

ENGINEERING SPECIFICATIONS

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UL Classified Lead-Free Flex™ V's,
U's and Straight Flexible Connectors



**Lead-Free
Flex™**



UL Listed Fire
SafeFlex™ Connectors



**Fire
SafeFlex™**



CRN Products



CRN Approved for:
Manitoba, Ontario, Alberta,
British Columbia, Québec
and Saskatchewan.

Flexible V and U Connectors



Flexible Metal Braided Connectors



Rubber Expansion Joints



Pipe Alignment Guides



Bellow Pump Connectors



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ENGINEERING SPECIFICATIONS

THERMAL SEISMIC V AND U CONNECTORS

When indicated, use flexible thermal seismic V and U connectors of the size, type and end fittings noted. V and U connectors allow movement along the 6 planes of the X, Y and Z axis. V and U connectors can be constructed to accommodate standard 2", 3", 4" or greater movements on all planes. Movements are primarily in lateral directions, minimizing weld attachment stress. V and U connectors must be installed in the neutral length listed on the manufacturer's diagrams, unless otherwise directed by the engineer.

V and U connectors will be positioned and supported per the manufacturer's installation instructions. V connectors use two 45 degree elbows and one 90 degree elbow for a total of 180 degrees in pipe change. The U connectors consist of two flexible sections of hose and braid, two 90 degree elbows and a 180 degree return equaling a 360 degree pipe change.

In expansion compensation situations, the V and U connector can be installed pre-compressed or pre-extended, only if the full range of motion will be encountered in only one direction. Larger connectors are supplied with shipping bars attached. These bars are tack welded on to maintain the proper designed length. The shipping bars need to be removed from the V or U after installation. For steam applications, a drain port and plug are to be specified and factory installed into the bottom of the 90 or 180 degree elbow to allow condensate to be drained. An alternative position for steam service is with the 90 or 180 degree elbow pointing upward. Installing the V or U connector in this way will allow natural drainage into the surrounding piping.

Anchors are required on either side of the V or U connector to react to the spring forces of the connector. Pressure thrust loads are not a consideration because the V or U connector will not impose pressure thrust onto the system. Anchors should be of sufficient strength to withstand the spring forces of the loops and the frictional forces of the pipe sliding through any pipe alignment guides.

Flexible V and U connectors are rated for a minimum of 150 PSIG working pressure in all sizes. Flange, weld, threaded, groove, or copper tube end fittings are provided to match connecting pipe. V and U connectors are rated for 2, 3, or 4 inches of motion, as indicated on project drawings.

Custom movements are available; contact TCH for assistance. At least one pipe alignment guide must be used within four pipe diameters on each side of the V and U connector.

Flexible thermal seismic V and U connectors will be TCH Model SV for V Connectors or SL for U Connectors.

ENGINEERING SPECIFICATIONS

FLEXIBLE METAL BRAIDED CONNECTORS

Flexible metal braided connector assemblies can be used on pumps, equipment and coil connections as indicated in the specifications, drawings and equipment schedules.

Flexible metal braided connectors can also be used where flexible connectors are specified on equipment that will operate at temperatures above 210°F.

Flexible metal braided connectors must be installed in a straight line without offsets or twists. Support pipe without any load on flexible connectors.

Connectors for pipe sizes up to 2" I.D. will have threaded ends, and connectors for pipe sizes 2-1/2" I.D. or larger will be flanged. Connectors for copper piping will have female copper tube ends.

Utilize connectors of 300 Series stainless steel corrugated hose and braid and carbon steel Male NPT or 150# flange end fittings for connection to steel piping. Female connectors to be installed on copper piping should be constructed of bronze hose and braid with copper end connections.

