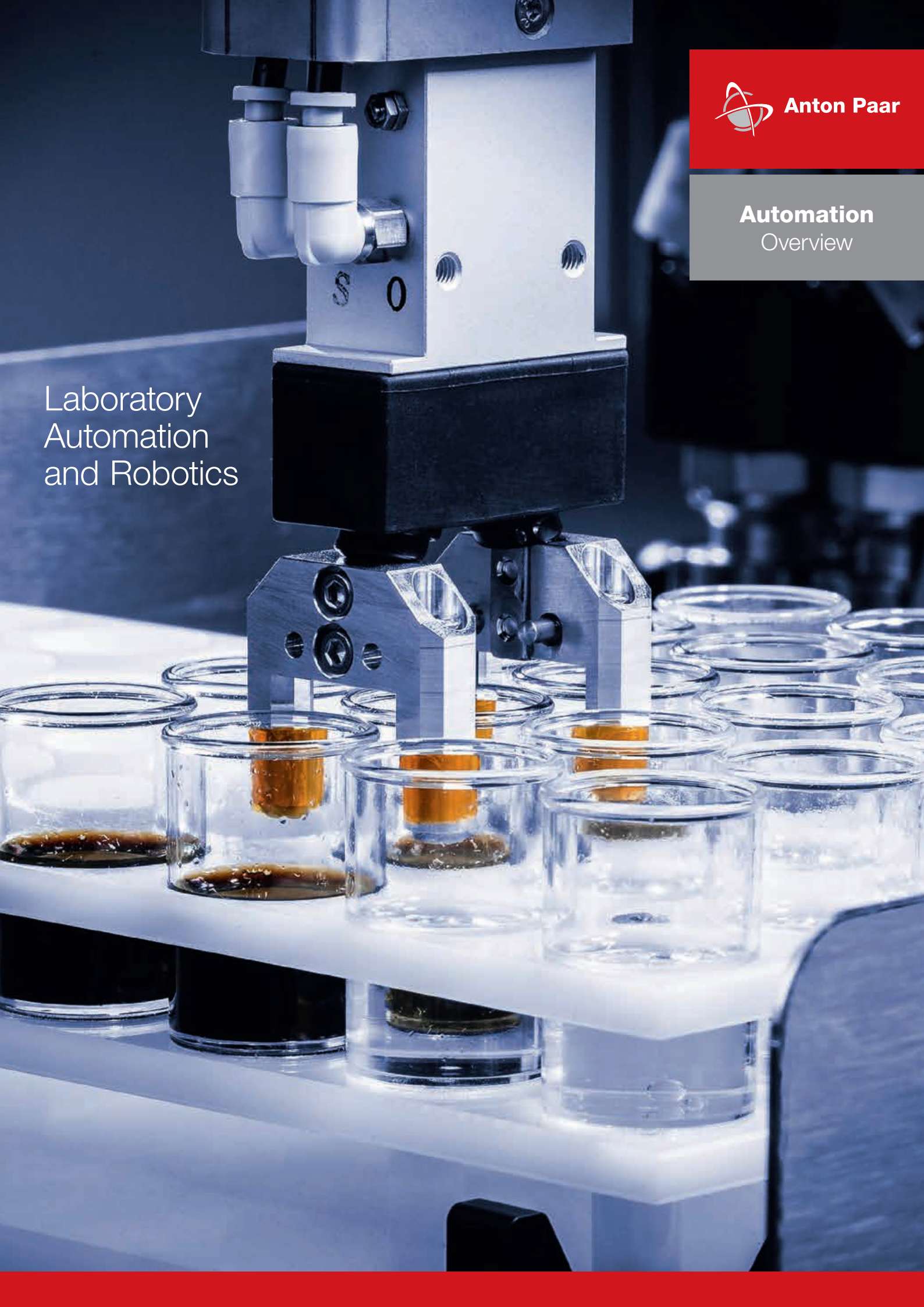


# Laboratory Automation and Robotics



# All in one: Automation and robotics

---

You want to increase your productivity.

Drawing on expertise available in-house, Anton Paar offers you flexible **ready-made** and **tailor-made automation** solutions fusing analytical equipment with high-performance automation and robotics. Expert teams master electrical engineering, mechanical design, software and robotics control, high-precision production, analytical instrumentation, application know-how and process understanding.

