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Pick for rotary drilling rig

旋挖钻机截齿

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3 Terms and definitions

A pick is the cutting tool with which a rotary drilling rig, or other piling equipment, cuts through ground of any kind and through rock. A conical pick is one whose head is a cone; a flat pick is one whose head is flattened.

The pick body is the parent part of the pick, the carbide excluded. The pick head is the part that stands out of the holder, carrying the cemented carbide brazed or set into its tip. The pick shank is the part that goes into the holder. The pick holder is the structure the pick is mounted in.

The cemented carbide tip is sintered from tungsten carbide and cobalt powder by powder metallurgy and may be a cylinder, a plate, a mushroom head or another shape, brazed or set into the top of the head. Pick length is measured from the cutting edge point to the end of the shank, along the axis; pick head length is the axial length of the head standing proud of the top face of the holder.

5 Model, code and designation

Rotary drilling picks are divided by shape into conical picks, coded C, and flat picks, coded B. Holders are divided into flat holders and conical holders, the latter being either round or square. Both the pick model and the holder model are written with Arabic numerals and Pinyin letters.

The diagram that sets out the order of the fields did not come through in the source file, but the two worked examples read as follows. WC385019-70Z is a conical rotary drilling pick

with a shank diameter of 38 mm, a collar diameter of 50 mm, a carbide diameter of 19 mm, a head length of 70 mm and a straight circlip. WCZY68/95-38 is a round holder with an outside diameter of 68 mm, an overall length of 95 mm and a bore of 38 mm.

6 Dimensions, shape and permissible deviations

Conical picks are drawn in three series, A, B and C, each with its own dimension table. The quantities fixed are the shank diameter, the small shank diameter, the collar diameter, the carbide diameter, the circlip groove diameter, its width and its position, the pick length and the head length. Those three tables came out of the source file with rows and columns that could not be brought back into register, so their individual figures are not repeated here.

The flat pick is tabled once and that table does read. Three head widths are offered, 55 mm, 70 mm and 80 mm. The shank diameter is 38 mm and the small shank diameter 30 mm, both with a deviation of minus 0.1 mm to minus 0.3 mm. The circlip groove diameter is 33.5 mm to the same deviation and the groove width is given as 31.5 mm +/- 0.2 mm. The mounting slot is 49 mm +/- 0.2 mm wide and 10 mm +/- 0.1 mm high. Pick length runs from 140 mm to 200 mm and head length from 90 mm to 130 mm.

One flat holder is tabled: 80 mm long, with a circlip groove 40 mm deep and a mounting slot 10 mm deep to a deviation of minus 0.2 mm to minus 0.3 mm. The holder is 79 mm wide and its mounting slot 50 mm wide with a deviation of plus 0.1 mm to plus 0.3 mm; the circlip groove diameter is 38 mm and the small bore 30 mm, both with a deviation of plus 0.2 mm to plus 0.4 mm.

Three round holders are tabled. Outside diameters of 68 mm and 78 mm are offered at an overall length of 95 mm, and an outside diameter of 68 mm at a length of 110 mm. In all three the circlip groove is 66 mm deep, the small bore is 40 mm deep and 30 mm in diameter, and the circlip groove diameter is 38 mm.

Square holders come in three types. The B type is 65 mm long with a small bore of 30 mm. The C type is also 65 mm long, with a circlip groove diameter of 38 mm, a groove depth of 40 mm and a small bore of 30 mm. The row for the A type could not be brought back into register and its figures are not reproduced. Holder length carries a deviation of +/- 0.3 mm throughout.

7 Technical requirements

The pick body is to be made of alloy structural steel of the CrMo, CrNiMo or MnB families, with the chemical composition and mechanical properties of GB/T 3077. The cemented carbide tip is to meet GB/T 18376.2. The surface is to be clean and even, free of cracks, laps and dents visible to the naked eye, and protected against rust.

After heat treatment the surface hardness of the head body is not to fall below 40 HRC and that of the shank is to lie between 38 HRC and 42 HRC. The holder after heat treatment is

to lie between 37 HRC and 43 HRC. Impact toughness at room temperature is not to fall below 49 joules per square centimetre, and the shear strength of the brazed joint is not to fall below 200 MPa.

The braze seam is to be at least 90 per cent filled and free of cracks in the seam zone. Picks and holders are supplied in the heat treated condition unless the parties agree otherwise, and dimensions may follow an approved drawing instead of the tables where that is agreed and noted in the contract.

8 Test methods

Surface quality is judged by eye. Dimensions are checked with vernier calipers, a vernier height gauge and a vernier depth gauge. Surface hardness is measured to GB/T 230.1 in test zones that are drawn for the conical pick, the flat pick, the square holder, the round holder and the flat holder.

Impact toughness is measured on specimens prepared to GB/T 229 with a 2 mm U-notch, the notch lying on the loaded face of the pick.

For the shear test a piece at least 5 mm long is cut from the cylindrical part of the carbide tip, the cut face being square to the axis of the tip within 0.02 mm. The punch presses along the axis of the specimen with its face in full contact; the punch diameter is to be smaller than the carbide diameter by not more than 2 mm, the support plate bore larger than the brazed bore of the tip by not more than 2 mm, and punch and support are not to fall below 48 HRC. Loading runs at 10 MPa per second on a testing machine accurate to +/- 1 per cent until failure, and the shear strength follows from the failure load divided by the product of pi, the carbide diameter and the height of the piece cut.

Fill ratio and cracks are examined on a longitudinal and a transverse section. Under a five times magnifier the actual seam length is measured on both sections and compared with the calculated seam length to give the fill ratio; the brazed seam and the section through the carbide tip are examined for cracks under the same magnifier, and the seam zone is examined under a high power microscope.

9 Inspection rules

Inspection is either routine or type. Routine inspection is carried out by the supplier before despatch, the lot being one production run. Three items are checked: surface quality on every piece at an acceptance quality limit of 4.0, and basic dimensions and surface hardness on a ten per cent sample at an acceptance quality limit of 2.5.

Type inspection is called for on a new product or one moved to another works, after a change of material, process or design that may bear on performance, after a break in production of more than two years, every three years for a product in mass production, and at the request of a supervisory body or a customer. The inspection lot is set at 151 to 280

pieces of one size, material, process, equipment and heat treatment, made in one run, and samples are drawn at random from the finished goods store.

Six items are checked at type inspection, each with its own sample size and acceptance and rejection numbers: surface quality and basic dimensions on 25 pieces, accept on 1 and reject on 2; surface hardness on 10 pieces, accept on 1 and reject on 2; impact toughness on 2 pieces, accept on 0 and reject on 2; braze shear strength on 2 pieces, accept on 0 and reject on 1; seam fill and cracks on 2 pieces, accept on 0 and reject on 1.

10 Marking, packaging, transport and storage

Every pick is marked before despatch with the works code or trademark and the pick code, in a place that will not wear away in use and in a way that does not shorten the life of the pick.

The case, basket or bale is to be sound and to hold a certificate of conformity naming the steel grade. Its outside carries the name and trademark of the works, the pick model, the number of picks, the unit weight and the total weight, the date of packing and the outside dimensions of the package as length by width by height in millimetres. Picks are protected against damp in transport and storage.