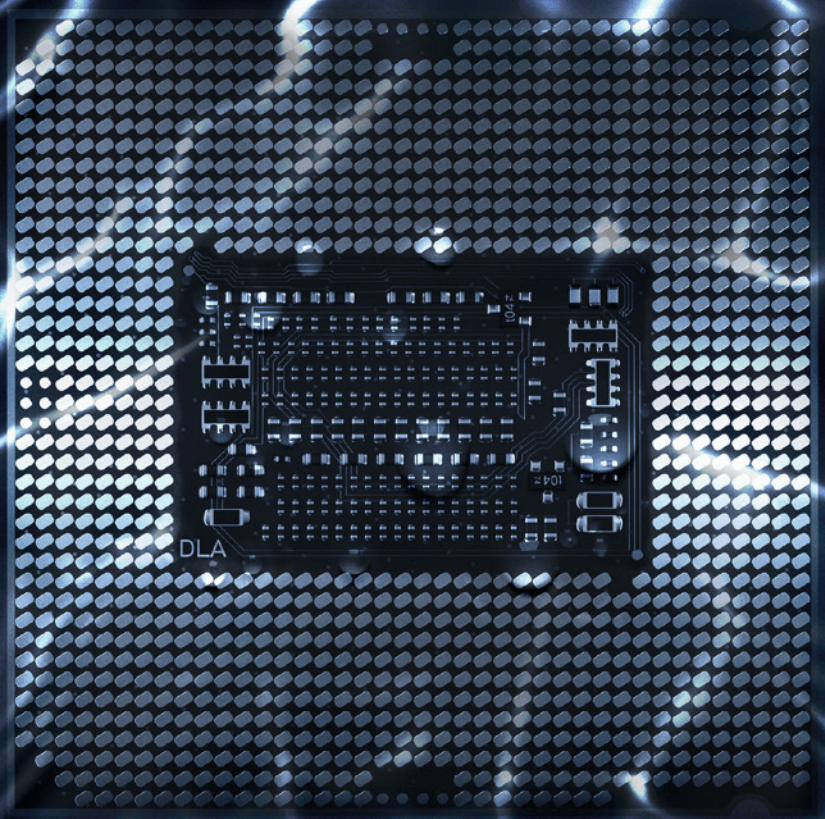
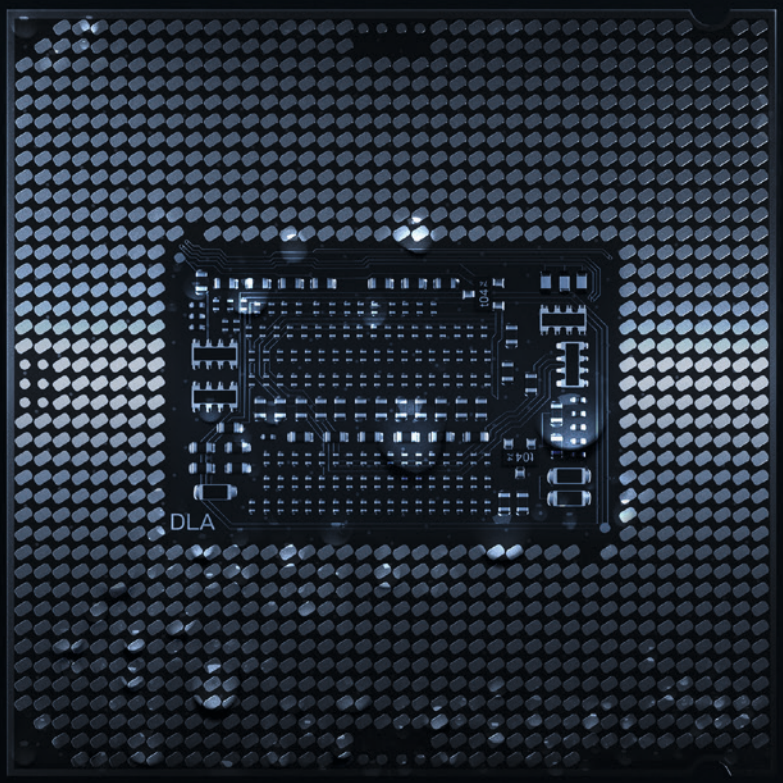
GF Piping Systems

Ultra system confidence

Mission-critical fluid handling solutions for microelectronics plants




DLA

The challenge of technology and natural resources

Semiconductors are essential for our way of life. Without them, our mobile phones, laptops, and cars couldn't function. As we embrace the connected world of the Internet of things, 5G, artificial intelligence, and the automotive industry evolves further towards autonomous vehicles, demand is booming, with the products developed by the microelectronics industry now ubiquitous in our daily life.

Innovation continues to drive the semiconductor industry forward, ensuring further expansion is a prerequisite for manufacturers to keep pace. However, the industry has now reached a size where the availability of resources, its carbon footprint, and the geopolitical spotlight on the sector are providing new challenges for sustainably managed growth.

Water is mission-critical

Water is one of the most important natural resources and critical for any semiconductor manufacturing facility. A fabrication factory, or fab, requires millions of gallons of water a day – and additionally needs to manage the hazardous waste it creates.

Compared to the world's total water supply, the impact of semiconductor manufacturing is a minor user. Still, the effect on specific regions where fabs are located can be significant. Semiconductor manufacturers at many locations have to overcome challenging processes for the additional water required to support production expansions or the construction of a new manufacturing facility to be approved. Given the water intensity of these companies, showing good stewardship is vital to managing water-related business risks.

The goal is for semiconductor manufacturers is to use less water per unit product output, despite the widely recognized fact that semiconductor manufacturing already returns a much higher production value per unit of water used than virtually any other human activity.[1] Approval for plant expansion often stipulates that water demand from the regional supply will not increase.

Circular economy waste solutions are imperative

Developing circular economy waste solutions across manufacturing and all industries to ensure a smaller environmental footprint is becoming more imperative. Implementing waste recovery and reuse initiatives at semiconductor factories worldwide demonstrates that even industrial manufacturers pursuing advanced technology can leverage these pioneering strategies in their businesses to meet stringent regulations.

Although investments are typically required to investigate avenues and implement these solutions, the potential returns, and rewards, including lower costs, reduced environmental impact, and reputational benefit, far outway the startup costs. In addition, suppliers and other strategic stakeholders can play a cooperative and important role in circular economy initiatives.

[1] **Libman & Neuber, "Water conservation challenges facing the Microelectronics Industry"**

Global network

Ultra integration partner

GF UK
(Coventry)
+ Prefabrication
+ Skids and modules
+ Clean room

GF US
(Irvine)
+ Custom products
+ Prefabrication
+ Skids and modules
+ Clean room

GF CPC
(Shawnee)
+ Prefabrication

GF CPC
(Dallas)
+ Prefabrication

GF Switzerland
(Schaffhausen)
+ Custom products
+ Prefabrication

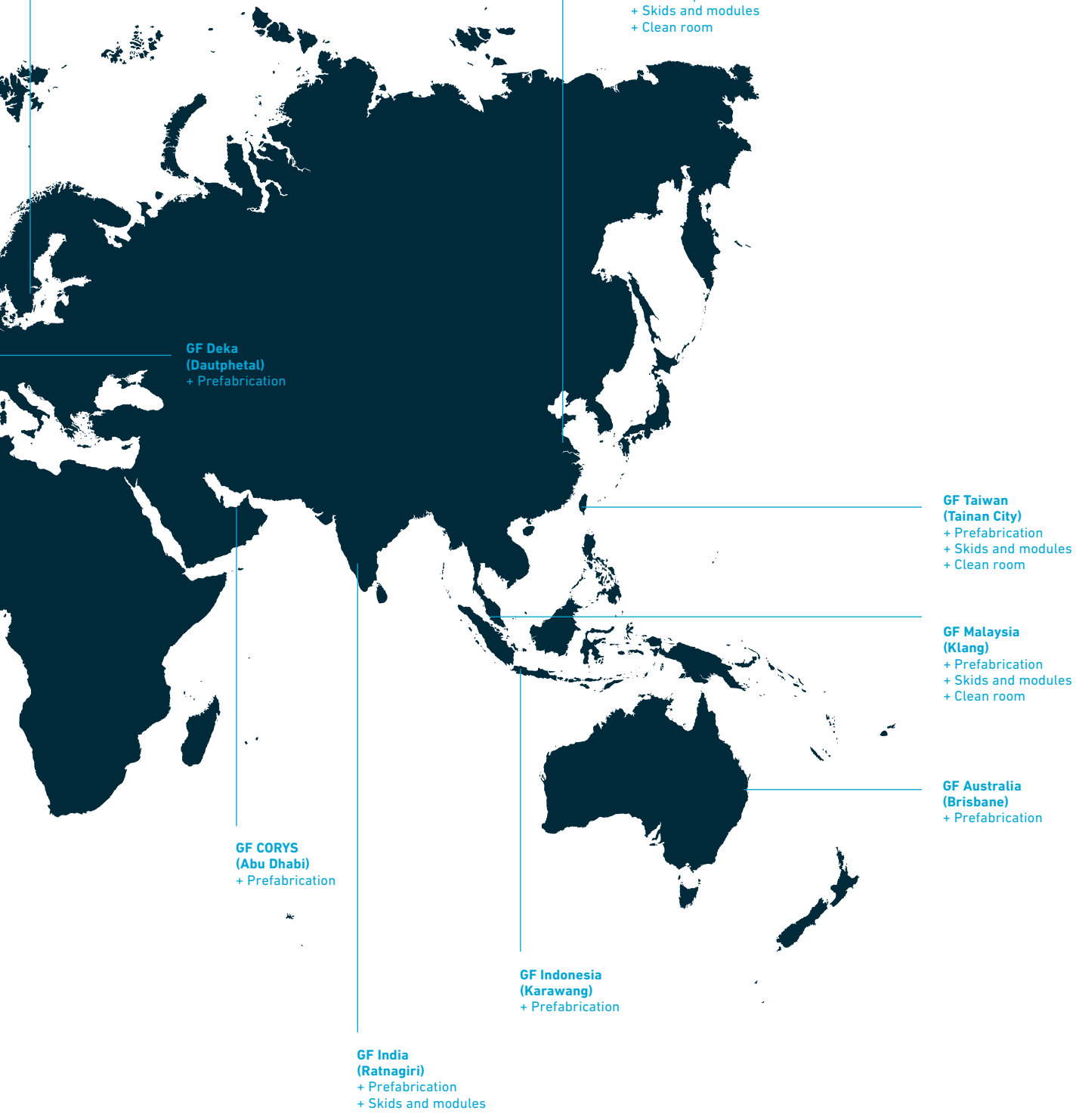
Ultra connected support

GF Piping Systems is the perfect partner to integrate into your project from design through to commissioning. Our mission-critical fluid handling solutions for microelectronics plants and our specialized solutions such as design support, offsite prefabrication, and training programs ensure we are always ready when you are.

