

## Unistat® 705

**Unistat 705 controlling a 20-litre Chemglass reactor**

### Requirement

The graphics illustrate the performance of Unistat 705 working with a 20-litre Chemglass reactor.

### Method

The Unistat and reactor are connected using two 1,5-metre insulated metal hoses. The reactor is filled with 19 l of Ethanol.

### Setup details

Temperature range: -75 ... +250 °C

Cooling power: 0,65 kW @ 0 °C

0,6 kW @ -20 °C

0,6 kW @ -40 °C

Heating power: 1,5 / 3,0 kW

Hoses: M30x1,5 ; 2x1,5 m

HTF: M90.055/170.03

Reactor: 20-litre glas reactor

Reactor content: 19 l Ethanol

Reactor stirrer speed: 200 rpm

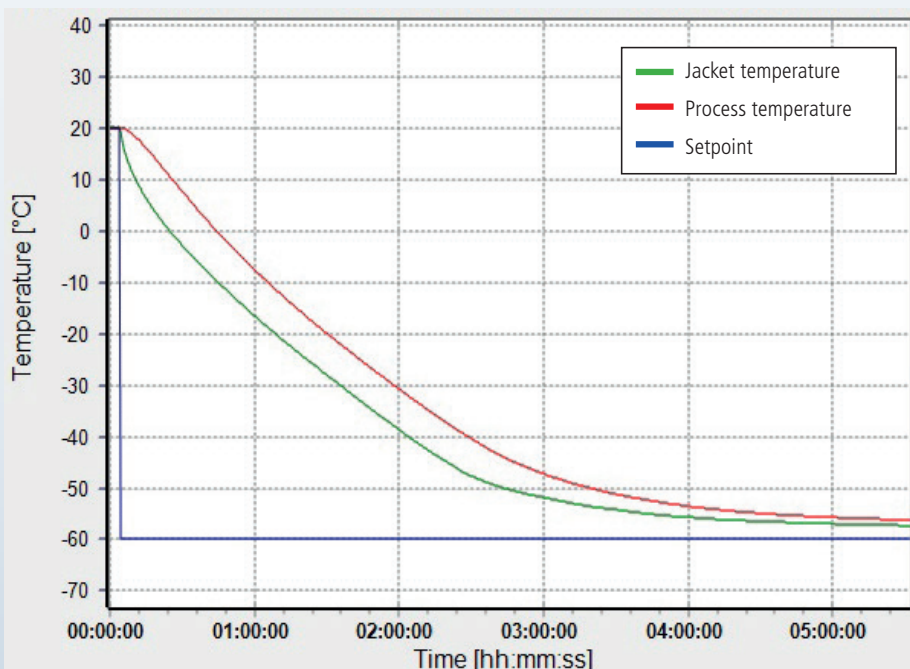
Control: Process



## Results

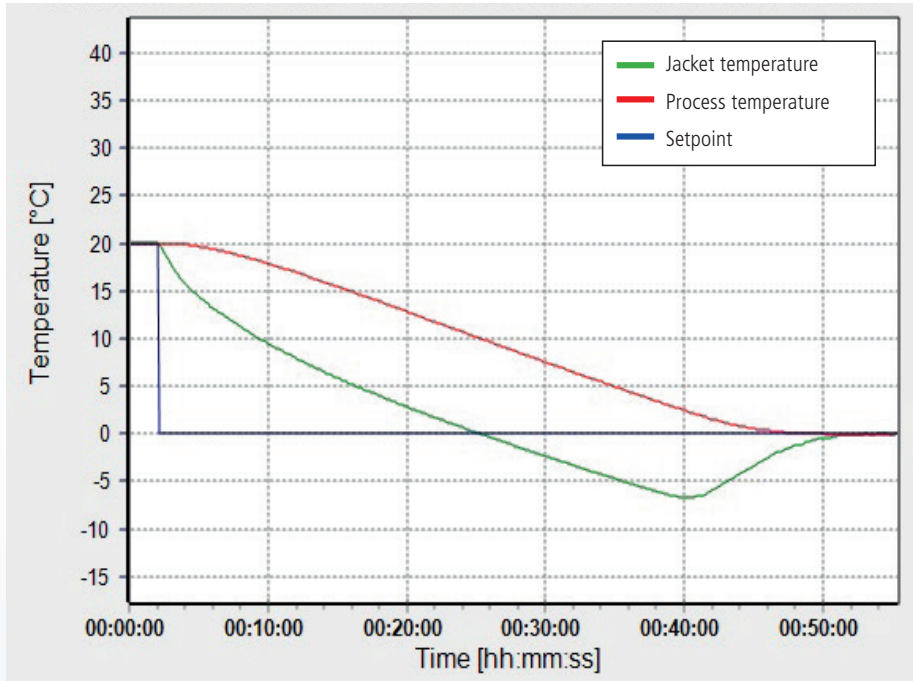
### 1. Lowest achievable temperature ( $T_{min}$ ):

