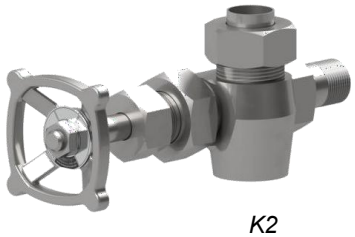
PENBERTHY TUBULAR GLASS LIQUID LEVEL GAUGES AND GAUGECOCKS

Low to medium pressure gauges and gaugecocks for direct visual identification of liquid levels.

N2



K2

N7

FEATURES

- Reliable easy to understand level reference.
- Gives users the ability to inspect liquid characteristics visually.
- Non-intrusive.
- No electrical power required. Provide accurate direct liquid level measurement in remote locations where power is not available. Not affected by power failures.
- Provide a near-unlimited length of measure.
- Plain transparent and redline glass available.
- Wide range of glass protectors provide improved protection.
- Glass unions provide superior pressure and temperature ratings.
- Can be supplied to meet ASME requirements.
- Straight and offset pattern valve bodies to allow for cleaning of the valve.
- Ball check shut-off prevents loss of process fluid in the event of an accidental breakage of the gauge glass.

GENERAL APPLICATION

Used to register liquid levels in low to medium pressure applications in the petroleum, chemical and general process industries, including steam boiler service.

TECHNICAL DATA

Materials	
Glass:	High pressure, heavy wall or red line
Gaugecocks:	Carbon, 316 Stainless Steel, Bronze, and Iron
Glass size:	5/8" and ¾" (DN 18 and 20)
Connections:	½" to 1" (DN 15 to 25)
Pressure ratings:	
Glass:	to 600 psi (41.4 bar)
Temperature rating	
Glass:	to 425°F (218°C)
Gaugecocks:	-325°F to 750°F (-198°C to 399°C)

PENBERTHY®

16633 Foltz Parkway, Strongsville, OH 44149 USA ● Telephone: +440-572-1500
www.PenberthyProcess.com ● sales@PenberthyProcess.com

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OVERVIEW

Penberthy tubular glass gauges are mounted to the vessel externally and use tubular glass to provide direct visual verification of the liquid level present. The transparent glass also provides an excellent means to inspect fluid characteristics optically.

Liquid enters the gauge through the lower tank connection. The meniscus present in the glass tube corresponds to the liquid level in the tank.

A wide range of accessories allows you to customize each gauge to your specific application requirements. These options can also provide enhanced level indication and protection for the tubular glass.

Protectors

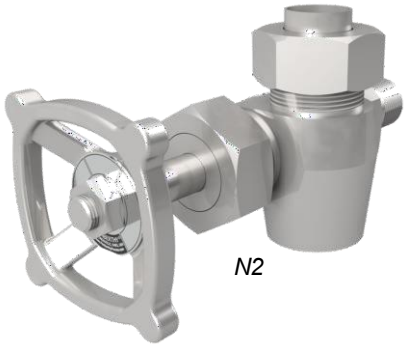
Tubular glass is susceptible to accidental breakage. To counteract this condition, a variety of protectors is offered which prevent damage to the glass but do not restrict level indication capability. In some cases, the protector actually enhances it. Protectors can be adapted to fit most major manufacturers' gaugecocks.

Guard rods – Two or four metallic rods placed next to the glass tube.

Plastic – A transparent box surrounding the tubular glass constructed from plastic.

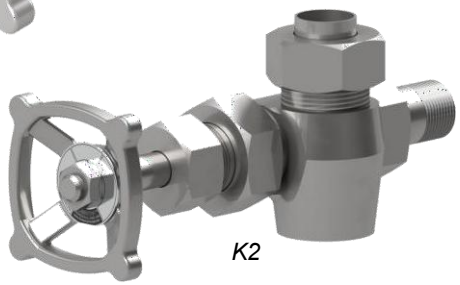
Center Fitting

Intended for use in gauges over 48" in height, it allows you to join two pieces of glass within the same gauge. This increases the length of the gauge to a max of 144" (with 2 center fittings).



