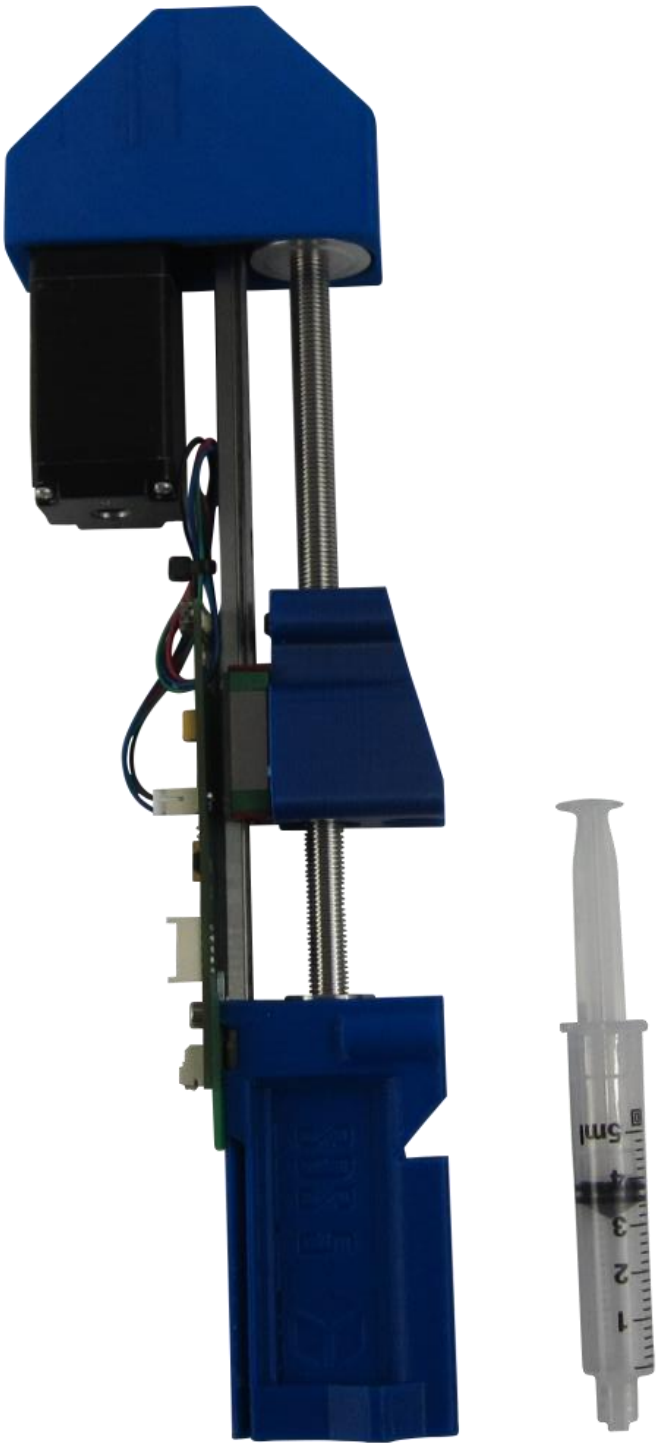
Extrusion Head SDS – 1cc

Compatible with:

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



CONTENTS:

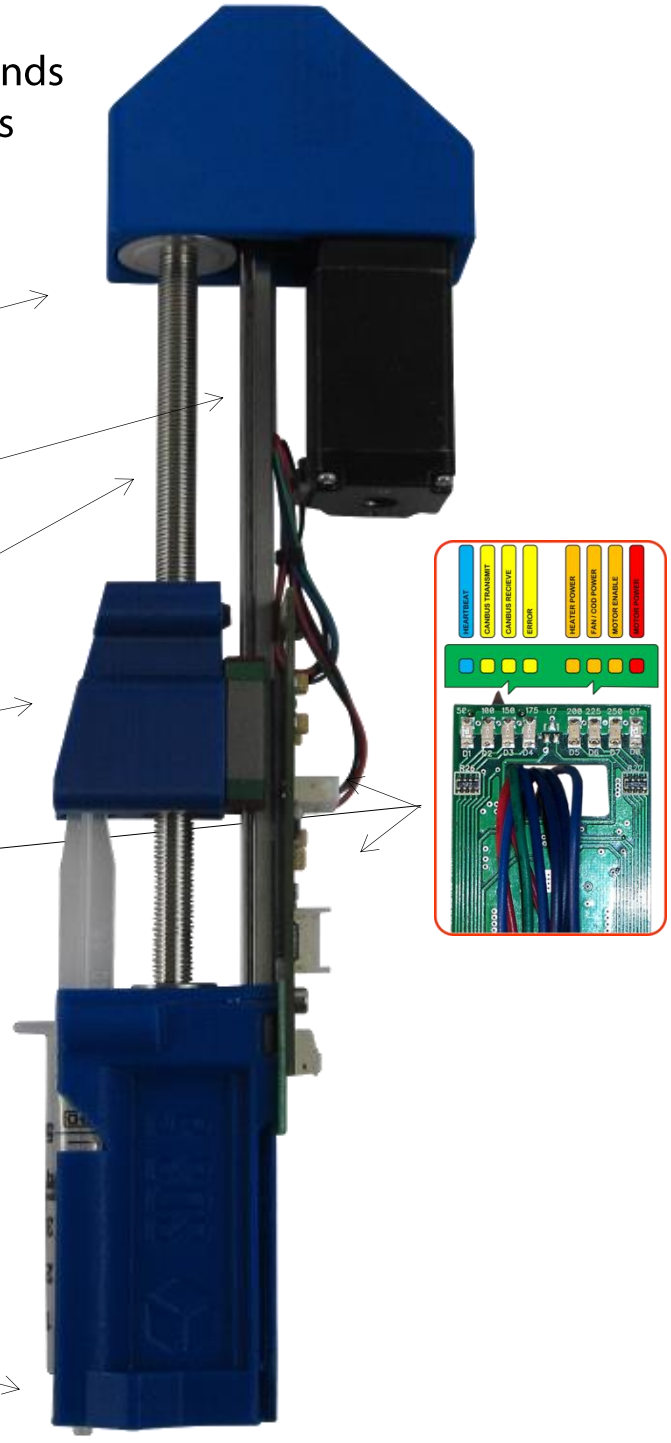
Extrusion Head SDS – 1cc

Compatible with:

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

Specifications:

Programmable start/stop dwell in milliseconds
Programmable prime/unprime in nanoliters
Weight: 600 grams, plus payload
Material Capacity: 1cc
Power supply: 12v 2 amps max
Interface: CanBus or TTL



Nozzles:

The SDS series of print heads use standard syringes, with standard luer fittings.

Use the following syringes from BD Inc. for SDS, CSD, HSD, and CMS heads:
5cc 309646
10cc 309604
30cc 302832
60cc 309653

You will need to prepare your syringe by clipping off one of the ears (see video https://www.youtube.com/watch?v=ej55bZXrltA) to allow it to be loaded properly into the syringe holder.

Make sure that when filling your syringe with material, you do not have any air inside. This will greatly affect the print quality.

Theory of Operation:

The SDS series of extruders is designed to allow emulisified, low viscosity materials 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: RTV Silicone clear, High Temp RTV, bio gels, epoxy, water....

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

The SDS series of extruder heads all have smart controllers, and up to four 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 syringe is loaded with the desired material, taking care not to get air inside the cylinder. The cylinder is loaded into the syringe clamp, loading the syringe plunger handle into the drive cradle. If you need to move the cradle, use the manual override switch, located at the top of the head controller, above the blinking leds.

The drive motor will turn at the desired rate when printing. The drive speed is controlled by head settings and the actual linear velocity of the print head, as set by the F argument in the G1, G2 or G3 commands. Generally speaking, you can print with the same code that you print plastic with, as long as the temperature and speed are set appropriately and the nozzle diameter is the same.

