PROVEN

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WT6000

TM900

MANUAL

DIRECT HEATING SYSTEM

Proven Energy Ltd
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Congratulations on purchasing a Proven Energy System - the power of the wind is yours! Please fill in the following short questionnaire - this will help us to improve both our products and the information that we supply to our customers on operation, maintenance and installation.

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NEW OWNER QUESTIONNAIRE FOR PROVEN ENERGY PRODUCTS	
Delivery	
Did your order arrive promptly? If not, give details.	
Was the order in good condition when it arrived? If not give details	
Installation	
What experience did the installer have of a) wind energy b) PV solar c) electrical wiring d) inverters e) batteries	a) b) c) d) e)
Were the Proven Installation Manuals helpful? If not, what would you like to see added.	
How long did the installation take (man-days)? How many people?	
What was the most difficult bit of the installation process?	
Performance	
How has the wind turbine performed since installation	
What % availability is estimated for a) the wind turbine b) the complete system?	a) b)
Maintenance	
Has the first (3 month) service been performed on the turbine? Give details of any work carried out.	
After Sales Care	
You have been put on the mailing list to receive details of new Proven Products and Proven Newsletters. What further support would you like?	

Thank you for your time in completing this form.
If you have further comments please send them on an attached sheet.
Please return to Fax No. + 44 (0) 1560 485 580 or mail it to -
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WT6000 MANUAL

SYSTEM SPECIFICATION

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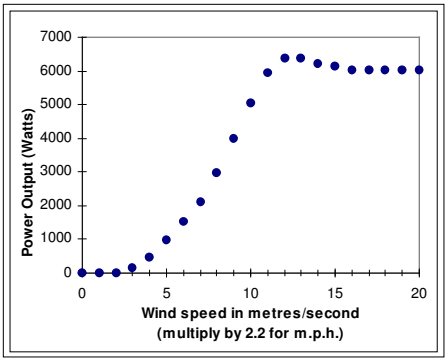
Proven WT6000 6kW Wind Turbine
Proven TM900 9m (or TM1500 15m) Self-Supporting Mast



Rotor Speed Control

Above 12m/s (25mph) the blade pitch is automatically adjusted to maintain 200 rpm and full output

High Build Quality

All components are hot-dipped galvanised steel, stainless steel or plastic.

Low Speed Equals Durability

Low rotor speed (half the speed of comparable machines) ensures extended durability of blades and bearings. It also means that Proven WTs are the quietest in the world!

Performance

Cut-In Wind Speed	2.5 metres/second (5.6 mph)
Cut-Out Wind Speed	none
Rated Wind Speed	12 metres/second (25 mph)

Rotor

Type	Down-wind, Self-Regulating
Number of Blades	3, Flexible
Rotor Diameter	5.6 metres
Blade Material	Wood/Epoxy/PU

Generator

Type	Brushless, Direct Drive, Permanent Magnet (No Gear-Box, Zero Maintenance)
Output	48V/120V/240V/300V 3-phase AC (25Hz nom)
Rated RPM	200 nominal
Rated Power	6000 Watts
Annual Output	7000-18 000 kWh depending on site

TM900 Mast

Type	Self supporting/Tilt Down.
Hub Height	9m
Foundations	35 Newton Concrete Pad 2.5 x 2.5 x 1 m
Tube ∅	175 mm top A/F 350 mm bottom A/F 530 mm square mast base

TM1500 Mast

Type	Self supporting/Tilt Down.
Hub Height	15m
Foundations	35 Newton Concrete Pad 3 x 3 x 1.2 m
Tube ∅	200 mm top A/F 440 mm bottom A/F 750 mm x 739mm mast base

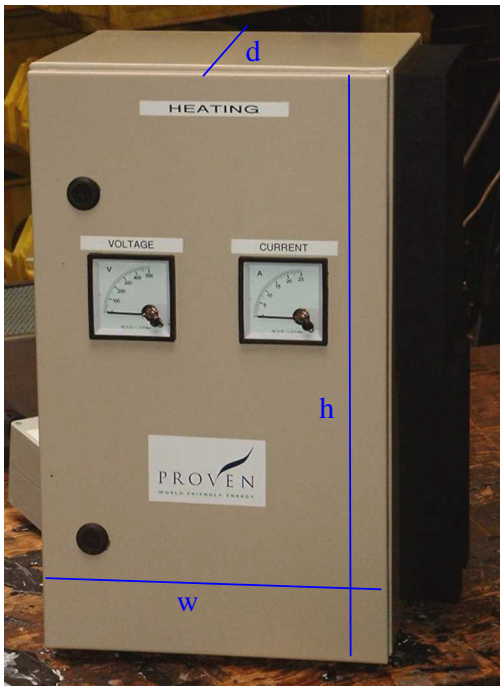
Noise

	(approximate)
<45dB	At 5m/s
<60dB	At 20m/s
70-80dB	Car 15m away at approx 40 mph.

Weight

WT6000	500 kg
TM900/6000	360 kg (+ 70kg gin pole)
TM1500/6000	656 kg (+ 240kg gin pole)

Proven ECM6003 120/240V 6kW Proven Wind Turbine Direct Heating Controller

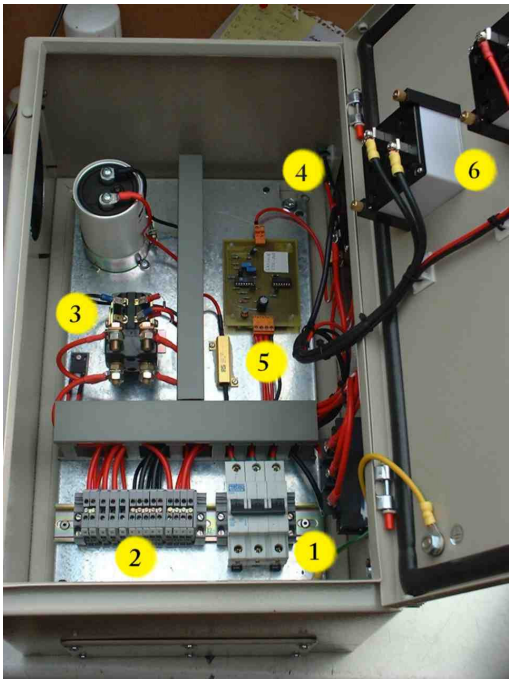


Functions

Voltmeter, Ammeter, Rectification of 3-phase input from WT6000, Isolator, Proportional Load Control, Change Over Contactor.

Enclosure

IP66 Box, height: 500mm, width: 300mm, depth: 260mm. Heatsink for rectifier on RHS adds 50mm to overall width. All connections via glands in base.



Layout

1. Miniature Circuit Breaker (MCB) WT Isolator
2. Terminal Strip
3. Change Over Contactor
4. IGBT
5. Control Circuit
6. Meters

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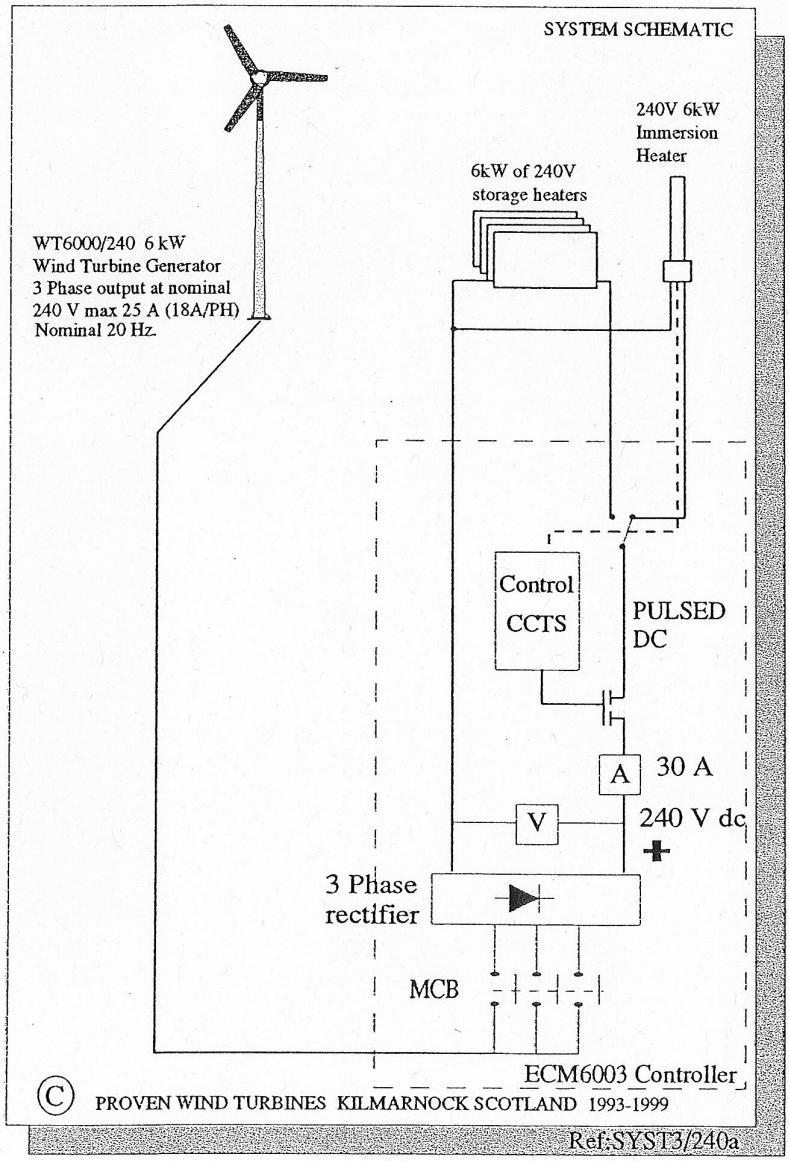
System 3/240V
Direct Heating System with dual output



System 3 provides heating from the wind for hot water and / or space heating. If both hot water and storage heating are required then normally the hot water will have priority. The controller ECM6003 can monitor the hot water thermostat so that all wind power is directed to hot water until it is up to temperature and then automatically switch over to space heating.

A 240V 6kW immerser is used, usually fitted as an extra in the hot water tank. The thermostat in this immerser is wired back to the ECM6003.

6 kW of standard 240V storage heaters are needed as the second source for wind power. The storage heaters should always be turned full up on both input and output stettings so that the windmill always has somewhere to store heat.

Alternatively the space heating may be fed into a water central heating system via another immerser as above fitted in a storage tank or directly in the heating circuit.(in which case gravity circulation or a circulating pump must be ensured so that when hot water is produced it is circulated even if the conventional heating system is not on).

The controller adjusts the ammount of power going to the heaters depending on wind speed. In this way the windmill is not overloaded in light winds; which would reduce its output.

Once installed the whole system works automatically to provide hot water and heat from the wind.

