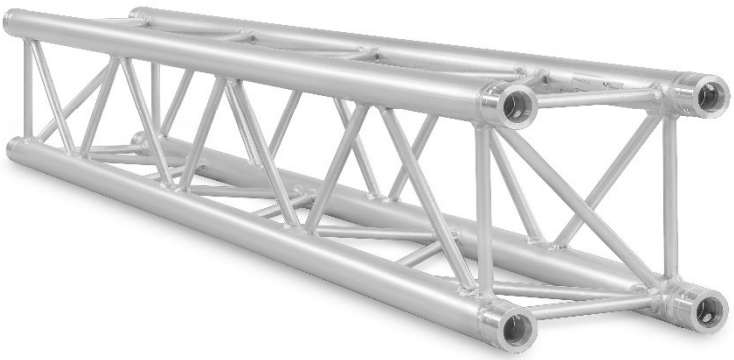
Milos. Works better.

MILOS

Trusses

User manual

Part 1: General instructions



Original instructions

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We have made every effort to ensure the accuracy of this manual. No liability will be accepted for errors. We reserve the right to change or alter our products or manuals without prior notice.

If you have a warranty claim, malfunction or spare part inquiry, contact your point of sale or the manufacturer.

If you have comments or improvement ideas for this document, please contact us at the e-mail address on the back cover. All comments and ideas will be carefully considered in the future development of the product or this document.

Contents

Change history

Issue	Date	Changes
1	July 2019	First issue
2	November 2023	Second issue
3	March 2025	Third issue

1 Introduction

This manual is intended for truss owners, providers, skilled riggers and any person who has been trained in working safely with trusses.

This manual is part 1 of the user manual. The user manual consists of the following parts:

- Part 1: General instructions
- Part 2: Product-specific instructions

This manual must be read in conjunction with Part 2: Product-specific instructions of the user manual. If there are discrepancies between part 1 and part 2, the information given in part 2 is the information that applies to the product and overrides the information given in part 1.

This manual assumes that you have been trained, or work under the control of a competent or qualified person who has been trained, in safety and assembly.

1.1 About this product

MILOS trusses are structural modules designed to be repeatedly assembled and disassembled to carry loads in temporary or permanent installations. Depending on the application, MILOS trusses can be referred to as lifting accessories or construction products. For information on the related standards, see Section 1.5.

We have paid special attention to product safety when designing the product.

The manufacturer is not liable for indirect consequential damage or financial loss. The manufacturer is not liable for any changes made to the product or for any damage resulting from such changes.

1.2 Related information

For more information on the product, see www.milossystems.com/products/truss/.

1.3 About this manual

Before working with the product, read this manual carefully and pay attention to the information provided. Use this manual to familiarise yourself with the product, its proper use and the safety regulations.

1.3.1 Safety conventions

Indicates a hazardous situation which, if not avoided, will result in death or serious injury. This signal word is limited to the most extreme situations.

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

Indicates information that is considered important but which is not hazard-related.

1.4 Terminology

Trusses and truss modules are referred to by the term "truss" in the following.

Term	Definition
Abrasion	Loss of material due to wear.
Bent member	A component or assembly that has permanent deviation from the intended centre line.
BM8 connector	A BM8 connector is a type of connector that has the following parts: male connector, female connector, conical truss pin, rubber washer, washer and nut. See Figure 1.
Cell clamp	A device for supporting objects or fastening them together.
Competent person	A person who is capable of identifying existing and predictable hazards in the workplace and who is authorised to take prompt corrective measures to eliminate them.
Conical connector	A conical connector is a type of connector that has the following parts: male connector, female connector, conical truss pin and R-clip. See Figure 2.
Conical truss pin	A pin used with a conical connector. See Figure 2.
Connecting hardware	Connecting components such as straight pins, conical pins, bolts, washers and R-clips.
Connection	A connection is used to connect two trusses together. There are two kinds of connections: conical connections and pin-fork connections. See Figure 2 and Figure 3.
Connector	A connector is a part of a connection. There are two kinds of connectors: conical connectors and pin-fork connectors.
Crack	A crevice-type discontinuity in a material.
Cross brace	An element of a truss module that, in contrast to an end brace, vertically or horizontally connects the main chords and is at a 90-degree angle to the main chords.
Diagonal	An element of a truss module that is not at a 90-degree angle to the main chords.
Duo truss	Truss consisting of two main chords arranged vertically above one other.
End brace	An element of a truss module that is located at the end of the truss module, directly after the connector, at a 90-degree angle to the main chords.
Female connector	A part of a conical connector. See Figure 2.
Female fork connector	A part of a pin-fork connector. See Figure 3.
Identification sticker	A sticker on the product containing several items of information about the product.
Internal diagonal	An element of a rectangular or square truss that diagonally connects the main chords at a 90-degree angle to the main chords.
Main chord	An element of a truss that carries the forces associated with bending moments, axial forces or a combination of them.
Male connector	A part of a conical connector. See Figure 2.

Male fork connector	A part of a pin-fork connector. See Figure 3.
Member	See "Truss member".
Node point	A location where the centre line of the main chord intersects with the centre line of the diagonals or end braces.
Ovalisation	Deformation of a circular pipe cross-section into an oval, measurable by the deviation of two outer diameters measured at a 90-degree angle to each other.
Pin hole	A hole in the connector that accommodates a conical or straight truss pin.
Pin-fork connector	Used for connecting trusses. See Figure 3.
Qualified person	A person who, by possession of a recognised degree or certificate of professional standing, or who by extensive knowledge, training and experience, has successfully demonstrated the ability to solve problems relating to the subject matter or work. A qualified person supervises the competent persons. See "Competent person".
R-clip	A clip used for securing a truss pin or clevis pin, for example. See Figure 2 and Figure 3.
Repetitive use	Assembling and disassembling the same modules or assemblies on multiple occasions.
Single-span girder	A single truss module or a composition of several connected truss modules, supported at both ends of the span.
Straight truss pin	A pin used with a pin-fork connector. See Figure 3.
Truss member	A part of the truss module.
Truss module	Lattice structure intended to be used on its own or in combination with other modules.
Truss pin	A pin used for connecting trusses. See Figure 2 and Figure 3.
Truss structure	An assembly made of truss modules.
User	A person or a company who or which assembles or uses modules or systems.

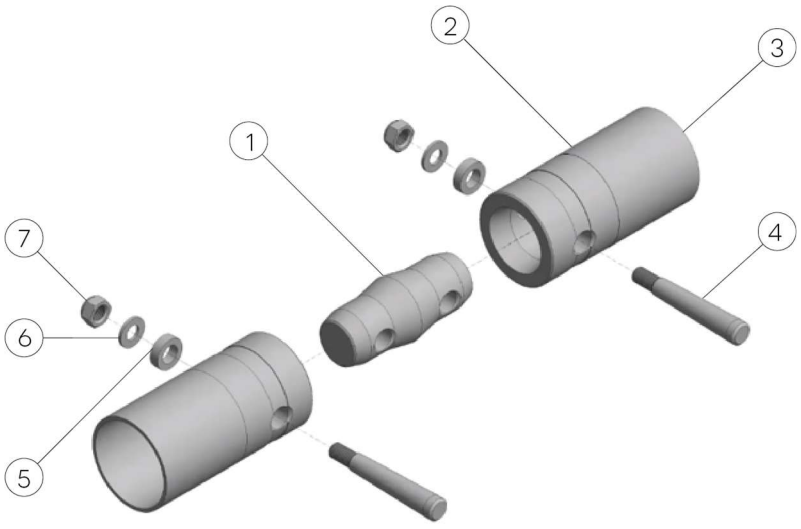


Figure 1: BM8 connection

1 Male connector
2 Female connector
3 Main chord
4 Conical truss pin
5 Rubber washer
6 Washer
7 Nut

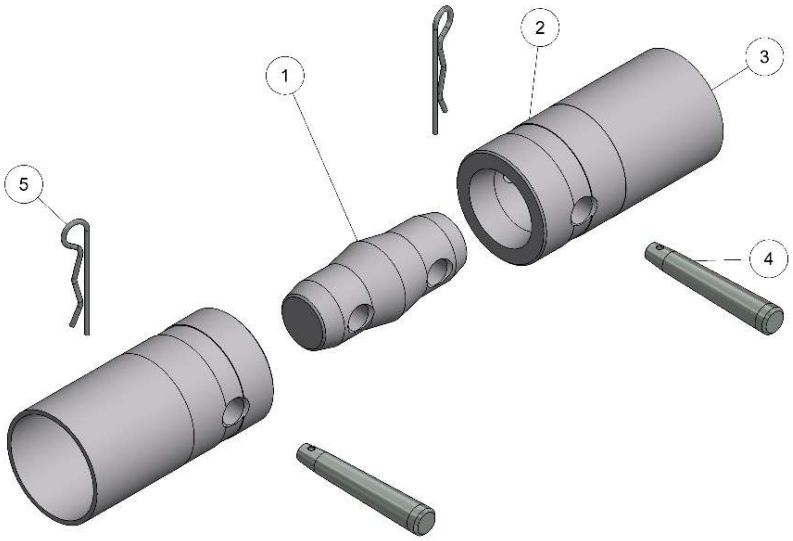


Figure 2: Conical connection

1 Male connector
2 Female connector
3 Main chord
4 Conical truss pin
5 R-clip

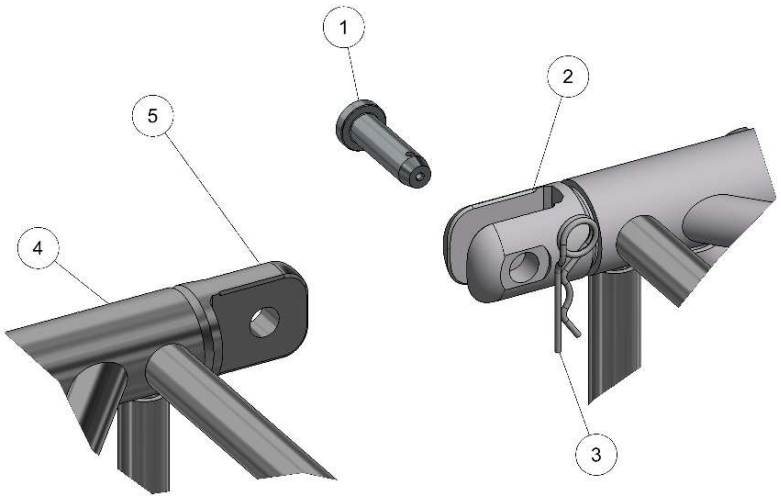


Figure 3: Pin-fork connection

1 Straight truss pin

2 Female fork connector
3 R-clip
4 Main chord
5 Male fork connector

1.5 Standards

If used as lifting accessories, trusses are subject to the European Machinery Directive 2006/42/EC. If used as an integral part of a permanent structure, trusses are subject to the European Construction Product Regulation 305/2011/EC.

For information on the declarations of conformity and performance, see Section 16.

NOTICE

It is the sole responsibility of the owner or provider to check with the local authorities whether the legislation used by MILOS is acceptable in the country of use.

The following standards are taken into consideration for manufacturing:

- 2006/42/EC, European Machinery Directive
- 305/2011/EC, European Construction Product Regulation
- DIN EN 1990, Eurocode 0: Basis of structural design
- DIN EN 1991, Eurocode 1: Actions on structures
- DIN EN 1993, Eurocode 3: Design of steel structures
- DIN EN 1999, Eurocode 9: Design of aluminium structures
- EN 1090-1, Execution of steel structures and aluminium structures – Part 1: Requirements for conformity assessment of structural components
- EN 1090-3, Execution of steel structures and aluminium structures – Part 3: Technical requirements for aluminium structures
- ANSI E1.2-2006, Entertainment Technology: Design, Manufacture and Use of Aluminium Trusses and Towers
- EN 17115, Entertainment technology – Specifications for design and manufacture of aluminium and steel trusses
- EN ISO 10042-2006, Arc-welded joints in aluminium and its weldable alloys – Quality levels for imperfections
- EN ISO 3834-1 & 3, Quality requirements for welding – Fusion welding of metallic materials - Part 1: Guidelines for selection and use Part 3: Standard quality requirements
- EN 754 (all parts), Aluminium and aluminium alloys – Cold drawn rod/bar and tube
- EN 755 (all parts), Aluminium and aluminium alloys – Extruded rod/bar, tube and profiles
- EN 515:1993, Aluminium and aluminium alloys – Wrought products – Temper designations
- EN 573 (all parts), Aluminium and aluminium alloys – Chemical composition and form of wrought products
- EN 10204:2004, Metallic products – Types of inspection documents

2 Safety

NOTICE

Read these safety texts carefully before working with the product.

