

Electrical safety in the electrical power supply

High availability of wind energy plants



Early detection instead of standstill

The protection of people and property against hazards due to electrical power is a key element of Bender's corporate philosophy and has been the focus of our actions since the invention of the ISOMETER in the 70s by Dipl.-Ing. Walther Bender.

Electrical safety therefore goes way beyond the implementation in device solutions. It is the constant challenge of always being that famous one step ahead and also having the courage to develop solutions that will only become standard tomorrow.

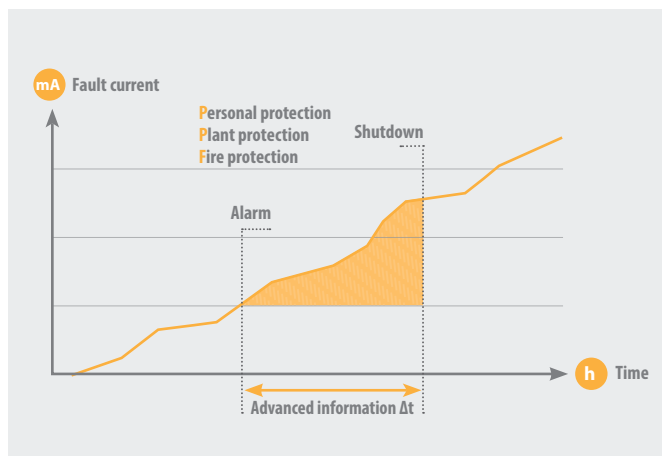
The most frequent cause of insulation faults or fault currents is defective insulation due to

- Mechanical damage to the cables due to
 - Vibration
 - Torsion
 - Wide temperature range
- Excessively low insulation resistance caused by
 - Moisture
 - Gearbox and hydraulic oils
 - Dirt
- Lightning

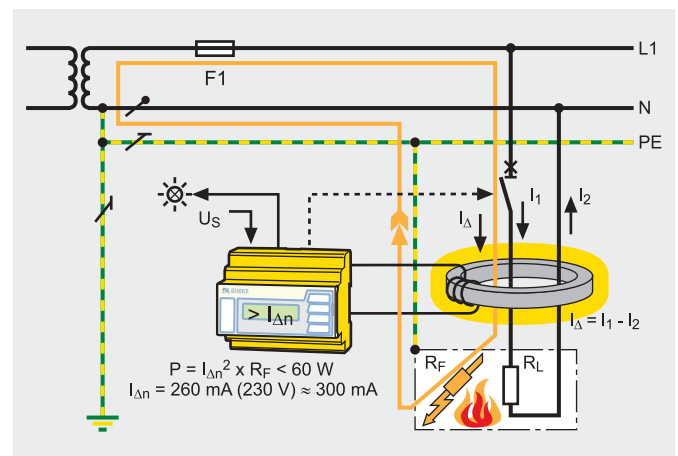
Fault currents or insulation faults have serious consequences, e.g.:

- High costs due to interruptions in operation
- Risk of fire in case of power dissipation $> 60 \text{ W}$
- Failure of safety critical systems
- Unplanned maintenance measures
- Unexpected triggering of protective devices
- Hazards for maintenance personnel

In earthed systems



Information edge due to RCM



Risk of fire due to insulation fault ($P > 60 \text{ W}$)

Residual current monitoring device / system (RCM / RCMS) in practice – protection against unexpected shutdown and risk of fire

What should you do?

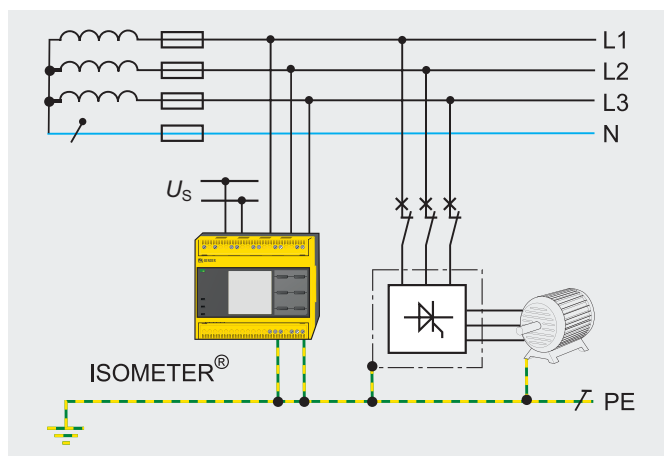
- Permanently monitor the residual current on important components
- Install residual current monitoring devices/systems in addition to existing protective devices
- Keep the insulation resistance of the installation high by immediately localising and rectifying insulation faults

