

# ***Operating manual***


## ***Sightglasses, flow indicators and flow meters***

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## 0 Introduction

This manual is intended to assist users of a MANKENBERG sightglass, flow indicator or flow meter during installation, operation and maintenance. Read the manual thoroughly before installing or putting this valve into service.

 <b>attention</b>	<p><b>Failure to follow the following instructions – particularly the cautionary and warning notes – may lead to hazards</b> and may invalidate the manufacturer's warranty.</p> <p>MANKENBERG is at your service for any assistance and queries. See Section 11 &lt;Further information&gt; for the addresses. Technical information is also available at <a href="http://www.mankenber.de">www.mankenber.de</a></p>
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## 1 Intended use

**A MANKENBERG sightglass, flow indicator or flow meter** is a device that is intended exclusively for on-site inspection of the flow of a medium after it has been installed in a pipeline system. Therefore, one or two plates of special glass are inserted.

Sightglasses, flow indicators and flow meters are also suitable for two-phase and multi-phase media and for media tarnished by or intransparent from solids. The MANKENBERG catalogue gives detailed information for selecting the appropriate type in the section <DA: Sightglasses, Flow indicators>.

The glass quality must fit the medium and the temperature.

MANKENBERG designates the supplied glass quality in the order confirmation.

To observe the flow with the naked eye, the following types are fitted with different installations:

- DA [ .]. 10** Indicator flag;
- DA [ .]. 30** Indicator with impeller;
- DA [ .].40** Ball-type indicator (vertical installation only);

The type

- DA [ .].00** has no moving installations and is intended for observing gas-liquid- and/or multiphase-mixtures.

With modified type number, some of these indicators are deliverable with two glasses, calibrated scale, two-directional indicators or flow speeds above 1 m/s.

MANKENBERG planning documents are available to give users precise assistance in selecting and designing the appropriate fitting, e.g.:

In the section <DA, accessoires>

<Know-how and selection flow indicators>

<Data sheet DA...> with technical data and tables of the setting ranges and the dimensions.

MANKENBERG fittings are supplied as standard for screw-mounted or flange-mounted pipeline/tank connections – also for special connections if required.

The upper limit of the permitted operating data for pressure and temperature is permanently marked on each fitting supplied.

In the following sections the different construction types are combined under the heading of “sight glasses” apart from a few sections that only apply to one of the construction types mentioned.

## 2 Marking of the fitting

Each fitting bears the following markings as a minimum:

For	Marking	Remark
Manufacturer	MANKENBERG	See Section 11 <Further information> for the address
Fitting design	Sight glass + type Flow indicator + type Flow meter + type	Design name as per accompanying MANKENBERG data sheet
Nominal diameter	e.g. DN or G and numerical value	Numerical value for DN in [mm], for G in [inches]
Nominal pressure	PN or Class and numerical value	Numerical value for PN in [bar], for Class in [lbs/square inch] pressure data are displayed as overpressure above the atmospheric pressure
Max. permitted temp.	Temperature and numerical value	
Body material	e.g. CrNiMo steel	CrNiMo steel = high-alloy austenitic steel
Flow direction	Indicated by an arrow	

The markings (in the case of fittings made of deep-drawn stainless steel, they are etched into the body) should neither be covered nor painted over, so that the fitting remains identifiable.

## 3 Safety instructions

### 3.1 General precaution

The same safety regulations apply to a fitting as to the system into which it is installed. These instructions only give those safety recommendations that have to be **additionally** observed for the fitting.



### 3.2 Special safety instructions for the plant operator

The following requirements for the intended use of a fitting are not the responsibility of the manufacturer but have to be guaranteed by the user:

- The fitting may only be employed for the purpose described in Section 1 <Intended use>.
- Only competent specialist personnel may install, operate and service the fitting. Competent as defined in these instructions refers to persons who, because of their training, specialist knowledge and professional experience, are capable of correctly assessing and properly executing the work with which they are entrusted and of recognizing and rectifying hazards.
- The pipeline system must be properly designed and installed so that the fitting can be mounted and operated without any tension.
- The fitting must be properly installed in the correct mounting position.
- The usual flow rates should not be exceeded in the pipeline section during continuous operation, and abnormal operating conditions such as vibrations, unusually high flow rates, etc. should be avoided or – if unavoidable – clarified with the manufacturer in advance.
- The prevailing operating conditions must comply with the limits of the design data stated in the MANKENBERG order confirmation.
- The corrosion protection for the fitting must be adapted to the local environmental conditions.
- The fitting must not be coated with thermal insulation.

