MCERTS 2007

A ‘Plant Operator’ friendly QAL3 concept

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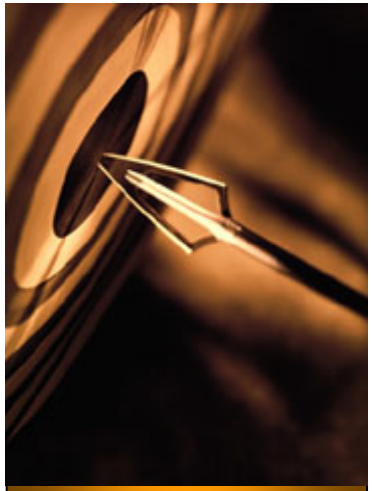

EN14181 Summary

QAL 3 – Key Points

QAL 3 – without calibration gas bottles

QAL 3 – ‘according to the maintenance interval’

ABB’s QAL 3 Software Package

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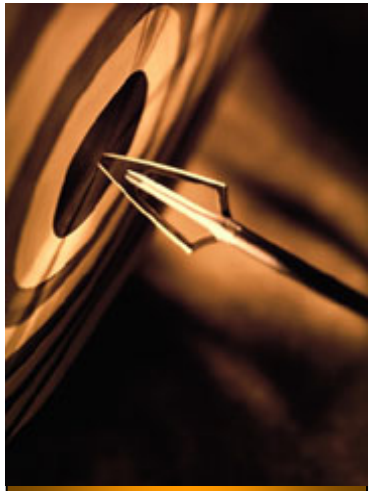

EN14181 Summary

QAL 3 – Key Points

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EN 14181 Quality Assurance of Automated Measuring Systems

Level	Application	Data
QAL1	■ Suitability of equipment	■ Performance evaluation, based on **EN ISO 14956** ■ Uncertainty calculations
QAL2 Annual Surveillance Test **AST**	■ Installation ■ Calibration ■ Functionality	■ Reference tests ■ Functionality checks ■ Calibration function ■ Variability test ■ Uncertainty calculations
QAL3	■ Precision ■ Drift ■ Performance	■ Zero drift ■ Span drift

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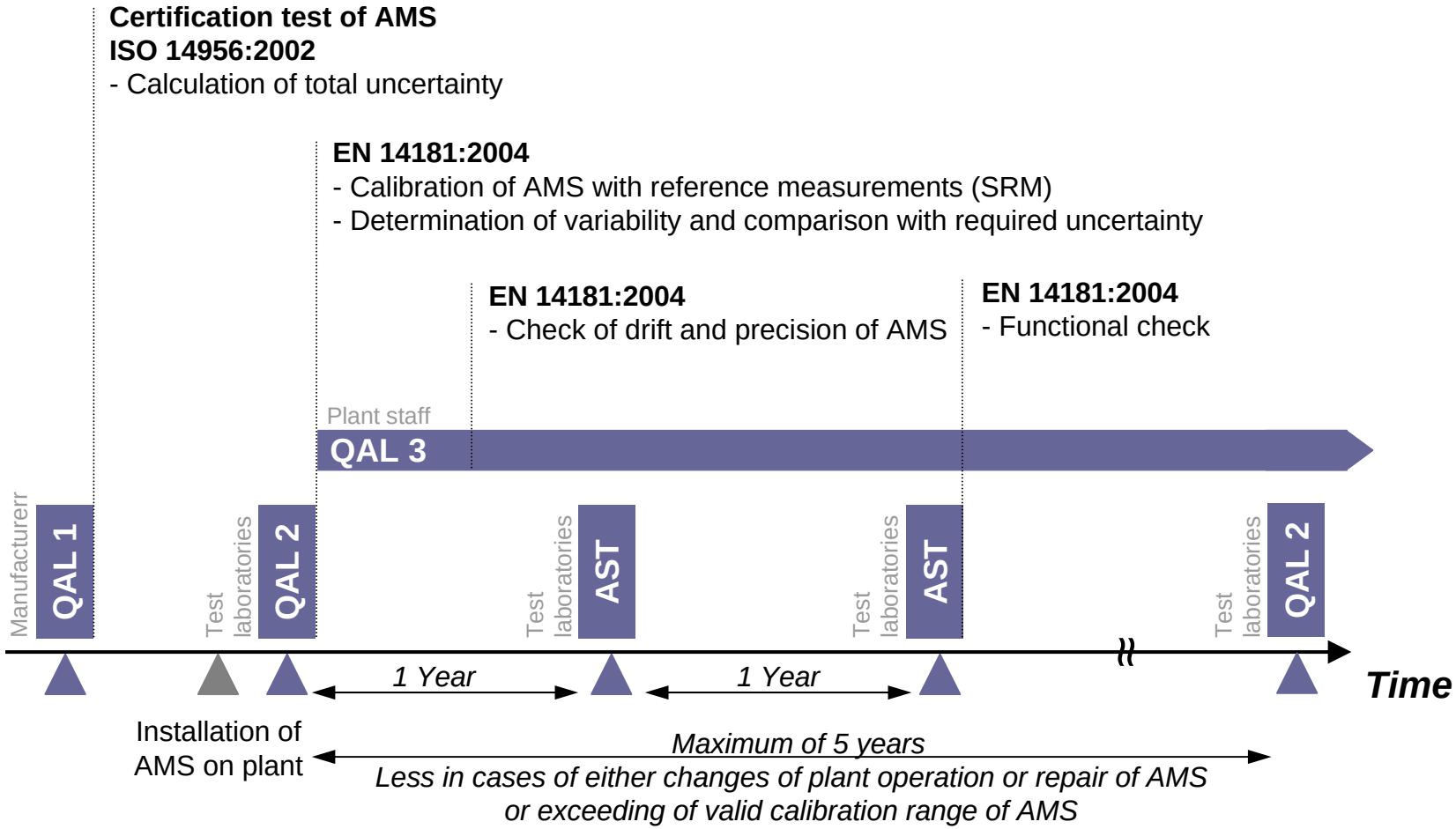
QAL1…3 over time, with references



AST = Annual Surveillance Test
AMS = Automated Measuring System
SRM = Standard Reference Method

