

Component	Reference clause number	Requirements	Declaration of compliance (service provider to indicate compliance using the following: "Refer to evidence of compliance")	Evidence to support compliance	Test procedure	Validation of in-field demonstration evidence
	4.	Active Track and Trace Device				
		The active track and trace device shall comply with the following specifications:				
	4.1.	The device shall be completely battery powered, and the device shall be certified for use in the railway environment in terms of temperature and vibration (specified in CSE_1154_001_CAT_E48 Version 2).				
	4.2.	The service provider shall declare performance and availability metrics of the device including but not limited to the following items:				
	4.2.1.	The device shall be considered available if it is reporting data, or if it is able to reply to direct requests for status updates.				
	4.2.2.	It is preferable that the device switches to sleep mode when it is stationary for a configurable duration of time. In this mode the device shall provide a minimum of one status update (heartbeat) per 12-hour period. This is to optimise battery life without losing data resolution.				
	4.2.3.	Availability shall be calculated as the total available time divided by the total time over a period of 7 days.				
	4.2.4.	The device shall have a minimum availability of 90%.				
	4.2.5.	The service provider shall declare MTTR and MTBF statistics to Transnet.				

4.2.6.	The service provider shall provide communications details namely: number of packets lost; latency; number of connection attempts; and communications coverage. This will be used to determine the overall quality of service				
4.2.7.	The service provider shall provide a comparison of device battery life (days/months) compared to frequency of transmission (seconds/minutes).				
4.3.	The device shall periodically (generally this will be the same as the 'upload frequency' and will be per customer/service provider) communicate diagnostic information such as but not limited to remaining battery life (%) and system health checks				
4.4.	The service provider shall provide details to TFR of all communication (such as GSM/satellite) and location (such as GPS/GLONASS) media, both primary and fallback.				
4.5.	The equipment and all interfaces (antenna, power, sensors) shall be encapsulated in a single enclosure				
4.6.	The enclosure shall be constructed from materials that are not flammable or prone to ignition. The enclosure shall not be constructed from conductive material				
4.7.	The enclosure shall be IP67 rated for water and dust protection and relevant certification shall be supplied to Transnet.				
4.8.	The device shall be environmentally hardened for the following (specified in CSE_1154_001_CAT_E48 Version 2):				
4.8.1.	The device shall have the ability to function within the railway environment, which is characterised by, amongst others, exposure to: lightning strikes and/or surges; water; humidity; and dust from metals and other products				

4.8.2.	The system efficiency shall not be adversely affected by environmental factors such as weather, dust, water, wind, shock, smog, vibration, heat, and humidity.				
4.8.3.	The device shall be robust and able to withstand typical operational activities including loading and offloading of products; placement and removal of tarpaulin covers; and bangs from tools, equipment, falling products etc.				
4.9.	The device shall be able to operate under non-electrified lines, 3kV DC, 25kV AC and 50kV AC electrified lines.				
4.10.	The device shall not interfere with track circuits and wayside (RF) equipment.				
4.11.	The device shall include a certificate of ICASA type approval.				
4.12.	The device shall not be susceptible to theft and vandalism:				
4.12.1.	The device shall be spray painted using rust proof paint of a similar colour to the vehicle.				
4.12.2.	The device shall not have flickering lights or audible noises.				
4.12.3.	The mechanical fastenings shall be sufficiently secured (not able to be removed by hand).				
4.13.	The device shall not exceed the external dimensions of 15cm x 30cm x 5cm and a weight of 1kg.				
4.14.	The device shall come with a tamper alert function to detect and alarm on any unauthorised removals and/or theft attempts.				
5.	Device Installation				

B: Device requirements

5.1.	The mounting location of the device shall not impede the typical operational and maintenance duties of the vehicle, which may include but are not limited to the following: shunting, loading (such as with a front-end loader), off-loading, handbrake activation/release, tarpaulin fitment/removal, and tippler operation.				
5.2.	The service provider shall mount their devices using a standard TFR footprint (refer to Appendix A). The back plate shall be supplied with the device and be constructed of mild steel. The back plate may be between 3mm and 6mm in thickness.				
5.3.	The device with backing plate shall be mounted flush to the sole bar of the vehicle. The sole bar is between 8mm and 12mm thick at the side plate and between 10mm and 12mm at the front/back plate respectively. Where a sole bar is not present, the service provider shall suggest an alternative mounting location to be approved by Transnet.				
5.4.	The device with backing plate shall be mounted to the vehicle using bolts or rivets or screws (refer to back plate dimensions in Appendix A) of size M6 (four holes). All mechanical fasteners used shall be stainless steel and be equipped with locking mechanisms so as not to come loose because of vibrations.				
5.5.	The service provider may use their discretion in the method of attaching the device to the back plate, provided that the back plate is able to be mounted flush to the sole bar (no protruding bolts/rivets/screws).				

