



## CAD Data Preparation & Exchange with External Math Data Exchange Partners



CONTENT	Page #
1. INTRODUCTION _____	3
2. CONDITIONS _____	3
2.1. USE OF DATA _____	3
2.2. REQUIRED DATA _____	4
2.3. FILE CONTENT _____	4
2.4. DATA QUALITY _____	4
2.4.1. TECHNICAL - MATHEMATICAL DATA QUALITY _____	4
2.4.2. ORGANIZATIONAL DATA QUALITY _____	5
2.4.2.1. MODEL STRUCTURE _____	5
2.4.2.2. DRAWINGS _____	6
2.4.2.3. TECHNICAL INFORMATION _____	6
2.5. CAD SYSTEMS _____	6
2.6. DATA EXCHANGE FORMATS _____	7
2.7. METHODS OF DATA EXCHANGE _____	7
2.7.1. OFFLINE DATA EXCHANGE WITH PHYSICAL MEDIA _____	7
2.7.2. ONLINE DATA EXCHANGE _____	7
2.8. FREQUENCY OF DATA EXCHANGE _____	8
2.9. RESPONSIBILITIES _____	8
2.10. DATA SECURITY AND CONFIDENTIALITY _____	8
3. DATA EXCHANGE PROCEDURE _____	9
3.1. DEFINITION _____	9
3.2. WORKFLOW _____	9
3.2.1. STRATEGY _____	9
3.2.2. COMMUNICATION PROCEDURE _____	9
3.2.3. DATA EXCHANGE PROCEDURE _____	10
3.3. CAD AUDIT / EVALUATION OF EXTERNAL PARTNER _____	11
3.3.1 STRATEGIC SUPPLIER AND TOOLMAKER CAD AUDIT _____	11



## 1. INTRODUCTION

The following document is intended to serve as an overview about technical, organizational, and operational aspects of data exchange with Delphi Harrison Thermal Systems. If you have any questions about the content of this document, please review the Delphi Design Standards, located on the [www.delphisuppliers.com](http://www.delphisuppliers.com) website, or contact a member of the Math Data Management Team.

## 2. CONDITIONS

### 2.1. USE OF DATA

One of the most important points for data exchange is the application range of data used. From this you are able to derive the quantity of data to be exchanged (chapter 2.2) and data quality (chapter 2.4). Possible ranges of CAD work and created data are:

- Component and tool design
- Component and tool optimization
- Detailing
- Modification
- Creation of 2D-drawings
- Creation of 3D-packaging models
- Creation of 3D-Detail models for release procedures
- Derive 2D-drawings associative from 3D-model
- Create 3D-surface models to derive STL-files for Stereolithography
- Derive midplane models for MOLDFLOW - and Finite Element Analysis
- Create Pixel / TIFF or plotfiles from existing data

In most of the cases data exchange will be done between DELPHI and:

#### - **Customers or Suppliers**

DELPHI receives package data, sketches, inspection files, 2D-drawings and 3D-models  
DELPHI sends 3D-models, 2D-release drawings and paper plots

#### - **Toolmaker, Prototype - and Sample Manufacturer**

DELPHI sends 2D-released drawings, 3D-models or shapes and receives tool designs.

#### - **Drafting houses and Design offices**

DELPHI sends sketches, 2D-drawings, 3D -models and receives them modified back.

#### - **DELPHI Technical -, Service - and Design Center**

Exchange of 2D-drawings, 3D-models, STL-files, analysis input and result files



All the data has to be as described in the agreed condition, which means for example file-content, quantity, quality, deadlines (chapter 2.2. / 2.4. / 2.8.).

*Supplied in the “Project Specific CAD Data and Exchange Information” form*

## 2.2. REQUIRED DATA

To exchange required CAD - data in the best way, it is necessary to define before starting, the data type, quantity and eventual use. This information must be filled in the “CAD Data Exchange Information” form.

Example: It makes no sense to get a complete HVAC module, when only a seal for an interface is required.

A detailed definition saves cost for exchange and time for rework.

## 2.3. FILE CONTENT

With this definition the content of the file is described. This depends on the use of the data (chapter 2.1.). In a bi-directional data exchange the file content does not have to be the same.

