

Here you will find:

-
- Customised Reaction Equipment

 - Customised Parallel Reactor Systems

 - Customised Reaction Calorimeters

 - Customised Formulating Stations

Note:

Plant components can be found under

- Equipment and Components,
- Process Analytics and Sensors,
- Dosing Systems and Pumps,
- Stirring and Dispersing,
- Liquid Handling and Autosampler.

Individually manufactured laboratory robot system can be found under Liquid Handling and Autosampler.



The demands in chemistry are different everywhere. For this reason, there exists no such thing as the universal plant. Wherever the properties or possibilities of our Standard Laboratory Reactor Systems are not convenient or sufficient, this calls for the deployment of our LabKit systems customised according to client specifications:

- customised reactor apparatus
- customised reaction calorimeters
- customised formulation devices

A LabKit Laboratory Reactor System is individually designed to your specific requirements and commissioned turnkey-ready by our project engineers directly in your company.

We manufacture LabKit Systems like:

- Laboratory Installations
- Bench Plants
- Mini Plants
- Pilot Plants

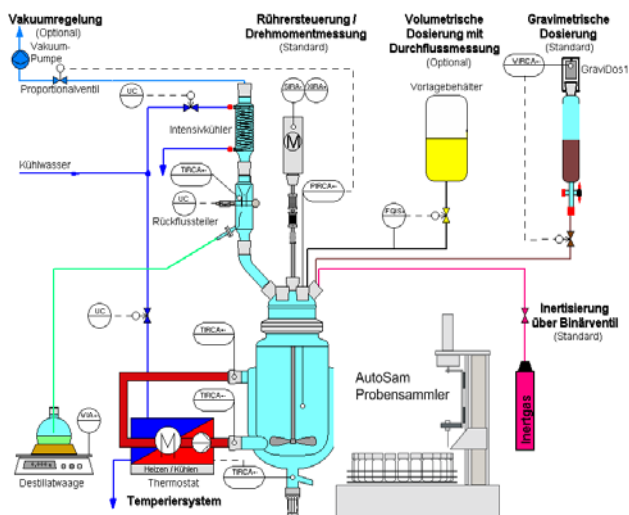
They are applied for product and process development, process optimisation, etc.

Characteristics:

- Client-specific Solutions
- Single and Multi Reactor Systems
- Batch, Semi-Batch or continuous Operation
- Fully automated
- Various possibilities for Upgrades

Advantages

- perfectly fitted to your needs
- open system with easy handling
- continuously expandable
- space-saving installation
- electrically lifted reactor vessel
- optimal usage of the laboratory's capacity by operating 24 hours
- best reproducibility
- increase in quality
- relief from routine jobs
- reducing the risk of accident
- GLP-compliant documentation
- accessible via network, e.g. from the office
- remote maintenance (dial-up by customer)



Possibilities

- single and multi stage syntheses
- distillation reflux
- crystallisation
- polymerisation and polycondensation
- hydrogenation with consumption measurement
- reaction calorimetry
- temperature, pressure, and vacuum control
- dosing of solids and gases
- dosing liquids, gravimetric and volumetric with pumps or with gas pressure via valves
- continuous weighing of distillate
- titration
- phase separation
- stirrer RPM control and torque measurement
- regulation the pH basic and/or acid
- controlling the recipe compliant with the NAMUR basic operational concept
- coupled multi reactor systems



Construction example: LabKit double jacket reactor system each with a three-jacket glass reactor for deep temperature handling up to -80°C reactor inside temperature, with freeze desalination and dosing unit for gases at -90°C , three volumetric and one gravimetric dosing circuits, inerting system with electronic reactor lift.

LabKit Modules

You have the choice between different mounting frames, vessels, gadgets, and other components for instrumentation and automation.

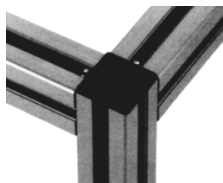
The composition of a laboratory system with single components, like pH dosing controller, vacuum controller, data acquisition, master control (e.g. PLC) etc. was regarded the best equipment during the last years. It is the limits of these conventional systems where LAB-Kit shows its superiority due to its NAMUR-compliant automation based on the LabManagersystems.

