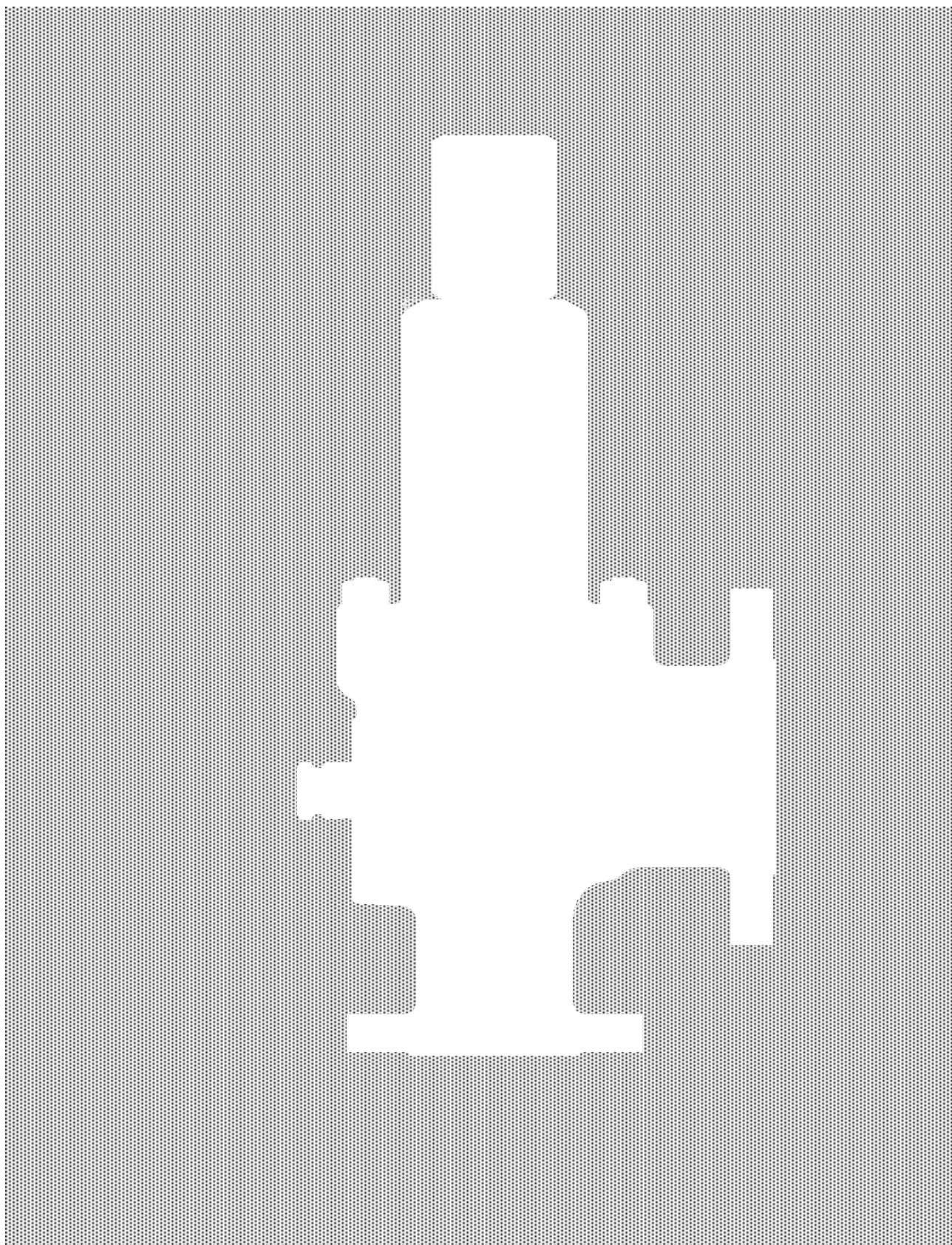




I N S T R U C T I O N S

For the installation and maintenance of proportional lift relief valves type CS35





I N S T R U C T I O N S

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1. GENERAL INFORMATION

1.1 RIGHT TO MODIFY AND "COPYRIGHT"

The regulations, standards, etc. mentioned in these user instructions are valid at the time of writing and are not subject to updating. It is the user's responsibility to apply them, under his own responsibility, according to the most up-to-date version.

The supplier reserves the right to make technical improvements and modifications to data and information at the time it deems most suitable. The user cannot in any case have any right to modification or improvement upheld on valves already delivered.

2. WARRANTY

The scope and the length of warranty are stated in the manufacturer's "General Terms of Sale". The applicable conditions are those mentioned in the most updated version at the time of delivery.

Warranty, moreover, does not cover damage to valves due to the following reasons:

- ° Ignorance or non-observance of these user instructions!
- ° Poorly trained personnel for assembly, use or maintenance.
- ° Normal wear.
- ° Error or negligence in using the valves.

The manufacturer's warranty and liability are ruled out in case of:

- ° Non-observance of the regulations on accident prevention and/or safety standards.
- ° Imperfect assembly, bad putting into operation and incorrect use
- ° Improper or incorrect use, inappropriate use or working conditions not as agreed
- ° The user is the only one responsible in case of physical and/or material damage deriving from non-observance of the above.

3. VALIDITY OF THESE INSTRUCTIONS

These instructions refer to relief valves type:

Type CS 35 - with closed bonnet (sealed).

Each valve is marked with letters and numbers according to the following identification:

- CS = Carraro Safety
- 35 = Proportional lift valve with sealed bonnet
- E-G-J = Orifice
- A/I = Valve with carbon steel bonnet / Valve with stainless steel bonnet
- F = Valve with flanged connections
- 1-2 = Variable number according to version

Example: **CS 35 G / A F 2**

valve type CS35 with orifice G, carbon steel bonnet, flanged connections, standard version.





