agru

The Plastics Experts.



# PURAD

## HIGH PURITY PIPING SYSTEMS



EXCELLENT LOGISTICS AND PRODUCT SUPPLY

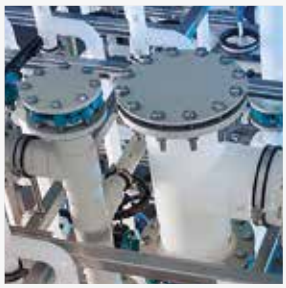


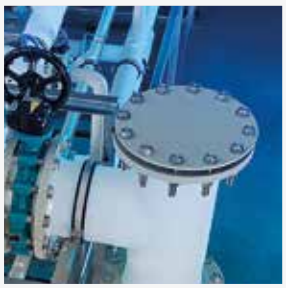




GLOBAL PRESENCE AND SERVICE







HIGHEST QUALITY TO MEET FUTURE DEMANDS









CUTTING EDGE WELDING TECHNOLOGY









SOLUTIONS FOR EACH REQUIREMENT





# The Plastics Experts.

PURAD high-purity piping systems are used for high-tech applications in the semiconductor industry, for TFT and OLED manufacturing, and in the life sciences, food and photovoltaic industries. The PURAD brand name stands for absolute purity, uncompromising quality, outstanding customer benefits, and high operational reliability. Whenever highest standards of purity, excellent leachout behaviour and high chemical resistance are required, PURAD is the first choice.

The AGRU success story has been unfolding now for around seven decades. Founded back in 1948 by Alois Gruber senior, nowadays the company is one of the world's most important single-source suppliers for piping systems, semi-finished products, concrete protection liners and lining systems made from engineering plastics. Our ability to supply everything from a single source sets us apart. We use only top-grade thermoplastic polymers as our raw materials. When it comes to application-technical consulting, we are your best partner in the field.



## Quality

At AGRU, customer satisfaction comes first. Technical consultation, seminars, welding training and expert on-site instruction form the foundation for achieving this. The AGRU quality assurance system is compliant with ISO 9001:2015 and its environmental management system fulfils ISO 14001:2015. This in turn ensures that the products comply with international norms. We are monitored and evaluated by independent testing agencies on a regular basis.

The start-to-finish attention to quality ensures that the products meet and beat the strictest technical specifications, providing safe operation within gas, water and wastewater infrastructures.

# PURAD
# The best solution for safe distribution of ultrapure water

**The PURAD piping system made of PVDF UHP, PP PURE, POLYPURE and ECTFE provides the best solution for safe distribution of ultrapure water (UPW) in semiconductor factories of the latest and of future generations (< 14 nm technology). The variety of materials available offers cost-efficient solutions for any range of applications.**

## Highest product purity & surface quality

**Production of all system components in ISO class 5 cleanrooms**

Top safety and performance for your application

- therefore optimal for high end ultrapure water quality (UPW)
- fast and safe rinsing of the pipework after correct installation
- suitable for < 14 nanometre technology semiconductor production

## ONE STOP Shopping

**Pipes, fittings and valves from one factory for highest performance**

Easy procurement and a reliable supply chain

- ensure fast and reliable availability of parts from OD 20 to 315 mm with PN 10 and PN 16
- guarantee supply availability for project-specific OEM components
- also for application-optimised welding technology and rental welding machines
- thanks to local service partners who ensure on-schedule delivery
- through technical support in all phases of construction

## Universal applicability

**Perfectly adjusted system components in PVDF UHP, ECTFE, PP Pure, PP natural (Polypure)**

Fulfill even the most demanding requirements in various industries

- such as semiconductor, photovoltaic, life sciences, nanotechnology, energy storage technology etc.
- and low space requirements for installation cause of a revolutionary product design
- because the majority of the fittings and valves are fabricated using innovative injection moulding technology
- due to the harmonious use of different welding technologies
- such as the FM 4910, DIBt, USP 25 VI, FDA and Semi F 57 product and material approval standards

## Long-term reliability

**Exclusive processing of selected premium thermoplastics**

Excellent and continuously monitored product characteristics

- safe and reliable 24/7 operation of piping systems, even in sensitive applications
- drastically reduced maintenance required by the installed piping system components
- deliver top performance even under operation at maximum load
- fully automated welding technology with integrated quality controls




# PURAD
# A new dimension of purity



## State-of-the-art cleanroom technology

At our new cleanroom production facilities in Bad Hall, Austria, PURAD PVDF UHP piping system components are fabricated for high-purity applications, such as for the distribution of ultrapure water in the semiconductor industry. A sophisticated cleanliness concept in plant 5 ensures that the pipes, fittings, valves, gaskets, flanges and special parts are fabricated with the highest possible purity and leave the plant in double hermetically sealed packaging. This is how AGRU provides unique system solutions for modern ultra pure media supply systems that are specially designed for specific customer applications.



