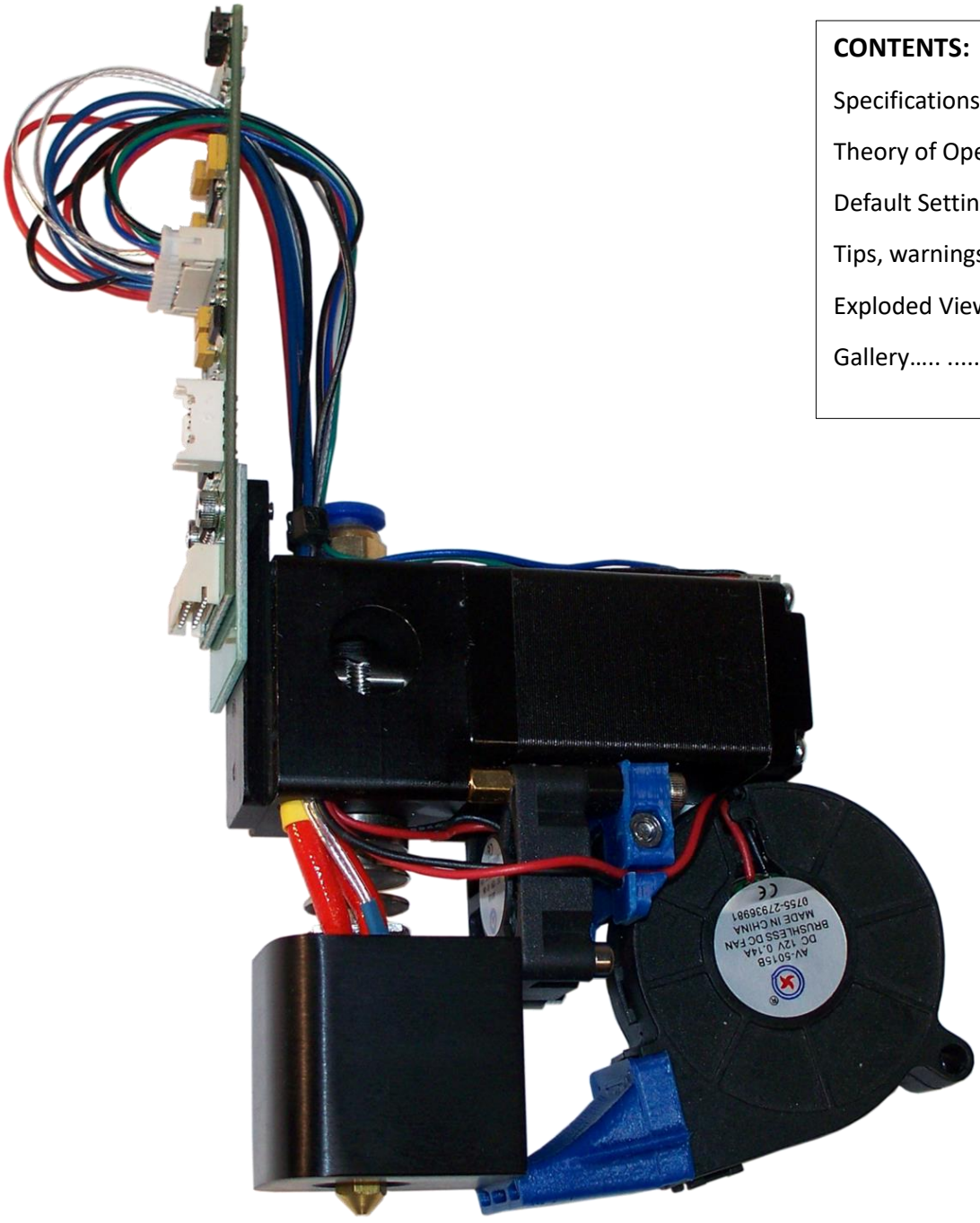
Filament Extruder MK1-450

Compatible with:

■ HYDRA Floor Model ■ HYDRA Bench Model ■ System 30M ■ Engine ■ Engine HD



CONTENTS:

Click Links below to watch MK1-450 videos:

Head Overview: https://www.youtube.com/watch?v=UvZMecXsHEM

Loading Material: https://www.youtube.com/watch?v=v2ifSlZ0qEw (same process)

Printing Tips: https://www.youtube.com/watch?v=Fg9omXlYR-Q

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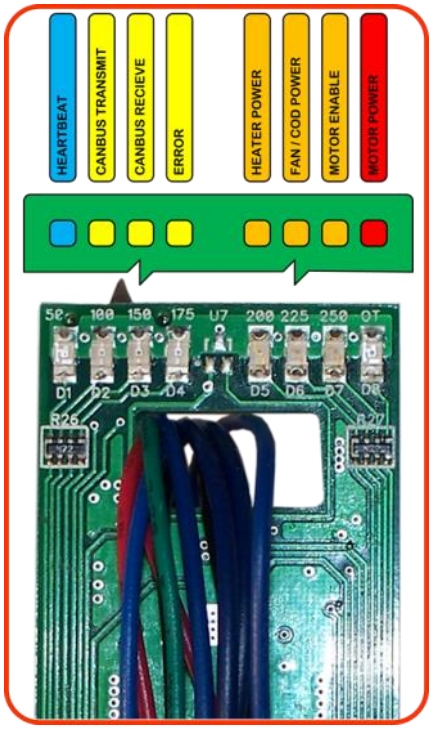
Specifications:

Operating Temperatures: 275°C minimum to 450°C maximum.
Programmable Start/Stop Dwell in milliseconds.
Programmable Prime/Unprime in pulses on feed motor.
Programmable Print Cooling Fan: 0 – 100%.
Weight: 600 grams, plus payload.
Power Supply: 12v, 3.5 amps max.
Interface: CanBus or TTL.



Manual Feed Control

Status LEDs

Smart Controller

Programming Port

Direct Drive Stepper

Printed Material Cooling Fan

Side Access or Inspection Port (reverse side) + Cleaning

Fusion Chamber behind insulated heat shield

Brass Nozzle; 0.5mm default; other sizes available.

Theory of Operation:

The MK1-450 Print head was designed to operate with most 1.75mm diameter filaments on the open market today, including: PEEK (PolyEtherEtherKetone), PC (PolyCarbonate), and various flavors of Ultem.

WARNING/CAUTION: Lower temperature (under 350°C) filaments, including PC, should be printed with one MK1-450, and higher temperature (over 350°C filaments should be printed with a second MK1-450. Changing back and forth between higher and lower temperature filaments with a single MK1-450 WILL NOT WORK.

WARNING/CAUTION: This head is NOT designed for use with FLEXIBLE or LOW TEMPERATURE filaments; please see the MK2-250 for flexible filaments and the MK1-250 for low temperature (under 260°C) filaments. Consult http://hyrel3d.net/wiki/index.php/Materials for a list of which materials are recommended for which heads.

The nozzle is made of brass, and comes with 0.50mm standard; 0.40mm and 0.30mm nozzles are available for order from Hyrel3D. See page 7 for instructions on changing nozzles.

The MK1-450 will give thousands of hours of printing typical before ANY maintenance is needed.

The side access port allows the drive area to be inspected, and the filament drive teeth to be cleaned with a vacuum cleaner - without the need to dismount the print head in most cases. KEEP IT CLEAN and it will work great.

Hyrel's *Cleaning on the Fly* (patent pending) allows for a clean during print option, to insure the prints running greater than 1000 hours can be achieved.

Due to the temperatures involved, the MK1-450 has an internal stainless steel material delivery chute, which mates with the proprietary brass nozzle; this ensures no voids for material buildup. A fan keeps the material cool until it enters the fusion chamber.