N2

N7



K2

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PRESSURE/TEMPERATURE RATINGS FOR GAUGES WITH A SINGLE PIECE OF TUBULAR GLASS (BOTH ⅝" AND ¾")

Center to center distance for vessel	No corrosion up to 150°F (66°C) psig (kPa)			Steam boiler service up to 425°F (218°C) psig (kPa)		
connections inch (mm)	High pressure	Heavy wall	Red line	High pressure	Heavy wall	Red line
10 (254)	410 (2830)	600 (4140)	340 (2340)	310 (2140)	345 (2380)	275 (1900)
15 (381)	385 (2650)	600 (4140)	310 (2140)	280 (1930)	325 (2240)	265 (1830)
20 (508)	355 (2450)	600 (4140)	285 (1960)	265 (1830)	315 (2170)	260 (1790)
25 (635)	300 (2070)	580 (4000)	260 (1790)	250 (1720)	300 (2070)	250 (1720)
30 (762)	275 (1900)	550 (3790)	230 (1590)	-	-	-
35 (889)	240 (1650)	500 (3450)	200 (1380)	-	-	-
40 (1016)	210 (1450)	420 (2890)	180 (1240)	-	-	-
45 (1143)	200 (1380)	360 (2480)	170 (1170)	-	-	-
50 (1270)	180 (1240)	340 (2340)	160 (1100)	-	-	-
55 (1397)	150 (1030)	N/A	140 (970)	-	-	-
60 (1524)	140 (970)	N/A	120 (830)	-	-	-
65 (1651)	125 (860)	N/A	100 (690)	-	-	-
70 (1778)	100 (690)	N/A	90 (620)	-	-	-

Using secured glass unions and multiple pieces of tubular glass will increase the pressure/ temperature rating over that of an equivalent length of single glass.

OPTIONS AVAILABLE FOR THE DIFFERENT TYPES OF TUBULAR GLASS

Glass type	Options		
(both ⅝" and ¾")	Gaugecocks	Guard Rods	Plastic
High Pressure	X	X	X
Heavy Wall	X	X	X
Red Line	X	X	X

Centerline factor to calculate lenghts

Model	Visible Range		Tubular Glass		Guard Rods	
	in	mm	in	mm	in	mm
K2 / N2	4.625	-117	-1.375	-35	-2.125	-54

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OVERVIEW

Penberthy tubular glass gaugecocks are used in low to medium pressure applications. Available in offset and straight patterns, they isolate the tubular glass from the liquid contents of the vessel.

They are available with a combination of features for a range of users, including union vessel connections and a choice of stuffing box sizes for various glass diameters. All stuffing box connections are designed for positive seal with minimum radial compression.

Offset gaugecocks have the advantage of permitting the inside of the tubular glass to be cleaned easily with a minimum of disassembly. By removing the vent and drain plugs (or other connection), a straight passage is opened through the tubular glass. A brush can be inserted through the gaugecock vent and drain for glass cleaning.

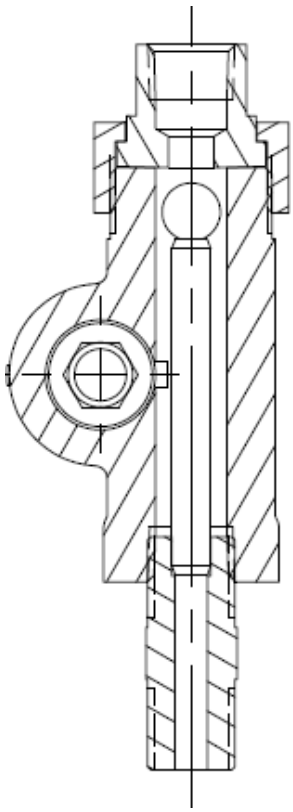
Automatic ball check shut-off

To prevent rapid loss of fluid in the event of accidental glass breakage. Penberthy gaugecocks are supplied with automatic ball check shut-off. Should the glass break, the pressure drop causes the ball checks to seat to prevent loss of tank contents. To unseat these ball checks during the liquid level readings, the tip of the gaugecock stem has an extension that pushes the ball away from its seat while allowing the gauge column to fill as liquid contents pass around the ball. Stainless steel retainers prevent reverse seating of balls or loss of balls during installation.

