

<b>USER MANUAL</b>		
<b>SPRING-LOADED SAFETY VALVES ZARMAK</b>	<b>781T (ex. 781) 776 ( ex. 775-l)</b>	<b>Edition: 07/2016 Date: 01.07.2016</b>

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Figure 781

Figure 776

**1. Principle of operation**

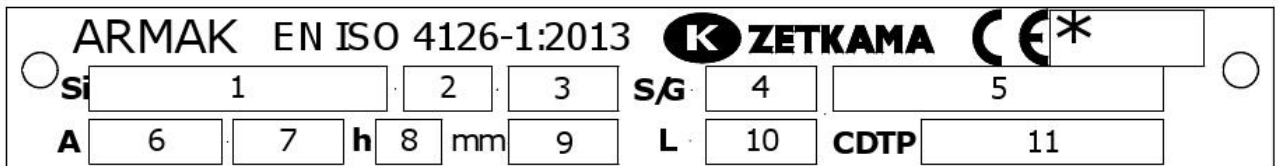
The purpose of the safety valve is to protect the equipment and installations against excessive pressure above the pressure limit.

When the force coming from the pressure acting on the disc surmount with the force from the spring, the valve starts to open. A further increase in the pressure, required for the particular design of the valve, causes its full opening aided by the bell or lifting ring.

**2. Delivery condition**

Supplied valves are tested and set for the required opening pressure or, when ordered for range, for the upper pressure of the range.

Valves are stamped on the nameplate fixed to the cylindrical part of the body.



Nameplate

**Symbols:**

1. Type of safety valve
2. Bore diameter
3. Spring number
4. The discharge coefficient for vapours and gases
5. Set pressure or set pressure range
6. Flow area
7. Year of manufacture
8. The minimum lift value
9. Overpressure
10. The discharge coefficient for liquids
11. Cold Differential Test Pressure

\* Notified body number

Additionally, the hexagon inlet nozzle is stamped with:

1. Year of manufacture / serial number
2. Workstation number of assembler
3. Stamp of an operator performing the test

Set pressure is secured by sealing between screw plug and body.

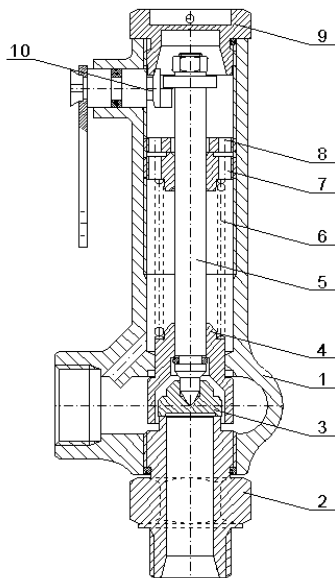
### 3. Installation of safety valves

- Before the installation on the unit or pipeline, check if valve was not damaged or contaminated during transport. It is necessary to check the cleanliness of flow channels, external surfaces and end connections. Any dirt must be removed.
- **The valve should be mounted in a vertical position.**
- Pipes connected to the valve should comply with the requirements included in the surveillance provisions. Cross-section and shape of the pipes should be selected so that they do not reduce the capacity of the valve. If the medium is discharged with one pipeline from a few safety valves, free area of the flow of this pipeline should be at least equal to the total area of outlet ports flow of these valves. Moreover, the pipes should be made advantageously to the flow (gentle curves). Drain should be provided at the lowest point of the discharge pipe.
- For the vapours and gases outlet port cannot be rigidly connected to the pipeline.
- The valve cannot act like a support structure for the pressure equipment on which it is mounted, and it cannot be exposed to deformation caused by installation of inlet and outlet pipes.
- Mounting place of the valve should be easily accessible, good lighted and protected from external influences. If the safety valve is mounted outdoors, it must be protected against frost and rain. When mounted near the platforms for service, they must be in compliance with the provisions of Health and Safety Regulations (blowing valve should not be a threat to the health and life of people).
- It should be ensured that in a system in which the valve is to be mounted, there are no impurities.

**ATTENTION**

Pressure water test and so-called plant cleaning should be performed before installing the safety valve, blinding the valve connecting socket. It is not allowed to perform this test with a valve mounted, by blocking any of its moving parts.

