ThermoHaake

Instruction Manual
Extruder Sensor
Rheomex 252/254

Part No. 002-8632
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Thermo Haake
Dieselstraße 4
D-76227 Karlsruhe

Tel. +49(0)721 4094-444
Fax +49(0)721 4094-418
E-mail info@thermohaake.com

Thermo Haake (USA)
53 W. Century Road
Paramus, NJ 07652

Tel. 201 265 7865
Fax 201 265 1977
infousa@thermohaake.com

Rheo s.a. (France)
99 Route de Versailles
91160 Champlan

Tel. +33(0)1 64 54 0101
Fax +33(0)1 64 54 0187
info@thermorheo.com

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1. Safety Recommendations

☞ Before operating the extruder, read all the instructions in this manual thoroughly.

☞ Do not leave the extruder running unattended.

☞ Do not leave corrosive and oxidizing materials in the extruder for a long period of time.

☞ Do not use steel tools for cleaning the extruder as they can damage the surfaces. Tools made of bronze and other copper alloys as well as plastic tools for low operating temperatures are more suitable for this purpose.

☞ Handle the sensor system with care.

☞ Avoid contact between the extruder cables and hoses and the hot working parts.

⚠ **Do not operate the heaters without control thermocouples.**

⚠ **Do not start up the extruder sensor from cold with material in the extruder or feed hopper.**

⚠ **Always start up the measuring sensor slowly beginning with speed setting 0.**

⚠ **Never start up the measuring extruder with a full feed hopper.**

Always wear protective gloves!
Parts of the extruder get very hot.

Keep hands well clear of the feed opening!

Use an air exhaust for all tests.

Do not stand in front of the extruder output when the extruder sensor is in operation.

Never look into the feed opening without wearing protective glasses.

2. Unpacking

Damaged in transit?

- Inform delivery agent (freight agent, railway)
- Prepare damage report

Before returning device:

- Inform manufacturer
  (minor damage can often be rectified on site)

Subject to authorization by Thermo Haake, the goods are to be returned franco domicile.

3. Description

The Thermo Haake Rheomex 252 is a single screw extruder sensor which can be used with all Thermo Haake torque rheometers.

The extruder barrel has three temperature control zones.

The feed zone can be additionally cooled using either air or liquid to prevent premelting of test material in the hopper area.

