

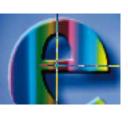
Enhanced environmental protection inspection for efficient control of air quality monitoring and of all entities under obligation within system of greenhouse gas emission allowance trading, in order to achieve better quality of air in Republic of Croatia















THEME 6: QA/QC (quality assurance/quality control)

Mato Papić dipl. ing. stroj. Bojan Abramović dipl. ing. stroj.

According to ISO 8402, we can say that:

The quality - the totality of the characteristics of an entity that demonstrates its ability to comply with the stated or implied requirements and / or needs.

Targeted data quality - represents the legal minimum required for the quality of data obtained by air quality measurements in one year.



- Only data that can be used to document the target quality can be used to run any kind of legally prescribed procedures.
- •Almost all measurements of air quality are determined by regulatory or inspection. Because of this, achieving and documenting the targeted quality of data sets as the primary goal of all QA / QC procedures in a network.



Targeted data quality

Parametar/onečišćujuća tvar	Sumporov dioksid, dušikov dioksid i oksidi dušika	Benzen	Ugljikov monoksid	Lebdeće čestice (PM10/PM2,5) i olovo	Ozon i pridruženi dušikovi oksidi: NO i NO2	
Stalna mjerenja:(1) nesigurnost minimalan obuhvat podataka Minimalna vremenska pokrivenost (gradska, pozadinska, prometna)	15% 90% - -	25% 90% 35% ⁽²⁾ 90%	15% 90% - -	25% 90% - -	15% 90% ljeti 75% zimi –	
Indikativna mjerenja: (14) nesigurnost minimalan obuhvat podataka minimalna vremenska pokrivenost	25% 90% 1.4% ⁽⁴⁾	30% 90% 14% ⁽³⁾	25% 90% 14% ⁽⁴	50% 90% 14% ⁽⁴⁾	30% 90% > 10% ljeti	





Targeted data quality (extension table)

Parametar/onečišćujuća tvar	Sumporov dioksid, dušikov dioksid i oksidi dušika	Benzen	Ugljikov monoksid	Lebdeće čestice (PM10/PM2,5) i olovo	Ozon i pridruženi dušikovi oksidi: NO i NO2
Nesigurnost modeliranja: satna 8-satni prosjeci dnevni prosjeci godišnji prosjeci	50% 50% 30%	- - - 50%	50% - -	nije definirano 50%	- 50% 50%
Objektivna procjena: nesigumost	75%	100%	75%	100%	75%



QA/QC plan network is the basic document on quality assurance of measurements in each network. It contains all the basic information on how quality assurance network is organized. QA/QC plan should have the following

structure:

1. UVOD

Svrha

Opseg

2. REFERENTNI DOKUMENTI

Zakonska regulativa Normativna regulativa

3. CILJANA KVALITETA PODATAKA

4. DIZAJN MREŽE

Onečišćujuće tvari koje se prate
 Kriteriji i dokumentacija za određivanje lokacija mjernih postaja
 Lokacije postaja

4.2 Oprema i mjerne metode

Mjerna oprema – certifikati o tipskim odobrenjima QA/QC oprema

- 4.3 Mjerne metode
- 4.5 Organizacijska shema

Organizacijske jedinice i njihove funkcije





Extension table

5. POSTUPCI OSIGURANJA I KONTROLE KVALITETE

Postupci preventivnog održavanja Postupci kontrole kvalitete na postaji

6. MJERNA NESIGURNOST

Sastavnice sastavljene mjerne nesigurnosti Izračun mjerne nesigurnosti na razini GV-a

7. IZVJEŠĆA O MJERENJIMA

Ratifikacijska izvješća Godišnje izvješće



Below I will briefly discuss all the chapters that should include a QA / QC plan with special emphasis on the section on quality assurance and quality assurance procedures.

1. INTRODUCTION

In the introduction it is necessary to mention the importance of quality assurance and briefly define the purpose and scope of the document. It is also necessary to specify the basic goals of the network, as well as the reasons for its establishment.



2. REFERENCE DOCUMENTS

This is an extremely important chapter. It should contain all reference documents that are referred to in the plan and which regulate and normatively define the operation of the network. By referring to legally or normatively defined methods of metering, and their consistent implementation and documenting, we ensure not only compliance but also disable the often malicious attempts to undermine the quality assurance of measurement. This also ensures the results of measurements that can be in practice and which are not acceptable to some.



The Croatian regulation is almost fully harmonized with the European one. However, some of the guidelines issued by various environmental bodies in the EU can be of great help in defining QA / QC procedures.

Regulations Of The REPUBLIC Of CROATIA

- The law on air protection (Official Gazette, no. 130/11, 47/14, 61/17)
- Rulebook on monitoring air quality (Official Gazette 79/17)
- Ordinance on the mutual exchange of information and the reporting of air quality and commitments for the implementation of the decisions of the Commission 2011/850/EU (Official Gazette 3/16)
- The regulation on the levels of pollutants in the air (OFFICIAL GAZETTE 117/12)



Regulations and guidelines of the EU

- Directive 2008/50/EC of the European Parliament and of the Council
- Commission Directive (EU) 2015/1480
- Implementing the Commission's decision of 12. December 2011. laying down rules for Directive 2004/107/EC and 2008/50/EC of the European Parliament and of the Council concerning the mutual exchange of information and reporting on the quality of the air (2011/850/EU)
- Guidance on the Decision 2011/850/EU
- "Criteria for EUROAIRNET The EEA Air Quality Monitoring and Information Network"; EEA Technical Report No. 12
- "QA/QC checks on air quality data in AIRBASE and on the EoI 2004 data Procedures and results"; ETC/ACC Technical paper 2005/3 September 2005; Wim Mol and Patrick van Hooydonk





When referring to the normative regulation in the QA / QC plan, it is necessary to state the general normative acts under which the measurements are carried out and to note that specific norms are mentioned in the lower quality assurance documents. The most important general normative acts relevant to quality assurance in the area of air quality are:

- HRN EN ISO / IEC 17025 General requirements for the qualification of testing and calibration laboratories
- ENV 13005, Guide to the expression of uncertainty in
- measurement
- EN ISO 14956:2002 Air quality. Evaluation of the suitability of a measurement procedure by comparison with a required measurement uncertainty.



3. TARGETED DATA QUALITY

It is necessary to mention the target quality data set for the pollutant and the types of measurement / modeling that are implemented in the network.

4. NETWORK DESIGN

In this chapter it is necessary to specify in detail how the network is designed. When writing this chapter that refers to points 4.1 to 4.3 QA/QC plan should respect the provisions of the regulations on the exchange of information about the data from the network for permanent monitoring of air quality (OFFICIAL GAZETTE 135/06) which defines the so-called metadata about the network, and each individual station.



5. QUALITY INSURANCE CONTROL

The primary goal of QA / QC procedures is to ensure targeted data quality and provide documentation that will document it. The quality system shall be written in accordance with the provisions of the EN ISO / IEC 17025 – General requirements for the competence of testing and calibration laboratories and certain prescribed measurement methods standards. Although each network has its own specifics, insurance and quality control for automatic measurements typically consists of the below described procedures.



Preventive maintenance procedures

Preventive maintenance of instruments is based on measurement methods, equipment manufacturer recommendations and experience. Typically consists of:

- regular status verification of the instrument's technical validity
- regular service and checking of the station
- regular maintenance of the system for sampling
- the regular annual services.



Quality control procedures at the stations

Quality control procedures on the station should be designed on the basis of the norms of the measurement methods, the recommendations of the manufacturer of the equipment and the experience. These procedures are used primarily to control the daily work of the instruments, or the total of the measuring system. This gives regular insight into the functionality of the instruments and enables a timely reaction to irregularities in the work of instruments that could otherwise remain unnoticed for a long time.



