Process Guidance Note: PG6/29 (2004)

ALcontrol Laboratories
Saxon House
Saxon Way
Fordbridge
Birmingham
B37 5AY

REPORT FOR EMISSIONS TO AIR

FROM

MANUFACTURE OF MICROCELLULAR POLYURETHANE

For

PHIL SHEPHERD
HEALTH & SAFETY CONSULTANCY
OAK TREE COTTAGE
LENCHWICK
NR EVESHAM
WORCESTERSHIRE
WR11 4TG

at

TRELLEBORG AUTOMOTIVE UK LTD
MICROVON PROCESSES
HOLBROOK LANE
COVENTRY
CV6 4QX

PART 1: EXECUTIVE SUMMARY

REPORT NO: 4712a **CLIENT REF:** Mr Phil Shepherd

DATE OF VISIT: 23rd August & 17th **CONTACT ON SITE:** Mr Phil Shepherd

October 2006

DATE OF REPORT: 03 November 2006

Process Guidance Note: PG6/29 (2004)	Trelleborg Automotive - Coventry ALcontrol Laboratories
Reported by:	
Jonathan Litterick MCERT No. MM 03236	
Approved by:	
for ALcontrol Laboratories	

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1 MONITORING OBJECTIVES

The monitoring at this installation was carried out for the compliance check monitoring of emissions to air in accordance with process guidance note, PG6/29(2004) – Di-isocyanate Processes.

The processes are covered by Authorisation Reference 050, issued by Coventry City Council.

The substances monitored at each emission point are listed in the table below.

Substances to be monitored	Emission Point Identification						
	Microvon Lines						
	Desma M/C No.3	COV Ralph No.5 M/C					
Total VOC	~	√	~				
Total Isocyanates	√	√	√				

1.1 Terms of Reference

Phil Shepherd of Health & Safety Consultancy, Oak Tree Cottage, Lenchwick, Nr Evesham, Worcestershire, WR11 4TG, has commissioned Alcontrol Laboratories to carry out the work described in this report. Monitoring was undertaken at Trelleborg Automotive UK Ltd, Holbrook Lane, Coventry, Warwickshire, CV6 4QX.

Monitoring was carried out on the $23^{\rm rd}$ August & $17^{\rm th}$ October 2006, by John Litterick at the request of Mr Phil Shepherd.

The work was carried out in accordance with the site specific sampling protocols outlined in proposal reference 12899a27e, dated 14th February 2006, and with the clients instructions.

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2 MONITORING RESULTS

2.1 Emission Point Reference: Microvon – Desma M/C No.3

Date of Monitorin	ıg	23 rd August 2006		Reference Conditions NT		NTP	
Process Status				Processes Rur	ning l	Normally	
Substances To Be Monitored	Em	Emission Limit Value Ave		sion	Sampling Met Reference		Sampling Times
Total VOC	1	00 mgC.m ⁻³	8.1 mg	C.m ⁻³	BS EN 13526/ 1	3649	10:03 – 11:03
Total Isocyanates	C	0.1 mg.m ⁻³	<0.007	mg.m ⁻³	BS ISO 1670	2	09:33 – 11:33

2.2 Emission Point Reference: Microvon – Desma M/C No.1

Date of Monitorin	g 23 rd August 20	23 rd August 2006		Reference Conditions NT		ITP	
Process Status			Processes Running Normally				
Substances To Be Monitored	Emission Limit Value	Aver Emiss Concent	sion	Sampling Metal Reference		Sampling Times	
Total VOC	100 mgC.m ⁻³	16.8 mg	gC.m ⁻³	BS EN 13526/ 1	3649	11:28 – 12:28	
Isocyanates	0.1 mg.m ⁻³	<0.007	mg.m ⁻³	BS ISO 1670	2	11:33 – 13:33	

2.3 Emission Point Reference: Microvon – COV Ralph No.5 M/C

Date of Monitorin	Monitoring 17 th October 2006 Refe		Referen	nce Conditions	NTP		
Process Status			Processes Running Normally				
Substances To Be Monitored	En	nission Limit Value	Average Emission Concentration		Sampling Met Reference		Sampling Times
Total VOC		100 mg.m ⁻³	8.7 mg	C.m ⁻³	BS EN 13526/ 1	3649	9:58 – 12:00
Isocyanates		0.1 mg.m ⁻³	<0.007 1	mg.m ⁻³	BS ISO 1670)2	9:58 – 12:00

3 PLANT AND OPERATING INFORMATION

Plant and operating conditions prevailing on the date of the survey were described as normal in all cases.

4 MONITORING DEVIATIONS

Emission Point	Substance	Monitoring	Other Relevant
Reference	Deviations	Deviations	Issues
All	None	None	

5 DISCUSSIONS

The processes are covered by the process authorisation Reference Number 050, issued by Coventry City Council, which specifies the following release limits.

