



## **AMR based meter fleet surveillance**





### Methods for periodical re-verification of heat meters

- Replacement of all heat meters e.g. with 5 years interval (most used principle in Europe)
- Statistical sample test (mainly used in Denmark)
- AMR based meter fleet surveillance (accepted by DANAK in Denmark)



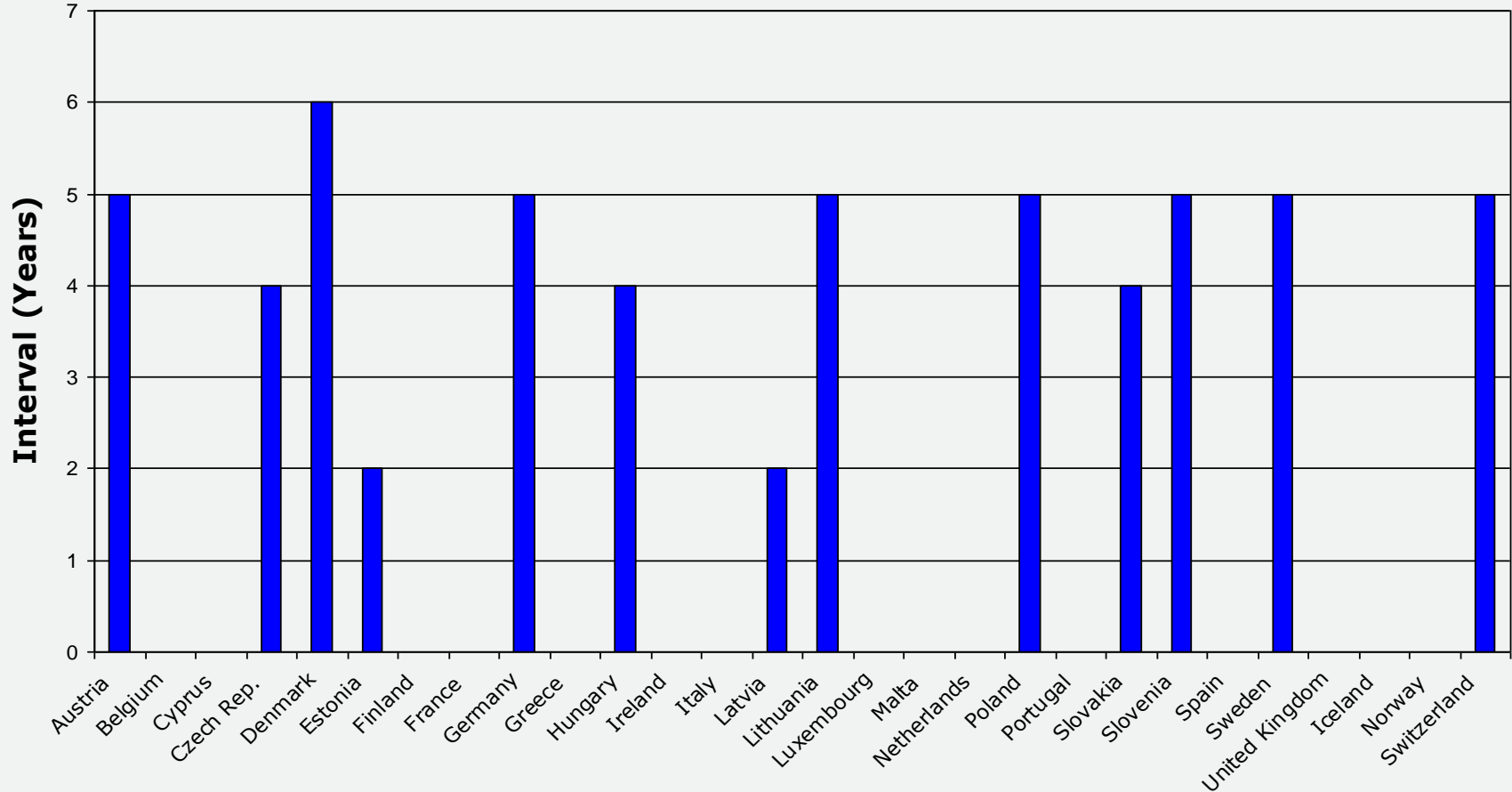


## AMR based meter fleet surveillance

- **Facts about AMR based meter fleet surveillance**
- 5 years field experience
- 7308 installations made from 2004 to 2009
- 20 Heat utilities in Denmark are using this method
- Accepted by DANAK in February 2006



