



UPS GUIDE



Introduction & Quick Index

This guide is a general technical reference for understanding UPS systems in a practical way. It helps the reader know what to check before operation, during monitoring, and when an alarm or fault appears.

Who is this guide for?

- Operation and facility teams responsible for daily monitoring.
- Technicians and engineers before installation or handover.
- Procurement teams that need to understand technical requirements before ordering.
- Sites with sensitive loads such as networks, servers, cameras, control systems, and critical equipment.

What will you gain?

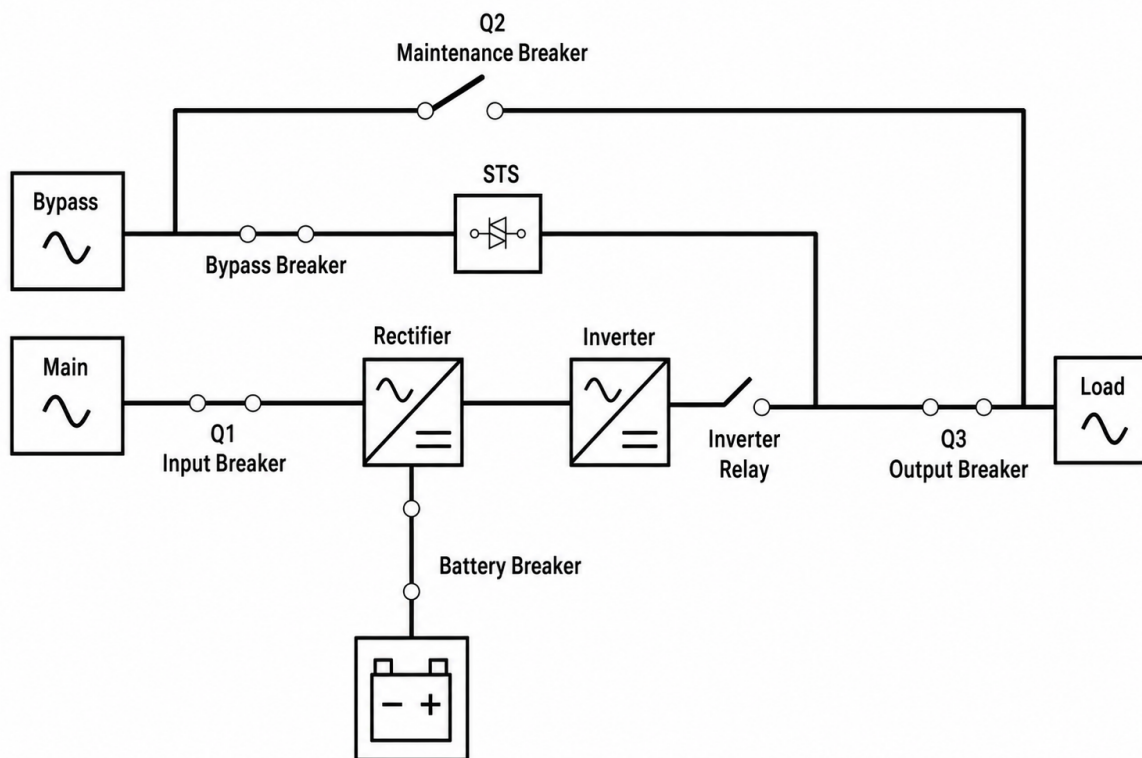
- Understand UPS operating modes and UPS types.
- Know the right selection data to collect.
- Review installation environment, wiring, and protection requirements.
- Handle common alarms and problems correctly at the first stage.

Section	Practical value for the reader
Operating concept	Understand how the system protects the load and when it shifts to batteries or Bypass.
UPS types	Understand the difference between Offline, Line Interactive, and Online.
Correct selection	Identify the technical questions that must be answered before purchase or installation.
Installation and protection	Reduce wiring, earthing, ventilation, and protection mistakes.
Batteries and alarms	Understand why runtime drops and how to respond to warnings.
Maintenance	Use periodic checks to reduce unexpected failures and extend system lifetime.

This is a general guide and does not replace the specific model manual or official installation instructions. Internal installation or maintenance must be performed only by qualified and authorized personnel.

UPS Operating Concept & Modes

This diagram shows the power path inside a UPS system from the main input, battery, and bypass path to the load, including switching and protection elements.



