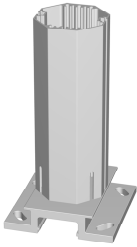
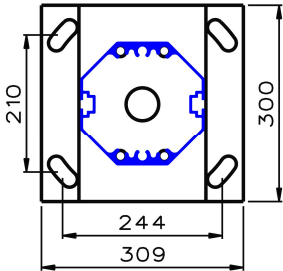
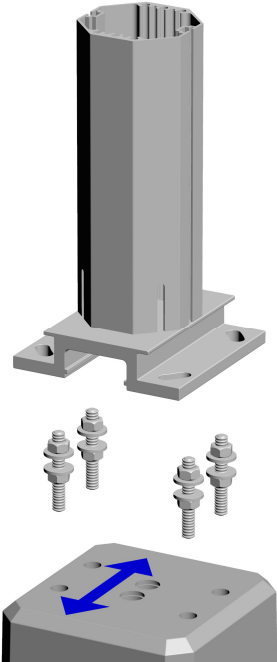
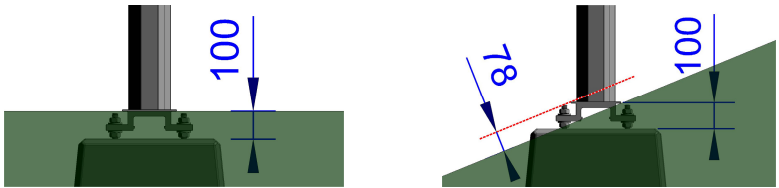


# DECLARATION OF PERFORMANCE

## No. 010.005-CPR-2020.03.01



By JSK - Approved on behalf of the manufacturer by Lars Tvette, Vingrom 01.03.2020

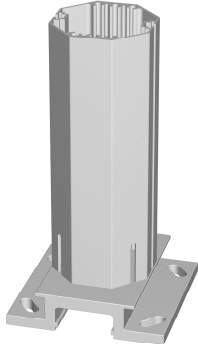

<b>Product name :</b>	<b>Norsafe Mast NM190-60</b>
<b>Product specifications :</b> 	<b>The mast is delivered complete with base plate</b> Tested & approved NS-EN12767:2019: 100-NE-C-R-SE-MD-NR Width : 190 mm Base plate height: 75 mm Base plate, width x length: 309 x 300 mm Bolt connection on side: M12 Bolt hole for threading on top: M16
<b>Material / Surface treatment :</b>	Mast: Aluminium 606385 T6 - 6005 T6 Base plate: 6082 T6 chromated Bolts: BUMAX 109 (A4 - acid proof stainless steel)
<b>Data / Weight / Capacity :</b> 	Bending Capacity: <b>60 kNm</b> Stiffness bending: 1812 kN/m <sup>2</sup> Torsional capacity: <b>42 kNm</b> Stiffness torsion: 59,22 kN/m <sup>2</sup> Min. C-C with 1,5m opening at 20° angle: 1,814 m Shape factor (force coefficient) wind: 1,1 Weight mast: 14,09 kg/m Weight base plate: 7,71 kg Bolt patterns for foundation (M24): 244 mm x 210 mm
<b>Assembly:</b> 	See separate descriptions for assembly of signs and foundations. - Before assembly; control that the top of the foundation is approx. 100mm under surrounding terrain. - Assemble the bolt set in the foundation. - Check (with, for example, a plank) that the top of the bolts are not sticking up from the hole, higher then the surrounding terrain. - Remove the top 4 washers and nuts and level correct height on the lower washers. The lower washers shall be approx. 60-70mm under terrain. - Put the mast with base plate in place and assemble the upper washers and nuts. Use appropriate lubricant/Teflon spray to avoid damage of the threads in the acid proof steel nuts. Assemble the nuts with a 30mm Slogging spanner to achieve enough torque. When the mast is assembled correctly only the top of the base plate will show above ground, as shown below. 
<b>Maintenance :</b>	No maintenance required

# DECLARATION OF PERFORMANCE

## No. 010.005-CPR-2020.03.01



By JSK - Approved on behalf of the manufacturer by Lars Tvete, Vingrom 01.03.2020

