

Date: 11/01/2017

V4.051 - 12/2016

Moteurs Leroy-Somer

Project Manager : PC

Electric Power Generation - Orleans

+44 (0) 771 350 4932

1 rue de la Burelle - 45800 Saint Jean de Braye - France

Peter.CLIFTON@Emerson.com

PC

## Main data

C

Generator type:	<b>LSA 44.3 S5 / 4p</b>		
Power:	95 kVA	76 kWe	82 kWm
Voltage:	600 V	Star serial	
Rated voltage range:	+5/-5%		
Power factor - Lagging:	0,8		
Frequency:	60 Hz		
Speed:	1800 rpm		
Nominal current:	91 A		
Winding type:	p2/3		
Classes (Insulation / Temperature Rise):	H / H		
Ambient Temperature:	50 °C		
Altitude:	1000 m		

## Installation

Quantity

1

Client:	CATERPILLAR MARINE
Prime mover:	Reciprocating engine
Manufacturer:	-
Type:	-
Duty:	Base Rating
Industry:	Marine

## 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 1940/1):	Half key - G2,5 (std)
Flange:	To defined later
Shaft height:	270 mm
Width:	356 mm

## Additional specificities

Stabilized Runaway speed:	2250 rpm - 2 min.
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## Cooling Method

IC01

Degree of protection:	IP23
Coolant:	Air / Temperature: 50 °C
Air quality:	Clean
Ventilation (internal):	Self-ventilated
Filters:	Without
Ducting for air inlet:	No
Ducting for air outlet:	No

## Connection, Excitation & Regulation

Parallel operation:	Island mode (0F)
Excitation:	Self-excited - Brushless - Type: AREP
Sustained 3-phase Isc:	> 3 x FLC for 10s.
AVR type:	R438
AVR location:	In terminal box
Alternator Voltage sensing:	Terminal box mounted voltage sensing VTs

## Terminal box

Power connection:	4 connectors (brought out neutral)
Main Terminal box location:	On Top
Line side outlet:	Left hand side (seen when facing the drive end - D)
Gland plate:	Non magnetic - Cable gland plate not drilled

## Protection and measurement accessories

### Temperature detection

Stator windings:	6 x 3-wire Pt100 RTDs
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### 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	Measurement of winding resistance
QUAL/INES/006 021	Insulation check on sensors (when fitted)
QUAL/INES/006 002	Voltage balance and phase order check
QUAL/INES/006 007	Overspeed test (according to test bench limitation)
QUAL/INES/006 009	High potential test
QUAL/INES/006 010	Insulation resistance measurement

**Main data:**

Power:	<b>95</b>	kVA	<b>76</b>	kWe	<b>82</b>	kWm	1
Voltage:	<b>600</b>	V	Frequency:	<b>60</b>	Hz		1
Rated voltage range:	+5% / -5%		Speed:	<b>1800</b>	rpm		1
Power factor - Lagging:	<b>0,8</b>						1
Nominal current:	<b>91</b>	A	Phases	<b>3</b>			
Insulation / Temperature rise:	<b>H / H</b>		Connexion	<b>Star serial</b>			1
Cooling:	<b>IC01</b>		Winding type:	<b>p2/3</b>			1
			Winding:	<b>9 - 12 Wires</b>			1
Ambient Temperature:	<b>50</b>	°C					1
Altitude:	<b>1000</b>	m	Overspeed (rpm)	<b>2250</b>			1
Duty: Base Rating			Total Harmonic Distortion (THD) < 5%				1

**Efficiency ( Base 95 kVA )**

IEC

	25%	50%	75%	<b>100%</b>	110%	
<b>Power factor - Lagging: 0,8</b>	86,1	91,2	92,4	<b>92,7</b>	92,7	1
<b>Power factor - Lagging: 1</b>	86,8	92,3	93,9	<b>94,5</b>	94,6	1