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3.1. CROSS-SECTIONAL DRAWING CS35 (fig.1)

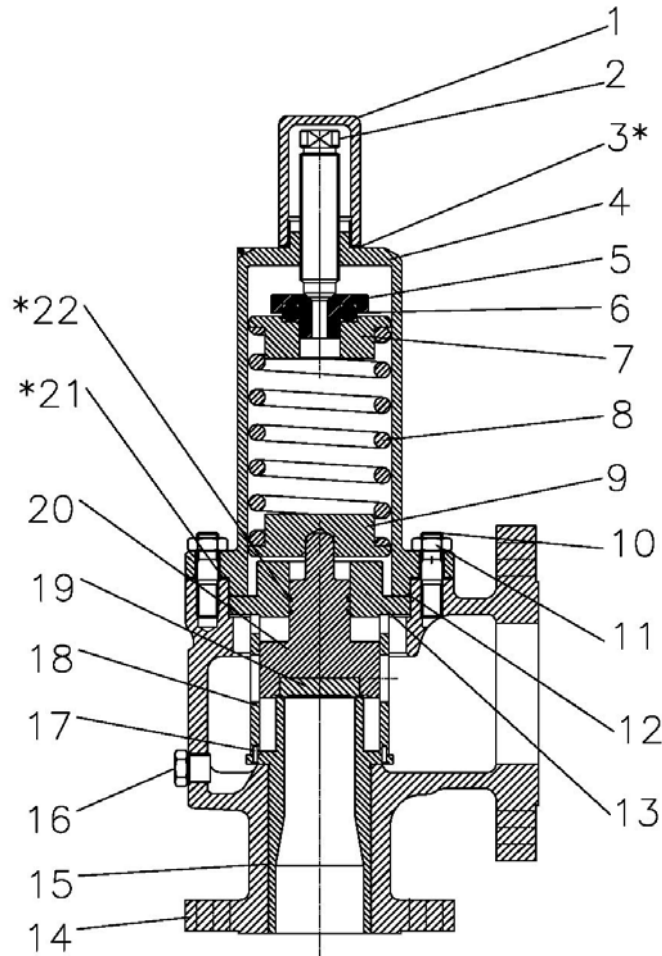


Fig.1: Assembly orifices G-J

- | | |
|--------------------------|----------------------|
| 1. Cap | 12. * O'Ring Gasket |
| 2. Adjusting screw | 13. Cover |
| 3. * Gasket | 14. Body valve |
| 4. Yoke | 15. Seat |
| 5. Bearing plate | 16. Draining plug |
| 6. Thrust bearing | 17. Pin |
| 7. Spring button (upper) | 18. Grid |
| 8. Spring | 19. * Disc |
| 9. Spring botton (lower) | 20. Plug holder disc |
| 10. Stud | 21. * Gasket |
| 11. Nut | 22. * O'Ring Gasket |

*** Recommended spare parts**



INSTRUCTIONS

For the installation and maintenance of proportional lift relief valves type CS35

4. PRODUCT SAFETY GUIDELINES AND LABEL SYSTEM

If and when appropriate safety warnings have been put in the rectangular boxes in the margin of the pages of this manual.

The rectangular labels are arranged vertically (as shown in the examples below) and consist of four boxes containing the messages to be communicated:


- Level of severity
- Nature of risk
- Consequences for people or products of interaction with the risk
- Instructions, if necessary, on how to avoid the risk

The top box contains a word of warning (DANGER - WARNING - CAUTION - ATTENTION) indicating the level of severity of the risk.

The middle box contains a drawing indicating the nature of the risk and potential consequences of interaction of people and property with the risk. In some cases of risk for people the drawing may suggest precautions to take, such as for instance wearing protective clothing.

The bottom box can contain a message with instructions on how to avoid the risk. In the case of risk for people, the message can also contain a more specific definition of the risk and its consequences for people.

- 1) **DANGER** - Immediate risk, which will undoubtedly have consequences with severe injury to people or death.
- 2) **WARNING** - Risk or hazardous behaviour that could cause severe damage or death.
- 3) **CAUTION** - Risk or hazardous behaviour that could cause non-severe injuries to people.
- 4) **ATTENTION** - Risk or hazardous behaviour that could cause damage to property.

1	2	3	4
! DANGER	! WARNING	! CAUTION	! ATTENTION
			
Do not loosen the bolts if the pipes are pressurised as this may cause serious injury or death.	Mark all possible discharge or leak points to prevent the risk of serious injury or death.	Wear safety clothing or equipment to prevent the risk of injury.	Do not knock or drop the valves.



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For the installation and maintenance of proportional lift relief valves type CS35

5. SAFETY WARNING

Careful overhaul and maintenance are important for safe and reliable operation of all valves. The service procedures recommended by CARRARO and described in this manual are effective methods for carrying out the necessary maintenance work. Some of these operations require using tools that are specially designed and made for the specific purpose. These tools must be used when and as recommended. It is important to note that this service manual contains various warnings and recommendations for attention that must be carefully read in order to minimize the risk of damage for people or the chance that incorrect methods are followed that could damage the valves or make their operation unsafe.

It is likewise important to realise that these warnings necessarily cannot be exhaustive.

CARRARO does not have the possibility of knowing, assessing and informing customers or users of all the conceivable ways in which the service could be performed and all the risky consequences of these methods.

As a result, CARRARO has not even attempted such an undertaking. Therefore, anyone using a service procedure or a tool not recommended by CARRARO must make sure that neither their own safety nor that of others and neither the safety nor the operation of the valve are jeopardized by the chosen method of operation.

Please contact CARRARO if you have any doubt about methods.

