indra navia

AIRPORT SOLUTIONS

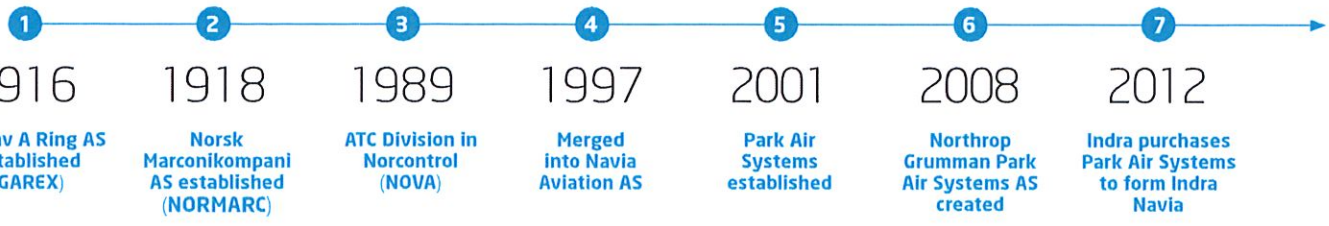
NORMARC Frangible Masts by AmpliSafe®

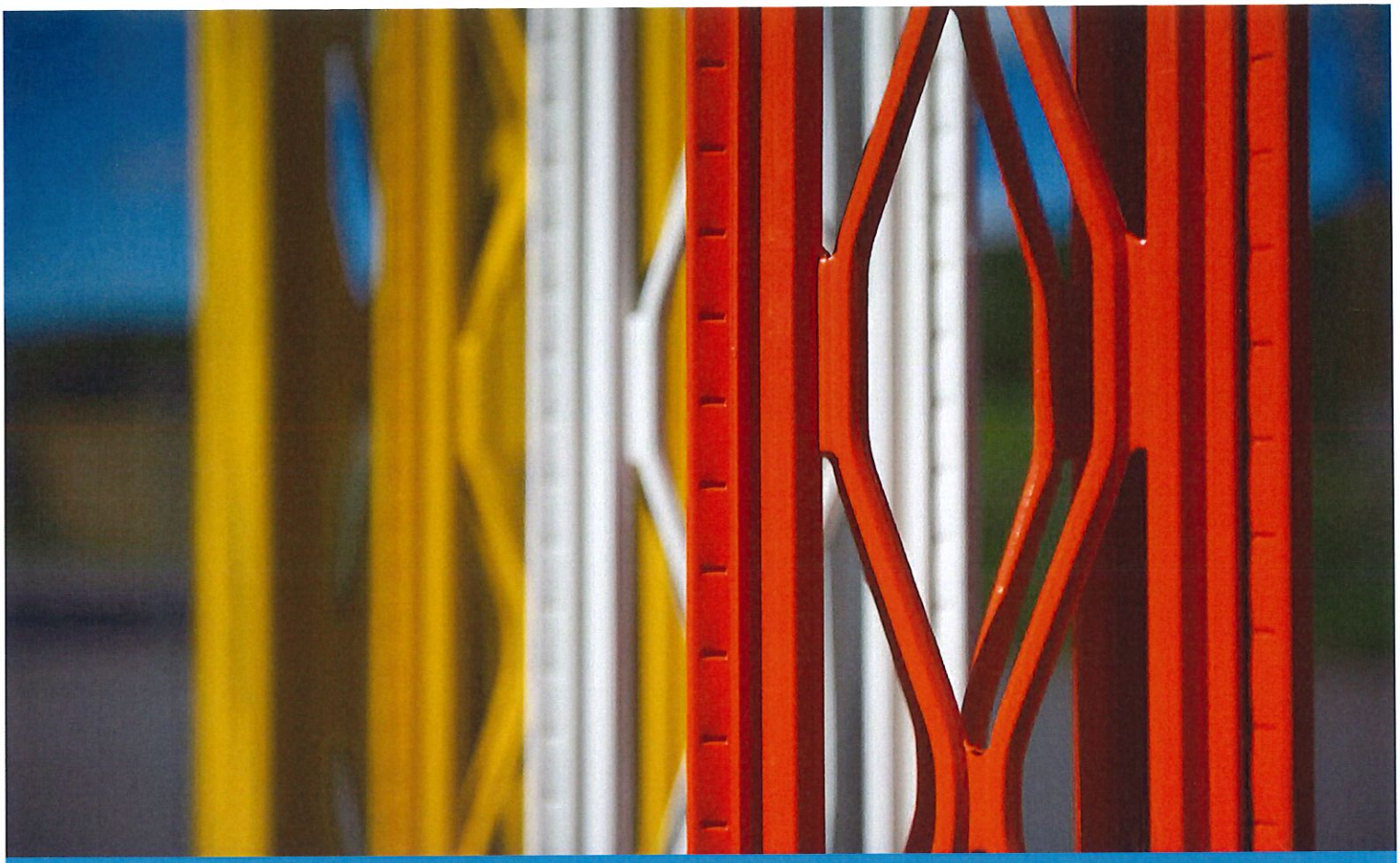
indranavia.com

THIS IS INDRA NAVIA

Indra Navia is a dedicated air traffic management technology company. We design, produce, integrate and support airport communication, navigation and tower systems. Our highly customized solutions deliver outstanding long-term value under the most demanding conditions. More than 1 200 airports around the world rely on our GAREX, NORMARC and InNOVA products.

COMPANY HISTORY





NORMARC Frangible Masts by AmpliSafe®

is a product family of frangible aluminium-masts, offered by Indra Navia AS in cooperation with Normeka AS.

