Claims

1. A method for manufacturing a complex-formed component in a multi-stage process where cold forming at a temperature in the range of – 20°C to 100°C and heating are alternated for at least two multi-stage process steps, the material being an austenitic stainless steel with TWIP hardening effect, whereby the steel has an initial elongation of A_{80} greater than or equal to 30%, the steel has a specific adjusted stacking fault energy SFE in the range 20 to 30 mJ/m², and the forming degree is less than or equal to 60 % **characterized** in the temperature during the heating steps being in the range of 750°C to 1150°C so, that the material during every process step and a component produced has an austenitic microstructure with non-magnetic reversible properties.

2. The method according to the claim 1, **characterized** the initial thickness of the sheet used for the multi-staged process should be less than 3.0mm, preferably between 0.25 and 1.5mm.

3. The method according to claim 1 or 2, **characterized** in that the sum of the carbon content and the nitrogen content (C+N) in the austenitic steel to be deformed in more than 0,4% weight %, but less than 1,2 weight %.

4. The method according to any of the preceding claims, **characterized** in that the component is in the form of a sheet, a tube, a profile, a wire or a joining rivet.

5. The method according to any of the preceding claims, **characterized** in that the used material is a stable full-austenitic steel using the TWIP hardening mechanism with a defined stacking fault energy (SFE) in the range 22-24 mJ/m².

6. The method according to any of the preceding claims, **characterized** in that the used material has an initial elongation A_{80} greater than or equal to 50%.

7. The method according to any of the preceding claims, **characterized** in that the used austenitic TWIP steel has a manganese weight-content between 10% and less than or equal to 26%, preferably between 12 and 16% manganese.

8. The method according to any of the preceding claims, **characterized** in that the used austenitic TWIP steel is a stainless steel with more than 10.5% chromium, preferably between 12 and 17% chromium.

9. The method according to any of the preceding claims, **characterized** in that the forming steps of the multi-staged process are carried out by deep-drawing, pressing, plunging, bulging, bending, spinning or stretch forming.

10. The method according to any of the preceding claims, **characterized** in that the forming steps of the multi-staged process are carried out by hydro-mechanical deep-drawing processes like sheet-hydroforming or internal high-pressure forming.

11. The method according to any of the preceding claims, **characterized** in that heating temperature of the heating steps is at a temperature range of 900 to 1050°C.

12. The method according to any of the preceding claims, **characterized** in that the heating steps of the multi-staged process are carried out by induction heating, conduction heating or infrared heating.

13. The method according to any of the preceding claims, **characterized** in that a forming process is integrated into the multi-staged process as a non-final step before a subsequent heating step.

14. The method according to any of the preceding claims, **characterized** in that an upset forming treatment on the surface like shot peening, grit blasting or

high frequency pounding is integrated into the multi-staged process to create a scratch-resistant and compressive-loaded surface of the component, which is at the same time non-magnetic.

15. The method according to any of the preceding claims, **characterized** in that a nitriding or carburizing surface heat treatment with a heating temperature between 500 and 650°C, preferably between 525 and 575°C, is integrated into the multi-staged process to create a scratch-resistance and at the same time non-magnetic surface of the component.

16. The use of a multi-staged complex-formed component manufactured by a method according to any of claims 1 to 15 as a white good like a kitchen sink or bathes in domestic appliances like a drum of a dish washer or washing machine.

17. The use of a multi-staged complex-formed component manufactured by a method according to any of claims 1 to 15 as an automotive component like a wheel-house, bumper system, channel or as a chassis component (e.g. suspension arm).

18. The use of a multi-staged complex-formed component manufactured by a method according to any of claims 1 to 15 as a mounting part for transportation systems like a door, a flap, a fender beam or a load-bearing flank, a interior part of a transport system like a seat structure component.

19. The use of a multi-staged complex-formed component manufactured by a method according to any of claims 1 to 15 as a part of a fuel injection system, like a filler neck or as a tank or storage for cars, trucks or as a pressure vessel or boiler.

20. The use of a multi-staged complex-formed component manufactured by a method according to any of claims 1 to 15 in battery electric vehicles or hybrid cars like a battery case.