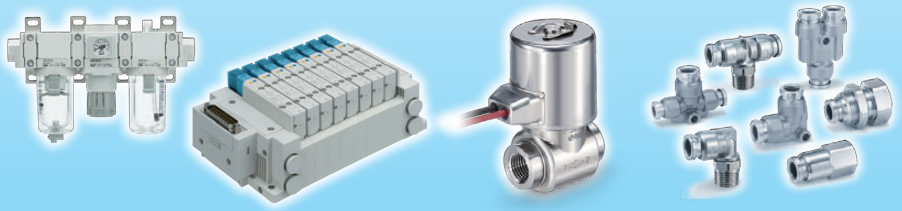
SMC's Solutions to Realize a Future Hydrogen Society

Production ed.
Hydrogen source/ production

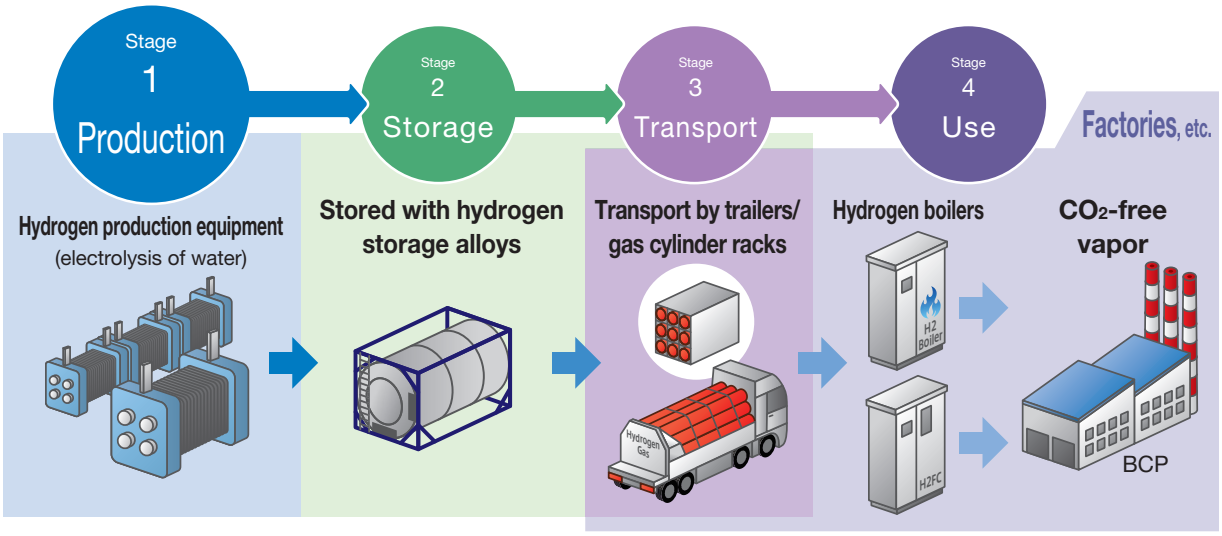


INDEX

P-E23-19

Equipment Proposals for Production Facilities of Hydrogen, the Next-Generation Energy

Four stages of the hydrogen supply chain



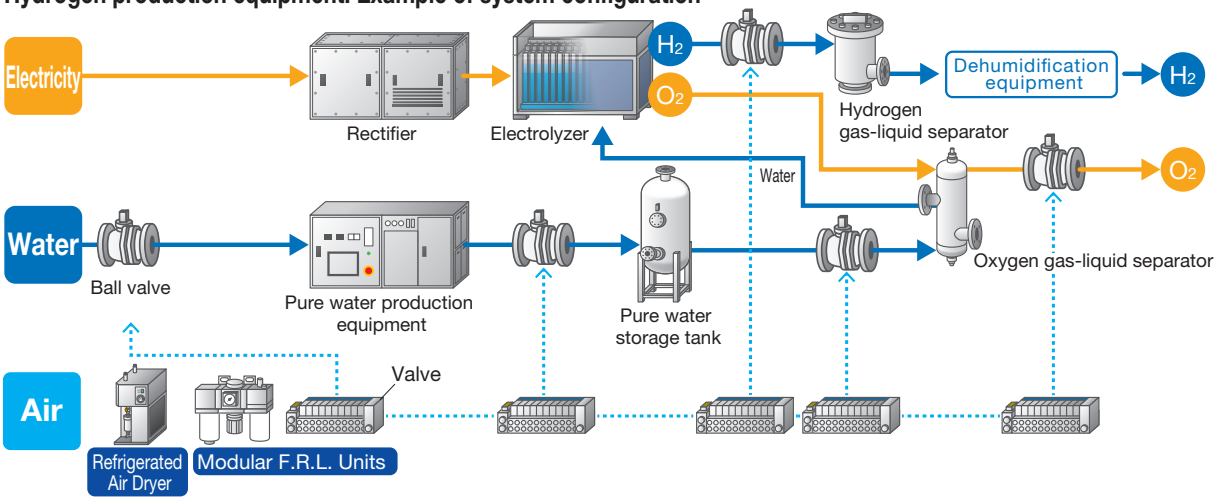
Proposing solutions associated with hydrogen-related facilities for the realization of a hydrogen society. SMC supports all four stages of Production, Storage, Transport, and Use. One-stop supply of automatic control equipment that contributes to decarbonization in each stage.

