



LIDCO, Pars SEE Zone, Assaluyeh,  
Integrated Methanol and Ammonia  
Plant 3000 MTPD MeOH / 900 MTPD NH3 PROJECT



PSV sizing calculations

Document No. 17735-47

| Project No. | Vendor Doc. | P.O. No. | Department | Document Type | Serial No | Revision | Page         |
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| N278        | VD          | 6019     | IN         | CAL           | 0040      | 01       | Page 1 of 12 |

**Airpack B.V. - Air Compressor –  
Integrated Methanol and Ammonia Plant  
17735-COM PSV sizing calculations (K020)**

- Compatibility of all related data between PSV sizing calculations and PSV data sheet is vendor scope.

Code 2  
M.Dalakeh

|             |             |                     |              |                |                 |
|-------------|-------------|---------------------|--------------|----------------|-----------------|
|             |             |                     |              |                |                 |
|             |             |                     |              |                |                 |
|             |             |                     |              |                |                 |
| 01          | 08-05-2024  | Issued for Approval | L.K.         | J.J.           | S.K.            |
| <b>REV.</b> | <b>DATE</b> | <b>DESCRIPTION</b>  | <b>DRAWN</b> | <b>CHECKED</b> | <b>APPROVED</b> |

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PSV sizing calculations

Document No. 17735-47

| Project No. | Vendor Doc. | P.O. No. | Department | Document Type | Serial No | Revision | Page         |
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|-----------|----|----|----|----|----|-----------|----|----|----|----|----|-----------|----|----|----|----|----|------------|----|----|----|----|----|--|
| 1         | X  |    |    |    |    | 26        |    |    |    |    |    | 51        |    |    |    |    |    | 76         |    |    |    |    |    |  |
| 2         | X  |    |    |    |    | 27        |    |    |    |    |    | 52        |    |    |    |    |    | 77         |    |    |    |    |    |  |
| 3         | X  |    |    |    |    | 28        |    |    |    |    |    | 53        |    |    |    |    |    | 78         |    |    |    |    |    |  |
| 4         | X  |    |    |    |    | 29        |    |    |    |    |    | 54        |    |    |    |    |    | 79         |    |    |    |    |    |  |
| 5         | X  |    |    |    |    | 30        |    |    |    |    |    | 55        |    |    |    |    |    | 80         |    |    |    |    |    |  |
| 6         | X  |    |    |    |    | 31        |    |    |    |    |    | 56        |    |    |    |    |    | 81         |    |    |    |    |    |  |
| 7         | X  |    |    |    |    | 32        |    |    |    |    |    | 57        |    |    |    |    |    | 82         |    |    |    |    |    |  |
| 8         | X  |    |    |    |    | 33        |    |    |    |    |    | 58        |    |    |    |    |    | 83         |    |    |    |    |    |  |
| 9         | X  |    |    |    |    | 34        |    |    |    |    |    | 59        |    |    |    |    |    | 84         |    |    |    |    |    |  |
| 10        | X  |    |    |    |    | 35        |    |    |    |    |    | 60        |    |    |    |    |    | 85         |    |    |    |    |    |  |
| 11        | X  |    |    |    |    | 36        |    |    |    |    |    | 61        |    |    |    |    |    | 86         |    |    |    |    |    |  |
| 12        | X  |    |    |    |    | 37        |    |    |    |    |    | 62        |    |    |    |    |    | 87         |    |    |    |    |    |  |
| 13        |    |    |    |    |    | 38        |    |    |    |    |    | 63        |    |    |    |    |    | 88         |    |    |    |    |    |  |
| 14        |    |    |    |    |    | 39        |    |    |    |    |    | 64        |    |    |    |    |    | 89         |    |    |    |    |    |  |
| 15        |    |    |    |    |    | 40        |    |    |    |    |    | 65        |    |    |    |    |    | 90         |    |    |    |    |    |  |
| 16        |    |    |    |    |    | 41        |    |    |    |    |    | 66        |    |    |    |    |    | 91         |    |    |    |    |    |  |
| 17        |    |    |    |    |    | 42        |    |    |    |    |    | 67        |    |    |    |    |    | 92         |    |    |    |    |    |  |
| 18        |    |    |    |    |    | 43        |    |    |    |    |    | 68        |    |    |    |    |    | ATTACHMENT |    |    |    |    |    |  |
| 19        |    |    |    |    |    | 44        |    |    |    |    |    | 69        |    |    |    |    |    | 1          |    |    |    |    |    |  |
| 20        |    |    |    |    |    | 45        |    |    |    |    |    | 70        |    |    |    |    |    | 2          |    |    |    |    |    |  |
| 21        |    |    |    |    |    | 46        |    |    |    |    |    | 71        |    |    |    |    |    | 3          |    |    |    |    |    |  |
| 22        |    |    |    |    |    | 47        |    |    |    |    |    | 72        |    |    |    |    |    | 4          |    |    |    |    |    |  |
| 23        |    |    |    |    |    | 48        |    |    |    |    |    | 73        |    |    |    |    |    | 5          |    |    |    |    |    |  |
| 24        |    |    |    |    |    | 49        |    |    |    |    |    | 74        |    |    |    |    |    | 6          |    |    |    |    |    |  |
| 25        |    |    |    |    |    | 50        |    |    |    |    |    | 75        |    |    |    |    |    | 7          |    |    |    |    |    |  |