You need optimization for efficiency.

From the idea and development to production and implementation, you benefit from automation and robotics from one single source. Anton Paar's global service and support network then accompanies you throughout the lifetime of the system.

Automated workflows speed up time-consuming, repetitive tasks and improve your reproducibility and repeatability. You enjoy up to 24/7 operation with minimized user interaction and operator influence.

## Application fields

4-5

Discover how Anton Paar's robotics and automation solutions are utilized.

## Ready-made automation systems

6-10

Choose from successfully implemented automation systems.

## Automation modules

11

Apply these automation modules as stand-alone solutions or combine them to make your workflow.

## Tailor-made automation solutions

12-15

Order your own tailored solution designed to suit your particular needs.

**Anton Paar creates  
solutions which you  
won't find off-the-shelf.**

# Your application mastered by high-precision engineering

## Petroleum industry

### The lifetime of machines and instruments matters

Used oil samples are contaminated due to their use. This affects their physical and chemical properties and influences the lifetime of machines. Therefore, the oil has to be checked and exchanged periodically.

For the continuous improvement of petroleum products, e.g. the aging behavior of different oils, a high number of identically prepared samples has to be analyzed statistically to detect the best candidate for improving the product quality.



## Personal & household care

### What you notice first

An unusual odor after opening, a different color, a strange texture - that's what is observed first and influences the buying decision or leads to complaints. During development it is important to find the formulation which has the optimal properties over a defined time. A large number of tests have to be undertaken to verify the right product from hundreds of versions in order to guarantee its special properties and stability.

## Polymers

### Plastic is all around – Plastic is always special

Ever thought about going one week without plastic? No refrigerator, no coffee, no PC, TV, tablet, not even a pen. For all these products special polymers are developed and characterized. Their properties are controlled in high numbers with respect to their structure and processing behavior during thermoplastic processes. Automating this complex measurement procedure increases the output of results for development, quality control and further improvements.



## Chemistry

### One day in the testing lab

Undertaking more than 100, 1000 or even 5000 measurements per day for various analytical determinations is not uncommon in the analytical testing lab. Reproducibility and repeatability are prerequisites to receive reliable results. That demands exactly the same sample preparation procedure for each sample before measurement. Automated sample preparation, subsampling, diluting and blending of e.g. dispersions, extracts, formulations, additives and reference standards ensures correct sample preparation for subsequent analysis.

# One partner – many automation possibilities.

# Ready-made automation systems

The HTX automation platform is the basis for integrating analytical equipment for fully automated workflows.

## To shape the future

- ▶ Individual use and control of up to 10 modules

## Everything under control

- ▶ Windows®-based software
- ▶ Verification, filling and cleaning cycles managed by the software
- ▶ Traceability of samples, actions and users
- ▶ Notification service via SMS or email

## To go easy on resources

- ▶ Optimized cleaning cycles for minimum solvent consumption
- ▶ Optimal combination of modules

## Communication with everybody - but safely

- ▶ Separation of machine and customer networks
- ▶ Supports industry standards e.g. PROFINET, Ethernet, CAN bus, RS232
- ▶ Data transfer as csv files or SQL database



The HTX automation platform is based on a modular concept. Single measurement and tray modules can be combined to suit your needs. Start with a minimum module configuration and flexibly adapt to your future requirements.



### Maximum uptime guaranteed

- ▶ No interruption of the complete workflow and workload. If one module needs to be maintained the others take over the work.
- ▶ Industry standards and established robotic control components are used

### Good to be on track

- ▶ Anton Paar's cartesian robot and gripper tool allows flexible vial and sample handling of different vial sizes
- ▶ Recognition of vial status

### A clever link

- ▶ Standardized interface for solvent, pressure, ventilation, energy supply and communication

### Assemble your specific workflow

- ▶ Open for implementation of any instrument
- ▶ Quick and easy adaptation of the Anton Paar Control Software
- ▶ Experts in-house will invest in the design, pricing model and feasibility to adapt the platform to your workflow needs

# The utmost flexibility with the HTX automation platform

The flexibility of the HTX platform is demonstrated by its use as the High Throughput Viscometer (HTV) which links the unique Anton Paar Stabinger Viscometer™ SVM 3000 to the HTX platform.

