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RIGAS

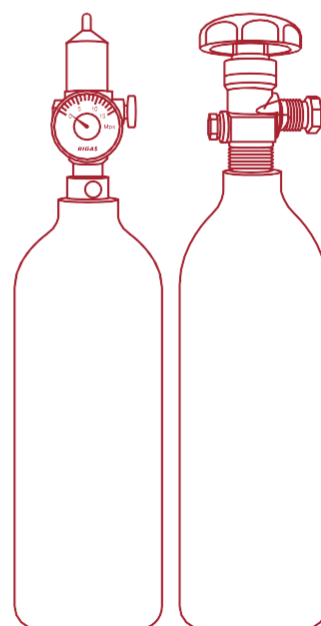
Research Institute of Gas Analytical Science

Calibration Gases

RIGAS 리가스
Research Institute of Gas Analytical Science

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Company Information

■ Company specialized in Production, Analysis and Research of Standard Materials

(株)RIGAS拥有制造和分析各种液体及气体标准物质的能力。我们通过应用独有的气瓶内表面处理技术提高活性气体的稳定性。为客户提供可靠的产品。

(株)RIGAS的所有标准气体均采用使用超精密高容量天秤的重量法制造，对各种成分用多种专用气体分析仪等进行定量、确认，保证其准确度。

RIGAS Co., Ltd has the capability to manufacture and analyze various specifications of liquid and gas standard Materials and supplies products in which customers can trust by application of our unique special cylinder inner-surface treatment technology essential for improving stability of low concentration reactive gases.

Our company also manufactures all standard gases in gravimetric method using high precision high capacity scale and guarantees the accuracy for the concentration of every components by quantifying and verifying it with various gas analyzers.

■ Company having Corporate-affiliated Research Institute

(株)RIGAS以促进基础研究及技术开发支援为基础，1999年成立了气体分析科学研究所，一直活跃在改善未开发的特殊气体和提升气体分析准确度等领域。

RIGAS Co., Ltd established Research Institute of Gas Analytical Science in 1999 on the basis of Korea Basic Research Promotion and Technology Development Supporting Act, and has performed gas analysis research actively for development of new products such as undeveloped special gases and improvement of accuracy of gas analysis.

■ Authorized Standard Gas Testing and Certification Agency in ROK

(株)RIGAS被韩国鉴定机构KOLAS*认定为 及ISO 17034标准物质的测试实验室。RIGAS公司负责测试和被鉴定标准物质的生产。

KOLAS* (Korea Laboratory Accreditation Scheme):根据国际标准相关机构ILAC(国际试验所认证机构协议体)制定的国际标准(ISO/IEC 17011)，进行标准物质的评估、鉴定，校正、试验和检验的认证机构。

As an internationally recognized testing laboratory and standard material agency in conformity with ISO 17034 accredited by KOLAS*, Korea accreditation organization, RIGAS CO. conducts testing and production of certified standard materials.

KOLAS* (Korea Laboratory Accreditation Scheme) : the Korea accreditation organization, which evaluates and certifies calibration, testing, inspection or standard material producing institutions based on the international standards (ISO/IEC 17011) established by ILAC (International Laboratory Accreditation Council), an international standard organization.

Company Information

Company History

- | | | | |
|----------|---|----------|---|
| 2019. 03 | Obtained ISO 17034 | 2013. 10 | Selected as a hidden champion (Ministry of Employment and Labor) |
| 2018. 06 | Registered an International TradeMark (KR-2018-0000651) | 2007. 06 | Obtained INNO-BIZ Certificate (Small & Medium Business Administration) |
| 2017. 07 | Obtained ISO/IEC 17025 | 2007. 06 | Approved as Company of Daedeok Special R&D Zone (Ministry of Science and Technology) |
| 2017. 02 | Expansion of the 2nd plant in Daedeok Industrial Zone | 2002. 04 | Appointed as Clean Workplace (Korea Occupational Safety & Health Agency) |
| 2016. 12 | Obtained Clean mark as TOP3 of Reducing Exposure level | 2001. 09 | Appointed as Standard Gas Testing Agency by Environmental Technology Development Act (Korea National Institute of Environmental Research) |
| 2016. 04 | Obtained Youth-friendly hidden champion certificate (Ministry of Employment and Labor) | 1999. 03 | Obtained Certificated of Gas Analysis and Science Research Institute as Corporate-affiliated Research Institute (Korea Industrial Technology Association) |
| 2014. 01 | Obtained Certificate of Good Workplace by Risk Assessment (Korea Occupational Safety & Health Agency) | 1998. 09 | Established a corporation in Daejeon, Korea. |
| 2013. 10 | Selected as a hidden champion (Ministry of Employment and Labor) | | |

