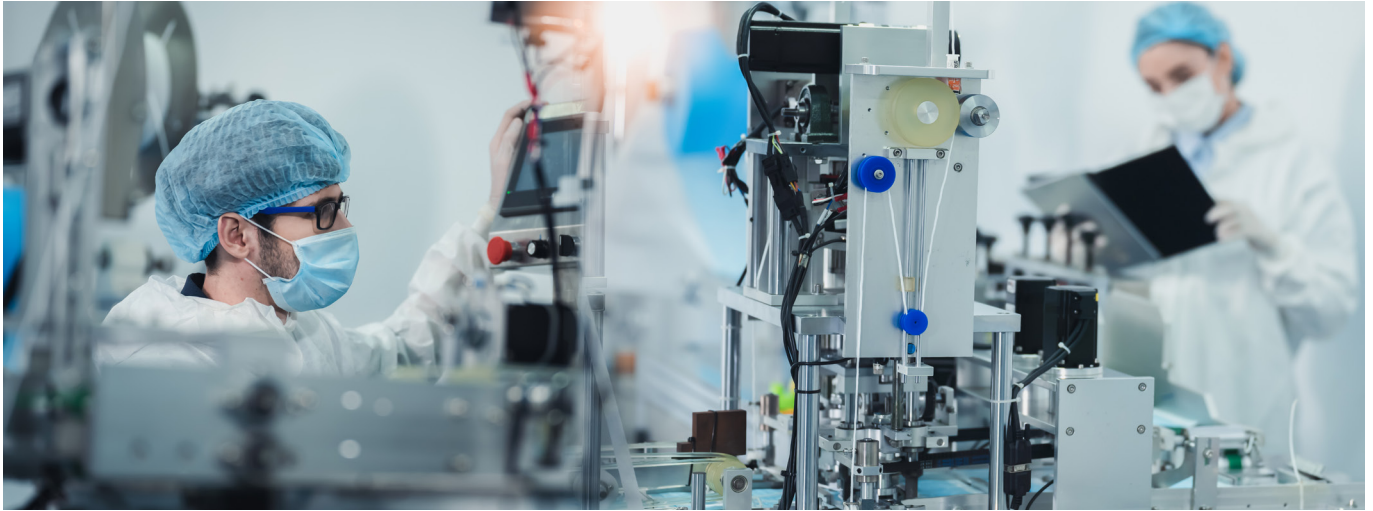# Automation & Special Solutions

interactive assistance of work steps, actions, processes for analytical, technical or scientific tasks and applications
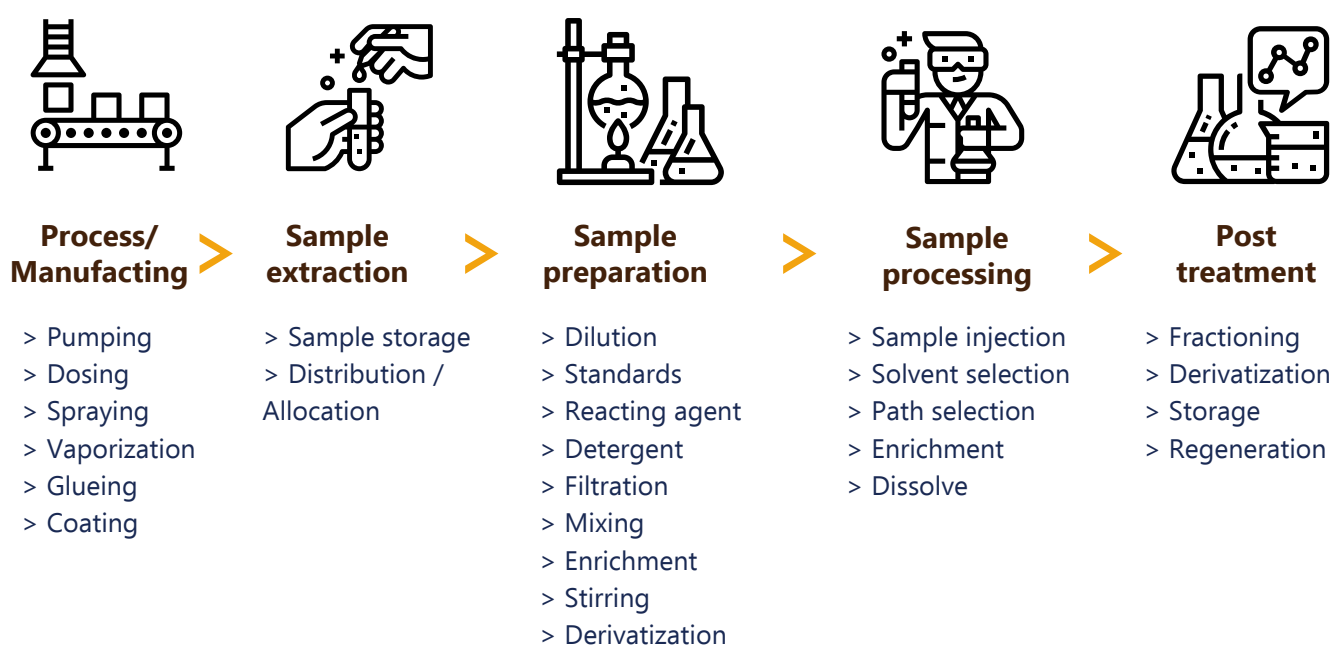
DURATEC
Analysentechnik GmbH

