

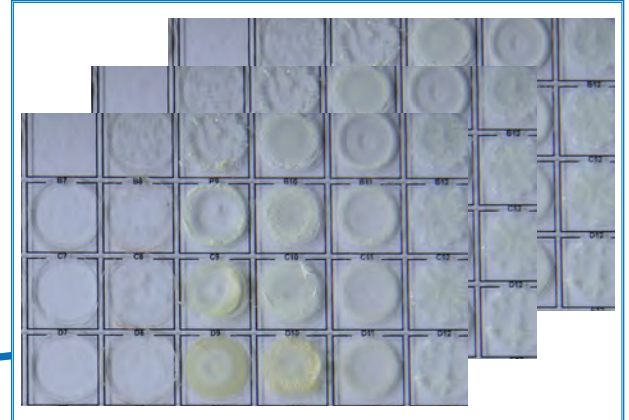
SWING CRYSTAL

Crystallization, Polymorph, Salt and Solubility Screening



CUSTOMER TESTIMONIAL

“... The principal gain over manual crystallization lies in the automated sequencing of crystallization steps, including computer controlled dosing of liquids and solids. ...”



ROBUSTNESS AND EASE-OF-USE BY DESIGN

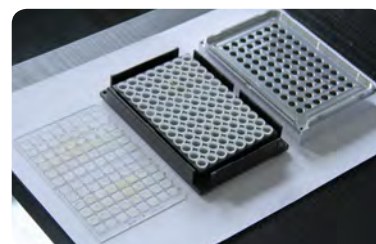
The leading technology in overhead gravimetric dispensing / dosing (patented) combined with a wide range of crystallization plates, and our user-friendly software, allow you to standardize and accelerate your crystallization experiments.

KEY ADVANTAGES

- Decrease in cost per sample up to 90+ %.
- Increase in productivity by a factor of 10+.
- Up to 192 crystallization experiments per run can be done on MTP based and other formats
- Wide range of workflows: salt, polymorph, co-crystal, solubility screening (incl. agitation, pH, temperature gradients, filtration, controlled evaporation).
- Systematically investigate the influence of critical factors such as different solvents (elutropic series), different concentrations, rate of evaporation, temperature, cooling rate, agitation on crystal structures.
- Run two different crystallization workflows simultaneously.
- Highly reliable and precise gravimetric dispensing tools for liquid and solid dispensing.
- Reproducible results.
- Different reactor sizes (from < 1 mL to 100 mL in disposable formats and up to 1'000 mL in high-output process development reactors) allow for screening and development / scale-up on the same platform.
- Direct output on XRPD compatible glass plates (eliminating e.g. risk of crystal damage, cross contamination by electrostatic forces due to moving the powders).
- Easy access to data with a convenient interface to pull results into Excel or virtually any other software.
- Interface to DoE.



SWING CRYSTAL workstation



Reactors for crystallization screening (easy-to-use sandwich design with direct output to XRPD)

