Transport Overview

Assurance Everywhere

Ardent®

Ardent®

A selection of OEMs we work with

ALTAS AUTO
ALEXANDER DENNIS
BYD
DAIMLER BENZ
EVM
HARRIS GROUP
HIGER
Irizar
KLEANDRIVE
MCV
Otokar
PELICAN Bus and Coach
Salvador Caetano
VOLVO Volvo Group
WRIGHT
YUTONG

A selection of operators we work with

arriva
Cardiff bus bws Caerdydd
eirebus dmc
First Bus
Go-Ahead
GoldenTours
Lothian Buses
LIVERPOOL CITY REGION
McGill's
Metroline
national express
NEWPORT bus
Nottingham City Transport
Reading buses
Stagecoach
TRANSPORT UK
transdev
Transport for Greater Manchester
TRANSPORT FOR LONDON

Contents

About Ardent

Ardent Group Global Presence

Fire suppression, safety and accessibility systems.

We have installed fire suppression and safety systems to over 180,000 vehicles around the world, ranging from double-decker buses to 1,000 tonne excavators.

1993
Over 30 years of innovation in vehicle fire protection and safety.

180k
Vehicles and machines protected by Ardent systems worldwide.

67
Countries connected through our global support network.

1
Dedicated in-house design and manufacturing facility.

We **protect people, fleets and operations** in the world's most testing environments

For over 30 years, we have worked alongside vehicle manufacturers, operators and transport authorities to address real-world safety challenges.

By combining engineering expertise with a deep understanding of transport operations, we develop systems that are reliable, straightforward to service and built to last.

Our solutions help reduce risk, improve accessibility and communications - keeping fleets moving, supported by training and ongoing support that our customers trust.

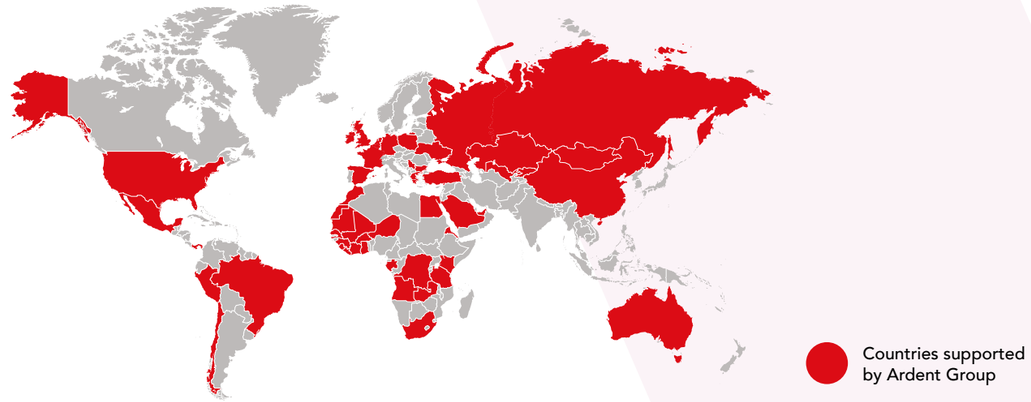
We exist to help people feel protected, valued and connected, wherever they are.

Across the world, our fire detection, suppression, safety and accessibility systems deliver confidence through careful engineering and thorough testing.

Every product that carries the Ardent name is built on decades of experience and supported by people who understand your industry. From installation to training, we work in partnership with you to ensure your system performs exactly as it should, because attention to detail matters.

When certainty is key, doing the right thing makes all the difference.

Ardent. Assurance everywhere.



In 2024, **49% of all new EU city buses were zero-emission**, with projections indicating **100% zero-emission sales by 2027** if the current growth trend continues.

Bus transportation and burgeoning market

Sustainability, the Environment, and the Strategic Role of Zero-Emission Buses

Europe's cities are rapidly transitioning to zero-emission public transport. Driven by EU climate legislation, urban bus fleets are shifting toward battery-electric and hydrogen vehicles to reduce emissions, improve air quality and meet 2030 and 2050 climate targets. In 2024, almost half of all new EU city buses were zero-emission, with full market transition expected within the next few years.

While combustion engines remain part of today's fleets, the move to electric and hydrogen is no longer optional. This transition introduces new operational risks: high-voltage charging infrastructure, large battery systems with thermal-runaway potential, hydrogen storage, and increasingly complex, multi-OEM depots. Managing these risks safely is now a core requirement of sustainable fleet operation.

Safety Is Central to Zero-Emission Success

Zero-emission vehicles deliver clear environmental benefits - lower CO2, NOx and particulate emissions, reduced noise and healthier cities. But these benefits depend on robust safety systems that protect vehicles, infrastructure and people.

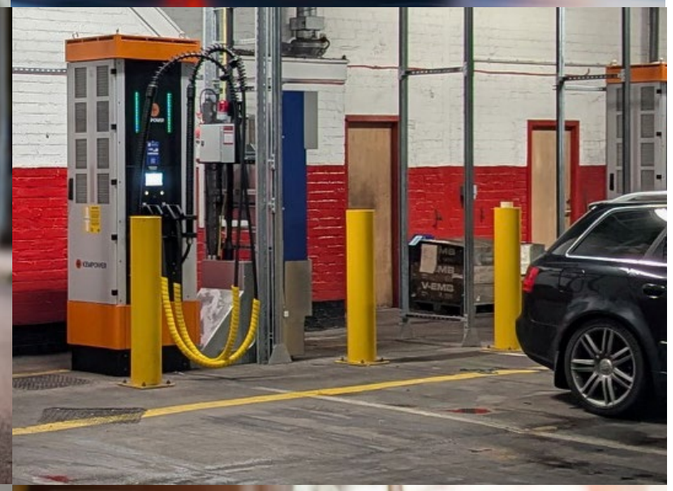
European standards such as UNECE R100, UNECE R107, EN 50557 and the EU Clean Vehicle Directive are reshaping expectations around fire protection, early detection, warning systems and depot safety. Compliance is no longer a checkbox - it is fundamental to operational continuity, public trust and long-term cost control.

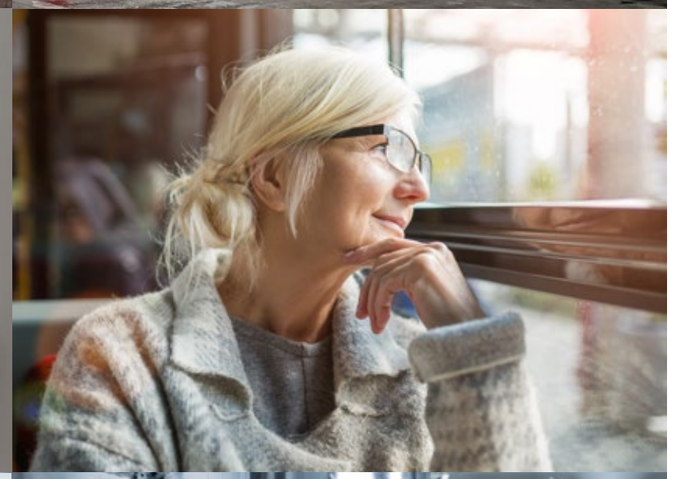
Ardent: Protecting the Transition

Ardent supports operators throughout the transition to zero-emission fleets with proven fire detection and suppression systems for diesel, electric and hydrogen buses, combined with depot-level risk management and regulatory alignment.

From thermal-runaway detection and high-performance suppression to hydrogen sensing, AVAS compliance and passenger information systems such as ClearConnect+, Ardent helps operators protect drivers, passengers, staff and assets - enabling cleaner, safer and more resilient urban mobility. Sustainability and safety now move together. Ardent makes sure both are delivered.

ZERO EMISSION CO_2 2050





R&D, Manufacturing and Installation

Systems installed **with pride**

Fire detection, suppression and transport safety systems installations play a critical role in performance over time. Good installation supports system reliability, delivers a professional finish and helps reduce the need for repair work and unplanned downtime.

Ardent installs are carried out to clearly defined standards. We focus on using appropriate equipment, approved components and completing each stage of the installation with consistency. This approach helps ensure systems perform as intended from day one and throughout their service life.

Attention to detail is central to how we work. By taking the time to do the job properly, we support long-term reliability and give customers confidence in their fire protection system.

- **Improved system reliability**
- **Significantly reduced remedial work and downtime**
- **Use of P-Clips rather than plastic ties to mount hoses and detection lines**
- **Use of spiral wraps to protect hoses from sharp edges**
- **Use of rubber grommets to protect hoses from sharp edges**

Technical, R&D and Testing

Innovation **at Our Core**

Ardent's technical team combines design, invention, and programming prowess to create systems that set industry benchmarks.

