

HAAKE PolyDrive



The Extrusion and Mixing Specialist

Analyze • Detect • Measure • Control™

Thermo
ELECTRON CORPORATION

HAAKE PolyDrive Extruder Providing Tools for Research and Production

The HAAKE PolyDrive extruder applies the proven and tested HAAKE PolyLab System technology to extrusion applications. Combined with specialized accessories such as screws, dies, post-extrusion and feeder units, it provides the best possible answer to application needs requiring the extrusion of polymers, ceramics, food products or rubber.

Contact us, .e.g. if you want to:

- process and pelletize small samples of an expensive polymer
- perform color matching on flat film
- carry out continuous fish-eye tests on blown or flat film
- do wire coating
- test catalyst ceramics for their extrudability
- develop breakfast cereals or create a new snack
- simply optimize your extrusion procedure.

Featuring a new, intuitive operating concept and “intelligent” electronics, HAAKE PolyDrive is designed to be used as a robust Plug&Play solution for the everyday working environment. Once entered, extrusion parameters can be stored and later be recalled at the touch of a button.



The Extruder

Extruder specifications

HAAKE PolyDrive standard models are equipped with a 3/4-inch single-screw extruder of 25 x D in length. This model is especially well suited for materials characterization of flow and melt behavior in thermoplastic materials under process conditions. A broad range of available options such as L/D=20 and L/D=10 for rubber applications, a grooved cylinder model for food application or wear reduction treatment ensures adaptability of the unit to specific process requirements. A 3-zone heating system with heating/cooling collars provides optimum temperature distribution along the extruder barrel.

Connection Panel – Extruder

The HAAKE PolyDrive connection panel provides connections for:

- 2 (optional 4) additional temperature control zones for dies, melt pump etc.
- 1 (optional 3) melt pressure sensor
- 1 (optional 3) melt temperature sensor
- Data transfer (via standard interface)
- Separate, potential-free signal input/output.
- Analog part (optional) for controlling e.g. a melt pump



Technical Specifications Extruder

Barrel	
Length L	25 x D (20 x D, 10 x D optional)
Diameter D	19,05 mm (3/4")
Material	SS No. 1.8550, nitrided stainless steel
Integrated heating/cooling zones	3
Feed section	22 x 35 mm
- Temperature control	Liquid/air
Max. flight depth	3.75 mm
Sensor ports at barrel end	2
Venting	(optional) at 17 x D
Functionality	
Coding	Automatic detection
Overload protection	Max. torque electr. controlled
Max. torque	120 Nm
Torque specs	class 1 (optional class 2)
Maximum operating temperature	450 °C
Maximum operating pressure	700 bar
Feeder unit	Hopper/single-screw feeder
Maximum throughput rate	5 kg/h (depending on sample-material)
Heater capacity/zone	1000 W
Dimensions L/W/H	115/45/120 cm
Weight	170 kg

Melt pump



The Extruder Application

Typical processing applications include:

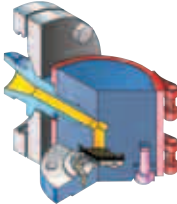
- ① Testing for transparency and fish-eyes with a blown film die, blown film take-off and OQT optical testing unit.



- ② Medical technology applications using melt pump, tube die and conveyor belt.



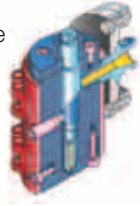
- ③ Filter test value monitoring with a filter die and pressure sensor (EN 13900).



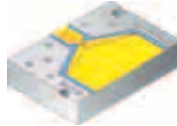
- ④ Manufacturing of uniform fibers using a melt pump and a spinning die.



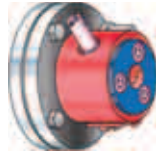
- ⑤ Production of sample cables with wire coating die and take-off.



- ⑥ Testing for pigment dispersion with a sheet die and tape and ribbon take-off.



