8. RUPTURE DISCS

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8.0 A GUIDE TO BENOIL'S PRODUCTS & PROCESSES

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Followed by Sections 8.1. to 8.14 listing the product part numbers by size, pressure etc.

1. A SHORT HISTORY

Benoil has supplied burst disc products since 1989. Originally this was in order to make a range of bodies for our cementing darts. Because of this success, customers later asked us to make a range of discs for oilfield tools. What gave us the incentive to develop more extensively was in fact a particular request from a contact in Dubai for a very urgent job indeed, which we were able to satisfy. From there, a process of continuous improvement and expansion led to an ever wider market, which continues to grow to this day. The most recent developments of the past year or so have taken us into many more custom-made products, wider ranges of standard products, and more particularly into the area of custom testing for special applications.

This publication summarises the considerations which we apply to the production of burst discs so that they are thoroughly reliable in use. The approach, as will be seen, is to focus on the application to which the disc will be put by the end-user, and, by understanding, make appropriate recommendations.

2. BASIC FUNCTION

The uses to which burst discs are put in the oilfield are ever expanding. They are in circulation subs, motor head assemblies, fishing tools, expansion packer retrieval, safety heads, triggers, pipe isolation and several other special applications. Most of these, apart from the safety heads, have little to do with the original purpose of a burst disc as used for example on pipelines or in petrochemical plant, which is essentially as a safety release for over-pressure build-up. Oilfield applications are instead using burst discs as specific triggers to enable particular operations.

Typically, though not invariably, this means that a disc has an expected life before use of only hours or days. By contrast, an industrial safety disc may be in place for a year and never be burst. This, among many other factors referred to below, affects the nature of the disc design.

3. DESIGN TYPES

Discs may be simple, no more than a shaped piece of metal foil, or of various degrees of complexity. Simple discs usually have re-usable holders, whereas complex ones come as assemblies built into their holders (Appendix 1). But while the former are therefore more economical, the latter are more reliable and accurate. Usually, in oilfield applications, the cost of an operation going wrong is huge, when measured correctly to include down-time, lost production and recovery costs, and it is poor economy to save a little but to risk a lot.

Consequently, Benoil does not list and rarely supplies simple discs. Products are usually fully welded assemblies, with the foil welded between two metal rings. There are also fully clamped versions as assemblies, ones which cannot be adjusted by the user from the pre-set arrangement. Discs can be held in place with a secondary mechanism (circlip, external screws) but for most applications are self-

threaded for fixing. The chief exceptions are the original cementing darts (see catalogue section 6), which are rubber over-moulded to slide, and not be fixed, in the tubing.

The seating and porting of a burst disc will depend on its application. Benoil will design an assembly to have a metal-metal seal, a carried O-ring seal, a chamfered O-ring seal, or whatever else is appropriate. There tends to be a lot of interaction in the overall design between the space or wall section available for a port, the type of seal, the size and position of any O-ring, and the requirements of burst pressure and orifice size. Benoil tackles the design using SolidWorks CAD to ensure the parameters fit together to meet the need.

4. CHOICE OF FOIL : CORROSION / WEAR

Benoil will use any foil appropriate to an application. We initially offered nickel which is, however, not always suitable. Alloy 600 (*Inconel* 600 - *TM* Inco) is much more resistant to sour gas (hydrogen sulphide) atmosphere. Even it is not perfectly resistant; plated forms are one approach for extreme conditions or cocktail mixtures. In some conditions, 316 stainless steel is appropriate. We now offer also the more highly corrosion resistant Alloy C-276 (*Hastelloy* C-276 - *TM* Haynes); this is considered better than the plating concept as the alloy is coherent, while plating can crack as the disc expands near its rupture point. Other materials will be considered and Monel 400 (*TM* Inco) has been added recently. We have also used copper, aluminium, Kovar and titanium, but in special designs, as these do not readily weld to stainless steel bodies.

Alloy C-276 is, in addition to its corrosion resistance, also more resistant to wear erosion than the other foils. If erosion is a severe problem, protection may be necessary.

The nature of the foil being so important, Benoil marks all disc bodies with a code to indicate the foil present.

5. A QUESTION OF PRESSURE

Most of our products are aimed at typical oil and gas well pressures, from 1000psi to 9500psi. Standard and special values within this range can supplied. Lower values have occasionally been made, and higher values can be produced, the total range so far being 150psi to 25,000psi.

At 10,000psi and upwards different test rigs and pumps have to be used to withstand the pressure and special safety precautions are required.

What matters in the use of a burst disc is not only the nominal value but the spread of values inherent in a produced batch of discs. The industry standard is generally +/- 5% (though for the very simple discs it can be only +/- 10 or even 15% and even then not be kept to in practice). But many applications need a closer standard and Benoil discs are often within +/- 2%, and with extra attention can be, and are, tailored even more closely.

