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Definition for inspection results in asanetwork			☐ Draft ☒ Released
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Brief description:

Definition of a general model for presentation of inspection results and an implementation based on XML.

Notes on changes:

See chapter 5.

Copyright notice

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1 Introduction

1.1 Aim and overview

In a networked workshop we can use vehicle testers and workshop equipment of different manufacturers. It therefore is necessary to use a common data to avoid multiple acquisition and conversion of test and measurement data.

The data format to be elaborated must be forward-looking, extensible and self documenting and based on existing standards.

1.2 Notes on the breakdown

Chapter 2 lists the requirements for the data format.

Chapter 3 introduces a logical structure to map inspection results into a hierarchical model

Chapter 4 defines the implementation using XML and chapter 4.2 shows some examples.

2 Requirements

The data format to be elaborated must

- be extensible in an easy and neutral way

  New data and structures must be added without changing the base design.

  At the same time these extension must be backward compatible to operate new and old software versions together.

- have a clear separation between structure and contents

The data format to be elaborated should

- have the possibility to verify the structure at runtime
- be human readable
- use international accepted standards

3 Specification

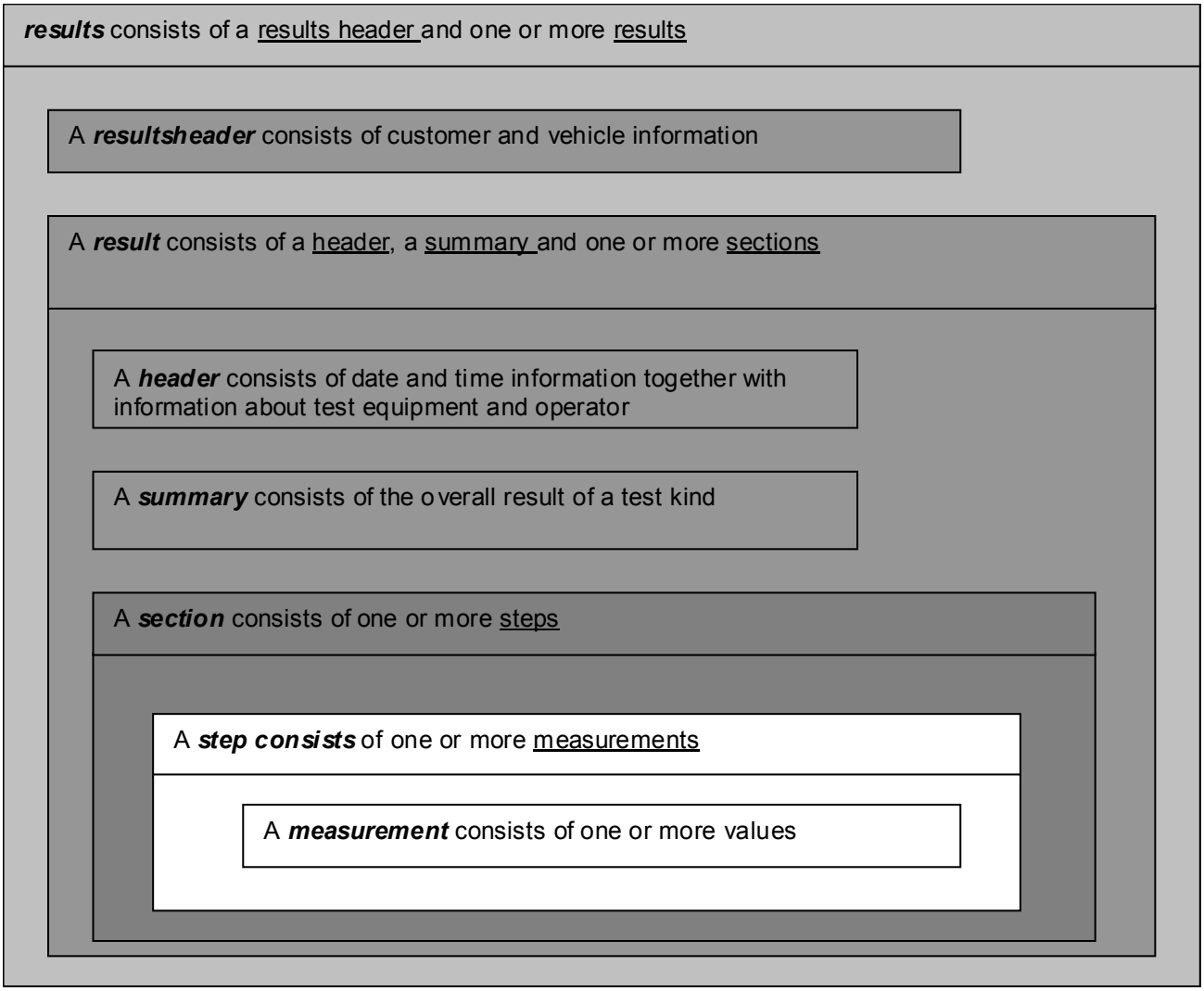
To map inspection results into a data format we have to consider two different levels:

- a structure, representing the frame of an inspection
- the data and their description

3.1 Structure

The mapping for inspection results uses a hierarchical model with max. 6 levels. Each level is provided with a keyword and some attributes.

3.2 Formal description



Formal:

results	::==	results header, result +
results header	::==	country info, customer info, vehicle info
country info	::==	regulation, language
customer info	::==	name, address, ...
vehicle info	::==	make, model, ...
result	::==	header, summary, section +
header	::==	date, time, equipment, operator
summary	::==	overall result of test kind
section	::==	step +
step	::==	measurement +, measurement row +
measurement	::==	Values +
measurement row	::==	Values 1..n +

+ one or more occurrences of this symbol

Each level is introduced by a key word. The possible values for a key word are defined in dependence of the test kind.

3.3 Key word overview

Every key word contains information (data) or additional key words (next level), which contain information.

Attributes are used to add supplemental information for key words.

Level	Key word	contents
1	RESULTS	the whole (inspection) result(s)
2	RESULTSHEADER	country, customer, vehicle
2	RESULT	one test, what and where is tested
2	SUMMARY	overall result(s) of all tests
3	HEADER	date, time, equipment, operator, order
3	SUMMARY	overall results of one test
3	SECTION	flow of the test process
4	SUMMARY	overall results of one section
4	STEP	additional subdivision
4	SUMMARY	overall results of the step
5	MEAS	measurements, generally physical values
6	VALUE	value
5	MEAS_ROW	measurement row containing arrays
6	ARRAY	array of values

3.4 Key word RESULTS

One or more results

Attributes

Key word	Attribute	required	Value	Explanation
RESULTS				
	VERSION	no	Version as string, e.g. "3.0"	Version of DTD at the time of XML implementation

Values

none

Next level

RESULTSHEADER (required)

RESULT (required, repeatable)

SUMMARY (optional)

XML DTD

```
<!ELEMENT RESULTS                (RESULTSHEADER, RESULT+, SUMMARY?)>
```

3.5 Key word RESULTSHEADER

Common data for all tests including vehicle, customer …

Attributes

none

Values

none

Next level

COUNTRY (required)	country
CUSTOMER (optional)	customer
VEHICLE (required)	vehicle
TRAILER (optional)	trailer
WORKSHOP (optional)	workshop or dealer
DRIVER (optional)	driver
REF (optional)	reference for previous test result

XML DTD

```
<!ELEMENT RESULTSHEADER          (COUNTRY, CUSTOMER?, VEHICLE, TRAILER?, WORKSHOP?,
                                  DRIVER?, REF?)>
```

3.6 Key word COUNTRY

Country specific information

Attributes

none

Values

none

Next level

REGULATION (required) country identifier

AMERICAN
BRAZILIAN
CHINESE
CROATIAN
CZECH
DANISH
DUTCH
ENGLISH
FINNISH
FRENCH
GERMAN
GREEK
HEBREW
HUNGARIAN
ITALIAN
NORWEGIAN
POLISH
PORTUGUESE
RUMANIAN
RUSSIAN
SLOVENE
SPANISH
SWEDISH
TURKISH

LANGUAGE (required) country identifier, same values as above

All above: no attributes, values as string, no next level

XML DTD

```
<!ELEMENT COUNTRY                (REGULATION,LANGUAGE)>
<!ELEMENT REGULATION             (#PCDATA)>
<!ELEMENT LANGUAGE               (#PCDATA)>
```

3.7 Key word CUSTOMER

Customer data

Attributes

none

Values

none

Next level

NAME (required)	first and last name
COMPANY (optional)	company title
ADDRESS (optional)	Street
ZIP (optional)	postcode, zip code
CITY (optional)	residence
TEL (optional)	(i•SHOP: primary phone number)
FAX (optional)	
CUSTNO (optional)	customer number (i•SHOP: CustID property)
ORDER (optional)	order number (i•SHOP: OrderNumber property)
FIRSTNAME (optional)	first Name
LASTNAME (optional)	last Name
EMAIL (optional)	e-mail address
STATE_PROVINCE (optional)	state (if US) or province (if Canada)
AAIA_ITEMID (optional)	(used by i•SHOP)

All above: no attributes, values as string, no next level

XML DTD

```
<!ELEMENT CUSTOMER              (NAME, COMPANY?, ADDRESS?, ZIP?, CITY?, TEL?,
                                 FAX?, CUSTNO?, ORDER?, FIRSTNAME?, LASTNAME?,
                                 EMAIL?, STATE_PROVINCE?, AAIA_ITEMID?)>
<!ELEMENT NAME                  (#PCDATA)>
<!ELEMENT COMPANY               (#PCDATA)>
<!ELEMENT ADDRESS               (#PCDATA)>
<!ELEMENT ZIP                   (#PCDATA)>
<!ELEMENT CITY                  (#PCDATA)>
<!ELEMENT TEL                   (#PCDATA)>
<!ELEMENT FAX                   (#PCDATA)>
<!ELEMENT CUSTNO                (#PCDATA)>
<!ELEMENT ORDER                 (#PCDATA)>
<!ELEMENT FIRSTNAME             (#PCDATA)>
<!ELEMENT LASTNAME              (#PCDATA)>
<!ELEMENT EMAIL                 (#PCDATA)>
<!ELEMENT STATE_PROVINCE        (#PCDATA)>
<!ELEMENT AAIA_ITEMID           (#PCDATA)>
```

3.8 Key word VEHICLE and TRAILER

Vehicle data

Attribute

none

Values

none

Next level

IDENT (required)

ADDITIONALIDENT (optional)

DATA (required)

INSURANCE (optional)

XML DTD

```
<!ELEMENT VEHICLE              (IDENT, ADDITIONALIDENT?, DATA, INSURANCE?)>
<!ELEMENT TRAILER              (IDENT, ADDITIONALIDENT?, DATA, INSURANCE?)>
```

3.9 Key word WORKSHOP

Workshop or dealer data

Attributes

none

Values

none

Next level

NAME (required)	workshop/dealer name
NAME2 (optional)	additional info
ADDRESS (optional)	street
ZIP (optional)	postcode, zip code
CITY (optional)	residence
TEL (optional)	
FAX (optional)	
PERMISSION (optional)	registration number
EMAIL	Email Address of workshop

All above: no attributes, values as string, no next level

XML DTD

```
<!ELEMENT WORKSHOP              (NAME, NAME2?, ADDRESS?, ZIP?, CITY?,
                                 TEL?, FAX?, PERMISSION?)>
<!ELEMENT NAME                  (#PCDATA)>
<!ELEMENT NAME2                 (#PCDATA)>
<!ELEMENT ADDRESS               (#PCDATA)>
<!ELEMENT ZIP                   (#PCDATA)>
<!ELEMENT CITY                  (#PCDATA)>
<!ELEMENT TEL                   (#PCDATA)>
<!ELEMENT FAX                   (#PCDATA)>
<!ELEMENT EMAIL                 (#PCDATA)>
```

3.10 Key word DRIVER

Driver data

Attributes

none

Values

none

Next level

NAME (required) driver name

All above: no attributes, values as string, no next level

XML DTD

```
<!ELEMENT DRIVER                (NAME)>
<!ELEMENT NAME                  (#PCDATA)>
```

3.11 Key word REF

Reference for a previous test result

Attributes

Key word	Attribute	required	Value	Explanation
REF				what and where is tested
	OBJECT	Yes	see chapter 3.41	what is tested
	METHOD	No	see chapter 3.41	test procedure or method
	METHOD_TITLE	No	Name of method	in national language