## Optimised material flow

The material flow in the AGRU cleanroom production facilities is optimally adapted to the production requirements. Our "everything under one roof" philosophy, which fulfills ISO class 5 standards for the whole process from delivery of the plastic granulate to production and final cleaning right through to packaging, ensures even better quality, purity and customer satisfaction.

## Comprehensive quality management

To achieve a standard of purity that is unique in the industry, PURAD system components are thoroughly inspected prior to packaging to find impurities, so-called "black specs." Then all components pass a final cleaning with ultrasonic, ultrapure water and special tenside. AGRU preserves this purity for its customers around the globe with the help of a double hermetically sealed packaging system.



## Logistics and service

High production capacities, comprehensive stocks of products and raw materials, as well as local warehouses ensure fast availability of all product components for our customers. Customer-oriented production capacity planning and cutting-edge products developed and produced for ever-increasing requirements offer significant benefits for large high-tech factories in the microelectronics industry. The worldwide AGRU distribution network makes it possible to provide fast local service and expert advice on location.





## ISO class 5 cleanroom

The ISO class 5 standard contains hygienic requirements that even surpass the cleanliness of an operating theatre. AGRU produces the PURAD PVDF UHP piping systems under these clinical conditions. The cleanrooms are designed so that the amount of airborne particles that could settle on the products is kept at an absolute minimum. Particulate air filters, protective clothing, and consistent positive air pressure in the room prevent particles from being brought in from the outside or develop inside the cleanroom.



Image courtesy of Ovivo

# PURAD piping systems
# Solutions for each requirement

In order to have the right solution on hand for any requirement, PURAD is fabricated out of various thermoplastic materials that each provide specific benefits. The most suitable material for high-end applications in the distribution of ultra pure media is PVDF UHP. As another variation for the distribution of ultra pure media and exhaust air in high-end industrial applications, complete piping systems made of PP-PURE, Polypure (PP-n) and ECTFE (Halar) are also offered.

## Highest standards of purity: AGRU PVDF UHP piping systems

PVDF UHP is particularly pure, and in contrast to many other plastics, it contains no stabilisers, softeners, lubricants or flame-retardant additives. Material of this quality is therefore ideally suited for the distribution of ultra pure media in ultrapure water systems and industrial supply systems. Contamination by leach out is nearly impossible in these piping systems. For more than 25 years, AGRU PURAD PVDF UHP piping systems have been used very successfully in the semiconductor industry.

AGRU regularly performs leach out tests according to F40-0699 E and F57-0312 in order to guarantee the quality of the pipes and fittings.

**Advantages of PURAD PVDF UHP systems**

- top-class mechanical and physical properties
- high safety reserves for 24/7 operation
- excellent long-term behaviour
- best possible weld seam quality (IR and beadless welding)
- lowest leach out behaviour at low and high temperatures (surpasses SEMI F 57 requirements)
- excellent surface finish quality (low roughness, no micropores) means a low risk of biofilm grow

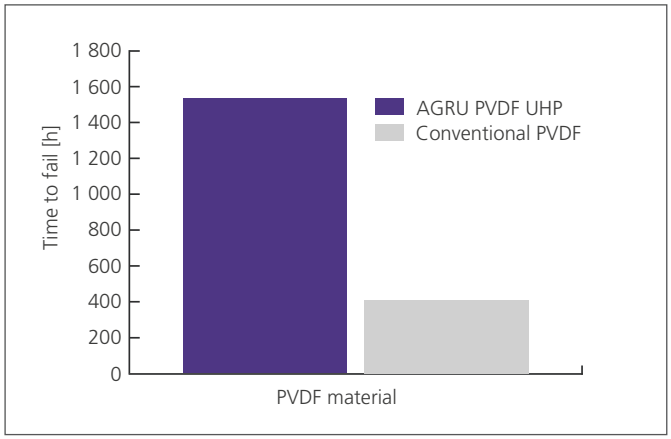
All pipe components are made of the same basic PVDF material (suspension grade PVDF, type II according to ASTM D 3222).



