Contents

17.1 Introduction

Safety valves are safety devices and must be able to operate at all times. In order to minimize the likelihood of failures, care should be taken in

- selecting the proper type of safety valve and options
- selecting the suitable materials for the application (see chapter 9 Materials)
- selecting the correct size of the safety valve (see chapter 7 Sizing)
- correct installation and handling of the safety valve (see chapter 6 Installation and Plant Design)

In practice the user may encounter various problems with the operation of a safety valve. If an unacceptable problem is found, it needs to be determined if it is a potential safety issue which requires immediate attention or an undesired operation condition, e.g. a performance issue.

The purpose of this chapter is to give an overview of common safety issues and operational problems, their possible symptoms and causes along with the immediate actions and preventive measures recommended by LESER. This overview does not claim to be complete. For detailed information do not hesitate to contact LESER or an authorized LESER service partner. You will find your contact person at the LESER-Homepage: www.leser.com.

CAUTION! ACHTUNG! ATTENTION! ATENCÍON! 留神

Do not remove the seal wires in an effort to adjust and/ or repair a safety valve if you are not authorized!
Safety valves are safety devices and improper repair may cause damage to equipment and serious injury or death!
The seal wires may only be removed by LESER or authorized personnel.

17.2 How this Chapter is Organised

The following table shows how the information in this chapter is organised. Using the table as a starting point, try first to identify the observable symptom in the list below and then go to the page indicated on the right. This page contains details about possible causes, immediate actions and preventive measures for the symptom.
For your convenience, the symptoms have been grouped into Problem Areas (e.g. “Leakage”, “Opening/Closing”) and can be looked up in a Problem Area Chart using their symptom number and description.

Classification of symptoms:

- Symptoms marked with a small sign ⚠ are potential safety issues, e.g. “The safety opens too late”
- Symptoms not marked are issues regarding the performance of the safety which not necessarily result in a safety issue, e.g. “The safety is leaking”

However each symptom in each application has to be considered individually to decide whether it is a safety issue or not.

The last section of this chapter deals with typical mistakes and their effects that may occur as a result of improper and/or unauthorized repair.

17.3 Problem Areas, Symptoms, Immediate Actions and Preventive Measures

The following charts show detailed information on individual symptoms, including background information, if required („Note"), possible causes, immediate actions and preventive measures. The symptoms are grouped into problem areas.

Table 17.3-1: Problem Areas and Symptoms

Table 17.3-2: Typical Mistakes as a Result of Unauthorized Repair

17.3.1 Leakage

Figure 17.3.1-1: Symptom 1 – Disc worn out due to permanent leakage

Symptom 1: The Safety Valve Seat is Leaking		
	Explanation: Seat leakage is the escape of fluid between the seat and disc. Seat leakage may or may not be audible or visible. Unacceptable seat leakage is defined as a leakage exceeding the limits of API Standard 527 at 90% of the set pressure or below. Leakage is not the same as simmering (see symptom 3, "The Safety Valve is Simmering"). **Standard tests at LESER:** Every safety valve is leak tested by LESER at 90% of the set pressure according to LESER standard LGS 0201which is based on API Standard 527.	
No.	Failure Cause	Action *Preventive measure*
1	Damaged seat/ disc	Repair or replace seat/ disc *Ensure periodical maintenance*
2	Foreign matter between disc and seat	Clean or repair safety valve *Small damages might be compensated by the use of soft seals.*
3	Corrosion in the inlet pipe may produce rust particles between seat and disc	Clean or repair safety valve/ Repair inlet pipe *Ensure periodical maintenance of inlet pipe*
4	Soft seat materials unsuitable for application	Replace soft seat or disc *Replace soft seat material by suitable material*
5	Seat and disc is damaged by improper handling/ transport	Repair or replace seat and disc – Check safety valve for further damages *Review LESER's operating instructions manual for correct handling*
6	The safety valve has simmered	Repair or replace seat/ disc *For details see symptom 3, "The safety valve is simmering"*
7	Excessive pipe loads or momentum caused by improper valve installation, e.g. stress by thermal expansion of pipes	Check or repair safety valve *Check assembly of pipe system and install safety valve free of stress*