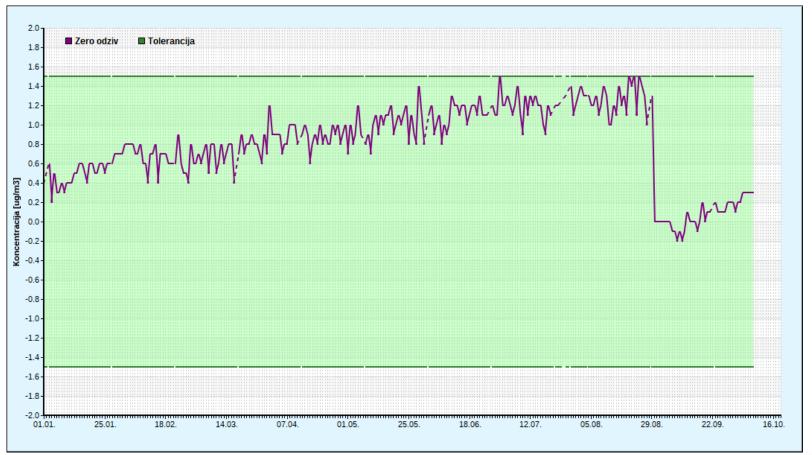


Quality control procedures at the stations usually consist of:

- checking the response og the zero gas "ZERO CHECKING,
- checking the response of the calibration gas "SPAN CHECKING,
- calibration at two points
- recertification of gases
- testing of the sampling line
- testing of the sampler manifolds.

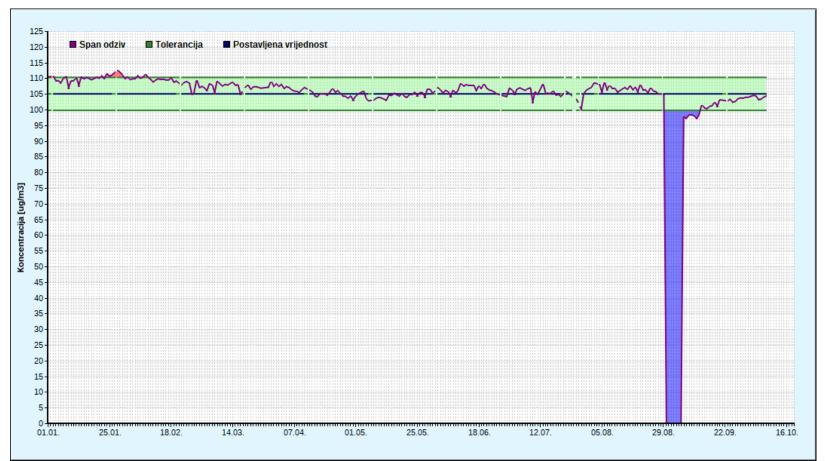


Quality control procedures at the stations





Quality control procedures at the stations





Calibration and tests in the laboratory

After each annual service or after major servicing of the instrument the calibration and testing of the instrument is performed in a calibration laboratory. Such tests, as well as, quality control data in the station together with the data obtained during the performance of the type approval tests are used to calculate the measurement uncertainty that is being carried out each year. Operating performance tests are designed based on standardized metering methods. Also for the conducted tests, in the standards for certain methods, the acceptable limits have to be met.



Such procedures typically consist of:

- calibration with certified or primary standards
- "lack of fit" test in three or four points and zero gas
- testing of repeatability standard deviation
- testing of short-term offset



For the purpose of quality assurance and quality control, documentation is developed which describes the procedures and establishes documents that document the regular conduct of the procedures.

Performing procedures should ensure the proper functioning of the equipment both in the technical and in the analytical sense, enable the prediction of possible problems and their avoidance or elimination as soon as possible.

All completed procedures need to be well documented and kept in line with the legal and normative regulations.



DOCUMENTATION

6.2 QA/QC PLAN NETWORK

ISPITIN LABORATOR,J							
eLAB-PI-01	Imisijska ispitivanja	eLAB-PE-01	Emisijska ispitivanja				
eLAB-PI-02	Imisijska oprema	eLAB-PE-02	Emisijska oprema				
eLAB-PI-03	Prikazivanje rezultata imisijskih ispitivanja	eLAB-PE-03	Prikazivanje rezultata emisijskih ispitivanja				
eLAB-PI-101	Mjerenje koncentracije CO	eLAB-PE-101	Uzorkovanje plinova radi određivanja koncentracije				
eLAB-PI-102	Mjerenje koncentracije SO 2	eLAB-PE-102	Uzorkovanje sumporovih oksida - mokra metoda				
eLAB-PI-103	Mjerenje koncentracije H 2 S	eLAB-PE-103	Mjerenje emisije analizatorom PG-250				
eLAB-PI-104	Mjerenje koncentracije NOx	eLAB-PE-104	Mjerenje emisije krutih čestica sustavom ITES				
eLAB-PI-105	Mjerenje koncentracije C 6 H 6	eLAB-PE-105	Mjerenje emisije krutih čestica GRAVIMATOM				
eLAB-PI-106	Mjerenje koncentracije O 3	eLAB-PE-106	Mjerenje temperature u kanalu otpadnih plinova				
		eLAB-PE-107	Mjerenje vlage u otpadnom plinu				
		eLAB-PE-108	Računsko određivanje vlage				
		eLAB-PE-109	Određivanje dimnog broja				
eLAB-RI-101	Validacija mjernih podataka	eLAB-RE-101	Provjera funkcionalnosti sustava za odsis i hlađenje				
eLAB-RI-102	Procjena prikladnosti	eLAB-RE-102	Rad s analitičkom vagom				
eLAB-RI-103	Provjera sustava za prijenos podataka	eLAB-RE-103	Rad s preciznom vagom				
eLAB-RI-104	Održavanje i provjera sustava za uzorkovanje	eLAB-RE-104	Rad sa sušionikom Memmert UNB-200				
eLAB-RI-105	Održavanje mjernih postaja	eLAB-RE-105	Rad s mjernim uređajem Almemo 2590				
eLAB-RI-106	Ugađanje analizatora u mjernoj postaji	eLAB-RE-106	Preračunavanje izmjerenih vrijednosti emisije				
eLAB-RI-107	Redovno godišnje održavanje instrumenata						
eLAB-RI-108	Korištenje ISKAZ-a						

