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Rapporto di Prova

UB Trino C.le Leri Cavour misure controllo emissioni ISPRA Caldaie Ausiliarie 1-2 anno 2011

Prova effettuata:

In data: 10- 11/03/11	Operatore Tecnico di Prova (OPT): <i>Ensoli Diego</i>	Responsabile Tecnico di prova (RTP): <i>Grigioni Fulvio</i>
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18/03/11	<i>Parti Mauro</i>	Sarti Silvano	<i>Cenci Vincenzo</i>
Data emissione rapporto	Redazione	Approvazione	Emissione

 L'ENERGIA CHE TI ASCOLTA. GEM/SAI/ASP	Rapporto di Prova	ASP11EMIRP017-00	18/03/2011
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SOMMARIO

Impianto: Leri Cavour

Località: Trino Vercellese

Gruppo: Caldaie Ausiliarie 1-2

Tipo di combustibile: Gasolio

Giorni di misura 10-11/03/2011

Tipo di misura: Controllo Emissioni in ottemperanza A.I.A.


Quota punto di misura: 9 m

Orari e condizioni di funzionamento impianto:

10-11/03/2011 dalle 08.00 alle 18.00 carico stabile


Punto di misura:

Il camino è di sezione circolare ed è diviso internamente in due sezioni semicircolari, le quali raccolgono i gas delle rispettive caldaie. Sono presenti n. 2 bocchelli da 5" per semisezione posizionati ortogonalmente rispetto alla direzione del flusso del camino

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1. PREMESSA E SCOPI

Il Laboratorio garantisce che i risultati si riferiscono solo agli oggetti provati.

Il rapporto di prova non deve essere riprodotto parzialmente, senza l'approvazione scritta del laboratorio.

Responsabile delle prove: Grigioni Fulvio

Esecutori delle prove : Ensoli Diego.


1.1. Descrizione degli obiettivi di misura

La direzione UB di Trino ha richiesto con comunicazione interna, a GEM/SAI/ASP Unità Combustione ed Effluenti sede di Santa Barbara, la verifica delle emissioni ai sensi del decreto Legislativo n. 152 del 03 Aprile 2006 e di Autorizzazione Integrata Ambientale per l'Esercizio (AIA) del Ministero dell'Ambiente, per il mese di Marzo 2011.

Le misure sono state effettuate in accordo con la Direzione della centrale Leri Cavour.

Il presente documento contiene pertanto la descrizione ed i risultati delle seguenti prove:


- Determinazione delle emissioni in atmosfera, durante la fase di normale esercizio di CO, NOx ,SO2 e O2 e Particolato solido.

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2. NORMATIVE DI RIFERIMENTO

- [1] Norma UNI EN 15058:2006, "Emissioni da sorgente fissa – Determinazione della concentrazione in massa di monossido di carbonio (CO) – Metodo di riferimento. Spettrometria ad infrarossi non dispersiva";
- [2] Norma UNI EN 14792:2006, "Emissioni da sorgente fissa – Determinazione della concentrazione in massa di ossidi di azoto (NOx) – Metodo di riferimento: Chemiluminescenza";
- [3] Norma UNI EN 14789:2006, "Emissioni da sorgente fissa – Determinazione della concentrazione in volume di ossigeno (O2) – Metodo di riferimento: Paramagnetismo".
- [4] Norma UNI 10169 "Misure alle emissioni – Determinazione della velocità e della portata di flussi gassosi convogliati per mezzo del tubo di Pitot";
- [5] Norma UNI EN 14791:2006 "Emissioni da sorgente fissa – Determinazione della concentrazione in massa di diossido di zolfo (SO₂) – Metodo di riferimento";
- [6] Norma UNI EN 13284-1 "Emissioni da sorgente fissa - Determinazione della concentrazione in massa di polveri in basse concentrazioni – Metodo manuale gravimetrico";

Autorizzazione Integrale Ambientale per l'esercizio dell'impianto Enel di Leri AIA
DSA-DEC-2009-0001199 del 25/09/2009

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3. MODALITA' OPERATIVE

La misura effettuata con il metodo di riferimento è stata eseguita utilizzando un sistema estrattivo diretto costituito dall'analizzatore le cui caratteristiche identificative sono riportate al § 3.2.

La verifica delle emissioni inquinanti è stata effettuata ai sensi del D.M. 152 del 03/04/2006 mediante l'esecuzione di campionamenti compiuti con il sistema di controllo attraverso un bocchello opportunamente predisposto sul camino della caldaia.

I valori istantanei misurati sono stati acquisiti dall'idoneo sistema in dotazione ad ASP Unità Combustione ed Effluenti.


Prima dell'avvio del periodo di test è stata eseguita una verifica della taratura del sistema di riferimento utilizzando miscele di gas con una incertezza certificata del $\pm 2\%$ come da tabella al § 3.2.

Tutta la strumentazione utilizzata come riferimento è stata tarata presso Laboratori accreditati e i relativi certificati di taratura sono conservati presso la sede di ASP Unità Combustione ed Effluenti.

Le misure di particolato solido sono state effettuate a reticolo con affondamenti, secondo quanto previsto dalla norma di riferimento [6] riportata nel § 2, sul bocchello posizionato ortogonalmente rispetto alla direzione del flusso, direttamente nel camino.

Il sistema di misura utilizzato è il Tecora modello Isostack Plus, ed è costituito da una sonda in acciaio inox, dotata di tubo di Pitot e termocoppia certificati e da una Unità di Controllo per la rilevazione dei parametri.

La linea di campionamento è costituita da una sonda riscaldata, un filtro riscaldata, da un dispositivo di captazione del vapor d'acqua, un sistema di raffreddamento, una pompa aspirante e un'unità di controllo per l'acquisizione dei dati.

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3.1. Descrizione del sito di misura

Bocchello posizionato sul condotto a quota 9 m; piano di calpestio in grigliato a quota 7.5 m. Accesso assicurato da una scala sono presenti prese di alimentazione Palazzoli 240V 16° a piano terra.

3.2. Strumentazione e bombole utilizzate

Analizzatore O ₂	Analizzatore NO	Analizzatore CO	Analizzatore SO ₂
FS 25%	FS 250 ppm	FS 500 ppm	FS 100 ppm
Horiba PG 250 AN s/n : NUT30NOB			


Per la calibrazione sono state usate le seguenti bombole certificate:

Matricola Bombola	Gas Campione	Concentrazione
Enac 997501	CO+N ₂	406.6 ppm
Enac 997498	NO+N ₂	201 ppm
Enac 997463	SO ₂ +N ₂	68.8 ppm

4. RISULTATI

Nel periodo dal 10 all'11 marzo 2011 ASP Unità Combustione ed Effluenti ha effettuato diverse serie di misure secondo le modalità descritte al precedente § 3.

