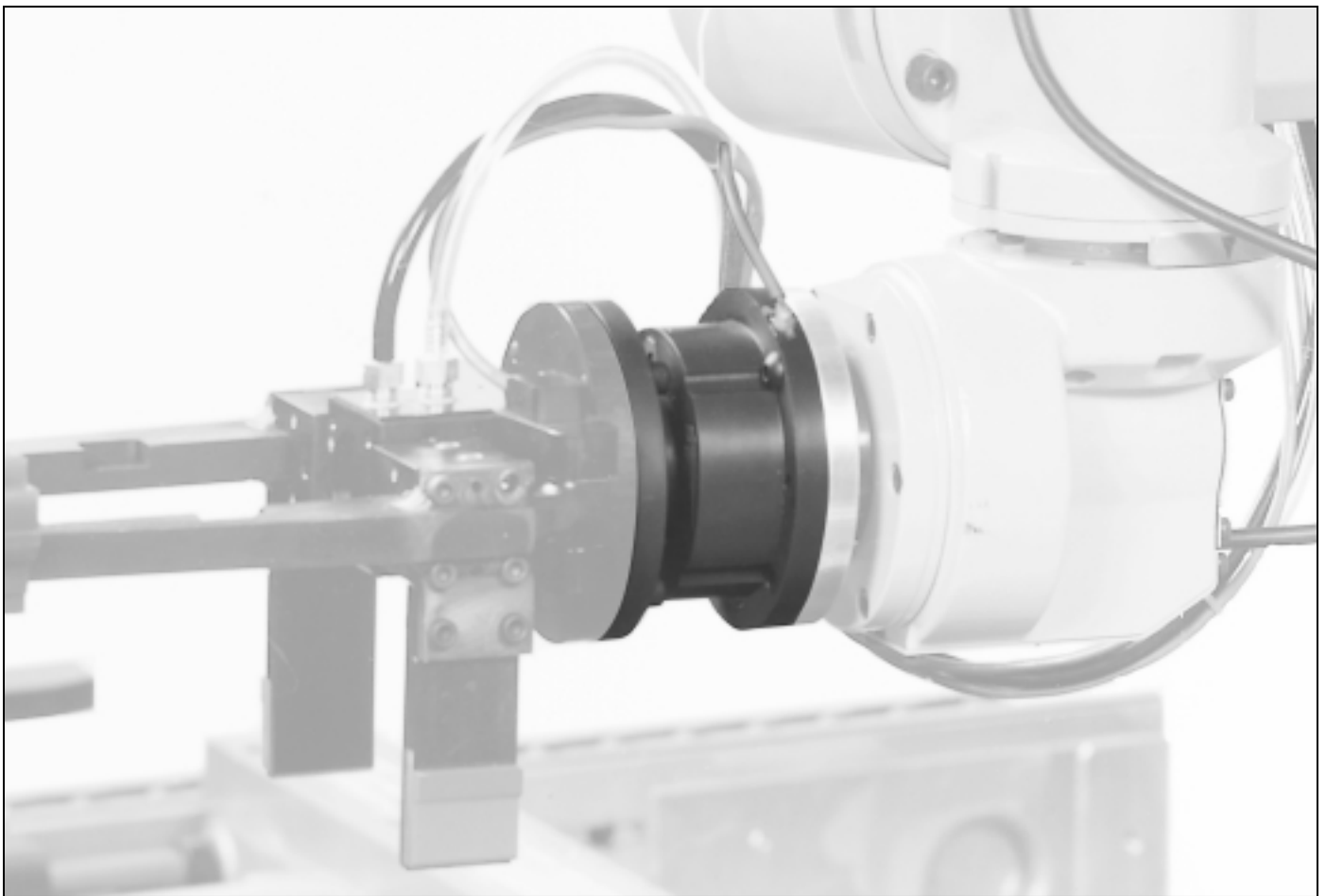


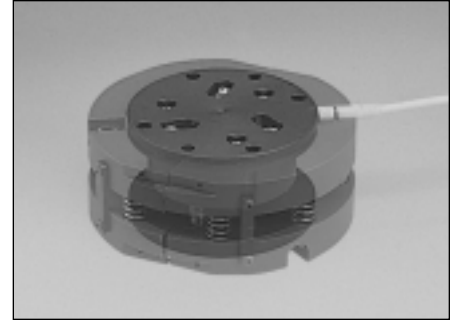
Uni-Coupler & Versa-Matic Safety Joints

Collision Sensors



Uni-Coupler Safety Joint–Spring Loaded Series Page 4

- ✓ Automatic Reset
- ✓ Resistance Range from 4.2 to 6653.3 in-lb.
- ✓ Nylon-Graphite Composite
- ✓ Outriggers Available



Versa-Matic Safety Joint–Pneumatic Series Page 8

- ✓ Full Pneumatic Control
- ✓ Spring Assist Option
- ✓ Automatic Reset
- ✓ Resistance Range from 2 to 7491 in-lb.
- ✓ Nylon-Graphite Composite



Collision Sensor Accessories Page 12

Ordering Data Page 14

Robotic Accessories

Uni-Coupler™ Safety Joints

General Purpose Series — U. S. Patent Numbers 4,639,184, 4,786,769 & 4,954,005

Operating Principle

The Uni-Coupler safety joint is a spring-loaded mechanical device. It is activated by lateral and vertical forces which open a

normally closed switch, signaling the robot when the hand encounters an obstruction.