5.6.	The service provider shall provide an installation plan to TFR for approval before device installation may commence. This plan shall include details regarding the date and place of installation, the types and number of vehicles to be fitted, and the proposed mounting location on the vehicle.				
5.7.	Should grinding be required for installation, all surfaces shall be refinished with rust proof spray paint. No welding shall be permitted.				
5.8.	The service provider/customer shall take photos of each installation to be provided to Transnet. The photo shall clearly display the vehicle number, device serial number, and mounting location. The picture of the installation must be linked to the serial number of the device and must display the vehicle number and type.				
5.9.	The device shall be configured with the Vehicle Number and Vehicle Type stencilled on the side of the vehicle. Dashes and spaces in these fields shall not be included e.g., 17761174, CCEW12. The service provider shall provide a list of additional configurable parameters (associated attributes).				
5.10.	As part of the full data set, TFR requires at least (minimum) the data fields as specified in Appendix B.				
5.11.	The device shall not pose a safety risk to TFR personnel due to items such as sharp edges and incorrect placement close to moving parts (e.g., handbrake mechanism).				
5.12.	The device shall be installed on the wagon at the customer's private siding and shall not influence the regular revenue generating exercises of the wagon.				
5.13.	A representative of TFR or the customer shall be on site to sign off on the completed installation and device configuration.				

5.14.	Only one active tracking device per vehicle shall be permitted to be installed.				
5.15.	If a device is found on rolling stock that does not have an approved installation plan and/or from a service provider not on the approved list, TFR reserves the right to remove the device from the vehicle.				
6.	Device Maintenance				
6.1.	The service provider shall only be granted access to the device to perform routine maintenance when the vehicle is at the customer's private siding.				
6.2.	TFR shall be notified of all maintenance activities including, but not limited to replacement of batteries. All maintenance logs shall be communicated through the respective customer's key account manager.				
6.3.	Should a device be damaged or stolen during operation TFR shall not be liable for any costs related to the replacement/repair of the device.				
9.	Flexibility and Expansion				
	TFR envisions consistent technology improvements as well as new operational applications in the future; therefore, the following standards are not mandatory but may be used to prioritise bidders according to their degree of compliance				
9.1.	It is preferred that the device shall accommodate a wireless interface such as Bluetooth Low Energy for sensor integration.				
9.2.	The pairing interface between the BLE sensors and the gateway shall be made available to Transnet.				
9.3.	The service provider shall provide a roadmap of development features so that TFR is able to gauge future applications.				

	9.4.	The service provider shall provide a proposal in the case of a customer using shipping containers on how to pair the containers (which do not have a dedicated device) with the active track and trace device on the wagon.				
	9.5.	The service provider shall demonstrate the ability to measure a train consist, i.e., a sequence of physically coupled vehicles.				
	10.	Remote update				
	10,1	It is envisaged that during the operational life-cycle of the devices, there shall be additional configuration changes applied				
	10,2	As such the devices shall have capability to receive all applicable updates over-the-air from a central portal, i.e. not from a one to one Bluetooth device. Typical configurable parameters include reporting waypoints, reporting frequency, current location trigger etc.				
	10,3	The devices shall remain operational during remote parameter updates and shall only apply changes when the integrity of update file / packets is verified				
	10,4	If the device loses connectivity during the updates, it shall resume seamlessly when connectivity is restored until the complete update is received.				
	10,5	All updates shall be documented and accessible in a revision data sheet.				
	10,6	All software, firmware and configuration updates shall be tested in a laboratory first before they are uploaded				
	10,7	It shall be possible to roll back the software, firmware or configuration versions if bugs are detected in newer versions				
C: Interface	11.1.	The service provider shall provide a secure REST endpoint on their platform, from which Transnet is able to retrieve messages received from the active track and trace devices				

Requirements	11.2.	The minimum expected data fields are described in Appendix B				
	11.3.	The service provider shall provide Transnet with a complete message specification				
D: In-field compliance demonstration	8.1	The device shall be made available for in-field compliance demonstration for a configurable duration of time (to be determined per project).				
	8.2	Service providers shall install, configure and demonstrate compliance with only two (2) devices fitted on separate vehicles during the in-field compliance demonstration stage				
	D1 Compliance period	The device shall be made available for in-field compliance demonstration for no more than ninety (90) days.				
	D2 Funding for In-field demonstration	The service provider shall fund the in-field compliance demonstration of their devices; this should be included in the financial viability				
E: Decommissioning and early contract termination	7.2.	Following the in-field demonstration period, the devices are to be removed from the wagons within a 3 month period. If they are not removed within this period, Transnet reserves the right to remove them.				
	7.3.	Device removals shall be conducted at the customer siding.				
	7.4.	provider shall mark the location of the backplate holes (on the vehicle) with a visible spray paint.				
	7.5.	The service provider shall provide photographic evidence to TFR of successful removals, showing the marked drill holes and the vehicle number.				

	E1 : Removal	TFR shall continue to charge the supplier within the ninety (90) day removal period until evidence is provided that the device has been removed.				
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