



Operating Instructions  
in compliance with  
Pressure Equipment Directive 2014/68/EC

FAS Flanged Sight Glasses



Please read these operating instructions carefully to ensure a safe operation and keep the same for further use.





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## **Safety**

The FAS flanged inspection sight glass, hereinafter referred to as sight glass, is designed for use in refrigeration/air conditioning systems, hereinafter referred to as systems. It may only be put into service if installed in the system unchanged in accordance with these instructions and in its entirety is in compliance with the statutory provisions.

The sight glass incorporates state-of-the-art technology and has been built according to the applicable regulations. Great value has been set upon the user's safety.

These operating instructions are integral part of the contract and shall be kept throughout the entire life of the sight glass.

### **Authorized personnel**

Only trained and instructed personnel shall be allowed to do any work on the sight glass. As regards the qualification and expertise of the personnel the applicable rules and guidelines shall apply.





### **Residual dangers**

Unavoidable residual dangers may emanate from the sight glass. Every person working on this device shall therefore carefully read these instructions.

To be observed are for example:

- the generally accepted safety regulations,
- EC directives,
- Norms (e.g. EN 378) and all national provisions.






### **Symbols used for safety information**

|   |   |
|---|---|
|  | <b>DANGER!</b><br>Instructions on preventing imminent serious danger to persons.<br>Imminent most serious injuries or death as a possible consequence.<br>Any non-observance may lead to an immediate failure of the sight glass. |
|  | <b>WARNING!</b><br>Instructions on preventing potential serious danger to persons.<br>Avoidable serious to very serious injuries or death as a possible consequence.<br>Any non-observance can cause the sight glass to fail.     |
|  | <b>CAUTION!</b><br>Instructions on preventing a minor danger to persons.<br>Minor, reversible injuries cannot be excluded.<br>Any non-observance may lead to a medium-term failure of the sight glass.                            |
|  | <b>ATTENTION!</b><br>Instructions on preventing potential damage to equipment.<br>Minor, reversible injuries cannot be excluded.<br>Any non-observance may lead to a medium-term failure of the sight glass.                      |

## General safety information

These operating instructions are based on the safety requirements of DIN EN 378-2 and DIN EN 12178.

Instructions to prevent dangers in all cycles of service life:

|   |   |
|---|---|
|    | <p><b>DANGER!</b><br/>           Risk of bursting if operated beyond the technical parameters.<br/>           Most severe injuries and immediate system failure possible.<br/>           Observe the technical parameters!</p>  |
|    | <p><b>WARNING!</b><br/>           Damage due to improper handling.<br/>           Serious injuries and system failure possible.<br/>           Never use the sight glass as transport, lifting or lashing point.</p>  |
|    | <p><b>WARNING!</b><br/>           Any non-observance of the instructions may cause the sight glass to fail.<br/>           Avoidable serious to very serious injuries or death possible.<br/>           Installation, operation and maintenance by authorized trained personnel only.</p> |
|   | <p><b>WARNING!</b><br/>           Risk of service fluid being released.<br/>           Depending on the kind of service fluid serious to very serious injuries or death possible.<br/>           Wear personal protective equipment (e.g. respirators, gloves).</p>                       |
|  | <p><b>CAUTION!</b><br/>           Very cold or very hot surface temperatures possible.<br/>           Frostbites/burns possible.<br/>           Wear personal protective equipment (e.g. respirators, gloves).</p>  |

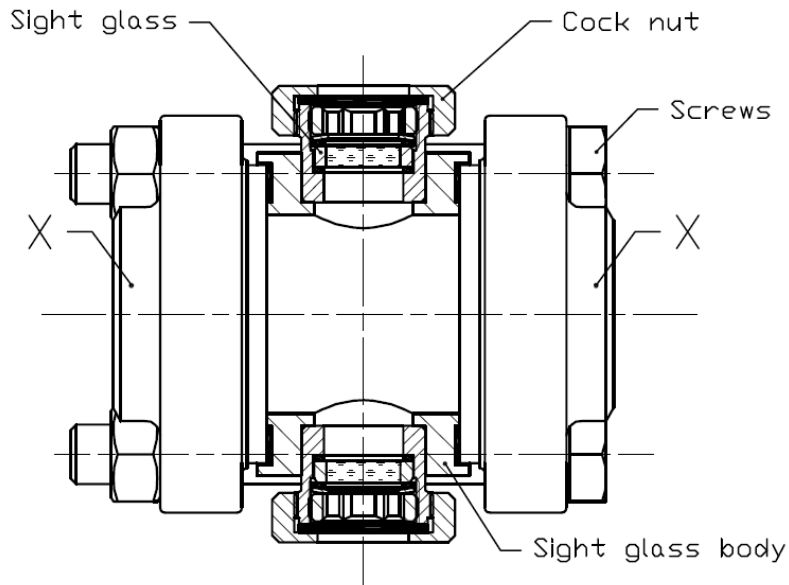
## Other information

The information contained herein represents to the best of our belief our knowledge at the time when these instructions were prepared. It shall serve as code of practice to ensure a safe handling of the sight glass in transport, storage, installation, commissioning, maintenance and dismantling/disposal. A final decision as to whether the sight glass suits the purpose is to be taken by the user. This information shall not be deemed a warranty of quality.

