EMCEL

Engineering Company for Fuel Cell, Hydrogen Technology and Electric Mobility

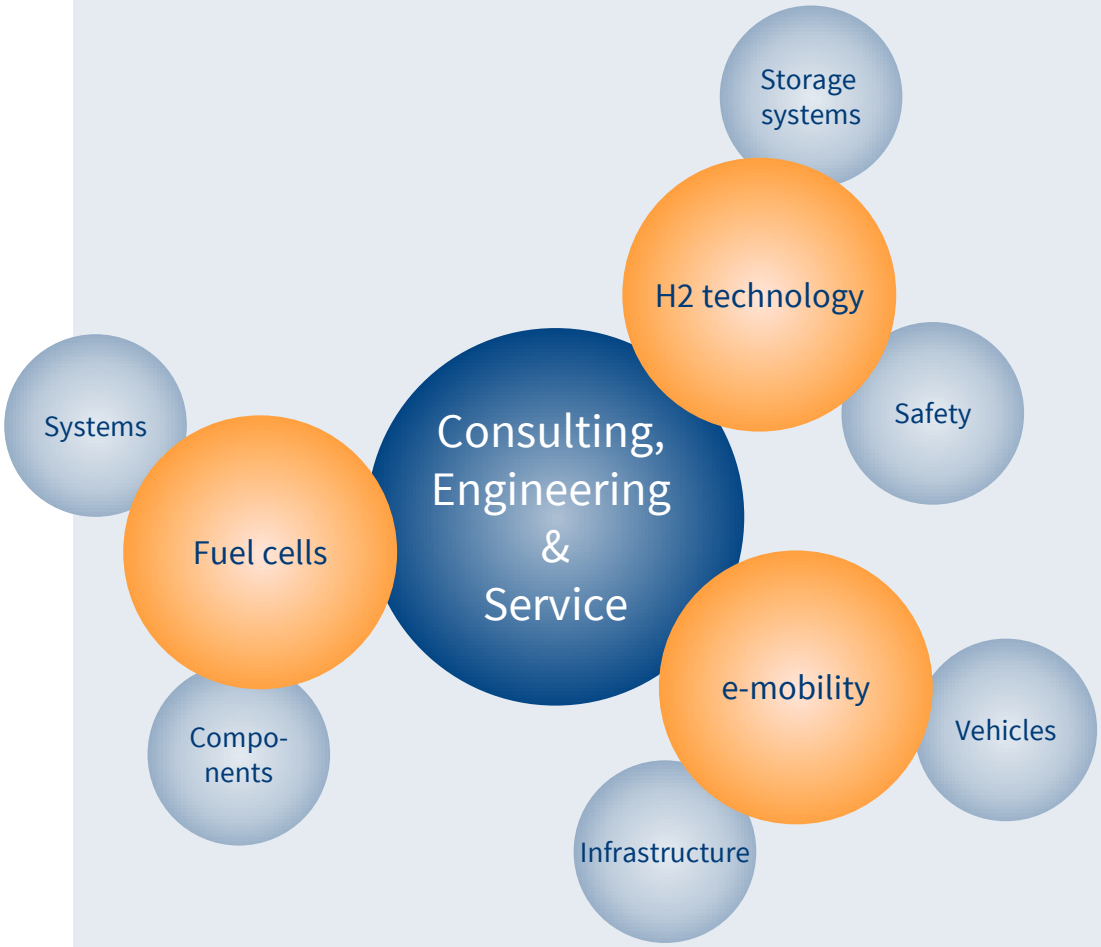
Hydrogen quality measurement

according to SAE J2719 at hydrogen refueling stations (HRS)

Consulting | Engineering | Service

Stuttgart | October 10th 2017

Our range of services



Engineering company
with a focus on:

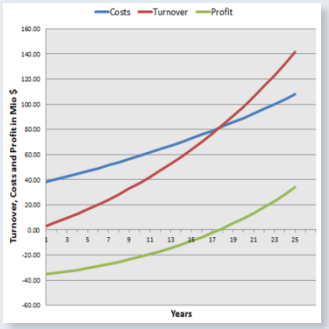
- Fuel cells
- Hydrogen technology
- Electric mobility