**Reactances (%) - ( Base 95 kVA )**

		Unsaturated	Saturated		Unsaturated	Saturated	
	Direct axis			Quadrature axis			
Synchronous reactance	Xd	243	172	Xq	124	88	1
Transient reactance	X'd	18,6	11,1	X'q	124	88	1
Subtransient reactance	X''d	11,0	6,6	X''q	23,1	13,9	1
Negative sequence reactance	X2	17,0	10,2				
X0	2,2	Zero sequence reactance					1
Xl	5,5	Stator leakage reactance					
Xr	13,8	Rotor leakage reactance					
Kc	<b>0,58</b>	Short-circuit ratio					1

**Time constants (s)**

		Direct axis		Quadrature axis		
Open circuit transient time constant	T'do	2,21		T'qo	NA	1
Short-circuit transient time constant	T'd	0,169		T'q	NA	1
Open circuit subtransient time constant	T''do	0,017		T''qo	0,048	1
Subtransient time constant	T''d	0,010		T''q	0,009	1
Ta	0,015	Armature time constant				1

**Resistances (%)**

Ra	3,0	Armature resistance	R0	0,7	Zero sequence resistance	1
X/R		X/R ratio (without unit)	R2	3,4	Negative sequence resistance	

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, improve the design or change conditions of utilization