File content can be:

- technical drawings (several kinds are possible)
- 2D shapes
- 3D data
- Wireframe - models
- Face - / Surface - models
- Solid models
- FEA -, MOLDFLOW -, SLA - data
- Plot – data

## 2.4. DATA QUALITY

An important point is the quality of CAD data. All the following activities in the design process, (deadlines of data exchange as well as extra time for doing rework on data) depend on the data quality. That means for both data exchange partners, that they have to guarantee a defined data quality for the exchange in all directions. The DELPHI Data Creation Standards (DCS) are the standards, which have to be applied when working with DELPHI. The DCS can be found on the [www.delphisuppliers.com](http://www.delphisuppliers.com) website, in the “Vendor Documents” section under the “Delphi A” tab. A possible standard for the geometric quality, is the VDA 4955 – recommendation (if there is conflicting information in these two documents, the DCS overwrites the VDA standard). This standard (VDA) includes the following points:

### 2.4.1. TECHNICAL - MATHEMATICAL DATA QUALITY

The technical - mathematical quality of the data describes how and under what precision requirements geometric elements should be created; in order to be used in the process-chain.

(This relates to Delphi UG environment. Each customer can have its own requirements for these values [especially concerning Catia])



## 2.4.2. ORGANIZATIONAL DATA QUALITY

The organizational data quality (DCS) describes the structure of CAD data, the model structure, drawings and technical information.

### 2.4.2.1. MODEL STRUCTURE

The model structure is an important condition for the clarity of CAD models and makes a fast and safe reduction of model content to a practical work size possible.

The structure must have following qualities:

- must be recognizable, understandable and classified to the data model,
- during data exchange the structure must be delivered as quality documentation,
- should make a difference between help geometry and product geometry,
- should reproduce logical relations as functions, groups and other,
- should make a difference between changeable and unchangeable contents.
- should illustrate associatively between the 3D model and drawing

#### Coordinate System

To guarantee clear three-dimensional solidarity it is necessary to exchange CAD geometry referring to a single coordinate system.

The binding reference is the car coordinate system (of the specific customer project).

Other coordinate systems are permissible (CAM, NC, QS). Geometries exchanged in one of these coordinate systems require the assignment to the reference-coordinate system and must be documented.

#### Modifications

The description of modifications must be documented and delivered. The location of the modification must be marked (for example color, layer structure and other).

### 2.4.2.2. DRAWINGS

This is a description of the criteria for the creation of CAD drawings as a technical documentation.

#### Views

Views must be inside the drawing frame.

Elements must be created in the view where they appear.

Views with detail cutouts / - enlargements have the same origin point as the origin view.

#### Reference of 3D-models in drawings

Before project start there must be a definition whether a drawing consists of genuine elements or views on 3D-models.

#### CAD system information

Drawing must contain information about the CAD - system (System name, version, etc.).

#### Fonts

For data exchange in a neutral format the IGES - conform text fonts # 1, 1001, 1002, 1003 are recommended. Avoid a high number of letters per line (~= 70) and multi line text.



## Reference on external databases and libraries

If for example symbols, drawing sheets or standard parts from external databases are used, there must be a definite link to such references and you have to send the libraries or you have to dissolve all structures.

## Drawing Format

All drawings exchanged with Delphi Harrison Thermal Systems must contain the Delphi Drawing Format with all necessary information recorded. These drawing formats can be downloaded from the [www.delphisuppliers.com](http://www.delphisuppliers.com) web site under the Vendor Documents, Delphi H.

### 2.4.2.3. TECHNICAL INFORMATION

The CAD model should include the following information. If they are not linked with the geometry, they must be described on the drawing

This information could be:

- material
- tolerance
- data referred quality
- data referred to assembly
- statement to surface condition
- proof - area

## 2.5. CAD - SYSTEMS

### Data exchange between same CAD - systems

If both data exchange partners use the same CAD system, it is necessary to exchange system – parameters, like seed- or start files and customer - default parameters. In this case native CAD data will be exchanged, attention must still be paid to hardware specific attributes and compatible software versions.

### Data exchange with different CAD - systems

If different systems are used, CAD data can be exchanged in neutral formats, chapter 2.6. To implement a running procedure you have to follow a three-step data exchange implementation plan explained in attachment 3.2.2.

## 2.6. DATA EXCHANGE FORMATS

### Native Formats

The standard native formats are

UNIGRAPHICS  
CATIA

(Versions dependent on customer requirements)

### Neutral Formats

The used neutral formats are

IGES  
DXF  
STEP AP 214 (as released)  
STEP AP 203 (as released)

## 2.7. METHODS OF DATA EXCHANGE

Different methods are available. DELPHI prefers the ONLINE method [www.delphisuppliers.com](http://www.delphisuppliers.com) for suppliers. In exceptional cases physical media (offline) can be used. In case you have to define the data format in agreement with DELPHI Engineering.



