Low temperature cooling system Type T-G for applications to -170°C (-274°F)

+/-0°C KALTGAS

to -170°C KALTGAS

Cryogenic cooling system for cooling applications to -170°C (-274° F)

This KALTGAS system is designed to cool items to temperatures as low as -180°C (-292° F), by means of a tempering system that solely uses a flow of ultra cold gas. The system uses cold nitrogen gas to achieve very low temperatures. Liquid nitrogen (LN2) is vaporized in the LN2 storage container, and is then used as a cold gas for tempering. As examples of the many applications, a steady flow of cold gas can be directed at the object to be cooled or can be fed into a sample chamber to cool the whole space.

Applications include:

- Thermal testing of plastics, metals, composites etc.
- Cooling of electronic components
- Cooling of sample chambers
- Rapid freezing of biological samples, food and other materials
- Tempering of test samples during:
  - Tension or torsion tests
  - Notched bar tests
  - Chemical or physical tests
  - Chemical engineering processes

KGW - ISOTHERM
76185 Karlsruhe Gablonzerstraße 6
Tel:0721 95897-0 Fax: 0721 95897-77
E.mail: info@kgw-isotherm.de
Internet: www.kgw-isotherm.com

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 adjust 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 (N_2 gas line) to the object you wish to cool. A KALTGAS system needs only a few minutes to produce a cold gas flow with a temperature as low as -170° C (-274° F).
In most cases, this KALTGAS system is only used to produce a cold gas flow. The volume of the gas flow is adjusted with the SL1 safety control unit. Since the controlled system operates without a heat exchanger, it is not possible to maintain precise temperature stability.
To achieve good temperature and control stability, a post-heating module (heat exchanger) must be installed. This module can be connected directly to the line, or installed in a chamber right next to the cold gas flow.
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.
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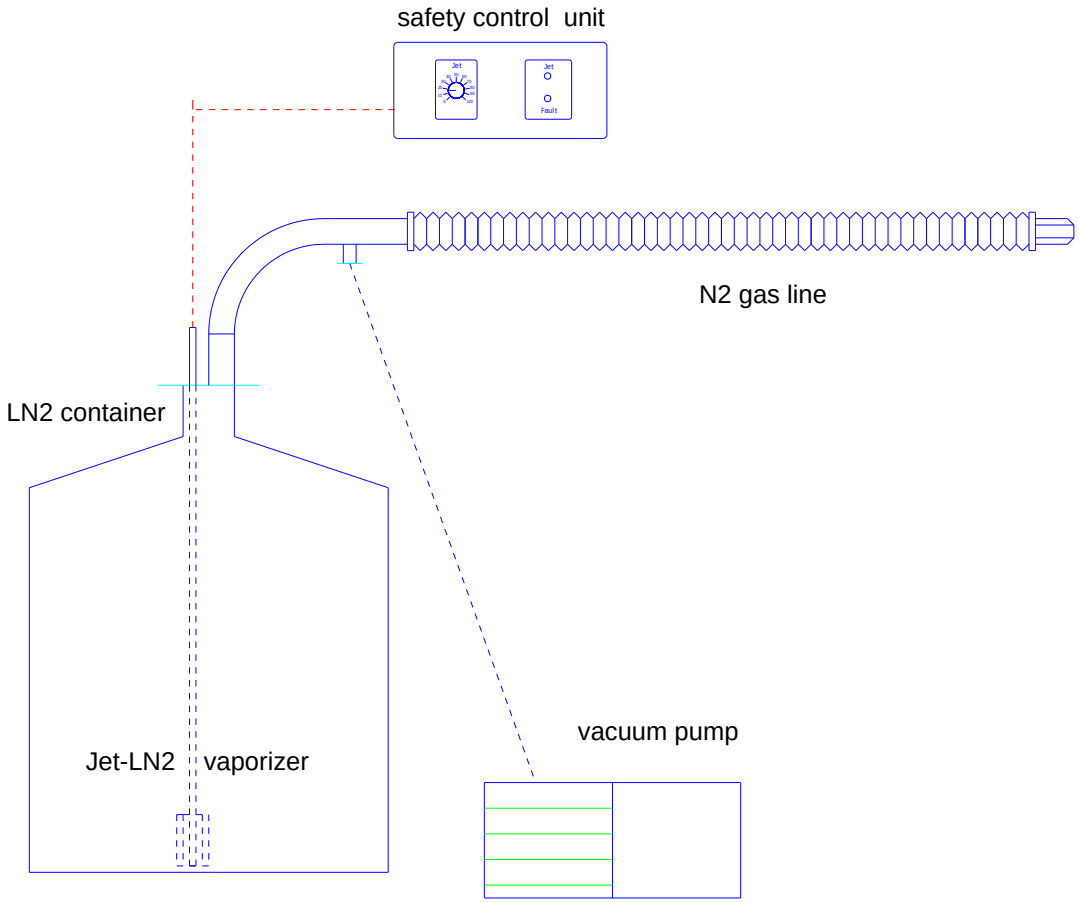
Apart from the high cooling speed, another advantage of KALTGAS systems is their modular design. By swapping out individual modules such as the N_2 gas line, the LN2 vaporizer (Jet) or the heater, it is possible to change the cooling speed, LN2 consumption as well as the application. The basic modules, including the LN2 container and the vacuum pump remain unchanged.



The T-G 50 KALTGAS system includes a safety controller SL1, a KF-NW 50 siphon with an LN2 vaporizer (Jet), a flexible, evacuable N_2 gas line, a PT100 temperature sensor and a vacuum pump with accessories.

Technical data for	**Model T-G50** LN2 vaporizer (Jet) = 500 watts / LN2 consumption = 0.8l/h to 8.8l/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.: Typ T-G 50**
	Model T-G50 FV LN2 vaporizer (Jet) = 500 watts / LN2 consumption = 0.8l/h to 8.8l/h (liters per hour) N2 gas line = V2A, length 1.8 meters, flexible, constant vacuum insulated, siphon for LN2 container with KF NW 50 **Order No.: Typ T-G50 FV**
Accessories	LN2 container with 20 to 300 liter capacity Post-heating module

Further achievements of KALTGAS systems on request.
Technical subject to change.

2/2014

Cryogenic cooling system T-GM for small cooling applications to -170°C (-274°F)

from
+/-0°C
KALTGAS

to
-170°C
KALTGAS

Cryogenic cooling system for small cooling applications to -170°C (-274° F)

This KALTGAS system is designed to produce a cryogenic gas flow with a temperature as low as -170°C (-274° F); it does not control the temperature of the gas flow. The system uses cold nitrogen gas to reach very low temperatures. Liquid nitrogen is vaporized in the LN2 storage container, after which it is used as a cold gas for cooling. As examples of applications, the steady flow of cold gas can be directed at the object to be cooled or fed into a small sample chamber for cooling.

Applications include:

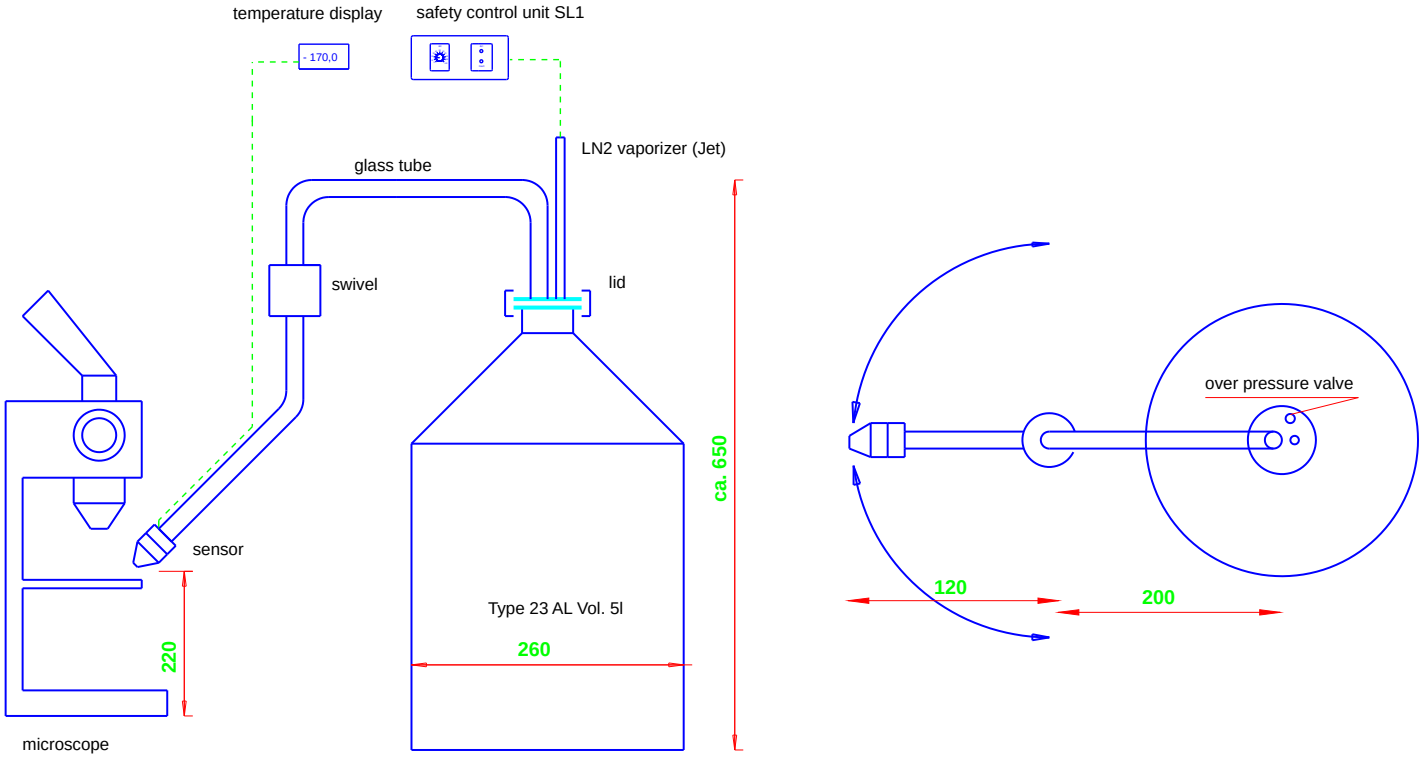
- Thermal testing of small plastics, metals, composites etc.
- Cooling of small electronic components
- Cooling of small sample chambers
- Cooling of samples under the microscope

KGW - ISOTHERM
76185 Karlsruhe Gablonzerstraße 6
Tel:0721 95897-0 Fax: 0721 95897-77
E.mail: info@kgw-isotherm.de
Internet: www.kgw-isotherm.com

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 Dewar flask, 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 swiveling, vacuum insulated glass tube to the object you wish to cool. The temperature generated by the cold gas flow is indicated on the control unit. A T-GM KALTGAS system needs only a few minutes to produce a gas flow with a temperature as low as -170°C (-274°F).