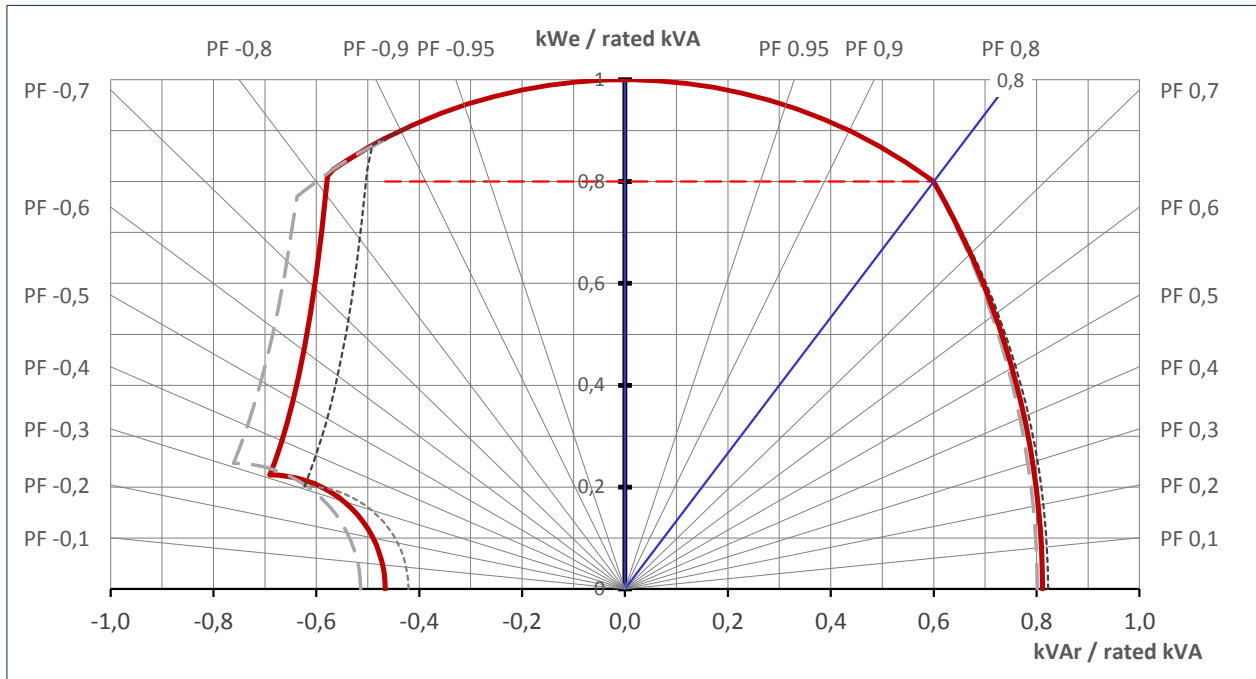
Date: 11/01/2017

95kVA - 600V - 60 Hz

V4.05I - 12/2016

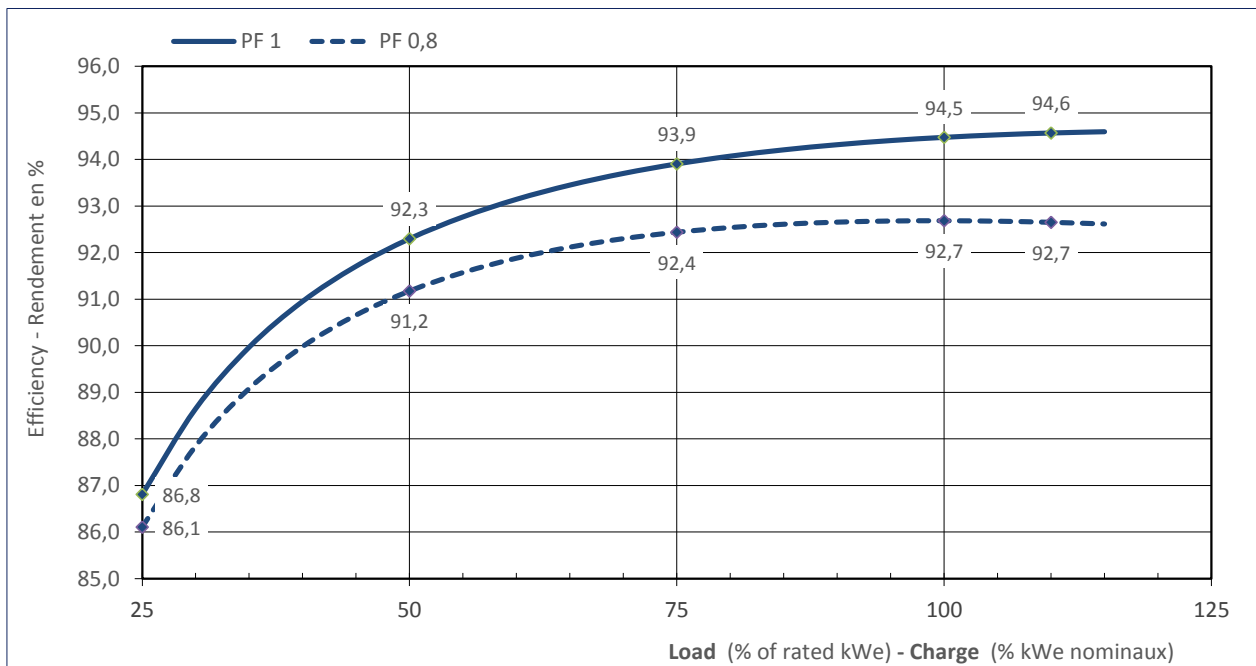
### Capability Curve

---	Umax	+ 5%	630	V
—	Un		<b>600</b>	V
---	Umin	- 5%	570	V



### Efficiency Curves

According to IEC



### Stator Current decrement curves

Symmetrical phase to neutral short-circuit