|   |  |             |                     |
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| <br>The-Safety-Valve.com | Sizing acc. to<br>API 520 for Gas<br>VALVESTAR® - v.7.3.3.0331 | Page:       | 1 of 2              |
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|   |  | Project:    | 17735-47            |
|   |  | Tag No:     | 320PSV-8201         |
|   |  | LESER Job № |                     |

| Sizing - Medium |                         |     |            |
|-----------------|-------------------------|-----|------------|
| 1000            | Designation             | Air |            |
| 1004            | Formula                 |     |            |
| 1001            | Molar mass              | M   | 29 kg/kmol |
| 1002            | Ratio of specific heats | k   | 1.400      |
| 1003            | Compressibility factor  | Z   | 1.000      |

| Sizing - Service condition |  |        |                   |
|----------------------------|--|--------|-------------------|
| 1009                       | Case for blow off                                |        | Blocked discharge |
| 1100                       | Maximum allowable working pressure               |        |                   |
| 1101                       | Set pressure                                     | p      | 12.5 bar-g        |
| 1102                       | Constant superimposed back pressure              | paf    |                   |
| 2102                       | Variable superimposed back pressure              |        |                   |
| 1103                       | Built up back pressure                           | paе    |                   |
| 1104                       | Backpressure                                     |        |                   |
| 1105                       | Overpressure                                     | dp     | 10.00 %           |
| 1106                       | Environmental pressure                           | pu     | 1.013 bar         |
| 1107                       | Relieving Temperature                            | T      | 46 °C             |
| 1108                       | Required massflow                                | qm,ab  | 45.285 kg/h       |
| 1109                       | Volume flow to be discharged (working condition) | qvb,ab | 2.807 m³/h        |
| 1110                       | Volume flow<br>P=101,3 bar                       |        | m³/h              |
| 1120                       | Rupture disc correction factor                   | Kc     | 1.000             |

The comments should be implemented for all PSV


| Initial Sizing according to API 520 for conventional safety valve |                              |                                    |             |
|---|------------------------------|------------------------------------|-------------|
| 1150  | NPS inlet Orifice NPS outlet |                                    | 1D2         |
| 1151  | PR inlet x PR outlet         | "Body/bonnet" Shall be specified , | #300 x #150 |
| 1152  | Material                     |                                    | WCB         |
| 1153  | Required orifice             |                                    | D           |
| 1154  | Selected orifice             |                                    | D           |

As per data sheet should be SS316

As default of leser software template, Bonnet type, Order code and other relevant specification will be indicated as report, please specify

| Sizing - Calculation |   |         |              |
|----------------------|---|---------|--------------|
| 1200                 | Certified massflow                          |         | 3.544 kg/h   |
| 1201                 | Certified volume flow (operating condition) |         | 2.282 m³/h   |
| 1203                 | Certified volume flow (standard condition)  | qvn,zu  | 651.958 m³/h |
| 1204                 | Maximum mass flow                           | qm,max  | 937.271 kg/h |
| 1205                 | Maximum volume flow (working condition)     | qvb,max | 58.091 m³/h  |
| 1206                 | Maximum volume flow (standard condition)    | qvn,max | 724.398 m³/h |
| 1207                 | Capacity exceed                             |         | 1762.74 %    |

