NELES

Industry standards

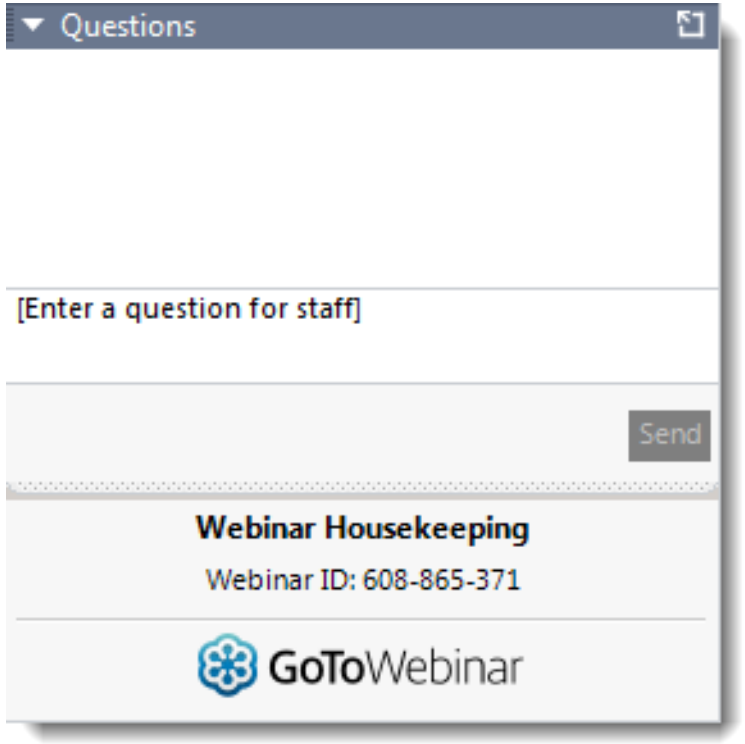
Fred Porth
North American Business Manager

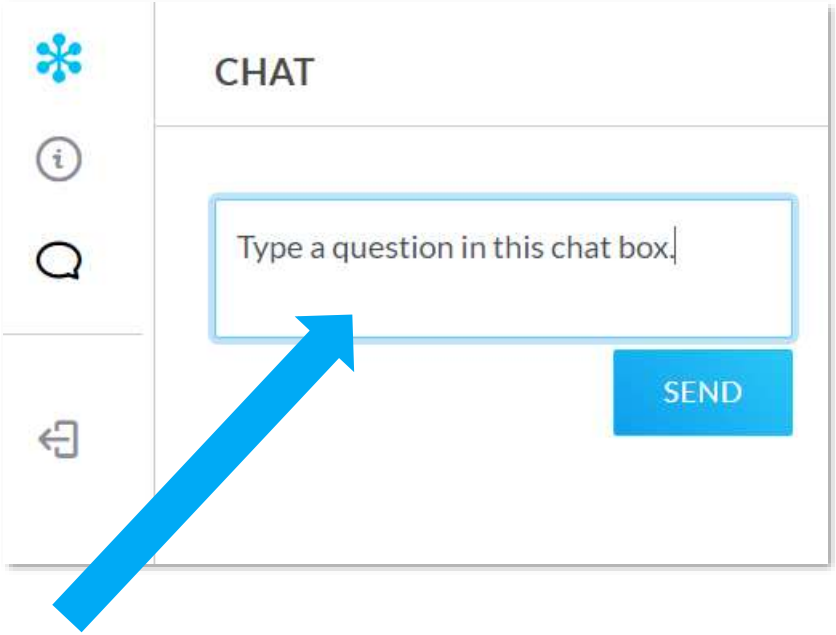
In session features

Practicalities

NELES

How to submit your questions





If you can’t hear the audio, comment in the Chat box for help

Industry standards

Table of Contents

- Design Standards
- NACE
- Seat Leakage
- Emissions
- Fire Safe

NELES

GENERAL	1	Tag Number			371EV 104		
	2	Service			HC OVRHEAD VAPOR TO COKER FRACTNTR		
	3	Location			FIELD		
	4	Equipment System			NA		
	5	Line No.	P&ID		371-PB-010-24"-EK34FC-HC-50	G41-RK371-063	
	6	Area Classification	IP Rating		Zone1,Gr.IIC,T3	IP65	
	7	Ambient Temperature:	Min.	Max.	7.5°C	43°C	
	8	Equipment number					
	9	Enclosure Type			ATEX EExd,IIC,T6/CCOE Certified		
	10	NACE Requirement	IBR Certification		NA	NA	
PIPE	11	Line Size_Schedule	Inlet	Outlet	24 in 40	24" 40	
VALVE BODY	28	Body Type	Material	Ball / Rotary	A217-C5		
	29	Body Size	Rating	24 in	300#		
	30	Body Form		Flanged type			
	31	Trim Material		13% Chr+Hard faced seat			
	32	Packing Material		Note 10			
	33	Inlet Connection	Rating	RTJ	ANSI 300#		
	34	Outlet Connection	Rating	RTJ	ANSI 300#		
	35	Flange Finish		ANSI B16.5			
	36	Lubrication & Isolation		Manufacturer Std.			
	37	Bolting	Leakage Class		ANSI VI (TSO)		
	38	Bypass Taps: Loc/Size		STA			
	39	Port Size		Full Port			
	40	Plug/ Ball/ Disk Material		Solid CA6NM/H Chr/stellite6			
	41	Seat Material		stellite6			
	42	Shaft Material		CA6NM			
	43	Type	Size	ELECTRIC	STA		
	44	Speed (RPM)		STA			
ACTUATOR CONTINUED	50	Motor Starter		Required			
	51	KW Rating		STA			
	52	Full Load Current Rating		STA			
	53	Schematic Detail		Required			
	54	Handwheel		Yes			
	55	Inching		STA			
ACCESSORIES	56	Local/Off/Remote Selector		Required			
	57	Open/Close/Stop Pushbuttons		Required			
	58	Limit Switch Closed		Required			
	59	Limit Switch Open		Required			
	60	Status Lights		Required			
	61	Open&Close Torque Switches		Required			
	62	Limit Switch Tag		371 EZSO/EZSC 104			
ELECTRICAL CONNECTION	63	Power Cable		1" NPT(F)			
	64	Control Cable		1/2" NPT(F)			
	65	Data Cable		1" NPT(F)			
	66	Test Category		API 598			

