



Cryogenic cooling system Type TG-LKF-H for cooling applications from +100°C (+212°F) to -180°C (-292°F)

from
+100°C
KALTGAS

+/-0°C
KALTGAS

to max.
-180°C
KALTGAS

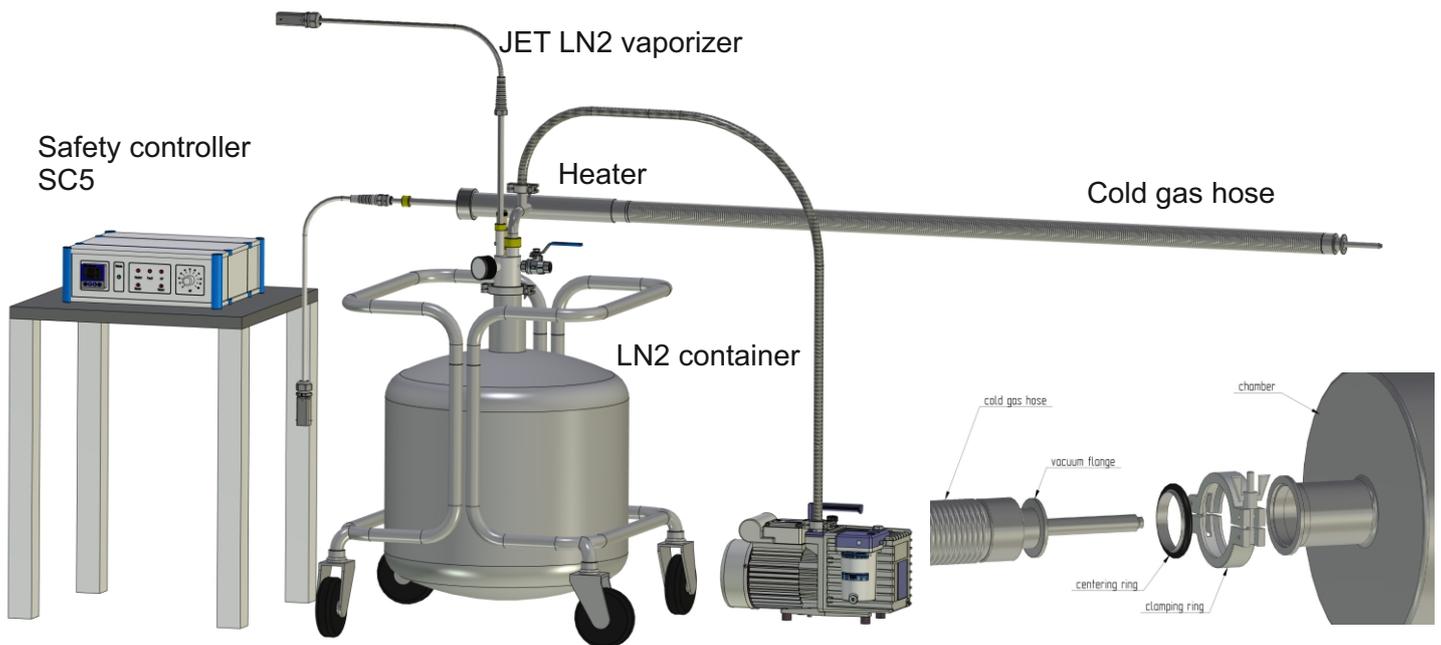


Indirect cryogenic cooling in a sample chamber

To obtain rapid cooling speeds and very low temperatures, sometimes you have to switch from conventional mechanical cooling to cryogenic cooling. With this scenario in mind, KGW-ISOTHERM has developed a new KALTGAS system. In it, the reactor is cooled with cryogenic nitrogen gas, resulting in a high cooling speed. For a better handling of the cold gas hose, the Heater is directly on the siphon of the LN2 container. With this modification the cold gas hose is simply to connect on a chamber.