			LABOR	ATORUI			
			HARRY PERS	CNA SCHITTE		_	
dillenid	i						
		2007.0		487500	Popis matikje čaninti kai naprodrušta Pina kolekudir Pina kolekudir Pina kolekudir Pina kolekudir Popis matikumatis Katinia naprodeljamanis i nris Popis malima Popis malima Portoda a matradisjoj inclina Portoda a matradisjoj Portoda a matradisjoj Portoda a matradisjoj Portoda a matradisjoj Portoda matradisjoj Portoda a matradisjoj Portoda a matradisjoj Portoda matradisjoj Portoda a		
				407000	Program reproduljavanja Katrica reproduljavani i sela	dimje	
				101000	Propin auditoru Bentopia Batanian australiaini laukan		
				407000	Patenda a sepandidjenesti Jajan a melilja		
				4M FEEDER	epervanjskog smaleša Plan povedbe liječniških pos Analina rieša nesvidna —	gloda	
				-	Pies povodbe lipivishih par kanisa risha sepri dramosi lime meldija Projis seniralishih dalamenala Projis seniralishih dalamenala Projis Teori pramata Zepischiva seniralis Projis senjisa Minoramban laharutarija Priming liminemina Sana lengura		
		4000	Lindour de bounemake	487000	Propin umatrudiojih dolo umersud Propin numjolich deli umersuda		
				4.007.0004	Zepintikus unterka Resolutoramento		
		6077	Linforr coping	40700	Propin septina		
				481800	Reservation Internstorija		
		2007.00	Protopiliranje nakljeva, semala i semora	40070000	Printe/Antenira Sessiones		
		4400	Nation a subage (687500	Lahijer samaheru Pengini robe i usinge Bana deberijalu Jadaria u naderoljstva bagua		
				40070000	Progled rate i unlarge Sansa deber hala		
		607.0	Employee Suppress	40700	Anderia e madernijstva Impea		
		KM17	Ninte	481500 481500 481500	Prijessprindle Spiesseje prindle Prijesskile Spiesseje kile		
		6879		201720	lipiano(ryrindia		
					Spiessoprialie		
		6879	kailar er skiaderes		irejelisje neskladomi		
		AUR 10	Processor and a selector	497930	inspiritaj a propraemoj raskoji		
		448711	Processioner realisier	4871100	leojeliuju perendirmoj nadoj Plan alstronosti i perendirali	i radio	
		2000	Destroits) and t	207000	Program unuivalning and its		
				5 M F 12 M S	Program omiralning audito Plan omiralning audita Opinish - HEX EX EX/SEC 17 Opinish - HEX EX EX/SEC 17 Spripting omiralning audita	iot Hil	
				687 200	larejednoj umatradnijeg analita		
		2007	Freispilleunije servetivnija	500 COM	lenjeliu) uposev lenjeliu) u staniu nadav	ndjenje	
			Francisco militare aministrativa			_	
		2007	erestata	507.000	Ominaleja kontrola kvalitete Venikovanie medalah men	sie seerde	
				487 100	Program hominale les dillete Flan hominale les dillete		
				687500	Proteini melalakerakerjian Jeografia melalakerakerjia	apanda aj apanda	
	ISRTN LA	BORATORU		UMENU	BORROW	LABORATOR J. ZALISPT	TVANE SPOROBLOS
							Naninarje i provodenie
MARKET .	mojske ispirivoje	4400	mojski ipilooje Inisiski saar	648.00	Droma as an investiga	CHARLE .	liptifornje uproslovnski lanjedanji u kontinunje
2112/F41	Principality mediate	640 FEB.	Pilantanji wadata	64 FF 65	Principal residents	50000	predest
essentiti.	Njermje lamentranje (D	64877301	modishi ketimaja Surkovaje planov mili utodinasia k	ALE POINT	Improvenje Improvenje imiglah	ALERO III	Spelinsop questional a
SMRIE	Opromje lamanskom sje Eliv	648730	Search and amproved	X107010	Injewey mights	#11E FO 102	Spirituraje specularenti u molisiaras
estate.	Namanje komentomije Kr I	diff man	Compressor malestane (C.23)	ALC: U	Graftsharp plantid rejelenter		
essente.	Njermje lamoniracije M2 c	dament.	Greenje zeninje bruisk Imilian malanam EEEE				
SMRIE	Colle	diff man	Greenje emisije brusik Instise CAUSCHATON				
PARTY 100	Njermje lamoninacje i r	6.0070.000	Kjerneje inmperature u Iemalu nipsolnih pilmovu				
		63878-007	ejou				
		days on	liniumin submilismeje elege				
-110 M 101	feldinja njeroh	4400000	Televalivanje dimneg breja Projeva fanktimakosit	4000000	Pdupijanje i strada	-111.00.111	lipitimoji konspransi
534 P. SE	Projesa práladnosti	A44 W 102	intere es esta titledesje led canalitiken ragum	AMERICA	minimus (prosjena	2148 SO 151	lateria lateria delijeljatur priminasti
644.00	Programman as	AUT III	lied spresioners region	AUDIO	Ted surpresses apresses		- Proposition of the last of t
-	Minhounje i prenjera notinca na upor bovanje	A1000 HI	fed sensitivation Messacre (NO 200	A1000101	find a uniformum aproximum on emission annual serior		
600.000	Dirkeweje mjerede moleje	AUTON.	Sod s rejensin analojem Onome 2000	AUTOU	Controls Statistic Sellinature		
d.0000-000	Spalarje analizatoru u njernoj postoji	25.50 SEC. 100	Armalanananje innjeromb orijednosi ominje				
254 TE 102	linkerne gadilinje sih linenje insirumensia						
25A T 10 10 E	Gorillanja 20082-a						
	Pagis mjernih bilancja Verifikacija navog indonja	-	Verifikacje nerog indenje sumer is područje resisje	ARTER	Andrellie Verifikesje innjene e	AUDER	Man alemer ispiliteorija specarismosti Goddinji plan ispiliteorija
440000	Papis mjerosk kdaseju Preffikacje nevog indesje mener is posledja inisije Basicianiski	447.00	Trefficije sorog inžerje sorov is počračje reskije Rojis sorisljake spreme Kratin sorisljake spreme	407700	Reduction Employee in majorana protection in majorana pier Employee in majorana pier	400000	Namahmeni pakenga spendonasi Ledinji plan ispitenoja spendonasi Maninasje temena sa
	Augio nejevnih labacije Profilmoje nevog indosje never is podralje intoje Augio intojale spreme Kartina intojale spreme	447.00	Terfilosija nerog indenja nome is pudrulja renisja Augis neisijske spreme Korina renisjske spreme Augis nomenski djalova	ARTERI	Andreine Trofilenje innjena s postojin snjenanoje Antrodociania	400 000 400 000 400 000	Man show updowing growbacid Cadding plan inphrosip growbacid Manimuly Manimula Applicacje spandowić Jerjelacje inplinosje
440000	Agio njevsk lekarju Evrjikanje noveg velenje novec is posivalja smoje Agio imiojele spreme Eurisa miojele spreme Eurisa smojele spreme Eurisa smojenosaje imiojele	AMERICA AMERIC	Terifikusja navog sokosja navarski područja renisja Pogleseminjske aprome Kartina eminjske aprome Poglesenovnik dijelena minijske oprome Kartina kalilenatjskag pilma	ANTERN ANTERN ANTERN ANTERN	Бада Ба Геофиція і порти в разіорія портивація Балічнік Іванія Варічні разіоння Баліна порти проти	ARD 880	Han skene igalisedje spenikanski izdisedje spenikanski Paniranje nemena na opislansje nemena na opislansje spenikanski Jajelikaja i spislansju spenikanski Spini difermanije u kraje
440000	Anglo ngovah lekarja Profilacije neveg volenje novar iz podradja inicije Anglo inicijele spreme Eurika inicijele spreme Eurika inicijele spreme Promesanje inicijele prome Eurikaj inspilaj	444.000	Errifikacija navog svikosja navara is počenija renosja Buja aminijske apovan Rapia renosial diplova nasiajske apovan Karina kalibranjskeg plina Kan prosjena svijenacaja nasiajske apovane	ANTESSE ASSESSED.	Radicitie Freijberije innjene e pastiglie mije promote Entrimine korite Aught mije me apromot Entrim mije me apromot Entrim mije me apromote Frei me angie me apromote Frei me angie me apromote Frei me angie me apromote	AMO 800 AMO 800 AMO 800 AMO 800	Пан абото проботра принадамента Сандор убен проботра при объеми Панатора отнеча на предостра отнеча на предостра от при от при объеми при объе
440000	Rajan nejerati kelangia Berdikanja meng indonja gunera i pulminja intoja Rajan intojaka sperma Rajan intojaka sperma Rajansa Gudingi intojaka Gudingi intojaka	6879000	Empleope namy minep manne is paintige medige Agin miniple spreme Earline medigide spreme Agin remembi diplose miniple spreme Earline hallowsping plan Kan projekte unjersomje miniple spreme Agin miniple gran Agin miniple	ABTERDA ABTERDA ABTERDA ABTERDA ABTERDA ABTERDA	Sadaritat Profilencja izanjena a prosinjela najvenanje Storencja izanjena prosin Storencja izanjena prosin Storencja izanjena prosin Storencja izanjena prosin Storencja izanjena sprosin Storencja izanjena sprosin Storencja izanjena sprosina Storencja izanjena sprosina	400 000 400 000 400 000 400 000 400 000 400 000	при в при
440000	Pagin ngirmih belangi Benglikanja meng milanja menga padandya mingi Mgalambahjuka ngerana Pagambahjuka ngerana Mgambahjuka ngerana Mgambahjuka ngerana Galilingi mepelingi	487.00	Empleope norm protope free production reside free normalist represe for the model of proton for the	ABILITADA ABILITADA ABILITADA ABILITADA ABILITADA ABILITADA ABILITADA ABILITADA	Вайн Тай Теор Панар с сетрена и пострат пересения Компенда Валия Вариа пересения Компенда Вариа пересения Компенда Вариа пересения Компенда Вариа пересения Компенда Вариа пересения Компенда Вариа пересения Вариа пересения у разви	480 1000 480 1000	Постобрания прийский пристобрания Стабор убле прийский рассийский рассийский рассийский Выстобрания от прийский рассийский рассийский прийский прийский рассийский прийский прийский рассийский прийский прийский прийский рассийский Весейний прийский Весейний прийский Весейний прийский Весейний прийский Весейний прийский Весейний прийский Весейний прийский прийский Весейний прийский выстаби Весейний выстаби Весейний Весейний выстаби Весейний выстаби Весейний выстаби Весейний выстаби Весейний выстаби Весейний выстаби Весейний выстаби Весейний выстаби Весейний выстаби Весейний выстаби