Values

none

Next level

TITLE (required)	description of the previous test in national language
START_TEST (required)	start of previous test
END_TEST (required)	end of previous test
CONTROL_NO (optional)	control number of test method
PROTOCOL_NO (optional)	protocol number of previous test
OPERATOR (optional)	operator of previous test
ORDER (optional)	order number of previous test

3.12 Key word IDENT

Vehicle identification data

Attributes

none

Values

none

Next level

REGISTRATION (required)	i•SHOP: populates with LicensePlate
MANUFACTURER (optional)	
MODEL (optional)	
TYPE (optional)	
KEY2; KEY3 (optional)	German KBA-Keys, part 2 and 3
CATEGORY (optional)	(European) Vehicle category M1, M2, M3 (passenger cars), N1, N2, N3 (trucks), O1, O2, O3, O4 (trailers)
VIN (optional)	Vehicle identification number
MANUFACTURER_ID (optional)	Manufacturer specific key or id
ENGINECODE (optional)	
PISTONDISPLACEMENT (optional)	Attribute UNIT
CYLINDERS (optional)	
FUEL1 (optional)	
FUEL2 (optional)	
EMISSIONCODE	German KBA-Key part 1 or new European 4 digit emission key

BRAKE_SYSTEM (optional)	Type of brake system, e.g. crossed
SERVICE_BRAKE (optional) AUXILARY_BRAKE (optional) PARKING_BRAKE (optional)	HYDRAULIC, MECHANICAL, PNEUMATIC or MIXED
PARKING_BRAKE_CONTROL (optional)	HAND, FOOT
PARKING_BRAKE_AXLE (optional)	FRONT, REAR
FOURWD (optional)	TRUE, FALSE
NUMBER_OF_AXLES (optional)	
PRODUCTION_SINCE (optional)	First year of production
PRODUCTION_UNTIL (optional)	Last year of production
PRODUCTIONDATE	Year of production (i•SHOP: future implementation)
INSPECTIONDATE	(i•SHOP: InspectionDate property of the IiSHOPVehicle interface)
LASTINDATE	(i•SHOP: LastInDate property of the IiSHOPVehicle interface)
AAIA_ID	(i•SHOP: AAIAid property in the IiSHOPVehicle interface)
AAIA_TAGNAME	(i•SHOP: LicensePlate property of the IiSHOPVehicle interface))
AAIA_LICENSESTATE	(i•SHOP: LicenseState property of the IiSHOPVehicle interface)
AAIA_GOVERNMENTID	(i•SHOP: GovernmentID property of the IiSHOPVehicle interface)
AAIA_UNITNUMBER	(i•SHOP: UnitNumber property of the IiSHOPVehicle interface)
AAIA_TELEMATICSCONTACTNUMBER	(i•SHOP: future implementation)

All above: values as string, no next level

XML DTD

```
<!ELEMENT IDENT                 (REGISTRATION, MANUFACTURER?, MODEL?, TYPE?,
                                 KEY2?, KEY3?, VIN?, MANUFACTURER_ID?,
                                 ENGINECODE?, PISTONDISPLACEMENT?, CYLINDERS?,
                                 FUEL1?, FUEL2?, BRAKE_SYSTEM?, SERVICE_BRAKE?,
                                 AUXILARY_BRAKE?, PARKING_BRAKE?,
                                 PARKING_BRAKE_CONTROL?, PARKING_BRAKE_AXLE?,
                                 FOURWD?, NUMBER_OF_AXLES?, PRODUCTION_SINCE?,
                                 PRODUCTION_UNTIL?, PRODUCTIONDATE?,
                                 INSPECTIONDATE?, LASTINDATE?,
                                 AAIA_ID?, AAIA_TAGNAME?, AAIA_LICENSESTATE?,
                                 AAIA_GOVERNMENTID?, AAIA_UNITNUMBER?,
                                 AAIA_TELEMATICSCONTACTNUMBER?)>
<!ELEMENT REGISTRATION          (#PCDATA)>
<!ELEMENT MANUFACTURER          (#PCDATA)>
<!ELEMENT MODEL                 (#PCDATA)>
<!ELEMENT KEY2                  (#PCDATA)>
<!ELEMENT KEY3                  (#PCDATA)>
<!ELEMENT TYPE                  (#PCDATA)>
<!ELEMENT CATEGORY              (#PCDATA)>
<!ELEMENT VIN                   (#PCDATA)>
<!ELEMENT MANUFACTURER_ID       (#PCDATA)>
<!ELEMENT ENGINECODE            (#PCDATA)>
<!ELEMENT PISTONDISPLACEMENT    (#PCDATA)>
<!ELEMENT CYLINDERS             (#PCDATA)>
<!ELEMENT FUEL1                 (#PCDATA)>
<!ELEMENT FUEL2                 (#PCDATA)>
<!ELEMENT EMISSIONCODE          (#PCDATA)>
<!ELEMENT BRAKE_SYSTEM          (#PCDATA)>
<!ELEMENT SERVICE_BRAKE         (#PCDATA)>
<!ELEMENT AUXILARY_BRAKE        (#PCDATA)>
<!ELEMENT PARKING_BRAKE         (#PCDATA)>
<!ELEMENT PARKING_BRAKE_CONTROL (#PCDATA)>
<!ELEMENT PARKING_BRAKE_AXLE    (#PCDATA)>
<!ELEMENT FOURWD                (#PCDATA)>
<!ELEMENT NUMBER_OF_AXLES       (#PCDATA)>
<!ELEMENT PRODUCTION_SINCE      (#PCDATA)>
<!ELEMENT PRODUCTION_UNTIL      (#PCDATA)>
<!ELEMENT PRODUCTIONDATE        (#PCDATA)>
<!ELEMENT INSPECTIONDATE        (#PCDATA)>
<!ELEMENT LASTINDATE            (#PCDATA)>
<!ELEMENT AAIA_ID               (#PCDATA)>
<!ELEMENT AAIA_TAGNAME          (#PCDATA)>
<!ELEMENT AAIA_LICENSESTATE     (#PCDATA)>
<!ELEMENT AAIA_GOVERNMENTID     (#PCDATA)>
<!ELEMENT AAIA_UNITNUMBER       (#PCDATA)>
<!ELEMENT TELEMATICSCONTACTNUMBER (#PCDATA)>

<!ATTLIST PISTONDISPLACEMENT    UNIT CDATA                      #IMPLIED>
```

3.13 Key word ADDITIONALIDENT

Additional (manufacturer specific) vehicle identification

Attribute

none

Value

none

Next level

FEATURE (required)

XML DTD

```
<!ELEMENT ADDITIONALIDENT       (FEATURE+)>
```

3.14 Key word FEATURE

Manufacturer specific name/value combination

Attributes

Key word	Attribute	required	Value	Explanation
FEATURE				
	MID	yes	Manufacturer identification	e.g. manufacturer name

Value

none

Next level

Manufacturer specific vehicle identification

NAME (required) name of feature

VALUE (required) value of feature

XML DTD

```
<!ELEMENT FEATURE               (NAME, VALUE)>
<!ATTLIST FEATURE               MID CDATA         #REQUIRED>
```

3.15 Key word DATA

Vehicle data, fixed and changing

Attributes

none

Values

none

Next level

ODOMETER (optional)	mileage	Attribute UNIT (note: i•SHOP users will populate this field with “OdometerIN”)
AXLE_WEIGHT (optional)		Attribut UNIT, Axle=No
AXLE_WEIGHT_MAX (optional)		Attribut UNIT, Axle=No
TOTAL_WEIGHT (optional)		Attribute UNIT
TOTAL_WEIGHT_MAX (optional)		Attribute UNIT
DIESEL_GT_35 (optional)	Diesel vehicle, weight exceeds 3,5t	Boolean
NOISE (optional)	noise level	Attribute UNIT
NOISE_RPM (optional)	speed for noise level	Attribute UNIT
REGISTRATION_DATE (optional)	first registration	Attribute UNIT
COLOR (optional)	Color of vehicle	
ODOMETEROUT (optional)	Mileage out	(used in i•SHOP)
INSPECTION_DATE (optional)	Data of last inspection (if applicable)	(used in i•SHOP)

All above: values as string, no next level

XML DTD

```
<!ELEMENT DATA                  (ODOMETER?, AXLE_WEIGHT*, AXLE_WEIGHT_MAX*,
                                 TOTAL_WEIGHT?, TOTAL_WEIGHT_MAX?,
                                 DIESEL_GT_35?, NOISE?, NOISE_RPM?,
                                 REGISTRATION_DATE?,
                                 COLOR?, ODOMETEROUT?, INSPECTION_DATE?)>

<!ELEMENT ODOMETER              (#PCDATA)>
<!ELEMENT AXLE_WEIGHT           (#PCDATA)>
<!ELEMENT AXLE_WEIGHT_MAX       (#PCDATA)>
<!ELEMENT TOTAL_WEIGHT          (#PCDATA)>
<!ELEMENT TOTAL_WEIGHT_MAX      (#PCDATA)>
<!ELEMENT NOISE                 (#PCDATA)>
<!ELEMENT NOISE_RPM             (#PCDATA)>
<!ELEMENT REGISTRATION_DATE     (#PCDATA)>
<!ELEMENT COLOR                 (#PCDATA)>
<!ELEMENT ODOMETEROUT           (#PCDATA)>
<!ELEMENT INSPECTION_DATE       (#PCDATA)>
<!ATTLIST ODOMETER              UNIT CDATA                          #IMPLIED>
<!ATTLIST AXLE_WEIGHT           AXLE CDATA                          #REQUIRED
                                UNIT CDATA                          #IMPLIED>
<!ATTLIST AXLE_WEIGHT_MAX       AXLE CDATA                          #REQUIRED
                                UNIT CDATA                          #IMPLIED>
<!ATTLIST TOTAL_WEIGHT          UNIT CDATA                          #IMPLIED>
<!ATTLIST TOTAL_WEIGHT_MAX      UNIT CDATA                          #IMPLIED>
<!ATTLIST NOISE                 UNIT CDATA                          #IMPLIED>
<!ATTLIST NOISE_RPM             UNIT CDATA                          #IMPLIED>
<!ATTLIST REGISTRATION_DATE     UNIT CDATA                          #IMPLIED>
<!ATTLIST ODOMETEROUT           UNIT CDATA                          #IMPLIED>
```

3.16 Key word INSURANCE

Insurance data

Attributes

none

Values

none

Next level

COMPANY (required) name of insurance company

CONTRACT (optional)

ADJUSTER (optional)

TEL (optional)

All above: values as string, no next level

XML DTD

```
<!ELEMENT INSURANCE              (COMPANY, CONTRACT?, ADJUSTER?, TEL?)>
```

3.17 Key word RESULT

Result data of a test

Attributes

Key word	Attribute	Required	Values	Explanation
RESULT				what and where is tested
	OBJECT	Yes	see chapter 3.41	what is tested
	METHOD	No	see chapter 3.41	test procedure or method
	METHOD_TITLE	No	Name of method	in national language
	MODE	No	DEMO, DEMO_MEAS, DEMO_LIMITS or REAL	results from a demo, only demo results, only demo limits or real measurement results

Values

none

Next level

TITLE (required),description of test in national language, e.g. ”Exhaust gas test”

HEADER (required)

SECTION (required)

SUMMARY (optional)

