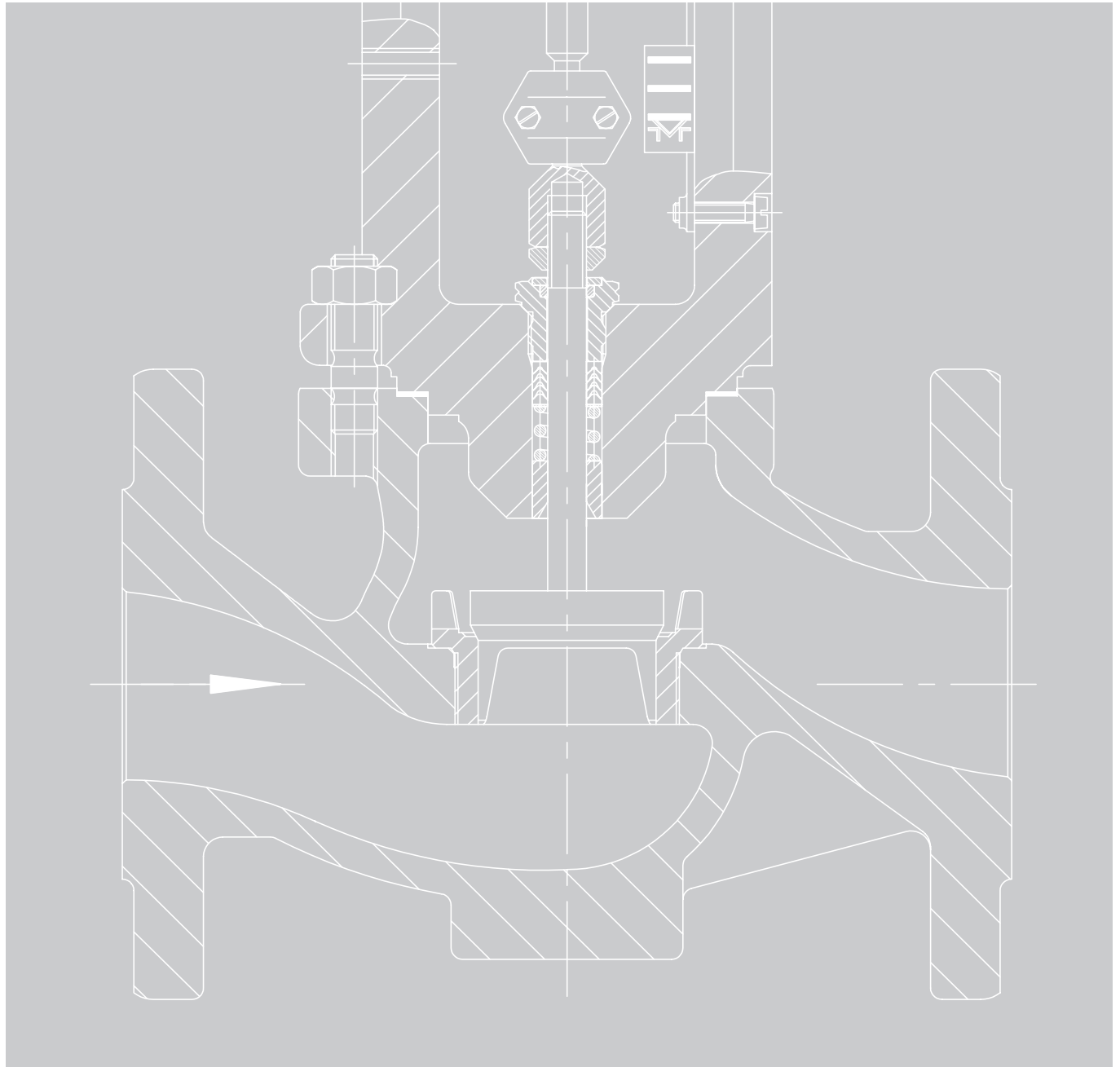


Series 3240 · 3250 · 3280 · 3510 · 3520 · PFEIFFER Series 1
Control Valves for Industrial Processes



Technical Information • Selection Guide

Size ½" ... 16" • Class 125 ... 2500 • -420 ... +1100 °F
Globe • Angle • 3-Way • Diaphragm • Sanitary • Micro • Steam Conditioning



Associated Technical Data Sheets

T 8012 to T 8097
T 8250 to T 8265

Edition May 2000

ANSI Version

Survey of Valve Materials

T 8000-2

Technical Information

T 8000-1

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SAMSON Control Valves

The SAMSON Control Valves Series 3240, 3250 and 3280 comprise pneumatic and electric globe valves, three-way valves and angle valves. Their application range extends from control tasks in process and industrial plants to the use in plant engineering and supply and distribution systems. The modular system allows easy retrofitting and servicing.

The control valves consist of the valve and the actuator. They can be equipped with pneumatic, electric, electro-hydraulic or hand-operated actuators. For controlling purposes and travel indication, accessories such as positioners, limit switches and solenoid valves can either be attached directly (see page 19 and Information Sheet T 8350) or according to EN 60 534-6 (NAMUR rib).

The valve bodies are made of cast iron, spheroidal graphite iron, cast carbon steel, stainless or cold-resisting cast steel, forged carbon steel or forged stainless steel as well as other special materials. With the completely corrosion-resistant version, all the parts of the valve and the body of the pneumatic actuator are made of stainless steel. Please refer to the associated Technical Data Sheets for details.

Valves up to ANSI Class 300 / PN 50

Series 3240

Control Valves Series 3240 are available in ANSI nominal valve sizes ½" to 10" and in metric nominal sizes from DN 15 to DN 250. Pressure ratings up to ANSI Class 300 and nominal pressure PN 40. Control valves in the standard version are suitable for temperatures of 15 to 430 °F (-10 to +220 °C). In addition, the application range can be extended by means of an insulating section to the temperature range -325 to +840 °F (-200 to +450 °C). The plug stem is sealed either by a self-adjustable PTFE V-ring packing or an adjustable packing. If the external tightness of the seal is subject to particular stress, a stainless steel bellows is used. The Type 3241 Control Valves can be equipped with a heating jacket that may also cover the bellows.

Valves for Special Applications

These valves have been developed for special requirements, some of which are up to ANSI Class 300, and others up to Class 2500. They essentially include cryogenic valves, valves for food processing, diaphragm control valves and micro-flow control valves.

Series 3500

The Type 3510 Micro-flow Control Valve is designed for precise throttling of small flow rates, with flow coefficients as low as the order of 10^{-5} . They are available in nominal sizes from ¼" to ½" and DN 10 to 15, for of ANSI Classes 150 to 1500 and nominal pressures PN 40 and PN 400 and for temperatures up to 1020 °F (550 °C).

The Series 3520 control valves are based on the Type 3241 design, but come standard with female threaded end connections and a threaded bonnet. They utilize the same packing design and the majority of the same trim parts from the Type 3241. They are available in bronze and stainless steel in nominal sizes ½" to 2" and a suitable for temperatures from -20 to +430 °F (-29 to +220 °C).

PFEIFFER Series 1

For highly corrosive process media, valves with all wetted parts of PTFE or PFA are the most efficient solution. PFEIFFER, a member of the SAMSON Group, specializes in lined control valves and produces the Series 1. The Series 1 are globe control valves with PTFE trim and bellows. The Type 1a, available in nominal valve sizes 1" to 6" and DN 25 to 150, with flanged ends according to ANSI Class 150 and PN 10/16, has a heavy duty PTFE liner for the toughest applications. The Type 1b, in sizes 1" to 3" and DN 25 to 80, has a more economical PFA liner, but is impervious to most liquid acidic media such as HCl and H₂SO₄. Both valves feature easily exchangeable PTFE trim, and are applicable from -20 to +390 °F (-29 to +200 °C).

Valves up to ANSI Class 2500 / PN 420

Series 3250

The Control Valves Series 3250 are used for large nominal sizes and/or high pressures in process and plant engineering as well as in supply and distribution systems. Apart from globe valves, three-way valves and angle valves, four-flange bodies with bottom plug stem guide, valves with axial multistage throttling plug and split-body, we are well prepared to develop customer-specific versions. The valves are manufactured in nominal valve sizes from ½" to 16" and nominal diameters DN 15 to DN 400 and for ANSI Classes 150 to 2500 and nominal pressures PN 16 to PN 400. Control valves in standard version are suitable for temperatures between 15 to 430 °F (-10 and +220 °C), however, when using adjustable high-temperature packing, the valves are suitable for temperatures from 15 to 660 °F (-10 to +350 °X), and with bellows or insulating section from -325 to +1020 °F (-200 to +550 °X).

Series 3280

The Steam-conditioning Valves Series 3280 are used whenever the steam pressure and steam temperature must be reduced simultaneously. Their application range extends from heat-economical energy and plant optimization to the use in process plants, e.g. refineries, food industries or pulp and paper industries. Steam-converting valves are based on Series 3250 Valves with Flow Divider St III, including an additional cooling water connection. They are available in nominal sizes from ½" to 16" and DN 50 to DN 400, for of ANSI Classes 150 to 2500 and nominal pressures PN 16 to PN 400 and for temperatures up to 1020 °F (550 °C).

Table 1a • Control Valves - up to ANSI Class 300 / PN 50 and Valves for Special Applications

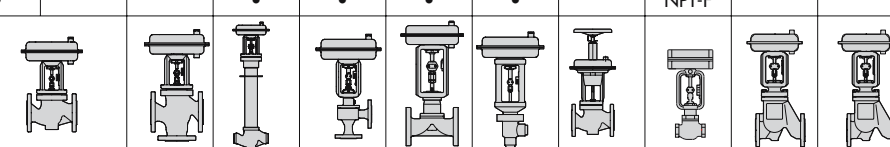
Control valve		Series 3240				For Special Applications				Series 1	
Type	3241		3244	3248	3249	3345	3347	3351	3520	1a	1b
	-ANSI	-DIN									
Technical Data Sheet T ...	8012	8015	8026	8093	8048	8031	8097	8039	8020	111a	111b
Globe valve	•	•		•		•		•	•	•	•
Three-way mixing or diverting valve			•								
Angle valve				•	•		•				
Standard version	ANSI	•	•	•	•	•	•	•	•	•	•
	DIN		•	•	•	•	•	•	•	•	•
	JIS	•	•								
Special applications	Low flow rates										
	Lined valves						•			•	•
	ON/OFF valve							•			
	Pharmaceutical/food industry					•	•	•			
	Cryogenic technology				•						
Nominal valve sizes	[inch]	½...10	½...6	½...6	½...2	½...4		½...4	½...2	1...6	1...3
	[mm]		15...250	15...150	15...150	15...50	15...100	25...100	15...100	25...150	25...80
Nominal pressure	Class	125, 300	150, 300	150, 300	125			150, 300	300	150	150
	PN		10... 40	16...40	16... 40	10	10	16	16...40	10/16	10/16
	JIS	10/20									
Perm. temperatures and differential pressures	See associated Technical Data Sheet										
Body material	ASTM A 126 B, cast iron	•					•				
	ASTM A 216 WCB, cast carbon steel	•							•		
	ASTM A 351 CF8M, cast stainl. steel	•		•	•		•		•	CF3M	
	Cast iron GG-25, WN 0.6025		•	•			•		•		
	Spheroidal graphite (ductile nodular iron, WN 0.7043, ASTM A 395		•				•			•	•
	Cast steel GS-C25, WN 1.0619		•	•					•		
	Cast stainless steel, WN 1.4581		•	•			•	1.4404	•		
	Forged steel WN 1.0460		•								
	Forged stainless steel WN 1.4571		•		•	•					
	G-X 6 Cr Ni 189 WN 1.4308		•		•						
	GS 21 Mn5, WN 1.1138		•								
	Special material	•	•	•	•	•	•			B148-9A	
Plug	Metal sealed	•	•	•	•	•		•	•	•	
	Lapped-in metal sealed	•	•	•					•		
	Soft sealed	•	•	•	•	•		•	•	•	
	Pressure-balanced	•	•							•	•
Diaphragm seal					•	•					
Option	Insulating section	•	•	•	•						
	Metal bellows seal	•	•	•	•					•	•
	Heating jacket	•	•	•							
	Low-noise (flow divider)	•	•								
Connection	Flange	•	•	•		•	•		•	•	•
	Welding ends	•	•		•	•	•				
	Special connections	•			•	•	•			NPT-F	
											
Technical Data Sheet T ...	8012	8015	8026	8093	8048	8031	8097	8039	8020	111a	111b

Table 1b • Control Valves - up to ANSI Class 2500 / PN 420

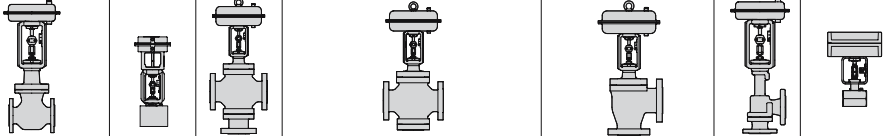
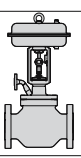
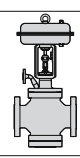
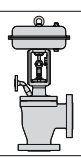
Type	3251		3252	3253	3254		3255	3256		3258	3510
Technical Data Sheet T ...	8051	8052	8053	8055	8060	8061	8062	8065	8066	8070	8091
Globe valve	•	•	•		•	•	•				•
Three-way mixing or diverting valve				•							
Angle valve			•					•	•	•	•
Standard version	ANSI	•	•	•		•	•		•		•
	DIN	•		•	•		•	•		•	•
Nominal valve sizes	[inch]	½...8	½...1	½...12		3...16	2...20		½...6		¼...½
	[mm]	15...200		15...25	15...400	80...500		50...500	15...150		25...150
Nominal pressure	Class	150...2500	300...2500	150...2500		150...2500	150...2500		150...2500		150...2500
	PN	16...400		40...400	10...160	16...400		16...400	16...400		16...40
Perm. temperatures and differential pressures	See associated Technical Data Sheet										
Body material	ASTM A 216 WCB, carbon steel		•				•			•	
	ASTM A 217 WC 6		•				•			•	
	ASTM A 351 CF8M stainl. cast steel		•	316 L			•			•	F 316
	Cast steel GS-C25, WN 1.0619	•			•	•		•	•		•
	Cast steel GS-17CrMo55, WN 1.7357	•				•		•	•		
	Cast stainless steel WN 1.4581	•		1.4404	•	•		•	•		•
Special material	•	•			•	•				•	•
Plug	Metal sealed	•	•	•	•	•	•	•	•	•	•
	Lapped-in metal sealed	•	•			•	•		•	•	•
	Soft sealed	•	•			•	•		•	•	•
	Pressure-balanced	•	•			•	•		•	•	
	Ceramic trim	•	•						•	•	•
On request	Insulating section	•	•	•	•	•	•	•	•	•	•
	Metal bellows seal	•	•	•	•	•	•	•	•	•	•
	Heating jacket	•	•			•	•		•	•	
	Low-noise (flow divider)	•	•			•	•		•	•	
Connection	Flange	•	•	•	•	•	•	•	•	•	•
	Welding ends	•	•	•	•	•	•	•	•	•	•
	Special connections	•	•	•		•	•		•	•	•
											
Technical Data Sheet T ...	8051	8052	8053	8055	8060	8061	8062	8065	8066	8070	8091

Table 1c • Steam-converting Valves - Series 3280

Type	3281		3284		3286	
						
Nominal valve sizes	[in]	2 ... 8	4 ... 16		2 ... 6	
	[mm]	50 ... 200	100 ... 400		50 ... 150	
Technical data according to ...	Type 3251		Type 3254		Type 3256	
Technical Data Sheet T ...	8251		8254		8251	

Series 3240

Type 3241 Globe Control Valve (T 8012 to T 8022)

This valve is used for various applications in process and industrial plants as well as in plant engineering and supply and distribution systems. Versions according to DIN, ANSI and JIS are manufactured on industrial scale.

Valve bodies made of cast iron, spheroidal graphite iron, cast carbon steel, stainless or cold-resistant cast steel.

Nominal valve size	1/2" ... 10"	DN 15 ... 250
Nominal pressure	ANSI Class 125...300 JIS 10/20 K	PN 10 ... 40
Temperature range	-325 ... +840 °F	-200 ... +450 °C

Valve plug with metal sealing, soft sealing, or lapped-in metal plug.

Further versions including adjustable packing, metal bellows seal, insulating section, heating jacket and flow divider for reducing the sound emission are available.

Type 3241 Forged-steel Version (T 8012 and T 8015)

Valve body and valve bonnet made of carbon steel ASTM A 105 or C22.8 or stainless steel A 182 F316 or WN 1.4571.

Nominal valve size	1/2" ... 3"	DN 15 ... 80
Nominal pressure	ANSI Class 300	PN 16 ... 40
Temperature range	-325 ... +840 °F	-200 ... +450 °C

Further details and versions are the same as for the cast body of Type 3241 (see above).

