<table>
<thead>
<tr>
<th>COLOUR</th>
<th>LABEL</th>
<th>ABBREVIATION</th>
<th>NAME</th>
<th>TEMP. RANGE °C</th>
<th>PROPERTIES</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>RED</td>
<td>EPDM</td>
<td>Ethylene Propylene Diene Monomer</td>
<td>-35 to +100</td>
<td>Weather-resistant; good gas tightness; resistant to attack by oxygen, UV, ozone and extreme weather environments.</td>
<td>Hot water, cooling water with salt solutions, chlorine solutions, detergents, compressed air, food, and fuels except for hydrocarbons.</td>
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</tr>
<tr>
<td>DOUBLE RED</td>
<td>EPDM HT</td>
<td>Ethylene Propylene Diene Monomer HT</td>
<td>-35 to +140</td>
<td>Special EPDM rubber compound suitable for high temperature up to 140 °C applications without hardening; Weather resistant; good gas tightness; resistant to attack by oxygen, UV, ozone and extreme weather environments.</td>
<td>High temperature applications up to 140 °C. Hot water, cooling water with salt solutions, chlorine solutions, detergents, compressed air, food, and fuels except for hydrocarbons.</td>
<td></td>
</tr>
<tr>
<td>GREEN</td>
<td>EPDM SW</td>
<td>Ethylene Propylene Diene Monomer SW</td>
<td>35 to +90</td>
<td>FSC Approved.</td>
<td>Drinking water.</td>
<td></td>
</tr>
<tr>
<td>YELLOW</td>
<td>NBR</td>
<td>Nitrile Butadiene Rubber</td>
<td>-40 to +90</td>
<td>Good general resistance to oils and hydrocarbons. Good mechanical properties especially tenacity strength, flexibility, compression set and impermeability to gases. Moderate ageing properties. Good abrasion resistance.</td>
<td>Oil and fuel, also suitable for greases, solvents and fats. Mineral oils, vegetable and animal oils, oils, petrol and butane or propane gas. Not suitable for steam and hot water.</td>
<td></td>
</tr>
<tr>
<td>DOUBLE YELLOW</td>
<td>NBR HT</td>
<td>Nitrile Butadiene Rubber HP</td>
<td>-40 to +140</td>
<td>Good general resistance to oils and hydrocarbons. Good mechanical properties especially tenacity strength, flexibility, compression set and impermeability to gases. Moderate ageing properties. Good abrasion resistance.</td>
<td>Oil and fuel, also suitable for greases, solvents and fats. Mineral oils, vegetable and animal oils, oils, petrol and butane or propane gas. Not suitable for steam and hot water.</td>
<td></td>
</tr>
<tr>
<td>WHITE</td>
<td>NBR W</td>
<td>White Nitrile Butadiene Rubber</td>
<td>-20 to +90</td>
<td>FSC approved material and has good resistance to oils and greases.</td>
<td>Food contact, good for pulses, fruits, juices and wines. Food and beverages, including fats and oils.</td>
<td></td>
</tr>
<tr>
<td>GREEN</td>
<td>CSST/HYPOLON</td>
<td>Chlorosulfonated polyethylene synthetic rubber</td>
<td>-25 to +90</td>
<td>Excellent resistance to oxidation. Outstanding resistance in atmospheric conditions and in particular strong sunlight and ozone. CSST compounds melt first and are self-extinguishing.</td>
<td>Strong and/or concentrated acids and bases, fluoride, hydroxides, ozone compressed at high flow rates.</td>
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</tr>
<tr>
<td>BLUE</td>
<td>SBR</td>
<td>Styrene butadiene rubber</td>
<td>-25 to +85</td>
<td>Good resistance to abrasion. Excellent mechanical properties. Only moderate resistance to tearing, ozone and general weathering.</td>
<td>Wear resistant material such as a durable suspended screen, coal bunker, etc.</td>
<td></td>
</tr>
<tr>
<td>BLACK</td>
<td>CR</td>
<td>Neoprene</td>
<td>-25 to +90</td>
<td>The best multi-function rubber. Good resistance to changes in temperature, ozone and weather conditions. Good resistance to chemicals; resistant to inorganic chemical products except oxidizing acids and halogens. Moderate resistance to aliphatic hydrocarbons. Low gas permeability.</td>
<td>Water, wet water, seawater, air and weak acids. Suitable for some small groups of acids and bases.</td>
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</tr>
<tr>
<td>RED-BLUE</td>
<td>IIR</td>
<td>Isobutylene isoprene rubber</td>
<td>-30 to +120</td>
<td>Good ozone and weather resistance. Resistant to oxidizing agents, vegetable and animal oils and polar solvents. Poor water resistance.</td>
<td>Animal and eng. oils, fats, greases, gas, water, many oxidizing chemicals and ozone.</td>
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</tr>
<tr>
<td>BROWN</td>
<td>NR</td>
<td>Natural rubber</td>
<td>-25 to +80</td>
<td>Good ozone and weather resistance. Resistant to oxidizing agents, vegetable and animal oils and polar solvents. Poor water resistance.</td>
<td>Seawater, sewage, rain, weak acids and alkalies. Up to 65 °C has a good resistance against chlorinated hydrocarbons in any concentration, sulfuric acid up to 10% concentration, sodium hydroxide, dilution and concentrated potassium hydroxide.</td>
<td></td>
</tr>
<tr>
<td>GREY</td>
<td>IR</td>
<td>Polychloroprene</td>
<td>-40 to +80</td>
<td>Excellent mechanical properties. Excellent abrasion resistance and excellent low temperature flexibility.</td>
<td>Up to 65 ℃ it has a good resistance against hydrochloric acid in any concentration, sulfuric acid up to 10% concentration, sodium hydroxide, dilution and concentrated potassium hydroxide.</td>
<td>High concentrated chemicals up to 150 ℃. Hydrocarbons, aliphatic, aromatic and chlorinated chemicals. Good resistance to acid and alkali’s including oxidizers. Good resistance to chemicals, oils, combustibles and solvents.</td>
</tr>
<tr>
<td>PURPLE</td>
<td>VITON</td>
<td>Fluoroplastic</td>
<td>-30 to +150</td>
<td>Good flame resistance, resistance to oxygen, ozone and natural weathering. Poor performance against ethers, ketones, and bases.</td>
<td>High temperature applications up to 150 ℃.</td>
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</tbody>
</table>