Parameter	Emissions Limit
Di-isocyanates	0.1 mg.m ⁻³
	(averaged over any 2hr period while the process is in operation)
Volatile Organic Compounds	100 mg.m ⁻³
(as total carbon excluding particulate matter)	

5.1 Volatile Organic Compounds

All average VOC emissions were well below the limits.

5.2 Di-isocyanates

Di-isocyanate emissions were less than the 0.007 $mg.m^{-3}$ analytical limit of detection, and therefore well below the 0.1 $mg.m^{-3}$ emissions limits.

5.3 Sampling Positions

The sampling locations used were all in straight sections of ductwork before the fans. In all cases the flow profiles at the sampling planes satisfied the requirements of BS EN 13284-1, and as such were acceptable.

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PART 2: SUPPORTING INFORMATION

REPORT NO: 4712a **CLIENT REF:** Mr Phil Shepherd

DATE OF VISIT: 23rd August & 17th **CONTACT ON SITE:** Mr Phil Shepherd

October 2006

DATE OF REPORT: 03 November 2006

Process Guidance Note: PG6/29 (2004)	Trelleborg Automotive - Coventry ALcontrol Laboratories
Reported by:	
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6 APPENDIX I

6.1 Field Staff Used

Name	MCERTS Registration No:	MCERTS Qualifications	Function
John Litterick	MM 03236	Level 2, TE1 &TE4	Team Leader

6.2 Field Monitoring Methods Used

6.2.1 Stack Velocity & Temperature Measurements

Stack velocity was measured using a pitot tube, conforming to the design specifications of ISO 3966-1977, coupled to an electronic manometer. Both are calibrated annually by a UKAS accredited supplier. Temperature measurements were taken using a K-type thermocouple connected to an electronic thermometer. Both are calibrated annually by a UKAS accredited supplier. Measurements fulfil the requirements of ISO10780:1994.

6.2.2 Total Gaseous Organic Compounds by FID

Continuous extractive sampling for Total VOCs was conducted using a Bernath heated line Flame Ionisation Detection. Measurements were made designed to fulfil the requirements of BS EN 13526:2002. Results are expressed as propane equivalent values.

6.2.3 Total Gaseous Organic Compounds by Sorbent Tube

Continuous extractive sampling for Total VOCs was backed up by periodic extractive sampling for total VOCs using charcoal adsorbent tubes connected to calibrated metered sampling pumps. Measurements designed to fulfil the requirements of BS EN 13649:2002. The results for this tube sampling were used to provide a correction factor for fid results. (Results expressed as solvent response corrected).

6.2.4 Isocyanates

Periodic extractive sampling for Isocyanates was conducted using a calibrated pump connected to an impinger sampling train containing 1-(2-methoxyphenyl)piperazine solution. The sampling method is designed to fulfil requirements of ISO 16702:2001. Analysis is by HPLC, also to the requirements of ISO 16702:2001.

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6.3 Laboratory Analysis Methods

6.3.1 Techniques & Detection Limits

Analyte	Analysis Technique	Detection Limit	UKAS Accredited	Laboratory Method Reference
MDI	HPLC	0.2 μg	Yes	13
Total VOC (Tubes)	GC/ MS	5 μg	No	n/a

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- 7 APPENDIX II
- **7.1** Flowrate Calculation Spreadsheets

This Appendix contains 3 pages.

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- 8 APPENDIX III
- 8.1 VOC Profiling Data

This Appendix contains 3 pages.

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- 9 APPENDIX IV
- 9.1 Calibration Records

This Appendix contains 8 pages.