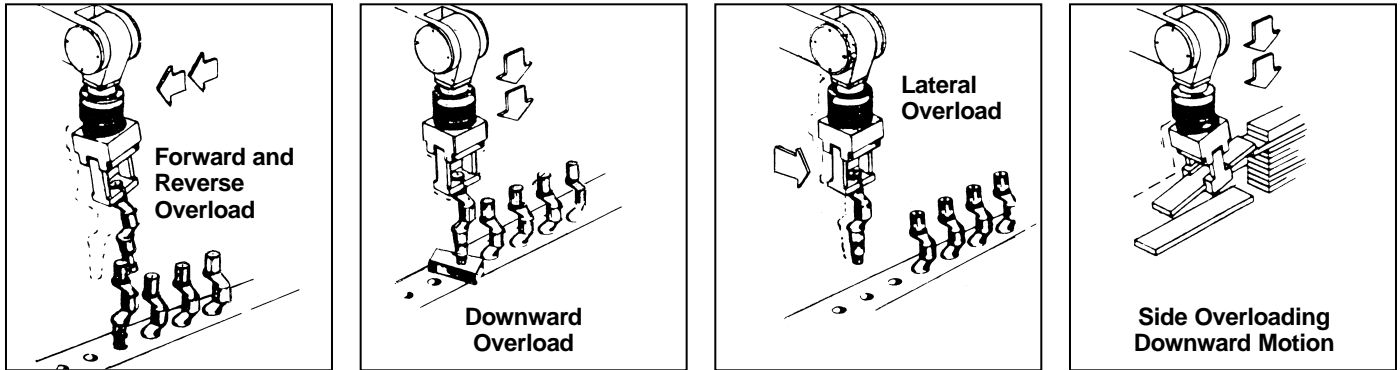
Options Available

- Compliance or Noncompliance. Units with compliance allow up to 0.040 inch “give” in the coupling before the load sensing mechanism is tripped. Models with compliance are recommended for most applications to avoid nuisance tripping. Models without compliance are sensitive to less than one degree of deflection.
- Some models can be modified to provide vertical travel only.
- Hard Wire or Quick Disconnect Option. Uni-Coupler safety joints are available in a hard wire version or with a connector which allows safety joint change or removal without rewiring to the controller.
- Adapter Plates are available for your robot and end effector to make the installation easy.
- Dust Bellows are recommended to protect your safety joint during welding, painting, grinding, etc.
- The Uni-Coupler Safety Joint may be used as a compliance device without the emergency-stop signal.

Features

- Automatic reset following removal of obstruction, unlike common safety joints which require manual reset.
- Simple switching mechanism eliminates the need for tedious adjustment of proximity and mechanical switches common among safety joints.
- Quality Materials. Constructed of tough, nylon-graphite composite with an aluminum mounting flange. Reinforced at critical points to prevent fatigue or sag.
- Built-in Robot Protection. Allows up to 15° deflection (depending on model) for continued motion, without damage, after the robot has been shut off.
- Simple Installation. Just connect the two wires to your 24 volt system.

- Uni-Coupler safety joints are completely field repairable for minimum downtime.
- Repeatability. Returns to within 0.002" of the original position after deflection (measured at mounting flange).
- Wide Range. Five model sizes offer a moment resistance range from 4.2 to 6653.3 in-lbs.
- Outriggers upgrade the capacity of the Uni-Coupler safety joint without advancing to the next larger size. Some safety joint models include Outriggers (reference specifications).



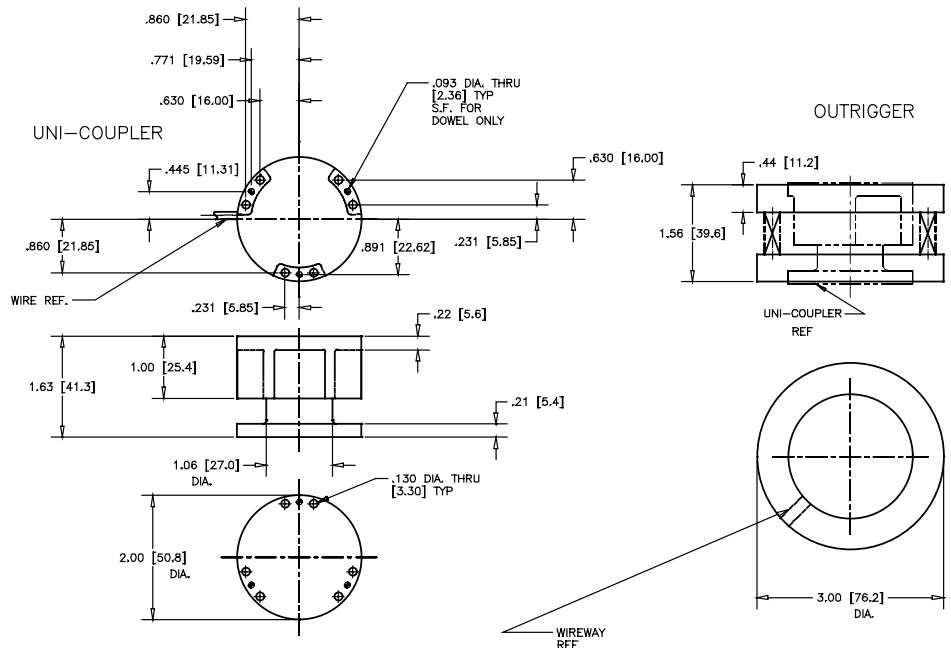
MODEL 4418

Specifications

Weight of Uni-Coupler 6 oz.
 Weight with Outrigger 9.5 oz.
 Maximum Deflection 12°

Moment Resistance Setting (in-lb)

Model	In-Lb
A	4.2
B	5.8
C	9.0
D	10.7
E	11.6
F	18.8
G	28.9
H	45.8
I	60.9
J	65.8



Models E through J include Outrigger.

