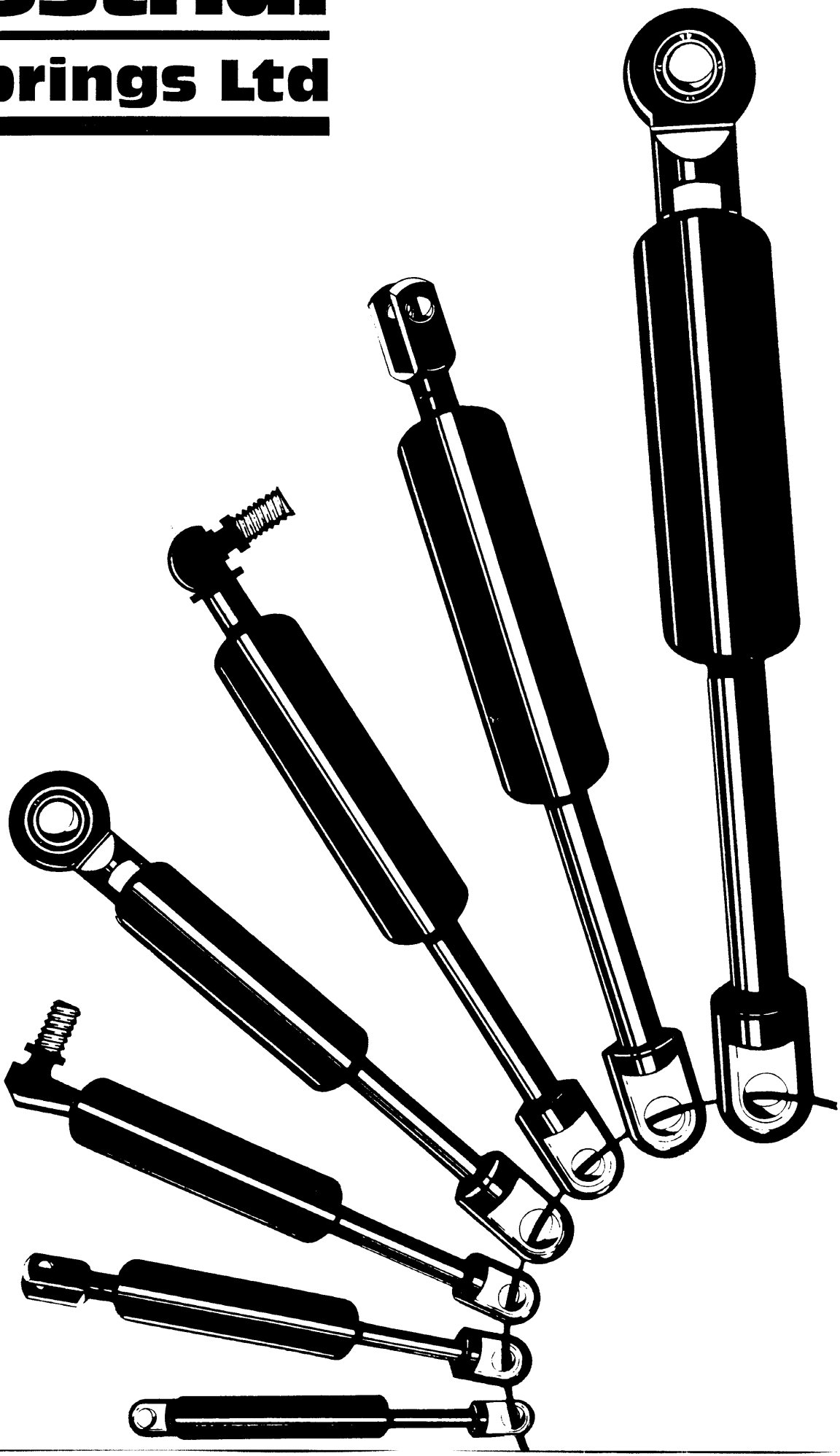
Industrial

Gas Springs Ltd



Industrial Gas Springs

Industrial Gas Springs (IGS) was formed in 1982 to supply a UK industrial market then poorly served - in terms of delivery, quality and variety - by manufacturers of automotive-type gas springs.

IGS specialises in fast delivery, high and consistent quality and the ability to meet customer requirements rather than impose spring sizes which are convenient for the manufacturer. Stock springs normally can be despatched in one to three days. Non-stock springs usually take two to four weeks and are generally priced at the same level as stock items. All springs are force tested and thoroughly inspected before despatch.

Gas springs from 10 to 10,000 Newtons

Industrial Gas Springs Ltd

22 Wates Way Mitcham Surrey CR4 4HR
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Facsimile: 0181 646 6594

Meeting your needs with design services

While the gas spring is a simple device, the application can be complex, especially with regard to its sizing and mounting. To make this as easy as possible, we have put a simple questionnaire on the back page which we ask you to photocopy, complete and return.