A particular example is a disc made to operate at 20,000psi at a particular well temperature with a spread of only +/- 250psi (or +/- 1.3%). This exceeded the customer's expectations.

6. CERTIFICATION

The difficulty about using any rupture disc is that it cannot be fully tested without destruction, so the quality of a product has to be achieved by consistency of manufacturing processes. Benoil has established procedures within its ISO 9001:2000 certification for the making of discs and makes burst tests on each batch produced. The typical number of tests is 5, whether the processed batch is 10 or 50, and these results are provided to customers in the form of a Certificate of Test and Conformity. This enables the user to assess the results directly (Appendix 1).

Even so, many oilfield operations take place at an elevated temperature. Temperature affects the burst disc rating and Benoil can advise a likely actual burst value; in critical cases, it may be desirable to have

results from testing at elevated temperatures, which Benoil can undertake on request.

Disc assemblies are marked for traceability with burst pressure as well as foil type (Appendix 1).

7. PRODUCT RANGES

Benoil makes a range of standard products which keeps growing. We characterise these for easy reference by a nominal bore size, which for historical reasons is given in metric in small sizes and in imperial in the larger.

5mm 8mm 11mm 3/4" 1" 1.1/4" 1.1/2" 2" 2.1/2" 3"

An alternative description is by a thread size, but neither is adequate in isolation. For example, there are two possible threads available on the 1-1/2" bore. Other design features may also mean that shorthand descriptions are insufficient, eg whether the O-ring is carried or fits to a chamfer. Some are available also with a choice of foils.

A typical standard item is illustrated in the attached drawing of an 8mm burst disc (Appendix 1). Our standard listings detail these and other products.

8. TESTING for SPECIAL APPLICATIONS

There have been numerous developments in the past couple of years which have expanded the range of products or provided them in special forms or with particular certification.

- A high pressure example has been mentioned above.
- Of particular value has been the addition of improved equipment for testing at elevated temperatures.
- Certain discs have been required to withstand a known but extensive range of pressure cycling and special cells have been built for the purpose.
- Another has involved simulation of disc behaviour over an expected use life of 9 months.
- Recently we have evaluated conditions of high pressure leading to collapse of other parts rather than the disc.

All such programmes are customer specific.

9. SPECIAL DESIGNS

It will be apparent that not all applications can be suited by standard product and it is a Benoil speciality to produce discs to meet particular needs, often in very small numbers. Sometimes these are the result of a direct customer design request, sometimes a mere modification of a standard design, sometimes they arise from the testing for a specific application as above. In all these cases, it is of great importance to define the parameters carefully with a customer to achieve the desired result, as quickly as possible, and at reasonable cost.

A particular example illustrates the point. Disc assemblies can be made to operate at different pressures in the two directions. Thus one can build safety into a disc which must operate in the desired sense at a known pressure, but must be protected from a reverse burst, from say a surge. Clearly, such are tailored to the customer need.

Again, it may be required to ensure a tight minimum value and for one customer application we ensured all discs were tested to 98% of the nominal in the laboratory before despatch.

Benoil has also made certain special holders and equipment that incorporate discs, including a special sub with a welded disc across it.

10. SERVICE

Time is of the essence in most oilfield operations. Benoil therefore carries stock of all the most popular discs, and indeed of many less common discs, for despatch as required, which has often been shown useful, especially when a customer has to adjust a planned job at short notice. We also make items quickly when necessary; this was, after all, how we started manufacturing discs in the first place. It is hard to generalise but we can usually make variations on the standard items in 7 days if necessary, though we might usually schedule on 2-3 weeks. Exceptionally, and usually at a cost, it can be done in less time.

Our flexibility and speed of response is proving a useful asset to those who buy and use our discs; naturally the prime concern is a disc suitable for purpose.

To supplement this, we also supply O-rings in each packet to accompany the products, on the basis that it is easier for the customer to know one is with the item and need not be thought about separately. We also offer blanks for testing the tool assembly, and specific fitting tools to ensure the discs can be safely fitted without risk of damage.

Please note that the lists give typical items. It does not mean all are necessarily in stock, particularly as we have taken the opportunity at this listing to give a wider indication of what can be made. Other values may be added to the ranges, and specials within them are made eg a requirement for 1375psi at BHT of 275F might need a special 1600psi at room temperature. Some values have been asked for but are not available within the range of known, available, reliable foil; these are indicated in square brackets, thus [1000psi].

8.1. Insertion Tools and Blank Plugs

Benoil makes a range of fitting tools to enable discs to be securely fitted or removed, ie without risk of the tool being able to touch and damage the disc. While many are standard, we are always willing to make adaptations to suit particular purposes. Those marked as extended, in particular, are made with a stem length as required. Cross-cuts are 4 way unless otherwise stated.