## 4. Operation of safety valves

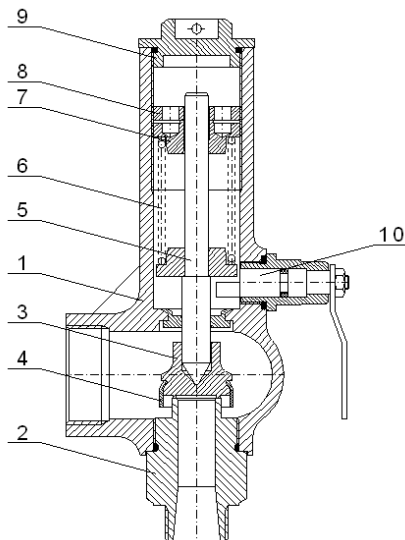


Drawing 1. Figure 781

Pos. Number	Element	Material
1	Body <sup>2)</sup>	CuZn39Pb2
2	Nozzle	X39CrMo17-1
3	Disc	X39CrMo17-1
4	Bell	CuZn40Pb2
5	Spindle <sup>1)</sup>	X20Cr13
6	Spring	B1
7	Adjusting Screw	CuZn40Pb2
8	Locking Screw	CuZn40Pb2
9	Screw plug	CuZn40Pb2
10	Lifting lever	-

<sup>1)</sup> for the marine design (WM) spindle is made of the X17CrNi16-2

<sup>2)</sup> with nickel coating



Drawing 2. Figure 776

Pos. Number	Element	Material
1	Body	EN-GJMW-400-5
2	Nozzle	X39CrMo17-1
3	Disc	X39CrMo17-1
4	Lifting ring	X3CrTi17
5	Spindle	X20Cr13
6	Spring	B1
7	Adjusting screw	X20Cr13
8	Locking screw	X20Cr13
9	Screw plug	S235JR
10	Lifting device	-

Safety valves that serve as important elements of the devices and pressure systems require particularly careful and competent service. Any operational gasp may cause damage to the valve mechanism, and consequently lead to the total failure of the pressure system. Therefore, during the operation, pay special attention to:

- Proper setting of safety valve, suitable for the operating parameters of the equipment being protected.
- Proper protection of the valve mechanism against arbitrary regulation and the possibility of damage.
- Periodically verification of correct operation of the valve, in accordance with the requirements of surveillance.
- Proper maintenance and repair management.

Checking the safety valve operation involves lifting of the disc with a lever (pos. 10). Starting the lever causes loosening of the spring force thereby allowing the minimum lift of the disc and the flow of medium. Release of the lever should be made at a pressure between 75% and 85% of set pressure. Keep in mind that too frequent checking may result in damage to the sealing surfaces of the valve disc and seat and thus to a loss of tightness, and the complete lack of checking usually leads to "seizing" of the valve mechanism, what can have serious consequences.

The frequency of these activities depends primarily on:

- Conditions of exploitation, i.e. the type of medium flowing and its parameters
- The specifics of the technological process,
- Place of installation,
- environment.

It should also be correlated with the overhaul and repair of pressure equipment / installations that protects the valve. Very important is the experience of the user. Determining the periods of checking the safety valve is the responsibility of the designer of installation.

**After checking of the valve, move the lever to the original position.** When checking the valve there is a possibility of contamination the sealing surfaces. In this case, again lift disc to remove these pollutions. If tightness was not obtained by this, the valve needs to be regrinded from the next stop of the pressure device. In the case of valves with soft sealing, any damage at the rubber surface of the disc requires replacement.

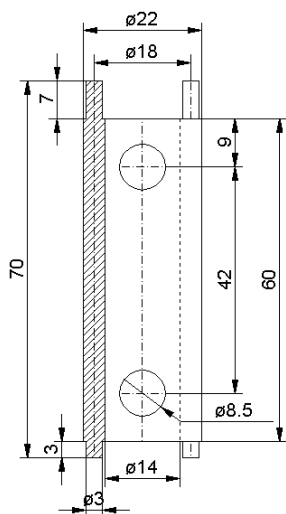
**Safety valve are not designed to use as a discharge valve, and inappropriate use dismiss producer from any obligation and warranty.**

## 5. Adjustment of the set pressure

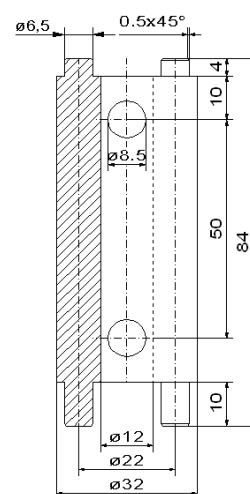
**Set pressure adjustment can be carried by a person authorized or UDT inspector performing the revise, who, in the case of valves ordered for the pressure range, adjusts the valve on the installation for the required set pressure.**

Set pressure of the valve can be adjusted only within the range of the provided spring.