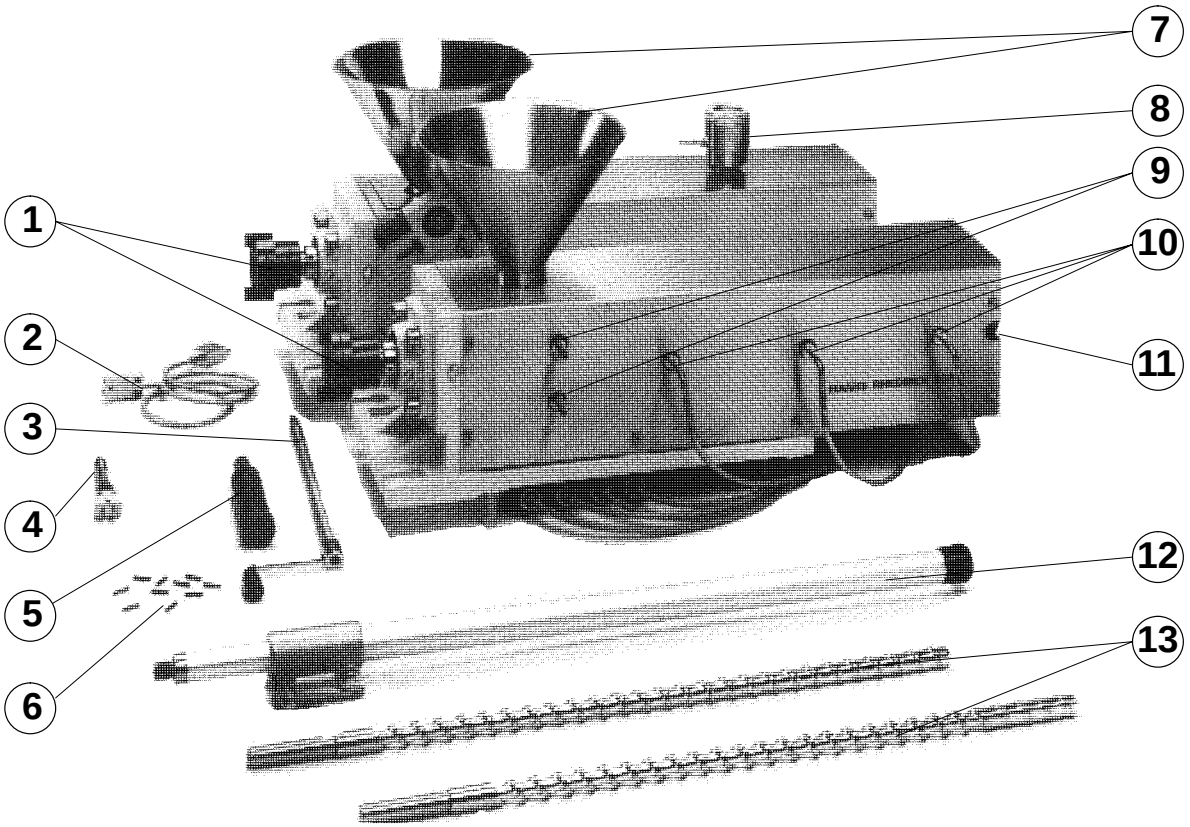
The extruder sensor can be equipped with screws with different geometries in order to achieve optimum test conditions.

The extruder sensor can also be fitted with sensors for measuring melt pressure and temperature.

The following applications are possible when using the correct measuring dies and take-off systems:

- the evaluation of the general extrudability of the test substance
- the production of small profiles and films for further analysis
- the manufacture of small batches
- optical testing for fish eyes, transparency, surface finish and pigment distribution
- the determination of die swell and contraction
- testing the rheological characteristics of a melt.

3.1 Functional parts



1 shear pin coupling
2 compensation line
3 screw ejection tool
4 melt thermocouple
5 grease gun
6 shear pin
7 hopper (special accessory)
8 venting dome (only Rheomex254)
9 cooling air or liquid connection
10 control thermocouple
11 measuring port
12 extruder support
13 screws (special accessories)

4. Installation

4.1 Fixing the extruder sensor

1 Loosen the nuts on the mounting pad of the drive unit.

2 Locate the extruder sensor on top of the mounting pad.

3 Rotate the shear pin coupling of the extruder sensor far enough so that it fits into the coupling of the torque measuring shaft.

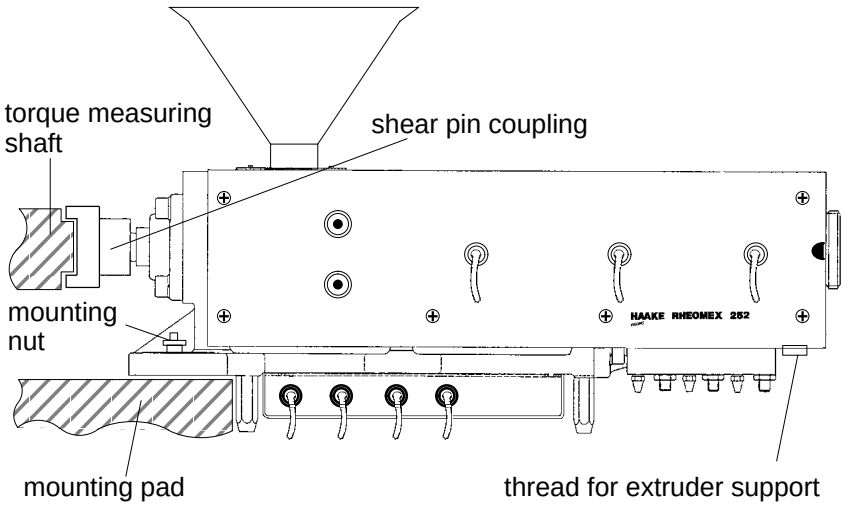
4 Slide the extruder sensor onto the torque measuring shaft.