T-bar handles are useful for general purpose fitting and de-mounting. Where a particular torque must be applied, it is necessary to use a stub form to engage a torque tool.

109101	T-bar handle	for 8 & 11mm	to fit 8.5. & 8.6.
109102	withdrawn, use 109104		
109103	withdrawn, use 109106		
109104	Stub hex toughened steel	for 5mm	to fit 8.4.
109105	T-bar handle	for 1.50"	to fit 8.10.
109106	Stub square 1/2"	for 1.50"	to fit 8.10.
109107	Stub hex end, in SS431	for 8 & 11mm	to fit 8.5. & 8.6.
109108	Stub square 3/4" extended	for 2.00"	to fit 8.11.
109109	Stub square 1/2"	for 1.00"	to fit 8.8.
109110	Stub square 1/2"	for 3.00"	to fit 8.13.
109111	Stub square 1/2"	for 2.50"	to fit 8.12.
109112	T-bar handle	for 1.00"	to fit 8.8.
109113	Stub square 3/4"	for 2.00"	to fit 8.11.
109114	Stub square 3/4" extended	for 2.50"	to fit 8.12.
109115	T-bar handle extended	for 1.50"	to fit 8.10.
109116	Stub square 1/2"	for 1.125"	to fit special
109117	T-bar handle	for 0.75"/19mm	to fit special
109118	Stub square 1/2" extended	for 3.00"	to fit 8.13.
109119	Stub as 109109 but 8-way	for 1.00"	to fit 8.8.
109120	T-bar as 109112 but 8-way	for 1.00"	to fit 8.8.
109121	T-bar handle extended	for 2.00"	to fit 8.11.
109122	-	for	to fit
109123	T-bar handle extended	for 2.50"	to fit 8.12.

Benoil also makes a range of blanking plugs for tool testing purposes in SS316.

109201	5mm cross-cut blank
109202	8mm blank
109203	11mm blank
109204	1.00"/25mm blank
109205	1.50"/38mm blank
109206	5mm hex blank

8.2. and 8.3. Simple ‘slick’ discs of 8 and 12mm bore are no longer listed in detail. Tools now generally use threaded forms rather than circlip held forms. These have not been generally required for many years; but they can be supplied if necessary and were again once in 2006.

However, a number of ‘slick’ discs for larger sizes have been required more recently. These are not listed and are treated as customer specials, but an indication is given in the following listings.

8.4. Threaded Disc Assemblies - 5mm bore styles

Notes on revision to this section to accommodate expansion.

There are now 3 thread options, 2 drive styles, high pressure versions, length and material variations.

To accommodate all these, some revision of part numbers and sections has been appropriate. The new numbers are listed together with the old for reference. At the same time, some uncalled for parts have been de-listed.

The part number now gives the disc pressure rating, a significant improvement which brings them into line with our discs of 1" and above. It also permits a wider range of intermediate values to be listed when necessary. The last three digits indicate the pressure rating. The digits are the same as the first three of the pressure rating, so that, for values up to 9990psi, pressure is indicated in steps of 10psi if required. For pressures above 10,000psi, this means intervals of 100psi. The lists which follow, however, are confined mostly to the commonly required 500psi steps.

Threads: Available as UN; BSP, NPT or other on request.

Bore nominal 5mm; OD 11mm; thickness 10mm; thread 7/16-20-UNF; no chamfer; metal-metal seal. These are the originals, now renumbered p/n 18xxxx.

Similar with thread 1/4"BSP; OD 13mm; thickness 10mm; chamfered to seat on o-ring BS.010.VI75. De-listed as never called for but could be supplied as specials.

Similar with thread 1/4"NPT; no chamfer - thread seal. De-listed as very rarely called for but can be supplied as specials.

Drives: Available with cross-cut or hex fitting.

8.4.1. Driven by cross-cut with special fitting tool or torque tool.
Standard with cross-cut; p/n 180xxx, 181xxx, 182xxx, 183xxx.

8.4.3. Driven by hex slot with Allen key or torque tool.
Standard with hex: p/n 190xxx, 191xxx, 192xxx, 193xxx.

High Pressure: At 10kpsi and above, pressure regulations require higher safety standards and equipment. Previously we had a short list of one type. These are now renumbered to enable an expanded list of intermediate values in both cross-cut and hex drive forms.

8.4.2. High pressure with cross cut; p/n 186xxx, 188xxx.

8.4.4. High pressure with hex drive; p/n 196xxx, 198xxx.

Length: Some of these have specially shortened forms as customer specials, p/n 7xxxxx.

Material: We indicate 4 material options (nickel, alloy 600, ss316, and alloy C-276) but this is not necessarily exclusive. Discs have been made in each, but the generally stocked items are the 600 and C-276 forms.
They are listed as sub-sections; thus 8.4.1.1. is Nickel p/n 180xxx, 8.4.1.2. is Alloy 600 p/n 181xxx etc.

