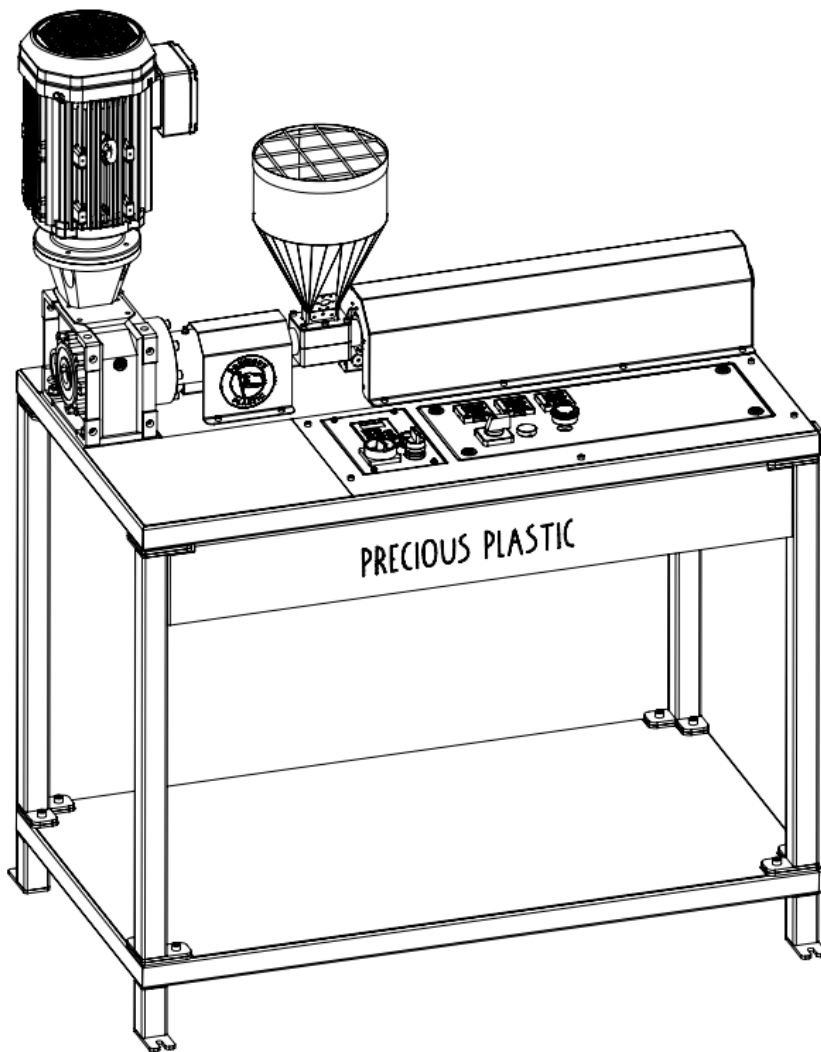




Extruder Pro



Machine Manual

Extruder Pro – Version 1.2
Feb 2022

Contents

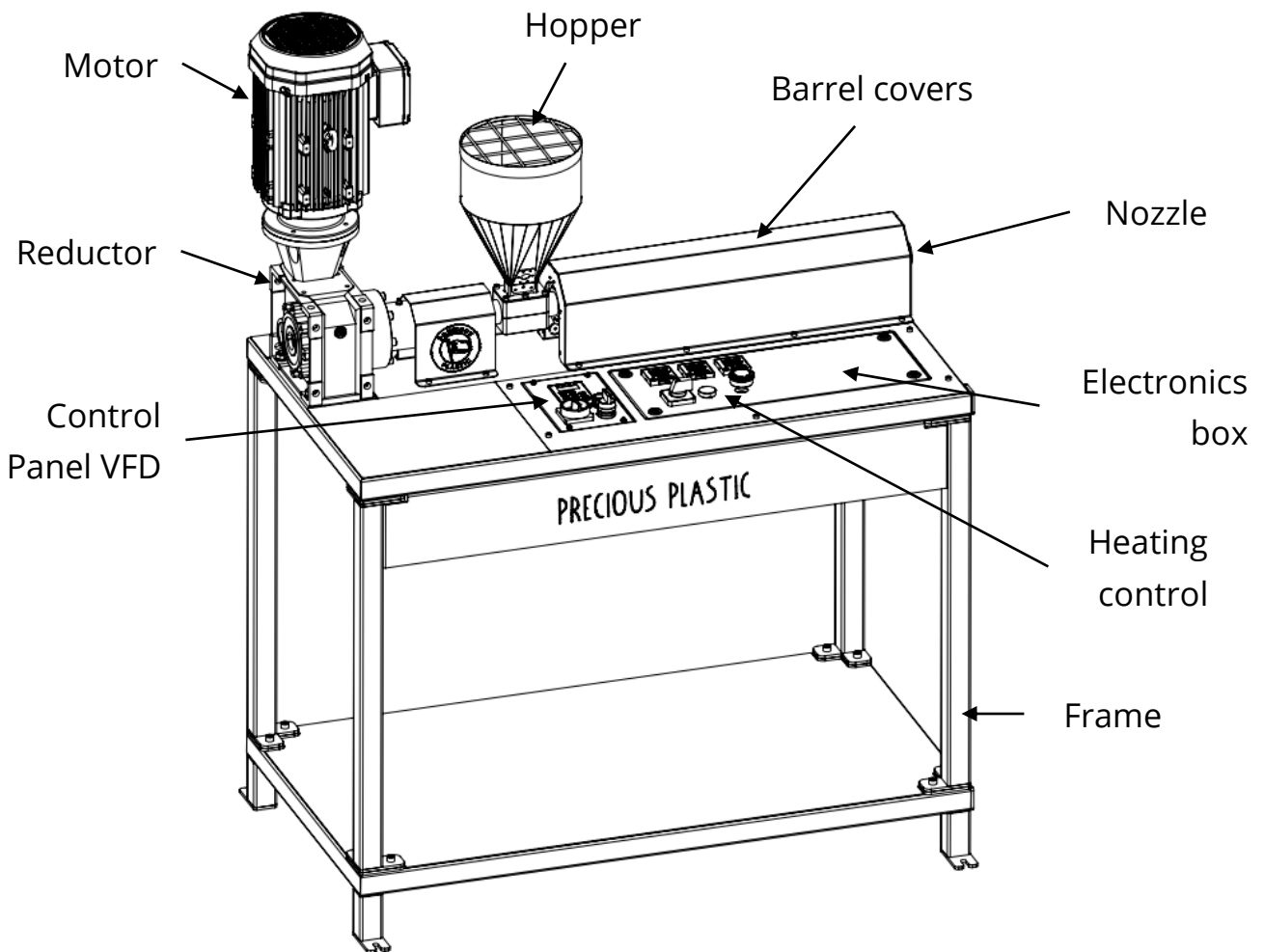
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1.0 Introduction

1.1 The Extruder Pro

The Extruder pro uses a screw to melt and pump plastic. It can be used to make bricks, beams and profiles. It has an throughput of 10 – 15 kg/hr depending on the type of plastic and the design of the mold/die.

1.2 Components



1.3 Specifications

Weight	110 kg
Dimensions (l x w x h)	1105x670x1460mm
Voltage	400 V, 3 phase
Total power consumption	4,8 kW
Motor Power	3,0 kW
Heating power	1,8 kW
Required amperage	16 A
Screw speed @ 50hz	227 rpm
Pressure	Rated up to 200 bar
Input	Thermoplastics
Rate troughput	15 kg/hr
Screw diameter	30 mm
L/d screw	20:1
Maximum temperature	350°C
Temperature regulation	Yes
Heater type	Band heater
Number of operators	1

