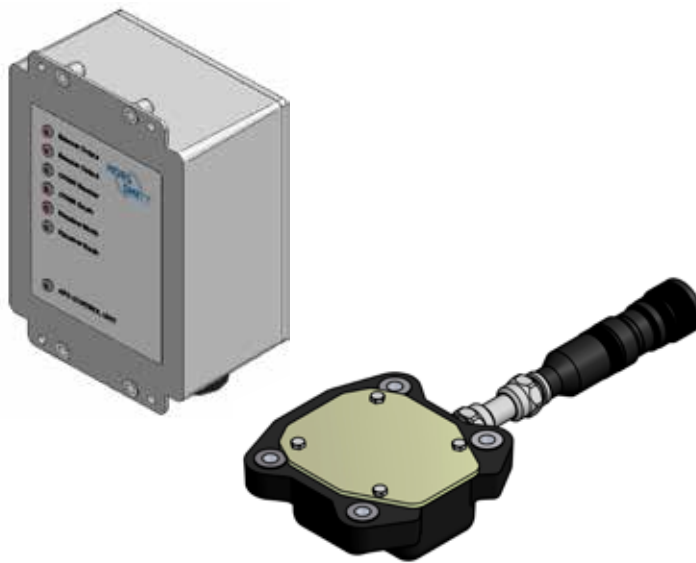


Automatic Power Control system

Datasheet

trainborne - neutral section - zero gap



Description

The Automatic Power Control system cuts the incoming power supply to a traction unit for short periods. This is required where power supplied from one part of a power distribution system is separated from another by a neutral section. Its fitment prevents damage to the power distribution system or the vehicle.

The onboard Automatic Power Control system consists of a control unit and a receiver. The system detects a track magnet positioned shortly before the beginning of the neutral section and sends a signal to the incoming power circuit breaker controller to open the circuit breaker. Once the system detects a second magnet positioned after the neutral section a second signal is sent to close the circuit breaker.

The control unit can be mounted inside the vehicle cab or integrated into an equipment rack. The receiver is a very robust unit and can be mounted on the vehicle main underbody or a bogie.

Application

All railway applications with different sections in electrified railway lines. For example when different sections of power supply are isolated from each other via an insulated material into the contact wire, the APC system detects the marking of the neutral section and controls a circuit breaker to interrupt the circuit between the pantograph and the onboard electronic equipment. This prevents damage/wear and tear to the pantograph and overhead line or third rail.

Features

- Compact design
- Robust system
- Status LED's on control unit
- Receiver bogie mounted or at main underbody
- Receiver available with conduit length to suit application
- Receiver conduit fitted with quick release bayonet connector
- Receiver compatible with Automatic Warning System
- Terminal box available to ease Receiver changeover

Benefits

- Long term availability
- Easy to maintain
- Low life cycle cost

Railway compliancy

- EN 50155 Electronic equipment used on rolling stock for railway applications
- IEC 61373 Rolling stock equipment - Shock and vibration test
- EN 50121 Electromagnetic compatibility for railway applications
- NF F16-101/102 Fire behaviour - Railway rolling stock
- IEC 60529 European standard describes the protection class (IP-code)
- RT/E/S/21088 Railtrack Line Specification
- NR/GN/ELP/27010 Business Process Document – Guidance for compatibility between electric trains and electrification systems Issue 2 December 2005



