



MAMOS MULTIGAS ANALYSER

SO₂, NO, NO₂, NO_x, CO, CO₂, VOC and O₂

About Us



AquaGas Monitoring Systems Integrated Systems and Customised Services

- Founded in 2013, based on the Gold Coast
- Systems integrator of AMS (Automated Monitoring Systems)
- Turnkey solutions for environmental compliance and process control
- Focused on customer satisfaction
- Air, Water, Emissions and Process gas
- Short to long term rental (CEMS & process analysers)
- High performance and cost-effective technologies
- Strong support of suppliers' network
- Customised service agreement with dedicated technicians
- Industry leading manufacturers: DURAG, HORIBA, Madur...

SmartCEMS



- Automated Monitoring System integrated in Australia by [AquaGas](#).
- Monitoring equipment is designed and manufactured by [MADUR](#) in Europe within the frame of an OEM agreement. Madur monitoring system are CE and ISO certified
- Data Acquisition and Handling System is designed and manufactured in UK by [a1cbiss](#). CDAS Software Suite is Mcerts certified for CEM application.

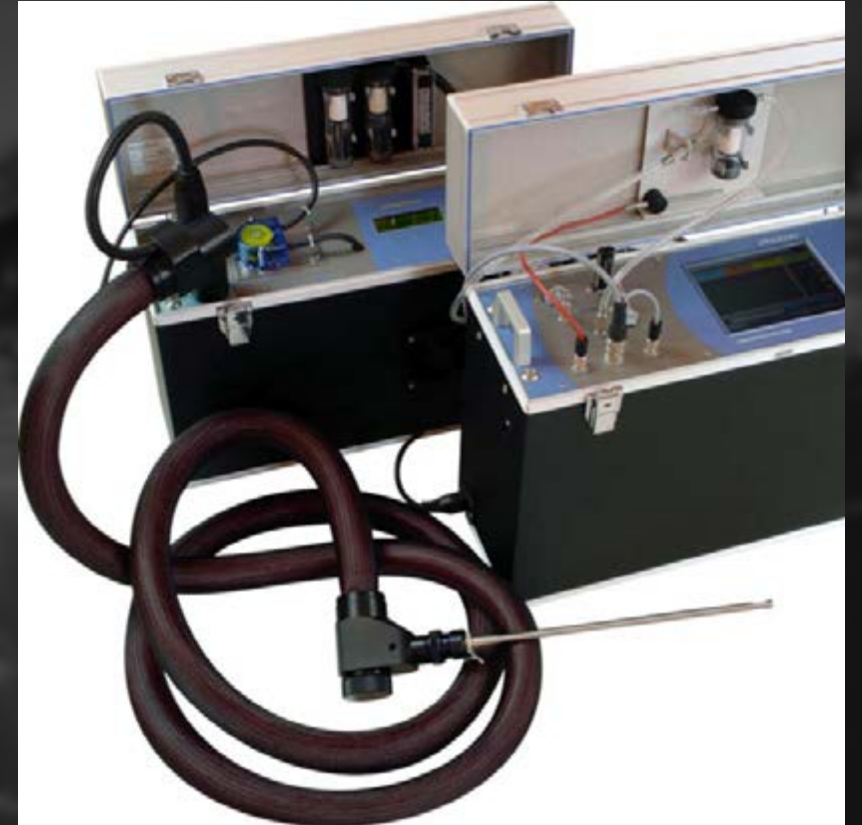
madur



MADUR



- Madur electronics was founded in 1984 in Vienna
- In 1994, Madur headquarters moved to Poland
- Handheld, portable and stationary gas analysers
- Large selection of sensors for complex gas matrix
- Broad selection of gas conditioning and sampling methods
- Field replaceable components (pre-calibrated sensor)
- AquaGas distributorship since 2013.



madur

a1cbiss



- A1-cbiss was created in 1989
- Offer a wide range of gas detection & cems solutions
- Now serve hundreds of customers
- Within a variety of industrial markets
- Mcerts certified gas monitoring solutions
- AquaGas distributorship since 2013.

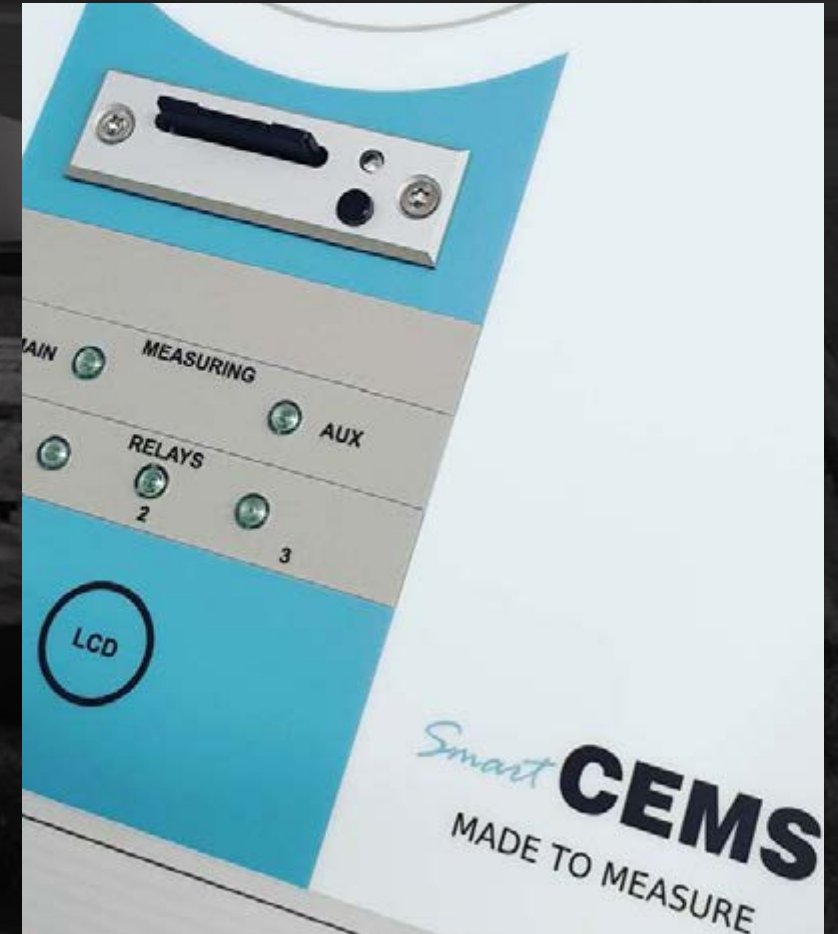


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Main Features

- Online Monitoring of Biogas Primary constituents in biogas and HC streams
- Powerful sensor combinations for complex gas matrices
- Fully supported by AquaGas in Australia, New Zealand and the Pacific Islands (sales and services)
- CH₄, C_xH_y, CO₂, H₂S, VOC, O₂, gas temperature, velocity and flow
- Modular and flexible design offering a pertinent selection of measuring and sampling methods
- Complies with international standards (EN14181, WA CEMS code, EPAs, NGER)
- Semi-automatic or automatic redundancy for greater data availability
- Empower NGER National Greenhouse and Energy Reporting
- Mcerts DAHS computer and CDAS software suite
- No requirements for career, purge or zero gas.