## HTV High Throughput Viscometer

The HTV in its standard configuration is designed to determine the kinematic viscosity of used oil samples at 40 °C and/or 100 °C. The unique advantage of the system is the parallel determination of the density. Cleaning routines and verification cycles can be programmed and scheduled.

The High Throughput Viscometer HTV is also the perfect solution for e.g. lube oils, fuels, chemicals and cosmetic samples. The HTV standard setup works according to **ASTM D7042** and **ASTM D2270/ISO2909**.

The HTX platform is also **ready to integrate additional Anton Paar analytical instruments** such as the Stabinger Viscometer™, DMA M density meters, Abbemat refractometers and MCP polarimeters.

In the same way, **external instruments** with a flow cell such as titrators, pH meters, particle quantifiers (PQ), etc. can be implemented.





### Stabinger Viscometer™ SVM 3000

- ▶ Dynamic, kinematic viscosity and density in one go
- ▶ One measuring cell covers the wide viscosity range



### Density and Concentration Meters Generation M

- ▶ Density precision up to  $0.000001 \text{ g/cm}^3$
- ▶ Oscillating U-tube technique for the most accurate and quick density results



### Abbemat Refractometers

- ▶ Fast and reliable measurement of the refractive index
- ▶ Universal refractometers covering all applications in all industries



### MCP Polarimeters

- ▶ Determination of the concentration or specific rotation of optically active substances
- ▶ Multiple wavelength option; additional wavelengths can be added at a later date

**Anton Paar builds and optimizes your automation workflow to suit your individual application needs.**

# The way to work faster – The Modular Sample Processor

A modular benchtop automation platform for sample preparation

## Accurate and fast sample preparation

The Modular Sample Processor module is made for automated sample preparation steps prior to analysis. It makes many samples from one sample or combines many samples to one sample. It can be used as a stand-alone benchtop unit or integrated into complete automated workflows. Liquid samples up to 1000 mPas can be processed. The Modular Sample Processor can be used for liquids, pastes and powders. It handles input volumes up to 1L.

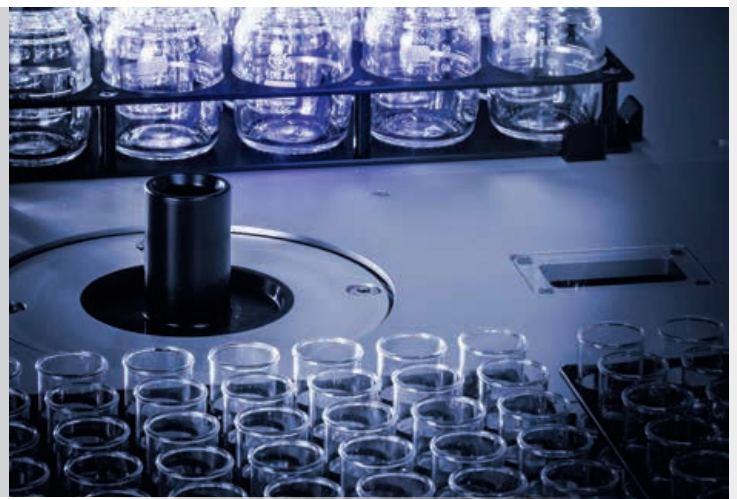


## Dilute, dispense, add and blend correctly

The basis for correct dilutions, end concentrations, blends and subsamples is the correct pipetting and/or dosing of defined volumes. To ensure precise and repeatable sampling the subsampling process is controlled gravimetrically using Anton Paar's Gravimetric & Volumetric Dosing and Weighing module. Full traceability of each sample is given by the integrated bar code reader.

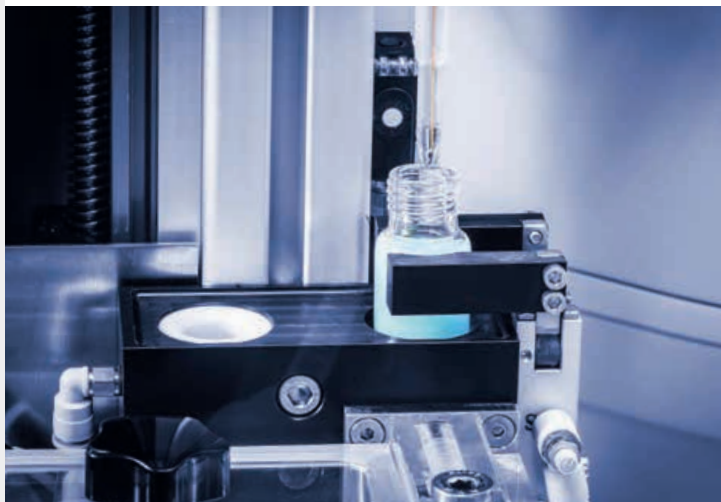
## Flexible like building blocks - many assembling options

