

# Cryoguard

Bedienungsanleitung • Operating instructions •  
Instructions de service



# Operating instructions for Cryoguard safety shut-off devices (abbreviated S.A.A.)

## Safety instructions

### Types: MG-97 S and MG-97 P/C/M

- Never put your hand into the body of the device!
- Never put any other objects into it!

### Danger of injuries and damages!

The recommended measures for limiting explosion hazards and the recommendations for wearing personal protective equipment as prescribed in the gas safety data sheets shall be strictly adhered to if screwed unions are loosened or if the release unit is reset or relieved.

The safety shut-off device might be under pressure.

Approved fluids are combustible; the formation of an explosive gaseous atmosphere must be avoided!

If the S.A.A. is used and operated as intended, it does not possess any inherent ignition source.

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# Cryoguard – the reliable safety shut-off device

## Scope of supply

The S.A.A. is delivered in its open position, it is shrink-wrapped in PE film, including a certificate of its set pressure and these operating instructions, and shipped in individual boxes. Two identical labels contain the product data.

The S.A.A. was cleaned for the use with oxygen. The PE film should thus not be opened unless the device is used immediately afterwards.

- 1 Manufacturer's name plate
- 2 Indicator of valve position (flap invisible in open position)
- 3 Certificate of set pressure/Declaration of CE conformity
- 4 Labels
- 5 Flange DN 40

## Recommended visual inspection

- Packaging undamaged
- Device shrink-wrapped and in its open position (flap invisible)
- Manufacturer's name plate and label are identical
- Body connection and set pressure meet the ordered requirements

## Intended use

High-performance centrifugal pumps used for the filling of cryogenic storage tanks achieve maximum pressures that are considerably higher than the maximum permissible operating pressures of these storage tanks. Due to this, pressure vessels used for storing cryogenic liquefied gases must be protected against any unpermissible pressure overrun caused by the filling process.

Independent from the delivery vehicle, the S.A.A. mounted onto the storage tank interrupts or restricts the delivered flow automatically. In doing so, a continued uncontrolled pressure increase can be prevented. The S.A.A. shall only be operated in line with the conditions described in the section "Technical data".



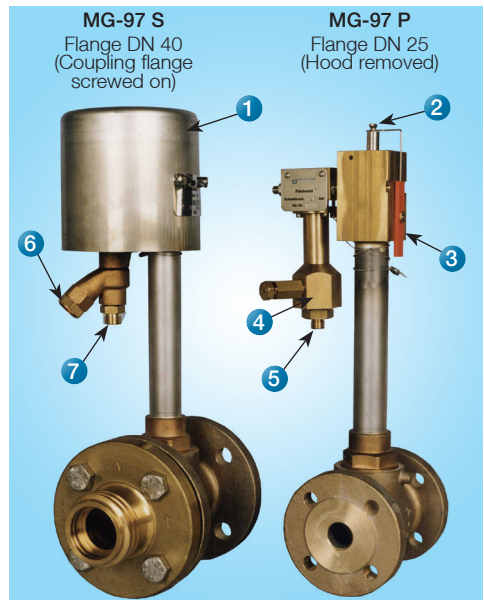
# Description of Cryoguard

## Description of the device and its function

The S.A.A. MG-97 S and MG-97 P/C/M consist of a cryogenic valve with the function of a spring- and pressure-loaded non-return valve and release unit, which is situated under a hood in the upper area of the spindle at ambient temperature. The release unit keeps the spindle in the open valve position. Due to the positioning of its body, the valve forms part of the filling line; the release unit is pressurised via the gas space of the storage tank.

By exceeding the set pressure, the spindle of the cryogenic valve is relieved by the release unit. Due to the internal compression spring, the spindle moves into the closed position. In this case, a red flap protrudes from the hood (indication of the valve position). The valve remains in this closed (locked) position! Trapped medium can escape from the pipework between the safety shut-off valve and the vessel shut-off valve in the direction of the filling hose if there is a minimum differential pressure of about 2.5 bar.

