

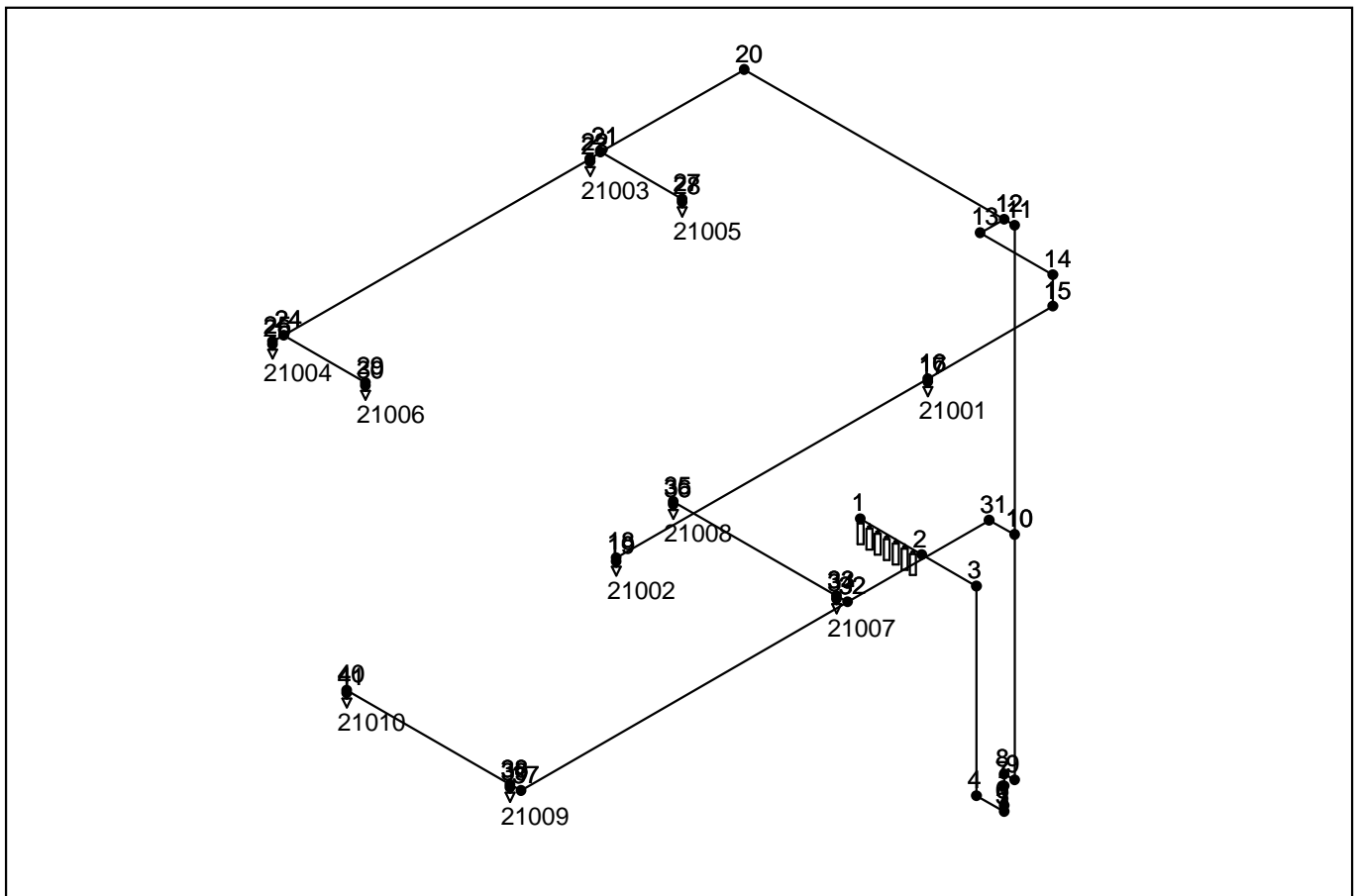
Project: WALDSTADT WUNSDORF  
Project-No:  
Building:  
Object: LB4 - IG100  
Contractor:  
Owner:  
Project engineer: FRD  
Date: 19/08/2024  
Regulation rule for calculation of Nitrogen quantities: ISO 14520-1  
Altitude above sealevel: 50 m  
Atmospheric correction factor: 1,000

