

Equipment Specification

Title	Test Equipment Interface
Equipment purpose	Data transfer to/from MOT Testing System (MTS)
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1. Introduction

1.1. This specification details the method of transfer and the specific data sets required for the transfer of MOT information from connectable test lane equipment in use at VTS premises.

2. Scope

2.1. Connectable test lane equipment which is unable to be connected to the MTS system will no longer be approved for use in the MOT scheme.

2.2. Connectable test lane equipment is defined as: -

Equipment Type	Required Data Set
Roller Brake Tester Class IV,V,VII	BrakeTestResult (RBT)
Decelerometer	BrakeTestResult (Decel)
Exhaust Gas Analyser	EmissionsTestResult (Spark)
Diesel Smoke Meter	EmissionsTestResult (Compression)
Headlamp Beam Tester	HeadlampTestResult

3. Purpose

3.1. To enable manufacturers of connectable test lane equipment to comply with the requirements of the MTS system in the transfer of MOT data to the MTS system.

4. Requirements

4.1. General

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4.1.1. Connectable test lane equipment must be able to communicate with 'MOT Testing Service' (MTS), receiving test and vehicle information from, and transmitting test results to, the MTS System using the Test Equipment Interface Specifications found in the accompanying Annexes.

4.1.2. Before any equipment is put into service using the interface for MOT testing purposes, proof of compliance with the equipment interface specification will be provided by a system of 'Type Approval' of the interface and arrangements to ensure that equipment supplied to the market conforms to the type approved master.

4.2. Equipment shall:

4.2.1. receive test and vehicle information from, and transmit test results to the MTS System;

4.2.2. meet with all appropriate data transmission requirements in the Annex.

4.3. Technical

4.3.1. The MTS test equipment interface consists of an Internet of Things (IoT) application programming interface (API) provided by Amazon Web Services (AWS) using their IoT Core service.

4.3.2. In order to connect to this API, the equipment will require an X.509 client certificate, which is issued by DVSA. These certificates are issued to the authorised site owner and are unique for each client.

4.3.3. Each client will be issued with the appropriate client certificates and a file containing the following properties: -

Property Name	Property Description
clientEndpoint	The URL of the MTS IoT service endpoint you connect to
clientId	A unique identifier for each client
certificateFile	The filename of the X.509 public certificate
privateKeyFile	The filename of the X.509 private key
siteNumber	The VTS site number for the site
topicPrefix	The prefix to the topic name

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4.3.4. The IoT API makes use of two IoT Topics, one for inbound messages and another for outbound. There are one set of topics per site and all clients subscribe to and therefore receive all messages sent from MTS. The names of the topics are composed of the values from the properties above

Topic Name	Topic Description
[<i>topicPrefix</i>]/in/[<i>siteNumber</i>]	Inbound messages to client from MTS
[<i>topicPrefix</i>]/out/[<i>siteNumber</i>]	Outbound messages from client to MTS

5. Operation Instructions

- 5.1. When the MOT test begins a WorkOrderRequest with a workOrderState of NEW will be published to the site's Inbound topic.
- 5.2. This WorkOrderRequest will be received by all connected equipment.
- 5.3. Once the relevant measurement has been performed each piece of equipment should formulate the appropriate WorkOrderResponse containing the measured results for that part of the MOT test.
- 5.4. The WorkOrderResponse should then be published to the Outbound topic. The WorkOrderResponses from each piece of equipment may be combined or sent individually.
- 5.5. When the MOT test has concluded a WorkOrder status message will be sent containing the workOrderState of COMPLETE. This may be used by the client to conclude the equipment test.
- 5.6. If the MOT test is aborted a WorkOrder status message will be sent containing the workOrderState of CANCELLED. This may be used by the client to conclude the equipment test.
- 5.7. If the client was not connected to the Inbound topic when MTS sent the WorkOrderRequest, this will be resent when the client connects.
- 5.8. When the client connects all WorkOrders that are currently in the NEW state i.e. the test is in progress, will be resent. The client should expect that if there are multiple connections such as when network connectivity is interrupted, then multiple [duplicate] WorkOrderRequests may be received for the same test.