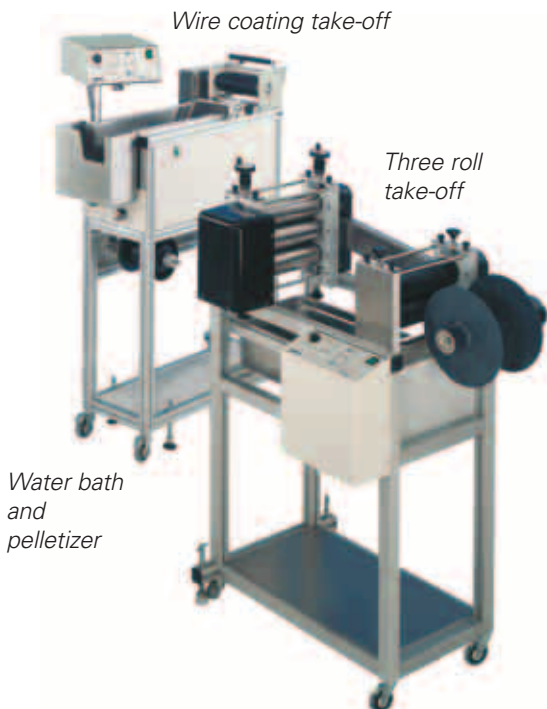
- ⑦ Small-scale manufacturing using multiple-strand die, water bath and pelletizer.



- ⑧ Manufacturing of test samples with rod die and conveyor belt.



Blown film take-off



Wire coating take-off

Three roll take-off

Water bath and pelletizer

Please request the corresponding brochures for additional information on Postex units or dies.

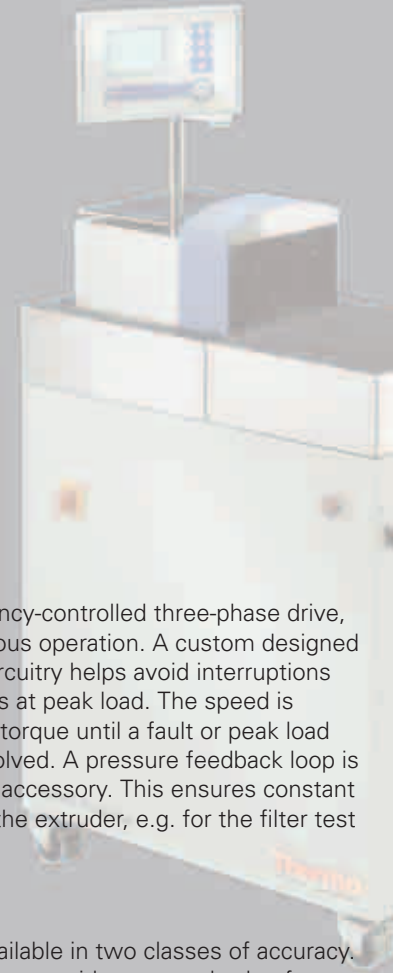
Common Features of the Extruder / Mixer

Display/Operating Console:

The operating console has a large, back-lit LCD and acts as the user interface. Special care has been taken to ensure ergonomic design, i.e. user-friendly, intuitive operation and clarity.

Its distinguishing features include:

- Functionality-oriented operator control panel
- 10-multiturn potentiometer for fine adjustment of speed
- Intuitive menu control
- Measurement and processing parameters are clearly readable from a distance
- Multiple language support (for up to 4 languages)
- Storage capability for up to 3 extrusion/measuring parameter sets
- 2 different sets of measuring units: default (°C, bar, min,...) USA (°F, psi, min, ...)



Drive Unit

The drive unit, a frequency-controlled three-phase drive, is designed for continuous operation. A custom designed torque/speed control circuitry helps avoid interruptions of the extrusion process at peak load. The speed is corrected to maximum torque until a fault or peak load condition has been resolved. A pressure feedback loop is available as an optional accessory. This ensures constant pressure at the end of the extruder, e.g. for the filter test application.

Torque measurement

Torque measuring is available in two classes of accuracy. Measurements can either provide a general value for process monitoring (class 1 extruder) or a calibrated measurement for quality control applications (class 2 HAAKE PolyDrive Mixer).

