



How to use VENT.iNG.

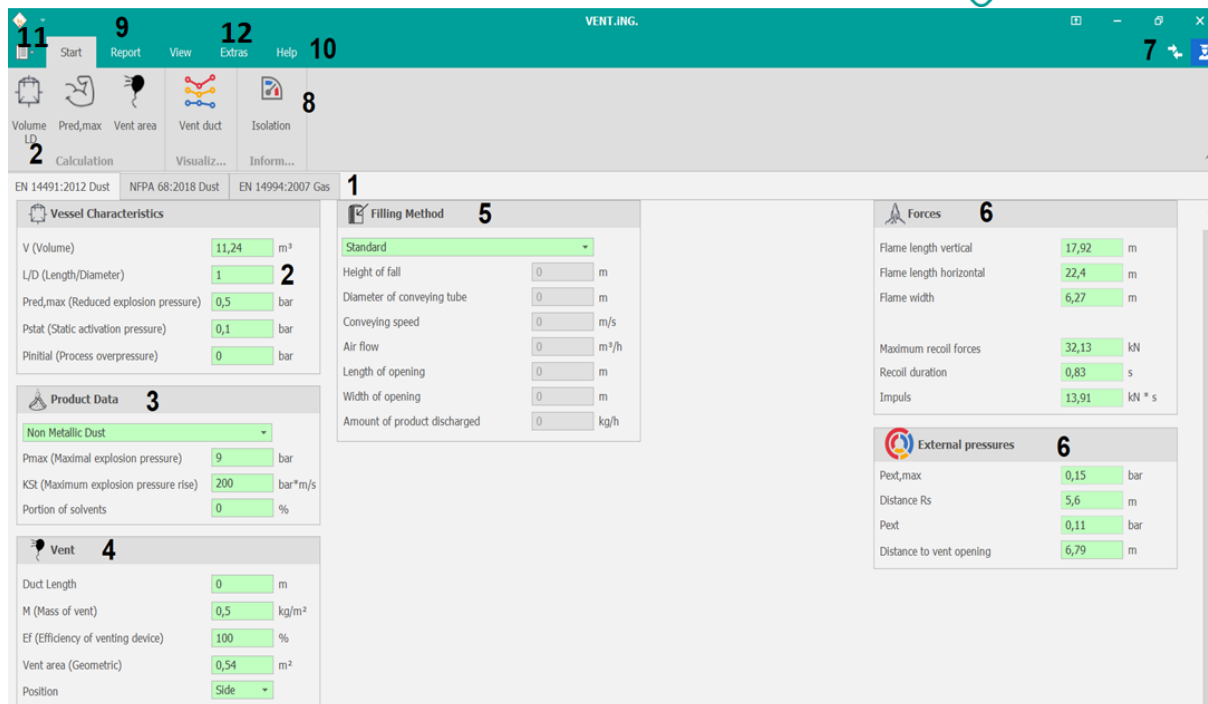
VENT.iNG. was developed to allow users to calculate the venting area for dust explosion venting according to the international standards NFPA 68:2018 and EN 14491:2012 / VDI 3673.

1. General explanation

The mask below shows two different tabs to calculate the vent area following NFPA 86:2018 and EN 14491:2012.

There is a simple mode and an expert mode available which can be activated by clicking on the figure on the right top of the window

Figure 1 Simple mode of VENT.iNG.



The screenshot shows the VENT.iNG. Expert mode interface. The top menu bar includes Start (11), Report (9), View (12), Extras (10), and Help (10). Below the menu is a toolbar with icons for Volume (2), Pred,max, Vent area, Vent duct, Isolation (8), and Calculation. The main area is divided into several sections:

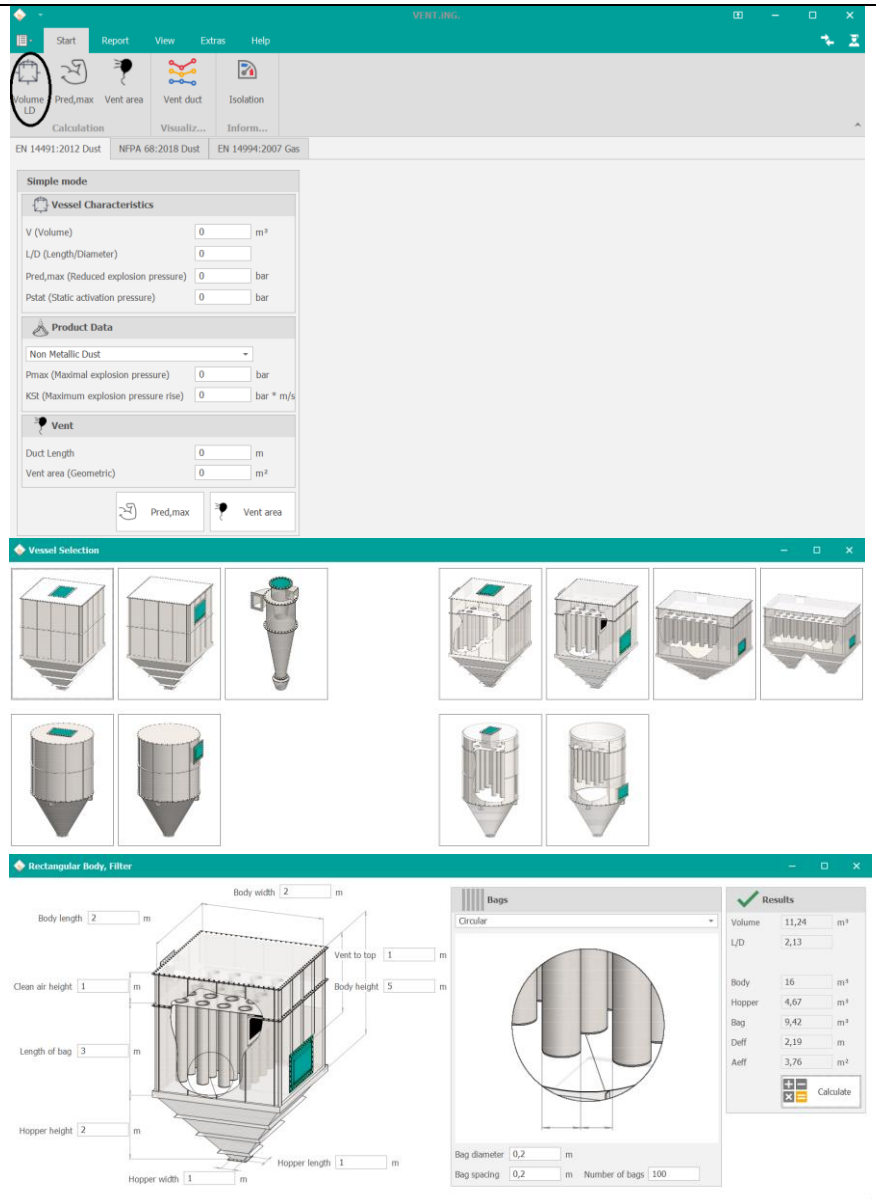
- Vessel Characteristics:** V (Volume) 11,24 m³, L/D (Length/Diameter) 1, Pred,max (Reduced explosion pressure) 0,5 bar, Pstat (Static activation pressure) 0,1 bar, Pinitial (Process overpressure) 0 bar.
- Product Data:** Non Metallic Dust, Pmax (Maximal explosion pressure) 9 bar, KSt (Maximum explosion pressure rise) 200 bar*m/s, Portion of solvents 0 %.
- Vent:** Duct Length 0 m, M (Mass of vent) 0,5 kg/m², Ef (Efficiency of venting device) 100 %, Vent area (Geometric) 0,54 m², Position Side.
- Filling Method:** Standard, Height of fall 0 m, Diameter of conveying tube 0 m, Conveying speed 0 m/s, Air flow 0 m³/h, Length of opening 0 m, Width of opening 0 m, Amount of product discharged 0 kg/h.
- Forces:** Flame length vertical 17,92 m, Flame length horizontal 22,4 m, Flame width 6,27 m, Maximum recoil forces 32,13 kN, Recoil duration 0,83 s, Impuls 13,91 kN * s.
- External pressures:** Pext,max 0,15 bar, Distance Rs 5,6 m, Pext 0,11 bar, Distance to vent opening 6,79 m.

Figure 2 Expert mode of VENT.iNG.

