

Product Information DOERING Cylpebs CHILLARD®

What are DOERING CYLPEBS ?

DOERING CYLPEBS are slightly tapered cylindrical grinding media with equal length and diameter. Their shape has been developed to maximize available grinding due to density and surface area advantages (fig.1).

The manufacturing process

DOERING CYLPEBS are made from a low alloy chilled cast iron CHILLARD®. The molten metal leaves the furnace at 1500 degrees Celsius and is transferred to a continuous casting machine where the selected size Cylpebs is created, by changing the moulds the full range of cylindrical media can be manufactured via one simple process.

The Cylpebs are demoulded while still red hot and placed in a cooling section for several hours to relieve internal stress. Solidification takes place in seconds and is formed from the external surface inward to the center of the media, a short needle like structure pointing inwards grow along this front. From the innumerable crystallization points a tough pearlitic matrix is formed between very hard carbides (figs. 2 + 3).

It is this manufacturing process that contributes to the cost effectiveness of the Doering Media, by being more efficient and requiring less energy than the conventional forging method.

Shape, dimensions, tolerances

DOERING CYLPEBS have a slightly tapered shape and all the edges are radiused. At the center of the larger circular face is a slight sink. This is a result of the natural contraction of the iron during solidification and in no way affects the serviceability of the Cylpebs. For practical reasons most mills are only topped up with one size of grinding media although the particle size spectrum of the mill feed material varies over a very wide range. Because of the technology used for manufacturing DOERING CYLPEBS the length tolerance of some of the Cylpebs fluctuates between 70 and 110 % of the nominal dimension. The resulting graduation in the weights of the Cylpebs compensates to some extent for the very wide particle size spectrum of the mill feed.



Fig. 1: Cylpebs

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The grinding action of DOERING CYLPEBS

The iron carbide crystals, which are perpendicular to all the surfaces, give the surfaces of the grinding media a microscopic roughness. This has a beneficial effect on the grinding action of the Cylpebs because it ensures better transfer of the grinding media energy to the mill feed. (Interlocking effect, less slip between mill feed and grinding media, figs. 2 + 3).

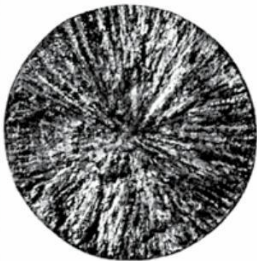


Fig. 2: Macrostructure



Fig. 3: Mikrograph 300 x

Uniform wear characteristics

DOERING CYLPEBS have amazing shape retention, a feature that remains a major advantage over balls for the entire working life of the media. As the basic microstructure is perpendicular to all working surfaces the DOERING CYLPEBS even retain the original taper (fig. 4).

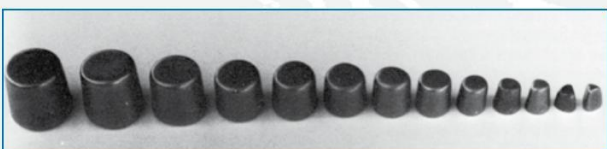


Fig. 4: Uniform wear characteristics retain the original taper.

Hardness distribution over the cross-section

DOERING CYLPEBS are through hardened from the outer shell to the center core (fig. 5).

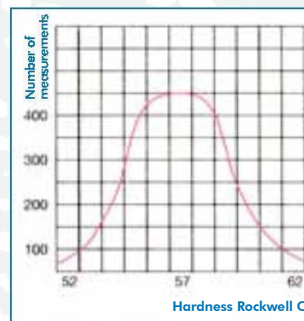


Fig. 5: Hardness distribution for the 20 x 20 mm; there is a slight shift of the curve to the left for the larger sizes, and to the right for the smaller sizes.

Hardness



DOERING CYLPEBS are manufactured with the following dimensions (mm):

45 x 45	40 x 40	32 x 32
28 x 28	24 x 24	20 x 20
16 x 16		

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Wear on the grinding media

To maximize the production potential of DOERING CYLPEBS, mill operating procedures can play a major role. High filling rates will greatly assist the media, the combination of a constant feed of slurry and the surface area and density advantages of the cylindrical media, will allow greater through put by reducing the retention time in the mill. Constant media to media contact is counter productive accelerating wear of the media. DOERING CYLPEBS have proved themselves in grinding a wide range of minerals offering a cost effective alternative to hardened balls. The typical wear rate expectation is parallel to balls in the hardness range of 650 Brinell hardness. When utilized in non impact type tower mills, the small DOERING CYLPEBS in the size range below 20 mm x 20 mm can give quite exceptional performance, with proven results matching the wear rates of cast balls having a chrome content above 18 %.

Advantages of DOERING CYLPEBS

The bulk density of DOERING CYLPEBS is 9 % greater than steel balls, 12 % greater than cast balls. The surface area of DOERING CYLPEBS is 14,5 % greater than balls of equal weight. The density and surface area combination, deliver 25 % greater grinding capacity in a typical mill charge.

The physical attributes of the DOERING CYLPEBS and their proven wear characteristics, combine with the low cost manufacture, to make available to industry a unique grinding tool. With the exception of the size 20 mm x 20 mm and below all products are available at one single price!

No longer do Metallurgists have to consider the commercial implications associated with small balls.



Equal volumetric grinding media charge.

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Comparative data for Cylpebs and balls

Cylpebs ($\gamma = 7,65 \text{ kg/dm}^3$)				
dimension	weight	surf. area	spec. surface	bulk density
mm	g	cm ²	cm ² /g	t/m ³
45 x 45	560.0	95.4	0.17	4.9
40 x 40	379.0	75.4	0.20	4.9
35 x 35	245.0	57.7	0.24	4.9
32 x 32	190.0	48.3	0.25	4.9
28 x 28	128.0	37.0	0.28	4.9
24 x 24	82.5	27.0	0.33	4.9
22 x 22	62.0	22.8	0.37	4.9
20 x 20	45.0	19.0	0.40	4.9
16 x 16	23.5	12.0	0.51	4.9
12 x 12	11.1	6.8	0.55	4.9

balls ($\gamma = 7,85 \text{ kg/dm}^3$)				
dimension	weight	surf. area	spec. surface	bulk density
mm Ø	g	cm ²	cm ² /g	t/m ³
50	510.0	79.0	0.15	4.5
45	372.0	63.6	0.17	4.5
40	264.0	50.0	0.19	4.5
35	175.0	38.5	0.22	4.5
30	112.0	28.0	0.25	4.5
25	65.0	20.0	0.31	4.5
20	33.0	12.5	0.38	4.5
15	13.0	7.0	0.54	4.5
10	4.5	3.1	0.69	4.5

Composition of grinding media charge

The correct sizing of media will be nominated by our engineers, upon receipt of the completed Mill Questionnaire available on this web page.

Kindly complete and transmit via either email or fax to receive our recommendations. For Metallurgists wishing to interpret their operating parameters, we include the Formula of Bond as a link to this site.

When replacing an existing mill charge, our standard policy is to establish the correct media size and then follow existing site procedures for top up media, it is not necessary to dump the existing charge prior to installing DOERING CYLPEBS.

Using DOERING CYLPEBS

For new installations, we recommend an initial graded charge. DOERING technicians will calculate the composition of such a charge and supply as a „first fill“, subsequent top up media will be sized based upon the data supplied on the completed mill questionnaire.

Technical Support

All DOERING products are sold with a guarantee of full support, our technicians will work through trial periods with metallurgical personal, perfecting the use of our media. To long term users we offer reviews to ensure optimum performance is achieved. We offer logistic assistance, investigating packaging options and materials handling methods based upon our experience in the field.