Stainless steel braided connectors will be TCH:

- Series TCHS-MMT (Male NPT)
- Series TCHS-FLG (Carbon Steel 150# Plate Flanges)
- Series TCHS-GR (Schedule 40 Carbon Steel Grooved Fittings)
- Series TCHS-GRPF (Schedule 40 Carbon Steel Fitting by 150# Carbon Steel Plate Flange)

Bronze braided connectors will be TCH:

- Series TCHB-MMT (Copper Male NPT)
- Series TCHB-CHMMT (Copper Hex Male)
- Series TCHB-FFSC (Copper Female Sweat Ends)

ENGINEERING SPECIFICATIONS

RUBBER EXPANSION JOINTS

Spherical, rubber expansion joints will be used on all pumps and equipment as indicated within the specifications, drawings and equipment schedules. Rubber expansion joints will be located perpendicular to pump inlet and outlet. Piping elbows at these areas should be supported with anchors to support full weight loads, as well as static pressure thrust forces. Piping system must be aligned prior to installation of rubber expansion joints. The rubber expansion joints cannot be used to correct piping misalignment during installations.

Rubber expansion joints are constructed of synthetic rubber tube and cover, which are molded and cured in hydraulic presses. They are reinforced with multi-ply Nylon tire cord fabric. Internal reinforcing of metal wire or embedded rings will not be used.

Utilize single or double sphere rubber expansion joints as indicated on the drawings. Double sphere flanged rubber expansion joints have a factory installed steel body ring installed externally between the two spheres to control ballooning under high pressure/temperature situations. Spherical rubber expansion joints installation instructions are provided by the manufacturer and are wire tagged to the expansion joint.

Rubber expansion joints for pipe sizes 2" or smaller will have threaded ends and connectors for pipe sizes 2-1/2" and larger will have floating steel flanges. The mating surface will be 100% rubber.

Neoprene connectors rated for a maximum of 170° F and working pressure of at least 225 PSIG will be utilized in chilled water installations. EPDM expansion joints rated for a maximum of 210°F and working pressure of at least 225 PSIG will be utilized in heating water applications.

Control rods can be installed on connectors to prevent excessive elongation and to control the static pressure thrust in the piping system. Control rods should utilize 1/4" thick neoprene grommets to limit vibration transfer. Thread-on nuts should be snug against the plate after installation.

Control rod installation instructions will be provided by the manufacturer and will be wire tagged to the control unit assemblies.

Flanged single sphere connectors will be TCH Series MS1 Neoprene or EPDM.
Flanged double sphere connectors will be TCH Series MS2 Neoprene or EPDM.
Spool type expansion connectors will be TCH Series S1 Neoprene or EPDM.
Threaded connectors will be TCH Series MSFU Neoprene or EPDM with female union ends.
Flanged reducing connectors will be TCH Series MRCE Neoprene or EPDM.

ENGINEERING SPECIFICATIONS

BELLOW PUMP CONNECTORS

Bellow pump connectors should be used on all heating water connections on pumps and other mechanical equipment as indicated within the specifications, drawings and equipment schedules.

Piping system must be aligned prior to installation of connector.
The connector can not be used to correct piping misalignment during installation.

Bellow pump connectors are constructed with Series 300 stainless steel multi-ply bellows welded to 150 lb. carbon steel flanges. Three tie rods are factory installed to prevent excessive elongation and to control the static pressure thrust at full rated working pressure of the connector.

Tie rods should utilize rubber grommets to limit vibration transfer.

MPB has 1/2" axial compression, 1/8" axial extension and 1/8" lateral offset.
MPBR has 1" axial compression, 3/8" axial extension and 1/8" - 5/16" lateral offset depending on size.

Working pressure ratings for bellows pump connectors will be a minimum of 225 PSIG @ 70°F and 210 PSIG @ 360°F.

Bellow pump connectors will be TCH Series MPB or MPBR.

ENGINEERING SPECIFICATIONS

EXTERNALLY PRESSURIZED EXPANSION JOINTS

Externally pressurized expansion joints can be utilized where expansion joints are indicated within the specifications, drawings and equipment schedules to compensate for thermal pipeline growth. They are used when growth cannot be adequately accommodated for changes of direction, bends, pipe loops and when the amount of axial growth that must be accommodated between anchors is greater than 3 inches.

