Monitoring Systems GmbH

DioxinMonitoringSystem®

meeting the

Requirements in the European Standard EN 1948 for dioxin long term monitoring

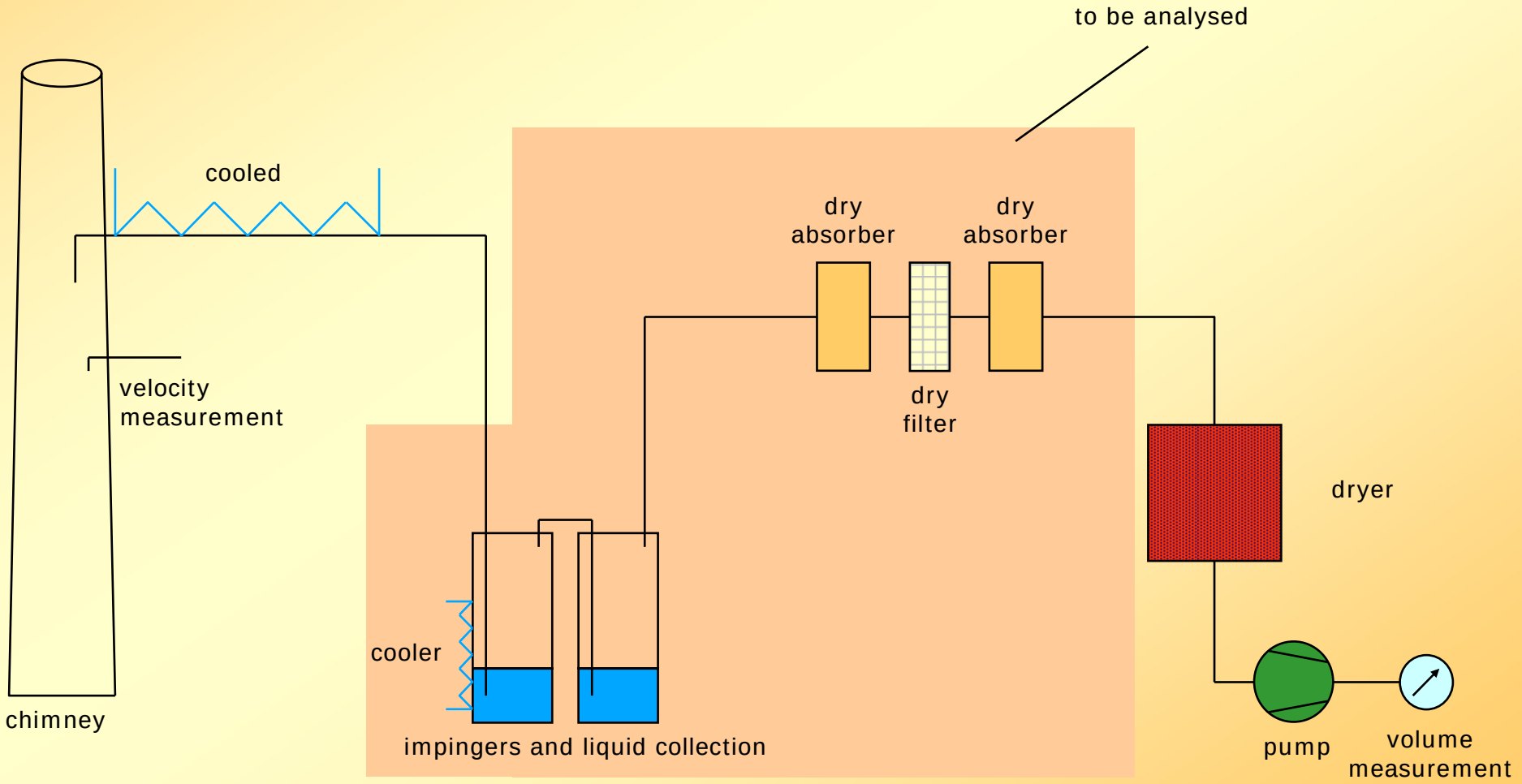
Requirements for Dioxin sampling