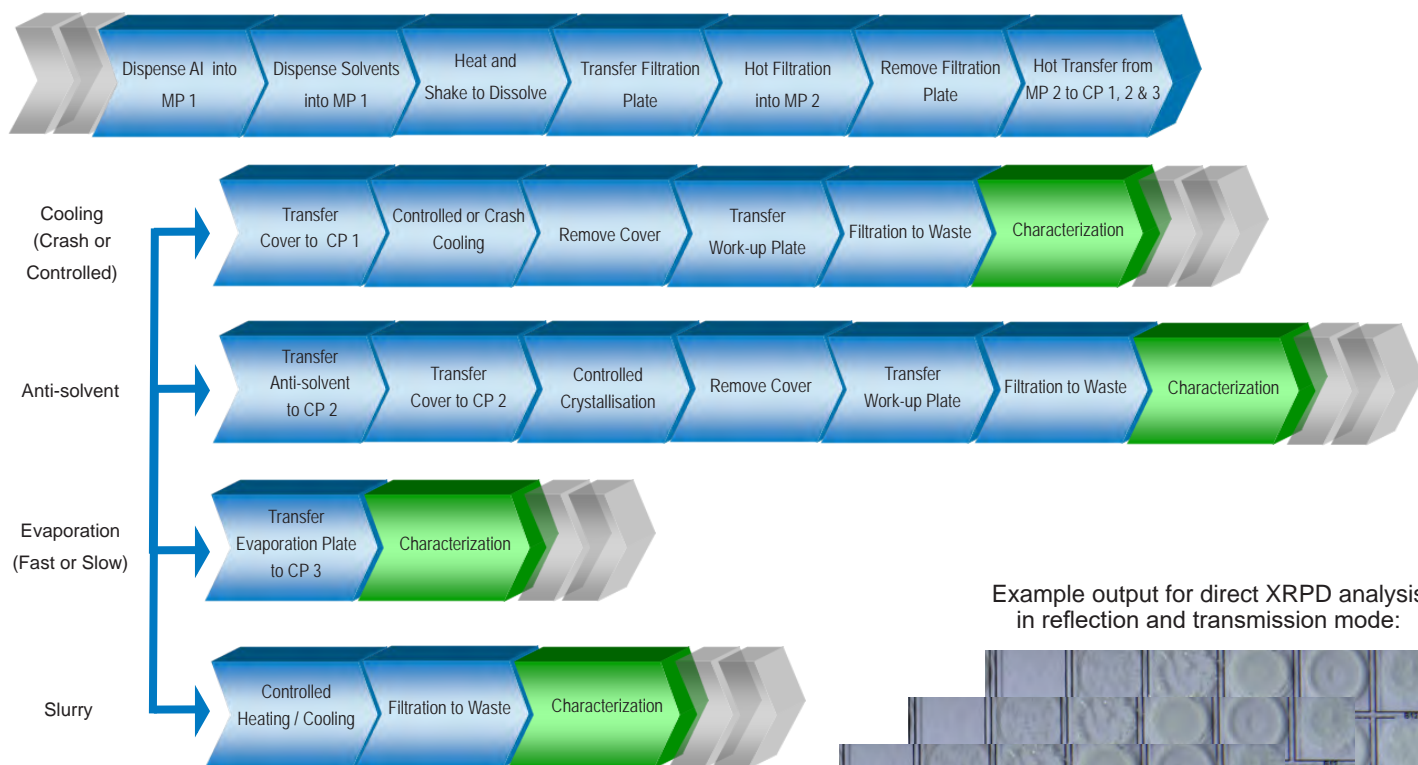


Reactors for crystallization development & scale-up

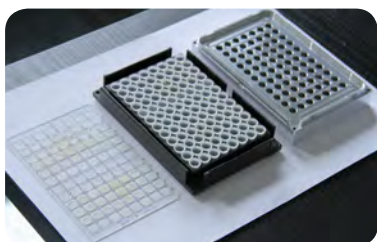


ENHANCE YOUR EFFICIENCY AND PRODUCTIVITY WITH OUR WORKFLOW SOLUTIONS!

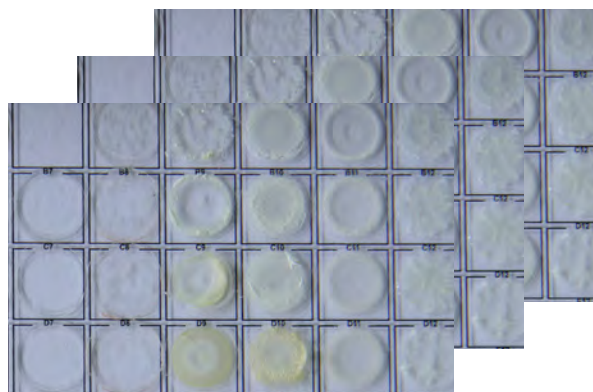
Example Workflow Crystallization Screening



Key:
MP = Mother Plate
CP = Crystallization Plate



Example output for direct XRPD analysis in reflection and transmission mode:



FEATURES

- Precise gravimetric solid dispensing for handling small quantity of solids (AI).
- 4-Needle Head for volumetric liquid handling, equipped with heated needles for hot transfer
- Active washing station for outside and inside rinsing of needles.
- Multigripper tool for transporting filtration, evaporation, work-up plates on the platform.
- Shaking racks with controlled heating / cooling (temperature range -20 to 150 oC, -70 to 200 oC with double-jacket reactors) and agitation (shaking range 100 - 1400 rpm).
- Individual shaking racks with independent functionalities (speed, temperature).
- Crystallization plates available in 96, 48, 24 MTP based formats - sandwich construction: easy to assemble and dismantle.
- Filtration plate equipped with 96 or 48 tips with integrated semi-disposable filters and heating functionality for hot filtration.
- Evaporation plate equipped with 96, 48, 24 tips allowing to evaporate the solvent in a controlled way.
- Work-up plate for filtration to waste.
- pH needle system for up to 4 parallel pH measurements and adjustments.

