Tension rod and compression strut systems

Modern architecture in steel and façade construction
**m-connect** - Tension rod and compression strut systems for modern architecture in steel and facade construction.

Products of MÜRMANN GmbH, a LISEGA Group company.
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rod and compression strut systems
Construction elements for modern building technology

Modern architecture

The current trend in modern architecture is, by the skilful use of steel and glass, to present large-scale buildings as airy, futuristic constructions soaring skywards. Outstanding features of this style of building are roofs that seemingly float on air, with a filigree supporting framework and skilfully suspended facades.

The availability of special, easily integrated fastening and support elements is a prerequisite for the optimum implementation of this form of construction. The special tension rod and compression strut systems, as integral elements in the building design, must guarantee maximum functionality and safety. At the same time they must blend into the whole construction as clearly visible design elements with aesthetic appeal.

m·connect product program

The product range of m·connect tension rod and compression strut systems was specially developed for the smooth fulfilment of these tasks. The products meet the toughest demands and, due to their wide-ranging applicability, are of great practical benefit to architects, construction engineers, and construction companies.

Tension rod and compression strut systems

The m·connect tension rod systems are the ideal components to distribute tension forces in an economical and, at the same time, elegant manner. They are suited to all types of suspension and anchoring. Connection plates (circular disks) and connecting lugs provide optimum additional features.

The m·connect compression strut systems are able to bear tension forces, but are also specially designed to take up and distribute compression forces. They are ideally suited to act as stabilizing elements and supports, suspension components on simultaneous compression loads and compression struts in frame construction. By combining compression strut and tension rod systems, additional construction possibilities are available.
Elegant designs of lightweight construction

The highest demands were made in the design and finish of the components. This also applies to structural connections, such as the connection lugs, whereby functionality is to be expressed through the corresponding design.

In line with the principle *design follows function* the distribution of material corresponds to FE (finite element) calculated operational stresses, whereby for the fork heads, the component function finds convincing expression in the optimized droplet shape. The cap nuts consistently follow the form of the fork heads and by a smooth transition seem to merge with the connecting tension rod.

**Design elements of significance**

As clearly visible elements, the m-connect tension rod and compression strut systems are of crucial significance in the representative design of the building. They blend easily, in a filigree fashion, into the sophisticated architecture and shape the style of the structure.
Practical construction elements for statics

The m-connect construction elements are designed strictly according to the application demands. In this way they offer an economical and at the same time attractive solution to a wide range of tasks in the field of construction. As the distribution of material corresponds to the loads imposed, the high-tensile materials are exploited to the optimum level. This permits lightweight construction at maximum loading capacity.

The modular system and corresponding engineering software further facilitate implementation and speed up the design and construction cycle.
The application possibilities of the m·connect tension rod and compression strut systems are as diverse as the possibilities in construction, whether in steel, steel/wood or steel/glass.

- exhibition halls
- bus terminals
- bridge building
- pedestrian bridges
- galleries
- airport buildings
- glass roofs
- glass facades
- industrial workshops
- shopping malls
- congress halls
- sports centres
- tower constructions
- covered sheds
- roofing
- canopies
- tent constructions

With the m·connect tension rod and compression strut systems, typical static design challenges can be expertly, elegantly, stylishly and economically solved - at a single stroke!
FORK HEADS

Only a few components are required for the formation of m·connect tension rod and compression strut systems. The fork heads are of crucial importance in the system as connections for the structural attachments (see p. 14). The operational load capacity of the fork heads is approved, both for tensile and compression loads. They are correspondingly designated for use in tension rod and compression strut systems.

A quenched and tempered steel casting, manufactured in a quality lost-wax investment process, bestows the component with great strength and excellent cold tenacity. For maximum corrosion protection of the threaded connection, the tapped hole takes the form of a pocket not a drilled-through hole.

