

STEP 표준을 이용한 제품설계-제조 연계 방안

2001. 2. 16

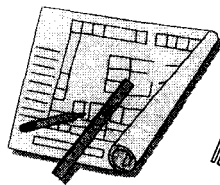
강 무 진



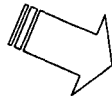
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제품 기술 정보의 흐름



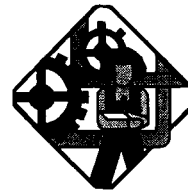
Design



Process Planning



Manufacture

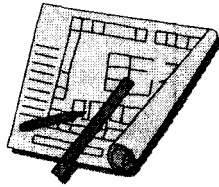


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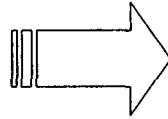
공정 계획

□ 설계와 제조의 가교(Bridge)



Design

- Geometry
- Function
- Cost
- etc.



Process Planning

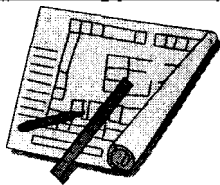
- Interpret design
- Identify machining feature
- Select process, machine, etc.
- and so on



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설계와 공정계획의 연계 조건



Design

- Geometry
- Function
- Cost
- etc.



Geometry
Feature
Tolerance



Process Planning

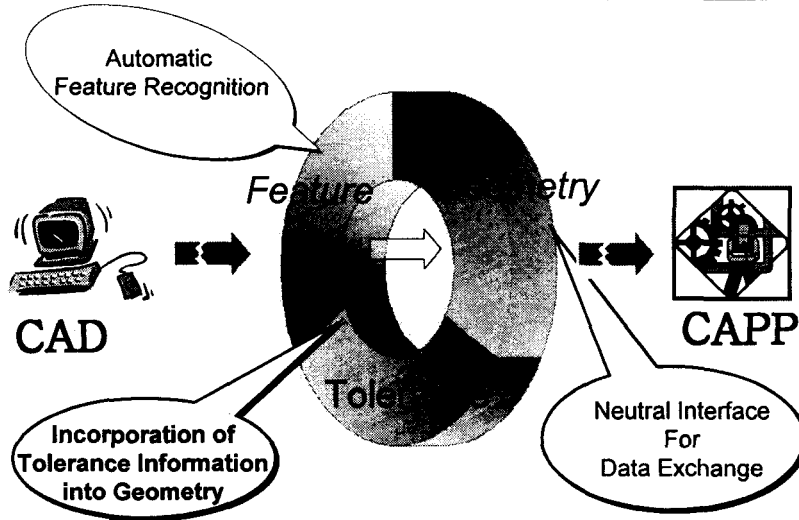
- Interpret design
- Recognize feature
- Select processes
- Determine m/c, tools
- etc.



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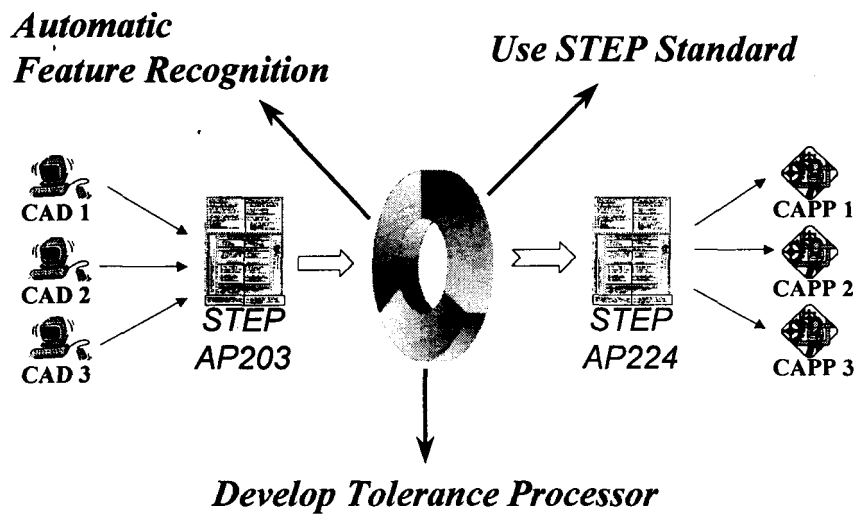
설계/공정계획 연계시 문제점



