

Operating manual Vacuum Breaker

Sheet no. VV/4.1.071.1 - issue 02.01.2007

**WIR REGELN DAS SCHON
FIRMLY IN CONTROL**

MANKENBERG


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0 Introduction




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

 caution	<p>Failure to follow the following instructions – particularly the cautionary and warning notes – may lead to hazards and may invalidate the manufacturer's warranty.</p> <p>MANKENBERG is at your service for any assistance and queries. See Section 11 <Further information> for the addresses. Technical information is also available at www.mankenberg.de</p>
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1 Intended use

A MANKENBERG vacuum breaker VV is a device only designed for protecting vessels or pipelines from inadmissible underpressure (vacuum).

If the internal pressure of a vessel decreases by more than the preset differential pressure, the valve opens. The system is vented until the preset differential pressure (towards the ambient pressure) is reached again. Then the valve closes automatically.

 note	<p>The spring of a vacuum breaker is only slightly tensioned when delivered and not adjusted to a defined opening pressure. It must be adjusted after installation. The pressure gauge needed for the adjustment is not part of the supply schedule. A suitable vacuum indicator has to be provided by the customer.</p>
 caution	<p>A vacuum breaker does not protect the vessel from overpressure. Therefore a suitable safety valve must be installed see (catalogue) section <SV>.</p>
 note	<p>For very small differential pressures towards ambient or for precise vacuum control, the installation of a MANKENBERG vacuum control valve is recommended see (catalogue) sections <DM> and <UV>.</p>

For very small differential pressures towards ambient or for precise vacuum control, the installation of a MANKENBERG vacuum control valve is recommended see (catalogue) sections <DM> and <UV>.

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

In the section <VV: Pressure control valves>:


<Know how vacuum valves>

<Data sheets VV34/35/36/59> with technical data and tables of the dimensions.

Admissible operating data are permanently marked on each device.

MANKENBERG valves 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.

 caution	<p>Vacuum breakers are not shut-off devices that ensure a sealed valve closure. According to VDI/VDE Guideline 2174, in closed position they may have a maximum leakage rate of max.:</p> <p>- 0,05 x kvs</p>
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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	vacuum breaker + 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]
Rated 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 stainless steel, they are etched into the body or the flange) 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.
- A vacuum breaker valve with an open spring must be installed in such a way that it presents no risk of crushing to the operating personnel.
- The usual flow rates should not be exceeded in the pipeline section during continuous operation, and abnormal operating conditions such as vibrations, water shocks and cavitation 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.
- Dust and dirt from the surroundings could contaminate internal functional parts of the fitting or the medium.
- The corrosion protection for the fitting must be adapted to the local 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

 danger of fatalities	<p>It is necessary to ensure on site, by an appropriate installation or by providing safety devices and/or positioning a clearly visible warning sign in accordance with the regulations of EN 292 (formerly accident prevention regulations), that effective protection is afforded against objects catching on an exposed spring in the vacuum breaker.</p> <p>If required, MANKENBERG will assist in selecting a suitable type with closed spring cap.</p> <p>Failure to observe this regulation may mean danger to life and limb.</p>
 danger of being crushed	<p>Before a fitting is removed from the system or before a fitting is dismantled but partially remains in place, the pressure in the system on both the inlet and outlet side must be completely reduced so that there is no uncontrolled flow of the medium out of the system.</p> <p>In the case of toxic or hazardous media, the system must be completely drained before the fitting is removed.</p> <p>Caution is required with residues that might continue flowing.</p>
 caution	<p><i>If a fitting is removed from a system with a toxic medium and is taken out of the plant:</i></p> <p>It must be properly decontaminated before repair.</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.

 note	<p>The fitting has moving internal parts.</p> <p>Even packaged fittings should be transported smoothly without any shocks.</p>
 caution	<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).</p> <p>Under no circumstances may the lifting gear be affixed to any attachments.</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 or sealing parts made of elastomeric materials. These cannot be stored for an unlimited period.

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

 caution	<p>As the fitting is open towards atmosphere, it must be adequately protected against dust and atmospheric conditions.</p>
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- The fitting must not be coated with thermal insulation.


 caution	<p>A fitting that is operated at a medium temperature above 130°C needs uninterrupted removal of heat if it is to function perfectly.</p> <p>Failure to observe this instruction may cause damage to the fitting and hence in the pipeline system as well.</p>
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- A vacuum breaker with an exposed spring must be installed in such a way that it does not presents a risk of crushing.



 danger of being crushed	<p>It is necessary to ensure on site, by an appropriate installation or by providing safety devices and/or positioning a clearly visible warning sign in accordance with the regulations of EN 292 (formerly accident prevention regulations), that effective protection is afforded against objects catching on an exposed spring in the vacuum breaker.</p> <p>If required, MANKENBERG will assist in selecting a suitable type with closed spring cap.</p> <p>Failure to observe this regulation may mean danger to life and limb.</p>
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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:


 danger of fatalities	<p>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. The manufacturer MANKENBERG should be consulted in the case of any applications outside of this range.</p> <p>Failure to observe this regulation may mean danger to life and limb and may cause damage to the pipeline system.</p>
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- A vacuum breaker that is not preset must be adjusted during initial start-up by setting the adjusting screws of the spring – see Section 7 <Initial start-up>. Make sure that during installation there is enough room for the appropriate wrench and screw driver above the adjusting screw and beneath the valve.
- 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.



 important note	<p>As a general rule, vacuum breakers (with exposed spring or with spring cap) must be installed in a way that the spring points vertically up.</p>
 note	<p>Dust and dirt from the surroundings could contaminate internal functional parts of the fitting or the medium. As the intake must be left open to the atmosphere it must be adequately protected against entering of foreign substance by the customer.</p>

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.
- 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.


 caution	<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.

 note	<p>It is necessary to ensure that even under operating conditions no tension from the pipeline is transferred to the fitting.</p>
 note	<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:

 note	<p>The sealing surfaces on the body of the fitting are formed in accordance with the MANKENBERG order confirmation. The accompanying flange seals are generally not included in the MANKENBERG supply schedule.</p>
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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:


 note	<p>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.</p>
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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 pressure-regulating valve 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.