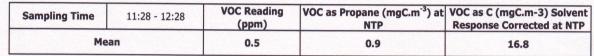
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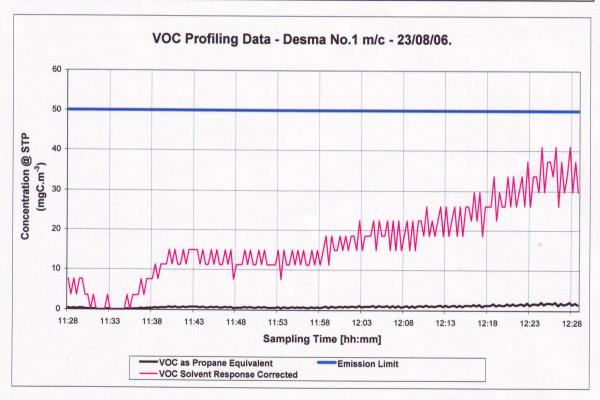
			430 E01		Date of Testing /e Consultant			23 August 2006 J Litterick			
Client		Trelle	eborg Autor	notive							
Plant Identification		DE:	SMA M/C N	0.1							
Ambient temperature (°				22 Atmospheric Pressure (kPa)			(kPa)		101.3		
Pitot Co-efficient									-1640		
Duct Diameter (cm)			45		Duct Length (cm)						
Duct Area (m²)			0.159								
Transect Point No	1	2	3	4	5	6	7	8	9	10	11
% of Dimension	6.5	15.0	25.0	35.0	45.0	50.0	55.0	65.0	75.0	85.0	93.5
Point	1	2	3	4	5	6	7	8	9	10	11
Pitot Reading (pa) Line A	210	214	198	190	189	141	156	121	100	90	90
Duct Temp (°C) Line A	24	24	24	24	24	24	24	24	24	24	24
Line A Duct Velocity msec-1) Duct Velocity (m sec Absolute Flow Rate (A1 18.6	24 A2 18.8	24 A3 18.1	24 A4 17.7	24 A5 17.7	24 A6 15.3	24 A7 16.0	24 A8 14.1	24 A9 12.8	15.8 9035	A11
	A1 18.6	A2	A3	A4 17.7	A5	A6 15.3	A7	A8	A9 12.8	15.8 9035 8171	A11 12.2
Line A Duct Velocity (msec-1) Duct Velocity (m sec Absolute Flow Rate (Flow @ STP (m³ hr⁻¹)	A1 18.6	A2	A3	A4 17.7	A5 17.7	A6 15.3	A7	A8	A9 12.8	15.8 9035	A11 12.2
Line A Duct Velocity (msec-1) Duct Velocity (m sec Absolute Flow Rate (Flow @ STP (m³ hr⁻¹) Data Entered by:	A1 18.6	A2 18.8	A3 18.1	A4 17.7 STP is @	A5 17.7	A6 15.3	A7 16.0	A8 14.1	A9 12.8	12.2 15.8 9035 8171	A11 12.2
Line A Duct Velocity (msec-1) Duct Velocity (m sec Absolute Flow Rate (Flow @ STP (m³ hr⁻¹) Data Entered by: Data Entry Verified b	A1 18.6	A2 18.8	A3 18.1	A4 17.7 STP is @	A5 17.7	A6 15.3	A7 16.0	A8 14.1	A9 12.8	12.2 15.8 9035 8171	A11 12.2
Line A Duct Velocity (msec-1) Duct Velocity (m sec Absolute Flow Rate (Flow @ STP (m³ hr⁻¹) Data Entered by:	A1 18.6 -1) (m³ hr-1) by:	A2 18.8 Com be less that	pliance on 5 pa	A4 17.7 STP is @	A5 17.7 273 °K and	A6 15.3	A7 16.0	A8 14.1	A9 12.8	15.8 9035 8171 J Litterick A Barnes	A11 12.2
Line A Duct Velocity (msec-1) Duct Velocity (m sec Absolute Flow Rate (Flow @ STP (m³ hr⁻¹) Data Entered by: Data Entry Verified b	A1 18.6 -1) (m³ hr-1) py:	A2 18.8 Com be less that s velocities	pliance on 5 pa	A4 17.7 STP is @	A5 17.7 273 °K and	A6 15.3	A7 16.0	A8 14.1	A9 12.8	15.8 9035 8171 J Litterick A Barnes	A11 12.2
Line A Duct Velocity (msec-1) Duct Velocity (m sec Absolute Flow Rate (Flow @ STP (m³ hr⁻¹) Data Entered by: Data Entry Verified b	A1 18.6 -1) (m³ hr-1) py: logs should dist local galal negative	Com be less than s velocities flow	pliance on 5 pa	A4 17.7 STP is @	A5 17.7 273 °K and	A6 15.3	A7 16.0	A8 14.1	A9 12.8	A10 12.2 15.8 9035 8171 J Litterick A Barnes PASS PASS	A11 12.2