In allegato sono riportati i "Fogli Raccolta Dati" ove sono raccolti tutti i dati istantanei e le principali informazioni al contorno relative ad ogni singola prova.

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4.1. Riepilogo Dati

Caldaia Ausiliaria 1

Data 10/03/2011

Portata gasolio	Portata aria	Apertura serranda aria	T° Fumi	O ₂	CO Normalizzato 3% O ₂	NO Normalizzato 3% O ₂	SO ₂ Normalizzato 3% O ₂	Polveri Normalizzate al 3% O ₂
lt/h	KNm ³ /h	%	°C	%	mg/Nm ³	mg/Nm ³	mg/Nm ³	mg/Nm ³
200	7100	5	146	8,38	45,58	171,69	41,46	7,15


Portata gasolio	Portata aria	Apertura serranda aria	T° Fumi	O ₂	CO Normalizzato 3% O ₂	NO Normalizzato 3% O ₂	SO ₂ Normalizzato 3% O ₂	Polveri Normalizzate al 3% O ₂
lt/h	KNm ³ /h	%	°C	%	mg/Nm ³	mg/Nm ³	mg/Nm ³	mg/Nm ³
800	11290	21	226	2,29	15,36	124	68,58	7,25

Caldaia Ausiliaria 2

Data 11/03/2011

Portata gasolio	Portata aria	Apertura serranda aria	T° Fumi	O ₂	CO Normalizzato 3% O ₂	NO Normalizzato 3% O ₂	SO ₂ Normalizzato 3% O ₂	Polveri Normalizzate al 3% O ₂
lt/h	KNm ³ /h	%	°C	%	mg/Nm ³	mg/Nm ³	mg/Nm ³	mg/Nm ³
350	7248	5	203	5,97	24,68	129,2	65,4	5,41

Portata gasolio	Portata aria	Apertura serranda aria	T° Fumi	O ₂	CO Normalizzato 3% O ₂	NO Normalizzato 3% O ₂	SO ₂ Normalizzato 3% O ₂	Polveri Normalizzate al 3% O ₂
lt/h	KNm ³ /h	%	°C	%	mg/Nm ³	mg/Nm ³	mg/Nm ³	mg/Nm ³
800	10877	24	332	4,16	22,47	141,57	64,98	4,05

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4.2. Note (Discussione del risultato)

I limiti di legge prestabiliti normalizzati all'ossigeno di riferimento (3%), sono per i gas di 200 mg/Nm³ per gli NO_x , 100 mg/Nm³ di CO e 10 mg/Nm³ di particolato solido
Le concentrazioni riscontrate sono entro i limiti prefissati dall'A.I.A.

4.3. Eventuali eventi insoliti avvenuti durante la misurazione

Durante la misurazione non è stato riscontrato nessun evento insolito rilevante.

5. ALLEGATI

- 5.1. Allegato 1 - Fogli di acquisizione caldaia 1
- 5.2. Allegato 2 - Fogli di acquisizione caldaia 2
- 5.3. Allegato 3 - Tabelle Riassuntive Emissioni
- 5.4. Allegato 4 - Certificati strumentazione
- 5.5. Allegato 5 - Certificazione bombole di calibrazione

CENTRALE DI LERI CAVOUR Caldaia AUX 1 200 litri ora

Data e Ora	CO ppm	SO2 ppm	NO ppm	O2 % Vol	CO mg/Nm3 Norm 3% O2	SO2 mg/Nm3 Norm 3% O2	NOx (NO2) mg/Nm3 Norm 3% O2
10/3/11 15.37	23,82	10,09	57,49	8,86	44,14	42,80	174,76
10/3/11 15.38	25,32	9,98	59,19	8,26	44,72	40,32	171,48
10/3/11 15.39	23,10	9,78	58,55	8,34	41,04	39,77	170,61
10/3/11 15.40	22,98	9,86	58,57	8,28	40,65	39,90	169,91
10/3/11 15.41	24,82	10,02	59,02	8,30	43,97	40,64	171,47
10/3/11 15.42	24,22	11,50	58,88	8,39	43,23	46,96	172,34
10/3/11 15.43	23,05	11,56	60,45	8,44	41,28	47,36	177,55
10/3/11 15.44	23,98	10,16	59,92	8,43	42,91	41,60	175,88
10/3/11 15.45	27,47	9,46	59,48	8,34	48,82	38,47	173,41
10/3/11 15.46	24,19	9,50	59,61	8,27	42,76	38,42	172,78
10/3/11 15.47	27,48	10,33	58,67	8,48	49,38	42,44	172,89
10/3/11 15.48	26,90	10,03	58,68	8,31	47,68	40,65	170,55
10/3/11 15.49	24,85	9,61	58,99	8,21	43,70	38,66	170,13
10/3/11 15.50	24,58	9,46	59,33	8,22	43,28	38,11	171,35
10/3/11 15.51	23,61	10,01	59,79	8,28	41,76	40,51	173,45
10/3/11 15.52	24,16	10,25	59,69	8,21	42,51	41,26	172,25
10/3/11 15.53	24,83	10,38	58,87	8,15	43,46	41,59	169,03
10/3/11 15.54	25,18	10,69	58,49	8,08	43,86	42,61	167,09
10/3/11 15.55	25,73	10,01	57,66	8,07	44,76	39,84	164,52
10/3/11 15.56	26,14	10,05	57,53	8,14	45,74	40,23	165,09
10/3/11 15.57	24,83	10,07	58,64	8,15	43,47	40,32	168,35
10/3/11 15.58	24,18	9,97	58,97	8,18	42,44	40,02	169,72
10/3/11 15.59	23,20	9,96	59,63	8,20	40,78	40,05	171,89
10/3/11 16.00	23,30	9,88	59,08	8,21	40,98	39,74	170,41
10/3/11 16.01	23,73	10,11	59,66	8,15	41,56	40,51	171,37
10/3/11 16.02	25,25	10,00	59,42	8,13	44,13	39,98	170,31
10/3/11 16.03	25,91	10,37	58,63	8,03	44,96	41,16	166,87
10/3/11 16.04	25,50	10,52	58,87	8,03	44,23	41,74	167,47
10/3/11 16.05	23,79	10,73	59,28	8,10	41,51	42,81	169,62
10/3/11 16.06	24,10	10,90	59,60	8,07	41,93	43,39	170,06
10/3/11 16.07	23,79	10,77	59,55	8,21	41,86	43,34	171,84
10/3/11 16.08	22,93	10,61	60,60	8,14	40,10	42,46	173,86
10/3/11 16.09	24,08	10,56	59,73	8,05	41,84	41,97	170,17
10/3/11 16.10	25,12	10,58	59,05	7,99	43,44	41,85	167,49
10/3/11 16.11	26,11	10,37	58,68	7,99	45,17	41,03	166,47
10/3/11 16.12	25,79	10,24	58,91	8,07	44,89	40,78	168,14
10/3/11 16.13	24,64	9,96	59,59	8,13	43,07	39,83	170,84
10/3/11 16.14	28,11	9,58	58,04	8,14	49,17	38,32	166,50
10/3/11 16.15	25,33	9,29	57,63	8,74	46,51	39,03	173,52
10/3/11 16.16	23,66	9,06	56,88	8,80	43,65	38,24	172,12
10/3/11 16.17	24,95	8,66	56,71	8,86	46,24	36,72	172,37
10/3/11 16.18	27,58	8,37	57,94	8,61	50,08	34,79	172,54