WT6000 MANUAL

ELECTRICAL INSTALLATION

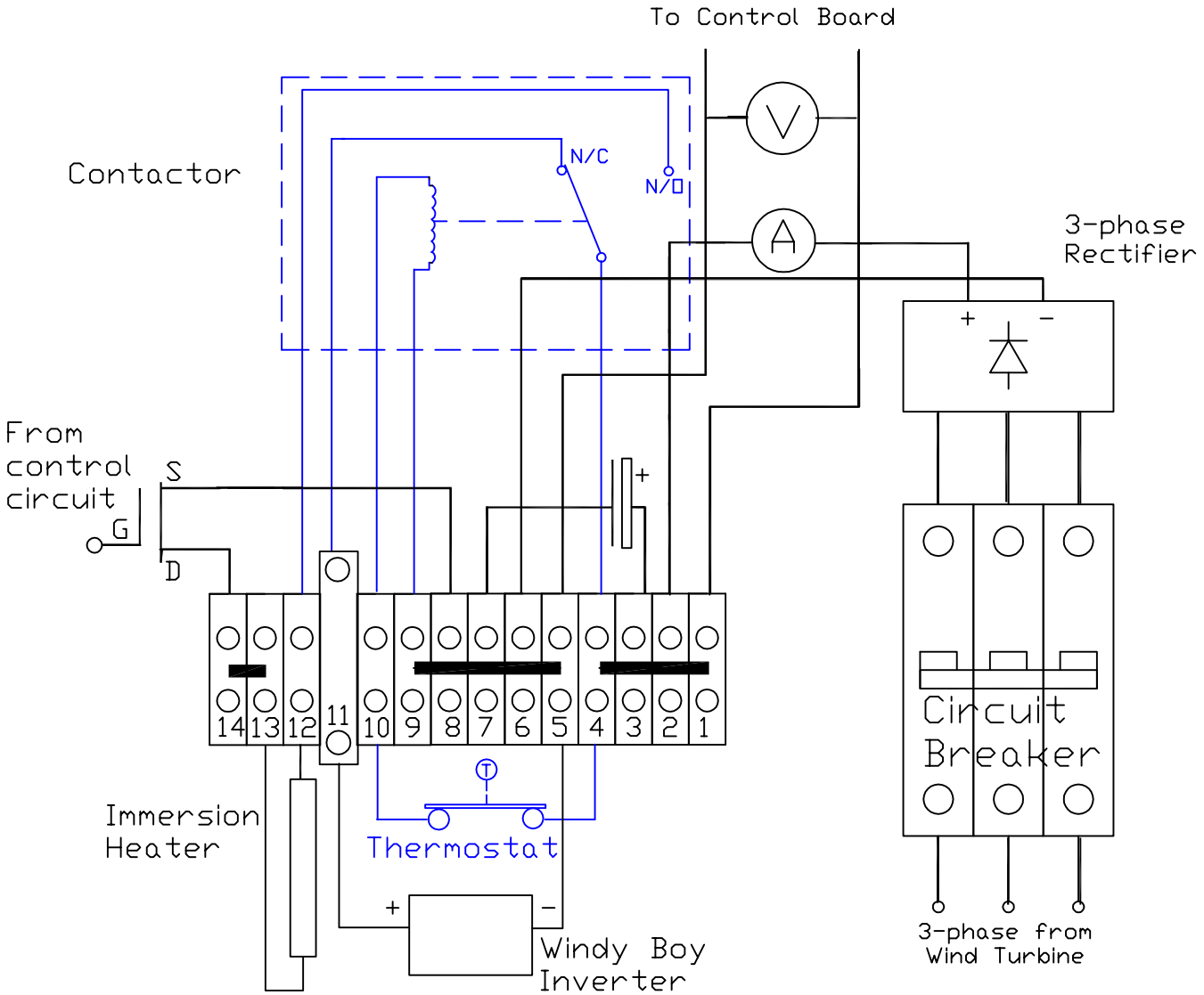
Customer Name: _____

Location: _____

WT Serial Number: WT-6000-000

ECM Serial Number: ECM-6003/0-000

CUSTOMER WIRING
Wind Turbine into cicruit breaker.
Connect Thermostat between 4 & 10.
Connect Windy boy between 11 & 5
Connect Immer heater between 12 & 13.



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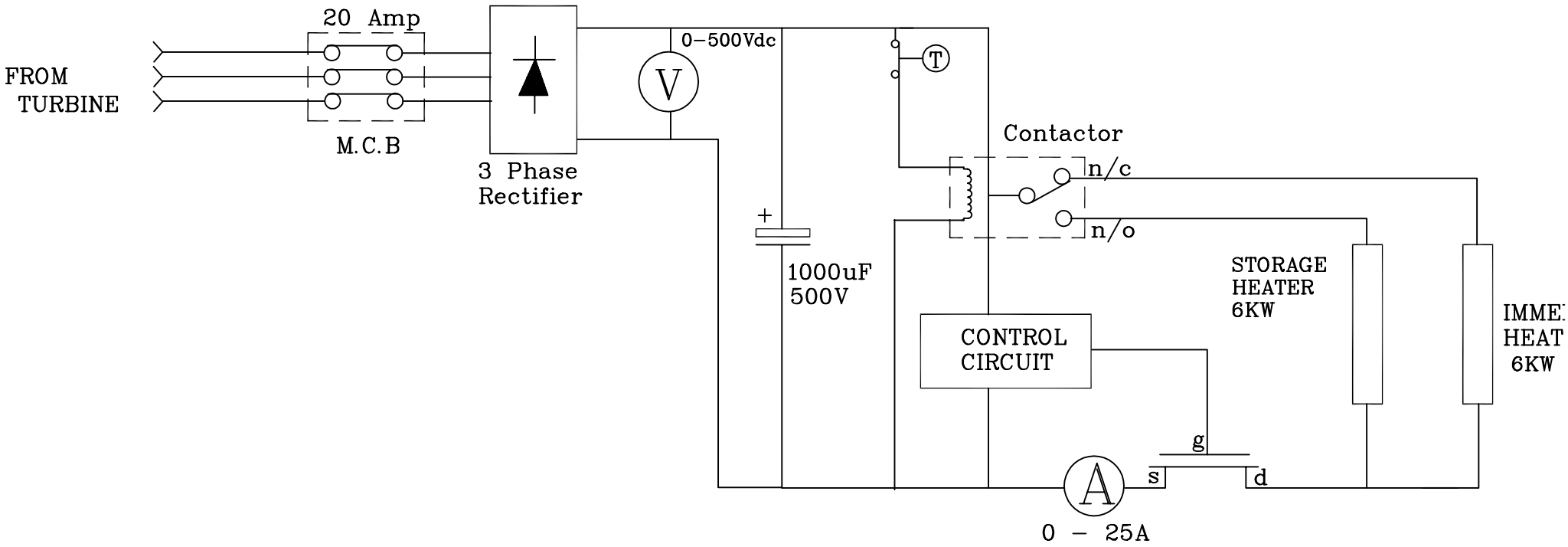
PREPARED BY

CHECKED BY

Drawing Title: ECM6003 Terminal Strip

FSCM NO.	DWG NO.	REV
	6000 EE 010.dwg	2

SCALE	Date	SHEET
	28/10/03	



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PREPARED BY | CHECKED BY

FSCM NO. | DWG NO. 6000 EE 011.dwg | REV 2

SCALE | DATE 28/10/03 | SHEET

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Drawing Title
ECM6003 Controller Sche

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WT6000 MANUAL

MECHANICAL INSTALLATION

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TOOLS LIST FOR WT6000 INSTALLATION

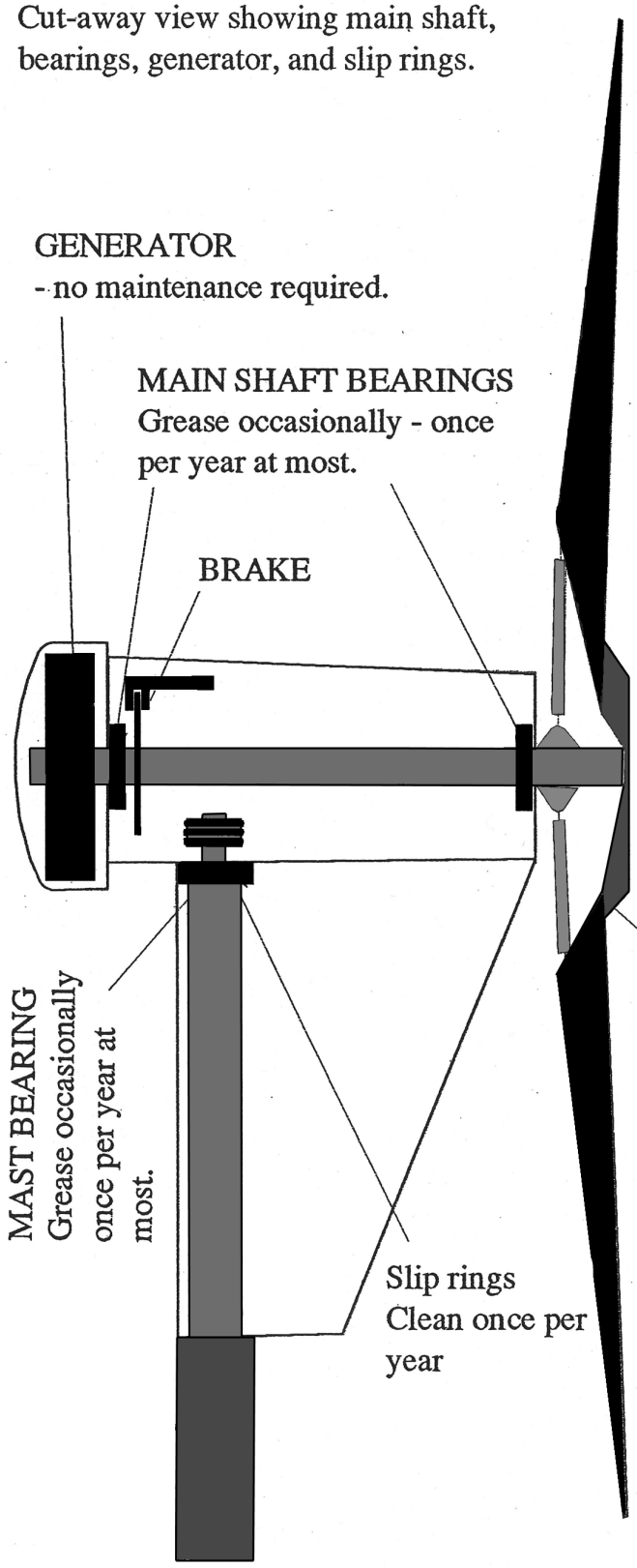
The following is a list of parts required for the mechanical installation of a Proven WT6000 Wind Turbine.

Number	Description	Used For
2	10mm Spanners (1 open ended)	Slip Rings
2	13mm Spanners (1 open ended)	Blade back spring fixings (normally factory tightened)
2	17mm Spanners (1 open ended)	Blade fixing bolts Spring U-bracket Fixings
2	19mm Spanners (1 open ended)	Lower Yaw Bearing
2	24mm Spanners (1 open ended)	Upper Yaw Bearing Main Shaft Bearings (normally factory tightened)
1	3 mm Allen Key	Slip Rings
1	5 mm Allen Key	Yaw Bearing
1	Pair of Wire Snips	Trimming cover cable ties
1	36mm Spanner (e.g. 36mm socket on ¾" drive ratchet with 1m scaffold tube or similar for extension. 4" to 6" socket extension sometimes useful)	M24 TM900 Tower Bolts (connecting tower onto base plate)
1	Tube of glazing silicon + gun	Cover Sealant
1	Loctite Studlock (A118 or similar)	All Fixings
1 Set	Pliers, Wirestrippers, Crimping Tool etc	Wiring
1	Hacksaw	Occasionally stainless steel nuts lock during tightening. Hacksaw is sometimes the last resort! May also be used to trim foundation j-bolts if required
1	TWT532 Tirfor winch (3 tonne static) with 20m wire rope and strop for attachment at anchor pin end. Rope should be with hook at one end or loop and large D-shackle.	Raising & Lowering on standard 9m mast
1	46mm Spanner (e.g. 46mm socket on ¾" drive ratchet with 1m scaffold tube or similar for extension. 4" to 6" socket extension sometimes useful)	M30 J-bolt nuts (connecting base plate to concrete foundation)
1	Flat file	Removing any galvanising drips to allow tower fitting with yaw bearing

Please let us know if you think any tool should be added to this list

PROVEN WT6000 6KW WIND TURBINE

Cut-away view showing main shaft, bearings, generator, and slip rings.



Maintenance Schedule

Once per year:
Grease the three bearings,
Clean slip rings
Check Brake pads
Check nuts and bolts.
Check springs

Operation

No action is required during normal running
the system is self regulating and automatic with passive fail-safe speed and power control.