⚠ **Take care that the measuring shaft is not damaged when attaching the extruder sensor. Mounting should be thus carried out with extreme caution.**

5 Secure the mounting nuts tightly with a wrench.

☞ If the gap between the coupling of the extruder sensor and that of the torque measuring shaft is larger or smaller than 1 – 2 mm, it can be adjusted by loosening the grub screw located at the extruder coupling part.

6 Screw the extruder support rod into the thread provided and extend the support down to the ground.



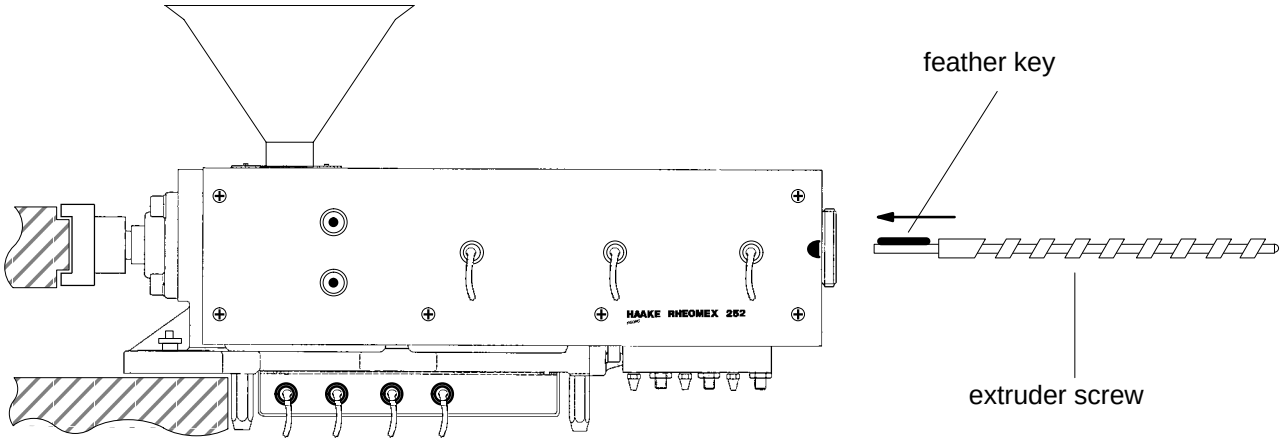
4.2 Inserting the screw

1 Insert the screw into the extruder barrel, feather key end first, and slide in the screw until it rests against the bearing flange.

2 Now rotate the screw until the feather key and the bearing flange groove are exactly aligned.

3 Slide the screw back as far as it will go into the barrel.

⚠ **The screw should fit easily within the feather key groove of the bearing flange! If this is not the case, the screw and extruder sensor should be thoroughly cleaned.**



