In this newsletter...

- Visiting Real Filament
- New; Real Filament ABS+HF
- Meet the Maker; Wanted!
- Russell's Printing Tips
- Thingiverse update: Graphical LCD Mount
- Exhibitions
- New products and developments

Next Beer & Pizza party Tonight! 3rd August

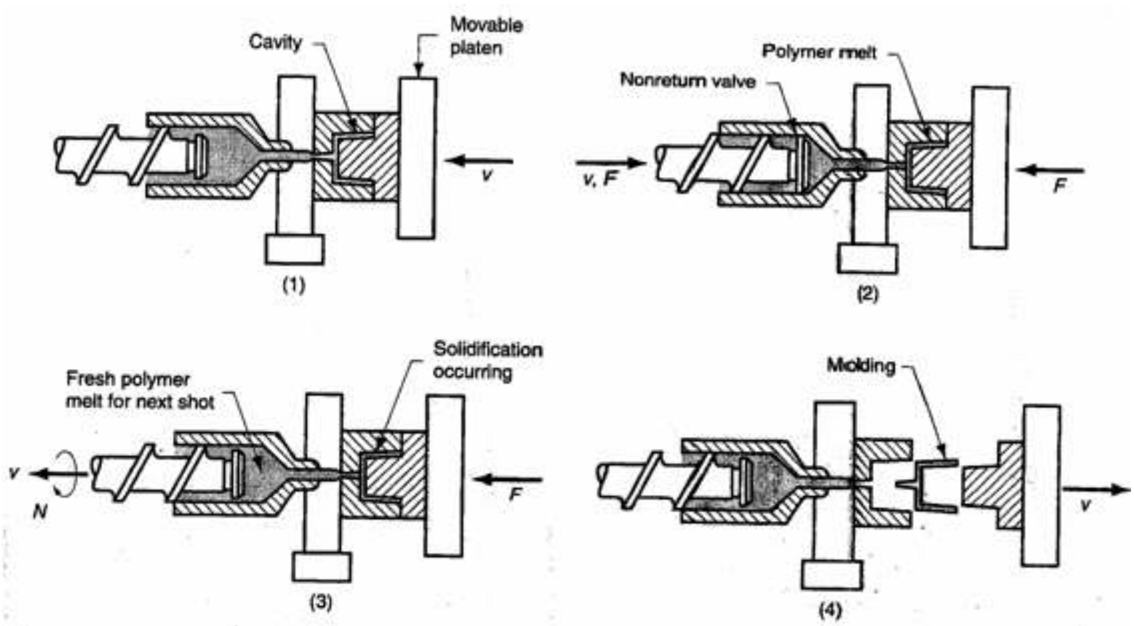
Visiting Real Filament

by Jaap van Wietmarschen

Last Thursday I visited Real Filament. Usually I am in the office at 08:00, but warm up of the machines starts at 07:00 in Amsterdam. Real Filament produces both the spool as the filament at the same location. I asked the owner, but I was not allowed to take any pictures. Not that the production of filament itself is such a big mystery, but the site produces more then just filament and he does not want the competition to get head start on those products.

Pressure molding department; Spools!

So while the machines heated up, we got some needed coffee and we then started out in the pressure molding department. Pressure molding machines work a lot like you would make icecubes with a tray. The mold is made up from 2 separate pieces leaving a cavity (1). They are pushed together and the heated plastic is pushed in under several tons of pressure (2). This heated plastic is actually not much different than the PLA/ABS/PETG we use to 3D Print. The part is then cooled (3), the mold separates and pushes the half spool (4) onto a belt which takes it out of the machine and into a box.



The owner actually told me the spools were first produced in ABS, but because they were dropped into a box at the end of the production line the tension in the material and the drop would cause them to shatter. So the spools are made out of polycarbonate which can survive this drop.

The molds are used to produce 2 sizes of parts of the spools. Real Filament is mainly availabe in 0.5, 0.75 and 1.0 Kilo spools. 2 smaller halfs make up the 0.5 Kg spool, 2 bigger halfs are the 1.0 Kg spool. So combining the halves you create the 0.75 Kg spool variant.

