NORHOF N2 Cold Gas Supply System #855 Series

- Controllable N2 Cold Gas flow up to 60 liter / minute
- Temperature control from ambient up to -160ºC
- Several N2 Cold Gas control possibilities:

  - Pressure control
  - PID temperature control with one temperature sensor
  - Software monitoring

Norhof manufactures N2 cold gas supply systems. Nitrogen (LN2) is used as the cooling medium and is taken from a storage vessel (Dewar) with low pressure (max. 300 mBar) and delivered (pumped) through a line to the application in a gaseous cold flow.

Norhof 855 series pump, mounted on a 50 Liter Dewar

Working principle

The pressure above the liquid level inside the Dewar is built by heating a small amount of liquid in the bottom of the Dewar. With only up to 300 mBar of overpressure, the cold gas will gentle flow out of the outlet pipe. In these systems a pressure less storage Dewar is used as a reservoir for LN2. On the Dewar our unique cold gas pump is mounted. Inside the housing of the pump a microprocessor is used to control the various actions, depending upon the mode selected. The selection of a particular mode is made by a 16-position switch, also located inside the pump housing. By controlling the pressure at time of cold gas transport, the flow is controlled and thus any temperature between ambient and -160°C can be realized.

Important: cold N2 gas supply may have its application advantages, however, important to know it has much lower heat removal capacity compared with liquid Nitrogen

Any #855 series model will work without modifications as:

- autonomous stand-alone unit
- direct remote controlled unit
  (controlled by your existing PID controller, PLC, computer with A/D conversion card, etc.)
- operates on 24 V, DC or with our power supply (115V or 230 V)
- a system with almost no installation time required
- no need for a pressurized supply of LN2
- no need for a cryogenic solenoid valve
- no need for additional control instruments

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Software

To display sensor temperature, vessel pressure, status of LED's on the pump etc. our Norhof Monitoring software is included with the #855 series pump. This software works under Windows '98 - 2000 - ME - NT - Vista - W7 – Windows 10 – Windows 11
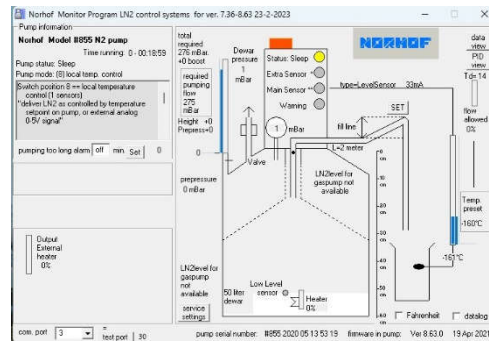
#855 series Technical Specifications

Flow rate	Up to 60 liter per minute (with a fill line of 1,5 meter and 6.6 mm ID)	
Average working pressure	adjustable from 1mBar to 270 mBar (by potentiometer on pump)	
Maximum working pressure	300 mBar	
Reaction time	+/- 1 minutes for cooling down the fill line (with 1,5 meters fill line)	
Power connection	115V / 230V AC with supplied power supply or 24 Volt DC	
Power consumption	average 125 Watts, during pumping 250 watts	
Model	**855-100-050**	**855-100-100**
Storage container volume	50 liter	100 liter
Outside dimensions (diameter)	460 mm	500 mm
Height dimensions	917 mm	1235 mm
Weight (empty, full)	17 / 59 kg	34 / 115 kg
Static holding time (days)	122 days	164 days
Standard fill line	1,5 m line length, 9,6 mm OD, 6,6 mm ID, Teflon FEB tube, with 32 mm OD Armaflex foam insulation	
System includes	Dewar, pump, fill line 1,5 m, power supply, cables, level sensor, PC software	
Working modes	temperature or flow control working modes: 1,7,8,9, A and B	
External control	5 volt signals for ON, OFF and RS232 signals for ON, OFF	
PC software	Monitor software, to monitor pump behavior, and for some working modes to adjust some parameters.	
Alarms/warning acoustical/ visual / mechanical	Dewar empty, Dewar 4 liters LN2 left, broken sensor(s), frozen alarm, mechanical overpressure protection valve.	
Dewar Trolley option	900-400-000	900-400-000
Floor Stand option	900-400-100	900-400-100
Custom made adapter	600-400-000	600-400-000

#855 recommended options

Norhof Dewar Trolley
for safe and easy transport of the LN2 Dewar

Norhof Floor Stand
for storing the pump in vertical position during refill of the LN2 Dewar

