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## Conformity declaration

EC directive for pressure equipment 97/23/EC

Product: Lined Butterfly Valve

Type: GAR-SEAL, MOBILE-SEAL, SAFETY-SEAL, STERILE-SEAL  
DN 50 - 600 / 2 - 24", PN 10 (PN 16)

Developed, designed and manufactured in compliance with the above EC directive, in the sole responsibility of

Company: Garlock GmbH, Falkenweg 1, 41468 Neuss

The following harmonizing norms and standards have been applied:

DIN EN 19	Industrial valves - Marking of metallic valves
DIN EN 1503	Valves - Materials for bodies, bonnets and covers
DIN EN 10213	Technical delivery conditions for steel castings for pressure purposes

The following other norms, directives and specifications have been applied:

AD 2000-Leaflet A 4	Bodies of equipment components
AD 2000- Leaflet W 0	Materials for pressure equipment – General principles for materials
DIN EN 558	Face-to-face and centre-to-face dimensions of metal industrial valves
DIN EN 1563	Spheroidal graphite cast irons
DIN EN ISO 5211	Industrial valves - Part-turn actuator attachments
DIN EN 12266	Testing of valves
DIN EN 12516	Industrial valves - Shell design strength

Suitable for: Fluid group 1 and 2

Conformity evaluation procedure: Module H1

The notified body TÜV Rheinland Industrie Service GmbH, Am Grauen Stein, 51105 Cologne, Identification number 0035, is involved in the evaluation of the quality assurance system according to 97/23/EC as well as to examine the draft according to 97/23/EC.

QS-System certificate no.: 01 202 926 / Q-01 0019


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Neuss, 2012-07-18

Herbert Noeckel  
Managing Director

## 0 Introduction

In order to fully utilise Garlock valves to their optimum performance it is obligatory to observe this operating manual. The intention is to support the user during installation, operation and maintenance.

 Attention	If the following; "Attention", "Danger" and "Note" information is not observed this may result in poor operation, harm & possible warranty invalidation by Garlock. Garlock is available for any questions; addresses see paragraph 9 < Further information >.
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 Note	Garlock valves are not subject to Directive 94/9/EC ("Atex 100 a" ), as they have no potential source of ignition. For the areas where static discharging is likely, due to non-conductive media, we recommend the use of the "Antistatic version" SAFETY-SEAL .
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## 1 Proper use

Garlock valves are exclusively intended, upon installation on or between the flanges of piping system, to lock, conduct or regulate the flow of media within the permitted pressure and temperature limits.

The planning documents and technical data sheets of Garlock valves describe the permitted pressure and temperature ranges in relation to the lining material.

These valves must be installed on or between flanges according to EN 1092-1 (DIN 2501) or EN 1759-1, with sealing strips according to shape C, D or shape E, or flanges according to ANSI B 16.5 Class 150, which are processed plane-parallel and must be flush. Other flanges may only be installed upon release by Garlock.

When using the gasket, paragraph 2.2 < Safety information for the operator > must be observed.

 Attention	If a valve is used in continuous operation for regulation, the limits of application according to the planning documents and technical data sheets of Garlock Armaturen must be observed. Cavitation must always be avoided.
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## 2 Safety information




### 2.1 General safety information

The same safety requirements that apply to the piping system also apply to the valves that are installed in it. The safety instructions in these operating instructions are those for gaskets that have to be observed in addition.






### 2.2 Safety instructions for the operator

The following is not the responsibility of Garlock. Therefore the operator must ensure when operating the valve that

- the valve is only used properly as intended and described in paragraph 1.
- the piping system has been laid professionally and is checked regularly.
- the valve is professionally connected to the piping.
- in the piping system, the common flow speeds in permanent operation are not exceeded. Abnormal operational conditions such as vibrations, cavitation, erosion (e.g. by wet steam) and a proportion of solid matter in the medium – especially of the wearing kind – have been discussed with Garlock.
- at operating temperatures that result in hot or cold valve parts (incl. add-ons) and therefore might cause dangers, the operator provides protective measures against touching.
- manual levers, gearing or drives later installed on the valve are tuned to the valve and is adjusted to the two final positions of the valve – especially to closing position.
- only expert personnel operate and service the valve.