The following summary shortly depicts some of the modules. More detailed descriptions of the same can be found in other chapters.

Frames

The frames are made of anodised aluminum square profiles and/or round profile high-grade steel.

Optionally, an electrical lifting device for the reactor can be installed.



Reactors

Verfügbar sind Glasgefäße, auch spezielle Anfertigungen von 100 ml bis 100 l, in unterschiedlichen Bauformen, mit Einfach- oder Doppelmantel. Deckel mit Öffnungen nach Bedarf. Für höhere Drücke sind geprüfte Glasreaktoren oder Edelstahl- und Hastelloygefäße von 20 ml bis 20 l verfügbar.



Cooler, reflux separator etc. custom-made products on demand.

Stirrer

The torque signal delivers substantial additional information for processes which are associated with viscosity modification. In many cases, the torque signal, which is easily traceable, can be consulted as an indicator for the product quality.



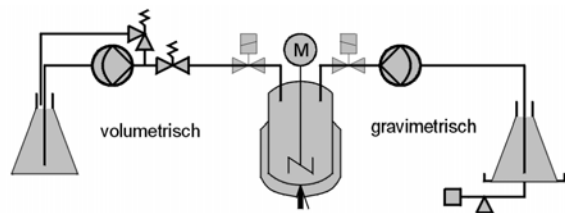
The ViscoPakt torque measuring stirrer is a stirrer drive with a high torque, with speed regulation and torque monitoring. It has outstanding measuring accuracy (see ViscoPakt). Anchor, beam, or propeller stirrers can be used. In special cases, the torque can be transmitted by a magnetic clutch.

Heating/Cooling System

Heating-/cooling thermostats in different versions made by Huber and Julabo, as well as other manufacturers, can be used within a range of -80 to $+300^{\circ}\text{C}$. Alternatively, a regulated rod heater or heating mantle or a cooling coil can be deployed.



Dosing Systems



The LabDos peristaltic pump is the cost-effective solution for the volumetric dosing of liquids. For precise dosing of smallest amounts and under high pressure the SyrDos dosing system is available.



For higher demands, gravimetric dosing with GraviDos or laboratory scales with dosing pump is advisable. The innovative GraviDos dosing system is first choice for gravimetric dosing even for high pressure dosing.



For special cases (exothermic reactions, risk of clumping due to crystallization...), time profiles can be programmed. The dosing process can also be linked with other variables (e.g. temperature, pH...) or integrated into control circuits.

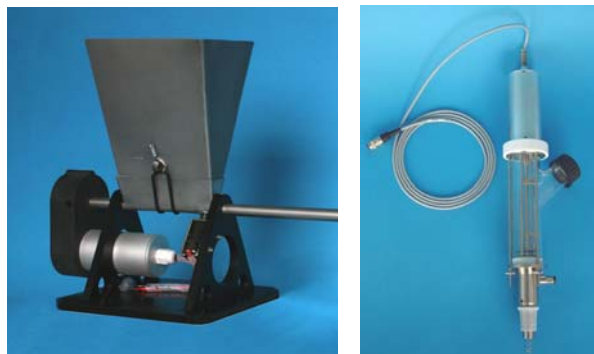
Gases can be valve-controlled, or alternatively, be proportioned via dosing pumps, balances, load cells or mass flow meters.



For hydration purposes the hydration unit VL-HICLAVE-HYDR is available.

HiTec Zang solids doser SoliDos is suited for dosing

of free flowing solids.



Pressure/Vacuum

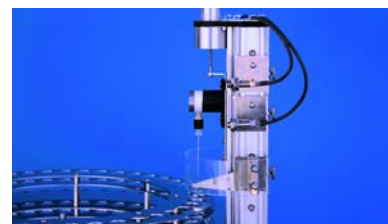
The glass reactors can generally be used in pressure ranges from vacuum to slight over pressure. Special designs, e.g. 2 L reactors made for up to 5 bar over pressure are possible. The required work protection equipment can optionally be provided.