CENTRALE DI LERI CAVOUR Caldaia AUX 1 200 litri ora

Data e Ora	CO ppm	SO2 ppm	NO ppm	O2 % Vol	CO mg/Nm3 Norm 3% O2	SO2 mg/Nm3 Norm 3% O2	NOx (NO2) mg/Nm3 Norm 3% O2
10/3/11 16.19	28,89	8,36	58,13	8,57	52,32	34,63	172,61
10/3/11 16.20	26,65	8,63	58,24	8,67	48,61	36,03	174,24
10/3/11 16.21	27,20	8,85	58,39	8,65	49,54	36,88	174,41
10/3/11 16.22	25,09	8,95	59,08	8,79	46,24	37,74	178,56
10/3/11 16.23	25,98	9,55	58,41	8,69	47,47	39,94	175,07
10/3/11 16.24	26,91	9,91	58,70	8,69	49,17	41,43	175,92
10/3/11 16.25	28,55	10,29	57,93	8,62	51,87	42,78	172,59
10/3/11 16.26	27,96	10,28	58,04	8,57	50,62	42,56	172,33
10/3/11 16.27	27,35	10,49	57,83	8,56	49,47	43,42	171,56
10/3/11 16.28	26,38	10,64	58,56	8,51	47,54	43,88	173,06
10/3/11 16.29	26,37	10,82	58,46	8,76	48,48	45,54	176,27
10/3/11 16.30	26,67	10,97	58,37	8,64	48,55	45,72	174,31
10/3/11 16.31	26,44	10,97	58,17	8,63	48,10	45,64	173,52
10/3/11 16.32	26,51	11,00	58,17	8,54	47,86	45,44	172,21
10/3/11 16.33	27,25	11,08	58,10	8,58	49,38	45,96	172,67
10/3/11 16.34	27,57	11,09	58,19	8,54	49,80	45,83	172,34
10/3/11 16.35	27,02	11,10	57,85	8,52	48,72	45,80	171,08
10/3/11 16.36	27,18	11,28	58,43	8,73	49,83	47,33	175,66
10/3/11 16.37	28,70	11,28	58,24	8,75	52,73	47,43	175,50
10/3/11 16.38	26,59	11,13	57,96	8,59	48,20	46,14	172,30
Media	25,54	10,16	58,70	8,38	45,58	41,46	171,69

CENTRALE DI LERI CAVOUR Caldaia AUX 1 800 litri ora

Data e Ora	CO ppm	SO2 ppm	NO ppm	O2 % Vol	CO mg/Nm3 Norm 3% O2	SO2 mg/Nm3 Norm 3% O2	NOx (NO2) mg/Nm3 Norm 3% O2
10/3/11 17.08	14,20	24,00	62,70	2,10	16,90	65,37	122,41
10/3/11 17.09	19,67	24,43	62,97	2,13	23,46	66,64	123,15
10/3/11 17.10	16,11	23,89	62,26	2,06	19,14	64,96	121,33
10/3/11 17.11	10,32	23,09	62,91	2,33	12,43	63,67	124,32
10/3/11 17.12	9,29	22,30	63,48	2,46	11,28	61,94	126,38
10/3/11 17.13	22,22	19,42	61,86	2,44	26,94	53,87	123,01
10/3/11 17.14	22,81	20,84	62,98	2,52	27,77	58,07	125,78
10/3/11 17.15	19,52	22,02	62,97	2,43	23,64	61,03	125,11
10/3/11 17.16	17,69	22,89	63,03	2,43	21,44	63,46	125,26
10/3/11 17.17	21,35	22,39	62,34	2,23	25,59	61,40	122,53
10/3/11 17.18	22,43	23,15	62,02	2,17	26,80	63,29	121,53
10/3/11 17.19	29,59	23,74	60,87	2,11	35,25	64,70	118,90
10/3/11 17.20	21,15	25,28	61,09	2,15	25,25	69,06	119,61
10/3/11 17.21	13,65	25,51	62,56	2,38	16,49	70,52	123,97
10/3/11 17.22	9,17	25,35	63,39	2,49	11,15	70,50	126,37
10/3/11 17.23	7,39	25,15	64,41	2,56	9,02	70,23	128,92
10/3/11 17.24	7,95	24,97	63,82	2,62	9,73	69,94	128,14
10/3/11 17.25	10,63	24,93	63,15	2,24	12,75	68,41	124,24
10/3/11 17.26	17,08	25,38	61,86	2,13	20,36	69,24	120,98
10/3/11 17.27	22,92	25,91	61,45	2,08	27,25	70,50	119,85
10/3/11 17.28	15,85	25,87	62,03	2,10	18,87	70,47	121,14
10/3/11 17.29	8,14	25,82	63,27	2,40	9,85	71,45	125,52
10/3/11 17.30	6,23	25,92	63,97	2,51	7,59	72,18	127,69
10/3/11 17.31	5,81	25,70	64,34	2,57	7,09	71,78	128,82
10/3/11 17.32	8,29	25,25	63,35	2,37	10,01	69,76	125,45
10/3/11 17.33	8,08	25,34	62,90	2,31	9,72	69,82	124,21
10/3/11 17.34	13,59	25,74	61,93	2,23	16,29	70,59	121,73
10/3/11 17.35	12,91	25,97	61,68	2,20	15,45	71,12	121,10
10/3/11 17.36	9,40	26,23	62,69	2,31	11,32	72,24	123,79
10/3/11 17.37	6,41	26,23	63,77	2,45	7,77	72,81	126,86
10/3/11 17.38	6,38	25,82	63,87	2,32	7,69	71,19	126,21
10/3/11 17.39	7,49	25,78	64,85	2,25	8,99	70,79	127,62
10/3/11 17.40	13,42	25,96	62,34	2,07	15,95	70,61	121,55
10/3/11 17.41	14,64	26,13	62,19	1,98	17,32	70,73	120,65
10/3/11 17.42	17,53	26,34	61,60	2,10	20,87	71,74	120,26
10/3/11 17.43	8,86	26,06	62,73	2,30	10,66	71,74	123,79
10/3/11 17.44	5,70	25,71	63,49	2,44	6,91	71,31	126,24
10/3/11 17.45	5,24	25,59	64,00	2,54	6,39	71,37	127,94
10/3/11 17.46	5,54	25,35	64,11	2,57	6,77	70,81	128,36
10/3/11 17.47	8,32	25,17	63,02	2,23	9,97	69,03	123,89
10/3/11 17.48	13,65	25,43	62,46	2,05	16,20	69,08	121,60
10/3/11 17.49	15,98	25,92	61,88	2,01	18,93	70,25	120,23
10/3/11 17.50	14,09	26,17	61,92	2,14	16,81	71,42	121,15
10/3/11 17.51	7,45	26,30	63,11	2,19	8,91	71,99	123,81
10/3/11 17.52	7,52	26,13	63,30	2,36	9,07	72,18	125,33
10/3/11 17.53	6,98	25,72	64,12	2,44	8,47	71,34	127,49
Media	12,80	24,92	62,85	2,29	15,36	68,58	124,00