### System elements

#### Fork Heads

- Only a few components are required for the formation of m·connect tension rod and compression strut systems.
- The fork heads are of crucial importance in the system as connections for the structural attachments.
- The operational load capacity of the fork heads is approved, both for tensile and compression loads.
- They are correspondingly designated for use in tension rod and compression strut systems.
- A quenched and tempered steel casting, manufactured in a quality lost-wax investment process, bestows the component with great strength and excellent cold tenacity.
- For maximum corrosion protection of the threaded connection, the tapped hole takes the form of a pocket not a drilled-through hole.

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<th>E</th>
<th>C</th>
<th>D</th>
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**Footnotes:**
1 = right-hand thread, 2 = left-hand thread

- **Corrosion protection (see Table, p. 24)**
- **Adjustment**
- **Right or left-hand thread acc. to function**
The MÜRMANN plant can look back on more than 40 successful years of experience in the manufacture of threaded rods and studs. The threads can be produced by cutting (CNC or cutter head), rolling or spinning process. The tension rods are equipped with left-hand / right-hand threads for length adjustment and with flat faces on both sides. Individual rod lengths of up to 12 m can be supplied as standard. The high-strength fine-grained structural steel S460N is the standard component material. Other materials, including a range of stainless steel can also be supplied.
**CAP NUTS**

The m-connect cap nuts are used to lightly lock the tension rod and also serve to cover the exposed thread.

To maintain the minimum engagement depth, no threading must be visible after a cap nut is screwed on!

---

<table>
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<tr>
<th>Type</th>
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<th>L [mm]</th>
<th>d [mm]</th>
<th>d4 [mm]</th>
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1. 3 = right-hand thread, 4 = left-hand thread, 2. Material / corrosion protection (see Table, p. 24)
CONNECTING SLEEVES

The m-connect sleeves are used as connecting parts between the tension rods if the system length, e.g. above 12 m, is to be extended. Through standardised design with left-hand/right-hand threads, they function as a turnbuckle at the same time.

CONNECTING SLEEVES WITH LUGS

The connecting sleeves can be fitted with suspension lugs for load-bearing in horizontally arranged tension rod systems (underbracing).

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<th>±V [mm]</th>
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<td>6</td>
<td>19.5</td>
<td>1.20</td>
</tr>
<tr>
<td>6-4636</td>
<td>10.5</td>
<td>10.5</td>
<td>6</td>
<td>19.5</td>
<td>2.10</td>
</tr>
<tr>
<td>6-4642</td>
<td>12.5</td>
<td>12.5</td>
<td>8</td>
<td>22.5</td>
<td>3.40</td>
</tr>
<tr>
<td>6-4648</td>
<td>12.5</td>
<td>12.5</td>
<td>8</td>
<td>22.5</td>
<td>4.70</td>
</tr>
<tr>
<td>6-4656</td>
<td>16.5</td>
<td>16.5</td>
<td>10</td>
<td>31.0</td>
<td>7.00</td>
</tr>
<tr>
<td>6-4664</td>
<td>16.5</td>
<td>16.5</td>
<td>10</td>
<td>31.0</td>
<td>11.20</td>
</tr>
<tr>
<td>6-4672</td>
<td>16.5</td>
<td>16.5</td>
<td>10</td>
<td>31.0</td>
<td>14.80</td>
</tr>
<tr>
<td>6-4680</td>
<td>20.5</td>
<td>20.5</td>
<td>12</td>
<td>39.0</td>
<td>20.50</td>
</tr>
<tr>
<td>6-4690</td>
<td>20.5</td>
<td>20.5</td>
<td>12</td>
<td>39.0</td>
<td>28.50</td>
</tr>
<tr>
<td>6-4600</td>
<td>20.5</td>
<td>20.5</td>
<td>12</td>
<td>39.0</td>
<td>38.50</td>
</tr>
</tbody>
</table>

① left-hand on one side, right-hand on the other ② Corrosion protection (see Table, p. 24)
The values d2, L, SW, V, X and Ød are identical for both types.
Compression strut systems

The compression strut systems are composed of the fork heads and the main truss elements (supplied as round bars for shorter lengths and tubes for longer lengths). The compression strut systems are supplied as standard without length adjustability.