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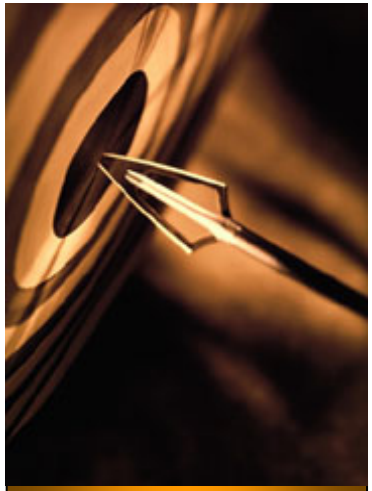

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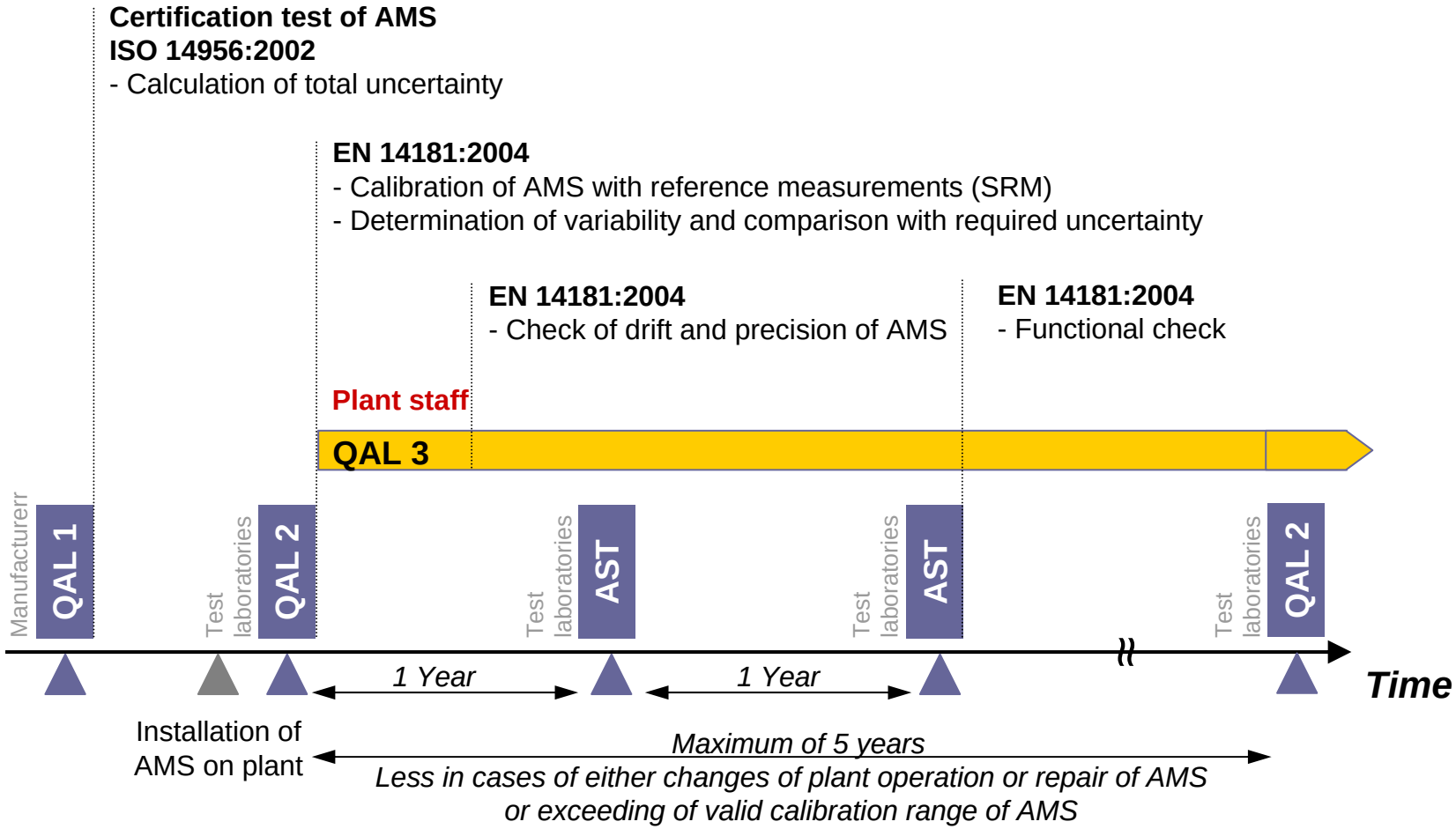
QAL1…3 over time, with references



AST = Annual Surveillance Test
AMS = Automated Measuring System
SRM = Standard Reference Method

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QAL 3 - **Plant Owners Responsibility**

Plant owner must ensure that - until the next AST / QAL2, the AMS meets the measurement uncertainty requirement

- Tests are performed continuously, during ongoing operation

- **Scope**
  - Periodic zero and span checks
  - Measured values are incorporated in **CUSUM** or **SHEWHART** control charts
  - Control charts reveal if drift and precision are in control, i.e. within an admissible range derived from results of the “QAL1 report”

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Comparison of CUSUM and Shewhart Control Charts

CUSUM [1] – Control Chart

- Determines **separately**
  Drift and Precision
  of the AMS
  at the zero and
  reference point
- Higher Flexibility

1) Cumulative sum chart

Shewhart [2] – Control Chart

- Determines the **combined**
  Drift and Precision
  of the AMS
  at the zero and
  reference point
- Easier procedure

2) Named after Walter Shewhart

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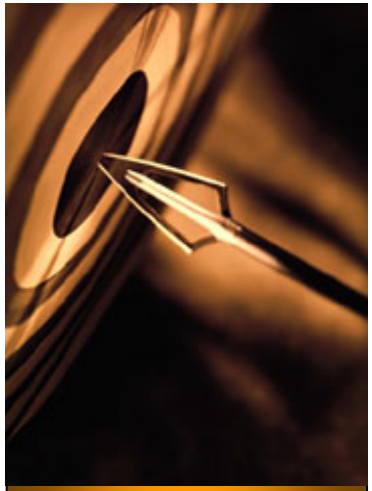

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ABB’s QAL 3 Software Package

QAL3 monitoring by ABB (CUSUM approach)

Every week (i.e. at least 52 times per year!) …

1. **… device adjustment must take place …**

TARGET: No additional influence on availability as a result!!

