# EUROPEAN TECHNICAL ASSESSMENTS

**Fire Resistant Solutions for Modular Support Systems**

**MT System & Pipe clamps**

ETA CE

# CONTENT

## 1. Innovative and ETA-approved solutions for MEP supports under fire conditions

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# Innovative and ETA-approved solutions for MEP supports under fire conditions

**Worldwide fire events endanger human life, harm the environment and cause significant economic losses.**

The overriding objective in terms of fire safety is to ultimately avoid fire events or in case they occur to minimize their consequences.

Fire design is crucial for buildings such as, hospitals, offices or hotels. These structures require escape routes. This is especially relevant for strategic and public buildings that have a large amount of people to be evacuated and often a low flow capacity. As a result, the correct design of the escape routes is essential to allow users to evacuate safely and for security teams to operate both during and after the fire.

Mechanical, Electrical and Plumbing (MEP) support systems are an integral part of the escape routes, and they need to remain structurally sound and operational for a fixed amount of time to enable safe passage of people during fire. It is important to have the correct fire design of every MEP support. The operation of the safety systems during a fire and the resistance of compartments can be damaged by the failure of these systems.

Hilti fire safe system serves the need of piping, ventilation and electrical systems from light to heavy applications. Hilti follows the state-of-the-art guideline, the European Assessment Document EAD-280016-00-062.
This method leads to cost-effective and flexible solution since fire resistant design can be applied for many installation configurations.
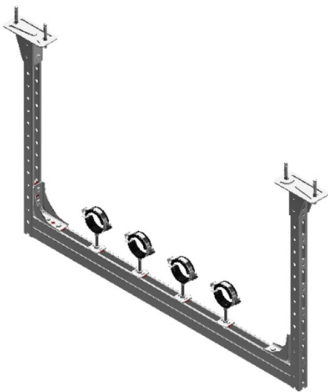
**Through its extensive testing, Hilti provides European Technical Assessments ETAs with detailed technical documentation for load calculations, meeting the design needs of complex projects requiring customized solutions.**

Hilti fire approved MT System provides solutions for the main relevant applications such as trapezes suspended by threaded rods, trapeze frames with horizontal and vertical channels, cantilevers without suspension, cantilevers suspended from ceiling with threaded rod, headrails and media connection to all above mentioned applications.

Support Systems design is crucial regarding compliance with fire safety objectives since significant deformations due to the exposure to fire can cause considerable damage.

**To reduce time and cost involved to design fire resistant Support System and to achieve higher flexibility regarding construction variants, Hilti remains the partner with the best solution that can offer complex fire engineering design.**

| Configuration | System component | ETA number |
|---|---|---|
| **Rod trapeze**  | Threaded rod | ETA-22/0809 |
| | Channel | ETA-23/0105 |
| | Drilled plate | ETA-22/0810 |
| | Pipe clamp | Pipe clamps with ETA |
| | Pipe clamp saddle nut<br>Pipe clamp drilled plate | ETA-23/0103<br>ETA-22/0810 |
| | Anchor | See Anchor ETAs |
| **Headrail**  | Threaded rod | ETA-22/0809 |
| | Channel | ETA-23/0105 |
| | Drilled plate | ETA-22/0810 |
| | Pipe clamp | Pipe clamps with ETA |
| | Pipe clamp saddle nut | ETA-23/0103 |
| | Anchor | See Anchor ETAs |
| **Frame trapeze**  | Trapeze frame | ETA-23/0104 |
| | Threaded rod | ETA-22/0809 |
| | Pipe clamp | Pipe clamps with ETA |
| | Pipe clamp saddle nut<br>Pipe clamp drilled plate | ETA-23/0103<br>ETA-22/0810 |
| | Anchor | See Anchor ETAs |

| Configuration | System component | ETA number |
|---|---|---|
| **Single pipe-clamp** <br>  | Threaded rod | ETA-22/0809 |
| | Pipe clamp | Pipe clamps with ETA |
| | Anchor | See Anchor ETAs |
| **Suspended cantilever** <br>  | Threaded rod | ETA-22/0809 |
| | Bracket | ETA-23/0106 |
| | Drilled plate | ETA-22/0810 |
| | Pipe clamp | Pipe clamps with ETA |
| | Pipe clamp saddle nut <br> Pipe clamp drilled plate | ETA-23/0103 <br> ETA-22/0810 |
| | Anchor | See Anchor ETAs |
| **Non-suspended cantilever** <br>  | Threaded rod | ETA-22/0809 |
| | Bracket | ETA-23/0106 |
| | Pipe clamp | Pipe clamps with ETA |
| | Pipe clamp saddle nut <br> Pipe clamp drilled plate | ETA-23/0103 <br> ETA-22/0810 |
| | Anchor | See Anchor ETAs |

**CSTB**
le futur en construction

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# ETA-23/0103
# of 30/06/2023

# European Technical Assessment

*English translation prepared by CSTB - Original version in French language*

## General Part

**Technical Assessment Body issuing the European Technical Assessment:**

Centre Scientifique et Technique du Bâtiment (CSTB)

| | |
|---|---|
| Trade name of the construction product: | Hilti saddle nuts<br>MQA-M10-B, MQA-M12-B, MQA-M16-B,<br>MT-PCC-G M8 / M10 OC, MT-PCC-G M12 OC,<br>MT-PCC-G M16 OC,<br>MT-CTR-GS M12 OC, MT-CTR-GS M16 OC,<br>MT-CTR-GL M12 OC, MT-CTR-GL M16 OC. |
| Product family to which the construction product belongs: | Products for installation systems for supporting technical building equipment |
| Manufacturer: | Hilti AG<br>Feldkircherstraße 100<br>9494 Schaan<br>FÜRSTENTUM LIECHTENSTEIN |
| Manufacturing plants: | L 1000446 and L1087643 |
| This European Technical Assessment contains: | 24 pages including 22 pages of annexes which form an integral part of this assessment |
| This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of: | European Assessment Document (EAD)<br>280016-00-0602 version June 2020 |
| This Assessment replaces: | ETA-18/0132 of 25/07/2018 |

**Specific Part**

## 1　　　Technical description of the product

Objects of this European Technical Assessment are the Hilti saddle nuts:

MQA-M10-B, MQA-M12-B and MQA-M16-B saddle nuts consist of a nut centred on a clamping plate made of steel, which are connected to one another by means of a spring element made of PET. The clamping plate have a centred round opening. The nut is used to fasten threaded elements, e.g. threaded rods.

MT-CTR-GS M12 OC, MT-CTR-GS M16 OC, MT-CTR-GL M12 OC and MT-CTR-GL M16 OC are kits with each kit consisting of a plate with a welded hexagon nut, a hexagon nut and washer, and one U-shaped steel plate with two vertical parallel legs with openings for fastening to the channels. The various distance between the legs allows the usage with Hilti channels MT-70, MT-80, MT-90 or MT-100 with Hilti connector MT-TFB. The upper horizontal part of the U-shaped steel plate has an opening to allow a threaded rod to pass through and to fasten it with the above-mentioned components of the kit.

MT-PCC-G M8/M10 OC, MT-PCC-G M12 OC and MT-PCC-G M16 OC are steel base plates with two long holes arranged symmetrically and with a centric arranged thread connection.

Annex A describes the dimensions and materials of above-mentioned Hilti saddle nuts.

## 2　　　Specification of the intended use

The performance given in Section 3 can only be assumed if the Hilti saddle nuts are used in compliance with the specifications and under boundary conditions set out in Annexes A to G. The test and assessment methods on which this European Technical Assessment is based lead to an assumption of a working life of the Hilti saddle nuts of at least 50 years in final use under ambient temperatures in indoor areas. The indications given on the working life cannot be interpreted as a guarantee given by the producer but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

In accordance with the European Assessment Document EAD 280016-00-0602, the product is intended to be used in

a) installations for the support of sprinkler kits,

b) installations for the support of other building service elements such as pipes, conduits and ducts.

## 3　　　Performance of the product and references to the methods used for its assessment

### 3.1　　Safety in case of fire (BWR 2)

| No. | Essential characteristic | Performance |
|---|---|---|
| 1 | Reaction to fire | Class A2 |
| 2 | Resistance under fire exposure for small channel deformations $\varepsilon \leq 2\ \%$ | See Annex D, G |
| 3 | Resistance under fire exposure for large channel deformations $\varepsilon > 2\ \%$ | See Annex E, G |

### 3.2　　Safety and accessibility in use (BWR 4)

| No. | Essential characteristic | Performance |
|---|---|---|
| 4 | Shape | See Annex A |
| 5 | Dimensions | See Annex A |
| 6 | Material | See Annex A |
| 7 | Characteristic pull-out resistance | See Annex G |

**4      Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base**

In accordance with the European Assessment Document EAD 280016-00-0602, the following legal bases apply:

- In case of intended use a) specified in Section 2:
  Decision of the commission N° 1996/577/EC as amended by Commission Decision 2002/592/EC.:
  System 1 applies for the assessment and verification of constancy of performance (AVCP).
- In case of intended use b) specified in Section 2:
  Decision of the commission N° 1999/472/EC as amended by Commission Decision 2001/596/EC.:
  System 3 applies for the assessment and verification of constancy of performance (AVCP).

**5      Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD**

The technical details necessary for the implementation of the system for the assessment and verification of constancy of performance are laid down in the control plan (confidential part of this European Technical Assessment) deposited at Centre Scientifique et Technique du Bâtiment.

**The original French version is signed by**

La cheffe de division, Anca CRONOPOL

**Table A1:**   **Dimensions and materials of Hilti MQA-B saddle nuts**

| Item number | Designation | M thread | Materials | Illustration |
|---|---|---|---|---|
| 2199452 | MQA-M10-B | M10 | Plate: DD11 according to DIN EN 10111 [1] or S235JR according to DIN EN 10025-2, zinc coated | |
| 2199453 | MQA-M12-B | M12 | Nut: C4C according to DIN EN 10263-2 |  |
| 2199454 | MQA-M16-B | M16 | Plastic part: PET | |

[1] with $235 < R_{eL} < 340$ N/mm², Deoxidization type: fully deoxidized

**Table A2:**   **Dimensions of the components of the MQA-M10-B and MQA-M12-B saddle nuts in mm**

| Plate | Nut | Spring section |
|---|---|---|
|  |  |  |

**Table A3:** **Dimensions of the components of the MQA-M16-B saddle nut in mm**
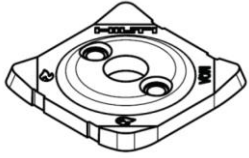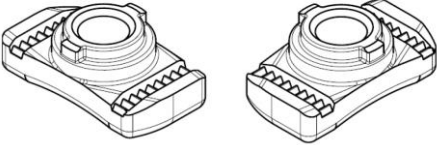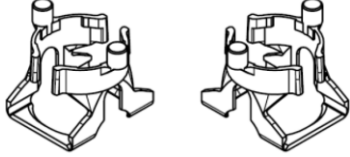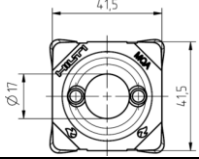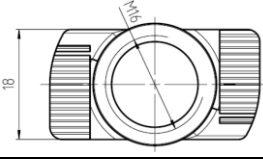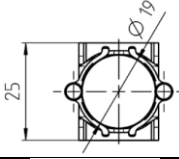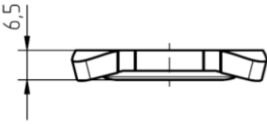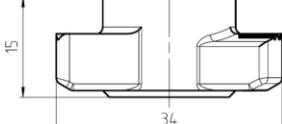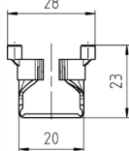
| Plate | Nut | | Spring section | |
|---|---|---|---|---|
|  |  |  |  |  |
|  |  | |  | |
|  |  | |  | |

**Hilti saddle nuts product families MQA-B, MT-PCC-G and MT-CTR-GS**

**Product Description**
Dimensions and materials

**Annex A2**

**Table A4:** Dimensions and materials of the components of the MT-PCC-G saddle nut in mm

| Item number | Designation | M thread | Baseplate thickness | Materials | Illustration (dimensions in mm) |
|---|---|---|---|---|---|
| 2353801 | MT-PCC-G M8/M10 OC | M10 | 4 mm | Baseplate: Q355B acc. to GB/T 1591, hot dipped galv. | |
| 2354564 | MT-PCC-G M12 OC | M12 | 4 mm | |  |
| 2354155 | MT-PCC-G M16 OC | M16 | 6 mm | Connection piece: 9SMN28 acc. to DIN 1651, hot dipped galv. | |

| Hilti saddle nuts product families MQA-B, MT-PCC-G and MT-CTR-GS | |
|---|---|
| **Product Description** <br> Dimensions and materials | **Annex A3** |

**Table A5:** Dimensions and materials of the components of the MT-CTR-G saddle nut in inches and mm

| Item number | Designation | M thread | Materials | Illustration [1] |
|---|---|---|---|---|
| 2332789 | MT-CTR-GS M12 OC | M12 | U-shape steel plate: Q355B acc. to GB/T 1591 Hot dipped galvanized<br><br>Hexagonal Nut: Strength class 8 acc. to ISO898-2 |  |
| 2332790 | MT-CTR-GS M16 OC | M16 | | |
| 2332793 | MT-CTR-GL M12 OC | M12 | Washer 12/40 and 16/40 acc. to ISO 7089-200HV<br><br>Plate: Q235B acc. to GB/T 700 Hot dipped galvanized |  |
| 2332796 | MT-CTR-GL M16 OC | M16 | | |

[1] Threaded rod in illustration is not part of the item. The threaded rod is shown to illustrate how the parts of the items are combined.

| | |
|---|---|
| **Hilti saddle nuts product families MQA-B, MT-PCC-G and MT-CTR-GS** | **Annex A4** |
| **Product Description**<br>Dimensions and materials | |

- Hilti saddle nuts are used to transfer building services component loads such as ducts and equipment for sprinklers, water, heating, cooling, ventilation, electrical and other systems. Hilti saddle nuts are performing this loadbearing function under the conditions described in Section 2 of this European Technical Assessment.

- Hilti saddle nuts MQA-M10-B, MQA-M12-B and MQA-M16-B are performing this loadbearing function at ambient temperature and in case of fire in combination with Hilti MQ and MT open profile channels as listed in Annex B3 to Annex B7. Hilti saddle nuts MQA-M10-B, MQA-M12-B and MQA-M16-B are deployed for the fixation of threaded rods in installation systems in combination with hexagonal nuts. Hilti threaded rods of strength class ≥ 4.8 in accordance with DIN 976-1 as per Table B1 may be connected to saddle nuts MQA-M10-B, MQA-M12-B and MQA-M16-B and fixed with hexagonal nuts of strength class ≥ 8 in accordance with ISO 4032 as per Table B2.

- The channels are cut to desired length centrally between the slotted- or round-holes or the round-holes on the marking. The channel may be cut within a range of 2 mm from both sides of the marking.



| | SW | $T_{inst}$ | $L_{min}$ |
|---|---|---|---|
| M10 | 17 mm | 18 Nm (14ft-lb) | 18 mm |
| M12 | 19 mm | 31 Nm (24ft-lb) | 20 mm |
| M16 | 24 mm | 40 Nm (30ft-lb) | 23 mm |
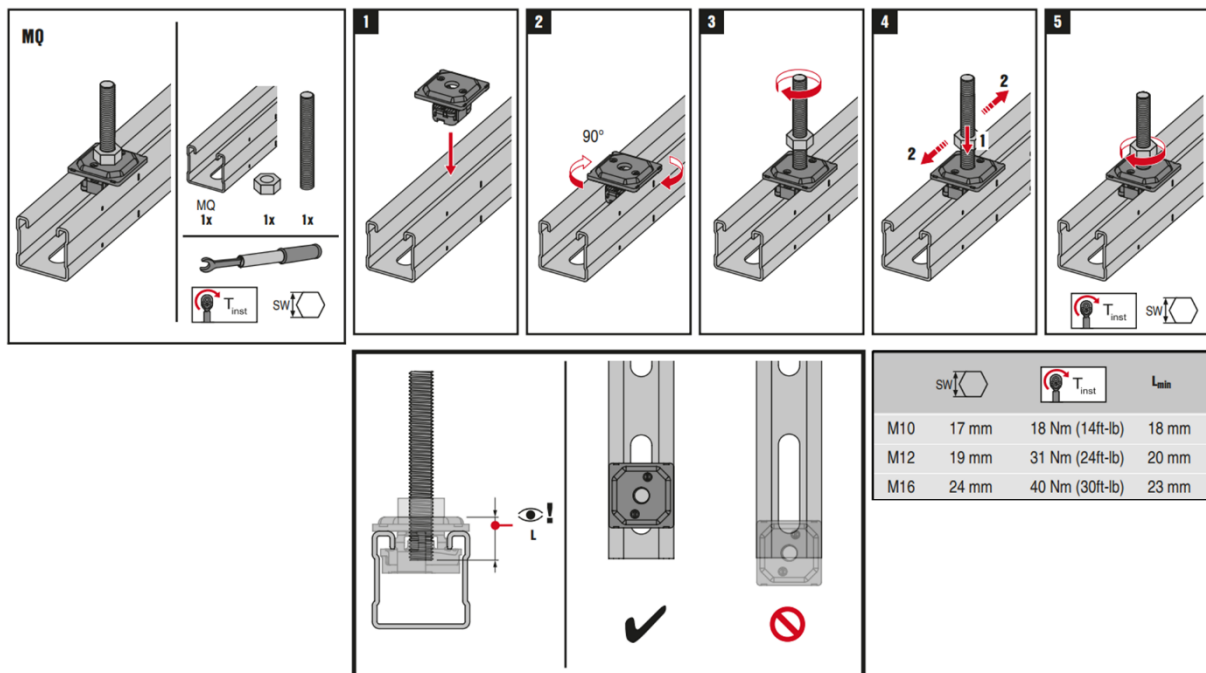
Figure A1: Installation instructions of the MQA-B saddle nut in conjunction with channel, hex-nut and threaded rod.

- Hilti saddle nuts MT-CTR-GS M12 OC and MT-CTR-GS M16 OC are used for suspending Hilti channels MT-70 or MT-80 using two Hilti thread forming bolt MT-TFB OC, see Figure A2 (left).

- Hilti saddle nuts MT-CTR-GL M12 OC and MT-CTR-GL M16 OC are used for suspending Hilti channels MT-80, MT-90 or MT-100 using two Hilti thread forming bolt MT-TFB OC, see Figure A2 (right).

| | |
|---|---|
| **Hilti saddle nuts product families MQA-B, MT-PCC-G and MT-CTR-GS** | **Annex A5** |
| **Requirements for performance assessment** | |

Figure A2: Assembly of Hilti MT-CTR saddle nut with Hilti MT channel

- The Hilti MT-PCC-G M8/M10 OC, MT-PCC-G M12 OC and MT-PCC-G M16 OC saddle nuts are used in combination with Hilti channels MT-70, MT-80, MT-90 or MT-100. Both items are connected with two Hilti thread forming bolt MT-TFB OC, see figure A3.
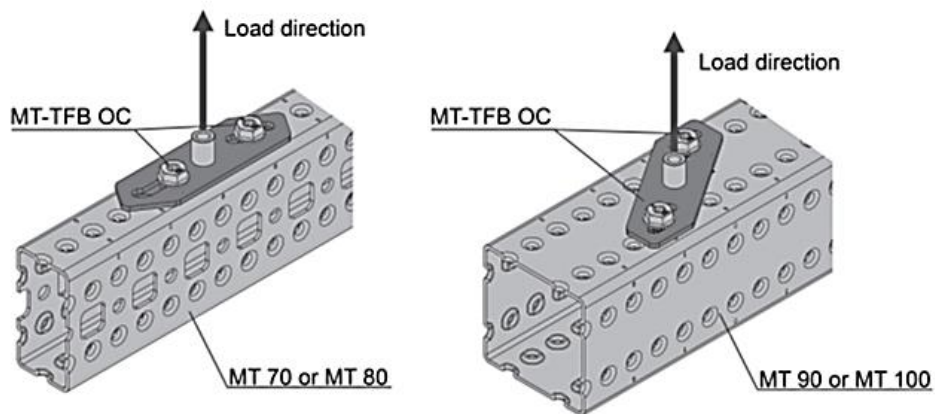


Figure A3: Assembly of Hilti MT-PCC-G saddle nut with Hilti MT channel

- MT-TFB OC thread forming bolts are positioned through the appropriate openings of these components. For the bolt MT-TFB OC a torque of 60 Nm applies.
- The required torques of Hilti saddle nuts may be applied with electrical devices or with a torque wrench.
- The saddle nuts must be installed by appropriately qualified personnel and under the supervision of the site manager. The installation instruction of the manufacturer applies.
- Information on resistance at ambient temperature and in case of fire applies to static and centric actions. The time values in conjunction with the resistance values at elevated temperatures refer to the boundary conditions of the standard Temperature / Time curve (STTC) according to EN 1363-1.
- Prior to installation, it must be ensured that the supported component, the anchoring of the threaded rod to the base material and the base material itself are suitable to withstand the resistance values of the installation system and that they have a fireproof certificate.

| Hilti saddle nuts product families MQA-B, MT-PCC-G and MT-CTR-GS | |
|---|---|
| **Requirements for performance assessment** | **Annex A6** |

**Table B1:** Dimensions and materials of Hilti threaded rods for use with Hilti saddle nuts

| Item number | Designation | M thread | L [mm] | Materials | Illustration |
|---|---|---|---|---|---|
| 339795 | AM10x1000 4.8 | M10 | 1000 | Strength class 4.8 in accordance with DIN976-1, zinc coated | |
| 339796 | AM10x2000 4.8 | M10 | 2000 | | |
| 216418 | AM10x3000 4.8 | M10 | 3000 | | |
| 339797 | AM12x1000 4.8 | M12 | 1000 | | |
| 216420 | AM12x2000 4.8 | M12 | 2000 | | |
| 216421 | AM12x3000 4.8 | M12 | 3000 | | |
| 216422 | AM16x1000 4.8 | M16 | 1000 | | |
| 216423 | AM16x2000 4.8 | M16 | 2000 | | |
| 216424 | AM16x3000 4.8 | M16 | 3000 | | |
| 407497 | AM 8.8 M10x1000 | M10 | 1000 | Strength class 8.8 in accordance with DIN976-1, zinc coated | |
| 2008566 | AM 8.8 M10x3000 | M10 | 3000 | | |
| 407498 | AM 8.8 M12x1000 | M12 | 1000 | | |
| 2008567 | AM 8.8 M12x3000 | M12 | 3000 | | |
| 407499 | AM 8.8 M16x1000 | M16 | 1000 | | |
| 2008568 | AM 8.8 M16x3000 | M16 | 3000 | | |
| 58670 | AM10x1000 A4-70 | M10 | 1000 | Strength class A4-70 in accordance with DIN976-1, Stainless steel | |
| 58707 | AM10x3000 A4-70 | M10 | 3000 | | |
| 58671 | AM12x1000 A4-70 | M12 | 1000 | | |
| 58709 | AM12x3000 A4-70 | M12 | 3000 | | |
| 58683 | AM16x1000 A4-70 | M16 | 1000 | | |
| 58712 | AM16x3000 A4-70 | M16 | 3000 | | |

| Hilti saddle nuts product families MQA-B, MT-PCC-G and MT-CTR-GS | |
|---|---|
| **Product description**<br>Dimensions and materials | **Annex B1** |

**Table B2:**     Dimensions and materials of Hilti hexagonal nuts for use with Hilti saddle nuts
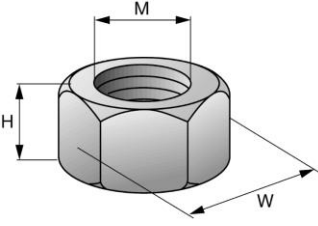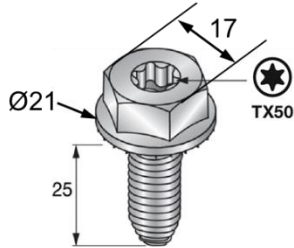
| Illustration | Item number | Designation | M thread | W [mm] | H [mm] | Material |
|---|---|---|---|---|---|---|
|  | 216466 | M10 hexagonal nut | M10 | 17 | 8 | Strength class 8 in accordance with DIN 934, zinc coated |
| | 2184554 | M12 hexagonal nut | M12 | 19 | 10 | |
| | 2184506 | M16 hexagonal nut | M16 | 24 | 13 | |
| | 2184474 | M10 hexagonal nut | M10 | 17 | 8 | Strength class 70 in accordance with DIN 934, stainless steel |
| | 2184475 | M12 hexagonal nut | M12 | 19 | 10 | |
| | 2184476 | M16 hexagonal nut | M16 | 24 | 13 | |

**Table B3:**   Dimensions and materials of Hilti MT-TFB OC thread forming bolt
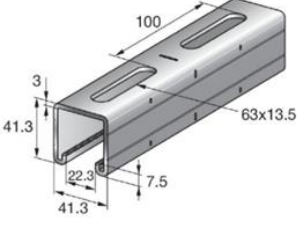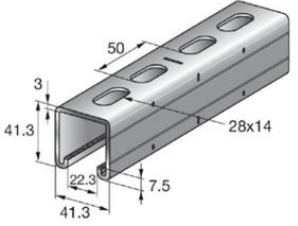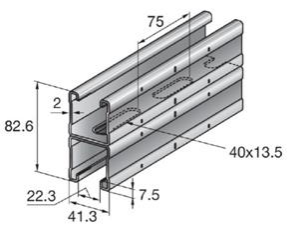
| Item number | Designation | Materials and coatings | Illustration (Dimensions in mm) |
|---|---|---|---|
| 2272084 | MT-TFB OC | C10B21 acc. to SAE J403, Surface hardness min. 530 HV, Core hardness min. 32-39 HRC zinc coated with organic topcoat |  |

| Hilti saddle nuts product families MQA-B, MT-PCC-G and MT-CTR-GS | |
|---|---|
| **Product description** <br> Dimensions and materials | **Annex B2** |
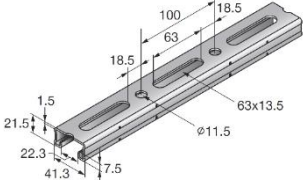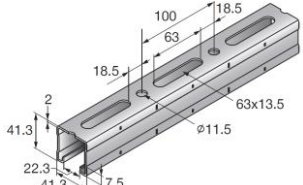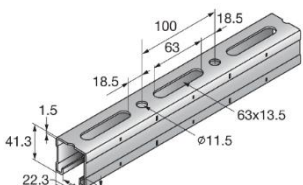
**Table B4:** Dimensions and materials of Hilti MQ-41/3 3M, MQ-41/3 6M, MQ-41/3 3M LL, MQ-41/3 6M LL, MQ-41 D 3M and MQ-41 D 6M installation channels for use with Hilti MQA-B saddle nuts

| Illustration[2] | Item number | Designation | Materials and coatings |
|---|---|---|---|
|  | 369596 | MQ-41/3 3M | S250GD+Z275-M-A-C according to DIN EN 10346 |
| | 369597 | MQ-41/3 6M | |
|  | 2048102 | MQ-41/3 3M LL | S250GD+Z275-M-A-C according to DIN EN 10346 |
| | 2048103 | MQ-41/3 6M LL | |
|  Two profiles of MQ-41 D channel are connected in the area of the slotted or round holes in the back of the channels in a shape-fitting and force-fitting way as a kind of riveted connection. | 369603 | MQ-41 D 3m | S250GD+Z275-M-A-C according to DIN EN 10346 |
| | 369604 | MQ-41 D 6m | |