Automation

In the field of liquid-handling & automation single or multiple process steps can be assisted or performed completely by suitable components. Better accuracy and quality are obtained by machine assistance or automation in comparison to manual processing and is less vulnerable to failures. Comprehensive applications can be realized in some cases completely in only one system which results in more time for the end-user to spend in higher valued work.
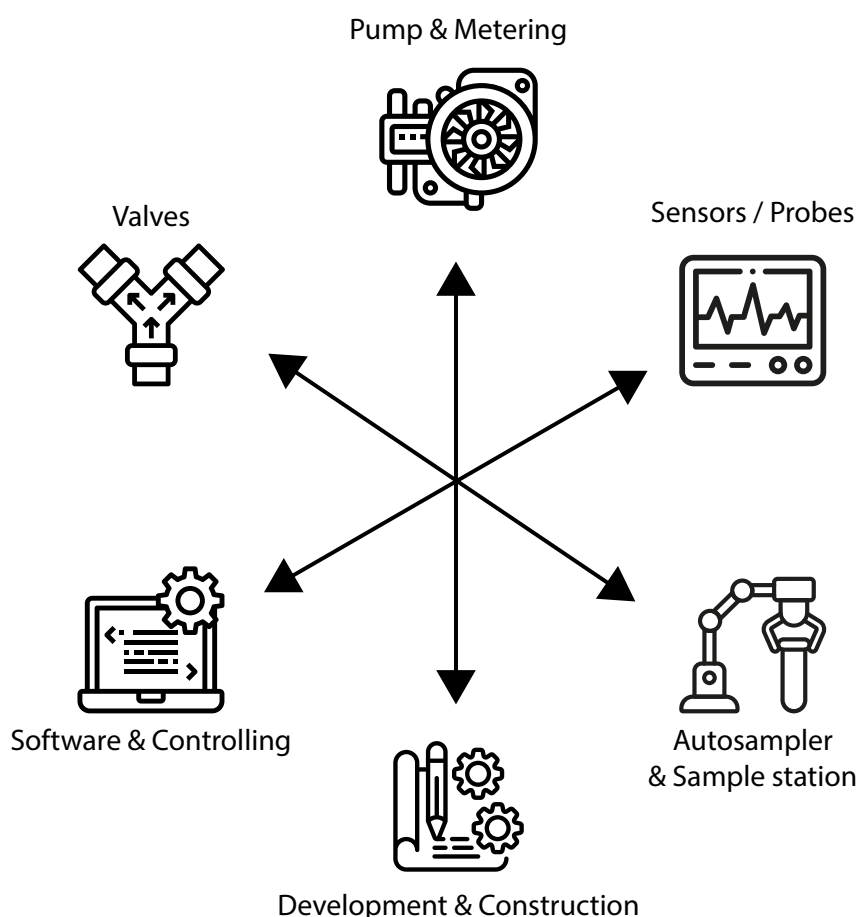
Automation process steps

If you follow a sample along the way from creation to the end of the chemical analysis then you can divide the process steps into groups. Each group stands for typical activities to be executed which are processed interactive or automatically by the use of suitable modules. In the technical field you can find them often in production lines or in test rigs and in the scientific field in experimental setups. For the chemical analysis in laboratory they are typically used for automation of sample preparation, sequence-processing and further treatment.

Process/ Manufacting	Sample extraction	Sample preparation	Sample processing	Post treatment
> Pumping	> Sample storage	> Dilution	> Sample injection	> Fractioning
> Dosing	> Distribution / Allocation	> Standards	> Solvent selection	> Derivatization
> Spraying		> Reacting agent	> Path selection	> Storage
> Vaporization		> Detergent	> Enrichment	> Regeneration
> Glueing		> Filtration	> Dissolve	
> Coating		> Mixing		
		> Enrichment		
		> Stirring		
		> Derivatization		

Automation building blocks

For individual projects you have to make clear the particular, necessary process steps together with their context. There are suitable modules for each process action and they are arranged in classes. One is dedicated to deliver liquids, another is specific to switch or select flow paths. Sample stations and autosamplers are used for sample allocation and storage or to provide additional media like standards, buffers or reagents. The devices are operated and controlled on one hand by external computer systems (e.g. PC or PCS), but also with the use of manual controllers or integrated micro-processors a self-sufficient mode of operation is enabled. Even complex applications or projects can be realized by smart selection of the right devices and their combinations as well as an intelligent controller. Integrated probes ensure safety and redundance for the whole system by monitoring or recording physical values like liquid level, pressure, temperature, conductivity or flow-rate.