KALTGAS is a tempering system that utilizes the very low temperature of liquid nitrogen as a cooling agent. The Jet vaporizes the liquid nitrogen in a cryogenic container, producing a steady cryogenic gas flow. This LN2 vaporizer (Jet) can be adjusted to minimize liquid nitrogen consumption and to change both the cooling rate and the volume of the gas flow. The cryogenic gas flow is then piped through a vacuum insulated flexible metal line (N₂ gas line) to a heat exchanger (heater). The heat exchanger is designed to heat the cold gas flow to the desired temperature. The final product, a clearly quantified gas flow exiting the heat exchanger at a clearly defined temperature, is ready for use as a cooling agent. A KALTGAS system needs only a few minutes to produce a cold gas flow with a temperature of -180°C (-292°F). Configuring the KALTGAS system to any customer's individual environment is possible thanks to various temperature controllers that can be embedded inside the safety control unit. Those temperature controllers are available with or without interfaces. By using an optimized temperature controller, a temperature stability of ± 0.1°C can be achieved. With the standard safety control unit (SC5), a temperature stability of better than ± 0.2°C can be achieved. The steady gas flow can be used to temper a chamber.

In addition to their high cooling speed and good control stability, another advantage of KALTGAS systems is their modular design. By swapping out individual modules such as the N₂ gas line, the LN2 vaporizer (Jet) or the heater, it is possible to change the cooling speed, LN2 consumption as well as the application. The basic modules, including the LN2 container, the vacuum pump and the safety control unit, remain unchanged.



The TG-LKF-H 63/50 KALTGAS system includes a standard safety control unit SC5 (a temperature controller with current value/set point display and a safety controller), a KF-NW 50 siphon with an LN2 vaporizer (Jet), a flexible, evacuable N₂ gas line with an integrated post-heating module (Heater), a Pt100 temperature sensor and a vacuum pump with accessories.

Technical data for

Model TG-LKF-H 63/50

LN2 vaporizer (Jet)= 500 watts
 Heater = 630 watts / LN2 consumption = 1.1l/h to 11l/h (liters per hour), N2 gas line = V2A, length 1.8 meters, flexible, with vacuum pump, siphon for LN2 container with KF NW 50
Order No.: TG-LKF-H 63/50

- Best. Nr: TG-LKF-H 63/50-1 (External thread)
- Best. Nr: TG-LKF-H 63/50-2 (Union nut)
- Best. Nr: TG-LKF-H 63/50-3 (Johnston coupling)
- Best. Nr: TG-LKF-H 63/50-4 (Swagelok)
- Best. Nr: TG-LKF-H 63/50-5 (Internal thread)

Model TG-LKF-H 63/100

LN2 vaporizer (Jet)= 1000 watts
 Heater = 630 watts / LN2 consumption = 2.2l/h to 22l/h (liters per hour), N2 gas line = V2A, length 1.8 meters, flexible, with vacuum pump, siphon for LN2 container with KF NW 50
Order No.: TG-LKF-H 63/100

- Best. Nr: TG-LKF-H 63/100-1 (External thread)
- Best. Nr: TG-LKF-H 63/100-2 (Union nut)
- Best. Nr: TG-LKF-H 63/100-3 (Johnston coupling)
- Best. Nr: TG-LKF-H 63/100-4 (Swagelok)
- Best. Nr: TG-LKF-H 63/100-5 (Internal thread)

Accessories

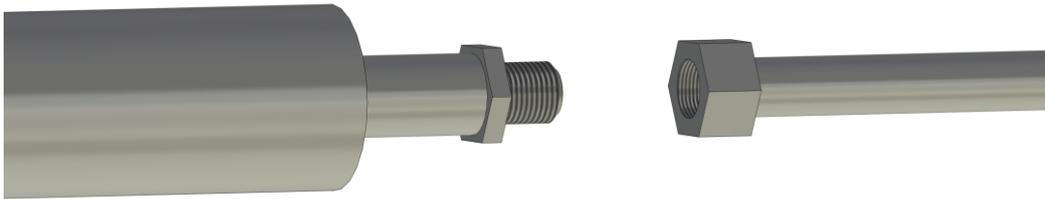
LN2 container with 20 to 300 liter capacity

Further information on KALTGAS systems available.
Technical data subject to change.

