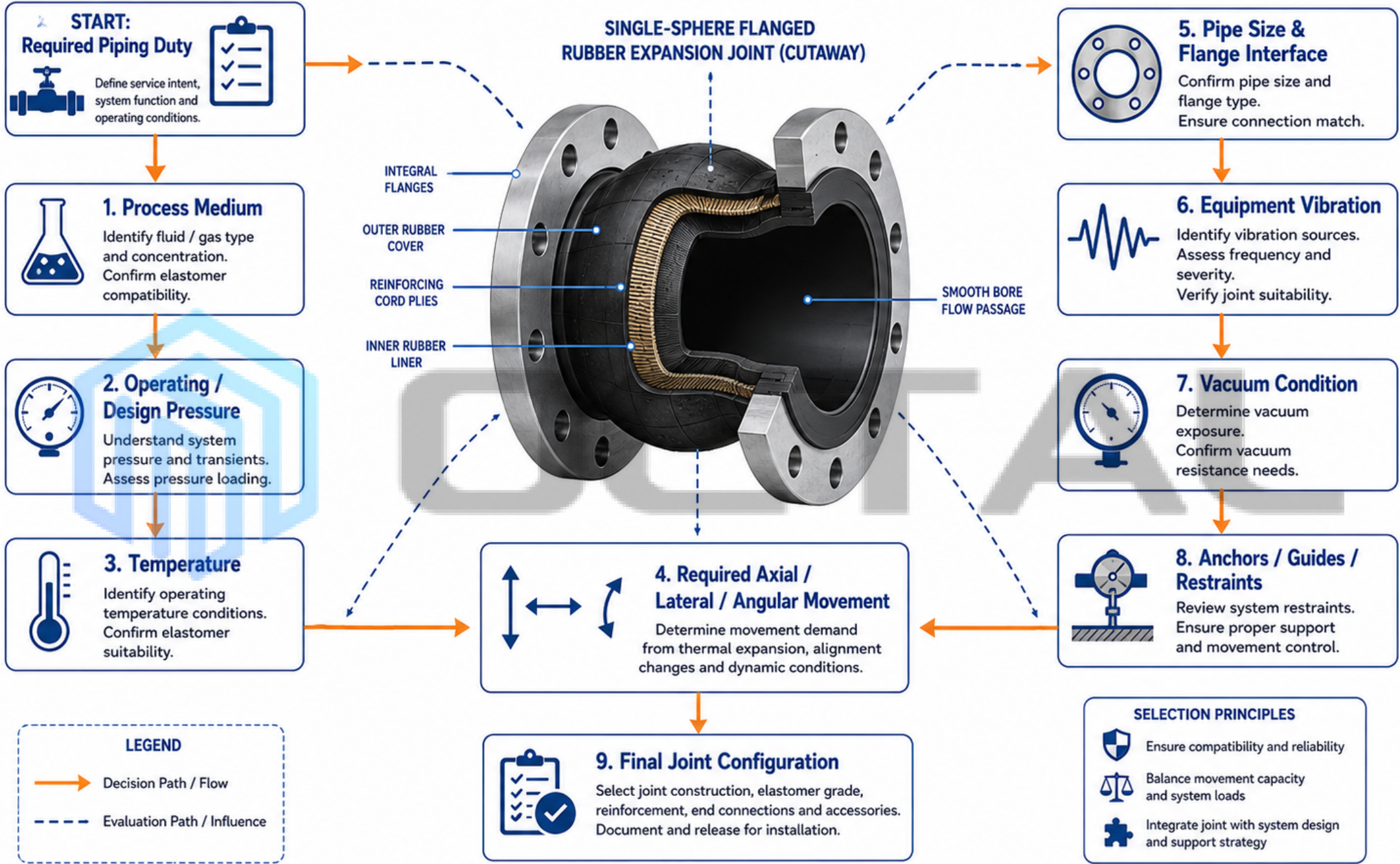




EXPANSION JOINT RESTRAINT PRINCIPLES – SYSTEM LAYOUT AND PRESSURE THRUST CONTROL

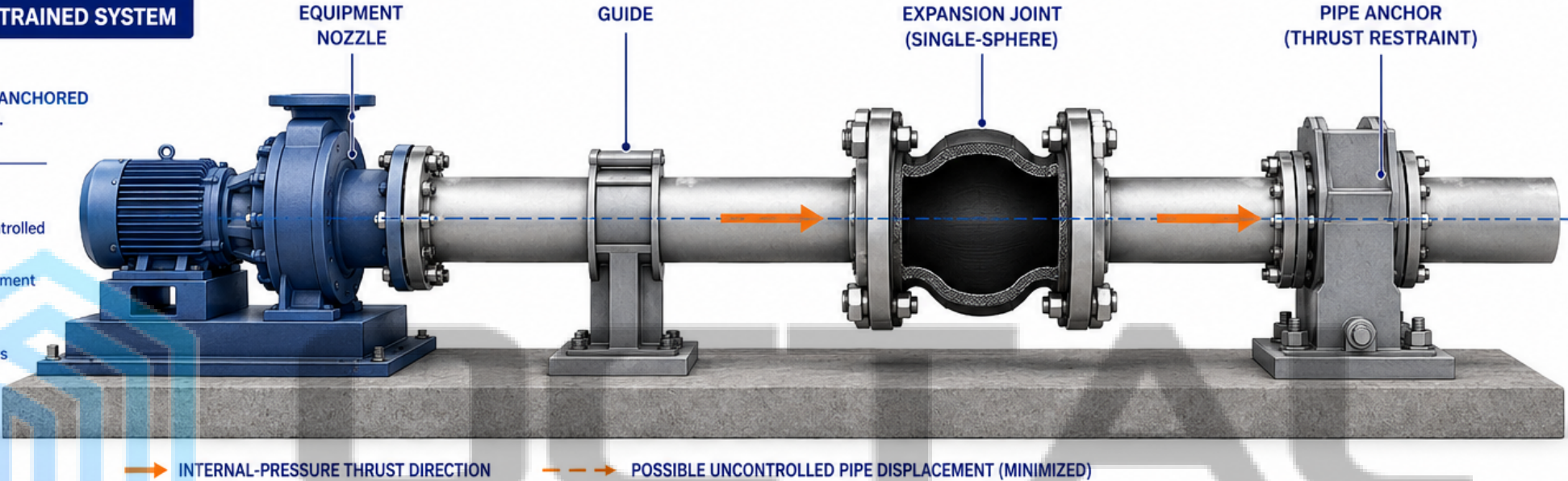
Single-Sphere Rubber Expansion Joint in Pump Piping System

1. PROPERLY RESTRAINED SYSTEM

 PIPELINE IS CORRECTLY ANCHORED AND GUIDED.

KEY BENEFITS

- ✓ Pressure thrust is controlled by the anchor.
- ✓ Expansion joint movement is limited to designed movement only.
- ✓ Piping system remains stable and aligned.