Pump & Metering

Valves

Sensors / Probes

Software & Controlling

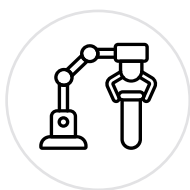Autosampler & Sample station

Development & Construction

Pump & Metering

- syringe & piston pumps
- one- & multi-channel systems
- flow rates nl/min to ml/min
- inert liquid paths

Valves

- distribution, selection, injection, on/off
- pressure range up to 1200 bar
- different materials available
- inert liquid paths

Autosampler & Sample Station

- XYZ systems
- up to 500 vial positions
- for different designs and volumes of vials/tubes and racks
- additional functions for temperature control, mixing, rinsing

Sensors / Probes

- flow rate
- pressure
- liquid level
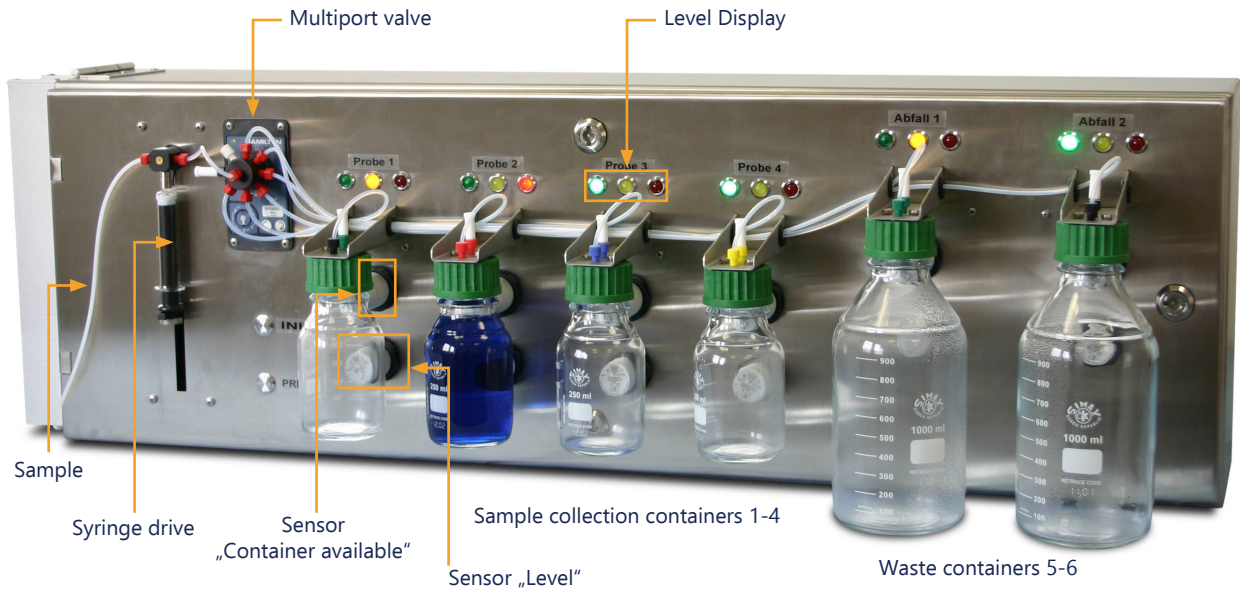- temperature

Software & Controlling

- setup, operation, control
- connection of devices
- data recording, monitoring
- evaluation, reporting, data transfer

Development & Construction

- customized devices and systems
- adaptation & modification of devices and systems
- special accessories
- electronic, mechanic and software

Extraction System for Retention Samples

Fixed volumes of sample are extracted from a production process line according to given cycle times and will be collected in containers over a period of 24 hours.

