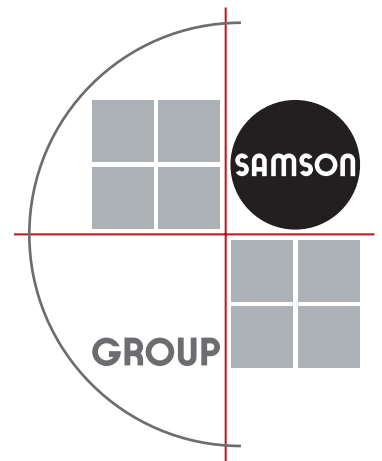


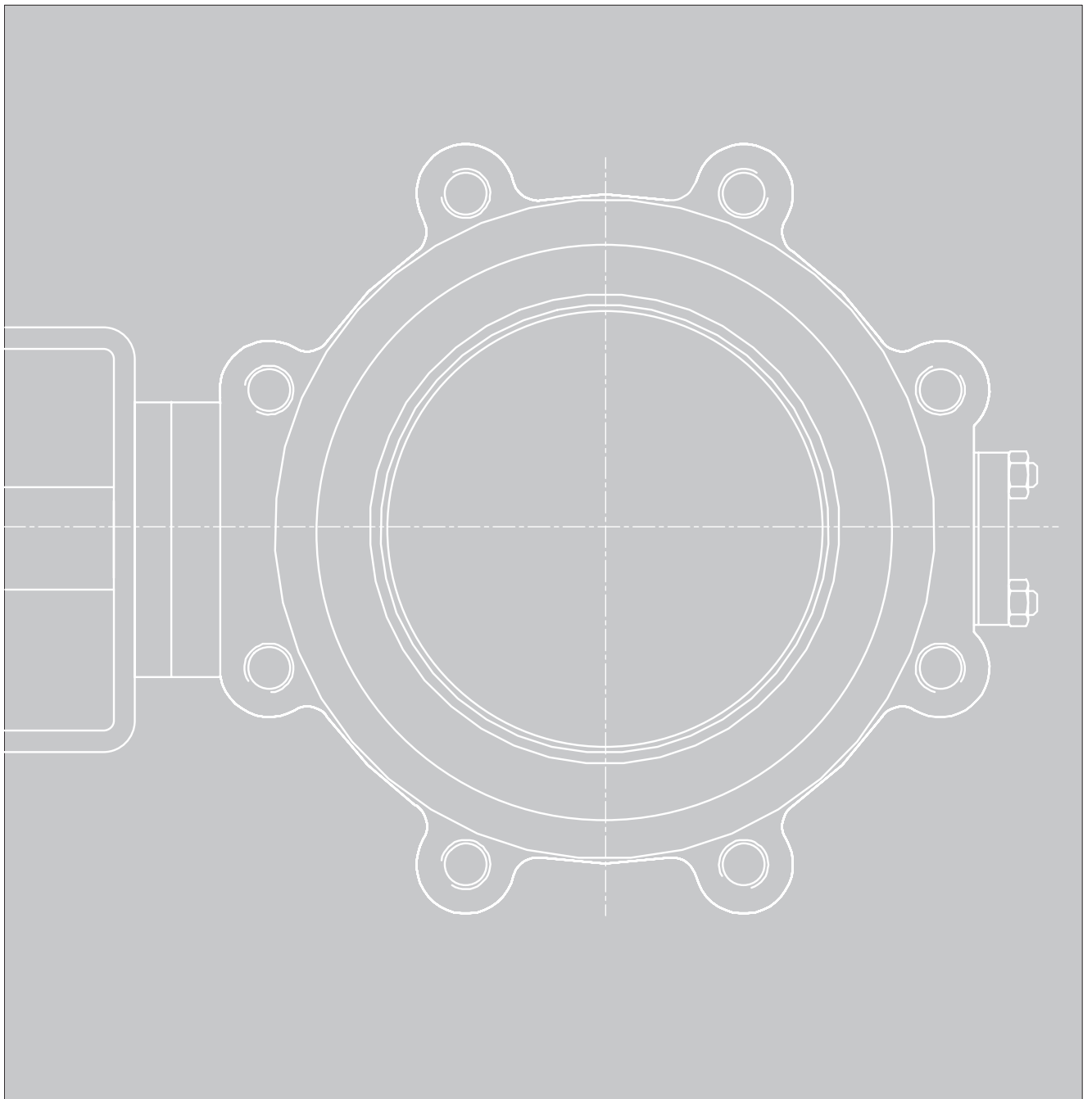
**SAMSON · CERA SYSTEM · LEUSCH · PFEIFFER  
RINGO VÁLVULAS · STARLINE · VETEC**

**Rotary Valves**

**Information Sheet Part 5**



	DIN	ANSI	API
Valve size	DN 15 to 2000	· NPS ½ to 80	· 1 <sup>13</sup> / <sub>16</sub> to 7 <sup>1</sup> / <sub>16</sub> "
Pressure rating	PN 6 to 400	· Class 125 to 2500	· Class 2000 to 15000
Temperature	Up to 1000 °C	· Up to 1830 °F	· Up to 482 °F



Edition February 2015

**Information Sheet**

**T 8000-5 EN**



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## Overview of markets and properties

### SAMSON, PFEIFFER and LEUSCH butterfly valves

• Standard version; ◦ Special version/option

		SAMSON	PFEIFFER			LEUSCH
		Type 3331	Type 10a	Type 10e	Type 14b	LTR 43
<b>Markets</b>	Chemicals and petrochemicals	•	•	•	•	•
	Refineries (downstream applications)					•
	Oil and gas (upstream and midstream applications)		•	•	•	◦
	Industrial gases					•
	Energy	•				◦
	Pharmaceutical and biotechnology					
	Food and beverage				•	
	Pulp and paper					◦
	Mining and ore extraction					◦
	HVAC, building automation, district heating and cooling	•				◦
	Water, waste water	•			•	
	Iron and steel				•	•
	Fertilizer and agricultural chemistry					•
	Other markets					◦
<b>Application</b>	On/off service		•	•	•	•
	Throttling service	•	•	•	•	•
<b>Suitable for</b>	Fibrous media					•
	Media containing suspended matter					◦
	Corrosive media		•	•		◦
	Highly viscous media	•	•	•	•	◦
	Abrasive media					◦
	Seawater		◦	◦	◦	◦
Oxygen		◦	◦	◦	◦	
<b>Version</b>	DIN	•	•	•	•	•
	ANSI	•	•	•	•	•
	JIS	◦				◦
	GOST	◦	◦	◦	◦	•
<b>Connection</b>	Wafer (sandwich)	•	•	•	•	•
	Lug		◦	•	•	•
	Flange					•
	Welding ends					•
	Grayloc® (clamp connection)					
<b>Valve size</b>	DN	100 to 400	100 to 800	50 to 400	50 to 800	80 to 2500
	NPS	4 to 16	4 to 32	2 to 16	2 to 20	3 to 100
<b>Pressure rating</b>	PN	10 to 40	10	10/16	10 to 40	10 to 420
	Class	150 to 300	150	150	150 to 300	150 to 2500
<b>Medium temperature [°C]</b>	Standard	-10 to +220	-50 to +200	-35 to +200	-60 (-10) to +200	-29 to +350
	Low	-10			-196 (-60)	-196
	High	400			550	800

