

AKAI

AKIC

Gas Analyzer Solutions for the Iron and Steel Producing Industries



Steel Application Requirements – First we need to know the challenges

Technique Requirements:

Environmental conditions:

- Temperature
- Space
- Dust

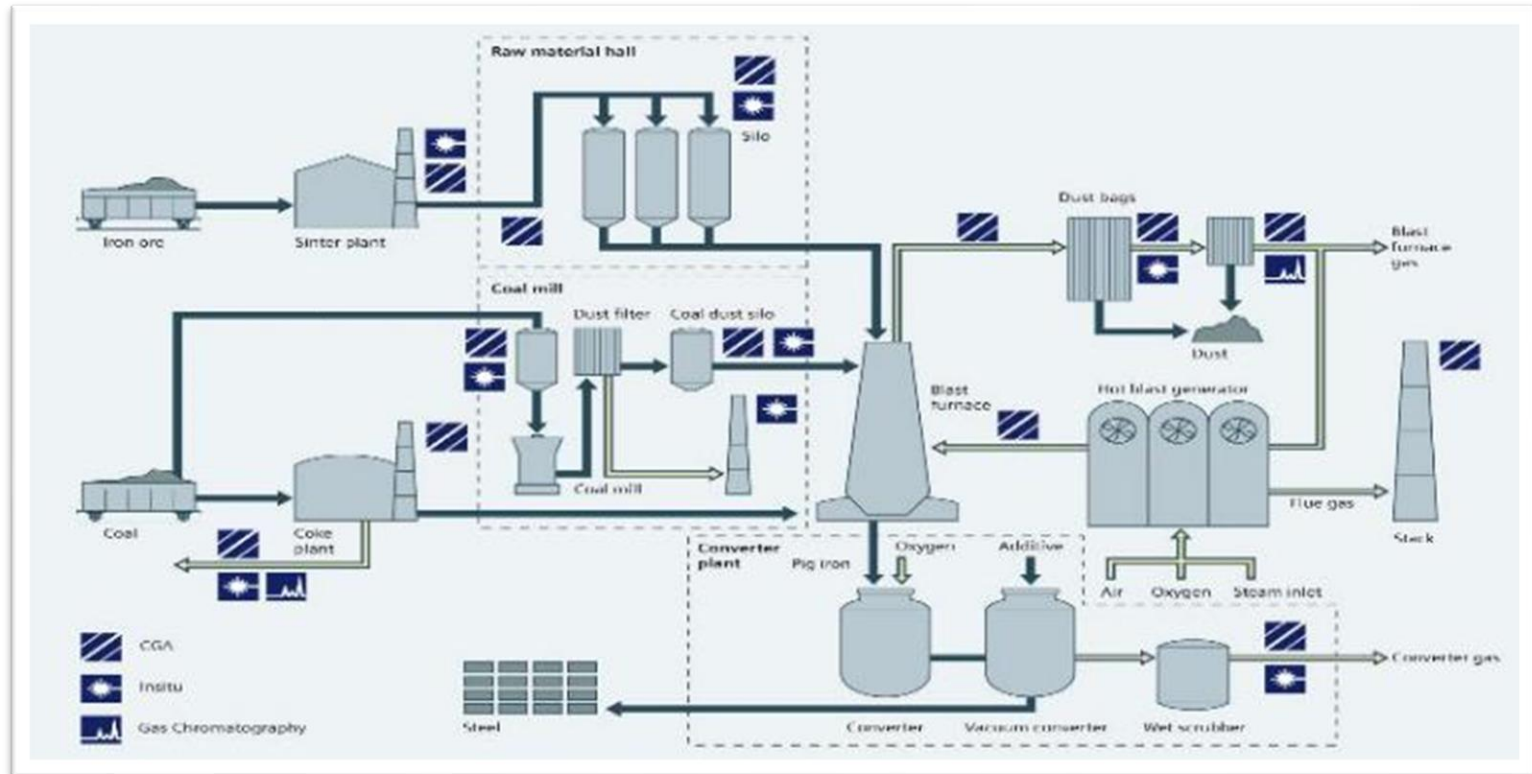


Analytical Requirements:

- All the Gases are saturated with moisture
- Coal tar presence in the Gas
- (up to 50 mg/m³)
- Dust Content is very High
- Also present ammonia and naphthalene in some cases

Traditional solutions have limitations

STEEL Process Overview



Application for Steel Plants

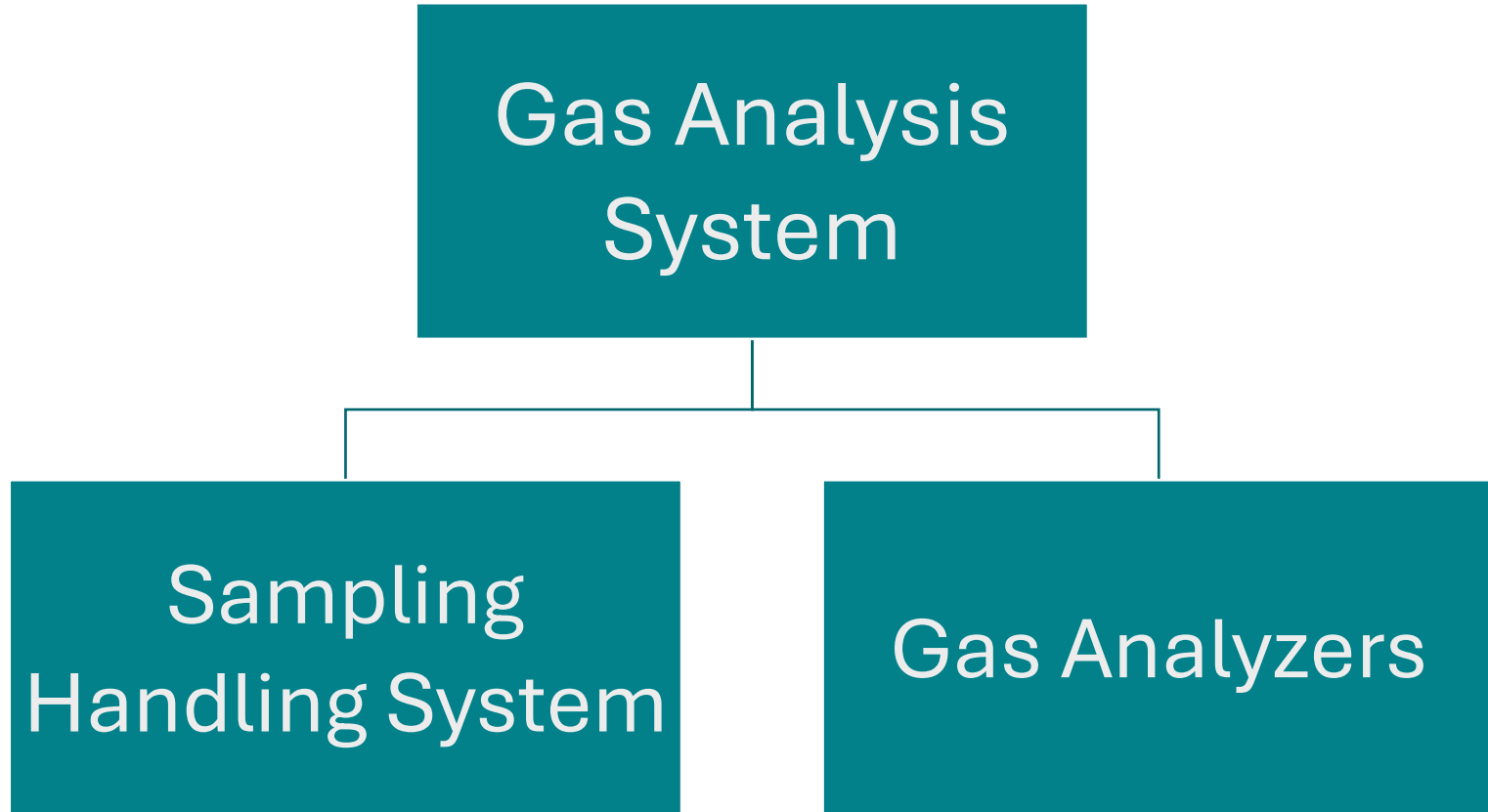
- Gas Analytical Application In Blast Furnaces
- Gas Analytical Application In LD Convertors
- Gas Analytical Application In Coke Ovens
- Gas Analytical Application In Power Plants
- Gas Analytical Application In Cold Rolling Mill
- Gas Analytical Application In Hot Strip Mill
- Gas Analytical Application In Sinter Plants
- Gas Analytical Application In Lime kiln

.....and many more



Application for Blast Furnaces

- CO/CO2 measurement in Above Burden
- CO/CO2 measurement in In Burden
- CO/CO2 & H2 measurement Top Gas Analysis System
- O2 Measurement in Cold Blast
- CO & O2 Measurement in Stove Waste Gas
- CO/ SOx / NOx Measurement in Chimney
- Moisture Measurement in Cold Blast
- CO & O2 Measurement in Coal Mill
- Calorific Value Measurement



Challenges for Gas Analysis System in Blast Furnaces

Gas sampling systems in Steel Plant must be able to withstand a very tough environment:

High gas temperature

High Pressure of Sample Gas

High Moisture Content

High dust concentration

High content of Alkalis, Sulfates and Chlorides

High level of mechanical stress and strain

Leakages in System

Important Points in Designing the Gas Analysis System For Steel Plants

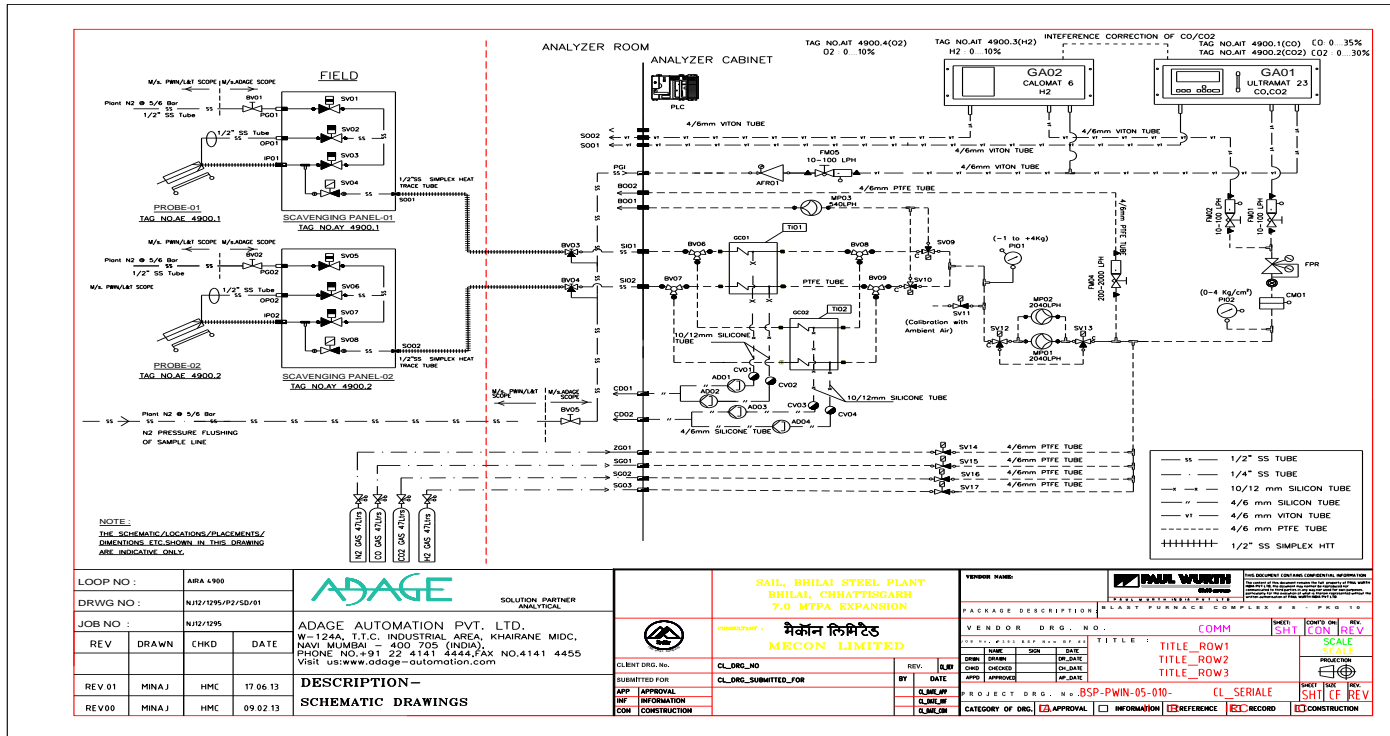
- The Process cannot be stopped. The System designed should be such that in case of any issues the System should run.
- The Sampling point should be redundant. So that in any point of time if one Probe has a problem the other probe should be able to operate the System. There should be no sampling Stoppages.
- The Filters should be chosen keeping the Sampling point in mind.
- There should be a minimum of 3 stages of filtration in the System
- A Heated Sample Line is also a must as the sample is loaded with moisture.
- Transportation time should be reduced to an optimum
- Now that the Sample is there in Panel The Analysers should be kept totally independent, so that in case of a failure / issue with one Analyser the readings of the other Analyser should be always available for the operation to continue the process.

Top Gas Analysis System

Challenges

- The Sample Gas is Raw Sample Gas with High Temperature
- The Dust content is High
- There is High Moisture.
- The Gas is sometimes at elevated pressure sometimes the pressure is low, depending on the tapping point.

Top Gas Analysis System



LOOP NO :	ARA L990		
DRWG NO :	N102/1295/P2/SD/01		
JOB NO :	N102/1295		
REV	DRAWN	CHKD	DATE
REV 01	MINA J	HMC	17.06.13
REV 00	MINA J	HMC	09.02.13

ADAGE SOLUTION PARTNER ANALYTICAL

ADAGE AUTOMATION PVT. LTD.
W-124A, T.T.C. INDUSTRIAL AREA, KHAIRANE MIDC,
NAVI MUMBAI - 400 705 (INDIA),
PHONE NO.-91 22 4141 4444, FAX NO.4141 4455
Visit us: www.adage-automation.com

SAIL, BHILAI STEEL PLANT
BHILAI, CHHATTISGARH
7.0 MTPA EXPANSION

CLIENT DRG. NO. CL_DRG_NO
SUBMITTED FOR CL_DRG_SUBMITTED_FOR

MECON LIMITED

VENDOR NAME: **PAUL WURTMER**

PACKAGE DESCRIPTION: MEATY FURNACE COMPLEX 2 - 3 - PRO 13

VENDOR DRG. NO. TITLE: TITLE_ROW1
TITLE_ROW2
TITLE_ROW3

PROJECT DRG. No. BSP-PWN-05-010- CL SERIALE

APPROVAL INFORMATION: CL_APP, CL_CHK, CL_APPR, CL_REC

CATEGORY OF DRG. APPROVAL INFORMATION REFERENCE RECORD CONSTRUCTION

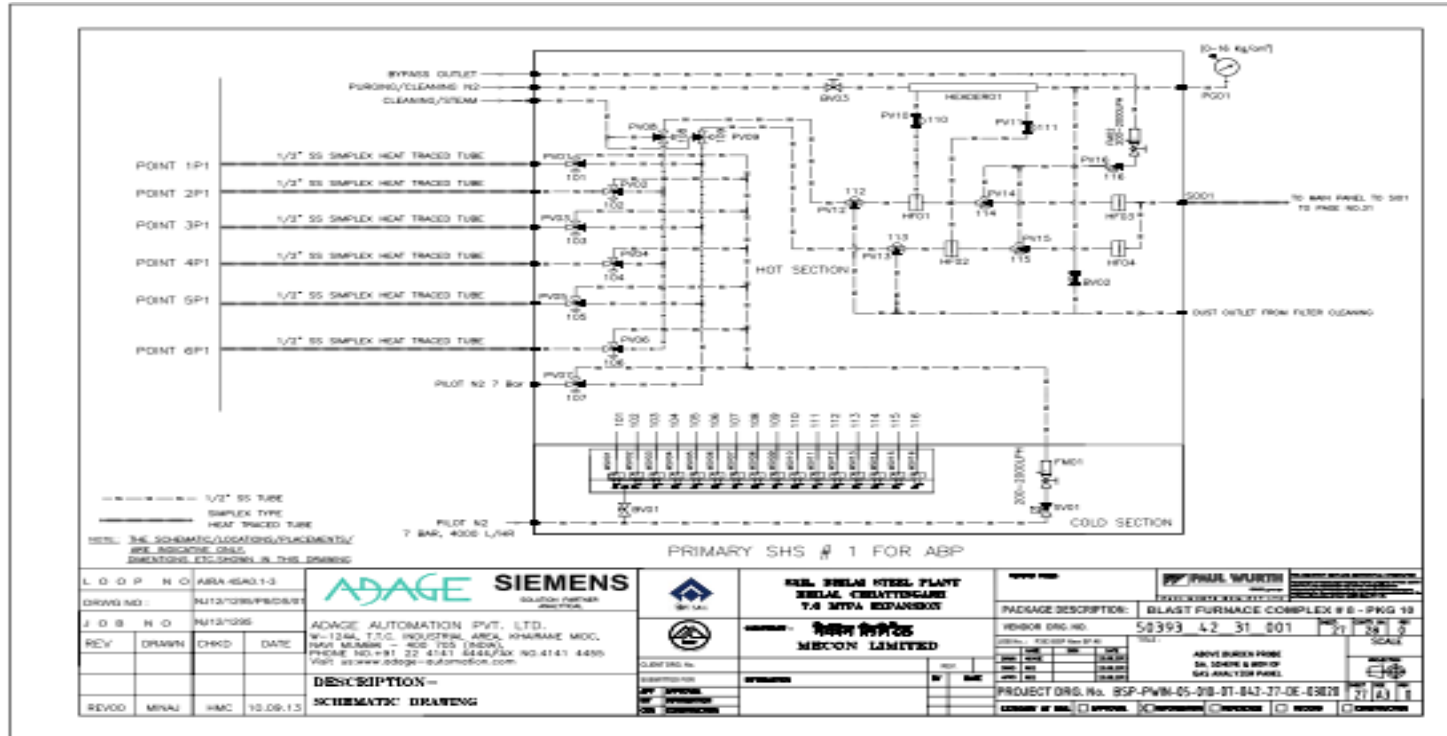
Above Burden Gas Analysis System

Challenges

- There are many points which are to be analysed sequentially.
- The Sample Gas is Raw Sample Gas with High Temperature
- The Dust content is High
- There is High Moisture.
- The Gas is already at elevated pressure.

