

NELES

Product school

Neles Metal Seated Ball Valves

In session features

Waiting to view Liz Davis's screen
Talking: Liz Davis

Webinar Housekeeping

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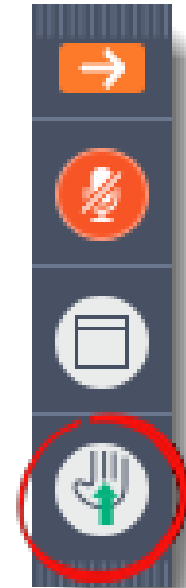
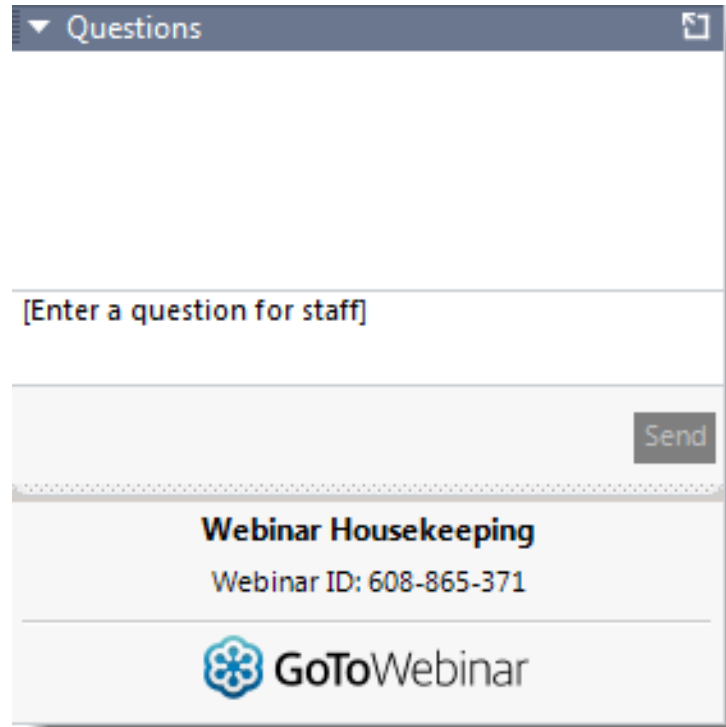
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In session features



Presenter(s)

- Michael Bouckaert
- I joined Neles in 2009 as an R&D technician working on various projects for our engineering team. After many years working in the R&D lab, I took over the role as supervisor for both warranty and R&D. I have now been a Product manager for Ball valves for around 2 years.



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Neles Ball Valves

September 20, 2021

Neles Ball Valves

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- Neles offers flexible, configurable products that can be altered for unique application requirements
- High temperature
- Cryogenic service
- Sealing requirements
 - Seat designs
- Prevention of wear and erosion
- Application know how



Neles Ball Valves Standard Offering

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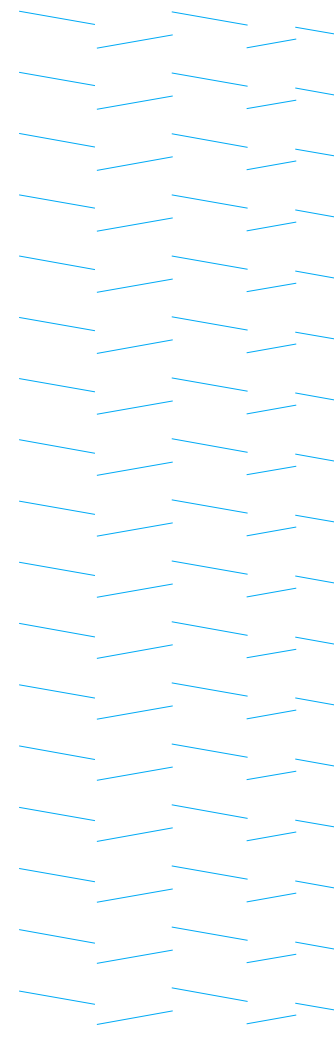
M –series
Bulletin: 1 M2 20 EN



X –series
Bulletin: 1 X 26 EN
Bulletin: 1 X 22 EN

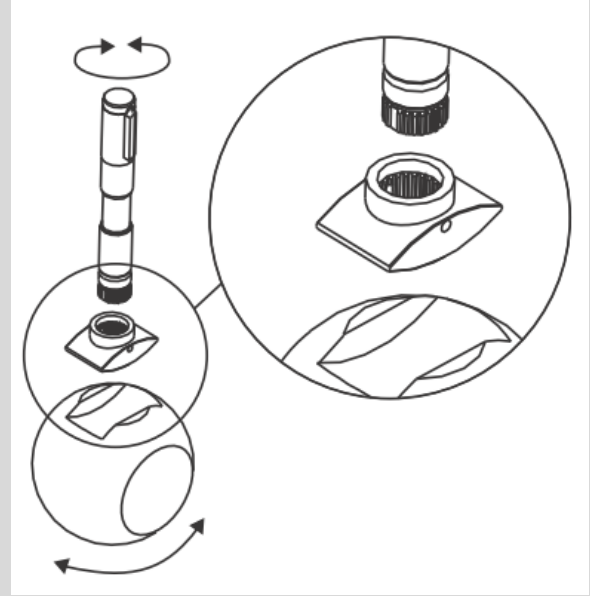
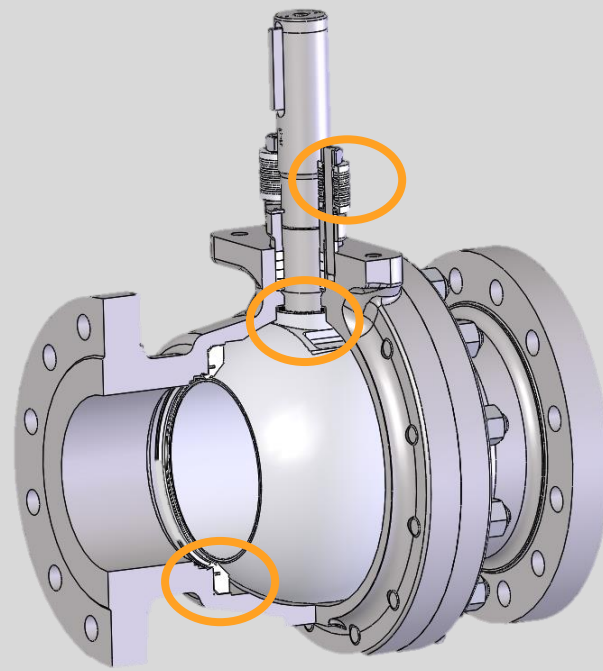


D –series
Bulletin: 1 D 21 EN



X and M series seat supported features

- Spline drive design
- Live loaded packing
- Multiple seat designs for specific applications
- Good shut off capabilities
- Other special constructions
- Q-trim options



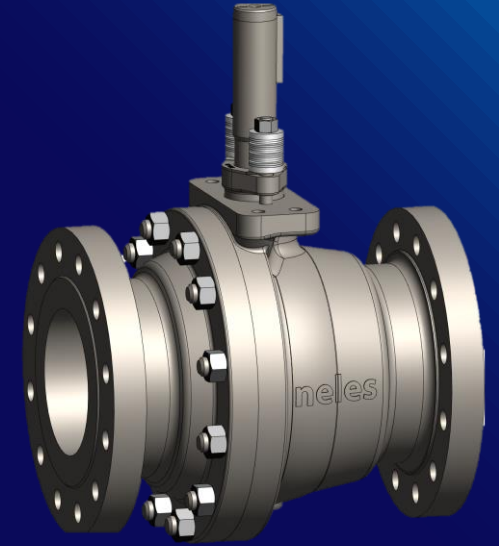
M-series Pulp and Paper Industry

Seat supported ball valve, series M

Features

Valve Design	Seat supported, 2 piece side entry body, casting, full bore ball valve.
Trim Port type	Full bore, cylindrical ball flow path, Q-trim option for control service
Design standards	EN, ASME
Size range	EN DN25-DN300, ASME 1"-12"
Pressure class	EN PN10-PN40; ASME 150-300
Temp range: std / option	-50...+260 °C
Materials: body / trim std and options	CF8M as std. Options i.e.: Duplex 4A, SuperDuplex 5A, SMO, Titanium, Hast C
Seat materials	Metal & Soft. Wide coverage of options per application.
Actuators, mounting std	B-series as a standard
Control / Monitoring, mounting std	On/off: EN, EQ, AM with Control: NE, NP, ND, NDX-series
Certificates, approvals	TA-Luft, Ex, CE-PED, IEC 61508 type A, TR CU 032, TR CU 012
Assembly testing: std option	All with functional and leakage testing as std.
Application areas	All general and demanding on/off applications including fouling, sticky and other more demanding flow medias. Options for control service trims.

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Series M seat supported
ball valves

M1, M2

Seat sealing requirements

Variety of seat options (Seat Supported)

- Scrapper style seats.
 - Used to have a continuous scrapping effect on the ball to remove residue or media buildup that could cause jamming.
- Locked in seats
 - Locked in seats prevent media buildup getting behind the seat.
- Spring loaded seat
 - Utilizes a spring on the back of the seat to create a consistant force onto the ball.
- Specialized seats
 - Bellows

Challenge

Metal sealing capabilities

Different applications
requiring unique designs

Solution

Variety of seat options
(Seat Supported)

M-series seat designs

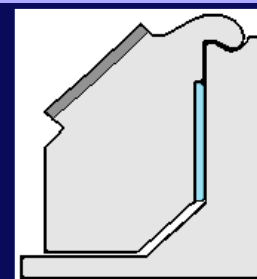
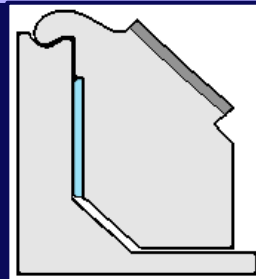
• General scraping locked seat

P (Stainless), V (4A), C (CK-3MCuN) Seat

- Minimum dP of 30 PSI to meet leakage requirements
- PTFE back seal

Application:

Media prone for build up or solidification
Slurries, wood pulp with metal fragments, black liquor



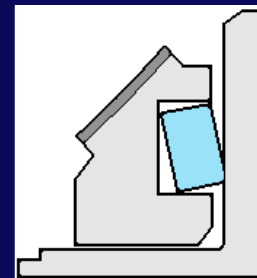
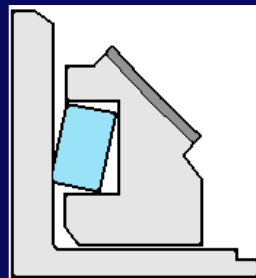
• General scraping unlocked seat

S Seat

- Seat “floats” inside body pocket
- Minimum dP of 30 PSI to meet leakage requirements
- Easier to repair since not locked.

Application:

Clean liquid and gas applications
Susceptible to media buildup can cause premature failure



M-series seat designs

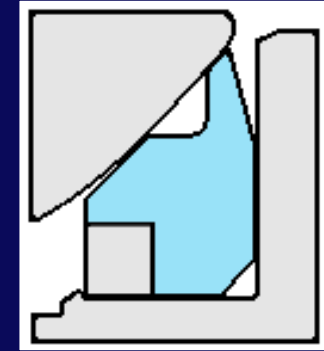
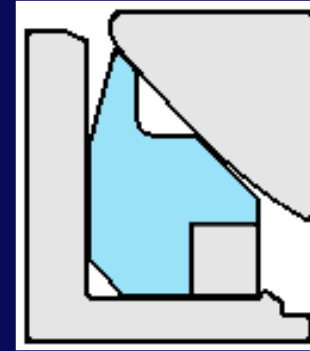
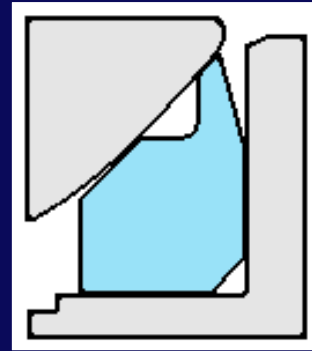
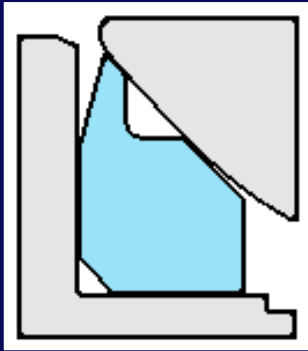
Soft seat

X (Xtreme), T (PTFE), M (Filled PTFE) Seat

- Bubble tight leakage

Application:

Used for tight shut off applications
Non abrasive/solid applications



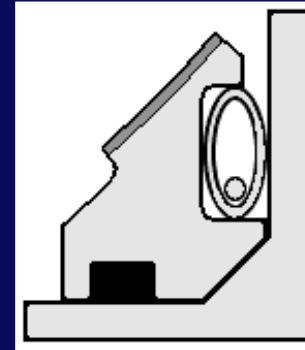
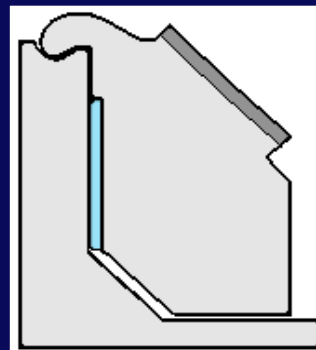
Low dP seat

E Seat

- Spring loaded metal seat
- Capable of pressures lower than 30 psi
- Max dP is 230 PSI

Application:

Used for low dP (≤ 30 PSI) applications that require the scrapping action.
Media can be clean liquid or gas applications