[2] Dimensions in mm

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**Hilti saddle nuts product families MQA-B, MT-PCC-G and MT-CTR-GS**

**Product description**
Dimensions and materials

**Annex B3**

**Table B5:** **Dimensions and materials of Hilti MQ-21.5 6m, MQ-21.5 3m, MQ-21.5 2m, MQ-41 6m, MQ-41 3m, MQ-41 2m, MQ-41-L 6m, MQ-41-L 3m and MQ-41-L 2m installation channels for use with Hilti MQA-B saddle nuts**

| Figure[3] | Item number | Designation | Materials and coatings |
|---|---|---|---|
|  | 2184773 | MQ-21.5 6m | S280GD+Z140-M-A-C according to DIN EN 10346 |
| | 2184772 | MQ-21.5 3m | |
| | 2184771 | MQ-21.5 2m | |
|  | 369592 | MQ-41 6m | S250GD+Z275-M-A-C according to DIN EN 10346 |
| | 369591 | MQ-41 3m | |
| | 304559 | MQ-41 2m | |
|  | 2141964 | MQ-41-L 6m | S250GD+Z140-M-A-C according to DIN EN 10346 |
| | 2141965 | MQ-41-L 3m | |
| | 2141966 | MQ-41-L 2m | |

[3] Dimensions in mm

**Hilti saddle nuts product families MQA-B, MT-PCC-G and MT-CTR-GS**

**Product description**
Dimensions and materials

**Annex B4**

**Table B6:** Dimensions and materials of Hilti MT-30 S, MT-30, MT-30 S OC, MT-30 OC, MT-40 S, MT-40, MT-40 S OC and MT-40 OC installation channels for use with Hilti MQA-B saddle nuts

| Figure[4] | Item number | Designation | Length [m] | Materials and coatings |
|---|---|---|---|---|
|  | 2268497 | MT-30 S | 3 | S280GD or equivalent as defined in HN704 + Z275-M-A-C acc. to EN 10346 |
| | 2268498 | MT-30 | 6 | |
|  | 2268499 | MT-30 S OC | 3 | S280GD or equivalent as defined in HN704 + ZM310-A-C acc. to EN 10346 |
| | 2268500 | MT-30 OC | 6 | |
|  | 2268505 | MT-40 S | 3 | S280GD or equivalent as defined in HN704 + Z275-M-A-C acc. to EN 10346 |
| | 2268506 | MT-40 | 6 | |
|  | 2268507 | MT-40 S OC | 3 | S280GD or equivalent as defined in HN704 + ZM310-A-C acc. to EN 10346 |
| | 2268508 | MT-40 OC | 6 | |

[4] Dimensions in inches and mm

**Hilti saddle nuts product families MQA-B, MT-PCC-G and MT-CTR-GS**

**Product description**
Dimensions and materials

**Annex B5**

**Table B7:** **Dimensions and materials of Hilti MT-50 S, MT-50, MT-50 S OC, MT-50 OC, MT-40D S, MT-40D, MT-40D S OC, MT-40D OC installation channels for use with Hilti MQA-B saddle nuts**

| Figure[5] | Item number | Designation | Length [m] | Materials and coatings |
|---|---|---|---|---|
|  | 2268509 | MT-50 S | 3 | S280GD or equivalent as defined in HN704 + Z275-M-A-C acc. to EN 10346 |
| | 2268510 | MT-50 | 6 | |
|  | 2268511 | MT-50 S OC | 3 | S280GD or equivalent as defined in HN704 + ZM310-A-C acc to. EN 10346 |
| | 2268512 | MT-50 OC | 6 | |
|  Two profiles of MT-40 channel are connected in the area of the slotted or round holes in the back of the channels in a shape-fitting and force-fitting way as a kind of riveted connection. | 2268517 | MT-40D S | 3 | S280GD or equivalent as defined in HN704 + Z275-M-A-C acc. to EN 10346 |
| | 2268518 | MT-40D | 6 | |
|  Two profiles of MT-40 OC channel are connected in the area of the slotted or round holes in the back of the channels in a shape-fitting and force-fitting way as a kind of riveted connection. | 2268519 | MT-40D S OC | 3 | S280GD or equivalent as defined in HN704 + ZM310-A-C acc to. EN 10346 |
| | 2268520 | MT-40D OC | 6 | |

[5] Dimensions in inches and mm

| **Hilti saddle nuts product families MQA-B, MT-PCC-G and MT-CTR-GS** | **Annex B6** |
|---|---|
| **Product description** Dimensions and materials | |

**Table B8:** Dimensions and materials of Hilti MT-70 S OC, MT-70 OC, MT-80 S OC, MT-80 OC installation channels for use with Hilti MT-PCC-C, MT-CTR-GS and MT-CTR-GL saddle nuts

| Figure[6] | Item number | Designation | Length [m] | Materials and coatings |
|---|---|---|---|---|
|  | 2268364 | MT-70 S OC | 3 | S350GD+ ZM310-A-C acc. to EN 10346 |
| | 2268365 | MT-70 OC | 6 | |
|  | 2268366 | MT-80 S OC | 3 | S350GD+ ZM310-A-C acc. to EN 10346 |
| | 2268367 | MT-80 OC | 6 | |
|  | 2268368 | MT-90 S OC | 3 | S350GD+ ZM310-A-C acc. to EN 10346 |
| | 2268369 | MT-90 OC | 6 | |
|  | 2268490 | MT-100 S OC | 3 | S350GD+ ZM310-A-C acc. to EN 10346 |
| | 2268491 | MT-100 OC | 6 | |

[6] Dimensions in inches and mm

| Hilti saddle nuts product families MQA-B, MT-PCC-G and MT-CTR-GS | |
|---|---|
| **Product description** Dimensions and materials | **Annex B7** |

**Table C1:    Characteristic pull-out resistance at ambient temperatures of Hilti MQA-B saddle nuts**

| Pipe ring saddle | Installation channel | Characteristic pull-out resistance |
|---|---|---|
| | | $F_{Rk}$ |
| | | [kN] |
| MQA-M10-B | MQ-41/3 | 23.26 |
| | MQ-41/3 LL | |
| | MQ-41 | 15.08 |
| | MQ-41 D | |
| | MQ-41-L | 7.39 |
| | MQ-21.5 | 7.09 |
| MQA-M12-B | MQ-41/3 | 20.63 |
| | MQ-41/3 LL | |
| | MQ-41 | 15.92 |
| | MQ-41 D | |
| | MQ-41-L | 8.02 |
| | MQ-21.5 | 6.93 |
| MQA-M16-B | MQ-41/3 | 21.70 |
| | MQ-41/3 LL | |
| | MQ-41 | 11.79 |
| | MQ-41 D | |
| | MQ-41-L | 6.89 |
| | MQ-21.5 | 6.29 |
| MQA-M10-B<br>MQA-M12-B<br>MQA-M16-B | MT-30<br>MT-30 OC<br>MT-40<br>MT-40 S<br>MT-40 S OC<br>MT-40 OC<br>MT-40D<br>MT-40D S<br>MT-40D OC<br>MT-50<br>MT-50 S<br>MT-50 S OC<br>MT-50 OC | NPA[7] |

[7] NPA: No performance assessed

All characteristic resistances for ambient temperatures do not consider deflections.
Partial safety factor for design resistance is $\gamma_M = F_{Rk} / F_{Rd}$ or $\gamma_M = M_{Rk} / M_{Rd.}$
For design resistances the manufacturer's specifications and national regulations must be observed.

| | |
|---|---|
| **Hilti saddle nuts product families MQA-B, MT-PCC-G and MT-CTR-GS** | |
| **Characteristic pull-out resistance of MQA-B at ambient temperatures** | **Annex C1** |

**Table D1:** Parameter of regression curve $F_{Rk,t} = c_3 (c_1 + c_2 / t)$ for $\varepsilon_{B,\theta a} \leq 2\%$ of Hilti MQA-B saddle nuts

| Designation | Installation channel | $c_1$ | $c_2$ | $c_3$ | $t_{min}$ [min] | $t_{max}$ [min] |
|---|---|---|---|---|---|---|
| MQA-M10-B MQA-M12-B | MQ-41/3 | 695,324 | 27657,410 | 0,704 | 20 | 150 |
| | MQ-41/3 LL | | | | | |
| | MQ-41 | 345,949 | 28750,936 | 0,713 | 20 | 120 |
| | MQ-41D | | | | | |
| | MQ-41-L | -462,03 | 35853,38 | 0,8808 | 30 | 33 |
| | MQ-21.5 | 110,27 | 19232,88 | 0,9786 | 30 | 48 |
| | MT-30[8] | 270,9122 | 21855,373 | 0,797211 | 22 | 130 |
| | MT-40[9] | | | | | |
| | MT-40D[8] | | | | | |
| | MT-50[9] | 449,2781 | 33887,6065 | 0,845128 | 29 | 131 |
| MQA-M16-B | MQ-41/3 | 758,416 | 38174,329 | 0,844 | 26 | 130 |
| | MQ-41/3 LL | | | | | |
| | MQ-41 | 345,949 | 28750,936 | 0,713 | 26 | 120 |
| | MQ-41D | | | | | |
| | MQ-41-L | -462,03 | 35853,38 | 0,8808 | 30 | 33 |
| | MQ-21.5 | 110,27 | 19232,88 | 0,9786 | 30 | 48 |
| | MT-30[8] | 16,1699 | 26899,3433 | 0,723396 | 24 | 150 |
| | MT-40[9] | | | | | |
| | MT-40D[8] | | | | | |
| | MT-50[9] | 326,9387 | 36881,5484 | 0,949819 | 41 | 130 |

[8] independent of production length and coating

[9] independent of production length, coating and presence of slotted or round holes

**Designation**

$F_{Rk,t}$        Resistance after an exposure time t in case of fire [N]

| | |
|---|---|
| **Hilti saddle nuts product families MQA-B, MT-PCC-G and MT-CTR-GS** | |
| **Parameter of pull-out regression curve of MQA-B for $\varepsilon_{B,\theta a} \leq 2\%$ in case of fire** | **Annex D1** |

**Table D2:** Pull-out resistance $F_{Rk,t}$ in case of fire after t = 30, 60, 90 and 120 minutes and $\varepsilon_{B,\theta a} \leq 2\ \%$ of Hilti MQA-B saddle nuts

| Designation | Installation channel | $F_{Rk,30}$ [N] | $F_{Rk,60}$ [N] | $F_{Rk,90}$ [N] | $F_{Rk,120}$ [N] |
|---|---|---|---|---|---|
| MQA-M10-B MQA-M12-B | MQ-41/3 | 1138 | 813 | 705 | 651 |
| | MQ-41/3 LL | | | | |
| | MQ-41 | 930 | 589 | 475 | NPA[10] |
| | MQ-41D | | | | |
| | MQ-41-L | 646 | NPA | NPA | NPA |
| | MQ-21.5 | 735 | NPA | NPA | NPA |
| | MT-30[11] | 796,7 | 506,4 | 409,6 | 361,2 |
| | MT-40[12] | | | | |
| | MT-40D[11] | | | | |
| | MT-50[12] | 1334,3 | 857 | 697,9 | 618,4 |
| MQA-M16-B | MQ-41/3 | 1710 | 1176 | 998 | 909 |
| | MQ-41/3 LL | | | | |
| | MQ-41 | 930 | 589 | 475 | NPA |
| | MQ-41D | | | | |
| | MQ-41-L | 646 | NPA | NPA | NPA |
| | MQ-21.5 | 735 | NPA | NPA | NPA |
| | MT-30[11] | 660,3 | 336,0 | 227,9 | 173,9 |
| | MT-40[12] | | | | |
| | MT-40D[11] | | | | |
| | MT-50[12] | 1478,2 | 894,4 | 699,8 | 602,5 |

[10] NPA: No performance assessed

[11] independent of production length and coating

[12] independent of production length, coating and presence of slotted or round holes

**Designation**

$F_{Rk,t}$        Resistance after an exposure time t in case of fire [N]

**Hilti saddle nuts product families MQA-B, MT-PCC-G and MT-CTR-GS**

**Pull-out resistance of MQA-B for $\varepsilon_{B,\theta a} \leq 2\ \%$ in case of fire**

**Annex D2**

**Table E2:** Parameter of regression curve $F_{Rk,t} = c_3(c_1 + c_2/t)$ for $\varepsilon_{B,\theta a} > 2\%$ of Hilti MQA-B saddle nuts

| Designation | Installation channel | $c_1$ | $c_2$ | $c_3$ | $t_{min}$ [min] | $t_{max}$ [min] |
|---|---|---|---|---|---|---|
| MQA-M10-B | MQ-41/3 | 445,338 | 18381,52 | 0,917 | 26 | 130 |
| | MQ-41/3 LL | | | | | |
| MQA-M12-B | MQ-41/3 | 434,765 | 24088,663 | 0,872 | 26 | 123 |
| | MQ-41/3 LL | | | | | |
| MQA-M10-B MQA-M12-B | MQ-41 | 255,989 | 15310,519 | 0,865 | 22 | 120 |
| | MQ-41D | | | | | |
| | MQ-41-L | 102,97 | 16294,33 | 0,9344 | 21 | 60 |
| | MQ-21.5 | 406,83 | 11709,31 | 0,9900 | 33 | 49 |
| | MT-30[13] | 39,8267 | 29669,8577 | 0,730085 | 23 | 130 |
| | MT-40[14] | | | | | |
| | MT-40D[13] | | | | | |
| | MT-50[14] | 516,5954 | 21842,9458 | 0,739941 | 17 | 150 |
| MQA-M16-B | MQ-41/3 | 434,382 | 19535,05 | 0,907 | 22 | 139 |
| | MQ-41/3 LL | | | | | |
| | MQ-41 | 255,989 | 15310,519 | 0,865 | 22 | 120 |
| | MQ-41D | | | | | |
| | MQ-41-L | NPA[15] | NPA | NPA | NPA | NPA |
| | MQ-21.5 | NPA | NPA | NPA | NPA | NPA |
| | MT-30[13] | -246,8885 | 34576,4287 | 0,440543 | 25 | 123 |
| | MT-40[14] | | | | | |
| | MT-40D[13] | | | | | |
| | MT-50[14] | 333,7164 | 18570,4336 | 0,712119 | 19 | 114 |

[13] independent of production length and coating

[14] independent of production length, coating and presence of slotted or round holes

[15] NPA: No performance assessed

**Designation**

$F_{Rk,t}$      Resistance after an exposure time t in case of fire [N]

| | |
|---|---|
| **Hilti saddle nuts product families MQA-B, MT-PCC-G and MT-CTR-GS** | **Annex E1** |
| **Parameter of pull-out regression curve of MQA-B for $\varepsilon_{B,\theta a} > 2\%$ in case of fire** | |

**Table E1:** Pull-out resistance $F_{Rk,t}$ in case of fire after t = 30, 60, 90 and 120 minutes and $\varepsilon_{B,\theta a} > 2\%$ of Hilti MQA-B saddle nuts

| Designation | Installation channel | $F_{Rk,30}$ [N] | $F_{Rk,60}$ [N] | $F_{Rk,90}$ [N] | $F_{Rk,120}$ [N] |
|---|---|---|---|---|---|
| MQA-M10-B | MQ-41/3 | 970 | 689 | 595 | 549 |
| | MQ-41/3 LL | | | | |
| MQA-M12-B | MQ-41/3 | 1080 | 729 | 613 | 554 |
| | MQ-41/3 LL | | | | |
| MQA-M10-B MQA-M12-B | MQ-41 | 663 | 442 | 369 | NPA[18] |
| | MQ-41D | | | | |
| | MQ-41-L | 646 | NPA | NPA | NPA |
| | MQ-21.5 | 735 | NPA | NPA | NPA |
| | MT-30[16] | 751,1 | 390,1 | 269,8 | 209,6 |
| | MT-40[17] | | | | |
| | MT-40D[16] | | | | |
| | MT-50[17] | 921 | 651,6 | 561,8 | 516,9 |
| MQA-M16-B | MQ-41/3 | 984 | 689 | 590 | 541 |
| | MQ-41/3 LL | | | | |
| | MQ-41 | 663 | 442 | 369 | NPA |
| | MQ-41D | | | | |
| | MQ-41-L | NPA | NPA | NPA | NPA |
| | MQ-21.5 | NPA | NPA | NPA | NPA |
| | MT-30[16] | 399 | 145,1 | 60,5 | NPA |
| | MT-40[17] | | | | |
| | MT-40D[16] | | | | |
| | MT-50[17] | 678,5 | 458,1 | 384,6 | NPA |

[16] independent of production length and coating

[17] independent of production length, coating and presence of slotted or round holes

[18] NPA: No performance assessed

**Designation**

$F_{Rk,t}$         Resistance after an exposure time t in case of fire [N]

| Hilti saddle nuts product families MQA-B, MT-PCC-G and MT-CTR-GS | |
|---|---|
| **Pull-out resistance of MQA-B for $\varepsilon_{B,\theta a} > 2\%$ in case of fire** | **Annex E2** |

**Table F1:** **Resistance $F_{Rk,t}$ of Hilti MT-CTR-GS M12 OC and MT-CTR-GS M16 OC saddle nuts in case of fire after t = 30, 60, 90 and 120 minutes in combination with threaded rod strength class ≥ 8.8**

| Designation | Installation channel | $F_{Rk,30}$ [N] | $F_{Rk,60}$ [N] | $F_{Rk,90}$ [N] | $F_{Rk,120}$ [N] |
|---|---|---|---|---|---|
| MT-CTR-GS M12 OC | MT-70 OC / S OC | 4015,3 | 2117,5 | 1484,8 | 1168,5 |
| | MT-80 OC / S OC | | | | |
| MT-CTR-GS M16 OC | MT-70 OC / S OC | | | | |
| | MT-80 OC / S OC | | | | |
| MT-CTR-GL M12 OC | MT-70 OC / S OC | NPA[19] | NPA | NPA | NPA |
| | MT-80 OC / S OC | | | | |
| MT-CTR-GL M12 OC | MT-70 OC / S OC | NPA | NPA | NPA | NPA |
| | MT-80 OC / S OC | | | | |

[19] NPA: No performance assessed

**Designation**

$F_{Rk,t}$        Resistance after an exposure time t in case of fire [N]

**Hilti saddle nuts product families MQA-B, MT-PCC-G and MT-CTR-GS**

**Pull-out resistance of MT-CTR-GS in case of fire in combination with threaded rod strength class ≥ 8.8**

**Annex F1**

**Table G1:** **Characteristic resistance of Hilti MT-PCC-G M8/M10 OC, MT-PCC-G M12 OC, MT-PCC-G M16 saddle nuts at ambient temperature**

| Designation | Threaded rod | Installation channel | Characteristic resistance $F_{z,Rk}$ in kN |
|---|---|---|---|
| MT-PCC-G M8/M10 OC | M8 | MT-70 S OC, MT-70 OC, | 15.87 |
| | M10 | MT-80 S OC, MT-80 OC | 26.03 |
| MT-PCC-G M12 OC | M12 | MT-90 S OC, MT-90 OC, | 26.20 |
| MT-PCC-G M16 OC | M16 | MT-100 S OC, MT-100 OC | 21.55 |

**Designation**

$F_{z,Rk}$          Resistance in direction of local z-Axis

All characteristic resistances for ambient temperatures do not consider deflections.
Partial safety factor for design resistance is $\gamma_M = F_{Rk} / F_{Rd}$ or $\gamma_M = M_{Rk} / M_{Rd.}$
For design resistances the manufacturer's specifications and national regulations must be observed.

**Hilti saddle nuts product families MQA-B, MT-PCC-G and MT-CTR-GS**

**Pull-out resistance of MT-PCC-G at ambient temperature**

**Annex G1**

**Table G2:** **Pull-out resistance $F_{Rk,t}$ in case of fire after t = 30, 60, 90 and 120 minutes for small and large channel deformations and inclination between 0 ° and 45 °in combination with threaded rod strength class ≥ 4.8**

| Designation | Installation channel | $F_{Rk,30}$ [N] | $F_{Rk,60}$ [N] | $F_{Rk,90}$ [N] | $F_{Rk,120}$ [N] |
|---|---|---|---|---|---|
| MT-PCC-G M8 / M10 OC | MT-70 OC / S OC | NPA[20] | NPA | NPA | NPA |
| | MT-80 OC / S OC | | | | |
| MT-PCC-G M12 OC MT-PCC-G M16 OC | MT-70 OC / S OC | 1740,7 | 1187,7 | 1003,3 | 911,2 |
| | MT-80 OC / S OC | | | | |

[20] NPA: No performance assessed

**Designation**

$F_{Rk,t}$        Resistance after an exposure time t in case of fire [N]

**Hilti saddle nuts product families MQA-B, MT-PCC-G and MT-CTR-GS**

**Pull-out resistance of MT-PCC-G in case of fire for small and large channel deformations and inclination between 0° and 45° in combination with threaded rod strength class ≥ 4.8**

**Annex G2**

# CSTB
le futur en construction

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# European Technical Assessment

# ETA-22/0809
# of 02/01/2023

*English translation prepared by CSTB - Original version in French language*

## General Part

| | |
|---|---|
| Trade name: | AM10 x L 4.8, AM12 x L 4.8, AM16 x L 4.8 threaded rods<br>AM10 x L 8.8, AM12 x L 8.8, AM16 x L 8.8 threaded rods<br>AM10 x L A4-70, AM12 x L A4-70, AM16 x L A4-70 threaded rods |
| Product family: | Products for installation systems for supporting technical building equipment |
| Manufacturer: | Hilti AG Liechtenstein<br>Feldkircherstraße 100<br>9494 Schaan<br>FÜRSTENTUM LIECHTENSTEIN |
| Manufacturing plants: | L 9295 |
| This European Technical Assessment contains: | 17 pages including 15 pages of annexes which form an integral part of this assessment |
| This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of: | European Assessment Document (EAD)<br>280016-00-0602 version August 2017 |
| This version replaces: | ETA-18/0131 of 9 July 2018 |

**Specific Part**

## 1 Technical description of the product

Objects of this European Technical Assessment are the Hilti threaded rods AM10 x L, AM12 x L and AM16 x L in strength class 4.8, 8.8 and A4-70. The threaded rods are made of steel with metric threads M10, M12 and M16. They are delivered in lengths of 1m, 2m and 3m and are cut to length as required.

Annex A describes the dimensions and materials of the Hilti threaded rods AM10 x L, AM12 x L and AM16 x L in strength class 4.8, 8.8 and A4-70.

Information on the intended use and the requirements for the performance assessment are given in Annex B.

## 2 Specification of the intended use

The performance given in Section 3 can only be assumed if the Hilti threaded rods AM10 x L, AM12 x L and AM16 x L in strength class 4.8, 8.8 and A4-70 is used in compliance with the specifications and under boundary conditions set out in Annexes A to D. The test and assessment methods on which this European Technical Assessment is based lead to an assumption of a working life of the Hilti threaded rods AM10 x L, AM12 x L and AM16 x L in strength class 4.8, 8.8 and A4-70 of at least 50 years in final use under ambient temperatures in indoor areas. The indications given on the working life cannot be interpreted as a guarantee given by the producer but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

In accordance with the European Assessment Document EAD 280016-00-0602, the product is intended to be used in

a) installations for the support of sprinkler kits,

b) installations for the support of other building service elements such as pipes, conduits, ducts and cables.

## 3 Performance of the product and references to the methods used for its assessment

### 3.1 Safety in case of fire (BWR 2)

| Essential characteristic | Performance |
|---|---|
| Reaction to fire | Class A1 |
| Resistance to combined bending and tension under fire exposure | See Annex C |
| Tension resistance under fire exposure | See Annex D |
| Compression resistance under fire exposure | See Annex D |

### 3.2 Safety and accessibility in use (BWR 4)

| Essential characteristic | Performance |
|---|---|
| Dimensions | See Annex A1 |
| Material | See Annex A1 |

**4      Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base**

In accordance with the European Assessment Document EAD 280016-00-0602, the following legal bases apply:

-   In case of intended use a) specified in Section 2:
    Decision of the commission N° 1996/577/EC as amended by Commission Decision 2002/592/EC.:

    System 1 applies for the assessment and verification of constancy of performance (AVCP).

-   In case of intended use b) specified in Section 2:
    Decision of the commission N° 1999/472/EC as amended by Commission Decision 2001/596/EC.:

    System 3 applies for the assessment and verification of constancy of performance (AVCP).

**5      Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD**

The technical details necessary for the implementation of the system for the assessment and verification of constancy of performance are laid down in the control plan (confidential part of this European Technical Assessment) deposited at Centre Scientifique et Technique du Bâtiment.

The manufacturer shall, on the basis of a contract, involve a notified body approved in the field of supporting systems for issuing the certificate of conformity CE based on the control plan.

**The original French version is signed by**

La cheffe de division, Anca CRONOPOL

**Figure A1: Dimensions and materials of Hilti threaded rods**

| Item number | Designation | M thread | L [mm] | Materials | Illustration |
|---|---|---|---|---|---|
| 339795 | AM10x1000 4.8 | M10 | 1000 | Strength class 4.8 in accordance with DIN976-1, zinc coated | |
| 339796 | AM10x2000 4.8 | M10 | 2000 | | |
| 216418 | AM10x3000 4.8 | M10 | 3000 | | |
| 339797 | AM12x1000 4.8 | M12 | 1000 | | |
| 216420 | AM12x2000 4.8 | M12 | 2000 | | |
| 216421 | AM12x3000 4.8 | M12 | 3000 | | |
| 216422 | AM16x1000 4.8 | M16 | 1000 | | |
| 216423 | AM16x2000 4.8 | M16 | 2000 | | |
| 216424 | AM16x3000 4.8 | M16 | 3000 | | |
| 407497 | AM 8.8 M10x1000 | M10 | 1000 | Strength class 8.8 in accordance with DIN976-1, zinc coated | |
| 2008566 | AM 8.8 M10x3000 | M10 | 3000 | | |
| 407498 | AM 8.8 M12x1000 | M12 | 1000 | | |
| 2008567 | AM 8.8 M12x3000 | M12 | 3000 | | |
| 407499 | AM 8.8 M16x1000 | M16 | 1000 | | |
| 2008568 | AM 8.8 M16x3000 | M16 | 3000 | | |
| 58670 | AM10x1000 A4-70 | M10 | 1000 | Strength class A4-70 in accordance with DIN976-1, Stainless steel | |
| 58707 | AM10x3000 A4-70 | M10 | 3000 | | |
| 58671 | AM12x1000 A4-70 | M12 | 1000 | | |
| 58709 | AM12x3000 A4-70 | M12 | 3000 | | |
| 58683 | AM16x1000 A4-70 | M16 | 1000 | | |
| 58712 | AM16x3000 A4-70 | M16 | 3000 | | |

**Hilti threaded rods AM10, AM12 and AM16 x L strength class 4.8, 8.8 and A4-70**

**Product Description**
Dimensions and materials

**Annex A1**

- Hilti threaded rods AM10 x L 4.8, AM12 x L 4.8 und AM16 x L 4.8 are used to transfer building services component loads such as ducts and equipment for sprinklers, water, heating, cooling, ventilation, electrical and other systems. Hilti threaded rods AM10 x L 4.8, AM12 x L 4.8 und AM16 x L 4.8 are performing this loadbearing function at elevated temperatures under the conditions described in Section 2 of this European Technical Assessment.

