TYPE 3600 SAFETY RELIEF VALVE

The Type 3600 Safety Relief valve is designed to have a short 'simmer', then to open rapidly to the full open position, and to re-seat at a controlled pressure. When the valve is in its fully lifted position, the discharge area is controlled by the bore of the nozzle, which ensures that flow calculations for various mediums can be reliably made.

Valves are supplied in sizes ½" to 1" and can be manufactured in Cast Steel or Stainless Steel (other materials available on request) with ends screwed male x female, female x female or flanged to customer requirements.

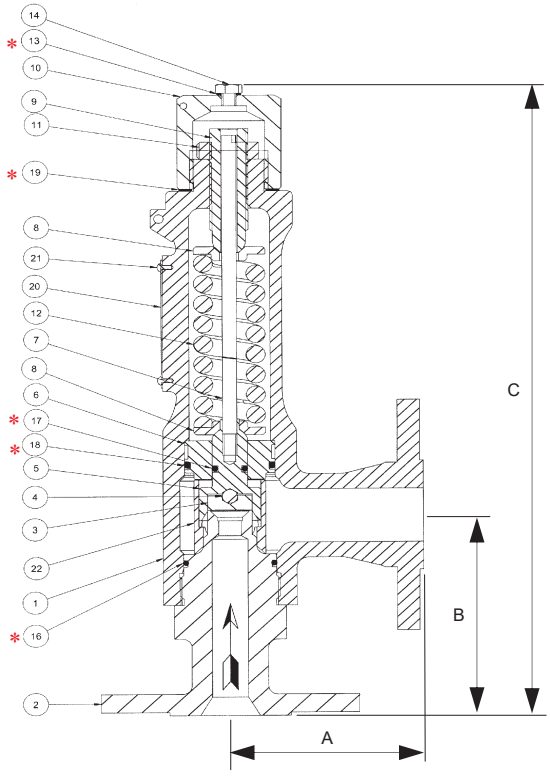
Valves can also be supplied with a packed lever lifting device, a limit switch to indicate opening and closing of the valve, or a governing ring to limit adjustment of the spring to the set point, for ease of resetting.

Limits and Standards
Minimum Set Pressure: 0.7 BARg
Maximum Set Pressure: 250 BARg
Orifice Designation 'D': Liquid 0.110 sq. in. / Gas 0.134 sq. in.
Design Standard: ASME B&PV Code, Section VIII Division 1: 2007 + 2009 Addenda
API Standard 520, 8th Edition, December 2008: Part 1
Materials of Construction: Stainless Steel, temperature range for type 316 is limited to –190°C to +548°C
Duplex Stainless Steel materials are limited to –29°C * to +315°C.
* Lower temperatures are permitted when the requirements of ASME VIII Div 1, UHA-51 are met in full.
Lapped Nozzle and Disc seating surfaces / Nitrile O Rings.
Many parts can be changed to suit customer requirements.
All materials used in the construction of the Type 3600 Safety Relief Valve comply with the impact testing requirements of Section UHA-51, ASME VIII, Div 1 2010.

Key Features
Opens rapidly with a maximum overpressure of 10% to full design lift.
Maximum blowdown of minus 7% for gases and minus 20% for liquid service.
Designed in close cooperation with industry specialists.

Industry Sectors
Chemical Injection
Metering Skids
Technical Gases
Hydraulics

Typical Flanged Type 3600 for Liquid



Installation
During installation of the valve avoid bumping or shaking to prevent damaging the end connections, or misalignment of the trim. To remove any foreign bodies, blow through the circuit line on which the valve is to be installed. Clean the valve and nozzle connections thoroughly; as foreign bodies on the nozzle may damage the valve seat during popping. Install the valve in a vertical position only, with the inlet downwards. After the valve has been installed make it pop at least twice to allow automatic alignment of the trim. Misalignment may be caused accidentally during transport or installation.

Maintenance
The most frequent operation to be carried out is a precise check, made a regular intervals, to observe whether any obvious faults exist in the different parts of the valve. It should be checked first of all that there are no leakages: these must always be avoided, especially when the medium is poisonous, highly volatile or very expensive. Carry out periodic venting for valves with a lifting device to check regular operation. During these tests the pressure must be at least 75% of the full working pressure.