**Project description:**

Pipe catalogue: Sch40-ANSI SP 2.rkl  
Component catalogue: Firetec1.arm  
Nozzle catalogue: Firetec - N.noz

**Error messages:**

No error detected





**Input Data: Pipe System**

| Section-<br>No: | Starting-<br>node | Endnode<br>Nozzle | Length<br>[m] | Height<br>[m] | Pipetype | Diameter<br>[mm]** | Fitting<br>* | Component<br>code | Component<br>coefficient | Nb of containers<br>Nitrogen quantity |
|-----------------|-------------------|-------------------|---------------|---------------|----------|--------------------|--------------|-------------------|--------------------------|---------------------------------------|
| 1               | 0                 | 1                 | 0,40          | 0,40          | 10       | 9,5                | C            | 124               | 2,100                    | 7                                     |
| 2               | 1                 | 2                 | 1,70          | 0,00          | 20       | 49,3               | B            | -                 | -                        |                                       |
| 3               | 2                 | 3                 | 1,00          | 0,00          | 41       | 52,5               |              | -                 | -                        |                                       |
| 4               | 3                 | 4                 | 2,00          | -2,00         | 41       | 52,5               | B            | -                 | -                        |                                       |
| 5               | 4                 | 5                 | 0,50          | 0,00          | 41       | 52,5               | B            | -                 | -                        |                                       |
| 6               | 5                 | 6                 | 0,10          | 0,10          | 41       | 52,5               | B            | -                 | -                        |                                       |
| 7               | 6                 | 7                 | 0,30          | 0,30          | 10       | 50,0               | C            | 200               | 1,000                    |                                       |
| 8               | 7                 | 8                 | 0,20          | 0,20          | 41       | 52,5               |              | -                 | -                        |                                       |
| 9               | 8                 | 9                 | 0,20          | 0,00          | 41       | 52,5               | B            | -                 | -                        |                                       |
| 10              | 9                 | 10                | 3,90          | 3,90          | 41       | 52,5               | B            | -                 | -                        |                                       |
| 11              | 10                | 11                | 2,95          | 2,95          | 41       | 52,5               | T-0°         | -                 | -                        |                                       |
| 12              | 11                | 12                | 0,20          | 0,00          | 41       | 52,5               | B            | -                 | -                        |                                       |
| 13              | 12                | 13                | 0,43          | 0,00          | 41       | 35,1               | T-90°        | -                 | -                        |                                       |
| 14              | 13                | 14                | 1,33          | 0,00          | 41       | 35,1               | B            | -                 | -                        |                                       |
| 15              | 14                | 15                | 0,50          | -0,50         | 41       | 35,1               | B            | -                 | -                        |                                       |
| 16              | 15                | 16                | 2,30          | 0,00          | 41       | 35,1               | B            | -                 | -                        |                                       |
| 17              | 16                | 17                | 0,05          | -0,05         | 41       | 21,0               | T-90°        | -                 | -                        |                                       |
| 18              | 17                | 21001             | 0,05          | -0,05         | 30       | 20,0               |              | -                 | -                        | 0,00                                  |
| 19              | 16                | 18                | 5,71          | 0,00          | 41       | 26,6               | T-0°         | -                 | -                        |                                       |
| 20              | 18                | 19                | 0,05          | -0,05         | 41       | 21,0               | B            | -                 | -                        |                                       |
| 21              | 19                | 21002             | 0,05          | -0,05         | 30       | 20,0               |              | -                 | -                        | 0,00                                  |
| 22              | 12                | 20                | 4,77          | 0,00          | 41       | 35,1               | T-0°         | -                 | -                        |                                       |
