ALTERNATOR TECHNICAL DESCRIPTION
WHA 53.2 L14

Date: 07-12-2024

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

Main data					C
Generator type:	**WHA 53.2 L14**				
Power:	2 500	kVA	2 000 kWe	2 069 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:	3 608	A			
Winding type:	p2/3				
Classes (Insulation / Temperature Rise):	H / F				
Ambient temperature:	45	°C			
Altitude:	1 000	m			

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

Mechanical construction	IM1101
Type of construction:	Two 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
Shaft end type:	Cylindrical with keyway
Balancing - Class (ISO 21940-11):	Half key - G2,5 (std)
Flange:	None / without
Shaft height:	500 mm
Width:	1 150 mm

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

Cooling Method	IC01
Degree of protection:	IP23
Coolant:	Air / Temperature: 45 °C
Air quality:	Clean
Ventilation (internal):	Self-ventilated
Filters:	Without
Ducting for air inlet:	No
Ducting for air outlet:	No

ALTERNATOR TECHNICAL DESCRIPTION
WHA 53.2 L14 / 4p

Date: 07-12-2024

Connection, Excitation & Regulation

Parallel operation:	Island mode (0F) - no droop CT
Excitation:	Self-excited - Brushless - Type: AREP + PMI
Sustained 3-phase Isc:	> 3 x FLC for 10s.
AVR type:	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 RTDs (3 wires)
Combined guide and thrust bearing - DE:	1 x PT100 RTD (3 wires)
Guide bearing - NDE:	1 x PT100 RTD (3 wires)

Anti-condensation heating

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

Various items

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

Controls

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 53.2 L14 / 4P

Date: 07-12-2024

Main data: C

Power:	**2 500**	kVA	**2 000**	kWe	**2 069**	kWm
Voltage:	**400**	V	Frequency:		**50**	Hz
Rated voltage range:	+5% / -5%		Speed:		1500	rpm
Power factor - Lagging:	0,8					
Nominal current:	3 608	A	Phases		3	
Insulation / Temperature rise:	H / F		Connexion		Star serial	
Cooling:	**IC01**		Winding type:		p2/3	
			Winding:		- 6 Wires	
Ambient temperature:	45	°C				
Altitude:	1000	m	Overspeed (rpm)		1800	
Duty: Base Rating			Total Harmonic Distortion (THD) < 3,5%			

Efficiency (Base 2000 kWe) IEC

	25%	50%	75%	**100%**	110%
Power factor - Lagging: 0,8	92,40	95,53	96,38	**96,67**	96,70
Power factor - Lagging: 1	92,83	96,08	97,02	**97,39**	97,47

Reactances (%) - (Base 2500 kVA)

Unitary impedance (1 per unit) = 0,064 ohms

		Direct axis *Unsaturated*	Direct axis *Saturated*		Quadrature axis *Unsaturated*	Quadrature axis *Saturated*
Synchronous reactance	Xd	179	117	Xq	91	60
Transient reactance	X'd	17,8	15,1	X'q	91	60
Subtransient reactance	X"d	9,4	8,0	X"q	9,9	8,4
Negative sequence reactance	X2	9,6	8,2			

X0	1,5	Zero sequence reactance
Xl	4,7	Stator leakage reactance
Xr	14,2	Rotor leakage reactance
Kc	**0,86**	Short-circuit ratio

Time constants (s)

	Direct axis		Quadrature axis	
Open circuit transient time constant	T'do	3,43	T'qo	NA
Short-circuit transient time constant	T'd	0,341	T'q	NA
Open circuit subtransient time constant	T"do	0,038	T"qo	0,166
Subtransient time constant	T"d	0,020	T"q	0,018

Ta	0,039	Armature winding short circuit time constant

Resistances (%)

Ra	0,8	Armature resistance	R0	0,5	Zero sequence resistance
X/R	10,1	X/R ratio (without unit)	R2	1,9	Negative sequence resistance
Ri	≥1kΩ/1V	Insulation resistance (phase - phase, phase -ground)			

Voltage accuracy: 0,25%
Maximum inrush current for a voltage dip of 15%: 2750 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

