Installing a MiniWind Turbine

These instructions have been written to show you what level of work will be required to install a MiniWind turbine. These are not "complete" instructions, but simply a guide to what is required. Full instructions will be supplied with your kit, and these will go into more detail than is covered here. An application to connect you turbine to your "mains" power supply should be submitted to your District Network Operator prior to fitting and commissioning your turbine. An example of this G83 form can be downloaded separately.

Selecting the site and fitting the tower:-

If possible, choose an open, exposed uninterrupted view of the prevailing wind, with no trees, buildings or hills in front of the turbine site. If you can't do this, then pick the spot that meets with the majority of these points. Keep the turbine tower away from buildings especially, such that if it collapses it won't land on someone's house or car. Buildings and trees will generally spoil the operation of your turbine, so take great care when choosing the optimum site on your plot. The image below is adjacent to a house which is in the middle of the countryside, and has clear open views in the prevailing wind direction.

Decide which direction the tower will be lowered towards, and "peg out" the foundation square. This should measure 1 to 1.2m square. If your soil is dry and sandy, extend this square to 1.5m. Dig out the hole, into which the concrete and tower support bolts will be housed. The hole should be 1.2m deep, and its sides should be vertical.

If your tower base site is on a slope (as this example is), then you can "shutter off" the exposed top of the hole to make the complete job look much neater. Do not shutter or line the hole itself, since this will drastically weaken the tower support, and could cause the turbine to collapse. Here's a picture of the hole after being dug out, and with the shuttering added to "level" the top of the concrete.

The 4 tower support bolts and foundation kit, supplied with your tower, should be centred and levelled using 2 pieces of strong wood. A short length of plastic pipe should also be secured to the centre of the "X" of the foundation support, through which your turbine power cables will later be run. A shot "trench" should be dug to a depth of at least 18 inches, with the plastic pipe running into it. The trench should be dug to a depth of 1m if the main power cable is to run through agricultural land, such that future farming activities, such as ploughing, would not damage the cable.

If you have reinforcing mesh, or any other type of mesh lying around, drop this into the hole prior to filling with concrete. This is not essential, since the tower foundation does not require reinforcing, but is good practice. The concrete should be of a 40 Newton mix, and can have

reinforcing fibres added to it during the final mixing on-site, if delivered using a bulk cement mixer. Ask about this when ordering your cement, as it may only cost a small amount to have this added, and will give you peace of mind that the foundation will never crack or break up over the years.

Fill the entire hole with concrete, and level off the top surface using a float or trowel. You should note that the foundation bolts will stick out of the concrete by some significant way. This is normal, and is essential for the fitting of the main tower pedestal. If you have not done this, then no is the time to fix it.

The finished block of concrete should now look like this.

Allow the concrete to set for at least 10 days prior to fitting the tower. Once cured, remove the shuttering (if you used any that is) and clean up the 4 main tower bolts, to ensure that there's no cement stuck to them. Fit the tower base pedestal, ensuring that the hydraulic ram mounts are facing the direction that the tower will be lowered towards. To fit this pedestal, first put one nut on to each foundation rod, and screw them down until they are almost touching the concrete block. Fit a washer on top of each of these 4 nuts. Now lower the pedestal over the 4 foundation bolts until it is resting on the 4 washers. Fit 4 washers over the bolts and finally fit the 4 remaining nuts to the top of each bolt. Using a spirit level, ensure that the top face of the pedestal is as horizontal as possible. Level the pedestal by raising the nuts under the pedestal base. Now tighten the top nuts down against the pedestal, and check for level once again. Once you're satisfied that the pedestal is level, fully tighten the top nuts using a large spanner or socket set. You can cover the exposed threads and top nuts using plastic sheathes, or suitable weatherproof tape. Your tower base should now look like this.

Next, fit the large bottom section of the tower, creating the “hinge” between the tower and the pedestal.

Fit the hydraulic ram to the tower base and bottom section of the tower, and adjust the tower until it is horizontal. Fit the mid section of the tower, firstly making a chalk mark 350mm down the outer face of the bottom tower section, to indicate how far down the mid section should be “pushed” in order to properly secure both tower sections together. If required, us a large baton of wood to “hammer” the two tower sections together. Do the same for the top tower section, but overlap by only 300mm this time. Your tower should now look like this.

If you look inside the main pedestal at this stage, it should look something like this.

Put a “draw rope” or short piece of wire though the power cable feed pipe to assist you when it comes time to fir the main power cable.

Finally, fit the top section to the tower, using the bolts supplied, completing the tower assembly.

Raise and lower the tower several times using the hydraulic power unit, just to get used to how the assembly behaves. Drop a draw rope down the tower to aid the fitting of the main power cables, when you're ready to fit the turbine head itself.

