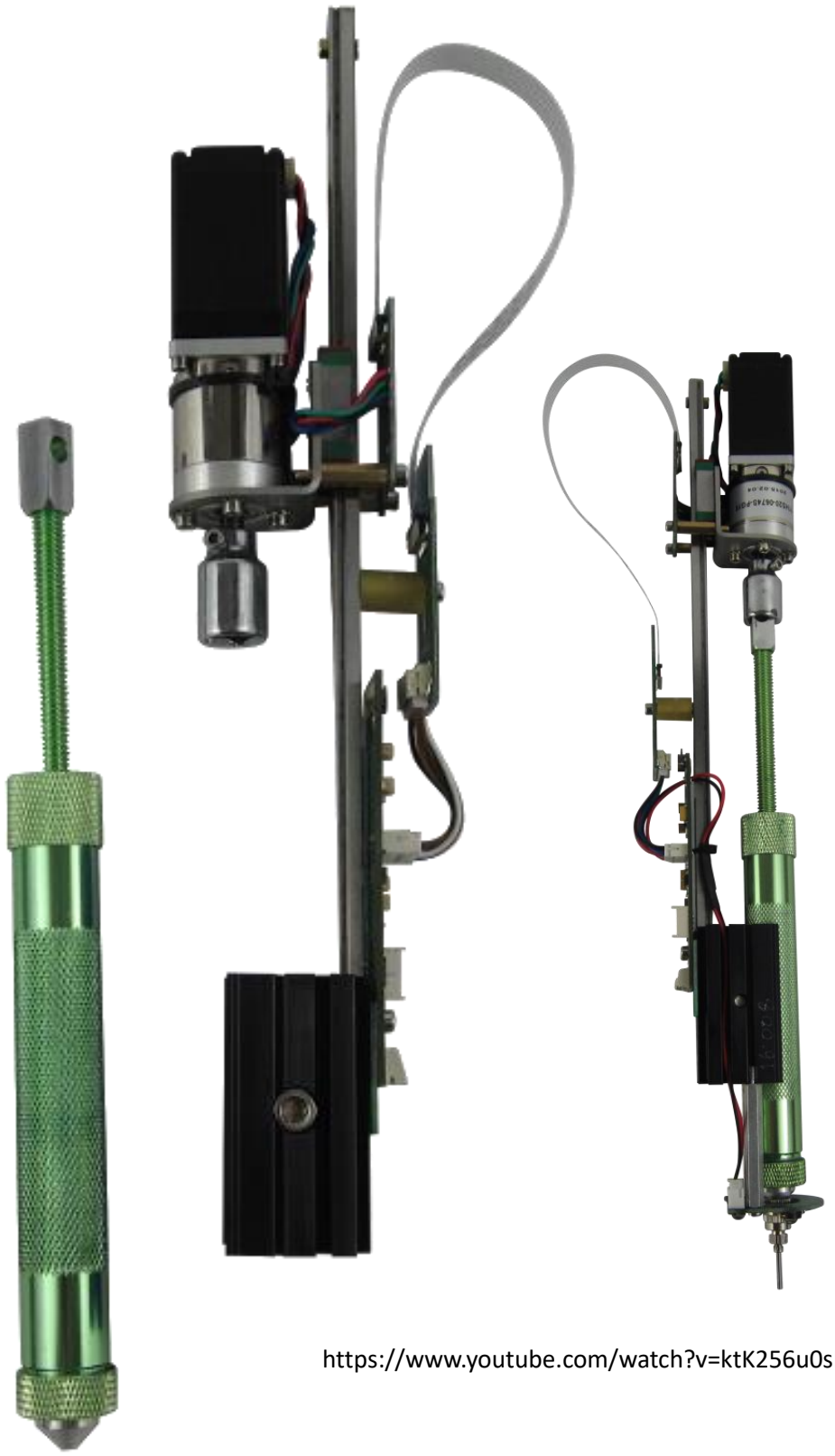
Extrusion Heads EMO-25 and COD-25

Compatible with:

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



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https://www.youtube.com/watch?v=ktK256u0sN8