Normeka AS is a subsidiary of Indra Navia AS, and has manufactured equipment for localizer systems for airports since 1980 - mainly as a sub-supplier to Indra Navia AS. Normeka AS is a full service mechanical subcontractor with a focus in manufacturing aluminium products.

FRANGIBILITY

At an airport, there is a lot of equipment that is necessary in order for operations to be carried out successfully.

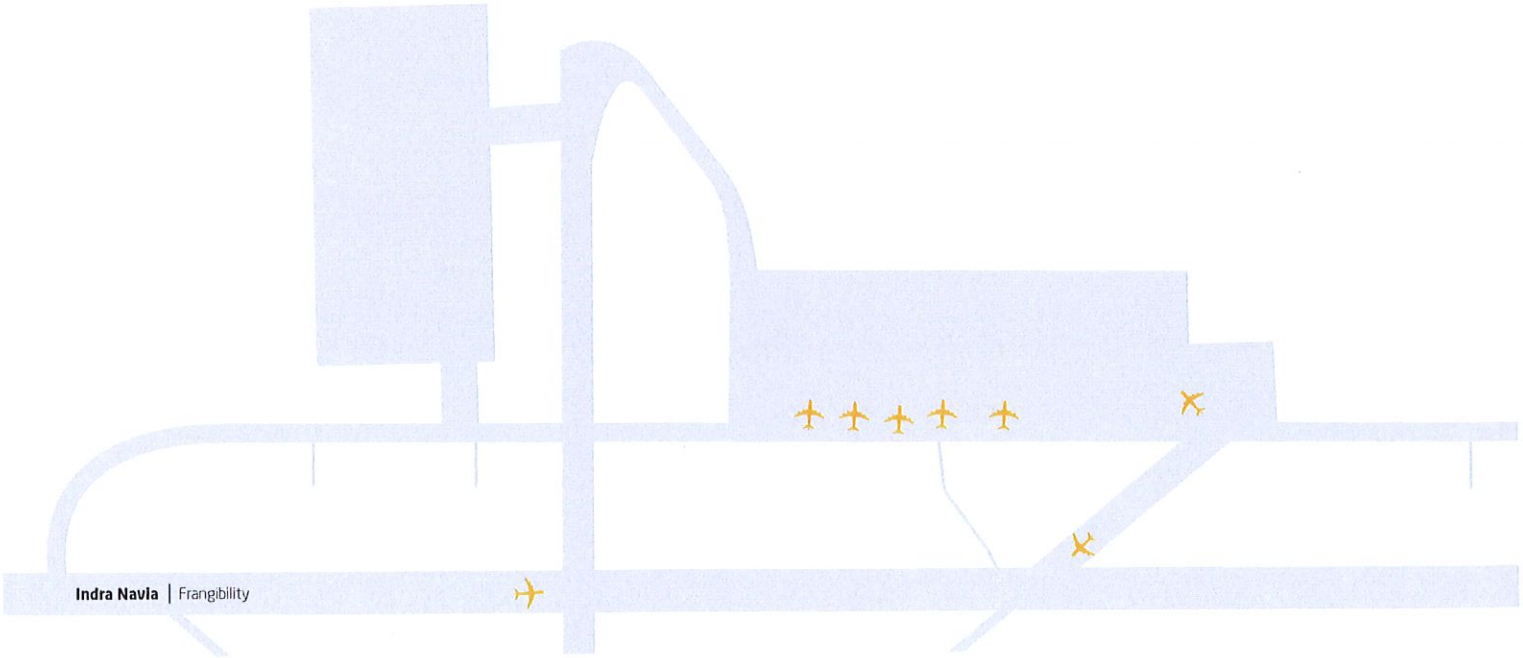
The problem is that the masts often used to elevate this equipment are a possible hazard to any airplane which, for any reason, is off course. In order to reduce the possibility for accidents it has been decided that masts that might be hit by an aircraft during takeoff/landing/taxiing must be frangible to the greatest extent possible.