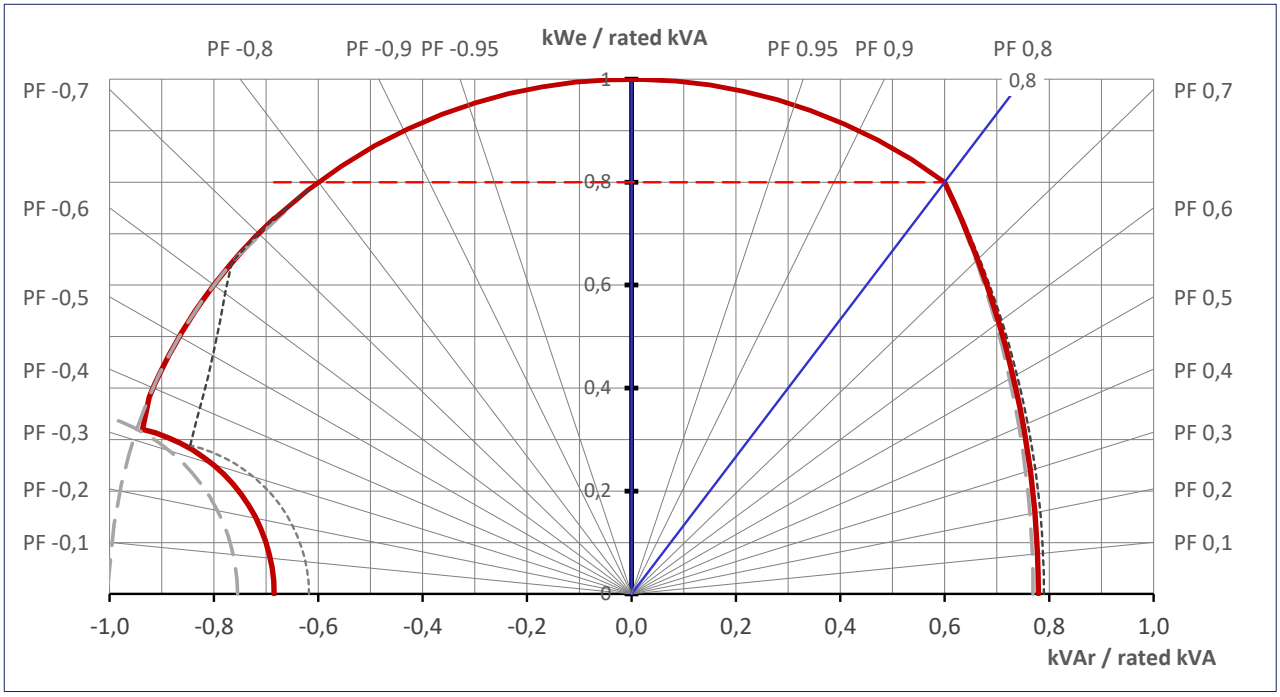
ALTERNATOR MAIN CURVES
WHA 53.2 L14 / 4P