NOTICE

Make sure manuals are available at all times for all users and employees.

Truss data published before 2015/2016 was based on calculations according to the German DIN 4113 standard, while truss data published after this date is based on Eurocode EN 1999. Data

such as the allowable bending moment, shear force and normal force cannot be compared due to the different safety principle in each standard.

WARNING

Do not mix structural data from different standards without knowing their respective safety principle.

WARNING

Beware when using data of structures based on Load and Resistance Factor Design (LRFD) standards, such as Eurocodes, or data based on Allowable Stress Design (ASD). A structural engineer can provide help.

Trusses and structures consisting of assembled trusses must always be checked as regards their structural stability and strength by a structural engineer. The technical specifications that are provided should never be exceeded.

WARNING

Do not use damaged or malfunctioning parts.

WARNING

Mark any damaged or worn material clearly and discard the material immediately.

2.1 Electrical safety

2.1.1 Equipotential bonding

WARNING

ELECTRICAL HAZARD

Truss structures that are in contact with electrical equipment can develop dangerous touch voltages in the event of an electrical fault. Before energising any of the electrical equipment, the user must ensure that the truss structure is properly earthed. This applies to all modules made of electroconductive material that have equipment placed on or attached to them, or across wire and cable runs that, if damaged, could make electrical contact with metal parts.

It is extremely important to earth the truss structures because the audience and installers very often come into direct contact with them when the suspended fixtures are electrically charged.

2.2 Personal protective equipment

For health and safety reasons, people moving, assembling, disassembling, maintaining or transporting the products should wear adequate personal protective equipment such as, but not limited to, gloves, hearing protection, hard hats and safety shoes.

All people working with trusses should be instructed and informed about the correct usage and possible dangers before use.

WARNING

PERSONAL INJURY HAZARD

Always wear hard hats, safety shoes, hearing protection and protective gloves when moving, assembling, disassembling, maintaining or transporting the products.

⚠ WARNING

PERSONAL INJURY HAZARD

Comply with your local noise level regulations when assembling and disassembling the products.

⚠ WARNING

PERSONAL INJURY HAZARD

Comply with your local regulations for the maximum weight allowed per person when carrying or moving the products.

3 Limitations of use

The trusses must always be used within the limits of the structural report and the declarations provided.

All of our trusses are calculated according to the Eurocode 9 (DIN EN 1999) standard. Eurocodes are standards based on Load and Resistance Factor Design (LRFD).

⚠ WARNING

The structural data provided before 2015/2016 was based on the German DIN 4113 standard. As this standard had a different safety principle, the structural values cannot be compared.

NOTICE

TÜV certificates issued after February 2015 are all based on Eurocode 9.

The MILOS trusses described in this manual are not specifically designed for lifting people. Adequate load reduction and safety precautions according to local legislation must be taken into consideration when people are lifted.

Use the product only for its specified purpose. Any use other than the specified use is regarded as misuse. The user or operator, not the manufacturer, is liable for any damage or injury resulting from such misuse.

3.1 Load charts

All truss loading calculations and TÜV certificates are based on the following:

- The self-weight is already taken into account
- Static loads only
- Single-span girders (all other structures made of trusses require dedicated structural reports)
- Loads applied at the node points
- Spans can consist of several modules
- The interaction of shear force and bending moment at the connector is taken into consideration
- Safety factors taken into consideration: self-weight 1.35 / variable load 1.5

3.2 Load reduction factor for repetitive use

To comply with the BS 7905-2, ANSI E1.2-2006 and EN 17115 standards for truss modules in repetitive use, all loads must or should (depending on the standard) be multiplied by 0.85.

The truss calculations only give consideration to static or virtual static loads, not fatigue loads based on a high number of load cycles.

3.3 Compatibility with other products

Some products within our range are compatible with those of other brands. However, trusses can differ considerably depending on their design, layout and manufacture (for example, material properties, alloy, diameter, system tolerances, thickness or layout of the bracing).

We provide comprehensive technical support and structural data for all of our truss modules. The structural integrity of an assembled structure consisting of different brands and legal compliance are the sole responsibility of the user. Their combined use must always be certified by a structural engineer on a case-by-case basis. MILOS accepts no responsibility for products manufactured by third parties. Our design and quality assurance certificates are based on the latest European standards including EN 1999 and EN 1090, and are at least equal to other truss manufacturer specifications within the EU and US markets.

3.4 Environmental influences

3.4.1 Temperature

Trusses can be used in environmental conditions from -20°C to +80°C (-4°F to +176°F). However, take special care if trusses are used at temperatures below 0°C (32°F).

The open heel of the welds and the capillary action of pin holes on some of our truss models can cause water to enter the truss chords and diagonals.

At temperatures below 0°C (32°F), the captive water can freeze and cause damage to the truss members.

To avoid this situation, MILOS can provide the same trusses with drainage holes.

3.4.2 Aggressive environments

Take special care when trusses are used in, or in the vicinity of, aggressive environments. The aluminium alloys used in trusses might not be suitable for this environment.

Avoid direct contact with concrete by using a sealant.

The alloy that is used has good properties in a saltwater environment. However, oxidation can occur on the surface. Clean regularly with fresh water or with a dedicated protection product.

The material used for the connectors is especially vulnerable to saltwater. Anodise, coat or treat it with a sealant so that no saltwater particles can come into contact with the material.

4 Transport, handling and storage

⚠ WARNING

PERSONAL INJURY HAZARD

Always wear hard hats, safety shoes, hearing protection and protective gloves when moving, assembling, disassembling, maintaining or transporting the products.

⚠ CAUTION

PERSONAL INJURY HAZARD

Vertical transportation or storage of the products can be hazardous due to the products falling over.

Handle the products with care. Do not drop them or drag them around. Do not throw truss modules on top of each other. Prevent damage caused by sharp edges such as the forks of a forklift.

Dedicated dollies can be a highly effective means of transportation and storage, while providing large truss modules or sections with some extra protection.

Make sure that the products cannot move or shake during transport. The abrasive motion of moving or shaking can lead to severe damage.

5 Identification

MILOS products can be recognised by identification stickers.

⚠ CAUTION

Make sure only MILOS original components are used. For more information, contact your distributor or the manufacturer.

NOTICE

An identification sticker is always delivered with the product. Replace any missing identification stickers. Contact the manufacturer or its representative for information on the correct procedure.

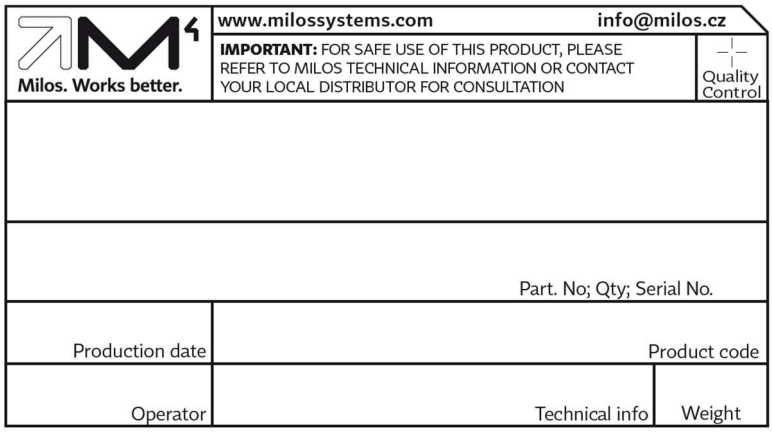


Figure 4: Example of an identification sticker (without product information)

6 Technical specifications

For information on technical specifications, see Part 2: Product-specific instructions.

7 Load capacity

For information on load capacity, see Part 2: Product-specific instructions.

8 Approved accessories

For a complete overview of approved accessories, see our brochures or www.milossystems.com.

⚠ WARNING

Use of excessive force when tightening accessories such as lamp hooks or truss clamps can damage the truss chords.

CAUTION

Pay special attention when using lamp hooks or cell clamps. Their inner radius might not meet the tube to which they need to be attached. This can lead to severe damage.

NOTICE

You should never allow accessories to damage other products.

9 Coatings and surface treatments

Coatings and surface finishes should only be applied after consulting the coating or finish manufacturer or another party qualified to evaluate the possible effects of the coating or surface finish on the structural properties and load bearing capabilities of the truss.

Powder coating is only permitted at a maximum temperature of 180°C (356°F) for up to 20 minutes. If it becomes necessary to renew the powder coating, the process must be coordinated with MILOS.

Records detailing the application of any coating or surface finish should be kept, paying particular attention to processes requiring the application of heat.

Chemical removal of coatings and surface finishes may only be carried out after consulting the chemical manufacturer to ensure that the chemical will not affect the mechanical properties of the aluminium.

Abrasive blasting should not be used, because it can cause loss of material.

10 Slinging methods

The load capacities listed in the load tables refer to trusses that are loaded and suspended or supported under optimum conditions. Since the method of attachment can generate local stress that reduces the global strength, it is important to use the correct slinging method, especially with high payloads.

Paying attention to the following points when slinging is therefore recommended:

- Make sure the attachment point is at the node of the diagonal or end brace with the main chord or directly next to it.
- Make sure the hanging point is above the centre of gravity of the truss.
- Minimise the horizontal compression of the main chords by choosing the correct slinging positions and avoiding flat bridle angles.

WARNING

Apply slinging only to the main chords, not to the connections, diagonals or internal diagonals.

WARNING

Apply slinging to node points, alongside end braces or alongside horizontal cross braces.

NOTICE

Slinging equipment must be made from non-abrasive and fire-retardant materials.

Use slinging devices that have a soft cover.

Direct contact between a steel wire rope and the truss chord should be avoided because of the abrasive surface of the steel wire rope.

For stability reasons, wrap slinging equipment around at least 2 main chords.

Trusses can be suspended from either the top or bottom chords. The best method depends on the application.

NOTICE

Suspending and supporting have the same effect on the truss.

If the truss is not supported or loaded at the node point, the main chords will be subjected to an additional local bending moment. This effect should be taken into consideration in the structural analysis and could reduce the load capacity.

This might be less of a problem for a simple span supported at both ends, as the bending moment at the ends is almost zero.

In a truss with multiple supports, the main chords at the mid-span supports are subjected to a bending moment and shearing at the same time.

For optimum performance, suspensions should be attached at the node points. If this is not done, the load capacity of the truss might be substantially reduced. Slinging to all main chords does not change this. The correct load can only be determined by examining each load case individually. This should be done by a structural engineer.

10.1 Recommended slinging methods

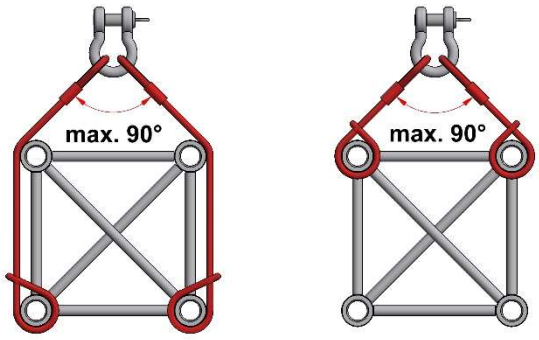


Figure 5: Slinging methods for MILOS Quatro and Rect trusses

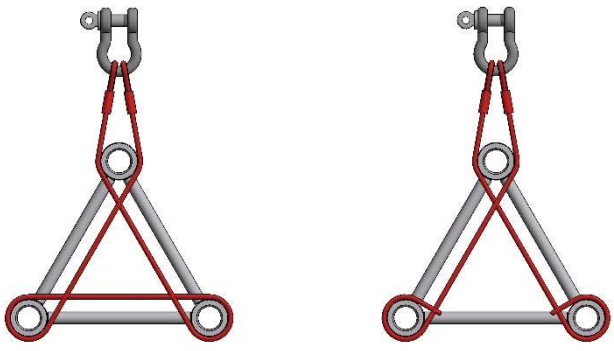


Figure 6: Slinging methods for MILOS Trio trusses

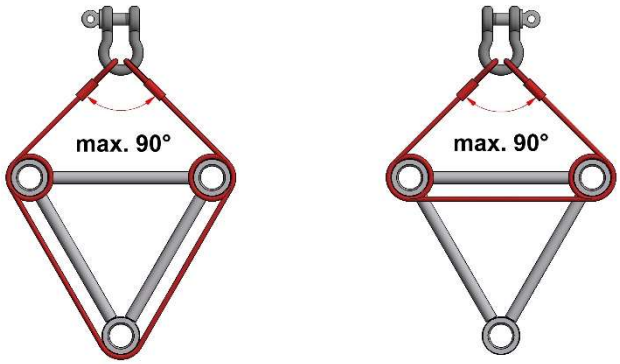


Figure 7: More slinging methods for MILOS Trio trusses

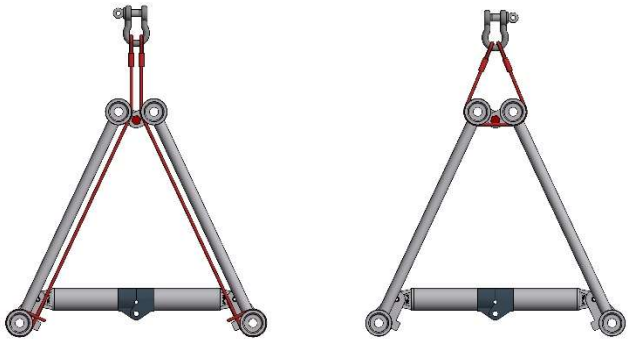


Figure 8: Slinging methods for triangular folding trusses.

