SMC

SMC'S SOLUTIONS TO REALISE A FUTURE HYDROGEN SOCIETY

Enabling reliable hydrogen production

Expertise
Passion
Automation

Hydrogen solutions for a sustainable industrial future

Across industries worldwide, the transition towards lower-carbon energy systems is reshaping the way energy is produced, stored and used. Green hydrogen is increasingly recognised as a key energy carrier to support decarbonisation while maintaining industrial performance, operational reliability and productivity.

As hydrogen technologies move from pilot projects to industrial-scale deployment, stable and efficient operation becomes essential. From hydrogen production to downstream processes, reliable automation, precise control and robust system design are critical to ensure long-term, safe and efficient operation.

A trusted partner from development to operation

At SMC, we understand the technical and operational requirements of hydrogen applications. With decades of experience in industrial automation, we support hydrogen projects across the entire value chain with solutions designed to enhance reliability, efficiency and system stability.

Whether supporting early-stage concepts or large-scale industrial installations, SMC works closely with customers to deliver solutions adapted to their specific hydrogen processes. By focusing on durability, energy efficiency and operational reliability, we help build the foundation for safe, scalable and sustainable hydrogen systems.

This leaflet focuses on hydrogen production through water electrolysis and highlights how SMC supports stable and efficient operation across the production process.