| 23              | 20                | 21                | 2,63          | 0,00          | 41       | 35,1               | B            | -                 | -                        |                                       |
| 24              | 21                | 22                | 0,20          | 0,00          | 41       | 35,1               | T-0°         | -                 | -                        |                                       |
| 25              | 22                | 23                | 0,05          | -0,05         | 41       | 21,0               | T-90°        | -                 | -                        |                                       |
| 26              | 23                | 21003             | 0,05          | -0,05         | 30       | 20,0               |              | -                 | -                        | 0,00                                  |
| 27              | 22                | 24                | 5,62          | 0,00          | 41       | 26,6               | T-0°         | -                 | -                        |                                       |
| 28              | 24                | 25                | 0,20          | 0,00          | 41       | 26,6               | T-0°         | -                 | -                        |                                       |
| 29              | 25                | 26                | 0,05          | -0,05         | 41       | 21,0               | B            | -                 | -                        |                                       |
| 30              | 26                | 21004             | 0,05          | -0,05         | 30       | 20,0               |              | -                 | -                        | 0,00                                  |
| 31              | 24                | 29                | 1,50          | 0,00          | 41       | 15,8               | T-90°        | -                 | -                        |                                       |
| 32              | 29                | 30                | 0,05          | -0,05         | 41       | 15,8               | B            | -                 | -                        |                                       |
| 33              | 30                | 21006             | 0,05          | -0,05         | 30       | 15,0               |              | -                 | -                        | 0,00                                  |
| 34              | 21                | 27                | 1,50          | 0,00          | 41       | 15,8               | T-90°        | -                 | -                        |                                       |
| 35              | 27                | 28                | 0,05          | -0,05         | 41       | 15,8               | B            | -                 | -                        |                                       |
| 36              | 28                | 21005             | 0,05          | -0,05         | 30       | 15,0               |              | -                 | -                        | 0,00                                  |
| 37              | 10                | 31                | 0,20          | 0,00          | 41       | 15,8               | T-90°        | -                 | -                        |                                       |
| 38              | 31                | 32                | 2,60          | 0,00          | 41       | 15,8               | B            | -                 | -                        |                                       |
| 39              | 32                | 33                | 0,20          | 0,00          | 41       | 15,8               | T-90°        | -                 | -                        |                                       |
| 40              | 33                | 34                | 0,05          | -0,05         | 41       | 15,8               | T-90°        | -                 | -                        |                                       |
| 41              | 34                | 21007             | 0,05          | -0,05         | 30       | 15,0               |              | -                 | -                        | 0,00                                  |
| 42              | 33                | 35                | 3,00          | 0,00          | 41       | 15,8               | T-0°         | -                 | -                        |                                       |
| 43              | 35                | 36                | 0,05          | -0,05         | 41       | 15,8               | B            | -                 | -                        |                                       |
| 44              | 36                | 21008             | 0,05          | -0,05         | 30       | 15,0               |              | -                 | -                        | 0,00                                  |
| 45              | 32                | 37                | 6,00          | 0,00          | 41       | 15,8               | T-0°         | -                 | -                        |                                       |
| 46              | 37                | 38                | 0,20          | 0,00          | 41       | 15,8               | B            | -                 | -                        |                                       |
| 47              | 38                | 39                | 0,05          | -0,05         | 41       | 15,8               | T-90°        | -                 | -                        |                                       |