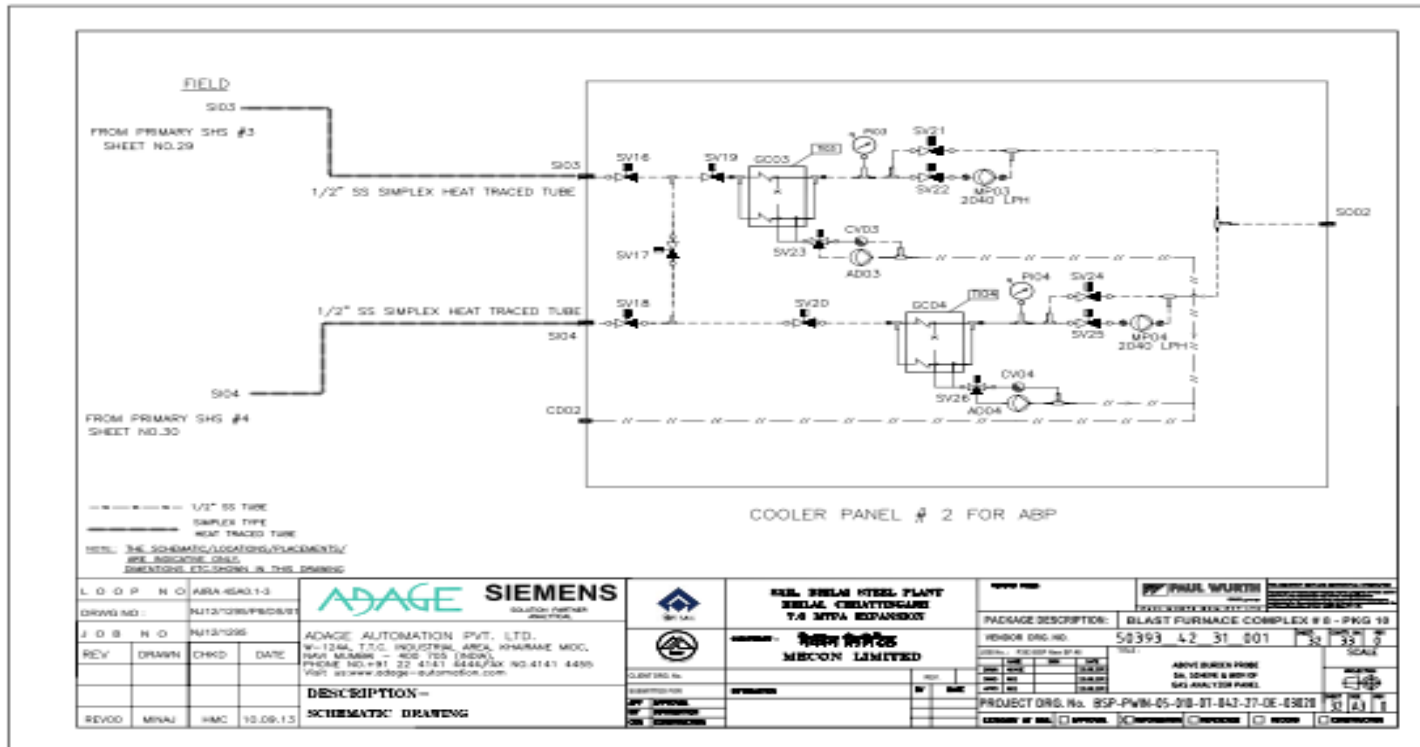
Above Burden Gas Analysis System

Primary Sampling System



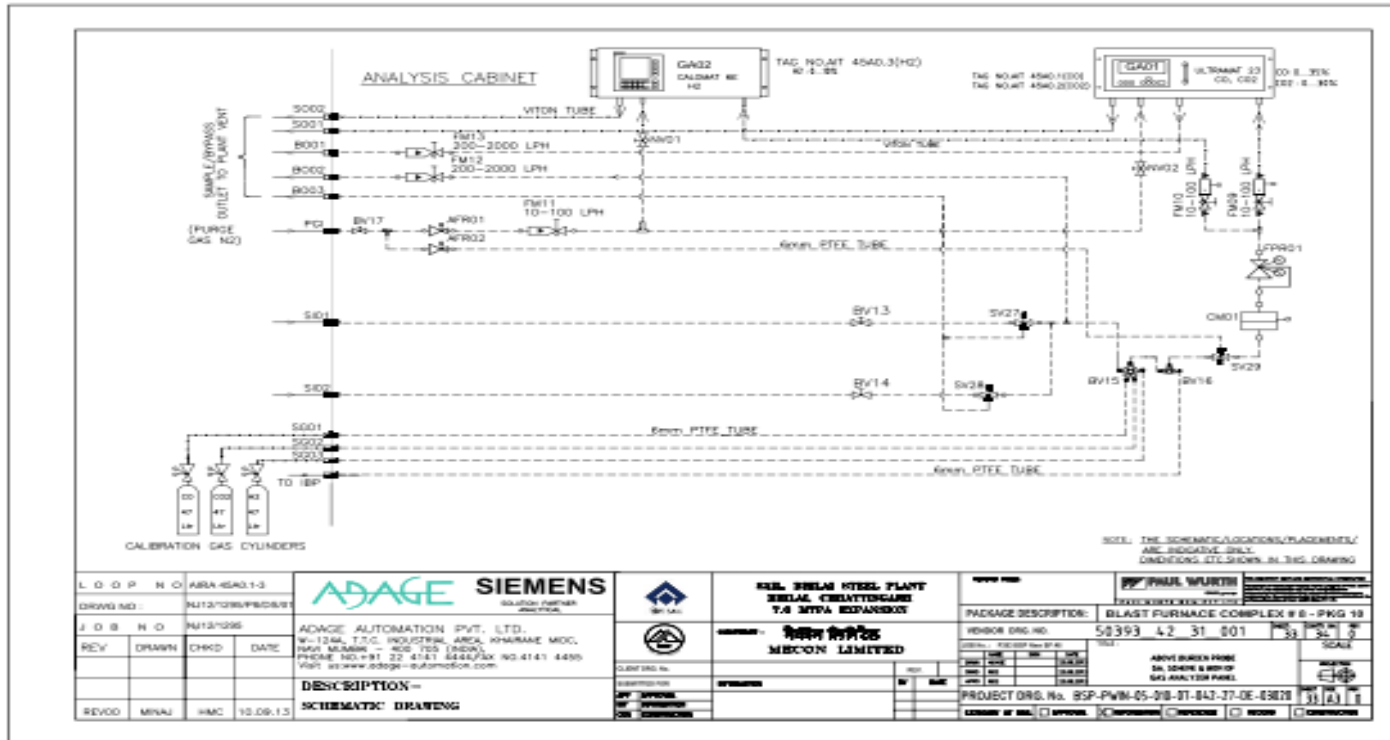
Above Burden Gas Analysis System

Cooler Panel

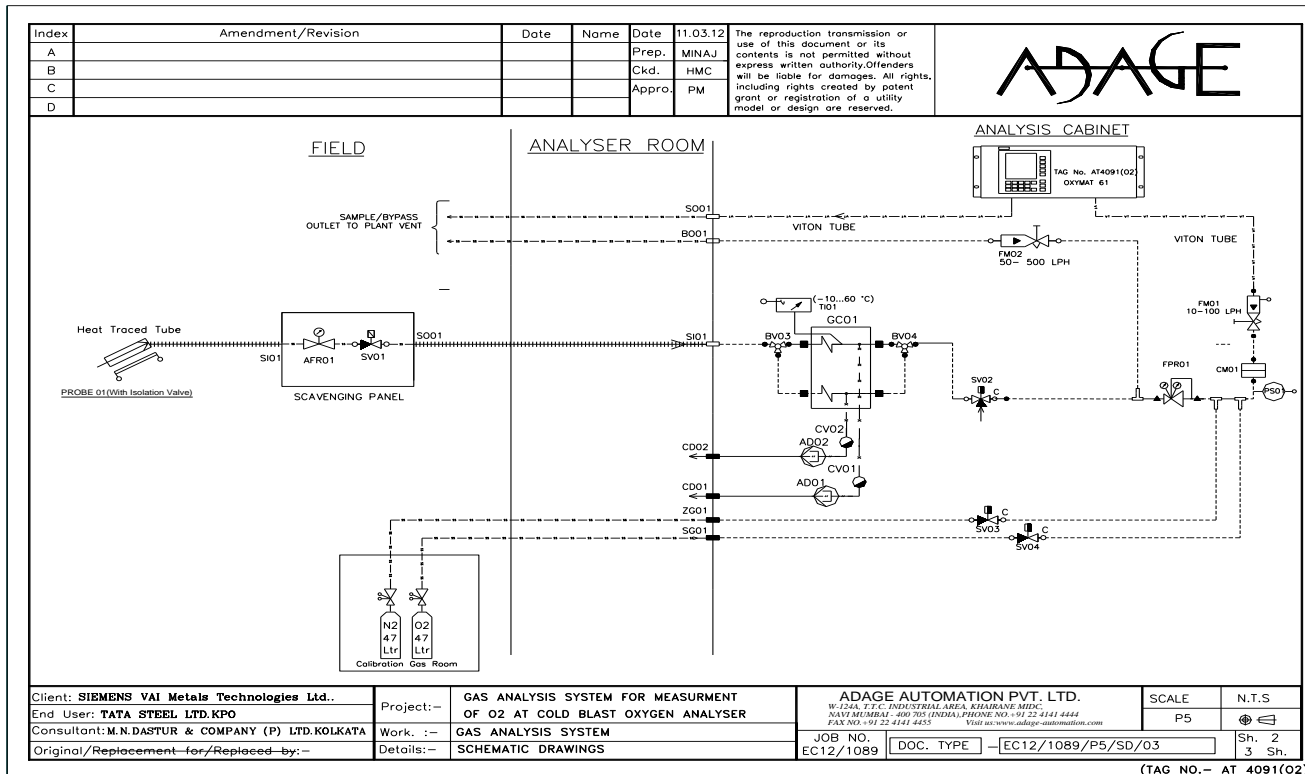


Above Burden Gas Analysis System

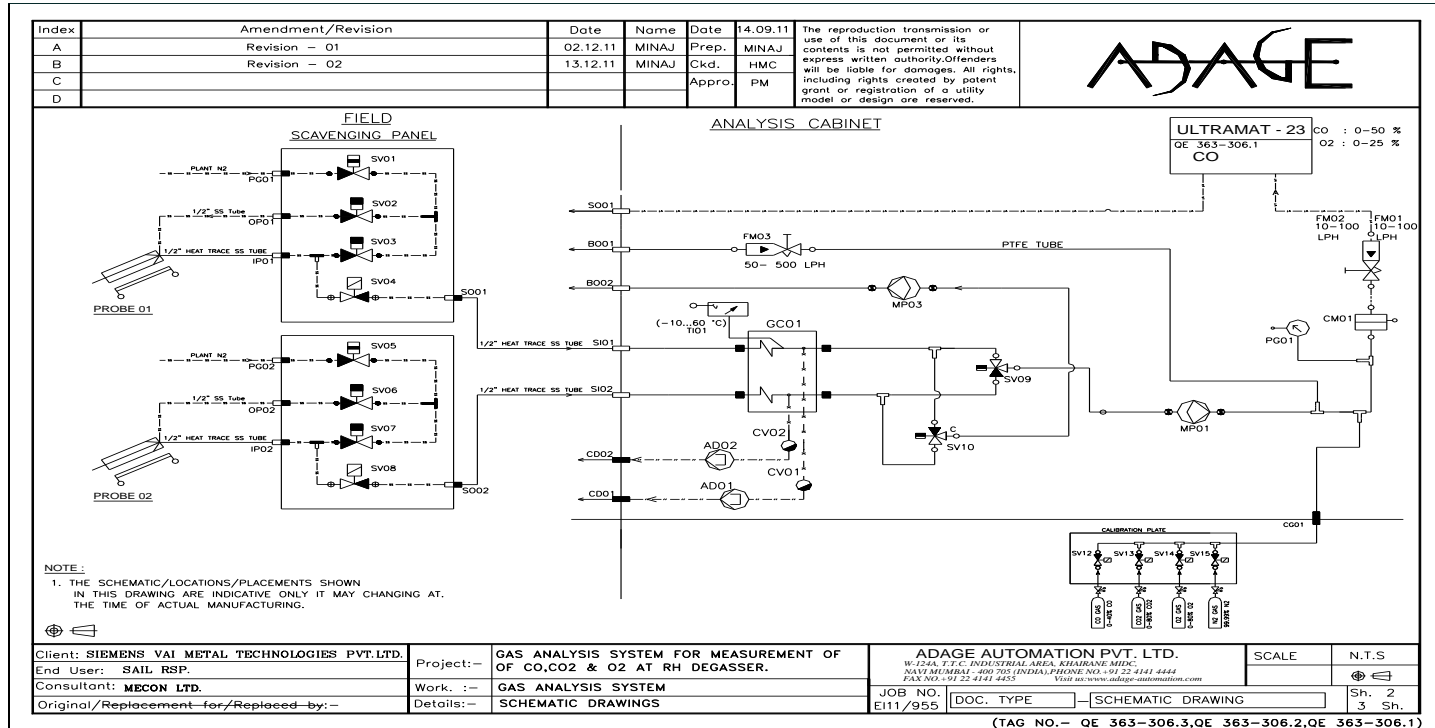
Gas Analyser Panel



O2 Measurement in Cold Blast



Stove Waste Gas Analysis



Application – Measurement of O2 Gas Holder

LD Gas is stored in the Gas Holder- The Gas is rich in Calorific Value and with a little extra O2 the Gas can become an explosive mixture.

- ***The aim is to detect the presence of O2 > 2 % at the fastest possible time.***
 - To take corrective action to prevent the O2 from reaching the Gas Holder
 - To have a System that is reliable and has the least maintenance.
-
- **Introduction of Laser Analyzer SITRANS SL with response time <2secs**
 - Laser Sitrans SL has an internal reference Cell which is checked 24 times per second to give an correct measurement of O2.
 - The System is Field mounted there is no need for Analyser Room.
 - Spares requirement is minimum.