Certificate

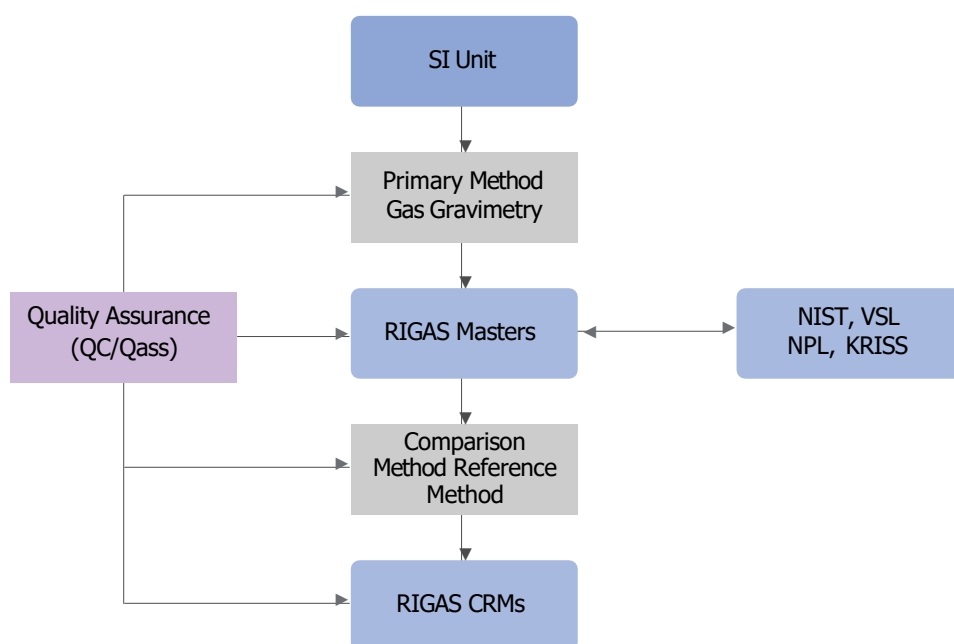


Maintaining Traceability

RIGAS的分析工作所用标准物质可追溯至NIS, VSL, KRISS, NPL等国家标准机构的CRM。

此外，用于重量法制造的砝码也可追溯至KRISS标准砝码。

Our analytical operations are traceable through a calibration standard produced to either a recognized international standard such as NIST, VSL, NPL, KRISS or a gravimetrically manufactured Primary Reference Standard traceable to KRISS standard masses.



Product Line

1. Atmospheric Environmental Calibration Standards
2. Automobile Exhaust Gas Standards
3. Petrochemical and Natural Gas Standards
4. Laser Gas Mixtures
5. Odor Standards
6. Volatile Organic Compound Standards (VOCs)
7. Other Gas Mixtures

Atmospheric Environmental Calibration Standards

环境是影响我们生活的重要因素之一。因此，必须使用正确的标准气体监控和测定工业排放。

RIGAS为测定各种环境污染物质，提供高精密校正标准气体。

Environment is one of critical element affecting to our life. Therefore, accurate standard gas shall be used to monitor and measure industrial effluents. RIGAS Co., Ltd. Provides high accurate calibration standard gas for measuring various environmental pollutants.

