Traceability of test rigs to national standards

Maxime LE RALLIC – **EP-E Engineering GmbH**

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27 – 29 June 2022, Senlis (France)

Traceability of test rigs to national standards

1) Norm and Calibration Pyramid
2) Practical example fan test bench – ISO 5801

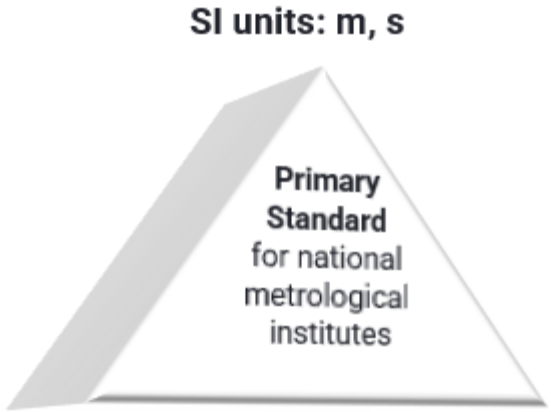
1) Norm and Calibration Pyramid

Standards are intended to ensure that products and services are **safe**, **reliable**, and of **good quality**, especially important for **world trade**.

For engineering related norms, the respect of SI units are a must, but how do we respect this traceability?

→ Use of the so-called transfer standard, following the calibration pyramid.

1) Norm and Calibration Pyramid



Physikalisch-Technische Bundesanstalt
Nationales Metrologieinstitut

LABORATOIRE NATIONAL DE MÉTROLOGIE ET D'ESSAIS

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The accreditation only applies to the scope of accreditation listed in the D-K-21444-01-00.

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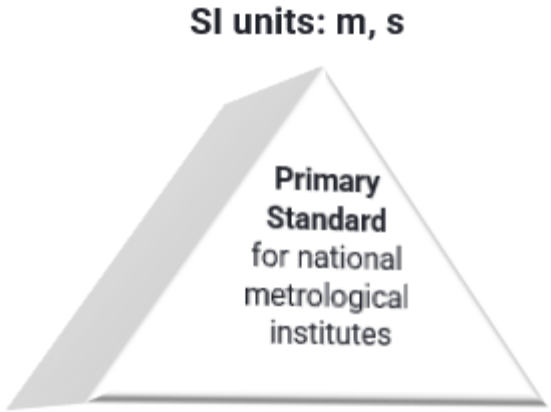

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Really high accuracy and repeatable
Uncertainty: <0,06% read value

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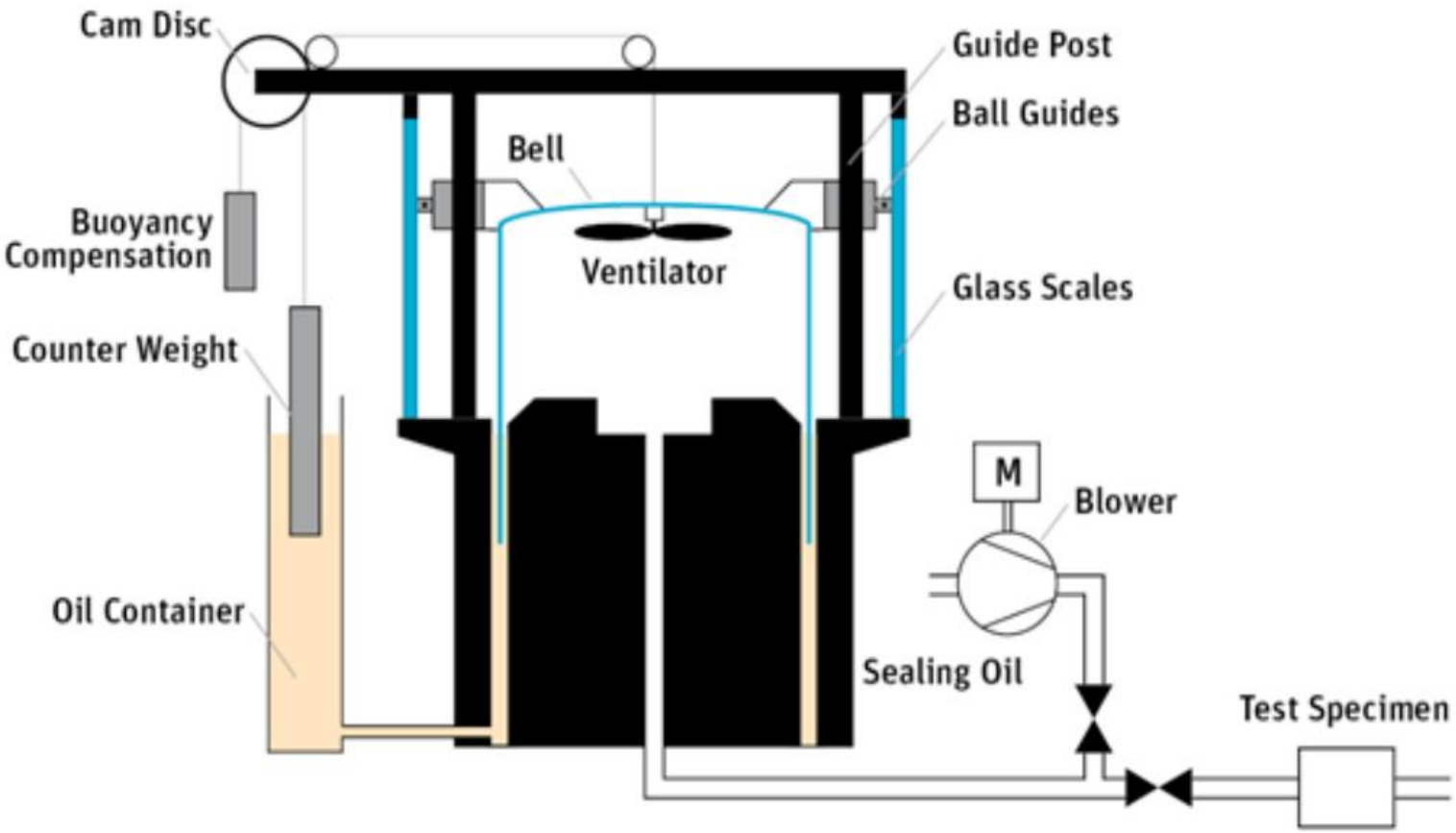
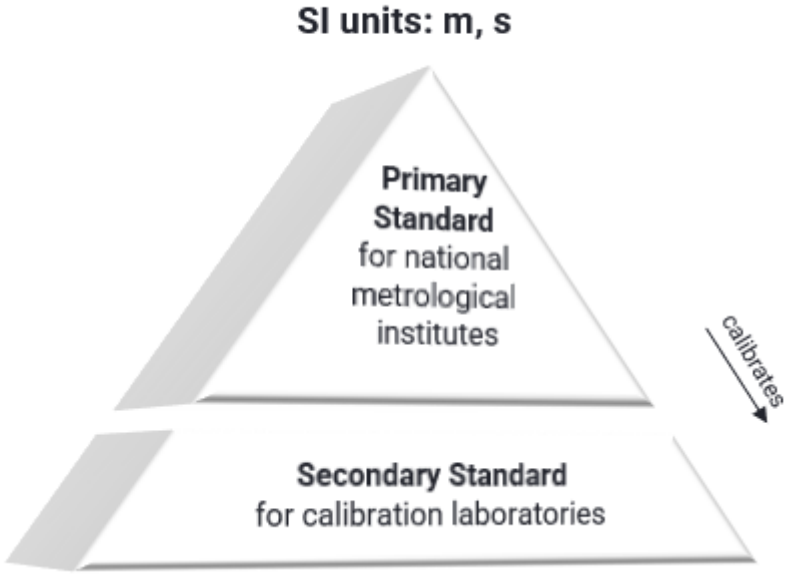


