

Manufacture and replace heater pipes.

This work is based on my own experiences, when I replaced the pipes on my X1/9-80.

I used stainless steel pipes (314) metric dimensions, dn32 (35mm OD) for the radiator pipes and dn16 (18mm OD) for the pipe to the heater matrix.

For the radiator pipes I am using Gerberit MA-Press fit system and the pipe for the heater matrix was sand-bended to mimic the original pipe.

Both the 35mm and the 18mm pipe is standard Gerberit MA-Press system.

I Guess that there are other manufacturers as well.

Tools:

A vise, used for bending the 18mm pipe.

Sand, preferably dry sand-blasting sand.

A funnel, so I can fill the pipe with sand.

2 M16 bolts and some duct-tape, to seal the ends.

Oxy-Acetylene torch.

Pipe-cutter for stainless steel.

Deburring tool for the 35 mm pipe.

Press-tool for the Gerberit MA-Press system. (Borrow from your Plumber/Pipe-fitter).

Something to cut the tunnel open (I used a pneumatic grinder with a thin disc, 1mm thickness).

8mm drill-bit and a power drill.

Welding equipment TIG/MIG/MAG.

White marker pen.

Material:

2x3m 35x1,5mm (DN32) Stainless steel pipe.

2x7 pcs 35mm 45 deg 35mm (DN32) MA-Press bends. (I am using the standard parts available in stock here in Sweden, however Gerberit do manufacture 15, 30 and 60 deg bends as well).

4 35mm brass compression rings/Olives from standard compression fittings.

2 M8 Stainless steel nuts

2 short (8mm or so) M8 Hex screws.

2 8mm Copper gaskets.

1x3m 18x1mm stainless steel pipe.

2 18mm Compression rings/Olives or 2 hose connectors



Hose connector used



Compression ring/Olive

Included files:

PDF-Files:

HeaterMatrix.pdf: Drawing of the Heater matrix pipe, with dimensions.

HeaterMatrix3D.pdf: A 3D-pdf of the Heater Matrix pipe model, you can rotate, zoom etc. Note you must trust the file in order to use these functions, probably need the Adobe reader.

LeftPipeWend3D.pdf: Same as above but the Left-hand side Radiator pipe.

RightPipeWend3D.pdf: Same as above, but the Right-hand side Radiator Pipe.

There is no annotated drawing for the radiator pipes, since they probably are built "on site".

CAD-files:

STEP files are 3-D files that can be imported into any 3D CAD system.

Workshops also use them, since most CNC-Machines can read them directly, without any additional programming.

HeaterMatrix.stp: The 3D model of the Heater matrix pipe. Compression rings or pipe connectors is needed on each end.

LeftPipeWend.stp and RightPipeWend.stp. 3D models of the radiator pipes WITH end forming, I.e the CNC-machine forms the pipe ends with an inverted groove for the hoses.

LeftPipeWend.stp and RightPipeWend.stp. 3D models of the radiator pipes WITHOUT end forming, a compression ring/olive is needed on each end.

Some thoughts.

There is obviously many ways to replace the coolant pipes in the lower tunnel, probably as many ways as the people who has done it.

However, I think my way is the easiest and the best (of course).

I do not like copper pipe, since copper is a strange material, and vibrations combined with heat will cause copper pipes to be brittle, over time. (That is the main reason why not using pure copper in brake lines, and CuNi or steel is used instead).

I don't trust plastics such as PEX or Silicone, since there is sharp edges and other that can and will cause problems.

I recommend that the heater matrix pipe should be sand-bended in one single piece and the radiator pipes should be assembled with press-fittings.

Doing it this way, you do not need to remove the tunnel, just cut it open on one side, makes it easier to restore it.

If you go for the pre-bended radiator pipes, the hole tunnel needs to be removed (hell of a job).

Anyway, that is my thoughts of it.

Preparations:

Cut the radiator pipes near the tunnel ends, also, drill out the spot-welds on the fixings in the front

Now you can easily remove the pipes.

Cut a slot in the bottom of the tunnel, near the bend, use a narrow disk, 1mm thickness or so, also cut the ends open so you can bend the bottom.