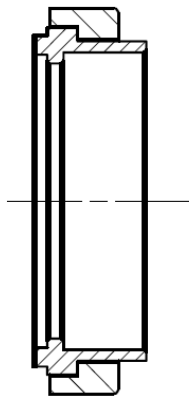
Any modification of the sight glass and operation under other than the prescribed parameters shall not be allowed and will result in the loss of the conformity declaration and all liability claims.

## Description of sight glass

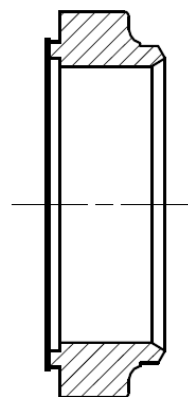
### Types (possible combinations of connections)



A  
brazed flange  
for X



B  
welded flange  
for X



Installation dimensions can be gathered from the AWA product catalogue or the technical documents.

The connecting options A and B are explained in more detail in "Design features".

## Product description


The sight glass is a direct-reading viewing / screening sight glass for use in refrigeration/air conditioning systems. The two opposite sight glasses (metal ring with sealed-in glass body) are tightly screwed with the sight glass base frame and covered with an sealing cap.

Any flow direction can be chosen.

The sight glass follows the DIN 28120 and is in conformity with DIN EN 12178:2003 and the Pressure Equipment Directive 2014/68/EC.

## Marking

The sight glass is marked according to DIN EN 12178:2003 on the sight glass body.

- Mark of sight glass manufacturer
- Type
- Year of make
- Allowable operating pressure
-  sign (if applicable)

## Technical parameters

### **Pressure/temperature:**

As indicated in the technical documents.

### **Media used:**

Refrigerants according to DIN EN 378-1-2012, PED fluid group 2 and appropriate refrigerating machine oils according to DIN 51503-1.

Other refrigerants may be permitted depending on what has been indicated in the technical documents. This is indicated in the technical documents.

### **Leak test:**


according to DIN 8964-3 (<4,1 g/a R-134a at 10bar)

### **Strength test:**

according to DIN EN 12178 at the 1.43fold of PS

### **Classification based on the Pressure Equipment Directive (PED 2014/68/EC):**

See information given in the technical documents.

From category I components get the  mark (and number of notified body if required).

## Design Features

- The material of the sight glass components and the manufacturing techniques are selected in line with EN12178:2003 and the Pressure Equipment Directive 2014/68/EC thus ensuring reliability over the entire range of applications.
- The sight glass base frame consists of multiple parts that are tightly connected with each other by inert gas brazing.
- The sight glass consists of a glass plate tightly fused into a steel ring. The different expansion coefficients of glass and metal lead to a homogenous state of compressive stress of the entire glass. This is why the glass behaves like a tough material on the principle "leakage before break". The sight glasses are screwed into the base frame in a pressure-tight manner.
- The sight glasses come with sealing caps as standard for protection against damage.
- The sight glass has internals of steel, glass and aluminium. Therefore it is possible to use ammonium as refrigerant on request.
- The flanged connections come with a tongue and groove system with fibre gasket. Depending on the size the flanges are tightly connected with the body for which 2 or 4 hexagon bolts and nuts are used.
- The sight glass is designed for installation a pipe.
- Types of connection:

**Connection "A"** – Detachable brazed capillary connection to render a brazed joint with copper pipes according to DIN EN 12735-1:2010 for Ø12 to Ø54mm. Inch-type pipes are available on request.

**Connection "B"** – Detachable welded connection for use of steel tube dimensions according to DIN EN 10220:2003-03 for DN 10 to DN50.

- The sight glass comes prime-coated with a two-component varnish of grey colour. In addition to that all components except the flanges are galvanized. The coating provides for a temporary corrosion protection until installation if transported and stored in dry condition.
- The service-friendly design makes it possible to purchase spare parts separately (e.g. sight glass pane, gaskets, flanges).

