TFW & TFDW Series AC Synchronous Generator.

Instructions for safe operation and maintenance.

SAFETY PRECAUTIONS

First Steps to Safe Operation
Read this manual, obey all Warnings and Cautions, and become familiar with the product. Ensure that all personnel operating, servicing, maintaining or working near this equipment are wearing appropriate Personal Protective Equipment (PPE) including eye and ear protection and are fully aware of the emergency procedures in case of any accidents.

Noise
Generators emit noise. Ensure appropriate ear protection is worn at all times. Maximum A-weighted emissions levels may reach 104 db (A) Contact site for application specific details.

Skill Requirements of Personnel
Service and maintenance procedures should only be carried out by experienced, qualified engineers, familiar with the procedures and the equipment. Before any intrusive procedures are carried out, ensure that the engine is inhibited and the generator is electrically isolated.

Electrical Equipment
All electrical equipment can be dangerous if not operated correctly. Always service and maintain the generator in accordance with this manual.

Before any maintenance work on the generator is carried out and before the removal of any protective covers, please ensure it is isolated from any source of mechanical and electrical energy.
It is recommended that a suitable Lock-Out/Tag Out process is adopted. The access covers are designed to be removed while the generator is off load. Ensure engine-starting circuits are disabled before commencing service or maintenance procedures and refer to detailed instructions. Always use insulated screwdrivers before commencing any commissioning or fault finding procedures, examine all wiring for broken or loose connections prior to commissioning the alternator for first use or after service / maintenance.

Lifting Warning: The lifting points provided are designed for lifting the generator only. Do not lift the Generating Set by the generator's lifting points.

Lift the generator using the points provided with the aid of a spreader and chains. The angle on the chains must be vertical during the lift. Do not lift single bearing generators without the, securely fitted, transit bar. When removing the transit bar just prior to offering the generator up to the engine, be aware that the rotor is not securely held in the generator. Keep the generator in the horizontal plane to when the transit bar is not fitted.

General Safety Information
Warning: The following may lead to catastrophic generator failure and could result in personal injury.

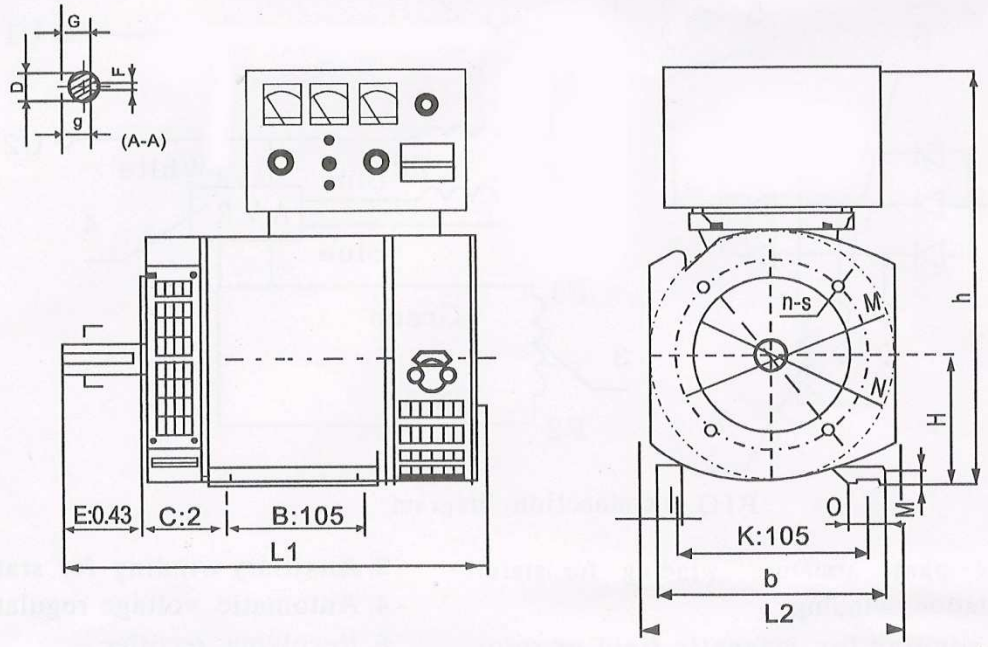
□□Excess Vibration
□□Overloading
□□Synchronising outside of set parameters
□□DO NOT exceed parameters on Ratings Plate and ensure effective coupling of the generator to the engine using bolts to avoid excessive vibration. Refer to specifications in the supplied Manual.