Ultra-fast response

With short project and operation lead times for semiconductor plants, our highly skilled project managers, engineering services, state-of-the-art welding technology, and advanced stock management can ensure we meet your tight deadlines on time, every time. Our global offsite prefabrication and customization network can support your needs, providing quality and operational excellence you can repeatedly trust.

Project support at every step of the process to achieve construction excellence.



Trust the leaders

Ultra system expertise

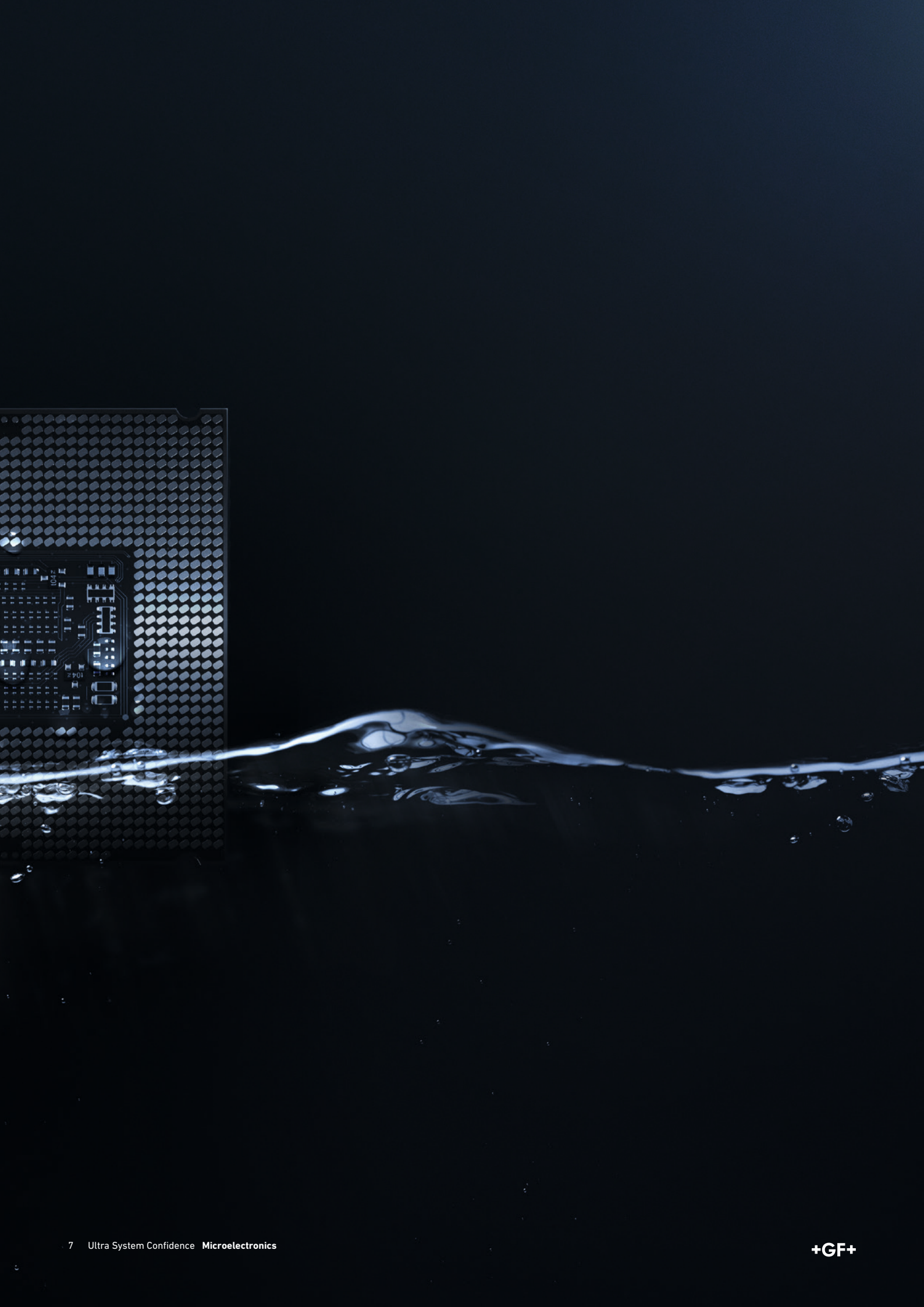
GF Piping Systems has supported the semiconductor industry's efforts to build the most sustainably managed fabrication factories for more than 30 years. Our global teams help the industry manufacture some of the world's most advanced technologies while still supporting their mission to use water resources more sustainability, reduce their carbon footprint, and lessen their impact on the environment.

Our mission-critical fluid handling solutions deliver solutions beyond the expectations of the demanding tech-based industry, with a total offering that encompasses all the needs to maintain water quality beyond ultra.

We utilize our industry-leading offsite fabrication capabilities, domain expertise, and speed of delivery to meet the rapid demands of large-scale projects tailored to challenging specifications.

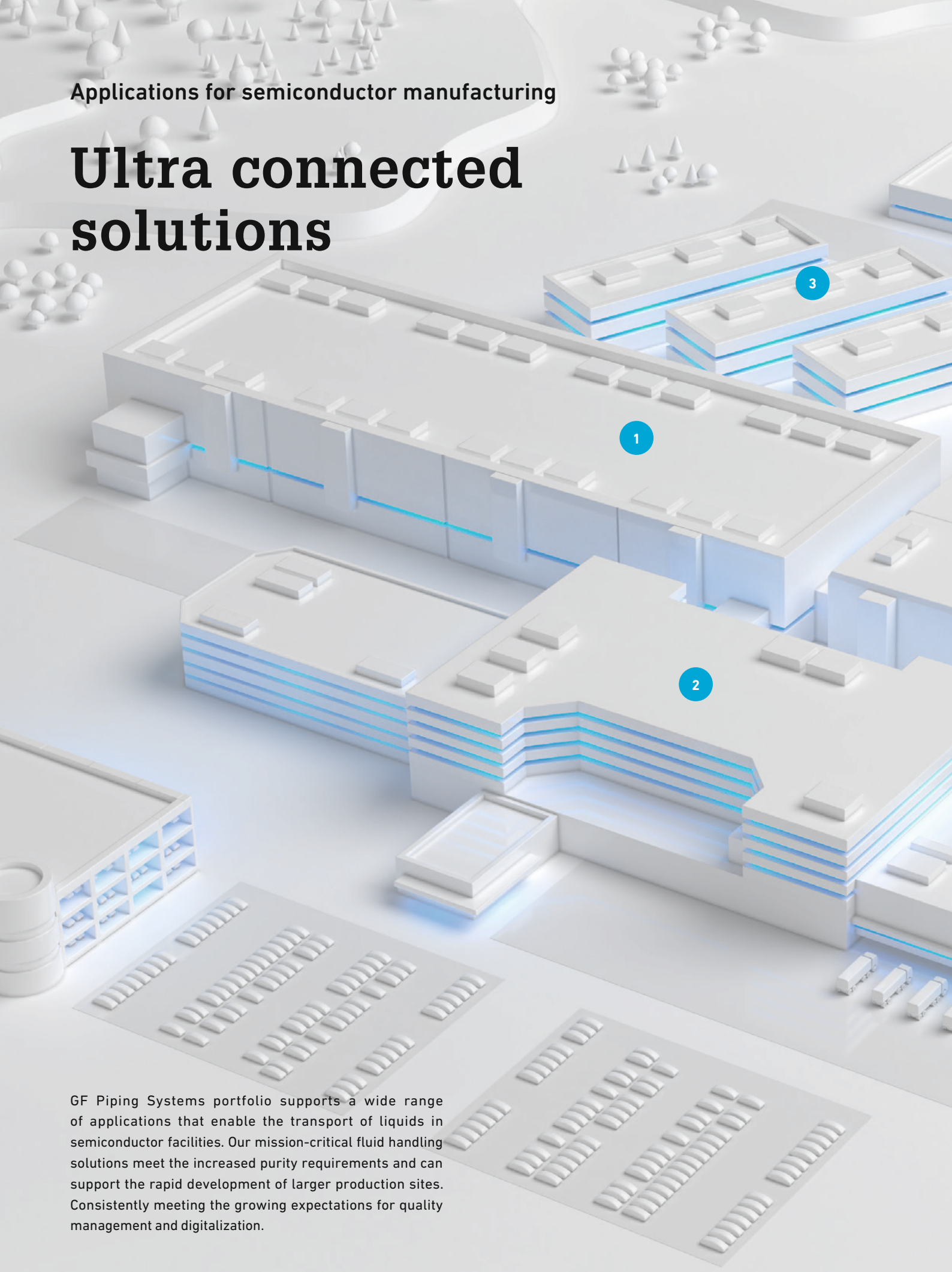
30 years experience

Supporting the semiconductor industry for over 30 years



Applications for semiconductor manufacturing

Ultra connected solutions



GF Piping Systems portfolio supports a wide range of applications that enable the transport of liquids in semiconductor facilities. Our mission-critical fluid handling solutions meet the increased purity requirements and can support the rapid development of larger production sites. Consistently meeting the growing expectations for quality management and digitalization.

1. Fab facility

Our systems safely convey ultrapure water, the lifeblood of the fab used in cleaning wafers as well as process cooling water, necessary for cooling heat intensive equipment. With waste systems to carry away spent chemicals, industrial and scrubber water, the factory is kept in compliance with environmental regulations. House vacuum and chemical mechanical planarization, just to name a few, are other common applications, where customers rely on our systems.

2. Office buildings and labs

These buildings include office areas, conference rooms, cafés and other amenities. These buildings also include laboratories where GF Piping Systems mission-critical fluid handling solutions support the ultra pure water, wastewater treatment, mechanical and chemical distribution applications.

3. Utility buildings

The Utility Buildings provide operational support for the fabrication facilities. GF Piping Systems are able to provide a variety of fluid handling solutions to solve multiple application challenges, including front end water softening and purification, chillers, waste storage and wastewater treatment systems and chemical processing.