Type 3244 Three-way Control Valve (T 8026)

Control valve for mixing and diverting service according to DIN or ANSI standards. The arrangement of the plugs which is fixed by the manufacturer settles either mixing or diverting service (see valve body on p. 11).

Valve body made of cast iron, cast steel or stainless cast steel (according to DIN or ASTM specifications).

Nominal valve size	1/2" ... 6"	DN 15 ... 150
Nominal pressure	ANSI Class 150 ... 300	PN 10 ... 40
Temperature range	-325 ... +840 °F	-200 ... +450 °C

Valve plug with metal seal. Further versions with insulating section, adjustable packing, metal bellows seal, heating jacket and additional handwheel available.



Type 3241-1



Type 3241-7, forged steel



Type 3244-7

Valves for Special Applications

Type 3248 Cryogenic Valve (T8093)

Control valve used for liquid gases in the field of cryogenic engineering. Installation in vacuum-insulated pipelines.

Nominal valve size	1/2" ... 6"	DN 15 ... 150
Nominal pressure	ANSI Class 150 ... 300	PN 16 ... 40
Temperature range	-325 ... +430 °F	-200 ... +220 °C

Valve plug with soft seal. Metal bellows seal with backup stuffing box. Special version with aluminum body.

Type 3249 Control Valve for Aseptic Service (T8048)

Angle valve for food and pharmaceutical industry according to DIN or ANSI standards. PTFE-coated EPDM diaphragm serves as external sealing; additional test connection and backup stuffing box.

Nominal valve size	1/2" ... 2"	DN 15 ... 50
Nominal pressure	ANSI Class 125	PN 10 ... 40
Temperature range	14 ... 284 °F	-10 ... +140 °C

Versions with threaded coupling, conical coupling and slotted round nut or flanges, and according to ANSI with flanges or clamp weld-on coupling are available.

Type 3345 Diaphragm Control Valve (T 8031)

Control valve for viscous, corrosive and abrasive fluids according to ANSI or DIN standards.

Valve body made of cast iron, spheroidal graphite iron or stainless cast steel with or without lining. Valve diaphragm made of butyl, FKM or ethylene propylene (also with PTFE protective facing).

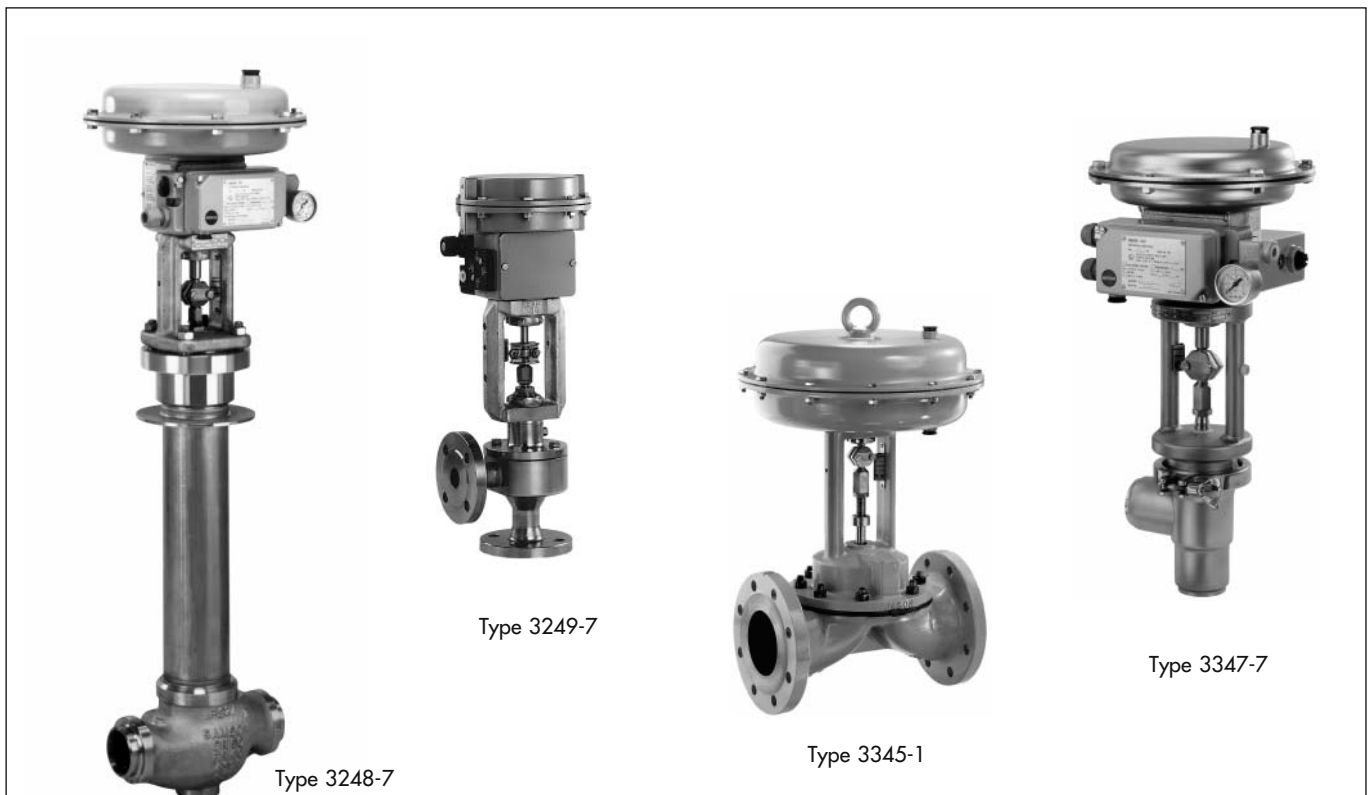
Nominal valve size	1/2" ... 4"	DN 15 ... 100
Nominal pressure	ANSI Class 125	PN 10
Temperature range	15 ... 300 °F	-10 ... +150 °C

Versions for higher temperatures available on request.

Type 3347 Control Valve for Food Processing (T 8097)

Angle valve for food and pharmaceutical industry as well as for biochemistry equipped with weld-on, screw or clamp connections.

Nominal valve size	1/2" ... 4"	DN 25 ... 100
Nominal pressure	ANSI Class 150	PN 16
Temperature range	15 ... 300 °F	-10 ... +150 °C



Valves for Special Applications

Type 3351 Pneumatic ON/OFF Control Valve (T 8039)

On/Off valve with tight closure for liquids, nonflammable gases and steam.

Valve body made of cast iron, cast steel or stainless cast steel.

Nominal valve size	1/2" ... 4"	DN 15 ... 100
Nominal pressure	ANSI Class 125 ... 300	PN 16 ... 40
Temperature range	15 ... 430 °F	-10 ... +220 °C

Valve plug with metal seal as well as with soft seal.

Self-adjusting PTFE V-ring packing.

Further versions with additional handwheel available.

Series 3500

Type 3510 Micro-flow Control Valve (T8091)

Stainless steel control valve for low flow rates designed as globe valve or angle valve.

Nominal valve size	1/4", 3/8", 1/2" NPT-F 1/2" flanged	1/4", 3/8", 1/2", DN 10 and 15 flanged
Nominal pressure	ANSI Class 150, 300, 600 and 1500	PN 40 and 400
Temperature range	-360 ... 1022 °F	-220 ... +550 °C

Versions with insulating section or metal bellows seal available.

Type 3521 Globe Control Valve (T8020)

Bronze and stainless steel control valve with NPT female threaded end connections. Compact design with integrated actuator directly mounted to the valve bonnet.

Nominal valve size	1/2" ... 2" NPT-F	
Nominal pressure	ANSI Class 300	
Temperature range	-20 ... 430 °F	-10 ... +220 °C

Valve plug with metal sealing, soft sealing, or lapped-in metal plug.

Further versions including adjustable packing available.

Type 3522 Globe Control Valve (T8020)

Bronze and stainless steel control valve with NPT female threaded end connections.

Nominal valve size	1/2" ... 2" NPT-F	
Nominal pressure	ANSI Class 300	
Temperature range	-20 ... 430 °F	-10 ... +220 °C

Valve plug with metal sealing, soft sealing, or lapped-in metal plug.

Further versions including adjustable packing available.



Type 3351-1



Type 3510-7



Type 3521-7



Type 3522-1

PFEIFFER Series 1

Type 1a PTFE-Lined Globe Control Valve (T 111a)

This valve is used for especially corrosive applications in process and industrial plants as well as in plant engineering and supply and distribution systems. Versions according to DIN and ANSI are manufactured.

Valve bodies made of ductile (spheroidal graphite) iron, with heavy-duty isostatically formed PTFE liner. A PTFE bellows seal is standard, optionally of material TFM.

Nominal valve size	1" ... 6"	DN 25 ... 150
Nominal pressure	See diagram	
Flanges	ANSI Class 150	PN 16
Temperature range	-20 ... +390 °F	-29 ... +200 °C

Further versions including slotted anti-cavitation plug, and anti-static conductive liner are available.

Type 1d PTFE-Lined 3-Way Globe Control Valve (on request)

This valve is essentially the same design as the Type 1a, but with a second plug and seat for the third port through the bottom flange.

Nominal valve size	1" ... 6"	DN 25 ... 150
Nominal pressure	See diagram	
Flanges	ANSI Class 150	PN 16
Temperature range	-20 ... +390 °F	-29 ... +200 °C

Further versions as for the Type 1a are available.

Type 1b PFA-Lined Globe Control Valve (T 111b)

This valve is used for similar applications to the Type 1a. Versions according to DIN and ANSI are manufactured.

Valve bodies made of ductile (spheroidal graphite) iron, with transfer-moulded PFA liner. A PTFE bellows seal is standard, optionally of material TFM.

Nominal valve size	1" ... 3"	DN 25 ... 80
Nominal pressure	See diagram	
Flanges	ANSI Class 150	PN 16
Temperature range	-20 ... +390 °F	-29 ... +200 °C

Further versions including slotted anti-cavitation plug are available.

Type 1c PFA-Lined Globe Control Valve (on request)

The Type 1c is essentially the same as the 1b, but with a diaphragm-type stem seal, in lieu of a bellows.

Nominal valve size	1" ... 3"	DN 25 ... 80
Nominal pressure	See diagram	
Flanges	ANSI Class 150	PN 16
Temperature range	-20 ... +390 °F	-29 ... +200 °C

Further versions as for the Type 1b are available.



Type 1a



Type 1b
(with PTFE bellows seal)



Type 1c
(with diaphragm stem seal)

Series 3250

Type 3251 Globe Valve

(T 8051/52)

Control Valves for process and plant engineering as well as for supply and distribution systems. Suitable for large nominal sizes and/or high pressures according to DIN and ANSI standards.

Valve body made of high-temperature, cold-resisting or stainless cast steel.

Nominal valve size	1/2" ... 8"	DN 15 ... 200
Nominal pressure	ANSI Class 150...2500	PN 16 ... 400
Temperature range	-328 ... 1022 °F	-200 ... +550 °C

Valve plug with metal seal, soft seal, or lapped-in metal plug.

Further versions with metal bellows seal, insulating section, heating jacket, flow divider for reducing the noise emission, or with pressure-balanced valve plug available.

Type 3252 High Pressure Control Valve

(T8053)

Stainless steel control valve with bar stock body designed as globe valve or angle valve.

Nominal valve size	1/2, 3/4, 1" NPT-F 1/2, 3/4, 1" flanged 1/2, 3/4, 1" weld ends	ISO G 1/2, 3/4, 1" DN 15, 20, 25 flanged DN 15, 20, 25 weld.
Nominal pressure	ANSI Class 300...2500	PN 40 ... 400
Temperature range	-320 ... +800 °F	-200 ... +450 °C

Versions with adjustable stuffing box, insulating section or metal bellows seal are available.

Type 3253 Three-way Valve

(T 8055)

Control valve for mixing or diverting service.

Valve body made of cast iron, high-temperature, cold-resisting or stainless cast steel.

Nominal valve size	1/2" ... 16"	DN 15 ... 400
Nominal pressure	ANSI Class 150...900	PN 16 ... 160
Temperature range	-328 ... 1022 °F	-200 ... +550 °C

Valve plug with metal seal. Further versions with metal bellows seal or insulating section available.

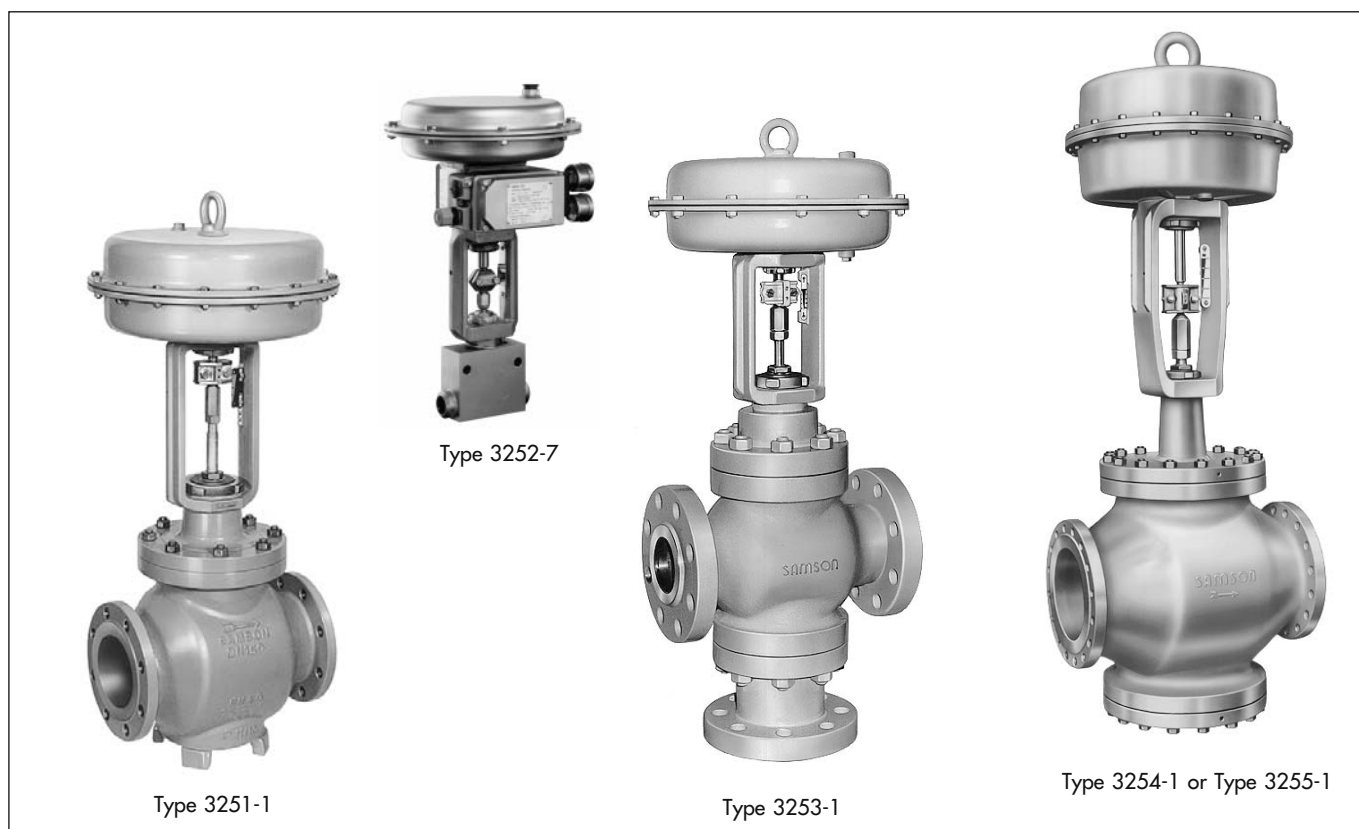
Type 3254 Globe Valve

(T 8060/61)

Control Valve for process engineering according to DIN or ANSI standards. The valve has an additional plug stem guide in the bottom flange of the body. Valve body made of high-temperature, cold-resisting or stainless cast steel.

Nominal valve size	3" ... 20"	DN 80 ... 500
Nominal pressure	ANSI Class 150...2500	PN 16 ... 400
Temperature range	-328 ... 1022 °F	-200 ... +550 °C

Valve plug with metal seal, soft seal, or lapped-in metal plug. Further versions with additional metal bellows seal, insulating section, heating jacket, flow divider for reducing the noise emission, or with pressure-balanced valve plug.



Type 3255 Globe Valve with multistage Plug (T 8062)

Control valve used for low-noise and low-wear service at high differential pressures. Axial throttling plug with either three or five stages including an additional bottom plug stem guide. Type 3255 utilizes the Type 3254 design, further details upon request.

Type 3256 Angle Valve (T 8065/66)

Utilizes Type 3251 components except the valve body, which is an angle pattern.