440000	Augusta pismong mining Pangling pismong mining Magani pismong mining Augusta pismong Augusta miningka ngeruna Augusta miningka ngeruna Augusta pismong miningka Augusta	6879000	Englisher meng sebaga memeri yantujuk seperani Rapis melajuk seperani Englisher melajuk seperani Rapis memala dipistera melajuk seperani Englisher melajuk yalan Rapis penjan seperani Japan sepirani Rapis seperani Rapis seperani Rapis seperani Rapis seperani	AMPLEAN AMPLEA	Balancias Trajilancja iranjama a paragina piranjama piranjama Rapina piranjama piranja	AND SECOND	дал дене артінар дене дене Селдіну рісп пердонур продости персонур продости персонур персонур продости персонур
440000	Agin apreals blacejo Freji koje semej sinkje Preji koje semej sinkje Agin intojske apreas Eurika intojske apreas Eurika intojske apreas Eurika intojske apreas Eurika intojske apreas Eurika intojske apreas Eurika intojske	487.00	Errifikasi meng ninipi menisi peminji dagara menisih dipikasi pemeni Appin menisih dipikasi peminjiha sperime dagara kanjisha sperime dagara kemilikasi peminjiha sperime dagara menjaha sperime menisiha sperime dagara menjaha sperime menisiha sperime dagara menisiha sperime dagara menisiha sperime dagara menjaha selakun menisiha sela	ARTESA	Байнскій Егід Інгідін каўта акра Байнонда Інгідін каўт Байнонда Інгідін Байнонда Інгідін каўта Байнонда Інгідін каўта Байнонда Інгідін Кай Байнонда Інгідін	480 1000 480 1000	An der gebrung Gewinner gebrung Gewinner gebrung Gewinner gebrung Gewinner gebrung Gewinner gebrung Gewinner gebrung Gewinner gebrung Gewinner gebrung Gewinner gebrung Gewinner gebrung Gewinner gebrung
440000	Agin ngond Malagin Trofficing samg nainga Manasa yaning samg Agin nainga samg Agin nainga Agin nainga samg Agin nainga samg A	487.00	Errificios mang mining arminis Pagin arminis	ARTERAL ARTERA	Embersion Foreign and processing an	480 1000 480 1000	the street optimized by the street of the st
440000	Agin ngond Malagin To gling yang mingin To gling yang mingi Agin mingili mingi Agin mingili mingi Agin mingili mingili Mina mingili mingili mingili Mina mingili mingili mingili Mina mingili mingili mingili mingili Mina mingili min	487.00	Errificially among analysis are assumed a probability among a security analysis analysis analysis appears. Errificial among language analysis appears analysis an	ADDITION OF THE PROPERTY OF TH	Embediciae Emplesia in injuries Emplesia in injuries Emplesia in injuries Emplesia	480 1000 480 1000	An alternative of the control of the
440000	Again again bhaing an Gaillean ag ag an ag	487.00	terificiale song mingle straight and process of particular process. A particular process of particular process of particular process of particular process of particular particu	ADTENDA ADTEND	Embridge For plant program For	480 1000 480 1000	See See of the see of
4400000	Agen agent bleedy mensor y pulsedy energy fregister and pulsedy energy fregister and pulsedy energy fregister and pulsed energy freeze and pulsed purpose freeze and pulsed purpose freeze and pulsed purpose freeze and pulsed pulsed freeze and pulsedy freeze	487.00	terificiale companies and control of the control of	ADTESSA ADTESS	Embridge Freighter groups are grown Freighter grown grown Freighter gro	480 1000 480 1000	See American See A
4400000	Age agant blesty against grant and grant grant grant grant grant grant grant grant for the bright grant grant for the bright grant grant for the bright grant grant grant for the bright grant grant grant for the bright grant grant grant grant for the bright grant grant grant grant grant for the bright grant	487.00	Friedrich wenn je mingel gestellige antige a	ANTIBAL MARIANTA MARI	Ingio anjerar aprone Euritar anjerar aprone Kan anjeraranje anjerar aprone Euritar njeraring pinar Ingio rejerarish pinara	480 1000 480 1000	An alternative control of the contro
4400000	Age against being a significant of the control of t	487.00	Tellular in separation of the	ATTENDADO DE LA COLLEGA DE LA	Anna In- Trafficient in agreement in a second in a sec	480 1000 480 1000	Marchan annual control of the contro
de mano de man	Anne general belogic General belogic menge palagoni palagoni belogic palagoni palagon	487.00	Stelland and spikeling and spi	ARTERIA ARTERI	American Ame	480 1000 480 1000	The beam of the control of the contr
4400000	Bener werd steel of the control of t	487.00	Section of the control of the contro	ARTERIA ARTERI	Apita control of the	480 1000 480 1000	Mark have generally appropriate programming and programming an
des mande	Bener person belagis (487.00	Section of the control of the contro	A PARTIE AND THE PART	Benderich werden gestellt der Schreiber der	480 1000 480 1000	The share of the s
de mand de mand de mand de mand de mand de mand	American Angelonia (American Angelonia (Americ	487.00	Selfment on design design and selfment of the	ARTERIA ARTERI	Apita control of the	480 1000 480 1000	The state of the s
	Section of the control of the contro	487.00	Selfender oder seiner Selfender oder seiner Selfender sei	ARTERIA ARTERI	Apita control of the	480 1000 480 1000	The state of the s
		487.00	And the second s	ARTERIA ARTERI	Apita control of the	480 1000 480 1000	The three grounds of the control of
	Section of the control of the contro	487.00	And the second s	ARTERIA ARTERI	Apita control of the	480 1000 480 1000	Marchael segments (Marchael September 1997) and the control of the
data mana	Section of the control of the contro	487.00	Section of the control of the contro	ARTERIA ARTERI	Apita control of the	480 1000 480 1000	The share of the s
	Section of the control of the contro	487.00	Section of the control of the contro	ARTERIA ARTERI	Apita control of the	480 1000 480 1000	March March (March March
data mana		487.00	Comment of the commen	ARTERIA ARTERI	Apita control of the	480 1000 480 1000	March March (March March
data mana		487.00	Comment of the Commen	ARTERIA ARTERI	Apita control of the	480 1000 480 1000	March March (March March
data mana		487.00	Comment of the Commen	ARTERIA ARTERI	Apita control of the	480 1000 480 1000	The control of the co
CAR STORY		40 11 11 11 11 11 11 11 11 11 11 11 11 11	And the state of t	ARTERIA ARTERI	Apita control of the	480 1000 480 1000	See A control of the
CAR STORY	And the second s	40 11 11 11 11 11 11 11 11 11 11 11 11 11		ARTERIA ARTERI	Apita control of the	480 1000 480 1000	The control of the co
CAR STORY	Marchael Andread Control Contr	40 11 11 11 11 11 11 11 11 11 11 11 11 11	Committee of the commit	AND THE PARTY OF T	Apita companies operando la Companie operando la Co	480 1000 480 1000	Service of the control of the contro
CAR STORY	And the second s				Apita companies operando la Companie operando la Co	480 1000 480 1000	The charge of th
CAR STORY		40 11 11 11 11 11 11 11 11 11 11 11 11 11	American de la composición del composición de la composición de la composición del composición de la composición del		Apita companies operando la Companie operando la Co	480 1000 480 1000	Comments of the comments of th
CAR STORY					Apita companies operando la Companie operando la Co	480 1000 480 1000	Comments of the comments of th
CAR STORY					Apita companies operando la Companie operando la Co	480 1000 480 1000	Comments of the comments of th
CAR STORY			And the second s		Apita companies operando la Companie operando la Co	480 1000 480 1000	Comments of the comments of th
CAR STORY			And the second s		Apita companies operando la Companie operando la Co	480 1000 480 1000	Comments of the comments of th
CAR STORY			And the second s		Apita companies operando la Companie operando la Co	480 1000 480 1000	Comments of the comments of th
CAR STORY			And the second of the second o		Apita companies operando la Companie operando la Co	480 1000 480 1000	Comments of the comments of th
CAR STORY			And the second of the second o	ANTENNAME OF THE PARTY OF THE P	Apita companies operando la Companie operando la Co	480 1000 480 1000	Comments of the Comments of th
CAR STORY			American de la composición del composición del composición de la composición de la composición del c		Apita companies operando la Companie operando la Co	480 1000 480 1000	Comments of the Comments of th
data mana			And the second of the second o	ANTENNAME OF THE PARTY OF THE P	Apita companies operando la Companie operando la Co	480 1000 480 1000	Committee of the commit
data mana			And the second of the second o	ANTENNAME OF THE PARTY OF THE P	Apita companies operando la Companie operando la Co	480 1000 480 1000	The control of the co
data mana			And the second of the second o	ANTENNAME OF THE PARTY OF THE P	Apita companies operando la Companie operando la Co	480 1000 480 1000	
data mana			And the second of the second o		Apita companies operando la Companie operando la Co	480 1000 480 1000	Comments of the comments of th
data mana			And the second of the second o	ANTENNAME OF THE PARTY OF THE P	Apita companies operando la Companie operando la Co	480 1000 480 1000	
data mana			And Control of the Co		Apita companies operando la Companie operando la Co	480 1000 480 1000	The control of the co
data mana			Annual control of the		Apita companies operando la Companie operando la Co	480 1000 480 1000	The control of the co
data mana			Annual control of the		Apita companies operando la Companie operando la Co	480 1000 480 1000	Committee of the commit
CAR STORY			And a second sec		Apita companies operando la Companie operando la Co	480 1000 480 1000	The control of the co
data mana			And the second of the second o		Apita companies operando la Companie operando la Co	480 1000 480 1000	The control of the co