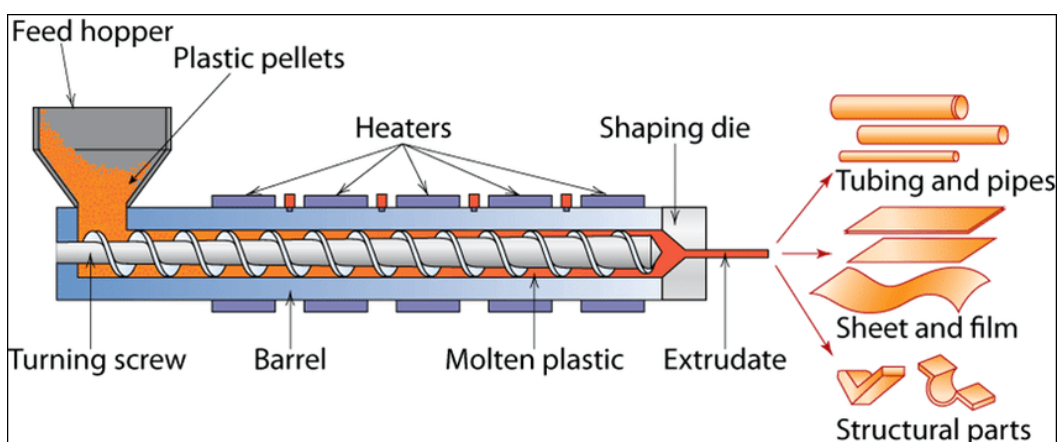
2.0 Operation & Maintenance

2.1 How the Extruder works

Note! Before operating the machine, make sure to read and understand chapter 3.0 safety section in this manual!

The extruder pro uses heat combined with friction to melt plastic granules or flakes at a high rate and pressure. The friction and thereby heat is generated by means of a plasticizing screw. The screw is able to pump the molten plastic (extrudate) at a high pressure into moulds or dies to produce a large variety of products.

Do your research, read through different How-To's and check out the products on the Bazar before investing in mould that will fit your needs best.



[Image source: Overview of a plastic extrusion machine with the plasticizing component... | Download Scientific Diagram \(researchgate.net\)](#)

2.2 Operating the machine

Make sure to use properly designed molds and dies while operating the extruder. Make sure to clean the sealing surfaces and thread of the nozzle before installing the molds. Always use high temperature ceramic or copper grease on the threads to prevent seizing of the threaded connection. Make sure to fill the hopper with plastic flakes or granules.

Startup

1. Plug in the Extruder in a 400V, 16A, 5 pole socket
2. check the emergency stop is released and switch on the main power switch. (the heating PID controllers should switch on)
3. Check the required temperatures to melt your type of plastic and set the PID controllers to the desired temperatures.
4. Switch on the heating by operating the “heating on/off” switch
5. Allow the temperatures to reach the set temperature. Wait an additional 5 minutes after it reaches the temperatures to make sure it’s fully heated evenly.
6. Switch on the VFD by operating the “VFD on/off” switch.
7. Set de desired motor speed using the turning knob on the VFD control panel.
8. Switch the direction switch on the VFD on fwd.
9. Press “run” on the “VFD control” panel to start the motor

2.2 Operating the machine

During operation

- Make sure to fill or dose the hopper with plastic during extrusion.
- Make sure not to leave the motor running without plastic to prevent excessive wear.
- Adjust the throughput of plastic by adjusting the motor speed.
- If needed, stop the motor by pressing the red “stop” button on the VFD control panel.

Shutdown

Before shutdown it's good practice to flush the extruder with clean, virgin polypropylene to remove any contaminants inside the barrel.

1. Allow the hopper to run empty and run the motor until the flow of plastic stops.
2. Stop the motor by pressing the red “stop” button on the VFD control panel.
3. Detach the mould or die.
4. With the motor stopped, switch off the “VFD on/off switch”
5. Switch off the heating using the “Heating on/off switch.
6. Allow the temperatures to cool down to a safe value (< 100°C)
7. Make sure to clean your workplace
8. Switch off the “main switch”.

The extruder is now clean, shut down and ready for the next production

2.3 Maintenance

Motor reductor maintenance

- Change the gearbox oil after the first run in period. This should take place after 300 running hours or 3 months
- After the first oil change, check the following after 3000 running hours or 6 months:

The oil quality

The oil level

Leakages of oil from the seals

- Replace the oil and bearing grease every 10000 running hours or 3 years

Note: recommended Oil volume in motor reductor = 0,75 l. Use synthetic gearbox oil of any of these types:

- ISO VG220
- Shell Omala HD220
- Mobil SHC 630

Daily extruder maintenance (after use)

- Flush barrel after use with clean / virgin PP

Monthly extruder maintenance

- Check the function of the band heaters by switching them on for about 30 seconds. The temperature of all heaters should increase at an equal speed. Use (infrared) temperature gauges to compare. Replace band heater if required.
- Check your emergency stop is still functional. If it is not, a licensed electrician must install a replacement before further use.