CENTRALE DI LERI CAVOUR Caldaia AUX 2 350 litri ora

Data e Ora	CO ppm	SO2 ppm	NO ppm	O2 % Vol	CO mg/Nm3 Norm 3% O2	SO2 mg/Nm3 Norm 3% O2	NOx (NO2) mg/Nm3 Norm 3% O2
11/03/2011 11.59	29,525	9,033	54,433	8,579	53,48	37,44	161,71
11/03/2011 12.00	24,358	10,358	55,842	8,512	43,89	42,70	165,01
11/03/2011 12.01	18,858	11,442	56,733	8,207	33,17	46,04	163,64
11/03/2011 12.02	16,992	12,133	57,392	8,324	30,16	49,28	167,07
11/03/2011 12.03	14,325	12,775	57,492	8,163	25,11	51,23	165,26
11/03/2011 12.04	13,392	13,325	57,925	8,147	23,44	53,37	166,30
11/03/2011 12.05	12,892	14,117	58,167	8,263	22,77	57,06	168,52
11/03/2011 12.06	12,775	14,850	57,942	8,139	22,35	59,44	166,24
11/03/2011 12.07	10,367	14,650	59,250	8,192	18,21	58,88	170,70
11/03/2011 12.08	15,092	14,567	57,550	8,307	26,75	59,08	167,30
11/03/2011 12.09	17,975	14,908	49,950	6,822	28,53	54,13	130,01
11/03/2011 12.10	21,175	15,492	45,408	5,872	31,49	52,72	110,76
11/03/2011 12.11	26,150	16,517	44,225	5,541	38,06	55,00	105,56
11/03/2011 12.12	40,783	17,742	42,200	5,043	57,51	57,24	97,59
11/03/2011 12.13	17,525	18,725	46,258	5,554	25,53	62,41	110,51
11/03/2011 12.14	18,067	19,550	46,767	5,714	26,59	65,84	112,89
11/03/2011 12.15	16,967	19,950	48,267	5,777	25,08	67,46	116,99
11/03/2011 12.16	15,600	20,242	50,525	5,237	22,27	66,11	118,27
11/03/2011 12.17	13,558	20,217	51,667	5,607	19,82	67,61	123,85
11/03/2011 12.18	14,725	20,125	50,600	5,413	21,26	66,47	119,79
11/03/2011 12.19	17,167	20,208	49,033	5,069	24,25	65,30	113,57
11/03/2011 12.20	17,858	20,867	48,050	4,847	24,87	66,50	109,76
11/03/2011 12.21	20,125	21,117	47,067	4,766	27,89	66,96	106,98
11/03/2011 12.22	20,125	21,350	46,725	4,797	27,95	67,83	106,41
11/03/2011 12.23	16,750	21,075	48,508	5,047	23,62	68,01	112,20
11/03/2011 12.24	16,467	21,083	49,000	5,049	23,23	68,04	113,35
11/03/2011 12.25	17,158	21,150	49,608	5,070	24,23	68,35	114,91
11/03/2011 12.26	19,217	21,200	49,158	5,035	27,08	68,36	113,62
11/03/2011 12.27	19,733	21,733	47,983	4,837	27,47	69,22	109,54
11/03/2011 12.28	20,242	21,850	47,033	4,778	28,08	69,34	106,99
11/03/2011 12.29	20,792	22,175	46,817	4,725	28,74	70,14	106,15
11/03/2011 12.30	18,375	22,008	47,758	4,832	25,57	70,08	109,00
11/03/2011 12.31	18,608	22,075	48,342	4,820	25,88	70,24	110,25
11/03/2011 12.32	15,275	22,242	49,142	4,924	21,38	71,22	112,80
11/03/2011 12.33	15,183	22,000	49,192	4,915	21,24	70,41	112,85
11/03/2011 12.34	17,317	21,667	48,358	5,001	24,35	69,72	111,53
11/03/2011 12.35	15,367	21,425	47,983	4,791	21,33	68,05	109,23
11/03/2011 12.36	24,058	21,542	46,533	4,793	33,40	68,42	105,94
11/03/2011 12.37	19,092	21,650	46,592	4,783	26,49	68,73	106,02
11/03/2011 12.38	17,492	22,017	47,658	4,758	24,23	69,78	108,28
11/03/2011 12.39	14,242	22,133	49,325	5,049	20,09	71,43	114,11
11/03/2011 12.40	14,558	21,683	50,067	5,132	20,64	70,35	116,42
11/03/2011 12.41	14,383	21,158	49,125	4,982	20,20	68,00	113,16