Bell Prover
Qv= Volume / Time

1) Norm and Calibration Pyramid



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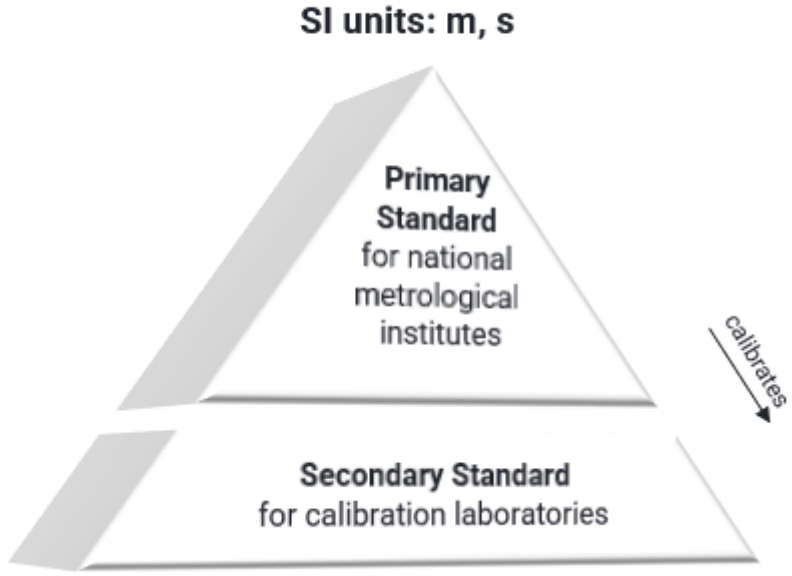
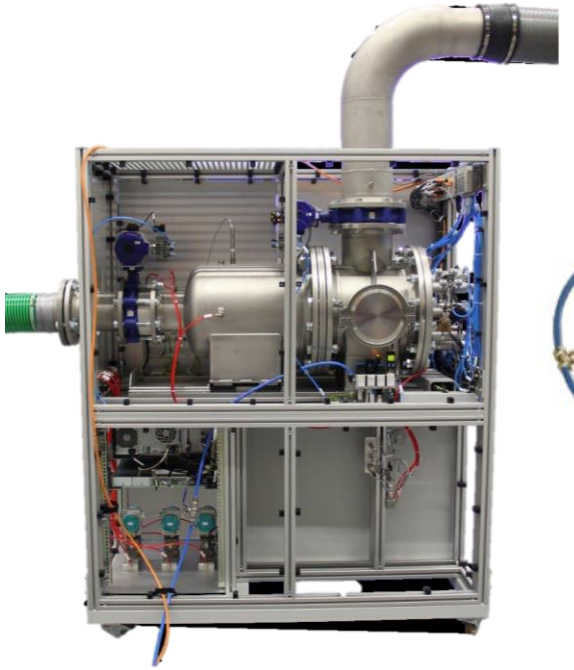
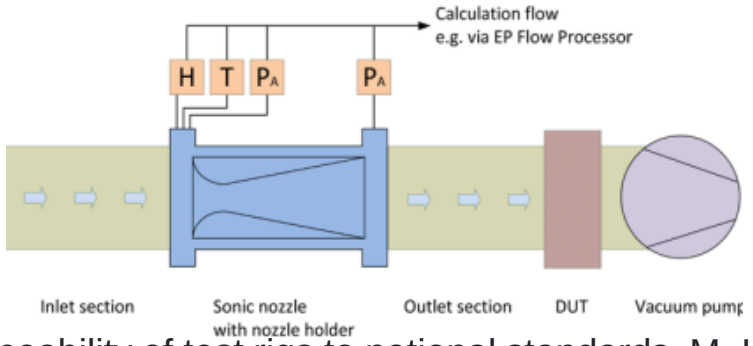




