

# **STC SERIES**

## **THREE-PHASE A.C. SYNCHRONOUS GENERATORS**

**INSTRUCTIONS FOR  
OPERATION AND MAINTENANCE**

# STC SERIES 3-PHASE A.C SYNCHRONOUS GENERATORS

The generator of this series completed with a matching internal combustion engine is available as a stationary or movable power station to supply a lighting or power resource for villages, towns, working sites and pasture-lands.

It is of three-phase with neutral point star connection, characterized by a line voltage of 400V, phase voltage of 230V, frequency of 50Hz, and power factor of 0.8 (lagging). We can provide with 60 Hz and other value generators which the users are necessity.

The connection of the generator to the prime mover may be made directly or by means of a triangle belt.

Its rotation can be in both positive and opposite sense for continuous rated duty.

In order to permit the machine to produce current in its normal running, it is well-advised to get yourself informed from the present instruction manual before hand

## I. SPECIFICATIONS AND CHARACTERSTICS

Modle	Output		Current (A)	pole number	Synchonous speed (r/min)
	KVA	KW			
STC-5-2	6.3	5	9	2	3000
STC-3	3.8	3	5.4	4	1500
STC-5	6.3	5	9	4	1500
STC-7.5	9.4	7.5	13.5	4	1500
STC-8	10	8	14.4	4	1500
STC-10	12.5	10	18.1	4	1500
STC-12	15	12	21.7	4	1500
STC-15	18.8	15	27.1	4	1500
STC-20	25	20	36.1	4	1500
STC-24	30	24	43.3	4	1500
STC-30	37.5	30	54.1	4	1500
STC-40	50	40	72.2	4	1500
STC-50	62.5	50	90.2	4	1500

In this series of generator a harmonic excitation is adopted. On the core in addition to the main winding, there is also a harmonic winding. The current to be rectified, after flowing through the 3-phase bridge silicon-controlled rectifier, enters the magnetic field coil where excitation takes place. So long as the third harmonic voltage will increase correspondingly upon the loading of the generator, a self-excitation constant voltage characteristic is acquired and any complicated automatic voltage regulator can thus be dispensed with.

This machine possesses a superb dynamic behaviour which makes possible anoload direct-on starting of squirrel-cage asynchronous motor with similar capacity without additional starting device.

## II. CONSTRUCTION

The generator is of rotating field type. Its frame and end-covers are all built of cast iron. The stator's core is made up of 0.5mm high quality silicon steel lamination, while the magnetic pole's core is made up of 1mm electrical sheet stampings. High-strength enamelled wire is used as conducting wire, stator insulation is of Class E, and rotor insulation is of Class B. The outlet box is located on top of the machine frame. In the box are installed the terminal panel and silicon-controlled rectifier unit. The switch-box are assembled on the frame of the generators. In the switchbox have been mounted connection plate, silicon rectifier and field rheostat, (with the addition of the field rheostat of 30-50KW). There are indicator of 6.3V and voltmeter on the face plate.

The output cable is wired from outgoing line hole plate in the rear of the switch box. When it is in operation before the seated film of the outgoing line hole plate be exposed with the pocket knife.

The wiring principle chart is shown as in Fig 1.

In the diagram the  $Z_4, Z_5$  and  $Z_6, Z_7$  as for the elementary wave coil of the auxiliary winding of the difference turns. Both can reach to adjust unloaded voltage purpose via change over right and reverses series connecting plate. The unloaded voltage rises when the  $Z_4, Z_5$  connect to the  $Z_7$ ,

Z<sub>8</sub>. When the Z<sub>4</sub>, Z<sub>7</sub> connect to the Z<sub>6</sub>, Z<sub>8</sub> the unloaded voltage goes down. When the Z<sub>4</sub> connect to the Z<sub>8</sub>, or the Z<sub>6</sub>, Z<sub>7</sub> connect to the Z<sub>5</sub>, Z<sub>8</sub> that the two elementary wave coil will be used separately. The connecting plate has been connected before delevering. According to the needs of the users it can be changed to connect elementary coil as above method.