Advance Optima and EasyLine

short adjustment times (e.g. < 10 min.) have no influence on availability,
=> small maintenance interval possible / advantageous

▼ = Adjustment and simultaneous QAL3 inspection

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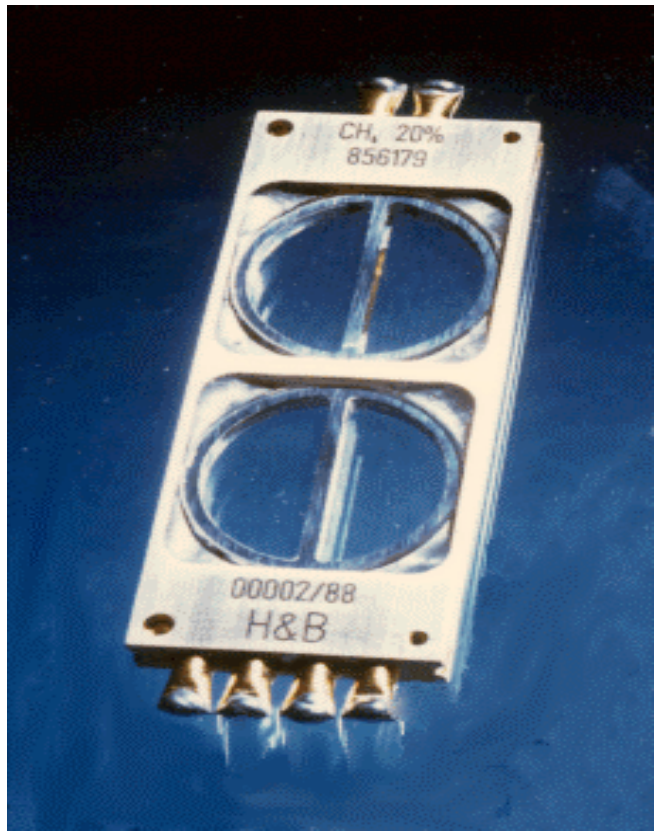
Validation/Calibration with Calibration Cells

- Validation/Calibration with gas filled calibration cells
- Selective adjustment of the span point
- Zero point calibration with ambient air
- No need for expensive test gas bottles
- Reduced maintenance workload (no changing of gas bottles)
- Higher availability



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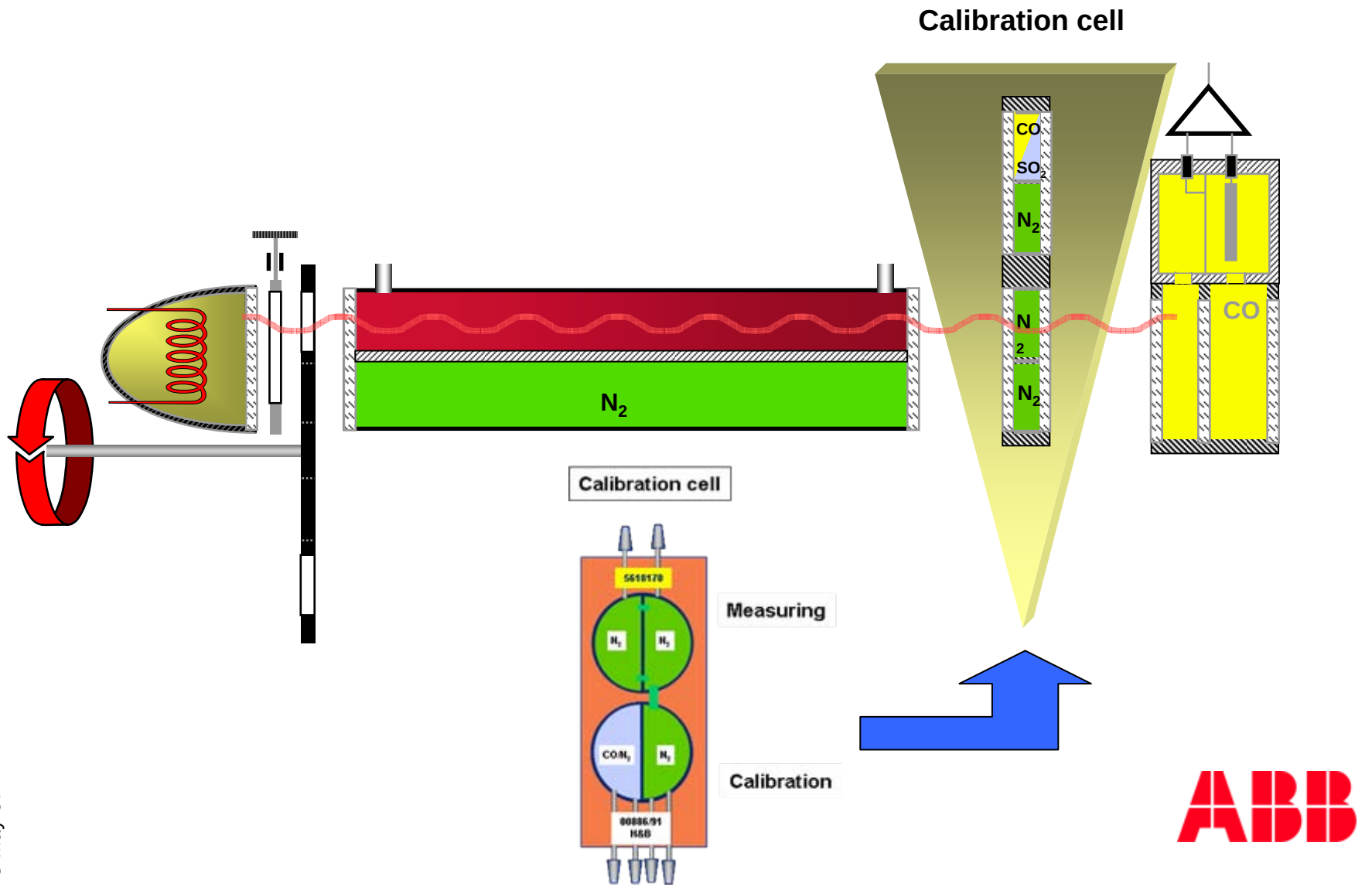
Validation/Calibration without test gas