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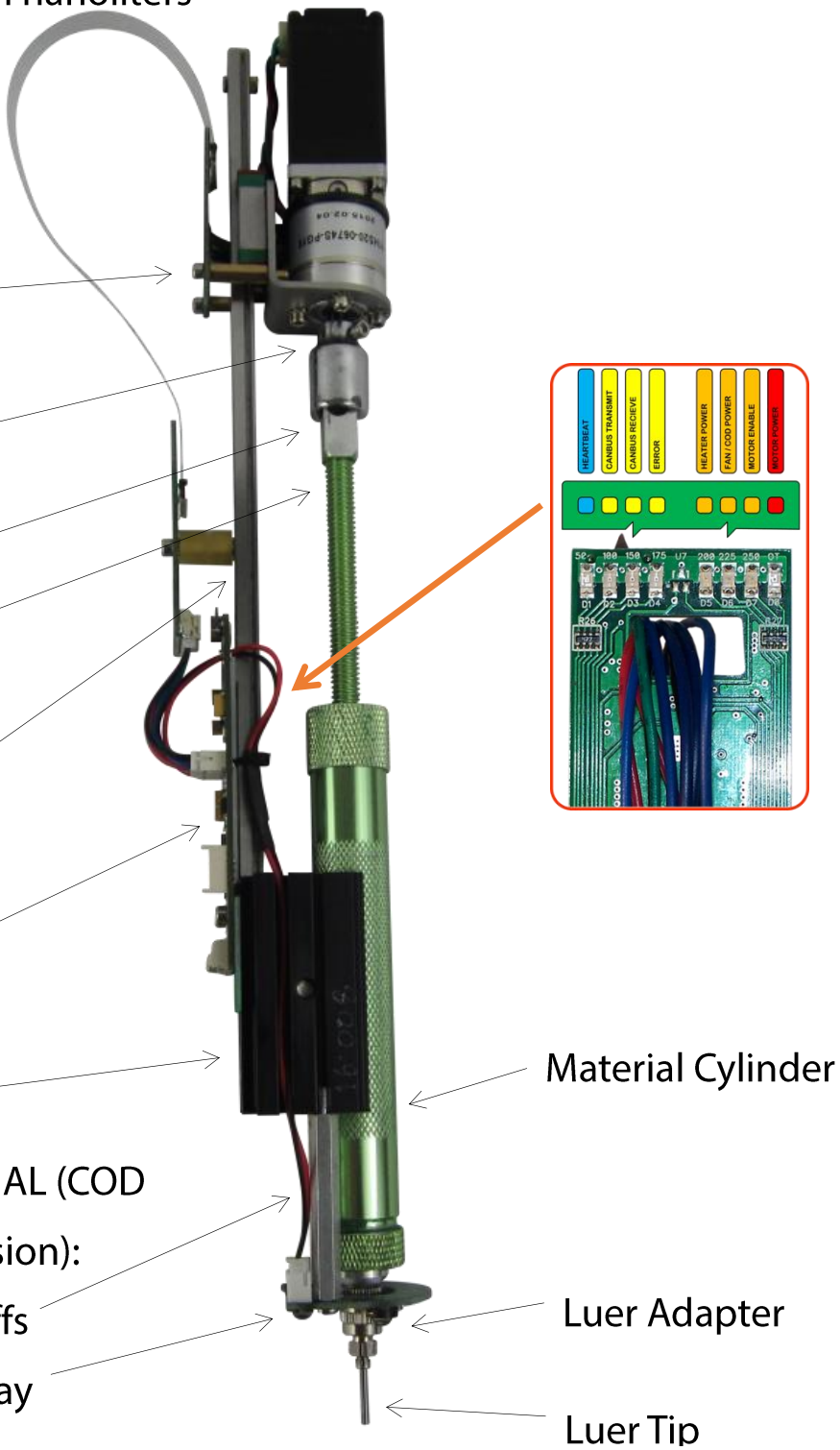
Specifications:

Programmable start/stop dwell in milliseconds
Programmable Prime/Unprime in nanoliters
Weight 600 grams, plus payload
Material Capacity, 25cc
Power supply, 12v 2 amps max
Interface, CanBus or TTL



Nozzles:

The dispensing end of the EMO25 can be easily configured to meet the wide variety of materials that it can dispense.