Warning: Do not place controls within the vicinity of the air inlet/outlet of the machine and ensure personnel are restricted from these areas during operation. In the event of catastrophic failure, machine parts may exit these areas.

Note: Due to our policy of continuous improvement, details in this manual which were correct at time of going to print and may now be due for amendment. Information included must therefore not be regarded as binding.

Description.

The TFW & TFDW Series synchronous generators are designed to operate as a primary AC power source. The range of power ratings available in this series of generators make them suitable for households, small holdings, light industrial and back up power situations, as well as supplying electricity for marine applications.



TYPE	Output		INSTALLING DIMENSIONS (mm)												EXTERNAL DIMENSIONS (mm)							Weight (kg)
	S	P	A	B	C	D	E	F	G	H	K	n-s	M	N	a	b	h1	h	L1	L2	g	
TFDW-8	10	8	279	203	121	ϕ42	110	12	37	180	15	4-M12	ϕ215	ϕ180	55	334	25	511	640	365	41.8	138
TFDW-10	12.5	10	279	203	121	ϕ42	110	12	37	180	15	4-M12	ϕ265	ϕ230	55	334	25	511	640	365	41.8	148
TFDW-12	15	12	279	203	121	ϕ42	110	12	37	180	15	4-M12	ϕ265	ϕ230	55	334	25	511	640	365	41.8	165
TFDW-16	20	16	318	228	133	ϕ48	110	14	42.5	200	19	4-M12	ϕ265	ϕ230	60	378	30	548	680	400	51.2	210
TFDW-20	25	20	318	228	133	ϕ48	110	14	42.5	200	19	4-M16	ϕ300	ϕ250	60	378	30	548	680	400	51.2	219
TFDW-24	30	24	318	267	133	ϕ48	110	14	42.5	200	19	4-M16	ϕ300	ϕ250	60	378	30	605	718	400	51.2	254
TFDW-30	37.5	30	356	286	149	ϕ60	140	18	53	225	19	4-M16	ϕ350	ϕ300	65	421	32	605	840	452	64	323
TFDW-40	50	40	356	311	149	ϕ60	140	18	53	225	19	4-M16	ϕ350	ϕ300	65	421	32	605	863	452	64	358
TFDW-50	62.5	50	356	356	149	ϕ60	140	18	53	225	19	4-M16	ϕ350	ϕ300	65	421	32	605	910	452	64	398

These units employ brushless AVR excitation to allow them to provide self-excitation and constant voltage operation. This simple system minimizes complexity and has proven to be very reliable in operation.

TFW & TFDW Series Generators are designed for continuous duty operation within their power ratings. When driven at constant rotational speed they generate single-phase current at a constant AC voltage and frequency. On certain models internal connections may be changed to provide for a variety of output voltages at 50Hz. Conversion between nominal voltages is a matter of changing contacts on a terminal strip inside the terminal box and adjusting the AVR.

