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Titan Overview

Titan is a revolutionary modular continuous chemical processing system for production scales from kilo lab, through pilot plant to manufacturing. Designed and manufactured by Syrris, the market leader in lab scale flow chemistry systems, Titan consists of a range of rapidly reconfigurable modules that enable simple or sophisticated continuous flow processes to be performed at rates from lab scale up to a tonne per day.

titan
continuous processing
scale-up

Titan key benefits

- **A complete turn-key system:** A wide selection of modules that integrate seamlessly, all designed specifically for flow chemistry at a larger scale
- **High performance:** High mass transfer and heat transfer reactors
- **Extremely high chemical resistance:** Glass, PTFE, Hastelloy, and Elgiloy wetted parts
- **Easily reconfigurable:** Modules can be rearranged in minutes to perform entirely different chemical processes
- **Reliable and robust:** Designed for long term use in demanding manufacturing environments
- **Easy to use:** Modules connect together in seconds and clip onto state of the art, intelligent floor standing skid systems or, for smaller systems, bench top stands
- **Easy to service:** Service made easy by innovative design features
- **Optional automation:** Control process parameters for the modules via Titan software or via pre-existing PLC or plant software
- **Scalable production rates:** Lab scale to a tonne per day
- **Scalable functionality:** Modules can be trivially added to modify scale or process type/complexity or to combine multiple processes into one system
- **Safe:** Enjoy the inherent safety benefits of continuous processing with Titan's designed-in safety features including interlocks, anti-tamper, pressure detection, and auto shut down features

Key specifications*

- Modular
- Chemically resistant (glass and fluoropolymer with occasional Hastelloy if required)
 - Stainless Steel and Hastelloy options for higher pressures/volumes
- Reactor volumes of 64 mL and 250 mL
 - Many reactors may be connected together e.g. 4 x 250 mL to create a 1 L reactor
- Flow rates 1 mL/min to 250 mL/min per channel
- Pressures up to 20 bar
- Suitable for fast or slow reactions
- Suitable for liquid-liquid (homogeneous), liquid-liquid (heterogeneous) or liquid-gas
 - Slurry handling versions in development
- Reaction temperatures from -40°C to +250°C
- Optional automation

Titan Systems

The modularity of Titan allows systems to be assembled in many configurations in order to suit the chemical process. Syrris has pre-defined 5 systems outlined below. The specifications of each module are at the end of this document.

	Titan Sys. 1 Small Scale Regular	Titan Sys. 2 Small Scale Comprehensive	Titan Sys. 3 Large Scale Regular	Titan Sys. 4 Large Scale Comprehensive	Titan Sys. 5 Small and Large Scale Advanced
Titan Reagent Store (Small)		2			1
Titan Reagent Store (Large)				2	2
Titan Syringe Pump	2	2	2	2	4
Titan Pre Reaction HEX		1		1	2
Titan FMI (64 mL, Glass)	1	1		1	2
Titan FMI (250 mL, Glass)			1		1
Titan RTU (64 mL, Glass)					1
Titan RTU (250 mL, Glass)				1	1
Titan Post Reaction HEX		1		1	2
Circulator	1	2	1	2	4
Titan Pressure Controller	1	1	1	1	2
Titan Product Collection (Small)		1			
Titan Product Collection (Large)				1	2
Titan Reactor Controller	1	1	1	2	3
Titan System Controller	1	1	1	1	1
Solvent Store Units (Small)					
Solvent Store Units (Large)					
Titan Tubing Kit	1	1	1	1	1
Titan Framework (Floor Standing)			1	2	3
Titan Framework (Bench Standing)	1	3			

Titan System 1 – Small Scale Regular



Titan System 2 – Small Scale Comprehensive



Titan System 3 – Large Scale Regular



Titan System 4 – Large Scale Comprehensive



Titan System 5 – Small and Large Scale Advanced



Module specification*

- Titan Syringe Pump
 - One continuous flow of 1 mL/min to 250 mL/min per pump
 - Extremely chemically resistant (glass, PTFE, Hastelloy and Elgiloy wetted parts)
 - Designed for long life in demanding environments
 - Ultra-smooth flow up to 20 bar at all flow rates
- Titan Reagent Store or Titan Large Reagent Store
 - Temperature controlled, refillable storage of input substrates/reagents from 1 L to 50 L
 - Quick change vessels and stirrers
- Titan Modular Reactor
 - The Titan Modular Reactor is made up of four optional sub modules. These include the Pre-Reaction Heat Exchanger (HEX), Fast Mixing Injector (FMI), Residence Time Unit (RTU) and the Post-Reaction HEX.
 - Two or more sub modules can be connected together in just a few minutes to create single- or multi-step and multi-temperature-zone reactors
 - Wide temperature range of -40°C to +250°C
 - Pressures up to 20 bar (290 psi)
 - All sub modules are highly chemically resistant
 - Pre-Reaction Heat Exchangers
 - High performance shell and tube heat exchangers designed to enable rapid heating or cooling of reactions prior to mixing
 - Fast Mixing Injectors
 - A range of extremely high mass transfer and heat transfer mixers/reactors for reactions with two or three inputs
 - Uses advanced microreactor technology
 - Integrated thermocouples enable accurate process monitoring and control
 - Optical transparency enables visualisation of the process and confirmation of cleanliness
 - Residence Time Unit
 - High performance shell and tube heat exchangers to enable longer residence times with efficient mass transfer and heat transfer
 - Post-Reaction Heat Exchangers
 - High performance shell and tube heat exchangers designed to enable rapid heating or cooling of the process after the reaction
- Titan Pressure Controller
 - Designed specifically for continuous chemical processes
 - Tolerates some particulates
- Titan Product Collector or Titan Large Product Collector
 - Temperature controlled and agitated product or intermediate collection/buffer vessels from 1 L to 50 L
 - Quick-change vessels and stirrers
- Titan Framework
 - Modular skid-like framework that can accept all Titan modules or other equipment
 - Easy to clip together to make small or large skids
 - Routing for circulator pipes and communications cables
 - Features include drip trays, wheels and levelling
- Titan Level 1 System Controller
 - Control and data logging of Titan modules

*Note that specifications may be subject to change.

For more information about Titan, including technical detail, availability and pricing, please contact your local Syrris office or email info@syrris.com.