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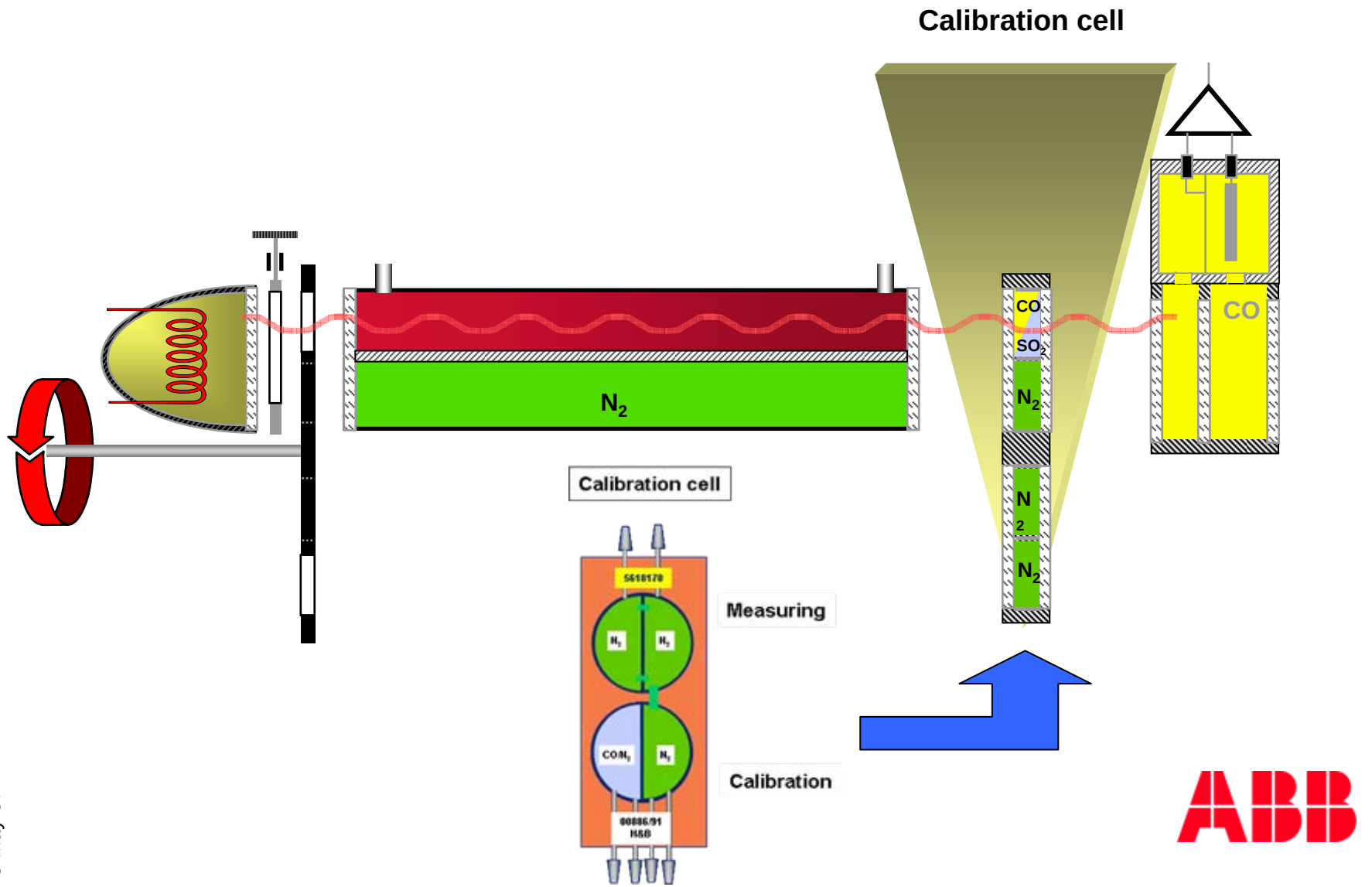
Validation/Calibration without test gas



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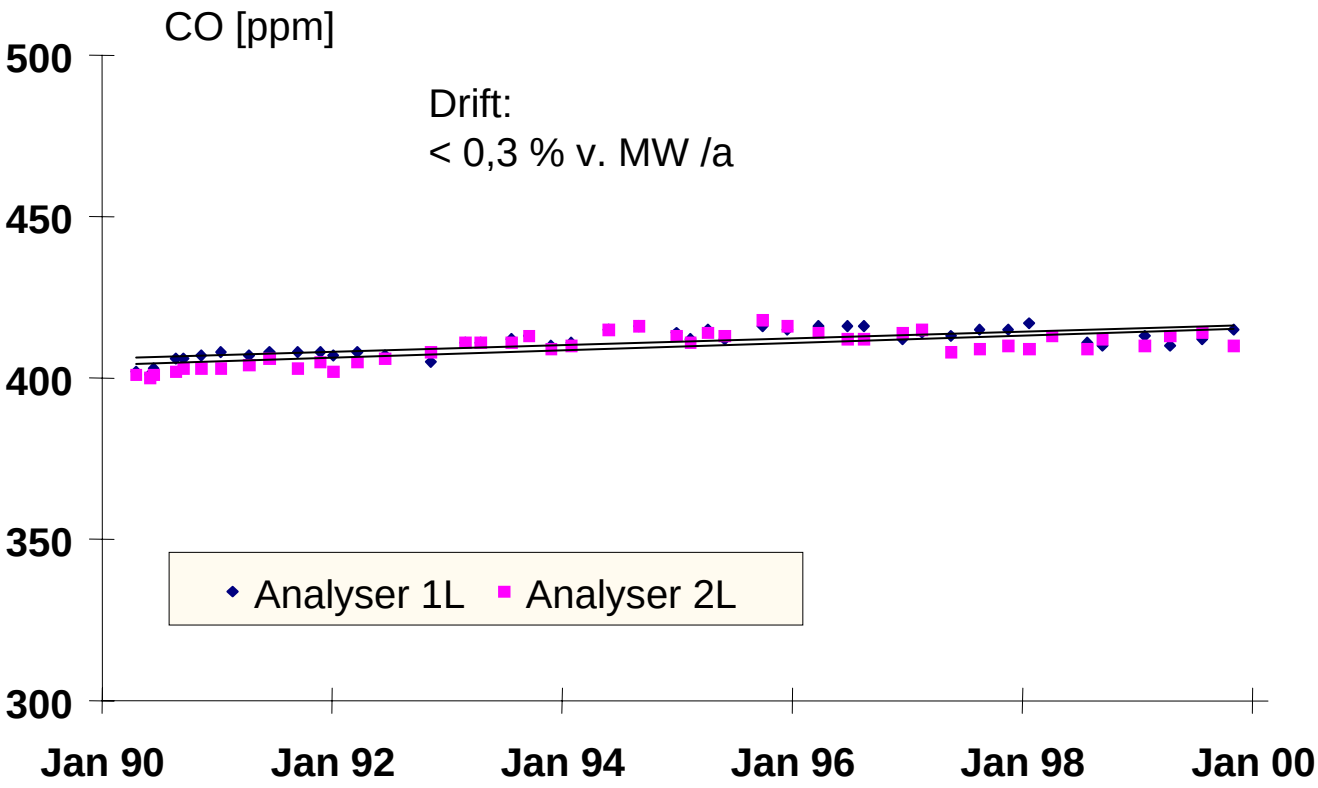
Longterm Stability of Calibration Cells



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TÜV approved for QAL3 monitoring

TÜV SÜD Industrie Service

Mehr Sicherheit. Mehr Wert.