## Re-verification intervals in Europe (or no official rules for re-verification of heat meters)



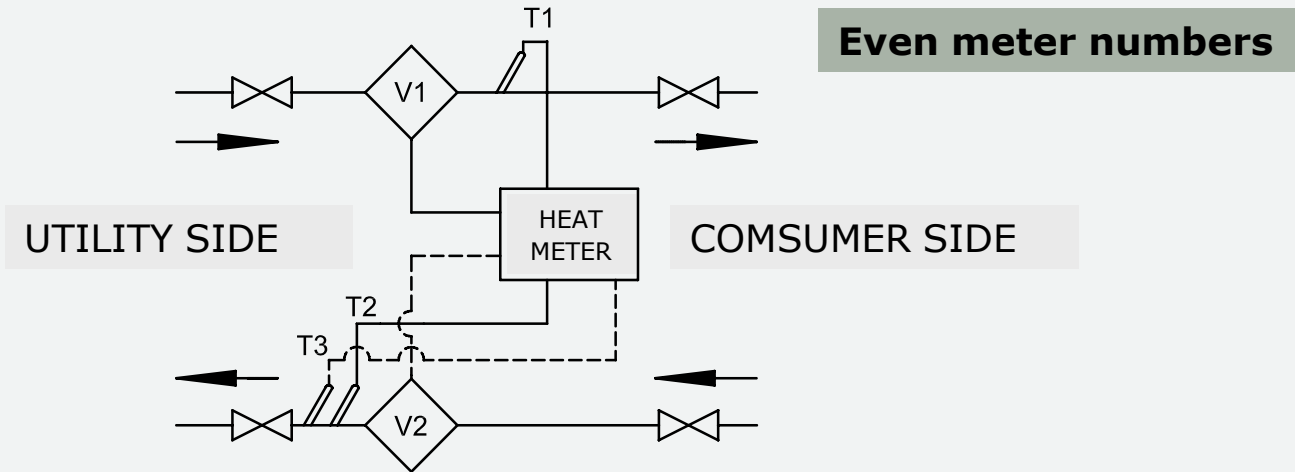
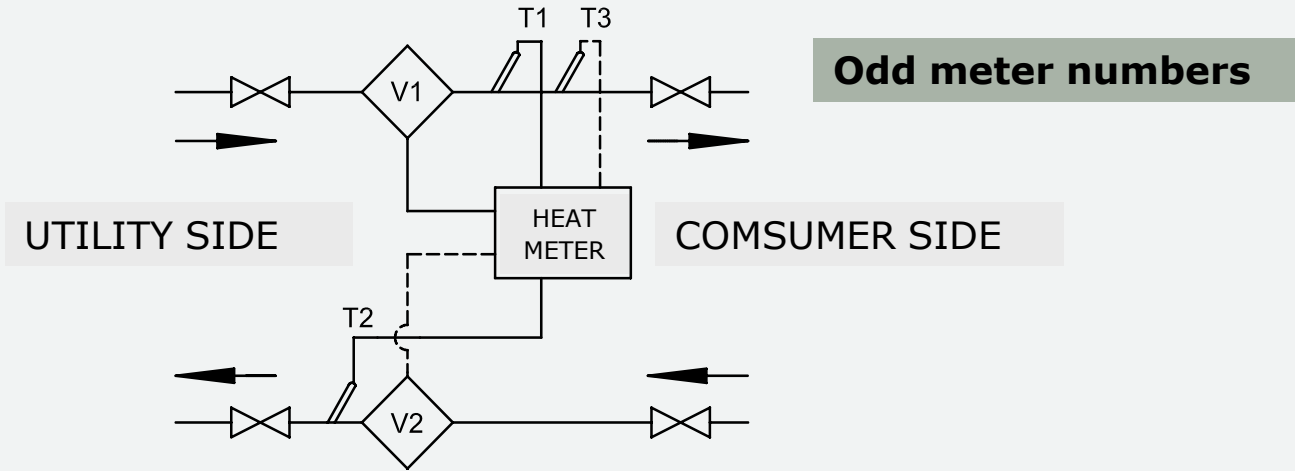