		SAMSON	PFEIFFER			LEUSCH
		Type 3331	Type 10a	Type 10e	Type 14b	LTR 43
<b>Materials</b>	Carbon steel	•			•	•
	Stainless steel	•			•	•
	Forged steel				○ (Type 14c)	•
	Special materials				○	○
	Lining		PTFE	PTFE		○ (Inconel)
<b>Mounting and seal of closure member</b>	Centric	•		•		
	Double eccentric		•		•	
	Triple-eccentric					•
	Metal seal	•			•	•
	Soft seal		•	•	•	•
	Hard facing, armor				○	○
<b>Leakage rate</b>	IEC 60534-1 or ANSI/FCI 70-2		○	VI	VI	VI
	DIN EN 12266-1, P12		○	A	A	A
	DIN 3230-3, BN/BO		•	•	•	•
	API 598					•
	% of $K_{VS}$ at max. opening angle	≤0.5 to 1 %				
<b>Further versions and other features</b>	Top entry					○
	Fire-safe				○	•
	Fugitive emissions (TA Luft, ISO 15848, others)	○ (TA Luft)	• (TA Luft)	• (TA Luft)	• (TA Luft)	○ (TA Luft)
	Anti-cavitation					○
	Noise reduction	○				○
	Bidirectional flow			•		○
	Heating jacket				○ (Type 14a)	○
	NACE				○	•
	API 6D					
	Blow-out proof shaft		•	•	•	•
	Static discharge		○	○	•	•
	SIL		•	•	•	○
Replaceable seat ring and disk ring				•	•	
<b>Recommended actuator</b>	AIR TORQUE	SRP/DAP (Type 31a)	SRP/DAP (Type 31a)	SRP/DAP (Type 31a)	SRP/DAP (Type 31a)	SC-A/ DR-A
	SAMSON Type 3278	○				○ (<NPS 6)
	Other		Type 30a	Type 30a	Type 30a	Rotork GP and GH
	Electric actuator		○	○	○	AUMA, Rotork etc.
<b>Documentation</b>		▶ T 8227	▶ TB 10a	▶ TB 10e	▶ TB 14b	▶ LTR 43

## Ball valves

**Table 1: CERA SYSTEM ball valves**

• Standard version; ◦ Special version/option

		CERA SYSTEM						
		KSV	KST	KST-HT	KAT	KZT	KGT	KBR
<b>Markets</b>	Chemicals and petrochemicals	•	•	•	•	•	•	
	Refineries (downstream applications)							
	Oil and gas (upstream and midstream applications)							
	Industrial gases							
	Energy	•	•	•				•
	Pharmaceutical and biotechnology	•						
	Food and beverage							
	Pulp and paper	•	•				•	
	Mining and ore extraction	•	•	•	•	•	•	•
	HVAC, building automation, district heating and cooling							
	Water, waste water	•	•					
	Iron and steel	•	•	•	•		•	•
	Fertilizer and agricultural chemistry	•	•	•			•	
	Other markets	•	•	•				
<b>Application</b>	On/off service	•	•	•	•	•	•	•
	Throttling service	•	•	•	•	•	•	
<b>Suitable for</b>	Fibrous media	•	•	•	•	•		
	Media containing suspended matter	•	•	•	•	•	•	•
	Corrosive media	•	•	•	•	•		
	Highly viscous media				•		•	
	Abrasive media	•	•	•	•	•	•	•
	Seawater		•		•	•	•	
Oxygen		•		•	•	•		
<b>Version</b>	DIN	•	•	•	•	•	•	•
	ANSI	•	•	•	•	•	•	•
	JIS	◦	◦	◦	◦	◦	◦	◦
	GOST	◦	◦	◦	◦	◦	◦	◦
<b>Connection</b>	Wafer (sandwich)	◦	◦	◦	◦	◦	◦	
	Lug	◦	◦					
	Flange	•	•	•	•	•	•	•
	Thread		◦	◦	◦	◦	◦	
	Welding ends		◦	◦	◦	◦	◦	
	Grayloc® (clamp connection)							
<b>Valve size</b>	DN	15 to 300	15 to 300	15 to 300	15 to 300	65 to 300	65 to 300	32 to 300
	NPS	½ to 12	½ to 12	½ to 12	½ to 12	2½ to 12	2½ to 12	1¼ to 12
<b>Pressure rating</b>	PN	10 to 40	10 to 63	10 to 63	10 to 63	10 to 63	10 to 63	10 to 40
	Class	150 to 300	150 to 600	150 to 600	150 to 600	150 to 600	150 to 600	150 to 300
<b>Medium temperature [°C]</b>	Standard	-30 to +160	-30 to +180	Up to 450	-30 to +310	-30 to +180	-30 to +180	-30 to +180
	Low							
	High		-30 to +310	Up to 950	-30 to +310	-30 to +310	-30 to +310	-30 to +180

		CERA SYSTEM						
		KSV	KST	KST-HT	KAT	KZT	KGT	KBR
<b>Materials</b>	Carbon steel		•	•	•	•	•	
	Stainless steel		•	•	•	•	•	•
	Forged steel							
	Special materials		•	•	•	•	•	
	Lining	• Al <sub>2</sub> O <sub>3</sub> ○ Si <sub>3</sub> N <sub>4</sub> / SSiC	<sup>1)</sup> • ZrO <sub>2</sub> / Al <sub>2</sub> O <sub>3</sub> ○ Si <sub>3</sub> N <sub>4</sub> / SSiC	• ZrO <sub>2</sub> / SSiC ○ Si <sub>3</sub> N <sub>4</sub>	• ZrO <sub>2</sub> / Al <sub>2</sub> O <sub>3</sub> ○ Si <sub>3</sub> N <sub>4</sub> / SSiC	• ZrO <sub>2</sub> / Al <sub>2</sub> O <sub>3</sub> ○ Si <sub>3</sub> N <sub>4</sub> / SSiC	• ZrO <sub>2</sub> / Al <sub>2</sub> O <sub>3</sub> ○ Si <sub>3</sub> N <sub>4</sub> / SSiC	○
<b>Mounting and seal of closure member</b>	Floating design	•	•	•	•			•
	Trunnion design					•	•	
	Live-loaded seat ring				•	•	•	
	Metal seal	○	○	○	○	○	○	•
	Soft seal							
	Hard facing, armor							
	Ceramic	•	•	•	•	•	•	○
<b>Leakage rate</b>	IEC 60534-1 or ANSI/FCI 70-2	IV	IV	IV	V	V	V	
	DIN EN 12266-1, P12							
	DIN 3230-3, BN/BO							
	API 598							
<b>Further versions and other features</b>	Top entry							
	Full bore	•	•	•	•	•	•	•
	Reduced bore	•	•	•	•	•	•	•
	Fire-safe		○	○	○	○	○	
	Fugitive emissions (TA Luft, ISO 15848, others)	○ (TA Luft)	○ (TA Luft)	○ (TA Luft)	○ (TA Luft)	○ (TA Luft)	○ (TA Luft)	
	Anti-cavitation							
	Noise reduction							
	Bidirectional flow							○
	Heating jacket		○	○	○	○	○	○
	NACE							
	API 6D							
	Blow-out proof shaft							
	Static discharge							
SIL								
<b>Recommended actuator</b>	AIR TORQUE	•	•	•	•	•	•	•
	SAMSON Type 3278							
	Other							
	Electric actuator		○	○	○	○	○	
<b>Documentation</b>								▶ <a href="http://www.cerasystem.de">www.cerasystem.de</a>