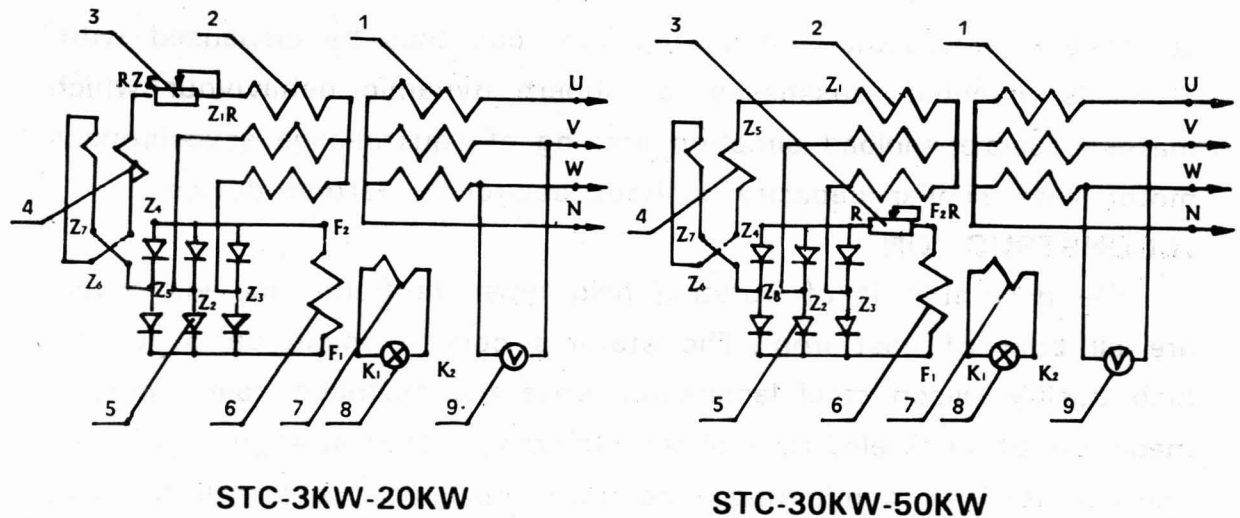
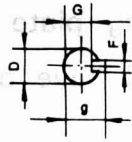


Fig 1 wiring principle chart

- |                                |   |
|--------------------------------|---|
| 1.Main winding                 | 2.Harmonic coil of the auxilliary               |
| 3.Field rheostat               | 4.Elementary wave coil of the auilliary winding |
| 5.Silicon-controlled rectifier | 6.Exciation winding                             |
| 7.Winding of indicator         | 8.Indicator                                     |
|                                | 9.Voltmeter                                     |

Code	Name	Specification		
		3-10kw	12-20kw	30-50kw
3	Field rheostat	BC <sub>1</sub> -150W10Ω	BC-150 <sub>1</sub> WΩ	BC <sub>1</sub> -500/25Ω
5	Silicon diode	2CZ-5A 800V		SQL <sub>14</sub> 40A 1000V
8	Indicator	XD <sub>1</sub> -6.3V		
9	Voltmeter	85L <sub>1</sub> -V 0~500V		69L <sub>13</sub> -V 0~500V



(A-A Section)