**The principles behind “AMR based meter fleet surveillance”**





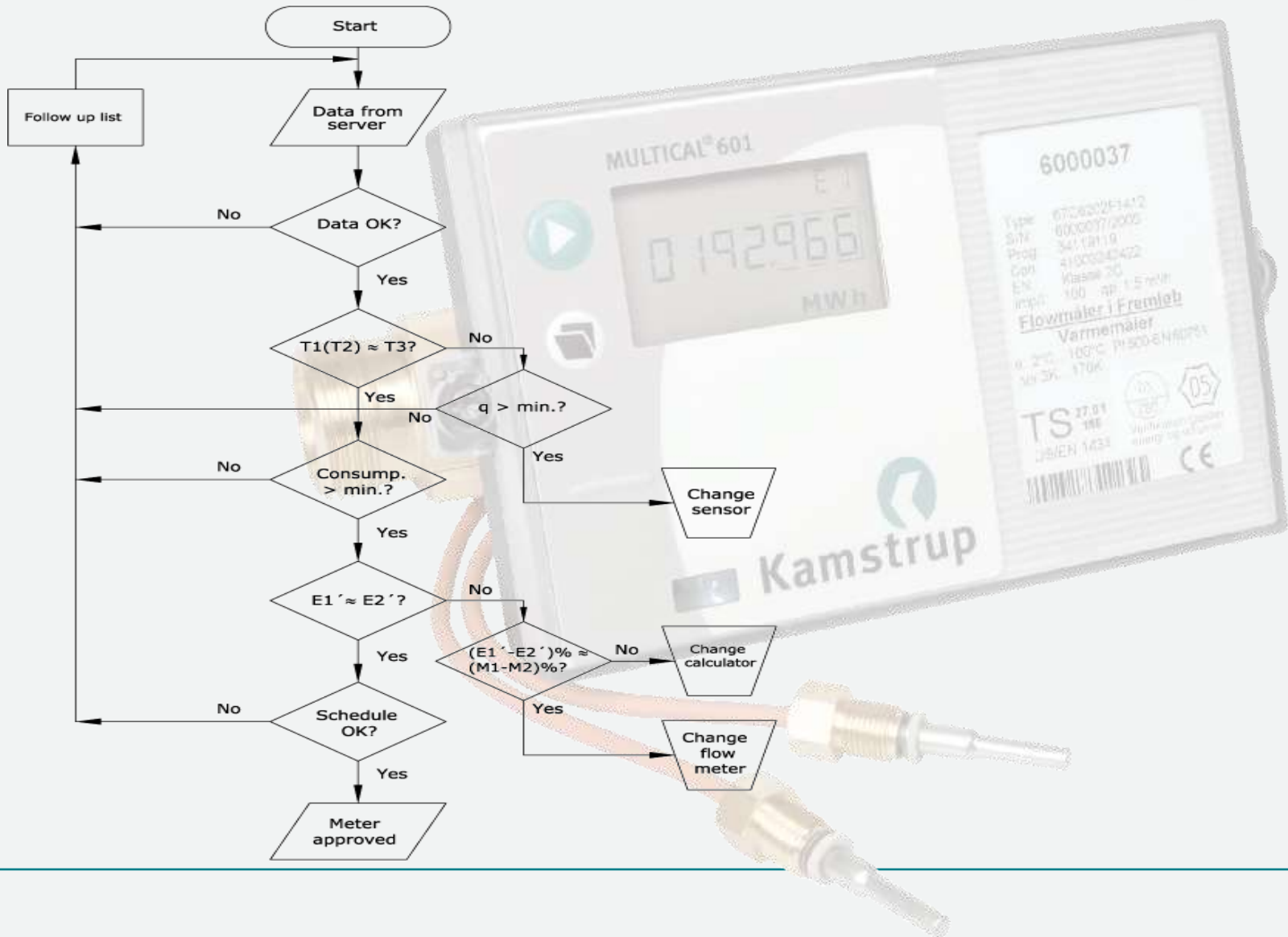
## AMR based meter fleet surveillance





# Kamstrup

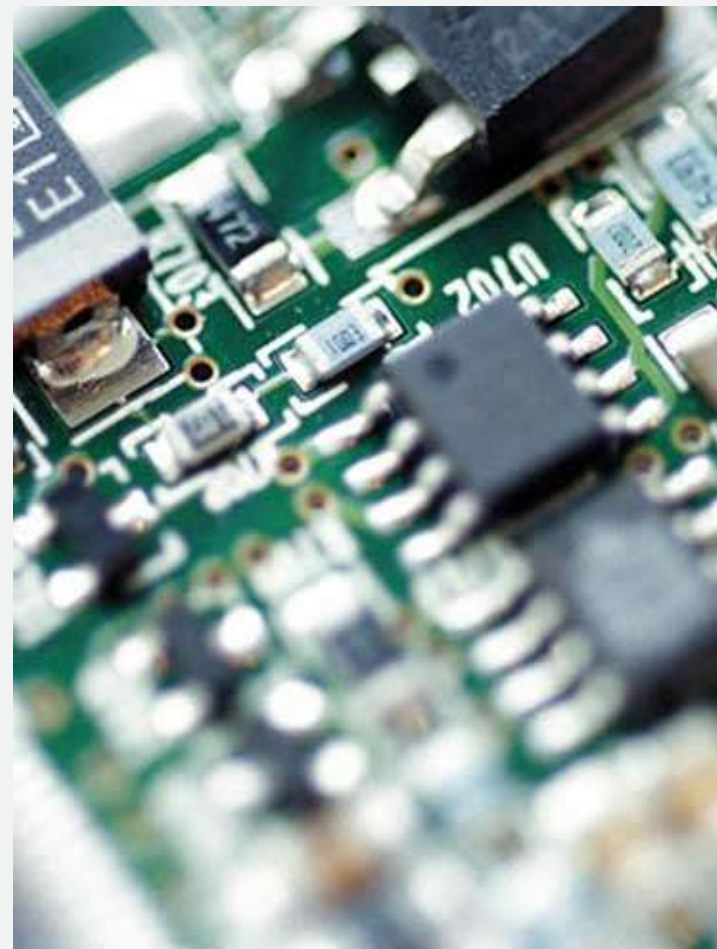
## AMR based meter fleet surveillance







**The heat meters used for “AMR based meter fleet surveillance”**







Kamstrup

## AMR based meter fleet surveillance

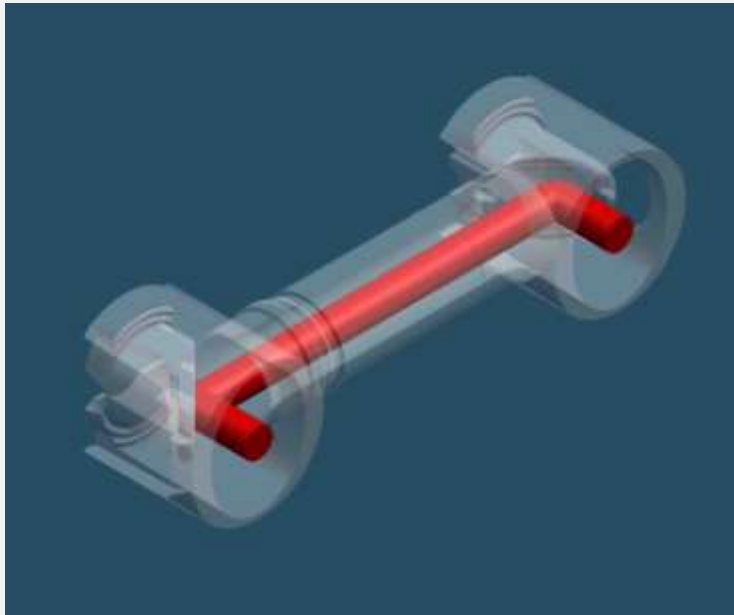


- AMR-based heat calculator for 2 flow meters and 3 temperature sensors

- Long-life flow meters qp 0.6...1000 m<sup>3</sup>/h. Insensitive to flow disturbances and magnetite



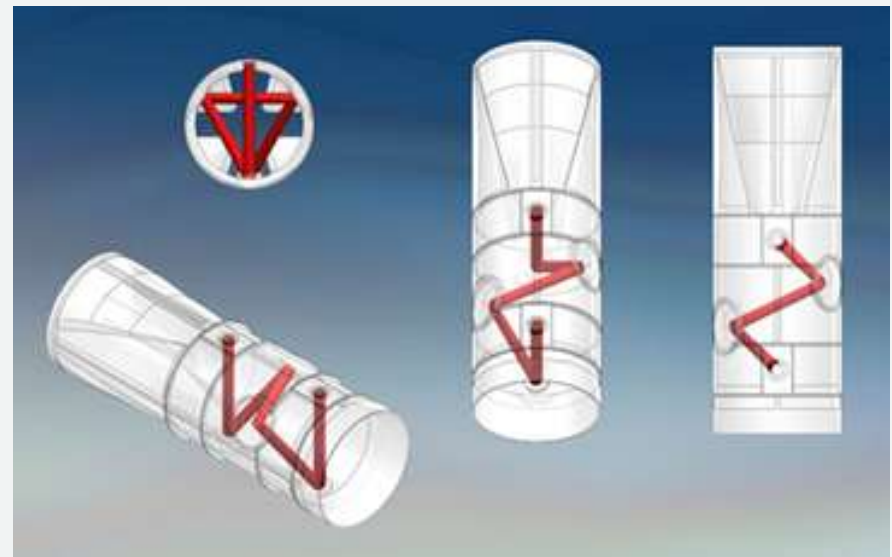
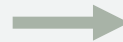
## AMR based meter fleet surveillance



- Parallel  
The ultrasonic beam runs in parallel with the measuring pipe and is transmitted from the transducers via the reflectors



