Turbo-generator SERIES

Shandong Qingneng Steam Turbine Co., Ltd.

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Company profile

Brief introduction

The main business of Shandong Qingneng Steam Turbine Co., Ltd (hereinafter called QNP) involves steam turbine, generator, compressor, EPC projects of power plant, energy-saving upgrading, installation and maintenance, etc., and continuously extends its product industry chain. It is a comprehensive manufacturing enterprise integrating scientific research, design, manufacturing, installation, service and EPC projects. The market covers both at home and abroad, and the business scope ranges from single machine to complete set.

QNP has won more than 60 honorary titles such as "Shandong Enterprise Technology Center", "Shandong High-speed and High-efficiency Steam Turbine Engineering Technology Research Center" and "Metrology Confirmation Guarantee Qualified Enterprise" and has passed the CE, ISO9001, ISO14001, ISO45001 certification of EU.

QNP has the design and production capacity between1.5MW and 400MW steam turbine generators.The 2-pole series and 4-pole series generators produced by QNP can be matched with various main machines such as steam turbines and industrial turbines, and can be widely used in waste incineration power generation, self-provided power plants, waste heat and waste pressure power generation, biomass power generation and other industries.

Generator

Generator inspection & test center

High-speed dynamic balance testing machine

Stator bar assembly

Rotor bar assembly completed

Generator type test platform

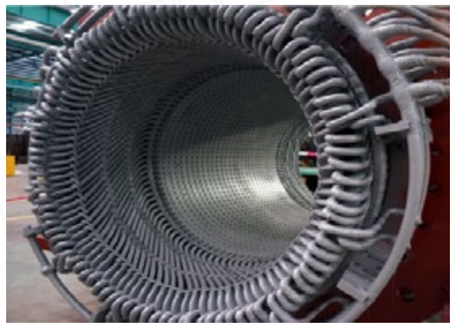
Project operating site

Rotor slotting machine of Italian Tacchi

Generator

The generators of 1.5MW and above produced by QNP can be combined with drivers of four speed types: 3000, 3600, 1500, 1800r/min and can provide 50HZ and 60HZ international common frequency for selection. The generator of 3000 (3600) r/min speed is 2-pole non-salient-pole type, and the type with 1500 (1800) r/min speed is 4-pole non-salient-pole generators.

Before leaving the factory, the generator will pass strict electrical testings. Various performance indicators meet the IEC60034-3 and China GB/T7064 standards. The generators have the advantages of excellent parameters, advanced technology, reasonable structure, good performance,and reliable operation, with the capacity from 1.5MW to 400MW, including the traditional classic, high-efficiency box, plane fast installation and other product series. QNP can provide products of different capacity level to various users, and can provide generator products that meet the requirements of special structures for different power generation modes as gas-steam combined cycle and high efficient cleaning power etc.



1、Product classification

Two-pole generators

Four-pole generators

Generator

2、 Product characteristics

The structure of the generator by QNP has unique features, and multiple styles of structures can be provided according to users requirements.

（1） Traditional model

After generator performance test, the rotor shall be transported separately, then center calibrated and installed at project site. The air cooler is traditionally located in the cooling chamber under generator stator, which is a reliable and economical structure and is most commonly used. The 2-pole turbine generator mainly adopts this structure.

（2） Pedestal bearing type integral model

Stator, rotor, pedestal bearing and exciter shall be assembled as an integral whole. Air cooler shall be transported separately, no more center correction of stator and rotor at project site. This structure is easy for installation and commissioning, and it is not necessary to build a cooling chamber. Four-pole turbine generator mainly adopts this structure.

（3） End cover bearing type integral model

Stator, rotor, end cover bearing and exciter shall be assembled as an integral whole. Only air cooler shall be transported separately, no more center correction of stator and rotor at project site. The air cooler shall be installed right above generator. Four-pole turbine generator mainly adopts this structure.

3、Cooling methods

The QNP turbo-generator uses an open or closed circulating ventilation system. The cooling methods include air cooling, air internal cooling, double water internal cooling, and water-hydrogen-hydrogen cooling.

4、 Excitation methods

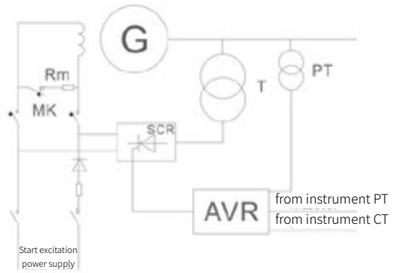
QNP turbo-generator has 3 types of excitation methods as static SCR excitation, double-unit AC brushless excitation and triple-unit AC brushless excitation. The end user can choose according to requirements.

