Stelkon CC

We specialize exclusively in highly reliable industrial type diaphragm non-return valves since 1969.

Product Information Sheet

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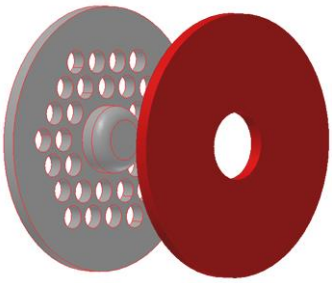
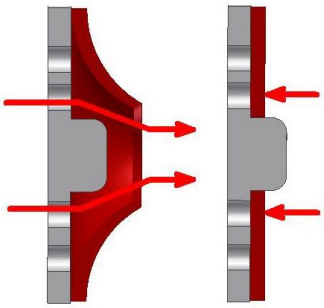
DIAPHRAGM NON-RETURN VALVES

Operation

The operating core of the valve consists of a centre plate and a rubber diaphragm as shown in the sketch on the left. Water flows through the holes in the plate. The sketch on the immediate right shows the diaphragm open, while water is flowing. After the pump stops, the rubber contracts as the pressure drops. At zero pressure the diaphragm seals on the centre boss, as shown on the far right. Closure at the exact point of zero pressure prevents reverse flow. (Reverse flow is a prime contributor to pressure surge and water hammer.) The soft rubber ensures completely droptight sealing even when solids like sand, wood, leaves, grit, slurries, etc. are present in the fluid. Valve operation is completely silent, highly reliable and gives long maintenance free operation. The diaphragm is the only wearing part in the valve.

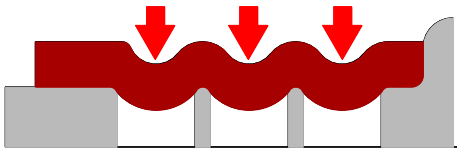




Valves that have operated without interruption for fifteen years and longer are being returned to us for servicing. The record is 34 years of uninterrupted service. Details are available on request.

Shock absorption and silent operation

Back pressure deforms the rubber and presses it into the holes in the centre plate, as shown in the sketch on the right. The resilience of the rubber acts as a pressure spike arrestor by absorbing all shock spikes that are generated in the system. Shock absorbtion reduces system fatigue, down time and the time between repairs of measuring instruments, seals, joints and other system components. Although the shock absorption eliminates spikes and surge in short pipelines it is not sufficient to eliminate the pressure surge generated in very long pipe lines.



TECHNICAL IMPROVEMENTS

Standardisation of models

The designs of all our valves have been rationalised and standardised to meet changing market requirements.

Model codes identify valves: 300-10-R indicates a 300NB valve for 10 bar pressure rating. R is a generic indicator for the model range with latest patent design features.

We can design and supply a valve tailored to any special application. For an offtake of say 3 or more valves the bodies are cast. For one off units valves may be manufactured, especially when special materials are required like stainless steel or nylon.

Conventional pipe flanges

All valves incorporate our new generation patents which provide the latest flow efficiency advances in technology and yield considerable improvements over conventional designs.

- Shaped centre plate inlet orifices with 80% lower head loss.
- Improved body internal profiles which reduce headloss and significantly reduce valve face-to-face length.
- Stretching of the rubber through the hole in the centre of the diaphragm has been virtually eliminated by a new large diameter torpedo. For all practical purposes the diaphragm now functions purely as a flap that stretches only negligibly to allow it to swing away from the plate. Rubber stretching and the concomitant headloss through the diaphragm has been reduced by between 50% and 80%.
- 200%+ increase in the life of the diaphragm (in the standard design): negligible rubber stretch and radiusing of the edges of the holes in the centre plate.
- A new diaphragm perimeter sealing method that eliminates diaphragm "bulging" due to clamping compression.

The nett effect of the improvements is that overall flow efficiency is significantly improved and all the improvements are financed by savings in valve mass and material costs. The mass and dimensional gains are not dramatic in the smaller valves but become increasingly significant in sizes above 250mm. The diameter of the 600mm 16 bar flanged type valve for instance, is down from 1360mm to 980mm and the mass from 875kg to 334kg.

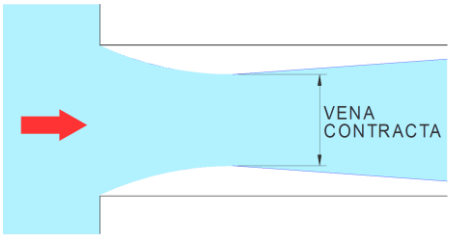
Cast centre plates

Centre plates for flanged 10 bar valves and up to 400 NB are now cast. Finite Element Analysis was used to optimize the design and new pattern technology was developed for the castings. The standard casting material is SG Iron Grade 42. It can however be cast in different materials to suit the application, such as for instance hard Chromium steel for highly corrosive applications ($FeSi_2$ grit, coal, etc).