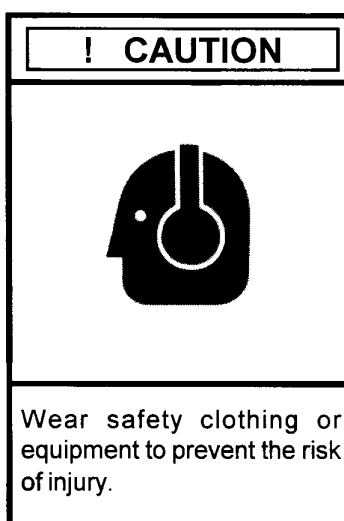
Testing, installing and disassembling valves and accessories can involve contact with fluids at very high temperatures or pressures and/or corrosive or erosive fluids and fluids that are able to trigger potentially explosive atmospheres.

As a result, it is necessary to take every precaution to prevent damage to people when carrying out testing, installation or disassembly; by way of example: ear defenders, safety eyewear, protective clothing such as gloves, etc., whether on the site of operation or in the surrounding area.

Given the many different conditions and circumstances that can occur in relation to the operations to carry out on the products and the potentially hazardous consequences of the methods used, CARRARO is not able to foresee everything that involves the risk of damage to persons or property and can only offer by way of assistance this call for caution along with the following suggestions concerning safety precautions.

It is the responsibility of the user of CARRARO products to train the personnel that is to use these products.

It is extremely important for this personnel to acquire thorough knowledge of the instructions concerning the product and specifically this manual.






INSTRUCTIONS

For the installation and maintenance of proportional lift relief valves type CS35

6. SAFETY PRECAUTIONS

Always follow the current safety rules on the plant, but be sure to observe the following guidelines:


! DANGER



Decrease pressure and keep away from the discharge side when operating a valve in order to prevent serious injury or death.

- Always lower the operating pressure before making any adjustments on the valve.
- When running or testing a valve, never stand on the side of the outlet.
- Ear defenders must be used when testing or assisting valve operation.
- Wear protective clothing.
- When disassembling a relief valve, keep at a distance and/or wear protective clothing to prevent getting splashed with any process fluid that might have remained accumulated inside. Pay attention to the fact that this fluid could trigger a potentially explosive mixture.
Make sure that the valve is cut off from any source of pressure in the system before commencing disassembly.


! CAUTION



Wear suitable protection equipment in order to prevent injury.

- Take care when examining a relief valve to check for leakage. In this case, the fluid coming out could spark off a potentially explosive mixture.
- Before operating a valve, make sure no one is near it. Even small amounts of fluid coming out during operation can cause severe harm to persons and spark off a potentially explosive mixture.
- Knocking a valve under pressure can cause it to trip early. Never strike a valve when the system has pressure near to the valve setting.

! WARNING



Mark all possible discharge or leak points in order to prevent serious injury or death.

The outside surfaces of the valves reach temperatures mostly equal to the temperature of the fluid flowing inside them. For this reason, when placing the valve in a potentially explosive atmosphere, check that the flash point of the mixture around the valve is suitably greater than that of the fluid treated by the system and prevent flammable dust from depositing on the outside of the valve.

- The connection between the valve and piping must ensure the system is equipotential to prevent electrostatic charges accumulating on the outside surfaces of the plant that can act as an effective sparking source in potentially explosive atmosphere.
- Before doing any work on parts of the valve, contact CARRARO.



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For the installation and maintenance of proportional lift relief valves type CS35

7. RELIEF VALVE TERMINOLOGY

1 - Back pressure - Back pressure is the existing static pressure at the outlet of a safety member, due to the pressure existing (or that has formed) in the outlet system.

2 - Blowdown - The difference between the actual trip pressure for opening a valve and the actual closing pressure. It is expressed as a percentage of the setting pressure, or in units of measurement of the pressure.

3 - Constriction area - The area of the minimum net cross section of the orifice or inlet of the valve (see points E.1.D.2, 1.6, 1.7 1.8 Volume E - ISPESEL).

4 - Diameter of the constriction - The minimum diameter of the valve inlet.

5 - Hammering - Hammering or beating is an abnormal rapid and alternating movement of the mobile parts of a relief valve, with the plug coming into contact with the nozzle.

6 - Closing pressure - The decreasing static pressure at the inlet when the plug comes back into contact with the nozzle, thereby reducing valve lift to zero.

7 - Plug - The plug or obturator is the mobile part of a relief valve that closes the valve and limits the pressure.

8 - Inlet diameter - The nominal diameter of the inlet connection of a relief valve (unless specified otherwise).

9 - Lift - The lift is the actual movement of the plug in relation to the closing position when the valve is discharging.

10 - Manual operation member - This is a member used to open a relief valve manually by applying a force that reduces the load of the spring keeping the valve closed.

11 - Orifice - In Volume E of ISPESEL it is defined as the valve inlet (see E.1.D.2, 1.6) and it is the part containing the pressure that forms the inlet pipe up to (and including) the fixed portion of the closing nozzles.

12 - Outlet diameter - The nominal diameter of the outlet of a relief valve (unless specified otherwise).

13 - Overpressure - The increase in pressure above the setting pressure, normally expressed as a percentage of the setting pressure.

14 - Popping pressure - This is the increasing inlet static pressure at which the plug moves on opening at a much higher speed than at higher or lower pressures. The phenomenon of popping action occurs only in relief valves applied on compressible fluids.

15 - Pressure containing member - Any part of the relief valve that comes into actual contact with the fluid under pressure that is inside the protected container.





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For the installation and maintenance of proportional lift relief valves type CS35

16 - Pressure retaining member - Any member of the relief valve that applies and is subjected to a force in its function of keeping one or more pressure containing members in position.

17 - Total lift - The design lift at which a valve reaches its nominal discharge capacity (flow rate).

18 - Safety relief valve - A safety member operated by the static pressure at the inlet and characterised by a modulating aperture in proportion to the excess flow rate (relief action).

19 - Pop safety valve - A safety member operated by the static pressure at the inlet and characterised by a rapid aperture or pop action.

