

# PDU – New Features Ensure More Safety and Reliability

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### Your Speaker





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- Study of Electro- and Communication-Technology
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## **Bachmann Group**



Headquater in Stuttgart, Germany

Around 800 employees world-wide

Manufacturing plants Germany, Romania and China









#### **Products and Solutions for Data Centres**







# **Power Distribution Units by Conviction!**

Technologies for Data Centers



## Safety and Reliability – Identify Default Risks in an Early Stage







## Are You Sure, That Your Data Center Operates Smoothly and Securely?





Hm, usually yes ...

He is initially thinking of the ...

- Existing Firewall
- Access Control
- Backup Data Center
- Mirrored Data Storage
- etc. etc. etc.



## At first a few basic points ...







#### At first a few basic points ...



The operation of electrical installations is governerd by rules and regulations based on NEN-EN50110-1.

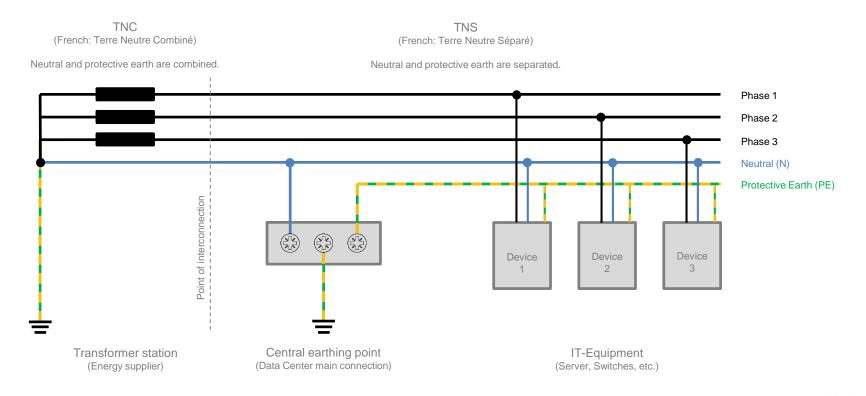
- This means that ... Access only for authorized personnel. (qualified elctricians, electrically qualified)
  - Regularly repeted inspections and testing based on IEC60364-6
- This means that ... Visual inspection while day-to-day business
  - Periodically testing (e.g. Generator, UPS, etc.)
  - Measurement (e.g. insulation measurement in a deenergized state)
- This means that ... Data center shutdown!!!

How can we avoid down times in general?



## Electrical Engineering Basics: The Electricity Grid

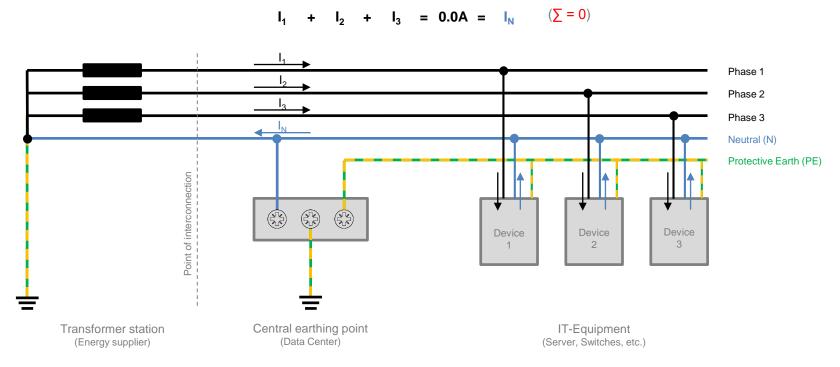






## Electrical Engineering Basics: 3 Phase Alternating Current





Lesson 1: The sum of all currents is zero.



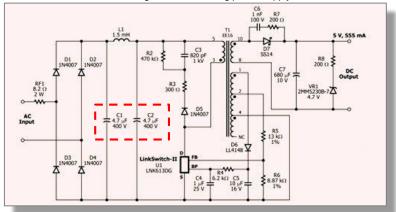
## Leakage Currents in Data Centers: Switching Power Supplies

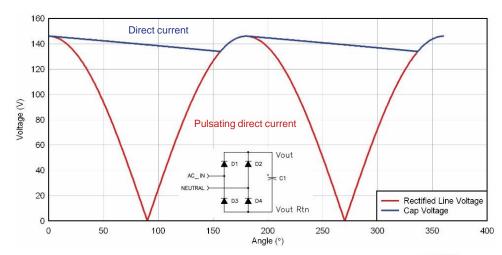


In Data Centers all the switches, servers, etc. are equiped with a substantial number of switching power supplies. These power supplies utilize electronic filters with capacitors which are connected to the protective earth.

After rectifying the alternating current the capacitors conduct the pulsed current to the protective earth in order to improve the quality of the direct current. In this case we are talking about the so called technically induced leakage current.

