

USER MANUAL

H2 Fill Controller

PO64Z-0001-00



PLEASE READ THIS MANUAL BEFORE USING THE H2 FILL CONTROLLER

MANUAL ISSUE 1.1



View this product on our website at www.viritech.co.uk/h2fill

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Introduction:

The Viritech H2 Fill Controller provides an easy to integrate solution for OEMs that require SAE standard filling using IR communications at the filler nozzle. SAE J2799 compliant with support for multiple pressure vessels and additional sensors beyond SAE compliance for advanced fill control and management.

The fill controller is suitable for any vehicle which needs to be filled with gaseous hydrogen via an SAE standard filling station. It supports 350bar and 700bar applications. B-Sample units support USB comms for configuration via the Viritech H2 Software tool whilst C-Sample units are fixed to the OEMs specification at build.

Important Safety Information:

The fill controller is designed for vehicle applications only where the vehicle hydrogen system conforms to SAE standards and relevant ECE/Homologation standards e.g. Reg134 compliant pressure vessels and where an SAE standard filling station / nozzle is used to fill the vehicle. Operation in architectures which differ from the SAE standard or with non homologated pressure vessels should be approached with caution and with advice from Viritech.



High pressure gas can be extremely dangerous, you should observe all relevant and sensible precautions when filling a vehicle with high pressure hydrogen in a prototype environment. Contact your relevant safety agency for advice on working with and handling high pressure gas.

Technical Information

Supply Voltage: The H2 Fill controller is designed to operate with a DC voltage supply of 8V – 28V covering all conventional 12V and 24V electrical systems present in road vehicles.

H2 Fill Controller Technical Specifications:

SAE Standard	J2799
Filler Communication	External IR/IRDA
Temp Sensor Inputs	20 X NTC
Pressure Sensor Inputs	2 X Analogue
Check Valve Drivers	2 X
Unit Connector	2 X 24 Wat Delphi Sicma
Mating Connector Available	Yes
Configuration Comms	B-Sample Via USB
OEM Branding Available	Yes
OEM Part Numbering	Yes
Vehicle Communications	CANBus
Local Market Manufacturing Option	Yes
ASIL Compliance	ASIL B
IP Rating	IP67
Available Volumes	1 to 000's
Length Excluding Connector	130 MM
Width Between Mountings	125 MM
Height	32.5 MM
Weight	490 Grams