XML DTD

```
<!ELEMENT RESULT                (TITLE, HEADER, SECTION+, SUMMARY?)>
<!ELEMENT TITLE                 (#PCDATA)>
<!ATTLIST RESULT                OBJECT (EMISSION|BRAKE|WHEEL_ALIGNMENT|
                                        HEAD_LIGHT|SIDE_SLIP|NOISE|
                                        SUSPENSION|VISUAL_INSPECTION|
                                        OIL_MANAGEMENT|CAR_MEASUREMENT|
                                        SAFETY_CHECK|DIAGNOSIS)
                                                              #REQUIRED
                                METHOD (SMOKE|SMOKE_TURBO|GAS|
                                        GAS_OL_CATALYST|GAS_CL_CATALYST|
                                        GAS_OBD_CATALYST|
                                        QUICK|STANDARD|DETAILED|
                                        MANUFACTURER_SPECIFIC|
                                        ACCIDENT_VEHICLE|FOURWD|
                                        FIRST_EXAMINATION|RE_EXAMINATION)
                                                              #IMPLIED
                                METHOD_TITLE CDATA            #IMPLIED>

                                MODE    (DEMO|REAL|DEMO_LIMITS|DEMO_MEAS) "REAL"
```

3.18 Key word HEADER

Information about one test

Attributes

none

Values

none

Next level

EQUIPMENT (required, repeatable)	used equipment
START_TEST (required)	
END_TEST (required)	
CONTROL_NO (optional)	code number for test method
PROTOCOL_NO (optional)	
OPERATOR (optional)	
COUNTRY (optional) see 3.6	
ORDER (optional)	
HUMIDITY (optional)	
TEMPERATURE (optional)	
ATMOSPHERIC_PRESSURE (optional)	

XML DTD

```
<!ELEMENT HEADER                (EQUIPMENT+, START_TEST, END_TEST, CONTROL_NO?,
                                 PROTOCOL_NO?, OPERATOR?, COUNTRY?, ORDER?,
                                 HUMIDITY?, TEMPERATURE?, ATMOSPHERIC_PRESSURE?)>
```

3.19 Key word EQUIPMENT

Attributes

make and model of equipment:

Key word	Attribute	Required	Values	Explanation
EQUIPMENT				equipment used for test
	TYPE	Yes	CONTROL	computer used for control and operation
			BRAKE	test block for brake test
			GAS	test bench
			SMOKE	test bench
			WHEEL_ALIGNMENT	wheel alignment tester
			LIGHT	head light tester.
			SIDE_SLIP	side slip tester
			NOISE	noise level meter
			SUSPENSION	suspension tester
			OIL_MANAGEMENT	oil management system
			INTERFACE	if asanetwork interface is realised as separate module
			OBD	device used for read out
			WHEELBALANCER	Device used for balancing wheels
			HANDHELD_DIAGNOSTIC_UNIT	Handheld device used for Diagnostics
			WORKSTATION_DIAGNOSTIC_UNIT	Workstation device used for Diagnostics
			IGNITION_ANALYZER	Device used for ignition analysis
			ENGINE_ANALYZER	Device used for engine analysis
			BATTERY	Device that diagnosis Battery and associated electrical systems

Values

none

Next level

TITLE	in natural language
MANUFACTURER (required)	(i•SHOP uses EquipmentMfg property)
MODEL (required)	(optional i•SHOP – found in EquipmentID property)
PROCEDURE (optional)	measurement principle used. Note: i•SHOP uses Diagnostic-Type to populate
SERIAL_NO (optional)	(optional i•SHOP – found in EquipmentID property)
HOMOLOGATION_NO (optional)	
VERSION (required)	(software) version number Note: i•SHOP does not use)
CALIBRATION_EXPIRES (optional)	
CALIBRATED_BY (optional)	
CHECKSUM (optional)	Check sum
SUPPORTS (optional)	Supported OBD protocols

All above: no attributes, values as string, no next level

XML DTD

```
<!ELEMENT EQUIPMENT              (TITLE, MANUFACTURER, MODEL, PROCEDURE?,
                                  SERIAL_NO?, HOMOLOGATION_NO?, VERSION,
                                  CALIBRATION_EXPIRES?, CALIBRATED_BY?,
                                  CHECKSUM?,SUPPORTS?)>
<!ELEMENT PROCEDURE              (#PCDATA)>
<!ELEMENT SERIAL_NO              (#PCDATA)>
<!ELEMENT HOMOLOGATION_NO        (#PCDATA)>
<!ELEMENT VERSION                (#PCDATA)>
<!ELEMENT CALIBRATION_EXPIRES    (#PCDATA)>
<!ELEMENT CALIBRATED_BY          (#PCDATA)>
<!ELEMENT CHECKSUM               (#PCDATA)>
<!ELEMENT SUPPORTS               (#PCDATA)>

<!ATTLIST EQUIPMENT              TYPE     (CONTROL|BRAKE|GAS|SMOKE|
                                           WHEEL_ALIGNMENT|LIGHT|SIDE_SLIP|
                                           NOISE|SUSPENSION|OIL_MANAGEMENT|
                                           INTERFACE|WHEELBALANCER|
                                           HANDHELD_DIAGNOSTIC_UNIT|
                                           WORKSTATION_DIAGNOSTIC_UNIT|
                                           IGNITION_ANALYZER|ENGINE_ANALYZER|
                                           BATTERY)      #REQUIRED>
```

3.20 Key words START_TEST, END_TEST

Start and end of test

Attributes

UNIT = DateTime (optional)

Values

start/end of test with date, time

Next level

none

XML DTD

```
<!ELEMENT START_TEST            (#PCDATA)>
<!ELEMENT END_TEST              (#PCDATA)>
<!ATTLIST START_TEST            UNIT    (DateTime)              "DateTime">
<!ATTLIST END_TEST              UNIT    (DateTime)              "DateTime">
```

3.21 Key word OPERATOR

Operator data

Attributes

none

Values

none

Next level

NAME (required) no next level

PERMISSION (optional)

XML DTD

```
<!ELEMENT OPERATOR              (NAME, PERMISSION?)>
```

3.22 Key word PERMISSION

Attributes

none

Values

none

Next level

ID1 (required) permission number 1

ID2 (optional) permission number 2

EXPIRES (optional) expiry of permission

All above: no attributes, values as string, no next level

XML DTD

```
<!ELEMENT PERMISSION            (ID1, ID2?, EXPIRES?)>
<!ELEMENT ID1                   (#PCDATA)>
<!ELEMENT ID2                   (#PCDATA)>
<!ELEMENT EXPIRES               (#PCDATA)>
```

3.23 Key word CONTROL_NO

Official code number

Attributes

none

Values

control code/registration code as string

Next level

none

XML DTD

```
<!ELEMENT CONTROL_NO            (#PCDATA)>
```

3.24 Key word PROTOCOL_NO

Protocol number

Attributes

none

Values

number as string

Next level

none

XML DTD

```
<!ELEMENT PROTOCOL_NO           (#PCDATA)>
```

3.25 Key word HUMIDITY

Attribute

UNIT

Values

as string

Next level

none

XML DTD

```
<!ELEMENT HUMIDITY              (#PCDATA)>
```

3.26 Key word TEMPERATURE

Attribute

UNIT

Values

as string

Next level

none

XML DTD

```
<!ELEMENT TEMPERATURE           (#PCDATA)>
```

3.27 Key word ATMOSPHERIC_PRESSURE

Attribute

UNIT

Values

as string

Next level

none

XML DTD

```
<!ELEMENT ATMOSPHERIC_PRESSURE   (#PCDATA)>
```

3.28 Key word SECTION

A section of a test

Attributes

Key word	Attribute	Required	Values	Explanation
SECTION				flow in the test process
	OBJECT	Yes	see chapter 3.41	what is tested
	TYPE	No	see chapter 3.41	how is tested
	TYPE_TITLE	No	Name of TYPE	in national language
	AXLE	No	Integer	1 = front axle
	AXLE_TITLE	No	Name of axle	in national language
	NO	No	Successive numbers starting with 1	For repeating sections

Values

none

Next level

TITLE (required), title of section in national language e.g. conditioning, initial measurement

(STEP or MEAS) or MEAS_ROW or DIAGRAM or DEFECT (required, repeatable)

SUMMARY (optional)

XML DTD

```
<!ENTITY % sm                    "(STEP|MEAS|MEAS_ROW|DIAGRAM)">
<!ELEMENT SECTION                (TITLE, (%sm;)+, SUMMARY?)>
<!-- TITLE                       already defined in Level 3 -->

<!ATTLIST SECTION                OBJECT (VISUAL_INSPECTION|CONDITIONING|
                                         FAST_IDLE|NATURAL_IDLE|
                                         CLOSED_LOOP_CTRL|GAS_BLAST|
                                         CONTROL|FOURWD|STANDARD|SINGLE|
                                         TIRE_INSPECTION|RUNOUT_COMPENSATION|
                                         MEASUREMENT|INITIAL_MEASUREMENT|
                                         FINAL_MEASUREMENT|
                                         TRACK_CURVE_MEASUREMENT|SIDE_SLIP|
                                         LOW_BEAM|HIGH_BEAM|FOG_BEAM|
                                         SILENCER|HORN|SUSPENSION|OIL)
                                         OTHER_DEFECTS|INNER_WHEEL_BRAKE_CHECK|
                                         MIL|OBD_CTRL|TROUBLE_CODES|IGNITION|
                                         UNBALANCE|RIDEHEIGHT|TIRE_TROUBLES|
                                          OBD_ANALYSIS|FUNCTION_TEST|MEAS_ROWS|
                                         BRAKE_FLUID|CYLINDER|CIRCUIT|DEFECTS)

                                                                  #REQUIRED
                                 AXLE     CDATA                  #IMPLIED
                                 TYPE     (0|1|2|3|4|5|PERM|INTERM)  #IMPLIED
                                 AXLE_TITLE CDATA                #IMPLIED
                                 TYPE_TITLE CDATA                #IMPLIED>
                                 NO CDATA                        #IMPLIED>
```

3.29 Key word SUMMARY

A summary of a section, step or a complete test result

Attributes

none

Values

none

Next level

TITLE (optional), summary in national language, e.g. visual inspection

STEP or MEAS or MEAS_ROW or DIAGRAM (required, repeatable)

XML DTD

```
<!ENTITY % sm                    "(STEP|MEAS|MEAS_ROW|DIAGRAM)">
<!ELEMENT SUMMARY                (TITLE?, (%sm;)+)>
```

3.30 Key word STEP

Further division of a section into steps

Attributes

Key word	Attribute	Required	Values	Explanation
STEP				additional subdivision
	OBJECT	No	see chapter 3.41	what is tested
	NO	No	Successive numbers starting with 1	For repeating steps, e.g. gas blasts
	NO_TITLE	No	Name of nr/gas blast	in national language

Values

none

Next level

TITLE (required) , step in national language, e.g. disturbance on, left wheel

MEAS or MEAS_ROW (required, repeatable)

DIAGRAM (optional)

SUMMARY (optional)

XML DTD

```
<!ELEMENT STEP                  (TITLE, (MEAS|MEAS_ROW)+, SUMMARY?)>
<!ATTLIST STEP                  OBJECT (BASE_VALUE|DISTURBANCE_ON|
                                        DISTURBANCE_OFF|SETTLED_ON|SETTLED_OFF|
                                        SERVICE_BRAKE|PARKING_BRAKE|
                                        AUXILARY_BRAKE1|AUXILARY_BRAKE2|
                                        VERTICAL_POSITION|HORIZONTAL_POSITION|
                                        ADDITIONAL|TROUBLE_CODES|READINESS|
                                        STATE|PROBE_TEST|CYLINDER|SEGMENT|
                                        TIRE_TROUBLE|OBD_O2_SENSOR_OUT_VOLTAGE|
                                        OBD_O2_SENSOR_SHORT_TERM_FUEL_TRIM|
                                        OBD_WIDE_RANGE_O2_SENSOR_OUT_LAMBDA|
                                        OBD_WIDE_RANGE_O2_SENSOR_OUT_CURRENT|
                                        OBD_WIDE_RANGE_O2_SENSOR_OUT_VOLTAGE|
                                        CONTROLLERS|IDENTIFICATION|ACTUAL_VALUES|
                                        ACTUATORS)                  #IMPLIED
                                NO_CDATA                            #IMPLIED
                                NO_TITLE CDATA                      #IMPLIED>
```

3.31 Key word DEFECT

Used inside of a SECTION for REPAIRED_DEFECTS

Attribute

Key word	Attribute	Required	Values	Explanation
MEAS				measurement
	OBJECT	Yes	see chapter 3.41	what is measured

Values

none

Next level

TITLE (required), physical value in national language, e.g. brake force

VALUE (required, repeatable)

