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Road vehicles — Multimedia data exchange format for impact tests

Véhicules routiers — Format d'échange de données multimédia pour les essais de choc

Related electronic document A

Examples and Hints

— Version 1.6 —

Revision 2

Changes to the version 1.6 Revision 1 are marked in red colour.

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RED A : Examples and Hints

A.1 Examples of files

A.1.1 Example of test descriptor file

File name : 2005ISO1.MME

```
Data format edition number          :1.6
Laboratory name                     :ALPHA Car Test Laboratory
Laboratory contact name             :Frank N. Stein
Laboratory contact phone            :+49-222/123-4567
Laboratory contact fax              :+49-222/123-8901
Laboratory contact email            :frank.stein@alpha.cartest.com
Laboratory test ref. number         :2005WG3
Customer name                       :ISO/TC22/SC12/WG3 Safety Laboratory
Customer test ref. number           :2005ISO1
Customer project ref. number        :ISOTC22
Customer order number               :SC12WG3
Customer cost unit                  :2001/0
Customer test engineer name         :Mary Land
Customer test engineer phone        :+44-123/555-123
Customer test engineer fax          :+44-123/555-456
Customer test engineer email        :mary.land@iso.tc22.sc12.wg3.uk
Title                               :Simulation Test
Medium No./number of media          :1/1
Timestamp                           :2005-05-22 14:25:15
Type of the test                    :Frontal
Subtype of the test                 :40% Offset left 0°
Regulation                          :EuroNCAP
Reference temperature               :285.5
Relative air humidity               :75
Date of the test                    :2005-05-22
Number of test objects              :2
Comments                            :
Comments                            :  The following block describes test object 1
Comments                            :
Name of test object 1               :Vehicle A
Velocity test object 1              :15.72
Mass test object 1                  :1430.00
Driver position object 1            :1
Impact side test object 1           :FR
Type of test object 1               :1
Class of test object 1              :Small Family Car
Code of test object 1               :A05
Ref. number of test object 1        :007-008
.Offset 1                           :40
Comments                            :
Comments                            :  The following block describes test object 2
Comments                            :
Name of test object 2               :Fixed barrier with load cell matrix
Velocity test object 2              :0.00
Mass test object 2                  :NOVALUE
Driver position object 2            :NOVALUE
Impact side test object 2           :FR
Type of test object 2               :B
Class of test object 2              :NOVALUE
Code of test object 2               :NOVALUE
Ref. number of test object 2        :NOVALUE
```

.Barrier width 2	:3.2
.Barrier height 2	:1.64
.Yaw angle 2	:-1.507
.Reference system 2	:laboratory
Comments	according to the SAE J211 coordinate system
.Origin X 2	:0.12
.Origin Y 2	:-1.4
.Origin Z 2	:-1.8
.Number of loadcells 2	:64

A.1.2 Example of test comment file

File name : 2005ISO1.TXT

The car to car test was performed on 22nd of May 2005 at ALPHA Car Test Laboratory. The airbags of vehicle A had to be exchanged before the test. ...

A.1.3 Example of channel comment file

File name : CHANNEL.TXT

Following problems occurred:
11HEAD0000H3ACXA: large deviations at post test calibration ...

A.1.4 Example of diagram comment file

File name : DIAGRAM.TXT

The plots and diagrams of the test are stored as postscript files. ...

A.1.5 Example of movie comment file

File name : MOVIE.TXT

The 16 mm films are scanned with an EPSILON film scanner in 1.020 x 1.360 pixel resolution. The images are resized to 576 x 768 pixel with the program TAU. The creation of the AVI container files was performed with the program AVIMAKER. ...

A.1.6 Example of photo comment file

File name : PHOTO.TXT

All pictures photographed with the ETA 007 are resized from 5.850 x 5.000 to 1.170 x 1.000 pixel. The resizing and the colour correction are performed with the program TAU. ...