Table 17.3.1-1: Symptom 1 – The Safety Valve Seat is Leaking

Symptom 2: The Safety Valve Body or Shell is Leaking		
⚠	**Explanation:** Body shell leakage may occur between body and bonnet, bonnet and cap or, at in threaded valves, between inlet body and body. **Standard tests at LESER:** All LESER safety valves leave the factory 100% shell tightness tested acc. to LGS 0201 which fulfils the requirements of DIN EN ISO 12266-1, sect. 4.2 test P11.	
No.	Failure Cause	Action *Preventive measure*
1	Safety valves with threaded connections: Excessive pipe loads or momentum caused by improper valve installation, e. g. stress by thermal expansion of pipes	Check or repair safety valve *Check assembly of pipe system and install safety valve free of stress*
2	Porous body gasket	Replace gasket *Ensure periodical maintenance*
3	Back pressure exceeds limits of the safety valve	Replace safety valve with a safety valve suitable for the application
4	Loosened nuts and bolts due to vibrations	Tighten the screws *Reduce maintenance interval*
5	Very low viscosity medium	Check or repair safety valve *Use Gylon or Halar gaskets*

Table 17.3.1-2: Symptom 2 – The Safety Valve Body or Shell is Leaking

Symptom 3: The Safety Valve is Simmering		
	Explanation: Simmer is the audible or visible escape of compressible fluid between the seat and disc which may occur at an inlet static pressure below the set pressure prior to opening (API 520 1.2.3.3 o). LESER defines simmering at an inlet static pressure >90% of the set pressure. Permanent simmering is undesirable as it will lead to wear of the seat/disc and permanent loss of medium. Simmering is a typical part of the operating characteristic for safety valves with a set a set pressure defined as pop. **Standard tests at LESER:** As the set pressure definition of all LESER safety valves is “Initial audible discharge”, there is no inherent simmering below the set pressure. This is verified during the set pressure adjustment acc. to LGS 0202, in accordance with DIN EN ISO 4126-1, sect. 7.2.1 a) and ASME XIII, 3.6.3. LESER uses only the upper tolerance of the allowed set pressure tolerance of ±3%.	
No.	Failure Cause	Action *Preventive measure*
1	Operating pressure too close to set pressure	Check or repair seat/ disc *Reduce operating pressure and/or increase set pressure*
2	Line vibrations	Check or repair seat/ disc *Eliminate any vibrations at the safety valve affecting the safety valve*
3	Pressure peaks	Check or repair seat/ disc *Eliminate pressure peaks by measures suitable for dampening pulsation*

Table 17.3.1-3: Symptom 3 – The Safety Valve is Simmering

17.3.2 Opening/ Closing

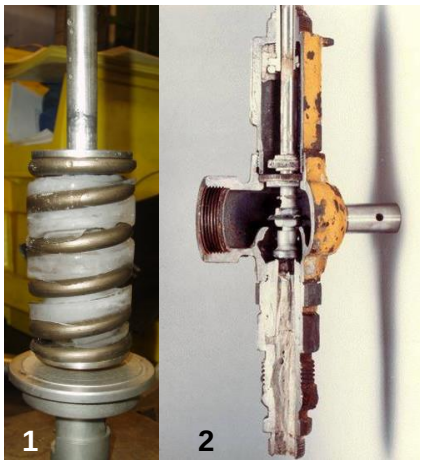

Figure 17.3.2-1: Symptom 6 - Frozen condensate in the bonnet
Figure 17.3.2-2: Symptom 6 - Hardened medium in the inlet area

