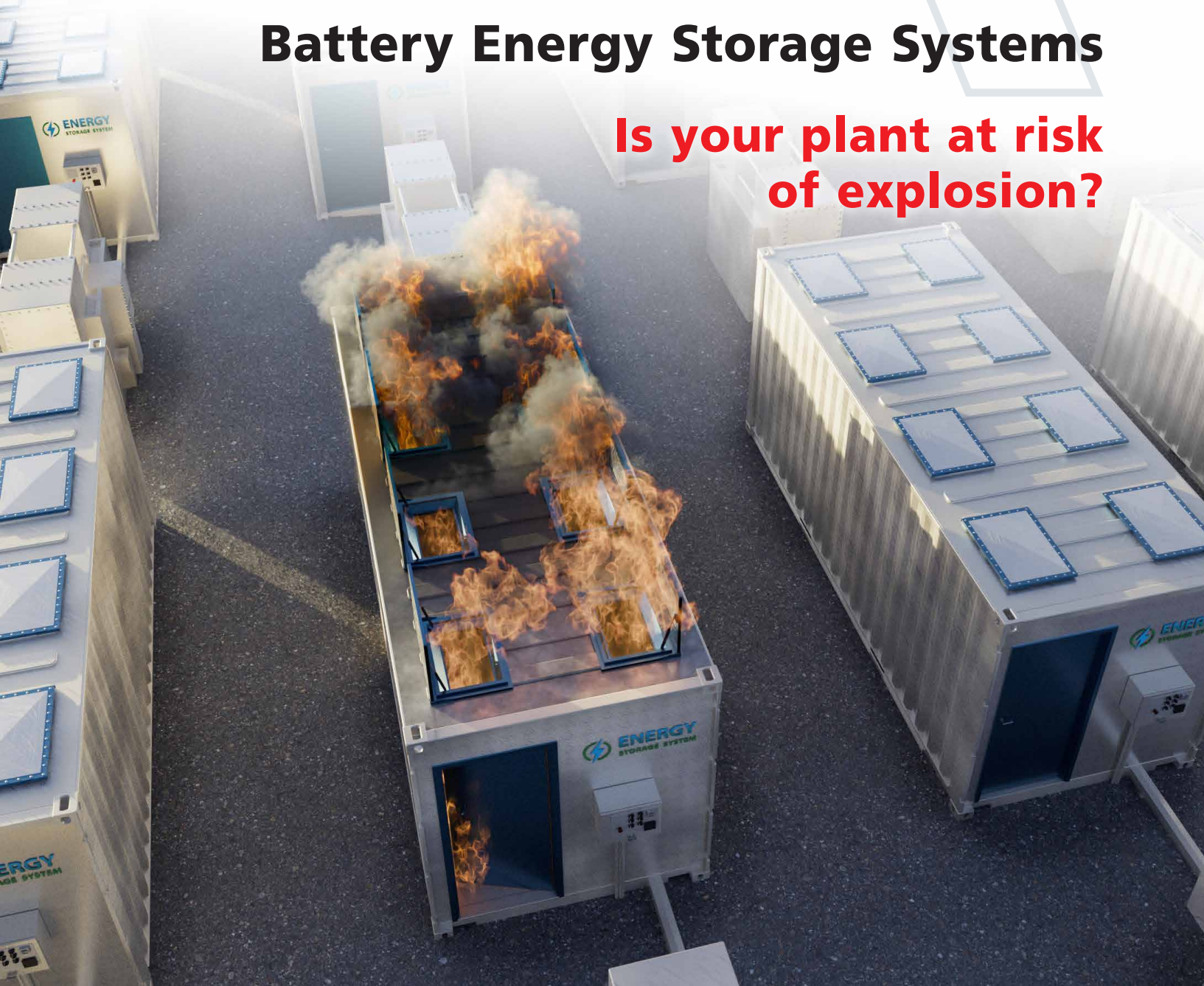


rotork[®]

Keeping the World Flowing
for Future Generations

Battery Energy Storage Systems

**Is your plant at risk
of explosion?**



Solutions for safety
critical ventilation and
climate control

BESS safety solutions

Battery Energy Storage Systems (BESS) are critical for storing renewable energy before distribution and use.

To reduce the amount of greenhouse gas emissions and transition to cleaner power generation, it is essential to implement reliable and cost-effective solutions such as BESS to upgrade our power grids. Modern lithium-ion battery cells have been proven to be both economically feasible and highly dependable for storing energy in BESS.

BESS problems:

Although BESS are innovative and environmentally friendly, they carry a potential risk of ignition and explosion in the rare event of a battery fault. This risk is significant considering that BESS can house up to 10,000 Li-ion cells.