Definition of Frangibility

ICAO Doc 9157 AN/901 – "Aerodrome Design Manual, part 6, Frangibility" defines frangibility. A frangible object should have low mass and be designed to break, distort or yield on impact. This can be verified by FEA (Finite Elements Analysis) or full-scale testing. Certain criteria have to be met in order to claim that a structure is frangible.

NORMARC Frangible Masts by AmpliSafe®, have been simulated and verified by the Swedish company, DYNAmore Nordic AB.

The conclusion is that the NORMARC Frangible Masts by AmpliSafe® fulfill the requirements given in the above mentioned ICAO document, and the masts are considered frangible.



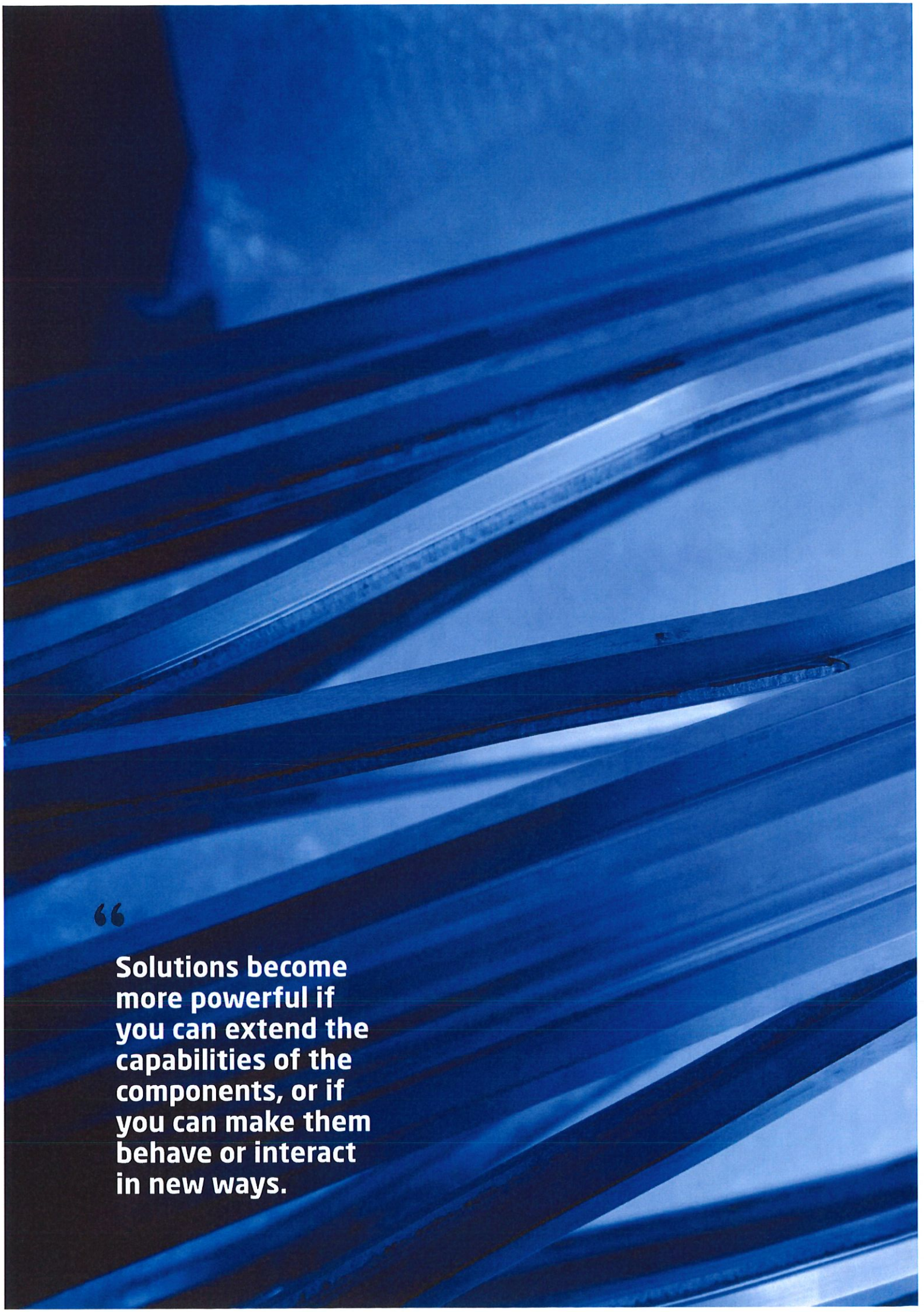
Normeka AS is a full service mechanical subcontractor with a focus in manufacturing aluminium products.