<sup>1)</sup> Plastic body (PP or PVDF) possible

**Table 2: PFEIFFER and RINGO VÁLVULAS ball valves**

• Standard version; ◦ Special version/option

		PFEIFFER			RINGO	
		Type 20a	Type 20b	Type 26	API 6D	API 6A
<b>Markets</b>	Chemicals and petrochemicals	•	•	•	•	
	Refineries (downstream applications)			•	•	
	Oil and gas (upstream and midstream applications)	•	•	•	•	•
	Industrial gases			•	•	
	Energy			•	•	
	Pharmaceutical and biotechnology			•		
	Food and beverage			•		
	Pulp and paper					
	Mining and ore extraction					
	HVAC, building automation, district heating and cooling					
	Water, waste water			•		
	Iron and steel				•	
	Fertilizer and agricultural chemistry			•	•	
	Other markets	•	•	•		
<b>Application</b>	On/off service	•	•	•	•	•
	Throttling service	◦ <sup>1)</sup>	◦ <sup>1)</sup>		◦	◦
<b>Suitable for</b>	Fibrous media					
	Media containing suspended matter			•	◦	◦
	Corrosive media	•	•	•	◦	◦
	Highly viscous media	•	•	•	◦	◦
	Abrasive media				◦	
	Seawater	◦	◦	◦	◦	
<b>Version</b>	Oxygen	◦	◦	◦	◦	
	DIN	•	•	•	◦	
	ANSI	•	•	•	•	•
	JIS			◦	◦	
<b>Connection</b>	GOST	◦	◦	◦	◦	
	Wafer (sandwich)					
	Lug					
	Flange	•	•	•	•	•
	Thread				◦	◦
	Welding ends				◦	◦
<b>Valve size</b>	Grayloc® (clamp connection)				◦	
	DN	15 to 200	15 to 200	15 to 800	◦	
<b>Pressure rating</b>	NPS	½ to 8	On request	½ to 32	½ to 56	1 <sup>3</sup> / <sub>16</sub> to 7 <sup>1</sup> / <sub>16</sub>
	PN	16	16	10 to 420	◦	
<b>Medium temperature [°C]</b>	Class	150	150	150 to 2500	150 to 2500	API Class 2000 to 15000
	Standard	-10 to +200	-10 to +200	-10 to +200	-29 to +250	-29 to +250
	Low	-40	-40	-196	-196	
<b>Medium temperature [°C]</b>	High			550	500	



		PFEIFFER			RINGO	
		Type 20a	Type 20b	Type 26	API 6D	API 6A
<b>Materials</b>	Carbon steel			•	•	•
	Stainless steel	○	○	•	•	•
	Forged steel			•	•	•
	Special materials		○	•	•	•
	Lining	PTFE	PFA	Non-stick coating	○ Alloy ○ Tungsten carbide	○ Alloy ○ Tungsten carbide
<b>Mounting and seal of closure member</b>	Floating design	•	•	•	• (up to NPS 2)	
	Trunnion design			•	•	•
	Live-loaded seat ring			•		
	Metal seal			•	•	•
	Soft seal	•	•	•	•	•
	Hard facing, armor			•	○	○
<b>Leakage rate</b>	Ceramic			•		
	IEC 60534-1 or ANSI/FCI 70-2	VI	VI	VI	VI	VI
	DIN EN 12266-1, P12	A	A	A/B	A	A
	DIN 3230-3, BN/BO			•		
<b>Further versions and other features</b>	API 598			•	•	•
	Top entry				○	○
	Full bore	•	•	•	•	•
	Reduced bore				•	•
	Fire-safe			○	○	○
	Fugitive emissions (TA Luft, ISO 15848, others)	•	•	•	○ (ISO 15848)	○ (ISO 15848)
	Anti-cavitation					
	Noise reduction					
	Bidirectional flow	•	•	•	•	•
	Heating jacket	○	○	•	○	○
	NACE			•	○	○
	API 6D			○	•	
	Blow-out proof shaft	•	•	•	•	•
	Static discharge			•	•	•
SIL	•	•	•	SIL 3	SIL 3	
<b>Recommended actuator</b>	AIR TORQUE	SRP/DAP (Type 31a)	SRP/DAP (Type 31a)	SRP/DAP (Type 31a)	○	○
	SAMSON Type 3278					
	Other			Type 31 (PFEIFFER)		
	Electric actuator	•	•	•	○	○
<b>Documentation</b>		▶ TB 20a	▶ TB 20b	▶ TB 26a-s	▶ <a href="http://www.ringospain.com">www.ringospain.com</a>	

<sup>1)</sup> Calibrated sealing rings for control option

**Table 3: STARLINE ball valves (floating and TwinValve designs)**

• Standard version; ◦ Special version/option

		STARLINE				
		Floating			TwinValve	
		Standard	MetalStar	CryoStar	DBB	SBB
<b>Markets</b>	Chemicals and petrochemicals	•	•	•	•	•
	Refineries (downstream applications)	•	•	•	•	•
	Oil and gas (upstream and midstream applications)	•	•	•	•	•
	Industrial gases	•	•	•	•	•
	Energy	•	•	•	•	•
	Pharmaceutical and biotechnology					
	Food and beverage					
	Pulp and paper	•	•	•	•	•
	Mining and ore extraction	•	•	•	•	•
	HVAC, building automation, district heating and cooling	•	•	•	•	•
	Water, waste water	•	•	•	•	•
	Iron and steel	•	•	•	•	•
	Fertilizer and agricultural chemistry	•	•	•	•	•
	Other markets	•	•	•	•	•
<b>Application</b>	On/off service	•	•	•	•	•
	Throttling service					
<b>Suitable for</b>	Fibrous media	•	•	•	•	•
	Media containing suspended matter		•			
	Corrosive media	•	•	•	•	•
	Highly viscous media	•	•	•	•	•
	Abrasive media		•			
	Seawater	•	•	•	•	•
<b>Version</b>	Oxygen	◦	◦	◦	◦	◦
	DIN	•	•	•	•	•
	ANSI	•	•	•	•	•
	JIS	•	•	•	•	•
<b>Connection</b>	GOST	•	•	•	•	•
	Wafer (sandwich)					
	Lug					
	Flange	•	•	•	•	•
	Thread	•	•	•	•	•
	Welding ends	•	•	•	•	•
<b>Valve size</b>	Grayloc® (clamp connection)					
	DN	8 to 200	15 to 80	15 to 150	15 to 300	15 to 300
<b>Pressure rating</b>	NPS	¼ to 8	½ to 3	½ to 6	½ to 12	½ to 12
	PN	10 to 420	10 to 100	10 to 100	10 to 420	10 to 420
<b>Medium temperature [°C]</b>	Class	150 to 2500	150 to 600	150 to 600	150 to 2500	150 to 2500
	Standard	-46 to +250	-50 to +600	-196 to -50	-46 to +250	-46 to +250
	Low					
	High					

		STARLINE				
		Floating			TwinValve	
		Standard	MetalStar	CryoStar	DBB	SBB
<b>Materials</b>	Carbon steel	•	•	•	•	•
	Stainless steel	•	•	•	•	•
	Forged steel	•	•	•	•	•
	Special materials	○	○	○	○	○
	Lining				316 WO for > NPS 4 <sup>1)</sup> Alloy WO for > NPS 4 <sup>1)</sup>	316 WO for > NPS 4 <sup>1)</sup> Alloy WO for > NPS 4 <sup>1)</sup>
<b>Mounting and seal of closure member</b>	Floating design	•	•	•	•	•
	Trunnion design				•	•
	Live-loaded seat ring		•	•	•	•
	Metal seal		•			
	Soft seal	•		•	•	•
	Hard facing, armor		•			
	Ceramic					
<b>Leakage rate</b>	IEC 60534-1 or ANSI/FCI 70-2	VI	V	VI	VI	VI
	DIN EN 12266-1, P12	A	C	A	A	A
	DIN 3230-3, BN/BO	1	2	1	1	1
	API 598	•		•	•	•
<b>Further versions and other features</b>	Top entry					
	Full bore	•	•	•	•	•
	Reduced bore	•	•	•	•	•
	Fire-safe	•	•	•	•	•
	Fugitive emissions (TA Luft, ISO 15848, others)	• <sup>2)</sup>	• <sup>2)</sup>	• <sup>2)</sup>	• <sup>2)</sup>	• <sup>2)</sup>
	Anti-cavitation					
	Noise reduction					
	Bidirectional flow	•	•		•	•
	Heating jacket	○	○		○	○
	NACE	•	•	•	•	•
	API 6D	•	•	•	•	•
	Blow-out proof shaft	•	•	•	•	•
	Static discharge	•	•	•	•	•
SIL	SIL 3	SIL 3	SIL 3	SIL 3	SIL 3	
<b>Recommended actuator</b>	AIR TORQUE	•	•	•	•	•
	SAMSON Type 3278					
	Other	•	•	•	•	•
	Electric actuator	•	•	•	•	•
<b>Documentation</b>		▶ <a href="http://www.starline.it">www.starline.it</a>			▶ <a href="http://www.starline.it">www.starline.it</a>	

<sup>1)</sup> WO (weld overlay)

<sup>2)</sup> Temperature and pressure rating limits must be observed.