1. Tabs to switch between venting standards
2. Input parameters for vessel volume and L/D
3. Product data to define the safety characteristics of the dust (metallic, non-metallic or hybrid mixture)
4. Input parameters for vent duct / vent characteristics and vent area result
5. Input parameters for filling method / influence of air flow characteristic
6. Output parameters for flame length, recoil forces and external pressures
7. Copy values of other standard
8. Exceptions of explosion isolation
9. Report
10. Report a Bug or ask a question
11. Save, open or start new calculation
12. Extras: Activation licenses and changing number format / decimal operator

2. Vessel volume and L/D calculation

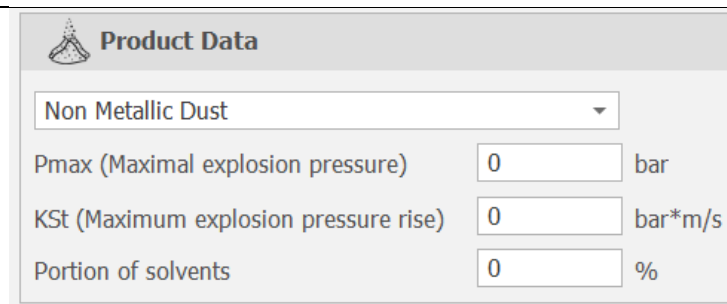
The needed vessel geometry needs to be selected. The position of the vent panel has an influence on the L/D (Length / diameter ratio). In case a duct collector needs to be calculated the volume of the filter elements are an essential part of the calculation for EN 14491, but not for NFPA 68:2018.



3. Safety characteristics of dust

It is required to select either metallic, non-metallic dust or hybrid mixture. If a portion of solvents is present, likely a hybrid mixture is present, which needs to be assessed following NFPA 68:2018 or EN 14491:2012.

K_{St} and P_{max} value likely need to be adapted to higher level.



4. Vent duct / Vent characteristics
Adding a vent duct results in increased $p_{red,max}$ values or increased vent area.

Both values can be calculated using the $p_{red,max}$ or the vent area button.

Using the vent duct button shows an overview of different vent area to $p_{red,max}$ dependencies related to the given case and vent duct length.

The specific mass of the vent influences the efficiency of the vent panel. The approaches of EN 14491 and NFPA 68 are different.

Vent

Duct Length	3	m
M (Mass of vent)	0,5	kg/m ²
Ef (Efficiency of venting device)	100	%
Vent area (Geometric)	0,9	m ²
Position	Side	▼



Pred,max



Vent area

Calculation

Start
Report
View
Extras
Help



Volume LD



Pred,max



Vent area



Vent duct



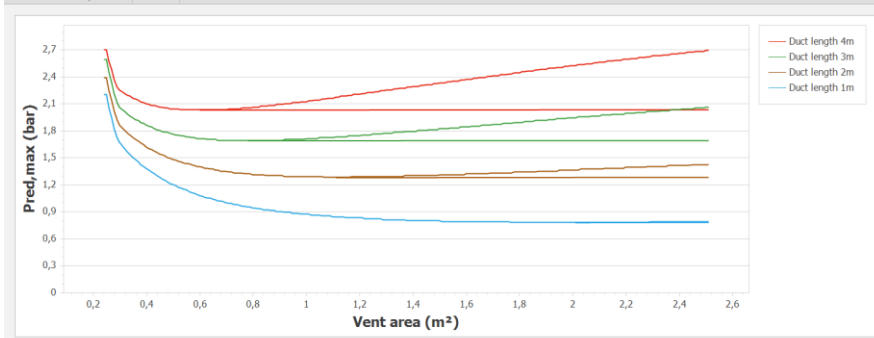
Isolation

EN 14491:2012 Dust
NFPA 68:2018 Dust
EN 14994:2007 Gas

Chart Tools

Print Preview
Print
Export
Refresh

Print and Export
View



Pred,max start: 2 bar

Vent area stop: 2,5 m²

Duct length stop: 4 m

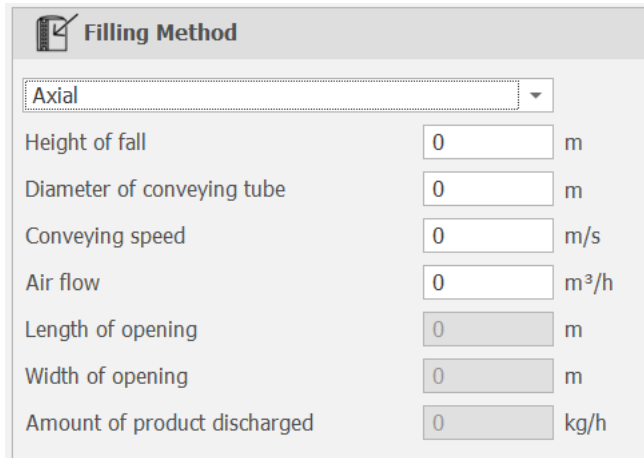
Duct length step width: 1 m

5. Filling method / air flow characteristics

In EN 14491 the filling method allows to reduce the vent area in most cases, since only an inhomogeneous dust cloud is considered in the calculation, which is based on experimental results of FSA.

