

SchuF Polymer Valves

SchuF's polymer valves were originally designed together with the polymer pioneers in the early stages of polymer development. SchuF can proudly claim that it developed more original polymer valves than anybody else. The first diverter, multiport and in-line sampling valves came from SchuF as well as the first bottom drain and lift-plug valves. Additive injection for PET, steam injection, stripper and killer valves for PVC and PP were all developed in SchuF's offices.

SchuF's polymer valves are used to drain, feed, changeover, sample, inject, distribute and control Polyester (including PET), Nylon, PVC, PP, PU, HDPE, LDPE and related polymers. Most applications are in Polyester plants.

In this brochure, we will look at valves and solutions for the above processes. More detailed leaflets are available for each valve type.

SchuF's strengths are its flexibility of design and construction, its unrivaled experience with the media and the way all its valves can handle vacuum, high pressures and temperatures as well as very high viscosities, while eliminating "dead" and "slow" spaces, avoiding impurities and reducing residence times.

SchuF offers cast valves to optimise polymer flow and forged or welded constructions where material integrity is of maximum importance. In all cases the flow path is optimised by the contour of the valve's body and moving parts. SchuF can provide valves with and without replaceable seats depending on start-up conditions. SchuF offers the best high pressure sealing by a judicious combination of different grades of stellite and a specially angled seat to achieve a tangential "zero force" seal.

For vacuumtightness, special aluminium grade sealing rings offer leak tightness under 10⁻⁶ torr.l.sec⁻¹ and a Helium vacuum test to prove it. We can offer you performance and seat testing under low or high temperatures, under high pressure or vacuum, with Helium, Nitrogen or water ... whatever is required.

SchuF is not only the first polymer valve company to have obtained ISO 9001 approval but also the only one with TRD 801 Nr. 45 which allows us to design and build high pressure vessels.

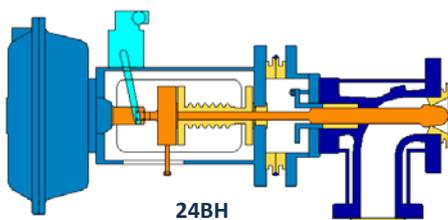
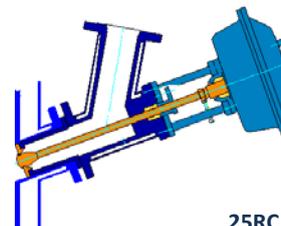
In short SchuF offers unmatched experience and individual solutions to specific polymer handling problems.

SchuF - the superior polymer valve!

SchuF Polymer Valves

Feeding Valves

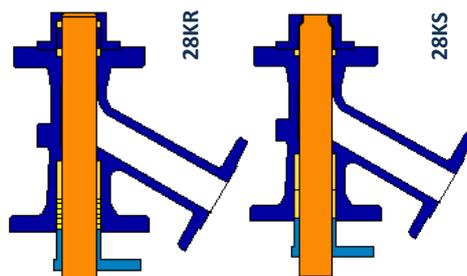
Disc valves are better suited than ram valves for feeding low viscosity feedstocks into reactors. However it may be necessary to adapt the shape and polish the disc and seat. For VC, a bellows seal is recommended to meet the stringent VC pollution requirements. Disc control valves such as the 25BS are used to regulate the level in PVC reactors.



For Polyester, Type 24BH, control valves are used to regulate the flow into the esterification and polymerization reactors. For vacuum service, bellows are generally used. As they are susceptible to failure in a crystallizing and polymerising environment, SchuF recommends external bellows. In these applications, weld-lip gaskets can further enhance the vacuum safety of the system.

Discharge Valves

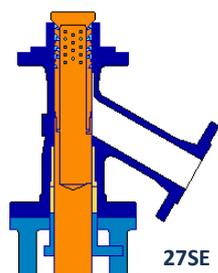
Ram and disc type bottom outlet valves are used to drain reactors or control access to the transfer lines between reactors and crystallizers. For PVC, we would



suggest either metal to metal (28KS) or radially sealed (28KR) ram type valves at the reactor outlet depending on the grade of PVC and philosophy of the customer.

Both sealing arrangements have seen many years of satisfactory service in various installations once standard design are adapted to suit the peculiarities of different grades of PVC. In the case of Polyester, Nylon and PP metal to metal sealing ram valves are definitely recommended. For LDPE radially sealed valves have proved most successful.