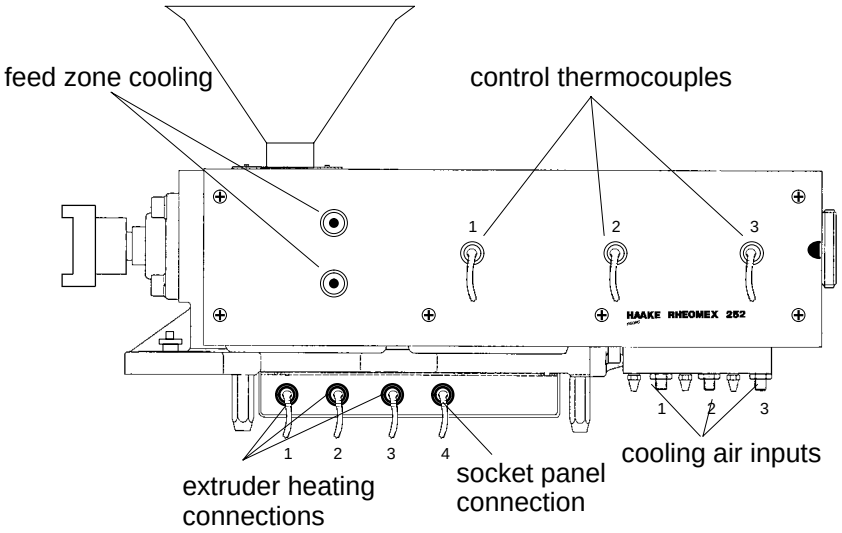
4.3 Connecting the extruder sensor

The extruder sensor has three independently controllable heating zones. Further zones are required for temperature controlling the dies. It should therefore be ensured that the plugs for heating and control thermocouples are connected to the correct sockets of the drive unit.

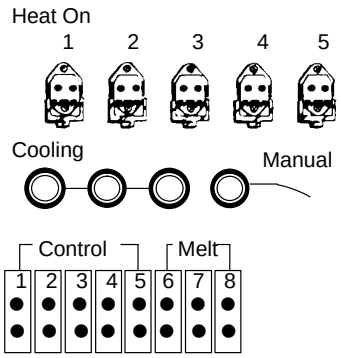
The cables are marked 1, 2 and 3.

4.3.1 Connecting to the Rheodrive

See 4.3.2 for connecting to the Rheocord

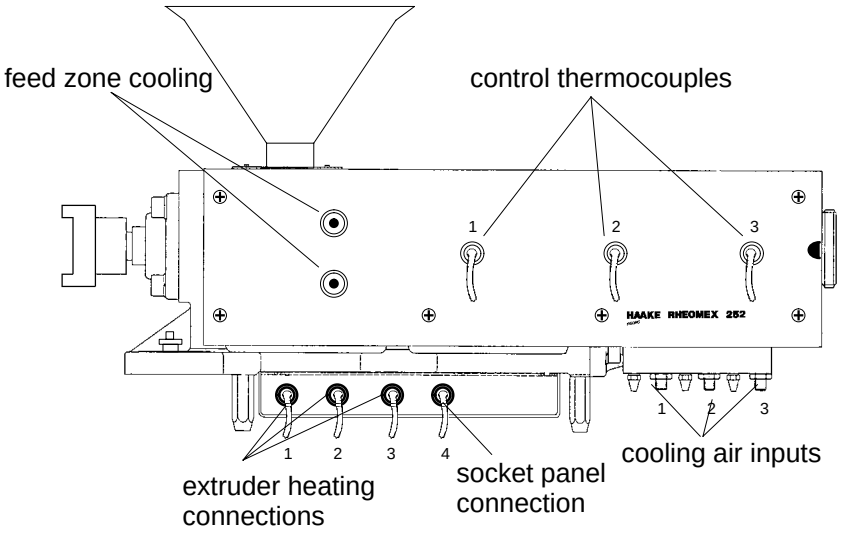


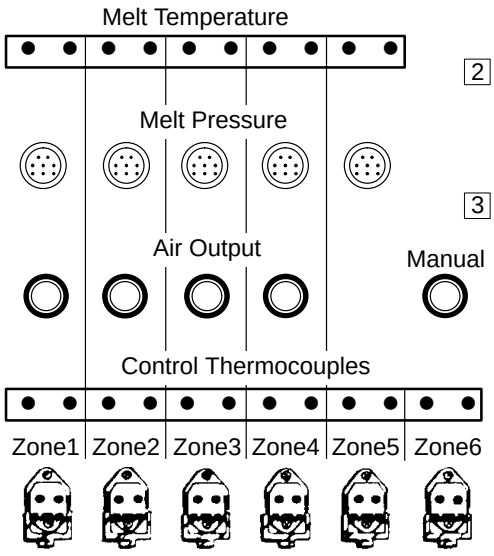
Rheodrive



1. Connect the control thermocouple plugs marked with (1), (2) and (3) into the respective sockets on the ”Control” panel.
2. Connect the cooling air inputs marked with (1), (2) and (3) to the respective ”Cooling” outputs of the Rheodrive using the air hoses.
3. Connect the heating plugs marked with (1), (2) and (3) to the respective sockets marked with (1), (2) and (3) on the ”Heat On” panel.

