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Application note

Applying pressure sensing in arc flash protection applications with air-magnetic circuit breakers



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1 DOCUMENT INFORMATION

Revision	1.0
Date	5 May 2015
Changes	– (N/A; first revision of the document)
Revision	**1.1**
Date	3 November 2026
Changes	– Layout update. – Added the following pages: Disclaimer and copyright, Document information, Contact information. – Language and readability check throughout the document. – Content updated where necessary to match current names and data. – Updated Figures 2 and 3.

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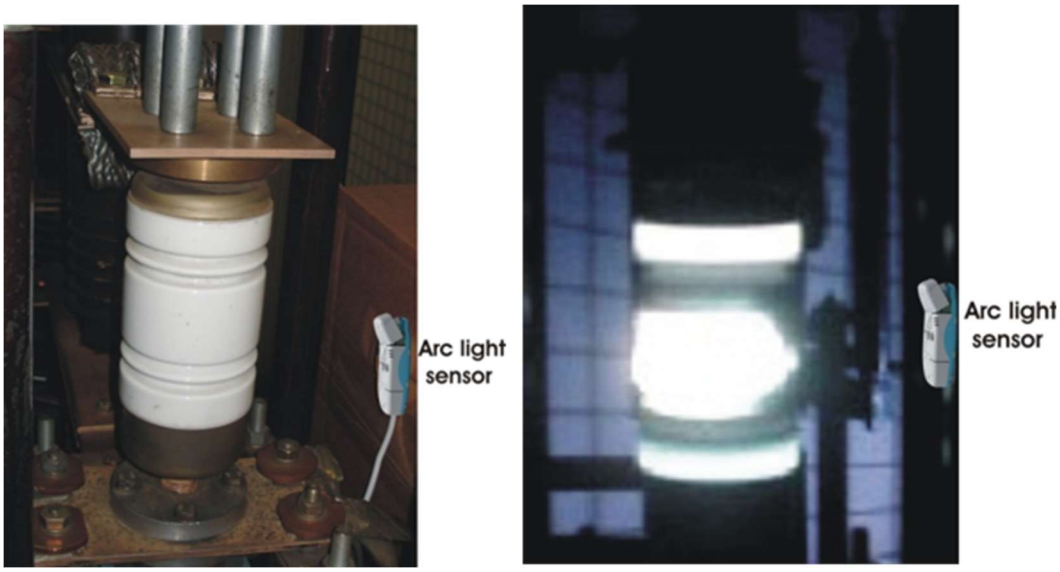
2 BACKGROUND

The first generations of arc flash protections used light sensitive arc sensors alone as the tripping criterion. Technological advances combined arc light and current sensing for the dual sensing method to further increase the reliability of the protection system. However, the traditional current-based and light-based dual sensing system may overtrip when installed in equipment involving air-magnetic circuit breakers. This document addresses the application of arc flash protection with air-magnetic circuit breakers and proposes a solution to overcome the challenge of air-magnetic circuit breakers.

2.1 Problem of air-magnetic circuit breakers

When an air-magnetic circuit breaker operates on a downstream fault, its arc chutes create an arcing that may result in activating any arc flash light sensor installed nearby. Since a downstream fault condition typically leads to exceeding of set overcurrent trip level, both light and current conditions may be activated simultaneously, and consequently the dual sensing arc flash protection system based on light and overcurrent may overtrip the circuit breaker of the incoming feeder.

Figure 1. *Activation of an arc flash light sensor when a circuit breaker opens.*



2.2 Solution

Adding an arc flash pressure sensor into the schemes involving air-magnetic circuit breakers provides for additional trip criterion that will not be fulfilled in an event of operating circuit breaker as described above. Using Arcteq's AQ-02 arc flash sensor combining arc light and pressure sensing in a single enclosure, a dual sensing system is achieved in a convenient solution that is easy to install. If an overcurrent sensing is also applied into the system, even a triple sensing system based on current, light, and pressure trip criteria can be used.