This KALTGAS system is only used to produce a cold gas flow. The only parameter adjusted by the control unit is the volume of the gas flow. Since this KALTGAS system operates without a post-heating module, it is not possible to control temperature stability.

In addition to the high cooling speed, a significant advantage of KALTGAS systems is their modular design. By swapping out individual modules such as the glass tube or the LN2 vaporizer (Jet) it is possible to change the cooling speed, LN2 consumption and the application. The basic modules - including the LN2 container, the output controller and the temperature display - remain unchanged.



The T-GM KALTGAS system includes an safety contol unit SL1 and a temperature display, a 23AL-NF60 Dewar flask, a NW 60 siphon head with an LN2 vaporizer (Jet), an vacuum insulated N_2 glass tube with swivel and protective cover, and an integrated NiCrNi temperature sensor.

Technical data for	**Model T-GM** LN2 vaporizer (Jet) = 100 watts / LN2 consumption = 0.2l/h to 2,2l/h (litres per hour) N2 gas line = glass, removable, vacuum insulated, LN2 container with flange NW 60, Vol. 5 litre, with lid and over pressure valve 0,3 bar. **Order No.: Typ T-GM**
Accessories	LN2 container with 10 litre capacity LN2 vaporizer (Jet) = 200 watts

Further achievements of KALTGAS systems on request.
Technical subject to change.

2/2014

Cryogenic cooling system Type TG-L for cooling applications from +120°C (+248°F) to -180°C (-292°F) measured at an internal temperature sensor

from +120°C KALTGAS

+/-0°C KALTGAS

to -180°C KALTGAS

Cryogenic cooling system for cooling applications from +120°C (+248°F) to -180°C (-292°F)

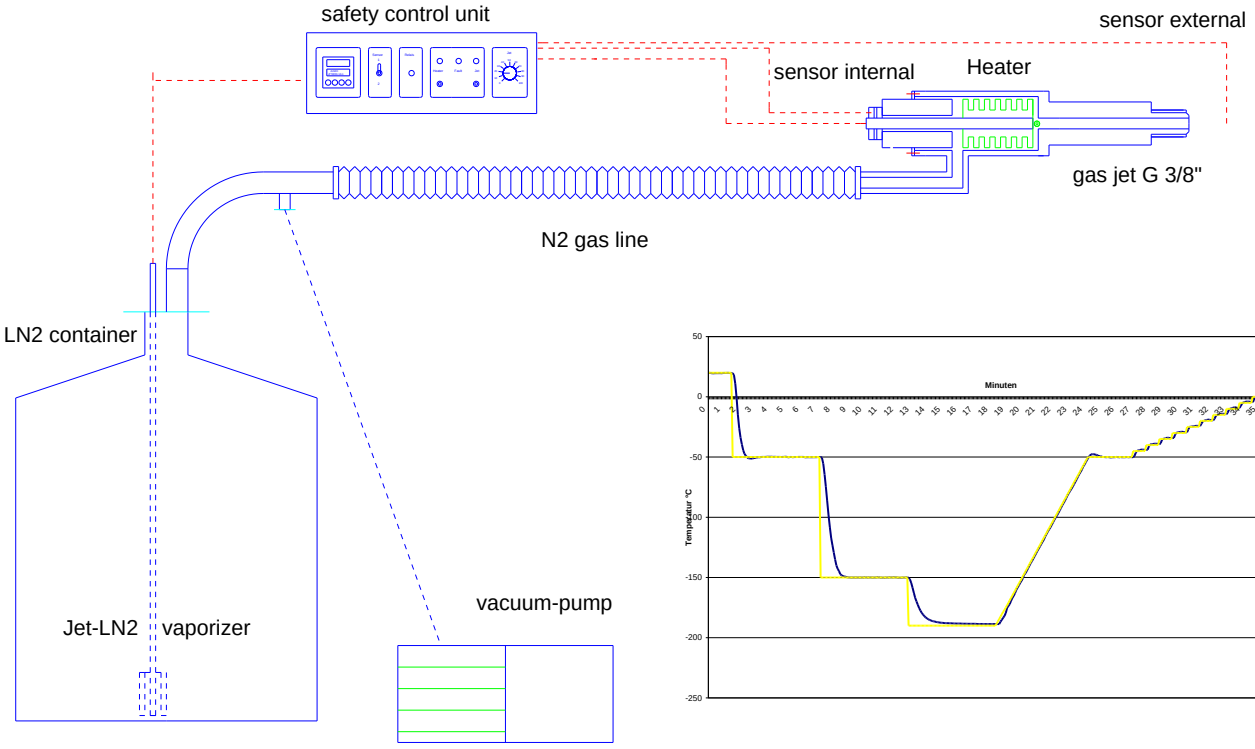
This KALTGAS system is designed for a temperature range from -180°C (-292°F) to +120°C (+248°F), in applications where the actual tempering equipment is separated from the sample to be cooled. The system uses cold nitrogen gas to reach very low temperatures. Liquid nitrogen (LN2) is vaporized and then tempered with a heat exchanger, generating a steady, tempered gas flow that is directed at the object to be cooled.
The TG-L KALTGAS system tempers samples whether they are enclosed in sample chambers or not.

Applications include

- Thermal testing of small plastic samples, metals, composites etc.
- Cooling of electronic components
- Rapid freezing of biological samples, food and other materials
- Tempering of test samples during:
  - Tension or torsion tests
  - Notched bar tests
  - Chemical or physical tests
  - Chemical engineering processes

KGW - ISOTHERM
76185 Karlsruhe Gablonzerstraße 6
Tel:0721 95897-0 Fax: 0721 95897-77
E.mail: info@kgw-isotherm.de
Internet: www.kgw-isotherm.com

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 adjust 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 (N_2 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 gas flow with a temperature of -170°C (-274°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. The control system can be set up as a simple temperature controller featuring current value/set point temperature display all the way to a cascade control system. 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 flow of cold gas can temper a cooling coil, a chamber or an open sample in a tension or torsion machine or in custom-designed heat exchanger, among other applications.
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 N_2 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-L 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 N_2 gas line with an integrated post-heating module (heater), a PT100 temperature sensor and a vacuum pump with accessories.

Technical data for	**Model TG-L 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-L 63/50**
	Model TG-L 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-L 63/100**
Accessories	LN2 container with 20 to 300 liter capacity

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

Cryogenic cooling system Type TG-LKF for cooling applications from +120°C (+248°F) to -180°C (-292°F) measured at an internal temperature sensor

