HENRIK J.

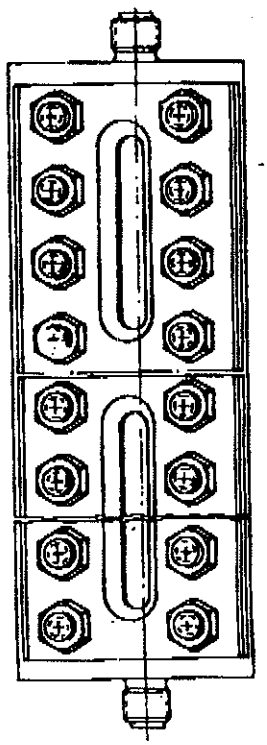
Installation and maintenance instructions for

KLINGER bi-colour high-pressure liquid level gauges

KTA

PN 250 / PN 315

120 bar, 323°C saturated steam
180 bar, 356°C saturated steam



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1. Basic information

In steam boilers operating at pressures over 35 bar reflex glasses are rapidly used up because of the high saturated steam temperatures. For such h working conditions we therefore recommend liquid level gauges with flat glasses, the steam side of which is protected by a mica shield. As a further addition to our range of transparent gauges we have developed the Klinger type KTA bi-colour water level gauge for extreme pressures, which may be used for steam pressures up to 180 bar, 356°C.

Type KTA water level gauges are provided with a special illuminator which can be supplied for either red-green or black-white indication. Depending on the type of illumination this gives the following images:

1) Red-green: Steam space red, water space green.
2) Black-white: Steam space white, water space black.

   The second pattern is primarily intended for use with TV observation of the liquid level.

KTA gauges, however, cannot be installed inclined, and it is likewise impossible to read the level at an angle from below.

If such gauges are mounted on elevated boilers the image must be transmitted down to the boiler control platform by periscopic mirrors. We supply such mirrors on request.

2.3 Illuminator, explosion-proof pattern

Type of protection	: VDE 0171	Ex d3nG4/G5
Test certificate	: to PTB No.	III B/E - 10534
Connecting voltage	: 110/225 V	
Nominal current	: max. 2 A	

The explosion protected illuminator consits essentially of the illuminator housing and the ex-protected "Schaco" lamps.

Lamp replacement is carried out easily as follows:

The glass dome of the lamp can be unscrewed by hand. The tubular light bulb is now easily accessible and can be replaced (bayonet fitting).

After the glass dome is again firmly screwed on, the illuminator is again fully servicable.

IMPORTANT NOTE:

The illuminator must always be installed in the correct position. The illuminator housings are marked "OBEN" (="TOP"). This applies, however, only for patterns made to the protection categories DIN 40 050 IP 20 and IP 54;

With TV-observation care must also be taken that the camera is correctly positioned; see enclosed drawings.
wT 3133

2. Illuminator

The illuminator is very robustly constructed and consists essentially of a row of ordinary light bulbs (220V/60W)

2.1 Red-green indication

Two colour filters (one red, one green) are mounted immediately in front of the lamps. Seen from the front the red colour filter must always be on the left.

The optical separation of the steam water space is based on the varying indices of refraction of steam and water and also on the differing positions of the red and green filter glasses. The bi-colour indication is produced as follows:

The red light passes through the steam, whereas in the water space it is deflected sidewards and absorbed. This results in a perfectly clear image:

Red = Steam Green = Water

2.2 Black-white indication

In this pattern the two colour filter glasses are replaced by a screen which has a narrow vertical slot. Depending on the angle of observation the following images are produced:

Black = Water White = Steam

or

White = Water Black = Steam

The pattern with black-white indication is mainly used for observation by closed-circuit TV.

3. Glass breakages and their causes

With Type KTA 28 gauges, glass breakages can be caused through the following circumstances:

3.1 Strong draughts (windows, lift-doors etc. in the vicinity of the gauge: in such cases the gauge should be screened off).