- 1 Hood
- 2 Spindle (S.A.A. open)
- 3 Indicator of valve position (red flap)
- 4 Release unit (pneumatic switch)
- 5 Connection of auxiliary pressure line,  $\varnothing 8 \times 1$
- 6 Release unit (safety valve)
- 7 Connection of auxiliary pressure line,  $\varnothing 12 \times 1$



## Technical data of Cryoguard

Technical data <sup>1)</sup>	
Adjustable set pressure	2-40 or 5-40 bar g (depending on the type)
Permissible operating temperature	77-323 K (-196 to +50 °C)
Time required for closing	≤ 30 ms
Differential pressure required for automatic opening of reverse flow direction	approx. 2.5 bar

<sup>1)</sup> For further information, please request our technical data sheets (Standard 54112).

For the preferential flow direction (arrow indicating the flow direction), the following parameters have been determined in line with VDI/VDE 2173:

Execution of housing	Nominal width	Cv value [m <sup>3</sup> /h]	Ø [mm] <sup>2)</sup>
Flange	DN 25	17	18
Flange	DN 40	28	21
Socket end	DN 40	28	21
Screwed union	DN 32	28	21
Butt weld end	DN 40	28	21

<sup>2)</sup> Ø determining the flow rate

Approved for the following non-toxic fluids:

Type of gas	Explosion group (as per ATEX directive)
Oxygen (O <sub>2</sub> )	-
Nitrogen (N <sub>2</sub> )	-
Argon (Ar)	-
Carbon dioxide (CO <sub>2</sub> )	-
Nitrous oxide (N <sub>2</sub> O)	-
Methane (CH <sub>4</sub> )	I
Ethylene (C <sub>2</sub> H <sub>4</sub> )	IIB
and mixtures thereof	

# Differentiating features

## Differentiating features of the types MG-97 S and MG-97 P/C/M

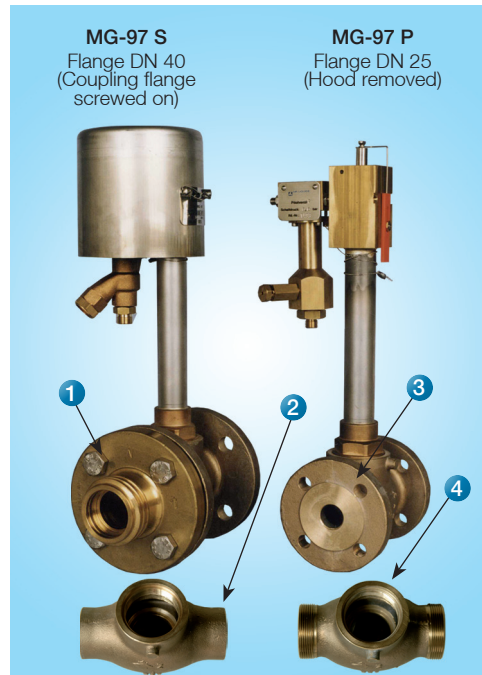
### MG-97 S

- Reduces, in addition to all other pressure-reducing devices, the tank pressure due to venting via the integrated full-lift safety valve in case the device is relieved
- Produces, due to the venting noise, a noticeably audible alarm signal
- Requires a specific auxiliary pressure line for the safety valve (nominal width, length, pressure drop)
- Covers tank pressures from 5 to 40 bar

### MG-97 P

- As this type is released via primarily static compressive forces, the release is effected in a "quiet" way
- In case of release, only a few cm<sup>3</sup> of gas are blown off
- Covers tank pressures from 2 to 40 bar

- 1 Flange DN 40
- 2 Connection for screws M 55 x 2
- 3 Flange DN 25
- 4 Socket end DN 40



# Installation instructions

## MG-97 C

- Special type for CO<sub>2</sub> vessels and filling pumps up to PN 80 (butt weld end)
- Same functionality as MG-97 P, thus, also suitable for air gas vessels
- MG-97 C also available with flanged connection DN 40/PN 40

## MG-97 M

- Same functionality as MG-97 P (PN 80; butt weld end)
- Shut-off valve for ultra pure gas applications (electropolished)

## Installation instructions for cryogenic device

The installation of the S.A.A. depends on the type which has been ordered (flange, socket end or body with male thread for union connection).

