

## THROTTLING DEVICES

A throttling device should be used when a pressure gauge is subjected to rapid pressure fluctuations, which make the gauge difficult to read because of rapid pointer movement. Such a device reduces pressure impact, slows the speed and range of pointer movement, and prolongs gauge life.

Throttling effect is obtained by installing a restricting orifice between the gauge socket connection and the bourdon tube. Several types are available: throttle screws, pressure snubbers, pulsation dampeners, Gauge Saver® and the Campbell MICRO-BEAN.

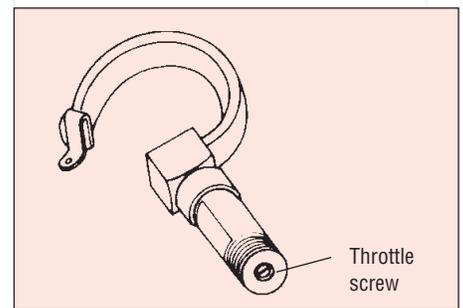
Severe service applications are characterized by the presence of significant levels of pressure pulsation and/or vibration. Gauges should be protected from severe pressure pulsation by the inclusion of a dampener such as a throttle plug/screw or porous metal snubber. If the pulsation is extreme, a liquid-filled gauge, with dampener, should be used. A liquid-filled gauge will also last significantly longer than a comparable dry gauge when vibration is present. If the vibration levels are extreme, the only solution may be to remotely mount the gauge away from the source of vibration. In that case capillary tubing may be used to connect the gauge to the pressure source.

## THROTTLE SCREWS

The simplest means of providing a restriction in the socket, a throttle screw, should be ordered with the gauge. Threaded or pressed into an instrument socket, the throttle screw orifice selected is based on the viscosity of the pressure fluid, rapidity of pressure fluctuations, and the amount of dampening effect desired.

A smaller orifice should be used for low viscosities, high frequencies, high pres-

sure and reduced pointer amplitude. To accommodate these variables, throttle screws are available in these sizes: 0.0135, 0.020, 0.031, 0.040, and 0.070 inches, in brass and stainless steel. When orifice size or service condition is not specified, a 0.020-inch orifice will be supplied on Royal pressure gauges 0.0135, on 3½" Regal Gauges.



## STATIONARY RED SET HAND



### Stationary Red Set Hand

to indicate a specific pressure. Ring must be removed to move the hand.

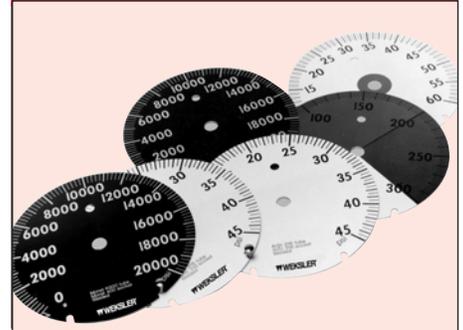
## OVERLOAD STOP



### Overload Stop

to protect gauge system against extreme overpressure.

## SPECIAL DIAL



### Special Dial

ranges different from standards, or custom artwork, available on application.

## MAXIMUM POINTER



### Maximum Pointer

available for gauges 4½" size and larger. Indicates maximum pressure attained. Can be reset by a knob on outside of window.

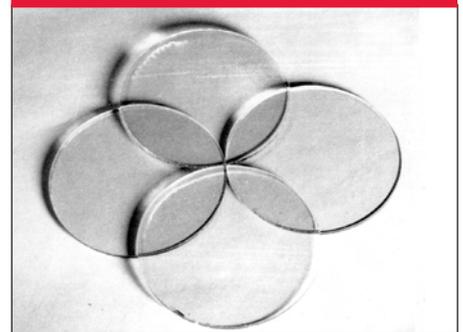
## VACUUM STOP



### Vacuum Stop

to protect low range gauges against vacuum.

## OPTIONAL WINDOWS



**Plastic Disc** – optional for glass window  
**Laminated Safety Glass** – optional for glass window  
**Nonglare Glass** – optional for glass window

**ELECTRIC WARNING CONTACTS**

The electric contact feature is a switching mechanism actuated by the indicating pointer. Switch points are adjustable and can be set throughout the 270° arc. Contacts are used to activate alarms and relays. (Not recommended for continuous switching). The Weksler electric contact is an ideal accessory to turn on a signal light, sound an alarm, or operate a pump or valve. The contacts can easily be set so that a circuit can be closed or opened at a desired pressure or temperature. Settings can be easily made in the field without removing the instrument from service. Contact adjustment is made externally with a removable key to make the instrument virtually tamper proof. Contacts are equipped with adjustable magnets to eliminate chatter caused by vibration. A plug-in connector with five feet of electrical cable is standard.

