Intelligent Measuring Technology For The Future

Luzern, 21. November 2014

swiss.smart.simple.

GWF

CHRIS BOLD, GWF EXPORT SALES MANAGER

- 16 years in utility metering industry
- Previously with Sensus International in South Africa and Germany
- Joined GWF in Switzerland in 2004
- MID Certified Verification officer
- Currently manages exports of meter systems to Europe, Middle East, North American and China
- Leading Aqua Promotion Group

AGENDA

- Introduction to GWF….Swiss, Smart, Simple
- Thermal Energy Systems and Thermal Metering Market Overview (Europe)
- European Metering Standards
- Thermal Metering 101
- GWF Thermal products and complete metering solutions
- FAQs and Best Practices

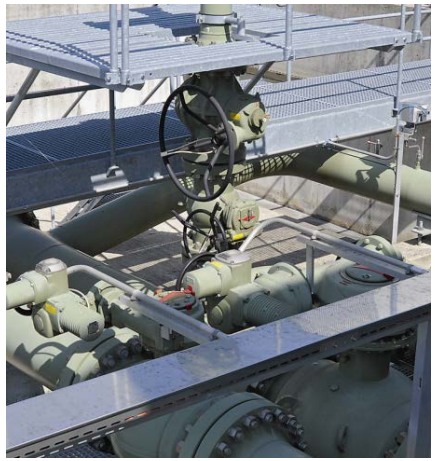
Introduction to GWF

Luzern, 21. November 2014

swiss.smart.simple.

GWF

GWF - MISSION



Gas

Water

Electricity

Thermal

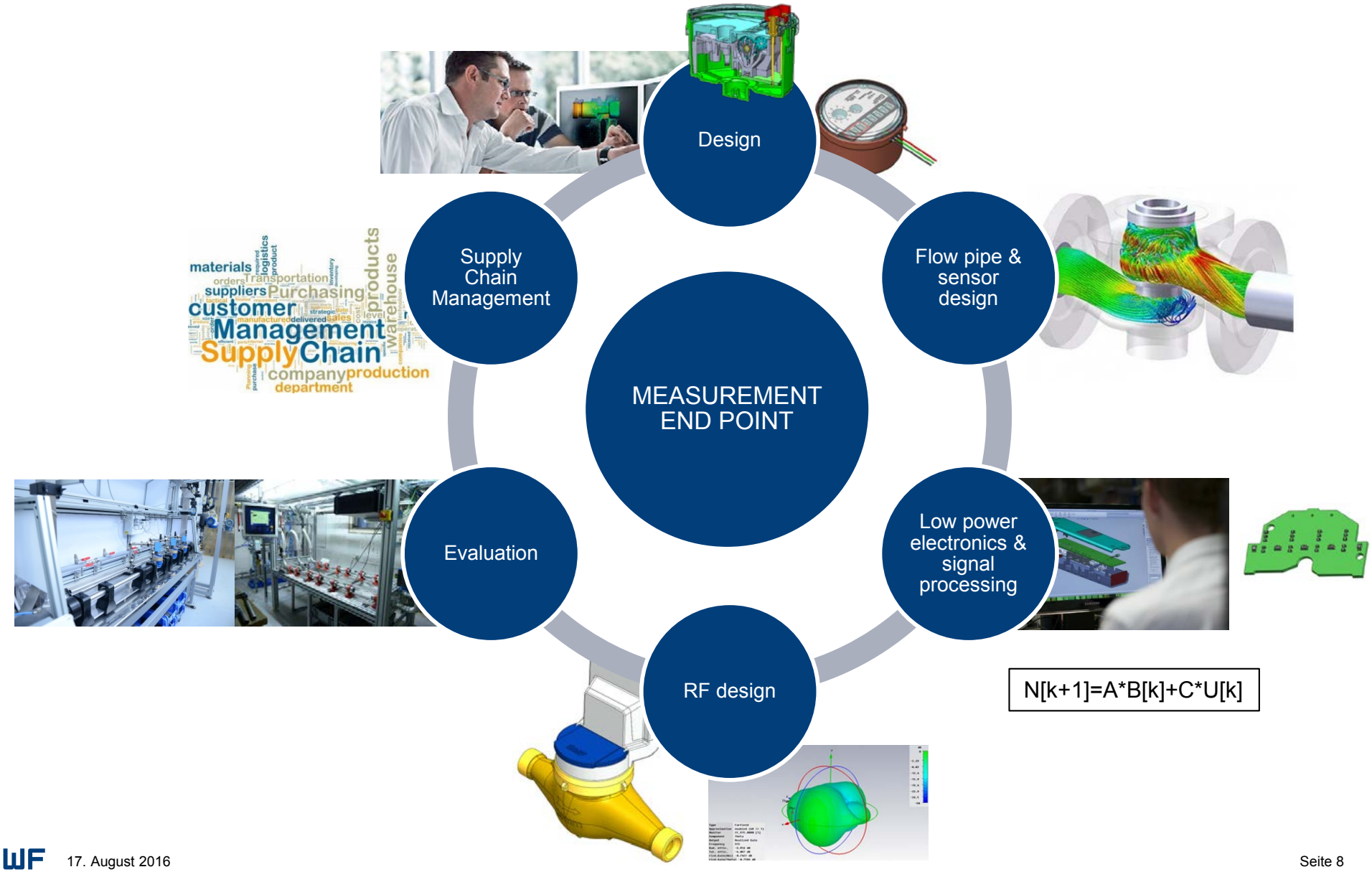
GWF Facilitates sustainable energy usage. We offer trendsetting Smart Metering system solutions based on precision measuring instruments with the **patented GWFcoder®-Technology** and interoperable M-Bus communication.

GWF – swiss.smart.simple.

Business entity	Joint-stock company (Family owned)
Founded	1899 in Lucerne
Employees	approx. 155
Turnover	47 MCHF, 39 MEUR, 56 MCAD
Encoder Licences	Elster, Sensus, Badger Meter, Metron Farnier, Apator Metrix
Quality System	ISO 9001, ISO 14001, OHSAS 18001
Directives EU	MID 2004/22/EC B+D, ATEX 1994/9/EG Encoder
Verification center	Gas, Water and Heating according to ISO/IEC 17020 and ISO/IEC 17025

GLOBAL PRESENCE

R&D: OUR VISION FOR THE FUTURE



Thermal Energy Systems and Thermal Metering Market Overview (Europe)

Luzern, 21. November 2014

swiss.smart.simple.

GWF

EUROPE / WORLDWIDE – ENERGY REALITY

1. High Energy Costs….why?
   - Europe has embarked reducing carbon emissions
   - Limited resources for energy – Coal, Nuclear, Gas are not preferred - Renewable
2. Need for Environmental Regulations and need for energy efficiency
3. High population density
4. Deregulation/Privatization of utilities

= Need for submetering of all utilities

Figure 7.1
The World Market for Heat Meters by Product Type
Market Growth - 2009 to 2015

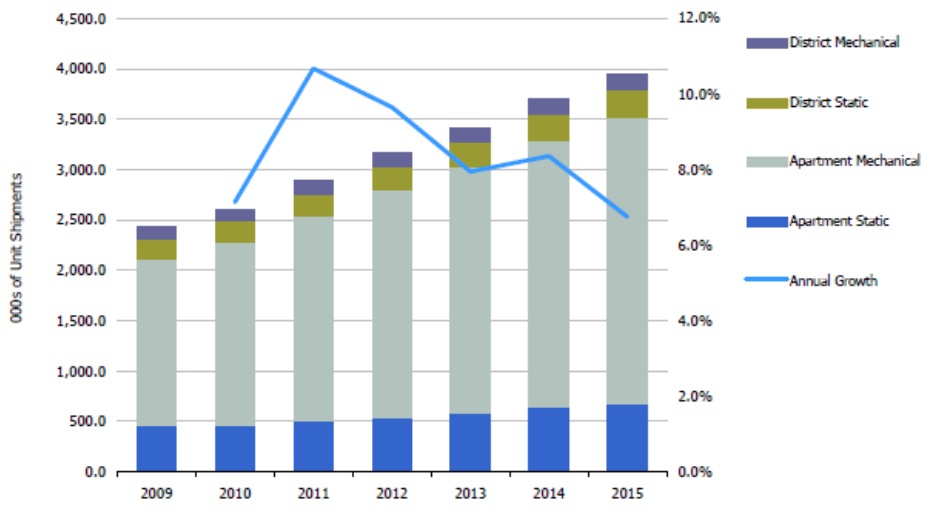
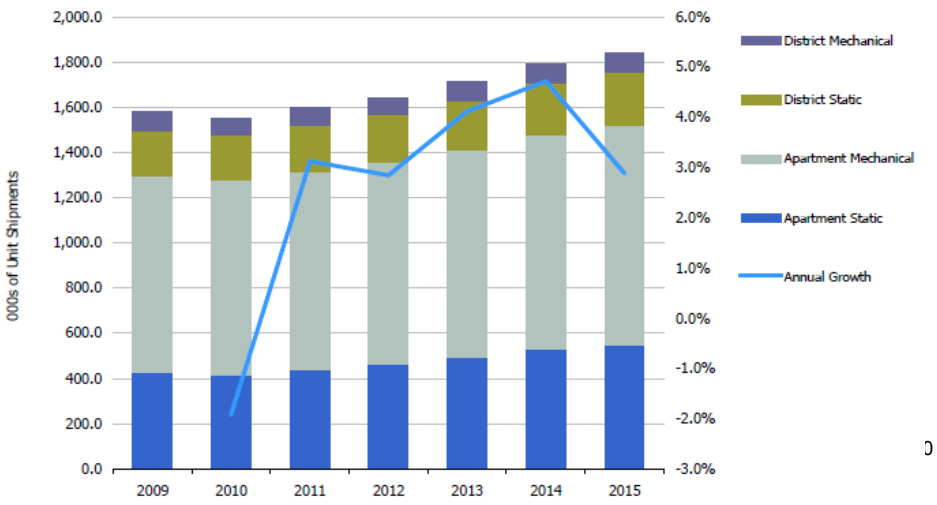


Figure 7.3
The EMEA Market for Heat Meters by Product Type
Market Growth - 2009 to 2015



GWF

CLIMATE CHANGE / RISING ENERGY DEMANDS

Driving Factors

IPCC- Climate report*: 1,4 to 5,6 Degrees warming this century

EU commitment in light of the 2005 put into force Kyoto Protocol, to lower CO2-Emissions until 2020 by 20% (Basis: 1990) IPCC

Energy Efficiency Directive – use energy more efficiently at all stages of the energy chain - December 2014

USA Obama Energy Policy: Reduce greenhouse emissions 80% by 2050

* Intergovernmental Panel on Climate Change (World climate summit Geneva)

EUROPEAN SOLUTION

Thermal Metering Systems

1. Abundant?
   - Extensive deployment due to regulatory measures

2. Economically viable?
   - Lower input (variable) costs and lower maintenance provide excellent ROI

3. Minimal environmental impact?
   - Efficient Plants and/or use of geothermal reduces carbon emissions produced

Resulted in massive growth of district and building heating and cooling systems….