Once stable at +20 °C under the "Process" control, a set point of -60 °C is entered. The Unistat cools the reactor down to the minimum achievable process temperature of -55 °C with a cooling rate of 0.3 K/min. The corresponding jacket temperature is -57 °C.

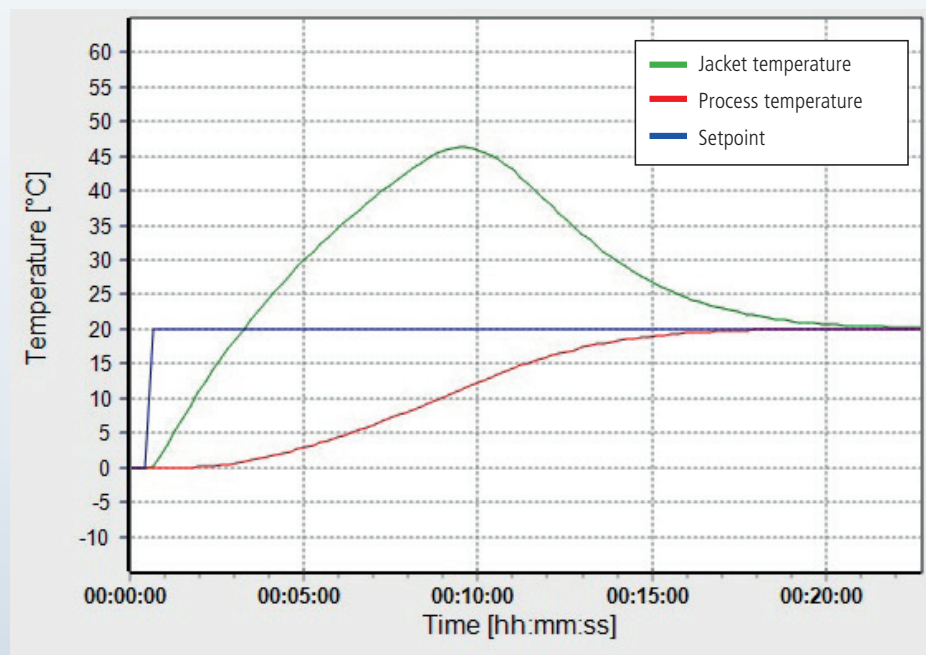


## 2. Temperature control of the reactor between 0 °C and +20 °C:

It can be seen from the graphic how the jacket ramps creating a difference in a temperature between the jacket and process in the initial cool down phase. Around 44 minutes after the start 0 °C could be reached as process temperature.