Development and scale-up on the same platform
Efficient, time-saving, reliable and reproducible
Run different crystallization workflows simultaneously



Flexibility and
Ease-of-Use by
Design

TECHNICAL DETAILS

Chemspeed's **SWING CRYSTAL** deck modularity allows the user to execute and perform a variety of crystallization, salt, polymorph and solubility screening workflows in a fully automated fashion.

SWING dimensions:
1'480 x 910 x 1'860 mm
(4' 4 3/8" x 3' x 6' 1 1/4")



SWING XL dimensions:
2'350 x 950 x 1'920 mm
(7' 70" x 3' 2" x 6' 4")



● Crystallization reactors range from < 1 mL to 1'000 mL



Crystallization MTP plate: 0.3 mL to 2 mL

- MTP based format 96, 48, 24.
- Sandwich-like, o-ring-free construction with detachable glass bottom for XRPD analysis in reflection and transmission.
- Glass plate can be placed directly on XRPD device.
- XRPD measurements in transmission and reflection mode.



Filtration plate

- Filtration plate with 96, 48, 24 tips with integrated semi-disposable filters for heated filtration of API solution from MP1 to MP2.
- Fast, simultaneous filtration of 96, 48, 24 wells.



Evaporation plate

- Evaporation plate equipped with 96, 48, 24 tips.
- Tips standing above liquid level to evaporate the solvent in a controlled way.



Work-up plate

- Work-up plate equipped with 96, 48, 24 tips.
- For filtration to waste after crystallization.
- For evaporation of the solvent in a controlled way.

● Scale-up options



Isynth array reactors: 2 mL to 100 mL

Disposable glass reactors available in different sizes (2, 8, 20, 100 mL).

The reactors are inserted in a shaking rack with heating / cooling functionality. Filter elements allow for hot filtration and filtration to waste.

