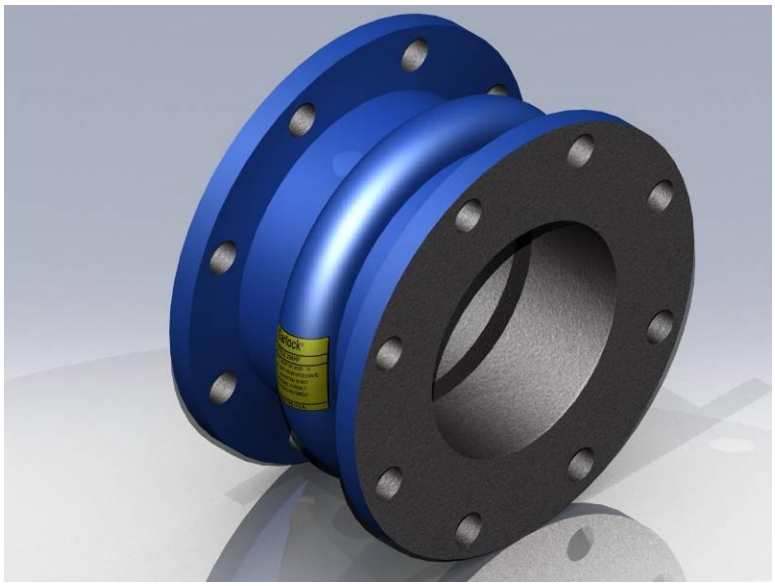
1.0 Application



The Style 204HP is used in rigid piping systems to compensate for axial, lateral, torsional and angular movement and misalignment due to thermal expansion and contraction, mechanical effects, system settlement, pressure surges and system vibration. It is intended to be used in dynamic, high pressure applications where a standard Style 204 does not meet pressure requirements. The product can be specially designed and manufactured to compensate for permanent piping misalignment or varying pipe sizes. This expansion joint accommodates higher pressures that standard expansion joints while allowing full movement capabilities of a Style 204 expansion joint.

2.0 Construction

The product construction shall include an elastomeric inner liner (tube) and consistent layers of fabric and metal reinforcement (body), bonded together with an elastomeric exterior cover. A protective coating shall be applied to the product exterior to impede deterioration due to environmental conditions.

2.1 Inner Elastomer Tube

The tube shall be a layer of homogeneous, elastomeric compound (1/8" minimum thickness) which is leak-proof and compatible with the conveyed media. The standard elastomer shall be chlorobutyl meeting ASTM D2000 Grade 4AA 610 A13 EA14.

2.2 Fabric Reinforcement

A minimum of 6 biased plies of high quality synthetic fabric, impregnated with compatible elastomers are to be utilized to provide flexibility as well as durability. Standard fabric is to be spun 20oz polyester. The polyester shall meet the following specifications:

Specification	Method	Value
Thread Count: Warp (Ends/Inch) Fill (Picks/Inch)	ASTM D3775	Warp: 19 ± 2 Fill: 20 ± 2
Gauge (Inch)	ASTM D1777	0.045 ± 0.004
Weight (oz/yd^2)	ASTM D3776	20.5 ± 1.5
Tensile Strength (lbs)	ASTM D5034	Warp: 700 min Fill: 700 min

2.3 Metal Reinforcement

Expansion joints shall have metal reinforcement within the body. The reinforcement may be metal wire or metal rectangular/round body rings. When wire is used, it must be coated with fabric in order to obtain proper bonding strength with the subsequent fabric and rubber plies. All expansion joints under 4”ID may use 1/16” minimum diameter wire for reinforcement. All expansion joints 4”ID and greater shall use steel body rings that are minimum 1/4” in height. For all expansion joints greater than 4”ID, a minimum of two (2) steel body rings shall be fastened at the base of the arch(es) to provide added support. When steel body rings are used, the metal shall meet the following specifications:

Specification	Value
Yield Strength 0.2% Offset (psi)	54,000 min
Ultimate Strength (psi)	64,000 min
Brinell Hardness (HBW)	126 min
Rockwell Hardness (HRB)	77 min

2.4 Exterior Elastomer Cover

The cover shall be a homogenous layer of elastomeric compound (1/16” minimum thickness) to protect against environmental conditions or mechanical damage. The standard elastomer shall be chlorobutyl meeting ASTM D200 4AA 610 A13 EA14.

