

**Mechanical Engineering Department
Thermal and Structures Division**



FRAMES-2

Material Database Facilities

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■ History

- DOREA is a small company located in Cannes (F) started in 2002 and specialised in integrating new technologies for "High-Tech" industries.
- DOREA team is based on the ESPRI-CONCEPT/SIMULOG team involved in ESA projects in mechanical and thermal activities (ESACRACK, FRAMES-2, STEP-TAS,...).

■ Space Projects

- DOREA implements and maintains the GUI and IT layers of ESACRACK (ESA project with NLR as prime).
 - <http://www.esacrack.com> or <http://esacrack.dorea.eu>
- DOREA implements and maintains FRAMES-2 database (ESA project with NLR as prime) -> website is coming soon.
- DOREA is in charge of the ESATAP (ESA thermal post-processing for space) maintenance
 - <http://www.esatap.com> or <http://esatap.dorea.eu>,
- DOREA participates to the STEP-TAS (ESA Thermal Standard based on ISO STEP) implementation.
- DOREA is in charge of the CORATHERM/CIGAL2 (FEM, modeler, mesher, solver, post) maintenance of the Thalès Alenia Space Cannes thermal suit of tools.
- DOREA implements the TMRT (ESA thermal model reduction) with EADS Astrium and Thalès Alenia Space.





■ Scope

- FRAMES-2 is a data base system for storage, processing and retrieval of material properties and associated mechanical test results, specimen geometry and testing conditions.

■ Main features:

- Material properties database.
- Mechanical testing database (crack growth, fatigue, fracture toughness, static strength, creep, corrosion cracking, R- curve, etc.).
- Searching facilities on material code or equivalent names, data set characteristics (multi criteria).
- Derivation of raw data, fitting constants calculation, statistical analysis.
- Post processing such as 2D plots, reports.
- Export of design data (e.g. to NASGRO, ESAFATIG)





■ History

- It was developed under ESA contract by Aérospatiale & ESPRI-Concept (later Simulog).

■ Consortium

- The current version (1.5.0) is available and is being further developed by DOREA (F) and NLR (NL) in the frame of the Structural Integrity of Pressurized Structures study (SIPS, contract 14923/00/NL/PA).

■ Implementation

- Definition of requirements and nomenclature for all types of test data complies with ESA PSS-01-745 (now ECSS-Q-70-45A) for metallic materials and based on international standards as ISO, EN and ASTM.



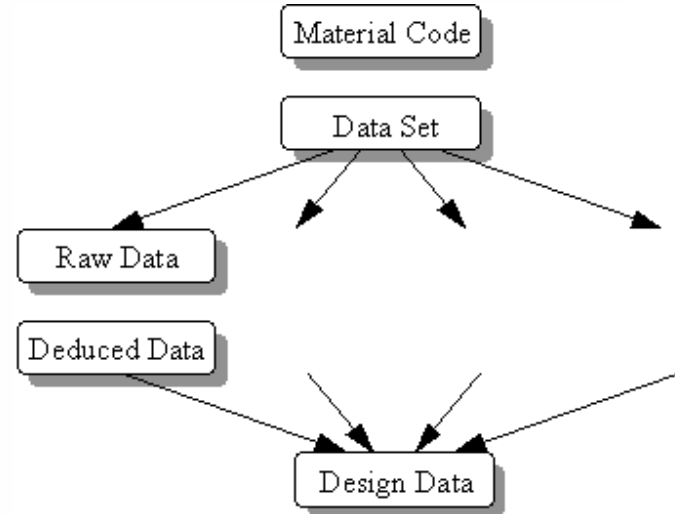


■ Focusing on the tests

- In contrast to classical philosophy of a materials handbook, the structure of FRAMES-2 is focused on the tests performed to derive materials data for engineering applications.

■ Data level

- Three levels have been identified for material data taken from tests:
 - Raw Data
 - Deduced Data
 - Design Data



- General material properties and other information such as chemical composition, hardness, heat treatment details, grain size, density, coefficient of thermal expansion or thermal conductivity can be consulted.





■ Raw Data:

- Taken from measurements performed on test specimens, such as force, displacement, crack length and number of load cycles.
- Example: a, N, force range & specimen geometry for crack growth test.