CENTRALE DI LERI CAVOUR Caldaia AUX 2 350 litri ora

Data e Ora	CO ppm	SO2 ppm	NO ppm	O2 % Vol	CO mg/Nm3 Norm 3% O2	SO2 mg/Nm3 Norm 3% O2	NOx (NO2) mg/Nm3 Norm 3% O2
11/03/2011 12.42	17,900	21,108	47,942	4,911	25,03	67,54	109,95
11/03/2011 12.43	21,767	21,367	47,017	4,877	30,38	68,22	107,61
11/03/2011 12.44	20,525	21,525	46,942	4,877	28,64	68,73	107,44
11/03/2011 12.45	18,383	21,567	47,567	5,053	25,94	69,62	110,06
11/03/2011 12.46	18,158	21,567	47,775	4,972	25,49	69,27	109,99
11/03/2011 12.47	12,933	21,583	50,225	5,383	18,63	71,15	118,67
11/03/2011 12.48	7,492	21,692	57,217	6,208	11,40	75,49	142,74
11/03/2011 12.49	8,075	21,058	54,875	5,268	11,55	68,91	128,71
11/03/2011 12.50	25,642	20,808	48,867	4,422	34,80	64,62	108,77
11/03/2011 12.51	6,150	20,983	57,692	6,260	9,39	73,29	144,42
11/03/2011 12.52	6,717	20,850	62,200	7,450	11,15	79,21	169,39
11/03/2011 12.53	6,967	19,917	63,625	7,968	12,03	78,68	180,16
11/03/2011 12.54	6,450	19,067	64,508	8,204	11,34	76,71	186,03
11/03/2011 12.55	6,350	18,500	64,650	8,106	11,08	73,86	185,01
11/03/2011 12.56	5,825	17,675	64,225	8,092	10,15	70,49	183,61
11/03/2011 12.57	6,683	17,533	63,467	7,937	11,51	69,10	179,27
Media	16,55	19,20	51,63	5,97	24,68	65,40	129,20

CENTRALE DI LERI CAVOUR Caldaia AUX 2 800 litri ora

Data e Ora	CO ppm	SO2 ppm	NO ppm	O2 % Vol	CO mg/Nm3 Norm 3% O2	SO2 mg/Nm3 Norm 3% O2	NOx (NO2) mg/Nm3 Norm 3% O2
11/03/2011 10.45	23,467	9,742	54,842	4,562	32,12	30,51	123,11
11/03/2011 10.46	24,878	8,292	58,542	3,336	31,69	24,17	122,29
11/03/2011 10.47	23,758	12,517	62,942	4,835	33,07	39,86	143,68
11/03/2011 10.48	20,183	15,167	61,842	4,953	28,30	48,66	142,21
11/03/2011 10.49	20,658	16,792	61,050	4,862	28,80	53,57	139,60
11/03/2011 10.50	19,350	18,000	60,817	4,978	27,17	57,84	140,07
11/03/2011 10.51	19,758	18,683	60,908	5,097	27,96	60,48	141,33
11/03/2011 10.52	19,683	19,075	61,433	5,099	27,85	61,76	142,56
11/03/2011 10.53	18,808	19,308	62,117	5,094	26,61	62,49	144,10
11/03/2011 10.54	18,800	19,350	62,458	5,103	26,61	62,66	144,98
11/03/2011 10.55	18,175	19,467	61,958	5,074	25,68	62,93	143,56
11/03/2011 10.56	17,600	19,675	61,650	5,071	24,86	63,59	142,81
11/03/2011 10.57	18,383	19,575	61,000	5,035	25,91	63,12	140,99
11/03/2011 10.58	18,083	19,608	61,142	4,985	25,41	63,03	140,88
11/03/2011 10.59	17,342	19,592	61,400	5,098	24,54	63,43	142,48
11/03/2011 11.00	17,542	19,467	65,217	4,297	23,63	60,00	144,08
11/03/2011 11.01	17,442	20,008	66,392	4,167	23,31	61,19	145,54
11/03/2011 11.02	17,417	20,583	66,425	4,067	23,14	62,58	144,75
11/03/2011 11.03	17,633	20,883	66,050	4,043	23,40	63,40	143,73
11/03/2011 11.04	16,650	20,917	65,483	4,033	22,08	63,46	142,41
11/03/2011 11.05	17,283	20,900	65,042	4,073	22,97	63,56	141,78
11/03/2011 11.06	17,842	20,975	65,517	3,999	23,61	63,51	142,20
11/03/2011 11.07	17,042	21,417	66,242	4,019	22,58	64,93	143,95
11/03/2011 11.08	17,142	21,492	66,833	4,031	22,73	65,20	145,33
11/03/2011 11.09	16,725	21,558	67,083	3,953	22,07	65,10	145,20
11/03/2011 11.10	17,117	21,700	66,258	3,870	22,48	65,21	142,73
11/03/2011 11.11	16,858	21,900	65,692	3,822	22,08	65,63	141,11
11/03/2011 11.12	17,225	22,158	64,958	3,764	22,49	66,18	139,07
11/03/2011 11.13	17,400	22,183	64,800	3,895	22,89	66,76	139,79
11/03/2011 11.14	16,717	22,092	65,533	3,928	22,03	66,61	141,64
11/03/2011 11.15	16,317	22,275	66,350	3,935	21,51	67,20	143,47
11/03/2011 11.16	15,783	22,525	66,925	3,911	20,78	67,86	144,51
11/03/2011 11.17	15,117	22,717	66,525	3,907	19,90	68,42	143,61
11/03/2011 11.18	15,833	22,883	66,150	3,881	20,81	68,81	142,58
11/03/2011 11.19	15,842	23,025	65,167	3,868	20,80	69,19	140,36
11/03/2011 11.20	15,867	23,067	64,833	3,917	20,90	69,51	140,04
11/03/2011 11.21	15,983	23,208	64,992	3,893	21,02	69,84	140,19
11/03/2011 11.22	15,908	23,158	66,000	3,933	20,97	69,85	142,70
11/03/2011 11.23	15,400	23,233	66,233	3,951	20,32	70,15	143,35
11/03/2011 11.24	15,525	23,183	66,858	3,953	20,49	70,01	144,72
11/03/2011 11.25	15,250	23,150	66,258	3,878	20,04	69,60	142,79
11/03/2011 11.26	16,242	23,575	65,425	3,879	21,34	70,89	141,01

CENTRALE DI LERI CAVOUR Caldaia AUX 2 800 litri ora

Data e Ora	CO ppm	SO2 ppm	NO ppm	O2 % Vol	CO mg/Nm3 Norm 3% O2	SO2 mg/Nm3 Norm 3% O2	NOx (NO2) mg/Nm3 Norm 3% O2
11/03/2011 11.27	15,867	23,458	64,900	3,862	20,83	70,47	139,74
11/03/2011 11.28	15,100	23,267	65,033	3,898	19,87	70,03	140,31
11/03/2011 11.29	15,517	23,167	65,417	3,911	20,43	69,79	141,25
11/03/2011 11.30	14,992	23,217	65,983	3,938	19,77	70,05	142,70
11/03/2011 11.31	14,550	23,617	66,833	3,908	19,15	71,13	144,29
11/03/2011 11.32	14,483	23,525	66,542	3,904	19,06	70,84	143,62
11/03/2011 11.33	14,800	23,542	66,100	3,765	19,32	70,32	141,52
11/03/2011 11.34	14,342	23,975	65,425	3,860	18,83	72,01	140,85
11/03/2011 11.35	14,642	24,608	64,858	3,896	19,26	74,07	139,92
11/03/2011 11.36	14,583	24,600	65,400	3,813	19,09	73,68	140,41
11/03/2011 11.37	13,642	24,208	65,817	3,830	17,88	72,58	141,45
11/03/2011 11.38	13,833	24,042	66,417	3,818	18,12	72,03	142,64
11/03/2011 11.39	13,492	24,042	66,683	3,837	17,69	72,11	143,36
11/03/2011 11.40	13,600	23,942	66,350	3,817	17,81	71,73	142,48
11/03/2011 11.41	14,325	23,842	65,917	3,804	18,74	71,38	141,45
11/03/2011 11.42	13,633	23,967	65,367	3,781	17,81	71,65	140,08
11/03/2011 11.43	14,083	23,817	65,100	3,787	18,41	71,23	139,56
11/03/2011 11.44	14,783	23,692	65,525	3,875	19,42	71,22	141,19
Media	16,77	21,29	64,62	4,16	22,47	64,98	141,57