Extrusion Head SDS – 1cc

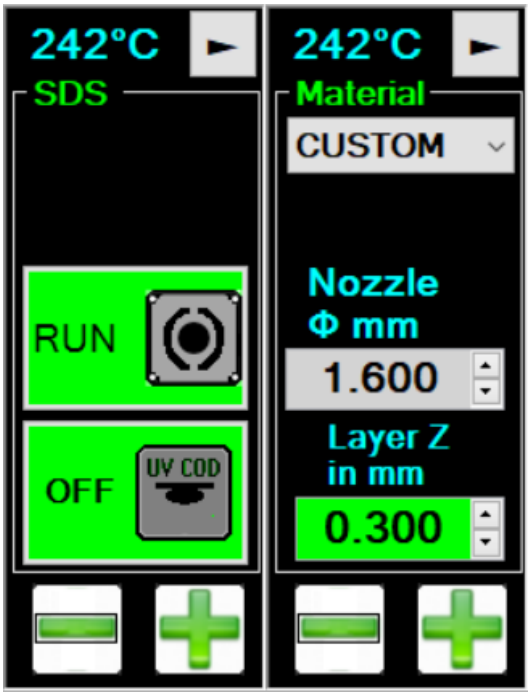
Compatible with:
HYDRA Floor Model | HYDRA Bench Model | System 30M | Engine | Engine HD

SDS 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.

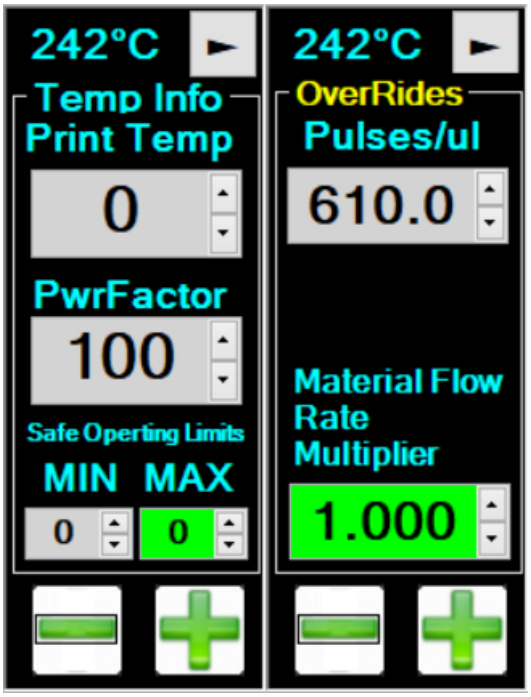
Layer Z in m:
Initial value. *Note: gcode will override this setting.*

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.

Extrusion Head SDS – 1cc

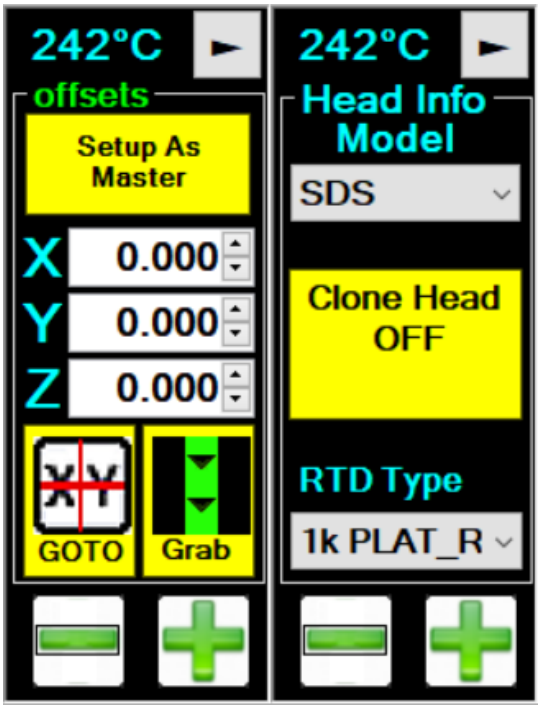
Compatible with:
HYDRA Floor Model | HYDRA Bench Model | System 30M | Engine | Engine HD

Offsets:

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.