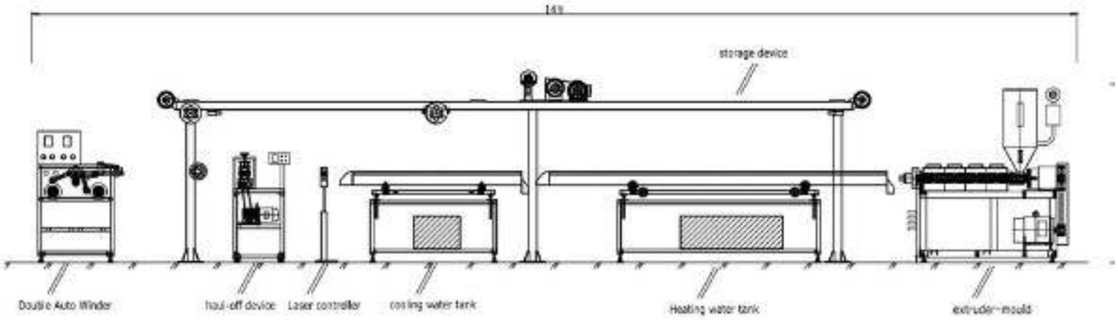
These halves are melted together in a special machine and it actually allows Real Filament to more quickly change the output if demand changes. And once I saw the spooling machines, it also makes sense to have more vertical layers on a spool, since it reduces the chance of the spool losing tension and get tangled when switching.

Extrusion department; lots of filament!

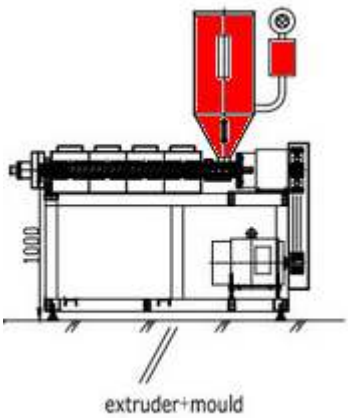
So once that tour was finished we went to the extrusion department. This is where the magic happens. The owner had several machines running filament and some more running producing parts which needed to be cut with large hydraulic machines. Which made a hell of a noise.

The first extrusion line was running PLA Gold and a second one the new ABS+HF in black. Both machines were pretty much the same setup.

Below is a schematic extrusion line, and I will try to go step-by-step.

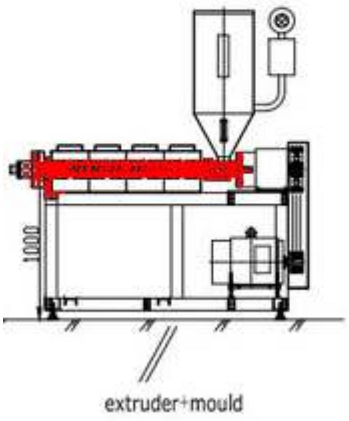


We first walked to the back, close to the loading area where the raw materials were stored. 1000Kg big bags are setup in line behind the different extrusion lines and the material is sucked out the big bag by what I can only describe as a industrial vacuum machine. This room was nice and air conditioned, which was a huge difference to the noisy room with extrusion lines.



We first walked to the back, close to the loading area where the raw materials were stored. 1000Kg big bags are setup in line behind the different extrusion lines and the material is sucked out the big bag by what I can only describe as a industrial vacuum machine. This room was nice and air conditioned, which was a huge difference to the noisy room with extrusion lines.

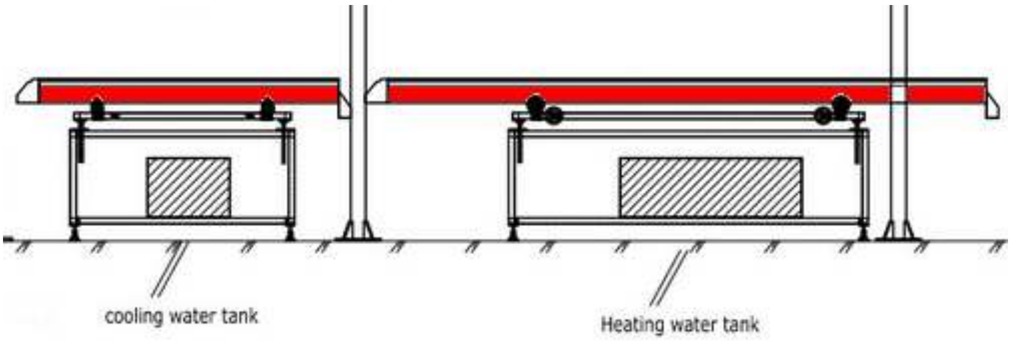
The sucked up ABS then is pushed into a big hopper which also has a dryer function. Temperature is risen a lot and air is pushed past the pellets. This causes the raw material to become even more dry and this creates the perfect material for extrusion.



