



MEASUREMENT AND CONTROL

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1000 Series Engineered Bypass Chambers

The **1000 Series Engineered Bypass Chambers** are the ideal solution for housing process instrumentation without the need for complicated piping systems. The use of a bypass chamber reduces turbulence effects on instrumentation, while also allowing for easy shutdowns for maintenance. SOR, Inc. has over 30 years of experience manufacturing chambers and a dedicated team of engineers ready to design a custom solution to fit new or existing piping systems.

Applications

- Magnetostrictive Transmitters
- Guided Wave Radars
- RF Capacitance Level Controllers
- Pressure Transmitters
- Mechanical Level Switches
- Mechanical Pressure Switches
- Temperature Sensors/Switches
- ...and many more!

Features and Benefits

- Completely customizable design
- Chambers designed to ASME codes B31.1 and B31.3 guidelines with certificates available
- Optional construction to NACE, CRN and/or PED 2014/68/EU
- Hydrotested @ 1.5 MAWP standard
- Inspections and testing certifications done to SOR standard or your specific requirements
- Extensive list of auxiliary instrumentation available
- Quick Delivery
- Dependable operation for years of service
- 5 year warranty

Product Specifications

Materials of Construction

Chamber 316/316LSST, 304/304LSST, 321/321LSST, A105/A106, A335 Gr.6, Duplex 2205, A335 P-5, A335 P-9, A335 P-11, A335-P-22, A335 P-91, Hastelloy-C 276, Alloy 20, Monel 400, Inconel 600, Inconel 625, Titanium

Studs/Nuts Alloy Steel (A193-B7M / A194-2HM) Standard
Other materials upon request

Process Capabilities Vac to 5000 psi, Vac to 345 bar
-320 to 1200 °F, -196 to 649 °C



Vent Size and Type

12

- 1/2" NPS (15 DN) NPT Plugged
- 3/4" NPS (20 DN) NPT Plugged
- 1" NPS (25 DN) NPT Plugged
- 1/2" NPS (15 DN) Gate Valve
- 3/4" NPS (20 DN) Gate Valve
- 1" NPS (25 DN) Gate Valve
- 1/2" NPS (15 DN) SW Gate Valve
- 3/4" NPS (20 DN) SW Gate Valve
- 1" NPS (25 DN) SW Gate Valve
- 1/2" NPS (15 DN) NPT Ball Valve
- 3/4" NPS (20 DN) NPT Ball Valve
- 1" NPS (25 DN) NPT Ball Valve
- 1/2" NPS (15 DN) Flanged Connection
- 3/4" NPS (20 DN) Flanged Connection
- 1" NPS (25 DN) Flanged Connection
- No Vent

- P1
- P2
- P3
- V1
- V2
- V3
- V4
- V5
- V6
- L1
- L2
- L3
- T1
- T2
- T3
- NN

See page 6 for more details

Center-to-Center Dimension

11

Enter Center-to-Center dimensions in inches.
(Contact factory for min. dim. which varies based on chamber configuration.)

XXX

Pressure

10

Enter your maximum design pressure in PSI. Round up to the nearest whole number.

XXX

Temperature

9

Enter your maximum design temperature in °F. Round up to the nearest whole number.

XXX

13

Drain Size and Type

- Q1 1/2" NPS (15 DN) NPT Plugged
- Q2 3/4" NPS (20 DN) NPT Plugged
- Q3 1" NPS (25 DN) NPT Plugged
- W1 1/2" NPS (15 DN) NPT Gate Valve
- W2 3/4" NPS (20 DN) NPT Gate Valve
- W3 1" NPS (25 DN) NPT Gate Valve
- W4 1/2" NPS (15 DN) SW Gate Valve
- W5 3/4" NPS (20 DN) SW Gate Valve
- W6 1" NPS (25 DN) SW Gate Valve
- M1 1/2" NPS (15 DN) NPT Ball Valve
- M2 3/4" NPS (20 DN) NPT Ball Valve
- M3 1" NPS (25 DN) NPT Ball Valve
- U1 1/2" NPS (15 DN) Flanged Connection
- U2 3/4" NPS (20 DN) Flanged Connection
- U3 1" NPS (25 DN) Flanged Connection
- NN No Drain