Reactors for crystallization development

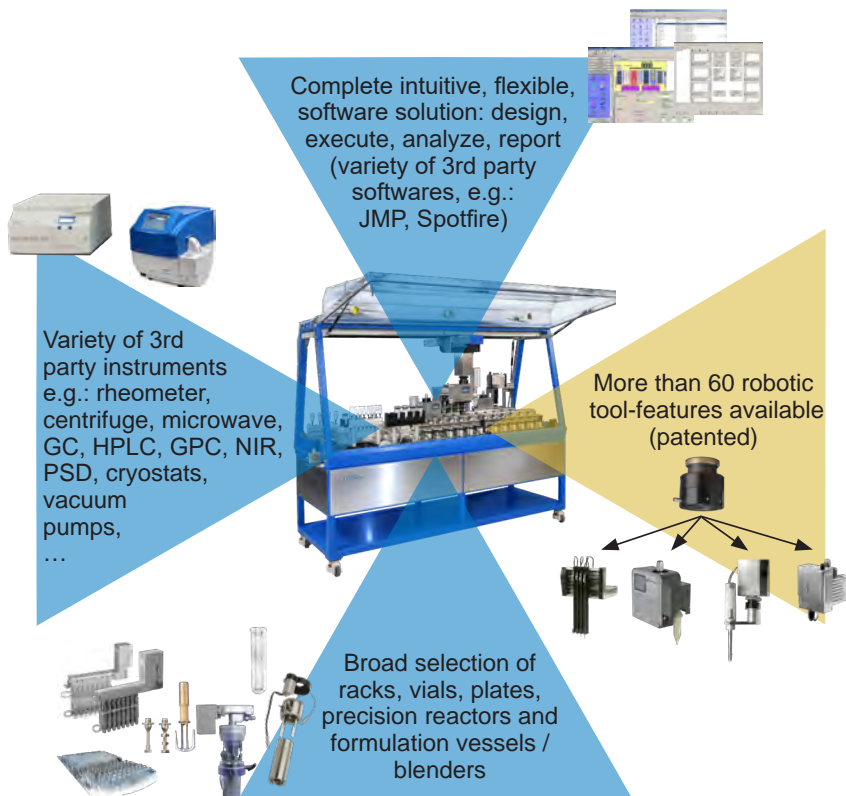


Process reactor: 100 mL to 1'000 mL

Individually controlled process reactors (reactor volumes 100, 250, 1'000 mL) with inline filtration, stirring control, reflux and high-precision heating / cooling (-50 to 250 oC), vacuum control (for solvent evaporation).

Reactors for crystallization development

4 DIMENSIONS OF MODULARITY AND FLEXIBILITY



- Individual platform configuration tailored to your workflow with market-proven off-the-shelf components.
- Robotic platforms which can be easily integrated into other systems to enable multi-workflow processes (e.g. Formulation, Application and Testing procedures all integrated in a single platform).

COMPLETE SOFTWARE SOLUTION: DESIGN, EXECUTE, ANALYZE, REPORT

Chemspeed's **AUTO SUITE** User Interface & Executor software packages execute and control all modules of the entire product development cycle. They control all Chemspeed robotic platforms and any other integrated 3rd party software and hardware.

AUTO SUITE SWING is a software with a user friendly interface which allows easy workflow oriented programming. Many features such as gravimetric dispensing are automatically calibrated, eliminating tedious optimization steps.

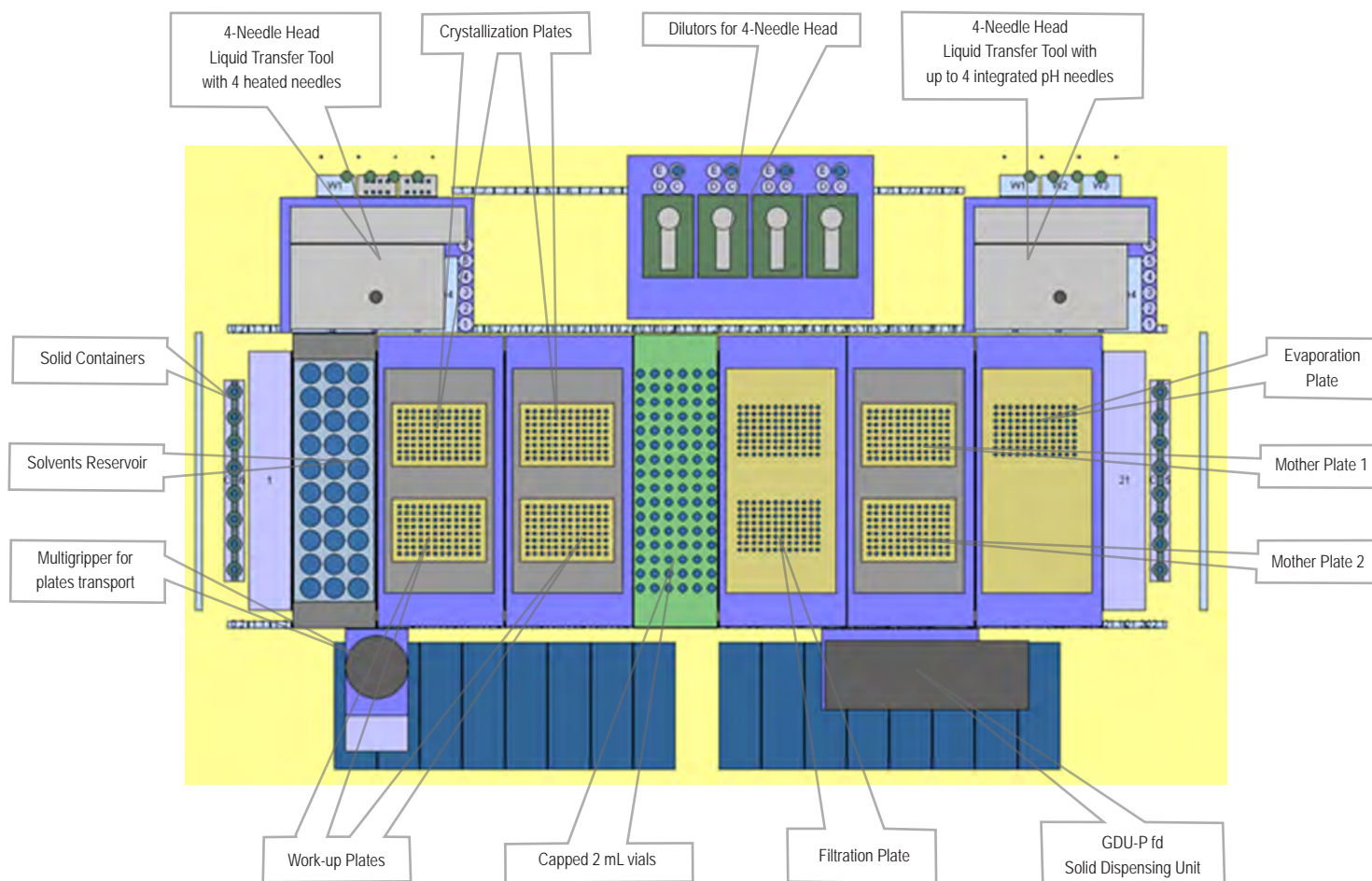
- The AutoTeaching tool simplifies dispensing applications without manual trials and is applicable to e.g. solids eliminating the need for manual optimization before the dispenses are done.
- Easy programming: drag-and-drop workflow steps or just execute standard workflow protocols.
- Barcode tracking.
- **ARK SUITE** Workflow Studio and Internet of the Lab Tools (e.g. DoE, data mgt, substance parameter database, inventory mgt, product mgt, run mgt). It includes a full document management system (electronic labjournal) and is 21 CFR Part 11 compliant. The software scales from a single PC to large network installations with multiple hardware and clients.