6. MEASUREMENT UNCERTAINTY

Based on the data from the type approval, laboratory tests and station tests, the parameters are calculated as follows:

- the measurement uncertainty for the data from the period to be reported in the annual report in the form of an expanded uncertainty of uncertainty for the lowest defined averaging time at the Uc limit value
- absolute expanded measurement uncertainty for averaging time at the limit value Uc
- relative measurement uncertainty Uc (relative measurement uncertainty should be expressed for each individual instrument in the network.)



PROCJENA MJERNE NESIGURNOSTI na razini GV za APMA-370 analizatore

MEASUREMENT UNCERTAINTY

 $u_{c} = \sqrt{(u_{c})^{2} + (u_{c})^{2} + (u_{$ U. ... = (U./hlv) x 100

Mjerr	na postaja	ı			
				Testovi obavljeni	9.9.2017.
Br. testa iz EN 14626	Oznaka iz EN 14626	Standardna mjerna nesigurnost zbog	Rezultati iz testova RK	u (p) (μmol/mol)	u²(p)
1	(u _{r,z})	ponovljivosti na zero plinu	134/2017	0,0010	0,0000
2	(u _{r,lv})	ponovljivosti na graničnoj vrijednosti za 8 h GV*	134/2017	0,0007	
3a	(u _I)	Lack of fit test za 8 h GV	134/2017	0,0271	0,0007
4	(u _{gp})	utjecaja varijabilnosti tlaka uzorkovanog plina	Tip. odobrenje Tablica 38	0,012	0,0001
5	(u _{gt})	utjecaja varijabilnosti temperature uzorkovanog plina	Tip. odobrenje Tablica 38	0,024	0,0006
6	(u _{st})	utjecaja varijabilnosti temperature okolnog zraka	Tip. odobrenje Tablica 38	-0,1823	0,0332
7	(u _V)	utjecaja varijabilnosti napona el. struje	Tip. odobrenje Tablica 38	0,028	0,0008
8a	(u _{H2O})	prisutnosti vodene pare na graničnoj vrijednosti za 8 h GV	Tip. odobrenje Tablica 38	0,3261	0,1063
8b,c,d	(u _{int})	Interferirajućih tvari (pozitivna int. – negativna int.)	Tip. odobrenje Tablica 38	0,4051	0,1641
9	(u _{av})	efekta usrednjavanja	Tip. odobrenje Tablica 38	0,0621	0,0039
10	(u _{rf})	reproducibilnost*	Tip. odobrenje Tablica 38	0,0052	0,00003
11	(u _{d,l,z})	dugotrajnog pomaka na zero plinu	Tip. odobrenje Tablica 38	0,0993	0,0099
12	(u _{d,l,lv})	dugotrajnog pomaka na graničnoj vrijednosti za 8 h GV	Tip. odobrenje Tablica 38	0,0268	0,0007
21	(u _{cg})	kalibracijskog plina na 8 h GV	134/2017	0,1592	0,0253
	•	esigumosti u² = ∑u²(p)			0,35
ložena mjerr	na nesigurno	ostna8hGV u_{GV}=√u² (µmol/	mol)		0,59
roširena mje	erna nesigur	nost na 8 h GV U _{GV} = u*k (k=2)	(µmol/mol)		1,18
elativna mje	rna nesigurr	nost na 8 h GV U _{GV,rel} = (U _{GV} /8,6)*100	(%)		13,67
egulatorno t	ražena relati	vna mjerna nesigurnost na 8 h GV	(%)		15

* uzeta reproducibilnost jer je veća od ponovljivosti

ZAKLJU	JČAK	Kvalitata miarania a abzi	zodovoliovo					
		Kvaiiteta mjerenja s obzi	liteta mjerenja s obzirom na ciljanu kvalitetu mjerenja - zadovoljava					

DATUM			IZR	ADIO
				1
9.9.2017.				
eLAB-PI-101.Ex	1/1			



Measurement uncertainty is calculated in accordance with ENV 13005, Guide to the expresion of uncartainity in measurement i EN ISO 14956:2002 Air quality, Evaluation of the suitability of a measurement procedure by comparison with a required measurement uncertainty and CEN standards for individual pollutants.