Yearly

- Check the **electronics box** and inspect for signs of dust, liquids or burn marks. Also ensure all wires are securely in place. If any repair is required, seek a licenced electrician.
- Remove the barrel and inspect the extruder screw. Replace the screw when required. Also check the condition of the inner surfaces of the barrel. Replace barrel if wear looks excessive.
- Disassemble the bearing body and check the bearings for wear. Replace the bearings and bearing shells if required. Regrease the bearings with bearing grease after reassembly. Don't overfill the bearing body with grease to prevent the seals from popping out of position. Check the shaft for smooth rotation after reassembly and make sure no bearing play can be felt.
- Check tightness and condition of all screws and bolts.

Periodically

- Check website for hacks/updates. The community are continuously developing hacks, modifications and techniques which get shared on the internet, take a look to see what is there that can help or inspire you!

3.0 Safety

3.1 - General instructions

- The Extruder pro is designed to process thermoplastics only. Processing other materials could introduce additional hazards.
- It is recommended that the source and grade of the plastic material is also known and does not contain any contaminants (for example water or oil) that could introduce additional risk.
- Batches of mixed plastics shall not be used with the Extruder pro as they may possess different melting temperatures - melting plastic at the incorrect temperature may increase the risk of VOC emissions.



- Regular maintenance must be conducted at intervals specified in 2.3 to ensure the system is working as intended.
- A monthly check of the electrical emergency stop shall be conducted. Instructions on how to do this can be found in section 2.3.
- If it is found that the emergency stop is no longer functional, a licensed electrician must install a replacement before continued use of the machine.

- The following components have been designed or selected for the safe operation of the machine. As such, they should not be removed or replaced by components which are not identical.
 - Electronics box and its contents
 - Extruder screw
 - Covers
- The Extruder pro must not be modified in any way. Doing so may introduce additional hazards.
- Always make sure to run the machine in a well ventilated room (More info section 3.2)
- Always use the correct personal protection equipment as indicated by the safety labels on the machine (More info section 3.4)

3.2 - Exhaust ventilation system

- **During the plastic melting process, hazardous compounds including volatile organic compounds (VOCs) are released.**
- **A ventilation system with an activated carbon filter or other filter suitable for VOC filtration must be used in conjunction with the Extruder pro at all times.**
- **It is recommended that an electrician wires the ventilation unit such that it automatically initiates once the power to the extruder pro is initiated.**
- **Consult the manufacturer guidelines of the filtration unit for details about maintenance and filter replacement.**
- **A respirator suitable for VOCs should always be worn when dealing with high volumes of plastic. Consult the manufacturer guidelines for instructions on replacement intervals of filters.**
- **It should be noted that melting thermoplastics above their unique melting temperature is proven to emit a higher level of VOCs and thus should be avoided. It is the user's responsibility to be informed on these melting temperatures and avoid heating plastics above these values.**
- **It should be noted that processing PS emits a higher level of VOCs which are hazardous to health and additional safety measures such as a VOC detector and additional space filtration is recommended when processing this materials**
- **Processing PVC can be highly hazardous and not advised with this system.**

Have a look at the chapter about safety in the Academy to read more about **fumes and safety gear**.

community.preciousplastic.com/academy/plastic/safety

3.3 Movements of moulds

- Movements of moulds, particularly when releasing products from hot moulds from the extruder, must be done with the motor switched off and using proper heat resistant gloves or suitable lifting tools.
- Direct contact and handling of the moulds when hot is not advised.
- Don't touch the molds or dies when the extruder is running.
- Never stand in front of the extruder nozzle with the extruder running!

3.4 Personal protective equipment

- Heat proof gloves such as MIG welding gloves should be used at all times while using the Extruder pro. These gloves should extend to provide protection to the forearms as well.
- A work suit or coverall that covers arms and legs must be worn while using the Extruder Pro
- Safety glasses or a face shield must be worn at all times in the vicinity of the Extruder pro to protect from spontaneous ejection of hot substances from the mould area or the unlikely failure of moving parts.