## Transport and Storage


Transport the sight glass in its original packing protected against weather influences in closed means of transport and store it in dry areas.




## Mounting

### Principles


- The sight glass and/or the connecting piece shall be arranged in the system so that it can be operated properly and that it is and protected from possible hazards.

|   |  |
|---|--|
|  | <b>DANGER!</b>   |
|   | Damage of sight glass possible.  |
|   | Serious injuries and system failure possible during operation.   |
|   | Sight glass to be installed without additional loads (forces, vibrations, etc.).<br>The sight glass must not serve as fixed points of pipes. |

- Removal space shall be so that the level indicating devices can be properly mounted by use of a tool and at the necessary torque. A removal space of min. 100 mm needs to be provided to loosen the sealing caps and replace the sight glass if necessary.
- Only authorized personnel shall be allowed to mount the sight glass.


|   |   |
|---|---|
|  | <b>DANGER!</b>  |
|   | Any non-observance of these instructions may cause the sight glass to fail. |
|   | Most serious injuries and death possible.                                   |
|   | Mounting and operation by personnel trained in refrigeration systems only.  |

- No modifications of the sight glass are permitted. If modifications become necessary, they have to be agreed with the manufacturer prior to mounting.


|   |   |
|---|---|
|  | <b>WARNING!</b>   |
|   | Product features may change.                                    |
|   | Avoidable serious to very serious injuries or death possible.   |
|   | Any modification has to be agreed with manufacturer in advance. |

### Mounting preparation

- When supplied the sight glass may be provided with additional transport protection. To avoid corrosion and contamination, such protective means should be removed shortly before mounting.


|   |  |
|---|--|
|  | <b>ATTENTION!</b>  |
|   | Damage of internal components possible.                            |
|   | Malfunction due to oxidation/contamination of internal components. |
|   | Remove the transport protection shortly before mounting.           |


- Connections A & B: remove connecting parts (flange screws, connecting flanges, gasket). Keep these parts safe until use.

|   |   |
|---|---|
|  | <b>ATTENTION!</b>   |
|   | Damage of internal components possible.                   |
|   | Malfunction of sight glass due to thermal shock possible. |
|   | For thermal bonding the parts must be demounted.          |


## Connecting the pipe

1. The dimension of the connecting piece must fit that of the sight glass. If not, use adapters.
2. Prepare the system connections so (metallic bright and grease-free) that a high-quality joint can be made.
3. Scavenge the relevant pipe sections with shielding gas during brazing and welding. Then allow the connection to cool down in the air.


|   |  |
|---|--|
|  | <b>WARNING!</b>  |
|   | Damage of flange (e.g. crack formation) due to rapid cooling possible.<br>Serious injuries and system failure during operation possible.<br>Allow the joint to cool down in the air. |

|   |  |
|---|--|
|  | <b>ATTENTION!</b>  |
|   | Possible damage of internals.<br>Malfunction due to oxidation of internal components.<br>Scavenge with inert gas during joining. |

4. Clean the pipe connections made. Flux residues are very corrosive and may cause long-term damage.

|  |  |
|--|--|
|  | <b>CAUTION!</b>  |
|  | Risk of increased corrosion and component damage.<br>Serious injuries and system failure during operation possible.<br>Thoroughly clean the joint when the work has been finished. |

5. Connections A & B: Attach the connecting parts to the pipes and body. Make sure there is no mechanical constraint. Tighten the connecting flanges crosswise in minimum two steps applying the given torques (see Item 6).

|   |   |
|---|---|
|  | <b>WARNING!</b>   |
|   | Any excessive torque or non-observance of the mounting order may cause failures.<br>Serious injuries and system failures possible during operation.<br>Observe the torques. |

6. The following torques apply for the nominal sizes DN 10 to DN 50 (in Nm):

| Threaded ring of sight glass | Sealing cap of sight glass | Bolts of connecting flanges |
|------------------------------|----------------------------|-----------------------------|
| 55 +5                        | 40 +5                      | 85 +10                      |

## Commissioning

### Principles

- The sight glass is a closed unit. It has already been tested for leakage and strength by the manufacturer.
- The sight glass and the system into which it is installed, may only be commissioned if they have been checked, with due regard to the intended mode of operation, for proper condition as to assembly, installation, set-up conditions and safe functioning.
- After mounting and initial start-up according to DIN EN 378-2:2012 the end user shall check again for leakage and strength and an effective corrosion protection.

## Steps of commissioning

1. Check the system with suitable media (e.g. helium, dry nitrogen) for tightness and pressure resistance.


**DANGER!**

Danger of sight glass bursting.  
Most serious injuries possible.  
The test pressure must not exceed the maximum allowable pressure (PS).  
Strictly observe the safety information (e.g. DIN EN 378).