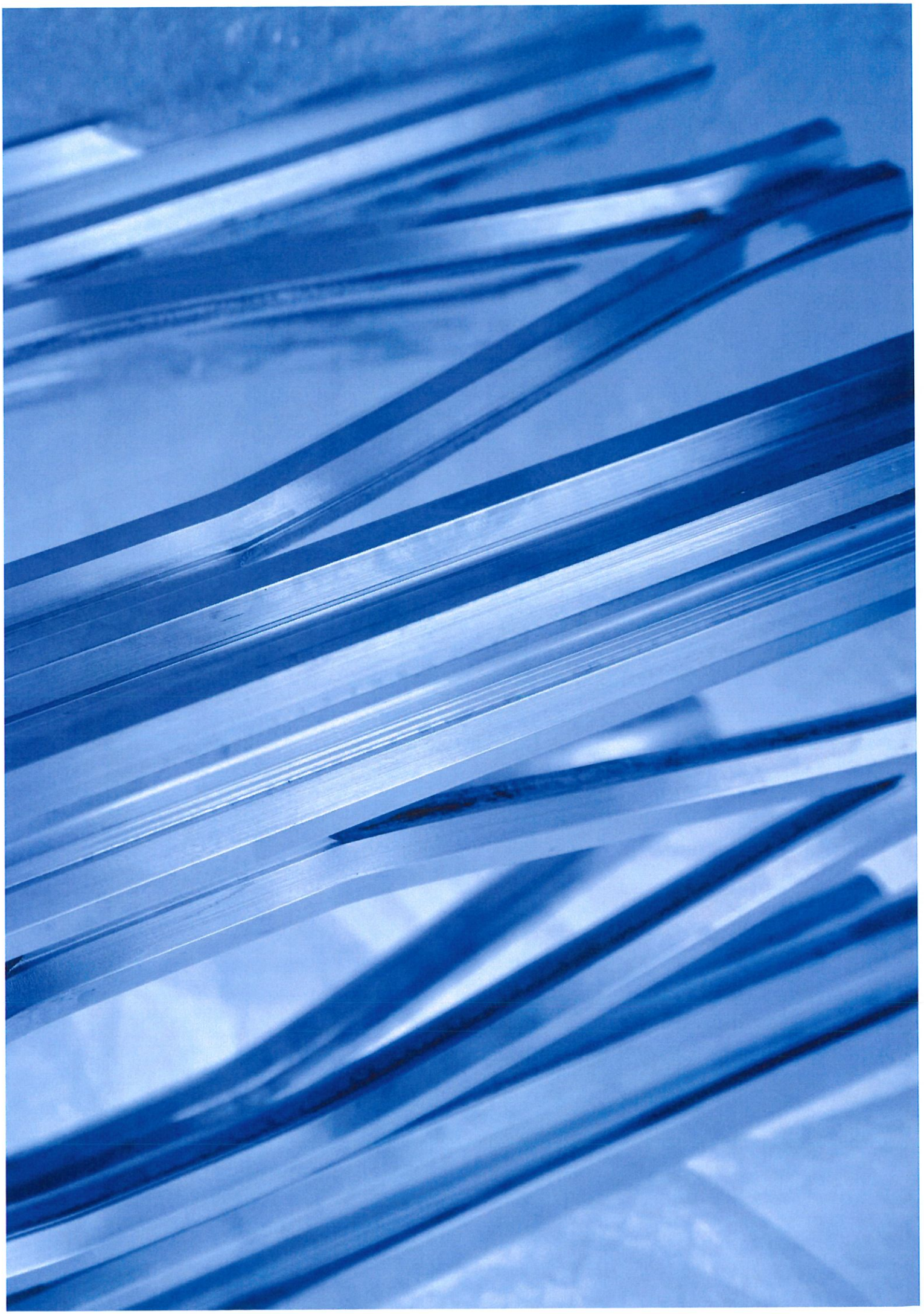
Description of NORMARC Frangible Masts by AmpliSafe®