 Danger to life	<p>No valve may be operated whose permitted pressure-temperature limits are not sufficient for the operating conditions: The permitted range is described in the planning documents and technical data sheets of Garlock Armaturen – see paragraph 9 &lt;Further information&gt;.          For application outside this range release by Garlock is mandatory.          Non-conformity with this regulation will result in danger for life and health and may cause damage in the piping system.</p>
 Note	<p>In the planning documents and technical data sheets of Garlock Valves see paragraph 9 &lt;Further information&gt; relevant information concerning selection of valves, installation dimensions, installation weights and valve structure are to be found.          In case of doubt, please contact Garlock.</p>
 Danger to life	<p>It must be ensured that the selected materials of the parts of the valve with media contact are fit for purpose. Garlock will assume no liability for damage caused by corrosion of aggressive media.          Non-conformity with this regulation will result in danger for life and health and may cause damage in the piping system.</p>

### 2.3 Special dangers

 Danger to life	<p>Before removing the valve from the piping or before loosening the body screws the pressure in the piping must be completely relieved on both sides of the valve, ensuring there is no uncontrolled escape of medium.</p>
 Danger	<p>If a valve has to be removed from piping, medium may escape from the piping or the valve. In case of unhealthy or dangerous media the piping must be completely emptied before the valve is removed. Be careful of residue that might be flowing out.</p>
 Danger	<p>For valves used as end-of-line-service valve:          For normal operation, especially for gaseous, hot and/or dangerous media a blind flange must be installed at the free connecting end and the valve must be locked securely in the “Closed” position.</p>
 Danger	<p>If a valve as an end-of-line valve in a pressure-conducting system is to be opened, utmost care should be taken, such that splashing medium cannot cause damage.          Take due care when closing the end valve: Danger of crushing between valve disk and body!</p>
 Attention	<p>Do not take off manual lever, gearing or drive while being in operation situation of pressure!</p>

### 2.4 Marking


The Garlock valve is marked on the type label / on the body with the following data:

Type label	Line	For	Marking
	1	Type of valve	GAR-SEAL
	2	Type key	111-W-MT
	3	Material body / lining / disc	GGG40.3 (0.7043) / PTFE / PTFE
	4	Nominal width pressure stage	DN 150 – 6“ PN 16
	5	Max. per. pressure, max. per. temp	16 bar 200 °C
	6	Serial no. (year of construction)	Numbers 1-2: year, numbers 3-4: month, numbers 5-8: serial number
	7	For customer-specific marking*	
	8	Garlock address	Garlock GmbH, 41468 Neuss
	9	Conformity ID-no. named place	CE (conf. 97/23/EG) 0035(TÜV Rheinland Group)

### 3 Transport and storage

The Garlock GAR-SEAL valve must be handled, transported and stored with care:

- The valve must be stored and transported in its closed original packaging (including to the place of installation). The packaging protects the sensitive lining of the valve from damage.
- If the valve is stored before it is installed it should be stored in a closed room and be protected from dirt, humidity or ozone.
- The sealing surfaces of the flange ends for the piping connection are not damaged, neither by mechanical nor by other influences.
- Do not stack valves!
- The Garlock valve is supplied with slightly open valve disc (transport position approx. 10°). Therefore, it must be stored in the way it is supplied. The locking valve must not be operated.

 <b>Danger</b>	<p>Valves that are supplied without manual lever / gearing or drive:                  The valve disc is not secured against moving. It must not open from its locked position due to outside influences (e.g. vibration).</p>
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### 4 Installation into the piping

#### 4.1. General

For installation of Garlock valves into piping systems the same instructions apply as for connection of pipes and similar piping elements.


The following instructions are to be additionally observed for valves.

For transport to the installation location, paragraph 3 <Transport and storage> must be observed.

 <b>Note</b>	<p>Garlock valves should be installed without additional gaskets.                  However, in case of rough or uneven sealing surfaces, a flange gasket is preferable.                  If you produce them yourself, please observe the dimensions in the following table.                  These dimensions are not compliant with a norm but are adjusted to the gaskets.                  We do not recommend using metal enforced seals or soft seals with metal inserts, as this may cause damage to the body lining.                  We recommend using Garlock GYLON Blue, Style 3504 flat sealing material.</p>
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DN	Inch	2	2½	3	4	5	6	8	10	12	14	16	18	20	24
		Mm	50	65	80	100	125	150	200	250	300	350	400	450	500
Di	Mm	61	71	83	106	128	158	208	259	310	336	388	431	485	579
Da	Mm	107	127	142	162	192	218	273	328	378	438	490	540	595	695

Garlock recommends a seal thickness of 3.2 mm.



 <b>Danger to life</b>	<p>If – in exceptional cases – a valve without drive unit must be installed, it must be ensured that such a valve is not exposed to pressure. If a drive unit is retrofitted the nominal torque and the setting of the final stops must be tuned to “OPEN” and “CLOSED” of the valve.                  Non-observation this regulation may result in danger of life and health and may cause damage in the piping system.</p>
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## 4.2 Preparations

It must be ensured that only such Garlock valves are installed whose pressure class, connection type and dimensions are compliant with the conditions of application. See marking of the valve.