	ber 430 E01 Date of Testing					Date of Tes	sting		23	3 August 20	06
Client		Trelle	borg Auton	notive	j	Consultant			J Litterick		
Plant Identification		DE	SMA M/C N	lo.3							
Ambient temperature ((°C)		20			Atmospher	ic Pressure	(kPa)	101.3		
Pitot Co-efficient			0.99			Duct Pressi	ure (pa)		-650		
Duct Diameter (cm)		36 Duct Length (cm)			Duct Length (cm)						
Duct Area (m²)			0.102		Duct Width (cm)			-			
Transect Point No	1	2	3	4	5	6	7	8	9	10	11
% of Dimension	6.5	15.0	25.0	35.0	45.0	50.0	55.0	65.0	75.0	85.0	93.5
Point	1	2	3	4	5	6	7	8	9	10	11
Pitot Reading (pa)	240	243	251	256	259	241	240	235	240	240	230
Line A Pitot Reading (pa) Line B	225.	238	256	262	255	250	235	220	215	200	195
Duct Temp (°C)	20	20	20	20	20	20	20	20	20	20	20
Line A Duct Temp (°C) Line B	20	20	20	20	20	20	20	20	20	20	20
Duct Velocity	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11
(msec-1)	19.8	19.9	20.2	20.4	20.5	19.8	19.8	19.6	19.8	19.8	19.4
					-		-			D40	
Ouct Velocity (msec-1) Ouct Velocity (m se Absolute Flow Rate	B1 19.1 c ⁻¹) (m³ hr ⁻¹)	B2 19.7	B3 20.4	B4 20.7	B5 20.4	B6 20.2	B7 19.6	B8 18.9	18.7	19.7 7205	
Duct Velocity (msec-1) Duct Velocity (m se Absolute Flow Rate Flow @ STP (m ³ hr ⁻¹	B1 19.1 c ⁻¹) (m³ hr ⁻¹)			20.7	20.4					18.0	
Duct Velocity (msec-1) Duct Velocity (m se Absolute Flow Rate	B1 19.1 c ⁻¹) (m ³ hr ⁻¹)			20.7	20.4	20.2				18.0 19.7 7205	B11 17.8
Duct Velocity (msec-1) Duct Velocity (m se Absolute Flow Rate Flow @ STP (m ³ hr ⁻¹ Data Entered by:	B1 19.1 c ⁻¹) (m ³ hr ⁻¹)	19.7	20.4	20.7	20.4 273 °K and	20.2	19.6	18.9		19.7 7205 6670	17.8
Duct Velocity (msec-1) Duct Velocity (m see Absolute Flow Rate Flow @ STP (m³ hr-1) Data Entered by: Data Entry Verified	B1 19.1 c ⁻¹) (m³ hr ⁻¹)	19.7	20.4	20.7	20.4 273 °K and	20.2	19.6	18.9		19.7 7205 6670	17.8
Duct Velocity (msec-1) Duct Velocity (m see Absolute Flow Rate Flow @ STP (m³ hr² Data Entered by: Data Entry Verified None of the Pitot read	B1 19.1 c ⁻¹) (m³ hr ⁻¹) by:	Com be less tha	pliance on 5 pa	STP is @	20.4 273 °K and	20.2	19.6	18.9		19.7 7205 6670 J Litterick A Barnes	17.8
Duct Velocity (msec-1) Duct Velocity (m se Absolute Flow Rate Flow @ STP (m³ hr⁻¹ Data Entered by: Data Entry Verified None of the Pitot readi Ratio of highest to low	B1 19.1 c ⁻¹) (m³ hr ⁻¹)) by: ings should est local ga	Com be less that is velocities	pliance on 5 pa	STP is @	20.4 273 °K and	20.2	19.6	18.9		19.7 7205 6670 J Litterick A Barnes	17.8
Duct Velocity (msec-1) Duct Velocity (m se Absolute Flow Rate Flow @ STP (m ³ hr ⁻¹ Data Entered by:	B1 19.1 c ⁻¹) (m³ hr ⁻¹) by: by:	Com be less that is velocities a flow	20.4 pliance on 5 pa should be I	STP is @ of sample ess than 3:	20.4 273 °K and	20.2	19.6	18.9		19.7 7205 6670 J Litterick A Barnes PASS PASS	17.8

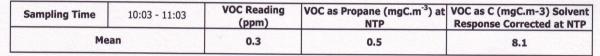
	21 0.99 50 0.196 3 25.0]	Atmospher Duct Presso Duct Lengt Duct Width	ic Pressure ure (pa) h (cm)	(kPa)		101.3 -150	
2 5 15.0	21 0.99 50 0.196 3 25.0	4		Duct Pressi Duct Lengt	ure (pa) h (cm)	(kPa)		-150	
15.0	0.99 50 0.196 3 25.0	La Carte Carte Carte		Duct Pressi Duct Lengt	ure (pa) h (cm)	(kPa)		-150	
15.0	50 0.196 3 25.0	La Carte Carte Carte		Duct Lengt	h (cm)				
15.0	0.196 3 25.0 3	La Carte Carte Carte						-	
15.0	3 25.0	La Carte Carte Carte		Duct Width	(cm)				
15.0	25.0 3	La Carte Carte Carte					-		
2	3	35.0		6	7	8	9	10	11
			45.0	50.0	55.0	65.0	75.0	85.0	93.5
84	444	4	5	6	7	8	9	10	11
	114	109	100	102	84	79	91	115	100
22	22	22	22	22	22	22	22	22	22
A2 9 11.7	A3	A4 13.4	A5 12.8	A6 12.9	A7 11.7	A8 11.4	A9 12.2	A10 13.7	A11 12.8
							J Litterick A Barnes		
Co	mpliance	of sampl	ing locat	ion with	BS EN 1	3284			
								PASS	
		less than 3:	1					PASS	
								PASS	
	n regard to th	ne duct axis						PASS	
				13284				YES	
	ould be less that gas velocition ative flow ess than 15° in	Compliance ould be less than 5 pa al gas velocities should be ative flow ess than 15° in regard to the flow criteria	Compliance of sample to the less than 3: ative flow the sess than 15° in regard to the duct axis afform to the flow criteria specified.	STP is @ 273 °K and Compliance of sampling locat ould be less than 5 pa al gas velocities should be less than 3:1 ative flow ess than 15° in regard to the duct axis nform to the flow criteria specified in BS EN:	STP is @ 273 °K and 101.3 kPa Compliance of sampling location with when the less than 5 pa al gas velocities should be less than 3:1 ative flow less than 15° in regard to the duct axis after to the flow criteria specified in BS EN13284	STP is @ 273 °K and 101.3 kPa Compliance of sampling location with BS EN 1: ould be less than 5 pa al gas velocities should be less than 3:1 ative flow ess than 15° in regard to the duct axis inform to the flow criteria specified in BS EN13284	Compliance of sampling location with BS EN 13284 would be less than 5 pa al gas velocities should be less than 3:1 ative flow ess than 15° in regard to the duct axis	Compliance of sampling location with BS EN 13284 ould be less than 5 pa al gas velocities should be less than 3:1 ative flow ess than 15° in regard to the duct axis inform to the flow criteria specified in BS EN13284	STP is @ 273 °K and 101.3 kPa J Litterick

