ALTERNATOR TECHNICAL DESCRIPTION
WHA 52.3 L9 / 4p

Date: 02-26-2024 V6.10 - 12/2023

197 A,Fushou East Street,High-Tech Development Zone, Weifang,China

Main data					C
Generator type:	**WHA 52.3 L9 / 4p**				
Power:	2 000	kVA	1 600 kWe	1 660 kWm	
Voltage:	400	V	Star serial		
Rated voltage range:	+5/-5%				
Power factor - Lagging:	0,8				
Frequency:	50	Hz			
Speed:	1 500	rpm			
Nominal current:	2 887	A			
Winding type:	p2/3				
Classes (Insulation / Temperature Rise):	H / F				
Ambient temperature:	40	°C			
Altitude:	1 000	m			

Installation	IEC	Quantity	1
Prime mover:	Reciprocating engine		
Manufacturer:	-		
Type:	-		
Duty:	Base Rating		

Mechanical construction	IM1201
Type of construction:	Single bearing
Mounting arrangement:	Horizontal Axis
Direction of rotation:	Clockwise (seen when facing the drive end - DE)
Bearing type:	Anti-friction
Bearing Lubrication:	Regreasable
Bearing insulation:	Not insulated
Flector type:	Cylindrical with keyway
Balancing - Class (ISO 21940-11):	Half key - G2,5 (std)
Flange:	SAE 0
Shaft height:	500 mm
Width:	750 mm

Comments: SAE0-18

Additional specificities	
Stabilized Runaway speed:	1 800 rpm - 2 min.

Cooling Method	IC01
Degree of protection:	IP23
Coolant:	Air / Temperature: 40 °C
Air quality:	Salt laden
Ventilation (internal):	Self-ventilated
Filters:	Without
Ducting for air inlet:	No
Ducting for air outlet:	No

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Connection, Excitation & Regulation

Parallel operation:	Island mode (0F) - no droop CT
Excitation:	Self-excited - Brushless - Type: PMG
Sustained 3-phase Isc:	> 3 x FLC for 10s.
AVR type:	Leroy Somer - D550 - Digital
AVR location:	In terminal box
Alternator Voltage sensing:	In terminal box

Terminal box

Power connection:	4 connectors (brought out neutral)
Main terminal box location:	1 terminal box on the top
Line side outlet:	Left hand side (seen when facing the drive end - D)
Gland plate:	Non magnetic, Undrilled
Auxiliaries	In main terminal box
	-

Protection and measurement accessories

Temperature detection

Stator windings:	6 x PT100 (3 wires)
Guide bearing - NDE:	1 x PT100 per bearing (3 wires)

Anti-condensation heating

Voltage: 230 V - 1Ph / Power: 500 W

Transformers (Client use)

LS Supply

Set of 3 x CTs (measuring and/or protection):			I Primary / I Secondary / Power / Class
Preliminary	Neutral side	S1	4000 / 5A / 10VA / Cl. 0,5

Various items

Paint:	PE - Primary - RAL 7032
Documentation:	PDF manual
Documentation Language:	English
Nameplate	Sticker

Controls

Standards:	IEC
QUAL/INES/006 001 => 101	Measurement of winding resistance
QUAL/INES/006 021 => 128	Insulation check on sensors (when fitted)
QUAL/INES/006 002 => 102&103	Voltage balance and phase order check
QUAL/INES/006 007 => 109	Overspeed test (according to test bench limitation)
QUAL/INES/006 009 => 111	High potential test
QUAL/INES/006 010 => 112	Insulation resistance measurement

ALTERNATOR ELECTRICAL DATA
WHA 52.3 L9 / 4P

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Main data: C

Power:	**2 000**	kVA	**1 600**	kWe	**1 660**	kWm
Voltage:	**400**	V	Frequency:		**50**	Hz
Rated voltage range:	+5% / -5%		Speed:		1500	rpm
Power factor - Lagging:	0,8					
Nominal current:	2 887	A	Phases		3	
Insulation / Temperature rise:	H / F		Connexion		Star serial	
Cooling:	**IC01**		Winding type:		p2/3	
			Winding:		- 6 Wires	
Ambient temperature:	40	°C				
Altitude:	1000	m	Overspeed (rpm)		1800	
Duty: Base Rating			Total Harmonic Distortion (THD) < 3,5%			