From clay to silicone, the possibilities are limitless.

Using the Luer Kit, you can purchase adapter needles at low cost from local hardware suppliers, such as McMaster Carr.
Typical working diameters are from <250 microns for liquid like substances, to 2mm for very stiff materials such as clays.

Theory of Operation:

The EMO series of Extruders is designed to allow materials that can be emulsified, to be dispensed (printed), in a controlled way.

The number of actual possible materials is vast, but we will list a few of our favorite materials to give you an idea.

Plasticine, (oil based clay, kids love it, and it can be reused). clays, porcelain, metal clays, pastes, gels, custom emulsions.

While it is possible to print with food products, we do NOT recommend it, due to the difficulty of insuring sanitary conditions.

The EMO- and COD- series of extruder heads All have smart controllers, and up to 4 heads can be loaded in a Hyrel Printer at a time. This allows mixing of materials, or parallel printing of high volume small parts.

The cylinder is loaded with the desired material, taking care not to get air inside the cylinder, the cylinder is loaded into the EMO cylinder Clamp, and held with moderate force (hand tight, firm but not so hard as to distort the cylinder).

The drive motor will turn at the desired rate when printing. The drive speed is controlled by head settings and the actual velocity of the print head, as set by the F argument in G1 commands.

Generally speaking, you can print with the same code that you print plastic with.

Make sure to clean your cylinders after using them, leaving material inside will almost certainly ruin the cylinders.

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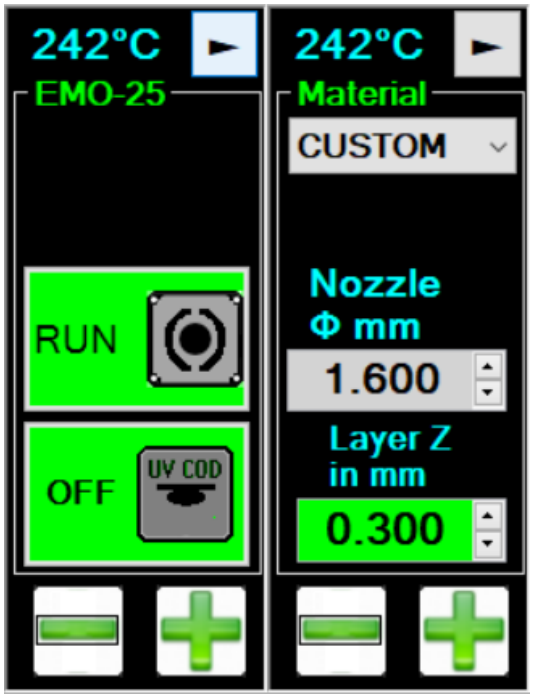
EMO Settings:
Used to manage control of the head.

Live Temperature:
In Celsius.

Motor:
On/Off and manual speed feed control.



Navigation:
Click to move to the next page.

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

Nozzle Diameter in mm :
Crucial for flow calculations.

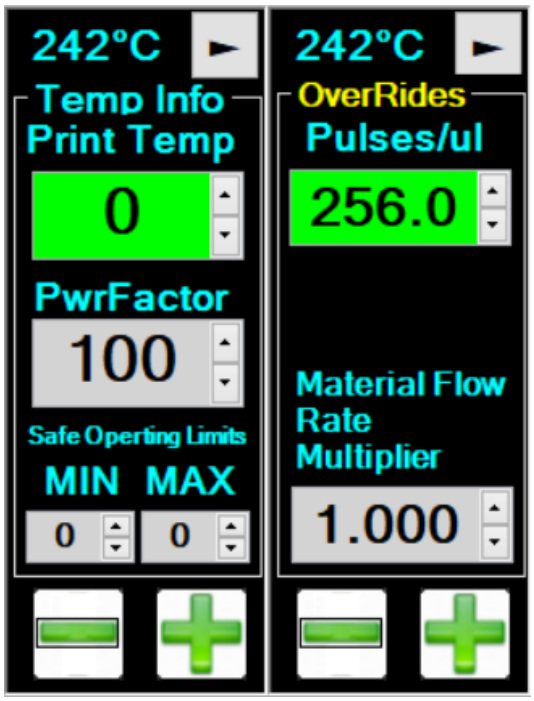
Layer Z in m:
Initial value. *Note: gcode will override this setting.*