Proven Patent Passive Blade control system

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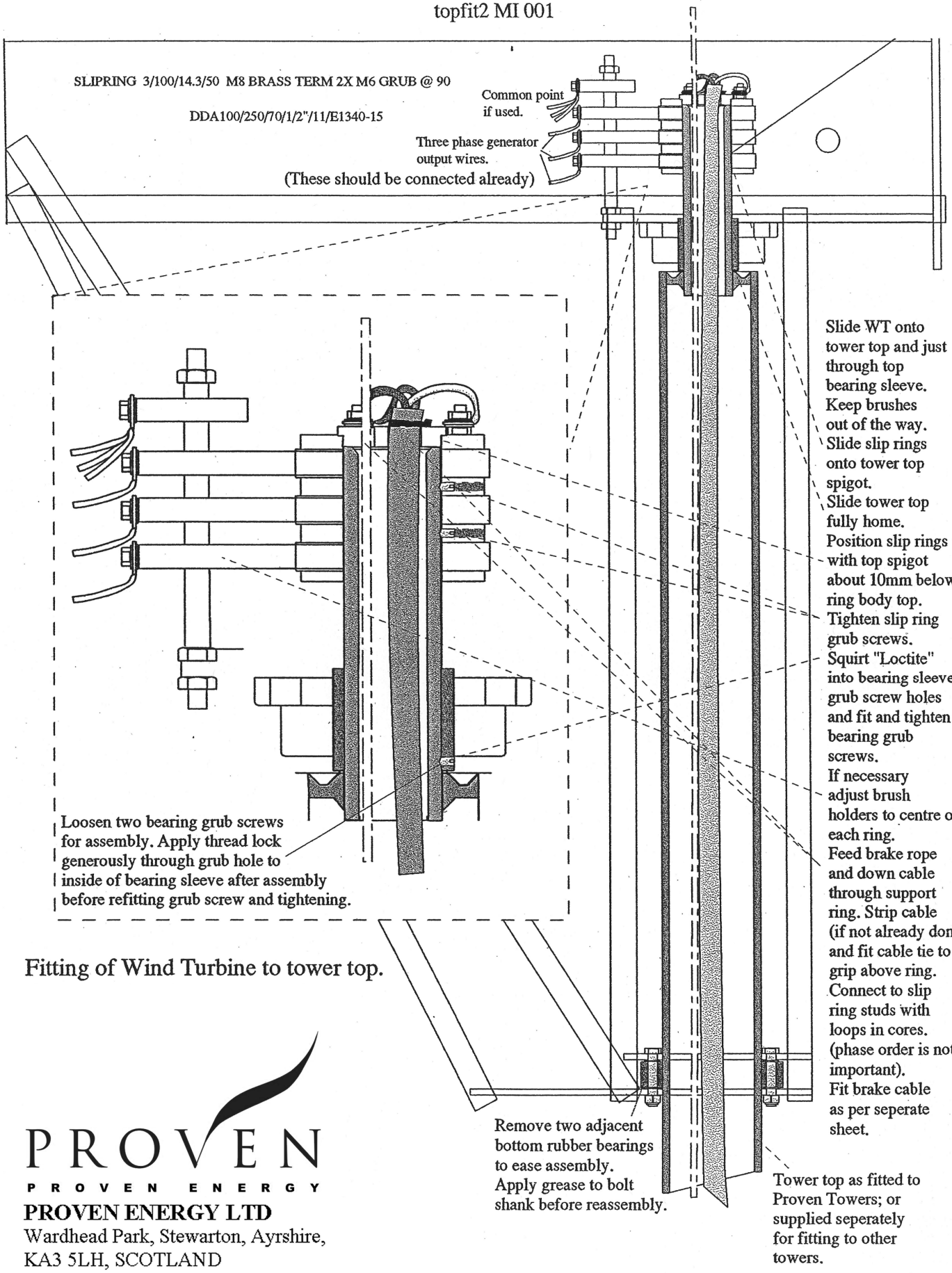
topfit2 MI 001



Fitting of Wind Turbine to tower top.

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FITTING THE WT6000 6KW

WIND TURBINE TO THE TOWER TOP

See also WT6000 Fitting Diagrams

- If fitted, remove covers by cutting the securing cable ties.
- Remove at least two of the rubber rollers to make it easier to fit the frame onto the tower top.
- Carefully slide the frame onto the tower until the tower top spigot is just through the bearing sleeve.
- As the turbine is pushed fully home fit the slip rings whilst keeping the brushes out of the way,
- The yaw bearing fixing bolts can now be tightened. They are left loose to assist the fitting. Ensure turbine is pushed fully home and tighten bearing grub screw. (Use a thread locking compound to prevent vibrating loose)
- The rubber rollers can now be refitted. Grease the bolt shank before assembly. Do not overtighten the rubbers so that they will not rotate.
- Position slip rings so that they overhang the tower spigot by about 10mm. This allows room for the "top hat".
- Using thread lock compound tighten the slip rings retaining grub screws.
- Check brushes are in line and making good contact with slip rings. Adjust as necessary.
- Remove slip ring stud nuts and washers. Feed cable down into tower top. Strip outer insulation and push cable through "top hat". Fit a cable tie to take the weight of the cable as shown in the diagram.
- Push "top hat" onto slip rings and using ring crimps fit cables to the relevant studs and check they are clear of the shaft. For a three-phase output machine the three cables can be connected in any order.

N.B. For a turbine with DC output (i.e. rectifier mounted within turbine) check the polarity of the connections).

- Check everything is tight and that the turbine will freely rotate within its yaw axis.
- Refit covers as per instructions.
- Fit blades as per instructions.
- Finally spin the rotor by hand to check that nothing rubs. If the turbine has been roughly handled then the domed generator cover can get pushed against the magnet plates. If this is the case gently tap the cover back into position and reseal if necessary with silicone.

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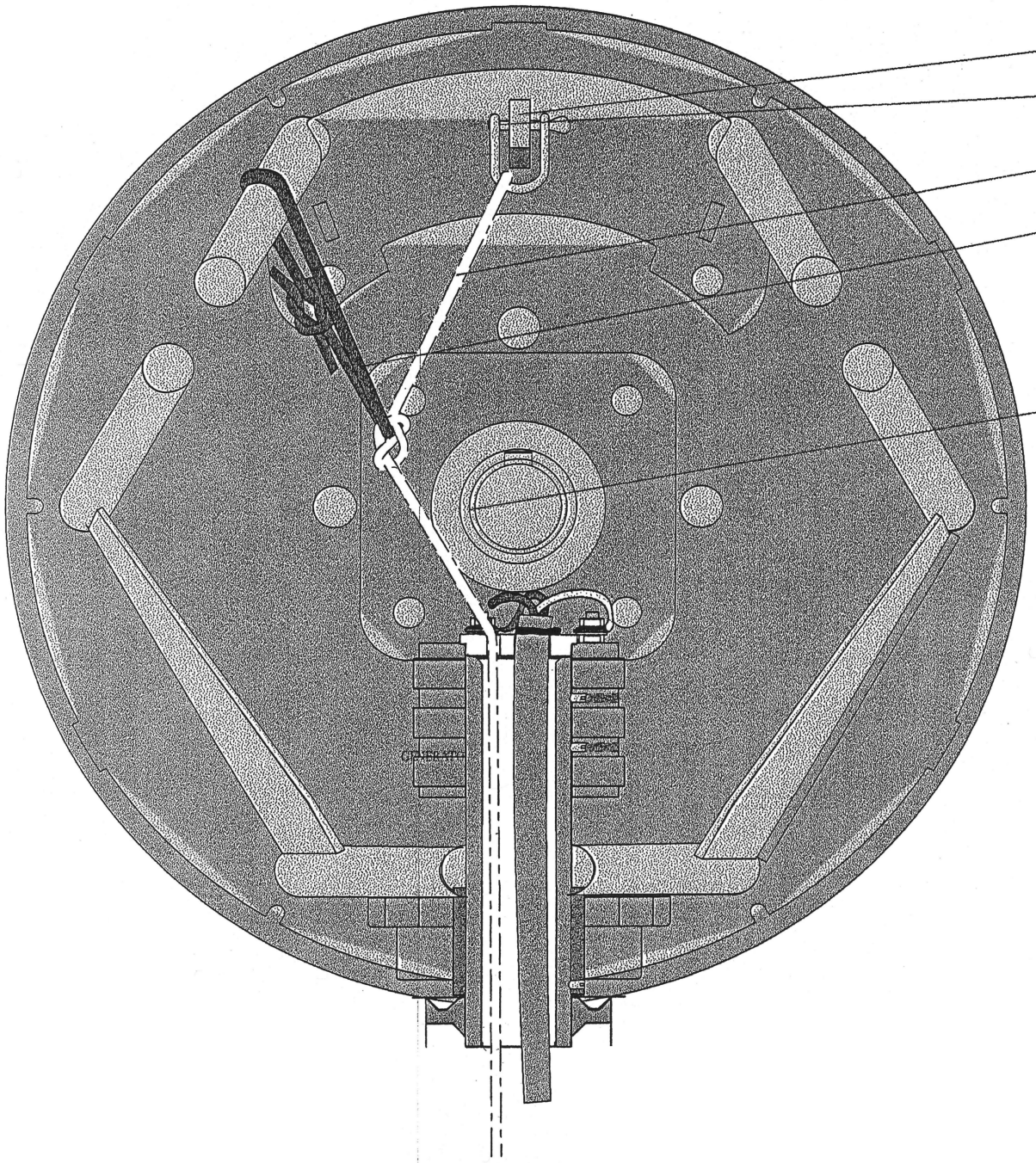

Brake Lever

Brake shackle; apply threadlock to threads.

Brake rope

Brake Elastic
This serves to take the weight of the brake rope and holds the rope away from the shaft while running.

When the brake is applied the rope leans against the stopped shaft.

View looking from rotor to generator.

WT2500
Brake rope arrangement
20/9/96
brakerop2 MI 002

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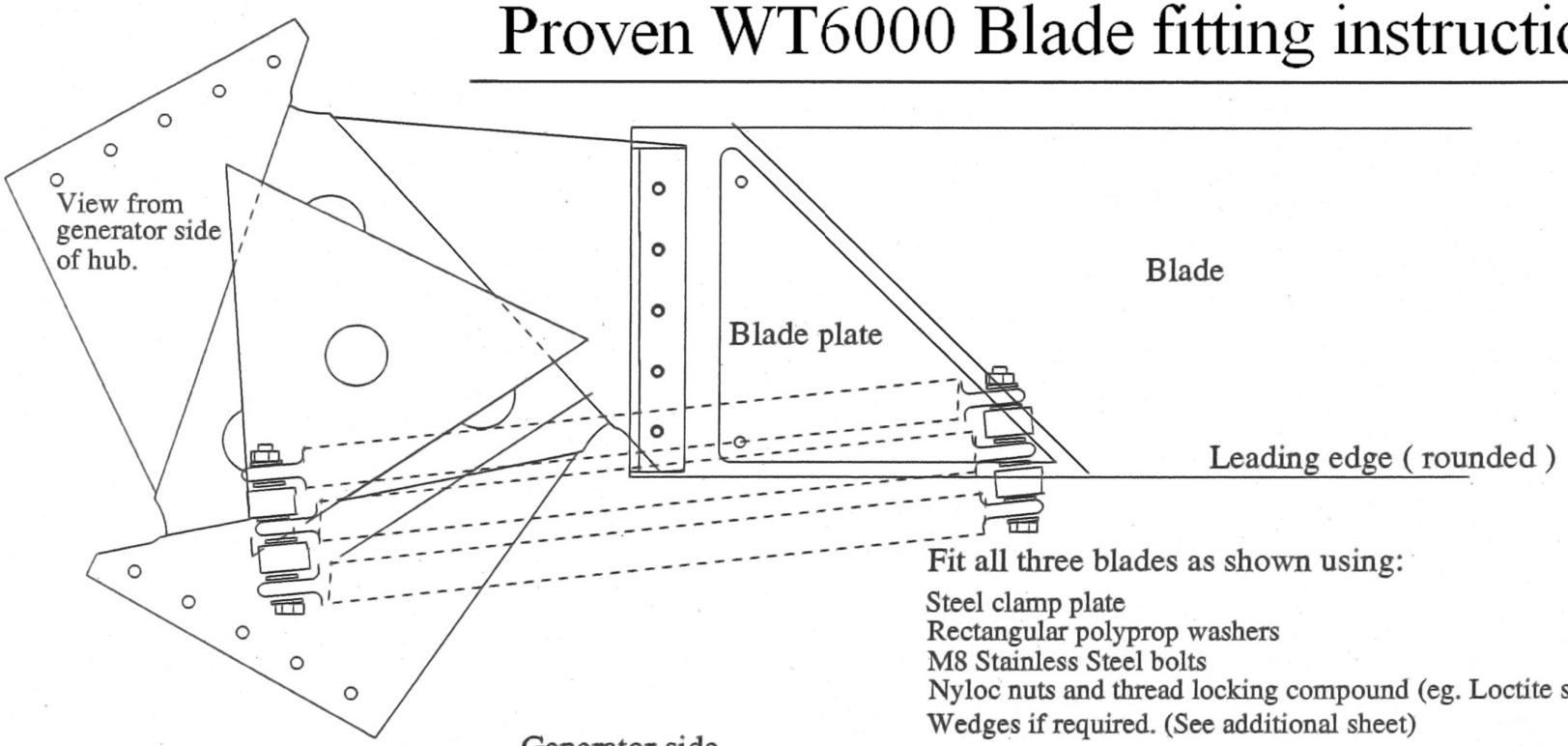
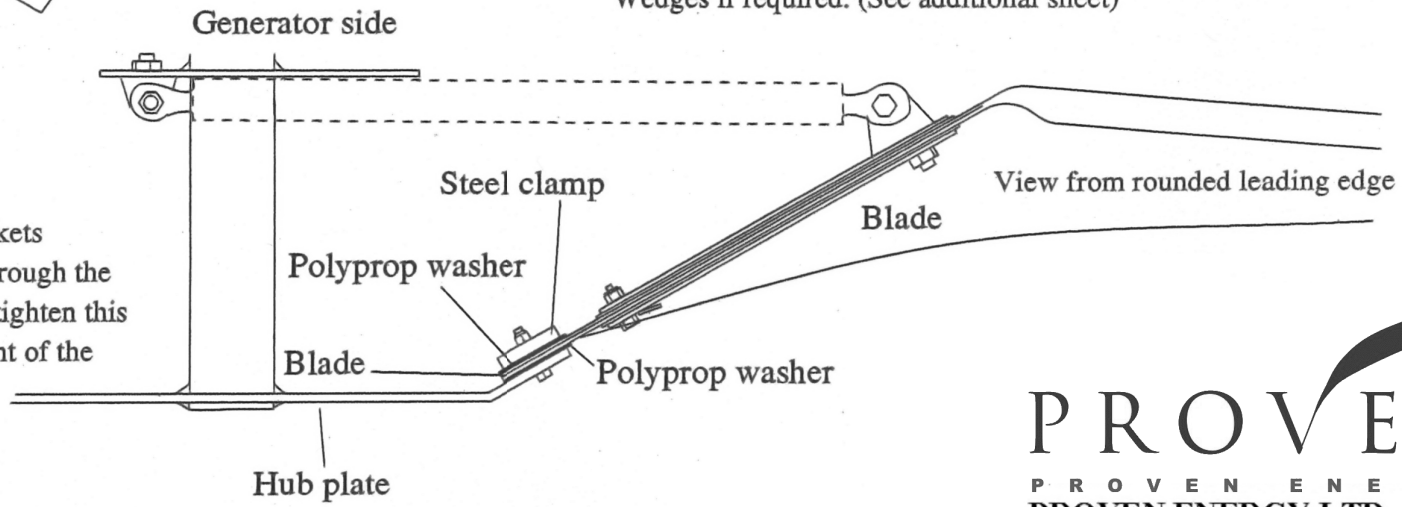
Proven WT6000 Blade fitting instructions