M-series trunnion seat designs

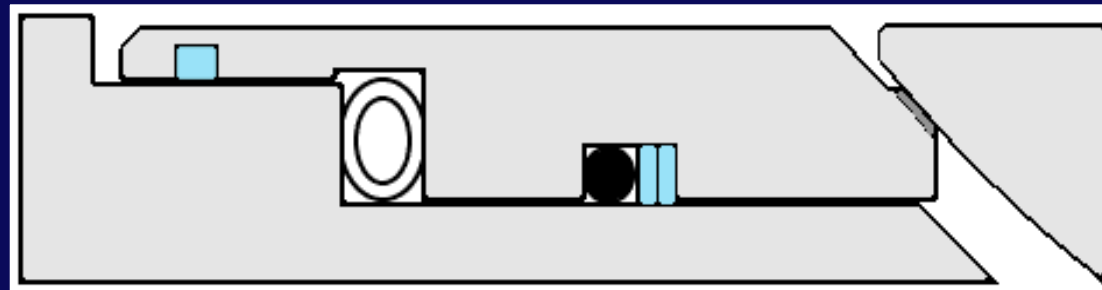
• Solids proof seat

P seat

- PTFE seal used to prevent solid media getting into the Inconel spring area
- O-ring on OD of seat with PTFE seal
- Spring energized seat

Application:

Processes that have medium amounts of solids that require the spring to be protected.
Has the scrapping action required to remove any media buildup



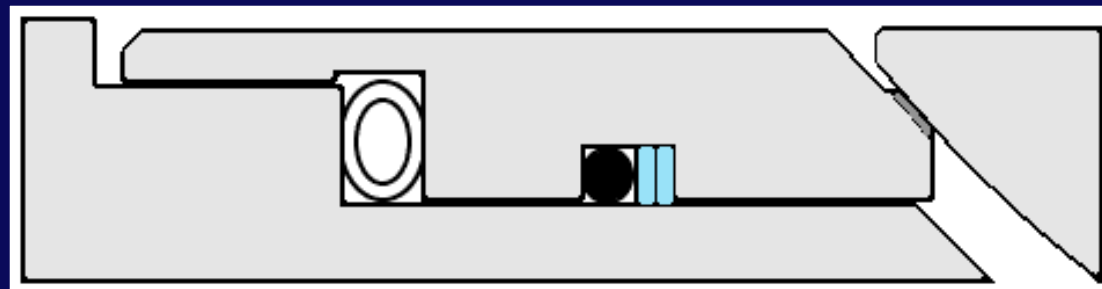
• General scraping seat

S Seat

- Spring energized seat to push the seat into the ball

Application:

Clean liquid and gas applications
Has the scrapping action required to remove any media buildup



X-series

Oil and gas industry

Seat supported ball valve, series X

Features

Valve Design	Seat supported, 2 piece side entry body, casting, full and reduced bore ball valve.
Trim Port type	full and reduced bore, cylindrical ball flow path, Q-trim option for control service
Design standards	EN, ASME
Size range	EN DN25-DN200, ASME 1"-8"
Pressure class	EN PN10-PN100; ASME 150-600
Temp range: std / option	-196...+600 °C
Materials: body / trim std and options	WCB and CF8M as std. Options i.e.: Duplex 4A, SuperDuplex 5A, SMO, Hast C
Seat materials	Metal & Soft. Wide coverage of options per application.
Actuators, mounting std	B-series as a standard
Control / Monitoring, mounting std	On/off: EN, EQ, AM with Control: NE, NP, ND, NDX-series
Certificates, approvals	API 608, API607, ISO15848-1, TA-Luft, Ex, CE-PED, IEC 61508 type A, TR CU 032, TR CU 012
Assembly testing: std option	All with functional and leakage testing as std.
Application areas	All general and demanding on/off applications including fouling, sticky and other more demanding flow medias. Options for control service trims.

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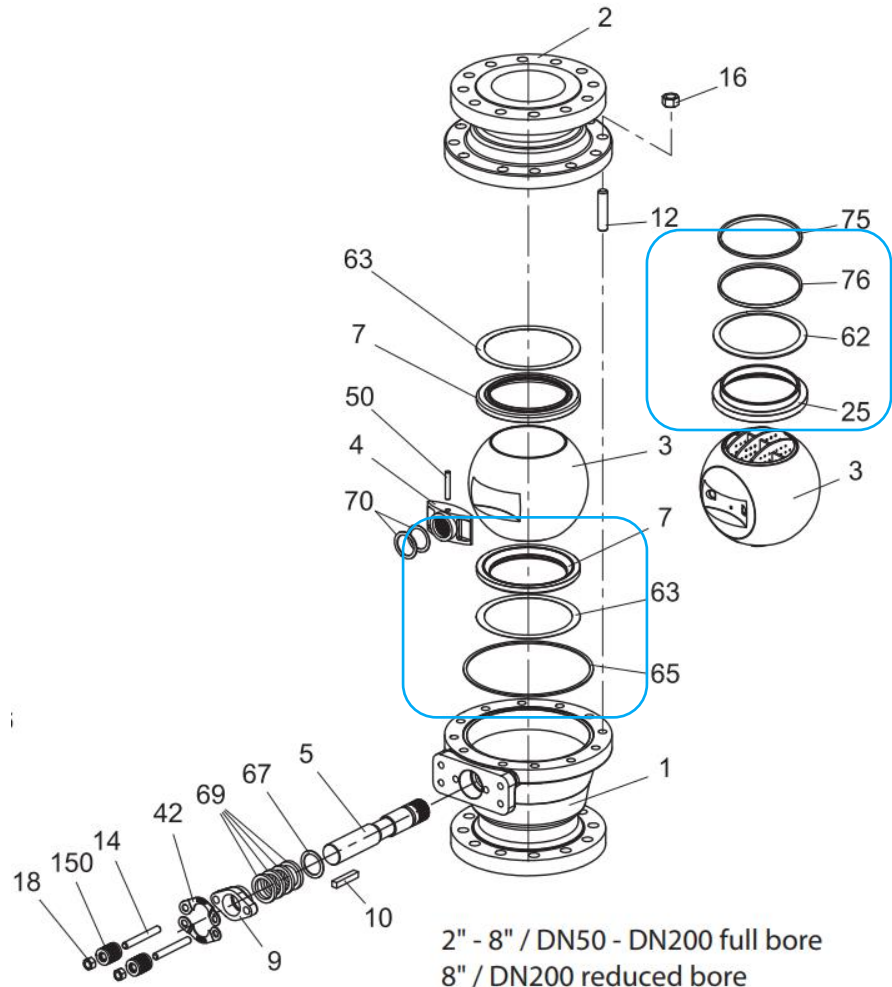


Series X seat supported
ball valves

XT, XA, XB, XC, XU

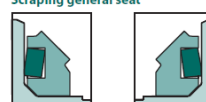

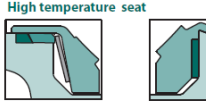
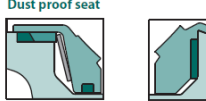
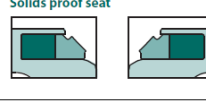
Seat supported ball valve, series X

Features



2" - 8" / DN50 - DN200 full bore
8" / DN200 reduced bore

STANDARD SEATS CONSTRUCTIONS AND MATERIALS

Seat type	Standard materials	
S Scraping general seat  1" - 8"	Ball seat: Stainless steel + hard facing Seat seal: PTFE Temp. range: -50 °C...+230 °C / -58 °F...+440 °F Note: Available only in sizes 1"...8" / DN 25...200	
K Scraping locked seat  1" - 8"	Ball seat: Stainless steel + hard facing Seat seal: PTFE Temp. range: -50 °C...+260 °C / -58 °F...+480 °F Note: Available in sizes 1"...8" / DN 25...200	
H High temperature seat  1" - 8"	Ball seat: Stainless steel + hard facing Seat seal: Graphite Spring: INCOLOY 825 Temp. range: -200 °C...+450 °C / -330 °F...+840 °F (+600 °C/+1110 °F with NiBo or carbide coated ball)	
G Dust proof seat  1" - 8"	Ball seat: SS steel + hard facing Seat seal: Graphite Spring: INCOLOY 825 Temp. range: -50 °C...+450 °C / -58 °F...+840 °F up to +600 °C / +1110 °F with carbide or NiBo coated ball	
J Solids proof seat  1" - 8"	Ball seat: SS steel + hard facing Seat seal: Graphite Temp. range: -50 °C...+600 °C / -58 °F...+1110 °F NOTE: Available only with carbide or NiBo coated ball. Available only in sizes 2"-8" / DN 50 - 200	

Soft seated versions - see bulletin 1 X 27 (full and reduced bore types).

Application based seat options and ball & seat coatings

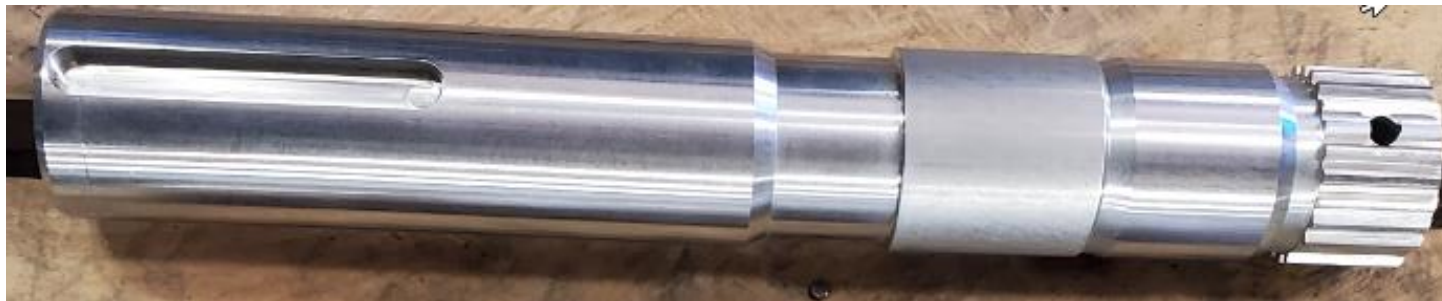
Shaft durability and accuracy

Spline Driver Shaft

Spline connection provides accurate and consistent operation.

Versatility. Easily able to change out for different materials.

Reduces cost. Does not require to machine completely out of bar stock. Example: Stem ball



Challenge

Hysteresis performance

Durability

Solution

Spline driver shaft

Emissions requirements

Live loaded packing

Construction designed for long lasting performance.

Provides low maintenance requirements for adjusting stem seals

Certified to ISO15848-1 type testing with leakage class BH. Requires specific model coding.

EX: XA02DWGAS6SJHADE

TA Luft Certified.



Challenge

Emissions performance

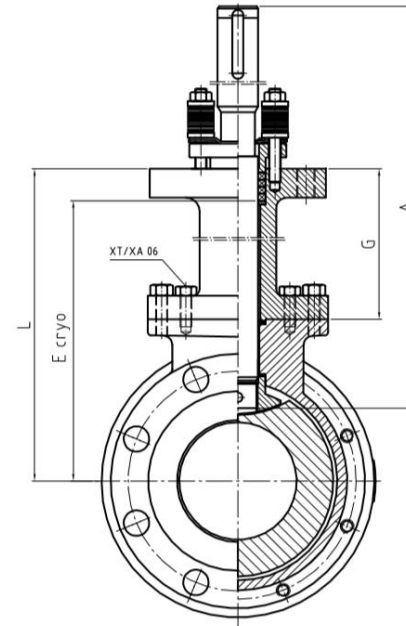
Solution

Live loaded packing

Special Applications

Cryogenic extensions available

- Cryogenic designs available 1-8" on the seat supported X-series.
- Have three standard options for different lengths of the extension piece.
- Standard seat used in Cryogenic service is the H seat.
- Typical coating used is Tungsten carbide.
- Available to -200°C



Challenge

Cryogenic applications

Solution

Cryogenic extensions available

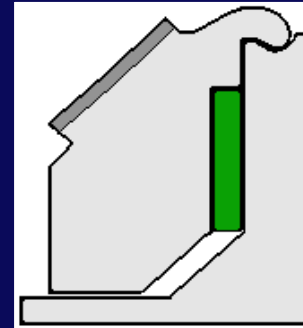
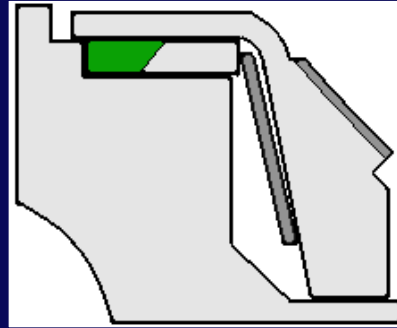
X-series seat supported designs

Standard spring-loaded seat

- **H seat - High Temperature Metal Seat**
- Utilizes an Inconel spring and graphite back seal

Application:

Works well with low to medium solids (no fine powders)
Water, gas applications requiring low shut off

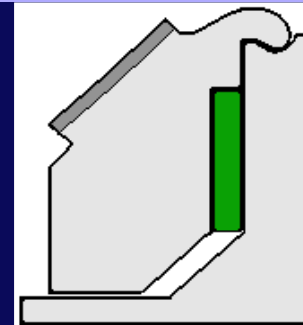
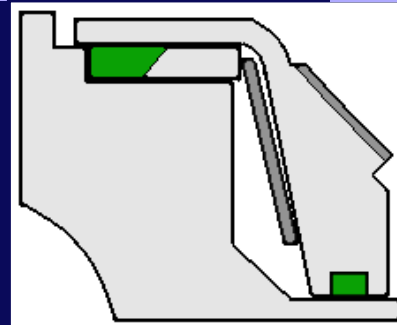


Dust Proof/spring loaded seat

- **G seat - Dust/Particle Proof High Temperature Metal Seat**
- Same design as the H style seat
- Uses a graphite wiper on the O.D of the seat housing

Application:

Very small particles, dust or powders and substances that are prone to buildup and solidification
Silicon particles, dust/debris



X-series seat supported designs

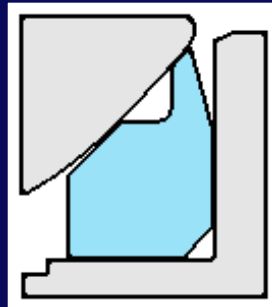
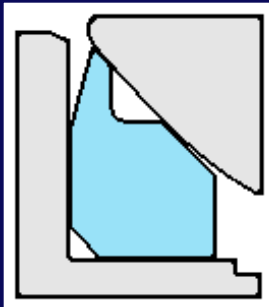
Soft seated

X seat – Soft seated

- Bubble tight
- Xtreme material

Application:

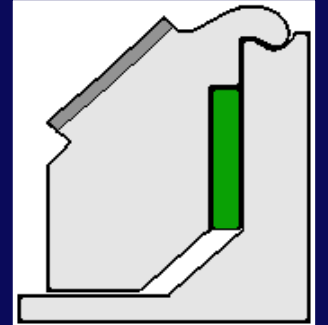
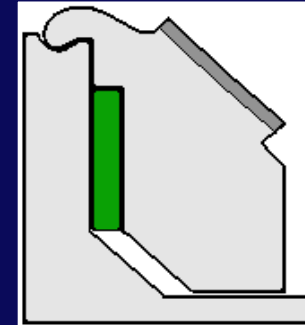
Services requiring complete shut off
Water, gas, steam.
No abrasive media



Locked seat

K seat – Locked Scraping Metal Seat

Used in both the H and G construction
Graphite back seal



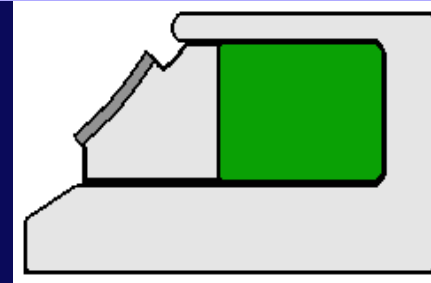
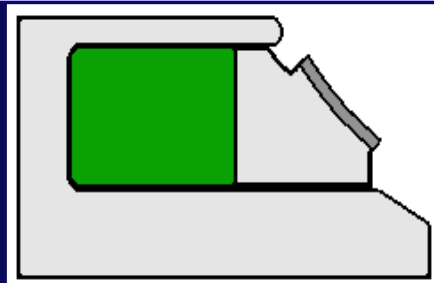
Solids Proof Metal Seat

J seat – Solids proof graphite loaded seat

- Spring loaded seat by pressing graphite sheets into the body cavity

Application:

Required where high concentration of solids or abrasives are present
Catalyst service, slurry with solids

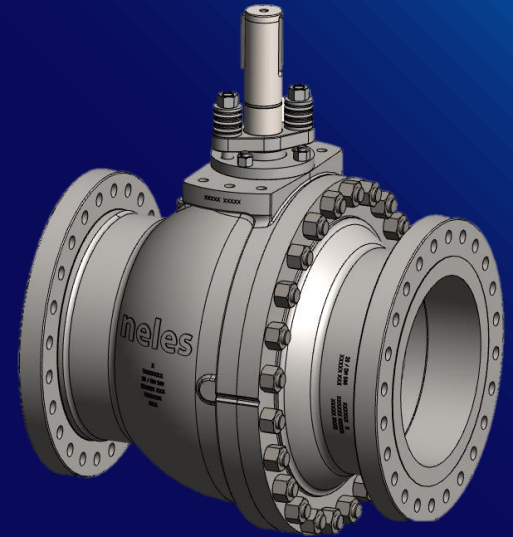


Trunnion mounted ball valve, series XM, XG

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Features

Valve Design	Trunnion mounted, 2 piece side entry body, casting, full bore
Trim Port type	Full port, cylindrical ball flow path, Q-trim, Q2-trim options for control service
Design standards	EN, ASME
Size range	EN DN50-DN600, ASME 2"-24"
Pressure class	EN PN10-PN40; ASME 150-300
Temp range: std / option	-50...+425 °C
Materials: body / trim std and options	WCB and CF8M as std. Options i.e.: Duplex 4A, SuperDuplex 5A, SMO, Hast C
Seat materials	Metal & Soft. Wide coverage of options per application.
Actuators, mounting std	B-series as a standard
Control / Monitoring, mounting std	On/off: EN, EQ, AM with Control: NE, NP, ND, NDX-series
Certificates, approvals	API 608, API607, ISO15848-1, TA-Luft, Ex, CE-PED, IEC 61508 type A, TR CU 032, TR CU 012
Assembly testing: std option	All with functional and leakage testing as std.
Application areas	All general and demanding on/off applications including fouling, sticky and other more demanding flow medias. Options for control service trims.



Trunnion mounted ball valve

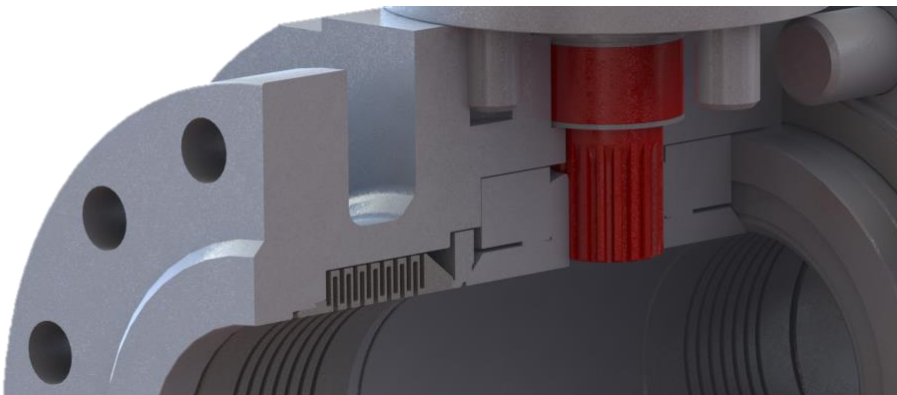
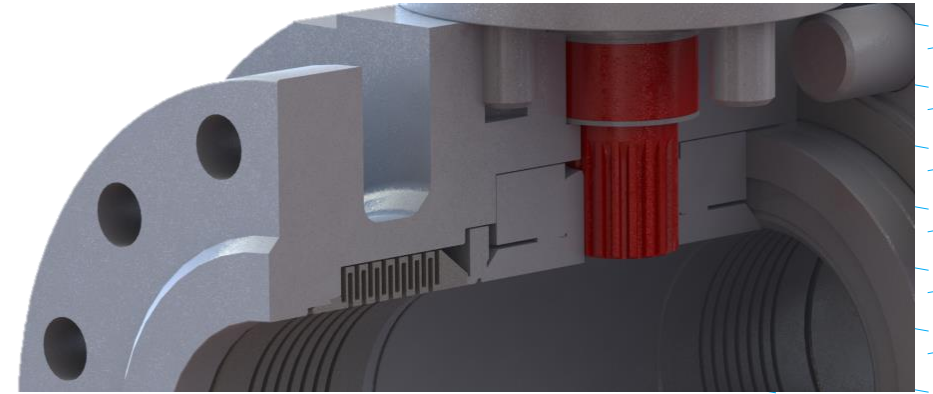
XM, XG

Trunnion mounted design features

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Stem connection

- Spline connection between ball and stem or Neles Stemball™ solid one piece design
- Connection is backlash free
- Spline is the most durable connection between stem and ball

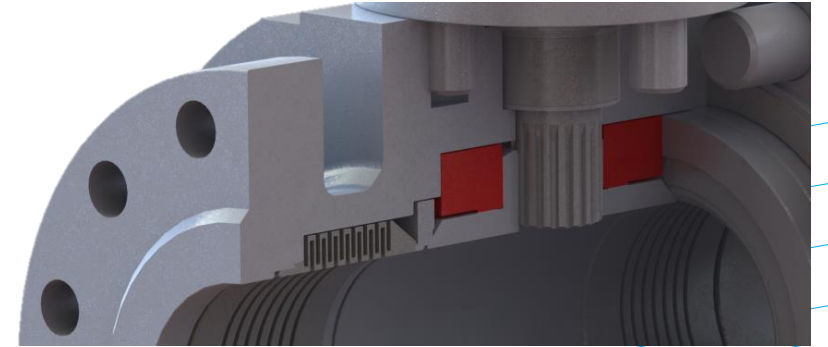


- In high cycle service spline connection will offer long lasting, trouble free performance

Trunnion mounted design features

Neles trunnion ball valves

- Can handle severe service, high pressure, and high temperature. – Achieved by selecting the proper materials for your application.
- Low friction carbide coated bearings for high cycle applications
- Trunnion design
 - smaller actuators
 - better cycle life
 - less weight on assembly



Emissions

Neles solutions

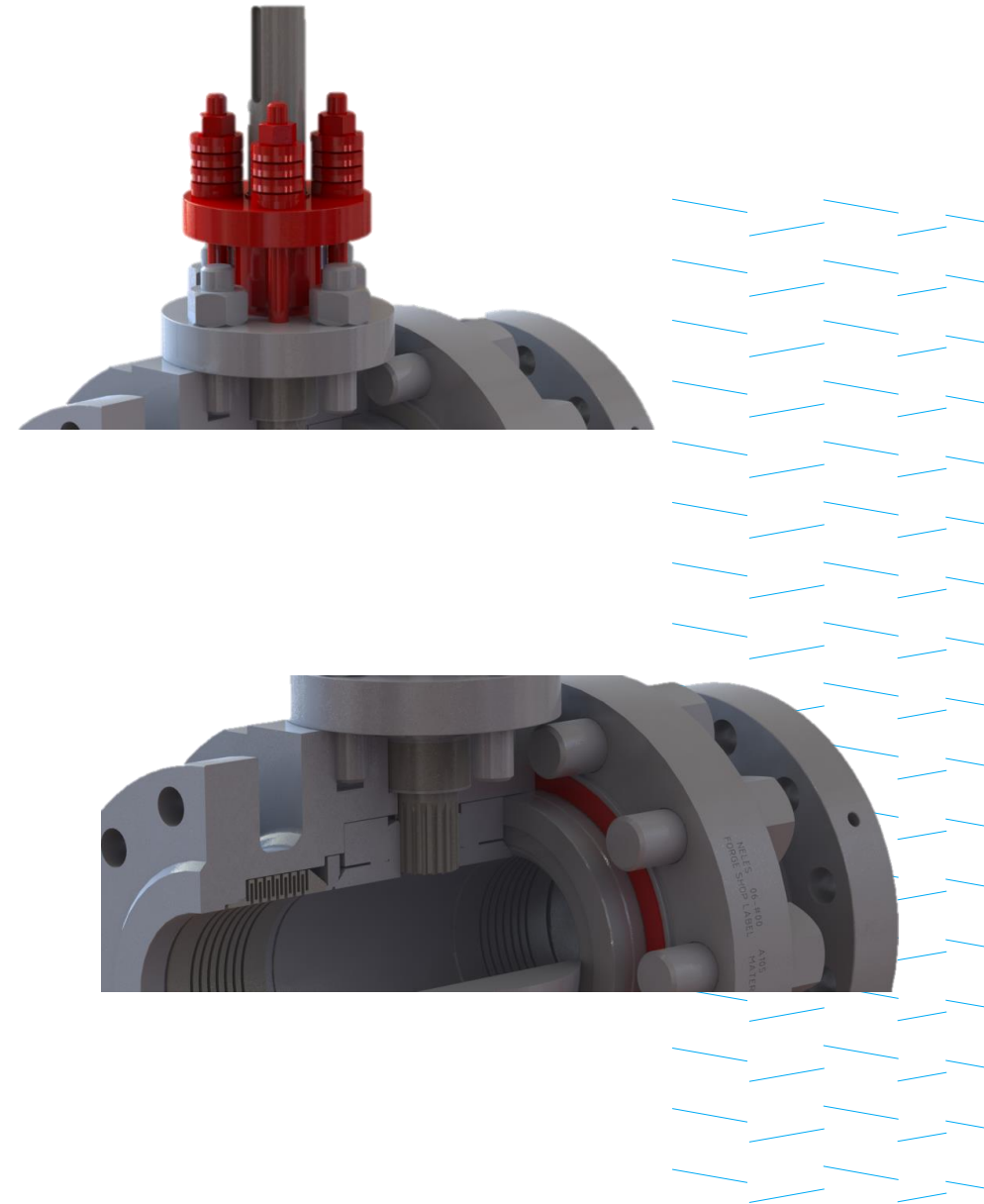
Adjustable live loaded (spring loaded) packing

- High cycle life
- Low environmental impact

ISO 15848 design

- Low overall emission level
- Long life time

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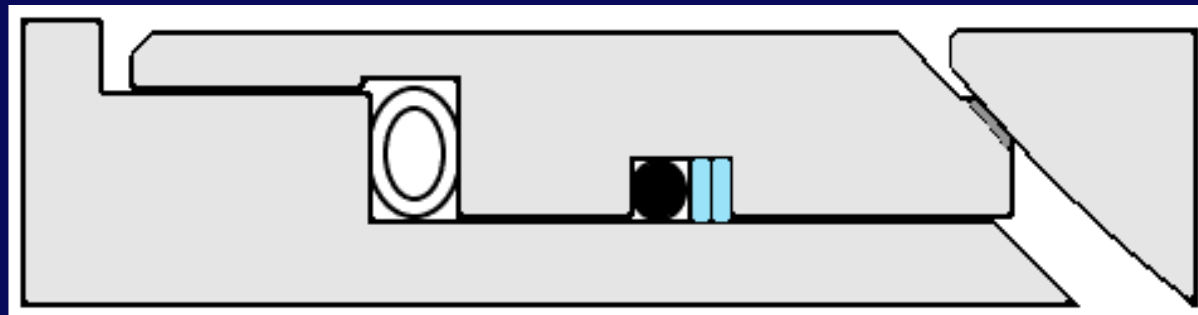
X-series trunnion seat designs

Scrapping seat

- **S seat – General Scrapping seat**
- Utilizes an Inconel spring that creates the contact on the ball achieving the scrapping action.
- O-ring and PTFE seal used for od sealing

Application:

Clean liquid and gas services. Not suitable for small particles or dust applications



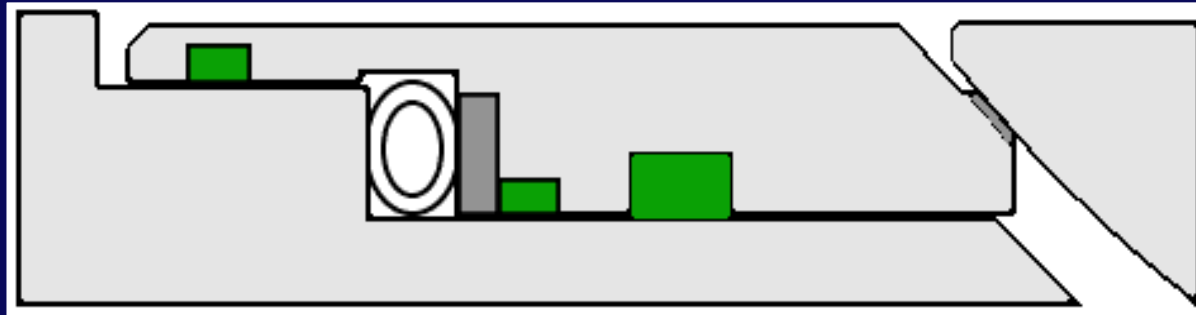
X-series trunnion seat designs

Solids proof

- **K seat – Solids Proof seat**
- Utilizes graphite seals to prevent media interrupting the spring force.