CAD Engineering: Advanced CAD tools for precision design and rapid prototyping.

Programming Excellence: Expertise in C programming and embedded systems for control logic and telematics.

Transport Protocols: Full compliance and integration with J1939 transport programming protocol and others, ensuring inter-operability across heavy-duty vehicle networks.

Innovation & Testing: Rigorous testing regimes for reliability, safety, and compliance with global standards. Custom Development: Bespoke solutions tailored to client specifications, including software and hardware integration.

Team Strength: A multi-disciplinary R&D team driving continuous improvement and future-proofing.

Manufacturing

Precision and **Scale**

Ardent's UK-based production facility is a state-of-the-art operation spanning over 3,000 sq metres, designed for high-volume, high-quality output that meets stringent international standards.

Advanced Robotics & Automation: Our assembly lines feature collaborative robotic arms and automated CNC machining for precision component manufacturing. Robotics handle repetitive, high-tolerance tasks, ensuring consistency and reducing human error while freeing skilled engineers for complex builds.

Lean Manufacturing & Efficiency: We operate under Lean principles and continuous improvement frameworks, supported by an Integrated Business Management System (BMS). This system drives data-led decisions, optimises workflows, and ensures rapid scalability without compromising quality.

Production Methods

Modular Assembly for flexibility and faster turnaround.

In-process inspection protocols embedded at every stage, governed by ISO 9001:2015 and ITAF 16949 standards.

Traceability systems for full accountability from raw material intake to final product dispatch.

Quality Assurance & Compliance: Certified to ISO 9001, ISO 14001 and ISO 45001 with BSI-aligned auditing and continuous improvement programs. Rigorous FAIR (First Article Inspection Reports), CMM (Coordinate Measuring Machine) capability, and digital NCR root-cause analysis ensure repeatable performance and zero-defect delivery.

Dedicated QESH team with aerospace and rail quality backgrounds, driving world-class standards.

Capacity & Global Reach: Capable of producing thousands of systems annually, supporting OEM factory-fit programs and aftermarket retrofits.

Over 180,000 vehicles protected worldwide at any time, backed by a global distribution and service network.

Future-Ready Manufacturing: Investment in AI-driven predictive maintenance, robotic process automation, and smart IoT-enabled production lines to maintain leadership in safety technology manufacturing.

Transport Safety Solutions

To ensure every person and every place can feel **protected, valued and connected**

With our 30 years of experience in fire protection and safety, we work closely with transportation manufacturers, operators and public authorities to address real-world safety challenges.

Combining engineering expertise with a strong understanding of transport operations, we develop systems that are reliable, robust and straightforward to service. Our solutions help reduce risk, improve accessibility and keep fleets operating efficiently. Ardent systems have been installed on more than 180,000 vehicles worldwide. Designed through careful engineering and proven in demanding conditions, operating reliably in a variety of environments.

For bus drivers, we focus on reducing distraction, improving situational awareness including: an acoustic feedback option (delivers warnings if sudden accelerator depression is detected), safety including our one or two-way intercom system and alerts and warnings in case of engine-bay overheating and fire.

For passengers, we offer an array key improvements in accessibility and communication including: our clear audio request system, so everyone can travel independently and safely - inclusive, compliant and practical - along with induction loop options, a multi-messaging system and our unique SafeStep solution which dramatically improves safety and minimalizes accidents on and around the internal staircase.

Public safety: Externally, systems like our unique AVAS (Acoustic Vehicle Alerting System) lets people know an electric bus is approaching and this function (volume and tone) even changes depending on ambient noise, day or night time, and surroundings.

Our products protect...

Driver

- Safe Assist Module (SAM)
- Pedal Acoustic Feedback
- Assault Alarm
- Multi-Message System

Passenger

- ClearConnect™
- High-Performance Intercom
- Audible Request Unit
- SafeStep™

Vehicle

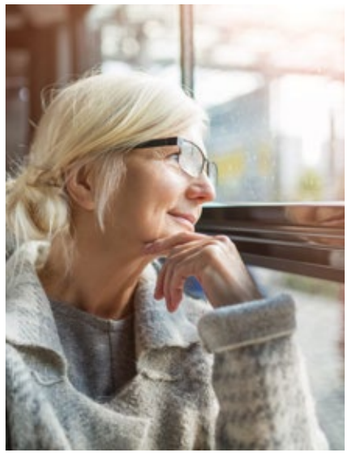
- R107 Fire Suppression System
- Hydrogen Leak Detection System

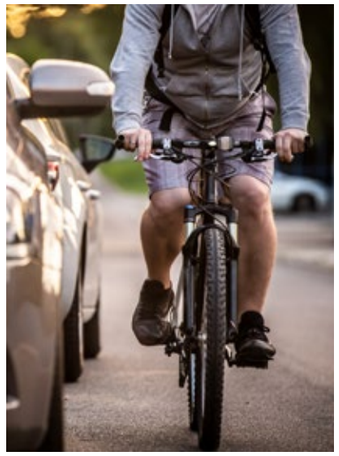
Operator

- Electric Vehicle Charging protection
- Telematics

Public

- Acoustic Vehicle Alerting System (AVAS)
- Cyclist Alert System





Driver

Safe Assist Module (SAM)
Driver safety and alert system with modular configuration

Pedal Acoustic Feedback (PAF)
Audible pedal feedback for electric or hybrid buses

Assault Alarm
Emergency alert system to protect drivers from on-board threats

Multi-Message System
Customisable voice announcements for route, safety, or passenger information

Passenger

ClearConnect™
Hearing loop system with next-gen and AuraCast-ready options

High-Performance Intercom
Clear, reliable two-way communication with the driver

Audible Request Unit
Passenger-activated audio signal for stop requests

SafeStep™
Sensor-triggered announcements encouraging safe behaviour

Public Safety

AVAS™
(Acoustic Vehicle Alerting System)
External pedestrian-awareness sound alerts

Cyclist Alert System
Directional warnings for vulnerable road users

Vehicle and Compliance

Hydrogen Leak Detection System
Early warning for hydrogen gas exposure risk

PSVAR compliant
In line with DfT regulations, we help our clients make PSVAR compliant vehicles

R107 (UNECE) compliant
Relating to fire detection and suppression

2.6 (Transport for London compliance)
For fire detection / suppression to support your vehicle 2.6 compliance (R118, SPR183 and 197 key elements). We help you install to 2.6 compliance levels. Our intercom and induction systems are 2.6 compliant. We support our customers in achieving AVAS 2.6 compliance.

EMC approved
For non-passive elements including - induction loops, intercom, SAM and VMMS

EC RED approved
Key and essential ISO/ILAC-IAF (RED2104/53/EU) certification for our ClearConnect induction loops, unique
to the marketplace

SAM (safe assist module)
Now fully USB upgradable

Operator

Electric Vehicle Charging Protection
Fire suppression for EV charging cabinets and infrastructure