ABB Automation GmbH
R&D Analysers & Methods (FEA)
Mr. Dr. Berthold Andres
Stierstaedterstr. 5
D-80488 Frankfurt/ Main

Ihre Zeichen/Nachricht vom	Unsere Zeichen/Name	Tel.-Durchwahl/E-Mail	Fax-Durchwahl	Datum	Seite
	IS-UISD-MB/Dr.Bra Dr. Alfred Brandl	089 5791-10 07 AlfredBrandl@tuev-sued.de	089 5791-28 95	26.04.2006	1 von 2

DIN EN 14181 **Applying QAL 3 to Uras 14 and Limas 11 (version with gas- filled adjustment devices)**

Dear Dr. Andres

Further to your telephone enquiry, I would like to comment on the question concerning the extent to which a regular check of zero point and sensitivity is required when QAL 3 is applied to Uras 14 and Limas 11 in accordance with DIN EN 14181.

Point 7 of DIN EN 14181 stipulates the need for on-going quality assurance during operation. This also includes determination of the precision and drift. We expect that Cusum control charts will mainly be used in accordance with Appendix C for drift calculation. According to "C6 Drift testing and necessary adjustments" contained in this appendix, an AMS which has automatic internal adjustment will be regarded as defective if a drift is detected and a repair has to be carried out. No differentiation is made here between zero point and reference point. No further stipulations are stated.

Uras 14 and Limas 11 can be equipped with automatic internal adjustment as an option. With this version, regular automatic adjustment of the zero point and reference point is carried out using zero gas or gas cells used as adjustment devices (adjusting cells). DIN EN 14181 does not state precise specifications on the intervals for drift checks. We assume that the intervals for drift checks ascertained in the performance test can be used.

Following announcement of Uras 14 and Limas 11, the following stipulation was stated with regard to drift checks:
"When gas cells are used as adjustment devices they should be checked at the annual functional test."

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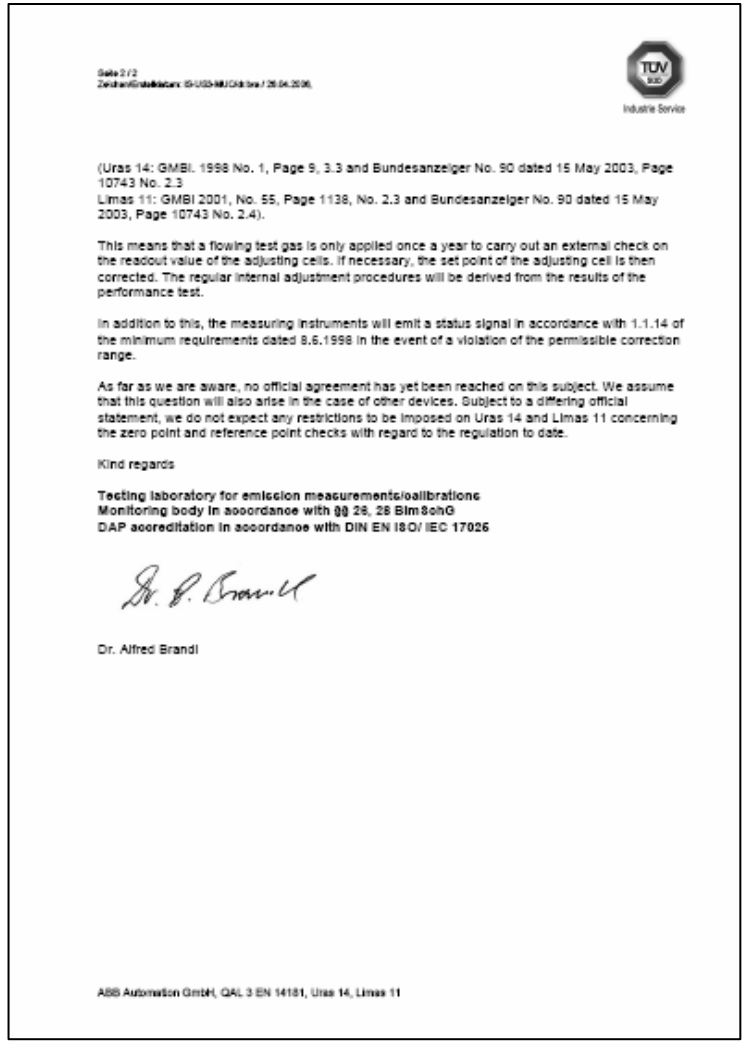

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Zeichen/Kurzbezeichnung: IS-UISD-MB/Dr.Bra / 26.04.2006

TÜV SÜD Industrie Service

(Uras 14: GMBl. 1998 No. 1, Page 9, 3.3 and Bundesanzeiger No. 90 dated 15 May 2003, Page 10743 No. 2.3
Limas 11: GMBl 2001, No. 55, Page 1138, No. 2.3 and Bundesanzeiger No. 90 dated 15 May 2003, Page 10743 No. 2.4).

This means that a flowing test gas is only applied once a year to carry out an external check on the readout value of the adjusting cells. If necessary, the set point of the adjusting cell is then corrected. The regular internal adjustment procedures will be derived from the results of the performance test.

In addition to this, the measuring instruments will emit a status signal in accordance with 1.1.14 of the minimum requirements dated 8.6.1998 in the event of a violation of the permissible correction range.

As far as we are aware, no official agreement has yet been reached on this subject. We assume that this question will also arise in the case of other devices. Subject to a differing official statement, we do not expect any restrictions to be imposed on Uras 14 and Limas 11 concerning the zero point and reference point checks with regard to the regulation to date.