Fit all three blades as shown using:

Steel clamp plate
Rectangular polyprop washers
M8 Stainless Steel bolts
Nyloc nuts and thread locking compound (eg. Loctite stud loc)
Wedges if required. (See additional sheet)



Springs come fitted with U brackets
The tension of the 10mm bolt through the U bracket is factory set. Do not tighten this bolt as some rotational movement of the spring must remain.

bladefitd3

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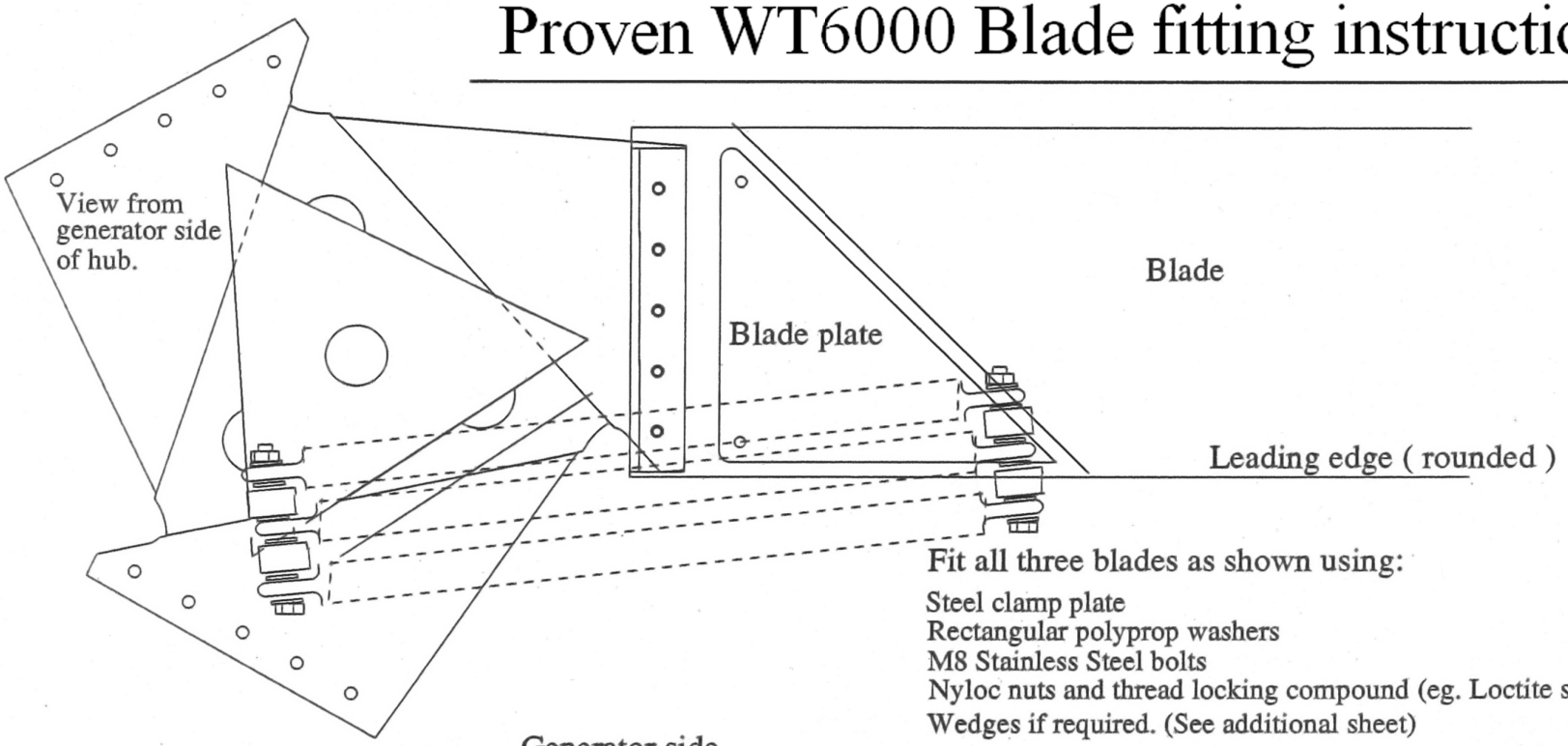

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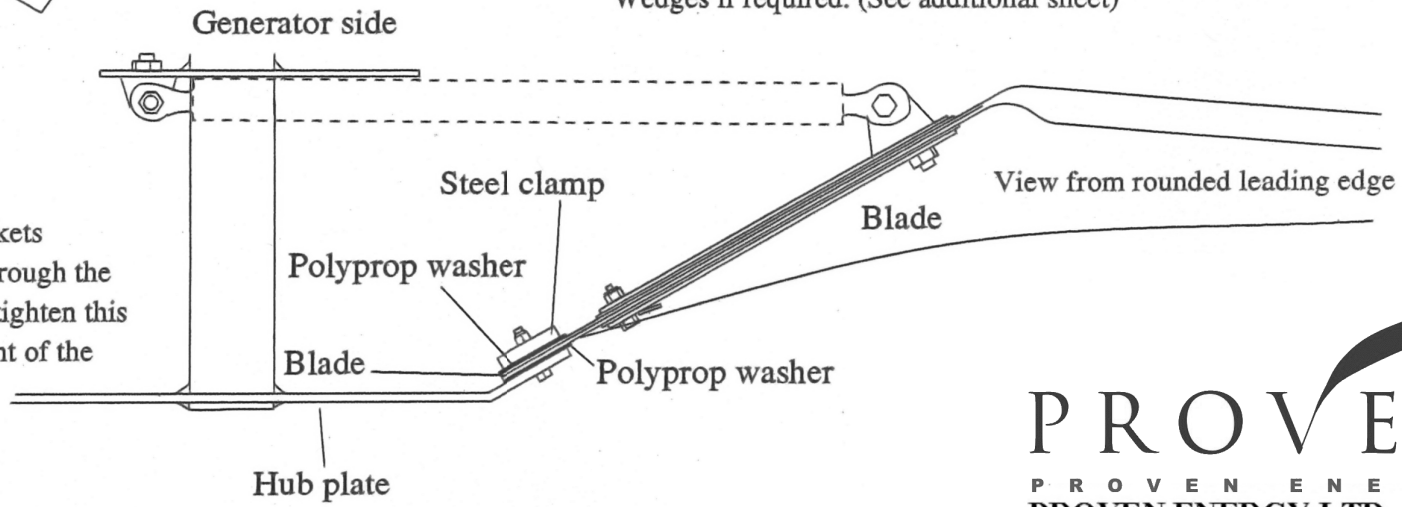

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bladefitd3

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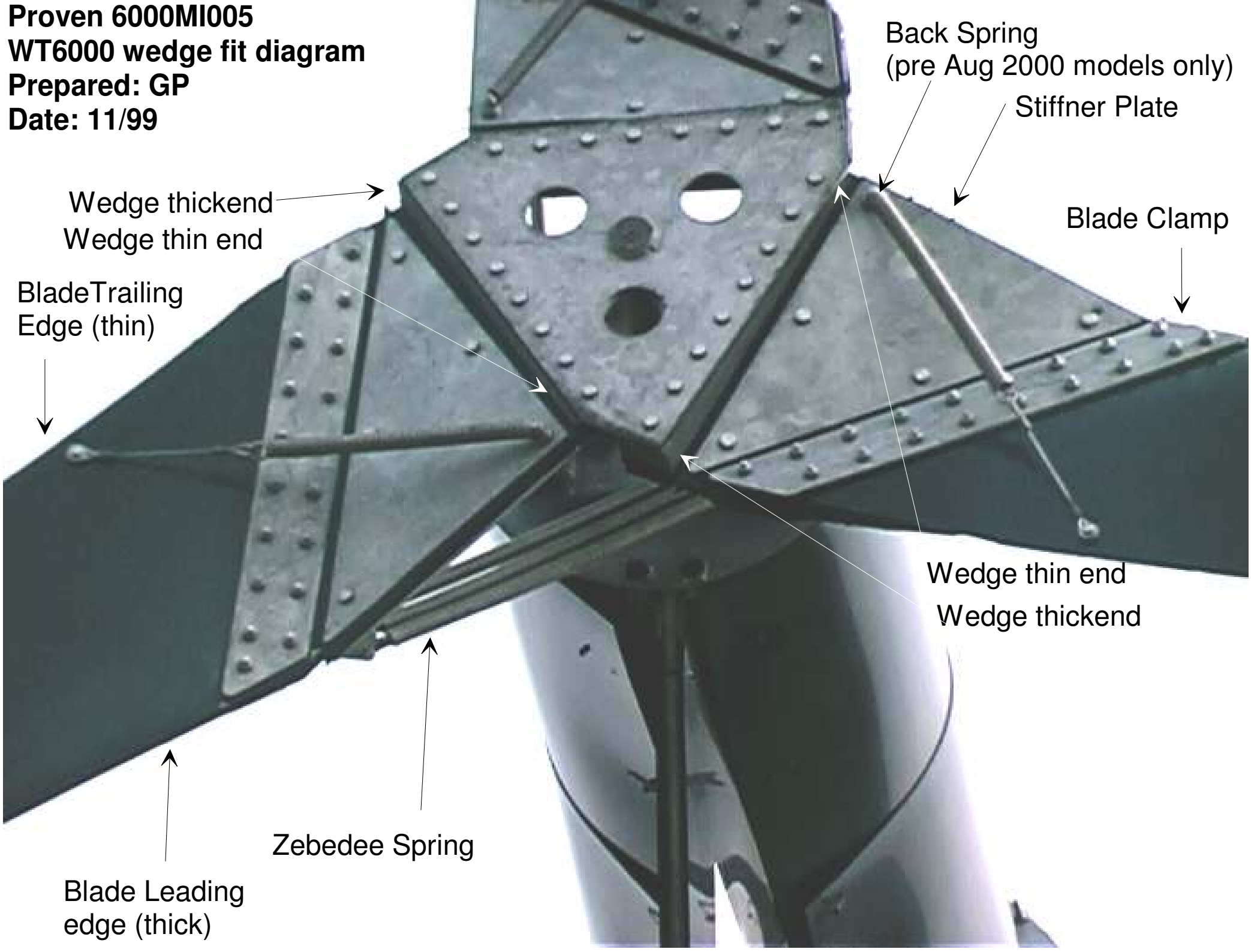
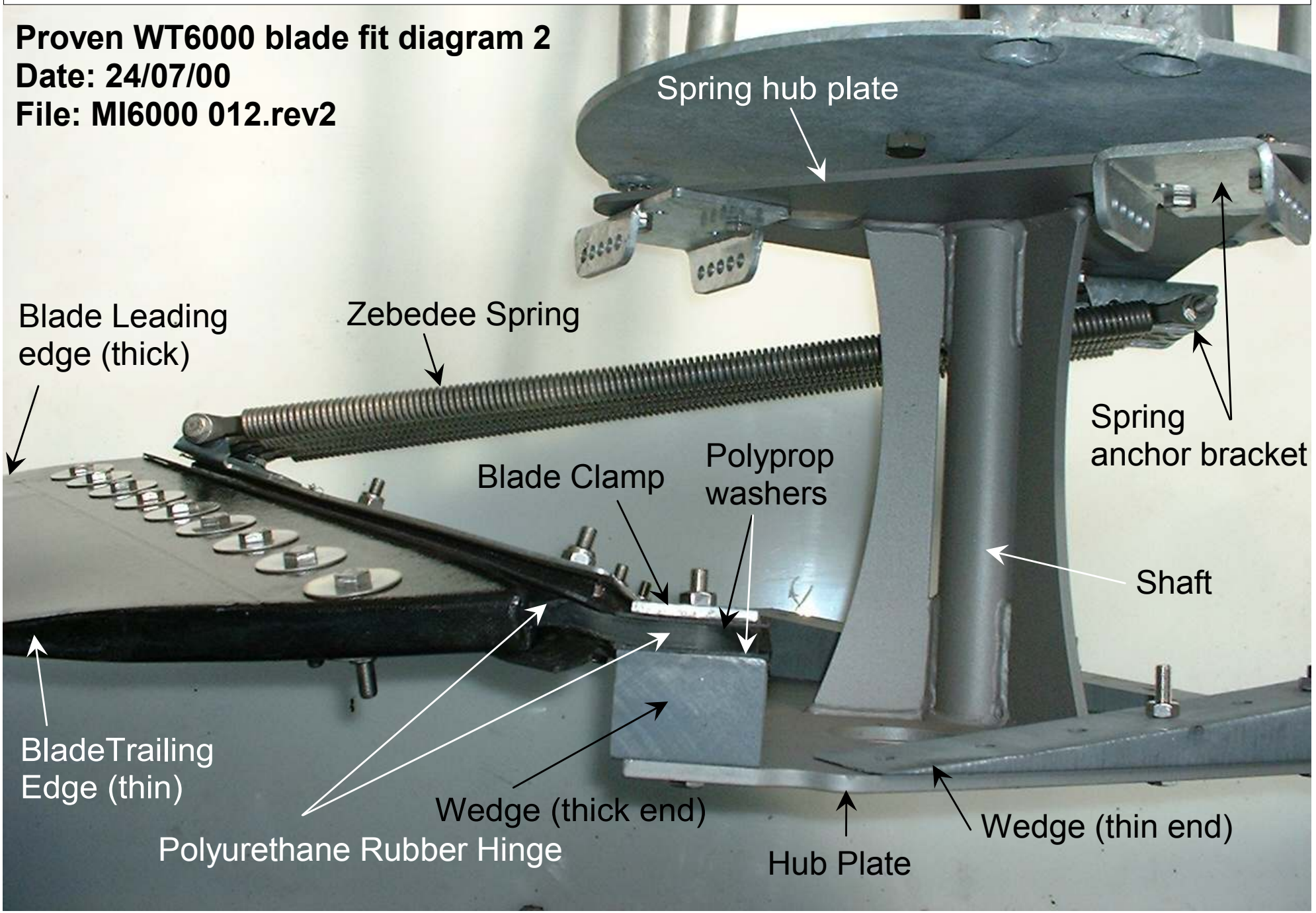
Proven 6000MI005
WT6000 wedge fit diagram
Prepared: GP
Date: 11/99