Externally pressurized expansion joints are rated for 150 PSIG or 300 PSIG as required by the piping system. Joints are constructed so pressure is only applied to the exterior of corrugations.

Bellows are constructed using Series 300 stainless steel formed bellows.

Integral internal guide will be present to eliminate bellows squirm, insure proper internal alignment and reduce turbulence. The external housing, pipe and end fittings are carbon steel and are designed for full line pressure. Expansion joints have welded, 150 lb. or 300 lb. ANSI steel flanges, grooved or plain ends suitable for piping in which it is installed. Drain port and plug can be provided upon request.

Single expansion joints will provide 4 inches or 8 inches of axial travel, as required, and dual expansion joints will provide 8 inches or 16 inches of axial travel, as required. Dual expansion joints can include a center anchor base. Joints will provide a minimum of 150% of expected growth between anchors.

Carefully align joint and make proper allowance for temperature of pipe at time of installation. Pipe guides should be placed per EJMA standards.

Externally pressurized expansion joints will be TCH Series TFEP.

ENGINEERING SPECIFICATIONS

EXPANSION COMPENSATORS

Expansion compensators can be utilized on heat transfer piping, tubing, heaters, radiators, solar panels and other equipment as indicated within the specifications, drawings and equipment schedules to compensate for thermal pipeline growth.

Vertical piping for domestic hot water, chilled water, heating water, steam and steam condensate will be provided with expansion compensators at each floor.

Joints are constructed with multi-ply Series 300 stainless steel bellows and carbon steel shroud, internal liner and end fittings. Joints will utilize an anti-torque and anti-squirm device.

All connections must have ends to match piping system.

Copper tube ends are provided on joints for copper piping.

Joints for steel piping will have plain weld ends, male NPT threaded ends, flange or groove ends.

Joints will have a minimum rating of 200 PSIG working pressure and axial movements of 1-3/4 inches compression and 1/4 inch extension. In all applications, joints will provide a minimum of 150% expected growth between anchors.

Carefully align joint and make proper allowance for temperature of pipe at time of installation.

Pipe guides should be placed as per EJMA standards.

Expansion compensators will be TCH Series EXCM, EXCW, EXCG, EXCF, EXCS.

ENGINEERING SPECIFICATIONS

PTFE EXPANSION JOINTS

PTFE expansion joints can be used on process pumps and equipment as indicated on the specifications, drawings and equipment schedules to absorb equipment and piping motions.

PTFE expansion joints are constructed of two, three or five convolutions of white PTFE material with stainless steel reinforcing rings. PTFE sealing surfaces will be flared out over the face of the backing flanges so that all wetted surfaces are PTFE.

Backing flanges is galvanized ductile iron. Built-on plated steel limit rods are attached to the backing flanges and set for the maximum rated extension of the connector.

PTFE expansion joints provide for axial travel, as well as parallel misalignment and angular rotation.

PTFE expansion joints will be TCH Series T2, T3 and T5.

ENGINEERING SPECIFICATIONS

PIPE ALIGNMENT GUIDES

Piping in conjunction with expansion joints must be guided as per EJMA (Expansion Joint Manufacturer's Association) guidelines. Guides will restrict lateral pipe movement and buckling caused by pressure thrust loads while allowing for axial movement.

Guides must be of sufficient strength to withstand lateral forces equal to 15% of pipe anchor loads.

The first guide must be located within four (4) pipe diameters on each side of the expansion joint.

The second guide must be located within fourteen (14) pipe diameters on each side of the expansion joint (the first guide may be eliminated when positioning in conjunction with externally pressurized or expansion compensator styles). Additional intermediate guides may be necessary and must be installed along the piping as recommended by the manufacturer and EJMA guidelines.

Pipe alignment guides will be the standard concentric spider type with heavy painted steel, bolted split-housing to be rigidly anchored, and steel sliding spider that is attached to the pipe.

