

Figure 1 Automatic Minimum Flow System SMA 63

Application

The Automatic Minimum Flow System SMA 63/64 (AR-Valve) is a pump protection device. It automatically protects centrifugal pumps from damage which might occur through partial evaporation of the fluid content during low load operation.

- Power Stations, Nuclear Power Stations
- Chemical industry
- Petrochemical industry
- Off-Shore-Industries
- Steel works
- Paper industry

Design and Operation

For the main flow - to the process - the valves have an inlet flange DN₁ and an outlet flange DN₂. The minimum flow is going out through an additional branch DN₃ back to the reservoir.

As soon as the pump capacity drops below a predetermined flow rate, the AR-valve opens complete the bypass to maintain the pump minimum flow rate. This rate is maintained even if the flow in main direction to the boiler or process is completely shut off.

The Automatic Minimum Flow System automatically opens and closes the bypass corresponding to the main flow rate. This **flow controlled** function operates without additional auxiliary energy.

Through actuation of the bypass via a pilot operated plunger (15) the bypass can be opened resp. closed completely. This On-Off-Regulation of the Bypass makes it possible to increase the load limit from 220 bar to 400 bar. The preferred duty is in the range of nominal pressure 250 to 400 bar resp. ASME2500

The pressure and flow reduction to the minimum flow requirements in the bypass line takes place through a multistage throttle system.

The pilot unit utilizes the medium and the pump pressure for actuation of the piston (15). Two pilot valves control the pump pressure in front of resp. behind the piston and consequently the position of the piston is ON resp. OFF regulated. The pilot valves are actuated depending on the main flow through the cone (3) position via the lever (32). With the integrated fine throttle (37) a cushioned move of the piston (15) is achieved.

Advantage and Utility

- assurance of the required pump minimum continuous safe flow no inadmissible temperature increase in the pump;
- avoidance of cavitations in the pump;
- avoidance of pump and plant damages
- integrated non-return valve in the main delivery stream
- avoidance of reverse operation of the pump;
- allows parallel pump operation
- favorable NPSH-value of the plant (NPSH_A) and the pump (NPSH_R)
- lower capacity in operating point because of automatic closure of the minimum flow line
- lower prime mover power requirement
- lower facility costs

Special Features

- wear resistant On/Off bypass regulation for high pressure applications with a pilot operated plunger
- non-return-function in main direction to the process
- multistage reduction of pressure and flow rate in the bypass - low cavitations and of low noise
- without additional auxiliary energy and measuring technique
- less pressure loss
- mounting position vertical* or horizontal
- all internal parts are made out of stainless steel
- reliable and durable

Technical Data SMA 63 / SMA 64

Medium		
Fluids without solids		
Viscosity	≤ 150 cSt	1/5
Temperature	-10 °C up to +300 °C* -14 °F up to +572 °F*	
Nominal width DN		
• main direction	80 up to 200 mm; (3" up to 8")*	
• bypass	32 up to 100 mm (1,25" up to 4")*	
Pressure rate	PN 250 up to PN 400* ASME1500 up to ASME2500*	
Bypass-control	On/Off regulated with throttle	
Material casing parts	1.0460 (A105)* ASME in () 1.0566 (A350-LF2); 1.4301 (A182-F304); 1.4541 (A276-321); 1.4571 (A276-316Ti); 1.4404 (A182-F316L); 1.4462 (A182-F51); further materials by request	
Connection	Flanges according to DIN / ASME* Sealing and connection parts are not scope of supply	
Mounting position	vertical* or horizontal	
Operating Condition		
Pressure difference between inlet (DN ₁) and Bypass branch (DN ₃)	max. 400 bar max. 5800 psi	
Flow rate main direction	140 m³/h up to 900 m³/h* 618 USgpm up to 3965 USgpm*	
Flow rate bypass	up to 250 m³/h* (1100 USGm)* Max. 35% of main flow rate is advised*	
Flow velocity	max. 10 m/s (flange)	
Pressure loss in the valve	0,8 bar	
* standard version, more by request		

Design

The construction is according to specification AD 2000 and particularly to EN 13445. As per Pressure Equipment Directive 97/23 EC the products are provided with the CE marking and the Declaration of Conformity. Certified according to the Module H1 (Pressure Equipment Directive 97/23 EC) all dangerous material classes of category 1 to 4 are covered.