- Hilti threaded rods AM10 x L 4.8, AM12 x L 4.8 und AM16 x L 4.8 are deployed as thread connectors in installation systems. Typical examples for the application of threaded rods in installation systems are:

  - for suspending or mounting pipe clamps in conjunction with installation channels;

  - for suspending installation channels.

- If such systems are exposed to elevated temperatures, threaded rods are exposed to combined bending and tension stress as a result of a link polygon forming between the suspension points and the channel. The combined bending and tension resistance at elevated temperatures results with a cantilever arm length of threaded rod ≤ 150 mm. Installed horizontally in a furnace, the threaded rod is rigidly connected to a vertical channel and loaded at its outer end (see Figure B1).

- The resistance in case of fire applies for static and centric actions.

- The anchoring used with the base material must be suitable and have a fireproof certificate.

- Prior to installation, it must be ensured that the supported component, the anchoring of the threaded rod to the base material and the base material itself are suitable to withstand the resistance values of the installation system and that they have a fireproof certificate.

- The threaded rods must be installed by appropriately qualified personnel and under the supervision of the site manager

**Figure B1: Installed threaded rod in conjunction with vertical channel**

Cantilever arm length of threaded rod ≤ 150 mm
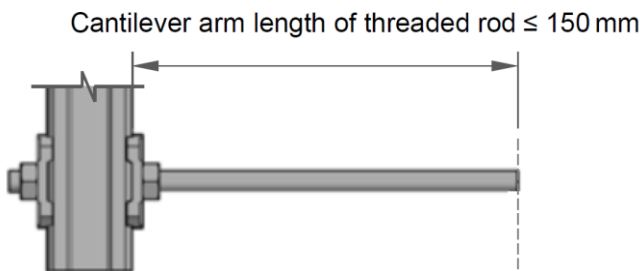


| **Hilti threaded rods AM10, AM12 and AM16 x L strength class 4.8, 8.8 and A4-70** | |
|---|---|
| **Requirements for performance assessment** | **Annex B1** |

**Table C1:** **Resistance to combined bending and tension load in case of fire: Parameter of regression curve $F_{Rk,t} = c_3 (c_1 + c_2 / t)$ of Hilti threaded rods**

| Designation | $c_1$ | $c_2$ | $c_3$ | $t_{min}$ [min] | $t_{max}$ [min] |
|---|---|---|---|---|---|
| AM10 x L 4.8 | 260,907 | 29615,482 | 0,927769 | 30 | 146 |
| AM12 x L 4.8 | NPA[1] | NPA | NPA | NPA | NPA |
| AM16 x L 4.8 | NPA | NPA | NPA | NPA | NPA |
| AM 8.8 M10 x L | 56,4981 | 62518,204 | 0,930393 | 45 | 130 |
| AM 8.8 M12 x L | -315,1713 | 117316,0732 | 0,851412 | 42 | 130 |
| AM 8.8 M16 x L | -315,1713 | 117316,0732 | 0,851412 | 42 | 130 |
| AM10 A4-70 x L | -1321,3377 | 432114,1576 | 0,617514 | 43 | 120 |
| AM12 A4-70 x L | -763,2431 | 538678,9931 | 0,887458 | 55 | 130 |
| AM16 A4-70 x L | -315,1713 | 117316,0732 | 0,851412 | 42 | 130 |

[1] NPA: No Performance Assessed

**Table C2:** **Resistance $F_{Rk,t}$ to combined bending and tension load in case of fire after t = 30, 60, 90 and 120 minutes of Hilti threaded rods**

| Designation | $F_{Rk,30}$ [N] | $F_{Rk,60}$ [N] | $F_{Rk,90}$ [N] | $F_{Rk,120}$ [N] |
|---|---|---|---|---|
| AM10 x L 4.8[1] | 1158 | 700 | 547 | 471 |
| AM12 x L 4.8[1] | NPA[2] | NPA | NPA | NPA |
| AM16 x L 4.8[1] | NPA | NPA | NPA | NPA |
| AM 8.8 M10 x L[1] | 1991,4 | 1022,0 | 698,9 | 537,3 |
| AM 8.8 M12 x L[1] | 3061,1 | 1396,4 | 841,5 | 564,0 |
| AM 8.8 M16 x L[1] | 3061,1 | 1396,4 | 841,5 | 564,0 |
| AM10 A4-70 x L[1] | 8078,6 | 3631,3 | 2148,9 | 1407,7 |
| AM12 A4-70 x L[1] | 7290,2 | 7290,2 | 4634,4 | 3306,4 |
| AM16 A4-70 x L[1] | 7290,2 | 7290,2 | 4634,4 | 3306,4 |

[1] Cantilever arm length of threaded rod ≤ 150 mm

[1] NPA: No performance assessed

| Hilti threaded rods AM10, AM12 and AM16 x L strength class 4.8, 8.8 and A4-70 | |
|---|---|
| Resistance to combined bending and tension in case of fire | **Annex C1** |

**Table D1:** Calculation-based tension resistance $F_{Rk,t}$ in case of fire after t = 30, 60, 90 and 120 minutes of Hilti threaded rods

| Designation | $F_{Rk,30}$ [N] | $F_{Rk,60}$ [N] | $F_{Rk,90}$ [N] | $F_{Rk,120}$ [N] |
|---|---|---|---|---|
| AM10 x L 4.8 | 1650 | 950 | 720 | 560 |
| AM12 x L 4.8 | 2400 | 1380 | 1050 | 810 |
| AM16 x L 4.8 | 4470 | 2560 | 1950 | 1520 |
| AM 8.8 M10 x L | 3310 | 1890 | 1440 | 1120 |
| AM 8.8 M12 x L | 4810 | 2750 | 2090 | 1630 |
| AM 8.8 M16 x L | 8950 | 5120 | 3900 | 3030 |
| AM10 A4-70 x L | 5040 | 1780 | 760 | 590 |
| AM12 A4-70 x L | 7330 | 2590 | 1100 | 860 |
| AM16 A4-70 x L | 13640 | 4820 | 2060 | 1600 |

**Designation**

$F_{Rk,t}$      Resistance after an exposure time t in case of fire [N]

| Hilti threaded rods AM10, AM12 and AM16 x L strength class 4.8, 8.8 and A4-70 | |
|---|---|
| **Calculation-based tension resistance in case of fire** | **Annex D1** |

**Table D2:** Calculation-based compression resistance $F_{Rk,t}$ in case of fire after t = 30, 60, 90 and 120 minutes of Hilti threaded rods AM10 x L 4.8

| Installation length l [mm] | $F_{Rk,30}$ [N] | $F_{Rk,60}$ [N] | $F_{Rk,90}$ [N] | $F_{Rk,120}$ [N] |
|---|---|---|---|---|
| 40 | 1240 | 740 | 560 | 440 |
| 50 | 1140 | 680 | 520 | 400 |
| 60 | 1030 | 630 | 480 | 370 |
| 70 | 920 | 570 | 430 | 340 |
| 80 | 820 | 520 | 390 | 310 |
| 90 | 720 | 460 | 350 | 280 |
| 100 | 640 | 420 | 320 | 250 |
| 110 | 570 | 370 | 280 | 220 |
| 120 | 500 | 330 | 250 | 200 |
| 130 | 450 | 300 | 230 | 180 |
| 140 | 400 | 270 | 200 | 160 |
| 150 | 360 | 240 | 180 | 140 |
| 160 | 320 | 220 | 170 | 130 |
| 170 | 290 | 200 | 150 | 120 |
| 180 | 260 | 180 | 140 | 110 |
| 190 | 240 | 170 | 130 | 100 |
| 200 | 220 | 150 | 120 | 90 |
| 210 | 200 | 140 | 110 | 80 |
| 220 | 190 | 130 | 100 | 80 |
| 230 | 170 | 120 | 90 | 70 |
| 240 | 160 | 110 | 80 | 70 |
| 250 | 150 | 100 | 80 | 60 |
| 260 | 140 | 100 | 70 | 60 |
| 270 | 130 | 90 | 70 | 50 |
| 280 | 120 | 80 | 60 | 50 |
| 290 | 110 | 80 | 60 | 50 |
| 300 | 110 | 70 | 60 | 40 |
| 310 | 100 | 70 | 50 | 40 |

| **Hilti threaded rods AM10, AM12 and AM16 x L strength class 4.8, 8.8 and A4-70** | **Annex D2** |
|---|---|
| **Calculation-based compression resistance in case of fire** | |

**Table D3:** Calculation-based compression resistance $F_{Rk,t}$ in case of fire after t = 30, 60, 90 and 120 minutes of Hilti threaded rods AM12 x L 4.8

| Installation length l [mm] | $F_{Rk,30}$ [N] | $F_{Rk,60}$ [N] | $F_{Rk,90}$ [N] | $F_{Rk,120}$ [N] |
|---|---|---|---|---|
| 40 | 1910 | 1120 | 850 | 660 |
| 50 | 1780 | 1060 | 810 | 630 |
| 60 | 1650 | 990 | 760 | 590 |
| 70 | 1520 | 930 | 710 | 550 |
| 80 | 1390 | 860 | 650 | 510 |
| 90 | 1270 | 790 | 600 | 470 |
| 100 | 1150 | 730 | 550 | 430 |
| 110 | 1040 | 670 | 510 | 390 |
| 120 | 930 | 610 | 460 | 360 |
| 130 | 840 | 550 | 420 | 330 |
| 140 | 760 | 510 | 380 | 300 |
| 150 | 690 | 460 | 350 | 270 |
| 160 | 630 | 420 | 320 | 250 |
| 170 | 570 | 390 | 290 | 230 |
| 180 | 520 | 360 | 270 | 210 |
| 190 | 480 | 330 | 250 | 190 |
| 200 | 440 | 300 | 230 | 180 |
| 210 | 410 | 280 | 210 | 170 |
| 220 | 380 | 260 | 200 | 150 |
| 230 | 350 | 240 | 180 | 140 |
| 240 | 320 | 220 | 170 | 130 |
| 250 | 300 | 210 | 160 | 120 |
| 260 | 280 | 190 | 150 | 120 |
| 270 | 260 | 180 | 140 | 110 |
| 280 | 250 | 170 | 130 | 100 |
| 290 | 230 | 160 | 120 | 100 |
| 300 | 220 | 150 | 120 | 90 |
| 330 | 180 | 130 | 100 | 80 |
| 360 | 160 | 110 | 80 | 60 |
| 390 | 130 | 90 | 70 | 60 |
| 420 | 120 | 80 | 60 | 50 |
| 450 | 100 | 70 | 60 | 40 |

| **Hilti threaded rods AM10, AM12 and AM16 x L strenght class 4.8, 8.8 and A4-70** | |
|---|---|
| **Calculation-based compression resistance in case of fire** | **Annex D3** |

**Table D4:** Calculation-based compression resistance $F_{Rk,t}$ in case of fire after t = 30, 60, 90 and 120 minutes of Hilti threaded rods AM16 x L 4.8

| Installation length l [mm] | $F_{Rk,30}$ [N] | $F_{Rk,60}$ [N] | $F_{Rk,90}$ [N] | $F_{Rk,120}$ [N] |
|---|---|---|---|---|
| 40 | 3800 | 2210 | 1680 | 1310 |
| 50 | 3630 | 2130 | 1620 | 1260 |
| 60 | 3460 | 2040 | 1560 | 1210 |
| 70 | 3290 | 1960 | 1490 | 1160 |
| 80 | 3120 | 1870 | 1420 | 1110 |
| 90 | 2940 | 1780 | 1350 | 1050 |
| 100 | 2760 | 1690 | 1280 | 1000 |
| 110 | 2580 | 1590 | 1210 | 940 |
| 120 | 2410 | 1500 | 1140 | 890 |
| 130 | 2240 | 1410 | 1080 | 840 |
| 140 | 2080 | 1330 | 1010 | 790 |
| 150 | 1930 | 1240 | 940 | 740 |
| 160 | 1790 | 1160 | 880 | 690 |
| 170 | 1660 | 1090 | 830 | 640 |
| 180 | 1540 | 1020 | 770 | 600 |
| 190 | 1430 | 950 | 720 | 560 |
| 200 | 1330 | 890 | 680 | 530 |
| 210 | 1240 | 830 | 630 | 490 |
| 220 | 1160 | 780 | 590 | 460 |
| 230 | 1080 | 730 | 560 | 430 |
| 240 | 1010 | 690 | 520 | 410 |
| 250 | 950 | 640 | 490 | 380 |
| 260 | 890 | 610 | 460 | 360 |
| 270 | 840 | 570 | 430 | 340 |
| 280 | 790 | 540 | 410 | 320 |
| 290 | 740 | 510 | 390 | 300 |
| 300 | 700 | 480 | 370 | 290 |
| 330 | 600 | 410 | 310 | 240 |
| 360 | 510 | 350 | 270 | 210 |
| 390 | 440 | 310 | 230 | 180 |
| 420 | 390 | 270 | 210 | 160 |
| 450 | 340 | 240 | 180 | 140 |

| **Hilti threaded rods AM10, AM12 and AM16 x L strenght class 4.8, 8.8 and A4-70** | |
|---|---|
| **Calculation-based compression resistance in case of fire** | **Annex D4** |

**Table D5:** Calculation-based compression resistance $F_{Rk,t}$ in case of fire after t = 30, 60, 90 and 120 minutes of Hilti threaded rods AM 8.8 M10 x L

| Installation length l [mm] | $F_{Rk,30}$ [N] | $F_{Rk,60}$ [N] | $F_{Rk,90}$ [N] | $F_{Rk,120}$ [N] |
|---|---|---|---|---|
| 40 | 2356 | 1407 | 1048 | 815 |
| 50 | 2049 | 1252 | 921 | 717 |
| 60 | 1738 | 1089 | 791 | 615 |
| 70 | 1455 | 932 | 669 | 520 |
| 80 | 1216 | 791 | 563 | 438 |
| 90 | 1020 | 672 | 475 | 370 |
| 100 | 863 | 574 | 403 | 314 |
| 110 | 737 | 493 | 345 | 269 |
| 120 | 635 | 427 | 298 | 232 |
| 130 | 552 | 372 | 260 | 202 |
| 140 | 484 | 327 | 228 | 177 |
| 150 | 428 | 290 | 202 | 157 |
| 160 | 380 | 258 | 179 | 140 |
| 170 | 340 | 231 | 161 | 125 |
| 180 | 306 | 208 | 145 | 113 |
| 190 | 277 | 189 | 131 | 102 |
| 200 | 252 | 172 | 119 | 93 |
| 210 | 230 | 157 | 109 | 84 |
| 220 | 210 | 144 | 100 | 77 |
| 230 | 193 | 132 | 92 | 71 |
| 240 | 178 | 122 | 84 | 66 |
| 250 | 165 | 113 | 78 | 61 |
| 260 | 153 | 105 | 73 | 56 |
| 270 | 143 | 98 | 68 | 53 |
| 280 | 133 | 91 | 63 | 49 |
| 290 | 124 | 85 | 59 | 46 |
| 300 | 117 | 80 | 55 | 43 |
| 320 | 103 | 71 | 49 | 38 |
| 340 | 92 | 63 | 43 | 34 |
| 360 | 82 | 56 | 39 | 30 |
| 380 | 74 | 51 | 35 | 27 |
| 400 | 67 | 46 | 32 | 25 |
| 450 | 53 | 37 | 25 | 20 |
| 500 | 43 | 30 | 21 | 16 |
| 550 | 36 | 25 | 17 | 13 |
| 600 | 30 | 21 | 14 | 11 |

| **Hilti threaded rods AM10, AM12 and AM16 x L strength class 4.8, 8.8 and A4-70** | |
|---|---|
| **Calculation-based compression resistance in case of fire** | **Annex D5** |

**Table D6:** Calculation-based compression resistance $F_{Rk,t}$ in case of fire after t = 30, 60, 90 and 120 minutes of Hilti threaded rods AM 8.8 M12 x L

| Installation length l [mm] | $F_{Rk,30}$ [N] | $F_{Rk,60}$ [N] | $F_{Rk,90}$ [N] | $F_{Rk,120}$ [N] |
|---|---|---|---|---|
| 40 | 3707 | 2185 | 1638 | 1275 |
| 50 | 3361 | 2013 | 1497 | 1165 |
| 60 | 2988 | 1825 | 1344 | 1045 |
| 70 | 2612 | 1628 | 1186 | 923 |
| 80 | 2258 | 1435 | 1035 | 805 |
| 90 | 1945 | 1256 | 897 | 698 |
| 100 | 1677 | 1096 | 778 | 605 |
| 110 | 1452 | 958 | 676 | 526 |
| 120 | 1264 | 840 | 591 | 460 |
| 130 | 1108 | 740 | 519 | 404 |
| 140 | 977 | 655 | 458 | 357 |
| 150 | 867 | 584 | 407 | 317 |
| 160 | 774 | 522 | 364 | 283 |
| 170 | 695 | 470 | 327 | 255 |
| 180 | 627 | 425 | 295 | 230 |
| 190 | 568 | 386 | 268 | 209 |
| 200 | 518 | 352 | 244 | 190 |
| 220 | 434 | 295 | 205 | 159 |
| 240 | 369 | 252 | 174 | 136 |
| 260 | 318 | 217 | 150 | 117 |
| 280 | 276 | 189 | 131 | 102 |
| 300 | 242 | 166 | 115 | 89 |
| 320 | 214 | 147 | 101 | 79 |
| 340 | 191 | 131 | 90 | 70 |
| 360 | 171 | 117 | 81 | 63 |
| 380 | 154 | 106 | 73 | 57 |
| 400 | 140 | 96 | 66 | 51 |
| 450 | 111 | 76 | 53 | 41 |
| 500 | 91 | 62 | 43 | 33 |
| 550 | 75 | 52 | 36 | 28 |
| 600 | 63 | 44 | 30 | 23 |
| 650 | 54 | 37 | 26 | 20 |
| 700 | 47 | 32 | 22 | 17 |
| 800 | 36 | 25 | 17 | 13 |

| **Hilti threaded rods AM10, AM12 and AM16 x L strenght class 4.8, 8.8 and A4-70** | **Annex D6** |
|---|---|
| **Calculation-based compression resistance in case of fire** | |

**Table D7:** Calculation-based compression resistance $F_{Rk,t}$ in case of fire after t = 30, 60, 90 and 120 minutes of Hilti threaded rods AM 8.8 M16 x L

| Installation length l [mm] | $F_{Rk,30}$ [N] | $F_{Rk,60}$ [N] | $F_{Rk,90}$ [N] | $F_{Rk,120}$ [N] |
|---|---|---|---|---|
| 40 | 7515 | 4376 | 3302 | 2569 |
| 50 | 7104 | 4169 | 3133 | 2438 |
| 60 | 6656 | 3946 | 2950 | 2296 |
| 70 | 6172 | 3705 | 2752 | 2142 |
| 80 | 5662 | 3448 | 2543 | 1978 |
| 90 | 5146 | 3182 | 2327 | 1811 |
| 100 | 4642 | 2913 | 2114 | 1645 |
| 110 | 4169 | 2652 | 1910 | 1486 |
| 120 | 3736 | 2405 | 1721 | 1339 |
| 130 | 3349 | 2177 | 1550 | 1206 |
| 140 | 3007 | 1970 | 1396 | 1087 |
| 150 | 2707 | 1786 | 1261 | 981 |
| 160 | 2444 | 1621 | 1141 | 888 |
| 170 | 2215 | 1475 | 1036 | 806 |
| 180 | 2014 | 1346 | 943 | 734 |
| 190 | 1837 | 1232 | 862 | 671 |
| 200 | 1682 | 1131 | 790 | 615 |
| 220 | 1423 | 960 | 669 | 521 |
| 240 | 1218 | 824 | 574 | 446 |
| 260 | 1053 | 715 | 497 | 386 |
| 280 | 920 | 625 | 434 | 338 |
| 300 | 809 | 551 | 382 | 297 |
| 320 | 718 | 489 | 339 | 264 |
| 340 | 641 | 437 | 303 | 236 |
| 360 | 575 | 393 | 272 | 212 |
| 380 | 520 | 355 | 246 | 191 |
| 400 | 471 | 322 | 223 | 174 |
| 450 | 377 | 258 | 178 | 139 |
| 500 | 308 | 211 | 146 | 113 |
| 550 | 256 | 176 | 121 | 94 |
| 600 | 216 | 149 | 103 | 80 |
| 650 | 185 | 127 | 88 | 68 |
| 700 | 160 | 110 | 76 | 59 |
| 800 | 124 | 85 | 59 | 46 |
| 900 | 98 | 68 | 47 | 36 |
| 1000 | 80 | 55 | 38 | 30 |

| **Hilti threaded rods AM10, AM12 and AM16 x L strength class 4.8, 8.8 and A4-70** | |
|---|---|
| **Calculation-based compression resistance in case of fire** | **Annex D7** |

**Table D8:** Calculation-based compression resistance $F_{Rk,t}$ in case of fire after t = 30, 60, 90 and 120 minutes of Hilti threaded rods AM10 x L A4-70

| Installation length l [mm] | $F_{Rk,30}$ [N] | $F_{Rk,60}$ [N] | $F_{Rk,90}$ [N] | $F_{Rk,120}$ [N] |
|---|---|---|---|---|
| 40 | 4301 | 1582 | 686 | 534 |
| 50 | 4110 | 1532 | 668 | 520 |
| 60 | 3910 | 1481 | 650 | 506 |
| 70 | 3700 | 1429 | 631 | 491 |
| 80 | 3482 | 1374 | 612 | 476 |
| 90 | 3257 | 1318 | 592 | 461 |
| 100 | 3029 | 1259 | 571 | 445 |
| 110 | 2804 | 1199 | 550 | 428 |
| 120 | 2585 | 1138 | 529 | 411 |
| 130 | 2377 | 1077 | 507 | 394 |
| 140 | 2182 | 1016 | 484 | 377 |
| 150 | 2003 | 956 | 462 | 359 |
| 160 | 1838 | 898 | 439 | 342 |
| 170 | 1689 | 842 | 417 | 325 |
| 180 | 1555 | 789 | 395 | 308 |
| 190 | 1433 | 739 | 374 | 291 |
| 200 | 1324 | 692 | 354 | 276 |
| 210 | 1225 | 648 | 335 | 261 |
| 220 | 1136 | 608 | 317 | 246 |
| 230 | 1056 | 570 | 299 | 233 |
| 240 | 984 | 535 | 283 | 220 |
| 250 | 918 | 503 | 268 | 208 |
| 260 | 859 | 474 | 253 | 197 |
| 270 | 804 | 446 | 240 | 186 |
| 280 | 755 | 421 | 227 | 177 |
| 290 | 710 | 398 | 215 | 168 |
| 300 | 669 | 376 | 204 | 159 |
| 320 | 596 | 338 | 185 | 144 |
| 340 | 534 | 305 | 167 | 130 |
| 360 | 482 | 276 | 152 | 118 |
| 380 | 436 | 251 | 139 | 108 |
| 400 | 397 | 229 | 127 | 99 |
| 450 | 319 | 185 | 104 | 81 |
| 500 | 262 | 153 | 86 | 67 |
| 550 | 219 | 128 | 72 | 56 |
| 600 | 185 | 109 | 62 | 48 |

| **Hilti threaded rods AM10, AM12 and AM16 x L strength class 4.8, 8.8 and A4-70** | **Annex D8** |
|---|---|
| **Calculation-based compression resistance in case of fire** | |

**Table D9:** Calculation-based compression resistance F<sub>Rk,t</sub> in case of fire after t = 30, 60, 90 and 120 minutes of Hilti threaded rods AM12 x L A4-70

| Installation length l [mm] | $F_{Rk,30}$ [N] | $F_{Rk,60}$ [N] | $F_{Rk,90}$ [N] | $F_{Rk,120}$ [N] |
|---|---|---|---|---|
| 40 | 6435 | 2348 | 1015 | 790 |
| 50 | 6211 | 2289 | 994 | 773 |
| 60 | 5980 | 2229 | 972 | 756 |
| 70 | 5740 | 2168 | 950 | 739 |
| 80 | 5490 | 2105 | 927 | 722 |
| 90 | 5232 | 2040 | 904 | 704 |
| 100 | 4965 | 1973 | 881 | 685 |
| 110 | 4692 | 1905 | 857 | 667 |
| 120 | 4418 | 1834 | 832 | 647 |
| 130 | 4146 | 1762 | 807 | 628 |
| 140 | 3879 | 1689 | 781 | 608 |
| 150 | 3621 | 1615 | 754 | 587 |
| 160 | 3376 | 1541 | 728 | 566 |
| 170 | 3144 | 1468 | 701 | 545 |
| 180 | 2928 | 1395 | 673 | 524 |
| 190 | 2727 | 1325 | 646 | 503 |
| 200 | 2542 | 1257 | 619 | 482 |
| 220 | 2214 | 1128 | 567 | 441 |
| 240 | 1938 | 1012 | 518 | 403 |
| 260 | 1706 | 908 | 472 | 367 |
| 280 | 1511 | 817 | 429 | 334 |
| 300 | 1345 | 737 | 391 | 305 |
| 320 | 1204 | 667 | 357 | 278 |
| 340 | 1084 | 605 | 327 | 254 |
| 360 | 980 | 551 | 299 | 233 |
| 380 | 890 | 503 | 275 | 214 |
| 400 | 812 | 462 | 253 | 197 |
| 450 | 655 | 376 | 208 | 162 |
| 500 | 540 | 312 | 174 | 135 |
| 550 | 452 | 263 | 147 | 114 |
| 600 | 384 | 224 | 126 | 98 |
| 650 | 330 | 194 | 109 | 85 |
| 700 | 287 | 169 | 95 | 74 |
| 800 | 222 | 131 | 74 | 58 |

| **Hilti threaded rods AM10, AM12 and AM16 x L strenght class 4.8, 8.8 and A4-70** | **Annex D9** |
|---|---|
| **Calculation-based compression resistance in case of fire** | |