Pipe guides will provide space for specified insulation thickness and are rated for a minimum of 4 inches of axial movement.

Pipe alignment guides will be TCH Series PG.

ENGINEERING SPECIFICATIONS

HEAT PUMP CONNECTORS

Stainless steel hose and braid heat pump assemblies will be used as flexible connectors for use on water source heat pumps or fan coil units as indicated within the specifications, drawings and equipment schedules.

Heat pump connectors are constructed with 300 Series stainless steel corrugated metal hose and braid.

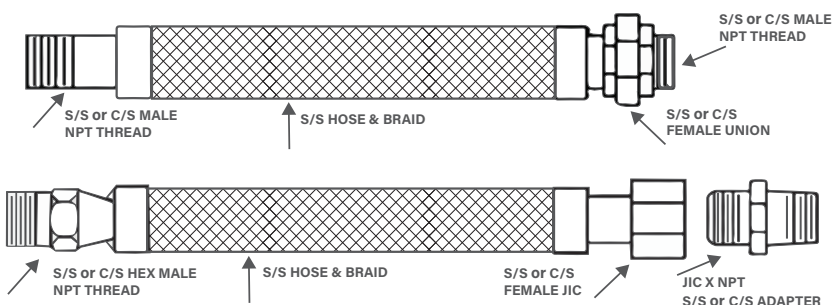
End fittings are permanently welded to the assembly and will consist of a solid male NPT at one end and either a female JIC swivel with adapter or female union with adapter, producing a male swivel NPT. When used in copper piping systems, stainless steel or brass nut end fittings must be used.

Heat pump connectors are rated for a minimum of 700°F and minimum working pressure of the following:

Size	WRK. PSIG	@ TEMP.	WRK. PSIG	@ TEMP.
1/2"	796	70° F	557	700° F
3/4"	597	70° F	417	700° F
1"	455	70° F	318	700° F
1 1/4"	441	70° F	308	700° F
1 1/2"	370	70° F	259	700° F
2"	370	70° F	259	700° F

Metal heat pump hoses are recommended for continuous service with temperatures above 140° F

Heat pump connectors are TCH Series MHPH.



ENGINEERING SPECIFICATIONS

UL CLASSIFIED NSF 61/NSF 372 WATER QUALITY LEAD-FREE FLEX™ STRAIGHT FLEXIBLE CONNECTORS

When indicated, for potable water, use flexible metal braided connectors of the size up to 12" I.D. shall be UL® Classified Water Quality NSF 61 and NSF 372.

Flexible metal braided connector assemblies can be used on pumps, equipment and coil connections as indicated in the specifications, drawings and equipment schedules.

Flexible metal braided connectors can also be used where flexible connectors are specified on equipment that will operate at temperatures above 210°F.

Flexible metal braided connectors must be installed in a straight line without offsets or twists. Support pipe without any load on flexible connectors.

Connectors for pipe sizes up to 2" I.D. will have threaded ends, and connectors for pipe sizes 2-1/2" I.D. or larger will be flanged. Connectors for copper piping will have female copper tube ends.

Utilize connectors of 300 Series stainless steel corrugated hose and braid and carbon steel Male NPT or 150# flange end fittings for connection to steel piping. Female connectors to be installed on copper piping should be constructed of bronze hose and braid with copper end connections.

Stainless steel braided connectors will be TCH Series:

- UL-TCHS-MMT (Male NPT)
- UL-TCHS-FLG (Carbon Steel 150# Plate Flanges)
- UL-TCHS-GR (Schedule 40 Carbon Steel Grooved Fittings)
- UL-TCHS-GRPF (Schedule 40 Carbon Steel Fitting by 150# Carbon Steel Plate Flange)
- UL-TCHS-SMMT (Stainless Steel Male NPT)
- UL-TCHS-SFLG (Stainless Steel 150# Plate Flanges)
- UL-TCHS-SGR (Schedule 40 Stainless Steel Grooved Fittings)
- UL-TCHS-SGRSPF (Schedule 40 Stainless Steel Fitting by 150# Stainless Steel Plate Flange)