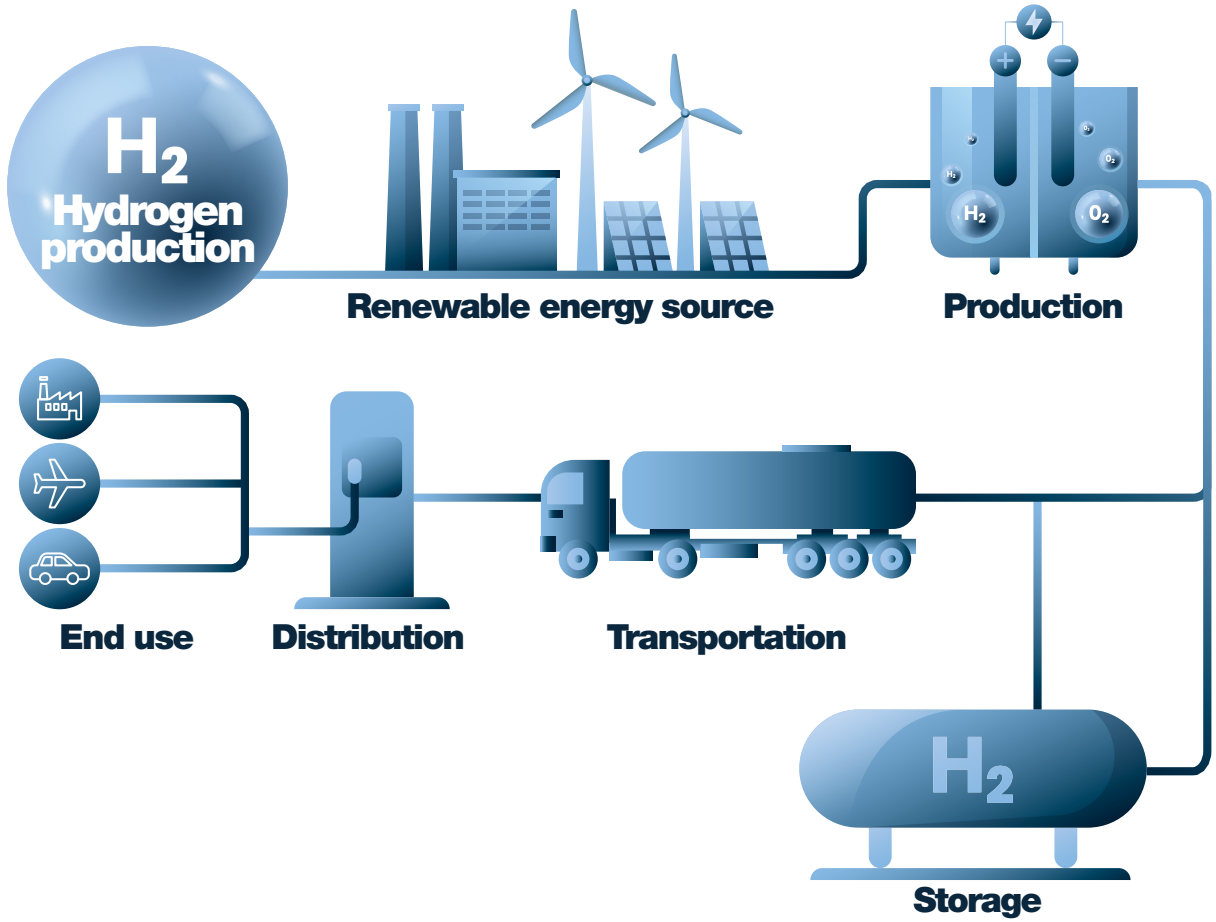
The hydrogen value chain

The hydrogen value chain connects renewable energy with real-world industrial and energy applications. From production to final use, each stage must operate reliably and efficiently to ensure hydrogen can be deployed at scale as a clean energy carrier.

While green hydrogen is produced using renewable electricity, its successful adoption depends on much more than the electrolysis process alone. Safe handling, stable operation and precise control are required across storage, transport and use, making the value chain a fully integrated system rather than a set of isolated steps.

At SMC, we understand the interdependencies across the hydrogen value chain. Our automation and fluid control solutions support stable and efficient operation at every stage, helping customers build reliable hydrogen systems that are ready to scale. Proposing solutions associated with hydrogen-related facilities for the realisation of a hydrogen society. SMC supports all four stages of production, storage, transportation and use of the hydrogen.

SMC supports hydrogen projects across the entire value chain, with a strong focus on reliable and efficient hydrogen production.



Hydrogen production

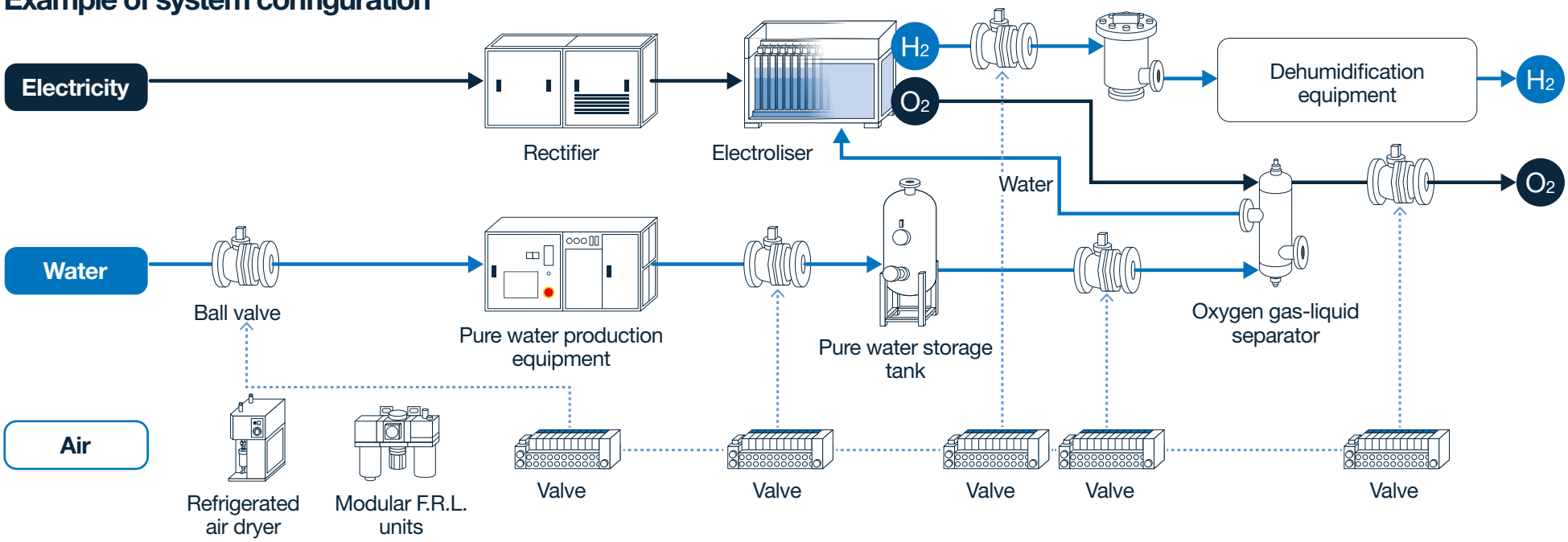
Hydrogen production through water electrolysis is a highly controlled industrial process that converts electrical energy into hydrogen using water as the primary input. To ensure stable, efficient and continuous operation, the electrolysis system relies on a combination of power electronics, water treatment, thermal management and precise control of gases and auxiliary utilities.