Application:

Very small particles, dust or powders and substances that are prone to buildup and solidification
Silicon particles, dust/debris

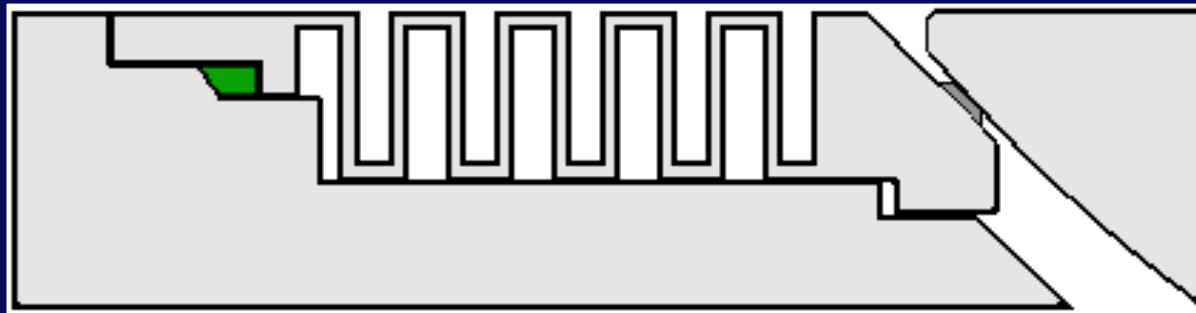


Bellows Seat

- **H seat – A bellows seat design that acts as the spring to make constant contact with the ball.**
- Utilizes a graphite seal for fire safe.

Application:

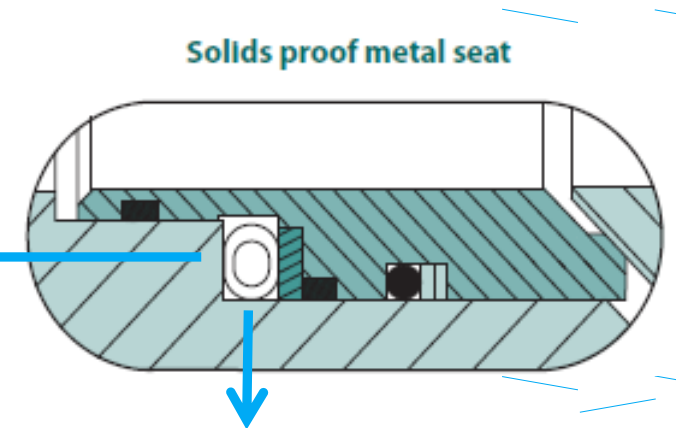
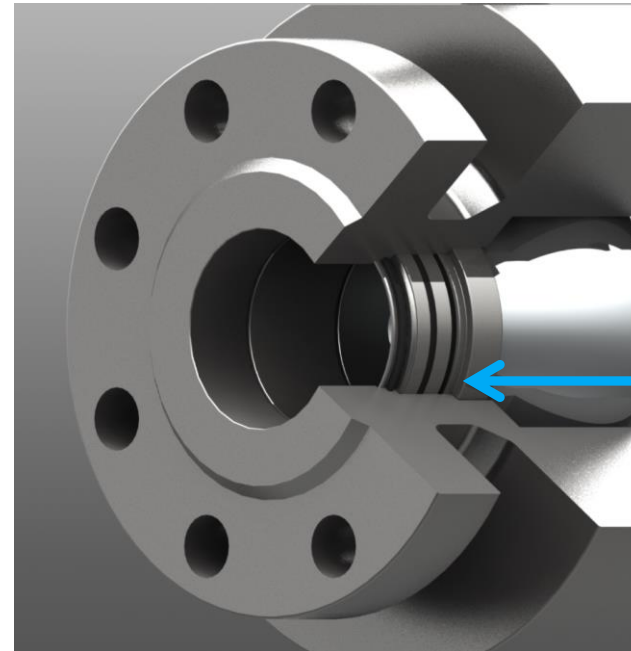
Clean liquid and gas applications



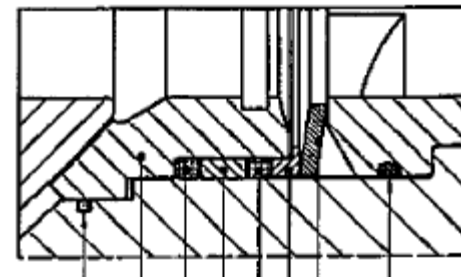
Trunnion mounted design features

Seat types

- Closed seat design → Reduced risk of polymer build up behind the seat
- Open seat cavity increase risk of polymer build up → jamming



The critical area is protected!



Competitors:
Cavity where particles can accumulate → Seat is stuck

- **Chemicals:**
- [Polysilicon Production](#) – X series ball valve using a G-seat construction to prevent the silicon dust from getting behind the seat and jamming the spring mechanism.
- [Methanol Synthesis](#) – X series ball valve utilized to shut off the synthesis loop in order to conserve energy usage and also isolate other pieces of equipment.
- **Oil and gas:**
- [Molecular sieve valves](#) – X series ball valves
- **Pulp:**
- [Black Liquor Evaporation](#) – M series ball valves
- [Oxygen Delignification](#) – M series ball valves
- [Hypochlorite bleaching](#) – M series ball valves in bleaching applications with special materials being used such as titanium.
- [Continuous Digester](#) – M -series ball valves with lock seats are used. The lock seats are required due to the scaling and possibility of media being trapped in the seat pocket area.
- **Other:**
- [Polymerization](#) – X-series ball valves

D-series

Trunnion mounted ball valve, series D

Features

Valve Design	Trunnion mounted, 2 piece side entry body, casting body, full and reduced bore
Trim Port type	Full port and reduced port, cylindrical ball flow path, Q-trim options for control service
Design standards	EN, ASME
Size range	EN DN50-DN900, ASME 2"-36"
Pressure class	EN PN10-100; ASME 150-600
Temp range: std / option	-196...+600 °C
Materials: body / trim std and options	WCB & CF8M as std. Options i.e.: Duplex 4A, SuperDuplex 5A, SMO, Hast C
Seat materials	Metal & Soft. Wide coverage of options per application.
Actuators, mounting std	B-series as a standard
Control / Monitoring, mounting std	On/off: EN, EQ, AM with Control: NE, NP, ND, NDX-series
Certificates, approvals	API 608, API607, ISO15848-1, TA-Luft, Ex, CE-PED, IEC 61508 type A, TR CU 032, TR CU 012
Assembly testing: std option	All with functional and leakage testing as std.
Application areas	All general and demanding on/off applications including fouling, sticky and other more demanding flow medias. Options for control service trims.



Trunnion mounted ball valve

D1, D2

D series features

- Standard Live-loaded packing
- Unique stem ball design with no hysteresis
- Self-flushing, low noise anti-cavitation Q-Trim[®]
- Available in cryogenic construction
- Multiple seat designs for different uses



Stem Ball

- Eliminates any backlash from stem connection to ball slot.
- Robust design allowing for large mounting actuators
- Available with Q trim technology



Challenge

Hysteresis in throttling service

Solution

Stem Ball

Cryogenic requirements

- “C” seat design for cryogenic applications.
- Available to -200°C
- Stem extensions available



Challenge

Cryogenic Service

Solution

D-series with stem extension and unique seat design

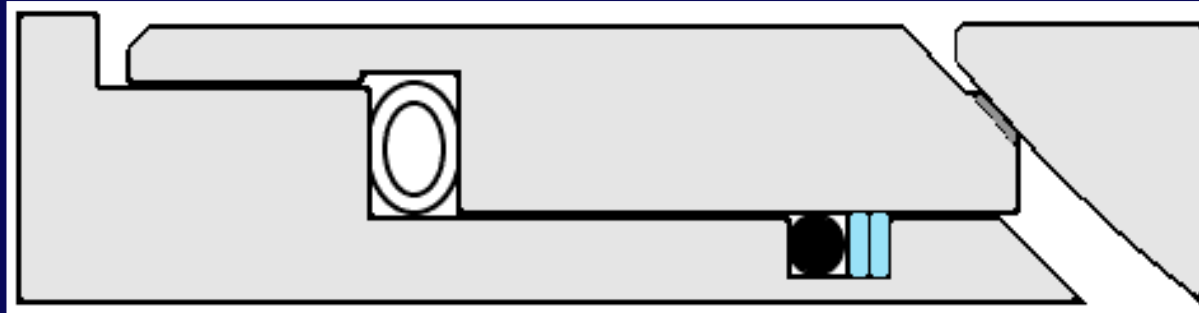
D-series seat designs

Standard spring-loaded seat

- **S seat – General scraping seat**
- Utilizes an Inconel spring and an o-ring on the OD of the seat

Application:

Clean liquids and gas services at moderate temperatures

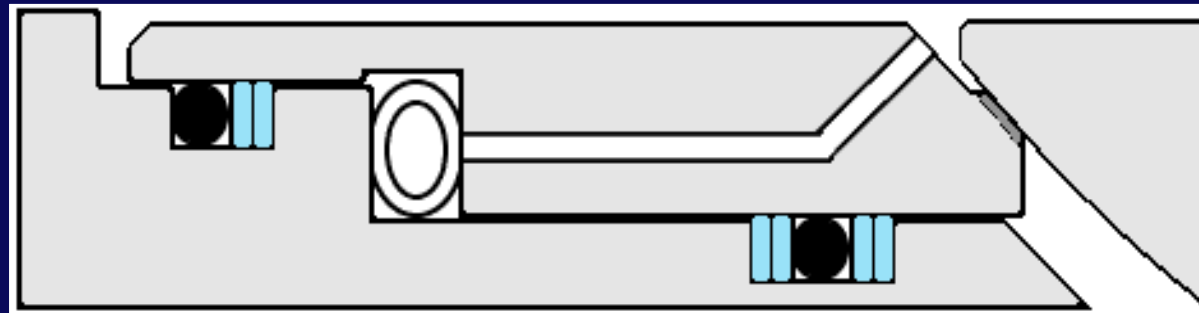


Ejector Control Seat

- **E seat –**
- Used in control service applications where the seat will eject away from the ball while throttling. This can also be used in shut off applications with minimum leakage.

Application:

Clean liquids and gas services at moderate temperatures

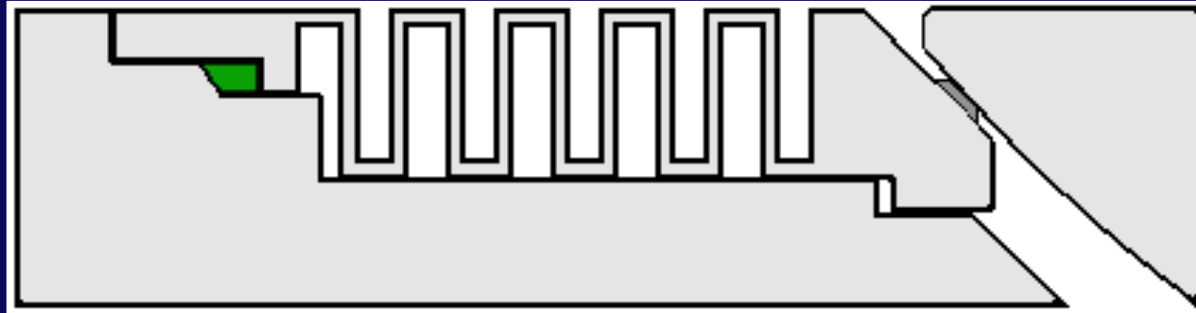


D-series seat designs

Cryogenic seat

- **C seat – Cryogenic seat**
- A bellows seat design that acts as the spring to make contact with the ball. Graphite seal prevents leakage from going behind the seat plus fire safe.

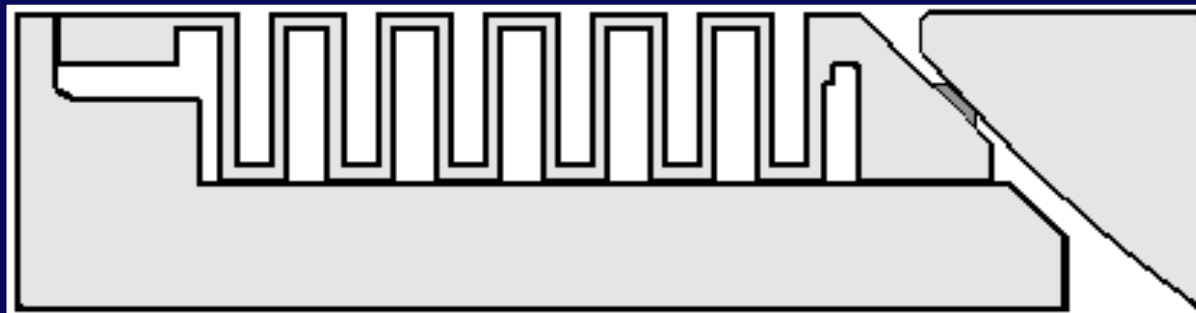
Application:
Clean cryogenic applications
Liquid nitrogen



Bellows Seat

H seat – A bellows seat design that acts as the spring to make constant contact with the ball.