Centrale **TRINO V.**

Controllo semestrale Caldaia Ausiliaria 1

Data: 10/03/2011

Portata gasolio	Portata aria	Apertura serranda aria	T° Fumi	O ₂	CO Normalizzato 3% O ₂	NO Normalizzato 3% O ₂	SO ₂ Normalizzato 3% O ₂	Polveri Normalizzate al 3% O ₂
lt/h	KNm ³ /h	%	°C	%	mg/Nm ³	mg/Nm ³	mg/Nm ³	mg/Nm ³
200	4890	5	146	8,38	45,58	171,69	41,46	7,15

Portata gasolio	Portata aria	Apertura serranda aria	T° Fumi	O ₂	CO Normalizzato 3% O ₂	NO Normalizzato 3% O ₂	SO ₂ Normalizzato 3% O ₂	Polveri Normalizzate al 3% O ₂
lt/h	KNm ³ /h	%	°C	%	mg/Nm ³	mg/Nm ³	mg/Nm ³	mg/Nm ³
800	12890	21	226	2,29	15,36	124	68,58	7,25

Limiti emissioni: CO - 100 mg/Nm³; NO - 200 mg/Nm³

Centrale **TRINO V.**

Controllo semestrale Caldaia Ausiliaria 2

Data: 11/03/2011

Portata gasolio	Portata aria	Apertura serranda aria	T° Fumi	O ₂	CO Normalizzato 3% O ₂	NO Normalizzato 3% O ₂	SO ₂ Normalizzato 3% O ₂	Polveri Normalizzate al 3% O ₂
lt/h	KNm ³ /h	%	°C	%	mg/Nm ³	mg/Nm ³	mg/Nm ³	mg/Nm ³
350	7248	5	203	5,97	24,68	129,2	65,4	5,41

Portata gasolio	Portata aria	Apertura serranda aria	T° Fumi	O ₂	CO Normalizzato 3% O ₂	NO Normalizzato 3% O ₂	SO ₂ Normalizzato 3% O ₂	Polveri Normalizzate al 3% O ₂
lt/h	KNm ³ /h	%	°C	%	mg/Nm ³	mg/Nm ³	mg/Nm ³	mg/Nm ³
800	10877	24	332	4,16	22,47	141,57	64,98	4,05

Limiti emissioni: CO - 100 mg/Nm³; NO - 200 mg/Nm³

Allegato 4

(Certificazioni strumenti)



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CERTIFICATE

Number 3221476.06

Page 1 of 4

Applicant Siemens S.p.a. Industry Sector
Viale Piero e Alberto Pirelli, 10
20126 Milan
Italy

Submitted Analyser
Manufacturer : Horiba
Type : PG-250
HGS number : NUT30N0B

Calibration method A calibrated gas divider was used to dilute several VSL Primary Reference Gas Mixtures containing. Prior to the calibration the analyser was adjusted for zero and span gas for each component. In this way the relationship between actual concentration and displayed concentration was recorded. During calibration the laboratory temperature condition was stabilized at $(20.5 \pm 0.5) ^\circ\text{C}$.

Date of calibration 18 June 2010

Result The results of the calibration are presented on pages 2, 3 and 4.

The reported uncertainty of measurement is based on the standard uncertainty of measurement multiplied by a coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with the Guide to the Expression of Uncertainty in Measurement (GUM).

Traceability The results of the calibration services of VSL are traceable to primary and/or (inter)nationally accepted measurement standards.

Delft, 18 June 2010
VSL B.V.

R.P. van Otterloo
Allround Metrologist K&R



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This certificate is consistent with Calibration and Measurement Capabilities (CMCs) that are included in Appendix C of the Mutual Recognition Arrangement (MRA) drawn up by the International Committee for Weights and Measures (CIPM). Under the MRA, all participating institutes recognize the validity of each other's calibration and measurement certificates for the quantities, ranges and measurement uncertainties specified in Appendix C (for details see <http://kcdb.bipm.fr>).

VSL B.V.

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Analyser

Manufacturer : Horiba
Type : PG-250
HGS number : NUT30N0B

Result

Component: O ₂	
Supplied concentration [%]	Displayed concentration [%]
0.00	0.00 ± 0.01
2.13	2.15 ± 0.01
4.30	4.32 ± 0.01
8.67	8.70 ± 0.01
12.97	12.98 ± 0.01
17.47	17.47 ± 0.01
22.01	22.01 ± 0.01
17.47	17.54 ± 0.01
12.97	13.08 ± 0.01
8.67	8.78 ± 0.01
4.30	4.39 ± 0.01
2.13	2.19 ± 0.01
0.00	-0.01 ± 0.01

Component: CO ₂	
Supplied concentration [%]	Displayed concentration [%]
0.00	-0.01 ± 0.01
0.55	0.43 ± 0.01
1.10	0.99 ± 0.01
2.21	2.18 ± 0.01
3.29	3.29 ± 0.01
4.39	4.39 ± 0.01
4.94	4.94 ± 0.01
4.39	4.41 ± 0.01
3.29	3.30 ± 0.01
2.21	2.20 ± 0.01
1.10	1.02 ± 0.01
0.55	0.44 ± 0.01
0.00	-0.01 ± 0.01



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Component: CO	
Supplied concentration [ppm]	Displayed concentration [ppm]
0.0	-0.1 ± 0.1
20.0	20.0 ± 0.1
40.1	40.1 ± 0.2
80.3	80.5 ± 0.1
119.5	119.8 ± 0.1
159.8	160.5 ± 0.2
200.2	200.9 ± 0.1
159.8	160.7 ± 0.1
119.5	120.6 ± 0.1
80.3	81.6 ± 0.1
40.1	41.4 ± 0.1
20.0	20.6 ± 0.1
0.0	0.7 ± 0.1