1. Unscrew the screw plug (pos. 9) and for safety valves figure 781, remove the lifting lever (pos. 10).
2. Loosen the lock screw with the key, according to the enclosed drawings, on a side with shorter stud (pos. 8) so that the holes in the lock screw are in line with the holes in the adjusting screw (pos. 7)
3. Set the required opening pressure with the same key, on the side with the longer stud (so that they pass through the lock screw and the regulatory screw), with the regulatory screw (pos. 7):
  - rotate clockwise - increasing the pressure,
  - rotate counter clockwise – reducing the pressure.
4. After setting the pressure, the key with shorter studs, tighten the lock screw, thereby locking the regulatory screw.
5. In case of the safety valves figure 781, insert the lifting lever the valve (pos. 10).
6. Screw the plug (pos. 9).
7. Seal the valve.



Drwaing 3. Key for setting the set pressure in valves 781



Drwaing 4. Key for setting the set pressure in valves 775

## 6. Maintenance and repair of safety valves

In order to ensure correct operation of safety valves, the following conditions must be met:

- valve disc cannot set slantwise to the valve seat
- sealing surfaces of the seat and disc should ensure tight closure of the valve;
- All cooperating moving parts of valve mechanism should maintain movability in operating conditions.

In order to maintain these conditions the valves should be periodically inspected and renovated. Inspections of safety valves should be conducted by persons with adequate authorisation. While the repairs should be first carried out by the manufacturer of the safety valve or at authorized service centres, or by the user's service teams having appropriate permissions

### ATTENTION

In addition to the recommendations included in these instructions, the requirements and recommendations resulting from the surveillance provisions of the country in which safety valve is operated also apply.

## 7. Causes of operating disturbances and their elimination

Disturbance	Possible causes	Elimination
Safety valve does not work - no flow or slight flow	Protective cap of the inlet has not been removed prior to installation of the valve	Remove inlet protective cap.
	Protective cap of the inlet flange has not been removed prior to installation of the valve	Remove the valve from the system and clean inlet of the valve.
	incorrect installation of the valve - the flow of the medium is opposite with the direction marked on the valve body	Install the valve correctly, in accordance with the indications of manufacturer's instructions.
	Too high set pressure, inadequate to the requirements of secured installation	If the required pressure is within the scope of spring mounted on the valve- set the safety valve to the required pressure, if it is outside the scope of spring mounted - replace the spring with the appropriate one and set the required pressure. In each case, act in compliance with manufacturer's instructions. If the required pressure does not fall within the scope of the safety valve type mounted - replace the valve with the appropriate type, with set pressure adjusted to the required pressure.
	backpressure not taken into consideration (in case of conventional valve, i.e. unbalanced)	I For stable superimposed backpressure - set the differential pressure. For variable superimposed backpressure - apply bellows compensating backpressure changes In each case, follow manufacturer's instructions and with matters requiring clarification - consult the manufacturer's technical advisor.

	Sticky medium	Use the valve with bellows and a heating jacket, optionally incorporate security plate into the system.
	Freezing or solidifying medium	The body and the pipes should be kept in a state incapable freezing or solidifying of media - apply the heating.
	"Seizing" of the sealing surfaces of the seat and valve disc preventing their separation at the set pressure	If the properties of the medium and the operating conditions do not exclude such possibility - appropriate frequency of inspections and repairs of the safety valve must be adapted, and the time of valve check provided in the operating records of protected device / system should be strictly observed.
No repeatability of valve opening pressure (conventional valves, i.e. unbalanced)	Variable superimposed backpressure	Replace conventional safety valve with the valve with bellows compensating superimposed backpressure changes
Checking of safety valve is not possible	Inlet pressure is lower than 75% of the set pressure	check the safety valve with a proper pressure – follow manufacturer's instructions.
	Damages within the lifting unit	Inspect the lifting unit and when necessary replace damaged parts to new ones.
Leak at sealing surface	Incorrect transport or storage - wrong position during transport and storage, protective cap from the inlet and outlet of the valve have fallen out and thus the impurities entered into the valve	During transport and storage follow manufacturer's instructions. If the inner part of the valve has been polluted, it need to be cleaned before installing the valve in the system in order to avoid damage to the sealing surfaces.
	There is no corresponding relationship between the set pressure and the working pressure.	Working pressure shall be: <ul style="list-style-type: none"> <li>• For compressible fluids and set pressure equal or higher than 2 bars - maximum 80% of set pressure,</li> <li>• For compressible fluids and set pressure below 2 bars – working pressure should be lower by 0,4 bar than set pressure,</li> <li>• For incompressible fluids and set pressure equal or higher than 3 bars – maximum 75% of set pressure,</li> <li>• For incompressible fluids and set pressure below 3 bars – working pressure should be lower than 0,75 bar than set pressure.</li> </ul>
	Lever not in neutral position (in case of closed valves and low pressures)	Move the lever to the neutral position
	Vibrations of the safety valve	Diagnose the cause of these vibrations, and if possible - remove the source. If the vibrations cannot be prevented mount appropriate damping systems. If the chattering of the valve is due to incorrect valve selection (see "Vibration") - analyse the accuracy of the valve selection and if necessary replace it.
	Medium pollutions, foreign substances between the disc and seat	Shortly lift valve disc to remove any impurities, and if it does not bring the expected results – take off the valve and perform regeneration of the sealing surfaces of the seat and the disc or