Application:
Clean liquid and gas applications



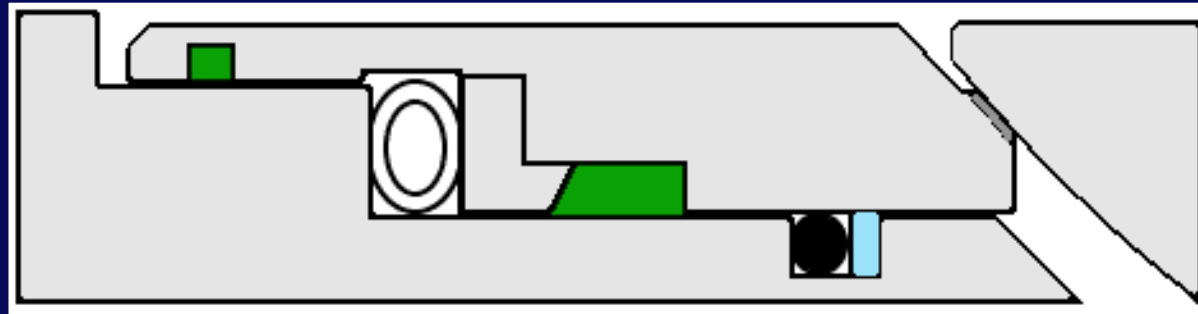
D-series seat designs

Solids Proof seat

- **K seat – Solids proof seat**
- Utilizes an o-ring seal along with two graphite seals to prevent media interrupting the spring force.

Application:

Used in applications that require that have small particles and dust that typically can get behind the seat.



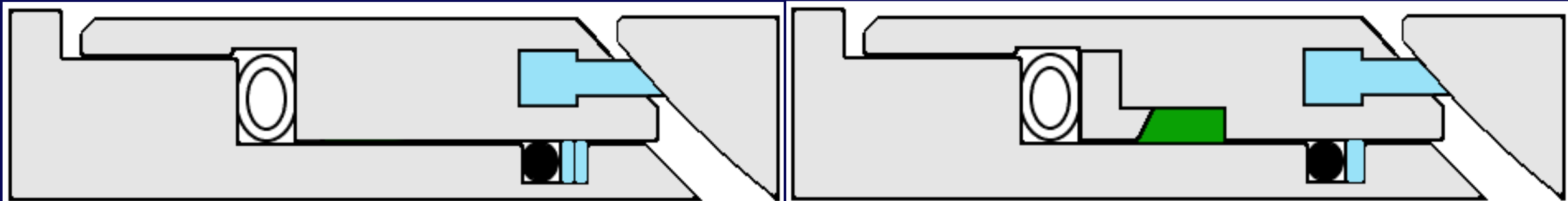
Soft seated

T and D soft seats

- Utilizes a plastic insert to achieve tighter shutoff
- Can achieve Class VI shutoff
- The D seat has a graphite seal for fire safe.

Application:

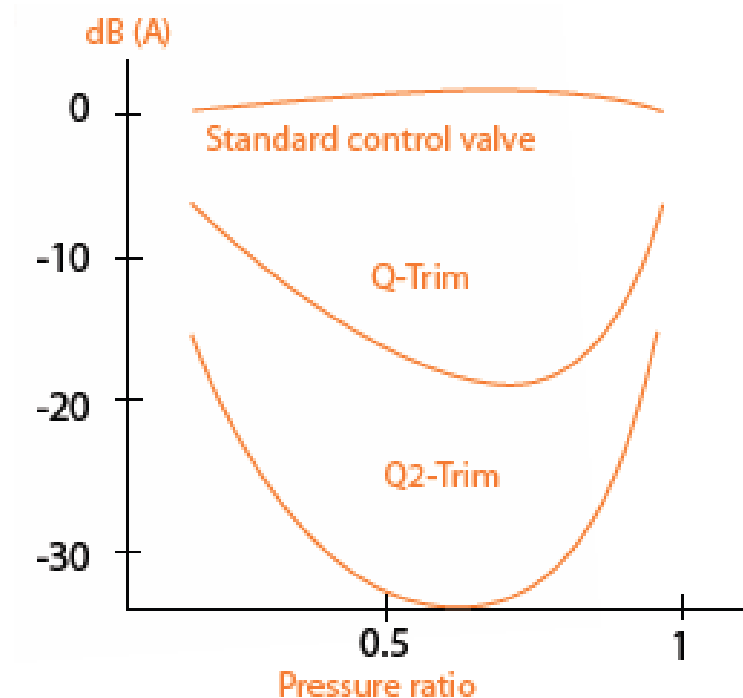
Clean liquid and gas applications



Q-trim Neles Ball Valves

Anti-Noise / Anti-Cavitation Trim

Q2-Trim



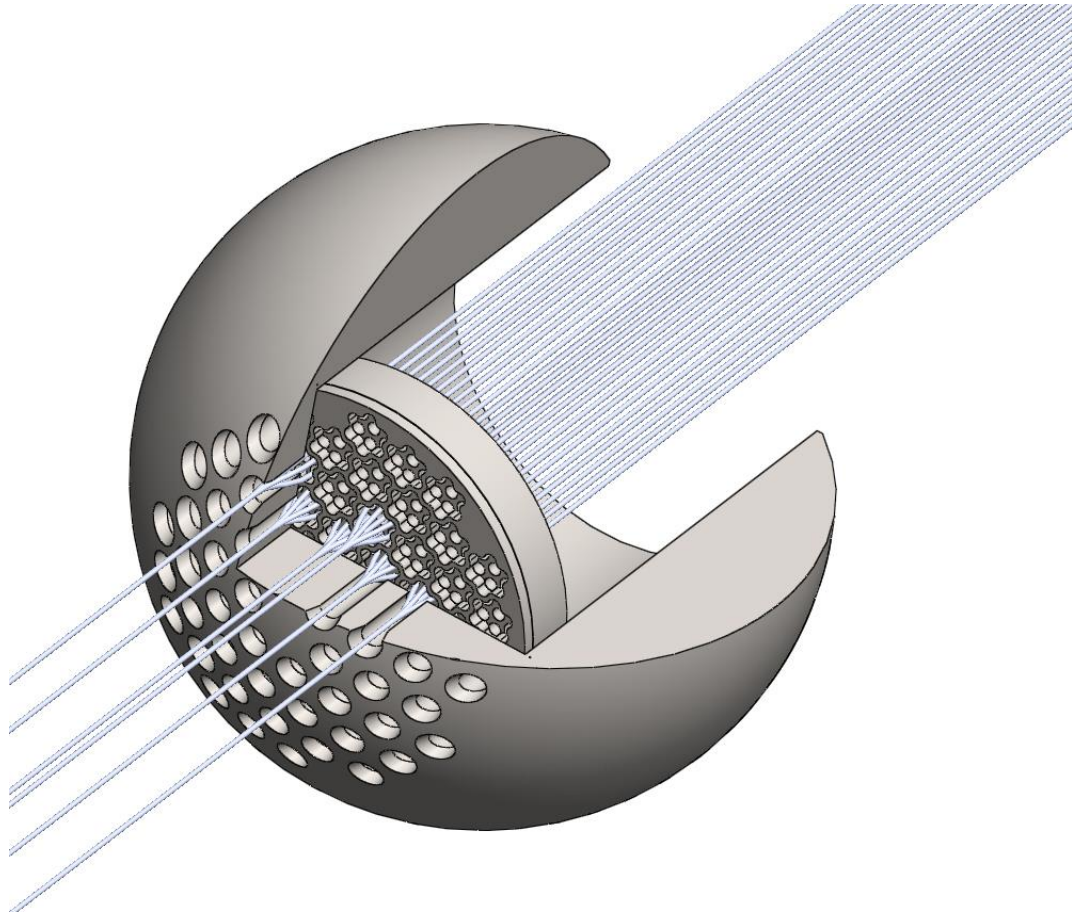
- Q2-Trim
 - Vapor / Gas for Noise Reduction
 - Should be relatively clean to avoid clogging
 - Trunnion Ball Valves
 - Max attenuation 32 dB
 - Utilized in place of diffusers

- Q-Trim
 - Liquid for Cavitation Prevention
 - Vapor / Gas for Noise Reduction
 - Self Cleaning
 - Handles dirty fluids / particles
 - R-Series, Finetrol, M-series, X-series, D-series
 - Max attenuation 18 dB

Anti-Noise / Anti-Cavitation Trim

NELES

Q2-Trim



- Q2-Trim
 - Vapor / Gas enters larger holes first
 - After large set of holes, media enters expansion chamber (looks like honeycomb patterned plate)
 - Each larger hole is divided into 7 smaller holds for a second stage of attenuation

Neles Application Specific Ball Valves

NELES



T5 Series
Bulletin: 1 T5 20 EN



S6 Series
Bulletin: 1 S6 20 EN



E-series
Bulletin: 1 E2 20 EN

Trunnion mounted ball valve, series T5

Features

Valve Design	Trunnion mounted, 2 piece side entry body, casting body, reduced bore
Trim Port type	Reduced port, cylindrical ball flow path, Q-trim, Q2-trim options for control service
Design standards	EN, ASME, ISA-S75.08.01 / IEC 60534-3-1 (=Globe valve length)
Size range	EN DN25-DN400, ASME 1"-16"
Pressure class	EN PN10-100; ASME 150-600
Temp range: std / option	-196...+600 °C
Materials: body / trim std and options	WCB & CF8M as std. Options i.e.: Duplex 4A, SuperDuplex 5A, SMO, Hast C
Seat materials	Metal & Soft. Wide coverage of options per application.
Actuators, mounting std	B-series as a standard
Control / Monitoring, mounting std	On/off: EN, EQ, AM with Control: NE, NP, ND, NDX-series
Certificates, approvals	API607, ISO15848-1, TA-Luft, Ex, CE-PED, TR CU 032, TR CU 012
Assembly testing: std option	All with functional and leakage testing as std.
Application areas	All general and demanding control applications including fouling and other more demanding flow medias.

NELES

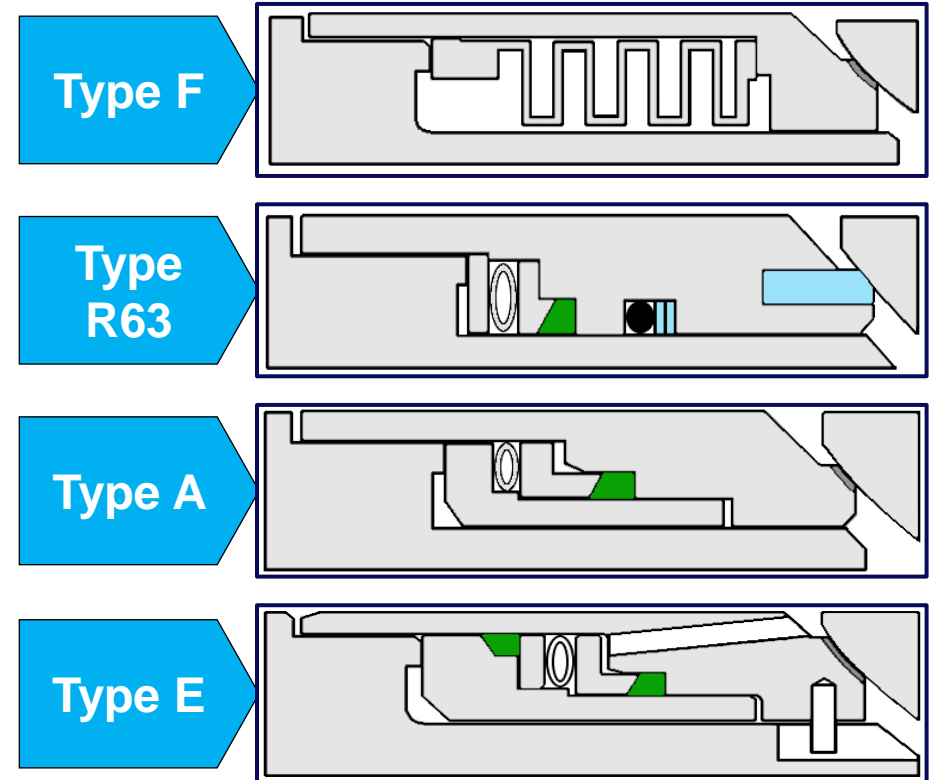


Series Top5 trunnion
mounted ball valve for
control service

T5

T5 series features

- Stable accurate control
 - Live loaded packing
 - Highest C_v per nominal size
 - Long lasting excellent seat tightness
 - Suitable for impure and abrasive fluids
 - Easy to maintenance due to top entry
 - Multiple seat designs
-
- Suitable for
 - ESD applications – Safety shutoff
 - switching applications
 - molecular sieving (drying ethanol), coal gasification
 - Severe service control
 - Cryogenic service