Components	
Nitric oxide	NO
Nitrogen dioxide	NO ₂
Sulfur dioxide	SO ₂
Carbon monoxide	CO
Oxygen	O ₂
Hydrogen chloride	HCl
Hydrogen fluoride	HF
Ammonia	NH ₃
Carbon dioxide	CO ₂

Mixed example

Components & Matrix	Nominal Fraction Range			Urel* (k=2) %	Shelf Life
	From	To	Unit		
Hydrogen chloride Nitrogen	2	10 000	μmol/mol	2 ~5	1year ~2year
Hydrogen fluoride Nitrogen	2	500	μmol/mol	2 ~5	1year ~2year
Nitric oxide Sulfur dioxide Carbon monoxide Nitrogen	5 5 5	5 000 5 000 10 000	μmol/mol μmol/mol μmol/mol	1 ~3	1year ~3year
				Determined in accordance with the customer's needs	

※ If you have any inquiry on products and mixing besides the above components and concentration, ask for consultation and we will provide further information.

※ Urel.: relative expanded uncertainty

Automobile Exhaust Gas Standards

环境是影响我们生活的重要因素之一。因此，必须使用正确的标准气体监控和测定工业排放。

RIGAS为测定各种环境污染物质，提供高精密校正标准气体。

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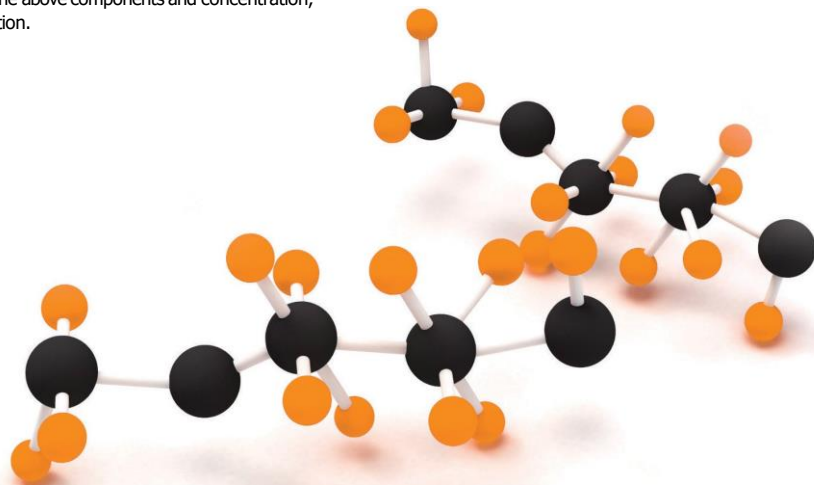
Components	
Carbon dioxide	CO ₂
Propane	C ₃ H ₈
Carbon monoxide	CO
Oxygen	O ₂

Mixed example

Component & Matrix	Nominal Fraction Range			Urel* (k=2) %	Shelf Life
	From	To	Unit		
Carbon dioxide	10.0	20.0	cmol/mol	1 ~ 2	1year ~ 3year
Propane	0.05	0.50	cmol/mol	Determined in accordance with the customer's needs	
Carbon monoxide	2.00	10.0	cmol/mol		
Oxygen	0.10	25.0	cmol/mol		
Nitrogen					

※ If you have any inquiry on products and mixing besides the above components and concentration, ask for consultation and we will provide further information.

※ Urel.: relative expanded uncertainty



Petrochemical and Natural Gas Standards

RIGAS的石油化学工程用标准物质是多级压缩的气液混合物，如烷类，烯烃，芳族化合物或其它。

RIGAS standard material for petrochemical process are supplied in gas and liquid mixture, and multi-compounds standard material such as alkanes, alkenes, aromatics or ether.