Used for calibration laboratories, R&D laboratories, and/or test benches where an accredidation is needed.
Use of realiable measurement techniques such as critical nozzle.
Uncertainty of < 0,15% read value



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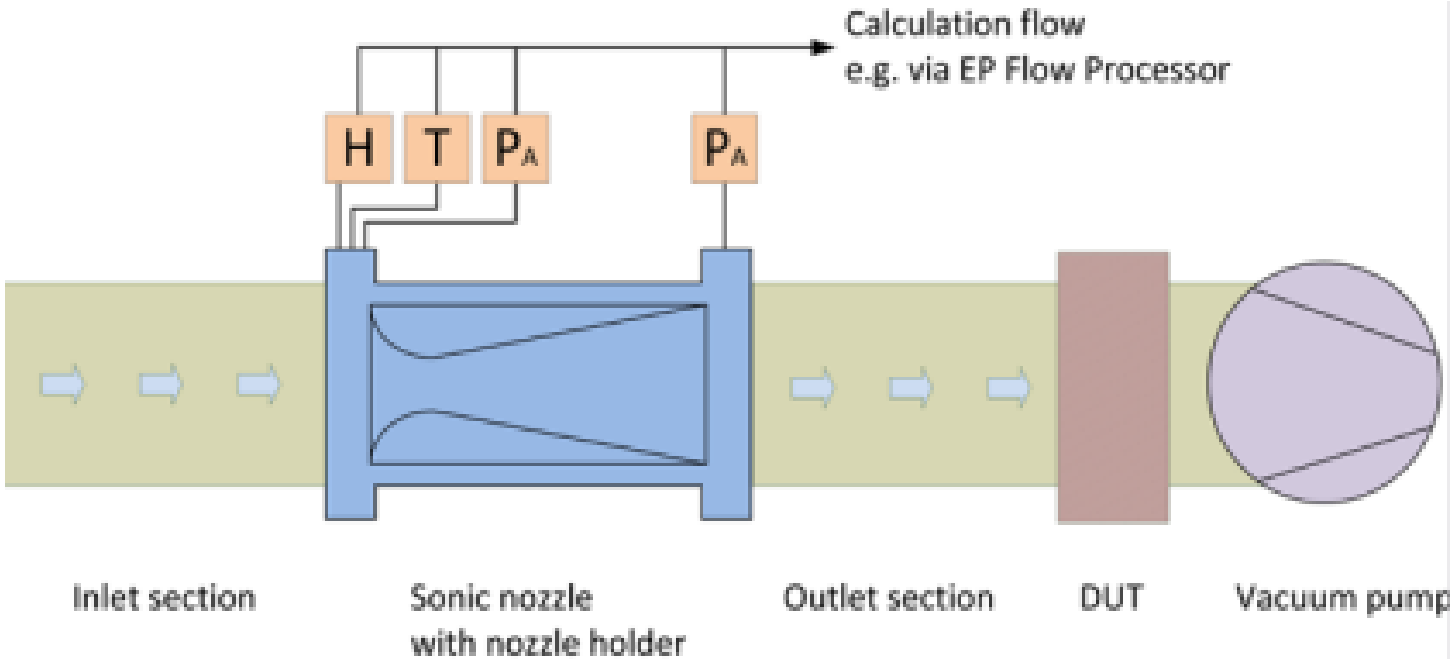

- ✓ Up to 0,15% MV
- ✓ Rapid reaction times – steady flow within 500 msec
- ✓ Easy set of parameters to measure
- ✓ Great long term stability – Recalibration period up to 10 years
- ✓ Configurable set-up