4.3.2 Connecting to the Rheocord



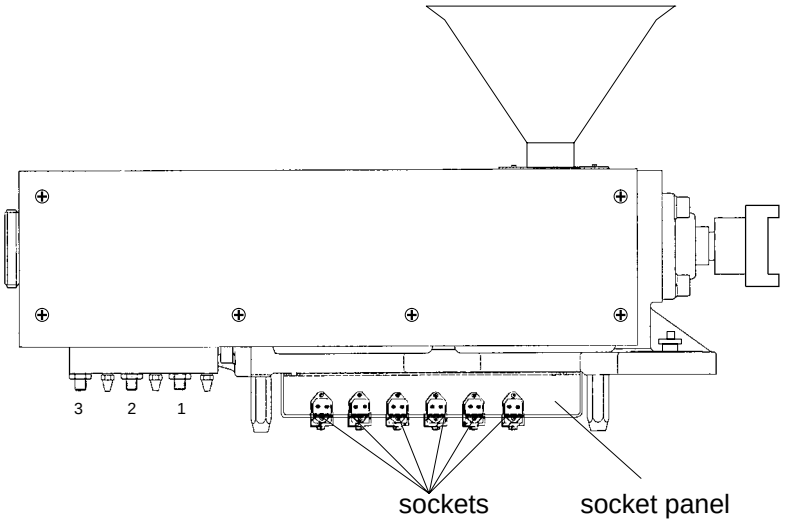


1 Connect the control thermocouple plugs marked with (1), (2) and (3) into the respective sockets on the ”Control Thermocouples” panel.

2 Connect the cooling air inputs marked with (1), (2) and (3) to the respective ”Air Output” sockets of the Rheocord using the air hoses.

3 Connect the heating plugs marked with (1), (2) and (3) to the respective sockets.

4.3.3 Connecting a die



A socket panel on the right side of the extruder is provided for connecting a die with several heating connections.

1. Connect the die control thermocouple to the ”Control Thermocouple” socket of zone 4 at the drive unit.
2. Connect the heating connection 4 (on the left side of the extruder) to the respective socket at the drive unit.
3. Connect the die heating connections to the sockets at the socket panel (on the right side of the extruder).

4.3.4 Adjusting the cooling

1 All zones apart from the dies are cooled using air to reduce the frictional heat.

2 The air pressure to be set at the drive unit depends on the operating temperature and the processing behavior of the test substance.

However a rough setting guideline is:

2 – 3 bar

3 The feed zone can be temperature controlled using either air or liquid.

- for air cooling, one of the two hose connection nozzles should be connected to the ”manual” air cooling output of the Rheocord using an air hose.
- for liquid cooling, both hose connection nozzles should be connected to the temperature control circuit inlet and outlet nozzles of a circulator.

A suitable circulator preferably with a cooling compressor is available from Thermo Haake: e.g. Thermo Haake D8-GH.

Recommended flow rate for heat transfer liquid:

approx. 20 – 50 liters per hour.

4.4 Connecting melt temperature and/or pressure sensors

A measuring port is situated at the end of the extruder as a standard feature. Further ports can be located along the barrel on special request.

1 Unscrew stoppers from the ports.

2 Coat the thread of the melt temperature or pressure sensor with a temperature-resistant lubricant.

☞ Failure to do so can damage the expensive pressure sensor beyond repair, even on first usage.