**Table D10:** Calculation-based compression resistance $F_{Rk,t}$ in case of fire after t = 30, 60, 90 and 120 minutes of Hilti threaded rods AM16 x L A4-70

| Installation length l [mm] | $F_{Rk,30}$ [N] | $F_{Rk,60}$ [N] | $F_{Rk,90}$ [N] | $F_{Rk,120}$ [N] |
|---|---|---|---|---|
| 40 | 12423 | 4491 | 1934 | 1505 |
| 50 | 12123 | 4410 | 1904 | 1482 |
| 60 | 11821 | 4330 | 1875 | 1459 |
| 70 | 11512 | 4249 | 1845 | 1436 |
| 80 | 11197 | 4167 | 1815 | 1413 |
| 90 | 10873 | 4084 | 1785 | 1389 |
| 100 | 10540 | 3999 | 1755 | 1366 |
| 110 | 10197 | 3913 | 1724 | 1342 |
| 120 | 9844 | 3825 | 1693 | 1317 |
| 130 | 9483 | 3735 | 1661 | 1293 |
| 140 | 9116 | 3643 | 1629 | 1268 |
| 150 | 8744 | 3549 | 1596 | 1242 |
| 160 | 8369 | 3453 | 1562 | 1216 |
| 170 | 7995 | 3355 | 1528 | 1189 |
| 180 | 7625 | 3256 | 1493 | 1162 |
| 190 | 7262 | 3156 | 1458 | 1134 |
| 200 | 6907 | 3056 | 1422 | 1106 |
| 220 | 6234 | 2854 | 1349 | 1050 |
| 240 | 5616 | 2654 | 1275 | 992 |
| 260 | 5061 | 2461 | 1201 | 935 |
| 280 | 4566 | 2276 | 1128 | 878 |
| 300 | 4128 | 2103 | 1057 | 823 |
| 320 | 3742 | 1942 | 989 | 769 |
| 340 | 3403 | 1793 | 924 | 719 |
| 360 | 3104 | 1658 | 863 | 671 |
| 380 | 2839 | 1534 | 806 | 627 |
| 400 | 2606 | 1421 | 752 | 586 |
| 450 | 2129 | 1184 | 637 | 495 |
| 500 | 1769 | 997 | 542 | 422 |
| 550 | 1491 | 849 | 466 | 362 |
| 600 | 1274 | 730 | 403 | 314 |
| 650 | 1100 | 634 | 352 | 274 |
| 700 | 959 | 556 | 309 | 241 |
| 800 | 747 | 436 | 244 | 190 |
| 900 | 598 | 351 | 197 | 154 |
| 1000 | 490 | 288 | 163 | 127 |

**Hilti threaded rods AM10, AM12 and AM16 x L strenght class 4.8, 8.8 and A4-70**

**Calculation-based compression resistance in case of fire**

**Annex D10**

**Figure E1: Example use case Hilti threaded rods on suspended rails**
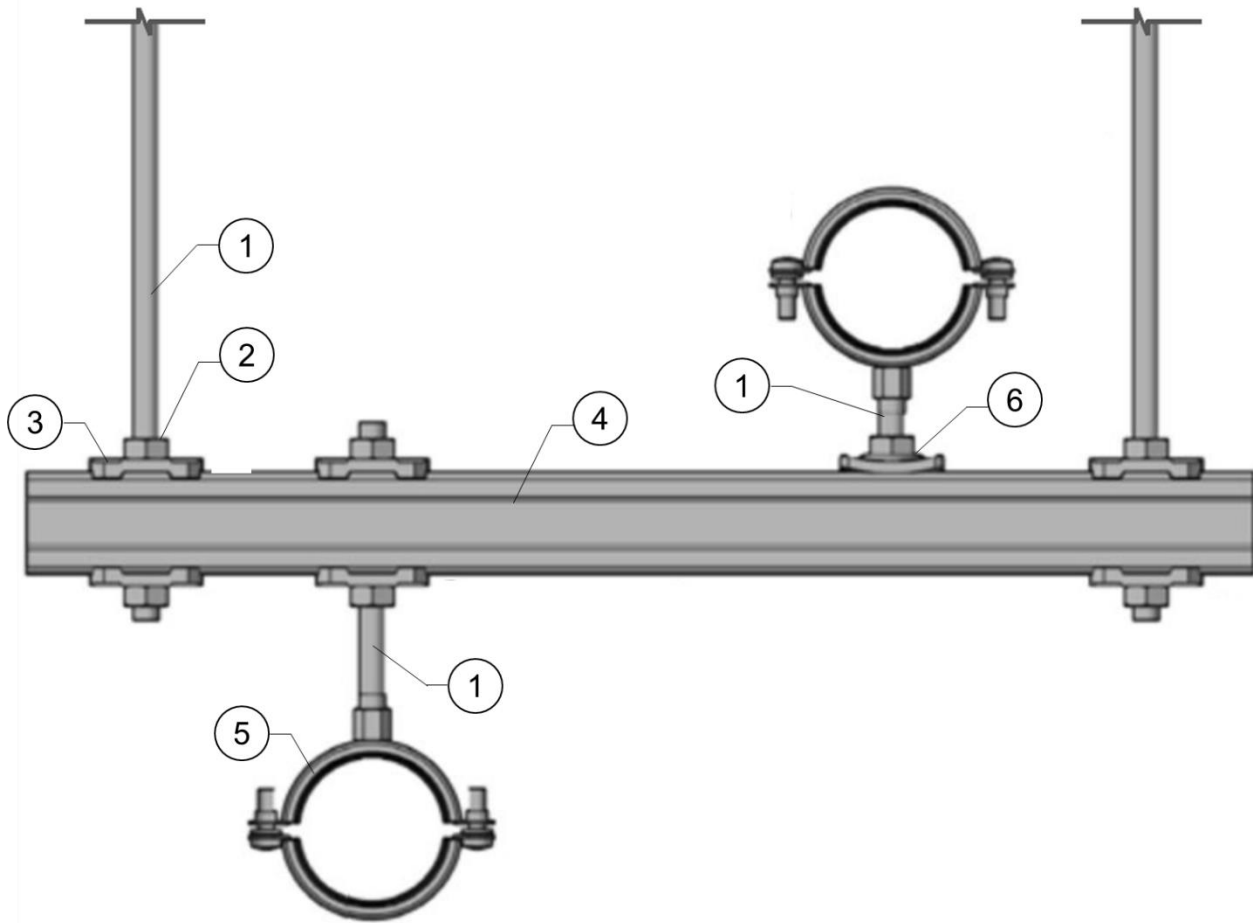


**Legend**

| | | |
|---|---|---|
| 1 | Hilti threaded rod | |
| 2 | Hexagonal nut | (not an integral part of this ETA) |
| 3 | MQZ-L drilled plates | (not an integral part of this ETA) |
| 4 | Installation channel | (not an integral part of this ETA) |
| 5 | Pipe ring | (not an integral part of this ETA) |
| 6 | Pipe ring saddle | (not an integral part of this ETA) |

**Hilti threaded rods AM10, AM12 and AM16 x L strength class 4.8, 8.8 and A4-70**

| | |
|---|---|
| **Example usage: Hilti threaded rods on suspended rails** | **Annex E1 (informative)** |

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No 305/2011

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# European Technical Assessment

# ETA-22/0810
# of 20/12/2022

*English translation prepared by CSTB - Original version in French language*

**General Part**

| | |
|---|---|
| Trade name: | Hilti drilled plate MQZ-L11 and Hilti drilled plate MQZ-L13 |
| Product family: | Products for installation systems for supporting technical building equipment |
| Manufacturer: | Hilti AG Liechtenstein<br>Feldkircherstraße 100<br>9494 Schaan<br>FÜRSTENTUM LIECHTENSTEIN |
| Manufacturing plants: | L 9295 |
| This European Technical Assessment contains: | 12 pages including 10 pages of annexes which form an integral part of this assessment |
| This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of: | European Assessment Document (EAD)<br>280016-00-0602 version August 2017 |
| This version replaces: | ETA-18/0102 of 21 September 2018 |

1) Specific Part

**1        Technical description of the product**

The MQZ-L11 and MQZ-L13 drilled plates are steel plates that are stamped rectangularly with a centrally positioned opening, which is 11.5 mm or 13.5 mm in diameter. The plates have raised edges in the corners at the rear to ensure a perfect fit with the Hilti installation channels. Annex A describes the dimensions and materials of the MQZ-L11 and MQZ-L13 drilled plates.

Annex A describes the dimensions and materials of the Hilti MQZ-L11 and MQZ-L13 drilled plates.

Information on the intended use and the requirements for the performance assessment are given in Annex B.

**2        Specification of the intended use**

The performance given in Section 3 can only be assumed if the Hilti MQZ-L11 and MQZ-L13 drilled plates is used in compliance with the specifications and under boundary conditions set out in Annexes A to C. The test and assessment methods on which this European Technical Assessment is based lead to an assumption of a working life of the Hilti MQZ-L11 and MQZ-L13 drilled plates of at least 50 years in final use under ambient temperatures in indoor areas. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

In accordance with the European Assessment Document EAD 280016-00-0602, the product is intended to be used in

a) installations for the support of sprinkler kits,

b) installations for the support of other building service elements such as pipes, conduits, ducts and cables.

**3        Performance of the product and references to the methods used for its assessment**

**3.1     Safety in case of fire (BWR 2)**

| Essential characteristic | Performance |
|---|---|
| Reaction to fire | Class A1 |
| Pull-through resistance under fire exposure | See Annex C1 |

**3.2     Safety and accessibility in use (BWR 4)**

| Essential characteristic | Performance |
|---|---|
| Shape | See Annex A1 |
| Dimensions | See Annex A1 |
| Material | See Annex A1 |
| Characteristic pull through resistance | No performance determinded |

**4　　Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base**

In accordance with the European Assessment Document EAD 280016-00-0602, the following legal bases apply:

- In case of intended use a) specified in Section 2:
  Decision of the commission N° 1996/577/EC as amended by Commission Decision 2002/592/EC.:
  System 1 applies for the assessment and verification of constancy of performance (AVCP).

- In case of intended use b) specified in Section 2:
  Decision of the commission N° 1999/472/EC as amended by Commission Decision 2001/596/EC.:
  System 3 applies for the assessment and verification of constancy of performance (AVCP).

**5　　Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD**

The technical details necessary for the implementation of the system for the assessment and verification of constancy of performance are laid down in the control plan (confidential part of this European Technical Assessment) deposited at Centre Scientifique et Technique du Bâtiment.

The manufacturer shall, on the basis of a contract, involve a notified body approved in the field of supporting systems for issuing the certificate of conformity CE based on the control plan.

**The original French version is signed by**

La cheffe de division, Anca CRONOPOL

**Figure A1: Geometry and dimensions of MQZ-L11 and MQZ-L13 drilled plates**

| Item number | Designation | D [mm] | Materials | Illustration |
|---|---|---|---|---|
| 2199455 | MQZ-L11 | 11,5 | S235JR in accordance with DIN EN 10025-2 | |
| 2199456 | MQZ-L13 | 13,5 | | |

**Hilti drilled plates MQZ-L11 and MQZ-L13**

**Product Description**
Dimensions and materials

**Annex A1**

- MQZ-L11 and MQZ-L13 drilled plates are used in building services engineering installation systems at ambient temperature and at elevated temperatures. MQZ-L11 and MQZ-L13 drilled plates are used to transfer building services component loads such as ducts and equipment for sprinklers, wastewater, drinking water, heating, cooling, ventilation, electrical and other installations. MQZ-L11 and MQZ-L13 described in this ETA are suitable for undertaking this load-bearing function under the conditions listed in section 2.

- The resistance and deformation in case of fire are referring to the boundary conditions of the standard temperature time curve (STTC) in accordance with EN 1363-1.

- MQZ-L11 and MQZ-L13 drilled plates are used to fix threaded rods to installation channels or brackets in conjunction with hexagonal nuts.

- The installation instructions described in Annex E are a prerequisite for the information on the performance assessment in Annex C and D

- MQZ-L11 drilled plates are used in pairs in conjunction with Hilti threaded rods in strength class ≥ 4.8 in accordance with DIN 976-1 as per Table B1; hexagonal nuts in strength class ≥ 8 in accordance with DIN 934 as per Table B2; and Hilti installation channels according to Annex B3, B4, B5 and B6.

**Table B1:  Threaded rods for use with Hilti drilled plates MQZ-L11**
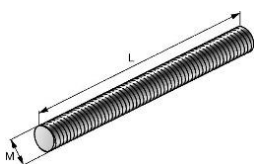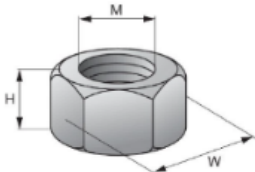
| Illustration | Item number | Designation | M Thread | L [mm] | Material |
|---|---|---|---|---|---|
| | 339795 | AM10x1000 4.8 | M10 | 1000 | Strength class 4.8 in accordance with DIN 976-1, zinc coated |
| | 339796 | AM10x2000 4.8 | M10 | 2000 | |
| | 216418 | AM10x3000 4.8 | M10 | 3000 | |

**Table B2:  Hexagonal nuts for use with Hilti drilled plates MQZ-L11**

| Illustration | Item number | Designation | M thread | W [mm] | H [mm] | Material |
|---|---|---|---|---|---|---|
| | 216466 | M10 hexagonal nut | M10 | 17 | 8 | Strength class 8 in accordance with DIN 934, zinc coated |

- MQZ-L13 drilled plates are used in pairs in conjunction with Hilti threaded rods in strength class ≥ 4.8 in accordance with DIN 976-1 as per Table B23; hexagonal nuts in strength class ≥ 8 in accordance with DIN 934 as per Table B4; and Hilti installation channels according to Annex B3, B4, B5 and B6.

| Hilti drilled plates MQZ-L11 and MQZ-L13 | |
|---|---|
| **Requirements for performance assessment** | **Annex B1** |

**Table B3:**     **Threaded rods for use with Hilti drilled plates MQZ-L13**
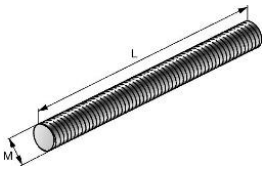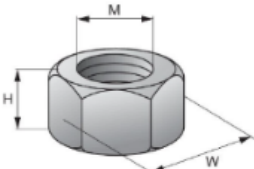
| Illustration | Item number | Designation | M thread | L [mm] | Material |
|---|---|---|---|---|---|
|  | 339797 | AM12x1000 4.8 | M12 | 1000 | Strength class 4.8 in accordance with DIN 976-1, zinc coated |
| | 216420 | AM12x2000 4.8 | M12 | 2000 | |
| | 216421 | AM12x3000 4.8 | M12 | 3000 | |

**Table B4:**     **Hexagonal nuts for use with Hilti drilled plates MQZ-L13**
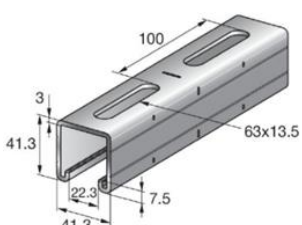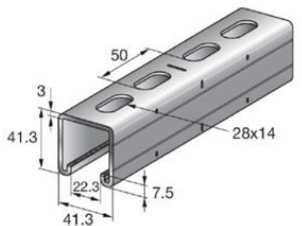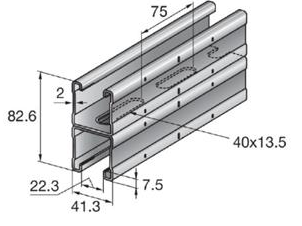
| Illustration | Item number | Designation | M thread | W [mm] | H [mm] | Material |
|---|---|---|---|---|---|---|
|  | 2184554 | M12 hexagonal nut | M12 | 19 | 10 | Strength class 8 in accordance with DIN 934, zinc coated |

| Hilti drilled plates MQZ-L11 and MQZ-L13 | |
|---|---|
| **Requirements for performance assessment** | **Annex B2** |

**Table B5:** Dimensions and materials of Hilti MQ-41/3 3M, MQ-41/3 6M, MQ-41/3 3M LL, MQ-41/3 6M LL, MQ-41 D 3M and MQ-41 D 6M installation channels for use with Hilti drilled plates MQZ-L

| Figure[1] | Item number | Designation | Materials and coatings |
|---|---|---|---|
|  | 369596 | MQ-41/3 3M | S250GD+Z275-M-A-C according to EN 10346 |
| | 369597 | MQ-41/3 6M | |
|  | 2048102 | MQ-41/3 3M LL | S250GD+Z275-M-A-C according to EN 10346 |
| | 2048103 | MQ-41/3 6M LL | |
|  Two profiles of MQ-41 D channel are connected in the area of the holes in the back of the channels in a shape-fitting and force-fitting way as a kind of riveted connection. | 369603 | MQ-41 D 3m | S250GD+Z275-M-A-C according to EN 10346 |
| | 369604 | MQ-41 D 6m | |

[1] Dimensions in mm

**Hilti drilled plates MQZ-L11 and MQZ-L13**

**Requirements for performance assessment**

**Annex B3**

**Table B6:** Dimensions and materials of Hilti MQ-21.5 6m, MQ-21.5 3m, MQ-21.5 2m, MQ-41 6m, MQ-41 3m, MQ-41 2m, MQ-41-L 6m, MQ-41-L 3m and MQ-41-L2m installation channels for use with Hilti drilled plates MQZ-L

| Figure[1] | Item number | Designation | Materials and coatings |
|---|---|---|---|
|  | 2184773 | MQ-21.5 6m | S280GD+Z140-M-A-C according to DIN EN 10346 |
| | 2184772 | MQ-21.5 3m | |
| | 2184771 | MQ-21.5 2m | |
|  | 369592 | MQ-41 6m | S250GD+Z275-M-A-C according to DIN EN 10346 |
| | 369591 | MQ-41 3m | |
| | 304559 | MQ-41 2m | |
|  | 2141964 | MQ-41-L 6m | S250GD+Z140-M-A-C according to DIN EN 10346 |
| | 2141965 | MQ-41-L 3m | |
| | 2141966 | MQ-41-L 2m | |

[1] Dimensions in mm

| Hilti drilled plates MQZ-L11 and MQZ-L13 | |
|---|---|
| **Requirements for performance assessment** | **Annex B4** |

**Table B7:** Dimensions and materials of Hilti MT-30 S, MT-30, MT-30 S OC, MT-30 OC, MT-40 S, MT-40, MT-40 S OC and MT-40 OC installation channels for use with Hilti drilled plates MQZ-L

| Figure[1] | Item number | Designation | Length [m] | Materials and coatings |
|---|---|---|---|---|
|  | 2268497 | MT-30 S | 3 | S250GD+ Z275-M-A-C acc. to EN 10346 |
| | 2268498 | MT-30 | 6 | |
|  | 2268499 | MT-30 S OC | 3 | S280GD+ ZM310-A-C acc. to EN 10346 |
| | 2268500 | MT-30 OC | 6 | |
|  | 2268505 | MT-40 S | 3 | S280GD+ Z275-M-A-C acc. to EN 10346 |
| | 2268506 | MT-40 | 6 | |
|  | 2268507 | MT-40 S OC | 3 | S280GD+ ZM310-A-C acc. to EN 10346 |
| | 2268508 | MT-40 OC | 6 | |

[1] Dimensions en mm

| Hilti drilled plates MQZ-L11 and MQZ-L13 | |
|---|---|
| **Requirements for performance assessment** | **Annex B5** |

**Table B8:** **Hilti MT-50 S, MT-50, MT-50 S OC, MT-50 OC, MT-40D S, MT-40D, MT-40D S OC, MT-40D OC installation channels for use with Hilti drilled plates MQZ-L**

| Figure[1] | Item number | Designation | Length [m] | Materials and coatings |
|---|---|---|---|---|
|  | 2268509 | MT-50 S | 3 | S280GD+ Z275-M-A-C acc. to EN 10346 |
| | 2268510 | MT-50 | 6 | |
|  | 2268511 | MT-50 S OC | 3 | S280GD+ ZM310-A-C acc to. EN 10346 |
| | 2268512 | MT-50 OC | 6 | |
|  | 2268517 | MT-40D S | 3 | S280GD+ Z275-M-A-C acc. to EN 10346 |
| | 2268518 | MT-40D | 6 | |
|  | 2268519 | MT-40D S OC | 3 | S280GD+ ZM310-A-C acc to. EN 10346 |
| | 2268520 | MT-40D OC | 6 | |

**[1]** Dimensions en mm

| Hilti drilled plates MQZ-L11 and MQZ-L13 | |
|---|---|
| Characteristic tensile strength at ambient temperature | **Annex B6** |

**Table D1:** Resistance of $F_{Rk,t}$ of MQZ-L drilled plates in case of fire after t = 30, 60, 90 and 120 minutes in combination with threaded rods ≥ M10 strength class ≥ 4.8

| Drilled plates | Installation channel | Parameter of regression curve $F_{Rk}(t) = c_3(c_1 + c_2/t)$ | $F_{Rk,t}$ [N] | | | |
|---|---|---|---|---|---|---|
| | | | $F_{Rk,30}$ | $F_{Rk,60}$ | $F_{Rk,90}$ | $F_{Rk,120}$ |
| MQZ-L11 MQZ-L13 | MQ-41/3 | $c_1 = 963,5$ $c_2 = 76594,354$ $c_3 = 0,847958$ 25 min ≤ t ≤ 150 min | 1491 | 949 | 769 | 679 |
| | MQ-41/3 LL | | | | | |
| | MT-30 | $c_1 = 427,2416$ $c_2 = 130158,0662$ $c_3 = 0,910073$ 33 min ≤ t ≤ 130 min | 2168,65 | 1181,5 | 852,5 | 687,95 |
| | MT-30 S | | | | | |
| | MT-30 OC | | | | | |
| | MT-30 S OC | | | | | |
| | MT-40 | | | | | |
| | MT-40 S | | | | | |
| | MT-40 OC | | | | | |
| | MT-40 S OC | | | | | |
| | MT-50 | | | | | |
| | MT-50 S | | | | | |
| | MT-50 OC | | | | | |
| | MT-50 S OC | | | | | |
| | MT-40D | | | | | |
| | MT-40D S | | | | | |
| | MT-40D OC | | | | | |
| | MT-40D S OC | | | | | |

**Designation**

$F_{Rk,t}$      Resistance after an exposure time t in case of fire [N]
$F_{Rk}(t)$      Resistance time function in case of fire [N]

| Hilti drilled plates MQZ-L11 and MQZ-L13 | |
|---|---|
| **Characteristic resistance in case of fire** | **Annex C1** |

**Figure E1: Bill of material and instructions for use**
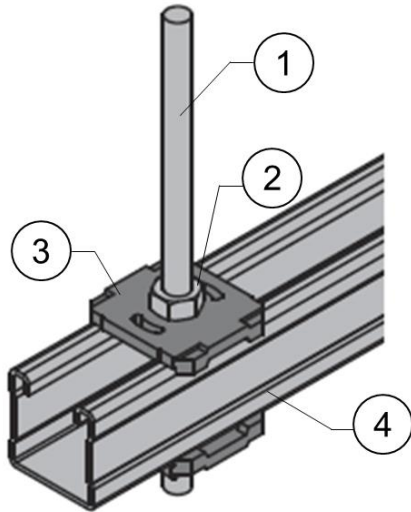
| Bill of material | | | | | |
|---|---|---|---|---|---|
| **Part of typical** | | **Ref.** | **Opt.** | **Item No.** | **Description** |
| **Setup** | **Fixation** | 1 | A | 339795<br>339796<br>216418 | AM10x1000 4.8 threaded rod<br>AM10x2000 4.8 threaded rod<br>AM10x3000 4.8 threaded rod |
| | | | B | 339797<br>216420<br>216421 | AM12x1000 4.8 threaded rod<br>AM12x2000 4.8 threaded rod<br>AM12x3000 4.8 threaded rod |
| | | 2 | A | 216466 | M10 hexagonal nut |
| | | | B | 2184554 | M12 hexagonal nut |
| **MQZ-L** | | 3 | A | 2199455 | MQZ-L11 drilled plate |
| | | | B | 2199456 | MQZ-L13 drilled plate |
| **Channel** | **Support** | 4 | A | 369596<br>369597<br>2048102<br>2048103 | MQ-41/3 3M installation channel<br>MQ-41/3 6M installation channel<br>MQ-41/3 3M LL installation channel<br>MQ-41/3 6M LL installation channel |
| | | | B | 369603<br>369604 | MQ-41 D 3M installation channel<br>MQ-41D 6M installation channel |
| | | | C | 369592<br>369591<br>304559<br>2141964<br>2141965<br>2141966 | MQ-41 6m installation channel<br>MQ-41 3m installation channel<br>MQ-41 2m installation channel<br>MQ-41 L 6m installation channel<br>MQ-41 L 3m installation channel<br>MQ-41L 2m installation channel |
| | | | D | 2268497<br>2268498<br>2268499<br>2268500 | MT-30 S installation channel<br>MT-30 installation channel<br>MT-30 S OC installation channel<br>MT-30 OC installation channel |
| | | | E | 2268505<br>2268506<br>2268507<br>2268508 | MT-40 S installation channel<br>MT-40 installation channel<br>MT-40 S OC installation channel<br>MT-40 OC installation channel |
| | | | F | 2268509<br>2268510<br>2268511<br>2268512 | MT-50 S installation channel<br>MT-50 installation channel<br>MT-50 S OC installation channel<br>MT-50 OC installation channel |
| | | | G | 2268517<br>2268518<br>2268519<br>2268520 | MT-40D S installation channel<br>MT-40D installation channel<br>MT-40D S OC installation channel<br>MT-40D OC installation channel |
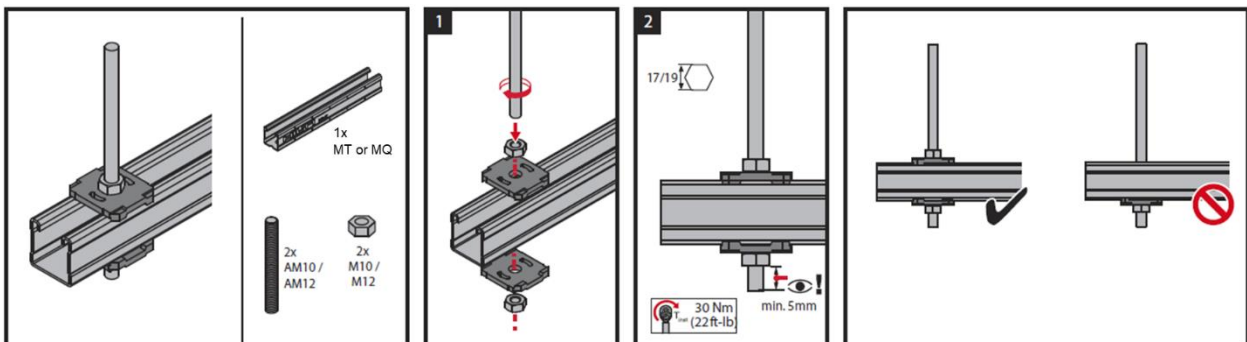


**Hilti drilled plates MQZ-L11 and MQZ-L13**

**General assembly instructions**

**Annex D1
(informative)**

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# European Technical Assessment

# ETA-23/0106 of 30/08/2023

*English translation prepared by CSTB - Original version in French language*

## General Part

**Technical Assessment Body issuing the European Technical Assessment:**

Centre Scientifique et Technique du Bâtiment (CSTB)

| | |
|---|---|
| Trade name of the construction product: | Hilti cantilevers of MT System |
| Product family to which the construction product belongs: | Products for installation systems for supporting technical building equipment |
| Manufacturer: | Hilti AG Liechtenstein<br>Feldkircherstraße 100<br>9494 Schaan<br>FÜRSTENTUM LIECHTENSTEIN |
| Manufacturing plants: | L 1027881 and L1087643 |
| This European Technical Assessment contains: | 34 pages including 31 pages of annexes which form an integral part of this assessment |
| This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of: | European Assessment Document (EAD)<br>280016-00-0602 version June 2020 |
| This Assessment replaces: | - |

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**Specific Part**

**1        Technical description of the product**

This European Technical Assessment covers HILTI cantilevers of MT System: MT-BR-30 300, MT-BR-30 300 OC, MT-BR-30 450, MT-BR-30 450 OC, MT-BR-40 300, MT-BR-40 300 OC, MT-BR-40 450, MT-BR-40 450 OC, MT-BR-40 600, MT-BR-40 600 OC, MT-BR-40 1000, MT-BR-40 1000 OC, MT-BR-40D 600, MT-BR-40D 600 OC, MT-BR-40D 1000, MT-BR-40D 1000 OC, MT-BR-40 O4 600 OC, MT-BR-40 O4 1000 OC, MT-BR-40D O4 600 OC, MT-BR-40D O4 1000 OC and MT-BR-40D O4 1500 OC.