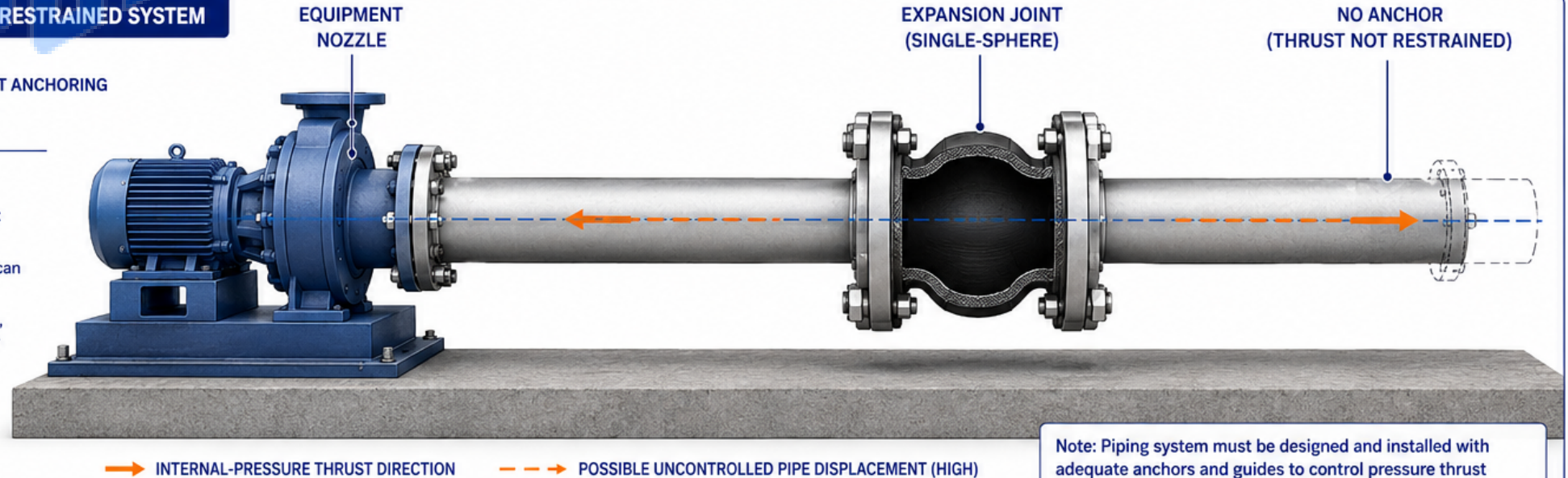


2. INADEQUATELY RESTRAINED SYSTEM

 INSUFFICIENT ANCHORING OR GUIDING.

KEY RISKS

- Pressure thrust is not controlled.
- Pipe and equipment can move or misalign.
- Overstress at nozzles, joint or supports may lead to failure.



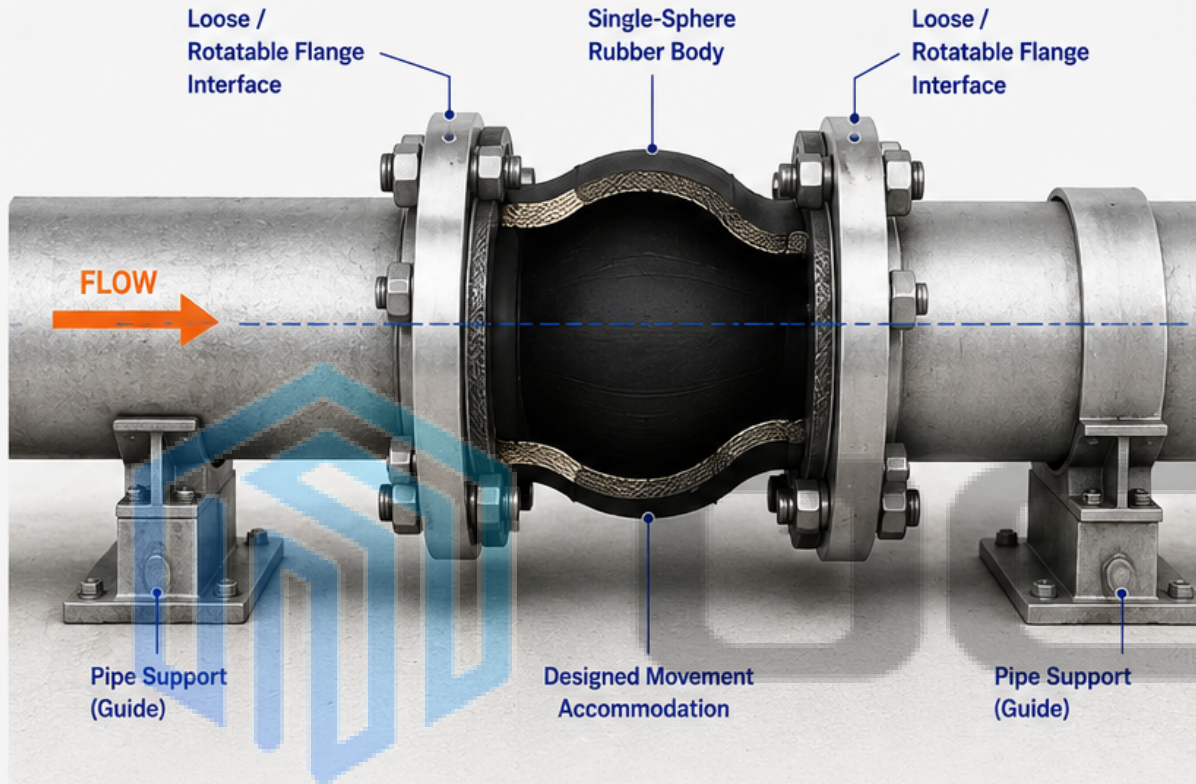
Note: Piping system must be designed and installed with adequate anchors and guides to control pressure thrust and limit movement within the joint's rated capability.