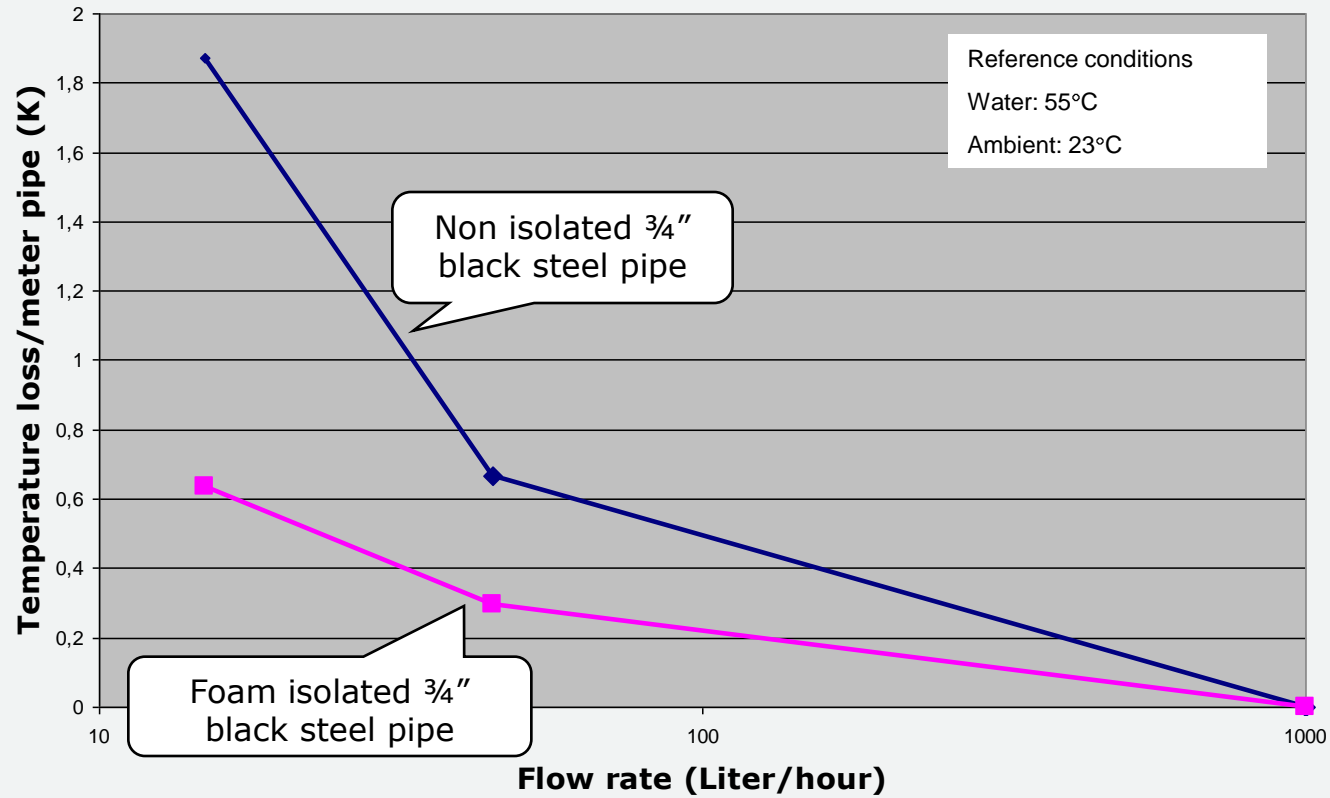
- Triangle  
The ultrasonic beam covers the measuring pipe in a triangle. The ultrasonic beam is transmitted from the transducers and reflected in a triangle to cover the measuring pipe





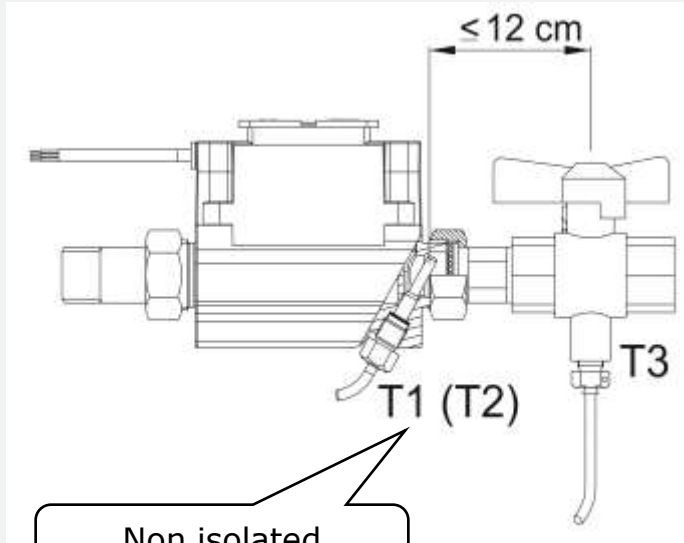
## AMR based meter fleet surveillance

### Temperature loss in steel pipes





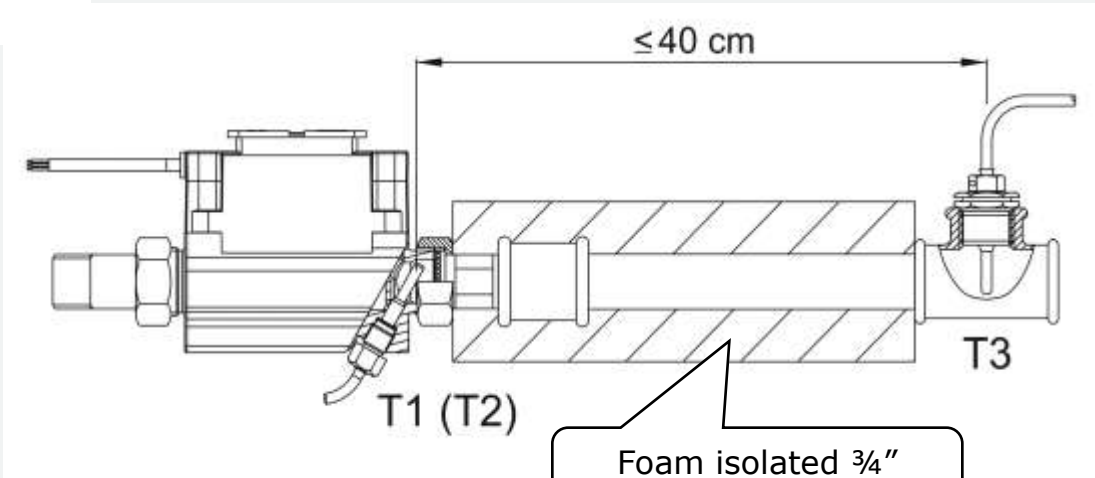
## AMR based meter fleet surveillance



Non isolated



Max. pipe distances between sensors when allowing up to 0.25 K error at  $q_i$  (15 liter/hour)