The HILTI cantilevers MT-BR-30 300, MT-BR-30 300 OC, MT-BR-30 450 and MT-BR-30 450 OC are made of steel installation channels with open profile, with two arms of different length perpendicular to each other.

The HILTI cantilevers MT-BR-40 300, MT-BR-40 300 OC, MT-BR-40 450, MT-BR-40 450 OC, MT-BR-40 600, MT-BR-40 600 OC, MT-BR-40 1000, MT-BR-40 1000 OC, MT-BR-40D 600, MT-BR-40D 600 OC, MT-BR-40D 1000, MT-BR-40D 1000 OC, MT-BR-40 O4 600 OC, MT-BR-40 O4 1000 OC, MT-BR-40D O4 600 OC, MT-BR-40D O4 1000 OC and MT-BR-40D O4 1500 OC consist of a steel baseplate with elongated holes and welded-on, steel installation channels with open profile.

Above mentioned cantilevers can also be used with additional suspension. In this case the cantilevers of MT System are combined with Hilti MQZ-L drilled plates.

Annex A describes the dimensions and materials of above-mentioned Hilti cantilevers of MT System and accessories.

**2        Specification of the intended use**

The performance given in Section 3 can only be assumed if the Hilti cantilevers of MT System are used in compliance with the specifications and under boundary conditions set out in Annexes A to D. The test and assessment methods on which this European Technical Assessment is based lead to an assumption of a working life of the Hilti cantilevers of MT System of at least 50 years in final use under ambient temperatures in indoor areas. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

In accordance with the European Assessment Document EAD 280016-00-0602, the product is intended to be used in

a) installations for the support of sprinkler kits,

b) installations for the support of pipes for the transport of gas/fuel intended for the supply of building heating/cooling systems.

**3        Performance of the product and references to the methods used for its assessment**

**3.1      Safety in case of fire (BWR 2)**

| No. | Essential characteristic | Performance |
|-----|--------------------------|-------------|
| 1 | Reaction to fire | Class A1 |
| 2 | Resistance under fire exposure | See Annex C and D |

**3.2** **Safety and accessibility in use (BWR 4)**

| No. | Essential characteristic | Performance |
|-----|--------------------------|-------------|
| 3 | Shape | See Annex A |
| 4 | Dimension | See Annex A |
| 5 | Material | See Annex A |
| 6 | Characteristic resistance | See Annex C |

**4** **Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base**

In accordance with the European Assessment Document EAD 280016-00-0602, the following legal bases apply:

- In case of intended use a) specified in Section 2:
  Decision of the commission N° 1996/577/EC as amended by Commission Decision 2002/592/EC.:
  System 1 applies for the assessment and verification of constancy of performance (AVCP).
- In case of intended use b) specified in Section 2:
  Decision of the commission N° 1999/472/EC as amended by Commission Decision 2001/596/EC:
  System 3 applies for the assessment and verification of constancy of performance (AVCP).

**5** **Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD**

The technical details necessary for the implementation of the system for the assessment and verification of constancy of performance are laid down in the control plan (confidential part of this European Technical Assessment) deposited at Centre Scientifique et Technique du Bâtiment.

**The original French version is signed by**

La cheffe de division, Anca CRONOPOL

**Table A1:** Shape, dimensions and materials of the cantilevers MT-BR-30 300, MT-BR-30 300 OC, MT-BR-30 450, MT-BR-30 450 OC, MT-BR-40 300, MT-BR-40 300 OC, MT-BR-40 450, MT-BR-40 450 OC, MT-BR-40 600, MT-BR-40 600 OC, MT-BR-40 1000, MT-BR-40 1000 OC

| Item number | Designation | L in mm | Materials | Illustration (Dimensions in mm and inch) |
|---|---|---|---|---|
| 2271288 | MT-BR-30 300 | 300 | Steel Q235B acc. to GB/T 700, galvanized [1] | |
| 2271440 | MT-BR-30 450 | 450 | | |
| 2271289 | BR-BR-30 300 OC | 300 | Steel Q235B acc. to GB/T 700, hot dip galvanized [2] | |
| 2271441 | MT-BR-30 450 OC | 450 | | |
| 2271442 | MT-BR-40 300 | 300 | Steel Q235B acc. to GB/T 700, galvanized [1] | |
| 2271444 | MT-BR-40 450 | 450 | | |
| 2271451 | MT-BR-40 600 | 600 | | |
| 2271446 | MT-BR-40 1000 | 1000 | | |
| 2271443 | MT-BR-40 300 OC | 300 | Steel Q235B acc. to GB/T 700, hot dip galvanized [2] | |
| 2271445 | MT-BR-40 450 OC | 450 | | |
| 2271449 | MT-BR-40 600 OC | 600 | | |
| 2271447 | MT-BR-40 1000 OC | 1000 | | |

[1] Alternative: S235JR or S280GD (or HN704) + Z275-M-A-C acc. to EN 10346

[2] Alternative: S235JR or S280GD (or HN704) + ZM310-A-C acc. to EN 10346

| Hilti cantilevers MT-BR-30, MT-BR-40 and MT-BR-40 D with load introduction component with and without additional suspension | |
|---|---|
| **Product Description** Dimensions and materials | **Annex A1** |

**Table A2:** Shape, dimensions and materials of the cantilevers MT-BR-40 D 600, MT-BR-40 D 1000, MT-BR-40 600 OC, MT-BR-40 1000 OC, MT-BR-40 O4 600 OC, MT-BR-40 O4 1000 OC, MT-BR-40 D O4 600 OC, MT-BR-40 D O4 1000 OC

| Item number | Designation | L in mm | Materials | Illustration (Dimensions in mm and inch) |
|---|---|---|---|---|
| 2271448 | MT-BR-40D 600 | 600 | Steel Q235B acc. to GB/T 700, galvanized [1] | |
| 2271450 | MT-BR-40D 1000 | 1000 | | |
| 2271449 | MT-BR-40D 600 OC | 600 | Steel Q235B acc. to GB/T 700, hot dip galvanized [2] | |
| 2271453 | MT-BR-40D 1000 OC | 1000 | | |
| 2271455 | MT-BR-40 O4 600 OC | 600 | Steel Q235B acc. to GB/T 700, hot dip galvanized [1] | |
| 2271456 | MT-BR-40 O4 1000 OC | 1000 | | |
| 2271459 | MT-BR-40D O4 600 OC | 600 | Steel Q235B acc. to GB/T 700, hot dip galvanized [2] | |
| 2271461 | MT-BR-40D O4 1000 OC | 1000 | | |
| 2271287 | MT-BR-40D O4 1000 OC | 1500 | | |

[1] Alternative: S235JR or S280GD (or HN704) + Z275-M-A-C acc. to EN 10346

[2] Alternative: S235JR or S280GD (or HN704) + ZM310-A-C acc. to EN 10346

**Hilti cantilevers MT-BR-30, MT-BR-40 and MT-BR-40 D with load introduction component with and without additional suspension**

**Product Description**
Dimensions and materials

**Annex A2**

**Table A3:   Hilti cantilevers and associated Hilti installation channels**

| Hilti Cantilever | Hilti installation channel |
|---|---|
| MT-BR-30 300<br>MT-BR-30 450 | MT-30 |
| MT-BR-30 300 OC<br>MT-BR-30 450 OC | MT-30 OC |
| MT-BR-40 300<br>MT-BR-40 450<br>MT-BR-40 600<br>MT-BR-40 1000 | MT-40 |
| MT-BR-40 300 OC<br>MT-BR-40 450 OC<br>MT-BR-40 600 OC<br>MT-BR-40 1000 OC<br>MT-BR-40 O4 600 OC<br>MT-BR-40 O4 1000 OC | MT-40 OC |
| MT-BR-40D 600<br>MT-BR-40D 1000 | MT-40 D |
| MT-BR-40D 600 OC<br>MT-BR-40D 1000 OC<br>MT-BR-40D O4 600 OC<br>MT-BR-40D O4 1000 OC<br>MT-BR-40D O4 1500 OC | MT-40 D OC |

| | |
|---|---|
| **Hilti cantilevers MT-BR-30, MT-BR-40 and MT-BR-40 D with load introduction component with and without additional suspension**<br><br>**Product Description**<br>Dimensions and materials | **Annex A3** |

**Figure A1: Suspended Hilti MT System cantilevers with load introduction components**
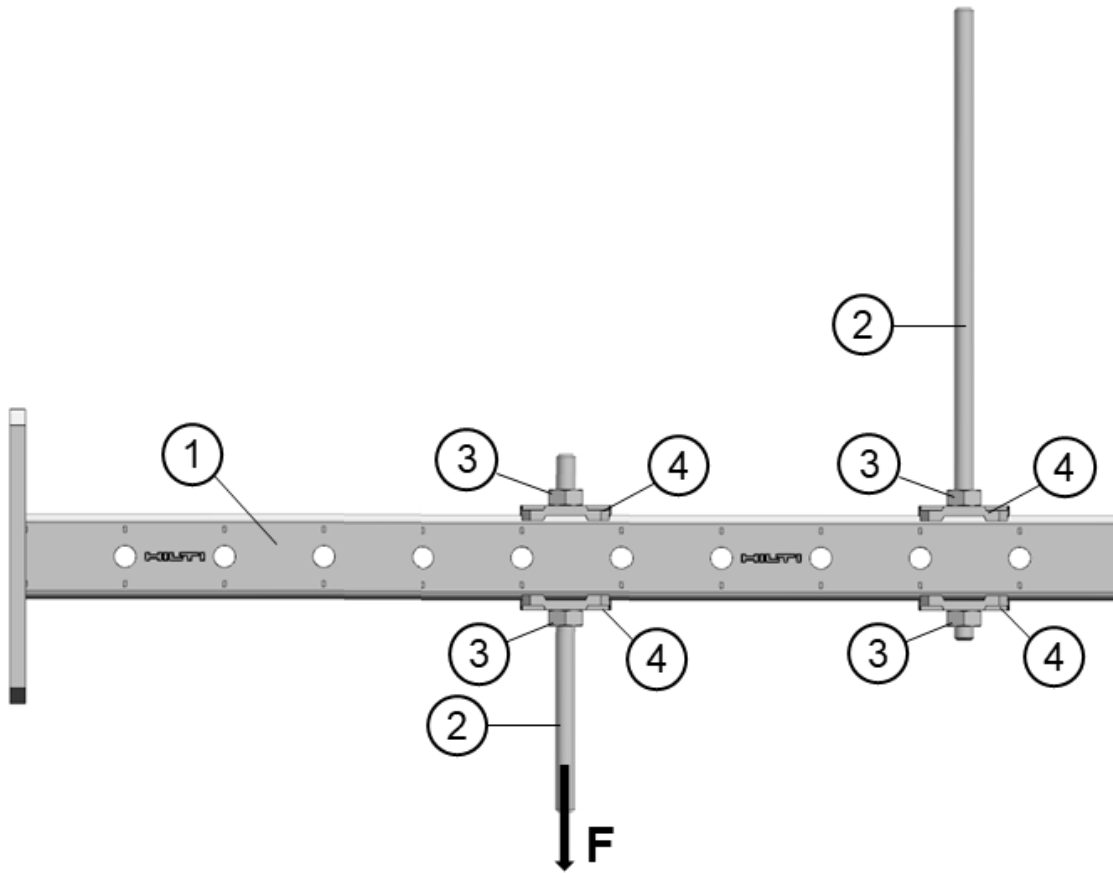


| Legend | | Annex |
|--------|--------------------------------------|----------------|
| 1 | MT-BR-30, MT-BR-40 or MT-BR-40D | Annex B to D |
| 2 | Threaded rod M10 or M12 | Annex B4 |
| 3 | Hexagonal nut M10 or M12 | Annex B5 |
| 4 | MQZ-L11 or MQZ-L13 drilled plates | Annex B5 |
| F | Applied load | |

| | |
|---|---|
| **Hilti cantilevers MT-BR-30, MT-BR-40 and MT-BR-40 D with load introduction component with additional suspension** | **Annex A4** |
| **Description of products for intended use** | |

**Figure A2: Hilti MT System cantilevers with load introduction components**
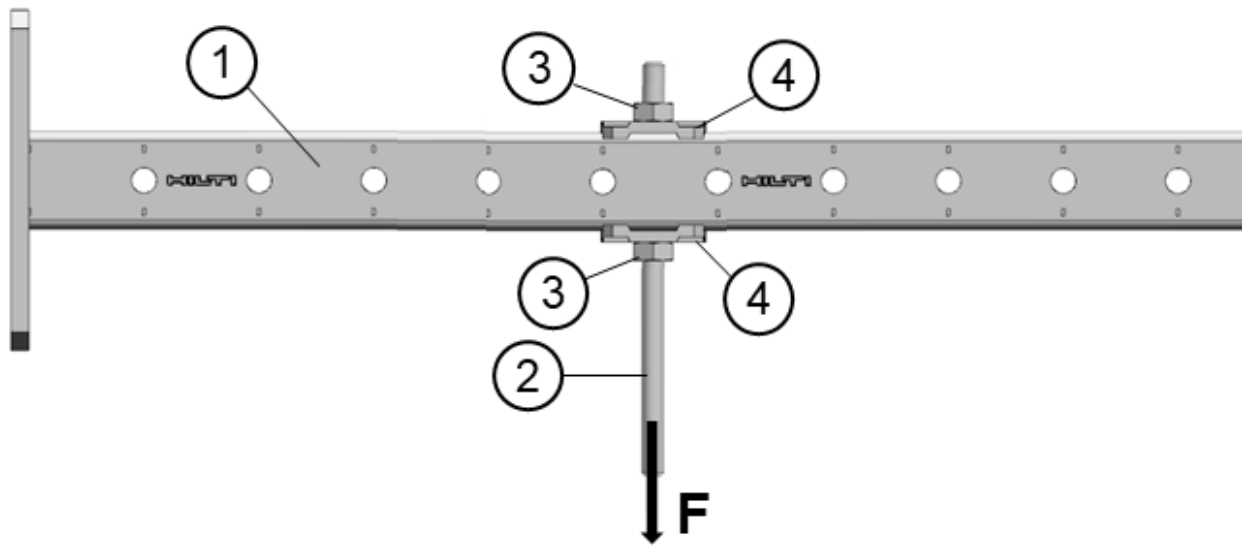


| Legend | | Annex |
|--------|--------------------------------------|-------------|
| 1 | MT-BR-30, MT-BR-40 or MT-BR-40D | Annex B to D |
| 2 | Threaded rod M10 or M12 | Annex B4 |
| 3 | Hexagonal nut M10 or M12 | Annex B5 |
| 4 | MQZ-L11 or MQZ-L13 drilled plates | Annex B5 |
| F | Applied load | |

| | |
|---|---|
| **Hilti cantilevers MT-BR-30, MT-BR-40 and MT-BR-40 D with load introduction component without additional suspension** | **Annex A5** |
| **Description of products for intended use** | |

**Specification of intended use**

- Hilti cantilevers of MT System with load introduction component are used to transfer building services component loads such as ducts and equipment for sprinklers, water, heating, cooling, ventilation, electrical and other systems at ambient temperature and in case of fire. The Hilti cantilevers of MT System can also be used with additional suspension when combined with MQZ-L drilled plate.

- Hilti cantilevers of MT System are performing this loadbearing function under the conditions described in Section 2 of this European Technical Assessment.

- The resistance and deformation at in case of fire are referring to the boundary conditions of the standard temperature / time curve (STTC) in accordance with EN 1363-1.

- The resistance of suspended cantilevers of MT System in case of fire applies for static and centric actions on the threaded rod M10 or M12 according to Annex D.

- The resistance of HILTI cantilevers set down in Annex C1 applies for static actions in the direction of the main axes X, Y, Z.

- For cantilevers MT-BR-30 300, MT-BR-30 300 OC, MT-BR-30 450 and MT-BR-30 450 OC the point of intersection of the axes X, Y, Z is located in the centroid position of the cross section of the installation channel acc. to Figure B1.
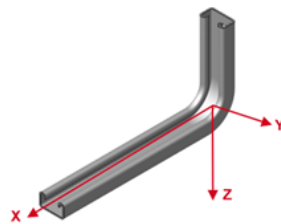


Figure B1:  Coordinate system of the resistances of MT-BR-30 300, MT-BR-30 300 OC, MT-BR-30 450 and MT-BR-30 450 OC

- For cantilevers MT-BR-40 300, MT-BR-40 300 OC, MT-BR-40 450, MT-BR-40 450 OC, MT-BR-40 600, MT-BR-40 600 OC, MT-BR-40 1000, MT-BR-40 1000 OC, MT-BR-40D 600, MT-BR-40D 600 OC, MT-BR-40D 1000, MT-BR-40D 1000 OC, MT-BR-40 O4 600 OC, MT-BR-40 O4 1000 OC, MT-BR-40D O4 600 OC, MT-BR-40D O4 1000 OC and MT-BR-40D O4 1500 OC the point of intersection of the axes X, Y, Z is located in the centroid position of the cross section of the installation channel and on the baseplate surface facing the channel acc. to Figure B2.
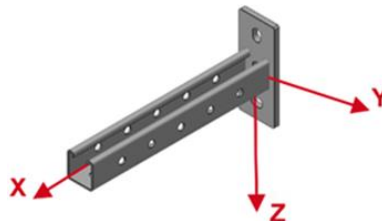


Figure B2:  Coordinate system of the resistances of MT-BR-40 300, MT-BR-40 300 OC, MT-BR-40 450, MT-BR-40 450 OC, MT-BR-40 600, MT-BR-40 600 OC, MT-BR-40 1000, MT-BR-40 1000 OC, MT-BR-40D 600, MT-BR-40D 600 OC, MT-BR-40D 1000, MT-BR-40D 1000 OC, MT-BR-40 O4 600 OC, MT-BR-40 O4 1000 OC, MT-BR-40D O4 600 OC, MT-BR-40D O4 1000 OC and MT-BR-40D O4 1500 OC

- The welded connections of the installation channel profiles to the base plates are presented in the Figures B3 to B6.

- The resistance of the welded connection in case of fire are presented in Annex C2 and Annex C3.

| Hilti cantilevers MT-BR-30, MT-BR-40 and MT-BR-40 D with load introduction component with and without additional suspension | |
|---|---|
| **Requirements for performance assessment** | **Annex B9** |

- Prior to installation, it has to be ensured that the component to be supported by the cantilevers, the anchoring of the cantilever to the base material and the base material itself are suitable to withstand the resistance values given in Annex C and Annex D in this European Technical Assessment at ambient temperature and in case of fire.

- The cantilevers must be installed by appropriately qualified personnel and under the supervision of the site manager. The general installation instructions of the manufacturer apply.
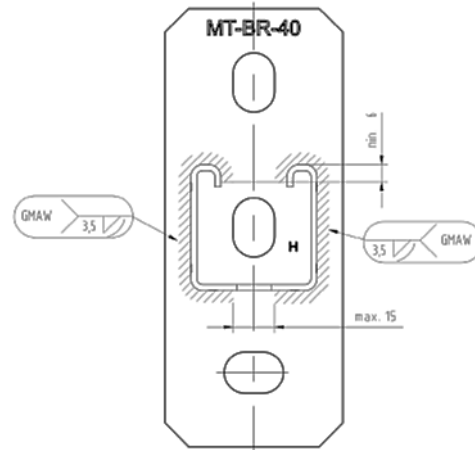


Figure B3: Welded connection of HILTI cantilevers MT-BR-40 300, MT-BR-40 300 OC, MT-BR-40 450, MT-BR-40 450 OC, MT-BR-40 600, MT-BR-40 600 OC, MT-BR-40 1000 and MT-BR-40 1000 OC
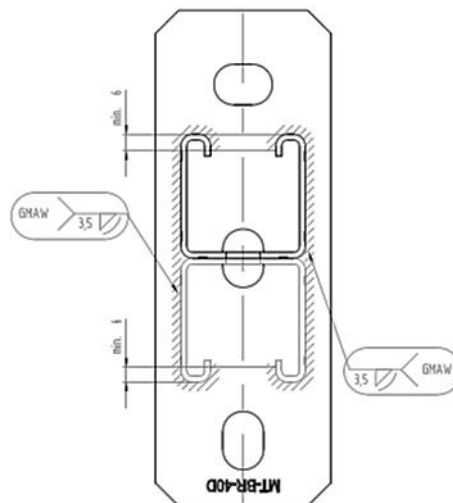


Figure B4: Welded connection of Hilti cantilevers MT-BR-40D 600, MT-BR-40D 600 OC, MT-BR-40D 1000 and MT-BR-40D 1000 OC

| Hilti cantilevers MT-BR-30, MT-BR-40 and MT-BR-40 D with load introduction component with and without additional suspension | **Annex B10** |
|---|---|
| **Requirements for performance assessment** | |
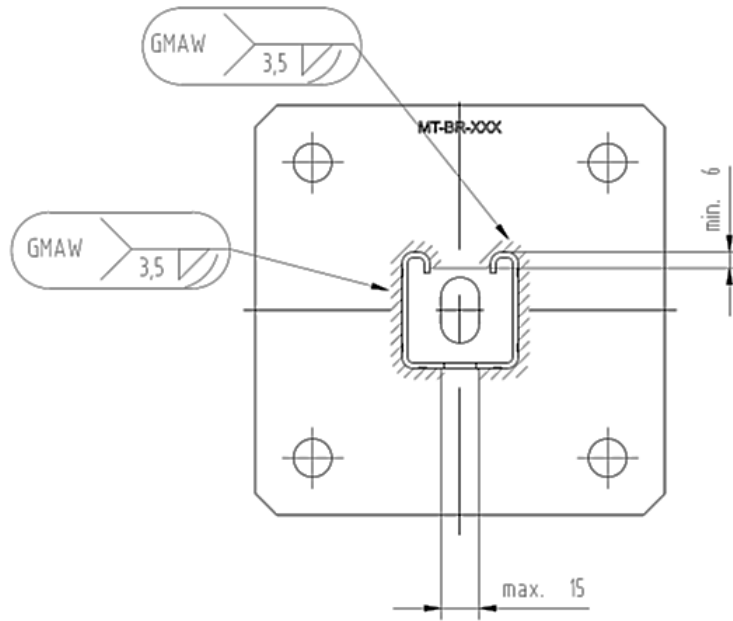
Figure B5: Welded connection types of Hilti cantilevers MT-BR-40 O4 600 OC and MT-BR-40 O4 1000 OC
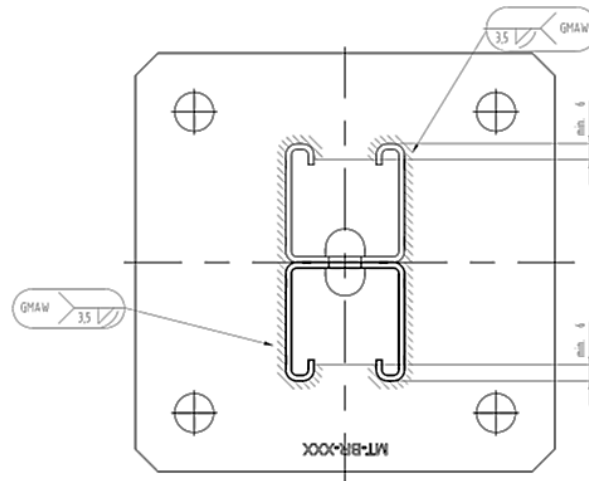


Figure B6: Welded connection types of Hilti cantilevers MT-BR-40D O4 600 OC, MT-BR-40D O4 1000 OC and MT-BR-40D O4 1500 OC

| Hilti cantilevers MT-BR-30, MT-BR-40 and MT-BR-40 D with load introduction component with and without additional suspension | |
|---|---|
| **Requirements for performance assessment** | **Annex B11** |

**Table B12:** Dimensions and materials of Hilti threaded rods for use with Hilti cantilevers of MT System

| Item number | Designation | M thread | L [mm] | Materials | Illustration |
|---|---|---|---|---|---|
| 339795 | AM10x1000 4.8 | M10 | 1000 | Strength class 4.8 in accordance with DIN976-1, zinc coated | |
| 339796 | AM10x2000 4.8 | M10 | 2000 | | |
| 216418 | AM10x3000 4.8 | M10 | 3000 | | |
| 339797 | AM12x1000 4.8 | M12 | 1000 | | |
| 216420 | AM12x2000 4.8 | M12 | 2000 | | |
| 216421 | AM12x3000 4.8 | M12 | 3000 | | |
| 407497 | AM 8.8 M10x1000 | M10 | 1000 | Strength class 8.8 in accordance with DIN976-1, zinc coated | |
| 2008566 | AM 8.8 M10x3000 | M10 | 3000 | | |
| 407498 | AM 8.8 M12x1000 | M12 | 1000 | | |
| 2008567 | AM 8.8 M12x3000 | M12 | 3000 | | |
| 58670 | AM10x1000 A4-70 | M10 | 1000 | Strength class A4-70 in accordance with DIN976-1, Stainless steel | |
| 58707 | AM10x3000 A4-70 | M10 | 3000 | | |
| 58671 | AM12x1000 A4-70 | M12 | 1000 | | |
| 58709 | AM12x3000 A4-70 | M12 | 3000 | | |

| | |
|---|---|
| Hilti cantilevers MT-BR-30, MT-BR-40 and MT-BR-40 D with load introduction component with and without additional suspension | **Annex B12** |
| Requirements for performance assessment | |

**Table B13:** Dimensions and materials of Hilti hexagonal nuts for use with Hilti cantilevers of MT System
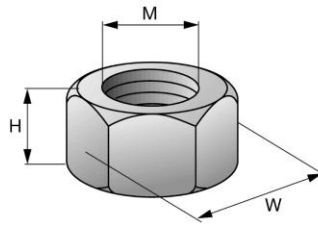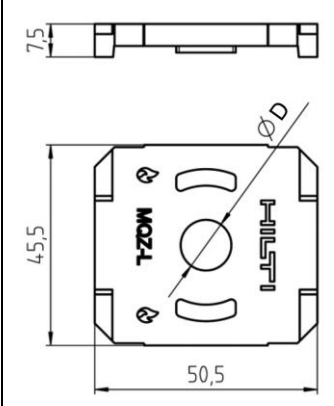
| Illustration | Item number | Designation | M thread | W [mm] | H [mm] | Material |
|---|---|---|---|---|---|---|
| | 216466 | M10 hexagonal nut | M10 | 17 | 8 | Strength class 8 in accordance with DIN 934, zinc coated |
| | 2184554 | M12 hexagonal nut | M12 | 19 | 10 | |
| | 2184474 | M10 hexagonal nut | M10 | 17 | 8 | Strength class 70 in accordance with DIN 934, stainless steel |
| | 2184475 | M12 hexagonal nut | M12 | 19 | 10 | |