from +120°C KALTGAS

+/-0°C KALTGAS

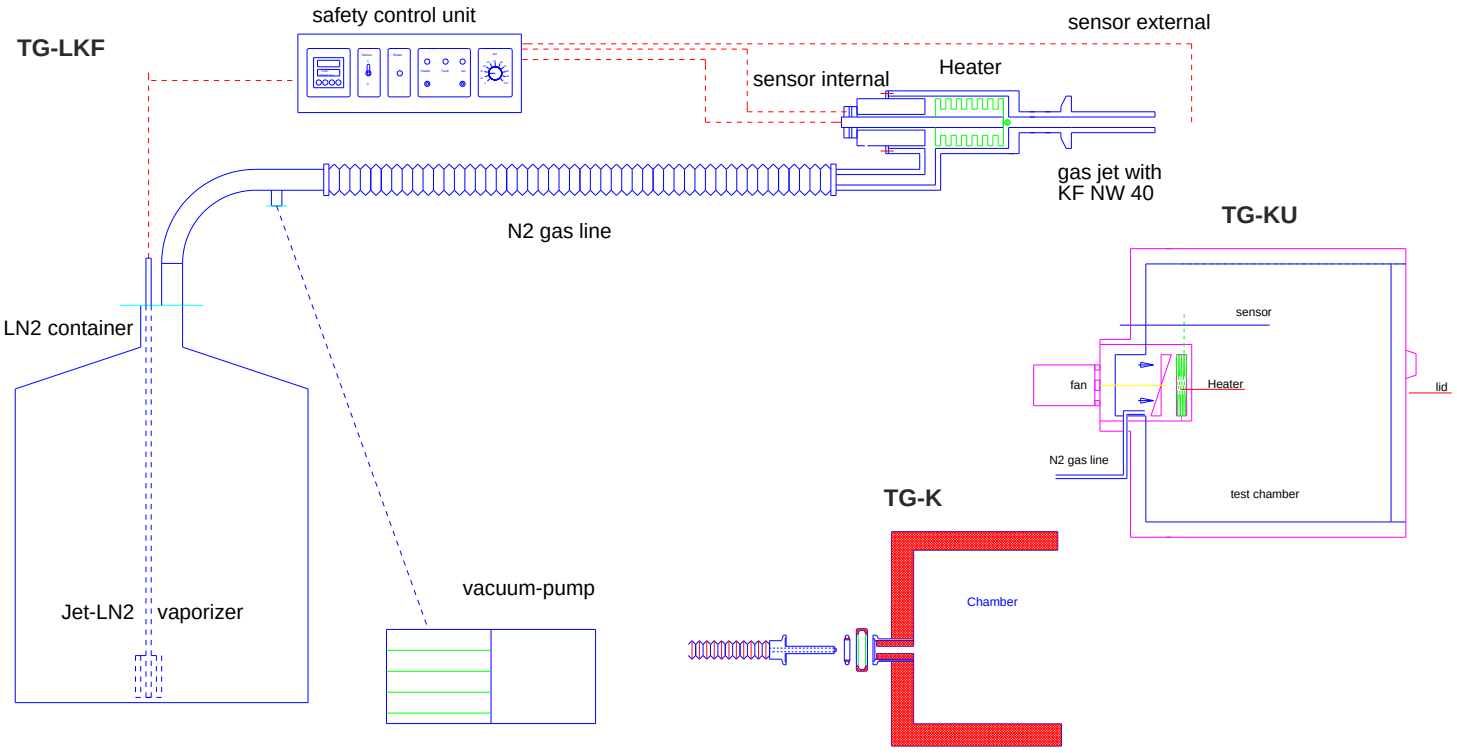
to -180°C KALTGAS

Cryogenic cooling system in sample chambers

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, a sample chamber is filled with cryogenic nitrogen gas, resulting in a high cooling speed.

KGW - ISOTHERM
76185 Karlsruhe Gablonzerstraße 6
Tel:0721 95897-0 Fax: 0721 95897-77
E.mail: info@kgw-isotherm.de
Internet: www.kgw-isotherm.com

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 (N_2 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 -170°C (-274°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 (TG-K KALTGAS).
Another option is a circulating-air tempering system (TG-KU KALTGAS). It circulates the air in the chamber and cools it with a KALTGAS system type G. This setup enables full utilization of LN2 in temperatures above -20°C (+4°F).
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 N_2 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 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 N_2 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 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 63/50**
	Model TG-LKF 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 63/100**
Accessories	LN2 container with 20 to 300 liter capacity

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

Cryogenic cooling system Type TG-LKF-H for cooling applications from +120°C (+248°F) to -180°C (-292°F) measured at an internal temperature sensor

From +120°C KALTGAS

+/-0°C KALTGAS

to -180°C KALTGAS

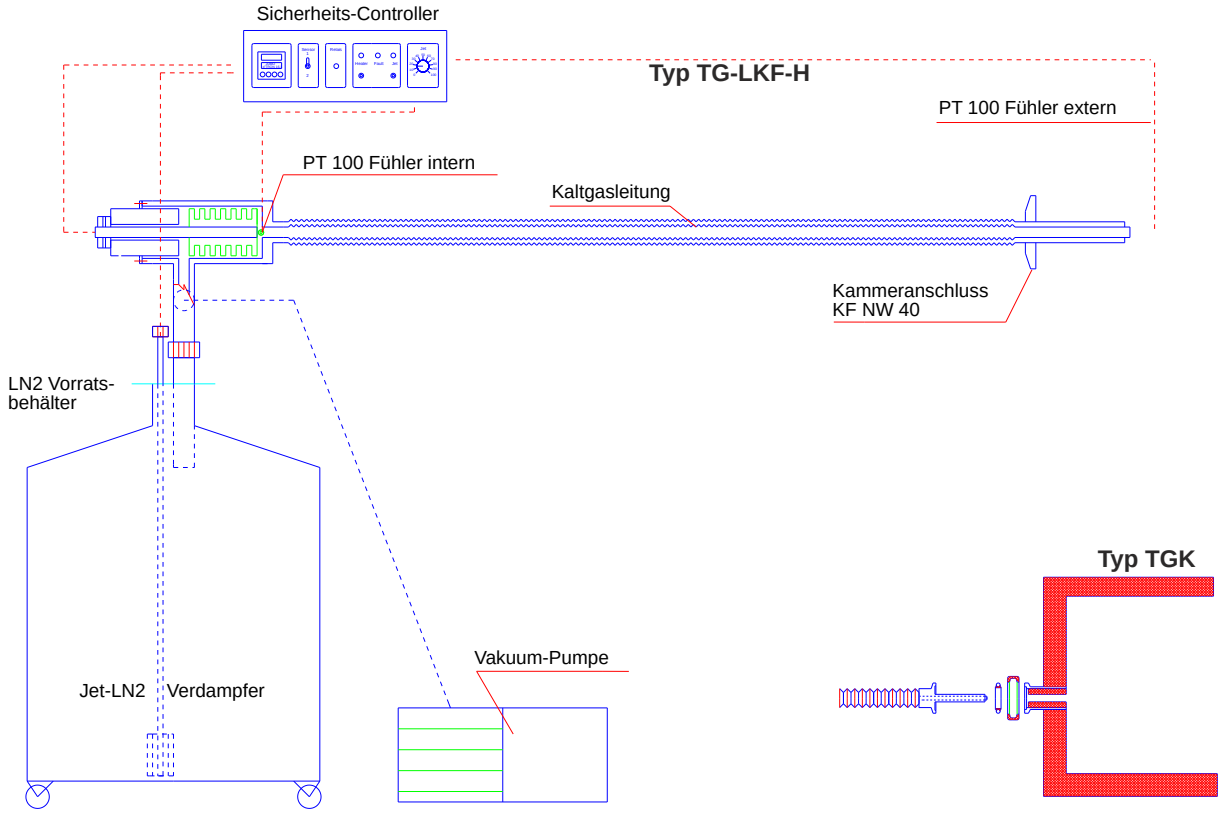
Indirect cryogenic cooling in a sample chamber

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.

KGW - ISOTHERM
76185 Karlsruhe Gablonzerstraße 6
Tel:0721 95897-0 Fax: 0721 95897-77
E.mail: info@kgw-isotherm.de
Internet: www.kgw-isotherm.de

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 (N_2 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 -170°C (-274°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 (TG-K KALTGAS).

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 N_2 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 N_2 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

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

Accessories — LN2 container with 20 to 300 liter capacity

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

Compact cryogenic cooling for small sample chambers from +120°C (+248°F) to -180°C (-292°F) measured at an internal temperature sensor

from +120°C KALTGAS

+/-0°C KALTGAS

to -180°C KALTGAS

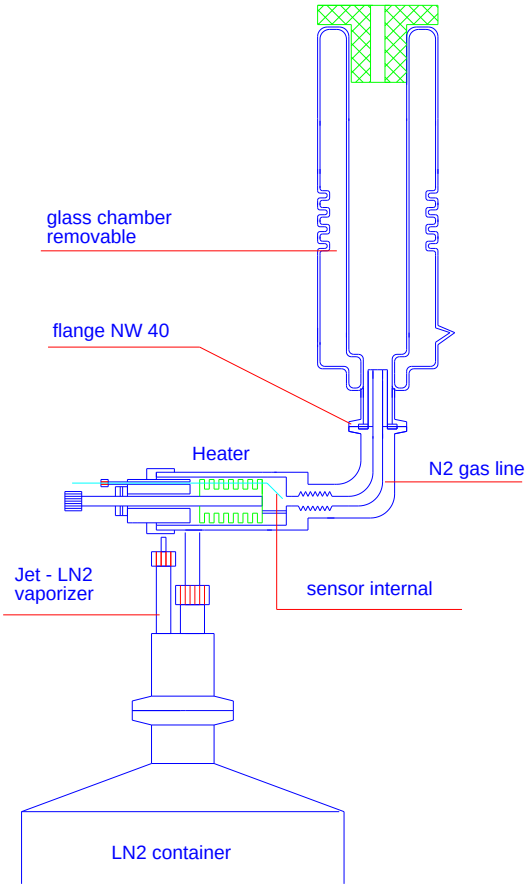
Compact cryogenic cooling for small sample chambers from +120°C (+248°F) to -180°C (-292°F)

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, a sample chamber is filled with cryogenic nitrogen gas, enabling very low temperatures to be reached at high cooling speeds. The KALTGAS system is highly compact, featuring a flanged end for connecting a variety of glass or metal chambers directly to the gas outlet.

KGW - ISOTHERM
76185 Karlsruhe Gablonzerstraße 6
Tel:0721 95897-0 Fax: 0721 95897-77
E.mail: info@kgw-isotherm.de
Internet: www.kgw-isotherm.com

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 metal line (N_2 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 gas outlet 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 -170°C (-274°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. This steady gas flow can then be used to temper a chamber flanged to the system.

In addition to their high cooling speed and good control stability, another significant advantage of KALTGAS systems is their modular design. Sensors, electronic components, test tubes and all kinds of other items can be tempered simply by exchanging the tempering chamber.



The TG-KKK 63/50 KALTGAS system includes a standard safety control unit SC5 (a temperature controller with current value/set point display and a safety controller with interface), a KF-NW 50 siphon with an LN2 vaporizer (Jet), a removable, evacuable compact N_2 gas system with an integrated post-heating module (heater), a PT100 temperature sensor and a vacuum pump with accessories.