Component: NO	
Supplied concentration [ppm]	Displayed concentration [ppm]
0.0	0.1 ± 0.1
10.0	9.6 ± 0.1
20.0	19.5 ± 0.1
40.1	39.4 ± 0.1
59.7	59.0 ± 0.1
79.8	79.3 ± 0.1
99.9	99.9 ± 0.1
79.8	79.6 ± 0.1
59.7	59.3 ± 0.1
40.1	39.8 ± 0.1
20.0	19.8 ± 0.1
10.0	9.8 ± 0.1
0.0	0.1 ± 0.1



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Number 3221476.06

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Component: NO ₂	
Supplied concentration [ppm]	Displayed concentration [ppm]
0.0	0.1 ± 0.1
20.1	18.7 ± 0.1
40.2	37.8 ± 0.1
59.8	56.4 ± 0.1
79.9	75.7 ± 0.1
100.1	95.2 ± 0.1

Component: SO ₂	
Supplied concentration [ppm]	Displayed concentration [ppm]
0.0	-0.3 ± 0.1
20.0	19.0 ± 0.2
40.1	38.9 ± 0.1
80.3	78.8 ± 0.1
119.5	117.7 ± 0.1
159.8	158.7 ± 0.1
200.1	199.7 ± 0.1
159.8	159.7 ± 0.1
119.5	119.4 ± 0.2
80.3	80.5 ± 0.1
40.1	40.4 ± 0.2
20.0	20.1 ± 0.1
0.0	0.0 ± 0.1

Remark

The uncertainty in the supplied concentration is 0.5 % relative



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Allegato 5

(Certificazioni bombole)



CERTIFICADO DE CALIBRACIÓN

Certificate of Calibration

Número
Number 3721/10

Página 1 de 4 páginas
Page 1 of 4 pages

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An **AIR PRODUCTS** Company

OBJETO

Item

GAS MIXTURE

MARCA

Mark

CARBUROS METÁLICOS

MODELO

Model

PR 303729

IDENTIFICACIÓN

Identification

Inspection lot n° : 40003027968 Cylinder n° : 997463

SOLICITANTE:

Applicant

AIR PRODUCTS
Zoning Industriel de Keumiée, Rue de la Spinette, 37
B-5140 - Sombrefe (Belgium)

FECHAS DE CALIBRACIÓN

Date/s of calibration

03/08/2010 12/08/2010

Signatario/s autorizado/s

Authorised signatory/ies

J. Aragonès
Laboratory manager

S. E. CARBUROS METALICOS, S. A.
LABORATORIO GASES ESPECIALES
ST. CELONI

Fecha de emisión

Date of issue

12/08/2010

Este certificado se expide de acuerdo con las condiciones de la acreditación concedida por ENAC que ha comprobado las capacidades de medida del laboratorio y su trazabilidad a patrones nacionales o internacionales.

ENAC es firmante del Acuerdo de Reconocimiento Mutuo (MLA) de calibración de European Cooperation for Accreditation (EA) y de International Laboratory Accreditation Cooperation (ILAC).

This certificate is issued in accordance with the conditions of accreditation granted by ENAC which has assessed the measurements capability of the laboratory and its traceability to national or international standards.

ENAC is one of the signatories of the Multilateral Agreement of the European Cooperation for Accreditation (EA) and the International Laboratory Accreditation Cooperation (ILAC).

CERTIFICATE OF CALIBRATION N° 3721/10

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1. CALIBRATION PROCESS

The concentration of the calibrated components has been determined by direct comparison against standard mixtures, which are traceable to reference materials, according to the processes that are indicated subsequently:

Components	Calibration process
Sulfur dioxide (SO ₂)	MA 511A

2. RESULTS

Components	Concentration	Expanded uncertainty	k	V _{ef}
Sulfur dioxide	68.8 · 10 ⁻⁶ (mol/mol)	1.1 · 10 ⁻⁶ (mol/mol)	2.05	39130
Nitrogen	Balance			

1 % = 1 · 10⁻² mol/mol // 1 ppm = 1 · 10⁻⁶ mol/mol // 1 ppb = 1 · 10⁻⁹ mol/mol

The expanded uncertainty of measuring has been obtained multiplying the typical uncertainty by the covering factor k which for a t Student's distribution with V_{ef} degrees of freedom equals to a cover probability about 95%. The typical uncertainty of measuring has been determined according to the EA-4/02 document.

3. ENVIRONMENTAL CONDITIONS

Laboratory temperature during the calibrations has been maintained between 20 °C and 30 °C.

This certificate is issued by S.E. Carburos Metálicos S.A. in accordance with the conditions of accreditation n° 99/LC216 granted by ENAC according to the norm ISO/IEC 17025:2005.

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**CARBUROS
METALICOS**

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CERTIFICATE OF CALIBRATION N° 3721/10

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4. REMARKS

The information of this section is not included in the scope of the accreditation.

- Cylinder type : Aluminium 10 L
- Valve outlet connection : U02
- Filling pressure at 15 °C : 200 bar
- Gas volume : 1,78 Nm³
- Stability : 2 year/s
- Maintain storage and use temperature between -10°C y 50°C.
- Do not use below a pressure of 10 bar.

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CERTIFICATE OF CALIBRATION N° 3721/10

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5. TRACEABILITY

The calibration of this mixture is traceable to organisms signatories of the Mutual Recognition Agreement (MRA) of the International Bureau of Weights and Measure (BIPM).

Cylinder n°: S188 Certificate NPL n°: E08090176-4

Cylinder n°: 194867 Certificate NPL n°: E08090176-3

This certificate is issued by S.E. Carbueros Metálicos S.A. in accordance with the conditions of accreditation n° 99/LC216 granted by ENAC according to the norm ISO/IEC 17025:2005.

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CERTIFICADO DE CALIBRACIÓN

Certificate of Calibration

Número
Number 3709/10

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Page 1 of 4 pages

S.E. DE CARBUROS METÁLICOS S. A.
LABORATORIO DE GASES ESPECIALES
Carretera C-35-Km.59.2
08470 Sant Celoni (Barcelona)
Tel. 93 8673815
Fax 93 8673248



An **PRODUCTS** Company

OBJETO

Item

GAS MIXTURE

MARCA

Mark

CARBUROS METÁLICOS

MODELO

Model

PR 303733

IDENTIFICACIÓN

Identification

Inspection lot n° : 40003030131 Cylinder n° : 997498

SOLICITANTE:

Applicant

AIR PRODUCTS
Zoning Industriel de Keumiée, Rue de la Spinette, 37
B-5140 - Sombrefe (Belgium)

FECHAS DE CALIBRACIÓN

Date/s of calibration

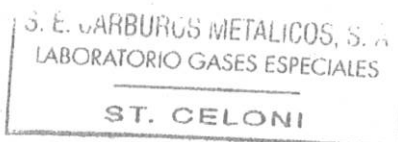
04/08/2010

Signatario/s autorizado/s

Authorised signatory/ies

pa.