In NFPA 68 a similar option is given, but which has another intention and mostly results in increased vent areas. This correction considers an additional turbulence caused by an increased air-flow larger than 20 m/s.

EN 14491:2012



Filling Method

Axial

Height of fall 0 m

Diameter of conveying tube 0 m

Conveying speed 0 m/s

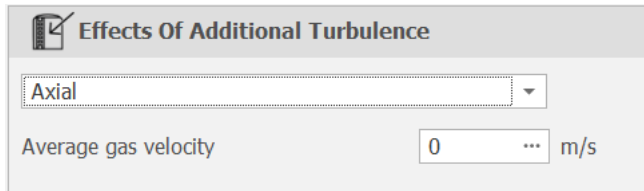
Air flow 0 m³/h

Length of opening 0 m

Width of opening 0 m

Amount of product discharged 0 kg/h

NFPA 68:2018



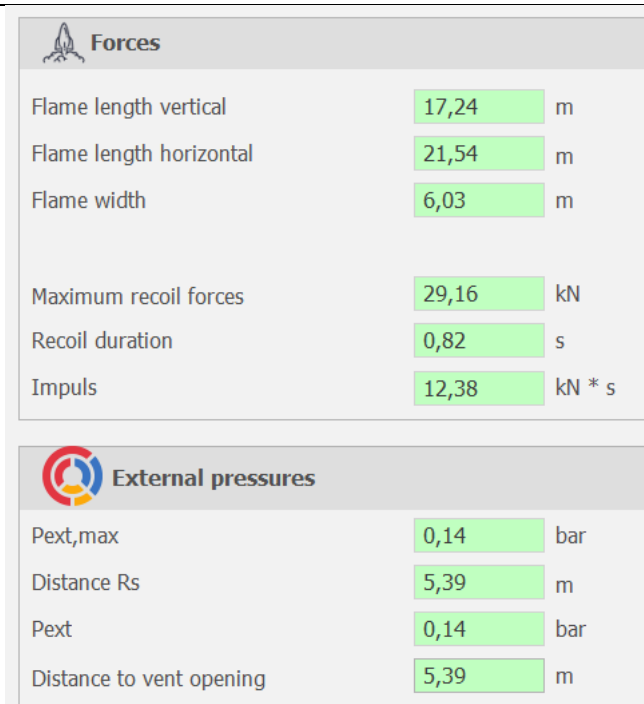
Effects Of Additional Turbulence

Axial

Average gas velocity 0 m/s

6. Flame length / recoil forces / external pressure

Any vented explosion results in flames, backpressures and external pressures, which are calculated in this section if they are in the applicable limits.



Forces

Flame length vertical 17,24 m

Flame length horizontal 21,54 m

Flame width 6,03 m

Maximum recoil forces 29,16 kN

Recoil duration 0,82 s

Impuls 12,38 kN * s

External pressures

Pext,max 0,14 bar

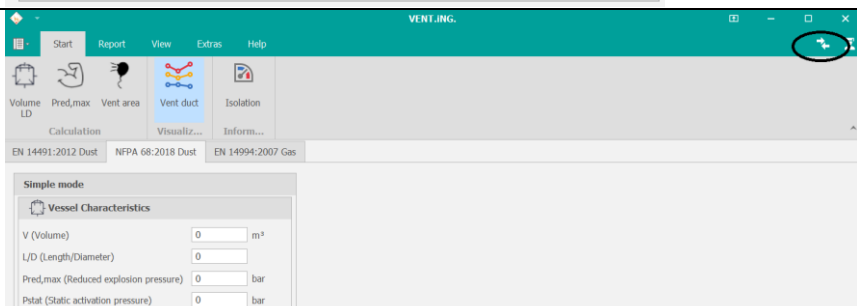
Distance Rs 5,39 m

Pext 0,14 bar

Distance to vent opening 5,39 m

7. Copy values

The button "copy values" allows copying the used values of the opposite standard and allows direct comparison of calculated vent areas.