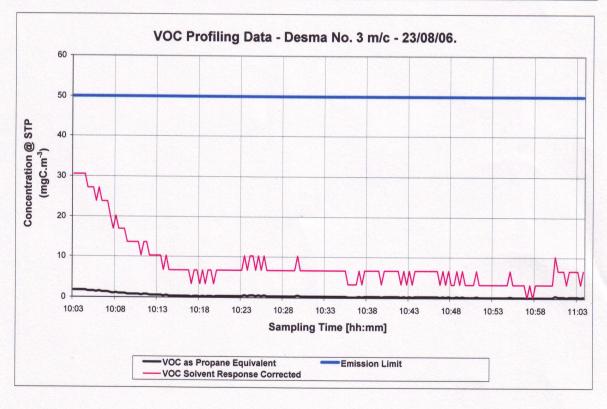
ob Number	430 E01	Date of Testing		23 August 2006
Client	Trelleborg	Consultant		J Litterick
Plant Identification	DESMA M/C No.1			
Ambient temperature (°C)	22	FID Identification		VC 08
Atmospheric Pressure (pa)	101.3	Detector Type		FID
Stack Pressure (pa)	-1640	Calibration Gas		Propane
Stack Temperature (°C)	24	Instrument Range		97.8
ogging Rate	00:00:20	Percent Carbon		82%
Emission Limit	50	Measurement Range (ppr	n)	300
	Instrun	nent Calibration		
		Calibration Cylinder Identification	Actual (ppm)	Instrument (v)
Initial Calibration	Zero	Air	0	0.00
	Span	5982	327	3.29
Final Calibration	Zero	Air	0	0.02
Tillal Calibration	Span	5982	327	3.40





	BS EN 12619: 19	99 & BS EN 13526:2	2002	
lob Number	430 E01	Date of Testing		23 August 2006
Client	Trelleborg	Consultant		J Litterick
Plant Identification	DESMA M/C No.3	3		
Ambient temperature (°C)	20	FID Identification		VC 08
Atmospheric Pressure (pa)	101.3	Detector Type		FID
Stack Pressure (pa)	-650	Calibration Gas		Propane
Stack Temperature (°C)	20	Instrument Range		97.8
ogging Rate	00:00:20	Percent Carbon		82%
Emission Limit	50	Measurement Range (ppr	n)	300
	Instrun	nent Calibration		150 ANOLA 125
		Calibration Cylinder Identification	Actual (ppm)	Instrument (v)
Initial Calibration	Zero	Air	0	0.00
Initial Calibration	Span	5982	327	3.29
Final Calibration	Zero	Air	0	0.02
Tillar Calibration	Span	5982	327	3.40





TOC Monitoring:- Flame Ionisation Detector	
BS EN 12619: 1999 & BS EN 13526:2002	

Job Number	430 E01	Date of Testing	29 September 2006
Client	Trelleborg	Consultant	J Litterick
Plant Identification	COV RALPH No.	5 M/C	
Ambient temperature (°C)	20	FID Identification	VC 08
atmospheric Pressure (pa)	101.3	Detector Type	FID
Stack Pressure (pa)	-1600	Calibration Gas	Propane
Stack Temperature (°C)	20	Instrument Range	97.8
.ogging Rate	00:00:20	Percent Carbon	82%
Emission Limit	50	Measurement Range (ppm)	300