Remote Monitoring
Real-time monitoring, reporting, and fleet-level insight

Passengers

ClearConnect™

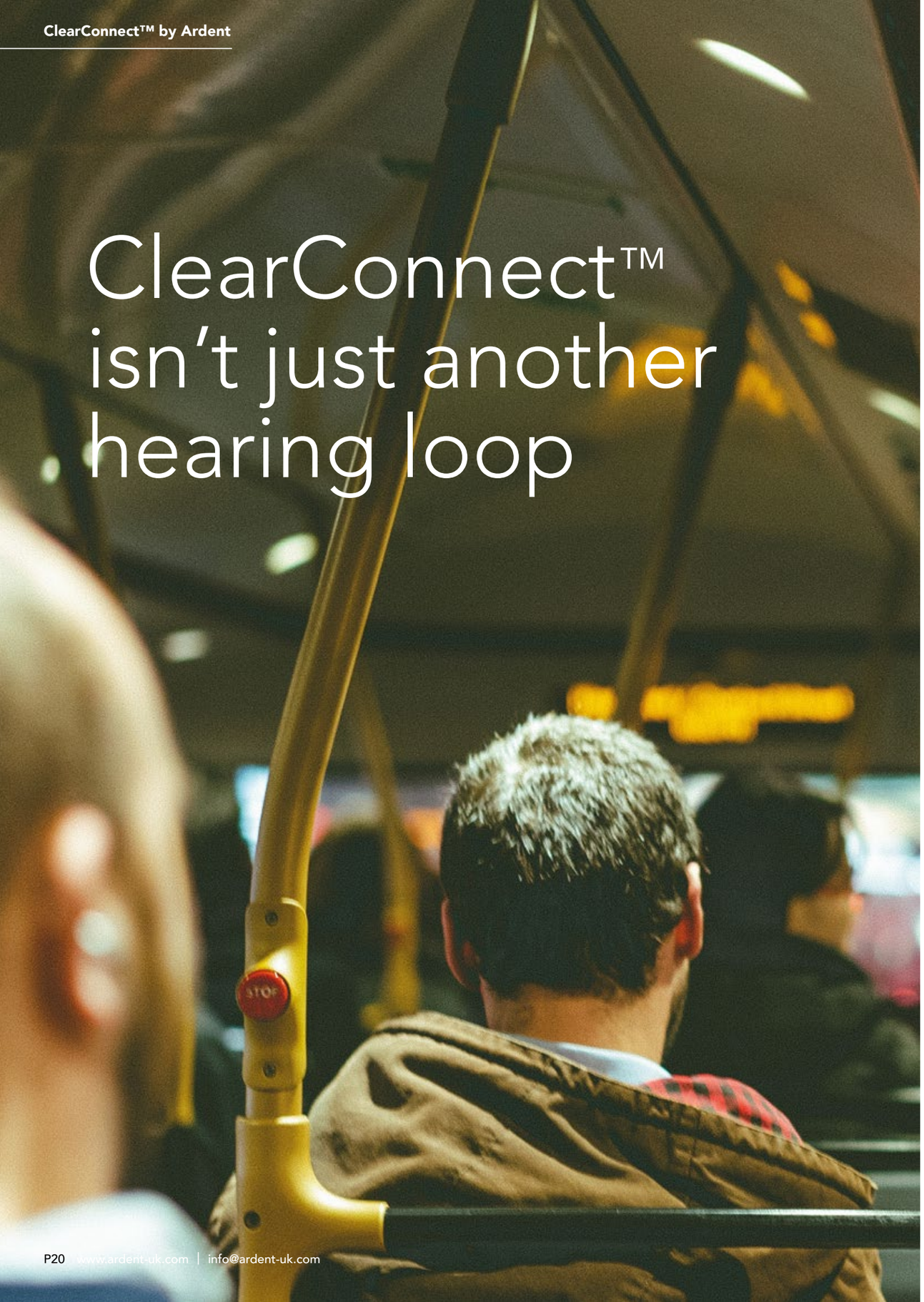
SafeStep™

High-Performance Intercom

PASSENGERS

ClearConnect™ by Ardent

The ClearConnect™ hearing loop has been designed to make travelling on public transport an accessible, reliable, and relaxed experience for hearing aid users.



ClearConnect™ isn't just another hearing loop

By switching their aid to hearing loop, passengers gain access to crisp and clear announcements – such as next-stop information, driver communication, and more

Elevating the customer experience

We want all customers to receive the best possible experience when it comes to travel. Through ClearConnect™, we empower hearing aid users to take every journey with confidence, transforming what may once have been a daunting experience into a comfortable one.

Our aim is to provide a product that not only does the job, but one that does it better than every other product on the market — because being inclusive matters to us, and we hope it does to you too.

A legal and ethical responsibility

The Public Service Vehicles (Accessible Information) Regulations 2023 states that all new buses must be fitted with a hearing loop system, and some older buses should now be retrofitted.

Ensuring accessible travel for all is not only a legal obligation, but an ethical one which means taking the time to source solutions that make the best possible difference to your customer base is crucial.

ClearConnect™ is a sophisticated and effective system that's been designed with the user in mind

Having worked in close collaboration with experts and charities such as the Royal National Institute for Deaf People (RNID), we've developed a solution that truly addresses the needs of those who are hard of hearing – and which overcomes the drawbacks of many other commonly used devices, allowing you to provide the highest level of customer care.

Having undergone a rigorous three-year development programme, the result is a sophisticated system that provides the utmost comfort to the user. Passengers are not confined to 'priority seating', enhancing the overall experience of their journey.

The system experiences less interference than others on the market, and is leading in its intelligibility and in picking up natural speech, meaning clear communication at all times.

Plus, drivers get peace of mind the system is activated and working and will be auto-alerted if there is a fault.

Our ClearConnect™ products provide direct communication between the driver and passengers

Entrance platform induction loop
The entrance platform induction loop allows the driver to communicate directly with passengers using hearing aids, regardless of physical barriers and ambient noise.

Direct delivery of vehicle information systems messages
The induction loop system allows for the delivery of vehicle announcements directly into the hearing aid.

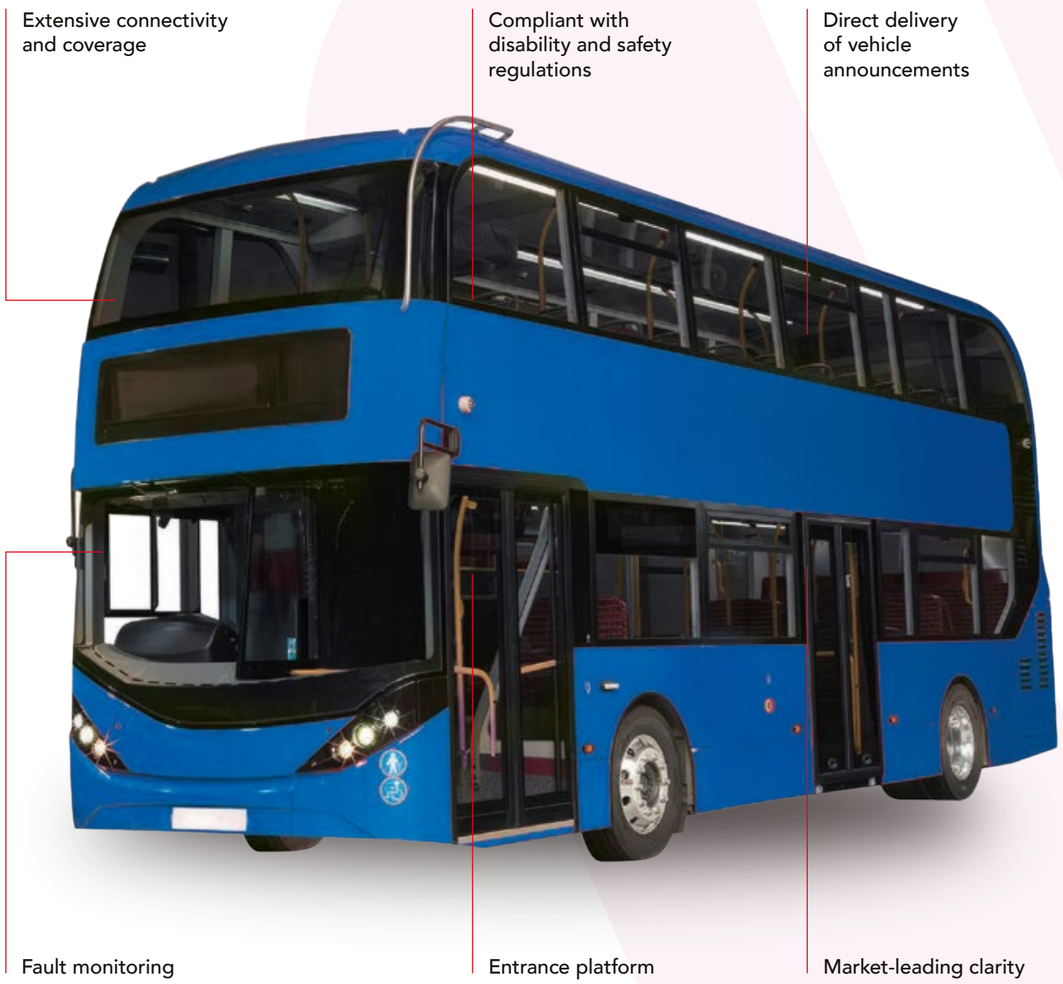
Fault monitoring
Monitors power and the signal, allowing the bus driver to confirm the system is activated and working.

Extensive connectivity and coverage
The system has the ability to cover listening areas outside of 'priority seating' with minimal interference, aiding passengers' comfort and enabling them to choose where to sit.

Compliant with disability and safety regulations
The system has been specifically designed to conform to the BS EN 60118-4 code of practice for AFILS and the PSVAR, which took full effect in 2020.

Market-leading clarity
Easily picks up natural speech, and experiences less interference than other systems on the market.