NOTE: The method on the right can only be used in combination with corner or sleeve blocks which stabilise the truss to prevent tipping or rotating.

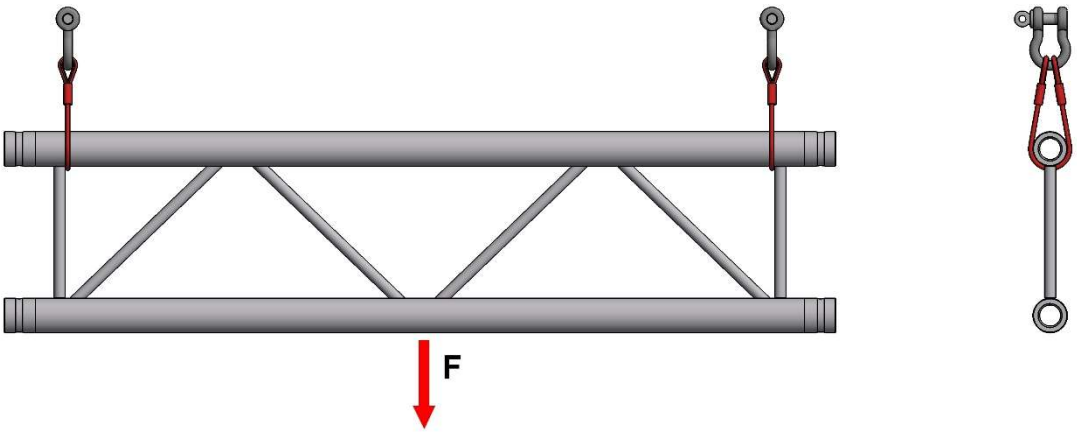


Figure 9: Duo truss pick-up

NOTE: Duo truss pick-up should only be done from the top chord.

⚠ CAUTION

Particular attention must be paid to Duo trusses, ladder trusses and two-chord trusses during slinging. The top chord must be stabilised because of a risk of lateral torsional buckling. Only load the bottom chord. Other types of loading require structural analysis before use.

11 Assembling and disassembling

11.1 Safety when assembling and disassembling

A competent person or sufficiently instructed personnel under the supervision of a competent person should always assemble the product.

Before assembly, use and disassembly, the competent person is responsible for the following, amongst other tasks:

- Carrying out all of the instructions as described in this manual and in the specific instructions of the applicable truss product.
- Instructing the people carrying out assembly and ensuring that all trusses and loads are suspended correctly.

You are strongly advised to show people carrying out assembly or disassembly how to physically assemble and disassemble trusses, how to orientate connections and which tools to use.

11.2 Before you start

The pin can only be inserted from the outside inwards on trusses with conical connections. Make sure that the conical hole in the connection is positioned correctly, i.e. that the larger side of the hole faces outwards.

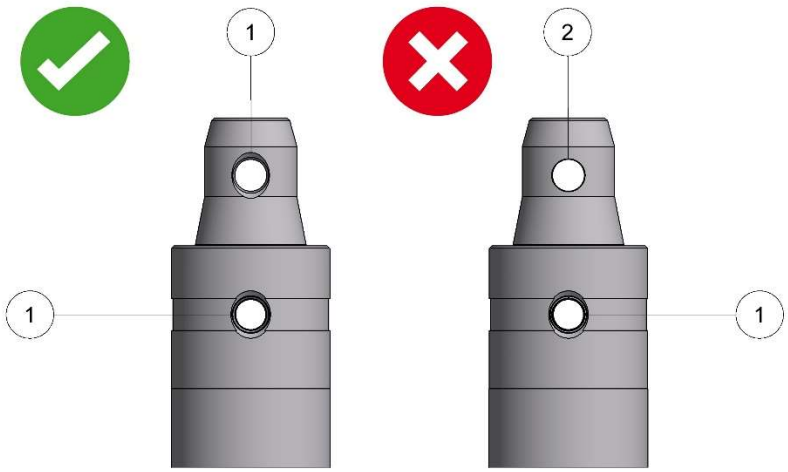


Figure 10: Holes in conical connections.

1 Large hole
2 Small hole

When two trusses with conical connectors are assembled, you can see a gap between them. This is done on purpose and has no negative influence on strength or function.

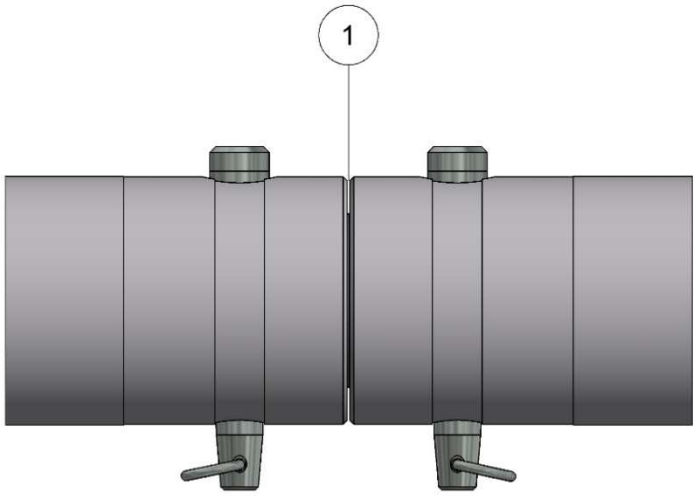


Figure 11: A gap between trusses assembled with a conical connection

1 Gap

When trusses with end braces are being assembled, it is irrelevent whether the diagonals follow the alternating zigzag pattern.

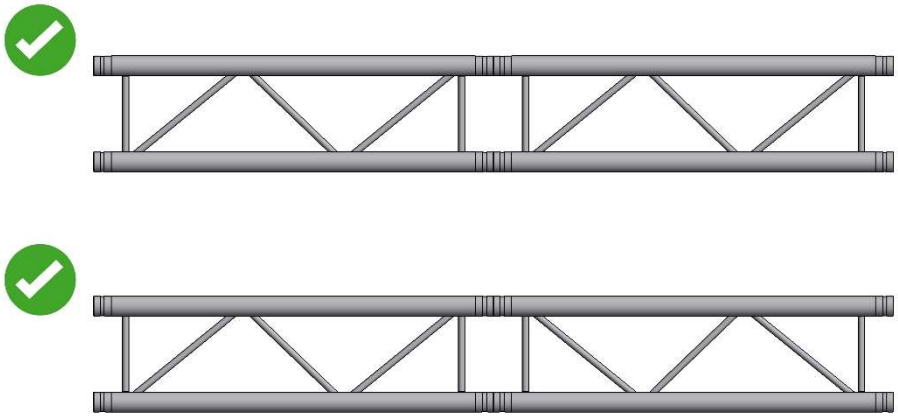


Figure 12: Both zigzag patterns can be used for trusses with end braces

11.3 Required tools

- Torque wrench
- Copper hammer

11.4 Torque

Use a torque wrench to tighten all bolts and nuts under tension. When bolts are connected to threaded aluminium components, use the following torque settings:

- M12: 15 Nm
- M16: 25 Nm

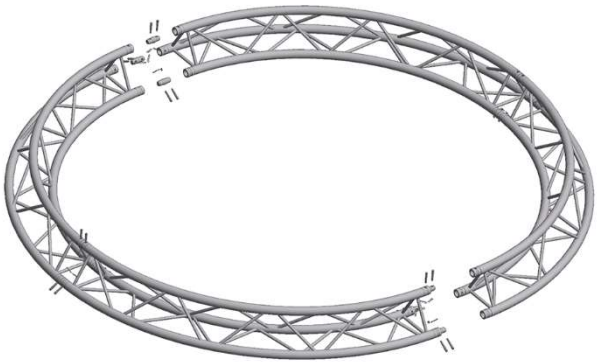
11.5 Assembling a truss

1. Slide both truss modules towards each other.
2. Align the pin holes of the female and male connectors. Adjust the male connectors if the holes are not aligned. Do not use excessive force.

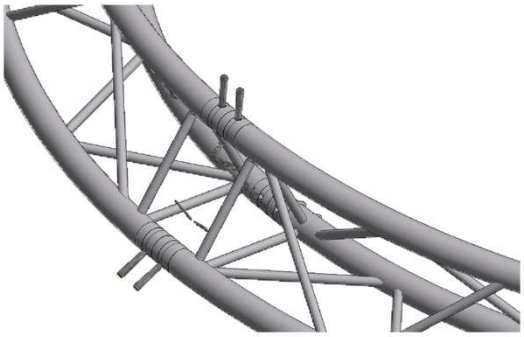
3. Assembling the truss pin
    a. When using a pin with an R-clip:
    Insert the pin through the pin holes, preferably with a copper hammer.
    Tip: position the pin so that the hole for the R-clip is perpendicular to the length of the truss. This makes it easy for you to mount the R-clip.
    Secure the pin with the R-clip.
    b. When using a pin with thread and nut:
    Insert the pin through the pin holes, preferably with a copper hammer and deep enough that it is not necessary to pull in the pin using the nut. Slide the rubber washer and washer onto the pin and secure the nut.
    (See Section 1.4, Figure 1 "BM8 connection"). Use self-locking nuts only.
4. Sling the truss as instructed in Section 10.
5. Check that all connections are made properly.
6. Attach loads as instructed in Section 11.7.
7. Lift the truss to working height and inspect all connections. Correct if necessary.
8. Lift the truss to the required height. When lifting, avoid "bumping", as this leads to increased forces in the truss and load.

11.6 Assembly instructions for truss circles

1. Start by assembling two or more truss modules to create two half circles.
2. Assemble the truss pins in both half circles as described in Section 11.5.
    NOTE: To allow a degree of flexibility to react to connectors that are not perfectly aligned, it is recommended not to hammer the truss pins in tightly yet, but to insert them loosely into the pin holes.
3. Slide the half circles together and connect them to form a full circle.
4. Once all junction points have been connected, hammer the pins in to their final, tight position.



Connecting two half circles



Loose connection

11.7 Attaching a load

⚠ WARNING

Before applying loads, a competent person should check whether all trusses are connected properly.

Make sure loads are equally divided over both bottom and top chords. Loading a truss on one side leads to internal torsional forces which are not taken into consideration in the loading data that is provided.

