

Bioproducts and biosystems

EXTRUDER MANUAL

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EQUIPMENT TYPE: Extruder

Version number: 2.1

Distribution/position:

Archive folder 1 pcs

Test laboratory 1 pcs

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1. INTRODUCTION

Labtech extruder is a twin-screw extruder for producing mixtures of thermoplastics and fibers.

- equipped with a sidefeeder and closed-loop water cooling unit
- barrel sections electrically heated
- screw diameter 20 mm
- screw rotational speed 0-800 rpm
- maximum barrel temperature 400 °C
- minimum amount of material about 0,5 kg
- maximum efficient throughput 3-6 kg/h
- if the pelletizer is needed it has to be loaned from polymer technology group

2. REFERENCES

Manuals:

Instruction Manual for Scientific Laboratory Twin Screw Extruder Types LTE20-44 with LSF-20-10 (PART 1)

Instruction Manual for Scientific Laboratory Twin Screw Extruder Type LTE20-44 (PART 2 - APPENDIX)

Instruction Manual for Scientific Laboratory Gravimetric Side Feeder Type LSF-20-10

Instruction Manual for Scientific Laboratory Water Circulating –Close Loop Type LCW-80

3. EQUIPMENT

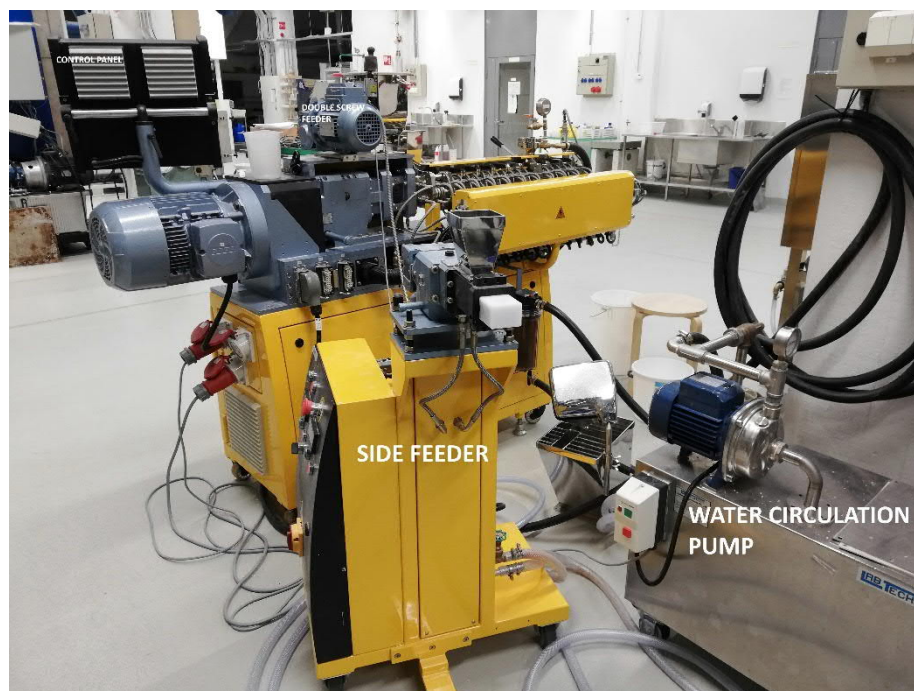


Figure 1 Equipment

4. BEFORE USE

Before use, make sure that plastic suitable for cleaning is available. For example, Fortum PP recycled plastic can be used.

Use **right temperatures** for your material. Arrange the cooling of the finished material. Remember its temperature is easily 200 °C when coming out!

5. PREPARATION AND OPERATION

5.1 PREPARATION

Open the cooling water inlet valve and make sure the water flows into the drain. **Usually it is enough to have just a small water flow.** If a side feed device is used for side feeding, its water circulation must also be ensured. Installing the side feeder is described in the Instruction Manual for Scientific Laboratory Gravimetric Side Feeder Type LSF-20-10 on pages 4-6.

Start the extruder from its main power switch.



Figure 2 Main power switch.

Start the water circulation pump.



Figure 3 Circulation pump switch.

If the side feed device is in use, turn on its main power switch.

5.2 OPERATION

Start the extruder using the green push button on the control panel and the side feed device using the top left green push button of feeder.

At this stage, the temperature alarms will flash. It is normal. Check for other possible alerts. At this point, you can download a temperature program or set the temperatures manually.