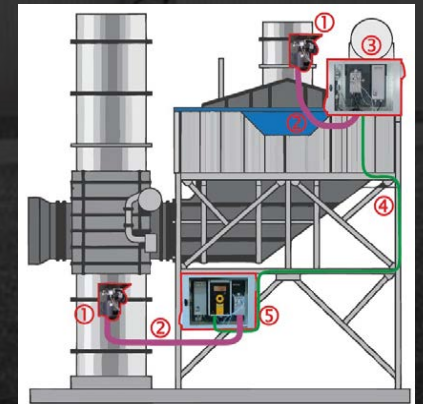


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Additional features

- Versatile selection of sample gas conditioning method incl. Peltier, Nafion, Compressor
- Extended monitoring capabilities with the inclusion of key components such as HF, HCl, NH₃
- Modular sampling train enabling optimal sampler transfer (up to 90m sampling line)
- Compact design
- Cost effective compared to typical intricate CEMS systems (spectrometer, multigas NDIR)

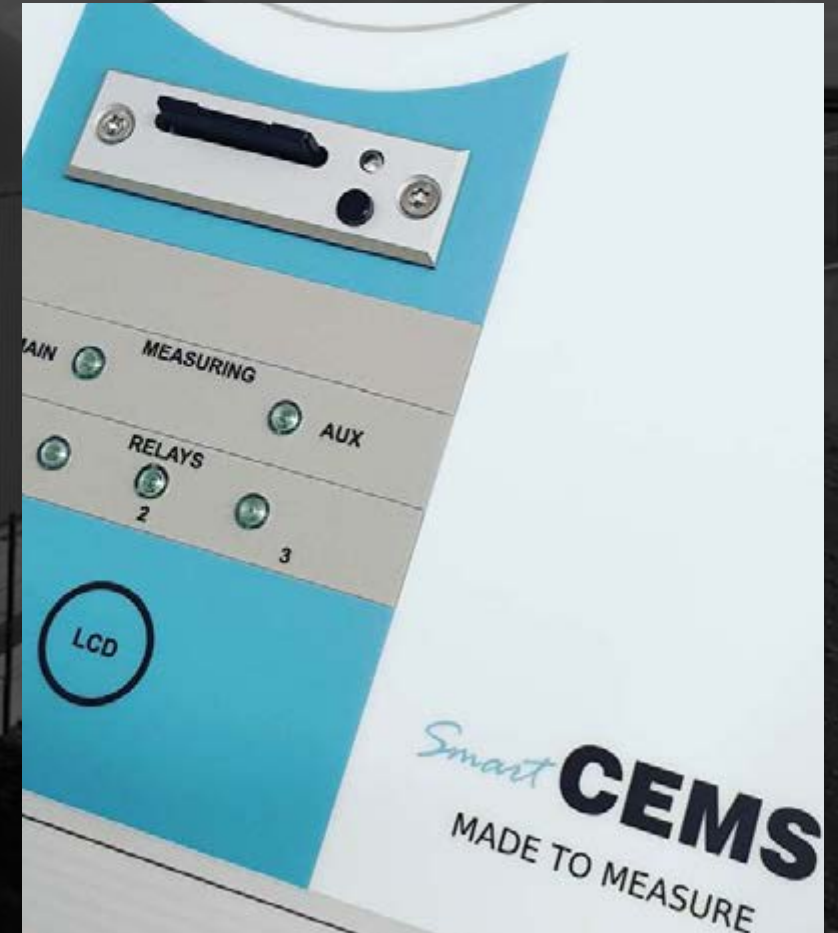


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References

- YARA Pilbara WA Package Boiler and Primary Reformer Two CEMS with DAHS
- VISY Smithfield NSW Biogas Plant Two CEMS
- NYRSTAR Port Pirie SA Acid Plant One CEMS
- ENVIROPACIFIC Barangaroo remediation site Sydney NSW Four CEMS
- PYROCAL Power Station Loganholme QLD Two CEMS
- Gold Coast City Council QLD Two CEMS
- Brisbane Utilities Brisbane QLD Two CEMS
- And more.

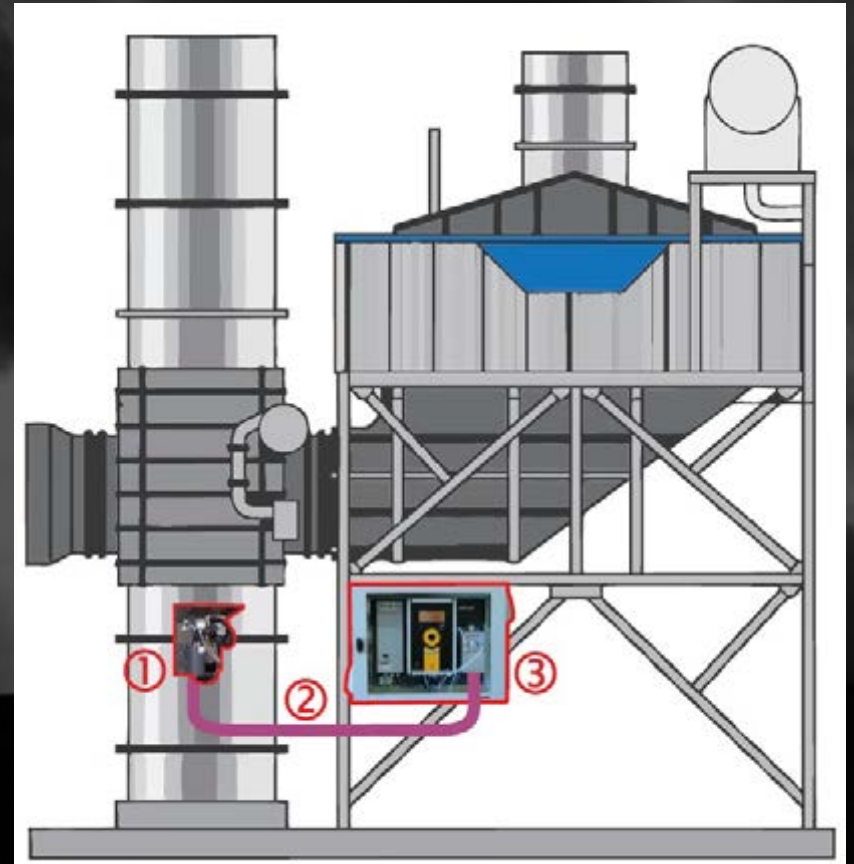


SmartCEMS Configuration

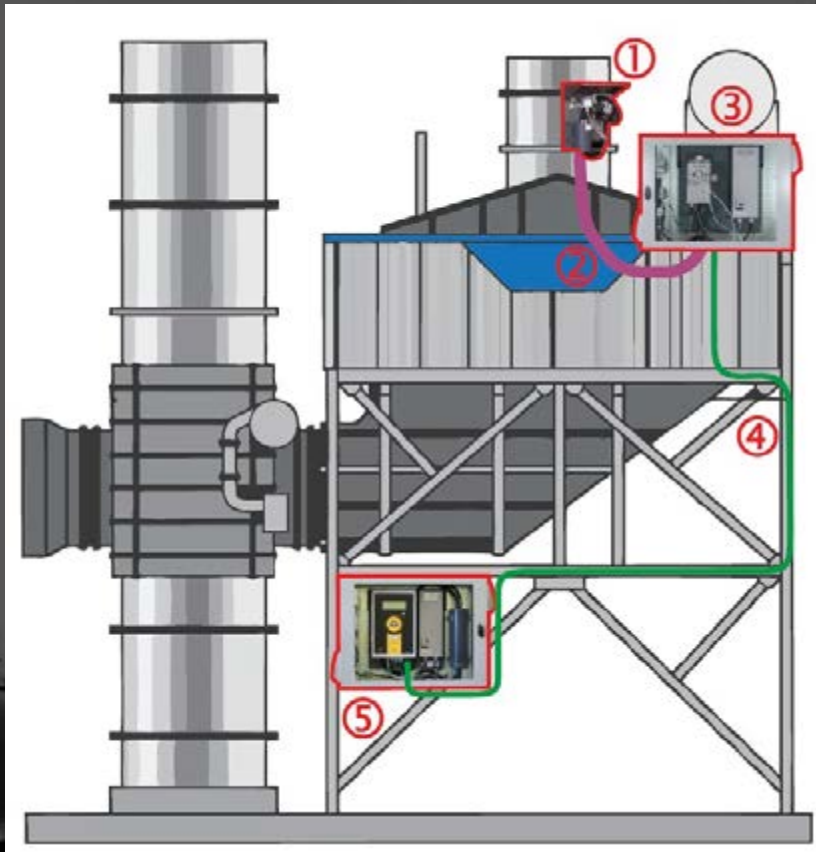


Compact Direct Extractive

1. Stationary gas sampling probe with optional heated filter, insitu filter and backflush
2. Heated sample line (1 to 5m)
3. Mamos Multigas CEM Analyzer with MD3 gas conditioning system with Peltier cooler, peristaltic pump and particulate filter with optional IP55 housing.