NOTE: Model 4418 is not available with Quick Disconnect Option.

MODEL 4419

Specifications

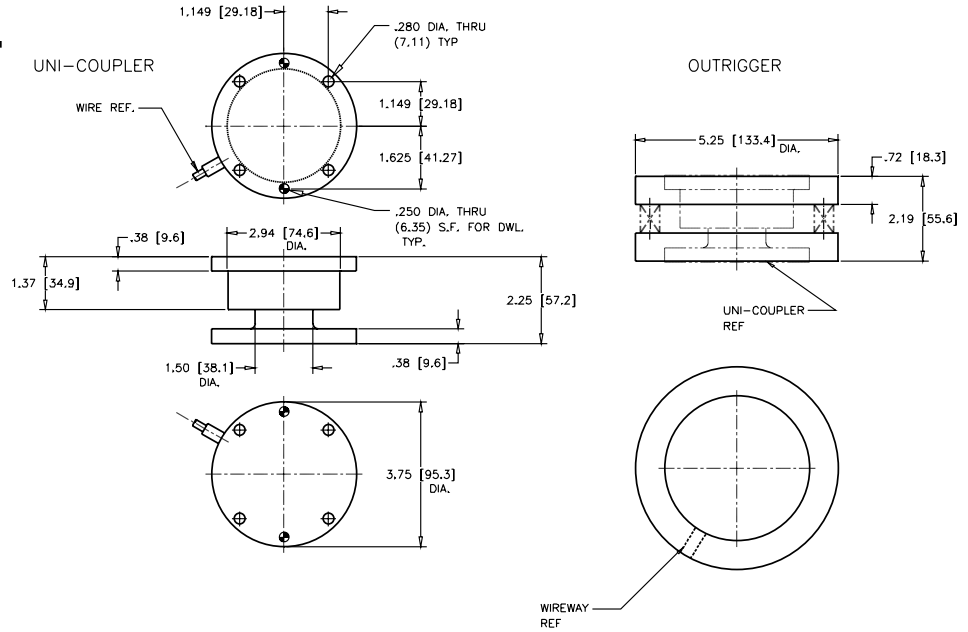
Weight of Uni-Coupler . . . 1.1 lbs.

Weight with Outrigger . . . 1.8 lbs.

Maximum Deflection 15°

Moment Resistance Setting (in-lb)

Model	In-Lb
A	12.7
B	14.5
C	19.1
D	31.8
E	38.0
F	43.7
G	49.8
H	87.3
I	107.3
J	137.3
K	154.8
L	173.0
M	178.7



Models G through M include Outrigger.

MODEL 4420

Specifications

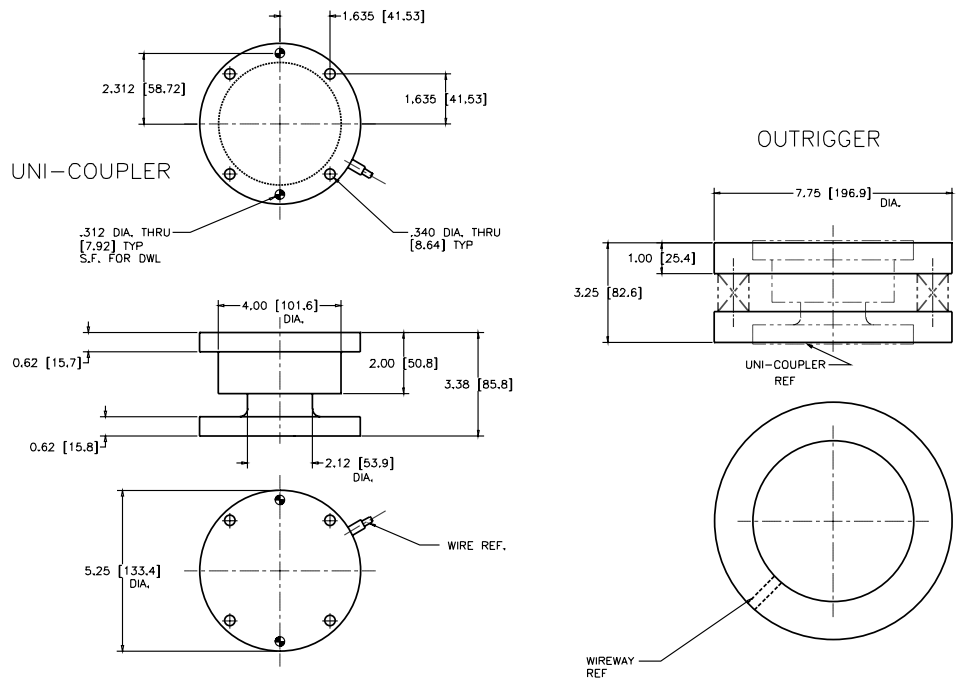
Weight of Uni-Coupler . . . 2.3 lbs.

Weight with Outrigger . . . 4.3 lbs.

Maximum Deflection 15°

Moment Resistance Setting (in-lb)

Model	In-Lb
A	50.0
B	59.3
C	70.6
D	102.7
E	126.8
F	223.6
G	252.0
H	303.0
I	423.0
J	462.0
K	550.6
L	606.8



Models F through L include Outrigger.