| Section-<br>No: | Starting-<br>node | Endnode<br>Nozzle | Length<br>[m] | Height<br>[m] | Pipetype | Diameter<br>[mm] ** | Fitting<br>* | Component<br>code | Component<br>coefficient | Nb of containers<br>Nitrogen quantity |
|-----------------|-------------------|-------------------|---------------|---------------|----------|---------------------|--------------|-------------------|--------------------------|---------------------------------------|
| 48              | 39                | 21009             | 0,05          | -0,05         | 30       | 15,0                |              | -                 | -                        | 0,00                                  |
| 49              | 38                | 40                | 3,00          | 0,00          | 41       | 15,8                | T-0°         | -                 | -                        |                                       |
| 50              | 40                | 41                | 0,05          | -0,05         | 41       | 15,8                | B            | -                 | -                        |                                       |
| 51              | 41                | 21010             | 0,05          | -0,05         | 30       | 15,0                |              | -                 | -                        | 0,00                                  |

\* C=Component, B=Bend, T=T-Piece, E=Elbow, P=Pressure control valve

\*\* If a pipe diameter is equal zero see the extra table of the calculated diameters

### Legend of pipetypes

| Type | Pipeclass                                    | Pipe roughness |
|------|--|----------------|
| 10   | Hoses and Ball Valves                        | smooth         |
| 20   | Welded Manifold                              | smooth         |
| 41   | Sch40 pipe ANSI B36.10 ASTM A53/A106 grade B | galvanized     |
| 30   | Nozzles                                      | smooth         |

### Legend of components

| Code | Type              | Resistance coefficient |
|------|-------------------|------------------------|
| 124  | B0480 IG DN12     | 2,100                  |
| 200  | Directional Valve | 1,000                  |

### Nozzle data:

| No.   | Calculation zone | Diameter [mm] |
|-------|------------------|---------------|
| 21001 | ROOM             | 10,5          |
| 21002 | ROOM             | 10,5          |
| 21003 | ROOM             | 11,0          |
| 21004 | ROOM             | 11,0          |
| 21005 | AKDECKE          | 3,0           |
| 21006 | AKDECKE          | 3,0           |
| 21007 | KB               | 3,0           |
| 21008 | KB               | 3,0           |



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| No.   | Calculation zone | Diameter [mm] |
|-------|------------------|---------------|
| 21009 | KB               | 3,0           |
| 21010 | KB               | 3,0           |

**Legend of nozzles:**

| Type                       | Number<br>of orifices | C1       | C2      | C3      | C4      | C5      | C6      |
|----------------------------|-----------------------|----------|---------|---------|---------|---------|---------|
| 2 FiretecNozzle 11/02/2019 | 1                     | -0,24677 | 0,02727 | 0,00000 | 0,00000 | 0,00000 | 0,00000 |

**Calculation zone data:**

**Calculation of design quantity:**

| Zone      | Total volume [m³] | Volume of building parts [m³] | Calculated volume [m³] | Max. Over-pressure [mbar] | Design temp. [°C] | Extinguish-conc. [% Vol] | Design factor | Design conc. [% Vol] | Design quantity [kg] |
|-----------|-------------------|-------------------------------|------------------------|---------------------------|-------------------|--------------------------|---------------|----------------------|----------------------|
| 1 ROOM    | 211,4             | 0,0                           | 211,4                  | 5,000                     | 20,0              | 34,8                     | 1,30          | 45,2                 | 148,16               |
| 2 AKDECKE | 8,0               | 0,0                           | 8,0                    | 5,000                     | 20,0              | 34,8                     | 1,30          | 45,2                 | 5,61                 |
| 3 KB      | 8,7               | 0,0                           | 8,7                    | 5,000                     | 20,0              | 34,8                     | 1,30          | 45,2                 | 6,10                 |

Regulation rule for calculation of Nitrogen quantities: ISO 14520-1  
Altitude above sealevel: 50,0 m  
Atmospheric correction factor: 1,000

**Nitrogen storage input data:**

Container volume: 80,0 l  
Container filling pressure: 301,0 bar abs  
Container filling temperature: 15,0 °C  
Storage temperature: 20,0 °C  
Supplement factor: 1,00  
Number of containers: 7

**Discharge time (input value):** 60,0 s



## Calculation results:

### Nitrogen design data:

|                                 |               |
|---------------------------------|---------------|
| Design quantity:                | 159,87 kg     |
| Minimum storage quantity:       | 159,87 kg     |
| Container pressure:             | 309,2 bar abs |
| Nitrogen-mass in one container: | 24,8 kg       |
| Number of containers:           | 7             |
| Actual storage quantity:        | 173,2 kg      |