For pressure measurements, proven piezo-resistive pressure sensors with stainless steel diaphragms are used. For more precise measurement during vacuum operation, a tandem sensor system with measurement range switching can also be used.

Over the entire pressure range, the internal pressure can be regulated very exactly with suitable sensor and valve configurations. The setpoints values are precisely reached and held within a short time. Control takes place with proportionally controlled solenoid valves.

For the vacuum range up to approximately 10 mbar, we mount vacuum systems, chemical membrane pumps. For low pressures, we deploy rotary vane pumps. We principally equip vacuum systems and pumps with a cold-trap (chargeable with (dry) ice).

Automatic Sample Bottling



Samples can be drawn automatically or process-controlled and subsequently bottled with an AutoSam sample collector.

Additional liquid-handling operations and downstream processing can be realised..

Options, Extensions

In-Situ sensors for the filling level, turbidity, flow rate, pH, Redox, etc. Connection of analysers for sophisticated control strategies, coupled multi-reactor systems and many client-specific plants.

Materials

Borosilicate glass, PTFE, PFA, Kalrez and high-grade steel are mainly used as standard materials. If required, other materials can be deployed.

Automation



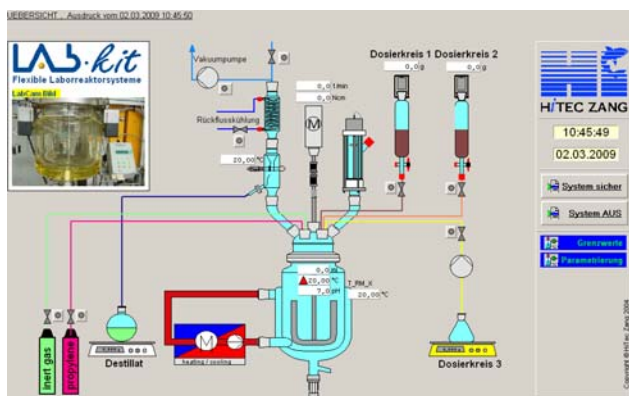
LabManager (and LabBox) provide the necessary interfaces for connection of the laboratory devices, sensors and actors, reaching from the temperature sensor to the dosing pump, to the proven connection boards with NAMUR-conform connections.

The devices are able to replace the electronics of various individual devices of the conventional laboratory automation, such as doser, controller, pen recorder, titrators, transducers, data loggers etc.

Predefined project modules for basic functions, e.g. Dosing, Tempering, Vacuum Control, etc, also enable the user inexperienced in automation applications to establish a fully automated application within a short period of time.

Application-oriented controllers for dosing, vacuum, pH, temperature, etc., ideally accomplish their tasks and do not require expert knowledge for parameterisation.

Visualisation

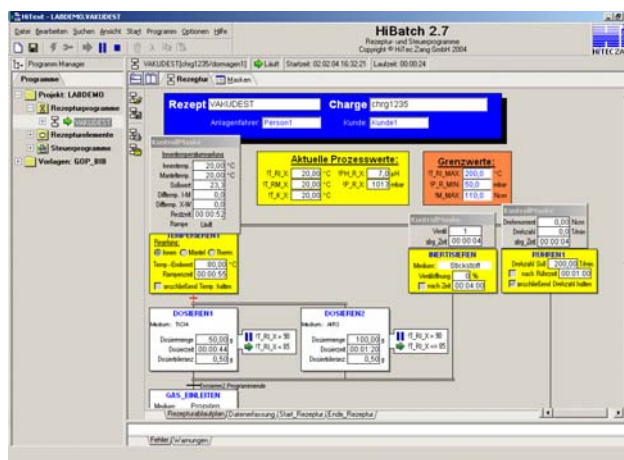


With LabVision, the plant can be operated and monitored from the display; recipes can be established, values monitored etc.