If required, these systems can also be supplied with weld-on studs or length adjustment.
The compression resistance $N$ given is calculated according to DIN EN 1993. The static resistance must be verified for each critical load case. To verify static resistance the acting loads are multiplied by the partial safety factors or combination factors. Static resistance is given if the values calculated in this manner do not exceed the compression resistance of the compression bar selected.

1. Material / corrosion protection (see Table, p. 24)
Connection plates and Structural attachments

**CONNECTION PLATES**

The *m-connect* connecting plates are required in frame constructions as central junction points. In standard designs three or four tension rods can be attached.

To guarantee a secure load distribution, only *m-connect* connecting plates with the material quality and dimensions corresponding to calculations should be implemented.

The direction of forces always passes through the junction point – an angle displacement of 5% is permissible.

For selection according to a particular design the basic shapes, e.g. rectangular or circular, are offered as standard. Variants can however be supplied.
Corrosion protection (see Table, p.24)
STRUCTURAL ATTACHMENTS

As structural attachments, connection lugs are required with geometries and properties which meet both building requirements and the size and nature of the loads given. For safe load-bearing by the tension rod or compression strut systems, strict observance of the specifications regarding material quality and dimensions must be guaranteed. The exclusive use of m-connect connection lugs is recommended.

The specifications for welding seams (p. 26) must also be strictly followed.

As standard solutions, the basic shapes for the most important installation situations are suggested in our catalog for selection according to a particular design. Variants can also be supplied.

Type 6 - 60 . . . -10

<table>
<thead>
<tr>
<th>Type</th>
<th>B</th>
<th>C</th>
<th>d3</th>
<th>E</th>
<th>t</th>
<th>a</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-6006 . . . 00</td>
<td>18,5</td>
<td>11,5</td>
<td>6,3</td>
<td>20</td>
<td>4</td>
<td>3,0</td>
<td>0,02</td>
</tr>
<tr>
<td>6-6008 . . . 00</td>
<td>25,0</td>
<td>15,5</td>
<td>8,4</td>
<td>22</td>
<td>5</td>
<td>3,0</td>
<td>0,04</td>
</tr>
<tr>
<td>6-6010 . . . 00</td>
<td>32,0</td>
<td>19,5</td>
<td>10,5</td>
<td>25</td>
<td>6</td>
<td>3,0</td>
<td>0,06</td>
</tr>
<tr>
<td>6-6012 . . . 00</td>
<td>37,0</td>
<td>22,5</td>
<td>12,5</td>
<td>30</td>
<td>8</td>
<td>3,0</td>
<td>0,10</td>
</tr>
<tr>
<td>6-6016 . . . 00</td>
<td>51,0</td>
<td>31,0</td>
<td>16,5</td>
<td>38</td>
<td>10</td>
<td>4,0</td>
<td>0,25</td>
</tr>
<tr>
<td>6-6020 . . . 00</td>
<td>64,0</td>
<td>39,0</td>
<td>20,5</td>
<td>45</td>
<td>12</td>
<td>5,0</td>
<td>0,45</td>
</tr>
<tr>
<td>6-6024 . . . 00</td>
<td>75,0</td>
<td>46,0</td>
<td>24,5</td>
<td>52</td>
<td>15</td>
<td>6,0</td>
<td>0,75</td>
</tr>
<tr>
<td>6-6030 . . . 00</td>
<td>91,0</td>
<td>56,0</td>
<td>30,5</td>
<td>62</td>
<td>20</td>
<td>7,5</td>
<td>1,40</td>
</tr>
</tbody>
</table>