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해결 방안

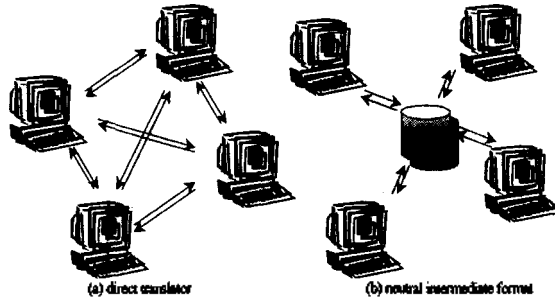


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제품 정보 모델 표준 - STEP

- Standard for the Exchange of Product model data
- Geometry + Feature + other Manufacturing Information

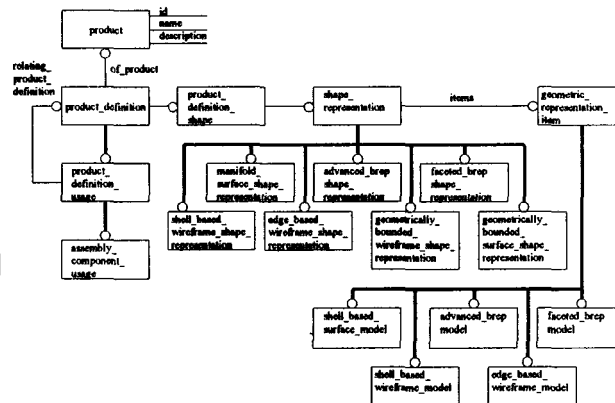


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STEP AP 203

- Configuration controlled design
- Mainly Brep geometry information
- Documentation of design change and its process

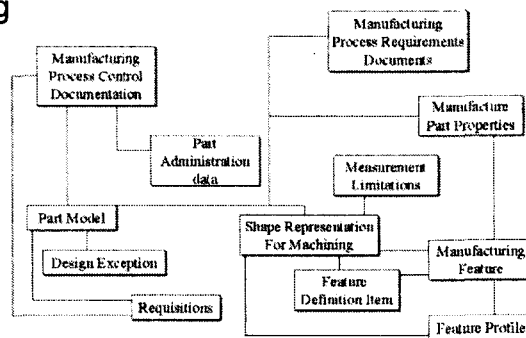


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STEP AP 224

- Mechanical product definition for process planning using machining features
- Covering milling and turning processes
- Order information
- Requisition of raw stock
- And additional part information

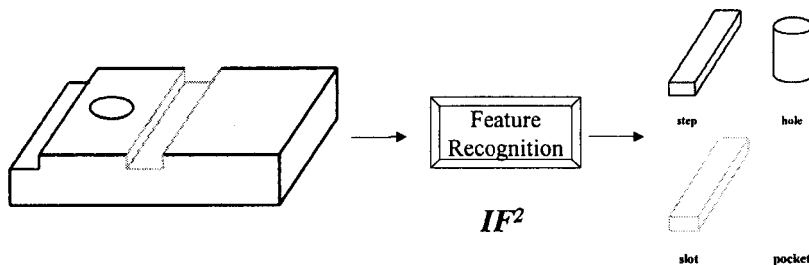


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Machining Feature

- Representation of geometry in manufacturing terms
(ex.) hole, pocket, slot, step, etc.



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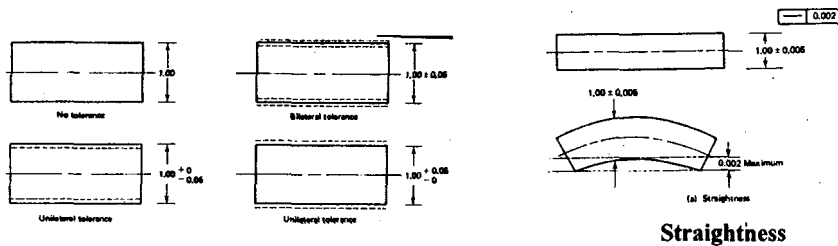
Tolerance Information

Dimensional tolerance

Surface roughness

Geometric tolerance

(ex.) straightness, parallelism, roundness, etc.