MODEL 4421

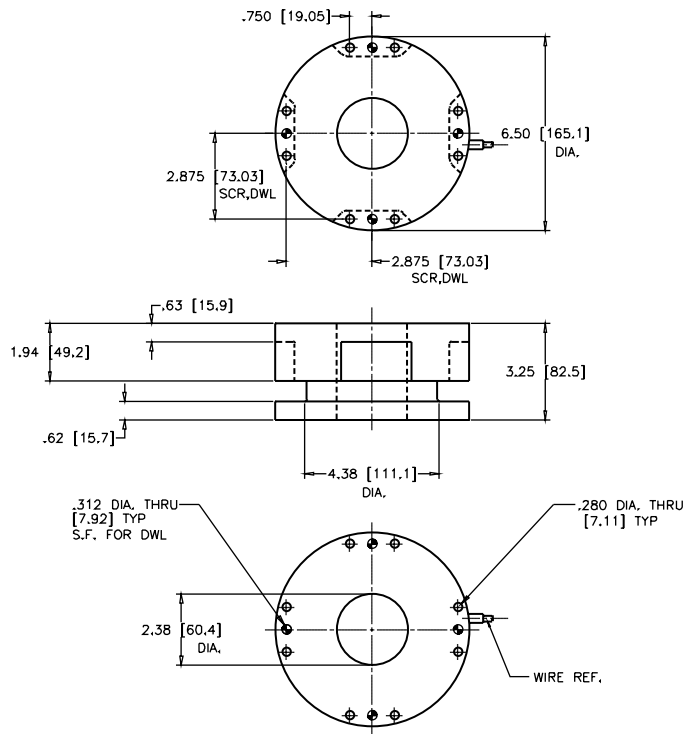
Specifications

Weight of Uni-Coupler . . . 3.4 lbs.

Maximum Deflection 7°

Moment Resistance Setting (in-lb)

Model	In-Lb
A	80.8
B	161.7
C	214.7
D	252.4
E	333.3
F	466.7
G	533.8
H	671.1
I	823.6
J	960.9
K	1067.6



NOTE: An Outrigger is not available for Model 4421.

MODEL 4422

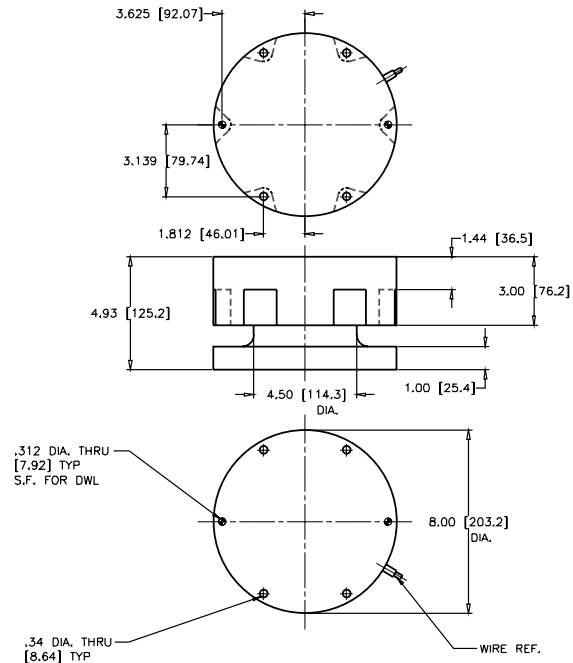
Specifications

Weight of Uni-Coupler . . . 11 lbs.

Maximum Deflection 8°

Moment Resistance Setting (in-lb)

Model	In-Lb	Model	In-Lb
A	735.4	O	4446.5
B	1006.2	P	4759.8
C	1180.1	Q	4979.1
D	1328.3	R	5229.7
E	1519.2	S	5449.0
F	1832.5	T	5942.0
G	2137.7	U	6204.0
H	2451.0	V	6653.3
I	2670.3		
J	2920.9		
K	3334.9		
L	3648.2		
M	3867.5		
N	4118.2		



NOTE: An Outrigger is not available for Model 4422.

Robotic Accessories

Versa-Matic Safety Joints

Variable Force Series — U. S. Patent Numbers 4,639,184, 4,786,769 & 4,954,005

Operating Principle

The Versa-Matic safety joint is a pneumatically actuated mechanical device. It is activated by lateral and vertical forces which

open a normally closed switch, signaling the robot when the hand encounters an obstruction.