6-6036 . . . 00 | 112,0 | 68,0 | 35,5 | 76 | 22 | 9,5 | 2,40 |

6-6042 . . . 00 | 135,0 | 82,0 | 42,5 | 90 | 25 | 10,5 | 3,90 |
| 6-6048 . . . 00 | 149,0 | 91,0 | 47,5 | 100 | 30 | 12,5 | 5,70 |

6-6056 . . . 00 | 176,0 | 107,0 | 55,5 | 120 | 35 | 15,0 | 9,40 |
| 6-6064 . . . 00 | 201,0 | 122,0 | 64,0 | 135 | 40 | 17,0 | 14,00 |
| 6-6072 . . . 00 | 225,0 | 137,0 | 73,0 | 145 | 50 | 18,5 | 21,00 |

6-6080 . . . 00 | 251,0 | 153,0 | 81,0 | 162 | 55 | 20,5 | 29,00 |

6-6090 . . . 00 | 286,0 | 174,0 | 91,0 | 180 | 60 | 22,5 | 40,00 |
| 6-6000 . . . 00 | 312,0 | 189,0 | 99,0 | 205 | 70 | 25,5 | 57,00 |

- Thread diameter
- Material / corrosion protection (see Table, p. 24)
- An angle displacement of the direction of force of $\pm 5^\circ$ is permissible for all connection lugs (Exception: Type 61)
### Permissible angle displacement of direction of force

**Material / corrosion protection (see Table, p. 24)**

<table>
<thead>
<tr>
<th>Type 6 - 60</th>
<th>Weight [kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>0°</td>
<td>45°</td>
</tr>
<tr>
<td>50°</td>
<td>60°</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type 6 - 60</th>
<th>Weight [kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>0°</td>
<td>45°</td>
</tr>
<tr>
<td>50°</td>
<td>60°</td>
</tr>
</tbody>
</table>

### M 68 tension rod or compression strut

Type 6-608R-50

### Weight [kg]

<table>
<thead>
<tr>
<th>Material / corrosion protection (see Table, p. 24)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
</tr>
</thead>
<tbody>
<tr>
<td>0°</td>
<td>45°</td>
<td>50°</td>
<td>60°</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
</tr>
</thead>
<tbody>
<tr>
<td>0°</td>
<td>45°</td>
<td>50°</td>
<td>60°</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Weight [kg]

<table>
<thead>
<tr>
<th>Material / corrosion protection (see Table, p. 24)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
</tr>
</thead>
<tbody>
<tr>
<td>0°</td>
<td>45°</td>
<td>50°</td>
<td>60°</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
</tr>
</thead>
<tbody>
<tr>
<td>0°</td>
<td>45°</td>
<td>50°</td>
<td>60°</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Further practical components for steel construction

Apart from the connection lugs, other practical connection elements can be offered from the MÜRMANN and LISEGA product ranges.

**Beam adapters Type L 76**

With these beam adapters, clamping joints are created which, with the corresponding pre-stressing, ensure form-fitting at the contact surfaces and thereby high security against displacement due to lateral forces.

**Beam clamps Type L 78**

Beam clamps are flexible due to their form of construction and can be supplied in many versions for all kinds of supports for practically any type or size of beam.

**Threaded clevises Type L 61**

Threaded clevises are, in combination with threaded rods, an economical alternative to costly welded lug designs for support bracing and fixing.
Functionality and Safety

The system components fulfil crucial load-bearing functions in the statics. The demands on these components regarding safety and reliability are correspondingly high.

**DESIGN**

In their design, ample safety factors were considered. The specifications are in full accordance with current regulations and have undergone expert scrutiny by the Institute for Structural Steel Engineering at the University of Brunswick and have been certified by the German Institute of Structural Engineering in Berlin under the number Z-14.4-441 of 12.01.2004 and comply with DIN 18800.

**QUALITY ASSURANCE**

The technical supervision and manufacture of the system components is carried out at the MÜRMANN Gewinde-technik (Thread Technology) plant in line with the requirements of certified quality assurance according to DIN EN ISO 9001. Suppliers are also subject to the corresponding certification and approval.

