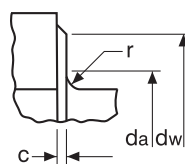
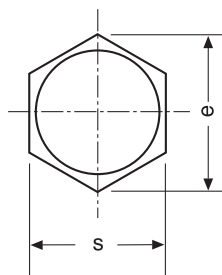
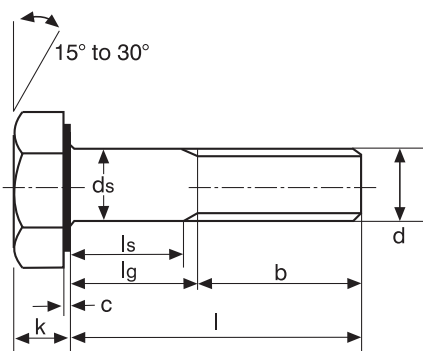
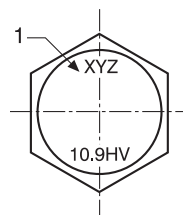


# Pre-load Fasteners

## EN 14399 - 4 System HV



### Head Marking



1. Identification mark of the manufacturer of the assembly

### EN 14399-4 Dimensions of bolts

Nominal size and thread diameter d	Pitch of thread P	Thread Length b	Depth of washer face c		Transition diameter da	Diameter of unthreaded shank ds		Diameter of washer face dw	Width across corners e	Thickness of head k		Radius under head r	Width across flats s	
	coarse pitch	Bolt ≤125	min.	max.	min.	min.	max.	min.	min.	min.	max.	min.	min.	max.
M12	1.75	23	0.4	0.6	15.20	11.30	12.70	20.10	23.91	7.55	8.45	1.2	21.16	22.00
M16	2.00	28	0.4	0.6	19.20	15.30	16.70	24.90	29.56	9.25	10.75	1.2	26.16	27.00
M20	2.50	33	0.4	0.8	24.00	19.16	20.84	29.50	35.03	12.10	13.90	1.5	31.00	32.00
M22	2.50	34	0.4	0.8	26.00	21.16	22.84	33.30	39.55	13.10	14.90	1.5	35.00	36.00
M24	3.00	39	0.4	0.8	28.00	23.16	24.84	38.00	45.20	14.10	15.90	1.5	40.00	41.00
M27	3.00	41	0.4	0.8	32.00	26.16	27.84	42.80	50.85	16.10	17.90	2.0	45.00	46.00
M30	3.50	44	0.4	0.8	35.00	29.16	30.84	46.60	55.37	17.95	20.05	2.0	49.00	50.00
M36	4.00	52	0.4	0.8	41.00	35.00	37.00	55.90	66.44	21.95	24.05	2.0	58.80	60.00

### EN 14399-4 Dimensions of bolts

Thread d			M12		M16		M20		M22		M24		M27		M30		M36	
nom.	l		ls min.	lg max.	ls min.	lg max.	ls min.	lg max.	ls min.	lg max.	ls min.	lg max.	ls min.	lg max.	ls min.	lg max.	ls min.	lg max.
	min.	max.																
35	33.75	36.25	6.75	12.00														
40	38.75	41.25	11.75	17.00	6.00	12.00												
45	43.75	46.25	16.75	22.00	11.00	17.00	4.50	12.00										
50	48.75	51.25	21.75	27.00	16.00	22.00	9.50	17.00	8.50	16.00								
55	53.50	56.50	26.75	32.00	21.00	27.00	14.50	22.00	13.50	21.00								
60	58.50	61.50	31.75	37.00	26.00	32.00	19.50	27.00	18.50	26.00	12.00	21.00						
65	63.50	66.50	36.75	42.00	31.00	37.00	24.50	32.00	23.50	31.00	17.00	26.00						
70	68.50	71.50	41.75	47.00	36.00	42.00	29.50	37.00	28.50	36.00	22.00	31.00	20.00	29.00				
75	73.50	76.50	46.75	52.00	41.00	47.00	34.50	42.00	33.50	41.00	27.00	36.00	25.00	34.00	20.50	31.00		
80	78.50	81.50	51.75	57.00	46.00	52.00	39.50	47.00	38.50	46.00	32.00	41.00	30.00	39.00	25.50	36.00		
85	83.25	86.75	56.75	62.00	51.00	57.00	44.50	52.00	43.50	51.00	37.00	46.00	35.00	44.00	30.50	41.00	21.00	
90	88.25	91.75	61.75	67.00	56.00	62.00	49.50	57.00	48.50	56.00	42.00	51.00	40.00	49.00	35.00	47.00	26.00	
95	93.25	96.75	66.75	72.00	61.00	67.00	54.50	62.00	53.50	61.00	47.00	56.00	45.00	54.00	40.50	51.00	31.00	
100	98.25	101.75			66.00	72.00	59.50	67.00	58.50	66.00	52.00	61.00	50.00	59.00	45.50	56.00	36.00	
105	103.25	106.75			71.00	77.00	64.50	72.00	63.50	71.00	57.00	66.00	55.00	64.00	50.50	61.00	41.00	
110	108.25	111.75			76.00	82.00	69.50	77.00	68.50	76.00	62.00	71.00	60.00	69.00	55.50	66.00	46.00	
115	113.25	116.75			81.00	87.00	74.50	82.00	73.50	81.00	67.00	76.00	65.00	74.00	60.50	71.00	51.00	
120	118.25	121.75			86.00	92.00	79.50	87.00	78.50	86.00	72.00	81.00	70.00	79.00	65.50	76.00	56.00	