Beyond the electrolyser itself, the surrounding balance of plant plays a decisive role in overall system performance. Power rectification, cooling, pure water supply, instrument air quality and gas handling must operate in harmony to maintain efficiency, safety and hydrogen purity. Any instability in these supporting systems can directly affect production efficiency and equipment lifetime.

SMC supports hydrogen production systems with automation, fluid control and thermal management solutions designed to enhance reliability and operational stability.

By providing precise control of air, water and gases, as well as efficient cooling and monitoring, **SMC helps ensure that hydrogen production processes run smoothly, safely and efficiently** from start-up to full-scale operation.

Example of system configuration



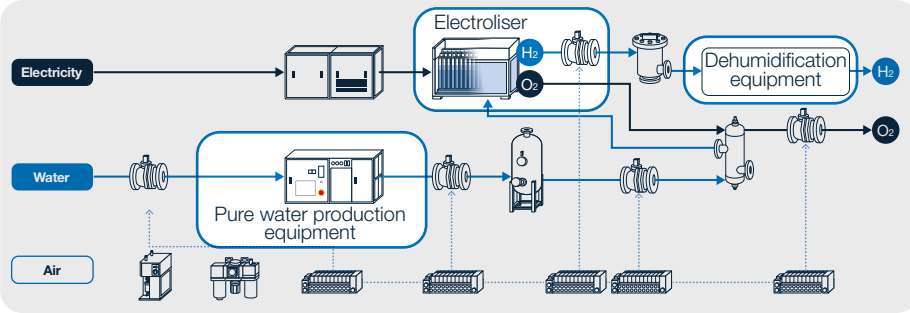
Cooling

Effective thermal management is essential for stable and efficient hydrogen production. During water electrolysis, significant heat is generated by key equipment such as rectifiers, electrolysers and auxiliary systems. In addition, controlled cooling is required prior to gas dehumidification to achieve the hydrogen purity levels required by downstream applications. Without precise temperature control, efficiency losses, reduced equipment lifetime and unplanned downtime can occur.

SMC supports hydrogen production processes with compact and energy-efficient thermo-chillers designed to ensure stable operation across varying heat loads. By maintaining optimal temperatures for power electronics, electrolysers and dehumidification systems, SMC solutions help improve process reliability, energy efficiency and overall system performance.

All SMC temperature control equipment is designed in compliance with the latest EU F-Gas Regulation, using low-GWP or natural refrigerants to meet current and future regulatory requirements.

This ensures long-term operational security, regulatory compliance and a reduced environmental impact throughout the lifecycle of hydrogen production systems.



HRSC Series

Non F-Gas (CO_2 refrigerant), standard type circulating fluid temperature controller

· F-Gas compliant. R454C refrigerant used (GWP:1)
· Cooling capacity: from 1.3 to 5.9 kW (50 Hz)
· Set temperature range: 5 to 40 °C.

HRRF Series

Low GWP refrigerant thermo-chiller/rack mount type

· F-Gas compliant. R454C refrigerant used (GWP:146)
· Cooling capacity: 1000 to 1600 W (50 Hz)
· Set temperature range: 5 to 35 °C.

HRSF Series

Low GWP refrigerant, standard type circulating fluid temperature controller

· F-Gas compliant. R454C (GWP: 146)
· Cooling capacity: From 1.3 to 5.9 kW (50 Hz)
· Set temperature range: 5 to 35 °C.

Sensors and switches for circulating fluid line

ISE20 Series

High-precision digital pressure switch

· 3-screen, 3-colour display
· IP65
· Pressure range: -0.1 to 1 MPa.

PSE56 Series

Remote pressure sensor

· Analogue output
· IP65
· Pressure range: -0.1 to 1 MPa.

PF3W Series

Digital flow switch

· 3-screen, 3-colour display
· IP65
· Pressure range: -0.1 to 1 MPa.

PSE Series

Digital sensor monitor

· Up to 4 channels
· Repeatability: ±0.1 % (F.S.)
· IP65.