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Summary of #855 series

Model:	#855
autonomous operation	√
remote control by TTL signal	√
remote control by +24V signal	√
display system status on PC screen	√

#855 series advantages:

- ● **there is no LN2 valve required**
  that implies no unnecessary heat input
- ● **there is no additional control unit required**
  which adds to a clean and elegant setup
- ● **the pump is software driven and many control modes are already built-in**
  subzero temperature control, flow control by 0-5V input, etc.
- ● **temperature sensor(s) are plugged directly into the pump housing**
  and not into a separate control box
- ● **the system can deliver N2 cold gas with a flow optimized for the application**
  without noise, vibration, excessive waste, etc.
- ● **the variable flow feature makes subzero temperature control extremely easy**
- ● **the system is prepared to be connected to a PC**
  perfect for monitoring and data logging or remote control
- ● **P.E.D. 99/36/EC (Pressure European Directive) for pressurized vessels does not apply for this system**
  The maximum possible pressure is lower than 300mBar.Therefore this system is allowed to be used inside the lab, near your working place, without danger.

#855 series working modes explanation
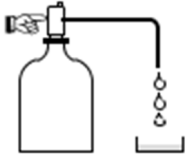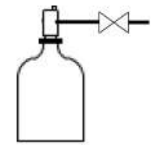

16-position switch

On the PCB in the pump, under the cap, is a 16-position switch to select the working mode. This working mode determines how the pump reacts on the sensor, button, etc.
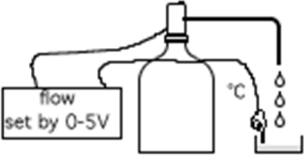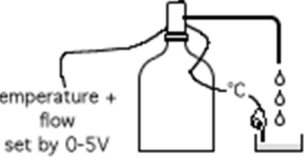
Each working mode is designed for a specific function. You must select a working mode (only once) to let the working correspond with your application.
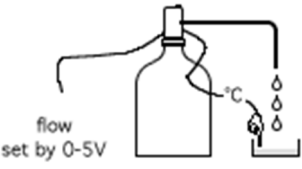
Model	Working modes	Functions
#855	working modes: 1,7,8,9, A and B	temperature control flow control.

#855 series details per working mode

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Working mode	Description	Details
model #855 **Working mode 1** straight pumping mode (no sensors) 	**Deliver LN2 cold gas as controlled by pump button or external signal**	Button on pump allows operator to toggle between Active and Sleep Active = pumping on Sleep = stop Active, set internal freeze protector ON to prevent ice clogging in riser pipe pump can be put in ACTIVE mode with TTL signal or +24V signal on 25D connector pump can be put in SLEEP mode with TTL signal or +24V signal on other pin of 25D connector FLOWRATE is set by potentiometer on pump
model #855 **Working mode 7** internal pressure control 	**Maintain LN2 pressure on a stable level in the supply line to an external valve**	Button on pump allows operator to toggle between Active and Sleep Active = pumping on Sleep = stop Active, set internal freeze protector ON to prevent ice clogging in riser pipe pump can be put in ACTIVE mode with TTL signal or +24V signal on 25D connector pump can be put in SLEEP mode with TTL signal or +24V signal on other pin of 25D connector PRESSURE is set by potentiometer on pump
model #855 **Working mode 8** local temperature control (1 sensor) 	**Deliver LN2 cold gas as controlled by temperature setpoint on pump, or external analogue 0-5 V signal**	Button on pump allows operator to toggle between Active and Sleep Active = pumping as long as sensor is above- , not- or soft-pumping when sensor is below temperature setpoint. pumping flow is depending of the speed of the temperature changes. (P.I.D.) Sleep = stop Active, set internal freeze protector ON to prevent ice clogging in riser pipe pump can be put in ACTIVE mode with TTL signal or +24V signal on 25D connector pump can be put in SLEEP mode with TTL signal or +24V signal on other pin of 25D connector FLOWRATE is set by potentiometer on pump *NOTE: temperature setpoint is depending on jumper setting JP7 *NOTE: temperature range is depending on jumper setting JP6 JP6 open = range – 200ºC to +70ºC JP6 closed = range +/- 30 ºC relative to potentiometer P1 on print

