

Calculation header

Identifier **12/31552**
 Client **Airlitec**
 TAG No. **1 LBA 30 CF 201**

Operating data

Medium **Water**
 Operating pressure p1 **59,0** bar(a)
 Operating temperature t1 **400,0** °C
 Automatic phase detection

Properties at operating point

State **Vaporous**
 Vapour pressure (t1) pv1 **220,64** bar(a)
 Vapour temperature (p1) tv1 **274,49** °C
 Operating density (t1, p1) ρ **20,703** kg/m³
 Isentropic exponent (t1, p1) κ **1,2837** -
 Dynamic viscosity (t1,p1) η1 **24,373** E -6 Pa s
 Kinematic viscosity (t1,p1) ν1 **1,1773** E -6 m²/s

Physical constants

Critical pressure pc **220,64** bar(a)
 Critical temperature tc **373,95** °C

Pipeline

Material number **1.5415**
 Material short name **16Mo3**
 Condition **new, seamless, cold drawn**
 Pipe diameter **Circular**
 Pipe outside diameter Do **219,1** mm
 Pipe wall thickness tp **12,5** mm
 Pipe inside diameter (20°C) Di **194,1** mm
 Linear coefficient of thermal expansion αlin **13,666** E -6 1/K
 Pipe roughness k **0,02** mm

Flow element - operating values

Device type **ISO 5167-device**
 Calculation standard **EN ISO 5167:2003**
 Primary device **Corner orifice**
 Calculation reference **Sizing: C and ε with 2/3 qm**
 Calculated value **d**
 Throttle orifice (20°C) d **134,12** mm
 Pressure difference Δp **1.250,0** mbar
 Mass flow rate qm **80.000,0** kg/h
 Volume flow rate (operating conditions) qv **3.864,3** m³/h

Flow element - material

Material number **Device 1.4571w**
 Material short name **Device 316Ti w**
 Linear coefficient of thermal expansion αlin,D **17,769** E -6 1/K
 Edge radius (20°C) rk **0,040237** mm

Values table

Flow value table
 Increment for value table n **10,0** %

No.	Δp [%]	Δp [mbar]	q_m [kg/h]	q_v [m ³ /h]	u_p [m/s]	Meets stand...
1	10,0	125,0	25.410,0	1.227,0	11,4	☒
2	20,0	250,0	35.870,0	1.733,0	16,1	☒
3	30,0	375,0	43.880,0	2.120,0	19,69	☒
4	40,0	500,0	50.620,0	2.445,0	22,72	☒
5	50,0	625,0	56.540,0	2.731,0	25,37	☒
6	60,0	750,0	61.880,0	2.989,0	27,77	☒
7	70,0	875,0	66.770,0	3.225,0	29,97	☒
8	80,0	1.000,0	71.320,0	3.445,0	32,01	☒
9	90,0	1.125,0	75.580,0	3.651,0	33,92	☒
10	100,0	1.250,0	79.600,0	3.845,0	35,72	☒

More calculated values

Values marked (*) depend on the calculation reference q_m or $2/3 q_m$

<input type="checkbox"/> Discharge coefficient (*)	C	0,60083	-
Residual pressure loss	$\Delta\omega$	656,21	mbar
Power loss	$P\Delta\omega$	70,832	kW
Mechanical stream power	$P\Delta p$	135,62	kW
Flow velocity in pipeline	u_p	35,902	m/s
Flow velocity in flow element	u_f	74,96	m/s
Reynolds number (*)	ReD	3,9666	E 6 -
Pipe inside diameter (t1)	Di,t1	195,11	mm
Throttle orifice (t1)	d,t1	135,03	mm
Diameter ratio	β	0,69207	-
Relative pipe roughness	kr	1,0251	-
Correction factor for pipe roughness	br	1,0	-
Correction factor for edge radius	bk	1,0	-
Expansion factor (*)	ϵ	0,99663	-
Pressure ratio (*)	τ	0,99058	-

In- and outlet section

Specify as factors

Presentation 0% additional uncertainty

Required inlet sections

One or two 90° bends, $S > 30D$	8.584,7	mm
Two 90° bends, $30D > S > 10D$, same plane	8.584,7	mm
Two 90° bends, $10D > S$, same plane	8.584,7	mm
Two 90° bends, $30D > S > 5D$, perpendicular planes	8.584,7	mm
Two 90° bends, $5D > S$, perpendicular planes	14.633,0	mm
Single 90° tee	8.584,7	mm
One or two 45° bends, $S > 2D$	8.584,7	mm
Reducer	2.536,4	mm
Diffusor	7.023,9	mm
Gate valve, completely open	4.682,6	mm
Abrupt diameter reduction	5.853,2	mm
Thermometer pocket, $\varphi < 0,03 Di$	975,54	mm
Thermometer pocket, $\varphi > 0,03 Di$	3.902,2	mm

Required outlet section

Required outlet section	1.560,9	mm
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Confirmation:

The calculation is according to EN ISO 5167:2003.