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... mehr als Leckageüberwachung

„ENERGY EFFICIENCY FOR A LOW CARBON ECONOMY“ BELGRAD, SERBIA – FEBR. 19th. 2014

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Who I am: Gerold Franz, Brandes GmbH, Germany

- specialists for **“pipe network monitoring systems”**
- largest independent and neutral system-supplier for more than 45 years in DHC-networks
- market leader for leakage detection and automatic localization
- delivering “network monitoring” for
  - “Nordic-system” (copper system)“
  - “Brandes-system” (NiCr system)
- supply energy providers & industrial companies in over 30 countries
- delivered more than 47.000 km of NiCr-sensor cable for leak detection & localization

Our aim:

- Energy efficiency can be increased significant by optimization of the DHC-network
- The challenge is to get a minimum loss of heat and water
- Therefore a **"network monitoring system"** for early leakage control and automatic localization is necessary

OR

- Prevention than reconstruction!
- Nothing saves more money and is more efficient than minor repairs instead of big renovations!

Pipe networks

- District heating networks today are performed mainly as underground pipe systems.
- The most significant pipe is the pre-insulated pipe system according AGFW working-sheet FW 401 and EN 253.
- More than 80% of the pipe networks are equipped with an in the thermal insulation integrated leakage monitoring system (according EN 14419).

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Root causes for water and heat loss:

Most system damages due to minor assembly quality (appx. 75%)!

- primarily the design of the sleeve joints (39%),
- leaking welded connections (14%) and
- quality defects in pre-insulated pipes and
- defects in thermal insulation (6%)
- etc.

Source: Schadensstatistik KMR 2010 AGFW)

Than we still have external damages like:

- civil and underground engineering
- excavation work
- etc.

Most damages based on defects like wetting insulation due to leaky sleeve joints and late damage opening (because nobody knew it).

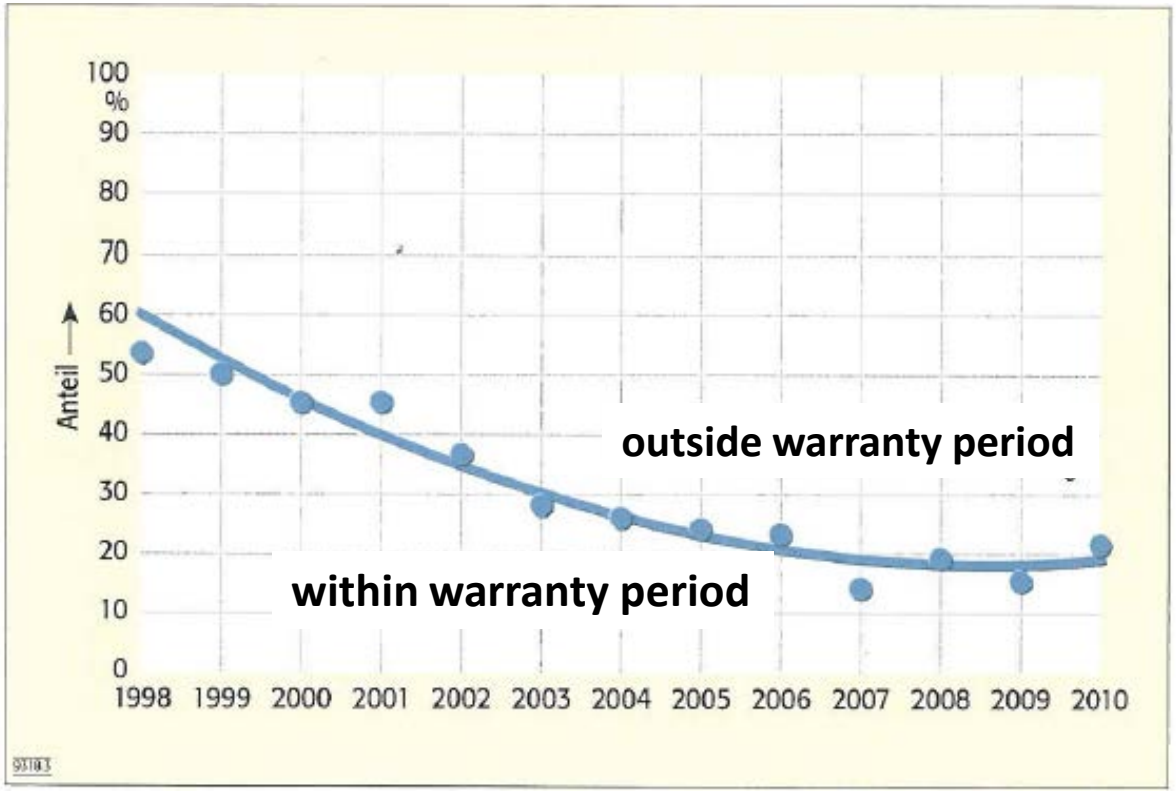
Poor construction: welding failure, fast and strong penetration of the insulation foam. Loss of thermal insulation. Loss of adhesion. Hydrolysis of the insulation foam. Pipe corrosion. → total loss