See page 6 for more details

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Accessories

- NC NACE MR0175
- C2 Hydro Test Cert
- C3 Inspection Report
- C4 Certificate of Compliance/Conformance
- C7 QA Test Report
- CV CRN
- CY ASME B31.1
- CZ ASME B31.3
- UT Ultrasonic Examination
- MR Mill Test Report
- MT Magnetic Particle Testing
- PD Pressure Equipment Directive 2014/681/EU
- PT Dye Penetrant Certificate
- RT Radiography Certificate

See pages 7 & 8 for additional accessories

continued from page 2

250 - 342 - 96 - P1 Q1 - NC

Example
Model No.

Note: Consult the factory for assistance with any options you need that are not shown.

1000 Series Engineered Bypass Chambers

How to Order *(continued)*

Chamber Material (Step 2)

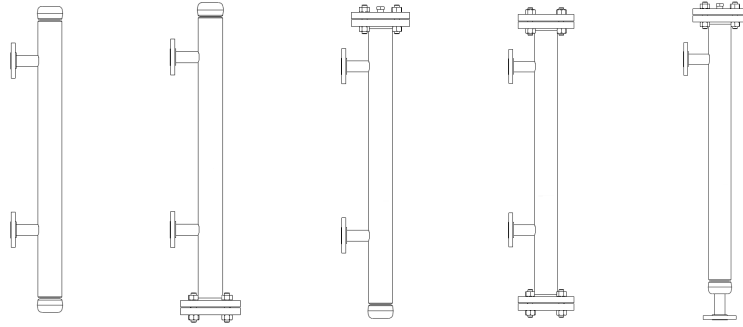
1000C-20A-F75N-S30-T250-342-96-P1Q1-NC

Designator	Material	ASTM Spec-Grade	ASME B16.9	ASME 16.11	ASME B16.5	Temperature Range
		Seamless Pipe	Wrought Butt Weld Fitting	Forged Fittings SW/Threaded	Pipe Flanges	
A	Carbon Steel	A106B	A234-WPB	A105	A105	-20°F to 800°F
B	304/304LSS	A213-TP304	A403-WP304	A182-F304	A182-F304	-425°F to 1000°F
C	316/316LSS	A213-TP316	A403-WP316	A182-F316	A182-F316	-425°F to 1000°F
D	Duplex SS	A-790	A-815	A182-F51	A182-F51	-60°F to 600°F
F	Low Temperature Carbon Steel	A333 Gr. 6	A420-WPL6	A350-LF2	A350-LF2	-50°F to 700°F
H	Hastelloy-C276 N10276	B6221	B366/B564	B366/B564	B366/B564	-325°F to 800°F
L	Alloy-20 N08020	B4641	B366/B962	B366/B462	B366/B462	-325°F to 800°F
M	Monel 400 N04400	B-1651	B366	B564	Gr N0 4400 B564	-325°F to 900°F

Chamber Style (Step 5)

1000C-20A-F75N-S30-T250-342-96-P1Q1-NC

- Mounting style indicates the location of the chamber's process connections
- Chamber top and chamber bottom dictates if the chamber is servicable



Designator	S	B*	T*	F*	V*
Mounting Style	Side/Side	Side/Side	Side/Side	Side/Side	Side/Bottom
Chamber Top	Sealed End Cap	Sealed End Cap	Flanged	Flanged	Flanged
Chamber Bottom		Flanged	Sealed End Cap		Sealed End Cap with Process Fange

*Models shown with optional mating flanges.

Custom configurations are available. Consult factory for additional details.

Flange Type (Step 8)

1000C-20A-F75N-S30-T250-342-96-P1Q1-NC

If the chamber configuration is sealed (S option) and the process connection type is socket weld (S option) or NPT (N option), please select the corresponding designator from the table to the right.

Socketweld	SCW
NPT	NPT

Otherwise, select a flange type and rating from the table below. This selection will determine the flange type and rating for flanges on top and bottom of the chamber as well as process connections.