IGS will enter this data into our mature suite of powerful and sophisticated computer applications programs so that the solution which best meets your needs can be calculated. A drawing showing the mounting position (figure one), a profile of the hand force requirements (figure two) and the price will then be provided. Sample quantities (one to three gas springs) for the customer to test can normally be provided within a week.

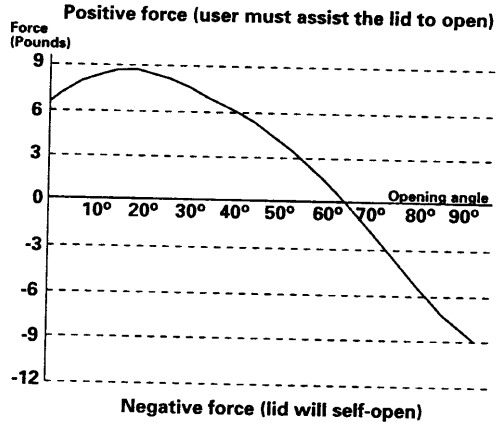


FIGURE TWO

FIGURE ONE

IGS makes every effort to ensure the accuracy of suggested solutions. It is not possible to take into account factors such as friction in the hinge, inaccuracy in fitting the gas spring, the position of the centre of gravity, the weight of the load etc. IGS cannot accept responsibility for suggested solutions. Whether IGS suggests a solution or not, samples should always be approved for the purpose for which they are required before further quantities of gas springs are ordered.

HOW IT WORKS

An IGS gas spring is a self-contained pneumatic device capable of producing very large forces (10 to 10,000 Newtons or 1 to 1,000 Kg force) from an extremely compact unit.

It consists of a precision rod attached to a piston, both of which move within a cylinder. The cylinder contains nitrogen at high pressure. It is this pressure which generates the force of the spring.

The gas spring is a low rate spring. The increase in force on compression is between 5% and 50% from the point where the rod is almost fully extended to the point where it is almost fully compressed. Under laboratory conditions, IGS gas springs achieve in excess of 250,000 cycles.

Taking a closer look

STOCK SPRINGS

IGS holds thousands of springs in stock to ensure that a wide range of requirements can be met as rapidly as possible. Despatch for these items is normally one to three days.

NON-STOCK SPRINGS

For non-stock items built from off-the-shelf components, despatch usually takes two to four weeks. There is generally no extra cost for these, though a minimum quantity (currently twenty five) must be ordered.

For custom springs, using specially made components, cost and delivery times may increase.

FORCE

Gas spring force is normally designated as P_1 and occasionally P_2, both expressed in Newtons measured at 20°C. P_1 is measured at a position 5mm from full extension of the spring, while P_2 is measured 5mm from full compression. As governed by Boyle's Law, the P_2 force for IGS stock gas springs is always greater than the P_1 force - by the following factors:

size 4	1.2	size10	1.3
size 6	1.2	size14	1.5
size 8	1.3	size 20	1.4

It is relatively easy on non-stock springs to increase these factors to give a higher P_2 up to an approximate maximum of 1.7. This is normally achieved by increasing the volume of oil inside the cylinder.

FINISH

The rod is made of steel and plated with hard chrome, while the cylinder, also steel, is coated with a baked matt black epoxy powder paint. Both finishes are resistant to corrosion; but for particularly corrosive environments, stainless steel rods or complete stainless steel springs can be provided.

TEMPERATURE

The force that gas springs produce varies linearly by 0.34% per °C e.g. a spring which produces a force of 100 Newtons at 20°C will produce a force of 86 Newtons at -20°C and 120 Newtons at 80°C. By using special seals and alternative lubricants IGS can provide gas springs capable of operating at -40°C and 160°C.

The options

LENGTH

A valuable service which IGS offers is the production of non-stock springs to meet the specific requirements of individual customers. Although a wide range of lengths and sizes can be supplied, there is a limit to how short a fully extended spring can be in relation to its stroke.

This length can easily be calculated by referring to the following table and then making a simple calculation (next page).

	*standard spring	*release valve spring	*oil chamber spring
size 4	48mm	not available	not available
size 6	67mm	90mm	100mm
size 8	81mm	107mm	121mm
size 10	107mm	128mm	143mm
size 14	122mm	141mm	170mm
size 20	169mm	169mm	228mm

* All three types of spring have standard end fittings. These are based on nylon for sizes 6 and 8 and metal for the rest. Smaller extended lengths are possible by the use of non-stock end fittings. Please refer to IGS for further details.