Extensive insulation damage by ruptured pipe.

Corrosion damage due to wetting and too late elimination of the insulation damage. No or insufficient leakage detection.

Civil engineering and excavation damage: destruction of pipe and the insulation. Damage caused by excavation are recognized without automatic pipe network monitoring too late or never.

Share of damages in the warranty time

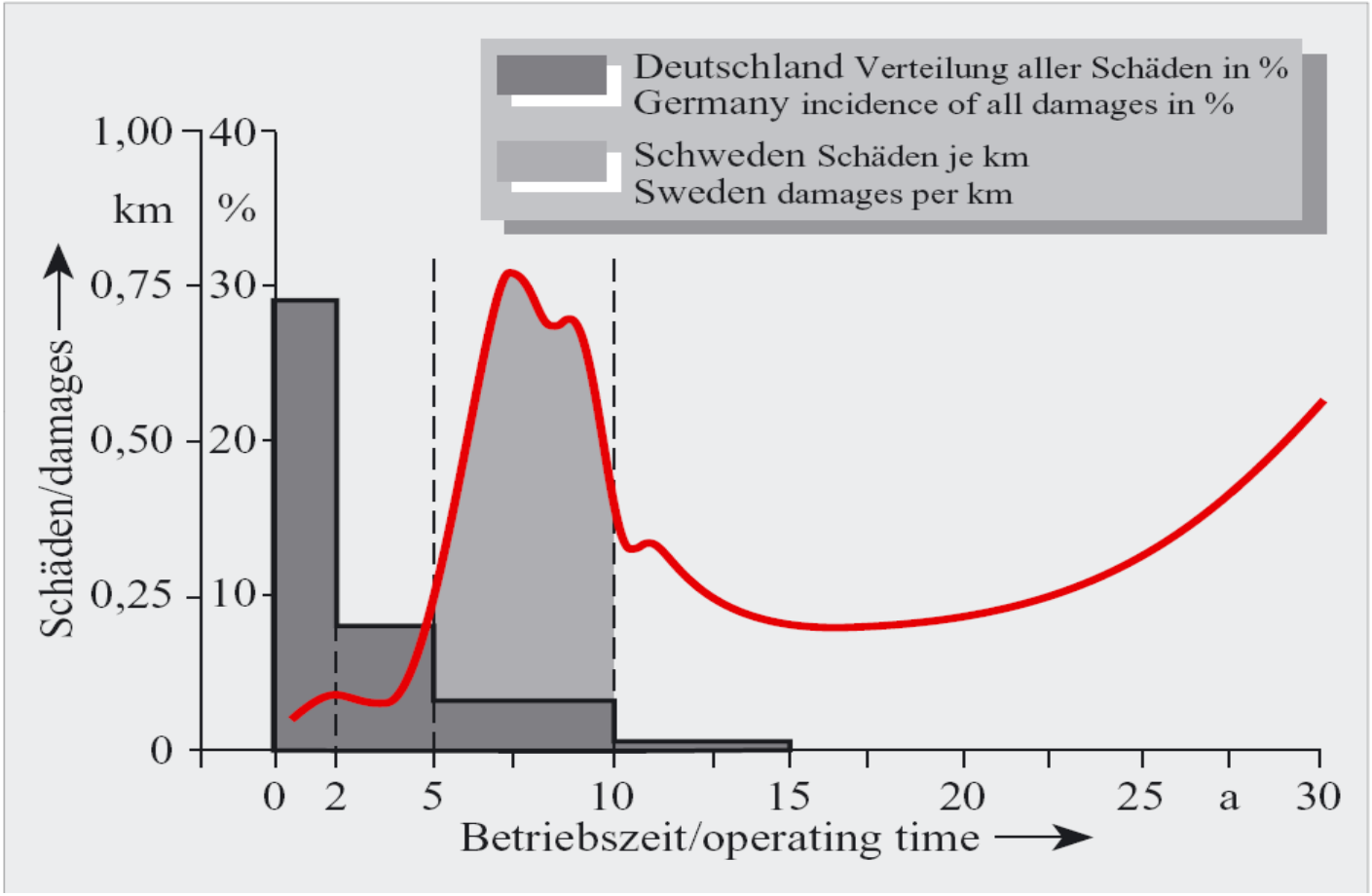


The observed damages during the warranty period, usually five years, are almost constant in recent years.