Enhanced comfort and a fully inclusive experience



Requirements and standards for induction loop systems

As society makes leaps towards creating a more inclusive environment for all, various acts, regulations, and standards are in place to help mitigate some of the challenges faced by people living with a hearing impairment.

The Equality Act (2010)

In the United Kingdom, the Equality Act (2010) aims to protect people from discrimination or unfair treatment on the basis of certain personal characteristics, such as disabilities.

The act requires service providers to make reasonable changes where required to improve accessibility for people with disabilities, including the hearing impaired. This includes the provision of auxiliary aids, such as induction loops for customers with hearing aids.

Approvals

E11 10R06/00*11815*00

Communication concerning approval granted of a type of electronic subassembly with regard to Regulation No. 10.06

BS EN 60118-4 is the code of practice for audio-frequency induction loop systems (AFILS), which aims to ensure that induction loops are fit for purpose, functioning correctly and of real benefit to the user.

The code of practice gives advice around the design, planning, installation, testing, operation, and maintenance of an audio-frequency induction loop system intended for communicating speech, music and/or other signals. To comply with BS EN 60118-4, it must be demonstrated that the induction loop systems meet certain criteria, including being fit for purpose, in working order and having a field strength of 400 mA/m.

Key features

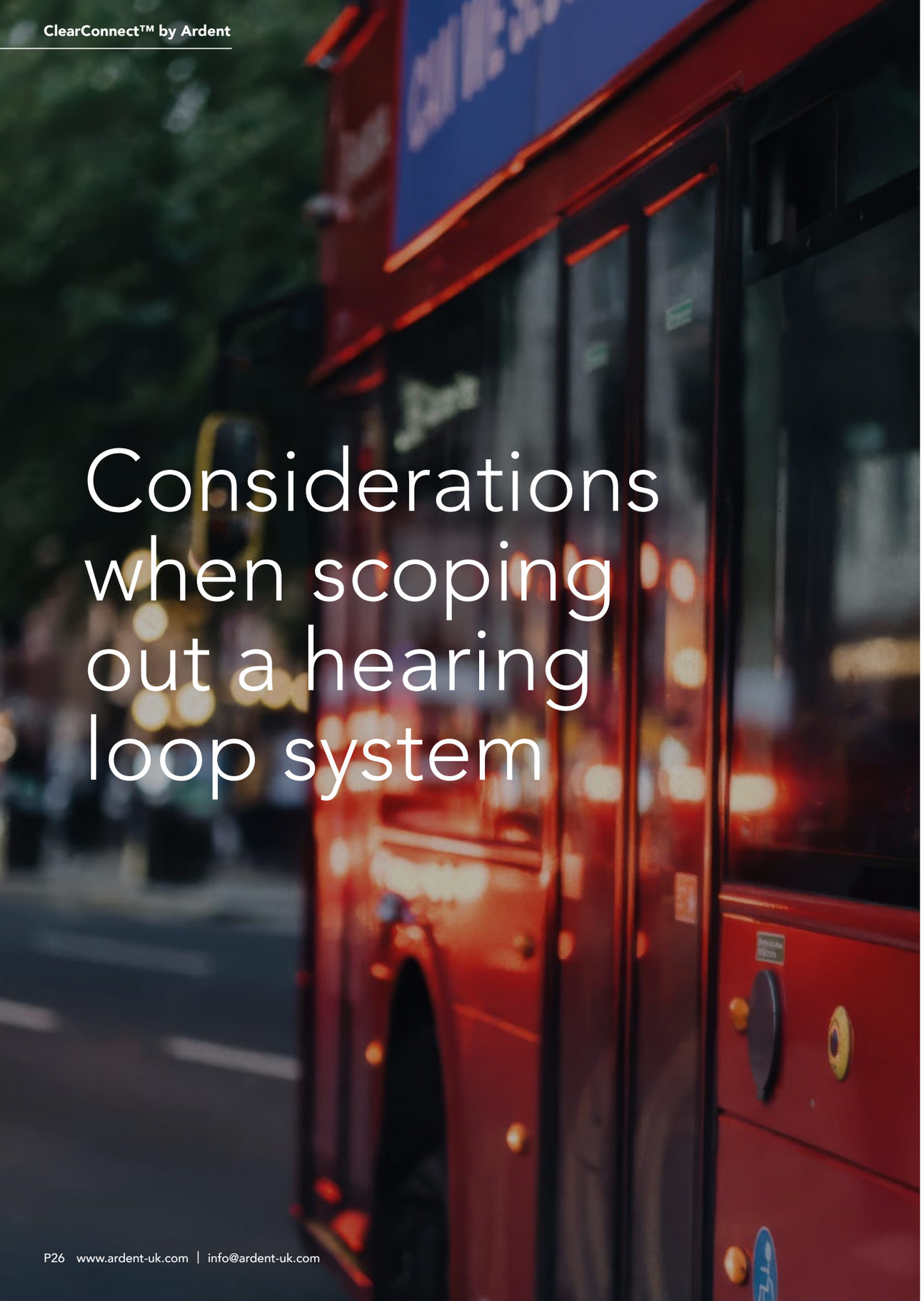
The Large Area Vehicle Hearing Loop Driver is a durable unit designed to enhance communication throughout transport vehicles such as buses and coaches.

This dual-output driver powers phased array and perimeter hearing loops with a Class-D amplifier output stage and an audio subsystem built around an advanced DSP core.

Automatic gain control and high-frequency compensation provide control in environments with metal loss. Applications for use in vehicles requiring coverage across large areas, such as buses and coaches.

Features include:

- 2 x Independent loop outputs (selectable 0° and 90° phase shift)
- Voltage: >12VRMS I Current: >4ARMS - Line level input (balanced and transformer isolated)
- Line high voltage level input (balanced and transformer isolated)
- Universal line or microphone input (microphone bias: optimised for Ardent microphones)
- DSP-controlled automatic gain control and high-frequency compensation for metal loss
- Integrated protection circuits with temperature, voltage, short-circuit and DC detection - Compact chassis with mounting brackets
- Flexible signal routing:
  - Line/mic input can feed one loop output whilst other inputs feed the second output, or,
  - All inputs can feed both outputs - outputs can then be selected as 0° and 90° phase shift
  - Connector: WAGO 769 series



Considerations when scoping out a hearing loop system

Although installing a hearing loop system from any provider will ensure legal compliance, opting for a cheap but inferior system is a false economy

Inclusivity is a rapidly growing area, and one which shows no signs of stalling.

A system that doesn't work as it should may result in a poor experience for customers, bus downtime, and increasing customer complaints – all elements that can reduce the chance of securing new routes.

Subpar equipment and a failure to invest in levelling up a customer's experience can also serve as a sign that inclusivity isn't high on a provider's agenda – a conclusion that can reflect poorly upon a company's reputation.

Choosing Ardent's installation service ensures:

Optimum placement

Many operators opt to place the hearing loop at the front of the bus. However, this may not always be the most appropriate location. Our audit takes this into account and settles on a placement that ensures passengers enjoy a comfortable and well-informed journey.

Servicing and maintenance

We pride ourselves on our customer care and a truly end-to-end service, from initial conversations through to bus surveys, installation and aftercare. We're here to support you at every stop on the journey.