7. Measurement reports

The laboratory that performs measurements in a particular network over the year informs the network coordinator through the ratification reports about the network operation and the measurement results. Likewise, at the end of the one-year measurement period set by regulation, the laboratory appends an annual report



Ratification Report

The Ratification Report is a periodic report in which the laboratory reports to the coordinator or network owner on all aspects of network operation and ratifies the measurement data for a specific period. Such reports are usually produced for a period of one to three months, depending on the requirements of the network owner. They are not obligatory and they are a matter of contract.

Yearly report

It is produced after the end of a one-year period.





Automatic instruments for monitoring the air quality require strict quality control of measurements. One of the most important quality assurance procedures is regularly calibration and testing of the instruments. The calibration is done at the stations and in the calibration laboratories. Calibration laboratory should ensure and document the accuracy and traceability of the measuring data and allow for the expression of measurement uncertainty at the level of the limit values for each instrument in the network. Only with the good cooperation of the testing and the calibration laboratories (with the support of the service team) can reach the extremely challenging regulatory target the quality of the data.

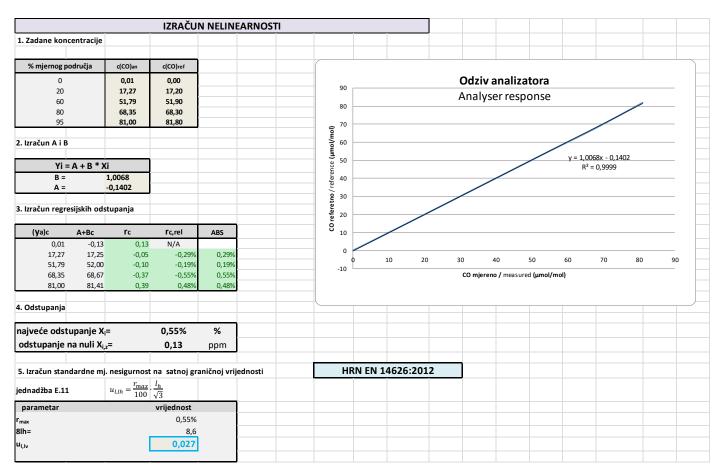
The calibration of instruments and measurement traceability
The calibration of the instruments is carried out periodically.
CEN-standards require calibration of instruments at stations
every three months. This procedure is performed with the help
of a certified gas cylinders (CRM certified referent material
CRM) at two points (zero and the so-called span which
represents a concentration of 70 to 80% of the maximum
certified measurement range) which ensures traceability.

It is also necessary to perform calibration in the laboratory after each major instrument intervention (major repairs, annual service). This is followed by testing performance of the instrument required by the same standards.

The most common and the most useful tests are so called. "LACK OF FIT" test (which represents the linearity test and is most often performed in 5 points within the measurement range), "STANDARD DEVIATIONS REPEATABILITY" test (which checks the repeatability of the instrument) and "SHORT TERM DRIFT" test which checks the stability of the measurements in a short period. If the instrument after the calibration meets the standard prescribed criteria for the above tests and if the calibration is ensured traceability, the prepared instrument is ready for measurements at the station. Calibration in laboratories is also carried out with the help of traceable reference materials.



"lack of fit" test in three or four points and zero gas





standard deviation repeatability test

	broj mjerenja		ARDNO C	DETLIDA			-		
			יאמטאט (IOM IIMOST	f		
			x _i (ppm)	DSTOFA	T FOR	IOVEJIVO3		x _i (ppm)	
		CO (20%)	CO (60%)	CO (span)		CO (95%)		CO (0%)	
		17,2	51,9	68,3		81,8	broj mjerenja	0	
		17,3	51,8	68,4	-	80,99	1	0,0	
	2	17,3	51,8	68,4		80,97	2	0,0	
	3	17,3	51,8	68,4		80,98	3	0,0	
	4	17,3	51,8	68,3		80,99	4	0,0	
	5	17,3	51,8	68,3		81,03	5	0,0	
	6	17,3	51,8	68,4		80,98	6	0,0	
	7	17,3	51,8	68,4		80,98	7	0,0	
	8	17,3	51,8	68,3		81,02	8	0,0	
	9	17,3	51,8	68,3		81,01	9	0,0	
	10	17,3	51,8	68,4		81,02	10	0,0	
	11	17,3	51,8	68,4			11	0,0	
	12	17,3	51,8	68,3			12	0,0	
	13	17,3	51,8	68,3			13	0,0	
	14	17,3	51,8	68,3			14	0,0	
	15	17,3	51,8	68,3			15	0,0	
	16 17	17,3	51,8	68,3			16 17	0,0	
	18	17,3 17,3	51,8 51,8	68,3 68,3			18	0,0	
	19	17,3	51,8	68,3			19	0,0	
	20	17,3	52,0	68,3			20	0,0	
	avg	17,27	51,80	68,34		81,00	avg	0,00	
	SD	0,009	0,048	0,021		0,023	SD	0,004	
	RSD	0,05%	0,09%	0,03%		0,03%	35	0,004	
		2,22,2	5,5575	-,,-		-,,-			
·		MJERN	A NESIGU	RNOST ZE	BOG PO	NOVLIVOS	TI		
		-							
nesia	ırnosti zbog poi	novliivosti	analizator	a					
		-	ost zbog pond						
		sr - ponovljive		ivijivosti					
		n - broj mjere							
			enja (s-span; .	z-nula)					
			, (,,	,					
	•	47.0	54.0	60.0	04.0				
	0	17,2	51,9	68,3	81,8				
-	0,001	0,002	0,011	0,005	0,007				
,s =	0,00459								
,z =	0,00091								
,20%=	0,00200								
	$\frac{s_{r,lh}}{\sqrt{m}}$	novljivosti	koje se izro	ažavaju u g	godišnje	m izvješću	ŀ	IRN EN 1462	6:2012





A national reference laboratory is required to ensure traceability of measurement for devices for automatic monitoring of air quality in the State network. (2008/50/EC Art. 3 Ann. AND C)

The traceability to the SI standard is achieved by the use of:

- the primary standard gases (PRM) or gases certified in accredited laboratories (CRM)
- calibration of calibrators in the accredited laboratories
- regular proficiency testing with reference laboratory instruments organized by JRC (Ref. Lab EU) - WHO - AQUILA



Several prominent institutions from which Croatian reference laboratory provide measuring traceability:

ČMI Brno

NMI Delft

Linde Prag

UBA Beč

NPL London

LNI Geneve

FMI Helsinki



calibration with certified or primary standards



EKONERG+Umjerni laboratorij+Koranska 5, HR-10000 Zagreb Tel: +385 (0)1 6000-111; Faks: +385 (0)1 6171-560

