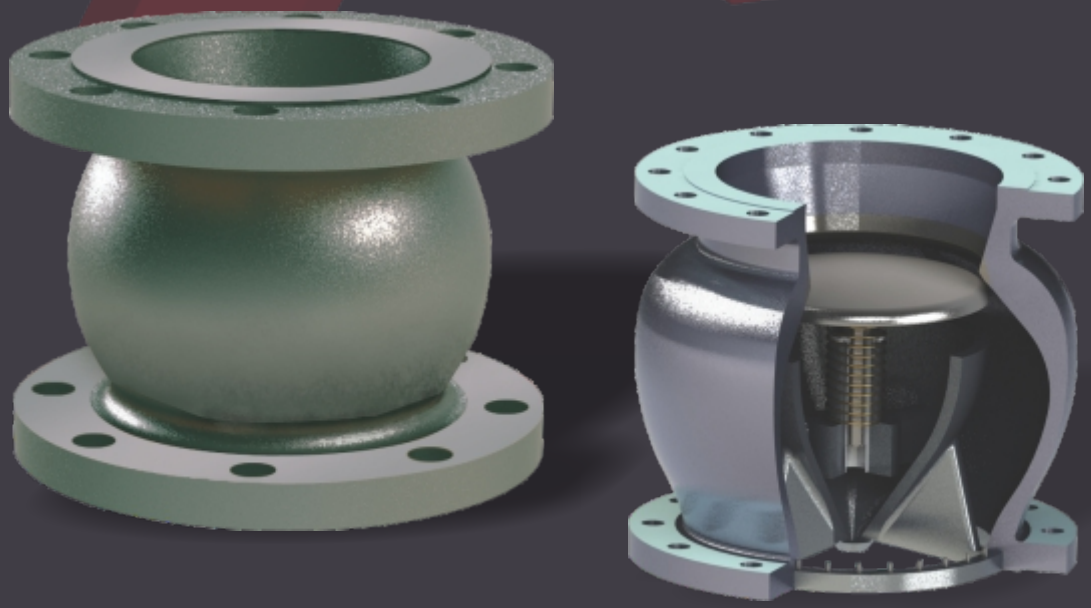
ADVANCE VALVES

Changing the way you think about valves

More than 3 Decades

Axial CHECK VALVE

NZ Series



Changing the way you think about valves...

An Introduction to Nozzle-Check Valves

Having started their operations in 1986 in India, Advance Valves today is globally recognized for their superiority in the design, engineering, manufacturing and supply of Dual plate check valves, double and triple offset butterfly valves ,Concentric butterfly valves and Balancing valves . As a natural evolution to the non-return valve range being manufactured, Advance Valve introduced their NZ-Series of axially operated Nozzle Check non-return valve with non-slam characteristics for special applications. The design incorporated latest 3D designed tools and rigorous computational fluid dynamics analysis validated by experimental testing to ensure a well matured, efficient and reliable product range.

Valve Design

Advance Valve NZ-Series of nozzle check valve design provide streamlined and unrestricted flow through the valve ensuring comparatively higher flow rates and low pressure-drop across the valve which inherently ensures low energy loss in the line thus improving the operational efficiency of any plant in operation. The design takes advantage of the tear drop shaped special venturi design to improve static as well as the dynamic performance of the valve. Due to the robust design of NZ- series valves which encompasses features like low failure rate, practically zero maintenance requirements ,zero seat leakage and improved performance characteristics ,these valves can be effectively, efficiently and safely used in critical process applications in particularly large size gas and liquid flow pipelines.

Advance Valve NZ-Series Nozzle check valve Designs have undergone an extensive design analysis using latest state-of-the-art 3D software tools. The design optimization and thereafter the validation has been carried out by performing complex structural and computational fluid analysis followed by laboratory flow testing . In case, any design customization is found necessary due to Specific application requirements, the customized design shall also undergo similar extensive design analysis on 3D platform before its finalization.

Valve Installation

Advance Valve NZ-Series of nozzle check valve have unique design features which are most suited for the installation in critical process applications such as high valued rotating equipment to avoid reverse flow and systems expecting water hammer conditions such as in liquid pipelines. Moreover, these valves provide trouble free operation in wide range of process fluids including moderately high viscous fluids, light and heavy hydrocarbons clear and contaminate water, fluids having presence of light solids et.