In this issue, we propose products focused on the Production of hydrogen.

Hydrogen Production Process

Stage 1 Production

Hydrogen production equipment: Example of system configuration



Cooling during the Hydrogen Production Process

▸▸ p. 3

Dehumidification following water electrolysis to produce highly purified hydrogen

SMC chillers are compact, energy-saving, and of high quality


Thermo-chiller


Thermo-chiller/ Inverter Type


Thermo-chiller/Rack Mount Type

Instrument Air Control

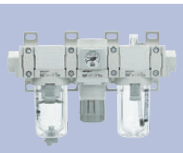
▸▸ p. 5

Air for ball valve operation

Compact, energy-saving, wireless, and compatible with various protocols


Compact 5-Port Solenoid Valve


4-Port Solenoid Valve/ Cassette Type Manifold

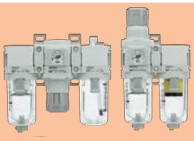

Modular F.R.L. Units

Cleaning of Instrument Air

▸▸ p. 6

Filtration and dehumidification of compressed air

Cleaning of compressed air to protect instrumentation from moisture and foreign matter


Modular F.R.L. Units


Refrigerated Air Dryer


Modular Connection Type Membrane Air Dryer

Fluid Control/ Piping Materials

▸▸ p. 7

ON/OFF control equipment and piping materials for various fluids

Complete proposal with a diverse lineup


Clean One-touch Fittings


Direct Operated 2-Port Solenoid Valves


Stainless Steel 316 Insert Fittings


Fluoropolymer Tubing

Solutions

▸▸ p. 8

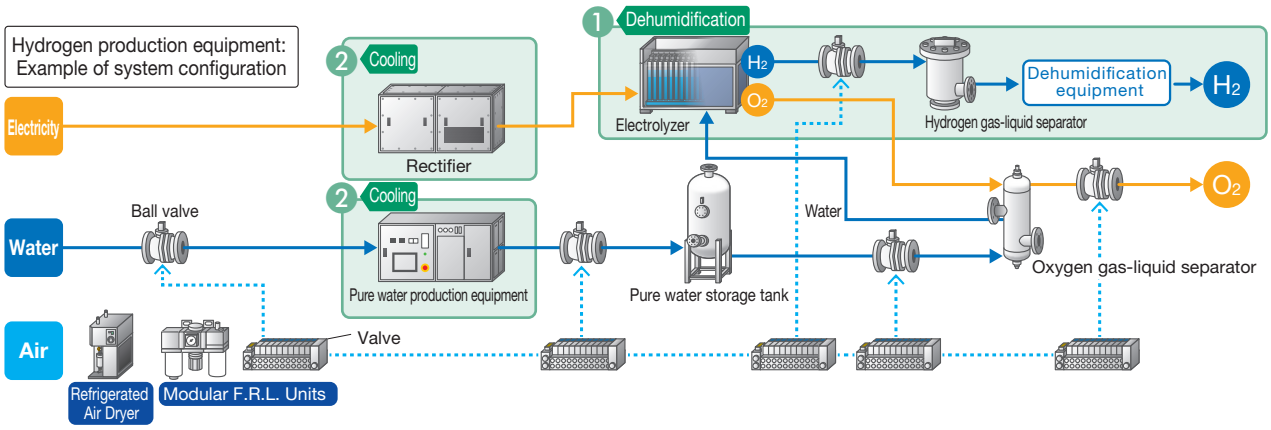
Process Gas Equipment Conversion to wireless communication

SMC's proposals for the hydrogen production process


For general and process gases


Wireless System

Cooling during the Hydrogen Production Process



1 Pre-cooling before dehumidification following water electrolysis to produce highly purified hydrogen

2 Cooling of heat loads of various equipment (rectifiers, etc.)

Thermo-chiller/Standard Type HRS

- With this chiller, cooling water can be obtained anywhere it is necessary because of easy installation and easy operation.

