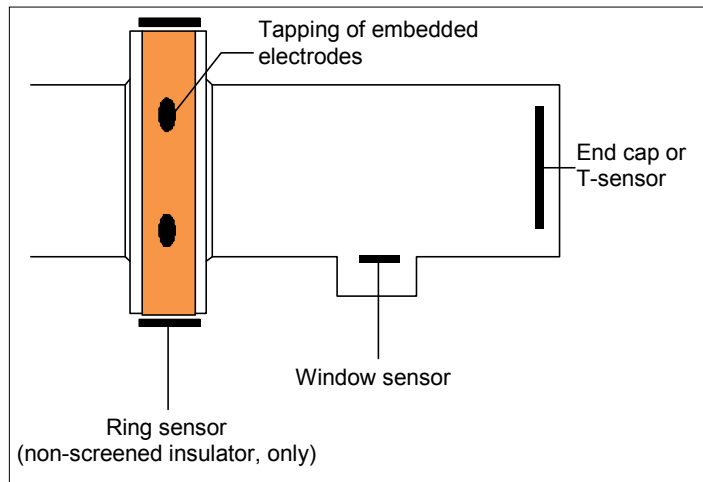


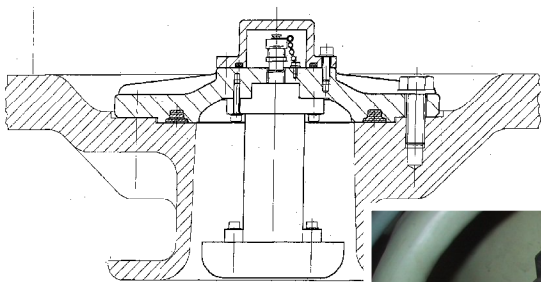
External Retrofit UHF Sensors

EFS1 and WS

Due to the dielectric properties of the SF₆ gas, partial discharge (PD) activity in gas insulated switchgear (GIS) covers a bandwidth of well beyond 2 GHz. The mechanical properties of the components of gas insulated switchgear further allow transmission of such signals over a distance of a couple of meters. Thus, partial discharge measurement on GIS equipment is done preferably in the UHF range. A sensor for UHF monitoring is basically an antenna. We distinguish two different types of sensors: those that were integrated by the GIS manufacturer and external retrofit sensors. Embedded sensors are most efficient because they offer highest sensitivity and the best signal-to-noise ratio. However, their installation requires opening the GIS. Any such opening of a GIS poses the risk of contamination with particles. Thus, embedded sensors are used mostly in case of new installations or in case of a major refurbishment of an old GIS, which requires the opening anyway. An external sensor is often less sensitive than the built-in, but it can be fitted to the GIS at marginal cost and whilst the equipment is on-line. Furthermore it's possible to retrofit a GIS with PD sensors by modifying internal components, such as metal shields, earthing switches, or embedded electrodes for the control of the electrical field.



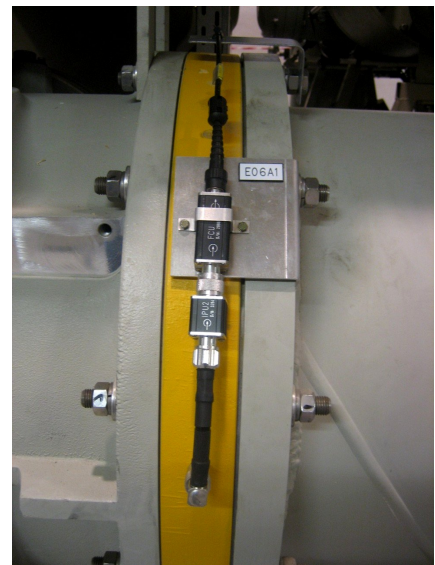
Examples of UHF sensor types



Embedded sensor (ABB)



Calibration impulse generator connected to an earthing switch



Embedded electrode, so-called "bed spring" sensor

Window Sensor WS

External window sensors can be mounted to inspection windows, which are frequently found with older GIS. Here, the obtained results with sensitivity are comparable to embedded sensors, if the window has a diameter of 80 mm or higher. Power Diagnostix offers such window sensors of different sizes to conveniently equip older GIS with UHF monitoring. In case well matched, such external window sensors offer a sensitivity of few pC.