Nominal valve size	½" ... 6"	DN 15 ... 150
Nominal pressure	ANSI Class 150...2500	PN 16 ... 400
Temperature range	-328 ... 1022 °F	-200 ... +550 °C

Options and versions according to those of the 3251, except additionally versions with ceramic or hard metal (carbide) outlet port liner available.

Type 3258 Angle Valve with Split-body (T 8070)

Control valve for process engineering, especially for chemical plants where valve materials are subject to high stress. Valve body of steel, stainless cast steel, Hastelloy B, Hastelloy C, titanium, Monel and with either tantalum or zirconium lining.

Nominal valve size	1" ... 6"	DN 25 ... 150
Nominal pressure	ANSI Class 150...300	PN 16 ... 40
Temperature range	-15 ... 430 °F	-10 ... +220 °C

Valve plug with metal seal, soft seal, or lapped-in metal plug. Trim of ceramic or other materials available.

Series 3280

Control valves for process engineering or for use in the field of heat technology in order to simultaneously reduce the steam pressure and steam temperature.

Types 3281 and 3286 Steam-converting Valves (T8251)

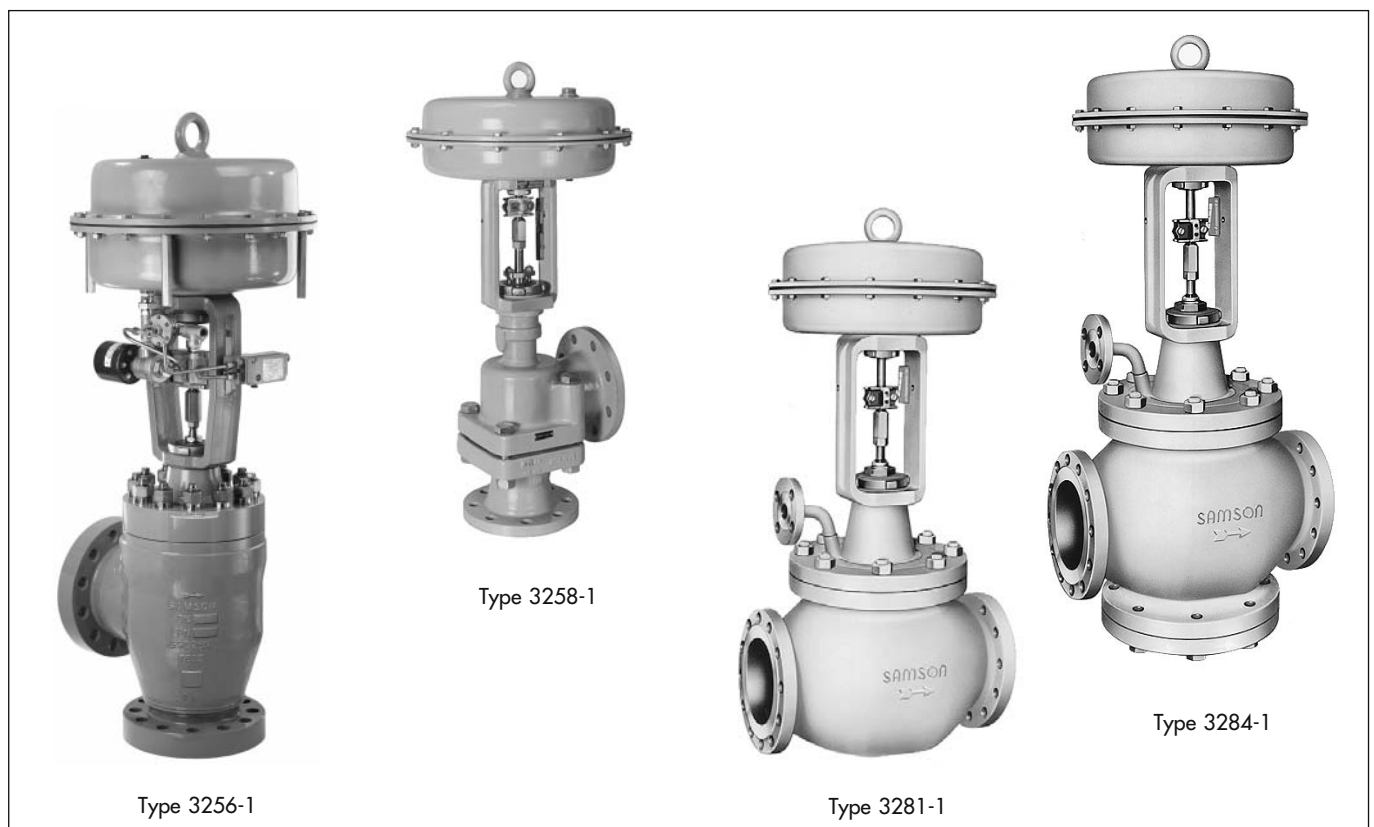
Globe valve (Type 3281) or angle valve (Type 3286) according to DIN or ANSI standards.

Nominal valve size	2" ... 8"	DN 50 ... 200
Nominal pressure	ANSI Class 300...2500	PN 16 ... 400
Temperature range	up to 1022 °F	up to 550 °C

Type 3284 Steam-converting Valve (T 8254)

Globe valve with four-flange body and double-guided plug stem according to ANSI or DIN standards.

Nominal valve size	4" ... 16"	DN 100 ... 400
Nominal pressure	ANSI Class 300...2500	PN 16 ... 400
Temperature range	up to 1022 °F	up to 550 °C



Actuators

Actuators convert the control signal coming from a controller or via a valve positioner into a travel motion carried out by the control valve.

Available from SAMSON are pneumatic, electric and electro-hydraulic actuators as well as hand-operated actuators (see Information Sheet T 8300 for actuator details).

Pneumatic actuators

They are used for pneumatic or electro-pneumatic instrumentation. Pneumatic actuators are diaphragm actuators with a rolling diaphragm and internal springs. Low overall height, strong positioning force and high speed of response are the typical features of these actuators.

Different signal pressure ranges are available. Pneumatic actuators are suitable for use in hazardous areas, and they have a fail-safe action: If the air supply fails, the control valve is either closed or opened.

The Type 3277 Pneumatic Actuators allow direct attachment of positioners or limit switches. To avoid any damage, the travel takeoff takes place within the yoke below the actuator housing.

Pneumatic actuators can additionally be equipped with a handwheel (see T 8310 and T 8311).

Electric actuators

If compressed air is not available, electric actuators with strong positioning forces and long travels may be used. These actuators are self-locking. Electric actuators are connected to three-step controllers, electric positioners issuing analog signals or a reversing contactor unit (see T 8330).

Electro-hydraulic actuators

These actuators are connected to an analog signal via three-step controllers or electric positioners. Versions with fail-safe action are available (see T 8340 and T 8342).

Hand-operated actuators

They are attached to Series 3240 and 3250 Control Valves which are used as hand-operated control valves with rated travels of 0.6 or 1.2 inches, 15 or 30 mm (see T 8312). Hand-operated actuators with longer travels are available on request (Type 3273-5/6).



Type 3277
Pneumatic Actuator

With additional
handwheel



Electric actuator



Electro-hydraulic actuator



Hand-operated
actuator

Accessories for Control Valves

SAMSON Control Valves can be equipped with several additional accessories. These accessories are e.g. used for actuator control and travel indication. They are attached either according to EN 60 534 (NAMUR rib) or directly with the Type 3277 Pneumatic Actuator up to size 700 (area in cm²). For direct attachment, the entire travel linkage is located in a closed housing in order to avoid contamination, mis-adjustment and also possible injuries of the personnel (for details, see Information Sheet T 8350).

Positioner

Positioners (p/p or i/p) compare the signal of a pneumatic or electric control system (e.g. 3 ... 15 psi, 0.2 ... 1 bar or 4(0) ... 20 mA) to the travel (manipulated variable) of the control valve. They issue a pneumatic signal pressure (p_{sp}) as output variable. The positioners can be used in standard operation or in split-range operation (see T 8351 onwards). Smart versions are configured and operated with the help of a PC or a handheld communicator (see T 8380).

Limit switch

Whenever an adjustable limit value is exceeded or not reached, a signal is sent out. Inductive limit switches are the preferred version. However, versions with electric or pneumatic microswitches are also available (see Information Sheet T 8350).

Position transmitter / Potentiometer

To indicate the travel position of a control valve, the rated travel range is represented by an analog electric signal (see T 8363).

Solenoid valve

The binary signals of a control system are converted into binary pneumatic control signals. As a result, the control valve can quickly be brought to its final position. The solenoid valves are used for ON/OFF valves or for control valves with fail-safe action.

Lockup valve

If the supply air pressure falls below an adjusted value, the signal pressure line is shut off. When this happens, the actuator stops on its last position (see T 8391).

Pneumatic remote adjuster

Manually adjustable precision regulator for the set point adjustment of pneumatic control systems.

Supply pressure regulator

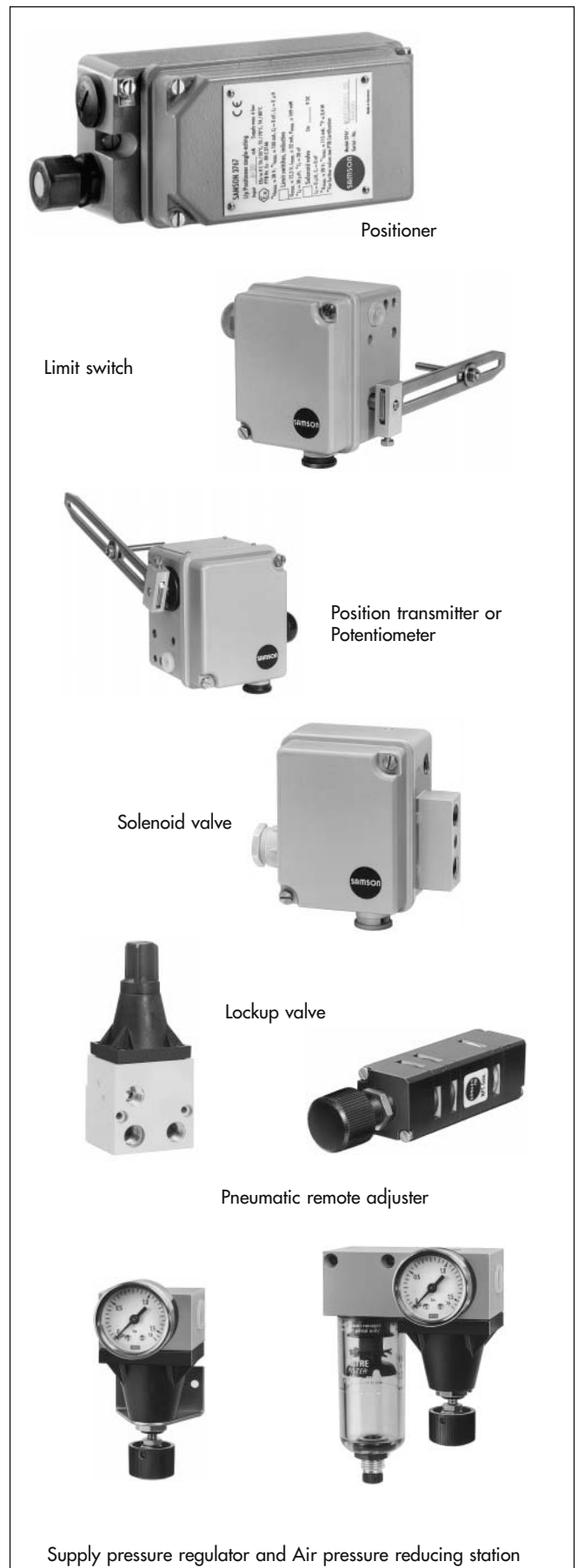
The supply pressure regulator provides pneumatic control valves with a constant air pressure (adjustable between 0 and 60 psi, 0 and 6 bar) (see T 8545).

Air pressure reducing station

This station consists of a supply pressure regulator and an air filter holding back foreign particles, oil and/or condensate (see T 8545).

Pneumatic amplifier

For fast control loops, the actuating time can be made shorter by means of pneumatic volume amplifiers.



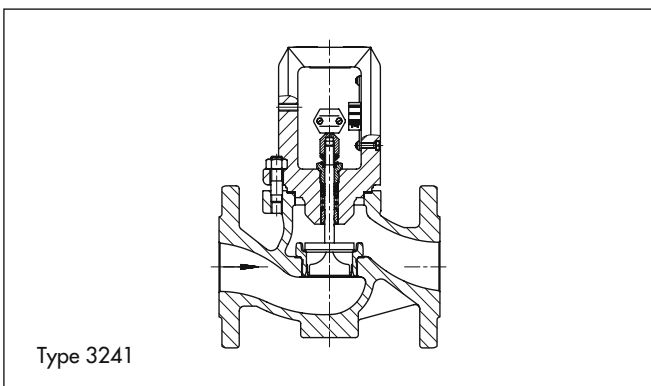
Control Valves in Detail

Valve Body and Valve Styles

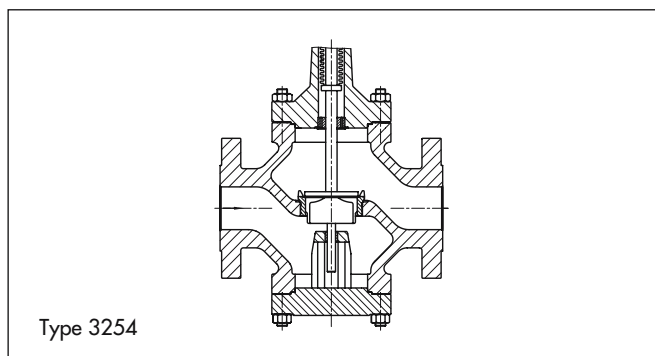
The valve body, the bonnet, and in some cases, the bottom flange, are subject to internal stress caused by the process medium flowing through. Thus the valves must be sufficiently resistant to mechanical and chemical stress. Under the influence of the operating temperature, the material strength changes. This behavior can be improved by combining certain alloys. For this reason, high-temperature materials are used at high temperatures (e.g. according to DIN 17 245) and cold-resistant materials are used at cryogenic temperatures. The materials table on page 23 and the AD Specification Sheet W 10 provide an overview.

Globe valve

Globe valves allow easy installation in straight pipelines. For nominal pressures up to Class 300 or PN 40, and nominal sizes up to 10" and DN 250, three-flange bodies of the Series 3240 are mainly used. The plug stem is guided in the valve bonnet, and the V-port plug in the threaded seat. The ports of the V-port plug are asymmetric in order to damp oscillations.

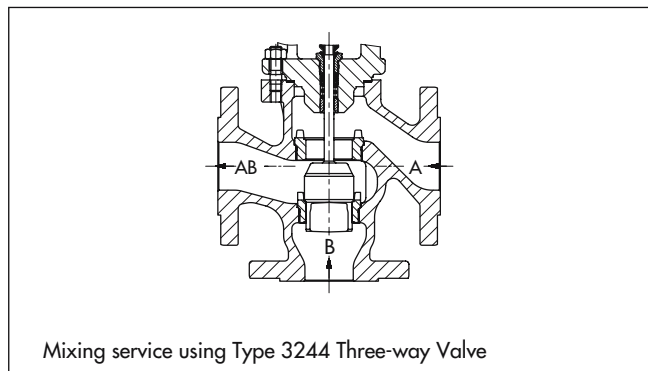


To resist higher stress levels and when larger seat diameters are required, the Type 3254 Globe Valve of the Series 3250 is provided with an additional plug stem guide in the bottom flange.

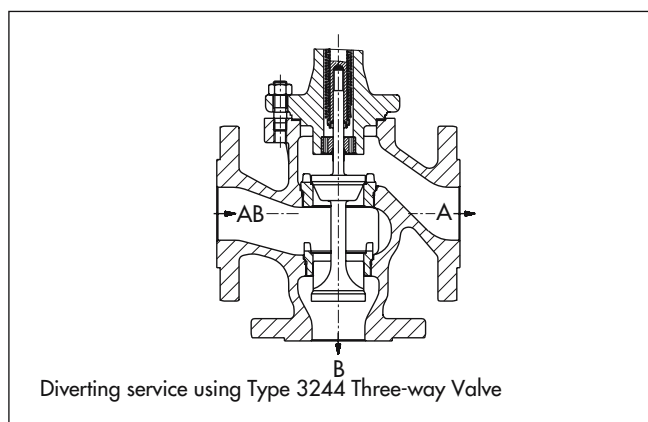


Three-way valve

For mixing or diverting service, three-way valves are used.

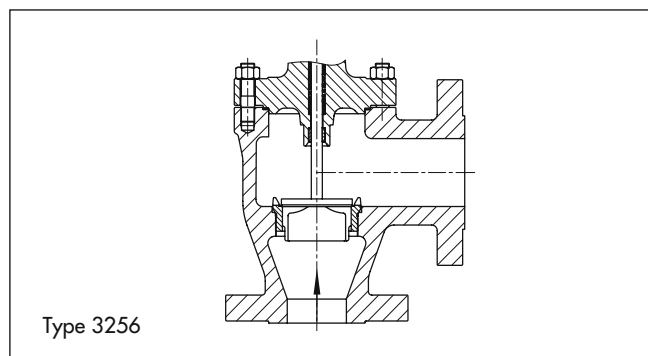


The mode of operation depends on how the two plugs are arranged. The direction of flow is indicated by arrows.