Recipe Control

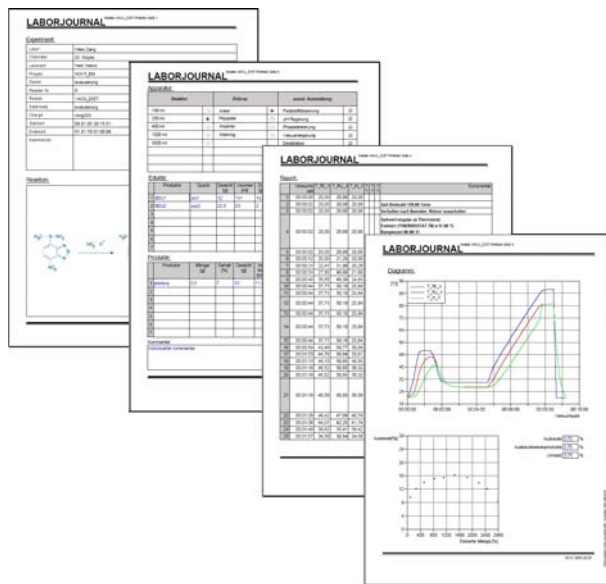
Step	Parameter	Value	Unit	Control Type	Comments
1	Warte bis	25.03.09 20:30:00		Time	
2	Setze			Temperature	
3	Warte auf	900.0	95.0	Flow	
4	Setze		110.0	Flow	
5	Warte auf	PH_R1_X=8		pH	Warte auf pH = 8
6	Setze			Flow	0 Start Abdestillieren
7	Warte auf	WV_GRAVOS_X1=12.5		Weight	Warte auf Destillat = 12.5g
8	Setze	10	80.00	Flow	Vorzeitiger Abbruch
9	Warte auf	T_R1_X1=87.5		Temperature	Warte auf T_innen = 85.7°C
10	Setze	0.0	20.0	Flow	

For a versatile recipe control and management either the table based EasyBatch or HiBatch with a graphical recipe editor and its extensive basic unit operation library are available.



Evaluation and Presentation

The LabVision module HiText enables evaluation already during the runtime of a process.



The electronic laboratory journal eJournal presents all relevant test parameter and data.

The laboratory journal protocols are deposited in the data base of the Laboratory Information Management System HiLIMS and can easily be retrieved and consolidated to reports.

Reaction Calorimetry

During almost all exothermal and endothermal processes, the signal of the current heat output provides additional information about the reaction process, the merit of which is still often underestimated.

Further information can be found in the chapter Custom Reaction Calorimeter.

LabKit™ Custom Reaction Equipment



The modular LabKit assembly system enables the customer-specific construction of laboratory and miniplant plants wherever the standard systems are not sufficient. A base frame made of aluminum or high-grade steel aligned to the available space is equipped with the respectively required process hardware, instrumenting and automation components.

Notice: You can find information regarding the standard laboratory systems LabKit-ALR1, LabKit-ALR2, LabKit-rcf, LabKit-rcb, and LabKit.ed in the chapter Automatic Laboratory Reaction systems.

The PI and suited software packages must be arranged according to the equipment and the desired level of automation.