4. R&D facilities

As the industry continues to accelerate with more advanced technologies, research and development facilities need to maintain an intense pace of evolving technology. GF's solutions can provide the mechanical reliability and ultrapure water processes required with our variety of solutions, as well as supporting wastewater treatment and chemical distribution.

5. Water recycling plants

Supporting water conservation and environmental sustainability efforts throughout microelectronics facilities is a key focus of GF. Within the water recycling plant our mission-critical solutions can help cleaning and treating water for reuse.

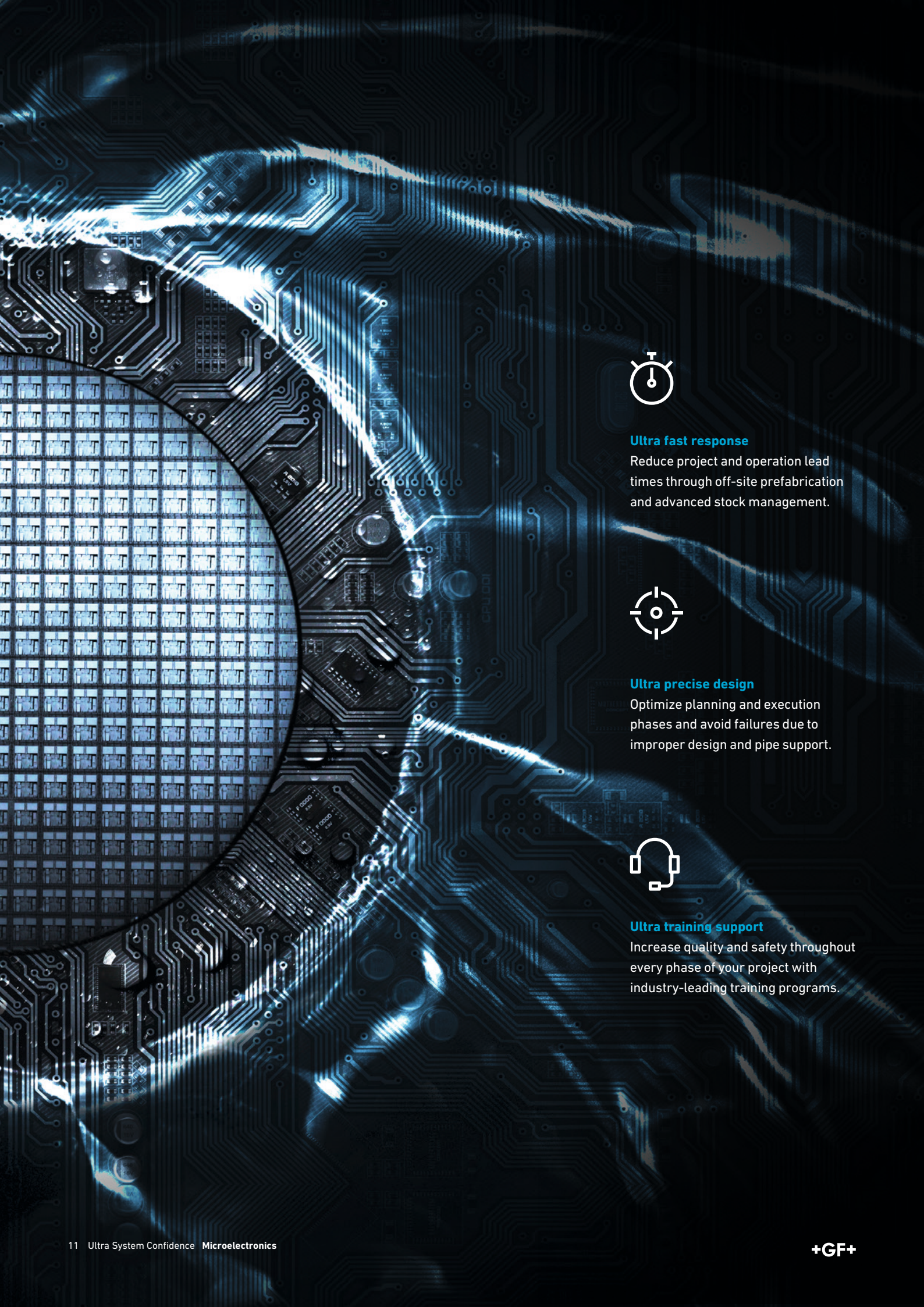
Mission-critical fluid handling solutions

Ultra system confidence

Ultra system confidence
Mission-critical fluid handling solutions for microelectronics plants. Sustainably delivering water quality beyond ultra.

Ultra integration partner
The perfect partner to integrate into your project from design through to commissioning.

Ultra production assurance
Corrosion and leakage-free piping solutions, quality assured with leading-edge welding technology.

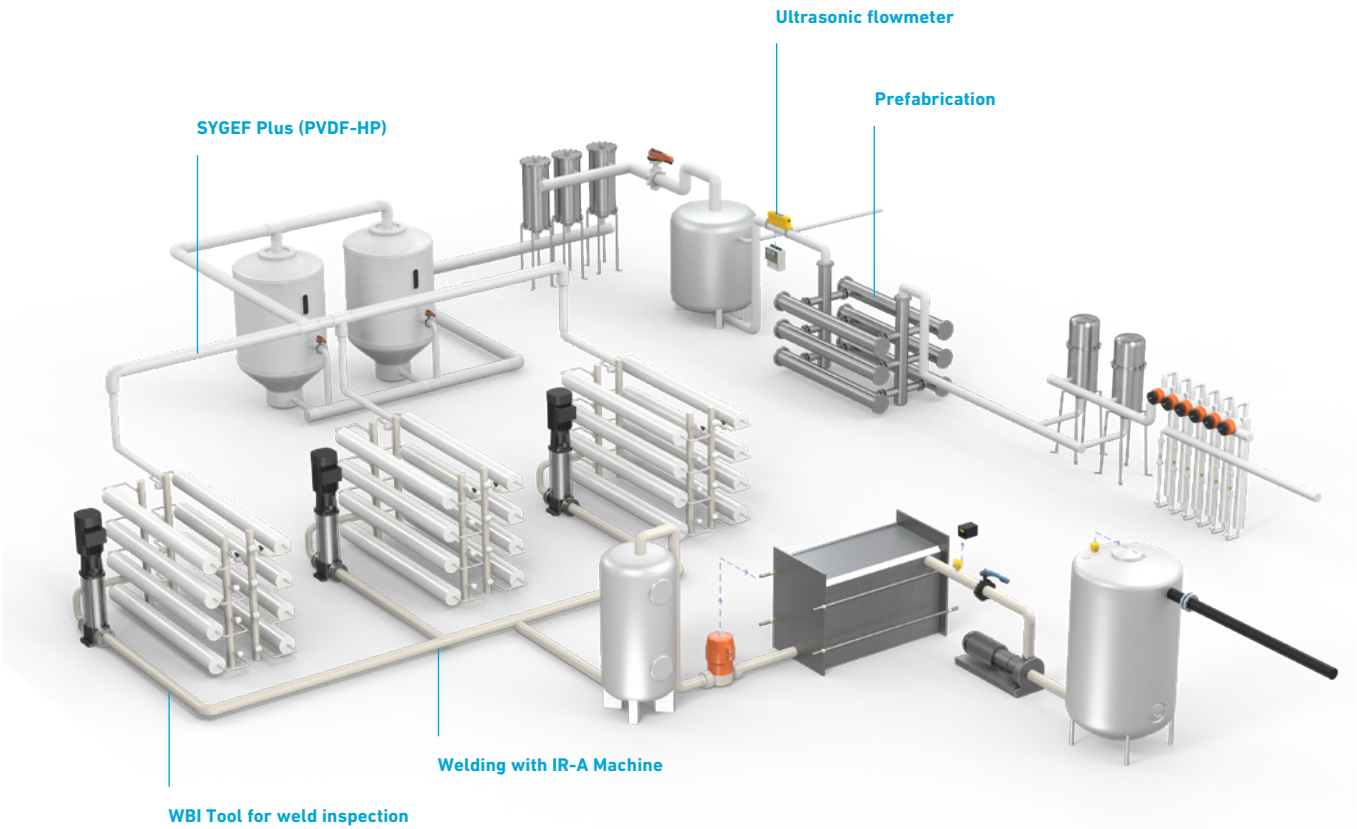


Ultra fast response
Reduce project and operation lead times through off-site prefabrication and advanced stock management.

Ultra precise design
Optimize planning and execution phases and avoid failures due to improper design and pipe support.

Ultra training support
Increase quality and safety throughout every phase of your project with industry-leading training programs.