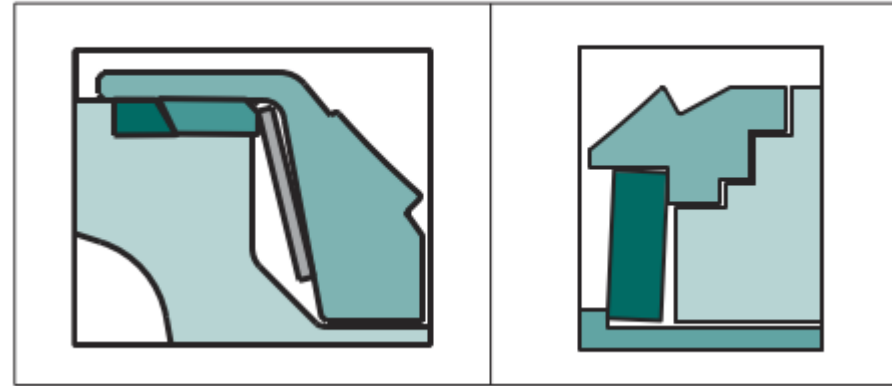


S6 series features

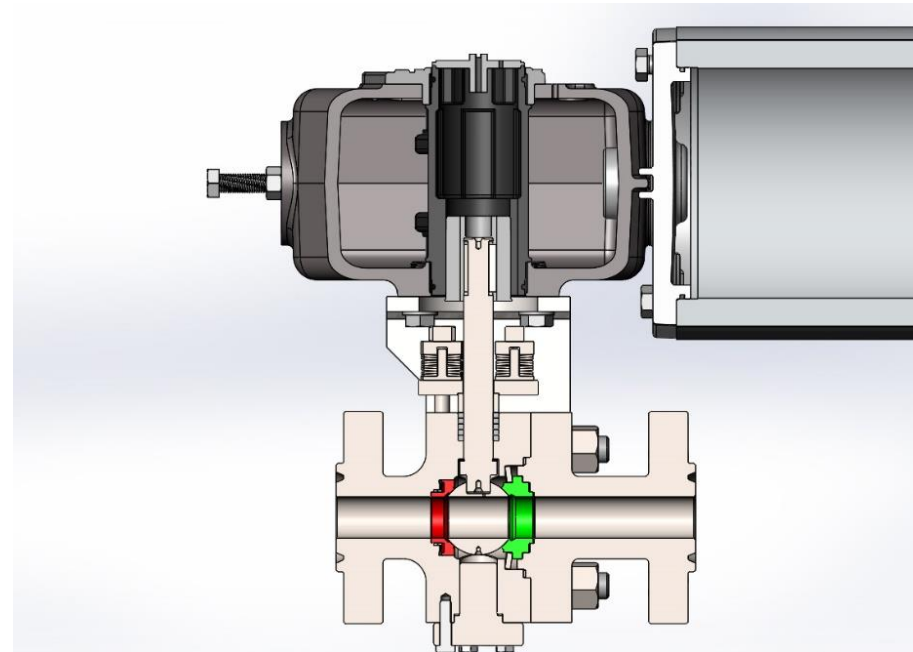
- Available in forged (S6) or casted body (S7)
- Available in Class VI shutoff/API 598
- Wide selection of materials available
- ASME 900 – 1500 Class, Seat supported
- High pressure and high temperature designs

- Suitable for
 - Hydrocarbons
 - Catalyst handling
 - Liquid, gas, and steam applications
 - Oxygen and power plants

H Seat



NELES



Ceramic ball valve, series E

Features

Valve Design	Seat supported, 1 piece side entry body, casting body, reduced bore
Trim Port type	Reduced port, cylindrical ball flow path
Design standards	EN, ASME
Size range	EN DN25-DN200, ASME 1"-8"
Pressure class	EN PN10-100; ASME 150-600
Temp range: std / option	-50...+450 °C
Materials: body / trim std and options	CF8M as std. Options i.e.: SuperDuplex 5A, Hast C
Seat materials	Ceramic or Metal Matrix Composite. Wide coverage of options per application.
Actuators, mounting std	B-series as a standard
Control / Monitoring, mounting std	On/off: EN, EQ, AM with Control: NE, NP, ND, NDX-series
Certificates, approvals	Ex, CE-PED, TR CU 032, TR CU 012
Assembly testing: std option	All with functional and leakage testing as std.
Application areas	Demanding control applications including highly erosive and other demanding flow medias.

NELES

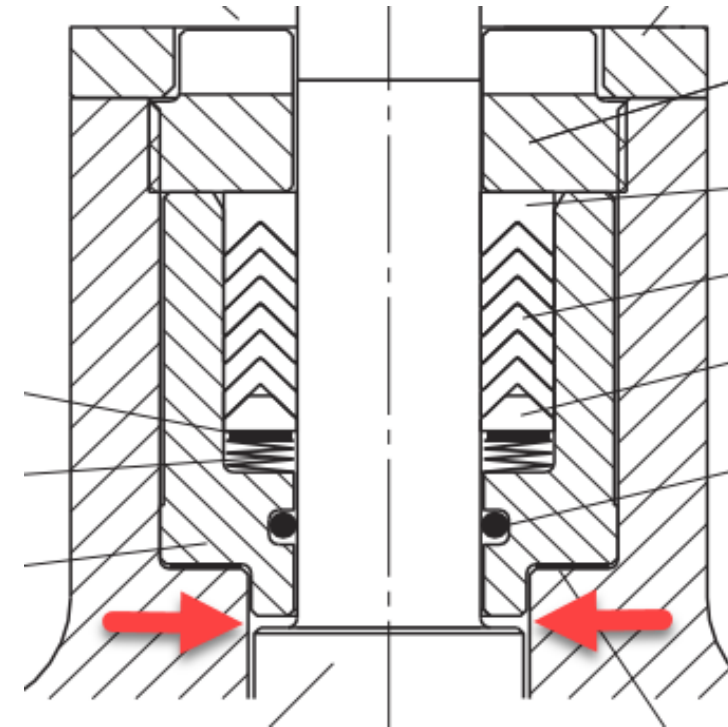
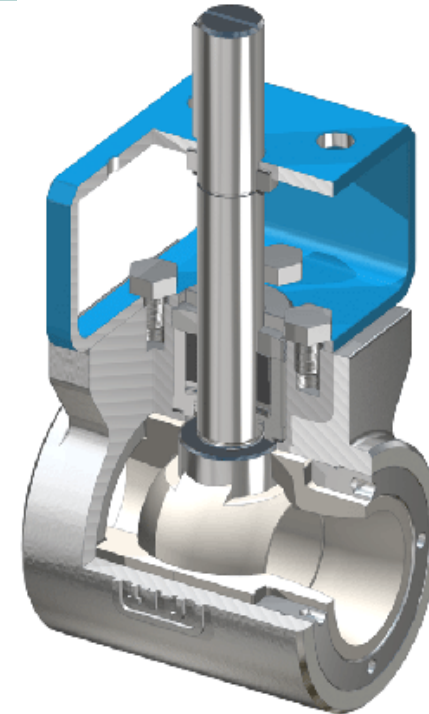
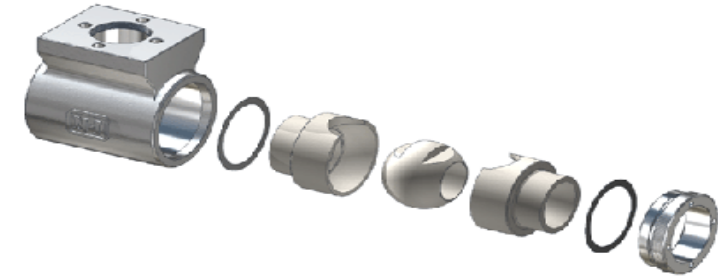
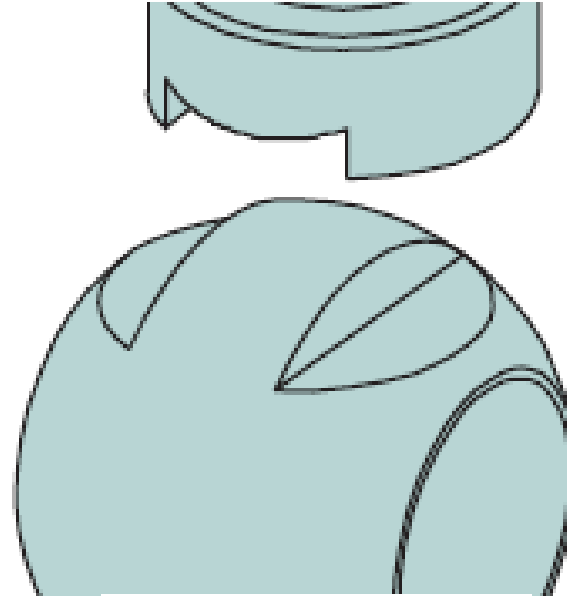


Series E2, E6 ceramic ball valve for erosive control service

Also available with MMC (Metal Matrix Composite)

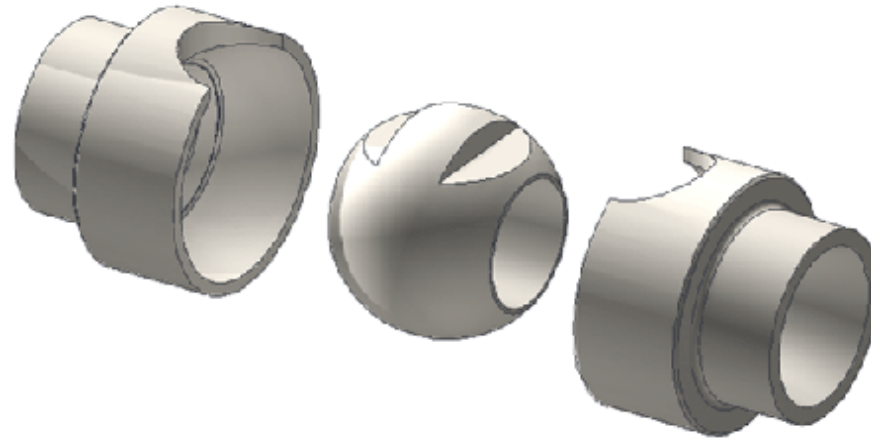
E Series Features

- Live-loaded packing
- Complete ceramic flow path
- Unique stem connection to prevent backlash
- Resistant to thermal shock up to 700 F
- Available in wafer and lugged style
- One piece body
- Actuators are pre-sized.



Applications/processes

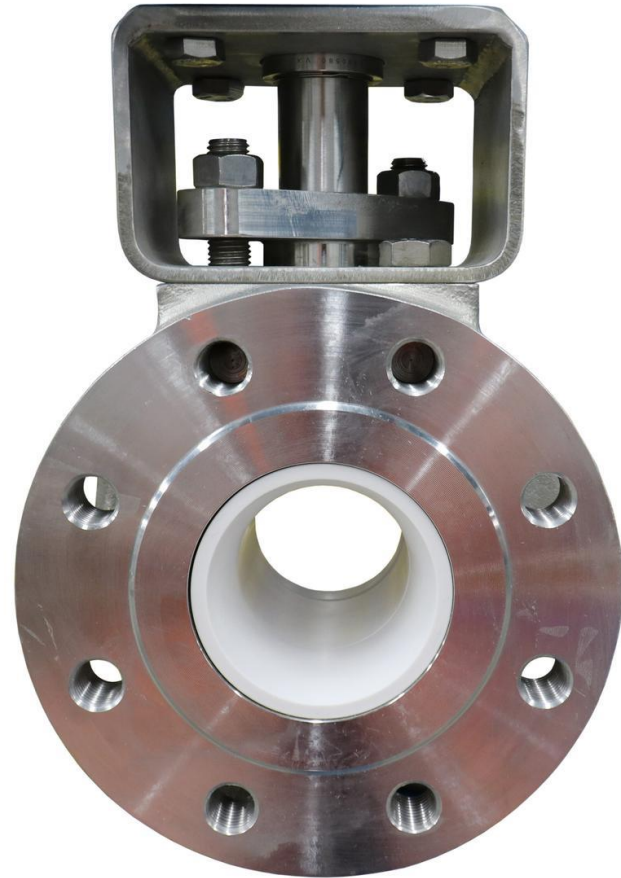
- Lime mud control
- Kaolin, china clay control
- Carbonate handling
- Gypsum handling
- Cement production
- Metal slurries
- Catalyst regeneration
- Desulphurization units



Lugged style version of the E series.

Full ceramic waterway

NELES



Seat Leakage

Test Pressure (psig) ->	Maximum Acceptable Leakage (ml/min)						Drops / Min
	ANSI / FCI 70-2 2013		ISO 5208				API-598
	50		73 to 102				60 to 100
Valve Size (in)*	Class V	Class VI	Rate A	Rate B	Rate C	Rate D	Low Pressure Test
1	4.7	0.15	0	0.45	4.5	45	0
1.5	7.05	0.30	0	0.72	7.2	72	0
2	9.4	0.45	0	0.9	9	90	0
2.5	11.75	0.60	0	1.17	11.7	117	10
3	14.1	0.90	0	1.44	14.4	144	12
4	18.8	1.70	0	1.8	18	180	16
6	28.2	4.00	0	2.7	27	270	24
8	37.6	6.75	0	3.6	36	360	32
10	47	11.1	0	4.5	45	450	40
12	56.4	16.0	0	5.4	54	540	48
14	65.8	21.6	0	6.3	63	630	56
16	75.2	28.4	0	7.2	72	720	64

