



Extrusion Heads KRA-15 and KCD-15

Compatible with:

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



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<https://www.youtube.com/watch?v=tLHpaePTP-k&feature=youtu.be>



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Specifications:

Programmable start/stop dwell in milliseconds

Programmable Prime/Unprime in nano-liters

Weight 600 grams, plus payload

Material Capacity, 15cc

Power supply, 12v 2 amps max

Interface, CanBus or TTL

Planetary Gear Drive

100:1 standard

Motivator Sled

Drive Socket

Linear Bearing Rail

Drive Shaft

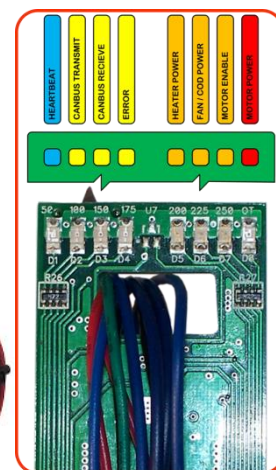
Heated Cylinder Clamp

Material Cylinder

Luer Adapter

Luer Tip

Smart controller



Standoffs

LED Array (KCD)



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Nozzles:

The dispensing end of the KRA-15 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 1.6mm (14#) for very stiff materials such as clays.





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Theory of Operation:

The KRA series of extruders is designed to allow materials that can be emulsified, to be dispensed (printed), in a controlled way at up to 200°C with added insulation, or 180°C without.

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

Clays, pastes, gels, custom emulsions and resins, hot glues (including 3M 3796).

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

The KRA- and KCD- series of extruder heads all have smart controllers and independent temperature control (up to 200°C, 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 KRA cylinder heater/clamp with the bottom ring removed and the top ring loose, and then those rings are secured. The cylinder is 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 KCD 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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KRA 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.



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:

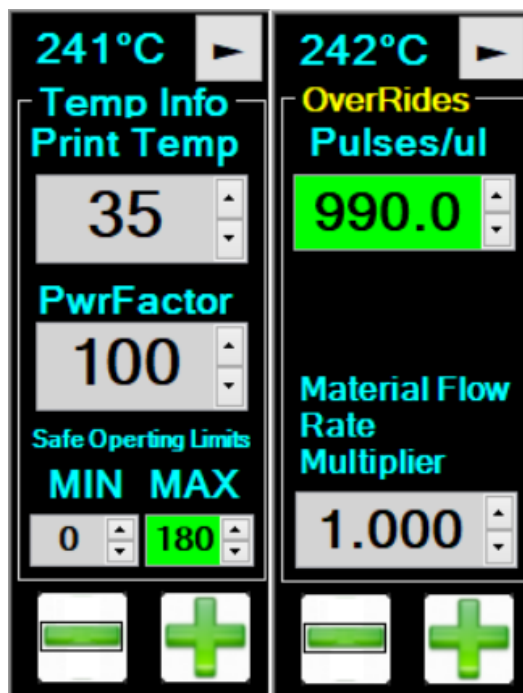
Default, in Celsius. *Note: gcode will override this setting.*

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)

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.

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.



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Soap String:

To store and read values.

Flash:

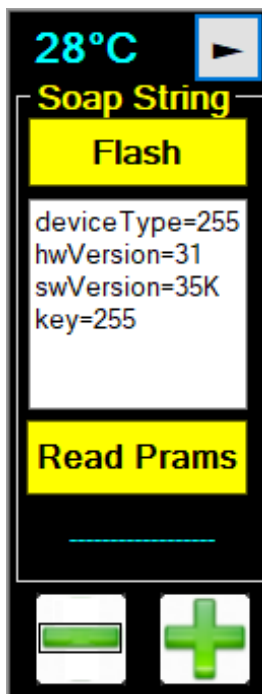
Right-click to store current values as defaults on this head.

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.

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



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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)				



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Using the KRA:

The KRA-15 is one of the best print heads for learning the basics of 3D printing. Many of the materials, such as plasticine can be used over and over again.

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

We do NOT recommend printing food with the KRA-15, just because it can be done, does not mean it should be done.

Once the head is installed, the KRA 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", "KRA", "Clay", "Silicone", "Porcelain"

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



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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.



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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.



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TIPS:

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

NO AIR should be inside the KRA-15, 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 KRA, the cylinder can achieve several hundred PSI in pressure, and this could cause self ignition.

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

Note that portions of this head can reach 200°C, so care must be used when handling the head!

Maintenance:

Keep your KRA 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.!!!