Series	Set temperature range	Cooling capacity	Temperature stability	Cooling method	Circulating fluid
HRS012 to 060	5 to 40°C	1.3 kW, 1.9 kW 2.4 kW, 3.2 kW 4.2 kW, 5.1 kW 5.9 kW (60 Hz)	±0.1°C	Air-cooled refrigeration Water-cooled refrigeration	Tap water Deionized water Ethylene glycol aqueous solution (15%)

Thermo-chiller/Inverter Type HRSH

Large type

- Complete with energy-saving triple inverter!
- Outdoor installation, Splashproof type (IPX4)

Series	Set temperature range	Cooling capacity	Temperature stability	Cooling method	Circulating fluid
HRSH	5 to 35°C	10 kW, 15 kW 20 kW, 25 kW 28 kW	±0.1°C	Air-cooled refrigeration Water-cooled refrigeration	Tap water Deionized water Ethylene glycol aqueous solution (15%)

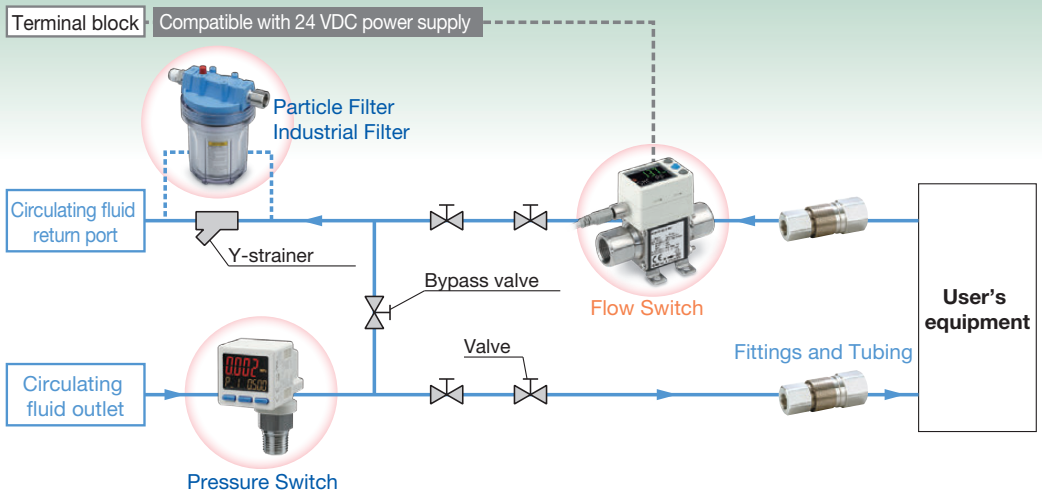
Thermo-chiller/Rack Mount Type HRR

- Operable without the need to remove the unit from the rack
  Front access: Simple to control, service, and maintain with all filters and drainage accessible via the front panel

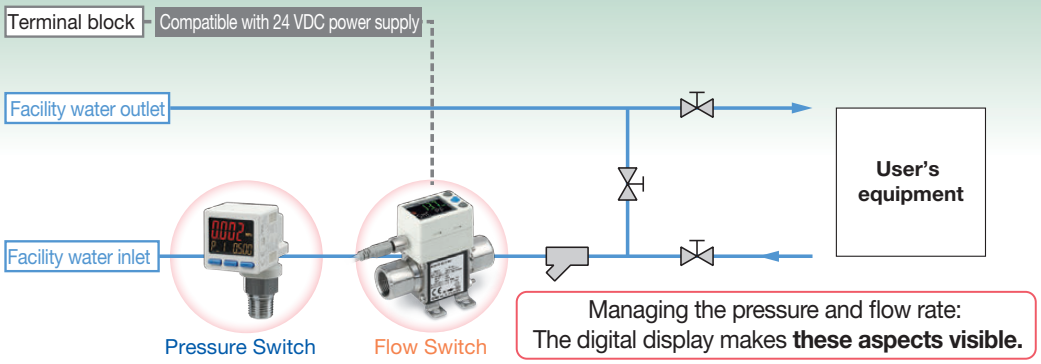
Series	Set temperature range	Cooling capacity	Temperature stability	Cooling method	Circulating fluid
HRR	5 to 35°C 15 to 35°C	1.1 kW, 1.2 kW, 1.8 kW, 2.4 kW, 3.0 kW	±0.1°C	Air-cooled refrigeration Water-cooled refrigeration	Tap water Ethylene glycol aqueous solution (15%)

Peripheral equipment for circulating fluids and facility water lines can also be supplied by SMC.