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)
(27:1 ratio: 256 pulses/ul)

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

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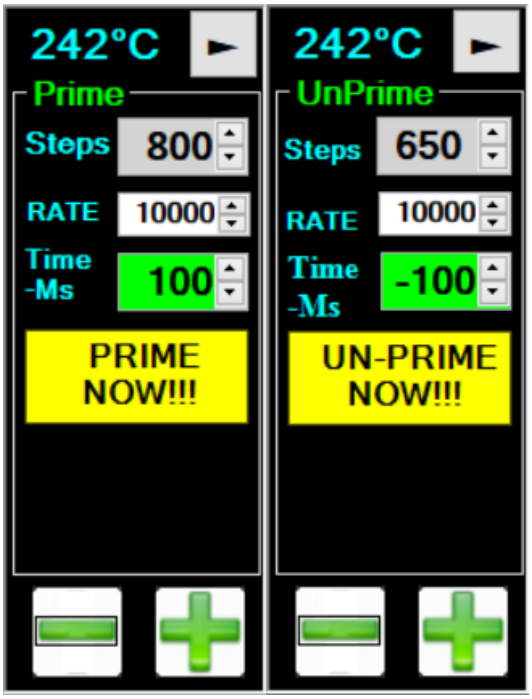
Prime Settings:
Used when starting the flow of filament.

Steps:
Number of steps to start the flow of filament.
(27:1 ratio: 800 steps)

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.
(27:1 ratio: 650 steps)

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.

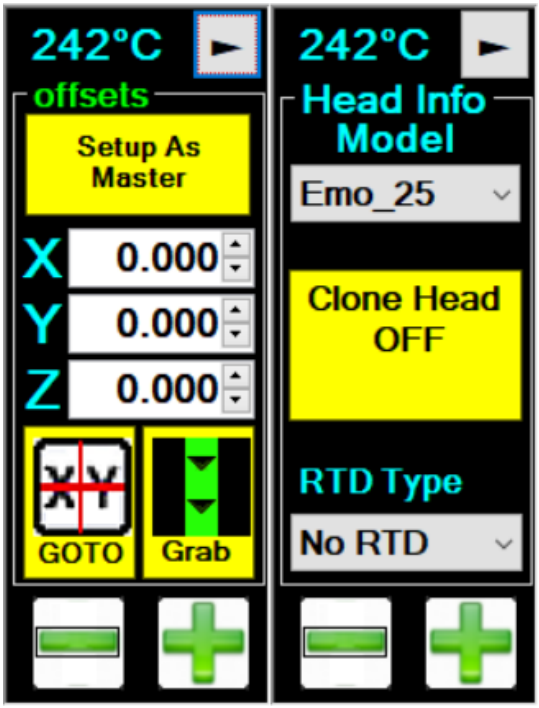
Offsets:

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.

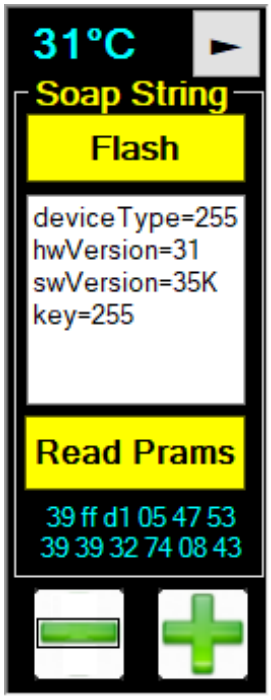
Step Mode:
For microstep resolution.

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.

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.

With our recipes, the layer thickness will be overwritten.