In 2010, approximately 21% of all damage was detected during the warranty period.

(Source: Schadensstatistik KMR 2010 AGFW)

Damages during operating time



(Source: Studsvik)

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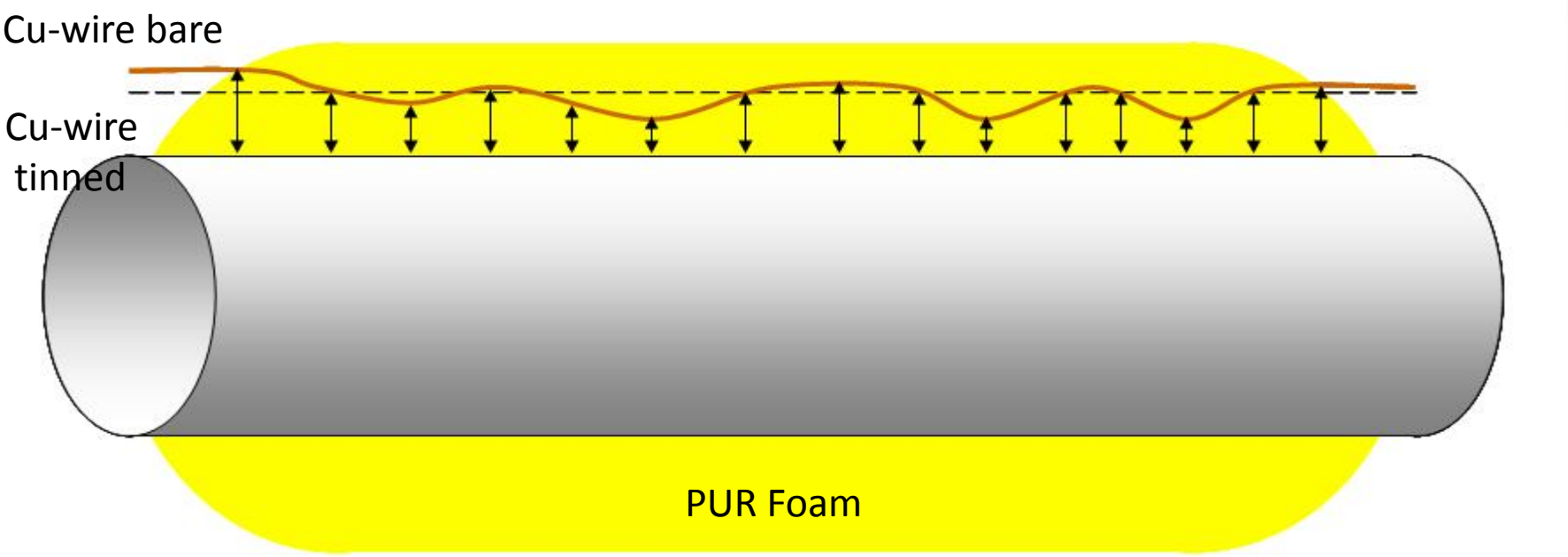
Principles of monitoring & leakage detection:

Two physical measurement principles became established over the years:

- TDR „Time domain reflectrometry“ („Nordic“ or Cu-System)
- Resistance detection system („Brandes“ or NiCr-System)

There are significant physical differences between these systems!