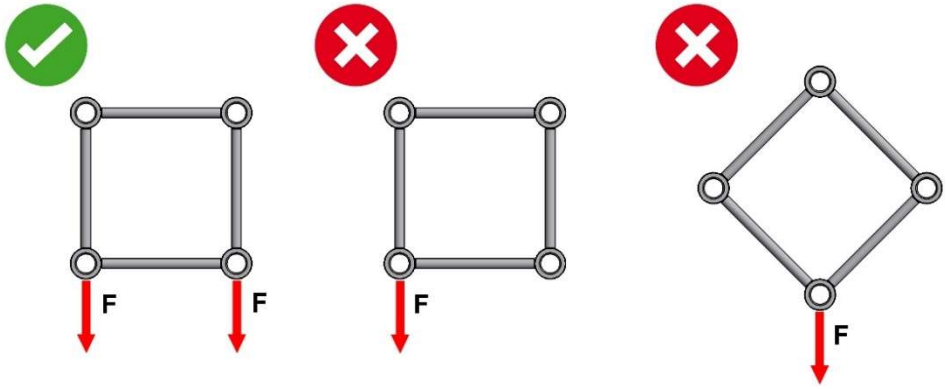


Figure 13: Attaching loads to a MILOS Quatro truss

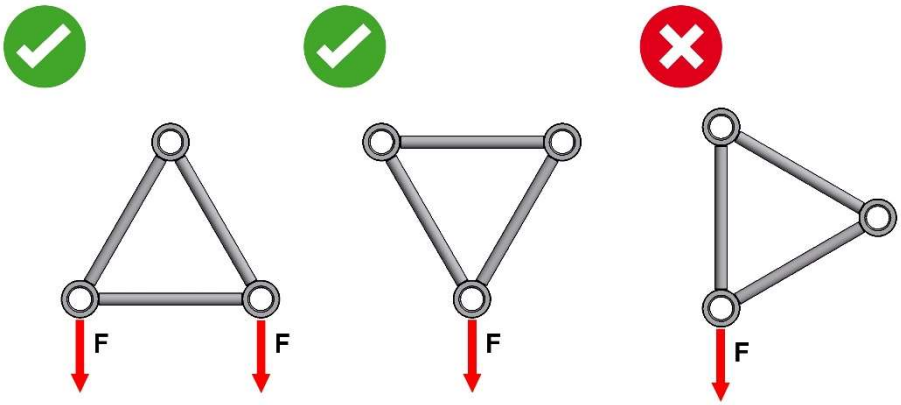


Figure 14: Attaching loads to a MILOS Trio truss

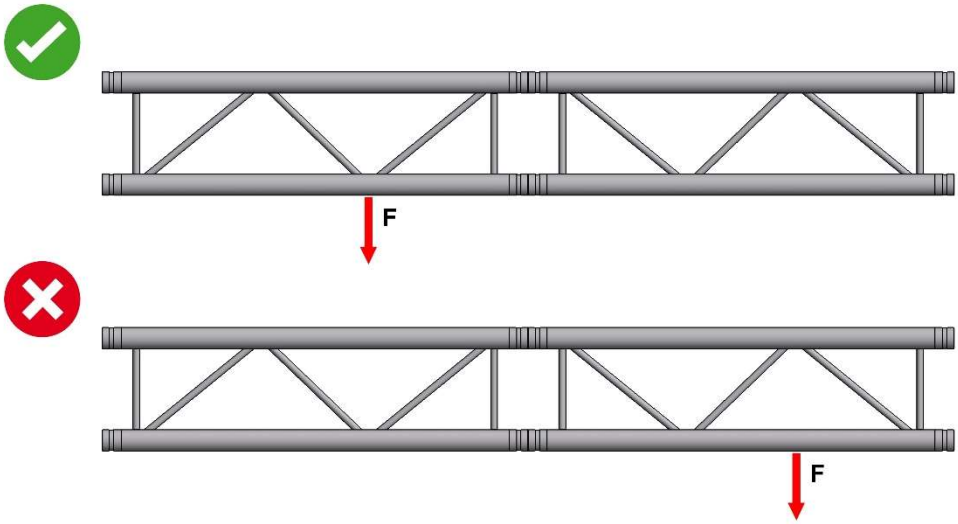


Figure 15: Attach the load as close to a node point as possible

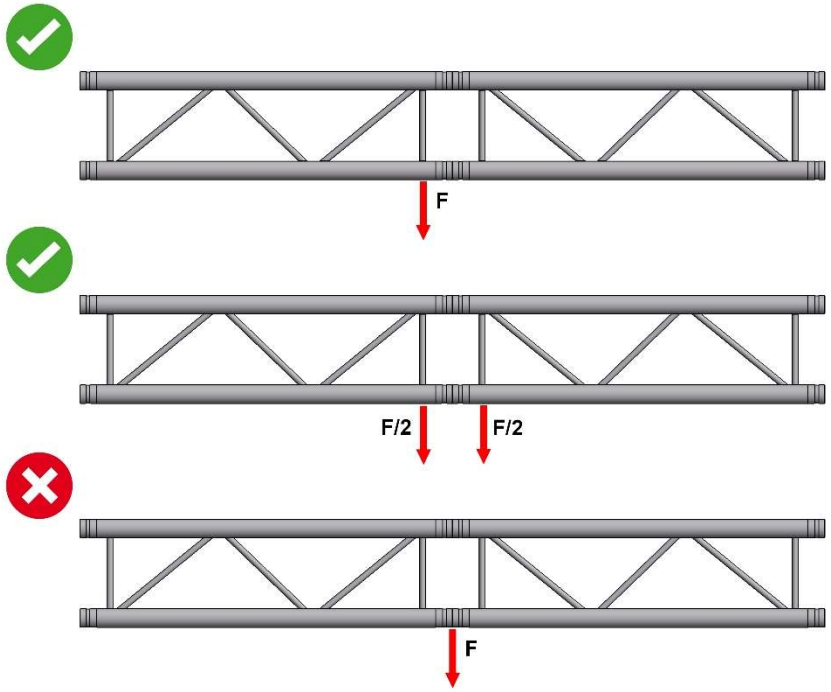


Figure 16: Attaching loads near the connection

NOTE: It may be possible to use some of the methods marked as incorrect, but only after consulting a structural engineer.

11.8 Disassembling a truss

1. Lower the truss to working height.
2. Detach the loads.
3. Inspect the truss for any damage. Mark the truss accordingly and discard it, if necessary.
4. Lower the truss to floor level.
5. Disconnect the slings or lifting accessories.
6. Remove the truss pins/clevis pins.
7. Hit the pins firmly to remove them.
8. Inspect the components for damage. Mark the components accordingly and discard them, if necessary.

12 Maintenance

Although aluminium does not corrode in the same way that many steel alloys do, ambient influences can have a corrosive impact on aluminium. Take special care with trusses that are placed outdoors for an extended period of time, especially in areas with a high level of industrial pollution, near saltwater, near tram lines or near swimming pools. Trusses should be individually inspected each time before being used to determine whether any pollution has had a corrosive effect.

Repairs should be carried out and warranted by either the manufacturer or a suitably qualified person approved by the manufacturer.

⚠ WARNING

Do not repair the products without first consulting the manufacturer.

Smooth the surface of coupling parts regularly. Use fine sandpaper or conventional abrasive materials.

Keep the coupling parts slightly lubricated with oil, silicone spray or a similar lubricant. Lubricants should not be sticky, in order to prevent the accumulation of dirt, dust or grit.

Avoid painting the inner surface of the connection and pin holes. This has a negative effect on the fit.

Remove any grit or dirt from trusses and their components. Do not use any abrasive methods other than an abrasive cloth or sandpaper with a grain size of 240 or higher.

13 Inspection

Depending on local regulations, we recommend that either a competent person or a certified body carries out a careful, documented inspection at least once a year or as often as required by the circumstances or the intensity of use.

Perform the inspections as instructed in Section 14 to ensure the safe use of the product.

In case of an accident, misuse or malfunction, the product should be marked, inspected by a qualified person to establish its structural integrity for re-use and discarded if necessary. The product should be identified accordingly, and records of identification numbers and photos should be kept.

Do not use damaged trusses, connections or pins.

The user is responsible and liable for the safe use of the product.

The open heel of the diagonal welds in the M290 and M390 series is part of the design and is TÜV-approved.

For information on the discard criteria, see Section 14.

13.1 Inspection levels

13.1.1 Regular inspection

A competent person must perform regular visual inspections each time before the product is used. You do not have to keep records. The regular inspection includes a visual inspection for signs of external damage and wear. If any damage is detected during the visual inspection, a qualified person must carry out a detailed inspection based on the criteria described in Section 14.

13.1.2 Periodic inspections

A qualified person must perform periodic visual inspections on behalf of the user user based on the criteria described in Section 14. Keep a record of the inspections.

13.2 Inspection frequency

13.2.1 Initial inspection

No matter whether the product is new or used when it is first purchased, inspect the product based on the criteria described in Section 14. Keep a record of the inspections and identification numbers.

13.2.2 Inspections after an accident, incident or malfunction

If the truss modules have suffered any accidents, inspect them based on the criteria described in Section 14.

Examples of accidents, incidents or malfunctions include, but are not limited to, the following:

- Dropping a truss on the floor from a height
- Lifting a truss with pins missing from joints, which might cause overloading
- Subjecting a truss to shock loads
- Tightening a truss during lifting

13.2.3 Truss in regular and non-regular service

Perform regular inspections each time before the product is used or when it is not in use for a period of one month or more, and periodic inspections at least once a year.

13.2.4 Permanent installations (stationary)

Perform periodic inspections on all truss modules that are permanently installed in a stationary configuration. A qualified person must determine the frequency of the inspections based on the conditions in the location of use.

13.2.5 Permanent installations (moving)

Perform periodic inspections on all truss modules that are permanently installed in a configuration where movement of the truss is an integral part of use. Periodic inspections must be carried out every three months or in accordance with an inspection routine established by a qualified person.

13.3 Records

The owner must keep records of initial and periodic inspections for each truss. These records should be signed and dated by the person carrying out the inspections.

Please refer to the sample inspection report at the end of this document.

14 Discard criteria

All discard criteria must be taken into consideration when performing inspections.

In addition to the normal requirements related to the use, professional assembly and disassembly, transportation and storage of the product, regular inspections are vital. Carefully inspect each individual module visually each time before the product is used, regardless of the respective field of use.

For information on the required frequency of inspections, see Section 13.2.

If any damage that prevents the continued, safe use of the product is noted during an inspection, the product must be discarded and disposed of. In most cases, it is not enough to just identify the damage.

Disposal through the manufacturer, supplier or a metal recycling company is the only safe way of protecting others from risks associated by damaged material.

Due to manufacturing, the dimensions of the truss can deviate from the theoretical dimensions that are provided. These deviations are within the limits specified in EN 1090-3.

14.1 Overview of discard criteria

Inspection	Failure symptoms									
Geometry	Bending	Twisting		Corrosion	Scratches, indentations, signs of abrasion	Holes	Ovalisation	Distortion, constriction		
Main chords	Fractures, cracks	Bending	Deformations that prevent easy assembly	Corrosion	Scratches, indentations, signs of abrasion	Holes	Ovalisation			
Diagonals, end braces	Fractures, cracks	Missing	Bending	Corrosion	Scratches, indentations, signs of abrasion	Holes	Ovalisation			
Connections	Cracks in welds	Deformations that prevent easy assembly	Corrosion	Scratches, cuts, hammer strokes	Oval signs of wear in pin holes	Ovalisation of pin holes due to overloading				
Connecting hardware	Pressure area on pin or bolt	Bending	Deformation of R-clip hole	Reused self-locking nuts	Damage on smooth surface of pin	Mushroom heads	Corrosion			

14.2 General criteria

WARNING

If any part of the product shows significant visible damage or is suspected of containing a damaged module, visible or not, the product must be marked accordingly and discarded. A qualified person should assess the product.

WARNING

If in doubt when assessing individual damage, contact the manufacturer, supplier or a qualified person.

WARNING

Mark any damaged or worn material clearly and discard the material immediately.

Part	Failure symptoms
Truss	Welds which have cracks or other irregularities. Note that the incomplete welding seams around the diagonal braces are production-related and their stability has been TÜV-approved.
Truss	Excessive corrosion whereby the total cross-sectional area of the truss is reduced by more than 25% of the thickness or more than 10% of the cross-sectional area of the component.

14.3 Geometry of the truss

If any part of the product shows any of the following damage, the product is unfit for further use and must be discarded.

Part	Failure symptoms
Truss	The permanent deformation of the truss by twisting is more than 0.15° per metre (3.28 ft) of the truss length. Check the twisting with a digital leveller. The angular difference between the measurements at both ends of the truss, divided by the length of the truss, must not exceed 0.15°.
Truss	The permanent deformation of the truss by bending exceeds the following limits: Max. Δ = 3 mm (0.12 in) if L < 2250 mm (7.38 ft) Max. Δ = L/750 (length divided by 750) if L > 2250 mm (7.38 ft) See Figure 17.