Valve Maintenance

Advance Valve NZ-Series of nozzle check valves are practically maintenance free due to the fact that has been designed to minimize the effect of erosion and corrosion thus reducing the process down time. Moreover these valves have no soft parts or resilient operational component which can deteriorate during operation. These features considerably improve the operational up-time, reduce maintenance cost and therefore substantially reduce the operational cost irrespective of the application.

Specific Applications

Advance Valve NZ-Series of nozzle check valves have fast dynamic response which provide excellent solution to water hammer and reverse flow problems. Since this valve design restricts the reverse flow through the valve , therefore these valves are highly recommended for their use in liquid and gas pipeline applications including for compressor stations and pumping stations, large size water pipelines, Large and critical centrifugal compressors Refineries and petrochemicals, off-shore Hydrocarbon assets etc.,

DESIGN FEATURES:

Advance Valve NZ-Series of nozzle check valve have been designed to provide an efficient valve operation and reliable non-return valve function by ensuring full valve opening at very low flow, allowing full flow under normal conditions and fast closing under reverse flow conditions. Some of the major design features of this valve are:

1. **Special Seating Design:** Specially profiled metal to metal seating surface design provides an excellent alignment between seat and disc. This feature ensures high degree of closure against leakage through the valve seat even under worst operating conditions without the need of any additional sealing arrangement.
2. **Reliable non-slam Operation:** This valve has been specifically designed to avoid water hammer in the pipeline system. Optimized disc travel and suitably designed spring provides fast closure of valve when the pressure upstream of the valve drops. This feature helps preventing the reverse flow through the valve, eliminating the possibility of damage caused by water hammer in the system.
3. **Low minimum Flow requirement:** The spring of Advance Valves NZ- series of axial flow valves is designed in such a way that the valve achieves its full opening at low flows. Due to this design feature, the disc always remains seated on the diffuser and avoids chattering of the valve disc under normal operating conditions.
4. **Unique Diffuser design:** In order to enhance the performance of the valve ,Advance valve have developed an improved Tear Drop shape diffuser design which ensures a uniform flow pattern in the valve. This diffuser design ensures a streamlined and turbulence free flow through the valve.
5. **High capacity & Low Pressure Drop Design:** Fluid Flow and Pressure drop across the valve is largely affected by the internal profiles of the valve body and diffuser. The specific shape of the diffuser and special body profile make the flow path aerodynamic and ensure a streamlined flow through the valve body. This design also eliminate turbulence and generation of eddies which not only reduces the pressure drop across the valve body but also prevents the erosion and vibrations.
6. **Ease of Installations:** Advance's valves NZ-series of axial flow valves are not orientation sensitive and can be installed in any direction in a pipeline such as in vertical or horizontal position. These can be installed in above ground or underground pipelines without compromising on any operational feature. The valve can be installed between the line flanges without the need of any additional mountings arrangement which helps in easy installation.
7. **Standardized End-to-End Dimensions:** End-to-End dimensions of the valve have been standardized as per Advance valve manufacturing standards. This standardization helps in faster engineering and easy installation.
8. **Maintenance-free design:** Advance's valves NZ series of axial flow valves have been designed

keeping long maintenance free valve operational life in mind. The design features like all metal construction, erosion free stream lined flow and non-chattering disc operation ensure long and trouble free life of the valve.

9. **Design customization** Advance's valves NZ series of axial flow valves have been designed considering their suitability for their installation in most of the critical process applications. The design can be customized to suit any specific application or customer requirements.

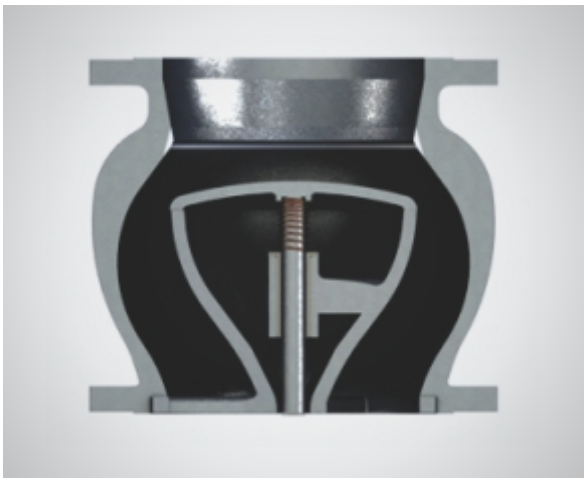
10. **No Fugitive Emission to Atmosphere:** The valve design is compact and has no leakage path to environment. The valve body design has one piece construction with all valve components assembled with the body casing. Moreover there is no bonnet, no gland packing or no through-and-through body drilling which could form the potential source of leakage to atmosphere.