About us

- Based in Cologne, Germany
- Established in 2009

What we do for our customers

Consulting



FC, PtG, H2, E-buses

- Initial consultation
- Feasibility studies

Engineering

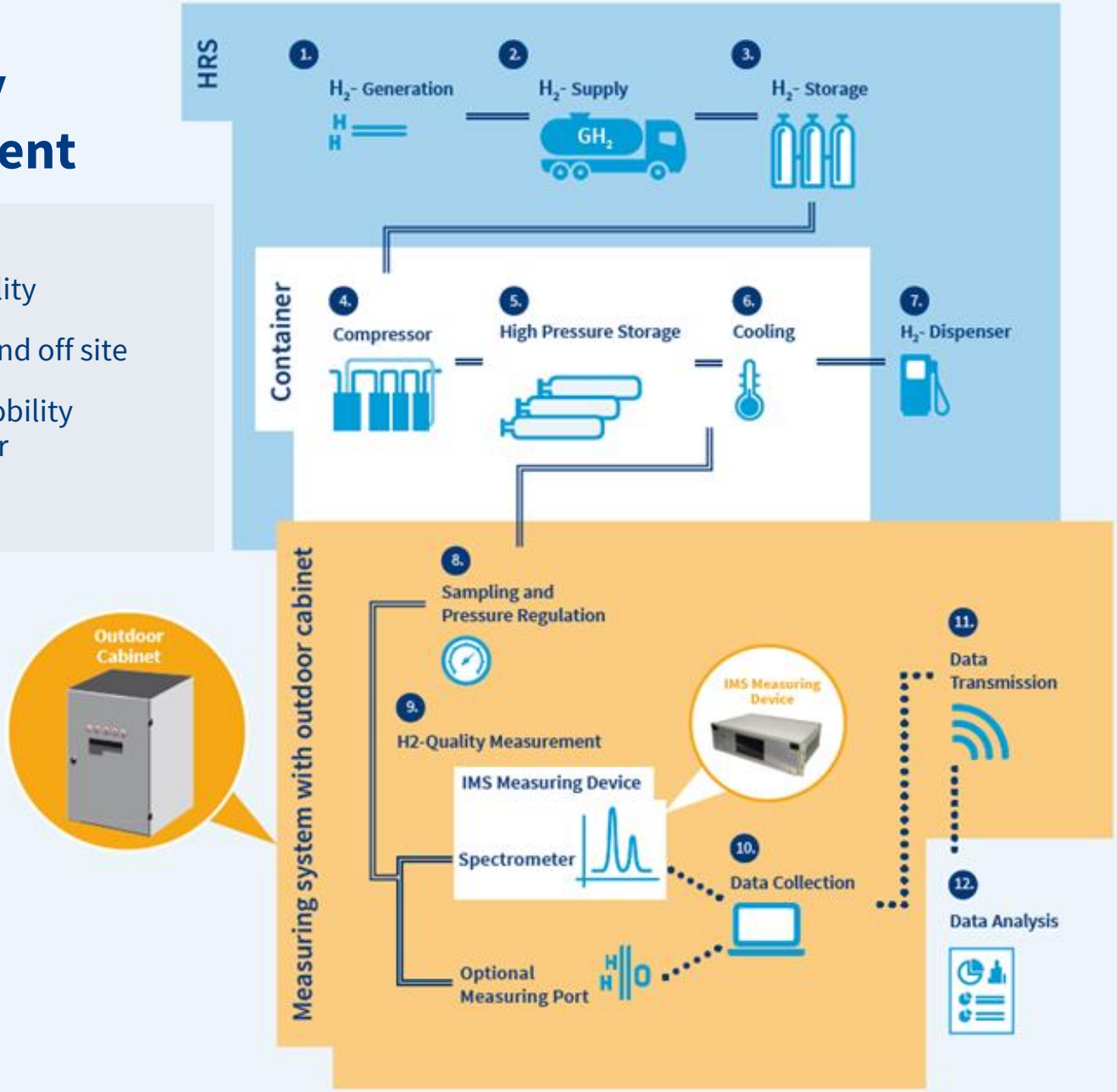
- H2 quality measurement
- H2 supply (HRS, UPS)
- Safety / approval

Service

Maintenance of fuel cell and battery buses

H2-Quality Measurement

- **Why?** reliability
- **Where?** on and off site
- **How?** Ion mobility spectrometer



IMS-Measuring Device – Purpose

Description

- Device for the measurement of impurities in hydrogen
- Especially for the use of hydrogen for fuel cell applications
- Designed to detect significant contaminations of SAE J2719 and ISO 14687 respectively.
- Also detects numerous substances which are not described in the two standards.

