


ABB Oy MV Induction Machines	Classifying code or document type			PERFORMANCE DATA OF GENERATOR	
	Department/Author PIC / Y. Tyllinen	Date of issue 2002-03-05	Lang. en		
Customer ref. Bonus 2.3 / 0.4 MW , 4/6-pole	Saving ident 8001749I.doc		Rev./Changed by I/zoku	Pages 1/24	

Driven Machine: Wind Turbine

Machine type code	AMA 500L4/6A BAXYH				
Machine type	Two speed, squirrel cage generator				
Mounting designation	IM 1001				
Protected by enclosure	IP 54				
Method of cooling	IC 611				
Insulation / Temperature rise	Class F / Class B				
Standards	IEC				
Ambient temperature, max.	50 °C				
Cooling air temperature, max.	40 °C				
Altitude, max.	1000 m.a.s.l.				
Duty type	S1	S1			
Rated output	2300kW/2632kVA	400kW/464kVA			
Connection of stator winding	Delta	Star			
Voltage	690 V	690 V			
Frequency	50 Hz	50 Hz			
Speed	1512 rpm	1011 rpm			
Current	2174 A	384 A			
Relat. Starting current	5,2	5,4			
Relat. Maximum torque	2,4	2,5			
No load current	584 A	111 A			
Rated torque	15080 Nm	4108 Nm			
Load characteristics	Load %	Current A		Efficiency %	Power Factor
	100	2174	384	96,3 92,2	0,887 0,872
	75	1661	296	96,4 92,7	0,870 0,852
	50	1180	213	95,8 92,3	0,811 0,786
	25	768	142	93,2 88,5	0,605 0,566
Direction of rotation	Uni-directional				
Overspeed	2200 rpm, 2 min				
Sound pressure level: (sinus supply, no load)	88 dB(A), tol. + 3 dB(A), 1 m				
Inertia rotor	61 kgm ²				
Weight	6580 kg				
Bearings	Antifriction				

This performance data is final and the motor will be manufactured accordingly. All machine data is subject to tolerances in accordance with IEC.

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MV Induction
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Department/Author PIC / Y. Tyllinen	Date of issue 2002-03-05	Lang. en	Rev. date 2004-07-13	Our ref. 7691HD299/298,8126HD2	
Customer ref. Bonus 2.3 / 0.4 MW , 4/6-pole	Saving ident 8001749I.doc		Rev./Changed by I/zoku	Pages 2/24	

Machine type code: AMA 500L4/6A BAXYH

Nominal ratings	4-pole	
Output	2300 kW	
Voltage	690 V / D	
Frequency	50 Hz	
Speed	1512 rpm	
Current	2174 A	

Single phase equivalent circuit parameters in ohms and in p.u. , resistances at full load temperature

Stator resistance	R_1	0.0016		0,0087	
Stator leakage reactance	$X_{\sigma 1}$	0.0302		0,164	
Rotor resistance (running, start)	R'_2	0.0015	0.0028	0,0081	0,0152
Rotor leakage reactance (running, start)	$X'_{\sigma 2}$	0.0107	0.0086	0,0584	0,0469
Core loss resistance ¹⁾	R_{Fe}	30.0		163	
Magnetizing reactance ¹⁾ (saturated, unsat)	X_m	0.64	0.94	3,49	5,13
Transient reactance	X'	0.0407		0,222	
Sub-transient reactance	X''	0.0386		0,210	

Approximated synchronous machine parameters: 2)

Synchronous reactance (saturated, unsat)	X_d	0.670	0.97	3,65	5,30
Negative phase sequence synchronous reactance	X_-	0.041		0,223	
Negative phase sequence synchronous resistance	R_-	0.003		0,016	
Positive phase sequence synchronous reactance	X_+	0.084		0,458	
Positive phase sequence synchronous resistance	R_+	0.161		0,878	
Zero phase sequence reactance ²⁾	X_0	N.A.		-	
Zero phase sequence resistance ²⁾	R_0	N.A.		-	
Direct axis transient open circuit time constant	T'_{d0}	1.519 s			
Subtransient open circuit time constant	T''_{d0}	0.013 s			
Direct axis transient short circuit time constant	T'_d	0.081 s			
Subtransient short circuit time constant	T''_d	0.012 s			
Armature time constant	T_a	0.042 s			
Locked rotor power factor		0.12			
Open circuit saturation curve points ³⁾	$S(1.0)$	1.42			
Open circuit saturation curve points ³⁾	$S(1.2)$	2.24			
Inertia constant of generator	H	0.294 kWs/kVA			