3.6 Moulds

- **Only use molds which are specifically designed for the extruder pro and are capable of handling high pressures.**

3.7 Ancillary equipment

- **The Extruder pro is not designed to be used in conjunction with any other equipment than what is provided.**
- **Ancillary equipment shall not be mounted to the existing frame.**
- **Any additional equipment used may introduce additional risk which is not the responsibility of Precious Plastic.**

3.8 Work-space hazards

- **Make sure the extruder pro is standing level on a strong surface during operation. Always make sure to have 80 cm or room all around the machine during operation.**
- **It is recommended that an additional risk assessment specific to your space is completed to identify and control risks posed by the Extruder pro in your specific context. Note that tripping and slipping hazards can have more severe consequences when dealing with hot equipment.**

3.9 Information for emergency situations

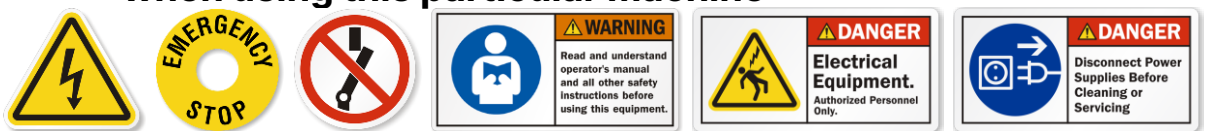
- **The Extruder pro can reach temperatures of up to 350°C and so as such, poses a serious risk of fire if there are no steps taken to reduce this risk.**
- **It is recommended that an individual risk assessment is undertaken for each specific workspace. As part of this assessment, a fire extinguisher shall be located near the machine.**
- **It is recommended that all operators shall regularly undergo an induction on the emergency procedure associated with their specific space.**
- **It is advised that only PP and HDPE are used without further installation of extraction to the space. If, however, a hazardous plastic is accidentally used with the machine, an evacuation procedure shall be initiated. This consists of disconnecting power to the machine and all persons within the space being removed until the fumes have cleared.**

3.10 Safety Labels



Safety stickers on the Extruder frame

1. **Hand Crush:** Indicates an area of hazard due to crushing
2. **Burn Hazard:** Indicates a hazardous hot surface
3. **Lifting Point:** Indicates lifting points for handling
4. **Wear Eye Protection:** Indicates that eye protection is required when using this particular machine
5. **Wear Respirator:** Indicated that a respirator is required when using this particular machine



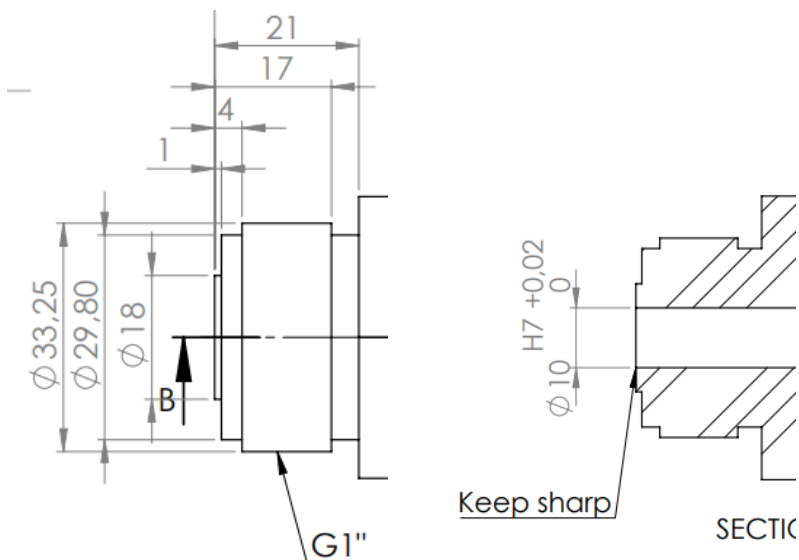
Safety stickers on electronics control box

6. **Emergency stop:** Signifies the emergency stop button for cutting power to machine in case of emergency
7. **Electrocution:** Indicates hazards due to live parts
8. **Do not switch:** Do not disconnect during operation
9. **Read manual:** Read manual before using equipment
10. **Electrical equipment:** Authorised personnel only
11. **Disconnect power:** Disconnect power for service

4.0 Setup and Decommissioning

4.1 Setup

- Complete assembly of the machine is out the scope of this manual.
- The Extruder Pro machine frame van be fitted with either adjustable machine feet or castor wheels to level the machine and optionally make it mobile. The feet of the machine frame is designed wit a slot suitable for M8 Thread to fit these parts.
- Make sure to leave at least 0,5m of space all around the machine for safety purposes.
- Molds and dies can be mounted to the extruder nozzle using a nozzle profile as shown below. Always use high temperature ceramic grease on the threads to prevent seizing of the threads. The face also indicated with the "keep sharp" header seals the insert to the extruder nozzle.