Note: Weldneck flanges are required for ASME B31.1 B31.3 (CY & CZ)

Flange Type	Design Standard	Class Rating	Designator
Slip-on	ANSI B16.5	150# RF	S50
		300# RF	S30
		600# RF	S60
		1500# RF*	S15
		1500# RTJ*	S1R
	EN 1092-1	PN16 RF	DS1
		PN25 RF	DS2
		PN40 RF	DS4
		PN63 RF	DS6
		PN 100 RTJ	DS0

Flange Type	Design Standard	Class Rating	Designator
Weld Neck	ANSI B16.5	150# RF	W50
		300# RF	W30
		600# RF	W60
		1500# RF*	W15
		1500# RTJ*	W1R
	EN 1092-1	PN16 RF	DW1
		PN25 RF	DW2
		PN40 RF	DW4
		PN63 RF	DW6
		PN 100 RTJ	DW0

*Options may change specifications and dimensions. Contact factory for additional details.

1000 Series Engineered Bypass Chambers

How to Order *(continued)*

Flange Type *(Step 8) continued*

When applicable, extruded process connections will be the SOR standard. If extruded connections are prohibited or non-extruded branches are requested, the TE accessory designator may be selected. Extruded connections are available in the chart below. If these conditions are not met, then the user will be forced to select the TE option. Welded or seamless chambers can be extruded.

Pipe Size	Schedule	3Branch Size	Flange Type	Chamber Connection
2	10	1	Weld Neck or Slip-On	B,F,S,T
2	10	1.5		
2	10	2		
2.5	40	1.5		
2.5	40	2		
2.5	40	2.5		
3	10	1		
3	10	1.5		
3	10	2		
3	10	2.5		
3	10	3		

Vent and Drain Connection *(Step 12 & 13)*

1000C-20A-F75N-S30-T250-342-96-**P1Q1**-NC

SOR offers a wide selection of vent and drain options for custom chambers. Vent and drain* material will match chamber material. Contact factory for additional options.

		Size	Designator			Size	Designator
VENT	with NPT Plug	1/2" NPS (15 DN)	P1	DRAIN	with NPT Plug	1/2" NPS (15 DN)	Q1
		3/4" NPS (20 DN)	P2			3/4" NPS (20 DN)	Q2
		1" NPS (25 DN)	P3			1" NPS (25 DN)	Q3
	with NPT Gate Valve	1/2" NPS (15 DN)	V1		with NPT Gate Valve	1/2" NPS (15 DN)	W1
		3/4" NPS (20 DN)	V2			3/4" NPS (20 DN)	W2
		1" NPS (25 DN)	V3			1" NPS (25 DN)	W3
	with SW Gate Valve	1/2" NPS (15 DN)	V4		with SW Gate Valve	1/2" NPS (15 DN)	W4
		3/4" NPS (20 DN)	V5			3/4" NPS (20 DN)	W5
		1" NPS (25 DN)	V6			1" NPS (25 DN)	W6
	with NPT Ball Valve	1/2" NPS (15 DN)	L1		with NPT Ball Valve	1/2" NPS (15 DN)	M1
		3/4" NPS (20 DN)	L2			3/4" NPS (20 DN)	M2
		1" NPS (25 DN)	L3			1" NPS (25 DN)	M3
	Flanged ¹	1/2" NPS (15 DN)	T1		Flanged ¹	1/2" NPS (15 DN)	U1
		3/4" NPS (20 DN)	T2			3/4" NPS (20 DN)	U2
		1" NPS (25 DN)	T3			1" NPS (25 DN)	U3
No Vent	-	NN	No Drain	-	NN		

*Valve material will match chamber material unless otherwise specified.

¹ Flange style and rating is determined by the "Flange Type" designator (Step 8). Consult factory for a different flange style.