Technical data for	**Model TG-KKK 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, removable, with vacuum pump for LN2 container with KF NW 50
	Order No.: TG-KKK 63/50
Accessories	LN2 container with 20 to 300 liter capacity

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

Cryogenic cooling system Type TG-DH for cooling applications from +120°C (+248°F) to -180°C (-292°F) measured at an internal temperature sensor

from +120°C KALTGAS

+/-0°C KALTGAS

to -180°C KALTGAS

Cryogenic cooling system for cooling applications from +120°C (+248°F) to -180°C (-292°F)

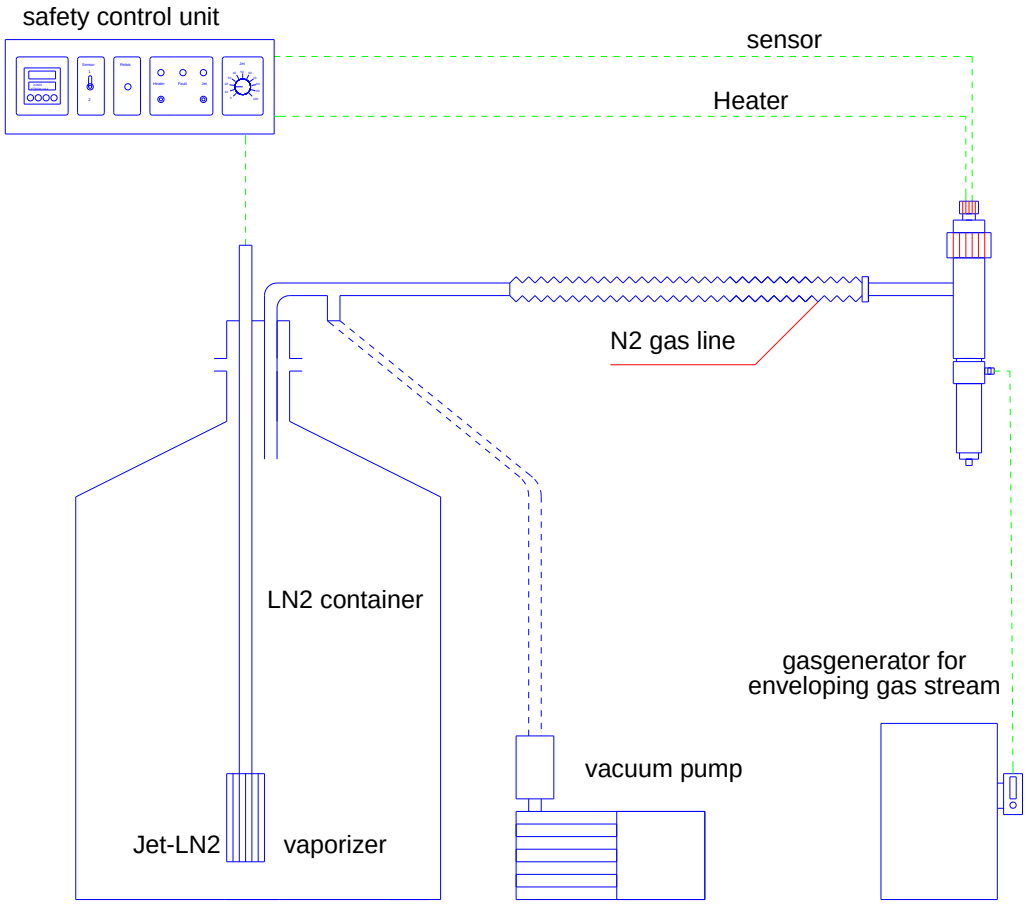
This KALTGAS system is designed for a temperature range from -180°C (-292°F)to +120°C (+338°F), in applications where a gas flow is directed at the sample to be cooled. The system uses cold nitrogen gas to reach very low temperatures. Liquid nitrogen is vaporized and then tempered in a heat exchanger, generating a cold, tempered gas flow that is directed at the object to be cooled. An additional co-flow envelops the cold gas flow, making it possible to temper samples outside chambers without ice forming on the sample.

Applications include

- Thermal testing of small plastic samples, metals, composites etc.
- Cooling of electronic components
- Rapid freezing of biological samples
- Tempering during tension or torsion tests
- Cooling in diffractometer applications

KGW - ISOTHERM
76185 Karlsruhe Gablonzerstraße 6
Tel:0721 95897-0 Fax: 0721 95897-77
E.mail: info@kgw-isotherm.de
Internet: www.kgw-isotherm.com

KALTGAS is a tempering system that uses 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 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 (N_2 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 -170°C (-274°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.
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 N_2 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 TGDH 40/50 KALTGAS system allows the installation of an additional co-flow connection. This co-flow envelops the actual cold N_2 gas flow, making it possible to direct the flow at small samples outside chambers without ice forming on the sample.



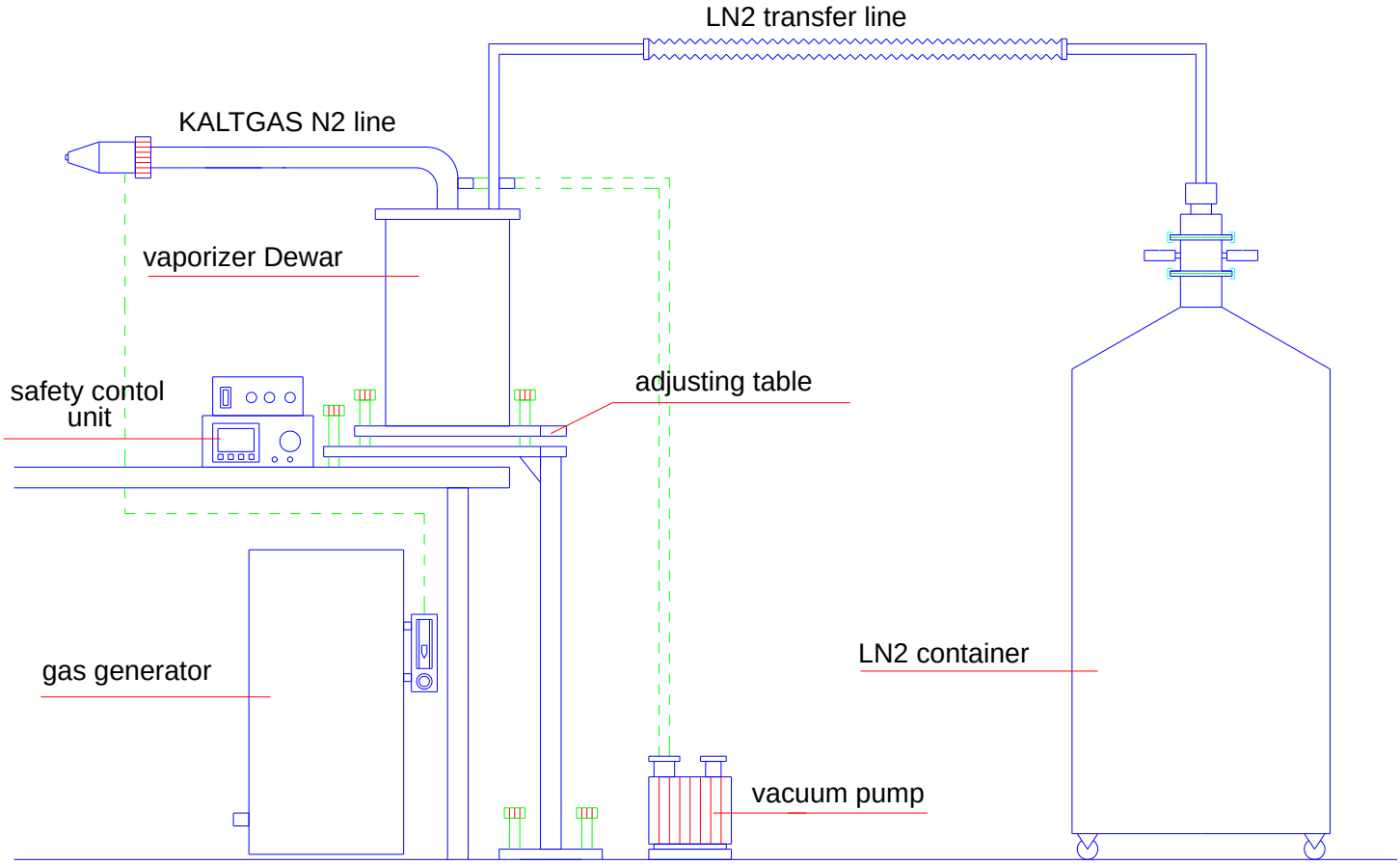
The TGDH 40/50 KALTGAS system includes a standard safety control unit SC5 (a temperature controller with current value/set point display and a safety controller), a KF-NW 50 siphon with an LN2 vaporizer (Jet), a flexible, evacuable N_2 gas line with an integrated post-heating module (heater), a PT100 temperature sensor and a vacuum pump with accessories.

Technical data for	**Model TG-DH**
	LN2 vaporizer (Jet)= 500 watts Heater = 400 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-DH 40/50
Accessories	LN2 container with 20 to 300 liter capacity

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

Cryogenic cooling system Type TG-DD for cooling applications from +50°C to -155°C (-170°C)

from +50°C KALTGAS



to -170°C KALTGAS

Cryogenic cooling system for continuous cooling applications from +50°C (+120°F) to -155°C (-247°F) and only for unregulated cooling -170°C (-274°F)

This KALTGAS system is designed for continuous cooling in a temperature range from -155°C (-247°F) to +50°C (+120°F), in applications where a gas flow is directed at the sample to be cooled. The system uses liquid nitrogen to reach the very low temperatures by converting it into a cold gas flow and then tempering it with a heat exchanger, generating a steady and tempered gas flow that is directed at the object to be cooled. An additional co-flow envelops the cold gas flow, making it possible to temper samples outside chambers without ice forming on the sample.