Task	Name	Parameter
1	Hybrid Standard Demo	Execute Once
1	Show Dialog	Yes/No/Stop-Dialog: 'you want to run DEMO?'
2	Show Dialog	Yes/No/Stop-Dialog: 'you want to run DEMO?'
1	Macro Task	Execute Once
1	Transfer Gravimetrically	Gravimetric Transfer with GDU-P #1 from P04 01...
2	Macro Task	Execute Once
1	Transfer Gravimetrically	Gravimetric Transfer with GDU-P #2 from P05 01...
2	Macro Task	Execute Once
3	Transfer Gravimetrically	Gravimetric Transfer with GDU-P #3 from P06 01...
4	Transfer Gravimetrically	Gravimetric Transfer with GDU-Ps #1 from Ps 01 Na2CO...
5	Macro Task	Execute Once
4	Transfer Gravimetrically	Gravimetric Transfer with GDU-HV #1 from HV01 Sun...
5	Transfer Gravimetrically	Gravimetric Transfer with GDU-HV #2 from HV02 Sun...
4	Macro Task	Execute Once
1	Macro Task	Execute Once
1	Transfer Gravimetrically	Transfer liquid from valve port 1+3 to Waste 1+3 with Ne...
2	Macro Task	Execute Once
1	Transfer Gravimetrically	Transfer liquid from valve port 1+3 to Waste 1+3 with Ne...
2	Stir	Agitation ON on zone F Reactor 01-02
3	Scrape	Agitation ON on zone F Reactor 01-02

**EASY PROGRAMMING
INTUITIVE INTERFACE**

PLATFORM CONFIGURATION EXAMPLE

Exemplary swing crystal deck with mother plates, evaporation, filtration, crystallization, work-up plates; and the following tools: a 4-Needle Head for hot transfer, a Solid Dispensing Unit (GDU-P) for Al dispensing, a 4-Needle Head for liquid handling, and a Multigripper.



All tools and accessories from **Chemspeed's ISYNTH, AUTOPLANT, FORMAX, APPLICATOR AND INVESTIGATOR** platforms are fully compatible with the **SWING CRYSTAL** platforms and vice versa.

Available upgrade options:

- High performance reactor array technology.
- High precision process reactors.
- Connection to HPLC (MS), GC (MS) including interfaces.
- Large choice of sample, reagent and customized

VARIETY OF PLUG-IN (3RD PARTY) SOLUTIONS

Available upgrade options:

- XRPD.
- HPLC (MS).
- GC (MS).
- Centrifuge.
- ...



















