VESDA REFERENCING APPLICATION NOTE

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Doc. No. 32486_07

Preface

This Application Note details the guidelines for applying reference detection on VESDA detectors to overcome nuisance alarms from external pollutant sources such as bush fire, electric generator and etc.

Related Products

VESDA models except VESDA-E VEA.

Contents

1 Background

The use of outside air, intended for human comfort and for reducing HVAC operating costs, has the potential of introducing outside pollutants (i.e. vehicle / industrial / mining emissions, etc.), into the building which can lead to false (positive) alarms with unwanted consequences.

Aspirating smoke detectors are more susceptible to these nuisance events since they are a hundred times more sensitive than conventional detection systems and utilize cumulative sampling.

To overcome this issue, VESDA detectors employ referencing detection, which is an effective, proven and less costly technique to guard against nuisance alarms from outside pollutants, whilst allowing detectors in the building to maintain sensitive alarm thresholds for the earliest possible warning of a fire.

With the referencing approach, one VESDA detector (Reference Detector) monitors the outside air and produces a reference reading which is subtracted from all VESDA detectors internal to the building space. This allows the internal VESDA detectors to determine if a rise in background level is due to outside pollution or a fire event inside the protected area.

Note!

A Reference Detector can be placed in both the Unfiltered and Filtered Zones if required.

2 VESDA Referencing Network

A VESDA referencing network consists of the Reference Detector and internal detectors connected through VESDAnet (Figure 1). The referencing network can be setup using LCD Programmer, Xtralis VSC / Xtralis VSM4 software. VESDA-E variants are easily expandable up to 100 detectors in a loop/network.