Ultra specialized solutions

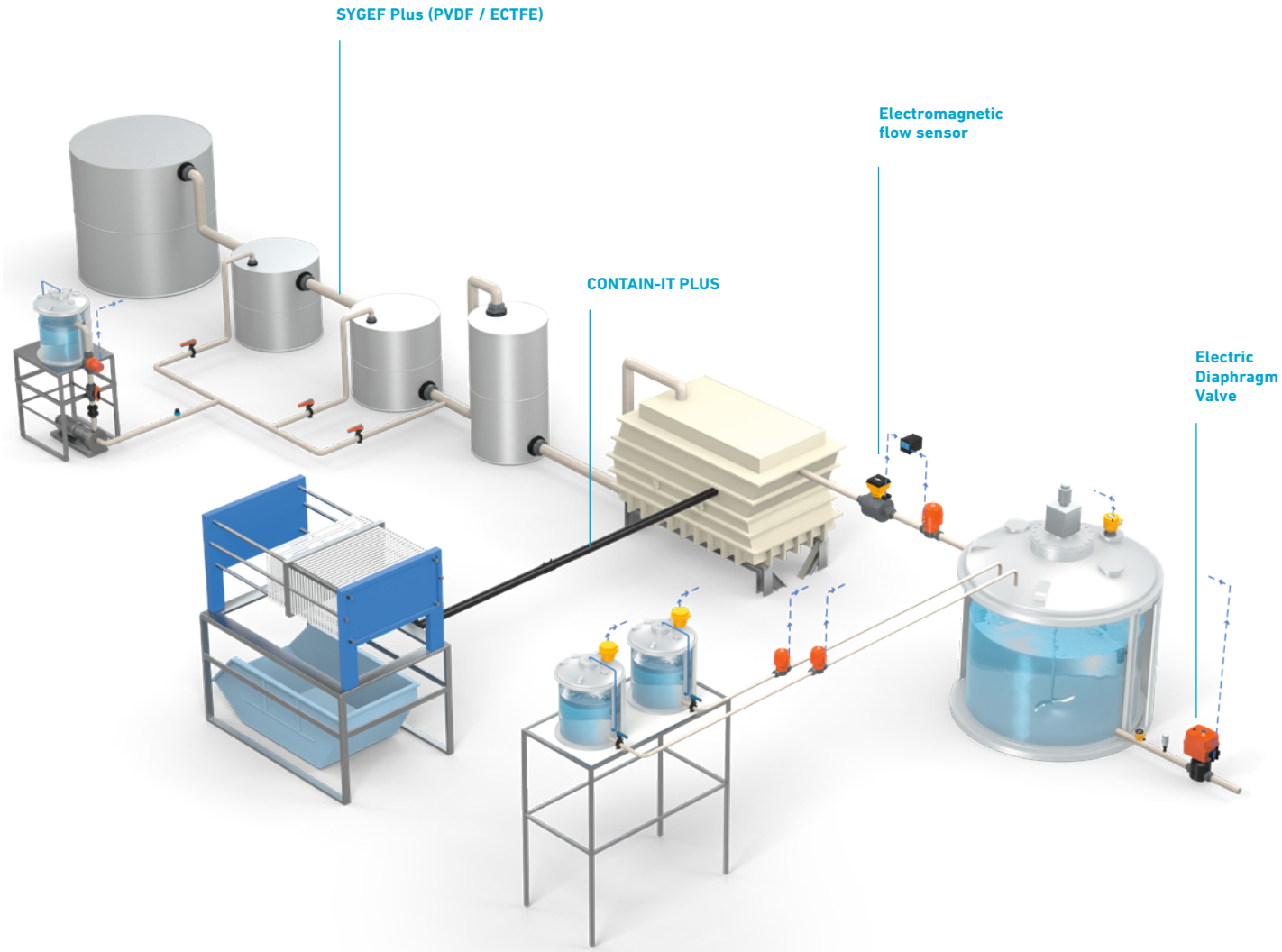


Ultrapure water & hot ultrapure water

Ultrapure and hot ultrapure water are essential to the production of microelectronic products. GF Piping Systems provides pipes, fittings, valves and supporting components that are designed and manufactured to the most stringent industry specifications to ensure the quality of water being delivered to the manufacturing tools meet even the most difficult quality requirements. State of the art jointing technologies supported by worldwide engineering, training and support organizations ensures quality installations and long-term reliability of systems.

Benefits

- Safety: Comprehensive quality assurance and quality control
- Purity: Fully controlled and monitored high-purity manufacturing process
- Efficiency: 100% process repeatability
- Performance: Unique complete system in conjunction with global support and training



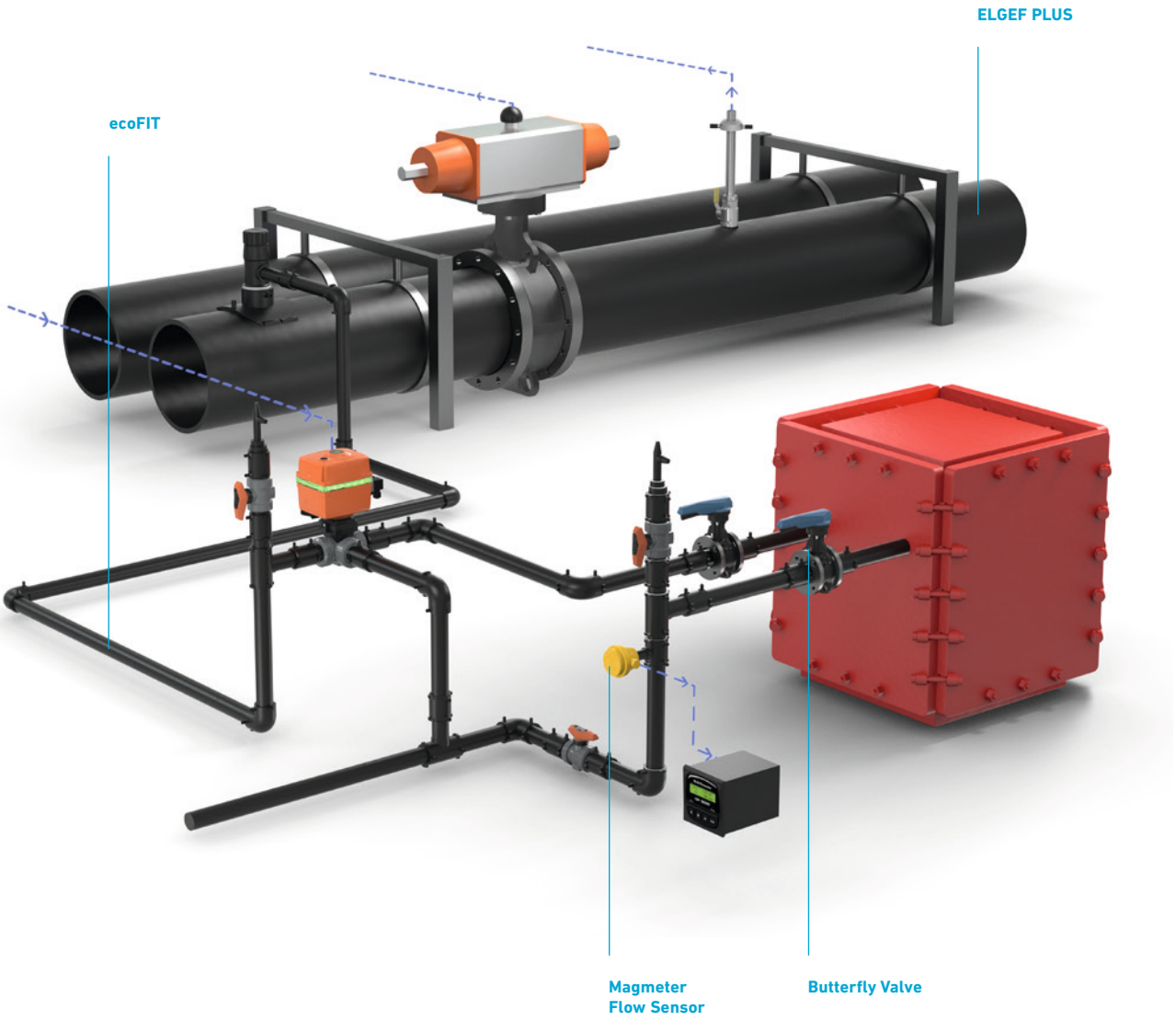
Specialty waste & dedicated waste water treatment

The manufacture of microelectronics products can often produce waste products from highly corrosive to thermally challenging. GF Piping Systems portfolio of products are designed from a wide range of materials, extensive test library, laboratory test facilities and highly experienced staff to enable the best engineering and product selection for your specific needs. State of the art jointing technologies supported by worldwide engineering, material test facilities, training and support organizations ensures quality installations and long-term reliability of systems.

Benefits

- Safety: Leak-tight systems for the safe handling of aggressive chemicals
- Efficiency: No need for passivation and welding times reduced compared to steel
- Performance: Highest chemical / corrosion resistance results in zero maintenance

Application know-how

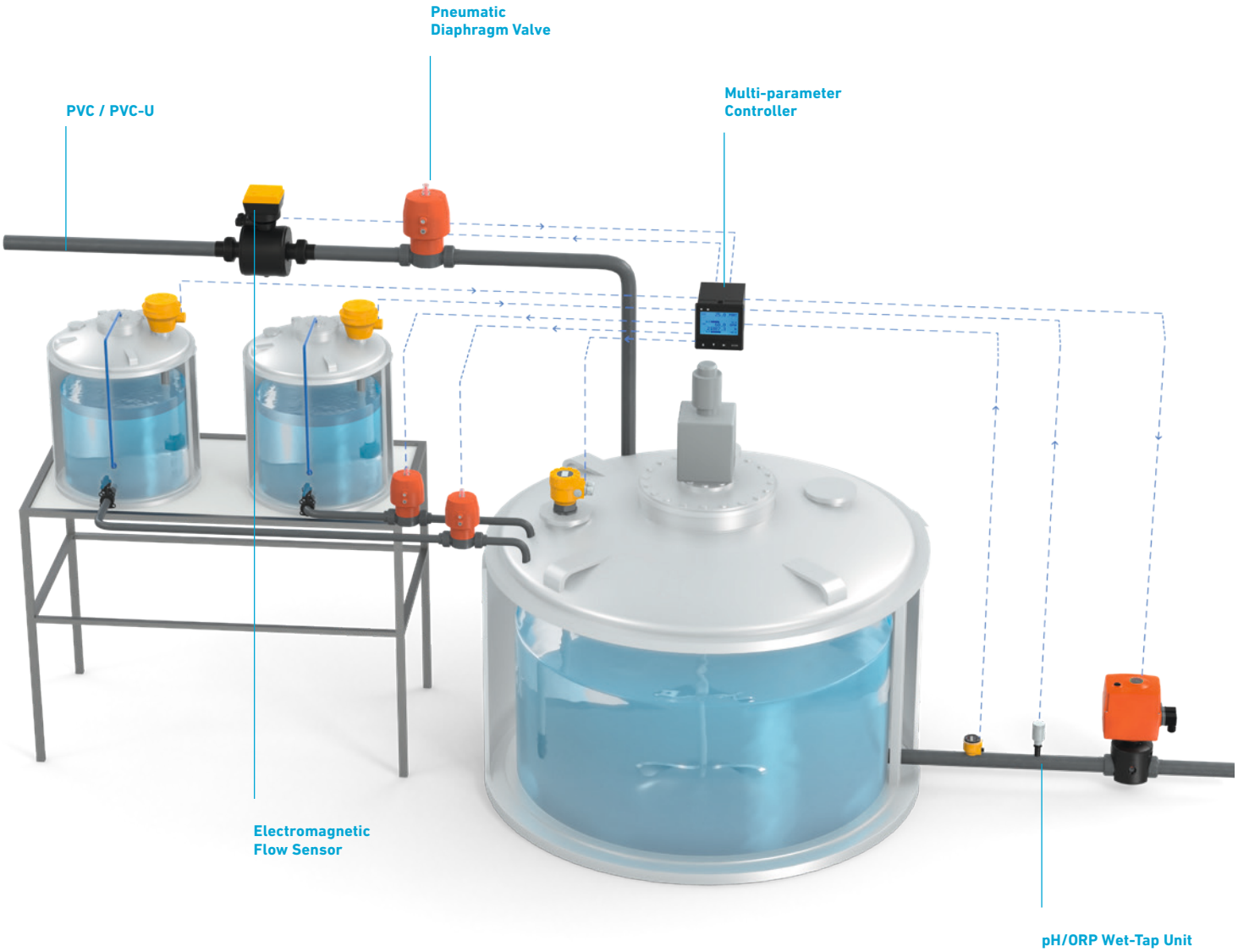


Process cooling water

Process cooling water is used extensively throughout microelectronics production due to the need to remove heat from manufacturing tools. Thermoplastic systems provide an excellent alternative to metal systems in the speed of installation, cost to install and operate, and the ease of completing system expansions. State of the art jointing technologies supported by worldwide engineering, training and support organizations ensures quality installations and long-term reliability of systems.