**STANDARD FEATURES**

- High impact polycarbonate enclosure for ambient temperature up to 150°F
- Full scale contact adjustment from front of enclosure
- Available on ranges 30 psi and up
- Magnetically assisted, silver alloy contact
- Accuracy ±2% of scale arc (add to instrument accuracy)
- Rated for ¼ amp. 110 volt AC non-inductive load
- Available in: 4½" case styles #2\*, #4, #6, "A"  
6" case styles #2, #4, #6, "A"

Model	Code	Contact arrangements
2265	XED	High and low contact
	XEE	Double high contact
	XEF	Double low contact
	XEG	"OFF" at low and high, and "ON" in between

\* Style case #2 with lower connect comes with DIN Connection. No cable, mating connector available at extra charge.



Indicating accuracy of Royal Gauge, above 300 psi with contact: Pointer not carrying contact – 1.0%. Pointer carrying contact – 1.5%. For ranges below 30 psi, add an additional ½% to indicating accuracies.

**TEST GAUGE CARRYING CASE**

This rugged blow-molded high-density polyethylene carrying case accommodates the standard 4½", 6 & 8½" Regal analog test gauges. It accepts both lower and back connect gauges. A foam insert protects the gauge when not in use. Type No. 2505.



**TOOLS**

**Hand Jack Set** – gauge pointer remover and a pointer set to secure pointer to the shaft. Type No. 3220.

**Ring Removal** – For the 3½" Regal gauges. Includes 2½" and 3½" wrench and nest. Type No. 1206T.

**Small Tools** – For the 3½" Regal gauges. Includes pointer puller, span adjust wrench, slotted screw driver for pointer adjustment, pointer staker and pinion backup. Type No. 1205.

**Gauge Tool Kit** – A complete kit for gauge maintenance. Includes hand jack set, screw driver, five reamers, pin vise holder, wiggler and tweezers all packed in a neat carrying case. Ideal for a gauge maintenance shop. Type No. 1105T.



TYPE NO. 3220

TYPE NO. 1206T

TYPE NO. 1205

TYPE NO. 1105T

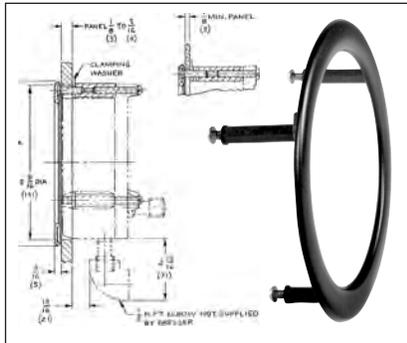
**ROYAL AND REGAL GAUGE OPTIONS**

CODE	DESCRIPTION
XNN	Paper Tag on Gauge
XNH	SS Tag Wired to Gauge
XMN	SS Tag Wired to Gauge
XOS <sup>(1)</sup>	Overload Stop
XVS <sup>(1)</sup>	Underload Stop
XTS	Throttle Screw
XDM	Dial Markings
X6B	Cleaned for Oxygen Service
XGV	Silicone Filled
XSH	Red Set Hand
XSJ	Dual Red Set Hands
XEP*	Max. Indicating Hand
XEQ*	Min. Indicating Hand
XSG	Safety Glass
XPD	Plastic Window
XC1	Certificate of Conformance
XC4	Calibration Certificate

\* Not available in 3½" Regal

(1) Standard for 3½"

**TYPE 1278M FLUSH MOUNTING RING**



Gauge Size (inches)	Ring O.D. (inches)	A Dia. (inches)	"B"-Three Screws
			Size
4½	6.000	5.625	#10-24 x 1½"
67.765	7.25	¼-20 x 1½"	

Used to flush-mount 4½" and 6" Royal and bellows type gauges. Standard finish is black; polished stainless steel finish is available at an extra charge, 4½" and 6".

**FLUSH MOUNTING RING**

CODE	DESCRIPTION	TYPE	MOUNTING MATERIAL
56	Flush Mounting	1278M	Black
57	Rings*	1278MC	Polished SS

\*For 4½" and 6" Royal / Regal gauges manufactured after 10/1/04

**TYPE A-1285**

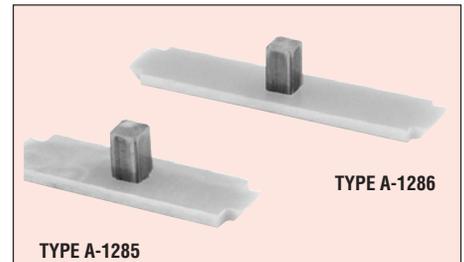
**Ring Wrench – 4½"**

(For installing front threaded rings in 4½" #2, #4 safety cases)

