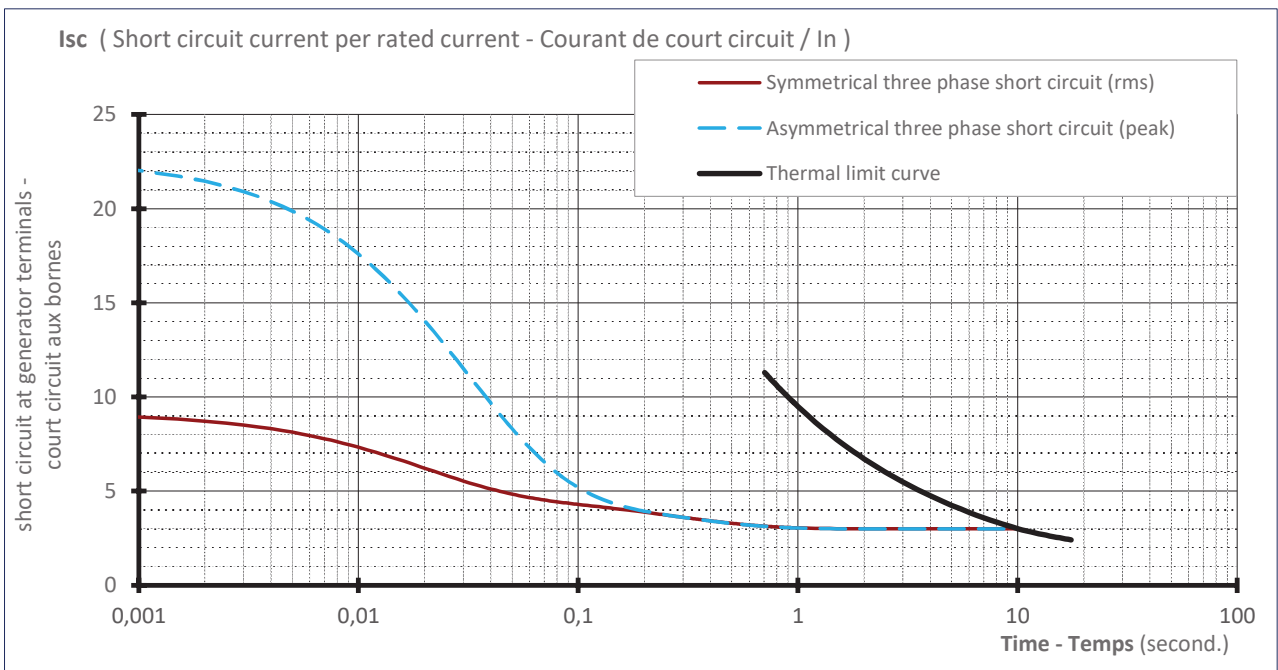
LS Reference: MB342-10-2020-2

Stator Current decrement curves

Symmetrical phase to neutral short-circ		initial	1 370	A	9,3 x In	
Symmetrical two phase short-circuit		max	1 144	A	7,7 x In	In = 148 A
Symmetrical three phase short-circuit		value	1 321	A	8,9 x In	
Thermal Limit						