The S.A.A. is preferably installed between the filling coupling and the first shut-off device of the tank. The axle of the spindle may deviate from the vertical line by up to 30°. In doing so, frost formation is avoided and an impeccable functioning of the release unit can be ensured.

Due to the installation of the S.A.A., lever arms having an effect on the filling line may change. If the S.A.A. is installed on the tank in a deflection-resistant and torsion-proof way, the influence of rough handling of the coupling can be minimised.

The safety shut-off devices of the type MG-97 shall be connected to the complete unit in a permanently conductive way; the complete unit can be earthed individually or included in the equipotential bonding of the building.

The equipotential bonding shall be checked by the operator at regular intervals.

Additional lightning protection measures that might be necessary shall be taken by the operator on the basis of VDE 0185.

**Important:** The arrow on the housing of the device shall correspond to the flow direction during filling (from the delivery vehicle to the storage tank).

# Connection of Cryoguard

## Connection of auxiliary pressure line

The line to the release unit should be laid in such a way that its routing is as direct as possible with only minor pressure losses, free of tension, and tamper-resistant (objective: minimum pressure drop, no delays in signal transmitting).

If existing lines are used for this purpose, all operating sequences shall be critically reviewed (e. g. temporarily containing liquid, multi-functional, lockable, not exclusively influenced by the pressure of the inner tank).

In case of repair or maintenance, it might be appropriate to have a stop valve in the auxiliary pressure line. Adequate measures against operating errors and misuse shall be taken, this also includes technical measures, if and as required.

- **Connection of the release unit MG-97 S (full-lift safety valve):**

Screwed union with an olive ring for the pipe,  $\varnothing$  12 x 1 mm

Type EO-12 L

The maximum length of DN 10 pipes should not exceed 1,200 mm; up to 3 pipe bends are permissible.

- **Connection of the release unit MG-97 P/C/M (pneumatic switch):**

Screwed union with an olive ring for the pipe,  $\varnothing$  8 x 1 mm

Type EO-8 L

Normal tank geometry given, restrictions with regard to the pipe length have not been determined.

Upon completion of the installation, a leak test is to be effected by a qualified person.



# Installation instruction for Cryoguard

## Re-testing and operation

Due to the dispersion of gas from the pressure relief valve in case the release unit is relieved or vented, the formation of an explosive gaseous atmosphere has to be expected. The classification of areas, however, depends on the frequency of activation of the safety shut-off device as well as on the gas quantity released and it is thus to be determined by the operator.

It is recommended to mark an area with a radius of one metre from the release source as hazardous area.

The recommended measures for limiting explosion hazards and the recommendations for wearing personal protective equipment as prescribed in the gas safety data sheets shall be strictly adhered to if screwed unions are loosened or if the release unit is reset or relieved.

Re-testing of the set pressure has to be performed periodically on the basis of the set pressure certificate (see Pressure Equipment Directive (97/23/EC)).

The safety shut-off device should only be checked and opened by trained and authorised persons.

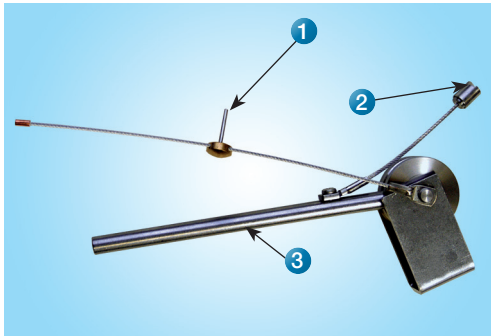
If the release unit is pressurised up to the set pressure, the safety shut-off device will close in a noticeably audible way. A red flap becoming visible under the name plate serves as indicator of the valve position (closed!).

Reset (opening) of the safety shut-off device:

- Close the filling valve(s) of the tank, depressurise the filling hose.
- Reduce the tank pressure to  $\leq 90$  % of the set pressure.

## Connection of the auxiliary pressure line

Proceeding:



Clamping device for MG-97 S and MG-97 P/C/M

- 1 Pin
- 2 Plug socket
- 3 Clamping lever

- Remove hood following unscrewing of the 2 screws of the manufacturer's name plate.