### EN 14399-4 Dimensions of bolts (concluded)

Thread d			M12		M16		M20		M22		M24		M27		M30		M36	
l			ls min.	lg max.	ls min.	lg max.	ls min.	lg max.	ls min.	lg max.	ls min.	lg max.	ls min.	lg max.	ls min.	lg max.	ls min.	lg max.
nom.	min.	max.																
125	123.00	127.00			91.00	97.00	84.50	92.00	83.50	91.00	77.00	86.00	75.00	84.00	70.50	81.00	61.00	73.00
130	128.00	132.00			96.00	102.00	89.50	97.00	88.50	96.00	82.00	91.00	80.00	89.00	75.50	86.00	66.00	78.00
135	133.00	137.00					94.50	102.00	93.50	101.00	87.00	96.00	85.00	94.00	80.50	91.00	71.00	83.00
140	138.00	142.00					99.50	107.00	98.50	106.00	92.00	101.00	90.00	99.00	85.50	96.00	76.00	88.00
145	143.00	147.00					104.50	112.00	103.50	111.00	97.00	106.00	95.00	104.00	90.50	101.00	81.00	93.00
150	148.00	152.00					109.50	117.00	108.50	116.00	102.00	111.00	100.00	109.00	95.50	106.00	86.00	98.00
155	153.00	159.00					114.50	122.00	113.50	121.00	107.00	116.00	105.00	114.00	100.50	111.00	91.00	103.00
160	158.00	164.00							118.50	126.00	112.00	121.00	110.00	119.00	105.50	116.00	96.00	108.00
165	163.00	169.00							123.50	131.00	117.00	126.00	115.00	124.00	110.50	121.00	101.00	113.00
170	168.00	174.00									122.00	131.00	120.00	129.00	115.50	126.00	106.00	118.00
175	173.00	179.00									127.00	136.00	125.00	134.00	120.50	131.00	111.00	123.00
180	178.00	184.00									132.00	141.00	130.00	139.00	125.50	136.00	116.00	128.00
185	182.70	189.60									137.00	146.00	135.00	144.00	130.50	141.00	121.00	133.00
190	187.70	194.60									142.00	151.00	140.00	149.00	135.50	146.00	126.00	138.00
195	192.70	199.60									147.00	156.00	145.00	154.00	140.50	151.00	131.00	143.00
200	197.70	204.60											150.00	159.00	147.50	156.00	136.00	148.00

### Specification for bolts and reference standard

Characteristic	Standard	
Material	Steel	
General Requirements	EN 14399-1	
Thread	Tolerance	6g <sup>a</sup>
	International Standard	ISO 261, ISO 965-2
Mechanical Properties	Property Class	10.9
	European Standard	EN ISO 898-1
Impact Strength	Value	Kv, min = 27 J at -20°C
	Test Piece <sup>b</sup>	ISO 148
	Test	EN 10045-1
Tolerances	Product Grade	C except: dimensions c and r. + IT 17 Tolerance for length ≥ 155mm: - 1/2 IT 17
	International Standard	EN ISO 4759-1
Surface Finish <sup>c</sup>	Self Colour	as processed
	Hot Dip Galvanised	EN ISO 1461
	Others	to be agreed
Surface discontinuities	Limits for surface discontinuities as specified in EN26157-1.	
Acceptability	For acceptance procedure, see EN ISO 3269.	

a The tolerance class specified applies before hot-dip galvanising. Hot-dip galvanised bolts are intended for assembly with oversize tapped nuts.  
b The location of chappy V-notch test pieces in the bolt shall be specified in EN ISO 898-1.  
c Attention is drawn to the need to consider the risk of hydrogen embrittlement in the case of bolts of property class 10.9, when selecting an appropriate surface treatment process (e.g. cleaning and coating), see the relevant coating standards.  
d "As processed" means the normal finish resulting from manufacture with a light coating of oil.  
e Other coatings may be negotiated between the purchaser and the manufacturer provided they do not impair the mechanical properties or the functional characteristics. Coatings of cadmium or cadmium alloy are not permitted.

