

PRODUCT CONFORMITY CERTIFICATE

This is to certify that the

AtmosFIR

Manufactured by:

Protea Ltd

10 Prosperity Court, Midpoint 18
Middlewich, Cheshire
CW10 0GD

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 (CEMS), Version 4 dated July 2018
EN15267-1:2009, EN15267-2:2009 & EN15267-3:2007,
& QAL 1 as defined in EN 14181: 2014**

Certification Ranges :

NO	0 to 105 mg/m ³	0 to 200 mg/m ³
NO ₂	0 to 80 mg/m ³	0 to 200 mg/m ³
N ₂ O	0 to 50 mg/m ³	
SO ₂	0 to 75 mg/m ³	0 to 300 mg/m ³
CO	0 to 75 mg/m ³	0 to 240 mg/m ³
HCl	0 to 15 mg/m ³	
NH ₃	0 to 15 mg/m ³	
CH ₄	0 to 15 mg/m ³	
CO ₂	0 to 20% vol.	
O ₂	0 to 21% vol.	
H ₂ O	0 to 30% vol.	

Project No. : 70197049
Certificate No : Sira MC190346/00
Initial Certification : 24 April 2019
This Certificate issued : 24 April 2019
Renewal Date : 23 April 2024

Emily Alexander
Environmental Project Engineer

MCERTS is operated on behalf of the Environment Agency by

Sira Certification Service

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Approved Site Application

Any potential user should ensure, in consultation with the manufacturer, that the monitoring system is suitable for the intended application. For general guidance on monitoring techniques refer to the Environment Agency Monitoring Technical Guidance Notes available at www.mcerts.net

On the basis of the assessment and the ranges required for compliance with EU Directives this instrument is considered suitable for use on waste incineration and large coal-fired combustion plant applications. This CEM has been proven suitable for its measuring task (parameter and composition of the flue gas) by use of the QAL 1 procedure specified in EN14181, for IED Chapter III and IED Chapter IV applications for the ranges specified. The lowest certified range for each determinand shall not be more than 1.5X the daily average emission limit value (ELV) for IED Chapter IV applications, and not more than 2.5X the ELV for IED Chapter III and other types of application.

The field trial was conducted on an Energy from Waste incinerator for 4 months.

Basis of Certification

This certification is based on the following Test Report(s) and on Sira's assessment and ongoing surveillance of the product and the manufacturing process:

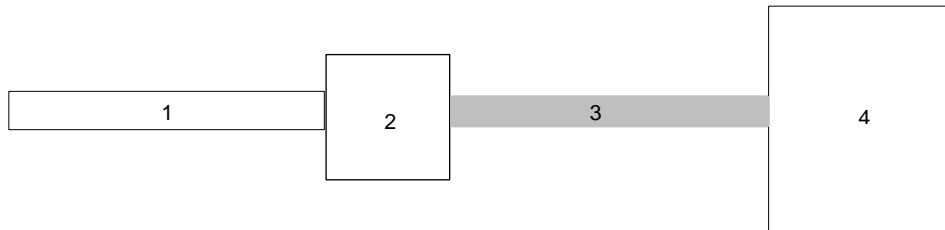
- Test Report Reference 2016110056 by National Physics Laboratory, dated Tuesday 19th March 2019
- Test Report Reference 102153/QE2100/PROTEA by National Physics Laboratory, dated Tuesday 19th March 2019

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Product Certified

The atmosFIR measuring system consists of the following parts:



1. Sample Probe	2. Heated Filter	3. Heated Sample Line	4. Analyser
Model: Tube with pre-filter if required	Model: JES300, PTFE filter heated to 180°C, with calibration port and with blow-back option	Model: PTFE/PFA core, heated to 180°C with integrated span line(s) and probe power/alarm	Model: atmosFIR model AFS-B2 FTIR multigas analyser, with integrated sample filtration and pre-heater Zirconia O2 sensor

Allowable variations could include:

- A different brand or model of sampling system of the same type, provided that there is evidence the alternative system works with similar types of CEM.
- Additional manifolds and heated valves used to allow more than one analyser to share a sampling system.

This certificate applies to all instruments fitted with PAS-Pro software version v2.5.2 (serial number 1608) onwards.