SmartCEMS Configuration



Split

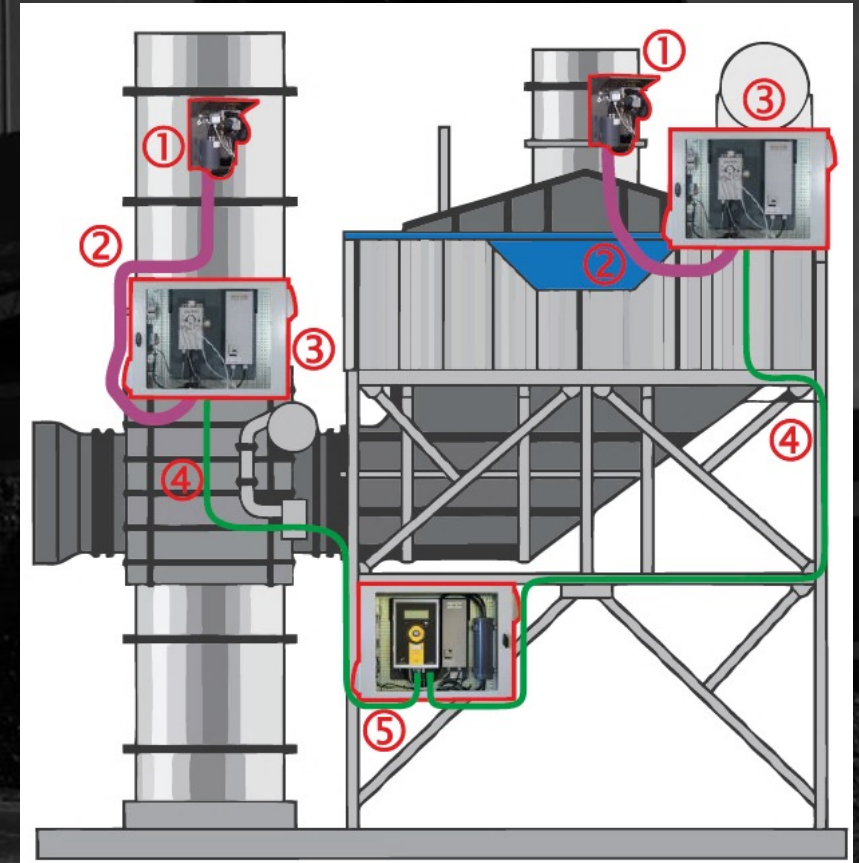
1. Stationary gas sampling probe with optional heated filter, Insitu filter and backflush
2. Heated Sample line short (1 to 3m)
3. MD3 gas conditioning system with Peltier cooler, peristaltic pump and particulate filter installed near the sampling probe assembly and integrated into the AC housing.
4. Non-heated sampling line with gas and electric cables – up to 100M
5. Mamos Multigas CEM Analyzer with optional IP55 housing

SmartCEMS Configuration



Two stream Multiplexer

1. Stationary gas sampling probe with optional heated filter, Insitu filter and backflush
2. Heated Sample line short (1 to 3m)
3. MD3 gas conditioning system with Peltier cooler, peristaltic pump and particulate filter installed near the sampling probe assembly and integrated into the AC housing.
4. Non-heated sampling line with gas and electric cables – up to 100M
5. Mamos Multigas CEM Analyzer with optional IP55 housing

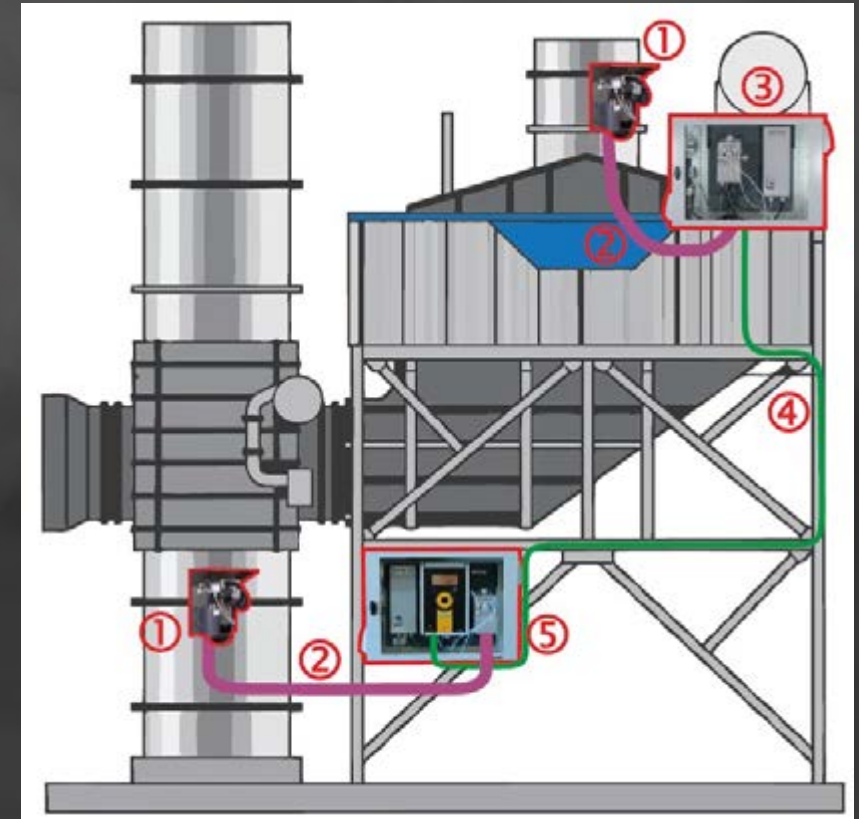


SmartCEMS Configuration



Two stream Multiplexer Twin Split compact with remote dryer

1. Stationary gas sampling probe with optional heated filter, Insitu filter and backflush
2. Heated Sample line short (1 to 3m)
3. MD3 gas conditioning system with Peltier cooler, peristaltic pump and particulate filter installed near the sampling probe assembly and integrated into the AC housing.
4. Non-heated sampling line with gas and electric cables – up to 100M
5. Mamos Multigas CEM Analyzer with optional IP55 housing



SmartCEMS

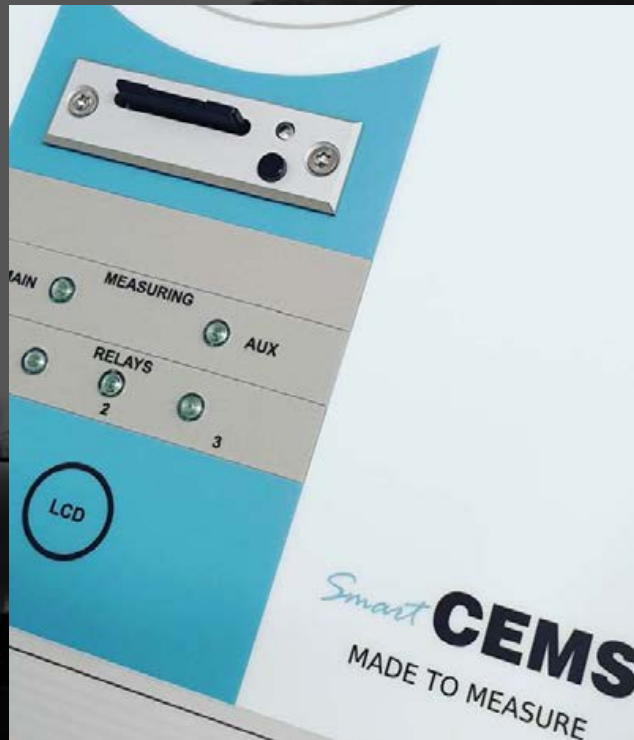


SYSTEM OVERVIEW

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Analytical Performances Lower Detection Limits



Gas	LoD	Unit
NO	1	ppvm
SO2	1	ppvm
NO2	0.5	ppvm
CO	1	ppvm
CO2	0.01	%
O2	0.01	%
VOC (NMHC)	0.5	ppvm
CxHy (CH4)	0.5	ppvm

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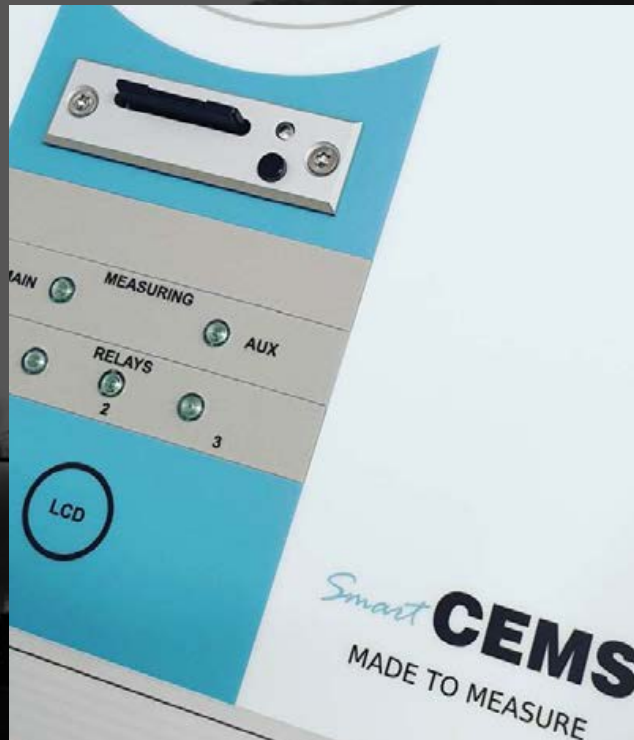
Analytical Performances Measuring Ranges