Group	Components	
Hydrocarbons Gas or Liquid Mixtures	Methane	CH ₄
	Ethane	C ₂ H ₆
	Ethylene	C ₂ H ₄
	Propane	C ₃ H ₈
	Cyclopropane	C ₃ H ₆
	Propylene	C ₃ H ₆
	iso-Butane	iso-C ₄ H ₁₀
	n-Butane	n-C ₄ H ₁₀
	Propadiene	C ₃ H ₄
	Acetylene	C ₂ H ₂
	trans-2-Butene	trans-2-C ₄ H ₈
	1-Butene	1-C ₄ H ₈
	iso-Butylene	iso-C ₄ H ₈
	Cyclopentane	C ₅ H ₁₀
	cis-2-Butene	cis-2-C ₄ H ₈
	2,2-Dimethyl propane	2,2-C ₅ H ₁₂
	iso-Pentane	iso-C ₅ H ₁₂
	n-Pentane	n-C ₅ H ₁₂
	1,2-Butadiene	1,2-C ₄ H ₆
	1,3-Butadiene	1,3-C ₄ H ₆
	Methyl acetylene	C ₃ H ₄
	Vinyl acetylene	C ₄ H ₄
	Ethyl acetylene	C ₄ H ₆
	trans-2-Pentene	trans-2-C ₅ H ₁₀
	etc.	

Mixed example-Gas Phase

cmol/mol = %mol/mol = 10⁻²mol/mol

Component & Matrix	Nominal Fraction Range		Urel* (k=2) %	Shelf Life
	Concentration	Unit		
Nitrogen	0.50	cmol/mol	1 ~2	1year ~3year
Carbon dioxide	1.00	cmol/mol		
Ethane	8.00	cmol/mol		
Propane	4.00	cmol/mol		
iso-Butane	1.00	cmol/mol		
n-Butane	1.00	cmol/mol		
iso-Pentane	0.05	cmol/mol	Determined in accordance with the customer's needs	
neo-Pentane	0.05	cmol/mol		
n-Pentane	0.05	cmol/mol		
n-Hexane	0.05	cmol/mol		
Methane	84.3	cmol/mol		

※ If you have any inquiry on products and mixing besides the above components and concentration, ask for consultation and we will provide further information.

※ Urel.: relative expanded uncertainty

Petrochemical and Natural Gas Standards

RIGAS的石油化学工程用标准物质是多级压缩的气液混合物，如烷类，烯烃，芳族化合物或其它。

RIGAS standard material for petrochemical process are supplied in gas and liquid mixture, and multi-compounds standard material such as alkanes, alkenes, aromatics or ether.

Mixed example-Gas Phase

cmol/mol = %mol/mol = 10^{-2} mol/mol

Component & Matrix	Nominal Fraction Range		Urel* (k=2) %	Shelf Life
	Concentration	Unit		
Methane	2.50	cmol/mol	1 ~ 3	1year ~ 3year
Ethane	1.00	cmol/mol		
Ethylene	1.00	cmol/mol		
Propane	0.70	cmol/mol	Determined in accordance with the customer's needs	
Propylene	4.00	cmol/mol		
iso-Butane	1.00	cmol/mol		
n-Butane	0.30	cmol/mol		
trans-2-Butene	0.90	cmol/mol		
1-Butene	1.00	cmol/mol		
iso-Butylene	1.50	cmol/mol		
cis-2-Butene	1.00	cmol/mol		
iso-Pentane	1.00	cmol/mol		
n-Pentane	0.10	cmol/mol		
1,3-Butadiene	0.10	cmol/mol		
1-Pentene	1.00	cmol/mol		
n-Hexane	1.00	cmol/mol		
Nitrogen	81.9	cmol/mol		

Mixed example-Liquid Phase

cmol/mol = %mol/mol = 10^{-2} mol/mol

Component & Matrix	Nominal Fraction Range		Urel* (k=2) %	Shelf Life
	Concentration	Unit		
Ethane	2.00	cmol/mol	1 ~ 3	1year ~ 3year
Ethylene	2.00	cmol/mol		
Propane	35.0	cmol/mol		
Cyclopropane	0.10	cmol/mol	Determined in accordance with the customer's needs	Liquid phase (Dip tube +He head pressure)
Propylene	1.00	cmol/mol		
iso-Butane	20.0	cmol/mol		
trans-2-Butene	0.20	cmol/mol		
1-Butene	0.20	cmol/mol		
iso-Butylene	0.20	cmol/mol		
cis-2-Butene	0.20	cmol/mol		
iso-Pentane	0.40	cmol/mol		
n-Pentane	0.10	cmol/mol		
1,3-Butadiene	0.10	cmol/mol		
n-Butane	38.5	cmol/mol		

※ If you have any inquiry on products and mixing besides the above components and concentration, ask for consultation and we will provide further information.