<p><b>Order no. Mast :</b></p>  <p><b>Norsafe Mast NM190-60</b></p>	<table border="0"> <tr><td>22310050100</td><td>NM190-60 x 1,0 m mast complete w/base plate</td></tr> <tr><td>22310050200</td><td>NM190-60 x 2,0 m mast complete w/base plate</td></tr> <tr><td>22310050250</td><td>NM190-60 x 2,5 m mast complete w/base plate</td></tr> <tr><td>22310050300</td><td>NM190-60 x 3,0 m mast complete w/base plate</td></tr> <tr><td>22310050350</td><td>NM190-60 x 3,5 m mast complete w/base plate</td></tr> <tr><td>22310050400</td><td>NM190-60 x 4,0 m mast complete w/base plate</td></tr> <tr><td>22310050450</td><td>NM190-60 x 4,5 m mast complete w/base plate</td></tr> <tr><td>22310050500</td><td>NM190-60 x 5,0 m mast complete w/base plate</td></tr> <tr><td>22310050550</td><td>NM190-60 x 5,5 m mast complete w/base plate</td></tr> <tr><td>22310050600</td><td>NM190-60 x 6,0 m mast complete w/base plate</td></tr> <tr><td>22310050650</td><td>NM190-60 x 6,5 m mast complete w/base plate</td></tr> <tr><td>22310050700</td><td>NM190-60 x 7,0 m mast complete w/base plate</td></tr> <tr><td>22310050750</td><td>NM190-60 x 7,5 m mast complete w/base plate</td></tr> </table>	22310050100	NM190-60 x 1,0 m mast complete w/base plate	22310050200	NM190-60 x 2,0 m mast complete w/base plate	22310050250	NM190-60 x 2,5 m mast complete w/base plate	22310050300	NM190-60 x 3,0 m mast complete w/base plate	22310050350	NM190-60 x 3,5 m mast complete w/base plate	22310050400	NM190-60 x 4,0 m mast complete w/base plate	22310050450	NM190-60 x 4,5 m mast complete w/base plate	22310050500	NM190-60 x 5,0 m mast complete w/base plate	22310050550	NM190-60 x 5,5 m mast complete w/base plate	22310050600	NM190-60 x 6,0 m mast complete w/base plate	22310050650	NM190-60 x 6,5 m mast complete w/base plate	22310050700	NM190-60 x 7,0 m mast complete w/base plate	22310050750	NM190-60 x 7,5 m mast complete w/base plate
22310050100	NM190-60 x 1,0 m mast complete w/base plate																										
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22310050700	NM190-60 x 7,0 m mast complete w/base plate																										
22310050750	NM190-60 x 7,5 m mast complete w/base plate																										
<p><b>Order no. Bolt set :</b></p> 	<p>22350000024      NM190-60 - NM290 Found. Bolt set M24</p> <p>M24 Bolt Set for foundation consists of:</p> <p>Threaded rod: 4 pcs. M24x150mm DIN 976B A4-80</p> <p>Washer: 8 pcs. M24 25x60x8mm DIN 6340 316L (labeled A4)</p> <p>Nut: 8 pcs. M24 DIN934 A4-80 coated with Gleitmo 605</p> <p>Spanner size tools: 36mm, impact wrench or torque wrench</p> <p>Torque: 754Nm</p> <p>- See separate documentation for torque.</p>																										
<p><b>CE marking and system of assessment and verification of constancy of performance:</b></p>	<p>The mast is CE marked; EN 12899-1:2007. Notified body nr. 1358, se attached certificate.</p> <p>System of assessment and verification of constancy of performance: System 1</p> <p>CE marking is approved and valid for: 2,5m – 7,5m mast lengths.</p> <p>All data and capacities are stated in the CE marking label. And there are in addition permanent marking for traceability on both mast and base plate</p> <div data-bbox="1289 1279 1517 1899" style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;"><b>CE</b> 1358</p> <p><b>Euroskilt AS</b> Paul A. Owrens veg 46 2607 Vingrom +47 61 24 80 50 www.euroskilt.no</p> <p style="text-align: center;">13</p> <p style="text-align: center;">010.005-CPR-2020.03.01</p> <p><b>NM190-60</b> <b>Norsafe® Mast</b> EN 12899-1:2007 M<sub>b</sub> 60 kNm (M<sub>u</sub>) EI 1812,0 kN/m<sup>2</sup> M<sub>t</sub> 42 kNm (T<sub>u</sub>) GI<sub>t</sub> 59,22 kN/m<sup>2</sup> EN12767:2019 100-NE-C-R-SE-MD-NR</p> <p><small>Ytelseserklæring &amp; DoP: www.euroskilt.no/ye/010</small></p> </div>																										
<p><b>Referrals / Attachments:</b></p>	<p>Approval from Norwegian Road Authorities</p> <p>EC - Certificate of conformity</p> <p>Torque documentation</p>																										