Installation and Connection

The Automatic Minimum Flow system is produced and tested only for the ordered data according the customer data sheet. Following points have to be alluded:

- Mounting direct on the pump discharge branch (advised)
- Pipes have to be connected free of stress, without offset, mismatch or longitudinal shifting
- The pipe system must be cleaned and free of soiling
- Installation has to be in the ordered mounting position
- To maintain the valve and to calm down the flow a piece of straight pipe with a length of 1 meter (40") has to be installed at the bypass branch DN₃ and at the outlet branch DN₂
- The bypass pipe has to be filled with medium anytime
- The supplied installation and operating instructions has to be followed

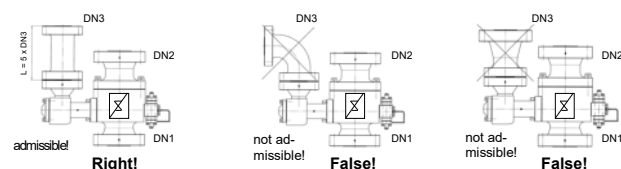


Figure 2 Mounting with straight pipe piece

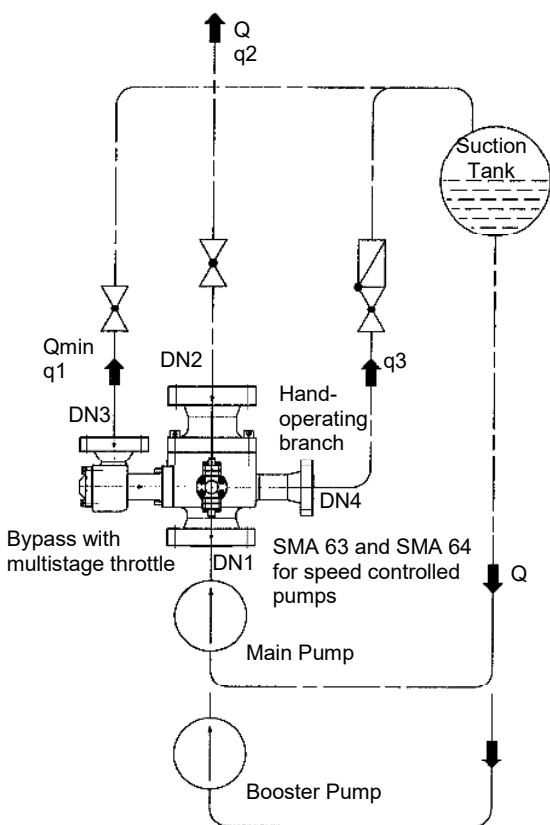


Figure 3 Bypass Return with additional hand operated branch (optional)

Note of Application

The operator of these fittings is responsible for suitability, proper use and corrosion resistance of the used materials with regard to the used fluid. It must be ensured that the materials selected for the fitting parts in contact with the medium are suitable for the used process media. The fitting may only be used for the application specified in the operating instructions and the data sheets. Provide a touch guard for surface temperatures of $< -10\text{ }^{\circ}\text{C}$ or $> +50\text{ }^{\circ}\text{C}$. This touch guard must be designed in a way that the max. allowable ambient temperature on the unit is not exceeded. Before replacing the valve, check that the unit is free of hazardous media and pressures.

Type Designation of the Valves

The designation of the valve specifies the type, nominal width and pressure rate, the flange sizes and the mounting position.