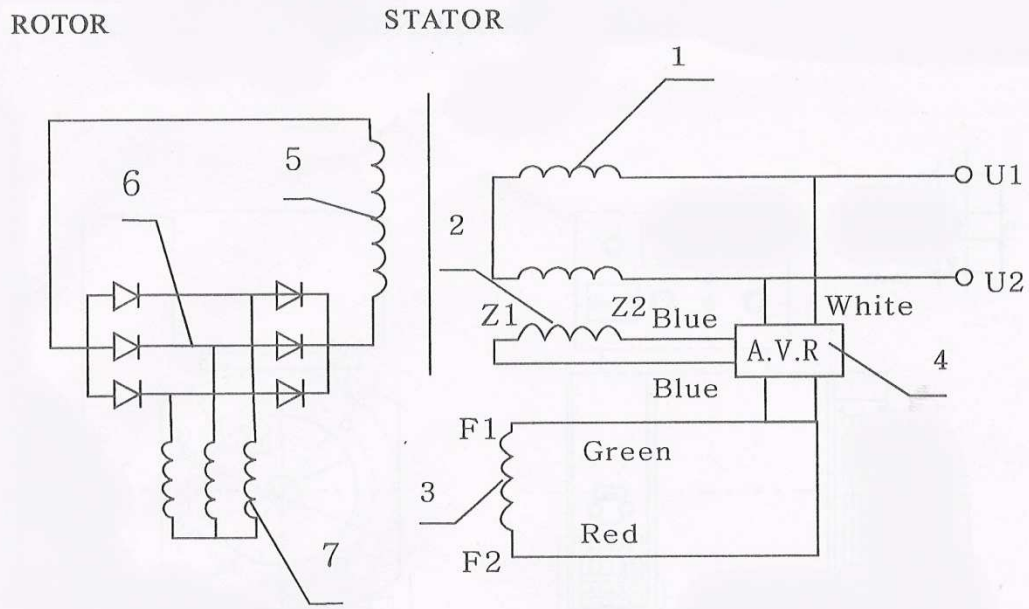
Generators may be coupled to the prime mover (driving internal combustion engine) either by direct shaft-to-shaft coupling or by a flexible belt and sheaves or pulleys. The AC frequency of the output power is determined solely by the speed of rotation of the prime mover and the number of poles in the generator. Four pole generators must spin at 1500 RPM to generate 50Hz power.

Please read these instructions completely and ensure that you understand them thoroughly prior to operating your alternator generator. This will allow you to operate your alternator generator correctly and achieve the longest and most reliable safe service from your unit.

Construction.

TFW & TFDW Series generators are “rotating field” types. In this type of generator, the output power comes from windings that are held fixed in position on the motor frame (the stator) while an electrically-generated magnetic field is rotated past the stator windings by turning the rotating assembly (the rotor). The rotor windings carry DC current obtained by rectifying a portion of the generator’s AC output. This “exciting current” is self generated, and is used in a manner which causes the output voltage to be self-regulating via the AVR. TFW & TFDW Series generator construction is intended to be drip-proof – that is, a few drops of liquid onto the generator should not immediately cause damage. However, like all electrical equipment, the generator should be protected from damp conditions, immersion in water, or water dripping onto the generator.

The frame is either cast iron or rolled steel and the end covers are cast iron. The stator is built from high quality 0.5mm thick silicon steel laminations, wound with Class B temperature rated insulated wire. The rotor is also wound with Class B temperature rated insulated wire. Overall, the generator carries a protective class rating of IP 21. Schematic and details of wiring are shown below.



connection diagram

1. Three-phase armature winding for staror
2. Auxiliary winding for srator
3. Excitation winding
4. Automatic voltage regulation
5. The winding for magnetic field of rotor
6. Revolving rectifier
7. Excitation magnetic armature winding

SPECIFICATION FOR MAIN MODELS

Model	Output (KW)	Voltage (V)	Current (A)	Power Tactor (Cos Φ)	Pole Number	Speed (r. p. m)
TFDW-8	8	230	34.8	1.0	4	1500
TFDW-10	10	230	43.5	1.0	4	1500
TFDW-12	12	230	52.2	1.0	4	1500
TFDW-16	16	230	70.0	1.0	4	1500
TFDW-20	20	230	87.0	1.0	4	1500
TFDW-24	24	230	104.3	1.0	4	1500
TFDW-30	30	230	130.4	1.0	4	1500
TFDW-40	40	230	174.0	1.0	4	1500
TFDW-50	50	230	217.4	1.0	4	1500

The output frequency of the generator is completely dependent on the rotational speed of the generator shaft. If accurate output frequency is needed, then some means must be provided to accurately govern the speed of the prime mover which drives the generator. However, the output voltage is also dependent on the rotational speed of the prime mover (as well as the

AVR setting). If very accurate frequency of the output power is not necessary, as might be the case for lighting applications, it is possible to use the output voltage as an indicator of the proper rotational speed.

All that is necessary is to regulate the speed of the prime mover so that the voltmeter indicates the rated voltage. Since the output voltage depends partially on the prime mover's rotational speed, the output voltage provides a fairly accurate estimate of the rotational speed. The resulting frequency may not match commercial power line standards exactly, but the voltage will be correct and for applications such as incandescent lighting, correct voltage and close frequency is sufficient for use.