3.2 Distorted cover plates and centre-pieces: can be corrected by re-machining.

3.3 Corroded cover plates and centre-pieces: can be corrected by re-machining.

3.4 Glass cushion gasket is too thick: the transparent glass projects beyond the glass holder. The glass is thereby subjected to the full bolting load and fractures. Under all circumstances the glass surface must be recessed by 0.15 - 0.35 mm.

3.5 Thermal shocks resulting from incorrect blow-down or too rapid commissioning.

3.6 Cycling service: e.g. sudden on-loading of the gauge.

3.7 Transparent glass has too little clearance within the glass holder: during on-loading siezes and breaks. The glass must be capable of movement in all directions by a few tenths of a millimetre or at least to a small extente

3.8 Glass cushion gasket is too long and tends to corrugate. In this event the cushion gasket should be shortened with scissors: it may be 1mm shorter than the glass.

3.9 Distortion of the entire gauge through badly aligned boiler connections.

3.10 Use of graphite, Molykote etc. to prevent adhesion of the glass cushion gasket: this results in a layer of non-uniform thickness and the glass cushion gasket is also unevenly thickened.

4. Glass corrosion and its causes

Glass corrosion may result from fracture of the mica which may occur for the following reasons:

4.1 The mica shield was wrongly installed: the better side must face the water space; please note the word "Wasserseite" (=water side) stamped on the glass.

4.2 Blow-down was not carried out in accordance with our instructions (see section 6.3): the mica was exposed to the full force of the steam jet.

4.3 Excessive torque: the gasket is thereby stressed beyond its mechanical resistance, flows outwards and inwards, consequently tears or crushes the gasket. For torque per bolt please see section 6.1.

4.4. Use of Molykote etc. to prevent adhesion of the gasket. If, however, the gasket cannot grip it begins to flow and tears or crushes the mica.

4.5 The mica shield is too thin: minimum thickness 0.3 mm.

4.6 The mica shield is damaged by the edges of the glass holder. This may be prevented through the use of a mica-protector (see attached details).
Note: The edges of the glass holder respective to the glass recess must invariably be well rounded-off. See drawing wT 3036.

4.7 As a natural product, mica has greater quality fluctuations than industrially manufactured products. Although we have very strict quality control tests a hair-crack may occur in a shield which becomes noticable only after start-up.

4.8 The mica glass protector with venting orifice protects the glass against draughts and acts as a thermal insulator. It is installed between the cover plate and the glass cushion gasket. This mica must not be installed on the side of the glass in contact with the water. Only the thicker mica without orifice may be used here.

5. Mounting on boiler

5.2 After insertion of compressed asbestos gasket, bolt gauge valves pressure-tight to boiler flanges.

5.4 After loosening the oval flanges the gauge can be turned to any desired position.

5.5 Adjustment of the illuminator and mirrors should be carried out by two fitters. It is advisable to use radio contact, by means of which a clearly discernible image is rapidly obtained.

6. Commissioning

A sudden temperature rise (thermal shock) in the gauge can adversely affect the service life or the performance of the glasses or micas. When the entire plant is being taken into service there is a slow rise in pressure and tmperature and - provided the valves are open - no danger for the glass or mica. If, however, a gauge is dismantled for repair purposes and subsequently installed on a working boiler the following re-commissioning procedure is recommended:

6.1 Shut lower gauge valve, open drain valve and open upper gauge valve so far that sufficient steam can enter to thoroughly heat the gauge - the condensate running down the glasses should be carefully observed. (Warming-up time about 50 - 60 min.)

6.2 Shut drain valve - the gauge now fills with condensate

6.3 Open upper gauge valve fully.

6.4 Open lower gauge valve fully.

6.5 During the slow warming-up of the gauge the gaskets will relax to some extent and it is therefore necessary to re-tighten at all sealing points and re-check the torques of all body-bolts.
Use of graphite gaskets eliminates the need for re-tightening (1-hour maintenance). However, it is still advisable to check the torques of the hexagon nuts before re-mounting the gauge and where necessary to re-tighten to the prescribed value (150 Nm).

