NAGANO KEIKI

Pressure Sensor and Gauge

Rev.2

Pressure Measurement Instruments for Hydrogen Applications

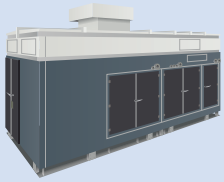
We contribute to the energy of the future

by supporting the age of hydrogen through manufacturing with safety, security and reliability in mind.

Our products cover the full value chain from hydrogen production, transportation and storage to utilization.

Production

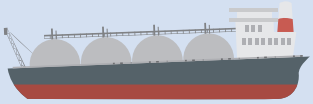
Natural gas, oil, coal



Hydrogen production equipment

Renewable energy

Transport



Liquefied hydrogen
LH_2 (liquefied -253°C)

Organic hydride
(Methylcyclohexane)
MCH (liquid at ordinary temperature and pressure)

Ammonia NH_3
(Liquefaction: ordinary pressure -33°C or 8.5 atm (20°C))

Vaporization

Vaporization

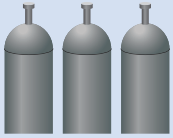
Dehydrogenation

H_2

Storage

Hydrogen tank

Hydrogen storage alloy

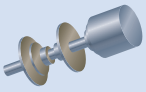


H_2

Utilization

Power generation field

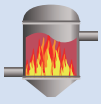
Boiler co-firing



Gas turbine

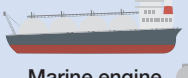
Fuel cell

Industrial field



Industrial furnace

Transportation field

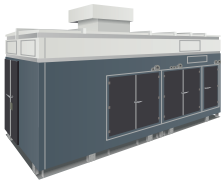


Marine engine

Automotive engine

Fuel cell vehicle

Use cases



Hydrogen production equipment

Hydrogen storage

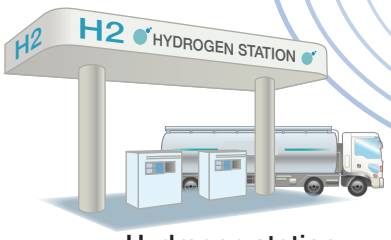
GF32

GV40/50

CD77

Fuel cells

Hydrogen-related industry

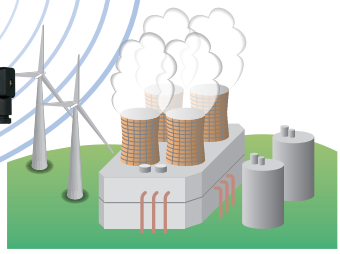


Hydrogen station

EH15

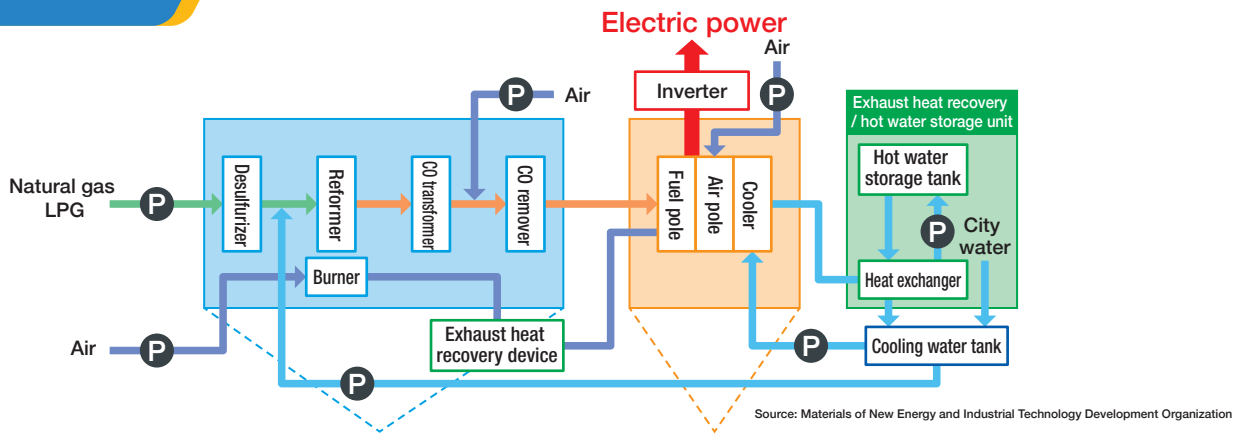
EJ15

KJ91

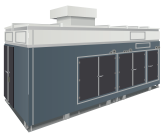


Renewable energy

Application



Source: Materials of New Energy and Industrial Technology Development Organization