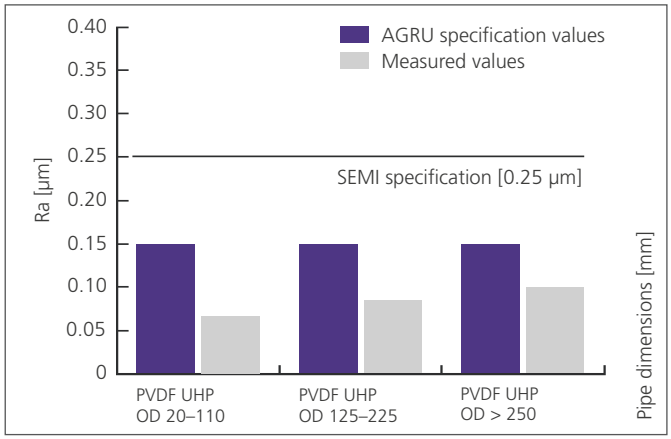


## Outstanding long-term behaviour

**Full Notch Creep Test behaviour (tested according to DVS 2203-4)**




**Surface quality of PURAD pipes**




## Highly cost-effective: AGRU PP Pure & Polypure piping systems

The PP Pure (PP HP grey) and Polypure (PP natural) piping systems are made of carefully chosen PPR (Polypropylene Random Copolymer) material. These products contain no softeners and are distinguished by their low density and excellent processability.

**Advantages of the PURAD PP Pure and Polypure systems**

- good mechanical properties such as improved impact strength
- high pressure resistance and therefore increased application safety
- very low leach out behaviour, in particular at media temperatures < 50 °C
- very good weldability
- cost-effective in comparison to other materials



## Highest flexibility: AGRU ECTFE piping systems

ECTFE possesses a unique combination of excellent chemical resistance together with high mechanical strength, even at high temperatures. These properties make ECTFE predestined for many fields of application, including as a cost-effective solution for modern ultra pure media supply systems.

**Advantages of ECTFE systems**

- the best surface finish quality of all fluoroplastics
- high purity even at high operating temperatures
- excellent weldability with IR welding
- reliable and safe in use
- excellent chemical resistance against ultra pure media that are used in the semiconductor and solar cell production (e.g. H2SO4 98%, HCl 37%, HF 90%, NaOH 50%, HNO3 65%, etc.)





# PURAD
# pipes & fittings



## PURAD pipes & fittings

Our PURAD piping systems include a wide range of pipes and fittings (such as bends, E-couplers, tee-pieces, stub ends, reducers, end caps and unions). AGRU also fabricates project-related custom made fittings.

**PURAD PIPES & FITTINGS PRODUCT RANGE**

| Product | PVDF UHP | PP PURE | POLYPURE | ECTFE |
|---|---|---|---|---|
| Pipes | SDR 33 OD 90 – 315 mm | SDR 11 OD 20 – 315 mm | SDR 11 OD 20 – 110 mm | SDR 21 OD 20 – 110 mm |
| Fittings | SDR 21 OD 20 – 315 mm | | | |

# Fittings for any application

## Sampling tee

- with PT female thread
- for the easy and secure connection of measuring devices
- butt and infrared welding are possible
- PVDF UHP material



**PURAD PRODUCT RANGE SAMPLING TEE**

| PVDF UHP | | |
|---|---|---|
| SDR 21 | OD 50 – OD 160 | ⅜", ¾", ¾", ½", 1" |

Product code: 220

## HPF E-socket

- electro-socket fitting for the beadless welding of PVDF piping system
- for tie in joints and welds on the pipe rack
- PVDF UHP natural material



**E-SOCKET PRODUCT RANGE**

| Product | PVDF |
|---|---|
| HPF E-socket | OD 20mm – 63mm |

Product code: 073

## Custom fittings

- designed according to customer requirements to ensure a perfect fit
- very low space requirements and minimal dead leg area
- reduced overall costs through perfect coordination
- produced under cleanroom conditions and delivered in high-purity quality ex works
- each custom component is designed based on the specific characteristics of the plastic and application



## PVDF UHP application

In the microelectronics industry, even the slightest amount of particles in the ultrapure water can interfere with the creation of the sensitive computer chip circuits. PURAD PVDF UHP piping systems are therefore the safest and most reliable solution for the distribution of ultrapure water. For more than 25 years, PVDF UHP piping system components have been used very successfully in these highly sensitive applications.