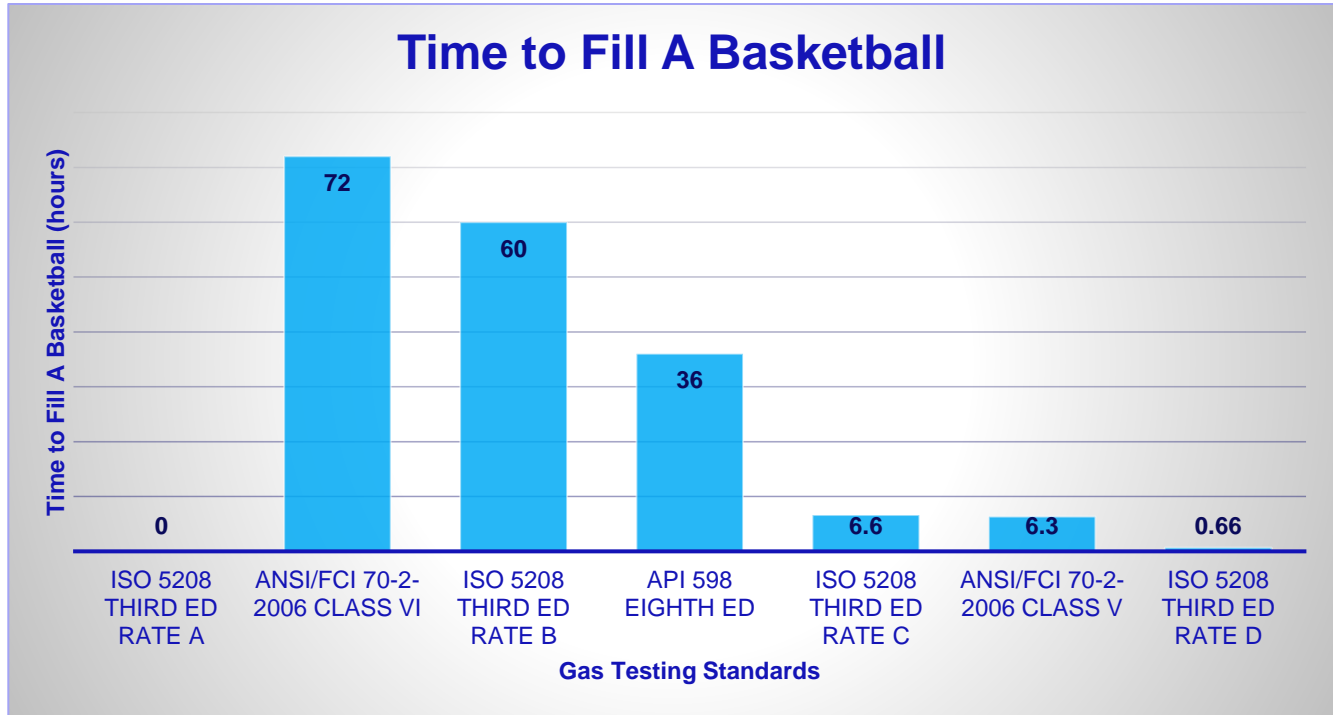
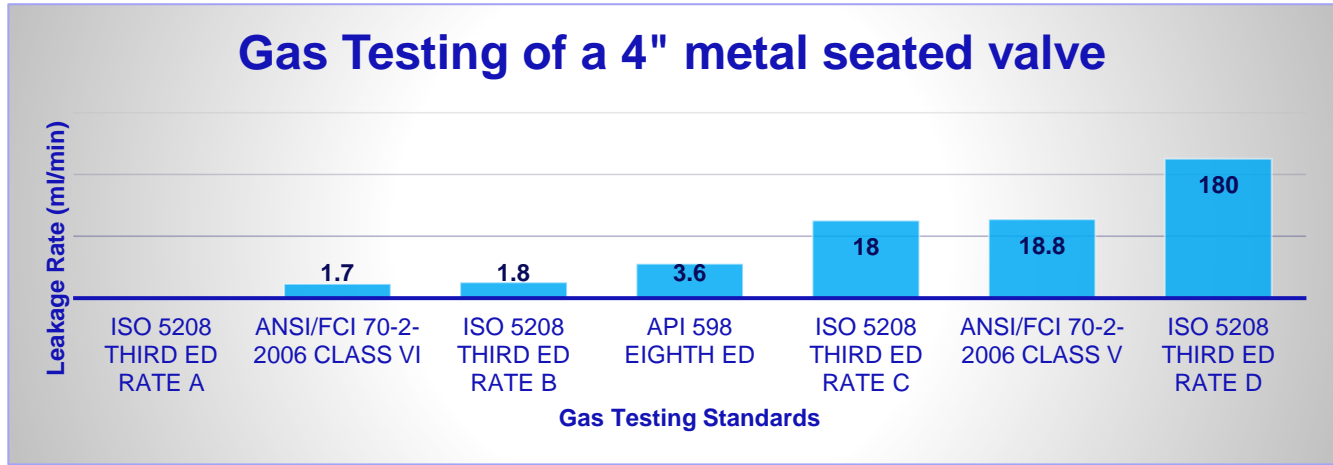
* Assumed full size seat diameter for ANSI / FCI 70-2-2013

Comparison of Leakage Rates Using Water

Pressures based on ASME class 300 carbon steel body rating 740psig per ASME B16.34

Test Pressure (psig) ->	Maximum Acceptable Leakage (ml/min)					
	ANSI / FCI 70-2 2013	ISO 5208				API-598
	740	814				814
Valve Size (in)*	Class V	Rate A	Rate B	Rate C	Rate D	High Pressure Test
1	0.37	0	0.015	0.045	0.15	0
1.5	0.56	0	0.024	0.072	0.24	0
2	0.74	0	0.03	0.09	0.3	0
2.5	0.93	0	0.039	0.117	0.39	5
3	1.11	0	0.048	0.144	0.48	6
4	1.48	0	0.06	0.18	0.6	8
6	2.22	0	0.09	0.27	0.9	12
8	2.96	0	0.12	0.36	1.2	16
10	3.70	0	0.15	0.45	1.5	20
12	4.44	0	0.18	0.54	1.8	24
14	5.18	0	0.21	0.63	2.1	28
16	5.92	0	0.24	0.72	2.4	32

* Assumed full size seat diameter for ANSI / FCI 70-2-2013



Industry standards vs Customer expectations

- Industry test standards are utilized for production testing of a valve. This provides a quality check to ensure the valve was assembled properly and is functioning as intended.
- The testing standards do not represent how the valve will perform once it is in line.
 - Different media – Gas vs liquid
 - Different pressures – higher or lower pressure

Closure test tightness

When customer specifies tighter sealing, please contact Product Manager to confirm availability

Neles Metal Seat Supported	X series		M series	E series
	H/G/K/S Seat	J seat	S/P Seat	Ceramic Seat
Standard Leakage offering	ISO 5208 Rate C (water)	ISO 5208 Rate D (water)	ISO 5208 Rate D (water)	ISO 5208 10 X Rate D (water)
Optional Tests (Water)	ANSI class V, API-598	N/A	ANSI class V, API-598, ISO 5208 Rate C	Check with PM
Optional Tests (Air)	ANSI class V & VI, API-598, ISO 5208 Rate C	ANSI class V	ANSI class V & VI, API-598, ISO 5208 Rate C	Check with PM

Closure test tightness

When customer specifies tighter sealing, please contact Product Manager to confirm availability

NELES

Neles Metal Trunnion mounted	X series		M series	
	S/B/G/K/L Seat	D/T Soft Seat	S/P Seat	T Soft Seat
Standard Leakage offering	ISO 5208 Rate C (water)	ISO 5208 Rate B (water)	ISO 5208 Rate D (water)	ISO 5208 Rate A
Optional Tests (Water)	ANSI class V, API-598		ANSI class V, ISO 5208 Rate B,C	
Optional Tests (Air)	ANSI class V & VI, API-598, ISO 5208 Rate C		ANSI class V & VI, API-598, ISO 5208 Rate D	
Neles Metal Trunnion mounted	D series		T series	S6 Series
	H/S/E/C/K Seat	D/T Soft Seat	A/E/F Seat	H Seat
Standard Leakage offering	ANSI class V (water)	ANSI class VI	ANSI class V (water)	ANSI class V (water)
Optional Tests (Water)	ISO 5208 Rate C, API 598		ISO 5208 Rate C, API 598	
Optional Tests (Air)	ANSI class V & VI, API-598, ISO 5208 Rate C		ANSI class V & VI, API-598, ISO 5208 Rate C	ANSI class VI, API 598

Seat and ball coatings

Coatings on seats and balls

- Increases wear resistance on the moving parts.
- Helps maintain valve sealing tightness.
- Chemical corrosion resistance is dependant upon base material.
 - Coating must be resistant and compatible for the media but it is not used to protect the base material.

Challenge

Rubbing/galling

Protection of parts

Solution

Coatings are applied to the surface of balls and seats

Seat Coating Scope

Code	Description	Process	Hardness HV	Thickness mm
Alloy 6	Co-base alloy (Stellite)	PTA welding	365-440	1,0-2,0
Alloy 50 Nb	Co-base alloy (Stellite)	PTA welding	400-480	1,0-2,0
Alloy 12	Co-base alloy (Stellite)	PTA welding	430-500	1,0-2,0
NiBo2	Ni-base alloy	Spray and fuse	650-750	0,5-1,0
WC-Co	Tungsten carbide	Thermal spray HVOF	1000	0,15-0,20
TC2	Tungsten carbide	Thermal spray HVOF	1000	0,15-0,20
CrC-LF	Chromium carbide	Thermal spray HVOF	800	0,15-0,20

Ball Coating Scope

Coating code	Description	Hardness*HV	Process
HCr	Hard chromium	1000	Electroplating
NiBo	Ni-base alloy	650	Thermal spray and fuse (S&F)
WC-Co	Tungsten carbide	1000	Thermal spray HVOF
TC2	Tungsten carbide	1100	Thermal spray HVOF
CrC-NiCr	Chromium carbide	800	Thermal spray HVOF
TiO2	Titanium oxide, ceramic coating	700	Plasma spraying
Cr2O3	Chromium oxide, ceramic coating	1000	Plasma spraying

Coatings on balls

Hard Chrome

- Suitable in liquid and gas applications
- Has similar corrosion resistance as stainless steel

Size of ball in NPS	Minimum stroke time in sec
NPS of ball trim, inches	HCr coating, min (sec)
1	No limit
1H	No limit
2	No limit
3	1
4	1
5	2
6	3
8	6
10	7
12	8
14	10
16	11
18	13
20	14
24	17
26	18
28	20
30	21
32	22
36	25



Challenge

Rubbing/galling

Protection of parts

Solution

Hard Chrome on balls

Coatings on balls

Hard Chrome

- Strong acids (hydrochloric, sulphuric, acetic acids)
- Seawater, brine
- Demineralized water
- Do not use for quick operating



Challenge

Application limitations for hard chrome

Coatings on seats

Stellite cobalt based alloy (seats)

- Plasma transfer arc welding
- Stellite is the most common grade used on Neles seats
- Resistant to wear
- Different types of Stellite are used dependent on the service conditions



Challenge

Rubbing/galling

Protection of parts

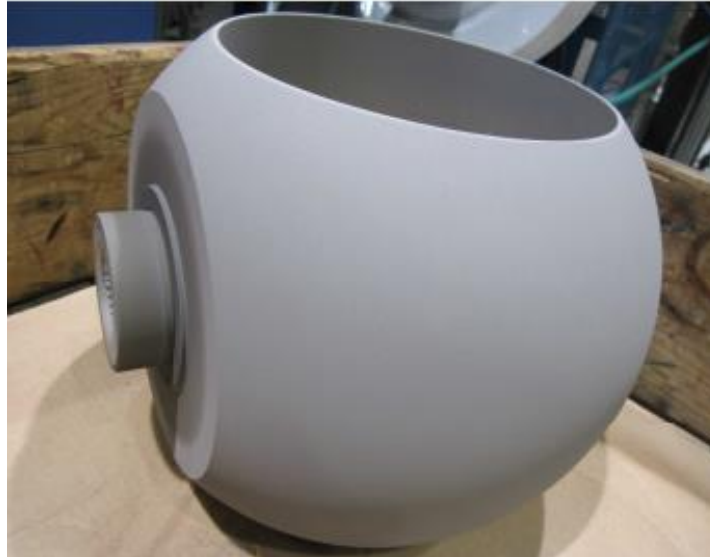
Solution

Stellite cobalt based alloy
(seats)

Coatings on seats and balls

Tungsten carbides (Ball and seats)

- Abrasive and solids handling services
- High cycle services
- Fast operation
- Oxygen and Cryogenic services
- Dry gas services



Challenge

Fast operation / high cycle requirements

Solution

Tungsten carbides (Ball and seats)

Coatings on seats and balls

Tungsten carbide

- Corrosive services in general
- Condensates (water)



WC-Co corroded in mixed steam and oxygen service

Challenge

Application limitations for Tungsten carbides

Coatings on seats and balls

Chromium carbide (Ball and seats)

- High Temperature gas services (up to + 600C)
- Abrasive services
 - Catalyst handling
 - Slurries
- Chloride waters
- Hydrocarbon gases



Challenge

High Pressure/ High temperature

Solution

Chromium carbide (Ball and seats)

Coatings on seats and balls

NiBo (Ball and seats)

- Medium to high pressure steam applications
- Boiler feed water service
- High pressure water or condensates
- Hydrocarbon gases/liquids
- High cycle / thermal cycles