And the need for submetering of thermal energy

EUROPEAN SOLUTION

Thermal Metering Systems

Thermal Metering

1. Low quality equipment gave the industry a bad reputation and resulted in a lack of confidence in thermal energy measurement
2. Standards not consistent across Europe and created trade barriers
3. Needed economies of scale to make the meters cost effective

= Need for meter standardization led to MID and EN1434

European Metering Standards

Luzern, 21. November 2014

swiss.smart.simple.

GWF

EUROPEAN UNION – HEAT METERING

STARTING POSITION

- **Approval vs. Type examination**
  - Up to now, **country specific approvals** were needed to sell measuring instruments in EU

  - For the future, there would be only **one type examination certificate needed** acc. the new **Measuring Instrument Directive (MID)** for the EU

CE

Bauartprüfzertifikat Nr. CH-MI001-07005-00

Type examination certificate

Auftraggeber: GWF MessSysteme AG, Obergrundstrasse 119, CH-6002 Luzern

Anforderungen: Schweizerische Messmittelverordnung (SR 941.210) vom 15. Februar 2006, Anhang 2 Modul B. Richtlinie 2004/22/EG des Europäischen Parlaments und des Rates vom 31. März 2004 über Messgeräte (MID), Anhang B, Messgerätekategorie MI-001

Gerätetyp: Mehrstrahl-Flügelradzähler für Kalt- und Warmwasser

Typenbezeichnung: MTK3, MTK3-VS,MTK3-VF, MTW3, MTW3-VS, MTW3-VF, MTK3 coder, MTK3-VS coder,MTK3-VF coder, MTW3 coder, MTW3-VS coder, MTW3-VF coder

Genauigkeitsklasse(n): R 160/80/40 (Q_4 4/6,3/10/16/25), R 100/80/40 (Q_2,5) (nach OIML R49)

Kennlasten: DN: von 15 bis 50; PN: 16 / 25 bar; Tmax: 30 / 90 °C

Zertifikat gültig bis: 15. August 2017

CH-3003 Bern-Wabern, 16. August 2007

Benannte Stelle: Zertifizierungsstelle METAS-Cert Nr. 1259

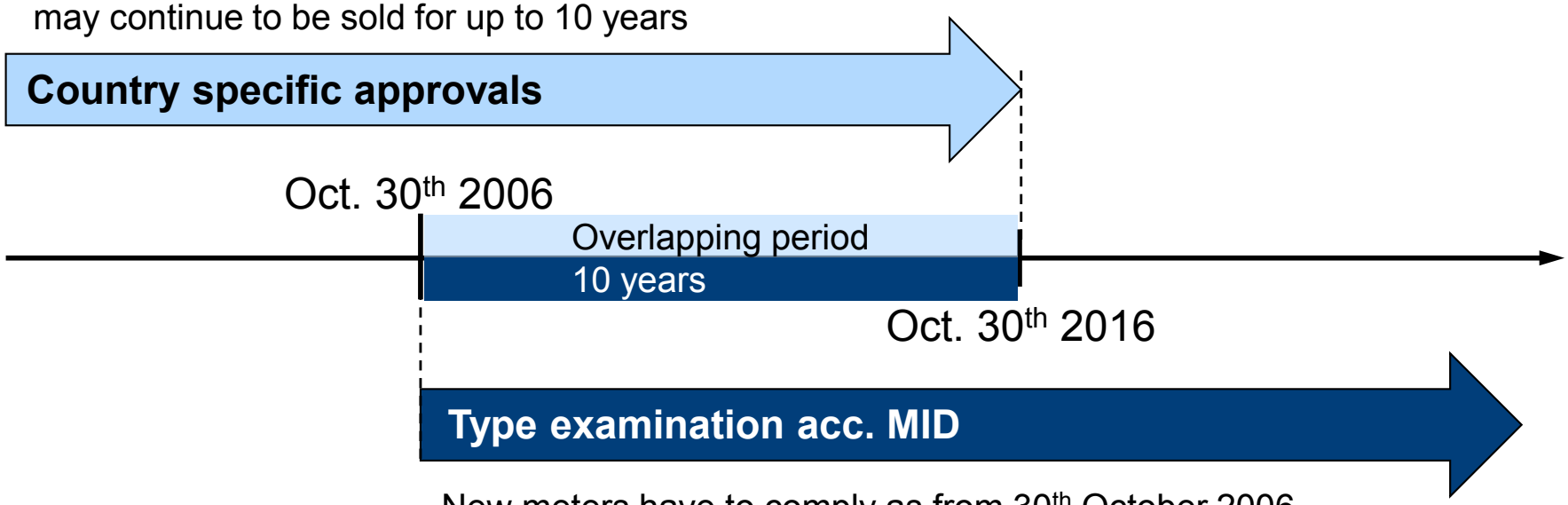
Für die Prüfung: Dr. Henri Baumann, Sektionschef Jörg Ramseyer, Leiter METAS-Cert

STARTING POSITION

- **Goal**
  - The main goal for the definition and introduction of the new measuring instrument directive was the **reduction of trade barriers** within the European countries.
  - More stringent testing for First Type Approval to conform to improved measuring technology

- **Validation period**

Instruments approved before 30th October 2006
may continue to be sold for up to 10 years



New meters have to comply as from 30th October 2006

MEASURING INSTRUMENT DIRECTIVE

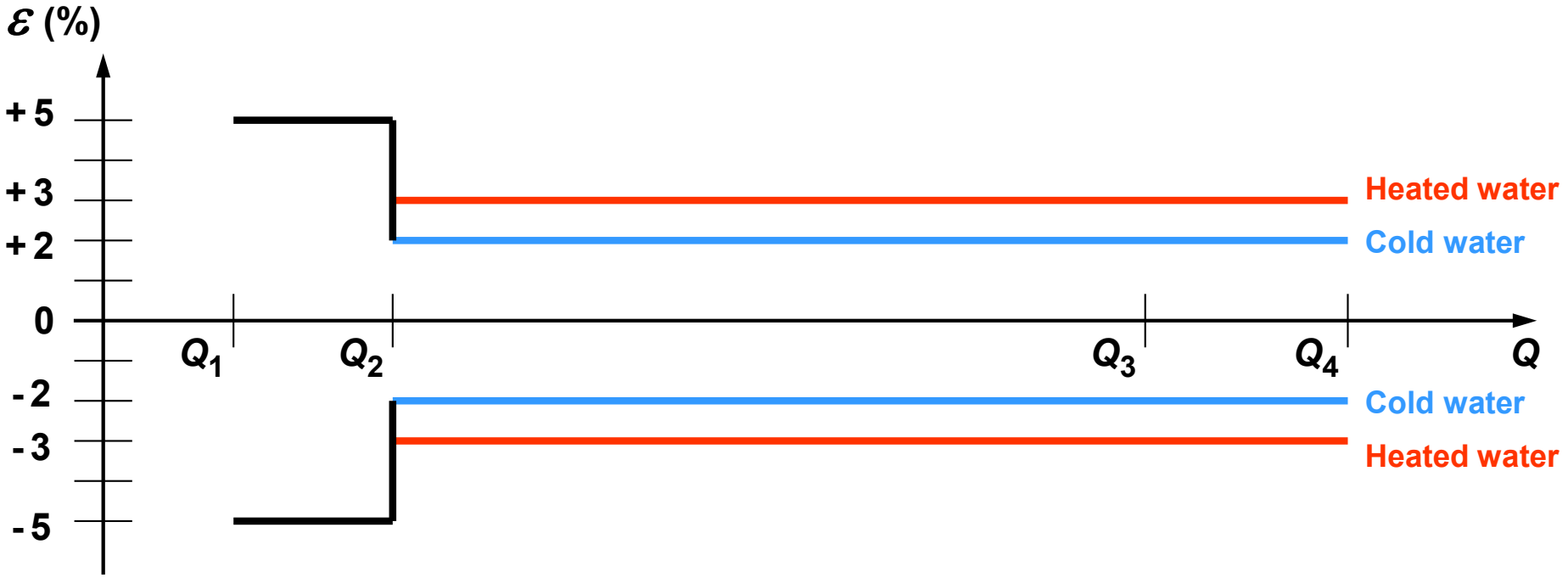
- **Regulation field**
  - The Measuring Instrument Directive **regulates**...
    - ...general requirements for measuring instruments (i.e. EMC requirements, etc.)
    - ...specific requirements for measuring instruments (i.e. MI-001, etc.)
    - ...requirements up to initial operation
    - ...the labelling of the measuring instruments
    - ...responsibilities between legislator, producer and user
  - The Measuring Instrument Directive **doesn't regulate**...
    - ...obligatory calibration and calibration period
    - ...requirements after initial operation
    - ...operational error limit

STANDARDS – THERMAL METERS

- EN1434: Heat meters
  - EN1434-1 = General requirements
  - EN1434-2 = Constructional requirements
  - EN1434-3 = Communication interfaces
  - EN1434-4 = Pattern approval tests
  - EN1434-5 = Initial verification tests
  - EN1434-6 = Installation, operational monitoring and maintenance

- OIML R75, main specifications identical to EN1434
  - OIML R75-1 = General requirements
  - OIML R75-2 = type approval and initial verification tests requirements
  - OIML R75-3 = test report format (approval and initial verification)

EVERY METER TO FULFILL MAXIMUM PERMISSABLE ERROR (MPE)



BENEFITS OF METERING

Where meters are installed, with **greater control and transparency of consumption** and charging, they allow consumers to:

- Decide **when to use their heating** (and cooling) systems and at what temperature to heat their homes (and businesses);
- **accurate measurement of what energy** they use and encourages consumers to identify and reduce wasteful consumption;
- **Avoid the subsidization** of abnormally high usage by lower energy consumers. For example, in multi-apartment buildings, where flat-rate charges can distort individual heat consumption variances

On a system-wide basis:

- Building-level meters help to highlight the heat provided to a building as a whole, and those heat distribution networks that are poorly performing at a system-wide level. This will enable heat network operators to identify system inefficiencies and remedy accordingly

Thermal Metering 101

Luzern, 21. November 2014

swiss.smart.simple.