APC system

Technical specifications

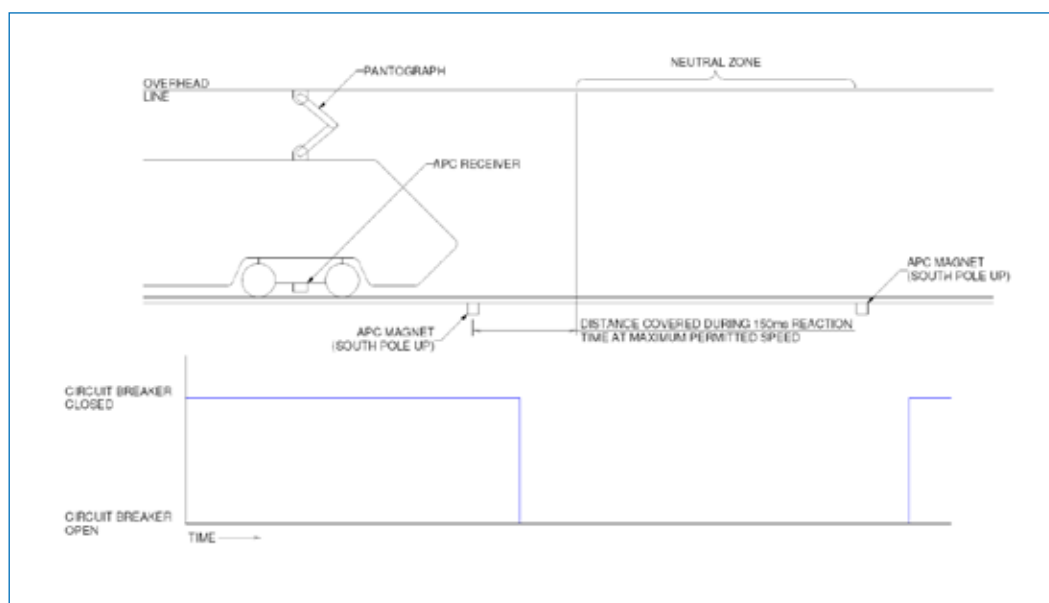
Working principle

Track magnets are mounted in a railway power line with the “South” pole facing up. One magnet is mounted leading up to the neutral section and one leaving the neutral section. In standard situation the APC receiver is in “North” mode, sending a “North” signal to the APC control unit.

When the receiver crosses a magnet the receiver is switched from “North” mode to “South” mode. The “North” signal to the control unit is switched off and a “South” signal switched on. On detecting a “South” signal from the receiver the control unit switches the outputs to the controller for the main pantograph circuit breaker which will consequently open. After a short delay the receiver is reset to the “North” mode. The “South” signal to the control unit is switched off and a “North” signal switched on. The short delay is to ensure that the receiver is no longer over the track magnet.

When the receiver crosses again a magnet the receiver is switched from “North” mode to “South” mode. The “North” signal to the control unit is switched off and a “South” signal switched on. On detecting a second “South” signal from the receiver the control unit switches the outputs to the circuit breaker controller so the circuit breaker will close again. After a short delay the receiver is reset to the “North” mode. The “South” signal to the control unit is switched off and a “North” signal switched on.

