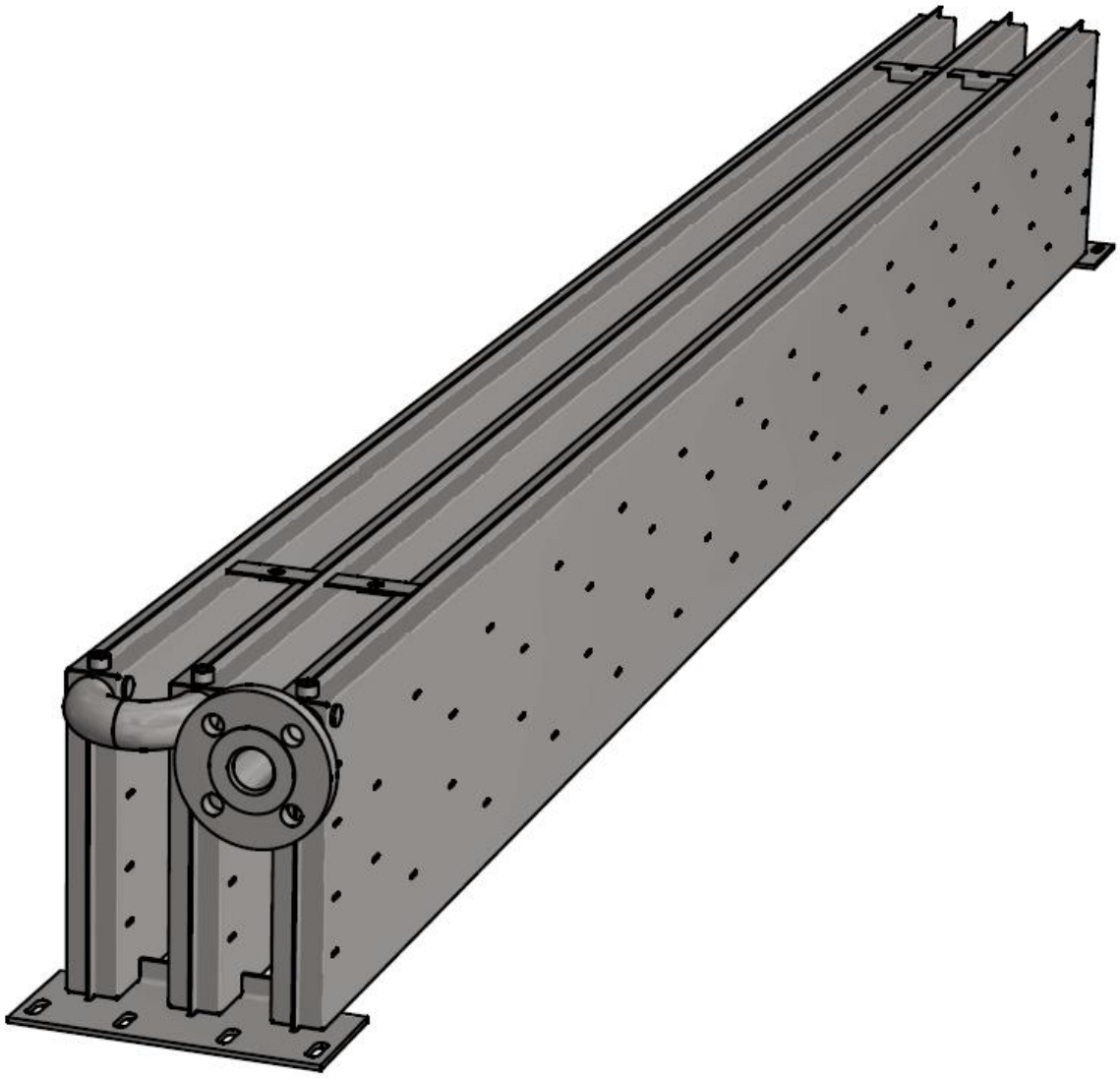
Renewables FIRST

Securing a clean energy future, profitably



FIRE FLO

Pipework Guide

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1. Introduction

This guide explains the how the FireFlo collectors are connected to the heat pump and the type of pipe and connections used.