Nordic / Cu-System

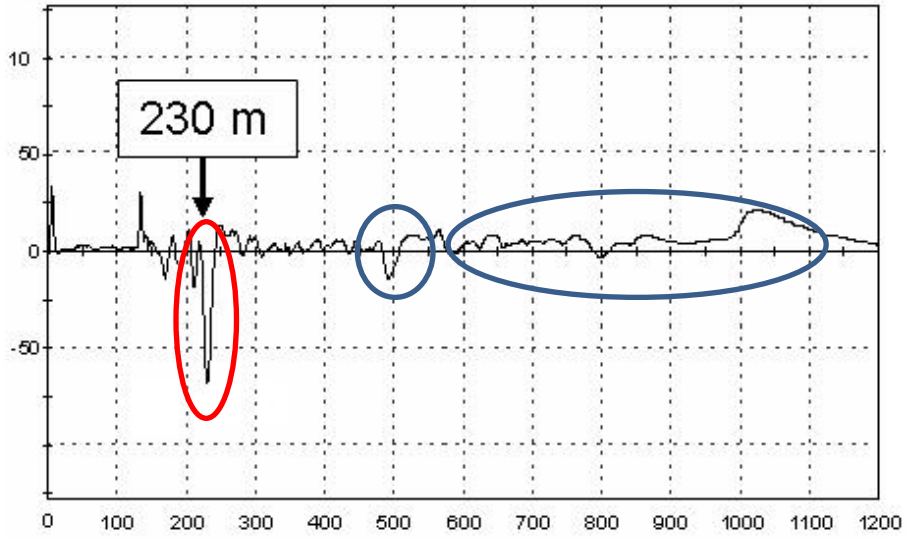


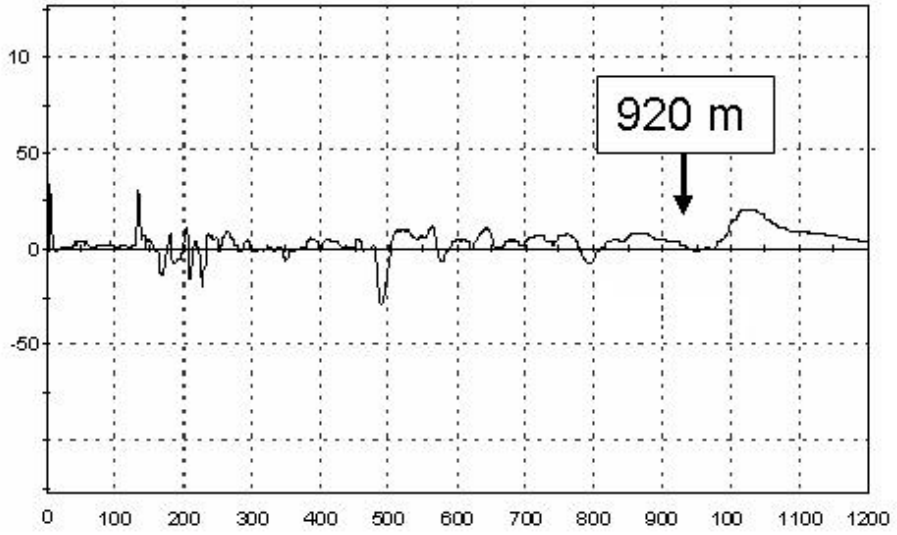
Wire and pipe are forming a line element for the transmission of high-frequency measuring pulses.

Varying distances and pipe diameter cause inhomogenities of the line impedance that lead to various pulse reflections.

Nordic Cu-System

Reflection of a leak at 230m and 920m (Fault resistance R_{Iso} each 1,2 kΩ).