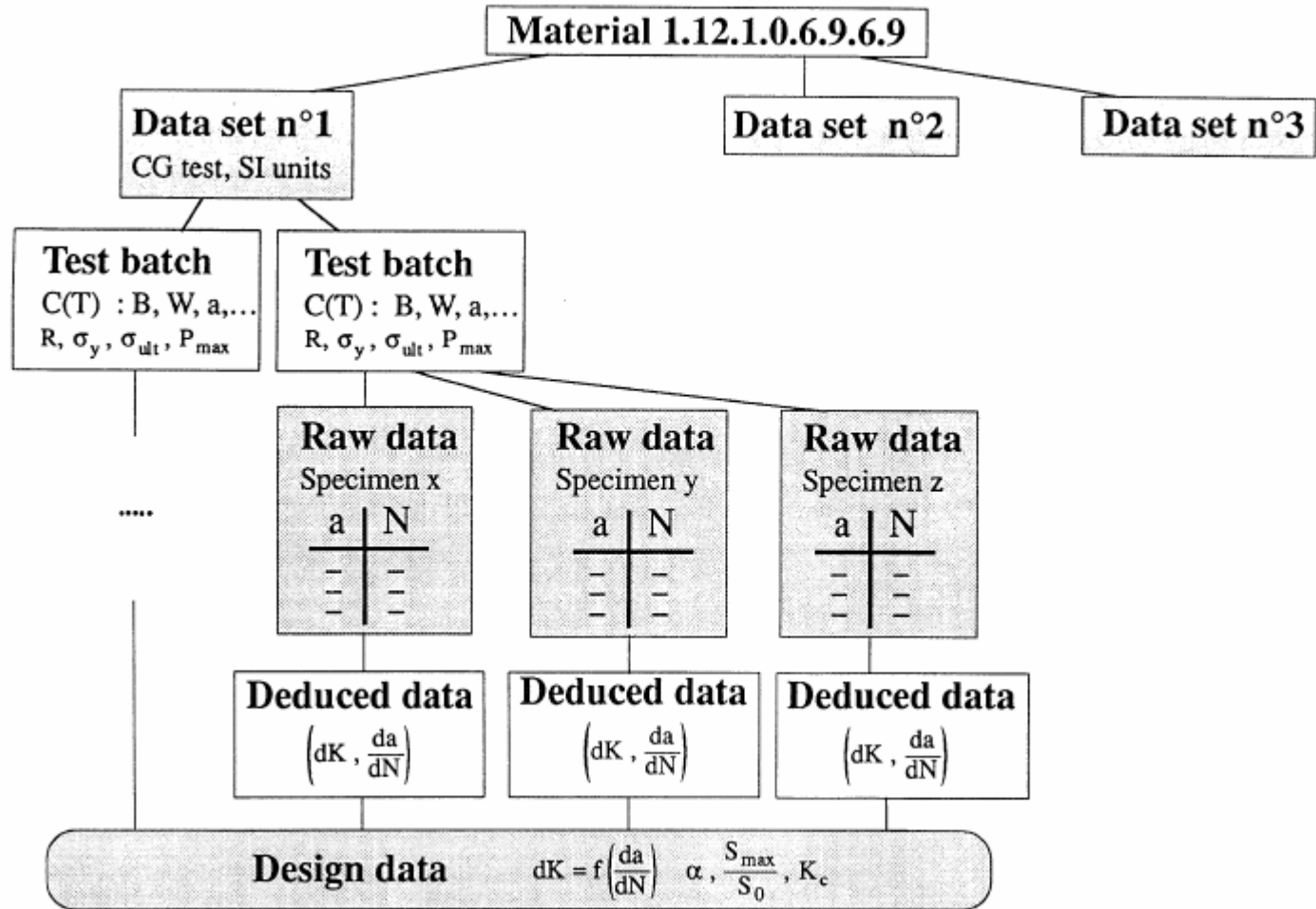
■ Deduced Data:

- Produced from raw data by numerical methods, such as curve fitting or differentiation, and represent the expected results of a test.
- Example: da/dN vs. ΔK data points for crack growth test.

■ Design Data:

- In principle derived data, intended for verifying a structural design, such as lower-bound values or the results of curve-fitting.
- Sometimes design data comes from external sources and is compared with obtained deduced data.
- Example: curve fitting parameters C , n , etc. for crack growth test (design data can be based on more than one data set).







■ Database engine improvement

- FRAMES-2 proprietary database engine has been replaced by the Open Source database engine MySQL®.

■ FRAMES-2: a client-server application

- It is now possible to connect FRAMES-2 users to a remote database over Internet or intranet.

■ Data consultation over the web

- Developed in order to consult datasets over the Internet (or intranet):

- <http://www.dorea.eu/FRAMES-2>





- **Crack Growth curve fitting improvement:**

- ESA, NLR and DOREA improved significantly the Crack Growth design data fitting parameters calculation based on Strip Yield method implemented by NLR.
- Now it is possible to iterate the fit until satisfying results.
- It is now possible to fix some of the C, n, p, q NASGRO parameters.



- **New Variable Amplitude test for Crack growth**

- **To come:**

- A dedicated website is coming soon
 - <http://www.frames-2.com>
- Improving the metallic database, according to a list of mechanical test results provided by ESA
- Improving the Composites software part,
- Improving the Composites database, according to a list of mechanical test results provided by ESA.





- **FRAMES-2 : Dataset searching facilities**
- **FRAMES-2 : Multicriteria searching tool**
- **FRAMES-2 : Material Database**
- **FRAMES-2 : Material Edition**
- **FRAMES-2 : Print - Plot Dataset**
- **FRAMES-2 : Dataset Edition**
- **FRAMES-2 : Crack Growth fitting calculation**
- **Web light client : Dataset Consultation**