Efficiency (Base 1600 kWe) IEC

	25%	50%	75%	**100%**	110%
Power factor - Lagging: 0,8	94,75	96,43	96,60	**96,41**	96,30
Power factor - Lagging: 1	95,31	97,13	97,46	**97,45**	97,41

Reactances (%) - (Base 2000 kVA)

Unitary impedance (1 per unit) = 0,08 ohms

		Direct axis *Unsaturated*	Direct axis *Saturated*		Quadrature axis *Unsaturated*	Quadrature axis *Saturated*
Synchronous reactance	Xd	292	217	Xq	149	111
Transient reactance	X'd	26,0	22,1	X'q	149	111
Subtransient reactance	X"d	13,1	11,2	X"q	13,6	11,6
Negative sequence reactance	X2	13,4	11,4			

X0	2,1	Zero sequence reactance
Xl	6,6	Stator leakage reactance
Xr	20,9	Rotor leakage reactance
Kc	**0,46**	Short-circuit ratio

Time constants (s)

	Direct axis		Quadrature axis	
Open circuit transient time constant	T'do	2,99	T'qo	NA
Short-circuit transient time constant	T'd	0,267	T'q	NA
Open circuit subtransient time constant	T"do	0,044	T"qo	0,216
Subtransient time constant	T"d	0,022	T"q	0,020

Ta	0,028	Armature winding short circuit time constant

Resistances (%)

Ra	1,5	Armature resistance	R0	0,7	Zero sequence resistance
X/R	7,3	X/R ratio (without unit)	R2	2,7	Negative sequence resistance

Voltage accuracy: 0,25%
Maximum inrush current for a voltage dip of 15%: 1507 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