Connector Loom Side Mating Half And Tooling

Connector 1 Grey SICMA: Part Number - 211PC249S8018

Connector 2 Black SICMA: Part Number - 211PC249S0018

2.8mm female crimp: SICMA-3 280 – Part Number - 211CC3S2160

1.5mm female crimp: SICMA-3 150 – Part Number - 211CC2S2160P

Crimp Tool: Part Number - 65201521-M

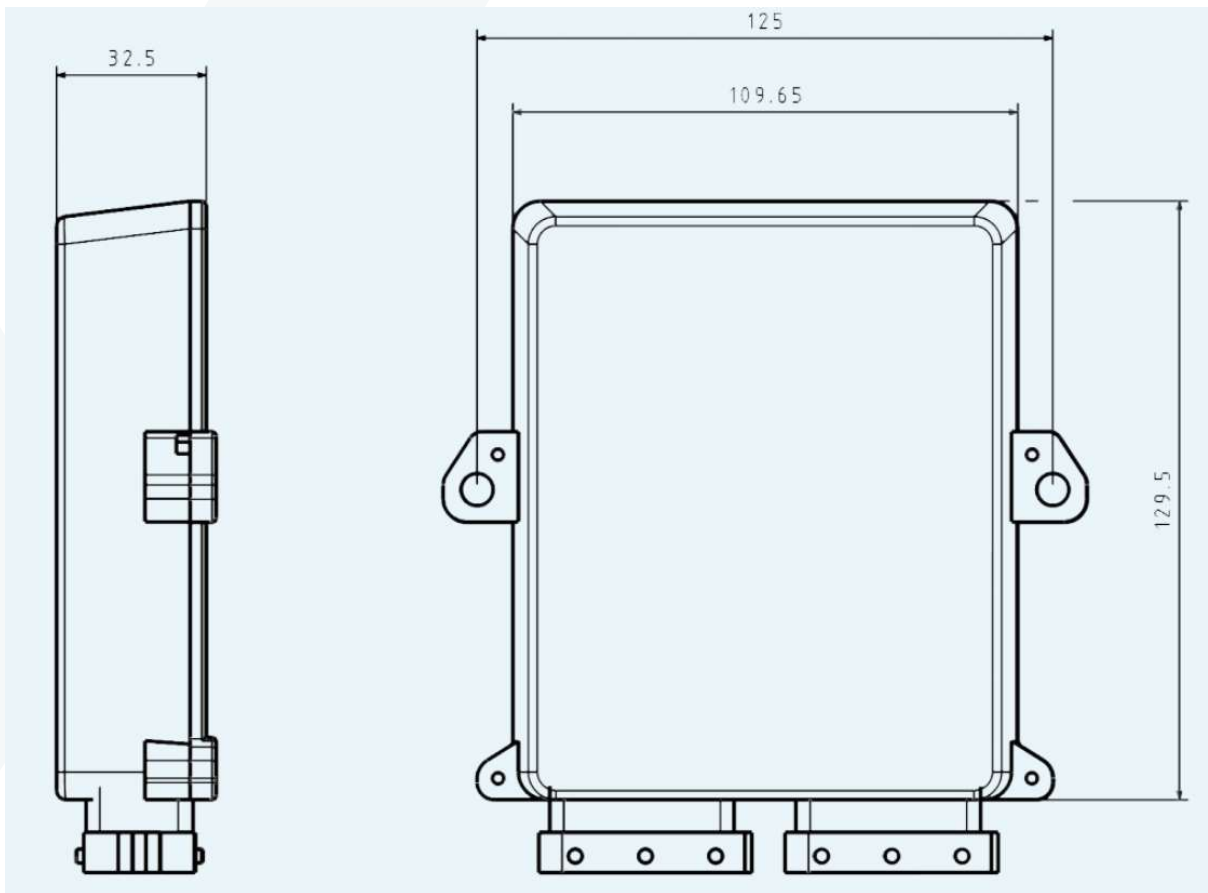
Connector 1 Pin Out:

Connector	<i>HCCPHPE2BKA90F</i>	Mating	211PC249S0018
Colour	Black		
Pin Count	24		
Pin Number	Description	Range	
A1	VBatt In	6-60V	
A2	VBatt In	6-60V	
A3	Control Valve 2 Lowside	8Amps	
A4	Control Valve 2 Highside	8Amps	
A5	5V sensor output	5V +- 1%	
A6	Lowside 1	8Amps	
A7	Control Valve 1 Lowside	8Amps	
A8	Control Valve 1 Highside	8Amps	
B1	Analogue/Digital Input 5	0-5V	
B2	VUSB	USB 5V Input	
B3	CAN H	CAN 2.0B H	
B4	USB D+		
B5	H2 Pressure Sensor 2	0-5V	
B6	J2799 Link Tx		
B7	Analogue/Digital Input 2	0-5V	
B8	Ground		
C1	Analogue/Digital Input 4	0-5V	
C2	USB D-		
C3	CAN L	CAN 2.0B L	
C4	Analogue/Digital Input 3	0-5V	
C5	J2799 Link Rx		
C6	Analogue/Digital Input 1	0-5V	
C7	H2 Pressure Sensor 2	0-5V	
C8	Ground		

Connector 2 Pin Out:

Connector	<i>HCCPHE24GYB90F</i>	Mating	211PC249S8018
Colour	Grey		
Pin Count	24		
Pin Number	Description	Range	
A1	5V Thermistor Pull up Chain B	5V with 10K pull up	
A2	Thermistor A6 Input		
A3	Thermistor A5 Input		
A4	Thermistor A8 Input		
A5	Thermistor B4 Input		
A6	Thermistor B6 Input		
A7	Thermistor B5 Input		
A8	Thermistor B7 Input		
B1	5V Thermistor Pull up Chain A	5V with 10K pull up	
B2	Thermistor A1 Input		
B3	Thermistor A3 Input		
B4	Thermistor A7 Input		
B5	Thermistor B1 Input		
B6	Thermistor B3 Input		
B7	Thermistor B10 Input		
B8	Thermistor B9 Input		
C1	Thermistor A2 Input		
C2	Thermistor A4 Input		
C3	Thermistor A10 Input		
C4	Thermistor A9 Input		
C5	Thermistor B2 Input		
C6	NC		
C7	NC		
C8	Thermistor B8 Input		

External Dimensions:



Installation Notes:

Location: The H2 Fill controller should be mounted in a location away from direct water and contaminating spray and located in such a way that it is not subjected to high levels of radiated heat from cooling systems, exhaust systems and similar.

Mounting: In high vibration applications the H2 Fill controller should be mounted with anti-vibration mounts.

Power Supply: The H2 Fill controller supports voltages from 8V to 24V, the power supply to the H2 fill controller should be configured so the unit is powered when filling is required i.e. it is unlikely that an ignition switched power supply is suitable and thought should be given to how the filling system is powered in key off scenarios.

CAN-Bus Termination: The H2 Fill controller has software defined CAN-Bus terminated as standard, please ensure this is configured to suit the CAN-Bus termination requirements of the vehicle bus.

Configuring The Controller:

The H2 Fill controller is configured using the PC setup tool. This is a windows-based application and is compatible with Windows 10 and Windows 11 for X86/X64, the tool is not supported on versions of Windows for ARM/RISC processors.

When the controller is connected via an available USB port, the Setup Tool will automatically connect showing details of the device connected as shown below on the splash screen:



Once connected, the setup tool shows a new screen displaying three tabs.

- Calibration
- Live Values
- Event Log

If the controller is unpowered or disconnected from the PC running the Setup Tool, the screen will revert back to the splash screen showing a message highlighting the controller's status as shown below:

Not communicating:



Not Connected:



Calibration Tab:

The calibration tab is used to configure the H2 Fill controller with the required parameters for its specific application. The screen is made up of several text boxes and check boxes used to change each of the available settings.

The screenshot shows the 'Calibration' tab of the 'H2 Fill Tool V1.2' software. The interface is organized into several functional sections:

- Version:** Displays 'GUI Version: 1.2' and 'Software Version: 1.1' in text boxes.
- Temperature Input Selection:** Features two rows of checkboxes labeled 'Chain 1' and 'Chain 2', each with columns numbered 1 through 10. Chain 1 has a checkmark in column 6, and Chain 2 has a checkmark in column 4.
- CAN Communications:** Includes a 'Baud Rate' dropdown menu set to '1Meg' and a checked checkbox for 'Enable CAN Termination'.
- Hydrogen Tank:** Contains 'Tank Volume: 900 (L)', 'Tank Style: H35', and 'Max Tank Temperature: 90.0 - 95.0 (C) (Hysteresis)'.
- Pressure Sensors:** Has checkboxes for 'Enable Pressure Sensor 1' (checked) and 'Enable Pressure Sensor 2' (unchecked), and a 'Max Pressure Difference Between Sensors: 2 (bar)'.
- Pressure Sensor 1:** Lists 'Min Sensor Voltage: 0.280 (V)', 'Max Sensor Voltage: 3.810 (V)', 'Min Sensor Pressure: 0 (bar)', 'Max Sensor Pressure: 500 (bar)', and 'Use Voltage Limits' (checked). It also includes 'Min Voltage Limit: 0.280 (V)' and 'Max Voltage Limit: 3.810 (V)'.
- Pressure Sensor 2:** Lists 'Min Sensor Voltage: 0.280 (V)', 'Max Sensor Voltage: 3.810 (V)', 'Min Sensor Pressure: 0 (bar)', 'Max Sensor Pressure: 500 (bar)', and 'Use Voltage Limits' (unchecked). It also includes 'Min Voltage Limit: 0.280 (V)' and 'Max Voltage Limit: 3.810 (V)'.
- Read / Write Control:** Contains two buttons: 'Read From Controller' and 'Save To Controller'.