EN1948-1: Sampling of Dioxins from stack emissions

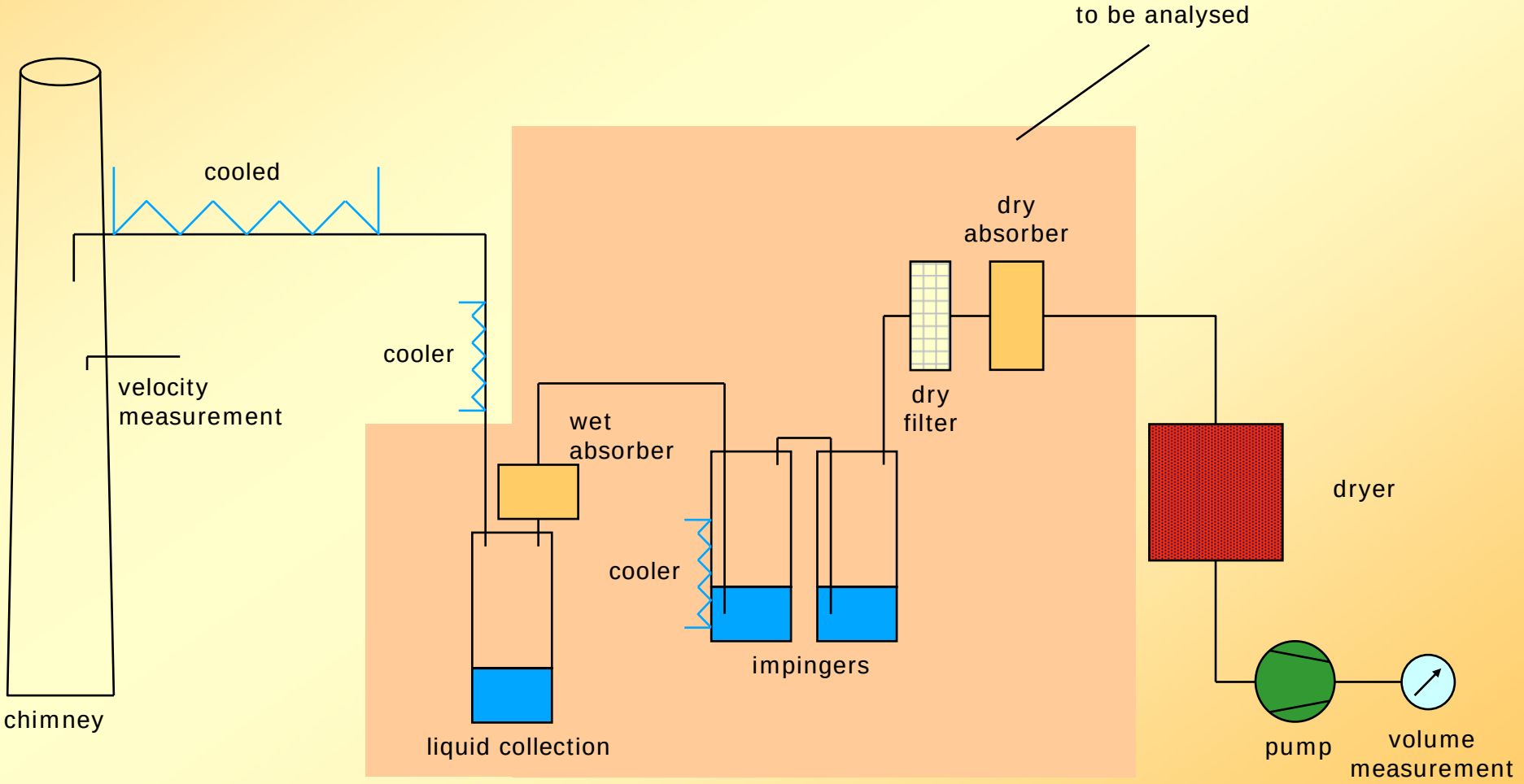
Tree principal methods

- Cooled probe method
- Filter-cooler method
- Dilution method

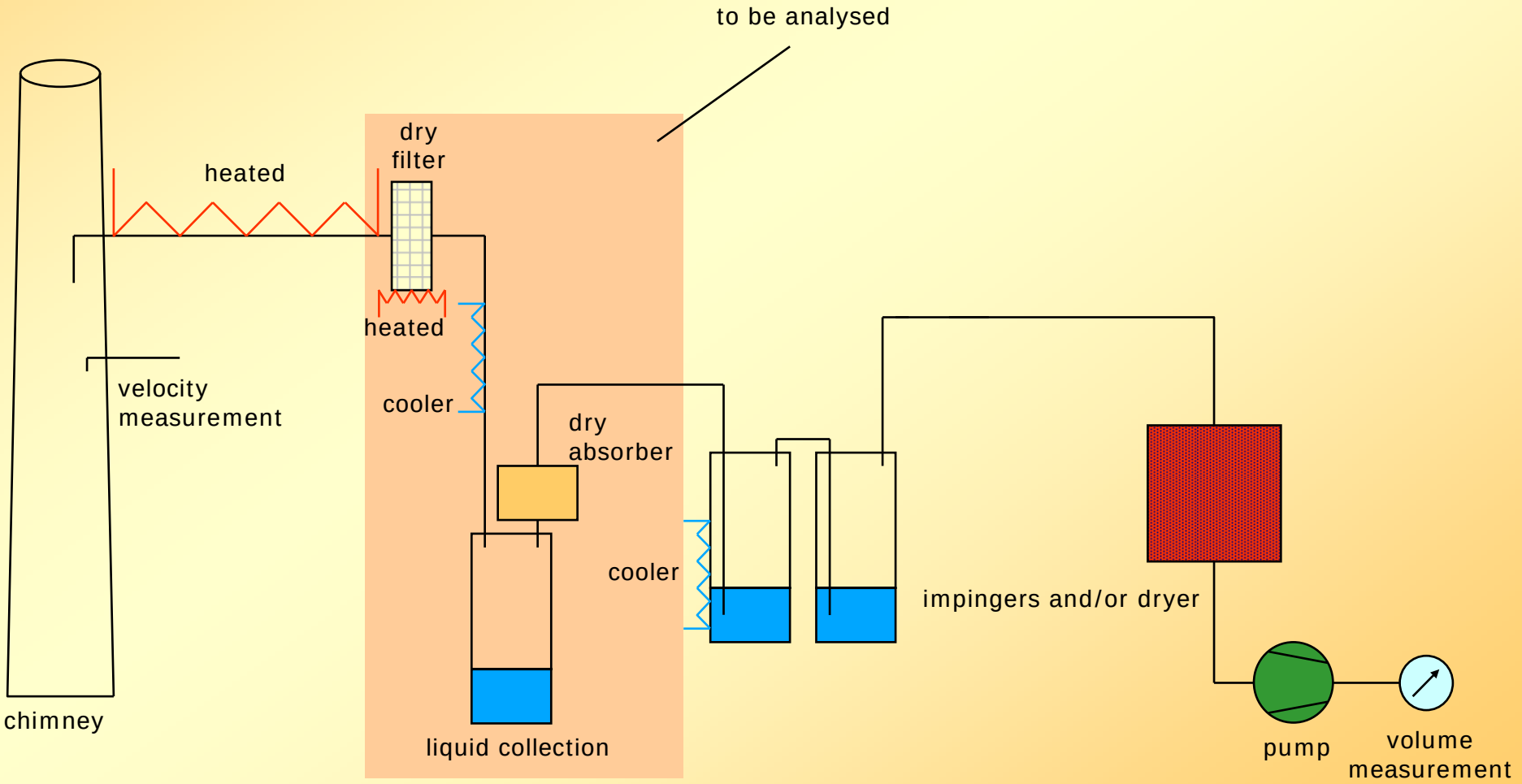
EN1948-1: Cooled probe method (var 1)