20 - Setting pressure - This is the static pressure at the inlet at which a pop safety valve triggers the functional characteristic known as "popping pressure".
This pressure value is stamped on the data plate.

21 - Nozzle - The nozzle is composed of the contact between the fixed and mobile portions of the pressure containing members of a valve.

22 - Nozzle seal pressure - The specified static pressure at the inlet at which a leakage test measurement is made in accordance with a standardized procedure.

23 - Nozzle diameter - The smaller diameter of the ring contact surface between the fixed and mobile portions of the pressure containing members of a valve.

24 - Simmer - The audible or visible discharge of fluid between the nozzle and plug at a static pressure at the inlet less than the popping pressure and with a flow rate that cannot be measured.





INSTRUCTIONS

For the installation and maintenance of proportional lift relief valves type CS35

8. HANDLING, STORING AND TRANSPORT



8.1 Transport

The relief valves, depending on their overall dimensions, can be transported without packing, in cardboard boxes or in wooden crates. All the valves have connections fitted with stoppers to prevent dirt getting inside. To facilitate handling it is possible to secure the packing on a pallet. Observe any instructions on the packing.



8.2 Storing

The relief valves must be kept in a dry place to protect them from the weather. They must not be removed from the boxes or packing until just before installation.

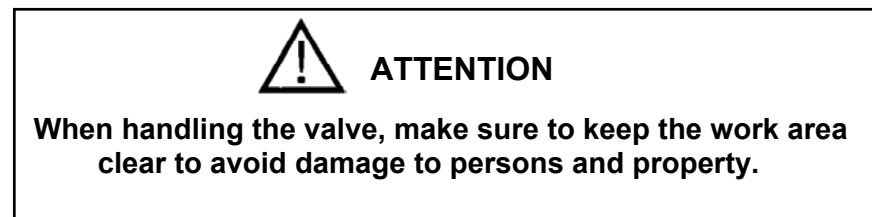
The protection for the flanges and the stoppers must be left on until the last moment. The relief valves, whether packed or not, must not receive any hard knocks.

The valve, whether packed or not, must always be kept upright, that is never set down on one side, to prevent distortion and damage to internal parts.



8.3 Handling

When the valves are taken out of the packing and the flange protection removed, immediately prior to installation, it is necessary to take the greatest care to prevent foreign matter from being able to get inside through the valve inlet and outlet while it is being secured to its connections.





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For the installation and maintenance of proportional lift relief valves type CS35

Valves that are not packed must be moved by hand or lifted by winding a chain or rope around the neck of the outlet connection and then around the upper structure of the bonnet so as to make sure the valve is kept upright during lifting and never gets into a horizontal position.



ATTENTION

Lift packed valves with the inlet flange at the bottom.

For handling and positioning inside the plant use a hand trolley or, for large valves, use a fork-lift truck. While lifting up to the point of installation, take care not to knock the valve against the metal structure or other objects.



ATTENTION

If the valve receives any hard knocks it is advisable, before being installed, to have its conditions checked by CARRARO.



I N S T R U C T I O N S

For the installation and maintenance of proportional lift relief valves type CS35

9. LIMITS ON USE

9.1 Carraro CS35 relief valves are not intended for use with cyclic loads.

9.2 CS35 valves are intended for use at temperatures below the limits where creep prevails.

10. RECOMMENDATIONS FOR INSTALLATION

1 - The valves can be used on:

a) Liquids

Refer to the installation diagram of Fig. 2

2 - The valves must be fitted upright, directly on the appliance or on the piping to protect

3 - No valve of any kind must be installed between the relief valve and the manifold, nor on the outlet pipe between the relief valve and the atmosphere.

4 - In no case may the valve inlet pipe have a smaller diameter than the nominal size of the valve inlet and it must be no longer than three times the diameter.

5 - A high loss of head at the valve inlet will cause it to open and close again in extremely quick succession, known as "hammering".

It may have the consequence of both a decrease in discharge capacity and damage to the surface of the valve nozzles.

Considerable hammering protracted over time can cause damage to other parts of the valve too. The following recommendations will help eliminate the factors that cause hammering:

a) The corners of the manifold connection section must be bevelled with a radius no less than 1/4 of the diameter of the aperture.

b) The loss of head due to friction as far as the valve inlet must not exceed half the blowdown for the valve.

To decrease the effects of the phenomenon known as "resonance" the following recommendations apply.

a) The valve must be installed at a distance of at least 8 - 10 diameters after a bend in the piping. This distance must be increased when the valve is installed on a horizontal length of the line preceded by a vertical length.

b) A relief valve will never be installed at less than 8 - 10 diameters either above or below a Y branch, whether it is converging or diverging.

c) When the piping setup makes it impossible or impractical to keep to the above two recommendations, the edges downstream from the connection section will be bevelled more than the edges upstream.

The bevel radius of the edge downstream must be equal to or at least 1/4 of the passage diameter and will gradually be reduced so that a small portion of the edge upstream remains with a bevel of a small radius.

