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Solid steel forgings with process documentation

1 Field of application

This order specification applies to steel forgings produced by solid deformation process (hot and / or cold pressing, die-forging), and for which process documentation is required. The order specification is subject-matter of an order. If the deformation shop is not direct ZF supplier, this order specification must be condition (component) of the contract between ZF supplier (e.g. machining shop) and forging shop.

2 Quality assurance and production documents

To ensure uniform and consistent quality, suppliers are to fulfil the following criteria:

2.1 The condition of rod steel and semi-finished forged products as supplied is to be determined and documented in the deformation shop´s delivery specifications. ZF must be able to consult these delivery specifications and, in case of need, to supplement them with regard to parts-family requirements. The deformation shop has to ensure observance of the delivery specifications by regular product and process audits.

2.2 Guarantee supply of material from one heat for as long as possible.

2.3 Any delivery to ZF may be made from one heat only; otherwise separate delivery.

2.4 The procedures of raw material production, forging and heat treatment are to be determined in coordination with the deformation shop. Any changes to these procedures require written ZF approval prior to their introduction.

2.5 The deformation shop is to prepare a life data file for each item, documenting observance of the criteria listed in the form. These documents must be submitted to ZF on request.

2.6 In the case of initial delivery and technological modifications, a cross-sectional etching to show the fiber orientation of the forging is to be carried out and documented with a general view photograph (1: 1), if requested by ZF.

3 Documentation

Prior to initial delivery or modification introduction, the deformation shop is to document the criteria listed in the form (see page 3) stating modification reason and submit this to ZF (material planning of relevant parts family) for approval. Monitoring of the observance of the criteria is effected by the deformation shop´s quality assurance. When a semi-finished part is delivered (part no. middle digits 480), the supplier of the semi-finished part has to ensure matching with the appropriate forging and to forward the forms for approval.

ZFF/FH-V, H. Kellermann
ISSUED BY ZF FRIEDRICHSHAFEN AG
CORPORATE ENGINEERING SERVICES/STANDARDS DEPARTMENT

3.1 For documentation:

Serial No. in FORM	To be stated in FORM	Modifications:
1. Steel mill	Name, address, production plant	Subject to approval
2. Type of smelting	Electric /blast-furnace steel	Subject to approval
3. Pouring process	Ingot/continuous casting dimens. /form of mold/bar	Subject to approval
4. Raw material (min. transformation for continous casting ≥ 6, unless agreed otherwise)	Form and size of raw material used for forgings	Subject to approval
5. Deformation temperature	Temperature and temperature tolerance of material section before forging	Subject to approval
6. Heating process	E.g. induction heating	Subject to approval
7. Deformation process unit	Type, power of unit with workshop machine No.	Subject to approval
8. Process sequences	Brief description of process sequence	Subject to approval
9. Heat treatment cycle (re item 10)	Diagram showing H.T. cycle, furnace type and no.	Subject to approval
10. Structure Strength	Structure description measured HB values min./max. (for component cross section and one production batch)	Subject to approval
11. Deformation shop	Name, address, production plant	Subject to approval
12. Material	Material description according to order	
13. Heat treatment	Heat treatment according to order	

4 Inspection certificate EN 10204 - 3.1B

Each delivery is to be accompanied by an inspection certificate containing the following:

- Confirmation that the material is supplied from a single heat.
- Information regarding steel mill, smelting process, casting process and heat no. for materials according to ZF delivery conditions. For materials with other delivery conditions, steel analysis, hardenability, quenching grain size and degree of purity are also to be given.

FORM - according to ZFB 134 (E)

1. Steel mill				
2. Type of smelting				
3. Pouring process				
4. Basic form and size of raw material				
5. Deformation temperature				
6. Pre-heating process				
7. Forging equipment				
8. Process sequences				
9. Heat treatment cycle (re point 10)				
10. Structure / strength				
11. Deformation shop			ZF approval	
Index	Date	Name	Date	Name
12. Material			13. Heat treatment	
Description			ZF forging no.	

Previous issues:
OCT 78, JUN 79, APR 82, JUL 85, SEP 86, APR 92

Amendments:
Editorial revision
Paragraph 2: Semi-finished forgings and rod steel
Paragraph 3: Semi-finished parts considered
Title: Forged parts shaped into solid forgings