Electrical Connections & turbine assembly

During the time it takes for the concrete to cure properly at your tower base, you can use this time to assemble the MiniWind turbine, install the inverter and controller, and get ready to commission your system.

The MiniWind turbine will be shipped to you in 2 boxes, with the inverter and controller being sent separately. Follow the simple instructions sent with the turbine to fit the blades to the hub. Keep the assembled rotor in a safe place taking care not to damage the blade surfaces and edges.

In the turbine kit you'll find a short nylon tube, around 120mm long, which should be fitted into the top section of the turbine tower. This will form a "liner" to protect the cabling, and to act as a "bearing surface" for the yaw part of the turbine to rotate around. You might have to hammer this nylon liner into the top of the tower using a piece of wood to protect it.

Run a length of 3-core heavy duty cable, and 2-core light duty cable down the inside of the tower using the draw rope you fitted inside the tower. The heavy cable should have a cross section of 10sq mm or more, and can be made up of 3 individual wires if you like. These will carry the 3-phase wild AC coming from the generator. The lighter 2-core cable can be as simple as 2-core 6A "mains" cable. This will be used to carry the signal from the in-built thermal sensor to the control unit.

These cables need only be long enough to reach to the bottom of the tower, where they will be connected to the main armoured power cable running through the trench to the house/building. You will also be required to run an "earth" wire from the turbine to the tower base, details of which are supplied with the turbine kit. This earth wire will be connected to the tower itself, inside the base part. An "earth rod" needs to be fitted at the tower base, next to the concrete block, with the tower being connected to this to form a proper earth for the tower and turbine. DO NOT connect any other wires to this earth.

Inside the tower "hatch" near the bottom of the tower, you will need to fit a waterproof plastic junction box (not supplied). This is where the main power and thermal cables will be connected to the main armoured cable running from the trench. The armoured cable size required to connect the turbine to the controller and inverter should be of the correct size, such that the overall power loss though it is under 4%. In practice this armoured cable will be standard 3-phase (4-core) armoured cable with a conductor cross section of 6sqmm, for runs up to around 50m, and 10sqmm for runs from 50 to 100m. Try to avoid placing your turbine much further away than 100m from the main inverter, since the cable losses will become significant.

Connect the 3 power wires and the 2 thermal sensor wires to the terminal block inside the turbine housing. Secure all bolts and fit the turbine cover as per the supplied instructions. The turbine head can now be slipped on to the top of the tower, taking care not to "trap" any of the wires in the process. The main rotor and nose cone can now be attached, finishing the installation of the turbine head unit.

The inverter should be positioned indoors, inside an out-building or similar location, and should be close to the main consumer unit of the house/building if possible. The inverter should be fixed to a vertical wall, in the way described in the inverter instructions supplied. The "mains" power supply to this must be run form a completely separate MCB (or fuse) within the main consumer unit for the property, and should have a rating of 16A or 20A. Do not run the inverter from an RCD (earth fault) protected circuit, since this will cause several operating faults with the inverter. The cable conductor size should be large enough to keep the overall system power transmission losses to under 4%. This usually means connecting the inverter using 6sqmm twin & earth cable (10sqmm if it's a long cable run).

If the inverter is positioned more than a few meters from the main consumer unit, a lockable isolation switch, like the one shown below, needs to be fitted close to both ends of the inverter supply cable. This allows the user to isolate the inverter from either end of the mains power feed. If the inverter is in an out-building, for example, it would not be acceptable to have to run into the house/building in order to switch off the inverter in an emergency. This is a requirement for installing a grid-tied inverter in the UK.

The armoured cable running from the turbine tower should be connected into the waterproof junction box inside the tower, mentioned above, with the outer armour being kept NOT EARTHED at the tower end. The outer shielding is in fact required as a connection to the thermal sensor coming from the turbine itself. One of the cores in the 2-core cable, which is connected to the thermistor in the turbine head, is connected to one of the spare cores of the 4-core armoured cable, with the other being connected to the armour screen.

At the inverter end of the armoured cable, terminate it inside a 63A 4-pole lockable isolator switch, like the one shown above. These switches can all be bought from a local electrical wholesaler, and are used in 415V AC 3-phase power applications typically, and should cost around £15 to £25 each. Use a proper "gland" to connect and secure the armoured cable to this 63A switch. Inside the switch, wire the 3 main power leads to the terminals marked "L1, L2 & L3". Using 10sqmm wire, short the opposite sides of these three switch terminals, such that when the switch is activated (switched ON) the 3 power cables from the turbine are "shorted" together through this switch. This allows the user to stop the turbine in an emergency, or for maintenance. The turbine MUST be switched off using this switch before the tower is raised or lowered. This switch should be labelled "TURBINE BRAKE", since when it is "ON" the turbine is actually "OFF", since its brakes are applied by switching this switch "ON". Without this label, the ON and OFF positions on the switch will become confusing to the user.