※ Urel.: relative expanded uncertainty

Laser Gas Mixtures

RIGAS的激光气体被广泛用于括半导体制造工程，医疗领域或精密工程。

RIGAS' Excimer laser gas is used widely including semiconductor manufacturing process, medical area or precision process.

■ Vision Correction

- PRK, LASIK
- ArF = 193 nm

■ Angioplasty & TMR

- XeCl = 308 nm

■ Microlithography

- ArF = 193 nm
- KrF = 248 nm

Mixed example

cmol/mol = %mol/mol = 10^{-2} mol/mol

Component & Matrix	Excimer Laser Gas Mixtures	
	Type	Concentration
Fluorine Argon Neon	ArF (193 nm)	0.2 cmol/mol 9.0 cmol/mol
Hydrogen Chloride Hydrogen Xenon Neon	XeCl (308 nm)	0.06 cmol/mol 0.03 cmol/mol 1.50 cmol/mol
Fluorine Krypton Neon	KrF (248 nm)	0.10 cmol/mol 1.00 cmol/mol

※ If you have any inquiry on products and mixing besides the above components and concentration, ask for consultation and we will provide further information.

Odor Standards

该气体是用于感知和测定气味的标准气体。

气味一般是由人或动物感知到的一种以上的低密度挥发性化学物质产生的。

This is RIGAS Standard gas for detecting and measuring odor.

Odor is caused by one or more volatile chemical materials in low density generally, which is recognized by human or animals.

Group	Components	
Formaldehyde	Formaldehyde	HCHO
Sulfur Compounds	Hydrogen sulfide	H ₂ S
	Methyl mercaptan	CH ₃ SH
	Dimethyl sulfide	(CH ₃) ₂ S
	Dimethyl disulfide	(CH ₃) ₂ S ₂
Nitrogen Compounds	Ammonia	NH ₃
	Trimethyl amine	(CH ₃) ₃ N
Aldehydes	Acetaldehyde	CH ₃ CHO
	Propionaldehyde	C ₂ H ₅ CHO
	n-Butyraldehyde	n-C ₃ H ₇ CHO
	n-Valeraldehyde	n-C ₄ H ₉ CHO
	iso-Valeraldehyde	iso-C ₄ H ₉ CHO
Alcohol & Ketones	iso-Butyl alcohol	iso-C ₄ H ₉ OH
	Ethyl acetate	CH ₃ CO ₂ C ₂ H ₅
	Methyl isobutyl ketone	C ₄ H ₉ COCH ₃
BTEXS	Toluene	C ₇ H ₈
	Styrene	C ₈ H ₈
	p-Xylene	p-C ₆ H ₄ C ₂ H ₆
Acids	Propionic acid	C ₂ H ₅ CO ₂ H
	n-Butyric acid	n-C ₃ H ₇ CO ₂ H
	n-Valeric acid	n-C ₄ H ₉ CO ₂ H
	iso-Valeric acid	iso-C ₄ H ₉ CO ₂ H

Mixed example

Component & Matrix	Nominal Fraction Range			Urel* (k=2) %	Shelf Life
	From	To	Unit		
Formaldehyde Nitrogen	2	100	μmol/mol	2 ~5	1year ~2year
Hydrogen sulfide Methyl mercaptan Nitrogen	2	100	μmol/mol	1 ~5	1year ~2year
	2	100	μmol/mol	Determined in accordance with the customer's needs	

※ If you have any inquiry on products and mixing besides the above components and concentration, ask for consultation and we will provide further information.