VALVE OPERATION

Valve move from close Position to Open position -

When the valve is in close condition, the disc rest on the metallic seat assisted by the spring. When the pressure at the inlet of the valve exceeds the crack opening pressure of the valve, the disc lifts off the seat and sits on the diffuser against the spring force. This allows maximum unhindered flow area through the valve body. The valve body and diffuser provide streamlined flow through the valve allowing very low pressure drop across the valve. Since the spring is designed to sustain valve opening even at low flow, the valve disc never attains an intermediate position, avoiding valve damage due to chattering .

Valve in **OPEN** Position



Valve in **CLOSE** Position

Valve move from open position to close position- When the upstream pressure falls and flow tend to stop and the disc moves to the close position assisted by the spring under reducing hydraulic force. The spring forces the disc to move to the seating position before the reverse flow starts. Further, the hydraulic force generated by the reverse surge assist the spring force to achieve tighter closure. Also since the valve has been designed considering the low disc travel, the valve avoids the reverse flow through the valve and as a result overcomes the water hammer situation.

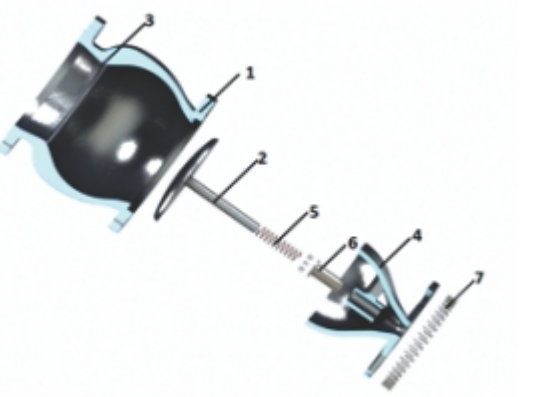
TECHNICAL SPECIFICATION

Size Range	:	1” - 48" (DN 25 - DN 1200). (Contact manufacturer for sizes higher than 24” (600mm) as well as for pressure ratings more than ANSI #300)
Pressure Rating	:	ASME/ANSI 150# to 300# as per B 16.34
End connection	:	Double Flange as per ASME/ANSI B 16.5. Other end connections are available on request
Material of Construction	:	Refer Table -1 for standard material of construction. Other materials are available on request
Valve Design Type	:	Cone type diffuse design up to 300mm Tear drop Diffuser design from 350mm to 1200mm
Flow Coefficient (CV)	:	Refer Table -3 for flow coefficient data
Testing standard	:	As per API 598
Face to Face Dimension	:	Manufacture's Standard. For details refer Table-2 on Standard Dimensions and weight

STANDARD MATERIAL OF CONSTRUCTION

Table-2 Standard Material of Construction[1]

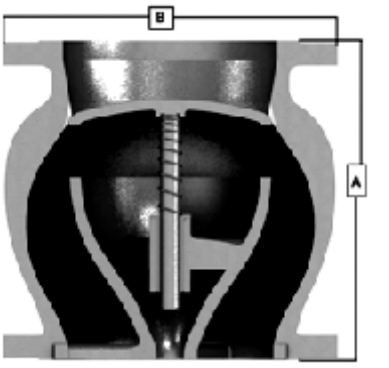
Valve Component Number	Valve Component	Standard Material of construction	Stainless steel material construction (Option)
1	Body	Carbon Steel ASTM A216 Gr.WCB	316 Stainless steel ASTM A351 Gr CF8M
2	Disc	ASTM A351 Gr. CF8M	ASTM A351 Gr. CF8M
3	Seat	Integral with SS316 overlay	Integral
4	Diffuser	ASTM A216 WCB	ASTM A351 Gr. CF8M
5	Spring	Inconel X-7602)	Inconel X-7602)
6	Guiding Bush	Ss316	Ss316
7	Bolting		