Symmetrical two phase short-circuit

Symmetrical three phase short-circuit

Thermal Limit

initial

max

value

1 414 A

15,5 x  $I_n$

921 A

10,1 x  $I_n$

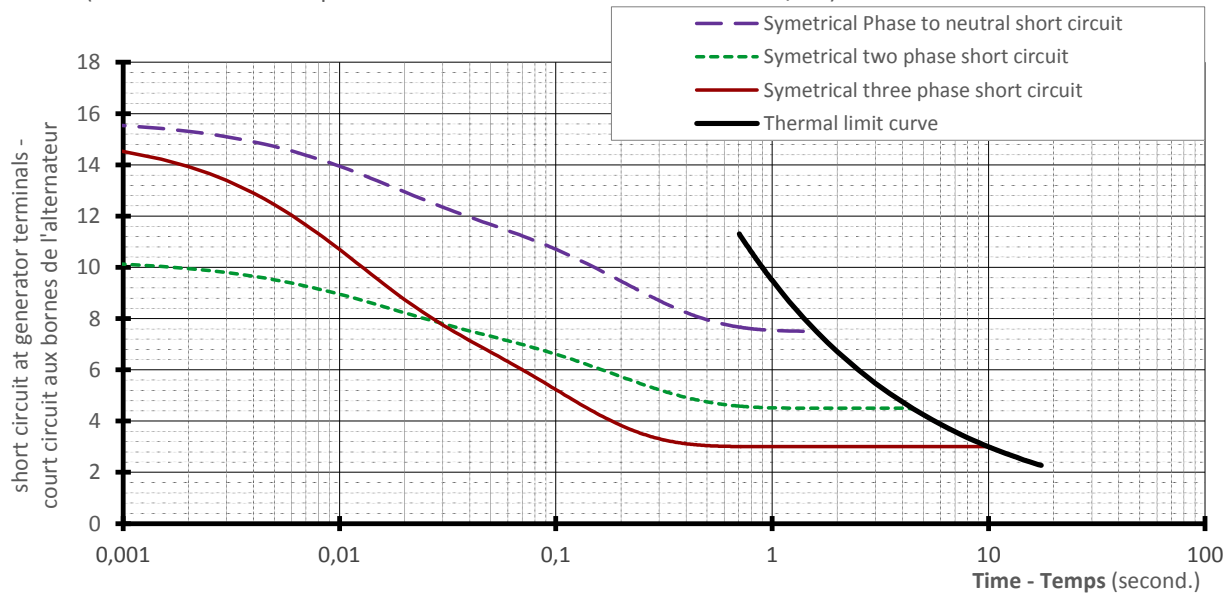
1 322 A

14,5 x  $I_n$

$I_n =$

91 A

Isc ( Short circuit current per rated current - Courant de court circuit /  $I_n$  )