Detailed notes are provided on some of these prerequisites in the following sections.



### 3.3 Special hazards

 <b>danger of fatalities</b>	<p>Before a fitting is removed from the system or before a fitting is dismantled but partially remains in place, <b>the pressure in the system on both the inlet and outlet side must be completely reduced</b> so that there is no uncontrolled flow of the medium out of the system.</p> <p>If a glass plate is removed, it must be inserted again as described in Section 10 &lt;Troubleshooting help&gt;.  <b>Otherwise there is a risk of fracture.</b></p> <p>In the case of toxic or hazardous media, the system must be completely drained before the fitting is removed.  <b>Caution is required with residues that might continue flowing.</b></p>
 <b>attention</b>	<p><i>If a fitting is removed from a system with a toxic medium and is taken out of the plant:</i>  <b>it must be properly decontaminated before repair.</b></p>




## 4 Transport and storage

A fitting must be handled, transported and stored with care:

- The fitting must be transported and stored in its protective packaging until it is installed.

 <b>attention</b>	<p>The fitting has moving internal parts.  <b>Even packaged fittings should be transported smoothly without any shocks.</b>          The glass plate is fragile.  <b>Handle with care so that the glass does not shatter during transport/storage.</b></p>
 <b>attention</b>	<p>In the case of a fitting that can no longer be transported by hand, the lifting gear must be attached to a suitable position on the housing (branches).  <b>Under no circumstances may the lifting gear be affixed to any attachments.</b></p>

- When the fitting is stored prior to installation, it should be kept in closed rooms and protected against harmful influences such as dirt, moisture and frost.
- In special cases, the fitting is supplied free of oil, grease or silicone and is marked accordingly. A fitting such as this must not come into contact with oil/grease/silicone during storage and handling (particularly when subsequently unpacked).
- A MANKENBERG fitting generally has functional and/or sealing parts made of elastomer materials. These cannot be stored for an unlimited period.

 <b>note</b>	<p>ISO 2230 describes the storage conditions for elastomers in detail and specifies the permissible storage period.  <b>Functional and sealing parts must be replaced well before the storage period expires.</b> They are available from MANKENBERG as a “service set”.          See also Section 10 &lt;Troubleshooting help&gt;.</p>
 <b>note</b>	<p>MANKENBERG fittings of small and medium nominal diameters are largely made of stainless steel (high-alloy CrNiMo steel).          If, under exceptional circumstances, fittings are stored in a unpacked state, they <b>must be protected against ferritic dust</b> to avoid corrosion.</p>
 <b>note</b>	<p><i>The fitting is generally not capable of standing alone:</i>  <b>Handle with care so that the fitting does not tip over during transport/storage.</b></p>

## 5 Installation

### 5.1 General notes


The same installation regulations apply to a fitting as to the system into which it is installed.

The following **additional** notes apply:


- Section 4 <Transport and storage> should also be observed during transport to the installation site.
- The installation site to allow perfect functioning of a fitting should be a section of pipe without any flow disruptions, without any angles and without any restrictors or shut-off devices close to the fitting, either upstream or downstream (optimum distance = 10 x DN). If this does not apply, the installation situation should be checked with the plant operator and/or MANKENBERG.
- The statics of the pipeline must be designed so as to take account of the weight of the fitting – particularly those with an eccentric mass. If required, the pipeline may have to be properly supported on both sides next to the fitting (or at the fitting itself) – particularly in the case of fittings with a substantial mass and especially if vibrations are to be expected in the system.

