



## SENTRON RESIDUAL CURRENT MONITORING FOR VENTILATION SYSTEMS

# Preventive fire protection for ventilation systems in critical areas

From intensive livestock farming and greenhouses to the pharmaceutical, food, and semiconductor industries – ventilation systems must operate continuously in many environments. However, continuous operation, aging, and environmental factors such as moisture, ammonia, and aggressive gases can damage system insulation, causing fault currents and a risk of fire ignition. With SENTRON 5SV8 COM residual current monitoring devices, SENTRON miniature circuit breakers, and SENTRON Powercenter 3000, such fault currents can be detected very early on, enabling intervention before the situation becomes critical. [siemens.com/protection-devices](https://www.siemens.com/protection-devices)

### Preventive fire protection for increased system availability

In critical areas, it is often essential that ventilation systems are not automatically shut down by a residual current protective device. For example, in intensive livestock farming, a ventilation failure can lead to heat stress and oxygen deficiency – resulting in the death of animals within a short period. In cleanrooms, ventilation failure endangers the health of personnel, compromises product safety, and jeopardizes regulatory compliance. Even slight contamination due to increased airborne particles can lead to batch losses, trigger recalls, and result in legal consequences. At the same time, however, fire must be prevented in all critical areas.

With SENTRON 5SV8 COM residual current monitoring devices (RCMs) and SENTRON miniature circuit breakers (MCBs), preventive fire protection through condition-based maintenance can be implemented – without triggering automatic shutdown. The RCMs' pre-alarm threshold signals emerging fire hazards at an early stage. This allows those responsible to be alerted – for example via indicator lights or SENTRON Powercenter 3000 – and to act before an actual shutdown is necessary.

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## for different areas

### **Preventive fire protection for high operating currents**

In very large and widespread ventilation systems with high-power ventilators and cooling fans, the operating current of the protected circuit may exceed the maximum rated current of a residual current protective device. In such cases, a SENTRON 5SV8 COM residual current monitoring device (RCM), in combination with a SENTRON miniature circuit breaker, offers an alternative for preventive fire protection – compliant with IEC 60364-4-42 and IEC 60364-5-53.

### **Monitoring with SENTRON Powercenter 3000**

Pre-alarms and alarms from circuits monitored with SENTRON 5SV8 COM RCMs can be forwarded to SENTRON Powercenter 3000 via SENTRON Powercenter 1100. There, they are displayed in the web interface, which can be accessed from any location in the local network via PC, HMI, or mobile device. Additionally, pre-alarms and alarms can be automatically sent to responsible personnel via e-mail so that they are immediately made aware of the action required and can react without delay.

### **Setting the monitored frequency range**

If higher frequencies can occur due to electronic equipment, e.g., frequency converters, there is a risk of significant leakage currents capable of causing fires. In such cases, the monitored frequency range must be set to at least 20 kHz. In all other circuits, the monitored frequency range must be selected according to the circuit topologies specified in the table and the corresponding RCM types.