Date: 07-12-2024

2500kVA - 400V - 50 Hz

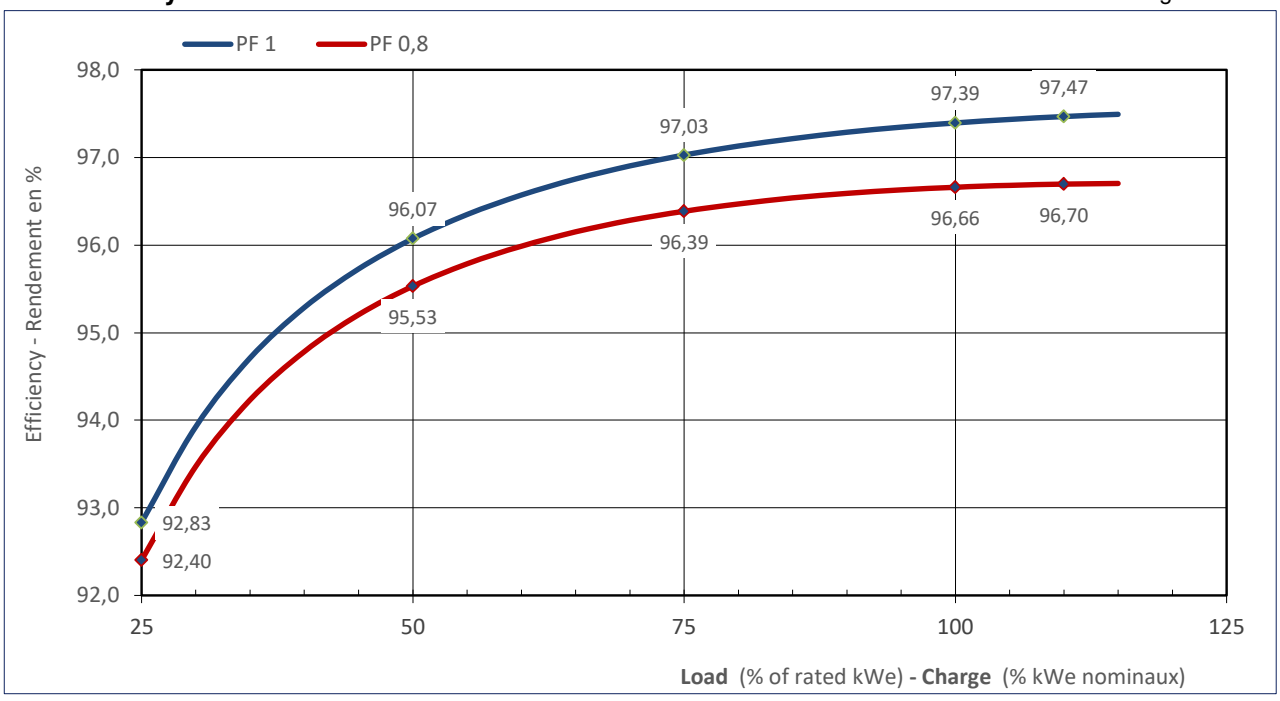
Capability Curve

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



Efficiency Curves

According to: IEC



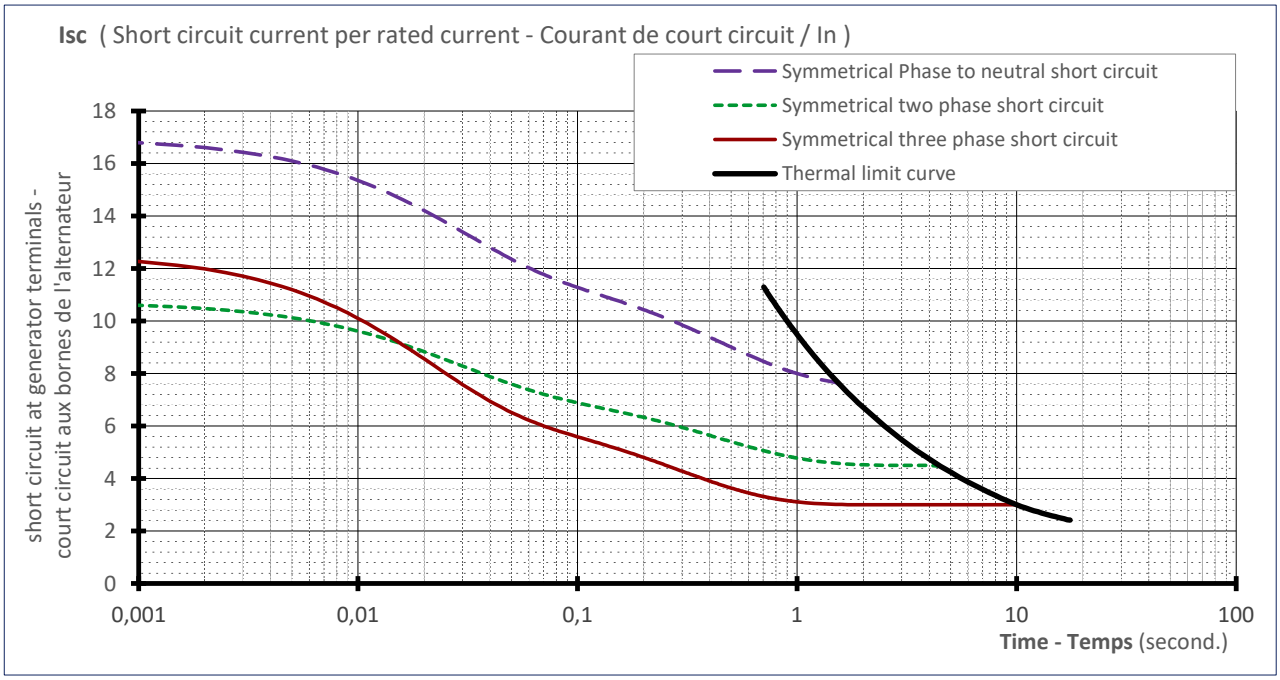
ALTERNATOR MAIN CURVES
WHA 53.2 L14 / 4P

