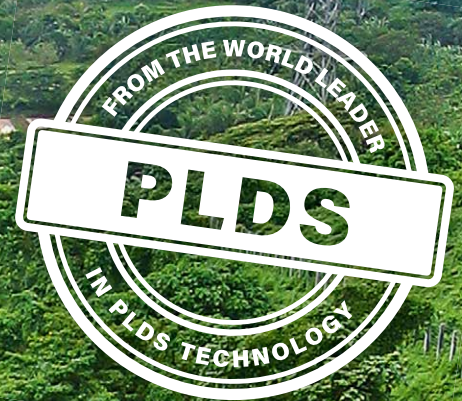


Penstock Leak Detection System (PLDS)

Highly accurate monitoring for public and environmental safety



Safety for people and the environment

Unique concept for safe and early detection of damages

Leaks in pressure pipelines can cause large-scale environmental damage and even fatalities leading to substantial losses and reduced public confidence in hydropower plants. Penstocks may constitute a significant potential risk; not only due to stresses from the high internal pressure, but also from external factors such as extreme weather, earthquakes, climate change, material fatigue, and increasing population densities in the vicinity.

In several well-documented cases, undetected leaks have led to flooding and damage of powerhouses resulting in total loss of production for more than six months. Continuous penstock leak monitoring is essential to ensure early leak and rupture detection and thus safe and reliable operation.

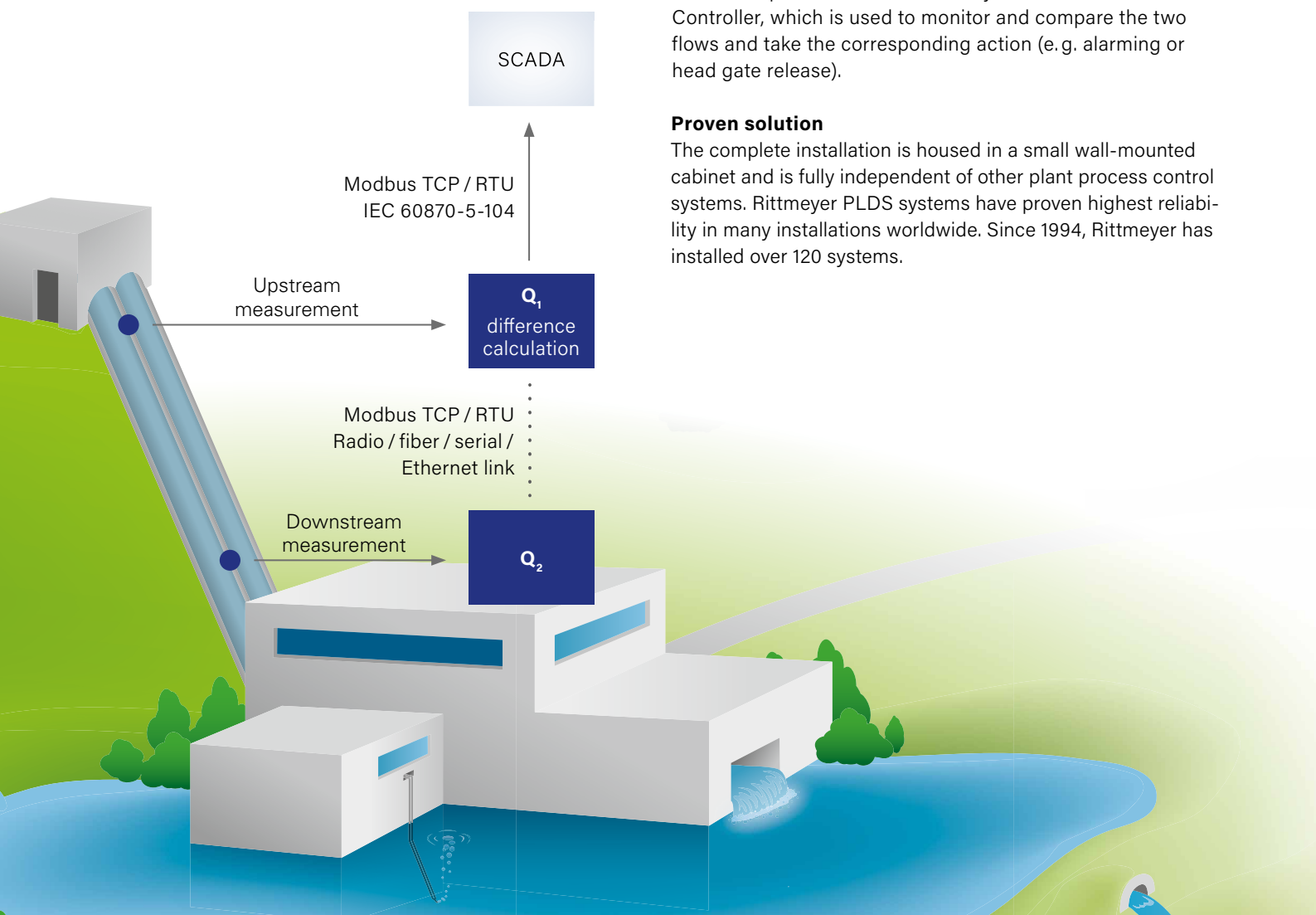
Safe reaction through accurate monitoring

The Rittmeyer Penstock Leak Detection System (PLDS) is a unique concept for reliable monitoring of penstocks. It is based on the accurate flow measurement at two different positions and the high repeatability of these measurements.