XML DTD

```
<!ELEMENT DEFECT                (TITLE?, MEAS*)>
<!ATTLIST SECTION               OBJECT (NONE|VISUAL_INSPECTION|CONDITIONING|
                                        FAST_IDLE|NATURAL_IDLE|
                                        CLOSED_LOOP_CTRL|GAS_BLAST|
                                        CONTROL|FOURWD|STANDARD|SINGLE|
                                        TIRE_INSPECTION|RUNOUT_COMPENSATION|
                                        MEASUREMENT|INITIAL_MEASUREMENT|
                                        FINAL_MEASUREMENT|
                                        TRACK_CURVE_MEASUREMENT|SIDE_SLIP|
                                        LOW_BEAM|HIGH_BEAM|FOG_BEAM|
                                        SILENCER|HORN|SUSPENSION|OIL|
                                        OTHER_DEFECTS|INNER_WHEEL_BRAKE_CHECK|
                                        MIL|OBD_CTRL|TROUBLE_CODES|IGNITION)
                                                                    #IMPLIED
```

3.32 Key word MEAS

Measurement object and values

Attributes

Key word	Attribute	Required	Values	Explanation
MEAS				measurement
	OBJECT	Yes	see chapter 3.41	what is measured
	LOC	No	see chapter 3.41	where is measured
	LOC_TITLE	No	Name of LOC	in national language
	DISTANCE	No	distance in meters	distance e.g. for head light test

Values

none

Next level

TITLE (required), physical value in national language, e.g. brake force

VALUE (required, repeatable)

XML DTD

```
<!ELEMENT MEAS                  (TITLE, VALUE+)>
<!ATTLIST MEAS                  OBJECT CDATA                    #REQUIRED
                                LOC CDATA                       #IMPLIED
                                DISTANCE CDATA                  #IMPLIED
                                LOC_TITLE CDATA                 #IMPLIED>
```

3.33 Key word VALUE

Measurement value and additional information

Attributes

Key word	Attribute	Re-quired	Values	Explanation
VALUE				
	TYPE	No	MAX	method: maximum value
			MIN	minimum value
			AVG (Default)	average
			DELTA	delta
			DISP	displayed value differs from measurement
			PERM	permanent value/error
			INTERM	intermittent value/error
			ABS	absolute value
			RMS	weighted average value
	UNIT	No	see chapter 0	unit of measurement
	DIGITS	No	number of digits of value	resolution of measurement
	DISPDIGITS	No	number of digits displayed.	resolution of displayed value
	CONDITION	No	0 (Default)	ending of measurement
			1	blocked
			2	lifted, not blocked
			3	timeout

	RESULT	No	0 (Default)	result of measurement, default undef.
			1	ok, symbol green, TRUE
			2	warning, symbol yellow
			3	severe fault, defective, symbol red, FALSE
			4	severe fault, symbol danger
			5	aborted
			6	can't be expressed, overflow
			7	timeout
	ERROR	No	0 (Default)	errors only together with result, default no error
			1	timeout
			2	fault in equipment
			3	aborted by operator
	REF	No	signal reference name	e.g. GROUND
	REF_LOC	No	location of signal reference	e.g. ABS connector pin 1
	SOURCE	No	HAND	input by hand
			MEASURED (Default)	measured
			signal source name	e.g. UBat
	SOURCE_LOC	No	location of signal source	e.g. ABS connector pin 2
	CALIBRATED	Nein	0 (false)	uncalibrated measurement
			1 (true)	calibrated measurement
	TEXT	No	String	comment or description
	FORMAT	No	NUM	numerical data only
			ALPHA	string data (default)
	LOWLIM1	No	same as measurement	set point min. 1
	HIGHLIM1	No		set point max. 1
	LOWLIM2	No		set point min. 2
	HIGHLIM2	No		set point max. 2
	LOWLIM3	No		set point min. 3
	HIGHLIM3	No		set point max. 3
	LOWLIM4	No		set point min. 4
	HIGHLIM4	No		set point max. 4
	NOMINAL	No		target for e.g. adjustment
	LOWDISP	No		display range limit min
	HIGHDISP	No		display range limit max
	NOMINALDISP	No		display range target value
	IMAGE	No	GIF, JPEG	graphic format
	TRIGGER	No		Trigger signal
	TRIGGER_EDGE	No	POS, NEG	Trigger slope
	REF_VALUE	No		Reference value
	COUPLING	No	AC, DC	Coupling
	DATE	No		Date
	TIME	No		ZTime
	RESOLUTION	No	time in s	Resolution in seconds
	ADDRESS	No	Hexadecimal value	Controller address

Values

Measurement as integer or generally as floating point value (e.g. 1.593E3).

Next level

none

XML DTD

```
<!ELEMENT VALUE            (#PCDATA)>
<!ATTLIST VALUE            TYPE (MAX|MIN|AVG|DELTA|DISP|PERM|INTERM|ABS|RMS) "AVG"
                           UNIT         CDATA                        #IMPLIED
                           DIGITS       CDATA                        #IMPLIED
                           DISPDIGITS   CDATA                        #IMPLIED
                           CONDITION    (0|1|2|3)                    "0"
                           RESULT       (0|1|2|3|4|5|6|7             "0"
                           ERROR        (0|1|2|3)                    "0"
                           SOURCE       CDATA                        "MEASURED"
                           SOURCE_LOC   CDATA                        #IMPLIED
                           FORMAT       (NUM | ALPHA)                "ALPHA"
                           TEXT         CDATA                        #IMPLIED
                           LOWLIM1      CDATA                        #IMPLIED
                           LOWLIM2      CDATA                        #IMPLIED
                           LOWLIM3      CDATA                        #IMPLIED
                           LOWLIM4      CDATA                        #IMPLIED
                           HIGHLIM1     CDATA                        #IMPLIED
                           HIGHLIM2     CDATA                        #IMPLIED
                           HIGHLIM3     CDATA                        #IMPLIED
                           HIGHLIM4     CDATA                        #IMPLIED
                           NOMINAL      CDATA                        #IMPLIED
                           LOWDISP      CDATA                        #IMPLIED
                           HIGHDISP     CDATA                        #IMPLIED
                           NOMINALDISP  CDATA                        #IMPLIED
                           CALIBRATED   (0|1)                        "0"
                           IMAGE        (GIF | JPEG)                 #IMPLIED
                           REF          CDATA                        #IMPLIED
                           REF_LOC      CDATA                        #IMPLIED
                           TRIGGER        CDATA                      #IMPLIED
                           TRIGGER_EDGE   CDATA                      #IMPLIED
                           REF_VALUE      CDATA                      #IMPLIED
                           COUPLING       (AC | DC)                  #IMPLIED
                           DATE           CDATA                      #IMPLIED
                           TIME           CDATA                      #IMPLIED
                           RESOLUTION     CDATA                      #IMPLIED
                           ADDRESS        CDATA                      #IMPLIED >
```

3.34 Key word MEAS_ROW

Series of measurement

Attributes

Key word	Attribute	Required	Values	Explanation
MEAS_ROW				some measurements as array
	OBJECT	Yes	See chapter 3.41	what is measured
	COUNT	Yes	Integer 0-16000	number of n-pairs in array

Values

none

Next level

VALUE (required)

ARRAY (required)

XML DTD

```
<!ELEMENT MEAS_ROW              (VALUE, ARRAY)>
<!ATTLIST MEAS_ROW              OBJECT   CDATA                  #REQUIRED
                                COUNT    CDATA                  #REQUIRED>
```

3.35 Key word ARRAY

Array of measurement values

Attributes

none

Values

measurement pairs, format x1:y1:z1, x2:y2:z2, ...

Next level

none

XML DTD

```
<!ELEMENT ARRAY                 (#PCDATA)>
```

3.36 Key word DIAGRAM

Diagramm

Attributes

Key word	Attribute	Required	Values	Explanation
DIAGRAM				mehrere Meßgrößen als Array
	OBJECT	YES	See chapter 3.41	what is measured
	VERSUS	NO	Reference value	For XY diagrams

Values

none

Next level

TITLE (required) Diagram identifier

GRAPH (required) curve progression

XML DTD

```
<!ELEMENT DIAGRAM               (TITLE, GRAPH+)>
<!ATTLIST DIAGRAM               OBJECT      CDATA               #REQUIRED
                                VERSUS      CDATA               #IMPLIED >
```

3.37 Key word GRAPH

One curve progression

Attributes

Key word	Attribute	Required	Values	Explanation
GRAPH				One curve progression
	COUNT	YES	Integer	Number of points
	NO	NO	Integer	Number of curve

Values

none

Next level

TITLE (optional) name of curve

X_AXIS (required) X-Axis

Y_AXIS (optional) Y-Axis

Z_AXIS (optional) Z-Axis

ARRAY (required) an array with values

XML DTD

```
<!ELEMENT GRAPH                (TITLE?, X_AXIS, Y_AXIS, Z_AXIS?, ARRAY) >
<!ATTLIST GRAPH                COUNT       CDATA                #REQUIRED
                               NO          CDATA                #IMPLIED >
```

3.38 Key word X_AXIS, Y_AXIS, Z_AXIS

Diagram axis

Attributes

Key word	Attribute	Required	Values	Explanation
X_AXIS				One axis
	OBJECT	YES	See chapter 3.41	what is measured
	CURSOS_POS1	NO	Integer	Cursor 1 Position (X)
	CURSOS_POS2	NO	Integer	Cursor 2 Position (X)
	CURSOS_POS1	NO	Measurement value	Cursor 1 Value
	CURSOS_POS2	NO	Measurement value	Cursor 2 Value

Values

none

Next level

none

XML DTD

```
<!ELEMENT X_AXIS                (TITLE?, VALUE)>
<!ATTLIST X_AXIS                OBJECT      CDATA          #REQUIRED
                                CURSOR_POS1 CDATA          #IMPLIED
                                CURSOR_POS2 CDATA          #IMPLIED
                                CURSOR_VAL1 CDATA          #IMPLIED
                                CURSOR_VAL2 CDATA          #IMPLIED >
```

3.39 Attribute UNIT

Description	UNIT	allowed values
acceleration in m/s^2	m/s2	Numerical
binary data	bin.base64	ascii string
bool	1	0=false, 1=true
date: day.month.year	Date	DD.MM.YYYY
speed in 1/min	rpm	Numerical
pressure in Bar	bar	Numerical
pressure in Pascal	Pa	Numerical
pressure in psi	psi	Numerical
frequency in Hz	Hz	Numerical
speed in m/s	m/s	Numerical
speed in km/h	km/h	Numerical
speed in m/h	mph	Numerical
mass in pounds	lbs	Numerical
mass in kg	kg	Numerical
mass flow in g/s	g/s	Numerical
capacity	Ah	Numerical
if unit is missing (default no unit)	1	1
force in Newton	N	Numerical
length in Meter	m	Numerical
Length in kilometer	km	Numerical
Length in miles	miles	Numerical
length in inches decimal	inch	Numerical
length in inches fractional	finch	Format "a b/c d/e"
plane	m2	Numerical
power	W	Numerical
lighting	Lux	Numerical
Parts per Million	ppm	Numerical
per cent	%	Numerical
sound	dB	Numerical
second	s	Numerical
voltage	V	Numerical
current	A	Numerical
temperature in degrees Celsius	degC	Numerical
temperature in Grad Fahrenheit	degF	Numerical
temperature in Kelvin	K	Numerical
blurring	1/m	Numerical
volume in m^3	m3	Numerical
volume per cent	%Vol	Numerical
volume ppm	ppmVol	Numerical
volume flow m³/h	m3/h	Numerical
fuel consumption	l/100km	Numerical
resistance	Ohm	Numerical
time hour, minute, second	Time	hh:mm:ss
date and time	DateTime	DD.MM.YYYY hh:mm:ss
ignition point in degres camshaft	degCS	Numerical
torque	Nm	Numerical
angle in degrees:minutes:seconds (°:′:″)	deg60	DDD:MM:SS
angle in decimal degrees	deg	Numerical

Note: If TYPE=DISP you can use any unit (even those not mentioned) for display. Example: oil volume in m3, if TYPE=DISP also in litre or gallon.