STANDARD DIMENSIONS AND WEIGHT

Table 2- Standard Dimensions and Weight (1),(2),(3)

Valve Size	#150			#300		
	A (Face to face)	B (Flange OD)	VALVE WEIGHT	A (Face to face)	B (Flange OD)	VALVE WEIGHT
0	120	150	7	120	165	9
80	120	190	13	150	210	20
100	140	230	19	170	255	34
150	210	280	36	210	320	59
200	280	345	66	280	380	99
250	350	405	122	350	445	175
300	425	485	175	435	520	255
400	545	595	319	545	650	486
600	810	815	846	810	915	1332



(1) The Dimensions and weight data provided in the table is for flange valves. The flanges are according to ASME B16.5 dimensions are in mm. For any variation, contact manufacturer for valve data.

(2) All dimensions are in mm

(3) All weight data is in Kilograms only. The weight data given in the table-2 is for standard valve and does not include line flanges and bolting.

(4) Contact manufacturer for dimensional and weight data, for valve sizes more than 600mm and rating greater than 600#,

FLOW COEFFICIENT DATA

Table 3 - Valve Flow Coefficient (Cv) Values (in GPM).

Size (mm)	[1] ANSI Pressure Rating-150#/300#
50	104
80	286
100	454
150	1095
200	2092
250	3186
300	2930
350	4318
400	5328
500	8362
600	12276

[1] For sizes more than 600mm and rating more than 300#, contact manufacturer for valve flow coefficient data.

TYPICAL AXIAL FLOW CHECK VALVE APPLICATIONS

Nozzle check valves are installed in various applications in different sectors:

- **GAS TRANSMISSION LINES** - mainly in pipeline gas compressor trains in discharge/suction lines
- **HYDROCARBON GAS PROCESSING UNITS** – mainly in gas compression, Gas dehydration units, Offshore and on-shore gas exploration, Liquified Natural gas units (LNG) etc.
- **CRUDE OIL REFINER UNITSIES** – mainly in Fluidized Catalytic Cracking (FCC/PFCC), Hydrocracker unit, Hydro Treatment units etc.
- **PETROCHEMICAL/ CHEMICAL PROCESSING INDUSTRIES** – Mainly in Gas/Naphtha cracker unit, Propylene Units etc.
- **POWER GENERATION PLANTS** – mainly in Blow-Down Units, Cooling Water Lines, Feed Water Lines, Steam Lines etc.
- **WATER TRANSMISSION UNITS** - Raw and treated water pipelines, Pumping Stations, Cooling System etc.