A.1.7 Example of report comment file

File name : REPORT.TXT

The name of the report file is 200**5**ISO1_REPORT.TXT. It contains plain text with up to 80 characters per line and each line is separated by a ‚carriage return‘ and a ‚line feed‘ (CR/LF). ...

A.1.8 Example of static comment file

File name : STATIC.TXT

The ID-number of the points starts with 7, because the first 6 points define our reference system for frontal impacts.
...

A.1.9 Example of channel information file

File name : 2005ISO1.CHN

Instrumentation standard	:ISO 6487 (1987) / SAE J211 (MAR95)	
Number of channels	:13	
Name of channel 001	:11HEAD0000H3ACXA	/ Head Acceleration X
Name of channel 002	:11HEAD0000H3ACYA	/ Head Acceleration Y
Name of channel 003	:11HEAD0000H3ACZA	/ Head Acceleration Z
Name of channel 004	:11CHST0000H3DSXC	/ Chest Displacement X
Name of channel 005	:14BPILLO0000ACXC	/ B-Pillar Acceleration X
Name of channel 006	:11NECKUP00H3FOZA	/ Neck upper Force Z
Name of channel 007	:11NECKUP00H3MOYB	/ Neck upper Moment Y
Name of channel 008	:B0LOMA007525FOXP	/ Loadcell matrix Force X
Name of channel 009	:B0LOMA007550FOXP	/ Loadcell matrix Force X
Name of channel 010	:B0LOMA007575FOXP	/ Loadcell matrix Force X
Name of channel 011	:11TIBILEUPH3FOZB	/ Tibia left upper Force Z
Name of channel 012	:11TIBILEUPH3MOXB	/ Tibia left upper Moment X
Name of channel 013	:11TIBILEUPH3MOYB	/ Tibia left upper Moment Y

A.1.10 Example of test channel file

Filename : 2005ISO1.001

Test object number	:1		
Name of the channel	:Head Acceleration X		
Laboratory channel code	:HEAD01AX		
Customer channel code	:1HEAD_X_ACC		
Channel code	:11HEAD0000H3ACXA		
Comments	: next 4 items are optional and part of the channel code		
Location	:Head	(=HEAD	at code position 3-6)
Dimension	:Acceleration	(=AC	at code position 13-14)
Direction	:Longitudinal	(=X	at code position 15)
Channel frequency class	:1000	(=A	at code position 16)
Unit	:m/(s*s)		
Reference system	:Local		
Transducer type	:TAU 7270 A		
Transducer id	:42		
Pre-filter type	:Butterworth, 6 pole		
Cut off frequency	:2000.0		
Channel amplitude class	:2000.0		
Reference channel	:implicit		
Reference channel name	:NOVALUE		
Data source	:transducer		
Data status	:ok		
Sampling interval	:0.0001		
Bit resolution	:12		
Time of first sample	:0.0000		
Number of samples	:2500		
Offset post test	:0.15		
Transducer natural frequency	:27000		
Transducer damping ratio	:0.5		

Comments	: next 6 items for proofing
First global maximum value	:+1.237802E+02
Time of maximum value	:+0.18450
First global minimum value	:-5.489905E+02
Time of minimum value	:+0.06860
Start offset interval	:-0.0500
End offset interval	:+0.0000