Both upper and lower gaugecocks in each set are equipped with horizontal ball checks. Balls re located on the vessel side of the guagecock seats.

Gaugecocks with ball checks omitted meet ASME boiler requirements. As an alternative method to ASME boiler requirements, the lower gaugecock is available with an optional vertical rising ball check located in the offset portion of the gaugecock body and the upper gaugecock has a leaky seat.

Vertically Rising Ball Check



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OVERVIEW

The N2 and K2 Series include models N2A/K2A, N2B/K2B and N2C/K2C. They are offered in steel or 316 stainless steel materials, in ½" to 1" (DN 15 to 25) sizes, with a 300 P-CL-ANSI rating and a wide range of features in offset pattern design.

FEATURES

- Offset pattern allows easy cleaning.
- Integral bonnet (N2 series).
- Union bonnet (K2 series).
- Union vessel connection.
- Ball check shut-off prevents loss of process fluid in the event of an accidental breakage of the tubular glass.
- Integral seat (N2 series).
- Threaded renewable seat (K2 series).
- Can be supplied to meet ASME requirements.
- Wide variety of vessel connections available.

A variety of optional features are available when specified. Optional materials can be specified for the gaugecock body and trim (trim consists of the stem, stem packing retainer, ball check and seat (K2 series only)). Standard and optional materials conform to ASTM specifications.

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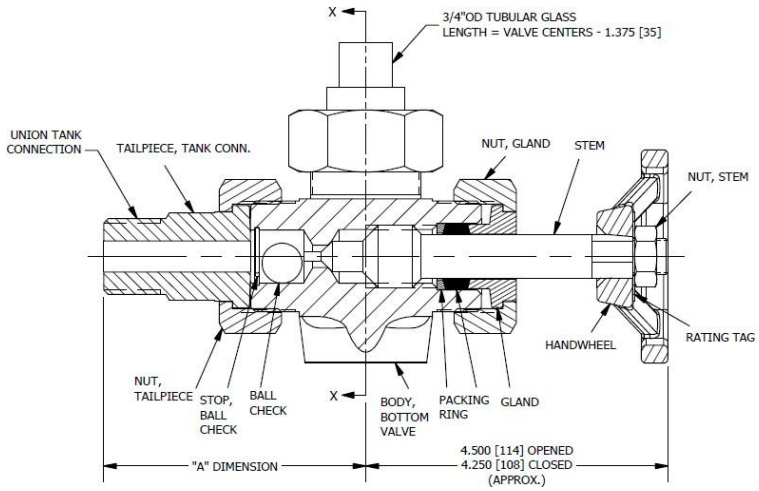
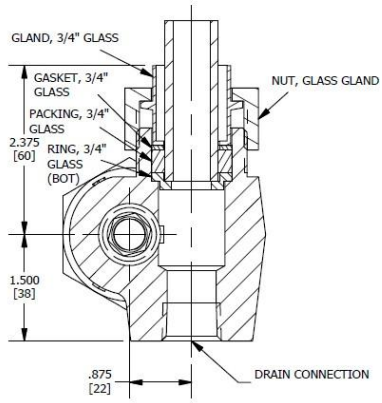
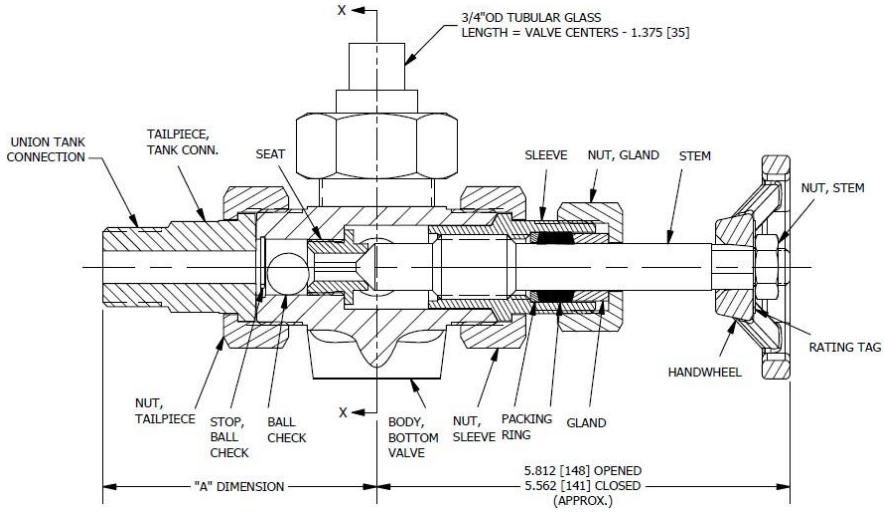
SERIES N2