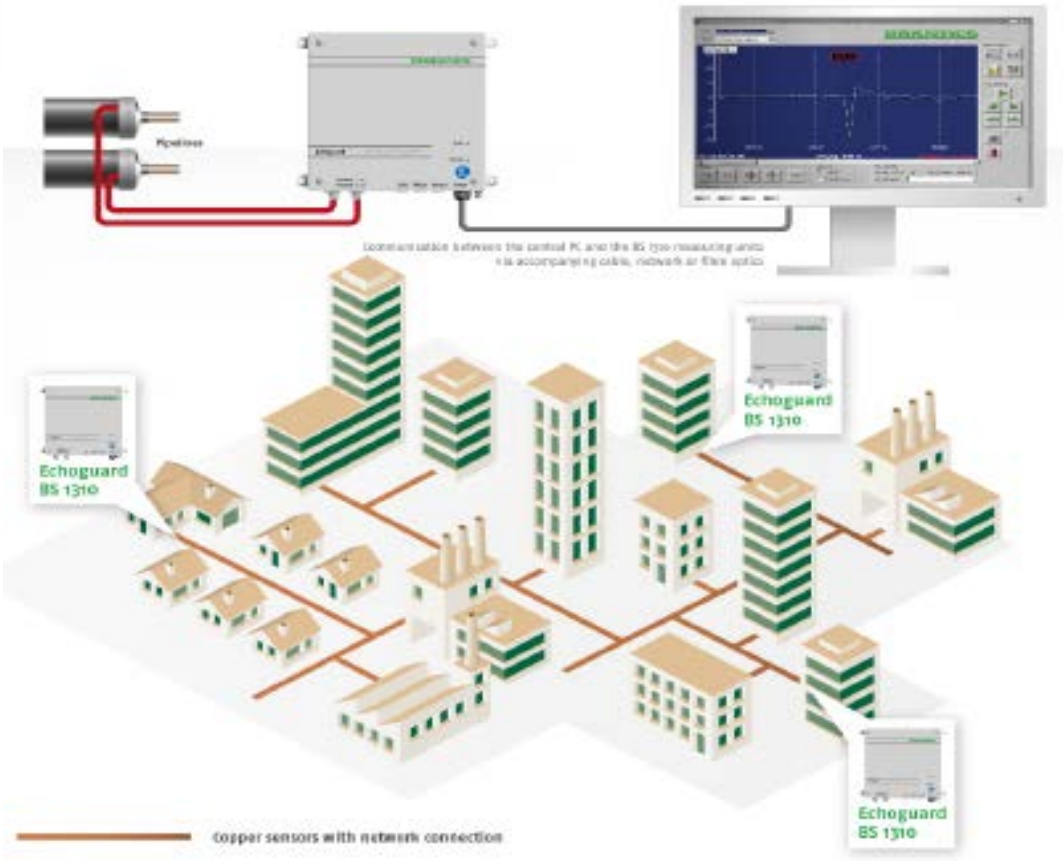
- Typical impuls reflectograme in Nordic systems.
- The wire attenuation makes it impossible to locate leaks over long distances. See location at 230m and at 920m
- Detection and localization possible **< 10 KOhm**

Nordic Systems (unspecified / unspecialized gauges)

The use of unspecified multimeter and other insulation testers for checking insulation values provides unrealistic and not reproducible measurement values.

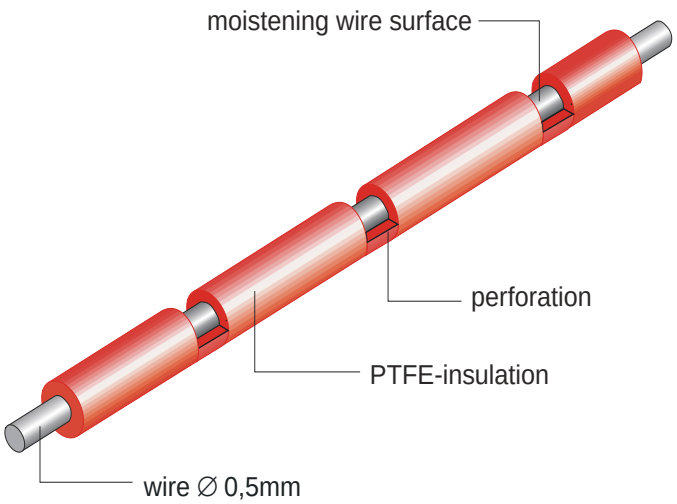
Reflectometer are specially designed for the measurement of specific cable types and thus are not suitable in any case for the application of the Nordic systems.