-4.788391E-01
-7.182586E-01
. . .
+3.064578E+01

A.1.11 Examples of moving image information files

A.1.11.1 Example of moving image information file

File name : 2005ISO1.MII

Number of movies	:7
Comments	:
Comments	: the following block describes movie 1
Comments	:
ID-number 1	:1
Origin 1	:Crashtest
Description 1	:total view of vehicle A from the left side
Camera type 1	:KAPPA ROC
Camera ID-number 1	:KAPPA12
Lens ID-number 1	:14579435
Lens type 1	:Schneider
Focus 1	:infinite
Lens focal length 1	:10
Number of images 1	:350
Film speed 1	:1000
Shutter time 1	:0.0001
Aperture 1	:5.6 - 8
Time zero 1	:50
Time vector filename 1	:NO
Reference system 1	:middle of the test block, on the floor
Location X 1	:-25.0
Location Y 1	:-9.5
Location Z 1	:1.2
Theta X 1	:90
Theta Y 1	:0
Theta Z 1	:270
Width of image 1	:512
Height of image 1	:384
Aspect ratio of pixels 1	:1.00
Colour 1	:RGB
Name of movie file 1	:LEFTATOT.AVI
Format of movie file 1	:AVI
Keyframes 1	: 3
Codec used 1	:Indeo video 5.11
Compression 1	:5.1 %
Distortion index 1	:NOVALUE
Movie images corrected 1	:NO
Correction parameter file 1	:KAPPA12_14579435.COR
Image history filename 1	:KAPPA12.IMH
Comments	:
Comments	: the following block describes movie 2
ID-number 2	:2

. . .

A.1.11.2 Example of image history file

File name : see MII file descriptor Image history filename i

Image processing system	:SICON V5.2.3
Image interpolation	:SICON V1.2
Sharpening 1	:5
Colour matrix 1	:R(113 / 38 / -50), G(-25 / 144 / -19), B(-25 / -50 / 175)
White balance 1	:175 / 175 / 240
Brightness 1	:R(15 / 135 / 255), G(15 / 135 / 255), B(15 / 135 / 255)
Contrast 1	:NOVALUE
Saturation 1	:1.0
Hue 1	:NOVALUE
Gamma 1	:1.5
Sharpening 2	:8

A.1.11.3 Example of correction parameter file for bundle adjustment

File name : see MII file descriptor Correction parameter file i

Distortion correction type	:bundle adjustment
Pixel distance x	:0.016
Pixel distance y	:0.016
Principal point x	:-9.38
Principal point y	:-8.25
Calibrated focal length	:10.128
Distortion unit	:mm
Distortion correction A1	:-1.1685e-003
Distortion correction A2	:5.3873e-006
Distortion correction A3	:2.8685e-007
Distortion correction B1	:-1.4558e-005
Distortion correction B2	:-3.2337e-005
Distortion correction C1	:6.6139e-007
Distortion correction C2	:3.6798e-005
Distortion correction R0	:3.413
+Method	:simple
+Date of the calibration	:200**5**-03-03

A.1.12 Example of photo information file

File name : 2005ISO1.PHO

Number of photos	:6
Comments	:
Comments	: the following block describes photo 1
Comments	:
ID-number 1	:1
Test object number	:2
Camera type 1	:ETA 007
Post-test / Pre-test 1	:POST
Description 1	:partial view of the frontcar of vehicle B
Direction 1	:right
Aperture 1	:8.0
Exposure time 1	:0.008
Comments	: original area of the camerachip 5850 x 5000 pixel
Width of image 1	:1170
Height of image 1	:1000
Aspect ratio of pixels 1	:1.00

Colour 1	:RGB
Name of photo file 1	:BRIGPOST.TIF
Format of photo file 1	:TIFF
Compression 1	:LZW
Comments	:
Comments	: the following block describes photo 2
ID-number 2	:2

. . .

A.1.13 Example of static data file

File name : 2005ISO1.SD1

Number of measurements	:30
Comments	: the following block describes point 1
Comments	: the first point of the origin
ID-number 1	:7
. . .	
Comments	: the following block describes point 7
ID-number 007	:13
Description 007	: Suspension dome right
X Pre 007	:0.017
Y Pre 007	:-0.466
Z Pre 007	:0.545
X Post 007	:0.287
Y Post 007	:-0.398
Z Post 007	:0.589
Comments	: the following block describes point 8
ID-number 008	:14
Description 008	: Sill at B-Pillar

. . .