Injection and Stripping (Desodorising) Valve



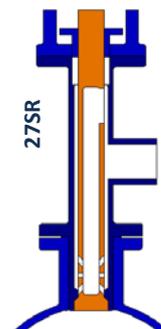
In many processes, unwanted impurities or remnants, such as unpolymerised monomers in PVC and Polyurethanes or Solvents in Paints and Coating suspensions are stripped from the batch at the end of the process by the injection of saturated steam. Important is the quality of control afforded by the linear step control characteristic and the proper diffusion of the steam throughout the batch. The ram tip is specially adapted to each vessel as well as to the required flow conditions, optimizing the spray pattern. The valve design prevents product reflux during the operating cycle and in the closed position.

Rather than emptying the reactor when an exothermic reaction goes out of control, a killer valve with a modified piston is used to inject a stopper. Another injection valve (this one bellows sealed) is used to inject protective colloids into PVC to limit particle size. The most efficient way of heating a reactor is to inject steam directly using a valve patented by SchuF and a partner in the chemical industry. Again, the steam must be distributed evenly to maximise the heating effect.

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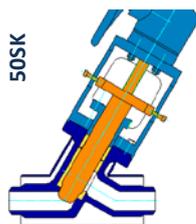
Spray Rinse Valves

To rinse polymer reactors, especially in the production of PVC a spray rinse valve can be used after a number of batches. Unlike other valves our valve directs the spray pattern specifically at the bottom of the reactor first, before rinsing the sides and then directing the cleaning agent backwards towards the vessel dome. Since the dome and bottom pad are the parts most in need of cleaning this approach has brought very good results using only half the number of valves otherwise required. The valve is used with water or steam at up to 40 bar. Sometimes catalyst or anti-stick agents are added to significantly reduce the cleaning frequency.



In-line Valves

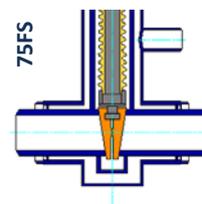
In-line valves are used to control and shut-off the flow of polymer through the piping system. Globe valves are not suitable in these high viscosity applications due to their high pressure drop and low capacity. A ball valve is unsuitable because the ball can fill with degrading polymer in the closed position.



A **Y-Globe valve** (50SK) has flow characteristics which come close to those of a ball valve but without the associated dead space and sealing wear. Fully jacketed, they are used in both manual on/off and automatic control versions, especially with Polyester.

Gate Valves

An alternative to y-globe valves, gate valves (75FS) are used as a shut-off valve for the larger sizes in low pressure and vacuum applications of the polymer line. Their main advantage is cost, the short take-out dimension required and the virtually zero pressure drop.

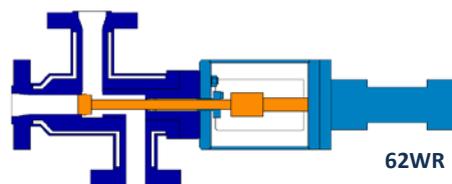


LiftPlug Valves

Lift-plug valves are used for switching polymer vapours. Their great advantage is that they offer the flow characteristic of a full bore plug valve without the temperature limitations. A straight plug version offers easy automation for smaller sizes.

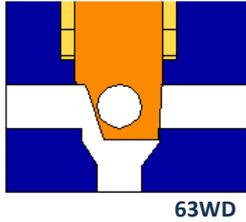
Changeover Valves

These valves (62WR) are being used for dual relief valve systems and as switchover valves between two lines. Their design makes it impossible to shut-off both valve outlets at the same time. During operation, one port opens as much as the other one closes. Changeover valves provide the most suitable way of connecting two relief devices to one pressure vessel outlet, while complying with ASME code requirements.



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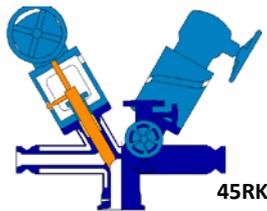
Dump Valves



Dump valves (63WD) are modified lift-plug or diverter valves which are specifically designed to dump polymer during start-up. Once the required quality level has been reached, the valve is switched and offers unimpeded, dead space free in line flow to the filters, chippers and spin blocks.