### Discharge time:

|                  |        |
|------------------|--------|
| Discharge time : | 52,1 s |
|------------------|--------|

### System information:

|                               |               |
|-------------------------------|---------------|
| Pipe system working pressure: | 33,1 bar abs  |
| Container working pressure:   | 216,4 bar abs |
| Total network volume:         | 47,9 l        |

**Pipe system pressures during the controlled phase of the discharge 19,4 seconds after start**

| Section-<br>No: | Starting-<br>node | Endnode<br>Nozzle | Pressure<br>[bar abs] | Temperature<br>[°C] | Flowrate<br>[kg/s] | Pipedimension<br>Di [mm] | DN    |
|-----------------|-------------------|-------------------|-----------------------|---------------------|--------------------|--------------------------|-------|
| 1               | 0                 | 1                 | 157,1                 | -12,4               | 0,42               | 9,5                      | B0692 |
| 2               | 1                 | 2                 | 32,4                  | -56,5               | 2,91               | 49,3                     | 2 reg |
| 3               | 2                 | 3                 | 32,3                  | -55,6               | 2,91               | 52,5                     | 2     |
| 4               | 3                 | 4                 | 32,1                  | -53,8               | 2,91               | 52,5                     | 2     |
| 5               | 4                 | 5                 | 32,0                  | -53,4               | 2,91               | 52,5                     | 2     |
| 6               | 5                 | 6                 | 31,9                  | -53,4               | 2,91               | 52,5                     | 2     |
| 7               | 6                 | 7                 | 31,7                  | -53,3               | 2,91               | 50,0                     |       |
| 8               | 7                 | 8                 | 31,7                  | -53,1               | 2,91               | 52,5                     | 2     |
| 9               | 8                 | 9                 | 31,6                  | -53,0               | 2,91               | 52,5                     | 2     |
| 10              | 9                 | 10                | 31,3                  | -49,5               | 2,91               | 52,5                     | 2     |
| 11              | 10                | 11                | 31,0                  | -46,9               | 2,72               | 52,5                     | 2     |
| 12              | 11                | 12                | 30,9                  | -46,8               | 2,72               | 52,5                     | 2     |
| 13              | 12                | 13                | 30,6                  | -46,2               | 1,27               | 35,1                     | 11/4  |
| 14              | 13                | 14                | 30,4                  | -44,3               | 1,27               | 35,1                     | 11/4  |
| 15              | 14                | 15                | 30,3                  | -43,6               | 1,27               | 35,1                     | 11/4  |
| 16              | 15                | 16                | 30,0                  | -40,3               | 1,27               | 35,1                     | 11/4  |
| 17              | 16                | 17                | 29,6                  | -40,1               | 0,65               | 21,0                     | 3/4   |
| 18              | 17                | 21001             | 29,5                  | -39,8               | 0,65               | 20,0                     | 3/4 N |
| 19              | 16                | 18                | 29,4                  | -27,1               | 0,62               | 26,6                     | 1     |
| 20              | 18                | 19                | 29,0                  | -27,1               | 0,62               | 21,0                     | 3/4   |
| 21              | 19                | 21002             | 28,9                  | -27,0               | 0,62               | 20,0                     | 3/4 N |
| 22              | 12                | 20                | 30,4                  | -40,0               | 1,45               | 35,1                     | 11/4  |
| 23              | 20                | 21                | 30,0                  | -36,8               | 1,45               | 35,1                     | 11/4  |
| 24              | 21                | 22                | 29,8                  | -36,5               | 1,40               | 35,1                     | 11/4  |
| 25              | 22                | 23                | 29,3                  | -36,3               | 0,69               | 21,0                     | 3/4   |
| 26              | 23                | 21003             | 29,2                  | -36,1               | 0,69               | 20,0                     | 3/4 N |
| 27              | 22                | 24                | 29,1                  | -25,2               | 0,71               | 26,6                     | 1     |
| 28              | 24                | 25                | 28,9                  | -24,8               | 0,66               | 26,6                     | 1     |
| 29              | 25                | 26                | 28,4                  | -25,0               | 0,66               | 21,0                     | 3/4   |
| 30              | 26                | 21004             | 28,4                  | -24,8               | 0,66               | 20,0                     | 3/4 N |
| 31              | 24                | 29                | 28,6                  | -12,4               | 0,05               | 15,8                     | 1/2   |
| 32              | 29                | 30                | 28,6                  | -11,8               | 0,05               | 15,8                     | 1/2   |
| 33              | 30                | 21006             | 28,6                  | -11,2               | 0,05               | 15,0                     | 1/2 N |
| 34              | 21                | 27                | 29,4                  | -21,3               | 0,05               | 15,8                     | 1/2   |
| 35              | 27                | 28                | 29,4                  | -20,6               | 0,05               | 15,8                     | 1/2   |
| 36              | 28                | 21005             | 29,4                  | -19,8               | 0,05               | 15,0                     | 1/2 N |
| 37              | 10                | 31                | 30,9                  | -48,3               | 0,19               | 15,8                     | 1/2   |
| 38              | 31                | 32                | 30,5                  | -32,0               | 0,19               | 15,8                     | 1/2   |
| 39              | 32                | 33                | 30,2                  | -30,6               | 0,10               | 15,8                     | 1/2   |
| 40              | 33                | 34                | 30,1                  | -29,7               | 0,05               | 15,8                     | 1/2   |
| 41              | 34                | 21007             | 30,1                  | -28,8               | 0,05               | 15,0                     | 1/2 N |
| 42              | 33                | 35                | 30,2                  | -1,7                | 0,05               | 15,8                     | 1/2   |
| 43              | 35                | 36                | 30,2                  | -1,3                | 0,05               | 15,8                     | 1/2   |
| 44              | 36                | 21008             | 30,2                  | -0,8                | 0,05               | 15,0                     | 1/2 N |
| 45              | 32                | 37                | 30,2                  | 10,3                | 0,09               | 15,8                     | 1/2   |