※ Urel.: relative expanded uncertainty

Volatile Organic Compound Standards (VOCs)

挥发性有机化合物(VOCs)可能会长期损害人体健康，需进行监测。

RIGAS可供应挥发性有机化合物检测系统的校正气体。

VOCs in certain period may cause long term damage on human health, so it shall be monitored. The followings are calibration gas of volatile organic compound measuring system supplied by RIGAS, and required and recommended generally.

Group	Components	
Aromatics	Benzene	C ₆ H ₆
	Toluene	C ₇ H ₈
	Ethylbenzene	C ₆ H ₅ C ₂ H ₅
	o-Xylene	o-C ₆ H ₄ C ₂ H ₆
	m-Xylene	m-C ₆ H ₄ C ₂ H ₆
	p-Xylene	p-C ₆ H ₄ C ₂ H ₆
	Styrene	C ₈ H ₈
	1,2-Dichlorobenzene	1,2-C ₆ H ₄ Cl ₂
	1,2,4-Trimethylbenzene...etc.	1,2,4-C ₆ H ₃ (CH ₃) ₃ ...etc.
PAMs (Ozone Precursors)	Acetylene	C ₂ H ₂
	Benzene	C ₆ H ₆
	Butane	C ₄ H ₁₀
	1-Butene...etc.	1-C ₄ H ₈ ...etc.
CFCs / HCFCs / HFCs / PFCs	Trichloro fluoromethane	CCl ₃ F
	Dichloro difluoromethane	CCl ₂ F ₂
	1,1,2-Trichloro trifluoroethane	C ₂ Cl ₃ F ₃
	1,2-Dichloro tetrafluoroethane	1,2-C ₂ Cl ₂ F ₄
Chlorinated Hydrocarbons	Methyl chloride	CH ₃ Cl
	Ethyl chloride	C ₂ H ₅ Cl
	Vinyl chloride	C ₂ H ₃ Cl
	Methylene chloride	CH ₂ Cl ₂
	Chloroform	CHCl ₃
	Carbon tetrachloride	CCl ₄
	1,1-Dichloroethane	1,1-C ₂ H ₄ Cl ₂
	1,2-Dichloroethane...etc.	1,2-C ₂ H ₄ Cl ₂ ...etc.

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Volatile Organic Compound Standards (VOCs)

挥发性有机化合物(VOCs)可能会长期损害人体健康，需进行监测。

RIGAS可供应挥发性有机化合物检测系统的校正气体。

VOCs in certain period may cause long term damage on human health, so it shall be monitored. The followings are calibration gas of volatile organic compound measuring system supplied by RIGAS, and required and recommended generally.

Mixed example

Component & Matrix	Nominal Fraction Range			Urel* (k=2) %	Shelf Life
	From	To	Unit		
Benzene	1	100	μmol/mol	1 ~5	1year ~3year
Toluene	1	100	μmol/mol		
Ethylbenzene	1	100	μmol/mol		
o-Xylene	1	100	μmol/mol		
m-Xylene	1	100	μmol/mol		
p-Xylene	1	100	μmol/mol		
Styrene	1	100	μmol/mol		
Nitrogen				Determined in accordance with the customer's needs	

Component & Matrix	Nominal Fraction Range			Urel* (k=2) %	Shelf Life
	From	To	Unit		
Vinyl chloride	5	10	μmol/mol	2 ~3	1year ~2year
1,3-Butadiene	5	10	μmol/mol		
Dichloromethane	5	10	μmol/mol		
Acrylonitrile	5	10	μmol/mol		
Chloroform	5	10	μmol/mol		
Carbon tetrachloride	5	10	μmol/mol		
Benzene	5	10	μmol/mol		
1,2-Dichloroethane	5	10	μmol/mol		
Trichloroethylene	5	10	μmol/mol		
Tetrachloroethylene	5	10	μmol/mol		
Ethylbenzene	5	10	μmol/mol		
Styrene	5	10	μmol/mol		
Aniline	5	10	μmol/mol		
Nitrogen				Determined in accordance with the customer's needs	

※ If you have any inquiry on products and mixing besides the above components and concentration, ask for consultation and we will provide further information.