|        |                      |  |  |  |
|--------|----------------------|--|--|--|
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|   |  | LESER Job N° |                     |

| Valve - Dimensions |  |    |         |                 |
|--------------------|--|----|---------|-----------------|
| 1400               | Discharge area                           | Ao | 153.938 | mm <sup>2</sup> |
| 1401               | Discharge diameter                       | do | 14      | mm              |
| 1402               | Centre to Face dimensions                | a  | 105     | mm              |
| 1403               | Centre to Face dimensions                | b  | 114     | mm              |
| 1405               | Height                                   | H  | 440     | mm              |
| 1406               | Weight                                   | M  | 17.3    | kg              |
| 1411               | Inlet flange thickness incl. raised face | S1 | 30      | mm              |

| Lift |          |  |     |    |
|------|----------|--|-----|----|
| 1507 | Standard |  | 1.5 | mm |

| Valve - Calculation |   |         |         |                   |
|---------------------|---|---------|---------|-------------------|
| 1200                | Certified massflow  | qm,zu   | 843.544 | kg/h              |
| 1201                | Certified volume flow (operating condition)                   | qvb,zu  | 52.282  | m <sup>3</sup> /h |
| 1203                | Certified volume flow (standard condition)                    | qvn,zu  | 651.958 | m <sup>3</sup> /h |
| 1204                | Maximum mass flow   | qm,max  | 937.271 | kg/h              |
| 1205                | Maximum volume flow (working condition)                       | qvb,max | 58.091  | m <sup>3</sup> /h |
| 1206                | Maximum volume flow (standard condition)                      | qvn,max | 724.398 | m <sup>3</sup> /h |
| 1207                | Capacity exceed   |         | 1762.74 | %                 |
| 1600                | Required actual discharge area                                | Ao, req | 8.264   | mm <sup>2</sup>   |
| 1601                | Required discharge diameter                                   | do, req | 3.244   | mm                |
| 1602                | Noise level in 1m distance from the valve (acc. to AD2000:A2) | L       | 101.74  | dB                |
| 1617                | Back pressure correction factor                               | Kb      | 1.000   |                   |

|        |                      |  |  |  |
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|   |  | Tag No:     | 320PSV-8202         |
|   |  | LESER Job № |                     |


| Sizing - Medium |                         |     |            |
|-----------------|-------------------------|-----|------------|
| 1000            | Designation             | Air |            |
| 1004            | Formula                 |     |            |
| 1001            | Molar mass              | M   | 29 kg/kmol |
| 1002            | Ratio of specific heats | k   | 1.400      |
| 1003            | Compressibility factor  | Z   | 1.000      |

| Sizing - Service condition |   |        |                   |
|----------------------------|---|--------|-------------------|
| 1009                       | Case for blow off   |        | Blocked discharge |
| 1100                       | Maximum allowable working pressure                                    |        |                   |
| 1101                       | Set pressure  | p      | 30.5 bar-g        |
| 1102                       | Constant superimposed back pressure                                   | paf    |                   |
| 2102                       | Variable superimposed back pressure                                   |        |                   |
| 1103                       | Built up back pressure  | pae    |                   |
| 1104                       | Backpressure  |        |                   |
| 1105                       | Overpressure  | dp     | 10.00 %           |
| 1106                       | Environmental pressure  | pu     | 1.013 bar         |
| 1107                       | Relieving Temperature   | T      | 157 °C            |
| 1108                       | Required massflow   | qm,ab  | 45.285 kg/h       |
| 1109                       | Volume flow to be discharged (working condition)                      | qvb,ab | 1.616 m³/h        |
| 1110                       | Volume flow to be discharged (std condition) [T=0 °C<br>P=101,325 Pa] | qvn,ab | 35 Cm³/h          |
| 1120                       | Rupture disc correction factor  | Kc     | 1.000             |

| Initial Sizing according to API 520 for conventional safety valve |                              |             |
|---|------------------------------|-------------|
| 1150  | NPS inlet Orifice NPS outlet | 1D2         |
| 1151  | PR inlet x PR outlet         | #600 x #150 |
| 1152  | Material                     | WCB         |
| 1153  | Required orifice             | D           |
| 1154  | Selected orifice             | D           |