COVER FITTING

See also WT6000 Cover Fitting Diagram

The two 3mm polyprop covers are secured to the turbine with at least 4.2mm cable ties. When fitting covers leave the ties loose until all ties are fitted and the covers pushed firmly into position.

Fit the lower cover first. Fix the cable ties in the order shown (A, B, etc.). When fitting the top cover note the corners which are cut. One corner has a longer cut edge which gives clearance for the cable conduit.

A. Tie goes through hole and around frame spar. Repeat both sides. Push cover under the frame spar.
B. Through hole, around spar and out of second hole. Repeat both sides.
C. Through hole, through hole on other side of cover, round and back out.
D. Use one long tie or join two short ties together. Tie goes through cover, into one frame hole, out of the second, through cover and then fastened. This should pull the cover flat to the frame.
E. Tie through cover and around spar.

Push the lower cover firmly up so the top edges but inside the horizontal spars of the space frame. The ties on the lower cover can now be tightened and trimmed off. Now tighten the top cover while pushing it firmly against the generator housing. Check that it does not rub against the spring anchor plate on the shaft.

Using a silicon sealant fill the gap between the cover and generator housing to keep water out of the turbine. If not already done also seal the domed generator cover.

FITTING THE BLADES

Throughout the blade fitting process be careful of them - they are fragile. Protect the blade tips, leading and trailing edges with padding if necessary (stones on ground etc).

Fit one blade to the hub as shown in diagram 6000 blade fit diagram 2 (ref: 6000 MI 012/2) as follows.

1. Place wedge onto hub
2. Put polyprop (plastic) washer on top of wedge
3. Place PU (rubber) hinge of blade on top of washer
4. Place further washer on top with metal clamp plate as final layer
5. Secure blade using M10 bolts and lock nuts provided. It is good practice to use Loctite Threadlock (A118 or similar) to lubricate **and** secure fixings against vibration. Use only a **small** amount on each bolt.
6. Referring to diagram 6000 MI013 attach zebedee springs to the blade bracket and spring anchor bracket.
7. It is **very** important that the M10 fixing bolt running through the spring ends is not fully tightened. The spring ends should be allowed to freely rotate during normal operation. However, there should be no lateral play of the spring ends within the spring bracket.
8. Check all fasteners are tight and repeat for the other two blades.

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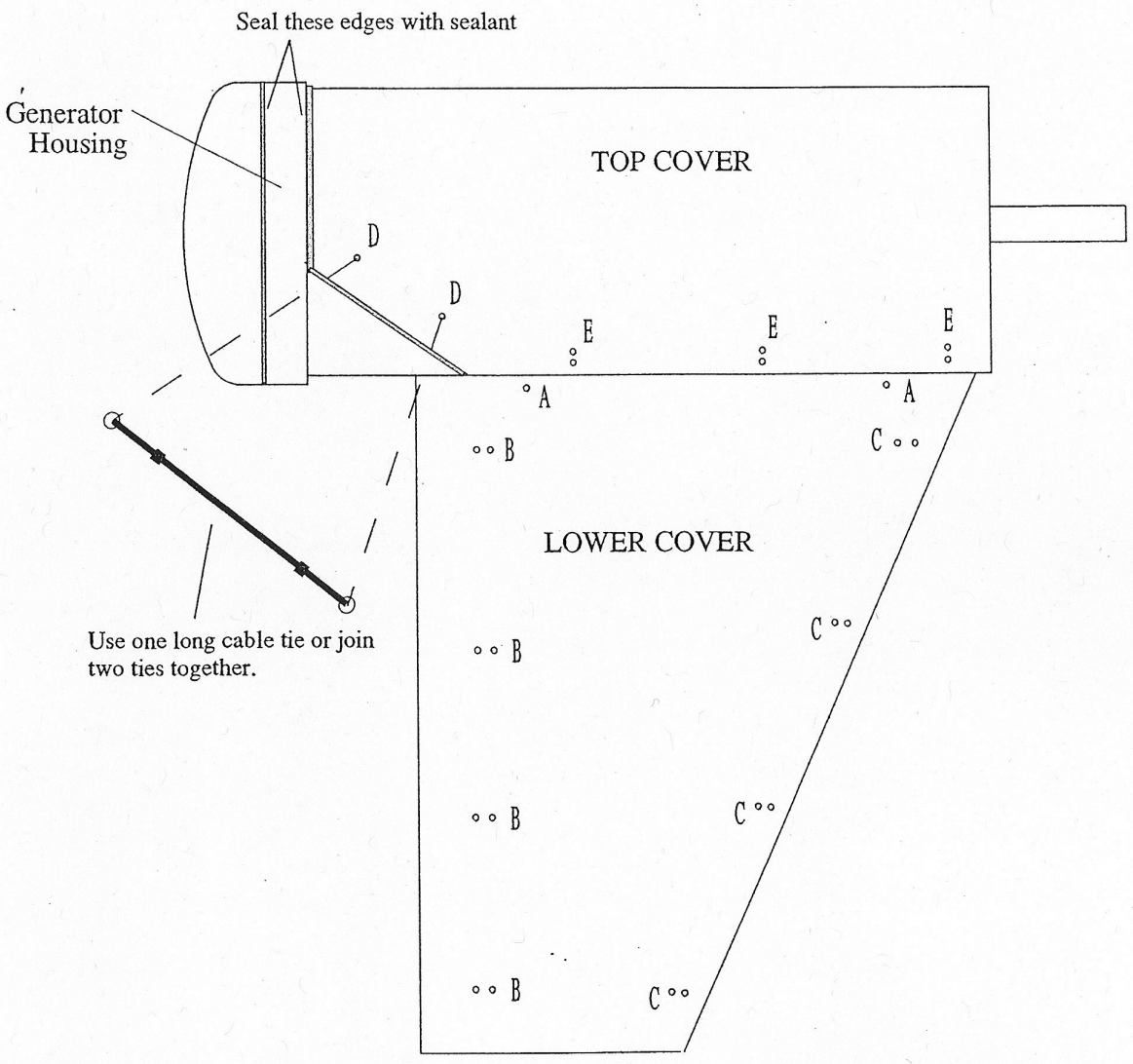

WT6000 Cover Fitting Diagram

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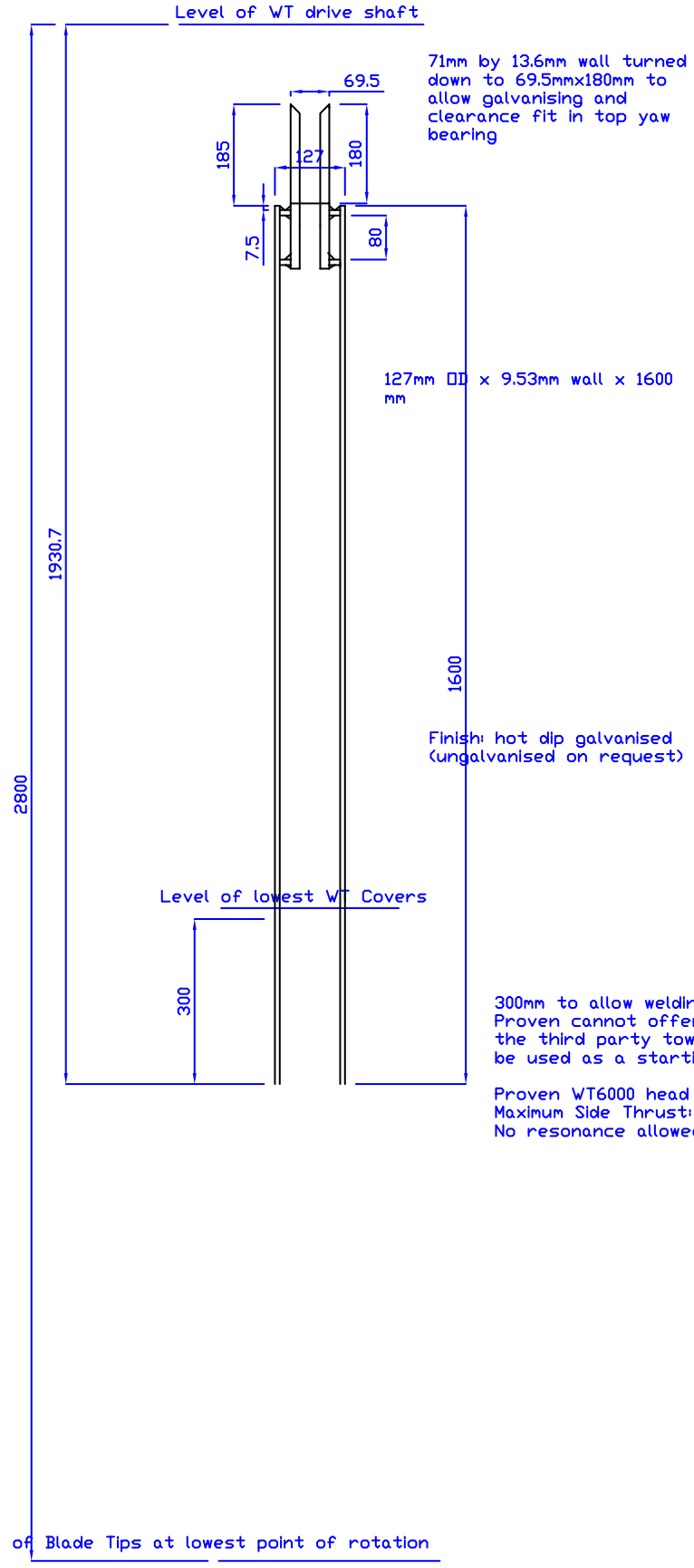

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PREPARED BY BR

CHECKED BY

Proven TM160 Tower Mount for the WT6000 turbine for use with masts by others

FSCM NO.	DWG NO.	REV
	6000 MI 006 rev4.dwg	4

SCALE	Date 25/10/03	SHEET

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WT6000 MANUAL

OPERATION
&
MAINTENANCE

PROVEN WT6000 WIND TURBINE WITH TM900 SELF-SUPPORTING TOWER

RAISE/LOWER USING TIRFOR WINCH

RAISING

- Check hinge pin is in position and split ends at both ends.
- Assemble two piece gin pole and attach one end to attachment points at base of mast and other end to mid pole bracket located 2.5m up from base of mast.
- Check gin pole nuts/bolts are tight.
- Hook Tirfor wire rope to mid pole bracket. Hook Tirfor to winch anchor and feed wire rope through Tirfor as per Tirfor instructions.
- Check that power cables will not be trapped under wind turbine base when lifted.
- Apply wind turbine brake.