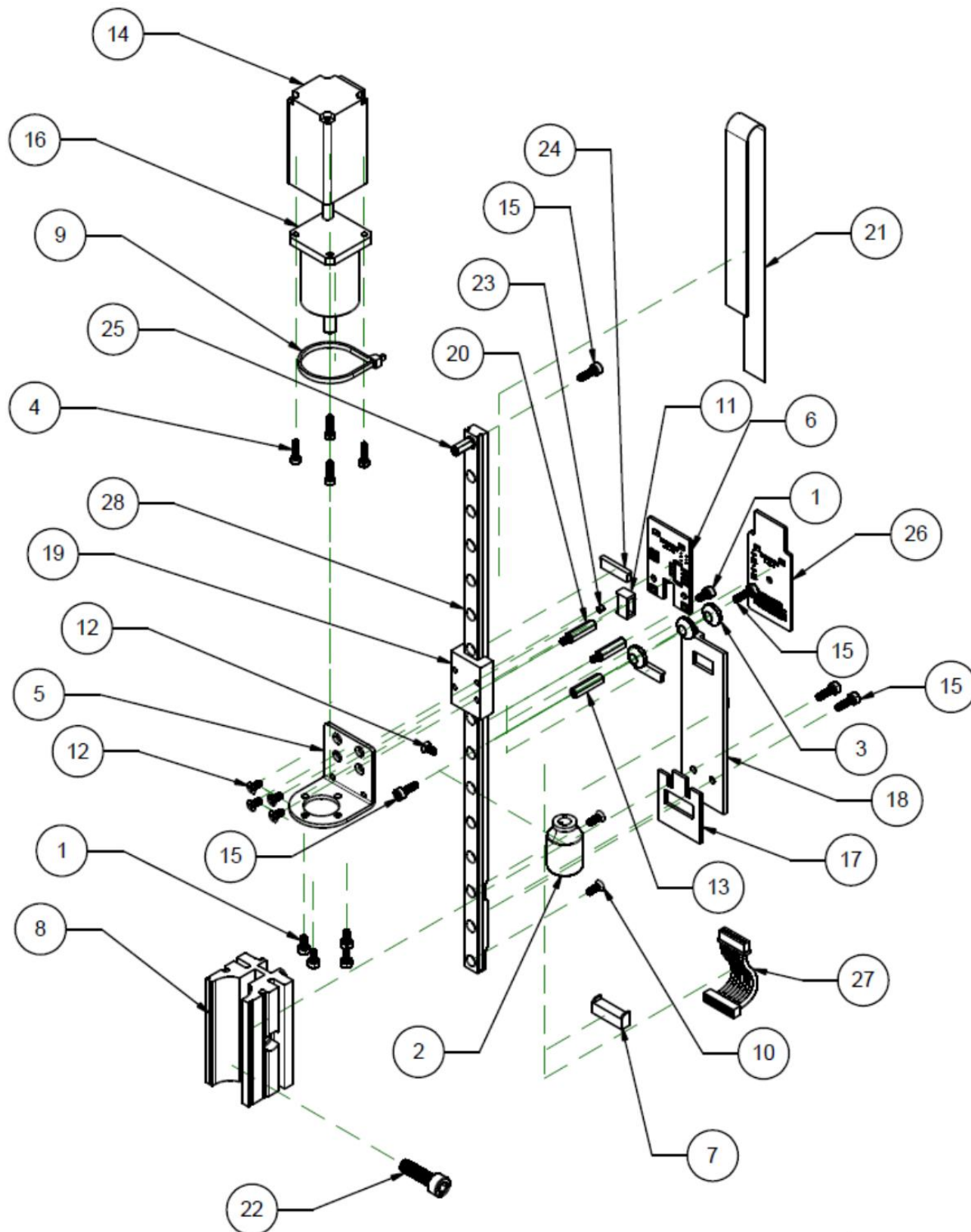
No warranty or guarantee is offered for the application of this product, the user agrees to be ENTIRELY responsible for safe operation of this product.



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Item #	Qty.	Part Number	Part Name
1	6	200303-6	200303-6.M3x6mm.SocketHead
2	1	102428	102428.EMO25.ShaftHead.GR
3	3	200223	200223.RubberStop
4	4	200091-10	200091-10.M2.5x10.Socket.91292A014.
5	1	102527.EMO25.GR.Body	102527.EMO25.GR.Body
6	1	102265	102265
7	1	300282-8	300282-8
8	1	102080-99	102401-6.FEED.MOUNT.GRIPPER.V5.EMO.H3D
9	1	200224	200224.CableTie..1x6inch
10	2	200086-8	200086-8.Screw,M3x8mm.FlatPhil
11	1	300282-4	300282-4
12	5	200086-6	200086-6.Screw,M3x6mm,Flat
13	1	200101-18	200101-18.STANDOFF - M3X15, HEX, FF, BRASS
14	1	300311	300311.Motor.Stepping.0.8A28x28x52mm
15	5	200303-10	200303-10.M3x10.SocketHead.Screw.SS.91292A113
16	1	300315-27	300315-27.GearReduction27
17	1	102508	102508.PCBSpacerStop.H3D
18	1	500207	500207.EXTRUSIONHEADCIRCUITBOARDMODELREPRESENTATION
19	1	102409	102409-6.5.BEARINGRAILTRUCK.EXTRUSIONHEAD
20	2	203166	203166.M3x16+6.STANDOFF
21	1	300053	300053_Cable Flat Flex 12x1mm x 10
22	1	200072-20	200072-20.M6x20.Socket.Head.Screw
23	1	200706	200706.Magnet.2.5x2.5.Neo
24	2	300202-12	300202-12
25	1	200101-10	200101-10.M3x10.Hex.Standoff.FF.Brass
26	1	102266	102266.EMO.HotHeadSide.Board
27	1	420034	420034
28	1	102408-2	102408-6.5.BEARINGRAIL.EXTRUSIONHEAD



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Photoinitiated Crosslinking: the KRA (Emulsion On demand) becomes the KCD (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 KCD heads, as well as the CSD, COD, and KCD heads.

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

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

M106 T# S100 ; sets the KCD 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	203059-075	203059-075.6-32x0.75+.25 Standoff M-F
4	1	404042	404042.Krakatoa.EB.ASSEMBLY.H3D
5	1	420044	420044 COD Cable Assembly