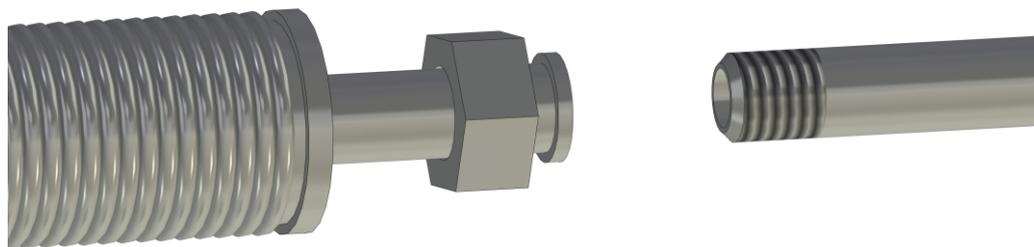
Connection options



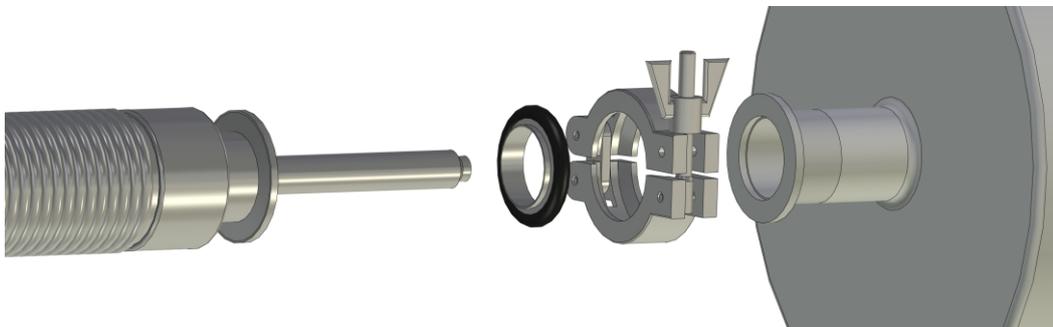
1. External thread (specify thread)



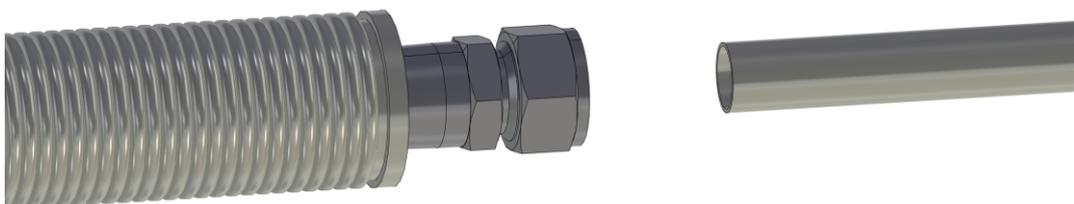
2. Union nut (UNF 3/4" standard kryo connector)



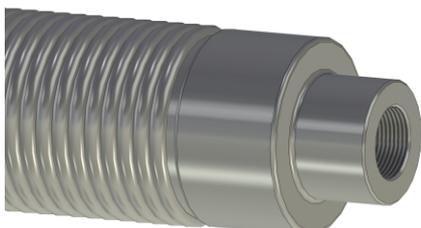
3. Johnston coupling (DN25/DN40) gas outlet pipe (l=80/150/200mm)