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 Cold Flow heads, see http://hyrel3d.net/wiki/index.php/Cold_Flow

Settings for Cold and Warm Flow Heads with METAL Reservoirs

Settings	EMO, VOL, KRA, COD, VCD, KCD Heads *and New KR2* (17mm Tubes, Various Gear Ratios)				
	19:1 Ratio	**27:1 Ratio**	**51:1 Ratio**	**100:1 KRA**	**100:1 KR2**
Material					
Type	Custom	Custom	Custom	Custom	Custom
Color	(any)	(any)	(any)	(any)	(any)
Nozzle	1.600	1.600	1.600	1.600	1.600
Layer	0.300	0.300	0.300	0.300	0.300
Temp Info					
Print Temp	35	35	35	35	35
Power Factor	100	100	100	100	100
Minimum	0	0	0	0	0
Maximum	0/100/200	0/100/200	0/100/200	0/100/200	0/100/200
Overrides					
Pulses: v2.x	***1.6***	***2.3***	***4.7***	***9.0***	***15.0***
Pulses: v3.x	***176***	***256***	***517***	***1000***	***825***
Feed Rate %	1.000	1.000	1.000	1.000	1.000 2.000
Prime *Please note that Prime values will vary greatly from those shown, depending on the compressibility of your material.*					
Steps	600	800	1000	3000	6000
Rate	10,000	10,000	10,000	10,000	10,000
Dwell Time (ms)	100	100	100	300	600
Before Tool Change	1	1	1	1	1
Unprime *Please note that Unprime values will vary greatly from those shown, depending on the compressibility of your material.*					
Steps	500	650	800	2500	5000
Rate	10,000	10,000	10,000	10,000	10,000
Dwell Time (ms): v2.x	***100***	***100***	***100***	***250***	***500***
Dwell Time (ms): v3.x	***-100***	***-100***	***-100***	***-250***	***-500***
After Tool Change	1	1	1	1	1
Offsets					
Clone Head	Off	Off	Off	Off	Off
X	0,000	0,000	0,000	0,000	0,000
Y	0,000	0,000	0,000	0,000	0,000
Z	0,000	0,000	0,000	0,000	0,000
Head Info					
Model	(varies)	(varies)	(varies)	(varies)	(varies)
RTD Type	1k PLAT_RTD	1k PLAT_RTD	1k PLAT_RTD	1k PLAT_RTD	1k PLAT_RTD
Motor Current	High	High	High	High	High
Step Mode	Sixteenth	Sixteenth	Sixteenth	Sixteenth	Sixteenth
Settings	**19:1 Ratio**	**27:1 Ratio**	**51:1 Ratio**	**100:1 Ratio**	**100:1 KR2**
	EMO, VOL, KRA, COD, VCD, KCD Heads *and New KR2* (17mm Tubes, Various Gear Ratios)				

Using the EMO:

The EMO-25 is one of the best print heads for learning the basics of 3D printing. Many of the materials, such as plasticene can be used over and over again.

Basically mount the EMO head on your printer yoke, load the material cylinder , and print...

We do NOT recommend printing food with the EMO-25, just because it can be done, does not mean it should be done.

Once the head is installed, the EMO cylinders can be changed without removing the head from the yoke if you Use care, this will make it fast and easy to swap out materials, or make large prints.

Additional Help:

Check our **YouTube** channel
https://www.youtube.com/channel/UCT-48K-0Y4xoTvbJCjyDFXA/videos
and look for key words;
“Hyrel”, “Emo”, “Clay”, “Silicone”, “Porcelain”

You will find many examples of how to use your EMO.

For more information:

hyrel3d.net/wiki/index.php/EMO & hyrel3d.net/wiki/index.php/COD

Loading material on the EMO:

1. Remove head from printer.

2. Remove reservoir from head. Allow to cool if needed.

* If needed, invert reservoir now (nozzle up), and keep inverted until nozzle is reattached.

3. Remove nozzle collar and nozzle.

4. Remove plunger collar, but do not remove plunger.

5. Add material from the bottom, displacing the plunger as material is added, to avoid air pockets.

6. Attach plunger collar.

7. Attach nozzle collar and nozzle.

8. Purge any air introduced between nozzle and reservoir.

9. Load reservoir into head.

10. Load head into printer.

Changing nozzles on the EMO:

1. Remove head from printer.

2. Remove reservoir from head. Allow to cool if needed.

* If needed, invert reservoir now (nozzle up), and keep inverted until nozzle is reattached.