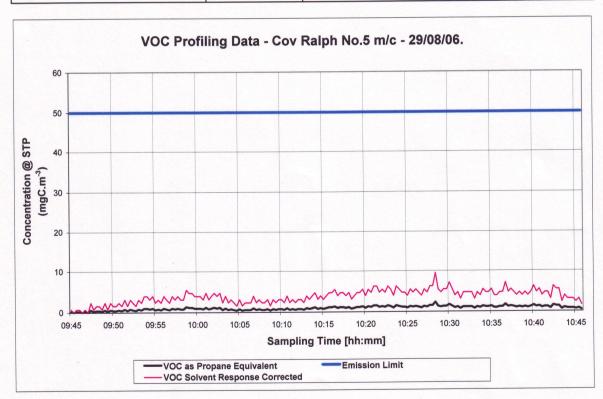
Instrument Calibration

		Calibration Cylinder Identification	Actual (ppm)	Instrument (v)
	Zero	Air	0	0.00
Initial Calibration	Span	5982	327	3.29
	Zero	Air	0	0.02
Final Calibration —	Span	5982	327	3.40

Span gas concentration should be \pm - 80% of the measurement range

PASS

Sampling Time	9:45 - 10:45	VOC Reading (ppm)	VOC as Propane (mgC.m ⁻³) at NTP	VOC as C (mgC.m-3) Solvent Response Corrected at NTP
Me	ean	0.6	0.9	3.8



annan kanaaraan kanaaraa kana

Issued By:



Pullman Instruments (UK) Ltd.

Chatsworth Terrace, Chatsworth House, Harrogate, HG1 5HT.

Tel: 01423 720360

Email: info@pullman.co.uk

www.pullman.co.uk

Customer:

3A AIR & ACOUSTICS

28D, 4th FLOOR, VERNON MILL

MERSEY STREET

STOCKPORT

CHESHIRE, SK1 2HX

The Instrument Listed Below Has Been Calibrated By A UKAS Accredited Laboratory. For Results Refer To UKAS Certificate Issued.

Certificate No:

0072/N3018831P

Instrument information___

LD No.

31041226

Description

Digital Manometer

Manufacturer:

TESTO

Model

512

Serial No.

31041226

Job No.

NE₩

Signatory : A.J.COX

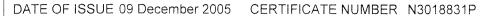


Calibration Date: 09/12/2005

issue! Date 25 002000 Ammonyed in 1 Sandt.

Approved Signatory

CERTIFICATE OF CALIBRATION





ASAP Calibration Services Ltd

Romsey Laboratory

UNIVERSAL HOUSE

ROMSEY INDUSTRIAL ESTATE

ROMSEY **HAMPSHIRE** SO51 0HR

Telephone

01794 523935 Facsimile

Email Website

01794 523910 info@asap-cal.co.uk www.asap-cal.co.uk



PAGE 1 OF 2 PAGES APPROVED SIGNATORY

∄M. Flux

Customer : Address :

PULLMAN INSTRUMENTS CHATSWORTH HOUSE CHATSWORTH TERRACE

HARROGATE HG1 5HT

Order No :

202519

Apparatus Tested -

DIGITAL MANOMETER

Type No :

512

Serial No :

31041226

Inventory No :

Manufacturer:

TESTO LTD

Range/Scale :

0 to 20 mbar

DIVISIONS: 0.01 mbar

est Conditions -

Date Instrument Received: 01 December 2005

Date Calibration Completed: 09 December 2005

Ambient Temperature :

 20 ± 2^{-5} C

Reference No :

3018831



Certified by

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to recognised national standards, and to units of measurement realised at the National Physical Laboratory or other recognised national standards laboratories. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory,

CERTIFICATE OF CALIBRATION

CERTIFICATE NUMBER
N3018831P

PAGE 2 OF 2 PAGES

UKAS Accredited Calibration Laboratory No. 0072

SERIAL NO: 31041226

CALIBRATION FLUID: AIR

THE PRESSURE WAS APPLIED TO THE + PORT THE - PORT WAS LEFT OPEN TO ATMOSPHERE

NO ADJUSTMENTS WERE MADE TO THE INSTRUMENT UNDER TEST PRIOR TO THE CALIBRATION CHECK OTHER THAN SETTING IT TO ZERO.

THE INSTRUMENT WAS CALIBRATED IN THE HORIZONTAL POSITION AGAINST A PRECISION LIQUID MANOMETER. THE CALIBRATION OF WHICH IS TRACEABLE TO NATIONAL STANDARDS.

BEFORE THE COMMENCEMENT OF THE TEST, THE PRESSURE WAS INCREASED TO THE MAXIMUM PRESSURE AND DECREASED TO ZFRO.

APPLIED PRESSURE INSTRUMENT READING UNITS: mbar gauge UNITS: mbar gauge

	RISING PRESSURE	FALLING PRESSURE
0.000	0.00	0.00
4.000	3.98	3.98
8.000	7.98	7.98
12.000	12.03	12.02
16.000	16.01	16.00
20.000	20.04	-

THE UNCERTAINTY OF MEASUREMENT IS \pm [0.03% + 0.004 mbar OF THE APPLIED PRESSURE (+ INSTRUMENT RESOLUTION)]

THE UNCERTAINTIES ABOVE MUST BE TAKEN INTO ACCOUNT WHEN USING THE ABOVE INSTRUMENT SINCE THEY ARE SIGNIFICANT WHEN COMPARED WITH THE VALUES ACROSS THE RANGE OF THE INSTRUMENT

THE ABOVE UNCERTAINTY REFERS TO THE MEASUREMENT AND IS NOT INTENDED TO INDICATE THE SPECIFICATION OR STABILITY OF THE INSTRUMENT UNDER TEST.