3.40 Attributes for measurements

Usage:

A –Wheel alignment

B – Brake

C – Car measurement

F – Safety check

G – Gas/Emission

L – Light

N – Noise

O – Oil management

S – Side slip

U – Suspension

V – Visual Inspection

W – Wheel balancing

D – Diagnostic

3.40.1 General Attributes

Values	Unit	Description	Usage
EXPIRATION_DATE	Date		all
NOTES			all
IDENTNUMBER	1	for parts	all
IMAGE	bin.base64		all
PERMISSION			All

3.40.2 Exhaust gas test

Values	Unit	Description	Usage
ACCEL_TIME	s		G
CLEANING_GAS_BLAST		number of cleaning gas blasts	G
CLEANING_SPEED	rpm	speed for cleaning	G
CO	%Vol		G, D
CO2	%Vol		G, D
COUNT		number of faults (OBD)	G
COVRAI	%Vol		G
CUTOFF_SPEED	rpm		G
DEFECTS_NO6	Bool	Faults found, but not repaired	G
DWELL_ANGLE	Deg		G
DWELL_RATIO	%		G
FAULT_MEMORY			G
GAS		Final result	G
GASTEMP	degC,	Temperature in degrees Celsius	G
	degF	Temperature in degrees Fahrenheit	
	K	Temperature in Kelvin	
HC	ppmVol		G, D
HOLD_TIME	s		G
MI_CONTROL	Bool	Malfunction indicator activation	G
MI_STATE	Bool	Malfunction indicator state	G
MI_VISUAL_INSPECTION	Bool	Visual inspection of malfunction indicator lamp	G
IDLE_SPEED	rpm		G
IGN_POINT	degCS		G
LAMBDA	1		G, D
NOX	ppmVol		G, D
O2	%Vol		G, D
OBD_CTRL	Bool	Functional check of OBD	G
OILTEMP	degC	Temperature in degrees Celsius	G, D
	degF	Temperature in degrees Fahrenheit	
	K	Temperature in Kelvin	
OPACITY	1/m		G
PERFORMED_TEST		Test perfomed	G
REPAIRED_DEFECTS_NO5	Bool	Repaired faults	G
SMOKE		Final result	G
SPEED	rpm		G
SUPPORTED_TESTS		Supported Tests (OBD)	G
TROUBLE_CODE		OBD	G
VISUAL_INSPECTION	Bool		G
WAIT_TIME	min	Wait time for catalyser conditioning	G
WATERTEMP	degC	Temperature in degrees Celsius	G
	degF	Temperature in degrees Fahrenheit	
	K	Temperature in Kelvin	

3.40.3 Wheel alignment

Values	Unit	Description	Usage
AXLE_OFFSET	m, inch, deg60, deg		A
BALL_POINT_LOCATION	m, inch		A
CAMBER	deg60, deg		A
CAMBER_ADJUST	deg60		A
CAMBER_RAISED	deg60		A
CASTER_10	deg60, deg		A
CASTER_20	deg60, deg		A
CROSS_CAMBER	deg60, deg		A
CROSS_CAMBER_20_INSIDE	deg60		A
CROSS_CAMBER_20_OUTSIDE	deg60		A
CROSS_CAMBER_RAISED	deg60		
CROSS_CASTER	deg60, deg		A
CROSS_INCLUDED_ANGLE	deg60		A
CROSS_SAI	deg60, deg		A
CROSS_TOE	m, inch, deg60		A
CROSS_TOE_CONSTANT	m, inch, deg60		A
CROSS_TOE_OUT_ON_TURNS	deg60		A
CTRL_POINT_WIDTH_LEVEL_CTRL	m, inch		A
INCLUDED_ANGLE_20	deg60, deg		A
INCLUDED_ANGLE	deg60, deg		A
LATERAL_OFFSET	m, inch, deg60, deg		A
MAX_STEER	deg60, deg		A
MAX_STEER_TO_LEFT	deg60		A
MAX_STEER_TO_RIGHT	deg60		A
OFFSET_DEPTH	m, inch		A
RIM_DIAMETER	m, inch		A
RIM_WIDTH	m, inch		A
ROBJECTE_HEIGHT	m, inch, deg60, deg		A
SAI_10	deg60, deg	Steering Axis Inclination	A
SAI_20	deg60, deg		A
SCRUB_RADIUS	m, inch		A
SHOCK_ABSORBER_TRAVEL	m, inch		A
TEST_LOADING	kg		A
THRUST_ANGLE	m, inch, deg60, deg		A
TIRE_DIMENSION	mm/%-inch		A
TIRE_FABRICATOR	1		A
TIRE_PERFORMANCE	m, inch		A
TIRE_PRESSURE	bar, Pa, psi		A
TIRE_TREAD_DEPTH_CENTER	m, inch		A
TIRE_TREAD_DEPTH_INSIDE	m, inch		A
TIRE_TREAD_DEPTH_OUTSIDE	m, inch		A
TOE	m, inch, deg60, deg		A
TOE_ADJUSTMENT	m, inch, deg60		A
TOE_CONSTANT_ADJUSTMENT	m, inch, deg60		A
TOE_CONSTANT_CONTROL	m, inch, deg60		A
TOE_OUT_ON_TURNS_10	deg60, deg		A
TOE_OUT_ON_TURNS_20	deg60, deg		A
TOE_TO_INTERMEDIATE_AXIS	m, inch deg60		A

Values	Unit	Description	Usage
TOE_TO_THRUST_ANGLE	m, inch, deg60		A
TOTAL_TOE	m, inch, deg60, deg		A
TOTAL_TOE_UNDEPRESSED	m, inch, deg60,		A
TRACK_CURVE	m, inch, deg60, deg		A
TRACK_WIDTH	m, inch, deg60, deg		A
TRACK_WIDTH_DIFFERENCE	m, inch, deg60, deg		A
TURN_TABLE_ANGLE	deg60		A
VEHICLE_LATERAL_INCLINATION	m, inch		A
VEHICLE_LONGITUDINAL_INCLINATION	m, inch		A
WHEEL_BASE	m, inch		A
WHEEL_BASE_DIFFERENCE	m, inch		A
WHEEL_SETBACK	m, inch, deg60, deg		A

3.40.4 Brake test

Values	Unit	Description	Usage
AXLE_WEIGHT_STAT	kg	static	B
AXLE_WEIGHT_DYN	N	dynamic	B
AXLE_WEIGHT_MAX	N		B
BRAKEFORCE	N		B
BRAKEFORCE_MIN_PRESSURE	N		B
BRAKING_RATIO	%	@test weight	B
BRAKING_RATIO_CALC	%	calculated	B
BRAKING_RATIO_CALC_SC	%	calculated for safety check	B
BRAKING_RATIO_MAX	%	@total weight	B
CALC_PRESSURE	Pa		B
DYNAMIC_DIFF	%		B
MIN_PRESSURE	Pa		B
OVALITY	%		B
OVALITY_2	%		B
OVALITY_3	%		B
OVALITY_4	%		B
PEDALFORCE	N		B
PRESSURE_PM	Pa		B
PRESSURE_PZ	Pa		B
ROAD_FRICTION	N		B
SLIP	%		B
SPEED	rpm		B
TOTAL_WEIGHT	N		B
TOTAL_WEIGHT_DYN	N	Dynamic weight	
TOTAL_WEIGHT_MAX	N		B
VISUAL_INSPECTION	Bool		B
WHEEL_WEIGHT_DYN	N	dynamic	B
WHEEL_WEIGHT_STAT	N	static	B
WARM_UP	Bool	Warm up of brake (France)	

3.40.5 Car measurement

Values	Unit	Description	Usage
HEIGHT	m		C

LENGTH	m	C
WIDTH	m	C

3.40.6 Oil management

Values	Unit	Description	Usage
DISPENSE	m3	Oil dispense	O
HOSE	1	Hose number	O
PRODUCT	1		O
TANK	1	Tank number	O

3.40.7 Suspension

Values	Unit	Description	Usage
ROAD_HOLDING	%		U
RESONANCE_FREQUENCY	Hz		U
WAY_AMPLITUDE	m		U
WHEEL_DAMPING	%		U
BUILDUP_DAMPING	%		U
DAMPING_INDEX	1		U
WHEEL_WEIGHT_DYN	N		U
AXLE_WEIGHT	N		U

3.40.8 Wheel balancing

Values	Unit	Description	Usage
DIAMETER_ALU	m		W
IMBALANCE_DISPLAY		Display imbalance in	W
	1	1 gram steps	
	5	5 gram steps	
	10	10 gram steps	
IMBALANCE_INIT	g, oz		W
IMBALANCE_INIT_STATIC	g, oz		W
IMBALANCE_RES	g, oz		W
IMBALANCE_RES_MAX	g, oz		W
IMBALANCE_RES_STATIC	g, oz		W
LATERAL_RUNOUT_RIM	m		W
LATERAL_RUNOUT_RIM_MAX	m		W
LATERAL_RUNOUT_TIRE	m		W
NUMBER_SPOKES	Number		W
OFFSET_ALU	m, inch		W
OFFSET_NORMAL	m, inch		W
OPTIMISED	1	1 = true, 0 = false	W
RADIAL_FORCE	N		W
RADIAL_RUNOUT_RIM	m		W
RADIAL_RUNOUT_RIM_MAX	m		W
RADIAL_RUNOUT_TIRE	m		W
RIM_DIAMETER	m, inch	only steel	W
RIM_FABRICATOR	1		W
RIM_OFFSET_DEPTH	m, inch		W

Values	Unit	Description	Usage
RIM_TYPE			W
RIM_WIDTH	m, inch		W
SPLITTING_WEIGHTS	1	1 = true, 0 = false	W
SPLITTING_WEIGTH_1	g, oz		W
SPLITTING_WEIGTH_2	g, oz		W
TIRE_DIMENSION	mm/%-inch		W
TIRE_FABRICATOR	1		W
TIRE_PERFORMANCE	m, inch		W
TIRE_PRESSURE	bar, Pa, psi		W
TIRE_SEAT_PRESSURE	bar, Pa, psi		W
TIRE_TREAD_DEPTH_CENTER	m, inch		W
TIRE_TREAD_DEPTH_LEFT	m, inch		W
TIRE_TREAD_DEPTH_RIGHT	m, inch		W
USER_ID	1		W
WEIGHT_ALU_HEIGHT	m, inch		W
WEIGHT_ALU_WIDTH	m, inch		W
WEIGHT_HEIGHT	m, inch		W
WEIGHT_PLACE_MODE	1	1=default 2=glued 3=glued, hidden 4=static 5=CTS 6=special	W
WEIGHT_WIDTH	m inch		W
WEIGTH_ANGLE	deg60		W
WHEEL_WEIGHT_TYPE		1 = default 2 = truck type 3 = standard 4 = coated 5 = safety type DC 6 = safety type BMW 7 = glued, standard 8 = glued, chromium-plate	W

3.40.9 Noise level

Values	Unit	Description	Usage
BACKGROUND_NOISE	db		N
NOISE_LEVEL	db		N

3.40.10 Head light test

Values	Unit	Description	Usage
ALIGNMENT	% deg		L
ILLUMINANCE	lx		L

3.40.11 Safety check (Germany)

Values	Unit	Description	Usage
AXLE_WEIGHT_DYN	kg		F
AXLE_WEIGHT_STAT	kg		F
AXLE_WEIGHT_MAX	N		F
BRAKEFORCE	N		F
BRAKEFORCE_MAX	N		F
BRAKEFORCE_MIN_PRESSURE	Pa		F
BRAKING_RATIO	%		F
BRAKING_RATIO_CALC_SC	%		F
BRAKING_RATIO_MAX	%		F
CALC_PRESSURE	Pa		F
FINISHED	1	examination done (used with wheel brake)	F
MEAN_BRAKING_RATIO_SC	%		F
OTHER_DEFECTS	Bool		F
PRESSURE_PZ	Pa		F
REQUIRED	1	examination required (used with wheel brake)	F
VISUAL_INSPECTION	Bool		F