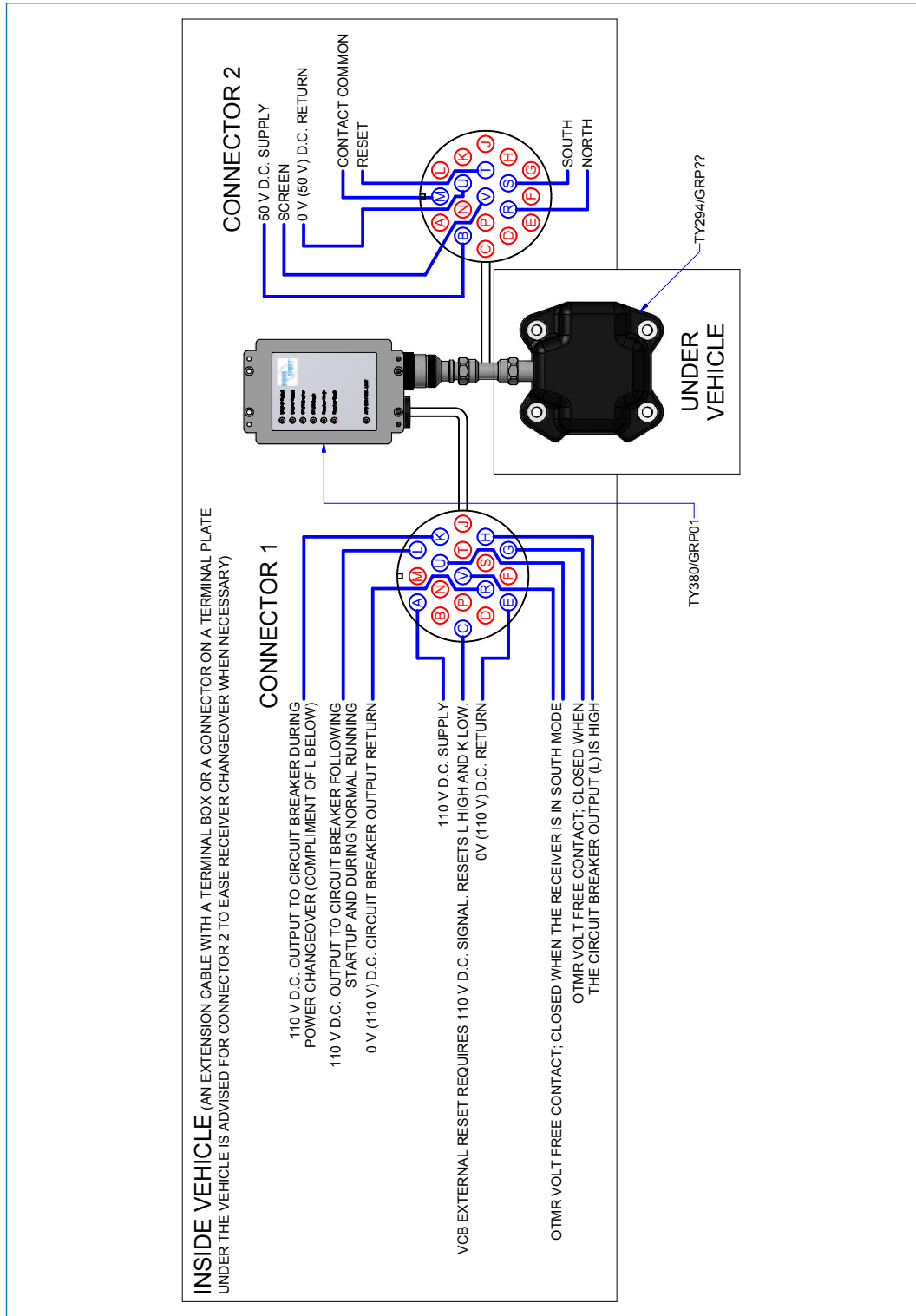
Timing diagram



APC system

Technical specifications

System schematic



APC system

Technical specifications

APC control unit



The APC Control unit comprises a painted, die cast aluminum enclosure containing the control electronics, power supply and two connectors. One connector is the interface with the vehicle and the second is the interface with the receiver.

The first connector has contacts for the vehicle power supply, control signals to the circuit breaker controller, OTMR outputs and a manual reset input. The outputs to the circuit breaker controller and the OTMR has duplicate LED indication to ease installation and fault finding. The manual reset input can be used to close the main circuit breaker if the system remains in the open mode. The second connector has contacts for power supply, reset and a common feed for the North and South outputs from the control unit, and North and South outputs to the control unit.



APC system

Technical specifications

Characteristics

Connectors	Amphenol AC Series or equivalent Circular Multi-pole Bayonet to MIL-C-5015 Contact Layout 22-14 with 16 gauge connectors Power connector to plug into Control Unit with female contacts Receiver connector to plug into Control Unit with male contacts Under vehicle receptacle to plug receiver into with female contacts
Power supply	110 VDC (-30% + 25%) Other voltages on request
On Train Monitoring Recorder (OTMR) output	<ol style="list-style-type: none"> 1. Circuit Breaker output (high during power changeover) 2. Receiver 'South' output (high when a receiver 'South' input is present)
Status LEDs	<ol style="list-style-type: none"> 1. Circuit breaker output (illuminated during power changeover) 2. No circuit breaker output (illuminated during normal running) 3. OTMR circuit breaker output 4. OTMR Receiver 'South' output 5. Receiver 'South' input 6. Receiver 'North' input
Circuit breaker output	Normally closed and normally open volt free contacts, rated 110 V / 1 A DC
Rated OTMR output	Volt free contacts rated at 110 V and 50 mA DC
Mounting	4 x M6 threaded inserts Mounting inside vehicle cab or integrated into an equipment rack
Protection	IEC 60529, IP65
Operating temperature	-25 °C...70 °C
Shock and vibration	IEC 61373, Category I, Class B, Body mounted
Outer material	Cast Aluminum, painted to meet BS 476 Part 7 Class 1 for surface spread of flame
Weight	2.0 kg