Given synchronous machine parameters are for transient simulation only. They shall not be used to calculate static operating points. ABB does not take any responsibility of the simulations made with these values.

Notes:

¹⁾ Core loss resistance and magnetizing reactance connected in parallel.

²⁾ Zero phase sequence parameters are not applicable for windings with delta connection and for ungrounded windings with star connection. In these cases the given parameters are purely theoretical.

³⁾ Saturation curve points: $S\left(\frac{1.0}{1.2}\right) = \frac{I_{o,sat}}{I_{o,unsat}} @ (100\% \text{ or } 120\%) \times U_N$.

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Machine type code: AMA 500L4/6A BAXYH

Nominal ratings	6-pole	
Output	400 kW	
Voltage	690 V / Y	
Frequency	50 Hz	
Speed	1011 rpm	
Current	384 A	

Single phase equivalent circuit parameters in ohms and in p.u. , resistances at full load temperature

Stator resistance	R_1	0.0415		0,040	
Stator leakage reactance	$X_{\sigma 1}$	0.1365		0,131	
Rotor resistance (running, start)	R'_2	0.0114	0.0236	0,0109	0,0227
Rotor leakage reactance (running, start)	$X'_{\sigma 2}$	0.0811	0.0636	0,782	0,613
Core loss resistance ¹⁾	R_{Fe}	179		172	
Magnetizing reactance ¹⁾ (saturated, unsat)	X_m	3.46	3.89	3,33	3,75
Transient reactance	X'	0.216		0,208	
Sub-transient reactance	X''	0.199		0,191	

Approximated synchronous machine parameters: 2)

Synchronous reactance (saturated, unsat)	X_d	3.58	4,02	3,45	3,88
Negative phase sequence synchronous reactance	X_-	0.215		0,207	
Negative phase sequence synchronous resistance	R_-	0.052		0,050	
Positive phase sequence synchronous reactance	X_+	0.503		0,485	
Positive phase sequence synchronous resistance	R_+	0.90		0,867	
Zero phase sequence reactance ²⁾	X_0	0.18		0,173	
Zero phase sequence resistance ²⁾	R_0	0.052		0,050	
Direct axis transient open circuit time constant	T'_{d0}	1.007 s			
Subtransient open circuit time constant	T''_{d0}	0.0085 s			
Direct axis transient short circuit time constant	T'_d	0.057 s			
Subtransient short circuit time constant	T''_d	0.007 s			
Armature time constant	T_a	0.012			
Locked rotor power factor		0.30			
Open circuit saturation curve points ³⁾	$S(1.0)$	1.023			
Open circuit saturation curve points ³⁾	$S(1.2)$	1.024			
Inertia constant of generator	H	0.745 kW/s/kVA			

Given synchronous machine parameters are for transient simulation only. They shall not be used to calculate static operating points. ABB does not take any responsibility of the simulations made with these values.

Notes:

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- ²⁾ Zero phase sequence parameters are not applicable for windings with delta connection and for ungrounded windings with star connection. In these cases the given parameters are purely theoretical.

$$\supset \text{Saturation curve points: } S\left(\frac{1.0}{1.2}\right) = \frac{I_{o,sat}}{I_{o,unsat}} @ (100\% \text{ or } 120\%) \times U_N.$$

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Machine type code: AMA 500L4A BAXYH

Rated output	2300 kW	Power Factor	0.887
Voltage	690 V	Rated torque	15080 Nm
Frequency	50 Hz	Relat. starting current	5.2
Speed	1512 rpm	Relat. starting torque	
Current	2174 A	Relat. maximum torque	2.4