Symptom 4: The Safety Valve Opens too Early		
	Explanation: The safety valve opens at a pressure below the required set pressure minus tolerance. **Standard tests at LESER:** Set pressure adjustment acc. to LGS 0202, in accordance with DIN EN ISO 4126-1, sect. 7.2.1 a) and ASME XIII, 3.6.3. LESER uses only the upper tolerance of the allowed set pressure tolerance of ±3%.	
No.	Failure Cause	Action *Preventive measure*
1	Temperature or back pressure not taken into account	Reset the safety valve *Review CDTP (Cold Differential Test Pressure) correction in order to achieve the correct set pressure for the operating condition.*
2	Operating pressure too close to set pressure	Reset the safety valve *Reduce operating pressure and/ or increase set pressure, if possible* *Use a supplementary loading system or a pilot operated safety valve*
3	The temperature at the spring is too high	Replace spring *Replace spring material by suitable material* *Use an open bonnet or stainless steel bellows and bonnet spacer*
4	Spring demineralized by condensate and fractured – steam service	Replace spring – change material *Use a stainless steel spring or an open bonnet*

Table 17.3.2-1: Symptom 4 – The Safety Valve Opens too Early

Symptom 5: The Safety Valve Opens too Late		
⚠	**Explanation:** The safety valve opens at a pressure above the required set pressure plus tolerance. **Standard tests at LESER:** Set pressure adjustment acc. to LGS 0202, in accordance with DIN EN ISO 4126-1, sect. 7.2.1 a) and ASME XIII, 3.6.3. LESER uses only the upper tolerance of the allowed set pressure tolerance of ±3%.	
No.	Failure Cause	Action *Preventive measure*
1	Temperature is below range	Reset the safety valve *Recalculate CDTP correction in order to achieve the correct set pressure for the operating condition*
2	Set pressure selected incorrectly	Reset the safety valve *Reduce set pressure if possible*
3	Superimposed back pressure not taken into account	Reset the safety valve *Adjust safety valve to the conditions as present:* *- Correct CDTP if back pressure is constant* *- Select stainless steel bellows if back pressure is variable*
4	Disc and seat are stuck together due to adhesive medium	Clean or repair safety valve *Regular lifting of the safety valve with lifting lever.* *Use a heating jacket or bursting disk*
5	Choice of a unsuitable soft sealing	Replace disc – change material *Select a correct soft sealing*
6	During test safety valve does not reach the CDTP temperature	Wait until safety valve has heated up properly
7	Disc and seat are stuck together in steam service	Repair or replace seat/ disc *Ensure periodical lifting* *If ferritic materials are involved, use different materials for seat and disc*

Table 17.3.2-2: Symptom 5 – The Safety Valve Opens too Late

Symptom 6: The Safety Valve Does not Open		
⚠	**Explanation:** The safety valve does not open although the pressure is above the required set pressure plus tolerance. **Standard tests at LESER:** Set pressure adjustment acc. to LGS 0202, in accordance with DIN EN ISO 4126-1, sect. 7.2.1 a) and ASME XIII, 3.6.3. LESER uses only the upper tolerance of the allowed set pressure tolerance of ±3%.	
No.	Failure Cause	Action *Preventive measure*
1	CDTP incorrect or not regarded	Reset safety valve *Review CDTP correction in order to achieve the correct set pressure for the operating condition*
2	Bonnet is soiled by medium - guide and spindle are stuck	Repair or replace internal parts *Use stainless steel bellows*
3	Bonnet is corroded by medium - guide and spindle are stuck	Repair or replace internal parts *Use stainless steel bellows*
4	Medium is hardened in the inlet area	Repair or replace safety valve *Change dimensions of the inlet pipe to obtain a shorter, wider inlet* *Use a heating jacket or bursting disc*

Symptom 6: The Safety Valve Does not Open (Continued)		
No.	Failure Cause	Action
		Preventive measure
5	Condensate or medium is frozen in the bonnet	Check or repair internal parts
		Use stainless steel bellows to avoid medium in the bonnet *Allow proper drainage of bonnet, body and outlet pipe* *Use a heating jacket*
6	Protective cover for the flange not removed	Remove the protective cover for the flange
		Before installation: remove covers
7	Test gag still in place	Remove test gag