Example:

SMA 63-80/320 -80/80/40/0-1
SMA 63-3" ASME2500 -3"/3"/1,5"
/0-1 ▲

Valve type	
for not speed	63
controlled pump	
for speed controlled	64
pumps	
Valve size	
DN 80 mm	8
DN 3" (ASME)	3
Pressure rate	
320 bar	
ASME2500	
Flange sizes	
inlet DN ₁ 80 mm	
inlet DN ₁ 3" (ASME)	
outlet DN ₂ 80 mm	
outlet DN ₂ 3" (ASME)	
bypass DN ₃ 40 mm	
bypass DN ₃ 1,5" (ASME)	
additional branch	
no additional branch	
mounting (applied to main flow)	
vertical	
horizontal	

2/5

SMA 64 for speed controlled pumps

The type SMA 64 corresponds technically with the SMA 63 and has to be used for pumps with a speed control device.

For using the **SMA63** the minimum discharge pressure of the pump has to be at least 70 bar.

Marking of the Valve

The Automatic-Recirculation-Check Valve has the following name plate with all relevant valve data.

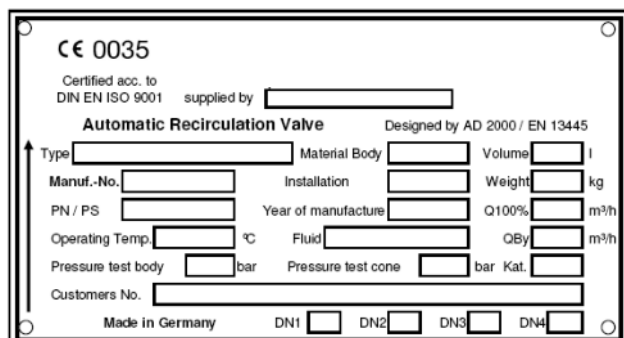


Figure 4 Name plate mounted to the fitting

Accessories

Pressure gauge at the bypass for preventive maintenance of the function and the wear of the Minimum Flow System.

The **hand operating branch** with multiport-throttle is fitted at the casing below the cone seat and serves to pass off the minimum flow via a hand-operated valve combination. We recommend the branch for protection of the internal bypass parts at extreme operating conditions, e.g. at frequent operation in the range of bypass flow as well as for filling and start-up of the plant.

Warm-up branch, pressure gauge branch, draining branch etc. can be provided, if required.

The **pressure device SPD** avoids cavitations and flashing in piping. The function corresponds to a variable throttle which adjusts oneself to the flow rate.

The **damping valve SRV** will be applied to absorb pressure shocks during recurrent on/off operation e.g. for descaling facilities at steel mills. The SRV has to be mounted direct to the AR-Valve.

Filtering installation to provide filtered medium for the pilot control of the bypass, e.g. for descaling plants.

Parts List SMA 63/64

Part-#	Designation	Materials
1	Lower body	
2	Upper body	
3	Cone	
4	Cone guide	
5	Cone guide	
11	Bypass body	
12	Closing plate	
13	Multiport throttle	
14	Ring seat	
15	Piston	
16*	Disc	
17*	Piston guide	
18	Spacer ring	
19	Disc	
30	Valve block	
31	Control plunger	
32	Lever	
33	Connection piece	
35	Connection piece	according to operating conditions and valid standards
36	Valve needle	
37	Adjustment throttle	
38	Spacer ring	
39	Bearing pinn	
40	Connection piece	
70.1 - 4	Impulse pipes	
73.1	Pipe coupling	
78.1	O-Ring	
79.1	Seal ring set	
79.2	Seal ring set	
79.3	Gasket	
90.1	Locking screw	
91.1 ff	Socket screw	
92.1*	Hexagonal nut	
92.2*	Lock washer	
95.1	Coil spring	
95.3	Coil spring	
95.4*	Coil spring	
98.1	Name plate	