8.4.1. Thread 7/16-20-UNF and Cross-Cut Drive

New no Old no

8.4.1.1 **5mm - Nickel Disc**

180150 203302 1500psi
180200 203303 2000psi
180250 203304 2500psi
180300 203305 3000psi
180350 203306 3500psi
180400 203307 4000psi
180450 203308 4500psi
180500 203309 5000psi
180550 203310 5500psi
180600 203311 6000psi
180650 203312 6500psi
180700 203313 7000psi
180750 203314 7500psi
180800 203315 8000psi
180850 203316 8500psi
180900 203317 9000psi
180950 203318 9500psi

8.4.1.2. **5mm - Alloy 600 Disc**

181100 203321 1000psi n/a
181150 203322 1500psi
181200 203323 2000psi
181250 203324 2500psi
181300 203325 3000psi
181350 203326 3500psi
181400 203327 4000psi
181450 203328 4500psi
181500 203329 5000psi
181550 203330 5500psi
181600 203331 6000psi
181650 203332 6500psi
181700 203333 7000psi
181750 203334 7500psi
181800 203335 8000psi
181850 203336 8500psi
181900 203337 9000psi
181950 203338 9500psi

See 8.4.2.2. for pressures >10kpsi

8.4.1.3. **5mm - SS316 Disc**

182100 203341 1000psi

New no Old no

182150 203342 1500psi
182200 203343 2000psi
182250 203344 2500psi etc

8.4.1.4. **5mm - Alloy C-276**

183100 203361 1000psi n/a
183150 203362 1500psi n/a
183200 203363 2000psi
183250 203364 2500psi
183300 203365 3000psi
183350 203366 3500psi
183400 203367 4000psi
183450 203368 4500psi
183500 203369 5000psi
183550 203370 5500psi
183600 203371 6000psi
183650 203372 6500psi
183700 203373 7000psi
183750 203374 7500psi
183800 203375 8000psi
183850 203376 8500psi
183900 203377 9000psi
183950 203378 9500psi

See 8.4.2.4 for pressures >10kpsi

8.4.2. Thread 7/16-20-UNF and Cross-Cut Drive : HP forms

8.4.2.1. **5mm - Alloy 600 Disc**

186100	10,000psi
186105	10,500psi
186120	12,000psi
186123	12,300psi
186135	13,500psi etc

8.4.2.2. **5mm - Alloy C-276**

New no	Old no	
188100	203380	10,000psi
188101		10,100psi
188110	203381	11,000psi
188150		11,500psi
188120	203382	12,000psi
188125		12,500psi
188128		12,800psi
188130	203383	13,000psi
188135		13,500psi
188140	203384	14,000psi
188150	203385	15,000psi
188160	203386	16,000psi
188170	203387	17,000psi
188180	203388	18,000psi
188190	203389	19,000psi
188200	203390	20,000psi
188210	203391	21,000psi
188220	203392	22,000psi
188230	203393	23,000psi
188240	203394	24,000psi

8.4.3. Thread 7/16-20-UNF and Hex Drive

8.4.3.1. **5mm - Nickel Disc**

190150	1500psi
190200	2000psi
190250	2500psi
190300	3000psi
190350	3500psi
190400	4000psi
190450	4500psi
190500	5000psi
190550	5500psi
190600	6000psi
190650	6500psi
190700	7000psi
190750	7500psi
190800	8000psi
190850	8500psi
190900	9000psi
190950	9500psi

8.4.3.2. **5mm - Alloy 600 Disc**

191100	1000psi n/a
191150	1500psi
191200	2000psi
191250	2500psi
191300	3000psi
191350	3500psi
191400	4000psi
191450	4500psi
191500	5000psi
191550	5500psi
191600	6000psi
191650	6500psi
191700	7000psi
191750	7500psi
191800	8000psi
191850	8500psi
191900	9000psi
191950	9500psi

See 8.4.4.2. for pressures >10kpsi

8.4.3.3. **5mm - SS316 Disc**

192100	1000psi
192150	1500psi
192200	2000psi
192250	2500psi etc

8.4.3.4. **5mm - Alloy C-276**

193100	1000psi n/a
193150	1500psi n/a
193200	2000psi
193250	2500psi
193300	3000psi
193350	3500psi
193400	4000psi
193450	4500psi
193500	5000psi
193550	5500psi
193600	6000psi
193650	6500psi
193700	7000psi
193750	7500psi
193800	8000psi
193850	8500psi
193900	9000psi
193950	9500psi

See 8.4.4.4 for pressures >10kpsi

8.4.4. Thread 7/16-20-UNF and Hex Drive : HP Forms

8.4.4.1. **5mm - Alloy 600 Disc**

196100	10,000psi
196105	10,500psi
196120	12,000psi
196123	12,300psi
196135	13,500psi etc

