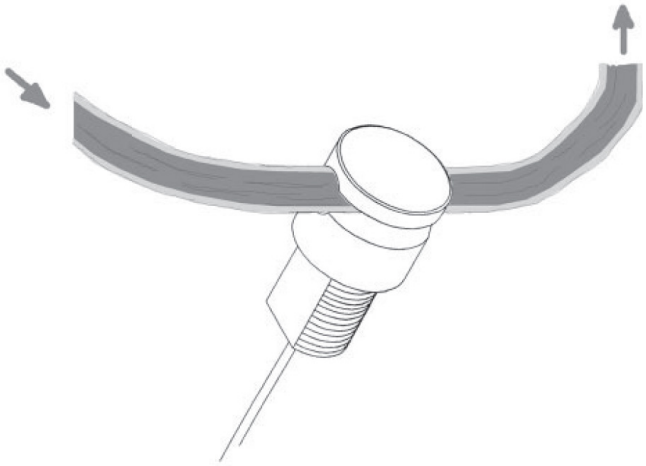
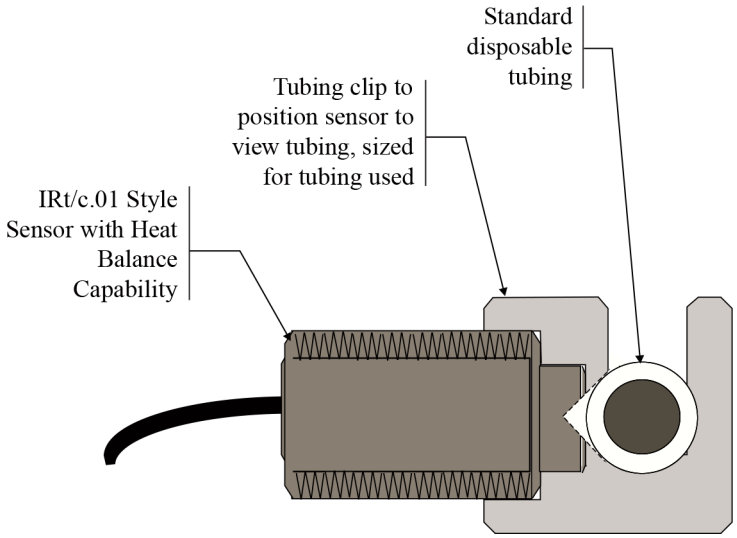
IRt/c HEAT BALANCE SERIES FOR MEDICAL APPLICATIONS

The Heat Balance (HB) Series of IRt/c infrared thermocouples have the ability to measure the **internal temperature** of the target material, non-invasively, by employing a patented heat balance technique. A typical application in medical equipment is monitoring or controlling the temperature of fluid transported through disposable tubing when warming or cooling:



- Transfusion systems
- IV warming systems
- Dialysis systems
- Cardio-pulmonary bypass systems
- ECMO systems
- Blood analyzers



The IRt/c.01HB model pictured, actually measures the internal fluid temperature by measuring both tubing surface and ambient temperatures then calculating the internal temperature necessary to maintain the heat balance. A convenient clip head provides a reproducible mounting location for the sensor and can be quickly attached to new tubing and removed from used tubing.

Exergen Global offices:

USA
400 Pleasant Street
Watertown, MA 02472
Tel: +1 617 923 9900 press 4 for industrial
Fax: +1 617 923 9911

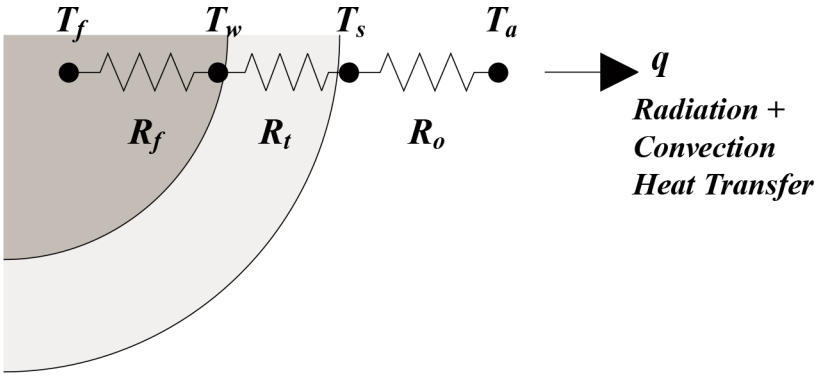
The Netherlands
Pastoor Clercxstraat 26
5465 RH Veghel
Tel: +31 (0)413 376 599
Fax: +31 (0)413 379 310

industrial@exergen.com
www.exergen.com

IRt/c HEAT BALANCE SERIES FOR MEDICAL APPLICATIONS

Principles of Operation

Fluid at temperature T_f flowing in tubing transfers heat via convection through thermal resistance R_f to the tubing inside surface, which in turn conducts heat to the tubing external surface through thermal resistance R_t, which then transfers to the environment via radiation and convection thermal resistance R_o. The temperatures of the wetted surface of the tubing, outside surface of the tubing, and the local ambient are given by T_w, T_s, and T_a, respectively.



Employing the method of thermal analysis with electrical analogs: current = heat flow, and voltage = temperature, the heat transfer equation may be written as follows:

$$q = \frac{1}{R_f + R_t + R_o}\left(T_f - T_a\right)$$

and via heat balance:

$$= \frac{1}{R_o}\left(T_s - T_a\right)$$

Accordingly,

$$T_f = \frac{R_f + R_t + R_o}{R_o}\left(T_s - T_a\right) + T_a$$

The IRt/c-HB Series measures both T_s and T_a, and solves this equation automatically for fluid temperature T_f, providing a highly accurate method of monitoring or controlling the temperature of interest.

The configuration shown above is the model IRt/c.01HB-J-37C with its convenient tubing clip. Any of the IRt/c models can be configured for the HB calculation. Contact the factory for further details.