7.000	Engineer	
100%	नमञ्जयक्त	THE RESERVE OF THE PARTY OF THE

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $\kappa = 2.00$, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

INTERNAL CALIBRATION CERTIFICATE - Rules and Tape Measures

Equipment Name / Type: Son PAPE was INC (5L)
Equipment Reference Number: APS SI

Date of Calibration: 03/01/06

Person Conducting Calibration: 51

Reference Rule Reading mm	Working Rule Reading mm	Error (+/- mm)	Pass/Fail	Markings Clearly Visable?
" CYCOT ,	(333	0	P	y
13070	1020	0	P	7
1,2.0	1000	0	Q	<u> </u>

Tolerance = \pm /- 5mm

Reference Rule Used: 5170

Date of Next Calibration: CA (OA (OA)

Signed:

Issue Number: 2.0 Issue Date: Jan 2006 Issued By: Ryan Kitching **Test Pump Reference:**

APJ 72 26 - 27/04/2006

Reference Dry Gas Meter Number: Reference Dry Gas Meter Calibration Certificate:

E 949 N 207 4964F

Date of Calibration:

Reference Dry Gas Meter Calibration Date:

08/08/2006

Section 1: Calibration Record

Flow Rate Setting	Leak Check (Y/N)	SKC 222-3 Stroke Counter Reading			Time Period			Reference Dry Gas Meter Readings (litres)		
(%)		Start	Finish	Δ	Start	Finish	Δ (hrs:min)	Start	Finish	Volume Measured
10	Y	640011	743056	103045	15:20	8:00	16:40	39239.6	39284.1	44.5
25	Y	800700	846000	45300	11:02	15:02	06:06:00	39309.8	39329.1	19.3
45	Υ	743056	800700	57644	8:01	11:01	03:00	39284.1	39309.8	25.7

Section 2: Calculations

Flow Rate Setting (%) Calibrated Volume, ml **Test Period, (hh:mm)** No of Strokes

Volume: Stroke Ratio

10	25	45
44500	19300	25700
16:40	06:06	03:00
103045	45300	57644
0.43	0.43	0.45

Mean Volume:Stroke (ml/stroke) 0.43 Maximum Volume:Stroke (ml/stroke) 0.45 Minimum Volume:Stroke (ml/stroke) 0.43 N

Is either max or min Volume:Stroke ratio more than 0.02 from the mean?

If yes then pump needs overhaul.

Calibrated By:

Signature:

Pitot Calibration Record

Working Pitot: APJ 39
Calibration Date: 27/04/2006
Reference Pitot Used: E 039
Person Conducting Calibration: AB/PC/JL

Ref Pitot Next Calibration Due:

03/07/2006

Pitot Type	Test	Pressure Reading Pascals	Pitot tube Coefficient	Cp(A) - Cp(B)
Reference Pitot	Pre Test Zero	0.0	_	
reference i not	Pitot Reading	8	0.994	1
	Post Test Zero	0.0	9.27*	
	1 001 1001 2010	0.0		er de produce de
Working Pitot	Pre Test Zero	0.0		
Working 1 not	1st Pitot Reading Leg A	\$ \$	-	
	Ist Pitot Reading Leg B	8	+	0
	Zero Check	0,0	1	0
	Pitot Coefficient =	0.0	Side A	0.99
	Pitot Coefficient =		Side B	
			Side D	0.99
	Average (side A&B= Side A Deviation=			0.99
				0.00
	Side B Deviation=			0.00
D.C. Div.	D T . 7	0.0		
Reference Pitot	Pre Test Zero	0.0	+	
	Pitot Reading	98	0.994	
	Post Test Zero	0.0	_	
			4	
337 1 D24.4	D., T., 7	0.0	4	
Working Pitot	Pre Test Zero	0.0	4	
	1st Pitot Reading Leg A	101	4	
	1st Pitot Reading Leg B	101	-	0
	Zero Check	0.0	2::	L
	Pitot Coefficient =		Side A	0.98
	Pitot Coefficient =		Side B	0.98
	Average (side A&B)=			0.98
	Side A Deviation=			0.00
	Side B Deviation=			0.00
Reference Pitot	Pre Test Zero	0.0	4	
Reference Phot		0.0	2.201	
	Pitot Reading Post Test Zero	240	0.994	
	POST TEST ZETO	0.0	4	
Working Pitot	Pre Test Zero	0.0	-	
TO KING I HOU	1st Pitot Reading Leg A	243	-	
	1st Pitot Reading Leg B	243	-	0
	Zero Check	0.0	-	U
	Pitot Coefficient =	0.0	Side A	0.99
	Pitot Coefficient =			
	Average (side A&B)=		Side B	0.99
				0.99
	Side A Deviation=			0.00
	Side B Deviation=			0.00

Mean Pitot Coefficient

0.99

INTERNAL CALIBRATION CERTIFICATE - THERMOMETER & THERMOCOUPLES

Equipment Name / Type:

Temperature Indicator

Equipment Reference Number: Date of Calibration:

APJ 80 27/04/2006 26/04/2007

Date of Next Calibration.