Date: 07-12-2024

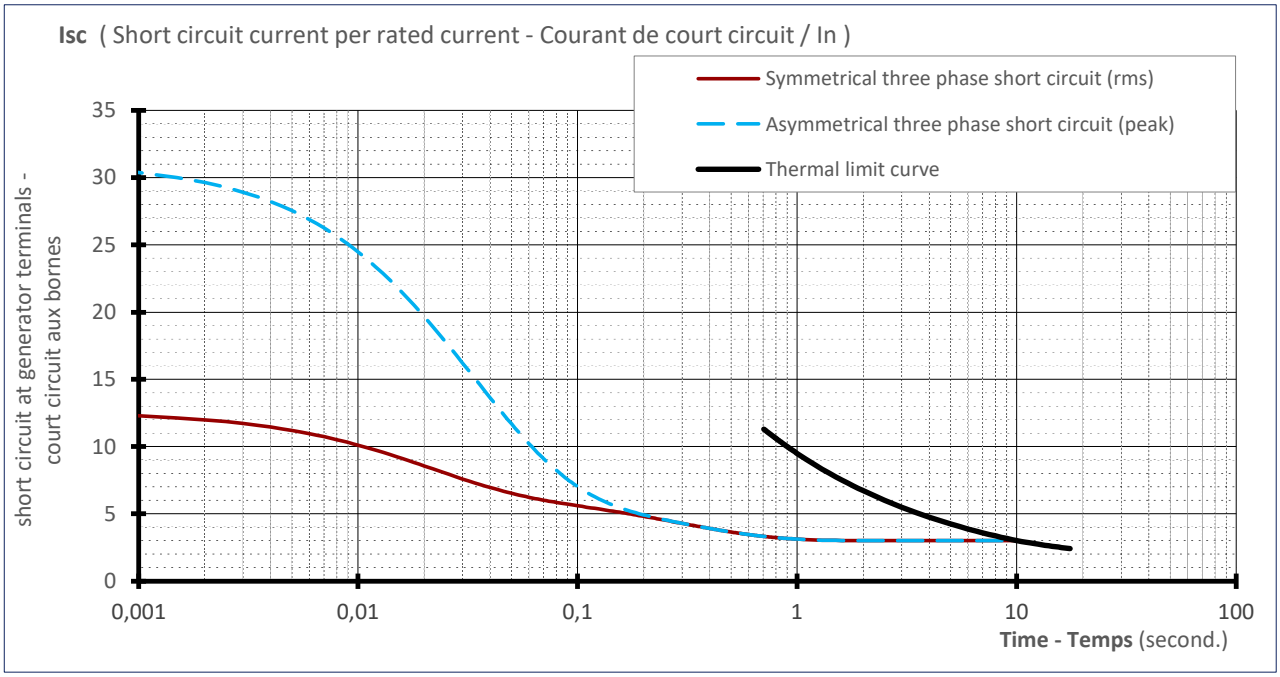
2500kVA - 400V - 50 Hz

Stator Current decrement curves

Symmetrical phase to neutral short-circ	initial	60 559	A	16,8 x In	In =	**3608** A
Symmetrical two phase short-circuit	max	38 242	A	10,6 x In		
Symmetrical three phase short-circuit	value	44 278	A	12,3 x In		
Thermal Limit						