It is important that these guidelines are followed to ensure that the pipework and connections seal completely and will have long-term durability. The methods and parts specified have been carefully selected to ensure compatibility both from a mechanical perspective and chemical compatibility between the recommend heat transfer fluid (Kilfrost Geo) and the various polymer materials.

2. Heat transfer fluid

There are a number of heat transfer fluids that can be used in the collector loops of water-source heat pumps, but some are better than others. The main options are:

- Kilfrost Geo
- Monoethylene Glycol (such as Thermox DTX)
- Polypropylene Glycol

Kilfrost Geo

Kilfrost Geo is the recommended heat transfer fluid for use with FireFlo collectors. It is significantly more environmentally-friendly than the other options, has a lower viscosity in the normal operating temperature range (which means lower head losses and lower pumping costs), has the best heat-transfer characteristics while still containing the corrosion inhibitors found in most good quality heat transfer fluids. It is a similar price to the alternatives, so considering the technical and environmental advantages it offers it is a win/win choice.

Note that a food-grade version is also available if needed – Kilfrost Geo Plus.

Monoethylene Glycol (such as Thermox DTX)

Monoethylene Glycol heat transfer fluids are also suitable for use with FireFlo collectors and are compatible with PVC pipework components (if used), but note that it is more viscous than Kilfrost Geo (hence the pressure drop and pumping cost will be greater), is not as good from a heat-transfer perspective and is significantly more damaging to the aquatic environment if it leaks out due to its higher BOD (Biological Oxygen Demand) and COD (Chemical Oxygen Demand) - even if the fluid contains detoxifying additives to make it more biodegradable. Monoethylene Glycol is very toxic to mammals, so needs additional care when handling by human operatives because it is dangerous to inhale or get on your skin, amongst other things, so better to avoid and use Kilfrost Geo instead.

Polypropylene Glycol

Polypropylene Glycol is very viscous so is a poor choice for water-source heat pump projects, and has a poorer heat transfer performance. It is also not compatible with PVC polymers, so cannot be used if there are any PVC materials in the pipework. Therefore, Polypropylene Glycol is not recommended for use with FireFlo collectors – use Kilfrost Geo instead.

3. Pipes

The pipe used between the FireFlo collectors and the manifold (if used) or heat pump is normally made from either Flexible PVC, HDPE or stainless steel. For most applications Flexible PVC is the most practical option, though the others will work well if preferred. If HDPE or stainless-steel pipes are used, DN32 PN16 flanges will need to be fitted to the FireFlo collectors, as described below under 'Connections to FireFlo collectors'.

Flexible PVC pipe

Flexible PVC pipe has a number of practical advantages:

- All bends are long-radius, which lowers head losses / pumping losses.
- Routing the pipe between the collector(s) and manifold is easier because the pipe can follow any route, and doesn't need numerous elbows to be fitted.
- It is easier to make connections with the added flexibility to align connections.
- The length of the pipework does not have to be exactly right to make-up connections, as is the case with rigid MDPE and stainless-steel pipework.
- It is much quicker to install when working in a wet environment.

There are some disadvantages to consider:

- Flexible PVC pipe should not be buried direct into the ground, unless it is inside a rigid duct to avoid the risk of crushing.
- Flexible PV pipe cannot be routed over sharp-edged objects (like over the top of a wall) because it will kink, significantly increasing head losses and probably get punctured over time.
- If there is any risk of vandalism (puncturing the pipe etc.), rigid pipe would be better.

Provided the disadvantages above are considered and mitigated against, FireFlo recommends flexible PVC pipework because of the numerous practical advantages it provides.

For Flexible PVC pipe, FireFlo recommends 1 ¼" / 32 mm ID Merlett Vacupress Superelastic pipe.

4. Connections to FireFlo collectors

FireFlo collectors have an integral 304 stainless steel 1 ¼" BSPT (final T meaning 'tapered') male threaded connection for the pipework connections. This will connect to any 1 ¼" BSPP (Final P meaning 'parallel') or BSPT threaded female connection, with a thread sealant applied to the threads.