Advantages of Laser Analyser

LIFE TIME CALIBRATION FREE

NO EFFECT OF HIGH DUST

NO RANGE LIMITATIONS

NO CONSUMABLES

SUPER FAST

NO EFFECT OF HIGH MOISTURE

NO EFFECT OF VIBRATION

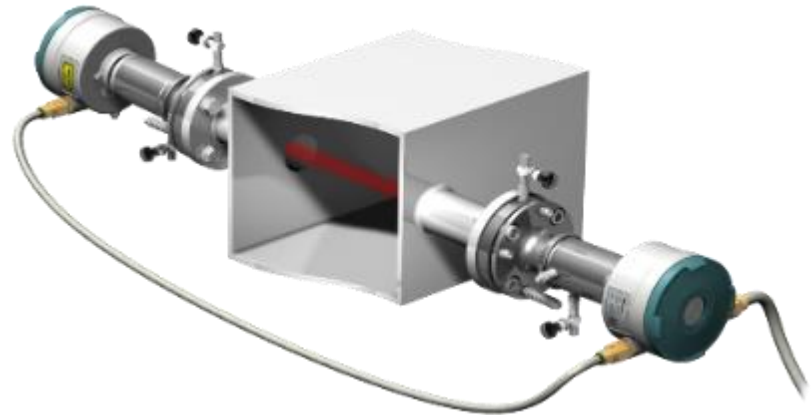
HIGH SENSITIVITY

HIGH SELECTIVITY

NO CROSS INTERFERENCE


SITRANS SL

- SITRANS SL is an all-in-one transmitter-like laser gas analyzer.
- SITRANS SL is a non fiber optic-based system.



Standardized design also for hazardous zones

Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin



EG-Baumusterprüfbescheinigung

(1) Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen - **Richtlinie 94/9/EG**

(2) EG-Baumusterprüfbescheinigungsnummer

PTB 08 ATEX 1008 X

(3) Gerät: Kontinuierlicher Gasanalysator SITRANS SL

(4) Hersteller: Siemens AG

(5) Anschrift: 76181 Karlsruhe, Deutschland

(6) Die Bauart dieses Gerätes sowie die verschiedenen zulässigen Ausführungen sind in der Anlage und den darin aufgeführten Unterlagen zu dieser Baumusterprüfbescheinigung festgelegt.

(7) Die Physikalisch-Technische Bundesanstalt bescheinigt als benannte Stelle Nr. 0102 nach Artikel 9 der Richtlinie des Rates der Europäischen Gemeinschaften vom 23. März 1994 (94/9/EG) die Erfüllung der grundlegenden Sicherheits- und Gesundheitsanforderungen für die Konzeption und den Bau von Geräten und Schutzsystemen zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen gemäß Anhang II der Richtlinie.

Die Ergebnisse der Prüfung sind in dem vertraulichen Prüfbericht PTB Ex 08-17 111 festgehalten.



(8) Die grundlegenden Sicherheits- und Gesundheitsanforderungen werden erfüllt durch Übereinstimmung mit

EN 60079-0:2006	EN 60079-1:2004	EN 60079-7:2007
EN 61241-0:2006	EN 61241-1:2004	EN 60079-28:2007

(9) Falls das Zeichen „X“ hinter der Bescheinigungsnummer steht, wird auf besondere Bedingungen für die sichere Anwendung des Gerätes in der Anlage zu dieser Bescheinigung hingewiesen.

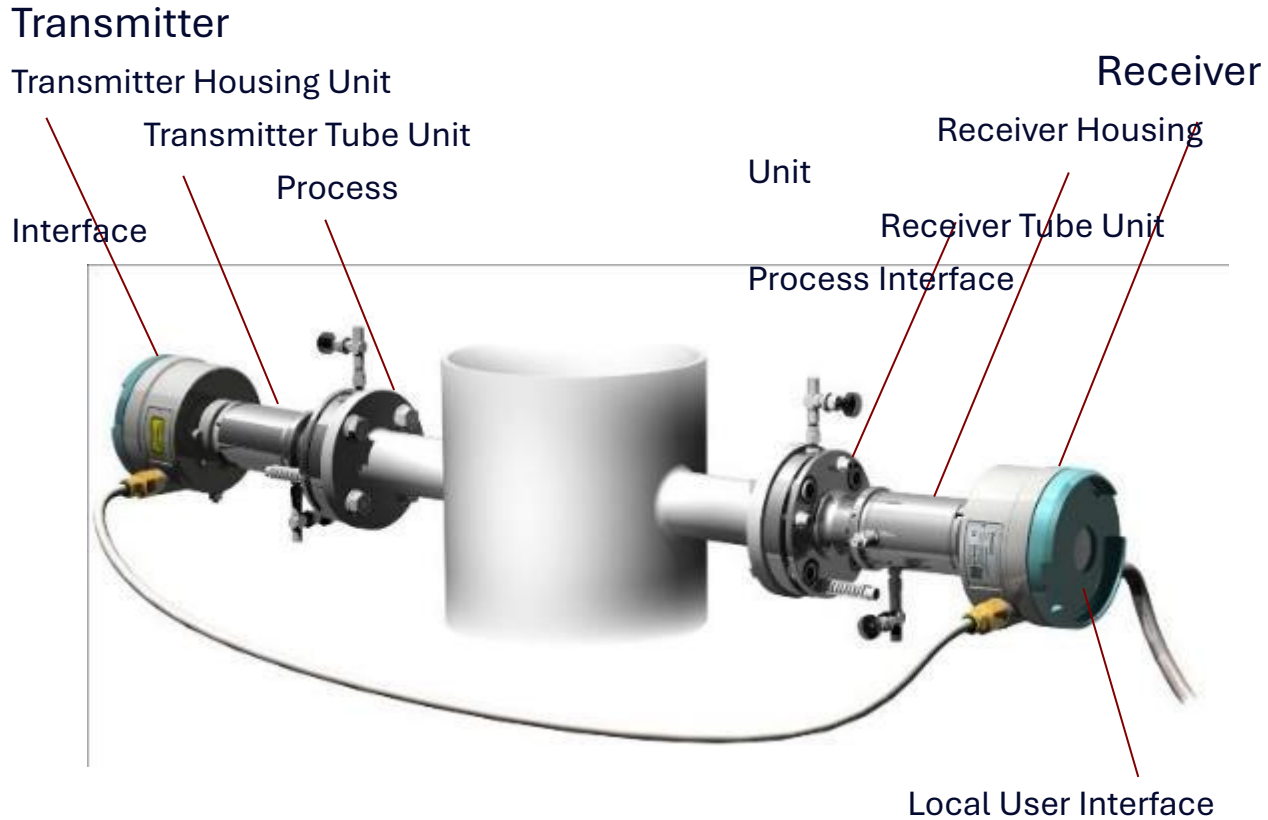
(10) Diese EG-Baumusterprüfbescheinigung bezieht sich nur auf Konzeption und Prüfung des festgelegten Gerätes gemäß Richtlinie 94/9/EG. Weitere Anforderungen dieser Richtlinie gelten für die Herstellung und das Inverkehrbringen dieses Gerätes. Diese Anforderungen werden nicht durch diese Bescheinigung abgedeckt.

(11) Die Kennzeichnung des Gerätes muß die folgenden Angaben enthalten:

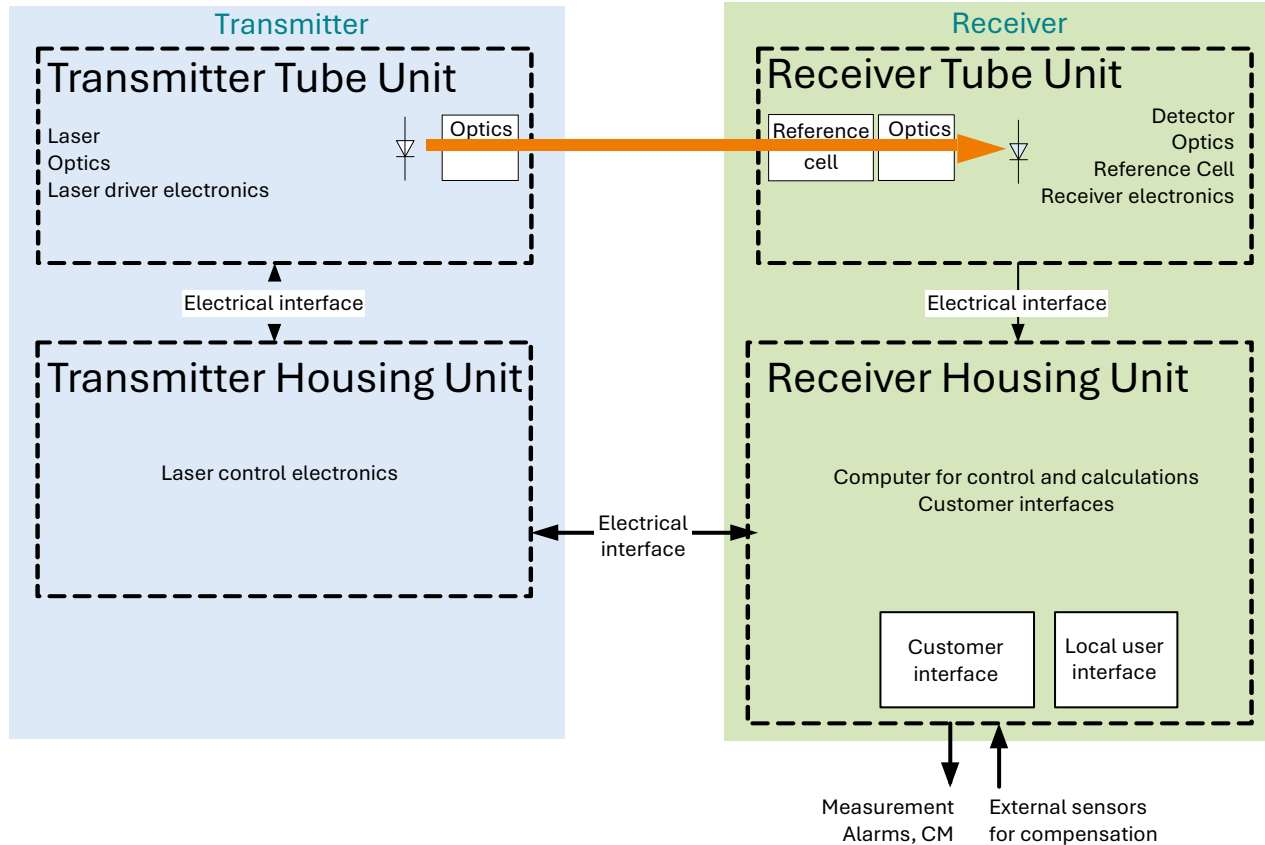
	II 2 G	Ex de IIC T6
	II 2 D	Ex tD A21 IP 65 T85 °C



