



VPhase

An Energetix Group Company

VPhase VX1 Technical FAQs

Why do devices operate more efficiently at a lower voltage? Would a 2kW load continue to draw 2kW but at a higher current if the voltage is reduced?

Ohms law gives a simple view of electrical loads where:

$$V = I \times R$$

Where V = Voltage [Volts]

I = Current [Amps]

R = Resistance [Ohms]

The electrical load is represented by the resistance (R).

An extension of Ohms law provides electrical power:

$$P = V \times I$$

Where P = Power [Watts]

Combining these equations gives:

$$P = \frac{V^2}{R}$$

Substitution of real values into the above equation shows that a 10% reduction on voltage will yield a 21% reduction on the power drawn. In this simple case the current reduces by the same percentage as the reduction in voltage.

Of course real appliances do not behave like simple electrical loads. VPhase has undertaken back to back testing (245V to 220V) on numerous household appliances. A single VPhase unit can save energy across your whole house. Tests have shown typical energy savings include: 17% reduction on electricity consumption on fridges and freezers. 15% saving on lighting, even new energy saving light bulbs save 10%. 15% saving on central heating pumps. Further savings are possible on numerous other electrical appliances in the home. Actual results will vary depending upon type of appliance and the incoming voltage.

Appliances that will not save energy are electrical heating devices that operate to a thermostatically controlled level; these appliances continue to consume the same amount of energy when voltage is reduced. Therefore dedicated heating circuits are not connected to the VPhase output.

If you reduce the voltage to a light bulb, doesn't it produce less light? Isn't that how a dimmer works?

The VPhase output voltage is within statutory limits and is therefore the voltage range that the bulbs were designed to operate to.

A dimmer switch reduces the voltage supplied to a light bulb to below statutory limits and hence reduces the light output from the bulb.

With VPhase consumers are likely to recognise a more consistent output from their appliances rather than the variability that usually occurs within the statutory limits.

What about thermostatically controlled heating appliances that are plugged into ring circuits such as a dishwasher. Should these circuits be left out?

We recommend that all ring circuits in typical residential properties are supplied via VPhase. There may be some appliances connected that will not save energy however the majority of appliances in the home will consume less power.

In addition to heating loads there are often other loads in the appliances such as pumps and fans. Appliances like dishwashers and washing machines have shown energy savings when supplied by VPhase.

Can an electric cooker be supplied by VPhase?

Appliances that will not save energy are electrical heating devices that operate to a thermostatically controlled level; these appliances continue to consume the same amount of energy when voltage is reduced. Therefore dedicated heating circuits such as cookers, electric showers, storage heaters and immersion heaters are not connected to the VPhase output.

Small closed loop heating appliances that plug into ring circuits can be supplied via VPhase but no energy savings will be made.

What is the power consumed by the VPhase device?

VPhase only converts and transforms the “anti-phase” component of voltage and not the complete supply to the house. Therefore VPhase losses as a percentage of the whole house load are very small, approximately equivalent to the energy used by a low powered child’s night light. The level of power consumed by VPhase is typically only a fraction of the energy saving potential.

Is there any galvanic isolation between input and output? Are the earths linked across both terminals?

There is no galvanic isolation. The Neutral terminals are linked. There is only one earth terminal which accommodates the earth conductor for both the input and output cable.

Is there any mitigation of generated harmonics or any consequence to larger neutral currents due to electronic power supplies? Does the VPhase offer transient and surge protection?

There is no mitigation to power supply issues within the VPhase unit .

The output voltage is regulated to the set voltage however the VPhase unit offers no compensation for fast transients and does not offer surge protection.

What is the power rating of the VPhase device?

The VPhase VX1 is designed to be suitable for typical domestic residential properties.

The VPhase VX1 is thermally controlled. During periods of high continuous load the VX1 will switch into bypass mode and voltage regulation will cease. Voltage regulation will restart automatically when the load current reduces. Details are provided in the technical specification (available from www.vphase.com).

How does the unit go into bypass?

Under normal operating conditions the VPhase ramps out the anti-phase component of voltage before closing the bypass contactor. Similarly the anti-phase component of voltage is set to a minimum before opening the bypass contactor following a bypass event.

For what durations could the unit operate in Bypass? Will the energy savings be lost during these periods?

The unit can operate in bypass mode indefinitely. There is no limit to the duration the unit can operate in bypass mode. When in bypass mode there will be no energy savings.

The length of time the unit can operate beyond its continuous rating before entering bypass is dependent upon several factors:

- Ambient conditions
- Previous loads
- Actual load current

Typically the unit can run for several hours at 10A but only 10 minutes or so at 16A. For the majority of homes we anticipate that the unit will only rarely enter bypass mode.

Presumably the unit provides step control adjustment as the supply voltage varies. How is this manifested on the load terminals i.e. is there a break or spike introduced into the supply / load as this occurs?

We have a maximum voltage reduction (anti-phase voltage component) of 30V and this is divided into 100 steps. The anti-phase voltage component is supplied via a low pass filter to minimise voltage steps.

How does the unit perform under short circuit and earth fault conditions?

The unit is designed to be able to be connected in an installation which is fed from a substation transformer with a maximum prospective short circuit capability of 16kA. The VPhase achieves this capability by a combination of up-stream protection devices and the capability of the VPhase unit.

The VPhase should be fed from a suitably rated MCB in the domestic consumer unit. In addition in a domestic installation the VPhase device must be fed from a supply that is protected upstream (before the consumer unit) by a 100A (or lower) rated fuse link complying with Type II of BS1361. This is the fuse installed by the electricity provider before the electricity meter in a domestic property. In a commercial installation the VPhase device must be fed from a supply that is protected upstream by a BS60269 100A fuse link in addition to the lower rated MCB directly protecting the VPhase.

The appropriate standard for the VPhase unit is EN60730.

How does the unit effect earth supply characteristics?

The VPhase unit supplies power to circuits via a transformer. The installer must ensure that the VX1 device is active and regulating to the set output voltage (220V) before undertaking Earth Loop Impedance Testing.

Have you any MTBF data to illustrate the products reliability? Could a failure in the unit result in the whole property losing power?

We do not yet have published MTBF data. We have run prototype equipment in a test house 24/7 since March 2008 without failure. In 2009 we started running equipment in real homes.

Regardless of MTBF the equipment is designed to enter and latch in bypass mode should failure occur, therefore maintaining power at the property.

Will the VPhase unit work in three phase and commercial applications?

The VPhase VX1 is a single phase unit designed primarily for domestic residential applications. The VX1 unit can be used in some small commercial applications however care should be taken when considering the loads to be supplied. Please refer to the installation manual and technical specification (available from www.vphase.com).

Can the VPhase unit be fitted between the electricity meter and the consumer unit (fuse box)?

The VPhase VX1 unit is designed to be fed from a circuit breaker within the consumer unit (typically a 50A Type B MCB). The output of the VPhase unit is then fed back to the consumer unit to supply the relevant circuits. The VPhase VX1 unit is **not** designed to be directly fed from the electricity meter and can not accept meter tails. Full details can be found in the installation manual (available from www.vphase.com).



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