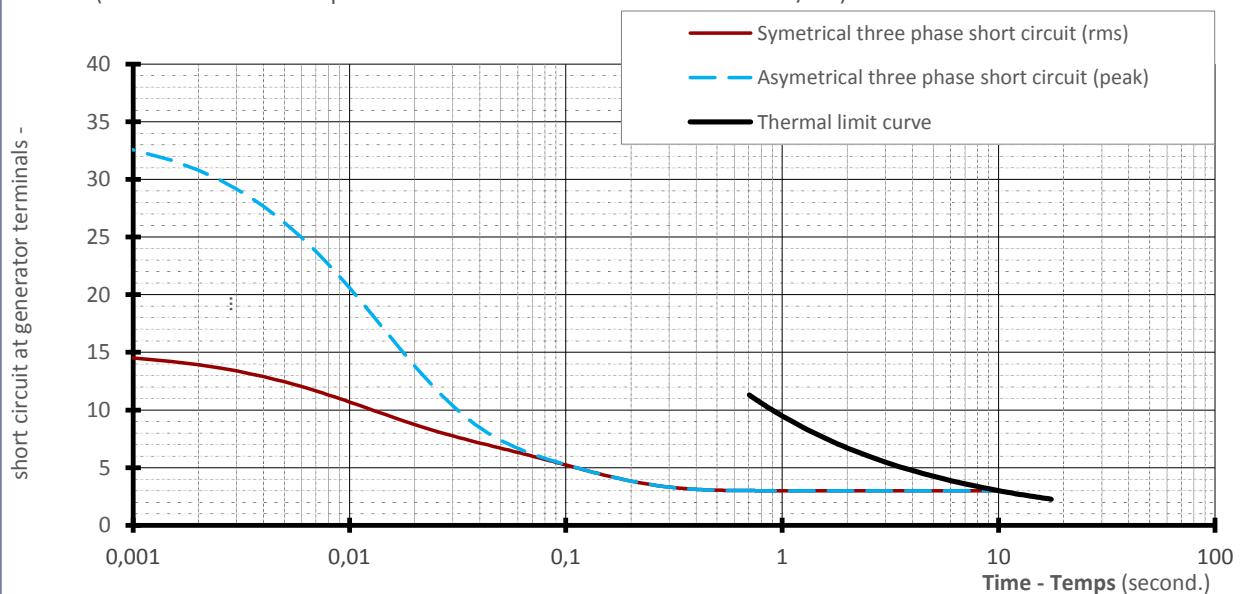
Asymmetrical three phase short-circuit

IP

2 972 A

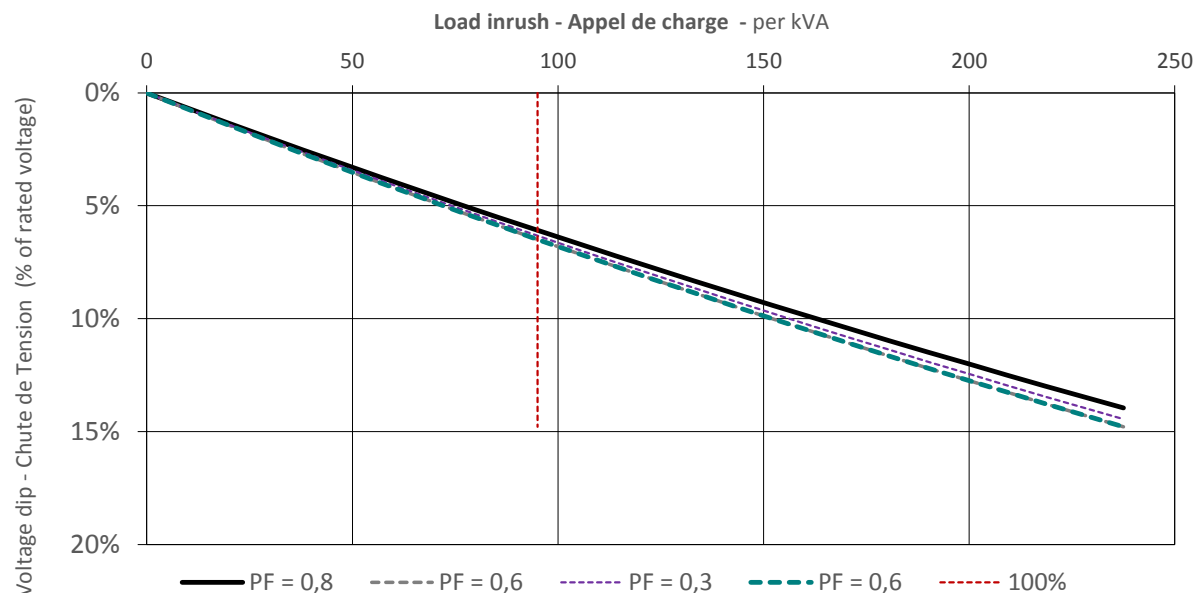
32,7 x  $I_n$

Isc ( Short circuit current per rated current - Courant de court circuit /  $I_n$  )