To perform the calculation, simply multiply the length of the stroke by two and add the appropriate figure from the table on the previous page. Thus, for a fully extended size 8 spring, with standard nylon end fittings and a 95mm stroke the calculation would be as follows:

(2 x 95mm) + 81mm = 271mm

From this it can be seen that the minimum extended length for a size 8 spring with a stroke of 95mm is 271mm. Maximum extended length is only limited by the need to avoid buckling an over long spring.

Metal ball end fittings will increase the extended length as shown in the table on page 6.

DAMPING

As a standard IGS gas spring extends in a rod down condition, a damping effect is created firstly by nitrogen gas then oil being forced through valved orificing within the piston. Since oil is considerably more viscous than the nitrogen, maximum damping occurs as it reaches the oil near the point of full extension. The oil within the spring also lubricates the seal which retains the gas charge while allowing free movement of the rod.

IGS can increase the damping within the spring by increasing the amount of oil, increasing the oil viscosity or reducing the size of the orifice.

It is much more difficult, although not impossible, to increase damping when the spring is mounted horizontally, upside down (with an oil chamber) or during the compression stroke. Please contact IGS for further information.

HORIZONTAL USE

Because the main seal must be kept lubricated by the oil within the spring to prevent it from drying out, a standard compression gas spring must be mounted so that it spends most of its time in a rod-down position, within 60° of the vertical.

For applications which require the spring to be used horizontally or rod up, IGS have developed an oil chamber spring which keeps oil in contact with the seal no matter what the position of the spring.

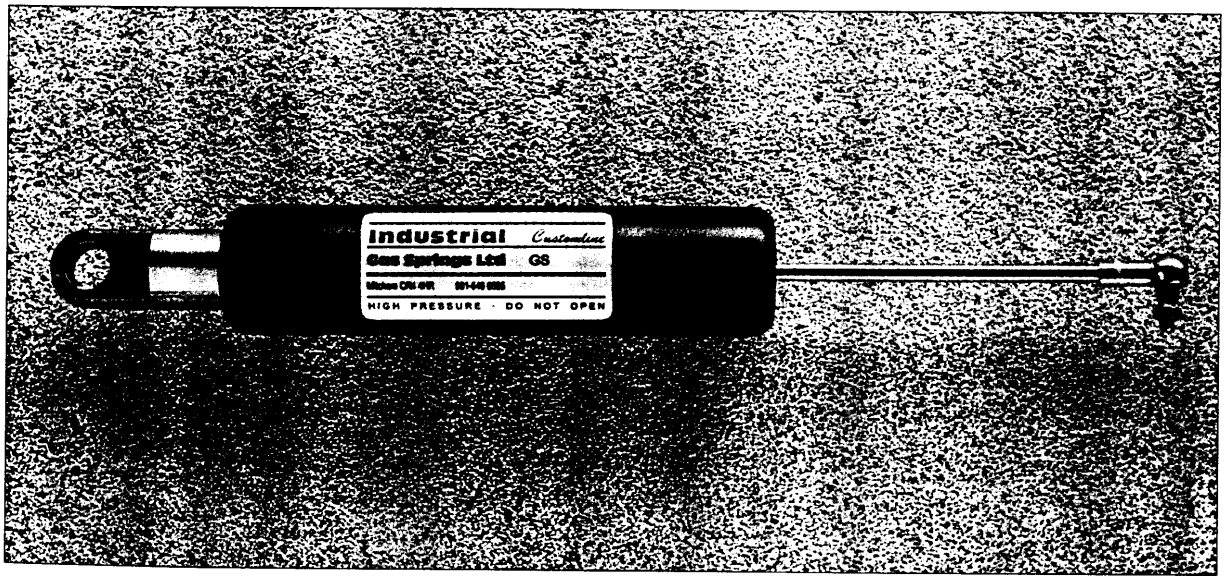
COLOUR

The body is black, but can be supplied in any of the standard epoxy powder coat colours, subject to a minimum batch of 100 springs.