Foam isolated 3/4" black steel pipe



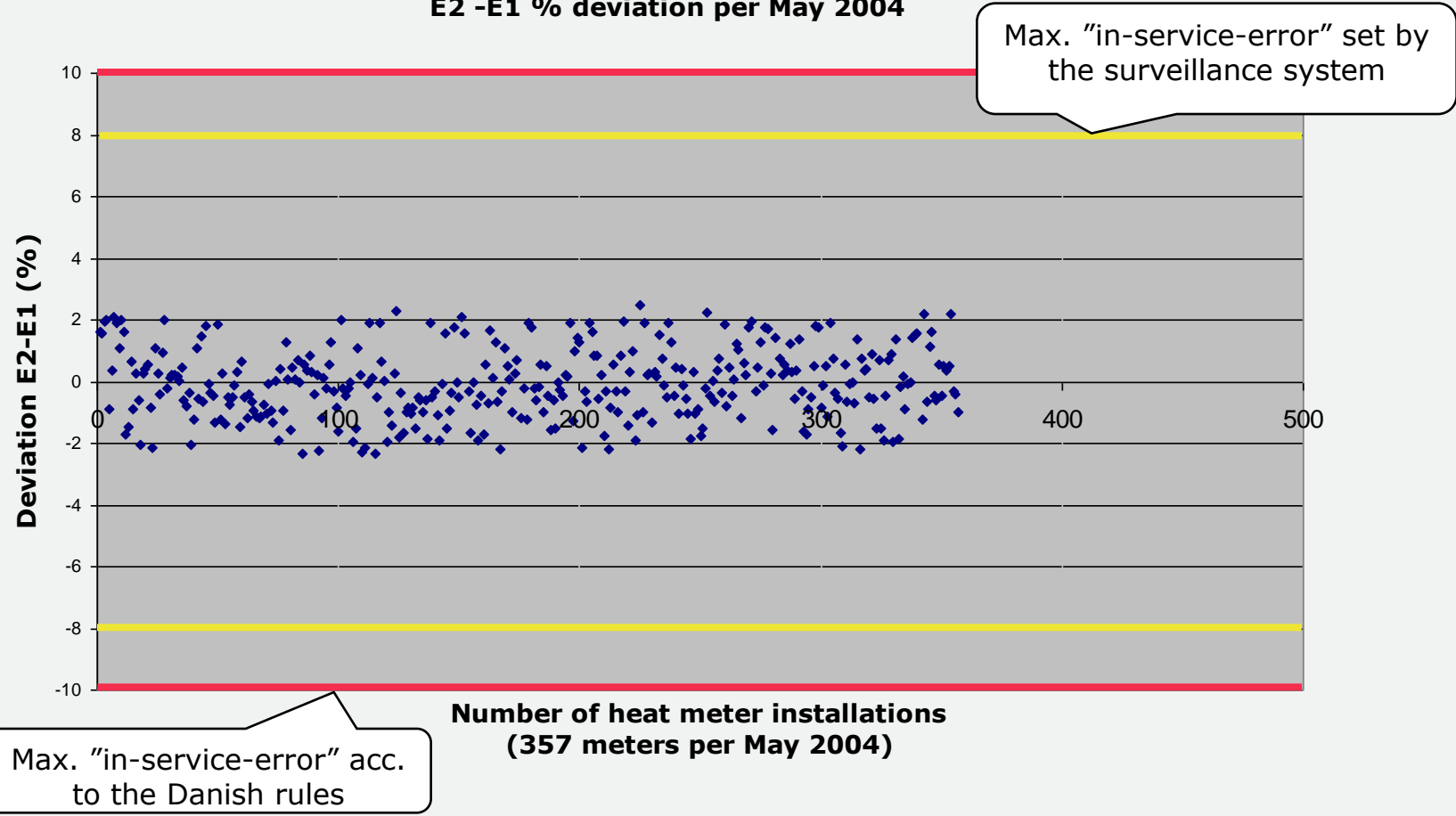
**Results from “AMR based meter fleet surveillance”**