CLEAR LIFTING AREA OF ALL NON-ESSENTIAL PERSONNEL. DO NOT ALLOW ANYONE TO BE IN THE VICINITY OF THE WIND TURBINE WHILST RAISING.

- Pull wind turbine up slowly and smoothly with the Tirfor winch, following Tirfor instructions at all times.
- When upright, keep tension on rope, until all base bolts are in and tight. When base bolts are tight, release rope. Dismantle gin pole and winch and remove from lifting area.
- Release wind turbine brake and remove brake cord from brake lever.
- If breezy, check rotation of wind turbine.

LOWERING

- Apply wind turbine brake and place trestle to support lowered wind turbine.
- Fit gin pole and winch as for raising.
- Check all shackles, bolts and fittings are secure before lowering.
- Take up slack in Tirfor winch/rope and put handle in lowering position.
- Make sure hinge pin and split pins are in position.

CLEAR LIFTING AREA OF ALL NON-ESSENTIAL PERSONNEL. DO NOT ALLOW ANYONE TO BE IN THE VICINITY OF THE WIND TURBINE WHILST LOWERING.

- Remove tower bolts.
- Pay out a little rope and lift end of gin pole to tilt wind turbine over balance point until strain comes on Tirfor.
- Lower turbine by operating Tirfor slowly and smoothly.

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PROVEN WT6000 WIND TURBINE WITH TM900 SELF-SUPPORTING TOWER

OPERATION

BRAKE

The wind turbine has a brake for safety during raising and lowering, maintenance and in case of emergency.

To apply the brake – open tower access door; turn brake lever fully up; pull brake rope down and place loop over pin lever; pull lever down and "under centre" until it meets back plate and stops the rotor.

RUNNING

The wind turbine can be left to run in any wind. It is not necessary to keep a load on the wind turbine since the self regulating blades will control speed without load.
N.B. Extended unnecessary periods of running off-load should be avoided where possible.

When working on the output cables or systems ALWAYS stop the wind turbine AND switch off MCB in controller before proceeding.

NOTE

When running unloaded the generator will give up to double the full load output voltage – so always treat the output with caution, even on low voltage models.

MAINTENANCE

After 3 months;
1. Lower wind turbine and check all fittings for tightness.
2. Grease main rotor bearings and yaw bearing housing.
3. Check base plate fittings are tight.

Yearly – as above plus the following;
1. Check brake pad thickness is more than 2mm.
2. Check brake operation before raising wind turbine.
3. Check for general wear and tear and replace any worn parts.
4. Pay particular attention to the blades, especially the blade root. A damaged or cracked blade should be repaired or replaced immediately.
5. If the wind turbine is operating in particularly arduous conditions (e.g. severe turbulence etc.) then check fittings and wear more often.

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Proven Wind Turbine Maintenance Schedule

Frequency of recommended checks

TASK	TYPE OF SERVICE CHECK			
	INITIAL 3 MONTH	QUARTERLY	ANNUAL	10 YEAR
check for smooth running	✓	✓	✓	✓
check tower bolts	✓	✓	✓	✓
chech ph-ph voltages*	✓	✓	✓	✓
check base plate j-bolt nuts	✓	✓	✓	✓
check brake operation**	✓	-	✓	✓
check VAB operation***	✓	-	✓	✓
check blades	✓	-	✓	✓
check zebedee springs	✓	-	✓	✓
polish slip rings	-	-	✓	✓
check slip ring brushes	-	-	✓	✓
grease shaft bearings	-	-	✓	✓
grease upper yaw bearing	-	-	✓	✓
check lower yaw bearing	-	-	✓	✓
check covers	-	-	✓	✓
check welds	-	-	✓	✓
blade change	-	-	-	✓
zebedee spring change	-	-	-	✓

* wind allowing
** disc brake assembly is special option on WT600 model
*** on HS versions only

PROVEN WIND TURBINES

PROVEN WIND TURBINES

WIND TURBINE SPARES PRICE LIST JANUARY 05

Product Code	*Description* *NOTE: All prices exclude VAT and carriage.*		*List Price*
	WT600 Zebedee Springs		
ZB601	1 set WT600 Zebedee Springs (3 off)	£	110
ZB602	1 WT600 Zebedee Spring	£	40
	WT600 Blades		
BL601	1 set WT600 blades (3 off) including blade clamps, hub blade clamp and all fixings for each blade	£	260
BL602	1 WT600 blade including blade clamps, hub blade clamp and all fixings for each blade	£	97
BL603	1 set WT600 blades (3 off) (to be used with previous fixings)	£	150
BL604	1 WT600 blade (to be used with previous fixings)	£	56
	Generator WT600		
GW601	Windings of generator for WT600	£	415
GP601	1 set generator magnet plates (2 off) for WT600	£	430
GP602	1 generator magnet plate for WT600	£	235
	WT2500 Zebedee Springs		
ZBD2501	1 set WT2500 Zebedee Springs (6 off) (includes fixings) 84 coils	£	175
ZBD2502	1 WT2500 Zebedee Spring (includes fixings) 84 coils	£	45
ZBT2501	1 set WT2500 Zebedee Springs (9 off) (includes fixings) 88 coils	£	260
ZBT2502	1 WT2500 Zebedee Spring (includes fixings) 88 coils	£	50
	WT2500 Blade		
PU2501	1 set of WT2500 blades (3 off) with long life PU hinge including 2 blade clamps, hub blade clamp and fixings	£	415
PU2502	1 set of WT2500 blades (3 off) with long life PU hinge.	£	290
PU2503	1 set of 3 long life PU hinges for use with previous WT2500 blades. Includes instructions	£	195
	Generator WT2500		
GW2501	Windings of generator for WT2500	£	759
GP2501	1 set generator magnet plates (2 off) for WT2500	£	785
GP2502	1 generator magnet plate for WT2500	£	432
	WT2500 Yaw Bearings		
LYR2501	1 set (of 4) rubber bearings for the lower yaw bearing of the WT2500. Supplied without fixing bolts unless requested. NOTE. Grease should be applied on the internal surface of the yaw rubber where it contacts the bolt **but not** on the outer surface where it contacts the mast		£5
	WT6000 Zebedee Springs		
ZBL6001	1 set WT6000 Zebedee Springs (15 off) with tapered spring ends	£	515
ZBL6002	1 WT6000 Zebedee Spring with tapered spring ends	£	55
BL6001	1 set WT6000 blades (3 off) including blade clamps, hub blade clamp, back spring and all fixings for each blade.	£	1,655
	Generator WT6000		
GW6001	Windings of generator for WT6000	£	1,620
GP6001	1 set generator magnet plates (2 off) for WT6000	£	1,670
GP6002	1 generator magnet plate for WT6000	£	920

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Proven Wind Energy Products UK Warranty

Proven Wind Energy Products are carefully designed, manufactured, tested and inspected. In consequence we undertake to replace any part found to be defective in material or workmanship free of charge for a period of two years from delivery to the end user. This warranty covers only those products manufactured by Proven Energy Ltd.

General Conditions*:* This warranty does not cover damage to Proven Wind Energy Products resulting from unauthorised alteration or modification, accident, misuse, improper installation, operation or maintenance or failure to conduct periodic inspections and maintenance. Proven Energy Ltd. reserve the right to repair or replace the defective component(s) at their sole option. Proven Energy Products Ltd does not accept any additional liability for defects arising from reasonable wear and tear.

Use of Proven Wind Turbines with Masts or Towers manufactured by others: Poor mast design may cause vibration both in the mast and the nacelle of the wind turbine. Faults arising from poor mast design shall be classed as improper installation (see General Conditions). Masts should be designed to avoid resonance within the operating frequency range of the wind turbine. The onus shall lie with the owner to show their mast has not caused the fault.

Shipping and Transport Costs: Warranty repairs will be made at the premises of Proven Authorised Representatives or our factory. The end user must return the defective component(s) properly packed, and with all freight and insurance charges prepaid. All freight, shipping and insurance costs including duties, fees, taxes and import charges incurred in returning Proven Wind Energy Products are to be met by the end user.

Disclaimer: Proven Energy Ltd. shall not be liable for any incidental or consequential damages resulting from the proper or improper use, for any purpose whatsoever, of Proven Wind Energy Products.

Statutory rights: This warranty in no way diminishes the end user's statutory or legal rights.

Actions in the event of a defect occurring during warranty

In the unlikely event of a defect arising, *first ensure the safety of people and equipment by electrical disconnection and application of the wind turbine brake, as appropriate.* Please immediately notify the Proven Service Department, or the Proven Authorised Representative who will advise on the correct procedure.

Minor faults
If the fault is a minor one and can be rectified by replacing components which could be simply fitted by the end user or a local fitter, then a replacement part will be sent as soon as possible by post or carrier.

Serious faults
In the unlikely event of a serious fault, Proven Energy Ltd. or a Proven Authorised Representative will arrange for an engineer to attend the site, if required, and rectify the fault. The work will be charged at standard rates if the conditions of the Proven Warranty as set out above do not apply.

Warranty on other products supplied by Proven Energy Products Ltd
Proven Energy Ltd. will arrange for the goods to be promptly returned to the manufacturer for repair or replacement as applicable.

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Proven Wind Energy Products Limited Export Warranty

Proven Wind Energy Products are carefully designed, manufactured, tested and inspected. In consequence we undertake to replace any part found to be defective in material or workmanship free of charge for a period of two years from delivery to the end user. This warranty covers only those products manufactured by Proven Energy Ltd.

General Conditions*:* This warranty does not cover damage to Proven Wind Energy Products resulting from unauthorised alteration or modification, accident, misuse, improper installation, operation or maintenance or failure to conduct periodic inspections and maintenance. Proven Energy Ltd. reserve the right to repair or replace the defective component(s) at their sole option. Proven Energy Products Ltd does not accept any additional liability for defects arising from reasonable wear and tear.

Use of Proven Wind Turbines with Masts or Towers manufactured by others: Poor mast design may cause vibration both in the mast and the nacelle of the wind turbine. Faults arising from poor mast design shall be classed as improper installation (see General Conditions). Masts should be designed to avoid resonance within the operating frequency range of the wind turbine. The onus shall lie with the owner to show their mast has not caused the fault.

Shipping and Transport Costs: Warranty repairs will be made at the premises of Proven Authorised Representatives or our factory. The end user must return the defective component(s) properly packed, and with all freight and insurance charges prepaid. All freight, shipping and insurance costs including duties, fees, taxes and import charges incurred in returning Proven Wind Energy Products are to be met by the end user.

Disclaimer: Proven Energy Ltd. shall not be liable for any incidental or consequential damages resulting from the proper or improper use, for any purpose whatsoever, of Proven Wind Energy Products.

Statutory rights: This warranty in no way diminishes the end user's statutory or legal rights.

Actions in the event of a defect occurring during warranty

In the unlikely event of a defect arising, *first ensure the safety of people and equipment by electrical disconnection and application of the wind turbine brake, as appropriate.* Please immediately notify the Proven Service Department, or the Proven Authorised Representative who will advise on the correct procedure.

Minor faults

If the fault is a minor one and can be rectified by replacing components which could be simply fitted by the end user or a local fitter, then a replacement part will be sent as soon as possible by post or carrier. For some locations, it will be the customer's responsibility to arrange transport of these parts from our Stewarton factory to site.

Serious faults

In the unlikely event of a serious fault, the turbine should be packed in sturdy export crate and shipped to our Stewarton factory. All shipping charges shall be the responsibility of the customer. An appraisal will then be carried out to determine whether works required are covered under warranty and the customer advised. Any works required which are not covered under Proven Warranty will be charged at standard rates.

Warranty on other products supplied by (but not manufactured by) Proven Energy Ltd will be followed in accordance with the manufacturers recommendation.