System overview



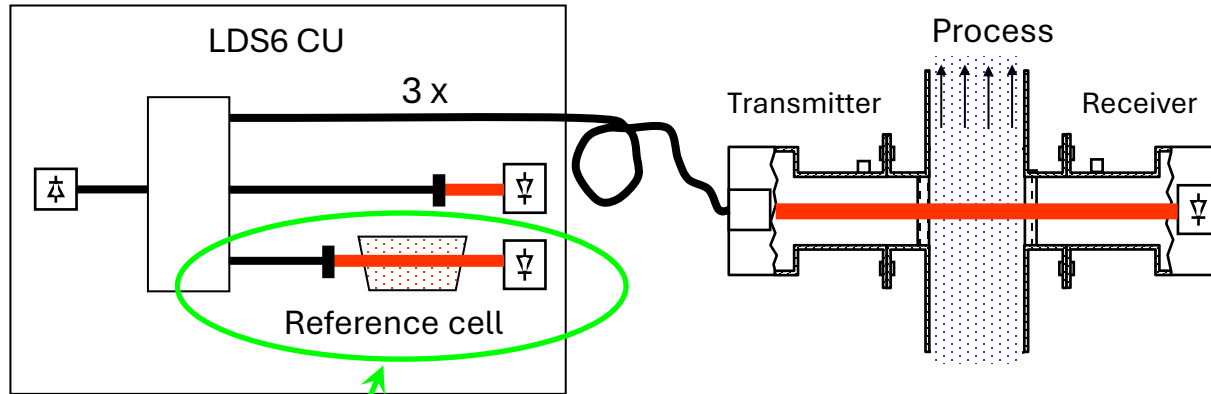
Functionality of the Four Analyzer Modules



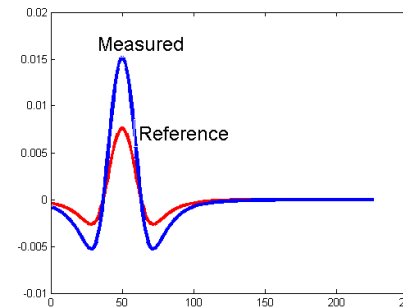
Some Technical Highlights

- **Built-in reference cell (!)**
 - ⇒ **Stable instrument operation**
- **Single line absorption technology using wavelength modulation**
 - ⇒ **High sensitivity**
 - ⇒ **Immunity to interferences**
- **Curve fit and normalization**
 - ⇒ **Accurate measurements in true process conditions**
 - ⇒ **Less matrix effects, higher instrument flexibility**
- **Optical interference reduction**
 - ⇒ **Lower detection limits and less drift**
- **ATEX version available as standard (EEx-d for zone I and II)**
 - ⇒ **No additional external pressure control like for EEx-p required**

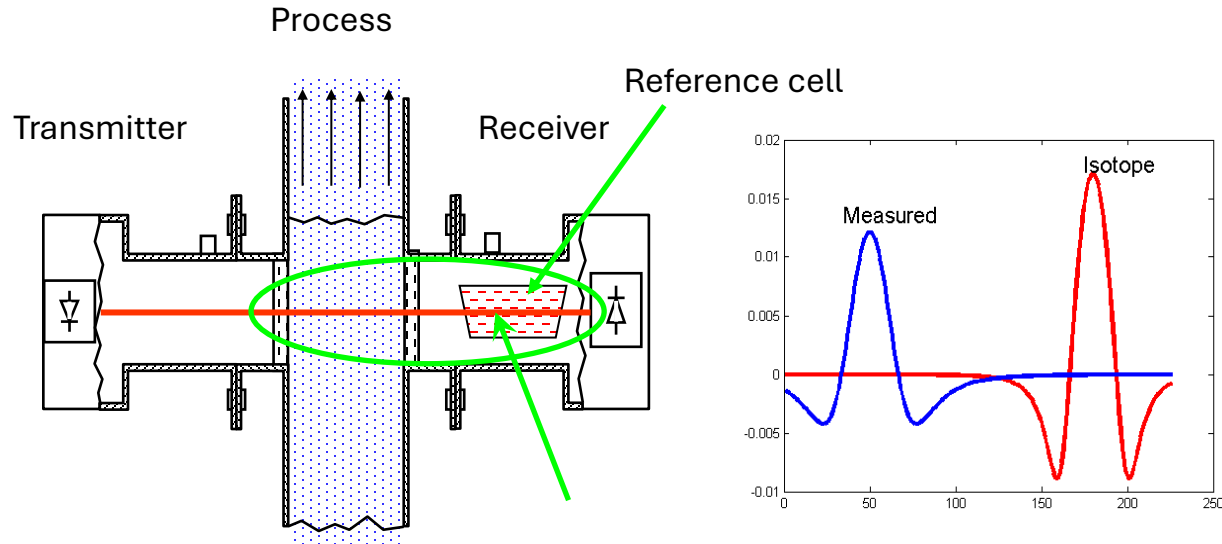
Laser Locking with Built-in Reference Channel



Laser frequency locking is realized with a separate reference channel



SITRANS SL: Built-in Reference Cell filled with Isotope O18



Built-in reference cell with non-interfering gas, here: $^{18}\text{O}_2$

- ➔ Higher stability of the measurement.
- ➔ Locking signal is always available, no signal losses.

Laser Locking with Built-in O18 Isotope Cell: Setting a new Technology Benchmark!

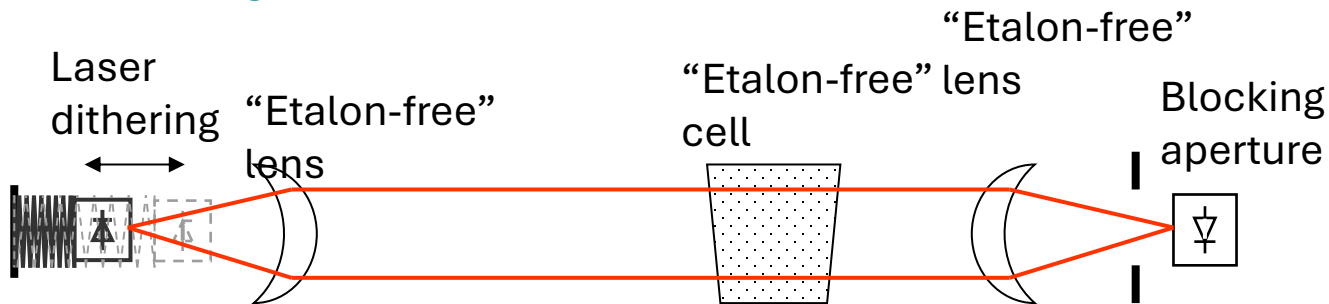
Benefits of the O18 isotope cell solution:

- Better instrument performance
- Less frequent recalibrations
- Present in every analyzer, not just as an option
- A life-time valid instrument calibration.

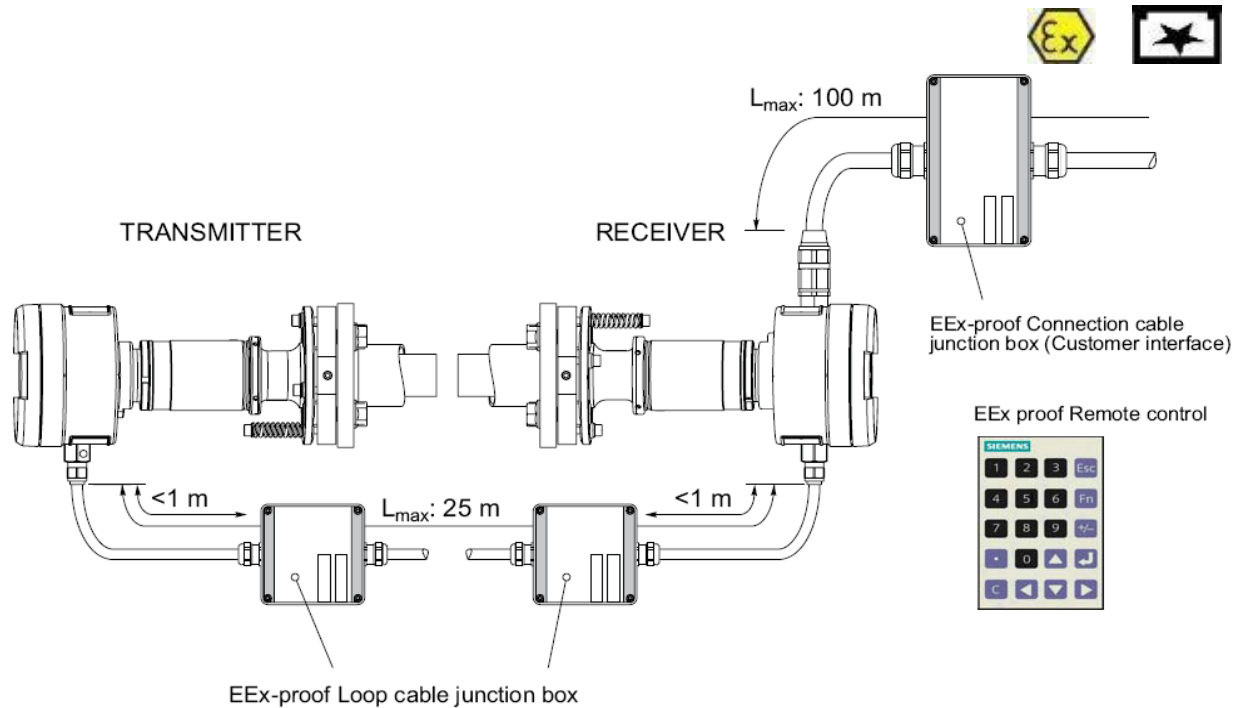
Reduction of Optical Interferences:

Better Minimum Detection Limit and Accuracy

- Optical interferences occur when light travels through optical interfaces.
- These interferences lead to a higher background and worse detection limits.
- ⇒ SITRANS SL reduces interferences via special opto-mechanical design and a vibrating laser holder.