A process control system (PCS) opens an on/off valve at the end of each cycle time (e.g. 30 or 60 minutes) to the production line and sets a trigger signal for the extraction system. In the first step the syringe drive picks up fresh sample out of the product stream and rinses the liquid path to the waste container. In the second step the syringe drive picks up fresh sample again and dispenses the volume through the multi-port-valve into the collection container.
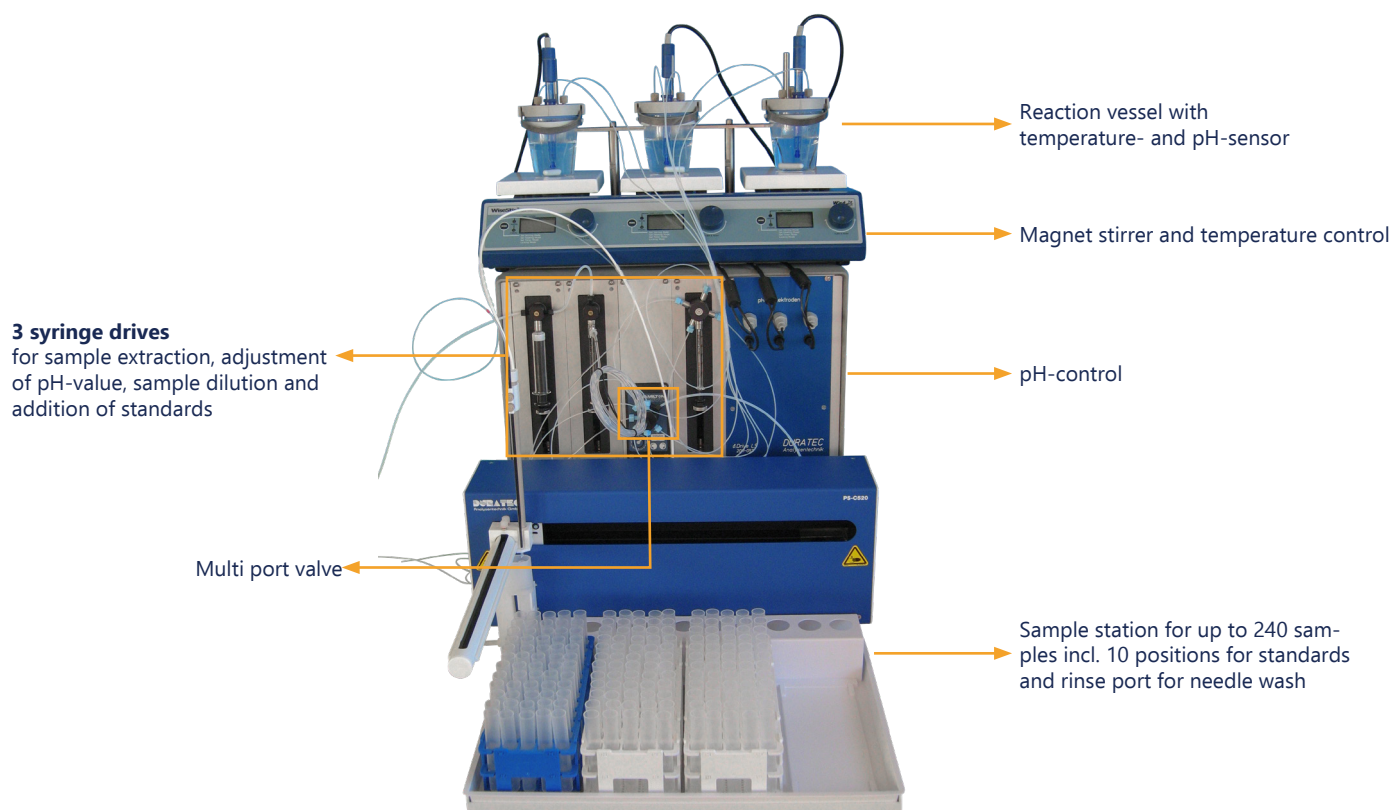
Collection containers (position 1-4) as well as waste containers (5-6) are monitored by 2 level sensors. One sensor checks the presence of the bottle while the second detects if the maximum level is not exceeded.

The internal controller of the extraction system reports the status of collection and waste bottles as well as the collection progress to the PCS.

- link to PCS
- internal µController
- syringe drive and 8-way-distribution-valve
- extraction out of production stream via flange & Valve
- collection of 24h retention sample
- sensors for safety & redundancy

Investigation of Corrosion Characteristics

Reaction vessel with temperature- and pH-sensor

Magnet stirrer and temperature control

3 syringe drives
for sample extraction, adjustment of pH-value, sample dilution and addition of standards

pH-control

Multi port valve

Sample station for up to 240 samples incl. 10 positions for standards and rinse port for needle wash

The investigation of corrosion characteristics in body liquid is part in development of implant materials. The solid sample material is embedded in the matrix medium and is arranged in a temperature- as well as pH-controlled reaction vessel. Liquid samples will be extracted according to scheduled time points (not necessarily in equally timed periods), then diluted and added with a standard. The resulting sample solutions are measured and evaluated by elementary analysis systems (e.g. AAS or ICP) in a post process.

- scheduled sample extraction
- pH- and temperature-control
- dilution of samples
- addition of standards and/or buffer