SAE J2719 / ISO 14687	ppm
Water	5,0
O2	5,0
He	300,0
N2	100,0
Argon	10,0
CO2	2,0
CO	0,2
Ammonia (NH3)	0,1
Formic acid (CH2O2)	0,2
Formaldehyde (CH2O)	0,01
Other HC	2,0
Sulfur (SO2, COS, CS2, H2S, CH4S, C2H6S)	0,004

IMS-Measuring Device – Key Features

Technical Data

- **Dimensions:** 19 inch-rack (ca. 20 x 50 x 40 cm)
- **Temperature:** -5 - 50 °C
- **Inlet Pressure Level:** 1 bar
- **Power Supply:** 230 V (others on request)

Characteristics

- High sensitivity (lower ppb range)
- High selectivity
- Measurement frequency: 5 minutes (typical, on request faster)
- Integrated PC with Windows interface
- Programmable measuring sequences
- Robust construction

IMS-Measuring Device – Substances

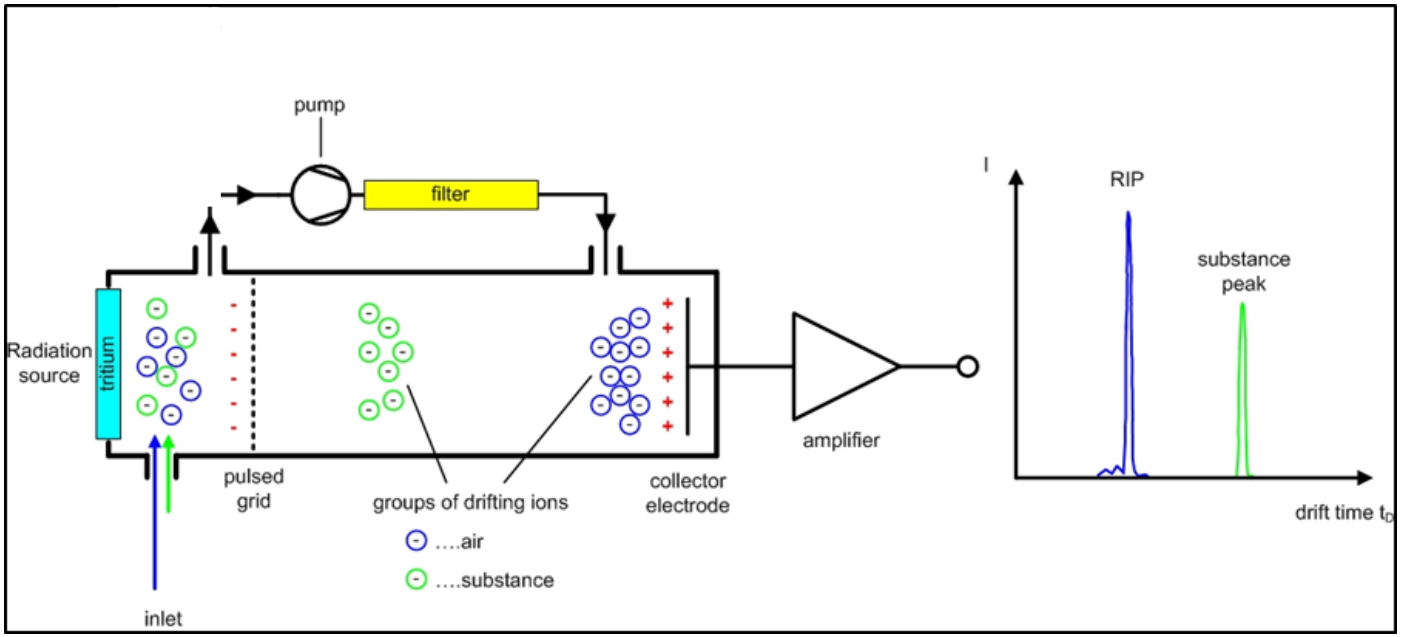
Measurable substances
(from SAE J2719 / ISO 14687)

