

FA-7R™ Safety Head

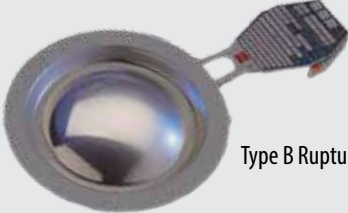






# Type B™

## Solid Metal Rupture Disks





# Type B™ Forward Acting Rupture Disk

Disk Types	Description	
B	The type B solid metal disk, available in many sizes and metals, utilizes a dome-shaped disk with a 30° angular seating arrangement. System pressure is applied to the dished or concave side, subjecting disk metal to tension loading.	 <p>Type B Rupture Disk</p>
BV	Where vacuum and / or back pressure occur, a vacuum support may be required. Consult the vacuum support selection criteria table for guidance on when to use a type BV, BRV or BSV disk.	<p>Type BV Rupture Disk</p> 
BR	At or below the burst pressures identified in the Protective Ring Selection Criteria Table, type BR disks shall be used. If burst pressure for type B disk is lower than shown pressures for standard sizes and disk metals, a BR protective ring should be considered.	 <p>Type BR rupture disk</p>
BRR	Close to the minimum type B disk burst pressure, a type BRR disk is recommended. A lined type B disk having a low burst pressure is recommended to be selected as type BRR. The rings attached to each side of the solid metal disk improve handling and installation of low burst pressure disks.	<p>Type BRR rupture disk</p> 
BRV	At or below the burst pressures identified in the Protective Ring Selection Criteria Table, when a vacuum support is required according to the Vacuum Support Selection Criteria Table, a type BRV disk shall be used.	 <p>Type BRV Rupture Disk</p>
BSV	For type BV rupture disks applied in applications where strong vacuum conditions are present, a type BSV disk is recommended. The BSV rupture disk includes a soft ring to enhance sealing on its upstream side. The ring can be selected from aluminum, silver or nickel.	<p>Type BSV Rupture Disk</p> 
BRSV	If a BR ring is also attached to the atmospheric side of a BSV disk, the assembly is called a Type BRSV Rupture Disk.	 <p>Type BRSV Rupture Disk</p>

Soft gasket ring; Standard materials are aluminum or fluoropolymer. Special materials include silver or nickel. Protective ring material: 316ss, aluminum, Inconel®, Monel®, or nickel.

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# Table 1

## Vacuum Support Selection Criteria

Where condition is:	Full vacuum		2/3 vacuum		1/3 vacuum	
Absolute pressure is:	0 psia	0bar	5 psia	0.35	10 psia	0.67
Atmospheric back pressure is:	14.7 psi	1bar	9.7 psi	0.67	4.7 psi	0.32
Rupture disk material is:	and pressure rating of disk is less than:					
	psig	barg	psig	barg	psig	barg
Aluminum	450	31	360	25	270	19
Silver	700	48	560	39	420	29
Nickel	1200	83	960	66	720	50
Monel*	1200	83	960	66	720	50
Inconel*	1200	83	960	66	720	50
316 stainless steel	1200	83	960	66	720	50

# Table 2

## Type B™ Rupture Disk

### Protective Ring Selection Criteria Table

Disk Size		Aluminum		Nickel alloy 200		Monel® alloy 400		Inconel® alloy 600		316 SS	
in	mm	psig	barg	psig	barg	psig	barg	psig	barg	psig	barg
1	25	260	18	1,100	76	1,450	100	1,800	124	2,100	145
1.5	40	173	12	733	51	967	67	1,200	83	1,400	97
2	50	104	7	440	30	580	40	720	50	840	58
3	80	73	5	309	21	407	28	506	35	590	41
4	100	57	4	241	17	318	22	395	27	461	32
6	150	43	3	181	13	238	16	296	20	345	24
8	200	33	2	138	10	181	13	225	16	263	18
10	250	25	1.7	107	7	141	10	175	12	204	14
12	300	22	1.5	92	6	121	8	150	10	175	12
14	350	19	1.3	79	6	104	7	129	9	150	10
16	400	17	1.2	69	5	91	6	113	8	131	9
18	450	15	1.0	61	4	81	6	100	7	117	8
20	508	13	0.9	55	4	73	5	90	6	106	7
24	610	10	0.7	46	3	60	4	75	5	88	6