Simple mode

Vessel Characteristics

V (Volume) 0 m³

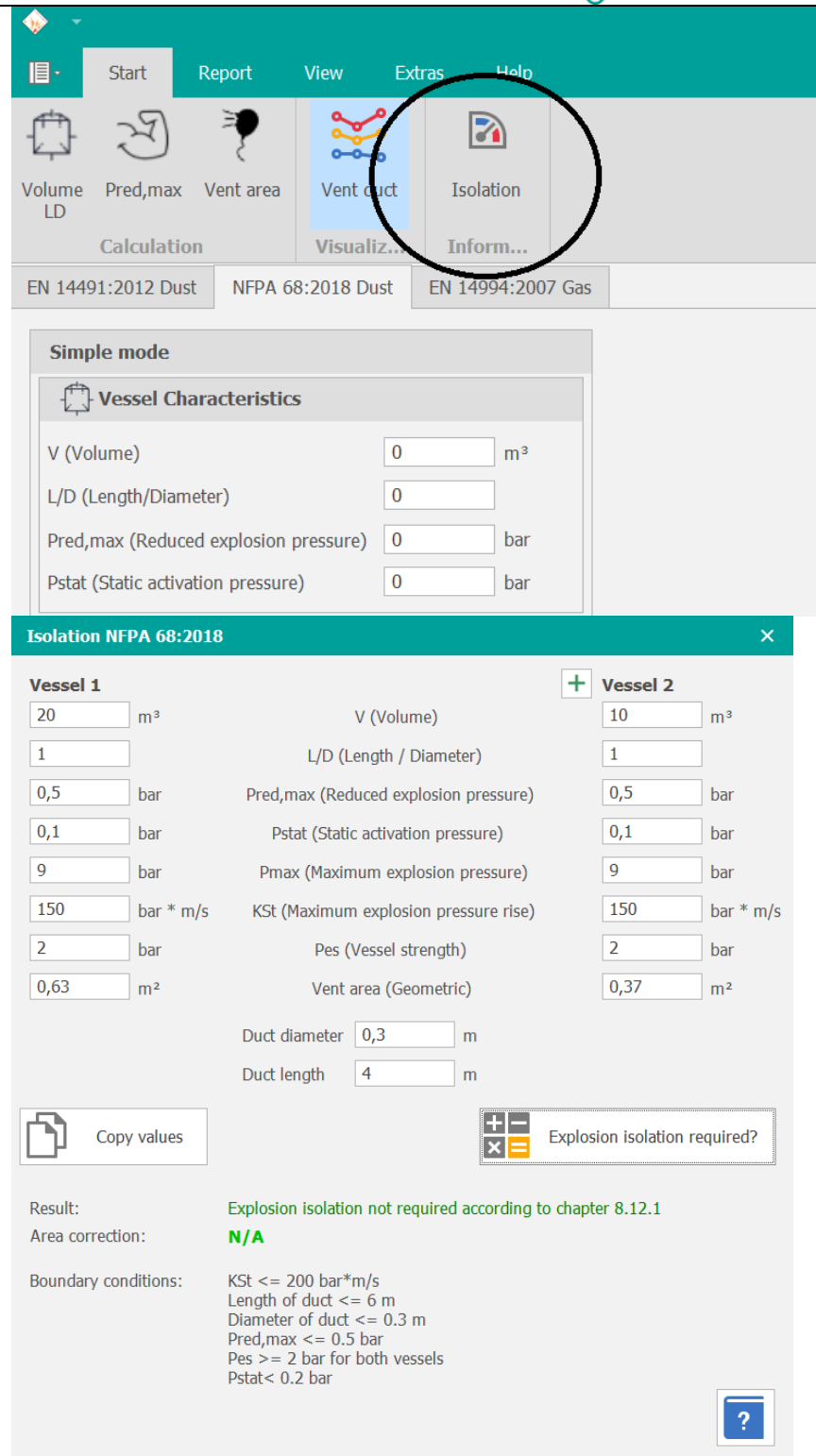
L/D (Length/Diameter) 0

Pred,max (Reduced explosion pressure) 0 bar

Pstat (Static activation pressure) 0 bar

8. Exceptions of explosion isolation

There are certain exceptions where no explosion isolation between vessels is required. This button allows calculating these exceptions. EN and NFPA define different exceptions. To see all relevant exception the user can click on the question mark.



