Calculation header

Identifier		**12/31011**		

User-defined fields:

Client		**AIRLITEC Sarl**		
TAG No.		**Dry Chloric**		

Operating data

Medium		**Chlorine**		
Operating pressure	p1	**1,4**		bar(g)
Operating temperature	t1	**60,0**		°C
Gas		**Gas, dry (Operating conditions)**		

Properties at operating point

State		**Gaseous**		
Vapour pressure (t1)	pv1	**17,159**		bar(g)
Vapour temperature (p1)	tv1	**-12,284**		°C
Real gas factor (t1, p1)	Z1	**0,9783**		-
Operating density (t1, p1)	ρ	**6,3146**		kg/m³
Isentropic exponent (t1, p1)	κ	**1,3153**		-
◉ Dynamic viscosity (t1,p1)	η1	**7,3442**	**E -3**	mPa s
○ Kinematic viscosity (t1,p1)	ν1	**1,1631**		mm²/s

Physical constants

Critical pressure	pc	**79,911**		bar(a)
Critical temperature	tc	**143,81**		°C

Pipeline

Material number		**1.4404**		
Material short name		**A 182 (F 316 L)**		
Condition		**new, seamless, cold drawn**		
Pipe diameter		**Circular**		
◉ Pipe inside diameter (20°C)	Di	**100,0**		mm
Linear coefficient of thermal expansion	αlin	**16,0**	**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	**64,969**		mm
Pressure difference	Δp	**50,0**		mbar
◉ Mass flow rate	qm	**2,0**		t/h
○ Volume flow rate (operating conditions)	qv	**316,73**		m³/h

Flow element - material

Material number	Device	**1.4404**		
Material short name	Device	**A 182 (F 316 L)**		
Linear coefficient of thermal expansion	αlin,D	**16,0**	**E -6**	1/K
Edge radius (20°C)	rk	**0,019491**		mm

Values table

☒ Flow value table

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

No.	Δp [%]	Δp [mbar]	qm [t/h]	qv [m³/h]	up [m/s]	Meets stand...
1	10,0	5,0	0,6356	100,7	3,556	☒
2	20,0	10,0	0,8971	142,1	5,018	☒
3	30,0	15,0	1,097	173,8	6,138	☒
4	40,0	20,0	1,265	200,4	7,079	☒
5	50,0	25,0	1,413	223,8	7,906	☒
6	60,0	30,0	1,547	245,0	8,653	☒
7	70,0	35,0	1,669	264,4	9,338	☒
8	80,0	40,0	1,783	282,4	9,974	☒
9	90,0	45,0	1,89	299,2	10,57	☒
10	100,0	50,0	1,99	315,2	11,13	☒

More calculated values

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

☐ Discharge coefficient (*)	C	**0,6056**	-
Residual pressure loss	Δω	**28,654**	mbar
Power loss	PΔω	**0,25361**	kW
Mechanical stream power	PΔp	**0,44452**	kW
Flow velocity in pipeline	up	**11,188**	m/s
Flow velocity in flow element	uf	**26,505**	m/s
Reynolds number (*)	ReD	**641.690,0**	-
Pipe inside diameter (t1)	Di,t1	**100,06**	mm
Throttle orifice (t1)	d,t1	**65,011**	mm
Diameter ratio	β	**0,64969**	-
Relative pipe roughness	kr	**1,9987**	-
Correction factor for pipe roughness	br	**1,0**	-
Correction factor for edge radius	bk	**1,0**	-
Expansion factor (*)	ε	**0,99701**	-
Pressure ratio (*)	τ	**0,99079**	-

In- and outlet section

☐ Specify as factors

Presentation **0% additional uncertainty**

Required inlet sections

One or two 90° bends, S>30D	**4.402,8**	mm
Two 90° bends, 30D>S>10D, same plane	**4.402,8**	mm
Two 90° bends, 10D>S, same plane	**4.402,8**	mm
Two 90° bends, 30D>S>5D, perpendicular planes	**4.402,8**	mm
Two 90° bends, 5D>S, perpendicular planes	**6.003,8**	mm
Single 90° tee	**3.602,3**	mm
One or two 45° bends, S>2D	**4.402,8**	mm
Reducer	**1.200,8**	mm
Diffusor	**2.801,8**	mm
Gate valve, completely open	**1.801,2**	mm
Abrupt diameter reduction	**3.001,9**	mm
Thermometer pocket, φ < 0,03 Di	**500,32**	mm
Thermometer pocket, φ > 0,03 Di	**2.001,3**	mm

Required outlet section

Required outlet section	**700,45**	mm

Confirmation:

The calculation is according to EN ISO 5167:2003.