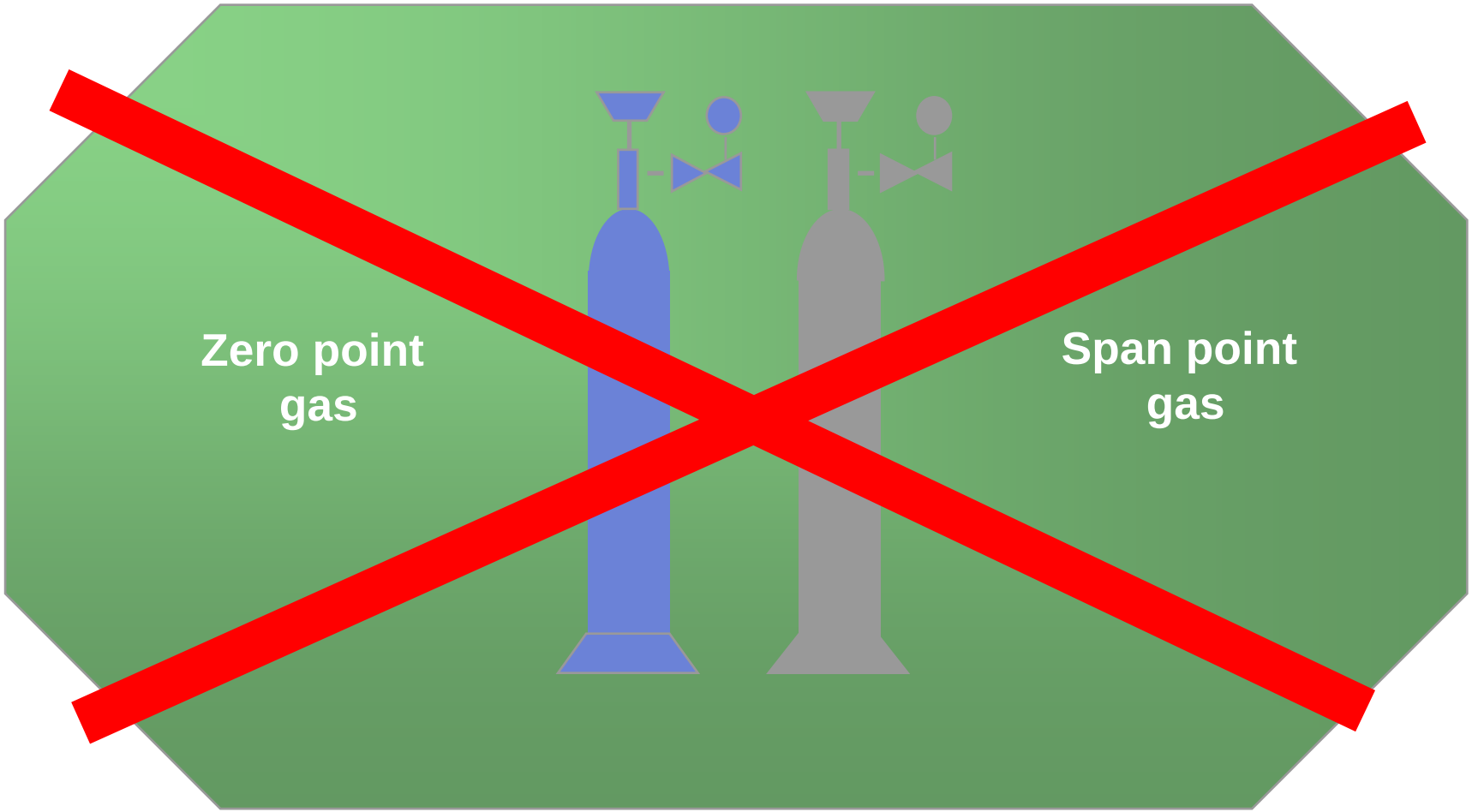
Kind regards

Testing laboratory for emission measurements/calibrations
Monitoring body in accordance with §§ 26, 28 BImSchG
DAP accreditation in accordance with DIN EN ISO/ IEC 17026

Dr. Alfred Brandl

ABB Automation GmbH, QAL 3 EN 14181, Uras 14, Limas 11

No need for expensive test gases!



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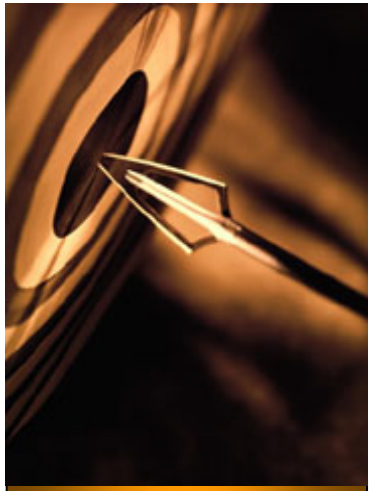

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ABB’s QAL 3 Software Package

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QAL3 monitoring by ABB (Shewhart approach)

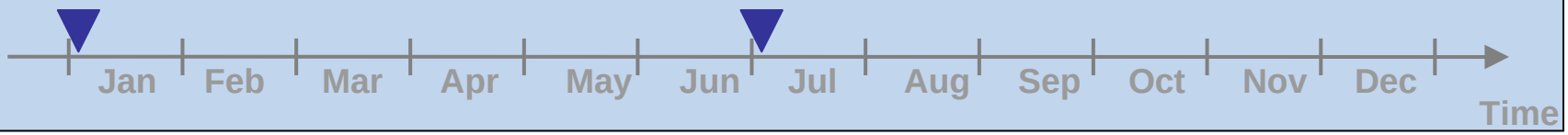
According to the maintenance interval …

1. **… device adjustment must take place …**

TARGET: No additional influence on availability as a result!!