8.4.4.2. **5mm - Alloy C-276**

198100	10,000psi
198101	10,100psi
198110	11,000psi
198150	11,500psi
198120	12,000psi
198125	12,500psi
198128	12,800psi
198130	13,000psi
198135	13,500psi
198140	14,000psi
198150	15,000psi
198160	16,000psi
198170	17,000psi
198180	18,000psi
198190	19,000psi
198200	20,000psi
198210	21,000psi
198220	22,000psi
198230	23,000psi
198240	24,000psi

8.5. Threaded Disc Assemblies - 8mm bore style

8.5.1. 8mm with cross-cut drive

Bore nominal 8mm; OD 16mm; thickness 10mm; thread 11/16-32-UN-2A.
With chamfered edge to seat on o-ring BS.014.VI75 provided.

8.5.1.1. 8mm - Nickel

203601 1000psi	203607 4000psi	203613 7000psi
203602 1500psi	203608 4500psi	203614 7500psi
203603 2000psi	203609 5000psi	203615 8000psi
203604 2500psi	203610 5500psi**	203616 8500psi
203605 3000psi	203611 6000psi	203617 9000psi
203606 3500psi	203612 6500psi	203618 9500psi

**We also have 5750psi available

8.5.1.2. 8mm - Alloy 600

203621 1000psi	203627 4000psi	203633 7000psi
203622 1500psi	203628 4500psi	203634 7500psi
203623 2000psi	203629 5000psi	203635 8000psi
203624 2500psi	203630 5500psi	203636 8500psi
203625 3000psi	203631 6000psi	203637 9000psi
203626 3500psi	203632 6500psi	203638 9500psi

8.5.1.3. 8mm - SS316

203641 1000psi	203647 4000psi	203653 7000psi
203642 1500psi	203648 4500psi	203654 7500psi
203643 2000psi	203649 5000psi	203655 8000psi
203644 2500psi	203650 5500psi	203656 8500psi
203645 3000psi	203651 6000psi	203657 9000psi
203646 3500psi	203652 6500psi	203658 9500psi

8.5.1.4. 8mm - Alloy C-276

203661 1050psi	203667 4000psi	203673 7000psi
203662 1500psi	203668 4500psi	203674 7500psi
203663 2000psi	203669 5000psi	203675 8000psi
203664 2500psi	203670 5500psi	203676 8500psi
203665 3000psi	203671 6000psi	203677 9000psi
203666 3500psi	203672 6500psi	203678 9500psi

8.5.2. 8mm - Alloy C-276, High Pressure

260100 10kpsi	260180 18kpsi
260110 11kpsi	260190 19kpsi
260120 12kpsi	260200 20kpsi
260130 13kpsi	260210 21kpsi
260140 14kpsi	260220 22kpsi
260150 15kpsi	260230 23kpsi
260160 16kpsi	260240 24kpsi
260170 17kpsi	260250 25kpsi

8.5.3. 8mm with hex drive

Bore nominal 8mm; OD 16mm; thickness 10mm; thread 11/16-32-UN-2A.

With chamfered edge to seat on o-ring BS.014.VI75 provided.

8.5.3. 8mm - Alloy C-276

201105 1050psi	201400 4000psi	201700 7000psi
201150 1500psi	201450 4500psi	201750 7500psi
201200 2000psi	201500 5000psi	201800 8000psi
201250 2500psi	201550 5500psi	201850 8500psi
201300 3000psi	201600 6000psi	201900 9000psi
201350 3500psi	201650 6500psi	201950 9500psi

NB in error previously published as 260xxx instead of 201xxx.

8.5.4. 8mm - Alloy C-276, High Pressure

261100 10kpsi	261180 18kpsi
261110 11kpsi	261190 19kpsi
261120 12kpsi	261200 20kpsi
261130 13kpsi	261210 21kpsi
261140 14kpsi	261220 22kpsi
261150 15kpsi	261230 23kpsi
261160 16kpsi	261240 24kpsi
261170 17kpsi	261250 25kpsi

8.6. Threaded Disc Assembly - 11mm bore style

8.6.1. 11mm with cross-cut drive

Bore nominal 11mm; OD 19mm; thickness 10mm; thread 3/4-16-UNF-2A.
With chamfered edge to seat on o-ring BS.112.VI75 provided.