# PURAD valves

Due to their robustness, purity, low amount of dead space and easy operation, PURAD valves ensure that you have a safe and complete piping system that fulfills all the requirements for modern ultra-pure media supply systems. Cause of their compatibility with pipes and fittings, the valves can be integrated quickly and easily. Depending on the material and dimensions, various components for measurement and control technology are available (diaphragm valves, pressure reducing valves, ball valves, sampling valves, check valves and swing-type check valves, pressure relief valves, flow meters and diaphragm seals).



Image courtesy of Ovivo



## Diaphragm valves and T-diaphragm valves

- corrosion and chemical resistant
- excellent flow properties
- minimal dead leg area
- with visual position indicators
- tamper-proof and hand wheel lockable
- also available with pneumatic actuator
- different connection methods possible (IR and beadless welding, screw connection, flange connection)
- T-diaphragm valves available in custom dimensions and designs fabricated under cleanroom conditions (product code 240)

**PURAD DIAPHRAGM VALVE PRODUCT RANGE**

| Product | PVDF UHP | PP PURE | POLYPURE | ECTFE |
|---|---|---|---|---|
| Diaphragm valve* | OD 20 mm – 110 mm | OD 20 mm – 110 mm | OD 20 mm – 63 mm | OD 20 mm – 63 mm |
| T-diaphragm valve** | OD 20/20 mm – 160/63 mm | OD 20/20 mm – 63/32 mm | OD 20/20 mm – 63/32 mm | |
| injection moulded fabricated T-diaphragm valves*** | OD 75/75 mm – 225/140 mm | OD 40/40 mm – 225/110 mm | | |

Product codes: *340/342, **343, ***240

## Pressure reducing valves

Reduce pressure in the system after the valve to a defined value

- all parts in contact with the media are made of high-purity, robust plastics
- can be installed in any position
- suitable for ultrapure water applications
- stainless steel or plastic pressure gauge available
- low maintenance
- available with or without pressure gauge



**PURAD PRESSURE REDUCING VALVE PRODUCT RANGE**

| Product | PVDF UHP | PP PURE |
|---|---|---|
| V82 pressure reducing valve with pressure gauge* | SDR 21 OD 20 – 63 mm | SDR 11 OD 20 – 75 mm |
| V786 pressure reducing valve without pressure gauge** | SDR 21 OD 20 – 63 mm | SDR 11 OD 20 – 50 mm |

Product codes *241, **243

## Ball valve

- integrated bottom mounting stand
- safety locking handle
- modular design
- FPM seal
- centered ball = minimal dead leg area



**PURAD BALL VALVE PRODUCT RANGE**

| PVDF UHP | PP PURE |
|---|---|
| SDR 21 OD 20 – 75 mm | SDR 11 OD 20 – 75 mm |
| SDR 33 OD 90 mm | |

Product code: 363



# PURAD welding technology

In addition to high product quality, the welding technique for connecting the parts and proper installation are important facts for the proper functioning of an ultra-pure media system. As a reliable solution for the fusion bonding of PURAD pipes and fittings, AGRU offers different welding methods. The innovative and patented PVDF E-coupler welding technology as well as contact-free and bead-less welding methods are well-suited for all PURAD products. AGRU welding machines are perfectly adapted to industrial requirements and deliver optimal quality and performance.

**Electrofusion socket welding**

- electrofusion socket welding is available for PVDF UHP piping system components
- provides short welding times and easy handling
- welding with no inner bead thanks to the special design of the compact E-coupler and patented welding process
- the EF 110-B mobile welding machine makes it possible to work on site in the pipe bed and places that are difficult to access

**Contact-free welding (IR welding)**

- infrared technology for fully automatic, contact-free welding
- highest purity & reproducibility are ensured
- the bead is reduced to a minimum
- up to 70% shorter welding times in comparison to conventional heated element butt welding

**Beadless welding**

- most modern technology for beadless welding seams
- absolutely smooth surface prevents accumulation of deposits for highest purity
- particularly well-suited for sanitisable piping systems in the life science Industry
- the welding process and documentation are performed fully automatically
- easy to use
- touchscreen operation