# DECLARATION OF PERFORMANCE

## No. 010.005-CPR-2020.03.01

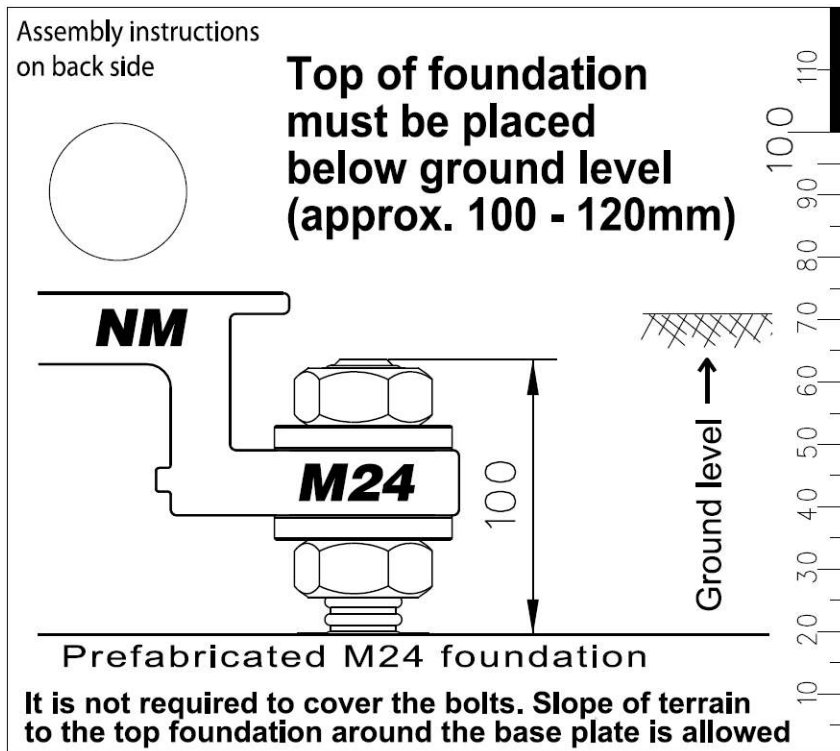


By JSK - Approved on behalf of the manufacturer by Lars Tvette, Vingrom 01.03.2020

### Assembly Instructions:

Yellow plastic with installation instructions that come mounted on Norsafe Mast M24 prefabricated foundation. The plastic is fitted with the plastic cap that seals the hole where bolts should be installed:

#### Front:



#### Back:

Assembly: **NM190-60 and NM290-100 (M24)**

1. Check with for example a plank laid over the hole and the ruler on the front that the foundation is mounted at the correct height so that the bolts will not stick up above the ground.
2. Bolts are screwed hard all the way down in to the foundation.
3. Remove the top four nuts and washers.
4. Levelling is made on the four lower nuts.
5. Place the mast with base plate and mount washers and nuts. The nuts are coated with Gleitmo 605 to prevent the stainless nuts to seize. Additional lubrication is not normally necessary. Do not use oil or grease.

Install the nuts with **torque wrench (754Nm)** or **impact wrench (width 36mm)** to get enough torque; beat until the nut is no longer moving.