SITRANS SL: EEx-d design (explosion protection by encapsulation)



Applications

- **Steel plants**
 - Converters
 - Gas Holder
 - Coke gas
- **Combustion control for boilers**
- **Combustion control for MWs**
- **Chemical Applications:**
 - Safety monitoring
 - Process control

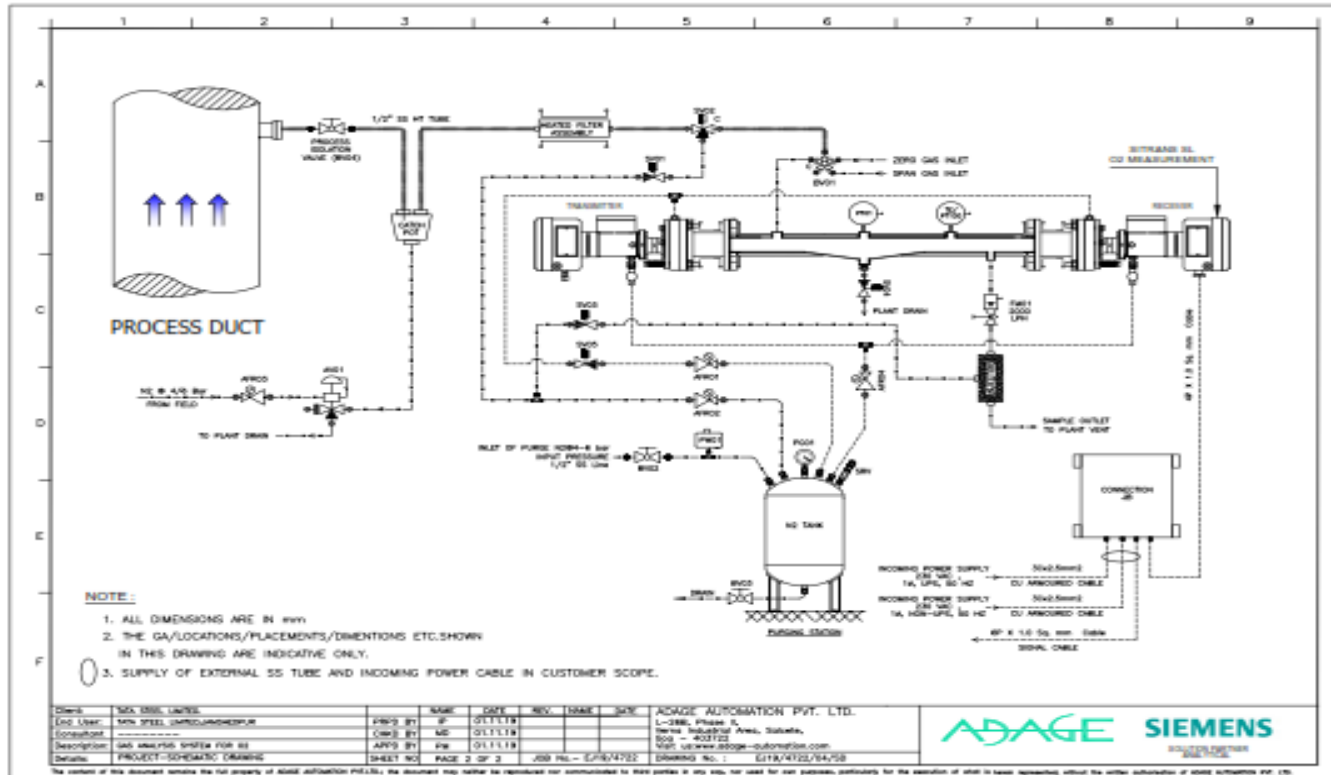
Setting a new TDLS Technology Benchmark:

- **O18 reference cell**
 - ⇒ Non-interfering reference gas
 - ⇒ Less demand for verification (minimum for 1 year!)
 - ⇒ Stability and Availability
- **EEx-d version as standard, without need of additional EEx-p pressure control units**
- **Wireless parameterization in EEx-zones**
- **Profibus DP communication as an option**

Installation Photographs



Application – Measurement of O₂ Gas Holder



System Installation Photographs



Worlds Most installed NDIR Analyzer



Ultramat 23

ULTRAMAT 23 - Multi-component Gas Analyzer

- **Central Electronics concept with Sensor Module**
 - Saves costs and space
 - One analyzer, one gas path, less maintenance
- **AUTOCAL with ambient air due to inbuilt Gas Filled detector (TUV Certified)**
 - No calibration gases and valves necessary
- **High selectivity by using multi-layer detectors**
 - Less interference (e.g. with water)
- **Sample cell is easy to clean**
 - Cost-saving by reusing the sample cell after cleaning
- **Menu driven operation in plain text**
 - Easy to operate, without manual
- **Freely programmable measuring ranges and output signals**
- **Service information and logbook**
 - Preventive maintenance, support for commissioning, cost-saving
- **Open interface architecture (RS 485/232, PROFIBUS, SIPROM GA)**
 - Improved and easy system integration, remote control and monitoring



ULTRAMAT 23 - Multi-component Gas Analyzer

- Highly selective measurement of up to 3 IR-active components
- Paramagnetic Sensor Dumbbell for oxygen measurement
- 19" rack version
- Freely programmable measuring ranges and output signals
- Unparalleled cost/performance ratio



Gas Component	Smallest Measuring Range	
CO	0-50 ppm	0-150 mg/m ³
CO ₂	0-50 ppm	
NO	0-100 ppm	0-100 mg/m ³
SO ₂	0-150 ppm	0-400 mg/m ³
CH ₄	0-500 ppm	

ULTRAMAT 23 - Multi-component Gas Analyzer

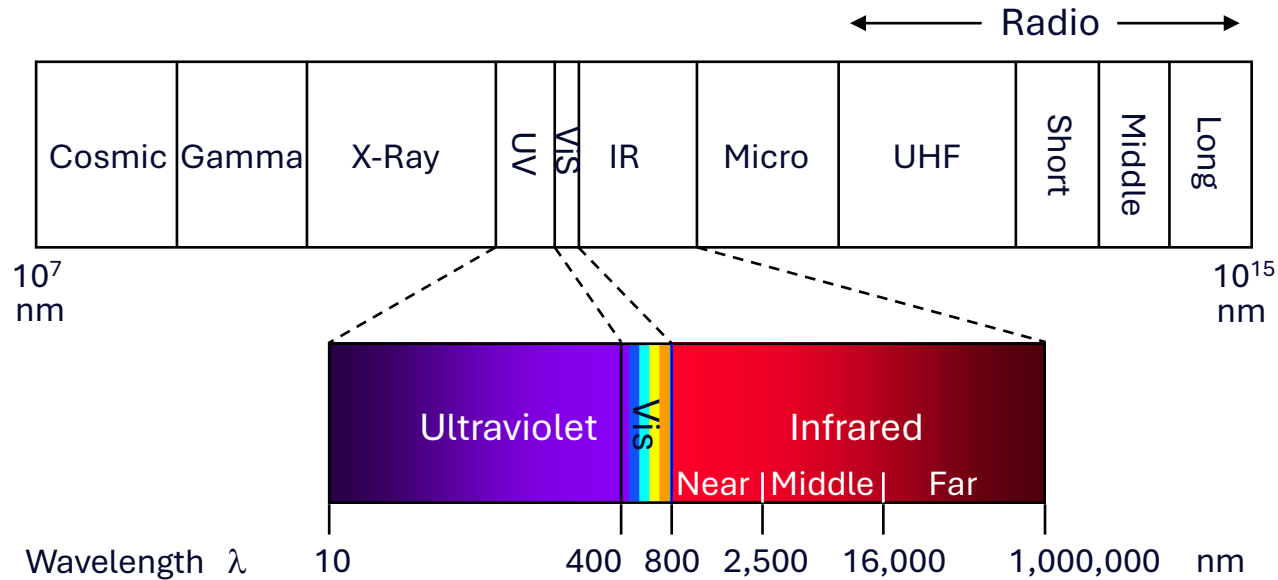


- Large, easy to read display
- Versatile display in all measuring units: ppm, %, mg/m³
- Information about pre-warnings, faults, limits, maintenance, pump, coding
- Logbook



- Self explanatory plain text menus
- Pushbutton operation
- Access to all internal functions and operating parameters
- Code protected operating levels

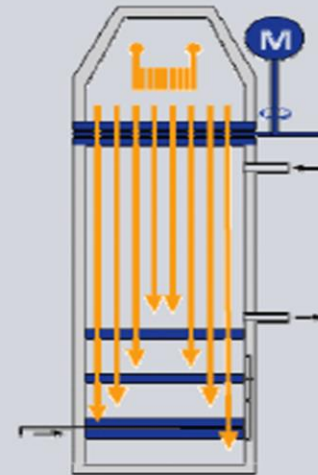
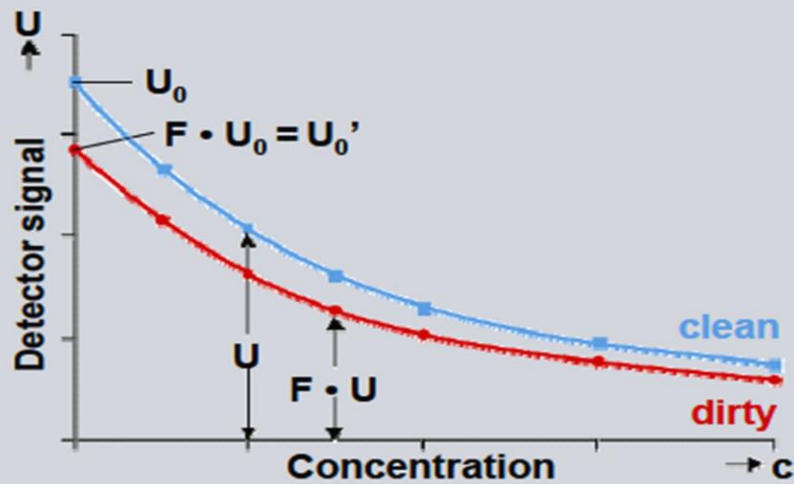
Measurements in the infrared wavelength range: 2-9 μm



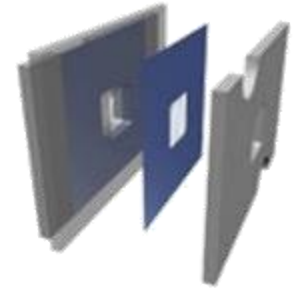
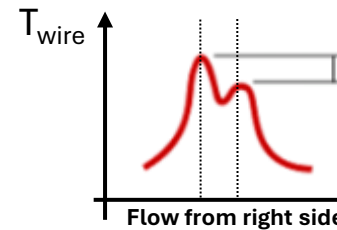
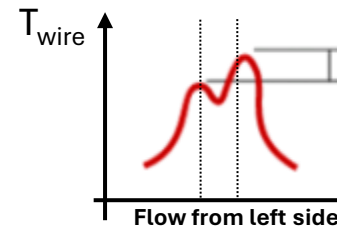
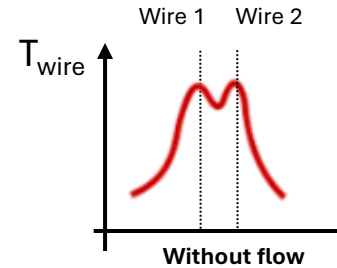
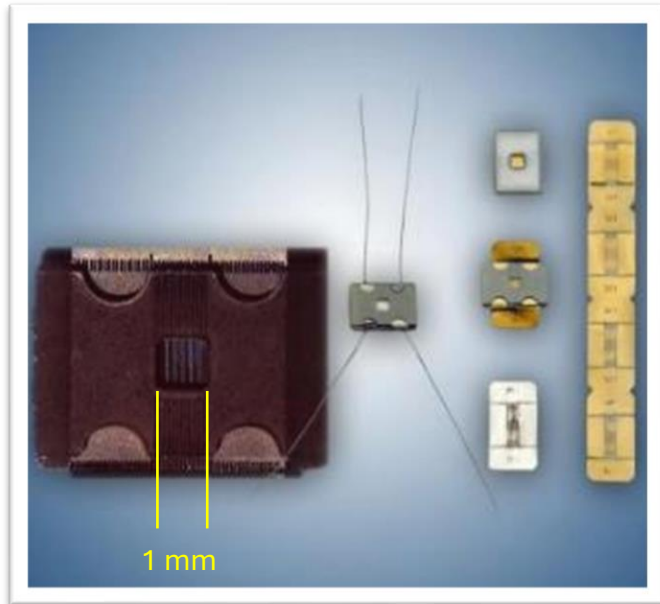
SIEMENS