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Foundation Pack for WT6000/TM900

LIST OF PARTS TO BE SENT WITH BASE PLATE

1 - GALVANISED BASE PLATE

6 - FOUNDATION RODS, WITH 12 NUTS AND 6 WASHERS

9 - M24 HIGH TENSILE BOLTS AND 9 WASHERS

1 - ANCHOR PIN

1 set Foundation Pack

- 1 Pack Description (this page)
- 1 Standard foundation diagram
- 1 Anchor foundation diagram
- 1 Alignment/Access diagram
- 1 Foundation description (incl. concrete mixing details)

N.B. REINFORCING STEEL MESH SHEET IS ALSO REQUIRED FOR THE FOUNDATION WORK BUT IS NOT INCLUDED IN THE KIT SUPPLIED BY PROVEN

PROVEN TM900/WT6000
MAST FOUNDATION PREPARATIONS

The main foundation consists of a large block of high-strength concrete. Six lengths of M30 screwed rod are set into the concrete and are attached to the Foundation Base Plate. The Base Plate includes the hinge-pin attachment, which is used to raise and lower the turbine (see diagrams). Preferably, the concrete should be prepared and the foundation prepared with one load of concrete. Where this is not possible, the top layer should be added before the bottom one has had time to set.

Important

Before setting the Base Plate and foundations into the concrete foundation consider which way your WT will be lowered/raised and position the hinge-pin accordingly

Don't 'Shutter & Backfill'

When preparing house foundations a mould is prepared into which the concrete is poured. Earth/rocks are then filled around the foundation after the concrete has set.

For WT foundations it is better to have an irregular shaped foundation than to have a perfect cube and then surround it with loose earth - just dig a hole and then fill it! This will produce a foundation with good stability.

Preparing the Base Foundation

The base foundation consists of 6m^3 of strong-mix concrete. Normally this is prepared as a rough 2.5 x 2.5 x 1m cube, but where ground conditions dictate, a shallower wider foundation of the same volume may be used. As and when required soil analysis can be conducted to identify exactly what type and dimension of foundations are to be used in certain ground-types. Proven Energy Ltd. can provide basic information to give an idea as to what is required, however professional advice should be sought when an exact soil analysis is required.

Screw the 9 large (M24) bolts supplied with the base-plate it to their full extent (not transported this way to protect the end thread). The ends of the bolts are factory greased. These bolts will later be withdrawn and used to bolt the WT tower to the base plate. Inserting them at this stage makes sure there is the necessary clearance in the concrete.

Attach the M30 screwed rod with nuts provided to the base plate before pouring concrete. Insert reinforcing mesh into hole and jack up base plate assembly to approximately the right height. **It is very important that one of the M30 screwed rods at the hinge side of the base plate is set low into the concrete so that there will be access for the hinge pin to slide in later. If this is not done when the concrete is laid then the screwed rod should be hacksawed off just above the nut afterwards**. Insert conduit or soil pipe used for wind turbine power cable from edge of hole up through centre of base plate. Add concrete (Readimix supplier is usually easiest for this type of volume) and use vibrating concrete poker as necessary to remove air bubbles.

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Use a spirit level and the nuts on the screwed rod to get the base plate flat. **It is vital that underneath the base plate is completely filled with concrete. The base plate must be fully supported by concrete when installation of turbine and tower takes place.** Leave the final tightening of the M30 nuts until the hardening period is over.

Clean the base plate of any excess concrete.

Winch Anchor Foundation

Refer to foundation diagrams for positioning. The anchor consists of a 1m cube or equivalent. It should be located on the opposite side of the base plate to the hinge pin attachment. **N.B. It is important that the anchor is placed exactly in line with the centre of the base plate and perpendicular to the line of the hinge brackets.** The pull on the anchor point for the WT6000/TM900 during raising and lowering is approximately 2500kg.

Concrete Specification

If using a Readimix supplier, ask for 35 Newton concrete. If mixing the concrete yourself, you should use the following proportions by volume

1:2:4
cement:sand:gravel

Approximate volumes and weights for a $1m^3$ foundation are

Cement:	310kg or 6.2 bags	(1 bag = 50kg)
Sand:	$0.43m^3$	(967 kg or approx 1.0 tonnes)
Gravel:	$0.86m^3$	(2150kg or approx 2.2 tonnes)

Hardening Time

You should allow plenty of time for the foundation to set and harden fully before erecting the turbine. We recommend a hardening period of approximately 2 weeks. For this reason, foundations are normally prepared in advance of the main installation. Note that the hardening time may be lengthened by poor weather conditions and shortened by the use of a quick-setting concrete additive.

Poor Foundation Preparations

Proven reserve the right to cancel an installation of a turbine if it is thought the foundations are of a poor quality. Subsequent costs in repairing the foundation and any further site visits will be met by the customer.

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Wind Turbine Delivery and Installation Details

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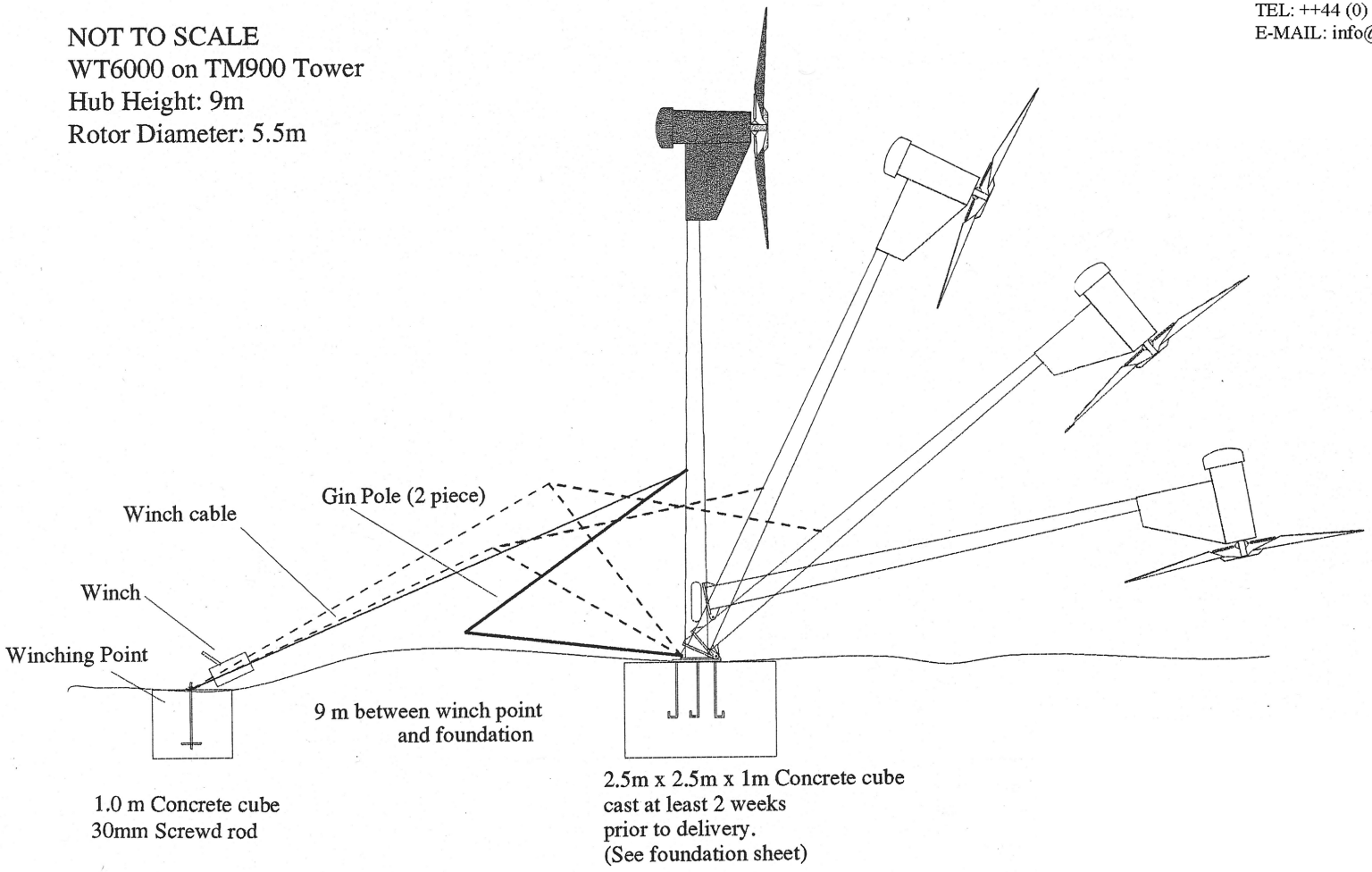
NOT TO SCALE
WT6000 on TM900 Tower
Hub Height: 9m
Rotor Diameter: 5.5m



6000 FO 003 Sept2003

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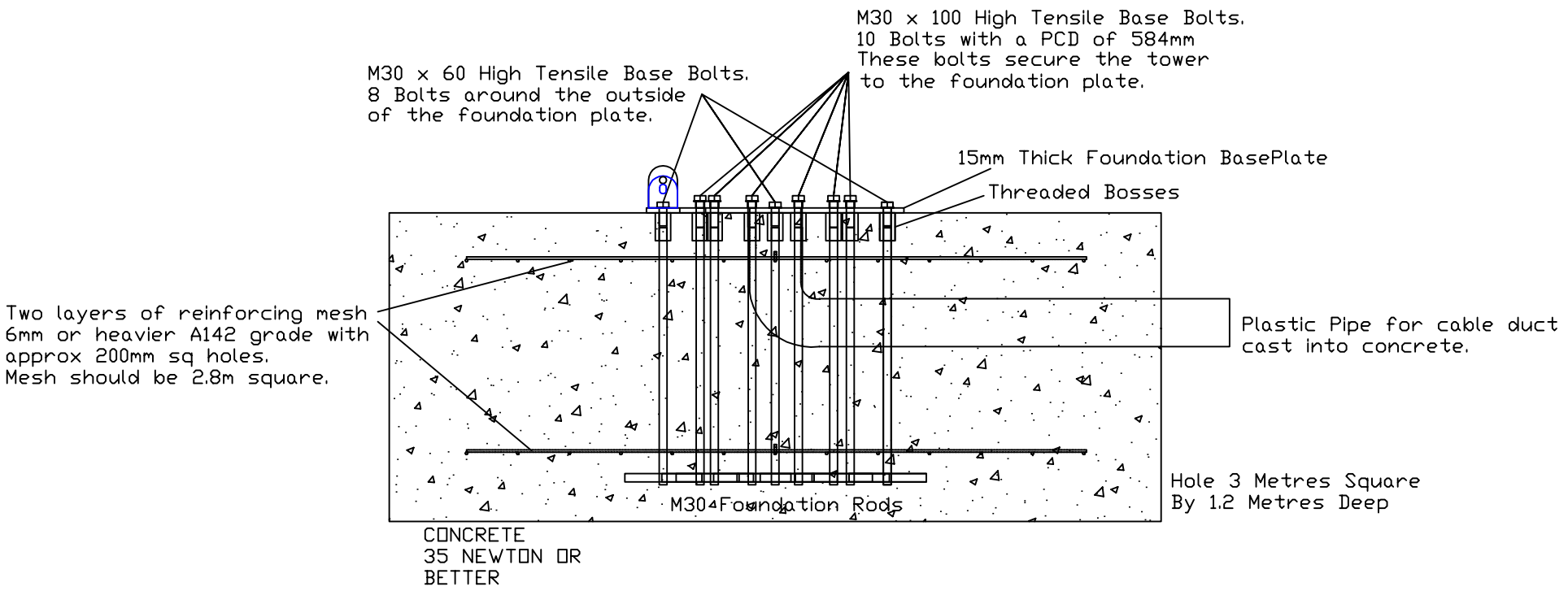

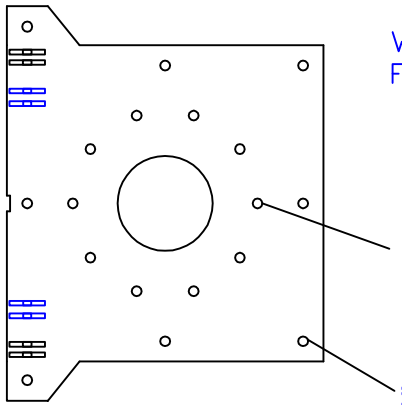

WT6000 15m Proven Mast Foundation Baseplate

10 OFF DRILLED HOLES CLEARANCE
CLEARANCE FOR M30 BASE BOLTS
(32mm DIAMETER) PCD 584mm

8 OFF DRILLED HOLES
FOR M30 FOUNDATION
RODS. (32mm DIAMETER)

ZONE	REV	DESCRIPTION REVISIONS	DATE	APPROVED
	1	MODIFICATION TO SHOW NEW BOSS ARRANGEMENT	15/01/03	–
	2	MODIFICATION TO SHOW NEW SHAPE AND LUGS	15/01/04	–
	–	–	–	–