LFE Series

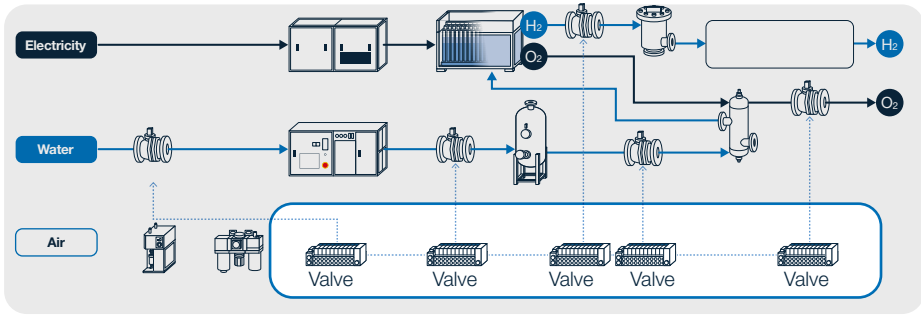
3-colour display electromagnetic type digital flow switch

· 3-screen, 3-colour display
· IP65
· Pressure range: -0.1 to 1 MPa.

Valve actuation and control

In electrolysis plants, compressed air is commonly used to actuate process valves, especially for on/off operation of ball valves within the hydrogen production system. Reliable valve actuation is essential to support safe isolation, switching and control of key lines and equipment throughout operation and maintenance.

SMC supports instrument air control with compact, energy-saving solenoid valves and manifolds designed for dependable on/off actuation. With scalable configurations and options suited to different installation needs, SMC solutions help simplify valve control architectures, reduce wiring and space requirements, and support reliable operation across the hydrogen production process.



JSY Series +

Compact 5-port solenoid valve

- Extremely compact and lightweight valve
- High flow rates between 173-1551 l/min
- IP67.

SY Series +

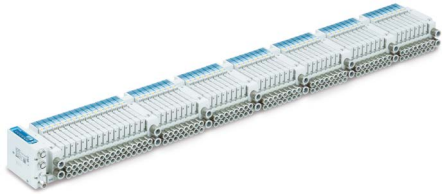
Compact 5-port solenoid valve

- Impressively functional all-purpose valve
- High flow rates between 191-1751 l/min
- IP67.

SJ Series +

4-port solenoid valve

- Ultra compact valve, 40 mm height, as low as 6.5 mm width
- Easy to mount and replace thanks to card edge-type connectors
- Flow rates between 40-625 l/min.



JSY3000-L Series +

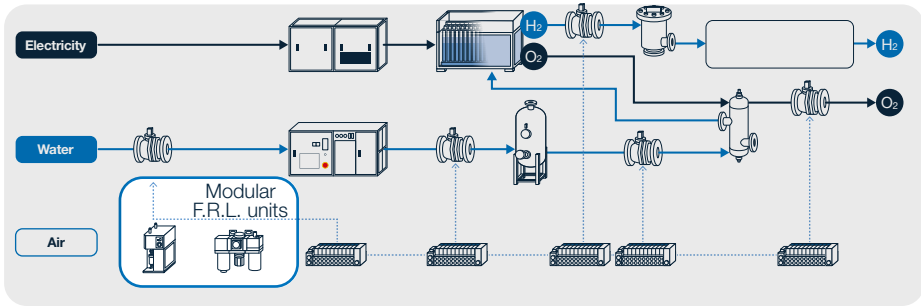
64-station compatible manifold plug-in compact 5-port solenoid valve

- Serial wiring
- Plug-in connector connecting base
- Flow rate: up to 567 l/min
- P67.

Air treatment and pressure control

Clean and stable instrument air is essential for any pneumatic installation. The compressed air used in control systems must be free from moisture, particles and oil mist, as contaminants can lead to malfunction, increased wear and reduced reliability of pneumatic components.

SMC supports the cleaning and control of instrument air with modular and energy-efficient air treatment solutions. Through filtration, moisture removal and precise pressure control, SMC helps ensure that the compressed air supplied to pneumatic systems is clean, stable and suitable for continuous operation in demanding industrial environments.



AC-D Series +

FRL combination units

· Modular, compact and lightweight
· Integrated and other selectable pressure gauges
· Many attachments available.