**TYPE A-1286**

**Ring Wrench – 6"**

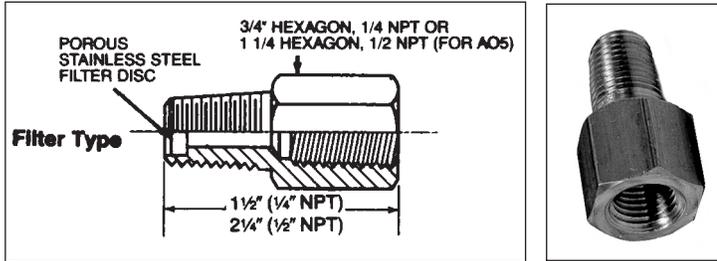
(For installing front threaded rings in 6" #4 aluminum safety cases)



TYPE A-1285

TYPE A-1286

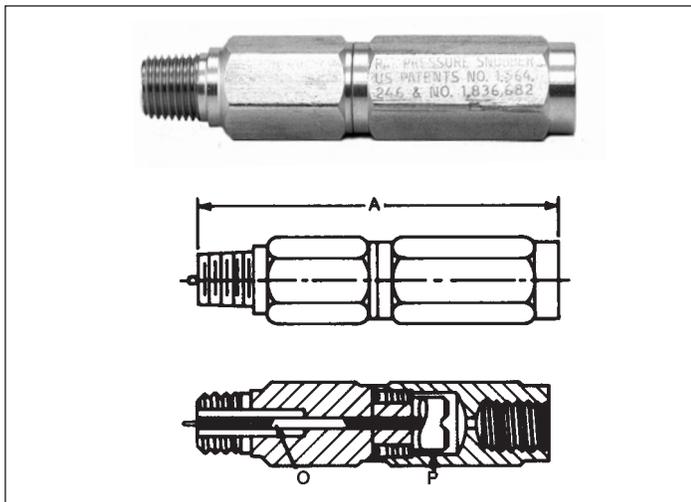
## FILTER TYPE



**Filter Type:** Snubbing element consists of a  $\frac{3}{8}$ " diameter x  $\frac{1}{8}$ " thick Micro Metallic stainless steel filter. When placed in the line just before the pressure gauge, the gauge pointer moves across the scale at a rate which is proportional to the pressure differential across the snubber element.

TYPE NUMBER	GAS OR LIQUID IN PIPE LINE	PRESSURE RANGE	CONNECTION	MATERIAL
BW 41 BW 42 BW 43	Air Water-Light Oil Heavy Oil	1,500 psi	1/4 NPT	Brass
SW 41 SW 42 SW 43	Air Water-Light Oil Heavy Oil	5,000 psi	1/4 NPT	SS
A05D A05E A05G	Heavy Oil Water Light Oil Air	20,000 psi	1/2 NPT	SS

## PISTON TYPE



**Piston Type:** Shocks and pulsations are absorbed in the doughnut-shaped orifice (O) formed by the piston (P) in the tube. As the piston moves up and down with the pulsation, it automatically clears away any sediment or pipe scale that would clog a simple orifice or needle valve.

Each snubber is furnished with three pistons. The snubbing may be changed to suit individual installations by changing pistons. By using the proper piston, any of the listed snubbers can be made to operate satisfactorily from vacuum to its maximum rated pressure on any fluid compatible with the body material. These snubbers may be installed vertically, horizontally, inverted, or at any angle.

TYPE NUMBER	GAS OR LIQUID IN PIPE LINE	PRESSURE RANGE LBS.	PIPE SIZE AND LENGTH	MATERIAL
RS1	Air, water, steam, etc.	0-3000	1/4 NPT	Brass
RS7	Thin corrosive liquid, gases	0-5,000	A = 3 1/2"	SS
RS8	Thick corrosive liquids		1/2 NPT	Brass
RS6	Oil, water, etc.	0-10,000	A = 3 5/8"	SS
RS9	Thin or thick corrosive			

## ADJUSTABLE SNUBBER



MODEL	MAX. WORKING PRESS.	BODY MATERIAL	LENGTH O.A.	THREAD LENGTH	THREAD SIZE
MSB4	3,000	Brass	1.60	.50	1/4 NPT
MSB2	3,000	Brass	2.28	.80	1/2 NPT
MSS4	5,000	316SS	1.60	.50	1/4 NPT
MSS2	10,000	316SS	2.28	.80	1/2 NPT

**NOTE:** The adjusting screw, ball and ball retainer are Stainless Steel, Buna N Seals are standard. Teflon, Viton and Butyl Seals are available.