Options Available

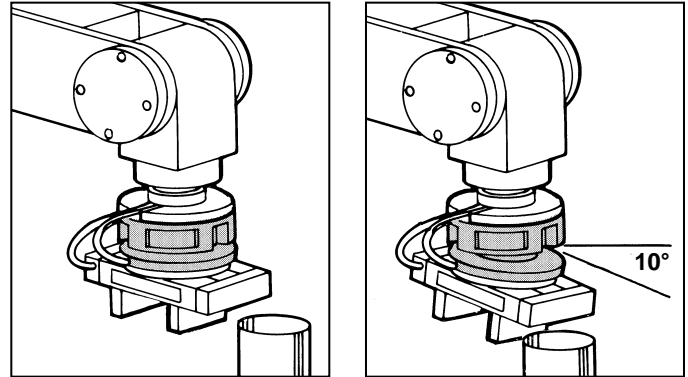
- **Preset Lower Limit.** In addition to full pneumatic control, the Versa-Matic safety joint can incorporate a preset lower limit spring. This allows a safe lower level at the work station, and then by increasing the limit pneumatically a heavier setting may be achieved for rapid transit. Using this technique, only one valve and regulator setting is required to produce two different settings. The lower limit spring increases the moment resistance capabilities of the safety joint by the value of the spring and reduces air pressure requirements. In a static condition, this spring may be sized to prevent tool “sag” in case of accidental air loss.
 - **Hard Wire or Quick Disconnect Option.** Versa-Matic joints are available in a hard wire version or with a connector which allows safety joint change or removal without rewiring to the controller.
 - The Versa-Matic safety joint may be used as a compliance device without the emergency-stop signal.
 - Adapter Plates are available for your robot and end effector to make the installation easy.
 - Dust Bellows are available to protect your safety joint during welding, painting, grinding, etc.
 - A manually adjustable regulator is available with each Versa-Matic safety joint at your request. Refer to the Accessories Section for regulator specifications.
- Application Note: The regulator should be mounted as close to the safety joint as possible to avoid back pressure (less than 36" recommended).***

Features

- **Full Pneumatic Control.** The tripping force of the Versa-Matic safety joint can be pneumatically set using your robot logic and valve system. The Versa-Matic safety joint will respond to as many interim load levels as you choose to install.
- **Automatic reset** following removal of obstruction, unlike common safety joints which require manual reset.

- **Quality Materials.** Constructed of tough, nylon-graphite composite with an aluminum mounting flange. Reinforced at critical points to prevent fatigue or sag.
- **Mechanical piston** resists breakage which is common among air diaphragm styles of pneumatic safety joints.
- **Built-in Robot Protection.** Allows up to 10° deflection (depending on model) for continued motion, without damage, after the robot has been shut off.
- **Simple switching mechanism** eliminates the need for tedious adjustment of proximity and mechanical switches common among other safety joints.
- **Easy Installation.** Connect the two wires to your 24 volt system. Only one air line is required for pneumatic control.

- **Versa-Matic safety joints** are completely field repairable for minimum downtime.
- **Repeatability.** Returns to within 0.002" of the original position after deflection (measured at mounting flange).
- **Versa-Matic safety joints** offer a range of tripping forces from 2 to 7491 inch-pounds within five wide-ranging series. This means one device may suit many applications in your facility.



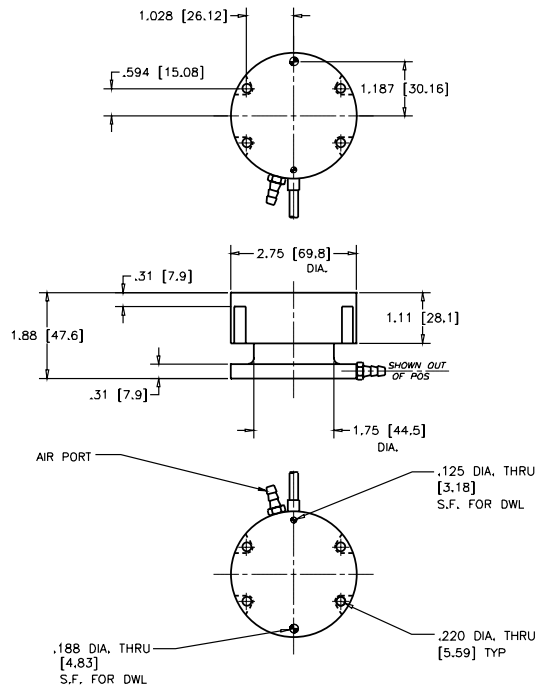
MODEL 4318

Specifications

Weight of Versa-Matic 9 oz.
 Operating Range –
 @ 90 psi (max) 2-107 in-lb.
 Maximum Deflection 10°

Spring Assisted Lower Limits

Model	In-Lb
Z.	Fully Pneumatic
A.	5
B.	8
C.	9
D.	13
E.	15
F.	19
G.	26
H.	32
I.	37
J.	47
K.	51
L.	55



To Determine Air Pressure Requirements:

IN-LB Requirements – Preset Lower Limit (if Applicable) ÷ 1.18 (4318 Constant) = PSI

Example: 80 in-lb – 19 ÷ 1.18 = 51 psi

MODEL 4319

Specifications

Weight of Versa-Matic . . . 1.6 lbs.

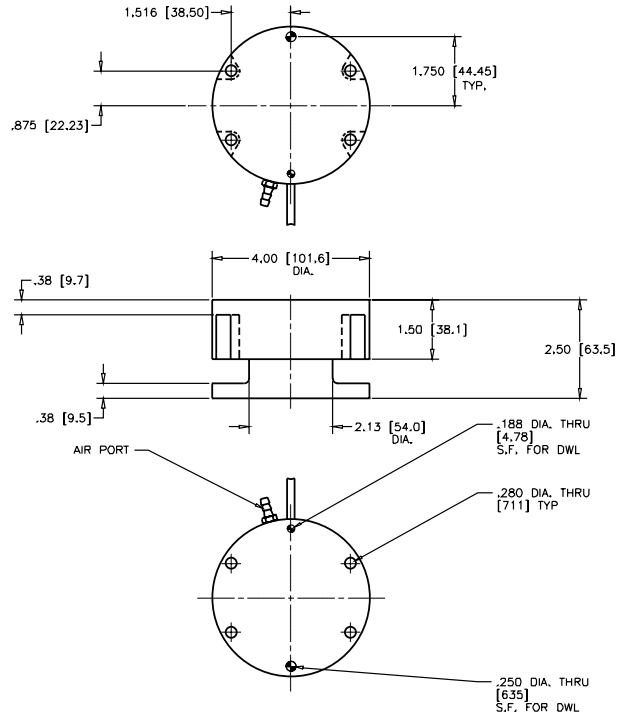
Operating Range –

@ 90 psi (max) 10-208 in-lb.