IDFA Series +

Refrigerated air dryer

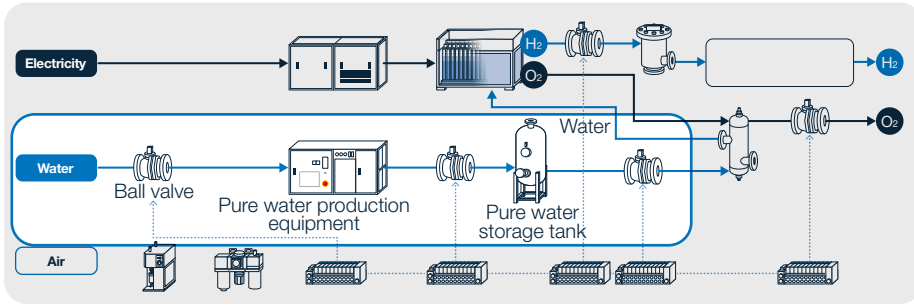
· F-Gas compliant. Low GWP refrigerants: R1234yf (GWP <1) and R454C (GWP <150).
· Inlet air temperature up to 50, 60 or 65 °C.

IDG-D Series +

Modular connection type membrane air dryer

· Up to class 3 ISO water quality
· No tools required for maintenance
· Refrigerant-free.

Fluid control and piping equipment



Reliable fluid control is essential to ensure safe and stable operation in hydrogen production systems. Valves, fittings and piping materials must be compatible with different fluids and operating conditions while ensuring leak-tight performance, chemical resistance and long-term durability.

SMC offers a broad range of fluid control components and piping materials, including stainless steel fittings, fluoropolymer tubing and oil-free solutions suitable for clean and demanding environments. With options designed to meet stringent material, cleanliness and regulatory requirements, SMC supports safe system design and reliable fluid handling across the hydrogen production process.

KP Series +

Clean one-touch fittings

· Completely oil-free (fluoro-coated rubber portions)
· Wetted parts are non-metallic.

KFG2 Series +

316 stainless steel insert fittings

· Compact and lightweight
· Suitable for highly corrosive environments, aggressive chemicals and extreme temperatures between -65 to 260 °C.

JSX Series +

Direct operated/Pilot operated 2-port solenoid valve

· Flow rate up to 12.6 l/min (water)
· Body material: stainless steel, brass and aluminium
· IP67.

TLM/TILM Series +

Fluoropolymer tubing

· Flame resistant (equivalent to Standard UL-94 V-0)
· Operating temperature (fixed usage): air, inert gas: -65 to 260 °C.

Related products

In hydrogen production facilities, precise gas handling and reliable system integration are key to ensuring stable operation and long-term flexibility. In addition to core automation components, dedicated solutions for process gas control and communication support safe operation, efficient system design and future scalability.

SMC complements hydrogen production processes with specialised solutions such as **AP Tech™ process gas equipment** for accurate and reliable control of critical gases, as well as **wireless fieldbus systems** that enable flexible communication and reduced wiring. These solutions support improved monitoring, simplified installation and adaptable system architectures within hydrogen production environments.

AP Tech +

AP Tech process gas equipment

· Pressure regulators
- Valves
- Flow devices.