Electrofusion technology | Infrared welding technology | Beadless welding technology

# PURAD welding machines

## Infrared welding technology (SP-S series)



SP 110-S V3



SP 250-S V3



SP 315-S



SP 63 mobile

## Beadless welding technology (SP 110-B, EF 110-B)



SP 110-B



EF 110-B



# PURAD
# joining and installation technology

PURAD union connection, flange with Seal Clean gasket and clamp are ideal for temporary connections. These mechanical connections provide easy installation and the flexible integration of individual piping segments. Perfect compatibility with the other PURAD products guarantees absolute leak tightness and reliability.



## Flanges

- backing ring made of PP-FRP, blind flange made of PP-FRP and PVDF UHP

## Seal Clean gaskets

- made of 100% pure ePTFE
- very low leach out values promise high purity
- excellent chemical and temperature resistance
- available for DIN, ANSI and JIS plastic flange connections
- excellent adaption to the sealing surface
- dead-leg-free and rinsable flanged connection
- ensure high reliability and long lifetime, even under extreme operating conditions

**SEAL CLEAN GASKET PRODUCT RANGE**

| Standard | Dimension (mm) | SDR pipe class |
|---|---|---|
| DIN | 20, 25, 32, 40, 50, 63, 75 | SDR 21 |
| | 90, 110, 125, 140, 160, 180, 200, 225, 250, 280, 315 | SDR 21/33 |
| ANSI | 20, 25, 32, 40, 50, 63, 75 | SDR 21 |
| | 90, 110, 125, 160, 200, 225, 250, 280, 315 | SDR 21/33 |
| JIS | 20, 25, 32, 40, 50, 63, 75 | SDR 21 |
| | 90, 110, 125, 140, 160, 200, 225, 250, 280, 315 | SDR 21/33 |

Product code: 372

## Sanitary joint fittings

- compatible with stainless steel
- the standard connection for pipework in the pharmaceutical and food industries
- available in Twin and Tri-Clamp versions



| PRODUCT RANGE |
|---|
| OD 20 mm – OD 63 mm |

Product code: 35.306

## Unions

- fast and easy connections
- reliable and detachable connections for plastic pipe
- high pressure resistance and purity
- provide for the uncomplicated exchange or integration of piping system components





| PURAD UNIONS PRODUCT RANGE | | | |
|---|---|---|---|
| **PVDF UHP** | **PP PURE** | **POLYPURE** | **ECTFE** |
| SDR 21 OD 20 mm – 90 mm | SDR 11 OD 20 mm – 63 mm | SDR 11 OD 20 mm – 63 mm | SDR 21 OD 20 mm – 63 mm |

Product code: 024.5

## PP Pure application

PP PURE pipework is well suited for ultrapure water return lines, as well as for high-purity media of lower quality (e.g. PW). PURAD piping systems are available in various materials. PP Pure is also the best piping system for industrial applications with high operating temperatures and high media purity.





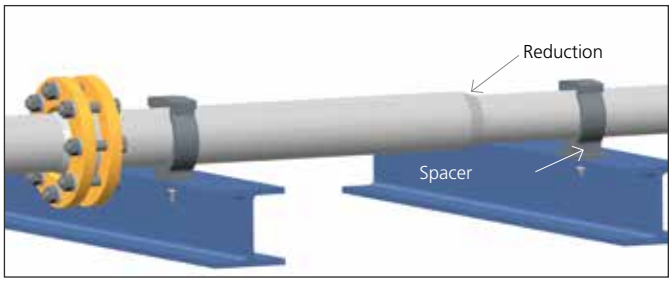
# PURAD installation technology for high operational reliability

Also the correct installation is a very important point for high-purity piping systems. For this purpose, AGRU offers specially designed pipework fasteners made of plastic (clean and non-corroding). These pipe clamps can be used in all fields and are specially designed according to the tolerances and expansion characteristics of the plastic pipe. These pipe supports are easy to install and ensure that the pipework can expand and contract as a result of variations in temperature during operation, preventing point loads on the pipe.



## Pipe clip

- rugged design
- applicable for anchor points
- non-corroding
- uncomplicated and fast installation on various channel support systems. For example, compatible with HILTI and Unistrat channel support systems.
- the inner diameter of the pipe clip is set up so that the pipe can slide through the clip even under extreme pressure and temperature conditions (no anchor point).