## AMR based meter fleet surveillance

E2 -E1 % deviation per May 2004

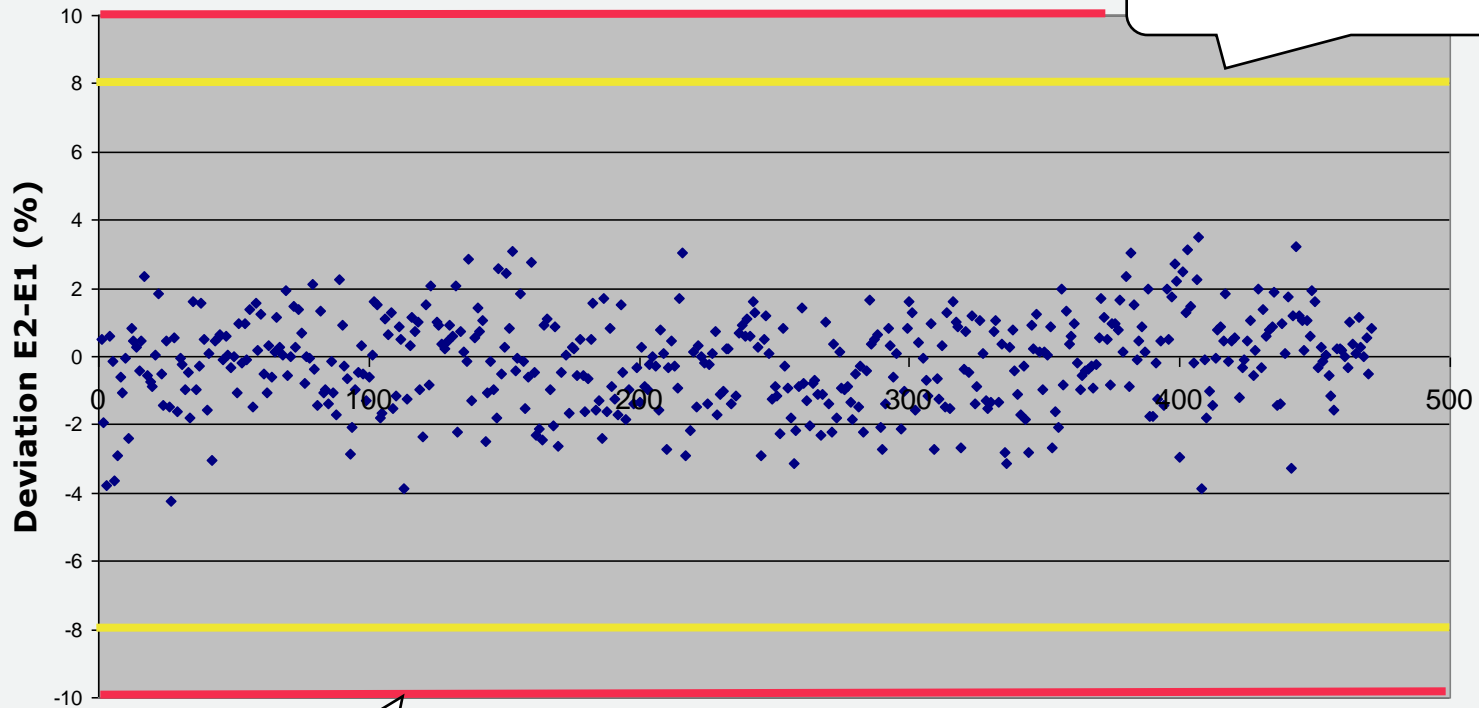




# AMR based meter fleet surveillance



**E2 -E1 % deviation per May 2009**

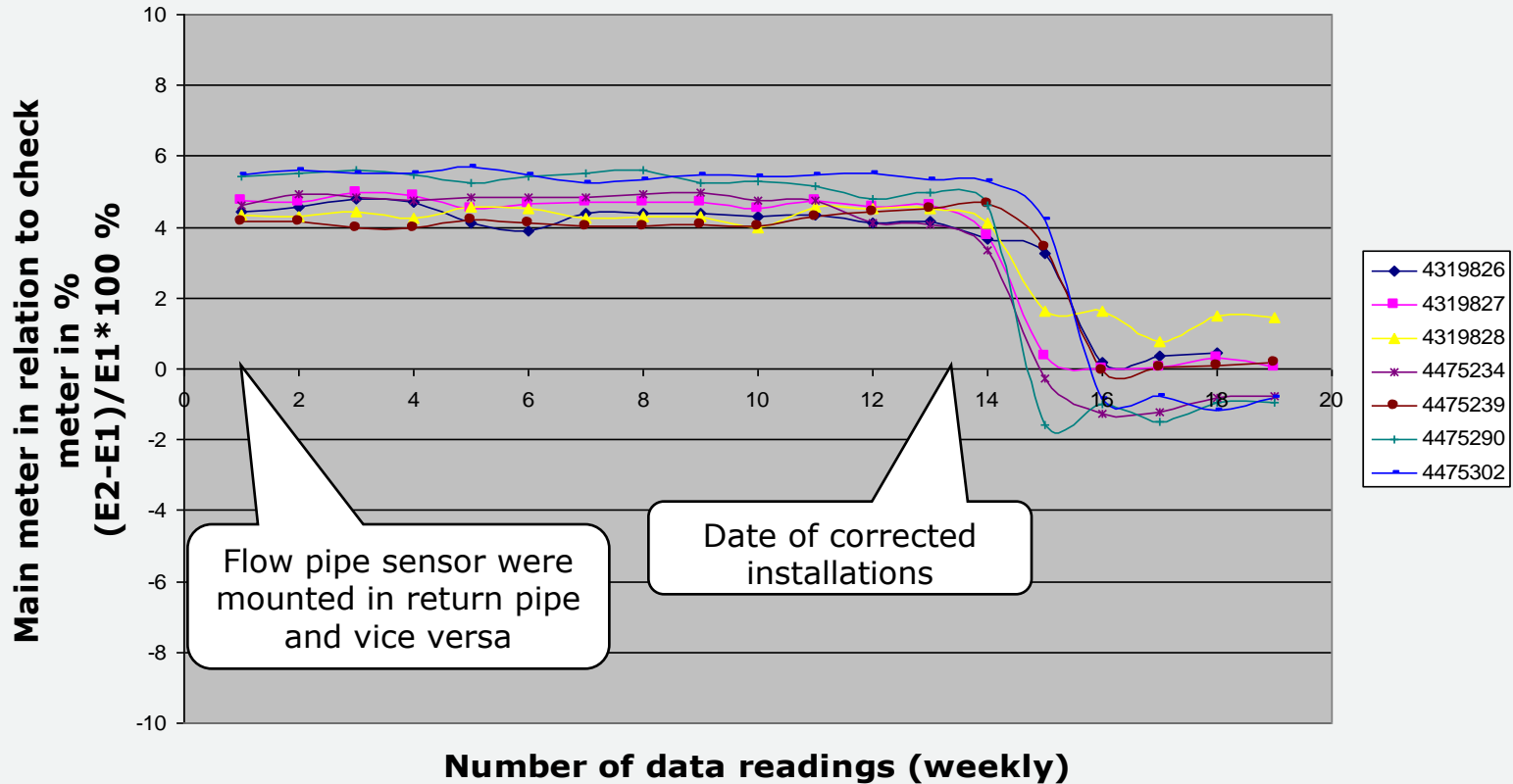


Max. "in-service-error" set by the surveillance system

Max. "in-service-error" acc. to the Danish rules