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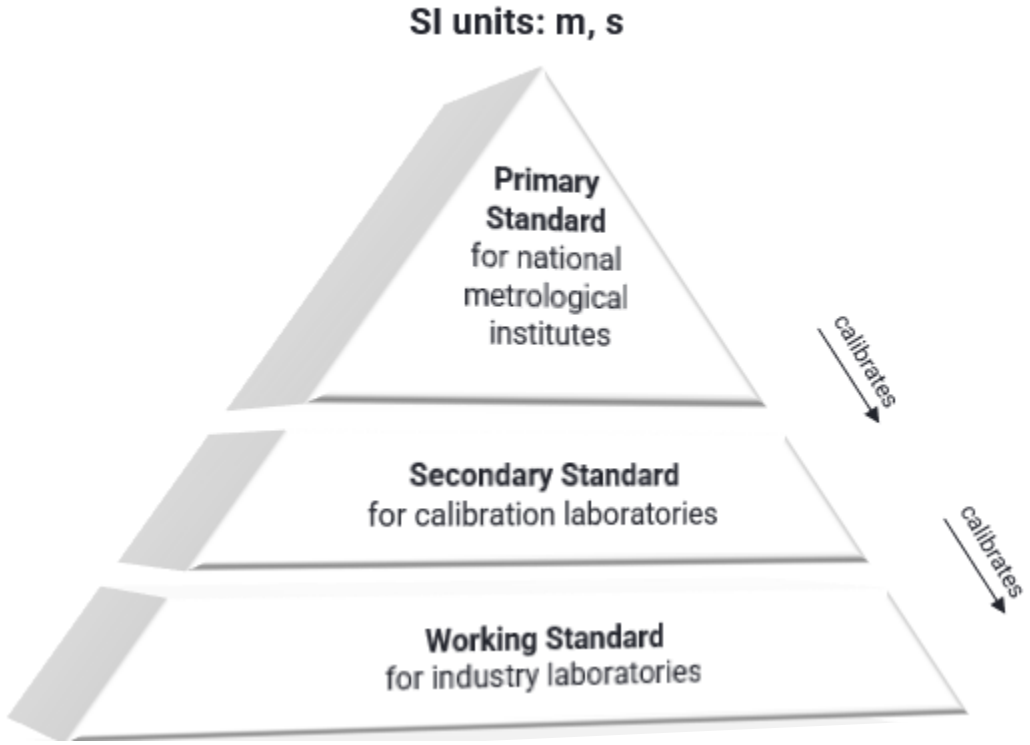

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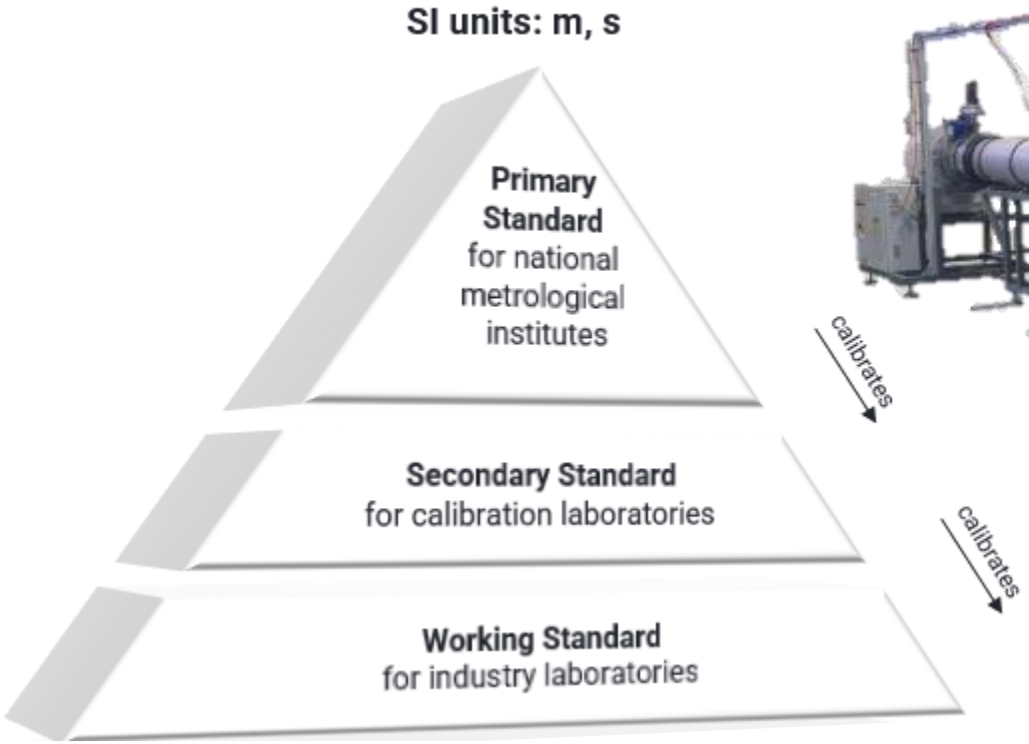

Used for industry R&D laboratories or/and end of line test.
Uncertainty of <0.5% read value
Different measurements techniques: LFE, venturi nozzle, Prandtl probes, etc …