Table 17.3.2-3: Symptom 6 – The Safety Valve Does not Open

Symptom 7: The Safety Valve Closes too Late		
	Explanation: The safety valve does not close within the blow down limits of the applicable codes and standards. **Standard tests at LESER:** Every safety valve is leak tested by LESER at 90% of the set pressure according to LESER standard LGS 0201 which is based on API Standard 527.	
No.	Failure Cause	Action
		Preventive measure
1	Adjusting ring position too close to disc	Screw down the adjusting ring
		Keep the adjusting ring fixed in the lowest position (applies only to LESER API series 526 safety valves)
2	Spring material unsuitable for temperature	Replace spring
		Replace material by suitable material
3	Spring relaxed	Replace spring - change material
		Ensure periodical maintenance

Table 17.3.2-4: Symptom 7 – The Safety Valve Closes too Late

Symptom 8: The Safety Valve Does not Close		
	Explanation: The safety valve does not close at all, but remains open far below the set pressure. **Standard tests at LESER:** Every safety valve is leak tested by LESER at 90% of the set pressure according to LESER standard LGS 0201 which is based on API Standard 527.	
No.	Failure Cause	Action
		Preventive measure
1	Spring broken due to - medium/ corrosion - steam operation	Replace spring – change material
		Use stainless steel spring, stainless steel bellows and/ or an open bonnet *Allow proper drainage of of bonnet, body and outlet pipe*
2	Foreign matter between disc and seat	Clean or repair safety valve
		Small damages of the sealing surface might be compensated by the use of soft seals.
3	Spindle and guide are galled	Repair or replace safety valve
		Avoid chattering; see also symptom 9, "The safety valve is chattering/ fluttering"

Table 17.3.2-5: Symptom 8 – The Safety Valve Does not Close

17.3.3 Operation/ Function

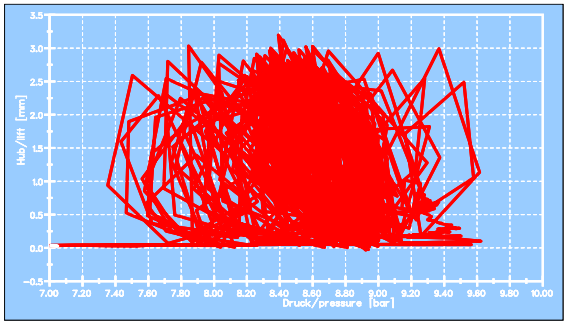

Figure 17.3.3-1: Symptom 9 - Safety valve is chattering

Symptom 9: The Safety Valve Is Chattering/ Fluttering	
⚠	**Explanation:** Chatter refers to the abnormally rapid reciprocating motion of the pressure relief valve disc where the disc contacts the pressure relief valve seat during cycling… Flutter is similar to chatter except that the disc does not come into contact with the seat during cycling. (API 520-1, 3.3.3.1.2)

Note: What is the difference between chattering/ fluttering and frequent opening?
Chattering and fluttering must be distinguished from the frequent opening of a safety valve. A frequent opening means that the safety valve goes through a complete operating cycle and discharges enough medium to lower the pressure in the protected equipment below the reseating pressure of the safety valve.
The root causes for frequent opening are:

- oversized valve
- small volume in the vessel (protected equipment)

Frequent opening is generally not a safety issue – the safety valve does what it is supposed to do.
By contrast, the symptoms of chattering or fluttering ARE safety issues. A chattering or fluttering safety valve does not discharge its full rated capacity and may cause the pressure in the system to increase.