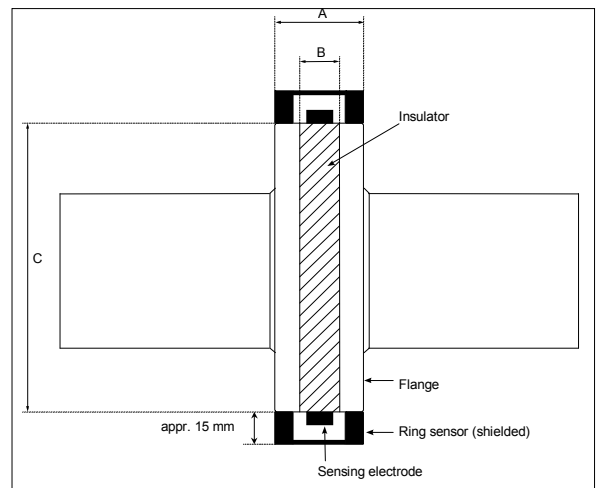
Window sensors with frequency processing units FCU2



Different types of inspection windows

Flange Sensor EFS1

With unshielded isolated spacers, such as epoxy resin disks, ring sensors offer capturing the radiated UHF field. Although the bolts tightly connect the two flanges at such spacer in terms of power frequency, a mayor portion of the UHF field is radiated between the bolts and thus captured by the shielded ring antenna of the external sensor. Such flexible ring sensors are tailor-made with respect to the dimensions of the GIS to be equipped. Required dimensions to be specified are the flange width (A), the insulator thickness (B), the maximum thickness, and the flange diameter (C), or the flange's circumference (see figure to the right).



External flexible ring sensors for non-shielded spacers



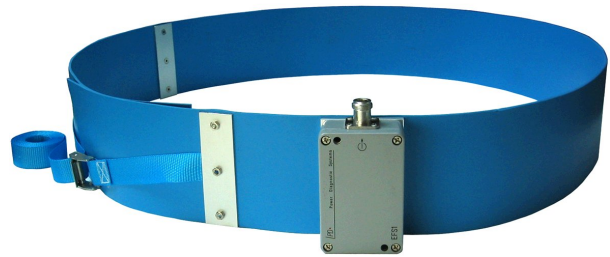
External flange sensor EFS1 (permanently installed)



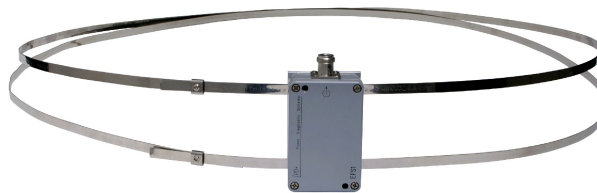
External flange sensor EFS1 (provisionally installed)



WS window sensors in different sizes



EFS1 sensor for temporary installation



EFS1 sensor for permanent installation

Technical Data

Window Sensor WS

| | |
|--------------------|---|
| UHF range: | Up to 2 GHz (depending on window size) |
| Output: | N-connector (female) |
| Window diameter: | To be specified upon order |
| External diameter: | Depending on window diameter, standard diameters: 60, 75, 80, 95, 100, 120, and 140 mm |
| Depth: | 15 mm and 25 mm |
| Mounting holes: | To be specified upon order |
| Protection: | IP52 (indoor application) |

Flange Sensor EFS1

| | |
|------------|--|
| UHF range: | Up to 2 GHz |
| Output: | N-connector (female) |
| Size: | Depending on flange dimensions, dimensions needed and to be specified upon order: flange diameter, width of spacer, width of flange + spacer, max. thickness |

Included in scope of delivery is a flexible mounting belt for temporary installation or a stainless steel belt fixture for permanent installation.