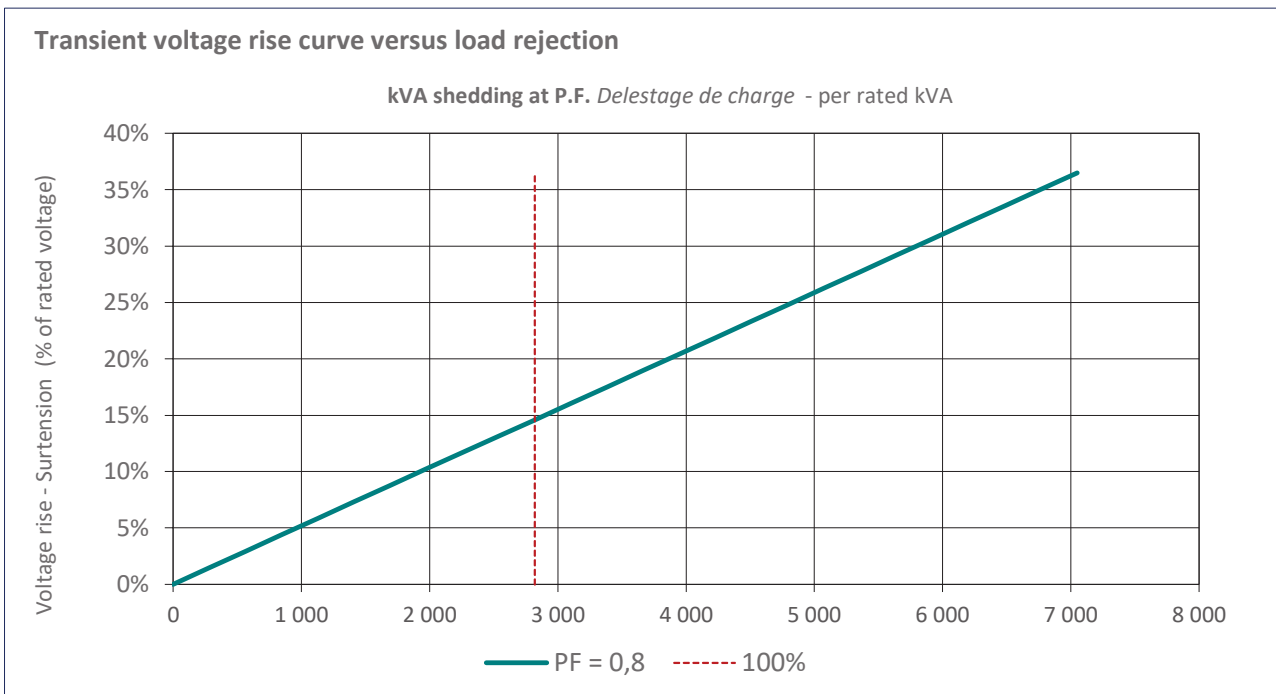
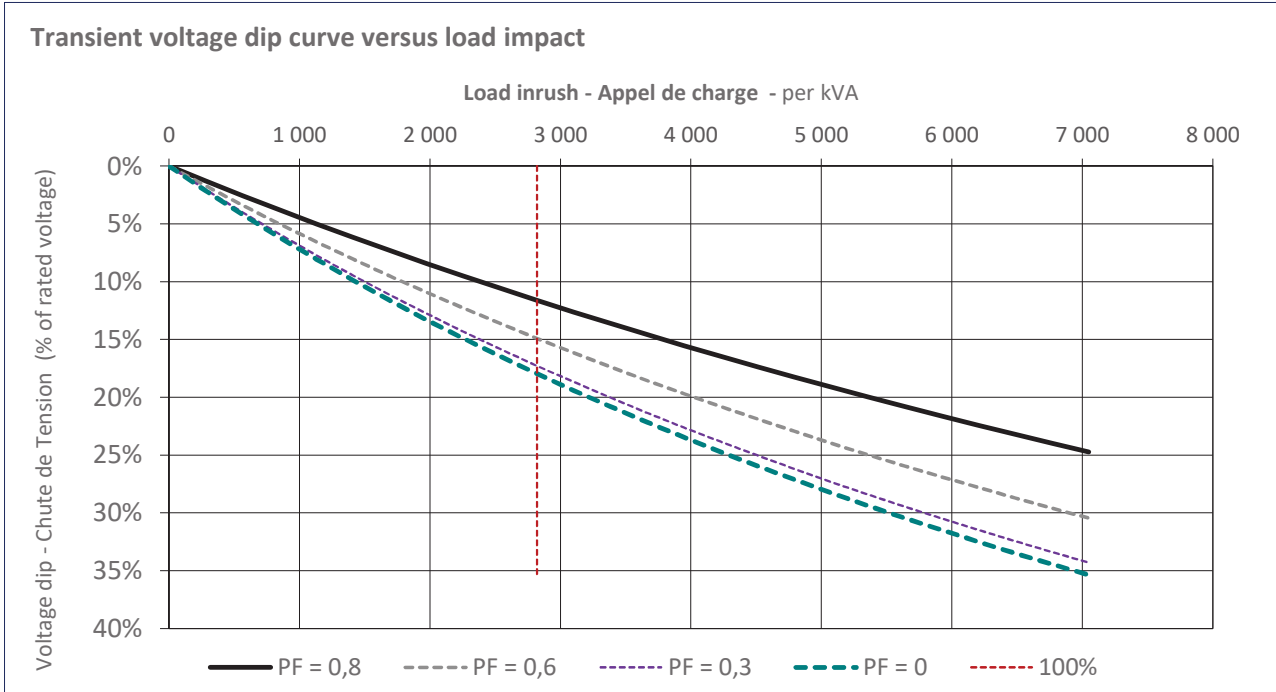
Asymmetrical three phase short-circuit		IP	3 228	A	21,8 x In
--	--	----	-------	---	-----------