**Table B3:** Geometry and dimensions of MQZ-L11 and MQZ-L13 drilled plates for use with Hilti cantilevers of MT System

| Item number | Designation | D [mm] | Materials | Illustration |
|---|---|---|---|---|
| 2199455 | MQZ-L11 | 11,5 | S235JR in accordance with DIN EN 10025-2 | |
| 2199456 | MQZ-L13 | 13,5 | | |

| Hilti cantilevers MT-BR-30, MT-BR-40 and MT-BR-40 D with load introduction component with and without additional suspension | |
|---|---|
| Requirements for performance assessment | **Annex B13** |

**Table C1:** **Characteristic resistance of the cantilevers MT-BR-30 300, MT-BR-30 300 OC, MT-BR-30 450 and MT-BR-30 450 OC acc. to the coordinate system in figure B1**

| +$F_{x,Rk}$ [kN] | -$F_{x,Rk}$ [kN] | +$F_{y,Rk}$ [kN] | -$F_{y,Rk}$ [kN] | +$F_{z,Rk}$ [kN] | -$F_{z,Rk}$ [kN] |
|---|---|---|---|---|---|
| NPA | NPA | NPA | NPA | 1,775 | 1,65 |
| +$M_{x,Rk}$ [kNm] | -$M_{x,Rk}$ [kNm] | +$M_{y,Rk}$ [kNm] | -$M_{y,Rk}$ [kNm] | +$M_{z,Rk}$ [kNm] | -$M_{z,Rk}$ [kNm] |
| NPA | NPA | 0,239 | 0,239 | NPA | NPA |

**Table C2:** **Characteristic resistance of the cantilevers MT-BR-40 300, MT-BR-40 300 OC, MT-BR-40 450, MT-BR-40 450 OC, MT-BR-40 600, MT-BR-40 600 OC, MT-BR-40 1000, MT-BR-40 1000 OC acc. to the coordinate system in figure B2 (including resistance of welded connection)**

| +$F_{x,Rk}$ [kN] | -$F_{x,Rk}$ [kN] | +$F_{y,Rk}$ [kN] | -$F_{y,Rk}$ [kN] | +$F_{z,Rk}$ [kN] | -$F_{z,Rk}$ [kN] |
|---|---|---|---|---|---|
| NPA | NPA | NPA | NPA | 9,48 | 10,66 |
| +$M_{x,Rk}$ [kNm] | -$M_{x,Rk}$ [kNm] | +$M_{y,Rk}$ [kNm] | -$M_{y,Rk}$ [kNm] | +$M_{z,Rk}$ [kNm] | -$M_{z,Rk}$ [kNm] |
| NPA | NPA | 1,006 | 1,006 | NPA | NPA |

**Table C3:** **Characteristic resistance of the cantilevers MT-BR-40D 600, MT-BR-40D 600 OC, MT-BR-40D 1000, MT-BR-40D 1000 OC acc. to the coordinate system in figure B2 (including resistance of welded connection)**

| +$F_{x,Rk}$ [kN] | -$F_{x,Rk}$ [kN] | +$F_{y,Rk}$ [kN] | -$F_{y,Rk}$ [kN] | +$F_{z,Rk}$ [kN] | -$F_{z,Rk}$ [kN] |
|---|---|---|---|---|---|
| NPA | NPA | NPA | NPA | 17,17 | 17,17 |
| +$M_{x,Rk}$ [kNm] | -$M_{x,Rk}$ [kNm] | +$M_{y,Rk}$ [kNm] | -$M_{y,Rk}$ [kNm] | +$M_{z,Rk}$ [kNm] | -$M_{z,Rk}$ [kNm] |
| NPA | NPA | 2,25 | 2,25 | NPA | NPA |

**Table C4:** **Characteristic resistance of the cantilevers MT-BR-40 O4 600 OC, MT-BR-40 O4 1000 OC, acc. to the coordinate system in figure B1,2 (including resistance of welded connection)**

| +$F_{x,Rk}$ [kN] | -$F_{x,Rk}$ [kN] | +$F_{y,Rk}$ [kN] | -$F_{y,Rk}$ [kN] | +$F_{z,Rk}$ [kN] | -$F_{z,Rk}$ [kN] |
|---|---|---|---|---|---|
| NPA | NPA | NPA | NPA | 9,91 | 9,97 |
| +$M_{x,Rk}$ [kNm] | -$M_{x,Rk}$ [kNm] | +$M_{y,Rk}$ [kNm] | -$M_{y,Rk}$ [kNm] | +$M_{z,Rk}$ [kNm] | -$M_{z,Rk}$ [kNm] |
| NPA | NPA | 0,489 | 0,489 | NPA | NPA |

**Table C5:** **Characteristic resistance of the cantilevers MT-BR-40D O4 600 OC, MT-BR-40D O4 1000 OC, MT-BR-40D O4 1500 OC according to the coordinate system in figure B2 (including resistance of welded connection)**

| +$F_{x,Rk}$ [kN] | -$F_{x,Rk}$ [kN] | +$F_{y,Rk}$ [kN] | -$F_{y,Rk}$ [kN] | +$F_{z,Rk}$ [kN] | -$F_{z,Rk}$ [kN] |
|---|---|---|---|---|---|
| NPA | NPA | NPA | NPA | 20,29 | 20,29 |
| +$M_{x,Rk}$ [kNm] | -$M_{x,Rk}$ [kNm] | +$M_{y,Rk}$ [kNm] | -$M_{y,Rk}$ [kNm] | +$M_{z,Rk}$ [kNm] | -$M_{z,Rk}$ [kNm] |
| NPA | NPA | 2,253 | 2,253 | NPA | NPA |

Characteristic resistances for ambient temperatures do not consider deflections.
Partial safety factor for design resistance is $\gamma_M = F_{Rk} / F_{Rd}$ or $\gamma_M = M_{Rk} / M_{Rd}$. Design resistances from the manufacturer's specifications and national regulations must be observed.

In case of more than one force acting simultaneous on the cantilever, the interaction formula given in appropriate Eurocode can be used for the design of the cantilevers.

| Hilti cantilevers MT-BR-30, MT-BR-40 and MT-BR-40 D with load introduction component with and without additional suspension | **Annex C1** |
|---|---|
| **Characteristic resistance of Hilti cantilevers at ambient temperature** | |

**Table C6:** **Resistance of MT-BR-40 weld in case of fire: Parameter of regression curve $\sigma_{Rk,t} = c_3\,(c_1 + c_2 / t)$ of Hilti MT-BR-40 cantilevers**

| Designation | $c_1$ | $c_2$ | $c_3$ | $t_{min}$ [min] | $t_{max}$ [min] |
|---|---|---|---|---|---|
| MT-BR-40 300<br>MT-BR-40 450<br>MT-BR-40 600<br>MT-BR-40 1000<br>MT-BR-40 300 OC<br>MT-BR-40 450 OC<br>MT-BR-40 600 OC<br>MT-BR-40 1000 OC<br>MT-BR-40 O4 600 OC<br>MT-BR-40 O4 1000 OC | 31,5988 | 1780,0922 | 0,718372 | 16 | 144 |

**Table C7:** **Resistance of MT-BR-40 weld in case of fire after t = 30, 60, 90 and 120 minutes**

| Designation | $\sigma_{Rk,30}$ [N/mm²] | $\sigma_{Rk,60}$ [N/mm²] | $\sigma_{Rk,90}$ [N/mm²] | $\sigma_{Rk,120}$ [N/mm²] |
|---|---|---|---|---|
| MT-BR-40 300<br>MT-BR-40 450<br>MT-BR-40 600<br>MT-BR-40 1000<br>MT-BR-40 300 OC<br>MT-BR-40 450 OC<br>MT-BR-40 600 OC<br>MT-BR-40 1000 OC<br>MT-BR-40 O4 600 OC<br>MT-BR-40 O4 1000 OC | 65,3 | 44,0 | 36,9 | 33,4 |

| Hilti cantilevers MT-BR-30, MT-BR-40 and MT-BR-40 D with load introduction component with and without additional suspension | **Annex C2** |
|---|---|
| **Resistance of Hilti MT-BR-40 to baseplate welding in case of fire** | |

**Table C8:** **Resistance of MT-BR-40D weld in case of fire: Parameter of regression curve**
$\sigma_{Rk,t} = c_3 (c_1 + c_2 / t)$ **of Hilti MT-BR-40D cantilevers**

| Designation | $c_1$ | $c_2$ | $c_3$ | $t_{min}$ [min] | $t_{max}$ [min] |
|---|---|---|---|---|---|
| MT-BR-40D 600<br>MT-BR-40D 1000<br>MT-BR-40D 600 OC<br>MT-BR-40D 1000 OC<br>MT-BR-40D O4 600 OC<br>MT-BR-40D O4 1000 OC<br>MT-BR-40D O4 1500 OC | 10,0446 | 1902,3367 | 0,854055 | 24 | 150 |

**Table C9:** **Resistance of MT-BR-40D weld in case of fire after t = 30, 60, 90 and 120 minutes**

| Designation | $\sigma_{Rk,30}$ [N/mm²] | $\sigma_{Rk,60}$ [N/mm²] | $\sigma_{Rk,90}$ [N/mm²] | $\sigma_{Rk,120}$ [N/mm²] |
|---|---|---|---|---|
| MT-BR-40D 600<br>MT-BR-40D 1000<br>MT-BR-40D 600 OC<br>MT-BR-40D 1000 OC<br>MT-BR-40D O4 600 OC<br>MT-BR-40D O4 1000 OC<br>MT-BR-40D O4 1500 OC | 62,7 | 35,7 | 26,6 | 22,1 |

| Hilti cantilevers MT-BR-30, MT-BR-40 and MT-BR-40 D with load introduction component with and without additional suspension | |
|---|---|
| Resistance of Hilti MT-BR-40D to baseplate welding in case of fire | **Annex C3** |

**Table C10:** **Resistance to combined bending and tension load in case of fire: Parameter of regression curve $F_{Rk,t} = c_3 (c_1 + c_2 / t)$ of Hilti threaded rods**

| Designation | $c_1$ | $c_2$ | $c_3$ | $t_{min}$ [min] | $t_{max}$ [min] |
|---|---|---|---|---|---|
| AM10 x L[1] 4.8 | 260,907 | 29615,482 | 0,927769 | 30 | 146 |
| AM12 x L[1] 4.8 | NPA[2] | NPA | NPA | NPA | NPA |
| AM 8.8 M10 x L[1] | 56,4981 | 62518,204 | 0,930393 | 45 | 130 |
| AM 8.8 M12 x L[1] | -315,1713 | 117316,0732 | 0,851412 | 42 | 130 |
| AM10 A4-70 x L[1] | -1321,3377 | 432114,1576 | 0,617514 | 43 | 120 |
| AM12 A4-70 x L[1] | -763,2431 | 538678,9931 | 0,887458 | 55 | 130 |

**Table C11:** **Resistance $F_{Rk,t}$ to combined bending and tension load in case of fire after t = 30, 60, 90 and 120 minutes of Hilti threaded rods**

| Designation | $F_{Rk,30}$ [N] | $F_{Rk,60}$ [N] | $F_{Rk,90}$ [N] | $F_{Rk,120}$ [N] |
|---|---|---|---|---|
| AM10 x L[1] 4.8 | 1158 | 700 | 547 | 471 |
| AM12 x L[1] 4.8 | NPA[2] | NPA | NPA | NPA |
| AM 8.8 M10 x L[1] | 1991,4 | 1022,0 | 698,9 | 537,3 |
| AM 8.8 M12 x L[1] | 3061,1 | 1396,4 | 841,5 | 564,0 |
| AM10 A4-70 x L[1] | 8078,6 | 3631,3 | 2148,9 | 1407,7 |
| AM12 A4-70 x L[1] | 7290,2 | 7290,2 | 4634,4 | 3306,4 |

[1] Cantilever arm length of threaded rod ≤ 150 mm
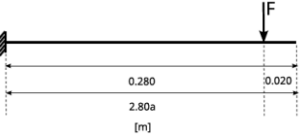
L        Length of threaded rod: 1000 mm, 2000 mm or 3000 mm
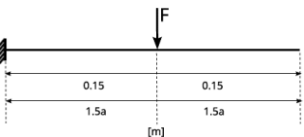
| Hilti threaded rods M10 and M12 for use with MT-BR-30, MT-BR-40 and MT-BR-40 D as load introduction component or suspension | |
|---|---|
| **Characteristic resistance of Hilti threaded rods in case of fire** | **Annex C4** |

**Table D18: Calculation-based deformation in case of fire for Hilti MT-BR-30 300 and MT-BR-30 300 OC cantilevers without suspension**

| System | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| | | MPa | - | N | mm | min | mm | mm | mm | mm |
| | | 5 | 0,50 | 15,91 | 48,09 | 120,00 | 9,75 | 26,30 | 31,98 | 48,09 |
| | | 10 | 0,50 | 34,07 | 95,46 | 120,00 | 18,84 | 44,31 | 63,05 | 95,46 |
| | | 15 | 0,50 | 52,22 | 145,11 | 120,00 | 28,47 | 63,82 | 98,14 | 145,11 |
| | | 20 | 0,50 | 70,38 | 181,56 | 120,00 | 39,57 | 86,80 | 131,95 | 181,56 |
| | | 25 | 0,50 | 88,53 | 205,38 | 120,00 | 52,78 | 112,23 | 160,50 | 205,38 |
| | | 30 | 0,50 | 106,69 | 221,36 | 120,00 | 68,25 | 136,37 | 182,31 | 221,36 |
| | | 5 | 0,50 | 15,91 | 49,56 | 120,00 | 9,85 | 26,67 | 32,81 | 49,56 |
| | | 10 | 0,50 | 34,07 | 110,50 | 120,00 | 19,34 | 46,01 | 68,53 | 110,50 |
| | | 15 | 0,50 | 52,22 | 185,73 | 120,00 | 29,71 | 68,87 | 116,11 | 185,73 |
| | | 20 | 0,50 | 70,38 | 236,59 | 120,00 | 42,46 | 100,96 | 170,41 | 236,59 |
| | | 25 | 0,50 | 88,53 | 274,95 | 120,00 | 58,77 | 140,79 | 213,45 | 274,95 |
| | | 30 | 0,50 | 106,69 | 295,73 | 120,00 | 81,37 | 179,31 | 248,71 | 295,73 |
| | | 5 | 0,25 | 29,71 | 41,96 | 120,00 | 8,09 | 22,99 | 27,16 | 41,96 |
| | | 10 | 0,25 | 63,60 | 81,50 | 120,00 | 15,48 | 37,69 | 52,64 | 81,50 |
| | | 15 | 0,25 | 97,49 | 129,18 | 120,00 | 23,26 | 53,71 | 83,13 | 129,18 |
| | | 20 | 0,25 | 131,37 | 168,86 | 120,00 | 32,17 | 73,14 | 116,16 | 168,86 |
| | | 25 | 0,25 | 165,26 | 196,44 | 120,00 | 42,97 | 96,45 | 146,75 | 196,44 |
| | | 30 | 0,25 | 199,15 | 215,33 | 120,00 | 55,72 | 120,64 | 171,43 | 215,33 |
| | | 5 | 0,25 | 29,71 | 43,62 | 120,00 | 8,25 | 23,49 | 28,17 | 43,62 |
| | | 10 | 0,25 | 63,60 | 98,10 | 120,00 | 16,03 | 39,53 | 58,49 | 98,10 |
| | | 15 | 0,25 | 97,49 | 192,77 | 120,00 | 24,53 | 58,85 | 103,54 | 192,77 |
| | | 20 | 0,25 | 131,37 | 282,32 | 120,00 | 35,05 | 87,86 | 181,76 | 282,32 |
| | | 25 | 0,25 | 165,26 | 316,77 | 120,00 | 48,96 | 130,96 | 260,06 | 316,77 |
| | | 30 | 0,25 | 199,15 | 335,93 | 120,00 | 68,54 | 207,15 | 294,13 | 335,93 |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load

**Symbols and designation**

| | |
|---|---|
| $\varepsilon_{B,\theta a}$ | Channel bending strain at elevated temperatures $\theta_a$ |
| $\sigma_B$ | Channel bending stress |
| V | Momentum degree of fullness |
| F | Load |
| $\delta_{tmax;B}$ | Deformation of the channel at the point in time of stability failure or of the plastic hinging |
| $t_{max,B}$ | Time in which loss of rigidity or plastic hinging of the channel occurs under bending stress |
| $\delta_{30}$ | Displacement after exposure time of 30 minutes to elevated temperatures |
| $\delta_{60}$ | Displacement after exposure time of 60 minutes to elevated temperatures |
| $\delta_{90}$ | Displacement after exposure time of 90 minutes to elevated temperatures |
| $\delta_{120}$ | Displacement after exposure time of 120 minutes to elevated temperatures |
| a | constant coefficient with 0,1 m |

Thermal analyses as well as calculations are referring to the boundary conditions of STTC.

| | |
|---|---|
| **Hilti cantilevers MT-BR-30, MT-BR-40 and MT-BR-40 D with load introduction component** | |
| **Bending characteristics of the cantilever in case of fire** | **Annex D1** |

**Table D19: Calculation-based deformation in case of fire for Hilti MT-BR-30 300 and MT-BR-30 300 OC cantilevers without suspension**

| System | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| | | MPa | - | N | mm | min | mm | mm | mm | mm |
| | | 5 | 0,33 | 8,25 | 45,60 | 120,00 | 9,07 | 24,94 | 30,00 | 45,60 |
| | | 10 | 0,33 | 17,67 | 87,12 | 120,00 | 17,18 | 40,99 | 57,48 | 87,12 |
| | | 15 | 0,33 | 27,08 | 130,98 | 120,00 | 25,72 | 58,29 | 88,44 | 130,98 |
| | | 20 | 0,33 | 36,49 | 164,31 | 120,00 | 35,45 | 78,38 | 118,66 | 164,31 |
| | | 25 | 0,33 | 45,91 | 187,53 | 120,00 | 47,00 | 100,77 | 144,55 | 187,53 |
| | | 30 | 0,33 | 55,32 | 204,08 | 120,00 | 60,26 | 122,26 | 165,08 | 204,08 |
| | | 5 | 0,33 | 8,25 | 46,91 | 120,00 | 9,13 | 25,23 | 30,72 | 46,91 |
| | | 10 | 0,33 | 17,67 | 103,16 | 120,00 | 17,66 | 42,71 | 63,20 | 103,16 |
| | | 15 | 0,33 | 27,08 | 178,77 | 120,00 | 26,96 | 63,42 | 107,81 | 178,77 |
| | | 20 | 0,33 | 36,49 | 249,60 | 120,00 | 38,36 | 92,90 | 162,20 | 249,60 |
| | | 25 | 0,33 | 45,91 | 286,34 | 120,00 | 53,05 | 131,65 | 226,82 | 286,34 |
| | | 30 | 0,33 | 55,32 | 308,71 | 120,00 | 73,15 | 170,75 | 261,48 | 308,71 |

[1] Momentum degree of fullness without contribution from channel dead weight

[2] Size of designated system's single load

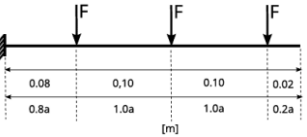Symbols and designation see Annex D1

| Hilti cantilevers MT-BR-30, MT-BR-40 and MT-BR-40 D with load introduction component | |
|---|---|
| Bending characteristics of the cantilever in case of fire | **Annex D2** |

**Table D20: Calculation-based deformation in case of fire for Hilti MT-BR-30 450 and MT-BR-30 450 OC cantilevers without additional suspension**

| System | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| | | MPa | - | N | mm | min | mm | mm | mm | mm |
| | | 5 | 0,50 | 8,54 | 77,26 | 120,00 | 17,81 | 42,37 | 55,18 | 77,26 |
| | | 10 | 0,50 | 20,36 | 159,10 | 120,00 | 34,77 | 75,62 | 111,03 | 159,10 |
| | | 15 | 0,50 | 32,18 | 235,09 | 120,00 | 52,57 | 110,50 | 169,23 | 235,09 |
| | | 20 | 0,50 | 44,00 | 287,42 | 120,00 | 72,69 | 149,06 | 220,50 | 287,42 |
| | | 25 | 0,50 | 55,83 | 321,67 | 120,00 | 96,18 | 188,77 | 261,29 | 321,67 |
| | | 30 | 0,50 | 67,65 | 344,67 | 120,00 | 122,59 | 224,78 | 292,17 | 344,67 |
| | | 5 | 0,50 | 8,54 | 78,94 | 120,00 | 17,79 | 42,58 | 55,95 | 78,94 |
| | | 10 | 0,50 | 20,36 | 179,86 | 120,00 | 35,33 | 77,83 | 118,70 | 179,86 |
| | | 15 | 0,50 | 32,18 | 284,42 | 120,00 | 54,22 | 117,69 | 193,26 | 284,42 |
| | | 20 | 0,50 | 44,00 | 349,76 | 120,00 | 76,82 | 168,89 | 267,07 | 349,76 |
| | | 25 | 0,50 | 55,83 | 386,92 | 120,00 | 104,91 | 225,66 | 322,91 | 386,92 |
| | | 30 | 0,50 | 67,65 | 408,49 | 120,00 | 141,51 | 277,04 | 359,80 | 408,49 |
| | | 5 | 0,25 | 16,32 | 66,41 | 120,00 | 14,76 | 36,34 | 46,51 | 66,41 |
| | | 10 | 0,25 | 38,91 | 137,26 | 120,00 | 28,23 | 63,11 | 92,76 | 137,26 |
| | | 15 | 0,25 | 61,51 | 215,45 | 120,00 | 42,49 | 92,29 | 146,39 | 215,45 |
| | | 20 | 0,25 | 84,10 | 274,85 | 120,00 | 58,86 | 126,95 | 199,99 | 274,85 |
| | | 25 | 0,25 | 106,69 | 314,23 | 120,00 | 78,43 | 166,41 | 246,38 | 314,23 |
| | | 30 | 0,25 | 129,28 | 340,66 | 120,00 | 101,46 | 204,90 | 282,30 | 340,66 |
| | | 5 | 0,25 | 16,32 | 68,70 | 120,00 | 14,94 | 36,93 | 47,82 | 68,70 |
| | | 10 | 0,25 | 38,91 | 160,56 | 120,00 | 28,98 | 65,64 | 101,05 | 160,56 |
| | | 15 | 0,25 | 61,51 | 280,28 | 120,00 | 44,34 | 99,80 | 174,08 | 280,28 |
| | | 20 | 0,25 | 84,10 | 375,38 | 120,00 | 63,21 | 148,52 | 261,07 | 375,38 |
| | | 25 | 0,25 | 106,69 | 423,66 | 120,00 | 87,47 | 211,50 | 340,36 | 423,66 |
| | | 30 | 0,25 | 129,28 | 450,66 | 120,00 | 121,31 | 273,53 | 393,74 | 450,66 |
| | | 5 | 0,33 | 3,28 | 76,03 | 120,00 | 17,37 | 41,47 | 54,02 | 76,03 |
| | | 10 | 0,33 | 7,82 | 147,03 | 120,00 | 32,38 | 70,84 | 103,20 | 147,03 |
| | | 15 | 0,33 | 12,36 | 209,97 | 120,00 | 48,21 | 101,67 | 153,03 | 209,97 |
| | | 20 | 0,33 | 16,89 | 254,58 | 120,00 | 66,05 | 135,07 | 196,19 | 254,58 |
| | | 25 | 0,33 | 21,43 | 286,26 | 120,00 | 86,55 | 168,86 | 231,21 | 286,26 |
| | | 30 | 0,33 | 25,97 | 309,40 | 120,00 | 109,41 | 199,16 | 258,88 | 309,40 |
| | | 5 | 0,33 | 3,28 | 76,76 | 120,00 | 17,02 | 41,06 | 53,94 | 76,76 |
| | | 10 | 0,33 | 7,82 | 169,88 | 120,00 | 32,69 | 72,73 | 111,13 | 169,88 |
| | | 15 | 0,33 | 12,36 | 266,18 | 120,00 | 49,72 | 109,26 | 180,19 | 266,18 |
| | | 20 | 0,33 | 16,89 | 329,69 | 120,00 | 70,26 | 156,77 | 249,15 | 329,69 |
| | | 25 | 0,33 | 21,43 | 379,47 | 120,00 | 95,78 | 209,87 | 302,68 | 379,47 |
| | | 30 | 0,33 | 25,97 | 410,75 | 120,00 | 129,38 | 258,03 | 343,21 | 410,75 |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load
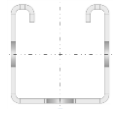
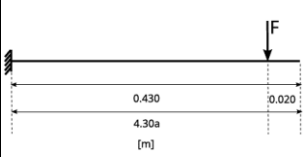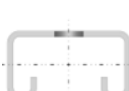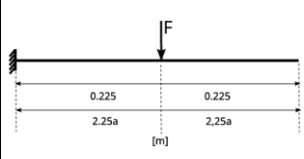Symbols and designation see Annex D1

| Hilti cantilevers MT-BR-30, MT-BR-40 and MT-BR-40 D with load introduction component | |
|---|---|
| **Bending characteristics of the cantilever in case of fire** | **Annex D3** |

**Table D21: Calculation-based deformation in case of fire for Hilti MT-BR-40 300 and MT-BR-40 300 OC cantilevers without additional suspension**