Start **Report** **View** **Extras** **Help**

Volume LD Pred,max Vent area Vent duct Isolation

Calculation Visualiz... Inform...

EN 14491:2012 Dust NFPA 68:2018 Dust EN 14994:2007 Gas

Simple mode

Vessel Characteristics

V (Volume) 0 m³

L/D (Length/Diameter) 0

Pred,max (Reduced explosion pressure) 0 bar

Pstat (Static activation pressure) 0 bar

Isolation NFPA 68:2018

Vessel 1		Vessel 2
20 m ³	V (Volume)	10 m ³
1	L/D (Length / Diameter)	1
0,5 bar	Pred,max (Reduced explosion pressure)	0,5 bar
0,1 bar	Pstat (Static activation pressure)	0,1 bar
9 bar	Pmax (Maximum explosion pressure)	9 bar
150 bar * m/s	KSt (Maximum explosion pressure rise)	150 bar * m/s
2 bar	Pes (Vessel strength)	2 bar
0,63 m ²	Vent area (Geometric)	0,37 m ²
	Duct diameter	0,3 m
	Duct length	4 m

Copy values **Explosion isolation required?**

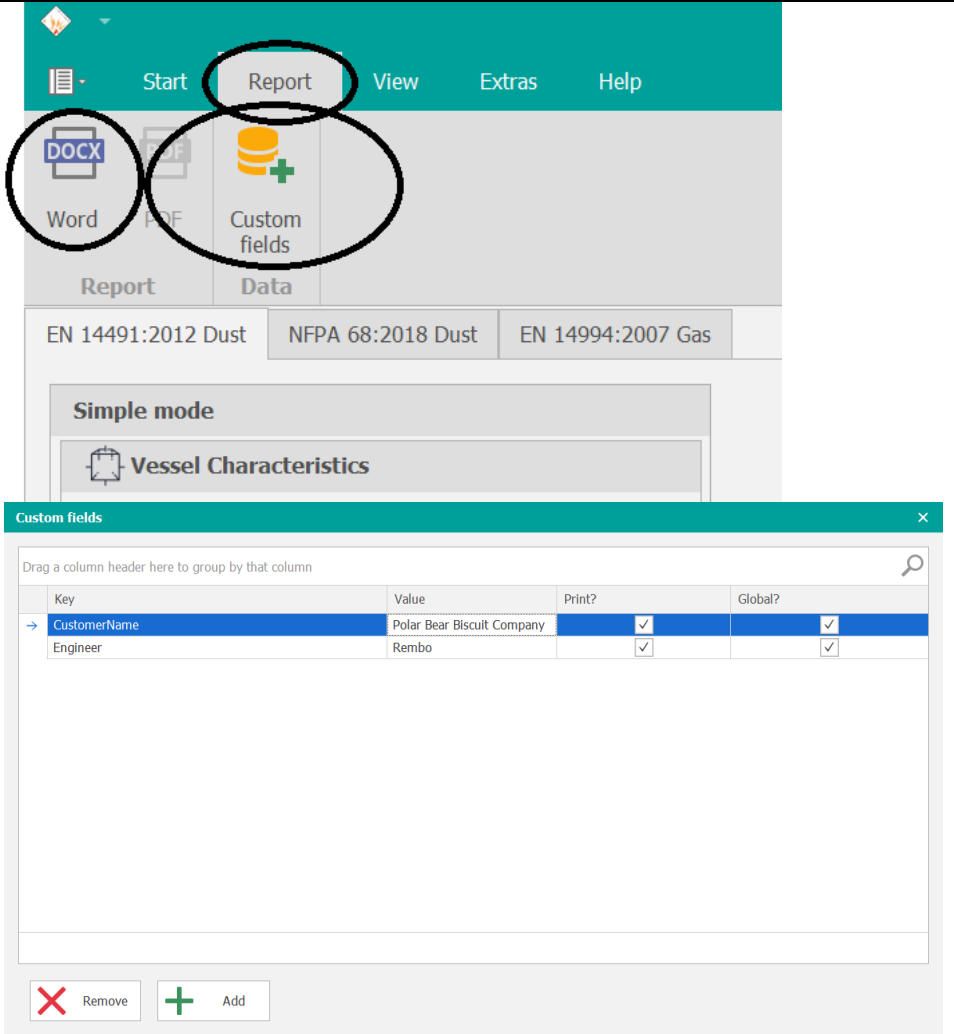
Result: Explosion isolation not required according to chapter 8.12.1