8.6.1.1. 11mm - Nickel

203701 1000psi	203707 4000psi	203713 7000psi
203702 1500psi	203708 4500psi	203714 7500psi
203703 2000psi	203709 5000psi	203715 8000psi
203704 2500psi	203710 5500psi	203716 8500psi
203705 3000psi	203711 6000psi	203717 9000psi
203706 3500psi	203712 6500psi	203718 9500psi

8.6.1.2. 11mm - Alloy 600

203721 1000psi	203727 4000psi	203733 7000psi
203722 1500psi	203728 4500psi	203734 7500psi
203723 2000psi	203729 5000psi	203735 8000psi
203724 2500psi	203730 5500psi	203736 8500psi
203725 3000psi	203731 6000psi	203737 9000psi
203726 3500psi	203732 6500psi	203738 9500psi

8.6.1.3. 11mm - SS316

203741 1000psi	203747 4000psi	203753 7000psi
203742 1500psi	203748 4500psi	203754 7500psi
203743 2000psi	203749 5000psi	203755 8000psi
203744 2500psi	203750 5500psi	203756 8500psi
203745 3000psi	203751 6000psi	203757 9000psi
203746 3500psi	203752 6500psi	203758 9500psi

8.6.1.4. 11mm - Alloy C-276

203761 1000psi	203767 4000psi	203773 7000psi
203762 1500psi	203768 4500psi	203774 7500psi
203763 2000psi	203769 5000psi	203775 8000psi
203764 2500psi	203770 5500psi	203776 8500psi
203765 3000psi	203771 6000psi	203777 9000psi
203766 3500psi	203772 6500psi	203778 9500psi

8.6.2. 11mm - Alloy C-276, High Pressure

262100 203780 10kpsi	262180 203788 18kpsi
262110 203781 11kpsi	262190 203789 19kpsi
262120 203782 12kpsi	262200 203790 20kpsi
262130 203783 13kpsi	262210 203791 21kpsi
262140 203784 14kpsi	262220 203792 22kpsi
262150 203785 15kpsi	262230 203793 23kpsi
262160 203786 16kpsi	262240 203794 24kpsi
262170 203787 17kpsi	262250 203795 25kpsi

8.6.3. <u>11mm with hex drive</u>

Bore nominal 11mm; OD 19mm; thickness 10mm; thread 3/4-16-UNF-2A.
With chamfered edge to seat on o-ring BS.112.VI75 provided.

8.6.3. <u>11mm - Alloy C-276</u> available on request

213100 1000psi	213400 4000psi	213700 7000psi
213150 1500psi	213450 4500psi	213750 7500psi
213200 2000psi	213500 5000psi	213800 8000psi
213250 2500psi	213550 5500psi	213850 8500psi
213300 3000psi	213600 6000psi	213900 9000psi
213350 3500psi	213650 6500psi	213950 9500psi

NB in error previously published as 261xxx instead of 213xxx.

8.6.4. <u>11mm - Alloy C-276, High Pressure</u> available on request

263100 10kpsi	263180 18kpsi
263110 11kpsi	263190 19kpsi
263120 12kpsi	263200 20kpsi
263130 13kpsi	263210 21kpsi
263140 14kpsi	263220 22kpsi
263150 15kpsi	263230 23kpsi
263160 16kpsi	263240 24kpsi
263170 17kpsi	263250 25kpsi

8.7. Threaded Disc Assembly - 3/4" (19mm) bore style - Alloy C-276

8.7.1. With chamfered edge to seat on BS.020.VI75 o-ring provided

Usually made in alloy C-276; others on request. Bore is nominal 3/4" (19mm).
Thread is 1.125"-12-UNF-2A Thickness 5/8" (16mm) Drg 10274 B

202100 1000psi	202350 3500psi	202600 6000psi
202150 1500psi	202400 4000psi	202650 6500psi
202200 2000psi	202450 4500psi	202700 7000psi
202250 2500psi	202500 5000psi	202750 7500psi
202300 3000psi	202550 5500psi	202800 8000psi

8.7.2. With carried BS.(TBA).VI75 o-ring provided

Usually made in alloy C-276; others on request. Bore is nominal 5/8" (16mm)
Thread is 1.125-12UNF-2A Thickness 0.90" (23mm) Drg 10289-B

222100 1000psi*	222350 3500psi	222600 6000psi
222150 1500psi	222400 4000psi	222650 6500psi
222200 2000psi	222450 4500psi	222700 7000psi
222250 2500psi	222500 5000psi	222750 7500psi
222300 3000psi	222550 5500psi	222800 8000psi

*also available as 910psi

NB These are new and only a few values are yet stocked.

8.8. Threaded Disc Assembly - 1.0" (25mm) bore - Alloy C-276

8.8.1. With chamfered edge to seat on BS.025.VI75 o-ring provided

Usually made in alloy C-276; others on request. Bore is nominal 1" (25mm). Thread is 1.5"-12-UNF-2A. Thickness 5/8" (16mm).

This is the common form for these discs.

204100 1000psi	204150 1500psi	204450 4500psi
204110 1100psi	204200 2000psi	204500 5000psi
204120 1200psi	204250 2500psi	204550 5500psi
204130 1300psi	204300 3000psi	204600 6000psi
204140 1400psi	204400 4000psi	204650 6500psi

Also available as 'slick' discs without thread and OD reduced to 1.25".