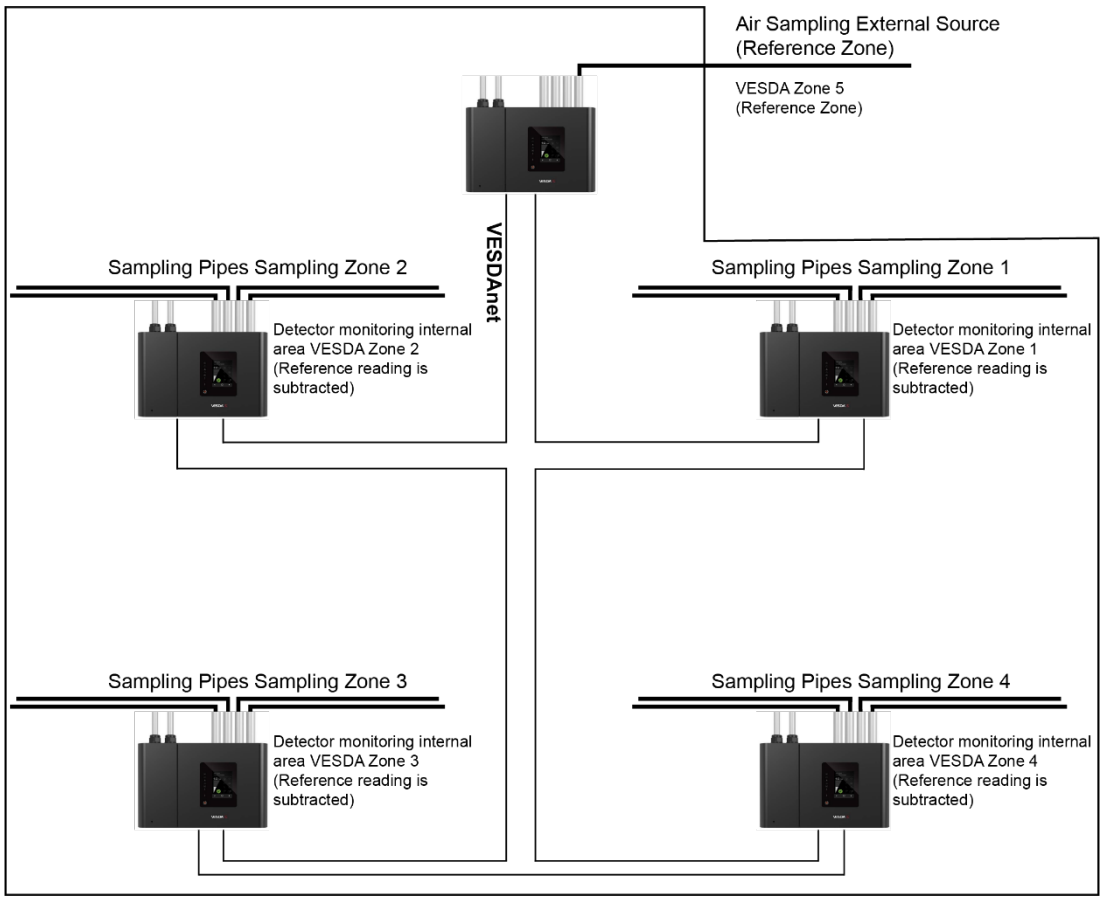


Figure 1: Referencing Network

3 Reference Detector Installation

The Reference Detector sampling must occur where the outside air enters the building. An example of a Reference Detector installation in a packaged HVAC unit is shown in Figure 2. It is noted that the sampling pipe is placed downstream the filtration system with sampling holes oriented 30˚ to the incoming air and with the exhaust air returned to the same area.

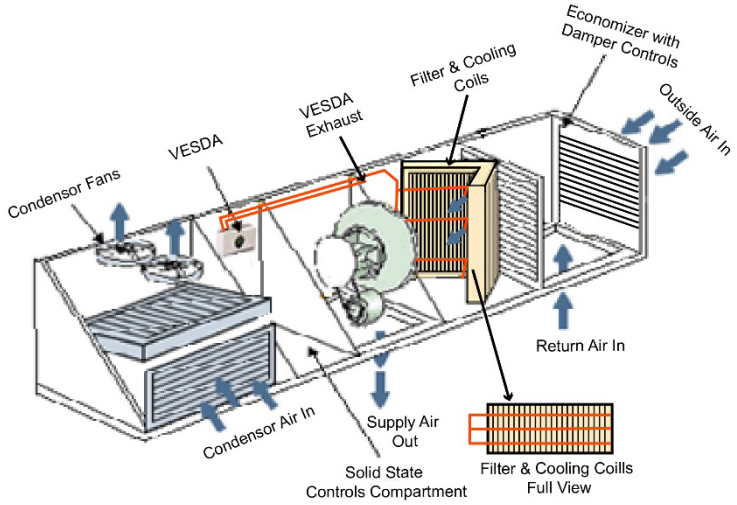


Figure 2: Reference Detector sampling arrangement – packaged HVAC

For a building HVAC system, Reference Detector sampling occurs within the ductwork, downstream the outside air intake damper and before the return air junction (Figure 3). The distance between the damper and Reference Detector sampling hole(s) should be kept greater than 500mm. More details of pipe network setup should follow the guidelines in “VESDA Application Note Ducts (Document No.10760)”.

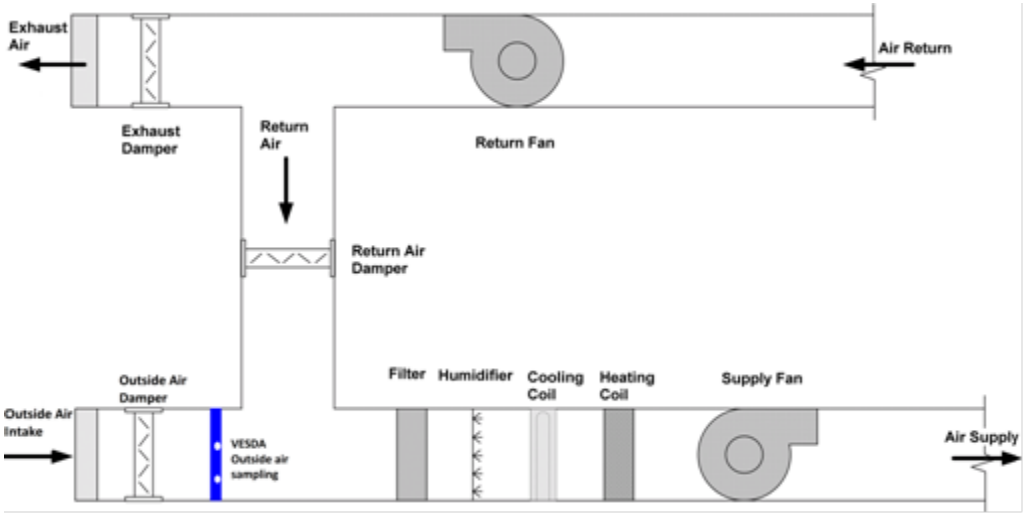


Figure 3: Reference Detector sampling arrangement – building HVAC

Note!