Area correction: N/A

Boundary conditions: KSt <= 200 bar*m/s
Length of duct <= 6 m
Diameter of duct <= 0.3 m
Pred,max <= 0.5 bar
Pes >= 2 bar for both vessels
Pstat < 0.2 bar

?

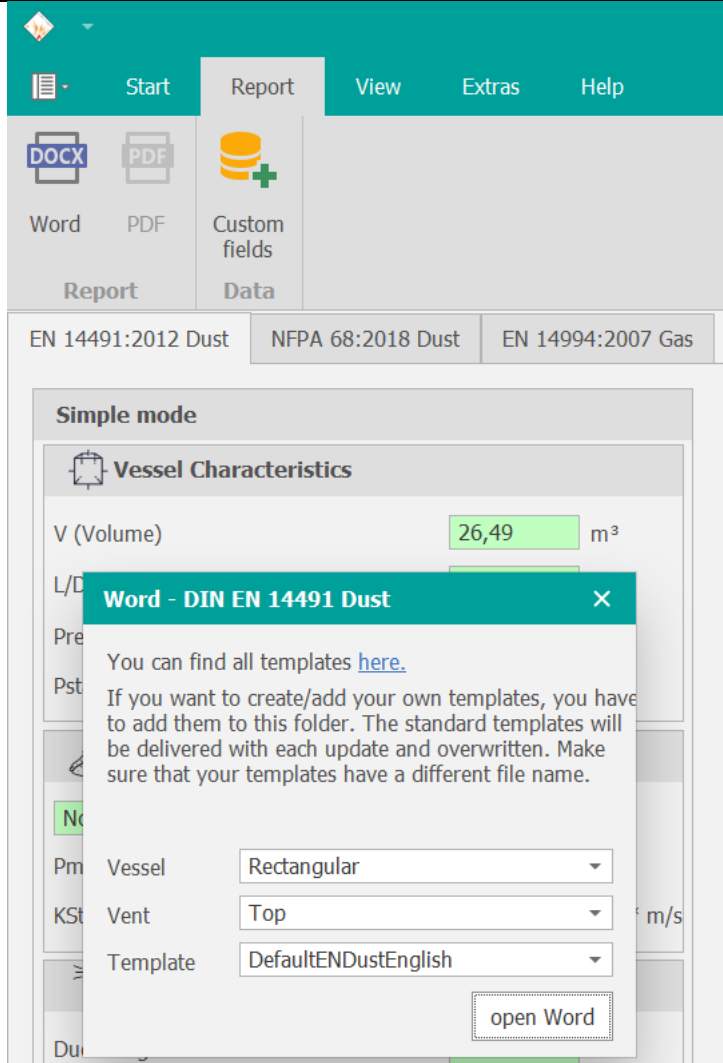
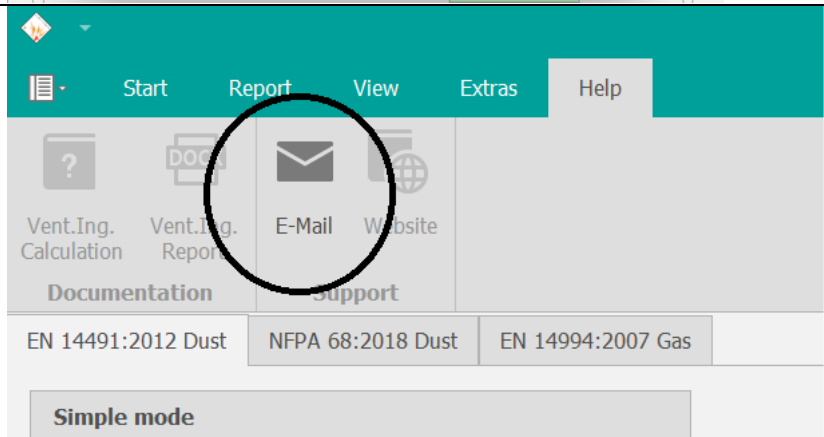
9. Report:
It is possible to print a report giving all used input values. If additional information needs to be added, such as customer name or Engineer custom fields can be added to the word template.