NOTES

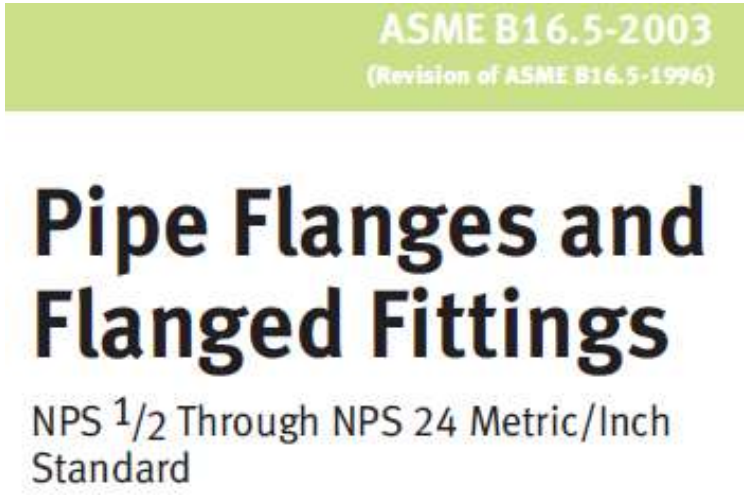
1. Presence of coke fines
2. 4 way switch ball valve full bore ASME class 900 metal seated
3. Steam purges required: Yes, MP Steam (operating = 16.2barg/250°C, design = 19barg/400°C)
4. Connections: Flanged 10" ASME B16.5 900# RF 3.2-6.3Ra
5. Body material: Cast A217.C12, pipe spec 9Cr 1Mo
6. Trim material: *
7. Seat material: Stellite 6 welded on 9Cr 1Mo ring *
8. Packing: Graphite *
9. Operator: Motor - see technical description 190687-00-IC-SP-00007
10. Fireproofing: Yes, see technical description 190687-00-IC-SP-00007
11. Limit switches: Yes, five(5), see technical description 190687-00-IC-SP-00007
12. Local Panel: Yes, see technical description 190687-00-IC-SP-00007
13. NACE Compliance: MR0103

Design standards

ASME(American Society of Mechanical Engineers)

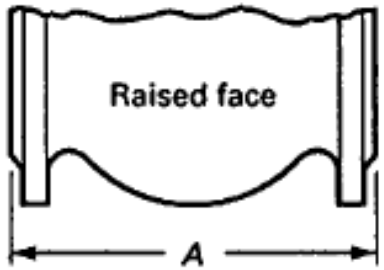
ASME/ANSI - 1986

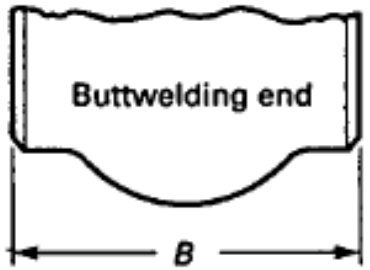
- ASME B16.34: Standard for valve design for flanged, threaded and welded end valves. Pressure-temperature rating, dimensions, tolerances, materials, etc.
- ASME B16.10: Standard for face to face and end to end dimensions of valves.
- ASME B16.5: Standard for flange ends



Design standards

ASME B16.10





Nominal Valve Size		Class 250 Cast Iron and Class 300 Steel				Class 300 Steel				
		Gate, Solid Wedge and Double Disc, *A*	Plug			Globe, Lift Check, and Swing Check, *A*	Angle and Lift Check, *D*	Ball		
NPS	DN		Short Pattern, *A*	Regular Pattern, *A*	Venturi Pattern, *A*			Long Pattern, *A*	Short Pattern, *A* and *B*	Long Pattern, *B*
2	50	8.50	7.25	8.50	. . .	10.50	5.25	8.50	8.50	8.50
2½	65	9.50	8.00	9.50	. . .	11.50	5.75	9.50	9.50	9.50
3	80	11.12	9.25	11.12	. . .	12.50	6.25	11.12	11.12	11.12
4	100	12.00	10.50	12.00	. . .	14.00	7.00	12.00	12.00	12.00
5	125	15.00	. . .	15.25	. . .	15.75	7.88	. . .	. . .	. . .
6	150	15.88	14.88	16.75	15.88	17.50	8.75	15.88	15.88	18.00
8	200	16.50	. . .	19.75	16.50	21.00	10.50	19.75	16.50	20.50
10	250	18.00	22.38	23.50	18.00	24.50	12.25	22.38	18.00	22.00

Valve design standard

ASME B16.34

NELES

- The body, bonnet or cover, body joint bolting, and body-bonnet or cover bolting, shall be constructed of materials as listed in the respective ASTM specifications referred to in Table 1.

Table 1 Material Specification List: Applicable ASTM Specification

GROUP 1 MATERIALS

Material Group No.	Nominal Designation	Forgings		Castings		Plates		Bars		Tubular	
		Spec. No.	Grade	Spec. No.	Grade	Spec. No.	Grade	Spec. No.	Grade	Spec. No.	Grade
1.1	C–Si	A 105		A 216	WCB	A 515	70	A 105			
	C–Mn–Si	A 350	LF2			A 516	70	A 350	LF2	A 672	C 70
						A 537	Cl. 1	A 696	C		B 70
	$3\frac{1}{2}$Ni	A 350	LF3								
	C–Mn–Si–V	A 350	LF6 Cl. 1								
1.2	C–Si									A 106	C
	$2\frac{1}{2}$Ni			A 352	LC2	A 203	B				
	$3\frac{1}{2}$Ni			A 352	LC3	A 203	E				
	C–Mn–Si			A 216	WCC						
				A 352	LCC						

Valve design standard

NELES

ASME B16.34 - Rating designations are tabulated for Class in Table 2

Table VII-2-1.1 Ratings For Group 1.1 Materials

A 105 (1)(2)	A 515 Gr. 70 (1)	A 696 Gr. C	A 672 Gr. B70 (1)
A 216 Gr. WCB (1)	A 516 Gr. 70 (1)(3)	A 350 Gr. LF6 Cl.1 (4)	A 672 Gr. C70 (1)
A 350 Gr. LF2 (1)	A 537 Cl. 1 (5)	A 350 Gr. LF3 (6)	