Circulating Fluid Line



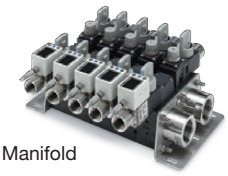
Facility Water Line (Water-cooled)



Flow Switch: Monitors the flow rate and temperature of the circulating fluid and facility water

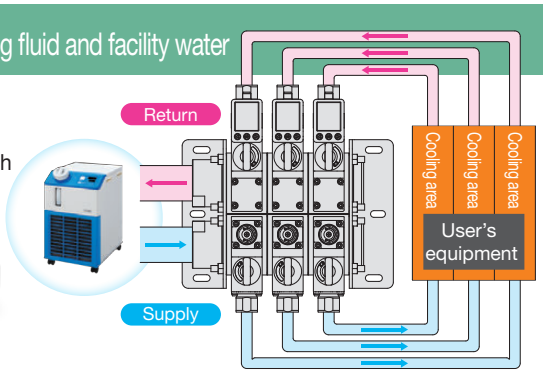
3-Color Display
Digital Flow
Switch for Water
PF3W

PVC piping



Manifold

3-Color Display
Electromagnetic
Type Digital Flow Switch
LFE



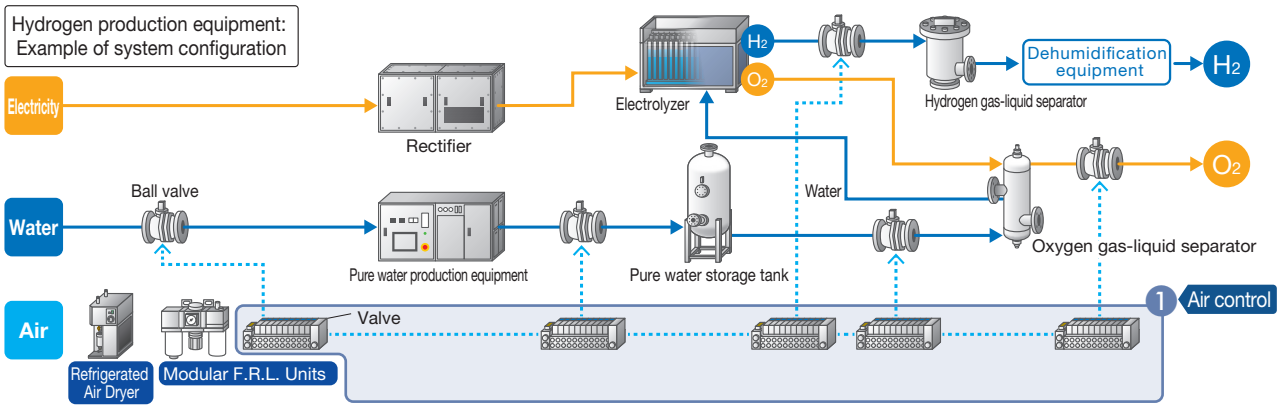
Pressure Switch: Monitors the pressure of the circulating fluid and facility water

3-Screen Display
High-Precision
Digital Pressure
Switch
ISE20C

Pressure Sensor for General Fluids ***PSE56□***

Digital Sensor Monitor
PSE200A, 300A, 300AC

Instrument Air Control



1 Air control for ball valve operation

Compact 5-Port Solenoid Valve/Plug-in Type JSY1000/3000/5000

- Size reduction possible thanks to a flow increase. This leads to space saving, weight reduction, and a large flow rate.

Series	Flow rate characteristics 4/2→3/5 (A/B→E)		Applicable cylinder size	Power consumption [W]
	C [dm³/(s·bar)]	b		
JSY1000	0.91	0.48	ø40	0.2 (With power saving circuit)
JSY3000	2.77	0.27	ø50	0.4 (Standard) 0.1 (With power saving circuit*) * Made to Order
JSY5000	6.59	0.22	ø80	0.4 (Standard) 0.1 (With power saving circuit*) * Made to Order

4-Port Solenoid Valve/Cassette Type Manifold SJ1000/2000/3000/4000

- Low-profile cassette type with baseless structure

Series	Flow rate characteristics 4/2→3/5 (A/B→E)			Applicable cylinder size	Power consumption [W]
	C [dm³/(s·bar)]	b	Cv		
SJ1000	0.32	0.33	0.08	ø32	0.55 (Standard) 0.23 (With power-saving circuit)
SJ2000	0.36	0.13	0.08	ø20	0.55 (Standard) 0.23 (With power-saving circuit)
SJ3000	0.56	0.11	0.12	ø25	0.4 (Standard) 0.15 (With power-saving circuit)
SJ3000A Large flow type	0.76	0.19	0.21	ø63	0.4 (Standard) 0.15 (With power-saving circuit)
SJ4000	2.61	0.20	0.68	ø80	0.4 (Standard) 0.15 (With power-saving circuit)