Benefits

- Safety: Flexibility of plastics pipes minimizes the risk of water hammer
- Purity: Avoid metal contamination in clean manufacturing areas
- Efficiency: No corrosion and no incrustation reduces maintenance to a minimum
- Performance: Low thermal conductivity results in minimum heat loss



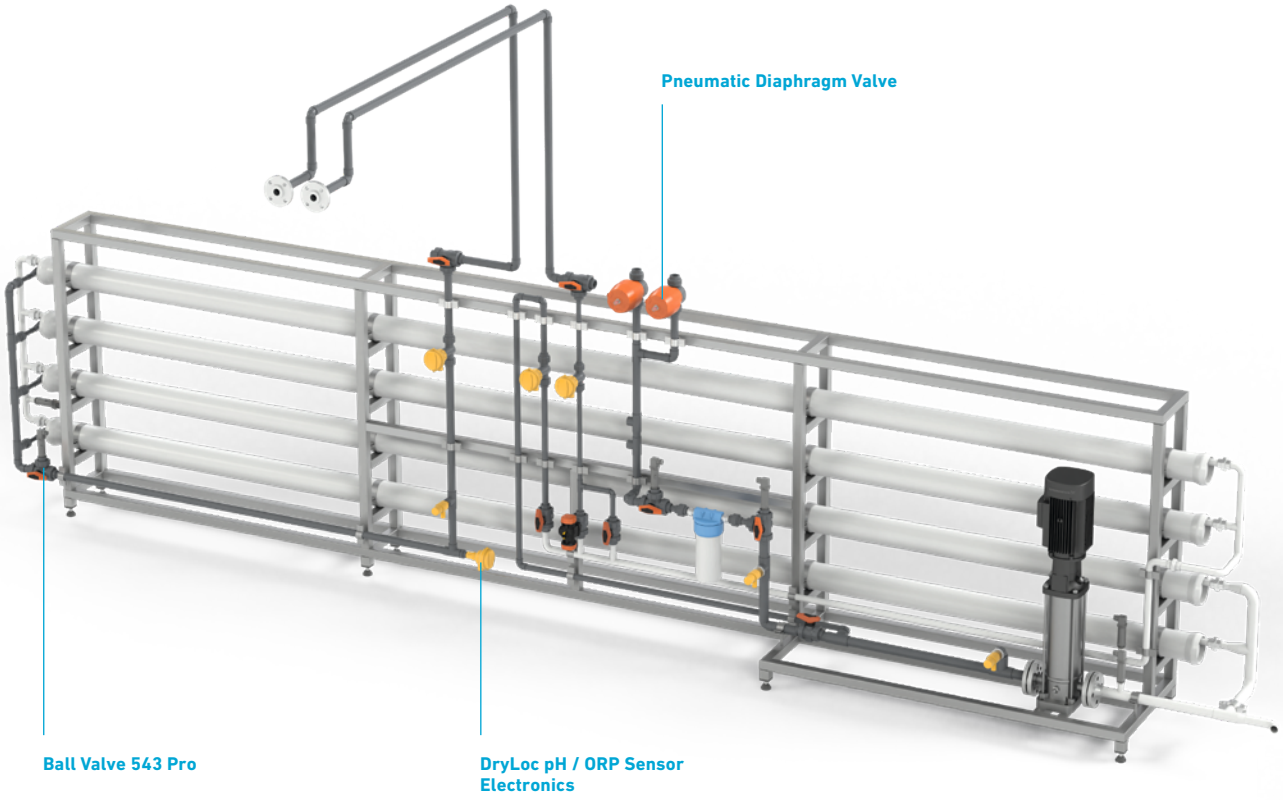
General waste neutralization

Waste Neutralization Systems are commonly found in every microelectronics facility and often are required to handle a wide range of operating parameters. GF Piping Systems portfolio of products, extensive test library, laboratory test facilities and highly experienced staff enable the best engineering and product selection for your specific needs. State of the art jointing technologies supported by worldwide engineering, training and support organizations ensures quality installations and long-term reliability of systems.

Benefits

- Safety: Fully automated process
- Simplicity: Only one controller required
- Efficiency: Reduced quantity of chemicals needed
- Environment: Less waste water

Application know-how

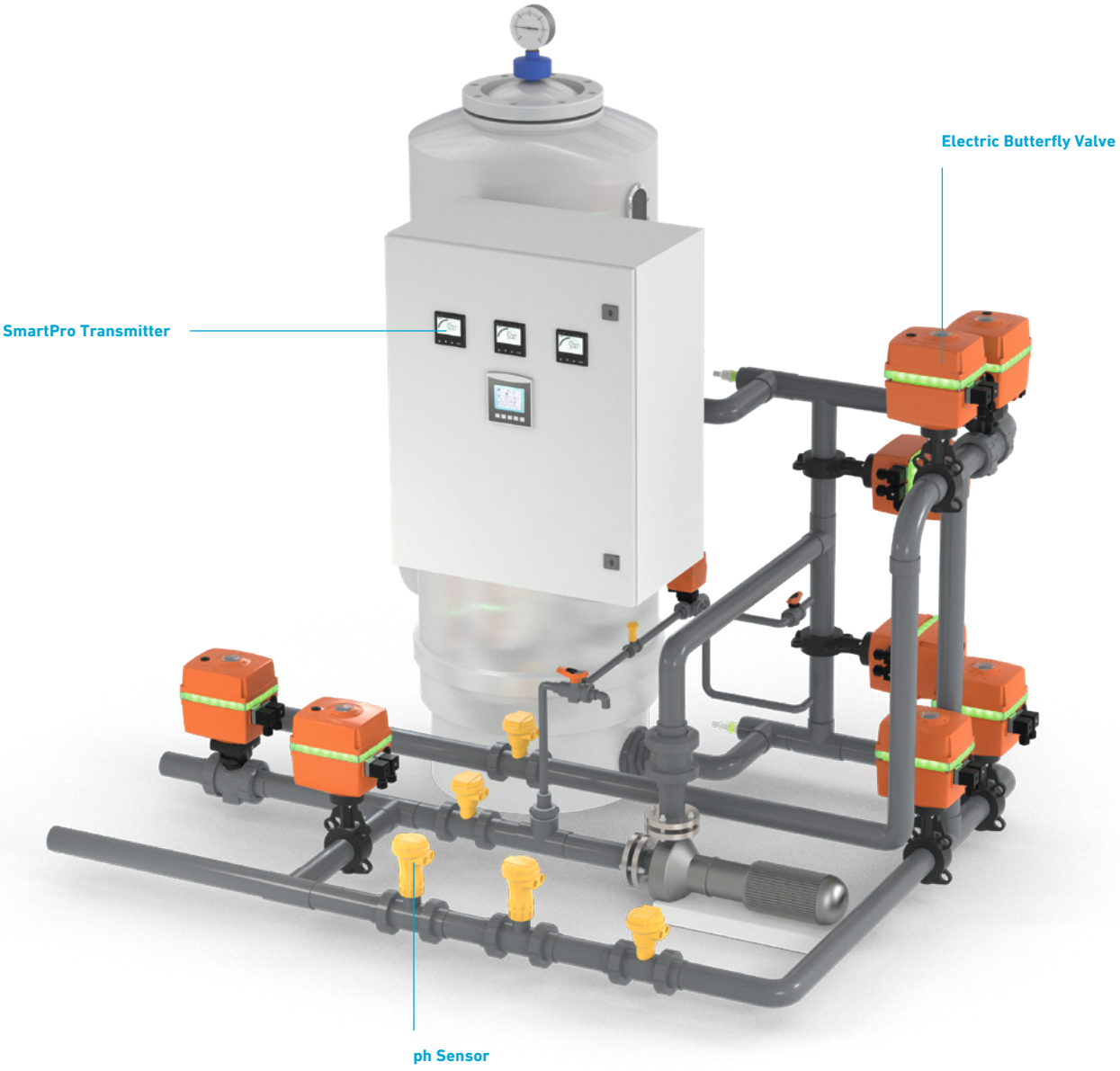


Reverse osmosis

Reverse Osmosis technology covers several filtration techniques all based on selective membranes porosities. Based on selective porosity of a semi permeable membrane, impurities will be removed from a pressurized liquid. Due to the fact that it needs no chemicals, energy consumption is low and handling is easy.