Copper sensors with automatic location (Brandes)

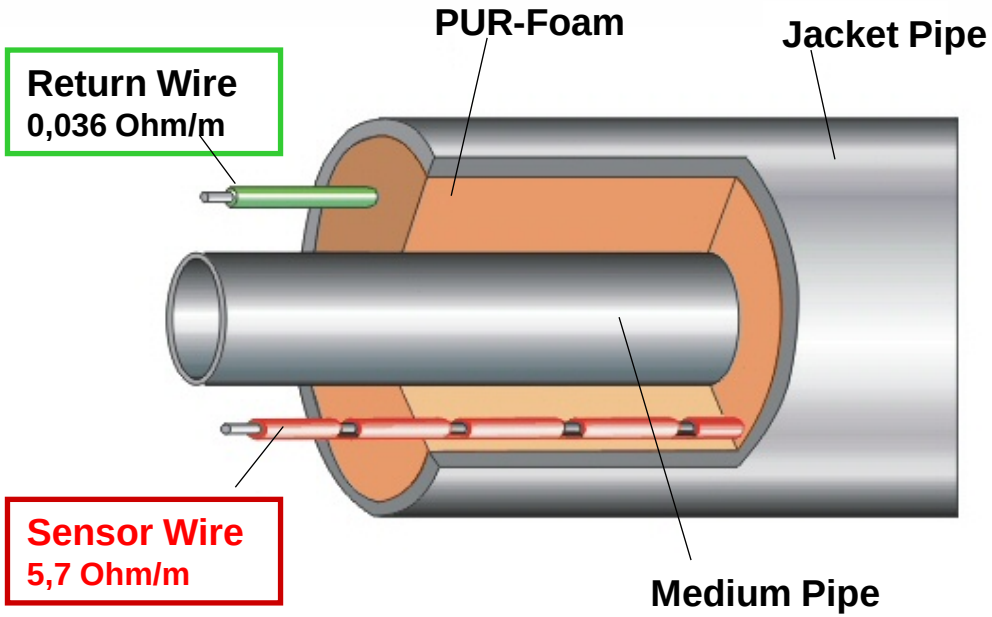


Brandes NiCr-System

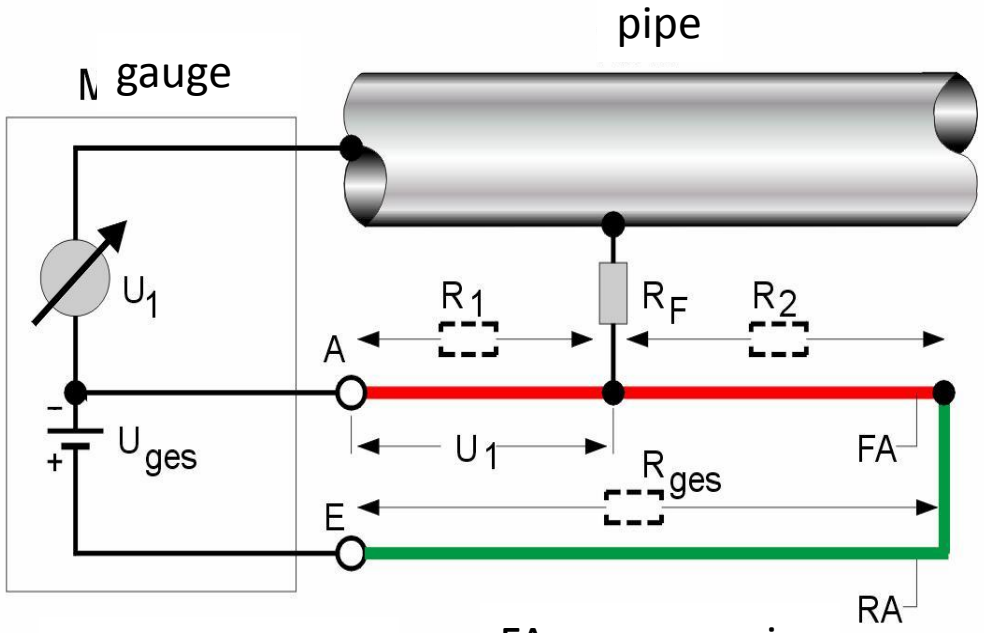
Sensor wire (NiCr)



resistance 5,7 Ω/m



Brandes NiCr-System



A = start (0%)
E = end (100%)

FA = sensor wire
RA = return wire

Brandes location principle:

The unloaded voltage divider allows any distance on the same response.