A.2 Hints and changes

A.2.1 MME file

A.2.1.1 MME file - Additional descriptors

To handle the information about the test type more automatically it is meaningful to introduce additional descriptors to specify the subtype of a certain main test type and the regulation for the test. If for example the test type is a "frontal impact" possible values for subtype and regulation could be “ODB” and “Euro NCAP”. For every test object (m) the offset value in percent can be described by an optional descriptor.

Additional descriptors for the specification of a test:

Subtype of the test	alphanumeric	
Regulation	alphanumeric	
.Offset m	float	Overlap in percent

A.2.1.2 Barrier information descriptors

If the test object m is a barrier, optional descriptors can be used to describe its orientation and loadcell matrix. The coordinate system according to SAE J211/1 MAR95 Instrumentation for Impact Test is described in A.2.2.5

.Barrier width m	float	[m]
.Barrier height m	float	[m]
.Yaw angle m	float	Angle of barrier with normal to direction of vehicle travel. Units: radians. limited to $\pm\pi/2$. 0 rad means that the barrier is perpendicular to the vehicle. Positive sense: Clockwise when viewed from above (SAE J211)
.Reference system m	alphanumeric	Coordinate reference system eg. laboratory
.Origin X m	float	[m] Top left corner of the loadcell matrix within the reference system - X coordinate
.Origin Y m	float	[m] Top left corner of the loadcell matrix within the reference system - Y coordinate
.Origin Z m	float	[m] Top left corner of the loadcell matrix within the reference system - Z coordinate
.Number of loadcells m	integer	

A.2.2 Test channel files, CHN file and channel comment file

A.2.2.1 Test channel files - Additional descriptors

Additional descriptors for time channel reference:

Reference channel	possible values:	
	implicit	Time reference is given with the descriptor values ‘Time of first sample‘ and ‘Sampling interval‘
	explicit	Explicit time channel exists in test data. Channel name is given with the descriptor ‘Reference channel name‘
	NOVALUE	No time reference is available. For example in case of constant channels (filter class ‘X‘).
Reference channel name	Name of reference channel in test data if reference channel value ‘explicit‘ is required. Then use ??TIRS??????TI?0 otherwise NOVALUE	

Additional descriptor for channel data source and status:

Data source	possible values:	
	transducer	Channel data has been generated by transducer
	calculation	Channel data has been calculated from other channels
	camera	Channel data has been generated by film analysis
	simulation	Channel data has been generated by simulation
	parameter	Channel data can be constant or limit curve

Data status	possible values:
	ok
	channel failed
	meaningless data
	no data
	questionable data
	scaling factor applied
	system failed
	linearised data
	NOVALUE

The descriptor “Errors occurred” should not be used any longer.

Additional descriptor for transducers:

Transducer id	alphanumeric

The optional descriptor for the dimension of a channel is missing in the main document:

Dimension	alphanumeric	see ‘Dimension’ in related electronic document "Channel codes"

A.2.2.2 Test channel files and CHN file - Hint: Sign convention

The directions X, Y and Z of RED B refer to the SAE J211 sign convention. For any other sign convention, which shall be defined as value of the descriptor *Instrumentation standard* in the Channel Information File or as value of the descriptor *Reference system* in every Test Channel File, the directions 1, 2 and 3 shall be used.

A.2.2.3 Test channel files - Hint: Order of fine locations

If there is a need for more than one fine location in the channel code you shall use LE / RI for fine location 1.

A.2.2.4 Test channel files - Hint: Data from film analysis

For the exchange of trajectories from film analysis it is possible to use the channel files. Up to now no specific channel code for such data is defined, but the code described in the RED B may be used. Therefore the trajectories shall be split into the distinct directions. *Test Object, Position, Main Location, Fine Locations* and *Direction* are also usable similar to transducer channels. To distinguish between film analysis data and other data use “V” as *Filter Class* for data from film analysis. For the descriptor *Data source* you shall use the value camera.