Your benefits

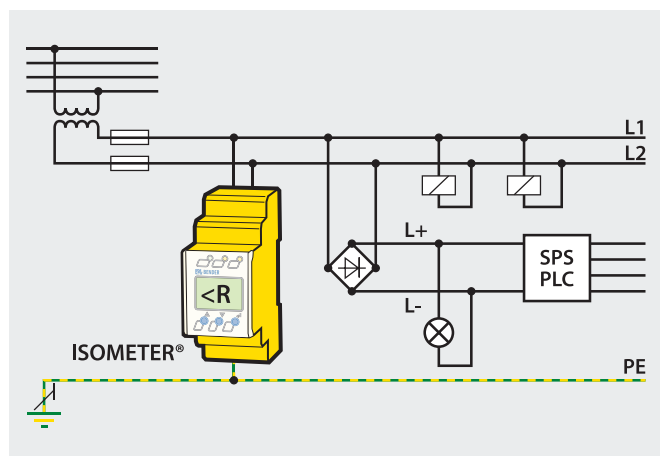
- Increased availability of the installation
- Personnel, fire and installation safety
- Increased rate of return on the installation due to reduced downtimes
- No unexpected shutdown, fault currents in the mA range are detected at an early stage and signalled
- Service visits can be better planned



In unearthed systems



Insulation monitoring in main circuits



Insulation monitoring in auxiliary and control circuits

Insulation monitoring devices (ISOMETER®) in practice – superior early warning system

Unearthed power supplies (IT system) have an invaluable advantage in that a first insulation fault will not cause a failure. As a result complex processes and the operation of the wind energy plant are not interrupted. Quite the contrary, IT systems can continue to operate under controlled conditions and faults can be rectified at an appropriate stage, without incurring the costs associated with failures.

IT systems differ in relation to the voltage, the natural insulation resistance, the magnitude of the leakage capacitances and the voltage waveform (AC, DC, AC and DC components, etc.). These features define the requirements on the insulation monitoring.