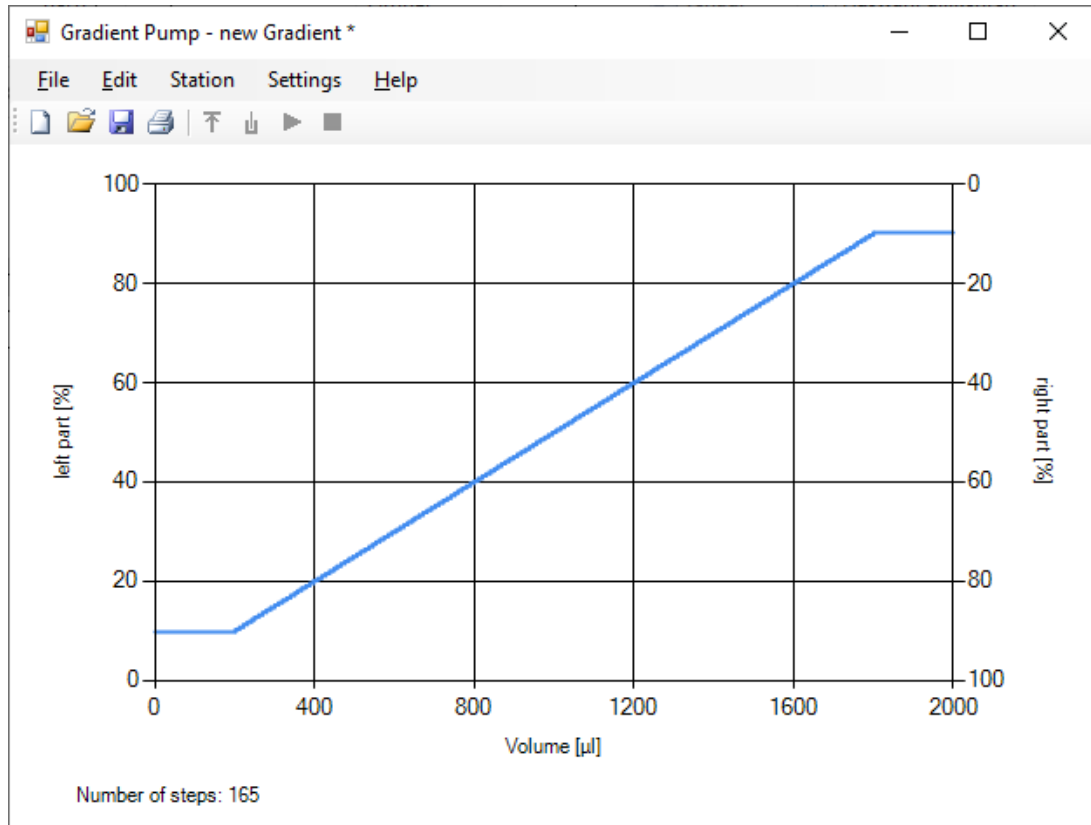## Production of a continuous Density Gradient for preparative Ultra-Centrifugation
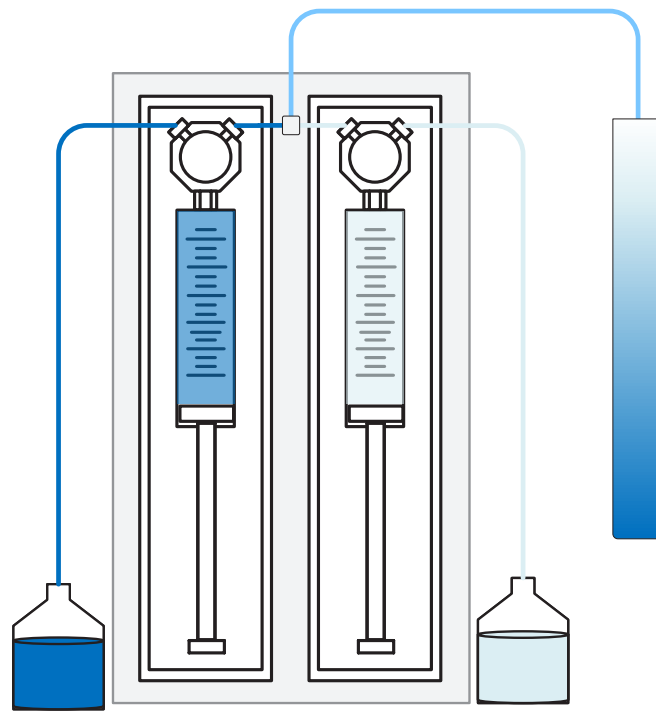
To separate macro molecules due to their different motion speeds, centrifuge tubes have to be prepared with two media filled in a desired density gradient from bottom to top. The production of the density gradient within the centrifuge tube is performed by using a two-channel-syringe-drive and a customized software. It allows linear, exponential and asymmetric gradients.

- dispensing of two media following a gradient

Software

Smart Sample Preparation for demanding Analytic

Sample station for up to 60 samples incl. rinse port for needle wash and modified racks

Photometer incl. flow cell

Syringe dispenser for sample dilution and sample transfer into flow cell

This application is to dilute samples into a requested absorption to have the resulting solution able for measurement in another analytical system. In a first step the sample is diluted with a defined ratio and then measured in a photometer. If the determined absorption is not in the required range, then the necessary dilution ratio will be calculated, the dilution accordingly performed and the photometric measurement repeated. As soon as the requested absorption is achieved the resulting solution will be transferred into the target vial.