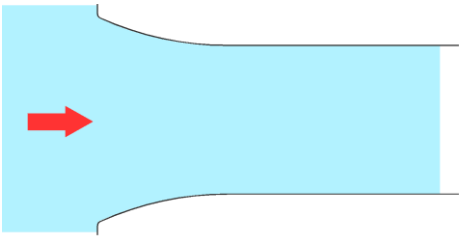
Increased flow efficiency

Holes with sharp corners effectively reduce flow due to the vena contracta phenomenon as shown in the sketches below. The holes in Stelkon center plates are profiled and allow virtual full flow. The Head Loss Coefficient for the patented orifice profiles is 0.08, compared with 0.5 before - a reduction of 80% in pressure head loss through the centre plate holes.

Due to the increased flow efficiency, less holes are required in the centre plate to deliver the same flow, with lower pressure losses than before. This results in reduced overall diameter, length, valve mass and material costs.



Unprofiled sharp corners

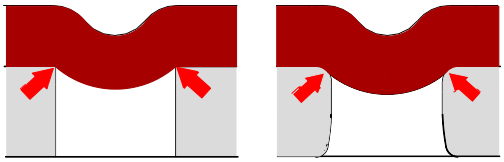


Profiled hole edges

Internal body shapes are profiled with the latest Fluid Mechanics research results for improved head losses.

Decreased diaphragm wear

The holes in the centre plate of the old design valves were drilled as shown left in the sketch on the right. In the new generation valves these edges are radiused, as shown on the right. This reduces diaphragm wear and more than doubles its life. It means that productive down time for repairs is reduced by more than 50%.



Drilled Radiused

GENERAL INFORMATION

THE USE OF NATURAL RUBBER FOR DRINKING WATER SUPPLY LINES

Stelkon's non-return valves use natural rubber diaphragms and are sometimes wrongly deemed to be unsuitable for use in drinking water distribution pipe lines. This is due to misinterpretation of the definition of food in the applicable statutory codes which exclude natural rubber from use if it were to be in contact with fatty substances like in kitchen drains. Drinking water is however prohibited from containing any fatty substances and there are no prescriptive or logical reasons for prohibiting the exposure of natural rubber to drinking water. Natural rubber can therefore be used in public water supply lines.

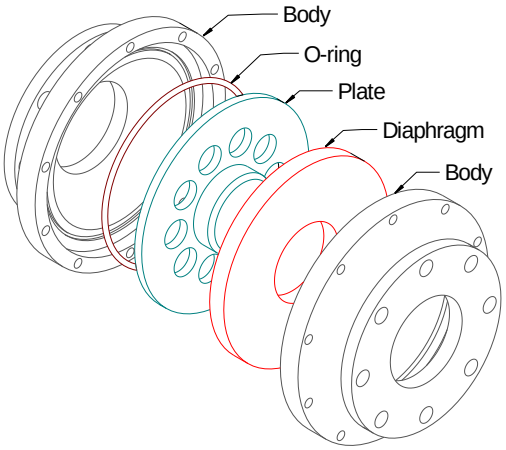
Drinking water is sanitised by the addition of chlorine. Normally chlorine is toxic for humans and attacks and breaks down natural rubber. But the concentration of chlorine in drinking water is so low that it is classified as safe for human consumption. Natural rubber is immune to chlorine degradation at these extremely low levels.

VALVE ASSEMBLIES

There are two basic types of valves: Normal non-return valves and footvalves.

Bolted centre flanges

Valves are configured with bolted centre flanges for on site dis-assembly and maintenance. A typical assembly arrangement is shown in the sketch on the right.



Foot valves

Foot valves remain absolutely drop-tight after priming, even in muddy and environmentally soiled reservoirs. Users normally prefer to construct their own strainers around the valve, so the units are supplied more often without the strainer shown in the photograph on the left. In cases of severe debris, clogging may occur, and an additional secondary strainer around the valve may be advisable. The secondary strainer can for instance be a chicken wire screen positioned radially 500mm to 800mm around the foot valve.

SPARE PARTS

Diaphragms and centre plates are supplied as spare parts.

APPLICATIONS AND USERS

- The valves are a cost effective solution where shock absorption, drop tightness and long operational life is a prime requirement, or when abrasive materials have to be pumped. The rubber diaphragm is soft and abrasive resistant and it continues to seal reliably even after heavy wear. Within the normal range of pumping velocities and densities of slurry lines, a valve could last between 10 and 15 years before a diaphragm needs to be replaced for the first time.
- Water supply and cooling towers. The valves are highly reliable and have very low attention and maintenance requirements, which makes it highly suitable for use in water supply lines where any down time is critical. A 450mm valve in the fresh water supply line of Parow, Cape Town, was removed for the first time after 29 years of continuous and uninterrupted service.
- The valves can be installed in any direction: horizontally or vertically.
- The valves cannot handle fibrous materials or solids, like paper pulp, sewage, etc which block the centre plate. Leaves and plant stems in moderate concentrations are shredded by the flow and present no problems.

SIZES AND PRESSURE RANGES

Valves can be supplied in any size and for any operating pressure. The standard ranges are from 100NB to 600NB and for pressures of 16 bar, 25 bar and 40 bar. Valves have been supplied for pressures as low as 5mm water pressure and as high as 120 bars. The largest valve supplied was 1200 NB weighing 1.25 tonnes.