#### Circuit diagram of a switching pewer supply





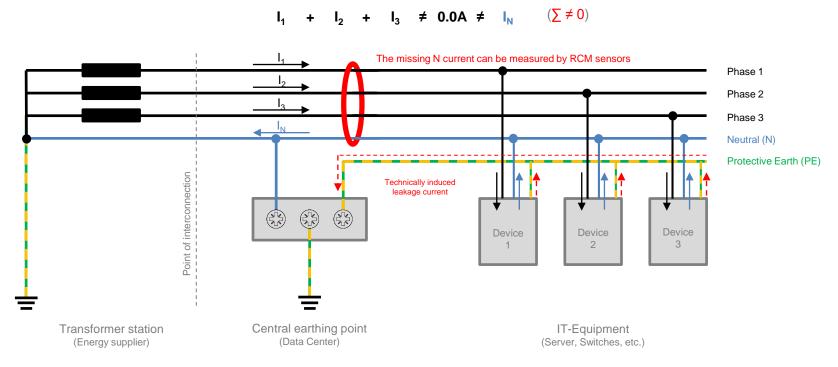
Source: www.kulon.com

Source: analog-praxis.de



## Leakage Currents in Data Centers: Switching Power Supplies



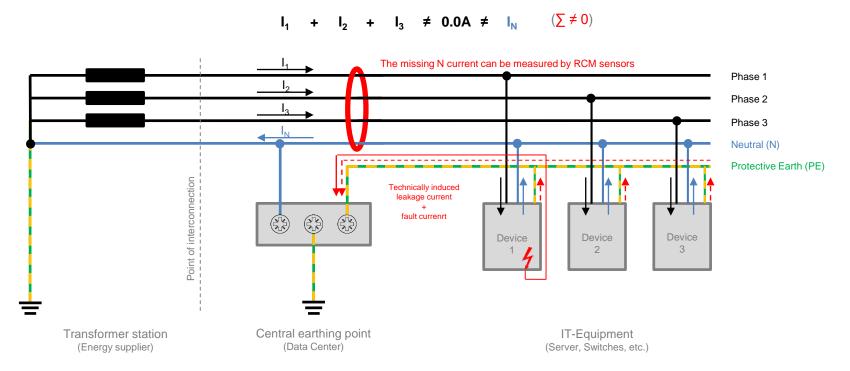


Lesson 2: The are some leckage currents.



## Leakage Currents in Data Centers: Switching Power Supplies





Lesson 3: Insulation faults can call fault currents.



#### Leakage Currents in Data Centers: What sensor is the right one?



The RCM sensor which we use is **B-type** based on the international standard IEC 62020 "Electrical accessories - Residual current monitors for household and similar uses (RCMs)".

RCM sensor AC-type detects only AC residual currents.



RCM sensor **A-type** detects AC and pulsating DC residual currents.



RCM sensor **B-type** detects AC, pulsating DC and smooth DC residual currents.



Typical waveforms of a switching power supply DC OUT AC IN Detection Waveform 3 Waveform 4 Waveform 5 Waveform 2

Source: www.omron.con

In order to detect defective electronic components RCM sensors B-type are required



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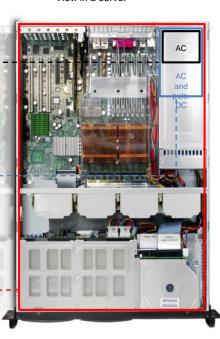
RCM sensor **B-type** detects AC, pulsating DC and smooth DC residual currents.



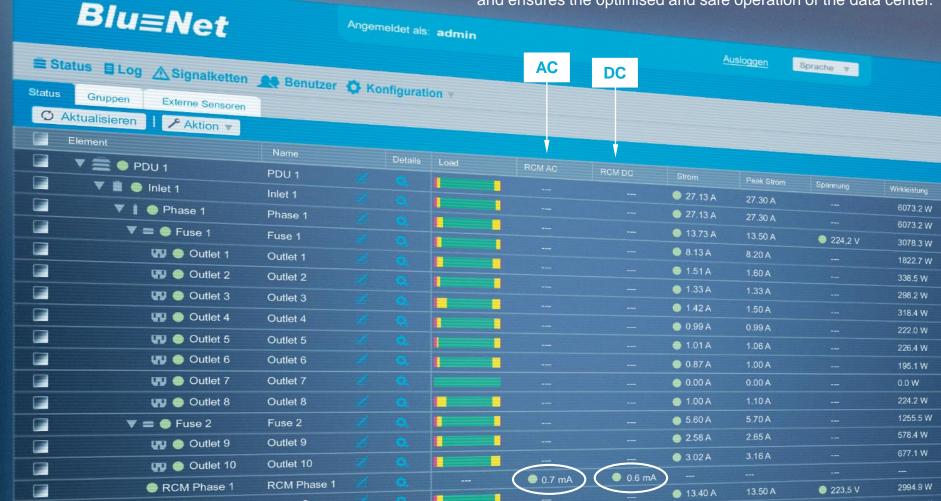
After the power supply there are only smooth direct currents. Therefore, only the RCM B-type sensor is able to monitor the entire device.