- The Extruder Pro 3kW version requires a power input of 380-400 Vac with a 16A supply. The machine comes with a 5P male plug.
- Only run the machine in well ventilated rooms, use suction devices with filtration to remove fumes while extruding.
- Make sure to remove the rubber seal on the deairation plug on the motor gearbox. This allows the gearbox to “breath” while running
- Be aware of smoke and fumes from the barrel during first heat up because of oil and grease residue from manufacturing.

4.1 Decommissioning

- Make sure the machine is cooled down
- Switch of the main switch and disconnect the extruder from the power supply
- Clean the machine from any residual plastics or other debris
- Dismantle the product in accordance with all the precautions imposed by the laws in force in the country of use. If required before demolishing request an inspection by the relevant authorities and relative report
- Proceed with disassembly of the individual components/parts and group them together
- according to the materials they are made of: (steel, stainless steel, aluminum, electrical parts, electronic parts).
- Clean all the disassembled parts.
- Dispose off / scrap the separated, segregated individual parts /materials in compliance with the laws in force in the country of use.

5.0 More

5.1 Online resources

Getting started can be overwhelming. Plastic recycling is a big topic and there is a lot to learn. We do our best to create online tools to help you find more information, resources and people to connect with:

Website

Our website explains everything around the project, from the history and mission, to machines, the community around it and which options are there to start recycling.

www.preciousplastic.com

Academy

The Academy is where you'll find video tutorials, tips, drawings and much more on topics like plastic, machines, product design, business and so on.

community.preciousplastic.com/academy

Map

There is a custom map to connect the Precious Plastic Universe. Find recycling spaces near you to push local plastic recycling in your area.

community.preciousplastic.com/map

Events

Find and share Precious Plastic events and meet people in real life. Meetups, presentations, conferences and more to start collaborating locally.

community.preciousplastic.com/events

How-to's_

How-to's are a tool for people to share step-by-step guides on how they tackle plastic waste. Learn how people around the world hack machines, make products, collect plastic and more.

community.preciousplastic.com/how-to

Bazar

The Bazar is a marketplace to buy and sell Precious Plastic machines, parts and products. Creating a new recycling economy, so entrepreneurs can recycle full time!

bazar.preciousplastic.com

Discord

As a community we make use of Discord to chat, learn from each other and answer questions. Besides the practical stuff it's also a great place to meet like-minded people and get inspired by other projects.

discord.com/invite/rnx7m4t

5.2 Community power

Precious Plastic comes with a worldwide community of collectors, machine builders, recyclers, designers, activists and more people sharing the mission to tackle plastic pollution.

It's fun to be part of a global community of like minded people, you can always find new interesting and wonderful human beings to connect to and exchange :) But it can also just be really really useful - if everyone takes part in it!

Get inspired

Many people working on the same topics means many different ideas and solutions. Following, connecting and exchanging with the community brings all the creative minds together and can result in something one person alone could have never done alone.

Learn and improve together

Working with plastic opens a big world of possibilities but also challenges and uncertainties. It's a lot about trying, failing, learning from failures and making it better the next time. By sharing those experiences (successes as well as failures), we can save each other a lot of time on the way and achieve better results much faster.

Make a positive impact

Finally, it creates a movement, a global army of people fighting plastic waste, helping each other and (instead of waiting for the system to change) making a positive change locally, and getting more people involved on the way.

5.3 Be part of it

There are several ways to participate in the community. Here are the main things you should keep in mind and why:

Put your Pin on the Map

Create your profile, describe your setup and activities and include links to your website, social media, Bazar account - whatever you want other people to find about you.

Why? This exposes you to the community, and generally people who want to connect and collaborate for a recycling project. It also helps us to get an overview of the active Precious Plastic community and potentially get you involved in our projects!

community.preciousplastic.com/map

Buy and sell on the Bazar

If you're looking for materials, machines or product around plastic recycling, or want to sell your own, do it on the Precious Plastic Bazar.

Why? It can be a lot easier for you to find what you need and enables other people to find you as a seller in the plastic recycling area. This way we can also highlight and feature you on our platforms - AND with every purchase or sale you directly support individuals in the community, and Precious Plastic to keep improving and running the platform.

bazar.preciousplastic.com/

Make How-to's

We understand that documenting is the boring part. However, this is also one of the most important parts of the project. Discord is a great place to share small highlights, but if you develop a product, machine hack or technique, the best way to document that is with a How-to.