Slit the fixings of the 16mm matrix pipe (you will need to re-weld them on assembly).

Then you can remove the heater matrix pipe.

I would recommend saving it and compare it with the newly manufactured pipe.

Manufacture the heater matrix pipe:

I used the sand-bending technique to create the bends.

Preferably use Sandblasting sand, it is however very important that the sand is very dry, funny things happens otherwise.

I stuffed an M16 bolt in one of the ends, secured it with some duct tape, and then filled up the pipe:

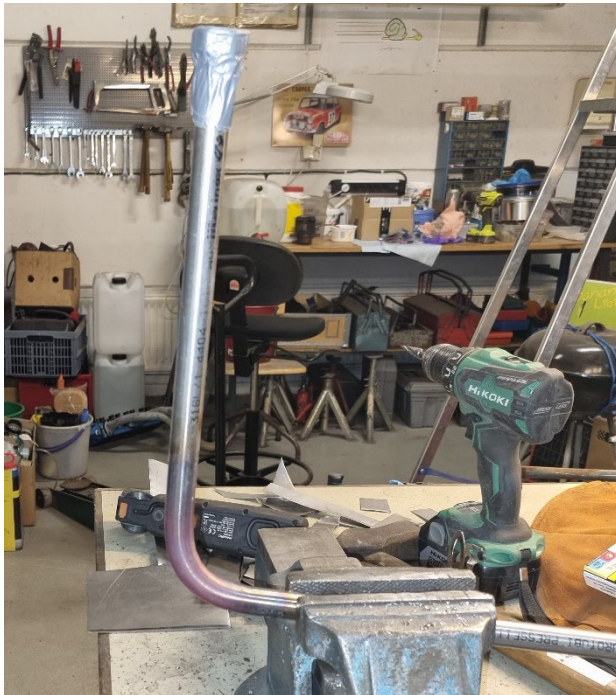


When the pipe was filled up, I tapped it several times to the floor, so the sand got packed, filled up again and tapped again, repeated a number of times until I was satisfied. (and another M16 bolt inserted, so I could see how much it compressed.

Now, with both ends sealed, you need to mark out the bends and the heating zones.

As a rule of thumb the heating-zone should be at least 2 times the diameter on each side of the bend center, meaning the total heating zone should be 80 mm for an 18mm pipe.

Heat the pipe, start to bend, place the bend center in a vise, and finish of the bend.



Continue with all the other bends.

For the hose connection I used a standard brass hose nipple, I just cut off the hex part, and as it transpired it was 16mm OD, I silver brazed it on the pipe.



Instead, you can braze a brass compression ring on the pipe ends, to form the inverted groove to secure the hose and the jubilee clip.

Assembly

Before you start to assemble everything, you can treat the inside of the tunnel, clean it out, sandblast it etc., but bear in mind that you are going to weld it together. Mine was fine, didn't need any extra work though (at the moment).

Cut the 35mm pipes in decent length, and slid them in, there is three fixings inside the tunnel, that they need to go through.

Place the heater matrix pipe in place and using pliers etc. bend the fixings round the pipe, cut some pieces from 0,7mm steel and weld the fixings.

Bend back the tunnel bottom, fix it in place with vices or similar, and start welding the tunnel.

Spotweld every 100 mm or so in the beginning and get the spots narrower until the whole tunnel is welded.





The radiator pipes.

Now the straight parts of the radiator pipes is in, you can fit the drains.

Start by forming an M8 Stainless steel nut, use a file so it get the same radius as the pipe, silver braze it to the pipe (at a location some 50 mm or so in front of the tunnel).

Drill an 7-8 mm hole in the pipe (center of the nut), take an M8 Hex screw with an appropriate length together with an copper gasket and screw into the nut. Orient the drain on each pipe to about 45 deg angle from the bottom or something similar.

Finish of by cutting pipes in correct lengths and using the MA-press fittings to get the proper routing.

Before you fit (and press) the final ends on each side of the pipe, you need to silver braze the 35 mm compression rings/olives to the pipe ends.

Then you are finished, job done, have a nice Single malt and enjoy the result.



If you have any questions, please contact me.

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