PREPARED BY PH		CHECKED BY RC	
FSCM NO.	DWG NO. 6000 FO 012.dwg		REV 2
SCALE	DATE 15/01/04	SHEET N/A	

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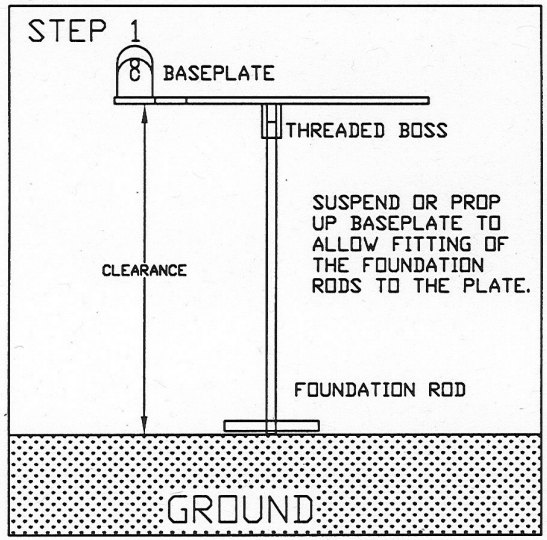
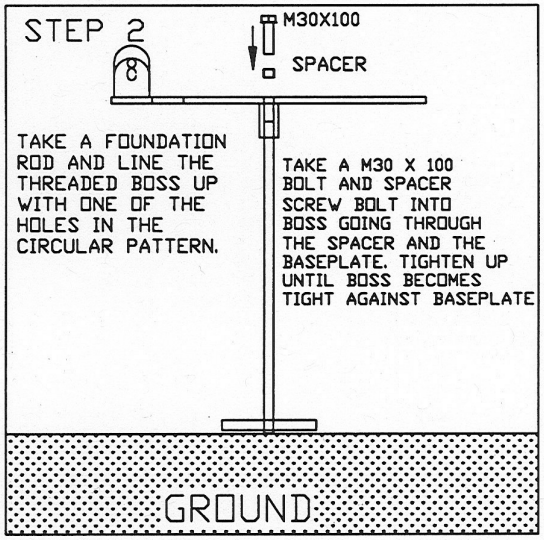
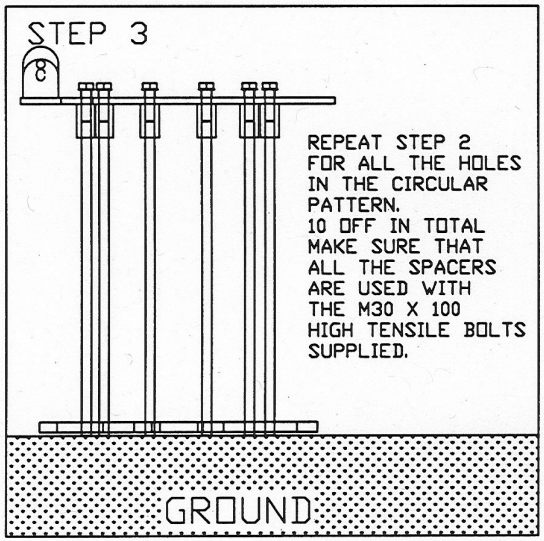
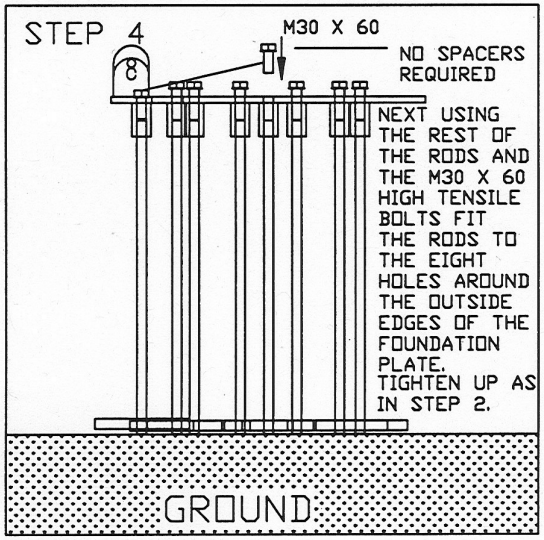
Drawing Title
6kW 15m TOWER FOUNDATION DIAGRAM









ZONE	REV	DESCRIPTION REVISIONS	DATE	APPROVED
	-	-	-	-
	-	-	-	-
	-	-	-	-

PREPARED BY PH | CHECKED BY RC

FSCM NO. | DWG NO. 6000 FO 013.dwg | REV 2

SCALE | DATE 15/01/03 | SHEET N/A

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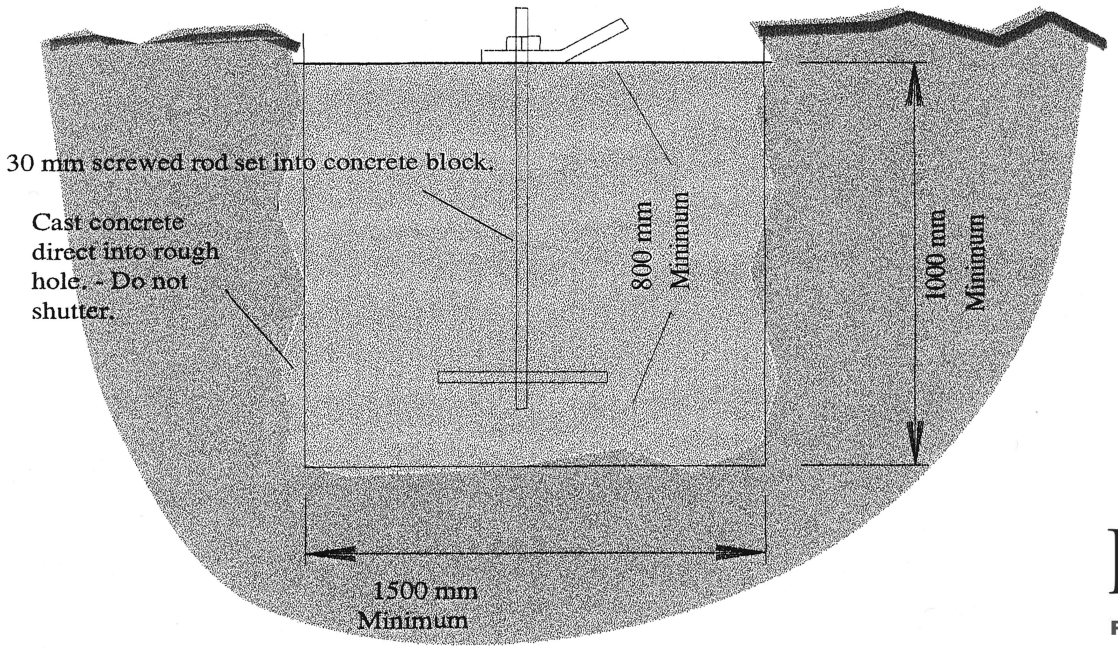
Drawing Title

6kW 15m TOWER FOUNDATION ASSEMBLY STEPS

Anchor Block Layout For WT6000 with TM1500 Mast

Secure winch atachment plate once concrete has cured.



6000 FO 014 08/10/03

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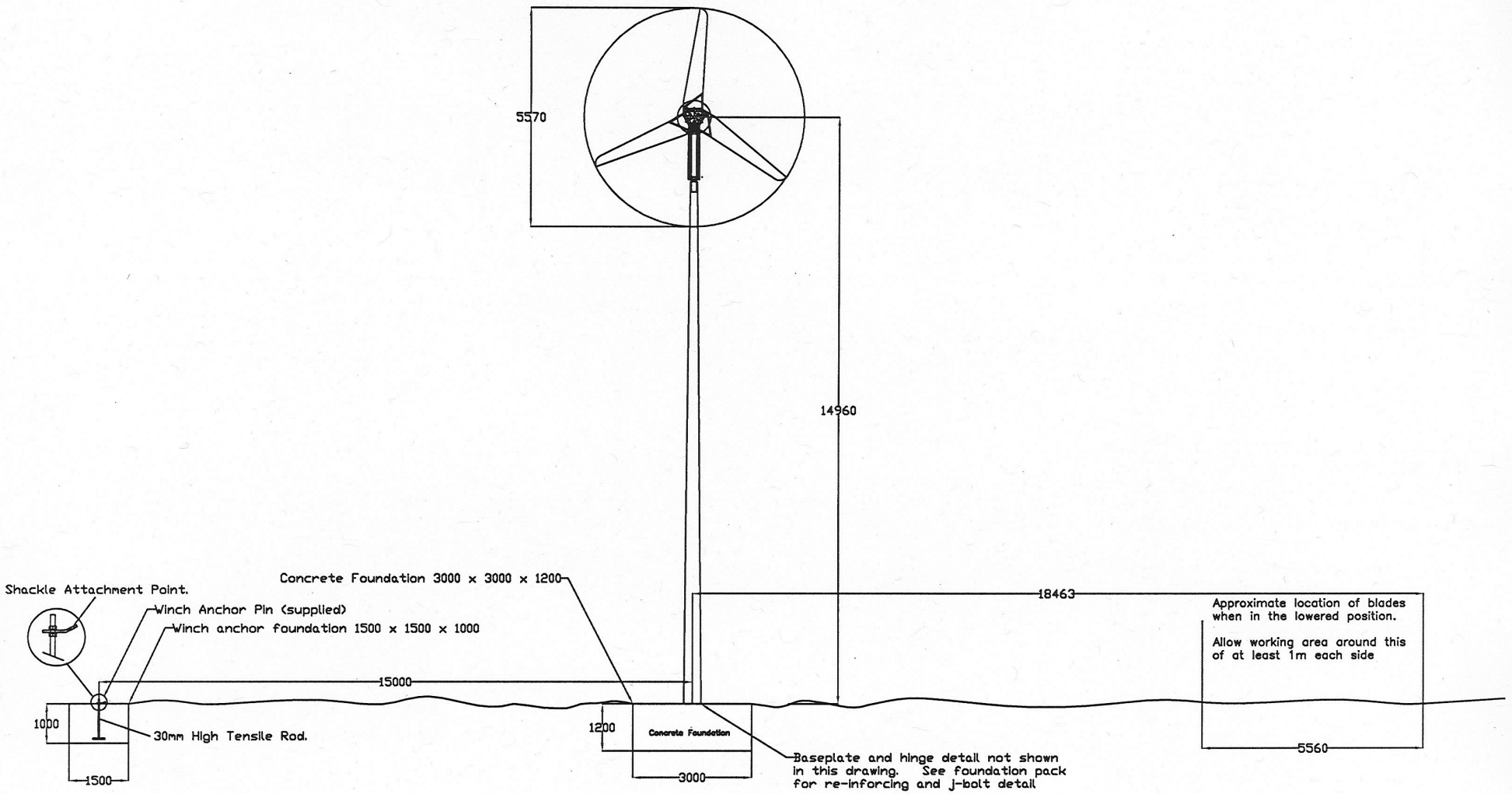

ZONE	REV	DESCRIPTION REVISIONS	DATE	APPROVED
	2	Converted to A4/dims changed	5/3/02	BR
	–	–	–	–
	–	–	–	–

PREPARED BY BR | CHECKED BY

FSCM NO. | DWG NO. 6000 FO 017 rev 3.dwg | REV 2

DATE REV OCT '03 | SHEET 1

PROVEN
PROVEN WIND TURBINES

WT6000 Wind Turbine with TM15000 Tilt up Tower

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PROVEN CUSTOMER FOUNDATION CONFIRMATION

Please read the following statement. On completion of your foundation work please sign the statement and return to Proven Energy Ltd, at the above address.

I CERTIFY THAT THE FOUNDATIONS FOR THE WIND TURBINE AND TOWER (TO BE INSTALLED AT THE ADDRESS BELOW) ARE COMPLETED AS PER PROVEN INSTRUCTIONS*. I UNDERSTAND THAT I MAY BE CHARGED FOR ADDITIONAL INSTALLATION WORK IF REQUIRED DUE TO ANY DEVIATION FROM THE PROVEN SPECIFICATION**.

SIGNED: _____

DATE: _____

NAME (CAPITALS): _____

SITE ADDRESS: _____

_____

* Foundation specification for each wind turbine model is available from Proven. Please check that you have the current Proven Foundation Pack for your particular wind turbine & tower combination.

**e.g. lack of anchor block, wrong hinge orientation etc.

N.B. This form need only be completed and returned if your system is being installed by Proven Engineers. If your system is being installed by others e.g. Proven Authorised Distributor, consult them directly regarding foundation requirements.