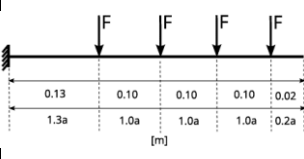| System | Load direction | $\sigma_B$ MPa | $V^{1)}$ - | $F^{2)}$ N | $\delta_{tmax;B}$ mm | $t_{max,B}$ min | $\delta_{30}$ mm | $\delta_{60}$ mm | $\delta_{90}$ mm | $\delta_{120}$ mm |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 5 | 0,50 | 45,07 | 34,01 | 120,00 | 6,20 | 22,10 | 29,76 | 34,01 |
| | | 10 | 0,50 | 92,80 | 51,14 | 120,00 | 11,85 | 30,81 | 43,77 | 51,14 |
| | | 15 | 0,50 | 140,53 | 72,49 | 120,00 | 17,69 | 40,57 | 59,87 | 72,49 |
| | | 20 | 0,50 | 188,25 | 98,04 | 120,00 | 23,98 | 50,82 | 76,83 | 98,04 |
| | | 25 | 0,50 | 235,98 | 127,63 | 120,00 | 31,21 | 63,08 | 98,46 | 127,63 |
| | | 30 | 0,50 | 283,71 | 163,81 | 120,00 | 39,29 | 77,59 | 123,79 | 163,81 |
| | | 5 | 0,50 | 45,07 | 34,12 | 120,00 | 6,25 | 22,17 | 29,84 | 34,12 |
| | | 10 | 0,50 | 92,80 | 51,10 | 120,00 | 11,96 | 30,92 | 43,81 | 51,10 |
| | | 15 | 0,50 | 140,53 | 71,56 | 120,00 | 17,81 | 40,61 | 59,48 | 71,56 |
| | | 20 | 0,50 | 188,25 | 95,05 | 120,00 | 24,09 | 50,65 | 75,60 | 95,05 |
| | | 25 | 0,50 | 235,98 | 120,70 | 120,00 | 31,20 | 62,32 | 94,98 | 120,70 |
| | | 30 | 0,50 | 283,71 | 152,64 | 120,00 | 39,01 | 75,67 | 117,44 | 152,64 |
| | | 5 | 0,25 | 84,13 | 33,37 | 120,00 | 5,76 | 21,60 | 29,17 | 33,37 |
| | | 10 | 0,25 | 173,22 | 48,19 | 120,00 | 10,85 | 29,29 | 41,17 | 48,19 |
| | | 15 | 0,25 | 262,31 | 65,76 | 120,00 | 16,10 | 37,71 | 54,62 | 65,76 |
| | | 20 | 0,25 | 351,41 | 86,54 | 120,00 | 21,63 | 46,47 | 68,77 | 86,54 |
| | | 25 | 0,25 | 440,50 | 111,25 | 120,00 | 27,69 | 56,34 | 85,76 | 111,25 |
| | | 30 | 0,25 | 529,59 | 150,02 | 120,00 | 34,30 | 67,76 | 107,40 | 150,02 |
| | | 5 | 0,25 | 84,13 | 33,43 | 120,00 | 5,80 | 21,65 | 29,23 | 33,43 |
| | | 10 | 0,25 | 173,22 | 47,90 | 120,00 | 10,90 | 29,30 | 41,02 | 47,90 |
| | | 15 | 0,25 | 262,31 | 64,30 | 120,00 | 16,11 | 37,54 | 53,86 | 64,30 |
| | | 20 | 0,25 | 351,41 | 82,38 | 120,00 | 21,53 | 45,95 | 66,91 | 82,38 |
| | | 25 | 0,25 | 440,50 | 101,58 | 120,00 | 27,35 | 55,07 | 81,20 | 101,58 |
| | | 30 | 0,25 | 529,59 | 124,87 | 120,00 | 33,58 | 65,13 | 97,74 | 124,87 |
| | | 5 | 0,33 | 23,37 | 33,80 | 120,00 | 6,01 | 21,90 | 29,55 | 33,80 |
| | | 10 | 0,33 | 48,12 | 49,34 | 120,00 | 11,34 | 29,98 | 42,19 | 49,34 |
| | | 15 | 0,33 | 72,86 | 67,97 | 120,00 | 16,88 | 38,88 | 56,51 | 67,97 |
| | | 20 | 0,33 | 97,61 | 89,75 | 120,00 | 22,70 | 48,19 | 71,55 | 89,75 |
| | | 25 | 0,33 | 122,36 | 113,77 | 120,00 | 29,14 | 58,78 | 89,34 | 113,77 |
| | | 30 | 0,33 | 147,11 | 143,70 | 120,00 | 36,20 | 70,89 | 110,28 | 143,70 |
| | | 5 | 0,33 | 23,37 | 33,80 | 120,00 | 6,02 | 21,91 | 29,55 | 33,80 |
| | | 10 | 0,33 | 48,12 | 49,02 | 120,00 | 11,37 | 29,97 | 42,01 | 49,02 |
| | | 15 | 0,33 | 72,86 | 66,59 | 120,00 | 16,90 | 38,72 | 55,79 | 66,59 |
| | | 20 | 0,33 | 97,61 | 86,08 | 120,00 | 22,63 | 47,72 | 69,84 | 86,08 |
| | | 25 | 0,33 | 122,36 | 106,20 | 120,00 | 28,87 | 57,59 | 85,32 | 106,20 |
| | | 30 | 0,33 | 147,11 | 129,09 | 120,00 | 35,58 | 68,51 | 102,73 | 129,09 |

System diagrams (top): dimensions 0.280 / 0.020, 2.80a [m], load F.

System (middle): 0.15 / 0.15, 1.5a / 1.5a [m], load F.

System (bottom): 0.08 / 0,10 / 0.10 / 0.02, 0.8a / 1.0a / 1.0a / 0.2a [m], loads F, F, F.

$^{1)}$ Momentum degree of fullness without contribution from channel dead weight
$^{2)}$ Size of designated system's single load

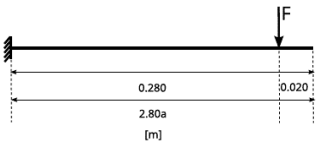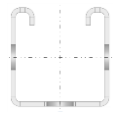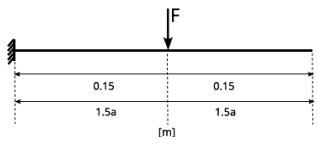Symbols and designation see Annex D1

| | |
|---|---|
| **Hilti cantilevers MT-BR-30, MT-BR-40 and MT-BR-40 D with load introduction component** | **Annex D4** |
| **Bending characteristics of the cantilever in case of fire** | |

**Table D22: Calculation-based deformation in case of fire for Hilti MT-BR-40 450 and MT-BR-40 450 OC cantilevers without additional suspension**

| System | Load direction | $\sigma_B$ MPa | $V^{1)}$ - | $F^{2)}$ N | $\delta_{tmax;B}$ mm | $t_{max,B}$ min | $\delta_{30}$ mm | $\delta_{60}$ mm | $\delta_{90}$ mm | $\delta_{120}$ mm |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 5 | 0,50 | 27,18 | 42,23 | 120,00 | 10,02 | 27,10 | 36,48 | 42,23 |
| | | 10 | 0,50 | 58,26 | 72,99 | 120,00 | 19,73 | 42,43 | 61,97 | 72,99 |
| | | 15 | 0,50 | 89,34 | 112,91 | 120,00 | 29,89 | 60,08 | 91,79 | 112,91 |
| | | 20 | 0,50 | 120,42 | 158,83 | 120,00 | 41,06 | 78,80 | 123,01 | 158,83 |
| | | 25 | 0,50 | 151,50 | 206,62 | 120,00 | 54,37 | 101,74 | 161,47 | 206,62 |
| | | 30 | 0,50 | 182,58 | 255,45 | 120,00 | 69,61 | 128,87 | 201,80 | 255,45 |
| | | 5 | 0,50 | 27,18 | 42,34 | 120,00 | 10,06 | 27,16 | 36,56 | 42,34 |
| | | 10 | 0,50 | 58,26 | 73,01 | 120,00 | 19,87 | 42,60 | 62,06 | 73,01 |
| | | 15 | 0,50 | 89,34 | 111,97 | 120,00 | 30,09 | 60,21 | 91,42 | 111,97 |
| | | 20 | 0,50 | 120,42 | 156,91 | 120,00 | 41,29 | 78,73 | 121,97 | 156,91 |
| | | 25 | 0,50 | 151,50 | 216,91 | 120,00 | 54,46 | 100,98 | 160,29 | 216,91 |
| | | 30 | 0,50 | 182,58 | 283,34 | 120,00 | 69,41 | 127,46 | 211,68 | 283,34 |
| | | 5 | 0,25 | 51,95 | 40,69 | 120,00 | 8,98 | 25,92 | 35,10 | 40,69 |
| | | 10 | 0,25 | 111,34 | 65,80 | 120,00 | 17,35 | 38,77 | 55,59 | 65,80 |
| | | 15 | 0,25 | 170,74 | 97,08 | 120,00 | 26,10 | 53,17 | 79,31 | 97,08 |
| | | 20 | 0,25 | 230,13 | 135,16 | 120,00 | 35,40 | 68,36 | 104,59 | 135,16 |
| | | 25 | 0,25 | 289,53 | 180,59 | 120,00 | 45,97 | 86,30 | 136,65 | 180,59 |
| | | 30 | 0,25 | 348,92 | 241,56 | 120,00 | 57,78 | 107,58 | 176,00 | 241,56 |
| | | 5 | 0,25 | 51,95 | 40,79 | 120,00 | 9,03 | 25,99 | 35,18 | 40,79 |
| | | 10 | 0,25 | 111,34 | 65,51 | 120,00 | 17,44 | 38,83 | 55,46 | 65,51 |
| | | 15 | 0,25 | 170,74 | 95,12 | 120,00 | 26,16 | 53,02 | 78,35 | 95,12 |
| | | 20 | 0,25 | 230,13 | 129,33 | 120,00 | 35,34 | 67,72 | 101,97 | 129,33 |
| | | 25 | 0,25 | 289,53 | 166,56 | 120,00 | 45,62 | 84,54 | 129,86 | 166,56 |
| | | 30 | 0,25 | 348,92 | 214,80 | 120,00 | 56,88 | 103,72 | 162,76 | 214,80 |
| | | 5 | 0,33 | 10,44 | 42,05 | 120,00 | 9,71 | 26,82 | 36,26 | 42,05 |
| | | 10 | 0,33 | 22,37 | 69,30 | 120,00 | 18,74 | 40,72 | 58,66 | 69,30 |
| | | 15 | 0,33 | 34,30 | 102,77 | 120,00 | 28,07 | 56,31 | 84,24 | 102,77 |
| | | 20 | 0,33 | 46,23 | 140,54 | 120,00 | 38,12 | 72,72 | 110,75 | 140,54 |
| | | 25 | 0,33 | 58,16 | 177,47 | 120,00 | 49,64 | 91,96 | 141,51 | 177,47 |
| | | 30 | 0,33 | 70,10 | 215,13 | 120,00 | 62,38 | 113,61 | 173,45 | 215,13 |
| | | 5 | 0,33 | 10,44 | 41,87 | 120,00 | 9,64 | 26,73 | 36,11 | 41,87 |
| | | 10 | 0,33 | 22,37 | 68,77 | 120,00 | 18,73 | 40,64 | 58,32 | 68,77 |
| | | 15 | 0,33 | 34,30 | 101,11 | 120,00 | 28,07 | 56,09 | 83,34 | 101,11 |
| | | 20 | 0,33 | 46,23 | 137,18 | 120,00 | 38,06 | 72,16 | 108,89 | 137,18 |
| | | 25 | 0,33 | 58,16 | 173,27 | 120,00 | 49,35 | 90,60 | 138,02 | 173,27 |
| | | 30 | 0,33 | 70,10 | 211,63 | 120,00 | 61,72 | 111,25 | 169,44 | 211,63 |

$^{1)}$ Momentum degree of fullness without contribution from channel dead weight
$^{2)}$ Size of designated system's single load
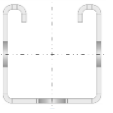
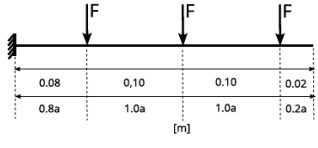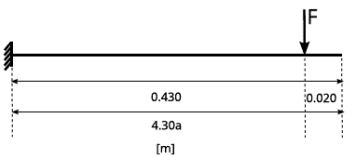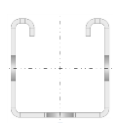Symbols and designation see Annex D1

| Hilti cantilevers MT-BR-30, MT-BR-40 and MT-BR-40 D with load introduction component | |
|---|---|
| **Bending characteristics of the cantilever in case of fire** | **Annex D5** |

**Table D23:** Calculation-based deformation in case of fire for Hilti MT-BR-40 600, MT-BR-40 600 OC and MT-BR-40 O4 600 OC cantilevers without additional suspension

| System | Load direction | $\sigma_B$ MPa | $V^{1)}$ - | $F^{2)}$ N | $\delta_{tmax;B}$ mm | $t_{max,B}$ min | $\delta_{30}$ mm | $\delta_{60}$ mm | $\delta_{90}$ mm | $\delta_{120}$ mm |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 5 | 0,50 | 17,90 | 52,03 | 120,00 | 14,85 | 33,25 | 44,60 | 52,03 |
| | | 10 | 0,50 | 40,94 | 99,56 | 120,00 | 29,24 | 56,52 | 84,28 | 99,56 |
| | | 15 | 0,50 | 63,99 | 161,80 | 120,00 | 44,66 | 84,00 | 130,98 | 161,80 |
| | | 20 | 0,50 | 87,03 | 229,42 | 120,00 | 61,84 | 113,13 | 178,52 | 229,42 |
| | | 25 | 0,50 | 110,07 | 291,46 | 120,00 | 82,79 | 148,79 | 233,17 | 291,46 |
| | | 30 | 0,50 | 133,11 | 349,99 | 120,00 | 106,79 | 189,54 | 286,48 | 349,99 |
| | | 5 | 0,50 | 17,90 | 52,09 | 120,00 | 14,87 | 33,28 | 44,64 | 52,09 |
| | | 10 | 0,50 | 40,94 | 99,67 | 120,00 | 29,41 | 56,74 | 84,45 | 99,67 |
| | | 15 | 0,50 | 63,99 | 162,12 | 120,00 | 44,96 | 84,28 | 131,02 | 162,12 |
| | | 20 | 0,50 | 87,03 | 246,53 | 120,00 | 62,26 | 113,54 | 181,42 | 246,53 |
| | | 25 | 0,50 | 110,07 | 345,39 | 120,00 | 83,19 | 149,38 | 263,57 | 345,39 |
| | | 30 | 0,50 | 133,11 | 393,00 | 120,00 | 107,20 | 197,98 | 339,58 | 393,00 |
| | | 5 | 0,25 | 34,61 | 49,17 | 120,00 | 12,88 | 31,04 | 42,03 | 49,17 |
| | | 10 | 0,25 | 79,16 | 87,05 | 120,00 | 25,17 | 50,12 | 73,19 | 87,05 |
| | | 15 | 0,25 | 123,71 | 135,51 | 120,00 | 37,90 | 71,81 | 109,54 | 135,51 |
| | | 20 | 0,25 | 168,25 | 193,75 | 120,00 | 51,75 | 94,83 | 148,42 | 193,75 |
| | | 25 | 0,25 | 212,80 | 260,98 | 120,00 | 67,89 | 122,78 | 198,15 | 260,98 |
| | | 30 | 0,25 | 257,35 | 338,15 | 120,00 | 86,06 | 155,94 | 254,57 | 338,15 |
| | | 5 | 0,25 | 34,61 | 49,29 | 120,00 | 12,94 | 31,12 | 42,12 | 49,29 |
| | | 10 | 0,25 | 79,16 | 86,82 | 120,00 | 25,30 | 50,25 | 73,13 | 86,82 |
| | | 15 | 0,25 | 123,71 | 133,31 | 120,00 | 38,04 | 71,73 | 108,52 | 133,31 |
| | | 20 | 0,25 | 168,25 | 187,56 | 120,00 | 51,79 | 94,20 | 145,46 | 187,56 |
| | | 25 | 0,25 | 212,80 | 249,63 | 120,00 | 67,61 | 120,85 | 191,02 | 249,63 |
| | | 30 | 0,25 | 257,35 | 336,17 | 120,00 | 85,14 | 151,64 | 244,82 | 336,17 |
| | | 5 | 0,33 | 5,24 | 52,07 | 120,00 | 14,31 | 32,86 | 44,49 | 52,07 |
| | | 10 | 0,33 | 11,99 | 92,63 | 120,00 | 27,50 | 53,44 | 78,12 | 92,63 |
| | | 15 | 0,33 | 18,74 | 141,68 | 120,00 | 41,16 | 76,60 | 116,02 | 141,68 |
| | | 20 | 0,33 | 25,49 | 192,42 | 120,00 | 55,99 | 100,90 | 153,69 | 192,42 |
| | | 25 | 0,33 | 32,24 | 237,52 | 120,00 | 72,95 | 128,46 | 193,63 | 237,52 |
| | | 30 | 0,33 | 38,99 | 279,40 | 120,00 | 91,62 | 157,92 | 231,94 | 279,40 |
| | | 5 | 0,33 | 5,24 | 51,47 | 120,00 | 14,07 | 32,53 | 43,98 | 51,47 |
| | | 10 | 0,33 | 11,99 | 92,04 | 120,00 | 27,43 | 53,30 | 77,75 | 92,04 |
| | | 15 | 0,33 | 18,74 | 141,22 | 120,00 | 41,21 | 76,53 | 115,68 | 141,22 |
| | | 20 | 0,33 | 25,49 | 193,47 | 120,00 | 56,13 | 100,80 | 153,72 | 193,47 |
| | | 25 | 0,33 | 32,24 | 242,70 | 120,00 | 73,20 | 128,70 | 195,56 | 242,70 |
| | | 30 | 0,33 | 38,99 | 290,35 | 120,00 | 92,01 | 158,98 | 237,18 | 290,35 |

First system dimensions: 0.580 / 0.020, 5.80a [m], load F at end.

Second system dimensions: 0.30 / 0.30, 3.0a / 3.0a [m], load F at centre.

Third system dimensions: 0.08 / 5 x 0.10 / 0.02, 0.2a / 5.0a / 0.2a [m], loads F at ends. Number of single forces = 6.

$^{1)}$ Momentum degree of fullness without contribution from channel dead weight
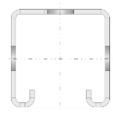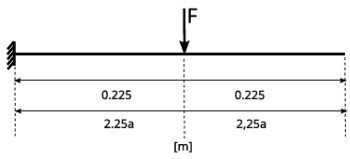$^{2)}$ Size of designated system's single load
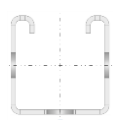
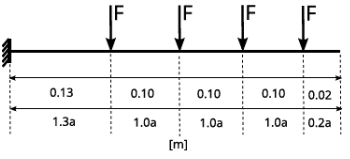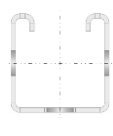Symbols and designation see Annex D1

| Hilti cantilevers MT-BR-30, MT-BR-40 and MT-BR-40 D with load introduction component | Annex D6 |
|---|---|
| Bending characteristics of the cantilever in case of fire | |

**Table D24: Calculation-based deformation in case of fire for Hilti MT-BR-40 1000, MT-BR-40 1000 OC and MT-BR-40 O4 1000 OC cantilevers without additional suspension**

| System | Load direction | $\sigma_B$ MPa | $V^{1)}$ - | $F^{2)}$ N | $\delta_{tmax;B}$ mm | $t_{max,B}$ min | $\delta_{30}$ mm | $\delta_{60}$ mm | $\delta_{90}$ mm | $\delta_{120}$ mm |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 5 | 0,50 | 5,19 | 85,70 | 120,00 | 31,49 | 54,34 | 72,81 | 85,70 |
| | | 10 | 0,50 | 18,83 | 193,25 | 120,00 | 62,71 | 106,52 | 163,64 | 193,25 |
| | | 15 | 0,50 | 32,46 | 325,16 | 120,00 | 96,58 | 168,27 | 265,89 | 325,16 |
| | | 20 | 0,50 | 46,10 | 446,36 | 120,00 | 135,04 | 232,34 | 359,40 | 446,36 |
| | | 25 | 0,50 | 59,74 | 538,79 | 120,00 | 182,42 | 305,90 | 450,49 | 538,79 |
| | | 30 | 0,50 | 73,37 | 615,84 | 120,00 | 234,48 | 380,13 | 530,52 | 615,84 |
| | | 5 | 0,50 | 5,19 | 85,18 | 120,00 | 31,23 | 54,02 | 72,31 | 85,18 |
| | | 10 | 0,50 | 18,83 | 194,47 | 120,00 | 62,87 | 106,81 | 164,51 | 194,47 |
| | | 15 | 0,50 | 32,46 | 365,29 | 120,00 | 97,25 | 169,92 | 277,68 | 365,29 |
| | | 20 | 0,50 | 46,10 | 554,78 | 120,00 | 137,09 | 243,52 | 445,34 | 554,78 |
| | | 25 | 0,50 | 59,74 | 645,64 | 120,00 | 188,39 | 383,20 | 563,17 | 645,64 |
| | | 30 | 0,50 | 73,37 | 707,26 | 120,00 | 268,67 | 495,64 | 636,89 | 707,26 |
| | | 5 | 0,25 | 10,17 | 80,67 | 120,00 | 28,42 | 50,79 | 68,31 | 80,67 |
| | | 10 | 0,25 | 36,90 | 165,14 | 120,00 | 53,16 | 91,59 | 138,64 | 165,14 |
| | | 15 | 0,25 | 63,63 | 273,76 | 120,00 | 79,71 | 138,88 | 219,41 | 273,76 |
| | | 20 | 0,25 | 90,36 | 392,43 | 120,00 | 109,42 | 189,73 | 303,58 | 392,43 |
| | | 25 | 0,25 | 117,08 | 505,61 | 120,00 | 145,51 | 252,01 | 401,12 | 505,61 |
| | | 30 | 0,25 | 143,81 | 610,66 | 120,00 | 186,65 | 323,68 | 495,89 | 610,66 |
| | | 5 | 0,25 | 10,17 | 80,82 | 120,00 | 28,45 | 50,86 | 68,40 | 80,82 |
| | | 10 | 0,25 | 36,90 | 166,18 | 120,00 | 53,51 | 92,19 | 139,58 | 166,18 |
| | | 15 | 0,25 | 63,63 | 279,12 | 120,00 | 80,36 | 139,84 | 221,31 | 279,12 |
| | | 20 | 0,25 | 90,36 | 437,60 | 120,00 | 110,58 | 191,95 | 314,90 | 437,60 |
| | | 25 | 0,25 | 117,08 | 619,38 | 120,00 | 146,76 | 256,03 | 461,38 | 619,38 |
| | | 30 | 0,25 | 143,81 | 710,49 | 120,00 | 188,90 | 346,01 | 605,23 | 710,49 |
| | | 5 | 0,33 | 0,96 | 95,32 | 120,00 | 34,47 | 58,97 | 80,99 | 95,32 |
| | | 10 | 0,33 | 3,48 | 184,24 | 120,00 | 61,50 | 104,22 | 155,94 | 184,24 |
| | | 15 | 0,33 | 6,00 | 272,91 | 120,00 | 90,14 | 152,53 | 228,29 | 272,91 |
| | | 20 | 0,33 | 8,52 | 347,16 | 120,00 | 121,30 | 199,99 | 289,85 | 347,16 |
| | | 25 | 0,33 | 11,05 | 405,76 | 120,00 | 156,34 | 248,30 | 345,10 | 405,76 |
| | | 30 | 0,33 | 13,57 | 453,98 | 120,00 | 192,03 | 293,56 | 393,19 | 453,98 |
| | | 5 | 0,33 | 0,96 | 89,59 | 120,00 | 32,35 | 55,94 | 76,01 | 89,59 |
| | | 10 | 0,33 | 3,48 | 178,89 | 120,00 | 59,59 | 100,95 | 151,29 | 178,89 |
| | | 15 | 0,33 | 6,00 | 274,59 | 120,00 | 88,45 | 150,30 | 227,96 | 274,59 |
| | | 20 | 0,33 | 8,52 | 359,44 | 120,00 | 120,04 | 199,83 | 296,10 | 359,44 |
| | | 25 | 0,33 | 11,05 | 427,42 | 120,00 | 156,09 | 252,34 | 359,47 | 427,42 |
| | | 30 | 0,33 | 13,57 | 484,26 | 120,00 | 193,85 | 303,59 | 415,84 | 484,26 |

System diagrams (left column): first system — cantilever with point load F at 0.980 / 0.020, 9.80a [m]; second system — cantilever with load F at 0.50 / 0.50, 5.0a / 5.0a [m]; third system — cantilever with multiple loads F, 0.08 / 9 x 0.10 / 0.02, 0.8a / 9.0a / 0.2a [m], Number of single forces = 10.