A.2.2.5 Test channel files - Hint: Barrier load cell channel code

For barrier load cells the channel code has to be M?LOMA??nnmm???? for mobile and B?LOMA??nnmm???? for fixed barriers, where nn gives the row in percent of the total height and mm gives the column in percent of the total width of the load cell matrix. The values nn and mm are the positions of the load cell center rounded to the nearest integer. The barrier is seen as a vehicle with a coordinate system according to SAE J211/1 MAR95 Instrumentation for Impact Test. This means the row points into the Y-, the column into the Z-direction and the origin is in the left upper corner of the load cell matrix looking from the barrier to the other test object.

A.2.2.6 Channel comment file - Hint: Channel specific information

Channel codes may also be used to mark channel specific information.

A.2.2.7 Channel file – Additional descriptors for load cells

This file contains information concerning the specific barrier loadcell channel and all its measurement values, expressed in physical units and balanced. Its structure complies to a test channel file with the following additional descriptors.

.Width	float	[mm] width of loadcell
.Height	float	[mm] height of loadcell
.Top left Y	float	[mm] defines top, left of loadcell wrt the loadcell matrix origin
.Top left Z	float	[mm] defines top, left of loadcell wrt the loadcell matrix origin

A.2.2.8 Test channel files - Hint: Channel numbering

If the channel number is greater than 999 the number of digits of the channel number “NNN” can be expanded.

A.2.2.9 Test channel files – Transducer damping ratio

For the description of the overall frequency response of a transducer channel and the entire data collection system two new mandatory descriptors are necessary.

Transducer natural frequency	float	[Hz]
Transducer damping ratio	float	[1]

A.2.2.10 Test channel files – Transfer function

For a long time only linear regression has been used to describe the calculation of physical units from the transducer signal. New types of transducers and new regulations require an extended concept of the describing parameters. The way from the transducer signals to the exchanged data can be described as a set of transfer functions.

Use case	Application	Transfer function
Linear transducer with relative measurement	Standard for most transducers	`Linear regression`
Linear transducer with absolute measurement	Absolute pressure, angle transducer in IR-TRACCs	`Linear regression with offset`
Nonlinear transducer with polynomial approximation	Polynomial calibrated belt force	`Polynomial re-gression 3rd order`
Nonlinear transducer with power function approximation	Displacement transducer in the IR-TRACC	`Power function`
Linear transducer with relative measurement and additional polynomial calibration[1)]	Chest deflection of H III Dummy	`Linear regression`

Tab 1: Use cases for transfer functions

[1)] In the case of chest deflection measurement the data has to be calculated and exchanged with the *Linear regression* transfer function. In the channel file header the used parameters and in addition the parameters necessary for the calculation of the *Polynomial regression 3rd order* transfer function have to be stored. This functionality needs different descriptors for both transfer functions.

For all use cases described in **Tab 1** a specific set of descriptors are defined in **Tab 2**. The descriptors of the transfer functions are in principle optional, but if a specific function is named in the channel header, the set of associated descriptors has to be complete.

Transfer function	Formula		Descriptor	Unit
Necessary for all functions	D : physical value [Unit] S : sensor output reading [eU]		.Transfer function used .Direction polarity Offset post test	- - [Unit]
Linear regression	D = C * S	C	Inverse sensitivity Offset pre test .Sensitivity[2)]	[Unit/eU] [eU] [eU/Unit]
Linear regression with offset	D = C * S + M	C M	Inverse polynom coeff C Inverse polynom coeff M Offset pre test	[Unit/eU] [Unit] [eU]
Polynomial regression 3rd order	$D = A * S^3 + B * S^2 + C * S + M$	A B C M	Inverse polynom coeff A Inverse polynom coeff B Inverse polynom coeff C Inverse polynom coeff M	$[Unit/(eU)^3]$ $[Unit/(eU)^2]$ [Unit/eU] [Unit]
Power function	$D = C * (S + S_0)^{\alpha} + M$	C M S_0 α	.Power func sensitivity .Power func eng offset .Power func electr offset .Power func exponent	[Unit/eU] [Unit] [eU] [1]

Tab 2: Parameters and descriptors of transfer functions

2) Additional information: must not be used if *Inverse sensitivity* is missing or NOVALUE

The function *Linear regression with offset* is a special case of *Polynomial regression with offset* where the cubic and quadratic coefficients are 0.
Independent from the transfer function the descriptor *Offset post test* can be used to document the offset correction in physical units in the time between *Start offset interval* and *End offset interval*.