Gas	Range	Unit
NO	0-2,000	ppvm
SO2	0-5,000	ppvm
NO2	0-500	ppvm
CO	0-2,000	ppvm
CO2	0-25	%
O2	0-25	%
VOC (NMHC)	0-100	ppvm
CxHy (CH4)	0-100	ppvm
Stack gas Temp	-50 to 1000	°C
Diff Pressure	-10 to +40	hPa
Gas velocity	1 to 50	m/s

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Analytical Performances Accuracy and Response Time



Gas	Accuracy	Time T (90)
NO	± 2 ppmv abs	45s
SO2	± 2 ppmv abs	45s
NO2	± 2 ppmv abs	45s
CO	± 0.1% abs	45s
CO2	± 0.1% abs	45s
O2	± 0.1% abs	45s
VOC (NMHC)	± 1 ppmv abs	45s
CxHy (CH4)	± 2 ppmv abs	45s
Stack gas Temp	0.1°C	5s
Diff Pressure	1Pa	5s
Gas velocity	0.1m/s	5s

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Analytical Performances Approved Methods

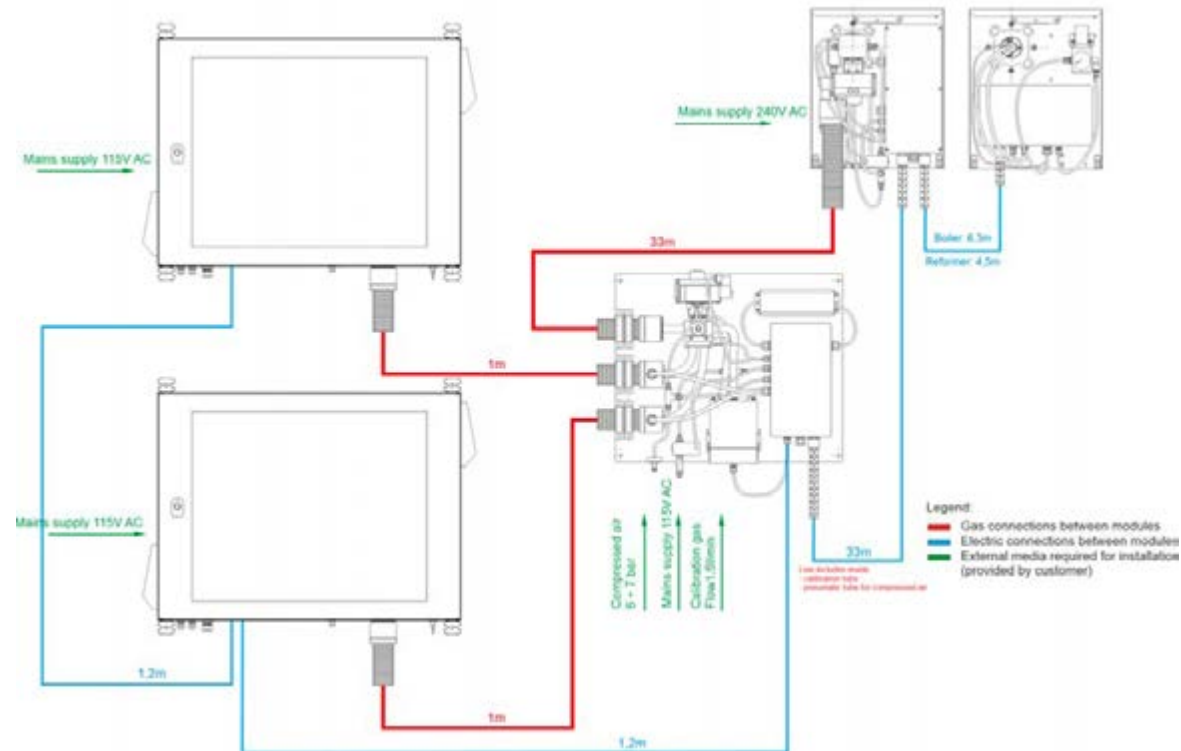
- O₂, CO: ISO 12039, CTM-030
- CO₂: ISO 12039, OTM-13
- NO, NO₂: EPA Method CTM022
- VOC : USEPA Method 21 Photo Ionization Detection (PID)
- Flow, velocity and temperature: USEPA method 2C



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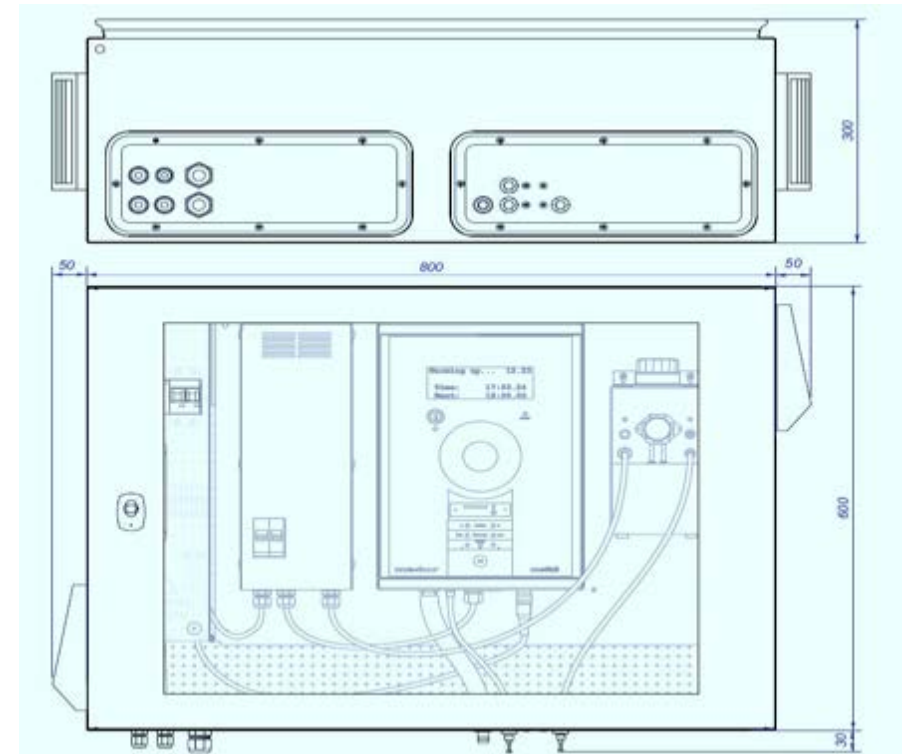
Flow Diagram



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Enclosure



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Main Components

- Sampling Probe (Madur)
- Pitot Tube (Madur)
- Heated Sample Line (Madur)
- CEMS switch panel (Madur)
- Duty and standby analysers (Madur)
- IVIS calibration terminal and switchover panel (a1cbiss)
- DAHS computer and CDAS software suite (a1cbiss)



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Sampling System Sampling Probe

- Insitu Filter (20 microns)
- Light weight sampling probe
- Variable length of sampling tube (up to 3.5 m)
- Calibration solenoid valve for injection as per EN14181
- SS316L wetted components
- Backflush solenoid valve
- Flange mounted (adaptor available)
- Reduced maintenance



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Sampling System Heated Sample Line

- Temperature controlled (150 deg C)
- Up to 50m length
- Prevent loss of targeted compounds (water soluble gases)
- Eliminate the risk of contamination
- Optimal and fast sample transfer



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Sampling System CEMS Switch Panel



HEATED FILTER AND SHORT SAMPLE LINES

- Temp set point: output gas dewpoint about +150 C
- Stability +/- 1 C
- Heating period: 5min
- Max gas flow 110 lph at inlet gas temp. 100 C and RH 100%