RUBBER EXPANSION JOINT – CORRECT INSTALLATION AND BOUNDARY CONDITIONS

Technical Reference Sheet

Single-Sphere Flanged Rubber Expansion Joint

CORRECT INSTALLATION



CORRECT INSTALLATION KEY POINTS

- ✓ Piping is properly aligned and supported.
- ✓ Joint is at neutral position.
- ✓ Flanges are loose / rotatable.
- ✓ Anchors / restraints are installed to control pressure thrust.
- ✓ System allows for specified movement only.



Use the joint for specified service movement, not for pulling piping into alignment.

BOUNDARY CONDITIONS – EXAMPLES OF INCORRECT INSTALLATION

- 1 CORRECT NEUTRAL ALIGNMENT**

✓ Piping is aligned.
Joint is at neutral position.
No pre-compression, extension, or offset.
- 2 EXCESSIVE PRE-COMPRESSION / EXTENSION**

✗ Joint is compressed or stretched beyond intended position.
Reduces life and may cause damage.
- 3 LATERAL CONSTRUCTION MISALIGNMENT**

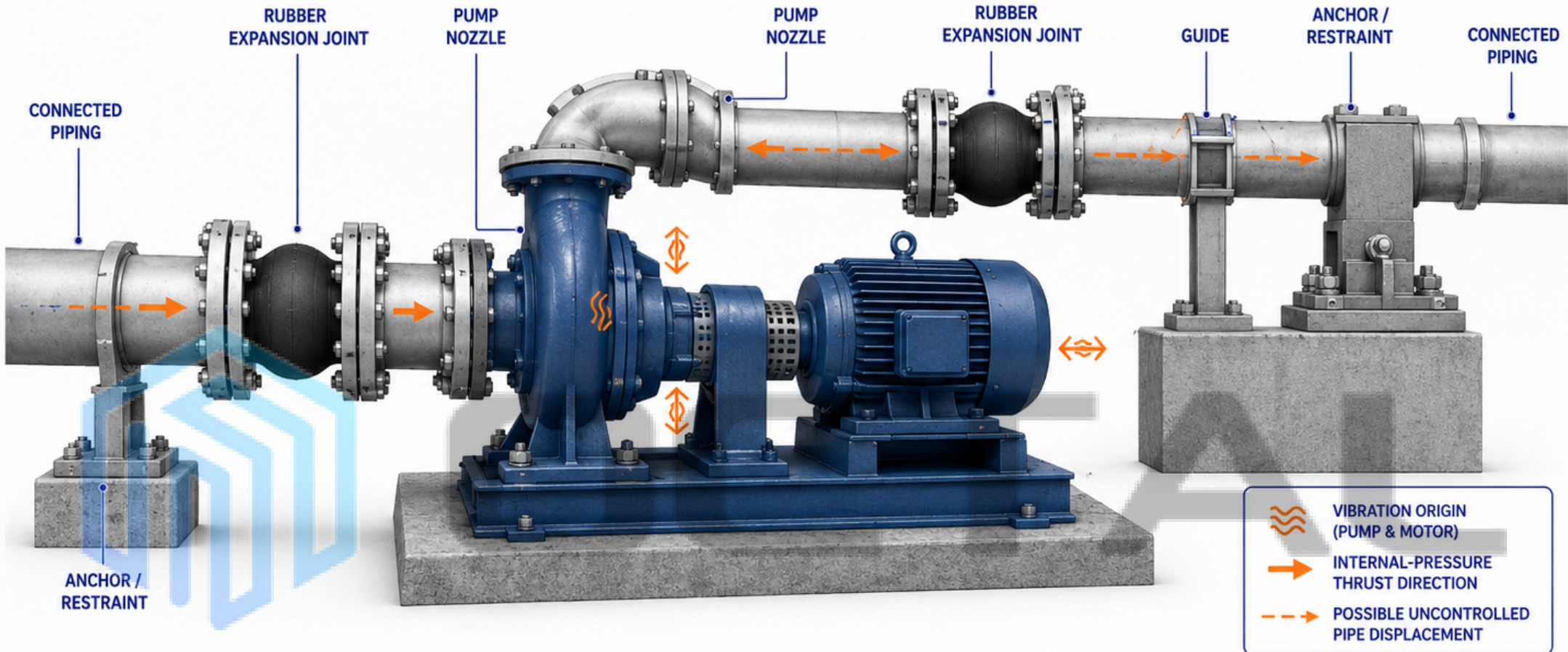
✗ Piping is laterally offset.
Creates side loads and may damage the joint and flanges.
- 4 TORSIONAL TWIST**