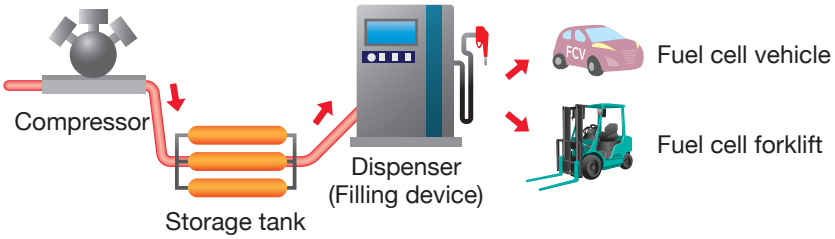


Hydrogen production equipment

Fuel cells

Hydrogen station

Hydrogen station | High-pressure hydrogen facilities



Key points of pressure measurement instruments for low-pressure hydrogen

Normal operating pressure 20MPa or less, recommended specifications for low-pressure hydrogen

Features

■ Pressure detection element for low-pressure hydrogen

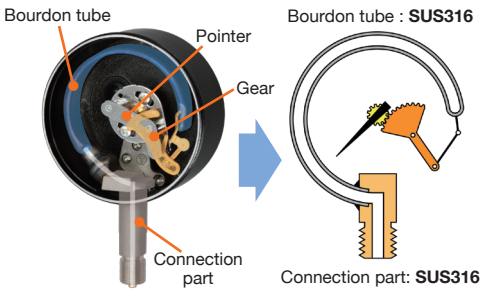
Pressure gauges and pressure switches — Bourdon tube and connecting part: Austenitic stainless steel (SUS316, SUS316L and SCS14, SCS16)


BE10/15


GV42


GV50

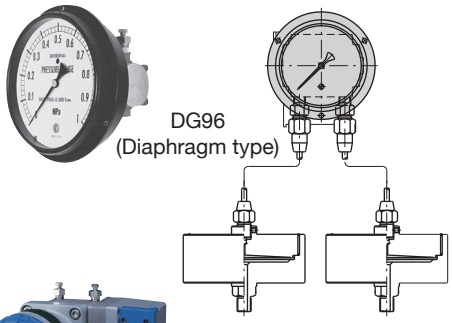

CD77



Bourdon tube and connection part are TIG welded

* The shape of the Bourdon tube varies depending on the pressure range. And the differential pressure gauges have a different structure.
* The pressure switch is a Bellows type.

Differential pressure gauges and differential pressure switches — Diaphragm type with fully welded structure


DG96 (Diaphragm type)

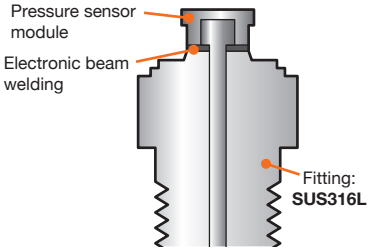

CD71

Pressure sensors — Sensor module and fitting : SUS316L

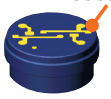

EH15


GC51

EJ15



Low to high pressure


Pressure sensor module **SUS316L**

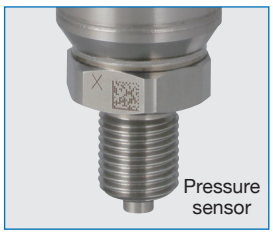
Pressure sensor and fitting are electron beam welded.

Connection

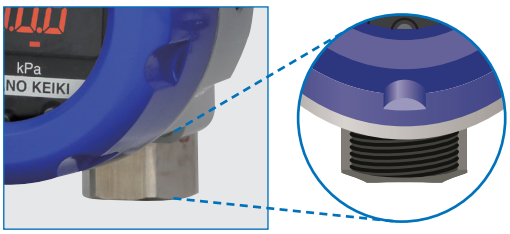
All models are compatible with parallel pipe thread connections.

Parallel male thread


Pressure gauge


Pressure sensor

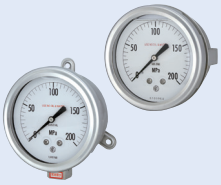
Parallel female thread



Applicable models : **GC51, KJ91**

NAGANO KEIKI's pressure measurement instruments is ideal for low-pressure hydrogen facilities

Pressure gauges and pressure switches

Model / Name	BE10/15 Sealed type pressure gauge	GV4□ Glycerin bath type pressure gauge	GV5□ Glycerin bath type pressure gauge	CB33 Pressure switch	CD77 Flame proof type pressure switch
External Appearance					
Size	ø100	ø100 · ø150	ø60 · ø75	—	
Structure	Sealed type	Glycerin bath type		IP66	
Configuration	Type A and Type B (mounting hole) / Type D (embedded type)			Panel mounting	Panel mounting, 2B pipe mounting
Pressure range	0 to 0.1→0 to 100MPa	0 to 0.1→0 to 200MPa*1	0 to 0.1→0 to 100MPa	0.01 to 0.1→1.5 to 13MPa	0.01 to 0.1→1 to 10MPa
Connection	G3/8B, G1/2B	G3/8B, G1/2B	G1/4B, G3/8B*1	G3/8B, G1/2B	

*1 Pressure range varies depending on pressure gauge size.

