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Forklift truck attachments - Safety requirements

叉车属具 安全要求

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Table of Contents

1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 General requirements	1
5 Metal structure	2
6 Components	2
7 Hydraulic system	3
8 Electrical system	4
9 Control and operating system	4
10 Information for use	4
11 Marking	5
12 Operation of the attachment	5
13 Inspection and maintenance of the attachment	6
Bibliography	9

3 Terms and definitions

One term is defined. A forklift truck attachment (3.1) is a relatively independent working device added to the forks, the fork carriage or the mast of a forklift truck, by hanging or by some other form of fitting, in order to extend the working functions of the truck.

4 General requirements

4.1 The moving parts of the attachment shall move freely, without sticking and without abnormal noise. 4.2 The attachment shall be designed so that the operator has a good field of view and can carry out the various operations. 4.3 The permissible deviation of the mass of the attachment is $\pm 3\%$ of the design value. 4.4 The mounting class and the dimensions of the hook shall meet GB/T 5184.

4.5 Measures shall be taken to prevent the attachment from moving unintentionally or falling off the truck unintentionally, and the movements of the attachment and its accessories shall have a mechanical end stop at their terminal positions. 4.6 After a dynamic load test at 1.1 times the rated lifting load, the hydraulic system shall show no oil leakage.

4.7 Parts that present a crushing or shearing hazard to an operator in the normal operating

position, other than the load bearing parts, shall be adequately guarded; where a hazard remains, it shall be made known in the instruction handbook as required by Clause 10 and a warning sign shall be applied to the attachment as required by 11.2.

5 Metal structure

5.1 In designing the metal structure, measures shall be taken so that the structural parts meet the requirements for strength, including fatigue strength, stability, rigidity and other aspects of safety during use. The structure shall have enough strength to show no permanent deformation and no damage after a static load test at 1.33 times the rated load, and shall be laid out so that inspection and maintenance are easy.

5.2 The material of the load bearing structural parts is chosen with regard to the importance of the structure, the load characteristics, the stress state, the connection method and the working ambient temperature. The material of the main load bearing structural parts shall have mechanical properties not lower than those of Q235 steel of GB/T 700. Cast steel parts should use cast steel meeting GB/T 11352 or GB/T 14408, and spheroidal graphite iron parts should use iron meeting GB/T 1348; those three standards appear only in the Bibliography of the document, not among its normative references.

5.3 The type and the dimensions of the welded joints of structural parts shall meet GB/T 985.1 and GB/T 985.2, and the welds shall show no cracks, undercut or weld beads; stress relief after welding shall be carried out where necessary. Steel welds of the attachment are graded B, C and D according to GB/T 19418: class B welds shall be inspected 100 %, class C and class D welds may be inspected on a sampling basis according to the circumstances, and butt welds shall undergo surface flaw detection whose acceptance level shall meet Table 1. Table 1 has two columns and three rows and pairs the weld quality classes B, C and D of GB/T 19418 with the acceptance levels 1, 2 and 3 of GB/T 26952 and GB/T 26953.

6 Components

6.1 The safety factor of a lifting chain used on an attachment shall be not lower than 5. 6.2 Cast hooks shall not be used; where the conditions of use or the operating method could make the load come off the hook unintentionally, a hook with a locking device shall be used; defects in a forged hook shall not be repaired by welding. A forged hook shall be replaced when it shows cracks, when the opening dimension or the measured length exceeds the basic dimension before use by more than 10 %, when the twist angle of the hook body exceeds 10°, when the shank shows plastic deformation, when the wear exceeds 5 % of the basic dimension, or when corrosion of the shank diameter is greater than 5 % of the basic dimension or the thread is corroded.

6.3 Sliding bearing parts that lubricate, resist wear or separate surfaces inside a

mechanism shall be adequately wear resistant, and shall be scrapped if they show plastic deformation, cracks, ageing, movement interference caused by wear, or wear reaching 40 % of the original thickness or a maximum wear greater than 5 mm.