* for SMA 64 only

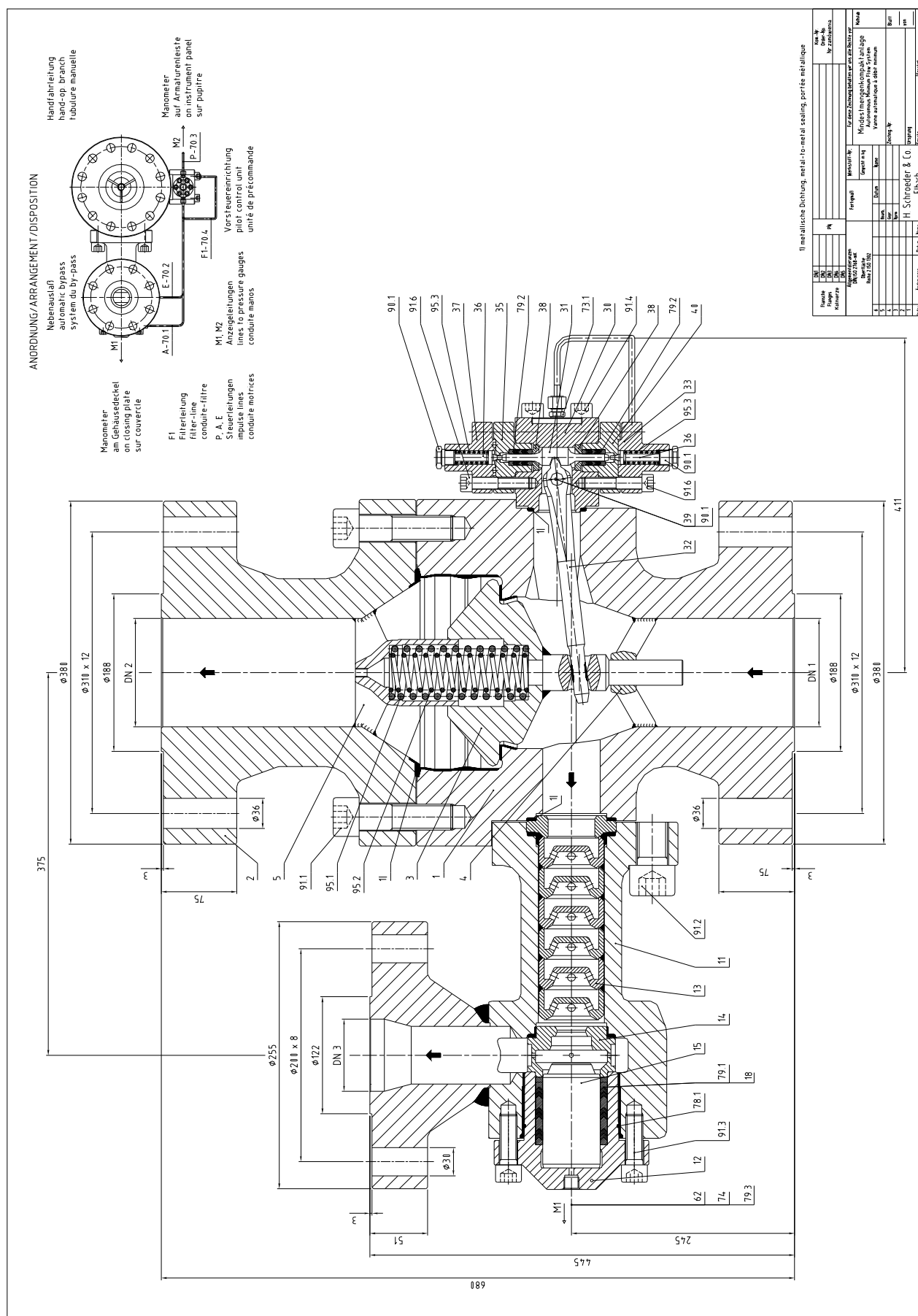


Figure 5 SMA 63 On/Off-regulated AR with multistage pressure and flow reduction in the bypass

