



UPS connections

Theory and Practice



UPS installed correctly

Uninterruptible power supplies (UPS) are practically the standard in IT. After all, no responsible person wants all systems to be functionally impaired and possibly shut down in a defined manner in the event of a brief interruption to the mains voltage. However, this does not apply to longer outages. In this case, the systems should be shut down in an orderly manner so that no data is lost.

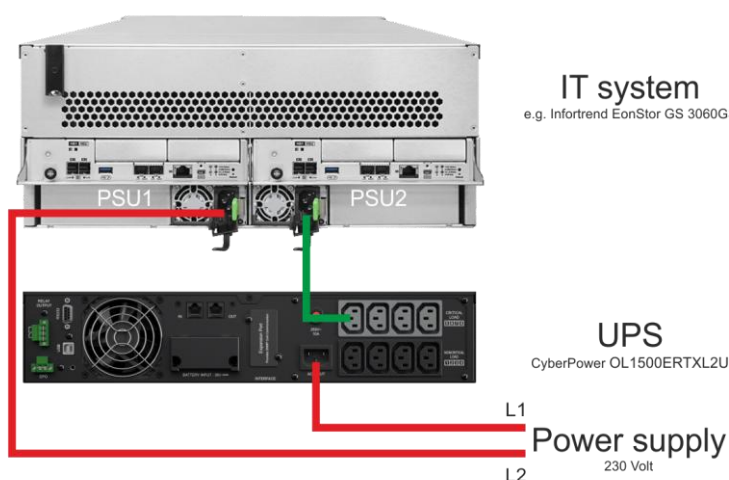
The systems generally referred to as “online UPS” ([double conversion technology](#), [VFI-SS-111](#)) are undoubtedly the best solution.

In the following, we compare common circuits with what we consider to be the best variant. The problems that arise in practice usually only become apparent in the event of damage.



1. Correctly wired

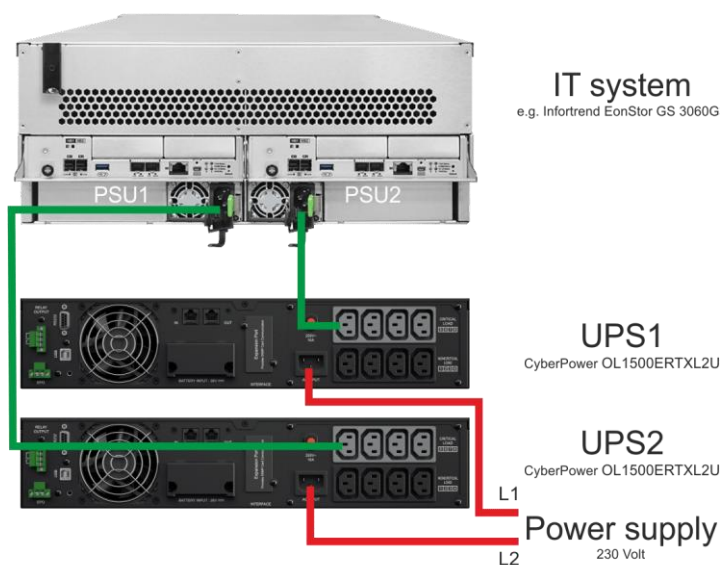
Professional storage systems and servers usually have redundant power supply units. Experts use this redundancy when installing UPSs. The following variants are usually used: In variant 1, the UPS supplies the PSU2 (power supply unit). PSU1 receives its mains voltage directly from the distribution board.



Variant 1:

This type of wiring ensures that the IT system is supplied without interruption at all times, even if the UPS itself should fail.

We have implemented a somewhat more complex solution with two UPS:



Variant 2:

In the second variant, the second phase is also redundantly protected.



2. In practice

For variant 1, the installer should first ensure that there is a common earth. In addition, the two power supply units should be supplied with different phases - for example, the UPS with L1 and power supply unit 2 with L2.

As long as there is a power failure with clear edges, the situation is usually not critical. However, other conditions can also occur, such as regenerations or harmonic faults, which can cause the voltage to “flutter”. In this case, the nominal voltage can change back and forth every 25-100 milliseconds

2.1 Variant 1

If there is a flutter in the mains voltage, for example if several short dips occur, variant 1 causes a kind of “life of its own” in the power supply units of the IT systems. The power supply unit supplied via the UPS does not perceive a faulty supply on the input side, but must absorb different loads at the output, as the second power supply unit, which is connected directly to the mains voltage, fails due to the voltage fluctuations.