7. Operating instructions

7.1 After initial commissioning (also after replacement of stuffing box or glass) the cover plate nuts should be re-tightened in a cross-wise sequence with a torque wrench (150 Nm cold, 120 Nm from 120°C upwards). The haxagon nuts of the mounting screws on the boiler flanges, stuffing-box retainer flanges and valve bonnet should likewise be re-tightened.

7.2 Leakages which occurs during service shbuld be stopped by re-tightening at the appropriate glass section.

7.3 The service life of the micas and hence of the glasses can be favourably influenced by correct blow-down procedure.
This is carried out as follows:
Shut upper gauge valve and briefly blow-through the lower gauge valve by opening the drain valve. The water in the gauge body is thereby extracted without the inside of the gauge body being completely relieved of pressure. When the drain valve is shut again water is again pressed upwards in the gauge body. This opening and shutting of the drain valve should be repeated several times so that the water level in the gauge body rises and falls and thereby cleans the mica of deposits. By shutting the upper and lower gauge valves and subsequently opening the drain valve the gauge body can be completely emptied of water. To clean the bore of the upper gauge valve, the gauge should be completely emptied as described above, the drain valve should then be shut and the upper gauge valve opened. Before a further blow-down the upper gauge valve must under all circumstances be shut and the procedure described above be repeated.
This procedure ensures the maximum possible protection of the micas, which are highly stressed by the boiler pressure and the blow-down procedure. To protect the micas further the period between blow-downs should be made as long as posible, this is naturally dependent on the boiler water.

7.4 If the boiler is shut down for a lengthy period of time the gauge should be emptied. This means: shut upper and lower gauge valves and then open drain valve.
When the boiler is again put into service open both gauge valves, shut drain valve and put the gauge on-load together with the boiler. If the gauge is put into service at a later point in time, please proceed as descrited in section 6.

7.5 Because of thermal radiation the temperature in the gauge is lower than in the boiler, in which the temperature is that of saturated steam at the given pressure. Since the pressure in the gauge and boiler is identical the specific gravity of the water is displaced along a line of equal pressure. In the lower pressure/temperature zones these curves are relatively flat, but in the upper zone are very steep.This means that in the high-pressure zone the error in the indicated level rapidly increases, since increased radiation also causes a greater temperature difference between the gauge and the boiler. In the high-pressure region and particularly from 180 kp/cm^2 to 210 kp/cm^2 the indication error may attain substantial values which should be taken into consideration in the interpretation of the level shown.

8. Dismantling and assembly instructions for gauge, gauge valves and drain valve

8.1 Replacement of glasses and micas

8.11 Shut gauge valves - empty gauge body by opening drain valve - disconnect electrical supply, remove securing screws for illuminator and lift off illuminator.

8.12 Unbolt oval flanges and lift off gauge.

8.13 Unscrew hexagon nuts from cover plates and dismantle gauge.

8.14 Check centre-piece and cover plates with straight-edge. There must be no unevenness caused by corrosion or excessive stress. Scrupulous attention should be paid to cleanliness during assembly.

8.15 There must be no traces of the previous cushion gasket on the cover plate - please clean carefully.

8.16 There must be no traces of the previous sealing gasket in the glass recess of the centre-piece - please clean carefully.

8.17 Clean sealing gasket with a clean cloth and place in the glass recess of the centre-piece - do not use lubricants etc.

8.18 Place mica shield on the sealing gasket and mica protector on the mica. With marked micas the side stamped "Wasserseite" (=water-side) must under all circumstances face towards the liquid chamber. Unstamped micas should be so inserted that the better side faces towards the liquid chamber.

8.19 Carefully clean glass holder of traces of previous mica protector (if necessary with fine emery paper) and place in the recess in the centre-piece, the smooth surface must face towards the mica protector, the surface with the pressure-relief notch towards the cover plate.

8.20 Insert transparent glass - it must lie loosely within the glass recess and be capable of slight displacement in all directions.