- H2S,
- COS,
- CS2,
- SO2
- Methyl- (CH4S)
- Ethylmercaptan (C2H6S)
- Ammonia (NH_3)
- Formaldehyde (CH2O)
- Formic acid (CH2O2)

Other substances and substance groups
(according to individual agreement)

- Various markers for the detection of oils and similar impurities
- Aromatics
- Alkanes
- Chlorine compounds
- NO2
- Numerous hydrocarbons

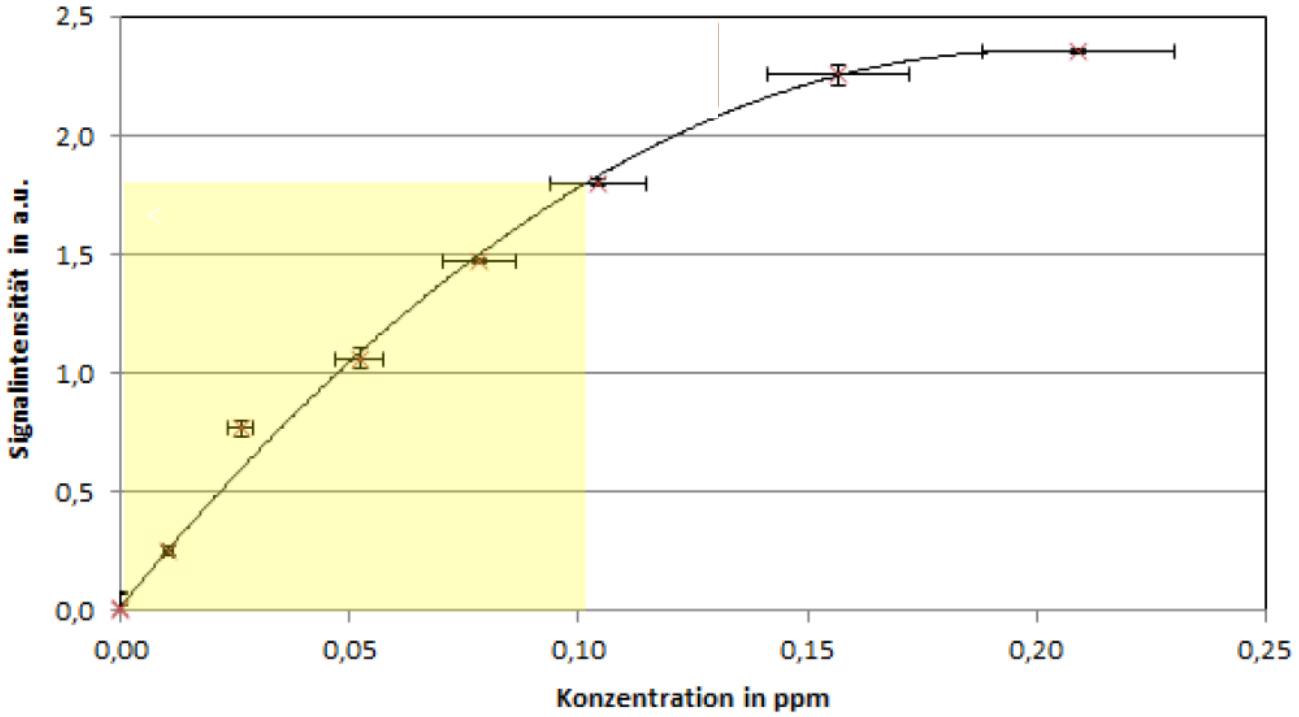
IMS-Measuring Device – Working Principle