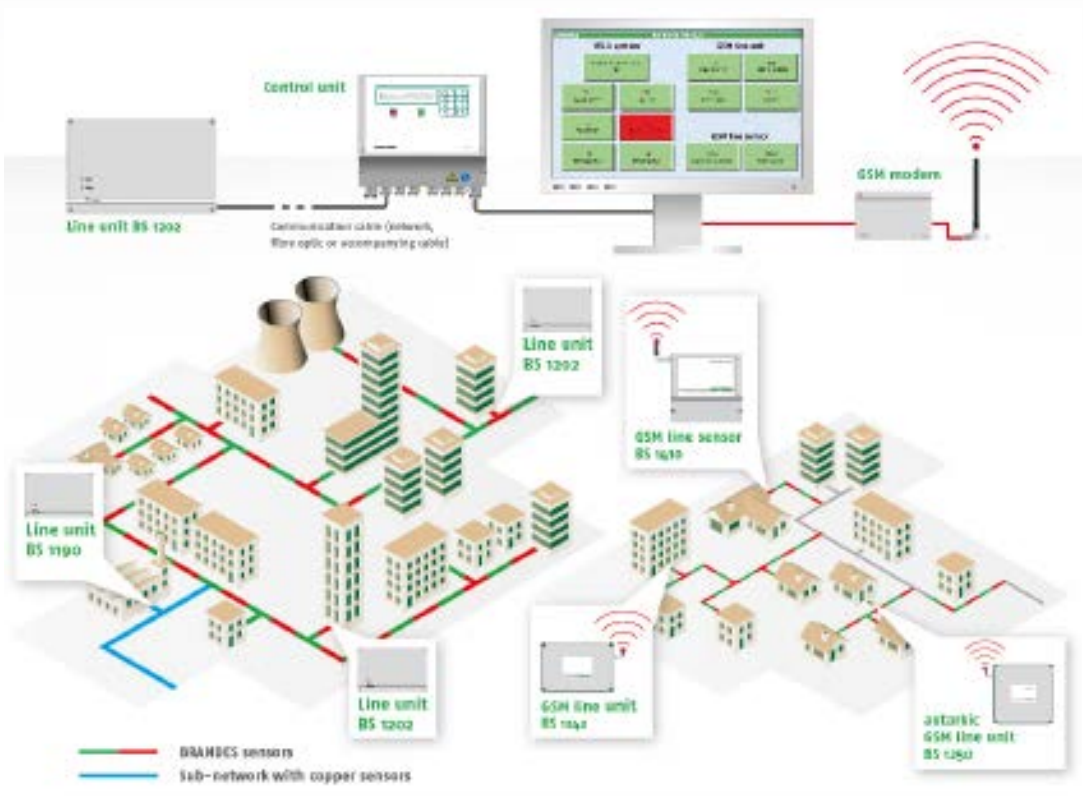
Possible disturbances by low-and high-frequency sources have no influence.

The positioning tolerance does not vary.