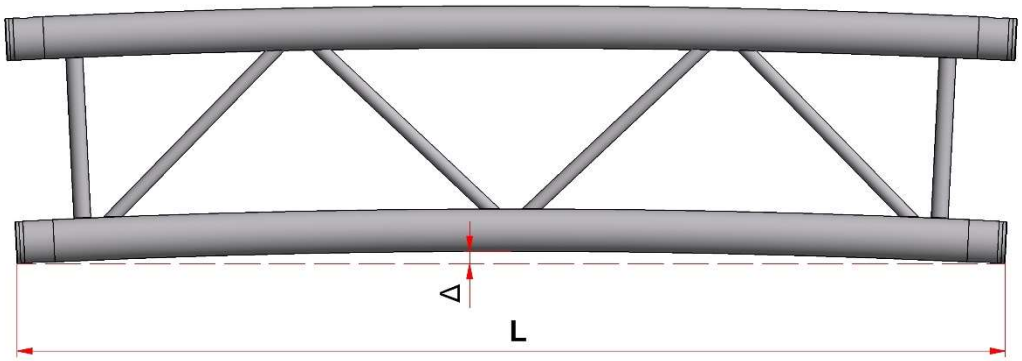


Figure 17: Limits for the permanent deformation of the truss by bending

14.4 Main chords

If any part of the product shows any of the following damage, the product is unfit for further use and must be discarded.

Part	Failure symptoms
Main chord	Fractures or cracks in the main chord.
Main chord	The main chord is bent by more than 3 mm (0.12 in) between two node points. See Figure 18.
Main chord	The end of the main chord or connection is deformed to such an extent that the truss can only be connected to another truss by using considerable force.
Main chord	Scratches or signs of abrasion on the surface of the main extrusions that reduce the wall thickness by more than 25% or the cross-sectional area of the tube by more than 10%.
Main chord	Indentation/dent deeper than the wall thickness.
Main chord	Holes appearing in the main chord after the truss has been put into use.
Main chord	Deformation of the main chord to an oval shape by more than 5% of the respective diameter.
Main chord	The main tube is distorted or constricted next to the welds due to excessive tensile force.
Main chord	Corrosion causing loss of material.

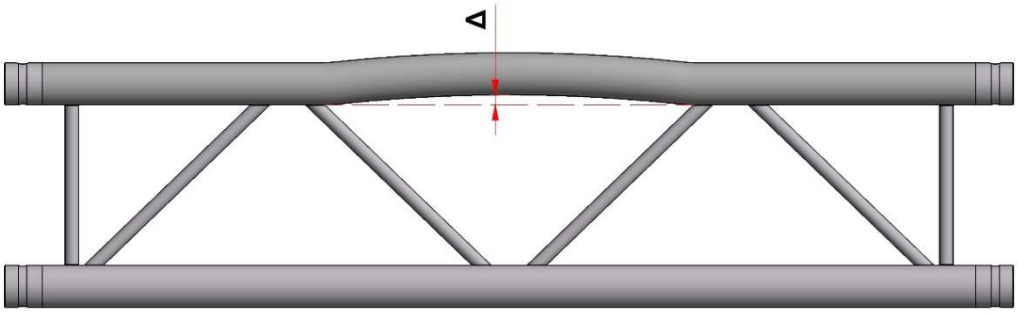


Figure 18: Main chord bent between two node points

14.5 Diagonals and end braces

If any part of the product shows any of the following damage, the product is unfit for further use and must be discarded. The term "brace" refers to a diagonal brace or an end brace.

Part	Failure symptoms
Braces	Fractures or cracks in a brace.
Braces	A brace no longer exists.
Braces	A brace is displaced from the original centre line by L/300 (length divided by 300) or 3 mm (0.12 in), whichever value is the lowest. See Figure 19.
Braces	Scratches, indentations or signs of abrasion on the surface of the section that reduce the wall thickness by more than 25% or the cross-sectional area of the tube by more than 10%.
Braces	Indentation/dent deeper than the wall thickness.
Braces	Holes appearing in the brace after the truss has been put into use.

Part	Failure symptoms
Braces	A brace shows deformation to an oval shape by more than 5% of the respective diameter.
Braces	Corrosion causing loss of material.

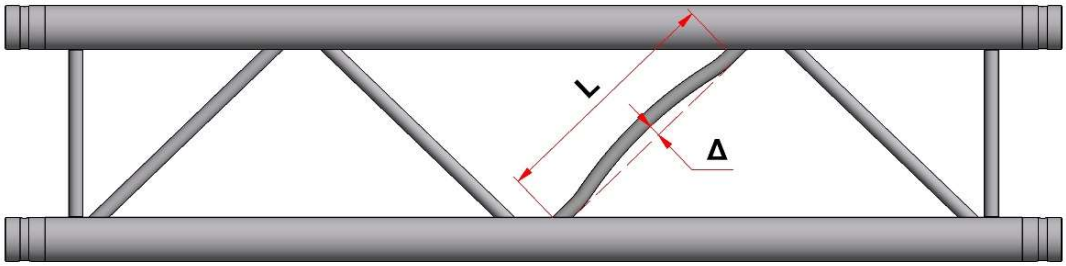


Figure 19: Bent diagonal

14.6 Connectors

If any part of the product shows any of the following damage, the product is unfit for further use and must be discarded.

Part	Failure symptoms
Connectors	Cracked or partially broken welding seams between the main tube and the connector.
Connectors	Oval signs of wear in the pin hole greater than 10% of the respective diameter. See Figure 20.
Connectors	Any visible ovalisation of pin holes due to overload.
Connectors	If a connector is deformed to such an extent that the truss can only be connected to another module by using considerable force.
Connectors	Corrosion causing loss of material.
Connectors	Scratches, cuts or hammer stroke indentations on the connector to a depth of more than 2 mm (0.08 in) and which are longer than 10 mm (0.39 in), regardless of the direction.

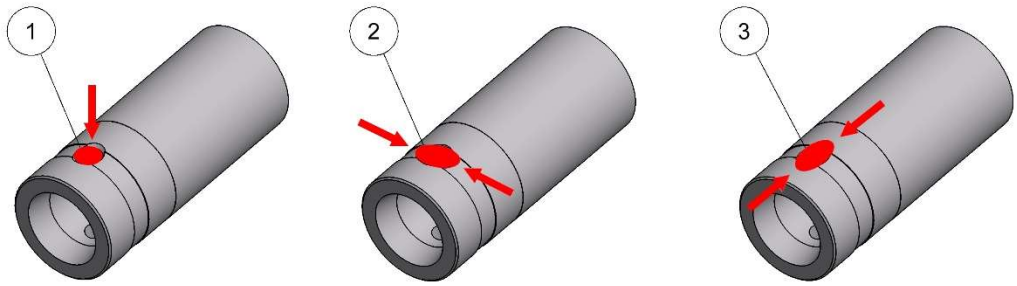


Figure 20: Conical connections.

1 Normal conical pin hole
2 Oval signs of wear in the pin hole
3 Oval signs of wear in the pin hole

14.7 Connecting hardware

Connecting hardware is subjected to wear when inserted and removed frequently, especially due to hammer strokes. Connecting hardware can be regarded as consumables.

WARNING

Do not re-zinc truss pins, as they are made of high-grade steel. Re-zincing may cause hydrogen embrittlement.

If the connecting hardware shows any of the following damage, replace the connecting hardware in question.

Part	Failure symptoms
Connecting hardware	Signs of galvanic corrosion.
Pin or bolt	Signs of pressure areas on the pin or bolt.
Pin or bolt	A bent pin or bolt.
Pin	Any damage to the smooth surface of the pin.
Pin	Burrs, mushroom heads or other protruding, sharp or pointed edges at the narrower end of the pin. See Figure 21.
R-clip hole	Deformations on the R-clip hole make it impossible to fit the R-clip.
Self-locking nut	A re-used self-locking nut. Self-locking nuts are for single use only.

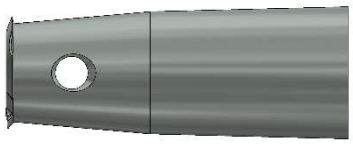


Figure 21: Mushroom head on the pin

15 Warranty

For a period of 24 months, we undertake to repair any damage attributable to faulty materials or workmanship free of charge provided that the product is forwarded freight paid to our factory or one of our contract service organisations.

The warranty period begins on the date of delivery, proved by a purchase receipt such as an invoice, a delivery note or a copy of one of these.

The warranty is applicable to new products only.

The warranty does not cover damage due to transport, negligent handling, overloading or parts subject to normal wear and tear. Nor does it cover damage resulting from misuse due to non-observance of the instructions in this manual.

The fitting of replacement parts not supplied by us or modifications of our design by third parties also invalidate the warranty.

Warranty repairs do not renew or extend the warranty period.

16 Certificates

16.1 CE Declaration of Conformity

Milos. Works better.

CE-DECLARATION OF CONFORMITY

(according to Machinery Directive 2006/42/EC annex II)

Milos s.r.o.
Spindlerova 286
413 01 Roudnice nad Labem
Czech Republic

Herewith declares that:

Milos Truss Range:

M220, M222, M290, M390, M400, M520, M760, M950, 4GS-35, 4GS-50, 4GS-62, 4GX-91, K-40

- are in compliance with the Machinery Directive 20006/42/EC annex II
- the following harmonized standards have been applied (or parts/clauses of):
  DIN EN 1993-1, DIN EN 1999-1, DIN EN 1999-1/A2, EN 1090-1, EN 1090-3, EN 12020-1/2,
  EN ISO 3834-3, EN ISO 12100-1, EN 754, EN 755, EN 515, EN 573, EN 10204:2004

Roudnice nad Labem, Czech Republic, 2019-07-04

Mr. Frantisek Zykan
CEO

16.2 CE Declaration of Performance

Milos. Works better.

PROHLÁŠENÍ O VLASTNOSTECH / Declaration of Performance

č. 1/2017

1. Jedinečný identifikační kód typu výrobku/ Unique identification code of the product-type:

M290, M390, M400, M520, M760, M950, 4GS-35, 4GS-50, 4GS-62, 4GX-91, K-40

2. Zamýšlená(é) použití/ Intended use/es:

Příhradová konstrukce v souladu s EN 1090-3:2008. / *Truss structure in accordance with EN 1090-3:2008.*

3. Výrobce / Manufacturer:

MILOS s.r.o., Špindlerova třída 286, CZ – 413 01 Roudnice nad Labem

5. Systém(y) POSV/ System(s) of AVCP: **2+**

6a. Harmonizovaná norma / Harmonised standard: **EN 1090-1:2009+A1:2011**

Oznámený(é) subjekt(y) / Notified body: **TÜV NORD Systems GmbH &Co. KG – 0045**

7. Deklarovaná(é) vlastnost(i) / Declared performance(s):

Základní charakteristiky / Essential characteristic	Vlastnost / Performance	Harmonizované technické specifikace / Harmonised technical specification
Svařitelnost / *Weldability*	**EN AW 6082**	**EN 1011-4:2000**
Křehký lom / *Fragile quarry*	**NPD**	**NPD**
Reakce na oheň / *Reaction to fire*	**Třída A1**/ *Class A1*	**EN 13501-1:2007+A1:2009**

Vlastnosti výše uvedeného výrobku jsou ve shodě se souborem deklarovaných vlastností. Toto prohlášení o vlastnostech se v souladu s nařízením (EU) č. 305/2011 vydává na výhradní odpovědnost výrobce uvedeného výše. / The performance of the product identified above is in conformity with the set of declared performance/s. This declaration of performance is issued, in accordance with Regulation (EU) No 305/2011, under the sole responsibility of the manufacturer identified above.

Podepsáno za výrobce a jeho jménem / Signed for and on behalf of the manufacturer by :
Ing. Vladimír Zeman, IWE; Vedoucí WPK / / Head FPC

V / Place: **Roudnice nad Labem,** Dne / Date: **01.01.2017**

Podpis / Sign

13-933
Ing. Vladimír ZEMAN

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PROHLÁŠENÍ O VLASTNOSTECH / Declaration of Performance

č. 2/2014

1. Jedinečný identifikační kód typu výrobku / Unique identification code of the product-type:

M222, M227, M254

2. Zamýšlená(é) použití / Intended use/es:

Příhradová konstrukce v souladu s EN 1090-3:2008. / *Truss structure in accordance with EN 1090-3:2008.*

3. Výrobce / Manufacturer:

MILOS s.r.o., Špindlerova třída 286, CZ – 413 01 Roudnice nad Labem

5. Systém(y) POSV/ Systém(s) of AVCP: **2+**

6a. Harmonizovaná norma / Harmonised standard: **EN 1090-1:2009+A1:2011**

Oznámený(é) subjekt(y)/ Notified body: **TÜV NORD Systems GmbH &Co. KG – 0045**

7. Deklarovaná(é) vlastnost(i) / Declared performance(s):

Základní charakteristiky / Essential characteristic	Vlastnost / Performance	Harmonizované technické specifikace / Harmonised technical specification
Svařitelnost / *Weldability*	**EN AW 6060**	**EN 1011-4:2000**
Křehký lom / *Fragile quarry*	**NPD**	**NPD**
Reakce na oheň / *Reaction to fire*	**Třída A1**/ *Class A1*	**EN 13501-1:2007+A1:2009**

Vlastnosti výše uvedeného výrobku jsou ve shodě se souborem deklarovaných vlastností. Toto prohlášení o vlastnostech se v souladu s nařízením (EU) č. 305/2011 vydává na výhradní odpovědnost výrobce uvedeného výše. / The performance of the product identified above is in conformity with the set of declared performance/s. This declaration of performance is issued, in accordance with Regulation (EU) No 305/2011, under the sole responsibility of the manufacturer identified above.