Torque Measuring Specifications

Measuring range	0.5 - 120 Nm	
Accuracy	Class 1	+/- 2 Nm
	Class 2	< +/- 0.1 Nm
Resolution	Class 1	1 Nm
	Class 2	0.005 Nm
Reproducibility	Class 1	+/- 1 Nm
	Class 2	+/- 0.01 Nm

The Mixing Sensor

Mixer Specifications

HAAKE PolyDrive Mixer Torque Rheometer

This figure illustrates the melting and degradation behavior of a PVC sample. Graphical or numeric test data can be exported and transferred via a standardized software interface for:

- import into standard software applications (e.g. MS Excel, statistics software etc.)
- use in process control and laboratory data processing applications
- processing in advanced data evaluation applications.

A glass plate, which is available as an accessory for the mixer, enables visual monitoring of the mixing cycle. Samples can be tested at temperatures of up to 200 °C due to the use of special TEMPAX glass.

The figure shows a mixing procedure of a PCV dry blend and a color pigment at the beginning of the melting and mixing cycle. The objective of this test is to produce a homogenous, molten material sample as well as to check the melting-, crosslinking- and degradation behavior.

For most materials, the cycle time required for this kind of test varies between 5 and 15 minutes. A 3-segment mixer chamber permits fast and easy cleaning after the test. Interchangeable rotors allow various configurations for a wide range of applications and shearing conditions.

All HAAKE PolyDrive models have a built in Class2 Torque Sensor for high accuracy measurements. The standard version of the HAAKE PolyDrive includes a Series 600 electrically-heated internal batch mixer with a chamber volume of 120 cm³. This model is suitable for all polyolefin and PVC applications. Available models also include the Series 610, which features a liquid temperature controlled mixer for measuring temperatures of up to 100 °C, as well as Series 540 mixers with a conical chamber for thermoset curing. A three-section mixer chamber and interchangeable rotors permit easy and efficient cleaning of the unit.

Connection panel

The HAAKE PolyDrive connection provides:

- 3 independent temperature control zones for front plate, mixer chamber and rear panel
- 1 melt temperature sensor inside the mixer chamber
- Data transfer via standard interface
- Separate, potential-free signal input/output
- Analog part (optional): e.g. for electrical conductivity tests



Technical Specifications Mixer

Chamber volume (gross)	120 cm ³ with Rotors (net) 70 - 100 cm ³
Max. torque	120 Nm
Torque specifications:	Class 2 (standard)
Temperature control	Electrical/Air cooling
Max. temperature	400 °C
Heating cap.	Total 3350 W
Control thermocouples	3
Melt thermocouples	1
Feeding device	Manual ram (optional: pneumatic)
Material	1.4301 stainless steel
Gear ratio	3:2 (option 2:3)
Round shaped feeding opening	Yes
Loading diameter	32 mm
Coding	Automatic detection
Electric overload protection	Max. torque control or cut-off
Dimensions L/B/H	100/45/120 cm
Weight	170 kg

The HAAKE PolyDrive Mixer Torque Rheometer uses the proven HAAKE PolyLab System technology tailored to mixing and kneading applications. As a genuine torque rheometer, it has been designed specifically for polymer, ceramics, food products and rubber applications.

HAAKE PolyDrive Mixer Torque Rheometer Mixing and Kneading in Perfection



Contact us, .e.g. if you

- want to perform incoming/pre-delivery inspections on PVC dry blends
- need to establish a continuous quality assurance system for thermoplastics materials
- want to manufacture small sample batches of specific elastomers for additional testing
- require mobility for routine tests in polymer production
- are looking for easy to implement thermosetting plastic testing procedures.

The all new, intuitive operating concept and intelligent electronics make the HAAKE PolyDrive a Plug&Play solution designed for everyday working environments. Measuring parameters are stored upon input and can be recalled at the touch of a button. All mixing procedures can be monitored on a large-screen LCD, and a data interface allows measuring data to be stored / processed on external computers.

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