Ultramat 23 - The unique AUTOCAL Principle

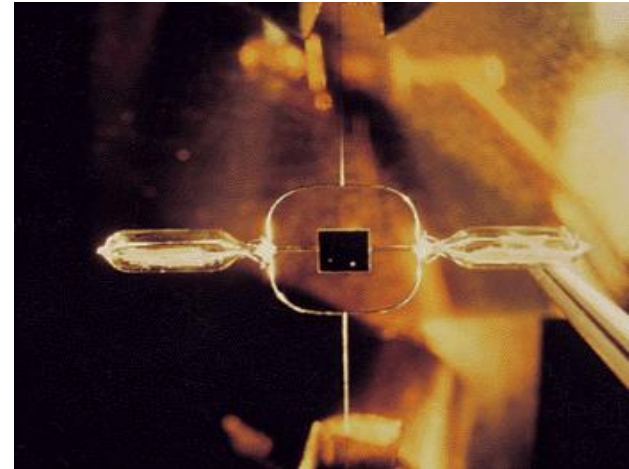
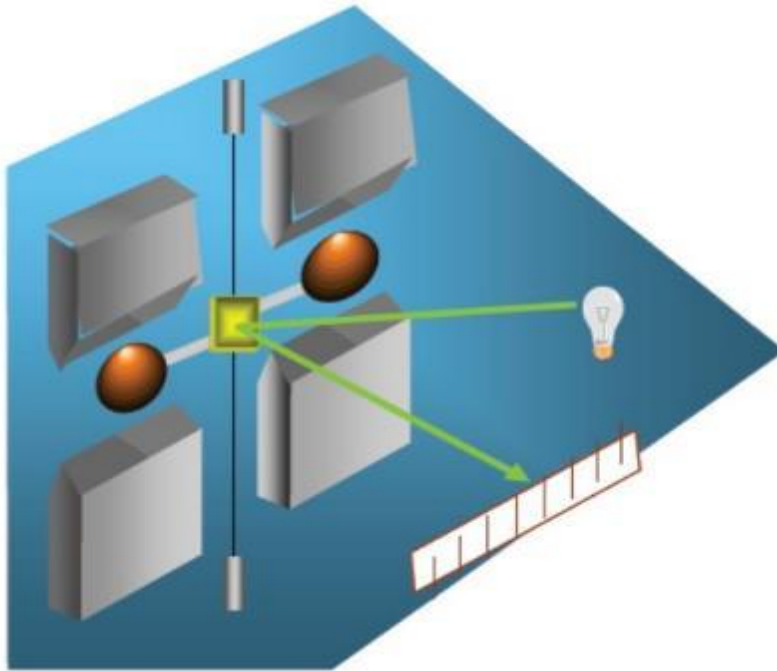
During the AUTOCAL procedure, the sample cell is purged with air. This causes the highest detector signal U_0 (no pre-absorption).



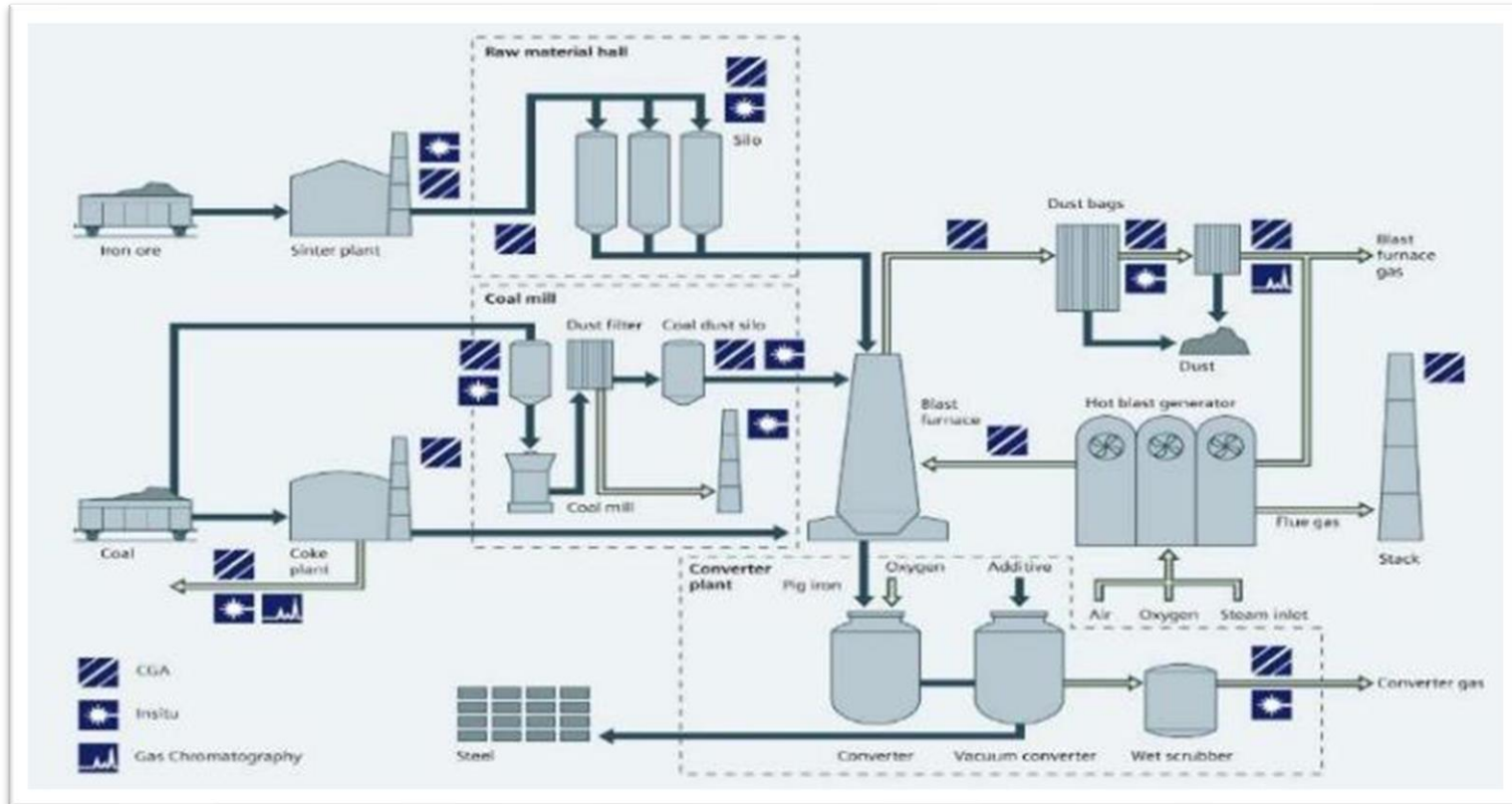
- Measuring very small alternating flows
- No membrane detector
→ no 'microphony effect'
- No moving parts → not subject to wear