GWF

CORE PRODUCTS
Meters

YOU MUST HAVE:

CASH REGISTERS
(Meters)

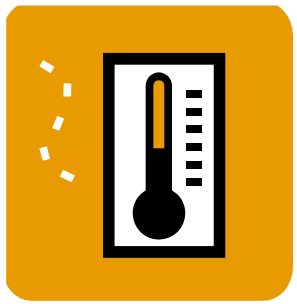
=

FUNDAMENTAL PRINCIPLE

What is thermal energy?

1 gram of water

1 °C temperature increase



Required energy:

1 Calory

=

4.18 Joule

=

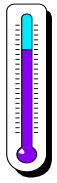
0,00116 Wh

GENERAL PRINCIPLE

The thermal energy meter has always 3 parts

To be measured:

water volume  → flow meter

temperatures  → temperature sensors

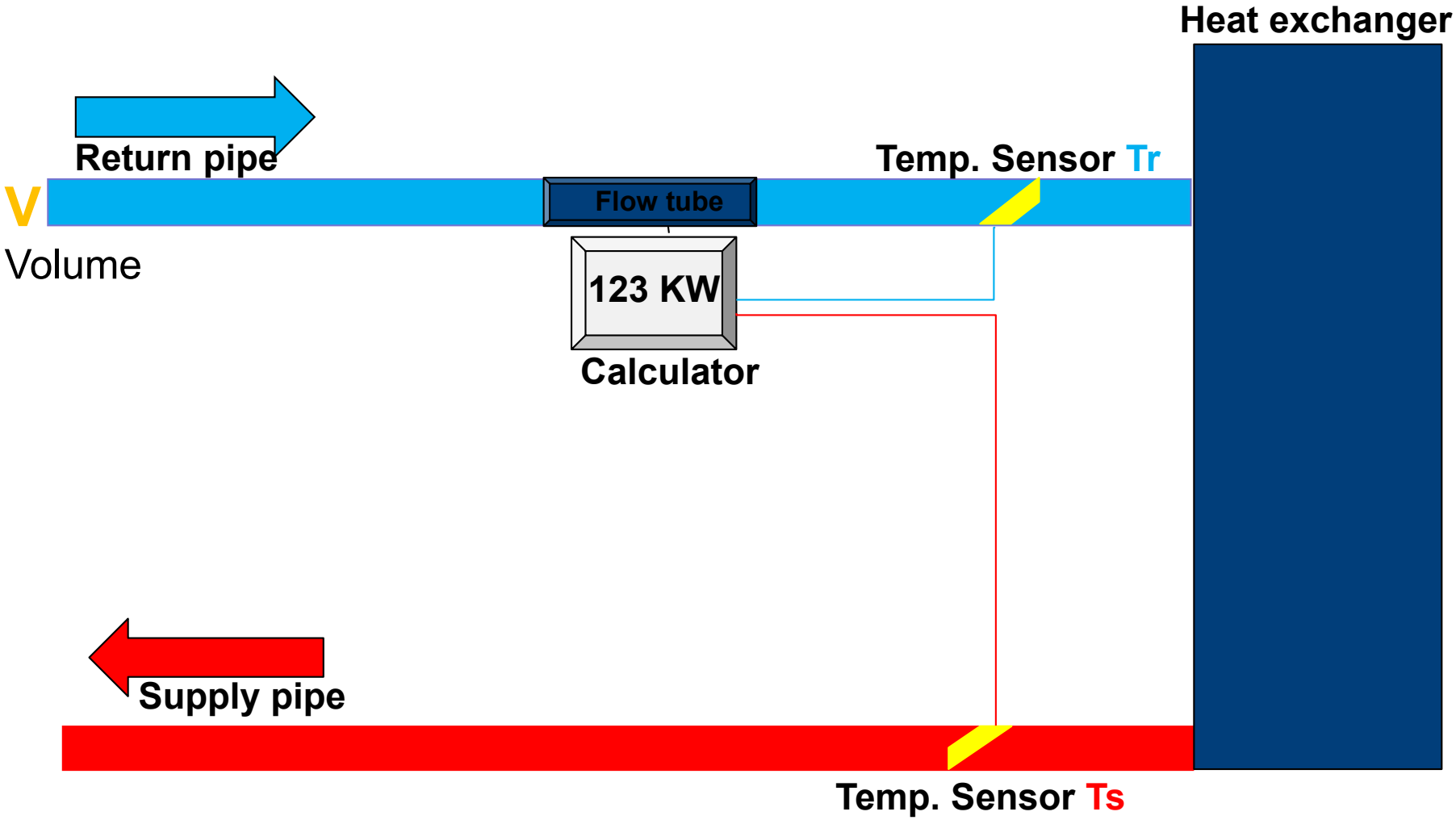
To be computed:

energy  → calculator

OPERATING PRINCIPLE

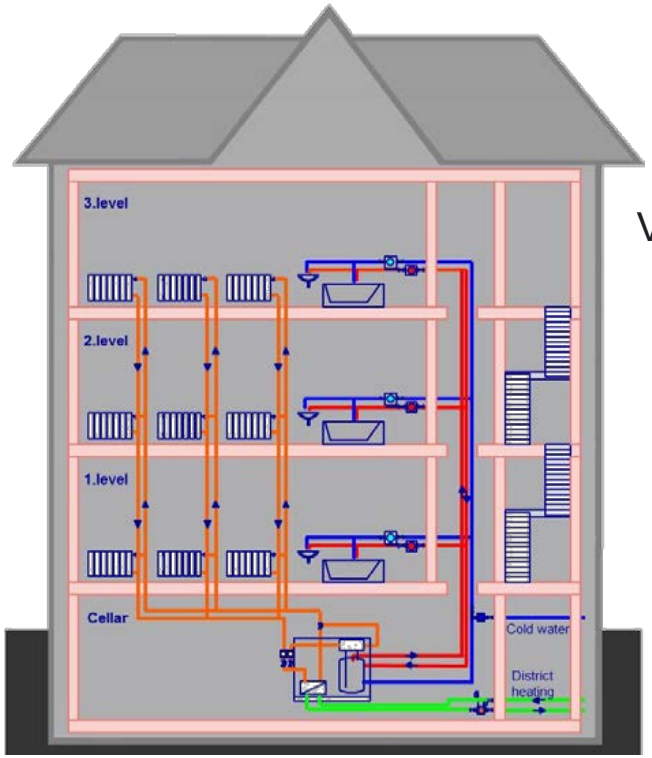
Energy measurement and calculation

$$E = V * (Ts - Tr) * k$$



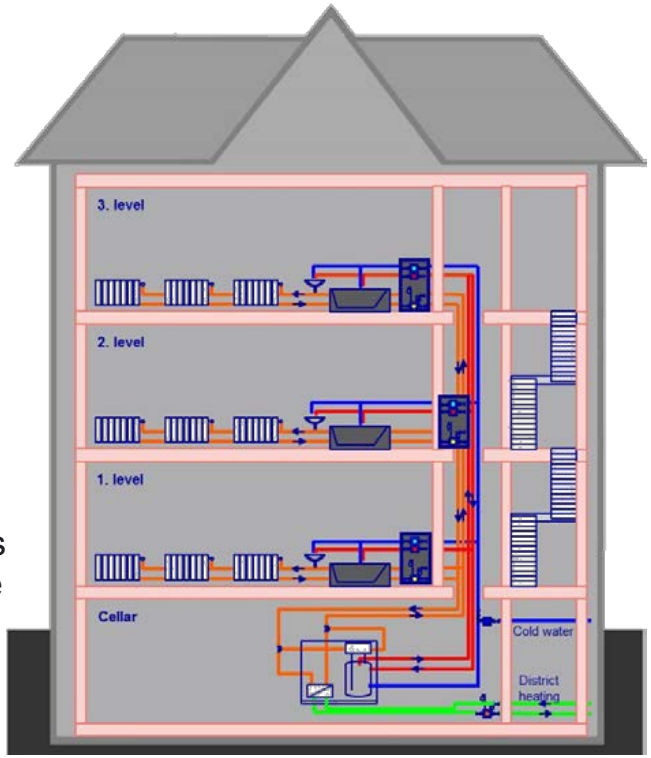
BUILDING ARCHITECHTURE

- Metering system architecture has changed over the years
  - Vertical systems > Heat cost allocators
  - Horizontal systems > Heat meters
- Water Meters are always required (Irrespective of building architecture)
- Vertical and Horizontal Architecture Worldwide
  - Trend to Horizontal Systems