Applications include

- Thermal testing of small plastic samples, metals, composites etc.
- Rapid freezing of samples
- Cooling in diffractometer applications

KGW - ISOTHERM
76185 Karlsruhe Gablonzerstraße 6
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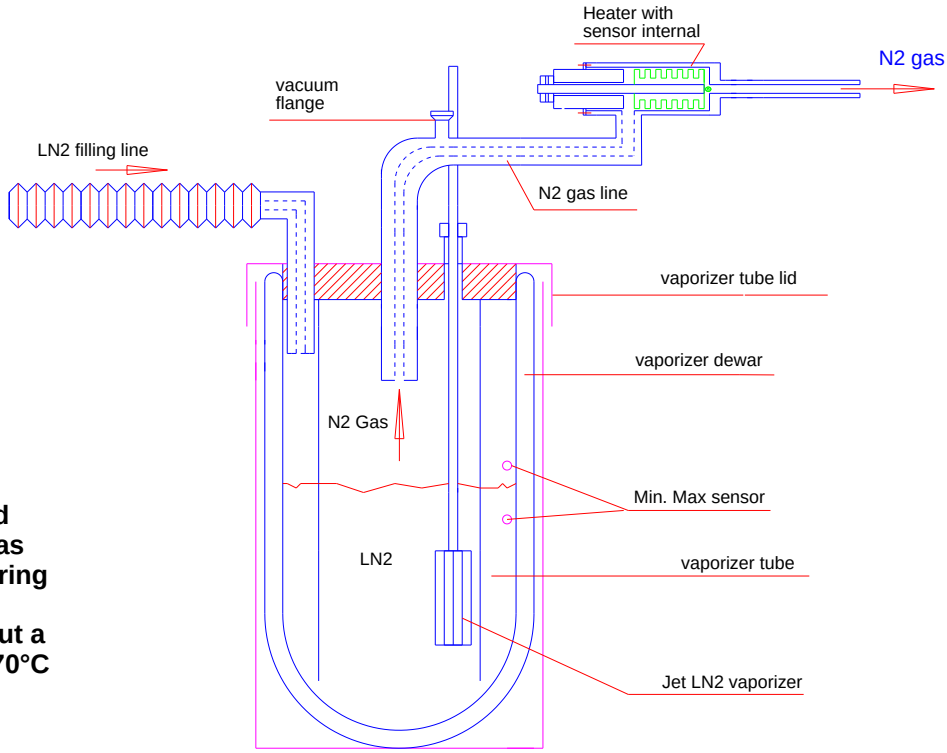
E.mail: info@kgw-isotherm.de
Internet: www.kgw-isotherm.com

KALTGAS is a tempering system that uses the very low temperature of liquid nitrogen as a cooling agent. The Jet vaporizes the liquid nitrogen in a vaporizer Dewar, 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 cold 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 gas. A KALTGAS system needs only a few minutes to produce a cold gas flow with a temperature of -155°C (-247°F). A temperature stability of better than ± 0.2°C can be achieved with the standard safety control unit (SC5).
The vaporizer Dewar operates independently of the LN2 storage container. The LN2 storage container is designed to maintain a consistent LN2 volume in the vaporizer Dewar using an automatic level control unit. When the LN2 storage container is empty, it can be replaced with a new container without having to interrupt gas production in the vaporizer Dewar. Depending on the size of the vaporizer Dewar and the LN2 vaporizer (Jet) power setting, refill cycles may be up to 1 hour long.
The vaporizer Dewar is available in different sizes, while the cold gas line is available in different types. For example, the cold gas lines can be supplied as flexible V2A-steel corrugated hoses or as vacuum insulated swiveling glass tubes.
The TG-DD KALTGAS system allows the installation of an additional tempered co-flow connection. This co-flow envelops the actual cold N_2 gas flow, making it possible to direct the flow at small samples outside chambers without ice forming on the sample.

Vaporizer Dewar with temperature and level control. In this setup, the cold gas line is made from metal, with a tempering module for temperatures from +50°C (+120°F) to -155°C (-244°F), and without a temperature module for cooling to -170°C (-274°F).



The TG-DD KALTGAS system includes an vaporizer Dewar with an LN2 vaporizer (Jet), an integrated min/max sensor for LN2 refilling, a standard safety control unit SC5 (a temperature controller with current value/set point display and a safety controller), an evacuable N_2 gas line with an integrated post-heating module, an integrated PT100 temperature sensor, a vacuum pump with accessories, and a conventionally insulated LN2 line with LN2 tank siphon and LN2 solenoid valve.

Technical data for	**Model TG-DD**
	LN2 vaporiyer = 200 watts
	Heater = 300 watts
	Temperature stability = +/-0.2°C
	LN2 consumption = 0.3l/h to 3l/h (liters per hour)
	N2 gas pipe = V2A, length 1 meter, with vacuum pump
	Siphon for LN2 container with KF NW 50
	Order No.: TG-DD
Accessories	LN2 container with 20 to 300 liter capacity
	Gas generator for enveloping gas stream

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

2/2014

Cryogenic cooling Type TG-RD for reaction vessels from +120°C (+248°F) to -180°C (-292°F) measured at an internal temperature sensor

from +120°C KALTGAS

+/-0°C KALTGAS

to -180°C KALTGAS

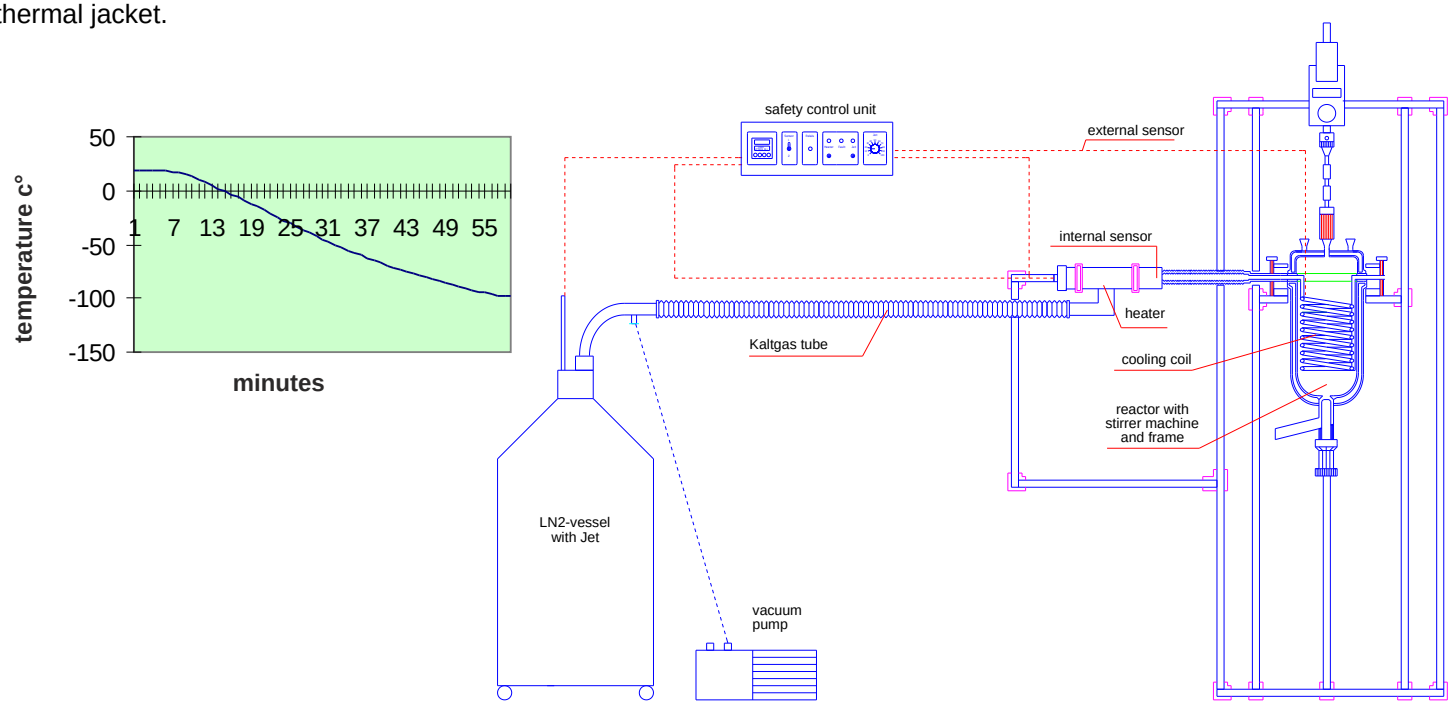
Cryogenic cooling for reaction vessels from to -180°C (-292°F)

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.