| Sizing - Calculation |   |         |                |
|----------------------|---|---------|----------------|
| 1200                 | Certified massflow                          | qm,zu   | 1,701.092 kg/h |
| 1201                 | Certified volume flow (operating condition) | qvb,zu  | 60.696 m³/h    |
| 1203                 | Certified volume flow (standard condition)  | qvn,zu  | 1,314.74 m³/h  |
| 1204                 | Maximum mass flow                           | qm,max  | 1,890.102 kg/h |
| 1205                 | Maximum volume flow (working condition)     | qvb,max | 67.44 m³/h     |
| 1206                 | Maximum volume flow (standard condition)    | qvn,max | 1,460.823 m³/h |
| 1207                 | Capacity exceed                             |         | 3656.40 %      |

|        |                      |  |  |  |
|--------|----------------------|--|--|--|
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|   |  | LESER Job N° |                     |

| Valve - Dimensions |  |    |         |                 |
|--------------------|--|----|---------|-----------------|
| 1400               | Discharge area                           | Ao | 153.938 | mm <sup>2</sup> |
| 1401               | Discharge diameter                       | do | 14      | mm              |
| 1402               | Centre to Face dimensions                | a  | 105     | mm              |
| 1403               | Centre to Face dimensions                | b  | 114     | mm              |
| 1405               | Height                                   | H  | 440     | mm              |
| 1406               | Weight                                   | M  | 17.3    | kg              |
| 1411               | Inlet flange thickness incl. raised face | S1 | 30      | mm              |

| Lift |          |  |     |    |
|------|----------|--|-----|----|
| 1507 | Standard |  | 1.5 | mm |

| Valve - Calculation |   |         |           |                   |
|---------------------|---|---------|-----------|-------------------|
| 1200                | Certified massflow  | qm,zu   | 1,701.092 | kg/h              |
| 1201                | Certified volume flow (operating condition)                   | qvb,zu  | 60.696    | m <sup>3</sup> /h |
| 1203                | Certified volume flow (standard condition)                    | qvn,zu  | 1,314.74  | m <sup>3</sup> /h |
| 1204                | Maximum mass flow   | qm,max  | 1,890.102 | kg/h              |
| 1205                | Maximum volume flow (working condition)                       | qvb,max | 67.44     | m <sup>3</sup> /h |
| 1206                | Maximum volume flow (standard condition)                      | qvn,max | 1,460.823 | m <sup>3</sup> /h |
| 1207                | Capacity exceed   |         | 3656.40   | %                 |
| 1600                | Required actual discharge area                                | Ao, req | 4.098     | mm <sup>2</sup>   |
| 1601                | Required discharge diameter                                   | do,req  | 2.284     | mm                |
| 1602                | Noise level in 1m distance from the valve (acc. to AD2000:A2) | L       | 113.399   | dB                |
| 1617                | Back pressure correction factor                               | Kb      | 1.000     |                   |

|        |                      |  |  |  |
|--------|----------------------|--|--|--|
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|   |  | Tag No:     | 320PSV-8203         |
|   |  | LESER Job № |                     |


| Sizing - Medium |                         |     |            |
|-----------------|-------------------------|-----|------------|
| 1000            | Designation             | Air |            |
| 1004            | Formula                 |     |            |
| 1001            | Molar mass              | M   | 29 kg/kmol |
| 1002            | Ratio of specific heats | k   | 1.400      |
| 1003            | Compressibility factor  | Z   | 1.000      |

| Sizing - Service condition |   |        |                   |
|----------------------------|---|--------|-------------------|
| 1009                       | Case for blow off   |        | Blocked discharge |
| 1100                       | Maximum allowable working pressure                                    |        |                   |
| 1101                       | Set pressure  | p      | 39 bar-g          |
| 1102                       | Constant superimposed back pressure                                   | paf    |                   |
| 2102                       | Variable superimposed back pressure                                   |        |                   |
| 1103                       | Built up back pressure  | pae    |                   |
| 1104                       | Backpressure  |        |                   |
| 1105                       | Overpressure  | dp     | 10.00 %           |
| 1106                       | Environmental pressure  | pu     | 1.013 bar         |
| 1107                       | Relieving Temperature   | T      | 116 °C            |
| 1108                       | Required massflow   | qm,ab  | 45.285 kg/h       |
| 1109                       | Volume flow to be discharged (working condition)                      | qvb,ab | 1.151 m³/h        |
| 1110                       | Volume flow to be discharged (std condition) [T=0 °C<br>P=101,325 Pa] | qvn,ab | 35 Cm³/h          |
| 1120                       | Rupture disc correction factor  | Kc     | 1.000             |