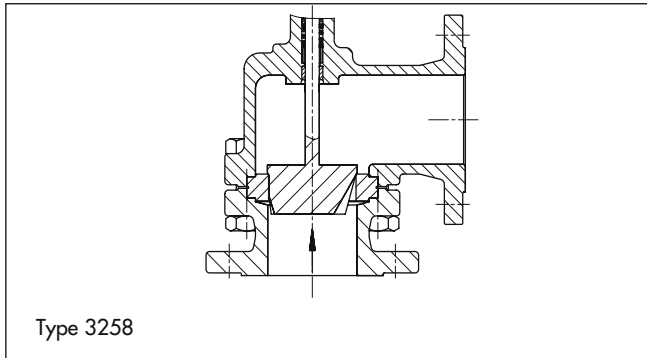
Angle valve

Angle valves are ideally installed when a vertical pipeline and a horizontal pipeline need to be connected. The process medium flow direction is changed only once. Angle valves allow condensate to be optimally treated, since they are practically entirely self draining. If the process medium flows in the closing direction of the plug, wear in the valve outlet is substantially reduced. For process media containing solids, the outlet of the Types 3256 and 3258 Control Valves can additionally be provided with a ceramic wear-resistant pipe.



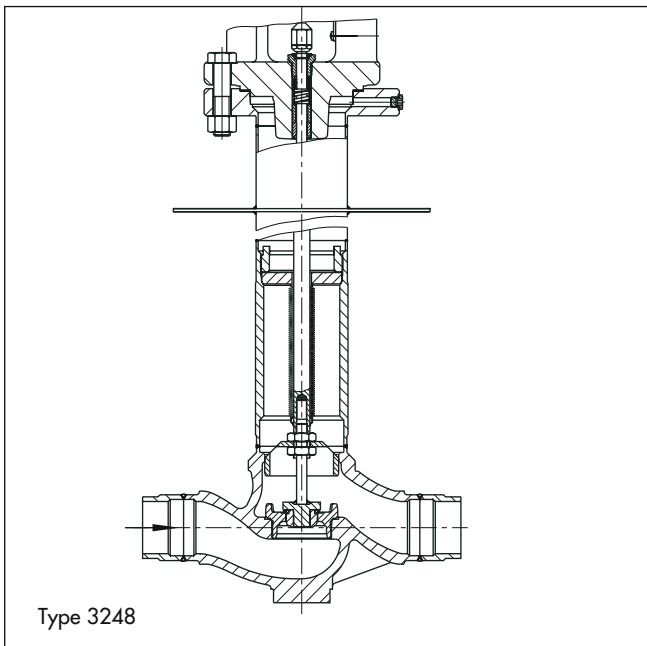
Split-body valve

The split-body valves are almost free of dead space, and due to their style, they can be manufactured of steel as well as of Hastelloy, titanium or Monel. The simple geometric shape allows trims and linings of tantalum, zirconium and ceramic to be used as a protection against abrasive process media.



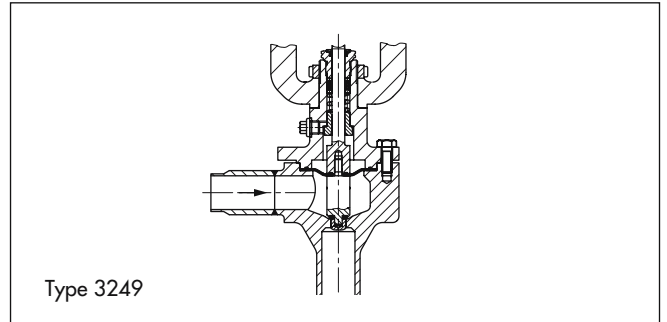
Cryogenic valve

In plants producing liquefied cryogenic gases, vacuum-insulated pipelines are often used in order to avoid environmental heat to be transferred to the medium. The control valves can be integrated in the vacuum jacket by means of a connecting flange. Constructional measures widely prevent thermal conduction to the effect that the stem remains free of ice. The primary sealing is a bellows seal. The jacketed pipeline is sealed and evacuated after the installation of the components. The temperature-insulating extension of the control valves is often welded to the jacketed pipeline via a flange, and therefore considerable efforts are necessary when the valve is to be removed from the pipeline. However, to make maintenance possible, the internal parts can be accessed via the temperature-insulating extension without the need to remove the valve from the pipeline.

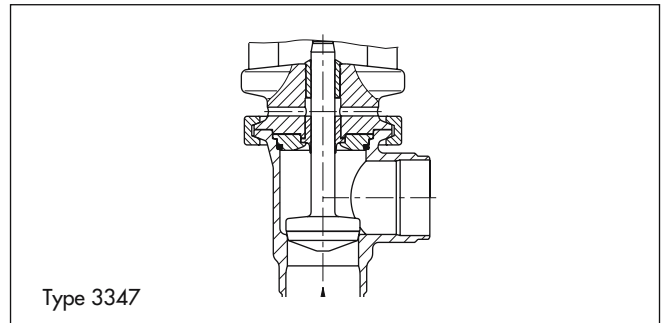


Valves for food processing

Valves for food processing are angle valves made of stainless steel. The internal surfaces exposed to the process medium are precision machined or polished. The valve bodies are self draining and can be cleaned (CIP) or sterilized (SIP) "in-place" (without being disassembled). The stem is sealed with a special diaphragm, thus preventing the trapping of bacteria.

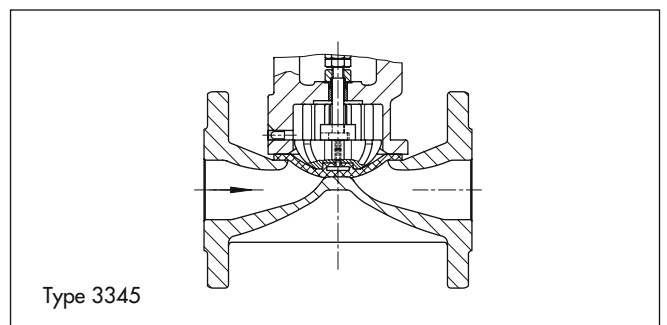


The Type 3347 Control Valve can be supplied with weld-on fittings, a threaded or a clamp connection according to ISO 2852, and with a steam trap if higher purity requirements are to be met.



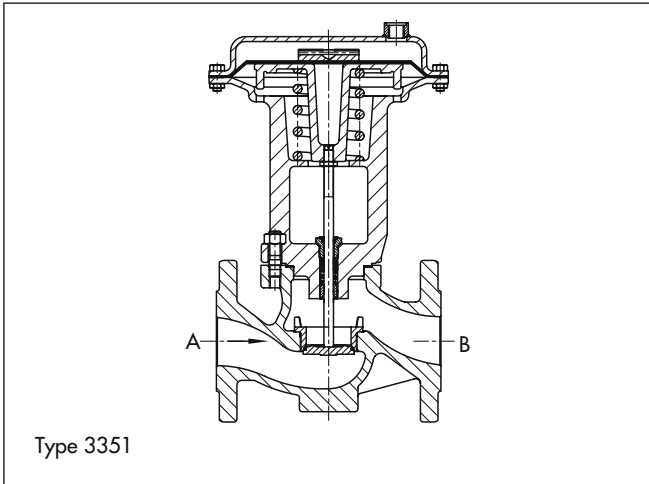
Diaphragm control valve

For viscous or corrosive media possibly containing solids, diaphragm control valves free of dead space and without stuffing boxes are an economical solution. The diaphragm may be made of rubber, nitrile, butyl or PTFE. The valve body may additionally be lined with rubber or PTFE.



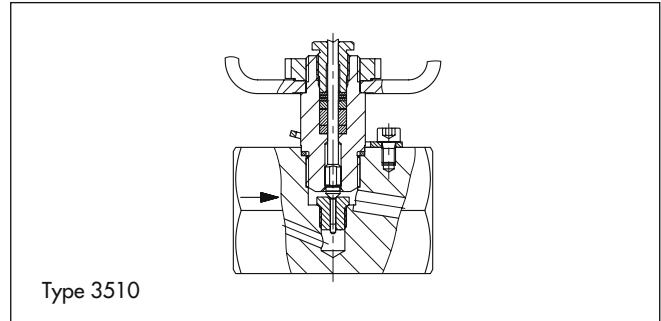
ON/OFF valve

The ON/OFF valve is used whenever liquids, nonflammable gases or steam require tight closure. As the valve plug is equipped with both a metal sealing and a soft sealing, the leakage flow rate class VI is obtained.



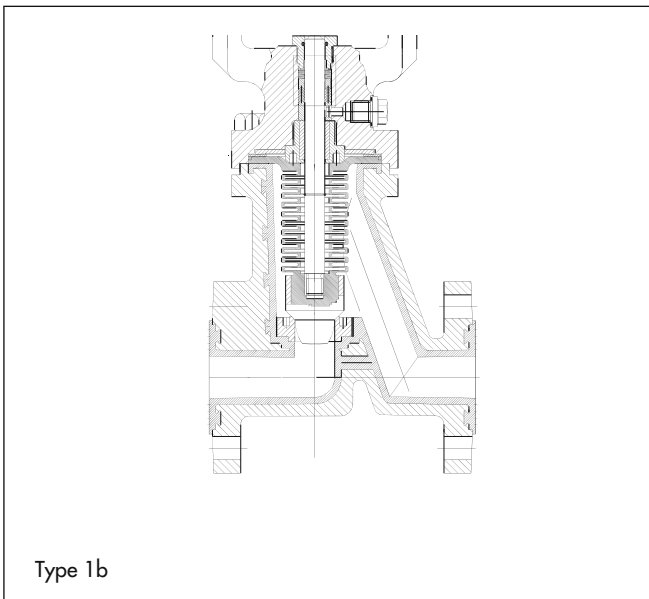
Micro-flow control valve

For low flow rates (C_V value ≤ 2.0 to 1.2×10^{-5} gpm, K_V value ≤ 1.6 to 1×10^{-5} m³/h), micro-flow control valves are used. The parts exposed to the process medium are generally made of stainless steel AISI 316 Ti (WN 1.4571). All valve parts are made of semi-finished products. As a result, special materials can be used in a particularly cost-effective manner, and the valve is suitable for a wide range of applications.



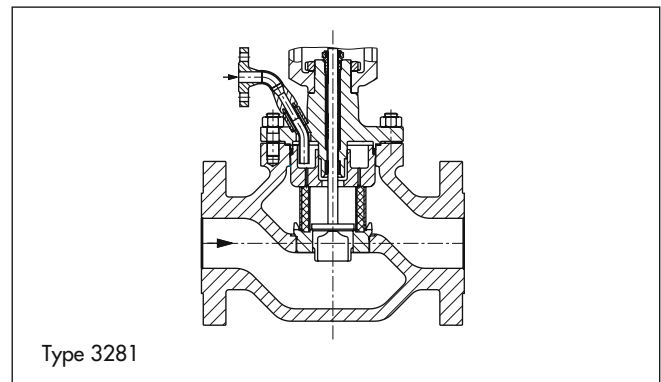
Lined valves

In the presence of very corrosive process media such as acids, which are incompatible with standard steels and stainless steels, exotic alloy materials would normally be required, which can be usually extremely expensive. Lined valves are very often a more effective and economical solution. Utilizing chemically non-reactive elastomer liners such as PTFE or PFA with massive PTFE or PTFE-encapsulated internals, the process medium is contained, while the ductile iron body, which serves to take the load from the pressure and pipeline forces, is totally protected. The thicker the liner, the more protection of the body from diffusion of the acid molecules. The liner is fitted and held to the body with dovetails, allowing valve operation under vacuum. The PTFE bellows primary seal shields the stainless steel stem and provides a complete seal between the process and the atmosphere. A PTFE stuffing box packing provides a secondary seal to back up the bellows.



Steam-converting valves

Steam-converting valves can reduce the steam pressure and the steam temperature at the same time. A connecting tube is used to direct the cooling water to the flow divider St III. At its inner edge, the cooling water meets the steam flow. The flow divider consists of a wire mesh with narrow openings where the steam flow and the entrained water are mixed. As the cooling water does not get into contact with the valve body, neither erosion nor thermal shock occur. The flow divider ensures low-noise and low-vibration operation.

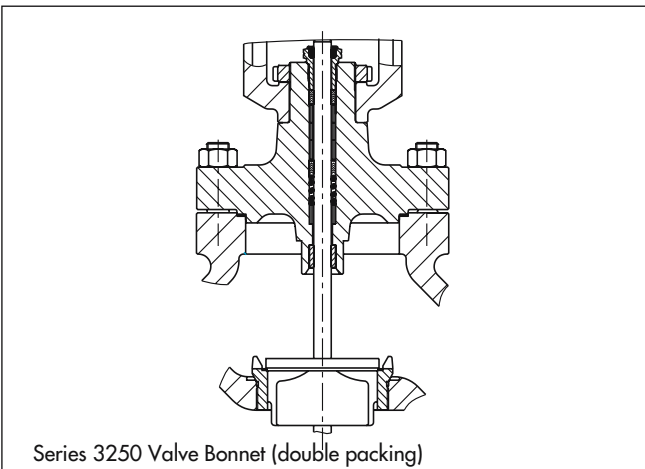
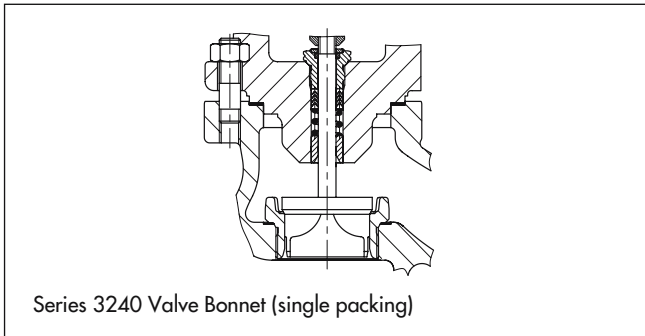


Valve Bonnet

The valve bonnet is the upper portion or top closure of the valve and incorporates the stuffing box and the plug stem guide. For Series 3240, the valve bonnet and the yoke are made as one piece. For Series 3250 and 3280, the valve bonnet and the yoke are screwed together. Attached to the yoke, the so-called NAMUR rib standardized according to EN 60 534-6 allows easy, standardized attachment of a positioner or other accessories. The valve bonnet is a pressure-carrying part and exposed to the process medium, therefore its material is subject to the same design requirements as the valve body.

Packing

The plug stem is sealed with the packing. Versions with bellows seal or insulating section are provided with a self-adjustable V-ring packing (PTFE-carbon compound - black), whereas standard versions are equipped with a backup stuffing box. The temperature range of the standard packing from 14 to 430 °F (-10 to 220 °C) can be extended when an insulating piece is added to the valve bonnet.



For special applications, the adjustable packing type A to type W may be installed.

Standard packing

Temp. range -10 ... +220 °C
w. insulating piece -200 ... +400 °C

Self-adjustable, spring-loaded V-ring packing made of PTFE-carbon compound for nominal sizes from DN 15 to DN 150. Suitable for all applications that require a tight seal and minimum maintenance.

Type A

Temp. range 14 ... +430 °F -10 ... +220 °C
with extension: -328 ... +750 °F -200 ... +400 °C

- Adjustable, PTFE silk cord / PTFE carbon packing, free of dead space.
- Especially suitable for fluids that polymerize or crystallize.
- For ½ to 6", DN 15 to 150, maximum ANSI 900, PN 160, the packing can be used with oxygen in the temperature range from -58 to +750 °F (-50 to +200 °C) when using a special lubricant (certified by the Bundesamt für Materialprüfung, i.e. the German federal office for materials testing).

Type B

Temp. range 14 ... +430 °F -10 ... +220 °C
with extension: -328 ... +750 °F -200 ... +400 °C

- Adjustable PTFE silk/PTFE white packing, free of dead space.
- Application and data same as for type A.

Type C

Temp. Range 14 ... +430 °F -10 ... +220 °C
with extension: -328 ... +750 °F -200 ... +400 °C

- Adjustable packing made of braided PTFE silk cord, free of dead space.
- Application for all chemicals including hot acids and alkaline solutions.

Type H

Temp. Range up to 660 °F 350 °C
Adjustable PTFE-free high-temperature packing made of pure graphite and carbon rings one laid over the other. Especially suitable for hot steam.