The configuration settings are logically grouped in boxes relating to their functionality. Each function is explained below.

Version: This section shows both the Setup Tool (GUI) version and the software version. These values cannot be changed, but provide useful information on compatibility and revision history.

CAN Communication: The CAN communication settings relate to the CAN vehicle interface which should be set to match the existing vehicle CAN network. The “Baud Rate” defines the data transfer speed of communication measured in “bits per second”. In most automotive systems, this is usually set to 500bps. The controller also has the option of a selectable terminating resistor. Networks should have one 120Ohm resistor at each end of the bus. If the controller is added to an existing network, the CAN terminator can be selected if required.

Temperature Input Selection: The H2 Fill Controller has twenty available temperature inputs. These inputs are used to read the minimum, maximum and the average temperature of the tank while filling. It is important to de-select any temperature inputs that are not used. The required inputs can be selected or deselected by clicking the individual check boxes for each of the corresponding inputs.

Hydrogen Tank Settings: These settings are used to configure the tank type and size. This information is sent to the filling system in order to provide the correct filling requirements for the vehicle. These settings are also used to calculate the percentage fill level of the tank calculated from the volume and pressure within the tank. The maximum tank pressure settings allow the controller to inhibit the filling request signal if the recorded tank pressure exceeds the configured level. The two values allow a hysteresis between the setting and clearing of the inhibit which is used to latch the state to prevent it fluctuating due to noise or errors in the input signal.

Pressure Sensor Selection: The H2 Fill controller is equipped with 2 pressure sensors. This allows either one or both to be selected. The benefit to using both sensors is that it gives an added level of redundancy. The output value from the controller is averaged when both are selected. If one sensor fails or mis-reads, this would cause a pressure difference between the sensors, causing the controller to enter a fault mode, inhibiting the fill. The expectable difference in sensor values is configured in this section which is available if both sensors are enabled via the check boxes.

Pressure Sensor Settings: Each pressure sensor is configurable with the minimum and maximum pressure range defined by the sensor used and it’s subsequent output voltages for those limits. Most common sensors have a range of 0.5V to 4.5V which proportionally relate to the output range of the sensor. The calculated pressure is assumed to be a linear interpolation between these limits. A minimum and maximum acceptable voltage range can also be enabled and configured to capture when the controller is receiving an invalid or faulty voltage input. When the sensor falls outside of this configured window, the fill request is inhibited.

Read and Write Buttons: When the controller initially connects to the setup tool, the controller’s calibration is loaded onto the screen showing the current working settings. Any parameters changed will be highlighted in yellow to show that they differ from the controllers stored settings. If an invalid entry is entered that cannot be sent to the controller, the entry will be highlighted in red as shown below:

Modified value:

Invalid Value:

The modified configuration can either be sent and written to the controller or cleared by reading the controller settings. The “Read Controller Settings” button requests an update from the controller, setting all the modified yellow parameters back to the original settings. When the “Write Controller Settings” button is pressed, the new configuration is sent to the controller. The values shown on the screen are automatically cleared and a request to read the new settings is sent to update the displayed values. This ensures the user that the values they see on the screen have been written successfully to the controller.