### **Setting the alarm thresholds**

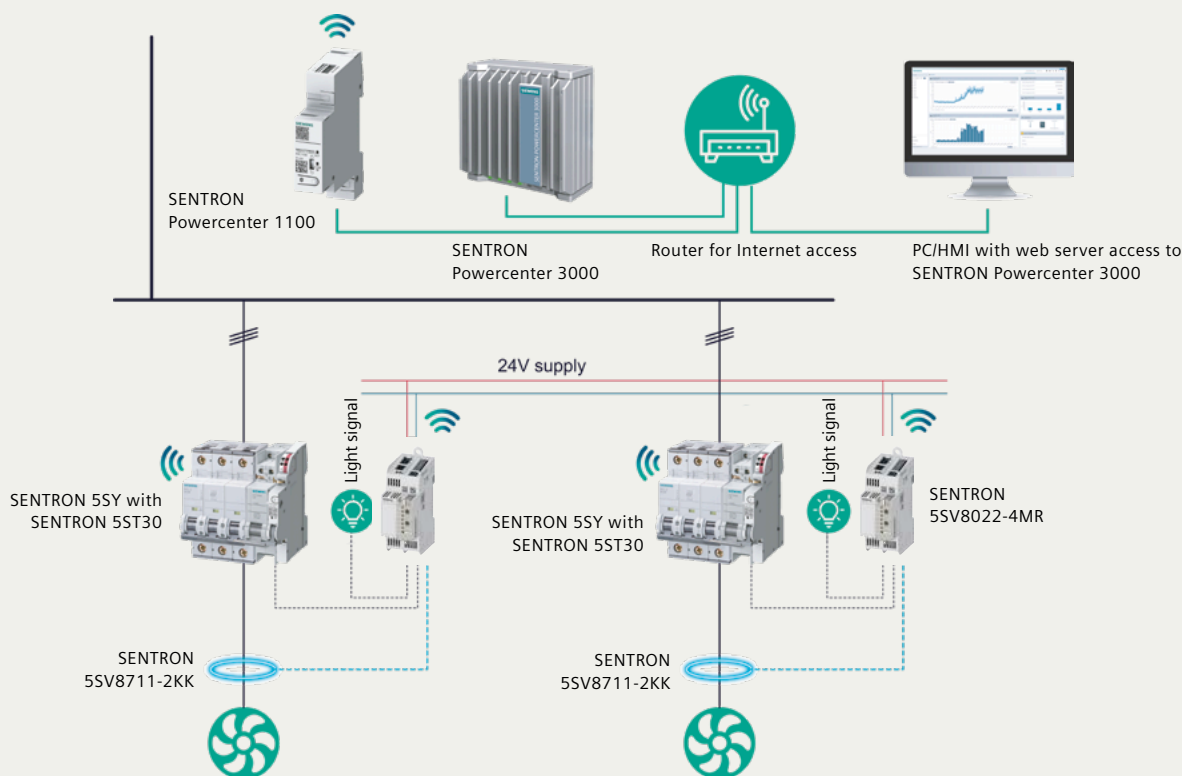
For preventive fire protection, the rated residual current at the SENTRON 5SV8 COM residual current monitoring device should generally be set to  $I_{\Delta n} \leq 300 \text{ mA}$  – and to  $I_{\Delta n} \leq 30 \text{ mA}$  in circuits where resistive faults could lead to fire. If the pre-alarm threshold is set to, for example, 50% of the alarm threshold value, emerging insulation faults can be identified before the fault currents reaches a level that is critical for fire protection.

### **Technical and organizational requirements**

Certain requirements apply to the use of RCMs instead of residual current protective devices (RCDs). For example, an RCM must be used in combination with a miniature circuit breaker and must have a supply voltage that is independent of the supply system. RCMs may only be used in place of RCDs for preventive fire protection – and under no circumstances for fault protection (in the event of indirect contact) or additional protection (in the event of direct contact). In addition, it must be ensured that a signaling chain guarantees a prompt response and the initiation of appropriate measures, and that reported faults are rectified quickly. The RCM function must also be checked regularly and the system must be continuously monitored and maintained by qualified electricians.

Suitable RCM type		Circuit diagram with fault location	Form of load current $i_L$	Form of fault current $i_F$
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <b>B</b>      </div> <div style="text-align: center;"> <b>F</b>    </div> <div style="text-align: center;"> <b>A</b>  </div> <div style="text-align: center;"> <b>AC</b>  </div> </div>		Without semiconductor element		
	1			
		Phase angle control		
	2			
		Burst control		
	3			
		Single-phase rectification		
	4			
		Two-pulse bridge circuit		
	5			
		Two-pulse bridge circuit, semi-controlled		
	6			
		Frequency inverter with two-pulse bridge circuit		
	7			
	Single-phase rectification with smoothing			
8				
	Frequency inverter with two-pulse bridge circuit and PFC			
9				
	Two-pulse bridge circuit between outer conductors			
10				
	Frequency inverter with two-pulse bridge circuit between outer conductors			
11				
	Three-phase star connection			
12				
	Six-pulse bridge circuit			
13				
	Frequency inverter with six-pulse bridge circuit			
14				

Possible fault current types and suitable types of residual current measuring devices



Example design of a residual current monitoring system for fire protection in ventilation systems in intensive livestock farming

## Example: Application for ventilation systems in intensive livestock farming

Use of SENTRON 5SV8 residual current monitoring devices for preventive fire protection in electrical circuits of ventilation systems requiring very high reliability – with pre-warning in the event of a potentially fire-hazardous insulation fault.

### Example setup from measurement to monitoring

For preventive fire protection, a combination of a SENTRON 5SV8 residual current monitoring device (RCM) and a SENTRON 5SY miniature circuit breaker (MCB) with SENTRON 5ST30 undervoltage release is used. A communication-capable auxiliary switch/fault signal contact is employed to monitor the switching status of the MCBs. This ensures that fault tripping or unintended shutdowns do not go undetected.

The RCM's pre-warning relay controls a light signal. Additionally, the residual current measurement data can be analyzed over time via PC and mobile devices. Trends indicating developing insulation faults can thus be detected at an early stage. In many cases, unexpected system shutdowns can be avoided through preventive maintenance.

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