| Initial Sizing according to API 520 for conventional safety valve |                              |  |             |
|---|------------------------------|--|-------------|
| 1150  | NPS inlet Orifice NPS outlet |  | 1D2         |
| 1151  | PR inlet x PR outlet         |  | #600 x #150 |
| 1152  | Material                     |  | WCB         |
| 1153  | Required orifice             |  | D           |
| 1154  | Selected orifice             |  | D           |

| Sizing - Calculation |   |         |                |
|----------------------|---|---------|----------------|
| 1200                 | Certified massflow                          | qm,zu   | 2,272.271 kg/h |
| 1201                 | Certified volume flow (operating condition) | qvb,zu  | 57.731 m³/h    |
| 1203                 | Certified volume flow (standard condition)  | qvn,zu  | 1,756.194 m³/h |
| 1204                 | Maximum mass flow                           | qm,max  | 2,524.746 kg/h |
| 1205                 | Maximum volume flow (working condition)     | qvb,max | 64.146 m³/h    |
| 1206                 | Maximum volume flow (standard condition)    | qvn,max | 1,951.326 m³/h |
| 1207                 | Capacity exceed                             |         | 4917.70 %      |

|        |                      |  |  |  |
|--------|----------------------|--|--|--|
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|   |  | Tag No:      | 320PSV-8203         |
|   |  | LESER Job N° |                     |

| Valve - Dimensions |  |    |         |                 |
|--------------------|--|----|---------|-----------------|
| 1400               | Discharge area                           | Ao | 153.938 | mm <sup>2</sup> |
| 1401               | Discharge diameter                       | do | 14      | mm              |
| 1402               | Centre to Face dimensions                | a  | 105     | mm              |
| 1403               | Centre to Face dimensions                | b  | 114     | mm              |
| 1405               | Height                                   | H  | 440     | mm              |
| 1406               | Weight                                   | M  | 17.3    | kg              |
| 1411               | Inlet flange thickness incl. raised face | S1 | 30      | mm              |

| Lift |          |  |     |    |
|------|----------|--|-----|----|
| 1507 | Standard |  | 1.5 | mm |

| Valve - Calculation |   |         |           |                   |
|---------------------|---|---------|-----------|-------------------|
| 1200                | Certified massflow  | qm,zu   | 2,272.271 | kg/h              |
| 1201                | Certified volume flow (operating condition)                   | qvb,zu  | 57.731    | m <sup>3</sup> /h |
| 1203                | Certified volume flow (standard condition)                    | qvn,zu  | 1,756.194 | m <sup>3</sup> /h |
| 1204                | Maximum mass flow   | qm,max  | 2,524.746 | kg/h              |
| 1205                | Maximum volume flow (working condition)                       | qvb,max | 64.146    | m <sup>3</sup> /h |
| 1206                | Maximum volume flow (standard condition)                      | qvn,max | 1,951.326 | m <sup>3</sup> /h |
| 1207                | Capacity exceed   |         | 4917.70   | %                 |
| 1600                | Required actual discharge area                                | Ao, req | 3.068     | mm <sup>2</sup>   |
| 1601                | Required discharge diameter                                   | do, req | 1.976     | mm                |
| 1602                | Noise level in 1m distance from the valve (acc. to AD2000:A2) | L       | 113.362   | dB                |
| 1617                | Back pressure correction factor                               | Kb      | 1.000     |                   |

|        |                      |  |  |  |
|--------|----------------------|--|--|--|
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|   |  | LESER Job N° |                     |

| Sizing - Medium |                         |     |       |
|-----------------|-------------------------|-----|-------|
| 1000            | Designation             | Air |       |
| 1004            | Formula                 |     |       |
| 1001            | Molar mass              | M   |       |
| 1002            | Ratio of specific heats | k   | 1.400 |
| 1003            | Compressibility factor  | Z   | 1.000 |