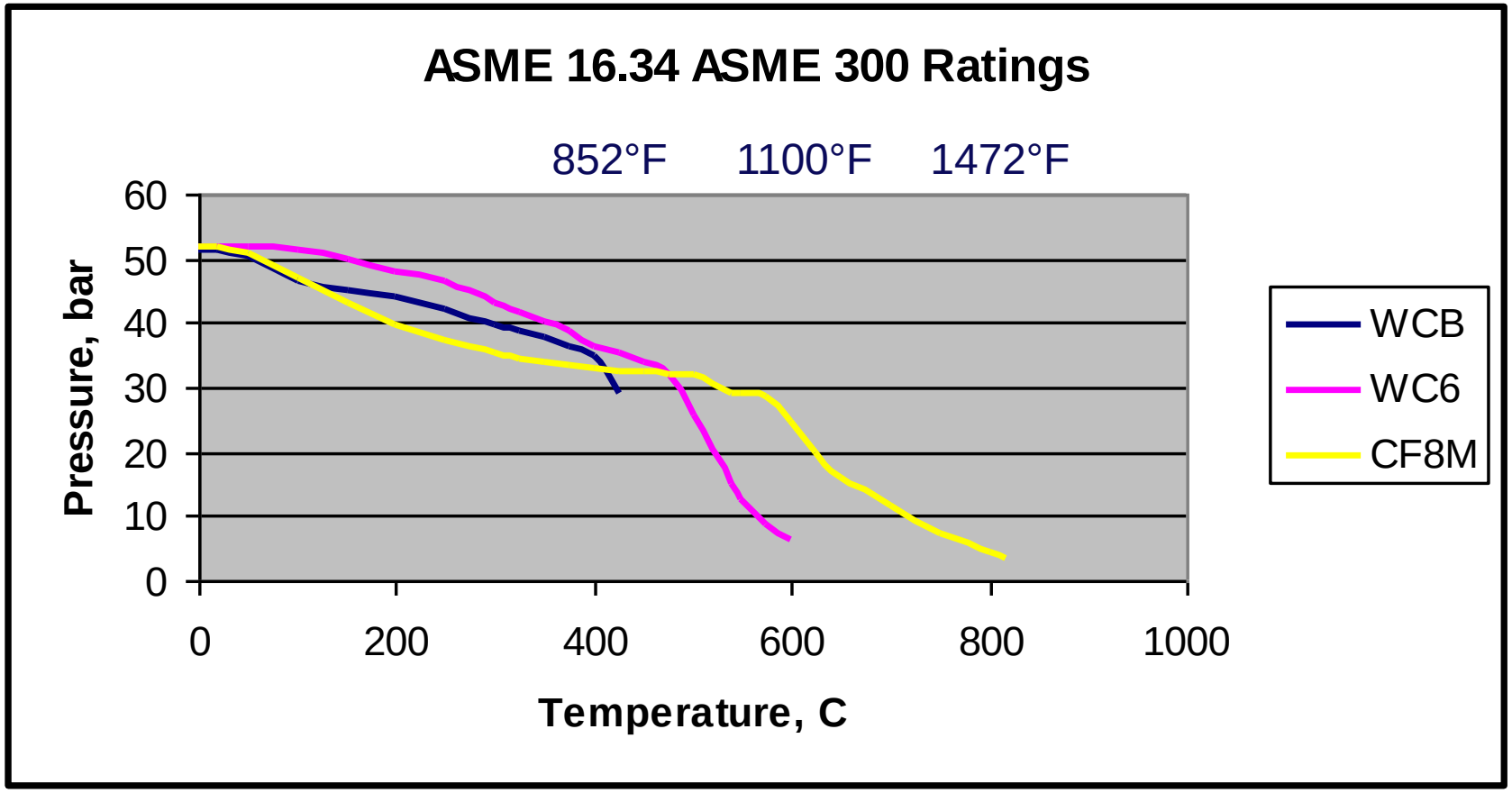
Temperature, °F	Working Pressures by Class, psig						
	150	300	600	900	1500	2500	4500
−20 to 100	285	740	1,480	2,220	3,705	6,170	11,110
200	260	680	1,360	2,035	3,395	5,655	10,185
300	230	655	1,310	1,965	3,270	5,450	9,815
400	200	635	1,265	1,900	3,170	5,280	9,505
500	170	605	1,205	1,810	3,015	5,025	9,040
600	140	570	1,135	1,705	2,840	4,730	8,515
650	125	550	1,100	1,650	2,745	4,575	8,240
700	110	530	1,060	1,590	2,665	4,425	7,960
750	95	505	1,015	1,520	2,535	4,230	7,610
800	80	410	825	1,235	2,055	3,430	6,170

Valve design standard
ASME B16.34

NELES

- Material groups may have different temperature limits

725psi



Valve design standard

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A 350 Gr. LF2 (1)	A 537 Cl. 1 (5)	A 350 Gr. LF3 (6)	

NOTES:

(1) Upon prolonged exposure to temperatures above 800°F, the carbide phase of steel may be converted to graphite. Permissible, but not recommended for prolonged use above 800°F.

(2) Only killed steel shall be used above 850°F.

(3) Not to be used over 850°F.

(4) Not to be used over 500°F.

(5) Not to be used over 700°F.

(6) Not to be used over 650°F.

ASTM - American Society for Testing and Materials

Dictates material physical and chemical properties

NELES

ASTM INTERNATIONAL

A351/A351M – 10

		304L	304	316L	316		
Element, % (max, except where range is given)	CF3, CF3A J92700	CF8, CF8A J92600	CF3M, CF3MA J92800	CF8M J92900	CF3MN J92804	CF8C J92710
Carbon	0.03	0.08	0.03	0.08	0.03	0.08
Manganese	1.50	1.50	1.50	1.50	1.50	1.50
Silicon	2.00	2.00	1.50	1.50	1.50	2.00
Sulfur	0.040	0.040	0.040	0.040	0.040	0.040
Phosphorus	0.040	0.040	0.040	0.040	0.040	0.040
Chromium	17.0–21.0	18.0–21.0	17.0–21.0	18.0–21.0	17.0–21.0	18.0–21.0
Nickel	8.0–12.0	8.0–11.0	9.0–13.0	9.0–12.0	9.0–13.0	9.0–12.0
Molybdenum	0.50	0.50	2.0–3.0	2.0–3.0	2.0–3.0	0.50

