



Vanguard WirelessHART® Fixed Point Gas Detector

IEC 60079-29-1 User Integration Guide

The purpose of this document is to describe practices the user must follow to be compliant with IEC 60079-29-1 guidelines.

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The Vanguard gas detector complies with the IEC 60079-29-1 standard when set up in accordance with the steps documented in this guide. Since the standard demands a safe communications channel, both the client (receiving end) and host (Vanguard) must be considered. This document outlines the requirements for construction, setup and commissioning of the Client system. For diagrams and instructions on safe use, installation and operation of the device, please reference the Vanguard Installation Manual for details.

Other documents referenced in this guide:



Installation and
Operation
Manual
(IM_TCD60)



Datasheet
(TCD-B)



Annex A
(IM_TCD_ANNEX_A)

The client system must suppress the indicated value if the primary variable (PV) out of range bit is set, or if the calibration mode bit is set. This ensures that the user/process controller does not see a value that may be incorrect. The user/process controller should not see any value in these cases, instead an error or notification should be displayed.

The client system must provide a watchdog timer that ensures the device is bursting safely in accordance with the Process Safety Time. This safety timer must be sourced from a separate clock than from the control processing unit (CPU).

The threshold value used to set the safety time for the watchdog timer must be protected by a cyclic redundancy check (CRC) and cannot be modified during runtime. The client system must be capable of detecting and annunciating the transmission errors outlined in 4.2.9.5 using the CRC and Nonce counter provided in the SafeHART™ packets.



AS A CORE COMMUNICATIONS PROTOCOL, THE VANGUARD USES SAFEHART AS DEFINED IN HART VERSION 7.9. USING A VANGUARD IN REGULAR WIRELESSHART MODE WILL NOT RESULT IN AN IEC 60079-29-1 COMPLIANT SYSTEM.

Part I - Construction

The client system must be constructed/programmed to comply with section 4.2.9 of the IEC 60079-29-1 standard. This also includes 4.2.9.6. The client software must be run on a system that includes self-test routines.

The client system must make the gas concentration values visible to the user. The resolution of this readout must be adequate to demonstrate compliance to IEC 60079-29-1.

The WirelessHART gateway and client system may or may not be co-located. If they are not co-located, the gateway may not need to be SafeHART compliant/capable. Since the gateway forwards the safety data to the client system where the SafeHART data is decoded, only the client needs to meet the applicable sections in the IEC standard. All parameter memory including the unique identifiers (UID), burst rates, and diagnostic info about each device must be protected by a 32 bit CRC and checked upon each use to ensure they are not modified during runtime.



ACCESS TO THE CLIENT MUST BE PASSWORD PROTECTED.

The user is responsible for the behavior of the system should an unsafe condition occur. The Vanguard is capable of conveying enough information about its state to fulfil the requirements of the IEC standard. Much of this information is contained in the extended status bytes. Additional information about the meaning of these bytes can be found in our Annex document.

Part II - Setup

During system setup, the user must make several decisions that include:

1 THE SENSOR TYPE. Select the sensor(s) that are applicable to the user's process safety. UE sells several sensors for monitoring different gases. Refer to datasheet for details. New sensors may be added in the future. Compliant sensors are listed in Figure 1.

2 PROCESS SAFETY TIME. This is the time in which the client system should realize a transmission error or unsafe condition has occurred and either notify the user or safe state the system. The IEC standard dictates that this should not be more than the claimed $t(90)+33\%$ of the SYSTEM so it is the responsibility of the user to choose this time and set up in the client. The $t(90)$ times for all of the compliant UE sensors are listed in Figure 1. These times shall be considered the minimum that a Vanguard based system can provide.

For example, our Methane sensor has a $t(90)$ time of 30 seconds. Its minimum process safety time is therefore 40 seconds. This may not be realized in practice due to a variety of factors including latency, system scan time, rate of gas application, prevention of false trips, or additional process constraints.



UE RECOMMENDS STARTING WITH A PROCESS SAFETY TIME OF 3X THE $t(90)$ OF THE SENSOR AS A STARTING POINT TOWARDS DETERMINATION OF THE ACTUAL SYSTEM SAFETY TIME.

3 BURSTS AND BURST RATES. These are the periodic transmissions sent from the Vanguard to the client. In order to meet the IEC 60079-29-1 standard, the user must send as a minimum, the process variable (gas concentration). Other bursts are optional. The process variable burst must occur more frequently than the Process Safety Time. It is recommended that these bursts be several times faster than the Process Safety Time. This provides some fault tolerance to the system, which can limit false alarms.