Correctly installed =

**Top of the base plate must show above ground**

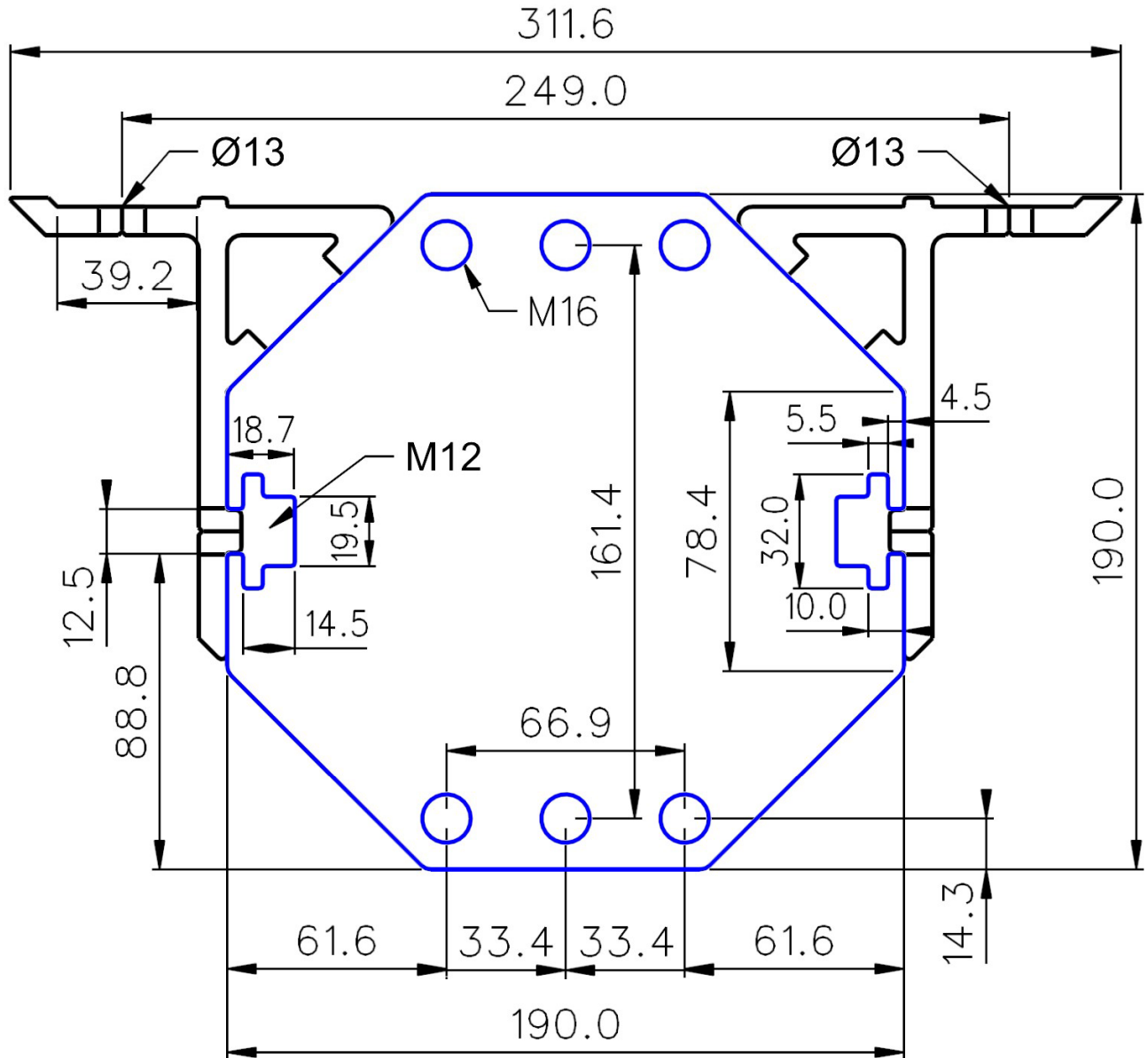
**Top of foundation must NOT show above ground**

**No. 010.005-CPR-2020.03.01**



By JSK - Approved on behalf of the manufacturer by Lars Tvette, Vingrom 01.03.2020

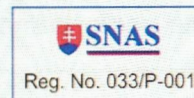
**Drawing with dimensions for attachments on the top (M16) and on the side (M12):**