In the past, various types of damage have occurred in such cases: In IT systems wired in this way, all components - even hard disks - have failed. There must have been a voltage surge on the DC side in the individual systems.

It should also be noted that today there are only power supply units with active PFC ([power factor correction](#)). If power supply unit 2 switches off, there is often a “correction”, which in turn could lead to power being fed back into the mains at the power supply unit behind the UPS. The UPS could interpret this as a short circuit and switch to battery operation.

In variant 1, there is also no galvanic isolation between the power supply units and the UPS, which can sometimes lead to problems in the event of overvoltages via earth. If a pre-supply via a generator is planned here, this solution should definitely be avoided



2.2 Variant 2

To avoid the problems of variant 1, a second UPS is often procured and connected as shown in the corresponding diagram above.

Normally, this is usually the case and the problems with load change reactions mentioned for variant 1 do not occur for the time being, as the UPS outputs remain stable.

However, if the power failure is somewhat longer and the UPS bridging time is exceeded, similar problems occur again.

The UPS systems cause the connected systems to shut down and then switch themselves off after a waiting period. In this state, the batteries are largely discharged and can no longer be used.

When power is restored, the UPS systems normally switch through the bypass (adjustable) to enable the systems to be supplied directly from the mains. Charging of the batteries begins.

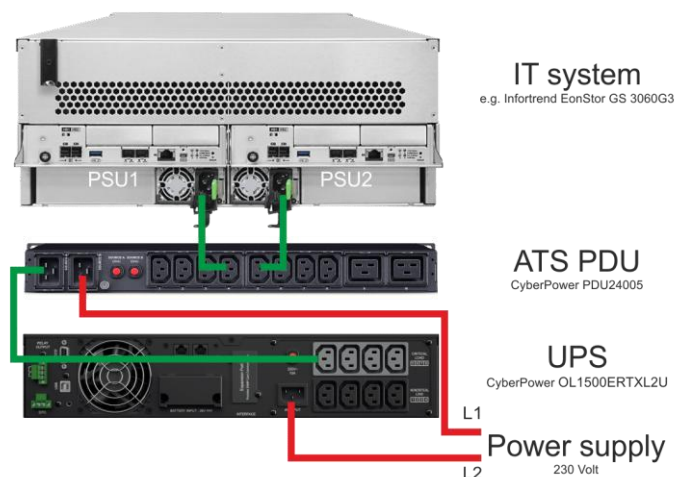
If both systems switch again simultaneously, everything is fine. However, if there is a time delay - perhaps a bypass does not switch through properly due to age - the same problems could then arise as in variant 1.

The corresponding frequency of damage is of course much lower in variant 2, because the duration of a mains voltage failure in Central Europe is generally very short.



3. Recommendation ATS PDU

According to the findings from many years of practical experience, the following variant should be considered (with one or two UPS upstream of the ATS PDU):



Variant 3:

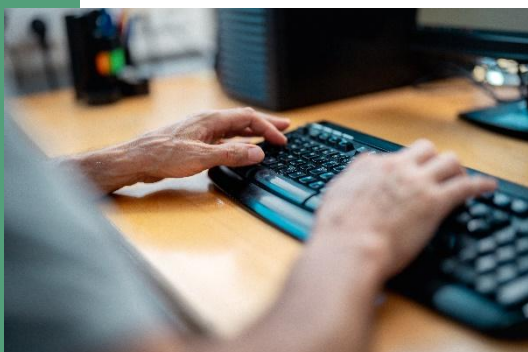
ATS PDUs enable fast switching between two inputs. Especially if the voltage does not fail completely, but only on individual phases. This functionality ensures a redundant power supply.

ATS PDUs have two inputs - each with automatic switchover if one source fails. This provides a reliable redundant power supply for servers or high-availability solutions at a comparatively low cost.

Several connections are available as outputs. It is ideal in conjunction with generators, two UPS sources or as a protection system against failure of the end devices if a UPS fails during mains operation.

If the UPS fails, the ATS PDU automatically switches the mains voltage to the power supply unit. This means that there is no critical state for the power supply units.

The ATS PDU facilitates monitoring, e.g. displays load management, input and output voltages and active power consumption. Thanks to the SNMP/HTTP card slot, the ATS PDU can be supplemented with an optional RMCARD. This enables the administrator to monitor the ATS PDU in real time via the management software. It then provides a view of vital data, event logging, input voltage, load levels and output status with automatic notifications in the event of corresponding events.



How we can help you?

We offer you innovative solutions, top products and courteous service. See for yourself: We will be happy to advise you individually - just give us a call or send us an e-mail. Get in touch with us, we look forward to hearing from you!

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