KGW - ISOTHERM
76185 Karlsruhe Gablonzerstraße 6
Tel:0721 95897-0 Fax: 0721 95897-77
E.mail: info@kgw-isotherm.de
Internet: www.kgw-isotherm.com

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 (N_2 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. The steady gas flow is directed through a cooling coil suspended in the reaction vessel, where it cools the medium contained in the vessel. The cooling coil can be connected to the KALTGAS system with a quick-lock mechanism, providing for quick and effortless assembly. This is a type of KALTGAS system that tempers reaction vessels directly.
The KALTGAS system cools the medium in the reaction vessel at an extremely high speed because of the great differences in temperature between the cold gas and the medium to be tempered.
A KALTGAS system needs only a few minutes to produce a cold gas flow with a temperature of -170°C (-274°F). This extremely cold gas flow makes it possible to rapidly cool down the medium in the reaction vessel. With the standard safety control unit (SC5), a temperature stability of better than ± 0.2°C can be achieved.
A cascade control system can also be used. With it, you can control the temperature of both the gas and the medium in the reaction vessel. As the current temperature approaches the temperature set point, the difference in temperature is continuously reduced by the temperature controller. That means that a temperature stability of approx. ± 0.1°C can be achieved at steady state.

In addition to their high cooling speed and good control stability, another significant advantage of KALTGAS systems is their modular design. Both the cooling rate and the cooling speed can be changed simply by replacing individual modules such as the N_2 gas line, the LN2 vaporizer (Jet) or the heater. The basic modules, including the LN2 container, the vacuum pump and the safety control unit, remain unchanged. Another advantage lies in the cooling agent itself. Since liquid nitrogen gas is inert, reaction vessels can be switched without the usual problems associated with the thermostat oil. Furthermore, cleaning the reaction vessel is limited to the vessel's reaction chamber and no longer entails cleaning the thermal jacket.



In a reaction vessel, 1.5 liters of methanol are cooled from +20°C (+68°F) to -95°C (-140°F) within approx. 50 minutes. During the cooling phase, about 5 to 6 liters of LN2 are consumed. To maintain the methanol at -95°C (-140°F), the reactor needs only about 1.2 liters of LN2 per hour.

Technical data for	**Model TG-RD**
	Ln2 vaporizer = 500 watts
	Heater = 400 watts
	Reactor = 2 liters volume vacuum insulated with viewing stips
	Reactor lid = 3 x NS 29/32 on sides and middle; vacuum insulated
	Fame = Aluminum / V2A
	N2 gas line = V2A, length 1.5 meters, with vacuum pump
	Standard safety control unit = Constancy +/-0,2°C
	Siphon Lever = for LN2 container with KF NW 50
	Order No.: TG-RD 40/50
Accessories	LN2 container with 20 to 300 liter capacity
	Stirrer, stirring machine and dynamic stirrer seal

Further reactor and cooling system information available.
Technical data subject to change.

2/2014

Cryogenic cooling Type TG-RID for reaction vessels from +120°C (+248°F) to -180°C (-274°F) measured at an internal temperature sensor

from +120°C KALTGAS

+/-0°C KALTGAS

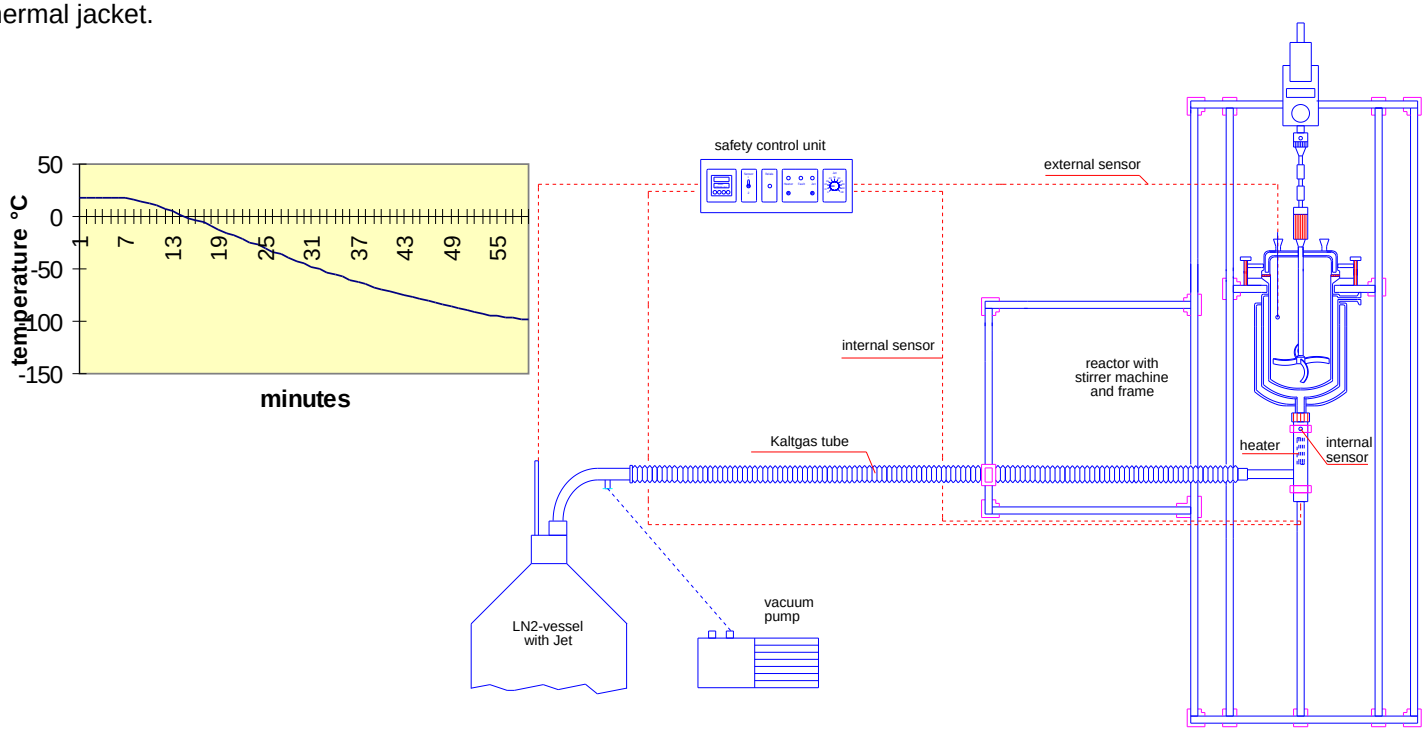
to -180°C KALTGAS

Indirect cryogenic cooling for reaction vessels from +120°C (+248°F) to -180°C (-292°F)

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. This cooling technology has low entry barriers thanks to its ease of use and high operational safety.

KGW - ISOTHERM
76185 Karlsruhe Gablonzerstraße 6
Tel:0721 95897-0 Fax: 0721 95897-77
E.mail: info@kgw-isotherm.de
Internet: www.kgw-isotherm.com

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 (N_2 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. The steady gas flow is directed through the reaction vessel's thermal jacket and cools the medium contained in the vessel. This is a type of KALTGAS system that tempers reaction vessels indirectly.
The KALTGAS system cools the medium in the reaction vessel at an extremely high speed because of the great differences in temperature between the cold gas and the medium to be tempered.
A KALTGAS system needs only a few minutes to produce a cold gas flow with a temperature of -170°C (-274°F). This extremely cold gas flow makes it possible to rapidly cool down the medium in the reaction vessel. With the standard safety control unit (SC5), a temperature stability of better than ± 0.2°C can be achieved.
A cascade control system can also be used. With it, you can control the temperature of both the gas and the medium in the reaction vessel. As the current temperature approaches the temperature set point, the difference in temperature is continuously reduced by the temperature controller. That means that a temperature stability of approx. ± 0.1°C can be achieved at steady state.
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 N_2 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. Another advantage lies in the cooling agent itself. Since liquid nitrogen gas is inert, reaction vessels can be switched without the usual problems associated with the thermostat oil. Furthermore, cleaning the reaction vessel is limited to the vessel's reaction chamber and no longer entails cleaning the thermal jacket.



In a reaction vessel, 1.5 liters of methanol are cooled from +20°C (+68°F) to -95°C (-140°F) within approx. 60 minutes. During the cooling phase, about 5 to 6 liters of LN2 are consumed. Maintaining the methanol at a temperature of -95°C (-140°F) requires only about 1.2 liters of LN2 per hour.

Technical data for **Model TG-RID**

LN2 vaporizer = 500 watts
Heater = 400 watts
Reactor = 2 liters volume vacuum insulated with control window
Reactor lid = 3 x NS 29/32 on sides and middle; vacuum jacketed
Frame = Aluminum / V2A
N2 gas line = V2A, length 1.5 meters, with vacuum pump
Standard safety control unit = Constancy +/-0,2°C
Siphon for LN2 container with KF NW 50

Order No.: TG-RID 40/50

Accessories

LN2 container with 20 to 300 liter capacity
Stirrer, stirring machine and dynamic stirrer seal

Further reactor and cooling system information available.
Technical data subject to change.

2/2014

Safety control SC5 unit for cryogenic cooling systems with two temperature sensor connections for a temperature range from +120°C (+248°F) to -196°C (-384,8°F)

from + 120°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 N_2 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 N_2 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 N_2 gas.)

KGW - ISOTHERM
76185 Karlsruhe Gablonzerstraße 6
Tel:0721 95897-0 Fax: 0721 95897-77
E.mail: info@kgw-isotherm.de
Internet: www.kgw-isotherm.de

Safety powerful manufactures for easy cryogenic cooling systems SL1

to
-180°C
KALTGAS

SL 1 safety control unit

The SL 1 safety controller has two functional components..

The first components is the LN2-evaporator. 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 N_2 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 N_2 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, one litre of LN2 produces approx. 700 litres of N_2 gas.)

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.