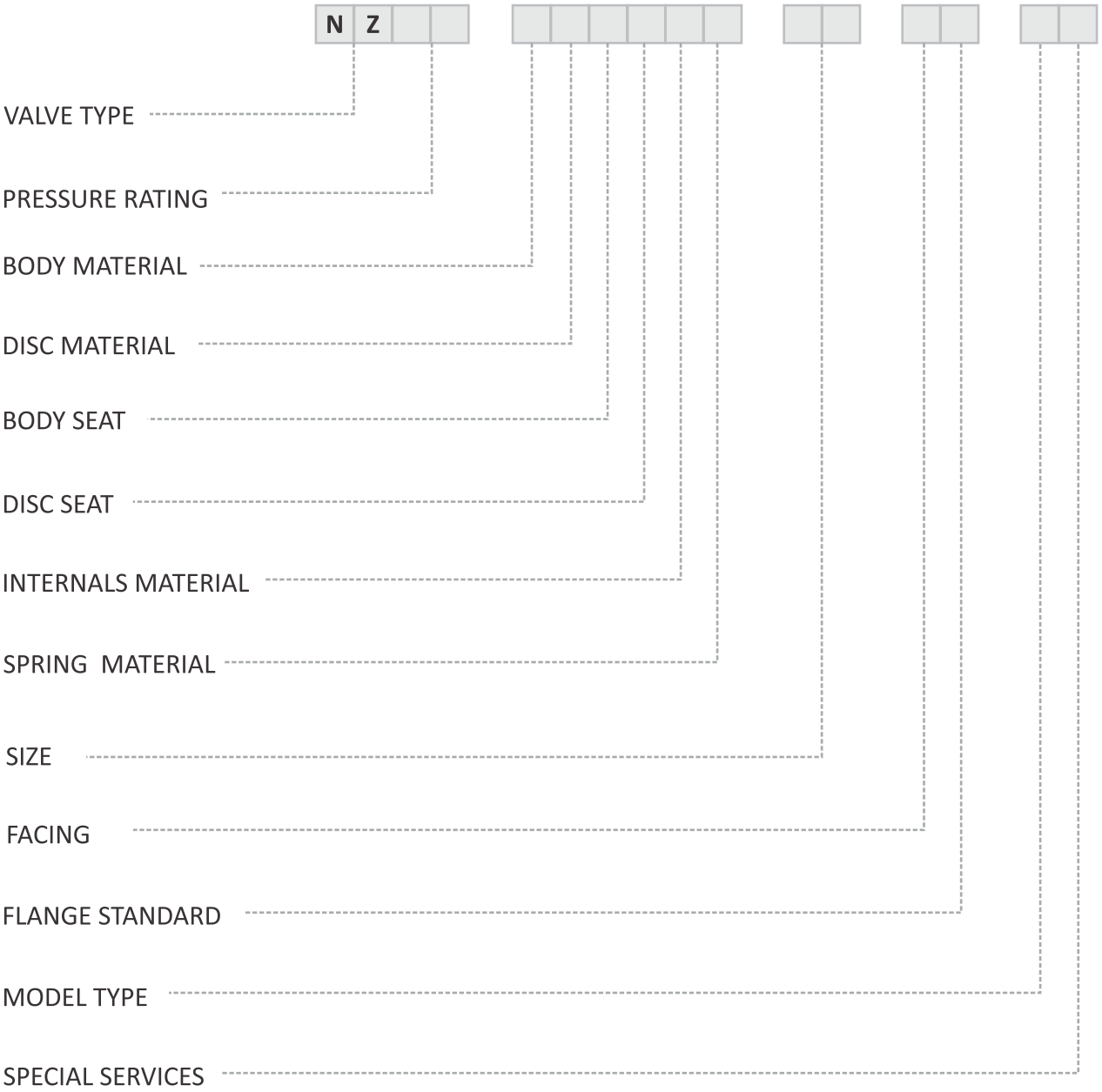
INSTALLATION GUIDELINES

Advance valve NZ series Axial Flow non-return valves can be installed in horizontal or in vertical lines (in both flow-up or flow-down orientation). However in case of vertical installation, the installation details must be informed to the manufacturer so that the design is rechecked for proper operation. The straight length requirements for the proper operation of the valve are as under:

Installation	Straight Length Recommendations		
	Upstream	**Downstream**	
Expander/Reducer upstream of Valve	4D	No Specific	
Expander/Reducer downstream of valve	No Specific	2D	
Bend upstream of valve	4D	No Specific	
Bend downstream of valve	No Specific	2D	
Bend upstream and downstream of valve	4D	2D	
Throttling valve upstream of valve	4D	No Specific	
Throttling valve downstream of valve	No Specific	2D	

For the proper performance of the axial flow valve, the straight length requirements indicated above should be followed.
Because of the construction of Axial flow valve, this type of non-return valve cannot be used in a pipeline where pigging of the line is the operational requirement.

VALVE FIGURE NUMBER SYSTEM AND ORDERING INFORMATION



Example:-NZ 15.SCDICI.08.CA.31

Valve Type	Pressure Rating	Body/ Diffuser Material	Disc Material	Body Seat	Disc Seat	Internals	Spring Material	Size	Facing	Flange Std.	Model	Special Service
NZ	15	S	C	D	I	C	I	08	C	A	31	N
	ANSI/ASME #150	WCB ASTM A216	CF8M ASTM A351-J92900	Stellite-6	Integral	SS-316	Inconel x750	0200	Raised Face Smooth	ANSI B16.5	Doubled Flanged	Nace