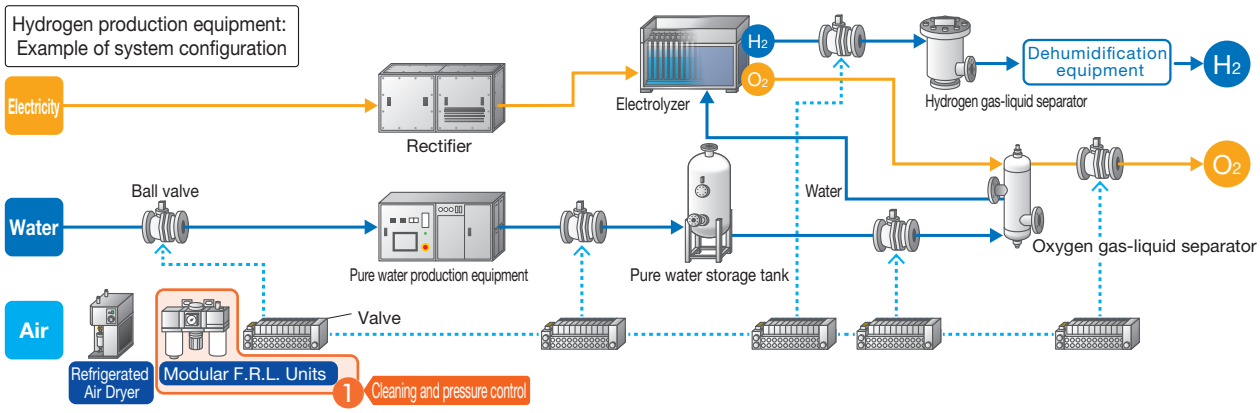
5-Port Solenoid Valve/Plug-in Type SY3000/5000/7000

Metal Seal
Rubber Seal

- Due to the flow increase, the valve size can be reduced!
  Saves energy and space.
- Power consumption: 0.1 W (With power saving circuit)/0.35 W (Standard)

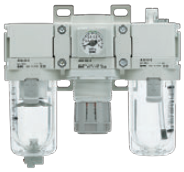
Series	Flow rate characteristics 4/2→5/3 (A/B→EA/EB)		Applicable cylinder size	Power consumption [W]
	C [dm³/(s·bar)]	b		
SY3000	1.6	0.19	ø50	0.35 (Standard) 0.1 (With power saving circuit)
SY5000	3.6	0.17	ø63	
SY7000	5.9	0.20	ø80	

Cleaning of Instrument Air



1 Removal of contaminants (moisture, particles, oil mist) in instrument air and pressure control

Modular F.R.L. Units AC-D



- Modular design with uniform body style

Description	Series	Port size
Air filter, Regulator, Lubricator	AC20 to 40-D	1/8, 1/4, 3/8, 1/2
Filter regulator, Lubricator	AC20A to 40A-D	
Air filter, Regulator	AC20B to 40B-D	
Air filter, Mist separator, Regulator	AC20C to 40C-D	
Filter regulator, Mist separator	AC20D to 40D-D	

Refrigerated Air Dryer IDF

- Applicable for the high-temperature environments
  Ambient temperature: Max. 45°C
  Inlet air temperature: Max. 65°C
- Increased air flow capacity