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MK1 Settings:
Used to manage control of the head.

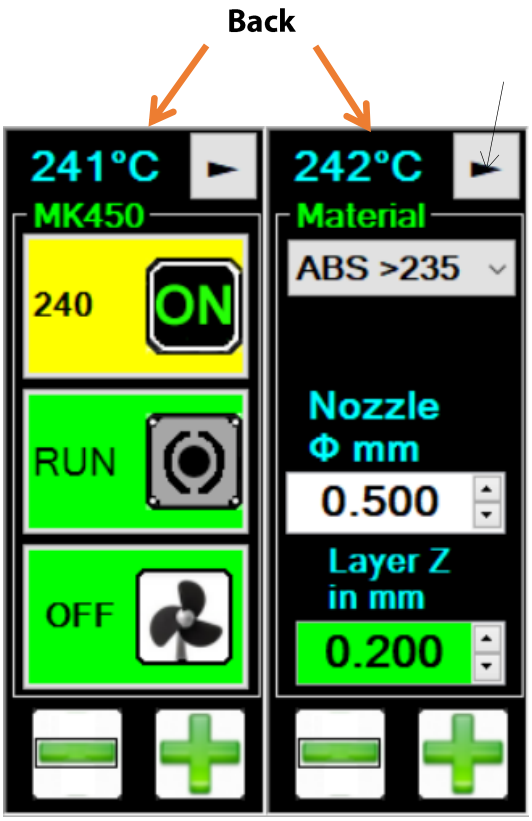
Live Temperature:
In Celsius.

Heater:
On/Off and default value.

Motor:
On/Off and manual speed feed control.

Fan:
On/Off and default value.

- and + :
Adjust the value last clicked.



Navigation:
Click to move to the next page.

Material:
Sources in defaults. *Note: gcode will override this setting.*

Color:
To represent this head.

Nozzle Diameter in mm :
Crucial for flow calculations.

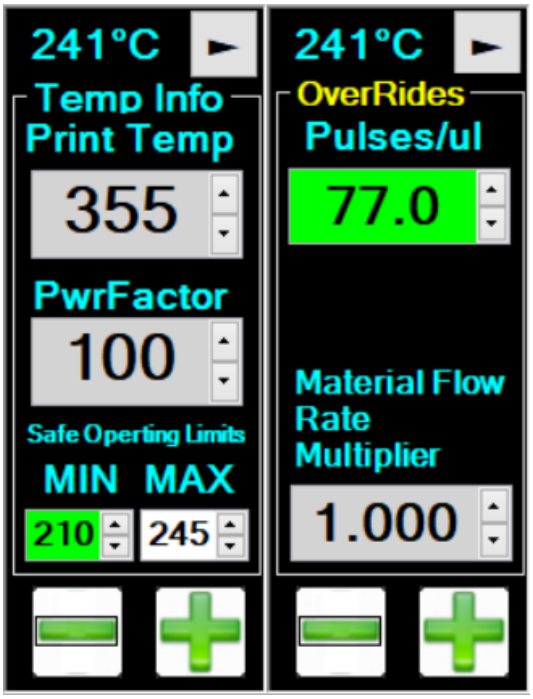
Layer Z in m:
Initial value. *Note: gcode will override this setting.*

Temp Info:
Used to manage control of the head.

Print Temp:
Default, in Celsius. *Note: gcode will override this setting.*

PwrFactor:
For heater – normally 100.

Min, Max :
Safe range for the head.



Overrides:
To adjust flow rates live.

Pulses:
Pulses on the motor to generate
10 nanoliters (v2.x) or
1 microliter (v3.x)

Feed Rate % :
Live, direct modifier to **Pulses** setting. Adjust the actual flow rate as a percent of the calculated value.