**Table 4: STARLINE ball valves (trunnion design)**

• Standard version; ◦ Special version/option

		STARLINE trunnion design			
		Standard	Abrasive service	High temperature	Cryogenic
<b>Markets</b>	Chemicals and petrochemicals	•	•	•	•
	Refineries (downstream applications)	•	•	•	•
	Oil and gas (upstream and midstream applications)	•	•	•	•
	Industrial gases	•	•	•	•
	Energy	•	•	•	•
	Pharmaceutical and biotechnology				
	Food and beverage				
	Pulp and paper	•	•	•	•
	Mining and ore extraction	•	•	•	•
	HVAC, building automation, district heating and cooling	•	•	•	•
	Water, waste water	•	•	•	•
	Iron and steel	•	•	•	•
	Fertilizer and agricultural chemistry	•	•	•	•
	Other markets	•	•	•	•
<b>Application</b>	On/off service	•	•	•	•
	Throttling service				
<b>Suitable for</b>	Fibrous media				
	Media containing suspended matter		•	•	◦
	Corrosive media	•	•	•	•
	Highly viscous media	•	•	•	•
	Abrasive media		•		
	Seawater	•	•	•	•
<b>Version</b>	Oxygen	◦	◦	◦	◦
	DIN	•	•	•	•
	ANSI	•	•	•	•
	JIS	•	•	•	•
<b>Connection</b>	GOST	•	•	•	•
	Wafer (sandwich)				
	Lug				
	Flange	•	•	•	•
	Thread	•	•	•	•
	Welding ends	•	•	•	•
<b>Valve size</b>	Grayloc® (clamp connection)	◦	◦		
	DN	15 to 300	15 to 300	15 to 300	15 to 300
<b>Pressure rating</b>	NPS	½ to 12	½ to 12	½ to 12	½ to 12
	PN	10 to 420	10 to 420	10 to 420	10 to 420
<b>Medium temperature [°C]</b>	Class	150 to 2500	150 to 2500	150 to 2500	150 to 2500
	Standard	-46 to +200	-46 to +200	-50 to +600	-196 to -50
	Low				
	High				

		STARLINE trunnion design			
		Standard	Abrasive service	High temperature	Cryogenic
<b>Materials</b>	Carbon steel	•	•	•	•
	Stainless steel	•	•	•	•
	Forged steel	•	•	•	•
	Special materials	○	○	○	○
	Lining	316 WO for > NPS 4 <sup>1)</sup> Alloy WO for > NPS 4 <sup>1)</sup>	316 WO for > NPS 4 <sup>1)</sup> Alloy WO for > NPS 4 <sup>1)</sup>	316 WO for > NPS 4 <sup>1)</sup> Alloy WO for > NPS 4 <sup>1)</sup>	
<b>Mounting and seal of closure member</b>	Floating design				
	Trunnion design	•	•	•	•
	Live-loaded seat ring	•	•	•	•
	Metal seal		•	•	•
	Soft seal	•			•
	Hard facing, armor		•	•	○
	Ceramic				
<b>Leakage rate</b>	IEC 60534-1 or ANSI/FCI 70-2	VI	V	V	VI
	DIN EN 12266-1, P12	A	C	C	A
	DIN 3230-3, BN/BO	1	2	2	1
	API 598	•			•
<b>Further versions and other features</b>	Top entry				
	Full bore	•	•	•	•
	Reduced bore	•	•	•	•
	Fire-safe	•	•	•	•
	Fugitive emissions (TA Luft, ISO 15848, others)	•	•	•	•
	Anti-cavitation				
	Noise reduction				
	Bidirectional flow	•	•	•	•
	Heating jacket	○	○	○	
	NACE	•	•	•	•
	API 6D	•	•	•	•
	Blow-out proof shaft	•	•	•	•
	Static discharge	•	•	•	•
	SIL	SIL 3	SIL 3	SIL 3	SIL 3
<b>Recommended actuator</b>	AIR TORQUE	•	•	•	•
	SAMSON Type 3278				
	Other	•	•	•	•
	Electric actuator	•	•	•	•
<b>Documentation</b>	▶ <a href="http://www.starline.it">www.starline.it</a>				

<sup>1)</sup> WO (weld overlay)

## SAMSON segmented ball valves as well as PFEIFFER tank bottom valves and rotary plug valves

• Standard version; ◦ Special version/option

		SAMSON Segmented ball valve	PFEIFFER Tank bottom valves		PFEIFFER Rotary plug valve
		Type 3310	Type 21a	Type 22a	Type 23e
<b>Markets</b>	Chemicals and petrochemicals	•	•	•	•
	Refineries (downstream applications)	•			
	Oil and gas (upstream and midstream applications)				
	Industrial gases	•			
	Energy	•			
	Pharmaceutical and biotechnology			•	
	Food and beverage			•	
	Pulp and paper	•			
	Mining and ore extraction				
	HVAC, building automation, district heating and cooling	•			
	Water, waste water	•			
	Iron and steel				
	Fertilizer and agricultural chemistry	◦		•	
	Other markets		◦	•	•
<b>Application</b>	On/off service	•	•	•	•
	Throttling service	•			◦
<b>Suitable for</b>	Fibrous media	•			
	Media containing suspended matter	◦		•	
	Corrosive media	◦	•	•	•
	Highly viscous media	•	•	•	•
	Abrasive media				
	Seawater	◦			◦
<b>Version</b>	Oxygen	◦			◦
	DIN	• <sup>1)</sup>	•	•	•
	ANSI	•		•	•
	JIS	◦			
<b>Connection</b>	GOST	◦	◦	◦	◦
	Wafer (sandwich)				
	Lug				
	Flange	•	•	•	•
	Thread				
	Welding ends				
<b>Valve size</b>	Grayloc® (clamp connection)				
	DN	25 to 300 <sup>1)</sup>	50 to 150	50 to 300	25 to 80
<b>Pressure rating</b>	NPS	1 to 12		2 to 12	1 to 3
	PN	40 <sup>1)</sup>	16	10 to 100	10
<b>Medium temperature [°C]</b>	Class	150 to 300		150 to 600	150
	Standard	-29 to +220	-10 to +200	-10 to +200	-10 to 200
	Low	-46	-40	-80	-40
	High	427		400	