2.5 Exterior Coating

The cover of the expansion joint shall have an acrylic, blue paint coating exhibiting excellent weathering characteristics without hindering the product’s flexibility. The coating shall be applied completely and uniformly.

3.0 Retaining Rings

Metal retaining rings shall be used with all expansion joints. Standard retaining rings shall be constructed of carbon steel and coated with a rust-resistant coating. Retaining rings shall be 3/8” thick and must be flat (not “L” shaped) to allow for full movements

without damage to the elastomeric bellows. Alternative materials may include galvanized carbon steel and stainless steel.

4.0 Control Units

Control units consist of two or more tie rods (ASTM A193 B7) connected between flanges. The standard gusset plate material shall be ASTM A36 carbon steel. Control units are utilized to prevent over-elongation; thus prolonging the life expectancy of the expansion joint. When it is required, compression nuts may be installed on the tie rods to prevent over-compression of the expansion joint.

5.0 Variations

5.1 Multiple Arches

To accommodate excessive movement, multiple arches can be utilized. A maximum of four (4) arches is recommended. The total rated movement equals the standard single arch movement multiplied by the number of arches.

5.2 Taper

When connecting piping of unequal diameters, a tapered (reducing) expansion joint is required. Concentric tapered expansion joints are used when the center lines of two connecting pipes are inline. Eccentric tapered expansion joints are required when center lines are offset. The pressure ratings are based on the larger ID. Movement ratings are based on the smaller ID.

5.3 Filled Arch

A filled arch can be used to eliminate sediment buildup in the arch. It can also be used to reduce the risk of abrasion due to solids. When filled arches are used, the movement ratings of the expansion joint is reduced by 50% (For full range of movement without entrapment of solids, see the Style 206 EZ-Flo Specification).

5.4 Offset

When pipe flange centerlines are not aligned or when flanges are non-parallel, an expansion joint can be manufactured with this offset to prevent stretching the joint at installation. This also allows the joint to move to its full rated movement during operation.

5.5 Sleeve Type

When pipes do not have flanges, a sleeve type joint can be used to slip over both ends of the piping. The ID of the expansion joint shall equal the pipe OD +1/8" (typically for ease of installation) and shall be used in conjunction with suitable t-bolt clamps. It is recommended to use an overlap of 2" minimum to clamp the expansion joint to the pipe OD. Sleeve type expansion joints do not follow standard pressure ratings of Style 204HP expansion joints.

6.0 Operating Capabilities

All expansion joints shall conform to (but may exceed) the guidelines of the Rubber Expansion Joint Division of the Fluid Sealing Association as stated in the Technical Handbook.

6.1 Pressure Capabilities with 4:1 Burst Ratio

Pipe ID		Pressure Rating @ 4:1 Safety Factor		Vacuum	
Inch	mm	psi	bar	In. Hg	mm Hg
1/2 – 6	13 – 150	200	14	29.9	750
8 – 12	200 – 300	190	13	29.9	750
14	350	130	9	29.9	750
16 – 20	400 – 500	110	8	29.9	750
22 – 24	550 – 600	100	7	29.9	750
26 – 40	650 – 1000	90	6	29.9	750
42 – 66	1050 – 1650	80	5.5	29.9	750
68 – 96	1700 – 2400	70	5	29.9	750
98 – 108	2450 – 2700	60	4	29.9	750
110 – 120	2750 - 3000	50	3.5	29.9	750

6.2 Vacuum Capabilities

All sizes shall be rated for 29.9 Inches Hg.