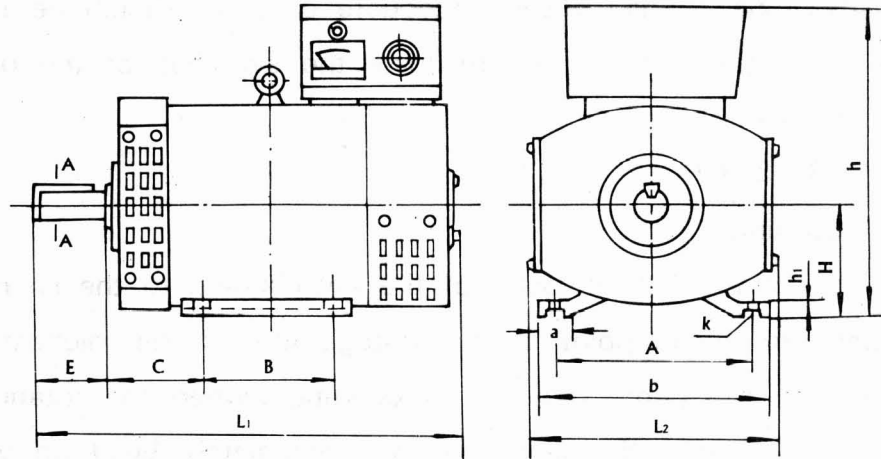


Fig.2 Overall and Mounting Dimensions

Frame NO	Output		Installing dimensions									External dimensions						
	KVA	KW	A	B	C	D	E	F	G	H	K	a	b	h <sub>1</sub>	h	L <sub>1</sub>	L <sub>2</sub>	g
STC-5-2	6.3	5	216	178	89	φ32	80	10	27	132	12	34	250	18	400	480	270	34.8
STC-3	3.8	3	216	178	89	φ32	80	10	27	132	12	34	250	18	400	480	270	34.8
STC-5	6.3	5	254	254	108	φ38	80	10	33	160	15	50	310	25	455	580	325	40.8
STC-7.5	9.4	7.5	254	254	108	φ38	80	10	33	160	15	50	310	25	455	580	325	40.8
STC-10	12.5	10	279	203	121	φ42	110	12	37	180	15	60	339	25	495	610	365	44.8
STC-12	15	12	279	203	121	φ42	110	12	37	180	15	60	339	25	495	610	365	44.8
STC-15	18.8	15	318	228	133	φ48	110	14	42.5	200	19	60	378	30	540	660	400	51.2
STC-20	25	20	318	228	133	φ48	110	14	42.5	200	19	60	378	30	540	660	400	51.2
STC-30	37.5	30	356	286	149	φ60	140	18	53	225	19	65	421	32	610	770	452	64
STC-40	50	40	356	286	149	φ60	140	18	53	225	19	65	421	32	610	770	452	64
STC-50	62.5	50	356	311	149	φ60	140	18	53	225	19	65	421	32	610	810	452	64

### **III.PRECAUTIONS TAKEN PRIOR TO OPERATION**

1.Connect the output cables on the connecting plate in the switchbox of the generator. The size of the cables should have a cross-section large enough to transmit current safely.

2.Open the outer shield of the rear cover to see that the electric brushes are all in normal condition.

3.Switches and fuses adequate capacity should be fixed on every user-end. Before starting the machine the switches of the user-ends must be left open.

### **IV.START-STOP**

#### **A.Starting:**

1.Adjust the field rheostat of the switchboard to the short-circuit e.i.the rotating arrowhead point at the voltage that is the highest.

2.Bring the prime mover into operation, when the rotating speed gets to the rated value,the generator will immediately build up voltage by self-excitation.Get the speed somewhat higher than the rotating speed,so as to compensate the drop of speed the load is in full.Meanwhile adjust the field rheostat to get the indicated reading of the voltmeter at 400V.

3.Turn on the user-end switches for normal current supply.

#### **B.Stopping**

1.Remove loads from the user ends and cut off the switches.

2.Stop the prime mover.

3.Adjust the field rheostat to the short circuit position.

#### **C.Special attention**

1.Take every caution to prevent against short-circuiting at the output ends of the machine,in which case rectifier elements may be damaged.

2.In stopping unload the generator first and then stop it.If stopping the machine with the load on,its residual magnetism may get lost and it will then need to be remagnetized before the next operation.