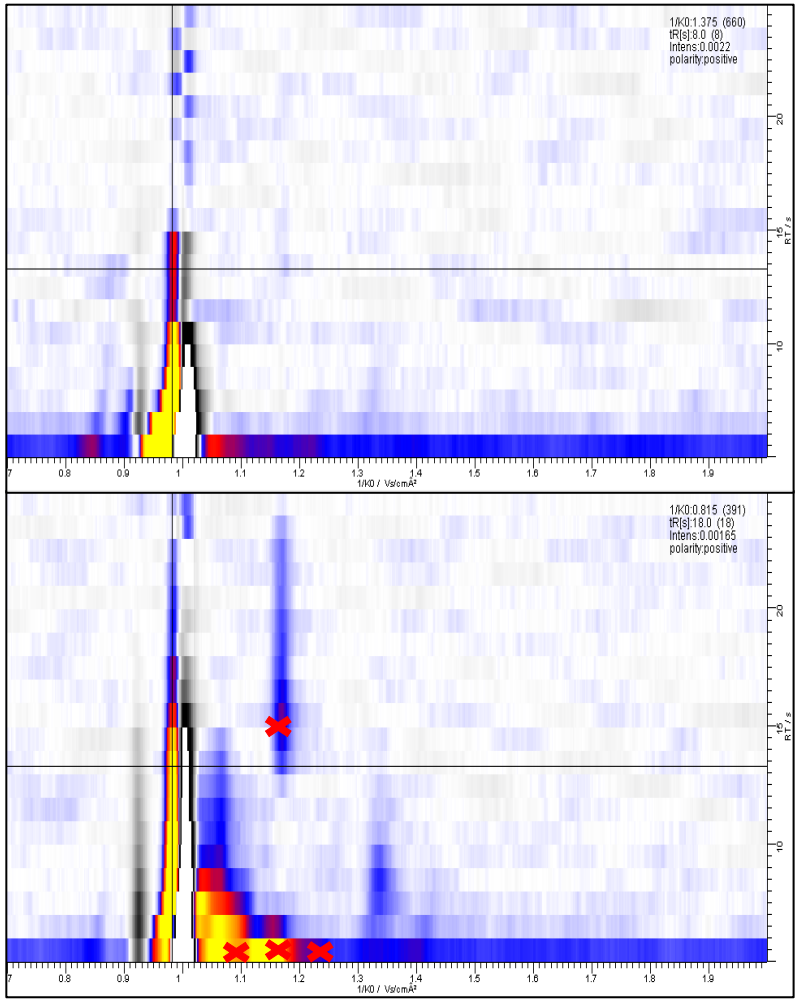
- GC-column for pre separation
- Sample ionization with radioactive source
- Ions pulsed into drift gas flow
- electric field forces ions towards collector

IMS-Measuring Device – Calibration

- Calibration gas sample (ppm / ppb)
- Multi point calibration (dilution)
- Substance library