ROBOTIC TOOL FEATURES

More than 60 robotic tool-features can be integrated with Chemspeed's unique robotic tool exchange technology, including unrivaled overhead gravimetric dispensing, which can operate while mixing, heating and cooling. Virtually any combination of these robotic tools is possible.

Highlighted are the most common and recommended robotic tool-features for the **SWING CRYSTAL** robotic platform.



Robotic tool exchange interface (proprietary)

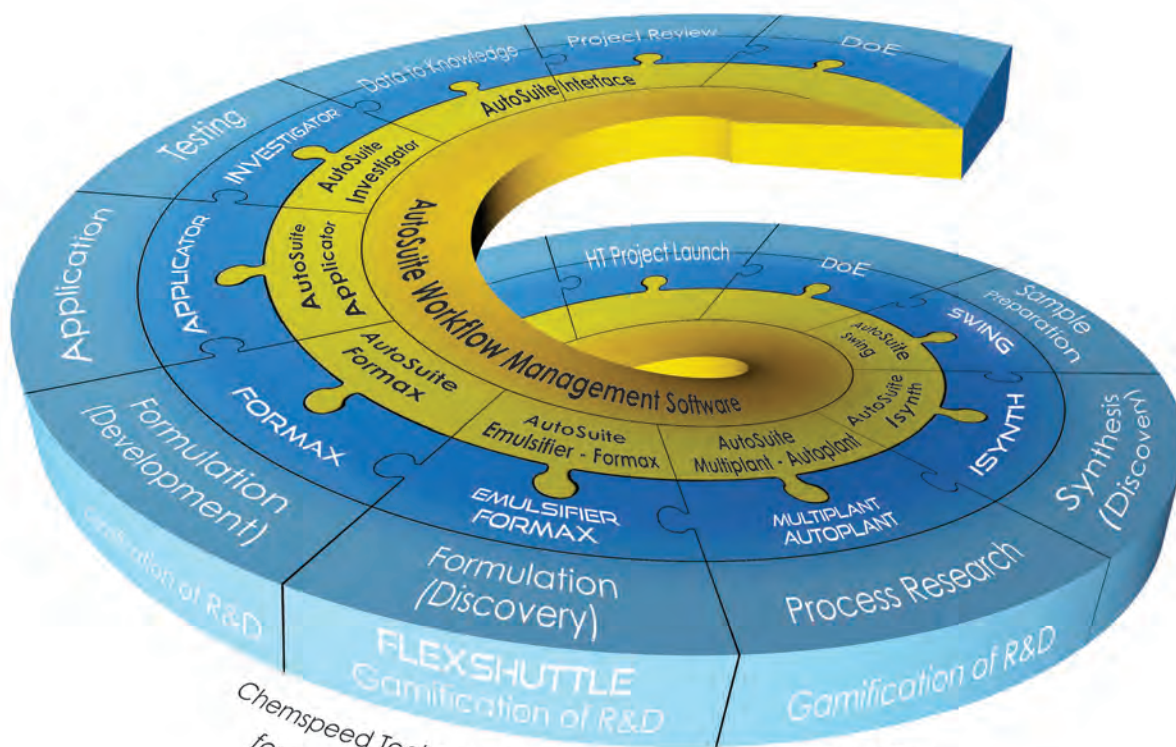
Precision balance Overhead gravimetric dispensing robotic tools (proprietary)	Volumetric dispensing robotic tools	Action robotic tools	Analytic robotic tools
<p>Overhead gravimetric 1:1 "pick & decision dispense" of solids & powders DIRECTLY from virtually any source to any destination (<100 µg to 100 mg).</p> <p>Disposable pick & dispense tips (no dead volume).</p> <p>Resolution: 100 µg (or 10 µg with an on-deck balance).</p> 	<p>Liquid handling powered by 4 syringe pumps (syringe volumes: 1, 10 or 25 ml) for viscosities from 1 mPa-s to 100 mPa-s.</p> <p>Special options:</p> <ul style="list-style-type: none"> - Disposable tips (1'200 µL). - Disposable syringes. - Heated needles (up to 100 °C). - Spray needles - pH and temperature measurement and control - Coated needles, PEEK needles... 	<p>Multigripper for vial, MTP transport and much more.</p> <p>Automated barcode scanner.</p> 	<p>Online density measurement (aspiration technology), on the fly.</p> <p>Resolution: 1 mg (or 10 µg with an on-deck balance).</p> 
<p>Overhead gravimetric 1:1 "pick & decision dispense" of liquid to sticky compounds DIRECTLY from virtually any source to any destination (<100 µg to 100 mg).</p> <p>Disposable pick & dispense tips (no dead volume).</p> <p>Resolution: 100 µg (or 10 µg with an on-deck balance).</p> 	<p>Liquid gas dispensing with gravimetric control.</p> <p>Resolution: down to 100 µg.</p>	<p>Screw capper.</p> <p>Vial diameter range: from 10 mm to 50 mm. Larger ranges available.</p> 	<p>Brookfield Viscometer (RVDV-II+ Pro BK).</p> 
<p>Overhead gravimetric fine dispensing of solids & powders (100 µg to 20 g).</p> <p>Dispensing container volume of 30 ml.</p> <p>Resolution: 100 µg (or 10 µg with an on-deck balance).</p> 		<p>Capping, crimping and decapping (N8 / N11 / N13 / N20).</p> 	<p>Tri gloss measurement.</p> <p>Thickness measurement.</p> <p>Color measurement.</p> <p>Precision tack-cure.</p> 