Asymmetrical three phase short-circuit	IP	108 649	A	30,1 x In		



ALTERNATOR MAIN CURVES
WHA 53.2 L14 / 4P

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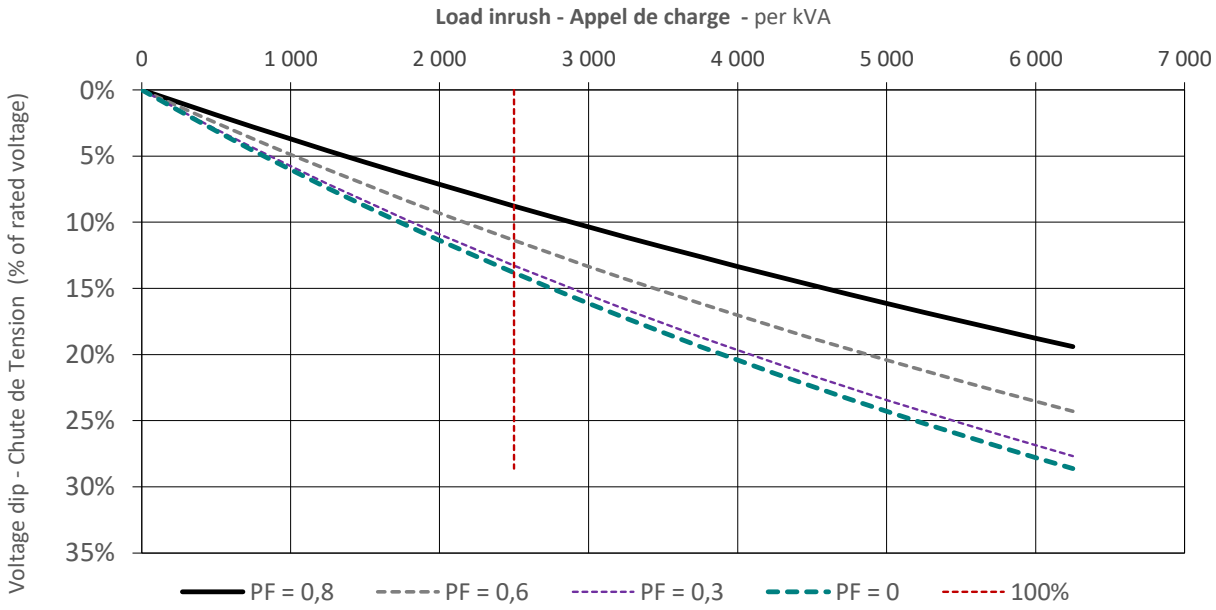
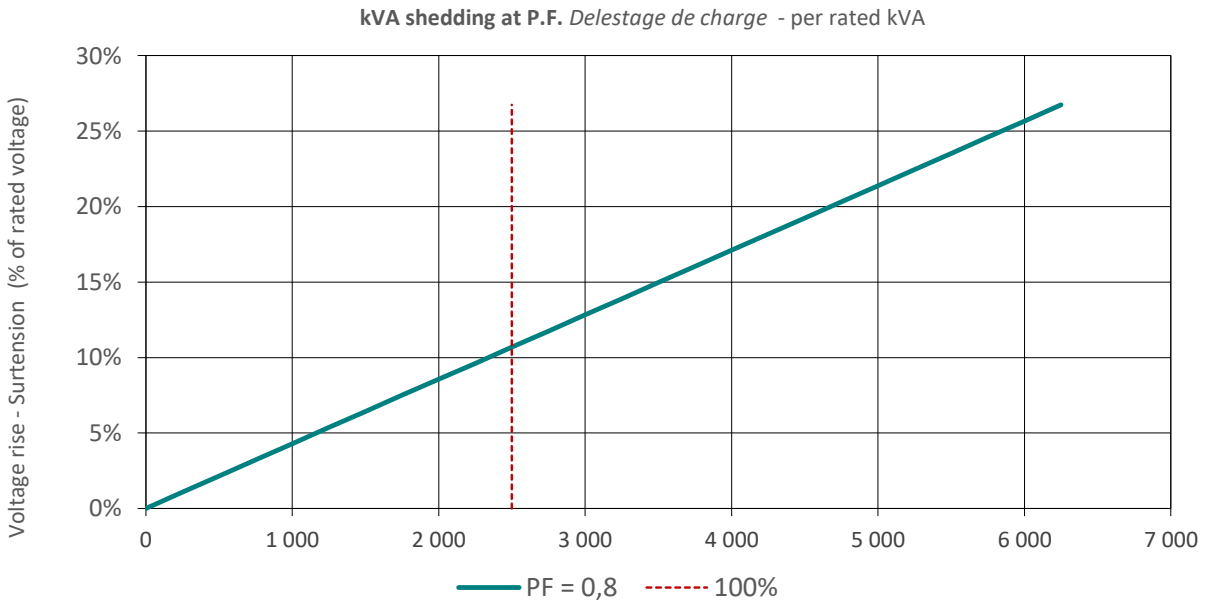
2500kVA - 400V - 50 Hz