		replace it with new one. If it is possible - apply valve with soft seal on the valve disc, which has a lower sensitivity to grit in the seat. Follow manufacturer's instructions.
	Corrosion of elements directly in contact with the medium, which is the result of improper valve selection in respect of material	Replace the valve with the construction appropriate to the medium according to resistance of used materials or apply safety valve system with a bursting disc
	The deformation caused by stresses of the installation. Valve bodies can get deformed due to excessive load transferred from the pipes, causing, among others, leaking.	Diagnose and eliminate the causes of stress. If the deformations of valve body are permanent- replace the safety valve with a new one.
	Other causes of leaks on the seat.	Depending on the reason diagnosed - according to the indications and decision of the manufacturer - replace the defective parts or replace the safety valve with a new one.
Safety valve opens at a pressure lower than at adjusted set pressure	With the cold setting of a valve, appropriate temperature adjustment was not included. (in case of valves used for media of 100°C and higher)	Revise opening pressure, observing the guidelines and recommendations of the manufacturer.
	High spring relaxation at the working conditions (for valves at upper limit for medium and temperature / pressure)	Consult the manufacturer-replace the spring, according to the guidelines and recommendations of the manufacturer. If possible- apply the valve with open bonnet construction (better cooling of a spring) or / and with cooling section. When such situation reoccurs – replace the valve with a new one, intended for a use in higher temperature range.
	Slight damage or contamination of the sealing surface of the seat / disc	Remove the valve, check the sealing surfaces and, if necessary - make regeneration according to the manufacturer's instructions and recommendations.
	The valve is set to the differential pressure (considering the presence of superimposed backpressure) when the backpressure don't exist	Regulate setting of the valve. If the required pressure is within the scope of spring mounted on the valve- set the safety valve to the required pressure, if it is outside the scope of spring mounted - replace the spring with the appropriate one and set the required pressure. In each case, act in compliance with manufacturer's instructions.
Sudden increases in pressure (pulsations)	Incorrect positioning of the safety valve at pressure source	Analyse positioning of the safety valve at pressure source. Safety valve should be installed in such a distance from pressure source that protects it from the pressure pulsations.
Crack on the valve body	Transport defect	Replace safety valve
	defect of the material	Replace safety valve

	Installation errors	Replace safety valve. Strictly follow manufacturer's instructions and the requirements of the relevant provisions in terms of requirements for installation of safety valves – do not induce stress during installation.
	Forces like bending, or torque act on safety valve.	Replace safety valve. When designing the installation check the manufacturer's instructions and the requirements of the relevant provisions of supervision institutions in the requirements for pipes connected to the safety valve, taking into account all the possible reaction forces occurring at the outlet, provide for appropriate support, do not let the valve to be a supporting structure for the other elements of the installation. Consider the possibility to use safety valves with support lugs.
Vibrations	Too high flow resistance in the supply line - pressure loss in the supply line exceeds 3% (set pressure of safety valve)	Reduce flow resistance in the supply line. If this is not possible, for some reasons - consider the possibility of a safety valve with damper. Effectiveness of this valve construction is possible in particular conditions – clarify with the manufacturer.
	Wrong characteristic of the safety valve in the protected installation	Analyse this matter, taking into consideration special conditions. If such adjustment is not possible- replace the valve with a new one with a proper characteristics.
	The valve was designed with too large capacity in relation to the requirements of protected installation.	Analyse the selection of safety valve – apply smaller valve, respectively to the required capacity.
	Built-up backpressure occurring in the discharge line at the blow out from the valve - exceeds the value allowed by the manufacturer (10 ÷ 15% of the set pressure) -e.g. too long outlet pipe, its diameter is too small, rapid changes in the direction of flow, the use of silencers, etc.	If it is not possible to introduce changes to the construction of discharge line, reducing built-up backpressure - apply valve with bellow compensation
	Excessive fluctuation of the superimposed backpressure at the outlet of the valve (in the case of the conventional valve i.e. unbalanced)	Apply valve with bellow resistant to influence of changing superimposed backpressure.
	Too large construction lift of closing element (e.g. in case of full stroke safety valves used for fluids)	Apply safety valve of characteristics adjusted to this type of fluids, or- if the manufacturer enables such construction- reduce the construction lift of the full lift valve to the value indicted by the manufacturer.
	Incorrectly made welds on connecting pipes, too small gaskets on inlet and outlet or gaskets placed incorrectly (non-centrally) disrupting the flow	Eliminate incorrectness



