

# ISO 4126-10:2024-03 (E)

## Safety devices for protection against excessive pressure - Part 10: Sizing of safety valves and bursting discs for gas/liquid two-phase flow

---

Contents	Page
Foreword.....	v
Introduction.....	vi
<b>1 Scope.....</b>	<b>1</b>
<b>2 Normative references.....</b>	<b>1</b>
<b>3 Terms and definitions.....</b>	<b>1</b>
3.1 General.....	1
3.2 Pressure.....	2
3.3 Flow rate.....	4
3.4 Flow area.....	5
3.5 Fluid state.....	5
3.6 Temperature.....	5
<b>4 Symbols and abbreviated terms and figures.....</b>	<b>6</b>
4.1 Symbols.....	6
4.2 Abbreviated terms.....	8
4.3 Figures.....	9
<b>5 Application range of the method.....</b>	<b>11</b>
5.1 General.....	11
5.2 Limitations of the method for calculating the two-phase mass flux in safety devices.....	11
5.2.1 Flashing flow.....	11
5.2.2 Condensing flow.....	12
5.2.3 Flashing flow for multi-component liquids.....	12
5.2.4 Dissolved gases.....	12
5.2.5 Compressibility coefficient $\omega$ .....	13
5.3 Limitations of the method for calculating the mass flow rate required to be discharged.....	13
5.3.1 Rate of temperature and pressure increase.....	13
5.3.2 Immiscible liquids.....	13
<b>6 Sizing steps.....</b>	<b>13</b>
6.1 General outline of sizing steps.....	13
6.2 Step 1 — Identification of the sizing case.....	14
6.3 Step 2 — Flow regime at the inlet of the vent line system.....	15
6.3.1 General.....	15
6.3.2 Phenomenon of level swell.....	15
6.3.3 Influence of liquid viscosity and foaming behaviour on the flow regime.....	15
6.3.4 Prediction of the flow regime (gas/vapour or two-phase flow).....	17
6.4 Step 3 — Calculation of the mass flow rate required to be discharged.....	20
6.4.1 General.....	20
6.4.2 Pressure increase caused by an excess in-flow.....	20
6.4.3 Pressure increase due to external heating.....	22
6.4.4 Pressure increase due to thermal runaway reactions.....	25
6.5 Step 4 — Calculation of the dischargeable mass flux through and pressure change in the vent line system.....	29
6.5.1 General.....	29
6.5.2 Two-phase flow discharge coefficient, $K_{dr,2ph}$ .....	32
6.5.3 Dimensionless mass flow rate, $C$ .....	33
6.5.4 Compressibility coefficient, $\omega$ (numerical method).....	34
6.5.5 Calculation of the downstream stagnation condition.....	35
6.5.6 Slip correction for non-flashing two-phase flow.....	35
6.5.7 Slip correction for two-phase flow in straight pipes.....	36

6.6	Step 5 — Ensure proper operation of safety valve vent line systems under plant conditions.....	36
6.7	Simultaneous calculation of the dischargeable mass flux and pressure change in the vent line system.....	36
6.8	Summary of calculation procedure.....	37
<b>Annex A (informative) Identification of sizing scenarios .....</b>		<b>44</b>
<b>Annex B (informative) Example calculation of the mass flow rate to be discharged.....</b>		<b>46</b>
<b>Annex C (informative) Example of calculation of the dischargeable mass flux and pressure change through connected vent line systems.....</b>		<b>50</b>
<b>Annex D (informative) Environmental factor.....</b>		<b>67</b>
<b>Bibliography.....</b>		<b>68</b>