When the fitting is supported, it is important to check that all functioning parts remain capable of moving freely and are not blocked.

- The fitting must not be coated with thermal insulation.


	A fitting that is operated at a medium temperature above 130°C needs uninterrupted removal of heat if it is to function perfectly.
caution	<b>Failure to observe this instruction may cause damage to the fitting and hence in the pipeline system as well.</b>

- To protect internal functional parts (e.g. indicator flag) against damage and/or blockages, it may be necessary to install a strainer and/or filter upstream of the fitting.

	The mesh size of the sieve/filter for protecting against aggregates in the pipe section should be selected by the plant operator according to the operating conditions.
note	<b>Failure to observe this instruction may impair the function of the fitting and lead to damage.</b>


### 5.2 Installation preparations

- It is necessary to ensure that a fitting is not installed unless it matches the operating conditions in terms of function, pressure and temperature, range, body material as well as connection type and dimensions.

	No fitting may be operated that does not have a sufficient pressure and temperature range for the operating conditions – see Section 1 <Intended use> and markings on the fitting.
danger of fatalities	The manufacturer MANKENBERG should be consulted in the case of any applications outside of this range.
	<b>Failure to observe this regulation may mean danger to life and limb and may cause damage to the pipeline system.</b>


- Newly installed tanks and pipeline sections must be thoroughly rinsed and cleaned before commissioning.

- The corrosion protection for the fitting must be adapted to the local conditions:



 <b>important note</b>	<p>If it is to function perfectly, the fitting must not be installed in a high lying pipe section: In a high lying section, the observation of the flow may be (considerably) troubled.</p> <p>If a sight glass may be installed in any desired, only vertical or only horizontal direction is described in the project (catalogue) data of the sight glasses.</p>
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### 5.3 Installation steps

- Fittings should only be finally unpacked at the installation site and inspected for damage prior to assembly. Damaged fittings must not be installed - under no circumstances those with a damaged glass.
- It is necessary to ensure that the covers have been removed from all the connection branches before installation.
- The fitting should be inspected to ensure that it is clean. Interior parts must be free of liquid (e.g. condensate): if necessary, connecting branches should be cleaned before installation with clean compressed air.
- The type and dimensions of the line or tank connections must match the fitting to be installed and be flush with the connecting surfaces of the fitting as well as in a parallel plane to the fitting itself.
- If the fitting is marked with an arrow on the housing, the flow in the pipe section must match the marked direction of flow.


 <b>caution</b>	<p>If installed in the opposite direction to the arrow, the fitting will not perform its intended function.</p>
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- The fitting must be installed without any tension. In the case of an already installed system, the geometry of the pipeline must match the face-to-face length of the fitting.

 <b>note</b>	<p>It is necessary to ensure that even under operating conditions <b>no tension from the pipeline is transferred to the fitting.</b></p>
 <b>note</b>	<p>A MANKENBERG fitting made of "high grade" or "high grade pure" stainless steel (austenite, e.g. 1.4404 or 1.4435) does not need any surface protection for normal environmental atmosphere and for normal weather conditions.</p> <p>External parts of the fitting made of low-alloy or non-alloy materials that are supplied ex-works with a primer have to be provided with a suitable coating by the customer.</p> <p>Caution: Never paint over the marking(s) of the fitting (either etched into the body or on nameplate).</p>


In addition, the following applies to the pipeline connection:

With flanges:

	The sealing surfaces on the body of the fitting are formed in accordance with the MANKENBERG order confirmation. The accompanying flange seals are generally <b>not included in the MANKENBERG supply schedule.</b>
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- During installation, centre the fitting by means of the flange screws on the mating flange before the screws are tightened.