### Important note

Preloaded bolted assemblies are very sensitive to differences in manufacture and lubrication. Therefore it is important that the assembly is supplied by one manufacturer who is always responsible for the function of the assembly.

For the same reason, it is important that the coating of the assembly is under the control of one manufacturer.

Beside the mechanical properties of the components, the functionality of the assembly requires that the specific preload can be achieved if the assembly is tightened with a suitable procedure. For this purpose a test method for the suitability of the components for preloading was created, which will demonstrate whether the function of the assembly is fulfilled.

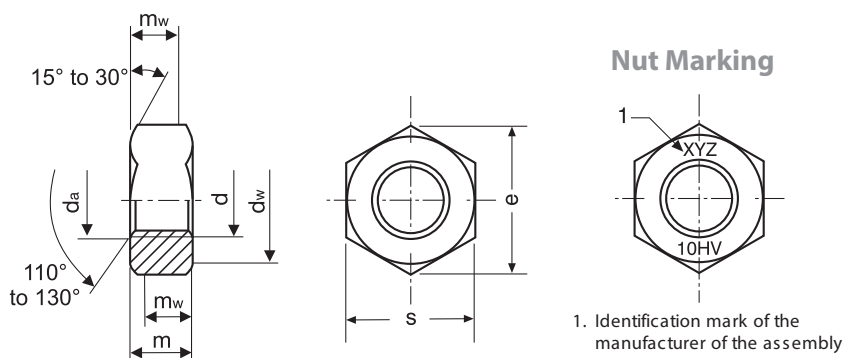
# Pre-load Fasteners

## EN 14399 - 4 System HV

### EN 14399-4 Dimensions of nuts

Nominal size and thread diameter d	p	da		dw	e	m		mw	s	
	(coarse pitch series)	min.	max.	min.	min.	min.	max.	min.	min.	max.
M12	1.75	13.00	12.00	20.10	23.91	9.64	10.00	7.71	21.16	22.00
M16	2.00	17.30	16.00	24.90	29.56	12.30	13.00	9.84	26.16	27.00
M20	2.50	21.60	20.00	29.50	35.03	14.90	16.00	11.92	31.00	32.00
M22	2.50	23.70	22.00	33.30	39.55	16.90	18.00	13.52	35.00	36.00
M24	3.00	25.90	24.00	38.00	45.20	18.70	20.00	14.96	40.00	41.00
M27	3.00	29.10	27.00	42.80	50.85	20.70	22.00	16.56	45.00	46.00
M30	3.50	32.40	30.00	46.60	55.37	22.70	24.00	18.16	49.00	50.00
M36	4.00	38.90	36.00	55.90	66.44	27.70	29.00	22.16	58.80	60.00

a For hot-dip galvanised nuts, the dimensions apply before galvanising.



### Specification for nuts and reference standards

Characteristic	Standard	
Material	Steel	
General Requirements	EN 14399-1	
Thread	Tolerance	6H or 6AZ
	International Standard	ISO 261, ISO 965-2 ISO 965-5
Mechanical Properties	Property Class	8 <sup>a</sup> or 10 <sup>a</sup>
	European Standard	EN 20898-2
Surface Finish	Self Colour	as processed <sup>b</sup>
	Hot Dip Galvanised	EN ISO 1461
	Others	to be agreed <sup>c</sup>
Surface Discontinuities	Limits for surface discontinuities as specified in EN 493.	
Acceptability	For acceptance procedure, see EN ISO 3269.	

a For proof load values, see (Proof load values of nuts) table. All other mechanical properties as specified in EN 20898-2.  
b "As processed" means the normal finish resulting from manufacture with a light coating of oil.  
c Other coatings may be negotiated between the purchaser and the manufacturer provided they do not impair the mechanical properties or the functional characteristics. Coatings of cadmium or cadmium alloy are not permitted.

### EN 14399-4 Proof load values of nuts

Nut thread diameter d	Nominal stress area of standard test mandrel (mm <sup>2</sup> ) A <sub>S</sub>	Property Class	
		8	10
M12	84.30	84.30	97.80
M16	157.00	157.00	182.10
M20	245.00	245.00	284.20
M22	303.00	303.00	351.20
M24	353.00	353.00	409.50
M27	459.00	459.00	532.40
M30	561.00	561.00	650.80
M36	817.00	817.00	947.70

\*6H is the tolerance class for self colour nuts.  
\*\*6AZ is the tolerance class of hot dip galvanised nuts.