# Table 3

## When Support Ring will withstand Full Vacuum

Disk metal	psig	barg
Aluminum	200	13.7
Silver	300	20.7
Nickel (alloy 200)	500	34.5
Monel® (alloy 400)	500	34.5
Inconel® (alloy 600)	500	34.5
316 stainless steel	500	34.5

For burst pressures below the values indicated in this table, a vacuum support shall be added to the type B or BR rupture disk

Soft gasket ring; Standard materials are aluminum or fluoropolymer. Special materials include silver or nickel. Protective ring material: 316ss, aluminum, Inconel®, Monel®, or nickel.

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## Fluoropolymer Linings

Liners may be applied to the upstream and downstream side of type B disks.

Protective ring is required for type B disks with Fluoropolymer lining on both sides in all disk materials except aluminum. Specify type BR, BRV, BV, BRSV, BRR, BSV.

Material	Maximum Recommended Temperature	
PTFE	500° F	260° C
FEP	400° F	204° C
PFA	500° F	260° C

*Note: Order as fluoropolymer liner and specify which side(s) applied*

## Burst Tolerance

Burst tolerance is the maximum expected variation from the disk stamped burst pressure.

Marked Burst Pressure	Burst Tolerance
> 2 to < 15 psig ( > 0.14 to < 1.03 barg)	±1.5 psig (+0.1 barg)
15 to < 40 psig (1.03 to < 2.8 barg)	±2.0 psig (0.14 barg)
≥ 40	±5%

## Manufacturing Design Range (MDR)

When specifying a rupture disk, an MDR will automatically be assigned to the specified burst pressure per the table. As an example, if you select a B disk to burst at 80 psig, the standard MDR shown on the table (+9, -5) or 75-89 psig will apply. The marked burst pressure for the lot of type B disks shall be within the MDR 75-89 psi in this example. Once the disk is rated and stamped, 78 psig for example, the burst tolerance of +5% now applies to this stamped pressure.

*Optional: The standard manufacturing design range can be reduced to 1/2 or 1/4 in most cases upon request.*

## Features

- Tension loaded, forward acting
- Maximum operating pressure - 70% of marked burst pressure
- Gas or liquid service
- One piece construction (type B)- sizes from 1/8 to 44 inches (3 to 1,100mm)
- Flange type installation in BS&B type FA-7R safety heads for installation between companion flanges
- Threaded union type installation in BS&B type UA safety heads
- Fragmentation - The type B ruptures in a random pattern and may fragment upon activation. Consult BS&B when pressure protection is required with minimal fragmentation
- High burst pressure capability

## Standard Manufacturing Design Range for Solid Metal Disks

Desired Burst Pressure		Standard Range			
		Plus		Minus	
psig	barg	psig	barg	psig	barg
2.5 - 3.5	0.17 - 0.24	1	0.07	1	0.07
4 - 6	0.3 - 0.4	2	0.13	1	0.07
7 - 10	0.48 - 0.03	2.5	0.17	1.5	0.1
11 - 16	0.75 - 0.05	3	0.2	2	0.13
17 - 25	1.17 - 1.72	4	0.27	2	0.13
26 - 40	1.8 - 2.76	5	0.34	3	0.2
41 - 65	2.8 - 4.5	6	0.4	4	0.27
66 - 100	4.6 - 6.9	9	0.62	5	0.34
101 - 150	6.9 - 10.3	12	0.8	6	0.4
151 - 200	10.5 - 13.7	16	1.1	9	0.62
201 - 350	13.8 - 24.1	23	1.6	12	0.8
351 - 500	24.2 - 34.4	30	2	15	1.03
501 & up	34.5 & up	+ 6%		- 3%	



### Temperature Conversion Table

To determine the estimated rupture pressure of a disk at other than 72°F (22°C), multiply related pressure at 72°F (22°C) by the temperature correction factor shown for the disk metal.