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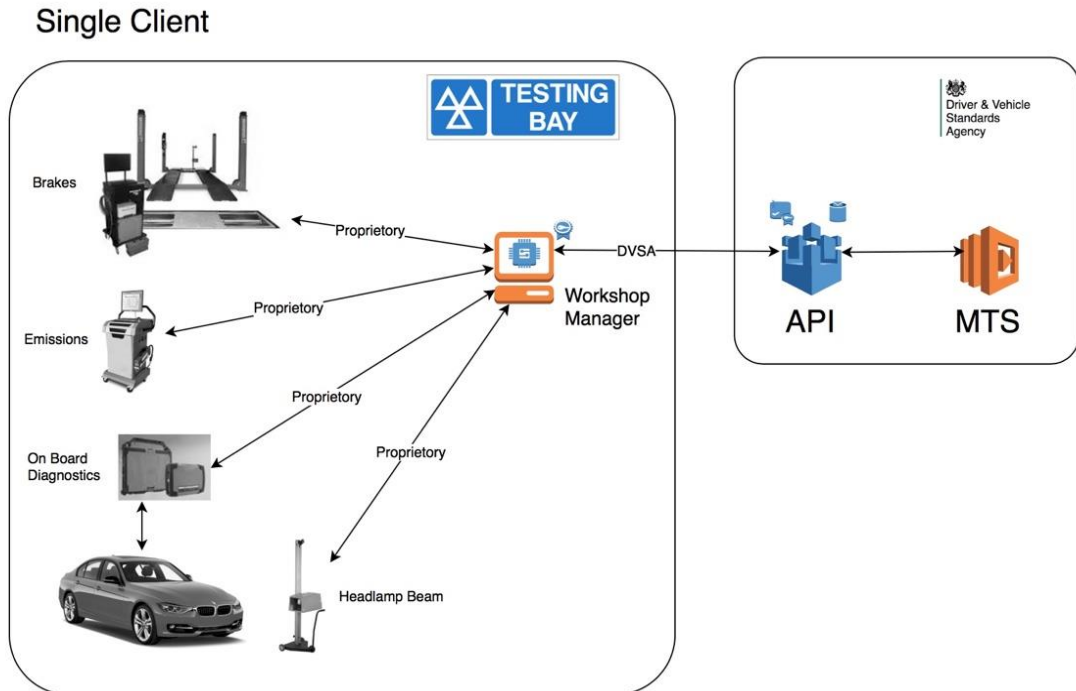
6. Method of Inspection – Vehicle Testing

6.1. Not Applicable.

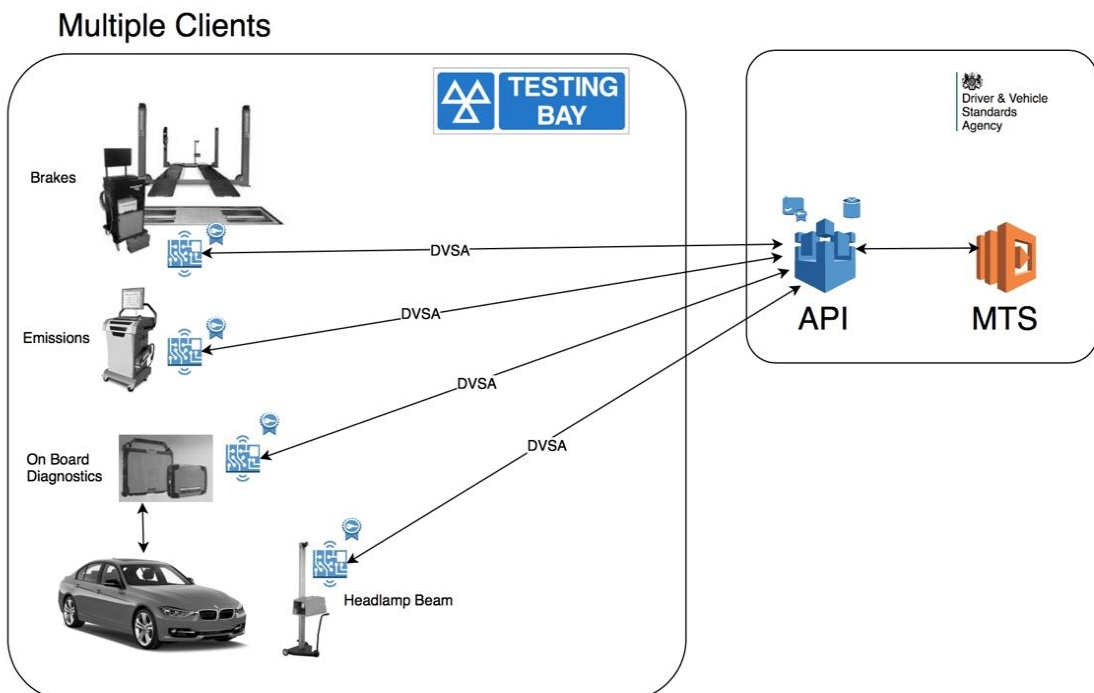
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7. Process Chart