ALTERNATOR MAIN CURVES
WHA 52.3 L9 / 4P

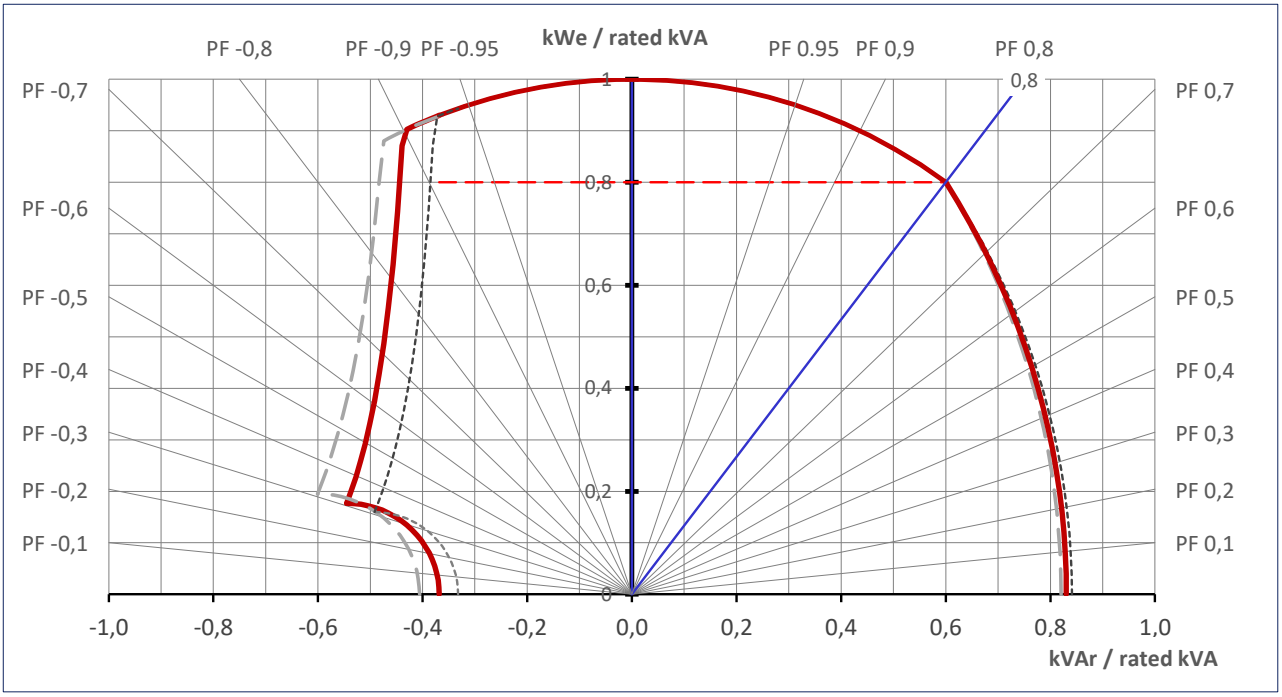
Date: 02-26-2024

2000kVA - 400V - 50 Hz

V6.10 - 12/2023