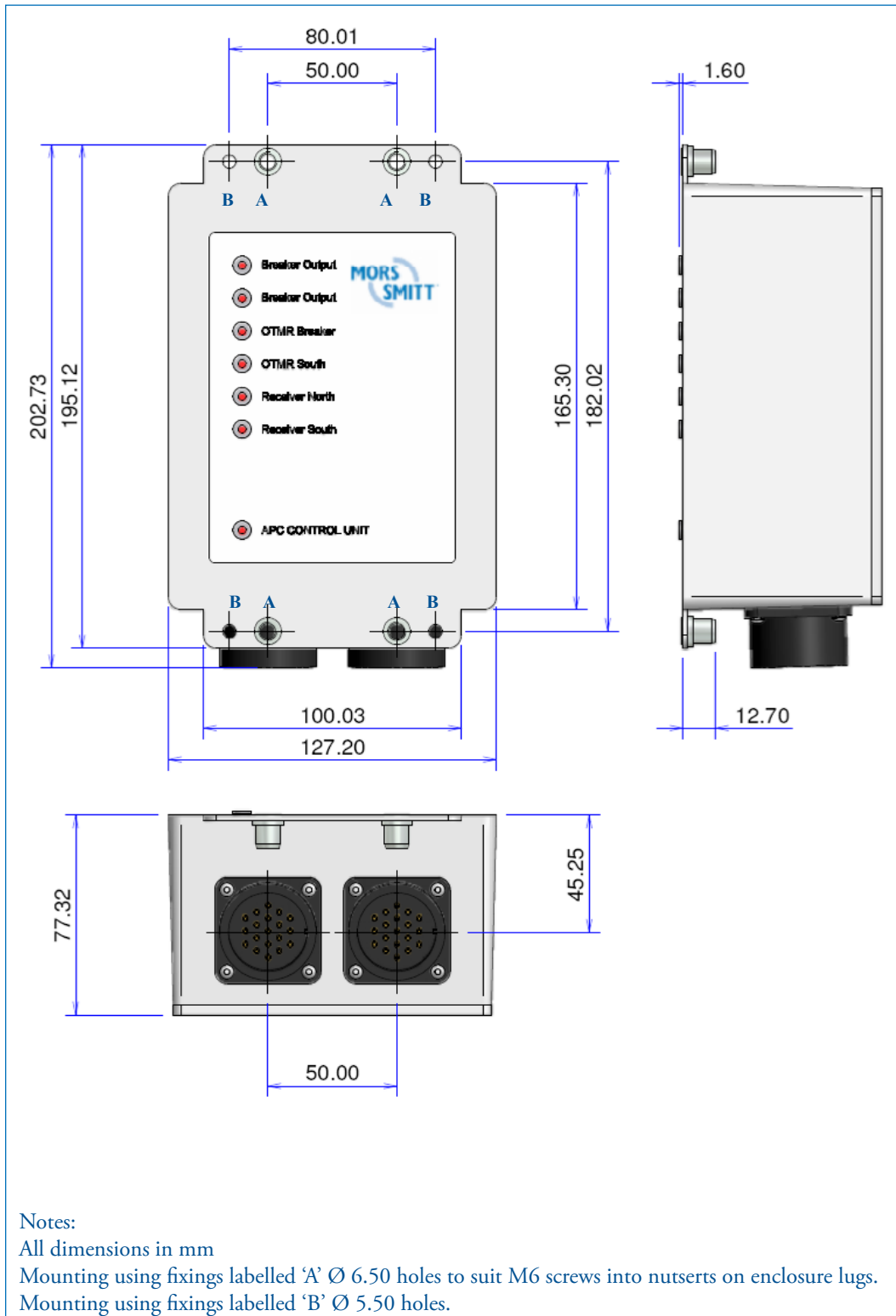
A manual reset for the circuit breaker circuit is available as a separate input.