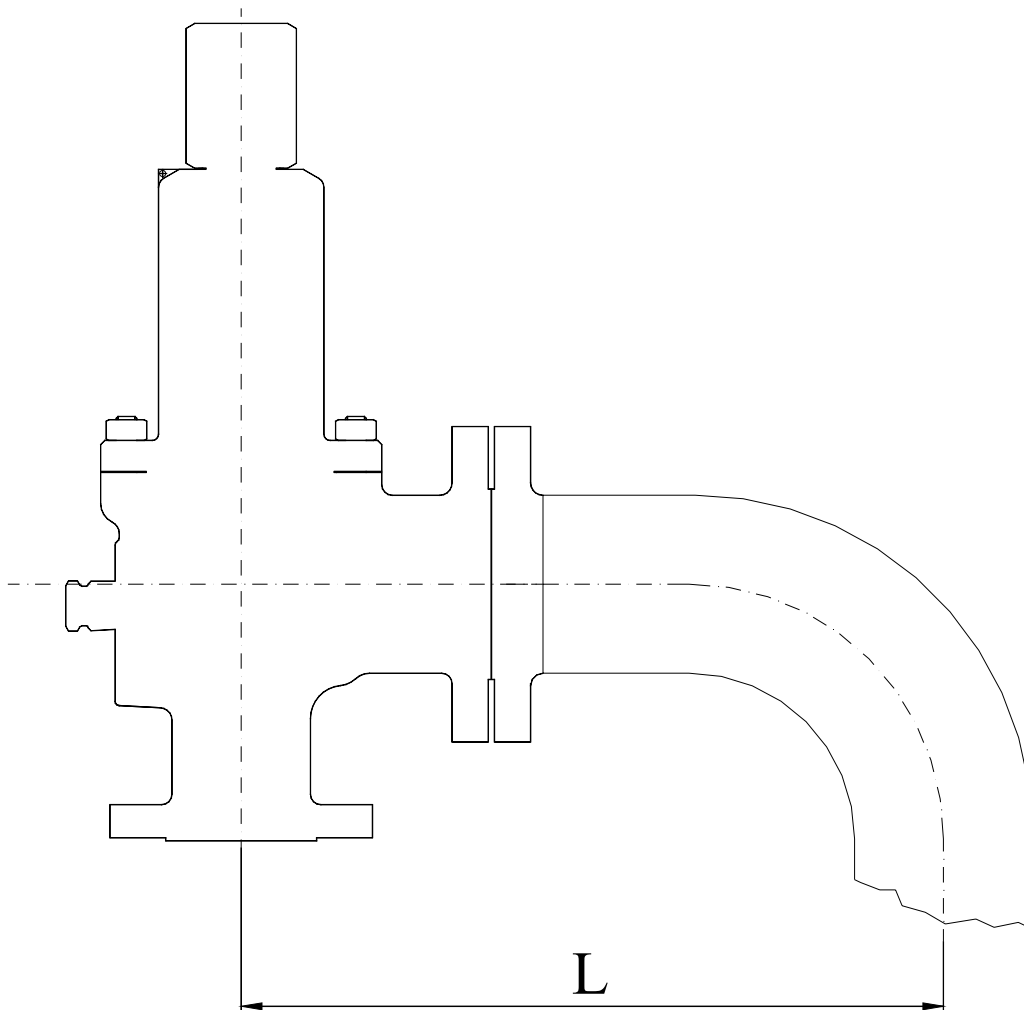
d) The relief valves will never be applied on the line in a position directly opposite to a branch.



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For the installation and maintenance of proportional lift relief valves type CS35

Fig. 2
Valves type CS35 used with liquids.



PRESCRIPTIONS FOR OUTLET PIPING

Distance L – As short as possible (gauge plus twice the diameter of the outlet pipe). If the outlet pipe is longer than the stated max, it is necessary to have suitable supports (so as not to produce forces of an external origin, such as expansion, on the valve) to sustain the weight of the piping and the forces of reaction caused by the discharge.



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For the installation and maintenance of proportional lift relief valves type CS35

Strong vibration of the piping can cause shifts in the setting of a relief valve. Vibration can cause hammering and thereby damage the valve and reduce the discharge capacity. This vibration also contributes to an increase in leakage through the nozzles.

It will therefore be necessary to pay full attention to eliminate this trouble before putting the valves into operation on the unit.

Liquid flowing vertically from an outlet elbow causes an upwards reaction on the elbow. Bending stresses on the valve are determined by the product of the force of reaction for the arm of the moment between the point where the liquid comes out and the section considered to be subject to bending.

When designing the assembly system of a relief valve it is necessary to foresee the effects on all the components of the valve and on the outlet pipes of both the reaction forces and the vibration and seismic loads.

To assure perfect performance it will be necessary to have a regular control and maintenance service with at least two yearly frequency, provided there is no leakage between the seats.

For this service to be performed effectively it is necessary for the valves to be installed so as to be easily accessible.

If two or more valves are fitted near, the outlets should be parallel to each other so that there is minimal chance of damage for the maintenance personnel working by them.

The relief valves must be installed in an upright position.

The nominal tolerance is 1 degree.

The cross-section of the outlet pipe of a relief valve must be at least equal to the cross-section of the valve outlet connection. If more than one valve is connected to a single outlet pipe, the cross-section of the latter must be at least equal to the sum of the cross-sections of all the outlet connections of the valves connected to it.

All the relief valve outlets must be channelled into pipes that do not obstruct passageways or platforms and must be conveyed into a suitably inert environment compatibly with the working fluid in the plant.

The outlet pipes must be installed so as not to cause any forces on the relief valve that could produce distortion of the body and therefore break the seal.

Bear in mind the following recommendations:

a) The outlet pipes must not be supported by the valves.

The weight on the valve outlet must at most be equal to that of one flange.

b) The area between the outlet pipe and the discharge line must be sufficient to prevent interference taking account of movements, due to heat expansion, of the manifold, valve and discharge pipes. It is also necessary to take account of the movements due to vibration, changes in temperature and forces of reaction on the valve.

c) Flexible metal pipes are not as a rule recommended; if they are used to connect the valve to the discharge line they must be sufficiently long and be designed and installed so as never to become rigid no matter what configuration they may take on.

More certain results are obtained if the flexible pipes are installed so that the movements are permitted by bending rather than by stretching or axial compression.

When lifting a valve it must always remain in an upright position. The valve can be lifted with a sling around the bonnet and the neck of the outlet flange.

The valve must not get knocked or dropped during installation. If the valve falls it is necessary to check it has not got damaged and its setting must be checked.