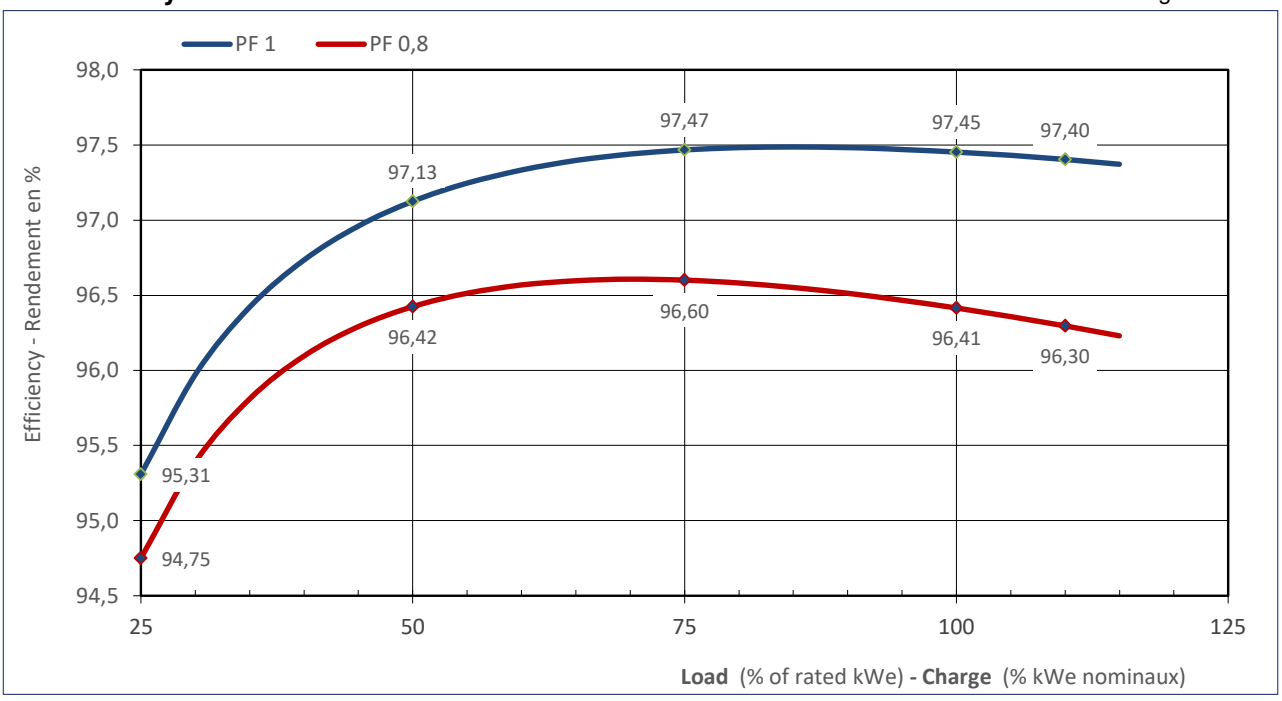
Capability Curve

Umax	+ 5%	420	V
Un		**400**	V
Umin	- 5%	380	V



Efficiency Curves

According to: IEC