If an exact adjustment of voltage is needed, you must set both the rotational speed and the AVR. Set the prime mover speed to exactly 1500rpm by means of a calibrated tachometer on the prime mover engine or a frequency meter on the output power. (Either method works equally well as the output frequency is controlled only by the prime mover rotational speed.)

The output frequency will now be exactly 50Hz. Adjust the AVR to set the desired output voltage. Once the AVR is adjusted in this manner with no load, it is generally unnecessary to readjust it for correct voltage under load.

Before operating the generator.

Check to ensure that all the internal terminals are securely and correctly connected for the desired output voltage and frequency, as shown in the wiring diagram.

Connect output wiring to the output terminals inside the terminal box of the generator. Pay particular attention to making sure that the wires connected to the generator output are of a heavy enough wire gauge to carry the rated output current.

Measure the insulation resistance between the output winding and earth, if the resistance is lower than 0.5Mohms the windings should be dried until an acceptable resistance is achieved.

Ensure that the wiring to the load is correctly installed, secure, and that switches and fuses or circuit breakers rated for carrying and interrupting the rated power output are in place. Switches and/or circuit breakers capable of isolating all electrical loads should be correctly installed, and should be opened before starting the generator. Once the generator is up to speed and indicating the correct output voltage, the switches may be closed.

Starting and stopping.

Starting.

1. Start the prime mover operating and bring it up to the rated speed. When the rotational speed of the prime mover and generator near the rated speed, the generator will start generating voltage by the self-excitation circuit.

2. Adjust the speed of the prime mover exactly if needed. Read the voltmeter on the unit. This should be at or near the rated value.

3. After a short warm up time under no load, the generator voltage will drop slightly. This is a consequence of the changes that increased temperature cause in the self excitation circuit. If needed, the voltage rheostat may be adjusted for a more precise output voltage after this initial warm up.

4. Once the frequency and voltage are acceptably adjusted, turn on the output switch(es) to the load(s).

Stopping.

1. Remove the load(s) from the output by opening the output switch(es).
2. Stop the prime mover.

Cautions:

1. Be very careful not to allow short circuits at the output of the generator. This can damage the AVR or the rectifier diodes in the rotor.

2. Before stopping the generator, remove all output electrical loading first before turning off the prime mover. If you turn off the prime mover while the generator is under load, the resulting spin-down and gradually reducing electric fields will erase the residual magnetism in the rotor that allows the generator to start self excitation.

3. If the residual magnetism in the rotor is too weak to start self-excitation, the rotor will need to be re-magnetized.

Problems and troubleshooting.

First, verify that all internal and external connections are secure and correct. Once this has been verified, if there is no voltage output then possible causes are:

Loss of residual magnetism

The rotor's residual magnetism, which enables self-excitation, may be lost over time if the generator is unused for a long time or suddenly if the generator's prime mover is turned off while the electrical load is still connected to the generator.
To re-magnetize the rotor, connect a 6V storage battery to the field winding while the generator is rotating. The positive (+) battery lead must be connected to terminal F1, the negative (-) battery lead must be connected to terminal F2. Do not connect the battery in the reverse direction.

Rotational speed too slow
Measure the rotating speed of the prime mover with a tachometer and adjust it.

Open circuit or short circuit in the (self-excitation) winding
Replace the winding.

No DC output to the self excitation circuit (damaged rectifiers)
Replace the rectifier assembly.

Field winding is open or short circuited
Replace field winding.

Loose connection or poor contacts on the terminals
Clean and tighten the connections.

Under voltage when no load applied
The speed of the prime mover is too slow, adjust speed or increase the AVR output.

Over voltage when full load applied
The speed of the prime mover is too high, lower the speed or lower the AVR output.

Generator becomes too hot
Ensure the generator is not being overloaded and that air is free to flow through the unit with sufficient ventilation provided in the generator room.

Excessive Vibration
Check for true alignment with the prime mover and that the unit is fixed to a suitably sturdy flat and level base providing adequate support.

Maintenance and repair - General maintenance

1. If the generator is to be stored, ensure that the storage place is dry and clean. If the generator is to be stored on earth or concrete floors, place a wooden base beneath it to prevent contact between the generator and floor. Cover the generator with a water repellent tarpaulin or other water resistant covering to prevent water and dust from entering the generator.