Finite element calculation and supplementary load tests ensure the maximum degree of safety.
Rational application via modular system

At the conception of the m-connect product program, rational application stood at the forefront together with functionality and design: simple engineering, simple application and simple installation.

A prerequisite was to conceive the product range as a modular system. Standardised according to uniform criteria, the individual components are assembled herein as modules. Through strict classification as to loads and connection geometries, the components within a load group are compatible with regard to connections. They can consequently be assembled at will to form functional load chains. At the same time the combination of components of different load-bearing capacity is excluded. For projects, engineering can be executed very easily and safely using this catalog or, even more conveniently, by electronic means with our CONNCAD® software program (see p. 23).

As integrated elements in suspension and support constructions, the m-connect-load chains fulfil important tasks in building structures. The range of applications is considerable and the multiple combination possibilities of individual components are designed to fulfil almost all practical demands.

**Verification of static resistance**

For each critical load case, the verification of static resistance shall be determined:

Examples for typical load cases:
- permanent loads
- permanent loads plus one leading variable load
- permanent loads plus one leading variable load and other variable loads

For the verification of static resistance, the acting loads has to be multiplied with the relevant partial factor resp. factor of combination (s. DIN EN 1990, Annex A1 resp. national annexes).

The static resistance is given, when the above calculated values do not exceed the tension resistance $N_{Rd}$ of the selected thread size.

<table>
<thead>
<tr>
<th>Load size</th>
<th>Tension load diameter [mm]</th>
<th>Tension resistance acc. to DIN 18800 $N_{Rd}$ [kN]</th>
<th>Tension resistance acc. to EN 1993 $N_{Rd}$ [kN]</th>
</tr>
</thead>
<tbody>
<tr>
<td>M6</td>
<td>6</td>
<td>9.1</td>
<td>9</td>
</tr>
<tr>
<td>M8</td>
<td>8</td>
<td>16.6</td>
<td>16.4</td>
</tr>
<tr>
<td>M10</td>
<td>10</td>
<td>26.3</td>
<td>26.1</td>
</tr>
<tr>
<td>M12</td>
<td>12</td>
<td>38.3</td>
<td>37.4</td>
</tr>
<tr>
<td>M16</td>
<td>16</td>
<td>71.3</td>
<td>69.7</td>
</tr>
<tr>
<td>M20</td>
<td>20</td>
<td>111</td>
<td>109</td>
</tr>
<tr>
<td>M24</td>
<td>24</td>
<td>160</td>
<td>156</td>
</tr>
<tr>
<td>M30</td>
<td>30</td>
<td>255</td>
<td>248</td>
</tr>
<tr>
<td>M36</td>
<td>36</td>
<td>371</td>
<td>361</td>
</tr>
<tr>
<td>M42</td>
<td>42</td>
<td>509</td>
<td>504</td>
</tr>
<tr>
<td>M48</td>
<td>48</td>
<td>669</td>
<td>662</td>
</tr>
<tr>
<td>M56x4</td>
<td>56</td>
<td>936</td>
<td>933</td>
</tr>
<tr>
<td>M64x4</td>
<td>64</td>
<td>1222</td>
<td>1198</td>
</tr>
<tr>
<td>M72x4</td>
<td>72</td>
<td>1547</td>
<td>1527</td>
</tr>
<tr>
<td>M80x4</td>
<td>80</td>
<td>1910</td>
<td>1893</td>
</tr>
<tr>
<td>M90x4</td>
<td>90</td>
<td>2418</td>
<td>2406</td>
</tr>
<tr>
<td>M100x4</td>
<td>100</td>
<td>2985</td>
<td>2954</td>
</tr>
</tbody>
</table>
For surface protection against corrosion, selection can be made from the usual types of corrosion protection:

<table>
<thead>
<tr>
<th>Component</th>
<th>1 untreated</th>
<th>2 undercoated</th>
<th>3 hot dip galvanized</th>
<th>4 galvanized</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fork head</td>
<td>blasted</td>
<td>primer</td>
<td>centrifuge galv.</td>
<td>centrifuge galv.</td>
</tr>
<tr>
<td>Pin</td>
<td>bright</td>
<td>black</td>
<td>black primer</td>
<td>stainless steel</td>
</tr>
<tr>
<td>Lock ring</td>
<td>bright</td>
<td>rough rolled</td>
<td>bright primer</td>
<td>centrifuge galv.</td>
</tr>
<tr>
<td>Cap nut</td>
<td>bright</td>
<td>blasted</td>
<td>bright primer</td>
<td>hot dip g.</td>
</tr>
<tr>
<td>Tension rod</td>
<td>bright</td>
<td>rough rolled</td>
<td>bright primer</td>
<td>brushed</td>
</tr>
<tr>
<td>Outer threads</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connecting sleeve</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection plate**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>and lug</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Suppliable only for lengths of tension rods ≤ 3m

Oberflächen der Edelstahlsysteme

untreated glass bead blasted polished

** We reserve the right to use, in agreement with the customer, materials of equal quality according to building supervision certificate Z-14.4-441.

* Construction measures against contact corrosion are set out in the building supervision certificate Z-30.3-64.
CONNCAD® – Design and engineering program

CONNCAD®: The design software for tension rod and compression strut systems

CONNCAD®: All essential functions at a glance

Individual project administration as a tree structure

Choice of configurations

The result - optimum design

For the swift and simple design and planning of m-connect tension rod and compression strut systems, the user has our design and engineering software CONNCAD® at his disposal. The basis of this special user-friendly program is the m-connect modular system (p. 21) and the coding of components (p. 24).

CONNCAD® helps to save time and cut costs. Just a few mouse clicks suffice to generate ready-to-order design documentation, to scale and in the required detail. By way of the appropriate interfaces the designs can be fed into common CAD programs. The usual time and effort spent on planning is thereby reduced to a minimum. CONNCAD® is available on our homepage under www.mconnect.eu or for downloading free of charge.

In addition our components are now part of versions 16.0 and 16.1 of Tekla Structures. Brief instructions can be found at www.mconnect.eu or www.tekla.com.

The planning software bocad® likewise includes our components as design templates for simplified building planning. Further information is available at: www.bocad.com.
## Code numbers for clear identification

An easily understandable coding system simplifies the application of the modular system in modern computer systems, such as the current CAD programs used by design engineers. All components can be identified by means of an alphanumeric six-digit type designation.