A Reference Detector can also be configured to report alarms should this be required i.e. close intake dampers when excessive outside pollutants are detected.

4 VESDA Referencing Network Setup with VSC/VSM

When using the Xtralis VSC/VSM software to set up the VESDA referencing network, three parameters must be defined:

- Reference Detector – The Reference Detector zone should not be 0 or 255.
- Dilution factor (%) – 100% by default.
- Delay (minutes) – 2 minutes by default.

The VSC Device View shown in Figure 4 will be used as an example for a VESDA referencing network setup. In this example, the VEP detector is the Reference Detector with VES, VEU and VLF as internal detectors.

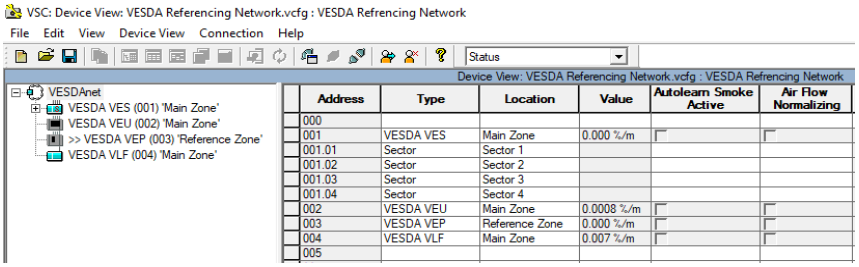


Figure 4: VESDA Referencing Network – VSC Device View

1. Assigning Reference Detector: Right click the internal detector intended to use the reference signal (i.e. VEU).
2. Select **Edit** to display the dialog box (Figure 5).
3. Select the **Referencing** tab.