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Certified Performance

The instrument was evaluated for use under the following conditions:

Ambient Temperature Range: +5°C to +40°C
 Instrument IP rating: IP65

Note: If the instrument is supplied with an enclosure, then the ambient temperature shall be monitored inside the enclosure to ensure that it stays within the above ambient temperature range.

Results are expressed as error % of certification range, unless otherwise stated.

Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Response time						
NO (0 to 105 mg/m ³)					120s	<200s
NO (0 to 200 mg/m ³)					118s	<200s
NO ₂ (0 to 80 mg/m ³)					160s	<200s
NO ₂ (0 to 50 mg/m ³)					157s	<200s
N ₂ O (0 to 50 mg/m ³)					194s	<200s
SO ₂ (0 to 75 mg/m ³)					108s	<200s
SO ₂ (0 to 300 mg/m ³)					104s	<200s
CO (0 to 75 mg/m ³)					193s	<200s
CO (0 to 300 mg/m ³)					93s	<200s
HCl (0 to 15 mg/m ³)					220s	<400s
NH ₃ (0 to 15 mg/m ³)					298s	<400s
CH ₄ (0 to 15 mg/m ³)					192s	<200s
CO ₂ (0 to 20% vol)					121s	<200s
O ₂ (0 to 21% vol)					198s	<200s
H ₂ O (0 to 30% vol)					166s	<200s

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Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Repeatability standard deviation at zero point						
NO (0 to 105 mg/m ³)	0.22					<2.0%
NO ₂ (0 to 80 mg/m ³)	0.41					<2.0%
N ₂ O (0 to 50 mg/m ³)	0.44					<2.0%
SO ₂ (0 to 75 mg/m ³)	0.47					<2.0%
CO (0 to 75 mg/m ³)	0.23					<2.0%
HCl (0 to 15 mg/m ³)		0.97				<2.0%
NH ₃ (0 to 15 mg/m ³)		0.53				<2.0%
CH ₄ (0 to 15 mg/m ³)	0.23					<2.0%
CO ₂ (0 to 20% vol)	0.07					<2.0%
O ₂ (0 to 21% vol)	0.01					<0.2%
H ₂ O (0 to 30% vol)	0.42					<2.0%
Repeatability standard deviation at reference point						
NO (0 to 105 mg/m ³)	0.27					<2.0%
NO ₂ (0 to 80 mg/m ³)	0.46					<2.0%
N ₂ O (0 to 50 mg/m ³)		0.56				<2.0%
SO ₂ (0 to 75 mg/m ³)	0.38					<2.0%
CO (0 to 75 mg/m ³)	0.29					<2.0%
HCl (0 to 15 mg/m ³)			1.17			<2.0%
NH ₃ (0 to 15 mg/m ³)			1.15			<2.0%
CH ₄ (0 to 15 mg/m ³)	0.32					<2.0%
CO ₂ (0 to 20% vol)	0.3					<2.0%
O ₂ (0 to 21% vol)	0.01					<0.2%
H ₂ O (0 to 30% vol)		0.77				<2.0%

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Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Lack-of-fit						<2.0%
NO (0 to 105 mg/m ³)			1.00			<2.0%
NO (0 to 200 mg/m ³)		0.94				<2.0%
NO ₂ (0 to 80 mg/m ³)			1.59			<2.0%
NO ₂ (0 to 50 mg/m ³)		0.94				<2.0%
N ₂ O (0 to 50 mg/m ³)		0.96				<2.0%
SO ₂ (0 to 75 mg/m ³)		0.87				<2.0%
SO ₂ (0 to 300 mg/m ³)		0.99				<2.0%
CO (0 to 75 mg/m ³)		0.62				<2.0%
CO (0 to 300 mg/m ³)		0.98				<2.0%
HCl (0 to 15 mg/m ³)			1.74			<2.0%
NH ₃ (0 to 15 mg/m ³)			1.44			<2.0%
CH ₄ (0 to 15 mg/m ³)		0.93				<2.0%
CO ₂ (0 to 20% vol)			1.56			<2.0%
O ₂ (0 to 21% vol)	0.14					<0.2%
H ₂ O (0 to 30% vol)			1.97			<2.0%
Influence of ambient temperature zero point (+5°C to +40°C)						
NO (0 to 105 mg/m ³)		0.6				<5.0%
NO ₂ (0 to 80 mg/m ³)			1.47			<5.0%
N ₂ O (0 to 50 mg/m ³)		0.54				<5.0%
SO ₂ (0 to 75 mg/m ³)		0.84				<5.0%
CO (0 to 75 mg/m ³)		0.54				<5.0%
HCl (0 to 15 mg/m ³)			1.61			<5.0%
NH ₃ (0 to 15 mg/m ³)		0.69				<5.0%
CH ₄ (0 to 15 mg/m ³)	-0.28					<5.0%
CO ₂ (0 to 20% vol)	-0.4					<5.0%
O ₂ (0 to 21% vol)	0.17					<0.5%
H ₂ O (0 to 30% vol)				2.41		<5.0%