LOW K FACTORS

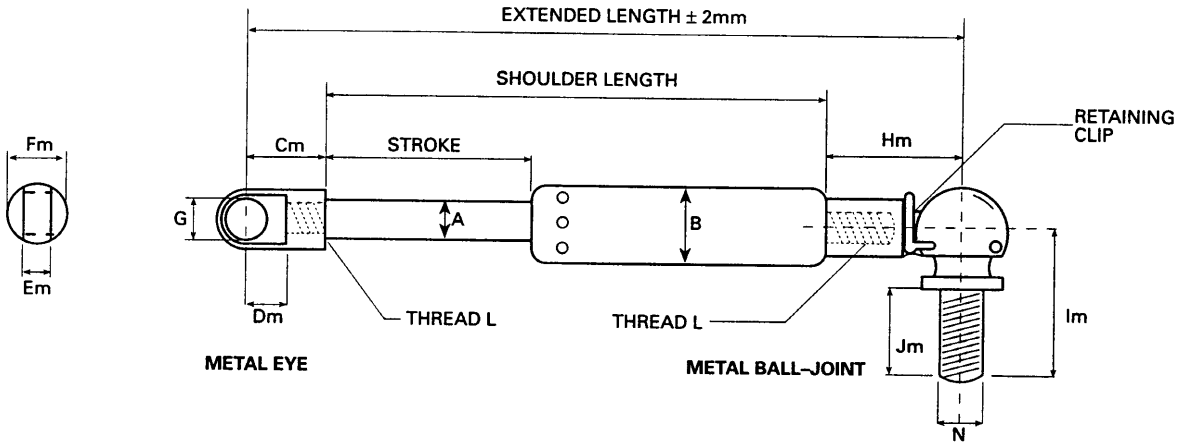
The spring design can be modified to support applications which require a lower K factor (spring rate), i.e. where the extended force and compressed force are almost equal. This situation often arises when the spring is required to achieve a straight rather than rotational lift.

IGS can accomplish this either by increasing the length of the steel body or by increasing the diameter of the body compared with the rod. The photograph below shows a gas spring with a 6mm rod within a 40mm tube giving a K factor of 1.04. Please contact IGS for further details.



Low K Factor Spring

Stock size gas springs with metal end fittings



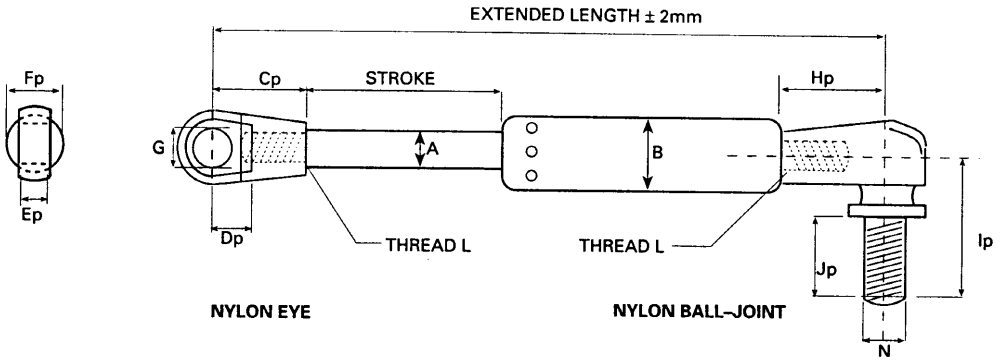
Size A	Stroke	Shoulder Length	B	Cm	Dm	Em	Fm Dia	G Dia	Hm	Im	Jm	N	L*	Oil Damping Zone	K P_2/P_1	P_1 Force (Newtons)
4	30 40 55 65 80 90	86 106 136 156 186 206	12	12	6	4	8	4	N/A	N/A	N/A	N/A	M4 x 0.7 6	10	1.2	10-150
6	60 100 150 200	184 264 364 464	15	18	9	6	10	6	22	19	10	M5 x 0.8	M6 x 1.0 11	10	1.2	40-400
8	50 100 150 200 250	168 268 368 468 568	18	21	10	9	14	8	30	29	17	M8 x 1.25	M8 x 1.25 14	10	1.3	100-600
10	50 100 150 200 250 300 400	165 265 365 465 565 665 865	23	30	14	10	16	8	30	29	17	M8 x 1.25	M10 x 1.5 10	25	1.3	150-1200
14	100 150 200 300 400 500	280 380 480 680 880 1080	28	35	16	10	20	8	35	36	20	M10 x 1.5	M10 x 1.5 14	25	1.5	250-2500
20	100 200 300 400 500	338 538 738 938 1138	40	42	20	14	25	14	45	48	28	M14 x 1.5	M14 x 1.5 15	25	1.4	500-5000

*TYPE, PITCH AND LENGTH

Size 10 gas springs with a release valve will not compress the final 3mm of Stroke.

Extended length is shoulder length plus length of **each** end fitting (Cm or Hm).