Key technical specification

Physical data

Dimensions	Height – 143mm (5.62") Width – 294mm (115.7") (361mm (142") inc. brackets) Depth – 41mm (16.1")
Construction	Zintec / mixed
Finish	Powder coated

Technical data

Audio inputs		
1 x line level input (balanced and transformer isolated)	Voltage Frequency range Topology	-45dBV – 0dBV (optimised for -10dBV – 0dBV) 100Hz-6000Hz Balanced and transformer isolated
1 x line high voltage Level Input (balanced and transformer Isolated)	Voltage Frequency range Topology	+5dBV – +45dBV (0.562Vrms -100Vrms) 100Hz-6000Hz Balanced and transformer isolated
1 x universal line or microphone Input (microphone bias: optimised for Ardent microphones)	Voltage Frequency range Topology Microphone bias	-45dBV – 0dBV (optimised for -10dBV – 0dBV) 100Hz-6000Hz Electronically balanced Optimised for Ardent microphones
1 x digital audio Input (optional extra feature, not fitted on standard units)	Connection Encoding Sample rate	SPDIF PCM 16 bit 44.1KHz, 48KHz, 96KHz
Outputs		
2 x independent loop outputs (selectable 0°and 90° phase shift)	Voltage Current Selectable 0° and 90° phase shift	>12Vrms >4Arms
1 x line level output	The line outputs should have the following characteristics: Format Phase shift Gain	 Audio mix of all drivers 0° 0dB
System connections		
1 x power connection	Voltage Current Selectable 0° and 90° phase shift	>12Vrms >4Arms
1 x USB connection (for factory configuration and system setup, adjustments and updates)	The input should have the following characteristics: Connector Use	 USB type-A Firmware/config/update
2 x enable/disable (mute) connections	The input should have the following characteristics: Trigger Threshold	 Configurable (high-low or low-high) Production configurable (resistor change)
Connector type	WAGO 769 series	

PASSENGERS

SafeStep™ by Ardent

In 2025, Ardent won the Transport for London innovation challenge. Successfully creating a solution to trips and falls happening every year

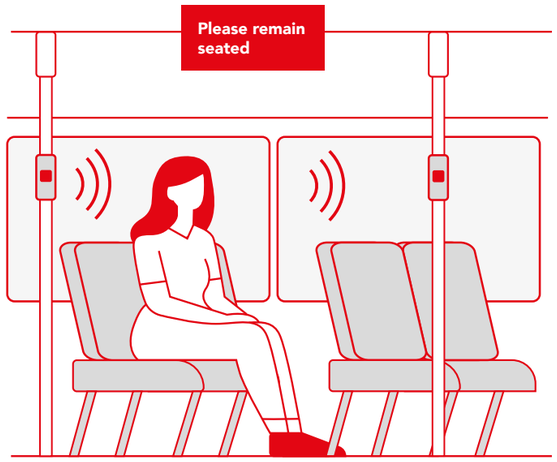
In 2024 there were...

- 712 reported trips and falls on stairs
- 369 minor injuries
- 18 serious injuries and 1 fatality

TRANSPORT FOR LONDON

Innovation Process

A functional prototype was deployed featuring two key safety measures:



Upper Saloon Alerts

Encourages passengers to remain seated until the bus stops.

Staircase Safety Alerts

Detects passenger movement on stairs and plays an audible reminder to use handrails.

Validation Results

The trial demonstrated a significant impact on passenger behaviour, with a **50% reduction** in the number of people not using handrails on stairs

This confirms the effectiveness of the staircase safety feature in influencing behaviour and reducing risk

SafeStep™ by Ardent

SafeStep by Ardent is a customisable passenger safety system that produces clear, sensor-triggered alerts to reduce onboard accidents and improve the travel experience. With features like boarding announcements, seat availability updates, and integrated safety systems, it improves both passenger safety and operator efficiency.

Key Benefits

Clear Alerts:
Messages like “Please hold on to the handrails” are triggered by sensors, improving onboard safety.

Accident Reduction:
Reduces passenger incidents and lowers insurance claims for transport providers.

Customisable System:
Adapts to both operator and passenger needs with tailored messages, triggers, and rules for optimal performance.

Additional Features:
Includes boarding alerts, saloon seat availability, and wheelchair area notifications.

Proposed Hardware

Safe Assist Module (SAM) or Multi Message System (MMS)

Occupancy sensors and speakers

Full integration with other safety systems like Acoustic Vehicle Alert System (AVAS) and fire suppression

Transforming passenger safety with dynamic, automated messages that anticipate and address risks in real-time

- We have developed a solution that will pro-actively message passengers of risks in real-time.
- We are working with operators and transport authorities, Ardent has finished a series of trials on highly-utilised bus routes in London – initial results show positive behavioural changes of passengers.
- We are transforming passenger safety with dynamic, automated messages that anticipates and addresses risks in real-time.

SafeStep™ is designed and manufactured in the UK.

PASSENGERS

High-Performance Intercom

Increasing safety measures to protect drivers is an essential part of making public transport safer for everyone. However, with new safety procedures come new challenges: implementing new secure screens for drivers to sit behind can make driver-to-passenger communication harder.

A reliable solution to this, Ardent's intercom unit is designed to facilitate easy communication between passenger and driver at the bus entrance platform.

What does our intercom unit do?

Our intercom unit enables clear two-way communication between the driver in the cab and the passenger at the entrance platform, regardless of physical barriers. It fits seamlessly into the vehicle, with flush-fit or surface-mount speakers and microphones positioned either side of the protective screen.

Two-way communication

Our unit is designed to enable clear communication between driver and passengers through microphones and speakers.

Hands-free operation

The intercom unit is operated hands-free, making it safe and easy to use when the vehicle is in operation.

Adjustable volume levels

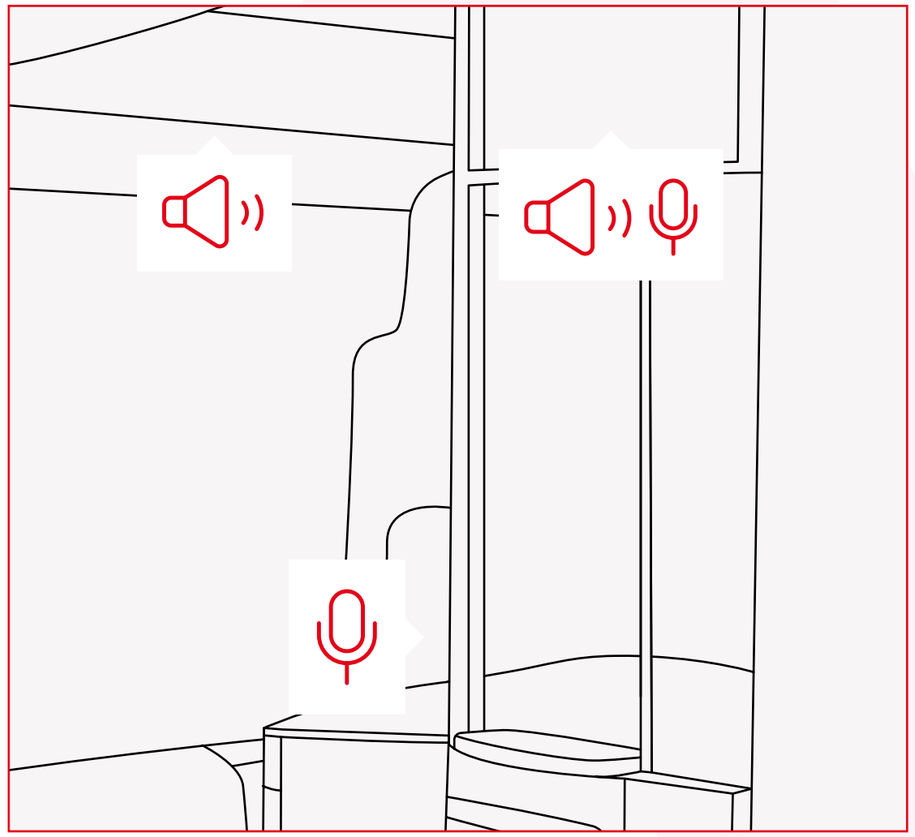
With adjustable volume, our intercom unit allows the driver to adjust the volume level in response to increased or reduced background noise.

How our intercom unit works

The flush-fit or surface-mount speakers and microphones are positioned at either side of the protective screen for optimal two-way communication between the driver and passenger.

Through the control unit, the driver can adjust the speaker volume if required. An LED is used to signal that the system is in use.

The system meets stringent EMC requirements regarding its electromagnetic compatibility, and is CE-marked. With a simple setup procedure, the intercom unit is easy and quick to install or retrofit.



Key technical specification

Supply voltage	10 V to 30 V (32 V tolerated)
Current consumption	For normal conversation: typically, less than 200 mA at 28V and 400 mA at 14 V
Indicator LED	Indicates the presence of power: the control input has no effect on this
Microphone inputs	x2 Input impedance: 2 kΩ Recommended microphone: electret condenser with 3.5 mm mono jack plug, line powered and taking less than 0.5 mA Power supply: To power the microphone, VSIS applies a 4 V bias to the jack's tip
Speaker outputs	x2 Recommended speaker: 4Ω, 8 W An 8ohm speaker may be used but will give lower audio volume x1
Control input	Low-side switched. The intercom is ON while this input is connected to GND

For the complete technical specification and operating instructions, please get in touch.

Public Safety

Acoustic Vehicle Alerting System (AVAS)

PUBLIC SAFETY

Acoustic Vehicle Alerting System (AVAS)

When travelling at low speeds, electric and hybrid buses are almost silent. This factor increases the risk of incidents with pedestrians and other road users. The visually impaired in particular usually rely on audible environmental cues to assist with mobility and orientation.