Based on Anton Paar's modular benchtop automation platform the Modular Sample Processor can be assembled according to your application needs. Besides the flexibility of integration into specific lab workflows, you are also flexible in integrating defined features into the Modular Sample Processor unit itself.



# Steps to automated workflows – Automation modules

Automation modules are single functional units which are developed to provide the most important connections and communication interfaces to make automated processing possible. They are used as stand-alone modules, integrated into automation platforms and in combination to form a complex benchtop module as an intermediate step on the way to fully automated workflows.



## Acid or base - know one extra fact about your sample

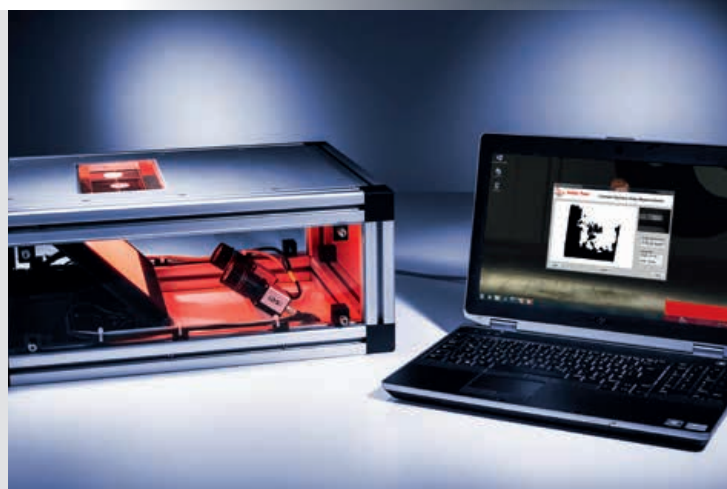
### pH Measurement Module

The pH is one control parameter which tells you whether your sample is as required. The pH module enables you to detect the pH alongside or in addition to analytical determinations from exactly the same sample. It is equipped with an automatic cleaning routine, a 3-point calibration and a resting position.

## Knowing the real area between contacting surfaces

### Contact Area Measurement Module

Contact area measurement informs you about the deformation properties of solid materials like polymers, rubbers, etc. The Contact Area Measurement module enables you to determine the real contact area based on the principle of total internal reflection.



## It's time for perfection

### Gravimetric & Volumetric Dosing and Weighing Module

This is the ideal tool if you have to produce precise liquid samples or dilutions. The volumetric sampling is always checked gravimetrically and the real volume and dilution ratio is calculated. This value is used for subsequent analysis. Incorrect sampling due to volume dosing failures relating from e.g. gas bubbles is easily detected via the gravimetric control.

# Tailor-made automation solutions

## Making complex workflows run well

There is nothing available off-the-shelf which meets your demands for automation? You will find it here. Anton Paar offers tailor-made automation solutions in one go.

Anton Paar knows that depending on

- ▶ the industry segment
- ▶ the applied test routines
- ▶ new challenges

automation solutions need to be specifically tailored to your needs. Based on the expertise in-house Anton Paar can either adapt a ready-made automation system or design a completely new automated workflow based on your specific requirements.