DESCRIPTION OF FIGURE NUMBER	
Model Number	Always Specify NZ
Pressure Rating	150# - 15 300# - 30 600# - 60
Body Material	Refer Table 4
Disc Material	Refer Table 5
Body seat Material	Refer Table 6
Disc seat Material	Refer Table 7
Diffuser Material	Refer Table 4
Spring Material	SS316 – C Inconel X-750- I
Valve Size	Size in Inches
Valve Facing	Refer Table 8
Design Standard	ASME B16.34, API 594,API 6D
Model	31
Special Services	Refer Table 9

TABLE 6 -MATERIAL: DISC SEAT	
MOC CODES	MATERIALS
D	Alloy 6Fe3 - ST - 6
I	Integral
A	Stainless Steel-304 Gr. 18.8
C	Stainless Steel-316 Gr.-18.8.2
E	13% Cr./ Stainless Steel-410
F	Stainless Steel-316L
U	Inconel-825
N	Inconel-625

TABLE 7 -MATERIAL: BODY SEAT	
MOC CODES	MATERIALS
I	Integral
M	EPDM
Y	Viton
G	Buna-N
D	Alloy 6Fe3 - ST - 6
A	Stainless Steel-304 Gr. 18.8
C	Stainless Steel-316 Gr.-18.8.2
E	13% Cr./ Stainless Steel-410
F	Stainless Steel-316L
U	Inconel-825
N	Inconel-625

TABLE 8 -FACING	
MOC CODES	MATERIALS
D	Raised Face Serrated
C	Raised Face Smooth
B	Flat Face Serrated
A	Flat Face Smooth
E	Ring Joint

TABLE 4 -BODY & DIFFUSER MATERIAL		
MOC CODES	MATERIALS	CAST GRADE
S	Carbon Steel	ASTM A216 WCB
H	Cast Iron(CI)	ASTM A126 Gr.B
C	Stainless Steel 316	ASTM A351CF8M
E	Stainless Steel 410	ASTM A217 Ca15
A	Stainless Steel 304	ASTM A351CF8
F	Stainless Steel 316L	ASTM A351CF3M
3	Stainless Steel 304L	ASTM A351CF3
J	SGI	ASTM A536/A395 Gr.60-40-18
8	Stainless Steel 347(High Temp)	ASTM A351 CF8C
N	Inconel 625,	ASTM A494 CW_6MC-N26625
V	Hastalloy C	ASTM A494 CW12MW
4	Duplex 22% Chrome	ASTM A995 (4A)
5	Super Duplex 25% Chrome	ASTM A995 CD4MCuN (5A)
Z	Super Duplex 25% Chrome	ASTM A995 (6A)
M	Low Temperature Carbon Steel	ASTM A352 LCC

TABLE 5 - DISC MATERIAL		
MOC CODES	MATERIALS	CAST GRADE
E	Stainless Steel 410	CA-15, ASTM A217-J91150
F	Stainless Steel 316L	CF3M, ASTM A351-J92800
0	Cast Stainless Steel	CF3MN, ASTM A351-J92804
3	Stainless Steel 304L	CF3, ASTM A351-J92700
8	Stainless Steel 347(High Temp)	CF8C, ASTM A351-J92710
A	Stainless Steel 304	CF8, ASTM A351-J92600
C	Stainless Steel 316	CF8M, ASTM A351-J92900
4	Duplex 22% Chrome	DUPLEX Gr.4A ASTM995-J92205
5	Super Duplex 25% Chrome	DUPLEX Gr. 5A ASTM995-J93404
Z	Super Duplex 25% Chrome	DUPLEX Gr. 6A ASTM995-J93380
H	Cast Iron	ASTM A126 Gr.B
J	SGI	ASTM A536/A395 Gr.60-40-18
K	High Speed Steel	D2 ASTM A439
N	INCONEL 625	ASTM A494 CW_6MC-N26625

TABLE 9 -FACING	
MOC CODES	MATERIALS
N	Nace
J	Jacketed
V	Vacuum
A	Lethal
S	Special Spring
P	CE
I	IBR
O	Oxygen
M	Marine
C	Cryogenic

ADVANCE VALVES

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Corporate Office: 142, A&B, NSEZ, Phase-2, Noida – 201305, INDIA. Phone: +91 120 4796900, Fax: +91 120 4796948

info@advancevalves.com www.advancevalves.com