



THREE-PHASE SYNCHRONOUS GENERATOR

TCU228M

Datasheet For 4 Poles - 50Hz @ 1500rpm / 60Hz @ 1800rpm

Ambient Temperature	40 °C	Excitation	Brushless	Short Circuit Current Capacity (with PMG)	≥300%
Temperature Rise	125 °C	Winding Pitch	2 / 3	Method of Cooling	IC01
Service Duty	Continuous	Power Factor	0.8	Direction of Rotation	Counter-clockwise
Phase	3	Insulation Class	Class H	Maximum Over-speed	2250 rpm
Pole	4	Waveform : TIF	<50	Degree of Protection	IP21
Voltage Regulation	+/- 0.5%	Waveform : THF	<2%	Radio interference	Class B Group 1
AVR Model	ETC-1	Altitude	≤1000 m.a.s.l	Total Harmonic Content	< 3% - At no load

Electrical and Mechanical Characteristic

Frequency	Hz	50			60				
		1500			1800				
Round per minute	rpm								
Voltage (Y Connection) - Series Star	V	380	400	415	380	416	440	460	480
Voltage (YY Connection) - Parallel Star	V	190	200	208	190	208	220	230	240
Voltage (Δ Connection) - Series Delta	V	220	230	240	220	240	254	266	277
Voltage (ΔΔ Connection) - Parallel Delta	V	110	115	120	110	120	127	133	138
Rated power at Class H (125 °C) temperature rise	kVA	142.5	150.0	145.0	142.5	155	165	172.5	180.0
	kW	114	120	116	114	124	132	138	144
Efficiency at Class H (P.F.=0.8)	4/4%	91.9	92	92.1	91.4	91.5	91.6	91.8	92
	3/4%	92.4	92.5	92.6	92.1	92.2	92.3	92.5	92.7
	2/4%	92.1	92.2	92.1	91.7	91.8	91.9	92.1	92.3
Efficiency at Class H (P.F.=1.0)	4/4%	93.7	93.8	93.9	93.3	93.4	93.5	93.7	93.9
	3/4%	94.2	94.3	94.4	94.0	94.1	94.2	94.4	94.6
	2/4%	93.9	94	94.1	93.6	93.7	93.8	94.0	94.2

Reactance (%) at Class H

	Kcc	0.3200	0.3360	0.3740	0.2660	0.2930	0.3080	0.3220	0.3360
Short-circuit ratio									
Direct axis synchronous reactance unsaturated	X _d	3.1337	2.9770	2.6735	3.7601	3.4104	3.2474	3.1086	2.9770
Quadrature axis synchronous reactance unsaturated	X _q	1.7368	1.6500	1.4818	2.0840	1.8902	1.7999	1.7229	1.6500
Direct axis transient reactance saturated	X' _d	0.1632	0.1550	0.1392	0.1958	0.1776	0.1691	0.1619	0.1550
Direct axis subtransient reactance saturated	X'' _d	0.1358	0.1290	0.1158	0.1629	0.1478	0.1407	0.1347	0.1290
Quadrature axis subtransient reactance saturated	X'' _q	0.1600	0.1520	0.1365	0.1920	0.1741	0.1658	0.1587	0.1520
Zero sequence reactance unsaturated	X ₀	0.0316	0.0300	0.0269	0.0379	0.0344	0.0327	0.0313	0.0300
Leakage reactance	X _L	0.0853	0.0810	0.0727	0.1023	0.0928	0.0884	0.0846	0.0810
Negative sequence reactance saturated	X ₂	0.1484	0.1410	0.1266	0.1781	0.1615	0.1538	0.1472	0.1410

Open circuit time constant (sec.)	T' _{do}	1.2680							
Short-circuit transient time constant (sec.)	T' _d	0.0510							
Subtransient time constant (sec.)	T'' _d	0.0110							
Armature time constant (sec.)	T _α	0.0169							
No load excitation current	io(A)	0.45			0.45				
Full load excitation current	ic(A)	1.7			1.6				
Full load excitation voltage	uc(V)	49			47				
Stator Winding Resistance (20°C)	ohm	0.0294							
Rotor Winding Resistance (20°C)	ohm	1.021							
Exciter Stator Resistance (20°C)	ohm	21.12							
Exciter Rotor Phase resistance	ohm	0.04657							
Cooling air requirement	m ³ /sec	0.352			0.422				

Configuration	Single Bearing	Double Bearing
Type of Construction	B2 - SAE	IM B34
Inertia (J) [kgm ²]	1.61	1.56
Total Weight	449	454
Drive end bearing / Lubrication	Not supply	6315 C3-2Z / Prelubricated - sealed for life
Non-drive end bearing / Lubrication	6310 C3-2Z / Prelubricated - sealed for life	
Recovery time - sec.	0.5	
Stator winding	DOUBLE LAYER CONCENTRIC	
Number of Terminal	12	
Rotor	with damping cage	
Overload	110% rated load for 1 hour	

STANDARD COMPLIANCE - IEC 60034-1; CEI 2-3; BS 4999-5000; VDE 0530; NF 51-100,111; OVE M-10, NEMA MG 1.22.

Data and Technical Specification are subject to change in order to update or improve the products, without prior notice