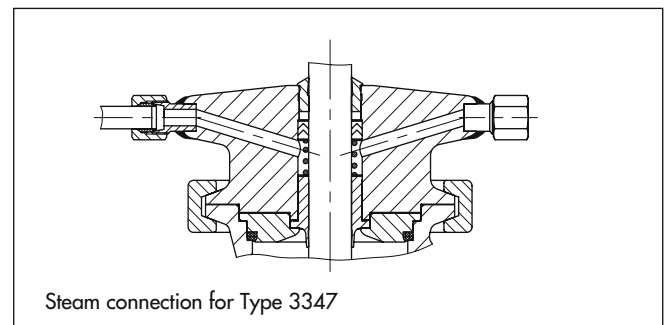
Type W

Temp. Range 14 ... +430 °F -10 ... +220 °C

- For ½ to 6", DN 15 to 150, maximum ANSI 300, PN 40
- Adjustable packing that is free of dead space. Consists of plastic fiber sealing rings and carbon bushings used for fresh water and service water.
- The carbon bushings are used as wiper rings.
- Especially suitable for hard water and possible deposits at the plug stem.

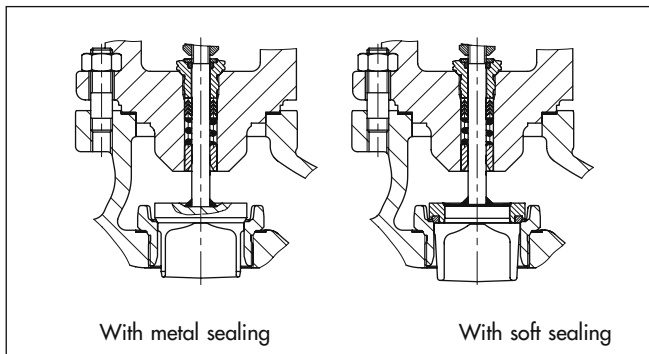
Steam connection

To meet the requirements regarding purity in the food and pharmaceutical industry, the Type 3347 Control Valve can be provided with a valve bonnet including a steam connection. Steam or a sterilizing liquid is applied around the plug stem between the two PTFE V-ring packing. As a result, bacteria is prevented.



The Trim Elements: Seat and Plug

The design of the seat and the plug determines the rated C_v (or Kvs) value and the characteristic as well as the seat leakage of a valve. The figures show seat-guided V-port plugs with asymmetric ports with metal sealing and soft sealing.



The seat, plug and plug stem are made of stainless steel. In some cases the trim units are subject to high stress due to high differential pressures, cavitation, flashing and process media containing solids. In order to increase the service life, the seats and the plugs with metal sealing can be provided with Stellite hard facing, and plugs up to 4", DN 100 can be made of pure Stellite. The seats are screwed so that they can easily be exchanged also for plugs of other materials.

Seat leakage

The seat leakage is determined according to ANSI/FCI 70-2 or EN 60 534 Part 4. This standard specifies which quantity of the test process medium (gas or water) maximally flows through the closed control valve under test conditions. On special applications (e.g. using Type 241-Gas or Type 241-Oil) or on shutoff valves (Type 3351), a high leakage class may be obtained by using a lapped-in metal or a soft seat-plug seal.

Table 2 · Plug sealing and leakage rate

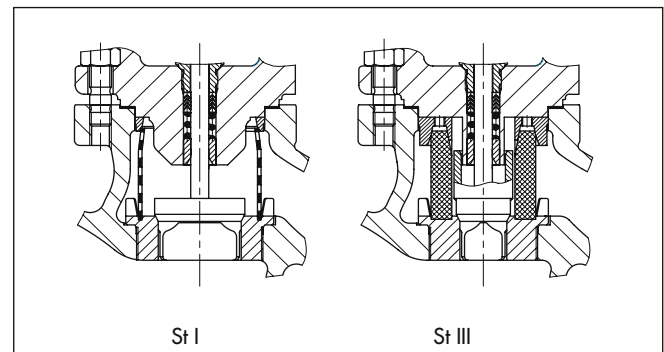
Seat-plug seal	Leakage class acc. To ANSI/FCI 70-2 (EN 60 534)	Seat leakage% of C_v or Kvs
With metal seal	IV	≤ 0.01
Lapped-in metal seal up to 3", DN 80	IV (IV-S2)	≤ 0.0001
Lapped-in metal seal from 4", DN 100	IV (IV-S1)	≤ 0.0005
With soft seal	VI	1)
Pressure-balanced plug with PTFE balancing seal	IV	≤ 0.01
Pressure-balanced plug with Graphite balancing seal	III	≤ 0.1

1) According to ANSI/FCI 70-2: values from Table 2 of the standard; or according to EN 60 534: $(0.3 \cdot \Delta p \cdot f_l)$, leakage factor f_l from Part 4, Table 4 of the EN standard.

Low-noise operation with flow divider

For reducing the noise emission and protecting the body against high velocity erosion, the flow dividers St I and St III are used.

The process medium reaches its maximum velocity after having passed the restriction between the seat and plug. Before creating a high-energy, turbulent mixing zone, the process medium hits the inner wall of the flow divider. The flow is divided and the noise of the imploding gas bubbles resulting in pressure waves is silenced.

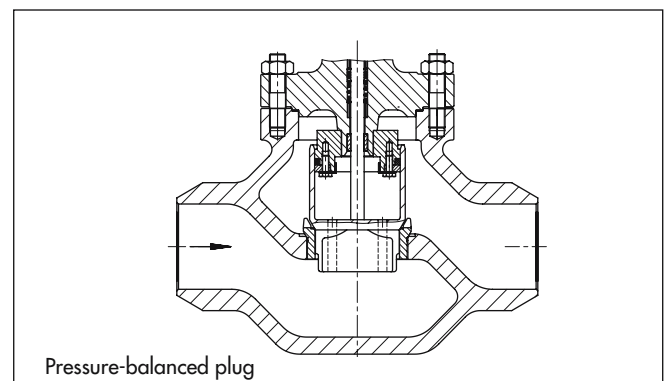


For noise calculation according to VDMA 24 422, Edition 1989, the valve-specific correction values η_G for gases and steam as well as η_F for liquids are required when using flow dividers. Please refer to the diagrams on page 22 for details. Further details regarding noise calculation may be found in EN 60354 Part 8-4, or you consult SAMSON to make these calculations for you.

The C_v or Kvs value of the valve trim is reduced when using the flow divider. The associated Technical Data Sheets include the values C_{vI} (Kvs_I) for the flow divider St I and C_{vIII} (Kvs_{III}) for the flow divider St III.

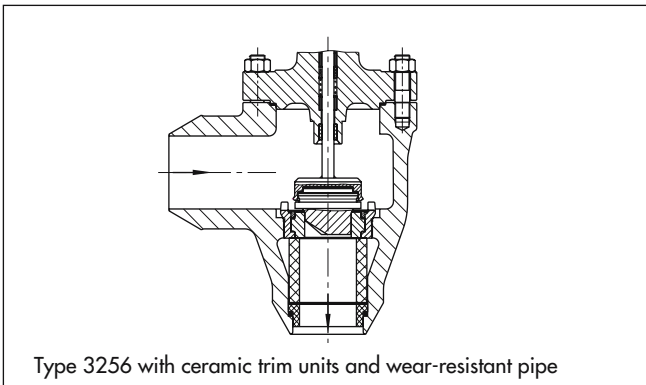
Pressure-balanced plug

If the actuating force is not sufficient to control the differential pressures, pressure-balanced plugs are a solution. The plug is designed to serve as a piston. The upstream pressure p_1 enters the internal chamber of the plug via a borehole in the bottom of the plug. The forces acting on the plug are compensated with exception of the area around the plug stem. Pressure-balanced plugs are sealed against the inner side of the plug with a PTFE ring or a graphite ring assembled to the bonnet. The pressure-balanced components are subject to wear. As a result, the leakage rate (see Table 2) and maintenance of these valves increases. Pressure-balanced plugs should not be used for process media that contain solids or crystallize. In these cases, a more powerful actuator is recommended.



Control valves with ceramic trim elements

Control valves with extremely resistant ceramic trim elements are used when the body and the trim are subject to particularly erosive and abrasive stress.



The following control valves can be equipped with ceramic trim:

- Type 3251 Globe Control Valve
- Type 3256 Angle Control Valve
- Type 3258 Angle Control Valve with Split-body.

The Type 3256 and Type 3258 Angle Valves can be equipped with a ceramic wear-resistant pipe. If the process medium flows in the closing direction of the plug, these versions are suitable for extremely erosive and abrasive stress caused by process media with solids content. Ceramic materials and properties on request.

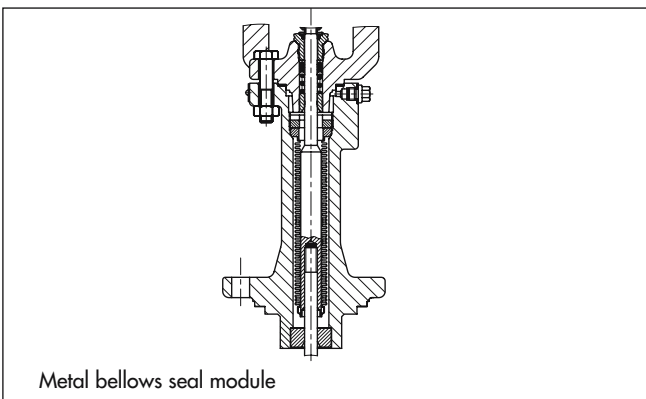
Additional Equipment

Metal bellows seal

If a very high external tightness of the seal is required, e.g. for satisfying the technical requirements of the German TA-Luft or in vacuum technology, a metal bellows is used to seal the plug stem. The top sealing flange of the plug stem is additionally sealed with a packing. This packing fulfills the task of a backup stuffing box. The metal bellows can be checked or provided with a sealing medium by means of a test connection.

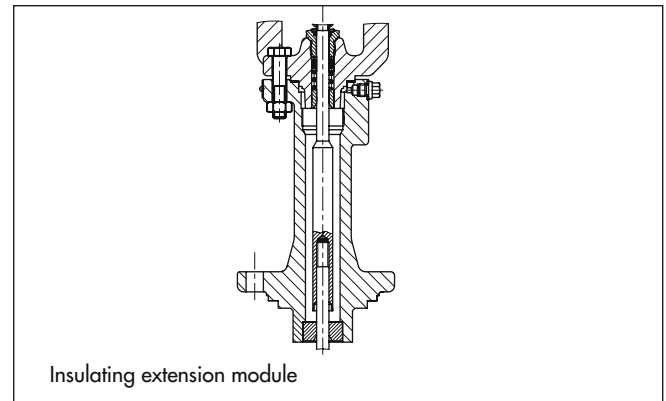
The metal bellows seal can be used with the following series:

- Series 3240: from -328 to +750 °F (-200 to +400 °C)
- Series 3250/3280: from -328 to +842 °F (-200 to +450 °C)
- Series 3510: from -328 to +842 °F (-200 to +450 °C)



Insulating section

The application range of a standard packing can be extended to an operating temperature of less than 15 °F (-10 °C) or more than +430 °F (220 °C) with the help of an insulating section. The different series have the following temperature ranges:



Series 3240

- 328 ... +842 °F -200 ... +450 °C (long extension)
- 58 ... +842 °F -50 ... +450 °C (short extension)

Series 3250

- 328 ... +1022 °F -200 ... +550 °C

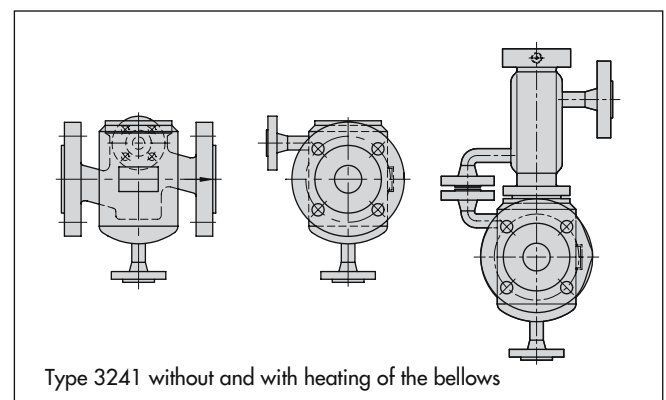
Series 3280

- max. +1022 °C +550 °C

The temperature ranges specified above can be restricted by the material used according to the pressure-temperature diagram.

Heating jacket

Some process media are only fluid above a certain temperature. If this temperature is not reached, they become solid or crystallize out. To maintain their fluid state, the valve bodies are provided with a heating jacket. When sealing the plug stem with a metal bellows, the valve bonnet may also be equipped with a heating jacket. A heat transfer medium flowing between valve body and heating jacket ensures that the desired temperature of the process medium is maintained. If steam is used as heating transfer medium, take care to ensure excellent condensate discharge.



Types of Piping Connections

In industrial plants, flange connections are the preferred solution. The reasons are easy assembling and disassembling of the valves as well as high reliability and tightness of the milled sealing surfaces.

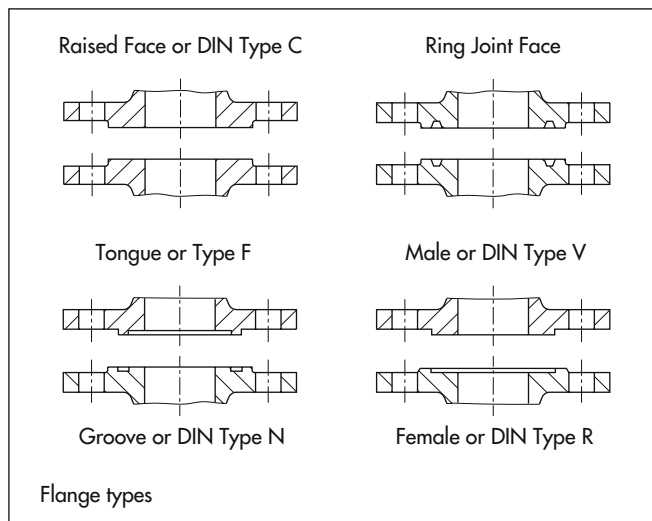
The US standard for flanges is ANSI/ASME B 16.1 for Class 125, and for higher nominal pressure ratings ANSI/ASME B 16.5. The standard version for valves of Class 125 made of cast iron is manufactured without sealing face (FF-flat face). Valves of Class 300 have a sealing face RF 0.06 (raised face with 0.06" height), with higher nominal pressure ratings the valves have a sealing face RF 0.25. Flange face finish for RF is standard R_a 125 ...250 μ inch (3.2...6.3 μ m).

Other end connection versions are possible. More details available on request.

A survey of DIN flanges is provided in DIN 2500. Whereas the connecting dimensions are specified in DIN 2501, and the types of the possible sealing faces in DIN 2526. The standard version of SAMSON Control Valves have Type C sealing faces. Other types available on request.

For critical process media and/or high nominal pressure, the valve bodies can be supplied with weld-on fittings or welded-neck ends. For control valves according to DIN standards, the weld-on fittings are designed according to DIN 3239 T1 with edge forms according to DIN 2559 T1. For control valves according to US standards, the weld-on fittings are specified in ASME/ANSI B 16.25.

For installation methods according to US standards, the control valves Type 3241 and Series 3520 are available with NPT female thread 1/2" to 2".



Face-to-face and End-to-end Dimensions

For control valves according to US standards, the face-to-face dimensions of are specified in ANSI/ISA-S75.03, .04, .08, .12, .15, .16, and .22. For other valve types, the ASME/ANSI B16.10 applies. The face-to-face dimensions of metric globe valves and face-to-center dimensions of angle valves are specified in DIN 3202. Part 1 includes the dimensions for the flange connections (row F 1 for PN 10 to 40, row F 2 for PN 63 to 160 and row F 3 for PN 250 and 320).

SAMSON Control Valves with welding ends according to DIN have the same dimensions as those with flanges. Versions with welded-neck ends are not standardized, their end-to-end dimensions must be determined on agreement.