Differential pressure gauges and differential pressure switches (supported by diaphragm type)

Model / Name	DG95/96 Differential pressure gauge	DG97/98 Differential pressure gauge with electric contact	CD71 Flame proof type differential pressure switch
External Appearance			
Size	ø100 · ø150		—
Structure	Sealed type		IP65
Configuration	2B pipe mounting, embedded type	2B pipe mounting, wall mounted type	Panel mounting, 2B pipe mounting
Differential pressure range	0 to 0.05MPa→0 to 1MPa		0 to 0.05MPa→0.2 to 1MPa
Connection	Screw / flange connection (depending on diaphragm specifications)		

Pressure sensors

Model / Name	EH15 Pressure sensor for hydrogen measurement	GC51	EJ15	KJ91
External Appearance				
Model No.*2	EH15□□2G	GC51-□4G	EJ15-□□G	KJ91-□□G
Pressure range	0 to 0.3MPa→0 to 1MPa * Please contact us for low-pressure range below 100kPa.*3	0 to 0.3MPa→0 to 35MPa	0 to 0.5→0 to 35MPa	0 to 0.3→0 to 35MPa
Connection	G1/4B, G3/8B	G1/4 female	G1/4B, G3/8B, G1/2B 9/16-18UNF female (equivalent to autoclave F250C)	G1/4 female, 9/16-18UNF female (equivalent to autoclave F250C)
Explosion class	—		Exia IIC T4 Ga	

*2 The □ indicates the mounting method and connection thread.
*3 For low-pressure hydrogen measurement below 100 kPa, we can provide products that suit your operating pressure and temperature needs.

Key points of pressure measurement instruments for high-pressure hydrogen

We have our very own in-house core technology for pressure measurement instruments used in high-pressure hydrogen!

Features

■ Pressure detection element for high-pressure hydrogen

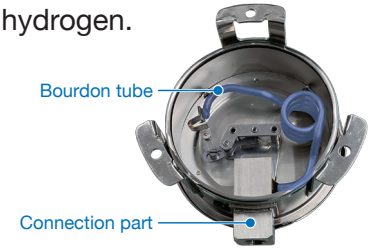
Pressure gauges Bourdon tube and joint material: SUS316L or XM-19 (HRX19®*)

Reliability is ensured through field tests conducted on pressure gauge using actual high-pressure hydrogen.

* HRX19® is a registered trademark of NIPPON STEEL CORPORATION.

GF32

GV40/45



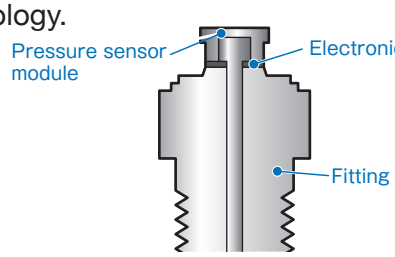
Detection element: Helical Bourdon tube
Structure: Bourdon tube and connection part are welded.

Pressure sensors Sensor module material: SUH660 (A286), Fitting material: SUS316 (Ni equivalent material)

Utilizes semiconductor strain gauge for pressure sensor element welding it to fitting by own technology.

EJ15

KJ91



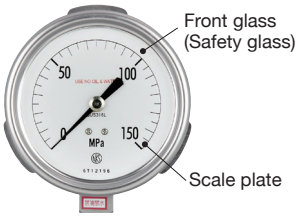
Detection element: Pressure sensor module
Structure: Pressure sensor and fitting are electronic beam welded.

For high-pressure hydrogen, "Use no oil & water" and "He leak test" are standard.

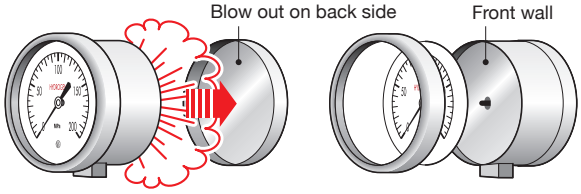
"Safety First" construction

■ Pressure gauge

Solid front type



GF32



- **Safety measures**
  Glass: Safety glass
  Solid front structure: A strong wall is provided behind the scale, and if the Bourdon tube should burst, the blow-out back of the case will detach.