Temperature Accessories

Accessory	Description	Designator
Standard High Temp Insulation Blanket	<p>Insulation is recommended when chambers are to be used under extreme temperature conditions. Factory installed, removable, high-temperature insulation blankets are available for two temperature ranges and two configurations.</p> <p>1. For temperatures up to 500°F (260°C), a 2" thick (compressed to 1") #6 Cer-Wool HP enclosed in 3201-2-SS silicone coated fiberglass cloth.</p> <p>2. For temperatures above 500°F (260°C), fiberglass material rated to 1100°F (593°C) is included on the contact surface of the blanket.</p>	Chamber Only BL
		Chamber & Flanges BA
Cryogenic Insulation Blanket	<p>Cryogenic insulation is recommended when process temperatures need to be maintained between 32°F (0°C) and -300°F (-184°C). Cryogenic Insulation will help ensure the process media doesn't undergo a state change while maintaining critical process temperatures.</p> <p>SOR Cryogenic insulation is constructed from a 2" layer of closed-cell polyisocyanurate foam insulation. All joints are sealed and taped with fiberglass tape. In addition, a waterproofing membrane is installed over the insulation providing an additional layer of protection. Stucco embossed aluminum cladding is custom cut to fit over the membrane and the pieces are riveted and sealed together to ensure complete weatherproofing of the unit.</p>	Cryogenic Insulation BC
Heat Tracing	Heat tracing is used for freeze protection or to maintain the process temperature in bypass chamber. A wide variety of heat tracing options are available. Heat tracing is engineered to customer specifications and can be provided with controllers.	Steam Heat Tracing ST
		Electrical Heat Tracing TR

Note: Options may change specifications and dimensions. Contact factory for additional details.

Construction Modifications/Accessories

Accessory	Description	Designator
304SS Studs & Nuts	A193 Gr. B8 Class 2 / A194 Gr. 8 studs and nuts.	SN
Mating Flanges	Blind flanges attached to Top/Bottom chamber flanges.	MF
Seamless Pipe	Standard pipe is welded. Changes pipe to seamless.	SM
Non-Extruded Branches ¹	Standard process connections are extruded. Changes connection to non-extruded branches.	TE

¹Option no available for branch connections smaller than 1 NPS. See page 6 for more information.

Inspection & Testing Certifications

If inspection or testing options are selected, a completed Application Data Sheet is required at time of order or inquiry.

See Application Data Sheet PART 2 on page 12 for more information and options.

Accessory	Designator
Hydrostatic Pressure Test Certificate	C2
Inspection Report	C3
Certificate of Compliance/Conformance	C4
Certificate of Origin	D1
Manufacturer's Certificate	D2
QA Test Report	C7
Canadian Registration Number (CRN) ¹	CV
Certificate of Conformance (power plant piping ASME B31.1) ²	CY
Certificate of Conformance (plant piping ASME B31.3) ^{2,3}	CZ
Factory Acceptance Testing	FA
Mill Test Report	MR
PED 2014/68/EU2.5	PD
Compliance to NACE Certification MR0175/ISO 15156	NC
Positive Material Identification	PM
Dye Penetration Examination	PT
Radiographic Examination	RT
Ultrasonic Examination	UT

¹ CY or CZ option required for CRN.

² If CY, CZ or PD option is selected, see *Examination and Testing Requirements* on page 9. Consult factory for assistance.

³ Fluid category must be provided. Different processes require different quality inspection procedures.

⁴ Design pressure must be less than 4003 psi (276 bar)

⁵ Material certifications (MR) and Hydrostatic Test (C2) are required for PED.

See page 9 for additional details.

EXAMINATION AND TESTING REQUIREMENTS

Specify either a CY/CZ/PD option in the accessory section of the model number for a certificate of conformance.

Designator	Certificate of Conformance to
CY	ASME B31.1 Power Piping
CZ	ASME B31.3 Process Piping
PD	Pressure Equipment Directive 2014/68/EU

Notes

- If certification to B31.3 is required, SOR Inc. must know the fluid category per the chart below. Read the ASME B31.3 Fluid Category Section at the bottom of this page to determine the applicable category. If fluid category is not provided normal category is assumed.
- All units being certified to PED will also require (MR) Material Certificates and Hydro Static Test (C2) Certificate.