ASTM - American Society for Testing and Materials

Dictates material physical and chemical properties

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ASTM INTERNATIONAL

A351/A351M – 10

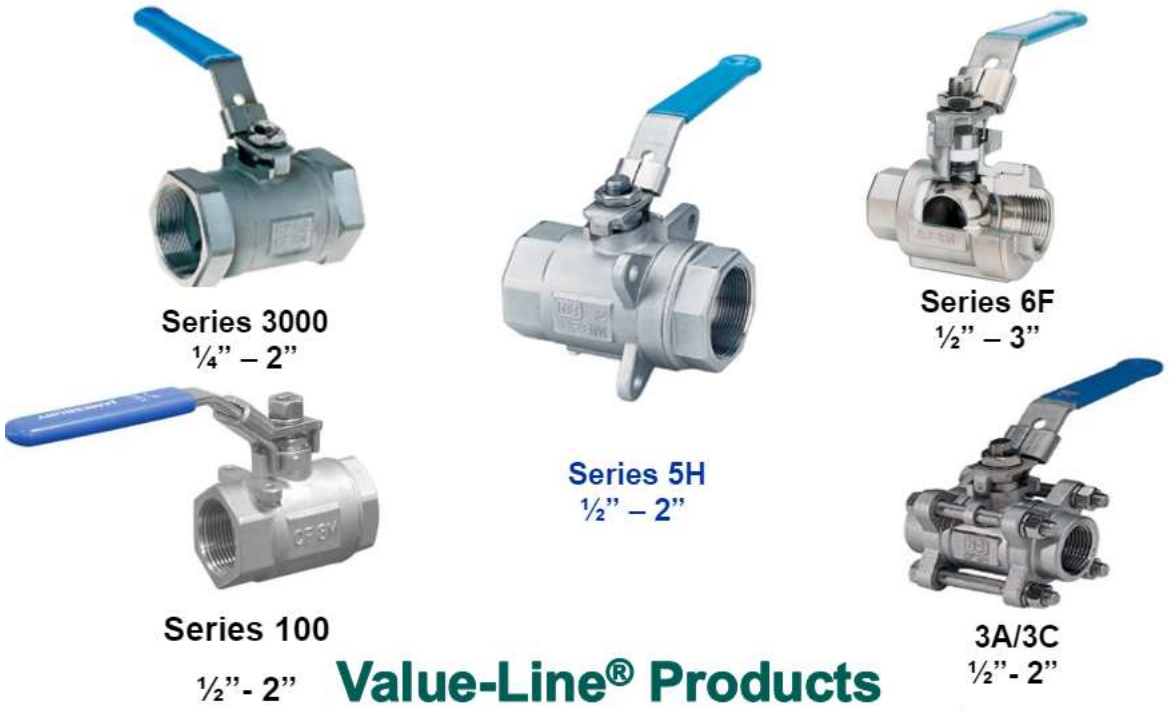
TABLE 3 Tensile Requirements

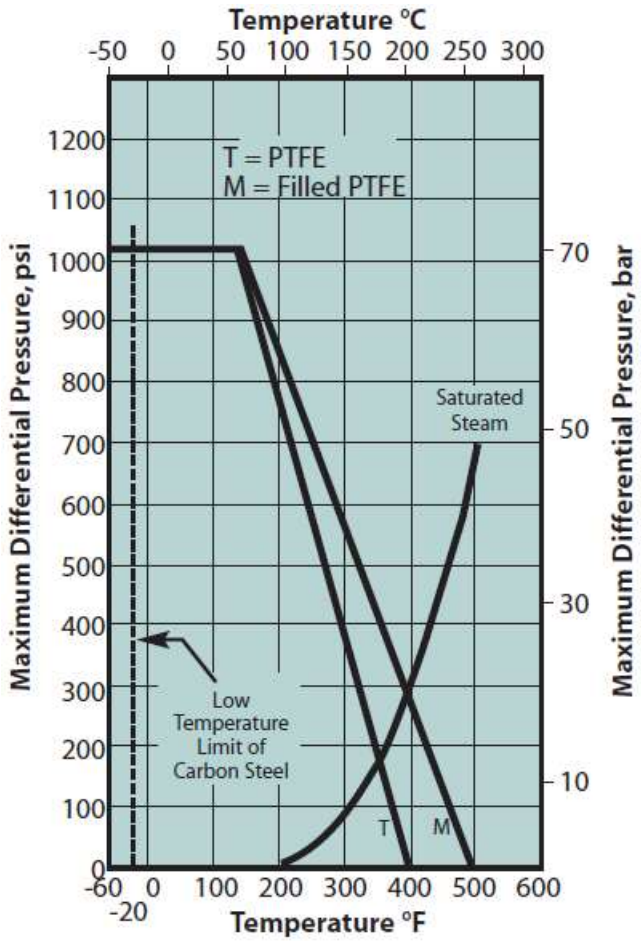
	CF3 J92700	CF3A J92700	CF8 J92600	CF8A J92600	CF3M J92800	CF-3MA J92800	CF8M J92900	CF-3MN J92804	CF8C J92710	CF10 J92950
Tensile strength, min, ksi [MPa]	70 [485]	77 [530]	70 [485]	77 [530]	70 [485]	80 [550]	70 [485]	75 [515]	70 [485]	70 [485]
Yield strength,[A] min, ksi [MPa]	30 [205]	35 [240]	30 [205]	35 [240]	30 [205]	37 [255]	30 [205]	37 [255]	30 [205]	30 [205]
Elongation in 2 in. or 50 mm,[B] min, %	35.0	35.0	35.0	35.0	30.0	30.0	30.0	35.0	30.0	35.0

Design standards

CWP/WOG – Not ASME rated

- **CWP / WOG (Cold Working Pressure / Water Oil Gas)**
  - The maximum pressure the valves are rated for (-20°- 100°F)
  - Standard for Jamesbury™ "Value-Line Products"





Design standards
API-608

NELES

- API-608 is a ball valve design standard that require specific options:
  - Anti-Static Devices (i.e Static Grounding or Top Grounding)
  - Anti-Blow Out Stem
  - MAST must be larger than 2x max torque
- Certain material restrictions on stem material.
  - Due to MAST constraints 316SS might need to be upgraded to 17-4PH.
- API-608 can be called out by construction of the valve or word modifier.
  - WM NL = API-608

API 6D valves

Typical features and traits:

- Multi-piece bodies with multiple external leak paths
- Spring loaded metal seal with small polymer insert. Upstream seat sealing
- Emergency sealant injection ports for seats and stem seal
- Typically trunnion and higher pressure class
- Primarily on/off, low cycle life (a few thousand cycles)
- Many o-ring seals

API 608 valves

NELES

Typical features and traits:

- Uni-body and split body. Minimum external leak paths.
- Solid, single piece polymer or metal seat.
- Adjustable gland packing
- Mostly floating ball, some trunnion. Mostly downstream seat sealing
- Primarily on/off, higher cycle life (ten to hundreds of thousands)
- No o-rings

Design standards

API-609

- API-609 is a butterfly valve design standard that require specific options:
  - Disc Clearance (standard)
  - Specific Testing (API-598)
  - Anti-Blow Out Stem (standard)
  - Face to Face Limitations (standard)

- API-609 can be called out by WM NN.

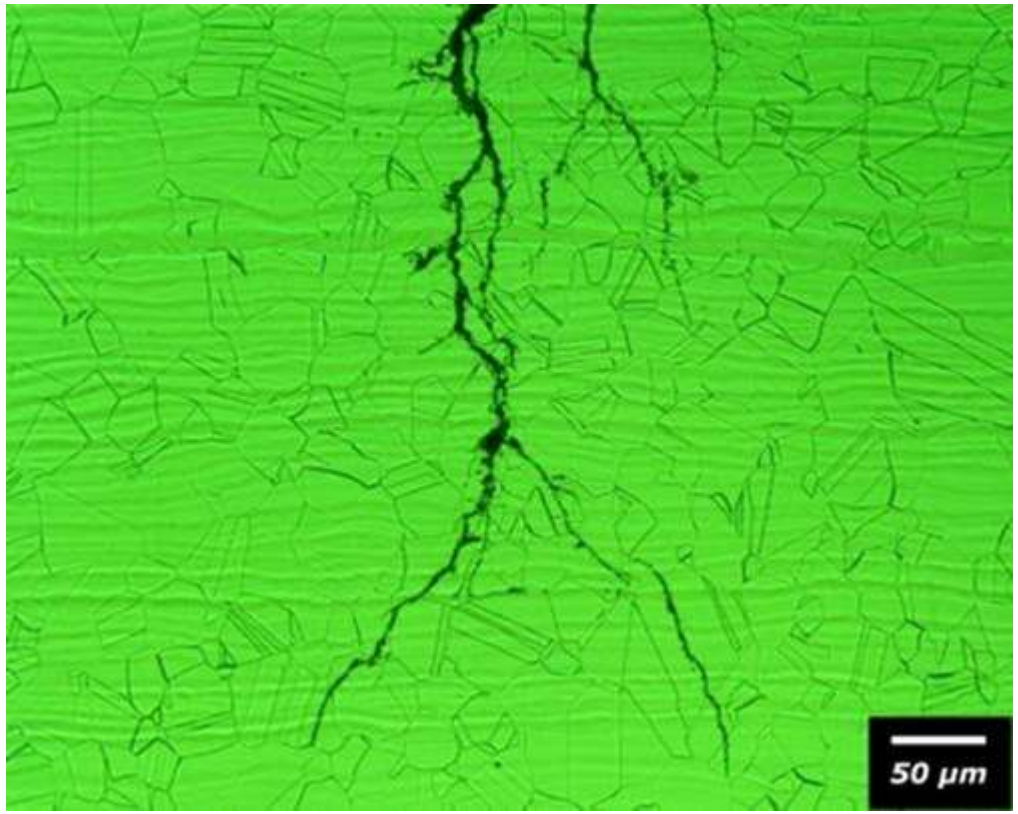
Questions?