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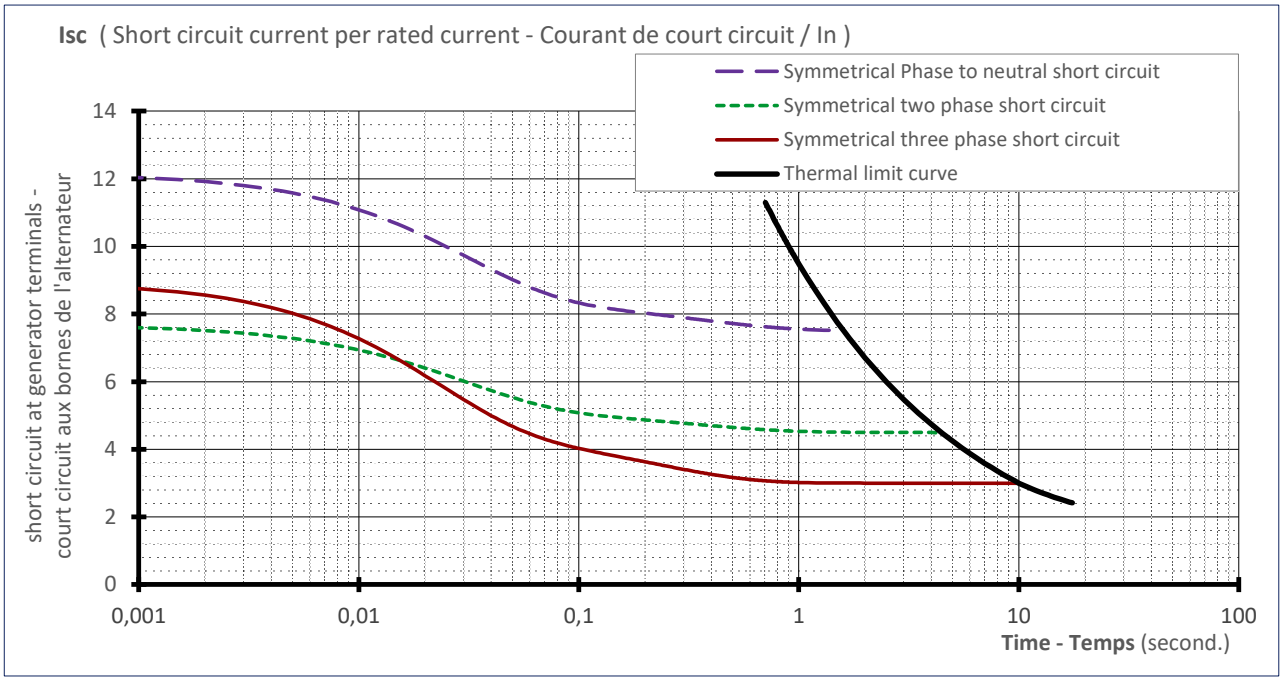
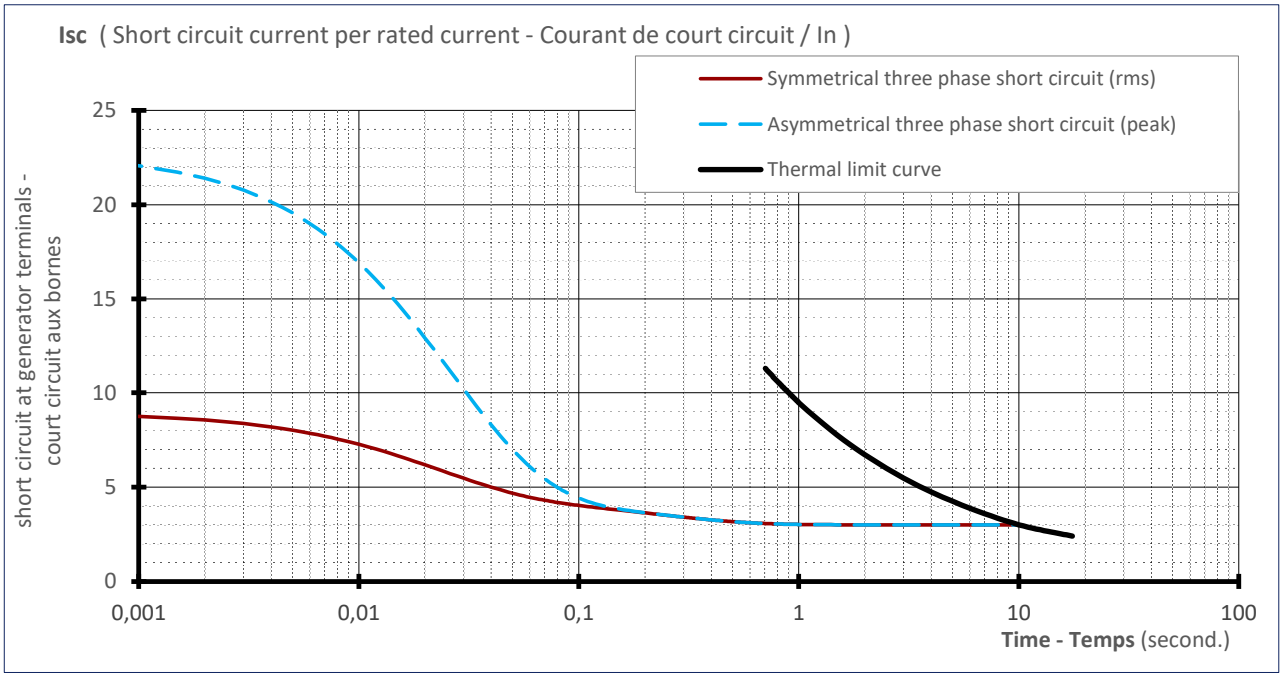
Stator Current decrement curves