Podepsáno za výrobce a jeho jménem / Signed for and on behalf of the manufacturer by :
Ing. Vladimír Zeman, IWE; Vedoucí WPK / Head FPC

V / Place: **Roudnice nad Labem,** Dne / Date: **01.06.2019**

13-933 Ing. Vladimír ZEMAN

Podpis / Sign

CE

0045

MILOS s.r.o.

Špindlerova třída 286

CZ – 413 01 Roudnice nad Labem

14

Ref.-Nr. 1/2014

EN 1090-3:2008

Příhradová konstrukce / Truss

M290, M390, M400, M520, M760, M950, 4GS-35, 4GS-50, 4GS-62, 4GX-91, K-40

Poznámky / Notice:

CE

MILOS s.r.o.	14	EN 1090-3:2008
Špindlerova třída 286		Not. St. 0045
CZ – 413 01 Roudnice nad Labem		Ref.-Nr.: 1/2014

M290, M390, M400, M520, M760, M950, 4GS-35, 4GS-50, 4GS-62, 4GX-91, K-40

13-933
Ing. Vladimír ZEMAN

1.1.2017

CE

0045

MILOS s.r.o.

Špindlerova třída 286

CZ – 413 01 Roudnice nad Labem

14

Ref.-Nr. 2/2014

EN 1090-3:2008

Příhradová konstrukce / Truss

M222, M227, M254

Poznámky/ Notice:

CE

MILOS s.r.o.	14	EN 1090-3:2008
Špindlerova třída 286		Not. St. 0045
CZ – 413 01 Roudnice nad Labem		Ref.-Nr.: 2/2014
	M222, M227, M254	

1.6.19 13-933 Ing. Vladimír ZEMAN

Truss inspection documentation

Inspection date _____

Inspector _____

Reason for the inspection

- ☐ First purchase
- ☐ Inspection after accident, incident or malfunction
- ☐ Periodic inspection

Truss system _____

Type of component _____

Serial number _____

Overview of criteria to be checked for discard

(in accordance with the MILOS Truss User Manual Part 1: General instructions)

		A	B	C	D	E	F	G
1	Identification sticker	Sticker is missing						
2	Global geometry	Bending	Not easy to connect	Torsion				
3	Main chords	Breaks / Cracks	Bending	Not easy to connect	Corrosion	Scratches, Indentations, Abrasions	Ovalisation	Distortion, constriction
4	Diagonals / End frames	Breaks / Cracks	Not existing	Bending	Corrosion	Scratches, Indentations, Abrasions	Ovalisation	
5	Connector	Not easy to connect	Corrosion	Scratches, Indentations, Abrasions	Oval signs of wear in pin hole	Ovalization of pin hole due to overload		

Legend	Failure mode does not exist	Failure mode exists
	✗	✓

If failure mode present:

Cell number	Description of failure mode
_____	_____
_____	_____
_____	_____
_____	_____

Should the component be discarded? ☐ Yes ☐ No

Contact details:
Area Four Industries Česko s.r.o.
Špindlerova 286
413 01 Roudnice nad Labem
Czech Republic
T +420 416 810 800
info@milos.cz

Area
Four
Industries

www.milossystems.com

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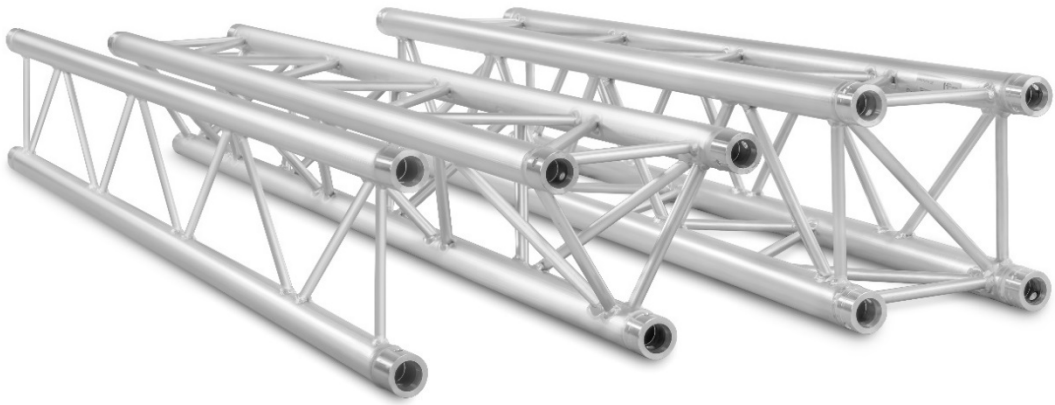
M290 Truss

User manual

Part 2: Product-specific instructions



Original instructions

DN00127 Issue 1
July 2019

Area Four Industries

Manufacturer:

MILOS s.r.o.

Spindlerova 286

413 01 Roudnice nad Labem

Czech Republic

T +420 416 810 800

info@milos.cz

If you have a warranty claim, malfunction or spare part inquiry, contact your point of sale or the manufacturer.

If you have comments or improvement ideas for this document, please contact us by using the e-mail address found on the back cover of the document. All comments and ideas will be carefully considered in the future development of the product or this document.

Milos. Works better.

Contents

Change history

Issue	Date	Changes
1	July 2019	First issue.

1 Introduction

This manual is intended for truss owners, providers and skilled riggers and any person who has been trained in working safely with trusses.

This manual is Part 2 of the User Manual. The User Manual consists of the following parts:

- Part 1: General instructions
- Part 2: Product-specific instructions

This manual must be read in conjunction with *Part 1: General instructions* of the User Manual.

If there are discrepancies between *Part 1* and *Part 2*, the information given in *Part 2* is the information that applies to the product and overrides the information given in *Part 1*.

This manual assumes that you have been trained or work under the control of a competent or qualified person who has been trained in safety and assembly.

1.1 About this product

MILOS trusses are structural elements designed to be repeatedly assembled and disassembled to carry loads in temporary or permanent installations. Depending on the application, MILOS trusses can be referred to as lifting accessories or construction products. For information on the related standards, see Chapter 1.5.

The M290 series can be used for indoor and outdoor structures.

1.2 Related information

For more information on the product, see www.milossystems.com/products/truss/.

1.3 About this manual

Before working with the product, read this manual carefully and pay attention to the information provided. Use this manual to familiarise yourself with the product, its proper use and safety regulations.

1.3.1 Safety conventions

DANGER

Indicates a hazardous situation, which, if not avoided, will result in death or serious injury. This signal word is limited to the most extreme situations.

WARNING

Indicates a hazardous situation, which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a hazardous situation, which, if not avoided, could result in minor or moderate injury.

NOTICE

Indicates information considered important but not hazard-related.

1.4 Terminology

See *MILOS Trusses User Manual, Part 1: General instructions*.

Trusses and truss modules are hereinafter referred to by the term "truss".

1.5 Standards

See *MILOS Trusses User Manual, Part 1: General instructions*.

2 Safety

Before working with the product, see the section *Safety* in *MILOS Trusses User Manual, Part 1: General instructions*. Read the Safety information carefully and pay attention to the information provided.

In addition to the Safety information provided in Part 1, make sure you read the Safety information provided in this product-specific user manual.

NOTICE

Read these safety texts carefully before working with the product.

NOTICE

Make sure manuals are available at all times for all users and employees.

3 Limitations of use

Make sure you read the information provided in section *Limitations of use* in *MILOS Trusses User Manual, Part 1: General instructions*.

MILOS trusses described in this manual are not specifically designed for lifting people. Adequate load reduction and safety precautions, according to local legislation, must be considered when people are lifted.

3.1 Allowable loading

For load capacity information, see Chapter 6.2.

3.2 Structural data

All our trusses are calculated according to the Eurocode 9 (DIN-EN 1999) standard. Eurocodes are standards based on Load and Resistance Factor Design (LRFD).

⚠ WARNING

The structural data provided before January 2016 was based on the German DIN 4113 standard. As this standard had a different safety principle, the structural values cannot be compared.

NOTICE

TÜV certificates issued after February 2015 are all based on Eurocode 9.

3.2.1 Regular

Code	Type	Material	Geometry								
			Dimensions centre to centre		Main chord [mm]	diagonals [mm]	Cross-section complete truss				Average dead weight
			Height	Width			A	I_y	I_z	I_T	g
			[mm]	[mm]			[cm^2]	[cm^4]	[cm^4]	[cm^4]	[kg/m]
M290B-BTB/BTF	duo	6082 T6	240	0	50x2	16x2	6.03	886.0	17.4	38.2	2.6
M290B-STB/STF	trio	6082 T6	208	240	50x2	16x2	9.05	894.3	894.7	155.4	3.9
M290B-QTB/QTF	quatro	6082 T6	240	240	50x2	16x2	12.06	1772.0	1772.0	482.0	5.1
M290U-BTU	duo	6082 T6	240	0	50x2	20x2	6.03	886.0	17.4	39.4	3.0
M290U-STU	trio	6082 T6	208	240	50x2	20x2	9.05	894.3	894.7	182.9	4.4
M290U-QTU/ QTUU	quatro	6082 T6	240	240	50x2	20x2	12.06	1772.0	1772.0	585.5	5.8

Table 1: Geometry

Code	Design values of resistances				
	Main chord	Complete truss			
	N_{rd}	$M_{y,rd}$	$M_{z,rd}$	$V_{z,rd}$	$Vy_{,rd}$
	[kN]	[kNm]	[kNm]	[kN]	[kN]
M290B-BTB/BTF	35.71	8.57	n/a	4.96	n/a
M290B-STB/STF	35.71	7.42	8.57	8.60	4.96
M290B-QTB/QTF	35.71	17.14	17.14	9.93	9.93
M290U-BTU	35.71	8.57	n/a	8.43	n/a
M290U-STU	35.71	7.42	8.57	14.60	8.43
M290U-QTU/QTUU	35.71	17.14	17.14	16.85	16.85

Table 2: Design values of resistances

3.2.2 Heavy duty

Code	Type	Material	Geometry								
			Dimensions centre to centre		Main chord [mm]	diagonals [mm]	Cross-section complete truss				Average dead weight
			Height	Width			A	I_y	I_z	I_T	g
			[mm]	[mm]			[cm^2]	[cm^4]	[cm^4]	[cm^4]	[kg/m]
M290V-BTV	duo	6082 T6	240	0	48x3	16x2	8.48	1243.0	21.6	46.4	2.8
M290V-STV/ STVF	trio	6082 T6	208	240	48x3	16x2	12.72	1253.3	1253.8	170.6	5.8
M290V-QTV/ QTVF	quatro	6082 T6	240	240	48x3	16x2	16.96	2486.0	2486.0	510.4	5.8
M290V-QTVU	quatro	6082 T6	240	240	48x3	20x2	16.96	2486.0	2486.0	620.8	5.8

Table 3: Geometry

Code	Design values of resistances				
	Main chord	Complete truss			
	$N_{,rd}$	$M_{y,rd}$	$M_{z,rd}$	$V_{z,rd}$	$Vy_{,rd}$
	[kN]	[kNm]	[kNm]	[kN]	[kN]
M290V-BTV	50.22	12.05	n/a	4.96	n/a
M290V-STV/STVF	50.22	10.44	12.05	8.60	4.96
M290V-QTV/ QTVF	50.22	24.10	24.10	9.93	9.93
M290V-QTVU	50.22	24.10	24.10	16.85	16.85

Table 4: Design values of resistances

4 Transport, handling and storage

See *MILOS Trusses User Manual, Part 1: General instructions*.

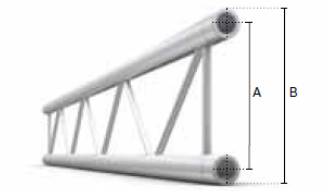
5 Identification

See *MILOS Trusses User Manual, Part 1: General instructions*.