No.	Failure cause	Action
		Preventive measure
1	Excessive pressure loss in the inlet pipe	Repair safety valve
		Recalculate pressure loss and change inlet pipe dimensions to obtain a shorter, wider, smoother inlet with less bends. *Adjust the safety valve's capacity to the conditions present by means of lift restriction* *Apply an O-ring damper* *Check gaskets of inlet flange connection*
2	Excessive built-up back pressure in the outlet pipe	Repair safety valve
		Change outlet pipe dimensions to obtain a shorter, wider, smoother inlet *Adjust the safety valve's capacity to the required capacity by means of lift restriction* *Use stainless steel bellows* *Check gaskets of outlet flange connection*
3	Valve is oversized for the application, leading to failure causes 1 or 2	Repair safety valve
		Resize safety valve *Use an O-ring damper or lift restriction*
4	Gasket for inlet/ outlet flange connection is incorrectly fitted and restricting the flow path, leading to failure causes 1 or 2	Change or refit gasket properly
		Check if gaskets are fitted properly

Symptom 9: The Safety Valve is Chattering/ Fluttering (Continued)		
No.	Failure cause	Action
		Preventive measure
5	Too large weld roots restrict flow path	Repair safety valve/ repair inlet pipe; remove too large weld roots
		Change pipe inlet dimensions to obtain a shorter, wider inlet

Table 17.3.3-1: Symptom 9 – The Safety Valve is Chattering/ Fluttering

Symptom 10: The Safety Valve is Fully Open; Pressure is Rising Above Maximum Relieving Pressure		
⚠	**Explanation:** Although the safety valve is fully opened, the pressure in the vessel rises above the maximum allowable accumulation pressure (typically MAWP+10%).	
No.	Failure cause	Action
		Preventive measure
1	Medium conditions/ back pressure correction not properly considered	Install a sufficiently sized safety valve
		Select the correct size for the safety valve
2	Excessive pressure loss in the inlet pipe	Reduce losses by changing the piping to obtain a shorter, wider, smoother inlet
		Check welding and gaskets of flange connections *See also symptom 9*

Table 17.3.3-2: Symptom 10 – The Safety Valve is Fully Open; Pressure is Rising Above Maximum Relieving Pressure

Symptom 11: The Safety Valve does not Achieve its Maximum Lift		
⚠	**Explanation:** Lift is the actual travel of the disc from the closed position when a valve is relieving. (API 520 1.2.2.8) Maximum lift must be achieved at max. 10% overpressure.	
No.	Failure cause	Action
		Preventive measure
1	Foreign matter trapped between spindle and guide	Clean or repair safety valve.
		Use stainless steel bellows or bursting disc
2	Built up back pressure is too high	Check or repair safety valve Reduce built up back pressure by using a shorter, wider outlet pipe
		Use a stainless steel bellows
3	The safety valve is operating in the partial load range	No action required, if 10% overpressure is not exceeded

Table 17.3.3-3: Symptom 11 – The Safety Valve does not Achieve its Maximum Lift

17.3.4 Corrosion/ Wear

Figure 17.3.4-1: Symptom 12 - Strong corrosion in a safety valve

Symptom 12: The Safety Valve Shows Strong Internal Corrosion		
⚠	**Explanation:** Corrosion is the oxidation of metal surfaces under the influence of its surrounding medium. Corrosion is critical to the operation of a safety valve especially if pressure containing or moving parts are affected. Limited corrosion might be acceptable, provided it does not affect the operability of the safety valve or the pressure containing properties of body or bonnet. Corrosion in the inlet pipe may affect the safety valve in several ways: Rust particles can be located between seat and disc producing leakage (see symptom 1). Corrosion may cause narrowing of the inlet pipe which can lead to excessive pressure loss and therefore chattering (see symptom 9).	
No.	Failure cause	Action *Preventive measure*
1	Disc/ Seat material unsuitable for the medium	Replace Seat/ Disc *Use suitable material, e.g. high alloy materials* *Ensure periodical maintenance*
2	Spindle/ guide material unsuitable for the medium	Replace spindle/ guide *Use suitable material, e.g. high alloy materials* *Install stainless steel or high alloy bellows for protection* *Reduce maintenance intervals*
3	Spring material unsuitable for the medium	Replace spring *Check material choice with regard to temperature and medium* *Install stainless steel or high alloy bellows for protection* *Ensure periodical maintenance*
4	Body/ bonnet material unsuitable for the medium	Repair or replace safety valve *Use suitable material, e.g. high alloy materials* *Ensure periodical maintenance* *Use Critical Service valves* *Use bursting discs*

