

The OPITZ classification system

- Example: Given the part design shown define the "form code" using the Opitz system
- Step 1: The total length of the part is 1.75, overall diameter 1.25, $L/D = 1.4$ (code 1)
- Step 2: External shape - a rotational part that is stepped on both with one thread (code 5)
- Step 3: Internal shape - a through hole (code 1)
- Step 4: By examining the drawing of the part (code 0)
- Step 5: No auxiliary holes and gear teeth (code 0)
- **Code: 15100**

Group Technology

- **The OPITZ classification system:**
- It is a **mixed** (hybrid) coding system
- Developed by **Opitz**, Technical University of Aachen, 1970
- It is widely used in industry
- It provides a basic framework for understanding the classification and coding process
- It can be applied to machined parts, non-machined parts (both formed and cast) and purchased parts
- It considers both **design** and **manufacturing** information

Group Technology

- The Opitz coding system consists of three groups of digits:

**Form
code
12345**

**part geometry
and features
relevant to part
design**

**Supplementary
code
6789**

**information
relevant to
manufacturing
(polycode)**

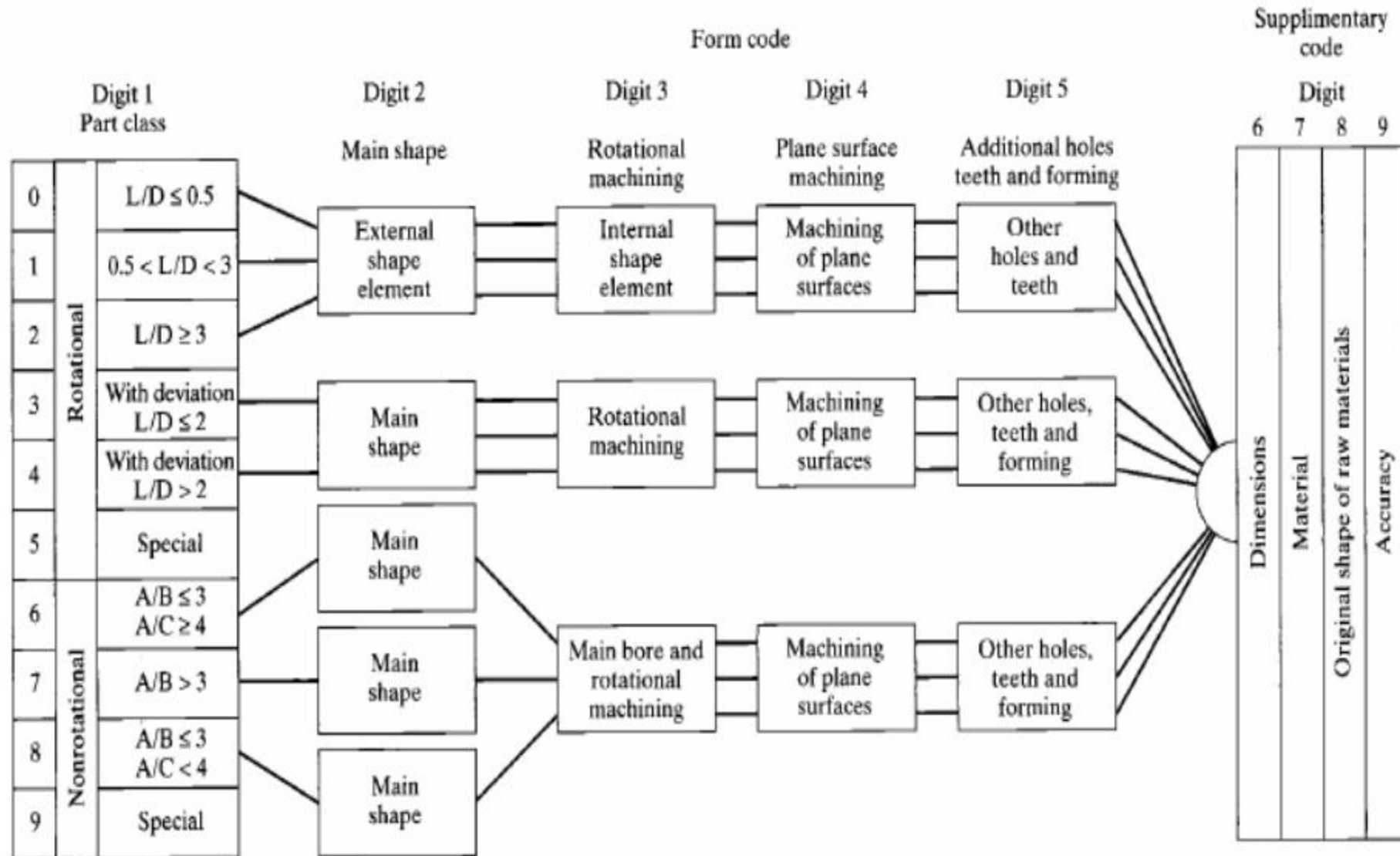
**Secondary
code
ABCD**

**Production
processes and
production
sequences**

Basic Structure of the Opitz Parts Classification and Coding System

Digit	Description
1	Part shape class: rotation versus nonrotational (Figure 22.1). Rotational parts are classified by length-to-diameter ratio. Nonrotational parts by length, width, and thickness.
2	External shape features; various types are distinguished.
3	Rotational machining. This digit applies to internal shape features (e.g., holes, threads) on rotational parts, and general rotational shape features for nonrotational parts.
4	Plane machined surfaces (e.g., flats, slots).
5	Auxiliary holes, gear teeth, and other features.
6	Dimensions—overall size.
7	Work material (e.g., steel, cast iron, aluminum).
8	Original shape of raw material.
9	Accuracy requirements.