## Concept Phase



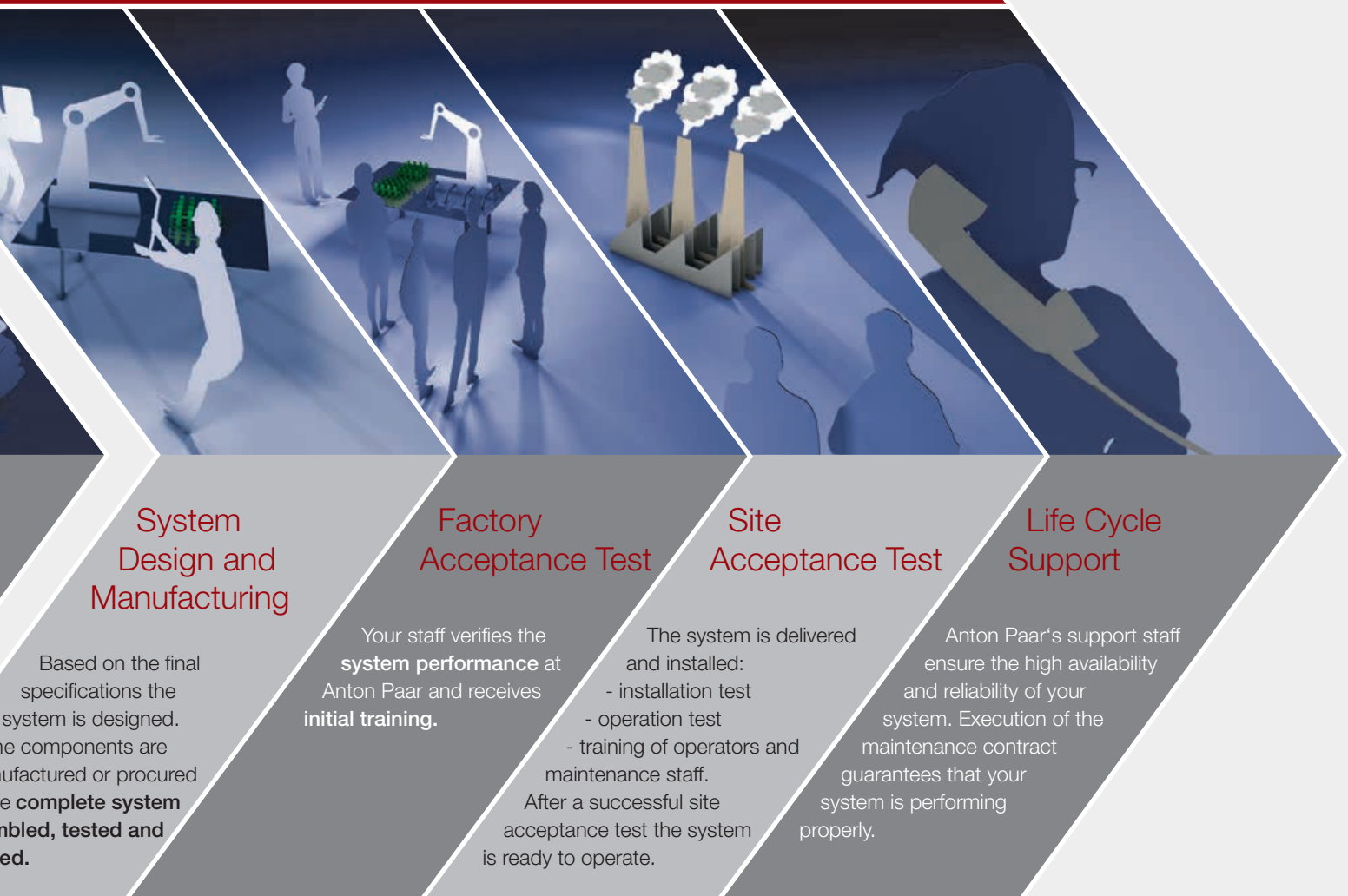
## Ideas take shape

You can rely on one single competent partner throughout the whole life cycle of your tailor-made automation solution.

Anton Paar helps you to shape your future and offers modular solutions which allow you to be flexible and adapt your system to future requirements. The automation systems come in one package with the Anton Paar Control Software which manages everything for up to 24/7 operation.

Together with you, Anton Paar develops the most beneficial automation solution for your workflow, from the first idea up to the final implementation at your facility.

## Implementation Phase



# Tailor-made automation of highly scientific instruments

## An innovation milestone: The first fully automated rheometer

The need to increase the throughput of samples for rheological characterization, to measure overnight and to reduce scientific staff's interaction in routine and reversible steps was the starting point for the first tailor-made, fully automated High Throughput Rheometer (HTR).

The trust in Anton Paar's world-class, high-precision and high-quality MCR rheometers together with Anton Paar's longstanding expertise in development and production were the key factors for the customer to decide for this tailor-made automation solution. This "all in one go" project realized by Anton Paar became an efficient automated solution.