Maximum Deflection 10°

Spring Assisted Lower Limits

Model	In-Lb
Z.	Fully Pneumatic
A.	12
B.	17
C.	22
D.	27
E.	31
F.	39
G.	51
H.	78
I.	121



To Determine Air Pressure Requirements:

IN-LB Requirements – Preset Lower Limit (if Applicable) ÷ 2.32 (4319 Constant) = PSI

Example: 140 in-lb – 39 ÷ 2.32 = 43 psi

MODEL 4320

Specifications

Weight of Versa-Matic . . . 3.6 lbs.

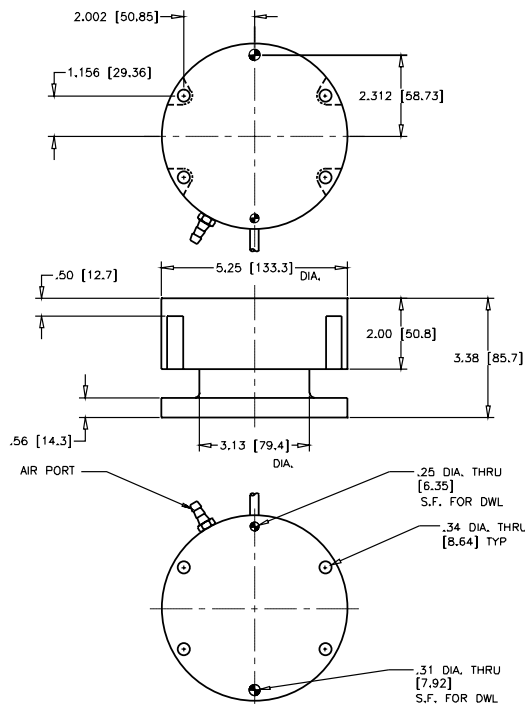
Operating Range –

@ 90 psi (max) 20-712 in-lb.

Maximum Deflection 10°

Spring Assisted Lower Limits

Model	In-Lb
Z.	Fully Pneumatic
A.	23
B.	29
C.	32
D.	37
E.	45
F.	50
G.	63
H.	93
I.	108
J.	162



To Determine Air Pressure Requirements:

IN-LB Requirements – Preset Lower Limit (if Applicable) ÷ 7.91 (4320 Constant) = PSI

Example: 400 in-lb – 45 ÷ 7.91 = 45 psi

MODEL 4321

Specifications

Weight of Versa-Matic . . . 5.3 lbs.

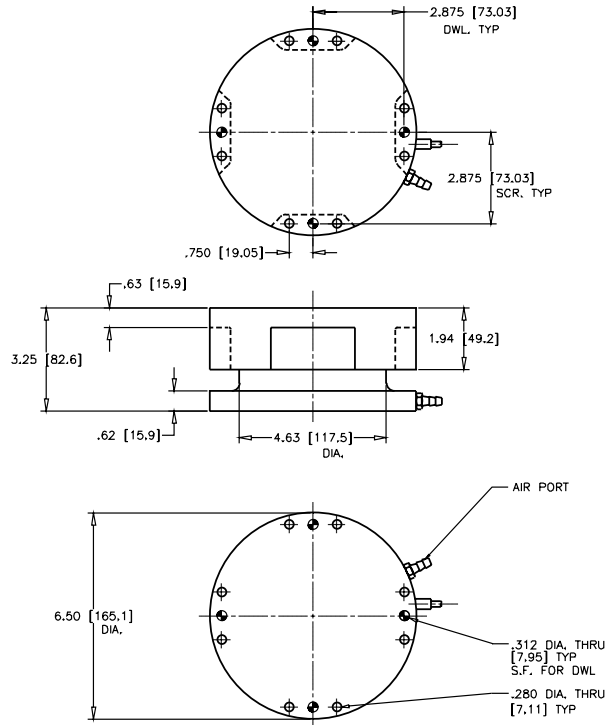
Operating Range –

@ 90 psi (max) . . . 10-2149 in-lb.

Maximum Deflection 6°

Spring Assisted Lower Limits

Model	In-Lb
Z.	Fully Pneumatic
A.	24
B.	26
C.	31
D.	34
E.	45
F.	75
G.	92
H.	113
I.	160
J.	221
K.	253
L.	366



To Determine Air Pressure Requirements:

IN-LB Requirements – Preset Lower Limit (if Applicable) ÷ 23.88 (4321 Constant) = PSI

Example: 800 in-lb – 75 ÷ 23.88 = 30 psi

MODEL 4322

Specifications

Weight of Versa-Matic 18 lbs.