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	<0.5	<1	<2	<5		
Influence of ambient temperature reference point (+5°C to +40°C)						
NO (0 to 105 mg/m ³)		-0.91				<5.0%
NO ₂ (0 to 80 mg/m ³)		-1.25				<5.0%
N ₂ O (0 to 50 mg/m ³)		1.56				<5.0%
SO ₂ (0 to 75 mg/m ³)	-0.38					<5.0%
CO (0 to 75 mg/m ³)		-0.94				<5.0%
HCl (0 to 15 mg/m ³)		1.44				<5.0%
NH ₃ (0 to 15 mg/m ³)		-1.49				<5.0%
CH ₄ (0 to 15 mg/m ³)	0.27					<5.0%
CO ₂ (0 to 20% vol)		0.71				<5.0%
O ₂ (0 to 21% vol)	-0.25					<0.5%
H ₂ O (0 to 30% vol)			2.27			<5.0%
Influence of sample gas pressure						
NO (0 to 105 mg/m ³)	0.43					<2.0%
NO ₂ (0 to 80 mg/m ³)		0.8				<2.0%
N ₂ O (0 to 50 mg/m ³)		0.79				<2.0%
SO ₂ (0 to 75 mg/m ³)		0.82				<2.0%
CO (0 to 75 mg/m ³)	0.44					<2.0%
HCl (0 to 15 mg/m ³)		0.73				<2.0%
NH ₃ (0 to 15 mg/m ³)			1.23			<2.0%
CH ₄ (0 to 15 mg/m ³)	0.44					<2.0%
CO ₂ (0 to 20% vol)	0.32					<2.0%
O ₂ (0 to 21% vol)	0.12					<0.2%
H ₂ O (0 to 30% vol)			1.85			<2.0%

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Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Influence of voltage variations (zero) (195.5VAC to 253VAC)						
NO (0 to 105 mg/m ³)	0.17					<2.0%
NO ₂ (0 to 80 mg/m ³)	0.39					<2.0%
N ₂ O (0 to 50 mg/m ³)		0.76				<2.0%
SO ₂ (0 to 75 mg/m ³)	0.34					<2.0%
CO (0 to 75 mg/m ³)	0.17					<2.0%
HCl (0 to 15 mg/m ³)		-0.98				<2.0%
NH ₃ (0 to 15 mg/m ³)		0.77				<2.0%
CH ₄ (0 to 15 mg/m ³)	-0.25					<2.0%
CO ₂ (0 to 20% vol)	0.08					<2.0%
O ₂ (0 to 21% vol)	0.05					<0.2%
H ₂ O (0 to 30% vol)	-0.28					<2.0%
Influence of voltage variations (span) (195.5VAC to 253VAC)						
NO (0 to 105 mg/m ³)		0.64				<2.0%
NO ₂ (0 to 80 mg/m ³)		0.95				<2.0%
N ₂ O (0 to 50 mg/m ³)		-0.94				<2.0%
SO ₂ (0 to 75 mg/m ³)	0.38					<2.0%
CO (0 to 75 mg/m ³)	0.44					<2.0%
HCl (0 to 15 mg/m ³)		-0.98				<2.0%
NH ₃ (0 to 15 mg/m ³)		-0.76				<2.0%
CH ₄ (0 to 15 mg/m ³)		-0.77				<2.0%
CO ₂ (0 to 20% vol)	0.09					<2.0%
O ₂ (0 to 21% vol)	0.03					<0.2%
H ₂ O (0 to 30% vol)		-0.95				<2.0%