Stock size 6 and 8 with nylon end fittings

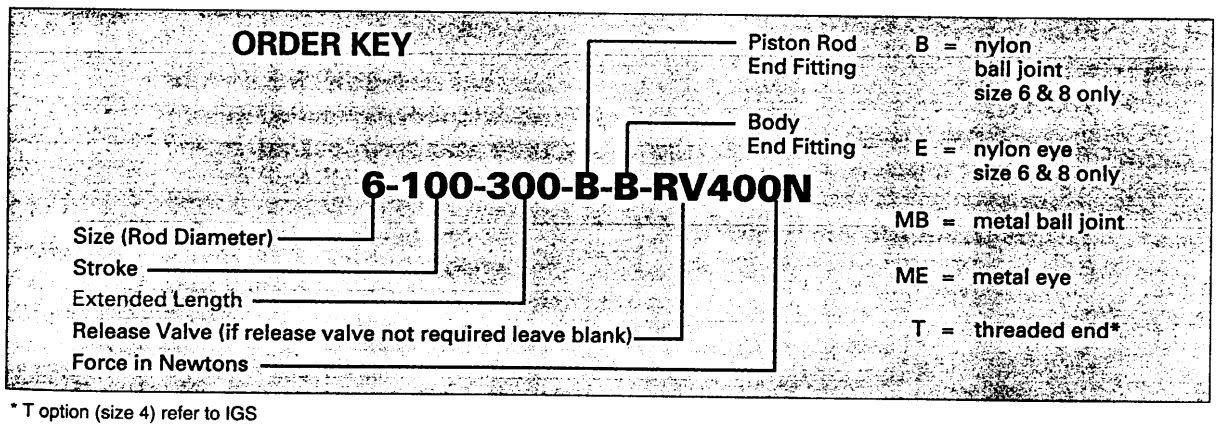


Size	Stroke	Extended Length	A dia	B dia	Cp	Dp	Ep	Fp dia	G dia	Hp	lp	Jp	N	L*	Oil Damping Zone	K (P_2/P_1)	P_1 Force Range (Newtons)
6	60 100 150 200	220 300 400 500	6	15	18	9	7	9	6	18	19	9	M5 x 0.8	M6 x 1.0 11	10	1.2	40-400
8	50 100 150 200 250	210 310 410 510 610	8	18	21	9	9	14	8	21	23	12	M8 x 1.25	M8 x 1.25 14	10	1.3	100-600

*TYPE, PITCH AND LENGTH

RELEASE VALVES

With the exception of the size 4, all standard springs can be fitted with a release valve (RV), without altering any of the dimensions stated. These R V units are fitted with an internal aerospace quality valve such that the springs can be supplied at a greater force than is deemed necessary. The spring force can then be reduced until the correct movement is achieved. Having obtained this movement the spring can be returned to IGS for force testing. Subsequent orders for gas springs can be supplied at the measured force without an RV valve. Should too great a reduction take place IGS can readily recharge the spring and return it for re-evaluation.



* T option (size 4) refer to IGS

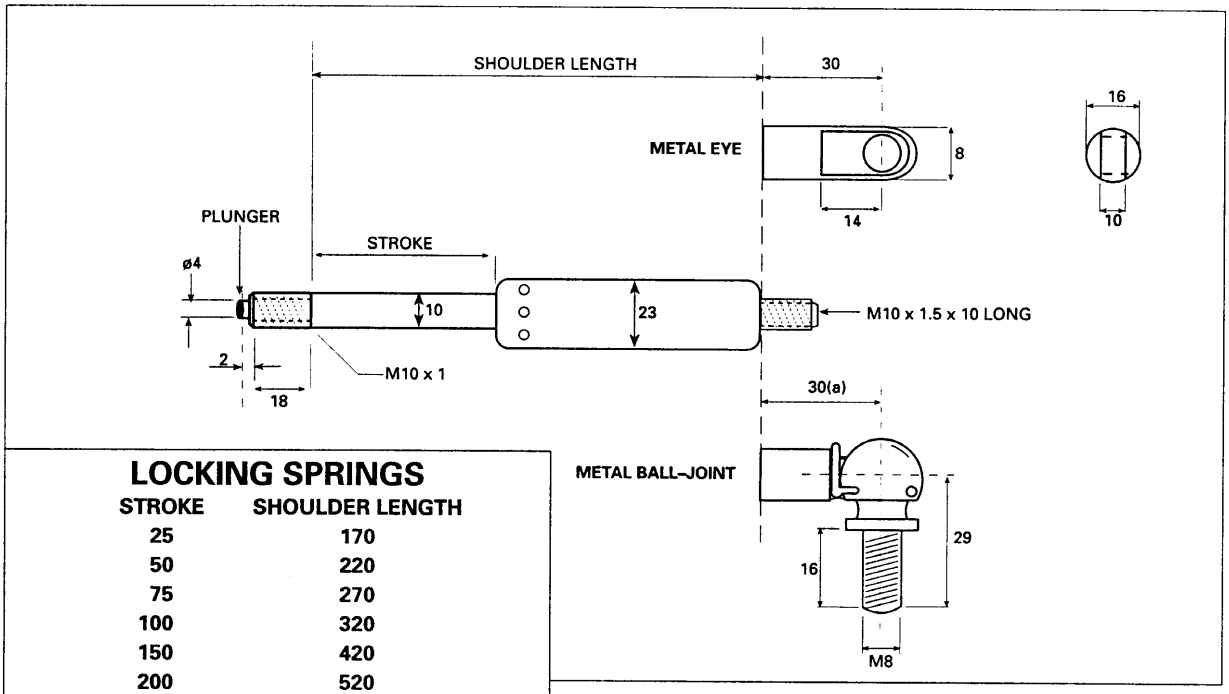
If forces are over 200 Newtons with a lid which is liable to flex then metal ball joints, which have a locking clip, rather than nylon ball joints, should be considered.All end fittings are screwed onto the spring so interchanging end fittings is easy within the same size. Please note that for sizes 6, 8 and 20 only, the extended length increases with the use of metal ball joints.