8.8.2. With carried BS.025.VI75 o-ring provided

Usually made in alloy C-276; others on request. Bore is nominal 1" (25mm). Thread is 1.5"-12-UNF-2A. Thickness approx 0.9" (23mm).

This is the less common form for these discs.

214100 1000psi	214150 1500psi	214450 4500psi
214110 1100psi	214200 2000psi	214500 5000psi
214120 1200psi	214250 2500psi	214550 5500psi
214130 1300psi	214300 3000psi	214600 6000psi
214140 1400psi	214400 4000psi	214650 6500psi

8.9. Threaded Disc Assembly - 1.25" (32mm) bore - Alloy C-276

8.9.1. With chamfered edge to seat on BS.029.VI75 o-ring provided

Usually made in alloy C-276; others on request. Bore is nominal 1.25" (32mm). Thread is 1.75"-12UN-2A. Thickness 5/8" (16mm).

This is the common form for these discs.

205100 1000psi	205150 1500psi	205450 4500psi
205110 1100psi	205200 2000psi	205500 5000psi
205120 1200psi	205250 2500psi	205550 5500psi
205130 1300psi	205300 3000psi	205600 6000psi
205140 1400psi	205400 4000psi	205650 6500psi

Also available as 'slick' discs without thread and OD reduced to 1.50".

8.9.2. With carried BS.(TBA).VI75 o-ring provided

Usually made in alloy C-276; others on request. Bore is nominal 1.25" (32mm). Thread is (TBA). Thickness approx 0.9" (23mm) (TBC).

This is the less common form for these discs.

215100 1000psi	215150 1500psi	215450 4500psi
215110 1100psi	215200 2000psi	215500 5000psi
215120 1200psi	215250 2500psi	215550 5500psi
215130 1300psi	215300 3000psi	215600 6000psi
215140 1400psi	215400 4000psi	215650 6500psi

8.10. Threaded Disc Assembly - 1.5" (38mm) bore - Alloy C-276

Made in alloy C-276 foil; other materials on request. Bore is nominal 1.5" (38mm). Now stocked in two threads.

8.10.1. With chamfered edge to seat on BS.129.VI75 o-ring provided. Thickness 5/8" (16mm).

Both A and B are the common forms for these discs.

A) Thread 1-7/8" 12-UN-2A.

206100 1000psi	206300 3000psi	206500 5000psi
206150 1500psi	206350 3500psi	206550 5500psi
206200 2000psi	206400 4000psi	206600 6000psi
206250 2500psi	206450 4500psi	206650 6500psi

We also have a special version of this at 500psi in nickel foil, p/n 701050.

B) Thread 1.5" BSP-11tpi

207100 1000psi	207300 3000psi	207500 5000psi
207150 1500psi	207350 3500psi	207550 5500psi
207200 2000psi	207400 4000psi	207600 6000psi
207250 2500psi	207450 4500psi	207650 6500psi

8.10.2. As above made as ‘slick’ discs without thread. OD reduced to 1.75". D/N 10353.

256100 1000psi	256300 3000psi	256500 5000psi
256150 1500psi	256350 3500psi	256550 5500psi
256200 2000psi	256400 4000psi	256600 6000psi
256250 2500psi	256450 4500psi	256650 6500psi

8.10.3. As above (A) with disc reverse domed. D/N 10352.

266100 1000psi	266300 3000psi	266500 5000psi
266150 1500psi	266350 3500psi	266550 5500psi
266200 2000psi	266400 4000psi	266600 6000psi
266250 2500psi	266450 4500psi	266650 6500psi

8.10.4. With carried BS.131.VI75 o-ring provided. Thickness approx 0.9" (23mm).

This is the less common form for these discs.

Thread 2.00" 16-UN-2A

216100 1000psi	216300 3000psi	216500 5000psi
216150 1500psi	216350 3500psi	216550 5500psi
216200 2000psi	216400 4000psi	216600 6000psi
216250 2500psi	216450 4500psi	216650 6500psi

208000 and 218000 series part numbers are reserved for 1-3/4" bore discs not yet made.

8.11. Threaded Disc Assembly - 2.0" (51mm) bore - Alloy C-276

These and larger sizes are presently used in subs to provide a barrier across the tubing. They are usually made to carry the o-ring for ease of fitting, rather than having an o-ring chamfer. Made in alloy C-276; others on request. Bore is nominal 2" (51mm).

8.11.1. With chamfer to seat on BS.228.VI75 o-ring provided. Thickness 1.00” (25.4mm). Thread is 2-5/8"-12-UN-2A for this chamfer version.

This is the less common form for these discs.