2. Take steps to prevent water, dust, metal chips and shavings, and other foreign material from entering the generator.

3. Do not cover the generator with cloth, wood, paper, etc. while operating. The generator should have free, unimpeded air circulation to allow it to dissipate normal internal heat build up. The generator may be damaged by heat build up if it is covered during operation.

4. Do not overload the generator. Provide circuit breakers or other means to prevent this.

5. During operation, check the generator periodically for unusual sounds. Stop the generator immediately if such sounds are noticed, and then inspect and repair the generator.

6. Do not operate the generator in atmospheres that are very humid or dusty, or when there are combustible gasses in the area of the generator.

7. Remove and replace the grease in the ball and roller bearings after every 3000 hours of operation, or at least once per year. The bearing housing should normally be filled to about half its volume with grease – do not fill it more than half full. Replace the grease only with a good grade of molybdenum disulfide lithium based grease. The maximum permissible temperature of the ball and roller bearings is 95C (203F).

Inspecting and overhauling

The generator should be inspected at intervals of no more than six months.

1. Remove the access covers and clean out any dust that may have accumulated in the generator. The preferred method for this is to use compressed air at not more than 0.4kg/cm^2 (5.7 psi)

2. Inspect the bearings. Remove the outer covering of the bearing and determine whether the grease is at a sufficient level and clean. If the grease is dirty or contaminated, remove the old grease and replace with the correct level of fresh grease.

Necessary precautions.

When inspecting and overhauling the generator, follow these precautions:

1. Keep the disassembled parts in a suitable container to prevent loss or contamination.

2. Mark terminal leads before disconnecting them so they can be easily identified and replaced in the correct positions on reassembly.

3. Whenever the bearing covers are removed, take care to prevent contamination of the bearing with dirt and dust. Clean the surrounding area before opening the cover, and protect the bearing cover and bearing with clean paper.

4. After the generator is properly installed, turn the rotor by hand to make sure that it moves freely.

Stationary Engine Parts Ltd alternator guarantee.

Guarantee Period

In respect of TFW & TFDW type generators the guarantee Period is six months from the date of delivery.

Defects, After Delivery

We will make good by repair, or at our option, by replacement, any fault that under proper use appears in the goods within the guarantee period. Provided, on examination by us, the defect is solely due to defective material or workmanship. The defective part is to be promptly returned, carriage paid, to us at the factory, our Subsidiary of or, if appropriate to the Dealer who supplied the goods. All identification marks and numbers must be intact to aid identification.

Any part repaired or replaced, under guarantee, will be returned to the customer free of charge (via sea freight if outside the UK).
We shall not be liable for any expenses that may be incurred in removing or replacing any part sent to us for inspection or in fitting any replacement part supplied by us. We shall be under no liability for defects in any goods which have not been properly installed in accordance with our recommended installation practices as detailed in the ‘Installation, Service and Maintenance Manual'.

We shall be under no liability for defects on products that have been improperly used or stored or which have been repaired, adjusted or altered by any person except our authorised agents or ourselves.
We shall not be liable for any second-hand goods, proprietary articles or goods not of our own manufacture although supplied by us, such articles and goods are being covered by the guarantee (if any) given by the manufacturers.

All claims must contain full particulars of the alleged defect, the description of the goods, the Serial Number, the date of purchase, and the name and address of the Vendor (as shown on the manufacturer’s identification plate). For Spare Parts, claims must contain the order reference under which the goods were supplied.

Our judgement, in all cases of claims, shall be final and conclusive and the claimant shall accept our decision on all questions as to defects and the exchange of a part or parts.
Our liability shall be fully discharged by either repair or replacement as above, and in any event shall not exceed the current list price of the defective goods.
Our liability under this clause shall be in lieu of any guarantee or condition implied by law as to the quality or fitness for any particular purpose of the goods, and save as expressly provided in this clause we shall not be under any liability, whether in contract, tort or otherwise, in respect of defects in goods delivered or for any injury, damages or loss resulting from such defects or from any work undone in connection therewith.

MACHINE SERIAL NUMBER…….

STATIONARY ENGINE PARTS

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