	Methane (CH ₄)	Propane (C ₃ H ₈)
Sensor Type	NDIR	NDIR
Recommended Storage Temp	72 °F (22 °C) within operating temperature required	
Storage Life	5 years	5 years
Service Life ^[i]	10 years	10 years
Min Op. Temp	-4 °F (-20 °C)	-4 °F (-20 °C)
Max Op. Temp	140 °F (60 °C)	140 °F (60 °C)
Range	0 to 100% LEL	0 to 100% LEL
Resolution	1% LEL	1% LEL
Accuracy ^[ii]	±2% LEL or ±5% of indication ^[iii]	±2% LEL or ±5% of indication ^[iii]
Response Time ^[iv] $t(90)$	30 sec	30 sec
Stabilization Time	2 min	2 min
IEC 60079-1 Certified	YES	YES

[i] Expected operational life varies with environmental conditions and gas exposure

[ii] At standard conditions: 68 °F (20 °C) and 1.0 atm. Accuracy may vary with frequency, accuracy of calibration, and environmental conditions

[iii] Whichever is greater

[iv] Excludes latency due to burst rate

Figure 1: $t(90)$ Response times for available UE sensors

Part III - Commissioning

Once the system setup is complete, the user must commission the Vanguard in accordance with this document in order for the system to be considered IEC 60079-29-1 compliant. These commissioning steps ensure that the correct devices are commissioned properly and that the commissioning information cannot be modified during runtime. Some of the steps require calibration / adjustment of the process reading. These operating instructions, application of test gases and use of the field calibration kit can be found in the Vanguard Installation Manual.

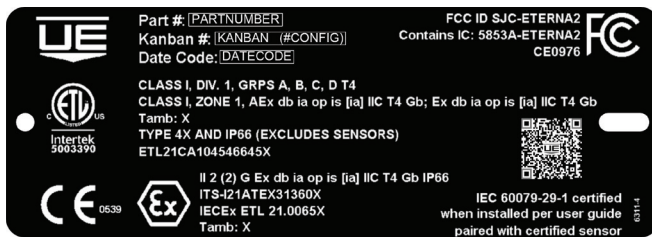


Figure 2

To safely commission the device the user must take the following steps:

- 1 Retrieve the device from the field. The user needs physical access to the device.
- 2 Using a Handheld HART communicator device or HART modem, verify that the gas sensor parameters match those desired for the selected sensor.
- 3 Calibrate the sensor using the instructions in the Installation and Operation manual.
- 4 After calibration, remove the calibration gas and wait 90 seconds. Ensure that the reading on the Vanguard returns to near 0. Allowable error is determined by the user.
- 5 Re-attach the calibration gas and wait another 90 seconds.
- 6 Ensure the gas concentration on the display matches the calibration gas. Allowable error is determined by the user.
- 7 If either the zero value or cal gas value are incorrect, return to step 3 and attempt the calibration again.
- 8 Using a communicator device, enter the gateway ID and Join Key into the Vanguard.
- 9 Wait for the Vanguard to join the network.
- 10 Using the client system software, read the UID of the device once it comes online. This can be queried using the client graphical user interface (GUI) or with HART command 0. Record this value.
- 11 With the handheld communicator query the UID of the device again. Record this value.
- 12 Read the Kanban # on the device label (See Figure 2) and convert this to a hexadecimal number. Record this value.
- 13 Confirm that the UID's from steps 4, 5 and 6 match. This ensures that the correct device is communicating with the client.
- 14 Using the handheld communicator or the client, set up the bursts as described in the setup phase. Ensure that both PV bursts are faster than the process safety time. Do not enable the bursts yet.
- 15 Set up the process safety time in the client system if possible. Some clients may assume the process safety time to be equal to the burst rate.
- 16 Using the client GUI or SafeHART command 109, start the bursts.
- 17 Ensure that the burst data is visible to the client and there are no transmission errors.
- 18 Using the handheld communicator, apply a write protection lock using HART command 549. Remember these login details; there is no way to modify the device parameters unless you unlock it with the same details.
- 19 Ensure that the device is bursting at the correct rate. The client should provide timestamps for incoming bursts/updates.
- 20 The device should now be communicating safely and can now be deployed to the field.
- 21 The device may drop off the network or miss bursts while the user is moving it into position. The client alarms/output may need to be silenced or ignored during this period or reset after the Vanguard reconnects.

Part IV - Other considerations

Whenever modifying device parameters (burst rates, info, etc.) always read back the data to ensure it has been written properly.



IF THE DEVICE IS LOCKED, IT WILL NOT SAVE CHANGES TO CALIBRATION DATA.

The calibration is also protected with the write protection lock. If an unauthorized person attempts to calibrate the sensor with different calibration gases, the value will not change if the device is locked. If it is locked, the user will first have to use command 549 to unlock the device, then calibrate, and use 548 to lock it again.

Alternatively, the user can provide other security measures to ensure that unauthorized users are not allowed access to the device. The user may

then skip step 18 and never lock the device. This would be more convenient for calibration and if changes are required after commissioning.



THE BATTERY SHOULD BE REPLACED WHEN IT DROPS TO 6.0V FOR SAFETY APPLICATIONS.

The battery voltage is displayed on the device itself. It is also available as a secondary variable included in command 9.

In addition, the extended status byte can be read using command 48. If bit 2 of the extended status byte is high, the battery voltage has dipped below its lower limit and the client system should indicate this to the user.



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