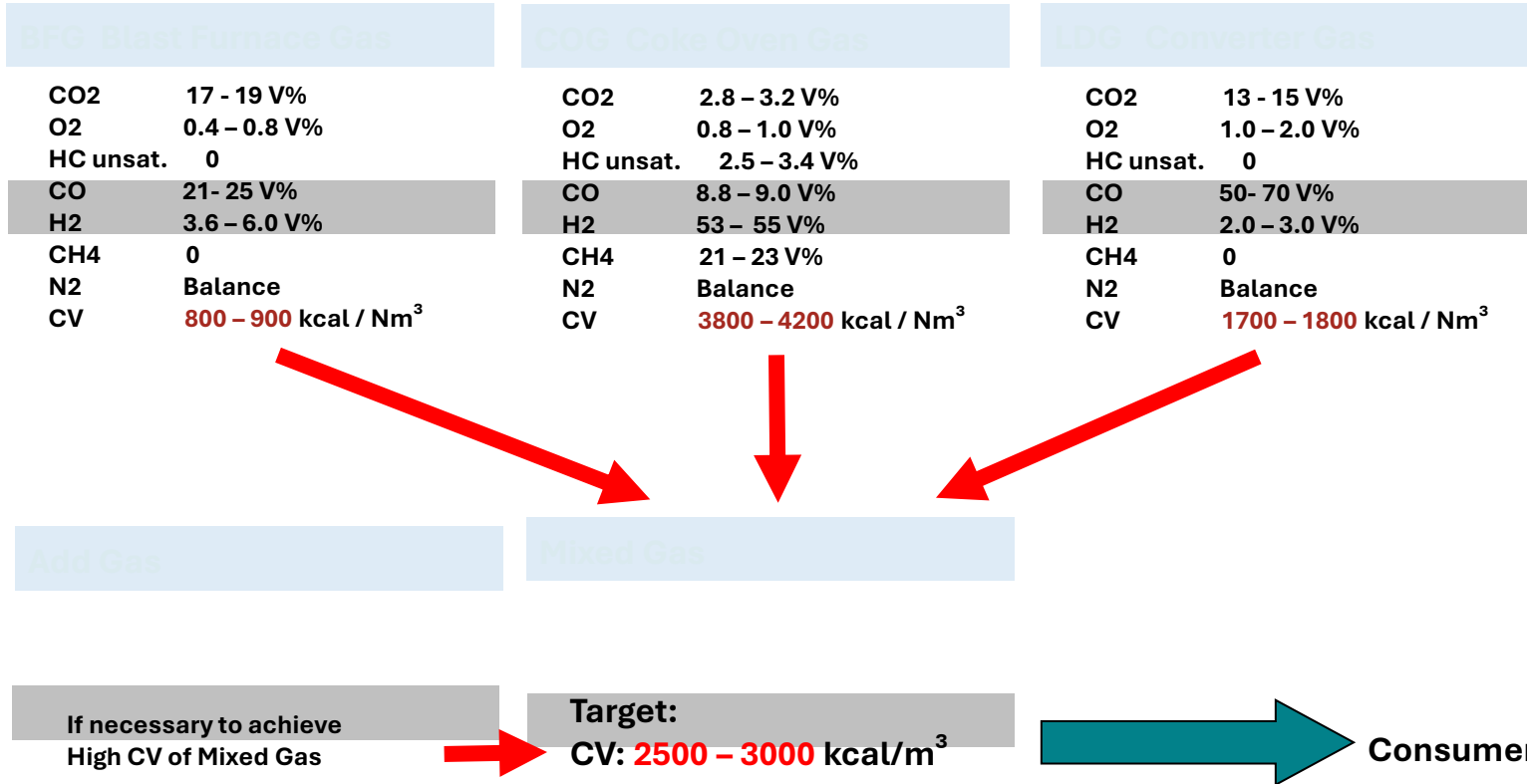
The Oxygen Measurement

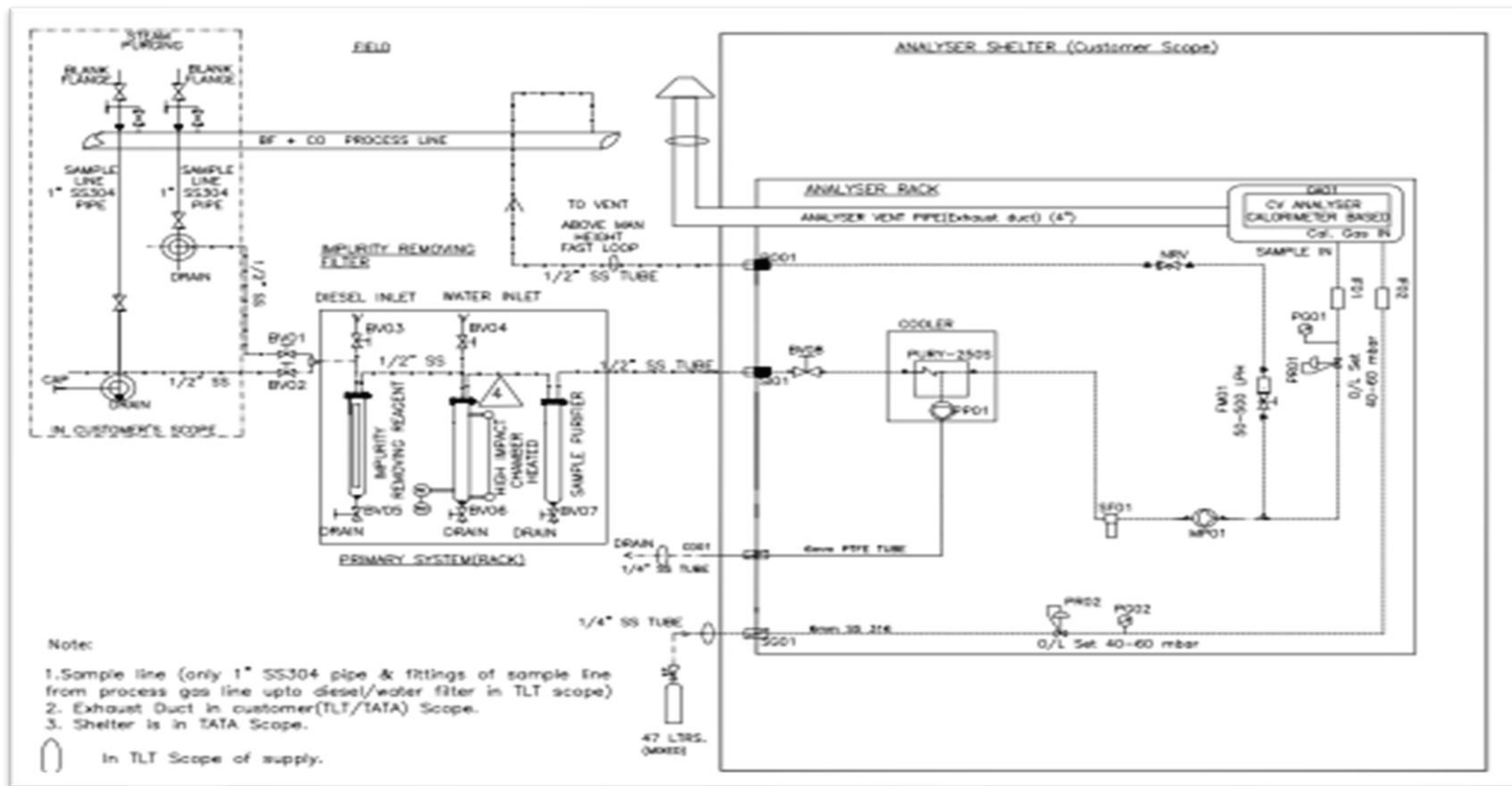


Valuable Gases Due To Energy Content

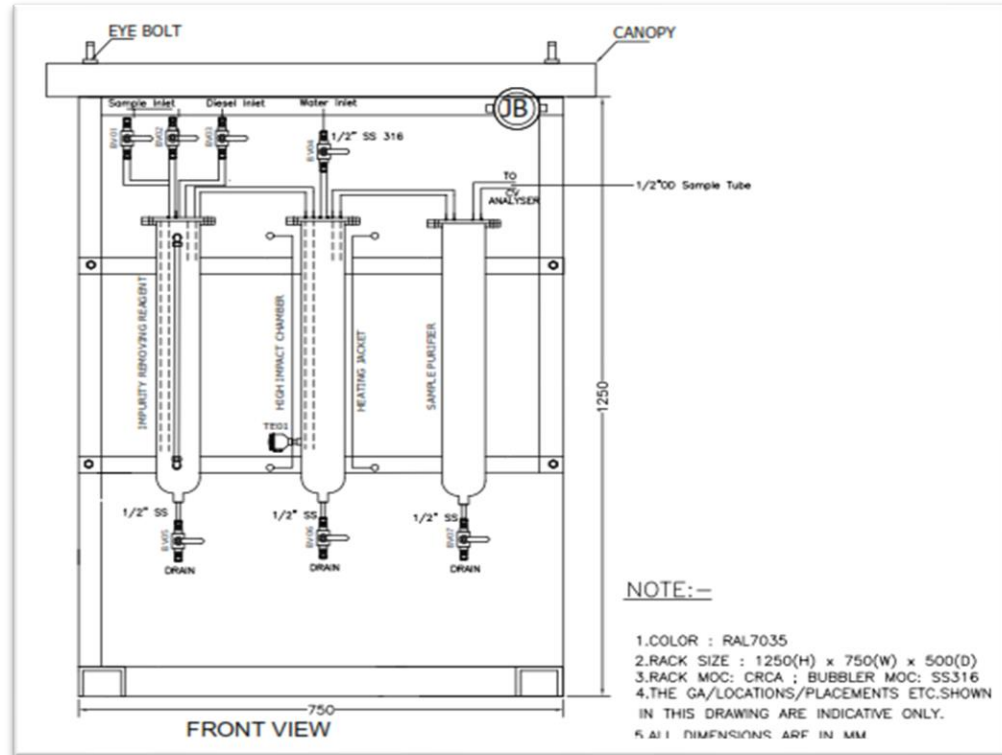
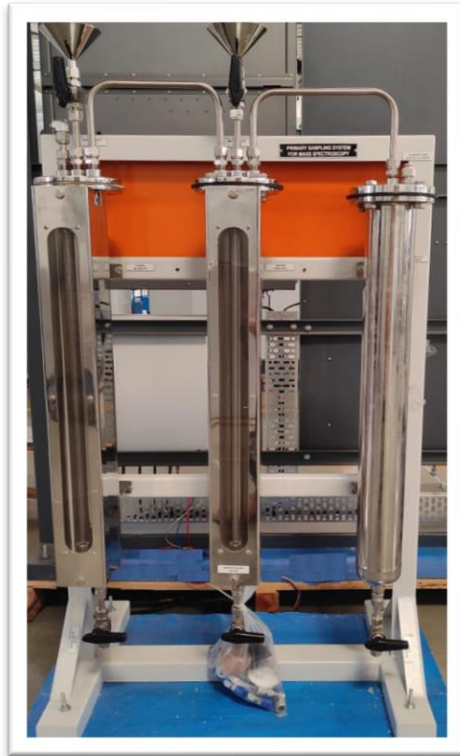


Challenge : Mix the gases to required CV

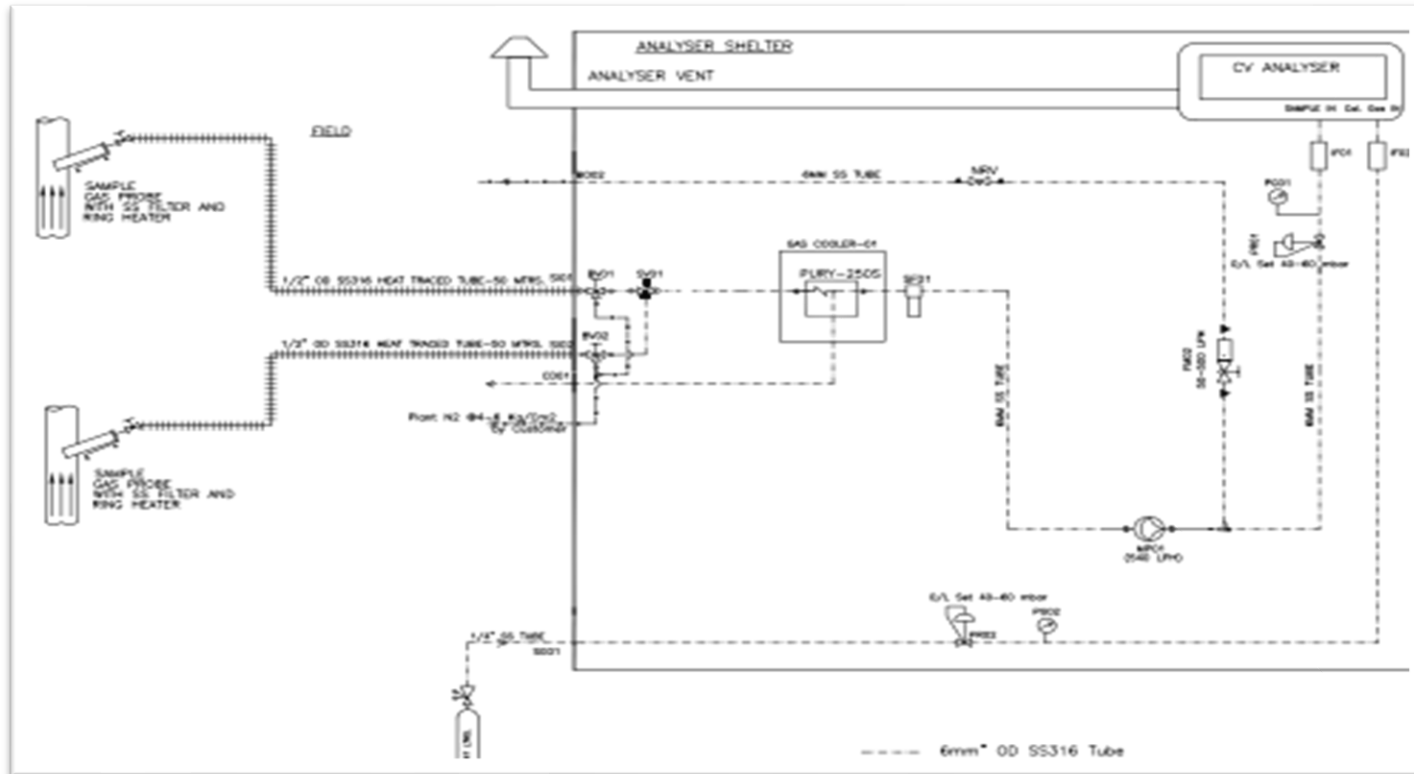




Primary Sampling System



Schematic for LD Gas & BF Gas



THANK YOU

AKAI

Adage Kanoo Analytical Industry LLC

D 64 & 65 / KLP 3

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United Arab Emirates

AKIC

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