

Vibration and Pulsation Control on Refrigerant Lines — Eliminators, Discharge Mufflers and Damping Loops

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Where to install a flexible vibration eliminator and where a discharge muffler, how the ITE M-05/M-10 and V-series catalogue items are sized, pressure-control damping loops, and the piping geometry that stops compressor pulsation breaking joints.

Two different problems

Reciprocating compressors export two distinct disturbances into the pipework: mechanical vibration — the machine shaking on its mounts — and gas pulsation — pressure waves at firing frequency travelling inside the discharge line. Mechanical vibration breaks solder joints and clamps; pulsation makes lines drum, fatigues elbows and raises plant noise. Each has its own hardware: flexible eliminators for mechanical motion, mufflers for pulsation.

Vibration eliminators

A vibration eliminator is a corrugated metal bellows in a braided jacket, installed in the line at the compressor so the machine's motion is absorbed before the rigid pipe. The catalogue carries the common solder sizes with their pressure ratings — e.g. 5/8", 44.8 bar (V58) and 1 3/8", 35 bar. The rules that make them work rather than fail:

Orientation: install parallel to the crankshaft (perpendicular to the dominant motion) and as close to the compressor as the first bend allows; a bellows takes shear, not axial push-pull or torsion.

No preload: the line must meet it relaxed; drawing pipework together over an eliminator pre-stresses the bellows and halves its life.

Anchor after it: clamp the line rigidly immediately downstream (see the clamp guide) so motion actually terminates there.

Protect while brazing: wet-rag or heat-paste the braid; overheated braid wires snap and the bellows then works unreinforced.

Discharge mufflers

A muffler is an internal-baffle chamber in the discharge line that flattens pulsation. Fit one when the discharge line drums audibly, when long straight discharge runs resonate at certain speeds, or when the condenser is remote: ITE M-05 5/8" ODF and M-10 7/8" ODF in the catalogue. Install close to the compressor, with the chamber oriented per the arrow so oil drains through rather than pooling, and support its weight independently — a muffler hanging on its stubs becomes the vibration problem it was meant to cure. On variable-speed plants, verify across the speed range: a muffler that silences 50 Hz operation can pass a resonance at 35 Hz.

Damping loops for controls

Pressure switches and transmitters hate pulsation too: contacts chatter and sensing elements fatigue. The classic protection is a damping loop — a coiled capillary between tapping point and instrument — stocked as 1.5 m steel loop, 1/4" flare, for KP/MP/RT-class controls (copper 0.9 m loops likewise). Mount the loop so it flexes, not the instrument stub, and the pressure control's lifetime stops being the shortest on the plant.

Geometry beats hardware

Hardware mitigates; geometry prevents. Discharge piping should leave the compressor with a short horizontal run and two planes of elbows before any long straight — the bends decouple motion in all axes. Avoid rigid straight-line connections between compressor and wall. Keep mass (driers, mufflers) clamped, not cantilevered. Mount the machine itself on the correct feet — rubber mounting sets per compressor series (e.g. feet for T/S frames) or load-rated machine shoes (35–100 kg mounts) — and renew them when hardened: eliminators are the second line of defence, mounts are the first. A plant survey that finds witness dust at clamps, shiny fretting marks or cracked paint at elbows has found next year's leak list; fix the geometry now.

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