Bronze braided connectors will be TCH Series:

- UL-TCHB-FFSC (Copper Female Sweat Ends)

ENGINEERING SPECIFICATIONS

UL CLASSIFIED NSF 61/NSF 372 WATER QUALITY LEAD-FREE FLEX™ V AND U CONNECTORS

When indicated, for potable water or lead free regulations, use flexible thermal seismic V and U connectors of the size up to 12" I.D. shall be UL® Classified Water Quality NSF 61 and NSF 372.

When indicated, use flexible thermal seismic V and U connectors of the size, type and end fittings noted. V and U connectors allow movement along the 6 planes of the X, Y and Z axis. V and U connectors can be constructed to accommodate standard 2", 3", 4" or greater movements on all planes. Movements are primarily in lateral directions, minimizing weld attachment stress. V and U connectors must be installed in the neutral length listed on the manufacturer's diagrams, unless otherwise directed by the engineer.

V and U connectors will be positioned and supported per the manufacturer's installation instructions. V connectors use two 45 degree elbows and one 90 degree elbow for a total of 180 degrees in pipe change. The U connectors consist of two flexible sections of hose and braid, two 90 degree elbows and a 180 degree return equaling a 360 degree pipe change.

In expansion compensation situations, the V and U connector can be installed pre-compressed or pre-extended, only if the full range of motion will be encountered in only one direction. Larger connectors are supplied with shipping bars attached. These bars are tack welded on to maintain the proper designed length. The shipping bars need to be removed from the V or U after installation. For steam applications, a drain port and plug are to be specified and factory installed into the bottom of the 90 or 180 degree elbow to allow condensate to be drained. An alternative position for steam service is with the 90 or 180 degree elbow pointing upward. Installing the V or U connector in this way will allow natural drainage into the surrounding piping.

Anchors are required on either side of the V or U connector to react to the spring forces of the connector. Pressure thrust loads are not a consideration because the V or U connector will not impose pressure thrust onto the system. Anchors should be of sufficient strength to withstand the spring forces of the loops and the frictional forces of the pipe sliding through any pipe alignment guides.

Flexible V and U connectors are rated for a minimum of 150 PSIG working pressure in all sizes. Flange, weld, threaded, groove, or copper tube end fittings are provided to match connecting pipe. V and U connectors are rated for 2, 3, or 4 inches of motion, as indicated on project drawings.

Custom movements are available, contact TCH for assistance. At least one pipe alignment guide must be used within four pipe diameters on each side of the V and U connector.

Flexible thermal seismic V and U connectors will be TCH Model:

SV-UL for V Connectors

SL-UL for U Connectors

ENGINEERING SPECIFICATIONS

CRN APPROVED

When indicated for Canadian Registration Number requirements for pressure vessels, pressure piping systems or boiler systems in Canada or surrounding territories, use TCH reducing assemblies, seismic V and U connectors and straight assemblies.

When indicated, use flexible thermal seismic V and U connectors of the size, type and end fittings noted. V and U connectors allow movement along the 6 planes of the X, Y and Z axis. V and U connectors can be constructed to accommodate up to 10" of movement on all planes. Movements are primarily in lateral directions, minimizing weld attachment stress. V and U connectors must be installed in the neutral length listed on the manufacturer's diagrams, unless otherwise directed by the engineer.

V and U connectors will be positioned and supported per the manufacturer's installation instructions. V connectors use two 45 degree elbows and one 90 degree elbow for a total of 180 degrees in pipe change. The U connectors consist of two flexible sections of hose and braid, two 90 degree elbows and a 180 degree return equaling a 360 degree pipe change.