6 Technical specifications

6.1 Regular

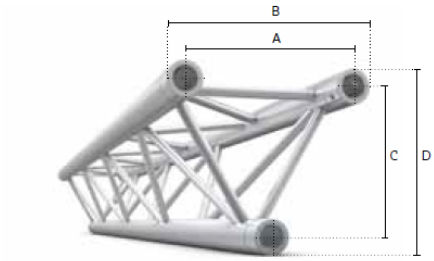
DUO



M290

	Main Chords	Diagonals	Alloy	A	B	Coupler
BTB	**50x2** (2x0.08)	**16x2** (0.62x0.08)	**EN - AW 6082 T6**	**240** (9.44)	**290** (11.41)	**CCB**
BTF	**50x2** (2x0.08)	**16x2** (0.62x0.08)	**EN - AW 6082 T6**	**240** (9.44)	**290** (11.41)	**CCF**
BTU	**50x2** (2x0.08)	**20x2** (0.78x0.08)	**EN - AW 6082 T6**	**240** (9.44)	**290** (11.41)	**CCU**

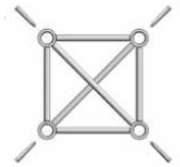
TRIO



M290

	Main Chords	Diagonals	Alloy	A	B	C	D	Coupler
STB	**50x2** (2x0.08)	**16x2** (0.62x0.08)	**EN - AW 6082 T6**	**240** (9.44)	**290** (11.41)	**207** (8.15)	**257** (10.12)	**CCB**
STF	**50x2** (2x0.08)	**16x2** (0.62x0.08)	**EN - AW 6082 T6**	**240** (9.44)	**290** (11.41)	**207** (8.15)	**257** (10.12)	**CCF**
STU	**50x2** (2x0.08)	**20x2** (0.78x0.08)	**EN - AW 6082 T6**	**240** (9.44)	**290** (11.41)	**207** (8.15)	**257** (10.12)	**CCU**

QUATRO



M290

	Main Chords	Diagonals	Alloy	A	B	Coupler
QTB	**50x2** (2x0.08)	**16x2** (0.62x0.08)	**EN - AW 6082 T6**	**240** (9.44)	**290** (11.41)	**CCB**
QTF	**50x2** (2x0.08)	**16x2** (0.62x0.08)	**EN - AW 6082 T6**	**240** (9.44)	**290** (11.41)	**CCF**
QTU	**50x2** (2x0.08)	**20x2** ((0.78x0.08)	**EN - AW 6082 T6**	**240** (9.44)	**290** (11.41)	**CCU**

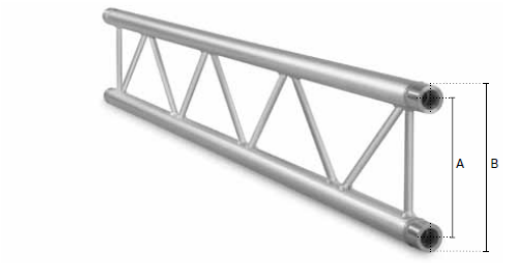
STANDARD LENGTHS AND WEIGHTS AVAILABLE

	m (ft)	**0.50** (1.64)	**1.00** (3.28)	**1.50** (4.92)	**2.00** (6.56)	**2.50** (8.20)	**3.00** (9.84)	**4.00** (13.12)	**5.00** (16.41)
DUO	kg (lbs)	**1.70** (3.75)	**2.60** (5.73)	**3.60** (7.94)	**4.50** (9.92)	**5.50** (12.13)	**6.60** (14.55)	**8.50** (18.74)	**10.30** (22.71)
TRIO	kg (lbs)	**2.80** (6.17)	**4.50** (9.92)	**6.00** (13.22)	**7.70** (16.98)	**9.10** (20.06)	**10.80** (23.81)	**14.10** (31.09)	**18.00** (39.68)
QUATRO	kg (lbs)	**3.90** (8.60)	**6.00** (13.23)	**8.30** (18.30)	**10.60** (23.37)	**12.90** (28.44)	**15.00** (33.07)	**19.60** (43.21)	**23.50** (51.81)

Connection material (pins/clips/couplers) and packaging are not included in above weights

6.2 Heavy duty

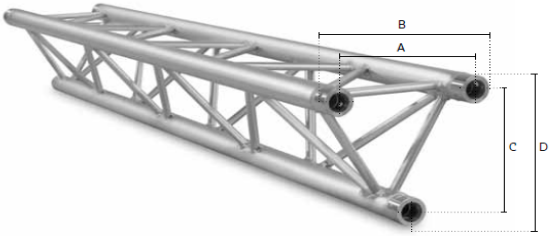
DUO



M290V

	Main Chords	Diagonals	Alloy	A	B	Coupler
BTV	**48x3** (1.89x0.12)	**16x2** (0.62x0.08)	**EN - AW 6082 T6**	**240** (9.44)	**288** (11.34)	**CCB**
BTVF	**48x3** (1.89x0.12)	**16x2** (0.62x0.08)	**EN - AW 6082 T6**	**240** (9.44)	**288** (11.34)	**CCF**
BTVU	**48x3** (1.89x0.12)	**20x2** (0.78x0.08)	**EN - AW 6082 T6**	**240** (9.44)	**288** (11.34)	**CCU**

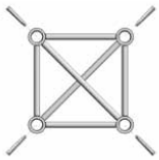
TRIO



M290V

	Main Chords	Diagonals	Alloy	A	B	C	D	Coupler
STV	**48x3** (1.89x0.12)	**16x2** (0.62x0.08)	**EN - AW 6082 T6**	**240** (9.44)	**288** (11.34)	**207** (8.15)	**255** (10.04)	**CCB**
STVF	**48x3** (1.89x0.12)	**16x2** (0.62x0.08)	**EN - AW 6082 T6**	**240** (9.44)	**288** (11.34)	**207** (8.15)	**255** (10.04)	**CCF**
STVU	**48x3** (1.89x0.12)	**20x2** (0.78x0.08)	**EN - AW 6082 T6**	**240** (9.44)	**288** (11.34)	**207** (8.15)	**255** (10.04)	**CCU**
STVUU	**48x3** (1.89x0.12)	**20x2** (0.78x0.08)	**EN - AW 6082 T6**	**240** (9.44)	**288** (11.34)	**207** (8.15)	**255** (10.04)	**CCU**

QUATRO



M290V

	Main Chords	Diagonals	Alloy	A	B	Coupler
QTV	**48x3** (1.89x0.12)	**16x2** (0.62x0.08)	**EN - AW 6082 T6**	**240** (9.44)	**288** (11.34)	**CCB**
QTVF	**48x3** (1.89x0.12)	**16x2** (0.62x0.08)	**EN - AW 6082 T6**	**240** (9.44)	**288** (11.34)	**CCF**
QTVU	**48x3** (1.89x0.12)	**20x2** (0.78x0.08)	**EN - AW 6082 T6**	**240** (9.44)	**288** (11.34)	**CCU**
QTVUU	**48x3** (1.89x0.12)	**20x2** (0.78x0.08)	**EN - AW 6082 T6**	**240** (9.44)	**288** (11.34)	**CCU**

STANDARD LENGTHS AND WEIGHTS AVAILABLE

	m (ft)	**0.50** (1.64)	**1.00** (3.28)	**1.50** (4.92)	**2.00** (6.56)	**2.50** (8.20)	**3.00** (9.84)	**4.00** (13.12)	**5.00** (16.41)
DUO	kg (lbs)	**1.70** (3.90)	**3.00** (6.75)	**4.30** (9.57)	**5.70** (12.57)	**6.90** (15.21)	**8.10** (17.86)	**10.70** (23.7)	**13.30** (29.34)
TRIO	kg (lbs)	**2.90** (6.39)	**5.00** (11.02)	**7.10** (15.65)	**9.30** (20.50)	**11.40** (25.13)	**13.50** (29.76)	**18.00** (39.68)	**22.00** (48.50)
QUATRO	kg (lbs)	**4.10** (9.04)	**7.00** (15.43)	**9.90** (21.83)	**12.50** (27.56)	**15.50** (34.17)	**18.30** (40.35)	**24.00** (52.91)	**29.70** (65.48)

Connection material (pins/clips/couplers) and packaging are not included in above weights

7 Load capacity

In addition to the information and instructions provided in *MILOS Trusses User Manual, Part 1: General instructions*, the truss loads shall never exceed the values stated in the load tables below.

As per Eurocode 9, all values provided are calculated based on a safety factor of 1.1 on the material and 1.5 on the load.

7.1 Regular

M290 DUO

LOADING CHART

Span	m (ft)	3.00	9.84	4.00	(13.12	5.00	(16.40)	6.00	(19.69)	7.00	(22.97)	8.00	(26.25)	9.00	(29.53)
CPL	kg (lbs)	667.50	(1471.58)	577.60	(1273.39)	460.00	(1014.13)	381.10	(840.18)	324.50	(715.40)	281.70	(621.04)	248.10	(546.97)
Deflection	mm (in)	6.00	(0.24)	12.30	(0.48)	19.30	(0.76)	27.80	(1.09)	38.00	(1.50)	49.80	(1.96)	63.20	(2.49)
TPL	kg (lbs)	333.70	(735.68)	332.60	(733.26)	331.40	(730.61)	285.80	(630.08)	243.30	(536.38)	211.20	(465.62)	186.10	(410.28)
Deflection	mm (in)	5.10	(0.20)	12.10	(0.48)	23.60	(0.93)	35.40	(1.39)	48.20	(1.90)	63.00	(2.48)	79.70	(3.14)
QPL	kg (lbs)	222.50	(490.53)	221.70	(488.76)	220.90	(487.00)	190.60	(420.20)	162.20	(357.59)	140.80	(310.41)	124.10	(273.59)
Deflection	mm (in)	4.70	(0.19)	11.20	(0.44)	22.00	(0.87)	32.90	(1.30)	44.90	(1.77)	58.70	(2.31)	74.40	(2.93)
FPL	kg (lbs)	166.90	(367.95)	166.30	(366.63)	165.70	(365.31)	158.80	(350.09)	135.20	(298.06)	117.40	(258.82)	103.40	(227.96)
Deflection	mm (in)	4.50	(0.18)	10.70	(0.42)	21.00	(0.83)	34.90	(1.37)	47.50	(1.87)	62.10	(2.44)	78.70	(3.10)
UDL	kg (lbs)	222.50	(149.51)	166.30	(111.75)	132.50	(89.04)	110.10	(73.98)	92.70	(62.29)	70.40	(47.31)	55.10	(37.03)
Deflection	mm (in)	3.80	(0.15)	8.90	(0.35)	17.40	(0.69)	30.10	(1.19)	47.20	(1.86)	61.60	(2.43)	78.10	(3.07)

DUO figures are based on use in vertical mode and stabilized every 1m • Higher loading values for U version available

M290 TRIO

LOADING CHART

Span	m (ft)	4.00	(13.12)	6.00	(19.69)	8.00	(26.25)	10.00	(32.81)	12.00	(39.37)	14.00	(45.93)	16.00	(52.49)
CPL	kg (lbs)	497.20	(1096.14)	325.60	(717.82)	238.00	(524.70)	184.10	(405.87)	147.00	(324.08)	119.40	(263.23)	97.90	(215.83)
Deflection	mm (in)	10.60	(0.42)	24.00	(0.94)	43.10	(1.70)	68.10	(2.68)	99.50	(3.92)	137.70	(5.42)	183.20	(7.21)
TPL	kg (lbs)	372.90	(822.10)	244.20	(538.37)	178.50	(393.52)	138.10	(304.46)	110.20	(242.95)	89.60	(197.53)	73.40	(161.82)
Deflection	mm (in)	13.50	(0.53)	30.40	(1.20)	54.10	(2.13)	84.80	(3.34)	122.50	(4.82)	167.40	(6.59)	219.60	(8.65)
QPL	kg (lbs)	248.60	(548.07)	162.80	(358.91)	119.00	(262.35)	92.00	(202.83)	73.50	(162.04)	59.70	(131.62)	48.90	(107.81)
Deflection	mm (in)	12.50	(0.49)	28.30	(1.11)	50.50	(1.99)	79.40	(3.13)	115.00	(4.53)	157.70	(6.21)	207.80	(8.18)
FPL	kg (lbs)	207.20	(456.80)	135.70	(299.17)	99.20	(218.70)	76.70	(169.09)	61.20	(134.92)	49.80	(109.79)	40.80	(89.95)
Deflection	mm (in)	13.30	(0.52)	30.00	(1.18)	53.40	(2.10)	83.70	(3.30)	121.00	(4.76)	165.50	(6.52)	217.30	(8.56)
UDL	kg (lbs)	248.60	(167.05)	108.50	(72.91)	59.50	(39.98)	36.80	(24.73)	24.50	(16.46)	17.10	(11.49)	12.20	(8.20)
Deflection	mm (in)	13.20	(0.52)	29.70	(1.17)	53.00	(2.09)	83.10	(3.27)	120.20	(4.73)	164.40	(6.47)	216.00	(8.50)