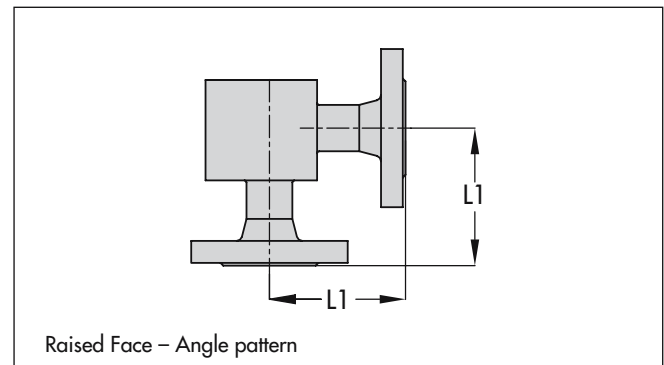
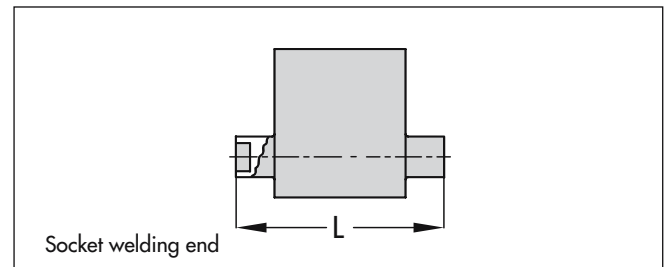
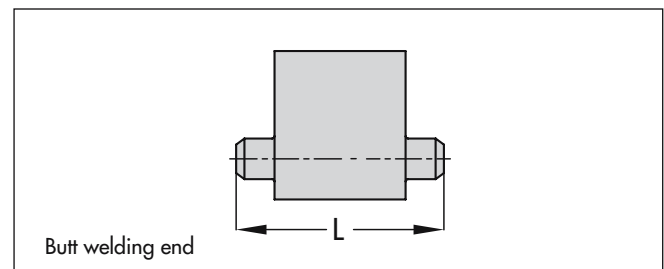
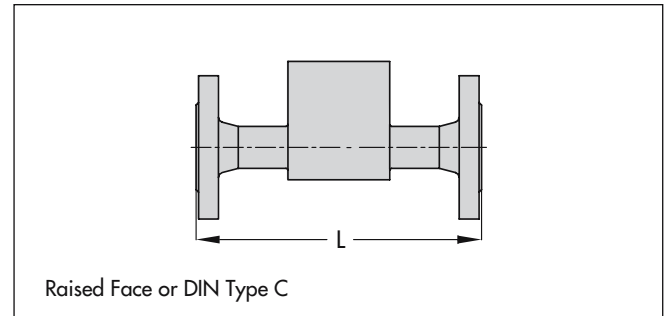


Table 3a · Face-to-face and end-to-end dimensions for globe control valves according to ISA and IEC · Dimensions in inches

ISA dimension "L" inches		Flanged ¹⁾		Short Pattern Class 150, 300, 600 (Grp 1 PN 20,50,100)	
				Socket weld ²⁾	Butt weld ³⁾
Nominal valve size		Class 150 (PN 20), Class 125	Class 300 (PN 50), Class 250	Socket weld ²⁾	Butt weld ³⁾
inches	mm				
½	15	7.25	7.50	6.69	7.38
¾	20	7.25	7.62	6.69	7.38
1	25	7.25	7.75	7.75	7.38
1½	40	8.75	9.25	9.25	8.75
2	50	10.00	10.50	10.50	10.00
2½	65	10.88	11.50	11.50	11.50
3	80	11.75	12.50	12.50	12.50
4	100	13.88	14.50	14.50	14.50
6	150	17.75	18.62	–	17.75
8	200	21.38	22.38	–	21.38
10	250	26.50	27.88	–	26.50
12	300	29.00	30.50	–	29.00
14	350	35.00	36.50	–	33.50
16	400	40.00	41.62	–	40.00

FF–Flat Face RF–Raised Face SWE–Socket welding ends BWE–Butt welding ends

Shaded cells refer to less customary versions. Check with SAMSON for availability, before ordering.

¹⁾ ISA-S75.03 and IEC 60534-3-1, Table I

²⁾ ISA-S75.12

³⁾ ISA-S75.15 and IEC 60534-3-3

Table 4a · Face-to-face and end-to-end dimensions for globe control valves according to ISA and IEC · Dimensions in inches

ISA dimension "L" inches		Flanged ¹⁾		Long Pattern Class 150, 300, 600 (Group 2 PN 20, 50, 100)	
				Socket weld ²⁾	Butt weld ³⁾
Nominal valve size		Class 600 (PN 100)	Socket weld ²⁾	Butt weld ³⁾	
inches	mm				
½	15	8.00	8.12	8.00	
¾	20	8.12	8.25	8.25	
1	25	8.25	8.25	8.25	
1½	40	9.88	9.88	9.88	
2	50	11.25	11.25	11.25	
2½	65	12.25	12.25	12.25	
3	80	13.25	13.25	13.25	
4	100	15.50	15.50	15.50	
6	150	20.00	–	20.00	
8	200	24.00	–	24.00	
10	250	29.62	–	29.62	
12	300	32.25	–	32.35	
14	350	38.25	–	40.50	
16	400	43.62	–	43.62	

RF–Raised Face SWE–Socket welding ends BWE–Butt welding ends
Shaded cells refer to less customary versions. Check with SAMSON for availability, before ordering.

¹⁾ ISA-S75.03 and IEC 60534-3-1, Table I

²⁾ ISA-S75.12

³⁾ ISA-S75.15 and IEC 60534-3-3

Table 5a · Face-to-centerline dimensions for flanged globe-style angle control valves · Dimension "L₁" in inches

Nominal valve size		Class 150 (ISO PN 20)	Class 300 (ISO PN 50)	Class 600 (ISO PN 100)
inches	mm			
½	15	–	–	–
¾	20	–	–	–
1	25	3.62	3.88	4.12
1½	40	4.37	4.62	4.94
2	50	5.00	5.25	5.62
2½	65	–	–	–
3	80	5.88	6.25	6.62
4	100	6.94	7.25	7.75
6	150	8.88	9.31	10.00
8	200	10.69	11.19	12.00

According to ISA-S75.22

Table 6a · End-to-end dimensions for globe control valves with ring joint facings · Dimensions in inches

Nominal valve size		Class 150 (ISO PN 20)	Class 300 (ISO PN 50)	Class 600 (ISO PN 100)
inches	mm			
½	15	7.25 + 0.50	7.50 + 0.44	8.00 – 0.06
¾	20	7.25 + 0.50	7.62 + 0.50	8.12 + 0.00
1	25	7.25 + 0.50	7.75 + 0.50	8.25 + 0.00
1½	40	8.75 + 0.50	9.25 + 0.50	9.88 + 0.00
2	50	10.00 + 0.50	10.50 + 0.62	11.25 + 0.12
2½	65	10.88 + 0.50	11.50 + 0.62	12.25 + 0.12
3	80	11.75 + 0.50	12.50 + 0.62	13.25 + 0.12
4	100	13.88 + 0.50	14.50 + 0.62	15.50 + 0.12
6	150	17.75 + 0.50	18.62 + 0.62	20.00 + 0.12
8	200	21.38 + 0.50	22.38 + 0.62	24.00 + 0.12
10	250	26.50 + 0.50	27.88 + 0.62	29.62 + 0.12
12	300	29.00 + 0.50	30.50 + 0.62	32.25 + 0.12
14	350	35.00 + 0.50	36.50 + 0.62	38.25 + 0.12
16	400	40.00 + 0.50	41.62 + 0.62	43.62 + 0.12

According to ISA-S75.03 and ASME B16.10

Table 3b · Face-to-face and end-to-end dimensions for globe control valves according to ISA and IEC · Dimensions in mm

ISA dimension "L" mm		Flanged ¹⁾		Short Pattern Class 150, 300, 600 (Grp 1 PN 20,50,100)	
				Socket weld ²⁾	Butt weld ³⁾
Nominal valve size		Class 150 (PN 20), Class 125	Class 300 (PN 50), Class 250	Socket weld ²⁾	Butt weld ³⁾
inches	mm				
½	15	184	190	170	187
¾	20	184	194	170	187
1	25	184	197	197	187
1½	40	222	235	235	222
2	50	254	267	267	254
2½	65	276	292	292	292
3	80	298	318	318	318
4	100	352	368	368	368
6	150	451	473	–	451
8	200	543	568	–	543
10	250	673	708	–	673
12	300	737	775	–	737
14	350	889	927	–	851
16	400	1016	1057	–	1016

FF–Flat Face RF–Raised Face SWE–Socket welding ends BWE–Butt welding ends

Shaded cells refer to less customary versions. Check with SAMSON for availability, before ordering.

1) ISA-S75.03 and IEC 60534-3-1, Table I

2) ^{ISA-S75.12}

3) ISA-S75.15 and IEC 60534-3-3

Table 5b · Face-to-centerline dimensions for flanged globe-style angle control valves · Dimension "L₁" in mm

Nominal valve size		Class 150 (ISO PN 20)	Class 300 (ISO PN 50)	Class 600 (ISO PN 100)
inches	mm			
½	15	–	–	–
¾	20	–	–	–
1	25	92	99	105
1½	40	111	117	125
2	50	127	133	143
2½	65	–	–	–
3	80	149	159	168
4	100	176	184	197
6	150	226	236	254
8	200	272	284	305

According to ISA-S75.22

Table 4b · Face-to-face and end-to-end dimensions for globe control valves according to ISA and IEC · Dimensions in mm

ISA dimension "L" mm		Flanged ¹⁾		Long Pattern Class 150, 300, 600 (Group 2 PN 20, 50, 100)	
				Socket weld ²⁾	Butt weld ³⁾
Nominal valve size		Class 600 (PN 100)	Socket weld ²⁾	Butt weld ³⁾	
inches	mm				
½	15	203	206	203	
¾	20	206	210	206	
1	25	210	210	210	
1½	40	251	251	251	
2	50	286	286	286	
2½	65	311	311	311	
3	80	337	337	337	
4	100	394	394	394	
6	150	508	–	508	
8	200	610	–	610	
10	250	752	–	752	
12	300	819	–	819	
14	350	972	–	1029	
16	400	1108	–	1108	

RF–Raised Face SWE–Socket welding ends BWE–Butt welding ends
Shaded cells refer to less customary versions. Check with SAMSON for availability, before ordering.

1) ISA-S75.03 and IEC 60534-3-1, Table I

2) ^{ISA-S75.12}

3) ISA-S75.15 and IEC 60534-3-3

Table 6b · End-to-end dimensions for globe control valves with ring joint facings · Dimensions in millimeters

Nominal valve size		Class 150 (ISO PN 20)	Class 300 (ISO PN 50)	Class 600 (ISO PN 100)
inches	mm			
½	15	184+13=197	190+11=201	203-1.5=201
¾	20	184+13=197	194+13=207	206+0=206
1	25	184+13=197	197+13=210	210+0=210
1½	40	222+13=235	235+13=248	251+0=251
2	50	254+13=267	267+16=283	286+3=289
2½	65	276+13=289	292+16=308	311+3=314
3	80	298+13=311	318+16=333	337+3=340
4	100	352+13=365	368+16=384	394+3=397
6	150	451+13=464	473+16=489	508+3=511
8	200	543+13=556	568+16=584	610+3=613
10	250	673+13=686	708+16=724	752+3=755
12	300	737+13=750	775+16=791	819+3=822
14	350	889+13=902	927+16=943	972+3=975
16	400	1016+13=1029	1057+16=1074	1108+3=1111

According to ISA-S75.03 and ASME B16.10

Valve-specific Parameters

Flow coefficients

C_V value

The necessary C_V value is calculated according to ISA-S75.01 or EN 60534 using the specified operating data.

For the designation of the valves, the C_V value is specified in the Technical Data Sheets. The valve C_{V100} value corresponds to the C_V value for the nominal travel height H₁₀₀. In order to increase control accuracy and with regard to the manufacturing tolerances, the C_V or value chosen is to be higher than the C_V value calculated.

K_V value

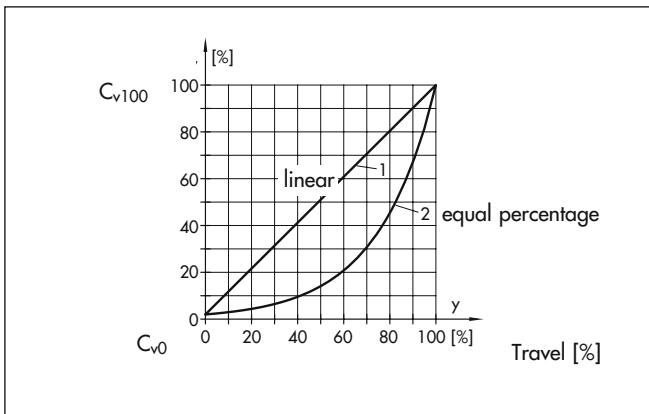
The K_V value is the alternative flow coefficient as defined by EN 60534. The conversion is $C_V \approx 1.17 \cdot K_V$.

Inherent characteristic

The characteristic represents the C_V value's dependence on the travel height (H). Control valves are provided either with an equal percentage (2) or with a linear (1) characteristic. The equal percentage characteristic means that equal changes in travel result in equal percentage changes of the C_V value in question. The linear characteristic means that equal changes in travel are followed by equal changes of the C_V value.

Rangeability

The rangeability is C_V multiplied by C_{V calc.} For this calculation, the C_{V calc.} value represents the smallest C_V value with which the characteristic lies still within the permissible gradient tolerance of the characteristic (ISA-S75.11 and EN 60 534 Part 2-4).



Cavitation parameters

With liquids, the lowest pressure level within the control valve occurs at a location just downstream of the throttling area, called the vena contracta. If the absolute pressure at the vena contracta p_{vc} , is reduced during the throttling process to a level at or below the vapor pressure of the process medium p_v , a portion of the fluid starts to vaporize, forming bubbles within the flow stream. Downstream of the vena contracta, the pressure level recovers back to a level above the vapor pressure, and the vapor bubbles collapse (implode) back to a liquid state, with a rapid transformation of energy which causes shock waves. The presence of cavitation can be detected by a sharp increase in the sound level due to the shock waves caused by the implosion of the vapor bubbles.

Incipient cavitation

The pressure drop can be expressed in the form of a ratio, X_F , which is defined as:

$$X_F = \frac{p_1 - p_2}{p_1 - p_v}$$

The pressure drop at which cavitation begins (z or X_{Fz}), is similarly defined:

$$z = X_{Fz} = \frac{p_1 - p_{2z}}{p_1 - p_v}$$

Z is dependent on the trim size and the relative opening, y , and is often expressed as z_y . Refer to Table X for z values for Series 3240 and 3250.

If the pressure drop is greater than or equal to the pressure drop at which cavitation begins, i.e.

- If $X_F \geq z$
→ Incipient cavitation
- If $X_F < z$
→ No cavitation

Incipient cavitation is considered to be insufficient to cause significant erosion of the valve internals.

Cavitation Index

The cavitation index K_C , defined by the NRC (U.S. Nuclear Regulatory Commission) standard CR-6031. It is the point at which it is possible to measure a deviation of the actual flow rate from the theoretical linearly increasing in flow rate predicted by the C_V equation, with increasing pressure drop $\sqrt{\Delta p}$. This deviation is caused by the increasing presence of vapor bubbles, which reduces the overall flow rate. From experimental measurements with SAMSON globe valves:

$$K_C \approx F_L^3$$

F_L and K_C values for Series 3240 are provided in Table 8.

- If $X_F \geq K_C$,
→ Significant cavitation

For water, with low pressure drops (less than 150 psig / 10 barg), standard trim materials are normally acceptable.

With moderate pressures drops (above 150 psi or 10 bar) hardened trim with Stellite or with very significant drops, special hard chrome steels are recommended. Consult SAMSON for advice concerning these applications.

