ECalPro **Instrumentation**

Control Valve Sizing — Liquid Service

Cv / Kv per ISA-75.01.01 · isa-75.01.01:2012

TAG	PROJECT	P&ID	REV	DATE
FV-204A	Demo — Crude Stabiliser	PID-204-03	A	2026-06-16

REQUIRED CV (OVERALL STATUS: FAIL)

190.76 Cv

Sub-critical: service ΔP is below the choked limit.

σ=1.33 — likely damaging cavitation; review trim/Δp staging.

Required opening 76% within the 20–80% band.

KV	SIZING ΔP	Σ (CAVITATION)	OPENING
165	460 kPa	1.326	76 %

Inputs

Volumetric flow, Q	360 m³/h
Inlet pressure, P_1 (abs)	6.8 bar(a)
Outlet pressure, P_2 (abs)	2.2 bar(a)
Vapour pressure, Pv (abs)	0.701 bar(a)
Critical pressure, Pc (abs)	221.2 bar(a)
Density, ρ	965.4 kg/m³
Valve diameter, d	150 mm
Pressure-recovery factor, FL	0.9
Valve style modifier, Fd	0.46
Rated Cv	250

Results (clause-cited)

Flow coefficient, Cv	190.76	ANSI/ISA-75.01.01 §7.2 / Eq.1–5 (incompressible)
Choked flow	No	IEC 60534-2-1 choked liquid flow
Service ΔP	460 kPa	
Sizing ΔP	460 kPa	
Valve Reynolds number, Re_v	2966953	

Flow coefficient, Kv	165	
Liquid critical-pressure ratio, FF	0.9442	ANSI/ISA-75.01.01 §7.3 FF critical pressure ratio
Choked ΔP	497.19 kPa	
Piping geometry factor, FP	1	
Cavitation index, σ	1.326	ISA-RP75.23 cavitation index σ

ECalPro Instrumentation — Free tier

Methodology & assumptions

- Liquid sizing per isa-75.01.01:2012 (IEC 60534-2-1 MOD): $C = Q/(N1 \cdot FP) \cdot \sqrt{((\rho_1/\rho_0)/\Delta P_sizing)}$; $Cv = Kv/0.865$.
- Sizing ΔP is the lesser of service ΔP and choked $\Delta P_choked = (FLP/FP)^2 \cdot (P_1 - FF \cdot Pv)$.
- FF (liquid critical-pressure ratio) = $0.96 - 0.28 \cdot \sqrt{(Pv/Pc)}$.
- Piping geometry factor FP and Reynolds factor Fr correct for fittings / non-turbulent flow.
- Cavitation index $\sigma = (P_1 - Pv)/\Delta P$; cautions/fails per ISA-RP75.23 screening bands.
- All inputs SI/absolute; unit conversion occurs only at the I/O boundary.

Document control

PREPARED	CHECKED	APPROVED

Basis & responsibility: results are computed from the cited standard editions and the inputs above. This report is an engineering aid; the responsible engineer must verify all inputs, assumptions and governing-standard applicability before use in design or construction.

ECalPro Instrumentation — Free Tier