3. Remove nozzle collar and nozzle.

4. Insert new nozzle into nozzle collar.

5. Attach nozzle collar and nozzle.

6. Purge any air introduced between nozzle and reservoir.

7. Load reservoir into head.

8. Load head into printer.

For Luer Tips:

1. Remove head from printer.
2. Remove reservoir from head. Allow to cool if needed.

* If needed, invert reservoir now (nozzle up), and keep inverted until nozzle is reattached.

3. Remove old luer tip by twisting counter-clockwise.
4. Attach new luer tip by twisting clockwise.
5. Purge any air introduced between luer tip adapter and luer tip.
6. Load reservoir into head.
7. Load head into printer.

TIPS:

Keep your cylinders CLEAN. Material that dries inside the cylinder is the number one cause of failures.

NO AIR should be inside the EMO-25, pack your cylinders carefully, it will make the material delivery spongy and sharp start and stop will be impossible.

NEVER put flammable material, such as Gasoline in your EMO, the cylinder can achieve several hundred PSI in pressure, and this could case self ignition.

ALWAYS USE good ventilation when using the EMO, many of the interesting materials will emit toxic fumes.

Maintenance:

Keep your EMO clean, do not allow material to get in the linear bearing.

CLEAN your cylinders IMMEDIATELY after use, this will insure that you have trouble free operation.

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

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.

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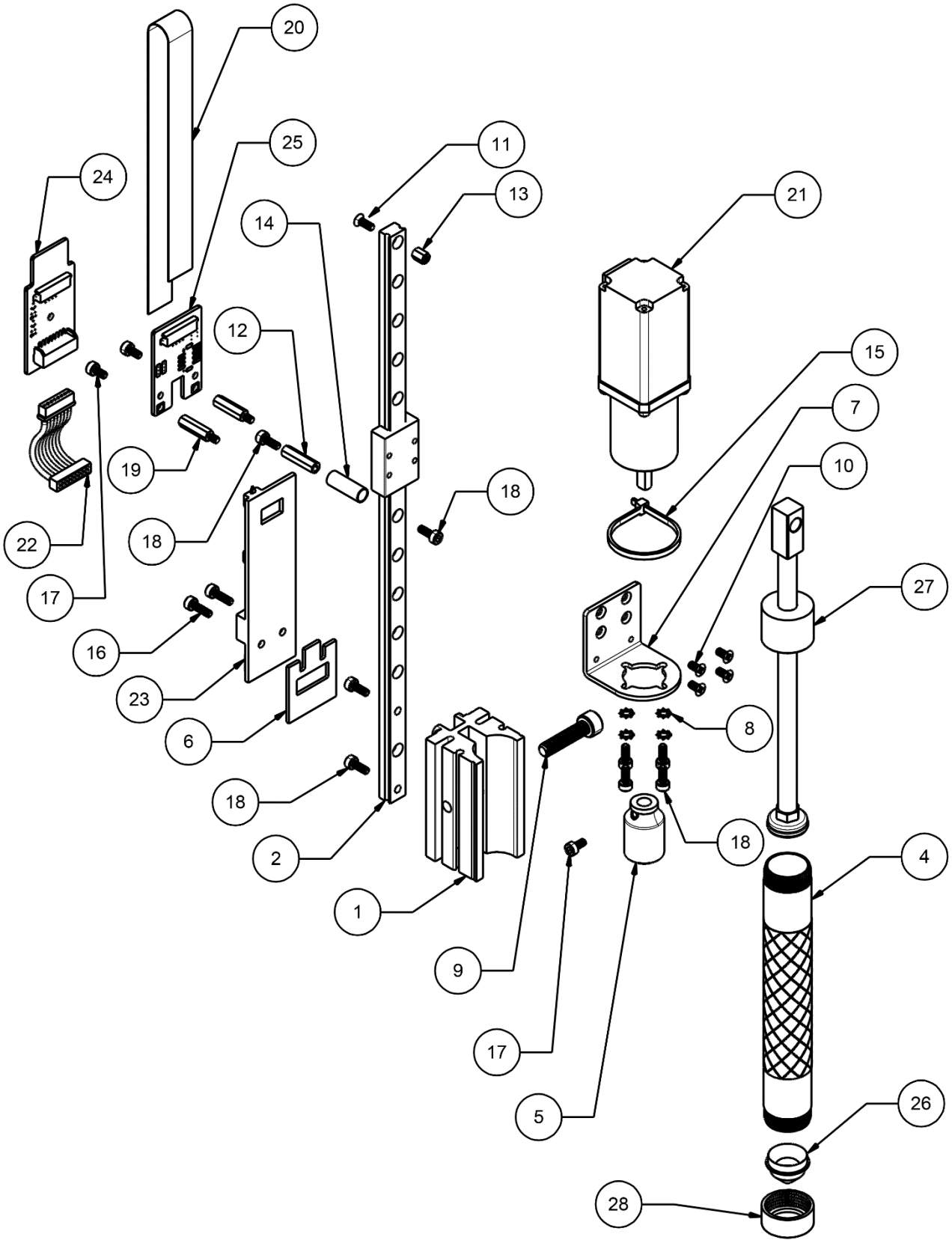