Symmetrical phase to neutral short-circu	initial	34 755	A	12 x In	In =	**2887** A
Symmetrical two phase short-circuit	max	21 929	A	7,6 x In		
Symmetrical three phase short-circuit	value	25 269	A	8,8 x In		
Thermal Limit						



Asymmetrical three phase short-circuit	IP	63 133	A	21,9 x In	



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2000kVA - 400V - 50 Hz

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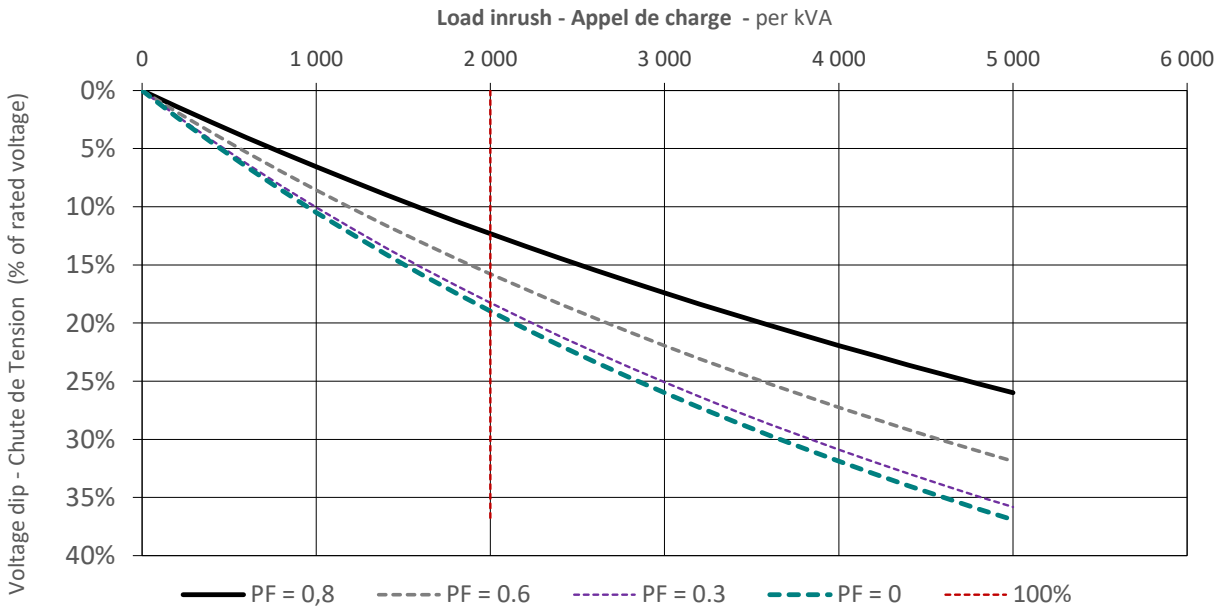
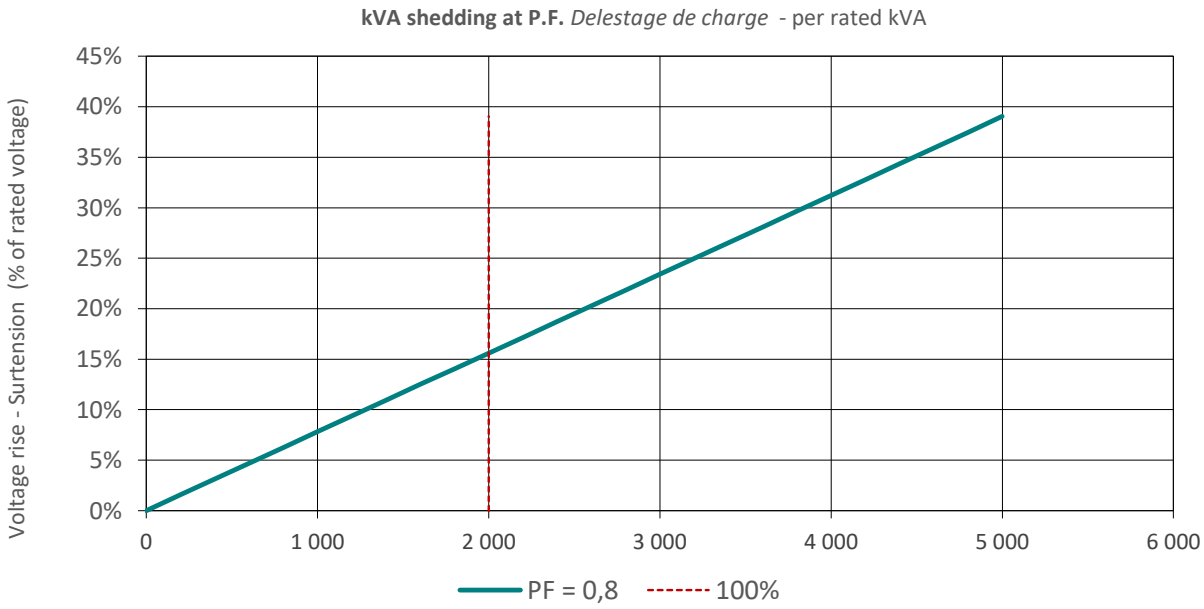
Transient Voltage Variation