APC system

Technical specifications

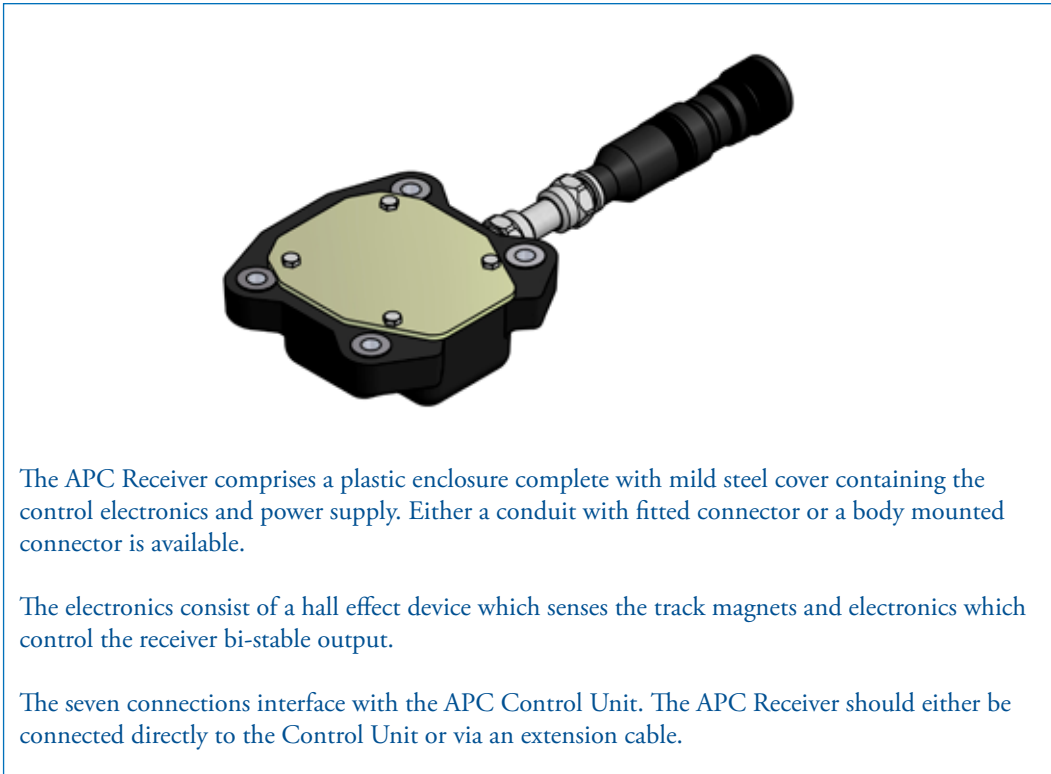
Dimensions



APC system

Technical specifications

APC receiver



The APC Receiver comprises a plastic enclosure complete with mild steel cover containing the control electronics and power supply. Either a conduit with fitted connector or a body mounted connector is available.

The electronics consist of a hall effect device which senses the track magnets and electronics which control the receiver bi-stable output.

The seven connections interface with the APC Control Unit. The APC Receiver should either be connected directly to the Control Unit or via an extension cable.

Characteristics

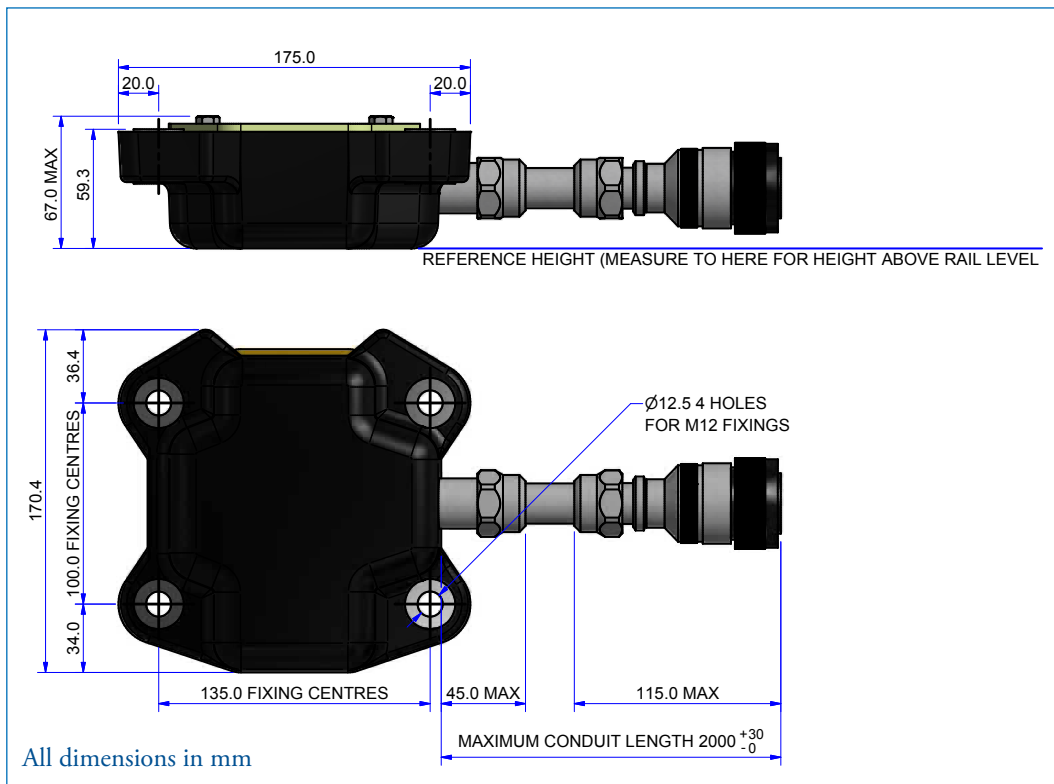
Connectors	<ul style="list-style-type: none"> - Amphenol AC Series or equivalent circular multi-pole bayonet to MIL-C-5015 - Contact layout 22-14 with 16 gauge connectors - Under vehicle receptacle to plug receiver into with female contacts
Power supply	50 VDC – supplied from APC control unit
Mounting	<ul style="list-style-type: none"> 4 inserts drilled on 100 x 135 mm centres to suit M12 fasteners Bogie mounted
Conduit length	Variable: 20 - 200 cm
Protection	IEC 60529, IPx6
Operating temperature	-25 °C...+55 °C
Shock and vibration	IEC 61373, Category 2, Bogie mounted
Salt mist	EN 50155 Clause 12.2.10 Class ST3
Outer material	Glass Reinforced Polyamide and Mild Steel
Weight	2.5 kg with 1000 mm conduit length