✗ Flanges are rotated relative to each other.
Causes torsional stress and may lead to leakage or failure.

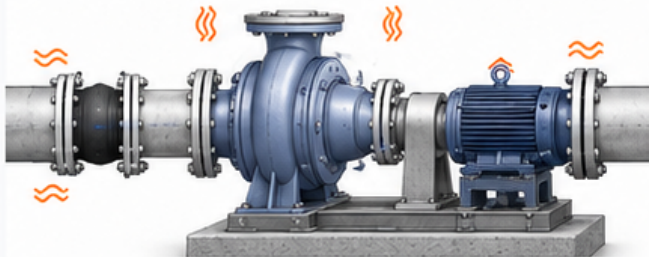
Note: These are examples only. Refer to project specifications and manufacturer recommendations.

Rubber Expansion Joint in Pump Piping

Technical Reference Sheet

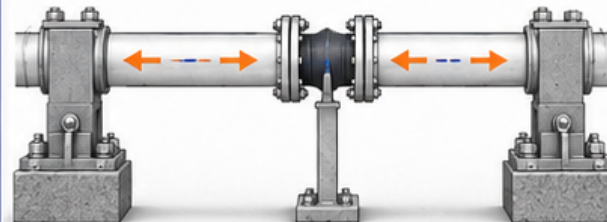


1. VIBRATION ISOLATION

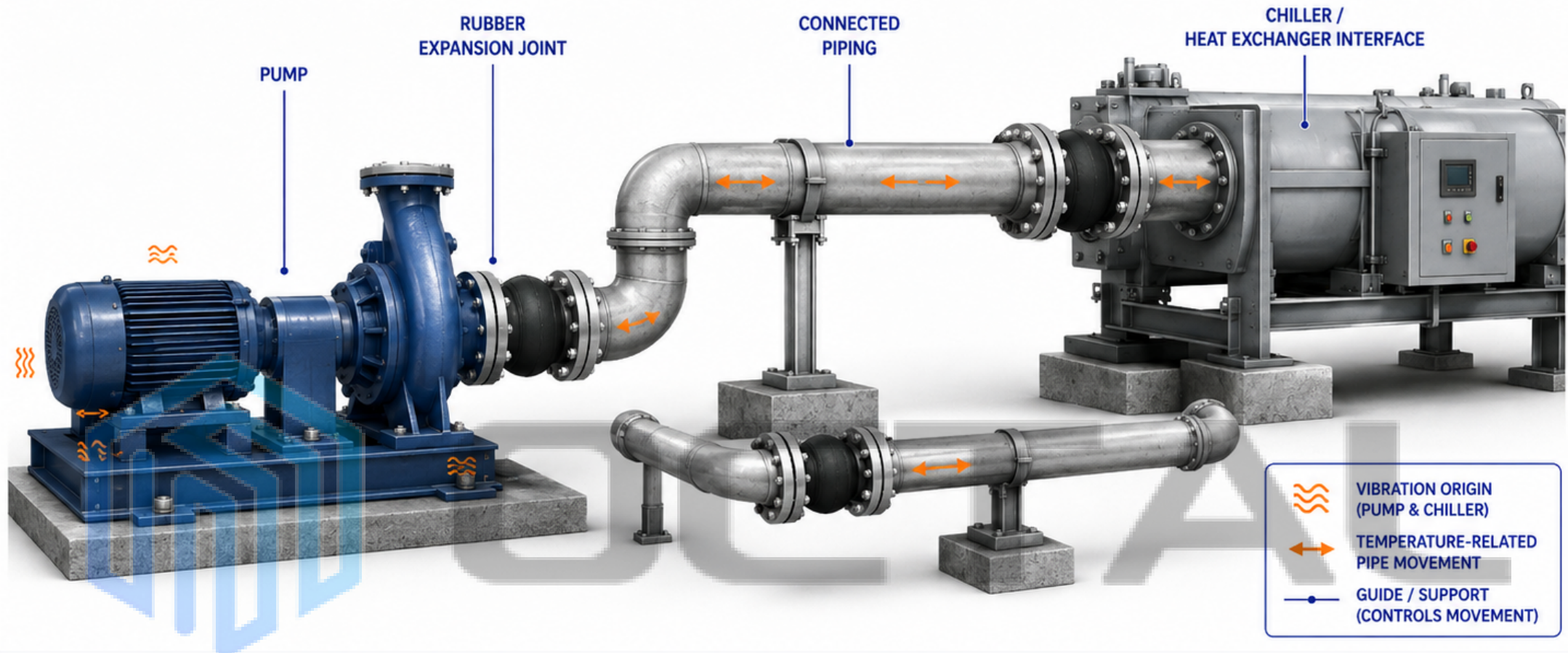


- ✓ Rubber expansion joints isolate vibration from the pump and motor from transferring into the piping system.