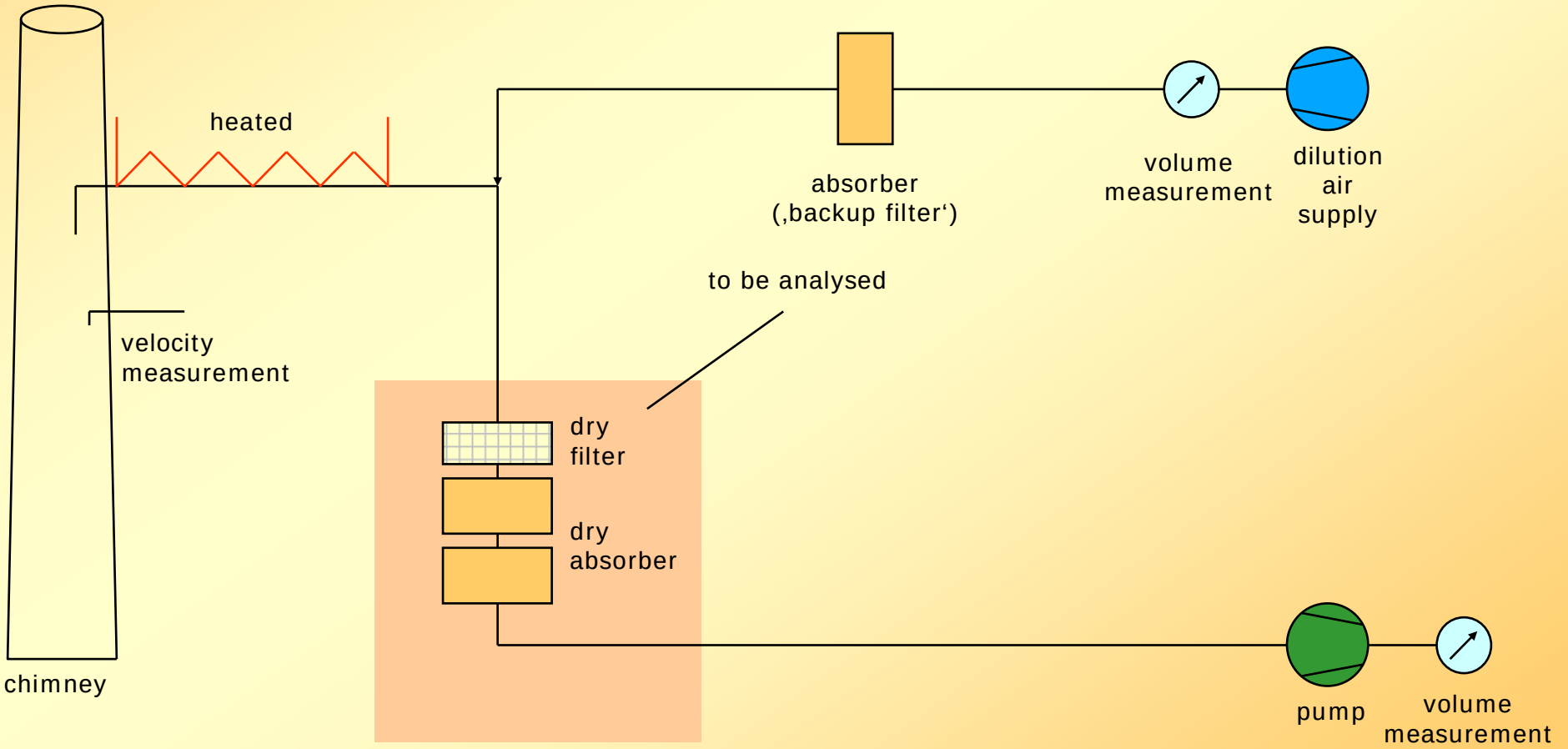
EN1948-1: Cooled probe method (var 2)



EN1948-1: Filter-cooler method



EN1948-1: Dilution method



Methods: EN 1948-1

- well established since >20 years, latest version >10 years
- validated
- provides 3 methods
  - cooled probe method
  - filter cooler method
  - dilution method
- where the dilution method is applicable for long term use also
  - with 2 limitations only:

    sampling time changed to >8 hours
    traversing missing

EN 1948-1 long term application

- sampling time extension
  - component stability on filters
  - breakthrough
- traversing missing
  - representativeness influenced
- condensed (liquid) phase not included in analysis (cooled probe method and filter cooler method)
  - precipitation efficiency from liquid phase
  - wash out (after precipitation)
  - wash through (particulates)

Representativeness influence

EN 13248-1 defines number of sampling locations
Depending on diameter / square of the stack

Original representativeness of sampling 95%

Corresponding percentage of lower sampling locations number
results in the same statistical t-value

A replacing single sampling location can not be selected (component diameter different)

Diameter [mm]			Square [m²]			Sampling locations acc. EN 13284-1	1 sampling location	2 sampling locations	3 sampling locations
0	**...**	**1000**	0,00	...	0,80	**4**	64%	85%	92%
1001	**...**	**1600**	0,80	...	2,00	**8**	56%	78%	86%
1601	**...**	**2000**	2,00	...	3,10	**12**	52%	75%	83%
2001	...	2256	3,10	...	**4,00**	**16**	51%	74%	82%
2257	...	2520	**4,00**	...	**5,00**	**20**	50%	73%	81%
> 2520			**> 5,00**		0,00	**24**	49%	73%	81%