IMS-Measuring Device – Visible Substances



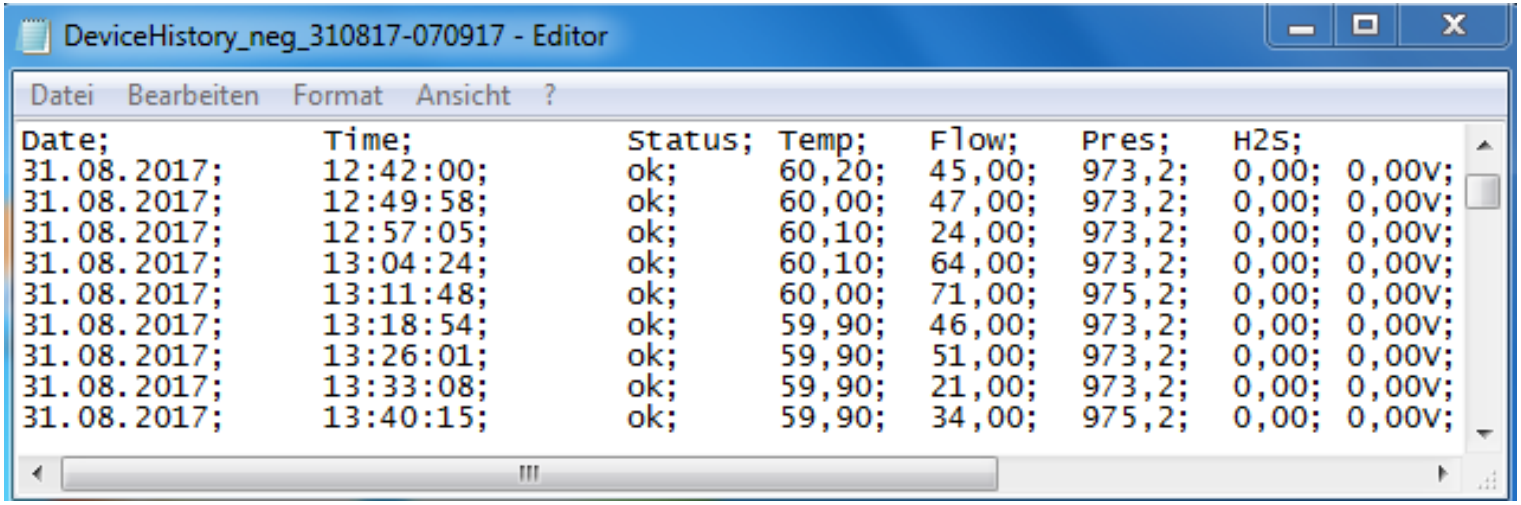
Sample pure H2 6.0

- Time stamp: zero
- Quick response time

Sample contaminated H2

- Time stamp plus 10 min
- Known substances visible
- Unknown substances as well

IMS-Measuring Device – Data Format


DeviceHistory_neg_310817-070917 - Editor

Datei Bearbeiten Format Ansicht ?

Date;	Time;	Status;	Temp;	Flow;	Pres;	H2S;	
31.08.2017;	12:42:00;	ok;	60,20;	45,00;	973,2;	0,00;	0,00V;
31.08.2017;	12:49:58;	ok;	60,00;	47,00;	973,2;	0,00;	0,00V;
31.08.2017;	12:57:05;	ok;	60,10;	24,00;	973,2;	0,00;	0,00V;
31.08.2017;	13:04:24;	ok;	60,10;	64,00;	973,2;	0,00;	0,00V;
31.08.2017;	13:11:48;	ok;	60,00;	71,00;	975,2;	0,00;	0,00V;
31.08.2017;	13:18:54;	ok;	59,90;	46,00;	973,2;	0,00;	0,00V;
31.08.2017;	13:26:01;	ok;	59,90;	51,00;	973,2;	0,00;	0,00V;
31.08.2017;	13:33:08;	ok;	59,90;	21,00;	973,2;	0,00;	0,00V;
31.08.2017;	13:40:15;	ok;	59,90;	34,00;	975,2;	0,00;	0,00V;

- Constant data collection
- Data format .txt and .csv
- Substance specific concentration (ppb) and raw data (V)
- Limit alarm for each known substance
- Limit alarm for unknown substances

H2-Measuring System – Options

- Measuring System consist of measuring core: IMS device (19 inch rack) with integrated Windows PC and varies interfaces (Modbus TCP, USB, RS232, LAN)
- Varies extra modules available - for laboratory use as well as outdoor use

Laboratory use	**Outdoor use**
IMS measuring device (19 inch rack) (incl. air filter)	IMS measuring device in outdoor cabinet (incl. air filter+ heating+ temperature sensor + H_2-sensor)

Extras for Laboratory and Outdoor use

Module UMTS

- Web based control unit
- Email report system
- Automatic protocol generator + data transmission

Module Analysis-Port

- Additional analysis port for further measurement equipment and devices
- e.g. for H_2O or N_2

Module Reference Inlet

- Additional inlet port for reference gas (e.g. pure H2 6.0)

Module Pressure Regulator

- Pressure regulation for H2 feed gas

  (As required form 1000 bar down to 1 bar regulation)

Summary – H2-Measurement System

- **Modular IMS-System**
  for the measurement of impurities in hydrogen
- **Multiple impurities**
  e.g. SAE J2719 / ISO 14687 and unknown impurities
- **High sensitivity**
  lower ppb range
- **Online measurement**
  frequency 5 minutes
- **Robust System**
  for indoor and outdoor use

EMCEL GmbH

… visit us also at **Hall 1 Stand 1K14**

Thank you for your attention

Marcel Corneille

+49 (0)221 299 319 29
mc@emcel.com

EMCEL GmbH
Brüsseler Strasse 85
50672 Köln, Germany
www.emcel.com

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