CALIBRATION GAS INLET

- For analyser calibration

CONTROLLERS

- PID temp controllers and SSR

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Sampling System Gas Conditioning System

MD3 PELTIER COOLER

- Temp set point: output gas dewpoint about +4°C
- Two inline filters
- Peltier cooler Stability +/- 1°C
- Cooling period: 5min
- Max gas flow 110 lph at inlet gas temp. 100°C and RH 100%

PERISTALTIC PUMP

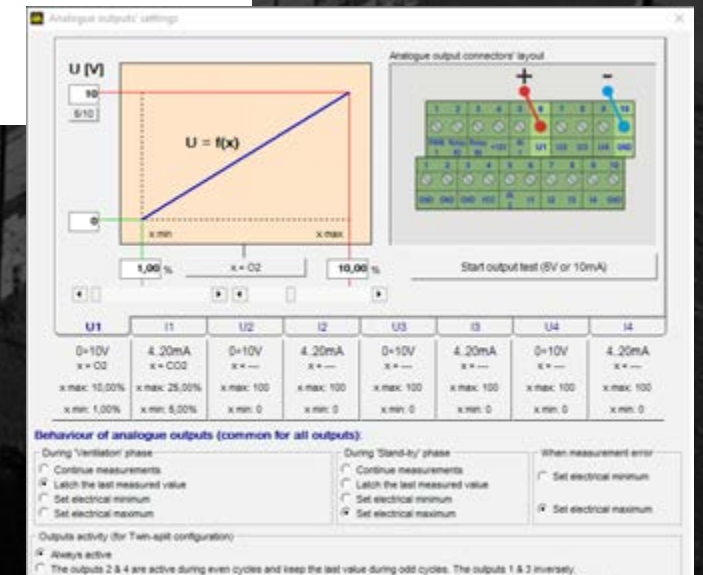
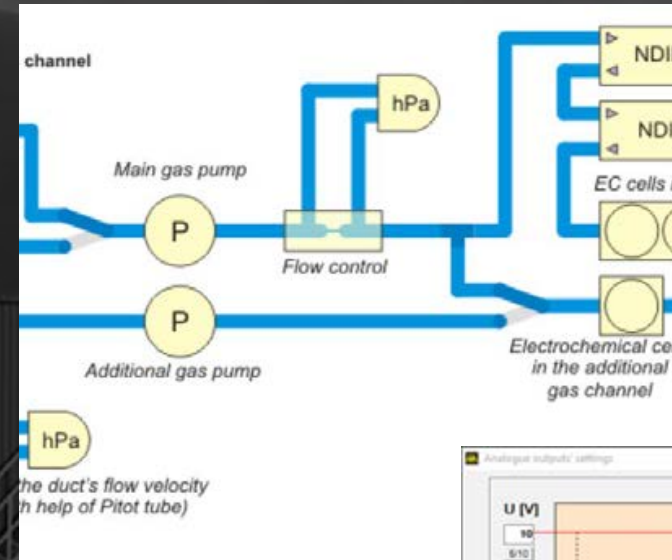
- Capacity 38ml/min

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Multigas Analyser

- Proprietary gas paths and cells
- Safety filter
- PTFE coated Diaphragm 1.5 l/min with automatic flow control
- T: 10°C to 50°C; RH: 5% to 90% (non-condensing)
- Light (10kg) and compact design
- Madur's patented electronics and signal processing
- Mosys configuration, acquisition and trending software
- Field replaceable measuring cells
- Built-in data logger with SD card
- Large range of IOs incl. digitals (0-10 vdc; 4-20mA), analogues



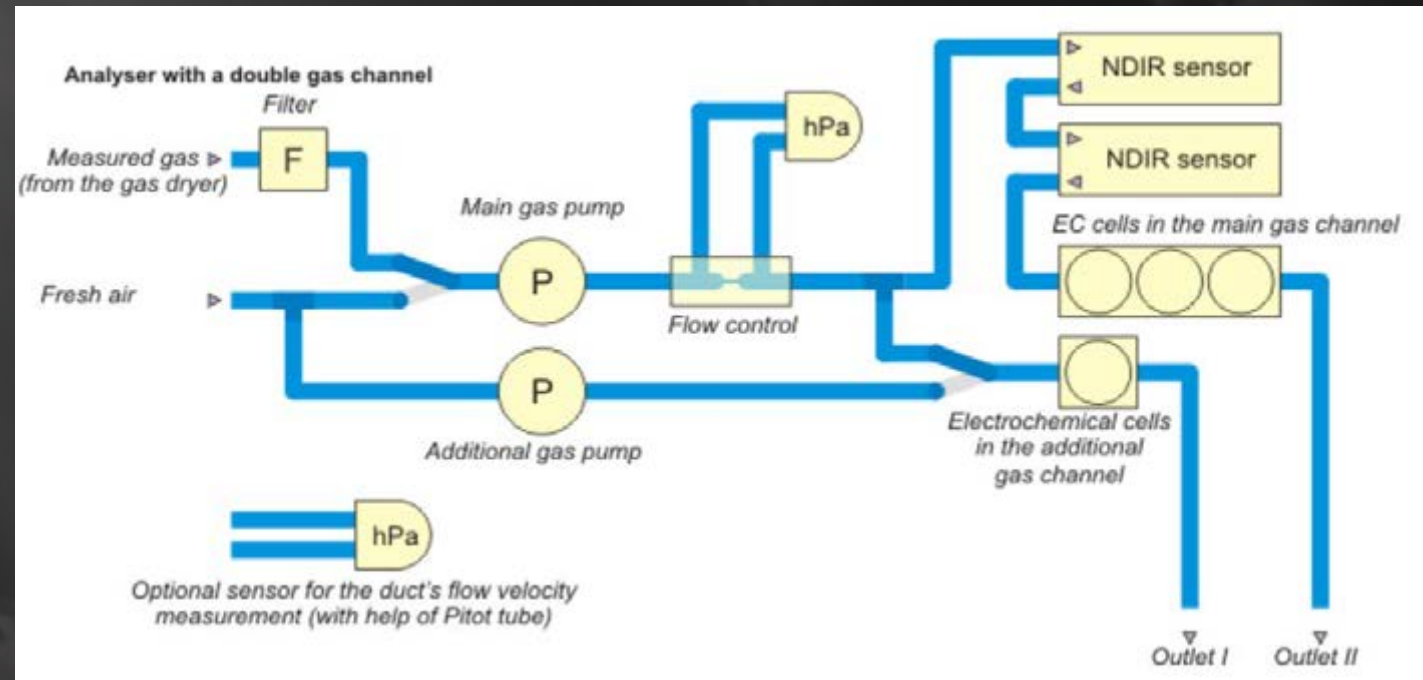
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Mamos

Proprietary gas paths and cells

- Inline filters
- Auxiliary gas path
- Independent monitoring
- Flow control



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Input IN1

Input IN2

☒ No action

☐ Re

☐ Ter

Analyser

MoSys Software

The input does not affect measurement cycle.

- User configurable measuring sequences
- USB or TCP/IP direct connection
- Remote control