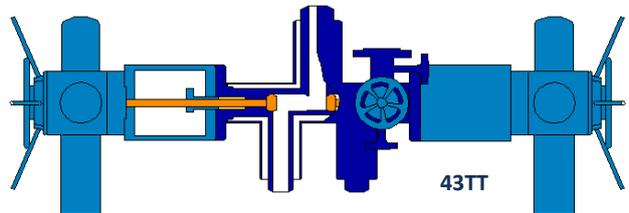
Multipoint Diverter Valves

Polymer lines are getting bigger, but the chips or spun threads are still the same or becoming finer. Somehow the lines need to be subdivided. Diverter valves eliminate multiple in-line valves with associated distributor T-pieces and piping as well as the stagnant polymer in these lines. By reducing pipe runs they reduce residence times. By eliminating dead spaces they prevent product degradation and improve quality.

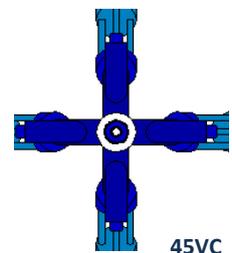


SchuF originally developed the 3-way diverter valve. Nowadays, the main line can be divided into up to 6 lines, while the main line is either continued (Type 48RK) or terminated (such as Type 45). Each branch is shut-off separately using a straight faced piston or disc or using the contoured and rotating options described before.

Diverter valves come in two basic types, one where the outlets are basically parallel to the inlet with a central block (Type 42 & 43), the other with the outlets at right angles to the inlet and the actuators at 45° to both (Type 45 & 46). Types 42 and 45 are piston valves, Types 43 and 46 have disc shut off elements with backseating options.



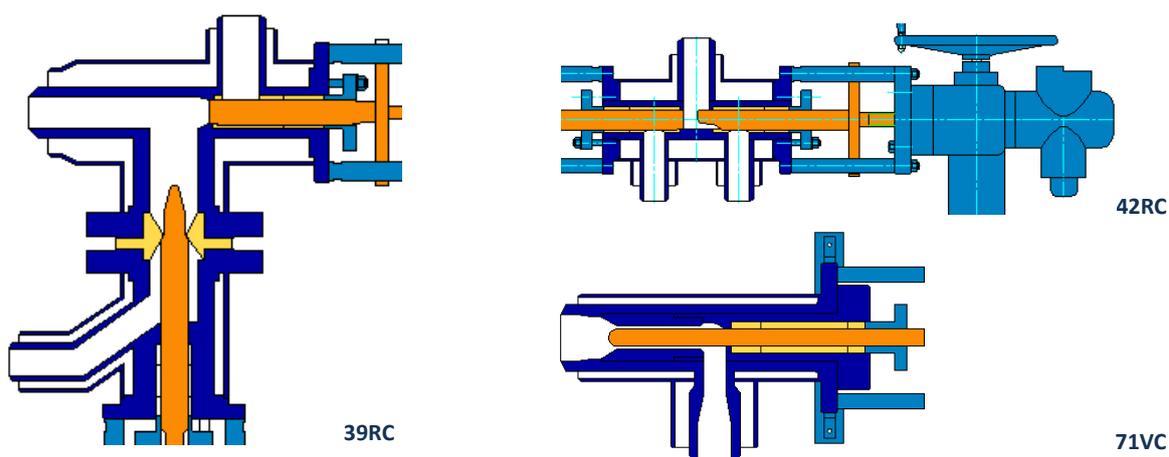
SchuF can deliver diverter valves in both designs with up to seven inlets and outlets. The type 45VC shown here has one inlet and four outlets, in this case each outlet is separately controlled with a contoured piston and an electric position control actuator.



SchuF Polymer Valves

In direct spinning polymer plants, it is important that the pressure at the spinheads is constant. A chip line is often added to take the overflow. The flow to the chipper line is varied using a flow control valve.

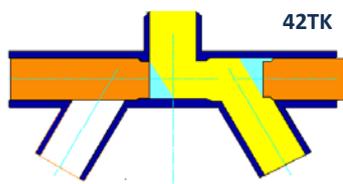
Different types are in use, be they take-off or branch valves (39RC) with a traditional control piston tip or a diverter valve in which one of the outlets is controlled by a rotating and specially contoured piston (42RC) or the unique Type 71VC where the pressure drop is controlled by the variable restriction length.



Filter switching Valves

Switching duplex filters is a tricky business especially in high viscosity polymer plants. There are usually two valves involved. The inlet valve diverts the flow to one of duplex filters, the outlet valve guides the flow back to the main line. The main requirements are:

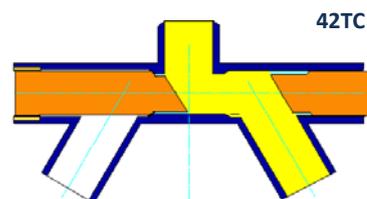
No dead or slow spaces in the valve in which product can degrade or accumulate causing unacceptable deviations in residence time.