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For the installation and maintenance of proportional lift relief valves type CS35

At the time of installation it is necessary to take off the protective covers at the valve inlet and outlet. It is necessary to check that the insides of the valve are clean. There must be no foreign bodies at the inlet or outlet of the valve as they could damage the valve components or fall into the manifold. All the surfaces that must ensure the pressure seal by tightening a gasket must be checked to see they are clean and have no defects that could cause leakage. Burrs, scoring, flaws in the surface, etc. are all possible causes of a seal defect.

Before fitting the valve check that the gaskets are suited for the dimensions and pressures at play.

It is extremely important for the gaskets used to be the correct size for adapting to the flanges and for the passages to the inlet and outlet to be kept perfectly clear. The gaskets, seal surfaces, nuts and bolts must be suited for the pressure and temperature at play.

Take account of the following points for installation:

a) Fit the inlet gasket, if there is one, on the manifold connection flange. Check cleanliness, etc. When possible the studs of the connection flange are used to guide the valve to be adapted on the flange. The studs must be lubricated with suitable lubricant.

b) When fitting flanged valves the nuts of the bolts will be tightened evenly to prevent distortion, alignment defects and seal defects.

c) When the valve is in position fit the nuts and tighten them by hand. Tighten them then alternately. As an additional precaution, while tightening the bolts, check the distance between the two flanges to make sure they are tightened in parallel with each other. For this purpose you can use a compass gauge. At the end make a general check to see that all the prescriptions have been satisfied.

d) In the same way you can now fit the discharge pipe. First make a careful inspection of all the parts, checking they are thoroughly clean. The bolts must be suitably lubricated.

e) Fit the outlet gasket with the nuts. Tighten the nuts by hand and then proceed as described in point c).

This pipe, too, must be definitely flexible so as to cause no stress on the valve under any working conditions.

When the valves have threaded connections, screwing and tightening on the inlet section must be done by using belt or chain wrenches, gripping the valve on the cylindrical portion of the bonnet.

During this operation do not subject the valve to sudden tightening or knocks. Do not use clamps when tightening. Any gaskets or products used to ensure a better seal on the inlet connection threads must not obstruct or deposit in the valve inlet line. The same precaution must also be taken when tightening the discharge pipe.





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For the installation and maintenance of proportional lift relief valves type CS35

11. DETERMINING FORCES OF REACTION

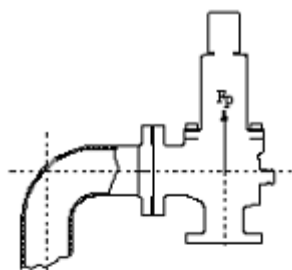


Fig.3 Valve closed

The figure on the left illustrates a relief valve type CS35 in its different operating modes. With the valve shut (Fig. 3), an upwards force is exerted in the valve collar due to the internal pressure of the valve. The valve collars are made so as to withstand the force (Fp) and tangential stresses originating from the internal pressure of the valve.

On opening the valve (Fig. 4), the force (Fp) remains constant until overpressure occurs.

The force resulting from the setting pressure plus the overpressure (Fsp) must be balanced by the forces of resistance in the valve collar.

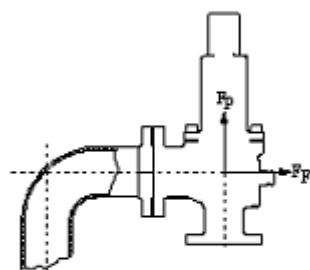


Fig.4 Opening transitory

After opening the valve, before the flow rate is established through the discharge curve a force of reaction (FF) acts sideways at the valve outlet. If the valve were not at the discharge, connected at a bend, but discharged horizontally, this force would continue throughout the discharge cycle and would be equivalent to FR.

Once the flow rate has stabilized (Fig. 5), the impact of the fluid on the discharge curve cancels the force (FF), and the fluid comes out downwards through the outlet; this gives a force (FR) acting upwards along the centre line of the discharge curve.

This force, associated with the arm (L) produces a bending moment in the collar of the valve. In addition it produces an unbalanced upwards force on the manifold to which the valve can be connected; this force must be compensated by the bracket of the spring or some other system.

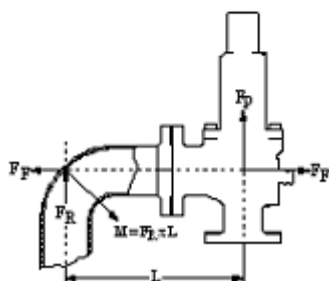


Fig.5 Valve open at regime condition

The force FR [Newton] is given by the equation:

$$FR = \frac{Q}{3600} \cdot V + 10PA$$

A= outlet area, [mm²]

Q= mass flow rate, [Kg/h]

P= static pressure, [bar]

V= Velocity, [m/s]

In addition to the actual flow rates of the valve, the values of the force of reaction are based on the pressure, temperature and configuration of the valve.



INSTRUCTIONS

For the installation and maintenance of proportional lift relief valves type CS35

12. STARTING UP



ATTENTION

The valve has been factory set with oil at ambient temperature and atmospheric back pressure. For temperatures other than ambient temperature resetting will be necessary for the actual operating conditions.



ATTENTION

Before acting on the valve to change the setting make sure that the working pressure is under blow-down so that the valve is completely closed.

13. SETTING

13.1 Setting relief valves type: CS 35 (see point 3.1)

To adjust the setting pressure you need to proceed as follows:

- a) Remove any seal and unscrew the cap (1).
- b) Loosen the locknut and turn the setting screw (2) clockwise (screwing in) if you want to increase the setting pressure or in the opposite direction (unscrew) if you want to decrease it.
- c) Tighten the locknut and refit the cap (1).

14. BLOWDOWN

When the cause of the relief valve opening ends, the pressure in the protected appliance starts decreasing. The valve always closes at a lower pressure than the setting pressure.

The difference between the closing pressure and the setting pressure is called BLOWDOWN for short and is expressed as a percentage of the setting pressure.