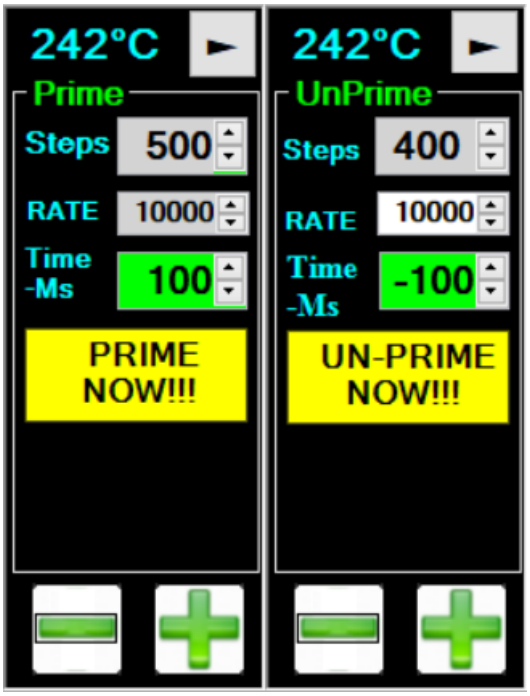
Prime Settings:
Used when starting the flow of filament.

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.



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.

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.

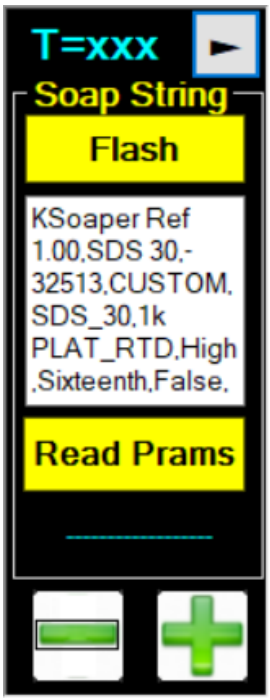
 # Before Tool Change:
Iterations to perform before a tool change.

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

Extrusion Head SDS – 1cc

Compatible with:

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

Settings for Cold and Warm Flow Heads with PLASTIC Reservoirs

Settings	SDS, CSD, HSD, and CHS Heads (Various Tube Diameters, Standard Gear Ratios)					DSD-50 (1:1)
	1cc ET	5cc	10cc	30cc	60cc	DSD-50
Material						
Type	Custom	Custom	Custom	Custom	Custom	Custom
Color	(any)	(any)	(any)	(any)	(any)	(any)
Nozzle	1.600	1.600	1.600	1.600	1.600	1.600
Layer	0.300	0.300	0.300	0.300	0.300	0.300
Temp Info						
Print Temp	0	0	0	0* *35 for HSD	0	0
Power Factor	100	100	100	100	100	100
Minimum	0	0	0	0	0	0
Maximum	0	0	0	0* *75 for HSD	0	0
Overrides						
Pulses: v2.x	*5.80*	*0.75*	*0.58*	*0.225*	*0.15*	*0.15*
Pulses: v3.x	*610*	*81*	*62.5*	*30*	*20*	*20*
Feed Rate %	1.000	1.000	1.000	1.000	1.000	1.000
Prime *Please note that Prime values will vary greatly from those shown, depending on the compressibility of your material.*						
Steps	500	200	200	150	100	1
Rate	10,000	10,000	10,000	10,000	10,000	10,000
Dwell Time (ms)	100	100	100	100	100	1
Before Tool Change	1	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	400	160	160	120	80	1
Rate	10,000	10,000	10,000	10,000	10,000	10,000
Dwell Time (ms): v2.x	*100*	*100*	*100*	*100*	*100*	*1*
Dwell Time (ms): v3.x	*-100*	*-100*	*-100*	*-100*	*-100*	*-1*
After Tool Change	1	1	1	1	1	1
Offsets						
Clone Head	Off	Off	Off	Off	Off	Off
X	0.000	0.000	0.000	0.000	0.000	0.000
Y	0.000	0.000	0.000	0.000	0.000	0.000
Z	0.000	0.000	0.000	0.000	0.000	0.000
Head Info						
Model	(varies)	(varies)	(varies)	(varies)	(varies)	(varies)
RTD Type	1k PLAT_RTD	1k PLAT_RTD	1k PLAT_RTD	1k PLAT_RTD	1k PLAT_RTD	1k PLAT_RTD
Motor Current	High	High	High	High	High	High
Step Mode	Sixteenth	Sixteenth	Sixteenth	Sixteenth	Sixteenth	Sixteenth
Settings	1cc ET	5cc	10cc	30cc	60cc	DSD-50
	SDS, CSD, HSD, and CHS Heads (Various Tube Diameters, Standard Gear Ratios)					DSD-50 (1:1)