Operating status	What it means	What the user should check
Normal / Line	Normal operation from the input supply.	Load level, battery condition, and no active alarms.
Battery	The UPS is running from batteries due to input loss or disturbance.	Available time, non-critical loads, and alarm status.
Bypass	The load is fed through an alternate path due to setting, protection, or maintenance.	Reason for transfer and whether technical support is required.
Warning / Fault	A warning or fault requires attention.	Read the code, avoid repeated restarts, and record the status.

UPS Types and Differences

The correct UPS type depends on load sensitivity, input power quality, and the acceptable transfer time during an outage or power disturbance.

Type	Operating idea	Protection level	Suitable use	Important note
Offline / Standby	The load normally runs from utility power. When power fails, the system transfers to battery.	Basic; mainly protects against outages with limited voltage disturbance protection.	Simple or non-critical loads such as light office devices or small routers.	Has a transfer time, so it is not the best choice for highly sensitive loads.
Line Interactive	Similar to Offline, but adds automatic voltage regulation (AVR) before using the battery.	Medium; better when voltage fluctuations or short interruptions are common.	Small networks, cameras, office equipment, and sites needing reasonable continuity.	A good balance between cost and protection, but not a replacement for Online UPS in critical applications.
Online Double Conversion	Power is continuously processed through rectifier and inverter; the load is fed from a stable output.	High; provides better isolation and output stability for sensitive loads.	Servers, data centers, control systems, sensitive networks, and critical equipment.	Best when the load cannot tolerate interruption or disturbance, provided batteries, ventilation, and protections are designed correctly.

Economic choice

Offline for simple loads that can tolerate a short transfer time.

Balanced choice

Line Interactive when voltage fluctuations are common and better-than-basic protection is needed.

Critical choice

Online for sensitive loads that need stable output and higher continuity.

Practical decision: Do not choose the type based on price only. Start with load sensitivity, the impact of outage, backup source availability, and installation environment.

Selecting a UPS Based on Load

Correct selection starts with understanding the load, not the model name. Load sensitivity, starting current, required runtime, and site environment all affect the decision.

Technical question	Why it matters	Practical example
Which loads must remain powered?	Prevents loading the UPS with unnecessary loads.	Servers, cameras, router, control system.
Is the load sensitive?	Sensitive loads need higher stability and clearer monitoring.	Control systems, networks, medical equipment, security systems.
Is there high starting current?	Some loads draw high inrush current and may cause Overload.	Motors, compressors, large laser printers.
What runtime is required?	Determines battery system sizing and load management strategy.	Short runtime for saving data or longer runtime until source returns.
Is there a generator or alternate source?	Affects operating sequence and compatibility with input supply.	Site with standby generator or multiple power sources.
What are the site conditions?	Heat, ventilation, and humidity affect batteries and reliability.	Ventilated room versus hot, closed room.

Usually suitable loads

Servers, networks, cameras, control systems, and communication equipment.

Loads needing review

Motors, compressors, large heating loads, and any load with high starting current.

Practical decision: Do not place every load on the UPS. Prioritize loads that cannot tolerate interruption, and disconnect non-critical loads during battery operation.

Installation Environment & Safe Operation

The installation location directly affects battery lifetime and system stability. A poor environment can cause repeated alarms even if the UPS itself is suitable.

Site conditions

- Clean, dry, indoor, and well-ventilated location.
- Away from humidity, dust, and heat sources.
- Enough access space for breakers and batteries.
- Level floor suitable for the UPS and battery weight.
- Reliable earthing according to site and local code requirements.

Before operation

- Check for visible transport damage.
- Make sure ventilation openings are not blocked.
- Ensure cable routing is safe and not under stress.
- Review breaker positions and connections before connecting loads.
- Do not hand over the system while an unexplained alarm is active.

Important: High temperature is one of the main causes of shorter battery lifetime and increased alarms. A strong UPS does not compensate for a poor installation environment.

Connections and Protections

UPS reliability depends not only on the device, but also on the quality of connections, earthing, breakers, protection elements, and isolation method during maintenance.