POPIS REFERENTNIH PLINOVA

IMISIJE Stanje: 2017-07-03

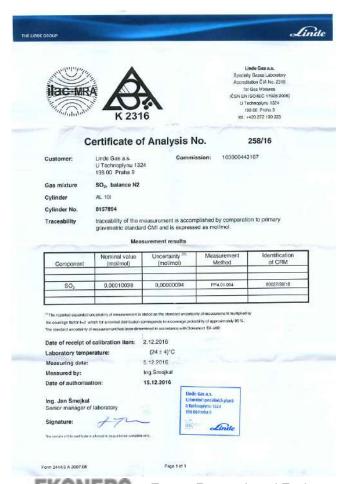
	Plin	Oznaka	Broj boce	Broj certifikata	Valjanost certifikata (do)	Koncentracija u boci (%vol/ppm/ppb)	Mjerna nesigumost (%vol/ppm/ppb)
1.	СО	RPI-CO/14128	8140862	Linde, 34/17	2018-02-09	14128 ppm	58 <u>ppm</u>
2.	SO ₂	RPI-SO2/-100.4	8157894	Linde, 258/16	2017-12-14	100,38 ppm	0,94 <u>ppm</u>
3.	NO	RPI-NO/199.5	8141331	Linde, 31/17	2018-02-09	199,5 ppm	3,2 ppm
4.	H₂S	RPI-H2S/100.0	NG646	NPL, 2016020330	2018-04-14	100,1 ppm	1, 1 , ppm
5.	BTX	RPI-BTX/12.14	D090592	NPL, 2015010056	2017-03-13	12,14 ppm	0,24 <u>ppm</u>
6.	C6H6	RPI-C6H6/9.15	D834760	OMSZ, 188/2015	2016-11-10	9,15 ppm	0,36 ppm
7.	B⊤X	RPI-BTX/1.4	A4103	OMSZ, 128/2017	2018-06-01	1,38 <u>ppm</u>	0,075 ppm
8.	BTX	RPI-BTX/12	9690D	OMSZ, 129/2017	2018-06-06	14,37 ppb	0,78 ppb
9.	CH ₄	RPI-CH4/10000	245306	BOC, 2573499	2020-03-05	10300 ppm	206 ppm
10.	NH₃	RPI-NH3/330	245303	BOC, 2574341	2017-03-31	330 ppm	6 <u>,6 ppm</u>

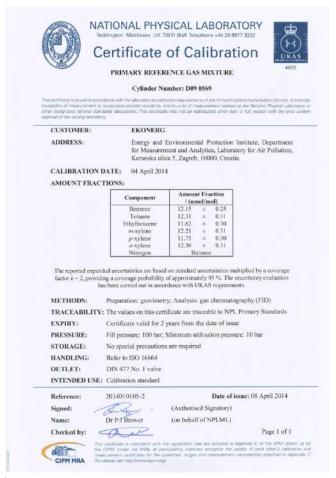
oLAB-PU-02.0b5/1 http://www.ekonarg-laboratorij.com/ stranica



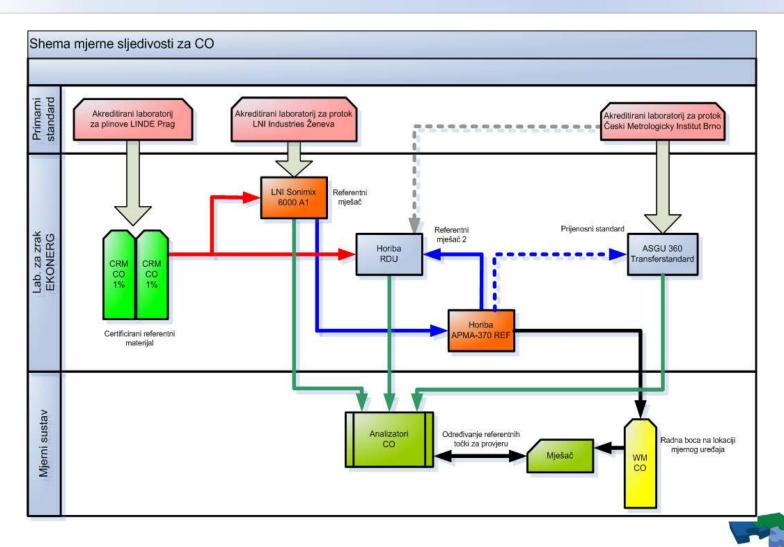


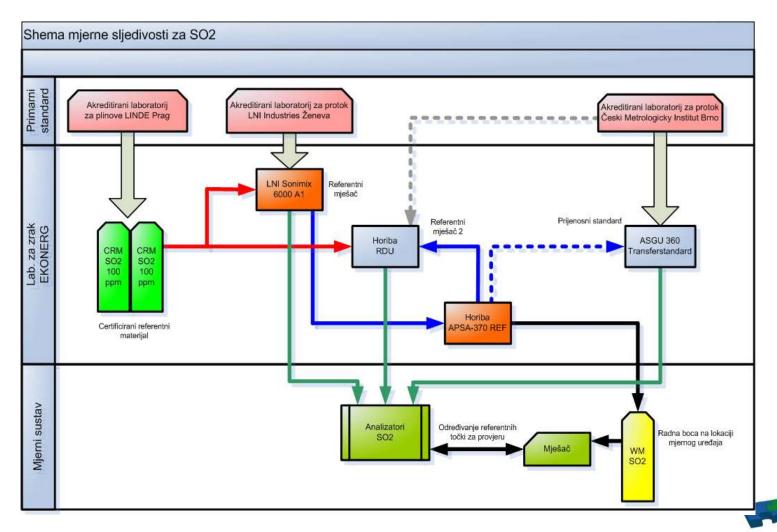
calibration with certified or primary standards

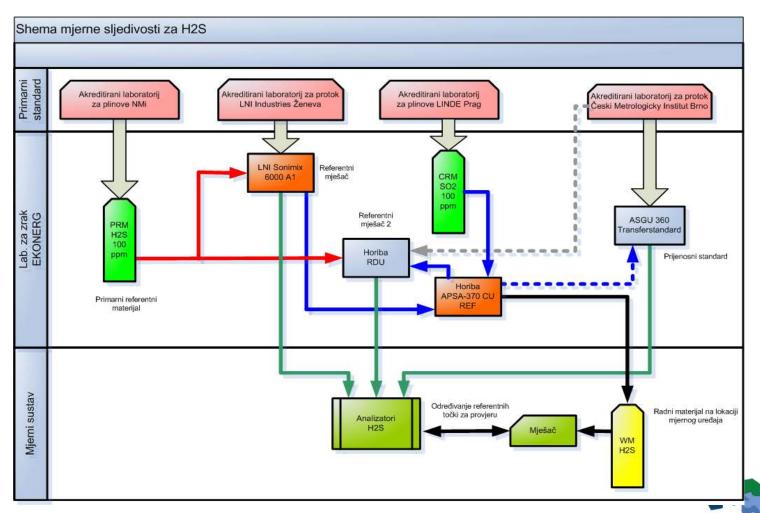












INZRAK

Only traceable instruments achieve valid results !!!!









Quality assesment

Interlaboratory comparisons are an additional process for assuring and verifying accuracy and traceability (Quality assessment).

These measurements are actually measurements of the same gas in several laboratories at the same time. For the gaseous pollutants are organized in laboratory conditions.

With the help of specially designed systems, it is possible to measure the pollutants of known concentrations simultaneously.





Interlaboratory comparisons represent the highest level in the process of harmonization of measurement and in Europe they are organized by the European Commission (through its ERLAP reference laboratory) in cooperation with the World Health Organization. Each the national reference laboratory of the **European Union Member State is obliged to perform** Interlaboratory comparisons with its reference instruments at least once every three years. National Reference Laboratories then organize such Interlaboratory comparisons for laboratories in their countries.