Generator

Static SCR Excitation System

For static SCR excitation system, the generator excitation shall be supplied by dual channel static SCR system which has auto-excitation regulation, COSφ control, forced excitation, forced reduction and automatic field-suppressing function. When one channel fails, it can be repaired without shut down.

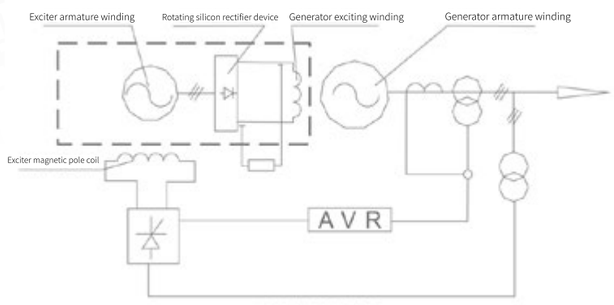
The excitation current is controlled by a dual channel microcomputer excitation regulator to control the terminal voltage and power factor of generator. It has excellent regulation functions of constant voltage, constant reactive power, constant power factor, and preventing synchronous generator oscillation. Each channel has automatic and manual control functions. When a fault occurs, it can automatically and undisturbed switch to the backup channel and simultaneously lock the faulty channel.



Self-shunt Static SCR Excitation Method
Electrical Schematic Diagram

Brushless excitation system

Two-pole generator is double-unit type with coaxial AC exciter. AC main exciter shall be pivot type structure, the rotor iron core is made of high-quality laminated cold-rolled silicon steel sheets, the armature coil is a double layer coil, three outgoing wires are tied with a weft free tape and then led to the rotating rectifier disc.



Brushless excitation system schematic diagram

Four-pole generator is triple-unit type with coaxial AC exciter and PMG. AC exciter shall provide exciting for generator’ s rotor, PMG’ s output current is rectified by excitation regulating cabinet and supplied to the exciter stator for excitation. The three-phase alternating current generated by the exciter armature is rectified full wave by a rotating rectifier and supplied to the rotor of turbine generator for excitation.

The output circuit can achieve the purpose of automatic regulating the parameters of excitation by using the dual feedback of the current voltage and the use of an automatic excitation regulating microcomputer device to adjust the excitation current of the exciter stator .

5、Insulation system

Class F insulation materials and structure shall be adopted. During running time, assess the system according to class B insulation, meanwhile some margin must be reserved.

Generator

6、Applicable Standards

IEC34-1 Latest Standard Requirements

IEC 60034-1 Rotating Electrical Machines Part 1: Rating and performance

IEC 60034-3 Rotating electrical machines - Part 3: Specific requirements for cylindrical rotor synchronous machines

IEC 60034-4 Rotating Electrical machines Part 4: Methods for determining synchronous machine quantities from tests

GB755 ‘Rotating electrical generator ratings and performance’

GB/T 7064 ‘ Technical requirements for non-salient pole synchronous generator’

GB/T 1029 ‘Test procedures for three-phase synchronous generator’

GB/T7409.3 ‘Technical requirements for excitation systems of large and medium-sized synchronous generator’

JB/T 7784 ‘Technical specifications of AC exciters for synchronous turbo-generators’

7、Model Description

Model Description(QFWD-3-2A)

Models	Definition
QF	Turbo-generator
W	“W” means Brushless excitation，Without ‘‘W’’ means Static SCR excitation
D	“D” means Double support, Without ‘‘D’’ means Single support.
3	Rated power
2	‘‘2’’ means 2-pole, rated speed shall be 3000r/min
	‘‘4" means 4 pole, rated speed shall be 1500(1800)r/min
A	Design Serial Number：A,B,C,D