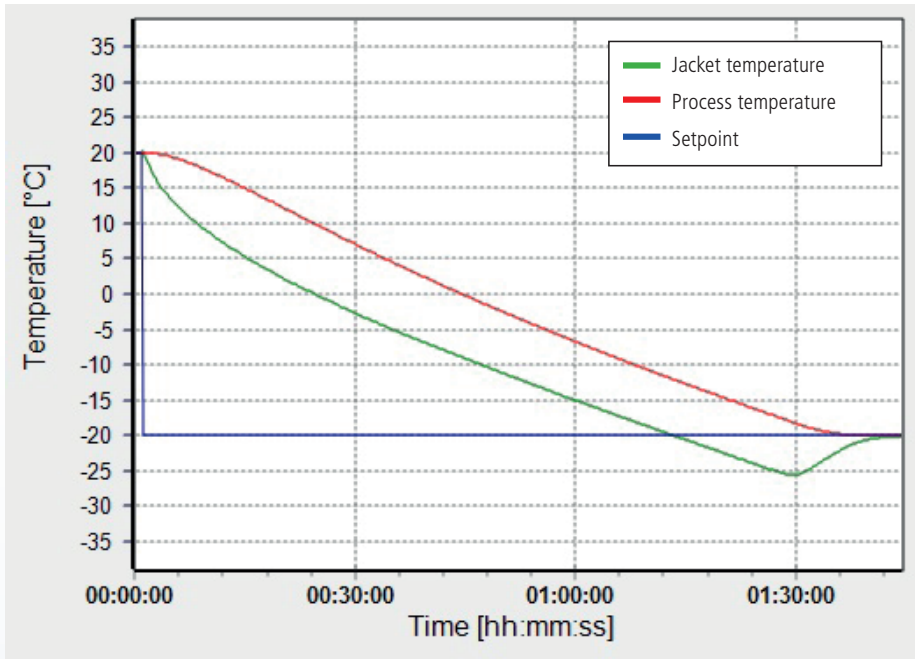


In the heat up phase the Unistat 705 takes 21 minutes to heat the 20-litres reactor from 0 °C to +20 °C. The heating rate of 0,9 K/min can be seen on the process temperature curve.

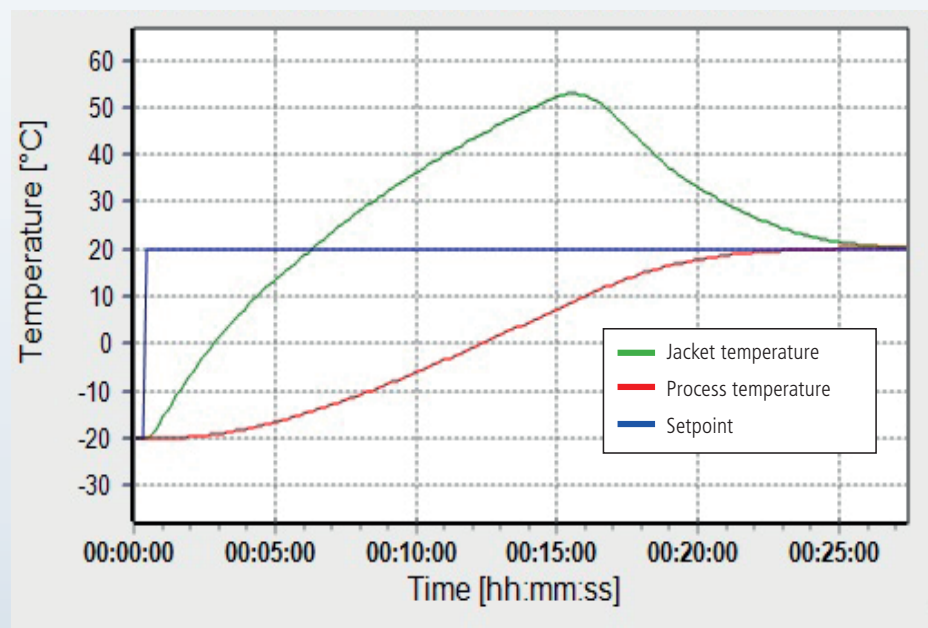


### 3. Temperature control of the reactor between +20 °C and -20 °C:

In the initial cool down phase the jacket ramps creating a difference in temperature between the jacket and process. It takes around 92 minutes to cool down the reactor from +20 °C to -20 °C.