		SAMSON Segmented ball valve	PFEIFFER Tank bottom valves		PFEIFFER Rotary plug valve
		Type 3310	Type 21a	Type 22a	Type 23e
<b>Materials</b>	Carbon steel	•		•	
	Stainless steel	•	◦	•	◦
	Forged steel			•	
	Special materials	◦		◦	
	Lining		PTFE	Non-stick coating	PTFE
<b>Mounting and seal of closure member</b>	Floating design		•	•	
	Trunnion design	•		•	•
	Live-loaded seat ring	•		•	
	Metal seal	•		•	
	Soft seal	•	•	•	•
	Hard facing, armor	◦		•	
	Ceramic				
<b>Leakage rate</b>	IEC 60534-1 or ANSI/FCI 70-2	IV/VI	VI	VI	VI
	DIN EN 12266-1, P12		A	A	A
	DIN 3230-3, BN/BO			•	
	API 598			•	
<b>Further versions and other features</b>	Top entry				
	Full bore	•	•	•	•
	Reduced bore				
	Fire-safe				
	Fugitive emissions (TA Luft, ISO 15848, others)	◦	•	•	•
	Anti-cavitation				
	Noise reduction				
	Bidirectional flow				
	Heating jacket	◦	◦	◦	
	NACE	◦		•	
	API 6D				
	Blow-out proof shaft	•	•	•	•
	Static discharge		•	•	•
	SIL	•	•	•	•
Replaceable seat ring and disk ring		•	•	•	
<b>Recommended actuator</b>	AIR TORQUE	•	SRP/DAP (Type 31a)	SRP/DAP (Type 31a)	•
	SAMSON Type 3278	◦			
	Other	◦		Type 31 (PFEIFFER)	
	Electric actuator	PS Automation, Rotork etc.	•	•	•
<b>Documentation</b>		▶ T 8222	▶ TB 21a	▶ TB 22a	▶ T 23e

<sup>1)</sup> Face-to-face dimensions according to ASME and flanges according to DIN

## VETEC rotary plug valves

• Standard version; ◦ Special version/option

		VETEC					
		62.7	72.3	72.4	73.3	73.7	82.7
<b>Markets</b>	Chemicals and petrochemicals	•	•	•	•	•	•
	Refineries (downstream applications)	•	•	•	•	•	•
	Oil and gas (upstream and midstream applications)	•	•	•	•	•	•
	Industrial gases		•	•	•	•	•
	Energy						
	Pharmaceutical and biotechnology						
	Food and beverage	•	•	•	•	•	•
	Pulp and paper			•			
	Mining and ore extraction						
	HVAC, building automation, district heating and cooling	•					
	Water, waste water	•	•	•	•	•	•
	Iron and steel	•	•	•	•	•	•
	Fertilizer and agricultural chemistry						
	Other markets						
<b>Application</b>	On/off service	•	•	•	•	•	•
	Throttling service	•	•	•	•	•	•
<b>Suitable for</b>	Fibrous media						
	Media containing suspended matter	•	•	•	•	•	•
	Corrosive media	•	•	•	•	•	•
	Highly viscous media	•	•	•	•	•	•
	Abrasive media	•	•	•	•	•	•
	Seawater		◦	◦	◦	◦	◦
Oxygen		◦	◦	◦	◦	◦	
<b>Version</b>	DIN	•	•	•	•	•	•
	ANSI	•	•	•		•	•
	JIS						•
	GOST		•	•	•	•	•
<b>Connection</b>	Wafer (sandwich)			•			
	Lug						
	Flange	•	• 1)		• 1)	•	•
	Thread						
	Welding ends						
	Grayloc® (clamp connection)						
<b>Valve size</b>	DN	25 to 200	25 to 700	25 to 300	25 to 250	25 to 700	25 to 250
	NPS	1 to 8	1 to 28	1 to 12	1 to 10	1 to 28	1 to 10
<b>Pressure rating</b>	PN	10 to 40	10 to 40	10 to 40	63 to 160	63 to 160	10 to 40
	Class	150 to 300	150 to 300	150 to 300	600 to 900	600 to 900	150 to 300
<b>Medium temperature [°C]</b>	Standard	-29 to +220	-100 to +400	-100 to +400	-100 to +400	-100 to +400	-100 to +400
	Low	-60 to +220	-200 to +300	-200 to +300	-200 to +300	-200 to +300	-200 to +300
	High		-10 to +600	-10 to +600	-10 to +600	-10 to +600	-10 to +600



		VETEC					
		62.7	72.3	72.4	73.3	73.7	82.7
<b>Materials</b>	Carbon steel	•	•	•	•	•	•
	Stainless steel	•	•	•	•	•	•
	Forged steel						
	Special materials		○	○	○	○	○
	Lining			○ Ceramic/ carbide metal			
<b>Mounting and seal of closure member</b>	Centric						
	Double eccentric	•	•	•	•	•	•
	Triple-eccentric						
	Metal seal	•	•	•	•	•	•
	Soft seal	○	○	○	○	○	○
	Hard facing, armor		○	○	○	○	○
	Ceramic		○	○	○	○	○
<b>Leakage rate</b>	IEC 60534-1 or ANSI/FCI 70-2	IV/VI	IV/VI	IV/VI	IV/VI	IV/VI	IV/VI
	DIN EN 12266-1, P12	VI	VI	VI	VI	VI	VI
	DIN 3230-3, BN/BO		○	○	○	○	○
	API 598		○	○	○	○	○
<b>Further versions and other features</b>	Top entry						
	Fire-safe		○			○	○
	Fugitive emissions (TA Luft, ISO 15848, others)	•	○	○	○	○	○
	Anti-cavitation		○	○	○	○	○
	Noise reduction		○	○	○	○	○
	Bidirectional flow						
	Heating jacket		○		○		
	NACE		○	○	○	○	○
	API 6D						
	Blow-out proof shaft	•	•	•	•	•	•
	Static discharge	•	•	•	•	•	•
SIL	•	•	•	•	•	•	
<b>Recommended actuator</b>	AIR TORQUE	•	•	•			•
	SAMSON Type 3278		•	•			•
	Other		•	•	•	•	•
	Electric actuator		•	•	•	•	•
<b>Documentation</b>		▶ T 62.7	▶ T 72.3	▶ T 72.4	▶ T 73.3	▶ T 73.7	▶ T 82.7

<sup>1)</sup> Long flange version; face-to-face dimensions according to DIN EN 558-1

## Rotary valves

### Principle of operation

The actuator opens the closure member of a rotary valve from 0 to 270°. This causes the medium flow through the valve to be either throttled or shut off.

### Special features

Rotary valves have a more compact design than globe valves. Consequently, these valves are more cost-efficient in large nominal sizes. Additionally, they have a higher flow capacities. The advantages and disadvantages as well as the fields of application depend on the rotary valve design.

## Designs







### Butterfly valves

The shaft turns the butterfly disk used to shut off or to control the medium flow by up to 90°. The various butterfly valve designs, in particular the bearing design of the disk, allows the valves to be used for throttling or on/off service.

Butterfly valves in the wafer-type or lug-type design are cost-effective and use less material. They are primarily used for large nominal sizes.

Butterfly valves are only suitable in applications where the pressure drop is relatively low. Higher differential pressures cause higher noise emissions and increase the load on the valve components. Possible countermeasures are restricted by the valve construction and space available in the valve.