Live Data

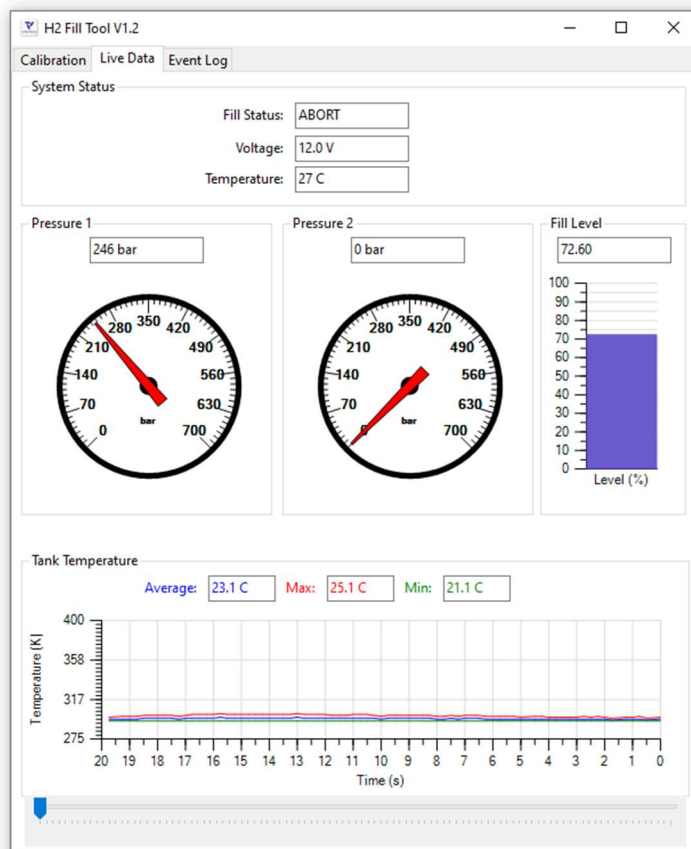
The “Live Data” tab shows the running status of the connected H2 Fill Controller. This screen can be used for both ensuring the calibration is set correctly as well as to test the connected temperature and pressure sensors used by the controller.

System Status: This area shows the operating state transmitted to the filling system. The controllers system supply voltage and internal temperature is also displayed.

Pressure 1 / 2: The two pressure inputs are displayed graphically on a gauge, illustrating their calculated values.

Fill Level: The histogram graph shows the calculated fill level of the tank as a percentage. This value is calculated based on the configured tank type, tank volume and received tank pressure.

Tank Temperature: The graph at the bottom of the screen displays a temperature-time graph showing the minimum, maximum and average tank temperature in degC. Note: The temperatures shown only relate to the selected temperature sensors configured in the configuration tab.



Trouble Shooting:

The most common cause of the controller failing to connect to the PC are:

- The power supply to the unit is not active or has failed. Either + Voltage Supply or – Earth is missing. Check the power supply to the unit and its configuration, the power supply must be present under filling conditions for the fill controller to function.
- The USB Cable used to connect to the unit is damaged or the USB wiring is incorrect at the unit connector. Check the USB connections at the mating half loom connector match the pin out on this manual.
- The USB drivers installed on the PC are incorrect. Please reinstall the drivers accordingly via Windows Device Manager.

For further support please raise a ticket via support@viritech.zendesk.com

*****CERTIFICATE OF CONFORMANCE*****

Viritech Ltd hereby certifies that the products and quantities of this shipment match the customer's purchase order. Viritech Ltd further certifies that products that are part of an initial purchase consist of new material. The Viritech Ltd products have been inspected and tested and conform to quality and performance standards as documented in the Viritech Ltd Quality Management System (QMS), in conformance with the ISO9001:2015 standard.

Viritech Ltd further certifies that the environment in which the products were tested is maintained within the operating specification of the instruments and the standards. For questions or comments, please contact Viritech Customer Support.

Signed,



Certificate No:381282021

End-User License Agreement ("Agreement")

Last updated: November 24, 2023

Please read this End-User License Agreement carefully before clicking the "I Agree" button, or downloading the Application.