For example:

Setting pressure: 10,0 bar

Closing pressure: 8 bar

BLOWDOWN 2 bar or blowdown 20%.





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For the installation and maintenance of proportional lift relief valves type CS35

15. OPERATING TROUBLE

The most common trouble is: leakage and blockage with the valve partially open. Some trouble can arise from wear, damage to internal parts, defective installation or adjustment.

15.1 - Fluid leakage.

15.1.1 Fluid leakage in valves type CS 35: (Point 3.1)

It is extremely important for the normal working pressure to always be less than the setting pressure by at least 20%; on the contrary, the force applied by the spring on the plug to make the seal is so small that a slight oscillation in the pressure would suffice to start a leak. There is very slight fluid leakage (that can be noticed by a hissing sound) when the pressure has nearly reached the point of opening, this can be neglected and it only indicates that there are slight irregularities on the surfaces of the seal seats. Whereas larger fluid leakage indicates that the nozzle is damaged. There can also be continual leaks at normal working pressure considerably under the valve closing pressure.

15.2 Blockage.

Blockage with the valve partially open can occur in the phase of closing.

The main causes of this phenomenon are:

- 1) - incorrect blowdown;
- 2) - friction of a mechanical origin.

15.3 Lowering of the setting pressure.

Lowering of the setting pressure is often ascribed to the spring losing elasticity.

Barring extraordinary cases it is on the contrary caused by damage to the seal seats caused by foreign bodies or by the difference in heat distribution in the internal parts of the relief valve between one discharge and the next. Therefore, carefully check whether there is any leakage before modifying the setting. Do not carry out repeated tests a short time apart, but let the valve cool down first.

16. PERIODICAL CHECKS ON RELIEF VALVES

To make sure that the relief valves remain in the conditions of operational efficiency at which they were sold you need to plan for a regular service of inspection and maintenance, with a *frequency of at least every two years*, provided there is no leakage between the seats, by technicians from Carraro or Authorized Centres.

If the protected structure stops working, it is recommended to make the check immediately prior to stopping in order to be able to take advantage for any necessary maintenance work.



I N S T R U C T I O N S

For the installation and maintenance of proportional lift relief valves type CS35

17. TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
THE VALVE DOES NOT MAKE A COMPLETE LIFT	FOREIGN MATTER TRAPPED BETWEEN THE PLUG HOLDER DISC AND GRID	DISASSEMBLE THE VALVE AND CORRECT ALL THE TROUBLE AND CHECK THAT THE PLANT IS CLEAN
INCORRECT SETTING	IMPROPER ADJUSTMENT OF THE ADJUSTING SCREW	ADJUST THE SETTING
THE VALVE LEAKS OR HAS IRREGULAR BLOWDOWN ON OPENING	-DAMAGED NOZZLES -THE DISCHARGE PIPE FORCES ON THE OUTLET	DISASSEMBLE THE VALVE, LAP THE SEATS AND RENEW THE DISC CORRECT AS NEEDED
BLOCKED OPEN OR NO COMPLETE CLOSURE	-FOREIGN MATTER - IMPROPER TOLERANCE BETWEEN OBTURATOR AND GUIDE	DISASSEMBLE THE VALVE AND CORRECT ALL THE TROUBLE CHECK THAT THE SYSTEM IS CLEAN CHECK TOLERANCES
EXCESSIVE BLOWDOWN ON CLOSING	EXCESSIVE BACK PRESSURE	DECREASE THE DISCHARGE PRESSURE INCREASING THE DIAM. OF THE OUTLET PIPE
BLOWDOWN ON CLOSING TOO SHORT	- EXCESSIVE HEAD LOSS AT INLET - IMPROPER VALVE DIAMETER	REDUCE THE HEAD LOSS AT INLET TO LESS THAN HALF THE REQUIRED BLOWDOWN CHECK THE SIZE OF THE VALVE





I N S T R U C T I O N S

For the installation and maintenance of proportional lift relief valves type CS35

18. MAINTENANCE

18.1 Routine and/or preventive maintenance

In order to ensure correct valve operation it is necessary to submit them to checks as described above (see paragraph 16) when it is necessary to renew the pack of gaskets that are essential to prevent intercommunication between the outside and inside of the valve (dangerous situation for personnel both because the working fluid is at high pressure and temperature and because the expelled fluid could spark off a potentially explosive atmosphere).

18.2 Spare parts

To order spare parts, state the valve serial number, type, size and setting pressure of the valve. Every cross-sectional drawing of the valves gives the spare parts we recommend keeping in stock to handle fast repairs.



ATTENTION

Before starting disassembly and maintenance work make sure that the valve is not under pressure.

19. RELIEF VALVE DISASSEMBLY

19.1 Disassembly of relief valves type CS 35 (orif. G-J) (Fig.1)

- Remove any seal and unscrew the cap (1) ;
- loosen the locknut and unscrew the setting screw (2) (anticlockwise) counting the number of turns until the spring is completely discharged;
- unscrew the nuts (11) and extract the yoke (4) from the valve body;
- remove the spring pack (5-6-7-8-9);
- take off the cover (13) and the plug holder disc (20) from the grid (18);
- extract the grid (18);
- if necessary, renew the disc (19).





INSTRUCTIONS

For the installation and maintenance of proportional lift relief valves type CS35

19.2 Lapping the nozzles

To face the sealing surface of the nozzle (16) use a smooth cast-iron ring (which can be supplied on request by CARRARO) and abrasive paste.