Disk Temp		Rupture disk material					
		Aluminum	Silver	Nickel	Monel®	Inconel®	316ss
F°	C°	%	%	%	%	%	%
-423	-253	170	164	165	155	132	200
-320	-195	152	152	144	140	126	181
-225	-143	140	141	126	129	120	165
-200	-129	136	138	122	126	118	160
-150	-101	129	130	116	123	115	150
-130	-90	127	126	116	121	114	145
-110	-79	122	123	115	120	113	141
-100	-73	120	122	115	119	112	139
-90	-67	120	121	114	118	112	136
-80	-62	120	120	114	117	111	134
-70	-57	119	120	113	116	110	132
-60	-51	119	119	112	115	110	130
-50	-45	119	118	112	114	109	128
-40	-40	118	117	111	113	108	125
-30	-34	117	115	110	112	108	123
-20	-28	116	112	109	111	107	121
-10	-23	115	110	108	110	106	118
0	-18	114	108	107	109	105	116
10	-12	113	107	106	108	105	114
20	-6	111	105	105	106	104	112
30	-1	110	104	104	105	103	110
40	4	108	103	103	104	102	107
50	10	106	102	102	103	102	105
60	15	103	101	101	101	101	103
72	22	100	100	100	100	100	100
80	26	100	100	100	99	100	99
90	32	99	99	99	98	99	98
100	37	98	99	99	97	99	96
110	43	97	98	98	96	99	95
120	48	97	98	98	95	98	94
130	54	96	97	97	95	98	93
140	60	95	96	97	94	98	92
150	65	94	95	96	93	97	91
160	71	93	94	96	93	97	90
170	76	92	93	96	92	97	90
180	82	90	92	95	92	96	89
190	87	89	91	95	91	96	89
200	93	88	90	95	91	95	88
210	99	87	89	94	90	95	88
220	104	85	87	94	90	95	87
230	110	84	86	94	89	95	87
240	115	82	85	94	89	95	86
250	121	81	84	93	89	95	86
260	126	-	-	93	88	94	86
270	132	-	-	93	88	94	85
280	138	-	-	93	88	94	85
290	143	-	-	93	87	94	84
300	149	-	-	93	87	94	84
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-

Disk Temp		Rupture disk materials			
		Nickel	Monel®	Inconel®	316ss
F°	C°	%	%	%	%
310	154	92	87	94	84
320	160	92	86	94	83
330	166	92	86	94	83
340	171	92	86	94	83
350	177	91	85	94	82
360	182	91	85	93	82
370	188	91	85	93	82
380	193	91	85	93	82
390	199	90	84	93	81
400	204	90	84	93	81
410	210	90	84	93	81
420	216	90	84	93	81
430	221	89	84	93	81
440	227	89	83	93	80
450	232	89	83	93	80
460	238	88	83	93	80
470	243	88	83	93	80
480	249	87	83	93	80
490	254	87	82	94	80
500	260	86	82	94	79
520	271	85	82	94	79
540	282	84	82	94	79
560	293	83	81	94	79
580	304	82	81	94	78
600	316	81	81	94	78
620	327	79	80	94	77
640	338	78	80	94	77
660	349	77	79	93	77
680	360	76	79	93	76
700	371	75	78	93	76
720	382	73	77	93	76
740	393	72	77	93	76
760	404	-	76	93	75
780	416	-	76	93	75
800	427	-	75	92	75
820	438	-	75	92	75
840	449	-	75	92	75
860	460	-	74	92	75
880	471	-	74	91	74
900	482	-	73	91	74
920	493	-	-	90	-
940	504	-	-	89	-
960	516	-	-	88	-
980	527	-	-	87	-
1000	538	-	-	86	-
1020	549	-	-	85	-
1040	560	-	-	85	-
1060	571	-	-	84	-
1080	582	-	-	83	-
1100	593	-	-	82	-