View in a server

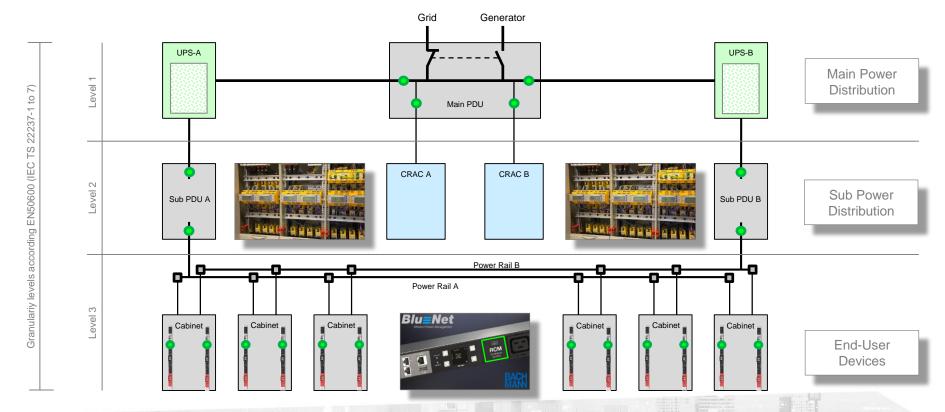


The **BlueNet** Software is constantly evaluates the RCM measurements and ensures the optimised and safe operation of the data center.



## Leakage Currents in Data Centers: Systematic Monitoring







UPS – Uninterruptible Power Supply CRAC – Computer Room Air Conditioning



# Reliability and Fail-Safe Operation – Identify Default Risks in an Early Stage Hill TROWN

Preventive Power Analyses

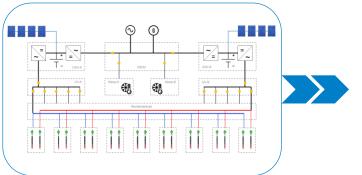




## **Evaluation and Recording of RCM Datas**







Transmission of mesasured values from the data center to the Cloud



Evaluation of the measured values by big data



Source: www.computerwoche.de



Average measured RCM values - Data Center - March 20, 2018			
Rack 1	Circuit A	14,17 mA (AC)	7,23 mA (DC)
	Circuit B	13,96 mA (AC)	4,16 mA (DC)
Rack 2	Circuit A	8,35 mA (AC)	2,41 mA (DC)
	Circuit B	8,85 mA (AC)	2,91 mA (DC)
Rack 3	Circuit A	11,23 mA (AC)	3,29 mA (DC)
	Circuit B	11,65 mA (AC)	3,89 mA (DC)
Rack 4	Circuit A	14,17 mA (AC)	7,23 mA (DC)
	Circuit B	13,96 mA (AC)	4,16 mA (DC)
Rack 5	Circuit A	16,13 mA (AC)	3,71 mA (DC)
	Circuit B	15,89 mA (AC)	4,10 mA (DC)
Rack 6	Circuit A	8,35 mA (AC)	2,41 mA (DC)
	Circuit B	8,85 mA (AC)	2,91 mA (DC)
Rack 7	Circuit A	14,17 mA (AC)	7,23 mA (DC)
	Circuit B	13,96 mA (AC)	4,16 mA (DC)
Rack 8	Circuit A	8,35 mA (AC)	2,41 mA (DC)
	Circuit B	8,85 mA (AC)	2,91 mA (DC)





Source: www.businessinspanien.com

Certified and secure data storage

Detailed measurement protocols



Reports (daily, wweekly, etc.)

### Leackage Currents in Data Centers: We did it in our own data center!

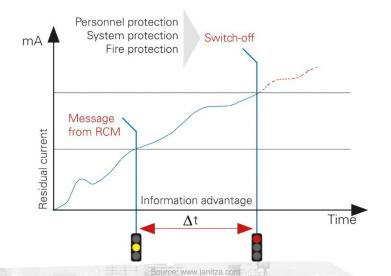




RCM system with optical and acoustic alarm

Status OK, leakage current < 30mA
Status WARNING, leakage current is > 30mA (and <100mA)

Status ALARM, leakage current is > 100mA





#### Residual Current Monitoring: Benefits at a Glance



#### > Preventive electrical safety for man and machine

The leakage/fault current can achieve values up to 10A in a large Data Center. Starting from a value of 30mA we talk about dangerous electric shocks.

#### > High availability of the power supply

Faults in the electrical installation can be detected at an early stage.

#### > Reducing of EMC disturbances

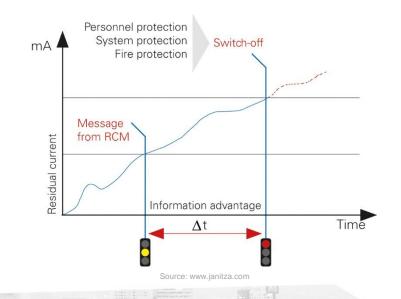
Malfunctions (e.g. undesired shut down) can be prevented by RCM systems.

#### > Time- and cost-optimised maintenance

The causes of critical measurements can be identified and localised.

#### Enormous savings on periodic inspections

The measurement reports are proof enough for a perfect insulation level of the electrical installation.







# Contactgegevens

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