With screw-mountings:

	The connecting surfaces on the body of the fitting are formed in accordance with the MANKENBERG order confirmation. The required seals are generally not included in the MANKENBERG supply schedule.
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with welding ends:

- Properly performed welding must ensure that no significant tension is transferred to either the section of pipeline or the body of the fitting.
- Under no circumstances may the body of the fitting exceed the temperature marked on it; otherwise the sealing and functional parts will be damaged **and the whole fitting will become unserviceable.**


	When a fitting with a body made of "high grade" or "high grade pure" deep-drawn parts (visible on the body connection with clamp rings) is welded, the welding joint must be carried out with special care; <b>it is recommended that the body should be kept cool with a damp cloth.</b>
caution	Failure to observe this regulation may cause damage to the glass plate and/or distortion of the body. Even the finest crack of the glass plate or 0.1 mm of permanent distortion in the seat region <b>may render the fitting unserviceable.</b>

## 6 Pressure testing the pipeline section




The fitting has already been pressure-tested by the manufacturer. The following points should be observed when conducting a pressure test on a pipeline section with a sight glass installed:

According to EN 12266-1, the test pressure may under no circumstances **exceed 1.5 times the value indicated on the body with “PN” or “Class”**.

If any leakage occurs on the fitting, Section 10 <Troubleshooting help> should be observed.



 <b>note</b>	<p>If the pipe section is flushed and/or dried after assembly or pressure testing, it is necessary to make sure that the fitting - especially the glass plate - has not been damaged by corrosion or excessively high temperature.</p>
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## 7 Initial start-up

 <b>danger of fatalities</b>	<p>No fitting may be operated that does not have a sufficient pressure and temperature range for the operating conditions – see Section 1 &lt;Intended use&gt; and markings on the fitting. The manufacturer MANKENBERG should be consulted in the case of any applications outside of this range.</p> <p><b>Failure to observe this regulation may mean danger to life and limb and may cause damage to the pipeline system.</b></p>
 <b>danger</b>	<p>At the beginning of or shortly after the initial start-up, the sieve or the filter insert of any installed strainer/filter should be cleaned in order to avoid blocking the strainer/filter.</p>
 <b>caution</b>	<p><i>After the initial start-up:</i></p> <p>Check the seals on screw-mounted parts of the body - especially on the glass plate - and reseal if necessary. Ask MANKENBERG for tightening torque, if necessary.</p> <p><b>Observe the relevant notes in Section 10 &lt;Troubleshooting help&gt;.</b></p>

## 8 Normal operation

A properly selected sight glass works automatically and does not need any form of auxiliary energy.

 <b>danger of fatalities</b>	<p>It is necessary to ensure that the materials selected for the parts of the fitting in contact with media are suitable for the media in use. The manufacturer accepts no liability for any damage due to corrosion by aggressive media on parts made of unsuitable materials - especially of unsuitable glass quality.</p> <p><b>Failure to observe this regulation may mean danger to life and limb and may cause damage to the pipeline system and to the fitting.</b></p>
 <b>note/ danger</b>	<p>The fitting has functional parts that have to remain capable of moving easily. Make sure that parts in contact with the medium cannot freeze nor become blocked by dirt or deposits. Observe the maintenance intervals.</p> <p><b>Failure to observe this instruction may cause damage to the pipeline system and to the fitting.</b></p>

It is recommended that the fitting should be inspected to ensure that it is functioning correctly after each new start-up.

## 9 Maintenance


The automatic function of the fitting requires maintenance to ensure that it continues to operate perfectly. It is important for maintenance work to take place in a **planned manner at periodic intervals**.

The maintenance plan in Table 1 is a recommendation by the manufacturer MANKENBERG, which should be supplemented by practical experience gained by the user under the prevailing operating conditions.

MANKENBERG shall assume no liability resulting from improper maintenance and/or repairs.