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Figure 2. *Arc flash protection scheme that uses an AQ-02 light and pressure sensor for circuit breaker chambers and incoming cable sections upstream of the current transformer.*

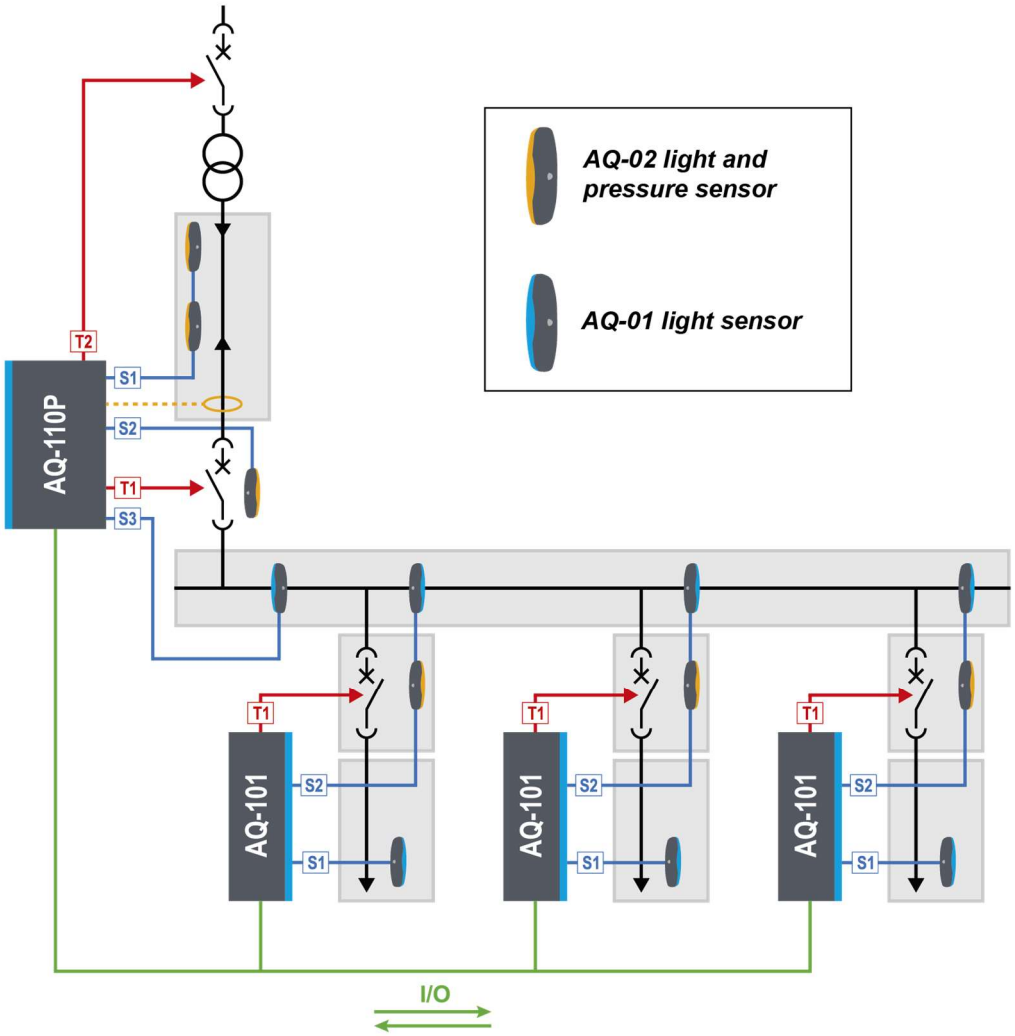


Figure 3. *AQ-02 light and pressure sensor.*



2.3 AQ-02 technical specifications

Table 1. *Technical data for the AQ-02 light and pressure sensor.*

Light intensity threshold options	8,000 lx (option A) 25,000 lx (option B) 50,000 lx (option C)
Pressure threshold (fixed)	0.2 bar above ambient pressure
Pressure measuring accuracy	± 1.8 % (of full scale)
Detection radius	180°
Mechanical protection	IP 20
Sensor cable specification	Shielded twisted pair 0.75 mm^2 (AWG: 18)
Maximum sensor cable length (per channel)	200 m
Operating temperature	–20…+85°

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3 CONCLUSION

Applying a pressure sensor in an arc flash protection system provides increased system reliability without compromising the desired dual sensing criteria. Adding the pressure criterion is especially encouraged in systems involving air-magnetic circuit breakers. Another recommended application for pressure sensing is when there are no current transformers in the protected zone. The AQ-02 light and pressure sensor can be applied as a stand-alone solution with light and pressure tripping criteria alone or in combination with the overcurrent condition resulting in triple sensing criteria.

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