Dimensional Tolerance

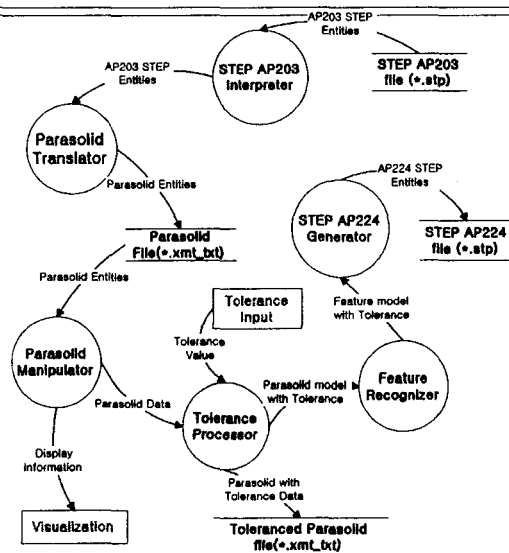
Straightness



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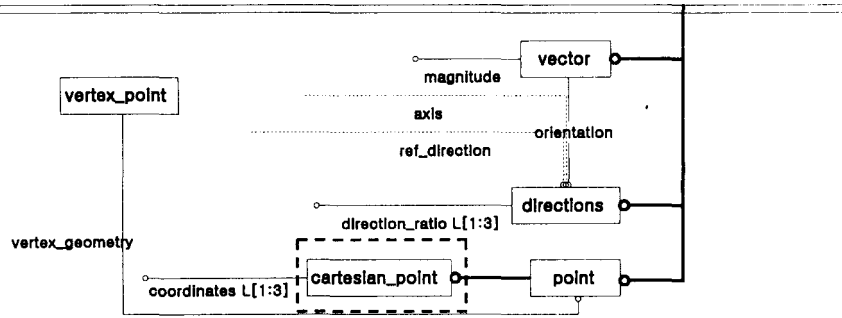
설계 - 공정계획 연계 흐름도



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STEP 203 해독



STEP AP203 Schema

```

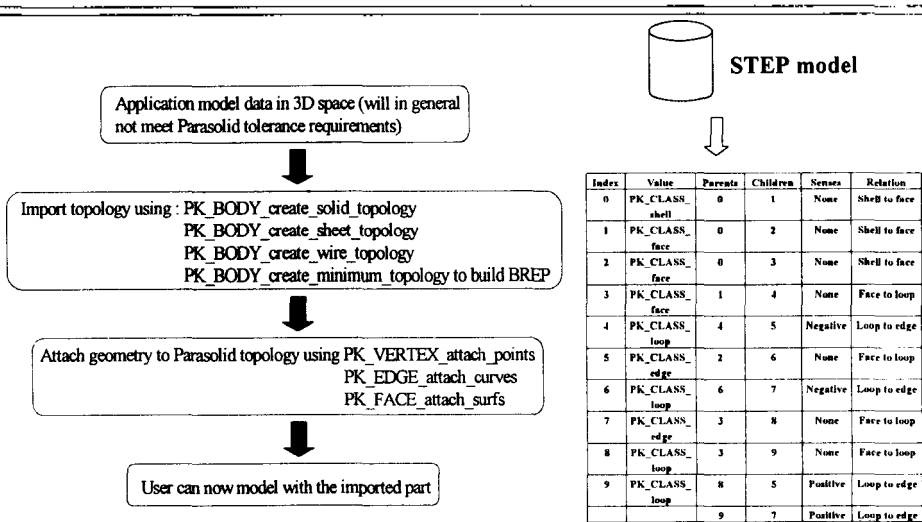
m_p203Design = ROSE.findDesign("my.stp");
List (cartesian_point) ca_points;
unsigned i, sz;

m_p203Design -> findObjects (&ca_points);
for (i=0, sz=ca_points.size(); i<sz; i++) {
    cartesian_point * pt = ca_points.get(i);
}
    
```