NACE – Nat'l Association of Corrosion Engineers

Materials Selection for Sour Service

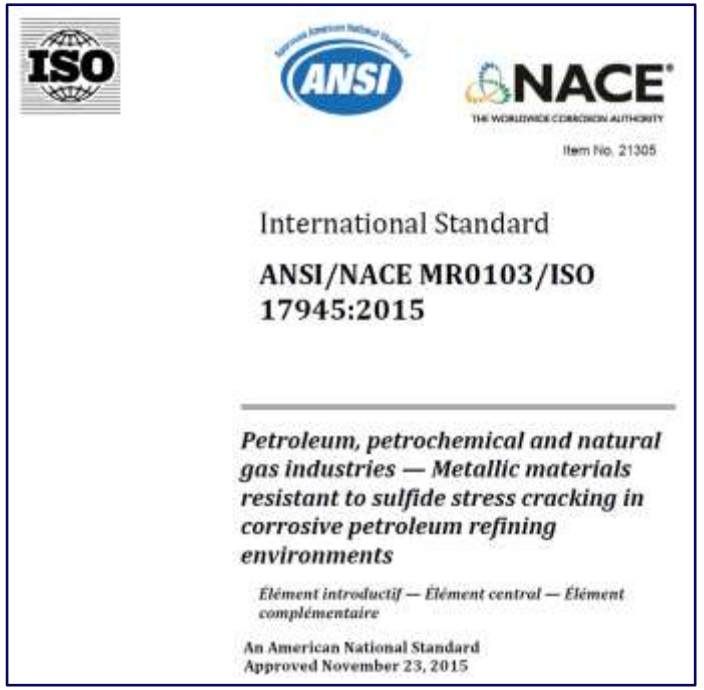
NELES

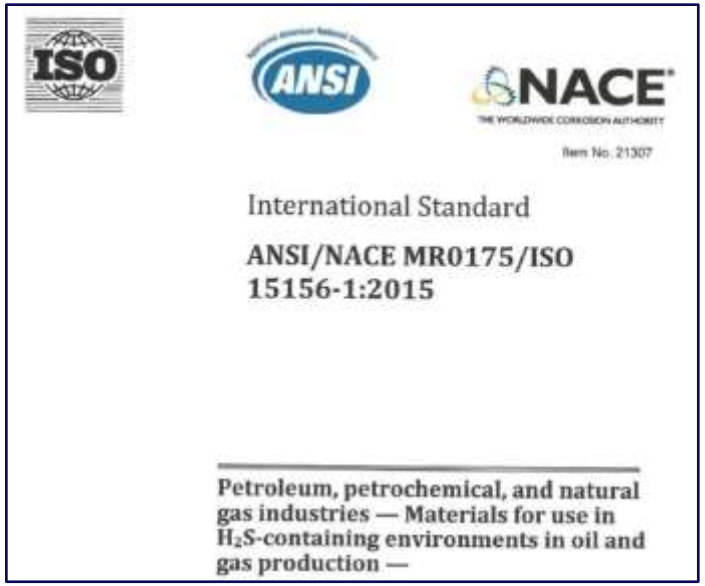
- Hydrocarbon streams are termed sour when they contain hydrogen sulphide, H_2S
- Standards can help to prevent sulphide stress corrosion cracking (SSC) failures wherever H_2S is present
- Prevention of SSC is controlled by limiting max hardness of the alloy



NACE

- NACE MR0175 used to be the sole standard. This was discontinued and replaced with two specs in 2003.
- MR0175 is designed for materials to be used in oil & gas applications.
- MR0103 is for petroleum refining applications.
- Neles has internal procedures to handle NACE applications (both specifications)
- Many customers are not aware of the change and continue to reference MR0175. (Pre-2003)

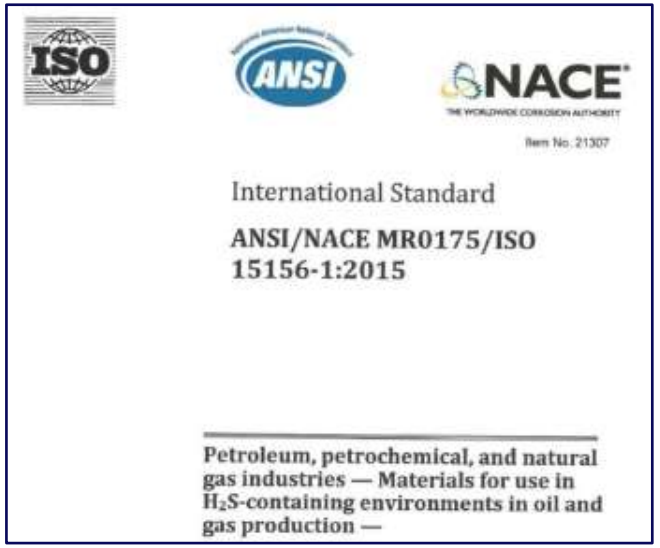

ISO ANSI NACE
THE WORLDWIDE CORROSION AUTHORITY
Item No. 21305
International Standard
ANSI/NACE MR0103/ISO 17945:2015
Petroleum, petrochemical and natural gas industries — Metallic materials resistant to sulfide stress cracking in corrosive petroleum refining environments
Élément introductif — Élément central — Élément complémentaire
An American National Standard
Approved November 23, 2015


ISO ANSI NACE
THE WORLDWIDE CORROSION AUTHORITY
Item No. 21307
International Standard
ANSI/NACE MR0175/ISO 15156-1:2015
Petroleum, petrochemical, and natural gas industries — Materials for use in H_2S-containing environments in oil and gas production —