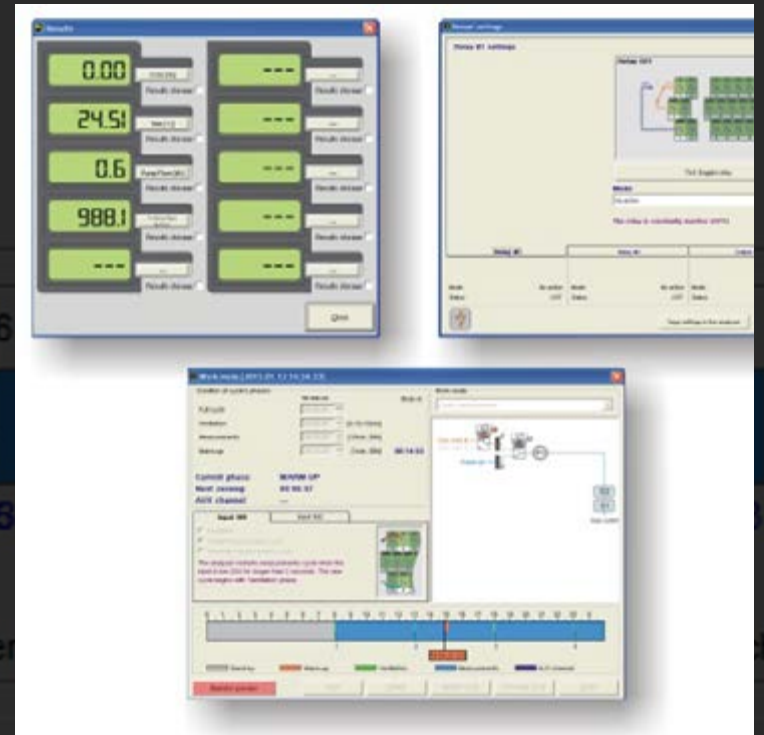
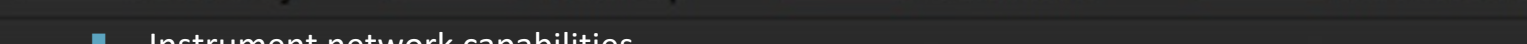
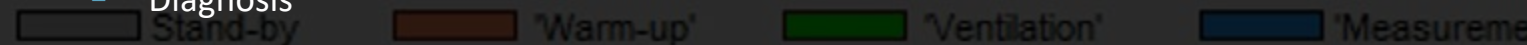
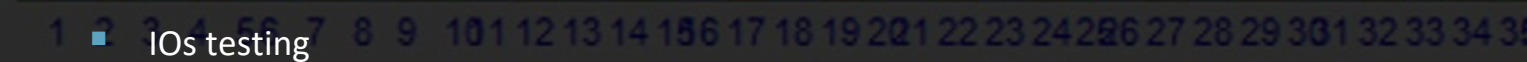
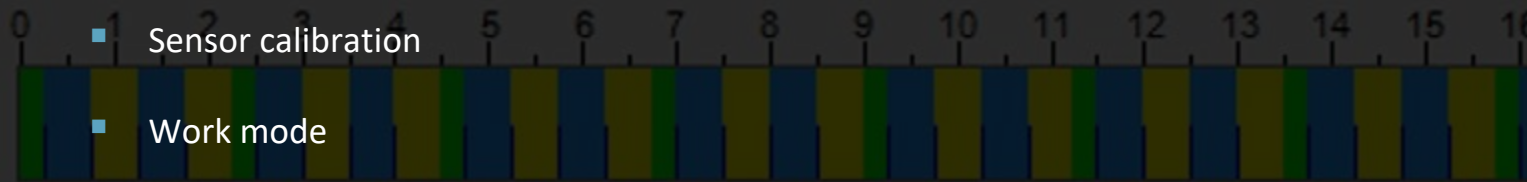
■ Sensor calibration

■ Work mode

■ IOs testing

■ Diagnosis

■ Instrument network capabilities



Preview

Save

Default

Restart cycle

Terminate cycle

Close

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Analytical Performances

Measuring Principle

CO₂, CXHY: NDIR NON-DISPERSIVE INFRA-RED

- Industrial-type construction – single path beam
- Possibility to measure large concentrations up to 100% vol
- Sensors are delivered pre-calibrated – easy to swap at site
- Do not wear out in time, cannot be poisoned

VOC: PID PHOTO IONIZATION DETECTION

O₂ PARTIAL PRESSURE

- Long-life oxygen sensor (up to 7 years in air)
- Range 0÷100% vol
- Suitable for stationary analysers
- Do not wear out in time, cannot be poisoned

H₂S, NO, NO₂, CO: EC ELECTROCHEMICAL

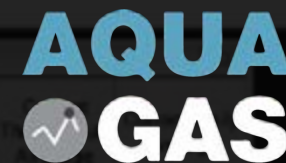
- Easy to use and to calibrate
- Low (ppm) and very low ranges possible
- Cheap (er) in comparison to other methods

PRESSURE: SILICON PIEZORESISTIVE

TEMPERATURE: K-TYPE THERMOCOUPLE



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CDAS Data Acquisition and Handling System

ACQUISITION AND DATA PROCESSING

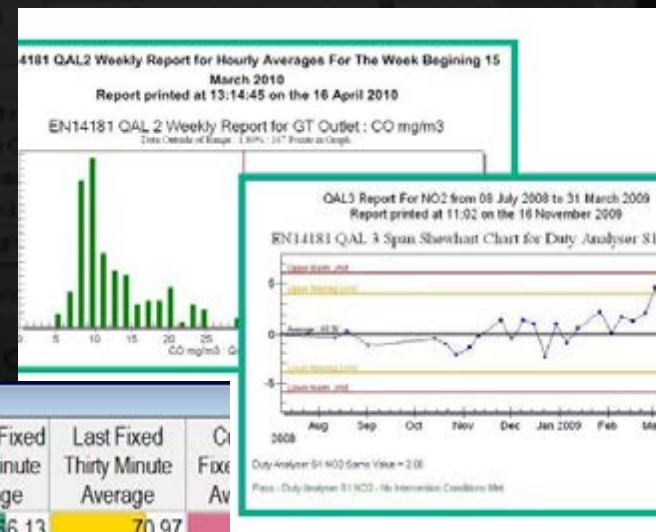
- Raw data (Instrument value)
- Calibrated data
- Corrected data (3....11% O₂ and dry gas compensation)
- National Greenhouse and Energy Reporting NGER
- Adjusted data (reportable values)

TRENDING AND SUPERVISION

- Realtime trending
- Alarms display
- View meter and gauge

BIOGAS ANALYSER CONTROL AND DATA HANDLING

- Automatic redundancy
- Automatic calibration
- Data validation (measures and calibrations)