Methods: TS 1948-5

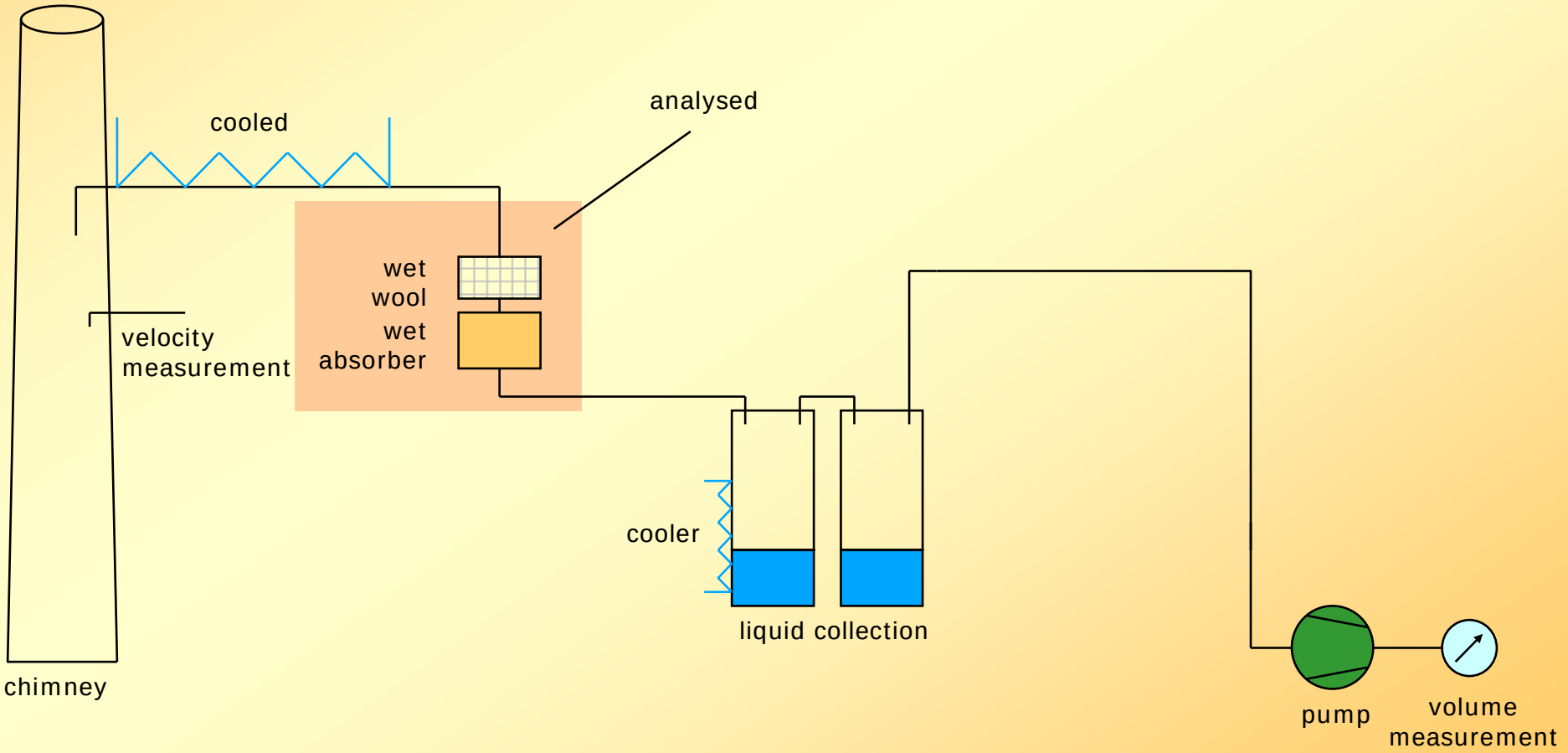
Monitoring Systems GmbH

- currently: technical specification – good draft for EN
- unvalidated, start of validation in preparation
- complex validation expected
  e.g. 3 mm nozzles instead of min 6 mm
- contradictions to be eliminated
  e.g. inclusion/exclusion of precipitated dust inside the probes
- inappropriate references and cross references to be changed
  e.g.
  - some defined requirements not applicable for all methods
  - reference to EN 15267 inappropriate, is for AMS
    French GA X 43-139 created for exactly this issue

TS1948-5: Modified cooled probe method

Monitoring Systems GmbH

Currently not validated !



Legal frame in Europe

Monitoring Systems GmbH

EN1948-1: Sampling of Dioxins from stack emissions

For each method several “minimum requirements”, e.g.

e.g. for cooled probe method:

> “The condensate is caught in a condensate flask.
> The filter is incorporated before the last ab/adsorption stage.”

e.g. for dilution method:

> “A solid adsorber stage is downstream from the filter.”

Device concept

Long time monitoring basing on EN 1948-1

- EN 1948-1 includes one of three methods for selection
- Two of the methods work with condensation of the gas humidity (cooled probe method, filter-cooler method), the complete liquid phases and the filters have to be analysed in the laboratory.

  For long term sampling the liquid amount is about 50 liters
  ---> these methods are not applicable correctly for long term sampling

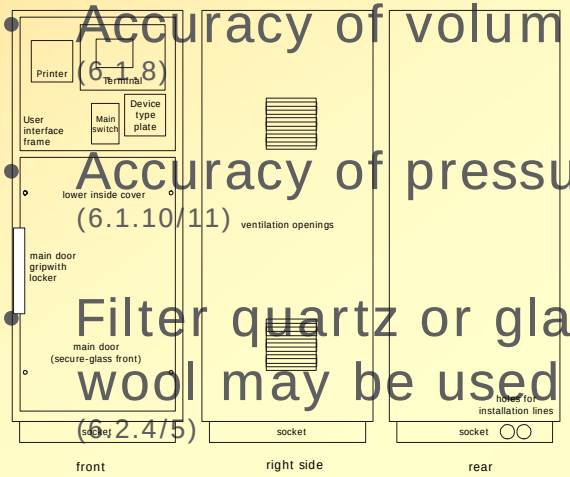
- One of the methods works with dry precipitation
  (dilution method)
  The solid filters are analysed in the laboratory

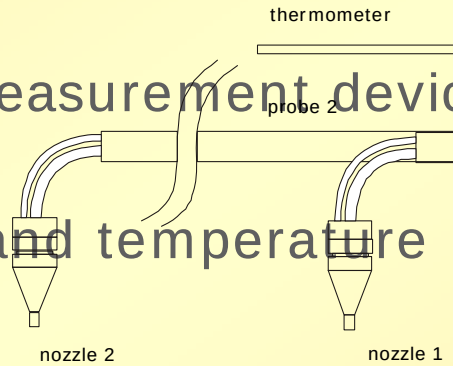
  → **Dilution method only possible and allowed method**