3. Field rheostat should be adjusted to the position of short circuit after stopping, avoid to build up voltage to weak next starting.

## **V. TROUBLES AND THEIR ELIMINATION**

Following are the possible causes of troubles and their ways of elimination.

1. Loss of residual magnetism.

Residual magnetism may get lost due to the generator's being stored for a long period of time or being stopped while it is loaded.

Magnetize the field of the generator with a 12V storage battery or dry battery while running. In so doing, the positive terminal of the battery should be connected with  $L_1$  and the negative with  $L_2$ . Connection in the reverse direction is impermissible.

2. Rotating speed is too slow to attain the rated value.

Measure the rotating speed with a tachometer and then duly increase it.

3. Open circuit or short circuit occurs in harmonic winding, thus there is no output of third harmonic voltage.

Check the connections of the winding, or replace it.

4. Rectifier element is punctured. There is no D.C. output.

Replace the rectifier by a new one.

5. Field winding is short- or open-circuited.

Check the connections of the field winding, or replace it.

6. Poor contact between brush and slip ring.

Clean the surfaces of the slip rings with a piece of emery cloth.

If the brush wears out and the spring pressure is not very good, should change the brush.

7. Loose connection or poor contact of the terminals.

Tighten the nuts on the terminals.

8. If the field rheostat will not be adjusted to the short-circuit, it will be poor contact or burnt out. Check and adjust rheostat to the short-circuit

position. Should exchange a new rheostat if it is burnt out.

If it is still difficult for the running generator to build itself up when the aforesaid troubles have been done away with, then you may apply an adequate load which will help build up voltage.

## **VI. MAINTENANCE AND REPAIR**

### **A. General maintenance:**

1. During storage, always keep the generator in a dry place. If and when placed on earthy or concrete ground, it should be bolstered with wood, and covered with oil cloth against getting damp.

2. Measures should be taken to prevent dust, dripping water, metal chips or other foreign matter from entering the generator.

3. In order to avoid obstruction of its heat dissipation, leave no clothes and the like on the machine while it is running.

4. Care must be exercised to avoid sustained overload.

5. If abnormal sparkings appear on the slip rings and unusual sounds are heard during operation, correction must be made instantaneously.

6. Places where there is plenty of water vapour, dust or combustible gas present are not suitable for the operation of the generator.

7. The lubricating grease should be replaced after every 1500 working hours of the ball bearings. Remove the old grease and replace with the new at least once a year. The amount to be filled is about half the capacity of the bearing box. Never use mixture of different kinds of grease, molybdenum disulfide lithium-base grease being recommended. The maximum permissible temperature of the ball bearings is 95 °C.

### **B. Inspecting and overhauling:**

The generator should be overhauled once half-yearly.

1. Remove the window cover plate and clear away the accumulated dust and dirt, if any, in the generator, preferably by means of compressed air at a



pressure not exceeding 0.4kgf/cm<sup>2</sup>.

2. The slip rings should first be wiped clean by means of a piece of coarse cloth (do not use waste yarn or other fibrous material) slightly moistened with kerosene. After that wipe them dry again with another piece of dry coarse cloth.

3. Remove the outer cover of the bearing and find out whether the lubricating grease is clean. If it is found to be tarnished, replace it with new grease.

4. Check the wear and tear of brushes, whether the constant pressure spring is different and replace all the worn out brushes or the changeful constant pressure spring with new ones.

C. Necessary precautions in overhauling:

1. Keep the disassembled parts in a suitable container, lest they should get lost or mislaid.

2. When disconnecting the terminal leads, they should be marked for easy identification. During assembly, they should be connected in place without any mistake.

3. When removing the bearing cover, make it a point to protect the bearings and bearing cover with clean paper against being soiled by dust and dirt.

4. When mounting the brush, make sure that its position is correct and at the same time that it keeps in good contact with slip rings.

5. After the generator has been properly installed, gently turn the rotor with your hand to make sure that it gives a free movement and noise.