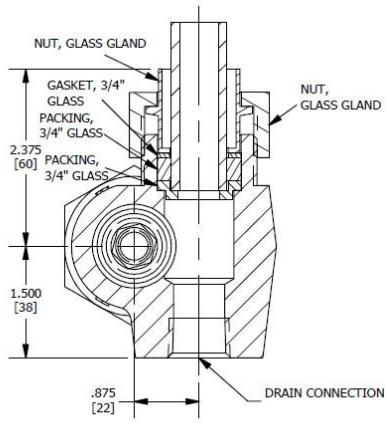




SECTION X-X

SERIES K2

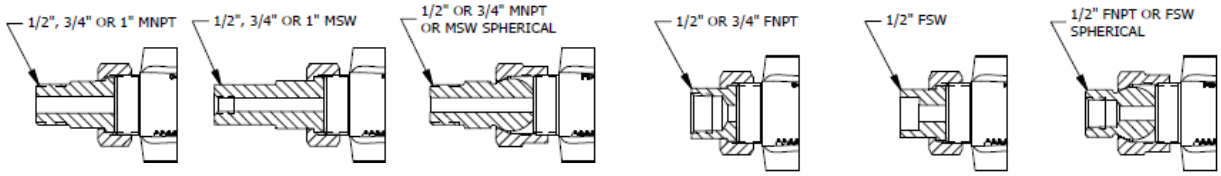




SECTION X-X

UNION TANK CONNECTION ("A" DIMENSION)								
1/2" MNPT (OR MSW)	1/2" FNPT (OR FSW)	1/2" MNPT SPH. (OR MSW)	1/2" FNPT SPH. (OR FSW)	3/4" MNPT	3/4" MSW	3/4" FNPT	3/4" MNPT SPH. (OR MSW)	1" MNPT (OR MSW)
3.688 [94]	2.813 [71]	4.313 [110]	3.438 [87]	3.688 [94]	4.500 [114]	2.813 [71]	4.313 [110]	4.125 [105]

VENT / DRAIN CONNECTION
1/2" OR 3/4" FNPT (OR FSW) ONLY



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SERIES N2/K2 STANDED/OPTIONAL FEATURES