Person Conducting Calibration:

AB/PC/JL

	Working	Injected Value mV	STDEV		PASS / FAIL
	Thermometer	(if applicable)			
	Reading ^O C				
lemperature				Error %	
Reading °C				(of absolute	
Equivalent				reading)	
-50	-52.9	1	2.05061	-1.300	Pass
0	0		2.03001	0.000	Pass
50	49.8	l — — — — — — — — — — — — — — — — — — —	0.141421		Pass
100	100.3	-	0.141421	0.080	Pass
150	148		1.414214		Pass
200	200.1		0.070711	0.021	Pass
250	248.6		0.989949	-0.268	Pass
300	300.2		0.141421	0.035	Pass
350	349.3		0.494975	-0.112	Pass
400	400.2		0.141421	0.030	Pass
450	449.5		0.353553	-0.069	Pass
500	500.1		0.070711	0.013	Pass
550	549.0		0.707107	-0.122	Pass
600	600.0		0.707107	0.000	Pass
650	648.0	1	1.414214	-0.217	Pass
700	700.0	·	1.414214	0.000	Pass
750	748.7	1	0.919239	-0.127	Pass
800	799.9	-	0.919239	-0.127	Pass
850	849.1	1	0.636396	-0.009	Pass
900	899.8		0.030390	-0.080	
950	949.6		0.141421		Pass
1000	999.7		0.202043	-0.033	Pass
1000	999.7		0.212132	-0.024	Pass
PRINCIPAL STATE OF THE STATE OF		ļ — — — — — — — — — — — — — — — — — — —			
		AL OTOEV	0.47569		
		Mean STDEV	U.4/509		

Correction factor =
Difference between Test
Temp and Equivalent
Temp (+/-) of the
calibration certificate

Temperature Simulator Used:

SIM 03

Date of Next Calibration:

Uncertainty: n

no more

Units

°C

Reference Thermometer Used: N/A

Date of Next Calibration:

Uncertainty:

than 3 °C no more than 3 °C

Reference Thermocouple Used: N/A

Date of Next Calibration:

Uncertainty: no more than 3

Corrective Action Required:

No [

Date entered back into service: 27/04/2006

Uncertainty of Measurement(+/-): 0-500°C = +/- 1°C

500-1000°C = +/- 3°C

Signed:

n/a

n/a

INTERNAL CALIBRATION CERTIFICATE - THERMOMETER & THERMOCOUPLES

Equipment Name / Type:

2 m stack Thermocouple

Equipment Reference Number: Date of Calibration

AQ 094 27/04/2006 26/04/2007

Date of Next Calibration: Person Conducting Calibration:

PC/JL/AB

		Working Thermometer /		Injected Value mV (if applicable)	STDEV	Error +/- °C	PASS/FAIL
Temperatu	Temperature Reading		couple				
C Equ	C Equivalent /		ng ^O C				
1	Reference			:			
Therm	Thermometer						
Reading							
Actual	Corrected	Actual	Corrected				
3.2	3.2	3.3	3.3		0.052681	0.1	
35.6	35.7	36.0	35.9		0.182002	0.4	
80.2	80.4	80.5	80.3		0.138036	0.3	
	0.0		0.0		0	0.0	
	0.0		0.0		0	0.0	
	0.0		0.0		0	0.0	
	0.0		0.0		0	0.0	
	0.0		0.0		0	0.0	
			Mean STDEV	0.04659			

Correction factor = Difference between Test Temp and Equivalent Temp (+/-) of the calibration certificate

> 1.002841 0.997167

Temperature Simulator Used:

Date of Next Calibration:

Uncertainty: no more

°C than 3

Units

Reference Thermometer Used:

TK14

Date of Next Calibration:

10/05/2006

Uncertainty: no more

than 3 °C

°C

Reference Thermocouple Used: TK07/A

Date of Next Calibration:

Signed:

12/05/2006

Uncertainty: no more than 3

Corrective Action Required:

No

Date entered back into service:

Uncertainty of Measurement(+/-): $0-500^{\circ}C = +/- 1^{\circ}C$

 $500-1000^{\circ}C = +/-3^{\circ}C$

Issue Number: 5.0 Issu∈ Date: April 2003