KGW - ISOTHERM
76185 Karlsruhe Gablonzerstraße 6
Tel:0721 95897-0 Fax: 0721 95897-77
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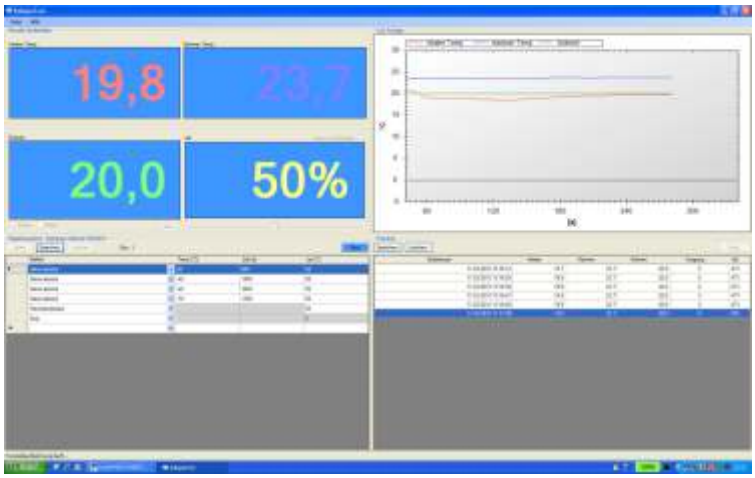
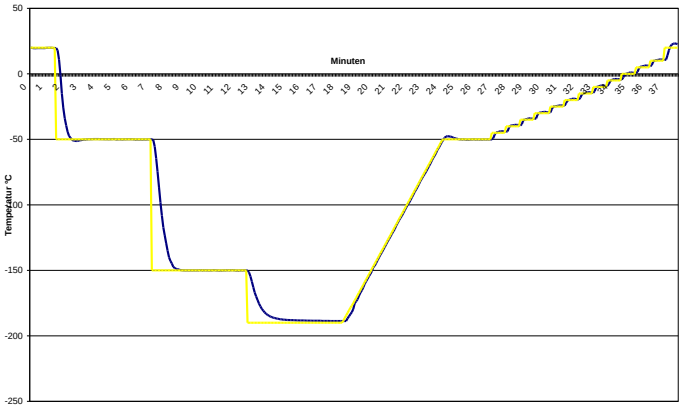
KALTGAS TOOL 4.04
Software to control kaltgassystems

The user interface is shown in the following diagram:



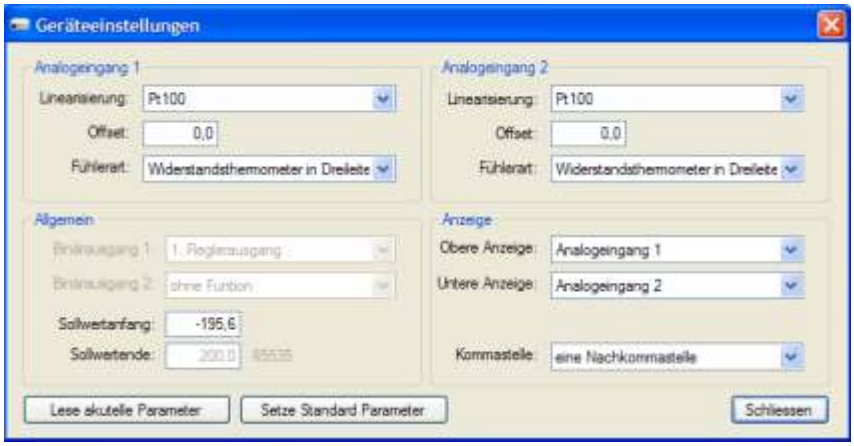


Settings
Sensor and properties
a) Linearization
b) Offset: “0” spot offset
c) type of sensor

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

Options
Here you can choose the serialport. Make sure that your controller is connected to the right port. Additionally, you can preset the interval unit of protocol data

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



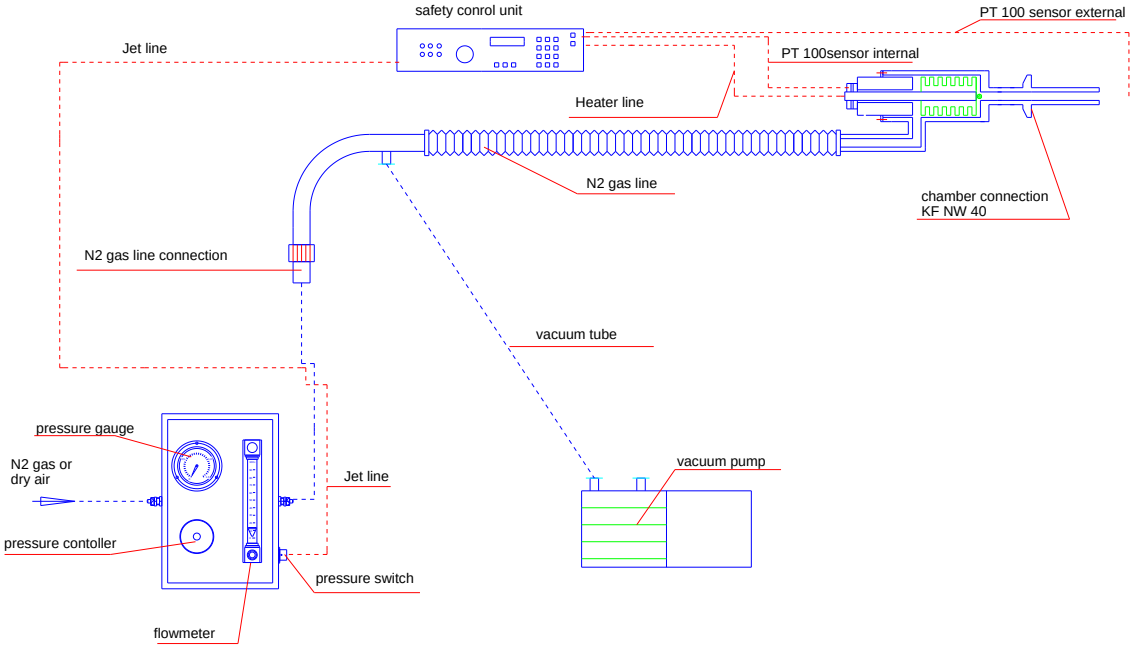
Gas control module for use in KALTGAS systems from +20°C (+68°F) to +180°C (+356°F)

Gas control module

LN2 may be too expensive a medium in long-running applications of KALTGAS systems at temperatures above +20°C (+68°F). Especially when above-zero temperatures are maintained over a longer period of time, e.g., in a tempering chamber, it may be more cost-effective to use N_2 gas or dried air in connection with a gas control module. Gas or dried air is blown into the cold gas line instead of gas from vaporized LN2. A gas control module is installed between the feed line and the cold gas line in order to control both the pressure and the volume of the N_2 gas or dried air. The pressure is controlled by the micro pressure reducer, while the volume is controlled by the flow meter.

For safety monitoring with the SC 5 safety control unit (inlet pressure of N_2 gas or dried air), the LN2 vaporizer's (Jet) extension lead is connected to the gas control module.
If the gas inlet pressure drops below 0.3 bar, the safety device in the SC5 safety controller shuts off the KALTGAS system and sounds an alarm. The only way to turn on the system again is manually.

Gas control module small: volume adjustable from 10 to 100 litres per minute.
Gas control module high: volume adjustable from 40 to 200 litres per minute.



KGW - ISOTHERM
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Tel:0721 95897-0 Fax: 0721 95897-77
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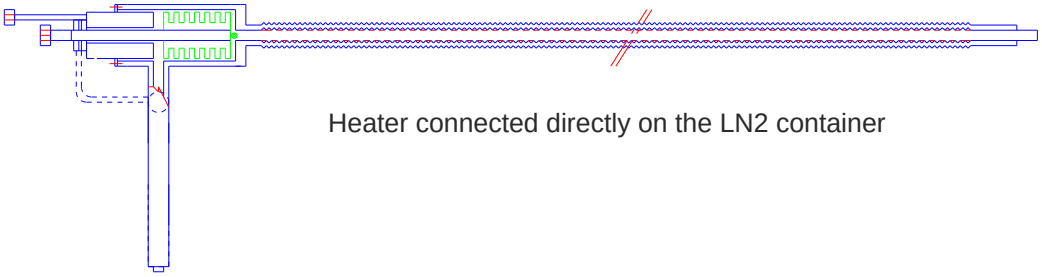
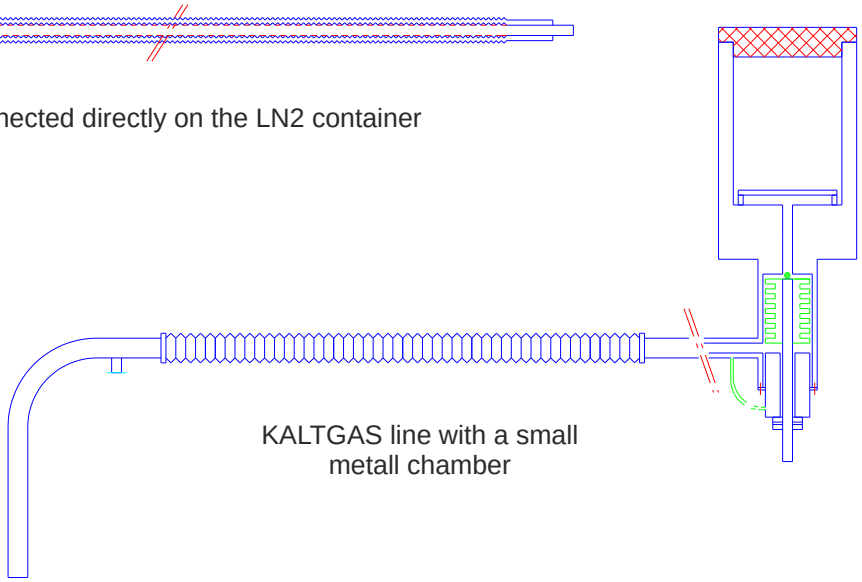
Custom made KALTGAS lines