3 Screw in sensor hand-tight.

4 Attach connection cable.

5 Tighten the sensor securely after the operating temperature has been reached.

4.5 Extruder sensor with venting opening (Rheomex254)

The venting opening is closed on delivery.

The venting zone is opened as follows:

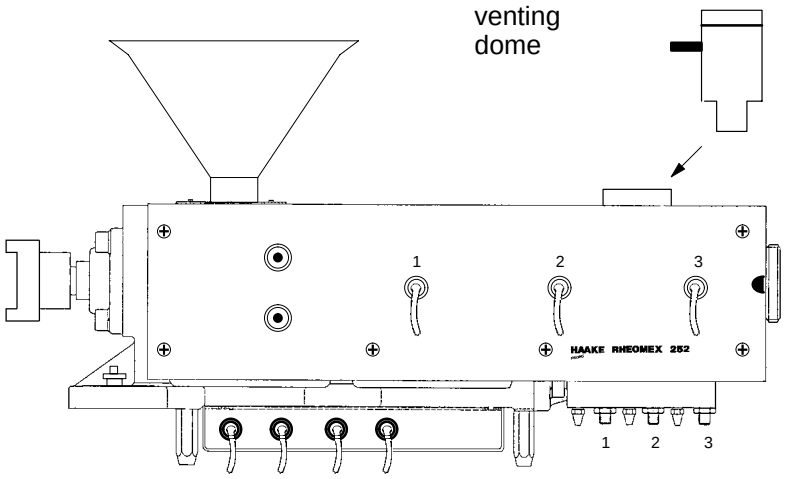
1 Unscrew the four mounting screws.

2 Force out the metal block with both forcing screws (heat up if necessary).

3 Locate the venting block and secure with four screws.

4 Mount the venting dome.

5 Connect the venting zone to the vacuum pump using a vacuum hose.



5. Temperature Controlling

The operating temperature is set at the control unit.

⇒ **See the control unit instruction manual**

⚠ **The extruder sensor should not be operated at temperatures above 450°C!**

⚠ **Operation at high temperatures results a higher degree of wear.**

6. Running a Test

1. Set the desired temperature at the control unit.
2. Activate the feed zone cooling (if necessary).
3. Tighten all screw fittings on the extruder (dies, melt sensors, etc.) after the operating temperature has been reached (after approx. 30 minutes).

   Calibration of the torque and pressure sensors should only be carried out when the extruder is not running and is empty.
4. Set the speed from 0 to about 5 revolutions.
5. When commencing a test, only fill enough material so that the screw is just covered. The torque and pressure curves should be observed during this process.
   The hopper can be filled as soon as the extrudate flows out of the die and no faults has been observed.
6. Set the desired speed.

7. Cleaning the Extruder Sensor

The extruder sensor should only be cleaned using tools which will not damage the surface. Thermo Haake supplies a complete set of cleaning instruments as a special accessory.

Do not clean the extruder sensor without wearing heat protective gloves!

Most samples are easier to remove from the mixer while still at test temperature.

There is a range of cleaning substances available. Get in contact with Thermo Haake for more detailed information.

1. Fill the barrel with the cleaning compound and extrude at medium speed (approx. 50 rpm).

A number of suitable heat-stable cleaning compounds are available on the market. These can be exchanged for the test subtance which often tends to decompose and as a result adheres to all surfaces during dismantling of the extruder and dies.

2. Stop the motor.
3. Remove the die and clean immediately.
4. Extrude the cleaning mixture again.
5. Clean the feed hopper.
6. Switch off the control unit.
7. Loosen both mounting screws which retain the extruder sensor on top of the mounting pad and rotate the extruder sensor to the left.
8. Screw tight the left mounting screw again.
9. Force out the screw from the back using the ejection tool and clean immediately.
10. Clean the extruder barrel.

8. Replacing the Shear Pin

If the safe operating torque limits are exceeded, the shear pin will snap.