For more information: http://hyrel3d.net/wiki/index.php/MK1-450

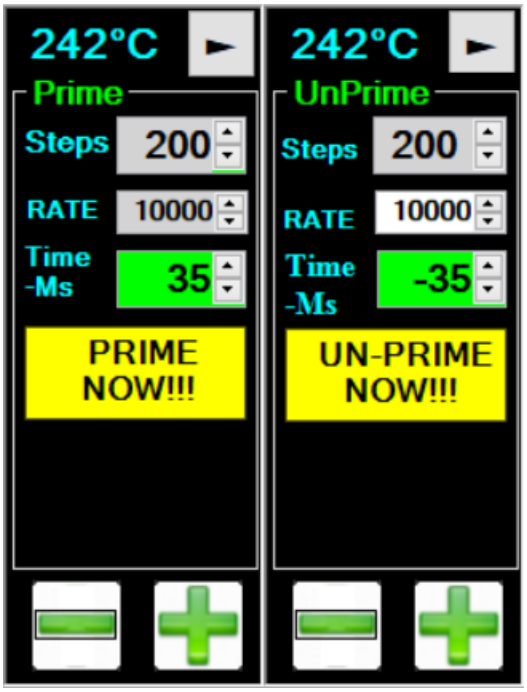
Prime Settings:
Used when starting the flow of filament.

Steps:
Number of steps to start the flow of filament.

Rate of Steps:
Default 10,000.

Dwell Time:
In milliseconds after the prime starts before starting motion.

 # After Tool Change:
Iterations to perform after a tool change.



UnPrime Settings:
Used when ending the flow of filament.

Steps:
Number of steps to stop the flow of filament.

Rate of Steps:
Default 10,000.

Dwell Time:
In milliseconds after the unprime starts before starting motion.

 # Before Tool Change:
Iterations to perform before a tool change.

Offsets:

Clone Head:
Used for parallel printing - multiple copies concurrently.

Offsets:
Used when multiple heads cooperate on a build. Ping pong and support material.

GOTO X//Y Offset:
Used to confirm X/Y offset calibration.

Grab:
Captures current X/Y offset for this head.

Head Model:

Model:
Type of head.

RTD TYpe:
For proper temperature table. *Most heads since 2015 should have 1K_PLAT selected.*

Motor Current:
For drive motor.

Step Mode:
For microstep resolution.

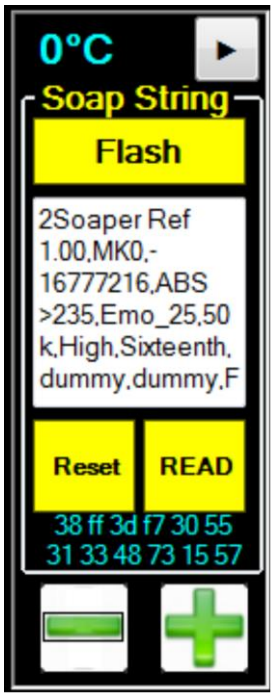
Soap String:
To store and read values.

Flash:
Right-click to store current values as defaults on this head.

Com Window :
For diagnostics, advanced status, and firmware version.

Reset :
Performs soft reset; discards current values, reloads defaults from head.

Read :
Returns firmware version info.



Please note:

These values are all initial, default values.

Your gcode will overwrite some of these values, and *can, if you specify,* explicitly declare most of them.

The printer will keep the last value for each variable persistently in memory.

If a mouse click or a gcode entry subsequently provides a new value, *that new value* will be persistent until *another, newer* value is set for that parameter on that head.

For current default parameters for Hot Flow heads, see http://hyrel3d.net/wiki/index.php/Hot_Flow

TIPS:

NEVER let your print head just sit for long periods of time while hot. The plastic can degrade and leave residue on the inside of the print nozzle.

ALWAYS preheat your print head, and run the filament manually for 5-30 seconds before printing. This will insure that the nozzle is clean and ready for action.

