Operating and Maintenance Instructions for METAGLAS® Fused Metal/Glass Sight Glasses.

Product Description

METAGLAS® Fused metal-glass sight glass discs comprise a glass viewing disc fused into a metal ring . During manufacture of the fused sight glasses, the steel ring and the glass disc are brought up to a temperature where the glass melts and fuses with the steel ring. After this there follows a controlled cooling phase. The glass solidifies and is compressed by the steel ring. The cooled sight glass unit is then ground and polished.

The mechanical prestressing causes metal-glass fused sight glass to take on the properties of a very tough material and offers superior safety against the conventional thermally treated/toughened sight glass. This is why fused metal/glass sight glasses units should always be used in preference to toughened Borosilicate or Sodalime glass discs in cases of hazardous process conditions.

Application

Fused Metal/Glass sight glasses are used wherever there is the need to have visual control of a process operation being carried out in a sealed container; e.g. pressure vessels, pipelines, electric switching stations, refrigeration technology, etc.

They are suitable for mounting in standard fittings (e.g. to DIN 28120 or DIN28121), mounting onto flange pads or weld flanges (with or without raised face), for screwing directly into threaded entries and for mounting within Triclamp and NA-Connect style assemblies etc.

Factors which could lead to damage or destruction of the sight glass are as follows

Temperature

- The minimum operating temperature is determined by the material of the metal ring. If this lower temperature limit is exceeded the metal may become brittle and its tensile strength may be affected resulting in break up of the sight glass unit
- The maximum operating temperature is determined by the mechanical pre-stressing of the glass and/or the material of the metal ring. Even if the temperature is exceeded by a small amount, the result will be failure of the sight glass.

Pressure

- The maximum operating pressure is determined by the configuration (dimensions) and the combination of materials of construction of the sight glass. If the pressure is exceeded concentric or net shaped cracks will appear in the surface of the glass on the low pressure side. Further increase will result in enlargement of the cracks, slivers of glass will come away and finally the glass will fail.

Temperature Shock

- Avoid rapid heating up or cooling down of the sight glass. With fused metal/glass sight glasses the steel ring is in tension and the glass insert in compression. The stresses in the two materials are not homogeneous. In the glass disc, the stress is concentrated around the peripheral glass/metal joint. If the sight glass is subjected to temperature shock, concentric cracks may appear in this area or even fine slivers of glass may come away. These cracks will not disturb the pressure- tightness/sealing properties of the glass, nor will they create a direct safety risk as long as they are no deeper than 10% of the original glass thickness. The sight glass should however be checked properly and if necessary exchanged. The same applies to chemical corrosion.

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Chemical Corrosion

The chemical resistance of the unit is determined by the two constituent materials, glass and metal.

Glass
Generally glass has a high resistance to water, salt solutions, acids, and organic substances and is thus superior to most metals and synthetic resins. It is only significantly attacked at raised temperatures by fluorine, strong alkaline and concentrated phosphoric acid solutions. Chemical erosion, however, can take place in the presence of condensate and salt solutions. Corrosion will increase at higher pH values, increased concentration and higher temperatures. The greatest deterioration of the glass will result from alternating exposure to acid and alkali. There is no mutual reaction between glass and non aqueous organic solutions.
Reciprocal reaction with glass surfaces can cause turbidity, spots, thin films with interference colouring and grainy or smooth deposits. These effects may remain restricted to the surface but in the extreme can lead to failure or dissolution of the glass.

Metal
The user should check that the material of the ring has the corrosion resistance to the substances to which it will be exposed.

Mechanical Loading

Fused metal/glass sight glass units are generally more resistant to distorting loads when incorrectly fitted than conventional sight glass discs. However incorrect installation can affect the function of the unit and even lead to its failure. Sight glasses should only be installed by personnel who have been thoroughly versed in:

- careful handling of sight glasses
- cleaning of housings, discs, gaskets, and inserts prior to installation i.e. removal of all foreign bodies (e.g. swarf)
- even tightening of securing bolts

During installation there should be no additional stresses imposed nor should the units be exposed to mechanical impact loads.

Fused metal/glass sightglasses must be included in all planned maintenance procedures and periodically checked both visually and with ultrasonic-wall thickness testing equipment. In the event of a glass being damaged, adequate visual checks should be made until the relevant vessel can conveniently be shut down. This will make for a practical glass exchange routine to suit the process operation.