**Description**

A rubber expansion joint is a flexible connector fabricated of natural or synthetic elastomers, fluoroplastics, fabrics, and if necessary, metallic reinforcements used to absorb movements in a piping system while containing pressure and a medium running through it.

**Advantages**

- Minimal face-to-face dimensions while absorbing large movements.
- Low spring rates due to inherent flexibility of rubber.
- Corrosion and erosion resistance.
- No gaskets required for installation.
- Reduced fatigue factor.
- Reduces noise.
- Isolates of vibration.
- Easy to install.

**Application**

- Power generating stations.
- Oil & gas.
- Desalination.
- Cooling systems.
- Pumps.
- Chemical plants.
- Heating, ventilating and air conditioning.
- Shipbuilding.
- Off-shore applications.
- Water treatment plants.
- Sewage.
- Sanitary piping systems.
- Pulp and paper plants.
- Piping systems for chilled or hot water.
- Cooling systems power generation.
- Phosphate plants.
- Potable water.
- Food process.

**Fabric reinforcements**

- Nylon®, Polyester, Aramid or Kevlar®.

**Metal reinforcements**

- Wire or solid steel strins are imbedded in the carcass and are used as strengthening members of the joint.

**Flanges**

- Shot-blasted and painted carbon steel as standard. Also available in high dip galvanized carbon steel, stainless steel, duplex, etc.

These spool arch vulcanized rubber expansion joints are available as follows:

**Dimensions:**
- DN50-DN4000
- Temperature range: From -50 °C up to 200 °C
- Pressure range: Full vacuum to 100 bar
High pressure ratings available upon request.

Rubber expansion joints can be supplied in any length.
MAC-F Series
Unrestrained

High quality custom-made expansion joints supplied with split or fixed steel flanges. The full face flanges are integral with the body of the joint and drilled to conform the bolt pattern of the companion flanges of the pipe line.

Flanges are shot-blasted and painted carbon steel as standard. Also available in hot dip galvanized carbon steel, stainless steel, etc. DN 1100-DN 3800 with flanges drilled to EN 1092-1 PN 6, PN 10, PN 16 and ANSI. On request, flanges are also available drilled to JIS and AWWA standards.

MAC-FT Series
Restrained

Similar to MAC-F but incorporating control units or tie rod system. Expansion joints expand in length when under pressure. The force created by this pressure is designated as Pressure thrust.