### Special features of butterfly valves

Centric control butterfly valves	Double-eccentric control and shut-off butterfly valves	Triple-eccentric control and shut-off butterfly valves
		
<ul style="list-style-type: none"> <li>- Simple applications in power stations and HVAC</li> <li>- Throttling service only due to high leakage <math>\leq 0.5</math> to 1 % of <math>K_{VS}</math> coefficient at maximum opening angle</li> </ul>	<ul style="list-style-type: none"> <li>- Suitable for chlorine applications</li> <li>- Lined versions specially for corrosive media</li> <li>- 8 to 12 mm thick lining to prevent permeation</li> <li>- Metal-seated version for use in steam pipes</li> </ul>	<ul style="list-style-type: none"> <li>- Versatile use to meet stricter requirements</li> <li>- Excellent seat shut-off: leakage class VI or A (metal-seated valve)</li> <li>- Exchangeable seat and disk rings facilitate maintenance</li> <li>- Versions available for reduced noise and cavitation</li> <li>- Quick-acting shut-off version with damping system for closing time less than 0.5 s</li> <li>- Fire-safe design</li> </ul>
		
See table SAMSON, PFEIFFER and LEUSCH butterfly valves (p. 4)		

## Ball valves

Either a ball with a cylindrical passage or a segmented V-notch ball is used in ball valves to control the flow rate or shut off the process medium. The ball is located between two metal or PTFE seat rings. The ball can be rotated by 90° (quarter-turn ball valve). The seat rings press against the ball and the sharp edges of the hole through the ball help wipe off particles that stick to the ball and cut off any long fibers.





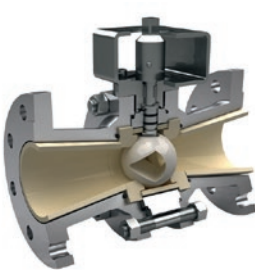


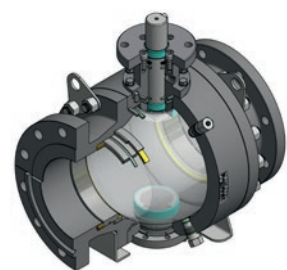
When the valve is open, the full pipe cross-section is released, which causes a negligible loss in pressure and allows its use in pigging systems.

Careful machining of valve inside surfaces ensures that a gas-tight shut-off can be achieved even at high pressure drops. Due to the high friction torques and gas-tight shut-off, ball valves are mainly used in on/off service.

There are two types of ball valves: floating and trunnion-mounted ball valves. The ball of the trunnion-mounted

ball valve is mounted on both sides, resulting in less friction torque which means smaller actuators can be used. Additionally, higher torques can be transferred which allows higher differential pressures to be controlled. However, mounting the ball on both sides makes the construction more complicated.

## Special features of ball valves

Ceramic-lined control and shut-off ball valves	PTFE/PFA-lined metal shut-off ball valves	Metal-seated control and shut-off ball valves	Forged metal-seated shut-off ball valves
 <p><b>CERA SYSTEM®</b> ✓ more than ceramics</p>	 <p><b>Pfeiffer</b> Chemie-Armaturenbau GmbH</p>	 <p><b>RINGO VALVULAS</b></p>	 <p><b>STAR LINE®</b></p>
<ul style="list-style-type: none"> <li>– Low wear prevents plant shut-downs</li> <li>– Various ceramic materials, e.g. aluminum oxide, zirconium dioxide, silicon carbide and silicon nitride</li> <li>– Optional plastic body</li> <li>– Typical fields of applications: steelworks and fossil-fuel power stations, mining, chemical (titanium dioxide), waste incinerators, pulp and paper, bioethanol plants, coal gasification, recycling plants</li> </ul>	<ul style="list-style-type: none"> <li>– Proven in chemical and petrochemical industries</li> <li>– Customized solutions</li> <li>– Suitable for chlorine applications</li> <li>– Lined versions and stainless steel versions for corrosive media</li> <li>– Metal-seated version for use in steam pipes</li> <li>– Modular design</li> </ul>	<ul style="list-style-type: none"> <li>– Versions according to API 6D and API 6A specifications</li> <li>– Suitable for mounting on well-head and christmas tree equipment</li> <li>– To meet stricter requirements</li> <li>– Large valve sizes, high pressure ratings and wide temperature ranges</li> <li>– Top-entry design to facilitate maintenance</li> <li>– Fire-safe design</li> </ul>	<ul style="list-style-type: none"> <li>– Long service life</li> <li>– Modular two-piece or three-piece side-entry design</li> <li>– Version according to DIN EN ISO 5211</li> <li>– Valves up to category 3 according to Pressure Equipment Directive 97/23/EC, Module H</li> <li>– Valves complying with ATEX 97/9/EC</li> <li>– Fire-safe design according to API 6FA, API 607 and DIN EN ISO 10497</li> <li>– To meet stricter requirements</li> <li>– Fire-safe design</li> </ul>
			
See Table 1 (p. 6)	See Table 2 (p. 8)	See Table 2 (p. 8)	See Table 3 (p. 10) and Table 4 (p. 12)

### Segmented ball valves

The design of the segmented ball valve is based on the trunnion-mounted ball valve. In place of a solid ball, a segmented ball with either a linear or equal percentage characteristic is used. To reduce the wear on the body when controlling abrasive media, the direction of flow can be reversed. Special alloys can also be used on request. The segmented ball is sealed by a spring-loaded seat.

Segmented ball valves are characterized by low friction torque, high flow coefficients and a closure member with its own characteristic. As a result, they are often used for throttling service where the pressure drop is low in the open position.

#### Special features

- Precise control with high flow capacity
- Suitable for use with fibrous media
- Free passage at 100 % open position



SAMSON Type 3310 Segmented Ball Valve with rotary actuator  
See table SAMSON segmented ball valves as well as PFEIFFER tank bottom valves and rotary plug valves (p. 14)

### Tank bottom valves

In tank bottom valves, the ball with its cylindrical bore rotates around the center axis. The rotary angle of the ball determines the flow rate across the free area between the body and the ball channel. PTFE-lined tank bottom valves are mainly suited for corrosive media.

In the standard version, these ball valves have a shaft which is located at an angle away from the tank. This allows the optimal position of the actuator to the tank.

#### Special features

- Dead space minimized
- Especially low leakage rate in on/off service (tight closing)
- Self-adjusting sealing system loaded by spring washers



PFEIFFER Type 21a Tank Bottom Valve  
See table SAMSON segmented ball valves as well as PFEIFFER tank bottom valves and rotary plug valves (p. 14)

### Rotary plug valves

A double offset is created in rotary plug valves: the center line of the shaft and plug (first offset), and the pivot of the plug (second offset). This double offset causes the plug to be immediately lifted out of the seat resulting in no friction or initial breakaway torque when the shaft turns from the closed to open position. The valve shows a stable control response even at small opening angles.

The flow coefficient can be reduced by a smaller seat diameter. As a result, throttling service is possible when the valve is open even with medium differential pressures.

Rotary plug valves are mainly used for throttling service, especially for media containing solids.

#### Special features

- Higher flow velocities compared to globe valves
- Short body for compact, lightweight design
- Suitable for all process media, regardless of whether they are viscous, abrasive, caking, contain solid matter or have a tendency to crystallize out
- No friction
- No stick-slip effect
- Rangeability 200:1



VETEC Type 82.7 MAXIFLUSS Rotary Plug Valve  
See table VETEC rotary plug valves (p. 16)

## Terminology

### States of the process medium

**Fibrous media** contain fibers (predominately cellulose fibers). This state is mainly found in paper production.

**Media that contain suspended matter**, such as mineral or organic solid matter, are unable to dissolve. Due to the small size and light weight of the solids, the matter is suspended and is redistributed at the slightest movement of the process medium.

**Corrosive media** include acids and alkaline solutions that cause corrosion of metal components.

**Highly viscous media** include heavy fuel oils.

**Abrasive media** cause the valve parts that come into contact with the medium to wear quickly. This wear is caused by the solid matter contained in the medium. It can be counteracted through the selection of the correct materials and construction.

The salt contained in **seawater** causes corrosion. The service life of valves used in conjunction with seawater can be considerably improved by the use of high-grade stainless steel or linings.

**Oxygen** is a hazardous substance due its ability to ignite. Therefore, safety measures and manufacturer's instructions must be observed when valves are used for oxygen service.