Summary LabKit Module

Base Frame	Anodised square aluminum profile, high-grade steel collecting tray, power distribution. Optional high-grade steel round profile with powder-coated connecting elements.
Reactors	Standard glass vessels from 100ml up to 50 litres with tempering jacket, optional vacuum jacket, or O-ring sprinkler, manual or automatic bottom discharge valve, cover with sockets according to requirements and feasibility, custom designs according to customer specifications, high-grade steel up to 300 bar, special materials.
Lowering Device	Electric lifting device for the reactor with manual switch.
Stirring Drives	ViskoPaktxx and ViskoPakt-rheoxxx precision stirring drives with RPM control and torque measurement.
Stirring Blades	Propeller, turbo, blade, and anchor stirrer can be selected. Other type and special designs available upon request.
Dosing, gravimetric	Gravimetric dosing with GraviDos (controlled dropping funnel) or via dosing pump (e.g. HiTec Zang LabDos) and laboratory scales.
Dosing, volumetric	Dosing with membrane pump, dosing with peristaltic pump (see chapter Instrumenting , Pumps).
Dosing Minute Quantities	Dosing with syringe doser or LabDos peristaltic pump (see chapter Instrumenting, Pumps).
Gas Dosing	Gas dosing via Mass-Flow-Controller.
Sequential Multi-Dosing via Scales	2/3 – way or multi-way valve for the selection of the feed tank.
Solid Dosing, volumetric	SoliDos solids doser.
Solid Dosing, gravimetric	SoliDos solids doser combined with GraviDos.
Heating/Cooling Systems	Heating/Cooling thermostats manufactured by Huber, Julabo, Lauda etc. with connection to the LAB-xxx PI.
Sensors	Temperature sensor for: reactor, thermostat, supply line, reflux and steam. Interior pressure, pH value, vacuum up to 2.5 bar and working temperature up to 130°C. Redundant monitoring of the jacket temperature with shut-down function.
Pressure Measurement, simple	Pressure pick-up 0-1.6 bar absolute, others available upon request.
Pressure Measurement, tandem	Tandem pressure pick-up system for increased precision in the vacuum range 0-250 mbar/1.6 bar absolute.

Continuation Summary LabKit Module

Vacuum Control	Laboratory vacuum system with chemical-resistant vacuum pump < 8mbar absolute, suction-side separator, cold trap, relief valve, lock valve (PVDF/Kalrez). Other vacuum systems available upon request.
Pressure Control /Inerting	Pressure control module (Standard up to 1,6 bar) combined with inerting. Venting valve and air relief valve with control. .
Pressure Relief	Spring-loaded ball and socket relief valve made of glass for unpressurised systems closed against atmosphere. Bursting disc for pressure systems. Safety valves.
Inerting, simple	Inerting (only for unpressurised systems with venting, otherwise, pressure and safety monitoring is necessary). Vent valve with control. Optional pressure relief valve with control.
Reflux Separator	Vacuum-jacketed reflux separator with electrically controllable reflux separation ratio (see chapter Equipment and Components, Reflux Separator).
Reflux Cooling	Intensive reflux condenser made of borosilicate glass. Optional lock valve for the cooling water. Cooling water monitoring with rotary flowmeter.
Distillation	Glass reflux separator with electrically controllable reflux separation ratio (see chapter Equipment and Components, Reflux Separator), vacuum jacket, silver-coated with viewing window (optional), NSH+K 29/32 with PT100 connection, distillate collecting scales, 2/2- way shut off to separate the distillate collecting tank from the distillate flow and from the venting.
Phase Separation	Automatic phase separation in the bottom discharge valve.
pH Control, Titration	Two AlfaDos dosing systems (optional GraviDos or dosing pumps) for acid and base with pH control module.
Sampling	Automatic sampling optionally on the basis of a valve cascade (for a small number of samples), a multi-way valve (for a medium number of samples), sample collector (see chapter Liquid Handling and Sample Drawing, AutoSam) or a pipetting robot (for large numbers of samples).
Reaction Calorimetry	Heat-flow calorimetry, heat balance calorimetry, online (option), calibration heating.
Extended Temperature Range	Extension of the heating/cooling system and the sealing materials to accord to lower or higher temperatures available upon request.
Materials	Mainly borosilicate glass, PFA, PTFE, ETFE, PVDF, seals in contact with media out of Kalrez, high-grade steel material 1.4571 (subject to modification)

Special solutions available upon request.



Multiple examples of our plant construction can be found on our website www.hitec-zang.de.

Custom Parallel Reactor System



Custom-made Parallel Reactor System for crystallisation screening with turbidity sensor. Joint heated dosing vessel.