- ✓ Reduces noise, vibration, and fatigue in the piping and supports.

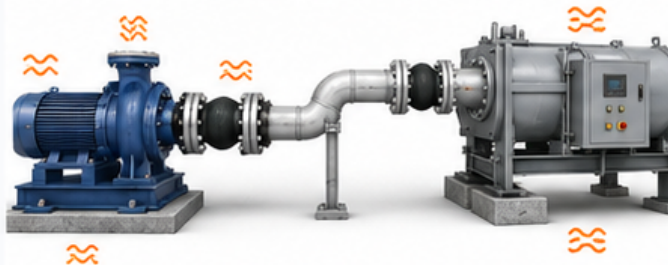
2. PRESSURE-THRUST LOAD PATH



- ✓ Internal pressure creates axial thrust along the pipeline.
- ✓ Anchors/restraints absorb and resist thrust at equipment connections.
- ✓ Guides control lateral movement and support the line.

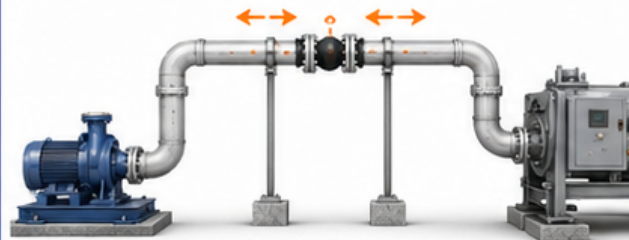


1. EQUIPMENT VIBRATION ISOLATION



- ✓ Rubber expansion joints isolate vibration from the pump and chiller.
- ✓ Protects piping, equipment, and building structure.
- ✓ Reduces noise and mechanical stress.