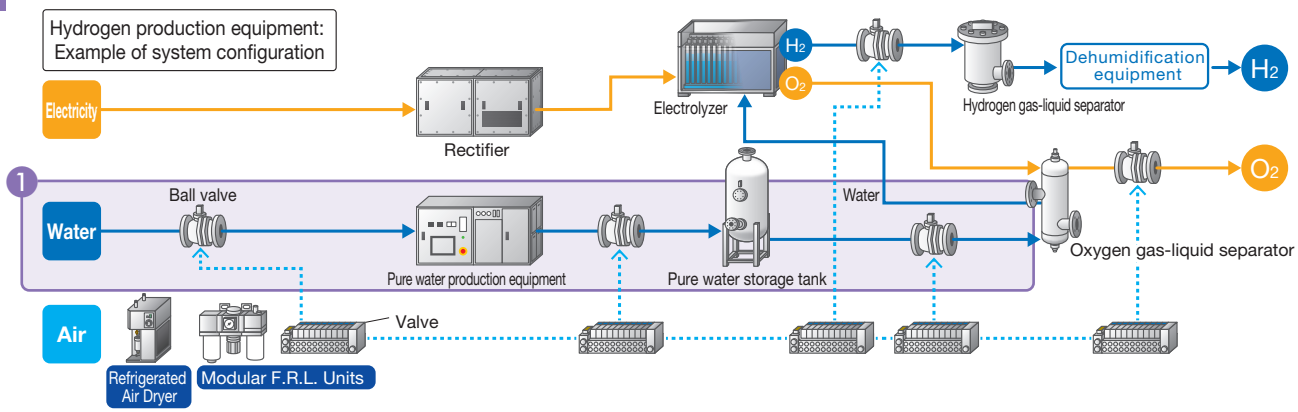
Series	Rated inlet condition	Air flow capacity [m³/min (ANR)]		Refrigerant	Port size
		50 Hz	60 Hz		
IDF60	35°C 0.7 MPa	5.6	6.5	R410A (HFC) GWP: 2088	R1
IDF70		8	9.1		R1 1/2
IDF80	40°C 0.7 MPa	11.6	13.6		R2
IDF90		14.3	16.4		R2

Modular Connection Type Membrane Air Dryer IDG-D

- Compatible with various ISO water quality classes
- Modular connection is possible.
- Non-fluorocarbon
- Power supply not required
- No vibration or heat discharge
- Contributes to energy saving
  Pressure drop: Reduced by up to 61%
  Outlet air flow rate: Max. 25% increase
  Purge ratio: Approx. 14%

Series	Standard inlet condition	Outlet air flow rate L/min (ANR)	Pressure dew point [°C]	Liquid water class	Applicable AC size	Port size
IDG20-D	25°C 0.7 MPa	100	3	4	AC20	Rc, NPT, G 1/8, 1/4
IDG30-D	25°C 0.7 MPa	250	3	4	AC30	Rc, NPT, G 1/4, 3/8
IDG40-D	25°C 0.7 MPa	500	3	4	AC40	Rc, NPT, G 3/8, 1/2

Fluid Control/Piping Materials



1 Control equipment and piping materials for various fluids

Clean One-touch Fittings KP

- One-touch fittings for clean room blowing systems
- Completely oil-free (Fluoro-coated rubber portions)
- Wetted parts are non-metallic

Series	Applicable tubing O.D.	Connection thread
KP	ø4, ø6, ø8, ø10, ø12	1/8, 1/4, 3/8, 1/2

Stainless Steel 316 Insert Fittings KFG2

- Compact and lightweight

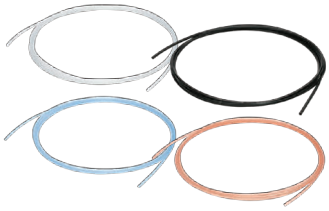
Series	Size	Tubing O.D. x I.D.	Connection thread
KFG2	Metric	ø4 x ø2.5, ø4 x ø3, ø6 x ø4, ø8 x ø6, ø10 x ø7.5, ø10 x ø8, ø12 x ø9, ø12 x ø10, ø16 x ø13	R, Rc 1/8, 1/4, 3/8, 1/2
KFG2	Inch	ø1/8" x ø0.086", ø5/32" x 0.098", ø1/4" x ø5/32", ø5/16" x 0.236", ø3/8" x ø1/4", ø1/2" x ø3/8"	NPT1/8, 1/4, 3/8, 1/2

Direct Operated/Pilot Operated 2-Port Solenoid Valve JSX/JSX□

- Space saving
- Energy saving

Series	Type	Valve type	Port size	Orifice diameter [mmø]
JSX	Direct operated	N.C.	1/8, 1/4, 3/8	1.6 to 7.1
JSX□□U	Direct operated High flow/power saving type	N.C.	1/8, 1/4, 3/8	2.4 to 7.1
JSXD	Pilot operated	N.C.	1/8, 3/8, 1/2, 3/8, 1/2, 3/4, 1, 1 1/4, 32A, 1 1/2, 40A, 2, 50A	10 to 50
JSXZ	Zero differential pressure type pilot operated	N.C.	1/4, 3/8, 1/2, 3/8, 1/2, 3/4, 1	10 to 25
JSXM	Modular mounting type	N.C.	1/8, 1/4, 3/8, 1/2	3.2, 4