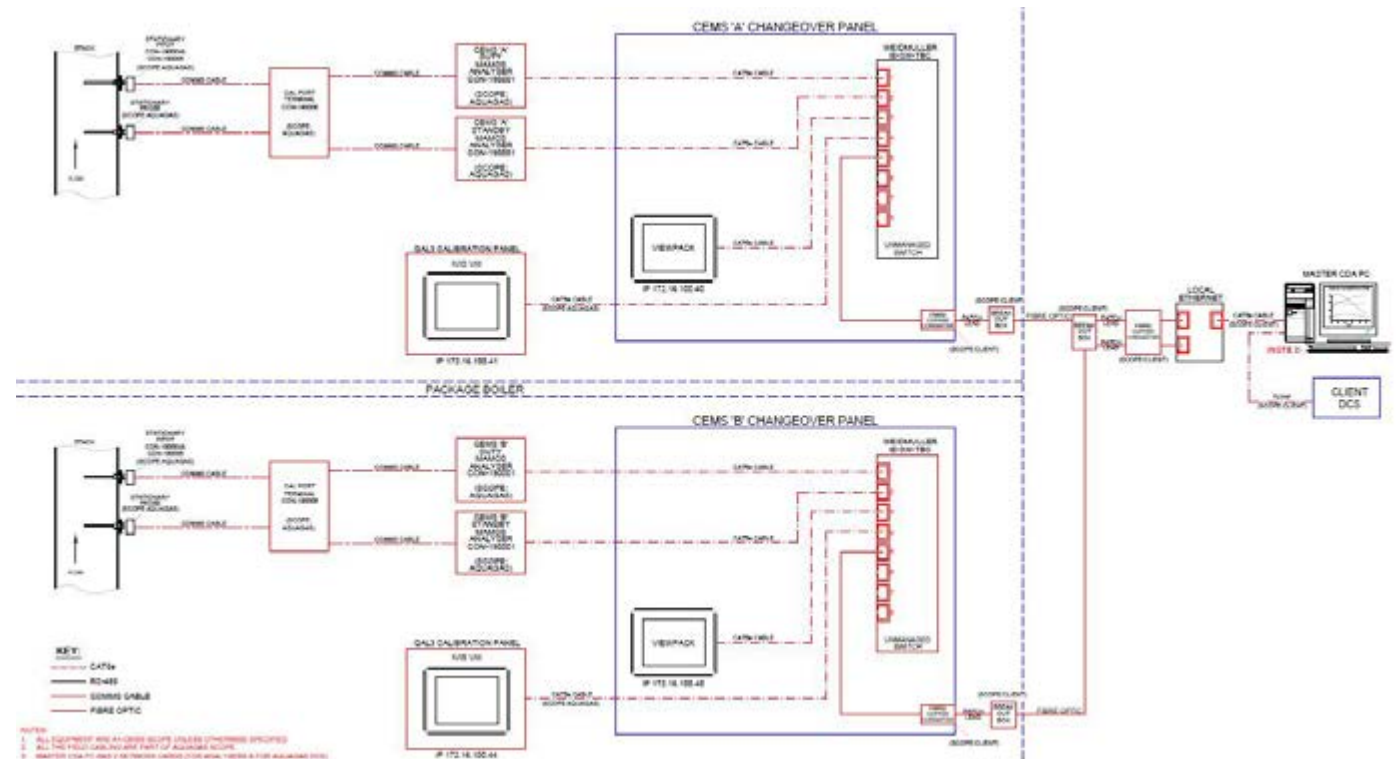


Calibrated Data	Corrected Data	Adjusted Data	One Minute Average	Current Fixed Thirty Minute Average	Last Fixed Thirty Minute Average	Fixed Average
43.40	62.76	62.76	60.19	66.13	70.97	
3.25	4.70	4.70	4.51	4.90	4.90	
69.65	100.73	100.73	96.60	106.08	113.48	
1.97	2.85	2.85	2.69	2.91	3.29	
0.81	1.16	1.16	1.14	1.37	1.09	
136.70	136.70	136.70	138.88	143.36	136.83	
11.98	11.98	11.98	11.34	12.16	11.66	
236.60	236.60	236.60	240.12	245.13	222.89	
1027.00	1027.00	1027.00	982.08	996.39	963.94	
275.00	275.00	275.00	289.15	279.28	221.25	
4.10	7.47	7.47	4.48	6.21	4.48	

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Communications



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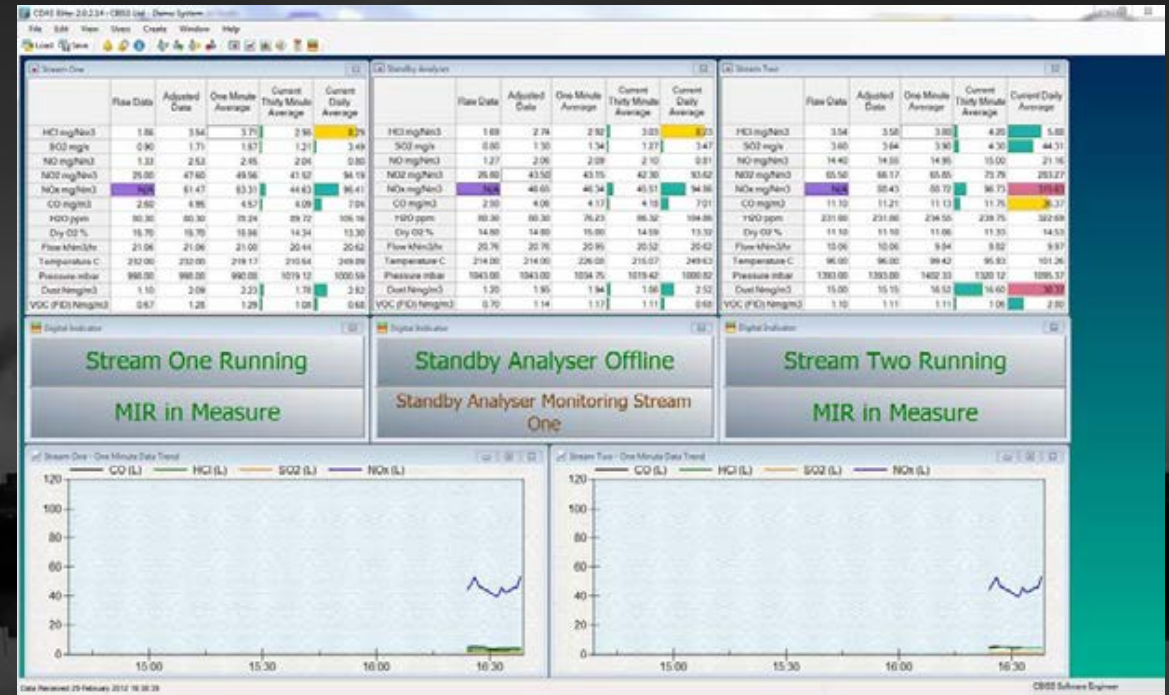
CDAS Data Acquisition and Handling System

COMPLIANCE

- CGA
- EN14181 QAL3
- National Greenhouse and Energy Reporting
- WID, LCPD, IPPC
- Calibration of instrument to SRM instrument

CERTIFICATIONS

- MCERTS accredited (parts A, B, C1 & C2) real time data acquisition and reporting software



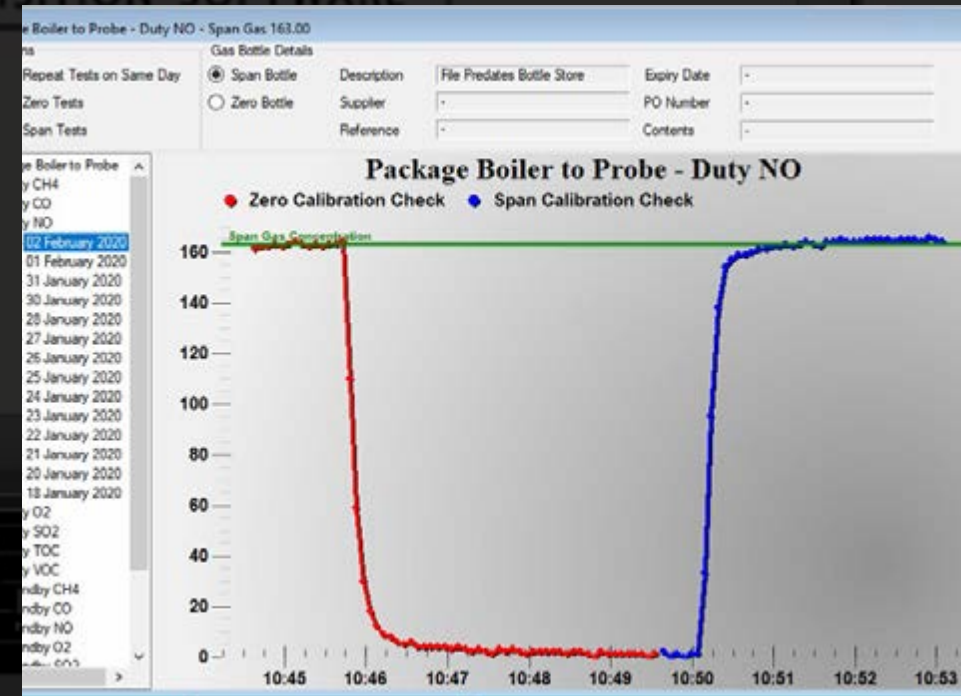
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CDAS Data Acquisition and Handling System

CALIBRATIONS

- CGA
- Calibration of instrument to SRM instrument
- Daily, weekly, monthly
- Automatic reporting
- Probe and analyser mode
- Local and remote control
- IVIS touchscreen interface



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Month	Maximum Half Hourly Value	Time of Maximum Half Hour	Exceedances in Month to Date	Valid Half Hours in Month	Exceedances in Year to Date	Valid Half Hours in Year to Date	Percentage Exceedances in Year to Date
January	N/A	N/A	0	0	0	0	0.00
February	N/A	N/A	0	0	0	0	0.00
March	N/A	N/A	0	0	0	0	0.00
April	N/A	N/A	0	0	0	0	0.00
May	N/A	N/A	0	0	0	0	0.00
June	N/A	N/A	0	0	0	0	0.00
July	N/A	N/A	0	0	0	0	0.00
August	N/A	N/A	0	0	0	0	0.00
September	N/A	N/A	0	0	0	0	0.00
October	N/A	N/A	0	0	0	0	0.00
November	N/A	05 November 2009 07:30	21	239	21	239	8.79
December	260.33	11 December 2009 00:00	66	354	87	593	14.67

CDAS REPORT
Emissions logging | Logged Parameters

RAW DATA (INSTRUMENT VALUE)

- NO, NO2, CO, CxHy, VOC in ppm and mg/Nm3
- O2, CO2, in ppm and mg/Nm3
- Stack Differential Pressure Pa
- Stack Static Pressure Pa
- Stack Temperature °C
- CEMS Enclosure temperature °C

INSTRUMENT STATUS

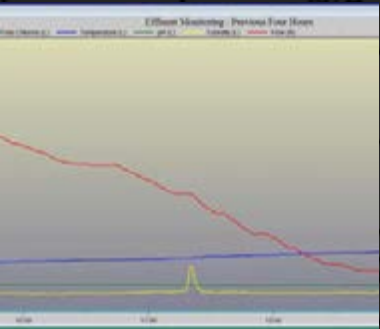
- Measuring / Standby / Alarm / Calibration