Tolerance on P_1 force +/- 5% at 20°C.

All the above springs except size 4 can be supplied in stainless steel or with just stainless rods. (see page 9)

With the exception of size 4 springs, metal shrouds can be supplied to protect the rods.

Locking gas springs



LOCKING SPRINGS

STROKE	SHOULDER LENGTH
25	170
50	220
75	270
100	320
150	420
200	520
250	620
300*	720
400**	920

FORCE RANGE 150 to 1000 NEWTONS

K FACTOR APPROXIMATELY 1.2 (stroke dependent)

* MAXIMUM FORCE 800 NEWTONS
** MAXIMUM FORCE 600 NEWTONS

RELEASE VALVES ARE AVAILABLE FOR ALL SIZES

The IGS standard locking spring operates in a similar fashion to a normal gas spring, with the added advantage of being lockable against compression and extension movement in any position along the stroke. This locking action is achieved by releasing a small plunger situated on the end of the rod. When locked, the spring is able to support a much higher load, typically four or five times P1, although this value could be much higher depending where on the stroke the spring is locked. The movement to compress the plunger is 2mm with a force approximately 20% of the P1.

Standard locking springs must be used in the rod down position, especially if increased damping has been introduced. An oil chamber can be supplied such that the standard locking gas spring can be used horizontally or rod up.

Standard locking springs are flexible i.e, in the locked position the spring will "bounce" a few millimetres either side of locked position. Typical applications for this type of locking spring are: seat backs, leg rests, equipment to assist the physically handicapped, arresting the movement of control instrumentation e.g. VDUs on machine tools.

Rigid locking springs can be supplied but there are several variations e.g. locking in extension or compression, to be used rod down or rod up, high or low K factor. Additionally, extended lengths are longer than standard locking springs, therefore please contact IGS to discuss your requirements.

Cable release mechanisms are available please contact IGS for full details.

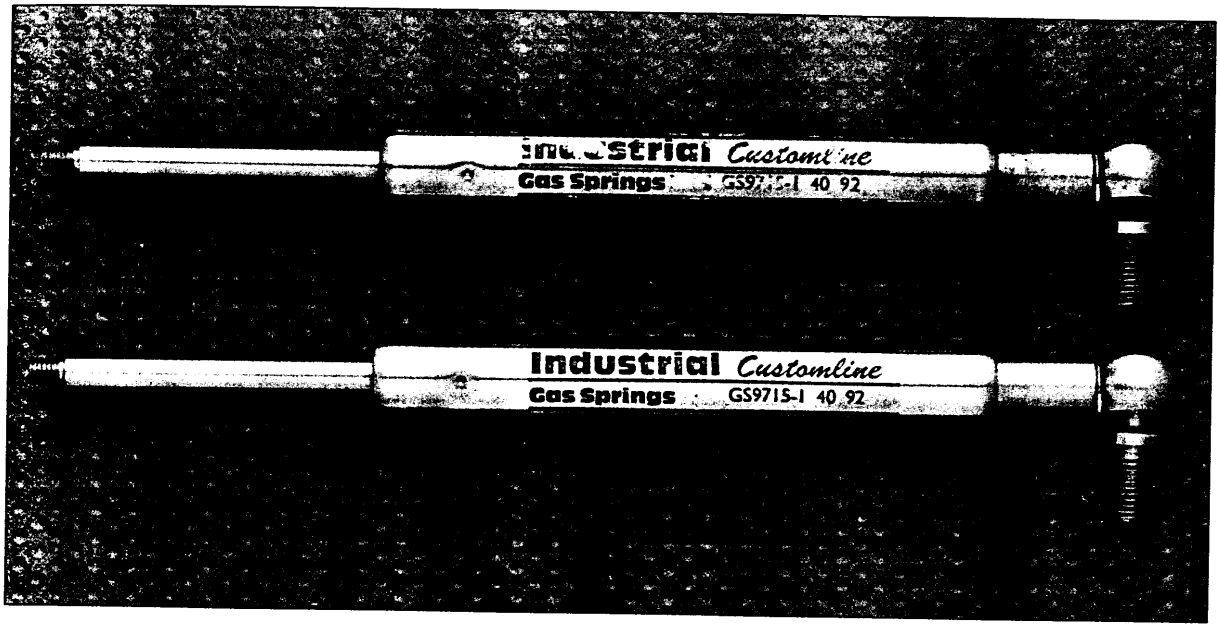
ORDER KEY

Type — Stroke 100 — Extended Length 360 — Rod End Fitting T — Body End Fitting MB — Release Valve RV — Force 1000N