The standard Type 42TK piston diverter valve is dead space free, but at larger nominal diameters there is appreciable slow space (shown in light blue).

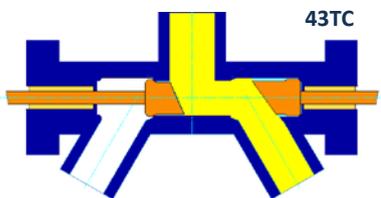
SchuF offers four unique remedies:

The "rotating optimized flow option" (Type 42TC) features a contoured and rotating piston, which eliminates the slow space. A minimal dead space remains between the body walls and the contoured piston section. This dead space can be ignored if the seat width is less than 2mm.



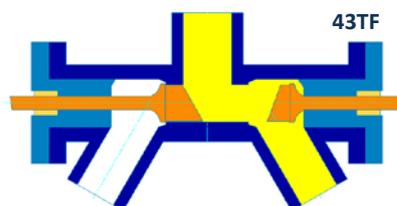
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The turning forces involved in turning the piston become very high at high pressures and larger piston diameters. This problem can be overcome by SchuF's unique two stage hydraulic cylinder.

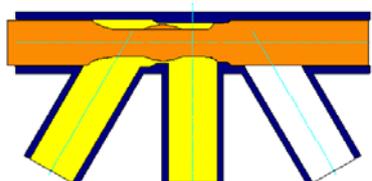


An alternative is the rotating disc valve type 43TC. It combines the advantage of the contoured rotating piston, (indeed the disc and piston tops are exactly the same), but is easy to turn and available with a back seat option.

The "forced flow option" features a SchuF **patented** disc valve, 43TF, with contoured but non-rotating discs. Computer aided FEM simulation optimizes non-Newtonian polymer flow through all areas of the valve with guaranteed equal residence times.



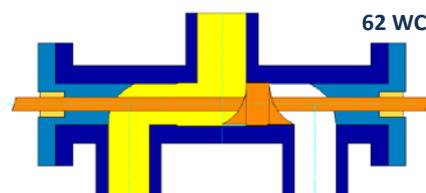
The slightly increased pressure drop due to the non optimal flow is offset by the absolutely guaranteed avoidance of all dead - and slow - spaces. Even the tolerances before the packing can be sealed by the metal to metal back seating option.



47MS

The "spool piece option" Type 47MS features a double piston joined across the middle by a spool piece. The spool piece guides the polymer flow in a 180° rotation around itself. This ensures full flow through all cavities, completely eliminating dead spaces, even those created by the metal sealing. This valve only needs a single actuator and is available at an extremely competitive price. Only drawback is the high pressure drop and the fact that the inlet is on the same side as the outlet (a 90° version is available).

The "optimized changeover option" features another **patented** SchuF design -the Type 62WC with a single, double contoured disc. This valve also makes do with a single actuator and thus is able to offer optimal flow characteristics without slow spaces at an extremely competitive price. Available with metal to metal and high temperature radial sealing.



The spindle goes through both outlet chambers, this guarantees that the pressure drop through both chamber is equal. It also guarantees that the sealing surfaces can be reduced to less than 2mm even for large bore valves and high pressures. Slow and dead spaces are absolutely eliminated as the area between disc contour and body is reduced to zero to all intents and purposes in the metal to metal version and does not exist in the radial version.

SchuF Polymer Valves

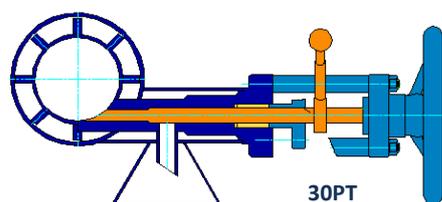
All switching valves offer the option of integrating vent, flush and drain valves in the inlet and outlet valves to allow for flushing and cleaning of the filters.

Further details are available in our brochure "Polymer Filter Switching Valves".

Sampling Valves

SchuF line drain and sampling valves allow the user to take a sample under high temperature and pressure or vacuum. They can also be used to drain a line in a shut-down situation, to flush or purge it or even as a simple injection valve.