Fluoropolymer Tubing (PFA)TLM/TILM



- Operating temperature (fixed usage): Air, Inert gas: -65 to 260°C
  Water: 0 to 100°C (No freezing)
- Flame Resistant (Equivalent to the Standard UL-94 V-0)
- Japan Food Sanitation Law compliant
- Compliant with the FDA's (U.S. Food and Drug Administration) § 177.1550 dissolution test

Series	Tubing O.D.		Color
	Metric size	Inch size	
TLM/TILM	ø2, ø3, ø4, ø6, ø8, ø10 ø12, ø16, ø19, ø25	ø1/8", ø3/16", ø1/4", ø3/8" ø1/2", ø3/4", ø1", ø1 1/4"	Translucent, Black, Red, Blue

Solutions

Equipment proposals for highly clean gas systems

For general and process gases

•gas delivery in semiconductor and other clean industries

Series	Type	Application	Body material	Connection type	Connection size
AK	Single stage	Distribution	Stainless Steel 316 or Brass	NPT female Compression	1/4",3/8" 1/2"
AK	Single stage	Source	Stainless Steel 316 or Brass	NPT female Compression	1/4",3/8" 1/2"
AK	Single stage	Sub-atmospheric pressure	Stainless Steel 316 or Brass	NPT female Compression	1/4",3/8" 1/2"
AK	Two stage	Source	Stainless Steel 316 or Brass	NPT female Compression	1/4"
BP	Back pressure regulator	–	Stainless Steel 316 or Brass	NPT female Compression	1/4"

Series	Type	Body material	Connection type	Connection size
AP	Air operated type	Stainless Steel 316L secondary remelt	Face seal Tube weld	1/4",3/8" 1/2",3/4"
AP	Manually operated type	Stainless Steel 316L secondary remelt	Face seal Tube weld	1/4",3/8" 1/2",3/4"

Equipment proposal for conversion to wireless communication system

Wireless System

•Conversion to wireless communication system associated with expansion of plants and equipment

Series	Enclosure	Communication protocol	Applicable valve
EXW1	IP20 (Remote)	CC-Link EtherCAT®	JSY1000, 3000, 5000
EX600-W	IP67 equivalent	EtherNet/IP™ PROFINET	SY3000, 5000, 7000 (Plug-in) SV1000, 2000, 3000 S0700 (IP40) VQC1000, 2000, 4000, 5000

Supported protocol lineup

PROFINET® EtherNet/IP™ EtherCAT® IO-Link CC-Link

■Trademark

EtherNet/IP® is a registered trademark of ODVA, Inc.

EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

SMC's Global Communication Network

Leading the way for automation around the world through continued customer communication

Since first expanding overseas in 1967, SMC has remained dedicated to building its global communication network. In order to quickly deliver high-quality products and services to customers around the world, we have established sales offices at the forefront of market. SMC has R&D facilities in Japan, the United States, Europe, and China, and production facilities in six domestic locations as well as in China, Singapore, Vietnam, and a number of other countries. Combining its strengths in manufacturing, sales, and technology, SMC is determined to exceed the expectations of customers around the world each and every time.

＊ As of the end of March 2022

Market share

Japan **63** %

Global **39** %

Number of products

Variations covering a wide variety of fields

12,000 basic models | **700,000** variations

Technical Development

5 locations worldwide

Engineering staff **1,700** employees

Production Facilities

Around **30** countries and regions worldwide

Distribution Centers

8 locations around the world

Sales Network

Around **80** countries and regions worldwide

Approx. **500** locations

Sales staff **8,300** employees

BCP Initiatives

＊As of August 2022

As a leading comprehensive manufacturer of automatic control equipment that supports automation, we strive to do everything in our power to be able to promptly–no matter the circumstances–provide products that meet the needs of our customers worldwide and earn their trust.

Production Department

- Risk diversification across production facilities and distribution centers
- SMC's supply system provides coverage of the world's major countries.
  Production Bases located in approximately 30 countries and regions with an extensive local inventory system

Technical Department

- Established a Global Engineering Network
  The BCP is implemented with collaboration between the Japan, Asia, US, and European Technical Centers, providing a quick response with 1,700 engineering staff members.
- Backup of business systems
- Functional backup at the Japan Technical Center (JTC)

Sales Department

- With approx. 500 sales offices in about 80 countries and regions around the world, SMC provides support for customers with an 8300-person (1100 in Japan and 7200 overseas) strong global sales force.
- Customer information management via SalesConnect (CRM)

Management and Finance

- Establishment of an advisory committee
- A strong financial foundation

Information Security (Applicable to all departments)

- Strengthened information security with a globally unified infrastructure.
- Prevention of cyber attacks, automatic detection, and strengthening of the monitoring system.
- Installation of data centers to establish a disaster recovery system.