APC system

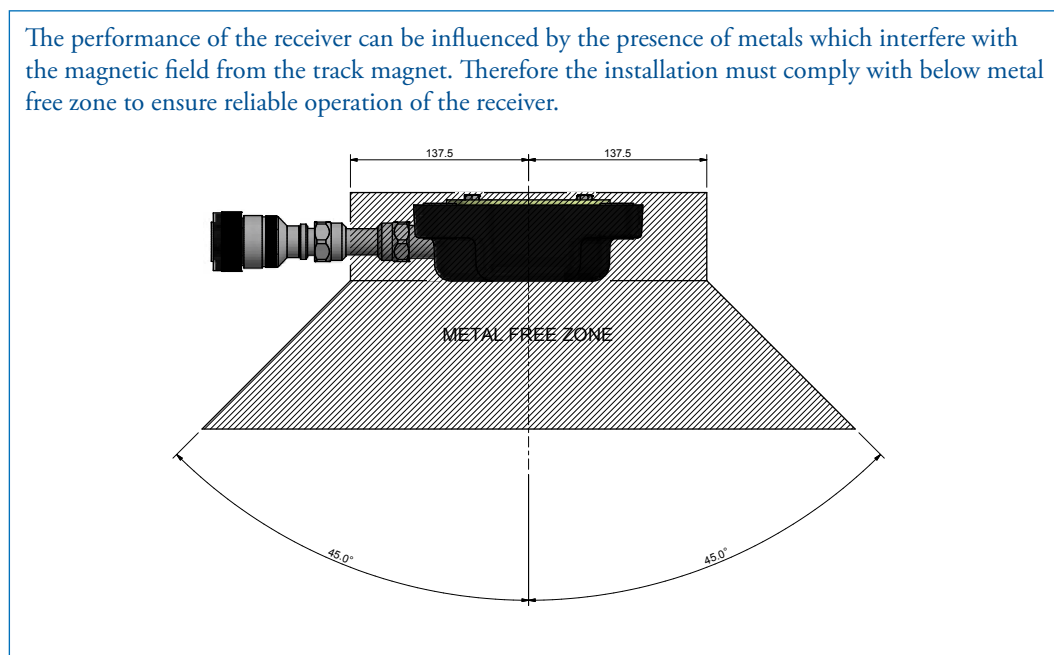
Technical specifications

Dimensions



Metal free zone

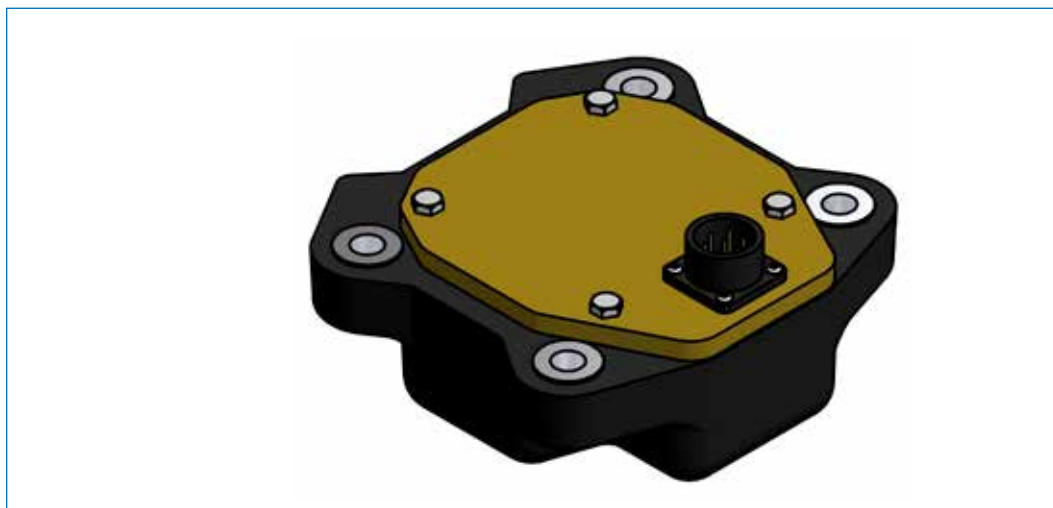
The performance of the receiver can be influenced by the presence of metals which interfere with the magnetic field from the track magnet. Therefore the installation must comply with