INSTALLATION INSTRUCTIONS

KLINGER-NORM
WT 3153/11

Ausgabe:

8.21 Clean cushion gasket with a clean cloth and place on the transparent glass.
NOTE: Under no circumstances may the cushion gasket be larger than the recess. If it is too long and tends to "wave" it should be cut to the appropriate length with scissors. The cushion gasket may be about 1 mm shorter than the glass.

8.22 Place spacer strips (4), glass pretector (8) - mica with venting orifice, taking care that the venting orifice is at the lower end of the glass - and cover-plate (2) on top of one another and secure firmly with hexagon nuts (the threads of the stud bolts should previously be lubricated with Molykote thread grease 1000). Since the upper surface of the centre-piece does not lie horizontally during assembly (this results from its wedge form) it may happen that the spacer strips move out of position before they are correctly clamped by the cover-plate. This can be prevented by slightly bending the spacer strips and thereby clamping then between cover-plate and centre-piece. The nuts must be tightened with a torque wrench in the sequence shown in drawing WT 3008, the torque being increased step-wise (for example : 30, 60 90, 120 and finally 150 Nm).

Kasten:
Fach:
Mapp.:

	Name:	Datum:
Gezeichnet:		
Geprüft:		
Normgeprüft:		

RICH. KLINGER
AKTIENGESELLSCHAFT

9. Installation of camera for observation by TV

9.1 The camera must be installed at the same level as the centre point of the gauge and be pivotable to all sides - see wT 3133.

9.2 The camera should be mounted at a distane of approximately 2,5 m to 5 m from the gauge.

9.3 After loosening the two oval flanges a preliminary setting of the black-white indication can be achieved by slightly rotating the guage body. The connections should then be re-tightened. Fine adjustment - i.e. making the water level visible on the monitoring screen, is only possible after the gauge is taken into service since it is only then that steam and water spaces exist. Since the gauge can no longer be moved, adjustment must b be made through a -movable camera (see drawing wT 3133). As with mirror (periscopic) observation the use of "walkie-talkie" radio equipment would be ideal since this permits direct contact between the monitoring centre and the gauge (camera).

9.4 In many cases it will be necessary to illuminate the front of the gauge through external light sources. Precise instructions can hardly be given since optimum illumination of the gauge depends both on the ambient lighting conditions and the sensitivity of the camera. However, the background to the gauge should be kept as dark as possible and reflection of external light sources in the gauge glass should under all circumstances be avoided.

10. Basic information on glass service-life

The worst enemy of micas and glasses is cycling service. The constant on - and off-loading of the boiler leads to rapid wear on the micas and glass breakages, through which the service-life may greatly vary. Generally speaking, one may reckon with a service life of about 8 weeks under such conditions.
Under constant loading, on the other hand, it is possible that the micas and glasses will function faultlessly throughout an entire heating period. However, prior to re-commissioning it is definitely advisable to replace glasses and micas, at the same time renewing all gaskets and spacer strips.

11. Brief summary of the most important points

11.1 Only genuine KLINGER replacement parts may be used; to prevent damage these should be left in their original packings until installation . At such pressures and temperatures it is much too dangerous to resort to experiments or expediency. For example it is quite impossible to cut out replacement micas oneself with scissors. Micas prepared in this manner are inherently damaged and totally unusable.

11.2 During assembly the greatest care must be given to cleanliness. All points mentioned in section 8.1 should be scrupulously observed.

11.3 Avoid strong draughts. If there are windows, lift doors etc. in the vicinity, the gauge must be screened off since draughts can cause glass breakage.

11.4 Any leakages should be immediately stopped by re-tightening at the appropriate point.

11.5 If the glasses become "milky" they should be replaced immediately since they would otherwise corrode further which at the high pressures for which these gauges are designed could have unforeseeable consequences.