EXW1/EX600-W Series +

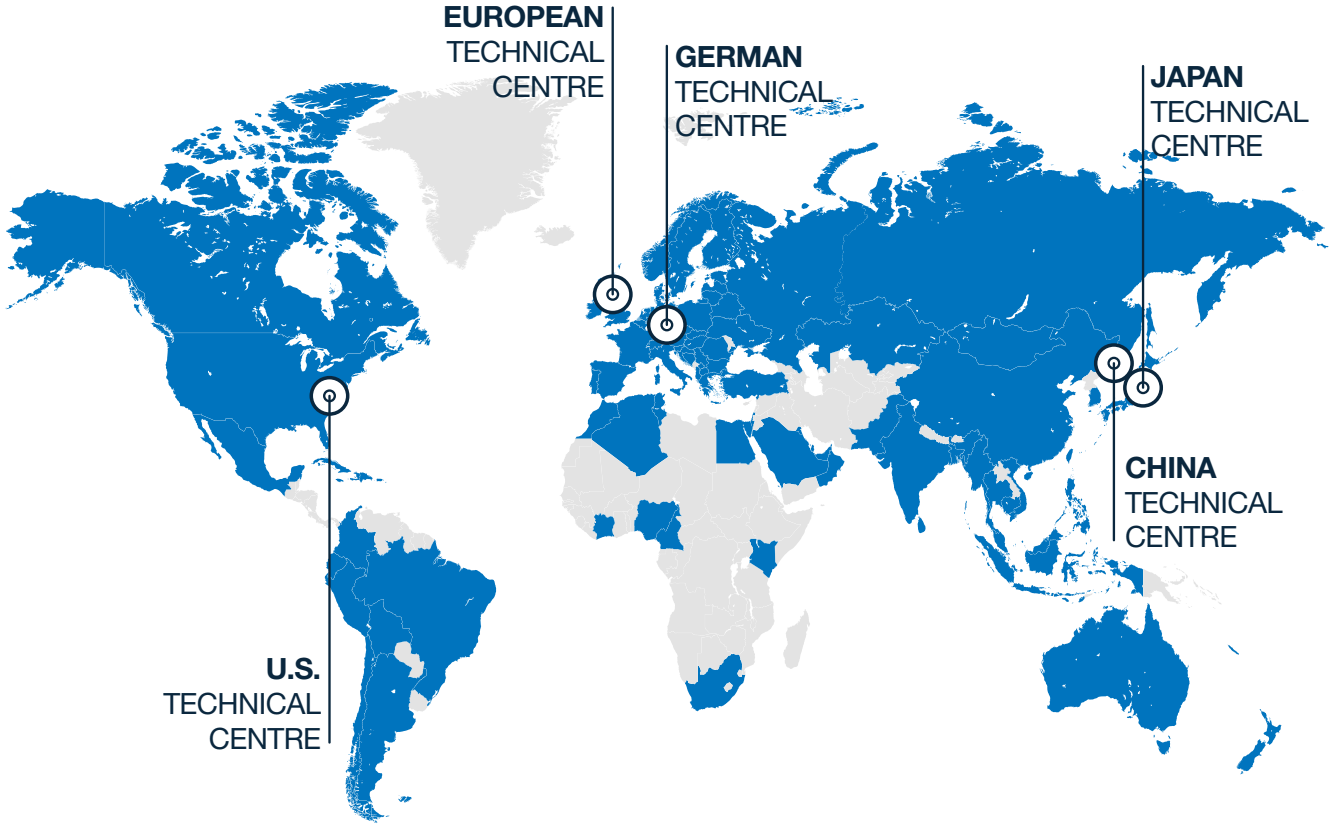
Wireless system

· Compact and modular wireless systems
· Protocols: OPC UA, PROFINET, EtherNet/IP™, CC-Link, EtherCAT®, DeviceNet®
· Communication distance: up to 100 m.

Our support network

SMC's worldwide commitment

One of the things we do best at SMC is **being close to our customers**. Local support, on a global scale.



With **support** in over **500 locations** across **80 countries** and regions **worldwide**, our sales force of **7000 experts** maintains **close communication with customers**.

SMC Business Continuity Plan

Sustainable growth also means ensuring uninterrupted operations

We are committed to ensuring that SMC is prepared for any emergency and that our business activities will not stop in the event of such circumstances. SMC aims to fulfil our product supply responsibilities and maintain our customers' trust by contributing to both sustainable growth and the expansion of technological innovations.

SMC, as a comprehensive manufacturer of automatic control equipment that supports automation, is able to promptly provider products that meet our customers' needs anywhere in the world.

Production BCP

Ensure customer order fulfilment

Reliable delivery for you thanks to our 9 global logistic centres and 38 production sites worldwide. Moreover, flexibility to rapidly respond to any sudden change in the manufacturing environment.

Finance BCP

Safe & Solid financial base

In the event of an emergency, SMC can provide a safe and solid financial base (with cash, deposits, and equity capital) that will sufficiently cover the working capital and funds needed to rebuild buildings and the equipment required for business continuity. This is done to provide peace of mind to our customers and workers alike.

Information security BCP

Vital data kept safe

Strengthen information security for protection against computer viruses and cyberattacks, plus the installation of data centres to establish a disaster recovery system. Your information is safe with us.

Engineering BCP

Consistent technical support

2,000 engineers at our 5 technical centres around the globe.

Sales BCP

Consistent sales support

7,000 sales engineers worldwide ready to recommend the best solution for you. Over 80 global locations to make sure that wherever you are, we are there too.

Discover more

Expertise
Passion
Automation

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