Challenge

Fast operation / high cycle requirements

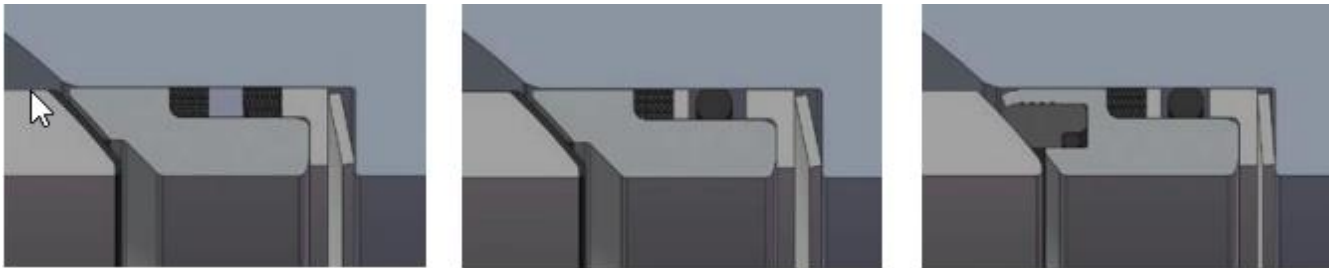
Solution

NiBo coatings

Competitors

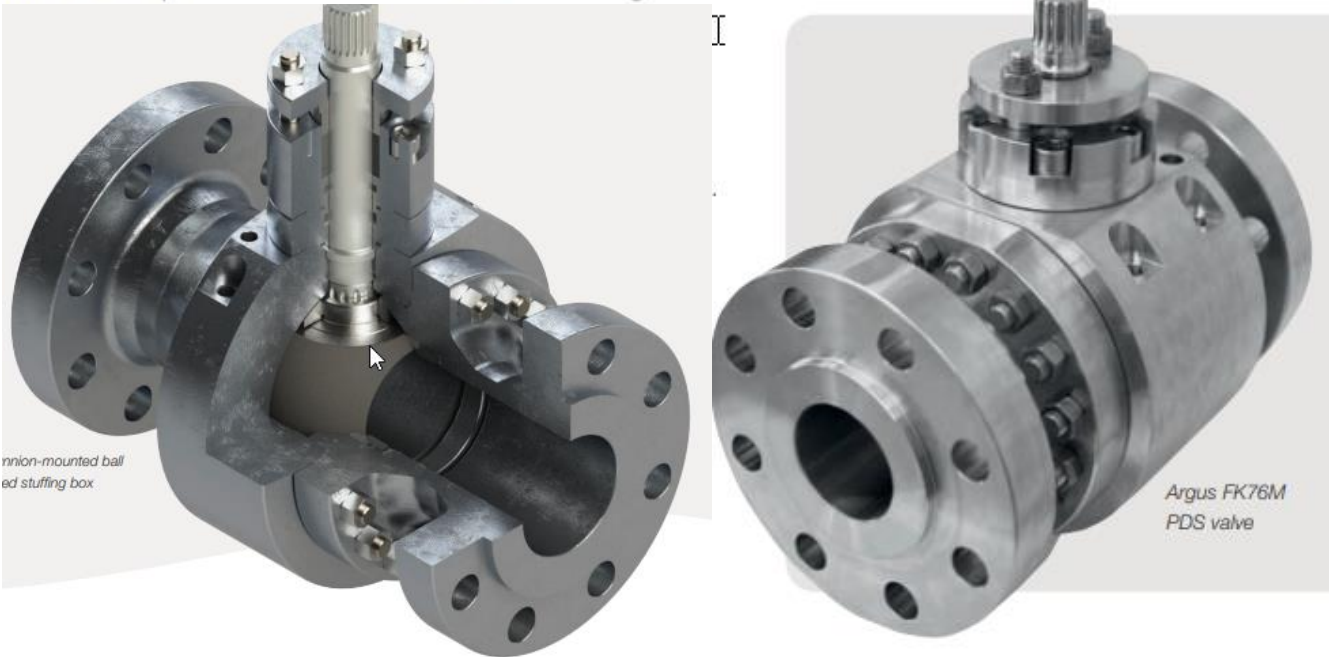
Argus Ball Valves

NELES



Metal seated/Graphite

Metal seated/O-ring



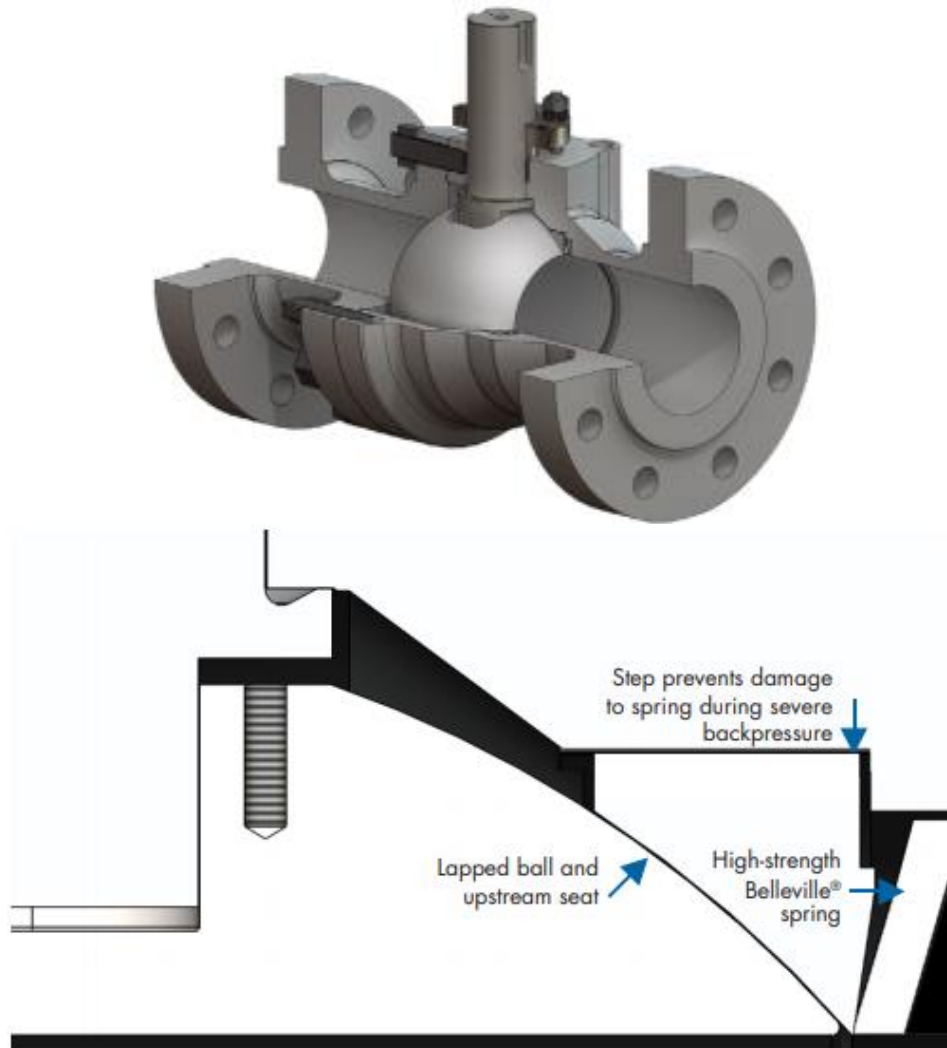
Union-mounted ball valve with stuffing box

Argus FK76M PDS valve

- Spline shaft connects directly to the ball
- No live loading.
- Achieves ISO emissions requirements by use of a stuffing box.
- Only capable of achieving FCI Class V with metal seat.
- Seat area are prone to having media build up and get in the spring area by design.
- Use of O-rings is reliant on temperature and chemical compatibility.
- Provides three seat options, only one able for high temperature.
- Difficult to mount to actuator
- Step design prevents compression of graphite

ValvTechnologies Ball Valve

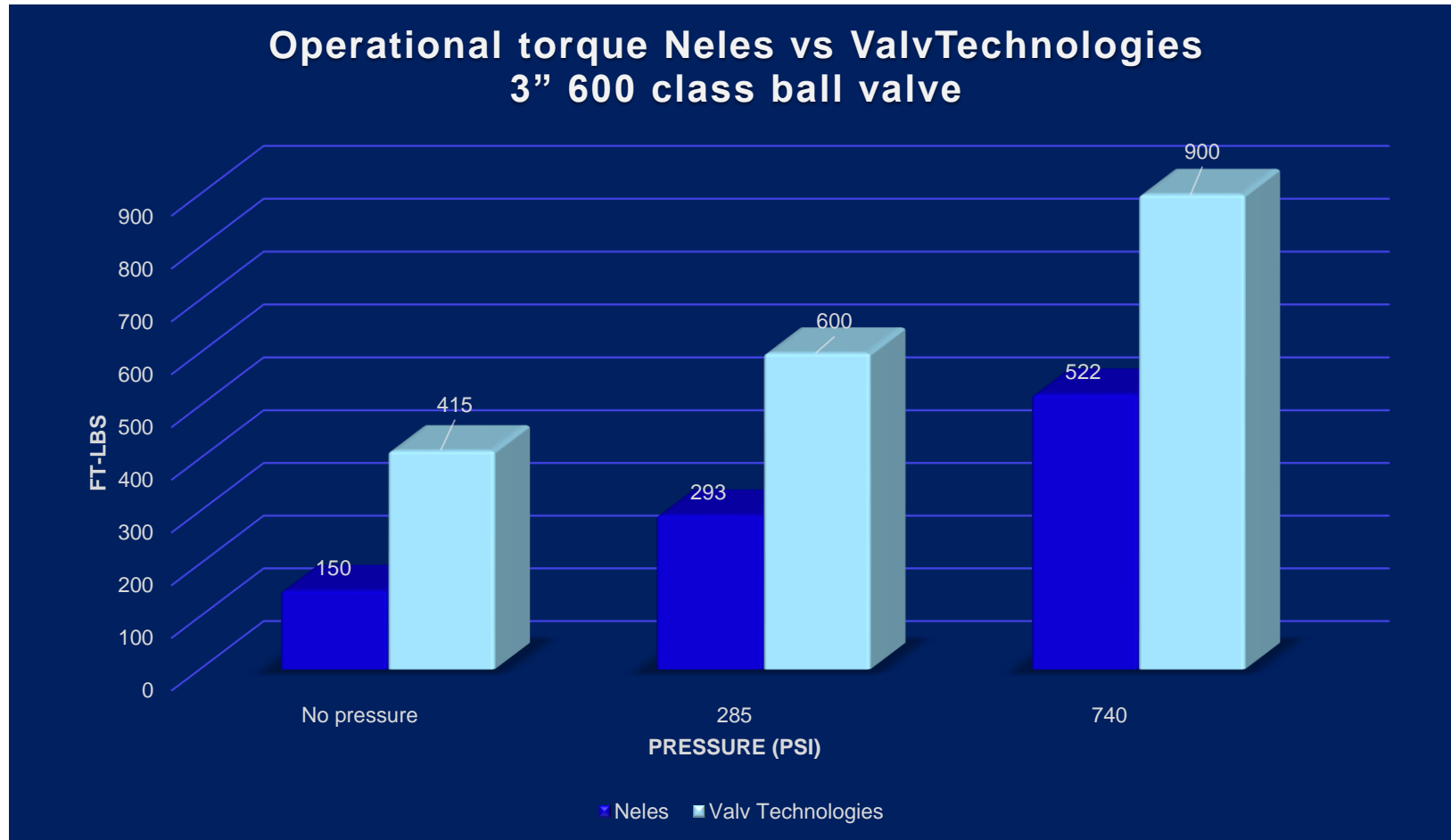
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- Has a slot connect on the ball and stem. Allows for hysteresis and less strength than the spline drive connection.
- Live loading available
- Media can get behind the seat causing the disc spring to jam and not work properly.
- Claims to have zero leakage/bubble tight using metal seats
- Repairability?
 - Metallic body seal used.
 - Downstream seat is integral.

ValvTechnologies Operational Torque vs Neles Ball Valves

NELES



Mogas – C Series

This series covers a large range of metal seated valves for severe service.

- Size Range: ½” – 42”
- Temperature Range: Up to 1652F
- Class: 150 – 4500
- End Connections: Flanged, Welded, hub/clamp, RTJ
- Coatings: Chromium Carbide as standard
- Seat leakage testing – FCI Class VI

Mogas - C series

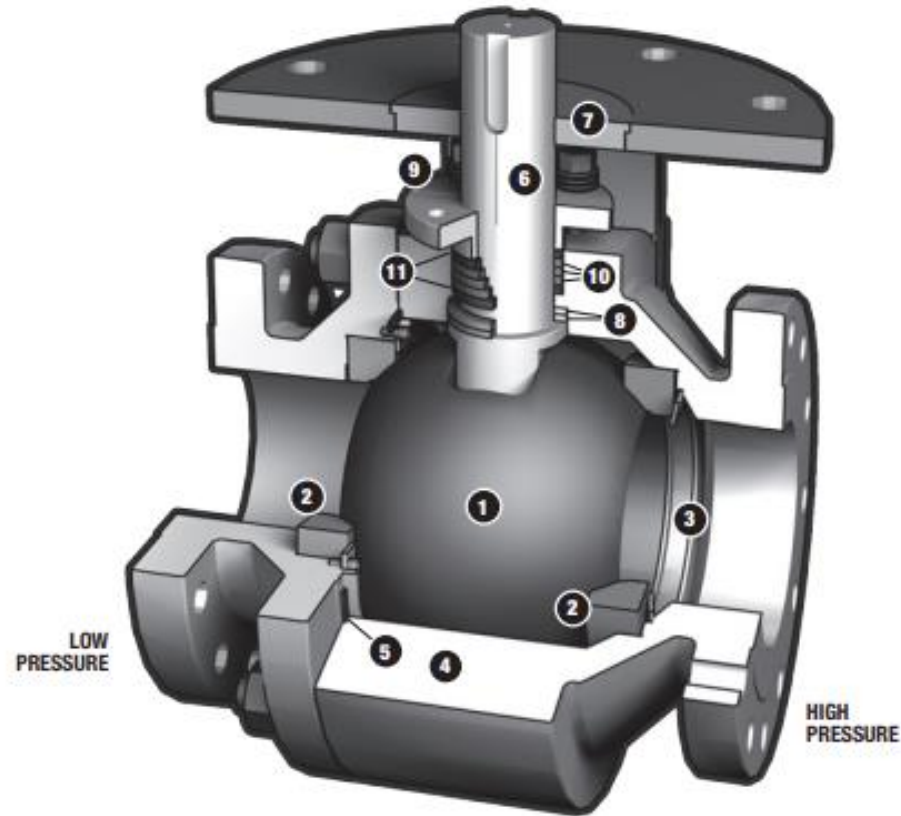
NELES

Has a low-pressure and high-pressure side.

Bill of Materials

Item No.	Description	Material
1	Ball	410SS / CC Coated
2	Seat	410SS / CC Coated
3	Seat Spring	Inconel 718
4	Body	A182 F22 A105 A182 F91
5	Body Gasket	Inconel 600 Grafoil Filled or Inconel 718 / Gold Plated
6	Stem	17-4PH SS or A638 GR660
7	Stem Bushing	Coated Cast Iron
8	Inner Stem Seal	410SS / CC Coated
9	Gland Flange	316SS / Moly Coated
10	Stem Packing	Expanded Graphite
11	Anti-Extrusion Rings	Braided Graphite w/ Inconel Wires

SS = Stainless Steel
CC = Chromium Carbide



Contact us

- Product Manager
 - Michael.Bouckaert@neles.com
- Applications Engineering
 - apps.engineering@neles.com

NELES



- Can I use construction type GA for series XT when the service is Liquid Hydrocarbon Slurry ? – Yes, Typically we use NiBo ball with either H or G seat depending on the solid content.
- L seat ? I thought we do not use it anymore – This is used on special applications. We typically call out the K or B seat in place of the L when applicable.
- Which applications do you recommend use D2 series ball valves? D series in general cover a large scope of sizes and pressure classes. You can use them in on-off/control services. Typically, you want to offer the X series when able as the cost will be significantly less.
- D-series soft seat insert is only available in PTFE + Carbon filler. Why do we not offer Xtreme? Xtreme was brought to the Neles branded valves a few years ago. The D-series did not get this upgrade because the D-series is starting to be phased out by the X series.
- H seat & G seat are they bidirectional? Yes. Both style of seats have the locked in K seat which is your preferred seat to see pressure. However, the valves can handle bidirectional service.
- For same valve size & pressure rating i.e. 6" 300# ;which valve have higher torque requirement between seat supported & trunnion mount valve? – This will depend on the size of the valve and the process conditions. Once you start getting into the larger sizes I.E 8"-12" your trunnion mounted valve could have lower torque than your seat supported.

Reinventing reliability

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