below metal free zone to ensure reliable operation of the receiver.



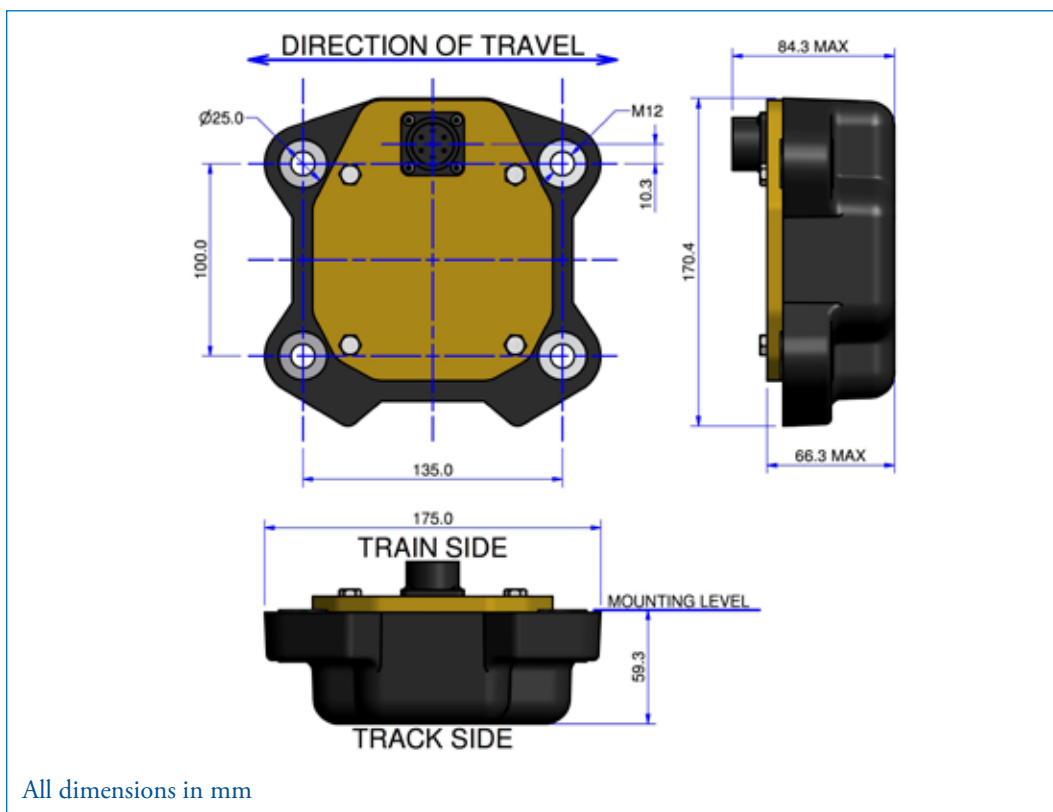
APC system

Technical specifications

APC receiver with connector mounted directly to the train body and no conduit



Dimensions



Metal free zone - see left page





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