~~A.2.2.9 Test channel files – Polynomial calibration~~

~~SAE J2517 of September 2006 specifies a multipoint calibration with a third order regression to correct for the nonlinearities of the system (polynomial calibration).~~
~~The relation between the sensor output readings S [mV/V] to the displacement values D [Unit] is given by the following equation:~~

~~(1)~~ $$D_{Poly} = A * S^3 + B * S^2 + C * S + M$$

~~where~~

~~***D**Poly* is the actual displacement in [Unit] from polynomial calibration~~
~~***S*** is the sensor output reading in [mV/V]~~
~~***A**, **B**, **C** and **M*** are the calibration coefficients~~

~~The conventional linear calibration (SAE-J2517 June 2000) is performed according to the following equations:~~

~~(2)~~ $$D_{Lin} = S^* * b - D_{Offset}$$

~~where~~

~~***D**Lin* is the actual displacement in [Unit] from linear calibration~~
~~***S**** is the sensor output reading in [mV/V] after the electrical offset compensation prior to the test~~
~~***b*** is the inverse sensitivity in [Unit /(mV/V)]~~
~~***D**Offset* is the physical offset correction done after the test (**offset post test**)~~

~~and~~

~~(3)~~ $$S^* = S - S_{Offset}$$

where

S is the sensor output reading in [mV/V]

S_{Offset} is the electrical offset correction done directly before the test (**offset pre test**)

For the data exchange the values of sample are the balanced values calculated with the linear calibration method D_{Lin}. The channel code has to be **??CHST0000H3DSX?** for the 50th percentile male Hybrid III dummy. In addition to the header information according ISO 13499 (MME version 1.5) the following descriptors have to be added:

Field Descriptor	**Data format**	**Remark**
Inverse sensitivity	float	b in Eq.2 [Unit / Sensor output]
Inverse polynom coeff A	float	A in Eq.1 [Unit /(Sensor output)^3]
Inverse polynom coeff B	float	B in Eq.1 [Unit /(Sensor output)^2]
Inverse polynom coeff C	float	C in Eq.1 [Unit /(Sensor output)^1]
Inverse polynom coeff M	float	M in Eq.1 [Unit]
Offset pre test	float	S offset in Eq.3 [Sensor output]
Offset post test	float	D offset in Eq.2 [Unit] (see A.2.2.10)

The unit used for the coefficients has to be equal to the unit of the data values of the linear calibrated channel.

The new descriptors are optional as a complete group, but mandatory completely whenever one of them is used.

With these additional information it is possible to calculate the polynomial displacement values D_{Poly} from the linear displacement values D_{Lin} according equation (1) with

(4) $$S = \frac{D_{Lin} + D_{Offset}}{b} + S_{Offset}$$.

If it is necessary for storage or illustration to use both kinds of calibration at the same time, the polynomial calibrated data has to be marked by the value 03 in the FineLocation2 of the channel code e.g. **??CHST0003H3DSX?.**

A.2.2.10 Test channel files – offset post test

Independent from the multipoint calibration an optional descriptor for the offset value is needed.

Offset post test float in the same unit as the values of sample

A.2.3 MII file

A.2.3.1 MII file - Correction

The data format for the descriptor *'Aperture i'* was specified as a float value. In practice it is often necessary to store an intermediate value like 5.6 - 8. Therefore the new data format specification is alphanumeric.