From the L1, L2 & L3 connections inside this switch, run 3 wires to the main controller input (shown in the controller's operating instructions). These wires should be run through some flexible or rigid "trunking". Run 2 separate wires, one from the spare core (the 4th wire inside the armoured cable) and the other from the armour itself to the controller. One of these 2 wires should be in the standard "earth" colours (green yellow striped) while the other can be any colour, since it is carrying signal voltages only. These 2 wires will connect inside the controller to the points marked on the instructions supplied with the controller.

The DC output connections from the controller to the main inverter should now be connected, again inside some flexible trunking, in order to fully protect the user from any shock hazard. The controller is fitted with a standard 230V AC plug and fuse, and should be connected to a wall socket. Do not switch on the controller at this stage, simply ensure that there is a wall socket nearby which can be used to power the controller. The Earth connection from this wall socket to the controller, inside the power cable

to the controller, provides an “earth” connection to the outer screen of the armoured cable. This is the only earth point that should be connected to the armoured cable.

A full schematic diagram of how everything needs to be connected is supplied with each kit, and this should be followed to the letter by the installer. An electrician should be used to carry out all the wiring required, but a suitably “competent” person can usually do this properly.

The final connection to the main consumer unit MUST be carried out by a qualified electrician, or a suitably qualified individual. Once this connection has been made, the earth continuity and insulation tests must be carried out using the necessary equipment (supplied by your electrician) and all relevant paperwork be completed with these test results. The 2 documents which must be completed upon commissioning of your electrical system are supplied with your kit, and can be downloaded from this website. These are the G83 form, and the IEEE form. Once completed, these should be forwarded to your District Network Operator (or DNO) who are the people who “own” the grid and metering hardware in your part of the country. Your DNO needs to receive this paperwork as soon as your installation has been carried out, and they should be informed prior to you installing your turbine, as a matter of course on the G83 form. Your DNO would then have the opportunity to object to you making connection to the national grid, and would have the opportunity to advise you of any concerns they may have.

If you, or your electrician, are in any doubt about completing the G83 and IEEE form correctly, then you MUST enlist the help of a qualified Renewable Energy Installer to “commission” your system for you. Details of the typical costs for this service are available on this website.

The rules relating to correct “labelling” of all the parts of your electrical system are provided with your kit, and these must be strictly adhered to. A schematic diagram of your installation also needs to be drawn up by your electrician, to the relevant standards, and must be “laminated” and affixed next to the main power inverter. Again, this schematic will be provided by the installer if you have chosen to enlist their help.

If you wish to get paid for the power you produce, you will have to install a “total generation meter” which is a “tamper proof” kWh meter, and is fitted by the installer or electrician on the output of the inverter. This meter will give you a reading of all the power produced by your wind turbine and will allow you to get paid for all units produced, and to sell Renewable Obligations Certificates each year (or ROC’s as they are known) The rate you will be paid for power generated will be typically around 10p per unit (nPower figures correct at the time of writing) for 60% of all units produced. Other suppliers may offer better rates than this, so it’s best to shop around for the best deal. They will also advise you how to sell your ROC’s and what rate will apply to them.

If you have any doubts about carrying out any part(s) of this installation, or you are not qualified to make the necessary connections, then you

should use the “commissioning” or “full installation” services offered by the experts in this industry. You will be supplied with the relevant people to contact if you decide to take up this offer.

Planning and other issues to consider

You should consult with your local Planning office before you decide to install a MiniWind turbine. They will tell you what their policy is in relation to this kind of installation (if they have one) and will let you know if planning consent is required. To help, you should consider who would be most likely to object to your installation, or be affected by its presence. If you live in the middle of nowhere, then you’re hardly likely to object to your own turbine, and so you stand a good chance of having your planning application approved, or not having to get approval in the first place. Several turbines have been installed in the UK without specific planning approval, but these tend to be in locations where there are no neighbouring properties, and where the local planners have been consulted and have decided to allow the installation to proceed without permission.

Turbines make noise, so be realistic about living with one in your garden. If you don’t like the sound that it makes when running, then your neighbours will probably not like it either, and so you will quickly find yourself having to keep it switched off most of the time. Turbine noise is generally not an irritant, and when the wind really picks up, the noise of the wind itself usually drowns out that of the turbine itself. There’s nothing you can do about the noise that the wind makes, so your turbine will only really produce a noticeable sound when the winds are light and variable.