7.1. There are two models anticipated for implementation as illustrated below. The first model uses a single client to communicate between MTS and each piece of connected test equipment.



The second model has multiple clients each connecting directly to MTS.



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8. Approval Process

8.1. Application for approval to be made to the Garage Equipment Association (GEA). The Driver and Vehicle Standards Agency (DVSA) is responsible for the management of the statutory annual testing of all vehicles in accordance with the Motor Vehicle (Tests) Regulations 1981, as amended, and where applicable, with the Goods Vehicle (Plating and Testing) Regulations 1988, as amended. DVSA has responsibility for controlling the overall standard of the statutory annual test and within that duty; a procedure for the approval of test equipment suitable for statutory MOT testing has been established. The approval of authorised MOT testing equipment has been contracted out to the GEA. Documents detailing the procedure to be followed by manufacturers who wish to gain approval of test equipment intended to be used for statutory MOT testing are held on the GEA website. Their contact details are also published there.

9. Evidential Requirements

9.1. Testing to be conducted by the approval engineer instructed by the GEA/DVSA in a simulated live environment to prove ability of product to send correctly packaged data to the MTS system.

10. Annex

10.1. Security

10.1.1. The following guidance provides basic cyber security controls for IoT devices connecting to MTS.

10.1.1.1. No Default Passwords - All device passwords must be unique. It should not be possible to reset a password to a universal factory default value.

10.1.1.2. Disclose Vulnerabilities - Provide a public point of contact as part of a vulnerability disclosure policy in order that security researchers (and others) are able to report issues. Disclosed vulnerabilities should be acted on in a timely manner.

10.1.1.3. Update Software regularly - All software components in internet-connected devices should be securely updateable. Updates must be timely and not impact on the functioning of the device. The need for each update should be made clear to consumers and an update should be easy to implement. For constrained devices that cannot physically be updated (such as sensors), the product should be capable of isolation and be replaceable.

10.1.1.4. Have an End Of Life plan - An end-of-life policy must be published for end-point devices which explicitly states, with reasons, the minimum length of time for which it will receive software updates.

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- 10.1.1.5. Protect data at rest – Any data on the devices must be protected from corruption and exfiltration and be subject to regular housekeeping (deleted as soon as no longer required).
- 10.1.1.6. Firewall – Connections to the internet must be via a properly configured and patched firewall which prevents remote access to the IoT devices from the internet unless such access is required for the operation of the device.
- 10.1.1.7. Protect data in transit – Data transmitted from a device to MTS must be protected using well-configured TLS v1.2.

10.2. Generic Data

10.2.1. WorkOrderRequest Data Set

WorkOrder (Request)

Field Name	Data Type	Description
siteNumber	String	VTS Site Number
testNumber	String	Unique MOT test number
vehicle	Vehicle	Details of the vehicle under test
workOrderState	String	NEW COMPLETE CANCELLED

10.2.2. Vehicle Data Set

Vehicle

Field Name	Data Type	Values
make	String	
model	String	
vrn	String	
vin	String	
firstRegistrationDate	String	YYYY-MM-DD
fuelType	String	PETROL DIESEL
vehicleClass	String	4 5 7

10.3. Equipment Specific Data

10.3.1. BrakeTestResult Data Set

WorkOrder (Response)

Field Name	Data Type	Values
siteNumber	String	

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testNumber	String	
vehicle	Vehicle	
brakeTestResult	BrakeTestResult	
emissionsTestResult	EmissionsTestResult	
headlampTestResult	HeadlampTestResult	

10.3.2. Roller Brake Tester Data Set

BrakeTestResult (Roller Brake Tester)

Field Name	Data Type	Values
serviceBrakeTestType	String	ROLLER
parkingBrakeTestType	String	ROLLER
vehicleWeightType	String	PRESENTED MANUFACTURER
vehicleWeightKg	Number	
serviceBrakeEfforts	Array [BrakeEffort]	
parkingBrakeEfforts	Array [BrakeEffort]	

BrakeEffort (Roller Brake Tester)

Field Name	Data Type	Values
axleNumber	Number	1 – (number of axles)
nearside	Number	
nearsideLock	Boolean	true false
offside	Number	
offsideLock	Boolean	true false

10.3.3. Decelerometer Data Set

BrakeTestResult (Decelerometer)

Field Name	Data Type	Values
serviceBrakeTestType	String	DECELEROMETER
parkingBrakeTestType	String	DECELEROMETER
serviceBrakeEfficiency	Number	
parkingBrakeEfficiency	Number	

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10.3.4. Emissions

EmissionsTestResult

Field Name	Data Type	Values	Mandatory
vehicleOdometerReading	Number		N
vehicleFuelType	String	PETROL DIESEL LPG	Y
startDateTime	String	ISO 8601 YYYY-MM- DDThh:mm:ssZ	Y
engineTempMinLimit	Number		N
engineTempValue	Number		N
engineTempCaptureMethod	String	PROBE OBD GUAGE FAN HOSE	N
engineTempTestResult	String	PASS FAIL NOT_MEASURED	N
overallTestResult	String	PASSED FAILED	Y
limitsApplied	String	DEFAULT MANUFACTURER	Y
sparkTestResult	SparkTestResult		Y
compressionTestResult	CompressionTestResult		Y

10.3.5. Emissions (Spark)

SparkTestResult

Field Name	Data Type	Values	Mandatory
testType	String	BET CAT NON_CAT	Y
fastIdleMinRPMLimit	Number		N
fastIdleMaxRPMLimit	Number		N
fastIdleRPMValue	Number		N
fastIdleRPMTTestResult	String	PASS FAIL	N
fastIdleMaxCOLimit	Number		Y
fastIdleCOValue	Number		Y
fastIdleCOTestResult	String	PASS FAIL	Y
fastIdleMaxHCLimit	Number		Y
fastIdleHCValue	Number		Y
fastIdleHCTestResult	String	PASS FAIL	Y
fastIdleMinLambdaLimit	Number		Y
fastIdleMaxLambdaLimit	Number		Y
fastIdleLambdaTestResult	String	PASS FAIL	Y
secondFastIdleMinRPMLimit	Number		N

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secondFastIdleMaxRPMLimit	Number		N
secondFastIdleRPMValue	Number		N
secondFastIdleRPMTTestResult	String	PASS FAIL	N
secondFastIdleMaxCOLimit	Number		N
secondFastIdleCOValue	Number		N
secondFastIdleCOTestResult	String	PASS FAIL	N
secondFastIdleMaxHCLimit	Number		N
secondFastIdleHCValue	Number		N
secondFastIdleHCTestResult	String	PASS FAIL	N
secondFastIdleMinLambdaLimit	Number		N
secondFastIdleMaxLambdaLimit	Number		N
secondFastIdleLambdaTestResult	String	PASS FAIL	N
naturalIdleMinRPMLimit	Number		N
naturalIdleMaxRPMLimit	Number		N
naturalIdleRPMValue	Number		N
naturalIdleRPMTTestResult	String	PASS FAIL	N
naturalIdleMaxCOLimit	Number		Y
naturalIdleCOValue	Number		Y
naturalIdleCOTestResult	String	PASS FAIL	Y

10.3.6. Emissions (Compression)

CompressionTestResult

Field Name	Data Type	Values	Mandatory
testType		FAST_PASS TURBO NON_TURBO	Y
opacityMaxLimit	Number		Y
fas1Value	Number		Y
fas1RPM	Number		N
fas2Value	Number		Y
fas2RPM	Number		N
fas3Value	Number		Y
fas3RPM	Number		N
fas4Value	Number		Y
fas4RPM	Number		N
fas5Value	Number		Y
fas5RPM	Number		N
fas6Value	Number		Y
fas6RPM	Number		N
meanValue	Number		Y
zeroDrift	Number		Y
correctedValue	Number		Y
testResult	String	PASS FAIL	Y

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10.3.7. Headlamp

HeadlampTestResult

Field Name	Data Type	Values	Mandatory
nearside	HeadlampResult		Y
offside	HeadlampResult		Y
overallTestResult	String	PASS FAIL	Y