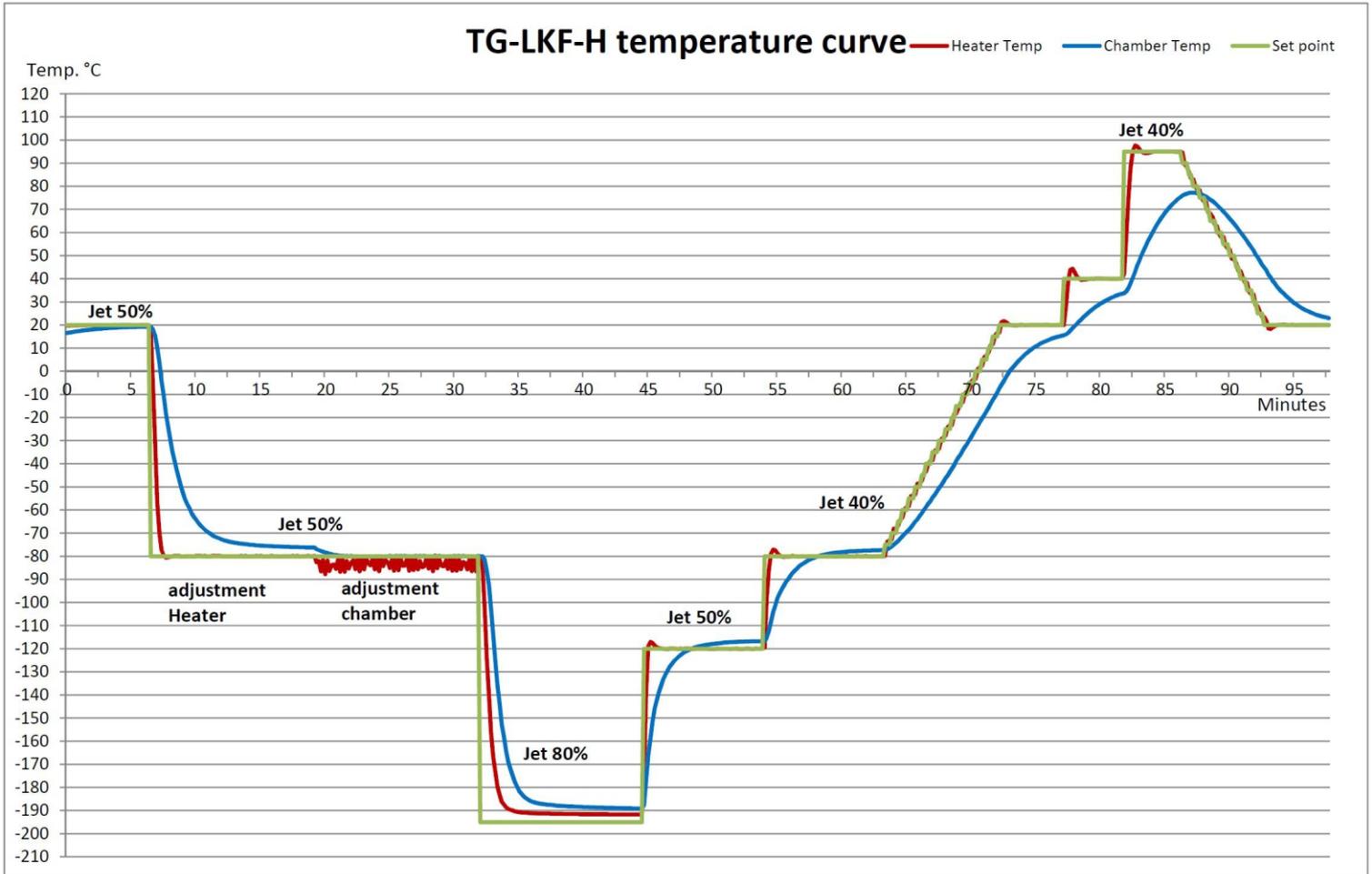
4. Swagelok (Specify pipe diameter)