As per Data sheet comment, thermal expansion shall be 3/4x1NPT

| Sizing - Service condition |   |        |              |
|----------------------------|---|--------|--------------|
| 1009                       | Case for blow off   |        | Tube rupture |
| 1100                       | Maximum allowable working pressure                                    |        |              |
| 1101                       | Set pressure  | p      | 7 bar-g      |
| 1102                       | Constant superimposed back pressure                                   | paf    |              |
| 2102                       | Variable superimposed back pressure                                   |        |              |
| 1103                       | Built up back pressure  | paе    |              |
| 1104                       | Backpressure  |        |              |
| 1105                       | Overpressure  | dp     | 10.00 %      |
| 1106                       | Environmental pressure  | pu     | 1.013 bar    |
| 1107                       | Relieving Temperature   | T      | 46 °C        |
| 1108                       | Required massflow   | qm,ab  | 45.285 kg/h  |
| 1109                       | Volume flow to be discharged (working condition)                      | qvb,ab | 4.756 m³/h   |
| 1110                       | Volume flow to be discharged (std condition) [T=0 °C<br>P=101,325 Pa] | qvn,ab | 35 Cm³/h     |
| 1120                       | Rupture disc correction factor  | Kc     | 1.000        |

| Initial Sizing according to API 520 for conventional safety valve |                                  |
|---|----------------------------------|
| 1150  | NPS inlet Orifice NPS outlet 1D2 |
| 1151  | PR inlet x PR outlet #150 x #150 |
| 1152  | Material WCB                     |
| 1153  | Required orifice D               |
| 1154  | Selected orifice D               |

| Sizing - Calculation |   |         |              |
|----------------------|---|---------|--------------|
| 1200                 | Certified massflow                          | qm,zu   | 497.858 kg/h |
| 1201                 | Certified volume flow (operating condition) | qvb,zu  | 52.282 m³/h  |
| 1203                 | Certified volume flow (standard condition)  | qvn,zu  | 384.785 m³/h |
| 1204                 | Maximum mass flow                           | qm,max  | 553.176 kg/h |
| 1205                 | Maximum volume flow (working condition)     | qvb,max | 58.091 m³/h  |
| 1206                 | Maximum volume flow (standard condition)    | qvn,max | 427.539 m³/h |
| 1207                 | Capacity exceed                             |         | 999.39 %     |

|        |                      |  |  |  |
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| Valve - Dimensions |  |    |         |                 |
|--------------------|--|----|---------|-----------------|
| 1400               | Discharge area                           | Ao | 153.938 | mm <sup>2</sup> |
| 1401               | Discharge diameter                       | do | 14      | mm              |
| 1402               | Centre to Face dimensions                | a  | 105     | mm              |
| 1403               | Centre to Face dimensions                | b  | 114     | mm              |
| 1405               | Height                                   | H  | 440     | mm              |
| 1406               | Weight                                   | M  | 17.3    | kg              |
| 1411               | Inlet flange thickness incl. raised face | S1 | 30      | mm              |

| Lift |          |  |     |    |
|------|----------|--|-----|----|
| 1507 | Standard |  | 1.5 | mm |

| Valve - Calculation |   |         |         |                   |
|---------------------|---|---------|---------|-------------------|
| 1200                | Certified massflow  | qm,zu   | 497.858 | kg/h              |
| 1201                | Certified volume flow (operating condition)                   | qvb,zu  | 52.282  | m <sup>3</sup> /h |
| 1203                | Certified volume flow (standard condition)                    | qvn,zu  | 384.785 | m <sup>3</sup> /h |
| 1204                | Maximum mass flow   | qm,max  | 553.176 | kg/h              |
| 1205                | Maximum volume flow (working condition)                       | qvb,max | 58.091  | m <sup>3</sup> /h |
| 1206                | Maximum volume flow (standard condition)                      | qvn,max | 427.539 | m <sup>3</sup> /h |
| 1207                | Capacity exceed   |         | 999.39  | %                 |
| 1600                | Required actual discharge area                                | Ao, req | 14.002  | mm <sup>2</sup>   |
| 1601                | Required discharge diameter                                   | do, req | 4.222   | mm                |
| 1602                | Noise level in 1m distance from the valve (acc. to AD2000:A2) | L       | 97.847  | dB                |
| 1617                | Back pressure correction factor                               | Kb      | 1.000   |                   |