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| Section-<br>No: | Starting-<br>node | Endnode<br>Nozzle | Pressure<br>[bar abs] | Temperature<br>[°C] | Flowrate<br>[kg/s] | Pipedimension<br>Di [mm] | DN    |
|-----------------|-------------------|-------------------|-----------------------|---------------------|--------------------|--------------------------|-------|
| 46              | 37                | 38                | 30,2                  | 10,6                | 0,09               | 15,8                     | 1/2   |
| 47              | 38                | 39                | 30,1                  | 10,8                | 0,05               | 15,8                     | 1/2   |
| 48              | 39                | 21009             | 30,1                  | 11,0                | 0,05               | 15,0                     | 1/2 N |
| 49              | 38                | 40                | 30,1                  | 15,0                | 0,05               | 15,8                     | 1/2   |
| 50              | 40                | 41                | 30,1                  | 15,0                | 0,05               | 15,8                     | 1/2   |
| 51              | 41                | 21010             | 30,1                  | 15,0                | 0,05               | 15,0                     | 1/2 N |

**Nozzle data:**

| Calculation-zone no: | Nozzle no. | Nozzle type | Number of orifices | Pipeconnection Di [mm] | DN    | Orifice [mm] | Nitrogen output [kg] |
|----------------------|------------|-------------|--------------------|------------------------|-------|--------------|----------------------|
| 1                    | 21001      | 2           | 1                  | 20,0                   | 3/4 N | 10,5         | 38,7                 |
| 1                    | 21002      | 2           | 1                  | 20,0                   | 3/4 N | 10,5         | 36,5                 |
| 1                    | 21003      | 2           | 1                  | 20,0                   | 3/4 N | 11,0         | 41,6                 |
| 1                    | 21004      | 2           | 1                  | 20,0                   | 3/4 N | 11,0         | 38,9                 |
| 2                    | 21005      | 2           | 1                  | 15,0                   | 1/2 N | 3,0          | 3,0                  |
| 2                    | 21006      | 2           | 1                  | 15,0                   | 1/2 N | 3,0          | 2,8                  |
| 3                    | 21007      | 2           | 1                  | 15,0                   | 1/2 N | 3,0          | 3,1                  |
| 3                    | 21008      | 2           | 1                  | 15,0                   | 1/2 N | 3,0          | 2,9                  |
| 3                    | 21009      | 2           | 1                  | 15,0                   | 1/2 N | 3,0          | 2,8                  |
| 3                    | 21010      | 2           | 1                  | 15,0                   | 1/2 N | 3,0          | 2,8                  |