Overhaul
To overhaul the valve the following procedure should be followed: remove the cap, mark the position of the Adjusting Screw relevant to the Locknut, so the correct position may be found during re-setting. Loosen the Adjusting Screw and Locknut to relax the spring, remove the Lockscrew from the Valve Body to free the Guide Ring. Unscrew the Nozzle from the Valve Body and
remove the complete Lid assembly from the inside of the body. Check the contact faces of the Nozzle and Disc. Should any scratching or pitting be present, the surfaces will require relapping. Replace all Joints and O Rings and reassemble the valve in reverse order. To prevent damage to the Disc and Nozzle faces, place a screwdriver in the spindle slot. This will prevent the spindle from turning whilst resetting the valve.

Item	Description	Material (S)	Material (C)
1	Valve Body	Stainless Steel	Carbon Steel
2	Nozzle	Stainless Steel	Stainless Steel
3	Disc	Stainless Steel	Stainless Steel
4	Ball	Stainless Steel	Stainless Steel
5	Disc Holder	Stainless Steel	Stainless Steel
6	Guide Ring	Stainless Steel	Stainless Steel
7	Spindle	Stainless Steel	Stainless Steel
8	Spring Carrier	Stainless Steel	Stainless Steel
9	Adjusting Screw	Stainless Steel	Stainless Steel
10	Cap	Stainless Steel	Carbon Steel
11	Locknut	Stainless Steel	Stainless Steel
12	Spring	Stainless Steel	Stainless Steel
* 13	Joint, Plugs	Non Asbestos	Non Asbestos
14	Cap Plug	Stainless Steel	Stainless Steel
15	Lockscrew (Not Shown)	Stainless Steel	Stainless Steel
* 16	O Rng	Nitrile	Nitrile
* 17	O Ring	Nitrile	Nitrile
* 18	O Ring	Nitrile	Nitrile
* 19	Cap Joint	Non Asbestos	Non Asbestos
20	Nameplate	Stainless Steel	Stainless Steel
21	Rivets	Stainless Steel	Stainless Steel
22	Huddling Ring (Liquid Duty Only)	Stainless Steel	Stainless Steel

* These Items are recommended spares.

Valve Size	A	B	C	Weight
Screwed Valves				
½" x 1"	48	83	285	4
¾" x 1"				
1" x 1"				
Flanged ANSI 150 x ANSI 150 Valves				
½" x 1"	81	95	297	6
¾" x 1"				
1" x 1"				
Flanged ANSI 300 x ANSI 150 Valves				
½" x 1"	81	98	300	6
¾" x 1"		100	302	
1" x 1"		101.5	303.5	

TYPE 3600 SAFETY RELIEF VALVE

Category IV Safety Accessory
Type 3600 Relief Valve

CE
Notified Body No. 0038

Application
Suitable for compressed air, gas, water, oil and steam service.

Operation
The set pressure can be varied as required by compressing or relaxing the spring using the adjusting screw:

Clockwise turns compress the spring increasing the set pressure.
Anti-clockwise turns relax the spring decreasing the set pressure.

Lifting and Handling
Wooden cases should be lifted using either a Fork Lift Vehicle or a Crane with adequate Safety Approved slings applied to carry the weight, which will be evenly distributed within the case.

Important: All manual handling operations should be carried out in compliance with the Manual Handling Operations Regulations 1992 (SI 1992/2793) (EC Directive 90/269/EEC).

Storage
Valves with Screwed ends shall have plugs fitted in their connections to prevent ingress of dirt etc. Flanged valves shall have their bores blanked off.

We recommend that plugs/blanks be removed immediately prior to installation.

General

1.When a new valve leaves Broady Flow Control, it has been manufactured and tested by trained and experienced personnel. When you remove a valve from your system and perform the maintenance tasks that are outlined herein, you will need proper training.

Do **not** attempt to accomplish these tasks without adequate training and understanding of the valve operation.

2. Any and all stated or implied warranties that are in effect during the purchase of a new Broady valve are null and void once the valve has been disassembled by someone other than approved Broady personnel.

3. The contents of this document are subject to change without notice.

Safety Warning!
Discharge from outlet may be violent and must not be allowed to create a hazard to persons or

Testing
It is recommended that the following tests be carried out before installation of the valve: Seat tightness and set pressure.