**PP-FRP PIPE CLIP SIZE RANGE**

OD 20 mm – OD 225 mm

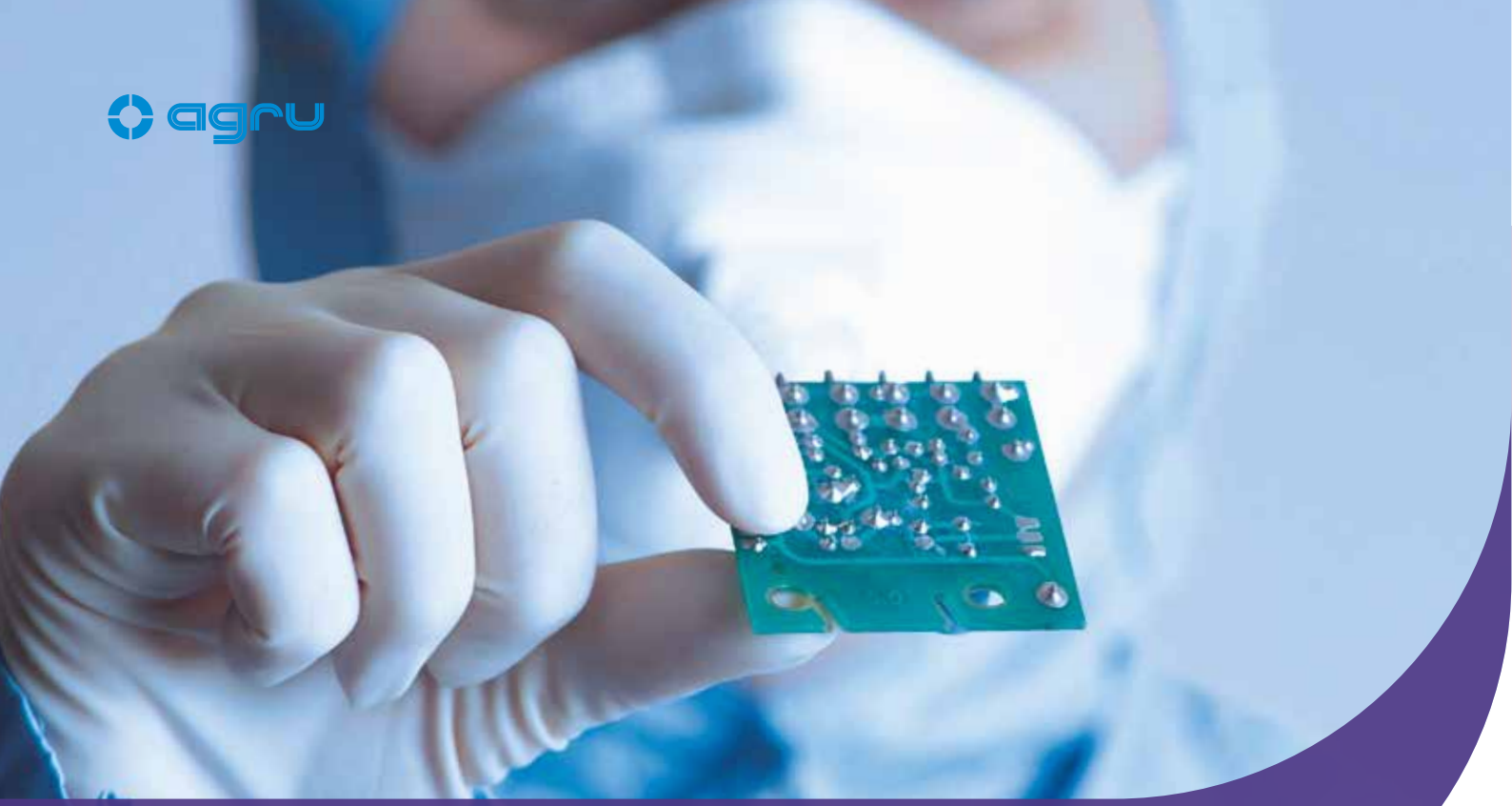
Product code: 049

Matching anchor point fittings in all pipe materials are also available in addition to the pipe clips