### Connections

**Flanged connections** can be easily exchanged as the construction and face-to-face dimensions are defined in standards (e.g. DIN EN 558, DIN EN 1092).

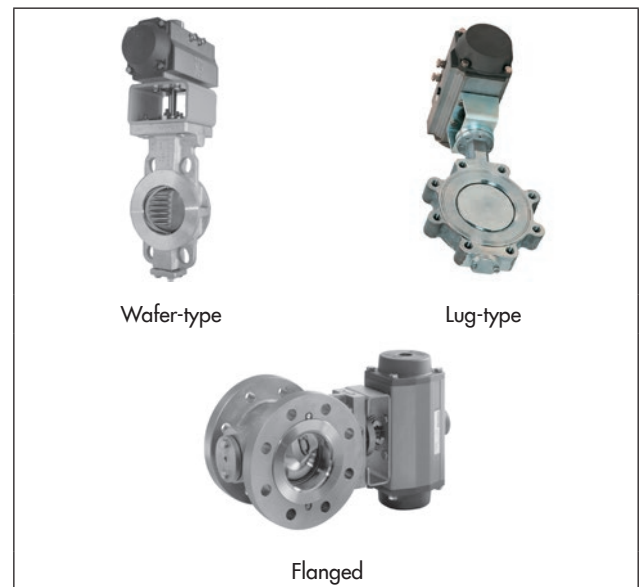
Wafer-type or lug-type designs are available as an alternative to flanged valves. These versions are cost-effective and use less material. These valve versions are mainly used for large valve sizes to reduce the material required for the valve construction.

The **wafer-type** is the simplest construction.

The **lug-type** construction has threaded lugs to match the boreholes in the mating flange of the pipeline.

Grayloc® is a patented **clamp connection** also used for high-pressure connections. These clamps provide a very tight connection, are easy to remove and can also be used for high pressures. Clamp connections are mainly used in the chemical industry, oil and gas sector as well as in applications with industrial gases.

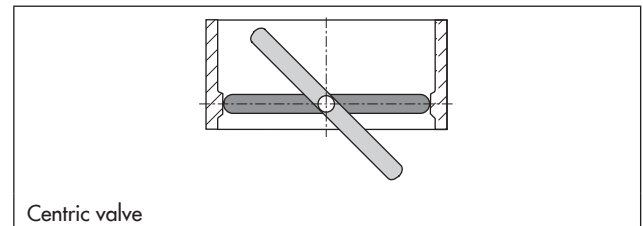
Clamp connections are smaller and lighter in weight than flanged joints. Furthermore, they can be opened and closed quickly without the need for special tools.



### Centric and eccentric valves

The pivot of the **centric design** is central to the body, pipe and butterfly disk.

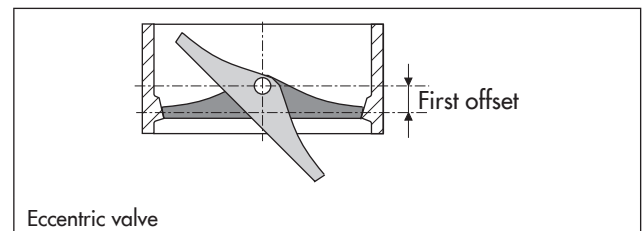
The metal-seated version of the centric butterfly valve is only used for throttling due to its high seat leakage caused by the facing of the shaft construction. In contrast, butterfly valves with soft-seated seat rings provide an excellent tight shut-off and are, therefore, suitable for on/off service.



The **eccentric valves** have a single offset:

1. Offset between the center line of the shaft and disk

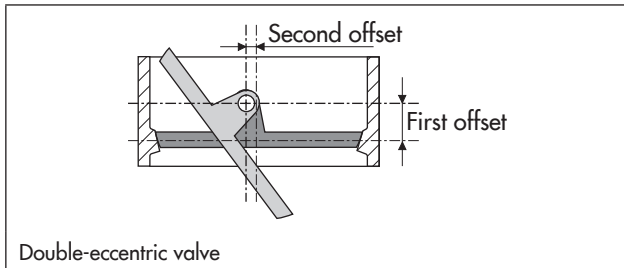
This offset reduces the cross-section released in the passage which may lead to increased seat leakage.



**Double-eccentric valves** has two offsets:

1. Offset between the center line of the shaft and disk
2. Offset between the center line of the body and disk

This construction causes less friction between the seat ring and disk ring. Furthermore, a much better tight shut-off is achieved in comparison to the centric and eccentric butterfly valves due to the offset seal. These valves are used for both on/off and throttling service.



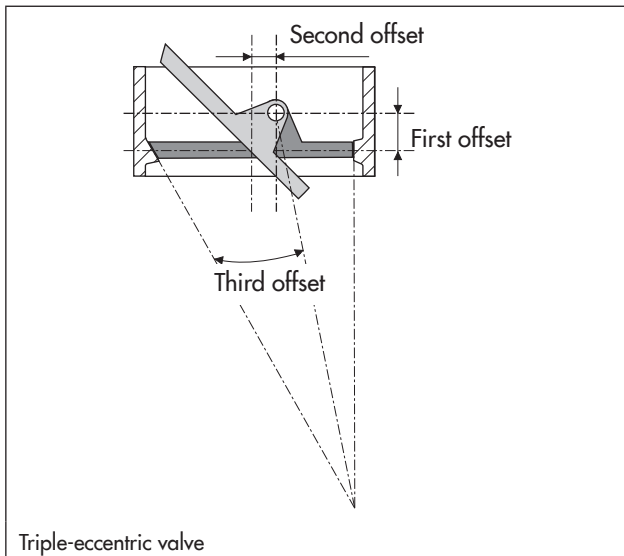
**Triple-eccentric design** have the three offsets:

1. Offset between the center line of the shaft and disk
2. Offset between the center line of the body and disk
3. Offset between the seal and the center line of the body

The seat and butterfly disk have a slanted design. As a result, the disk is lifted into the seat when it closes. The contact between the seat and disk shut off the valve. The seal and seat ring are separate.

The advantage of triple-eccentric metal-seated butterfly valves is the bubble tight shut-off even for large-sized valves or long periods of service.

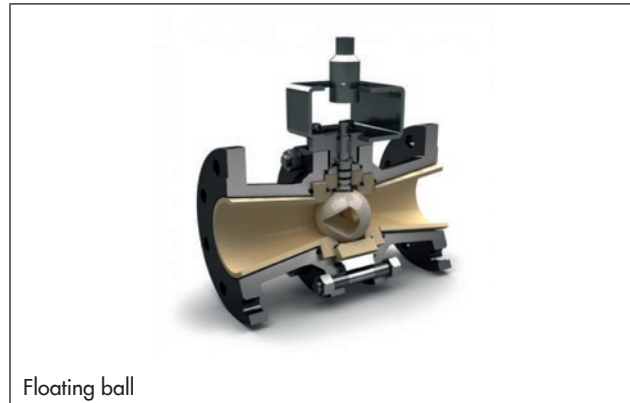
These valves are used for both on/off and throttling service.



## Types of ball valves

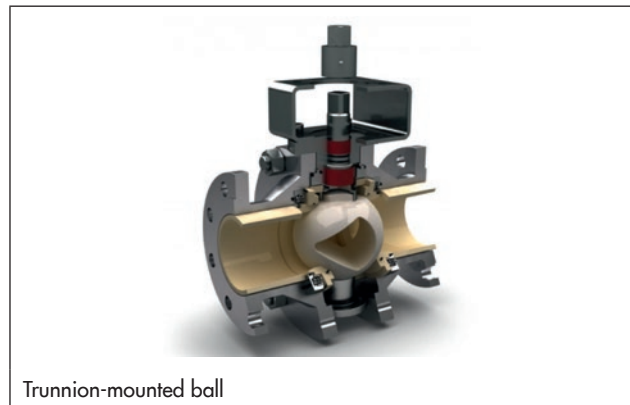
There are two types of ball valves: floating and trunnion-mounted.