209100 1000psi	209150 1500psi	209450 4500psi
209110 1100psi	209200 2000psi	209500 5000psi
209120 1200psi	209250 2500psi	209550 5500psi
209130 1300psi	209300 3000psi	209600 6000psi
209140 1400psi	209400 4000psi	209650 6500psi

8.11.2. With carried BS.230.VI75 o-ring provided. Thickness 1.25” (32mm). Thread is 2-7/8"-12-UN-2A for this carried version.

This is the common form for these discs.

219100 1000psi	219150 1500psi	219450 4500psi
219110 1100psi	219200 2000psi	219500 5000psi
219120 1200psi	219250 2500psi	219550 5500psi
219130 1300psi	219300 3000psi	219600 6000psi
219140 1400psi	219400 4000psi	219650 6500psi

8.12. Threaded Disc Assembly - 2.5" (63mm) bore - Alloy C-276

Made in alloy C-276; other materials on request. Bore is nominal 2.5" (63mm). Thread is 3-1/8"-12-UN-2A.

8.12.1. With chamfer to seat on BS.232.VI75 o-ring provided. Thickness - tba.

This is the exceptional form for these discs.

210100 1000psi	210170 1700psi	210450 4500psi
210110 1100psi	210200 2000psi	210500 5000psi
210120 1200psi	210250 2500psi	210550 5500psi
210130 1300psi	210300 3000psi	210600 6000psi
210140 1400psi	210400 4000psi	210650 6500psi

8.12.2. With carried BS.232.VI75 o-ring provided. Thickness 1.25” (32mm).

This is the common form for these discs.

220100 1000psi	220170 1700psi	220450 4500psi
220110 1100psi	220200 2000psi	220500 5000psi
220120 1200psi	220250 2500psi	220550 5500psi
220130 1300psi	220300 3000psi	220600 6000psi
220140 1400psi	220400 4000psi	220650 6500psi

8.13. Threaded Disc Assembly - 3.0" (76mm) bore - Alloy C-276

Made in alloy C-276; other materials on request. Bore is nominal 3" (76mm). Thread is 3-5/8"-12-UN-2A.

8.13.1. With chamfer to seat on BS.236.VI90 o-ring provided. Thickness - tba.

This is the exceptional form for these discs.

211100 1000psi	211170 1700psi	211450 4500psi
211110 1100psi	211200 2000psi	211500 5000psi
211120 1200psi	211250 2500psi	211550 5500psi
211130 1300psi	211300 3000psi	211600 6000psi
211140 1400psi	211400 4000psi	211650 6500psi

8.13.2. With carried BS.236.VI90 o-ring provided. Thickness 1-1/4” (16mm).

This is the normal form for these discs.

221100 1000psi	221170 1700psi	221450 4500psi
221110 1100psi	221200 2000psi	221500 5000psi
221120 1200psi	221250 2500psi	221550 5500psi
221130 1300psi	221300 3000psi	221600 6000psi
221140 1400psi	221400 4000psi	221650 6500psi

8.14. Special Items

The following special products are examples of what may be created for different circumstances.

8.14.1. Simple (non-threaded) Discs - 50mm bore

150psi pump pressure relief systems; simple disc clamped between flanges.

8.14.2. Threaded Discs - 5mm bore - Alloy 600

A product of about half the diameter of our standard items, these proved particularly testing to make with even higher levels of accuracy than larger items. That is important as the product forms a sensitive trigger. Techniques were therefore developed for the purpose.

8.14.3. Directional Discs

Designed for circumstances where the burst pressure in the forward direction has to be lower than the resistance to a reverse pressure condition. For example we have supplied 3400/7700psi in 11mm, 3500/5250psi in 1.5", and 7000/8500psi in 2.0" types.

8.14.4. Threaded Discs - 11mm bore - Alloy 600 - Gold-plated

An Alloy 600 disc was pre-pressured to 80% of nominal and thereby formed into dome; the result was then gold plated to resist sour gas. The same might be done to any disc type, but see the notes about corrosion and foil types.

8.14.5. Special Pressure Version of Standard Product

1350psi in SS316. A particular job required that the burst disc be rated with an unusually tight tolerance at ambient in order that a known value was obtained at the appropriate BHT.

8.14.6. Slimline Discs

We have had need to reduce the size of standard products to fit into particularly tight situations. This is not always possible by making at the desired size because of weld scorch on the foils and possible heat distortion of slim rings, but can be achieved by post machining discs in a specially protected environment.

8.14.7. Very High Pressure Discs

While we have now made a number of high pressure discs, defined as 10kpsi to 15kpsi, so that they are fairly routine, we have had need to produce even higher pressure discs on occasion to suit particular conditions. The pressures have been variously from 18kpsi to 27kpsi, and are by definition specials. They require extra care in design to ensure suitability and in testing to ensure safety. A feature of some of these is the careful control of angled or coned faces to ensure a good line contact in a metal-metal seal.