



Thermo Scientific Pharma 11 Chill Roll processing system

Downstream equipment to process hot-melt extrudates



Introduction

Amorphous solid dispersions (ASD) are crucial in the development of novel drugs, as they help overcome a common challenge in pharmaceutical development: improving the solubility and bioavailability of poorly water-soluble drugs. Hot-melt extrusion (HME) is a preferred method for producing ASDs due to its continuous processing technique and its scalability. Incorporating a chill roll in HME processing is beneficial as it rapidly cools the extrudate, preventing crystallization and ensuring a stable amorphous form. During research and development processes, having a small chill roll allows for efficient experimentation with minimal material. This can accelerate the optimization of formulations and process parameters, which ultimately speeds up the development of effective new drugs.

Pharma 11 Chill Roll

The Thermo Scientific™ Pharma 11 Chill Roll Processing System is an advanced downstream accessory for processing hot polymer melts, and it is designed specifically for use with the Thermo Scientific™ Pharma 11 Twin-screw Extruder.

The Pharma 11 Chill Roll can be used as a stand-alone unit with its own human-machine interface (HMI) or interconnected with the Pharma 11 twin-screw extruder. When connected to the extruder all control is done via the extruder HMI and all operations are interlocked to guarantee maximum safety and stable operation.



Figure 1. Pharma 11 Chill Roll and Twin-screw extruder set-up

ASD Processing

The melt flows out of the extruder die onto the two cooled rolls that have a defined gap and rotational speed. The cooling rate of the rolls is regulated with a thermostatic bath. The counterrotation of the rolls draws the material into the gap, simultaneously forming a thin film and cooling it down. The film is then conveyed against a scraping blade to peel off a sheet (see Figure 2). This sheet is conveyed along the chill roll conveyor belt at a defined speed and at the same time it is further cooled before it is crushed into irregular shaped flakes by the rotating flaker. The flake size can be varied either by adjusting the gap size between the rolls or by changing the rotational speed of the flaker. The most important advantage of the chill roll is the well-controlled and well-defined cooling it provides, which is beneficial and necessary to have an amorphous dispersion.

Easy usage for flawless operation

The design of the Pharma 11 chill roll system includes several patented features that make handling the chill roll easier and more comfortable than ever before. This makes even use in a glove box a pleasure.

The gap adjustment can be carried out very easily with just one lever, whereby both sides of the cooling roll gap are adjusted synchronously. The grid on the front of the device eliminates the need for further checking of the gap dimensions. The process is therefore precisely repeatable.

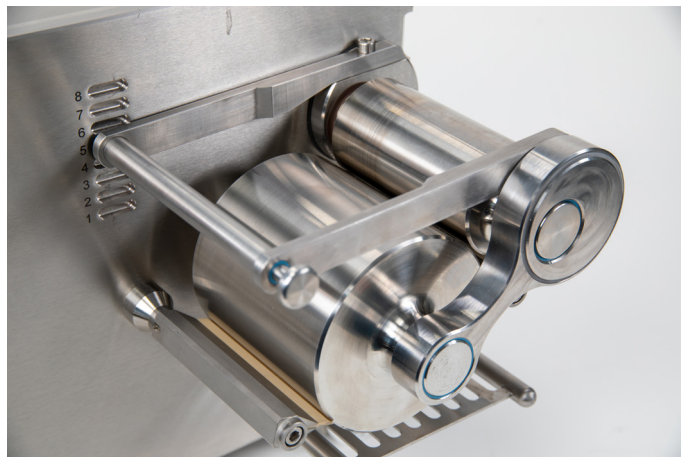


Figure 2. Easy gap adjustment

This patented cantilever design also allows for quick and thorough cleaning of the instrument. This greatly reduces the time spent doing clean-up and allows for more experiments to be run in a given period.

The chill roll's belt can be replaced from the front of the device using just one tool. This allows maintenance to be carried out in a matter of minutes, even in confined spaces such as a glove-box.



Figure 3. Chill Roll with dismantled belt

The Pharma 11 Chill Roll system is an essential accessory for researchers and manufacturers aiming to optimize their HME processes and produce high-quality ASDs efficiently.

Technical Data

Specification	Value
Product speed	0m/min to 2.5m/min
Throughput	0kg/h to 3kg/h
Film thickness setting	0.2mm to 2mm
Main cooling roller	Ø 108mm / width 110mm
Secondary cooling roller	Ø 57mm / width 110mm
Flaker speed	40 RPM, up to 300 RPM max
Power supply	1x 230 V/N/PE 16 A 50/60 Hz
Power consumption	12 A
Dimensions (L x W x H)	821mm x 461mm x 350mm
Weight	72kg (combined units)
Protection class	IP 54