**Nitrogen distribution by calculation zone**

| Calculation zone | Number of nozzles | 100% design quantity [kg] | 95% design quantity [kg] | Calculated total output [kg] |
|------------------|-------------------|---------------------------|--------------------------|------------------------------|
| 1 ROOM           | 4                 | 148                       | 141                      | 156                          |
| 2 AKDECKE        | 2                 | 6                         | 5                        | 6                            |
| 3 KB             | 4                 | 6                         | 6                        | 12                           |

Max. transport time difference between nozzles 21010 and 21007 is 0,91 s



**Concentrations:**

| Calculation-<br>zone no: | Gascomposition after the discharge of the design quantity [%] |     |     |      |
|--------------------------|---|-----|-----|------|
|                          | O2  | CO2 | AR  | N2   |
| 1                        | 11,7  | 0,0 | 0,6 | 87,8 |
| 2                        | 11,8  | 0,0 | 0,6 | 87,7 |
| 3                        | 7,2   | 0,0 | 0,3 | 92,5 |

Total flooded design quantity within discharge time: 159,87 kg

| Calculation-<br>zone no: | Gascomposition after total discharge [%] |     |     |      |
|--------------------------|--|-----|-----|------|
|                          | O2                                       | CO2 | AR  | N2   |
| 1                        | 11,1                                     | 0,0 | 0,5 | 88,3 |
| 2                        | 11,2                                     | 0,0 | 0,5 | 88,2 |
| 3                        | 6,6                                      | 0,0 | 0,3 | 93,1 |

Total flooded Nitrogen mass: 172,5 kg

**Pressure relief opening:**

| Calculation-<br>zone no: | Recommended area against overpressure |                     | Max. flow [kg/s] |
|--------------------------|---------------------------------------|---------------------|------------------|
|                          | Area [m <sup>2</sup> ]                | Overpressure [mbar] |                  |
| 1                        | 0,113                                 | 5,0                 | 2,61             |
| 2                        | 0,004                                 | 5,0                 | 0,10             |
| 3                        | 0,008                                 | 5,0                 | 0,20             |



### Component list:

| Nozzle-type | Number | C1       | C2      | C3      | C4      | C5      | C6      |
|-------------|--------|----------|---------|---------|---------|---------|---------|
| 2           | 10     | -0,24700 | 0,02730 | 0,00000 | 0,00000 | 0,00000 | 0,00000 |

| Pipe-type | Di [mm] | DN       | Length [m] |
|-----------|---------|----------|------------|
| 10        | 9,5     | B0692022 | 0,400      |
| 20        | 49,3    | 2 regul  | 1,700      |
| 41        | 52,5    | 2        | 11,100     |
| 10        | 50,0    |          | 0,300      |
| 41        | 35,1    | 11/4     | 12,100     |
| 41        | 21,0    | 3/4      | 0,400      |
| 30        | 20,0    | 3/4 Nozz | 0,400      |
| 41        | 26,6    | 1        | 11,500     |
| 41        | 15,8    | 1/2      | 18,800     |
| 30        | 15,0    | 1/2 Nozz | 0,600      |

### Number of bends (+) and elbows (-)

| Bend-type | Di [mm] | DN      | Number |
|-----------|---------|---------|--------|
| 90        | 49,3    | 2 regul | 1      |
| 90        | 52,5    | 2       | 6      |
| 90        | 35,1    | 11/4    | 4      |
| 90        | 21,0    | 3/4     | 2      |
| 90        | 15,8    | 1/2     | 6      |