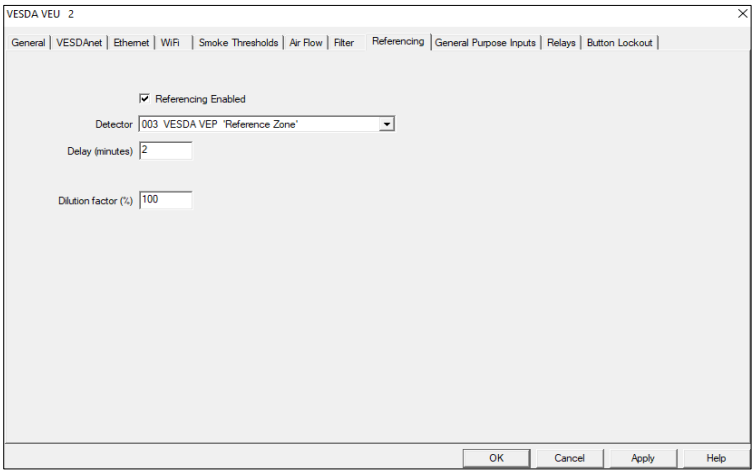


Figure 5: VSC dialog box for referencing setup

4. Check the **Referencing Enabled** check box.

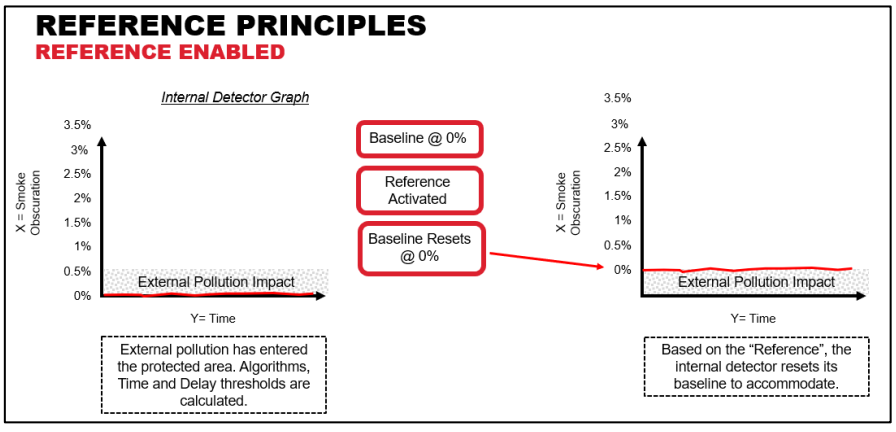


Figure 6: Reference enabled

5. From the **Detector** drop down menu choose the VEP detector as the Reference Detector.

Notes!

- A VES detector cannot be used as a Reference Detector.
- A single internal detector cannot use multiple reference detectors.
- For all VESDA detectors, the maximum subtracted value is half their Fire 1 setting.

6. After testing has completed, set the *Dilution Factor (%)*: In the Dilution Factor (%) text box (Figure 5), enter a value between 1 and 100% – default is 100%.
7. After testing has completed, set the Delay (minutes): In the Delay (minutes) text box (Figure 5), enter a value between 0 and 15 minutes – default is 2 minutes.

5 Perform Reference Smoke Test

Once the VESDAnet has been set up and is fault free, the following test procedure can begin, as shown in the below example, where two detectors (zones) are used for the reference smoke test.

Zone (2): Internal Detector
Zone (3): Reference Detector

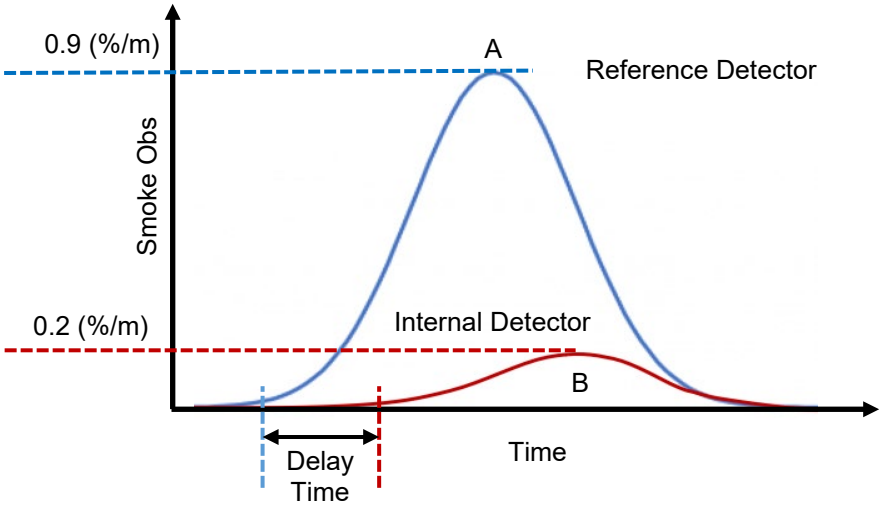
Step	Action
1	Ensure that the fire system is in the Commissioning mode; disable fire panel; outputs etc.
2	Ensure that both Reference Zone (3) and Internal detector(s) Zone (2) have **"Reference Disabled"** on VSC/VSM software.
3	Set both Reference Zone (3) and Internal detector(s) Zone (2) Fire 1 Alarm threshold to the same smoke level (e.g. default 0.2%/m).
4	Ensure that the protected area is operating normally (e.g. HVAC system is running as expected) or at a determined average setting).
5	Conduct Reference Smoke Test at the **reference detector Zone (3)** air inlet to achieve at least **0.2%/m peak** smoke reading regardless number of hole and sampling location.
6	Monitor smoke level and wait for smoke level to peak on Internal detector(s).
7	Download Event Logs of Reference Zone (3) and Internal detector(s) Zone (2) on VSC/VSM to review smoke trends.
8	Remove the smoke and return to normal operation.
9	Calculate the time Delay and Dilution for Reference Zone (3) and Internal detector(s) Zone (2). Refer to section 6 Calculate Dilution Factor and Time Delay.