The flow at both the upstream (Q_1) and the downstream (Q_2) location is processed in the Rittmeyer Instrumentation Controller, which is used to monitor and compare the two flows and take the corresponding action (e.g. alarming or head gate release).

Proven solution

The complete installation is housed in a small wall-mounted cabinet and is fully independent of other plant process control systems. Rittmeyer PLDS systems have proven highest reliability in many installations worldwide. Since 1994, Rittmeyer has installed over 120 systems.



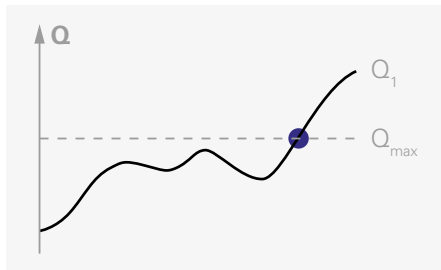
Comprehensive protection

Precise monitoring with convenient control

A standard Rittmeyer PLDS provides three levels of continuous monitoring: rupture, leak and fine leak detection. Thresholds, time delays and corresponding actions are easily configured to match the specific requirements on site. With the integration of additional sensors (level sensors, pressure switches, etc.), even more precise monitoring of critical locations is possible. All components can be controlled locally or remotely at any time via the web interface of the Instrumentation Controller to optimize the system performance.

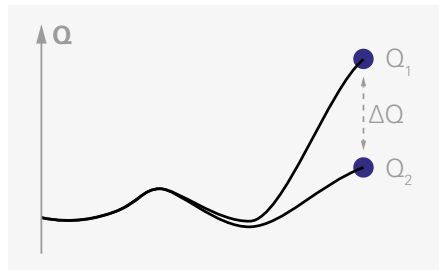
Rupture detection

The rupture detection monitors the upstream flow. An unexpected high flow rate exceeding the limit value initiates a rapid alarm or shutdown ($Q_1 \geq Q_{\max}$).



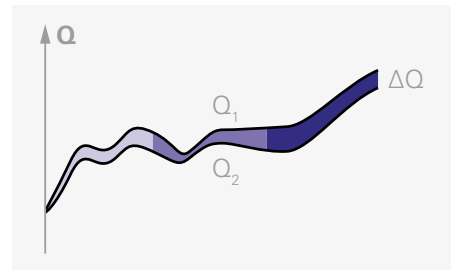
Leak detection

The leak detection supervises the flow difference between the upstream and downstream flow. A flow difference exceeding the limit value immediately initiates an alarm action ($\Delta Q = Q_1 - Q_2$).



Fine leak detection

The difference between the upstream and downstream flow is accumulated over a longer period of time. This ensures that also fine leaks are reliably detected ($\Delta Q = Q_1 - Q_2$).



*«Rely on the world leader:
**More than 100 years of
experience, over 120
protected penstocks.»***

Benefits

- Minimize potential damage through safe and early leak detection
- React fast and safe in the event of a rupture
- Exercise responsibility for public safety
- Meet governmental safety requirements
- Easy to integrate into existing plant equipment
- Bidirectional monitoring possible (pump and turbine operation)

Custom solutions

Flexible measurement setups for tailor-made protection



Rittmeyer offers several PLDS setups to fit your application and budget:

- **Standard setup:** Highest precision possible with two Rittmeyer flow meter systems (up- and downstream position).
- **Combined setup:** Economic combination of one Rittmeyer flow meter system and a Rittmeyer pressure system or a different flow meter.
- **Simple setup:** One single Rittmeyer flow meter system at only the upstream position.

All setups are also available with clamp-on sensors, e.g. if drilling is not possible.

	Standard setup	Combined setup	Simple setup
Upstream system	RISONIC modular + flow sensors	RISONIC modular + flow sensors	RISONIC modular + flow sensors
Downstream system	RISONIC modular / RISONIC compact + flow sensors	RIPRESS smart + pressure sensors, Winter-Kennedy system, or other flow meter	
Rupture detection	■	■	■
Leak detection	■	■	
Fine leak detection	■	■	



RISONIC modular



RIPRESS smart

Communication and alarm interfaces

Digital outputs	Modbus RTU / TCP, IEC 60870-5-104 (e.g. to SCADA / PLC systems)
Discrete outputs	at least 7 digital and 3 analog outputs, easily extendable
Alarms	Modbus RTU / TCP, IEC 60870-5-104, digital and analog outputs, SMS text message, SMTP

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