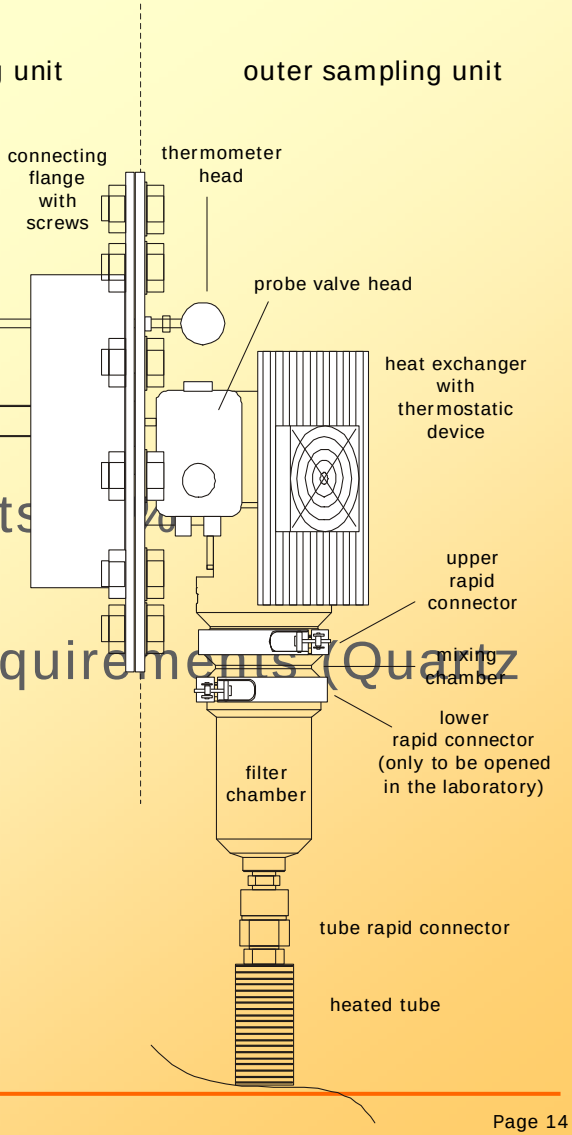
Device concept

Long time monitoring basing on EN 1948-1
General requirements

- Parts in contact with flue gas Titanium (6.1.2)
- Accuracy of volume measurement device ±2% (6.1.8)
- Accuracy of pressure and temperature measurements [illegible] (6.1.10/11)
- Filter quartz or glass fibre, meeting the minimum requirements (Quartz wool may be used as a prefilter only !) (6.2.4/5)