Benefits

- Safety: Our materials are designed for 25 years with 25°C water at 10 or 16 bar, respectively
- Efficiency: Maximum of security and profitability for efficient processes
- Environment: 25% lower carbon footprint compared to metal systems
- Performance: Less pressure loss



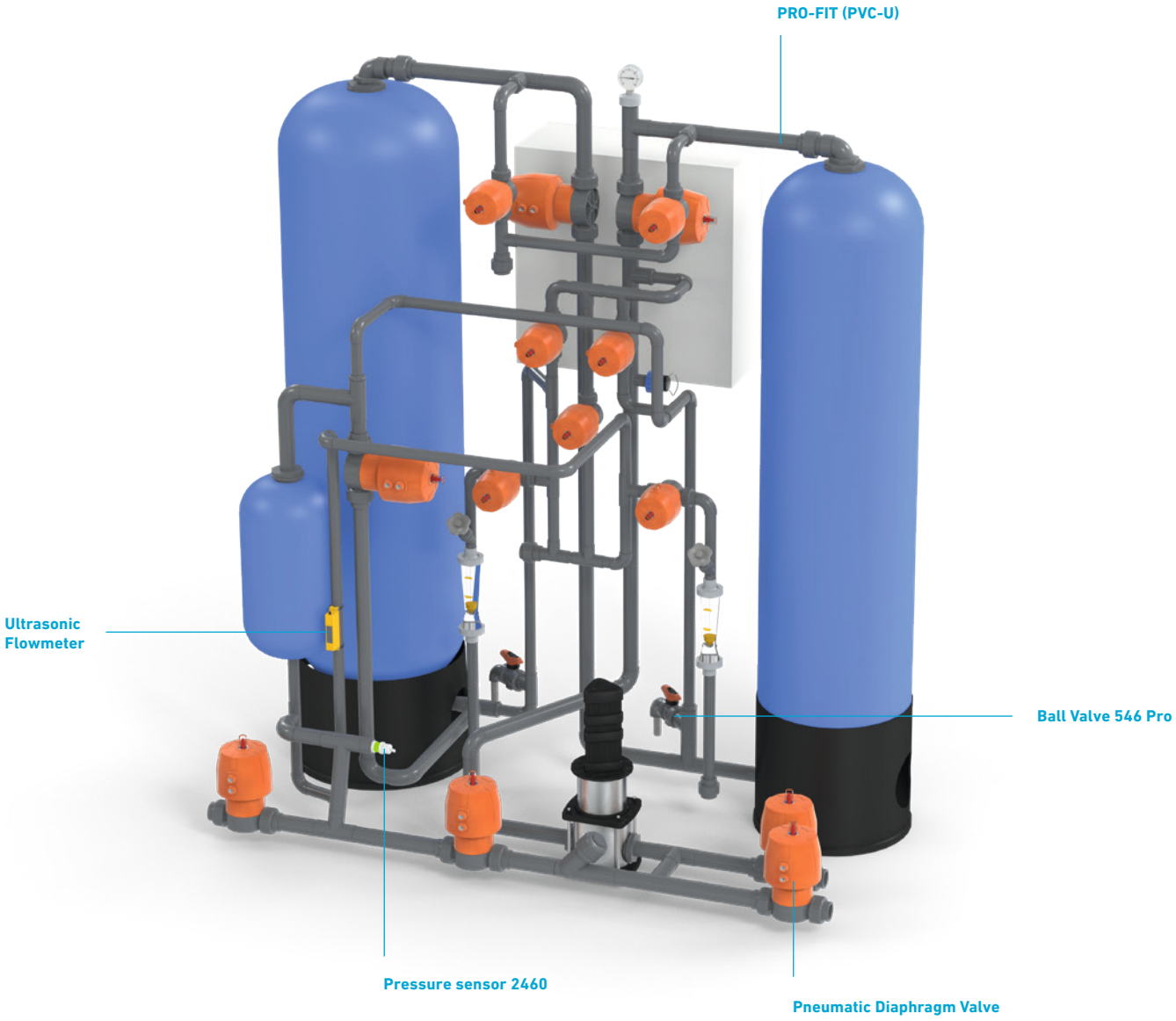
Media filtration

Media filtration is still very much in use in water treatment processes. In the multi-level filtration processes, anthracite or stones, as well as sand, are used to remove particles up to 10-15 µm from fluids. Due to the need for several operation modes, application-oriented system solutions help to achieve these processes efficiently.

Benefits

- Safety: High reliability and process safety thanks to over 50 years of experience
- Simplicity: Fully compatible with fieldbus systems
- Efficiency: Pre-assembly of critical pipelines for fast installation
- Environment: Better carbon footprint compared to stainless steel

Application know-how

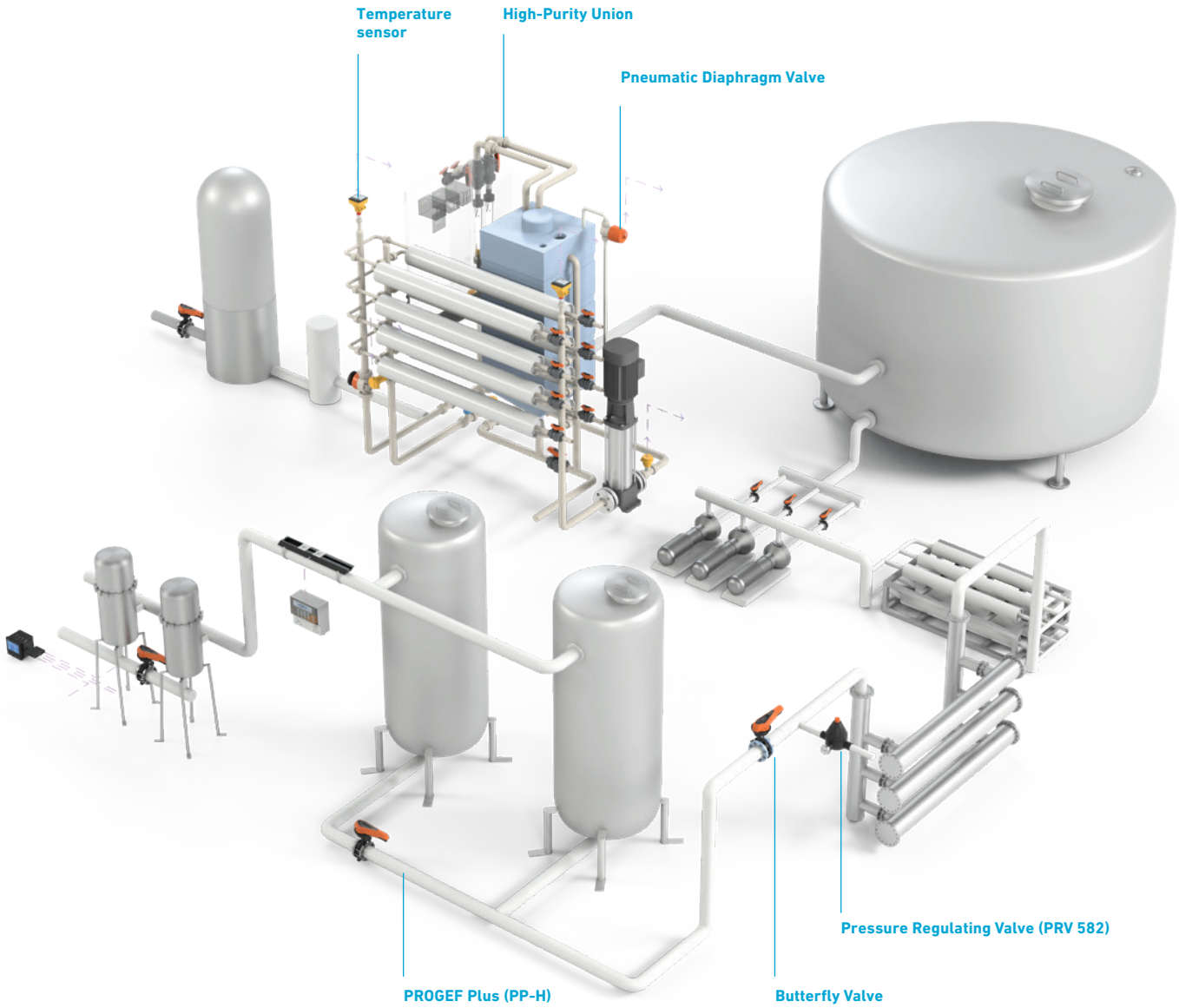


Ion exchanger

Demineralization units (deionization, reverse osmosis, distillation techniques) secure the production of pure high quality process water in the industrial environment. Water purification, separation and decontamination of aqueous and other ion-containing fluids characterize applications in that water treatment area. In this context, ion exchangers can absorb unwanted ions in the water, thanks to selective synthetic resin beads, and release them during a regeneration process. The compact construction of ion exchange plants requires flexible piping solutions and components. GF Piping Systems provides complete solutions of high-quality piping systems warranting a maximum of flexibility while ensuring an entirely safe plant operation with a maximum uptime.

Benefits

- Safety: Product lifespan of 25 years
- Simplicity: In-house customizing
- Efficiency: Compact skids for fast installation processes
- Environment: Lowest carbon and water footprint compared to steel systems



Deionized water

Completely controlled processes in industrial or laboratory applications with highest purity and quality standards in manufacturing require process water of specified qualities at different levels such as deionized water or less demanding UPW water. For initial industrial water treatment and for guaranteeing a consistently specified water quality throughout the entire process chain, physical water properties, parameters and concentrations have to be precisely controlled and reliably maintained. Deionization systems use a two-stage process of ion exchange resins to affect the removal of all cationic and anionic ions. GF Piping Systems provides high-quality systems for these demanding binding and filter processes, meeting all relevant industry standards. In several applications, solutions from GF Piping Systems assure the processing of water in a way that it maintains the given specifications.