Table 17.3.4-1: Symptom 12 – The Safety Valve Shows Strong Internal Corrosion

Symptom 13: The Safety Valve Shows Strong External Corrosion		
⚠	**Explanation:** Corrosion is the oxidation of metal surfaces under the influence of its surrounding medium. Corrosion is critical to the operation of a safety valve especially if pressure containing parts are affected. Limited corrosion might be acceptable, provided it does not affect the operability of the safety valve or the pressure containing properties of body or bonnet. Likewise, fading of external paint in special applications is not critical to the functioning of the safety valve.	
No.	Failure cause	Action *Preventive measure*
1	Corrosive environment (e.g. marine or offshore)	Repair or replace safety valve *Use multi layer or epoxy coating or Duplex stainless steel materials*

Table 17.3.4-2: Symptom 13 – The Safety Valve Shows Strong External Corrosion

Symptom 14: The Safety Valve Shows Wear between Spindle and Guide		
⚠	**Explanation:** Wear is the erosion of material from a solid surface by the action of another solid. This symptom frequently goes undetected until maintenance.	
No.	Failure cause	Action *Preventive measure*
1	The safety valves has chattered	Repair safety valve *See also symptom 9, "The safety valve is chattering"*
2	The safety valve is soiled	Repair safety valve *Use stainless steel bellows*

Table 17.3.4-3: Symptom 14 – The Safety Valve Shows Wear between Spindle and Guide

Symptom 15: The Safety Valve Shows Damaged Sealing Surfaces		
	Explanation: Sealing surfaces are damaged in a way that the tightness of the safety valve is affected. This symptom frequently goes undetected until the safety valve is disassembled for maintenance.	
No.	Failure cause	Action *Preventive measure*
1	The safety valve has simmered or leaked – the operating pressure is too close to the set pressure	Repair or replace seat/ disc *Increase set pressure if possible and/ or reduce the operating pressure*
2	The safety valves has chattered	Repair safety valve *For details see symptom 9 "The safety valve is chattering/ fluttering"*
3	Solid matter in liquid	Clean or repair safety valve *Use hardened or stellited seat/ disc*
4	Rust or particles in steam or gas application	Repair safety valve *Clean vessel before start-up of the facility*

Table 17.3.4-4: Symptom 15 – The Safety Valve Shows Damaged Sealing Surfaces

17.3.5 Symptoms in Special Applications

Figure 17.3.5-1: Symptom 16 - Corroded stainless steel bellows

Symptom 16: The Stainless Steel Bellows Fails Regularly		
⚠	**Explanation:** A stainless steel bellows is used to protect the moving parts and to compensate for back pressure. It is a damageable part because it is thin-walled. Failure reasons can be: corrosion, too high temperatures or an exceed of the allowable cycles in case the safety valve is chattering of fluttering. The risk involved in damages to the stainless steel bellows is the loss of the back pressure compensation so that the set pressure rises. For the static back pressure limits of stainless steel bellows to be considered, refer to the LESER catalog.	
No.	Failure cause	Action *Preventive measure*
1	Value of static back pressure too high for the installed stainless steel bellows	Replace stainless steel bellows *Install stronger stainless steel bellows*
2	Material of bellows unsuitable for the application	Replace stainless steel bellows – change material *Use high alloy materials, like Hastelloy*
3	Extensive chattering/ fluttering	Replace stainless steel bellows *For details please see symptom 9, "The safety valve is chattering/ fluttering"*
4	Too high temperature	Replace stainless steel bellows – change material *Use high alloy materials, like Hastelloy*
5	Frozen condensate in the stainless steel bellows	Check or replace stainless steel bellows *Proper drainage of bonnet, body and outlet pipe*
6	Corrosion	Replace stainless steel bellows – change material *Use high alloy materials, like Inconel*