■ Pressure sensors

Intrinsically safe pressure transmitter

EJ15

KJ91

- The pressure transmitter offers increased durability due to the improved pressure sensing element. This is achieved through optimized material control, design, excellent surface quality, and heat treatment.

Intrinsically safe pressure transmitter with compact design for easy installation (Exia II CT4)

- Durable construction that withstands 10 million cycles of dynamic pressure testing (medium: oil).
- Durability was tested for a high burst pressure of over 700MPa for sensors specified for 70MPa applications after previous evaluation of the sensor in high-pressure hydrogen applications.

NAGANO KEIKI's pressure measurement instruments is ideal for high-pressure hydrogen facilities

Mechanical pressure gauges

Model / Name	GF32·37 Pressure gauge				GF32 Glycerine bath type pressure gauges		GV42·47 Glycerine bath type pressure gauges*1		GV40·45 ϕ60 Pressure gauge for high-pressure hydrogen	
External Appearance										
Model Number	GF32–H01	GF32–H02	GF37–H01	GF37–H02	GF32–H03	GF32–H04	GV42–H01	GV47–H01	GV40–H01	GV45–H01
Size	ø100								ø60 60 DIA.	
Structure	Solid front type				Solid front type (Glycerine bath)		Glycerine bath type		Glycerine bath type	
Configuration	Surface mounting (Three-hole fixing)		Flush mounting (Three-hole fixing)		Surface mounting (Three-hole fixing)		Surface mounting (Three-hole fixing)	Flush mounting (Three-hole fixing)	A-frame	D-frame (Flush mounting)
Pressure range	0 to 70, 100, 120, 150, 200, 300MPa*2				0 to 70, 100, 120, 150, 200MPa				0 to 60MPa	
Connection	9/16-18UNF female (equivalent to autoclave F250C)									

*1 GV4□ series glycerine bath type pressure gauges do not have a solid front structure. A solid front structure is recommended for high-pressure hydrogen measurement applications.
*2 300MPa is only compatible with GF32-H02 and GF37-H02.

Pressure sensors

Model / Name	EJ15 Intrinsically safe Pressure sensor	KJ91 Intrinsically safe pressure transmitter
External Appearance		
Model Number	EJ15–M□H：M12 Connector type EJ15–T□H：Terminal box type *□ indicates the type of connection screw.	KJ91–□□H *□□ indicates the mounting method and the type of connection screw respectively.
Pressure range	0 to 35, 50, 70, 100, 120MPa For other pressure range, please contact us.	
Connection	G1/4B, G3/8B (50MPa range or less), G1/2B, 9/16-18UNF female (equivalent to autoclave F250C)	G1/4 female, 9/16-18UNF female (equivalent to autoclave F250C)
Explosion class	Exia ⅡC T4 Ga	

Specification of intrinsic safety explosion-proof construction	Explosion-proof standards	IECEx (International)	ATEX*3 (Europe)	Japan	TS (Taiwan)	NEPSI (China)	KCs (Korea)	IECEx (International)	ATEX*3 (Europe)	Japan
	Authorized number	IECEx CML 19.0013	CML 19ATEX2063	CML 19JPN2184	TD0502IJ (Identification number)	GYJ19.1315	19-AV4BO-0654	IECEx CML 20.0165X	CML 20ATEX2289X	CML 21JPN2867X

*3 Applicable directive: 2014/34/EU (ATEX directive)

■ Pressure measurement instruments for high-pressure hydrogen applications

	Product lineup		Pressure range: Low pressure / 35MPa / Medium pressure / 70MPa / High pressure Hydrogen generator, hydrogen power generation, etc. / Accumulator, dispenser, compressor, etc.
For low-pressure hydrogen	Pressure gauges	 BE10  GV□□	BE10/GV□□ 0.1 to 50MPa * Please select a product for high-pressure hydrogen for pressures above 70MPa.
	Pressure switches	 CB33  CD77	CB33 0.1 to 15MPa CD77 0.1 to 10MPa
	Differential pressure gauge and differential pressure switches	 DG9□  CD71 Supported by diaphragm type	DG9□ 0.05 to 1MPa CD71 0.05 to 1MPa
	Pressure sensors	 EH15 (For hydrogen measurement)  GC51	EH15 0.3 to 1MPa GC51 0.3 to 35MPa * Please contact us for low-pressure range below 100kPa.*1
For high-pressure hydrogen	Pressure gauges	 GF32·37  GV40·45	GV32,37 70 to 200MPa GV40,45 60MPa
	Pressure sensors	 EJ15  KJ91	EJ15 0.5 to 120MPa KJ91 0.3 to 120MPa

*1 For low-pressure hydrogen measurement below 100kPa, we offer products that meet your operating pressure and temperature requirements.

NAGANO KEIKI

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