Výskumný ústav dopravný, a. s.  
Veľký Diel 3323, 010 08 ŽILINA



Autorizovaná osoba SKTC-125 | Autorizovaná osoba SK05 | Notifikovaná osoba 1358  
Authorized Body SKTC-125 | Authorized Body SK05 | Notified Body 1358

## Certificate of constancy of performance

**1358 – CPR – 0113/1**

In compliance with *Regulation 305/2011/EU of the European Parliament and of the Council of 9 March 2011 (the Construction Products Regulation or CPR)*, this certificate applies to the construction product

### Norsafe® Mast

**types: NM 89-7,5; NM 120-15; NM 150-30; NM 190-45; NM 190-60; NM 290-100**

is a support structure supplied for fixed vertical road traffic signs with the passive safety.

Placed on the market under the name or trade mark of

**EUROSKILT AS  
Paul A Owrens Veg 46  
2607 Vingrom  
Norway**

and produced in the manufacturing plant

**EUROSKILT AS  
Paul A Owrens Veg 46  
2607 Vingrom  
Norway.**

This certificate attests that all provisions concerning the assessment and verification of constancy of performance described in Annex ZA of the standard

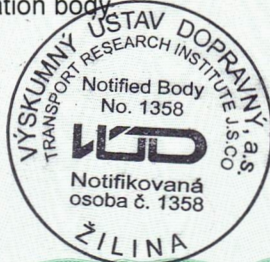
**EN 12899 - 1: 2007**

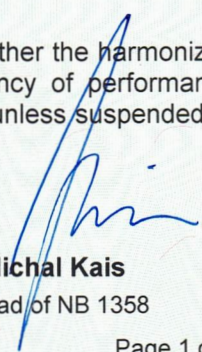
under system 1 for the performances set out in this certificate are applied and that the factory production control conducted by the manufacturer is assessed to ensure the

### constancy of performance of the construction product.

This certificate was first issued on 25/11/2013 and will remain valid as long as neither the harmonized standard, the construction product, the assessment and verification of constancy of performance methods nor the manufacturing conditions in the plant are modified significantly, unless suspended or withdrawn by the notified product certification body.

Žilina 22/10/2020



  
**Michal Kais**  
Head of NB 1358

124782

Page 1 of 2

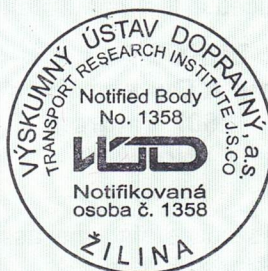


## The performance of the construction product

Parameters	Norsafe® Mast types					
	NM 89-7,5	NM 120-15	NM 150-30	NM 190-45	NM 190-60	NM 290-100
Resistance to horizontal loads						
Maximum bending moment M <sub>u</sub> [kNm]	7,75	15,42	30,07	47,33	61,31	117,17
Stiffness for bending EI [kNm <sup>2</sup> ]	107,33	287,83	701,58	1398,72	1811,96	5285,53
Maximum moment for torsion T <sub>u</sub> [kNm]	9,30	18,50	36,08	56,79	73,57	140,60
Stiffness for torsion GI <sub>t</sub> [kNm <sup>2</sup> ]	82,80	222,04	541,22	1079,01	1397,80	4077,41
Performance under vehicle impact						
Passive safety (EN 12767:2019)	100-NE-B-R-SE-MD-NR			100-NE-C-R-SE-MD-NR		
Durability						
Corrosion resistance	SP2			SP2		
Resistance to penetration of dust and water	Pass			Pass		

Note: - the manufacturer determines numbers and type of the supports by calculation.

Žilina 22/10/2020



**Michal Kais**  
Head of NB 1358





**Statens vegvesen**  
Norwegian Public Roads  
Administration

Euroskilt AS  
Postboks 92 Forus  
4064 STAVANGER  
Norge

Executive unit:  
Directorate of Public Roads

Contact person/direct line:  
Matteo Pezzucchi - 22073246

Our reference:  
2011/006855-025

Your reference:

Our date:  
15.04.2011

## **Approval of "Norsafe" (Euroskilt AS) passive safe support**

With reference to the Norwegian approval letter Journal nr 2004/050368-045 dated 12 March 2009 and the application from Euroskilt AS about approval of "Norsafe" passive safe support dated 23<sup>rd</sup> October 2008.