NORMARC Frangible Masts by AmpliSafe® can be used in many applications such as approach lights, antennas, meteorological equipment, wind socks etc. The mast itself will be the same, but the interface between the mast and the equipment will be tailor-made.

NORMARC Frangible Masts by AmpliSafe® are made in four different sizes. The size of the mast is determined by:

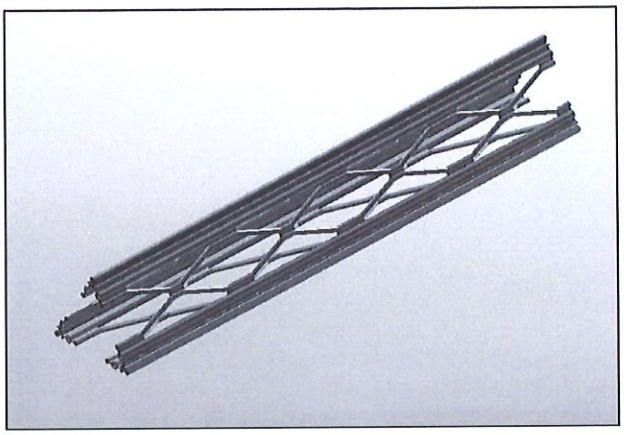
- the height of the mast
- the equipment (size, weight) to be mounted in the mast.


“
Solutions become more powerful if you can extend the capabilities of the components, or if you can make them behave or interact in new ways.