FireFlo recommends Loctite 567 as a thread sealant, and Loctite SF 7070 solvent cleaner for cleaning the threads prior to applying the thread sealant.

Flexible PVC pipework

Assuming the recommended Flexible PVC pipe is used, we recommend screwing a 1 ¼" BSPT female stainless-steel hose tail fitting for 1 ¼" ID pipe (32 mm) into the FireFlo collector connection (using a thread sealant) which would then join onto the recommended flexible PVC hose discussed above using either an Oetiker 'Ear Clamp' (preferred) or durable screw-type hose clip (i.e. Mikalor W4).

FireFlo can supply the hose tails pre-assembled onto the PVC flexible pipe to your specified length, using an Oetiker 'ear clamp' to join the pipe to the hose tail, which are extremely strong and long-lasting. FireFlo can also supply all of the stainless-steel fittings if required. The recommended arrangement is shown in Figure 1 below.

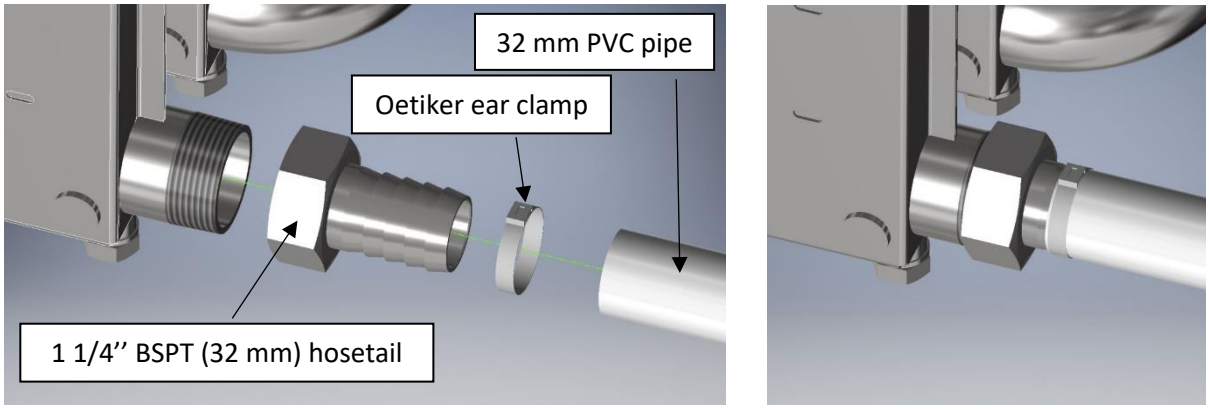


Figure 1 – FireFlo collector connected to Flexible PV hose.

The assembly shown in Figure 1 would need to be screwed into the FireFlo collector, which means that the other end of the same pipe must be disconnected to allow it to rotate while being screwed in. How the other end of the pipes that connect to the manifold or heat pump are configured will be left to the installer to determine because they will know best.

If you prefer to connect your pipework to the FireFlo collectors using rigid pipework (HDPE or stainless steel), the connections to FireFlo collectors will have to be with a DN32 PN16 flange (note PN10 and PN16 are identical at this size) with a 1 ¼" BSPT or BSPP female thread. This can be achieved stainless steel fittings as shown below. As before, a pipe sealant be should be used between all threaded connections.