ACF-NT

long adjustment times (approx. 1 day) reduce availability
=> large maintenance intervals (6 months) essential



▼ = Adjustment and simultaneous QAL3 inspection

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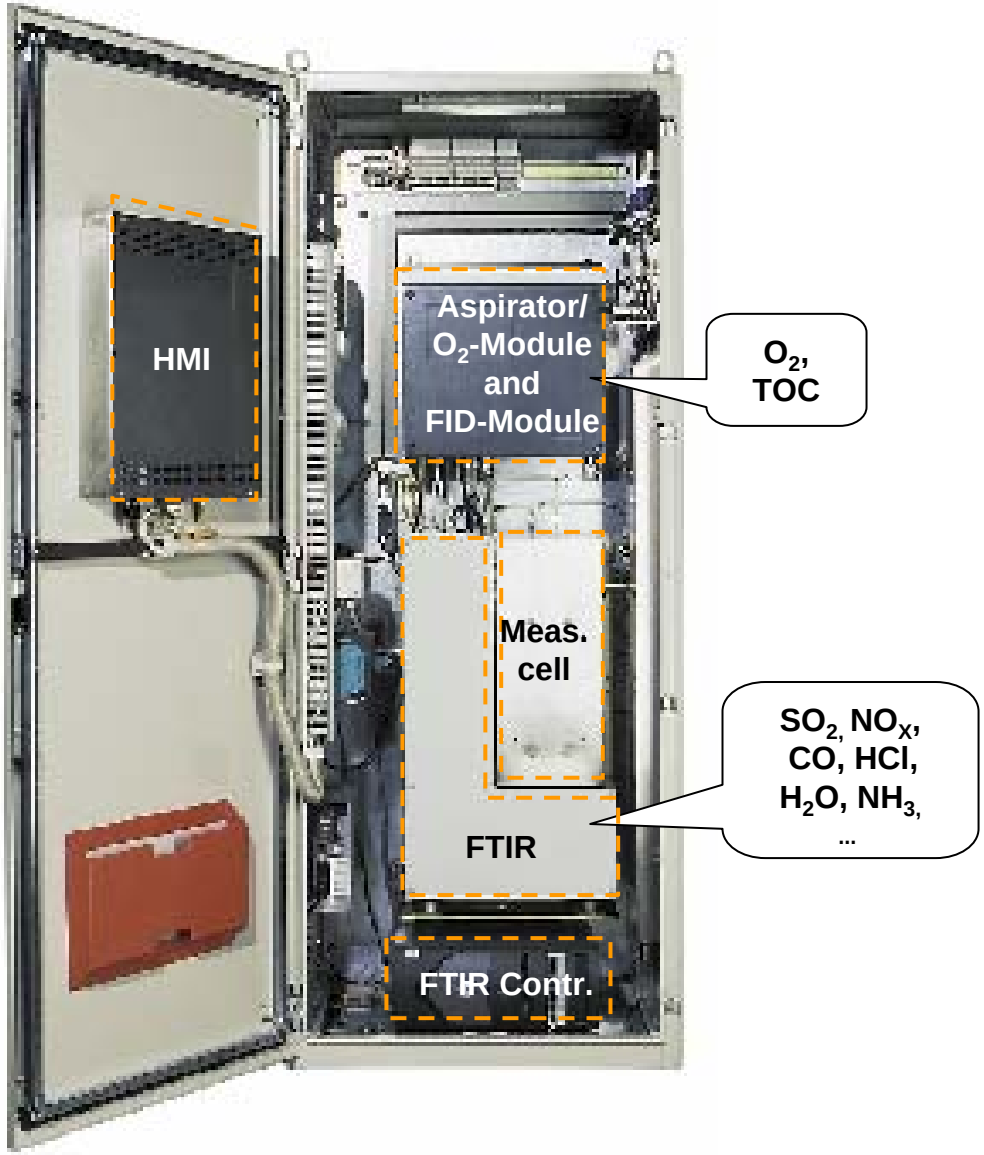
ACF-NT System



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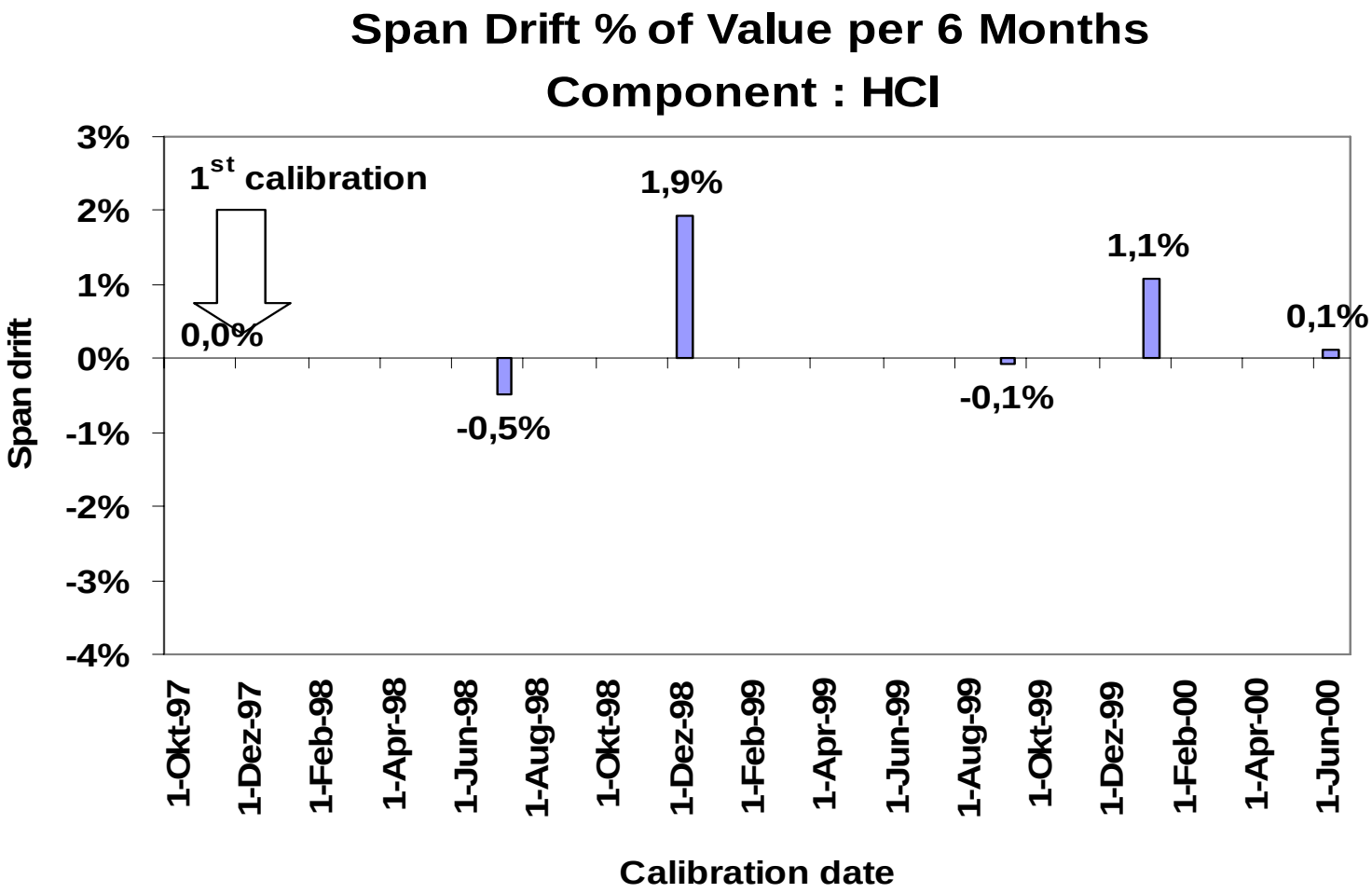
High Span Stability on HCl (Model ACF)