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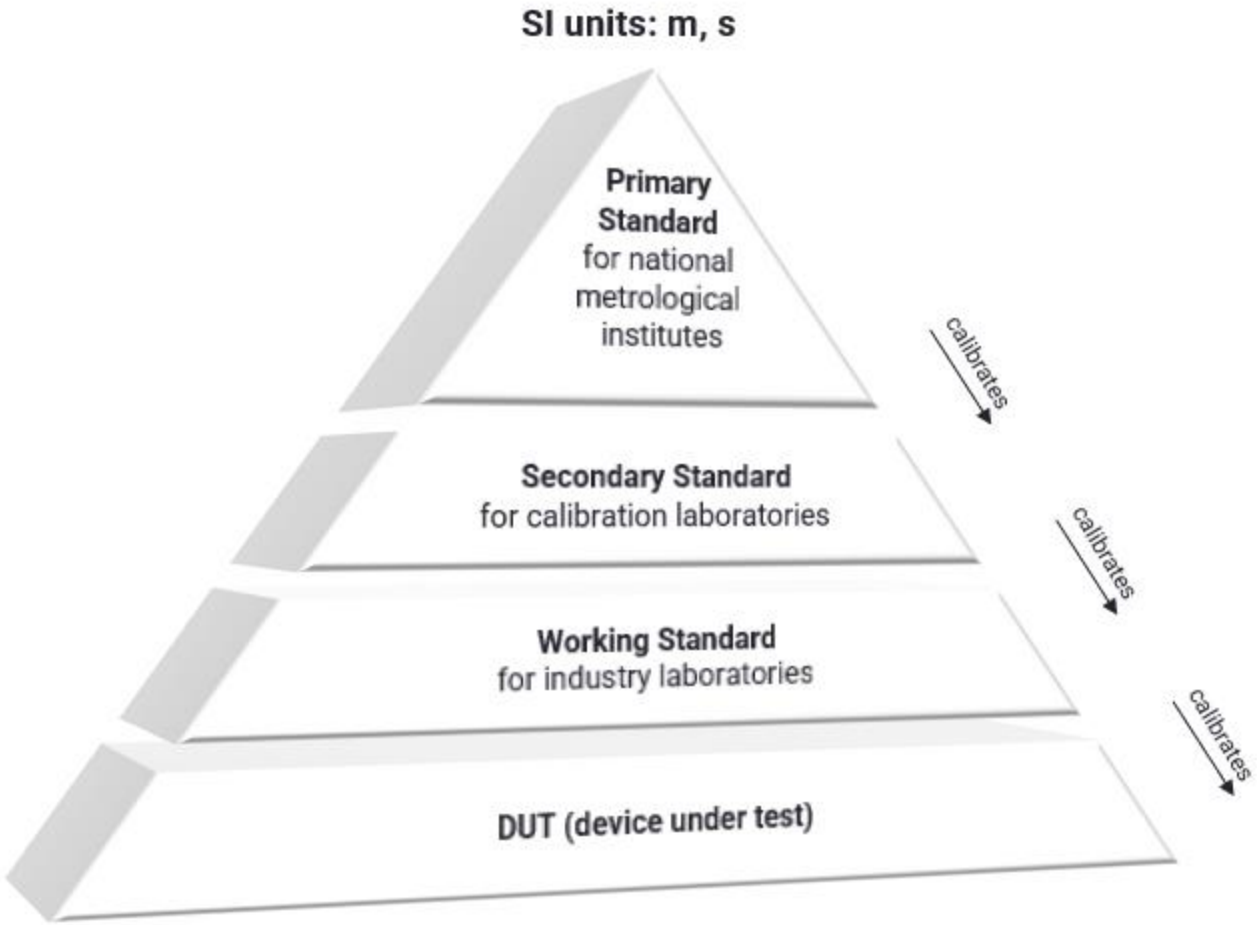

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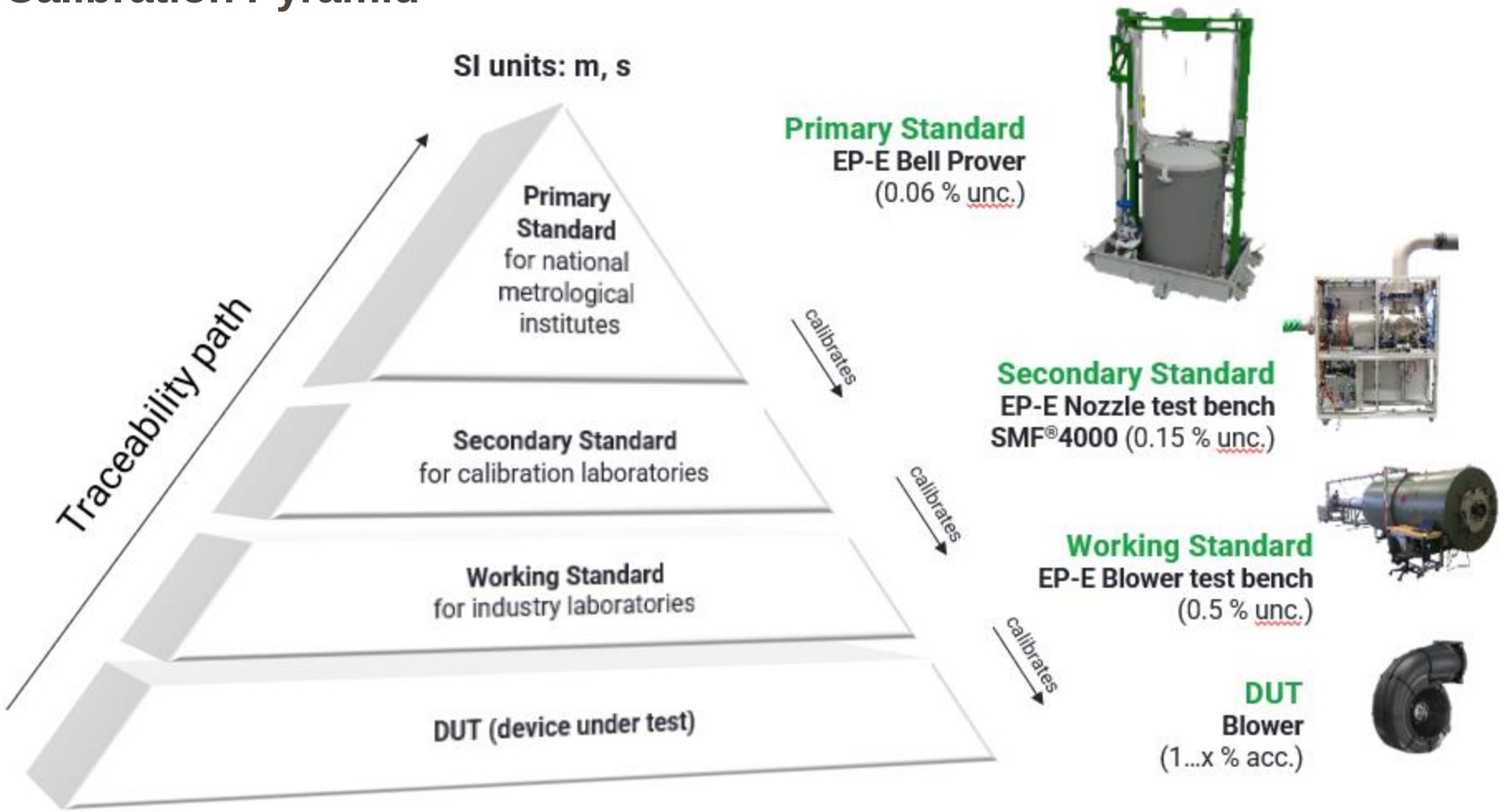