## 2.7.1. OFFLINE DATA EXCHANGE WITH PHYSICAL MEDIA

### CD (DOS / UNIX / Windows)

Files compressed with zip, gzip, compress or arj.  
Keep attention on the right version or add the wording- "uncompress"-file

All media must be labeled with its contents. If any media comes in or goes out it must be sure that all needed information is filled in.

## 2.7.2. ONLINE DATA EXCHANGE

### FTP-Connection

- DELPHI Intranet direct connection to workstations or dedicated FTP server
- IP-addresses or DNS-name required
- with logins and passwords

(Outside of DELPHI's firewall, only with special exchange partners, after secured VPN installation)

### OFTP Connection (VDA 4914 recommendation / ODETTE)

- ISDN connection with 64Kb/s to a special server-workstation requires a VDA license
- external company registration is required on the OFTP-server as well as DELPHI - registration on external server (available 24h a day around the year)
- through EDS – CAD EDI services

### [www.delphisuppliers.com](http://www.delphisuppliers.com) > DELPHI recommended for suppliers

- Mailbox system with Internet connection
- register of company information
- after registration external companies have their own data exchange area
- available nearly 24h a day around the year
- security by login and password
- DELPHI math data exchange personal can supply information on how to get registered

### Data Exchange through e-mail is generally not permitted !!!!!

(this includes tiff or cgm images)

- only in exceptional circumstances
- with the appropriate encryption (PGP, etc.)

## 2.8. FREQUENCY OF DATA EXCHANGE

Between both data exchange partners, an exchange mode has to be defined. Possible modes are:

### Continuous exchange mode

Exchange of data in time period's for example on a weekly basis to track project and design efforts.

### Irregular Exchange mode

Exchange as defined in project dependent agreement for example after design or gate reviews.

In both modes, the recommendation is the use of [www.delphisuppliers.com](http://www.delphisuppliers.com) (for suppliers)



## 2.9. RESPONSIBILITIES

In all case the sender of the data is responsible for the correct content of files and data quality as required. Use of correct exchange parameters and procedures, plus documentation for the receiver.

It is important that the data follows the organizational flow, a direct flow between sender and receiver as described in chapter 3.

It must be defined where the master model or original is stored, who is responsible for modifications on this model and associative connected or derived data.

## 2.10. DATA SECURITY AND CONFIDENTIALITY

It must be made sure that no data or information about data exchange will be offered to third parties, without special permission from DELPHI.

More details must be included in contracts between DELPHI purchasing and the external exchange partners.

## 3. DATA EXCHANGE PROCEDURE

### 3.1. DEFINITION

A necessary requirement to start a data exchange process is the complete definition of technical and organizational parameters. These have to be documented and distributed to the responsible persons. If there are to be changes (such as system updates or any improvements), both sides must be informed.

### 3.2. WORKFLOW

#### 3.2.1. STRATEGY

The strategy for data exchange is to exchange native data as required by DELPHI engineering. If agreed and necessary, files can be converted into the required CAD system or IGES / STEP formats before data exchange. If necessary External Translation Services (ETS) can be included in this exchange procedure

#### 3.2.2. COMMUNICATION PROCEDURE

To work with external companies in a productive way a three-step implementation plan of communication is proposed:

##### 1st Step: First contact

Exchange Company profiles information about resources and parameters in the Quotation process.

##### 2nd Step: Test - Phase

Perform data transfer with test files and reference projects (no project deadlines). At the end of this phase, CAD audits or supplier evaluations, may take place. DELPHI purchasing department has all needed facts to create and sign any contracts.