Pseudo code For Search Cartesian point



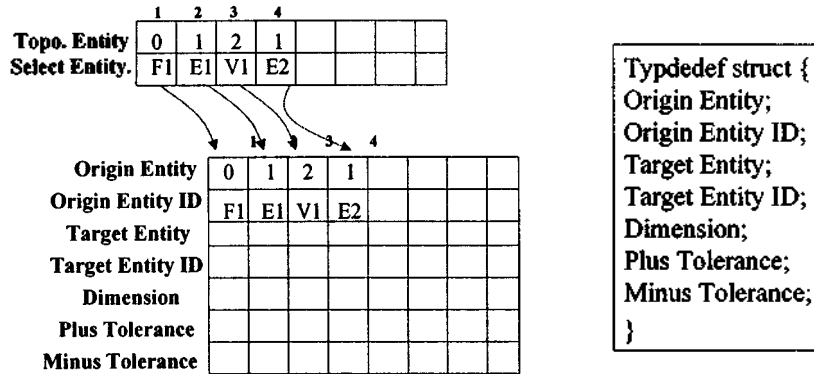
Parasolid 변환



공차 처리

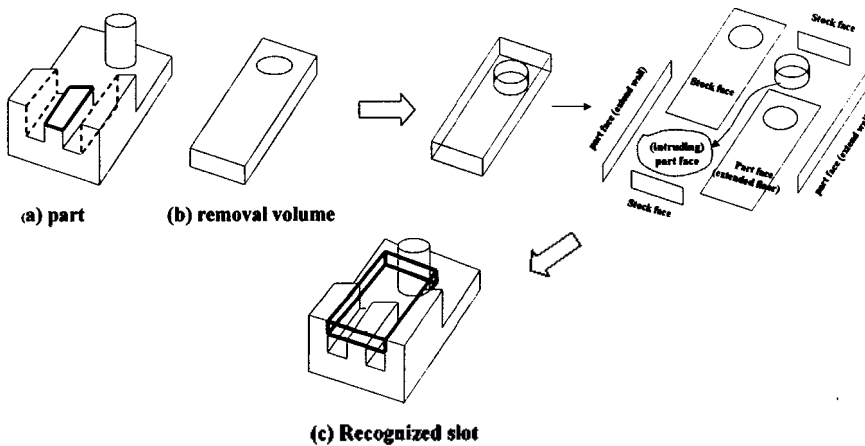
Assign tolerance information to geometric entity

(Ex.) Linear Dimensional Tolerance

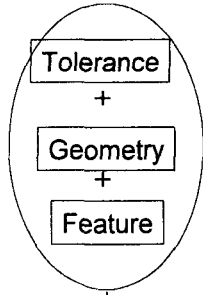


가공 특징 형상 인식

IF²(Integrated Incremental Feature Finder)



STEP AP 224 생성

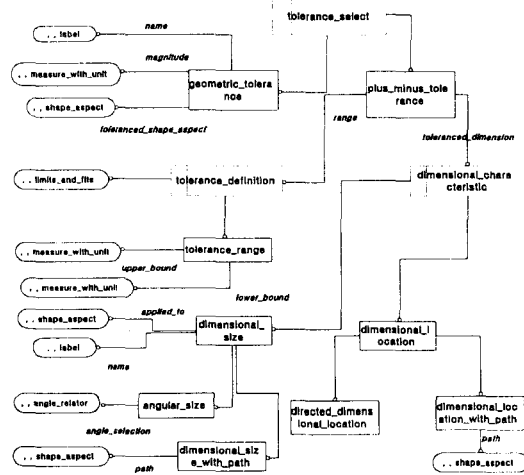


STEP AP 224 file

```
RoseObject * absr = ROSE.pnewInstance
("advanced_brep_shape_representation")
;
absr->putString("part224_test", "name;
absr->putObject(re_items, "items");
ROSE.saveDesign();
```