3.40.12 Visual inspection

Values	Unit	Description	Usage
Number/text string according to national regulation	none		V
STATISTICS	none	counter	V
AAIA_COMPONENTID	None	AAIA Component ID (from Parts Terminology Database)	V
AAIA_MAP_CONDITION	None	Map Condition Description	V

3.40.13 Side slip test

Values	Unit	Description	Usage
TRACK	mm/m		S

3.40.14 Diagnosis (not yet finished)

Values	Unit	Description	Usage
BATTERY	V	battery voltage	D
CONTRIBUTION_PER_CYLINDER	%	Measures each cylinder's contribution to engine output	D
COUNT		number of faults (OBD)	D
CRANKING_CURRENT_PER_CYLINDER	A	Current measured per cylinder while cranking	D
CRANKING_VACUUM_PER_CYLINDER	In. Hg.	Vacuum measured per cylinder while cranking	D
CURRENT	A	Measures current flow	D
CYLINDER_TIME_VARIATIONS	%	Timing Variations per cylinder	D
DELTA_SPEED	RPM	RPM difference	D
DUTY_CYCLE	%	Measures percentage of duty cycle for devices (fuel control solenoids for example)	D
DWELL_ANGLE	deg	Average Dwell measured	D
DWELL_PER_CYLINDER	deg	Dwell measured per cylinder	D
FINAL_SPEED	RPM	Engine RPM after 10 second crank	D
FINAL_VOLTAGE	V	Load voltage after 10 seconds	D
FREQUENCY	Hz		D
HALL_SENSOR	V	signal of hall sensor	D
IGN_PRIM_CHARGE_TIME	ms		D
IGN_PRIM_VOLTAGE	V		D
IGN_SEC_BURN_TIME	ms	Time for spark duration per cylinder	D
IGN_SEC_BURN_VOLTAGE	kV	Voltage measured that sustains ignition during cycle per cylinder	D
IGN_SEC_MIN_VOLTAGE	kV	Minimum kV measured during test sequence per cylinder	D
IGN_SEC_PEEK_VOLTAGE	kV	Voltage required to create spark per cylinder	D
IGNITION_TIMING	deg	Timing of Ignition measurement	D
INITIAL_VOLTAGE	V	Open Circuit Volts	D
MANIFOLD_VACUUM	In. Hg.	Vacuum measured at Intake Manifold vacuum source	D
PEAK_CURRENT	A	Full Field Current	D
PULSE_WIDTH	ms	Measurement in time of an event (fuel injector on-time, for instance)	D
RESISTANCE	Ohms	Measurement of resistance of a circuit or component	D
SOLENOID_DWELL	deg	Measurement of the Fuel Control Solenoid Dwell	D
SPEED	RPM		D
SPEED_DROP_PER_CYLINDER	%	Percentage of total RPM lost when cylinder is disabled – per cylinder	D
TROUBLE_CODE		fault code (OBD)	D
VACUUM_PER_CYLINDER	In.Hg.	Vacuum measured per cylinder while running	D
VOLTAGE_AC	V	General AC Voltage	D
VOLTAGE_DC	V	General DC Voltage	D
WATERTEMP	degC, degF	Coolant temperature	D

3.40.15 OBD Analysis

Values	Unit	Description	Usage
COUNT	-	Number of stored faults	O
MI_STATE	Bool	Malfunction state	O
SUPPLIER	Text		O
CUSTOMER	Text		O
FSD_NAME	Text		O
TROUBLE_CODE	Text		O
ACTUAL_VALUE		Read out value	O
VISUAL_INSPECTION	Bool		O

3.40.16 Sorted by value

Values	Unit	Description	Usage
ALIGNMENT	%, deg		L
AXLE_OFFSET	m, inch, deg60, deg		A
AXLE_WEIGHT_DYN	N		B, U
AXLE_WEIGHT_MAX	N		B, U
AXLE_WEIGHT_STAT	N		B, U
BACKGROUND_NOISE	db		N
BALL_POINT_LOCATION	m, inch		A
BATTERY	V	battery voltage	D
BRAKEFORCE	N		B
BRAKEFORCE_MAX	N		B
BRAKEFORCE_MIN_PRESSURE	Pa		B
BRAKING_RATIO	%	@test weight	B
BRAKING_RATIO_CALC	%	calculated	B
BRAKING_RATIO_CALC_SC	%	calculated for safety check	B
BRAKING_RATIO_MAX	%	@total weight	B
BUILDUP_DAMPING	%		U
CALC_PRESSURE	Pa		B
CAMBER	deg60, deg		A
CAMBER_ADJUST	deg60		A
CAMBER_RAISED	deg60		A
CASTER_10	deg60, deg		A
CASTER_20	deg60, deg		A
CLEANING_GAS_BLAST		number of cleaning gas blasts	G
CLEANING_SPEED	Rpm	speed for cleaning	G
CO	%Vol		G
CO2	%Vol		G
CONTRIBUTION_PER_CYLINDER	%	Measures each cylinder's contribution to engine output	D
COUNT		number of faults (OBD)	G, D
COVRAI	%Vol		G
CRANKING_CURRENT_PER_CYLINDER	A	Current measured per cylinder while cranking	D
CRANKING_VACUUM_PER_CYLINDER	In. Hg.	Vacuum measured per cylinder while cranking	D
CROSS_CAMBER	deg60, deg		A
CROSS_CAMBER_20_INSIDE	deg60		A
CROSS_CAMBER_20_OUTSIDE	deg60		A
CROSS_CAMBER_RAISED	deg60		

Values	Unit	Description	Usage
CROSS_CASTER	deg60, deg		A
CROSS_INCLUDED_ANGLE	deg60		A
CROSS_SAI	deg60 deg		A
CROSS_TOE	m, inch, deg60		A
CROSS_TOE_CONSTANT	m, inch, deg60		A
CROSS_TOE_OUT_ON_TURNS	deg60		A
CTRL_POINT_WIDTH_LEVEL_CTRL	m, inch		A
CUSTOMER			O
CURRENT	A	Measures current flow	D
CUTOFF_SPEED	rpm		G
CYLINDER_TIME_VARIATIONS	%	Timing Variations per cylinder	D
DAMPING_INDEX	%		U
DEFECTS_NO6	Bool		G
DELTA_SPEED	RPM	RPM difference	D
DIAMETER_ALU	m		W
DISPENSE	m3	Oil dispense	O
DUTY_CYCLE	%	Measures percentage of duty cycle for devices (fuel control solenoids for example)	D
DWELL_ANGLE	deg	Average Dwell measured	D
DWELL_PER_CYLINDER	deg	Dwell measured per cylinder	D
DWELL_RATIO	%		G
DYNAMIC_DIFF	%		B
FAULT_MEMORY			G
FINAL_SPEED	RPM	Engine RPM after 10 second crank	D
FINAL_VOLTAGE	V	Load voltage after 10 seconds	D
FINISHED	1	examination done (used with wheel brake)	F
FREQUENCY	Hz		D
FSD_NAME			O
GAS			G
GASTEMP	degC, degF, K		G
HALL_SENSOR	V	signal of hall sensor	D
HC	ppmVol		G
HEIGHT	m		C
HOLD_TIME	s		G
HOSE	1	Hose number	O
IDLE_SPEED	rpm		G
IGN_POINT	DegCS		G
IGN_PRIM_CHARGE_TIME	ms		D
IGN_PRIM_VOLTAGE	V		D
IGN_SEC_BURN_TIME	ms	Time for spark duration per cylinder	D
IGN_SEC_BURN_VOLTAGE	kV	Voltage measured that sustains ignition during cycle per cylinder	D
IGN_SEC_MIN_VOLTAGE	kV	Minimum kV measured during test sequence per cylinder	D
IGN_SEC_PEEK_VOLTAGE	kV	Voltage required to create spark per cylinder	D
IGNITION_TIMING	deg	Timing of Ignition measurement	D
ILLUMINANCE	lx		L
IMBALANCE_DISPLAY	1	Display imbalance in 1 gram steps	W

Values	Unit	Description	Usage
	5 10	5 gram steps 10 gram steps	
IMBALANCE_INIT	g, oz		W
IMBALANCE_INIT_STATIC	g, oz		W
IMBALANCE_RES	g, oz		W
IMBALANCE_RES_MAX	g, oz		W
IMBALANCE_RES_STATIC	g, oz		W
INCLUDED_ANGLE	deg60, deg		A
INITIAL_VOLTAGE	V	Open Circuit Volts	D
LAMBDA	1		G
LATERAL_ANGLE	deg		L
LATERAL_OFFSET	m, inch, deg60, deg		A
LATERAL_RUNOUT_RIM	m		W
LATERAL_RUNOUT_RIM_MAX	m		W
LATERAL_RUNOUT_TIRE	m		W
LENGTH	m		C
MANIFOLD_VACUUM	In. Hg.	Vacuum measured at Intake Manifold vacuum source	D
MAX_STEER	deg60, deg		A
MAX_STEER_TO_LEFT	deg60		A
MAX_STEER_TO_RIGHT	deg60		A
MEAN_BRAKING_RATIO_SC	%		
MI_CONTROL	Bool	Malfunction indicator activation	G
MI_STATE	Bool	Malfunction indicator state	G
MI_VISUAL_INSPECTION	Bool	Visual inspection of malfunction indicator lamp	G
MIN_PRESSURE	Pa		B
NOISE_LEVEL	db		N
NOTES			alle
NOX	ppmVol		G
NUMBER_SPOKES	Zahl		W
O2	%Vol		G
OBD_CTRL	Bool	Functional check of OBD	G
OFFSET_ALU	m, inch		W
OFFSET_DEPTH	m, inch		A
OFFSET_NORMAL	m, inch		W
OILTEMP	degC, degF, K		G
OPACITY	1/m		G
OPENING_PRESS	Pa		G
OPTIMISED	1	1 = true, 0 = false	W
OTHER_DEFECTS	Bool		F
OVALITY	%		B
OVALITY_2	%		B
OVALITY_3	%		B
OVALITY_4	%		B
PEAK_CURRENT	A	Full Field Current	D
PEDALFORCE	N		B
PERFORMED_TEST		Test perfomed	G
REPAIRED_DEFECTS_NO5	Bool	Repaired faults	G
PERMISSION			G
PRESSURE_PM	Pa		B
PRESSURE_PZ	Pa		B

Values	Unit	Description	Usage
PRODUCT	1		O
PROPAN	ppmVol		G
PULSE_WIDTH	ms	Measurement in time of an event (fuel injector on-time, for instance)	D
RADIAL_FORCE	N		W
RADIAL_RUNOUT_RIM	m		W
RADIAL_RUNOUT_RIM_MAX	m		W
RADIAL_RUNOUT_TIRE	m		W
REPAIRED_DEFECTS_NO5	Bool	Repaired faults	G
REQUIRED	1	examination required (used with wheel brake)	F
RESISTANCE	Ohm	resistance (circuit, component)	D
RESONANCE_FREQUENCY	Hz		U
RIM_DIAMETER	m inch	only steel	W, A
RIM_FABRICATOR	1		W
RIM_OFFSET_DEPTH	m, inch		W
RIM_TYPE			W
RIM_WIDTH	m, inch		W, A
ROAD_FRICTION	N		B
ROAD_HOLDING	%		U
ROBJECTE_HEIGHT	m, inch, deg60, deg		A
SAI_10	deg60, deg	Steering Axis Inclination	A
SAI_20	deg60, deg		A
SCRUB_RADIUS	m, inch		A
SHOCK_ABSORBER_TRAVEL	m, inch		A
SLIP	%		B
SMOKE		Final result	G
SOLENOID_DWELL	deg	Measurement of the Fuel Control Solenoid Dwell	D
SPEED	rpm		B;G
SPEED_DROP_PER_CYLINDER	%	Percentage of total RPM lost when cylinder is disabled – per cylinder	D
SPLITTING_WEIGHTS	1	1 = true, 0 = false	W
SPLITTING_WEIGTH_1	g, oz		W
SPLITTING_WEIGTH_2	g, oz		W
START_DELIVERY	degCS		G
STATISTICS			V
SUMMARY			G,B,A
SUPPLIER			O
SUPPORTED_TESTS		Supported Tests (OBD)	G
TANK	1	Tank number	O
TEST_LOADING	Kg		A
THRUST_ANGLE	m, inch, deg60, deg		A
TIRE_DIMENSION	mm/%-inch		W, A
TIRE_FABRICATOR	1		W, A
TIRE_PERFORMANCE	m inch		W, A
TIRE_PRESSURE	bar, Pa, psi		W, A
TIRE_SEAT_PRESSURE	bar, Pa, psi		W
TIRE_TREAD_DEPTH_CENTER	m, inch		W, A
TIRE_TREAD_DEPTH_INSIDE	m, inch		A