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TÜV/MCerts approved

sira

MCERTS
THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

ENVIRONMENT AGENCY

PRODUCT CONFORMITY CERTIFICATE

This is to certify that the

Advance CEMAS FTIR – NT
Multigas Continuous Emission Monitor

manufactured by:

ABB Automation Products GmbH
Stierstadtstrasse 5
D-60488 Frankfurt-am-Main
Germany

has been assessed by Sira Certification Service
and for the conditions stated on this certificate complies with:

MCERTS Performance Standards for Continuous Emission Monitoring Systems Version 2, Revision 1, April 2003

Certification Ranges :

SO_2	-	0 to 75 mg/m³
NO	-	0 to 200 mg/m³
HCl	-	0 to 15 mg/m³
H_2O	-	0 to 40 %Vol
CO	-	0 to 75 mg/m³
O_2	-	0 to 25%
NH_3	-	0 to 15 mg/m³

Laboratory tests have been carried out on this instrument for HF and the results have been included in the summary table on page 4. However it is not formally certified for HF as no field trials were carried out.

Certificate No: Sira MC030016/02
Initial Certification: 01 October 2003
This Certificate Issued: 20 July 2006
Renewal Date: 30 September 2008

Technical Director

MCERTS is operated on behalf of the Environment Agency by

Sira Certification Service
12 Acorn Industrial Park, Crayford Road, Crayford
Dartford, Kent, UK, DA1 4AL
Tel: 01322 520500 Fax: 01322 520501

This certificate may only be reproduced in its entirety and without change

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… 6 month certified maintenance interval!

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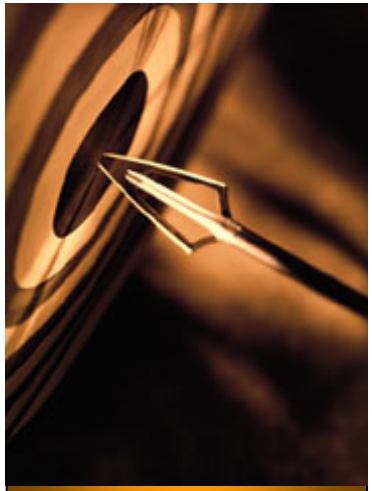

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ABB QAL3 Solution

Software Package QAL3

Quality control based on EN14181 – made easy

- Automated capture, checking and documentation of drift and precision at the zero and reference points
- Creation of Shewhart or CUSUM control charts
- Digital document archiving in database
- Applicable for all emission instruments regardless of manufacturer
- Supports Ethernet networks
- Fulfils the requirements of EN14181, QAL3

ABB

- Automated capture, checking and documentation of drift and precision at the zero and reference points
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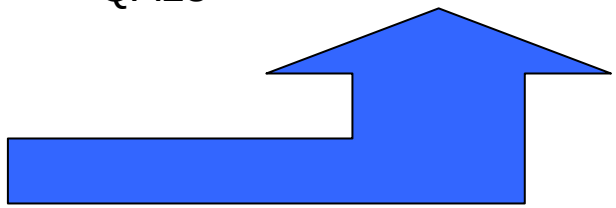

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QAL3 solution

	User: Servicing and maintenance
Interface	Ethernet
Application	"Analyze^{IT} Explorer" PC software package with **QAL3 components**
Platform	

Manual Input

Ethernet

Advance Optima
Syscon I
•Uras
•Limas
•MultiFID
•Magnos

Advance Optima
Syscon II
•Uras
•Limas
•MultiFID
•Magnos

ACF-NT
•FTIR (manual input)
•RGM (via Ethernet)
•MultiFID (via Ethernet)

EasyLine
•Uras
•Magnos

Classic and external devices
•Uras
•Radas
•FID
•External devices

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QAL3 Design

ABB devices with Ethernet connection

- The analyzer …

  … is adjusted at regular intervals (manually or automatically) in order to ensure that the control range is not exceeded (requirement concerning the definition of the maintenance interval). *In the process, the absolute drifts (cumulated drift values since basic adjustment) are ascertained in the device.*

- The Analyze^{IT} Explorer software package …

  1. … automatically records all absolute drifts with the date and time from the connected device so that all adjustments are documented
  2. Then the QAL3 inspection takes place, …
     1. … the relative drifts (d_t) between two adjustments are recalculated via the collective absolute drifts.
     2. … the control charts algorithm (CUSUM or Shewhart) is calculated with d_t and the device-specific S_{AMS}. In the event of an infringement of the control range, a warning signal is emitted.
     3. … all relevant parameters are stored and can be printed out

QAL3 Design

ABB devices without Ethernet connection and external devices

- The analyzer …

  … is adjusted at regular intervals (manually or automatically) in order to ensure that the control range is not exceeded (requirement concerning the definition of the servicing interval).

- With the Analyze^{IT} Explorer software package…

  … QAL3 inspection is performed manually. To this end, all data relevant to QAL3 can be entered (S_{AMS}, $C_{Reference}$, C_{Actual}, etc.)

  1. the control charts algorithm (CUSUM or Shewart) is calculated using the values entered. In the event of an infringement of the control range, a warning signal is emitted.
  2. all relevant parameters are stored and can be printed out

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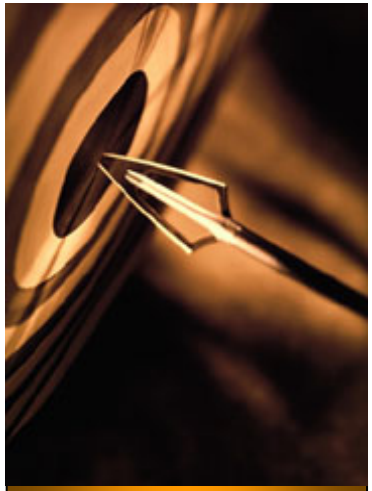

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Any Questions?

Come and visit us at Stands 44 & 45!!