

Calculation headerIdentifier **City Gas****User-defined fields:**client **Airlitec**
Zip code / City **80470 Dreuil Les Amiens****Operating data**Medium **Natural Gas (AGA8)**
Substance composition **City Gas**
Operating pressure p1 **200,0** bar(g)
Operating temperature t1 **20,0** °C
Gas **Gas, dry (Standard conditions)****Properties at operating point**State **Gaseous**
Operating density (t1, p1) ρ **260,46** kg/m³
Isentropic exponent (t1, p1) κ **2,6737** -**Pipeline**Material number **1.4404**
Material short name **316L 1.4404**
Condition **new, seamless, cold drawn**
Pipe diameter **Circular**
© Pipe inside diameter (20°C) Di **13,0** mm
Linear coefficient of thermal expansion α_{lin} **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 **4,5086** mm
Pressure difference Δp **10,0** mbar
○ Mass flow rate qm **25,719** kg/h
© Volume flow rate (standard conditions) qn **25,0** m³/h**Flow element - material**Material number Device **1.4404**
Material short name Device **316L 1.4404**
Linear coefficient of thermal expansion $\alpha_{lin,D}$ **16,0** E -6 1/K
Edge radius (20°C) rk **1,3526** E -3 mm**Values table** Flow value table**More calculated values**

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

 Discharge coefficient (*) C **0,61543** -
Residual pressure loss $\Delta\omega$ **8,6157** mbar
Power loss P $\Delta\omega$ **23,633** E -6 kW
Mechanical stream power P Δp **27,43** E -6 kW

Flow velocity in pipeline	up	0,20666	m/s
Flow velocity in flow element	uf	1,7181	m/s
Reynolds number (*)	ReD	17.125,0	-
Pipe inside diameter (t1)	Di,t1	13,0	mm
Throttle orifice (t1)	d,t1	4,5086	mm
Diameter ratio	β	0,34682	-
Relative pipe roughness	kr	15,385	-
Correction factor for pipe roughness	br	1,0001	-
Correction factor for edge radius	bk	1,0	-
Expansion factor (*)	ε	1,0	-
Pressure ratio (*)	τ	0,99998	-

In- and outlet section

Specify as factors

Presentation

0% additional uncertainty

Required inlet sections

One or two 90° bends, $S > 30D$	208,0	mm
Two 90° bends, $30D > S > 10D$, same plane	130,0	mm
Two 90° bends, $10D > S$, same plane	130,0	mm
Two 90° bends, $30D > S > 5D$, perpendicular planes	572,0	mm
Two 90° bends, $5D > S$, perpendicular planes	650,0	mm
Single 90° tee	117,0	mm
One or two 45° bends, $S > 2D$	390,0	mm
Reducer	65,0	mm
Diffusor	156,0	mm
Gate valve, completely open	156,0	mm
Abrupt diameter reduction	390,0	mm
Thermometer pocket, $\varphi < 0,03 Di$	65,0	mm
Thermometer pocket, $\varphi > 0,03 Di$	260,0	mm

Required outlet section

Required outlet section	78,0	mm
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Uncertainties

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

Unc. of operating temperature	e,t1	1,0	%
Unc. of absolute pressure	e,p1	0,6	%
Unc. of pipe diameter	e,Di	0,4	%
Unc. of throttle orifice	e,d	0,1	%
Unc. of pressure difference	e, Δp	0,8	%
Unc. of operating density	e, ρ_1	5,0	%
Unc. of correction factor br	e,br	0,013717	%
Unc. of correction factor bk	e,bk	0,0	%
Unc. of expansion factor (*)	e, ε	28,943	E -6 %
Unc. of flow coefficient	e,C	1,3303	%
Unc. of corrected flow coefficient	e,Cb	1,3304	%
Unc. of mass flow rate	e, q_m	2,8673	%
Additional uncertainty	e,ad	0,0	%

Warning:

Throttle orifice (20°C) - $d < 12.5$ mm is not according to standard but can be realized by calibration.

Pipe inside diameter (t1) - $Di,t1 < 50.0$ mm is not according to standard but can be realized by calibration.