This is the shoulder length plus the distance (a) on each end fitting

T= threaded end
ME = eye
MB = ball joint

Stainless steel springs



Gas spring rod and tube can also be manufactured from the highest marine quality 316 stainless steel. The photograph illustrates the effectiveness of 316 stainless steel: the bottom spring is new whereas the top spring has been subjected to 72 hours in a salt spray chamber in accordance with BS 5466 part 3. No corrosion is visible on either the rod or body of the top spring.

The corrosion visible on the top spring's ball joint arises because it has been manufactured from inferior 304 (V2a) stainless steel. The lack of corrosion on the top spring's rod and tube graphically illustrates why IGS uses 316 stainless steel in preference to 304 (V2a) stainless steel.

It is more difficult to machine 316 stainless steel. 304 (V2a) stainless steel has better machining characteristics (but lower corrosion resistance), which is why it is employed to manufacture ball joints.

IGS can supply eyes manufactured from 316 stainless steel. For size 6 and 8 gas springs either nylon eyes or nylon ball sockets with 316 studs can be supplied.

For long gas spring life where the gas spring is used in particularly corrosive environments, it is essential that the rod does not corrode. Any corrosion on the rod surface will be drawn through and damage the main seal resulting in premature spring failure.

Gas springs manufactured from both 316 stainless steel tube and rod are relatively expensive. Gas springs with stainless steel rods are the same or slightly more expensive than standard springs.

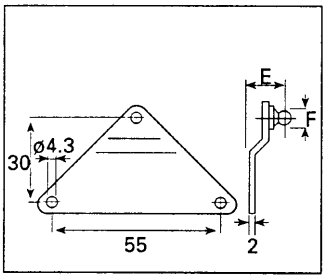
Tension springs

Tension Springs operate in exactly the opposite way to compression springs in that they pull rather than push. Being more complicated than compression springs, they are more expensive and have a life expectancy of around 80,000 cycles measured under laboratory conditions.

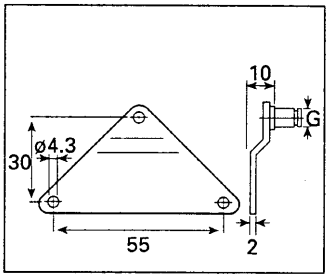
Standard tension springs have a force range of between 200 and 1200 Newtons although tension springs with a range of 10 to 5000 Newtons are available.

Further details of standard strokes and lengths are available from IGS.

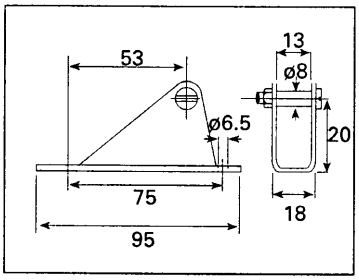
Mounting Brackets



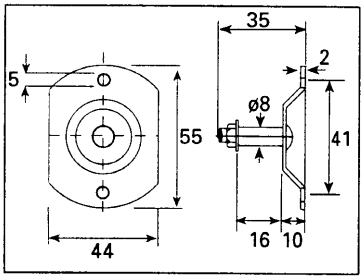
Style A



Style B



Style C



Style D

MOUNTING BRACKETS

STYLE	TYPE	DISTANCE E	DIAMETER F	DIAMETER G
A	1	18	8	-
A	2	19	10	-
A	3	20	13	-
B	1	-	-	6
B	2	-	-	8

Type A1 is suitable for size 6 metal and plastic ball joints
Type A2 is suitable for size 8 plastic ball joints
Type A3 is suitable for size 8 and 10 metal ball joints

Type B1 is suitable for size 6 metal and plastic eyes
Type B2 is suitable for size 8, 10 and 14 eyes
Types C and D are suitable for size 8, 10 and 14 eye

Dos and don'ts

DO

- Use standard gas springs rod down, i.e. the spring should be mounted so that it spends most time in a rod down position, within 60° of vertical, thus ensuring the seal stays lubricated. For tension springs the exact opposite is true, i.e. use rod up. Once installed, test at least every three months.
- Try to use ball joints to help avoid side load forces. If eyes or clevises are used, ensure a loose fit to allow lateral movement.
- Ensure that the end fittings are in line so that side load forces are not applied as a result of misalignment.
- Try to use shorter springs close to the hinge rather than longer stroke springs away from the hinge.
- Provide physical stops to limit the spring's extremes - i.e. ensure that no undue force is applied which might overcompress or overextend the spring.