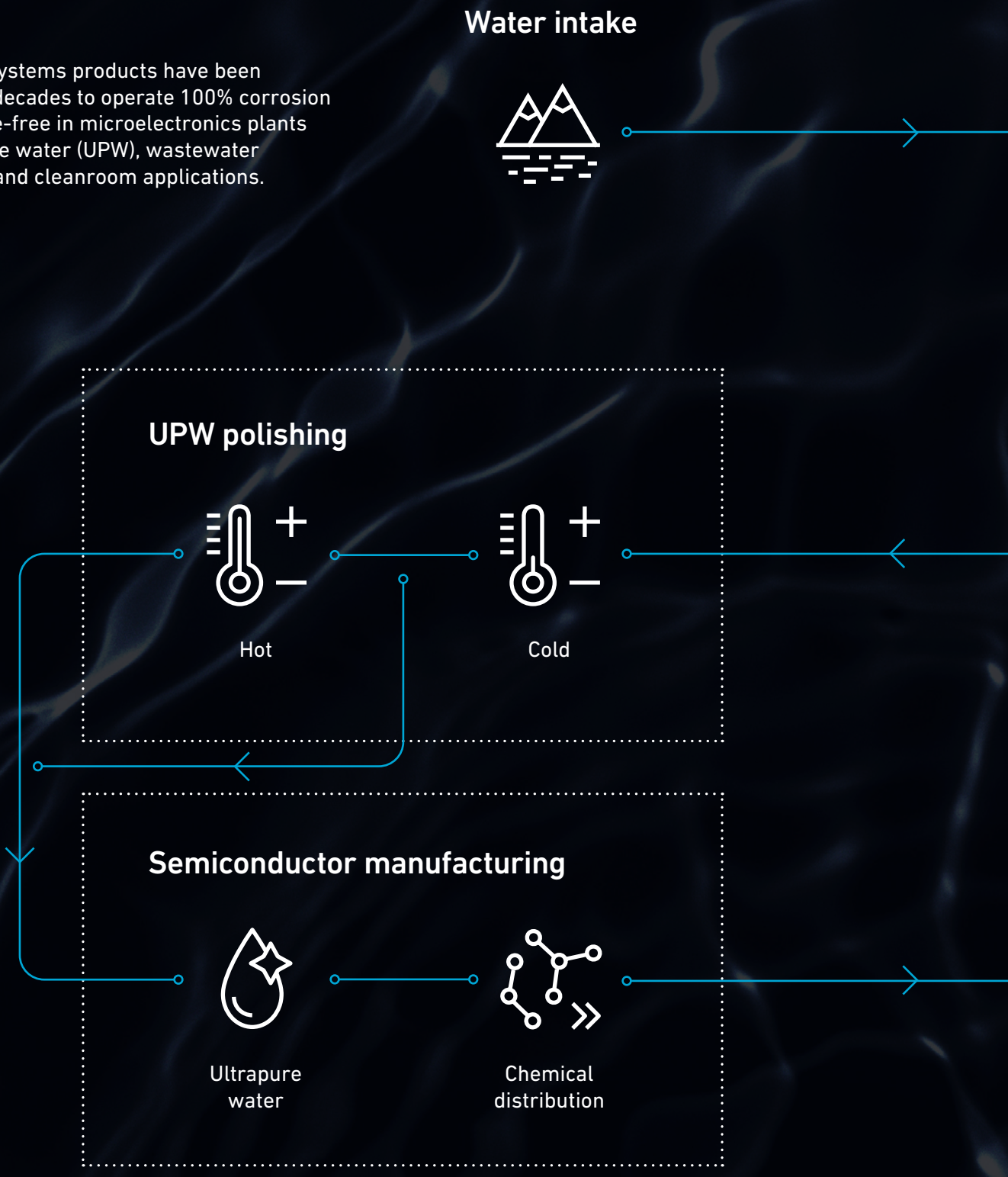
Benefits

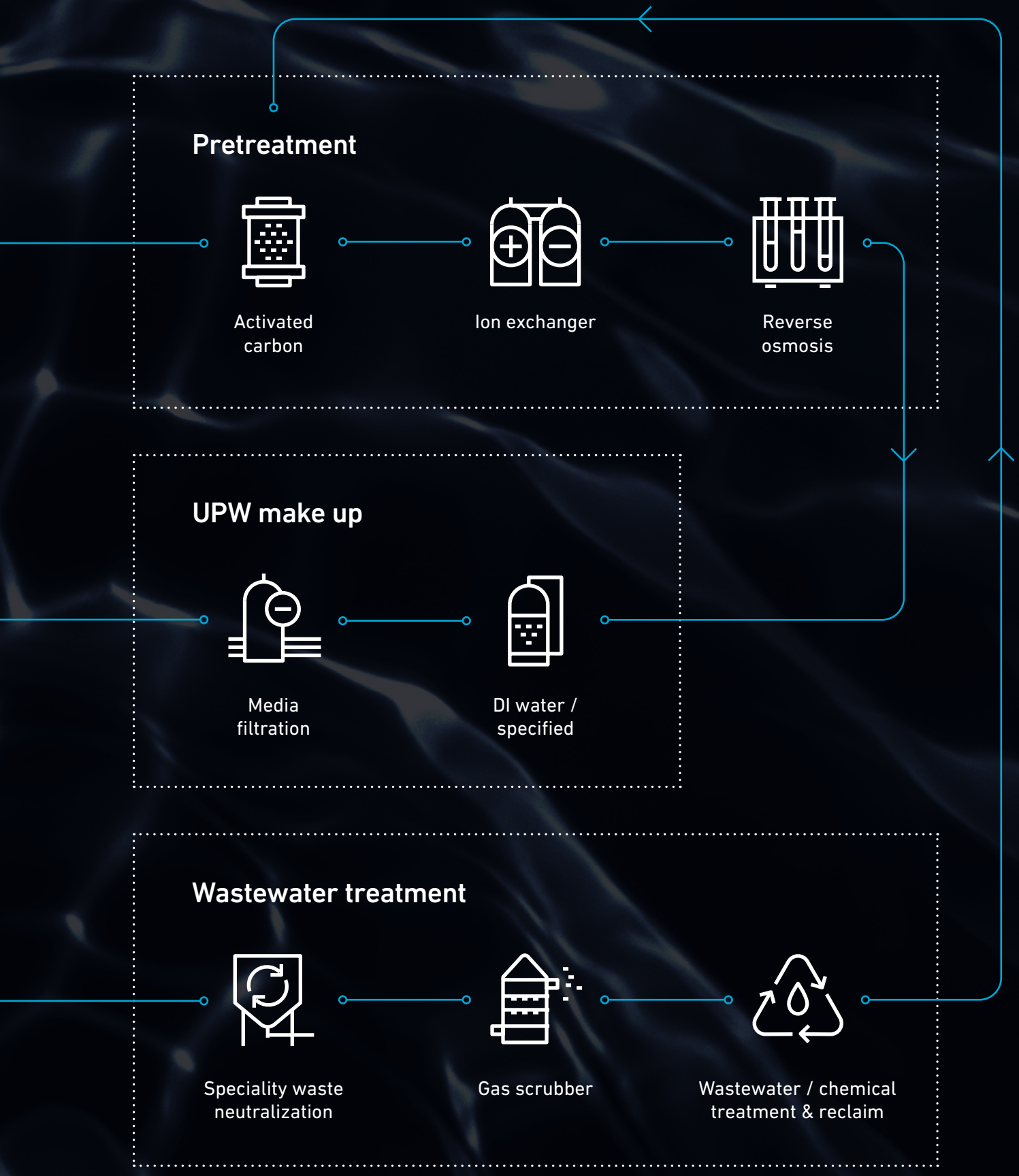
- Safety: Defined quality guidelines guarantee safe and reliable systems
- Purity: Specified system performance
- Efficiency: Reproducible and fast jointing technology for economic installations
- Performance: Minimum TOC ensures high water quality in ultrapure water systems

Semiconductor manufacturing

Ultra custom circulation

GF Piping Systems products have been proven for decades to operate 100% corrosion and leakage-free in microelectronics plants for ultrapure water (UPW), wastewater treatment, and cleanroom applications.

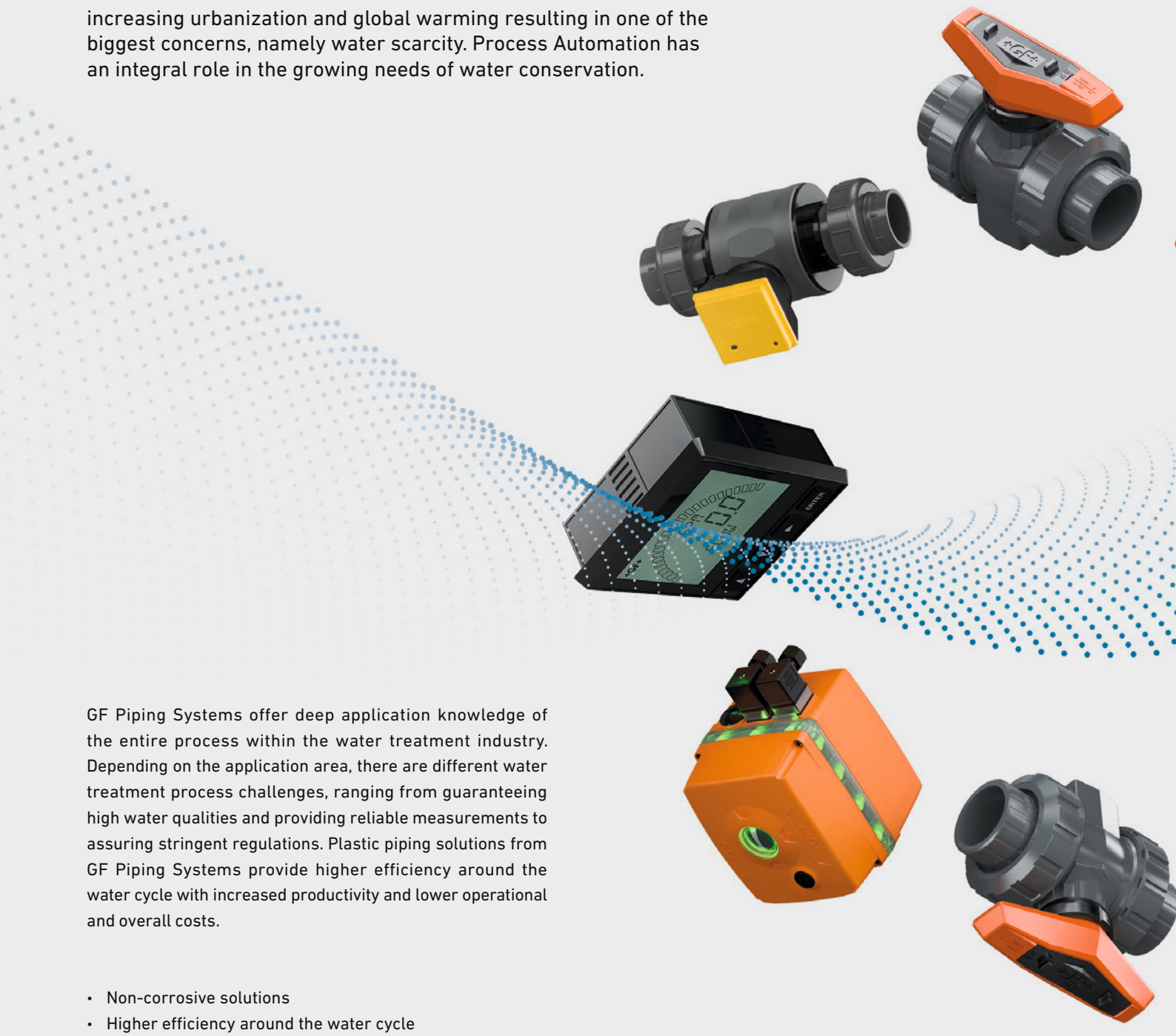



Pretreatment
Activated carbon
Ion exchanger
Reverse osmosis
UPW make up
Media filtration
DI water / specified
Wastewater treatment
Speciality waste neutralization
Gas scrubber
Wastewater / chemical treatment & reclaim

Together as one

We make Process Automation easy

The water treatment market faces several critical issues: increasing urbanization and global warming resulting in one of the biggest concerns, namely water scarcity. Process Automation has an integral role in the growing needs of water conservation.



GF Piping Systems offer deep application knowledge of the entire process within the water treatment industry. Depending on the application area, there are different water treatment process challenges, ranging from guaranteeing high water qualities and providing reliable measurements to assuring stringent regulations. Plastic piping solutions from GF Piping Systems provide higher efficiency around the water cycle with increased productivity and lower operational and overall costs.