Transient voltage dip curve versus load impact



Transient voltage rise curve versus load rejection



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2000kVA - 400V - 50 Hz

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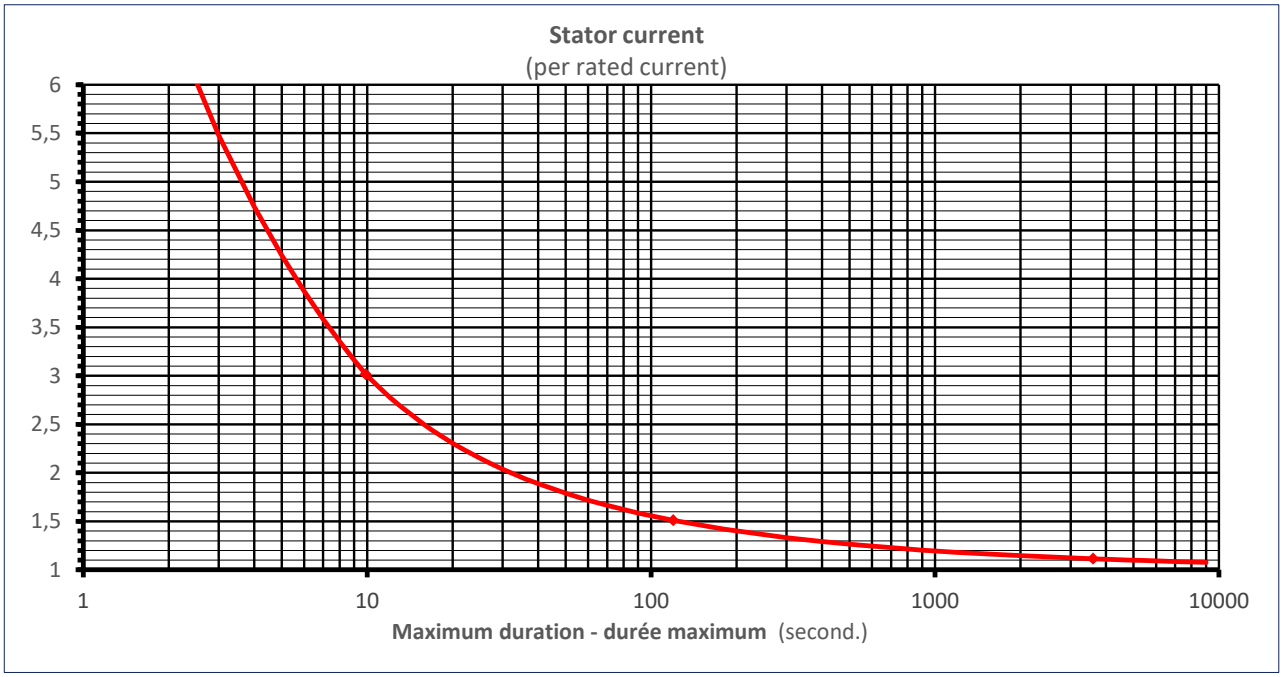
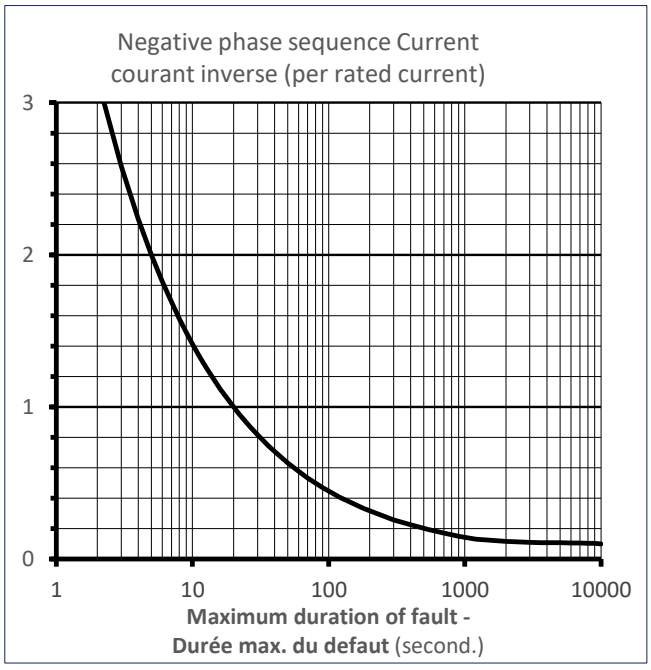
Thermal Damage Curve



Unbalance Load Curve



Stator Earth Fault Current