The screenshot shows the VENTuring software interface. The 'Report' menu is highlighted in the top navigation bar. Below it, the 'Word' and 'Custom fields' options are circled. The 'Custom fields' dialog box is open, showing a table with columns for Key, Value, Print?, and Global?.

Key	Value	Print?	Global?
→ CustomerName	Polar Bear Biscuit Company	☒	☒
Engineer	Rembo	☒	☒

At the bottom of the dialog box, there are 'Remove' and 'Add' buttons.

	 The screenshot shows the VENT.ING software interface. The top menu bar includes 'Start', 'Report', 'View', 'Extras', and 'Help'. Below the menu bar, there are icons for 'Word', 'PDF', and 'Custom fields'. The 'Report' menu is open, showing options for 'Word', 'PDF', and 'Custom fields'. A dialog box titled 'Word - DIN EN 14491 Dust' is displayed, containing text about templates and a button to 'open Word'. The background shows the 'Simple mode' section with 'Vessel Characteristics' and input fields for 'V (Volume)' (26,49 m³), 'L/D', 'Pre', 'Pst', 'Vessel' (Rectangular), 'Vent' (Top), and 'Template' (DefaultENDustEnglish).
10. Report a Bug or ask a question. If you want to report a bug or ask a question please use the e-mail button. VENT.ING. will send the background information of the last calculation with your mail in order to see what problem occurred during your calculation.	 The screenshot shows the VENT.ING software interface. The top menu bar includes 'Start', 'Report', 'View', 'Extras', and 'Help'. Below the menu bar, there are icons for 'Vent.Ing. Calculation', 'Vent.Ing. Report', 'E-Mail', and 'Website'. The 'Extras' menu is open, and the 'E-Mail' button is circled. The background shows the 'Simple mode' section with 'Vessel Characteristics' and input fields for 'V (Volume)', 'L/D', 'Pre', 'Pst', 'Vessel', 'Vent', and 'Template'.

	Send mail We automatically send with this email some files that can help us understand your request. The files are free of personal data, don't worry. It will be sent your license file, error log file and a project file. Your name Organization Your email address Subject Bug Message Send me a copy I have read and understood the privacy policy and terms and conditions Send																					
11. Save, open or start new calculation	New Open Save Save As... About Open <table><tr><th>Name</th><th>Path</th><th>Opened</th></tr><tr><td>→ Test REMBE.vnt</td><td>C:\Users\mbi\Desktop\Test REMBE.vnt</td><td>17.05.2021</td></tr></table>	Name	Path	Opened	→ Test REMBE.vnt	C:\Users\mbi\Desktop\Test REMBE.vnt	17.05.2021															
Name	Path	Opened																				
→ Test REMBE.vnt	C:\Users\mbi\Desktop\Test REMBE.vnt	17.05.2021																				
12. Extras: Activation licenses and changing number format. Multiple licenses can be active at one time, depending on which license was purchased. Decimal operator: Normally VENT.iNG. selects the correct decimal operator depending on which layout your computer was set too. If you wish to change this setting, you can do this on options.	Licenses Here you can see all your licenses. You are responsible for backing up and archiving your licenses. A license can only be activated on one device. If you want to use Venting on a new PC, you must first deactivate your licenses and then activate them on the new PC. To make new products accessible, Venting must be restarted after activating a license. Drag a column header here to group by that column <table><tr><th>Order ID</th><th>Key</th><th>Created at</th><th>Expires at</th><th>Product</th><th>Status</th><th>Is active</th></tr><tr><td>→</td><td></td><td>19.05.2021</td><td>20.06.2021</td><td>ALLINONE</td><td>License ok. Checked offline.</td><td>☒</td></tr><tr><td></td><td></td><td>05.05.2021</td><td>06.06.2021</td><td>ALLINONE</td><td>License ok. Checked offline.</td><td>☒</td></tr></table> activate deactivate remove Days before expiration (reminder) 2	Order ID	Key	Created at	Expires at	Product	Status	Is active	→		19.05.2021	20.06.2021	ALLINONE	License ok. Checked offline.	☒			05.05.2021	06.06.2021	ALLINONE	License ok. Checked offline.	☒
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