IE ERLAP JRC, Ispra -2008



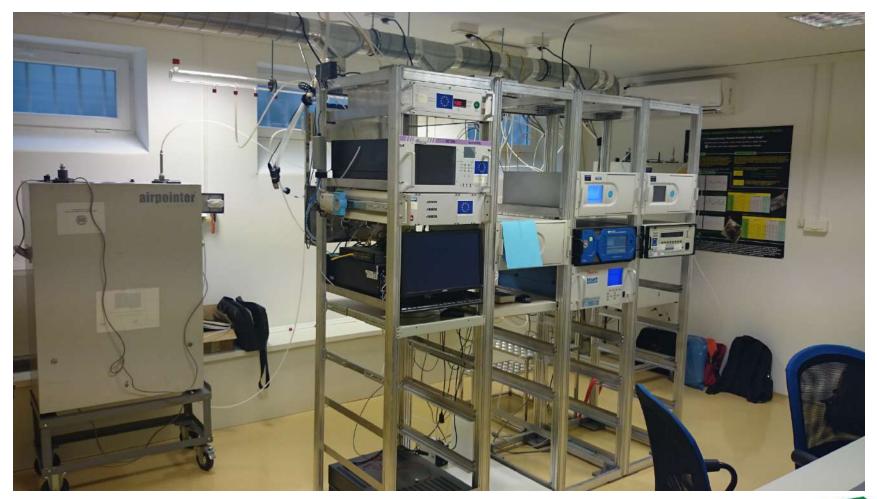




EKONERG, Zagreb -2014







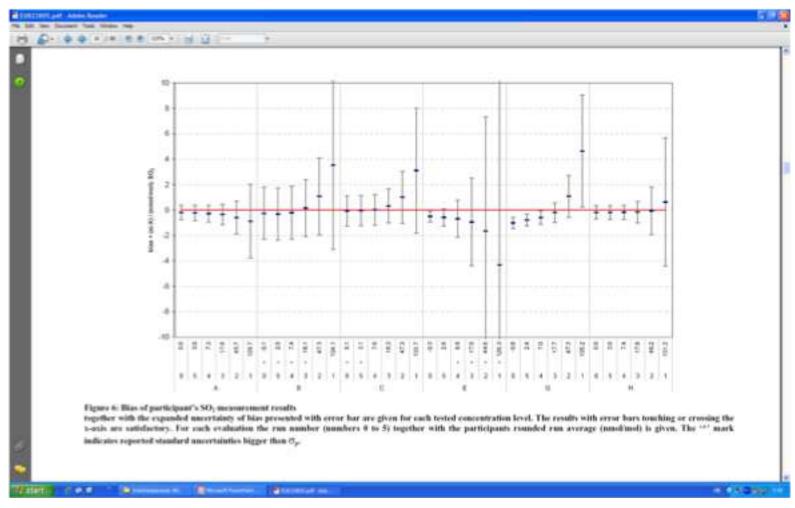






After the measurement is completed, the measurement results of each laboratory are compared and analysed. The results of each laboratory's measurement must meet certain criteria in terms of measurement accuracy and expressed measurement uncertainty for each measured concentration.







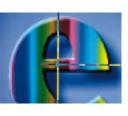
Lab.	Konc. (X)	Izvješteni podatci							Statistički podatci				Ocjena		
		Poluse	tne konc	entra cije	u _{si}	U _{si}	U _{ni} (%)	*	SDx,	z' skor	En br.	"biss" si-X	Ocjena sa konc.	Ukupna ocjena	
A	c0 / 0	0,090			0,600	1,200		0.090	1	0.802	0.075	0.090	a2		
	c1 / 13,400	13,500	13,260	13,670	0.280	0.560	4,16%	13,477	0,206	0.096	0.067	0.047	11	audovol) av	
	c2 /9,009	9,000	9,110	9,350	0,180	0.360	3,93%	9,153	0,179	0.404	0.295	0.144)AT		
	e3 /4,431	4,190	4.330	4,500	0.100	0,200	4,59%	4,300	0.187	-0.319	-0.272	-0,071	- 21		
ii.	69 / 0	-0.010		1	0.059	0.110		-0,010		-0.287	-0.257	-q.030	al.		
	c1 / 13,400	13,214	13,191	13,100	0,326	0,652	4,94%	13,190	0.014	0.094	430.0	0.017	31	zadovotjav	
	c2 /9,009	0.015	0.613	8,809	0.218	0,436	4,95%	8,812	8,003	-0.100	-0.071	-0.036	- 41		
	63 /4,431	4,295	4,305	4,299	0,110	0,236	5,49%	4,299	0,004	-0.408	-0.376	-0.091	- 11-		
с	c0 / 0	-0,085			0.250	0.500		40,085		-0.814	-0.169	-0,085	1/2	zadovoljav	
	c1 / 13,400	13,875	13,846	13,820	0,625	1,249	9,02%	13,647	0,028	Q.855	0.311	0.417	12		
	c2 /9,009	9,130	9,131	9,127	0.412	0,824	9.02%	9,132	0,006	0,346	Q.139	0.123	#2		
	c3 /4,431	4,203	4,194	4,206	0,180	0,379	9,02%	4,201	0.006	-1,002	-Q.555	-0,230	11.		
D	c6 / 0	0.049			0,053	0,107		0,049		0.469	0.399	0,049	#1	zadovoljav	
	c1 / 13,400	13,302	13,283	13,275	0.225	0.450	3,39%	13,297	0,014	-0.294	-0,216	-0.143	hX		
	c2 /9,009	8,868	8,875	8,846	0,166	0.332	3,75%	8,863	0.015	-0.439	-0.311	-0.146	a1		
	c3 /4,431	4,321	4,327	4,329	0,079	0.158	3,65%	4,326	0,004	-0,473	-0.456	-0.105	81		
E	c0 / 0	-0,048			0,240	0.400		-0.048		-0.460	-0.099	-0,048	0.2	zadovol) av	
	c1 / 13,400	13,601	13,590	13,595	0.613	1,226	9.02%	13,586	0.006	0.899	0.125	0.165	1/2		
	c2 /9,009	9,278	9,262	9,250	0,418	0,836	9.02%	9,266	0,010	0.721	0.286	0.257	142		
	c3 /4,431	4,406	4,351	4,352	0.197	0,394	9.02%	4,370	0.031	-0.275	-0.143	-0.061	a1.		
F.	c0 / 0	-0.024	-		0;092	0,184		-0,024		-0.230	-0.124	-0.004	12		
	c1 / 13,400	13,300	13,281	13,270	0,137	0.274	2,06%	13,284	0.015	-0.300	-0.262	-0.146	at	zudovoljav	
	c2 /9,009	8,859	8,860	8.867	0.095	0,190	2,14%	8,862	0,004	-0.412	-0.385	-0.147	al		
	c3 /4,431	4,275	4.270	4,285	0,055	0,110		4,280	0,005	-0.679	-0.752	-0.151	112		
G	c0 / 0	-0,030		0,050	0,100		-0,038	1	-0.287	-0.257	-0.030	a1	-		
	c1 / 13,400	13,450	13,450	13,440	0.269	0.538	-4,00%	13,447	0,006	0.034	0.023	0.017	11	zadovolja	
	c2 /9,009	8,970	8.970	8.960	0,179		3,99%	8.573	0.006	-0.100	-0.073	-Q.036	a1		
	c3 /4,431	4.340	4.340	4.340	0.087	0.174	4.01%	4.340	0.000	-0.408	-0.376	-0.091	41		



Quality assesment

- ACCREDITATION HRN EN ISO/IEC 17025
 - Internal independent audit 1 per year
 - ☐ HAA audit 1 per year
 - Reaccrediation every 5 years









THANK YOU FOR YOUR ATTENTION

<u>Disclaimer:</u> The contents of this publication are the sole responsibility of EKONERG – Energy Research and Environmental Protection Institute, Ltd. and can in no way be taken to reflect the views of the European Union