The material is then dropped into the extruder, the machines use multiple augers to push the material towards the nozzle. Before it reaches the augers additives are added to the raw material. These additives can be split into 3. Color pigment, additives and chemical enhancers. The pigment speaks for itself, the additives are things like wood particles, Fluorescent, metal particles, etc. The chemical enhancers are additives which allow for better printing results. I didn't know, but there are many different types of ABS, PLA, etc. and some need a little help to be effective in our 3D Printer.

Along the augers there are several over-sized heater cartridges which have a temperature of around ~200-250 degrees (same as we would do with our desktop 3d printer).

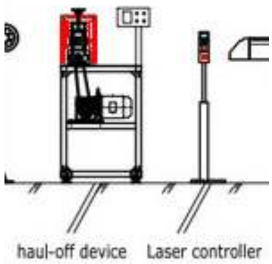
Then comes the first difference between a 3D Printer and a extrusion line. While we call it extrusion, in 3D Printers all the force is from pushing the filament through the nozzle from the back, a lot of the force needed to create filament in the extrusion line is from a machine further down the line which is pulling the filament from the nozzle. A big surprise for me is that the nozzle size on the machine is not 1.75mm when producing 1.75mm, but much closer to 3~4mm. And the size 1.75 mm is created by the pulling tension of the entire extrusion line.



From the nozzle the filament is cooled in water and run along special round profiles which help shape the filament wire.

For PLA the temperatures in the different water tanks can be almost room temperature. But PETG and especially ABS need to cool down more gradually. The temperature in the first tank goes up to 60-80 degrees depending on the mix of the filament and the diameter which is produced.

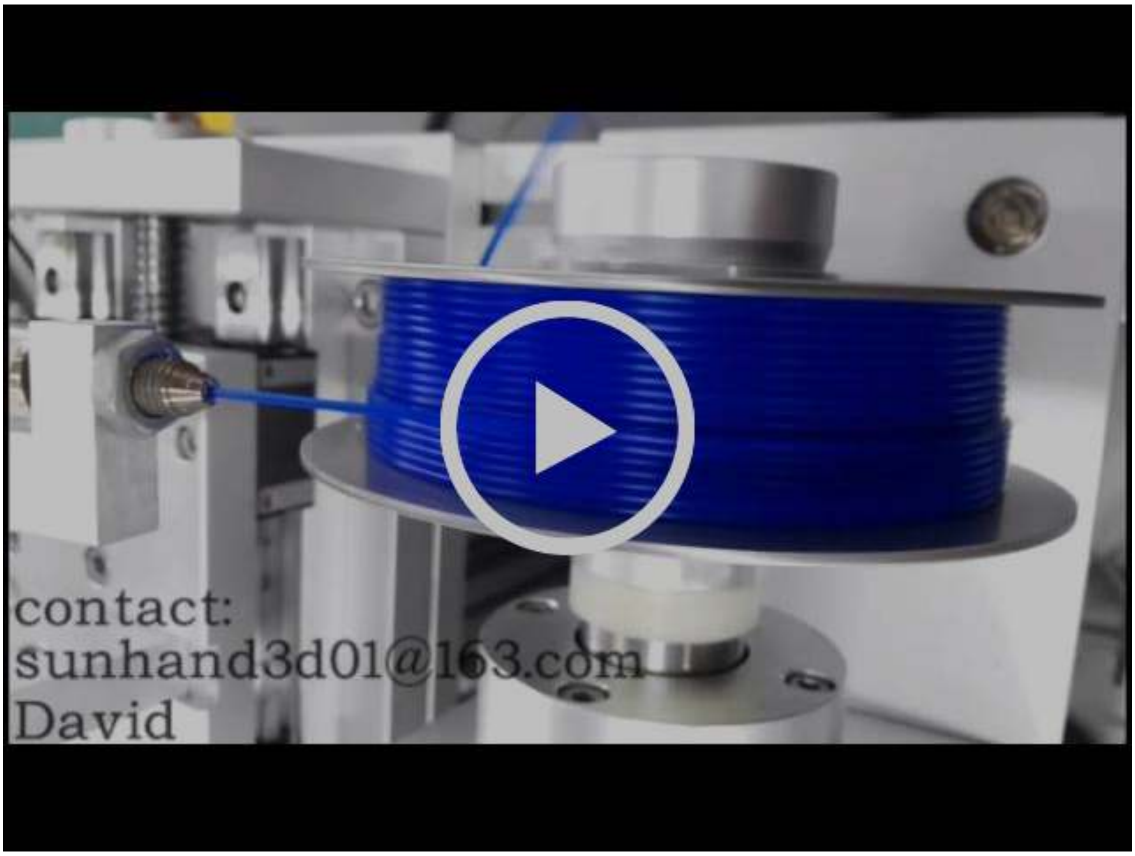
Then it passes a special machine which has several lasers to measure the diameter. And then comes the machine which I described before, which is pulling the wire (and pushing it into the spooling machine). By increasing or decreasing the speed of the haul-off machine the diameter is affected the most.