Pseudo code

STEP AP224 Schema

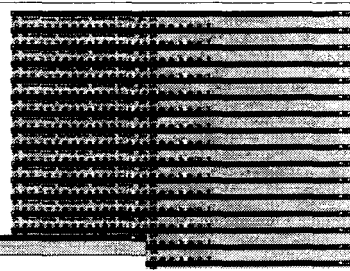
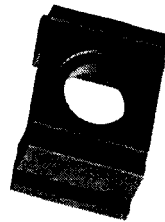


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개발 시스템 환경

- Windows NT v.4.0
- Visual C++ v.6.0
- STEP Tools v.7.0
- Parasolid v.11.0



Main System

Supplementary System



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적용 사례 (Parasolid 확인)

Model Manipulate

STEP Entity Tree

Model View

Unit Information

STEP File Viewer

STEP File Viewer Content:

```

STEP-18783-21:
HEADER:
  P Exchange file generated using ST-DEVELOPER v1.5.7
FILE_DESCRIPTION:
  P description '1' / 1
  P Implementation_Level '1' / 2
  P
FILE_NAME:
  P name '1' / advanced_1.intr'
  P time_stamp '1' / 1999-11-23T12:42:32+09:00
  P
  
```

Unit Information Content:

```

Length: MM
Mass: Kg
Plane Angle: DEGREE
Solid Angle:
  
```

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적용 사례 (공차 처리)

Select Entity

Surface Roughness

Geometric Tolerance

Dimensional Tolerance

Tolerance Information

Surface Roughness Table:

Surface	Symbol	Value	Unit
Surface 1	Ra	0.4	mm
Surface 2	Ra	0.8	mm

Geometric Tolerance Table:

Surface	Symbol	Value	Unit
Surface 1	0.1	mm	
Surface 2	0.2	mm	

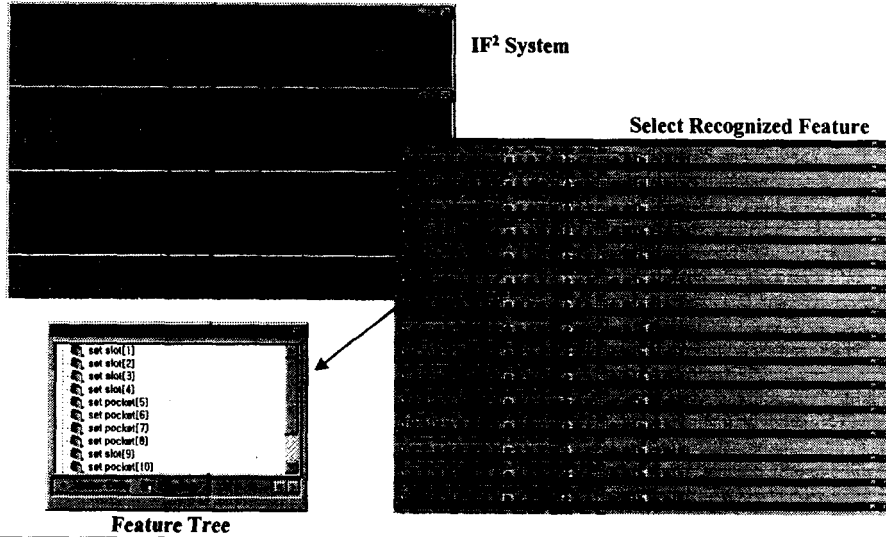
Dimensional Tolerance Table:

Surface	Symbol	Value	Unit
Surface 1	±0.1	mm	
Surface 2	±0.2	mm	

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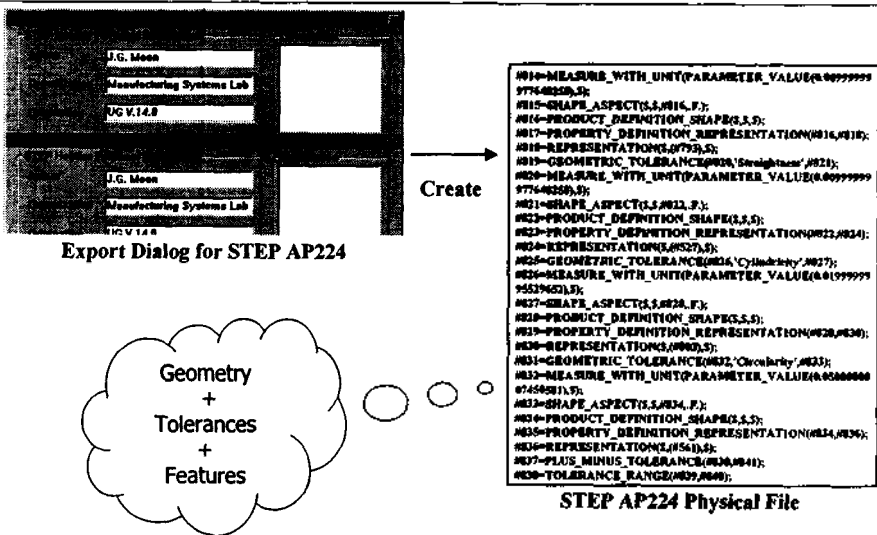
적용 사례 (가공 특징형상 추출)



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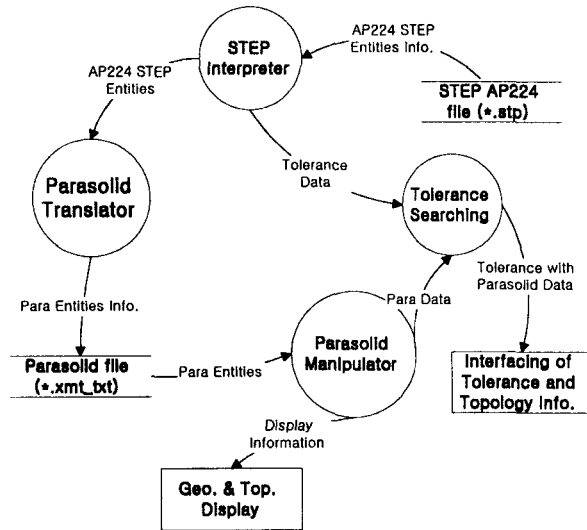
적용 사례 (AP204 생성)



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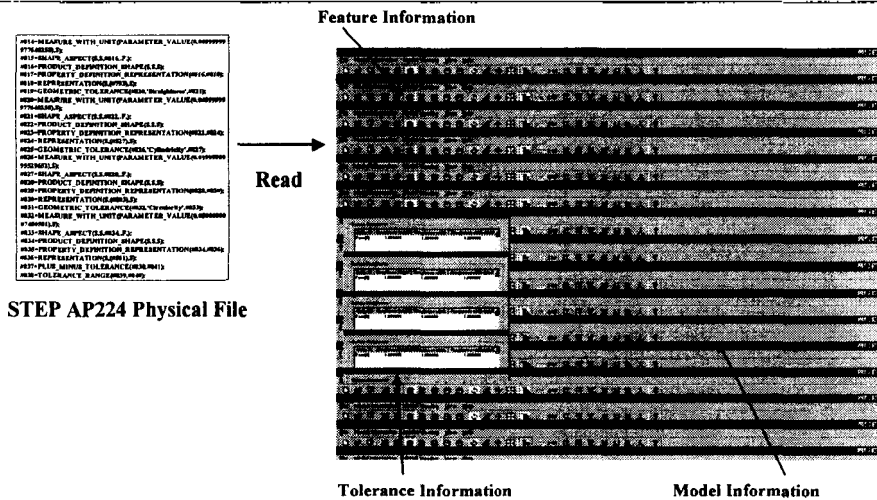
보조 시스템 (AP204 처리기)



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적용 사례 (AP204 해독)



STEP AP224 Physical File



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결론

- Representing tolerance information together with feature and geometry information in neutral format (using STEP AP 203 and AP 224)
- Preprocessor of a CAPP System
- System-independent Interfacing of CAD and CAPP



향후 과제

- Covering complete set of manufacturing features
- Incorporating more efficient feature recognizer
- Processing manufacturing information in STEP model