As part of Ardent's range of electronic products to enhance the safety of buses and coaches, our acoustic vehicle alerting system is designed to warn road users of approaching electric and hybrid buses.

What does our acoustic vehicle alerting system do?

This acoustic vehicle alerting system plays a sound to warn pedestrians and road users of nearby vehicles, providing distinct indications of the vehicle's location, direction, and speed. It offers a selection of sounds, including the TfL-developed sound used in the London area, or the user can supply their own sound to be programmed into the system.

Distinct pedestrian audio warning
The speed of the audio recording automatically varies in proportion to the vehicle's speed to cover a range of speeds.

Customisable system kit
The system can be supplied with Ardent's V-AMP Power Amplifiers, speakers and wiring harness, as per customer requirements.

Compliant with safety regulations
Designed in accordance with UNECE Regulation No. 138 for Quiet Road Transport Vehicles with regard to their reduced audibility.

How does it work?

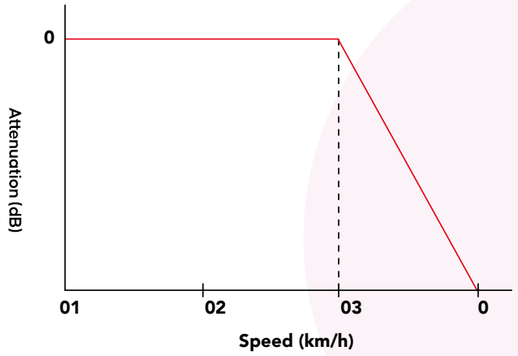


Diagram 1 - Attenuation

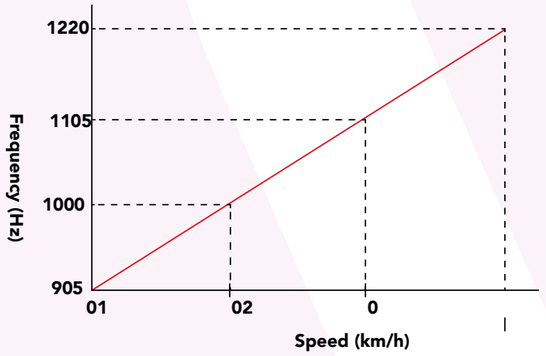


Diagram 2 - Frequency

Ardent acoustic vehicle alerting system uses an audio recording factory programmed into the system, corresponding to a speed of 10 km/h.

The system automatically reduces or increases its playback speed in proportion to the vehicle's speed, at a rate of 0.8% per km/h.

The sound level remains constant from 0 km/h to the specified speed, then fades to nothing.

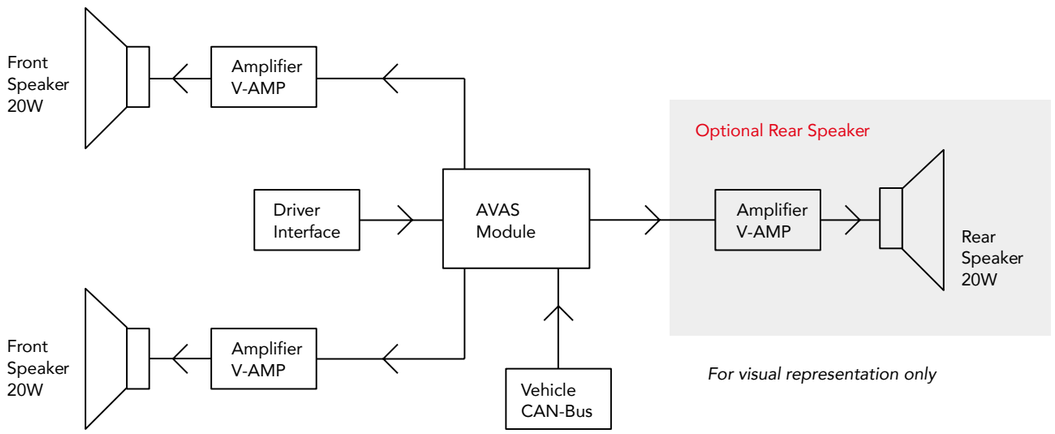
A frequency shift is also specified, meaning tonality of the sound changes with vehicle speed. This simulates a change in sound during acceleration or deceleration. The system can play one recording at a time, but has the capacity to store multiple recordings.

The above graphs illustrate the output of the acoustic vehicle alerting system for 1 kHz tone at 10 km/h.

Compliant with UNECE: Regulation No. 138
The Ardent acoustic vehicle alerting system hardware and sounds are compliant with Regulation No. 138 of the Economic Commission for Europe of the United Nations (UNECE) - uniform provisions concerning the approval of Quiet Road Transport Vehicles with regard to their reduced audibility.

In line with this regulation, all manufacturers must install an acoustic vehicle alerting system in new types of quiet electric and hybrid electric vehicles from July 2019, and to all quiet electric and hybrid vehicles registered from July 2021.

Sample layout



For visual representation only

Key features

4V nominal
The Ardent AVAS is suitable for use on 24V vehicles.

CAN-Bus interface
Ardent's AVAS links directly with the CAN-Bus interface to determine the vehicle state and speed.

Optional rear speakers
If rear speakers are fitted, audio can be directed towards front or rear speakers, in response to vehicle direction.

TfL-developed sound
Our AVAS systems can be fitted with the sound developed by Transport for London.

Driver switches
The driver of the vehicle can be offered switches to enable the control of AVAS behaviour.

Auxiliary messages
The AVAS has the capacity to store multiple recordings to suit a range of requirements.

Key technical specification

Acoustic Vehicle Alerting System

Power supply voltage	24Vdc nominal, 20Vdc to 30 Vdc range
Power supply current	~150 mA
Audio bandwidth	14 kHz
Compliances	Regulation No. 138 of the Economic Commission for Europe of the United Nations (UNECE)

V-AMP Power Amplifier

Power supply voltage	24Vdc nominal, 20Vdc to 30 Vdc range
Power supply current	3A peak, 800 mA average
Speaker output	20W peak

For the complete technical specification and operating instructions, please get in touch.

Developed in collaboration with:

ALEXANDER DENNIS

TRANSPORT FOR LONDON
EVERY JOURNEY MATTERS

Vehicle Details and Compliance

Fire detection and suppression systems

EV Charging Station Protection

VEHICLE DETAILS AND COMPLIANCE

Fire detection and suppression systems

For reliable protection in buses and coaches, the Ardent R107- approved bus fire suppression system meets all UNECE R107 requirements for automatic engine bay fire suppression. Having passed strict fire testing protocols from the Research Institutes of Sweden (RISE), and it successfully protects diesel, electric, hybrid and hydrogen vehicles against the risk of engine fire.

What does our bus fire suppression system do?

Ardent's engine compartment fire suppression system can be linked to our driver messaging unit. This allows audible warnings to be delivered to the bus driver through a speaker installed in their cab, alerting the driver if a fire or high temperature condition is detected.

Reliable operation without false discharges

The linear heat detection cable provides rapid fire detection while protecting against false discharges commonly caused by loss of pressure in tube systems.