 <b>Danger to life</b>	<p>No valve may be installed which permitted pressure-temperature limits are not sufficient for the operating conditions: The pressure- and temperature limits are marked on the valve, the permitted range of application depending on the lining material (see type label) is described in the Garlock planning documents – see paragraph 9 &lt;Further information&gt;.</p> <p>Non-observation this regulation may result in danger for life and health and may cause damage in the piping system.</p> <p>In case of doubt, please contact Garlock.</p>
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- Take Garlock valves out of their original packaging and remove all accompanying materials.
- Check Garlock valves for transport damage.  
Do not install damaged valves.
- Garlock valves are designed to be installed between flanges according to EN 1092-1 (DIN 2501) PN 10 (PN16) / ANSI B 16.5 Class 150.  
MOBILE-SEAL valves can also be used installation between flanges according to DIN 28459.  
Other flanges may only be used upon release by Garlock.

 <b>Danger</b>	<p>The inside diameter of the piping (flanges) must be bigger than the part of the valve disc, which in an opened position extends over the valve, ensuring the valve disc is not damaged when moving outward. See measurement C of the following table. If necessary, use intermediate rings.</p>
 <b>Attention</b>	<p>The installation space between the flanges must provide sufficient clamping width = width of the body lining. See measurement B of the following table. If necessary, use intermediate rings.</p>



DN	Inch	2	2½	3	4	5	6	8	10	12	14	16	18	20	24
	Mm	50	65	80	100	125	150	200	250	300	350	400	450	500	600
B	Mm	43	46	46	52	56	56	60	68	78	92	102	114	127	154
C	Mm	43	53	67	93	115	147	188	236	284	322	374	415	467	558

- Thoroughly clean the connecting end and the adjoining piping system, ensuring the lining is not damaged by debris.
- The connecting ends of the piping must be flush and plane parallel.

 <b>Attention</b>	<p>Connecting ends of the piping that are not flush / not parallel may damage the lining of the valve.</p>
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## 4.3 Installation

- Garlock GAR-SEAL valves can be installed independent of flow direction and position of the valve.
- The angle between valve and piping axis can be freely selected. However, installation with horizontally positioned feed shaft is preferred, especially for media containing solid matter; the lower part of the valve disc opens in flow direction.  
The position of the valve disc is indicated on the free shaft end by the dihedron (DN 50 to DN 300) or the keyway (DN 350); if a manual lever is installed, it also indicates the position, and in case of an installed worm gear, there is a position indicator.
- The valve must be carefully centred during installation by means of the flange screws.

 Attention	Exactly centre Garlock valves and install with slightly opened valve disc (transport position approx. 10°). By means of test switching, ensure that the valve disc is freely movable and that the valve disc does not drive against the inside edges of the flange when opening.
 Attention	Tighten flange screws evenly and crosswise with a spanner. Tightening torques according to the following table ensure sufficient crimping forces for secure outward sealing.

### Flange EN 1092-1 (DIN 2501) PN10

DN	Inch	2	2½	3	4	5	6	8	10	12	14	16	18	20	24
		mm	50	65	80	100	125	150	200	250	300	350	400	450	500
No. screws DIN		4x	4x	8x	8x	8x	8x	8x	12x	12x	16x	16x	20x	20x	20x
		M16	M16	M16	M16	M16	M20	M20	M20	M20	M20	M24	M24	M24	M27
Ma	Nm	80	120	60	90	120	170	270	230	280	230	330	370	400	600

### Flange EN 1092-1 (DIN 2501) PN16

DN	Inch	2	2½	3	4	5	6	8	10	12
		mm	50	65	80	100	125	150	200	250
No. screws DIN		4x	4x	8x	8x	8x	8x	12x	12x	12x
		M16	M16	M16	M16	M16	M20	M20	M24	M24
Ma	Nm	80	120	60	90	120	170	180	290	350

### Flange ANSI B 16.5 Class 150

DN	Inch	2	2½	3	4	5	6	8	10	12	14	16	18	20	24
		mm	50	65	80	100	125	150	200	250	300	350	400	450	500
No. screws ANSI "UNC"		4x	4x	4x	8x	8x	8x	8x	12x	12x	12x	16x	16x	20x	20x
		5/8"-11	5/8"-11	5/8"-11	5/8"-11	¾"-10	¾"-10	¾"-10	7/8"-9	7/8"-9	1"-8	1"-8	1 1/8"-7	1 1/8"-7	1 1/4"-7
Ma	Nm	80	120	120	90	130	170	260	240	290	340	360	500	430	660

### Flange DIN 28459 PN10

DN	Inch	2	2½	3	4	5	6
		mm	50	65	80	100	125
No. screws DIN		8x	8x	8x	8x	8x	12x
		M10	M10	M10	M12	M12	M12
Ma	Nm	25	40	40	65	80	70

## 5 Function test

First flush newly installed piping systems carefully in order to remove all debris.