Why? By sharing even just a small trick you learned, you can save others a lot of time and hassle and maybe even give them a good idea for another improvement or something completely else. Using all the different brains and backgrounds worldwide, we can develop better solutions much quicker. It's a global problem, which needs a global effort to be solved!

Tag us! #preciousplastic

When you share your process and creations with the world, please use #preciousplastic, or even better tag @realpreciousplastic in your text. Why?

Crediting: We give everything we develop away for free and enable thousands in the world to make some cash with recycling machines or products. So a little thank you in form of a mention should be easy to give back :)

Featuring: We are always stalking the community to find inspiring creations to feature and collaborate. But we can only do that on our social media or videos, if we actually FIND you and see that you are connected to Precious Plastic.

5.4 Feedback & Support

Your feedback is valuable!

Finding errors and typos in the Academy? Have an idea to improve the machines? Or other feedback for our solutions and platforms? Let us know! This is how we can improve Precious Plastic for you and for all the other people working on this.

The problems you encounter, inconsistencies, unclear descriptions or things that just feel like they could be improved is all very valuable feedback for us to fix issues and grow better, together.

The best place to give us this feedback is on the discord channel #feedback or via email to: community@preciousplastic.com

Support open-source solutions

We will always keep Precious Plastic developments open-source for everyone to benefit from. However, it's a constant challenge to fund this way of working. You can help us to continue this work with a **single donation** or by **supporting monthly on Patreon**.
support.preciousplastic.com

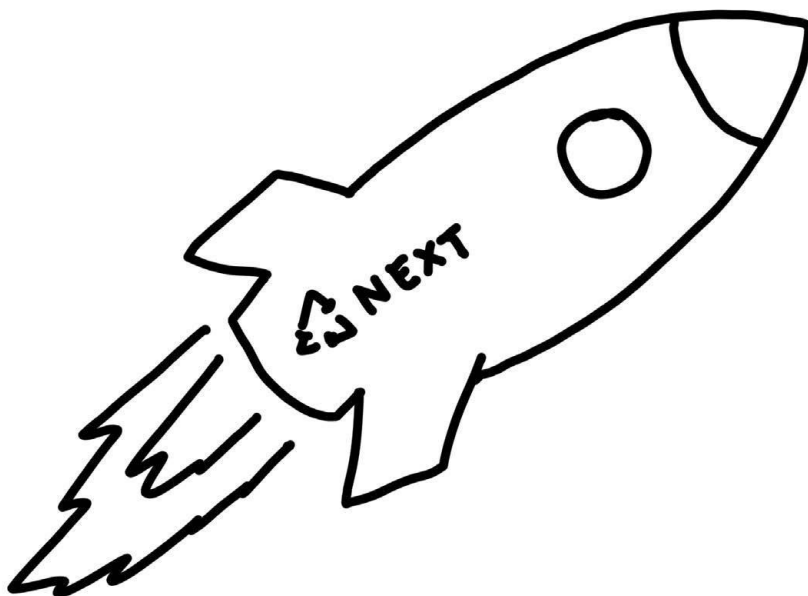
Precious Plastic is a project by **One Army**, tackling global problems to protect planet earth. We use a platform called Patreon, where everyone can become part and support these projects. Your money can fund materials for research and development, bills, rent, food for the team - and sometimes maybe a piece of chocolate :)
www.patreon.com/one_army

Thanks for your support! Hooray plastic recycling!

5.5 Take it to the next level

Precious Plastic provides you with the basic framework to run a recycling workspace effectively. It is up to you (and your team) to bring it to the next level. Create new products, new moulds, hack the machines, maybe make new ones, invent, collaborate with other craftsman, experiment, share your knowledge, teach other people, invent new reward systems to collect plastic or bring new people to the workspace - you never know where winning solutions will come from. Be open and collaborative.

We look forward to see where you and your team can take this project, pushing the limits of plastic!