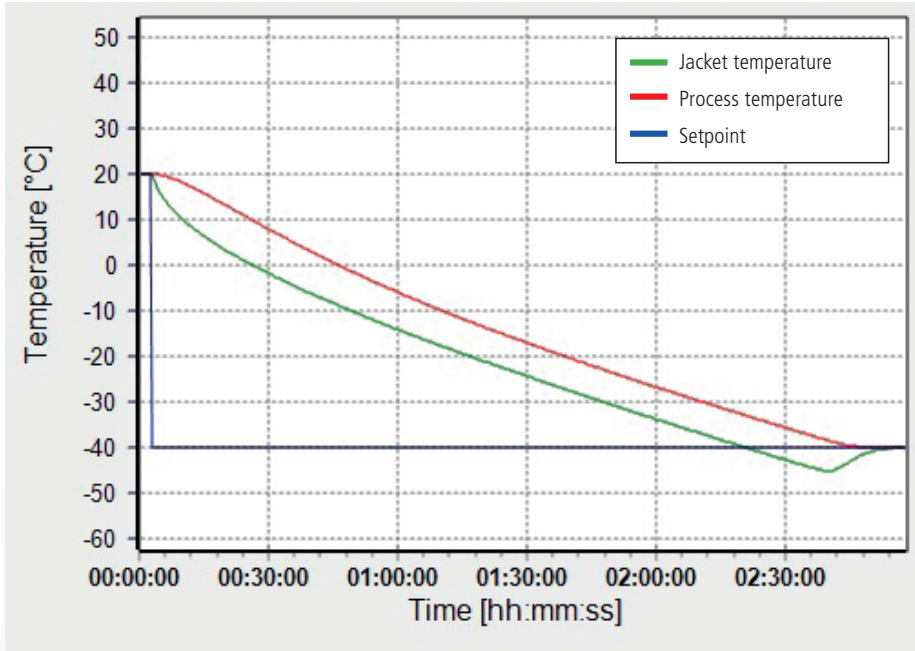


To heat up the reactor from -20 °C to +20 °C the Unistat 815w needs approximately 26 minutes.

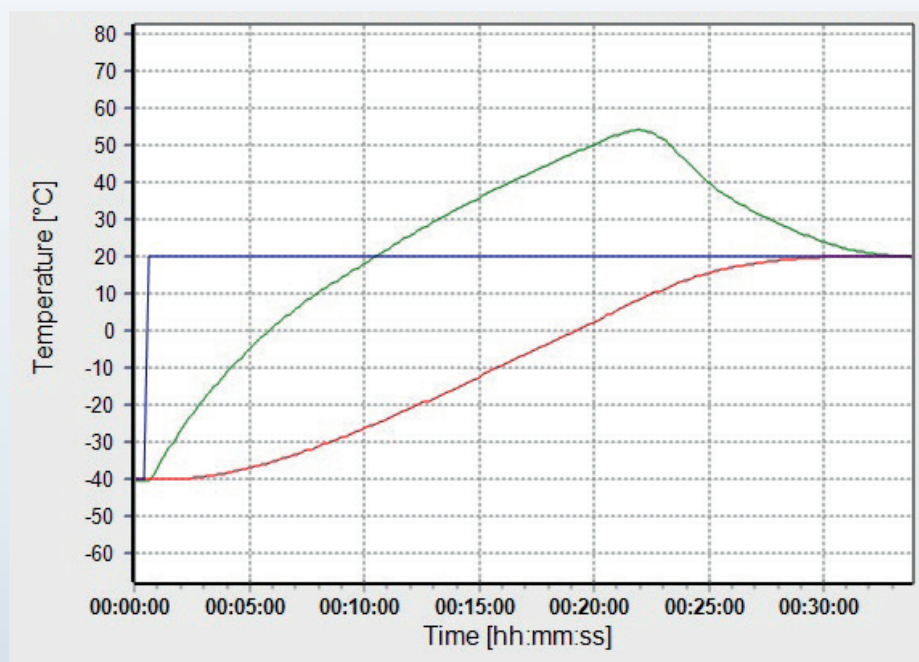


**4. Temperature control of the reactor between +20 °C and -40 °C:**

The curve shows that the Unistat 705 cools the process from +20 °C to -40 °C in approximately 162 minutes. The cooling rate is 0,4 K/min.



The heat-up time through 60 K (from -40 °C to +20 °C) is completed within 32 minutes.



## 5. Performance:

Graphic shows the performance of Unistat 705 controlling a 20-litre Chemglass reactor in a temperature range between +20 °C and -40 °C:

