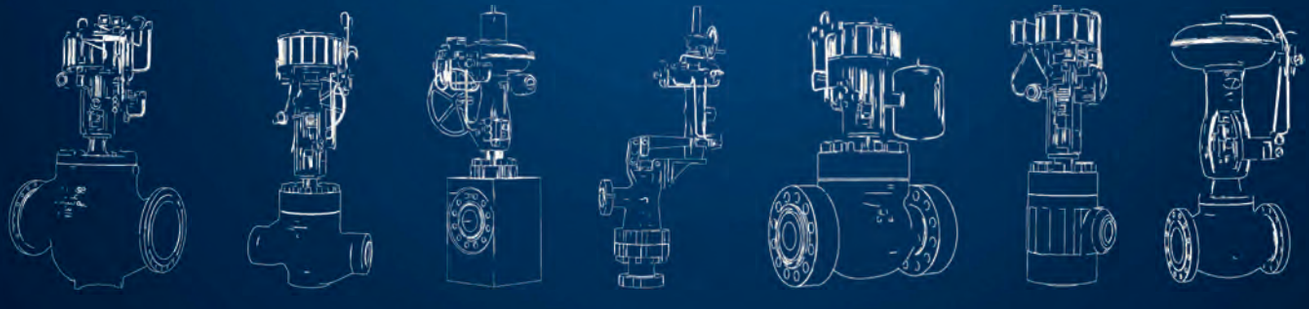
Control Valves for Process Industries

Controls . Protects . Performs



Products & Applications

KSB MIL Controls Limited

KSB MIL Controls Limited, a subsidiary of KSB SE & Co. KGaA, takes the KSB group's promise of providing right solutions in fluid control to our customers with the same vigor and intent. KSB MIL's control valves adds power and performance necessary for some of the most stringent applications in the most expensive and challenging processes worldwide to ensure successful operation throughout.

KSB MIL's manufacturing infrastructure is fully geared to meet the challenges of the global process industry with a well-established manufacturing set up and a qualified and skilled work force. KSB MIL is among the technology leaders in the manufacturing of control valves focused on developing optimum solutions using state-of-the-art R&D Centre. Our R&D Centre is the first of its kind, which is approved by Department of Scientific and Industrial Research (DSIR), Govt. of India.

With proven expertise across sectors including thermal, nuclear, fertilizer, oil & gas, petrochemicals and other core industries, KSB is equipped to cater to severe conditions prevalent in various process industries and provide novel concepts and customized solutions for tough process control applications in all industry sectors.

With a strong foothold of experience which spans over three decades in the industry, our installed base spreads across the globe and is supported in aftersales by the extensive service network of KSB SupremeServ. We reach out to the customers across the globe through the widespread KSB network. Our manufacturing sites, sales and a proficient after-sales team with prompt assistance from the service centres has been oiling the alliances for a smooth operation.

Contents

A. Product Range

1. Control Valves

1.1 For General Service

MIL 10000 - Double Ported Top & Bottom Guided Control Valves....5
MIL 21000/70000 - Single Seated Heavy Top Guided Globe/Angle Control Valves....7
MIL 27000 - Compact Globe Control Valves....9
MIL 29000 - Micropak Micro flow Control Valves....11
MIL 41000/71000 - Single Seated Heavy Duty Cage Guided Globe/Angle Control Valves....13

1.2 For Severe Service

MIL 76000 - High Pressure Letdown Control Valves....15
MIL 77000 - Multi-stage Labyrinth Lo-dB Control Valves....17
MIL 78000 - Multi-Stage Anti-cav/Low Noise control Valves....19
MIL 91000 - Multi-Stage Multi-Path Axial Flow Control Valves....21

1.3 Special Control Valves

MIL 81000 - Three Way Combining and Diverting Control Valves....23
MIL 90000 - Automatic Recirculation Control Valves....25
MIL 64000/74000 - Steam Conditioning Valves....27
MIL 63000 - Desuperheaters....29
Bellow Sealed Valves....30

1.4 Rotary Valves

MIL 33000 - Butterfly Valves....31
MIL 35220 - Trunnion Mounted Ball Valve....33
MIL 35500 - Segmented Ball valve....35

2 Actuators

MIL 37-38 - Pneumatic Spring Diaphragm Actuators....37
MIL 67-68 - Piston Cylinder Actuators....39
MIL 95-96 - Pneumatic Double acting & Spring return Quarter turn Actuators....41

B. Applications

1. Energy

1.1 Supercritical Thermal Power Stations

Boiler Feed Pump Recirculation Control Valves....43
Start-up feed water valves....44
Water Drain Control Valves....45
Super Heater Spray Control Valves....46

1.2 Captive Power Stations

Steam Conditioning Valves....47
Start up vent Control Valves....48
Steam Injection Control Valves....49

1.3 Nuclear Power Stations

Conrol Valves for Nuclear Applications....50

1.4 Ultra Supercritical Power Stations

High temperature/pressure reducing valves....51

2. Industry

Antisurge Control Valves....52
Amine Regeneration Control Valves....53
Cryogenic Control Valves for LNG....54
Hot High Pressure Seperator Letdown Control Valves....55
Control Valves for Hydraulic Pipeline....56
Valves for Corrosive Media....57
Water Injection Control Valves....58
High Performance Butterfly Control Valves....59
Segmented Ball Control Valves....60

Product Range

Special
Control Valves

Control Valves for
General service

Control Valves for
Severe Service

Rotary Valves

MIL 10000 - Double Ported Top and Bottom Guided Control Valves

Standard sizes & rating
¾" to 16" : ASME 150# to ASME 1500#
Seat leakage class (as per FCI 70.2)
Standard : Class II
Optional : Class III / Class VI

Applications

- Dirty fluid application with high pressure drops
- Chemical and Fertilizer industry
- Refinery and Petrochemical industry
- Oil & Gas extraction
- Paper and Pulp industry

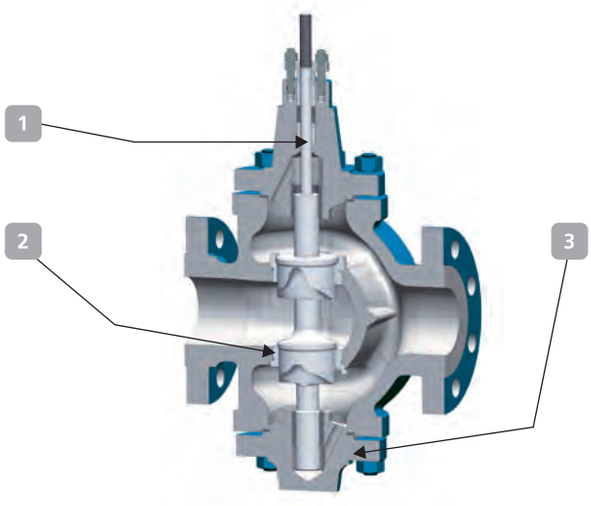
More information:
www.ksb-mil.com

Soft seated trim

Your contact:

MIL 10000 - Double Ported Top and Bottom Guided Control Valves

- Top and bottom guiding
- High allowable pressure drops
- High capacity with low recovery
- Reduced capacity trim
- High performance materials
- Invertible bodies and plugs



1 Plug stem Sub assembly 2 Seat Ring 3 Bottom Flange

Model Decodification

1st –	2nd –	3rd 1	4th 0	5th –	6th –	7th –
Actuator Type		**Body Series**		**Plug Type**	**Trim Type**	**Seat Type**
20.Hand Operated 37.Direct Spring Diaphragm 38.Reverse Spring Diaphragm 67.Direct Piston Cylinder 68.Reverse Piston Cylinder 90.Electrical Actuator		10. Double Ported Top and Bottom Guided Control Valves		0. Undefined 1. Double Seat (Std) 2. Double Seat (Special)	0. Undefined 3. Equal % 6. On-Off 7. Linear 8. Lo-dB Linear	0. Undefined 2. Down Seating 4 Up Seating 6. Down Seating (Soft Seat)

General Data

Body	Type	Double ported globe
	Recommended flow directions	Flow passing into the seats
Bonnet	Type	Stud bolted
	Temperature range	-29° C to 454° C
Gland Seal	Type	Adjustable double sealed packing box with PTFE or Graphite moulded split rings
	Option	Eco lock* (varying density for low emission, PTFE or Graphite) or PTFE V rings
	Temperature range	≤ 180° C for PTFE, > 180° C for Graphite
Trim	Plug type	Double seat, top and bottom guided
	Seat type	Threaded
	Options	Adjustable plug skirts with PTFE inserts
	Rangeability	50:1
	Characteristics	Equal percentage (V - port), linear (contoured) and quick opening

* Meets the stringent Class A emission requirement as per ISO 15848

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www.ksb.com/socialmedia

MIL 21000 / 70000 - Heavy Post Guided Single Seated Control Valves

Standard sizes & rating
½" to 10" : ASME 150# to ASME 2500#
Seat leakage class (as per FCI 70.2)
Standard : Class IV
Optional : Class V & Class VI

Applications

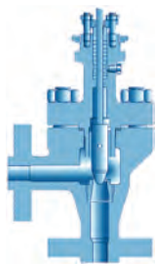
- For moderate pressure drops
- Handle fluids like air, water, steam, gas, oil and other fluids having wide flow range requirements
- Allowing small particles.
- In power plants for Boiler blowdown, Heater drain valves, Fuel oil control valves etc.
- In Refineries and petrochemicals for handling normal and viscous fluids

More information:
www.ksb-mil.com

Micro-flow high pressure drop plug and seat construction with extra guiding

Double stage low noise / anti-cavitation trim design for severe service

Committed to an emission free world. Bellows sealed valves for zero gland leakage

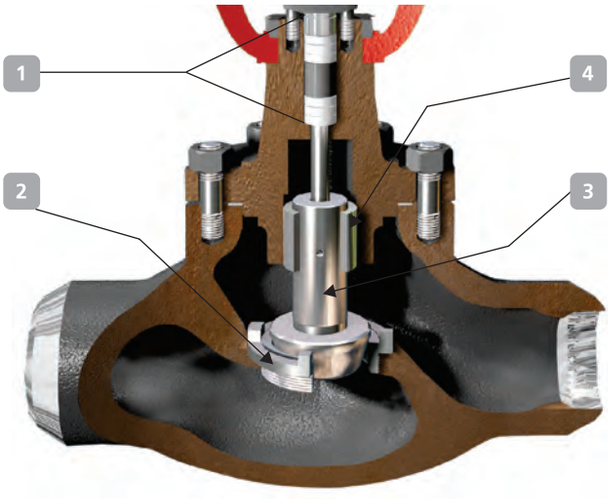


Typical MIL 70000 Angle body construction

Your contact:

MIL 21000 / 70000 - Heavy Post Guided Single Seated Control Valves

- **Challenging Performance Limits**
  - Precise control over wide range of flow
- **Design Features**
  - Heavy top guiding (shank guiding)
  - Tight shut off capability
  - Customized valve trim to meet emerging demands
- **Optional Characters**
  - Steam jacketing
  - Clamped seat ring
  - Extended bonnet design
- **Field Proven Material**
  - High Performance material for better longevity
- **Easy Maintenance**
  - Fewer internal trim parts
  - Quick change trim



1 Packing Box 2 Seat Ring 3 Plug Stem Sub-assembly 4 Guide bush

Model Decodification

1st - 2nd -	3rd - 4th -	5th -	6th -	7th -
Actuator Type	**Body Series**	**Plug Type**	**Trim Type**	**Seat Type**
20.Hand Operated 37.Direct Spring Diaphragm 38.Reverse Spring Diaphragm 67.Direct Piston Cylinder 68.Reverse Piston Cylinder 90.Electrical Actuator	21.Top Guided Globe Control Valve 70.Top Guided Angle Control Valve	0.Undefined 1.Contoured 7.Single Stage Anti cavitation/Lo-dB 8.Double Stage Anti-cavitation 9.Double Stage Lo-dB	0.Undefined 1.Linear 2.Equal % 3.Customised X.On-Off	0.Undefined 4.Clamped (Quick Change) 5.Threaded 6.Soft Seat

General Data

Body	Type	High capacity Globe or Angle
	Recommended flow directions	Flow to open (except Anti-cav design) Anti-cav design : Flow to close
Bonnet	Type	Stud bolted
	Temperature range	Standard bonnet: -27° C to 427° C, Extension bonnet (AB): -100° C to 566° C, Cryogenic bonnet (CB): -196° C to -100°C
Gland Seal	Type	Adjustable double sealed packing box with PTFE or Graphite moulded split rings
	Option	Eco lock* (varying density for low emission, PTFE or Graphite) or PTFE V rings
	Temperature range	≤ 180° C for PTFE, > 180° C for Graphite
Trim	Type	Top guided (Shank guiding)
	Plug type	Contoured / Anti-cavitation / Lo-dB/ with PTFE inserts for Class VI Leakage (if Cv > 6)
	Seat type	Threaded / Clamped (Quick Change)/ Soft seat with PTFE inserts, for Class VI leakage (if Cv < 6)
	Guiding	Top guiding
	Rangeability	50:1
	Characteristic	Standard: Linear / Equal % / Quick Opening, Anti-cav / Lo-dB: Linear

* Meets the stringent Class A emission requirement as per ISO 15848

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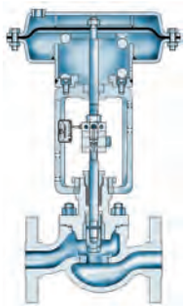
MIL 27000 - Compact Globe Control Valves

Standard sizes & rating
½" to 4" : ASME 150# to ASME 300#
Seat leakage class (as per FCI 70.2)
Standard : Class IV
Optional : Class V / Class VI

Applications

- For applications with moderate pressure drops
- Used for fluids containing small particulate presence
- Suitable for handling viscous fluids in refineries and petrochemicals
- Pharmaceutical, Chemical and Bio-medical industries

More information:
www.ksb-mil.com

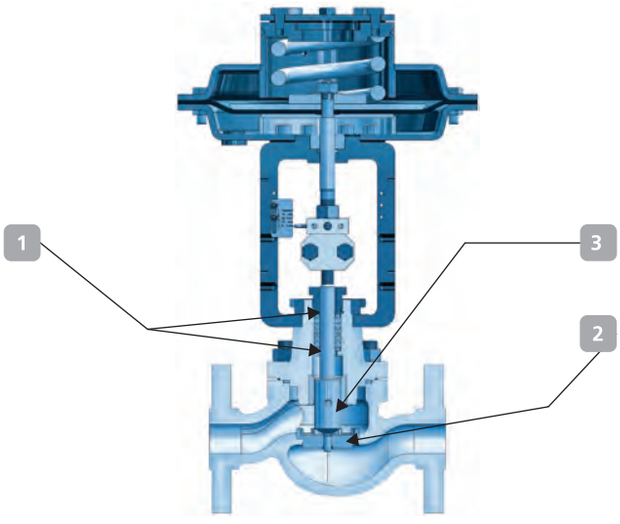


27 Type Actuator for use with
MIL 27000 (Air to Close)

Your contact:

MIL 27000 - Compact Globe Control Valves

- Compact and light weight construction
- Shank guiding
- Reduced capacity
- Field reversible actuator
- Optional handwheel
- Tight shut-off



1 Packing Box 2 Seat Ring 3 Plug stem Sub assembly

28 Type MIL 27000 (Air to Open)

Model Decodification

1st	2nd	3rd	4th	5th	6th	7th
-	-	2	7	-	-	-

Actuator Type	Body Series	Plug Type	Trim Type	Seat Type
20. Hand operated 27. Air to Close 28. Air to Open	27. Compact globe control valve	0. Undefined 1. Unbalanced contoured	0. Undefined 1. Linear 2. Equal % 3. Customized	0. Undefined 5. Threaded metal seat 6. Threaded soft seat

General Data

Body	Type	Globe
	Recommended flow directions	Flow to Open
Bonnet	Type	Stud bolted
	Temperature range	-27° C to 427° C
Gland Seal	Option	Ecolock* (varying density for low emission, PTFE or Graphite)
	Temperature range	≤ 180° C for PTFE, > 180° C for Graphite
Trim	Plug type	Unbalanced contoured
	Seat type	Threaded metal or Soft seat
	Options	Seat ring with Carbon filled PTFE insert for Class VI leakage
	Rangeability	30:1
	Characteristics	Equal percentage, Linear, On-Off

* Meets the stringent Class A emission requirement as per ISO 15848

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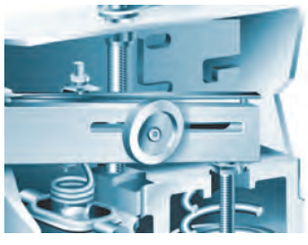
MIL 29000 - Micropak Micro flow Control Valves

Standard sizes & rating
½" to 1" : ASME 150# to ASME 1500#
Seat leakage class (as per FCI 70.2)
Standard : Class IV
Optional : Class V

Applications

- Accurate control in low flow applications
- Spray water control in lower capacity power plants
- Chemical and Pharmaceutical plants
- Refinery & Petrochemical complexes

More information:
www.ksb-mil.com



Cv adjustment possible at site

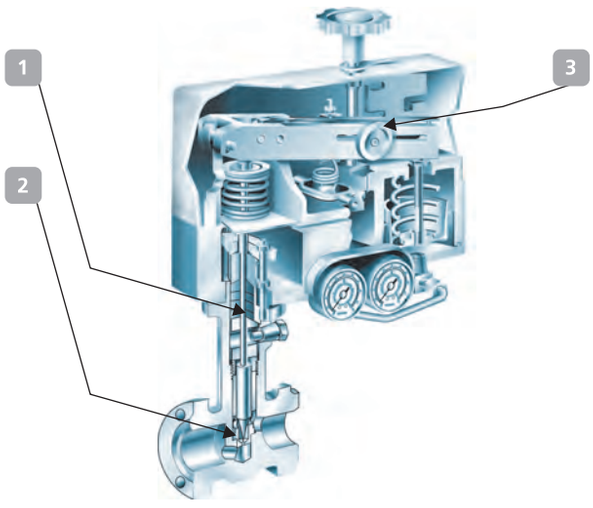
Compact and field reversible actuator

Optional Multi-stage anti-cavitation trim

Your contact:

MIL 29000 - Micropak Micro flow Control Valves

- **Low flow precise control**
- **Rangeability of 500 :1 to handle variations in flow**
- **Cv adjustable at site to fine tune site conditions**
- **Compact construction with field-reversible rolling diaphragm type actuator**
- **Force amplifying actuator technology with modular option for positioner**
- **Integral bonnet - No leaks & lesser soft parts**
- **Hardened trim for better longevity**



1 Plug Stem Sub-assembly 2 Seat Ring 3 Cv adjustment knob

Model Decodification

1st	2nd	3rd	4th	5th	6th	7th
-	-	2	9	-	-	-

Actuator Type

1. Parallel to Pipe Line
2. Perpendicular to Pipe Line[1]
6. Hand Operated
7. Air to Close
8. Air to Open

Body Series

29. Micropak Control Valve for Precise Microflow Control

Trim Type

0. Undefined
1. Standard Trim
2. Anti-cavitation trim[2]
3. Special[3]

Cv Range

Trim No	Min	Max
0	0.0018	0.005
1	0.005	0.011
2	0.011	0.026
3	0.021	0.051
4	0.041	0.11
5	0.11	0.26
6	0.26	0.61
7	0.51	1.30
8	0.91	2.40
9	1.51	3.70

Seat Type

0. Undefined
1. On-Off (No Positioner)
2. With integral Pneumatic Positioner
3. With External Pneumatic Positioner
4. With External Smart Positioner

[1]Not available with cast body construction. [2]Anti-cavitation trim available for trim nos 3 to 6 only. [3]Available on request - Bellows sealed, Cryogenic versions etc

General Data

Body	Type	Globe style with integral bonnet
	Recommended flow directions	Flow to open
Bonnet	Type	Integral to body
	Temperature range	-100° C to 343° C
Gland Seal	Type	Adjustable packing box with PTFE or Graphite moulded split rings
	Temperature range	≤ 180° C for PTFE, > 180° C for Graphite
Trim	Plug type	Adjustable microflow with unbalanced contoured plug
	Option	Multi-stage, Anti-cavitation
	Seat type	Clamped (Quick Change) with metal seat
	Guiding	Top & Cage guiding
	Rangeability	500:1 at max. rated Cv, 200:1 at min rated Cv
	Characteristic	Mod. Linear

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MIL 41000 / 71000 - Heavy Duty Cage Guided Control Valves

Standard sizes & rating
½" to 36" : ASME 150# to ASME 4500#
Seat leakage class (as per FCI 70.2)
Standard : Class III & Class IV
Optional : Class V

Applications

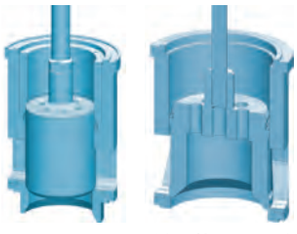
Utility / Captive Power Plants

- Feed water regulation
- Condensate pump recirculation
- Spray water control and block
- Deaerator pegging steam control
- Soot blower pressure reduction
- Heater drain etc.

Hydrocarbon Processing

- Compressor anti-surge
- Gas gathering and metering stations
- Make-up hydrogen & hydrogen quench
- Cold & hot recycle gas control
- Reactor feed & stripping steam
- Reformed gas vent, hydrocarbons to flare, etc.

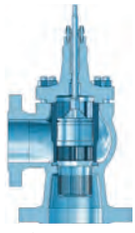
More information: www.ksb-mil.com



MIL 41200/41300 with self-energised seals for tight shut- off

MIL 41100 / 41700 Unbalanced Trim combine the dual advantage of cage guiding and single seat leak tightness

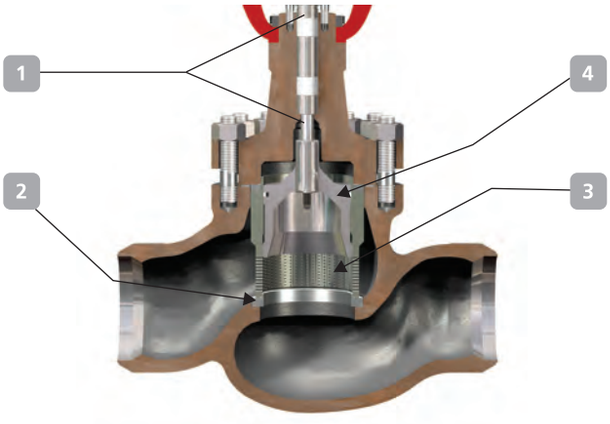
MIL 41400 (Pilot plug) Valves for high temperature tight shut-off applications



Typical MIL 71000 Angle body construction

MIL 41000 / 71000 - Heavy Duty Cage Guided Control Valves

- High allowable pressure drops
- High capacity with low pressure recovery
- Standardised high performance material
- Clamped Seal ring to facilitate easy removal
- Tight shut-off options
- Anti-cavitation / low noise trims
- Cryogenic applications
- Optional angle body (MIL 71000)



1 Packing Box 2 Seat Ring 3 Cage 4 Valve plug

Model Decodification

1st -	2nd -	3rd -	4th -	5th -	6th -	7th -
Actuator Type		**Body Series**		**Plug Type**	**Trim Type**	**Seat Type**
20.Hand operated 37.Direct spring diaphragm 38.Reverse spring diaphragm 67.Direct piston cylinder 68.Reverse piston cylinder 90.Electrical actuator		41.Heavy duty cage guided globe control valve 71.Heavy duty cage guided angle control valve		0.Undefined 1.Low capacity unbalanced 2.With pressure-energised polymeric seal ring (static) 3.With pressure-energised polymeric seal ring (dynamic) 4.With auxiliary shut-off pilot plug 5.With metallic seal ring 6.With polymeric seal ring 7.High capacity unbalanced 8.With auxiliary shut-off pilot plug and soft seat 9.With graphite seal ring	0.Undefined 1.Linear 2.Equal % 3.Customised X.On-Off	0.Undefined 1.Standard 2.Single stage Lo-dB / Anti-cav 3.Multi-stage, with diffuser seat ring 4.Multi-stage, Lo-dB 5.Multistage directional diffuser 6.Multistage Anticav, FTO 7.Multistage Anticav, FTC 8.Low flow control 9.High pressure micro flow X.Multi stage with plug control

General Data

Body	Type	High capacity Globe or Angle	
	Recommended flow directions	Flow to Open (FTO)	Flow to Close (FTC)
		Unbalanced valves (411/41700) Pressure-energised seal rings (412/300) Balanced valves (415/6/900) (Gas/Steam) Single stage low noise valves (41002) Multi-stage Lo-dB valves (41004)	Unbalanced valves (411/41700) Auxiliary shut-off pilot plug (41400) Balanced valves (415/6/900) (Liquid) Single stage anti-cavitation valves (41002) Anti-cav / lo-dB valves with diffuser (41003)
Bonnet	Type	Stud bolted with moderately finned extension	
	Temperature range	Standard bonnet: -29° C to 566° C, Extension bonnet (AB): -30° C to -100° C, Cryogenic bonnet (CB): -101° C to -196°C	
Gland Seal	Type	Adjustable double sealed packing box with PTFE or Graphite moulded split rings	
	Option	Eco lock* (varying density for low emission, PTFE or Graphite) or PTFE V rings	
	Temperature range	≤ 180° C for PTFE, > 180° C for Graphite	
Trim	Type	Single stage / Multi-stage (Anti-cav / Lo-dB)	
	Plug type	Balanced or Unbalanced ▪ Pressure balanced with spring-energised, Metallic, Polymeric or Graphite seal rings ▪ Pressure balanced with auxiliary shut-off pilot plug ▪ Unbalanced without seal rings	
	Seat type	Clamped (Quick Change)	
	Guiding	Cage guiding	
	Rangeability	100 : 1 for standard trims, 50 : 1 for Lo-dB/ Anti-cav trims	
	Characteristic	Standard - Linear/ Equal % / On-off, Anti-cav / Lo-dB - Linear/Mod. Equal% (on request)	

* Meets the stringent Class A emission requirement as per ISO 15848

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MIL 76000 - High Pressure Letdown Control Valves

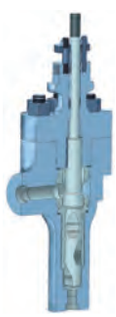
Standard sizes & rating
1" to 2" : ASME 150# to ASME 2500#
Seat leakage class (as per FCI 70.2)
Standard : Class IV
Optional : Class V

Applications

- High energy flashing services
- Boiler drain applications
- Turbine drain applications

More information:
www.ksb-mil.com

Single-stage

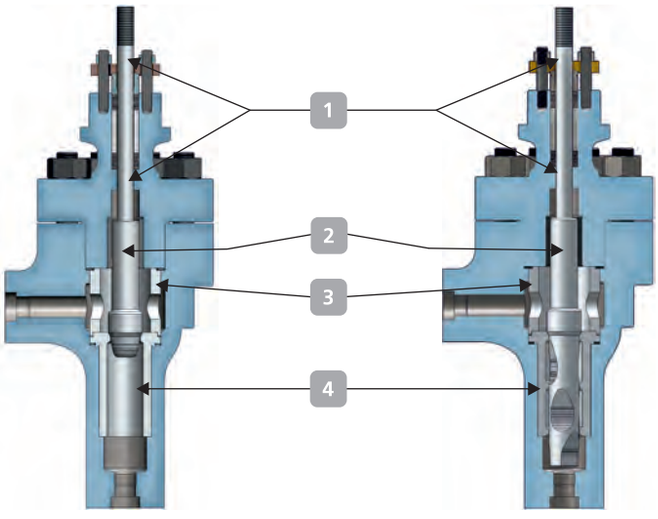


Multi-stage

Your contact:

MIL 76000 - High Pressure Letdown Control Valves

- **Unbalanced plug design without seal rings**
- **Larger flow paths**
- **Smooth axial flow**
- **Multi-stage pressure reduction for high pressure drop**
- **Advanced design that eliminates the damaging erosive effects**
- **Minimal seat damage by isolating the seat from the most severe expansion stages**
- **Easy maintenance**



1 Packing box 2 Plug stem sub-assembly 3 Cage 4 Seat ring

Model Decodification

1st	2nd	3rd	4th	5th	6th	7th
-	-	7	6	-	-	-

Actuator Type	Body Series	Body Type	Trim Characteristics	Trim Type
20.Hand Operated 37.Direct Spring Diaphragm 38.Reverse Spring Diaphragm 90.Electrical Actuator	76. High Pressure Letdown Control Valve	0. Undefined 2. Angle	0. Undefined 1. Mod. Linear* 2. Mod %*	0. Undefined 1. Single stage 2. Multi-stage

* Mod Linear for Single stage trim and Mod % for Multi-stage trim only

General Data

Body	Type	Angle Forgings
	Recommended flow directions	Flow to Close
Bonnet	Type	Stud bolted
	Temperature range	-27° C to 566° C
Gland Seal	Type	Adjustable double sealed packing box with PTFE or Graphite moulded split rings
	Option	Eco lock* (varying density for low emission, PTFE or Graphite) or PTFE V rings
	Temperature range	≤ 180° C for PTFE, > 180° C for Graphite
Trim	Type	Single stage / Multi stage
	Plug type	Unbalanced
	Seat type	Clamped (quick change) with metal seat
	Guiding	Top guiding (Single stage valves), Top & Bottom guiding (Multi-stage valves)
	Rangeability	50:1
	Characteristics	Mod. Linear (Single stage), Mod % (Multi-stage)

* Meets the stringent Class A emission requirement as per ISO 15848

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www.ksb.com/socialmedia

MIL 77000 - Multi-stage Labyrinth Lo-dB Control Valves

Standard sizes & rating
2″ to 8″ : ASME 600# to ASME 2500#
Seat leakage class (as per FCI 70.2)
Standard : Class IV
Optional : Class V

Applications

Hydrocarbon processing

- High pressure hot-separator letdown of flashing liquid hydrocarbons
- Delayed Coker Letdown

Oil & Natural gas production

- Gas pressure reduction
- Choke application
- Steam / water injection

High pressure superheated steam

- Turbine bypass
- Steam vent
- Boiler blowdown

More information:
www.ksb-mil.com

Trim 7C with single stage trim

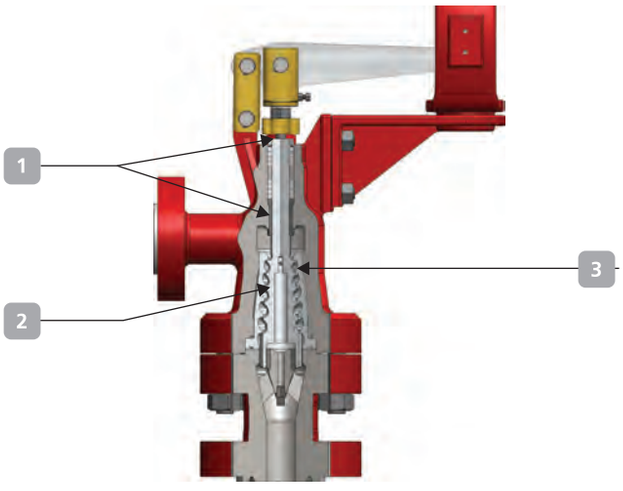
Multistage trim

Force Multiplication Actuator

Your contact:

MIL 77000 - Multi-stage Labyrinth Lo-dB Control Valves

- **Intelligent Design Principle**
  - Unbalanced plug design without seal rings
  - Employs adiabatic flow with friction
  - Labyrinth plug which provides a tortuous flow pattern
  - Advanced design that eliminates the damaging erosive effects
- **Rugged, Anti-clog Design**
  - Larger flow paths
  - Smooth axial flow path allowing movement of particles
- **Seat Protection**
  - Seat on the upstream section of the trim
  - Isolation of seat from the most severe and potentially damaging pressure reduction stages
  - Prevents premature seat wear, avoiding unwanted and undetected leakage
  - Minimized seat damage effects
- **Force Multiplication Actuator**
  - Offset actuator to meet the higher actuator thrust requirement
  - Flow-to-open direction gives dynamic stability



1 Packing box 2 Valve plug & stem 3 Seat ring

MIL 77000 (Trim 7A and 7B)

Model Decodification

1st	2nd	3rd	4th	5th	6th	7th
-	-	7	7	-	-	-

Actuator Type	Body Series	Plug Type	Trim Characteristics	Trim Type
37.Direct Spring Diaphragm 38.Reverse Spring Diaphragm 67.Direct Piston Cylinder 68.Reverse Piston Cylinder	77. Multi-stage Labyrinth Lo-dB Control Valves	0. Undefined 7. Labyrinth Lo-dB	0. Undefined 7. Mod. Linear	0. Undefined 7A. Reduced area 7B. Full Area 7C. High Capacity Single Step

General Data

Body	Type	Angle castings with integral bonnet and bolted outlet flange
	Recommended flow directions	Flow to open (Side inlet - Bottom outlet) (Top entry design on request)
Bonnet	Type	Integral to body
	Temperature range	-27° C to 566° C
Gland Seal	Type	Adjustable double sealed packing box with PTFE or Graphite moulded split rings
	Option	Eco lock (varying density for low emission, PTFE or Graphite) or PTFE V rings
	Temperature range	≤ 180° C for PTFE, > 180° C for Graphite
Trim	Plug type	Unbalanced
	Options	Multistage, expanding labyrinth High capacity single step (in trim 7C)
	Seat type	Clamped (quick change) with metal seat
	Guiding	Top and bottom guiding
	Rangeability	100:1
	Characteristics	Mod.linear

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MIL 78000 - Multi-step Anti-cavitation and Low Noise Control Valves

Standard sizes & rating
½" to 6" : ASME 300# to ASME 2500#
Seat leakage class (as per FCI 70.2)
Standard : Class IV & V
Optional : Class VI

Application

Energy sector

- For applications like boiler feed pump min. recirculation, spray control, low load feed water etc,
- For start-up (low load) drum level control in lower capacity boilers

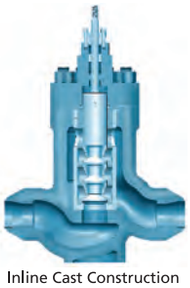
Refinery sector

- For high pressure hydrocarbon services including amine service
- In upstream oil fields, for high pressure injection water

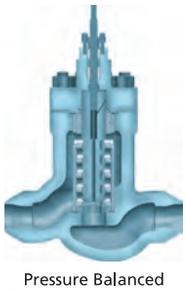
Fertilizer sector

- For high pressure Ammonia Letdown applications

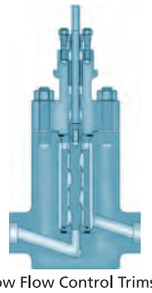
More information: www.ksb-mil.com



Inline Cast Construction



Pressure Balanced Construction in larger sizes to optimize actuator selection

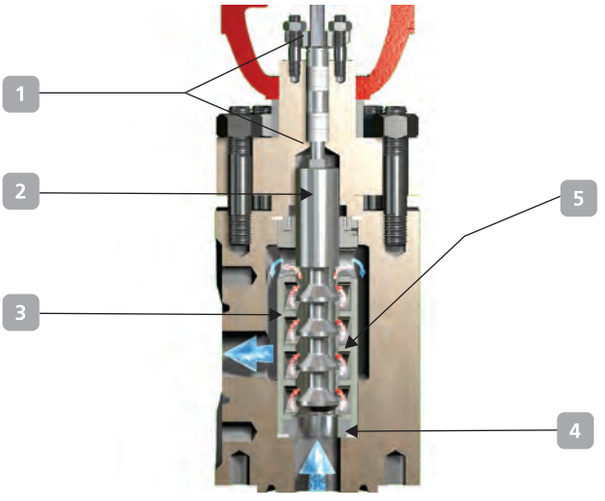


Low Flow Control Trims

Your contact:

MIL 78000 - Multi-step Anti-cavitation and Low Noise Control Valves

- Multiple-step axial-flow high resistance trim
- Low pressure recovery
- Special soft seat design (optional)
- High allowable pressure drops
- High performance material is standard
- Variety of body configuration offerings
- Simple trim maintenance
- Tight shut-off & seat protection
- Special Spray Trim



1 Packing Box 2 Plug 3 Spacer 4 Seat 5 Liner

Model Decodification

1st - 2nd	3rd 4th	5th	6th	7th
- -	7 8	-	-	-
Actuator Type	**Body Series**	**Body Type**	**Service**	**Trim Type**
20. Hand Operated 37. Direct Spring Diaphragm 38. Reverse Spring Diaphragm 67. Direct Piston Cylinder 68. Reverse Piston Cylinder 90. Electrical Actuator	78.Multiple Stage Anti-cavitation & Low Noise Control Valve	0.Angle 1.Inline	0.Liquid 1.Gas or Steam	1.Trim A or Gas/Steam 2.Trim B 3.Trim B+ 4.Special

General Data

Body	Type	High capacity Globe or Angle
	Recommended flow directions	Flow to open
Bonnet	Type	Stud bolted
	Temperature range	Standard bonnet: -29° C to 260° C
Gland Seal	Type	Adjustable double sealed packing box with PTFE or Graphite moulded split rings
	Option	Eco lock* (varying density for low emission, PTFE or Graphite) or PTFE V rings
	Temperature range	≤ 180° C for PTFE, > 180° C for Graphite
Trim	Type	Multiple step, Anti-cavitation
	Plug type	Unbalanced or pressure balanced with self energized seals (> 2")
	Seat type	Clamped (Quick Change) with metal or soft seat
	Guiding	Cage guiding
	Rangeability	30:1
	Characteristic	Mod. Linear

* Meets the stringent Class A emission requirement as per ISO 15848

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www.ksb.com/socialmedia

MIL 91000 Matrix Series - Severe Service Control Valves with Multi-stage Multi-path Trim

Standard sizes & rating
½" to 20" : ASME 150# to ASME 4500#
Seat leakage class (as per FCI 70.2)
Standard : Class V
Optional : Class VI

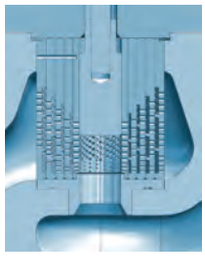
Applications

- Boiler Feed Water Control
- Boiler Feed Pump Minimum Recirculation Control
- Re-Heater and Super Heater Spray Control
- PRDS Spray Control
- Valve for Pump test loop
- High pressure drop Steam service
- Control of any fluid where High Pressure drop, Cavitation, Noise and High Velocity is expected

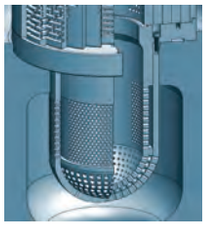
More information:
www.ksb-mil.com

Axial flow trims

Radial flow trims



Steam / Gas trims

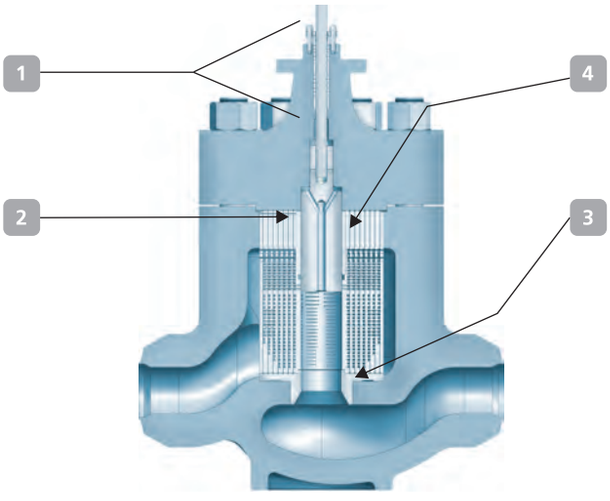


Optional double stage strainer for protection from foreign particles

Your contact:

MIL 91000 Matrix Series - Severe Service Control Valves with Multi-stage Multi path Trim

- Multi-stage, multi-path trim design
- Varying and expanding flow passage
- Discrete pressure and velocity reduction stages
- Tortuous, high impedance, energy absorbing 3 dimensional flow path
- Near zero pressure recovery and Pressure Recovery Factor (Cf or FL) up to 0.999
- Large stroke valves for precise controllability
- Flow to open design for inherent dynamic stability
- No cavitation damage to leading edges of the plug due to lesser pressure drop in last stages
- Field proven and rugged design with as many as 50 pressure / velocity reduction stages
- Low noise levels
- Custom built for specific site conditions



1 Packing Box 2 Plug 3 Seat ring 4 Cage stack S/A

Model Decodification

1st	2nd	3rd	4th	5th	6th	7th
-	-	9	1	-	-	-

Actuator Type	Body Series	Seal Type	Body Type	Trim Type
37.Direct spring diaphragm 38.Reverse spring diaphragm 67.Direct piston cylinder 68.Reverse piston cylinder 90.Electrical actuator	91.Multi- stage,multi-path, anti-cavitation & low control valve	0.Undefined 1.Unbalanced 2.Pressure energised polymeric seal ring (static) 4.Pilot operated 5.Metallic seal ring 6.Polymeric seal ring 8.Pressure-energised polymeric seal ring with soft seat 9.Graphite seal ring	0.Undefined 1.Inline 2.Angle - Bottom entry Side outlet 3.Z type 4.Angle - Side entry Bottom outlet	1.Axial (Incompressible flow) 2.Radial (Incompressible flow) 3.Radial (Compressible flow) 4.Axial Low flow control 5.Radial Low flow control 8.Radial(Compressible Flow - FTC) 9.Radial (Incompressible Flow - FTC)

General Data

Body	Type	Globe or Angle
	End connections	Flanged or Butt weld or Socket weld
	Standard flow directions	Flow to open, Flow to close* (Optional)
Bonnet	Type	Stud bolted with moderate extension
	Temperature range*	-29° C to 566° C (<315° C for balanced design)
Gland Packing	Type	Adjustable double sealed packing box with PTFE (<180° C) or Graphite (>180° C) moulded split rings
	Option	Ecolock# gland sealing system
Trim	Cage stack	Multi-stage and multi-path, radial or axial flow with flow stream under the plug
	Plug	Heavily guided all along its length. Unbalanced without seal ring or balanced with seal ring
	Seat	Metal seated, quick change type
	Optional	Diffuser seat ring

Meets the stringent Class A emission requirement as per ISO 15848
* Special designs available for applications outside the given temperature range, consult KSB MIL

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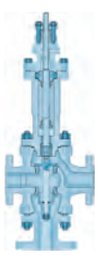
MIL 81000 - Three Way Combining and Diverting Control Valves

Standard sizes & rating
¾" to 12" : ASME 150# to ASME 2500#
Seat leakage class (as per FCI 70.2)
Standard : Class IV
Optional : Class VI

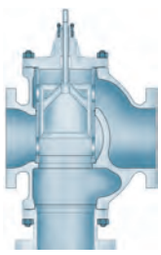
Applications

- Ideal for domestic water, radiant applications etc
- Installations with large variations in flow rate and supply conditions
- Installations requiring tightly controlled water temperature.
- Used in power plants as main trip valve for combining services.

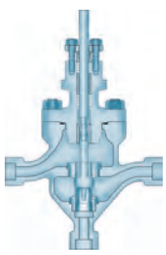
More information:
www.ksb-mil.com



MIL 81000 series 3-way bellow sealed body sub-assembly



3-way valve body sub-assembly 81500 balanced design

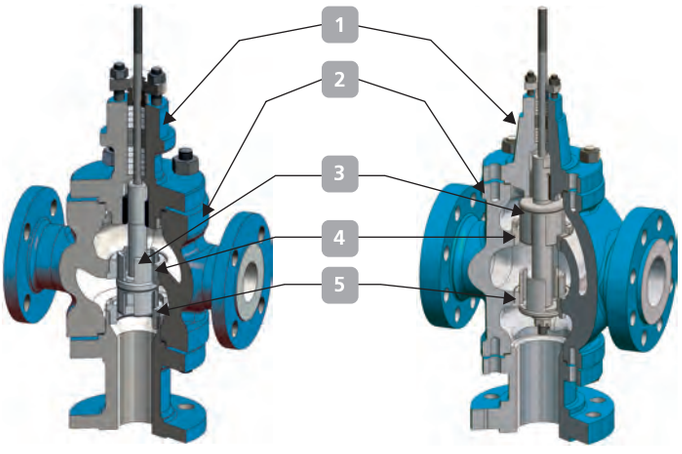


Common body for combining and diverting service

Your contact:

MIL 81000 - Three Way Combining and Diverting Control Valves

- Top and Bottom entry construction
- High capacity with low recovery
- Plug stability at throttling
- High performance materials
- Durability
- Extra guiding
- Reduced inventory control



81385 - Combining Valve

81386 - Diverting Valve

1 Bonnet 2 Body 3 Plug 4 Upper seat ring 5 Lower seat ring

Model Decodification

1st - 2nd	3rd 4th	5th	6th	7th
- -	8 1	-	-	-
Actuator Type	**Body Series**	**Body Type**	**Trim Type**	**Seat Type**
37.Direct Spring Diaphragm 38.Reverse Spring Diaphragm	81.Three way combining and diverting service control valve	0.Undefined 3.Top and Port Guided 4.Invertible Body 5.Cage Guided	0.Undefined 8.Linear 9.Special	0.Undefined 5.Combinig Design 6.Diverting Design

General Data

Body	Type	Three-way combining or diverting
	Option	Invertible body, combining and diverting action in the same body Cage guided, pressure balanced
	Recommended flow directions	Flow to open (both ports)
Bonnet	Type	Bolted
	Temperature range	-30° C to 454° C
Gland Seal	Type	Adjustable double sealed packing box with PTFE or Graphite moulded split rings
	Temperature range	≤ 180° C for PTFE, > 180° C for Graphite
Trim	Plug type	Combining Diverting
	Guiding	Top and Port guiding
	Rangeability	50:1
	Characteristic	Linear, Full capacity (reduced capacity on request)

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MIL 90000 - Automatic Recirculation Valves for Pump Protection

Standard sizes & rating
1" to 12" : ASME 150# to ASME 2500#
PN 10 to PN 400
Seat leakage class (as per FCI 70.2)
Main Check Valve: Class IV (all models)
Bypass: Class IV (for model 902 & 903)

Applications

- Ensures minimum flow for centrifugal pumps to avoid overheating and subsequent damages.
  - Boiler feed pump in energy sector
  - Centrifugal process pump in the process industries / petrochemical / refineries.
- Bypass trim modulates when main flow demand falls below the design limit.
  - Multistage pressure reduction prevents cavitation / flashing in High Pressure drops.
  - Bypass side trim also acts as check valve to prevent reverse flow.
- Check valve disc prevents reverse flow and positions the bypass trim for open, close or modulating flow by detecting the process flow demand
- Flow straightener streamlines the exit flow. Reduces erosive wear on downstream piping

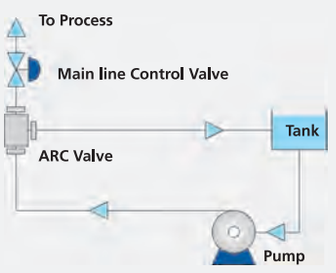
More information:
www.ksb-mil.com

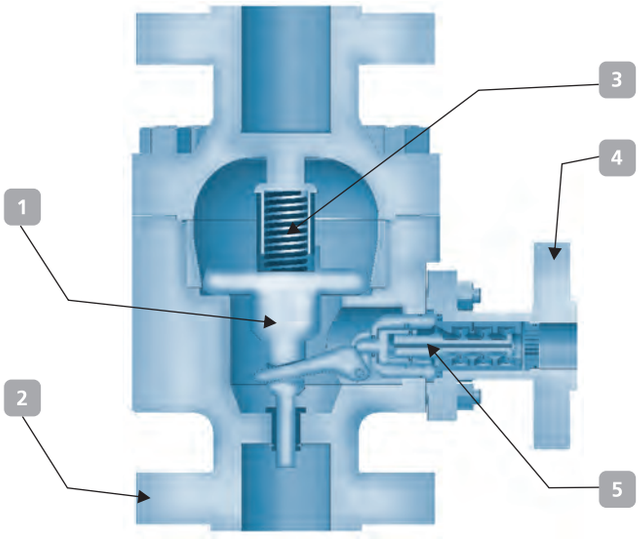
Your contact:

MIL 90000 - Automatic Recirculation Valves for Pump Protection

- **Regulatory duty**
  - The valve performs not only On/Off function, but modulating function also. It can also work in various load conditions without loss of energy
- **Stable Operation**
  - Sturdy spring loaded check valve design eliminates instability during operation. Hardfaced seat surface (check valve side) ensures long service life
- **Rugged Bypass design**
  - The bypass port employs the globally field proven MIL 78000 eries technology which is based on based on the principle of multi-step high resistance axial-flow.

Typical Automatic Recirculation System





1 Main Plug 2 Main Body 3 Spring 4 Bypass Body 5 Bypass Plug

Model Decodification

1st	2nd	3rd	4th	5th	Suffix			
9	0	-	-	-	-	-	-	-

Series	Model	Size	Pressure Class	Connection	Configuration	Bypass option	Body Material
90. Automatic Recirculation Control Valve	**1.** Single stage **2.** Double stage **3.** Multi stage	**1.** 1″ **7.** 5″ **2.** 1½″ **8.** 6″ **3.** 2″ **9.** 8″ **4.** 2½″ **A.** 10″ **5.** 3″ **B.** 12″ **6.** 4″	**1.** 150 **C.** PN 25 **2.** 300 **K.** PN 40 **3.** 600 **D.** PN 63/64 **4.** 900 **E.** PN 100 **5.** 1500 **F.** PN 160 **6.** 2500 **G.** PN 250 **A.** PN 10 **H.** PN 320 **B.** PN 16 **J.** PN 400	**F.** Flanged **W.** Weld End	**V.** Vertical Mounting **H.** Horizontal Mounting	**S.** Standard **O.** Oversized **R.** Reduced	**C.** Carbon Steel **S.** Stainless Steel **A.** Alloy Steel **D.** Duplex Steel

General Data

Flow direction	Flow To Open (Check Valve) Flow To Close (Bypass Valve)
Leakage Class	Main Check Valve: FCI 70.2 Class IV (all models) Bypass: FCI 70.2 Class IV (for 903 model)
Operating Temperature range	Up to 260 °C

O-Ring Materials	▪ Viton (FKM) ▪ FFKM	≤ 190 °C ≤ 260 °C

Installation requirements

- Standard Orientation - Vertical
- Filter mesh having mesh size 0.3 to 0.5mm should be used at pump suction side

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MIL 64000/74000 - Steam Conditioning Valves

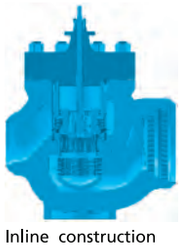
Standard sizes & rating
2" to 32" : ASME 2500# (With concept of Dual Rating)
Seat leakage class (as per FCI 70.2)
Seat leakage class: V

Applications

- Bypass to District Heating
- Auxiliary PRDS
- Process Steam Applications
- Turbine Bypass to Re-heater
- Turbine Bypass to condenser (Dump PRDS)
- Process Dump

More information:
www.ksb-mil.com

Angle body construction

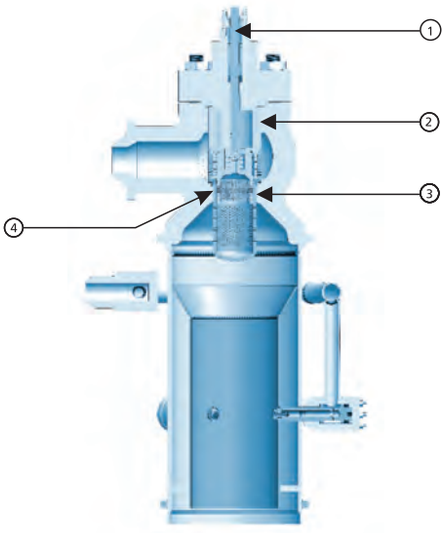


Inline construction
(without steam injection)

Your contact:

MIL 64000/74000 - Steam Conditioning Valves

- **Reliable Temperature Control**
- **Better Noise Attenuation**
- **Tight Shut-off**
- **Higher Allowable Pressure Drops**
- **High Performance Material as Standard**
- **Precision Control and Fast Response**
- **Simple, High Performance Trim Design**
- **Variety of Specially Engineered Trim Packages Lo-dB**
- **Auxiliary Shut-off Pilot Plug**
- **Thermal Steam Pipe Liner**



1 Packing Box 2 Cage 3 Seat Ring 4 Plug

Model Decodification

1st 2nd – –	3rd 4th – –	5th –	6th –	7th –
Actuator Type	**Body Series**	**Plug Type**	**Type of DSH**	**Trim Type**
20. Hand operated	64. Heavy duty cage guided globe control valve	0. Undefined	0. Undefined	0. Undefined
37. Direct spring diaphragm	74. Heavy duty cage guided angle control valve	1. Unbalanced	1. Lance Spring Loaded Nozzle	1. Single stage
38. Reverse spring diaphragm		4. Auxiliary shut-off pilot plug	2. Venturi	2. Multi-stage with seat Diffuser, FTC
67. Direct piston cylinder		9. With graphite seal ring (Dynamic)	3. Circumferential (Spring Loaded Nozzle)	7. Multistage, FTC
68. Reverse piston cylinder			4. Lance (Fixed area Nozzle)	M. Multi-stage with Plug control & seat Diffuser, FTC
70. Electro - Hydraulic Actuator			5. Steam Assisted	X. Multistage with Plug Control, FTC
90. Electrical actuator			6. Without spray nozzle	Z. Multi Stage, FTO

General Data

Body	Type	Globe or Angle
	Recommended flow directions	Flow to Open (FTO) Flow to Close (FTC)
Bonnet	Type	Bolted
	Temperature range	Standard bonnet: -29° C to 566° C, Extension bonnet (AB): -30° C to -100° C, Cryogenic bonnet (CB): -101° C to -196°C
Gland Seal	Type	Adjustable double sealed packing box with PTFE or Graphite moulded split rings
	Temperature range	< 180° C for PTFE, > 180°C for Graphite
Trim	Type	Single stage / Multi-stage/ Multi-stage with seat diffuser / Multi-stage with plug control & seat diffuser
	Plug type	Balanced or Unbalanced ▪ Pressure balanced with spring-energised, Metallic, Polymeric or Graphite seal rings ▪ Pressure balanced with auxiliary shut-off pilot plug, with graphite seal ring (Dynamic) ▪ Unbalanced without seal rings
	Seat type	Clamped (Quick Change)
	Guiding	Cage Guiding
	Rangeability	100 : 1 for standard trims, 50 : 1 for Lo-dB/ Anti-cav trims
	Characteristics	Standard- Linear, Equal %

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www.ksb.com/socialmedia

MIL 63000 - Desuperheaters

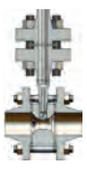
Suitable for Steam pipe
Standard sizes & rating
2″ to 32″ : ASME 300# to 2500#

Applications

- Power Generation
  - Ejector & Gland sealing PRDS
  - Deaerator pegging PRDS
  - Auxiliary PRDS
  - Condenser Dump PRDS
  - Turbine bypass
- Process Application
  - Reduce temperature of steam from boiler to economic levels
- Paper and Board Industry
  - Drying Machines
- Chemical and Pharmaceutical Industry
  - Steam boiler to process
  - Steam to Heater coils
- Oil & Gas Industry
  - Bypass and let down stations
  - Start up heaters
  - Steam supply to process heaters
- Others
  - Food, textile, brewing also find applications where steam generated is reduced to lower temperature and pressure for different process applications

More information:
www.ksb-mil.com

For MIL 63100
Fixed Orifice Nozzle



For MIL 63200
Venturi fixed Nozzle

For MIL 63300 Lance type
spring loaded Nozzle

For MIL 63400 circumferential
type with spring loaded Nozzle

Your contact:

Bellows Sealed Control Valves

MIL 41000, 4“, 1500# ASMEHydrogen service
ASTM A 216 GR. WCC Inconel bellows

Applications

- Valves handle toxic / hazardous fluids where the process fluid is required to be completely sealed off
- Valves used in inaccessible locations where periodic inspection of valve packing is impossible
- Also used in Primary piping system for Heavy Water and Active Water Drainage circuits of Nuclear power plants

More information: www.ksb-mil.com

Typical Control Valve Construction

Valves for Nuclear applications

Your Contact:

MIL 33000 - High Performance Butterfly Valve

- Excellent flow control and rangeabililty
- Disc design for minimum dynamic torque
- Low maintenance
- Metallic & Soft seat options

Applications

- Refinery / Oil & Gas
- Chemical & Fertilizer Industries
- Power Stations
- Water & Steam applications
- Pulp & Paper Industries

More information: www.ksb-mil.com

Double Flanged Double Offset Butterfly Control Valve

Butt weld End High Pressure Butterfly Control Valve

Wafer type Double Offset Butterfly Control Valve

Lugged Type Triple Offset Butterfly Control Valve

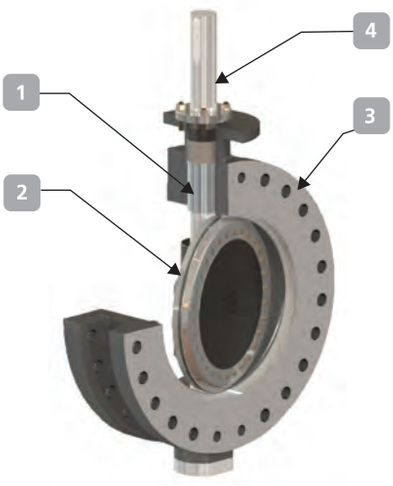
Your contact:

MIL 33000 - High Performance Butterfly Valve

KSB MIL 33000 series Double & Triple offset butterfly valves are considered as High Performance Butterfly valves. Double offset Butterfly valves are mostly used in industries for control applications where seat leakage requirements are not critical as valves will mostly will be in open position ie; in the controllable range between 20% to 80%. Triple Offset Butterfly valves are mostly used in Isolation applications & stringent shut off requirements using Graphite / PTFE with metallic laminated or Solid metallic seals which ensure better sealing even at high temperature or erosive services. These valves are designed in compliance to API 609, ASME B 16.34 or EN 593 & Tested in accordance to FCI 70.2, API 598 etc.

Additional Design features includes

- Fire safe Design with Primary soft seat & secondary metal seat in accordance to API 607 or ISO 10497. KSB MIL 33000 series soft seated Lugged wafer type Butterfly valves are Fire safe tested & certified by TPI in accordance with API 607.Metallic or laminated seals are considered as inherently Fire safe.
- Fugitive emission testing in accordance to ISO 15848-1
- Cryogenic testing in accordance to BS 6364 for valve with long extended bonnet with Sealing's complying for cryogenic low temperature services.



1 Guide Bush
2 Valve Disc
3 Valve Body
4 Shaft

Model Decodification

1st - 2nd	3rd 3 4th 3	5th -	6th -	7th -
Actuator Type	Body Series	Design Variant	End Connections	Seat Type
37. Spring diaphragm for fail close and open 67. Direct piston cylinder 68. Reverse piston cylinder 75. Rack and Pinion Double Acting 76. Rack and Pinion Spring Return 85. Scotch Yoke Double Acting 86. Scotch Yoke Spring Return 90. Electrical actuator 95. Link actuator Double acting 96. Link actuator Spring return	33. High Performance Butterfly Control Valves	0. Undefined 1. Concentric* 2. Double Offset 3. Triple Offset	0. Undefined 1. Wafer 2. Lugged 3. Flanged 4. RTJ 5. Weld end	0. Undefined 1. Rubber seated (NBR / Viton / EPDM / Ebonite) 2. PTFE Seated 3. Metal Seated 4. Clearance Seat

* For more details, consult KSB MIL

General Data*

Materials

Body	Carbon Steel, Stainless Steel, Super Duplex & Others on request
Disc	Stainless Steel & Specials on request
Stem	Stainless Steel & Specials on request
Seat	Stainless Steel / PTFE / Stellite & Specials on request

Actuator Options

Diaphragm Actuators
Single / Double acting Rack & Pinion Actuators
Electrical Actuators
Hydraulic Actuators
Single / Double Acting Scotch Yoke Actuators
Single / Double Acting Spring return

Technical Data

Size	2" - 56" (DN 50 to 1400)**
Pressure class	150# to 2500# **
Temperature Range	-196°C to 550°C **
Leakage class	Class II, III, IV & V (Metal to Metal seat) Class VI (PTFE / Laminated seal)
Body Connection Type	Wafer, Lugged, Double Flanged, RTJ & Weld end
Characteristics	Inherent (Mod. Equal %)
Valve Face to Face Standard	API 609
Disc Orientation	Counter Clockwise to Open & Clockwise to Close
Design Standard	ASME B16.34 & API 609

**Consult KSB MIL

Note

Additional accessories or Instruments like Solenoid Valve, Limit Switches, Air Filter Regulator & Positioner (Pneumatic / Electro-Pneumatic / Smart) can be supplied along with valve depending upon the requirement.

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MIL 35220 - Trunnion Mounted Ball Valve

Standard sizes & rating
3" to 24" : ASME 150# to 600#
Seat leakage class (Tight Shut off as per API 6D)

Applications

- Oil / Petrochemical Industry
- Cross country Oil & Gas Pipelines
- Floating Production, Storage, and offloading
- Isolation and Emergency shutdown application
- Corrosive and General services

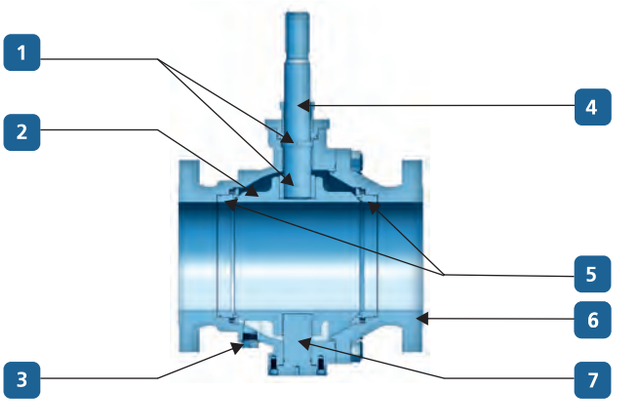
More information: www.ksb-mil.com

MIL 35220 with
MIL 96 Series Actuator

Your contact:

MIL 35220 - Side Entry Trunnion Mounted Ball Valve

- "Two-Piece" Side entry Body design
- Bi-directional tight seal
- Double Block and Bleed seat configuration on both sides
- Soft seat with metal back up
- Full Bore ball design
- API 6D Design compliance
- Fire safe construction as per API 607



1 Anti Static Device 2 Full Port Ball 3 Drain 4 Anti Blow out Stem
5 Single Piston Effect Seat 6 2 Piece Body Construction 7 Trunnion

Model Decodification

1st - 2nd	3rd 4th	5th	6th	7th
Actuator Type	Body Series	Design Variant	Body Type	Seat Type
20. Hand operated 95. Link actuator, double acting 96. Link actuator, spring return **. Scotch Yoke Double Acting **. Scotch Yoke Spring Return **. Electrical actuator	35. Ball Valve	2. Trunnion	0. Undefined 2. Two Piece, Side Entry	0. Undefined 1. Soft seat 2. Metal seat

** Bought out Actuators

General Data

Material Standard***

Body	ASTM A216 WCB / ASTM A351 CF8M / ASTM A352 LCC/LCB
Ball	A 105, SS 316, other common Austenitic SS grades
Seat	PTFE, RPTFE, PEEK
Ball Coating	ENP Coating 0.003" or 75 micron Min. Hard Chrome Plated
Seat Configuration	Single piston Effect (Double Block & Bleed) on both sides

***Other special materials on request

Actuator Options

Handwheel with gearbox
Electrical Actuators
Single / Double Acting Scotch Yoke Actuators
Single / Double Acting Link Actuators (MIL 95 / 96 Series)

Technical Data

Size	3" to 24"*
Pressure class*	ASME 150# to 600#
Temperature*	-29°C to 180°C*
End Connection	Flanged
Leakage class as per API 6D	TSO for soft seat
Flow Direction	Bi - Directional
Angle of Rotation	90 Degrees
Ball Orientation	Clockwise - Close Anticlockwise - Open
Design Standard	▪API6D ▪ASME B16.34 ▪ASME B16.5 ▪API 607 ▪NACE MR0103/ NACE Mr0175

*Consult factory for higher sizes, higher rating, non-standard material

Note

Additional accessories or Instruments like Solenoid Valve, Limit Switches, Air Filter Regulator & Positioner (Pneumatic / Electro-Pneumatic / Smart) can be supplied along with valve depending upon the requirement.

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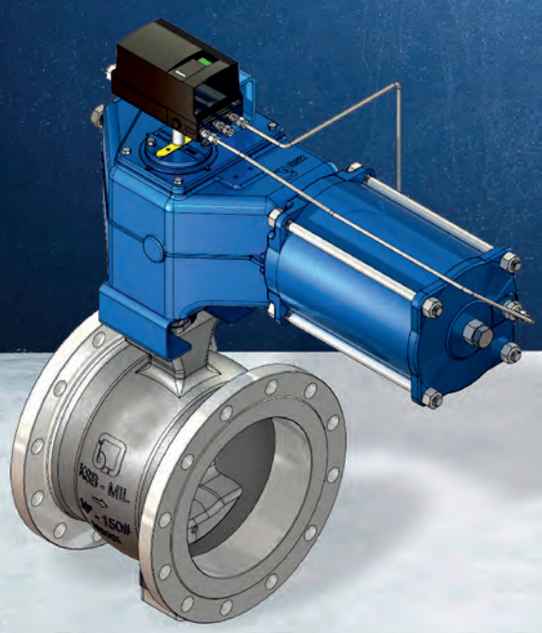
MIL 35500 - V Notch Segmented Ball Control Valve

Standard sizes & rating
1" to 12" : ASME 150# to ASME 300#
Seat leakage class (as per FCI 70.2)
Standard : Class IV for Metal seat &
Class VI for Soft seat valves



Applications

- **Paper & Pulp Industry**
  - Fibrous media
- **Petroleum Refineries**
  - Crude oil, Naphtha, Bitumen, HCO; Media containing Solids
- **Chemical & Fertilizer Industries**
  - Molten plastics, Media containing Solids
- **Mining Industries**
  - Ore extraction (abrasive and corrosive slurries)
- **Sewage treatment plants**
  - Clean/dirty corrosive liquids & gases. Erosive and abrasive slurries

More information: www.ksb-mil.com

With Scotch Yoke Spring Return Actuator

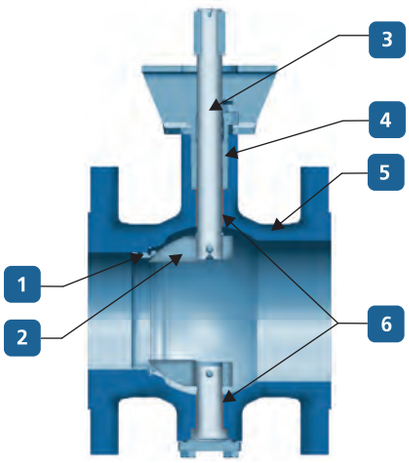
With Diaphragm Actuator

With Pneumatic cylinder actuator (link type)

Your contact:

MIL 35500 - V Notch Segmented Ball Control Valve

- "Single-Piece" Body design for minimal potential leak path.
- Spring loaded seat ensures proper sealing at low differential pressure.
- No-Threaded trim parts used. This makes assembly and disassembly of trims at site easy.
- Self-aligning segmented Ball is facilitated by special shaft and pin design.
- Excellent shearing action in Fibrous fluid mediums.
- Gland packing with Anti-Extrusion Ring prevent the potential leakage of medium to atmosphere.
- Blow-out proof stem for higher integrity and safety of the equipment.



1 Seat 2 Ball 3 Stem
4 Gland Packing 5 Body 6 Bearing area

Model Decodification

1st	2nd	3rd	4th	5th	6th	7th
-	-	3	5	5	-	-

Actuator Type	Body Series	Design Variant	Body Type	Seat Type
20. Hand operated 37. Spring diaphragm for fail close and open 67. Direct piston cylinder 68. Reverse piston cylinder 75. Rack and Pinion Double Acting 76. Rack and Pinion Spring Return 85. Scotch Yoke Double Acting 86. Scotch Yoke Spring Return 90. Electrical actuator 95. Link actuator, double acting 96. Link actuator, spring return	35. Ball Valve	5. V Notch Segmental Ball Control Valve	0. Undefined 1. Single Piece, Side Entry	0. Undefined 1. Soft seated 2. Metal

General Data

Material Standard***

Body	ASTM A216 WCB / ASTM A351 CF8M
Segmented Ball	CF8M / CF8M + Chrome Plating
Seat	316SS + PTFE / 316SS + Stellite
Stem	17-P4/ XM-19
Bearing	316 SS FABRIC + PTFE
Packing	PTFE / Graphite

***Other special materials on request

Actuator Options

Diaphragm Actuators
Single / Double acting Rack & Pinion Actuators
Electrical Actuators
Hydraulic Actuators
Single / Double Acting Scotch Yoke Actuators
Single / Double Acting Link Actuators

Technical Data

Size*	1" to 12" (DN 25 to 300)*
Pressure class*	ASME 150# to 300#
Temperature*	-29°C to 200°C *
End Connection	Wafer, Flanged
Leakage class as per FCI 70.2	Class IV (Metal seal), Class V (Metal seal) Class VI (PTFE seal)
Flow Direction	FTO - Normal flow is into the convex side of the valve
Flow Characteristics	Modified Equal % (Inherent)
Angle of Rotation	90 Degrees
Inherent Rangeability	300:1
Segmented Ball Orientation	Clockwise - Close Anti clockwise - Open
Design Standard	▪ ISA 75.08.02 / ASME B16.10 ▪ ASME B16.34 ▪ ASME B16.5 ▪ ANSI FCI 70.2 Leakage class ▪ NACE MR0103/ NACE MR0175

*Consult factory for higher sizes, higher rating, non-standard material and High temperature service requirement.

Note

Additional accessories or Instruments like Solenoid Valve, Limit Switches, Air Filter Regulator & Positioner (Pneumatic / Electro-Pneumatic / Smart) can be supplied along with valve depending upon the requirement.

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MIL 37-38 - Pneumatic Spring Diaphragm Actuators with optional hand wheels

Sizes: 11", 13", 15", 18" & 24"

Travel: ≤4"

Supply Pressure: 20 to 65 psig

Application

- Designed and used for smooth controls and stability
- Best suited where stroke is in between 0.125 inch and 4 inch
- Suitable for flow-to-open and flow-to -close type valves with moderate thrust requirements
- Designed for operating medium as plant air, sweet natural gas and any such non-corrosive fluids as per plant availability
- For use in control valves for critical applications like Boiler Feed water control, BFP Min. Recirculation, PRDS Spray control and on-off valves with less stroking time requirements

More information:
www.ksb-mil.com

6A Handwheel

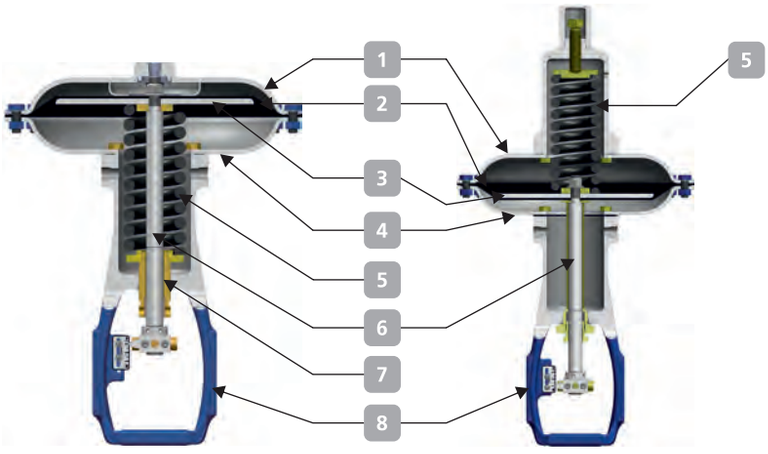
7A Handwheel

8A Handwheel

Compact 9" construction
(28 series)

MIL 37-38 - Pneumatic Spring Diaphragm Actuators with optional hand wheels

- Heavy one-piece yoke
- Moulded elastomer diaphragm with fabric insert for long life and high sensitivity
- Moulded Diaphragm and deep pressed steel Diaphragm cases minimise area change and produce linear relation between travel and air pressure
- Optional top / side mounted handwheels for valve operation in emergency



Type 37 Actuator
Direct: Air to Close

Type 38 Actuator
Reverse: Air to Open

1 Diaphragm case (upper) 2 Diaphragm 3 Diaphragm plate 4 Diaphragm case (lower)
5 Actuator spring 6 Actuator stem 7 Spring adjuster 8 Yoke

Standard Sizes / Spring / Supply

Size	Stroke (in)	Max Air Supply (psig)	Air to Close (37)		Air to Open (38)	
			Thrust (lbs)	Supply (psig)	Thrust (lbs)	Spring (psig)
11	0.5	60	1810	45	1300	16-30
	0.75	60	1740	45	1220	15-35
	1	60	1700	45	490	6-30
13	0.75	60	2500	45	2190	19-31
	1	60	2450	45	1840	16-31
	1.5	60	2360	45	1610	14-33
15	1.5	60	3400	45	1610	14-31
	2	60	3350	45	2110	12-35
18 & 18L*	1.5	60	4830	45	7770	35-60
	2	60	4650	45	6216	28-52
	2.5	60	4650	45	5550	25-55
	3	60	4650	45	3774	17-35
	3.5	60	4650	45	4000	18-46
	4	60	4650	45	2440	11-35
18H & 18HL*	1.5	60	5600	45	8160	30-48
	2	60	5580	45	7616	28-52
	2.5	60	5530	45	5550	25-55
	3	60	5425	45	4624	17-35
	3.5	60	5300	45	4000	18-46
	4	60	5000	45	2440	11-35
24	2.5	55	7580	45	11040	30-50
	3	55	6500	45	9200	25-50
	3.5	55	6500	45	8096	22-50
	4	55	5850	45	6624	18-50

Model Decodification

1st	2nd
3	-

Actuator Type
7. Air to close 8. Air to open

* 18L and 18HL actuators are applicable only for Air to close(37) type.

For ATC (37) actuators thrust values indicated is considering 3-15 psig spring range. For ATO (38) actuators thrust values indicated corresponds to the typical spring range listed above.

Thrust values will vary with other spring range / supply pressures which may be selected based on the valve design

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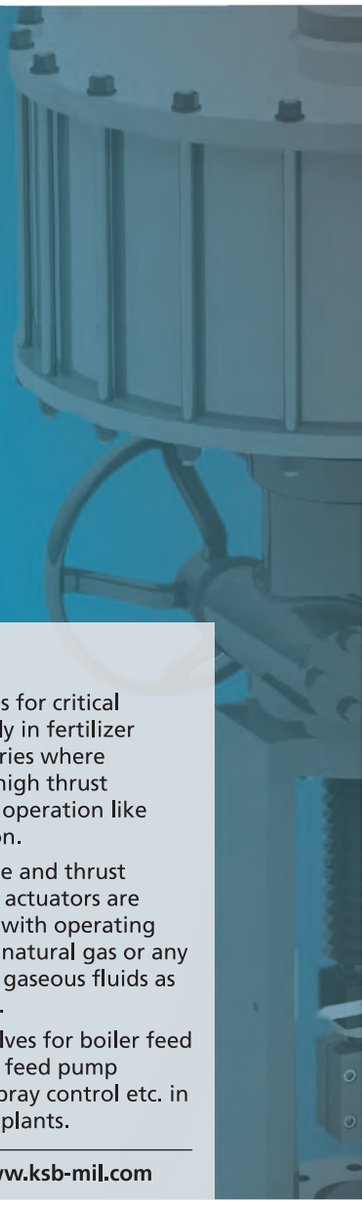
MIL 67-68 - Double Acting Piston Cylinder Actuators

Sizes: 6, 8, 12, 16, 20 & 24

Travel: ≤12"

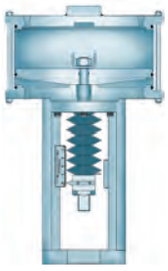
Supply Pressure: 60 to 100 psig



Application

- Used in control valves for critical applications especially in fertilizer industries and refineries where operation demands high thrust requirements or fast operation like Anti-surge application.
- To meet higher stroke and thrust requirements. Piston actuators are designed to operate with operating medium as plant air, natural gas or any other non-corrossive gaseous fluids as per plant availability.
- Used with control valves for boiler feed water control, boiler feed pump recirculation, PRDS spray control etc. in high capacity power plants.

More information: www.ksb-mil.com

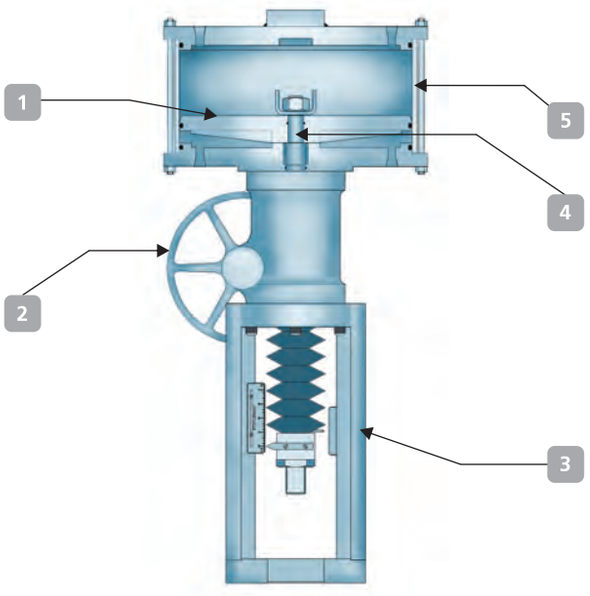


Without Handwheel

Your contact:

MIL 67-68 - Double Acting Piston Cylinder Actuators

- Wide Range of Strokes and Sizes
- High Thrust Capability
- High Frequency Response
- Field Reversible
- Stable Operation
- Faster Travel
- Compact and Lightweight
- Durable Components
- Simple Maintenance
- Tight Shut-off
- High-level Positional Stiffness



With handwheel

1 Piston 2 Handwheel 3 Yoke 4 Actuator Stem 5 Cylinder

Standard Sizes / Supply

Actuator Size	Stroke (inch)	Max. Air Supply - 60 psig (VT Supply)		Max. Air Supply - 80 psig (VT Supply)		Max. Air Supply - 100 psi (VT Supply)	
		Actuator Thrust* (lbf)	Volume Tank Size (ltr)	Actuator Thrust* (lbf)	Volume Tank Size (ltr)	Actuator Thrust* (lbf)	Volume Tank Size (ltr)
12*	1.5", 2"	6215	50	7345	20	7345	10
	3", 4"	5650	50	7345	35	7345	20
16*	3", 3.5"	8370	35	12090	50	12090	20
	4", 5"	8370	50	11160	50	12090	35
	6"	7440	50	10230	50	12090	50
	8"	7440	50	9300	50	12090	50
20**	3.5", 4"	11440	50	15730	50	21450	75
	5"	11440	50	14300	50	21450	75
	6"	10010	50	14300	50	20020	75
	8"	8580	50	12870	50	18590	75
24**	3.5"	16400	50	20500	50	30750	75
	4"	14350	50	20500	50	28700	75
	5"	14350	50	18450	50	26650	75
	6"	12300	50	16400	50	24600	75
	8"	10250	50	14350	50	22550	75

Model Decodification

1st	2nd
6	-

Actuator Type

7. Air to close
8. Air to open

* Supply pressure considered for actuator thrusts to limit Volume tank size below 50 Litres

** Supply pressure considered for actuator thrusts to limit Volume tank size below 75 Litres

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MIL 95-96 - Pneumatic Double acting & Spring return Quarter Turn actuators

9 different sizes for Double Acting (MIL 95 series)
7 different sizes for Spring Return (MIL 96 series)
Travel: 0° - 90°
Supply Pressure: 4 - 10 bar

Application

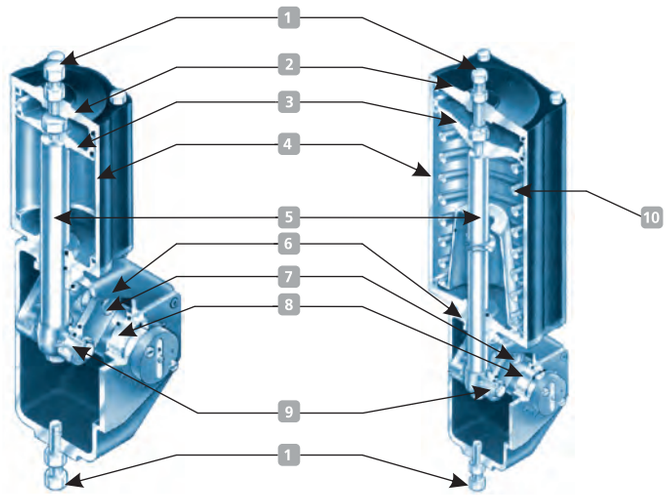
- Designed and used for smooth control and on-off applications.
- Excellent performance in high cycle rate.
- Available in two options - Spring End Torque ranging from 70 Nm to 8000 Nm and Double acting with output torque of up to 43,000 Nm
- Designed to operate in a minimum supply pressure of 4 bar and Maximum supply pressure of 10 bar
- Compact design and best suited for Paper & Pulp, Mining, Petrochemical and Oil & Gas industry.
- Best suited for operating Segmented ball, full ball, butterfly and eccentric plug valves

More information:
www.ksb-mil.com

Your contact:

MIL 95-96 - Pneumatic Double acting & Spring return Quarter Turn actuators

- Housing is of rugged ductile iron and cylinders are of Carbon Steel.
- Adjustable Travel stops are standard for both open and close position
- No lubrication required
- Optional Manual override (Hand wheel) available.
- Standard temp range Temperature Range - 20°C to 90°C
- Valve Mounting - ISO 5211
- Able to accommodate any type of accessories including positioner, limit switches, position indicators, Solenoid valves, transducers, relays, boosters and volume tanks etc.



MIL 95 Series Actuator Double Acting

MIL 96 Series Actuator Spring Return

1 Position adjuster
2 Cover
3 Piston
4 Cylinder
5 Piston stem
6 Housing
7 Bearing
8 Lever
9 Bearing arm
10 Spring

Standard Sizes / Spring / Supply

95 Series Double acting

Actuator	Piston dia (mm)	Travel volume (cubic m)	Shaft diameter (mm)	Nominal torque with max supply* pressure (Nm)
DA2	100	0.60	35	240
DA3	125	1.10	40	460
DA4	160	2.30	55	950
DA5	200	4.30	55	1800
DA6	200	5.40	70	2700
DA7	250	10.50	95	5300
DA8	315	21.00	105	11000
DA9	400	43.00	120	22000
DA10	500	84.00	135	43000

*Maximum supply considered for calculating the Nominal torque is 6.5 bar

96 Series Spring Return

Actuator	Piston dia (mm)	Travel volume (cubic m)	Shaft diameter (mm)	Nominal torque with max supply* pressure (Nm)	Spring torque at 90 Deg (Nm)
RM1	125	0.90	35	70	130
RM2	160	1.60	40	150	270
RM3	200	3.60	55	300	540
RM4	250	6.70	55	600	1000
RM5	315	13.00	70	1200	2000
RM6	400	27.00	95	2400	4000
RM7	500	53.00	105	4800	8000

Model Decodification

1st	2nd
9	-

Actuator Type

5. Double Acting (DA)
6. Spring Return (RM)

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Applications

With proven expertise across sectors including thermal, nuclear, fertilizer, oil & gas, petrochemicals and other core industries, KSB is equipped to cater to severe conditions prevalent in various process industries and provide novel concepts and customized solutions for tough process control applications in all industry sectors.

Energy Sector

KSB's credentials have proved that its control valves can deliver high performances at both captive power plants and utility power plants including supercritical units from 660 MW to 1000 MW. KSB can cater to the most demanding design challenges and applications, including those in nuclear and combined cycle power plants, thereby powering the power generation industry.

Severe service applications catered	Coal fired Supercritical (upto 1000 MW)	Coal fired Subcritical (upto 600 MW)	Combined Cycle (upto 1000 MW)	Nuclear (upto 700 MW)
Start-up Feed Control	■	■	■	■
BFP Min. Flow Control	■	■	■	■
Seperator Level Control Valve	■	N.A	N.A	N.A
Boiler Circulation Control	■	N.A	N.A	N.A
Soot Blower Pressure Reduction	■	■	N.A	N.A
SH/RH Spray	■	■	■	■
Aux. PRDS Package	■	■	■	■
HP Turbine / Boiler Drain	■	■	■	■
Heater Drain & Condensate System	■	■	■	■
HP / LP Bypass	■+	■+	■+	■++

Industry Sector

Control valves have become key components in offshore and onshore oil & gas industry, both upstream and downstream where applications are demanding due to the high pressure and adverse corrosive conditions experienced on production platforms and refineries. The indelible imprint of KSB quality has made its mark in the Indian fertilizer industry as well, with Ammonia, Urea let down valves and Low noise valves for steam applications that are being used at renowned facilities. We have the distinction of being associated with the supply of Cryogenic control valves including Bellows sealed & Vacuum jacketed valves for LNG terminals and Cryogenic test facilities.

Severe service applications catered	Oil & Gas (upstream)	Refinery	LNG/Petrochemical/ Chemical/ Fertilizer	Oil / Refinery Products (transportation)
Hydrocarbon service	■	■	■	■
Hydrogen service	■	■	■	N.A
Antisurge Control	■	■	■	N.A
Hot / Cold HP Separator Letdown	■	■	N.A	N.A
Cryogenic service	N.A	■	■	N.A
Water / Steam / Gas Injection	■	N.A	N.A	N.A
Amine / Carbamate Letdown	N.A	■	■	N.A
HP Ammonia Letdown	N.A	N.A	■	N.A
Urea Service	N.A	N.A	■	N.A
High Pressure Co2	N.A	N.A	■	N.A
HP Pump Recirculation	■	■	■	■
Micro Flow	■	■	■	N.A
HP Steam Vent	■	■	■	N.A

+ Through alliance partner ++ Alternatively uses Atmospheric Steam Discharge / Condenser Steam Dump valves N.A: Not applicable for the sector

Energy- Supercritical Thermal Power Stations

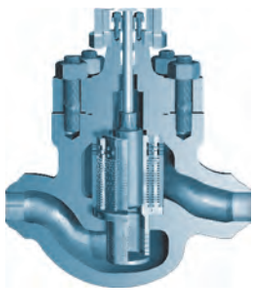
Boiler Feed Pump Recirculation Control Valves

- **660MW / 800MW Coal based Supercritical Thermal Power stations**
- **MIL 91000, 8"- 12", upto 3400# ASME**

Applications

- Maintains a minimum flow of Boiler Feed pump avoiding overheating and cavitation.
- Throttles when the boiler feed flow requirement is less than the minimum flow of the feed pump and recirculates the feed pump discharge to the condenser or deaerator
- Either On-Off or modulating depending on the plant philosophy.
- The control valve is kept closed when the plant picks up load

More information: www.ksb-mil.com



MIL 91000 Matrix series

Typical Product Specifications

- Function Mode: Modulating
- Design Pressure: 550 bar
- Max. Inlet Pressure: 500 bar
- Pressure Drop: 490 bar
- Body material: ASTM A 217 GrWC9 / F22

Energy - Supercritical Thermal Power Stations

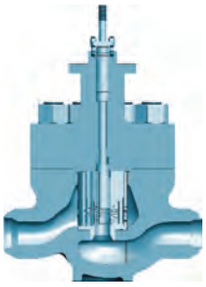
Start-up Feed Control Valves

- 660 MW / 800MW Coal based Supercritical Thermal Power stations
- MIL 91000, 12" - 14", upto 3200# ASME

Applications

- Used during Boiler Start-up conditions when pressure is not built up in the boiler.
- As Load picks up, the control valve is closed and flow takes place through the main gate valve / main feed water valve

More information: www.ksb-mil.com



MIL 91000 Matrix series

Typical Product Specifications

- Design Pressure: 540 bar
- Design Temperature: 225^{0}c
- Pressure Drop: 70 – 135 bar
- Body material: ASTM A 217 GrWC9

Energy - Supercritical Thermal Power Stations

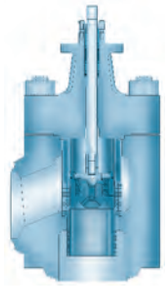
Water Drain Control Valves

- **Various 660 MW / 800MW Supercritical Thermal Power station, Madhya Pradesh**
- **MIL 71000, 12”, 2500# ASME, Forged Angle Valve**

Applications

- Operates during subcritical cycle of the plant operation and is used in startup and low load operation of the plant to drain water from the separator
- Valve will be closed throughout the operation of the plant once the load builds to supercritical
- Also operated in emergency situations
- Failure of the valve will affect the supercritical cycle

More information: www.ksb-mil.com



MIL 71000 series

Typical Product Specifications

- Cv: 425
- Design Pressure: 283 bar
- Design temperature: 370°C
- Body material: ASME SA 182 Gr. F22 (Class 3)

Energy - Supercritical Thermal Power Stations

Super Heater Spray Control Valves

- **Vrious 660 MW / 800MW Coal based Supercritical Thermal Power stations**
- **MIL 91000, 6“, 2500 ASME**

Applications

- Regulates the feed water required to maintain the steam temperature exiting from the superheaters / reheaters.
- The severity of this application varies with the location of the feed water tapping which can be either BFP discharge or Intermediate stage.