PLANT OPERATING CONDITIONS

- Plant in operation
- Kiln Temp
- O2 Kiln

EXTERNAL COMMANDS

- CEMS in Automatic Mode
- CEMS in Manual mode
- Standby Analyser measuring



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CDAS REPORT Emissions reporting | Reported Data

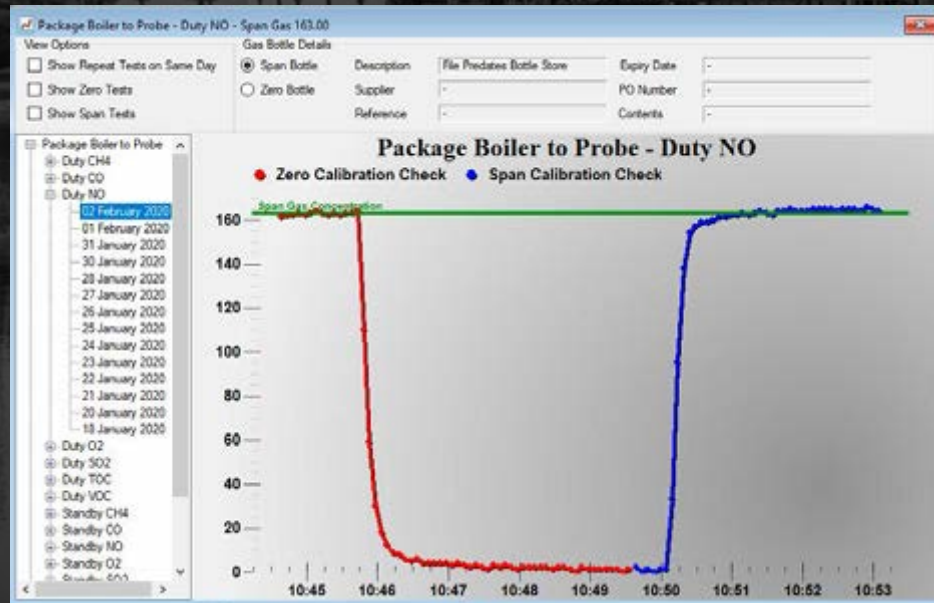
- NOx expressed as equivalent NO2 in ppmv at 11% O2
- CO expressed in ppmv at 11% O2
- Total VOCs expressed in ppmv at 11% O2
- Total NMHC expressed in ppmv at 11% O2
- Volumetric flow
- Stack gas temperature in degree Celsius
- Hourly, Daily, Weekly, Monthly and Yearly mass Emissions rates for SOx, CO, NOx and Total VOCs



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CALIBRATIONS



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Month	Maximum Half Hourly Value	Time of maximum Half Hour	Exceedances in Month to Date	Valid Half Hours in Month	Exceedances in Year to Date	Valid Half Hours in Year to Date	Percentage Exceedances in Year to Date
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February	N/A	N/A	0	0	0	0	0.00
March	N/A	N/A	0	0	0	0	0.00
April	N/A	N/A	0	0	0	0	0.00
May	N/A	N/A	0	0	0	0	0.00
June	N/A	N/A	0	0	0	0	0.00
July	N/A	N/A	0	0	0	0	0.00
August	N/A	N/A	0	0	0	0	0.00
September	N/A	N/A	0	0	0	0	0.00
October	N/A	N/A	0	0	0	0	0.00
November	245.32	05 November 2009 07:30	21	239	21	239	8.79
December	260.33	11 December 2009 00:00	66	354	87	593	14.67

Housing

SHELTER

- CEMS Shelter Zone C/D
- Form 15 wind rating C3 for
- Cyclonic Zone D Category 2
- AC, Gland plate, Instrument mounting
- System integration, Wiring and tubing
- Desk, cupboard and workbench
- Lighting and power plugs
- 115 and 240 VAC Junction boxes
- Ambient temperature sensor

IP56 ENCLOSURE

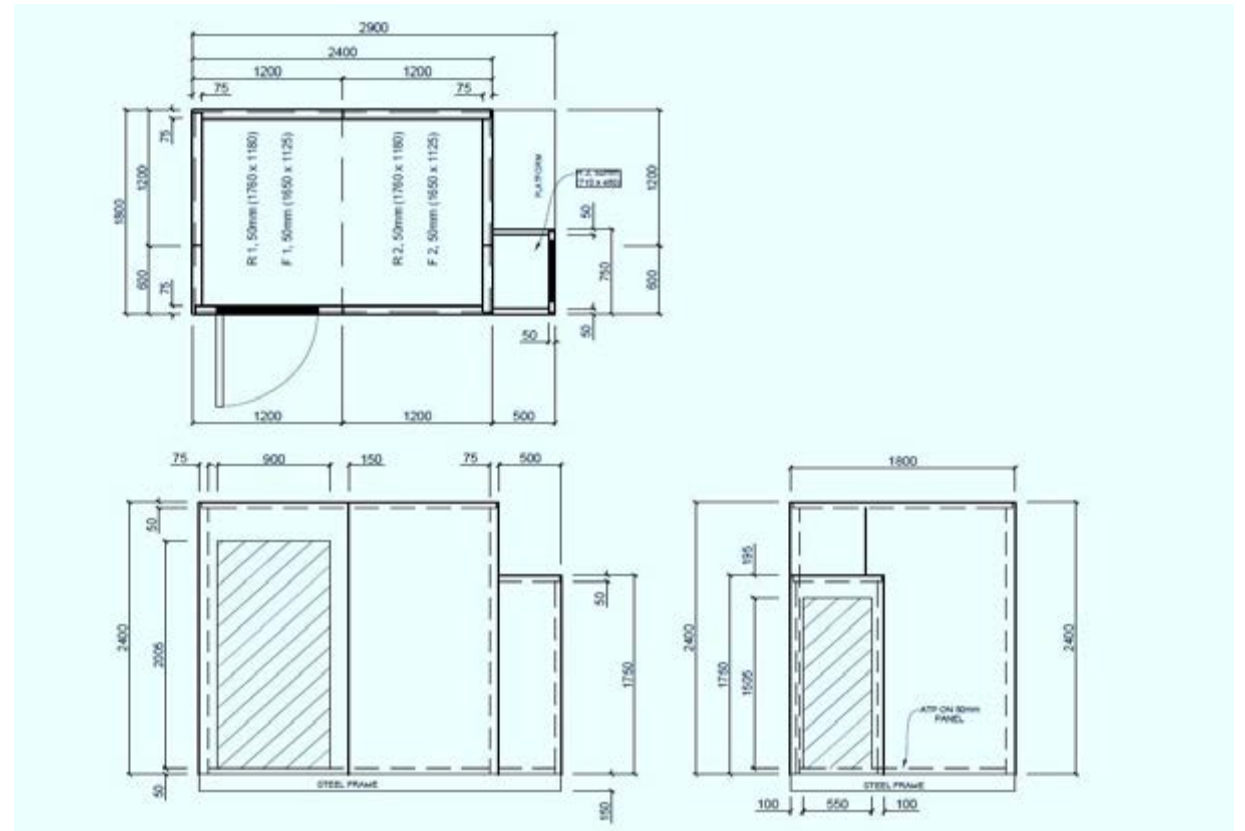
- Fan
- Enclosed wiring and tubing
- Additional protection



SmartCEMS Biogas



Shelter



Technical Support



- Supply of consumables and critical spares
- Remote diagnosis
- Installation, commissioning, maintenance, training
- Dedicated Technician factory trained by MADUR and A1CBISS assigned for ongoing support
- 4 visits a year to perform preventive maintenance tasks
- Maintenance visits scheduled at a time mutually convenient to both parties
- Free email and Phone support 24h/7d
- Site attendance within 72 hrs
- 24 months consumables delivered with the system and kept at site
- Critical Spares (field replaceable components) delivered with the system and kept at site
- 1 set of spare MAMOS measuring cells available off the shelves at AquaGas (for all gases)
- 1 set of MAMOS electronic board available off the shelves at AquaGas

Services and Product Enquiries



Local: 1300 850 862

International: +61 (0)755 768 295

info@aquagas.com.au

AquaGs Pty Ltd

Head Office

35 Jarrahdale Drive | Elanora 4221 QLD | AUSTRALIA