J. Aragonès
Laboratory manager



Fecha de emisión

Date of issue

04/08/2010

Este certificado se expide de acuerdo con las condiciones de la acreditación concedida por ENAC que ha comprobado las capacidades de medida del laboratorio y su trazabilidad a patrones nacionales o internacionales.

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ENAC is one of the signatories of the Multilateral Agreement of the European Cooperation for Accreditation (EA) and the International Laboratory Accreditation Cooperation (ILAC).



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CERTIFICATE OF CALIBRATION N° 3709/10

Page 2 of 4 pages

1. CALIBRATION PROCESS

The concentration of the calibrated components has been determined by direct comparison against standard mixtures, which are traceable to reference materials, according to the processes that are indicated subsequently:

Components	Calibration process
Nitric oxide (NO)	MA 503A - 13

2. RESULTS

Components	Concentration	Expanded uncertainty	k	V _{ef}
Nitric oxide	201.0 · 10 ⁻⁶ (mol/mol)	2.7 · 10 ⁻⁶ (mol/mol)	2.05	2880
NOx*	202.1 · 10 ⁻⁶ (mol/mol)	2.7 · 10 ⁻⁶ (mol/mol)	2.05	3443
Nitrogen	Balance			

1 % = 1 · 10⁻² mol/mol // 1 ppm = 1 · 10⁻⁶ mol/mol // 1 ppb = 1 · 10⁻⁹ mol/mol

*Calibrations not included in scope of accreditation.

The expanded uncertainty of measuring has been obtained multiplying the typical uncertainty by the covering factor k which for a t Student's distribution with V_{ef} degrees of freedom equals to a cover probability about 95%. The typical uncertainty of measuring has been determined according to the EA-4/02 document.

3. ENVIRONMENTAL CONDITIONS

Laboratory temperature during the calibrations has been maintained between 20 °C and 30 °C.

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CERTIFICATE OF CALIBRATION Nº 3709/10

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4. REMARKS

The information of this section is not included in the scope of the accreditation.

- Cylinder type : Aluminium 10 L
- Valve outlet connection : U02
- Filling pressure at 15 °C : 200 bar
- Gas volume : 1,78 Nm³
- Stability : 3 year/s
- Maintain storage and use temperature between -10°C y 50°C.
- Do not use below a pressure of 10 bar.

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CERTIFICATE OF CALIBRATION N° 3709/10

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5. TRACEABILITY

The calibration of this mixture is traceable to organisms signatories of the Mutual Recognition Agreement (MRA) of the International Bureau of Weights and Measure (BIPM).

Cylinder n°: 2015467 Certificate NMI n°: 3220786-05

Cylinder n°: 2015873 Certificate NMI n°: 3220786-04

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CERTIFICADO DE CALIBRACIÓN

Certificate of Calibration



Número
Number 3719/10

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Page 1 of 4 pages

S.E. DE CARBUROS METÁLICOS S. A.
LABORATORIO DE GASES ESPECIALES
Carretera C-35-Km.59.2
08470 Sant Celoni (Barcelona)
Tel. 93 8673815
Fax 93 8673248



An **AIR PRODUCTS** Company

OBJETO

Item

GAS MIXTURE

MARCA

Mark

CARBUROS METÁLICOS

MODELO

Model

PR 303730

IDENTIFICACIÓN

Identification

Inspection lot n° : 40003026034 Cylinder n° : 997501

SOLICITANTE:

Applicant

AIR PRODUCTS
Zoning Industriel de Keumiée, Rue de la Spinette, 37
B-5140 - Sombreffe (Belgium)

FECHAS DE CALIBRACIÓN

Date/s of calibration

10/08/2010

Signatario/s autorizado/s

Authorised signatory/ies


J. Aragonès

Laboratory manager

S. E. CARBUROS METALICOS, S. A.
LABORATORIO GASES ESPECIALES
ST. CELONI

Fecha de emisión

Date of issue

11/08/2010

Este certificado se expide de acuerdo con las condiciones de la acreditación concedida por ENAC que ha comprobado las capacidades de medida del laboratorio y su trazabilidad a patrones nacionales o internacionales.

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CERTIFICATE OF CALIBRATION N° 3719/10

Page 2 of 4 pages

1. CALIBRATION PROCESS

The concentration of the calibrated components has been determined by direct comparison against standard mixtures, which are traceable to reference materials, according to the processes that are indicated subsequently:

Components	Calibration process
Carbon monoxide (CO)	MA 110A

2. RESULTS

Components	Concentration	Expanded uncertainty	k	V _{ef}
Carbon monoxide	$406.6 \cdot 10^{-6}(\text{mol/mol})$	$3.7 \cdot 10^{-6}(\text{mol/mol})$	2.05	365
Nitrogen	Balance			

$1\% = 1 \cdot 10^{-2} \text{ mol/mol}$ // $1 \text{ ppm} = 1 \cdot 10^{-6} \text{ mol/mol}$ // $1 \text{ ppb} = 1 \cdot 10^{-9} \text{ mol/mol}$

The expanded uncertainty of measuring has been obtained multiplying the typical uncertainty by the covering factor k which for a t Student's distribution with V_{ef} degrees of freedom equals to a cover probability about 95%. The typical uncertainty of measuring has been determined according to the EA-4/02 document.

3. ENVIRONMENTAL CONDITIONS

Laboratory temperature during the calibrations has been maintained between 20 °C and 30 °C.

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**CARBUROS
METÁLICOS**

An **AIR PRODUCTS** Company

CERTIFICATE OF CALIBRATION N° 3719/10

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4. REMARKS

The information of this section is not included in the scope of the accreditation.

- Cylinder type : Aluminium 10 L
- Valve outlet connection : U02
- Filling pressure at 15 °C : 200 bar
- Gas volume : 1,78 Nm³
- Stability : 3 year/s
- Maintain storage and use temperature between -10°C y 50°C.
- Do not use below a pressure of 10 bar.

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CERTIFICATE OF CALIBRATION N° 3719/10

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5. TRACEABILITY

The calibration of this mixture is traceable to organisms signatories of the Mutual Recognition Agreement (MRA) of the International Bureau of Weights and Measure (BIPM).

Cylinder n°: 150191 Certificate VSL n°: 3221254-05

Cylinder n°: 150190 Certificate VSL n°: 3221254-06

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