### Only applicable for MG-97 P/C/M:

Insert the pin at the brass knob of the clamping device into the vent valve and depressurise the pneumatic switch. At the end of the venting process, the pneumatic switch is reset (subsequently, no venting shall be possible; if desired, the process should be repeated).

- Put the positive-locking plug socket on the clamping device on the spindle and turn by 90°.
- Lift the spindle up to the lift limiter with the clamping lever (noticeable deflexion) and slowly release it again. The spindle now locks into place and the safety shut-off device remains in its open position.

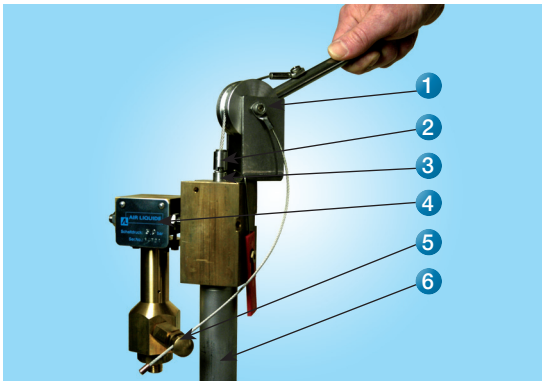
# Installation instructions for cryogenic device

## Attention!

Hold the clamping device with a firm grip even if the spindle is locked because an activation, e. g. due to a pressure increase, can lead to a sudden load on the rope.

**Danger of injuries and damages!**

- Immediately loosen the plug socket, remove the clamping device.
- Put the hood including the manufacturer's name plate back into place and screw it tightly.
- It is recommended to record inspection results and causes of a release in writing.



Reset (opening) of the S.A.A., this picture shows an MG-97 P

- 1 Clamping device
- 2 Plug socket
- 3 Valve spindle
- 4 Release unit (pneumatic switch)
- 5 Pin (inserted into the vent valve)
- 6 Cryogenic device

## Instructions for corrective maintenance

Corrective maintenance of the safety shut-off devices shall exclusively be effected by the manufacturer.

An exchange of the safety shut-off device shall only be effected in a safe, unpressurised state of the filling and auxiliary pressure lines. In case of flammable gases such as methane and ethylene, spark-proof tools shall be used.

# Notes and recommendations for users

## Notes and recommendations

With this safety shut-off device, Air Liquide has – as user for other users – developed an independent tank protection available in different designs which is operated by the gas coming from the storage tank.

Extensive and unusual qualification tests of a stand-by device were even effected with the series fabrication type (in-house, external users, TÜV).

Due to the installation of the device into the filling line of storage tank, however, the quality of the achieved protection becomes dependent on the whole system and can thus no longer be judged by the manufacturer of the device. The whole system can consist of the following items, for example:

- Delivery vehicle (centrifugal pump, control system, drive unit)
- Hose (pressure drop, protection against thermal pressure increase)
- Storage tank (safety valves, changeover valves, pressure build-up control, gas control) and other features depending on these individual items.

On the assumption that the S.A.A. is properly installed, the relevant codes also require an assessment of the complete system. By means of the safety reference number  $S_k$ , the geometric volume of the storage tank, its maximum permissible operating pressure, the possible throughput of the safety shut-off device and its closing time are taken into consideration.

Restrictions with regard to the use of the S.A.A. MG-97 S and MG-97 P/C/M due to system requirements are not expected because the closing time amounts to  $\leq 0.03$  seconds and the diameter determining the flow rate has been adjusted to the pipe cross sections which are currently being used. In case of tanks with maximum allowable working pressures  $\leq 6$  bar and volumes  $\leq 1,500$  litres, however, the safety reference number should always be reviewed.

Operating problems (not safety risks) are expected if the auxiliary pressure line is linked to lines with multiple functions (e. g. top filling). Between the individual filling processes, however, the S.A.A. is permanently subject to the operating processes via the auxiliary pressure line. It is recommended to carefully analyse these processes in order to exclude any operating problems.