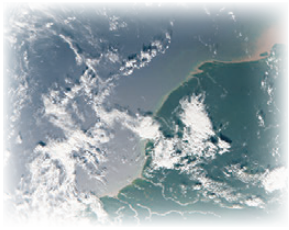
SMC's Initiatives

TARGET 01

Respect human rights, Promote diversity & Ensure safe and secure work environment

TARGET 02

Actions to take on Climate Change & Environmental Issues



TARGET 03

Stable global product supply

TARGET 04

Develop human resources & Disseminate automation control technology

Sustainable Management of CO_2

Production process and product performance improvements with a focus on the environment

SMC's CO_2 emission-reducing initiatives also include the promotion of eco-friendly factories and products. In addition, SMC promotes the reduction of CO_2 emissions in our operations.

Eco-Products | Eco-Factory | Air-saving System

Monitors the equipment standby conditions (when production stops) and automatically decreases the pressure.
Reduces unnecessary air consumption

Air consumption amount:
Max. 62% reduction

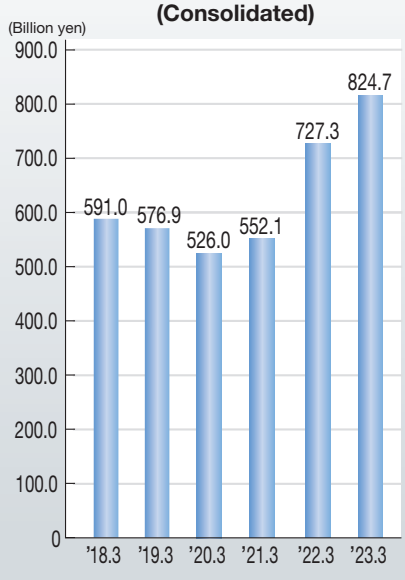
Corporate Summary

Company name	SMC Corporation
Head office	Akihabara UDX15F, 4-14-1 Sotokanda, Chiyoda-ku, Tokyo 101-0021, Japan Phone: +81(0)3-5207-8271 Fax: +81(0)3-5298-5361 https://www.smcworld.com
Established	April 27, 1959
President	Yoshiki Takada
Purpose of business	1. Manufacture, processing and sales of automatic control equipment. 2. Manufacture and sales of sintered filters and various types of filtration equipment.
Outstanding shares	67,369,359
Stock exchange listing	Tokyo Stock Exchange Prime Market
Capital stock	61 billion yen
Net sales	824.7 billion yen (Consolidated)*
Net income	224.6 billion yen (Consolidated)*
Number of employees	22,988 (Consolidated)*
Equity ratio	88.1%*
Rating	AA [R&I (Rating and Investment Information, Inc.)]*

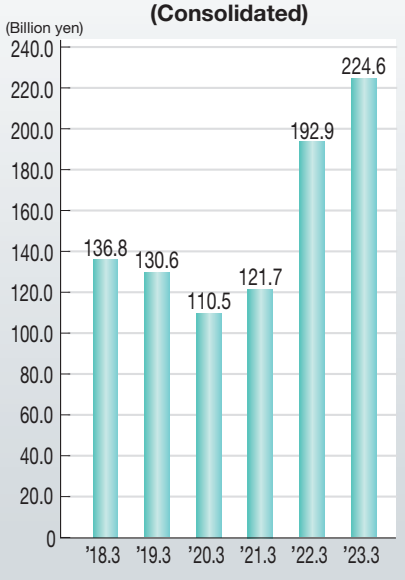
* As of the end of March 2023

Company information video

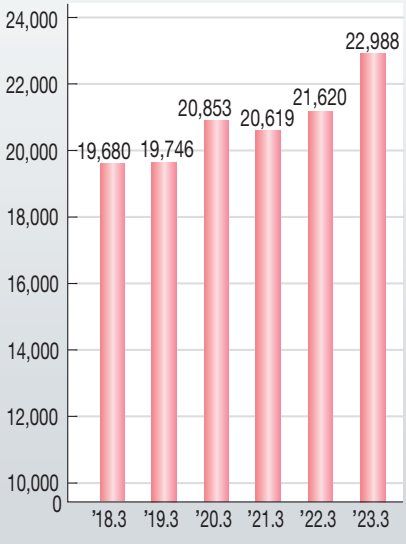
Net Sales (Consolidated)



Net Income (Consolidated)



Number of Employees (Consolidated)



SMC Corporation https://www.smcworld.com