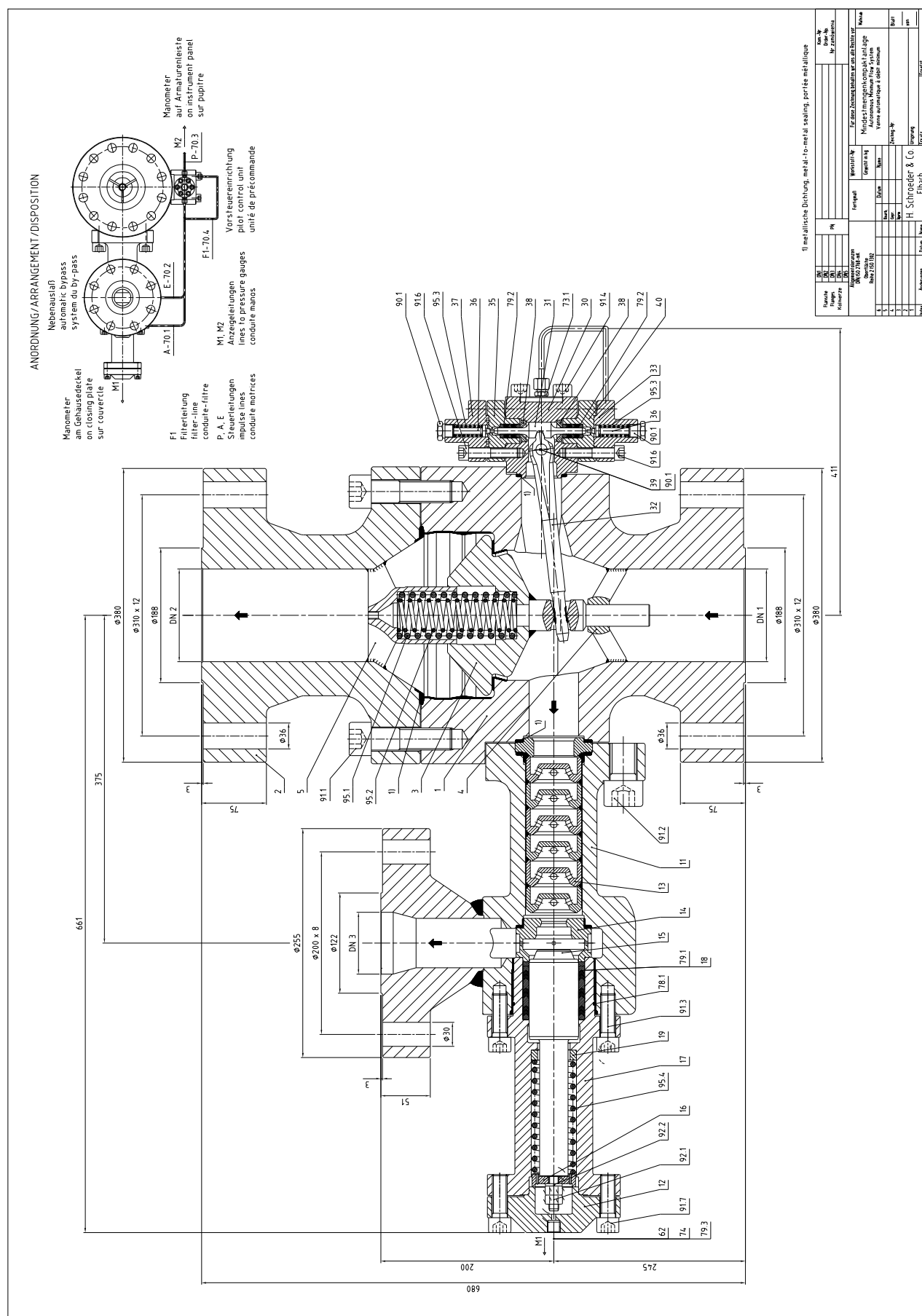


Figure 6 SMA 64 On/Off-regulated AR for speed controlled pumps with multistage pressure and flow reduction in the bypass