Generator selection table

Two-pole generator selection table

Model	Capacity MW	Rated Voltage KV	Rated Current A	Power Factor	Freguency H2	Efficiency %	Dimensions			Net Weight	
							L	W	H	stator	rotor
QFD-3-2	3	6.3,/6.6	344/328	0.8	50/60	96.9	3830	1780	1850	6.1	3.51
QF-3-2	3	6.3/6.6	344/328	0.8	50/60	96.8	3764	1780	1850	6.2	3.51
QFD-3-2	3	10.5/11	206.2/196.8	0.8	50/60	96.6	3830	1780	1850	6.4	3.51
QF-3-2	3	10.5/11	206.2/196.8	0.8	50/60	96.6	3721	1780	1850	6.4	3.51
QFD-4-2	4	6.3/6.6	458.2/437.4	0.8	50/60	96.8	4155	2186	2230	10.4	4.4
QF-4-2	4	6.3/6.6	458.2/437.4	0.8	50/60	96.8	4040	2186	2230	10.4	4.4
QFD-4-2	4	10.5/11	275/262.4	0.8	50/60	96.4	4163	1780	1880	8.3	4
QF-4-2	4	10.5/11	275/262.4	0.8	50/60	96.4	4471	1840	1880	8.3	4
QF-4.5-2	4.5	6.3/6.6	515.5/492	0.8	50/60	96.5	4040	2186	2230	10.4	4.5
QF-4.5-2	4.5	10.5/11	309.2/295	0.8	50/60	96.5	4040	2186	2230	10.6	4.5
QF-6-2	6	6.3/6.6	688/656	0.8	50/60	97	4290	2186	2230	11.91	5.24
QF-6-2	6	10.5/11	412.4/393.8	0.8	50/60	97	4290	2186	2230	12.4	5.15
QF-7-2	7	6.3/6.6	802/765.5	0.8	50/60	97.1	4290	2186	2230	11.91	5.24
QF-7-2	7	10.5/11	481.1/450.3	0.8	50/60	97.1	4290	2186	2230	12.05	5.24
QF-7.5-2	7.5	6.3/6.6	859.2/820.1	0.8	50/60	97.2	4290	2186	2230	11.91	5.24
QF-7.5-2	7.5	10.5/11	515.5/492	0.8	50/60	97.32	4340	2186	2280	12.8	5.3
QF-10-2	10	6.3/6.6	1145.6/1093.5	0.8	50/60	97.3	4570	2434	2230	16.5	7.2
QF-10-2	10	10.5/11	687.3/656.1	0.8	50/60	97.6	4768	2434	2530	1924	6.9
QF-12-2	12	6.3/6.6	1374.7/1312.2	0.8	50/60	97.5	5292	2434	2530	21.2	8.8
QF-12-2	12	10.5/11	825/787.4	0.8	50/60	97.3	5312	2434	2530	24.5	8.9
QF-15-2	15	6.3/6.6	1718.4/1640.3	0.8	50/60	97.6	5292	2434	2530	21.5	8.8
QF-15-2	15	10.5/11	1031/984.2	0.8	50/60	97.67	5314	2434	2530	24.5	8.9
QF-18-2	18	6.3/6.6	2062/1968.3	0.8	50/60	97.6	5650	2434	2530	28.5	10
QF-18-2	18	10.5/11	1237.2/1181	0.8	50/60	97.47	6030	2730	2815	37.14	14.66
QF-20-2	20	6.3/6.6	2291/2187	0.8	50/60	97.7	5928	2730	2815	35	12
QF-20-2	20	10.5/11	1374.7/1312.2	0.8	50/60	97.5	5928	2730	2815	35.8	12
QF-25-2	25	6.3/6.6	2864/2733.8	0.8	50/60	97.8	6828	2730	2815	42	16
QF-25-2	25	10.5/11	1718.4/1640	0.8	50/60	97.6	6828	2730	2815	43	16
QF-30-2	30	6.3/6.6	3437/3280.5	0.8	50/60	97.9	6828	2730	2815	42	16
QF-30-2	30	10.5/11	2062/1968.3	0.8	50/60	97.8	6828	2730	2815	43.5	16.2
QF-50-2	50	6.3/6.6	5728/5468	0.8	50/60	98.3	7410	3720	3650	62	19.5
QF-50-2	50	10.5/11	3437/3280.5	0.8	50/60	98.3	7745	3720	3650	65	21
QF-60-2	60	6.3/6.6	6873/6560	0.8	50/60	98.3	7745	3720	3650	67	22
QF-60-2	60	10.5/11	4124/3937	0.8	50/60	98.3	7745	3720	3650	68	23
QFa-75-2	75	10.5	4852	0.85	50	98.5	8752	3460	3418	68.5	23
QFa-100-2	100	10.5	6469	0.85	50	98.6	9887	3670	3850	100	31
QFa-110-2	110	10.5	7115.8	0.85	50	98.62	9887	3670	3850	100	31
QFa-135-2	135	13.8	6645	0.85	50	98.6	9150	3600	3600	133	36.9
QFa-150-2	150	15.75	6469	0.85	50	98.66	9550	3700	3615	152	47
QFS-300-2	300	20	10189	0.85	50	98.897	12869	3800	3705	192	57
QFS-330-2	330	20	11207	0.85	50	98.88	12869	3800	3705	192	57

Description:

(1) Only QF models are listed in the table. QFW series data are the same, only the excitation mode is different.