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Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Cross-sensitivity at zero with interferents: O ₂ , H ₂ O, CO, CO ₂ , CH ₄ , N ₂ O, NO, NO ₂ , NH ₃ , SO ₂ , HCl						
NO (0 to 105 mg/m ³)			1.0			<4.0%
NO ₂ (0 to 80 mg/m ³)		-0.65				<4.0%
N ₂ O (0 to 50 mg/m ³)				3.68		<4.0%
SO ₂ (0 to 75 mg/m ³)				-3.0		<4.0%
CO (0 to 75 mg/m ³)			0.77			<4.0%
HCl (0 to 15 mg/m ³)			1.03			<4.0%
NH ₃ (0 to 15 mg/m ³)				2.67		<4.0%
CH ₄ (0 to 15 mg/m ³)				2.2		<4.0%
CO ₂ (0 to 20% vol)		0.73				<4.0%
O ₂ (0 to 21% vol)	0.13					<0.40%
H ₂ O (0 to 30% vol)		0.65				<4.0%
Cross-sensitivity at reference with interferents: O ₂ , H ₂ O, CO, CO ₂ , CH ₄ , N ₂ O, NO, NO ₂ , NH ₃ , SO ₂ , HCl						
NO (0 to 105 mg/m ³)			1.25			<4.0%
NO ₂ (0 to 80 mg/m ³)				2.31		<4.0%
N ₂ O (0 to 50 mg/m ³)				-2.77		<4.0%
SO ₂ (0 to 75 mg/m ³)				-3.22		<4.0%
CO (0 to 75 mg/m ³)				-2.52		<4.0%
HCl (0 to 15 mg/m ³)			1.35			<4.0%
NH ₃ (0 to 15 mg/m ³)				-3.94		<4.0%
CH ₄ (0 to 15 mg/m ³)				2.45		<4.0%
CO ₂ (0 to 20% vol)			-1.58			<4.0%
O ₂ (0 to 21% vol)	-0.25					<0.40%
H ₂ O (0 to 30% vol)				2.05		<4.0%

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Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Measurement uncertainty					Guidance - at least 25% below max permissible uncertainty	
NO (for an ELV of 200 mg/m ³)				2.07		<15% (20%)
NO ₂ (for an ELV of 200 mg/m ³)			1.95			<15% (20%)
N ₂ O				4.14		<15% (20%)
SO ₂ (for an ELV of 50 mg/m ³)					8.43	<15% (20%)
CO (for an ELV of 50 mg/m ³)				4.89		<7.5% (10%)
HCl (for an ELV of 10 mg/m ³)					6.05	<30% (40%)
NH ₃				4.49		<30% (40%)
CH ₄				3.41		<22.5% (30%)
CO ₂				3.54		<7.5% (10%)
O ₂			1.52			<7.5% (10%)
H ₂ O					5.29	<7.5% (10%)
Calibration function (field)					Note 1*	
NO (0 to 105 mg/m ³)		0.9				>0.90
NO ₂ (0 to 80 mg/m ³)*	0.02					>0.90
N ₂ O (0 to 50 mg/m ³)*		0.67				>0.90
SO ₂ (0 to 75 mg/m ³)*	0.03					>0.90
CO (0 to 75 mg/m ³)*		0.84				>0.90
HCl (0 to 15 mg/m ³)*	0.22					>0.90
NH ₃ (0 to 15 mg/m ³)*	0.001					>0.90
CH ₄ (0 to 15 mg/m ³)*	0.01					>0.90
CO ₂ (0 to 20% vol)		0.9				>0.90
O ₂ (0 to 21% vol)		0.95				>0.90
H ₂ O (0 to 30% vol)*	0.24					>0.90

