


ABB Oy Motors & Generators		Classifying code or document type PRELIMINARY DATA OF GENERATOR				
Department/Author PG4131EE / E.Lepa	Date of issue 28.11.2016	Lang. En	Rev. date 28.11.2016	Our ref.		
Customer ref. 3904899 - Gamesa - AMK 500L4A BATYH Cant.rep. - 1.75_1.8_2.0MW - 60Hz		Saving Ident 28.11.2016 EL		Rev./Changed by A / E.Lepa	Pages 1/7	

Rotor short circuited

Generator type code	AMK 500L4A BATYH			
Generator type	Slip ring generator			
Mounting designation	IM 1001			
Protected by enclosure	IP 54			
Method of cooling	IC 666			
Insulation	Class F			
Standards	IEC			
Ambient temperature, max.	50 °C			
Altitude, max.	1000 m.a.s.l.			
Duty type	S1			
Temp. rise	Class F (RES)			
Connection of stator winding	Delta			
Rated output	1840 kW			
Voltage	690 V			
Frequency	60 Hz			
Speed	1817 rpm			
Overspeed	2450 rpm 2 min			
Current	1650 A			
Rotor Voltage	1827 V			
Rotor Current	584 A			
Connection of rotor winding	Star			
Rotor resistance/phase	0,0129 Ω			
Relat. maximum torque	2,1			
No load current	337 A			
Rated torque	-10000 Nm			
Load characteristics	Load %	Current A	Efficiency %	Power Factor
	100	1649	96,7	0,91
	75	1244	96,9	0,91
	50	862	96,7	0,88
Direction of rotation	Uni-directional			
Weight of rotor	1890 kg			
Total weight of generator	5525 kg			
Total weight of generator without cooler	5010 kg			
Inertia rotor / load	Approx. 69.9 kgm ²			
Bearings	Antifriction			

All generator data is subject to tolerances in accordance with IEC.
Efficiency based on typical additional load losses acc. measurements.


ABB Oy

Motors & Generators Visiting Address
Strömbergintie 1 B
HELSINKI

Postal Address
P.O.Box 186
FIN-00381 HELSINKI
Finland

Telephone
+358 10 222 000

Telefax
+358 10 222 2141

ABB Oy Motors & Generators		Classifying code or document type PRELIMINARY DATA OF GENERATOR				
Department/Author PG4131EE / E.Lepa	Date of issue 28.11.2016	Lang. En	Rev. date 28.11.2016	Our ref.		
Customer ref. 3904899 - Gamesa - AMK 500L4A BATYH Cant.rep. - 1.75_1.8_2.0MW - 60Hz	Saving Ident 28.11.2016 EL		Rev./Changed by A / E.Lepa	Pages 2/7		

Converter fed

Duty type	S1
Temp. rise	Class F (RES)
Ambient temperature, max.	40 °C
Connection of stator winding	Delta
Rated output	2040 kW
Power factor	1.0
Voltage	690 V
Frequency	60 Hz
Speed	2016 rpm
Current	1534 A
Rotor Voltage	220 V
Rotor Current	595 A

Duty type	S1
Temp. rise	Class F (RES)
Ambient temperature, max.	40 °C
Connection of stator winding	Delta
Rated output	2000 kW
Power factor	1.0
Voltage	690 V
Frequency	60 Hz
Speed	2016 rpm
Current	1505 A
Rotor Voltage	220 V
Rotor Current	584 A

Duty type	S1
Temp. rise	Class F (RES)
Ambient temperature, max.	50 °C
Connection of stator winding	Delta
Rated output	1790 kW
Power factor	1.0
Voltage	690 V
Frequency	60 Hz
Speed	2016 rpm
Current	1345 A
Rotor Voltage	222 V
Rotor Current	525 A

ABB Oy

Motors & Generators Visiting Address
Strömbergintie 1 B
HELSINKI

Postal Address
P.O.Box 186
FIN-00381 HELSINKI
Finland

Telephone
+358 10 222 000

Telefax
+358 10 222 2141

ABB Oy Motors & Generators		Classifying code or document type PRELIMINARY DATA OF GENERATOR			ABB	
Department/Author PG4131EE / E.Lepa	Date of issue 28.11.2016	Lang. En	Rev. date 28.11.2016	Our ref.		
Customer ref. 3904899 - Gamesa - AMK 500L4A BATYH Cant.rep. - 1.75_1.8_2.0MW - 60Hz		Saving Ident 28.11.2016 EL		Rev./Changed by A / E.Lepa	Pages 3/7	