"Norsafe" supports are divided in two series:

1. Alluminium supports with octagonal profile (190 mm width) fixed with M16 bolts. Furthermore a product family is defined (NM190 series) including NM190-60 fixed with 6 breaking bolts and NM190-45 fixed with 4 breaking bolts.
2. Alluminium supports with width less than 190mm fixed with M12 bolts. This includes: full scale test support NM150-30 with octagonal profile fixed with 6 breaking bolts, NM120-15 and NM89-7, 5 fixed with 4 breaking bolts.

The application includes the following documents (tests carried out at the Nordic Test Center in Lista, the 3<sup>rd</sup> and 4<sup>th</sup> July 2008):

- Test report nr NTSr-08-006/A, on Euroskilt mast NM 290 (35 km/h)
- Test report nr NTSr-08-007/A, on Euroskilt mast NM 290 (100 km/h)
- Test report nr NTSr-08-008/A, on Euroskilt mast NM 150 (35 km/h)
- Test report nr NTSr-08-009/A, on Euroskilt mast NM 150 (100 km/h)
- Videos and pictures from the tests

Tests 08-006/A and 08-007/A are carried out with 6,5 m height mast and total weight of 268,1 kg. (Support + foot plate 120,6 kg / sign + brackets 137,5 kg)

Tests 08-008/A and 08-009/A are carried out with 5 m height mast and total weight of 140,3 kg. (Support + foot plate 52,9 kg / sign + brackets 87,4 kg)

Postal address  
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Vegdirektoratet  
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N-0033 Oslo  
NORWAY

Telephone: +47 02030  
Telefax: +47 22 07 37 68  
firmapost@vegvesen.no

Office address  
Brynsengfare 6A  
0667 OSLO

Address for invoices  
Statens vegvesen  
Regnskap  
Båtsfjordveien 18  
N-9815 VADSØ, NORWAY  
Telephone: +47 78 94 15 50  
Telefax: +47 78 95 33 52

Drawing (Rev. A):

NM 290-100 nr. EUV5113

NM190-60 nr. TOV0280

NM190-45 nr. TOV0279

NM150-30 nr. TOV0278

NM120-15 nr. TOV0279

NM 89-7,5

Foundations:

NM89-7,5 275 kg (Top: 0,361m, Bottom: 0,386m Height: 1,1m )

NM120-15 440 kg

NM150-30 540 kg

NM190-45 800 kg

NM190-60 950 kg

NM290-100 1730 kg

The tests are carried out in accordance with NS-EN 12767; test's results meet the requirements of the specified speed categories.

Norsafe passive safe supports receive the following approval:

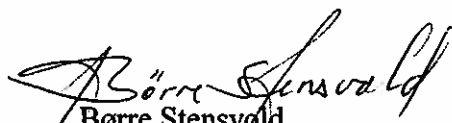
- Norsafe passive safe support type NM290-100 with height 6,5 m and total weight 268,1 kg and NM190-60 NM190-45 in the same product family are approved in the 100,NE,2 performance class.
- Norsafe passive safe support type NM150-30 with height 5 m and total weight 140,3 kg and NM120-15, NM 89-7,5 in the same product family are approved in the 100,NE,3 performance class.

The acceptance is limited to use within Norwegian Public Roads Administration.

In case of any discrepancy between the English and the Norwegian approval letter, the Norwegian version should be act as the original.

Bridge Section

Regards

  
Børre Stensvold  
Bridge Director

  
Otto Kleppe



# Tightening Torque and Force

## Bumax 88, Bumax 109 and A4-80



### Steel grades

Bulten Stainless	EN	ASTM
Bumax® 88	1.4435	316L
Bumax® 109	1.4435	316L
A4	1.4401	316

### Document

Calculation for tightening 20 % extra  
to increase the preload.

### General characteristics

Bumax®88 and 109 is a molybdenum-containing austenitic  
stainless steel to get improved corrosion resistance.