→ Mentioned in ISO-norm when referred to a comparison with „Standard Devices“

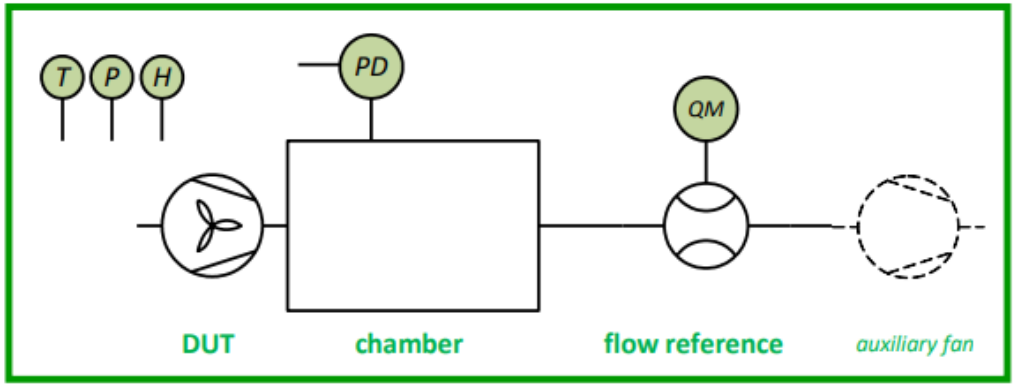
2) Practical example fan test bench - ISO 5801

“ Fans – Performance testing using standardized airways (ISO 5801:2017)”

2) Practical example fan test bench - ISO 5801

“ Fans – Performance testing using standardized airways (ISO 5801:2017)”

- Compact test bench
- Determination of characteristics lines
- Performance measurement according to the norm
- Determination of the energy efficiency of the fan/blower
- High accuracy 0,5% of read value
- High dynamic range 1:100 or higher



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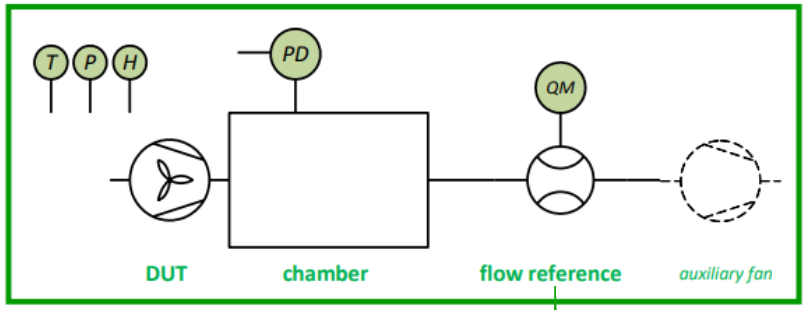
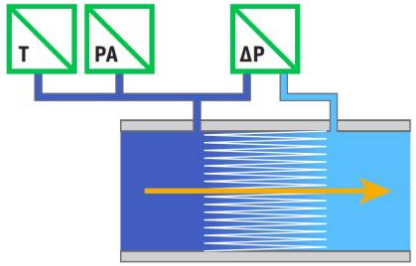
“ Fans – Performance testing using standardized airways (ISO 5801:2017)”

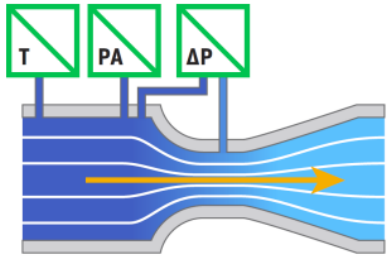


For each range, pressure drop, inflow quality, the right reference device need to be chosen.

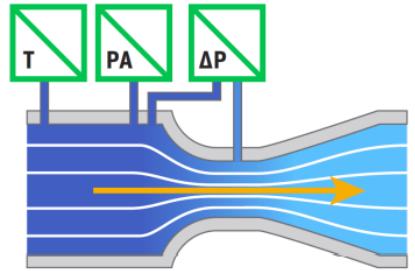
Laminar Flow Element

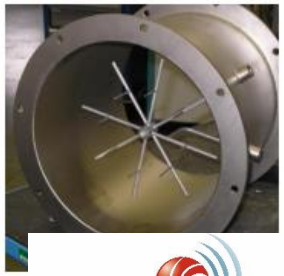


Venturi Nozzle



Wilson Staugitter





2) Practical example fan test bench - ISO 5801

“ Fans – Performance testing using standardized airways (ISO 5801:2017)”