		N2A		K2A		N2B		K2B		N2C		K2C	
Feature		**Std.**	**Opt.**	**Std.**	**Opt.**	**Std.**	**Opt.**	**Std.**	**Opt.**	**Std.**	**Opt.**	**Std.**	**Opt.**
Pattern													
Offset		X	-	X	-	X	-	X	-	X	-	X	-
Bonnet													
Integral		X	-	-	-	X	-	-	-	X	-	-	-
Union		-	-	X	-	-	-	X	-	-	-	X	-
Gauge Connection													
Stuffing Box	5/8" glass diameter	X	-	X	-	-	-	-	-	-	-	-	-
	1/2" glass diameter	-	-	-	-	X	-	X	-	X	-	X	-
Vessel Connection													
Union	1/2" NPTM	X	-	X	-	-	-	-	-	-	-	-	-
	3/4" NPTM	-	-	-	-	X	-	X	-	-	-	-	-
	1" NPTM (non floating)	-	-	-	-	-	-	-	-	X	-	X	-
Solid Shank	1/2" NPTM	-	X	-	X	-	-	-	-	-	-	-	-
	3/4" NPTM	-	-	-	-	-	X	-	X	-	-	-	-
	1" NPTM	-	-	-	-	-	-	-	-	-	X	-	X
Socketweld	1/2" Male	-	X	-	X	-	-	-	-	-	-	-	-
	3/4" Male	-	-	-	-	-	X	-	X	-	-	-	-
	1" Male	-	-	-	-	-	-	-	-	-	X	-	X
Flanged		-	X	-	X	-	X	-	X	-	X	-	X
Spherical Union	1/2" NPTM	-	X	-	X	-	-	-	-	-	-	-	-
	3/4" NPTM	-	-	-	-	-	X	-	X	-	-	-	-
Vent Connection													
3/4" NPTF		X	-	X	-	X	-	X	-	X	-	X	-
Drain Connection													
1/2" NPTF		X	-	X	-	X	-	X	-	X	-	X	-
Ball Check Shut-Off													
Horizontal Lower and Upper Gaugecocks		X	-	X	-	X	-	X	-	X	-	X	-
Vertical Lower/Horizontal Upper Gaugecocks*		-	X	-	X	-	X	-	X	-	X	-	X
Omitted*		-	X	-	X	-	X	-	X	-	X	-	X
Vacuum - Horizontal Upper and Lower		-	X	-	X	-	X	-	X	-	X	-	X
Seat													
Integral		X	-	-	-	X	-	-	-	X	-	-	-
Threaded (Renewable)		-	-	X	-	-	-	X	-	-	-	X	-
Handwheel													
w/ Standard Pitch Threads		X	-	X	-	X	-	X	-	X	-	X	-
w/ Quick Closing Threads		-	X	-	X	-	X	-	X	-	X	-	X
Lever													
w/ Quick Closing Thread (1/4 turn)		-	X	-	X	-	X	-	X	-	X	-	X
Guard Rods (4 per Gaugecock Set)													
¼" (6.4 mm) Diameter		-	X	-	X	-	X	-	X	-	X	-	X

* Acceptable for ASME service

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OVERVIEW

The N7 series consists of model N7A and N7B. They are offered in a choice of bronze, iron, steel and stainless steel constructions, in ½" to ¾" (DN 15 to 20) sizes with a wide range of features in straight pattern design.

Pressure (max.): 500 psi at 100°F (34.5 bar at 38°C)
Temperature range: -20°F to 500°F (-29°C to 260°C)

FEATURES

- Straight pattern.
- Integral bonnet.
- Rigid vessel connection.
- Ball check shut-off prevents loss of process fluid in the event of an accidental breakage of the tubular glass.
- Integral drain cock.
- Variety of vessel connections available.

A variety of optional features are available when specified. Combinations of optional features and materials are available. Each combination is designated by the model number in the features table. Optional materials can be specified for the gaugecock body and trim (trim consists of the stem, stem packing retainer and ball check). Standard and optional materials are available for service as described by ASTM Specifications.