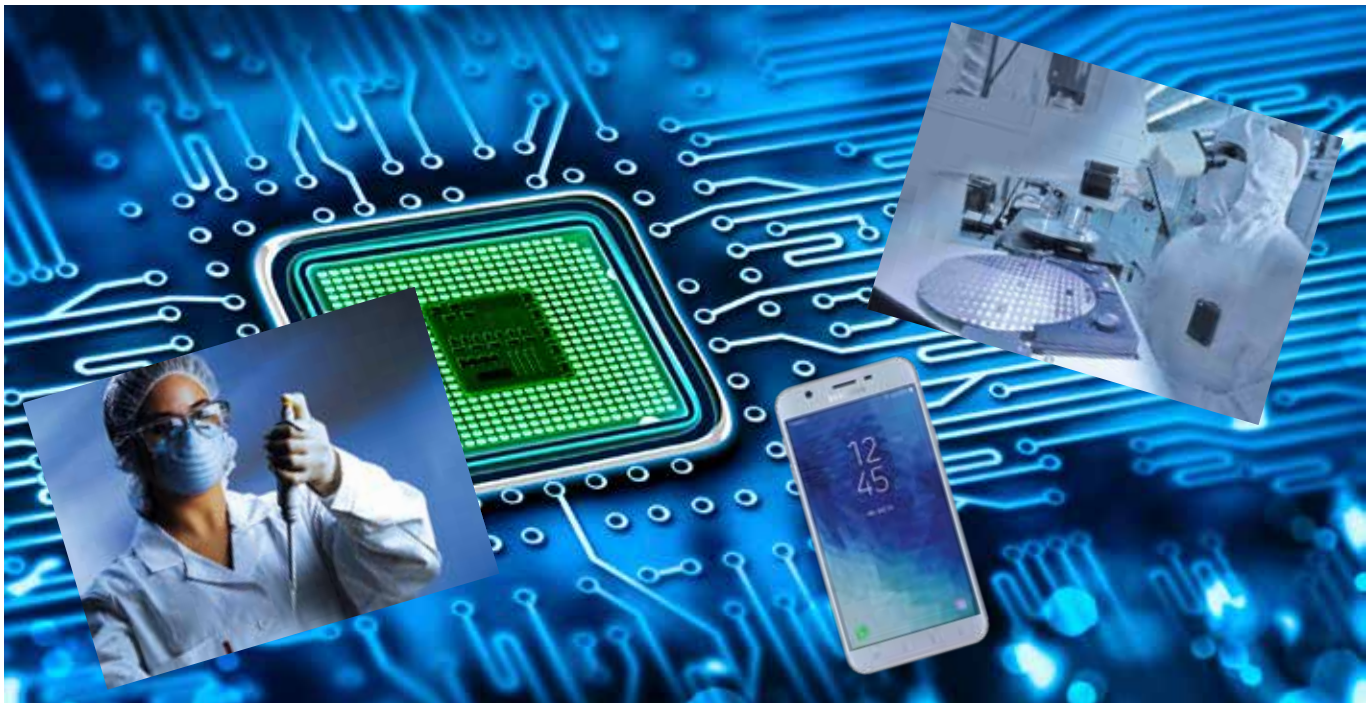
## PURAD installation

"Everything from a single source" is the AGRU motto, and it also applies to the PURAD piping system. Pipes, fittings, flanges and valves all come from the same manufacturer for maximum fitting accuracy and system purity.



# PURAD system
# Fields of application

PURAD ultra pure media piping systems are used for high-tech applications where absolute purity, excellent leach out behaviour, particle-free conditions and high chemical resistance are required. The main areas of use are as piping for ultrapure water systems for the production of UPW, HPW, PW and DI, for ring distribution systems, hook-up installations and piping systems in processing equipment (e.g. wet benches).





## Microelectronics industry

- semiconductor production (CPUs, DRAM, flash memory)
- flatscreen production (LCD, PDP, TFT, OLED)
- solar cell production (mono- and poylcrystalline PV panels)
- high brightness LED and OLED production
- circuit board manufacturing (PCBs)
- microelectromechanical systems (MEMS)
- polysilicon and wafer fabrication



## Food and beverage industry, dairy plants



## Life Science industries

- pharmaceutical industry
- bio-technology
- laboratory and research facilities
- hospitals
- dialysis



## Ultrapure and pure water systems

- in power plant construction and diverse other industries (e.g. petrochemical, etc.)



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