The shear pin is located within the coupling of the measuring sensor.

1. Switch off the drive motor of the drive unit immediately.
2. Loosen both mounting screws which retain the extruder sensor on top of the mounting pad and rotate the extruder sensor to the left.
3. Screw tight the left mounting screw again.
4. Rotate the two halves of the shear pin coupling so that their markings are exactly aligned with one another.
5. Force out the two broken off halves of the old shear pin by lightly tapping in the new shear pin.
6. Return the extruder sensor to it’s original position and screw down firmly.

⚠ **Only Thermo Haake shear pins may be used, otherwise the guarantee is null and void!**

9. Maintenance

⚠ Maintenance is limited to a few important tasks
These should however be carried out at regular intervals!

☞ The extruder sensor bearings should be lubricated every 6 months with temperature-resistant grease.

The grease gun supplied with the extruder should be used for this purpose.

☞ If the extruder sensor is subject to increased stress over a longer period of time, the lubrication intervals should be shortened.

⚠ **Operation at increased levels of stress results in a higher degree of wear.**

☞ Check the feed zone cooling circuit for leakages.

10. Trouble Shooting Guide

Problem	Possible Cause	Remedies
An extruder sensor zone does not heat up	*No voltage on heater*	**1. Check heater plug** **2. Check heater cartridges** **3. Check heater fuse on control unit**
Extruder sensor temperature too high	*Order of control thermocouple is incorrect*	**Check whether**: Control thermocouple of 1st zone after feed hopper is connected to zone 1 Control thermocouple of 2nd zone after feed hopper is connected to zone 2 Control thermocouple of 3rd zone after feed hopper is connected to zone 3 (See chapter 2)
Excessive noise when running the extruder sensor	*No gap between extruder sensor and torque shaft*	**Loosen extruder sensor coupling and displace axially until gap is between 1 – 2 mm**

11. Technical Specifications

Max. torque:	**160 Nm**
Overload protection:	**shear pin**
Temperature control:	**electric with air counter-cooling**
Number of temperature zones:	**3**
Control thermocouples:	**3**
Max. Temperature:	**450°C**
Max. permissible inner: pressure:	**700 bar**
Cylinder diameter:	**19.1 mm (3/4")**
Length:	**25 x D**
Feed opening:	**22 x 35 mm**
Material:	**No. 1.8550, nitrated**
Die connection:	**2 3/4" x 8 inch**
Dimensions: L x W x H	**720 x 250 x 230 mm**
Net weight:	**approx. 36 kg**

12. Spare Parts

Description	Part No.
Control thermocouple	001–8735
Air hose	001–8776
Grease gun	001–9400
Lubricant	082–5248
Set of shear pins	001–9442
Screw ejection tool	001–8681
Cover for torque sensor	002–2861
Stopper for sensor port	001–9060
Hexagon key	085–1696
Support for extruder sensor	001–9496
Melt temperature sensor	001–9308
Compensation line	001–9309
Hand brush	001–9264
Spatula, bronze	001–9266
Brush, bore	001–9318
Cooling air damper	001–8349
Cleaning set for extruder/dies	557–2505
Hose connection (feed zone)	001–7970
Adapter for control thermocouple	001–9399

13. Warranty

Thermo Haake warrants products of its manufacture for one year from shipment of the equipment to the purchaser, against defects in material and workmanship. This limited warranty covers parts and labor, but not transportation and insurance charges.

In the event of a warranty claim, contact the dealer who sold you the instrument. If the cause is determined to be a manufacturing fault, the dealer or Thermo Haake will repair or replace all defective parts to restore the unit to operation at our option. Under no circumstances shall Thermo Haake be liable for indirect, consequential or special damages of any kind.

This statement of warranty may only be altered by a specific published amendment. No individual has authorization to alter the provisions of this warranty policy or its amendments.

Expendable items such as reagents or tubing are not covered by this warranty. Damages due to corrosion or accidental breakage are not covered either.