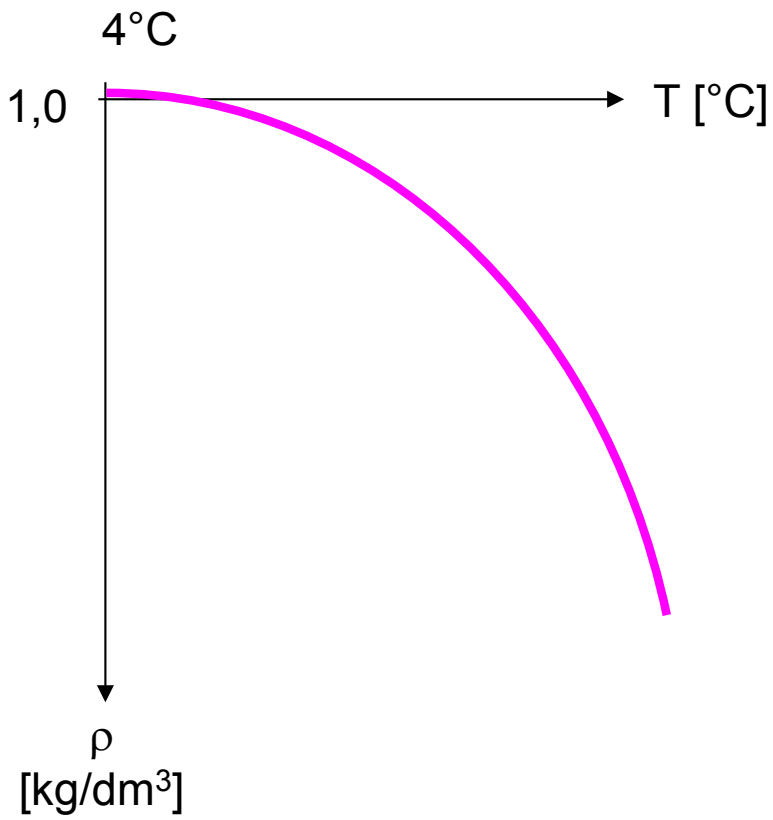
Vertical Piping Systems
- Built in the 80‘s/90‘s
- Found in most buildings in this period
- Difficult to regulate heat exchange point

Horizontal Pipe Systems
- Built as of middle 80‘s/90‘s
- Energy transfer at just one point
- Easy to manage and regulate heat exchange point

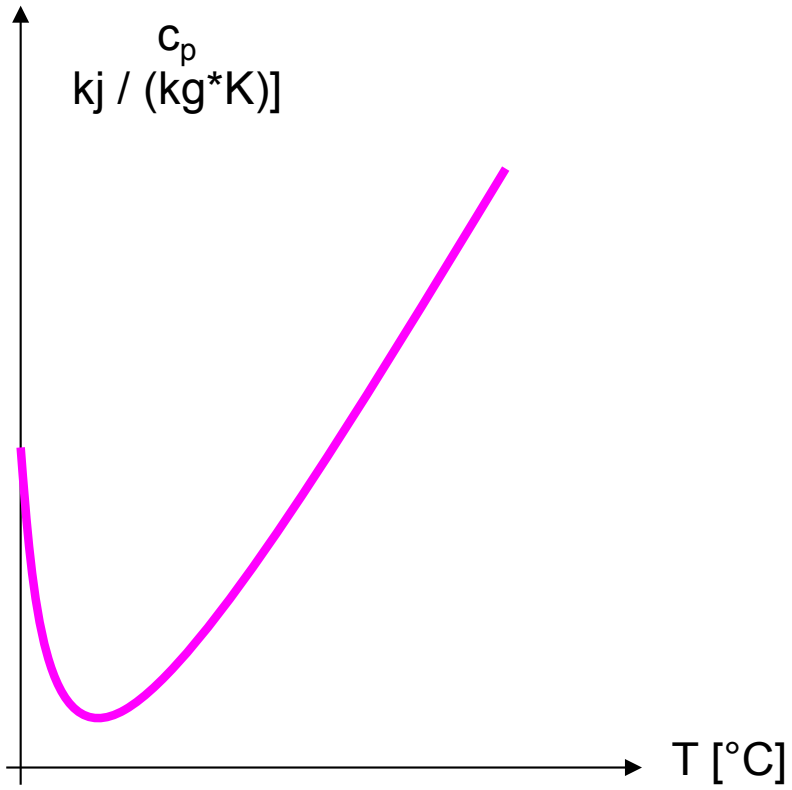


CORRECTION FACTOR k

Density of water (ρ) :



Specific heat capacity (c_p) :



The factor k compensates:

- dependence of density from temperature
- dependence of heat capacity from temperature
- Respecting flow meter position (return/supply)

New calculation of „k“ following operation conditions with each temperature acquisition

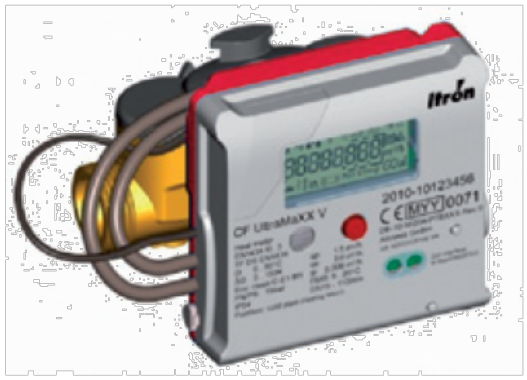
GWF Thermal Products and Complete Metering Solutions

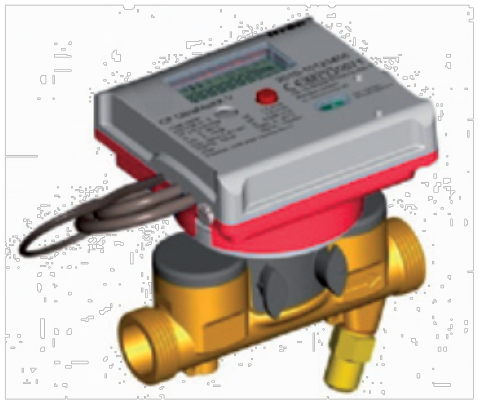
Luzern, 21. November 2014

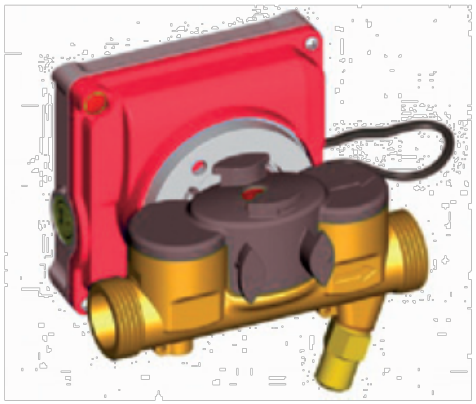
swiss.smart.simple.

GWF

CORE PRODUCT FOR CANADIAN MARKET
ULTRAMAXX-V



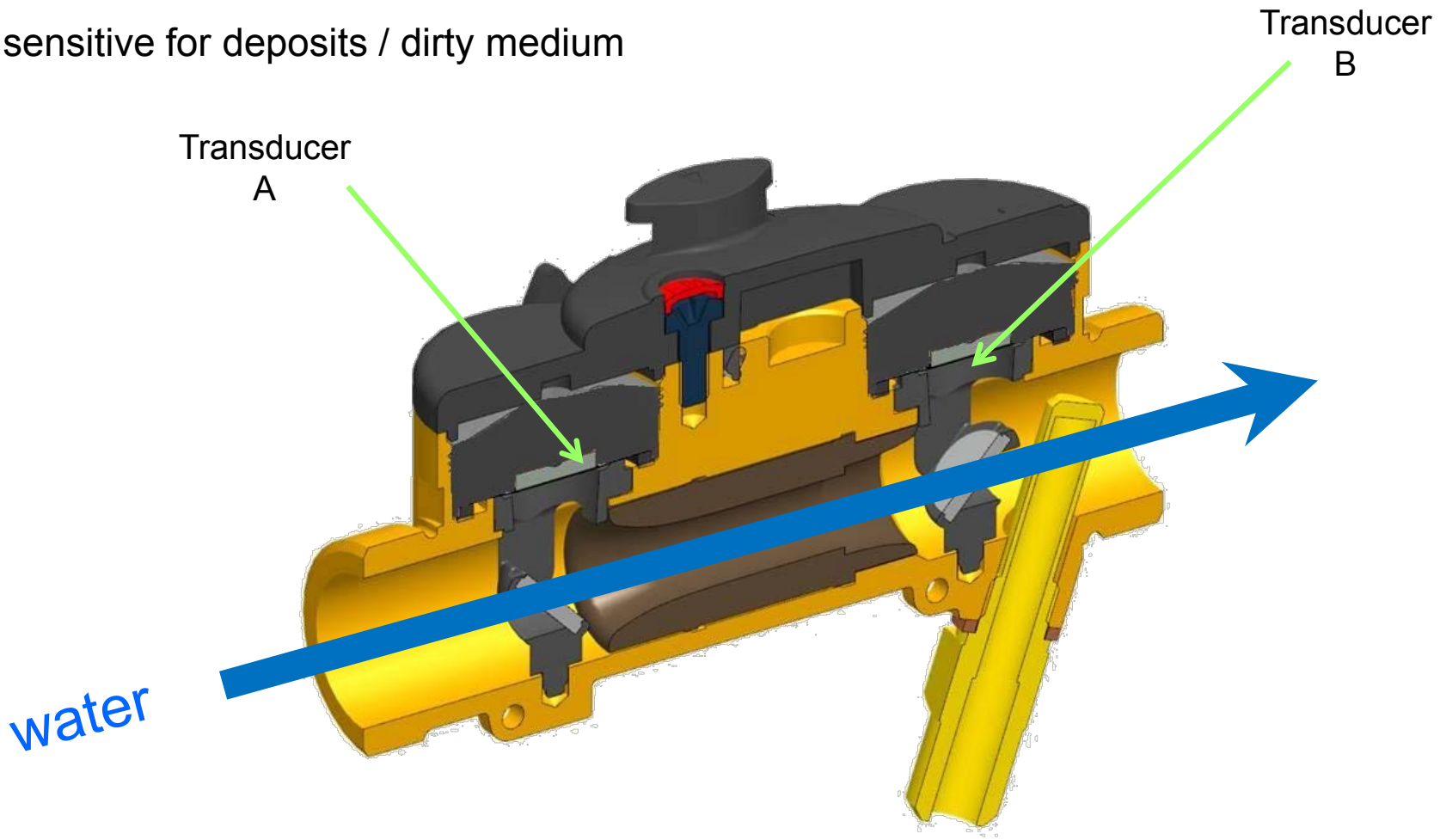




UltraMaXX V (Inline)