HeadlampResult

Field Name	Data Type	Values	Mandatory
high	String	PASS FAIL	Y
low	String	PASS FAIL	Y
left	String	PASS FAIL	Y
right	String	PASS FAIL	Y

10.4. Vehicle Registration

Register Vehicle

Field Name	Data Type	Values	Mandatory
siteNumber	String		Y
vin	String		N
vrm	String		N

10.5. Examples

The data set should be supplied in JSON format similar to the example below: -

WorkOrderRequest: -

```
{
  "siteNumber": "V123456",
  "testNumber": "1234567890",
  "vehicle": {
    "make": "Ford",
```

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```
"model": "Fiesta",  
"vrm": "ABC 123",  
"vin": "1234567890123456",  
"firstRegistrationDate": "2019-01-31",  
"fuelType": "PETROL",  
"vehicleClass": "4"},  
"workOrderState": "NEW"  
}
```

WorkOrder Response (RBT): -

```
{  
  "siteNumber": "V123456",  
  "testNumber": "1234567890",  
  "vehicle": {  
    "make": "Ford",  
    "model": "Fiesta",  
    "vrm": "ABC 123",  
    "vin": "1234567890123456",  
    "firstRegistrationDate": "2010-01-31",  
    "fuelType": "PETROL",  
    "vehicleClass": "4"  
  },  
  "brakeTestResult": {  
    "serviceBrakeTestType": "ROLLER",  
    "parkingBrakeTestType": "ROLLER",  
    "vehicleWeightType": "PRESENTED",  
    "vehicleWeightKg": 1500,  
    "serviceBrakeEfforts": [  
      {  
        "axleNumber": 1,  
        "nearside": 600,  
        "nearsideLock": false,  
        "offside": 600,  
        "offsideLock": false  
      },  
      {  
        "axleNumber": 2,  
        "nearside": 400,  
        "nearsideLock": false,  
        "offside": 400,  
        "offsideLock": false  
      }  
    ],  
    "parkingBrakeEfforts": [  
      {  
        "axleNumber": 2,  
        "nearside": 300,  
        "nearsideLock": false,  
        "offside": 300,  
        "offsideLock": false  
      }  
    ]  
  }  
}
```

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```
}  
]  
}  
}
```

WorkOrder Response (Decelerometer): -

```
{  
  "siteNumber": "V123456",  
  "testNumber": "1234567890",  
  "brakeTestResult": {  
    "serviceBrakeTestType": "DECELEROMETER",  
    "parkingBrakeTestType": " DECELEROMETER ",  
    "serviceBrakeEfficiency": 80.3,  
    "parkingBrakeEfficiency ": 60.7 }  
}
```

Spark Basic Emission Test (BET): -

```
{  
  "siteNumber": "V123456",  
  "testNumber": "1234567890",  
  "emissionTestResult": {  
    "vehicleFuelType": "PETROL",  
    "startDateTime": "2019-01-17T11:25:18.429Z"  
    "sparkTestResult": {  
      "testType": "BET",  
      "fastIdleMinRPMLimit": 2500,  
      "fastIdleMaxRPMLimit": 3000,  
      "fastIdleRPMValue": 2760,  
      "fastIdleRPMTTestResult": "PASS",  
      "fastIdleMaxCOLimit": 0.200,  
      "fastIdleCOValue": 0.140,  
      "fastIdleCOTestResult": "PASS",  
      "fastIdleMaxHCLimit": 200,  
      "fastIdleHCValue": 200,  
      "fastIdleMinLambdaLimit": 0.970,  
      "fastIdleMaxLambdaLimit": 1.030,  
      "fastIdleLambdaValue": 1.000,  
      "fastIdleLambdaTestResult": "PASS",  
      "naturalIdleMinRPMLimit": 450,  
      "naturalIdleMaxRPMLimit": 1500,  
      "naturalIdleRPMValue": 960,  
      "naturalIdleRPMTTestResult": "PASS",  
      "naturalIdleMaxCOLimit": 0.300,  
      "naturalIdleCOValue": 0.140,  
      "naturalIdleCOTestResult": "PASS"  
    },  
    "limitsApplied": "DEFAULT",  
    "overallTestResult": "PASSED"  
  }  
}
```