In expansion compensation situations, the V and U connector can be installed pre-compressed or pre-extended, only if the full range of motion will be encountered in only one direction. Larger connectors are supplied with shipping bars attached. These bars are tack welded on to maintain the proper designed length. The shipping bars need to be removed from the V or U after installation. For steam applications, a drain port and plug are to be specified and factory installed into the bottom of the 90 or 180 degree elbow to allow condensate to be drained. An alternative position for steam service is with the 90 or 180 degree elbow pointing upward. Installing the V or U connector in this way will allow natural drainage into the surrounding piping.

Anchors are required on either side of the V or U connector to react to the spring forces of the connector. Pressure thrust loads are not a consideration because the V or U connector will not impose pressure thrust onto the system. Anchors should be of sufficient strength to withstand the spring forces of the loops and the frictional forces of the pipe sliding through any pipe alignment guides.

Flexible V and U connectors are rated for a minimum of 150 PSIG working pressure in all sizes. Flange, weld, threaded, or copper tube end fittings are provided to match connecting pipe. V and U connectors are rated for up to 10 inches of motion, as indicated on project drawings.

Custom movements are available, contact TCH for assistance. At least one pipe alignment guide must be used within four pipe diameters on each side of the V and U connector.

Flexible thermal seismic V and U connectors will be TCH Model, SV-CRN for V Connectors, and SL-CRN for U Connectors. Flexible straight connectors will be TCH Model, TCHS-CRN (SS or CS Straight Connectors), RCFF-CRN (Reducing Connectors), TCHB-CRN (Bronze Connectors). Standard straight connectors up to 12 inch I.D. and open OAL.

ENGINEERING SPECIFICATIONS

UL LISTED FIRE SAFEFLEX™ V AND U CONNECTORS IN ACCORDANCE WITH NFPA 13

When indicated, for fire suppression systems, use Fire SafeFlex™ flexible thermal seismic V and U connectors of the size up to 10" I.D. shall be UL Listed NFPA 13.

When indicated, use flexible thermal seismic V and U connectors of the size, type and end fittings noted. V and U connectors allow movement along the 6 planes of the X, Y and Z axis. V and U connectors can be constructed to accommodate standard 4", 8" or up to 24" movements on all planes. Movements are primarily in lateral directions, minimizing weld attachment stress. V and U connectors must be installed in the neutral length listed on the manufacturer's diagrams, unless otherwise directed by the engineer.

V and U connectors will be positioned and supported per the manufacturer's installation instructions. V connectors use two 45 degree elbows and one 90 degree elbow for a total of 180 degrees in pipe change. The U connectors consist of two flexible sections of hose and braid, two 90 degree elbows and a 180 degree return equaling a 360 degree pipe change.

In expansion compensation situations, the V and U connector can be installed pre-compressed or pre-extended, only if the full range of motion will be encountered in only one direction. Larger connectors are supplied with shipping bars attached. These bars are tack welded on to maintain the proper designed length. The shipping bars need to be removed from the V or U after installation. For steam applications, a drain port and plug are to be specified and factory installed into the bottom of the 90 or 180 degree elbow to allow condensate to be drained. An alternative position for steam service is with the 90 or 180 degree elbow pointing upward. Installing the V or U connector in this way will allow natural drainage into the surrounding piping.

Anchors are required on either side of the V or U connector to react to the spring forces of the connector. Pressure thrust loads are not a consideration because the V or U connector will not impose pressure thrust onto the system. Anchors should be of sufficient strength to withstand the spring forces of the loops and the frictional forces of the pipe sliding through any pipe alignment guides.

Flexible V and U connectors are rated for a minimum of 175 PSIG working pressure 4" through 10" and 300 PSIG working pressure for 1/2" through 3". Flange, weld, threaded, and groove end fittings are provided to match connecting pipe. V and U connectors are rated for 4, 8 or up to 24 inches of motion, as indicated on project drawings.

Custom movements are available, contact TCH for assistance. At least one pipe alignment guide must be used within four pipe diameters on each side of the V and U connector.

Flexible thermal seismic V and U connectors will be TCH Model:
SV-SSF for V Connectors
SL-SSF for U Connectors