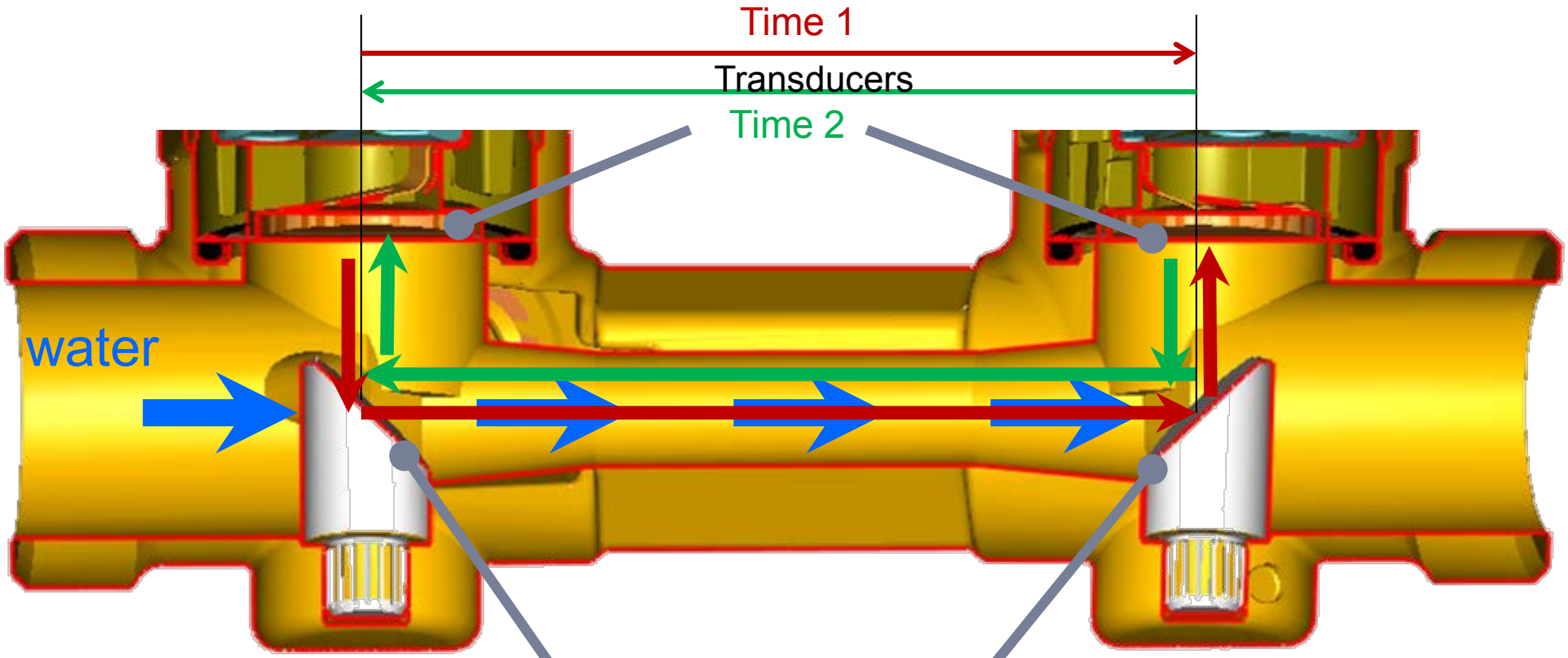
technology

- Ultrasonic principle:
  - Ultrasonic measurement = no turning parts
  - not sensitive for deposits / dirty medium



CORE PRODUCTS

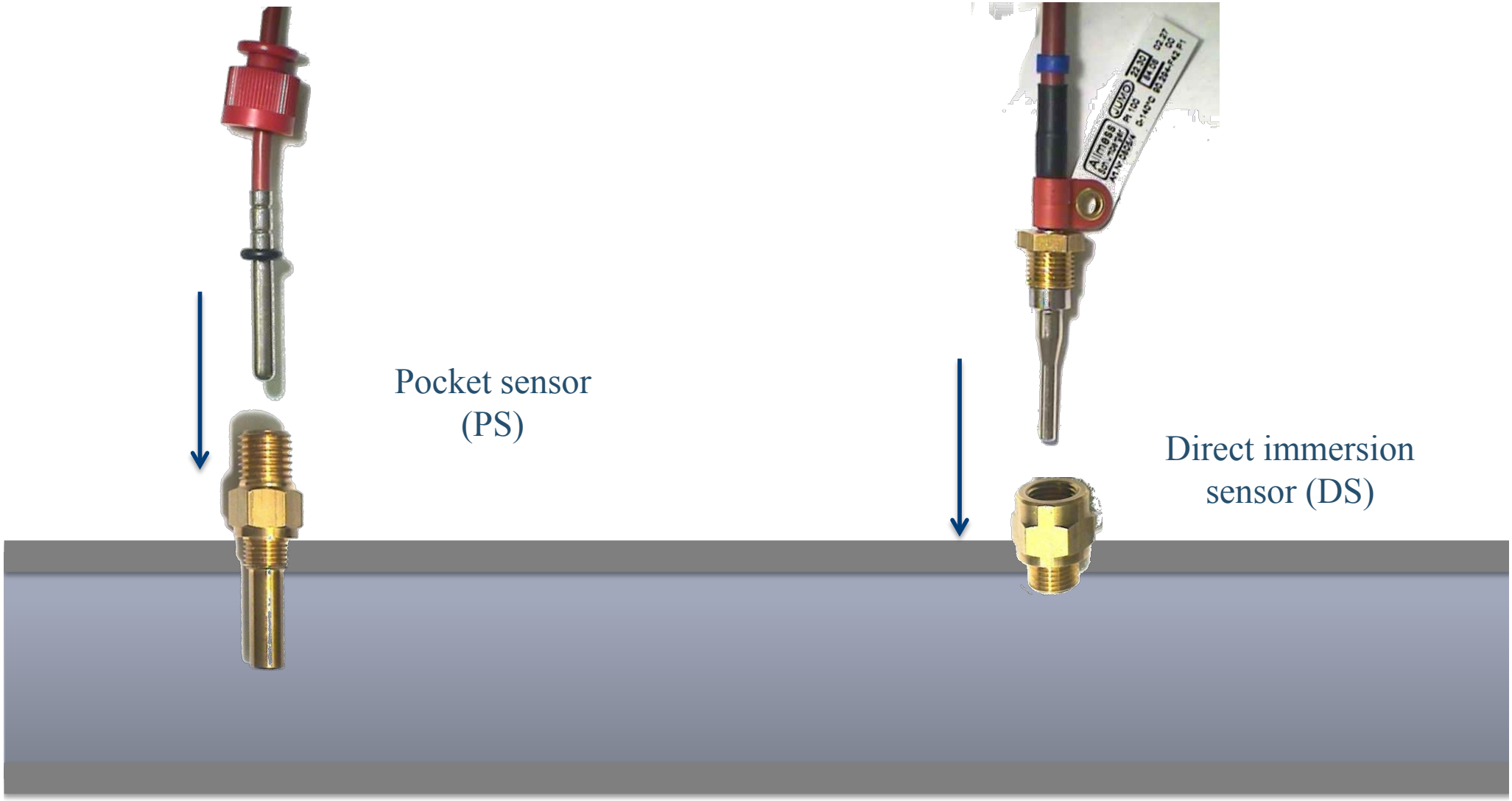
Ultrasonic Principle



- Ultrasonic principle
  - q > 0 => Time 1 < Time 2
  - runtime difference to measure the flow

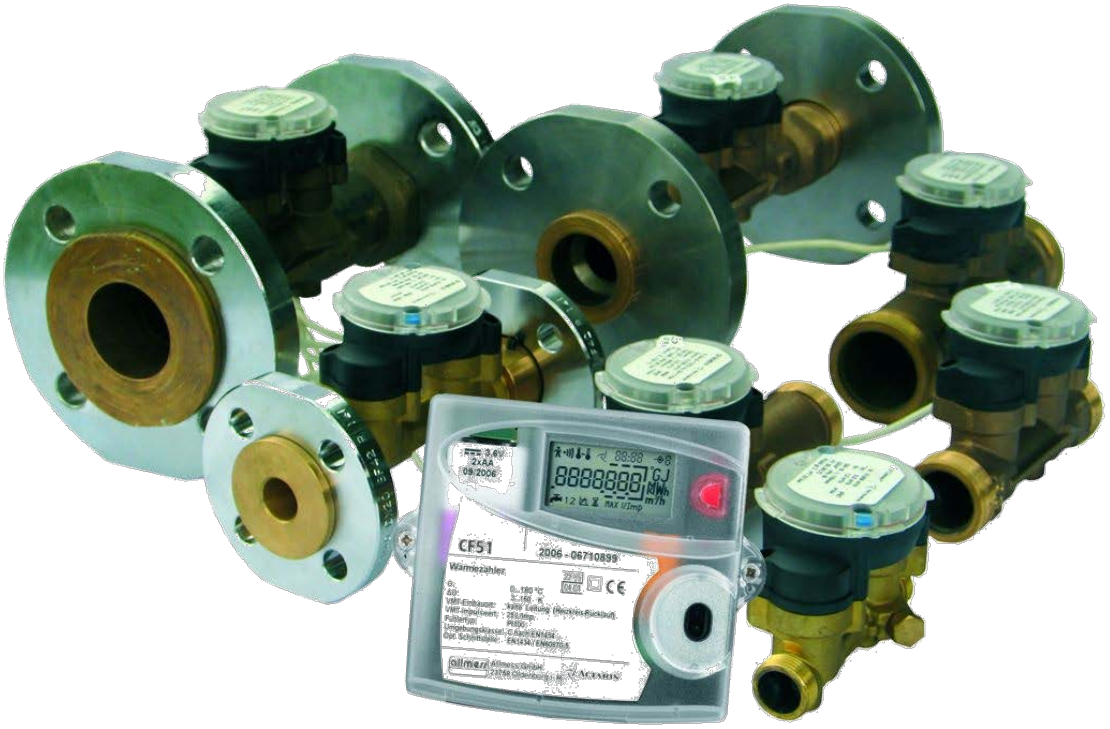
TEMPERATURE MEASUREMENT

Principle T-Sensor types



GWF COMBINED HEATING AND COOLING METER

- DN15-1200
- Versions qp0,6-qp9000
- ultrasonic flow measurement
- removable calculator
- Pt100, Pt500,
- 2/4-wire technology (CF55)
- plug & play com-options
- plug & play power supply
- datalogger (CF55)
- tariff functions (CF55)



WHAT IS M-BUS (METER BUS)?