NACE MR0175 / ISO 15156, Oil & Gas Service

NELES

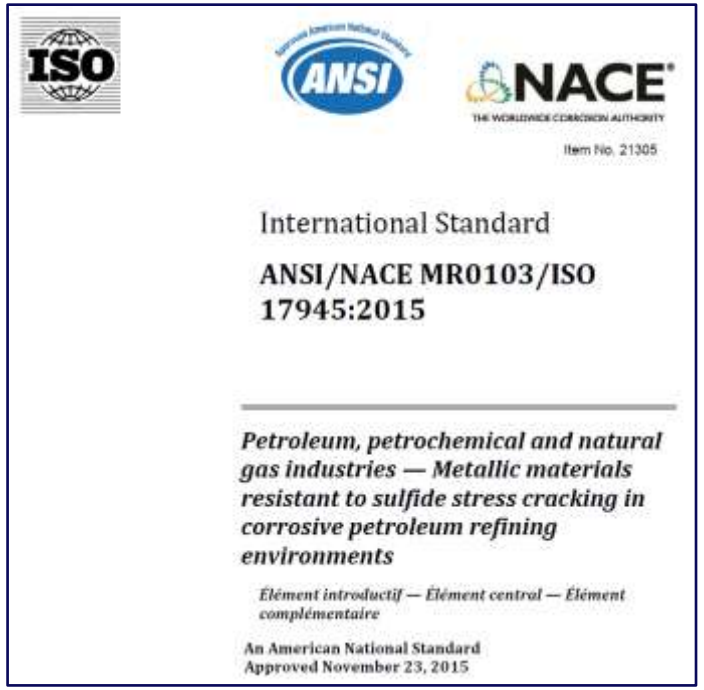
- Many major changes from previous version of MR0175 (pre-2003)
- Chloride stress corrosion (CSC) is added in the scope
- We need more information about the process in order to select a valve
  - Maximum Chloride Content (mg/l)
  - H_2S Content (Mol% or ppm)
  - Maximum Pressure and Temperature of the Application
  - Presence of Free Sulphur
- NACE MR0175 / ISO 15156 valves can not be pre-engineered without making assumptions



NACE MR0103, refining applications

NELES

- In many ways easier to handle than MR0175 / ISO 15156
  - Material selection does not depend on process parameters
  - Unique NACE MR0103 valves can be pre-engineered
  - Standard carbon steel and stainless steel NACE valves can be delivered from most Neles® and JB valve series.



ISO

ANSI

NACE

THE WORLDWIDE CORROSION AUTHORITY

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An American National Standard
Approved November 23, 2015

Neles summary

NACE compliance

- Nace MR0103
  - Downstream focused
  - Most standard Neles™ and Jamesbury™ valves meet this with standard model coding
- Nace MR0175
  - Upstream focused
  - Need to certify with the following information:
    - Sulfur content
    - H_2S partial pressure
    - pH of media
    - Chloride content (ppm)

Neles summary

NACE compliance

NELES

NELES

Example

Certificate of Compliance

Date: **May 14, 20XX**

Neles USA, Inc. certifies its Series 7000 and 9000 flanged ball valve products when supplied with ASTM A-216 grade WCB carbon steel body, ASTM A-351 grade CF8M ball and ASTM A-276 type 316 condition A stem are compliant materials to NACE MR0103. These materials are provided by product code combination 2236 from our body and trim material coding.

Example: 7150 31 2236 XTZ1

Jamesbury Product Manager
Neles USA, Inc.
+1-508-852-0215 Ext.
@neles.com

Seat leakage

Background

- Acceptable seat leakage is defined by test standards.
- Leakage testing procedure is defined by agreed upon test standard.
- All Neles valves are seat leak tested following assembly.

Most common standards:

- ANSI / FCI 70-2-2006
- ISO 5208 3rd Edition
- API 598 8th Edition

Control valve seat leakage
ANSI / FCI 70-2-2006

Fluid Controls Institute, Inc.
Technical Resources for Instrumentation and Fluid Control

NELES

- Leakage rates are defined by Classes I → VI and different test procedures.
- Class IV - generally associated single-seat control valves
  - Standard for Neles™ Control Valves (R-Series, FINETROL, Rotary Globe).
  - Acceptable Leakage: ***0.01% of rated valve capacity.***
- Class V - generally associated with metal seat, single-seat control valves required to close
  - Standard for Neles® Metal Seated Ball & Butterfly Valves.
  - Acceptable Leakage for Water: ***0.0005 ml/min per inch of seat per max. body rating pressure.***
  - Acceptable Leakage for Air: ***4.7 standard ml/min per inch of seat at 50 psig.***
- Class VI - generally associated with resilient seating control valves
  - Optional for select Neles® metal seated products.
  - Acceptable Leakage for Air: ***Refer to Table in Seat Leakage Guide.***

Seat leakage

ANSI / FCI 70-2-2006

NELES

- Class VI Acceptable Leakage

Seat Diameter (inches)	Leakage (ml/min)	Leakage (bubbles/min)*
≤1	0.15	1
1.5	0.30	2
2	0.45	3
2.5	0.60	4
3	0.90	6
4	1.70	11
6	4.00	27
8	6.75	45
10	11.1	
12	16.0	
14	21.6	
16	28.4	

* 1 bubble is equivalent to 0.15 ml

Seat leakage

ISO 5208

- Leakage rates are defined by rates for Gas or Liquid Tests.
- Low Pressure Gas Test
  - Pressure: 87 psig +/- 14.5 psig
- High Pressure Liquid Test
  - Pressure: 1.1 x CWP or dP of valve.
- Acceptable Leakage

Maximum Acceptable Leakage Rates
(mm3/second x DN number)*

Test Media	Rate A	Rate B	Rate C	Rate D
Liquid	0	0.01	0.03	0.1
Gas	0	0.3	3.0	30.0

* 1000 mm3 = 1 ml

Seat leakage

API 598

- Leakage rates are defined by Gas or Liquid Tests.
- Low Pressure Gas Test
  - Pressure: 60 psig to 100 psig
- High Pressure Liquid Test
  - Pressure: 1.1 x max. rated pressure or dP.
- Acceptable Leakage

Note: All resilient seated valves require zero leakage

Maximum Acceptable Leakage Rates

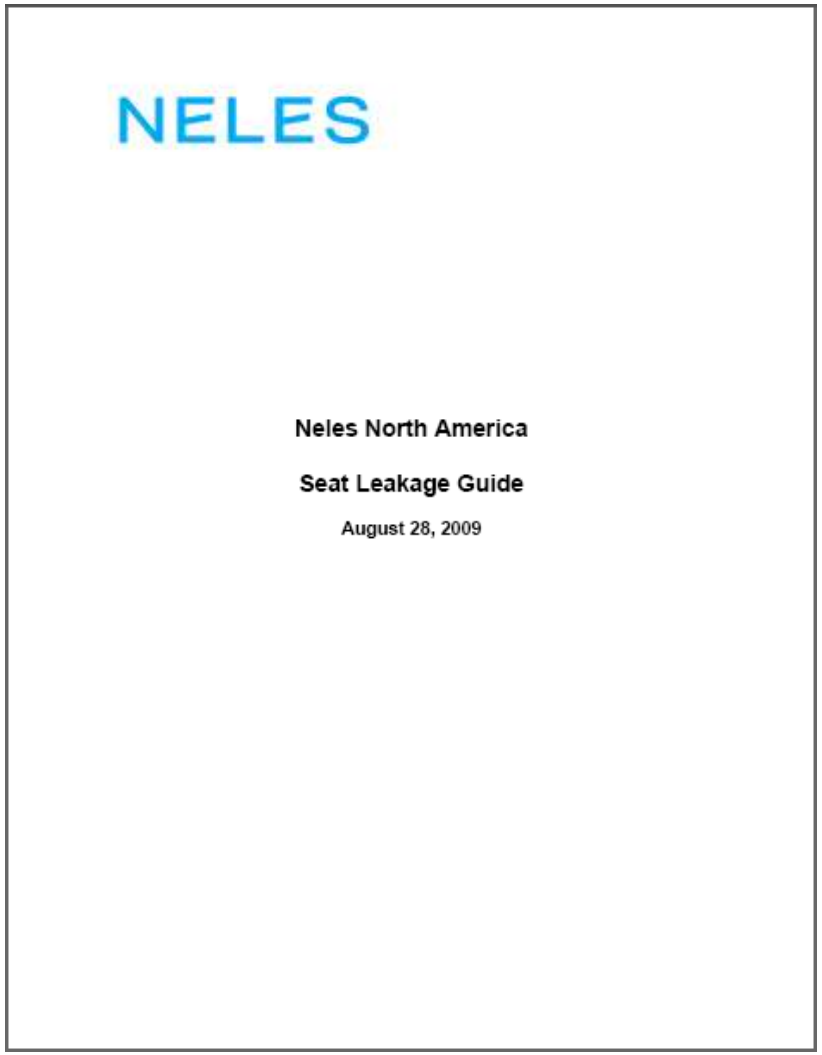
Valve Size	Liquid Test (drops/min)*	Gas Test (bubbles/min)**
≤ 2"	0	0
2.5" to 6"	12	24
8" to 12"	20	40
≥ 14"	2 drops/min per inch of valve size	4 bubbles/min per inch of valve size