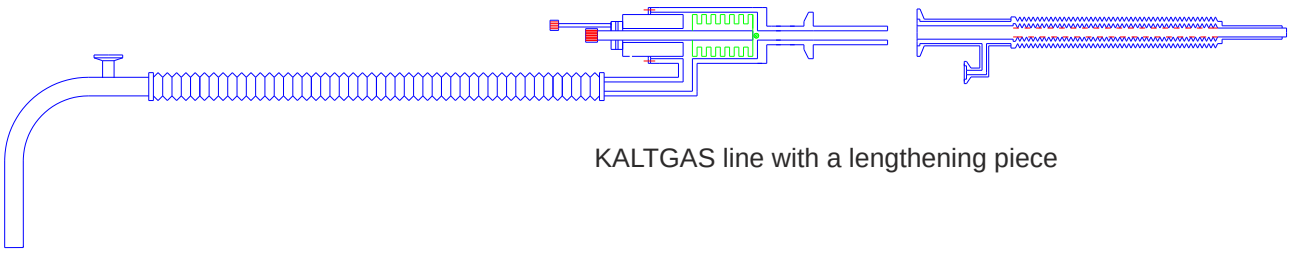
KALTGAS lines are made from prefabricated modules, so individual customer's needs and designs can be easily accommodated. Some examples of modified lines are shown below.



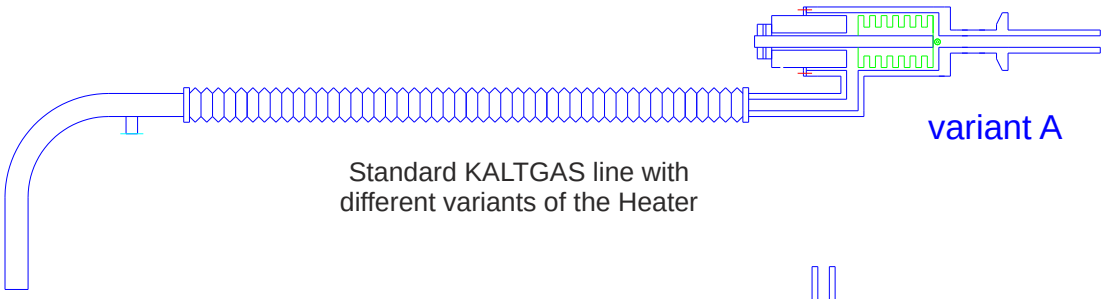
Heater connected directly on the LN2 container



KALTGAS line with a small metall chamber

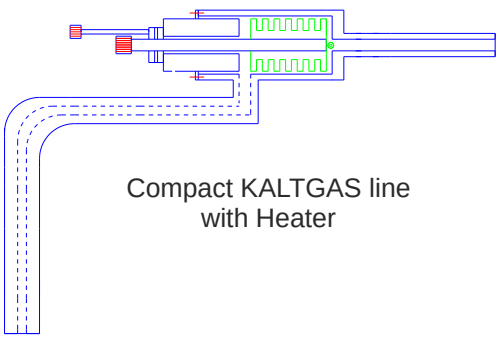


KALTGAS line with a lengthening piece

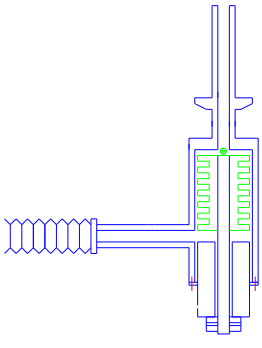


variant A

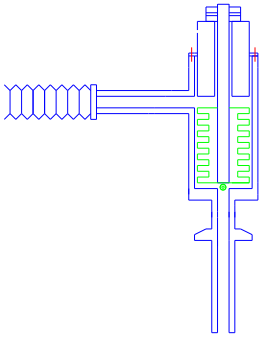
Standard KALTGAS line with different variants of the Heater



Compact KALTGAS line with Heater

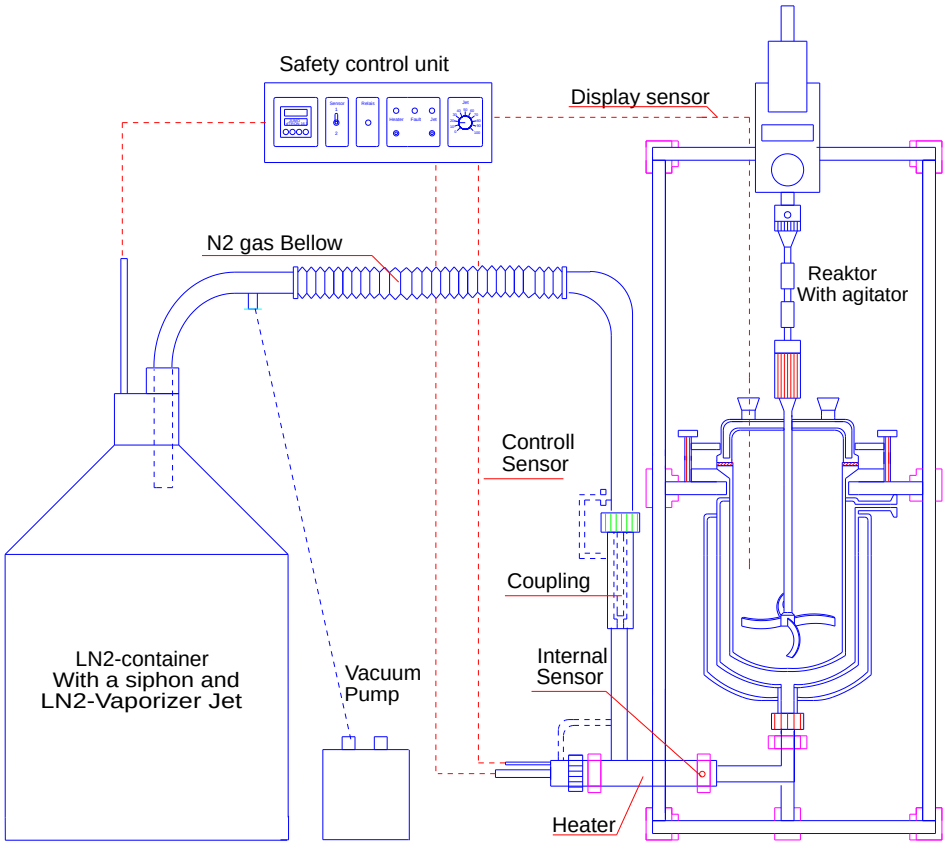


variant C



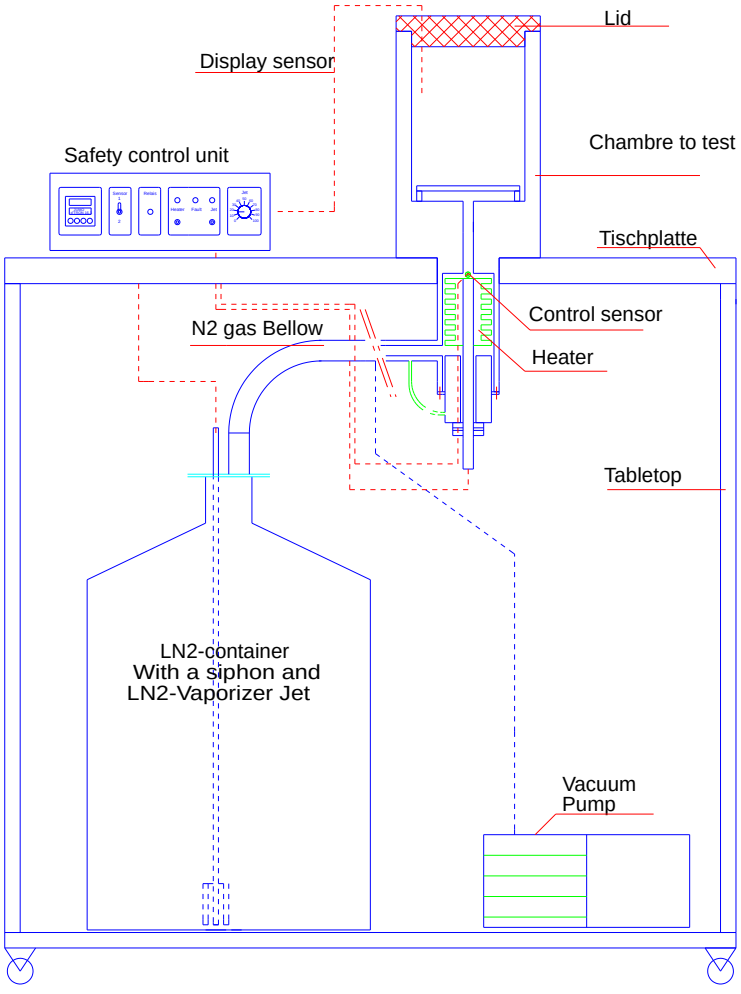
variant B

Special Kaltgas systems



Typ TG-RID-S1

Kaltgas system with reactor in a compact design applied in laboratory hood, in a temperature range from +120°C to -180°C measured at a internal sensor. The kaltgas system is equipped with a coupling



Typ TG-KKK-S1

Kaltgas system with a vacuum insulated chamber for tests. for example : notched impact test, Kryo-ampoules, small technical elements in a temperature range from +120°C to -180°C measured at the control sensor. The whole Kaltgas system is wheeled.