Why M-Bus?

- In the past, each European country had its own standards with its own advantages and disadvantages. These standards were incompatible to each others.

Why is M-Bus a good choice?

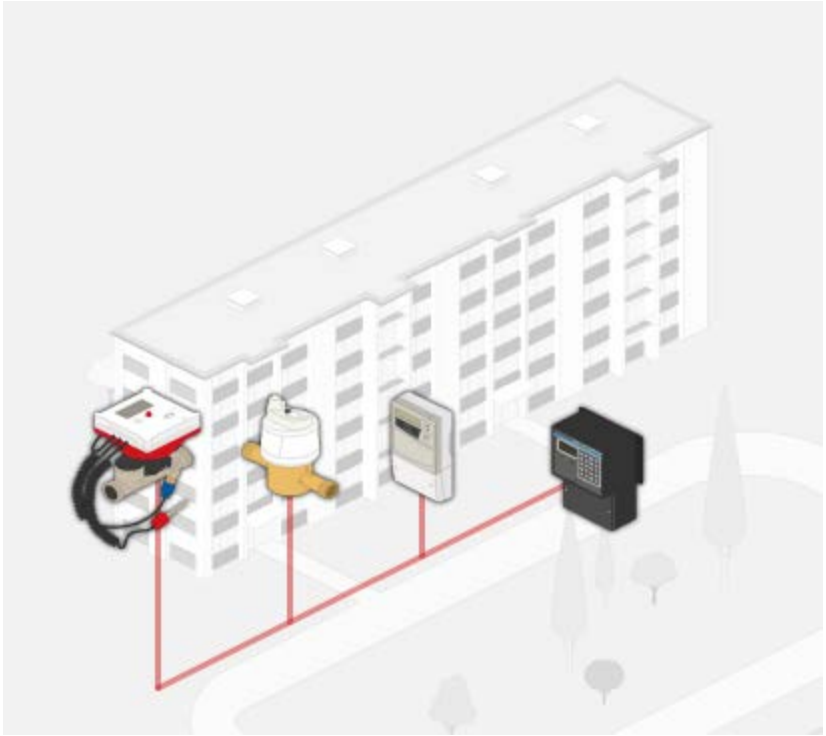
- The European commission has combines the know-how of each country holistically
  The M-Bus is a well established platform which has been in the market for over 22 years

M-Bus is used by more than 50 countries including:

- Europe (Germany, France, Great Britain, Poland, Italy, Spain, Russia,…)
- Middle East (Saudi Arabia, UAE, Qatar, …)
- Asia (China, Malaysia)

WHAT IS M-BUS (METER BUS)?

- **M-Bus network powers thermal & water meters**
- Meter sends header information plus register read upon request from Master
- Wireless technologies available (radio modules, bridges, etc.)
- Numerous options for remotely accessing and reading M-Bus system
  - TCP/IP
  - GSM/GPRS
  - Wireless M-Bus
- Modular design for easy scalability



METER BUS SYSTEM ABSOLUTE DATA

M-Bus-Meters, Interface over Absolute Passive Encoder Interface

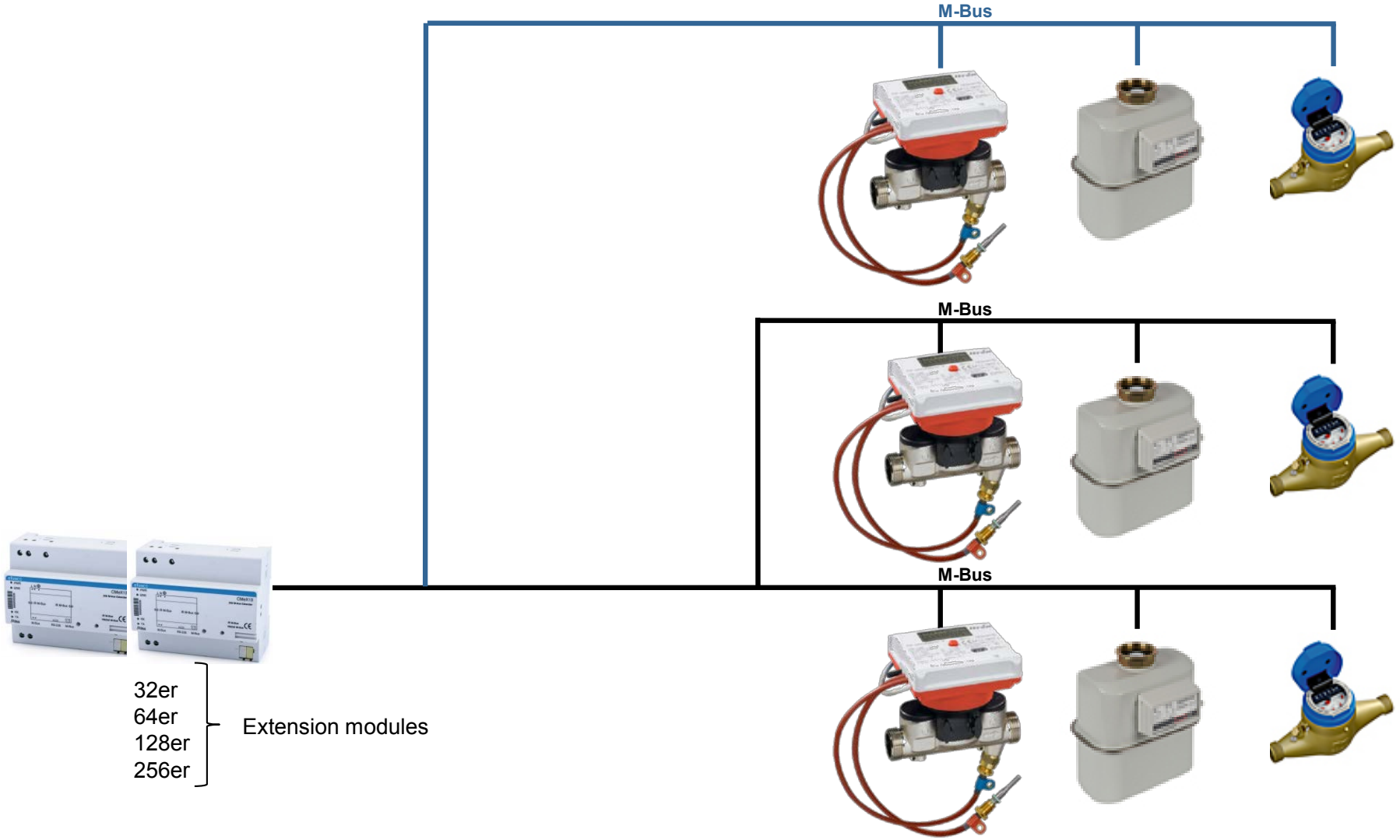
All meter end points do not need batteries – Power over the Bus

Cold Water Consumption			
Warm Water Heating + Consumption		 	
	UNICOcoder MP	**ULTRAMaXX MT… coder MP**	**Commercial / Industrial**

ABSOLUTE ENCODER OUR VISION FOR THE FUTURE

Video of Encoder Register

M-BUS MASTER EXAMPLE



M-BUS TECHNOLOGY
BETTER RETURN ON INVESTMENT

CUSTOMER SATISFACTION
thanks to absolute meter reading – never a deviation, and highly reliable proven technology

MINIMIZE INSTALLATION COSTS
thanks to plug & play installation (wired, wireless)

LOWER OPERATIONAL COSTS
thanks to process automation, no manual readings, opportunity costs of staff, no adjustment with meter reading deviation (pulse)

ROI =

Revenue ↑ **-** **Operational costs** ↓

Capital investment ↓

SECURE INVESTMENT
Thanks to interoperability and open standards (M-Bus)