11.6 The blow-down procedure (section 7.3) should be scrupulously observed.

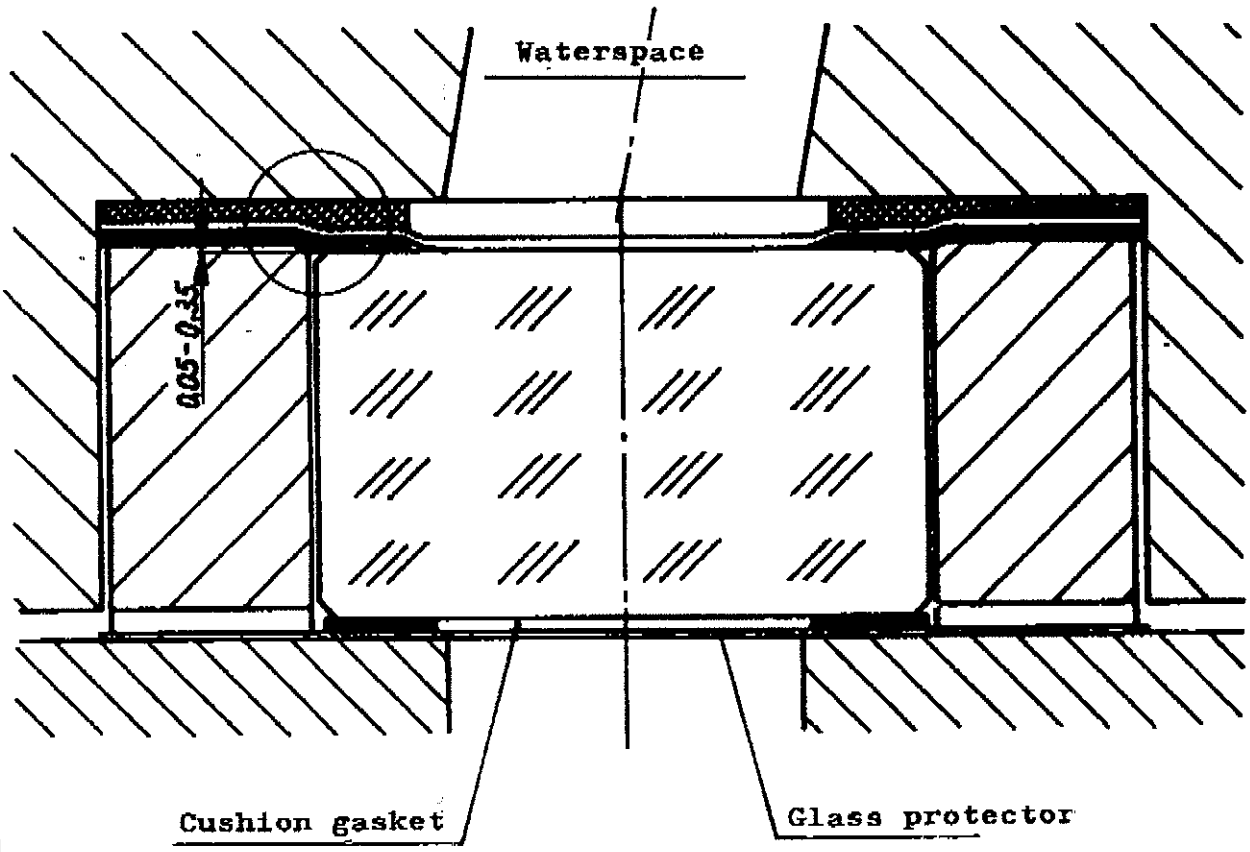
S T O R A G E

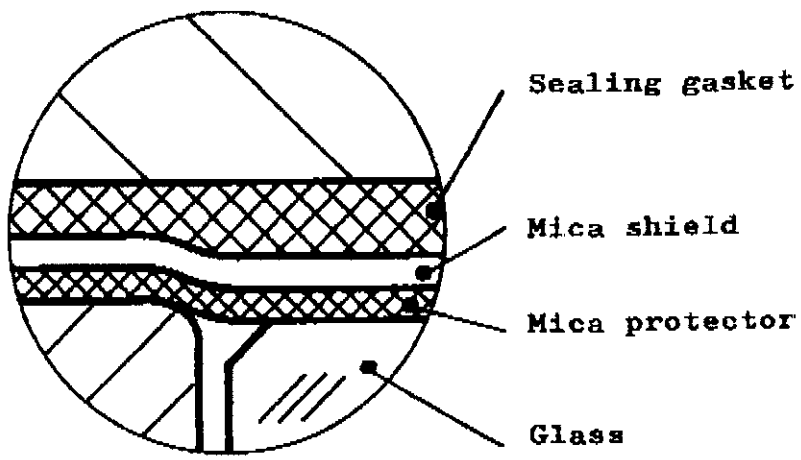
In accordance with DIN 3230 sheet 1, gauges should be stored in enclosed rooms in a non-aggressive atmosphereand be protected against dampness and dirt.