Printing Tips: https://www.youtube.com/watch?v=Fg9omXlYR-Q

ADDITIONAL WARNINGS:

WARNING/CAUTION: The fusion chamber and nozzle are EXTREMELY HOT, care must be taken not to touch by hand while hot.

MAINTENANCE:

Keep your drive teeth clean: simply vacuum from the side access port once every few days of printing.

Use care when installing the head into the yoke, due to its long format, it is possible for the connection point to be misaligned.

How to disassemble the nozzle from the MK1 head:

Carefully:
1. Heat to the printing temperature of the material loaded.
2. Move the manual lever to the left, retracting material until it is free of the hobbed shaft, then remove by hand.
3. Turn off heat to the head and remove it from the yoke.
4. With a 1/4" driver or wrench, remove the nozzle.
5. Inspect the nozzle cavity for any stray material; if found, remove with tweezers, solvent, air pressure or other means.

How to reassemble the nozzle on an MK1 head:

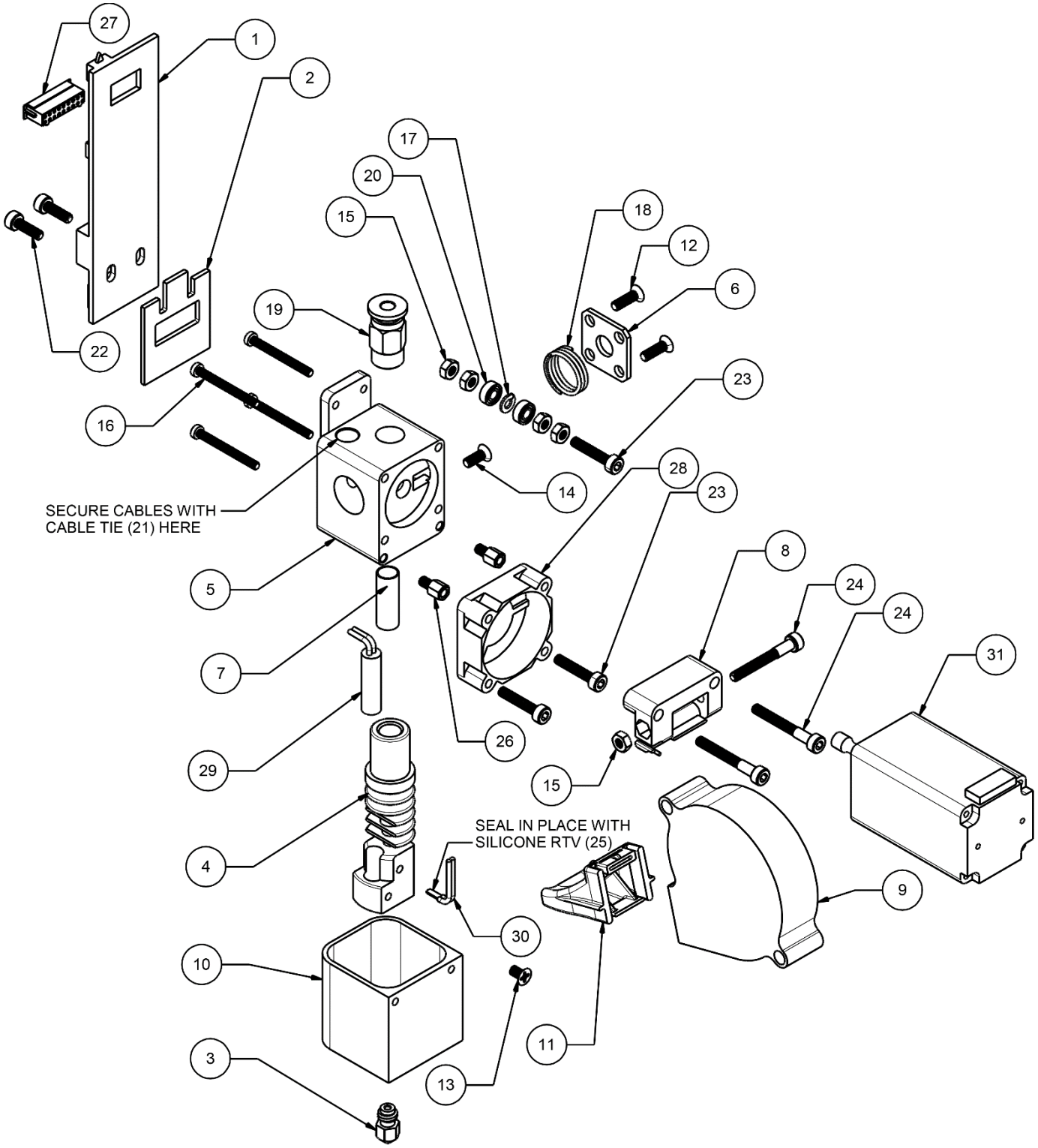
Carefully:
1. Ensure your MK1 has no filament loaded.
2. With a 1/4" driver or wrench, attach the nozzle.
3. Use normal procedure for heating and loading filament.