Voice driver alerts through in cab messaging system

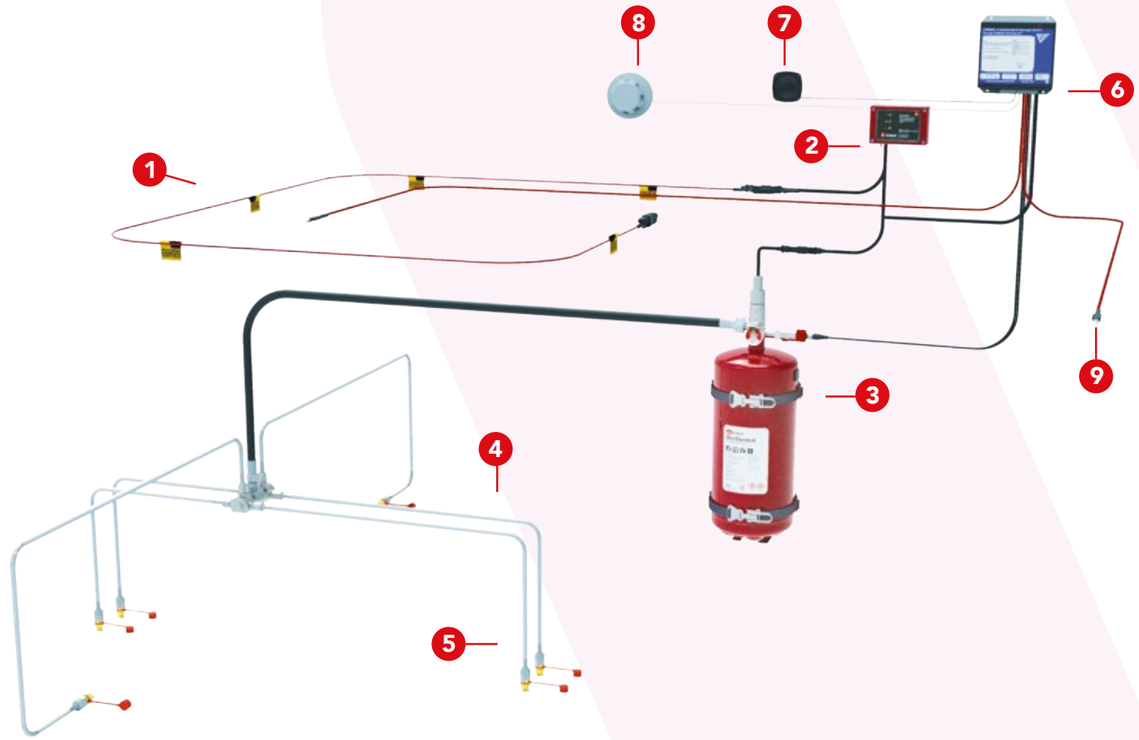
The driver message unit communicates system status and alerts the driver in the event of engine bay high temperature, low pressure in the system, or other incidents.

Engine bay temperature rise pre-warning

The system delivers warning messages to the driver in the event of a rapid temperature rise in the engine compartment, allowing the driver to act rapidly.

How does it work?

The Ardent R107-approved bus fire suppression system uses Linear Heat Detection Cable (1) that is routed around the fire hazard areas in the engine compartment. When the cable is exposed to a fire, it sends a signal to the Control Module (2). The Control Module then initiates the system discharge.
This process is extremely quick, allowing the system to actuate immediately to put out the fire in a matter of seconds. The Dry Chemical ABC suppression agent contained in the tank (3) travels through the distribution network (4) and is discharged through critically located nozzles (5) aimed at the identified fire hazards in the engine compartment. The system offers an optional output to interface with the vehicle or with the Driver Messaging Unit (6).



Ardent R107-approved bus fire suppression system layout sample

1 Linear heat detection cable
2 Control module
3 Dry chemical agent tank
4 Distribution network
5 Discharge nozzles
6 Driver messaging unit (optional)
7 Driver's cab speaker (optional)
8 Smoke alarm
9 Temperature rise pre-warn cable and detectors (optional)

Why dry chemical suppression agents?

Also known as dry powder, dry chemical is the world's most widely used suppression agent in the vehicle fire suppression market. In a study(1) commissioned by the Fire Protection Research Foundation analysing the impact of various suppression agents on Class A materials, ABC dry chemical showed the fastest extinguishing time using the least amount of agent.

Compared to water mist, the dry chemical agent was able to extinguish the fire in half the time, using half the quantity of agent. Ardent ABC dry chemical is highly effective at tackling most types of fires – including Class A, Class B, Class C, and electrical fires. This includes fires caused by a number of sources, such as combustible materials, flammable liquids, gases, and electrical hazards.

Test number	Suppression agent	Extinguishing time (sec)	Extinguisher Discharge time (sec)	Agent discharged (kg)
1B	ABC dry chemical	3	33	4.5
2B	Water mist	6	88	9.0
3B	Halotron I	3	13	7.0
4B	FE-36	4	14	6.0

Scheffey, J.L. and Forssell, E.W., "Measuring the Impact of Fire Extinguisher Agents on Cultural Resource Materials – Final Report," Fire Protection Research Foundation, Quincy, MA, February 2010.

Linear heat detection cable

Rapid fire detection

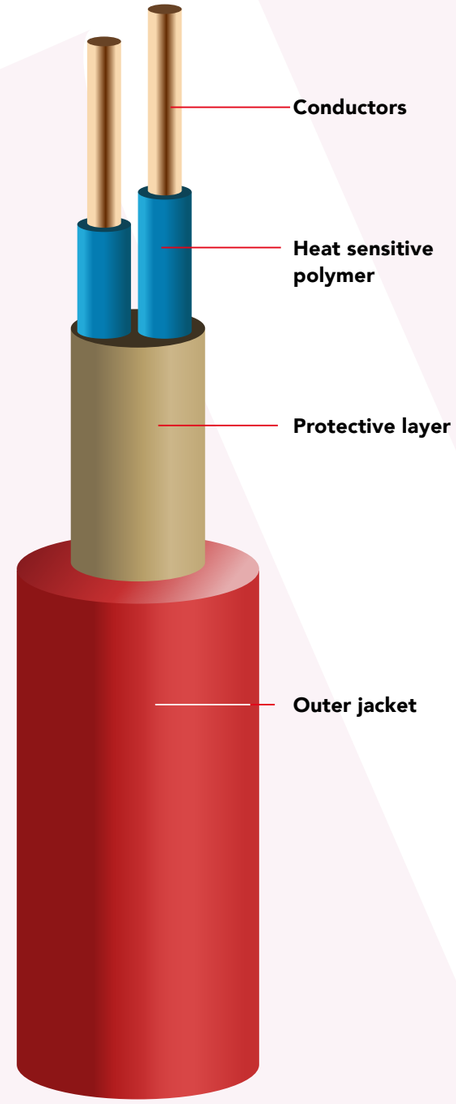
The detection cable detects the fire instantly, sending a message to the control module to initiate the system discharge - putting out the fire in a matter of seconds.

Easy and safe to install

For ease and safety, the detection cable can be routed around the fire hazards in the engine compartment, without the dangers posed by pressurised systems.

Reliable operation

To significantly reduce false discharges, the cable differentiates signals caused by problems such as a trapped, damaged, or cut pressurised tubes from a high temperature or fire signal. Only a fire will melt the heat sensitive polymer that separates the conductors. Once the polymer melts, the conductors initiate contact with one another and communicate with the control module to discharge the system.



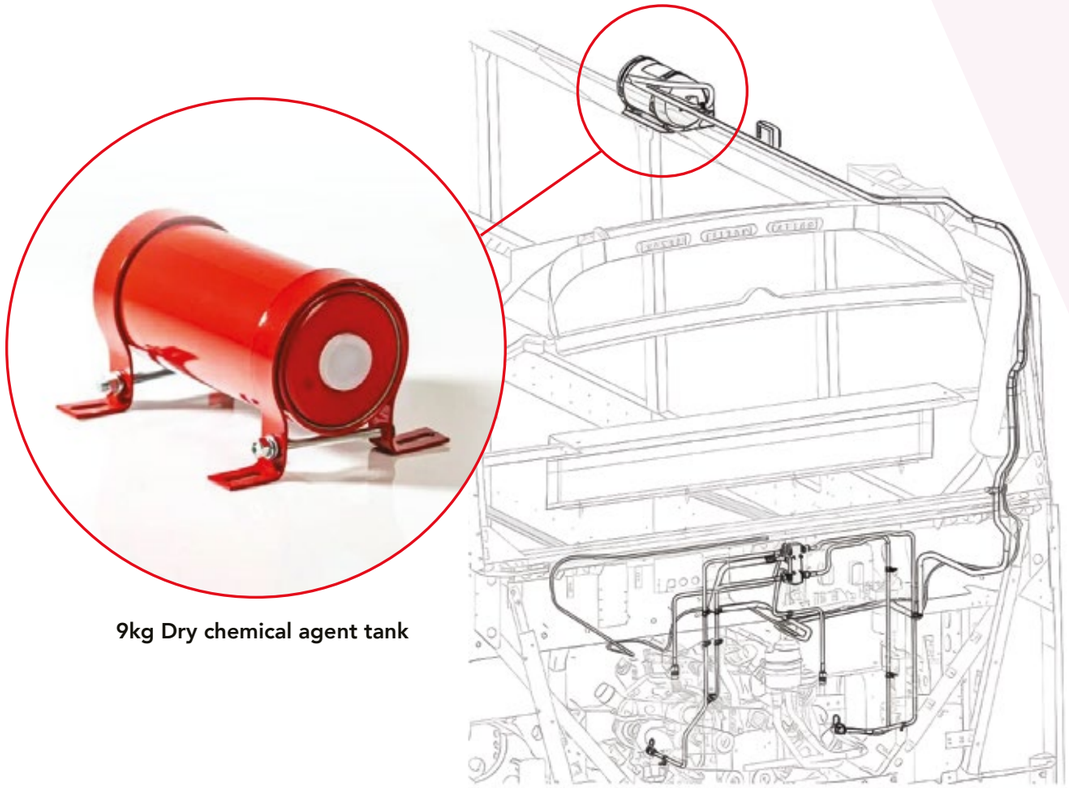
Key technical specification

Fire detection method	Linear heat detection cable
Suppression agent	Dry chemical ABC powder
Suppression agent quantity	9 kg (4m3 engine compartment) 12 kg (6m3 engine compartment)
Number of discharge nozzles	6 nozzles for 9 kg agent tank 8 nozzles for 12 kg agent tank
Agent tank construction	Stainless steel with red corrosion resistant paint
Nozzle discharge patterns	180° high-dispersion nozzle
Operating temperature range	-30°C to +60°C
Bump testing (EN 60068-2-27)	50 g
Shock testing (EN 60068-2-27)	40 g
Vibration testing (EN 60068-2-6)	5 – 200 Hz, 10g , amplitude ≤ ± 15 mm 200 – 500 Hz, 5g
Certifications and approvals	E5 Approval - UNECE Regulation 107 compliant CE marked