The addition of molybdenum provides improved  
resistance to pitting and crevice corrosion.

By choosing a low carbon content material the risk of  
getting chromium carbide precipitation is significant  
reduced.

### Chemical composition

Bulten Stainless	EN	ASTM	Typical composition <sup>1</sup> , %			
			C	Cr	Ni	Mo
Bumax® 88	1.4435	316L	0,02	17,3	12,7	2,7
Bumax® 109	1.4435	316L	0,02	17,3	12,7	2,7
A4	1.4401	316	0,05	16,8	10,7	2,2

1 Based upon facts from Avesta Sheffield Corrosion Handbook (ISBN 91-630-8118-0)

### Pitting Resistance Equivalent (PRE)<sup>2</sup>

Bulten Stainless	EN	ASTM	Average	Min	Max
Bumax® 88	1.4435	316L	26,2	24,7	28,4
Bumax® 109	1.4435	316L	26,2	24,7	28,4
A4	1.4401	316	24,06	22,6	27,9

2 PRE = %Cr + 3.3 x %Mo + 16 x %N

### Mechanical Properties

Bulten Stainless	EN	ASTM	Typical value, MPa		
			Tensile	Yield	Elongation
Bumax® 109	1.4435	316L	1105*	1030*	0,41*
Bumax® 88	1.4435	316L	950*	856*	0,73*

\* Based upon the actual average from more than 1500 batches produced by Bufab Bulten Stainless

### Mechanical Properties

Bulten Stainless	EN	ASTM	Minimum value, MPa			
			Tensile	Yield	Elongation	Dimension
Bumax® 88	1.4435	316L	800	640	0,3 X D	M3-M36
Bumax® 109	1.4435	316L	1000	900	0,2 X D	M6-M20
A4-80	1.4401	316	800	600	0,3 X D	M4-M24

## Recommended Torque

Bulten Stainless	EN	ASTM	Dimension	Normal tightening Torque MV in Nm 1), 3)	Elevated Torque 5)	Normal preload applied KN 2)	Elevated Preload applied KN +20% 4)
Bumax® 88	1.4435	316L	M20	385	462	102	122
Bumax® 88	1.4435	316L	M24	665	798	181	217
Bumax® 109	1.4435	316L	M20	481	577	128	153
Bumax® 109	1.4435	316L	M24	N/A	N/A	N/A	N/A
A4-80	1.4401	316	M20	364	436	96	115
A4-80	1.4401	316	M24	629	754	138	165

1) The Mv recommendations refer to burr-free surfaces lubricated with a good quality lubricant.

2) The preload applied is calculated as 65% of Rp 0,2 but in practice the value can be expected to vary between 50-80%

3) The Mv recommendations are calculated assuming a coefficient of friction of 0,16 which requires a good quality lubricant.

4) The preload applied is calculated as 65% of Rp 0,2 + 20 % Preload, but in practice the value can be expected to vary between 50-80%

5) Torque is increased by 16,5 - 17 %

## Failure and Yield Load KN

Bulten Stainless	EN	ASTM	Dimension	Failure Load KN	Yield Load KN	Normal preload applied 2)	Elevated Preload applied KN +20% 4)
Bumax® 88	1.4435	316L	M20	196	157	102	122
Bumax® 88	1.4435	316L	M24	282	226	181	217
Bumax® 109	1.4435	316L	M20	245	196	128	153
Bumax® 109	1.4435	316L	M24	N/A	N/A	N/A	N/A
A4-80	1.4401	316	M20	196	147	96	115
A4-80	1.4401	316	M24	282	212	138	165

2) The preload applied is calculated as 65% of Rp 0,2 but in practice the value can be expected to vary between 50-80%

4) The preload applied is calculated as 65% of Rp 0,2, taking consideration to Elevated Torque by 20 %,

but in practice the value can be expected to vary between 50-80%

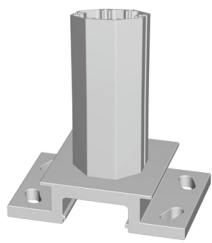
## Tightening torque and Force - Disclaimer

These recommendations are based upon information from steel manufacturer and from what we tested and are believed to be accurate. However, since the resistance of metals, can be affected by concentration, temperature, presence of other chemicals, and other factors, this information should be considered as a general guide and not an unqualified guarantee. Ultimately, the customer must determine the suitability of material used in various solutions. The elevated calculations are not statistic secured and must be tested and evaluated by our customer as a general guide.