##### 3rd Step: Production Work - Phase

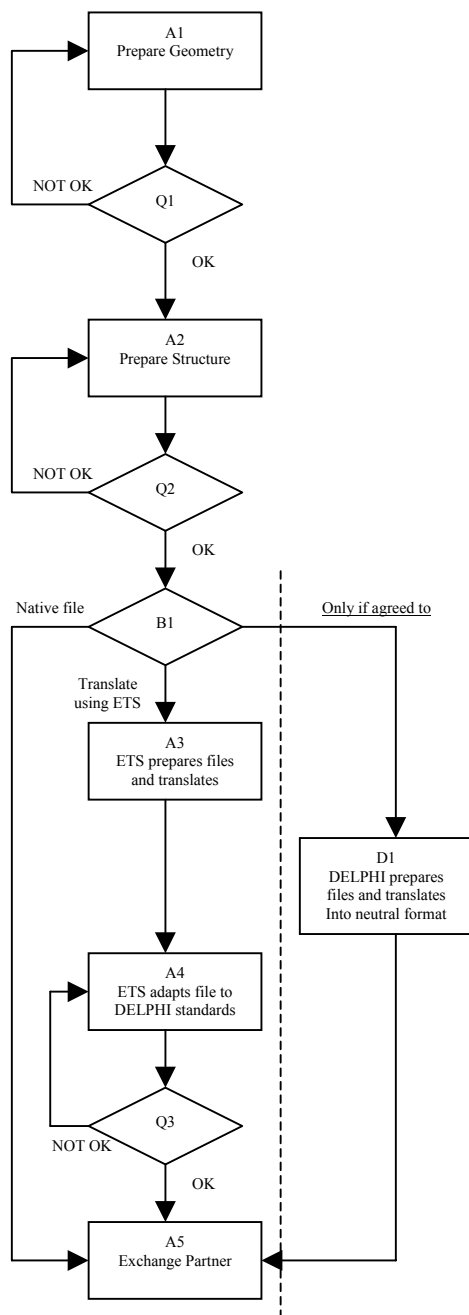
Perform project work with data transfer under time pressure. In the DELPHI project teams a coordination contact person for CAD data is placed, who is responsible for project tracking and supporting external companies that do any CAD work and data exchange with DELPHI.





## 3.2.3 DATA EXCHANGE PROCEDURE

DELPHI <=> EXTERNAL PARTNER



A 1 Prepare the file geometry (content) make sure that only the necessary geometry is included in the file, remove all confidential data and avoid the transfer of redundant geometry.

Q 1 Check the content of the data file

A 2 Prepare the structure of the file, adapt the file to required CAD guidelines and VDA recommendations

Q 2 Check the file structure

B 1 Decision whether to translate

A 3 ETS Preparation & Translation ETS confirms the receipt of the data exchange request, checks and adapts the model and performs the translation.

D 1 DELPHI Translation (if agreed to) DELPHI translates checked Files into neutral format

A 4 ETS adapts file to DELPHI standards ETS checks file and makes corrections if necessary

Q 3 DELPHI reviews file

A 5 Exchange partner



### 3.3. CAD AUDIT / EVALUATION OF EXTERNAL COMPANIES

For some strategic partners we have procedures to define the base for the data exchange:

#### 3.3.1. STRATEGIC SUPPLIER AND TOOLMAKER CAD AUDIT

For partners who are suppliers for DELPHI and deliver data that has to be used in internal development and engineering procedures. DELPHI will do a CAD Audit to define facilities and skills of them. This is necessary to guarantee a working data exchange procedure that fulfills the requirements of the end user and improves the relationship between both partners. Areas that will be looked on are:

##### Description of CAD / CAM Situation

- Suppliers Profile
- CAD / CAM Systems
- CAD / CAM competence

##### Knowledge of DELPHI 's production process

- Molding, Stamping
- Plastic -, metal - and silicon - parts
- Experience in working with DELPHI
- Design - / Drafting - / Data exchange standards

##### Management's comprehension of CAD / CAM process

- Education
- Support
- Delegation, Responsibilities
- Back - up routines

##### Project - / Design groups comprehension of CAD / CAM process

- Education
- Other experience
- Other customers

##### Operating skills

- Experience in parts- / tool designing and drafting
- CAD education
- Experience in working with CAD
- Knowledge of internal processes

##### Understanding of different needs of basic CAD - data

- Knowledge of relevant form of CAD - data
- Handling transformation between coordinate - systems
- Coordination between 3D-models and 2D-drawings
- Handling of reference files

##### Data quality assurance

- Internal basic CAD - data
- Incoming basic data
- Outgoing basic data
- Verification of basic DELPHI's requirements
- Check tools and handling
- Project tracking

##### CAD data storage and security

- Engineering changes
- Connection between DELPHI's CAD and internal documents
- Validity of basic data during lifetime of the product
- Validity of basic data irrespective of computer changes
- Confidentiality and access rule



**Revision History:**

<i>Revision Level</i>	<i>Change Description</i>	<i>Release Date</i>
1.0	First Release	MY01
2.0	Document reworked to latest status	OC03

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