The diameter is measured constantly and if there is a bad piece the machine will sound a alarm and the machine is adjusted. Because both the amount of meters and the diameter is measured a bad piece of filament can be excluded during packaging. From the pulling machine the filament is then fed into a machine which spools the filament on big 25 Kg wooden spools.

These spools are then delivered to the packaging department where the spool is fed into a machine which spools the filament onto a earlier described 0.5-0.75-1.0-3.0 Kg spool.

The filament is guided past 1 wheel with a photosensor which measures the amount of revolutions the wheel is turned and via this the amount of filament is calculated (there is a table with material, diameter and weight).



Videosource is Aliexpress.

The next wheels guide it towards the spool. These wheels are attached to a carriage which runs along a guide rail perpendicular to the spool. The machine is setup for the width of the spool (0.5, 0.75, 1.0, 3.0 Kg). This carriage is homed to the beginning of the width of the spool. Filament is then pushed into a hole in the mold on the edge of the spool and the machine is turned on. The motor runs for the setup amount of revolutions and the filament is locked by running the end through the holes along the edge of the spool.

The filament is then labeled with the batch number and product information, put unto a vacuum bag with a moisture absorber and vacuum packed. The spool then goes into a box, which is labeled and shipped to RepRapWorld.com by pallet.

After spending several hours in the production facility I have to say it is a lot of manual work and the work conditions itself are noisy and hot. So hats off to the workers who work there in the 2 shift system. I also need to thank Real Filament for giving me the big tour. They allowed me to look everywhere and I hope by writing this report some of your questions are also fulfilled (I had lots before visiting, having seen only the end-result for many years).

New: ABS+HF Filament!

During my visit I saw the new ABS+HF (High Flow) in production.

I was always under the impression PLA is PLA, ABS is ABS and with additives the manufacturers can change the properties of the filament. Examples are wood and metal filament, but some manufacturers use fillers to make production more cheap (and printing worse). But during my visit the R&D guys at Real Filament showed me a very very extensive product catalog of different types of raw materials. In short there are many types of plastics with different checmical structures considered ABS, PLA, PETG, etc. But not all of them are suitable for 3D Printing.

Real Filament has recently found one of those ABS variants that without a additive is not suitable for 3D Printing. But they have found the right combination that does allow for good results. And we have tested many kilo's in our printing lab at RepRapWorld and we are impressed.

The ABS+HF can be used at much higher speeds and this has a real positive effect on printing quality. ABS needs speed to overcome warping, tearing, etc etc.

So we are happy to introduce ABS+HF. Currently we have only 1.75mm and in colors black and white, but more colors are coming and we will also be ordering 2.85mm as we see also a benefit for those users. But that will also require some more testing.

If you are a ABS user printing larger objects or you already have good results but want higher speeds, then give ABS+HF from Real Filament a go!

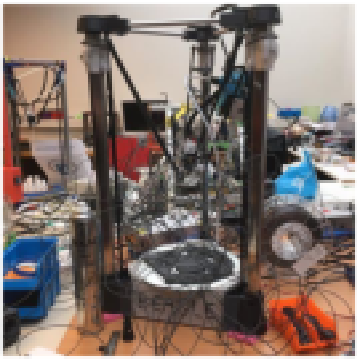
RepRapWorld's Meet the maker wanted!