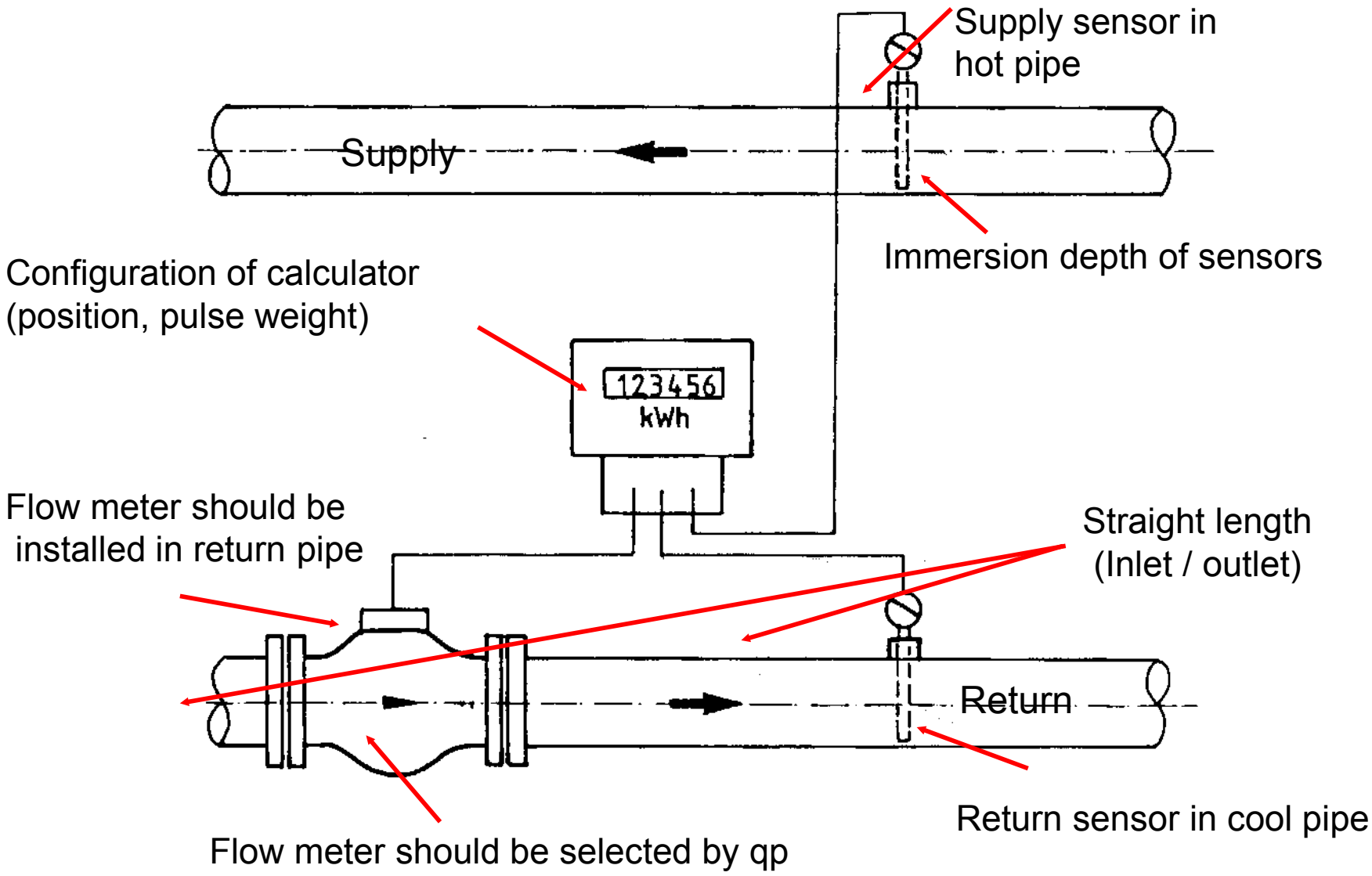
FAQs and Best Practices

Luzern, 21. November 2014

swiss.smart.simple.

GWF

POTENTIAL AREAS FOR ERRORS

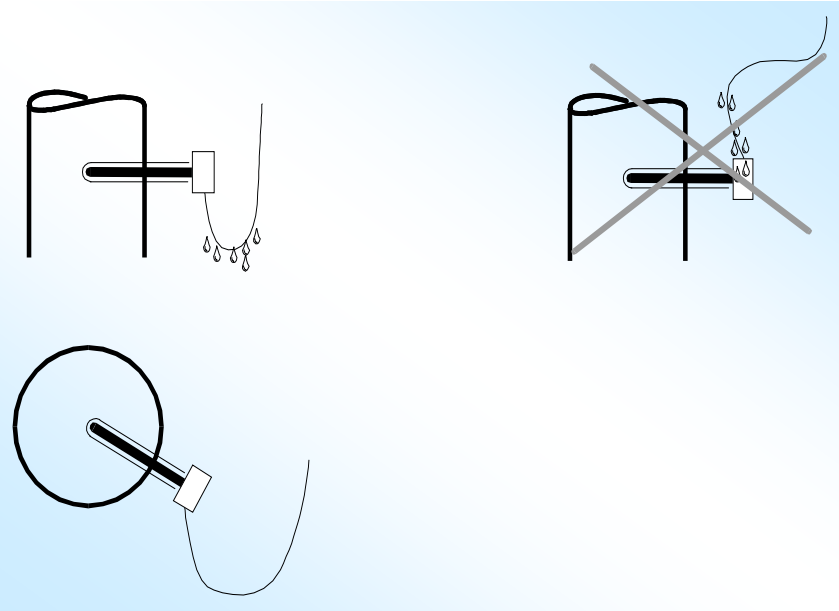


POTENTIAL AREAS IMPACTING ACCURACY

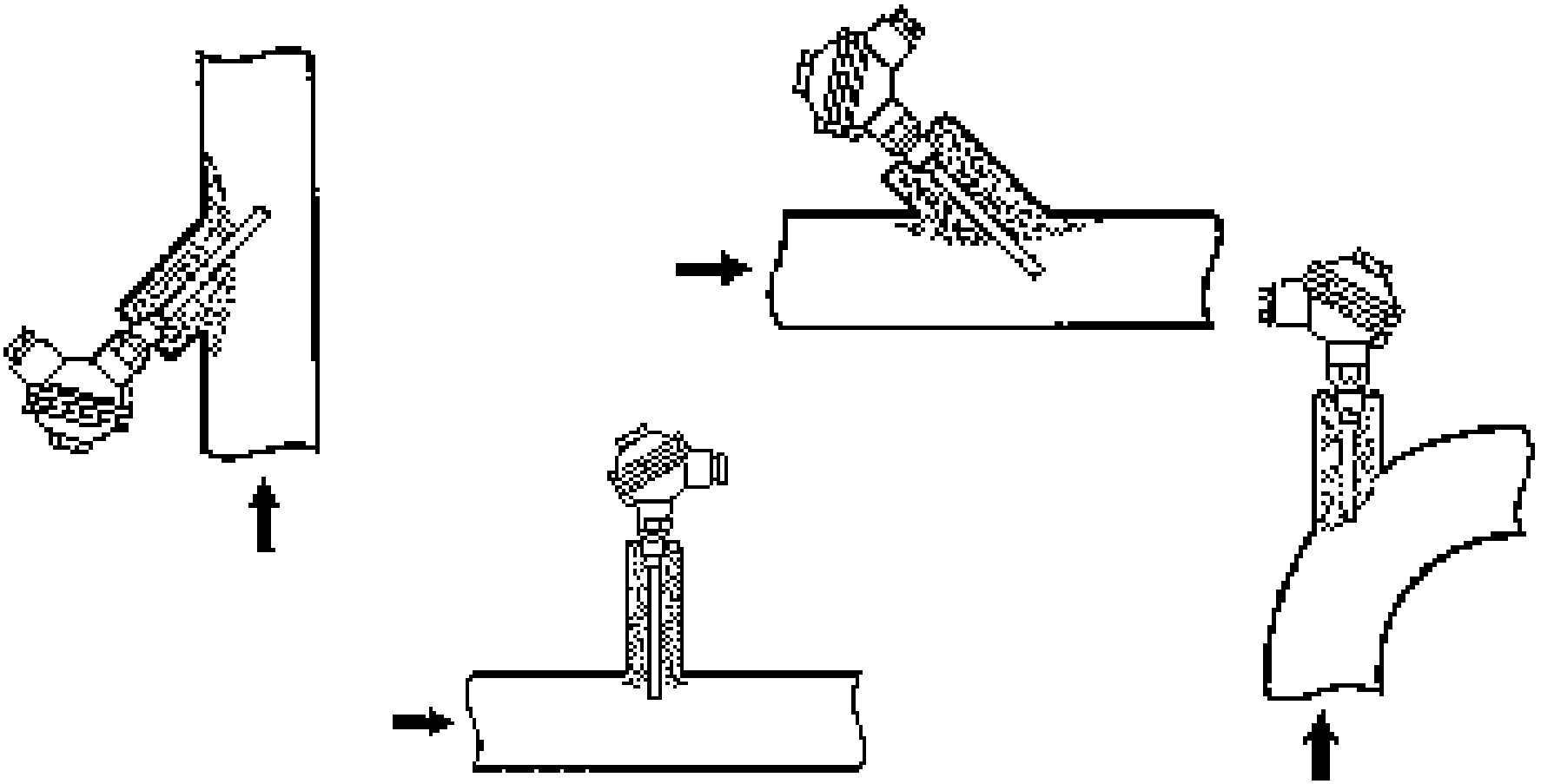
- Installation of meter components well done?
- Installation compliant to meter configuration?
- Combination of components (sub-assemblies) well done?
- On site sealing respected?
- System conditions / water quality.

INSTALLATION OF T-SENSOR – COOLING!

- Risk of condensation
- Avoid condensation between pipe and isolation
- In case of head sensors:
  - protect the cable clamps against humidity
  - or use potted head sensors
- Installation downwards
  - avoid water remaining in the pocket
- Cable positioning “drop down”
  - avoid water moving to calculator

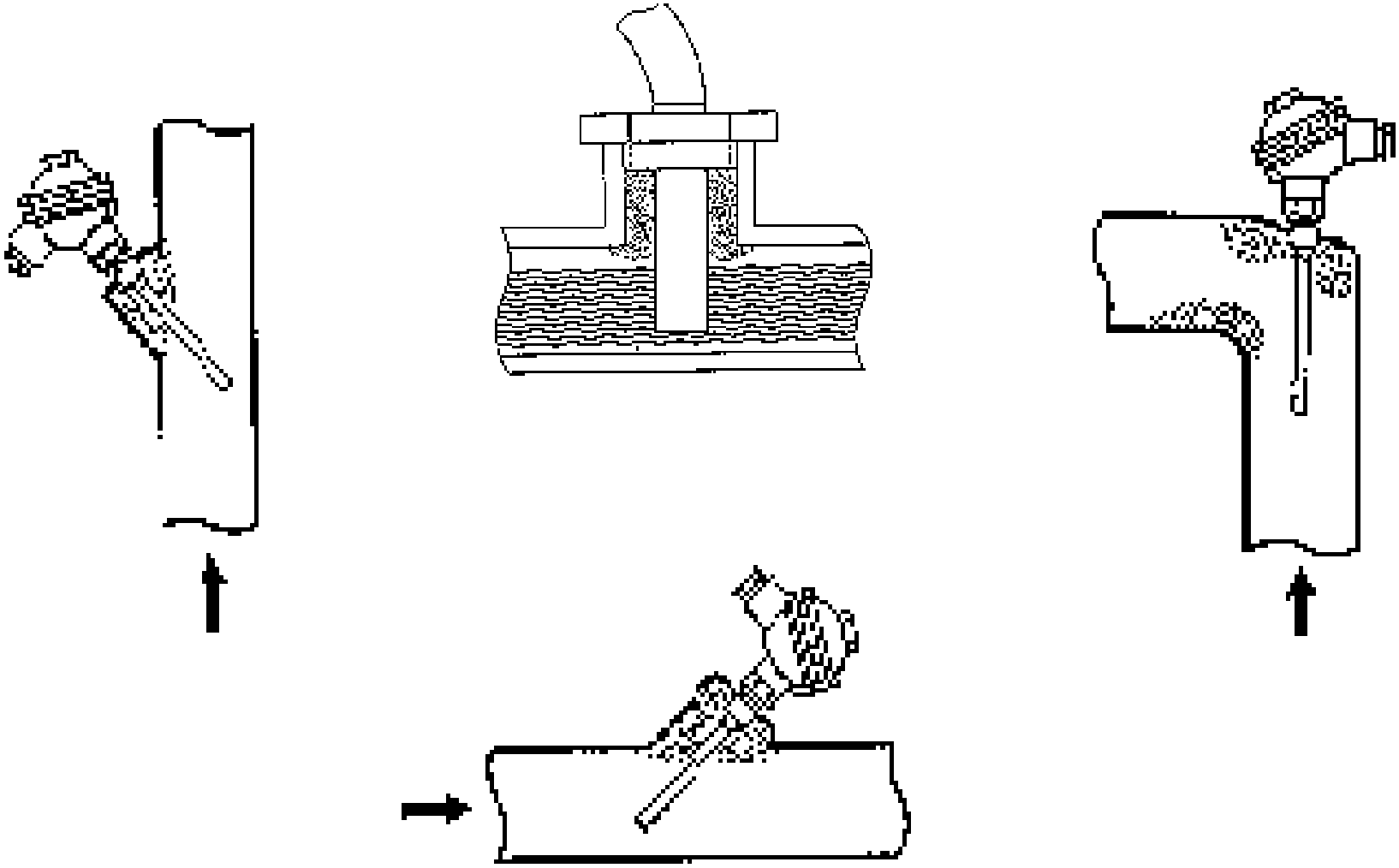


WRONG INSTALLATION



WRONG !