Temperature Conversion Factor in % indicating typical variance from burst pressure at 72°F (22°C)



**Type B™ Disk Specifications Minimum / Maximum Pressure Rating at 72°F (22°C) - Unlined Disks**

Disk Size		Aluminum				Nickel alloy 200				Monel® alloy 400			
in	mm	psig		barg		psig		barg		psig		barg	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
1/2	13	80	1500	6	103	280	20000	19	1379	340	25000	24	1724
1	25	40	1000	3	69	145	8000	10	552	175	10000	12	689
1.5	40	26	750	2	52	95	6000	7	414	115	6000	8	414
2	50	16	570	1	39	55	4000	4	276	67	4500	5	310
3	80	12	460	1	32	41	2500	3	172	49	3200	3	220
4	100	9	360	1	25	31	1900	2	131	37	2400	3	165
6	150	7	275	0.5	19	23	1400	2	97	28	1800	2	124
8	200	5	205	0.4	14	18	1100	1	76	22	1450	2	100
10	250	4	165	0.3	11	14	800	1	55	17	1150	1	79
12	300	4	140	0.3	10	12	670	1	46	15	960	1	66
14	350	3	125	0.2	9	11	570	1	39	13	750	1	52
16	400	3	105	0.2	7	9	410	1	28	11	475	1	33
18	450	3	95	0.2	7	8	445	0.5	30	10	450	1	31
20	508	2	85	0.1	6	8	400	0.5	28	9	450	1	31
24	610	2	71	0.1	5	37	145	3	10	-	-	-	-

Disk Size		Inconel® alloy 600				316ss				Hastelloy® alloy C-276			
in	mm	psig		barg		psig		barg		psig		barg	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
1/2	13	440	30000	30	2068	625	30000	43	2068	-	-	-	-
1	25	225	12000	16	827	320	12000	22	827	400	12000	28	827
1.5	40	150	6000	10	414	210	6000	14	414	263	6000	18	414
2	50	87	6000	6	414	120	6000	8	414	150	6000	10	414
3	80	63	4000	4	276	90	6000	6	414	113	6000	8	414
4	100	48	3000	3	207	68	6000	5	414	85	6000	6	414
6	150	36	2200	3	152	51	3600	4	248	64	3600	4	248
8	200	28	1700	2	117	40	2100	3	145	50	3600	3	248
10	250	22	1400	2	97	30	1400	2	97	-	-	-	-
12	300	19	1000	1	69	27	1000	2	69	-	-	-	-
14	350	17	750	1	52	23	750	2	52	-	-	-	-
16	400	15	500	1	35	20	500	1	34	-	-	-	-
18	450	13	475	1	33	18	475	1	33	-	-	-	-
20	508	12	450	1	31	16	450	1	31	-	-	-	-
24	610	-	-	-	-	60	230	4	16	-	-	-	-

*Note: Type B rupture disk technology is available up to nominal size 44" (1100mm). Consult BS&B*