The standard valve is welded directly into the centre of the line. It comes with a full jacket, avoiding the cold spots of a flanged connection. The full bore ram has a contoured tip so there is no dead space or flow deviation.

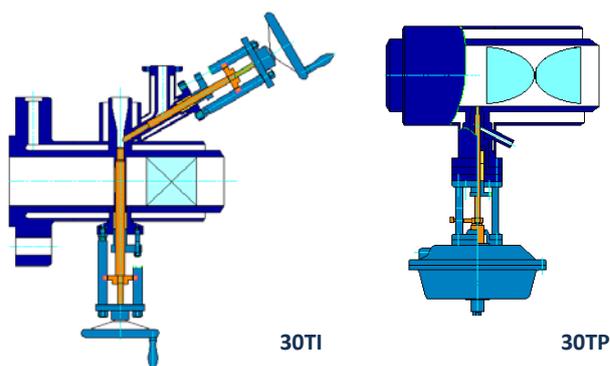


In the 80s SchuF developed the tangential sampling valve, 30PT. The design allows the valve to be installed horizontally, thus allowing the operator to take a vertical sample without having to turn a handwheel under the pipe endangering himself should the hot polymer splash or spill while he is opening the sampling valve.

Polymer Additives Injection Valve

These valves were developed to allow continuous polymer plants producing, for example PET, to customise their product. These valves allow small amounts of additives and catalysts, such as Titanium dioxide, be injected into the line and distributed evenly through the polymer.

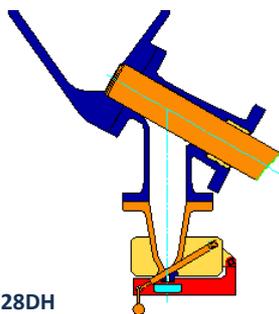
Different types are available. In one, the seat protrudes into the centre of the pipe and injection takes place at the pipe centre. In the 30TI, a specially designed slit allows the medium to be distributed uniformly across the centre of the line. For accurate and uniform injection of very small quantities, Type 30 TP an automated high frequency, minimal volume valve is used.



The cross-stem option closes the injection port, if the injection valve itself needs to be maintained, flushed, cleaned and removed during operation. All of these valves can be supplied as combinations with static mixers, flow invertors, sampling valves viscosity meters and pipe bends to minimize piping length (residence time) and flange connections (leakage).

SchuF Polymer Valves

Dye Head Valves



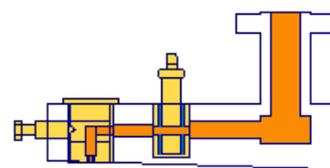
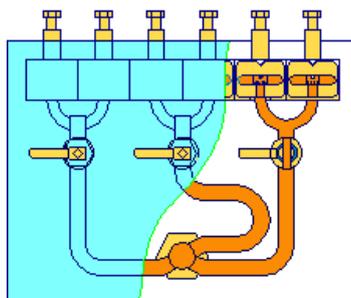
28DH

Originally designed by SchuF in the 1960's these valves combine a bottom outlet piston or an end of line Y-globe valve with a stranding dye head. They are used in Polyester and Nylon polymerisation plants and offer a short, smooth flow path to the die nozzle. Bellows stem sealing is available to prevent oxygen leaking into the process.

A distributor ensures that the round valve outlet is changed to a rectangular slit while maintaining equal flow time. The die can be a slit or hole design. The nozzles come with a seal plate which can be manually or automatically operated and which protects the remaining polymer from air. Alternatively the plate can have a cooling unit to freeze the polymer. The frozen part can then be broken off thereby removing any nozzle blockages.

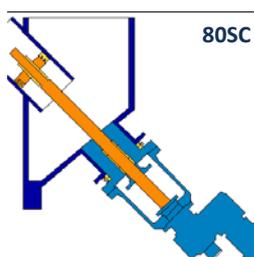
Strand dye plate distributor

Polymer must be distributed evenly from the main central line to the spinning or dye heads. The distributor distributes the polymer without residence time variation to up to 6 dye sets. Each set consists of two blocks with customised outlet nozzles, an individual shut-off valve and manual sealing system. The blocks are completely heated. A ventilation system at the outlet is available as an option.



80SA

Nozzle Scraper



80SC

These are used to keep the inlet nozzle of the condensor free of condensed polymer build-up. Scrapers are fitted with specially hardened and angled tips, for efficient scraping, long life and easy replaceability.