Transient Voltage Variation

Transient voltage dip curve versus load impact



Transient voltage rise curve versus load rejection



ALTERNATOR MAIN CURVES
WHA 53.2 L14 / 4P

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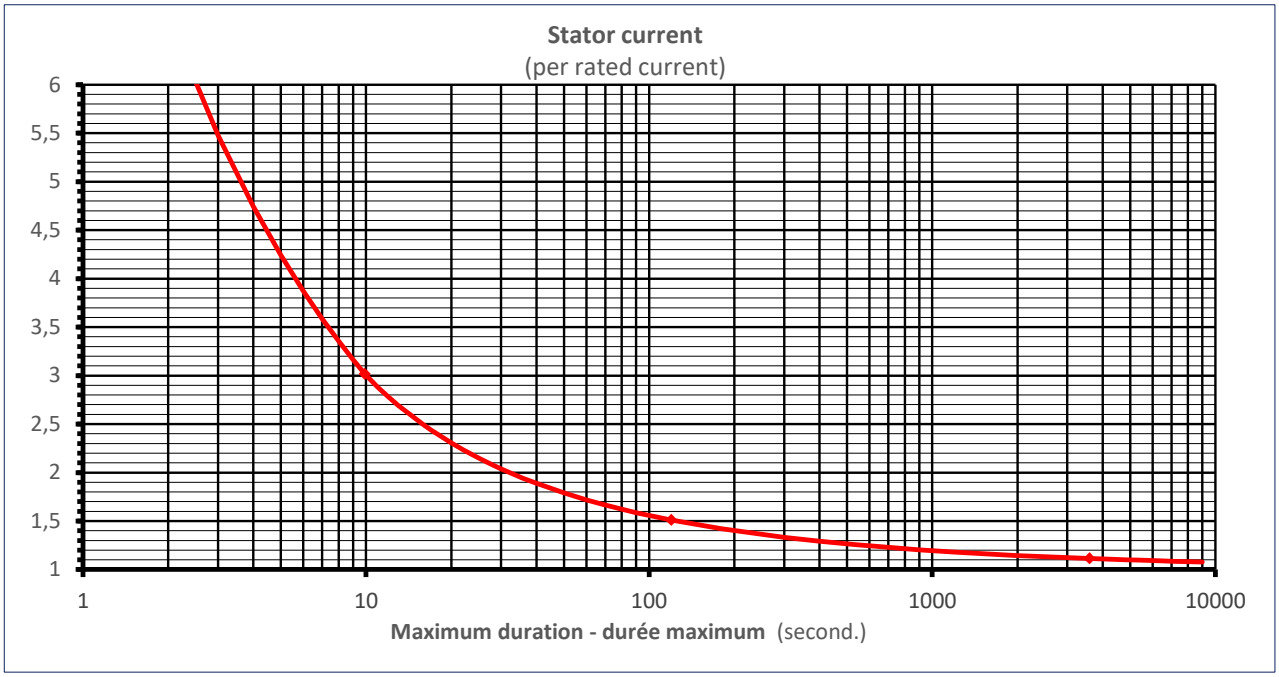
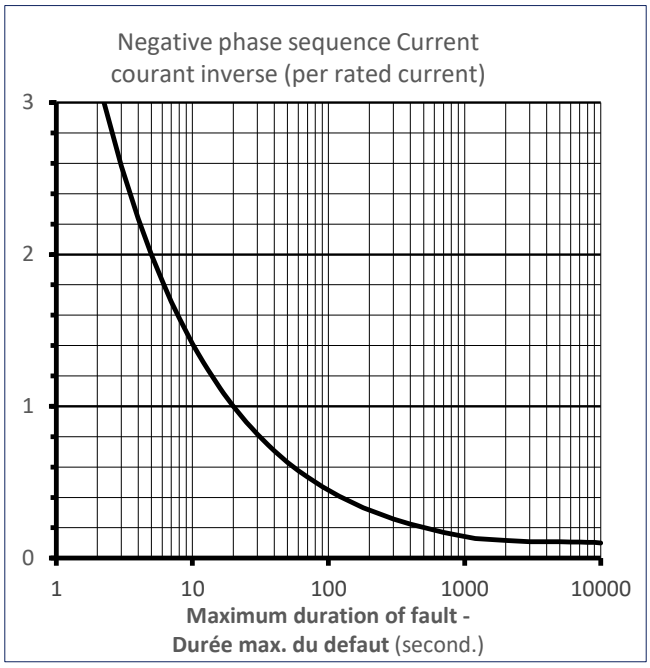
2500kVA - 400V - 50 Hz

Thermal Damage Curve



Unbalance Load Curve



Stator Earth Fault Current