Using the SDS:

It is good to use RTV, (from your local hardware store), to learn with.
Vaseline is also easy to use, but it will not get firm after printing.

Basically:
1. Load your material into the syringes
2. Mount the SDS head on your printer yoke,
3. Check the Z at the end of the needle on the syringe.
4. Load your G-Code file.
5. Print

We do NOT recommend printing food with the SDS. Just because it can be done does not mean that it should be done.

Once the head is installed, the syringes 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.

You can use the M0 code to insert cylinder change stops (pauses) in your program.

Example:

```
G0 X0 Y200 ; move to material change location
M0   ; Install new material then press continue
```

Additional Help:
Check our YouTube channel and look for key words “Hyrel”,“3DS”, “Syringe”, and “Silicone”, for helpful videos.

Tips:

Use fresh syringes and tips to avoid contamination.

NO AIR should be inside the SDS Print Head. Pack your syringes carefully; it will make the material delivery spongy, and a crisp start and stop will be impossible.

NEVER put flammable material, such as gasoline, in your syringes.

ALWAYS USE good ventilation when using the syringes. Many of the more interesting materials will emit toxic fumes.

Maintenance:

Keep your SDS head clean. Do not allow material to get on the linear bearing or drive screw.

Use care when Installing the head into the yoke. Due to its long format, it is possible to mis-align the connection point.

Disclaimer:

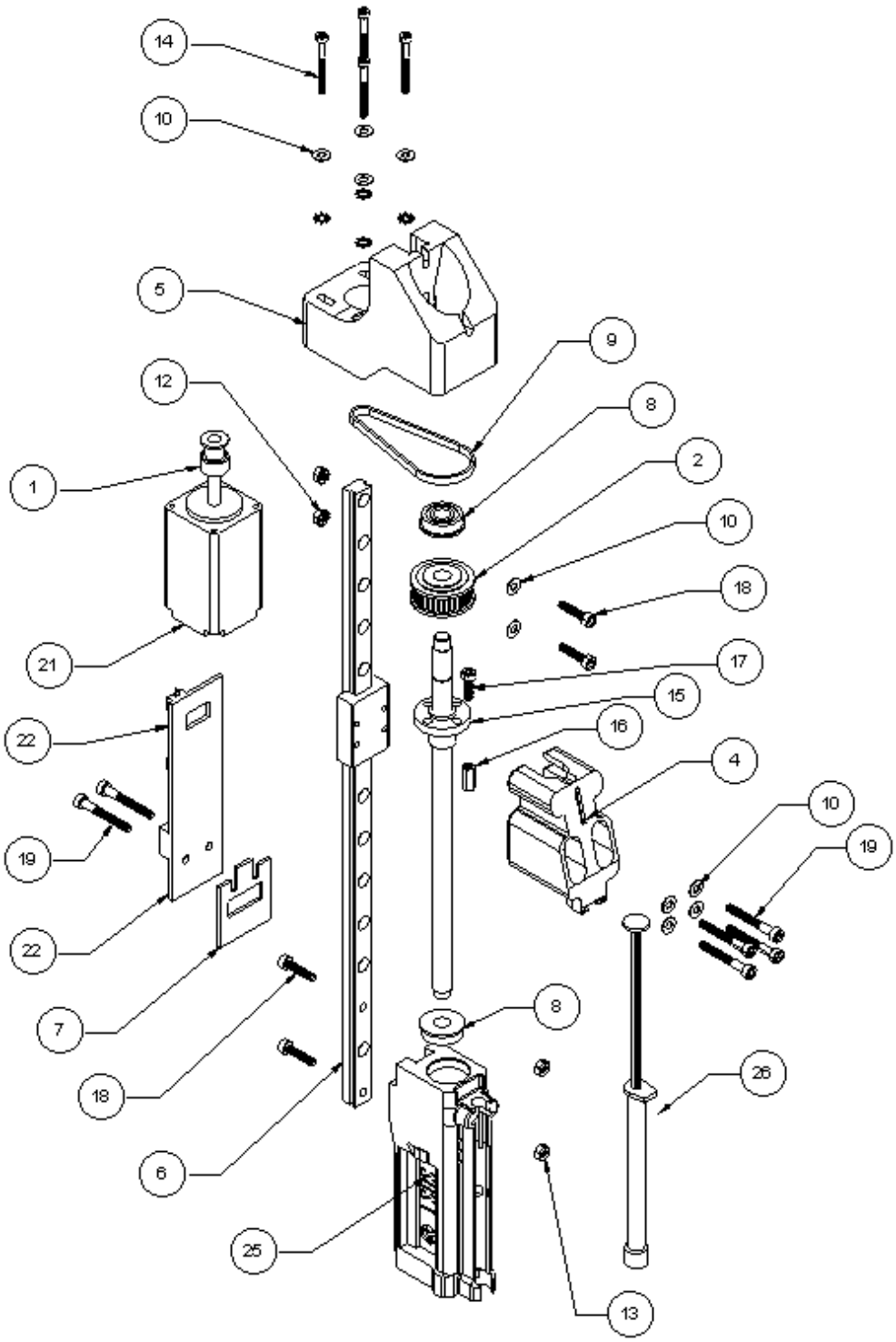
!!! Use at your own risk. !!!