LMF® - Flow measuring system
BTB175

LMF® - Flow measuring system
BTB1500

Passive measuring system
BTB6000

VMF® - Flow measuring system
BTB60,000

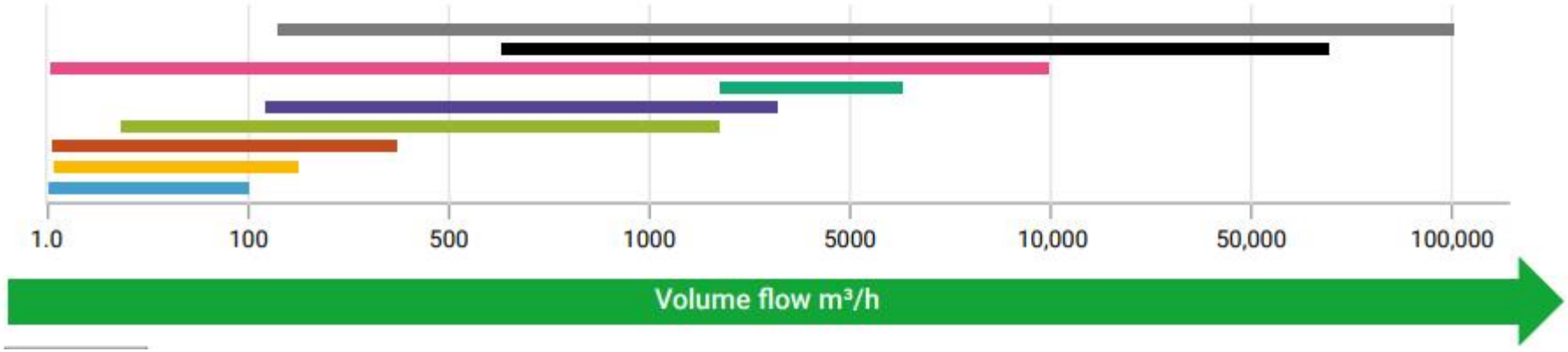
LMF® - Flow measuring system
BTB100

VMF® - Flow measuring system
BTB300

VMF® - Flow measuring system
BTB3000

LFE measuring sections &
Gas Sensor (Wilson-Staugitter)
BTB10,000

Ultrasonic measuring system
BTB100,000



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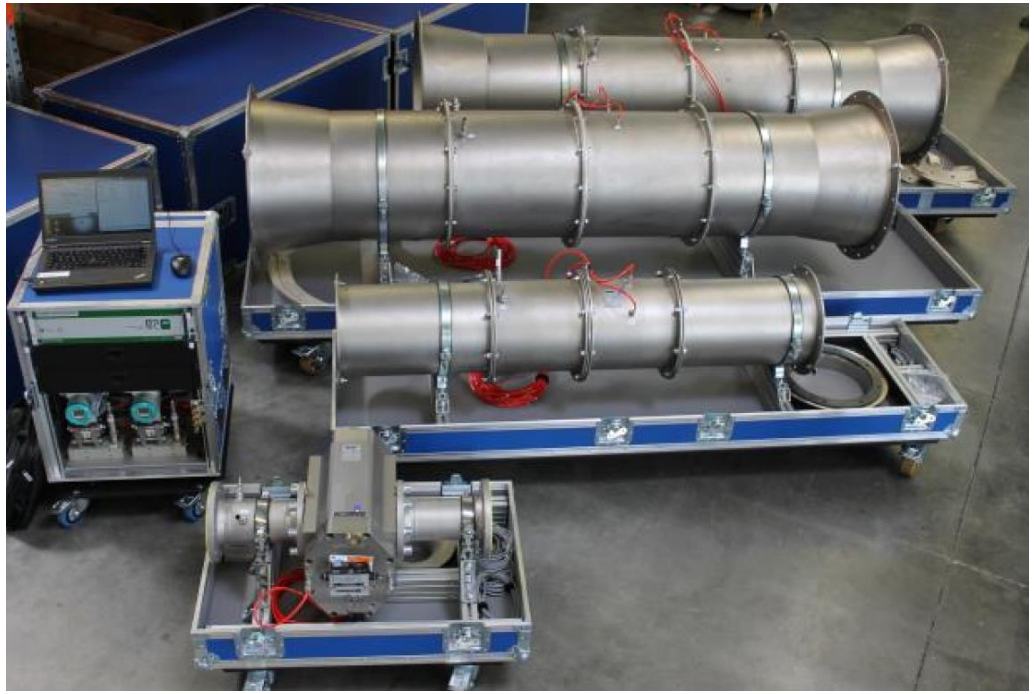
2) Practical example fan test bench - ISO 5801

“ Fans – Performance testing using standardized airways (ISO 5801:2017)”

- Measuring range: 700..54 000 m3/h
- Measurement accuracy: +/- 0,5% RV + 0,1%FS
- Measuring method: Wilson Staugitter or Venturi Nozzle
- Chamber Pressure: +/- 2500 Pa
- Chamber dimensions: 3x3x6m

2) Practical example fan test bench - ISO 5801

“ Fans – Performance testing using standardized airways (ISO 5801:2017)”



Modular System to adapt the right reference device to the desired range and targeted accuracy.

Thank you for your kind attention!

Backup

EP-E

Company of 75 employees founded in 1977 and located in Niederstetten (north Bavaria). EP-E is mainly specialized in all type of measurement techniques and applications using a fluid as a medium.

