Heating the Pump Cylinder to High Temperatures

TELEDYNE ISCO
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Pumps Application Note AN45

High Temperature Considerations

The purpose of this document is to give the user a basic understanding of heating the non-hazardous locations pump cylinders up to 200 °C. This document does not cover all the engineering and safety issues for all applications.

If the temperature needs to be above 100 °C then the standard pump and temp control jacket options will not work. The pump needs to be upgraded with a high temperature package. This consists of special seals, which are temperature resistant, and a replacement pressure transducer, as the standard one will not be able to withstand the higher temperatures. The standard transducer, in most cases, sits above the cylinder containing the liquid that needs to be heated. The replacement transducer is externally mounted which involves the standard transducer being replaced, during manufacture, with a blank cylinder cap.

With the high temperature upgrade installed it is possible to heat the contents of the pump up to 200 °C. Note however that some of the valve package options, particularly the automated ones, cannot be operated above 150 °C. This limitation is common across all pump manufacturers currently as many use valves from the same supplier.

To prevent minute flow and pressure changes due to expansion and contraction of the metal components and fluid it is important to keep the temperature as stable as possible. Be sure to choose a heating device that is accurate and can heat the amount of fluid being pumped through the system. Preheating the fluid before it reaches the cylinder and wrapping the cylinder and associated tubing in insulation should be considered.

Heating the Cylinder with Heating tape

There are many types of heating tape available. This approach involves wrapping heating tape around the cylinder containing the fluid and then controlling the temperature of the tape. It is also necessary to insulate the tape/cylinder to improve consistency of control and for safety reasons

The tape can be supplied in different sizes. It is useful to know the cylinder dimensions to be able to calculate the requirements. Below is a listing of dimensions of the outer dimensions of the different syringe pump cylinders.

Syringe Pump	Circumference (In.)	Length (In.; Threads to Threads)
1000X	9.820	11.700
500X, XV	6.880	12.310
260X	5.105	11.843
65X	5.105	11.643

If you have a pump already you can use flexible measuring tape and/or calipers to measure the cylinder length/diameter to determine the amount of heat tape required.

The heating tape or source of heat would require a controller and a thermocouple.

Companies such as Omega and Cole Parmer offer complete heating tape solutions.

Insulation

The insulation you choose should:

- Be able to withstand 200 °C
- Be flexible enough to be fitted to the necessary shape
- Maintain temperature with the heat source and amount of fluid pumped

Foil-backed insulation from manufacturers such as Rockwool, Kingspan or Knauf can be considered.

Note:

The purpose of this document is to highlight some options that are available. Teledyne ISCO cannot comment on or recommend any specific option from the suppliers above or alternatives available.

Potential supplier examples

Below are some examples/links to possible suppliers, there are also many alternate sources for these items. Note these links were active at the time of publication and may vary in different countries.

Heating tape and accessory options:

https://www.omega.co.uk/pptst/SRT_HEATERS.html

https://www.coleparmer.co.uk/c/heating-tapes?searchterm=heating%20tape

This is a useful link below for background information and gives some details about what you need to consider in terms of specification of the tape required.

Silicone Heaters - Introduction to Flexible Heaters
https://www.omega.co.uk/prodinfo/flexible-heaters.html

The link below discusses surface mount thermocouples which could be useful:

Stick on thermocouples
https://www.omega.co.uk/pptst/SA2.html

https://www.coleparmer.co.uk/c/thermocouple-probes?searchterm=Thermocouple%20Probes

Controllers

What is a Digital Temperature Controller? | Omega Engineering

https://www.omega.co.uk/prodinfo/temperature-controllers.html

https://www.coleparmer.co.uk/search?searchterm=X2+PID

Insulation

https://www.pipelagging.com/pipe-insulation/foil-backed-insulation

Teledyne ISCO
P.O. Box 82531, Lincoln, Nebraska, 68501 USA
Toll-free: (800) 228-4373 • Phone: (402) 464-0231 • Fax: (402) 465-3091