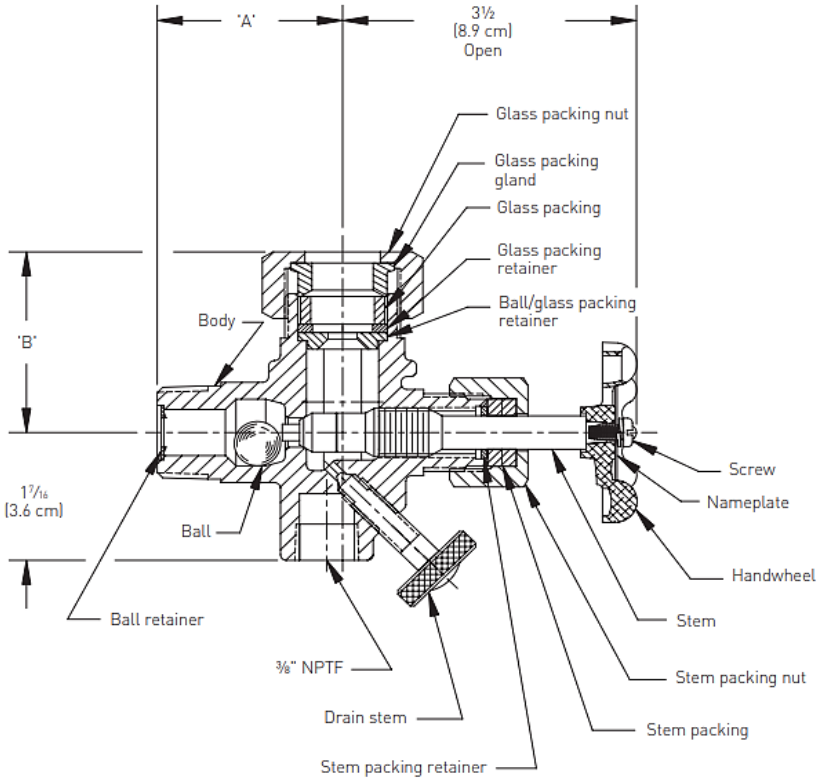
ASME Boiler Code
Series N7 gaugecock sets that are acceptable for ASME Boiler Code are available as an option. These gaugecock sets have a vertical rising ball check shut-off in the lower gaugecock and a horizontal ball in the upper gaugecock.

CENTER-TO-CENTER AND GUARD ROD DIMENSIONS (SEE DIMENSIONS ON PAGE 9)

Model	Dimension X, in. (cm)	Dimension Y, in. (cm)
All models	2 (5.1)	¾ (1.9)

PRESSURE/TEMPERATURE (SUBJECT TO LIMITATIONS OF TUBULAR GLASS)

Model	Maximum working pressure, psi (kPa) at temperatures to:							
	With standard Neoprene glass packing				With optional Teflon® glass packing			
	-20°F (-29°C)	100°F (38°C)	200°F (93°C)	300°F (149°C)	400°F (204°C)	450°F (232°C)	500°F (260°C)	Max. steam pressure
Bronze								
N7A	200 (1380)	200 (1380)	190 (1310)	165 (1140)	125 (860)	-	-	125 (860)
N7B	400 (2760)	400 (2760)	385 (2650)	335 (2310)	250 (1720)	-	-	250 (1720)
Ductile iron								
N7A, N7B	500 (3450)	500 (3450)	460 (3170)	375 (2580)	290 (2000)	250 (1720)	-	350 (2410)
STL, STS								
N7A, N7B	500 (3450)	500 (3450)	500 (3450)	500 (3450)	500 (3450)	500 (3450)	500 (3450)	350 (2410)



SERIES N7 DIMENSIONS

Connection	Dimension 'A' in inch (cm)	Dimension 'B' in inch (cm)
Solid shank		
½" NPTM	2 (5.1)	-
¾" NPTM	2 (5.1)	-
Socketweld		
½" Male	2 (5.1)	-
¾" Male	2 (5.1)	-
Flanged		
½"-150 P-CL R.F.	2¼ (5.7)	-
½"-300 P-CL R.F.	2¼ (5.7)	-
¾"-150 P-CL R.F.	2¼ (5.7)	-
¾"-300 P-CL R.F.	2¼ (5.7)	-
Stuffing box		
⅝" Dia. glass	-	2 (5.1)
¾" Dia. glass	-	2 (5.1)
Protector nut	-	2⅝ (6.7)