- Non-corrosive solutions
- Higher efficiency around the water cycle with increased productivity
- Lower operational and overall costs

One user experience across the whole control loop

GF Piping Systems is your experienced partner with a full portfolio of measurement, control, and actuation components, which are easy to install and use and have local support through all project phases. We offer the full package with our products and solutions, providing top-quality installation, a highly skilled team of experts standing by our customers' side every step of the way worldwide, and digitalized services ensuring a project is at the forefront of the market.

Design (Planning phase)
Easy planning thanks to application-specific solutions making an effortless combination around the complete control loop.

Select (Ordering phase)
Easy to select and order via configurators and matching components throughout the whole portfolio.

Install (Building phase)
Easy installation and calibration with intuitively designed products; finding the right product upon delivery - our packaging will guide you.

Own (Operation phase)
Easy monitoring once installed, including spare part availability. Long lifetime and low maintenance make for low downtimes.

The pioneer in IR fusion

GF Piping systems has been the pioneer and leader for innovative infrared fusion technology since 1992. We have been working closely together with our customers focussing on their real-life needs. As a result we developed the automated IR-A family, which covers the dimension range from d20 up to d400mm and is the completion of the IR-Plus line-up.

The optimized heating process

Non-contact heating (IR) shortens the heating time by more than 50% compared to conventional butt fusion. The entire equalization process is no longer necessary which solves the problem of varying bead formations. The tendency for melted material to stick to the heating element (especially PVDF) is eliminated.

Advantages of IR fusion:

- Short welding time
- Minimal defined bead
- High reproducibility
- High reliability
- Less thermo-stress
- Best for high purity applications

The Weld-Bead Inspection (WBI) Tool

Built to provide peace of mind for piping systems in the microelectronics sector, the Weld-Bead Inspection Tool from GF Piping Systems assesses the quality of infrared-weld beads more reliably than ever.

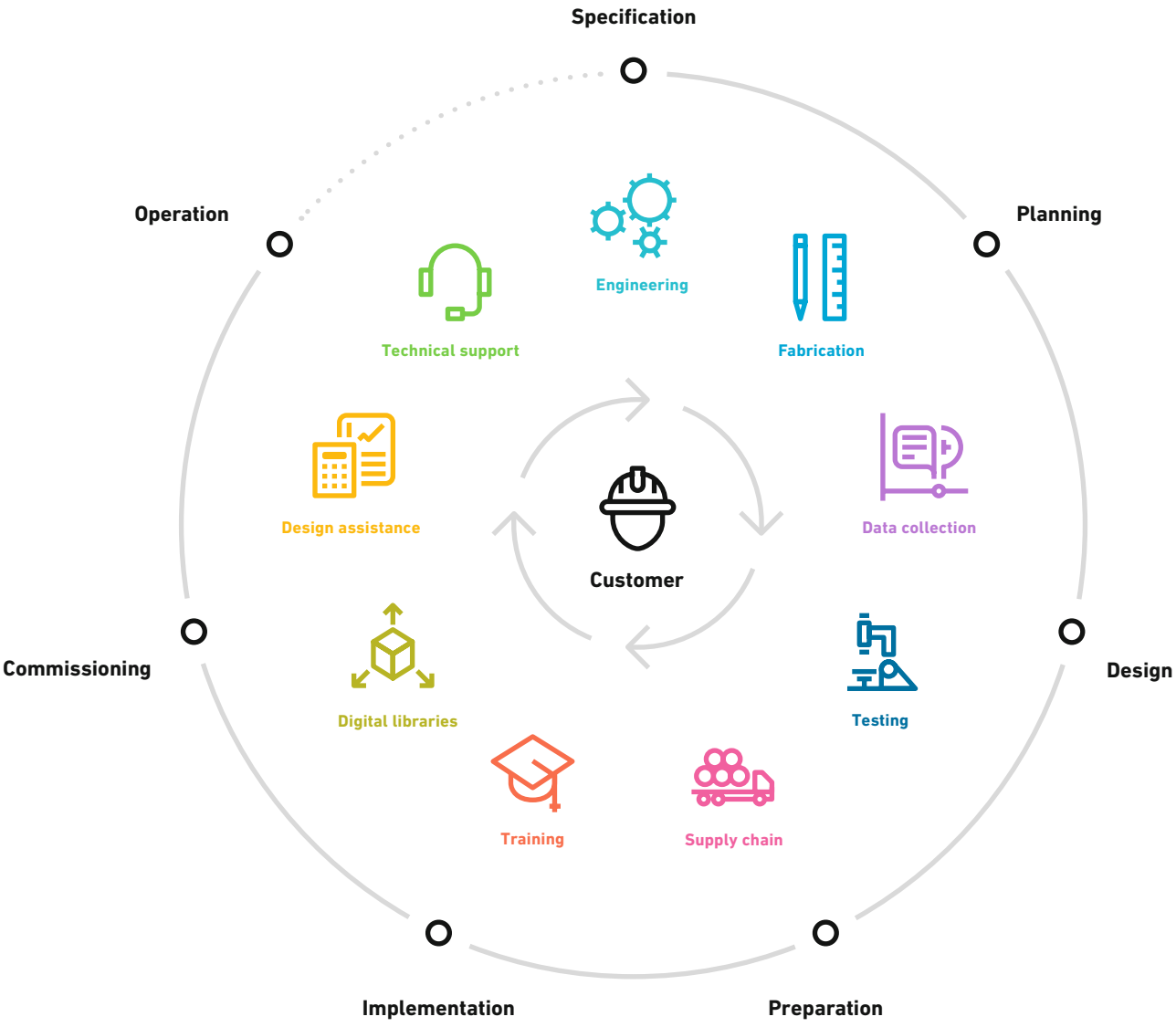
When an infrared butt fusion process is used to join plastic piping components together, a weld (or fusion) bead is produced. In the past, experienced welders or quality control managers assess the quality of the bead with the naked eye to see whether it is perfectly fused and as uniform as possible. But there are fewer and fewer qualified workers with this expertise, so why take the risk?

Better to be objective

As small as a computer mouse and packed with state-of-the-art photo-sensory technology: welds for highly demanding applications can now be digitally inspected to ensure potential weaknesses are highlighted objectively, ensuring the risks of leaks resulting in millions of dollars worth of damage are reduced. There has never been a tool like it before that can assess a weld bead and provide a seal of approval as quickly and objectively.

WBI-L assessing the strength of a weld

One partner from planning to commissioning



Ready when you are
With Specialized Solutions, the global leader GF Piping Systems provides project support every step of the way to achieve construction excellence. Allowing owners and planners to concentrate on their daily business without interruption.

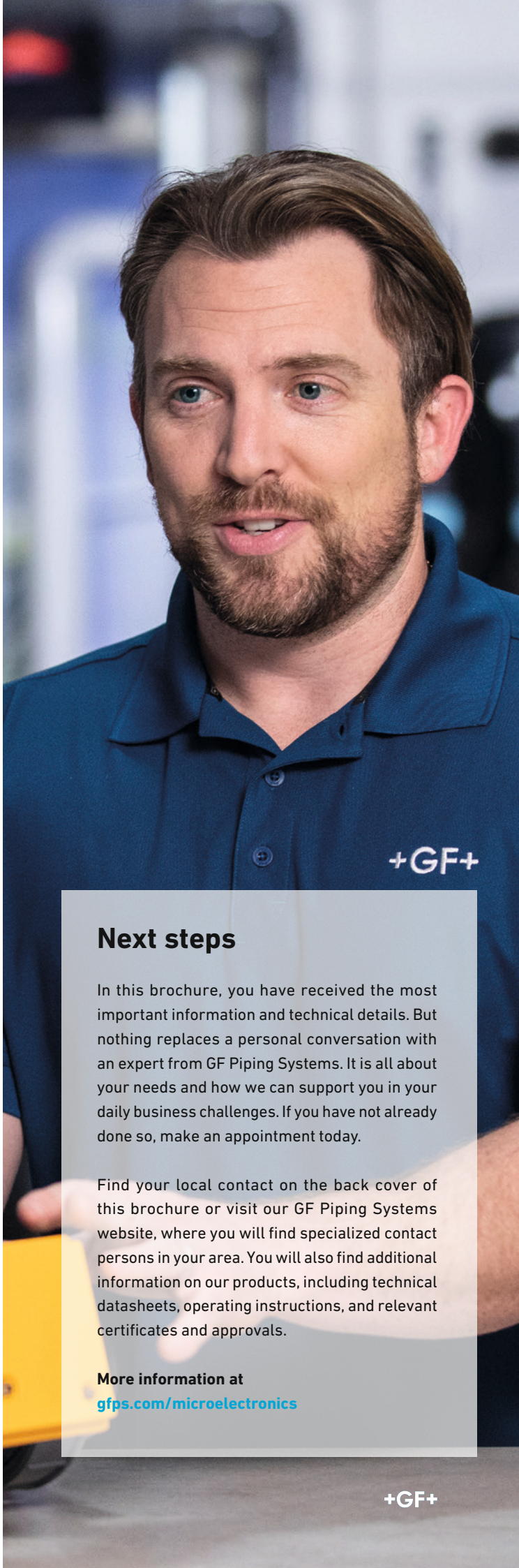
Ultra precise design
Optimize planning and execution phases and avoid failures due to improper design and pipe support.

Ultra training support
Increase quality and safety throughout every phase of your project with industry-leading training programs.

Ultra fast response
Reduce project and operation lead times through off-site prefabrication and advanced stock management.

Ultrasonic analysis
The integrity of a piping system is essential for the semiconductor industry. Our weld-bead inspection tools and ultrasonic NDT (Non-Destructive Testing) provides testing options at the point of installation, while Pipe Condition Assessment can be employed during operation to acquire real data about the state of piping systems.

More information at
gfps.com/specialized-solutions



Next steps

In this brochure, you have received the most important information and technical details. But nothing replaces a personal conversation with an expert from GF Piping Systems. It is all about your needs and how we can support you in your daily business challenges. If you have not already done so, make an appointment today.

Find your local contact on the back cover of this brochure or visit our GF Piping Systems website, where you will find specialized contact persons in your area. You will also find additional information on our products, including technical datasheets, operating instructions, and relevant certificates and approvals.

More information at
gfps.com/microelectronics

+GF+

GF Piping Systems

Local support around the world

Visit our webpage to get in touch with your local specialist:
www.gfps.com/our-locations

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