Table 17.3.5-1: Symptom 16 – The Stainless Steel Bellows Fails Regularly

Symptom 17: The Safety Valve Cannot Be Lifted Manually		
⚠	**Explanation:** A lifting device allows venting a safety valve in order to check operability. The lifting device must allow lifting the safety valve at an operating pressure above 75% (ASME XIII 3.2.7(a)) of set pressure.	
No.	Failure cause	Action *Preventive measure*
1	The operating pressure is too low compared to the set pressure	No action possible, see explanation above.
2	If failure cause no. 1 not applicable check symptom 6 "The safety valve does not open"	

Table 17.3.5-2: Symptom 17 – The Safety Valve Cannot Be Lifted Manually

Symptom 18: The Safety Valve Cannot Be Lifted Pneumatically (Lifting Device H8)		
⚠	**Explanation:** The pneumatic lifting device H8 allows Cleaning In Place (CIP) or Sterilizing In Place (SIP). Applying air pressure to the lifting device will lift the spindle, which will open the safety valve and allow a steam or cleaning solution to flush through the valve.	
No.	Failure cause	Action *Preventive measure*
1	Insufficient air supply pressure	Check air supply pressure *In the Clean Service catalog, check "selection chart H8"* *Use a double piston actuator*
2	Air supply line is blocked	Clean air supply line *Use clean air or filters*
3	If failure cause no. 1 or 2 not applicable check symptom 6 "The safety valve does not open"	

Table 17.3.5-3: Symptom 18 – The Safety Valve Cannot Be Lifted Pneumatically (Lifting Device H8)

17.4 Typical Mistakes as a Result of Unauthorized Repair

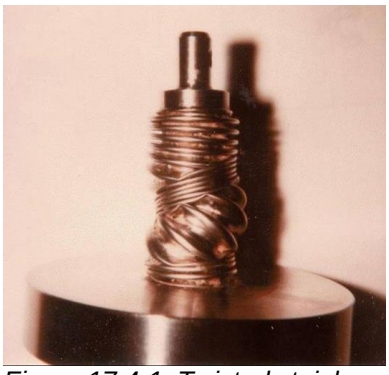

Figure 17.4-1: Twisted stainless steel bellows

Safety valves are safety devices and improper repair may cause damage to equipment and serious injury or death! The following table lists typical mistakes that are made when repair is performed by unauthorized or untrained personnel or when maintenance instructions are not followed.

No.	Mistake	Effect
1	Assembly of incorrect spring	1. Spring is too soft: Safety valve closes too late 2. Spring is too strong: Safety valve opens too late
2	Spring is compressed to solid after assembly	Safety valve does not open or does not achieve the required lift
3	Wrong disc is mounted	Overpressure and blow down of the safety valve may be outside the limits of codes and standards
4	Due to excessive machining of seat/ disc the tolerances of the critical dimensions may be exceeded	Overpressure and blow down of the safety valve may be outside the limits of codes and standards
5	After repair lifting aid was not reinstalled	Overpressure and blow down of the safety valve may be outside the limits of codes and standards
6	After repair lift restriction was not reinstalled	The safety valve will blow off with a higher capacity. Excessive pressure loss in the inlet and outlet line may occur as well as chattering
7	During assembly the spindle was not secured against rotation: → the stainless steel bellows is twisted	Safety valve does not open Sealing surfaces of seat and disc are damaged.
8	Unsuitable or insufficient grease is used for the lubrication of the actuator of the pneumatic lifting device H8	The Lifting device H8 fails; the safety valve continues to function
9	Lifting lever left in open position - lever with knob - H4 for Clean Service	The safety valves stays open

Table 17.4-1: Typical Mistakes as a Result of Unauthorized Repair