Interpretation and Definitions

Interpretation

The words of which the initial letter is capitalized have meanings defined under the following conditions. The following definitions shall have the same meaning regardless of whether they appear in singular or in plural.

Definitions

For the purposes of this End-User License Agreement:

- **Agreement** means this End-User License Agreement that forms the entire agreement between You and the Company regarding the use of the Application.
- **Application** means, The Viritech H2 Fill Controller configuration software.
- **Company** (referred to as either "the Company", "We", "Us" or "Our" in this Agreement) refers to Viritech Ltd., Summit House, 170 Finchley Road, London NW3 6BP.
- **Content** refers to content such as text, images, or other information that can be posted, uploaded, linked to or otherwise made available by You, regardless of the form of that content.
- **Device** means any device that can access the Application such as a computer, a cellphone or a digital tablet.
- **Third-Party Services** means any services or content (including data, information, applications and other products services) provided by a third-party that may be displayed, included or made available by the Application.
- **You** means the individual accessing or using the Application or the company, or other legal entity on behalf of which such individual is accessing or using the Application, as applicable.

Acknowledgment

By clicking the "I Agree" button, downloading or using the Application, You are agreeing to be bound by the terms and conditions of this Agreement. If You do not agree to the terms of this Agreement, do not click on the "I Agree" button and do not download or use the Application.

This Agreement is a legal document between You and the Company and it governs your use of the Application.

The Application is licensed, not sold, to You by the Company for use strictly in accordance with the terms of this Agreement. You will not receive or be granted (nor may You claim) any intellectual property rights in the Application or any of its component parts or elements.

License

Scope of License

The Company grants You a revocable, non-exclusive, non-transferable, limited license to download, install and use the Application strictly in accordance with the terms of this Agreement.

The license that is granted to You by the Company is solely for the purposes of configuring a Viritech H2 fill controller in accordance with the terms of this Agreement.

Third-Party Services

The Application may display, include or make available third-party content (including data, information, applications and other products services) or provide links to third-party websites or services.

You acknowledge and agree that the Company shall not be responsible for any Third-party Services, including their accuracy, completeness, timeliness, validity, copyright compliance, legality, decency, quality or any other aspect thereof. The Company does not assume and shall not have any liability or responsibility to You or any other person or entity for any Third-party Services.

You must comply with applicable third parties' terms and conditions when using the Application. Third-party Services and links thereto are provided solely as a convenience to You and You access and use them entirely at your own risk and subject to such third parties' terms and conditions.

Term and Termination

This Agreement shall remain in effect until terminated by You or the Company. The Company may, in its sole discretion, at any time and for any or no reason, suspend or terminate this Agreement with or without prior notice.

This Agreement will terminate immediately, without prior notice from the Company, in the event that you fail to comply with any provision of this Agreement. You may also terminate this Agreement by deleting the Application and all copies thereof from your Device(s).

Upon termination of this Agreement, You shall cease all use of the Application and delete all copies of the Application from your Device(s).

Termination of this Agreement will not limit any of the Company's rights or remedies at law or in equity in case of breach by You (during the term of this Agreement) of any of your obligations under this Agreement.

Indemnification

You agree to indemnify and hold the Company and its parents, subsidiaries, affiliates, officers, employees, agents, partners and licensors (if any) harmless from any claim or demand, including reasonable attorneys' fees, due to or arising out of your: (a) use of the

Application; (b) violation of this Agreement or any law or regulation; or (c) violation of any right of a third party.

No Warranties

The Application is provided to You "AS IS" and "AS AVAILABLE" and with all faults and defects without warranty of any kind. To the maximum extent permitted under applicable law, the Company, on its own behalf and on behalf of its affiliates and its and their respective licensors and service providers, expressly disclaims all warranties, whether express, implied, statutory or otherwise, with respect to the Application, including all implied warranties of merchantability, fitness for a particular purpose, title and non-infringement, and warranties that may arise out of course of dealing, course of performance, usage or trade practice. Without limitation to the foregoing, the Company provides no warranty or undertaking, and makes no representation of any kind that the Application will meet your requirements, achieve any intended results, be compatible or work with any other software, applications, systems or services, operate without interruption, meet any performance or reliability standards or be error free or that any errors or defects can or will be corrected.