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Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Response time (field)						
NO (0 to 105 mg/m ³)					75s	<200s
NO (0 to 200 mg/m ³)					85s	<200s
NO ₂ (0 to 80 mg/m ³)					140s	<200s
NO ₂ (0 to 50 mg/m ³)					140s	<200s
N ₂ O (0 to 50 mg/m ³)					80s	<200s
SO ₂ (0 to 75 mg/m ³)					135s	<200s
SO ₂ (0 to 300 mg/m ³)					150s	<200s
CO (0 to 75 mg/m ³)					85s	<200s
CO (0 to 300 mg/m ³)					80s	<200s
HCl (0 to 15 mg/m ³)					180s	<400s
NH ₃ (0 to 15 mg/m ³)					240s	<400s
CH ₄ (0 to 15 mg/m ³)					70s	<200s
CO ₂ (0 to 20% vol)					85s	<200s
O ₂ (0 to 21% vol)					190s	<200s
H ₂ O (0 to 30% vol)					100s	<200s
Lack of fit (field)						
NO (0 to 105 mg/m ³)			1.7			<2.0%
NO (0 to 200 mg/m ³)			1.4			<2.0%
NO ₂ (0 to 80 mg/m ³)			1.9			<2.0%
NO ₂ (0 to 50 mg/m ³)			1.8			<2.0%
N ₂ O (0 to 50 mg/m ³)			1.5			<2.0%
SO ₂ (0 to 75 mg/m ³)			1.6			<2.0%
SO ₂ (0 to 300 mg/m ³)			1.0			<2.0%
CO (0 to 75 mg/m ³)			1.9			<2.0%
CO (0 to 300 mg/m ³)			1.2			<2.0%
HCl (0 to 15 mg/m ³)				2.0		<2.0%
NH ₃ (0 to 15 mg/m ³)				2.0		<2.0%
CH ₄ (0 to 15 mg/m ³)			1.7			<2.0%

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	<0.5	<1	<2	<5		
CO ₂ (0 to 20% vol)	0.4					<2.0%
O ₂ (0 to 21% vol)	0.1					<0.2%
H ₂ O (0 to 30% vol)			1.8			<2.0%
Maintenance interval					Note 2 One month	>8 days
Zero and Span drift requirement	<p>The CEM controller records the zero and span gas calibration checks in concentration units. The log of this can be displayed or printed. In addition, where drift occurs outside of a predetermined level, an alarm can be activated.</p> <p>The CEMs can be programmed to provide zero drift and span drift results that conform to the requirements of the EN 14181 standard.</p> <p>The zero and span drifts were determined over a 24 hour period. The CEMs demonstrated that the zero and span drifts over 24 hours were all within the requirements (with the maximum observed drift for any determinand over 24 hours being 1.98% of the maximum of the certification range.)</p>					<p>Clause 6.13 & 10.13</p> <p>Manufacturer shall provide a description of the technique to determine and compensate for zero and span drift.</p>
Change in zero point over maintenance interval						
NO (0 to 105 mg/m ³)			1.71			<3.0%
NO ₂ (0 to 80 mg/m ³)				2.96		<3.0%
N ₂ O (0 to 50 mg/m ³)	0.33					<3.0%
SO ₂ (0 to 75 mg/m ³)		1.6				<3.0%
CO (0 to 75 mg/m ³)		0.69				<3.0%
HCl (0 to 15 mg/m ³)				2.95		<3.0%
NH ₃ (0 to 15 mg/m ³)				2.28		<3.0%
CH ₄ (0 to 15 mg/m ³)			1.27			<3.0%
CO ₂ (0 to 20% vol)	0.29					<3.0%
O ₂ (0 to 21% vol)	0.22					<0.2%
H ₂ O (0 to 30% vol)		0.97				<3.0%