6.3 Movement Capabilities

Pipe ID	Axial Compression	Axial Elongation	Lateral Deflection
1 – 2	1/4"	1/8"	1/4"
2 – 6	1/2"	1/4"	1/2"
8 – 18	3/4"	3/8"	1/2"
20 – 24	7/8"	7/16"	1/2"
26 – 40	1"	1/2"	1/2"
42 - 120	1-1/8"	1/2"	1/2"

Greater movements can be achieved for all sizes of expansion joints. Contact the product line for custom designs.

7.0 Material Variations

7.1 Tube Materials

The standard material for the tube shall be chlorobutyl. Alternative materials include EPDM, Nitrile, Neoprene, Fluoroelastomer, Natural Rubber, Natural Gum Rubber, Hypalon, HNBR and a High-Performance Fluoroelastomer.

7.2 Cover Materials

The standard material for the cover shall be chlorobutyl. Alternative materials include EPDM, Nitrile, Neoprene, Fluoroelastomer, Hypalon, HNBR and a High-Performance Fluoroelastomer.

7.3 Body Reinforcement Materials

The standard fabric reinforcement shall be 20oz. polyester bonded to chlorobutyl. Alternative fabrics include 20oz polyester bonded to neoprene, fiberglass/Kevlar bonded to chlorobutyl and fiberglass/Kevlar bonded to fluoroelastomer.

7.4 Temperature Resistance

7.4.1 Standard Temperature Rating

The standard combination of a chlorobutyl tube and cover with polyester reinforcement is rated from -20°F up to 250°F.

7.4.2 300°F Temperature Rating

To achieve a 300°F temperature rating, a chlorobutyl or EPDM tube and cover is used with fiberglass/Kevlar reinforcement bonded to chlorobutyl.

7.4.3 400°F Temperature Rating

The achieve a 400°F temperature rating, a fluoroelastomer tube and cover is used with fiberglass/Kevlar reinforcement bonded to fluoroelastomer

8.0 Product Qualifications

8.1 10CFR50 Appendix B and 10CFR21 Safety Related

This expansion joint shall be able to be supplied as a "Safety Related" component in nuclear power plants per 10CFR50 Appendix B and 10CFR21.

8.2 CRN Certification

This style of expansion joint shall be certified with an up-to-date CRN registration number in Ontario and Alberta.

8.3 Domestically Manufactured

All expansion joints shall be manufactured within the United States. All components within the expansion joints shall be manufactured within the United States of America.

9.0 Available Testing

9.1 Hydrostatic Testing

All expansion joints shall be hydrostatically tested prior to shipment. The standard test shall use a pressure of 1.5 times the design pressure for a 10 minute period.

9.2 Vacuum Testing

All expansion joints can be vacuum tested prior to shipment. The standard test shall use a vacuum of 26" Hg for a 10 minute period.

9.3 Fabric Testing

Upon receipt of all fabric material, all tests specified in section 2.2 are to be performed to ensure conformance to internal specifications. All appropriate documentation shall be maintained indefinitely.

9.4 Elastomer Testing

All elastomers are to be tested to ensure their compliance with the necessary ASTM D2000 material description. All appropriate documentation shall be maintained indefinitely.

10.0 Manufacturer Qualifications

10.1 ISO Registration

The manufacturer of expansion joints shall have a current ISO 9001:2008 certification.

10.2 NUPIC Auditing

The manufacturer shall have undergone a positive performance audit by the Nuclear Procurement Issues Committee (NUPIC) in order to supply expansion joints in accordance with 10CFR50 Appendix B, 10CFR21 and NQA-1 Basic.

11.0 Field Services

The manufacturer shall be able to provide a range of on-site services including: field measurements, visual inspection of existing products in service, evaluation of piping misalignments to determine build dimensions for offset expansion joints, training seminars and installation supervision.