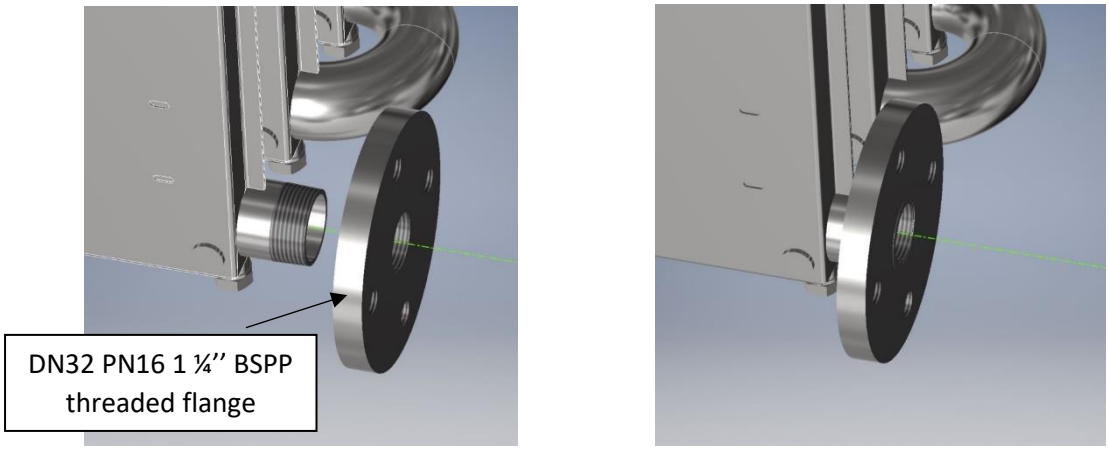


Figure 2 – Connection to FireFlo collector using DN32 PN16 flanged connection.

Note that in all cases, for 1 ¼" BSPT/BSPP fittings with thread sealant applied, they should be tightened to ½ to 1 ½ turns beyond finger tight. Basically, aim for the minimum, then if needed turn further to align the fitting as required.

5. Pipe retention

All pipework should be appropriately supported and anchored. The best way of doing this is often determined by the installer because it can be very site-specific in design.

Note that in wall-mounted applications of multiple FireFlo collectors, the welded-on spacers shown in Figure 3 below have a 9 mm hole / M8 hole which can be used to attach a pipe support of other bracketry. If you require bespoke fabricated bracketry, FireFlo may be able to provide this for an additional fee.

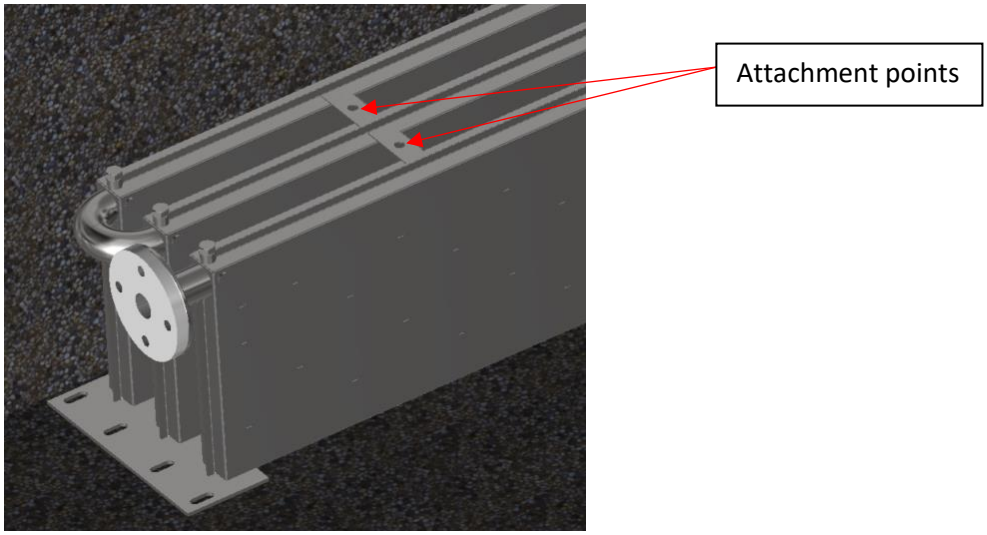


Figure 3 – Attachment points for pipe supports, if needed.

If flexible pipes need holding down onto the bed, sand / gravel / clay-filled sandbags are good for this. Normally one bag per metre of pipe length is adequate.

6. Design considerations when designing pipework

- With flexible pipe, avoid sharp edges.
- If vandals / tampering with pipework is likely, avoid flexible pipework where accessible out-of-water.
- With multiple-strings of parallel FireFlo collectors a manifold may be needed to connect the strings to the primary pipework. This manifold may also include flow balancing valves and filling / draining connections. Manifold design will be undertaken by the installer.