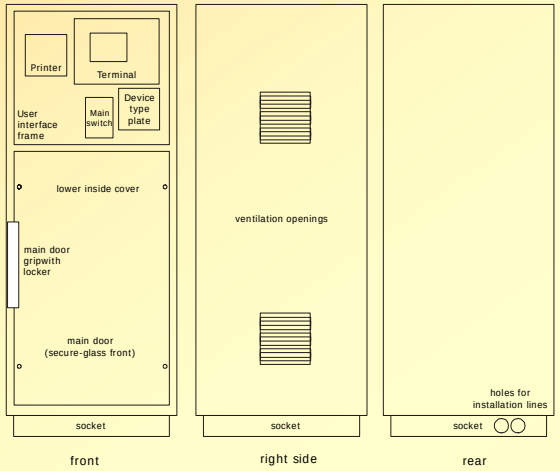


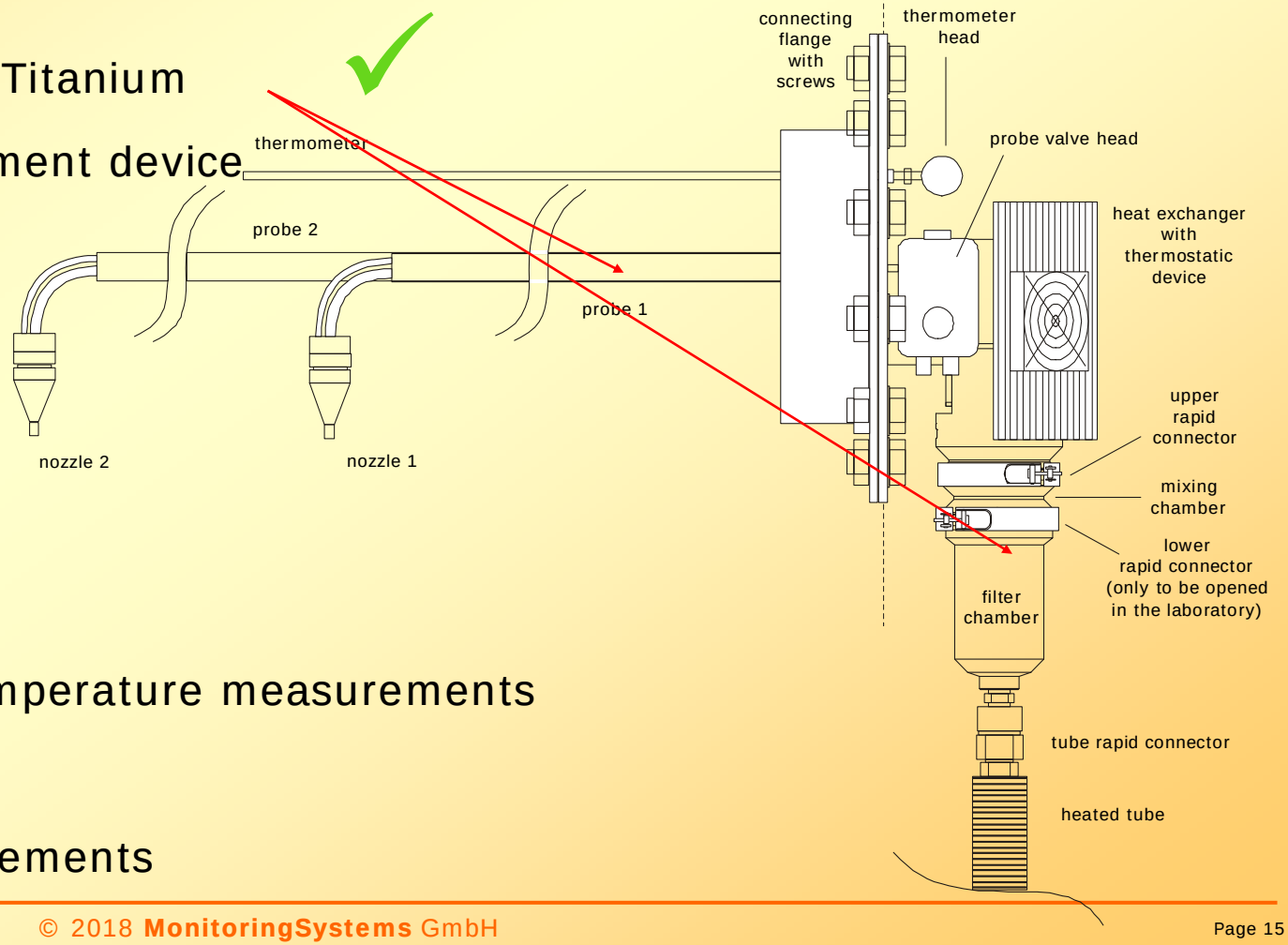
Device concept

Long time monitoring basing on EN 1948-1
General requirements

Parts in contact with flue gas Titanium

Accuracy of volume measurement device





Accuracy of pressure and temperature measurements

Filter quartz or glass fibre,
meeting the minimum requirements

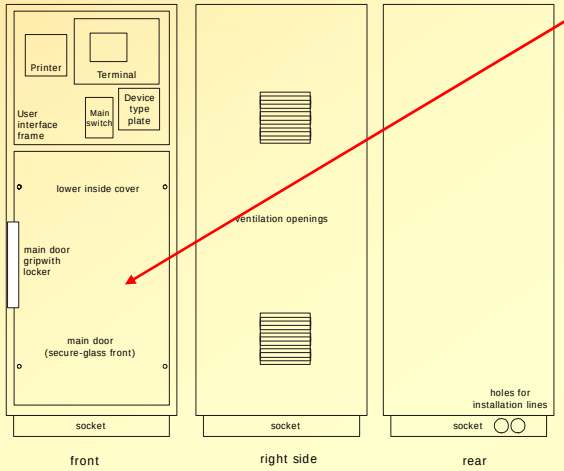
Device concept

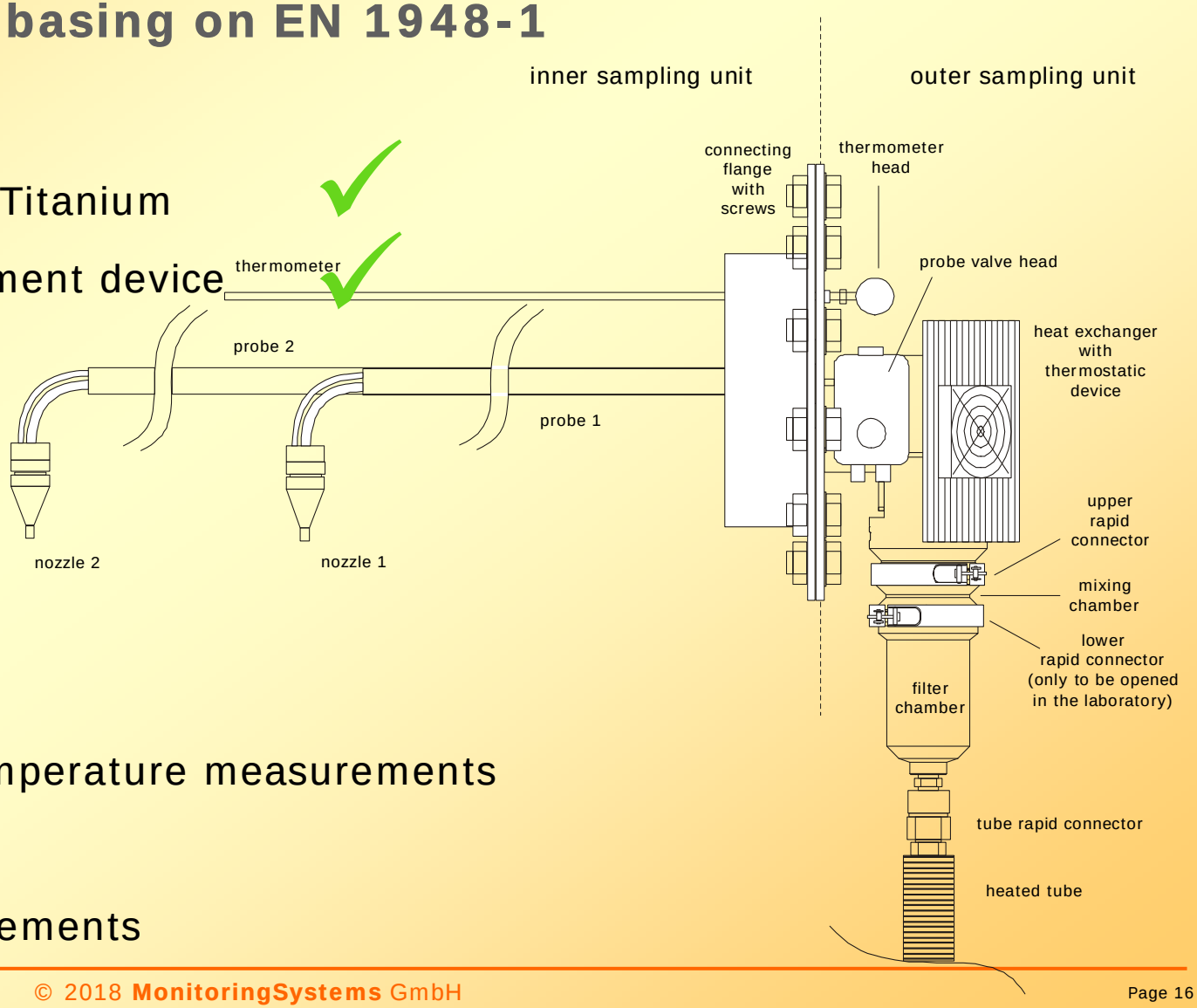
Long time monitoring basing on EN 1948-1