### Complete system

#### Tension rod system 01
1 tension rod with 2 fork heads incl. pins, circlips and 2 cap nuts

#### Tension rod system 02
1 tension rod with 2 fork heads incl. pins and circlips without cap nuts

#### Tension rod system 03
2 tension rods with connecting sleeves, 2 fork heads incl. pins, circlips and 4 cap nuts.

#### Tension rod system 04
2 tension rods with connecting sleeves, 2 fork heads incl. pins and circlips without cap nuts

#### Tension rod system 05
3 tension rods with 2 connecting sleeves, 2 fork heads incl. pins, circlips and 6 cap nuts

#### Tension rod system 06
3 tension rods with 2 connecting sleeves, 2 fork heads and circlips without cap nuts

### Components of the tension rod and compression strut systems

<table>
<thead>
<tr>
<th>Position</th>
<th>Product group</th>
<th>Type &amp; design / version / model</th>
<th>System diameter</th>
<th>Material class, rod surface</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-01</td>
<td>Tension rod system</td>
<td>01 = Tension rod system</td>
<td>M6</td>
<td>R = steel, crude, P = steel, undercoated, H = steel, hot dip galv.</td>
<td>System length in mm</td>
</tr>
<tr>
<td>6-02</td>
<td>Tension rod system without cap nuts</td>
<td>02 = Tension rod system without cap nuts</td>
<td>M8</td>
<td>A = austenite, crude, B = austenite, blasted</td>
<td></td>
</tr>
<tr>
<td>6-03</td>
<td>Tension rod system with cap nuts</td>
<td>03 = Tension rod system with cap nuts</td>
<td>M10</td>
<td>C = austenite, brushed</td>
<td></td>
</tr>
<tr>
<td>6-04</td>
<td>(1 connecting sleeve)</td>
<td>04 = Tension rod system with cap nuts (1 connecting sleeve)</td>
<td>M12</td>
<td>D = duplex steel, crude, untreated</td>
<td></td>
</tr>
<tr>
<td>6-05</td>
<td>Tension rod system with cap nuts</td>
<td>05 = Tension rod system with cap nuts (2 connecting sleeves)</td>
<td>M16</td>
<td>E = duplex, blasted, brushed</td>
<td></td>
</tr>
<tr>
<td>6-06</td>
<td>Tension rod system with cap nuts</td>
<td>06 = Tension rod system with cap nuts (2 connecting sleeves)</td>
<td>M20</td>
<td>F =</td>
<td></td>
</tr>
</tbody>
</table>

### Tension rod system 01 02
6-01: Tension rod system 
6-02: Tension rod system without cap nuts

### Tension rod system 03 04
6-03: Tension rod system with cap nuts
6-04: (1 connecting sleeve)

### Tension rod system 05 06
6-05: Tension rod system with cap nuts
6-06: (2 connecting sleeves)

### Connecting plates and lugs

<table>
<thead>
<tr>
<th>Position</th>
<th>Product group</th>
<th>Type &amp; design / version / model</th>
<th>System diameter</th>
<th>Material class, rod surface</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-12</td>
<td>Tension rod system</td>
<td>12 = Compression strut system (tube) without adjust.</td>
<td>M56</td>
<td>R = steel, crude, P = steel, undercoated, H = steel, hot dip galv.</td>
<td></td>
</tr>
<tr>
<td>6-13</td>
<td>Compression strut system</td>
<td>13 = Compression strut system (tube) with adjust.</td>
<td>M60</td>
<td>A = austenite, crude, B = austenite, blasted</td>
<td></td>
</tr>
<tr>
<td>6-14</td>
<td>Compression strut system with adjustment</td>
<td>14 = Compression strut system (tube) with adjust.</td>
<td>M64</td>
<td>C = austenite, brushed</td>
<td></td>
</tr>
<tr>
<td>6-15</td>
<td>Compression strut system</td>
<td>15 = Compression strut system (tube) with welded end (without adjust.)</td>
<td>M72</td>
<td>D = duplex steel, crude, untreated</td>
<td></td>
</tr>
<tr>
<td>6-16</td>
<td>Compression strut system</td>
<td>16 = Compression strut system (tube) with welded end (with adjust.)</td>
<td>M80</td>
<td>E = duplex, blasted, brushed</td>
<td></td>
</tr>
</tbody>
</table>

### Connecting plates and lugs

<table>
<thead>
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### ORDER EXAMPLE: 6-0136H-2800 (Product group = 6, Version = Tension rod system, System size = M36, Material/Surface = Steel, hot dip galvanized, system length = 2800 mm)
Special benefits for users

### Creative and efficient:
- Comprehensive product program as a modular system ensures complete solutions to problems.
- Broad field of application from M6 to M100, all from one source, rod lengths up to 12 m.
- Slim and elegant product design for imaginative solutions.
- Dependable designs due to standardized connection lugs.
- Variable adaptation of surface treatment to requirements.
- Cost-cutting design and planning using CONNCAD® software program.
- Optimum solutions in special cases through technical support.

### Dependable and safe:
- Certified safety through stress reports and overload testing. Approval by the German Institute of Structural Engineering, Berlin.
- Use of materials with guaranteed tensile values and high cold tenacity.
- High safety levels for connections by including connection lugs in the approval process.
- Competence through 40 years’ experience in hanger and thread technology.
- High and constant quality level through quality management according to DIN/ISO 9001 and ASME NF.