Pressure in installation still rising despite open safety valve	Inadequate selection of the safety valve – too small capacity of the valve in relation to the installation requirements	Reselect the valve considering the required capacity and replace it with a proper one.
Safety valve constantly releases medium	Valve spring is broken – as a result of corrosive medium or destroyed by a different factor	Replace the spring or the entire safety valve. In case of steam – consider the possibility of applying valve with open bonnet..
	“hangs” of the valve (the valve opened but did not close)	Diagnose the cause of the “hangs” If it is not possible to eliminate the reason- replace the valve.
	Very large damage to the surface of sealing, e.g. as the result of long-term leakage, crack of seat, “pitting” due to the medium	Replace the valve with a new one.
	Pressure do not fall down to closing pressure	Preserve adequate ratio between working and closing pressure
Crew injuries at discharge condition and external medium leakage	Use of safety valve without external tightness test confirmed by the manufacturer	Use valve with gastight construction, that is with external tightness test of the valve.
	Use of valve in which sealing is not adequate to the properties and parameters of medium.	Replace sealing in the operating valve with the adequate one (after consulting the manufacturer) or replace the entire valve.
	Incorrect discharge of medium from the safety valve	In case of steams and gases, the discharging pipe should be directed upwards, enabling safe discharge, minding that outlet end connector cannot be rigidly connected to the pipeline. In addition, in each case, the safety valve outlet flange (free discharge into the environment) or drain line must be positioned so that the flowing medium does not pose a threat to the environment. Follow the requirements of supervising institutions regulations and indications and recommendations of the manufacturer.
	Incorrect drainage medium form the valve and form the discharge pipe.	Eliminate the incorrectness in the drainage line, following the requirements of supervising institutions regulations and indications and recommendations of the manufacturer.

<p>Condensate in the expansion chamber of the safety valve</p>	<p>Improper drainage installation - discharging fluid from the safety valve, improper drainage installation, clogged drainage system</p>	<p>Eliminate the incorrectness in the discharge and drainage installations. In the lowest point of discharge installation it is required to apply drainage guarantying effective discharge of residual condensate. If the manufacturer of the safety valve offers the version with drainage of the expansion chamber of valve body – it should also be considered to use such a valve.</p>
<p>Noise emissions above the limit value (in case of discharge of steams and gasses)</p>	<p>Significant flow rates at medium discharge from the safety valve.</p>	<p>In the case of minor exceedances of limit values - consider the possibility of reducing the flow speed through the use of larger safety valve. It should be checked, however, that "oversizing" of the valve did not cause the instability of its work (see "vibrations"). In most cases it is necessary to apply silencer directly behind the valve and screening of the valve (noise barriers). While designing the outlet pipes fitted with silencers, static and dynamic interaction of flow stream flowing through the silencer should be taken into account. Silencer body should not interfere with effective operation of safety valve and additional pressure drops should be taken under consideration while calculating the discharge, and drainage pipes of the valve. In each case it should be considered not to exceed the value of backpressure allowed by the manufacturer of the safety valve</p>

## 8. Warranty

ZETKAMA grants quality warranty with assurance for proper operation of its products, providing that assembly of them is done according to the user's manual and they are operated according to technical conditions and parameters described in ZETKAMA's catalogue cards. Warranty period is 18 months starting from assembly date, however not longer than 24 months from the sales date.

Other warranty terms are to be agreed between the manufacturer of the valve and the purchaser. **The manufacturer reserves the right to introduce technical changes as the result of improving construction and manufacturing technology.** Failure to comply by the user with the regulations and indications included in this user's manual shall exempt the manufacturer from any liability and warranty.

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