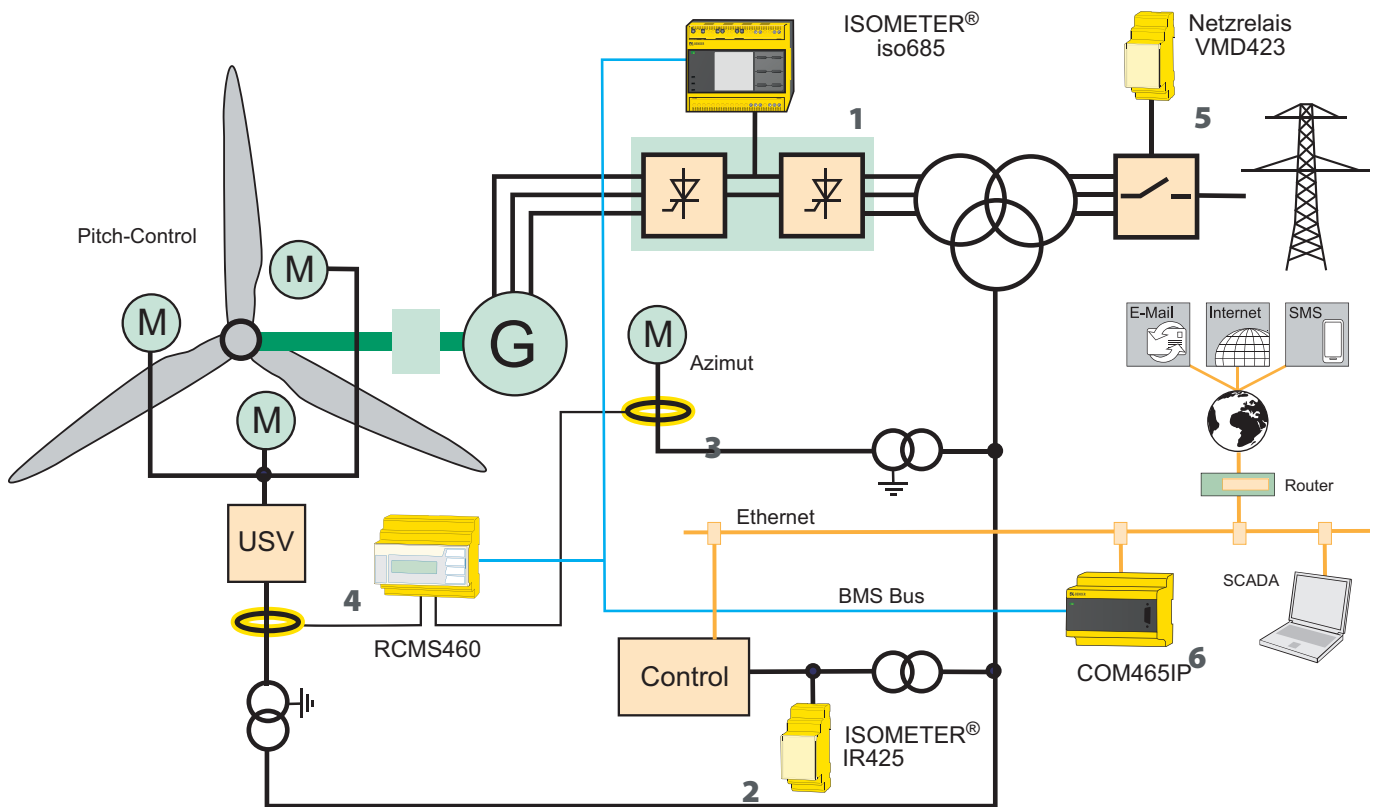
What should you do?







- Select the IT system
- Use a suitable insulation monitoring device (ISOMETER®)
- Permanently monitor the entire insulation resistance

Your benefits

- Highest possible availability of the installation, as the first insulation fault does not result in shutdown
- Higher, more reliable earthing resistance
- Due to low fault currents, no risk of fire
- More flexibility during maintenance
- Improved electromagnetic compatibility
- Crucial early warning

Product overview



No.	Bender device functions	Example application in the wind power installation	Bender devices
1	Insulation monitoring There is no interruption in operation on the first insulation fault.	Generator circuit	 Insulation monitoring device ISOMETER® iso685
2	Control errors and failures of control and display equipment are avoided.	Control circuit	 Insulation monitoring device ISOMETER® IR425
3	Universal AC/DC sensitive residual current monitoring Unexpected shutdowns in safety-critical systems and standstill of the wind energy plant are prevented.	Pitch control	 Multiple channel AC, pulsed DC and universal AC/DC sensitive residual current monitoring system RCMS460
4	Makes it possible to detect a gradual insulation degradation.	Yaw control	 E.g. using measuring current transformer W35AB
5	Grid monitoring Monitoring of phase sequence, frequency and voltage with threshold parameters that can be configured.	Point of supply	 Voltage and frequency monitoring relay VMD423
6	Communication Gateways make it possible to transmit the insulation resistance and the residual currents to monitoring systems.	Condition monitoring and SCADA	 BMS Ethernet gateway COM465IP



Bender GmbH & Co. KG

P.O. Box 1161 • 35301 Gruenberg • Germany
Londorfer Straße 65 • 35305 Gruenberg • Germany
Tel.: +49 6401 807-0 • Fax: +49 6401 807-259
E-mail: info@bender.de • www.bender.de

Photos: Adobe Stock (© instamatics, © fineart-collection) and Bender archives.



BENDER Group