Opitz System



Form code (digits 1-5) for rotational parts in the Opitz coding system

Digit 1		Digit 2		Digit 3		Digit 4		Digit 5				
Part class		External shape, external shape elements		Internal shape, internal shape elements		Plane surface machining		Auxiliary holes and gear teeth				
0 Rotational parts	$L/D \leq 0.5$	0	Smooth, no shape elements	0	No hole, no breakthrough	0	No surface machining	0	No auxiliary hole			
	$0.5 < L/D < 3$		1		No shape elements		1		Surface plane and/or curved in one direction, external	1	Axial, not on pitch circle diameter	
	$L/D \geq 3$				Stepped to one end or smooth				Thread		2	External plane surface related by graduation around the circle
			3				Functional groove		3	External groove and/or slot		3
	4				Stepped to both ends		No shape elements			4	External spline (polygon)	
			5				Thread		5		External plane surface and/or slot, external spline	5
6 Nonrotational parts	Stepped to both ends	Functional groove		6	Functional groove	6	Internal plane surface and/or slot	6		Spur gear teeth		
		7	Functional cone		7		Functional cone		7	Internal spline (polygon)	7	Bevel gear teeth
			8				Operating thread			8		Operating thread
9	All others	9		All others	9	All others	9	All others				
			9	All others		9		All others	9	All others	9	All others

Form code in Opitz system for rotational parts in classes 3, and 4

Digit 1		Digit 2		Digit 3		Digit 4		Digit 5		
Component Class		Overall shape		Rotational machining		Plane surface machining		Auxiliary hole(s), gear teeth, forming		
3	Rotational components	Around one axis, no segments	0	Hexagonal bar	0	No rotational machining	0	No surface machining	0	No auxiliary hole(s), gear teeth and forming
			1	Square or other regular polygonal section	1	Machined	1	External plane surface and/or surface curved in one direction	1	Axial hole(s) not related by drilling pattern
			2	Symmetrical cross section producing no unbalance	2	With screw thread(s)	2	External plane surfaces related to one another by graduation around a circle	2	Holes axial and/or radial and/or in other directions, not related
			3	Cross sections other than 0 to 2	3	Smooth	3	External groove and/or slot	3	Axial holes
			4	Segments after rotational machining	4	Stepped toward one or both ends (multiple increases)	4	External spline and/or polygon	4	Holes axial and/or radial and/or in other directions
			5	Segments before rotational machining	5	With screw threads	5	External plane surface and/or slot and/or groove, spline	5	Formed, no auxiliary holes
			6	Rotational components with curved axis	6	Machined	6	Internal plane surface and/or groove	6	Formed, with auxiliary holes
			7	Rotational components with two or more parallel axes	7	Screw thread(s)	7	Internal spline and/or polygon	7	Gear teeth, no auxiliary holes
			8	Rotational component with intersecting axes	8	External shape elements	8	External and internal spline and/or slot and/or groove	8	Gear teeth, with auxiliary hole(s)
			9	Others	9	Other shape elements	9	Other	9	Other

Supplemental code in Opitz system

Digit 1			Digit 2		Digit 3		Digit 4	
Diameter D or edge length A			Material		Initial form		Diameter D or edge length A	
0	mm	inches	0		0		0	
	≤ 20	≤ 0.8		Cast iron		Round bar, black		No accuracy specified
1	$> 20 \leq 50$	$> 0.8 \leq 2.0$	1	Modular graphitic cast iron and malleable cast iron	1	Round bar, bright drawn	1	2
2	$> 50 \leq 100$	$> 2.0 \leq 4.0$	2	Mild steel $\leq 26.5 \text{ tonf/in}^2$ not heat treated	2	Bar: triangular, square, hexagonal, others	2	3
3	$> 100 \leq 160$	$> 4.0 \leq 6.5$	3	Hard steel $> 26.5 \text{ tonf/in}^2$ heat-treatable low-carbon and case-hardening steel, not heat treated	3	Tubing	3	4
4	$> 160 \leq 250$	$> 6.5 \leq 10.0$	4	Steels 2 and 3 heat treated	4	Angle, U-, T-, and similar sections	4	5
5	$> 250 \leq 400$	$> 10.0 \leq 16.0$	5	Alloy steel (not heat treated)	5	Sheet	5	2 and 3
6	$> 400 \leq 600$	$> 16.0 \leq 25.0$	6	Alloy steel heat treated	6	Plate and slabs	6	2 and 4
7	$> 600 \leq 1000$	$> 25.0 \leq 40.0$	7	Nonferrous metal	7	Cast or forged components	7	2 and 5
8	$> 1000 \leq 2000$	$> 40.0 \leq 80.0$	8	Light alloy	8	Welded assembly	8	3 and 4
9	> 2000	> 80.0	9	Other materials	9	premachined components	9	$2 + 3 + 4 + 5$

The OPITZ classification system

- *Example: A part coded 20801*
- 2 - Parts has L/D ratio ≥ 3
- 0 - No shape element (external shape elements)
- 8 - Operating thread
- 0 - No surface machining
- 1 - Part is axial

The OPITZ classification system

Example