Table 7 · Nominal C_v verses relative travel · 3240 Series · Equal percentage characteristic

Relative travel					[%]	10	20	30	40	50	60	70	80	90	100
Rated C _v	Valve size [inches]	Seat diameter [inches]	Travel [inches]	Range-ability	Nominal C _v value										
0.12	½" to 1"	0.12	0.6	50:1	0.004	0.005	0.008	0.011	0.017	0.025	0.037	0.055	0.081	0.120	
0.2					0.006	0.009	0.013	0.019	0.028	0.042	0.062	0.091	0.135	0.200	
0.3					0.009	0.013	0.019	0.029	0.042	0.063	0.093	0.137	0.203	0.300	
0.5	½" to 2"	0.24			0.015	0.022	0.032	0.048	0.071	0.105	0.155	0.229	0.338	0.500	
0.75					0.022	0.033	0.049	0.072	0.106	0.157	0.232	0.343	0.507	0.750	
1.2					0.035	0.052	0.078	0.115	0.170	0.251	0.371	0.549	0.811	1.20	
2					0.059	0.087	0.129	0.191	0.283	0.418	0.618	0.915	1.35	2.00	
3					0.089	0.131	0.194	0.287	0.424	0.627	0.928	1.37	2.03	3.00	
5					0.148	0.219	0.323	0.478	0.707	1.05	1.55	2.29	3.38	5.00	
7.5	¾" to 2"	0.95			0.222	0.328	0.485	0.717	1.06	1.57	2.32	3.43	5.07	7.50	
12	1" to 2"				0.355	0.525	0.776	1.15	1.70	2.51	3.71	5.49	8.11	12.0	
20	1½" to 3"	1.22			0.592	0.875	1.29	1.91	2.83	4.18	6.18	9.15	13.5	20.0	
30		1.50			0.887	1.31	1.94	2.87	4.24	6.27	9.28	13.7	20.3	30.0	
40		2" to 3"			1.90	1.18	1.75	2.59	3.83	5.66	8.37	12.4	18.3	27.0	40.0
70	2½" to 3"	2.48			3.28	4.61	6.47	9.10	12.8	18.0	25.2	35.5	49.8	70.0	
75	4" to 6"	2.48	1.2	3.51	4.94	6.94	9.75	13.7	19.2	27.0	38.0	53.4	75.0		
95	3"	3.15	0.6	4.45	6.25	8.78	12.3	17.3	24.4	34.2	48.1	67.6	95.0		
120	4" to 6"	3.15	1.2	5.62	7.90	11.1	15.6	21.9	30.8	43.3	60.8	85.4	120		
190		3.94		8.90	12.5	17.6	24.7	34.7	48.7	68.5	96.2	135	190		
290	8" to 10"	4.92	2.4	13.6	19.1	26.8	37.7	52.9	74.4	105	147	206	290		
305	6"	5.12	1.2	14.3	20.1	28.2	39.6	55.7	78.2	110	154	217	305		
420	8" to 10"	5.91	2.4	19.7	27.6	38.8	54.6	76.7	108	151	213	299	420		
735		7.87		34.4	48.4	68.0	95.5	134	189	265	372	523	735		

Table 8 · F_L, x_T and K_c verses relative travel · 3240 Series · Flow to open valve

Relative travel		[%]	10	20	30	40	50	60	70	80	90	100
Liquid pressure recovery factor (liquids, without attached fittings)	F _L		0.96	0.95	0.94	0.93	0.92	0.91	0.91	0.90	0.90	0.90
Cavitation index (liquids)	K _c		0.90	0.86	0.83	0.80	0.77	0.76	0.74	0.73	0.73	0.72
Pressure drop ratio factor (compressible fluids, without attached fittings)	x _T		0.79	0.76	0.75	0.73	0.71	0.70	0.70	0.69	0.69	0.68

Valve Sizing

Calculation of the C_v value

The C_v value is calculated according to ISA-S75.01 and DIN IEC EN 60 534. The Technical Data Sheets provide the necessary device-specific data. A simplified manual calculation may be made with the help of the equations given below. They do not take into account the influence of the connecting fittings or the effects under non-turbulent (laminar or transitional) flow conditions.

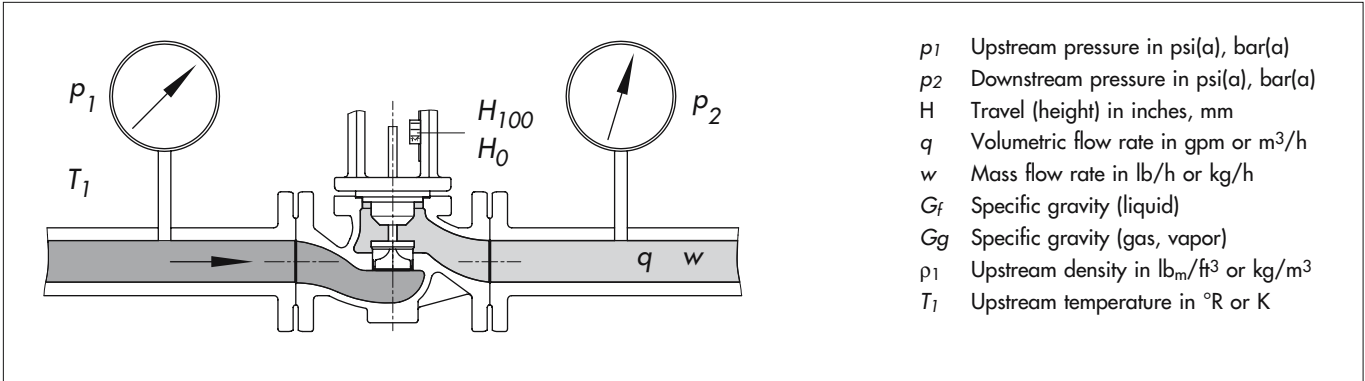
Valve selection

After having calculated the C_v value, the corresponding C_v value of the valve type in question is selected from the Technical Data Sheet. If actual operating data have been used for the calculation, apply the following equations:

$$C_{V_{max}} \approx 0.7 \text{ to } 0.8 \cdot C_{V_{rated}}$$

$$K_{V_{max}} \approx 0.7 \text{ to } 0.8 \cdot K_{VS}$$

For more information, refer to "Selection and Ordering information" on page 31



- p_1 Upstream pressure in psi(a), bar(a)
- p_2 Downstream pressure in psi(a), bar(a)
- H Travel (height) in inches, mm
- q Volumetric flow rate in gpm or m^3/h
- w Mass flow rate in lb/h or kg/h
- G_f Specific gravity (liquid)
- G_g Specific gravity (gas, vapor)
- ρ_1 Upstream density in lb_m/ft^3 or kg/m^3
- T_1 Upstream temperature in °R or K

Incompressible fluids (liquids)

Pressure drop	Equations for p_{vc} determination	Flow coefficient equation, with given units...			
		gpm, psi(a)	lb/h, psi(a), lb_m/ft^3	m^3/h , bar(a)	kg/h, bar(a), kg/m^3
Subcritical $\Delta p < F_L^2(p_1 - p_{vc})$	$p_{vc} = F_F p_v$	$C_v = q \sqrt{\frac{G_f}{p_1 - p_2}}$	$C_v = \frac{w}{63.3 \sqrt{(p_1 - p_2) \rho_1}}$	$C_v = \frac{q}{0.865 \sqrt{p_1 - p_2}}$	$C_v = \frac{w}{27.3 \sqrt{(p_1 - p_2) \rho_1}}$
Critical (choked) $\Delta p \geq F_L^2(p_1 - p_{vc})$	$F_F = 0.96 - 0.28 \left(\frac{p_v}{p_c} \right)^{1/2}$	$C_v = \frac{q_{max}}{F_L} \sqrt{\frac{G_f}{p_1 - p_{vc}}}$	$C_v = \frac{w_{max}}{63.3 F_L \sqrt{(p_1 - p_{vc}) \rho_1}}$	$C_v = \frac{q_{max}}{0.865 F_L \sqrt{p_1 - p_{vc}}}$	$C_v = \frac{w_{max}}{27.3 F_L \sqrt{(p_1 - p_{vc}) \rho_1}}$

Compressible fluids (gases, vapors)

Pressure drop	Equations for x, F_k, Y determination	Flow coefficient equation, with given units...			
		Std ft^3/h (scfh), psi(a), °R	lb/h, psi(a), lb_m/ft^3	m^3/h , bar(a), K	kg/h, bar(a), kg/m^3
Subcritical $x < F_x \cdot x_T$	$x = \frac{\Delta p}{p_1}$ $F_k = \frac{\kappa}{1.4}$	$C_v = \frac{q}{1360 p_1 Y} \sqrt{\frac{G_g T_1 Z}{x}}$	$C_v = \frac{w}{63.3 Y \sqrt{x p_1}}$	$C_v = \frac{q}{417 p_1 Y} \sqrt{\frac{G_g T_1 Z}{x}}$	$C_v = \frac{w}{27.3 Y \sqrt{x p_1}}$
Critical (choked) $x \geq F_x \cdot x_T$	$Y = 1 - \frac{x}{3 F_k x_T}$	$C_v = \frac{q_{max}}{907 p_1} \sqrt{\frac{G_g T_1 Z}{F_k x_T}}$	$C_v = \frac{w_{max}}{42.2 \sqrt{F_k x_T p_1}}$	$C_v = \frac{q_{max}}{278 p_1} \sqrt{\frac{G_g T_1 Z}{F_k x_T}}$	$C_v = \frac{w_{max}}{18.2 \sqrt{F_k x_T p_1}}$

Notes regarding the above equations:

For exact results with valves with attached fittings (pipe reductions, elbows, etc.), the Piping geometry factor (F_P) may be applied ($C_v = C_v / F_P$).

For non-turbulent flow (laminar and transitional), the Reynolds number factor (F_R) may be applied ($C_v = C_v / F_R$).

Refer to the ISA standard for determination and application of these two factors.

Symbols used:

p_1 (psi, bar)	Absolute pressure p_{abs} (inlet)	G_f	Specific gravity (liquids) (ρ/ρ_{H_2O}) at 60°F, 15.6 °C
p_2 (psi, bar)	Absolute pressure p_{abs} (outlet)	G_g	Specific gravity (gases) (ρ/ρ_{air}) at 60°F, 15.6 °C
Δp (psi, bar)	Differential pressure ($p_1 - p_2$)	ρ_l (lb_m/ft^3 , kg/m^3)	Density (liquids)
T_1 (°R, K)	Absolute temperature (inlet)	ρ_g (lb_m/ft^3 , kg/m^3)	Density (gases) 14.73 psi(a), 60°F, 15 °C, 1.013 bar(a)
q (gpm, m^3/h)	Volumetric flow rate (liquids)	p_v (psia, bara)	Absolute vapor pressure of liquid (inlet temperature)
q (scfh, nm^3/h)	Volumetric flow rate (gases) at 14.73 psi(a) and 60°F or 1.013 bar(a) and 15 °C	p_c (psia, bara)	Absolute critical pressure
w (lbm/h, kg/h)	Mass flow rate	p_{vc} (psia, bara)	Absolute pressure at the vena contracta
		(kappa)	Ratio of specific heats, dimensionless
		Z	Compressibility factor, dimensionless
		Y	Expansion factor, dimensionless

Calculation of the Sound Emission

z value

The valve-specific value z is measured on the valve test bench and provides the basis for the noise calculation.

When the load of the valve is $\gamma = 0.75$, the value z indicates the pressure ratio upon which cavitation begins.

Table 10a · Series 3240

C_v	0.12 · 0.2 0.3	0.5	0.75	1.2	2.0	3.0	5.0	7.5	12	20	30	40	70	75	95	120	190	230	290	305	420	735	
Seat \varnothing in.	0.12	0.24		0.47			0.95			1.22	1.5	1.9	2.48		3.15		3.94	4.33	4.92	5.12	5.91	7.87	
Travel in.	0.6												1.2	0.6	1.2			2.4	1.2	2.4			
K_{vs}	0.1 · 0.16 0.25	0.4	0.63	1.0	1.6	2.5	4.0	6.3	10	16	25	35	60	63	80	100	160	200	250	260	360	630	
Seat \varnothing mm	3	6			12			24			31	38	48	63		80		100	110	125	130	150	200
Travel mm	15												30	15	30			60	30	60			
Size (DN)	z · acoustical valve coefficient																						
½" (15)	0.8	0.8	0.75	0.65	0.65	0.6	0.55																
¾" (20)	0.8	0.8	0.75	0.65	0.65	0.6	0.55	0.45															
1" (25)	0.8	0.8	0.75	0.65	0.65	0.6	0.55	0.45	0.4														
– (32)		0.8	0.75	0.7	0.7	0.6	0.55	0.5	0.45	0.4													
1½" (40)		0.8	0.75	0.7	0.7	0.6	0.55	0.5	0.45	0.4	0.35												
2" (50)		0.8	0.75	0.7	0.7	0.6	0.55	0.5	0.45	0.4	0.35	0.35											
2½" (65)											0.35	0.35	0.25										
3" (80)											0.35	0.35	0.25		0.25								
4" (100)														0.25		0.25	0.2						
– (125)																0.25	0.2	0.2					
6" (150)															0.2	0.2	0.2				0.2		
8" (200)																				0.2		0.2	0.2
10" (250)																				0.2		0.2	0.2

Table 10b · Series 3250

C_v	0.12 · 0.2 0.3 · 0.5	0.75	1.2	2.0	3.0	5.0	7.5	12	20	30	47	75	120	190	290	420	735	1170	1280	2340	2925	
Seat \varnothing in.	0.24		0.47			0.95			1.22	1.5	1.9	2.48	3.15	3.94	4.92	5.91	7.87	9.84	11.81	13.78	15.75	
Travel in.	0.6										1.2			2.4			4.7					
K_{vs}	0.1 · 0.16 0.25 · 0.4	0.63	1.0	1.6	2.5	4.0	6.3	10	16	25	40	63	100	160	250	360	630	1000	1500	2000	2500	
Seat \varnothing mm	6			12			24			31	38	50	63	80	100	125	150	200	250	300	350	400
Travel mm	15										30			60			120					
Size (DN)	z · acoustical valve coefficient																					
½" (15)	0.8	0.75	0.65	0.65	0.6	0.55																
1" (25)	0.8	0.75	0.65	0.65	0.6	0.55	0.45	0.4														
1½" (40)	0.8	0.75	0.65	0.65	0.6	0.55	0.5	0.45	0.4	0.35												
2" (50)					0.6	0.55	0.5	0.45	0.5	0.4	0.35											
3" (80)						0.55	0.5	0.45	0.55	0.45	0.35	0.25	0.25									
4" (100)									0.55	0.45	0.35	0.3	0.25	0.25								
6" (150)											0.3	0.25	0.25	0.2								
8" (200)													0.25	0.25	0.2	0.2	0.2					
10" (250)													0.25	0.25	0.2	0.2	0.2	0.2				
12" (300)														0.25	0.2	0.2	0.2	0.2	0.2	0.2		
16" (400)																0.2	0.2	0.2	0.2	0.2	0.2	0.2

Gases and vapors

The noise emission of single-stage and multi-stage control valves for gases is determined according to EN 60 534, Part 8-3. This calculation method, however, does not apply to control valves with noise-reducing equipment such as flow dividers St I and St III. In this case, the calculation must be carried out according to VDMA 24 422, Edition 89.

The calculation bases on the flow rate generated during flashing. The sound emission is determined by means of an acoustical conversion coefficient η_G . The difference between the conversion coefficients with relation to the differential pressure ratio is shown in Diagram 1. This difference directly indicates the level difference of the internal acoustic capacities and also the sound pressure level to be expected when 1 m away from the pipeline.

For a differential pressure ratio of e.g. $x = 0.5$, the level difference between a valve with and without flow divider is -20 dB.

Liquids

The noise emission when throttling liquids is calculated according to EN 60 534, Part 8-4. This calculation corresponds with that according to VDMA 24 422, Edition 89. It is based on the flow capacity generated in the valve and also on the valve-specific acoustical conversion coefficient η_F empirically determined according to VDMA 24 423 for turbulent flows. As well it is based on the valve-specific pressure ratio z at the beginning of cavitation.

The sound capacity level and the sound level difference at a distance of 1 m for the valves with different z value can be seen in the diagram 2.

When we assume a pressure ratio of $x_F = 0.5$, then a valve with $z = 0.6$ has a sound level which is 20 dB less than that of a valve with $z = 0.3$.

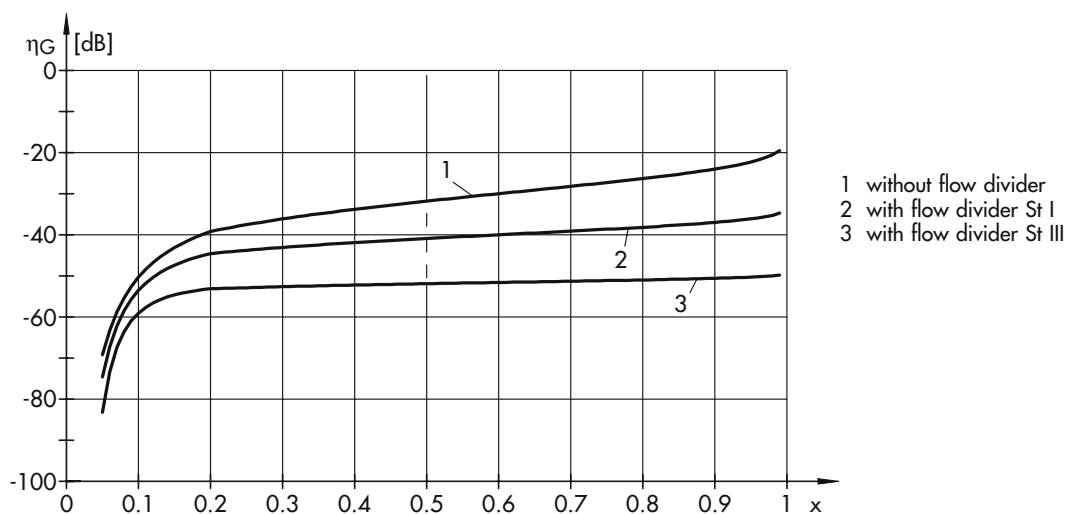


Diagram 1

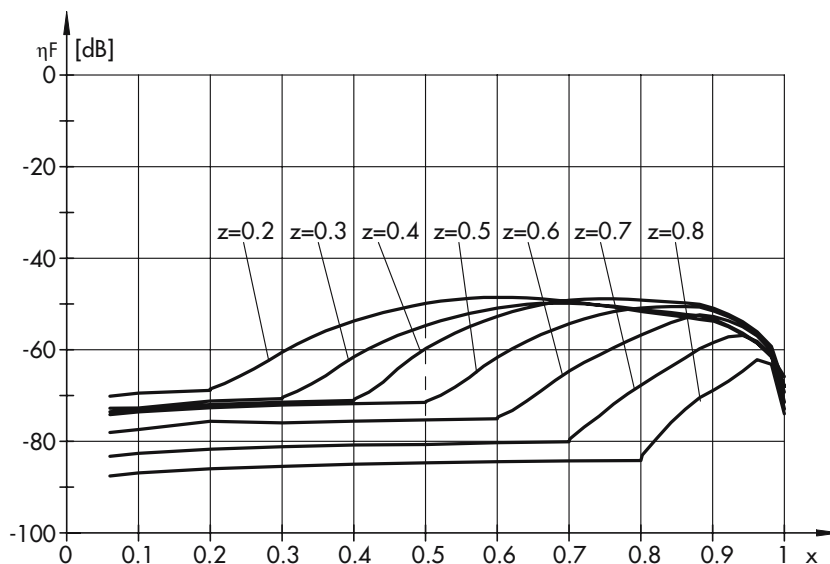


Diagram 2

Materials according to ASTM and DIN

The body materials mainly used and their temperature limits are listed in the following Table.