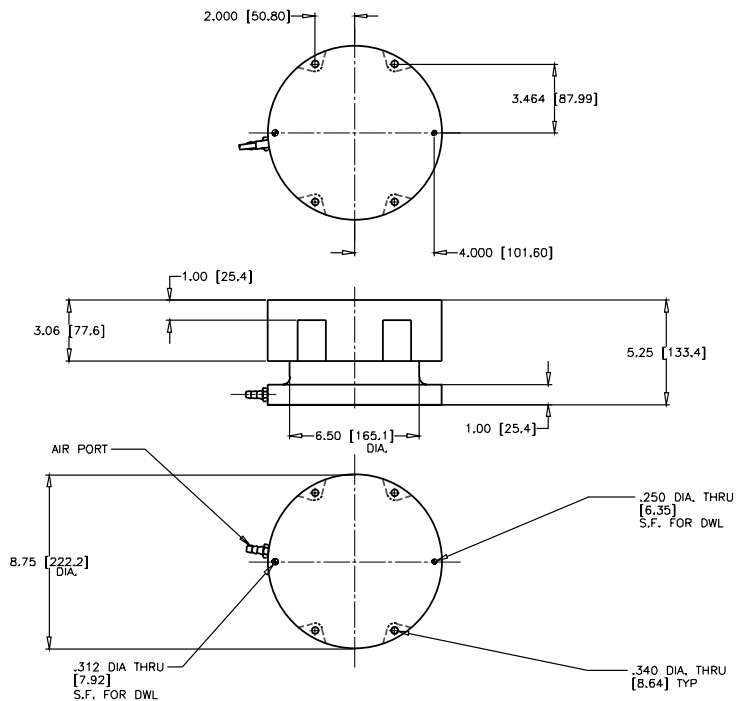
Operating Range –

@ 90 psi (max) . . . 20-6858 in-lb.

Maximum Deflection 8°

Spring Assisted Lower Limits

Model	In-Lb
Z.	Fully Pneumatic
A.	39
B.	58
C.	110
D.	156
E.	195
F.	227
G.	255
H.	303
I.	384
J.	633



To Determine Air Pressure Requirements:

IN-LB Requirements – Preset Lower Limit (if Applicable) ÷ 76.21 (4322 Constant) = PSI

Example: 4000 in-lb – 227 ÷ 76.21 = 49 psi

Robotic Accessories

Collision Sensor Accessories

Bellows

Robotic Accessories stocks two styles of bellows, however, availability of each style varies within the safety joint model line.

Aluminum coated nylon sleeves are flame retarding and the aluminum cover allows the material a 95% reflective heat property that makes it a good material in high heat. This style of sleeve is recommended for welding and other high heat applications.

Buna-N coated nylon bellows are generally resistant to oils, greases and hydrocarbons and offer good abrasion resistance. This style is recommended for protection against unclean environments.

Custom bellows can be manufactured for almost any application (i.e. clean room). We will recommend bellows manufacturers, at your request.

Hard Wire or Quick Disconnect



With the exception of Model 4418, all safety joint models are available with either a hard wire or a quick disconnect wire. The quick

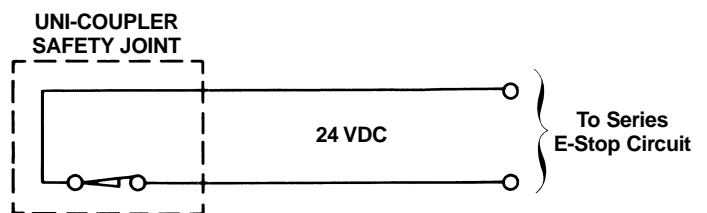
disconnect feature simplifies the removal of the safety joint from the robot. The molex connector is not recommended for those applications in which the tooling experiences extensive rotary motions.

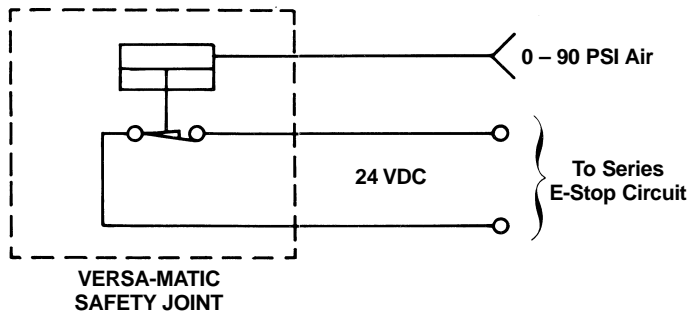
Adapter Plates

Adapter plates are available for any robot model or end effector. Following are estimated specifications on adapter plates for robots:

Estimated Adapter Plate Specifications			
Safety Joint Model	Height	Diameter	Weight
4318	3/8"	2-3/4"	3.5 oz.
4319	3/8"	4"	7.4 oz.
4320	1/2"	5-1/4"	1.1 lbs.
4321	5/8"	6-1/2"	2.0 lbs.
4322	3/4"	8-3/4"	4.4 lbs.
4418	3/8"	2"	2.0 oz.
4419	3/8"	3-3/4"	6.5 oz.
4420	1/2"	5-1/4"	13.0 oz.
4421	5/8"	6-1/2"	1.7 lbs.
4422	3/4"	8"	3.7 lbs.

Electrical & Pneumatic Schematics





Regulators (*For Versa-Matic Safety Joints*)



A regulator is available with each Versa-Matic safety joint. We will recommend programmable regulator suppliers at your request.

Air Trol Regulator (Part No. 5462): Miniature regulator shipped preset (psi) for your application, may be adjusted as required, designed for panel or box mounting, tamper-proof, 1.5 oz.

Watts Regulator (Part No. 5463): Compact regulator complete with gage and mounting bracket, removable adjustment knob, 10.5 oz.