The general development is moving towards increasingly smaller volumes and to parallel preparations. We dispose of experience in parallel reactor systems reaching from the ml to the litre scale, and from 4 to 48 reactors. Experience has taught us that these systems must also meet individual requirements. For this reason, there is no such thing as “the” reactor parallel system.

Application

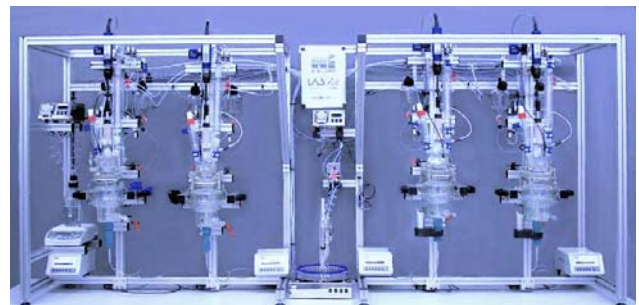
- Parallel Syntheses
- Active Ingredient Screening
- Bioprocess Monitoring etc.

In addition to our standardised parallel reactor systems MultiLab and MiniLab, we also construct client-specific parallel reactor systems for all possible kinds of application.

Your Advantages

- Individually designed
- Various possibilities
- Reactors reaching from the ml to the litre scale
- Adapted Dosing Technology
- Adapted Stirring Technology
- Adapted Tempering Technology

Further examples for Parallel Reactor Systems:



Fourfold parallel reactor system with 250ml double jacket reactors for deep temperature synthesis and sample taking.



Threefold parallel reactor system with 2 l reactors, parallel, selective dosing from the receiver tanks a, b and p.



Parallel reactor system with 2 reactors and MultiLab tempering system.

Further examples for parallel reactor systems can be found on our website.

Custom Reaction Calorimeters



Customer specific reaction calorimeter with heated cover and front side special nozzle.

Next to the standard reaction calorimeters LabKit-rcf and LabKit-rcb, HiTec Zang also offers customised calorimeters. HiTec Zang also modernises existing calorimeters.

Up to now, reaction calorimeter and laboratory reactors which can perform more than simple syntheses needed to be regarded separately. HiTec Zang LabKit-rc reaction calorimeters combine the two devices, which leads to a flexible system versatile in every aspect. As a calorimeter, the LabKit-rc offers various operational modes and measuring methods, as laboratory reaction system, the complete flexibility of the LabKit laboratory reaction technology and the LabManagerresearch process control system.

Next to the classic deployments in the security laboratory, the reaction calorimetry is increasingly also establishing itself as an effective method within

process development and process optimisation. For selective reaction control and risk analysis of chemical reactions, it is necessary to know the reaction heat output and the respective temporal progression at operational conditions.

The following components are available:

- Precision Temperature Measurement Module
- Calibrated Temperature Sensors
- Flowmeter for Heat Carriers
- Controllable proportional Calibration Heating
- HiCon adaptive Controller for ideal isothermal effect
- Basis Operation Calorimetry with Online Evaluation
- KalDas Evaluation Software for Heat Flow and Heat Balance Calorimetry

You will find a detailed description in the chapter Components for Reaction Calorimetry. The application possibilities are various and go far beyond the classic measurement of the heat tone and thermal conversion.

For the dimensioning of cooling systems, reliable data regarding the energy potential of a reaction mixture, as well as the heat transfer rate and the properties and/or the heat storage capability must be at hand, this often in dependency of the mixture and temperature.

The reliable evaluation of complex chemical processes requires variable test equipment, which can be aligned to the conditions of the process intended for examination.

For this reason, the systems can be arranged in such a manner that all functions of the laboratory or operational assembly can also be realised in the calorimeter.

Examples for our customised reaction calorimeters can be found on our website.

Formulation and Handling Stations



The programme-controlled formulation stations are used for the automatic establishment and adjustment of formulations to certain target variables such as final volume and viscosity. The required basis operations, e.g. filling with liquids and solids, stirring, measuring, dosing etc., are executed programme-controlled. This consequently leads to varied applications in the chemical, pharmaceutical, biotechnical, cosmetics and food industry. Due to the availability of custom designs and the flexible automation system, the hardware and software application possibilities are virtually unlimited.