Item #	Qty.	Part Number	Part Name
1	1	102401-6	102401-6.FEED.MOUNT.GRIPPER.V5.EMO.H3D
2	1	102408-AS2	102408-AS2.BEARING.RAIL.ASSEMBLY
3	1	102416	102416.PlungerTube.ExtrusionHead
4	1	102424	102414.ExtruderTube.ExtrusionHead.H3D
5	1	102428	102428.EMO25.ShaftHead.GR
6	1	102508	102508.PCBSpacerStop.H3D
7	1	102527	102527.EMO25.GR.Body
8	4	200045-1	200045-1.Washer,M3,Lock,Star
9	1	200072-25	200072-25.M6x25.Socket.Head.Screw.91292A138
10	4	200086-6	200086-6.Screw,M3x6mm,FlatPhil
11	1	200086-8	200086-8.Screw,M3x8mm.FlatPhil
12	1	200101-18	200101-18.STANDOFF - M3X15, HEX, FF, BRASS
13	1	200101-6	200101-6.M3x6.FF.Standoff.94868A162
14	1	200223-1	200223-1.RubberStop
15	1	200224	200224.CableTie..1x6inch
16	2	200303-10	200303-10.M3x10.SocketHead.Screw.SS.91292A113
17	3	200303-6	200303-6.M3x6mm.SocketHead
18	8	200303-8	200303-8.Screw,M3x8mm,SocketCap
19	2	203166	203166.M3x16+6.STANDOFF
20	1	300053	300053_Cable Flat Flex 12x1mm x 10
21	1	400105-27	300311.GearMotorReduction27
22	1	420034	420034 Bridge Cable Bundle
23	1	500207-3	500207.EXTRUSIONHEADCIRCUITBOARD
24	1	500266	500266.EMO.HotHeadSide.Board
25	1	500625	500265 EMO Top Board
26	1	Reference	102407-1.EXTRUDERTIP.EXTRUSIONHEAD.H3D
27	1	Reference	102415.Cartridge Plunger.ExtrusionHead.H3D
28	1	Reference	102413.ExtruderTipCap.ExtrusionHead.H3D

Photoinitiated Crosslinking: the EMO (Emulsion On demand) becomes the COD (Crosslinking On Demand).

The M106 command, used to control the fan which cools deposited material on the MK-series heads, controls the UV LED array on crosslinking heads. This functionality is the same on all COD heads, as well as the CSD, VCD, and KCD heads.

M106 T# S0 ; sets the COD LEDs (or fan) to 0% (off)

M106 T# S25 ; sets the COD LEDs (or fan) to 25%

M106 T# S100 ; sets the COD LEDs (or fan) to 100%

Note: T#, where # can be any of the following:

10 for yoke 1, ALL heads; or

11 for yoke 1, head 1; or

12 for yoke 1, head 2; or

13 for yoke 1, head 3; or

14 for yoke 1, head 4; or

15 for yoke 1, head 5; or

Left blank, to address the "currently active" head.