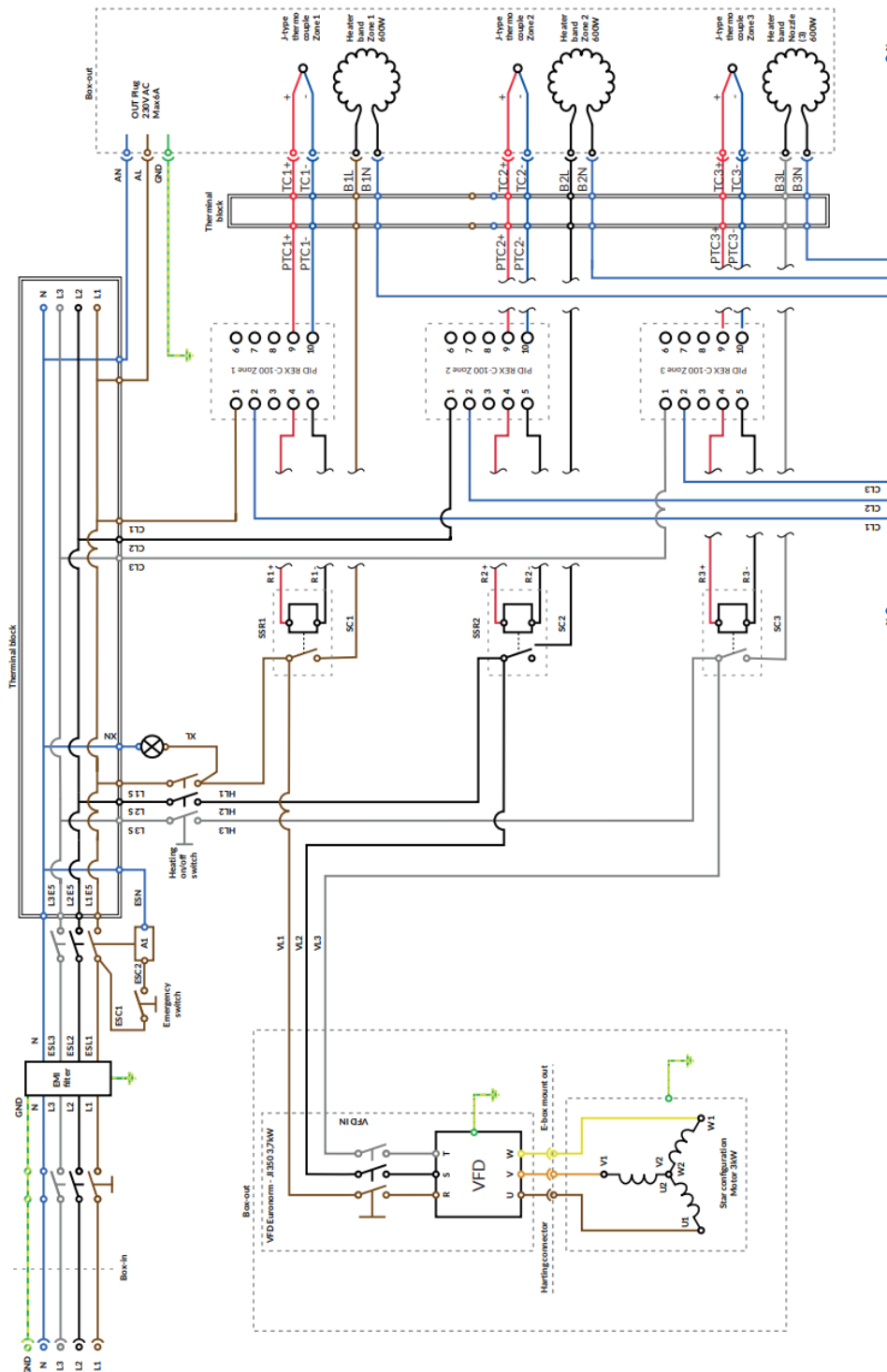
6.0 Technical Documents

6.1 List of recommended spares

Item	Details/Part no
Band Heaters	Wema DH500, d=40mm, b= 190 mm, Cable length = 800 mm, 600W
Thermocouples Bayonette type	Rokoma, Fe-CuNi J-type thermocouple, Tip 6mm, tip angle 118 degrees
PID controller	REX C100 - 240vac
40A SSRs	Fotek SSR-40DA
Replacement bearings	SKF - 32006 X
Replacement radial shaft seals	DIN 3760, 55 x 42 x 8 mm

6.2 Electrical control box

Below is a graphical representation of the control box wiring. Any work conducted inside the box shall be carried out by a licensed professional.



HAVE FUN!