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Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Change in reference point over maintenance interval						
NO (0 to 105 mg/m ³)			1.59			<3.0%
NO ₂ (0 to 80 mg/m ³)				2.21		<3.0%
N ₂ O (0 to 50 mg/m ³)			1.93			<3.0%
SO ₂ (0 to 75 mg/m ³)				2.75		<3.0%
CO (0 to 75 mg/m ³)			1.92			<3.0%
HCl (0 to 15 mg/m ³)				2.3		<3.0%
NH ₃ (0 to 15 mg/m ³)				4.72		<3.0%
CH ₄ (0 to 15 mg/m ³)				4.36		<3.0%
CO ₂ (0 to 20% vol)		0.97				<3.0%
O ₂ (0 to 21% vol)				2.68		<0.2%
H ₂ O (0 to 30% vol)	0.22					<3.0%
Availability						
Oxygen					98.24	>98%
All other parameters					97.6	>95%
Reproducibility						
NO (0 to 105 mg/m ³)				3.2		<3.3%
NO ₂ (0 to 80 mg/m ³)				3.2		<3.3%
N ₂ O (0 to 50 mg/m ³)				2.2		<3.3%
SO ₂ (0 to 75 mg/m ³)				2.7		<3.3%
CO (0 to 75 mg/m ³)		0.9				<3.3%
HCl (0 to 15 mg/m ³)				2.5		<3.3%
NH ₃ (0 to 15 mg/m ³)		0.9				<3.3%
CH ₄ (0 to 15 mg/m ³)		0.7				<3.3%
CO ₂ (0 to 20% vol)	0.2					<3.3%
O ₂ (0 to 21% vol)	0.1					<0.2%
H ₂ O (0 to 30% vol)			1.1			<3.3%

Note 1: The calibration function / R2 value for parameters marked * was <0.9. However this was due to the relatively low levels during the field trial. The instrument passed the variability tests for the limit values stated on the certificate.

Note 2: The atmosFIR has a maintenance interval of 1 month. The work detailed in the operating manual has to be carried out at regular intervals, depending on local conditions.

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Description

The atmosFIR CEM is a complete multi component emissions gas analyser system using the atmosFIR model AFS-B2 FTIR gas analyser. The atmosFIR CEM incorporates fully integrated sampling control components, as required by an extractive gas analyser, as well as collecting and analysing the FTIR spectral information. The atmosFIR FTIR gas analyser can be removed from the atmosFIR CEM rack.

The atmosFIR FTIR gas analyser samples hot and wet, without the need for sample conditioning. The high resolution (0.7cm⁻¹ unapodized) is used over a IR range 700-5000 cm⁻¹ with a multi-pass gas cell (from 4.2m to 6m) and ambient temperature DTGS detector. Internal self-reference of the IR beam eliminates drift in the measurement signal.

A built-in Zirconia O₂ sensor allows for the parallel measurement of Oxygen for measurement correction. An optional FID analyser can be integrated into the atmosFIR CEM, directly coupling with the sampling system already used for the FTIR.

PAS-Pro software runs continuously, with a flexible library of calibration data allows for unlimited gas species to be detected and measured. PAS-Pro also manages span and gas checks as required by QAL3, using span gas cylinders or alternatively internal automated validations (if allowable) without the need for span gas.

A sample probe with PTFE filter is used, with options of blow-back and sample probe pre-filtration for high dust applications. A heated sample line of length up to 50m transfers the sample to the analyser, with integrated sample probe power, alarms and span gas lines within the line braiding.

The complete sampling system is run at high temperature (180°C), with alarm and status information being reported continuously. A post-analyser sampling eductor pump gives a continuous sample flow through the entire system.

Local data files are saved in .csv format, whilst data outputs over 4-20mA, Modbus Serial, Modbus TCP/IP, OPC and PROFINET are all available. Remote access to the atmosFIR CEM is available over wired or wireless connection, for remote support and diagnostics.

AtmosFIRt AFS-B2T is a portable version of the AFS-B2 and is used in the following configuration:

- atmosFIRt Portable FTIR gas analyser
- Laptop running software
- Heated Sample Line and Line Controller heated to 180°C
- Sample Pump
- Portable Sample Probe and filter heated to 180°C

AtmosFIRi AFI-B2 is a model with low path length gas cell for high concentration applications.

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General Notes

1. This certificate is based upon the equipment tested. The Manufacturer is responsible for ensuring that on-going production complies with the standard(s) and performance criteria defined in this Certificate. The Manufacturer is required to maintain an approved quality management system controlling the manufacture of the certified product. Both the product and the quality management system shall be subject to regular surveillance according to 'Regulations Applicable to the Holders of Sira Certificates'. The design of the product certified is defined in the Sira Design Schedule V00 for certificate No. Sira MC190346/00
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