GOOD INSTALLATION



Good !

BAD EXAMPLE

Cooling meter installed in intermediate ceiling

Searching for the meter….

BAD EXAMPLE

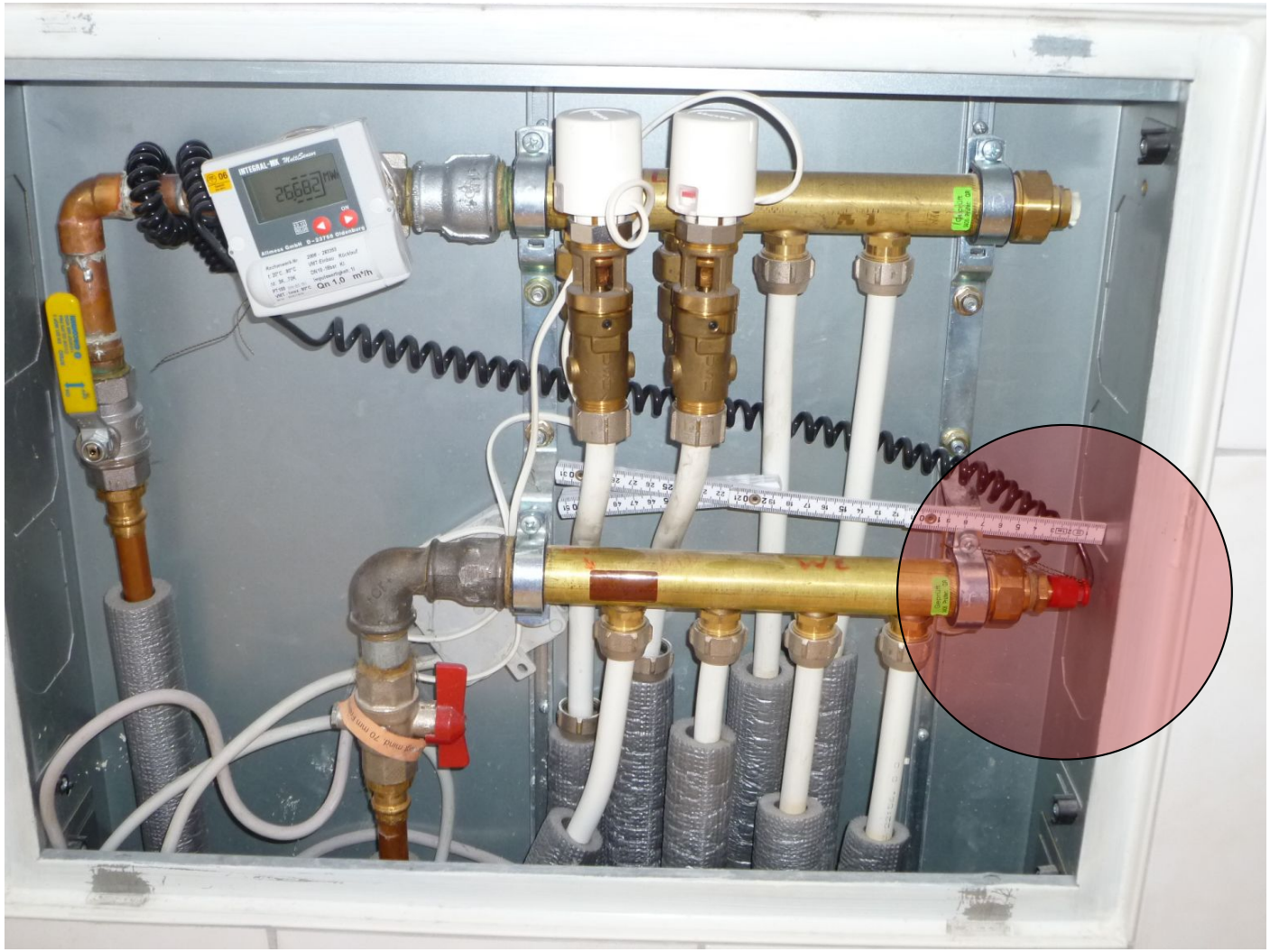
Cooling meter installed in intermediate ceiling

T-sensor found…

Flow meter and calculator found…

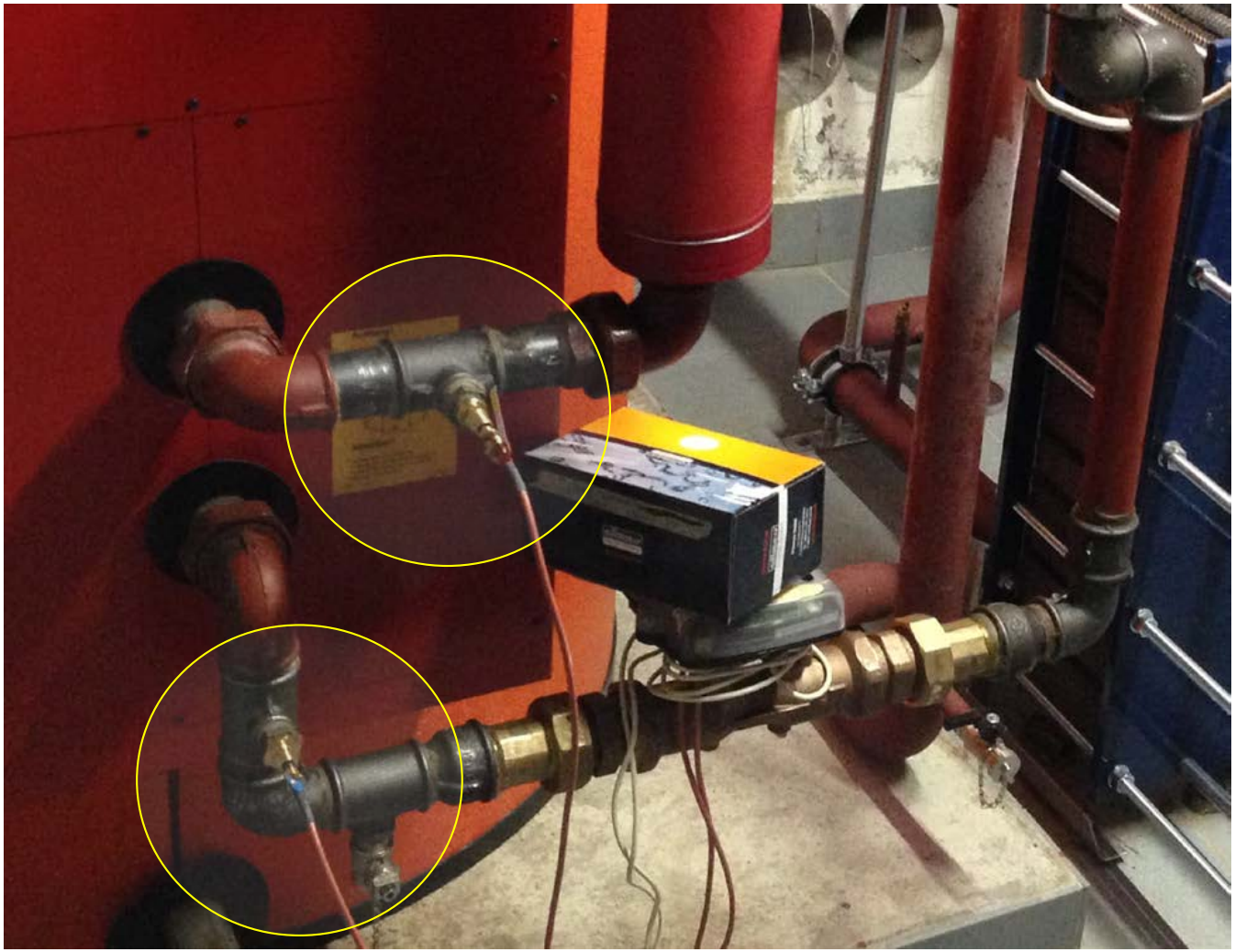
BAD INSTALLATION OF T-SENSOR

Temperature sensor installed in “dead zone”



BAD INSTALLATION OF T-SENSOR

Direct sensor installed in pocket



GWF + QMC + ENERCARE

Luzern, 21. November 2014

swiss.smart.simple.

GWF

STRONG PARTNERS

- **QMC Metering Solutions represents GWF in Canada**
  - Canada-wide support of submetering systems
  - Measurement Canada laboratories and verification teams
  - Shared values of GWF/QMC:
    - continuous improvement, commitment to quality, open protocols and non-proprietary systems

EnerCare Connections

GWF MessSysteme AG
Obergrundstrasse 119
6002 Lucerne, Switzerland

T +41 (0)41 319 50 50
F +41 (0)41 310 60 87

chris.bold@gwf.ch
info@gwf.ch, www.gwf.ch