If you would like to participate in the Meet the maker section. Please use the button below to contact us. And share your story with thousands of like-minded-makers!

Want to pitch your project for the 'Meet the maker' section. Please click here!

Russell's Printing Tips

By Russell Gulman



Print Adhesion...
... For this Month's Russell's Tips.

Ask 1000 printer enthusiasts about the best ways to achieve print adhesion and you'll get 1001 opinions. Learning how to get your prints to stick well is almost a rite of passage in this field, and it seems we all have a few stories of heavily warped or detached prints to share.

The goal of a good adhesion system is to achieve a strong mechanical bond to the bed plate during a print, yet easily removed once done. The fact that there are so many 3D printing adhesive products and techniques out there already indicates that there is no universal solution (yet). But a few universal principals do apply, and in my experience as an operator of a printer farm, some specialized products tend to dominate others in cost, efficacy, reliability and maintenance.

I might as well start off mentioning the approach I've settled on as most effective for my requirements (i.e. 3D print production): a light coating of 3D printing aerosol spray* onto an already-heated glass bed, with no other cleaning or bed prep between prints. I work mainly with PLA and PETG, so I can keep bed temperatures under 70 degrees in almost all cases. I prefer to avoid using brims or rafts as much as possible, which reduces post processing and keeps the final bottom surface smooth and clean (for production orders, I will often work with the designer to minimize the need for support material for the same reason).

I might as well start off mentioning the approach I've settled on as most effective for my requirements (i.e. 3D print production): a light coating of 3D printing aerosol spray* onto an already-heated glass bed, with no other cleaning or bed prep between prints. I work mainly with PLA and PETG, so I can keep bed temperatures under 70 degrees in almost all cases. I prefer to avoid using brims or rafts as much as possible, which reduces post processing and keeps the final bottom surface smooth and clean (for production orders, I will often work with the designer to minimize the need for support material for the same reason).

There is nothing particularly special about this system, and for those who also avoid high shrink thermoplastics, coating a heated glass bed is now very common. However, I got here as a result of a circuitous experimentation process that began years ago with printing PLA on expensive stick sheets and cheap painters tape, before a rushed transition to ABS, desperately trying to print it on _anything_ that would work: Kapton tape, "ABS juice", even an acrylic plate (hint: it works...but don't ever expect to remove your prints). Over the next couple years, the aesthetic and quality improvements in PLA, along with the widespread industry adoption of PETG, allowed me to reduce my dependency on ABS. With the recent introductions of friendlier "ABS+" variants showing noticeable reductions in shrinkage and toxicity, I have started giving ABS a second look.

Input caption text here. Use the block's Settings tab to change the caption position and set other styles.

Some other various methods and their relative merits**:

Painters tape: The Original method. Pretty much limited to PLA, no heater bed required. Requires frequent replacement of the tape, and the gap between strips will show up as an impression on the base surface of the print.

Kapton tape: The ABS version of painter's tape. Very strong adhesion to the bed plate and to ABS parts and works reasonably well for PLA and PETG. But will be a lot of work: the nozzle eventually tears apart the tape and it is difficult to stick the strong tape to the underlying bed plate without trapping small air pockets (you don't get second chances), which will also show up as impressions in the print.

Roll on / Glue stick: Roll on / Glue stick: Inexpensive and usually works well with PLA and PETG. Some Acetone-infused brands have even shown success with ABS. However, clean up and fresh application is often required between prints. I have a limited experience with glues, which makes it hard to give an accurate assessment of their pros and cons. However, a bit of online research indicates that good glues and aerosol sprays are equally acceptable for effective PLA and PETG stick, with sprays like 3DLAC winning on the convenience factor.

ABS Juice / Slurry: A sticky mixture of partially dissolved ABS and acetone, spread over the bed. Some people simply dip a cylinder or cube of ABS into acetone and spread it across the heated bed. Not surprisingly, ABS prints bond to the slurry very well, but it is a fair deal of clean up and preparation work between prints, and the swirls of the mixture often leave an impression.

Generic stick sheets: They tend to be expensive, and need semi-frequent replacement (similar to Kapton). Results vary. Some stick sheets are worse than having nothing, while others have provided the best bonding I have ever seen (there is one ABS print I still haven't removed from the bed plate).