# Type B Disk Specifications - FEP Lined Disks (1 side or 2 sides of disk)

Disk Size		Aluminum								Nickel alloy 200							
in	mm	Minimum pressure 1-side		Minimum pressure 2-side		Maximum pressure 1&2 sides		Maximum temperature FEP		Minimum pressure 1-side		Minimum pressure 2-side		Maximum pressure 1&2 sides		Maximum temperature FEP	
		psig	barg	psig	barg	psig	barg	F°	C°	psig	barg	psig	barg	psig	barg	F°	C°
1/2	13	235	16	380	26	1500	103	250	121	500	34	600	41	6000	414	400	204
1	25	90	6	140	10	1000	69	250	121	195	13	245	138	3000	207	400	204
1.5	40	60	4	95	7	700	48	250	121	130	9	165	11	2000	138	400	204
2	50	40	3	64	4	500	34	250	121	79	5	105	7	1300	90	400	204
3	80	26	2	40	3	400	27	250	121	55	4	69	5	900	62	400	204
4	100	20	1	31	2	325	22	250	121	42	3	53	4	650	49	400	204
6	150	15	1	23	2	240	17	250	121	31	2	39	3	500	34	400	204
8	200	11	1	17	1	180	12	250	121	24	2	30	2	375	26	400	204
10	250	9	1	14	1	135	9	250	121	19	1	24	2	300	21	400	204
12	300	8	1	12	1	110	8	250	121	16	1	20	1	250	17	400	204

Disk Size		Monel® alloy 400								Inconel® alloy 600							
in	mm	Minimum pressure 1-side		Minimum pressure 2-side		Maximum pressure 1&2 sides		Maximum temperature FEP		Minimum pressure 1-side		Minimum pressure 2-side		Maximum pressure 1&2 sides		Maximum temperature FEP	
		psig	barg	psig	barg	psig	barg	F°	C°	psig	barg	psig	barg	psig	barg	F°	C°
1/2	13	500	34	600	41	6000	414	400	204	790	54	790	54	10000	689	400	204
1	25	225	16	275	19	3000	207	400	204	275	19	325	22	5000	344	400	204
1.5	40	150	10	185	13	2000	138	400	204	185	13	220	15	3400	234	400	204
2	50	91	6	115	8	1300	90	400	204	110	8	135	9	1800	124	400	204
3	80	63	4	77	5	900	62	400	204	77	5	91	6	1500	103	400	204
4	100	48	3	59	4	650	49	400	204	59	4	70	5	1100	75.8	400	204
6	150	36	3	44	3	500	34	400	204	44	3	52	4	800	55.1	400	204
8	200	28	2	34	2	375	26	400	204	34	2	40	3	600	41.4	400	204
10	250	22	2	27	2	300	21	400	204	27	2	32	2	500	34.4	400	204
12	300	19	1	23	2	250	17	400	204	23	2	27	2	400	27.5	400	204

Disk Size		316ss								Hastelloy® alloy C-276							
in	mm	Minimum pressure 1-side		Minimum pressure 2-side		Maximum pressure 1&2 sides		Maximum temperature FEP		Minimum pressure 1-side		Maximum pressure 2-side		Maximum pressure 1&2 sides		Maximum temperature FEP	
		psig	barg	psig	barg	psig	barg	F°	C°	psig	barg	psig	barg	psig	barg	F°	C°
1/2	13	820	57	910	63	10000	689	400	204	-	-	-	-	-	-	400	204
1	25	370	26	420	30	5000	344	400	204	450	31	500	34	5000	344	400	204
1.5	40	245	17	280	19	3400	234	400	204	298	21	333	23	3400	234	400	204
2	50	145	10	170	12	1800	124	400	204	175	12	200	14	1800	124	400	204
3	80	105	7	120	8	1500	103	400	204	128	9	143	10	1500	103	400	204
4	100	79	5	90	6	1100	76	400	204	96	7	107	7	1100	75.8	400	204
6	150	59	4	67	5	800	55	400	204	72	5	80	6	800	55.1	400	204
8	200	46	3	52	4	600	41	400	204	56	4	60	4	600	41.4	400	204
10	250	27	2	32	2	500	34	400	204	-	-	-	-	-	-	400	204
12	300	23	2	27	2	400	28	400	204	-	-	-	-	-	-	400	204

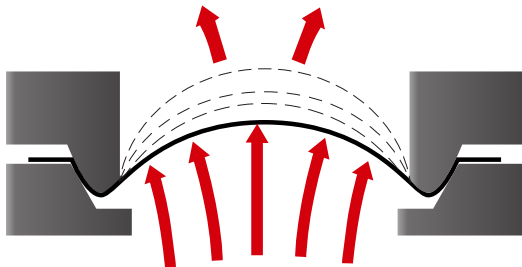
For 14-44 inch (350-1,100mm) sizes, consult BS&B for ratings and availability

# Bolted Type Safety Heads for type B series rupture disks

BS&B Safety Systems bolted type safety heads are constructed to be compatible with user pipe flanges connections. Safety head inlets and outlets feature angular seating design to accommodate the type B solid metal disks.