Test Equipment
Connect valve inlet to a pressure vessel in which pressure may be raised gradually and measured by means of a precision pressure gauge.

Seat Tightness Test

The valve outlet should be fitted with an appropriately sized leakage detector (see Fig. 1) in accordance with API 527.

Raise inlet pressure to 90% of set pressure and check that not more than 40 air bubbles per minute pass through the water.

Should the leakage exceed the stated value, refer to table "Faults in Operation" (Fig. 2)

EQUIPMENT FOR SEAT TIGHTNESS TEST

Fig. 1- API 527 compliant leakage detector

Set Pressure Test
Check that valve starts opening at required set pressure (refer to Valve Nameplate for correct value).

Changes outside the stated tolerances must be corrected by varying the spring compression using the Adjusting Screw (9).

To regulate the set pressure:
1. Fit valve to Test Rig with no pressure on valve inlet.
2. Remove the cap (10).

3. Prevent Disc Holder (5) rotating by holding Spindle (7) with screwdriver in slot on Spindle end.

4. Loosen Locknut (11) (fitted to Adjusting Screw (9)
5. Adjust using Adjusting Screw (9) until the desired set pressure is achieved. Do not allow Disc Holder (5) to rotate.
6. Reassemble Cap (10).
Note: For each successive set pressure check; Locknut (11) **must** be tightened.

Installation and Commissioning
It is most important that the pipeline and valve connections be clean and free from dirt, scale, etc.
Avoid bumping or shaking valve to prevent misalignment of trim and damage to flange faces.

Fit valve in pipeline with flow direction as indicated by arrow cast on valve body; with inlet down and Adjusting Screw in vertical position above pipeline.

It is also advisable to fit a stop valve on high-pressure side of line.

Use inlet and outlet pipework as short as possible and of dimensions equal to the valve connections.

Uniformly tighten fasteners securing valve connections to pipework.

Secure outlet pipework in order to reduce vibration and avoid strain on outlet flange.
Avoid elbows with small curvature radii on the outlet pipe: for high temperature gas and vapour discharge, use expansion joints.
After valve has been installed, make it pop at least twice to allow automatic alignment of trim.

Maintenance

Regular Checks:
Check at regular intervals for signs of obvious faults.

Leakages must be repaired immediately, especially when the medium is poisonous, highly volatile or very explosive.

When valve is fitted with lifting device, vent periodically (at least three or four times a year) to check operation. During these tests, the pressure must be at least 75% of the full working pressure.

Annual Checks:
Examine annually for signs of defect, damage or deterioration.
Give special attention to contact/seating faces. If damaged, these must be re-machined and lapped in.

Springs should be replaced if there is any sign of deterioration.

All parts should move freely in their respective guides.

Note: Quote the unique valve serial number when ordering spare parts.

Lapping the Disc

Use a cast iron or plate glass block of suitable size, with a perfectly smooth and flat surface. Apply a small quantity of lapping compound to smooth surface of block. Pass Disc (3) across smooth surface in a figure of eight movement. Lift Disc periodically away from block so that lapping compound may flow from edges towards centre.

Lapping the Nozzle Seat
Use a cast iron or plate glass block of suitable size; check that it does not tilt, to avoid rounding off edges. Apply lapping compound to smooth surface of block. Pass Nozzle seating surface across smooth surface in a figure of eight movement. During lapping operation, make sure no foreign matter is on either lapped surface or block.

Note: Lapped parts must be carefully cleaned before assembling, to remove every trace of lapping compound.

Safety Warning!
Before dismantling, ensure that the valve has been isolated from the pressure and the adjusting screw has been removed.

Dismantling and Reassembly

Dismantling: Note:- Small Loose Parts in Valve
1. Remove Cap and Joint (10 & 19).
2. Measure position of the Adjusting screw (9) and record for re-assembly purposes.
3. Slacken Locknut (11) and unscrew Adjusting screw (9).
4. Remove Lockscrew (15).
5. Unscrew Nozzle (2), lift off Body(1) and O-ring (16) attached to Nozzle
6. Remove Disc(3) & Ball (4) from Disc holder(5)

7. Remove Disc Holder(5), Spindle(7) & O-ring(17) from valve.
8. Remove Guide Ring(6),O-ring(18),Spring Carriers(8) & Spring(12) from Body(1) by firmly tapping Body on a clean wooden surface to knock out Guide Ring(6).

