

# Specifications, mechanical properties and standards for washers

General requirements	EN 14399-1
Mechanical properties; standard	EN 14399-6
Dimensions and tolerances	EN 14399-6
Diam 12-24 type HD - Diam 27-36 type H	

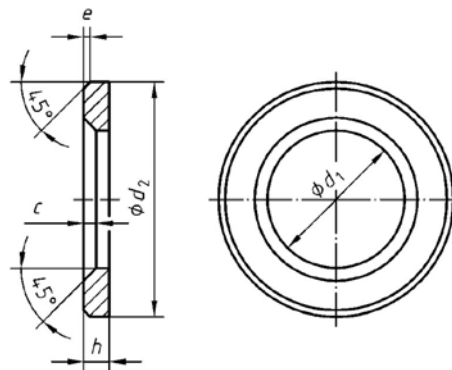
Nominal diameter	Vickers hardness (HV)	
	min	max
M16 to M36	300	370

## Dimensions of washers <sup>a</sup>

All dimensions in millimetres

Nominal size	M12	M16	M20	M22	M24	M27	M30	M36	
$d_1$	min	13	17	21	23	25	28	31	37
	max	13.27	17.27	21.33	23.33	25.33	28.52	31.62	37.62
$d_2$	min	25.48	31.38	39.38	43.38	47.38	49.00	54.80	64.80
	max	26	32	40	44	48	50	56	66
$h$	nom	3	4	4	4	4	5	5	6
	min	2.7	3.7	3.7	3.7	3.7	4.4	4.4	5.4
	max	3.3	4.3	4.3	4.3	4.3	5.6	5.6	6.6
$e$	nom=min	0.50	0.75	0.75	0.75	0.75	1.00	1.00	1.25
	max	1.0	1.5	1.5	1.5	1.5	2.0	2.0	2.5
$c$	min	1.6	1.6	2.0	2.0	2.0	2.5	2.5	2.5
	max	1.9	1.9	2.5	2.5	2.5	3.0	3.0	3.0

<sup>a</sup> – dimensions apply before Greenkote®



## Minimum specified preloads

Thread $d$	Nominal stress area of standard test mandrel $A_s$ mm <sup>2</sup>	$F_r$ min $0.7 \times f_{ub} \times A_s$ <sup>a</sup> kN	$F_r$ mean min $0.77 \times f_{ub} \times A_s$ <sup>a</sup> kN
		<i>Minimum individual value of bolt force at spline shear when tested in accordance with EN 14399-2 &amp; 10</i>	<i>Minimum mean value of bolt force at spline shear of 5 sets tested in accordance with EN 14399-2 &amp; 10</i>
M12	84.3	59.01	64.911
M16	157	109.9	120.89
M20	245	171.5	188.65
M22	303	212.1	233.31
M24	353	247.1	271.81
M27	459	321.3	353.43
M30	561	392.7	431.97
M36	817	571.9	629.09

<sup>a</sup>  $f_{ub}$  is the nominal tensile strength of the bolt ( $R_m$ , nom)

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