General information about torque and force can be found on our webpage <http://bumax.se>







# Norsafe<sup>®</sup> Mast



## A Vision Zero Mast<sup>®</sup>

**Norsafe Mast is a fourth generation signpost, designed to meet the Zero Vision goals.**

The Norsafe Mast is only made of non corrosive materials / aluminium and stainless steel (316 / A4) with an extensive lifespan. The mast is especially good to meet the demands in a slope due to a new light zero vision base plate instead of Slip-base.

The mast is tested and approved EN 12767. Norsafe Mast has many fixing solutions.

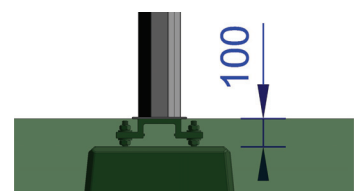
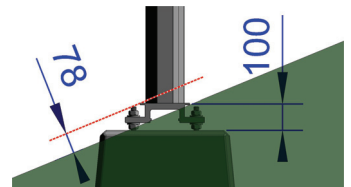
Norsafe Mast is low cost, maintenance free with a long life span and gives more signs for the money!

Norsafe Mast is an aluminium deformation mast with break-off bolts. It does not need any Slip-base or equivalent solutions. That means that the light and soft mast first deforms and then does the bolts break off like the other third generation masts.

In addition to keeping the characteristics of the older types of aluminium masts on the market, this mast has a number of new qualities.

This mast has gone further, an entire generation further, with the following improved qualities:

1. The mast is designed for assemblies in slopes with the new zero vision base plate. It has a special shape that assures that there are no remaining parts that can hit the undercarriage of the car after a collision in a slope, as the case can be with older masts.
2. The mast can safely be hit from any direction; there are no foundation bolts sticking up to stop the mast in any directions.
3. Lower weight with light aluminium base plates – no heavy steel base plates. This makes it less demanding to assemble the mast by the road and in most cases it can be assembled without the use of a crane.
4. No danger for ice-expansion due to open water draining shapes for the bolt in the aluminium profile, due to this no water tight top-plate or cap is needed.
5. There are shapes in the mast profile for both standard bolts and T-bolts to make it easy to fasten; the customers can easily make their own customizations or fasteners for electrical boxes, cameras etc.
6. The mast can easily be cut in any length; you do not have to adjust the cutting length to any lattice.
7. Longer lifespan, only aluminium and stainless steel (316 / A4), no galvanized steel parts with short lifespan.
8. It has hidden foundation bolts so that the mast can be used in city environments on sidewalks etc. There is only a flat aluminium plate showing above ground. The foundation top is approx. 10cm under ground.
9. Optimized foundations with increased ground surface area and increased stability, with a wider 20cm high bottom section that uses the surrounding soil efficiently to stabilize it further. At a lower cost than older foundations. It is also longer in the direction it must support the highest load. They are not deeper than 80cm so they can be assembled over shallow cables, beside mountains and over rock. All foundations can support the full capacity of the mast so no calculations or selections for the foundations are needed.
10. Norsafe Mast can be delivered with a break off plug, an IP68 flood safe electrical plug that releases horizontally in a collision. Both the plug and the cables are well protected inside the mast. The mast can also be delivered with pre-fitted connection plugs, and then it is just plug & play on the road.
11. Hi torsional strength ( $M_T$ ). This is an important quality, when calculating the torsion you get when the wind is not blowing perpendicularly to the sign and the load point from the wind moves 1/4 of the sign width. Where you need two lattice masts, you can often use a single Norsafe Mast due to the high torsional strength. The calculation of askew wind load resulting in torsion is often called the W/4 rule. It is based on physical facts and is mandatory according to both national standards and Eurocode (EN 1991-1-4 p.7.4.3)
12. The mast is climb protected.



Johnny Sköld 04.09.2013

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