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Working mode	Description	Details
model #855 **Working mode 9** FLOW control by external signal (no sensors) *(diagram: flow set by 0-5V)*	**Deliver LN2 cold gas as controlled by external analogue 0-5V signal**	Button on pump allows operator to toggle between Active and Sleep Active = pumping with flow as set by external 0-5 volt signal (0 volt = stop pumping) Sleep = stop Active, set internal freeze protector ON to prevent ice clogging in riser pipe pump can be put in ACTIVE mode with TTL signal or +24V signal on 25D connector pump can be put in SLEEP mode with TTL signal or +24V signal on other pin of 25D connector Maximum FLOWRATE is set by potentiometer on pump *NOTE: external analogue signal on pin 10 of 25D connector delivers a flow depending on the setting of the flow potentiometer on the pump 0 - 5 Volt delivers 0 - 100% of the adjustment of the flow potentiometer on the pump.
model #855 **Working mode A** remote temperature control (1 sensor) *(diagram: temperature + flow set by 0-5V)*	**Deliver LN2 cold gas as controlled by external analogue 0-5V signal(s)**	Button on pump allows operator to toggle between Active and Sleep Active = pumping as long as sensor is above- , not- or soft-pumping when sensor is below temperature setpoint. pumping flow is depending on the speed of the temperature changes. (P.I.D.) Active = when pumping, use maximum flow as set by external 0-5 volt signal (0 volt = stop pumping) Sleep = stop Active, set internal freeze protector ON to prevent ice clogging in riser pipe pump can be put in ACTIVE mode with TTL signal or +24V signal on 25D connector pump can be put in SLEEP mode with TTL signal or +24V signal on other pin of 25D connector Maximum FLOWRATE is set by potentiometer on pump *NOTE: temperature setpoint is depending on jumper setting JP7 *NOTE: range is depending on jumper setting JP6 JP6 open = range – 200ºC to +70ºC JP6 closed = range +/- 30ºC relative to potentiometer P1 on print *NOTE: external analogue signal on pin 10 of 25 D connector delivers a flow depending on the setting of the flow potentiometer on the pump 0 - 5 Volt delivers 0 - 100% of the adjustment of the flow potentiometer on the pump. *NOTE: external analogue signal for temperature setpoint 0 - 5 Volt gives a setpoint from -200ºC to +70ºC according PT100 characteristics

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Working mode	Description	Details
model #855 **Working mode B** FLOW control by external signal (and 1 sensor) flow set by 0-5V	**Deliver LN2 cold gas as controlled by external analogue 0-5V signal and 1 sensor**	Button on pump allows operator to toggle between Active and Sleep Active = pumping with flow as set by external 0-5 volt signal (0 volt = stop pumping) pumping as long as sensor is warm, not pumping when sensor is cold Sleep = stop Active, set internal freeze protector ON to prevent ice clogging in riser pipe pump can be put in ACTIVE mode with TTL signal or +24V signal on 25D connector pump can be put in SLEEP mode with TTL signal or +24V signal on other pin of 25D connector maximum FLOWRATE is set by potentiometer on pump *NOTE: external analogue signal on pin 10 of 25D connector delivers a flow depending on the setting of the flow potentiometer on the pump 0 - 5 Volt delivers 0 - 100% of the adjustment of the flow potentiometer on the pump.

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#855 series 25 p Dconn pins

1=14 AC1
AC or DC 12 to 24 Volts Power supply (min. 4 A.)

13=25 AC2
AC or DC 12 to 24 Volts Power supply (min. 4 A.)

17=18=19=20 system ground

8 RXD serial connection

9 TXD serial connection

4 TTL_1 input, 0 or 5 Volt, 0 Volt = switch pump to SLEEP

5 TTL_2 input, 0 or 5 Volt, 0 Volt = switch pump to ACTIVE

10 ext. flow input, analog 0-5 Volt

11 ext. temp setpoint input, analog 0-5 Volt

6 ext. EXTRA sensor input (PT100 element) to ground

7 ext. MAIN sensor input (PT100 element) to ground

15 opt1C optocoupler input 1 neg.

2 opt1A optocoupler input 1 pos. : 0 or 5-24 Volt input. 5-24 V. to switch pump to ACTIVE

16 opt2C optocoupler input 2 neg.

3 opt2A optocoupler input 2 pos. : 0 or 5-24 Volt input. 5-24 V. to switch pump to SLEEP

(*) connect C to ground and supply positive signal to A to switch

(*) OR, connect A to ground to use negative signal on C to switch

12 output TTL 5 Volt external heater LOW = active (*)

21 optEXH1E optocoupler output emitter for external heater (*)

22 optEXH1C optocoupler output collector for external heater (*)

23 optAL2E optocoupler output emitter ALARM

24 optAL2C optocoupler output collector ALARM

(*) connect E = emitter to ground to switch a positive signal

(*) OR, connect C = collector to ground to switch a negative signal

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