Notes!

- All relays and Alarm thresholds are expected to operate normally with new Reference parameters.
- It's recommended to use VSM4 software for logging smoke data to prevent timeout while testing in progress.

6 Calculate Dilution Factor and Time Delay

Figure 7: Calculate Dilution Factor and Time Delay



Step	Action
1	Read the smoke peak values for both Reference Detector (A) Zone (3) and Internal detectors (B) Zone (2) from smoke trend graph on VSC/VSM software
2	Reference Dilution Factor (%) = B (zone 3) /A (Zone 2); in this example 0.2/0.9 = 22%. (if reference smoke reading is lower than internal detectors, than use 100% dilution as setting).
3	Determine the “Delay Time” between A (Zone 2) and B (Zone 3) (when each detector first detects smoke) for all Internal Detectors. ***Note:*** *If Delay Time is less than 1 minute, set Reference Delay to “1” minute.*
4	Set Internal Detector(s) Zone (2) to “**Reference Enabled**” and select a smoke tested detector to be Reference Zone (3)
5	Enter Dilution Factor and Delay Time for Internal detector(s) Zone (2) in VSC/VSM.

Notes!

- For each internal VESDA unit, calculate the below Dilution Factor and Time Delay and complete the commissioning form in Appendix A.
- Consider a time delay on the internal VESDA unit to compensate for the Transport Time of the Reference Detector.

7 Reference Commissioning

It is important to log Reference Commissioning data as part of the standard commissioning process to calculate the reference settings and to keep as part of the commissioning handover. We recommend that the VESDA event logs (*.vevt) are also captured.

The commissioning form should capture the following data:

- Reference Detector(s) VESDAnet Zone number
- Referenced Detector(s) VESDAnet Zone number (and associated Reference Detector)
- Smoke Peaks of all detectors from Reference Smoke Test
- Calculated Dilution Factor
- Calculated Reference Delay (time between smoke reading of Reference and Referenced detector)
- Reference Delay Setting per detector (in minutes)

Refer to Appendix A for VESDA Reference Commissioning Form example.

8 Further Support

Contact an Xtralis office or distributor for further information.

Appendix A - VESDA Reference Commissioning Form

VESDA Reference Commissioning Details

Testing Date									
Site Name									
ASPIRE File Name									
Reference Unit Type									
No# of Units on Network									
Type	**VES**		**VEU**		**VEP**		**VLF**		**VLI**	
Smoke Test Method	**Type**					**Size/Qty (g)**				

Smoke Test Checks

Step	Action	Status
1	Ensure that the fire system is in the Commissioning Mode (disable fire panel; outputs etc).	
2	Ensure that both Reference and Internal detector(s) have “Reference Disabled” on VSC/VSM software.	
3	Set both Reference and Internal detector(s) Fire 1 Alarm threshold to the same smoke level (e.g. default 0.2%/m).	
4	Ensure that the protected area is operating normally (e.g. HVAC system is running as expected).	
5	Conduct Reference Smoke Test at air inlet where reference detector is located (e.g. 5g or 10g smoke pellet or alternate).	
6	Monitor smoke level and wait for smoke level to peak on all Internal detector(s).	
7	Download Event Logs of reference and internal detector(s) on VSC/VSM to review smoke trends.	
8	Remove the smoke and return to normal operation.	

Note: Repeat the test and re-capture data should the environmental / installation conditions change.

Record and Calculate Factors (Time and Dilution)

Unit	VESDA Zone	Start Test (Seconds)	Smoke Registration (Time)	Peak Value (%)	Time Delay Setting Applied	Dilution (%) Setting Applied
Reference						
Internal						
Internal						
Internal						
Internal						
Internal						
Internal						
Internal						
Internal						
Internal						

VESDA Smoke Graph (All Units During Test)

Add Smoke Event Graph Capturing Smoke Peak Levels and Time For all Units.

Saved Files

Task	File Name	Status
Save copy of event logs (.vevt) for all units		Yes / No
Save copy of configuration files (.vcfg) for all units		Yes / No
Save copy of ASPIRE files for all units		Yes / No

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