- automated dilution incl. adaptation of dilution ratio
- automated photometric measurement of samples
- filling of prepared sample into target vial

Production and Filling of Reagents Mixtures for Cuvette-Test-Instruments

3-channel syringe dispensers for 3 different Media

Filling station for up to 180 vials incl. 3-channel output and rinse system
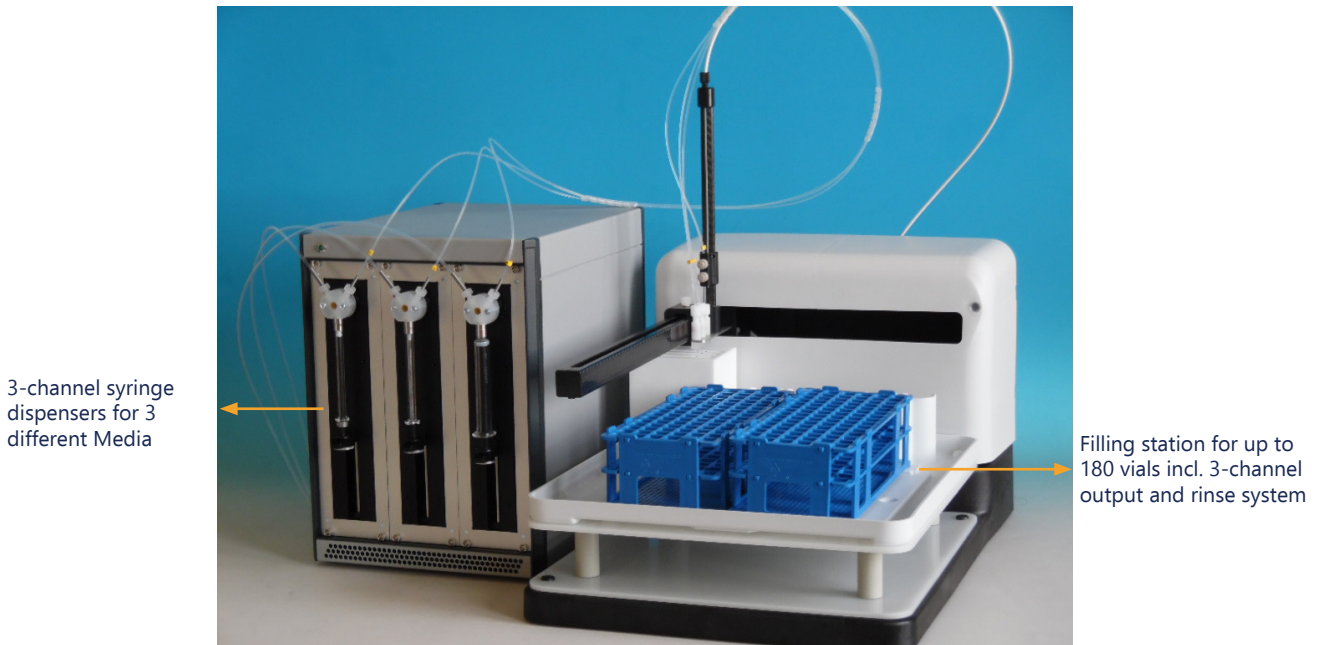
This system was designed to manufacture reagents mixtures for a cuvette-test-instrument to investigate the Chemical Oxygen Demand (COD) in water and waste water. Therefor three chemical agents are dispensed according to a programmable filling procedure in different quantities into target vials.

- filling of three different media in in one vial
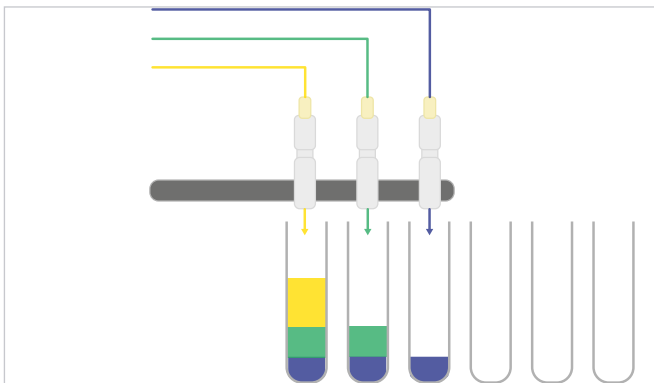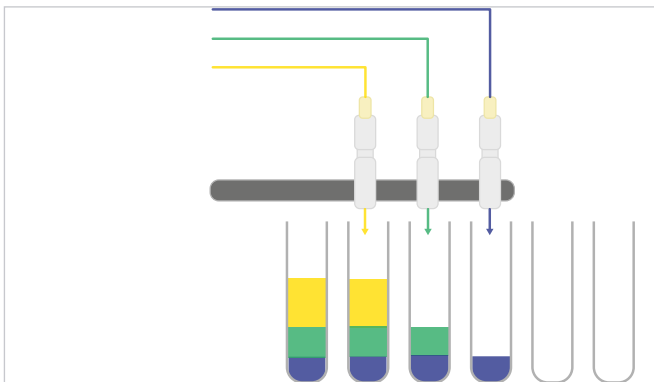- programmable filling procedure