TRIO figures are based on use in apex up/down orientation • Higher loading values for U version available

M290 QUATRO

LOADING CHART

Span	m (ft)	4.00	(13.12)	6.00	(19.69)	8.00	(26.25)	10.00	(32.81)	12.00	(39.37)	14.00	(45.93)	16.00	(52.49)
CPL	kg (lbs)	1155.40	(2547.22)	762.50	(1681.02)	563.70	(1242.74)	442.50	(975.54)	360.20	(794.10)	300.00	(661.39)	253.80	(559.53)
Deflection	mm (in)	12.30	(0.48)	27.80	(1.09)	49.70	(1.96)	78.30	(3.08)	113.70	(4.48)	156.20	(6.15)	206.40	(8.13)
TPL	kg (lbs)	665.30	(1466.73)	571.90	(1260.82)	422.80	(932.11)	331.90	(731.71)	270.10	(595.47)	225.00	(496.04)	190.30	(419.54)
Deflection	mm (in)	12.10	(0.48)	35.40	(1.39)	63.00	(2.48)	98.50	(3.88)	142.10	(5.59)	193.90	(7.63)	253.90	(10.00)
QPL	kg (lbs)	443.50	(977.75)	381.30	(840.62)	281.80	(621.26)	221.30	(487.88)	180.10	(397.05)	150.00	(330.69)	126.90	(279.77)
Deflection	mm (in)	11.20	(0.44)	32.90	(1.30)	58.70	(2.31)	91.90	(3.62)	132.90	(5.23)	181.70	(7.15)	238.50	(9.39)
FPL	kg (lbs)	332.60	(733.26)	317.70	(700.41)	234.90	(517.87)	184.40	(406.53)	150.10	(330.91)	125.00	(275.58)	105.70	(233.03)
Deflection	mm (in)	10.70	(0.42)	34.90	(1.37)	62.10	(2.44)	97.20	(3.83)	140.30	(5.52)	191.50	(7.54)	250.90	(9.88)
UDL	kg (lbs)	332.60	(223.50)	220.20	(147.97)	140.90	(94.68)	88.50	(59.47)	60.00	(40.32)	42.90	(28.83)	31.70	(21.30)
Deflection	mm (in)	8.90	(0.35)	30.10	(1.19)	61.60	(2.43)	96.50	(3.80)	139.30	(5.48)	190.10	(7.48)	249.20	(9.81)

Higher loading values for U version available

CPL (Centre Point Load)	TPL (Third Point Load)	QPL (Quarter Point Load)	FPL (Fifth Point Load)	UDL (Uniformly Distributed Load)

All truss loading calculations and TUV certifications are based on:
Truss supported or suspended at both ends • Static loadings only • Loads applied on the node points • Included self-weight of the trusses • Spans made of different truss lengths • Interaction of bending moment and shear force at connector • Structural calculations based on DIN EN 1999-1-1 and DIN EN 1999-1-1/A2 made in 2014 • To comply with BS 7905-2 / ANSI E1.2-2006 / CWA 15902-2 all loading data should be multiplied by 0.85 • For any other application, or in case of an assembled structure, contact Milos or a structural engineer • Safety factors used – self weight 1.35 / loading 1.5

7.2 Heavy duty

M290V DUO

LOADING CHART

Span	m (ft)	3.00	(9.84)	4.00	(13.12)	5.00	(16.40)	6.00	(19.69)	7.00	(22.97)	8.00	(26.25)	9.00	(29.53)
CPL	kg (lbs)	666.90	(1470.26)	664.40	(1464.75)	648.80	(1430.36)	538.30	(1186.75)	459.00	(1011.92)	399.20	(880.08)	352.40	(776.91)
Deflection	mm (in)	4.30	(0.17)	10.10	(0.40)	19.30	(0.76)	27.90	(1.10)	38.00	(1.50)	49.70	(1.96)	63.10	(2.48)
TPL	kg (lbs)	333.50	(735.24)	332.20	(732.37)	330.90	(729.51)	329.60	(726.64)	328.30	((723.78)	299.40	(660.06)	264.30	(582.68)
Deflection	mm (in)	3.60	(0.14)	8.60	(0.34)	16.80	(0.66)	29.00	(1.14)	46.10	(1.81)	63.10	(2.48)	79.90	(3.15)
QPL	kg (lbs)	222.30	490.09)	221.50	(488.32)	220.60	(486.34)	219.70	(484.36)	218.90	(482.59)	199.60	(440.04)	176.20	(388.45)
Deflection	mm (in)	3.40	(0.13)	8.00	(0.31)	15.60	(0.61)	27.00	(1.06)	42.90	(1.69)	58.70	(2.31)	74.40	(2.93)
FPL	kg (lbs)	166.70	(367.51)	166.10	(366.19)	165.50	(364.86)	164.80	(363.32)	164.20	(362.00)	163.50	(360.46)	146.90	(323.86)
Deflection	mm (in)	3.20	(0.13)	7.70	(0.30)	15.00	(0.59)	25.80	(1.02)	41.00	(1.61)	61.20	(2.41)	78.80	(3.10)
UDL	kg (lbs)	222.30	(149.38)	166.10	(111.61)	132.40	(88.97)	109.90	(73.85)	93.80	(63.03)	81.80	(54.97)	72.40	(48.65)
Deflection	mm (in)	2.70	(0.11)	6.30	(0.25)	12.40	(0.49)	21.40	(0.84)	34.10	(1.34)	50.90	(2.00)	72.50	(2.85)

DUO figures are based on use in vertical mode and stabilized every 1m

M290V TRIO

LOADING CHART

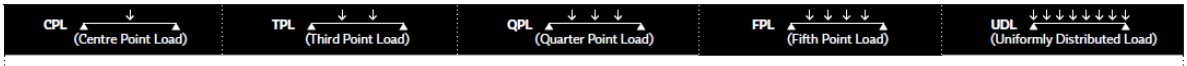
Span	m (ft)	4.00	(13.12)	6.00	(19.69)	8.00	(26.25)	10.00	(32.81)	12.00	(39.37)	14.00	(45.93)	16.00	(52.49)
CPL	kg (lbs)	700.50	(1544.34)	459.80	(1013.68)	337.30	(743.62)	262.10	(577.83)	210.50	(464.07)	172.40	(380.08)	142.80	(314.82)
Deflection	mm (in)	10.60	(0.42)	24.00	(0.94)	43.10	(1.70)	68.00	(2.68)	99.20	(3.91)	137.00	(5.39)	182.00	(7.17)
TPL	kg (lbs)	525.40	(1158.31)	344.90	(760.37)	253.00	(557.77)	196.60	(433.43)	157.90	(348.11)	129.30	(285.06)	107.10	(236.11)
Deflection	mm (in)	13.50	(0.53)	30.50	(1.20)	54.30	(2.14)	85.00	(3.35)	122.70	(4.83)	167.60	(6.60)	219.80	(8.65)
QPL	kg (lbs)	350.20	(772.06)	229.90	(506.84)	168.70	(371.92)	131.00	(288.81)	105.30	(232.15)	86.20	(190.04)	71.40	(157.41)
Deflection	mm (in)	12.60	(0.50)	28.40	(1.12)	50.60	(1.99)	79.50	(3.13)	115.10	(4.53)	157.70	(6.21)	207.50	(8.17)
FPL	kg (lbs)	287.80	(634.49)	191.60	(422.41)	140.50	(309.75)	109.20	(240.74)	87.70	(193.35)	71.80	(158.29)	59.50	(131.17)
Deflection	mm (in)	13.20	(0.52)	30.10	(1.19)	53.60	(2.11)	83.90	(3.30)	121.20	(4.77)	165.70	(6.52)	217.40	(8.56)
UDL	kg (lbs)	287.80	(193.39)	153.30	(103.01)	84.30	(56.65)	52.40	(35.21)	35.10	(23.59)	24.60	(16.53)	17.80	(11.96)
Deflection	mm (in)	10.90	(0.43)	29.80	(1.17)	53.10	(2.09)	83.30	(3.28)	120.40	(4.74)	164.60	(6.48)	216.00	(8.50)

TRIO figures are based on use in apex up/down orientation

M290V QUATRO

LOADING CHART

Span	m (ft)	4.00	(13.12)	6.00	(19.69)	8.00	(26.25)	10.00	(32.81)	12.00	(39.37)	14.00	(45.93)	16.00	(52.49)
CPL	kg (lbs)	1328.00	(2927.74)	1076.00	(2372.17)	797.70	(1758.63)	628.60	(1385.82)	514.10	(1133.40)	430.80	(949.75)	366.90	(808.88)
Deflection	mm (in)	10.10	(0.40)	27.90	(1.10)	49.70	(1.96)	78.20	(3.08)	113.30	(4.46)	155.50	(6.12)	205.00	(8.07)
TPL	kg (lbs)	664.00	(1463.87)	658.70	(1452.18)	598.30	(1319.02)	471.40	(1039.26)	385.60	(850.10)	323.10	(712.31)	275.20	(606.71)
Deflection	mm (in)	8.60	(0.34)	29.00	(1.14)	63.10	(2.48)	98.70	(3.89)	142.30v	(5.60)	194.00	(7.64)	254.00	(10.00)
QPL	kg (lbs)	442.70	(975.99)	439.10	(968.05)	398.90	(879.42)	314.30	(692.91)	257.00	(566.59)	215.40	(474.88)	183.50	(404.55)
Deflection	mm (in)	8.00	(0.31)	27.00	(1.06)	58.70	(2.31)	92.00	(3.62)	132.90	(5.23)	181.50	(7.15)	238.00	(9.37)
FPL	kg (lbs)	332.00	(731.93)	329.30	(725.98)	326.70	(720.25)	261.90	(577.39)	214.20	(472.23)	179.50	(395.73)	152.90	(337.09)
Deflection	mm (in)	7.70	(0.30)	25.80	(1.02)	61.20	(2.41)	97.40	(3.83)	140.50	(5.53)	191.60	(7.54)	250.80	(9.87)
UDL	kg (lbs)	332.00	(223.09)	219.60	(147.56)	163.30	(109.73)	125.70	(84.47)	85.70	(57.59)	61.50	(41.33)	45.90	(30.84)
Deflection	mm (in)	6.30	(0.25)	21.40	(0.84)	50.90	(2.00)	96.60	(3.80)	139.40	(5.49)	190.20	(7.49)	249.10	(9.81)



All truss loading calculations and TUV certifications are based on:
Truss supported or suspended at both ends • Static loadings only • Loads applied on the node points • Included self-weight of the trusses • Spans made of different truss lengths • Interaction of bending moment and shear force at connector • Structural calculations based on DIN EN 1999-1-1 and DIN EN 1999-1-1/A2 made in 2014 • To comply with BS 7905-2 / ANSI E1.2-2006 / CWA 15902-2 all loading data should be multiplied by 0.85 • For any other application, or in case of an assembled structure, contact Milos or a structural engineer • Safety factors used – self weight 1.35 / loading 1.5

8 Approved accessories

For a complete overview of approved accessories, see our brochures or www.milossystems.com.

⚠ WARNING

By using excessive force when tightening accessories such as lamp hooks or cell clamps, you may cause damage to the truss chords.

⚠ CAUTION

Pay special attention when using lamp hooks or cell clamps. Their inside radius may not meet the tube they need to be attached to. This can lead to severe damage.

NOTICE

You should never allow accessories to damage other products.

9 Coatings and surface treatments

See *MILOS Trusses User Manual, Part 1: General instructions*.

10 Slinging methods

See *MILOS Trusses User Manual, Part 1: General instructions*.

11 Assembly and disassembly

See *MILOS Trusses User Manual, Part 1: General instructions*.

12 Maintenance

See *MILOS Trusses User Manual, Part 1: General instructions*.

13 Inspection

See *MILOS Trusses User Manual, Part 1: General instructions*.

14 Discard criteria

See *MILOS Trusses User Manual, Part 1: General instructions*.

15 Warranty

See *MILOS Trusses User Manual, Part 1: General instructions*.

16 Certificates

The TÜV certificates for this product are available at:

https://www.milossystems.com/support/product-support/download-center

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