The application limits of selected materials are included in the associated pressure-temperature table.

Table 11 · Materials

Material	Casting			Forging			Temperature range	
	Identification	Standard	Grade	Identification	Standard	Grade	[°F]	[°C]
Materials according to ASTM								
Gray iron	Cast iron	ASTM A 126	Class B	–	–	–	–20 ... +450	–29 ... +232
Ductile iron	Ductile iron	ASTM A 395	–	–	–	–	–20 ... +650	–29 ... +343
Aluminum Bronze	UNS C95200	ASTM B 148	9A	–	–	–	–20 ... +430	–29 ... +220
Carbon steel	WCB	ASTM A 216	WCB	–	ASTM A 105	–	–20 ... +800	–29 ... +427
Carbon steel, low temp.	LCB	ASTM A 352	LCB	–	ASTM A 350	LF 2	–50 ... +650	–46 ... +343
Carbon steel, low temp.	3½ Ni	ASTM A 352	LC3	–	ASTM A 350	LF 3	–150 ... +650	–100 ... +343
Carbon steel, high temp.	Chrome Moly	ASTM A 217	WC6	UNS K11564	ASTM A 182	F 12	–20 ... +1100	–29 ... +593
Carbon steel, high temp.	Chrome Moly	ASTM A 217	WC9	UNS K21590	ASTM A 182	F 22	–20 ... +1100	–29 ... +593
Stainless steel 18Cr-8Ni	Type 304	ASTM A 351	CF8	UNS S30400	ASTM A 182	F 304	–425 ... +1000	–254 ... +537
Stainless steel	Type 316	ASTM A 351	CF8M	UNS S31600	ASTM A 182	F 316	–425 ... +1000	–254 ... +537
Stainless steel	Type 316 L	ASTM A 351	CF3M	UNS S31603	ASTM A 182	F 316 L	–425 ... +850	–254 ... +454
Alloy 400	Ni-Cu	ASTM A 494	M35-1	UNS N04400	ASTM A 564	400	–20 ... +500	–29 ... +260
Alloy C-4	Ni-Mo-Cr	ASTM A 494	CW2M	UNS N06455	ASTM A 574	C-4	–20 ... +800	–29 ... +427
Comparable materials according to DIN								
Gray cast iron	GG-25	DIN 1691	0.6025	–	–	–	+14 ... +572	–10 ... +300
Spheroidal graphite iron	GGG-40.3	DIN 1693	0.7043	–	–	–	+14 ... +662	–10 ... +350
Cast steel	GS-C25	DIN 17 245	1.0619	C 22.8	DIN 17 243	1.0460	+14 ... +752	–10 ... +400
Cast steel, low temp.	GS-21 Mn 5	SEW 685	1.1138	TSIE 355	SEW 081	1.0566	–58 ... +572	–50 ... +300
Cast steel, high temp.	GS-17CrMo 5 5	DIN 17 245	1.7357	13CrMo 44		1.7335	+14 ... +932	–10 ... +500
Cast steel, high temp.	GS-17CrMo V 5 11	DIN 17 245	1.7706				+14 ... +1022	–10 ... +550
Stainless steel	G-X6CrNi 18 9	DIN 17 445	1.4308	X5CrNi 18 9		1.4301	–328 ... +572	–200 ... +300
Stainless steel (cast)	G-X5CrNiMoNb18 10	DIN 17 445	1.4581	–	–	–	+14 ... +842	–10 ... +450
Stainless steel (forged)	–	–	–	X6 CrNiMoTi 17 12 2	DIN 17 440	1.4571	–454 ... +842	–270 ... +450
Stainless steel (forged)	–	–	–	X2 CrNiMo 17 12 2	DIN 17 440	1.4404	–454 ... +842	–270 ... +450
Alloy 400	NiCu30Fe	DIN 17743	2.4360			2.4360		
Alloy C4-C	NiMo16Cr16Ti	DIN 17744	2.4610			2.4610	+14 ... +752	–10 ... +400

Table 12 · Permissible pressure dependent upon the temperature · Iron and Bronze acc. to ANSI B16.1, B16.4, B16.15, B16.24

Body material	Class	Temperature (°F) and perm. operating pressure (psi)																
		-20	100	150	175	200	225	250	275	300	325	350	353	375	400	406	425	450
Threaded (NPT)																		
A 126 Cl.B (NPT) B16.4 -20...406 °F	125	175	(175)	175	(170)	165	(158)	150	(145)	140	(133)	125	125	-	-	-		
	250	400	(400)	400	(385)	370	(355)	340	(325)	310	(305)	300	(297)	(275)	250	250		
B 62 Bronze (NPT) B16.15 -20...400 °F	125	200	(200)	200	(195)	190	(185)	180	(173)	165	(158)	150	(149)	(138)	125			
	250	400	(400)	400	(393)	385	(375)	365	(350)	335	(318)	300	(297)	(275)	250			
Flat face flanged (FF)																		
A 126 Cl.B (FF) B16.1 -20...450 °F	125	200	(200)	200	(195)	190	180	175	170	165	155	(150)	150	145	(141)	140	130	125
	250	500	(500)	500	(480)	460	440	415	395	375	355	(337)	335	315	(295)	290	270	250
B 62 Bronze (FF) B16.24 -20...430 °F	150	225	(225)	225	220	210	205	195	190	180	(173)	165	(164)	(158)	(152)	150	135	-
	300	500	(500)	500	480	465	445	425	410	390	(390)	350	(348)	(333)	(315)	(311)	(298)	280

Table 12b · Permissible pressure dependent upon the temperature · Steels according to ANSI B16.34 · Standard Class

Body material	Class	Temperature (°F) and perm. operating pressure (psi)																
		-20	100	200	300	400	500	600	650	700	750	800	850	900	950	1000	1050	1100
A 216 WCB -20 ... +800 °F	150	285	285	260	230	200	170	140	125	110	95	80						
	300	740	740	675	655	635	600	550	535	535	505	410						
	600	1480	1480	1350	1315	1270	1200	1095	1075	1065	1010	825						
	900	2220	2220	2025	1970	1900	1795	1640	1610	1600	1510	1235						
	1500	3705	3705	3375	3280	3170	2995	2735	2685	2665	2520	2060						
	2500	6170	6170	5625	5470	5280	4990	4560	4475	4440	4200	3430						
A 105 forged -20 ... +800 °F	300	740	740	675	655	635	600	550	535	535	505	410						
A 352 LCB -50 ... +650 °F	150	265	265	250	230	200	170	140	125									
	300	695	695	655	640	620	858	535	525									
A 217 WC6 -20 ... +1100 °F	300	750	750	710	675	660	640	605	590	570	530	510	485	450	380	225	140	95
	600	1500	1500	1425	1345	1315	1285	1210	1175	1135	1065	1015	975	900	755	445	275	190
	900	2250	2250	2135	2020	1975	1925	1815	1765	1705	1595	1525	1460	1350	1130	670	410	290
	1500	3750	3750	3560	3365	3290	3210	3025	2940	2840	2660	2540	2435	2245	1885	1115	684	480
	2500	6250	6250	5930	5605	5485	5350	5040	4905	4730	4430	4230	4060	3745	3145	1860	1145	800
A 217 WC9 -20 ... +1100 °F	300	750	750	715	675	650	640	605	590	570	530	510	485	450	380	270	200	115
	600	1500	1500	1430	1355	1295	1280	1210	1175	1135	1065	1015	975	900	755	535	400	225
	900	2250	2250	2150	2030	1945	1920	1815	1765	1705	1595	1525	1460	1350	1130	805	595	340
	1500	3750	3750	3580	3385	3240	3200	3025	2940	2840	2660	2540	2435	2245	1885	1340	995	565
	2500	6250	6250	5965	5640	5400	5330	5040	4905	4730	4430	4230	4060	3745	3145	2230	1660	945
A 351 CF8 -425 ... +1500 °F 2)	150	275	275	235	205	180	170	140	125	110	95	80	65	50	35	20		
	300	720	720	600	530	470	435	415	410	405	400	395	390	385	375	325		
	600	1440	1440	1200	1055	940	875	830	815	805	795	790	780	770	750	645		
	900	2160	2160	1800	1585	1410	1310	1245	1225	1210	1195	1180	1165	1150	1125	965		
A 351 CF8M -425 ... +1500 °F 2)	150	275	275	240	215	195	170	140	125	110	95	80	65	50	35	20		
	300	720	720	620	560	515	480	450	445	430	425	415	405	395	385	365		
A 351 CF3M -425 ... +850 °F	600	1440	1440	1240	1120	1030	955	905	890	865	845	830	810	790	775	725		
	900	2160	2160	1860	1680	1540	1435	1355	1330	1295	1270	1245	1215	1180	1160	1090		
	1500	3600	3600	3095	2795	2570	2390	2255	2220	2160	2110	2075	2030	1970	1930	1820		
2500	6000	6000	5160	4660	4280	3980	3760	3700	3600	3520	3460	3380	3280	3220	3030			
A 182 F 316 forged -425 ... +1500 °F 2)	300	720	720	620	560	515	480	450	445	430	425	415	405	395	385	365		

Values in parentheses are interpolated values.

Some valve types may have lower limits based on the design. Consult the Technical Data Sheet for the respective model.

1) For welding end valves only. Flanged end valves terminate at 1000 °F.

2) For temperatures above 1000 °F, use only when carbon is 0.04% or higher. For temperature values above 1100 °F, consult the ANSI standard.

Table 13 · Valve materials and nominal pressure ratings for Series 3240 (•) and Series 3250, 3280 (X) - Versions acc. to ANSI

Body Material	Code designation	Temp. range		Class								
		[°F]	[°C]	125	250	150	300	600	900	1500	2500	
Cast iron	ASTM A 126 B	-20 ... 450	-29 ... 232	•	•							
Cast steel	ASTM A 216 WCB	-20 ... 800	-29 ... 427			•	• X	X	X	X	X	
	ASTM A 352 LCB	-50 ... 650	-46 ... 343			•	• X	X	X	X	X	
	ASTM A 217 WC6	-20 ... 1020	-29 ... 550				X	X	X	X	X	
Forged steel	ASTM A 105	-20 ... 800	-200 ... 450				•					
Stainless cast steel	ASTM A 351 CF8M	-328 ... 842	-200 ... 450			•	• X	X	X	X		
	ASTM A 351 CF8	-328 ... 572	-200 ... 300			•	• X	X	X	X		
Forged stainless steel	ASTM A 182 F316	-328 ... 842	-200 ... 450				•					

Selection and Ordering information

Selection and sizing of the control valve

1. Calculate the required C_v or K_v value according to ISA-S75.01 or EN 60534. You may use for example the SAMSON program "Valve sizing". This sizing usually is also carried out by SAMSON. If real operating data are used for the calculation, apply the following equation:
 $C_{vmax} \approx 0.7 \text{ to } 0.8 \cdot C_{vrated}$ or $K_{vmax} \approx 0.7 \text{ to } 0.8 \cdot K_{vs}$
2. Select the C_{vrated} or K_{vs} value and the nominal size DN according to the table in the corresponding Data Sheet.
3. Select the appropriate characteristic curve on the basis of the behaviour of the controlled system.
4. Determine the permissible differential pressure Δp and select an adequate actuator using the differential pressure tables included in the associated Technical Data Sheet.
5. Select the materials to be used with regard to corrosion, erosion, pressure and temperature. Please use the materials tables and the associated pressure-temperature diagram.
6. Select the additional equipment, such as positioners and/or limit switches.

Ordering information

Please submit the following details in your order:

Type of control valve: . . . ¹⁾

Nominal size ANSI or DN: . . . ¹⁾

Nominal pressure ANSI or PN: . . . ¹⁾

Body material: . . . ¹⁾

Connecting type: Flanged connection/welding ends/
socket welded ends

Plug ¹⁾: Standard, pressure-balanced,
with metal sealing, soft sealing, or
lapped-in metal plug
hard facing, if needed

Characteristic : Equal percentage or linear

Pneumat. actuator: Versions acc. to T 8310 or T 8311

Fail-safe action: Valve closed or open

Actuating time: (please submit this detail only if
special actuating times are required)

Process medium: Density in kg/m^3
under standard or operating conditions,
and temperature in °F, °C


Flow rate: In kg/h or m^3/h
under standard or operating conditions

Pressure: p_1 in bar (absolute pressure p_{abs})
 p_2 in bar (absolute pressure p_{abs})
for min., standard and max. flow rate

Accessories: Positioner and/or limit switch,
position transmitter, solenoid valve,
lock-up valve, volume amplifier,
supply pressure regulator

¹⁾ If no details have been submitted, SAMSON will make a proposal

**Specification Form for Controls Valves
According to ISA Form S20.50, Rev. 1**

	Project _____				Data Sheet _____ of _____				
	Unit _____				Date _____				
	P.O. _____				Spec _____				
	Item _____				Tag _____				
	Contract _____				Dwg _____				
	Mfr Serial* _____				Service _____				
1	Fluid _____						Crit Press Pc _____		
2	SERVICE CONDITIONS	Flow Rate	Units	Max Flow	Norm Flow	Min Flow	Shut-Off		
3		Inlet Pressure					-		
4		Outlet Pressure							
5		Inlet Temperature							
6		Density/Spec Grav/Mol Wt					-		
7		Viscosity/Spec Heat Ratio					-		
8		Vapor Pressure Pv					-		
9		* Required Cv					-		
10		* Travel	%				0		
11		Allowable/*Predicted SPL	dB(A)				-		
12									
13	LINE	Pipe Line Size	In _____	53	* Type _____				
14		& Schedule	Out _____	54	* Mfr & Model _____				
15		Pipeline Insulation		55	* Size _____ Eff Area _____				
16	VALVE BODY / BONNET	* Type	_____	56	On/Off _____ Modulating _____				
17		* Size	_____ ANSI Class _____	57	Spring Action Open/Close _____				
18		Max Press/Temp	_____	58	* Max Allowable Pressure _____				
19		* Mfr & Model	_____	59	* Min Required Pressure _____				
20		* Body/Bonnet Matl	_____	60	Available Instr. Air		Max _____		
21		* Liner Matl/ID	_____	61	Supply Pressure		Min _____		
22		End	In _____	62	* Bench Range _____				
23		Connection	Out _____	63	Act Orientation _____				
24		Flg Face Finish	_____	64	Handwheel Type _____				
25		End Ext/Matl	_____	65	Air Fails Valve _____ Set at _____				
26		* Flow Direction	_____	66					
27		* Type of Bonnet	_____	67	Input signal _____				
28		Lub & Iso Valve	_____ Lube _____	68	POSITIONER	* Type _____			
29		* Packing Material	_____	69		* Mfr & Model _____			
30		* Packing Type	_____	70		* On Increasing Signal Output Incr/Decr _____			
31			71	Gauges _____ Bypass _____					
			72	* Cam Characteristic _____					
32	TRIM	* Type	_____	73					
33		* Size	_____ Rated Travel _____	74	SWITCHES	Type _____ Quantity _____			
34		* Characteristic	_____	75		* Mfr & Model _____			
35		* Balanced/Unbalanced	_____	76		Contacts/Rating _____			
36		* Rated Cv	_____ FL _____ XT _____	77		Actuation Points _____			
37		* Plug/Ball/Disk Material	_____	78					
38		* Seat Material	_____	79	AIRSET	* Mfr & Model _____			
39		* Cage/Guide Material	_____	80		* Set Pressure _____			
40	* Stem Material	_____	81	Filter _____ Gauges _____					
41			82						
42									
43	SPECIALS / ACCESSORIES	NEC Class	_____ Group _____ Div. _____	83	TESTS	* Hydrostatic Pressure _____			
44				84		ANSI/FCI Leakage Class _____			
45				85					
46				86					
47									
48					Rev	Date	Revision	Orig	App
49									
50									
51									
52									

* Information supplied by manufacturer unless already specified.



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