※ Urel.: relative expanded uncertainty

Other Gas Mixtures

RIGAS还根据客户的不同要求提供照明气体、稀有气体或半导体用混合气体。本公司将按照不同客户的需求生产。

RIGAS also supplies illuminating gas, rare gas or semiconductor gas mixture according to various customer needs. We RIGAS will produce gas at your order.

- Illuminating Gas Mixtures
- Toxic Gases
- Semiconductor Gas Mixtures
- Rare Gases
- Research and Development Gas Mixtures
- Hydrocarbons
- High Purity Gases
- Etc.

Cylinder

Material	Size	Material	Size
Steel	3.4 L	Aluminum	1 L
	10 L		3.7 L
	15 L		10 L
	40 L		15 L
	47 L		30 L
	118 L		ETC.
	ETC.		

Valve

Standard	Specification	Material
C10	5/8"-18 UNF	Ni-Plated
JIS	W22mm-14th -RH	Brass, Ni-Plated, SUS
	W22mm-14th -LH	
	W23mm-14th -RH	Brass
CGA	CGA 350 825"14NGO-RH-EXT	Brass, Ni-Plated, SUS
	CGA 510 885"14NGO-LH-INT	Brass
BS	Valve connector is available	
DIN	Valve connector is available	



※ The above cylinders and valves may be limited depending on the components requested by a customer. Details will be delivered when an estimate is provided.

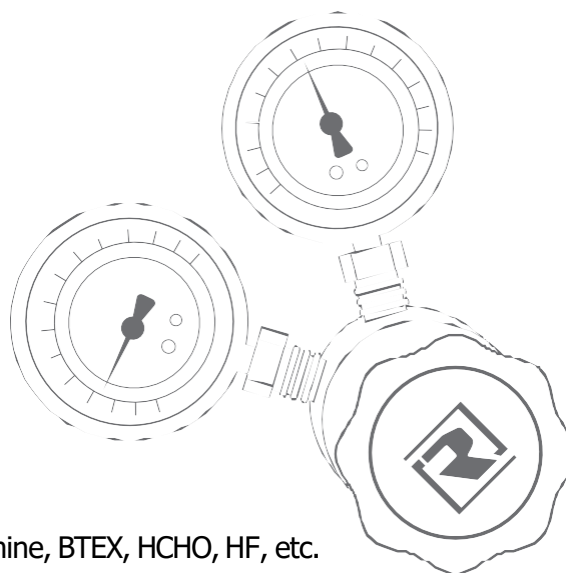
RIGAS Regulator for Calibration Gases

■ Specification

- 1Stage(Single-stage) and 2Stage(Double-stage) Construction
- Body : Brass(Ni-Plated), SUS316L
- Seat : PCTFE / PTFE
- Diaphragm : Hastelloy
- Stem : SUS316L
- Temperature Range : -40 °C~74 °C
- Inlet and outlet port size : 1/4 Inch NPT
- Maximum Inlet Pressure : 25 MPa

■ Typical Applications

- Research Laboratories
- Gas Chromatography
- Laser Gas System
- Process Analyzer
- Zero & Calibration Gases
- Purging Systems
- The following gases can be analyzed : HCl, Amine, BTEX, HCHO, HF, etc.



■ Order information

Series	Material	stage	Inlet pressure gauge	Pressure control range	Inlet connections (Nut type)	Outlet connections (Male connector)
G S	S : SUS316L B : Brass (Ni-Plated)	1 : 1stage 2 : 2stage	25 : 25 MPa	06 : 0.6 MPa 10 : 1.0 MPa	R : 22 mm-RH L : 22 mm-LH C : CGA350 N : no option E : etc.	0 : no option 1 : 1/4 inch 2 : 1/8 inch 3 : 1/16 inch 4 : etc.



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