<p>Overhead gravimetric dispensing of solids & powders (1 mg to 100 g, larger volumes are available).</p> <p>Dispensing container volume of 200 ml.</p> <p>Resolution: 1 mg (or 10 µg with an on-deck balance).</p> 		<p>High shear homogenization (11'000 rpm to 30'000 rpm).</p> 	<p>Camera.</p> <p>Observation of dissolution.</p>
<p>Overhead gravimetric dispensing of highly viscous liquids, pastes and creams (1 mg to 100 g) with viscosities from 1 mPa-s to 500'000 mPa-s (based on Newtonian substances).</p> <p>Dispensing container volume of 65 ml.</p> <p>Resolution: 1 mg (or 10 µg with an on-deck balance).</p> <ul style="list-style-type: none"> - Optional aspiration feature. - Optional transfer of hot (up to 90 °C) substrates via heatable cartridges (e.g. for waxes). 		<p>Overhead stirrer (20 rpm to 200 rpm). Different stirrer types available.</p>	<p>Particle size distribution and dynamic light scattering.</p>
<p>Overhead gravimetric aspiration and dispensing of viscous liquids with viscosities from 1 mPa-s to 15'000 mPa-s via disposable positive displacement syringes (0.1 to 12.5 ml).</p> <p>Resolution: 1 mg (or 10 µg with an on-deck balance).</p> 	<p>Overhead volumetric aspiration and dispensing of viscous liquids with viscosities from 1 mPa-s to 15'000 mPa-s via disposable positive displacement syringes (0.1 to 12.5 ml).</p> 	<p>Ultrasonic dispersion (100 W).</p> 	<p>Precision tack-cure.</p>
		<p>Vacuum / Degassing.</p> <p>Reflux condenser.</p> <p>Evaporation.</p> <p>Filtration.</p>	
		<p>High speed injection molding.</p> <p>Foam formation.</p>	
		<p>Draw Down with disposable or reusable precision spiral and / or gap bars.</p> <p>Free film generation.</p> <p>Dip coating.</p> <p>Spray coating.</p> <p>Wet-on-wet coating.</p> 	
		<p>Robotic transfer arm to serve 3rd party instruments e.g. centrifuge.</p> 	



Swiss Quality Products
An International Team of Highly
Experienced Chemists

More than 20 Years of Experience in
Automated Experimentation
Customized Workflow Solutions

Chemspeed Technologies is the leading provider of high-throughput and high-output research & development workflow-solutions from single bench-top / standalone automated workstations (powder dispensing - sample preparation - synthesis - process development - formulation - application - testing) up to complete and integrated product development workflows for the entire product development processes in the chemical, material science, renewables & energy, pharmaceutical, agrochemical, specialty chemical, home care, cosmetics and nutrition industries, as well as academia.



Chemspeed Technologies offers hardware and software
for every step in the product development cycle

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