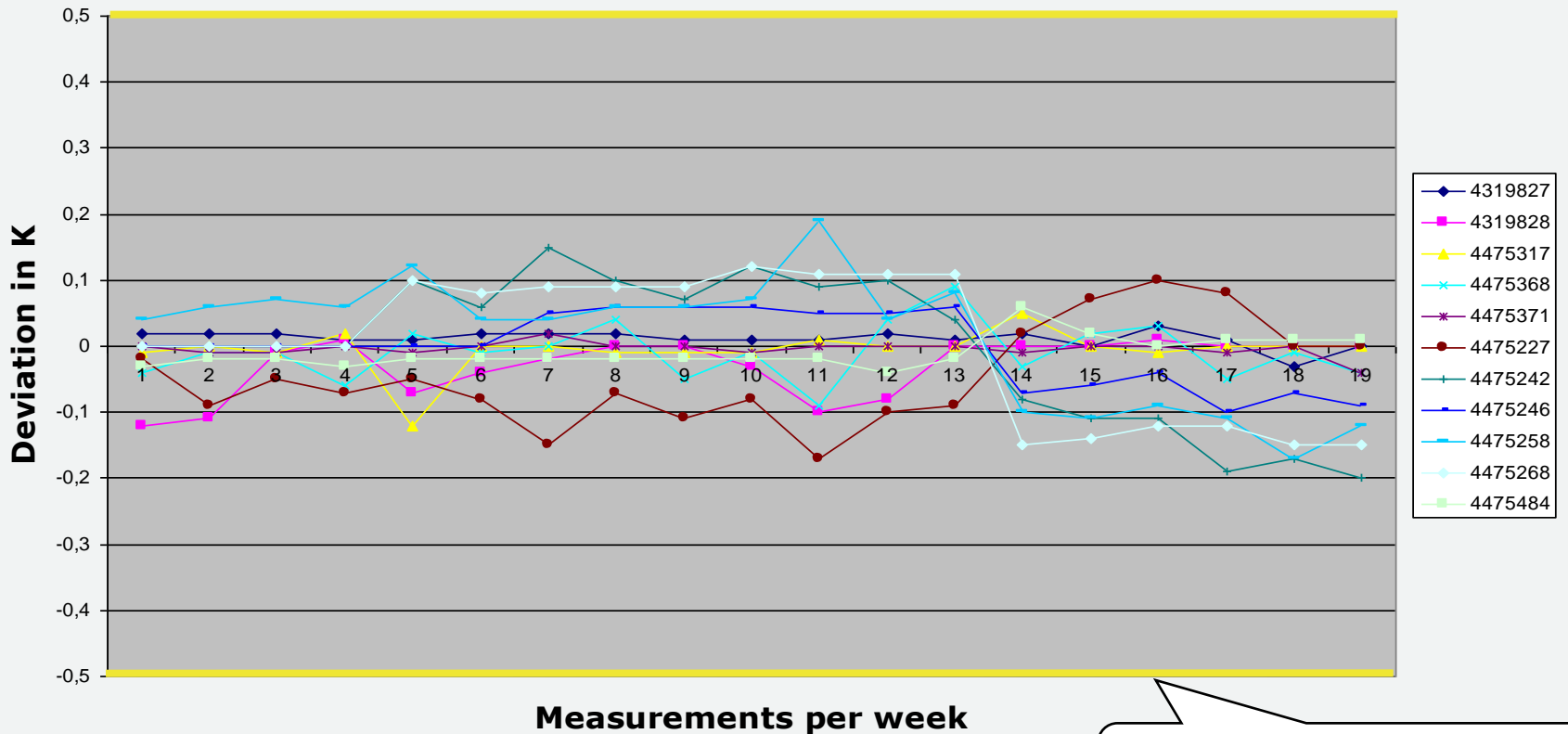
**Number of heat meter installations  
(471 meters per May 2009)**

## Flow meters in flow pipe and return pipe, wrongly installed



Due to the water density, the inlet is about 2.2% higher than the outlet at the temperature sets 75° C/27°C. This means approx. 4.4% error when the flow sensors are wrongly installed.