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```
}  
}
```

Spark CAT: -

```
{  
  "siteNumber": "V123456",  
  "testNumber": "1234567890",  
  "emissionTestResult": {  
    "vehicleFuelType": "PETROL",  
    "startDateTime": "2019-01-17T11:30:09.585Z",  
    "engineTempMinLimit": 80,  
    "engineTempValue": 80,  
    "engineTempTestResult": "PASS",  
    "sparkTestResult": {  
      "testType": "CAT",  
      "fastIdleMinRPMLimit": 2450,  
      "fastIdleMaxRPMLimit": 3050,  
      "fastIdleRPMValue": 2820,  
      "fastIdleRPMTTestResult": "PASS",  
      "fastIdleMaxCOLimit": 0.2,  
      "fastIdleCOValue": 0.098,  
      "fastIdleCOTestResult": "PASS",  
      "fastIdleMaxHCLimit": 200,  
      "fastIdleHCValue": 100,  
      "fastIdleMinLambdaLimit": 0.969,  
      "fastIdleMaxLambdaLimit": 1.03,  
      "fastIdleLambdaValue": 1.0,  
      "fastIdleLambdaTestResult": "PASS",  
      "naturalIdleMinRPMLimit": 575,  
      "naturalIdleMaxRPMLimit": 875,  
      "naturalIdleRPMValue": 720,  
      "naturalIdleRPMTTestResult": "PASS",  
      "naturalIdleMaxCOLimit": 0.299,  
      "naturalIdleCOValue": 0.140,  
      "naturalIdleCOTestResult": "PASS"  
    },  
    "limitsApplied": "MANUFACTURER",  
    "overallTestResult": "PASSED"  
  }  
}
```

Spark Non CAT: -

```
{  
  "siteNumber": "V123456",  
  "testNumber": "1234567890",  
  "emissionTestResult": {  
    "vehicleFuelType": "PETROL",  
    "startDateTime": "2019-01-17T11:47:43.123Z",  
    "sparkTestResult": {
```

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```
"testType": "NON_CAT",
"naturalIdleRPMTestResult": "PASS",
"naturalIdleMaxCOLimit": 3.500,
"naturalIdleCOValue": 0.140,
"naturalIdleCOTestResult": "PASS",
"naturalIdleMaxHCLimit": 1200,
"naturalIdleHCValue": 200,
"naturalIdleHCTestResult": "PASS"
},
"limitsApplied": "DEFAULT",
"overallTestResult": "PASSED"
}
}
```

Compression Fast Pass: -

```
{
  "siteNumber": "V123456",
  "testNumber": "1234567890",
  "emissionTestResult": {
    "vehicleFuelType": "DIESEL",
    "startDateTime": "2019-01-17T13:46:36.950Z",
    "compressionTestResult": {
      "testType": "FAST_PASS",
      "opacityMaxLimit": 1.500,
      "fas1Value": 1.040,
      "zeroDrift": 0.020,
      "correctedValue": 1.020,
      "testResult": "PASS"
    },
    "limitsApplied": "DEFAULT",
    "overallTestResult": "PASSED"
  }
}
```

Compression Turbo: -

```
{
  "siteNumber": "V123456",
  "testNumber": "1234567890",
  "emissionTestResult": {
    "vehicleFuelType": "DIESEL",
    "startDateTime": "2019-01-17T13:49:46.368Z",
    "compressionTestResult": {
      "testType": "TURBO",
      "opacityMaxLimit": 0.699,
      "fas1Value": 1.110,
      "fas2Value": 0.359,

```

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```
"fas3Value": 0.200,  
"fas4Value": 0.500,  
"fas5Value": 0.320,  
"fas6Value": 0.359,  
"meanValue": 0.390,  
"zeroDrift": 0.000,  
"correctedValue": 0.390,  
"testResult": "PASS"  
},  
"limitsApplied": "MANUFACTURER",  
"overallTestResult": "PASSED"  
}  
}
```

Headlamp Test: -

```
{  
  "siteNumber": " V123456",  
  "testNumber": "1234567890",  
  "headlampTestResult": {  
    "nearside": {  
      "high": "PASS",  
      "low": "PASS",  
      "left": "PASS",  
      "right": "PASS"  
    },  
    "offside": {  
      "high": "PASS",  
      "low": "PASS",  
      "left": "PASS",  
      "right": "PASS"  
    },  
    "overallTestResult": "PASS"  
  }  
}
```