Units Covered	Visual Examination ¹	Radiographic (X-Ray) RT	Magnetic Particle MT	Dye Penetrant PT	Hydrotest
Standard Inspection					
All Chambers	100%	0%	0%	0%	1.5 x pressure for 3 minutes
CY Option (ASME B31.1)					
Below 750°F Below 1025 psi	100%	-	-	-	1.5 x pressure for 10 minutes
Below 350°F All pressures	100%	-	-	-	
350°F - 750°F Above 1025 psi	100%	All butt welds $\geq 2"$	-	-	
Above 750°F All pressures	100%	All butt welds $\geq 2"$	Butt welds $\geq 2"$ all other welds	Butt welds $\geq 2"$ all other welds	
CZ Option (ASME B31.3)					
Normal Fluid	5%	5% ²	-	-	1.5 x pressure for 10 minutes
Category D	Engineering/ QA Choice	-	-	-	
Category M	100%	20% of all welds ³	-	-	
High Pressure	100%	100% of girth/ branch welds	-	-	

Notes

- In process visual inspection: inspecting pipe bevel prior to welding, check fit-up, check after-tack weld, and check during weld passes. After completion visual inspection: welding and grinding is checked.
- In process examination may be substituted on a weld-for-weld basis.
- In process examination supplemented by appropriate NDE (MT or PT) may be substituted on a weld-for-weld basis.

ASME B31.3 Fluid Category

Normal	A fluid service not subject to the following four categories.
Category D	A fluid service in which all of the following apply: <ol style="list-style-type: none"> The fluid handled is non-flammable, non-toxic, and not damaging to human skin. The design gage pressure does not exceed 150 psi. The design temperature is between -20°F and 366°F.
Category M	A fluid service in which the potential for personnel exposure is judged to be significant and in which a single exposure to a very small quantity of a toxic fluid, caused by leakage, can produce serious irreversible harm to persons on breathing or bodily contact, even when prompt restorative measures are taken.
High Pressure	Pressure in excess of that allowed by the ASME B16.5 Class 2500 rating for the specified temperature and material group or any piping so designated by the customer.

Pressure Equipment Directive (PED) – Directive 2014/68/EU

If PED is required, SOR must know the following to determine EPR Category of the unit.

1. Design Pressure.
2. Design Temperature Range.
3. Process Fluid Group.
4. Design Code. Unless otherwise required by the Customer, ASME Section VIII will be the default design code.

Notes

- All units being certified to either PED will also require Material Certificates (MR) and Hydrostatic Test (C2)
- For B31.3 construction and PED compliance, in-process weld inspection will be performed to meet B31.3 requirements.
- If the X-Ray is requested, this will be done in addition to the in-process weld inspection. Since this X-Ray would be a customer requirement and not a design code requirement, SOR can use any approved Vendor for this NDE. For B31.3 Category M PT (in addition to in-process weld inspection) will be substituted in lieu of X-ray inspection. MT may be substituted when the unit's construction is Carbon Steel.