Replacement parts - gaskets, packings etc. - must be stored in dry, cool rooms.

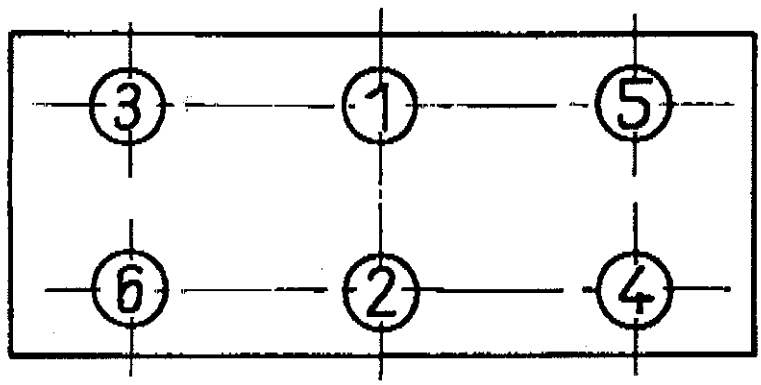
KLINGER high-pressure bi-colour water level gauge

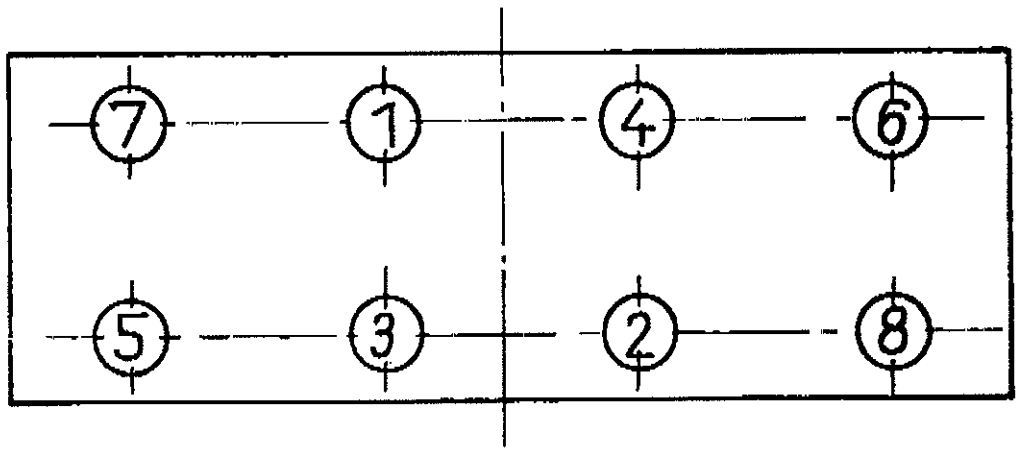
KTA 28



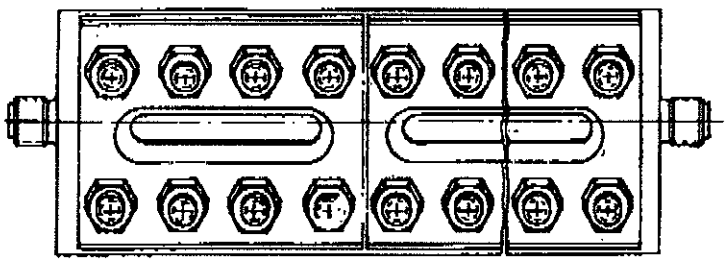


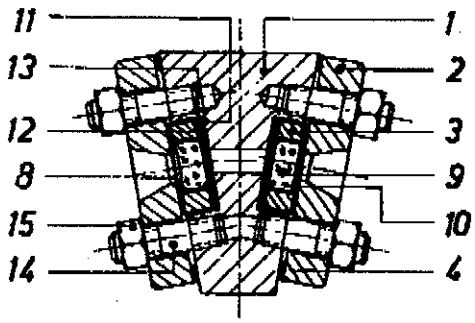
TIGHTENING SEQUENCE FOR BODY BOLTS OF GAUGE TYPES TA and KTA