2. It is indispensable to apply an anticorrosive coating that meets the operating conditions because the sight glass comes with a temporary anticorrosive coating only. Make sure that the fabrication data remain legible.


**CAUTION!**

Delayed failures due to corrosion possible.  
Serious injuries and system failure during operation possible.  
Apply a suitable anticorrosive coating.


**ATTENTION!**

Loss of product conformity by removal of lettering.  
Loss of warranty.  
Lettering must remain legible.

3. Evacuating and filling the system with refrigerant.


**DANGER!**

Danger of bursting if operated beyond the technical parameters.  
Most serious injuries possible.  
Observe the technical parameters of the sight glass.  
Make sure the system is not filled with an excessive amount of refrigerant.

4. Then, tighten the sealing caps applying the given torque (see item "Mounting").


**WARNING!**

Excessive torques may result in failures.  
Serious injuries and system failure during operation possible.  
Observe the torques.

5. Never cool down or heat up abruptly. The temperature gradient of the level indicator shall not exceed 30K.


**CAUTION!**

Cracks and resulting leakage of the glass lens possible.  
Injuries and system failure during operation possible.  
Observe the temperature differences.

6. When the system is started for the first time, check the pipes for abnormal vibrations and record the operating data.


**CAUTION!**

Cracks by vibration in the pipe system and at the sight glass possible.  
Injuries and system failure during operation possible.  
Avoid strong vibrations, and, if necessary, take safety measures.

## Operation, Maintenance and Repair

### Principles

- The sight glass is maintenance-free.
- When cleaning, make sure that there is no excessive temperature difference between the cleaning agent and the level indicator.



**DANGER!**

Leakage of refrigerant possible.  
Leaking refrigerant may cause most serious injuries.  
Repairs to be carried out in areas being free of refrigerant, sufficiently ventilated and that have the right temperature.

- The regular system inspection should include checks for corrosion, damage and proper functioning. If necessary, proper condition should be restored.



**WARNING!**

Media contact possible, contact with hot/cold surfaces.  
Burns, frostbites  
Wear personal protective equipment as prescribed by national regulations during maintenance and inspections.

- Before using the sight glass carefully remove the cap. If it is found that the cap is pressurized and pressure compensation cannot be easily achieved, tightly seal it again. In such case the sight glass is leaky and the system must be put out of operation.



**WARNING!**

The sealing cap is pressure-tight and may be pressurized.  
Serious injuries possible.  
Carefully remove the cap.

- Upon completion of work put the caps and the sealing washer in place again.




**WARNING!**


Any excessive torque or non-observance of the mounting order may cause failures.  
Serious injuries and system failures possible during operation.  
Observe the torques.

## Repair

- If the sight glass needs repair, shut down the system, drain the refrigerant from the system (or system section) in an environmentally friendly manner and vent the system.

|   |   |
|---|---|
|  | <p><b>DANGER!</b><br/> Refrigerant may escape.<br/> Escaping refrigerant may cause most serious injuries.<br/> For repairs the system must have the right temperature, free from refrigerant and sufficiently ventilated.</p> |
|---|---|


- For repairs use no other than original spare parts. For mounting/start-up follow these operating instructions. It is indispensable to do a leakage and strength test once again. AWA assumes no warranty for tightness after repairs.


|   |   |
|---|---|
|  | <p><b>WARNING!</b><br/> Sight glass damage due to defective spare parts/mounting.<br/> Avoidable serious injuries and system failure possible.<br/> Use no other than original spare parts for repairs.</p> |
|---|---|

## Dismantling and Disposal

### Principles

- To dismantle the sight glass, shut off the system, remove the refrigerant from the system (or system section) in an environmentally friendly manner and sufficiently ventilate the system (or system section).

|   |  |
|---|--|
|  | <p><b>DANGER!</b><br/> Escape of refrigerant possible.<br/> Escaping refrigerant may cause most serious injuries.<br/> For repairs the system must have the right temperature, free from refrigerant and sufficiently ventilated</p> |
|---|--|

|   |  |
|---|--|
|  | <p><b>WARNING!</b><br/> Media contact possible, contact with hot/cold surfaces.<br/> Burns, frostbites<br/> Wear personal protective equipment as prescribed by national regulations during maintenance and inspections.</p> |
|---|--|

- The sight glass and its components resp. can be recycled:

|                   |                   |
|-------------------|-------------------|
| sight glass body: | steel scrap       |
| flanges:          | steel/brass scrap |
| dust caps:        | plastics (PE)     |



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