## Deviations in temperature sensor validations

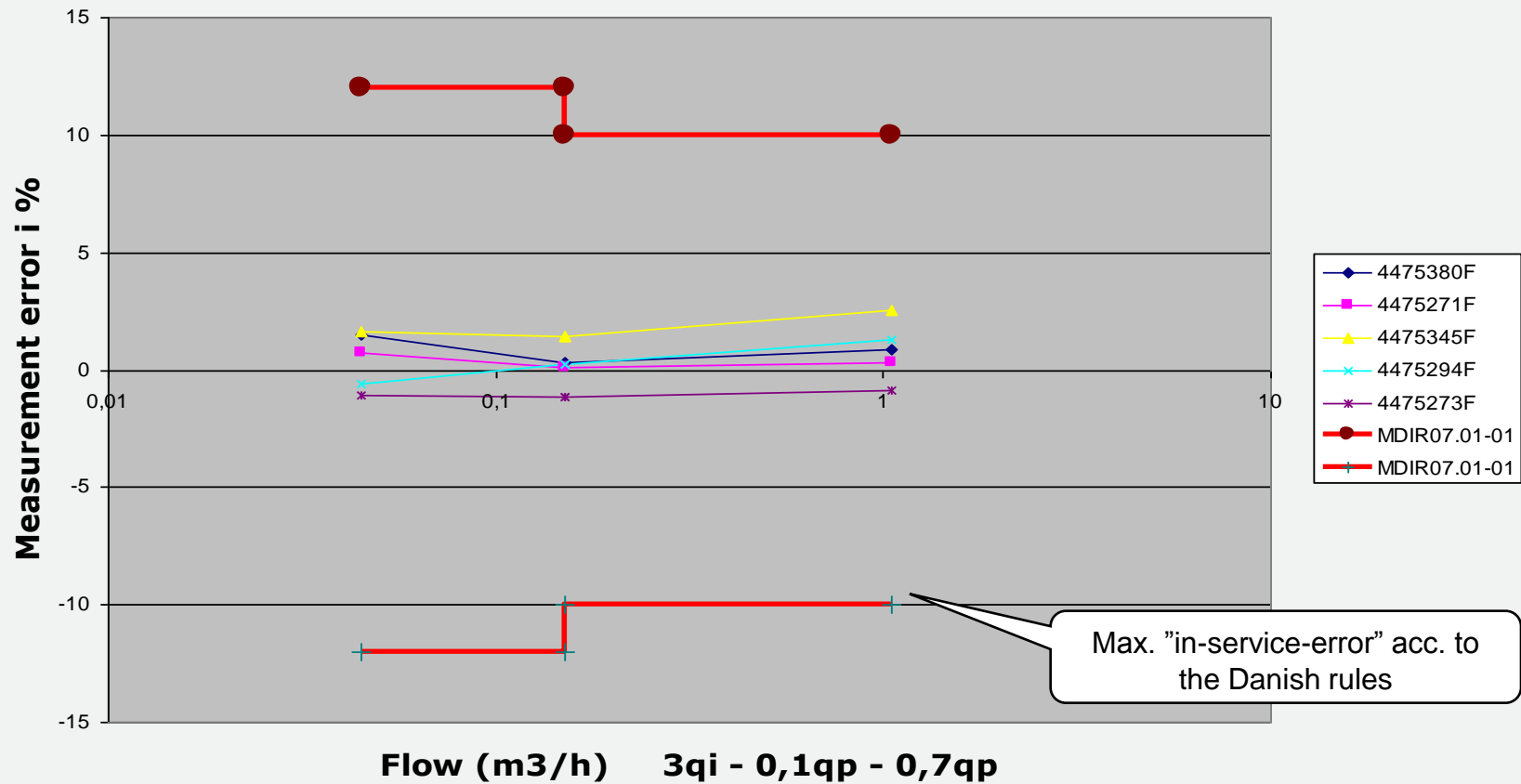


Max. "in-service-error" set by the surveillance system



## AMR based meter fleet surveillance

### Compliance between system result and Laboratory re-verification (complete heat meters)





### Cost comparison between:

- Replacement of all heat meters with 5 years interval

and

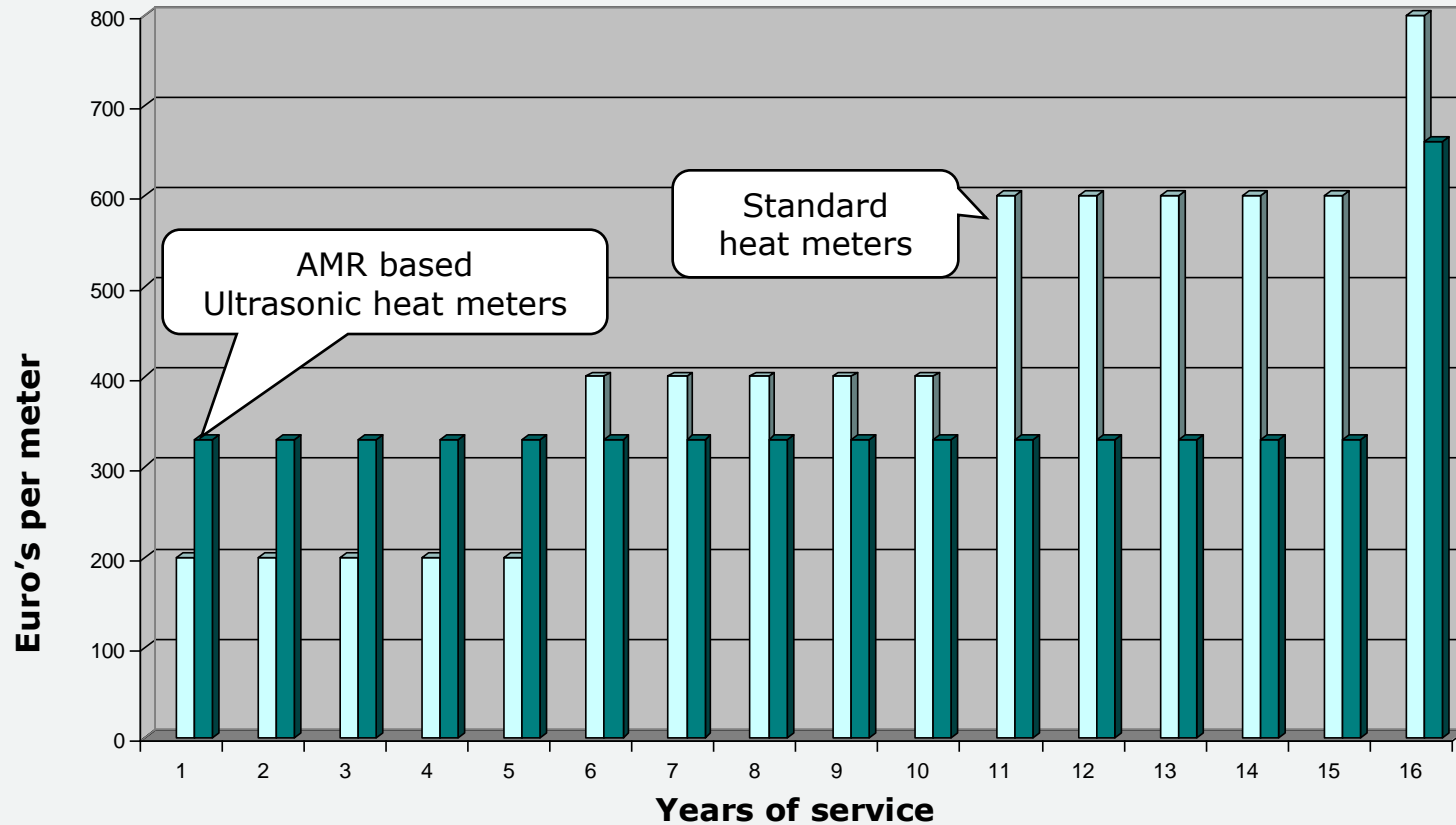
- "AMR based meter fleet surveillance"





# AMR based meter fleet surveillance

### Accumulated cost of new meters and installations







## AMR based meter fleet surveillance

### Advantages with AMR based meter fleet surveillance

- Environmental savings because heat meters are in service as long as they are performing well
- Economical savings for the heat supplier
- Heat loss due to defective meters is reduced to a minimum





## AMR based meter fleet surveillance

### Advantages with AMR based meter fleet surveillance

- Meter surveillance in real installations means also surveillance of the impact of e.g. flow disturbances
- AMR and leak surveillance are included, meaning economical savings on meter reading and reduced supply water
- Efficient fraud detection





**Kamstrup**

## AMR based meter fleet surveillance

**Thank you for your attention!**

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