Full electronic analyse and calculation

Detection and localization
< 5 MOhm

Integration of various sub-networks (also mixed integration NiCr & Cu)



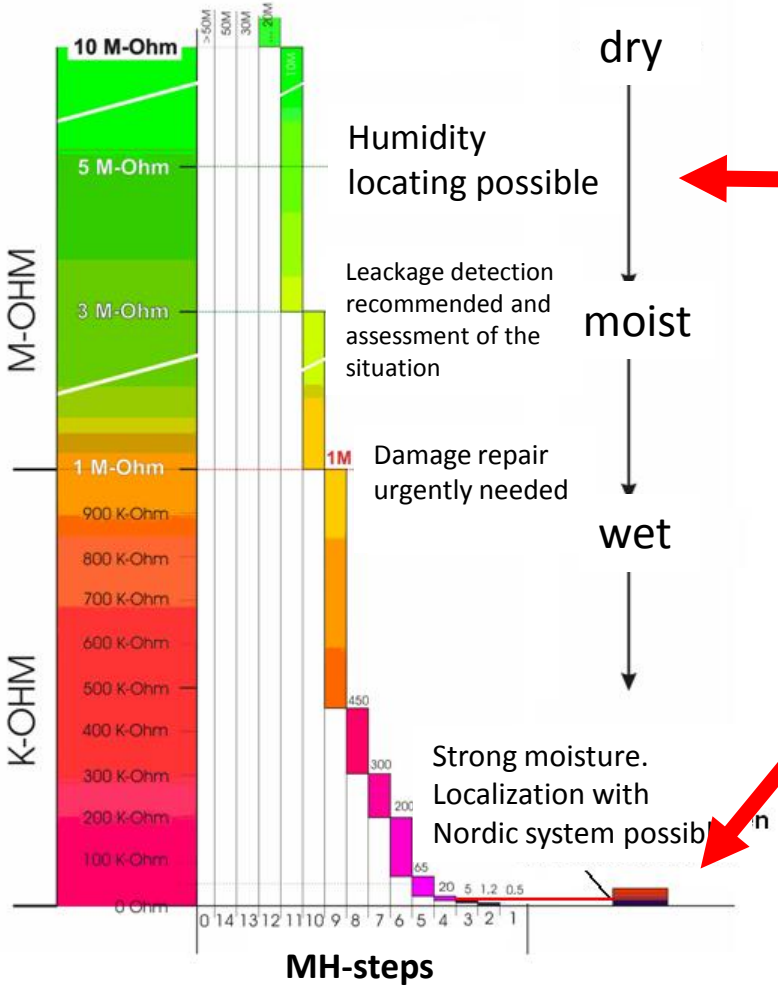
Customized solutions from a single device to remote communication on the WWW.

Integration of any measurement loops ("Nordic", “Brandes”, “HDW” -systems ...) in a Brandes system.

Ergonomic operating levels. Central control panel and remote communication arbitrarily large networks.

Ongoing product maintenance and further development.

Comparison NiCr vs. Cu / measurement possibility / physical difference



Possibility of moisture detection with NiCr (Brandes) system as early as < **5 M-ohms ;** when the moisture in the insulation foam is currently being built

Leak detection with Cu (Nordic) systems and impulse-only below < **10 k-ohms;** when the pipe was already soaking wet and the leak has started to spread

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Recommendations

- Adopt, use, and control regulations and rules (AGFW). That protects your interests in case of profitability and efficiency.
- Organize tests for the pipe quality already in the construction and start-up phase.
- Take a quality manager to protect and control your construction sites to keep high quality.
- Provide an independent monitoring that protects your interests. Only long life and long-term usage of a DHC-network is profitable and efficient.
- Organize good services and quick repairs that identified problems cannot grow.

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Selection of projects (>47.000 km)

- Munich (D)
- Hanover (D)
- Berlin (D)
- Dusseldorf (D)
- Augsburg (D)
- Saarbrucken (D)
- Essen (D)
- Amsterdam (NL)
- Heerlen (NL)
- Bern (CH), Zurich (CH)
- Milano (I)
- Roma (I)
- Torino (I)
- Ferrara, Bologna (I)
- Bruneck (I)
- Toblach / Innichen (I)
- Brixen (I)
- Warszaw (PL)
- Wroclaw (PL)
- Bialystok (PL)
- Paris (F)
- Marseille (F)
- Sofia (BG)
- Bucuresti (RO)
- Buzau (RO)
- Ploesti (RO)
- I asi (RO)
- Yantai, Tianjin (CN)
- Datong (CN)
- Riyadh; Jeddah (RSA)
- Bundang / Anyang (RK)
- Istanbul, Maltepe (TR)
- Kuwait
- etc.

Thank you for your attention!

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