### Simple assembly:
- No time-consuming approval procedures required, due to DIBt (=Deutsche Institut für Bautechnik) certification.
- Simplification of inquiry and ordering procedures using the CONNCAD® process.
- Reduction in installation time through preassembly at the works.
- No particular sealing required in fork heads due to pocket hole design.
- Balancing of on-site dimension tolerances through wide range of length adjustment.
- Simple length adjustability using left-hand / right-hand thread (turnbuckle function) and flat faces.
- Checking of minimum engagement depths by enclosing rod thread with cap nut.
- Prompt servicing by our experts.

Special features at the same time ensure optically attractive and reliable application, together with great economy. For profitable order the optimization of processing total costs is decisive.
Installation instructions

m-connect tension rod and compression strut systems are of crucial significance as load-bearing components for the load-bearing capacity of the whole construction. Observation of the following instructions is a prerequisite for trouble-free functioning. If the components in the tension rod system are subsequently subjected to thermal or mechanical treatment, the building supervision certification loses its validity.

1. Delivery condition

1.1. The m-connect tension rod and compression strut systems are preassembled and supplied as ready-to-install load chains with the corresponding markings.

1.2. If connection lugs are also supplied, they are separately marked with the installation position and tied to the tension rod system with binding wire.

Welding seams of the connection lugs

The following procedure is recommended when welding connection lugs:

1.3. To guarantee the given load capacity of the connection lugs, the welding specifications under Point 3 of these instructions must be strictly adhered to.

2. Packaging

2.1. Wooden laths are used to protect the tension rod systems from damage. The delivery packages are wrapped in foil as protection against moisture by storage in closed rooms until assembly.

3. Welding procedure for connection lugs

3.1. The minimum welding seam thickness (a) for connection of the lug to a supporting structure depends on the shape of the connection lug and the angle of load distribution.

3.2. The “a” dimensions according to lug type are given in the table.

3.3. Connection lugs for tension rod systems ≥ M56x4 (corresponding to see thickness ≥ 35mm) must be preheated to approx. 100°C.

3.4. Only approved welding filler metals (I-stamp), preferably base electrodes (e.g. EN499; E 42 5 B4 2 H5) are permissible.

3.5. Vertical seams are only to be welded using the appropriate welding filler metals (e.g. EN499: E38 0 RC 1).

3.6. Spot welds are to be made with an intermediate layer temperature ≤ 250°C.

3.7. Delays in welding are to be avoided by the appropriate welding sequence (see Fig. 1).

3.8. The connection lugs are always to be welded all around.

The welding seam sizes given are based on a minimum yield strength of the parent metal of 235 N/mm².
4. Installation

The following procedure is to be followed when installing the preassembled load chains:

4.1. Before installation it is advisable to check that the installation dimensions correspond with the lengths delivered.

4.2. Loosen cap nuts, screwing them back a little.

4.3. Remove the circlips on the pins at the forked ends and extract the pins.

4.4. Position the fork heads on the connection lugs and make the pin connections. Sudden loading of the fork heads is not permissible.

4.5. If length adjustment is required, it is only to be made by rotating the tension rod; in this way the engagement depths of the left-hand/right-hand thread are kept equal and the maximum adjustment possibility is maintained.

4.6. For the proper functioning of the tension rod, the end connection must be free of play. Therefore sufficient prestress must be applied by rotation of the rod. It is recommended to turn both ends at the same time.

4.7. To ensure minimum engagement depths, the tension rod thread must be fully covered by the tightened cap nuts. If no cap nuts are ordered, the visible thread length must not exceed the catalog dimension L (p. 10) of the cap nut.

4.8. Tighten the cap nuts. The screw connections are supplied with permanently elastic, silicon-free sealing material. If the tension rod systems are to be used in the open, the gap between cap nut and tension rod should be filled with a suitable sealant.