For the complete technical specification and operating instructions, please get in touch.

Ardent R107 Fire Suppression System

9kg Layflat cylinder



9kg Dry chemical agent tank

Extinguishing agents

Dry Chemical

- ✓ **Rapid fire knock-down**
- ✓ **Excellent coverage**
- ✗ Flexible piping configuration (trees and branches)
- ✗ Accurately positioned nozzles
- ✗ Powder dispersion – around obstacles / objects

Wet Chemical

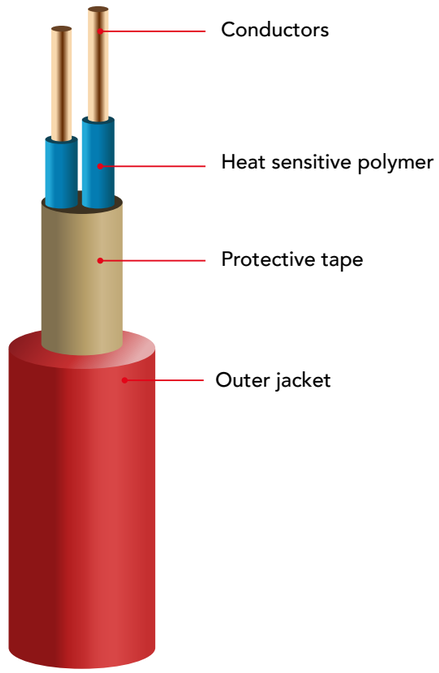
- ✓ **Good cooling capabilities**
- ✗ **Takes twice as long to extinguish a fire**
- ✗ **Potential to cause damage to EV's**

Ardent Detection Types

Electronic Detection (ACM)

Uses linear detection cable that sends an electric signal to the system when reaching a certain temperature, activating the system.

- Significantly reduces potential false discharges
- 24/7 monitored system able to communicate any damage to the detection or actuation lines – increased reliability



Pneumatic or Loss Of Pressure

'LOP' uses pressurised detection tubing that bursts when reaching a certain temperature, activating the system.

- Does not require any external energy /power supply
- Suitable for simple / budget installations

VEHICLE AND COMPLIANCE

EV Charging Station Protection

As the demand for larger energy sources grows, so does the risk of electrical incidents. From faulty wiring and electrical surges to overheating batteries, these fire risks create an environment ripe for ignition – threatening valuable assets, compromising insurance premiums, and putting personnel at risk. Targeting the hazard at source is therefore crucial. This is where Ardent's direct fire suppression system comes in.

Why Ardent direct fire suppression systems?

In enclosed Electric Vehicle chargers, it can be difficult to detect a fire before the damage is already done. When every second counts, our direct fire suppression system delivers rapid fire detection and suppression, right where it's needed most - minimising damage to your assets within a matter of seconds.

Clean and safe agents

Our clean agent is non-corrosive, non-conductive, and marries outstanding extinguishing performance with a remarkably low residue. This is an ideal solution for special hazards fire protection, without causing damage to your equipment.

No Mains Power required

Our direct systems operate independently of any mains electricity source, ensuring round-the-clock, uninterrupted protection for your high-value assets. However, power is essential for: beacon operation, shunt-trip circuit breaker operation and IPS charging and transfer. An internal battery system disconnects mains power to the charger and activates the alert beacon.

Cost-effective solutions

Our systems minimise potential cabinet and infrastructure downtime and can be quickly reinstated after deployment, delivering exceptional value without compromising on safety. Meanwhile, clear installation and maintenance instructions ensure these systems continue to facilitate the highest standards.

Complete peace of mind

Backed by over 30 years of experience and trusted by operators, manufacturers, and people across the world to protect their people and assets, Ardent takes care of all aspects of fire protection so you have complete piece of mind that your facility is safe.

EV Charger Protection

How does the system work?

Pressure gauge confirms readiness

The pressure gauge located on the cylinder valve will be visible in the green segment to confirm the pressure of the system is adequate and ready for normal use.

Detects high temperatures, fast

Flexible detection tubing is routed around the high-risk areas and is connected to the fire suppression system.

Activates the system

Pressured with nitrogen gas, the tubing is designed to rupture when exposed to high temperatures, initiating the release of the suppression agent.

Suppresses in seconds

By targeting the heart of the fire at the point of rupture, the suppression agent gets to work in a matter of seconds. It evaporates cleanly after deployment, without leaving residue, and automatically suppresses the source of heat.

Shuts down mains power to the charger

As the suppression agent is released, the system shuts down the main power to the charger to reduce the potential for re-ignition.

Flashing beacon alerts operators

The beacon is powered by an internal battery system and provides a continuous alert that the system has deployed.

What can Ardent direct fire suppression systems protect?

- Electrical equipment enclosures
- Electric vehicle chargers
- Data processing enclosures
- Many other applications:
- Suitable for use with Kempower, Nidec, Zenobe and other EV chargers.

Technical specification

Ardent direct fire suppression system

Fire detection method	Linear heat detection tube
Extinguishing agent	FK 5-1-12
Cylinder capacity	2 kg, 4 kg, 6 kg, 9 kg
Optional features	Shunt trip for mains power isolation Alert Beacon

For further technical specifications, operating instructions and assistance from the Ardent Team, please contact +44 1423 326740.

Ardent Servicing

Complete **Peace of Mind**

Our servicing contracts and packages deliver proactive protection and operational continuity for your fleet, backed by robust agreements and technical expertise.

Lifecycle Support:
Multi-year strategies, scheduled upgrades, and machine-specific risk-reviews under comprehensive framework agreements.

Rapid Response:
Minimise downtime with guaranteed SLAs and fast turnaround for mission-critical equipment.

Embedded Expertise:
On-site Ardent specialists for audits, training, and technical reviews.

Training & Onboarding:
Comprehensive operator training via the Ardent Academy, supported by manuals and refresher modules.

Retrofit Solutions:
Extend protection to older assets and integrate with third-party systems.

Interface & Integration:
Ability to create and offer interfaces aligned with SLAs and framework agreements for seamless fleet management.

Customer Support you can rely on

At Ardent, exceptional customer service is at the heart of everything we do. Our dedicated Customer Service Team is based at our UK headquarters, providing a central hub of expertise and support for customers across the transport sector.

Operating 24 hours a day, 7 days a week, our team is always ready to respond when you need us most. Whether it's technical guidance, operational support, or urgent assistance, we ensure that help is always just a call or message away.

Our specialists work closely with operators, engineers, and fleet managers to deliver fast, knowledgeable support. From product enquiries and troubleshooting to service coordination and parts assistance, the team helps keep your vehicles operating safely and efficiently.

Because our team sits at the centre of Ardent's operations, they are able to connect customers directly with our engineering, technical, and production teams, ensuring issues are resolved quickly and effectively.

With Ardent, you're not just getting industry-leading solutions, you're gaining a trusted partner committed to supporting your fleet, every hour of every day.

Assurance Everywhere

To find out more or to explore how we can help you enhance the safety and security of your vehicles and plant, contact our sales team on +44 (0)1423 326 740 or info@ardent-uk.com

Ardent®

Ardent Limited,
Unit 3 Becklands Close,
Roecliffe, North Yorkshire,
YO51 9NR

+44 (0) 1423 326 740
info@ardent-uk.com
ardent-uk.com