The locking function of the installed Garlock valve must be checked by repeated opening and closing. The pressure test of the valves has already been conducted by Garlock.



Please observe the following for the pressure test of a piping system with installed valves:

Valve open:	The test pressure (PT) must not exceed the value 1.5 x (PS) (acc. to type label).
Valve closed:	The test pressure (PT) must not exceed the value 1.1 x (PS) (acc. to type label). If leakage occurs at a valve, follow paragraph 8 < In emergency >.

## 6 Normal operation and maintenance


As the plastic sealing surfaces incline towards the flow it may be necessary, during commissioning and after reaching the operating temperature, to re-tighten all flange connections between piping and gasket using the respective torque according to tables in 4.3 Installation.

For manual operation (manual lever / gearing) normal manual forces are sufficient. Using extensions to increase the operating torque are not permitted.

 Note	<p>Valves with manual lever: The position of the manual lever indicates the position of the disc: Manual lever 90° horizontal to piping: Valve closed, Manual lever parallel to piping: Valve open.</p>
 Note	<p>Valves with gearing: Clockwise operation of the manual wheel closes the valve. Counter-clockwise operation of the manual wheel opens the valve. Position of the valve disc 90° to piping = Valve closed and Valve disc parallel to piping = Valve open can be read on the position display on the gearing.</p>

Due to their construction, Garlock valves are maintenance-free.


If the lining is damaged or destroyed through mechanical influence and complete or partial replacement of the interior set is required, easy and fast repair is possible (see 7 Repair).

 Danger	<p>If a gasket has to be removed from piping, medium may escape from the piping or the valve. In case of unhealthy or dangerous media the piping must be completely emptied before the valve is removed. Be careful of residue that might be flowing out or remained in dead spaces. The parts of the valve with product contact must be properly de-contaminated before repair.</p>
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## 7 Repair

### 7.1 Repair steps

- Loosen and remove body screws.
- Remove lower body part. Remove any remaining seal from the lower part.
- Remove complete interior set from the upper body part and pull it off the shaft.  
Remove any remaining seal from the upper part.

 Danger	<p>Be careful of residue that might be flowing out or remain in dead spaces. The parts of the valve in media contact must be properly de-contaminated before further repair.</p>
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- Insert seal into the upper part (Pos. 10 of the spare parts list).
- Push new, pre-mounted interior set onto shaft (Pos. 11, 13, 15, 16).  
Ensure that the valve disc is slightly open during installation (approx. 10°).
- Insert the elastomer semi-spheres (Pos. 12) in the upper body part and check that they are flush with the drain of the elastomer groove in the lining.
- Insert seal into lower part (Pos. 14).



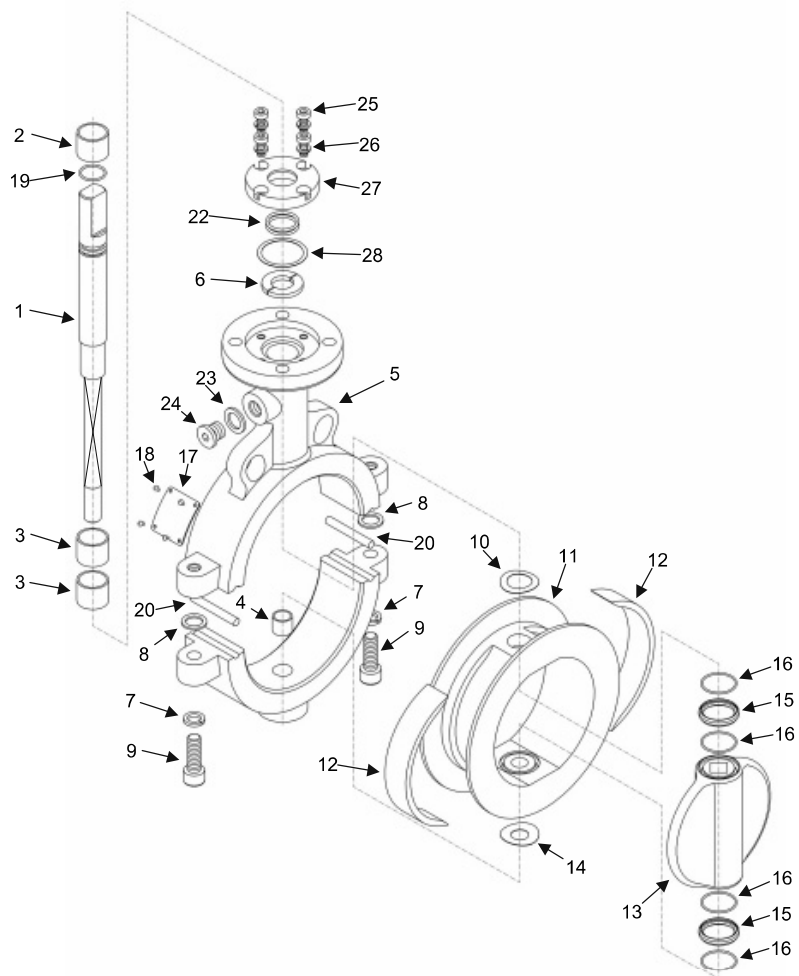
- Insert securing elements (Pos. 20) and intermediate disc (Pos. 8).
- Put on lower body part and tighten body screws with torques according to the following table:

DN	Inch	2	2½	3	4	5	6	8	10	12	14	16	18	20	24
		mm	50	65	80	100	125	150	200	250	300	350	400	450	500
Ma	Nm	45	50	55	60	60	80	110	130	130	200	250	280	320	350

- Turn valve disc open and close repeatedly, so that the elastomer semi spheres can settle in the elastomer groove of the lining.
- Before installing into the system, check valve for tightness.  
If leakage occurs at a valve, follow paragraph 8 < Help in case of trouble >.

## 7.2 Spare parts list

Pos.	Designation
1	Feed shaft (one part)
2	Upper feed shaft bearing
3	Middle feed shaft bearing
4	Lower feed shaft bearing
5	Body (two parts)
6	Holding ring
7	Spring ring
8 <sup>1,2</sup>	Washer
9	Body screw
10 <sup>1,2</sup>	Seal (upper part)
11 <sup>1,2</sup>	Body lining
12 <sup>1,2</sup>	Elastomer semi-sphere
13 <sup>1</sup>	Valve disc
14 <sup>1,2</sup>	Seal (lower part)
15 <sup>1,2</sup>	Seal ring
16 <sup>1,2</sup>	O-ring (seal ring)
17	Type label
18	Grooved stud
19	O ring (feed shaft)
20 <sup>1,2</sup>	Securing element
22	O ring (head flange)
23	Seal disc
24	Lock screw
25	Screw
26	Spring ring
27	Head flange
28	Seal (head flange)



- 1 = Spare parts kit for fully lined valves
- 2 = Spare parts kit for valves with metallic disc

## 8 In case of emergency

### 8.1 General



Note

All repair and maintenance works must be carried out by qualified skilled personnel using suitable tools and original spare parts.  
The safety and danger information above must be observed.

### 8.2 Trouble and remedy

Trouble	
Leakage on the flanges	
Leakage at the closure	
Leakage on the shaft	
Torque too high	
Valve does not open	
Valve does not close	
Possible cause	Remedy
Incorrect flanging	Check flange type and re-tighten screws with prescribed torque acc. to 4.3 - If no improvement increase torque by 10 % - If still no improvement → contact Garlock
Flanges not plane parallel	Re-align flanges and tighten screws with prescribed torque acc. to 4.3
Debris in the valve	Open empty / flow-free piping Remove debris Check lining and valve disc for damage → Replace defective parts with spare parts kit
Valve disc damaged/ corroded	Open empty / flow-free piping Check flange connection (see 4.2 measurement C with inside diameter piping) → Replace defective disc with spare parts kit
Lining worn, damaged	Open empty / flow-free piping Check lining and valve disc for damage → Replace defective parts with spare parts kit
Worm shaft twisted (broken)	Open empty / flow-free piping Check lining / valve disc for damage → Replace defective worm shaft
Manual lever / gearing / drive damaged (defective)	Check dimension data → Replace defective parts or replace with other parts

## 9 Further information

The mentioned planning documents and technical data sheets of Garlock Valves as well as further information and advice can be obtained – also in other languages – at the following address:

Garlock GmbH, Falkenweg 1, 41468 Neuss – Phone: +49 (0) 21 31 349 – 0, Email: [garlockgmbh@garlock.com](mailto:garlockgmbh@garlock.com)