- Risk of explosion due to faulty battery cells creating an explosive atmosphere within the BESS
- Thermal runaway can result in the rapid spread of cell failure throughout a battery rack
- Using safety equipment that is not certified may result in failure when exposed to high temperatures
- Use of non-certified safety equipment can lead to the ignition of explosive atmospheres

When Li-ion cells fail, they can emit harmful gases that are combustible which can build up within the BESS. If these gases come into contact with an ignition source, such as heat from malfunctioning batteries, and an increase in oxygen, it can result in an explosion. To prevent an explosive atmosphere from forming, it is essential to properly ventilate any off-gases. If left undetected, the battery may progress to the next stage of failure, which is characterised by the generation of smoke. This condition is known as "thermal runaway" and it is highly unstable, potentially resulting in rapid disassembly, heat generation, or even fire.

If ventilation equipment in BESS is not explosionproof, it could potentially cause an explosion by igniting the combustible atmosphere through a spark during operation.

It is essential that safety equipment remains functional even after long periods of inactivity. In the unlikely event of a catastrophic failure, these systems must operate flawlessly when needed.

Rotork solutions:

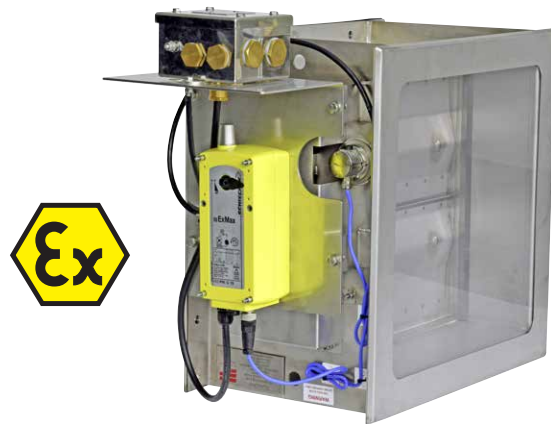
The Schischek (a Rotork brand) actuator and control systems are specifically designed to monitor and regulate enclosed atmospheres, such as those found in BESS utilities.

- Rotork solutions are certified explosionproof (Ex) and fireproof for safe use in potentially explosive atmospheres (IIC) and high temperatures (T6)
- ExMax actuator ~1 second fail-close mechanism quickly prevents oxygen from entering the BESS
- Rapid response in venting explosive gases or closing ventilation can minimise thermal runaway risk and help prevent total loss of BESS
- Our product's safety and reliability help keep personnel and equipment safe

Schischek actuators and sensors are designed and certified to operate safely and reliably in harsh environmental conditions, ensuring the effective control of BESS ventilation dampers, maximising system integrity and minimising risk to life.

In the event of an emergency, the ~1 sec fail-close option in Schischek ExMax actuators can quickly seal off the ventilation system, preventing additional oxygen from entering and fuelling any fire.

Schischek products are compatible with most third-party environmental monitoring and control gas sensor systems, such as those designed for BESS.



Schischek actuators and sensors are suitable for installation and operation in hazardous areas. They are certified for safe operation in the highest explosion group (IIC) and temperature class (T6).

Schischek explosionproof products are IECEx certified and safe for use in Ex areas, zones 0, 1, 2, 21 and 22. They are also certified explosionproof to regional standards such as ATEX, CCC, KOSHA, and UL.

BESS safety solutions

International safety standards

Rotork engineers are experts in designing and installing fire safety systems that comply with the National Fire Protection Association (NFPA) and UL standards.