2. TEMPERATURE-RELATED PIPING MOVEMENT



- ✓ Temperature changes cause pipes to expand and contract.
- ✓ Rubber expansion joints absorb axial movement.
- ✓ Guides/supports keep the line aligned and control lateral movement.

1. Water / Wastewater Pumping



 Pump
Vibration

 Pipe
Movement

 Medium
Compatibility

2. Industrial Cooling Water



 Pump
Vibration

 Pipe
Movement

 Medium
Compatibility

3. Process Utility Piping



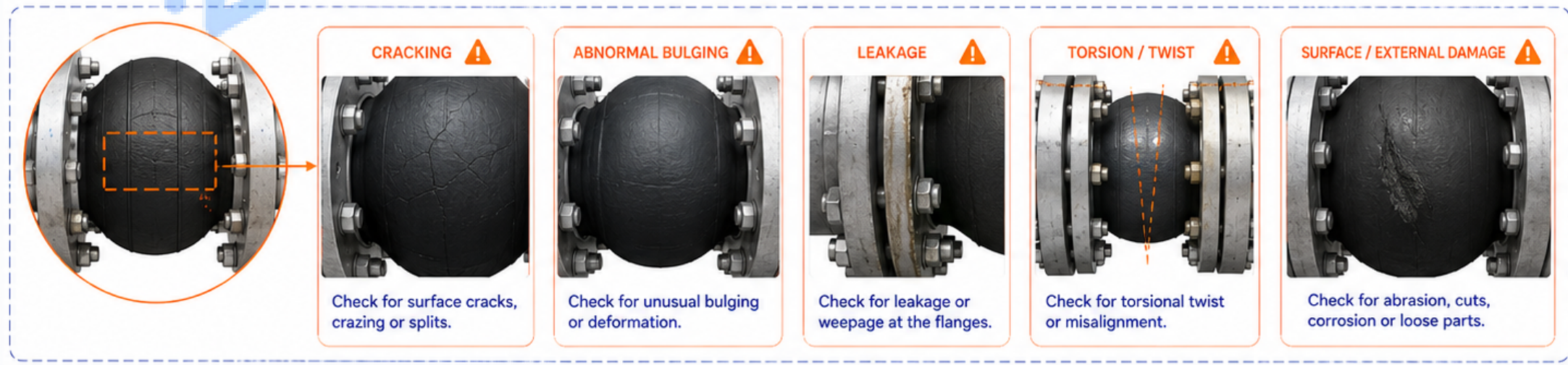
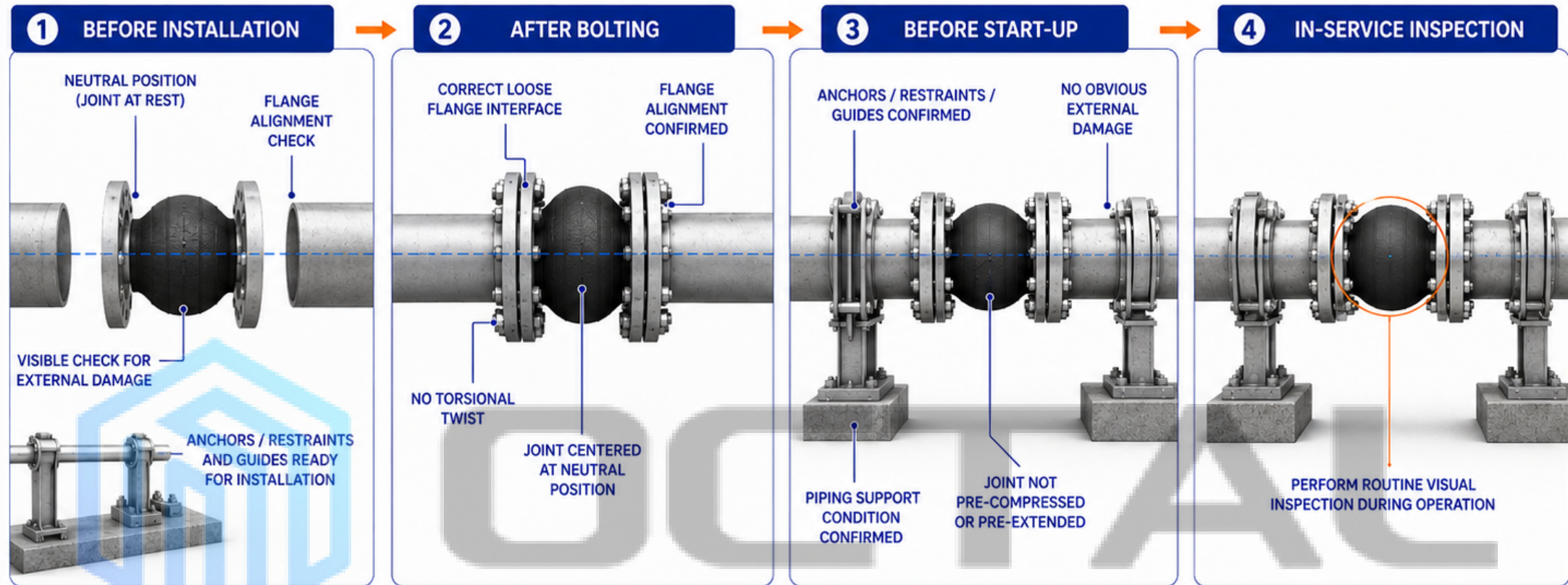
 Pump
Vibration