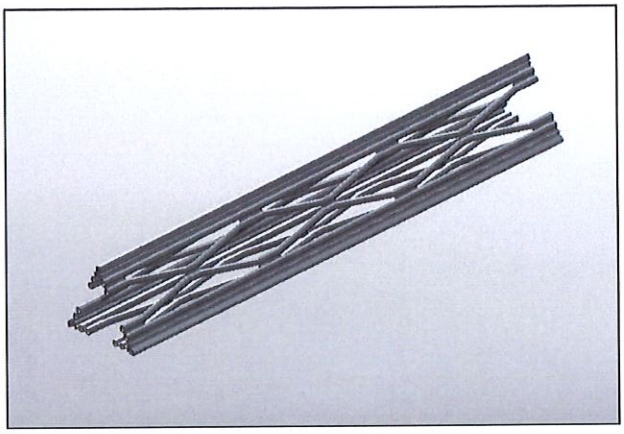
The Four Masts

1 3S195



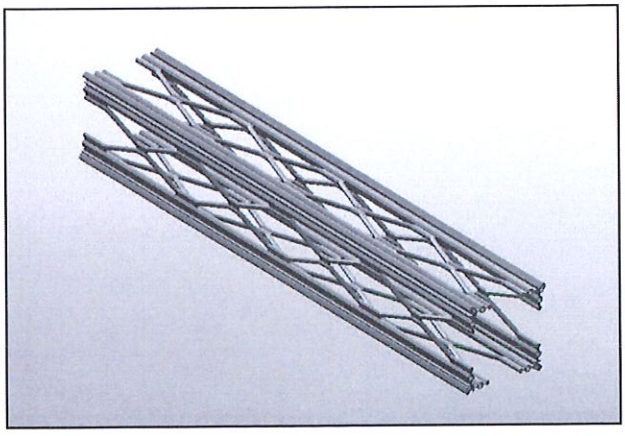
This is the smallest mast, it has a triangular cross-section where the side wall is 195mm. This mast is generally used for one or two approach lights (or similarly sized equipment), height of the mast up to 4 m.

2 3M240



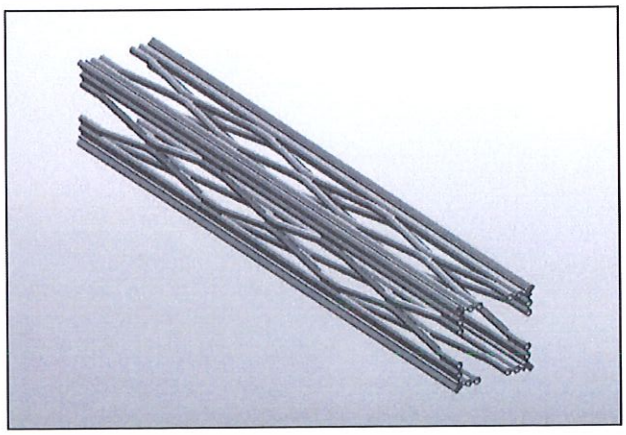
Also a triangular mast, with a slightly larger side wall; 240 mm. It is used as a base for the 3S195 mast when the one or two approach lights should be mounted on a mast up to 10 m. The first 6 m will then be the larger 3S240, and the upper 4 m will be the smaller 3S195 4S195. This is a mast with square cross-section, side wall 195 mm. It is used for up to 5 approach lights and a Running Rabbit light (or similarly sized equipment), height of mast up to 5 m.

3 4S195



This is a mast with square cross-section, side wall is 195 mm. This mast is normally used as moderate tall mast with more than two lights or as top-section when combined with 4M240.

4 4M240



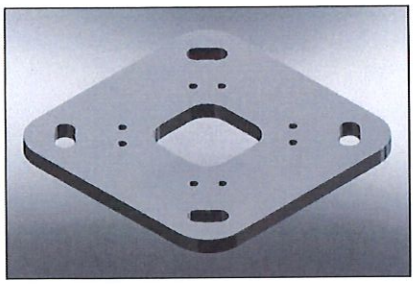
Also a square mast, with a slightly larger side wall; 240 mm. It is used as a base for the 4S195 when the requested height of the square mast exceeds 5 m. Maximum height for the combination 4M240 and 4S195 is 12 m. This combination of masts is also applicable when the requested height for the 3M/3S combination exceeds 10 m.

Description of Accessories

From Bottom to Top

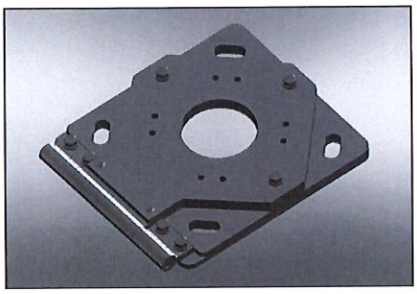
Base Plate

Each mast is supplied with at base plate mounted to the lower end. The base plate is made of aluminum. 3 holes (triangular masts) or 4 (square masts) will be used to mount the mast to the foundation. The base plate is made of aluminum and there are 4 unique base plates to the 4 mast types.