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

Extrusion Head SDS – 1cc

Compatible with:

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



SDS 1 BOM

Item	QTY.	Part No.	Part Name
1	1	102123	102123.TimingPulley.MXL-12.Modified
2	1	102160-M	102160-M.MXL36TX.710LONG-CUSTOM (Modified)
4	1	102224-1.0	102224-1.0 Syringe EMO Bearing Block 1cc.v5.5
5	1	102239	102239 Syringe EMO Fixed Motor Mount.v4
6	1	102408-AS2	102408-AS2.BEARINGRAIL.EXTRUSIONTHEAD
7	1	102508	102508.PCBSpacerStop.H3D
8	2	200016	200016_Bearing .25B X .625D X .205T R4F
9	1	200027-65	200027-65_Belt 125x65
10	10	200045	200045.M3.FlatWasher.93475A210
11	4	200045-1	200045-1.Washer,M3,Lock,Star
12	2	200080-3	200080-3.Nut,Hex,Star,M3
13	2	200088	200088.Nut,Hex,M3
14	4	200091-25	200091-25.M2.5x25.Socket.91292A036
15	1	200094-1	200094-1 Precision Threaded Rod, 1mm pitch
16	1	200101-10	200101-10.M3x10.Hex.Standoff.FF.Brass
17	1	200303-10	200303-10.M3x10.SocketHead.Screw.SS.91292A113
18	4	200303-14	200303-14.M3x14.SocketCap.92290A118
19	6	200303-25	200303-25.M3X25.SOCKETCAP.91292A020
21	1	300311	300311.Motor.Stepping.0.8A.28x28x52mm
22	1	500207-3	500207.EXTRUSIONHEADCIRCUITBOARD
25	1	102187-1.0	102187-1.0 Syringe EMO Mounting Block 1cc.v8
26	1	201012-1.0	Syringe, EasyTouch, 1cc, with Luer Lock Tip

Syringe Suppliers

HYREL www.hyrel3d.com
McMaster Carr
Use the following syringes from BD Inc. for SDS, CSD, HSD, and CMS heads:
5cc 309646
10cc 309604
30cc 302832
60cc 309653

Photoinitiated Crosslinking: the SDS (Syringe Dispensing System) becomes the CSD (Crosslinking Syringe Dispenser).