Components of KLINGER transparent gauge type KTA

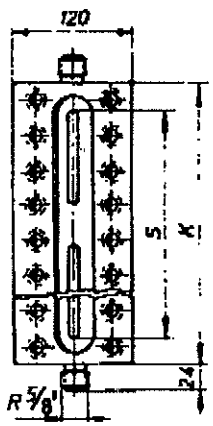




Part	Name	Material
1	Centre-piece	Steel
2	Cover plate	Steel
3	Glass holder	Steel
4	Spacer strip	Brass
5		
6		
7		
8	Glass protector	Mica

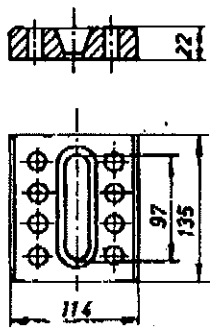
Part	Name	Material
9	Glass	Borosilicate
10	Cushion gasket	Klingerit
11	Sealing gasket	Graphite
12	Mica shield	Mica
13	Mica protector	Klingerit
14	Stud bolt	Steel
15	Hexagon nut	Steel

1 Centre-piece

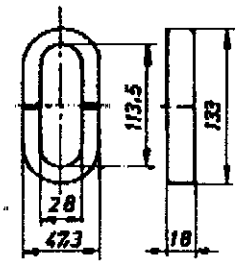


Size	S	K
2 x I	233	290
3 x I	369	426
4 x I	505	562
5 x I	641	698
6 x I	777	834

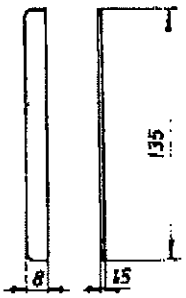
2 Cover plate



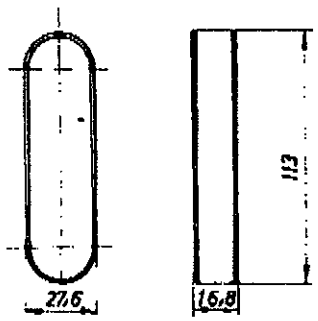
3 Glass holder



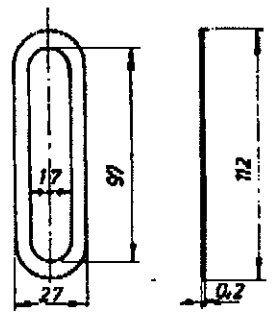
4 Spacer strip



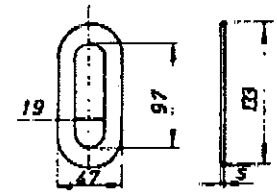
9 Gauge glass



10 Cushion gasket



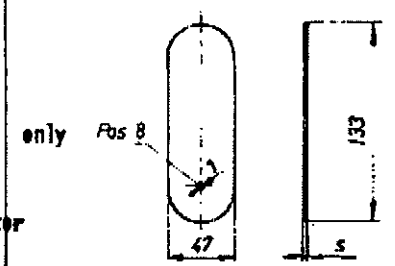
11, 13 Sealing gasket Mica protector



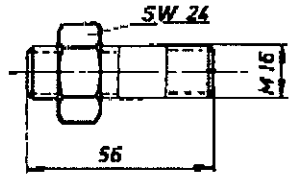
sealing gasket	Mica protector
2	0.3

8,12 Glass protector Mica shield

s=0.1÷0.15
s=0.3÷0.4



14, 15 Stud bolt Hexagon nut



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