General requirements

Parts in contact with flue gas Titanium ✓

Accuracy of volume measurement device ✓





Accuracy of pressure and temperature measurements

Filter quartz or glass fibre,
meeting the minimum requirements

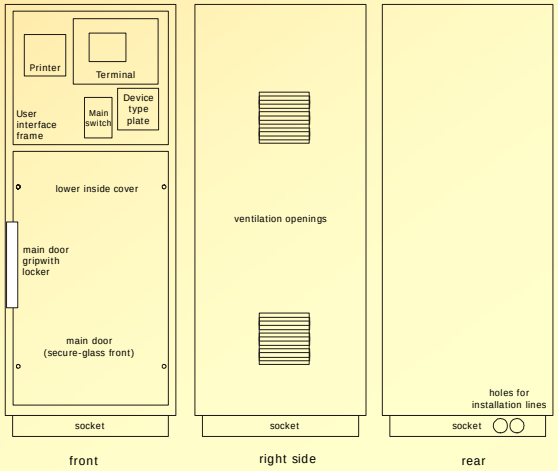
Device concept

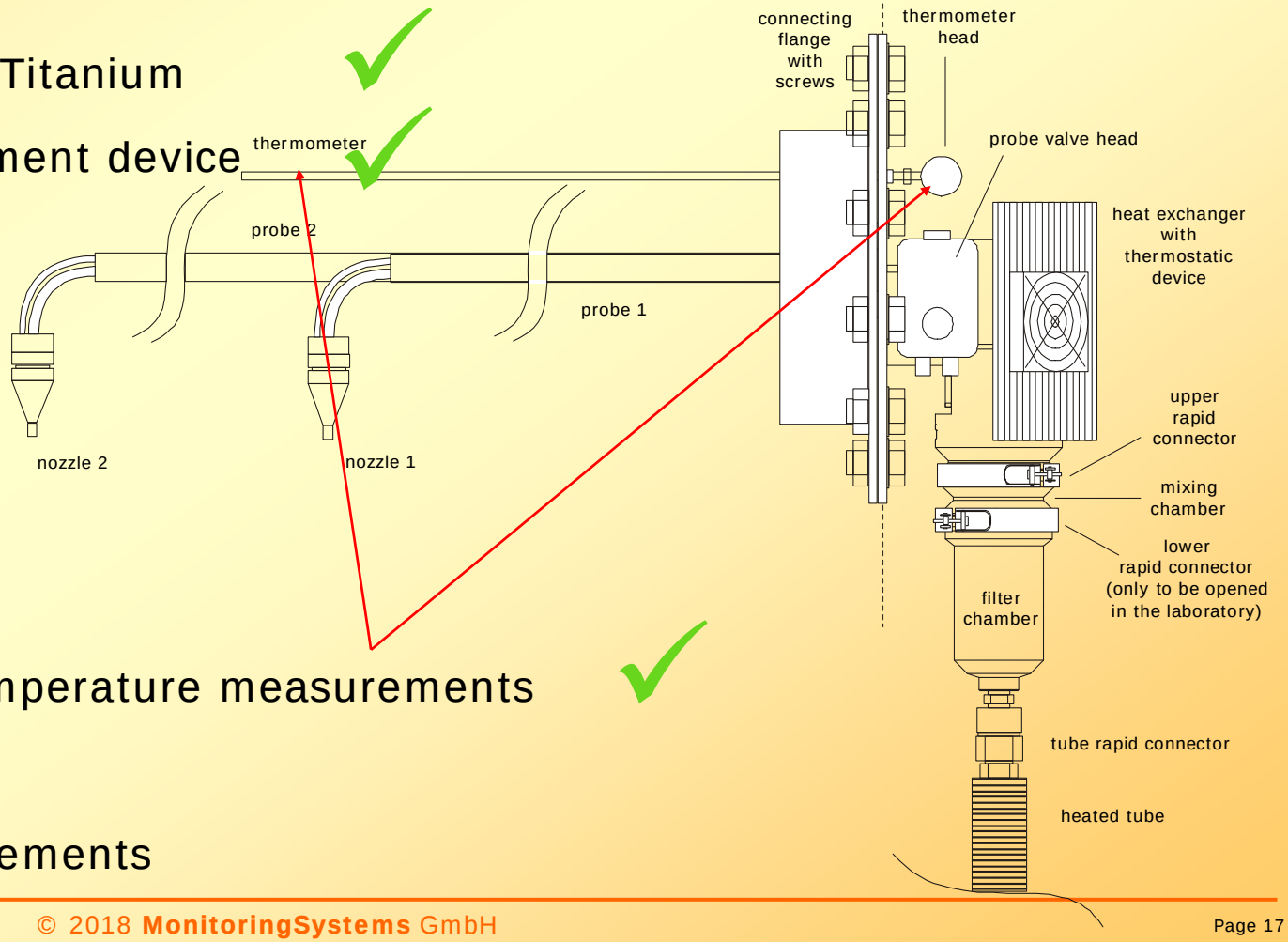
Long time monitoring basing on EN 1948-1