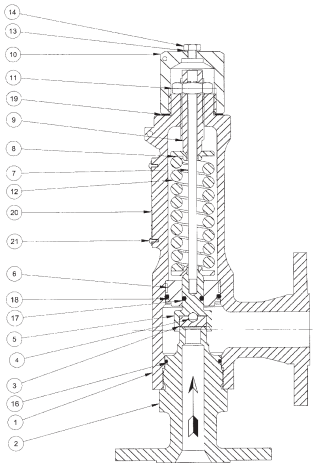
Note: Replace all Joints & O-Ring with new ones.

Danger of Explosion!
Oxygen Service - Carefully degrease all components before assembling valves. Failure to do so will result in an explosion.

Reassembly:
Carry out the operations listed for disassembly in reverse, taking care to avoid scratching lapped surfaces.

To prevent damage to Disc/Nozzle faces, hold Spindle (7) with screwdriver in the slot on the Spindle end whilst turning Adjusting Screw(9) & compressing Spring(12)

Clean the trim thoroughly throughout. Lubricate Adjusting Screw, Spring Carrier and all threads with graphite grease.



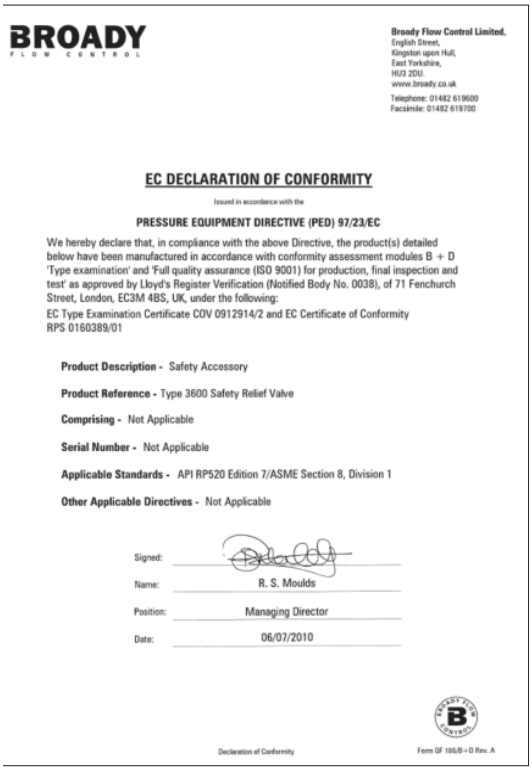
Item	Description	Qty
1	Valve Body	1
2	Nozzle	1
3	Disc	1
4	Ball	1
5	Disc Holder	1
6	Guide Ring	1
7	Spindle	1
8	Spring Carrier	2
9	Adjusting Screw	1
10	Cap	1
11	Locknut	1
12	Spring	1
* 13	Joint , Plugs	2
14	Cap Plug	1
15	Lockscrew	1
* 16	O Ring	1
* 17	O Ring	1
* 18	O Ring	1
* 19	Cap Joint	1
20	Nameplate	1
21	Rivets	2

* Recommended spare parts

TYPE 3600 SAFETY RELIEF VALVE

Fig. 2 - Faults in Operation

FAULT	CAUSES	SOLUTIONS
Leakage	(1) Presence of foreign matter between seat and disc	(1) Discharge valve once or twice consecutively. Should leakage continue, disassemble valve and clean trim.
	(2) Scratching or pitting on seat surface	(2) Disassemble valve, grind and lap seat.
	(3) Valve used with a medium other than specified when ordering	(3) Lap seat and disc more finely if the valve originally ordered for liquid service is used with gas
	(4) Valve not mounted vertically.	(4) Correct installation.
Discharge at incorrect pressure	(1) Variable back pressure	(1) Check that discharge takes place in piping, whose dimensions are equal to or greater than those of the outlet connections of the valve, and that the discharge piping is free from obstruction.
	(2) Back pressures different from specified when ordered	(2) The valve must be re-calibrated, correcting the spring compression for the revised set pressure.
	(3) Loosening of lock nut on spring adjusting screw.	(3) Tighten lock nut after re-calibrating the valve.
	(4) Poor trim alignment.	(4) Discharge the valve 2 or 3 times to allow self-alignment of the trim.
Chatter (rapid opening and closing cycle).	(1) Blowdown ring incorrectly adjusted.	(1) Ensure that the blowdown ring is in the lowest position for liquid service. For valves used on gas; regulate suitably.
	(2) Insufficient discharge capacity.	(2) Check that the discharge piping is not too long. Check that the valve is not undersized.



