

APPLICATION NOTE

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

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Changes	N/A
Prepared	JA
Approved	SD

1 BACKGROUND

The first generations of arc flash protections utilized light sensitive arc sensors alone as the tripping criteria. 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 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.

1.1 PROBLEM OF AIR MAGNETIC CIRCUIT BREAKERS

When an air magnetic circuit breaker operates on a downstream fault, its arc shutes create an arcing that may result in activating any arc flash light sensor installed nearby. Since 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 incoming feeder circuit breaker.

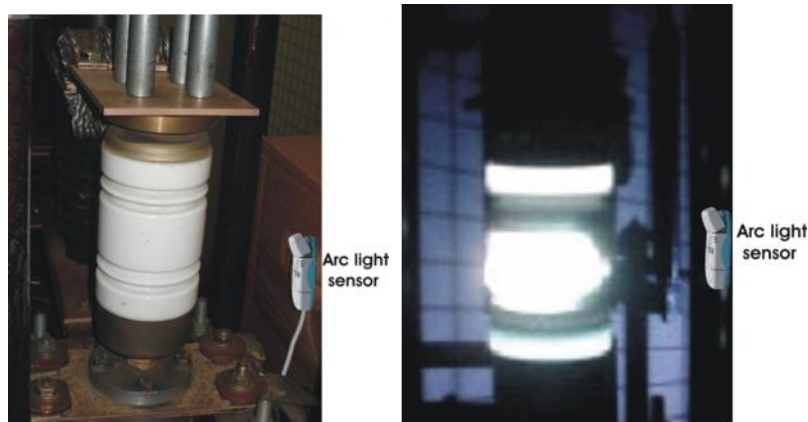


Figure 1: Arc flash light sensor activation during circuit breaker opening

1.2 SOLUTION

Adding arc flash *pressure* sensor into the schemes involving air magnetic circuit breakers provides for additional trip criteria 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 and easy to install solution. If applying an overcurrent sensing into the system, even a triple sensing system based on current & light & pressure trip criteria can be utilized.

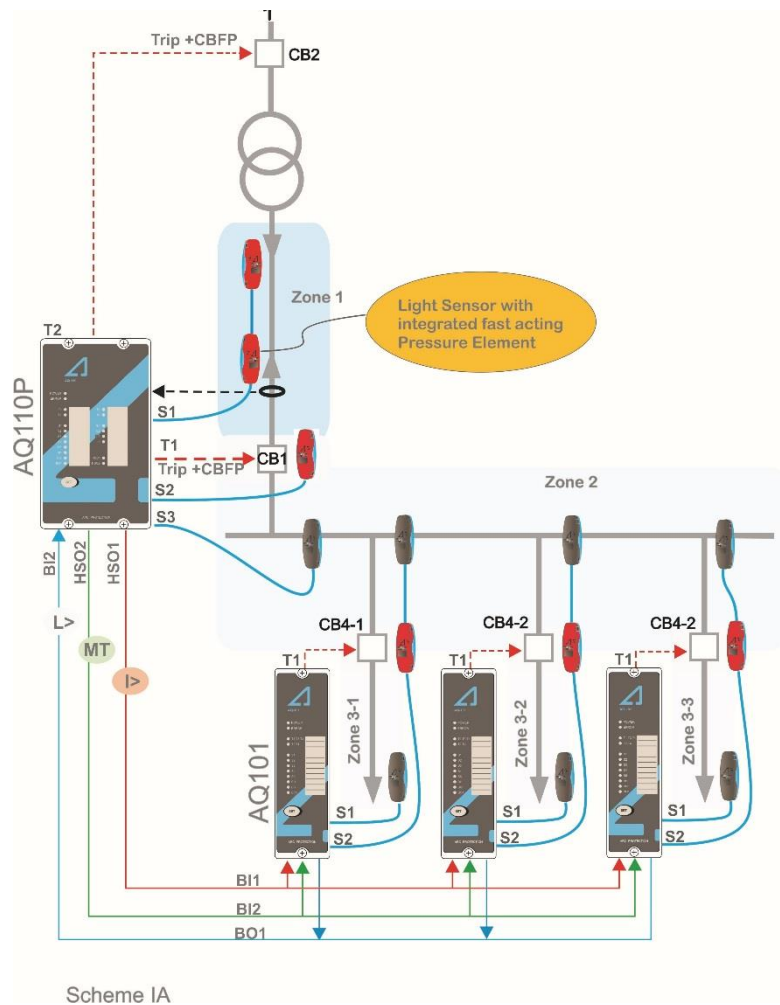


Figure 2: Arc flash protection scheme utilizing AQ 02 type of light and pressure sensor for circuit breaker chambers and incoming cable sections upstream of current transformer.



Figure 3: AQ02 type of pressure and light sensor

1.3 AQ 02 TECHNICAL SPECIFICATION

AQ 02 main technical specification	
Light Intensity thresholds ¹	8Klux/25Klux/50Klux
Pressure threshold setting (fixed) ²	0.2 bar above ambience
Pick up time ³	1ms
Trip time ⁴	7ms typically
Pressure measuring accuracy	±1.8 %FS (full scale)
Sensor wiring arrangement	2 wires and shield
Sensor cable specification	Shield twisted pair up to 0.75mm ² (21 AWG)
Max. sensor cable length per sensor channel	200 meters (656 feet)
Operating temperature	-20°C ~ 85°C
Storage temperature	-20°C ~ 85°C
Mechanical protection for photodiode element	IP60
Mechanical protection for pressure element	IP30
Mounting Screw Type	Phillips Pan-head sheet metal screw, Diameter: M3 Length: >16mm
Dimensions(WxHxD)	90.0x27.5x32.5 mm
Weight	20 g

1: Factory default setting options.

2: A standard atmospheric pressure is 1 bar.

3: Time for activation after exceeding the set threshold pressure.

4: Time for activation after exceeding the set threshold pressure, including output relay operation time.

2 CONCLUSION

Applying pressure sensor in arc flash protection system provides for increased system reliability without compromising the desired dual sensing criteria. Adding the pressure criteria is especially encouraged in systems involving air magnetic circuit breakers. Another recommended application for pressure sensing is in case of absence of current transformers in protected zone. AQ02 type of pressure and light sensor can be applied as a stand-alone solution with light and pressure tripping criteria alone or in combination with overcurrent condition resulting in triple sensing criteria.