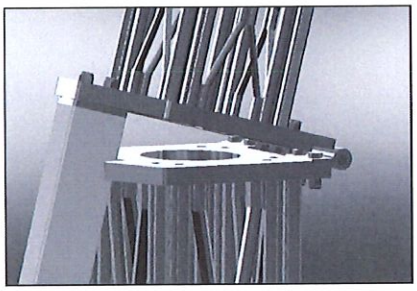
Base Plate With Hinge

Normally the base plate is fixed, but it can be supplied with hinge. The hinge will ease the maintenance of the equipment mounted in the top of the mast because it is possible to swing down the mast. Thus no climbing or lifting is needed.



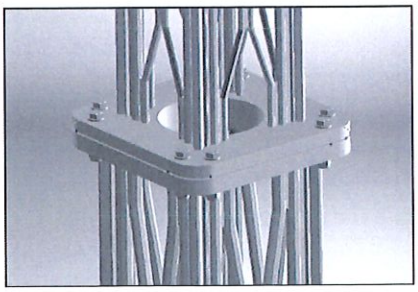
Hinged Connection Plate Between M and S Mast

Taller masts, which are compriseed of one small and one medium mast, will normally be supplied with a hinged connection plate. The reason for the hinge is the same as described above, but the hinge is placed in the connection plate between the two masts because a hinged tall mast will be very heavy to swing down and up again if hinged in the base. A middle hinge will normally be used in masts exceeding a 5 m height. The mast will be supplied with a rope arrangement in order to securely lower the upper part down. The lowering rope arrangement can be operated by two men. Normally there will be one rope supplied for each site.



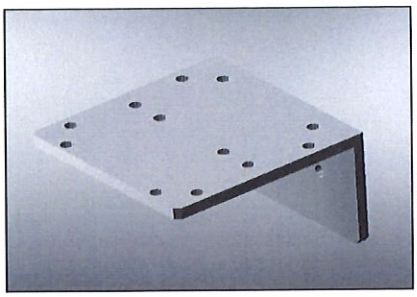
Connection Plate Between M and S Mast

Some customers will have easy access to masts with a lift. In such cases, it will be cheaper to supply a mast without a middle hinge, only a connection plate.



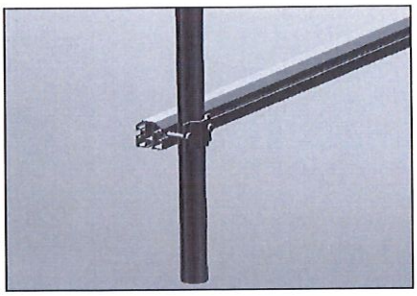
Top Plate

The top plate will always be mounted on top of the mast. Its geometry will depend on the actual equipment which the customer wants to place in the top of the mast. This will be manufactured according to customer specifications.



Crossbar

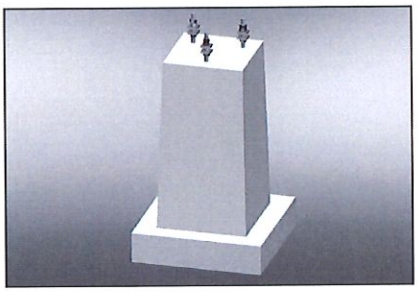
A special profile might be mounted horizontally on top of the mast. The mast itself is very stable, and when mounting a crossbar (which can hold up to 6 lamps, and be up to 5,5 m long) the number of masts can be kept as low as possible. Vertical Ø60 aluminum pipes are mounted to the horizontal traverse, each of them holding one lamp.



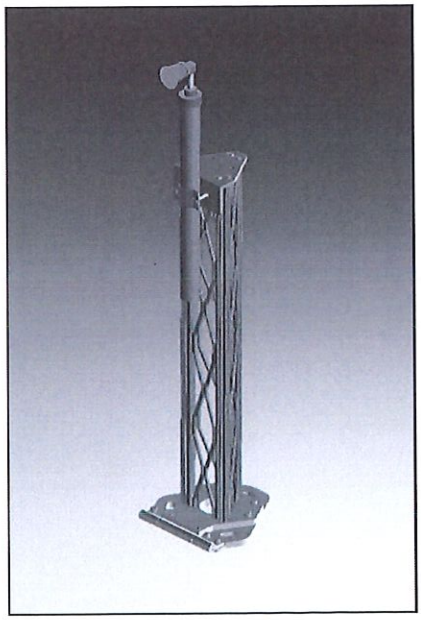
Foundation

The masts shall be mounted on concrete foundations. The foundations must have a certain size to withstand the bending moment imposed on it from the mast. Drawings of typical concrete foundations are enclosed in the last chapter. Normally the foundations are casted on site. The foundations will hold 3 (for triangular masts) or 4 (for square masts) foundation bolts. We supply the necessary template in order to secure correct position of the bolts.