 Pipe
Movement

 Medium
Compatibility

 Application selection depends on service medium, piping movement and overall system layout.

Use rubber expansion joints to reduce vibration, absorb movement and protect system integrity.



ASTM F1123 CONTROL AREAS FOR RUBBER EXPANSION JOINTS

Design, Manufacture and Quality Requirements for Pipe-Type Rubber Expansion Joints

1. CONSTRUCTION



- Pipe-type configuration
- Reinforcement layers
- End configurations
- Flange drilling
- Loose flange design
- Marking

2. MATERIALS



- Elastomer (rubber) compound
- Reinforcement materials
- Metal components
- Adhesion and compatibility
- Traceability of materials

3. PERFORMANCE



- Pressure containment
- Axial movement
- Lateral movement
- Angular movement
- Vacuum resistance
- Burst pressure
- Fatigue life

4. DIMENSIONS



- Nominal size
- Face-to-face length
- Overall diameter
- Flange drilling
- Bolt circle
- Flange thickness

FSA GUIDANCE



INSTALLATION

- Follow neutral alignment
- Do not pre-compress or extend
- Support and anchor piping properly



MAINTENANCE

- Routine visual inspection
- Check for leakage, cracking, bulging
- Verify movement capacity



STORAGE

- Store in clean, dry area
- Protect from ozone, UV and heat
- Keep flanges protected



PIPING APPLICATION

- Use for movement and vibration isolation
- Not for correcting misalignment
- Ensure proper restraint design

PROJECT RELEASE CHAIN



MEDIUM

Identify fluid/
chemical and
concentration



P & T

Define operating
and design
pressure /
temperature



MOVEMENT

Define required
axial, lateral
and angular
movement



FLANGE INTERFACE

Specify standard,
rating, facing,
drilling and
flange type



VACUUM

Confirm vacuum
condition
(low / high
vacuum)



RESTRAINT

Define anchors,
guides and
restraints to
control thrust



INSPECTION / DOCUMENTATION

Define inspection
requirements
and documents



RELEASE

Review and
approve for
installation
and service



****Applicable standards must be specified and confirmed for the ordered configuration. Reference does not imply certification.****