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As per Data sheet comment, thermal expansion shall be 3/4x1NPT


| Sizing - Medium |             |                 |                       |
|-----------------|-------------|-----------------|-----------------------|
| 1000            | Designation | Water           |                       |
| 1004            | Formula     | H2O             |                       |
| 1005            | Density     | $\rho$          | 998 kg/m <sup>3</sup> |
| 1006            | Viscosity   | $\mu$ or $\eta$ |                       |

| Sizing - Service condition |  |                   |                     |
|----------------------------|--|-------------------|---------------------|
| 1009                       | Case for blow off                                | Thermal expansion |                     |
| 1100                       | Maximum allowable working pressure               |                   |                     |
| 1101                       | Set pressure                                     | $p$               | 7 bar-g             |
| 1102                       | Constant superimposed back pressure              | $p_{af}$          |                     |
| 2102                       | Variable superimposed back pressure              |                   |                     |
| 1103                       | Built up back pressure                           | $p_{ae}$          |                     |
| 1104                       | Backpressure                                     |                   |                     |
| 1105                       | Overpressure                                     | $dp$              | 10.00 %             |
| 1106                       | Environmental pressure                           | $p_u$             | 1.013 bar           |
| 1107                       | Relieving Temperature                            | $T$               | 135 °C              |
| 1108                       | Required massflow                                | $q_{m,ab}$        | 998 kg/h            |
| 1109                       | Volume flow to be discharged (working condition) | $q_{vb,ab}$       | 1 m <sup>3</sup> /h |
| 1120                       | Rupture disc correction factor                   | $K_c$             | 1.000               |

| Initial Sizing according to API 520 for conventional safety valve |                              |             |
|---|------------------------------|-------------|
| 1150  | NPS inlet Orifice NPS outlet | 1D2         |
| 1151  | PR inlet x PR outlet         | #150 x #150 |
| 1152  | Material                     | WCB         |
| 1153  | Required orifice             | D           |
| 1154  | Selected orifice             | D           |

| Sizing - Calculation |  |              |                         |
|----------------------|--|--------------|-------------------------|
| 1200                 | Certified massflow                         | $q_{m,zu}$   | 7,449.67 kg/h           |
| 1201                 | Certified volumeflow (operating condition) | $q_{vb,zu}$  | 7.465 m <sup>3</sup> /h |
| 1203                 | Certified volumeflow (standard condition)  | $q_{vn,zu}$  |                         |
| 1204                 | Maximum mass flow                          | $q_{m,max}$  | 8,277.412 kg/h          |
| 1205                 | Maximum volume flow (working condition)    | $q_{vb,max}$ | 8.294 m <sup>3</sup> /h |
| 1206                 | Maximum volume flow (standard condition)   | $q_{vn,max}$ |                         |
| 1207                 | Capacity exceed                            |              | 646.46 %                |

|        |                      |  |  |  |
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| Valve - Dimensions |  |    |         |                 |
|--------------------|--|----|---------|-----------------|
| 1400               | Discharge area                           | Ao | 153.938 | mm <sup>2</sup> |
| 1401               | Discharge diameter                       | do | 14      | mm              |
| 1402               | Centre to Face dimensions                | a  | 105     | mm              |
| 1403               | Centre to Face dimensions                | b  | 114     | mm              |
| 1405               | Height                                   | H  | 440     | mm              |
| 1406               | Weight                                   | M  | 17.3    | kg              |
| 1411               | Inlet flange thickness incl. raised face | S1 | 30      | mm              |

| Lift |          |  |     |    |
|------|----------|--|-----|----|
| 1507 | Standard |  | 1.5 | mm |

| Valve - Calculation |   |         |           |                   |
|---------------------|---|---------|-----------|-------------------|
| 1200                | Certified massflow                          | qm,zu   | 7,449.67  | kg/h              |
| 1201                | Certified volume flow (operating condition) | qvb,zu  | 7.465     | m <sup>3</sup> /h |
| 1203                | Certified volume flow (standard condition)  | qvn,zu  |           |                   |
| 1204                | Maximum mass flow                           | qm,max  | 8,277.412 | kg/h              |
| 1205                | Maximum volume flow (working condition)     | qvb,max | 8.294     | m <sup>3</sup> /h |
| 1206                | Maximum volume flow (standard condition)    | qvn,max |           |                   |
| 1207                | Capacity exceed                             |         | 646.46    | %                 |
| 1600                | Required actual discharge area              | Ao, req | 20.622    | mm <sup>2</sup>   |
| 1601                | Required discharge diameter                 | do,req  | 5.124     | mm                |

|        |                      |  |  |  |
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