### Number of T-distributors (in- and outdiameter)

| Number | Input | 90-out | 90-out | 0-out |
|--------|-------|--------|--------|-------|
| 1      | 52,5  | 15,8   | 0,0    | 52,5  |
| 1      | 52,5  | 35,1   | 0,0    | 35,1  |
| 2      | 35,1  | 21,0   | 0,0    | 26,6  |
| 1      | 35,1  | 15,8   | 0,0    | 35,1  |
| 1      | 26,6  | 15,8   | 0,0    | 26,6  |
| 3      | 15,8  | 15,8   | 0,0    | 15,8  |



## Dynamic flooding results

The calculation bases on a mean nozzle pressure!

| Flooding time [s] | Storage mass [kg] | Flooded ratio [%] | Flow [kg/s] | Storage pressure [bar] | Pressure downstream control valve [bar] | Pressure at nozzle [bar] |
|-------------------|-------------------|-------------------|-------------|------------------------|---|--------------------------|
| 0,0               | 173,2             | 0,0               | 0,00        | 309,2                  | 1,0                                     | 1,0                      |
| 1,6               | 165,8             | 4,6               | 2,91        | 287,1                  | 32,9                                    | 29,4                     |
| 1,9               | 165,1             | 5,1               | 2,90        | 286,8                  | 32,9                                    | 29,4                     |
| 2,1               | 164,4             | 5,5               | 2,90        | 282,3                  | 33,0                                    | 29,4                     |
| 2,4               | 163,6             | 6,0               | 2,90        | 279,4                  | 33,0                                    | 29,4                     |
| 2,6               | 162,9             | 6,4               | 2,90        | 277,2                  | 33,0                                    | 29,4                     |
| 2,9               | 162,2             | 6,9               | 2,90        | 275,0                  | 33,0                                    | 29,4                     |
| 5,1               | 155,7             | 10,9              | 2,90        | 258,1                  | 33,0                                    | 29,4                     |
| 7,1               | 149,8             | 14,6              | 2,90        | 243,0                  | 33,0                                    | 29,4                     |
| 9,1               | 144,0             | 18,3              | 2,91        | 226,2                  | 33,0                                    | 29,4                     |
| 11,0              | 138,2             | 21,9              | 2,91        | 211,3                  | 33,0                                    | 29,4                     |
| 16,0              | 123,7             | 31,0              | 2,91        | 178,6                  | 33,0                                    | 29,5                     |
| 21,0              | 109,1             | 40,1              | 2,91        | 147,0                  | 33,0                                    | 29,5                     |
| 26,0              | 94,6              | 49,2              | 2,91        | 121,2                  | 33,0                                    | 29,5                     |
| 31,0              | 80,1              | 58,2              | 2,91        | 95,9                   | 38,8                                    | 34,6                     |
| 36,0              | 65,5              | 67,4              | 2,91        | 74,4                   | 43,9                                    | 39,1                     |
| 41,0              | 51,0              | 76,4              | 2,91        | 54,4                   | 38,1                                    | 34,0                     |
| 46,0              | 36,5              | 85,5              | 2,91        | 35,8                   | 33,8                                    | 30,2                     |
| 51,0              | 23,7              | 93,5              | 1,91        | 21,6                   | 20,9                                    | 18,8                     |
| 56,0              | 16,4              | 98,1              | 1,23        | 15,0                   | 13,9                                    | 12,6                     |
| 61,0              | 11,5              | 101,1             | 0,85        | 10,6                   | 9,9                                     | 9,0                      |
| 66,0              | 8,0               | 103,3             | 0,59        | 7,5                    | 7,1                                     | 6,4                      |
| 71,0              | 5,7               | 104,8             | 0,41        | 5,3                    | 5,1                                     | 4,6                      |
| 76,0              | 4,0               | 105,8             | 0,28        | 3,8                    | 3,6                                     | 3,3                      |

Discharge time at valve:

52,1 s