* 1 milliliter is considered equivalent to 16 drops
** 1 bubble is considered equivalent to 0.15 ml

Neles seat leakage guide

NELES

- Guide to ANSI/FCI 70-2-2006
- Guide to ISO 5208 3rd Edition
- Guide to API 598 8th Edition
- Comparison of Leakage Rates
- Examples & Contexts
- Standard Neles Offerings



Seat leakage

Leakage rates comparison charts

NELES

Comparison of Leakage Rates Using Air / Nitrogen

	Maximum Acceptable Leakage (ml/min)						Drops / Min
	ANSI / FCI 70-2 2013		ISO 5208				API-598
Test Pressure (psig) ->	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

Bubbles/min

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

Seat leakage

Leakage rates comparison charts

Comparison of Leakage Rates Using Water

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

	Maximum Acceptable Leakage (ml/min)					
	ANSI / FCI 70-2 2013	ISO 5208				API-598
Test Pressure (psig) ->	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

Drops/min

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

Comparison of leakage rates

Example: XT04CWTAS6SJHADD

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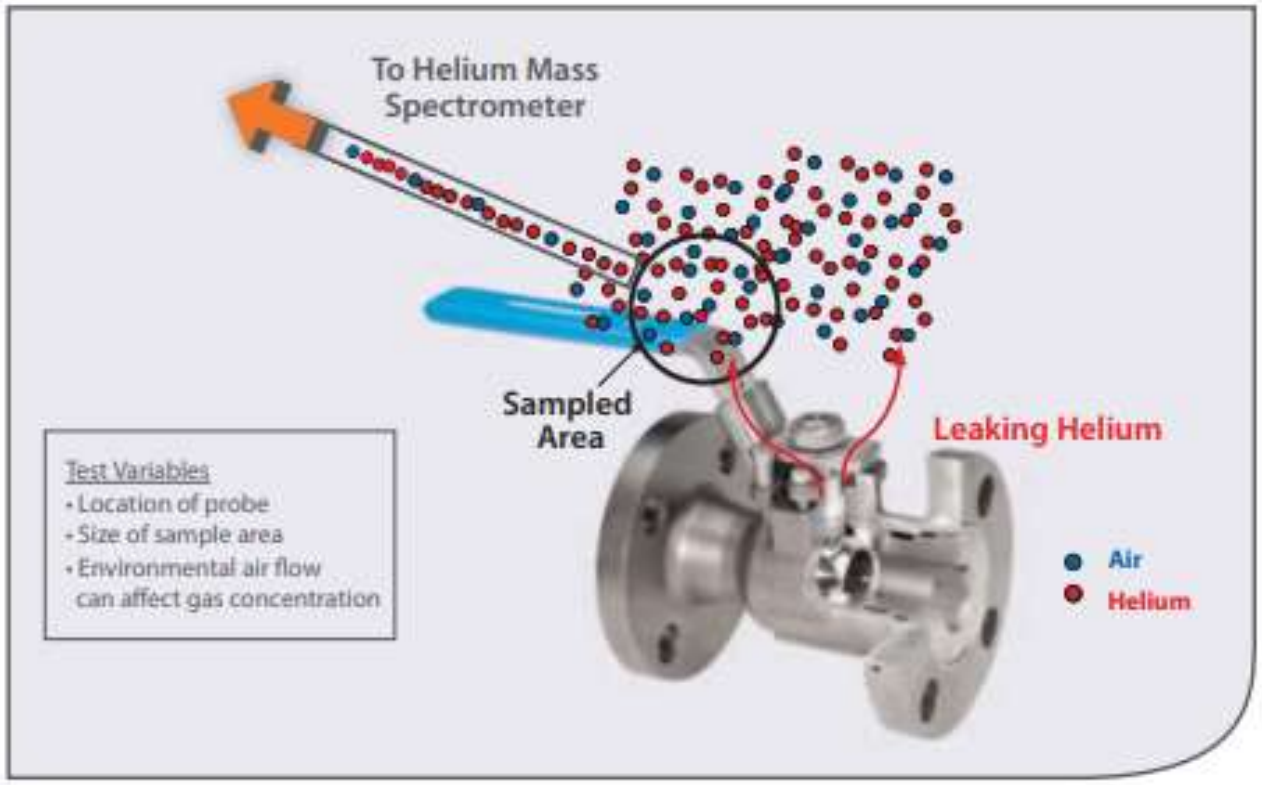
Gas Test	Leakage Rate (ml/min)	Time to fill the volume of a basketball
ISO 5208 Third edition Rate A	0	
ANSI/FCI 70-2-2006 class VI	1.7	about 3 days
ISO 5208 Third edition Rate B	1.8	a little less than 3 days
API 598 Eighth edition	3.6	about a day and a half
ISO 5208 Third edition Rate C	18.0	6.6 hours
ANSI/FCI 70-2-2006 class V	18.8	6.3 hours
ISO 5208 Third edition Rate D	180	40 minutes

Liquid Test	Leakage Rate (ml/min)	Time to fill a medium cup of coffee (14oz)
ISO 5208 Third edition Rate A	0	
ISO 5208 Third edition Rate B	0.06	a little less than 5 days
ISO 5208 Third edition Rate C	0.18	about a day and a half
ANSI/FCI 70-2-2006 class V	0.55	12.5 hours
ISO 5208 Third edition Rate D	0.60	11.5 hours
API 598 Eighth edition	0.75	9 hours

Emissions

Background

- Unnecessary loss of end product.
- Frequent maintenance.
- Higher risk of fire and explosions.
- Higher risk of toxic atmosphere and injuries.
- **Regulatory Requirements**



Fugitive emission requirements

EPA - Environmental Protection Agency

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- Part of environmental legislation in the United States.
- Requirements set forth based on the Clean Air Act of 1990.
- Plants handling toxic or hazardous chemicals must comply with EPA fugitive emissions requirements.
- The current EPA criteria for VOC emissions level is 500 ppm.
  - Neles often fulfills 100 ppm.