Without limiting the foregoing, neither the Company nor any of the company's provider makes any representation or warranty of any kind, express or implied: (i) as to the operation or availability of the Application, or the information, content, and materials or products included thereon; (ii) that the Application will be uninterrupted or error-free; (iii) as to the accuracy, reliability, or currency of any information or content provided through the Application; or (iv) that the Application, its servers, the content, or e-mails sent from or on behalf of the Company are free of viruses, scripts, trojan horses, worms, malware, timebombs or other harmful components.

Some jurisdictions do not allow the exclusion of certain types of warranties or limitations on applicable statutory rights of a consumer, in which case some or all of the above exclusions and limitations may not apply to You. But in such a case the exclusions and limitations set forth in this section shall be applied to the greatest extent enforceable under the law applicable in that jurisdiction. To the extent any warranty exists under law that cannot be disclaimed, the Company shall be solely responsible for such warranty.

Limitation of Liability

Notwithstanding any damages that You might incur, the entire liability of the Company and any of its suppliers under any provision of this Agreement and your exclusive remedy for all of the foregoing shall be limited to the amount actually paid by You for the Application or through the Application.

To the maximum extent permitted by applicable law, in no event shall the Company or its suppliers be liable for any special, incidental, indirect, or consequential damages whatsoever (including, but not limited to, damages for loss of profits, loss of data or other information, for business interruption, for personal injury, loss of privacy arising out of or in any way related to the use of or inability to use the Application, third-party software and/or third-party hardware used with the Application, or otherwise in connection with any provision of this Agreement), even if the Company or any supplier has been advised of the possibility of such damages and even if the remedy fails of its essential purpose.

Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages, in which case the above limitation or exclusion may not apply to You.

Severability and Waiver

Severability

If any provision of this Agreement is held to be unenforceable or invalid, such provision will be changed and interpreted to accomplish the objectives of such provision to the greatest extent possible under applicable law and the remaining provisions will continue in full force and effect.

Waiver

Except as provided herein, the failure to exercise a right or to require performance of an obligation under this Agreement shall not affect a party's ability to exercise such right or require such performance at any time thereafter, nor shall the waiver of a breach constitute a waiver of any subsequent breach.

Product Claims

The Company does not make any warranties concerning the Application.

United States Legal Compliance

You represent and warrant that (i) You are not located in a country that is subject to the United States government embargo, or that has been designated by the United States government as a "terrorist supporting" country, and (ii) You are not listed on any United States government list of prohibited or restricted parties.

Changes to this Agreement

The Company reserves the right, at its sole discretion, to modify or replace this Agreement at any time. If a revision is material we will provide at least 30 days' notice prior to any new terms taking effect. What constitutes a material change will be determined at the discretion of the Company.

By continuing to access or use the Application after any revisions become effective, You agree to be bound by the revised terms. If You do not agree to the new terms, You are no longer authorized to use the Application.

Governing Law

The laws of England and Wales, excluding its conflicts of law rules, shall govern this Agreement and your use of the Application. Your use of the Application may also be subject to other local, state, national, or international laws.

Entire Agreement

This Agreement constitutes the entire agreement between You and the Company regarding your use of the Application and supersedes all prior and contemporaneous written or oral agreements between You and the Company in relation to the Application.

You may be subject to additional terms and conditions that apply when You use or purchase other Company services, which the Company will provide to You at the time of such use or purchase.

Contact Us

If you have any questions about this Agreement, You can contact your usual Viritech commercial contact or our Customer Support team at support@viritech.zendesk.com