BROADY
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EC DECLARATION OF CONFORMITY

Issued in accordance with the

PRESSURE EQUIPMENT DIRECTIVE (PED) 97/23/EC

We hereby declare that, in compliance with the above Directive, the product(s) detailed below have been manufactured in accordance with conformity assessment modules B + D 'Type examination' and 'Full quality assurance (ISO 9001) for production, final inspection and test' as approved by Lloyd's Register Verification (Notified Body No. 0038), of 71 Fenchurch Street, London, EC3M 4BS, UK, under the following:

EC Type Examination Certificate COV 0912914/2 and EC Certificate of Conformity RPS 0160389/01

Product Description - Safety Accessory

Product Reference - Type 3600 Safety Relief Valve

Comprising - Not Applicable

Serial Number - Not Applicable

Applicable Standards - API RP520 Edition 7/ASME Section 8, Division 1

Other Applicable Directives - Not Applicable

Signed:

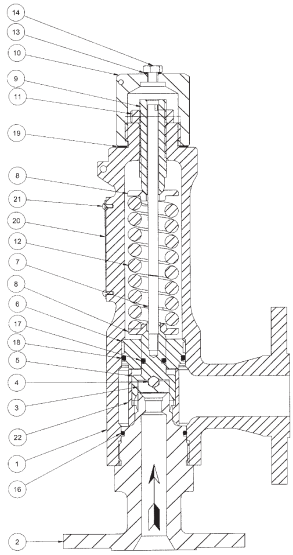
Name: R. S. Moulds

Position: Managing Director

Date: 06/07/2010

Declaration of Conformity

Form QF 106/B + D Rev. A



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* 18	O Ring	1
* 19	Cap Joint	1
20	Nameplate	1
21	Rivets	2
22	Huddling Ring (Liquid Service Only)	1

* Recommended spare parts

TYPE 3600 SAFETY RELIEF VALVE

Numbering System Code

To simplify the selection and specifying of Type 3600 Safety Relief Valves, a numbering system is used in which the digits have a distinct significance.

Examples:-

1. A ¾" ANSI 300 Flanged Inlet x 1" ANSI 150 Flanged Outlet, stainless steel body and trim, without test gag.
   The valve number would be:- **36312-SN-000**.

2. A 1" NPT Screwed Male Inlet x 1" NPT Screwed Female Outlet, stainless steel construction, fitted with a gag.
   The valve number would be:- **36003-SN-001**.

A breakdown of the numbering system is listed below:-

The first and second digit indicate the valve series.

36	3600

The third and fourth digit identify the inlet and outlet end connections.

Third Digit	Inlet Connection
0	Screwed NPT Male
1	Flanged ANSI 150
3	Flanged ANSI 300
5	Flanged ANSI 600

Fourth Digit	Outlet Connection
0	Screwed NPT Female
1	Flanged ANSI 150
2	Flanged ANSI 300

The fifth digit identifies the inlet bore.

Fifth Digit	Inlet Bore
1	½"
2	¾"
3	1"

The sixth digit identifies the body and spring materials.

Sixth Digit	**Body**	**Spring**
C	Carbon Steel SA216 WCB	Stainless Steel
S	Stainless Steel SA351 CF8M	Stainless Steel
A	Alloy Steel SA217 WC6	Inconel X750
B	Aluminium Bronze SB148 C95800	Stainless Steel
G	Gunmetal SB62 C83600	Stainless Steel
L	Alloy Steel SA352 LC1	Stainless Steel
T	Carbon Steel SA216 WCB	Inconel X750

The seventh digit indicates the type of construction.

N	Balanced Arrangement Available Only

The eighth digit indicates the type of bonnet.

0	Closed Bonnet Available Only

The ninth digit identifies the lifting device.

0	None
2	Packed Lifting Lever

The tenth digit refers to the test gag.

0	Without test gag
1	With test gag

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