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 CSD heads, as well as the COD, 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

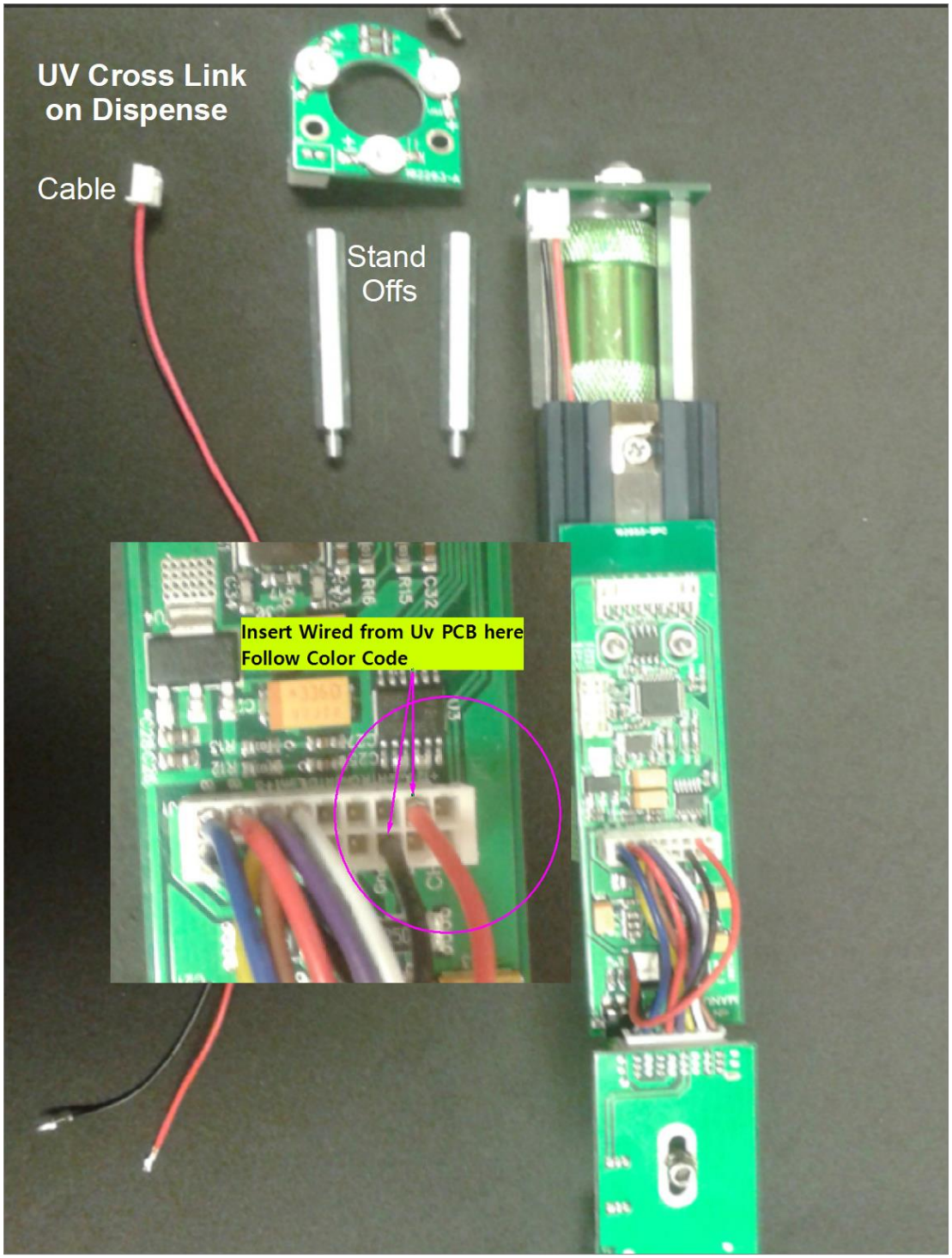
12 for yoke 1, head 2; or

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.


UV Cross Link
on Dispense
Cable
Stand
Offs
Insert Wired from Uv PCB here
Follow Color Code