The ball in the **floating ball valve** is attached to the shaft at the top and guided at the bottom by a plain bearing.



The ball in the **trunnion-mounted ball valve** is anchored at the top and bottom by two bearing bushings.

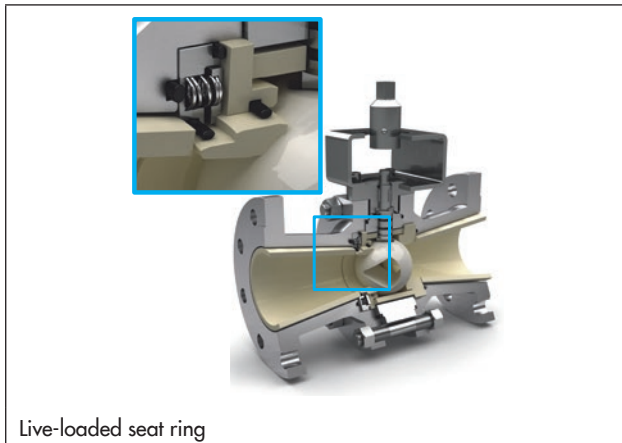
The additional anchorage allows higher torques to be transferred and higher closing pressures to be used for large valve sizes. Trunnion-mounted ball valves are mainly used to meet stricter requirements and for large valve sizes and high pressure ratings.





### Live-loaded seat ring in ball valves

In ball valves, shut-off between the seat and ball is implemented by a live-loaded seat ring. This results in a gas-tight shut-off to the outlet when the ball valve is closed. Most trunnion-mounted ball valves have live-loaded seat rings.

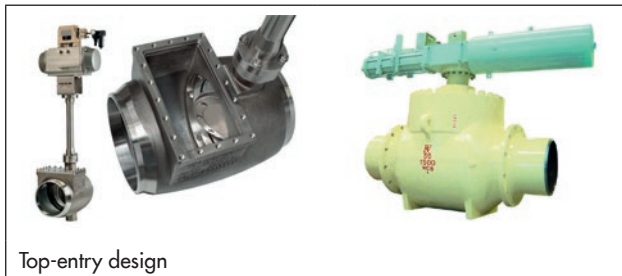


Live-loaded seat ring

### Design

**Side-entry** valve constructions are usually assembled from two or three pieces which are bolted together. This type of valve must be removed from the pipeline for maintenance.

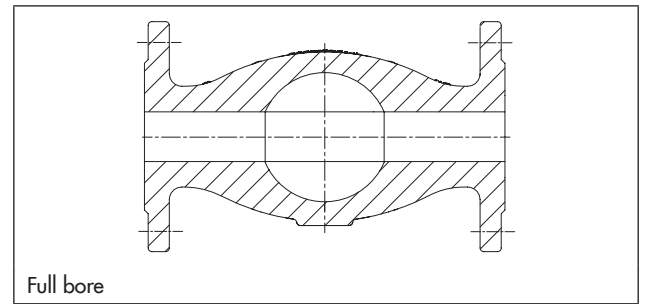
The one-piece **top-entry** valve construction allows internal parts to be installed or removed while the valve is installed in the pipeline. Internal parts can be accessed through the bonnet or special shaped body.



Top-entry design

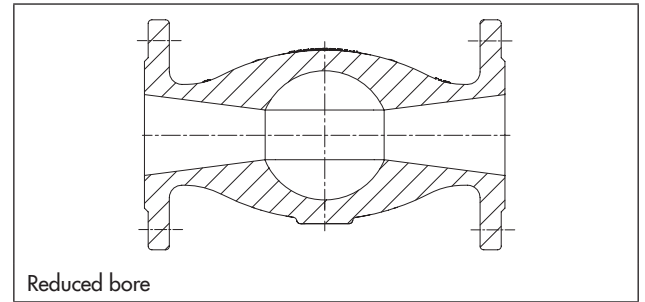
### Cross-sectional area of flow

A **full bore** means that the cross-section is not restricted when the valve is fully open.



Full bore

A **reduced bore** means that the cross-section is restricted even when the valve is fully open.



Reduced bore

### Fire-safe version

The fire-safe requirements are intended for the function testing of safety valves. In the event of a fire in the plant, the shut-off function of the valve must be guaranteed and the specified amount leakage must be kept between the inlet and outlet of the valve as well as leakage to the atmosphere for a defined time period. The most common standards for function testing include BS 6755, API 607 and ISO 10497, which define the conditions and testing.

**Note:** The fire-safe version does not meet the same requirements as a valve fitted with fire-protection jacketing (heat pads).

### Fugitive emissions

Fugitive emissions applies to the stem leakage of shut-off and control valves. Various regulations exist that specify leakage limits e.g. TA Luft (Germany) or ISO 15848 and ANSI/FCI 91-1-2010.

### Anti-cavitation

Avoiding cavitation is only relevant to control valves as it concerns pressure letdown. Various constructions are used by valve manufacturers based on the sizing criteria. A general solution applicable to all SAMSON valves is the Type 3381 Silencer. By raising the downstream pressure, the medium pressure at the valve outlet is increased to a level above vapor pressure, which prevents cavitation. See Data Sheet ▶ T 8084 for more details.



Attenuation plates in SAMSON Type 3381 Silencer

### Noise reduction

The noise emission in the valve increases as the pressure let-down increases. This also causes the flow load to increase. Valve manufacturers apply various constructive measures to counteract this problem. In most cases, the noise emission is reduced by installing perforated element in the axis of the flow.



Noise-reducing measures by LEUSCH (left) and VETEC (right)

### Heating jacket

Valves fitted with heating jackets are used in applications where process media tend to crystallize, e.g. soluble salts, or when the temperature of the process media must not fall below a certain limit.

### NACE standards

NACE International (National Association of Corrosion Engineers) organization is active in corrosion control. It publishes material requirements (MR) standards.

The organization focuses on the avoidance of sulfide stress cracking (SSC). This phenomenon often occurs, for example, in oil and gas production. Natural gas and crude oil contain high levels of hydrogen sulfide (H<sub>2</sub>S) which may cause sulfide stress cracking in carbon and low alloy steels. The NACE standards define the materials that are resistant to cracking in oil and gas systems.

The API 6A specification defines the requirements placed on ball valves used in upstream applications.

### API 6D

The API 6D specification defines the requirements and provides recommendations for the design, manufacture, testing and documentation of ball, check, gate and plug valves for use in pipeline systems in the oil and gas industry.

### Blow-out proof shaft

This design prevents the shaft from being ejected out of the valve while removing the actuator or when the valve is under pressure.

### Static discharge

The rotary motion of the ball can create static charging between the plastic seat rings and packing. Depending on the process medium and environmental conditions, this may lead to a fire or explosion. This is prevented by discharging static electricity over conductive parts (e.g. carbon bearings) with a resistance of maximum 50 Ω. Optionally, the ball valve body can be grounded in the plant.

### SIL (Safety Integrity Level)

The SIL is used to rate safety-instrumented systems. There are four discrete levels to specify safety requirements. SIL 4 represents the highest level and SIL 1 the lowest.

In simplified terms, SIL describes the probability of failure of the entire safety loop (not just the valve) within a certain period of time.

The IEC 61508 or IEC 61511 standards must be taken into account on sizing safety-instrumented systems in the process industry. The valves used in the safety-instrumented system play a significant role and are often the dominant factor on determining the SIL rating achieved for the entire safety-instrumented function (SIF).

Specifications subject to change without notice



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