- 1) keep the pieces thoroughly clean;
- 2) frequently change the emery on the lapping ring;
- 3) apply a very thin layer of abrasive paste on the lapping ring. This will prevent the edge of the nozzle from getting rounded;
- 4) when lapping the nozzle, pay attention so that the emery ring does not fall onto it and dent it;
- 5) do the lapping, with reciprocating motion, using the special ring in every direction, pressing evenly and turning the ring slowly.
- 6) frequently change the paste after removing the old one;
- 7) to control the lapping on the nozzle, take off all the abrasive paste from it and from the lapping ring. Polish the nozzle with the same thoroughly clean ring, making the same movements described above for lapping. If there are any hollows on the sealing surface they will appear as shadows in contrast with the polished portion. In this case further lapping is needed. Bear in mind that good lapping always requires using lapping rings with absolutely flat surfaces; to remove shadows it only takes a few minutes of lapping;
- 8) when the lapping is concluded, if there are any radial lines they can be removed by turning the lapping ring around its axis after removing all the abrasive paste. Carefully clean the sealing nozzles with paper or thread-free cloth. If the indentations on the nozzle are such as to require lapping over 0,25 mm deep it is advisable to return the valve to Carraro for repair, unless on site you have an equipped workshop to do the restoration work. Bear in mind that when turning all the profiles must be faithfully reproduced, otherwise the relief valve will no longer work regularly.

LAPPING RINGS

Orif.	Code
G	70 01 T0196
J	70 01 T0197

ABRASIVE PASTE

Type	Grain	Function
Tetrabor	400	General
Tetrabor	800	Finish
Tetrabor	1000	Polishing

Two lapping rings are recommended for each orifice.





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For the installation and maintenance of proportional lift relief valves type CS35

20. CHECKS AND MAINTENANCE ON THE SPRINGS FITTED ON THE RELIEF VALVES

The springs of the relief valves are protected on the surface by a treatment or coating suited to the environmental situation indicated by the customer at the time of the request and of the order.

If no special indication is given, it is presumed that the installation environment is the normal one of industrial works with non-aggressive atmosphere, or heating plants, or ordinary residential installations.

If fitted outdoors, it is presumed that the valves are anyhow protected against dirt and moisture.

The springs are normally aluminized or protected with aluminium paint.

They can remain in service for many years without getting particularly damaged or corroded.

During periodical maintenance to the plants it is necessary to carefully check the state of repair of the surfaces of the springs.

If the surface protection is penetrated, carefully brush the surface and restore the protection.

If experience shows that the local atmosphere tends to attack the protection quite quickly, the painted surface can be further protected with a layer of temperature-resistant protective grease.

The springs inserted in a closed cover and exposed to sudden changes in temperature with the possible consequence of moisture condensating on the inside surfaces, or the ones exposed to being wet by the liquids contained, are more susceptible to damage and must therefore be checked more frequently.

Bear in mind that rust or corrosion over time cause a reduction in the strength of the spring and the formation of concentrated stresses with the consequent creation of points of incipient breakage that can cause the spring to yield.

Checking the state of repair of the surface of the spring and its maintenance are therefore essential for conserving the efficiency of the relief valve.



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For the installation and maintenance of proportional lift relief valves type CS35

21. REFITTING RELIEF VALVES

21.1 Refitting relief valves type CS 35 (orif. G-J) (Fig.1)

- Place and fixed the grid (18) onto the seat (15) by means of the pins (17);
- Insert the disc (19) within the plug holder disc (20).
- Assemble plug holder disc (20) into the cover (13) using lubricant between the surfaces in relative sliding;
- Place the plug holder disc (20) and the cover (13) into the grid and put o'ring gasket (12) on the upper surface of the cover;
- Fit the spring pack (5-6-7-8-9) back in, place gasket (21), fit the yoke (4) back on and tighten the nuts (11)
- Screw the adjusting screw (2) with same number of turns necessary to raise the compression when the valve was dismantled.
- Tighten the locknut and refit the cap (1) into contact with the gasket.

21.2 Checking the gaskets

During reassembly check the efficiency of the existing gaskets (3, 12, 21, 22) and, where necessary, change them.



ATTENTION

If it is necessary to do any welding on the pipes, do not connect the ground socket on the valve since important sliding parts could be damaged.





INSTRUCTIONS

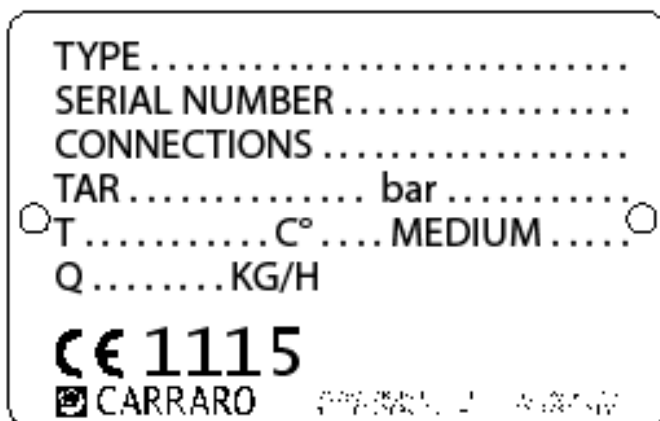
For the installation and maintenance of proportional lift relief valves type CS35

22. REPAIR

22.1 If it is not possible to remedy the trouble, it is necessary for the defective valves to be sent to the supplier/manufacturer accompanied by a report on the trouble.

22.2 To receive spare parts and information, always state the serial number on the data plate applied on the valve or stamped on the outer surface of the flanges.

22.3 Data plate (example)



22.4 To guarantee correct operation of the valves treated in this manual it is necessary for their maintenance to be performed by Carraro technicians or by Carraro Authorized Centres using genuine spare parts.



ATTENTION:

In all the relief valves there are means of sealing the external adjustments. At the time of shipment the valves are sealed by CARRARO or by the inspection authority. The seals must be applied so that it is possible to change the adjustment without breaking them. Unauthorized breakage of the seals invalidates warranty.



ATTENTION!

The manufacturer declines all responsibility for modifications to the product or actions not contemplated in this manual.