DISCLAIMER:

Use at your own risk!

No warranty or guarantee is offered for the application of this product. The user agrees to be ENTIRELY responsible for safe operation of this product.

MK1-450 Exploded View



MK1-450 BOM

Item #	QTY	Part #	Part Name
1	1	102081	102081.ExtrusionHeadCircuitBoardModelRepresentation
2	1	102508	102508.PCBSpacerStop.H3D
3	1	102512-1.75P	102512-1.75P.HOTTIP.1.75mmFilament.PURCHASED
4	1	102514-5	102514-5.STAINLESS 350C TUBE.H3D
5	1	102533-5	102533-5.MK1-400 Body
6	1	102536-1	102536-1.Spring.Cover.MK1.H3D.v2
7	1	102538	102538.PTFE.For High Temp
8	1	103109-1	103109-1 MK450 BLOWER MOUNT
9	1	103109-3	103109-3.QUIETSTORMBLOWER
10	1	103121-1	103121-1 MK350 Insulating Shroud
11	1	103122	103122_Mk1-400_Blower nozzle
12	2	200086-10	200086-10.Screw,M3x10mm.FlatPhil
13	1	200086-5	200086-5.SCREW,M3X5MM,FLATPHIL
14	1	200086-8	200086-8.Screw,M3x8mm.FlatPhil
15	5	200088	200088.Nut,Hex,M3
16	4	200092-25	200092-25.M2.5x25.Pan.92000A112
17	1	200113	200113.M3lockwasher.92153A416
18	1	200127-.75	200127-.75.Spring.Compression .75x.48x.045.9657K291
19	1	200140-4	200140-4.4mmBowdenTubeConnector
20	2	200170	200170.3x7x2.5mm.bearing
21	1	200225	200225.Cable Tie, 0.075" x 3"
22	2	200303-10	200303-10.M3x10.SocketHead.Screw.SS.91292A113
23	3	200303-16	200303-16.M3x16.SocketCap.92290A120
24	3	200303-25	200303-25.M3X25.SOCKETCAP.91292A020
25	0.3	200509-2.8	200509-2.8 Silicone RTV, 2.8 oz
26	2	203056	203056.M3X5+6.STANDOFF
27	1	300015-18	300015-18.Conn, HOUSING PHD 2mm 18POS
28	1	300132	300132 30x30x10.5mm.fan
29	1	301450-40	301450-40 Heating Element, 40W
30	1	420018	420018.RTD Assembly
31	1	420019-1	420019-1.MOTOR.STEPPING.0.8A.28X28X52MM

SAMPLE PRINTS:

Some prints from the MK1-450 print head on a Hyrel 3D printer:.

Ultem	PolyCarbonate	PEEK