1000 Series Engineered Bypass Chamber Application Data Sheet

PART 2: Inspection and Testing Certifications

<input type="checkbox"/> PMI Report	<input type="checkbox"/> SOR Standard Alloy verification of wetted parts using x-ray fluorescence (XRF) technology to positively identify the part material used post manufacturing.
	<input type="checkbox"/> Customer specified alternate requirements _____
<input type="checkbox"/> Hydrostatic Pressure Test	<input type="checkbox"/> SOR Standard Process conforms to ASME Section V and is conducted per serial number. If valves are used, hydro testing will be done with valve open and ports plugged.
	<input type="checkbox"/> Customer specified alternate requirements _____
<input type="checkbox"/> Visual Inspection Report	<input type="checkbox"/> SOR Standard Visual weld inspection by certified weld inspector per sales order line item.
	<input type="checkbox"/> Customer specified alternate requirements _____
<input type="checkbox"/> Factory Acceptance Test	<input type="checkbox"/> SOR Standard Summary of testing schedule completed per sales order line item.
	<input type="checkbox"/> Customer specified alternate requirements _____
<input type="checkbox"/> Inspection Test Plan	<input type="checkbox"/> SOR Standard Summary of all the testing processes that will be conducted per sales order line item.
	<input type="checkbox"/> Customer specified alternate requirements _____
<input type="checkbox"/> Mill Test Report	<input type="checkbox"/> SOR Standard Certifies that the listed serial numbers were manufactured using the materials on the associated Certified Material Test Reports (CMTR).
	<input type="checkbox"/> Customer specified alternate requirements _____
<input type="checkbox"/> Dye Penetrant Examination	<input type="checkbox"/> SOR Standard Certifies that the listed serial numbers were examined by visible liquid penetrant in accordance with ASME Section V, Article 6.
	<input type="checkbox"/> Customer specified alternate requirements _____
<input type="checkbox"/> NACE Compliance	<input type="checkbox"/> SOR Standard SOR shall provide certification of compliance that the pressure boundary components of the listed serial numbers were manufactured to meet NACE MR0175/ ISO15156.
	<input type="checkbox"/> Customer specified alternate requirements _____
<input type="checkbox"/> Ferrite Test	<input type="checkbox"/> SOR Standard Certifies the Ferrite Number (FN) of 20% of the welds per serial number is documented on associated weld map drawings.
	<input type="checkbox"/> Customer specified alternate requirements _____
<input type="checkbox"/> Radiographic Examination (X-Ray)	<input type="checkbox"/> SOR Standard Certifies the 3rd party radiographic examination of 5% of welds per sales order line item by sample size in accordance with ASME Section V.
	<input type="checkbox"/> Customer specified alternate requirements _____
<input type="checkbox"/> Heat Treat	<input type="checkbox"/> SOR Standard Certifies heat treatment was conducted to ASTM standards per sales order line item.
	<input type="checkbox"/> Customer specified alternate requirements _____
<input type="checkbox"/> Mag Particle Examination	<input type="checkbox"/> SOR Standard Certifies that the listed serial numbers were examined by visible mag particle in accordance with ASME Section V.
	<input type="checkbox"/> Customer specified alternate requirements _____
<input type="checkbox"/> Ultrasonic Examination	<input type="checkbox"/> SOR Standard Certifies that the listed serial numbers were examined by 3rd party ultrasonic examination in accordance with ASME Section V.
	<input type="checkbox"/> Customer specified alternate requirements _____
<input type="checkbox"/> ASME B31.1	<input type="checkbox"/> Pressure _____ psi <input type="checkbox"/> Temperature _____ °F
<input type="checkbox"/> ASME B31.3	Fluid Class: <input type="checkbox"/> Normal <input type="checkbox"/> Category D <input type="checkbox"/> Category M <input type="checkbox"/> High Pressure
<input type="checkbox"/> PED	<input type="checkbox"/> Pressure _____ psi <input type="checkbox"/> Temperature Range _____ °F
	<input type="checkbox"/> Pressure Fluid _____ <input type="checkbox"/> Design Code _____

1000 Series Engineered Bypass Chambers

PED Chamber Application Data Sheet

[Link to online fillable one page PDF](#)

PED Chamber Application Data Sheet (Form 1900)

This form must be completed prior to engineering order review.

1000 Series Engineered Bypass Chambers

1100 Series Magnetic Level Indicator

Name _____	Date _____
SOR Representative _____	Order No. _____
End User/Install Location _____	Item No. _____
Process Information	
Intended Application _____	Design Temperature _____ °C
Design Pressure _____ bar	Operating Temperature _____ °C
Operating Pressure _____ bar	Minimum Temperature _____ °C
Process Media 1 _____ SG _____	Fluid Group <input type="checkbox"/> 1 <input type="checkbox"/> 2
Process Media 2 _____ SG _____	Fluid Group <input type="checkbox"/> 1 <input type="checkbox"/> 2
Process Media 3 _____ SG _____	Fluid Group <input type="checkbox"/> 1 <input type="checkbox"/> 2
Design Code _____ (unless specified ASME Section VII will be default)	
Chamber Information	
Model No. _____	Technology <input type="checkbox"/> Float <input type="checkbox"/> Displacer
Chamber Material _____	<input type="checkbox"/> Other _____
Trim Material _____	
Required Testing _____	Construction Code
_____	<input type="checkbox"/> B31.1 <input type="checkbox"/> B31.3 <input type="checkbox"/> BPVD Sec VIII
_____	Hazard Category
_____	<input type="checkbox"/> SEP <input type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV
Accessories _____	

<i>All PED chambers will include material certificates and hydrostatic test certifications.</i>	
Additional Information	
Provide any additional details that impact the installation, operation, maintenance and overall safety of this product and its intended use.	

14685 West 105th Street, Lenexa, Kansas 66215 | 913-888-2630 | Fax 913-888-0767 | SORInc.com

Form 1900 (02.24) ©SOR Inc.



MEASUREMENT AND CONTROL

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