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SERIES N7 MATERIALS

Ref. no.	Description		Standard materials: Bronze to -20°F	Carbon steel to -20°F	Iron to -20°F	STS construction to -325°F	Optional materials
11	Body		ASME SB584 UNS C89836 Bronze	ASTM A216 Carbon steel Gr. WCB	ASTM A395 Ductile iron	ASTM A351 316/316L STS Gr. CF3M	ASTM A351 304/304L STS Gr. CF3 ASTM A890 Duplex 2205 STS Gr. 4A ASTM A494 Hastelloy B® Gr. N-12MV ASTM A743 Alloy 20 Gr. CN7M ASTM B564 Monel® 400 N04400 ASTM A494 Hastelloy C® Gr. CW12MW
14	Ball retainer		18-8 STS (302-304 STS)				None
15	TRIM	Ball	316 Stainless steel			ASTM A493, A262 or A276 316 STS	ASTM B574 Hastelloy C® 276 Borosilicate glass ASTM B473 Alloy 20 (CARP 20Cb3)® ASTM B164 Monel® 400 ASTM B335 Hastelloy B® CRS 304 STS ASTM A276 Duplex 2205 STS
17	TRIM	Stem	ASME SB171 CA Alloy 464 Bronze	ASTM A582 416 STS		ASTM A276 316/316L STS	ASTM A276 304/304L STS ASTM A276 Duplex 2205 STS ASTM B164 Monel® 400 ASTM B473 Alloy 20 (CARP 20Cb3)®
18	TRIM	Stem packing retainer	ASTM B291 Sheet brass	ASTM A240 sheet 316 STS			ASTM B335 Hastelloy B® ASTM B574 Hastelloy C® 276
25	Stem packing		Graphite composite				Teflon® Neoprene
26	Stem packing nut		ASME SB171 CA Alloy 464 Bronze	ASTM A108 Carbon steel AISI C1018		ASTM A276 316/316L STS	ASTM A276 304/304L STS ASTM A276 Duplex 2205 STS ASTM B164 Monel® 400 ASTM B473 Alloy 20 (CARP 20Cb3)® ASTM B335 Hastelloy B® ASTM B574 Hastelloy C® 276
28	Handwheel		ASTM B85 Aluminum				None
34	Glass packing		Neoprene®				Teflon® Graphite composite
35	Glass packing retainer		ASTM A240 sheet 316 STS				ASTM A276 316/316L STS ASTM A276 304/304L STS ASTM A276 Duplex 2205 STS ASTM B164 Monel® 400 ASTM B473 Alloy 20 (CARP 20Cb3)®
35A	Vertical ball seat/glass retainer		MPIF SS-316N2-33 316 STS (sintered)				ASTM B335 Hastelloy B®
36	Glass packing gland		MPIF CT-1000-K26 Bronze (sintered)	MPIF SS-316N2-33 316 STS (sintered)			ASTM B574 Hastelloy C® 276
37	Glass packing nut		ASME SB171 CA alloy 464 Bronze	ASTM A108 Carbon steel AISI C1018		ASTM A276 316/316L STS	ASTM A276 304/304L STS ASTM A276 Duplex 2205 STS ASTM B164 Monel® 400 ASTM B473 Alloy 20 (CARP 20Cb3)® ASTM B335 Hastelloy B® ASTM B574 Hastelloy C® 276
40	Guard rods		ASTM B21 CA alloy 464 Naval brass			ASTM A582 303 STS	None
47	Drain stem		ASME SB171 CA alloy 464 Bronze	ASTM A108 Carbon steel AISI C1018		ASTM A276 316/316L STS	ASTM A276 304/304L STS ASTM A276 Duplex 2205 STS ASTM B164 Monel® 400 ASTM B473 Alloy 20 (CARP 20Cb3)® ASTM B335 Hastelloy B® ASTM B574 Hastelloy C® 276
100	Handwheel screw		ASTM B633 Zinc plated Carbon steel				None

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SERIES N7 STANDARD/OPTIONAL FEATURES