More information: www.ksb-mil.com

MIL 91000 Matrix series

Typical Product Specifications

- Body configuration: Inline or Angle
- Cv: 40
- Design Pressure: 314 bar
- Design Temperature: 358^{0}c
- Rangeability: 1:50
- Body material: ASTM A 182 GrF22

Energy - Captive Power Stations

Steam Conditioning Valves

- Turbine bypass valves for Captive powerplants
- MIL 64000 ASME 600# to 2500#
- Valve size: Inlet- 3" to 16" ; Outlet- 8" to 24"

Applications

- Bypass to District Heating
- Auxiliary PRDS
- Process Steam Applications
- Turbine Bypass to Re-heater
- Turbine Bypass to condenser
- Dump PRDS

More information: www.ksb-mil.com

MIL 64000 series

Product Highlights

- Steam conditioning valve with integral DSH design
- Alloy Steel body with field proven trim
- Special Trim design for horizontal mouting
- Quick and high level atomisaion.

Energy - Captive Power Stations

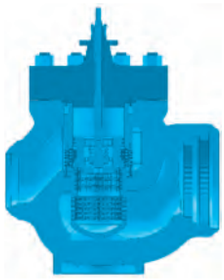
Start-up vent Control Valves

- MIL 41000 and MIL 64000, ASME 600# to 2500#
- MIL 41000 and MIL 64000, 3" to 24" (Outlet), upto 2500# ASME

Applications

- Used during start-up or shut down of boilers to regulate the system pressure by venting excess steam

More information: www.ksb-mil.com



MIL 64000 series

Product Highlights

- Low noise designs with tight shut off
- Expanded outlets with additional static restricters and vent silencer
- Alloy steel material for construction to have high temperature strength

Energy - Captive Power Stations

Steam Injection Control Valves

- Protection Valves for Steam Turbines
- MIL 41000, 4" to 20" 600# ASME

Applications

- Controlling the steam injection to the turbine.
- valves regulate or shut off the steam injection flow, depending on the load and flow variations in the turbine.
- Quick response to Stop the turbine.

More information: www.ksb-mil.com

MIL 41000 series

Product Highlights

- Special actuation mechanism with damping arrangement to avoid sudden impact load to the valve.
- High capacity rugged body and special pressure-balanced trim to facilitate a quick closing.
- Special Hook up accessories and tubing to meet the short travel times.

Energy - Nuclear Power Stations

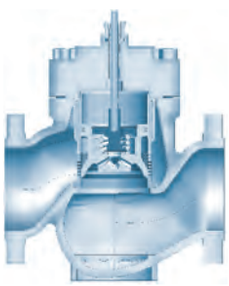
Control Valves for Nuclear applications

- **Atmospheric steam discharge/ Condenser steam dump Valves**
- **MIL 41000, 16“, 600# ASME**

Applications

- Highly critical for plant safety and releases steam to atmosphere whenever the containment pressure goes up or for crash cooling in case of station blackout
- Discharges steam to atmosphere / condenser during plant transient

More information: www.ksb-mil.com



MIL 41000 series

Typical Product Specifications

- Design Pressure: 60 bar
- Design Temperature: 270°C
- Max. inlet pressure: 50 bar
- Pressure drop: 45 bar
- Body Material: A352 Gr.LCB / 17.4PH
- Rated Cv:1000

Energy - Ultra Supercritical Power stations

High temperature/ High pressure reducing valves

- AUSC Test loop inside a thermal power plant
- MIL 91000, 4“, High pressure temperature valve

Applications

- Hydraulically actuated Steam pressure reduction valve in pilot plant for testing equipments of Ultrasupercritical power plants
- Steam temperature above 700°C

More information: www.ksb-mil.com

MIL 91000 Matrix series

Product Highlights

- 3 stage pressure reduction
- Fins provided for effective heat transfer
- Uniform body wall thickness to reduce the effect of thermal stress
- Special gasket and packing box design for high temperature service

Industry

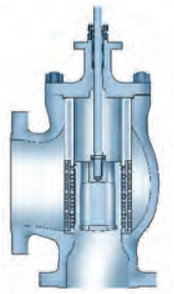
Antisurge Control Valves

- **Various Refinery/ Petrochemical/ Petrochemical complexes**
- **MIL 41000, 20“, 300# ASME**

Applications

- Used to protect centrifugal compressors from surge during occurrence of load transients or interruption in the power to the compressor drive
- Can also be used in flow control during the start-up and shutdown of the compressor

More information: www.ksb-mil.com



MIL 71000 series

Typical Product Specifications

- Travel time: < 2–3 s in modulating mode, < 1 s in trip mode
- Opening dead time: < 0.4 s
- Dead band: < 0.4 % in full signal range
- Linearity: < 1 % of rated travel
- Overshoot: < 3 % of the calibrated range)

Industry

Amine Regeneration Control Valves

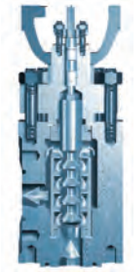
- Various Refinery complexes
- MIL 78000, 6" x 8", 1500# ASME

Applications

Used to control the CO_2 / H_2S removal process by taking care of the high pressure drop from absorber to stripper in

- Amine and/or CO2removal units
- Gas / LNG plants – Amine units (H_2S removal)
- Ammonia plants – CO_2 removal units
- Crude Oil Production Facilities (H_2S removal)

More information: www.ksb-mil.com



MIL 78000 series

Typical Product Specifications

- Multi-stage, anti-cavitation angle
- Design Pressure: 175 bar
- Max. Inlet Pressure: 166 bar
- Pressure Drop: 160 bar
- Body Material: ASTM A 182 GrF304L

Industry

Cryogenic Control Valves for LNG

- **FSU Conversion Project**
- **MIL 41000, 4”, ASME 300#, With electro hydraulic actuator**

Applications

- Used in LNG regasification and storage terminal project to regulate the process.
- Used aboard LNG carriers and FSRU’s for handling LNG with appropriate class certification

More information: www.ksb-mil.com

MIL 41000 series

Product Highlights

- Pneumatic or hydraulically actuated with marine class certification (optional)
- Suitable to handle LNG at -160^{0}c
- Size: up to 20"
- Pressure class:1500# ASME

Industry

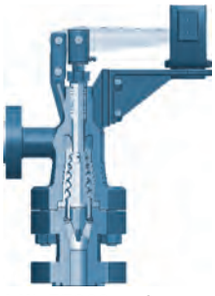
Hot High Pressure Seperator Letdown Control Valve

- For Hydrotreater/Hydrocracker complexes
- MIL 77000, 6" x 8", 1500# ASME

Applications

- Used in the Hydrotreater plant, located at the bottom stream of Separator Vessel designed to take care of the Outgassing effects of dissolved gases and high pressure drop

More information: www.ksb-mil.com



MIL 77000 series

Product Highlights

- Expanding labyrinth trim with high pressure drop anti-clog flow path
- Body Material: ASTM A351 Gr CF8C
- Trim Material: SS 347 + Stellite

Industry

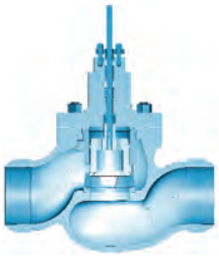
Control Valves for Hydraulic Pipeline

- **LPG valves with Electrohydraulic for cross country Pipeline in India**
- **MIL 41000, 20“ and 16“, 600 ASME**

Applications

- LPG / Product transportation between refineries or outside the refinery control system
- Stand alone functions

More information: www.ksb-mil.com



MIL 41000 series

Product Highlights

- Linear or rotary control valves
- Size: 6" to 36"
- Electro Hydraulic actuated
- Valve body design suitable for Hydro carbon Service

Industry

Valves for Corrosive Media

- **Revamp of sea water system, Al Jubail, Kingdom of Saudi Arabia**
- **MIL 41000, 32", 300# ASME, Super Duplex Construction**

Applications

- Special metallurgy to enhance corrosion protection while handling aggressive fluids.
- Wide variety of exotic metallurgy can be offered including
  - Duplex, Super duplex
  - Monel, Inconel, Hastelloy
  - Titanium, Alloy 20, NAB, Super austenitic

More information: www.ksb-mil.com

Titanium Control Valve

Product Highlights

- Linear and Rotary Control Valves
- Size: From 1" to 36"
- Body & Trim material in special alloy
- Gland protection as per ISO 15848 standard to minimise fugitive emission

Industry

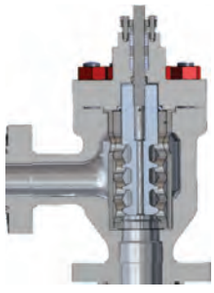
Water Injection Control Valves

- Enhanced Oil Recovery (Steam Injection) Plant
- MIL 78000, 2" to 6", < 2500# ASME

Applications

- Used in the oil & gas exploration fileds designed to take care of the high pressure drop, high cavitation and plugging possibility due to entrained particulates (like sand)

More information: www.ksb-mil.com



MIL 78000 series

Product Highlights

- Anti-Clog design with Separable Liner/Spacers and Large Flow Path
- Multi-Stage pressure drop eliminates cavitation
- Corrosion resistant material including Duplex Material

Industry

High Performance Butterfly Valves

- For Hydro carbon applications, Oman
- MIL 33000 , 30” 150# ASME

Applications

- Oil & Gas
- Effluent Treatment Plants
- Fertilizer & Chemical Industries
- Paper & Pulp industry

More information: www.ksb-mil.com

MIL 33000 series

Product Highlights

- Triple offset Butterfly Control Valve
- Actuator: Pneumatic Quarter turn Piston Actuator
- Torque seated Design
- Low operating Torque
- Field replacable seal ring
- Robust single-piece stem design
- Leakage class: IV, V & VI

Industry

Segmented Ball Control Valves

- **Used in PTA Project, India**
- **MIL 35500, 6" & 10" ASME 300#**

Applications

- Paper & Pulp industry
- Oil & Gas
- Effluent Treatment Plants

More information: www.ksb-mil.com

MIL 35000 series

Product Highlights

- "Single-piece" body design for minimal linkpath
- Self aligning segmented ball
- Excellent shearing action in Fibrons fluid medium
- Actuator: Pneumatic quarter turn piston Actuator
- Leakage class: IV, V & VI

The power. To create .

A plant design driven to meet Customer's expectations / Lead time. Solutions tailor made for you which are cost effective.

Manufacturing expertise and unbeaten technology - all under one roof

Interior view of the large manufacturing plant

Interior view of the standard manufacturing plant

Plasma Nitriding Furnace

Vacuum Heat Treatment facility

Coordinate Measurement Machine

Automatic hard facing process

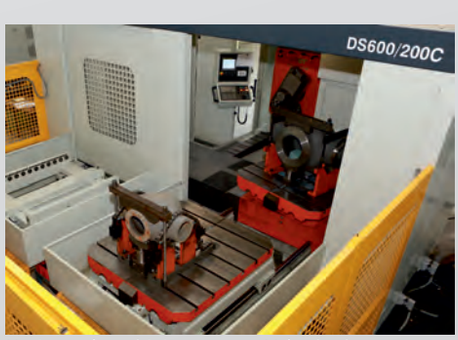
Positive Material Identification of special alloys

Load and deflection testing of Actuator springs

CNC Machining bay

A 32 inch size valve being tested on the High pressure test bench

Fully automated valve test bench



Horizontal machining centre - Valve body machining in single setting

The power. To speak for our customers.

We think for them, we stand for them, we act for them. It's all about understanding them. KSB MIL's strength lies in the loyalty of its strong customer base. The mutual growth in our partnerships had humble beginnings, which grew beyond a mere deal and today stands for some great work together.

Approvals from major players in Industry / Energy sector

Aerial View of KSB MIL Manufacturing Plant

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