The devices are arranged by combing the different components of our mechatronic modular system with our laboratory automation systems, laboratory devices and our sensor/actor components.

The processes are programmed with the self-explaining script language HiText or the graphic sequential function chart HiBatch. For this reason, they can be easily adapted to modified conditions by the user. The protocols can be automatically established. The protocol layout can be flexibly designed.

The protocols can be automatically stored in the data base of the HiLIMS Laboratory Information Management System. HiLIMS supports the uncomplicated and efficient administration of all parameters and data.

With the help of freely establishable search queries, the protocols are quickly retrieved when needed.

Rotary disc type

The presented formulation station produces up to 8 formulations fully automatically in exchangeable containers with a volume reaching from 1 to 5 litres. The user charges the tray before the test-start with stirring tanks that contain a random sample amount.

After the start of the test, the predefined samples are adjusted exactly to the predefined viscosity and target amount by adding doses of certain educts in consecutive order. The stirrer is cleansed automatically to ensure contamination is excluded.

Due to the high-resolution torque coverage of the ViscoPakt-X7 torque measurement stirrer, it is possible to reach ideal reproducibility and therefore a consistent product quality during different tests.

In comparison to the manual procedure conducted in the past, the automatic formulation usually leads to time saving in regard to the test period of 70 %, and 80 % in regard to the handling period. The pay-back period of the plants is accordingly short. To be stated as additional advantages are the increased reproducibility and product quality, as well as the automatically established documentation.

The required sensor system can be fully integrated and enable measurement directly in the tanks. In comparison to the in situ sensor system, the measurement sensor is spared and can be easier exchanged and calibrated.

Properties

- Flexible Construction
- Comprehensive Tank Selection
- Fully automated
- Freely programmable
- Flexible Sensor System
- Short Pay-Back Period

Please note the versatile xyz-robots in the chapter Liquid Handling.



Linear Type

As an alternative to the formulating stations based on rotary plates or AutoSam sample collectors, a pneumatically driven linear type is available for special applications.



Special Application Cases

- Ex- Zone
- Little available Construction Depth

Properties

- Pneumatic Drive
- Bottling of sampling bottles. Bottle size 250 ml (plastic or glass, other sizes available upon request).

Options

- Programme-controlled handling of liquids and solids.
- Automatic Sensor System (pH, RedOx, conductivity, ion-selective electrodes, turbidity, pO₂, viscosity, in situ spectroscopy).
- LIMS Coupling

Components

Viscosity Measurement

Precision measurement stirrers of the ViscoPakt-Rheo Series enable a in situ measurement of the viscosity and, with the help of the automatic fluid handling system, e.g. the automatic adjustment of the viscosity. In particular low viscous media, can be measured with the ViscoPakt-Rheo X7.



Technical Data (ViscoPakt-Rheo X7)

Maximum Torque	7Ncm
Resolution	0,003 Ncm
Reproducibility	0,05 Ncm
Minimum RPM	40U/min
Maximum RPM	3000 u/min
Uncertainty RPM	0,1 %
Chuck	1-10mm
Drive Weight	ca. 900g
Diameter Motor	70mm
Length across axis approx.	250mm

For further information, see chapter Stirring and Dispersing, ViscoPakt.

Further components of our Miniplant Technology:

- Laboratory Scales
- Reactor Weighing
- Electric Bottom Discharge Valves
- Automatic Liquid Phase Separation
- Valves and Shut-Offs
- Multi-way Valves

can be found in the chapter „Equipment and Components“. Further devices and components can be found in the chapters:

- Process Analytics and Sensors
- Dosing Systems and Pumps
- Liquid Handling and Sample Drawing
- Stirring and Dispersing
- Custom Reaction Calorimeters

Please note our customised **robots** in the chapter Liquid-Handling and Sampling.

Talk to our engineers about our special requirements!