PEI sheets: Rapidly becoming popular as a low cost, open source material with near-universal adhesive properties. PLA and ABS stick very well, with mixed results on PETG and Nylon. PEI is available in various thicknesses from a fraction of a mm (i.e. coated directly onto the print surface) up to a 3+ mm sheet that can be placed on top of the existing bed plate as its own layer. This is the one of the few materials I would personally consider as a replacement for 3D spray in terms of reliability, convenience and long term cost.

Other branded stick sheets: (Coropad / Buildtak) These commercial products are expensive, but have demonstrated excellent adhesive properties, particularly with ABS. Since they tend to be thicker and softer than PEI, they tend to not last very long and similar to Kapton, have strong adhesion to the bed plate and are thus difficult to remove. Due to their padding, they are more useful than Kapton tape in compensating for an uneven bed plate.

Here is a list of universal principles of good bed adhesion:

Heated bed: While not critical for PLA and PETG, they will improve the chance of successful completion without warps or detachment. A heated bed set to 100 deg C or higher is _absolutely_ essential for high shrink thermoplastics such as ABS, Nylon or Polycarbonate, and temperature itself is usually not sufficient; it will need to be combined with one of the other surfaces listed above.

Flat Surface: No matter which system is chosen, it does little good on an uneven surface. This is one of the big advantages of glass, it is generally quite flat. Mirrored or picture frame glass is made to even tighter flatness specs by the nature of their application.

Minimizing oil and dust: One reason so many 3d printing veterans are adamant about a clean bed is to remove any of the natural oils from human hand, or dust that can quickly accumulate in a workshop-type environment. Grease and lubricating oil are bed-adhesion killers in particular (I learned of course the hard way). If oils and dust are kept off the bed surface, religious cleaning between prints is less critical as long as a fresh coating of spray or other adhesive surface is added when needed.

Heated Enclosure: For high temp / high shrink plastics especially, print quality and reliability is much improved by raising the ambient temperature and minimizing drafts of cool air. Thus, many high end printers enclose the entire print in a heat chamber. This also has the added benefit of reducing particulate contamination from petro-based plastics.

Lastly, another advantage of spray on a glass bed: If I don't have time to wait for a print to fully cool down, I use the crude approach of a hammer and chisel to remove the print (I usually let the bed plate cool down at least 10-20 deg). After a few few solid whacks at different positions on the model, and making sure the chisel has a very shallow angle to the glass bed, the mode usually pops right off. After hundreds of prints and thousands of parts, I haven't broken a glass bed yet (knock on wood, which is less prone to shattering).

*Such as 3DLAC but a few hair sprays also work
** All the materials except painter's tape are intended to be combined with a heated bed

---

Did you print something for one of our products? Let us know and we will put it in our next newsletter

---

Thingiverse updates

Thingiverse

On Thingiverse you can find a lot of cool stuff to print. From Spinners to Pokemon. You can also find handy stuff to cover up electronics.

Maker DonVito
Did you buy a Graphical LCD to use with your Megatronics? And you have no idea on how to mount it? You can attach it to your frame with the design by DonVito!

Find the Megatronics mainboard cardmount here.

Find your quality Real Filament here!

Exhibitions

Exhibitions update: The stand for fomnext has now also been confirmed. We will be upstairs in Hall 3 (Halle 3.1) and stand B61. We will be showing off our electronics, Proline, Real Filament and (DIY) printers.

26 - 28 September 2017
NEC, Birmingham, UK

Stand G56

RepRapWorld will be attending the TCT show 2017. And we would like to invite all of you to come visit us at the booth.

---

14 - 17 November 2017
Frankfurt, Germany
Messe Frankfurt Hall 3

Stand: Halle 3.1 B61
RepRapWorld will also be attending the formnext show in the messe in Frankfurt. Again, everyone is welcome to join us.

formnext
POWERED BY
tct

See here our newest products, some promotions and order your Real Filament ABS+HF!

Real Filament; Filament that fulfills your wishes!

Real Filament ABS+HF White
1.75mm 1.0 Kg
€17.99

Buy Now

Real Filament ABS+HF Black
1.75mm 1.0 Kg
€17.99

Buy Now

Real Filament PETG Red
1.75mm 0.5 Kg
€13.65

Buy Now

Our newest Graphical LCD

Buy your Megatronics now!

Do you want to see more or different information? Any feedback? Please drop us an email and click here!