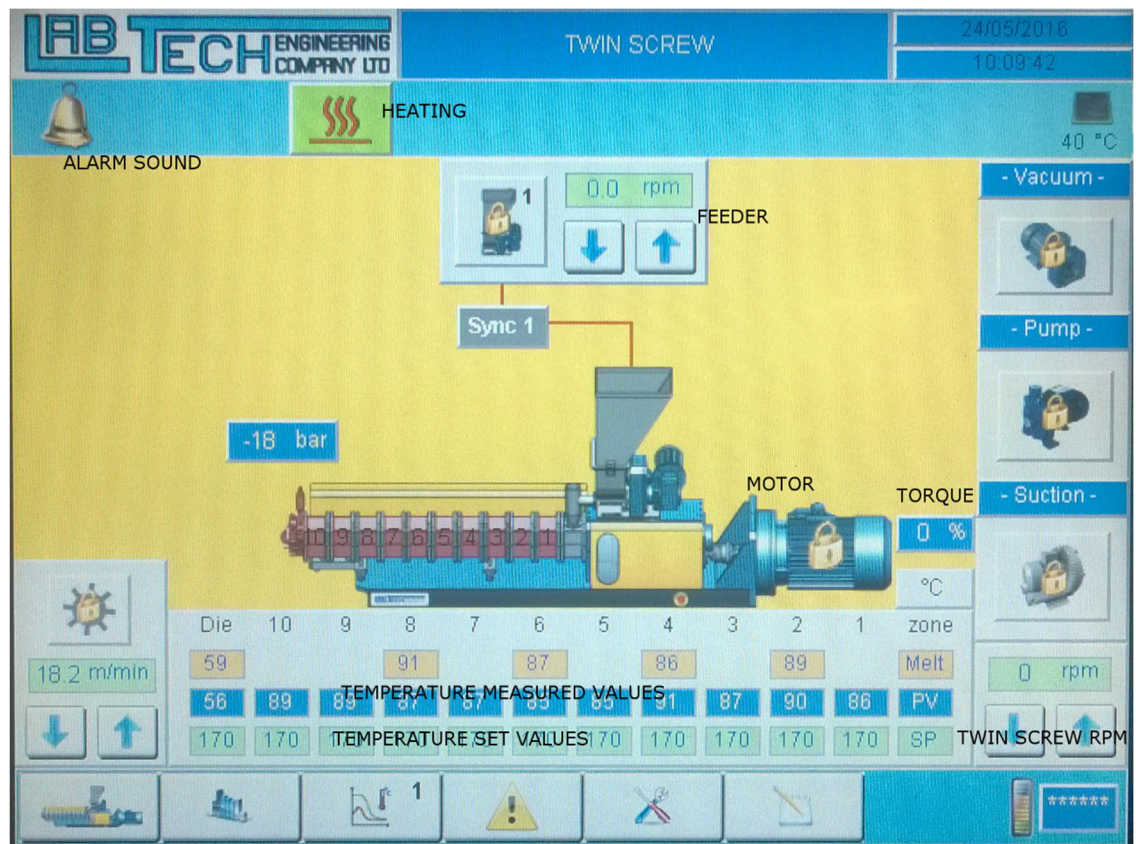



Figure 4 Main display.

Download the readymade program:

On the screen, press on the password and enter the password 1234. Now, at the bottom of the screen, there should be an icon  for reading and saving programs (as in Figure 4). Select the program with arrows, read the program and make sure the temperature and other settings change accordingly.

Manual temperature setting:

Temperatures can be set by touching the touch screen at each thermal module.

When the temperatures are set, press the heating icon , making it green (as shown in Figure 4). Once the set temperatures have been reached, the screws can be started.

Before starting the screw, make sure that the temperatures are sufficient to melt and hold the molten material! Start the extruder's main screw by touching the main engine of the touchscreen, which turns green. Then you can raise the speed from the bottom right corner of the screen selector. Check the screw rotation at the hopper.



Fig.5 Feed hopper with overhanging hole.

At first, you can use a low speed of less than 10-15 rpm. Then also start the screw on the feeder. Also start with low speed (about 5 rpm). Check the rotation of the screws.

The %-reading in the main control panel (Figure 4) indicates the screw torque. **Always watch it.** It should always be less than 90%. The increasing torque is due either to too low temperature (the mass does not melt properly) or to excessive material feed. **Keeping torque around 30% is safe.**

It is recommended to run some purifying material before you experiment, to be sure there will not be any dirt coming out from screws!

Pour the pellets in the tank above the feeder. Remember that the size and form of pellets affect the feeding. First time it is not recommended to fill the feeder much.

Purifying:

Before shutting down the machine, it is advisable to drive about 0.5 kg of pure plastic to remove any remaining fibers from the screws. There is a program "ltp.csv", which has right temperatures for every zone, if you use the recycled PP. Screw speed should be about 150 to 200 rpm.

Turning off:

First stop the granulate feeder screws, then the vacuum pump (if used). When the nozzles no longer come into contact with the material, stop the extruder screw. Load a cooling program to 25 °C. When the Die temperature is well below 200 °C, turn off the heating and close the water circulation. Stop the side feeder and the extruder from the red push buttons. Turn the main power switch of the extruder and the side feeder to zero.

If it is apparent during operation, that some material is blocked by nozzles or screw rotation, the outlet nozzle / heating chamber should be opened hot. In this case, the molten material is easily removed.

6. SPECIAL CASES

Moisture removal can be enhanced by opening the hinged door at the vacuum pump (Figure 6). If you want to use a vacuum pump, never put it on before you are sure the molten material is flowing continuously past the point of the pump and coming out of the nozzles. The vacuum pump discharge valve must be fully open when it is first used. After starting the pump, adjust the discharge valve until the vacuum level is appropriate.



Figure 6 Steam removal enhancement

The fiber material may not be easy to feed and it does not pass through the nozzles. You can also feed directly to the twin screw by removing the hopper cover. The filter inside the end funnel can be removed to facilitate the output of fiber-rich material. In the extreme case, even the end piece can be opened so that the material comes out straight from the screw.

NOTE: Because the feeding of fiber containing materials has been challenging, the feeding systems have been changed.

- The hopper from the side feeder has been moved in place of the main hopper, because it has double screws for more efficient feeding.
- Material should be mixed before feeding and poured into the hopper.
- Control of the hopper speed is working by the side feeder's controls. Cooling of the side feeder in this configuration is not needed.
- The filter inside the end funnel is removed, because it easily hinders fiber containing material flowing

It is possible to do the change back to ordinary configuration, mainly if you really need to feed fibers from the side.

7. NOTICED DEVIATIONS

Remember to follow the turning off procedure, to avoid possible power surge.

8. SERVICE

9. APPENDICES

Appendix 1	Change history
15.1.2018	Version 1.1. Finnish
14.9.2018	Version 1.1. English
27.11.2020	Version 2.1