General requirements

Parts in contact with flue gas Titanium

Accuracy of volume measurement device





Accuracy of pressure and temperature measurements

Filter quartz or glass fibre,
meeting the minimum requirements

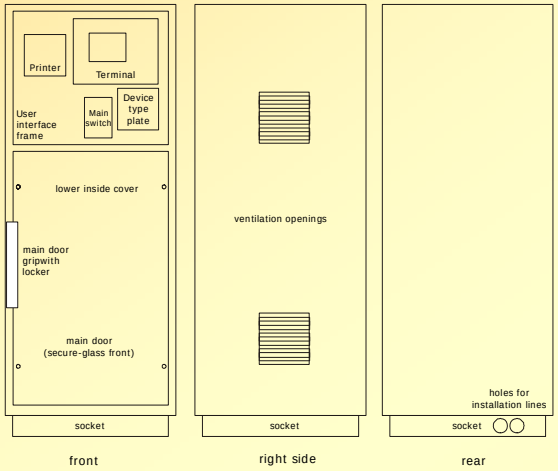
Device concept

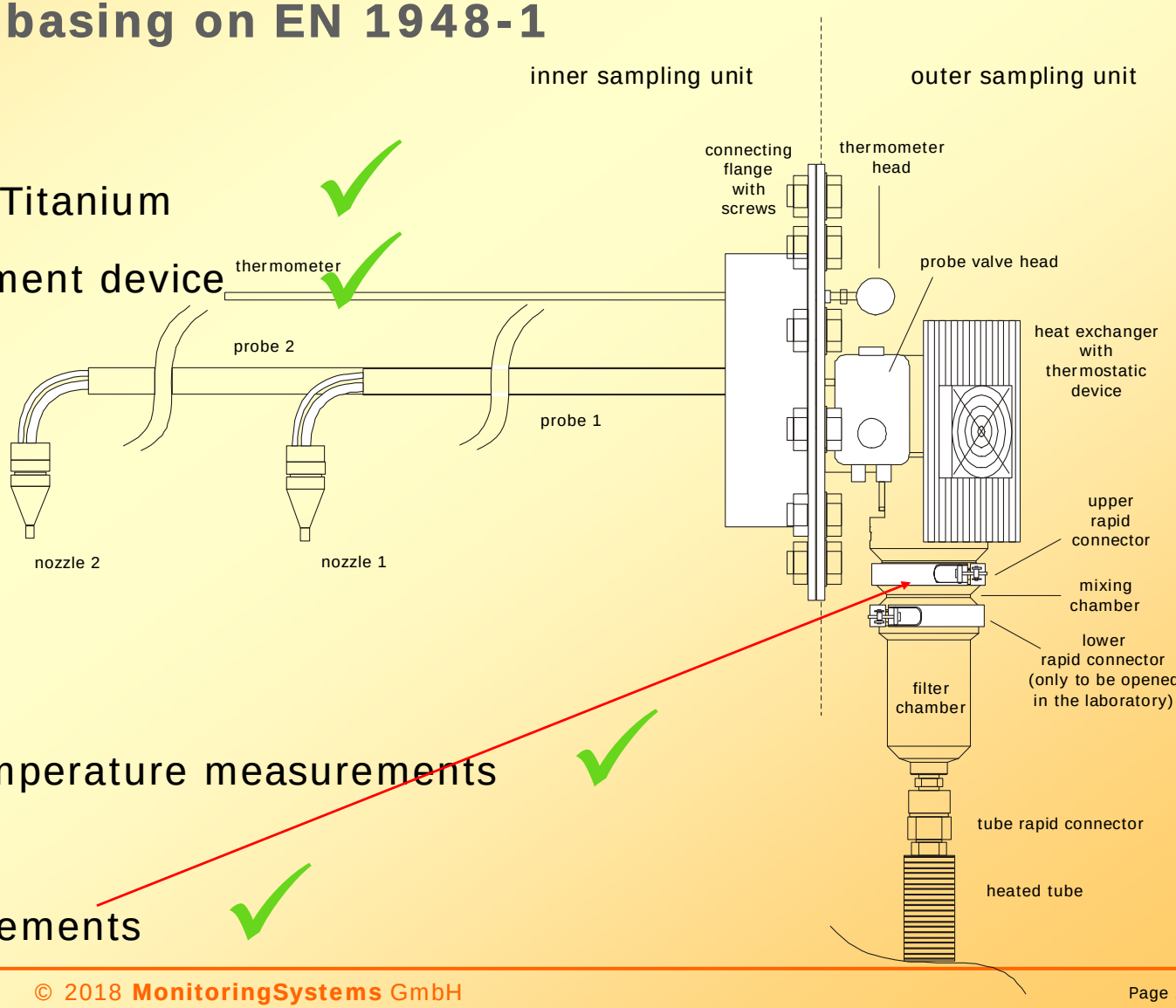
Long time monitoring basing on EN 1948-1

General requirements

Parts in contact with flue gas Titanium ✓

Accuracy of volume measurement device ✓





Accuracy of pressure and temperature measurements ✓

Filter quartz or glass fibre,
meeting the minimum requirements ✓

Device concept

Monitoring Systems GmbH

Long time monitoring basing on EN 1948-1
General requirements

- Filter efficiency: better than 99,5% @ 0,3 µm or 99,9% @ 0,6 µm
  7.1a)
- Adsorption stage efficiency: better than 90 %
  7.1b)
- Isokinetic sampling and representative positions (EN 13284-1)
  7.2 a,b)

Device concept

Long time monitoring basing on EN 1948-1
Special requirements for dilution method

- Condensation shall be avoided ✓
- Solid adsorber stage downstream from the filter ✓
- Dilution air verification adsorption stage ✓

Other methods' concept

Monitoring Systems GmbH

All other methods used on the market

Long time monitoring different to EN 1948-1

- Filter efficiency (7.2 a): **quarz wool only** ✗
- Not representative positions (7.2 b): **one probe only** ✗
- Filter is incorporated before last adsorption stage (7.6): **filter is missing** ✗
- "Condensate is caught in a condensate flask. Downstream, ... solid adsorber units are linked in order to collect the gaseous PCDDs/PCDFs" (5.1.4)

  condensate is not collected ✗

  solid adsorber is passed wet ✗

Contact

Monitoring Systems GmbH

MonitoringSystems GmbH

Bartbergstrasse 5
3021 Pressbaum
Austria / Europe

phone +43 2252 790619
fax +43 2252 70592
e-mail office@dioxinmonitoring.com
web www.dioxinmonitoring.com