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

The vacuum breaker is supplied with no tension on the spring – hence no defined operating pressure has been set in the factory. The valve must be adjusted during initial start-up. Tension the spring with the adjusting screw:

Clockwise rotation (when looking onto the adjusting screw) has the following effect:





- The differential pressure (between atmospheric and internal pressure) for the valve opening increases.

Note:

The adjustment of the vacuum breakers VV 34 and VV 35 is done with the scale on the spring cap.



This scale indicates the differential pressure between atmospheric and internal pressure.

The setting value must be controlled by evacuating the system. The control of the settings of the vacuum breaker VV 36 can only be done with a corresponding vacuum in the system.

 caution	<p><i>When looking onto the adjusting screw:</i></p> <p>Do not violently screw the adjusting screw against the limit stop (by rotating anticlockwise).</p>
 danger of fatalities	<p>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. The manufacturer MANKENBERG should be consulted in the case of any applications outside of this range.</p> <p>Failure to observe this regulation may mean danger to life and limb and may cause damage to the pipeline system.</p>
 note	<p>At the beginning of initial start-up any intake protection - if installed by the customer – has to be cleaned to avoid constipation.</p> <p>Observe the corresponding notes in Section 5.2 <Installation preparations>.</p>
 caution	<p><i>After the initial start-up:</i></p> <p>Check the seals on screw-mounted parts of the body and reseal if necessary. If required, ask MANKENBERG for the tightening torques.</p> <p>Observe the relevant notes in Section 10 <Troubleshooting help>.</p>

8 Normal operation

A properly designed vacuum breaker works automatically and does not need any form of auxiliary energy.

 danger of fatalities	<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.</p> <p>Failure to observe this regulation may mean danger to life and limb and may cause damage to the pipeline system and to the fitting.</p>
 caution	<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>Failure to observe this instruction may cause damage to the pipeline system and to the fitting.</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 ¹⁾
Check function	Check whether function is fulfilled as per Section 1) <Intended use>	at least 1x per week
<i>with soft packing (VV 34, VV35, VV36):</i> actuate taper spindle mechanically	The soft packing tends to sticking to the seat. Make valve pressureless and release spring. Press taper spindle down (done with a screw driver through the lateral borehole at VV 34 and 35)	at least 1x per week
Check seals on the body and the pipe connection	Visual inspection	at least 1x per month
Monitor open spring cap	Visual inspection: if necessary, remove any dirt/corrosion ²⁾	at least 2x 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 ³⁾	at least 1x per year
<p>¹⁾ 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.</p> <p>²⁾ Caution danger of crushing: shut down the valve for cleaning purposes!</p> <p>³⁾ Request maintenance set and replacement instructions from MANKENBERG.</p>		

 danger	<p>During maintenance work (apart from visual inspections) the relevant recommendations and warning notes in Section 10 <Troubleshooting help> should be observed.</p> <p>Failure to observe this warning may mean danger to life and limb and may cause damage to the pipeline system and to the fitting.</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 as well as correct adjustment of the adjusting and functional components!


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.

 note	<p><i>If functional or corrosion damage is detected during maintenance or after a fault: 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.</i></p>
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Type of fault	Action
<p>Leakage at a connection body parts (flange, threaded pin or clamp ring):</p> <p>reseal connection</p>	<p>Retighten housing/flange connection and clamp ring screws (clockwise)</p> <p style="text-align: center;">  <u>danger of fatalities</u> </p> <p>To prevent any risk for operating personnel, make sure that this repair measure is only carried out when the pipeline section is not under pressure. Take note of Section 3.3 <Special hazards> and then Section 5 <Installation in the pipeline>.</p>
<p>Functional fault leakage at the seat</p> <p>clean functional parts</p>	<p>Cut off system immediately and/or remove pressure.</p> <p><i>A foreign object may be jammed in the seat and be preventing proper sealing:</i></p> <p>Slacken spring: Rotate adjusting screw anticlockwise (viewed from above) so that the vacuum breaker can open: the foreign body should be flushed away.</p> <p>If the functional fault cannot be rectified in this way: The vacuum breaker must be disassembled and cleaned</p> <p style="text-align: center;">  <u>danger of fatalities</u> </p> <p>To prevent any risk for operating personnel, make sure that this repair measure is only carried out on a system that is not under pressure. Take note of Section 3.3 <Special hazards>..</p> <p>When the vessel is pressureless, dismantle the vacuum breaker and disassemble and clean the functional parts. Here all parts of the maintenance set should be renewed. Then reassemble the readjust fitting. When reinstalling, regard Section 5 <Installation at the vessel> and readjust as described in Section 7 <Initial start-up></p>

<p>Functional fault cleaning alone – see above – cannot rectify the fault:</p> <p>The fitting must be repaired</p>	<p><i>If during cleaning it is found that the cone or other functional parts are damaged:</i> 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 <Further information> for addresses.</p> <p>or:</p> <p>Send the fitting to the manufacturer for repair. See Section 11 <Further information> 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:

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