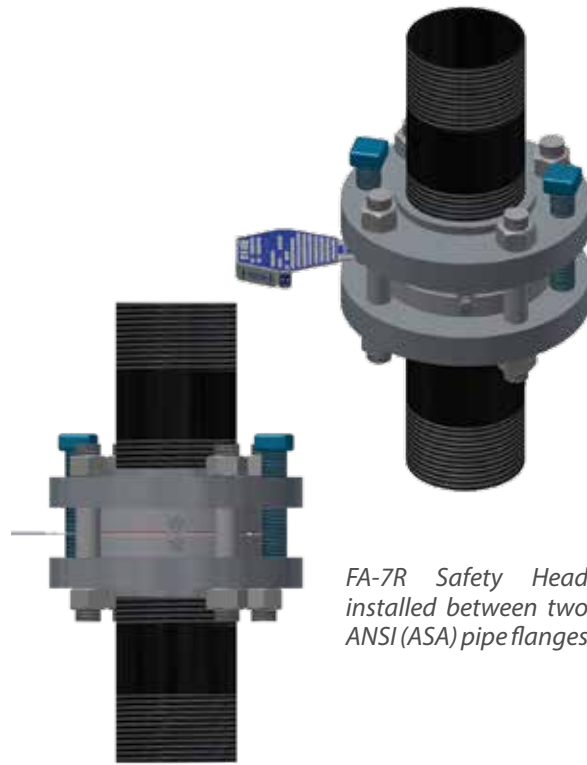
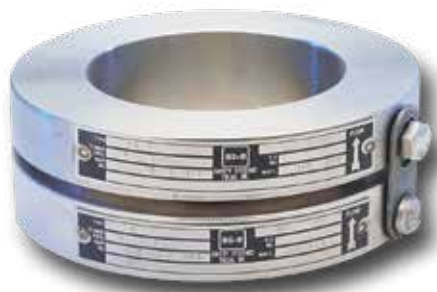
BS&B bolted type safety heads are available in standard sizes ranging from 1/2 (12 mm) - 44 inches (1100 mm) nominal size.

Standard materials for bolted type safety heads are carbon steel, 304 and 316 stainless steel. Special materials include Monel®, nickel, Hastelloy® B and C, aluminum, brass and other types of stainless steel. Glass-lined base and plastic-coated are also available.



**Example:** Cross-section diagram of a Type B tension loaded conventional rupture disk and FA-7R Quick-Sert safety head. With 30-degree angular seating, pressure loading is on concave side of disk. This puts the disk metal under tension. As pressure increases on a conventional disk in tension, the seating design allows the dome to thin out to a point where it can no longer withstand the pressure. The disk ruptures and metal segments fold back against the walls of the fitting in an irregular pattern to provide a full opening.

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FA-7R Safety Head  
installed between two  
ANSI (ASA) pipe flanges

## Maximum Temperature for all Components

Disk Material	F°	C°
FEP	400	204
PTFE	500	260
Aluminum	800	427
Silver	800	427
Nickel alloy 200	1000	538
Monel® (alloy 400)	1000	538
Inconel® (alloy 600)	1000	538
316ss	1000	538
Hastelloy® B or C-276 (alloy C-276)	1000	538

BS&B FA-7R safety head - flanges are assembled with bolted side lugs in sizes through 8 inches ID - with recessed cap screws in 10 inch size and up

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