ALTERNATOR MAIN CURVES
LSA 53.2 ZL14 / 4P

LS Reference: MB342-10-2020-2

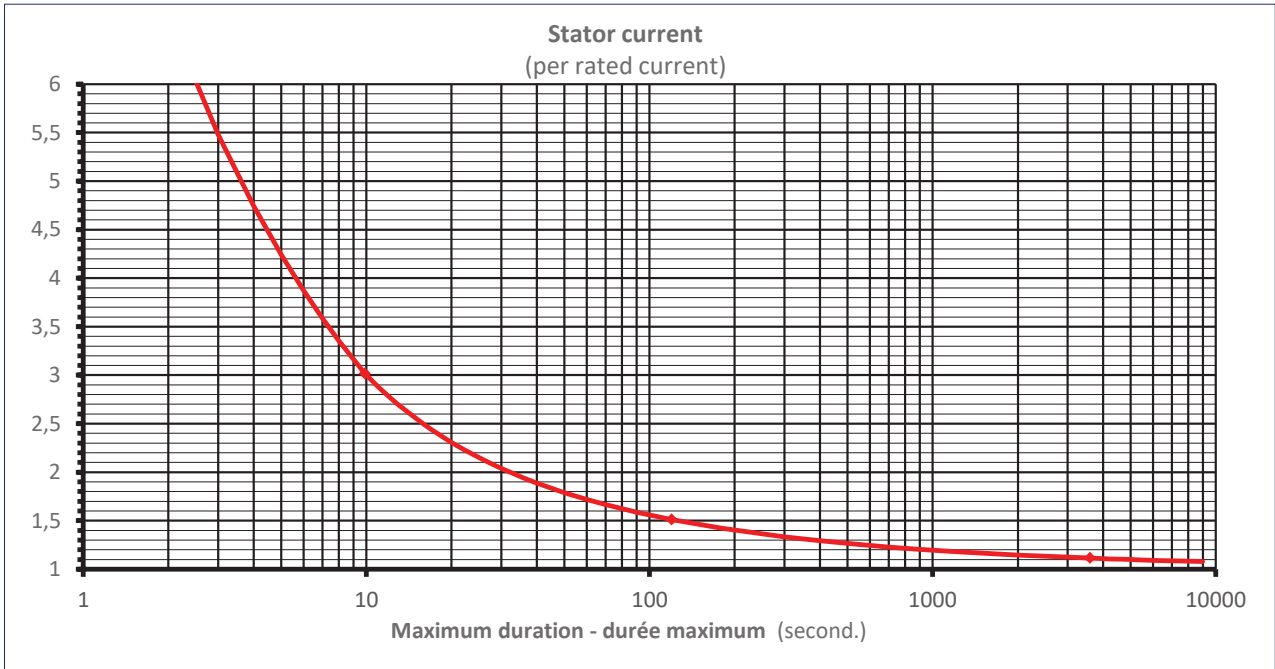
Transient Voltage Variation



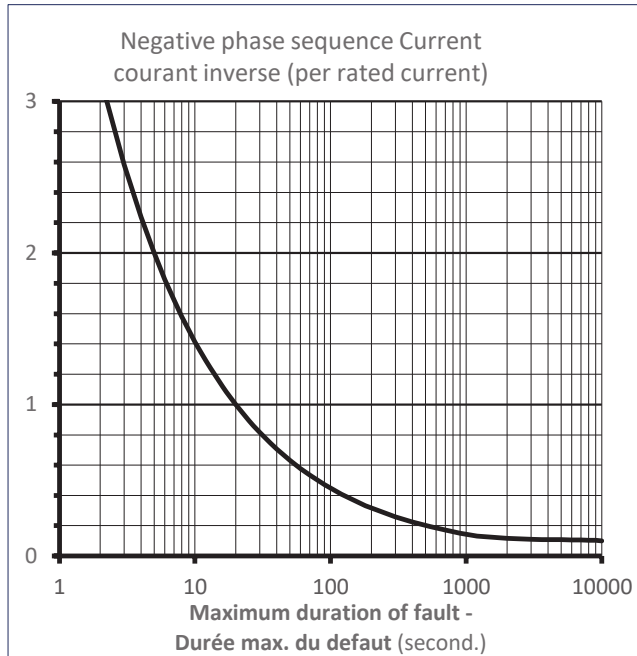
**ALTERNATOR MAIN CURVES
LSA 53.2 ZL14 / 4P**

LS Reference: MB342-10-2020-2

Thermal Damage Curve



Unbalance Load Curve



Stator Earth Fault Current