Rotor short circuited

Rated output	1840 kW	Power Factor	0,91
Voltage	690 V	Rated torque	-10000 Nm
Frequency	60 Hz	Relat. starting current	4,5
Speed	1817 rpm	Relat. starting torque	-0,2
Current	1650 A	Relat. maximum torque	2,1

Equivalent circuit corresponding to star-connection

Running			
Stator resistance R_1 (95 °C)	0,00160 Ω	Rotor resistance R_2' (105 °C)	0,00240 Ω
Stator reactance X_1	0,0228 Ω	Rotor reactance X_2'	0,0311 Ω
Magnetizing reactance X_m	1,16 Ω	Iron loss resistance R_{Fe}	0,05 k Ω
Starting			
Stator resistance R_1 (50 °C)	0,00136 Ω	Rotor resistance R_2' (50 °C)	0,00222 Ω
Stator reactance X_1	0,0223 Ω	Rotor reactance X_2'	0,0304 Ω
Ambient condition			
Stator resistance R_1 (40 °C)	0,00131 Ω	Rotor resistance R_2' (40 °C)	0,00214 Ω

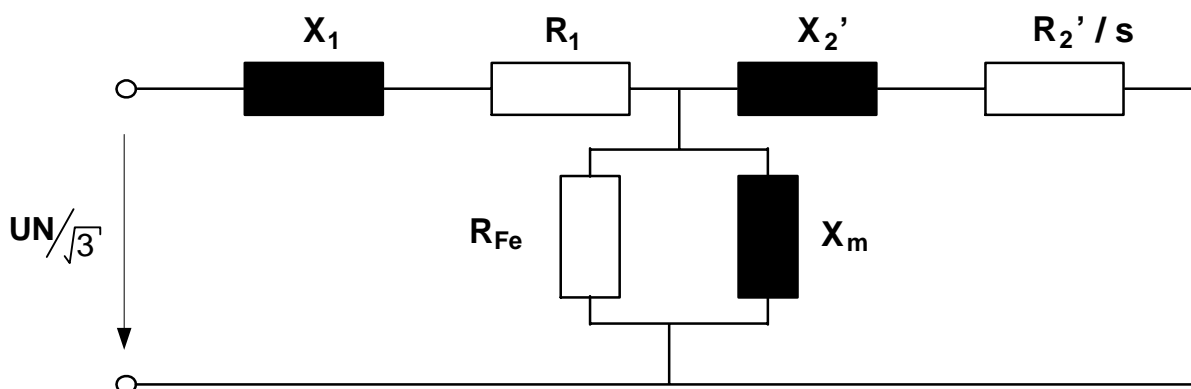


ABB Oy

Motors & Generators Visiting Address
Strömbergintie 1 B
HELSINKI

Postal Address
P.O.Box 186
FIN-00381 HELSINKI
Finland

Telephone
+358 10 222 000

Telefax
+358 10 222 2141

ABB Oy Motors & Generators		Classifying code or document type PRELIMINARY DATA OF GENERATOR			ABB	
Department/Author PG4131EE / E.Lepa	Date of issue 28.11.2016	Lang. En	Rev. date 28.11.2016	Our ref.		
Customer ref. 3904899 - Gamesa - AMK 500L4A BATYH Cant.rep. - 1.75_1.8_2.0MW - 60Hz	Saving Ident 28.11.2016 EL		Rev./Changed by A / E.Lepa	Pages 4/7		

Rotor short circuited

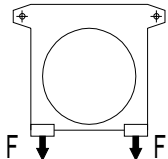
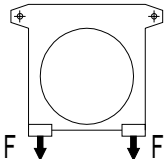
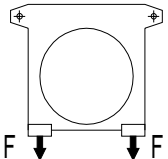
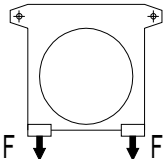
Forces on the foundation per stator side			
Static  F = 31 kN	Direct On Line Start  F = 0 kN	Rated torque  F = 31 kN ± 10 kN	2-phase short circuit  F = 31 kN ± 63,4 kN