A.2.3.2 MII file - Hint: Single image sequences

In most cases of movie exchange container files like AVI are used. Especially for film analysis it could be necessary to exchange the original single images. To avoid equivocal filenames the best method is to store every sequence of single images within an own subdirectory of the movie directory. The name of the subdirectory shall be equal to the container filename without extension. The names of the single image files shall contain numbers for sorting.

The descriptive parameters of the container file and the image sequence are partly different. Therefore it is necessary to use two distinct information blocks within the MII file if both are exchanged. For the whole image sequence only one descriptor *'Name of moviefile i'* can be used. It shall contain only the subdirectory name without dots and pathnames.

Example for the image sequence F00000.IMG ... F00299.IMG in the subdirectory LEFT1 together with the container file LEFT1.AVI:

...	
Number of images 1	200
Time zero 1	5
Width of image 1	512
Height of image 1	512
Colour 1	RGB
Name of movie file 1	LEFT1.AVI
Format of movie file 1	AVI
Codec used 1	Indeo video 5.11
Compression 1	5 %
...	
Number of images 2	300
Time zero 2	10
Width of image 2	1024
Height of image 2	1024
Colour 2	RGB
Name of movie file 2	LEFT1
Format of movie file 2	TIFF
Codec used 2	uncompressed
Compression 2	NOVALUE
...	

All other descriptive data should be equal for both kinds of movie.

A.2.3.3 MII file - Additional descriptors for 3D film analysis

Camera ID-number i	alphanumeric
Lens ID-number i	alphanumeric
Lens type i	alphanumeric
Focus i	alphanumeric

A.2.3.4 MII file - Hint for AVI format files

The recommended compression algorithm for the use in AVI files is **X264** Revision 1195. This codec may be used with the following parameters:

Single pass – ratefactor-based (CRF)	
Ratefactor	23 or less
FourCC	X264
ME algorithm	umh
Subpixel ME refinement	7 RD on all
Min. GOP Size	7
Max. GOP Size	7
Max. Number of consecutive B-Frames	0

The first frame of an AVI file has the number 0. It has to be considered for the calculation of the “Time zero” value.

A.2.3.5 MII file - Additional information about the history of image processing and distortion correction

A.2.3.5.1 MII file - Additional descriptors for image processing and distortion correction

The history of the image processing and also the parameters for the distortion correction may be stored in special files in the movie subdirectory referenced by:

Image history filename i	alphanumeric	according to the filename convention
Correction parameter file i	alphanumeric	according to the filename convention

Additional information about the distortion correction and the quality of the optical chain shall be given by:

Distortion index i	float	[%] Distortion index according ISO 8721
Movie images corrected i	alphanumeric	**YES** or **NO** are the images corrected with the distortion parameters?

A.2.3.5.2 Structure of an image history file

The image history file is optional. The descriptors are not mandatory. They are unique but their position order shall show the time history of the single processing steps. The numbering of the descriptors is used to decide between twice or more usage of the same processing item.

Image processing system	alphanumeric	with version number
Image interpolation	alphanumeric	with version number
Sharpening i	alphanumeric	typically 1 integer value
Colour matrix i	alphanumeric	
White balance i	alphanumeric	typically 3 integer values
Brightness i	alphanumeric	single or matrix of integer
Contrast i	alphanumeric	single or matrix of integer
Saturation i	alphanumeric	integer or float
Hue i	alphanumeric	typically integer
Gamma i	alphanumeric	typically 1 float value

A.2.3.5.3 Structure of a correction parameter file for bundle adjustment

The correction parameter file is optional. The file content for the correction method *bundle adjustment* shall be:

Distortion correction type	alphanumeric	**bundle adjustment**
Pixel distance x	float	[mm]
Pixel distance y	float	[mm]
Principal point x	float	[pixel] deviation from the centre of the image (positive from left to right)
Principal point y	float	[pixel] deviation from the centre of the image (positive from top to bottom)
Calibrated focal length	float	[mm] as positive value
Distortion unit	alphanumeric	**pixel** or **mm** unit for all following distortion parameters
Distortion correction A1	float	1. corr. coeff. for radial symmetrical distortion
Distortion correction A2	float	2. corr. coeff. for radial symmetrical distortion
Distortion correction A3	float	3. corr. coeff. for radial symmetrical distortion
Distortion correction B1	float	1. corr. coeff. for radial asymmetrical distortion
Distortion correction B2	float	2. corr. coeff. for radial asymmetrical distortion
Distortion correction C1	float	affinity
Distortion correction C2	float	non-orthogonality
Distortion correction R0	float	2. zero crossing of the distortion curve

Additional descriptors shall start with a '+' sign.
The descriptors for other correction methods shall be agreed between the partners.

A.2.4 PHO file

A.2.4.1 PHO file - Correction

The data format for the descriptor *'Aperture i'* was specified as a float value. In practice it is often necessary to store an intermediate value like 5.6 - 8. Therefore the new data format specification is alphanumeric. The allowed values for the descriptor '*Post-test / Pre-test i*' are changed to POST, PRE, DURING, NOVALUE.

A.2.5 Data exchange with the NHTSA

The additional information for data exchange with the NHTSA shall be placed in special files in the subdirectory NHTSA . For detailed specification see RED D Version 1.6 .

A.2.6 Calculated value codes and channels

It is possible now to exchange calculated value codes and channels. For detailed specification see RED E Version 1.6 .

A.2.7 Channel code – Hint: Naming convention for the position field

For special seat arrangements with different rows or more than three seats per row the usage of capital letters A - Z for the position field is recommended. Therefore the old code value "D" for Motorcycle Driver is now changed into "2", the old code value "S" for Motorcycle Sozius is changed into "5".

A.2.8 MME directory structure – Hint: Missing media objects

Subdirectories and their information files for missing media objects are no longer mandatory.

A.2.9 Optional descriptors

Optional descriptors can be introduced in all ISO-MME information files. They have to begin with a ".".

A.2.10 Line length of information files

The lines of all information files can exceed 80 characters if agreed between the transferring parties.

A.2.11 Case sensitivity of filenames

Parts of filenames and extensions like the testnumber, which occur several times in the file structure, have to be identical in the usage of upper and lower case letters.

A.2.12 Combination of dummy parts

When combining parts of different dummy types a unique FineLocation3 has to be used. Esp. when using THOR legs together with the 50^{th} percentile male Hybrid III the FineLocation3 should be H3 for all dummy channels.

A.2.13 MME file - Test object information

For the descriptor '*Class of test object m'* the EuroNCAP class or the platform type is recommended for vehicles. The descriptor '*Code of test object m'* should refer to the code of model type or stage of development for vehicles and to the code of Fine Location 3 for pedestrian impactors. The '*Ref. number of test object m'* should be a unique identification number like the vehicle Id.

A.2.14 Naming rules for channels

For the Channel Codes the following general naming rules apply:

• **The MainLocation should describe the position of the measurement point.**

• **ChannelCodes which deviate from the following rules but are in use for a long time should not be changed.**

Especially for new dummy and impactor channels the following naming rules apply:

• **The naming of the channels should describe the structure of the dummy as a measurement device.**

• **The FineLocation1 should describe the most significant spatial orientation of the channel.**

• **The FineLocation2 should describe the less significant characteristic of the channel location or property.**

• **The FineLocation3 is identical to the dummy code.**

In addition for all other channels where the FineLocation3 is not reserved for the dummy code the following rules apply:

• **The FineLocation 1,2,3 should be used in the order X,Y,Z in the coordinate system of the testobject, if all three spatial directions are used.**

• **If one or two spatial directions are unused the other move up, resulting in 00 values at the FineLocations 3 and possibly 2.**

A.2.15 MME directory structure – Recommendations for special data

For the exchange of data files with CAN-Bus or FlexRay protocols the subdirectory BUSDATA should be used. For the exchange of simulation input- or output-decks the subdirectory SIMULATION should be used.