STANDARD VALVE MATERIALS

Bodies	:	Cast SG Iron Grade 42 to BS 2789 420/12 or Grey Cast Iron to BS 1452/17.
Centre plates	:	Cast SG Iron Grade 42 to BS 2789 420/12 or Mild Steel to BS 4360 Grade 43A.
Diaphragms	:	Natural rubber specified by us according to DIN 53516 and ISO 4649.

The valves can be supplied in a wide range of finishes to accommodate an almost inexhaustible range of fluids, with or without solids. A wide range of body and diaphragm materials can be supplied in different combinations as required to withstand the effects of corrosive and erosive fluids and gases. Valves have been supplied to handle methane gas, corrosive acids and $FeSi_2$-grit.

SPECIFICATIONS AND STANDARDS

The valves are supplied to conform with any international specification standard, e.g. SABS, BS, ANSI, ISO, DIN.

Valve lengths do not adhere to the International Standards for non-return valves. Conforming to Standard lengths would double mass and cost without any functional contribution. If required, distance pieces can be fitted in gaps.

Valves are manufactured and if required, tested in accordance with ISO 9001.

SPECIAL APPLICATIONS

We have the technological infrastructure with CAD capability to design non-return valves for specialised applications which are not included in our standard ranges.

TECHNICAL DATA

Ordering Information

1 Nominal bore.

2 Flange specification E.g. SABS 1123 1000/3; BS 4504 PN16; ANSI B 16.1 Class 125RF.

3 Pumping pressure.

4 Valve closing frequency per day. (*Low: 12; high : 48)*

5 Maximum or peak dynamic back pressure in the pipeline after pump shut-down.

6 Properties of the fluid to be pumped (*Type, temperature, corrosive chemicals, abrasive grit type and particle size, etc*).

7 Material of body, centre plate and diaphragm (*if not standard*).

For specials, the above, plus:

8 Pumping velocity.

9 Special requirements.

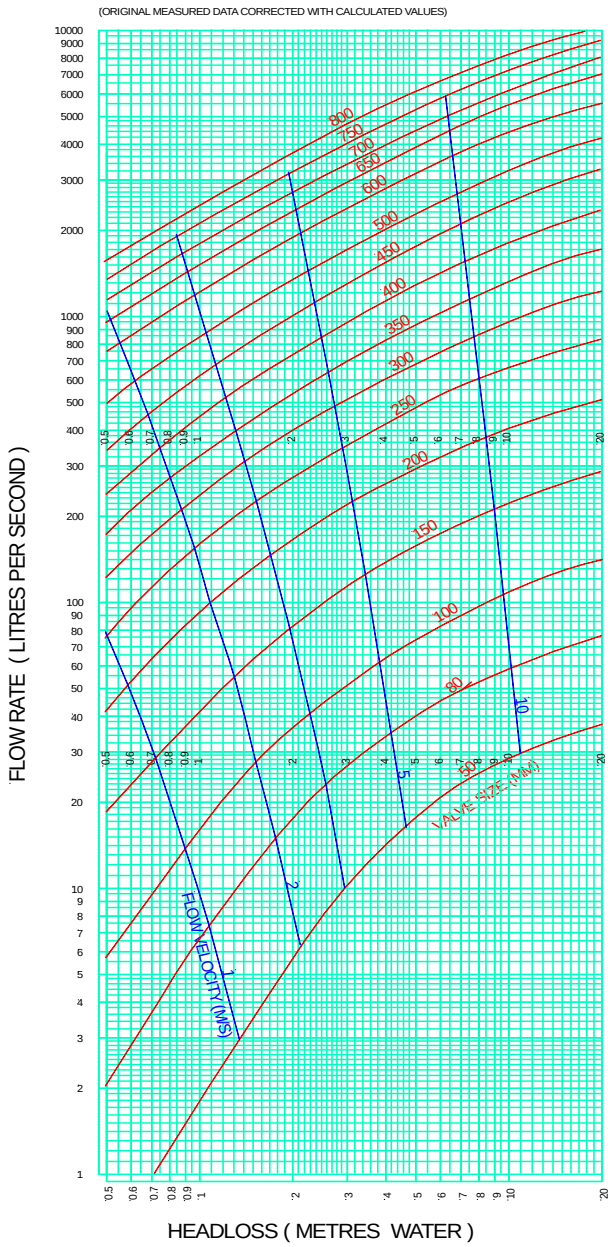
Pressure head loss

The head loss graphs on the right are for 1600 kPa valves and 40 Shore hardness rubber diaphragms.

Head loss for valves fitted with harder 60 to 70 Shore hardness diaphragms such as EPDM, Linard, VITON, etc., can be 300% to 400% (or more) of the depicted values.

For 25 and 40 bar diaphragm non-return valves, thumb rule head loss is typically 150% and 200% respectively of the depicted values.

HEADLOSS GRAPHS
FOR 1600kPa MODEL R VALVES



Stelkon products are continuously developing and we reserve the right to change specifications or materials without prior notice.

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