Emissions standards

TA-Luft regulation / VDI 2440

- Effective in Germany since Oct. 2002.
  - Leakage = 1E-4 or 1E-2 (mbar x liter) / (sec x m)
  - 60,000 cycles
  - Graphite or Teflon
- Standard requirement for valves delivered into most European industries.

Test Laboratory for Pressure Equipment of
TÜV NORD GROUP
test laboratory for safety devices/armatures

TÜV NORD

Certificate
of typetest
in acc. to TA-Luft

Name and address of Manufacturer: Metso Automation Oy
Field Systems
00811 Helsinki
Finland

Regulation: TA-Luft; VDI 2440; temperature range: - 29°C bis +40°C;

Type classification:
- Armatures of series Neles RE Segment valves nominal diametre: DN 25 to DN 400;
- Armatures of series Neles LWLG Butterfly valves nominal diametre: DN 80 bis DN 400;
- Armatures of series Neles L8 Butterfly valves nominal diametre: DN 100 bis DN 600;

pressure range: Class 150 - 300 / PN 10, 16, 25, 40 and 63

Scope of application: Control and close off for poisonous or combustible liquids and gases.

material of stem packing: Virgin – PTFE (V – rings)

It is hereby certified that the above classified types of armatures satisfy the emission control performance as stipulated in the TA-Luft, section 5.2.6.4.

Hamburg, May. 25th 2005

Competence center
pressure equipment and system technology
test laboratory for safety devices/armatures

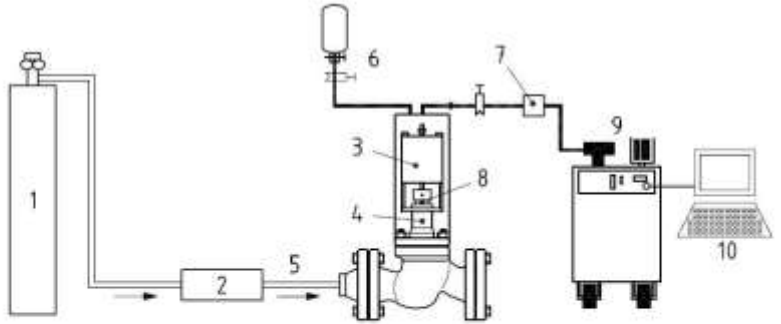
O. Schildenberg, Dipl.-Ing.

TÜV NORD GRUPPE

Emissions standards

EN-ISO 15848-1

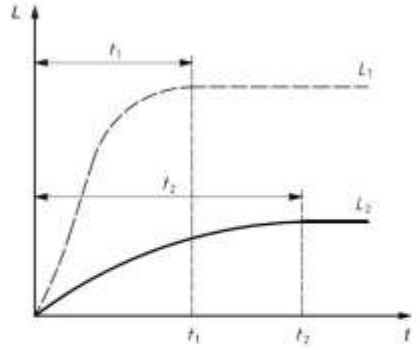
- ISO 15848-1 refers to a standard for fugitive type emissions approvals.
  - Tightness Class (A,B,C)
    - A being the tightest and only possible with a bellow seal.
  - Endurance Class (CO-1 to CC-3)
    - CO = On/Off and a few hundred cycles.
    - CC = Control and a few thousand to hundred thousand cycles.
  - Temperature Class (-196°C to 400°C)



Key

1	helium at 97 % purity	6	standard calibrated leak
2	pressure control	7	vacuum safety
3	actuator	8	tested stem sealing
4	vacuum	9	helium mass spectrometer
5	helium	10	data acquisition

Figure A.2 — Equipment



Key

L	leak rate, in milligrams per second per metre
L_1	leakage 1
L_2	leakage 2
T	time, in seconds
t_1	stabilization time t_1
t_2	stabilization time t_2

Figure A.3 — Examples of stabilization times for leaks measured using the global method

Fugitive emission requirements

API

- API 622 Type Testing of Process Valve Packing for Fugitive Emissions
- API 624 Type Testing of Rising Stem Valves Equipped with Graphite Packing for Fugitive Emissions
- API 641 Type Testing of Quarter-turn Valve for Fugitive Emissions

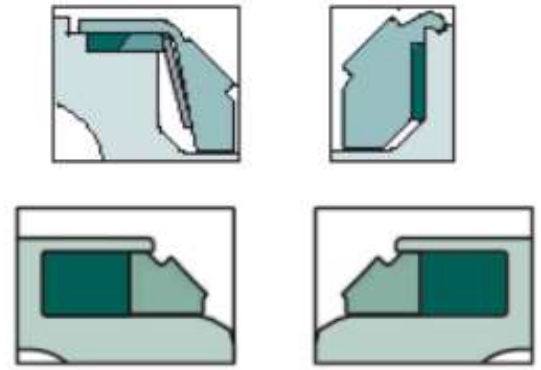
Neles solutions

- Emissions Offerings
  - Live-Loaded Stem Packing
  - PTFE V-Rings for moderate temperatures.
  - Graphite as standard for fire-safe requirements or elevated temperatures.
    - Die Molded, Fugitive emissions grade

Fire-safe

Valve definitions

- “Fire-Safe Certified”
  - Valves are tested, qualified and certified to meet industry standard.
  - Valves require fire-safe compatible seals, packing and construction.
- Inherently “Fire-Safe”
  - Valves are fire-safe by *design* but have not been tested or certified.
  - Valves require fire-safe compatible seals, packing and construction.
  - Neles Factory should be consulted for comprehensive offerings.
- None “Fire-Safe”
  - Valves can not be designated as fire-safe are not suitable for such applications.
  - Non-fire-safe seals, packing and construction are used.



Fire-safe

Background

NELES

- Common Neles Valve Standards
  - API 607 7th Edition
  - API 607 4th Edition, May 1993, 5th Edition, Sept. 2005, 6th Edition / ISO 10497, 2010
  - BS 6755: Part 2, 1987
  - API 6FA for Pipeline Valves
- Coverage and Comparability
  - API 607 is the most stringent test.
  - Testing Coverage in Valve Sizes:
    - Testing in API or BS qualifies to 2x valve sizes (i.e. 3” qualifies 4”, 6”).
    - Testing to 8” in API qualifies all larger sizes.
    - Testing to 16” in BS qualifies all larger sizes.
  - Testing Coverage in Valve Pressure Classes:
    - Testing in API or BS qualifies higher pressure classes (i.e. 300# qualifies 600#).

Fire-safe

General testing

- Expose valve to 1400°F – 1800°F fire for 30 minutes.
- Cool down valve by spraying water.
- API 607 4th edition, May 1993
  - Test external and internal leakage with low pressure (30 psig) after full open/close cycle.
- API 607 5th edition, Sept 2005
  - Test external and internal leakage with high pressure (75% of rated pressure, metal seated) and low pressure (30 psig, soft seated) after full open/close cycle.
- BS 6755
  - Test external and internal leakage with high pressure (75% of rated pressure) and low pressure (30 psig) after full open/close cycle.

Fire-safe

General testing

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General testing

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Questions?

Reinventing reliability

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