5. Internal thread (specify thread)



Temperature curve with different JET power



Excel data on request

Measuring point at the gas outlet nozzle

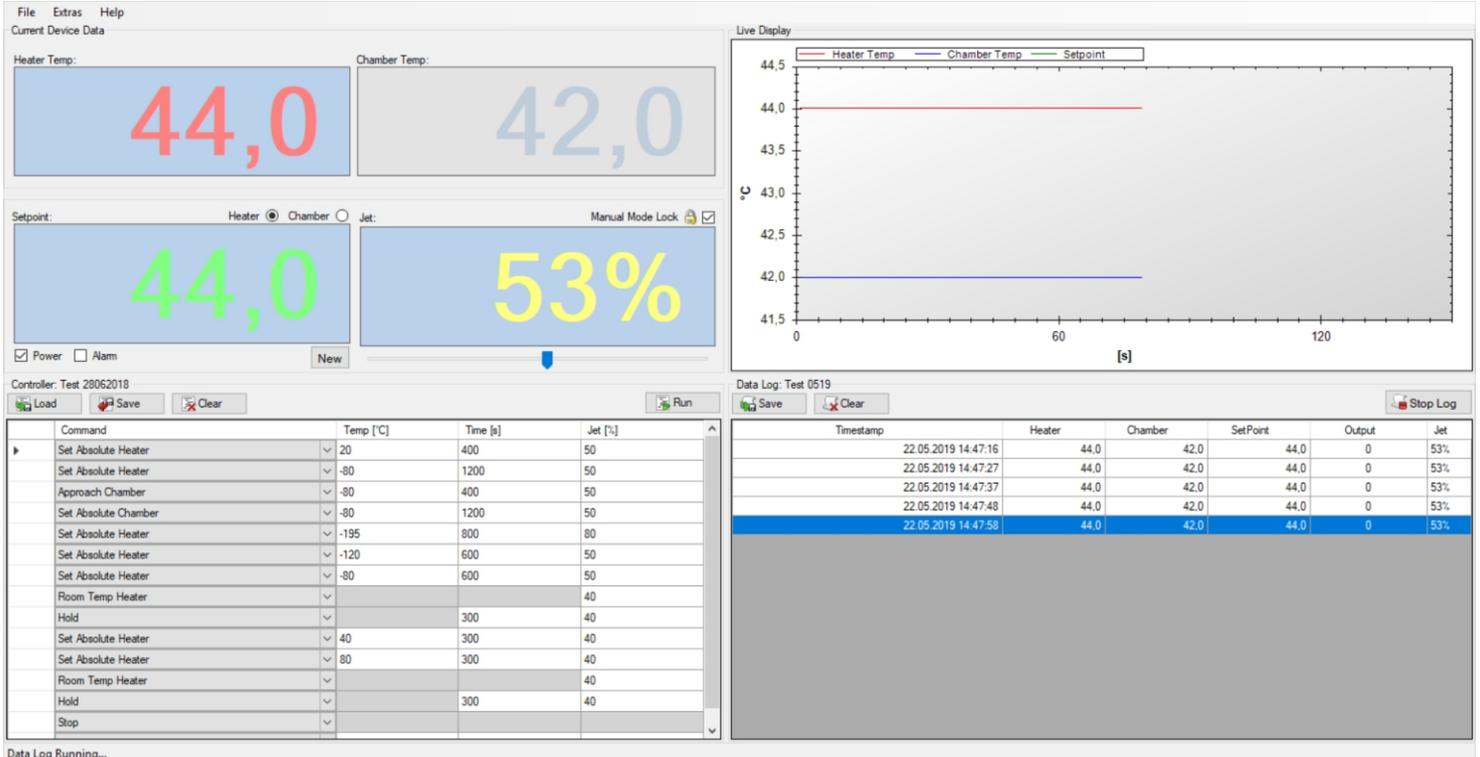




KALTGAS TOOL

Software to control kaltgassystems

The user interface is shown in the following diagram:



Settings

- Sensor and properties
- a) Linearization
- b) Offset: "0" spot offset
- c) type of sensor

Display

- set the upper prompt of controller
- set the power prompt of controller
- unit °C or K
- Decimal place of the Display of Temperature

Abstract

- define and set the desired value,
- set the max lower desired value,
- set the max upper desired value

Device Parameters

The 'Device Parameters' dialog box is shown with the following settings:

- Sensor 1:** Linearization: Pt100, Offset: 0,0, Type: Resistance thermometer in 3-wire ci
- Sensor 2:** Linearization: Pt100, Offset: 0,0, Type: Resistance thermometer in 3-wire ci
- Generic:** Binary Output 1: Controller output 1, Binary Output 2: No function, SPL: -180,0, SPH: 120,0 200
- Display:** Upper Display: Analog input 1, Lower Display: Analog input 2, Display Type: Celsius, Decimal Point: One decimal place

Buttons at the bottom include: Read Current Parameters, Set Standard Parameters, Autotune Heater, Autotune Chamber, and Close.



KALTGAS TOOL

Software to control kaltgassystems

Options

Here you can choose the serialport. Make sure that your controller is connected to the right port. Additionally, you can preset the

Settings

Generic

Data Logger Interval [s]:

Serial Port:

Time Measure:

Temperature Measure:

Approach Switching Point [s/1°C]:

Cancel OK

example program

Controller: Test 28062018

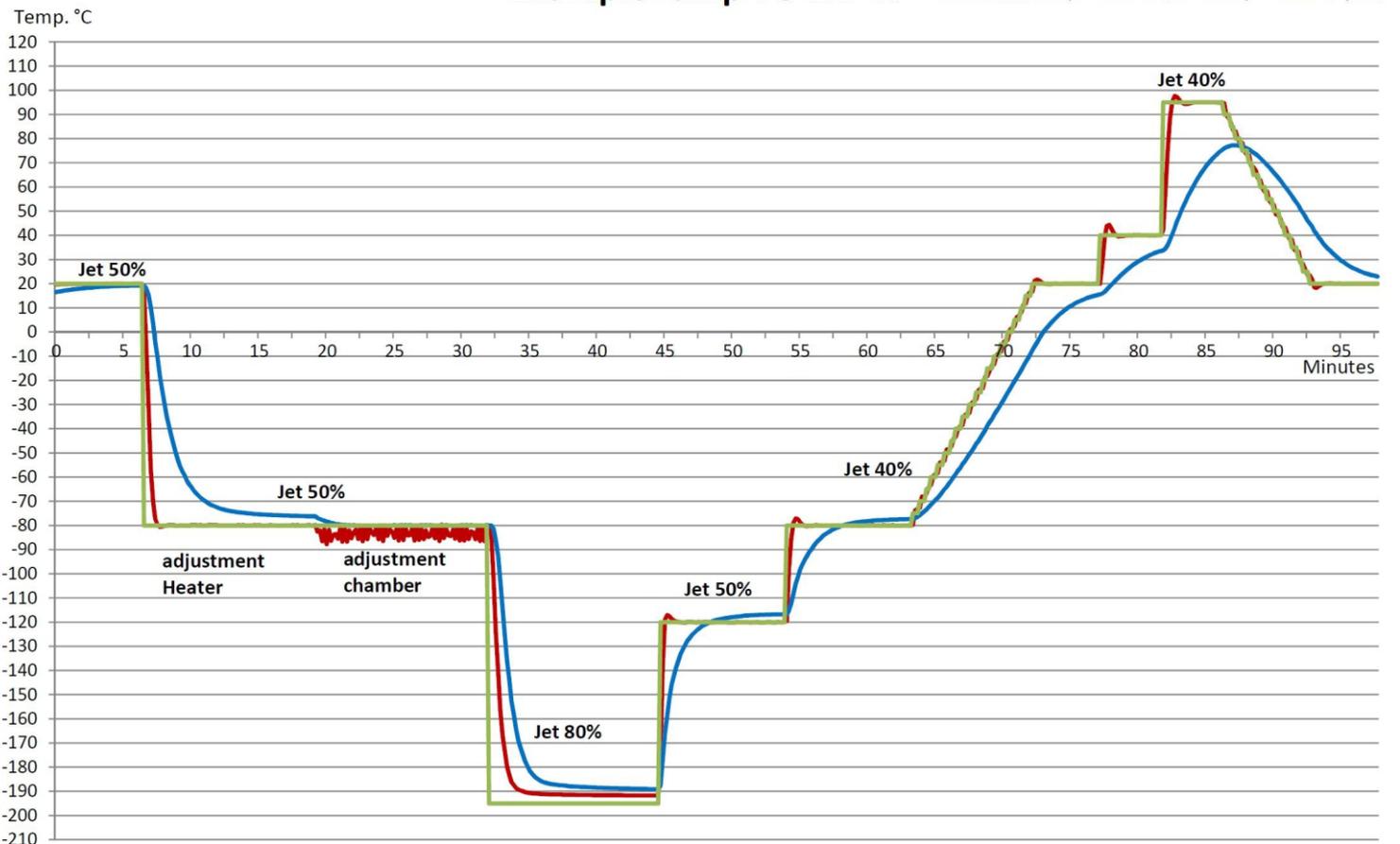
Load Save Clear Run

Command	Temp [°C]	Time [s]	Jet [%]
Set Absolute Heater	20	400	50
Set Absolute Heater	-80	1200	50
Approach Chamber	-80	400	50
Set Absolute Chamber	-80	1200	50
Set Absolute Heater	-195	800	80
Set Absolute Heater	-120	600	50
Set Absolute Heater	-80	600	50
Room Temp Heater			40
Hold		300	40
Set Absolute Heater	40	300	40
Set Absolute Heater	80	300	40
Room Temp Heater			40
Hold		300	40
Stop			

example ramp

(Excel data on request)

Example ramp TG-LKF-H





Safety control SC5 unit for cryogenic cooling systems with two temperature sensor connections for a temperature range from +100°C (+212°F) to -196°C (-320,8°F)

from
+/- 100°C
KALTGAS

+/- 0°C
KALTGAS

to
-196°C
KALTGAS



SC 5 safety control unit

The SC 5 safety controller has three functional components. The first component is the temperature controller. It allows users to set the temperature set point of the gas flow at the front of the control unit. The temperature controller then shows the current and the set point temperatures separately. In addition, this controller has an RS 485 interface allowing users to address the controller with software and to specify temperature ramps. The controller also has an auto tuning function where the controller automatically searches for and reads in the control parameters required to reach a high level of control stability. The controller can either control the KALTGAS system using its own internal temperature sensor, or it can be manually switched to the second, internal temperature sensor (e.g., on the sample).

The second component is the heating element safety monitor. It monitors the two heating elements for overheating. Should the internal temperature of either of the two heating elements (LN₂ vaporizer (Jet) and heater) rise above the specified safety temperature, the safety controller shuts the KALTGAS system off and sounds an alarm. The only way to turn on the system again is manually.

The third component is the LN₂ vaporizer (Jet). The gas rate is adjusted with a control knob, with possible manual settings for the gas rate ranging from 0 to 100 %. The resulting volume of cold N₂ gas depends on the Jet power and the specified vaporizer rate. The Jet is available in ratings from 100 to 1000 watts. For an Jet with a rating of 1000 watts, that translates into a maximum N₂ gas production of over 14,000 litres of cold gas per hour. (A Jet with 100 watts evaporates approx. 2 litres of LN₂ per hour; 1 litre of LN₂ produces approx. 700 litres of N₂ gas.)