ABB Oy

Motors & Generators Visiting Address
Strömbergintie 1 B
HELSINKI

Postal Address
P.O.Box 186
FIN-00381 HELSINKI
Finland

Telephone
+358 10 222 000

Telefax
+358 10 222 2141

ABB Oy Motors & Generators		Classifying code or document type PRELIMINARY DATA OF GENERATOR			ABB	
Department/Author PG4131EE / E.Lepa	Date of issue 28.11.2016	Lang. En	Rev. date 28.11.2016	Our ref.		
Customer ref. 3904899 - Gamesa - AMK 500L4A BATYH Cant.rep. - 1.75_1.8_2.0MW - 60Hz	Saving Ident 28.11.2016 EL		Rev./Changed by A / E.Lepa	Pages 5/7		

Rotor short circuited

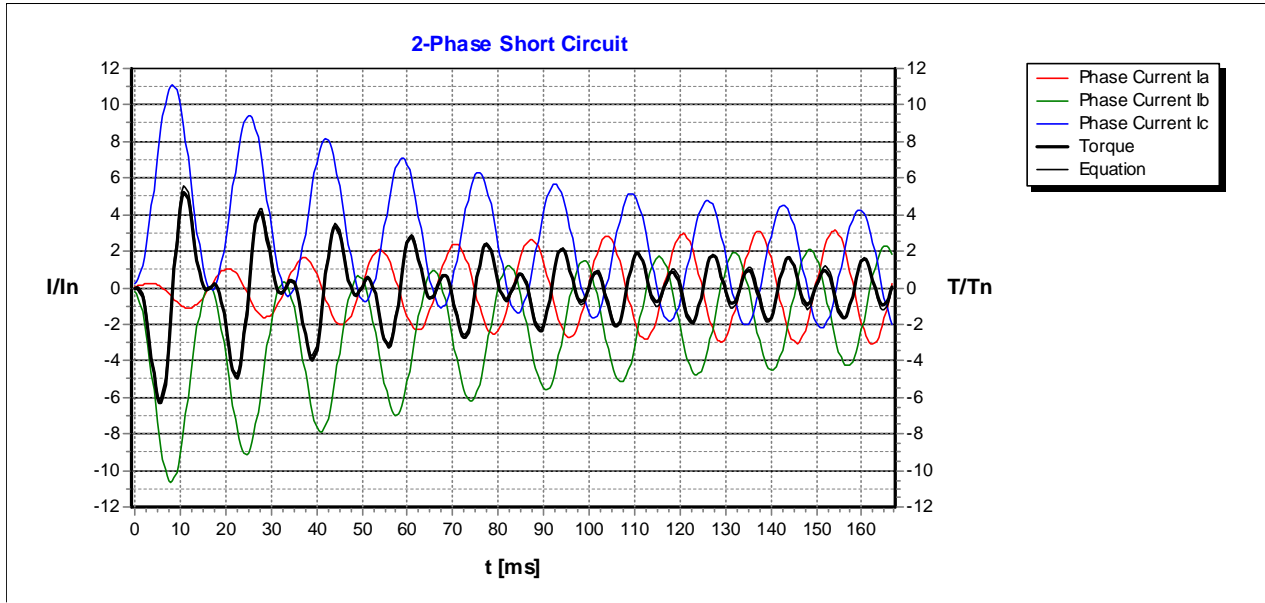


ABB Oy

Motors & Generators Visiting Address
Strömbergintie 1 B
HELSINKI

Postal Address
P.O.Box 186
FIN-00381 HELSINKI
Finland

Telephone
+358 10 222 000

Telefax
+358 10 222 2141

ABB Oy Motors & Generators		Classifying code or document type PRELIMINARY DATA OF GENERATOR			ABB	
Department/Author PG4131EE / E.Lepa	Date of issue 28.11.2016	Lang. En	Rev. date 28.11.2016	Our ref.		
Customer ref. 3904899 - Gamesa - AMK 500L4A BATYH Cant.rep. - 1.75_1.8_2.0MW - 60Hz		Saving Ident 28.11.2016 EL		Rev./Changed by A / E.Lepa	Pages 6/7	

Rotor short circuited

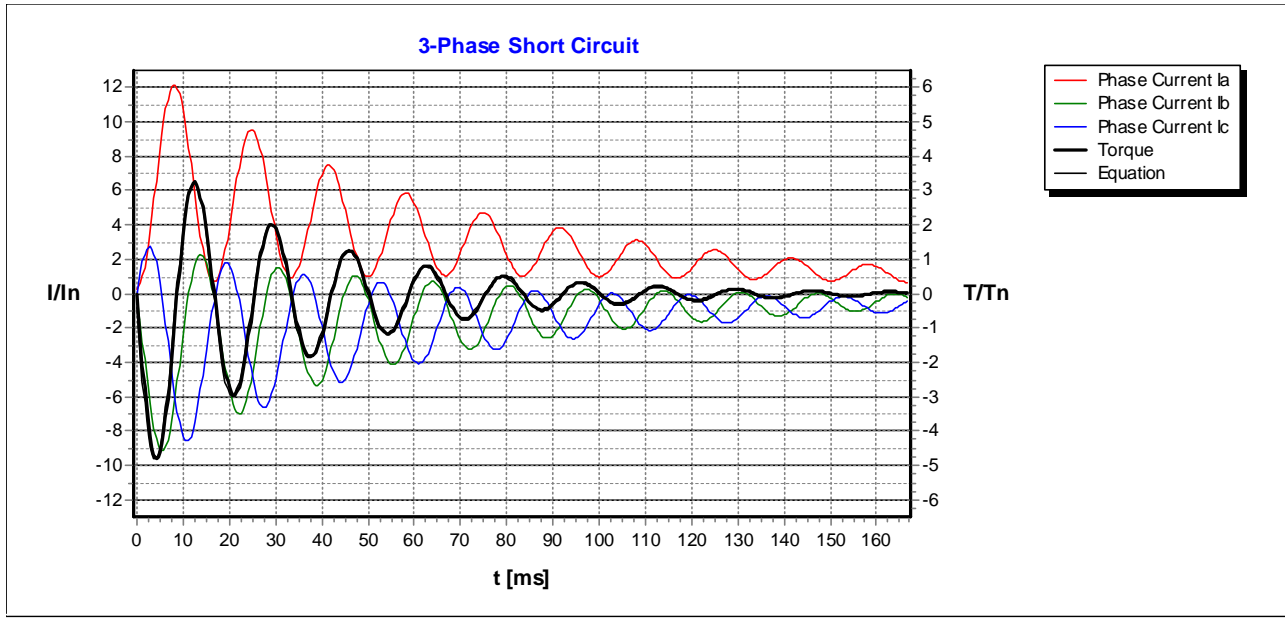



ABB Oy

Motors & Generators Visiting Address
Strömbergintie 1 B
HELSINKI

Postal Address
P.O.Box 186
FIN-00381 HELSINKI
Finland

Telephone
+358 10 222 000

Telefax
+358 10 222 2141

ABB Oy Motors & Generators		Classifying code or document type PRELIMINARY DATA OF GENERATOR				
Department/Author PG4131EE / E.Lepa	Date of issue 28.11.2016	Lang. En	Rev. date 28.11.2016	Our ref.		
Customer ref. 3904899 - Gamesa - AMK 500L4A BATYH Cant.rep. - 1.75_1.8_2.0MW - 60Hz		Saving Ident 28.11.2016 EL		Rev./Changed by A / E.Lepa	Pages 7/7	

Rotor short circuited

Airgap torque at 3-phase short circuit at terminals

$$T_e(t) = M_0 e^{-t/\tau_0} - M_1 e^{-t/\tau_1} \sin \omega t$$

$$M_0 = -0,39 ; \tau_0 = 0,0351 \text{ s} ; M_1 = 5,01 ; \tau_1 = 0,0353 \text{ s} ; \omega = 376 \text{ rad/s}$$

Maximum value of torque $-4,81 * T_N$, when $t = 4,17 \text{ ms}$

Airgap torque at 2-phase short circuit at terminals

$$T_e(t) = M_{00} (1 - e^{-t/\tau_0}) + (M_0 + M_2 e^{-t/\tau_2}) \sin 2\omega t - M_1 e^{-t/\tau_1} \sin \omega t$$

$$M_{00} = 0 ; M_0 = 1,41 ; M_1 = 4,96 ; M_2 = 1,35 ; \tau_0 = 10 \text{ s} ; \tau_1 = 0,0557 \text{ s} ; \tau_2 = 0,033 \text{ s} ; \omega = 377 \text{ rad/s}$$

Maximum value of torque $-6,32 * T_N$, when $t = 5,42 \text{ ms}$

Rev.	Date	Prepared by	Division/ Department	Description
A	2016-11-28	E. Lepa	DMMG/PG4131	Gamesa 60Hz turbine, Cantarey replacement generator

ABB Oy

Motors & Generators Visiting Address
Strömbergintie 1 B
HELSINKI

Postal Address
P.O.Box 186
FIN-00381 HELSINKI
Finland

Telephone
+358 10 222 000

Telefax
+358 10 222 2141