Filling principle
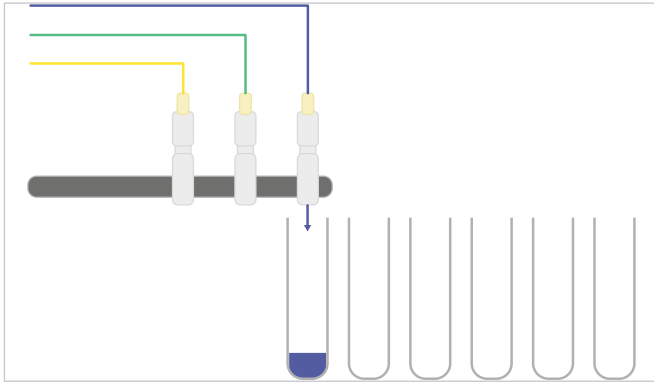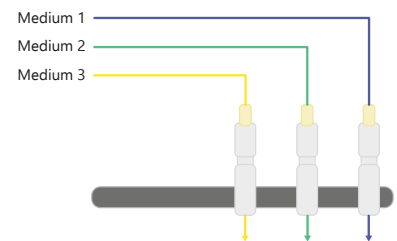

The filling starts with medium 1 in vial 1
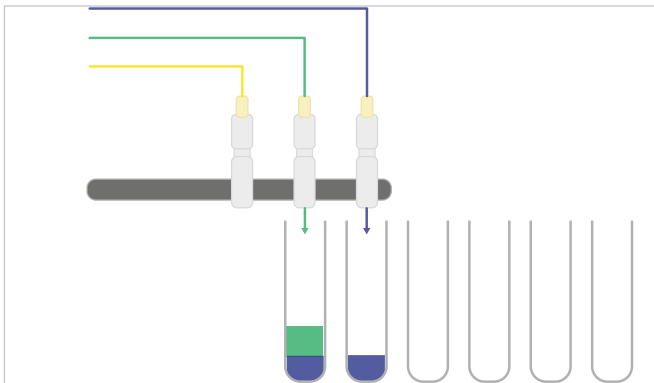
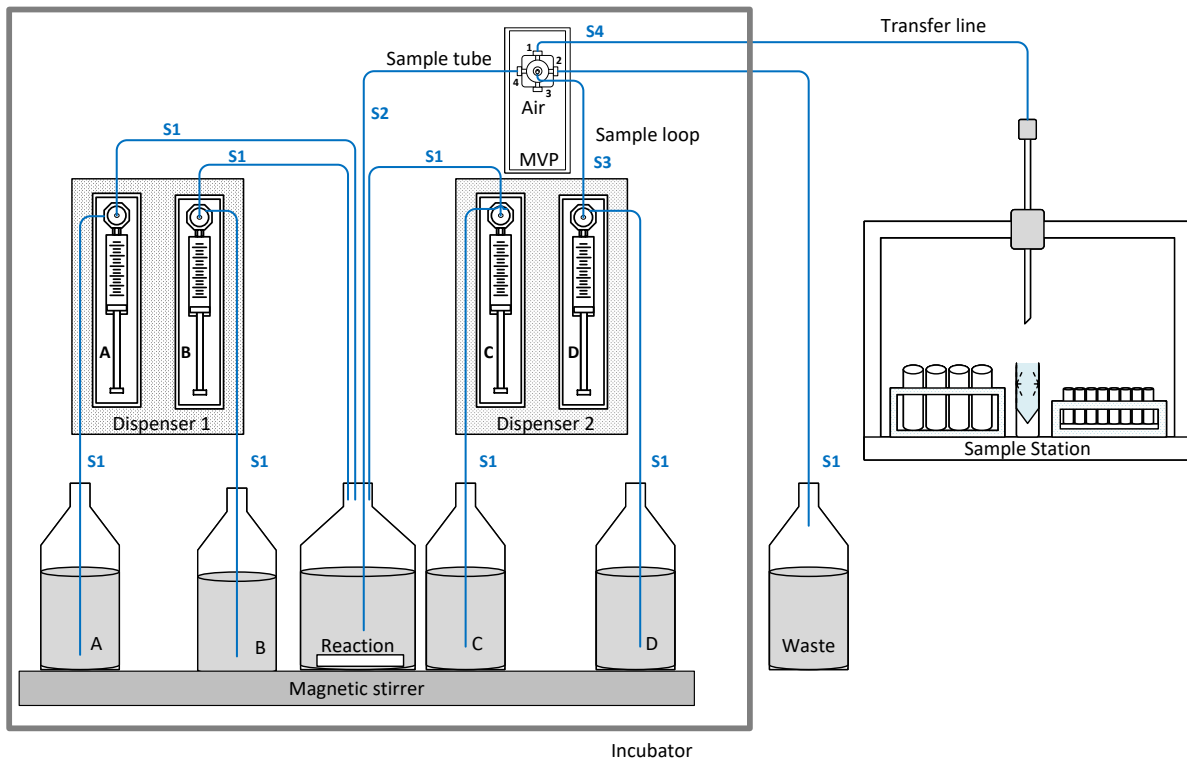Vial 1 is filled with medium 2 while vial 2 will be filled with medium 1