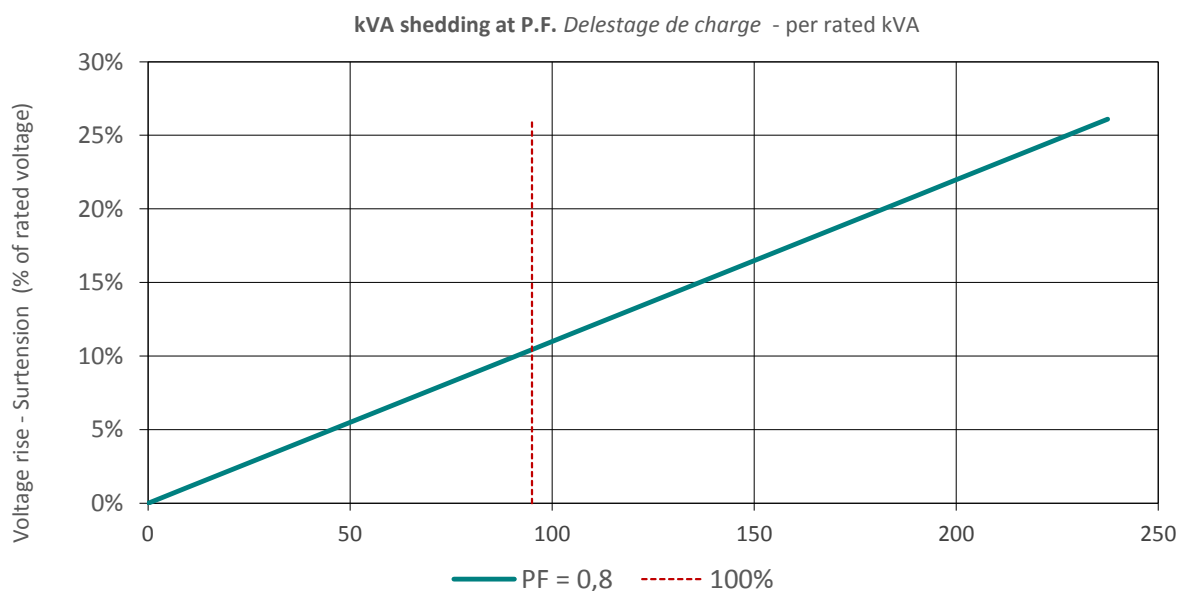


## Transient Voltage Variation

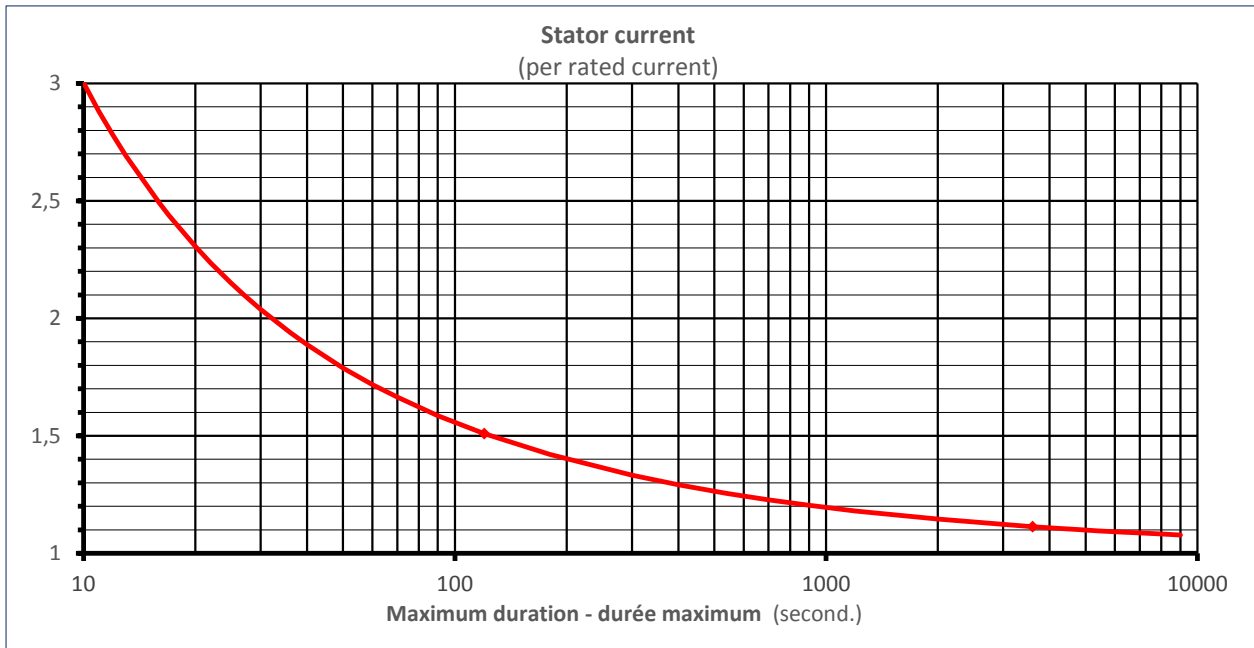
### Transient voltage dip curve versus load impact