Test benches & Measurement technology

Customized test benches

Standardized measurement systems

Reference standards

Measurement elements

Engineering & Consulting

Customized project management

Pre-engineering & technology management

Software solutions & services with industry 4.0

Calibration & Service

DAkkS & factory calibration

Maintenance & service

Flow training

- **Flow lab Niederstetten:**
  20 ml/h…10000 m³/h
  Measurement accuracy: from 0.22 % Q_V
- **On-site calibration:**
  0.005…3750 m³/h
  Measurement accuracy: from 0.30 % Q_V
- **Flow lab Hangzhou:**
  0.016…6500 m³/h
  Measurement accuracy: from 0.24% Q_V

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Test benches & Measurement technology

ep-e.com

Customized test benches & standardized measurement systems

- ✓ Flow measurement systems
- ✓ Gas measurement technology
- ✓ Calibration standards
- ✓ Climate test benches (media conditioning)
- ✓ Leakage & burst test benches
- ✓ Endurance & pulsation test benches
- ✓ Gas mixing & calibration
- ✓ Velocity measurement technology

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Test benches & Measurement technology

Reference standards & measurement elements

- ✓ Laminar Flow Elements (LFEs)
- ✓ Critical nozzles
- ✓ Venturi nozzles
- ✓ Reference gas meters
- ✓ Piston-cylinder systems
- ✓ Orifices
- ✓ Prandtl probes
- ✓ Ultrasonic flow meters

Engineering & Consulting

Customized project management

Pre-engineering & technology management

Software solutions & services with industry 4.0

LabVIEW, Siemens S7 Tiaportal, Inventor, CODESYS, C-Sharp, Wonderware, EPlan

Calibration & Service

DAkkS & factory calibration, test equipment calibration
Volume and mass flow of gases

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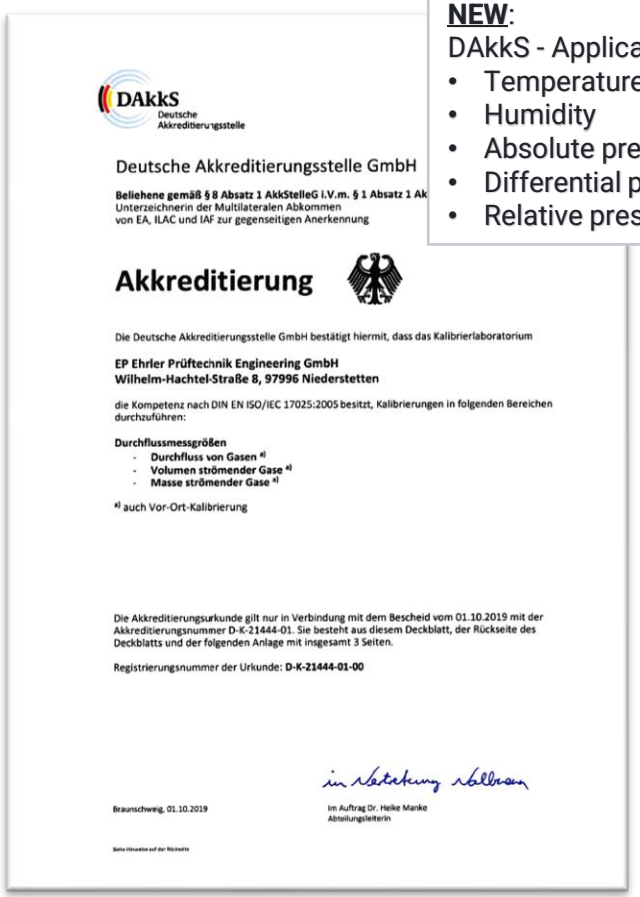
NEW:
DAkkS - Application procedure for:
- Temperature
- Humidity
- Absolute pressure
- Differential pressure
- Relative pressure


DAkkS Deutsche Akkreditierungsstelle

Deutsche Akkreditierungsstelle GmbH

Beliehene gemäß § 8 Absatz 1 AkkStelleG i.V.m. § 1 Absatz 1 Ak
Unterzeichnerin der Multilateralen Abkommen
von EA, ILAC und IAF zur gegenseitigen Anerkennung

Akkreditierung

Die Deutsche Akkreditierungsstelle GmbH bestätigt hiermit, dass das Kalibrierlaboratorium

EP Ehrler Prüftechnik Engineering GmbH
Wilhelm-Hachtel-Straße 8, 97996 Niederstetten

die Kompetenz nach DIN EN ISO/IEC 17025:2005 besitzt, Kalibrierungen in folgenden Bereichen durchzuführen:

Durchflussmessgrößen
- **Durchfluss von Gasen** a)
- **Volumen strömender Gase** a)
- **Masse strömender Gase** a)

a) auch Vor-Ort-Kalibrierung

Die Akkreditierungsurkunde gilt nur in Verbindung mit dem Bescheid vom 01.10.2019 mit der Akkreditierungsnummer D-K-21444-01. Sie besteht aus diesem Deckblatt, der Rückseite des Deckblatts und der folgenden Anlage mit insgesamt 3 Seiten.

Registrierungsnummer der Urkunde: **D-K-21444-01-00**

Braunschweig, 01.10.2019

Im Auftrag Dr. Heike Manke
Abteilungsleiterin

✓ **Maintenance & Service**

✓ **Flow training**

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Traceability of test rigs to national standards, M. Le Rallic et al., FAN 2022 – B – Calibration sco