(2) The weights in the table are general structural forms, and users can choose according to their requirements.

(3) Users can put forward requirements such as frequency, power factor, voltage level, etc. according to their needs, and we can design and manufacture as required.

Four-pole generator selection table

Model	Capacity		Voltage	Current	Power factor	Speed	Efficiency	Total weight	Rotational inertia	Shaft diameter/ shaft diameter length	Center pitch (air/ excitation)	Center height
	PN	PA	UN	IN	Cosφ	nN	η	G	GD2			
	kVA	kW	V	A		r/min	%	t	T-m2	mm	mm	mm
QF-5-4	6250	5000	3300	1093.5	0.8	1500	97	29	2.8	Φ225/200	1385/1495	900
QF-5-4	6250	5000	6300	572.8	0.8	1500	97	29	2.8	Φ225/200	1385/1495	900
QF-5-4	6250	5000	10500	343.7	0.8	1500	97	29	2.8	Φ225/200	1385/1495	900
QF-6-4	7500	6000	3300	1312.2	0.8	1500	97	30	3.2	Φ250/260	1475/1585	900
QF-6-4	7500	6000	6300	687.3	0.8	1500	97	30	3.2	Φ250/260	1475/1585	900
QF-6-4	7500	6000	10500	412.4	0.8	1500	97	30	3.2	Φ250/260	1475/1585	900
QF-8-4	10000	8000	3300	1749.5	0.8	1500	97.2	33	4.1	Φ250/260	1615/1725	900
QF-8-4	10000	8000	6300	916.4	0.8	1500	92.2	33	4.1	Φ250/260	1615/1725	900
QF-8-4	10000	8000	10500	549.9	0.8	1500	97.2	33	4.1	Φ250/260	1615/1725	900
QF-10-4	12500	10000	3300	2186.9	0.8	1500	97.4	38	5.2	Φ280/260	1615/1665	1000
QF-10-4	12500	10000	6300	1145.5	0.8	1500	97.4	38	5.2	Φ280/260	1615/1665	1000
QF-10-4	12500	10000	10500	687.3	0.8	1500	97.4	38	5.2	Φ280/260	1615/1665	1000
QF-12-4	15000	12000	3300	2624.3	0.8	1500	97.6	42	7.6	Φ280/260	1710/1710	1000
QF-12-4	15000	12000	6300	1374.6	0.8	1500	97.6	42	7.6	Φ280/260	1680/1740	1000
QF12-4	15000	12000	10500	824.8	0.8	1500	97.6	42	7.6	Φ280/260	1710/1710	1000
QF-15-4	18750	15000	6300	1718.3	0.8	1500	97.6	45	7.6	Φ280/260	1680/1740	1000
QF-15-4	18750	15000	10500	1031	0.8	1500	97.6	45	7.6	Φ280/260	1680/1740	1000
QF-18-4	22500	18000	6300	2062	0.8	1500	97.7	64	11.8	Φ300/260	1805/1865	1150
QF-18-4	22500	18000	10500	1237.2	0.8	1500	97.7	64	11.8	Φ300/260	1805/1865	1150
QF-20-4	25000	20000	6300	2291.1	0.8	1500	97.7	64	11.8	Φ300/260	1805/1865	1150
QF-20-4	25000	20000	10500	1374.6	0.8	1500	97.7	64	11.8	Φ300/260	1805/1865	1150
QF-25-4	31250	25000	10500	1718.3	0.8	1500	97.8	75	14.4	Φ315/260	1920/1980	1250
QF-30-4	37500	30000	10500	2062	0.8	1500	97.9	90	17.5	Φ320/320	2385/2445	1350
QF-35-4	43750	30000	10500	2405.6	0.8	1500	98	105	18.6	Φ350/320	2625/2625	1350

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