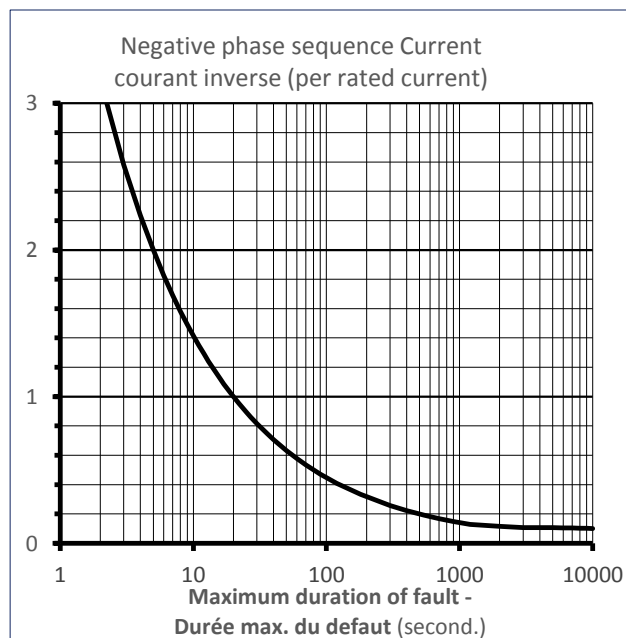
### Transient voltage rise curve versus load rejection



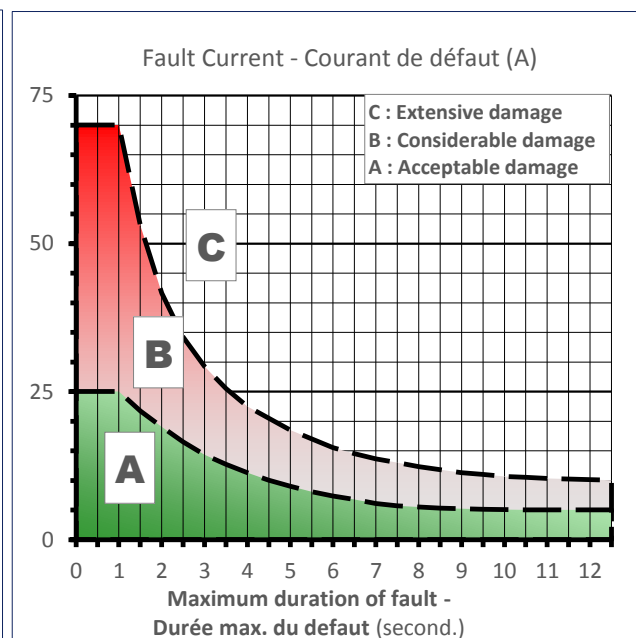
### Thermal Damage Curve



### Unbalance Load Curve



### Stator Earth Fault Current



**Alternator Modele**

***LSA 44.3 S5 / 4P - 1800 rpm - 60 Hz - 3 Phase - PF 0,8 - IC01***

**Power:**

Ambient Voltage (V)	class B	Class F				Class H			
	40°	40	45°	Marine	40°	40	45°	Marine	40°
	Continuous				Std-By	Continuous			Std-By
380	50,0	57,0	50,2	50,2	60,6	62,5	60,8	60,8	66,5
400	57,5	65,6	57,7	57,7	69,7	71,9	69,9	69,9	76,5
415	62,7	71,4	62,9	62,9	76,0	78,3	76,2	76,2	83,3
440	70,5	80,3	70,8	70,8	85,5	88,1	85,7	85,7	93,7
450	73,3	83,6	73,7	73,7	89,0	91,7	89,2	89,2	97,5
460	76,1	86,7	76,4	76,4	92,3	95,1	92,5	92,5	101,2
480	81,3	92,6	81,6	81,6	98,6	101,6	98,8	98,8	108,1