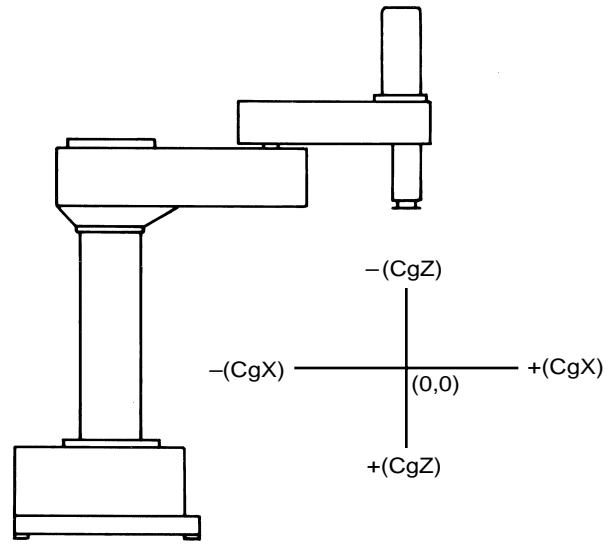
Ordering Data

Safety Joint Model Selection

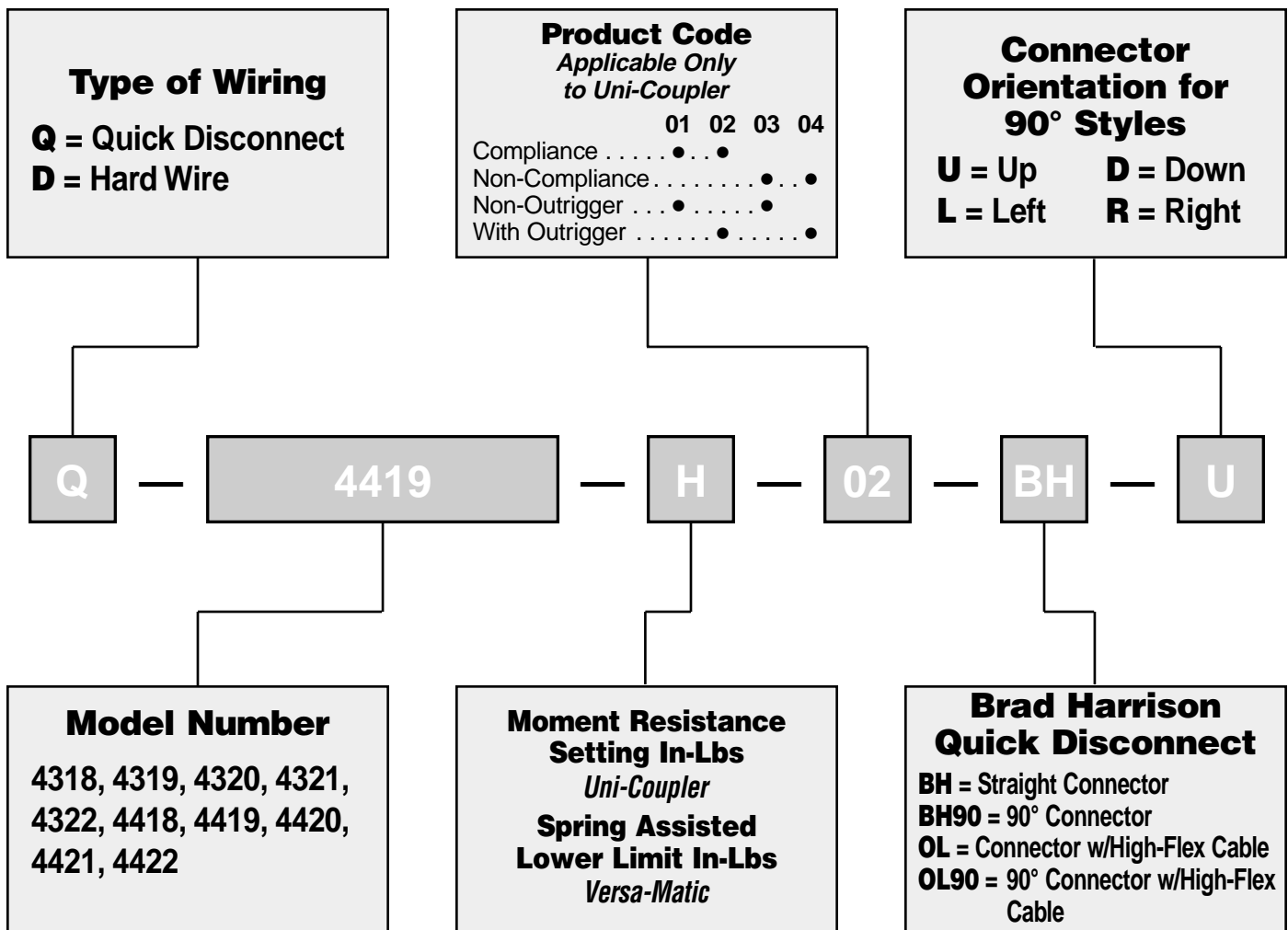
For assistance in selecting the correct safety joint model for your application, please provide us with the following information or send prints of your tooling.

1. Total Payload, including all tooling, part weight and any additional loads, such as insertion forces.
2. Acceleration of robot arm (inches/second²).
3. Center of gravity of part and tool, X axis (inches).
4. Center of gravity of part and tool, Z axis (inches).

Center of Gravity Diagram



NOTE: Dimensions are taken from robot flange face (ref 0,0)





6555 State Route 202 • Tipp City, Ohio 45371
937-667-5705 • FAX: 937-667-7602

E-mail us at: robotic@processeq.com • Visit us at: www.robotic-accessories.com

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