Where the pipe supports and anchors are not designed to absorb this force, tie rods across the joint must be incorporated. Tie rods are designed to take the full pressure thrust and tie rods supports are integrated in the flanges (retaining rings) so there is no thrust on counter flanges.

A control unit assembly is a system of 2 or more control rods placed across the expansion joint from flange to flange to set the maximum allowable expansion/contraction of the expansion joint and will absorb the pressure thrust.

Recommended on most applications to prevent damage due to excessive pipe movements, each rod incorporates double nuts on each end to keep the expansion joint from over elongating and spherical washers to allow lateral, angular and some angular movements.
**Variations**

**Multiple arch type**
Expansion joints with two or more arches (convolutions) may be manufactured to accommodate movements greater than those of which a single arch type joint is capable of.

Length of the joint is dependent on the number of arches.

**Filled arch type**
Filled arch-type expansion joints may be supplied with a bond-in-place soft rubber filler to provide a smooth interior bore.

Filled arch design reduces possible turbulence and prevents the collection of solid materials that may settle from the solution handled and remain in the archway. Filled arch joints also have a seamless tube so the arch filler cannot be dislodged during service.

**Advantages**
- Reduces flow turbulences
- Avoids solid deposits in the corrugations.

**Disadvantages**
- Decrease the flexibility.
- Movements of expansion joints with filled arches are limited to 50% of the normal movements of comparable size expansion joints with unfilled (open) arches.

**PTFE lining**
Spool arch type joints are available in many standard pipe sizes with fluoroplastic liners of TFE and/or FEP.

These liners are fabricated as an integral part of the expansion joint during manufacture and cover all wetted surfaces in the tube and flange areas.

Fluoroplastic provides exceptional resistance to almost all chemicals within the temperature range of the expansion joint body construction.

**Reduced type**
Reducing expansion joints are designed and manufactured in order to allow the connection of different diameter pipes.
Optional devices

External protective shields, covers and flame guards

Unusual applications of rubber expansion joints may require the specification of protective shields, protective cover or fire cover. These three types of covers, when manufactured of metal, have one end which is bolted to or clamped to the mating pipe flange. The other end is free, designed to handle the movements of the expansion joint.

Protective shields should be used on expansion joints in lines that carry high temperature or corrosive media. This shield will protect personnel or adjacent equipment in the event of leakage or splash. Wrap around protective shields of fluoroplastic impregnated fiberglass are the most common. Protective covers of expanded metal are used to prevent exterior damage to the expansion joint.

Fire covers, designed oversize, are insulated on the I.D. to protect the expansion joint from rupture during a flash fire. They are normally installed on fire water lines.

Sun covers protect the elastomer against UV radiation.

When possible, it is not recommended to insulate over elastomeric expansion joints.

CAUTION: Protection / Spray shield have some insulating properties. The containment of system temperatures can accelerate the aging of the product and makes required external inspections difficult.

Internal liner

Consists of a sleeve extending through the bore of the expansion joint with a full face flange on one end. Constructed of hard rubber, metal or fluoroplastic it reduces frictional wear of the expansion joint and provides smooth flow, reducing turbulence.

This type sleeve should not be used where high viscosity fluids, such as tars, are being transmitted. These fluids may cause packing-up or caking of the arch area, which reduces movements and in turn may cause premature expansion joint failure.
### Certifications
- Pressure Equipment Directive 2014/68/UE
- ISO 9001:2008
- FDA (EPDM DW)
- ATEX Directive 94/9/EC upon request. Declaration of Conformity in compliance with the requirements of the ATEX Directive 94/9/EC

### Testing
- Hydraulic tests
- Tensile strength
- Temperature resistance
- Burst test
- Cycle life test
- Spring rate testing
- Abrasion resistance
- Compression testing
- Chemical analysis of the elastomers
- Fluid and chemical compatibility testing
- Electrical properties

MACOGA is fully committed to a quality management process with quality as a foundational business principle.

All management levels participate in quality assurance activities incorporated into daily functional requirements.

No product is shipped to the customer until its quality and conformance to customer specifications is assured. Management assesses the effectiveness of the quality system on a regular basis and directs internal efforts towards continuous improvement.

### World-Class Commitment
Our expansion joints are present in more than 80 countries across all continents performing demanding tasks. MACOGA is always ready to provide support exceeding customer expectations.