DON'T

- Scratch, dent, chip, bend or paint the rod
- Apply side loads
- Try to re gas
- Puncture or incinerate
- Lubricate
- Fast cycle - typically no more than 15 times per minute.

SAFETY

Where gas springs are fitted and safety is a key factor, special care should be exercised with regard to end fitting suitability, mounting position strength and whether a secondary locking mechanism should be employed.

STORAGE

Store in a rod-down condition, except for tension springs which should be stored rod up.

from left to right: Locking gas spring with plunger on body, white bodied size 6, tension spring, shrouded spring, side release valved spring, locking spring with plunger on rod, stainless steel spring and size 20 spring. The inset photograph shows some of the special end fittings IGS can supply.

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GAS SPRING APPLICATION SHEET

Please photocopy this page, fill in the information and fax it to the above number. In order to give the optimum economical solution between ex stock, non stock and custom springs please fill in the approximate annual requirement.

Company _____ Contact _____

Address _____

_____

Telephone number _____ Fax number _____

Approximate annual quantity requirement _____

Type number (1 TO 8) _____ Number of springs per lid 1 ☐ OR 2? ☐

Weight of lid (W) _____ KG Opening angle (Ø) _____ degrees

Distance from pivot to end of lid (L) _____ mm

Distance from pivot to centre of gravity (C) _____ mm

Thickness of lid _____ mm

Do you wish the lid to open automatically or to remain closed, under it's own weight? Remain closed ☐

Open automatically (lid will need a catch) ☐

Do you require the spring to be mounted inside ☐ outside ☐ either ☐

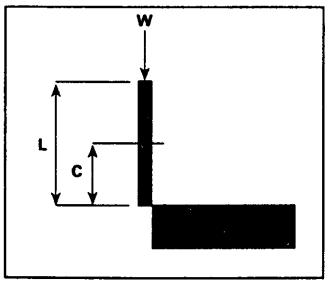
Ambient operating temperature _____ °C

Anticipated no. of cycles per minute _____

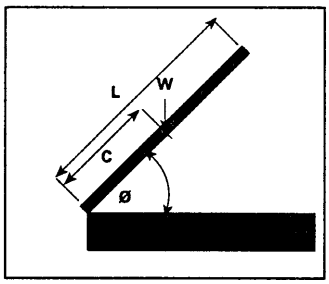
TYPE 7 ONLY
Distance of centre of gravity below the pivot (B) __ mm
Distance of end of lid below the pivot (D) ____ mm

Centre of gravity distances can normally be estimated

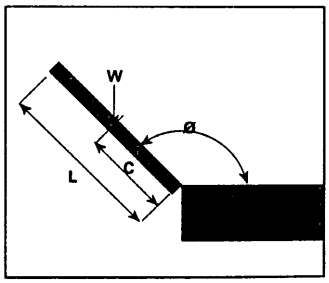
1. 90° OPENING



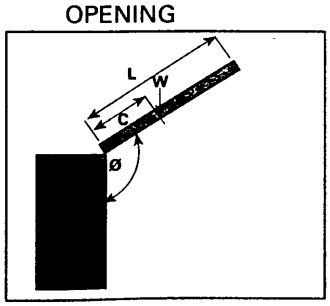
2. RESTRICTED OPENING

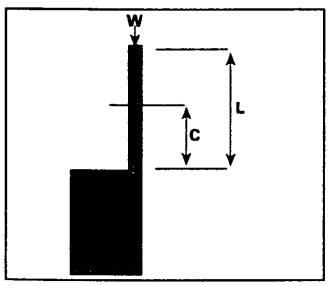


3. BEYOND 90° OPENING

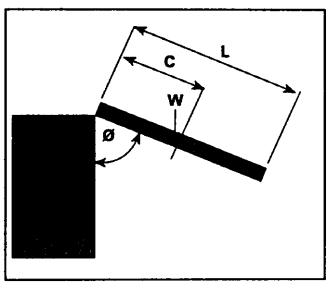


4. ABOVE HORIZONTAL OPENING

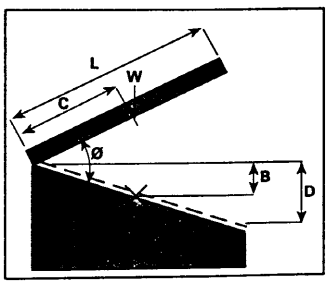




5. 180° OPENING



6. BELOW HORIZONTAL OPENING



7. BELOW TO ABOVE HORIZONTAL OPENING

8. OTHER

October 1994