Feature		N7A Std.	N7A Opt.	N7B Std.	N7B Opt.
Pattern					
Straight		X	-	X	-
Bonnet					
Integral		X	-	X	-
Gauge connection					
Stuffing box	5/8" glass diameter	X	-	-	-
	3/4" glass diameter	-	-	X	-
Vessel connection (solid shank)					
Threaded	1/2" NPTM	X	-	-	-
	3/4" NPTM	-	-	X	-
Socketweld	1/2" Male	-	X	-	-
	3/4" Male	-	-	-	X
Flanged		-	X	-	X
Drain connection					
3/8" NPTF		X	-	X	-
Ball check shut-off					
Horizontal lower and upper gaugecocks (iron, STL, STS)		X	-	X	-
Vertical lower/horizontal upper (bronze)		X	-	X	-
Vertical lower/horizontal upper*		-	X	-	X
Omitted*		-	X	-	X
Ball inspection plug**					
Furnished		-	X	-	X
Omitted		X	-	X	-
Seat					
Integral		X	-	X	-
Handwheel					
w/ standard pitch thread (iron, STL, STS)		X	-	X	-
w/ quick closing threads (bronze)		X	-	X	-
Drain cock					
Integral		X	-	X	-
Polished body					
Bronze		-	X	-	X
Guard rods (4 per gaugecock set)					
3/16" (4.8 mm) diameter		-	X	-	X

* Acceptable for ASME service
** Required for ASME serrvice

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SELECTION GUIDE - PART 1

PART 2 - PAGE 13

Example:	**N2A**	**S**	**S**	**X**	**C**	**A**	**X**	**D**	**E**	**A**	**C**	**A**	**G**	**G**	**S**	**S**

Model

N2A	Model N2A tubular gaugecock
N2B	Model N2B tubular gaugecock
N2C	Model N2C tubular gaugecock
K2A	Model K2A tubular gaugecock
K2B	Model K2B tubular gaugecock
K2C	Model K2C tubular gaugecock
N7A	Model N7A tubular gaugecock
N7B	Model N7B tubular gaugecock

Body Material

C	Carbon steel
S	316/316L Stainless
B	Bronze (N7 only)
G	Ductile Iron (N7 only)

Trim Material

C	416 SST (standard on Carbon steel and ductile iron body)
S	316/316L SST (standard on 316 SST body)
B	Bronze (standard on bronze body, N7 only)

NACE MR-01-75 and/or MR-0103

X	None
E	NACE Environmental

Vessel Connection Size

C	1/2"
E	3/4"
F	1"

Vessel Connection Type

A	NPT male union
B	NPT female union
C	Socket weld male union
D	Socket weld female union
E	Spherical union NPT male
J	Solid shank NPT male
K	Solid shank SW male
N	Raised face SO
P	Flat face SO

Pressure Class (if flanged)

X	None
1	P CL 150
3	P CL 300
6	P CL 600

Gauge Connection Size

D	5/8"
E	3/4"

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PART 1 - PAGE 12

N2A	S	S	X	C	A	X	D

SELECTION GUIDE - PART 2

Example:	E	A	C	A	G	G	S	S	XXX

Vent Connection Size

X	None (standard on N7)
C	1/2"
E	3/4" (standard on N2, K2)

Vent Connection Type

X	None (standard on N7)
A	NPT Female (standard)
B	Socket Weld Female
F	Plugged

Drain Connection Size

X	None
C	1/2" (standard on N2, K2)
E	3/4"

Drain Connecion Type

X	None
A	NPT Female (standard)
B	Socket Weld Female
F	Plugged
G	Drain Cock

Stem Packing Material

B	Braided Carbon Fiber
G	Grafoil® (standard)
T	Teflon®

Glass Packing Material

B	Buna N
T	Teflon®

Stem Operation

S	Standard close w/ handwheel (standard)
A	Quick close w/ lever
B	Quick close w/ handwheel
F	Standard close w/ lever

Paint Specification

X	None
S	Standard

Options

XXX	None
*	Plastic Protector
*	Horizontal ball check
*	Vertical rise ball check lower gaugecock
*	ASME vertical rise ball check lower gaugecock plug
*	Ball check shut off omitted (ASME)
*	Vacuum service vessel connection
*	Smooth body (N7 only)

* Option code assigned at time of order

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16633 Foltz Parkway, Strongsville, OH 44149 USA ● Telephone: +440-572-1500
www.PenberthyProcess.com ● sales@PenberthyProcess.com

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