## HTR High Throughput Rheometer

### A complex measurement becomes automated

#### Never gets tired

- ▶ The 6-axis robot handles viscous, paste-like and solid samples
- ▶ Measuring geometries are exchanged automatically

#### Everything is tracked

- ▶ Bar code reader for samples and used measurement geometries

#### Novelty in automated rheological measurements

- ▶ Concentric cylinder (CC)
- ▶ Cone-and-plate (CP)
- ▶ Parallel-plate (PP) geometries

#### Your warehouse in a robotic cell

- ▶ Measuring system magazine for up to 96 measuring geometries
- ▶ Sample magazine for up to 96 liquid and solid samples
- ▶ Sample cup magazine

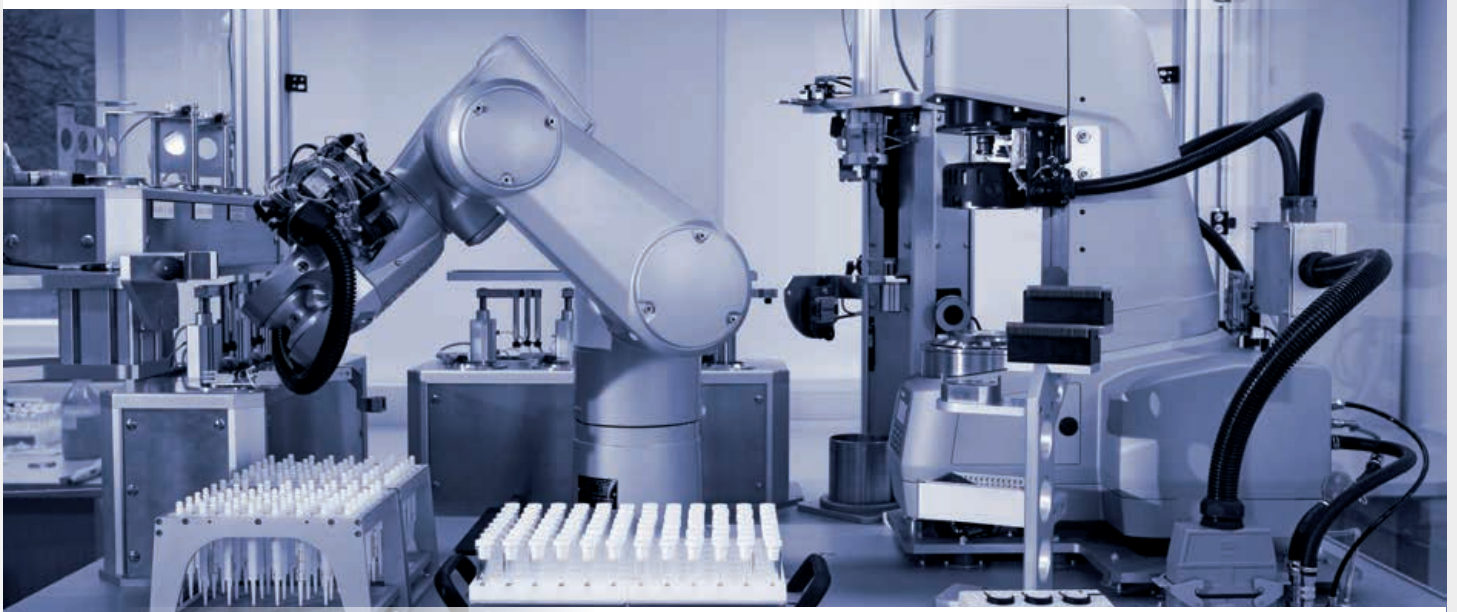
#### Precise dispensing system

- ▶ To dose the needed sample amount onto the rheometer's measuring plate



## Be sure the sample fits

- ▶ The trim tool ensures exact automated removal of excess sample material from the measuring area
- ▶ For parallel-plate geometries and cone-and-plate geometries
- ▶ Temperature control included
- ▶ Measuring in gaseous atmosphere for reactive samples



## No worries about contamination

- ▶ Cleaning of the upper and lower measuring geometry in four stages right after measurement
- ▶ Prewashing, cleaning with water, detergent and brushes, rinsing with water and drying with hot air
- ▶ Ensures continuous operation up to 24/7



**Anton Paar engineering fuses unique measurement instruments with sophisticated automated workflows.**