Values	Unit	Description	Usage
TIRE_TREAD_DEPTH_LEFT	m, inch		W
TIRE_TREAD_DEPTH_OUTSIDE	m, inch		A
TIRE_TREAD_DEPTH_RIGHT	m, inch		W
TOE	m, inch, deg60, deg		A
TOE_ADJUSTMENT	m,		A
TOE_CONSTANT_ADJUSTMENT	m,		A
TOE_CONSTANT_CONTROL	m,		A
TOE_OUT_ON_TURNS_10	deg60, deg		A
TOE_OUT_ON_TURNS_20	deg60, deg		A
TOE_TO_INTERMEDIATE_AXIS	m, inch, deg60		A
TOE_TO_THRUST_ANGLE	m, inch, deg60		A
TOTAL_TOE	m, inch, deg60, deg		A
TOTAL_TOE_UNDEPRESSED	m, inch, deg60		A
TOTAL_WEIGHT	N		B
TOTAL_WEIGHT_MAX	N		B
TRACK	mm/m		S
TRACK_CURVE	m, inch, deg60		A
TRACK_WIDTH	m, inch, deg60, deg		A
TRACK_WIDTH_DIFFERENCE	m, inch, deg60, deg		A
TROUBLE_CODE		OBD	G
TURN_TABLE_ANGLE	deg60		A
USER_ID	1		W
VACUUM_PER_CYLINDER	In.Hg.	Vacuum measured per cylinder while running	D
VEHICLE_LATERAL_INCLINATION	m, inch		A
VEHICLE_LONGITUDINAL_INCLINATION	m, inch		A
VISUAL_INSPECTION	Bool		B;G
VOLTAGE_AC	V	General AC Voltage	D
VOLTAGE_DC	V	General DC Voltage	D
WARM_UP	Bool	Warm up of brake (France)	
WAIT_TIME	min	Wait time for catalyser conditioning	G
WATERTEMP	degC, degF, K		G
WAY_AMPLITUDE	m		U
WEIGHT_ALU_HEIGHT	m, inch		W
WEIGHT_ALU_WIDTH	m, inch		W
WEIGHT_HEIGHT	m, inch		W
WEIGHT_PLACE_MODE	1	1=default 2=glued 3=glued, hidden 4=static 5=CTS 6=special	W
WEIGHT_WIDTH	m, inch		W
WEIGTH_ANGLE	deg60		W
WHEEL_BASE	m, inch		A
WHEEL_BASE_DIFFERENCE	m, inch		A
WHEEL_DAMPING	%		U
WHEEL_SETBACK	m, inch, deg60, deg		A
WHEEL_WEIGHT_DYN	N		B, U
WHEEL_WEIGHT_STAT	N		B, U
WHEEL_WEIGHT_TYPE		1 = default 2 = truck type	W

Values	Unit	Description	Usage
		3 = standard 4 = coated 5 = safety type DC 6 = safety type BMW 7 = glued, standard 8 = glued, chromium-plate	
WIDTH	m		C

3.41 Attributes for specific test kinds

Key word	Attribute	Exhaust gas	brake	wheelalignment	head light	side slip	noise level	Visual inspection
RESULT								
	OBJECT	EMISSION	BRAKE	WHEEL_ALIGNMENT	HEAD_LIGHT	SIDE_SLIP	NOISE	VISUAL_INSPECTION
	METHOD	OBD, SMOKE, SMOKE_TURBO, SMOKE_OBD GAS, GAS_OL_CATALYST, GAS_CL_CATALYST GAS_OBD_CATALYST GAS_BIKE, GAS_BIKE_CL_CATALYST	QUICK STANDARD	QUICK STANDARD MANUFACTURER_SPECIFIC ACCIDENT_VEHICLE FOURWD				
SECTION								
	AXLE		1,2,3 ...	1,2,3 ...		1,2,3 ...		
	OBJECT	VISUAL_INSPECTION MIL CONDITIONING FAST_IDLE NATURAL_IDLE CLOSED_LOOP_CTRL GAS_BLASTS OBD_CTRL	FOURWD STANDARD SINGLE	TIRE_INSPECTION VISUAL_INSPECTION RUNOUT_COMPENSATION MEASUREMENT INITIAL_MEASUREMENT FINAL_MEASUREMENT TRACK_CURVE_MEASUREMENT RIDEHEIGHT	LOW_BEAM HIGH_BEAM FOG_BEAM	SIDE_SLIP	SILENCER HORN	VISUAL_INSPECTION
	TYPE	0=Alt., 1/2 base method, 3=replacement, 4=jumping probe, 5=wide band probe, 9=Diesel						
STEP						N/A		N/A
	OBJECT	BASE_VALUE DISTURBANCE_ON, DISTURBANCE_OFF SETTLED_ON, SETTLED_OFF TROUBLE_CODES, CONTROLLERS	SERVICE_BRAKE PARKING_BRAKE AUXILARY_BRAKE1 AUXILARY_BRAKE2		VERTICAL_POSITION HORIZONTAL_POSITION			

	NO	1,2,3,...		1,2,3...			1,2,...	
MEAS								
	OBJECT	see chapter 3.40.2	see chapter 3.40.3	see chapter 3.40.5	see chapter 3.40.10	see chapter 0	see chapter 3.40.9	See chapter
	LOC		LEFT, RIGHT	LEFT, RIGHT	LEFT, RIGHT			

Attributes (continued)

key word	Attribute	Suspension	Oil management	wheel balancing	Car measurement	Safety check	Diagnosis	Brake fluid test	Motor test
RESULT									
	OBJECT	SUSPENSION	OIL_MANAGEMENT	WHEELBALANCER	CAR_MEASUREMENT	SAFETY_CHECK	DIAGNOSIS	BRAKE_FLUID	MOTOR_TEST
	METHOD			DYNAMIC STATIC		FIRST_EXAMINATION RE_EXAMINATION			
SECTION									
	AXLE	1,2,3 ...				1,2,3 …			
	OBJECT	SUSPENSION	OIL	UNBALANCE	INITIAL_MEASUREMENT FINAL_MEASUREMENT	STANDARD VISUAL_INSPECTION OTHER_DEFECTS INNER_WHEEL_BRAKE_CHECK	MEASUREMENT IGNITION TROUBLE_CODES OBD_ANALYSIS	BRAKE_FLUID	FUNCTION_TEST IGNITION MEASUREMENT CIRCUIT
	TYPE			1,2,3,...			PERM, INTERM		
STEP								N/A	
	OBJECT					SERVICE_BRAKE PARKING_BRAKE	CYLINDER		CYLINDER
	NO				no of measurement location		no of cylinder		
MEAS									
	OBJECT	see chapter 0	see chapter 3.40.5	see chapter 3.40.8	see chapter 3.40.5	see chapter 0	See chapter 3.36.15	See chapter	
	LOC	LEFT, RIGHT		INSIDE/OUTSIDE					

4 Implementation

For implementation the e**X**tensible **M**ark-up **L**anguage XML is used.

4.1 Why XML ?

XML is a standard defined by the World-Wide-Web consortium.

XML is a subset of SGML (sometimes called SGML light): 80 % of the functionality of SGML is realised with 30% of the complexity of SGML.

XML allows the definition of any data types needed.

XML has the ability (like SGML) to define the syntax permitted for an application, this is called the DTD (document type definition). Using an DTD it's possible to validate the syntax at runtime.

XML does not define any method for visualisation of the data. This is the job of the eXtensible Stylesheet Language (XSL). XSL is used to do a transformation of the data for e.g. a print out or a viewer. If XSL enabled browser are available (like IE 5), this transformation can be done at runtime on the client side.

4.1.1 Character encoding

The default encoding in XML is UNICODE. Other encoding can be used. To ease the processing in microcontroller applications 8 Bit ISO-8859-1 is used (this is similar to the windows code page 1252).

4.1.2 Image encoding

Images are embedded as ASCII strings with **Base64** encoding. A Base64 encoding maps 6 Bits as a character in the range (a-z, A-Z, +,-, 0-9) with a line length of 74 characters.

A graphic is treated in the same way as any MEAS, e.g.:

```
<MEAS OBJECT="IMAGE">
    <TITLE>embedded picture</TITLE>
    <VALUE UNIT="Bin.Base64" IMAGE="GIF">R0lGODlhWgBEAPcAAAAA1ggA1ggI1hAI1hAQ1hgQ1hgY1iEY1iEh1ikh1ikp1ikp3jEp
3jEx1jEx3jkx1jkx3jk51jk53kI53kJC1kJC3kpC3kpK3kpS3lJK3lJS3lJS51pS3lpS51pa
...
yMaJQXRRsI2cmTgGQDIRkHMWSEAAADs=</VALUE>
</MEAS>
```

Using a pre-processor, the embedded graphic is decoded and saved as a file IMAGEn.xxx where xxx is substituted with the IMAGE attribute and n is a successive number. Both attributes are removed and the contents is replace with the file path:

```
<MEAS OBJECT="IMAGE">
    <TITLE>embedded picture</TITLE>
    <VALUE>c:\temp\image0.gif</VALUE>
</MEAS>
```

After this pre-processing is performed, it's possible to transform the data with a style sheet into HTML and use a browser for visualisation.

4.2 The Document Type Definition for asanetwork “awnres.dtd”

The latest, up-to-date DTD is available as download with asanetwork viewer or here:

http://www.axonet.de/public_down/ex_xml_v40.zip

5 Annex

5.1 Revision history

5.1.1 Edition 4.0

Chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**, WORKSHOP extended with EMAIL

Chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**, UNIT defined for ODOMETER

Chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**, added DEMO_MEAS and DEMO_LIMITS

Chapter 0, added more devices

Chapter 3.36ff, DIAGRAM added

Chapter 3.41, updated and enhanced

5.1.2 Edition 3.0

First edition with i•SHOP requirements

Page 10, added more languages

Page 11f, added more tags (including i•SHOP tags)

Page 13f, added more tags (including i•SHOP tags)

Page 22, added more equipment

Page 27, Attribute NO for SECTION added

Page 44, added more tags (including i•SHOP tags)

Page 45, added more tags (including i•SHOP tags)

Page 46, Added OBD chapter

Page 58, Examples removed, link to download added

Examples in XML

5.2.1 A general example (overview)

This example show how we can integrate some inspection results into one file.