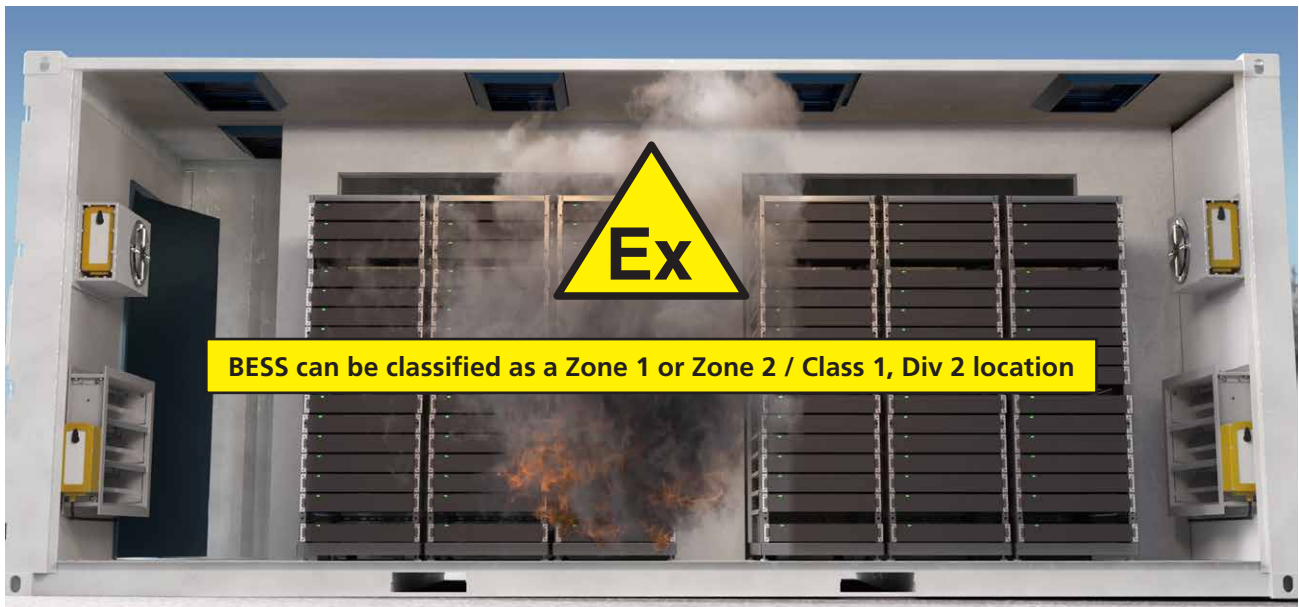
In environments where flammable gases are present, it is essential to use explosionproof electrical equipment. The UL certification of BESS is UL9540. The standards of UL9540 are mainly derived from the NFPA 855. Section 22.1 of UL9540 also makes a clear reference of NFPA 70 article 500. As per the definition of Class I, Division 2 in NFPA 70 it states that a location in which the ignitable concentrations of flammable gases that would normally be prevented by positive mechanical ventilation but might become hazardous through failure or abnormal operation of the ventilating equipment should be classified as Class I, Division 2.

Explosionproof classifications are different in different countries, but they are generally categorised by zones. The risk of explosion is higher in lower zone numbers. In our opinion, the BESS should be classified as Zone 2 according to the standards mentioned opposite. However, depending on the location of the BESS, it can also be classified as Zone 1.

NFPA 70: Article 500.5 Classifications of Locations

(2) Class I, Division 2. A Class I, Division 2 location is a location:

(2) In which ignitable concentrations of flammable gases, flammable liquid-produced vapours, or combustible liquid-produced vapours are normally prevented by positive mechanical ventilation and which might become hazardous through failure or abnormal operation of the ventilating equipment



A history of safety and reliability

For nearly 50 years, Schischek has been a leading designer and manufacturer of actuation and ventilation control equipment for hazardous areas.

Schischek products are designed to comply with global certification standards for use in both safe and Ex areas where fireproof and explosionproof equipment is required.





Rotork has been designing, testing, and installing flow control equipment for over 60 years in both hazardous and non-hazardous environments. Please refer to [PUB000-009](#) for further explanation of these enclosures.

SCHISCHEK

A **rotork** Brand



Schischek solutions are suitable for controlling and monitoring HVAC systems in BESS installations.

| | | |
|--|---|---|
| <p>ExMax 90° quarter-turn actuators</p> |  | <ul style="list-style-type: none"> • Compact quarter-turn electric actuators • For use in hazardous areas Zone 1, 2, 21, 22, explosionproof to international standards • Fast spring-return time ~1 second • IP66/IP67 aluminium housing • Operating temperature: -40 to +50 °C (-40 to +122 °F) |
| <p>ExMax SS 90° quarter-turn actuators</p> |  | <ul style="list-style-type: none"> • Compact quarter-turn electric actuators • For use in hazardous areas 1, 2, 21, 22, under extreme weather conditions and/or for offshore/onshore applications • Stainless steel housing for use in extreme weather conditions |
| <p>ExMax CT 90° quarter-turn actuators</p> |  | <ul style="list-style-type: none"> • Compact quarter-turn electric actuators • For use in hazardous areas 1, 2, 21, 22, under extreme weather conditions and/or for offshore/onshore applications • Aluminium housing with offshore/marine coating for use in extremely corrosive environments |
| <p>RedMax 90° quarter-turn actuators</p> |  | <ul style="list-style-type: none"> • Compact quarter-turn electric actuators • For use in Zone 2, 22, gas and dust certified • Control applications: Automation of air dampers, fire dampers and smoke dampers • IP66 housing aluminium housing |
| <p>ExCos ExBin, ExReg analogue and digital sensors</p> |  | <ul style="list-style-type: none"> • Analogue and digital sensors • For use in hazardous areas 1, 2, 21, 22, explosionproof to international standards • Measurement of differential pressure, temperature, humidity • Marine coating and stainless steel versions available |



A full listing of the Rotork sales and service network is available on our website.

www.rotork.com

Corporate Headquarters
Rotork plc
tel +44 (0)1225 733200
email mail@rotork.com

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