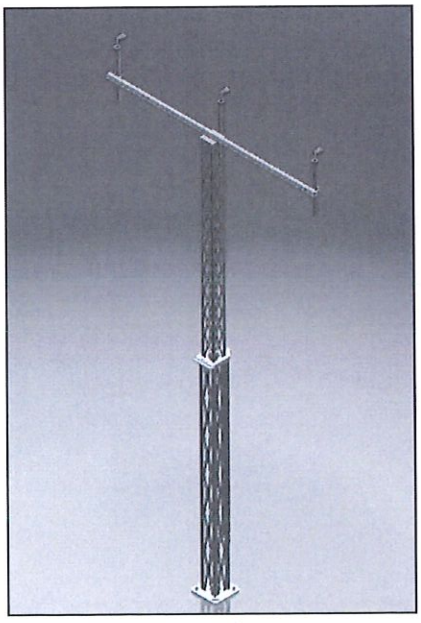
Normally not included in the delivery.



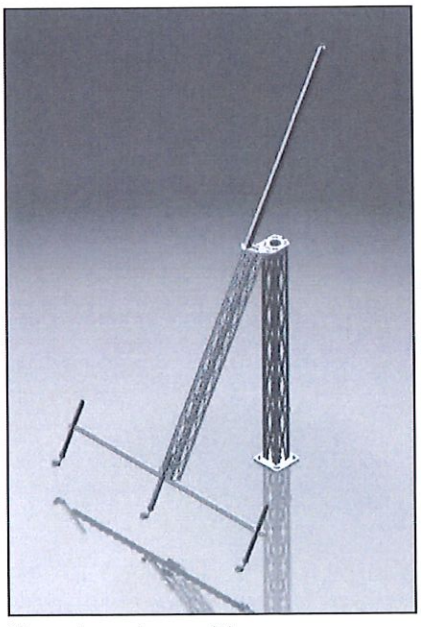
Typical Configurations of Approach Lights



Single light mounted on 3S mast. Hinge in the base plate.



Three lights mounted on a mast comprising 4M as the lower section, 4S hinged as the upper section.



Hinged service position.

Technical Specifications of Main Components

Description	Size	Weight	Material	Max bending moment
3S mast	Sidewall 195mm	5.8 kg/m	Aluminum 6063	16,1 kNm
3S footplate	Triangular	2,9 kg	Aluminum 6082	
3S footplate w/hinge		6,7 kg	Aluminum 6082	
3S top-plate		1,0 kg	Aluminum 6082	
4S mast	Sidewall 195mm	7,7 kg/m	Aluminum 6063	29,1 kNm
4S footplate	Square	5,2 kg	Aluminum 6082	
4S hinged footplate		8,9 kg	Aluminum 6082	
4S top plate		1,4 kg	Aluminum 6082	
3M mast	Sidewall 240mm	11,1 kg/m	Aluminum 6063	31,4 kNm
3M footplate	Triangular	5,9 kg	Aluminum 6082	
3M-3S middle hinge		9,2 kg	Aluminum 6082	
3M top plate		2,0 kg	Aluminum 6082	
4M mast	Sidewall 240mm	14,3 kg/m	Aluminum 6063	83,7 kNm
4M footplate	Square	9,0 kg	Aluminum 6082	
4M-4S middle hinge		9,4 kg	Aluminum 6082	
4M top plate		2,5 kg	Aluminum 6082	
Top traverse (for mounting >1 lamp/mast)		3,55 kg/m	Aluminum 6063	Max length 5500mm
Light fitting pipe	Ø60mm x 700	1,2 kg	Aluminum 6060	

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