Calculation header

Identifier		**12/31011**		

User-defined fields:

Client		**AIRLITEC Sarl**		
TAG No.		**Wet Chloric**		

Operating data

Medium		**Chlorine**		
Operating pressure	p1	**1,3**		bar(g)
Operating temperature	t1	**38,0**		°C
Gas		**Gas, humid (Operating conditions)**		
Humidity		**Relative**		
Relative humidity	φ	**1,53**		%
☒ Automatic phase detection		☒ Enhanced substance calculation		

Properties at operating point

State		**Gaseous**		
Vapour pressure of water part	pv,w	**-0,94692**		bar(g)
Vapour pressure (t1)	pv1	**9,8983**		bar(g)
Vapour temperature (p1)	tv1	**-13,443**		°C
Real gas factor (t1, p1)	Z1	**0,97447**		-
Operating density (t1, p1)	ρ	**4,6**		kg/m³
Isentropic exponent (t1, p1)	κ	**1,3187**		-
◉ Dynamic viscosity (t1,p1)	η1	**6,736**	**E -3**	mPa s
○ Kinematic viscosity (t1,p1)	ν1	**1,4643**		mm²/s

Physical constants

Critical pressure	pc	**79,911**		bar(a)
Critical temperature	tc	**143,81**		°C

Pipeline

Material number		**1.4404**		
Material short name		**A 182 (F 316 L)**		
Condition		**new, seamless, cold drawn**		
Pipe diameter		**Circular**		
◉ Pipe inside diameter (20°C)	Di	**230,0**		mm
Linear coefficient of thermal expansion	αlin	**16,0**	**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	**87,443**		mm
Pressure difference	Δp	**50,0**		mbar
◉ Mass flow rate	qm	**2.811,0**		kg/h
○ Volume flow rate (operating conditions)	qv	**611,09**		m³/h

Flow element - material

Material number	Device	**1.4404**		
Material short name	Device	**A 182 (F 316 L)**		
Linear coefficient of thermal expansion	αlin,D	**16,0**	**E -6**	1/K

Edge radius (20°C)	rk	**0,026233**	mm

Values table

☒ Flow value table

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

No.	Δp [%]	Δp [mbar]	qm [kg/h]	qv [m³/h]	up [m/s]	Meets stand...
1	10,0	5,0	891,5	193,8	1,295	☒
2	20,0	10,0	1.259,0	273,8	1,83	☒
3	30,0	15,0	1.541,0	335,1	2,239	☒
4	40,0	20,0	1.778,0	386,6	2,583	☒
5	50,0	25,0	1.987,0	431,9	2,886	☒
6	60,0	30,0	2.175,0	472,8	3,16	☒
7	70,0	35,0	2.348,0	510,4	3,41	☒
8	80,0	40,0	2.508,0	545,3	3,644	☒
9	90,0	45,0	2.659,0	578,0	3,862	☒
10	100,0	50,0	2.801,0	608,9	4,068	☒

More calculated values

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

☐ Discharge coefficient (*)	C	**0,60109**	-
Residual pressure loss	Δω	**41,957**	mbar
Power loss	PΔω	**0,71874**	kW
Mechanical stream power	PΔp	**0,85804**	kW
Flow velocity in pipeline	up	**4,0832**	m/s
Flow velocity in flow element	uf	**28,25**	m/s
Reynolds number (*)	ReD	**427.680,0**	-
Pipe inside diameter (t1)	Di,t1	**230,07**	mm
Throttle orifice (t1)	d,t1	**87,468**	mm
Diameter ratio	β	**0,38019**	-
Relative pipe roughness	kr	**0,86931**	-
Correction factor for pipe roughness	br	**1,0**	-
Correction factor for edge radius	bk	**1,0**	-
Expansion factor (*)	ε	**0,9974**	-
Pressure ratio (*)	τ	**0,99039**	-

In- and outlet section

☐ Specify as factors

Presentation **0% additional uncertainty**

Required inlet sections

One or two 90° bends, S>30D	**3.681,1**	mm
Two 90° bends, 30D>S>10D, same plane	**2.300,7**	mm
Two 90° bends, 10D>S, same plane	**2.300,7**	mm
Two 90° bends, 30D>S>5D, perpendicular planes	**10.123,0**	mm
Two 90° bends, 5D>S, perpendicular planes	**11.503,0**	mm
Single 90° tee	**2.070,6**	mm
One or two 45° bends, S>2D	**6.902,0**	mm
Reducer	**1.150,3**	mm
Diffusor	**2.760,8**	mm
Gate valve, completely open	**2.760,8**	mm
Abrupt diameter reduction	**6.902,0**	mm
Thermometer pocket, φ < 0,03 Di	**1.150,3**	mm
Thermometer pocket, φ > 0,03 Di	**4.601,3**	mm

Required outlet section

Required outlet section	**1.380,4**	mm

Confirmation:

The calculation is according to EN ISO 5167:2003.