6.4 Transmission gears and gear rims whose scrapping criteria are not given in the instruction handbook shall be scrapped in any of the following cases: plastic deformation of the teeth raising the peak of the tooth flank more than 20 % of the module above the theoretical tooth form, or lowering the valley of the tooth flank more than 20 % of the module below it; tooth breakage of at least one fifth of the face width or a tooth crack of at least one eighth of the face width; pitting reaching 50 % of the working area of the tooth flank, or a largest pit dimension of 0.2 module over more than 20 % of the flank, or, for other mechanisms, a pit depth of 0.15 module over 20 % of the flank; scuffing reaching 20 % of the working flank area with scuffing grooves 0.1 module deep; flaking judged by the same criteria as pitting; and a total wear on the two sides of the tooth root of 0.15 module.

6.5 The material of the main load bearing connecting pins should be 45 steel meeting GB/T 699 or 40Cr, 35CrMo or 42CrMo meeting GB/T 3077, and shall be heat treated as necessary. Pins and bushes shall be scrapped if they show plastic deformation, cracks, a fit clearance between pin and bush that has grown so much that the relative movement of the members can no longer be met, or wear of the pin end face reaching 5 % of the original size.

7 Hydraulic system

7.1 The design and installation of the hydraulic system shall meet GB/T 3766. 7.2 The set pressure of the relief valve shall be not more than 1.1 times the maximum working pressure of the system. 7.3 The system shall include a measure or a device that prevents the hydraulic motor from overspeeding under an external load. 7.4 The maximum temperature rise of the hydraulic oil in service shall not impair the safety performance of the attachment. 7.5 The manual valves shall offer an even resistance when operated, without shock and without jumping.

7.6 Hoses, tubes and fittings shall withstand three times the rated working pressure of the hydraulic circuit for 1 min without bursting and without abnormal behaviour. Tubes and hoses shall be positioned reliably and fixed where necessary, so that the risk of damage from wear, sharp corners and other causes is kept as small as possible. 7.7 The system shall be designed so that no uncontrolled movement of the attachment occurs if the power supply fails or is interrupted.

7.8 An attachment that clamps the load by power shall be designed so that, when the manual control of the truck is in the neutral position or the power supply system of the attachment fails, the designed maximum load stays clamped automatically for at least 10 min. 7.9 Where the hydraulic system of the attachment is connected to that of the truck, the two systems shall be compatible. 7.10 The inlet and outlet connections of the hydraulic

circuit of the attachment shall be clearly marked.

8 Electrical system

8.1 Suitable measures shall be taken on the electrical equipment to prevent circuit faults caused by overload or shock from leading to a hazard. 8.2 The overcurrent protection element shall be able to break the maximum overcurrent without causing a fire hazard. 8.3 All conductors shall be effectively insulated and shall be routed with suitable measures against damage from environmental factors and from mechanical stresses and other external actions.

8.4 The electrical system shall be designed to match the electrical system of the truck, so that the attachment works safely whether it supplies its own power or draws power from the truck; where a power connector is used, it shall prevent reversed polarity. 8.5 The electrical system shall be designed ergonomically, so that hazards during installation, use, inspection and maintenance can be prevented. 8.6 The degree of protection of the enclosure of the electrical equipment shall be not lower than IP54 of GB/T 4208-2017.

9 Control and operating system

9.1 The control and operating system shall be designed and laid out so that incorrect operation is avoided and the attachment runs safely and reliably. 9.2 The design shall pay attention to potentially hazardous working situations that cannot be foreseen, such as uncontrolled changes of speed, moving parts that cannot be stopped, or a safety device that is obstructed. 9.3 When power is restored after an interruption, the attachment shall be prevented from restarting by itself.

10 Information for use

10.1 Every attachment supplied to a user shall be accompanied by an instruction handbook, which shall include operating instructions and periodic maintenance instructions and shall point out all the hazards that have been identified.

10.2 The handbook shall contain at least the name and address of the manufacturer; the name of the attachment, for example a bale clamp or a paper roll clamp; assembly precautions, illustrated where necessary; the basic electrical or hydraulic circuit diagrams; a description of the safety devices and the warning signs; the intended use of the attachment and examples of hazardous misuse; instructions for safe operation, such as changing the attachment; warnings about hazards that may arise in use, including crushing and shearing; the lifting points of a detachable attachment; the inspection and maintenance intervals and items; instructions on what to do in the event of a fault; a description of the functional movements and the interfaces of the attachment; and the maximum oil supply pressure and flow rate of the attachment.