Vial 1 is filled with medium 3 and is now ready to use

All subsequent vials are filled accordingly
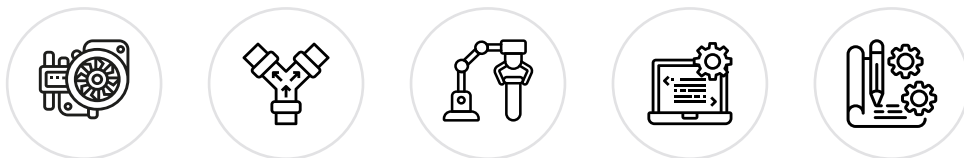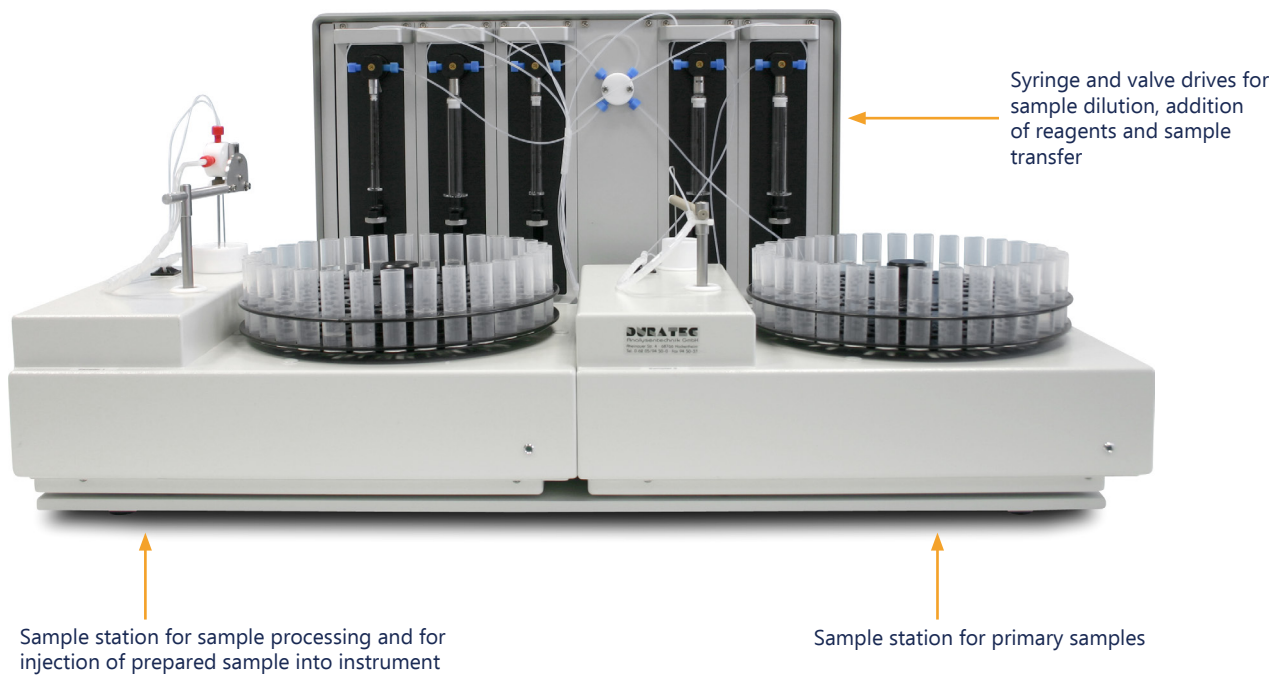
Medium 1
Medium 2
Medium 3

Study of Progress and Characteristics in Reaction Experiments

Different reagents are dispensed into a reaction vessel in certain quantities at scheduled times to affect and control the reaction process. Samples are extracted from the reactor periodically for evaluation of progress and characteristics. The sample will be diluted during the transfer into a special sample vial automatically. This enables to have it ready to use for the subsequent analytical system.

- scheduled dispensing
- periodically sample extraction
- sample dilution

Automated enzymatic Reaction Processing

Syringe and valve drives for sample dilution, addition of reagents and sample transfer

Sample station for sample processing and for injection of prepared sample into instrument

Sample station for primary samples

The device is part of a system to determine hydroxyproline in meats and sausages. As the protein hydroxyproline cannot be measured directly in a photometer, a time-controlled enzymatic reaction procedure is performed to convert the sample into a detectable compound. Therefor different media are added in scheduled time-points. After a defined reaction time the prepared sample is injected to the instrument for measurement. Completely processed tubes are rinsed afterwards and are available for another cycle of sample processing.

- sample dilution
- time controlled enzymatic reaction
- sample injection and measurement
- continuous loop process

Tel. +49 6205 9450 0
info@duratec.de
www.duratec.com

DURATEC
Analysentechnik GmbH

Rheinauer Str. 4
D-68766 Hockenheim
GERMANY