Element	Function	What to check
Input Breaker	Disconnects the input supply and protects the input path.	Selected according to site design and model instructions.
Output Breaker	Isolates loads when required.	Accessible and not overloaded beyond design.
Battery Breaker / Fuse	Protects the external battery path.	Correct polarity, firm terminals, and no reverse connection.
Earthing	Protects people and equipment and reduces leakage risks.	Connected before any live conductor and checked periodically.
Maintenance Bypass	Maintains load supply during maintenance in critical applications.	Used only according to the correct procedure.
EPO	Emergency power off when needed.	Connected and tested only by a specialist according to site procedures.

Technical warning: Some terminals may remain dangerous even after input disconnection because batteries are inside the system. Isolate the system and verify absence of voltage before maintenance.

Batteries and Runtime

Runtime is not a fixed number. It changes according to load, battery condition, temperature, battery age, and operating method.

What reduces runtime?

- Higher load or operation of non-critical loads.
- Old batteries or batteries that are not fully charged.
- High temperature or poor ventilation.
- No periodic battery condition test.
- Mixing batteries of different age or condition in one string.

Important guidance

- Keep battery backup for critical loads only.
- Watch for swelling, leakage, or abnormal temperature.
- Do not modify battery wiring except through a qualified technician.
- During long storage, recharge batteries according to the model manual.
- Record battery test results to compare performance over time.

Indicator	What it means	Correct action
Runtime lower than usual	Load increased or batteries became weak.	Reduce loads and review battery condition.
Battery alarm	Battery is weak, not charged, or incorrectly connected.	Check connections, allow enough charging time, and request technical inspection.
Battery temperature	Poor ventilation or a problem inside the battery group.	Stop operation if dangerous and request technical support.

Display and Alarms

The display and audible alarms are the first source for understanding system status. Do not ignore or silence an alarm before identifying the reason.

Message or status	General meaning	Correct action
Line / Normal	The system operates from input supply.	Monitor load and batteries; no visible problem.
Battery	The system operates from batteries.	Reduce non-critical loads and monitor available time.
Bypass	The load is on the bypass path.	Check the reason for transfer; do not treat it as always normal.
Overload	Load is excessive or high starting current is present.	Disconnect non-critical loads and start loads gradually.
Battery Low	Batteries are near the end of available energy.	Save data and transfer or shut down loads according to site plan.
Fault	A fault requires technical inspection.	Do not repeat restarts; record the code and contact support.

Practical rule: Read the message or code, then check load, batteries, ventilation, input supply, and connections before any restart.

Common Problems and First Action

The following table helps the user take the correct first action before requesting maintenance. It does not replace technical inspection if the problem continues.

Symptom	Possible cause	First action
UPS does not work	Input supply, breaker, or connection problem.	Check input supply, breakers, and external connections.
Battery alarm	Incorrect connection, weak battery, or not fully charged.	Check battery condition, connections, and charging time.
Runtime lower than expected	Higher load, weak batteries, or high room temperature.	Reduce non-critical loads and review batteries and ventilation.
Overload	Load is above suitable level or high starting current exists.	Disconnect non-critical loads and start loads gradually.
Bypass Active	Protection, setting, or fault condition requires review.	Read the message and do not assume bypass is always normal operation.
High temperature	Poor ventilation, blocked vents, or unsuitable environment.	Improve ventilation, clean the area around the UPS, and check fans.
Continuous fault	A fault requires technical inspection.	Isolate the system when needed and contact technical support.

Maintenance and Handover

Periodic maintenance reduces unexpected failures and protects battery life and operating stability. Handover without a clear checklist increases the chance of wrong operation.

Periodic checks

- Clean ventilation openings and check dust accumulation.
- Review room temperature and ventilation condition.
- Review battery condition and logged alarms.
- Test transfer to battery according to the maintenance plan.
- Check wiring, breakers, and earthing through a qualified technician.
- Update operation, alarm, and maintenance records.

Before handover

- No visible alarms on the display.
- Only critical loads are connected to the UPS.
- Ventilation path is clear and not blocked.
- Breakers and earthing have been reviewed.
- Basic operating states have been explained to the user.
- Site data and commissioning date are recorded.

When to request a technician?	Why?
Repeated alarms with no clear reason.	There may be a load, battery, ventilation, or connection issue.
Noticeable drop in runtime.	Possible battery weakness or load increase.
Smell, heat, or abnormal sound.	Could indicate a risk that must not be ignored.
Battery replacement or wiring changes.	Requires a qualified technician to avoid electrical hazards.

- Safe Operation
- Battery Health
- Alarm Tracking
- Preventive Maintenance