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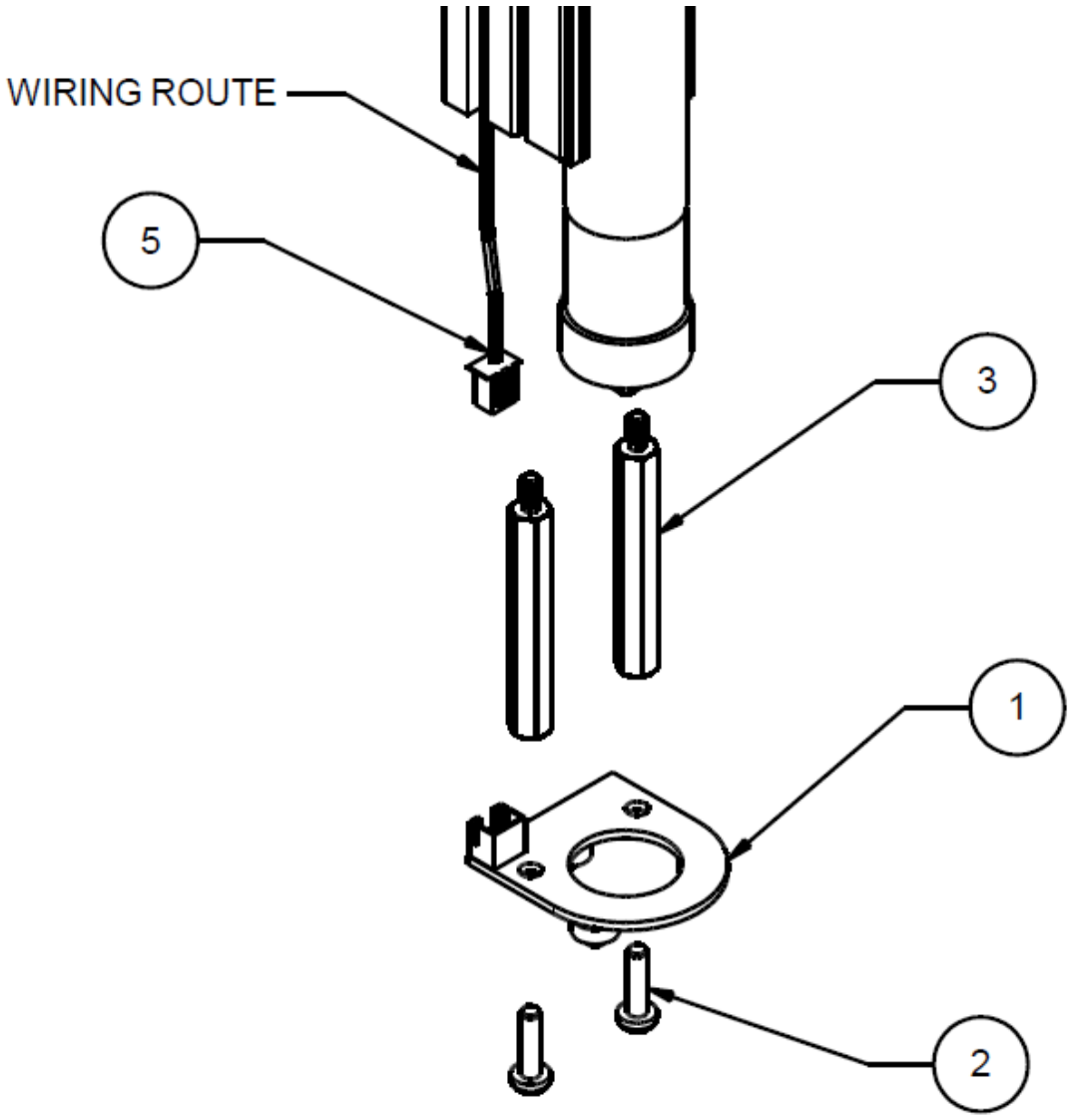

Item #	QTY	Part #	Part Name
1	1	102203	102203 COD Led board
2	2	200049-8	200049-8_Screw 6-32 x .50 PanHd
3	2	203059	203059.6-32x1.75+.25 Standoff M-F
4	1	402098-2	EMO 25 Assembly
5	1	420044	420044 COD Cable Assembly