**Table 1: Sample plan for maintenance work**

Type of maintenance	Work to be performed	Period <sup>1)</sup>
Check function	Visual inspection: Check cleanness of the glass plate(s) and free movement of any installed indicators.  <i>Note:</i> <i>Check, if wiper is installed or can be installed additionally.</i>	When needed
Check for proper sealing of the body, the pipe connection and the connection flange of the glass plate.	Visual inspection	at least 1x per month
Replace the seal in the connection flange of the glass plate, clean fitting	Remove glass plate, clean glass plate and internal parts, replace seals as described in Section 10 <Troubleshooting help>.	at least 1x per year
<i>If installed upstream of the fitting:</i> clean strainer	According to the manufacturer's instructions	Depends on the contamination of the medium
Preventive maintenance	Dismantle fitting, see Section 10 <Troubleshooting help>.  Visual inspection functional parts  Replace all parts of the maintenance set <sup>2)</sup>	at least 1x per year
<sup>1)</sup> See comment at the beginning of this section: The time intervals are guides which should be adapted to match the prevailing operating conditions, the properties of the medium in the system and the user's experience.  <sup>2)</sup> Request maintenance set and replacement instructions from MANKENBERG		

 <b>danger</b>	<p>During maintenance work (apart from visual inspections) the relevant recommendations and warning notes in Section 10 &lt;Troubleshooting help&gt; should be observed.</p> <p><b>Failure to observe this warning may mean danger to life and limb and may cause damage to the pipeline system and to the fitting.</b></p>
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When a fitting that has previously been dismantled is being put back into service, the fitting should be checked for proper sealing capacity and function!

## 10 Troubleshooting help


Be sure to observe Section 3 <Safety instructions> when rectifying faults.



Spare parts must be ordered with all the details on the nameplate.

**Only original parts from the manufacturer MANKENBERG may be installed.**

MANKENBERG experts are available to help in rectifying faults as quickly as possible.

See Section 11 <Further information> for the addresses.

 <b>note</b>	<p><i>If functional or corrosion damage or damage of the glass plate is detected during maintenance or after a fault:</i></p> <p>consult MANKENBERG to find out whether a more suitable fitting is available or whether the damaged part can be supplied in a better-suited material.</p>
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Type of fault	Action
<p>Leakage at a connection body parts (flange or clamp ring):</p> <p><i>(does not apply to the glass plate!)</i></p> <p><b>reseal connection</b></p>	<p>Tighten the screws clockwise (tighten flange screws crosswise).</p> <p><i>If the screws of the body connection have to be loosened or removed (= unscrewing in the anticlockwise direction):</i></p> <p style="text-align: center;">   <b>Danger of fatalities</b> </p> <p>To prevent any risk for operating personnel, make sure that this repair measure is only carried out on a section of pipe that is not under pressure. Take note of Section 3.3 &lt;Special hazards&gt; and then Section 5 &lt;Installation in the pipeline&gt;.</p>
<p>Leakage at the seal of the glass plate</p> <p><b>replace seal</b></p>	<p>Depressurize pipe section, loosen flange cap or clamp and drain fitting.</p> <p>Clean drained fitting and glass plate, - if any are installed – remove, clean and remount internal parts.</p> <p>Here all parts of the maintenance set should be renewed. Only use MANKENBERG original seals for replacing the seals of the glass plates.</p> <p>Insert the flange or clamp precisely and carefully tighten the screws (flange screws crosswise). <b>The seal of the glass plate must not be squashed.</b></p> <p>Hot or dangerous media:</p> <p style="text-align: center;">   <b>Risk of injury</b> </p> <p style="text-align: center;"><b>Wear suitable protective clothes.</b></p>

<p>Functional fault:</p> <p><b>The fitting must be repaired</b></p>	<p><i>If during cleaning or visual inspection it is found that the glass plate and/or internal functional parts are damaged and/or display incorrectly:</i></p> <p>Repair necessary: damaged parts have to be replaced</p> <p><i>If the repair is to be carried out in the customer's workshop:</i> make a note of all data according to the markings on the fitting and order the spare parts and necessary instructions from MANKENBERG. See Section 11 &lt;Further information&gt; for addresses.</p> <p>or:</p> <p>Send the fitting to the manufacturer for repair. See Section 11 &lt;Further information&gt; for the addresses</p>
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## 11 Further information

You can obtain these instructions, the MANKENBERG data sheets quoted as well as further information – including English language versions – from the following addresses:

**Mankenberg GmbH**  
**Spenglerstrasse 99**  
**D-23556 Lübeck**

**Tel. +49-451 -8 79 75 0**  
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