## Adjustable Snubber

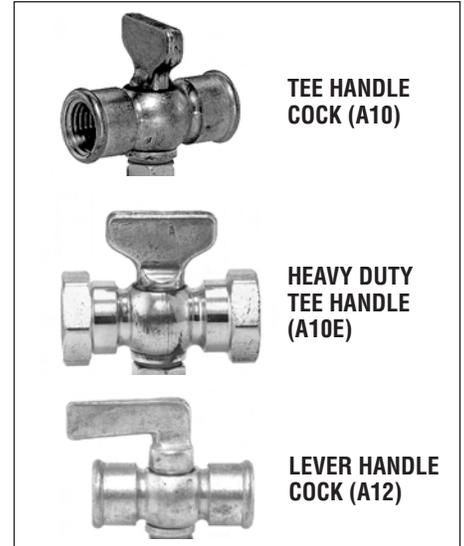
The Universal Adjustable Snubber has a ball check cut-off to block line surges, shock waves and fluid hammer; and an adjustable fine thread choke valve to tune out line pulsations. The combination of the ball cut-off and a tunable choke valve makes it an all-purpose, universal Snubber that is used on low displacement instruments such as bourdon tube gauges which require heavy dampening; and with high displacement instruments such as diaphragm, piston and bellows operated gauges, recorders and controllers, which require moderate to heavy dampening.

The adjustable choke valve is also used as a positive shut-off valve, to isolate the gauge or instrument, for servicing or replacement.

The operation of the Adjustable Snubber cut-off ball and the choke valve is shown in the chart. The cut-off ball blocks and clamps off shock and hammer transients in the line, which are above the normal pressure level in the system. The choke valve throttles and dampens out pulsations and cyclic pressure waves, and may be adjusted to dampen out to any level desired to prevent pointer oscillation on gauges, chart painting on recorders, instability in controllers or, damage to instruments, generally.

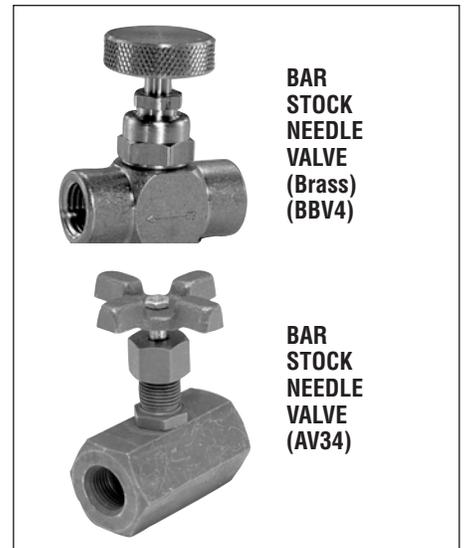
**BRASS GAUGE COCKS**

TYPE NO.	TYPE	CONNECTIONS	MAXIMUM PRESSURE
A10	Tee Handle - Brass	¼" Female	125 psi
A10C	Tee Handle - Chrome Plated	¼" Female	125 psi
A10E	Heavy Duty Tee Handle	¼" Female	200 psi
A11	Lever Handle - Brass	¼" Male and Female	200 psi
A12	Lever Handle - Brass	¼" Female	200 psi
A20	Tee Handle - Brass	½" Female	200 psi


**BAR STOCK NEEDLE VALVES**

These valves are used primarily to closely regulate fine flow. However, they may be used as a throttling device on lines where rapid and excessively pulsating pressures would tend to effect the gauge performance or mechanism.

TYPE NO.	SIZE	MATERIAL	PRESSURE & TEMP. RATING
BBV4	¼ NPT	Brass: For oil, water, gas, etc.	600 psi @ 300°F
SSV4	¼ NPT	303 Stainless Steel: For oil, water, gas, etc.	5000 psi @ 500°F
AV34	¼ NPT	Bronze: For oil, water, gas, etc.	500 psi @ 150°F
AV32	½ NPT		
AV44	¼ NPT	Carbon Steel: Parkerized and Parcolaced, for resistance to corrosion.	475 psi @ 1,000°F 550 psi @ 900°F 600 pssi @ 850°F 10,000 psi @ 150°F
AV42	½ NPT		
AV74	¼ NPT	316 Stainless Steel provides greatest overall resistance to corrosion; very good for sub-zero service.	4,000 psi @ 150°F
AV72	½ NPT		


**SIPHONS**

When a gauge is to be used for steam pressures, a siphon filled with water is recommended between the line and gauge to prevent high temperature steam from entering the gauge bourdon tube.

TYPE NO.	SIZE	SIPHON MATERIAL	CAPACITY
A03I	¼ NPT	Iron (Schedule 40)	500 psi and 400°F
A03B		Brass	250 psi and 400°F
CPS4		Seamless Steel, extra heavy (Schedule 80)	1,000 psi and 850°F
CPSS4		Seamless Stainless Steel XH (Schedule 80)	2,000 psi and 1000°F
CPS2	½ NPT	Steel (Schedule 80)	1,000 psi and 850°F
CPSS2		Seamless Stainless Steel XH (Schedule 80)	2,000 psi and 1000°F



**GAUGE TOOLS — Hand Jack:** for removing pointer. Specify Type A01. **Hand Set:** for installing pointer. Specify Type A02