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<!DOCTYPE RESULTS SYSTEM "awnres.dtd">
<!--generic example to demonstrate the structure -->
<RESULTS VERSION="1.8">
  <RESULTSHEADER>
    <!-- common information for all tests done on this vehicle -->
    <COUNTRY>
      <!-- Information about country spec. regulations -->
      <!-- global info, can be overridden in sub sections -->
      <REGULATION>GERMAN</REGULATION>
      <LANGUAGE>ENGLISH</LANGUAGE>
    </COUNTRY>
    <CUSTOMER>
      <!-- Customer information -->
      <NAME>Helmut Maier</NAME>
      <COMPANY>Maier und Sohn GmbH &amp;amp; Co. KG</COMPANY>
      <ADDRESS>Lange Nacht 12</ADDRESS>
      <ZIP>12345</ZIP>
      <CITY>Neustadt</CITY>
    </CUSTOMER>
    <VEHICLE>
      <IDENT>
        <!-- vehicle identification -->
        <REGISTRATION>ES-R 1555</REGISTRATION>
        <MANUFACTURER>Volkswagen</MANUFACTURER>
        <MODEL>Sharan 2,0</MODEL>
        <TYPE>7M</TYPE>
        <KEY2>0603</KEY2>
        <KEY3>349</KEY3>
        <VIN>WVWZZZ7MZWV031183</VIN>
        <ENGINECODE>AFN</ENGINECODE>
        <PISTONDISPLACEMENT>1898</PISTONDISPLACEMENT>
        <FUEL1>UNLEADED</FUEL1>
      </IDENT>
      <DATA>
        <!-- vehicle data, both fixed and changing like odometer -->
        <ODOMETER>54321</ODOMETER>
        <TOTAL_WEIGHT>1000</TOTAL_WEIGHT>
        <TOTAL_WEIGHT_MAX>4000</TOTAL_WEIGHT_MAX>
      </DATA>
    </VEHICLE>
    <!-- workshop data -->
    <WORKSHOP>
      <NAME>Autohaus MÃ¼ller</NAME>
      <NAME2>Ihr Audi-Partner</NAME2>
      <ADDRESS>Audistr. 3</ADDRESS>
      <ZIP>54321</ZIP>
      <CITY>Musterstadt</CITY>
      <TEL>0123/45678</TEL>
      <FAX>0123/45678</FAX>
    </WORKSHOP>
  </RESULTSHEADER>
  <!-- now each test kind, e.g. brake, gas, light ... -->
  <RESULT OBJECT="EMISSION">
    <TITLE>exhaust gas test</TITLE>
    <!-- info about equipment, operator and start/end of test -->
    <HEADER>
      <!-- each equipment has it's own block -->
      <EQUIPMENT TYPE="CONTROL">
        <TITLE>control program</TITLE>
        <MANUFACTURER>Bosch</MANUFACTURER>
        <MODEL>3.250</MODEL>
        <SERIAL_NO>65687</SERIAL_NO>
        <HOMOLOGATION_NO>43670</HOMOLOGATION_NO>
        <VERSION>2.0deu</VERSION>
        <CALIBRATION_EXPIRES>18.6.1999</CALIBRATION_EXPIRES>
      </EQUIPMENT>
      <EQUIPMENT TYPE="SMOKE">
        <TITLE>smoke meter</TITLE>
        <MANUFACTURER>Bosch</MANUFACTURER>
        <MODEL>RTM</MODEL>
        <SERIAL_NO>65687</SERIAL_NO>
        <HOMOLOGATION_NO>43670</HOMOLOGATION_NO>
        <VERSION>2.0deu</VERSION>
        <CALIBRATION_EXPIRES>18.6.1999</CALIBRATION_EXPIRES>
      </EQUIPMENT>
      <!-- start and end time of this test -->
      <START_TEST>10.5.1998 14:56:33</START_TEST>
      <END_TEST>10.5.1998 15:15:28</END_TEST>
```

```
    <!-- country dependent number -->
    <CONTROL_NO>BW-4-0815</CONTROL_NO>
    <!-- operator with permission and ids -->
    <OPERATOR>
      <NAME>Daniel Korn</NAME>
      <PERMISSION>
        <ID1>1234ABC4567</ID1>
        <ID2>1234ABC4567</ID2>
        <EXPIRES>10.02.2001</EXPIRES>
      </PERMISSION>
    </OPERATOR>
    <!-- override country info for this test kind -->
    <COUNTRY>
      <REGULATION>GERMAN</REGULATION>
      <LANGUAGE>ENGLISH</LANGUAGE>
    </COUNTRY>
  </HEADER>
  <!-- now one or more sections within the test kind -->
  <!-- the attribute OBJECT defines what is done in this section -->
  <SECTION OBJECT="CONDITIONING">
    <TITLE>Conditioning</TITLE>
    <MEAS OBJECT="OILTEMP">
      <TITLE>oil temperature</TITLE>
      <!-- a measurement has one or more values -->
      <VALUE RESULT="1" UNIT="degC" LOWLIM1="80">85</VALUE>
    </MEAS>
    <MEAS OBJECT="IGN_POINT">
      <TITLE>ignition point</TITLE>
      <VALUE RESULT="1" LOWLIM1="3" HIGHLIM1="7" UNIT="degCS">5</VALUE>
    </MEAS>
    <MEAS OBJECT="DWELL_ANGLE">
      <TITLE>dwell angle</TITLE>
      <VALUE RESULT="1" LOWLIM1="42" HIGHLIM1="58" UNIT="deg">54</VALUE>
    </MEAS>
    <!-- each section can contain a block of summary information -->
    <!-- in this way, SUMMARY is a replacement for STEP -->
    <SUMMARY>
      <MEAS OBJECT="CONDITIONING">
        <TITLE>Conditioning</TITLE>
        <VALUE RESULT="1">passed</VALUE>
      </MEAS>
    </SUMMARY>
  </SECTION>
  <!-- other sections are build in the same way -->
  <SECTION OBJECT="FAST_IDLE">
    <TITLE>fast idle</TITLE>
    <MEAS OBJECT="RPM">
      <TITLE>rotational speed</TITLE>
      <VALUE UNIT="rpm" LOWLIM1="2000" HIGHLIM1="3000" RESULT="1">2545</VALUE>
    </MEAS>
  </SECTION>
  <!-- other sections are build in the same way, here we have a summary -->
  <SECTION OBJECT="NATURAL_IDLE">
    <TITLE>natural idle</TITLE>
    <MEAS OBJECT="RPM">
      <TITLE>rotational speed</TITLE>
      <VALUE UNIT="rpm" LOWLIM1="600" HIGHLIM1="900" RESULT="3">545</VALUE>
    </MEAS>
    <SUMMARY>
      <MEAS OBJECT="RPM">
        <TITLE>rotational speed</TITLE>
        <VALUE RESULT="3">n. OK</VALUE>
      </MEAS>
    </SUMMARY>
  </SECTION>
  <!-- after all sections we can have a summary for the whole tests -->
  <!-- in this way, SUMMARY is a replacement for SECTION -->
  <SUMMARY>
    <TITLE>Results</TITLE>
    <MEAS OBJECT="GAS">
      <TITLE>emission test</TITLE>
      <VALUE RESULT="1">passed</VALUE>
    </MEAS>
    <MEAS OBJECT="PERMISSION">
      <TITLE>permission</TITLE>
      <VALUE RESULT="1">granted</VALUE>
    </MEAS>
    <MEAS OBJECT="EXPIRATION_DATE">
      <TITLE>next check</TITLE>
      <VALUE UNIT="Date">20.04.2005</VALUE>
    </MEAS>
  </SUMMARY>
</RESULT>
<!-- it is possible to combine different test results -->
<!-- in this case we have additional RESULT -->
<RESULT OBJECT="BRAKE">
  <TITLE>brake test</TITLE>
  <HEADER>
    <!-- each equipment has it's own block -->
```

```
    <EQUIPMENT TYPE="BRAKE">
      <TITLE>Brake tester</TITLE>
      <MANUFACTURER>Bosch</MANUFACTURER>
      <MODEL>BSA 250</MODEL>
      <SERIAL_NO>65687</SERIAL_NO>
      <HOMOLOGATION_NO>43670</HOMOLOGATION_NO>
      <VERSION>2.0deu</VERSION>
      <CALIBRATION_EXPIRES>18.6.1999</CALIBRATION_EXPIRES>
    </EQUIPMENT>
    <!-- start and end time of this test -->
    <START_TEST>10.5.1998 14:56:33</START_TEST>
    <END_TEST>10.5.1998 15:15:28</END_TEST>
  </HEADER>
  <!-- same structure as before -->
  <SECTION OBJECT="STANDARD">
    <TITLE>Bremsentest Standardverfahren</TITLE>
    <MEAS OBJECT="BRAKEFORCE">
      <TITLE>Bremskraft</TITLE>
      <VALUE/>
    </MEAS>
  </SECTION>
</RESULT>
<RESULT OBJECT="HEAD_LIGHT">
  <TITLE>light test</TITLE>
  <HEADER>
    <!-- each equipment has it's own block -->
    <EQUIPMENT TYPE="LIGHT">
      <TITLE>Light tester</TITLE>
      <MANUFACTURER>Bosch</MANUFACTURER>
      <MODEL>AEFLE</MODEL>
      <SERIAL_NO>65687</SERIAL_NO>
      <HOMOLOGATION_NO>43670</HOMOLOGATION_NO>
      <VERSION>2.0deu</VERSION>
      <CALIBRATION_EXPIRES>18.6.1999</CALIBRATION_EXPIRES>
    </EQUIPMENT>
    <!-- start and end time of this test -->
    <START_TEST>10.5.1998 14:56:33</START_TEST>
    <END_TEST>10.5.1998 15:15:28</END_TEST>
  </HEADER>
  <!-- same structure as before -->
  <SECTION OBJECT="LOW_BEAM">
    <TITLE>Abblendlicht</TITLE>
    <MEAS OBJECT="ILLUMINANCE">
      <TITLE>Beleuchtungsstaerke</TITLE>
      <VALUE/>
    </MEAS>
  </SECTION>
</RESULT>
<RESULT OBJECT="NOISE">
  <TITLE>noise test</TITLE>
  <!-- same structure as before -->
  <HEADER>
    <!-- each equipment has it's own block -->
    <EQUIPMENT TYPE="NOISE">
      <TITLE>Light tester</TITLE>
      <MANUFACTURER>Bruel &amp; Kjaer</MANUFACTURER>
      <MODEL>X123</MODEL>
      <SERIAL_NO>65687</SERIAL_NO>
      <HOMOLOGATION_NO>43670</HOMOLOGATION_NO>
      <VERSION>2.0deu</VERSION>
      <CALIBRATION_EXPIRES>18.6.1999</CALIBRATION_EXPIRES>
    </EQUIPMENT>
    <!-- start and end time of this test -->
    <START_TEST>10.5.1998 14:56:33</START_TEST>
    <END_TEST>10.5.1998 15:15:28</END_TEST>
  </HEADER>
  <SECTION OBJECT="HORN">
    <TITLE>Hupe</TITLE>
    <MEAS OBJECT="NOISE_LEVEL">
      <TITLE>Schallstaerke</TITLE>
      <VALUE/>
    </MEAS>
  </SECTION>
</RESULT>
<!-- at least we can build a final result from all RESULTS -->
<!-- in this way, SUMMARY is a replacement for RESULT -->
<SUMMARY>
  <TITLE>Main summary</TITLE>
  <!-- we can use a brief entry like this -->
  <MEAS OBJECT="SUMMARY">
    <TITLE>all test</TITLE>
    <VALUE RESULT="1">passed</VALUE>
  </MEAS>
  <!-- or can be more specific -->
  <MEAS OBJECT="GAS">
    <TITLE>emission test</TITLE>
    <VALUE RESULT="1">passed</VALUE>
  </MEAS>
  <MEAS OBJECT="BRAKE">
```

```
      <TITLE>brake test</TITLE>
      <VALUE RESULT="1">passed</VALUE>
    </MEAS>
    <MEAS OBJECT="LIGHT">
      <TITLE>light test</TITLE>
      <VALUE RESULT="3">not passed</VALUE>
    </MEAS>
    <MEAS OBJECT="NOISE">
      <TITLE>noise test</TITLE>
      <VALUE RESULT="1">passed</VALUE>
    </MEAS>
  </SUMMARY>
</RESULTS>
```

5.2.2 Diagram

Excerpt:

```
<DIAGRAM OBJECT="OSZI_DATA" VERSUS="">
   <TITLE>A</TITLE>
   <GRAPH COUNT="724" NO="1">
      <TITLE>Zündkreis A1</TITLE>
      <X_AXIS OBJECT="">
         <VALUE UNIT="°" RESULT="1" SOURCE="HAND" LOWDISP="0" HIGHDISP="720" RESOLUTION="0.95°"/>
      </X_AXIS>
      <Y_AXIS OBJECT="Spannung">
         <VALUE UNIT="V" DIGITS="18" RESULT="1" LOWLIM1="" HIGHLIM1="" LOWDISP="-10" HIGHDISP="50"
                REF="UNKNOWN" TRIGGER="NONE" TRIGGER_EDGE="POS" RESOLUTION="V" />
      </Y AXIS>
      <ARRAY>0,1.153794925 0.95,-2.450139712….719.005524861878,-1.134348356 </ARRAY>
   </GRAPH>
</DIAGRAM>
```

5.3 Other examples

More examples are available via download from http://www.axonet.de/public_down/ex_xml_v40.zip including the latest DTD.

5.4 Notes