$^{1)}$ Momentum degree of fullness without contribution from channel dead weight
$^{2)}$ Size of designated system's single load

Symbols and designation see Annex D1
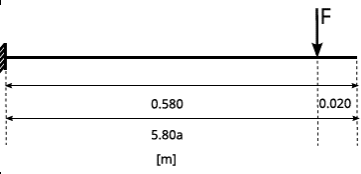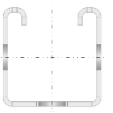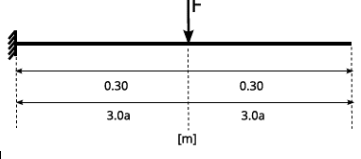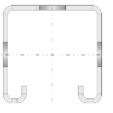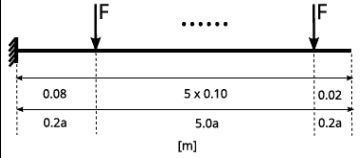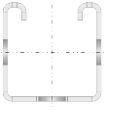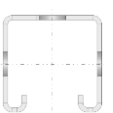
| Hilti cantilevers MT-BR-30, MT-BR-40 and MT-BR-40 D with load introduction component | Annex D7 |
|---|---|
| Bending characteristics of the cantilever in case of fire | |

**Table D25: Calculation-based deformation in case of fire for Hilti MT-BR-40D 600, MT-BR-40D 600 OC and MT-BR-40D O4 600 OC cantilevers without additional suspension**

| System | Load direction | $\sigma_B$ MPa | $V^{1)}$ - | $F^{2)}$ N | $\delta_{tmax;B}$ mm | $t_{max,B}$ min | $\delta_{30}$ mm | $\delta_{60}$ mm | $\delta_{90}$ mm | $\delta_{120}$ mm |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 5 | 0,50 | 50,82 | 24,32 | 120,00 | 9,90 | 13,72 | 19,38 | 24,32 |
| | | 10 | 0,50 | 111,93 | 57,62 | 120,00 | 20,72 | 30,37 | 46,28 | 57,62 |
| | | 15 | 0,50 | 173,05 | 100,90 | 120,00 | 32,25 | 49,84 | 78,75 | 100,90 |
| | | 20 | 0,50 | 234,16 | 155,35 | 120,00 | 44,87 | 70,94 | 114,82 | 155,35 |
| | | 25 | 0,50 | 295,28 | 242,85 | 120,00 | 59,37 | 95,90 | 164,22 | 242,85 |
| | | 30 | 0,50 | 356,39 | 421,79 | 120,00 | 75,95 | 126,61 | 263,38 | 421,79 |
| | | 5 | 0,50 | 50,82 | 24,45 | 120,00 | 9,99 | 13,82 | 19,50 | 24,45 |
| | | 10 | 0,50 | 111,93 | 57,60 | 120,00 | 20,94 | 30,61 | 46,38 | 57,60 |
| | | 15 | 0,50 | 173,05 | 99,63 | 120,00 | 32,55 | 50,00 | 78,26 | 99,63 |
| | | 20 | 0,50 | 234,16 | 150,86 | 120,00 | 45,13 | 70,75 | 112,99 | 150,86 |
| | | 25 | 0,50 | 295,28 | 223,55 | 120,00 | 59,63 | 95,29 | 157,94 | 223,55 |
| | | 30 | 0,50 | 356,39 | 415,99 | 120,00 | 76,02 | 124,29 | 320,29 | 415,99 |
| | | 5 | 0,25 | 98,24 | 23,14 | 120,00 | 9,08 | 12,79 | 18,31 | 23,14 |
| | | 10 | 0,25 | 216,40 | 52,15 | 120,00 | 18,73 | 27,44 | 41,31 | 52,15 |
| | | 15 | 0,25 | 334,56 | 88,48 | 120,00 | 29,05 | 44,17 | 68,60 | 88,48 |
| | | 20 | 0,25 | 452,73 | 135,24 | 120,00 | 40,21 | 62,45 | 99,75 | 135,24 |
| | | 25 | 0,25 | 570,87 | 205,25 | 120,00 | 52,61 | 83,56 | 138,49 | 205,25 |
| | | 30 | 0,25 | 689,03 | 261,73 | 113,33 | 66,53 | 108,69 | 188,60 | 0,00 |
| | | 5 | 0,25 | 98,24 | 23,16 | 120,00 | 9,14 | 12,85 | 18,36 | 23,16 |
| | | 10 | 0,25 | 216,40 | 51,45 | 120,00 | 18,79 | 27,42 | 40,96 | 51,45 |
| | | 15 | 0,25 | 334,56 | 85,16 | 120,00 | 29,01 | 43,73 | 66,87 | 85,16 |
| | | 20 | 0,25 | 452,73 | 124,97 | 120,00 | 39,90 | 61,13 | 95,03 | 124,97 |
| | | 25 | 0,25 | 570,87 | 175,73 | 120,00 | 51,80 | 80,51 | 128,00 | 175,73 |
| | | 30 | 0,25 | 689,03 | 274,99 | 120,00 | 64,88 | 102,48 | 169,14 | 274,99 |
| | | 5 | 0,33 | 14,89 | 24,18 | 120,00 | 9,60 | 13,45 | 19,18 | 24,18 |
| | | 10 | 0,33 | 32,79 | 54,40 | 120,00 | 19,68 | 28,74 | 43,26 | 54,40 |
| | | 15 | 0,33 | 50,69 | 92,67 | 120,00 | 30,56 | 46,43 | 72,21 | 92,67 |
| | | 20 | 0,33 | 68,59 | 141,06 | 120,00 | 42,22 | 65,68 | 104,87 | 141,06 |
| | | 25 | 0,33 | 86,50 | 224,88 | 120,00 | 55,30 | 87,99 | 147,13 | 224,88 |
| | | 30 | 0,33 | 104,40 | 366,08 | 120,00 | 70,00 | 114,43 | 207,30 | 366,08 |
| | | 5 | 0,33 | 14,89 | 23,94 | 120,00 | 9,55 | 13,37 | 19,02 | 23,94 |
| | | 10 | 0,33 | 32,79 | 53,35 | 120,00 | 19,64 | 28,55 | 42,64 | 53,35 |
| | | 15 | 0,33 | 50,69 | 88,93 | 120,00 | 30,41 | 45,80 | 70,14 | 88,93 |
| | | 20 | 0,33 | 68,59 | 130,01 | 120,00 | 41,78 | 64,11 | 99,68 | 130,01 |
| | | 25 | 0,33 | 86,50 | 176,93 | 120,00 | 54,29 | 84,43 | 133,02 | 176,93 |
| | | 30 | 0,33 | 104,40 | 233,27 | 120,00 | 68,05 | 107,18 | 170,59 | 233,27 |

System 1 dimensions: 0.580 / 0.020; 5.80a [m]

System 2 dimensions: 0.30 / 0.30; 3.0a / 3.0a [m]

System 3 dimensions: 0.08 / 5 x 0.10 / 0.02; 0.2a / 5.0a / 0.2a [m]; Number of single forces = 6

1) Momentum degree of fullness without contribution from channel dead weight
2) Size of designated system's single load

Symbols and designation see Annex D1
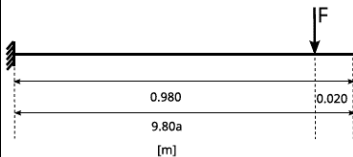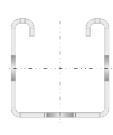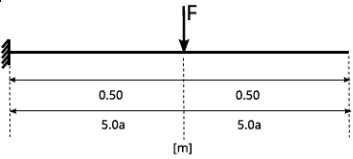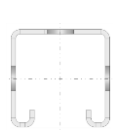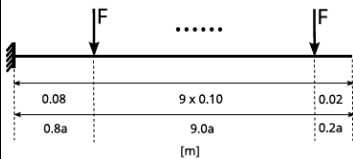
| Hilti cantilevers MT-BR-30, MT-BR-40 and MT-BR-40 D with load introduction component | **Annex D8** |
|---|---|
| Bending characteristics of the cantilever in case of fire | |

**Table D26: Calculation-based deformation in case of fire for Hilti MT-BR-40D 1000, MT-BR-40D 1000 OC and MT-BR-40D O4 1000 OC cantilevers without additional suspension**

| System | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| | | MPa | - | N | mm | min | mm | mm | mm | mm |
| | | 5 | 0,50 | 19,24 | 47,03 | 120,00 | 20,03 | 27,17 | 37,81 | 47,03 |
| | | 10 | 0,50 | 55,41 | 115,92 | 120,00 | 41,76 | 61,20 | 94,42 | 115,92 |
| | | 15 | 0,50 | 91,58 | 210,17 | 120,00 | 64,86 | 101,94 | 164,58 | 210,17 |
| | | 20 | 0,50 | 127,75 | 328,23 | 120,00 | 90,61 | 146,38 | 242,61 | 328,23 |
| | | 25 | 0,50 | 163,92 | 582,28 | 120,00 | 121,91 | 202,23 | 342,12 | 582,28 |
| | | 30 | 0,50 | 200,09 | 720,66 | 120,00 | 158,33 | 270,42 | 564,74 | 720,66 |
| | | 5 | 0,50 | 19,24 | 46,95 | 120,00 | 20,02 | 27,15 | 37,76 | 46,95 |
| | | 10 | 0,50 | 55,41 | 115,94 | 120,00 | 41,90 | 61,42 | 94,55 | 115,94 |
| | | 15 | 0,50 | 91,58 | 208,24 | 120,00 | 65,29 | 102,38 | 164,10 | 208,24 |
| | | 20 | 0,50 | 127,75 | 321,36 | 120,00 | 91,22 | 146,58 | 239,67 | 321,36 |
| | | 25 | 0,50 | 163,92 | 703,75 | 120,00 | 122,56 | 201,16 | 368,58 | 703,75 |
| | | 30 | 0,50 | 200,09 | 765,24 | 120,00 | 158,54 | 266,72 | 659,54 | 765,24 |
| | | 5 | 0,25 | 37,70 | 44,48 | 120,00 | 18,35 | 25,26 | 35,54 | 44,48 |
| | | 10 | 0,25 | 108,00 | 101,54 | 120,00 | 36,68 | 53,61 | 81,62 | 101,54 |
| | | 15 | 0,25 | 179,49 | 177,00 | 120,00 | 56,52 | 87,17 | 137,99 | 177,00 |
| | | 20 | 0,25 | 250,39 | 271,86 | 120,00 | 78,14 | 123,60 | 200,45 | 271,86 |
| | | 25 | 0,25 | 321,28 | 372,33 | 113,33 | 103,01 | 166,40 | 285,49 | 0,00 |
| | | 30 | 0,25 | 392,17 | 376,23 | 86,67 | 131,20 | 218,12 | 0,00 | 0,00 |
| | | 5 | 0,25 | 37,70 | 44,46 | 120,00 | 18,38 | 25,29 | 35,55 | 44,46 |
| | | 10 | 0,25 | 108,00 | 100,88 | 120,00 | 36,80 | 53,68 | 81,30 | 100,88 |
| | | 15 | 0,25 | 179,49 | 173,24 | 120,00 | 56,59 | 86,78 | 136,01 | 173,24 |
| | | 20 | 0,25 | 250,39 | 262,41 | 120,00 | 77,87 | 122,10 | 195,80 | 262,41 |
| | | 25 | 0,25 | 321,28 | 626,33 | 120,00 | 102,32 | 163,80 | 276,46 | 626,33 |
| | | 30 | 0,25 | 392,17 | 745,27 | 120,00 | 129,84 | 213,42 | 516,76 | 745,27 |
| | | 5 | 0,33 | 3,56 | 48,89 | 120,00 | 20,31 | 27,85 | 39,19 | 48,89 |
| | | 10 | 0,33 | 10,25 | 110,67 | 120,00 | 40,09 | 58,59 | 89,30 | 110,67 |
| | | 15 | 0,33 | 16,93 | 190,79 | 120,00 | 61,13 | 94,25 | 149,23 | 190,79 |
| | | 20 | 0,33 | 23,62 | 296,33 | 120,00 | 84,31 | 133,55 | 218,12 | 296,33 |
| | | 25 | 0,33 | 30,31 | 436,45 | 120,00 | 111,20 | 180,89 | 310,71 | 436,45 |
| | | 30 | 0,33 | 37,00 | 539,22 | 120,00 | 141,75 | 238,20 | 416,59 | 539,22 |
| | | 5 | 0,33 | 3,56 | 47,35 | 120,00 | 19,75 | 27,06 | 37,96 | 47,35 |
| | | 10 | 0,33 | 10,25 | 107,60 | 120,00 | 39,53 | 57,52 | 87,10 | 107,60 |
| | | 15 | 0,33 | 16,93 | 182,64 | 120,00 | 60,37 | 92,47 | 144,60 | 182,64 |
| | | 20 | 0,33 | 23,62 | 268,86 | 120,00 | 83,00 | 129,97 | 206,09 | 268,86 |
| | | 25 | 0,33 | 30,31 | 360,91 | 120,00 | 108,88 | 173,19 | 276,24 | 360,91 |
| | | 30 | 0,33 | 37,00 | 463,71 | 120,00 | 137,76 | 221,71 | 351,04 | 463,71 |

System 1: 0.980 / 0.020 ; 9.80a ; [m]

System 2: 0.50 / 0.50 ; 5.0a / 5.0a ; [m]

System 3: 0.08 / 9 x 0.10 / 0.02 ; 0.8a / 9.0a / 0.2a ; [m] ; Number of single forces = 10

$^{1)}$ Momentum degree of fullness without contribution from channel dead weight
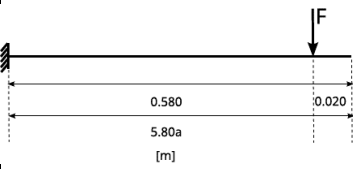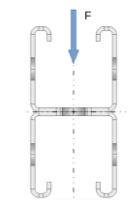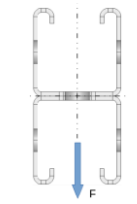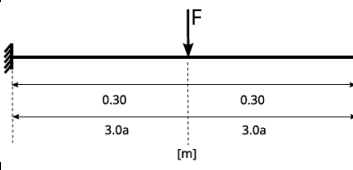$^{2)}$ Size of designated system's single load

Symbols and designation see Annex D1
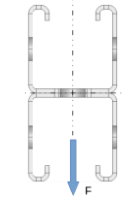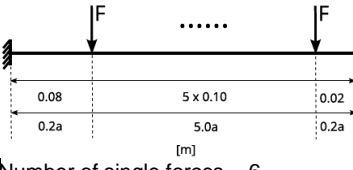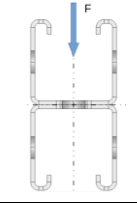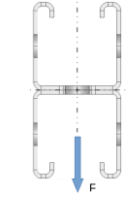
| Hilti cantilevers MT-BR-30, MT-BR-40 and MT-BR-40 D with load introduction component | |
|---|---|
| **Bending characteristics of the cantilever in case of fire** | **Annex D9** |

**Table D27: Calculation-based deformation in case of fire for Hilti MT-BR-30 300 and MT-BR-30 300 OC cantilevers with suspension**

| System | Load direction | $\sigma_B$ MPa | $V^{1)}$ - | $F^{2)}$ N | $\delta_{tmax;B}$ mm | $t_{max,B}$ min | $\delta_{30}$ mm | $\delta_{60}$ mm | $\delta_{90}$ mm | $\delta_{120}$ mm |
|---|---|---|---|---|---|---|---|---|---|---|
|  |  | 5 | 0,50 | 104,28 | 3,90 | 120,00 | 2,22 | 3,90 | 3,90 | 3,90 |
| | | 10 | 0,50 | 210,79 | 5,93 | 120,00 | 2,85 | 5,15 | 5,19 | 5,93 |
| | | 15 | 0,50 | 317,30 | 10,53 | 120,00 | 3,47 | 6,42 | 7,68 | 10,53 |
| | | 20 | 0,50 | 423,80 | 19,59 | 120,00 | 4,12 | 7,81 | 10,88 | 19,59 |
| | | 25 | 0,50 | 530,31 | 46,02 | 120,00 | 4,87 | 9,62 | 16,05 | 46,02 |
| | | 30 | 0,50 | 636,82 | 56,79 | 120,00 | 5,73 | 12,10 | 39,24 | 56,79 |
| |  | 5 | 0,50 | 104,28 | 4,10 | 120,00 | 2,33 | 4,10 | 4,10 | 4,10 |
| | | 10 | 0,50 | 210,79 | 7,18 | 120,00 | 3,07 | 5,58 | 5,98 | 7,18 |
| | | 15 | 0,50 | 317,30 | 13,73 | 120,00 | 3,84 | 7,18 | 9,17 | 13,73 |
| | | 20 | 0,50 | 423,80 | 33,42 | 120,00 | 4,68 | 9,06 | 13,75 | 33,42 |
| | | 25 | 0,50 | 530,31 | 25,95 | 93,33 | 5,65 | 11,56 | 23,36 | - |
| | | 30 | 0,50 | 636,82 | 30,66 | 80,00 | 6,79 | 15,08 | - | - |
|  |  | 5 | 0,55 | 66,92 | 3,88 | 120,00 | 2,21 | 3,88 | 3,88 | 3,88 |
| | | 10 | 0,55 | 135,28 | 5,51 | 120,00 | 2,82 | 5,10 | 5,10 | 5,51 |
| | | 15 | 0,55 | 203,63 | 9,94 | 120,00 | 3,43 | 6,32 | 7,39 | 9,94 |
| | | 20 | 0,55 | 271,98 | 16,16 | 120,00 | 4,04 | 7,60 | 10,28 | 16,16 |
| | | 25 | 0,55 | 340,33 | 29,65 | 120,00 | 4,69 | 9,07 | 14,00 | 29,65 |
| | | 30 | 0,55 | 408,68 | 28,03 | 100,00 | 5,46 | 11,03 | 20,40 | - |
| |  | 5 | 0,55 | 66,92 | 4,34 | 120,00 | 2,44 | 4,34 | 4,34 | 4,34 |
| | | 10 | 0,55 | 135,28 | 9,17 | 120,00 | 3,30 | 6,12 | 7,01 | 9,17 |
| | | 15 | 0,55 | 203,63 | 20,60 | 120,00 | 4,23 | 8,11 | 11,69 | 20,60 |
| | | 20 | 0,55 | 271,98 | 21,44 | 93,33 | 5,29 | 10,69 | 19,95 | - |
| | | 25 | 0,55 | 340,33 | 21,49 | 73,33 | 6,67 | 14,84 | - | - |
| | | 30 | 0,55 | 408,68 | 22,81 | 60,00 | 8,55 | 22,81 | - | - |
|  |  | 5 | 0,61 | 63,91 | 3,90 | 120,00 | 2,22 | 3,90 | 3,90 | 3,90 |
| | | 10 | 0,61 | 129,18 | 5,68 | 120,00 | 2,85 | 5,15 | 5,15 | 5,68 |
| | | 15 | 0,61 | 194,45 | 10,27 | 120,00 | 3,47 | 6,40 | 7,56 | 10,27 |
| | | 20 | 0,61 | 259,72 | 16,87 | 120,00 | 4,10 | 7,72 | 10,58 | 16,87 |
| | | 25 | 0,61 | 324,99 | 32,12 | 120,00 | 4,77 | 9,25 | 14,47 | 32,12 |
| | | 30 | 0,61 | 390,27 | 30,70 | 100,00 | 5,59 | 11,38 | 21,56 | - |
| |  | 5 | 0,61 | 63,91 | 4,04 | 120,00 | 2,29 | 4,04 | 4,04 | 4,04 |
| | | 10 | 0,61 | 129,18 | 6,58 | 120,00 | 2,99 | 5,45 | 5,67 | 6,58 |
| | | 15 | 0,61 | 194,45 | 12,53 | 120,00 | 3,70 | 6,90 | 8,64 | 12,53 |
| | | 20 | 0,61 | 259,72 | 24,33 | 120,00 | 4,44 | 8,52 | 12,58 | 24,33 |
| | | 25 | 0,61 | 324,99 | 70,91 | 113,33 | 5,27 | 10,52 | 18,52 | - |
| | | 30 | 0,61 | 390,27 | 73,64 | 93,33 | 6,29 | 13,51 | 52,11 | - |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load

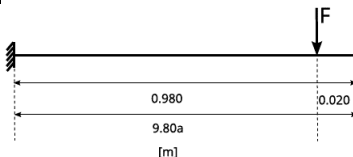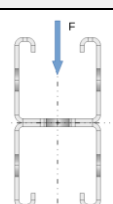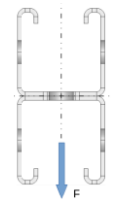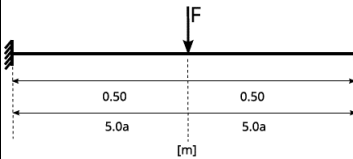Symbols and designation see Annex D1

| Suspended Hilti cantilevers MT-BR-30, MT-BR-40 and MT-BR-40 D with load introduction component | |
|---|---|
| **Bending characteristics of the suspended cantilver in case of fire** | **Annex D10** |

**Table D28: Calculation-based deformation in case of fire for Hilti MT-BR-30 450 and MT-BR-30 450 OC cantilevers with suspension**

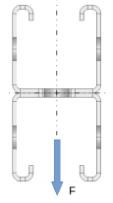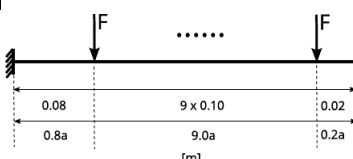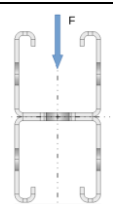| System | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| | | MPa | - | N | mm | min | mm | mm | mm | mm |
| | | 5 | 0,50 | 58,69 | 6,90 | 120,00 | 3,28 | 6,02 | 6,26 | 6,90 |
| | | 10 | 0,50 | 121,17 | 14,47 | 120,00 | 4,94 | 9,35 | 11,52 | 14,47 |
| | | 15 | 0,50 | 183,65 | 27,56 | 120,00 | 6,60 | 12,71 | 18,19 | 27,56 |
| | | 20 | 0,50 | 246,13 | 67,36 | 120,00 | 8,31 | 16,39 | 27,16 | 67,36 |
| | | 25 | 0,50 | 308,61 | 103,74 | 120,00 | 10,31 | 21,33 | 50,26 | 103,74 |
| | | 30 | 0,50 | 371,09 | 119,31 | 120,00 | 12,63 | 28,86 | 91,24 | 119,31 |
| | | 5 | 0,50 | 58,69 | 7,22 | 120,00 | 3,35 | 6,17 | 6,50 | 7,22 |
| | | 10 | 0,50 | 121,17 | 15,79 | 120,00 | 5,11 | 9,72 | 12,26 | 15,79 |
| | | 15 | 0,50 | 183,65 | 31,23 | 120,00 | 6,89 | 13,41 | 19,89 | 31,23 |
| | | 20 | 0,50 | 246,13 | 68,61 | 120,00 | 8,78 | 17,65 | 30,34 | 68,61 |
| | | 25 | 0,50 | 308,61 | 151,33 | 120,00 | 11,01 | 23,45 | 51,29 | 151,33 |
| | | 30 | 0,50 | 371,09 | 194,28 | 120,00 | 13,64 | 31,91 | 123,95 | 194,28 |
| | | 5 | 0,48 | 55,45 | 6,10 | 120,00 | 3,05 | 5,57 | 5,61 | 6,10 |
| | | 10 | 0,48 | 114,50 | 11,54 | 120,00 | 4,47 | 8,43 | 9,82 | 11,54 |
| | | 15 | 0,48 | 173,54 | 20,82 | 120,00 | 5,90 | 11,28 | 15,08 | 20,82 |
| | | 20 | 0,48 | 232,58 | 33,41 | 120,00 | 7,33 | 14,20 | 21,40 | 33,41 |
| | | 25 | 0,48 | 291,62 | 53,63 | 120,00 | 8,79 | 17,42 | 28,99 | 53,63 |
| | | 30 | 0,48 | 350,66 | 83,62 | 120,00 | 10,43 | 21,34 | 39,48 | 83,62 |
| | | 5 | 0,48 | 55,45 | 7,65 | 120,00 | 3,39 | 6,28 | 6,73 | 7,65 |
| | | 10 | 0,48 | 114,50 | 16,78 | 120,00 | 5,22 | 10,12 | 12,95 | 16,78 |
| | | 15 | 0,48 | 173,54 | 37,51 | 120,00 | 7,18 | 14,34 | 22,42 | 37,51 |
| | | 20 | 0,48 | 232,58 | 51,87 | 106,67 | 9,32 | 19,33 | 36,19 | - |
| | | 25 | 0,48 | 291,62 | 44,03 | 80,00 | 11,78 | 25,78 | - | - |
| | | 30 | 0,48 | 350,66 | 44,70 | 66,67 | 15,08 | 36,15 | - | - |
| | | 5 | 0,61 | 20,90 | 4,94 | 120,00 | 2,73 | 4,92 | 4,92 | 4,94 |
| | | 10 | 0,61 | 43,16 | 8,80 | 120,00 | 3,80 | 7,08 | 7,78 | 8,80 |
| | | 15 | 0,61 | 65,42 | 13,56 | 120,00 | 4,87 | 9,22 | 11,16 | 13,56 |
| | | 20 | 0,61 | 87,67 | 20,97 | 120,00 | 5,94 | 11,37 | 15,23 | 20,97 |
| | | 25 | 0,61 | 109,93 | 29,82 | 120,00 | 7,02 | 13,53 | 19,75 | 29,82 |
| | | 30 | 0,61 | 132,19 | 41,65 | 120,00 | 8,10 | 15,86 | 25,09 | 41,65 |
| | | 5 | 0,61 | 20,90 | 7,09 | 120,00 | 3,31 | 6,10 | 6,39 | 7,09 |
| | | 10 | 0,61 | 43,16 | 14,68 | 120,00 | 5,01 | 9,55 | 11,80 | 14,68 |
| | | 15 | 0,61 | 65,42 | 28,88 | 120,00 | 6,73 | 13,05 | 18,95 | 28,88 |
| | | 20 | 0,61 | 87,67 | 51,96 | 120,00 | 8,48 | 16,90 | 28,25 | 51,96 |
| | | 25 | 0,61 | 109,93 | 105,54 | 120,00 | 10,40 | 21,51 | 40,92 | 105,54 |
| | | 30 | 0,61 | 132,19 | 127,17 | 106,67 | 12,84 | 28,41 | 67,87 | - |

$^{1)}$ Momentum degree of fullness without contribution from channel dead weight
$^{2)}$ Size of designated system's single load
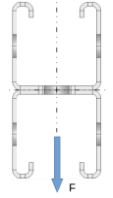
Symbols and designation see Annex D1

| Suspended Hilti cantilevers MT-BR-30, MT-BR-40 and MT-BR-40 D with load introduction component | **Annex D11** |
|---|---|
| **Bending characteristics of the suspended cantilver in case of fire** | |

**Table D29: Calculation-based deformation in case of fire for Hilti MT-BR-40 300 and MT-BR-40 300 OC cantilevers with suspension**

| System | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| | | MPa | - | N | mm | min | mm | mm | mm | mm |
| | | 5 | 0,50 | 249,79 | 5,74 | 120,00 | 2,54 | 4,19 | 4,65 | 5,74 |
| | | 10 | 0,50 | 502,53 | 7,59 | 120,00 | 2,98 | 5,01 | 6,19 | 7,59 |
| | | 15 | 0,50 | 755,28 | 10,48 | 120,00 | 3,48 | 6,06 | 8,22 | 10,48 |
| | | 20 | 0,50 | 1008,02 | 14,66 | 120,00 | 4,10 | 7,25 | 10,60 | 14,66 |
| | | 25 | 0,50 | 1260,77 | 24,09 | 120,00 | 4,96 | 8,93 | 14,21 | 24,09 |
| | | 30 | 0,50 | 1513,51 | 23,78 | 93,33 | 6,00 | 11,12 | 21,52 | - |
| | | 5 | 0,50 | 249,79 | 6,00 | 120,00 | 2,63 | 4,33 | 4,87 | 6,00 |
| | | 10 | 0,50 | 502,53 | 8,37 | 120,00 | 3,19 | 5,37 | 6,79 | 8,37 |
| | | 15 | 0,50 | 755,28 | 11,94 | 120,00 | 3,85 | 6,66 | 9,20 | 11,94 |
| | | 20 | 0,50 | 1008,02 | 16,95 | 120,00 | 4,69 | 8,24 | 12,25 | 16,95 |
| | | 25 | 0,50 | 1260,77 | 24,68 | 120,00 | 5,78 | 10,38 | 16,66 | 24,68 |
| | | 30 | 0,50 | 1513,51 | 37,82 | 120,00 | 7,08 | 13,13 | 22,46 | 37,82 |
| | | 5 | 0,50 | 215,29 | 5,70 | 120,00 | 2,52 | 4,17 | 4,60 | 5,70 |
| | | 10 | 0,50 | 433,12 | 7,16 | 120,00 | 2,93 | 4,85 | 5,92 | 7,16 |
| | | 15 | 0,50 | 650,95 | 9,83 | 120,00 | 3,38 | 5,88 | 7,87 | 9,83 |
| | | 20 | 0,50 | 868,79 | 13,30 | 120,00 | 3,91 | 6,95 | 9,97 | 13,30 |
| | | 25 | 0,50 | 1086,62 | 18,27 | 120,00 | 4,53 | 8,12 | 12,46 | 18,27 |
| | | 30 | 0,50 | 1304,45 | 30,35 | 120,00 | 5,42 | 9,86 | 16,62 | 30,35 |
| | | 5 | 0,50 | 215,29 | 5,76 | 120,00 | 2,55 | 4,21 | 4,65 | 5,76 |
| | | 10 | 0,50 | 433,12 | 7,42 | 120,00 | 2,99 | 4,98 | 6,13 | 7,42 |
| | | 15 | 0,50 | 650,95 | 10,15 | 120,00 | 3,48 | 6,05 | 8,11 | 10,15 |
| | | 20 | 0,50 | 868,79 | 13,54 | 120,00 | 4,05 | 7,16 | 10,22 | 13,54 |
| | | 25 | 0,50 | 1086,62 | 18,18 | 120,00 | 4,73 | 8,38 | 12,65 | 18,18 |
| | | 30 | 0,50 | 1304,45 | 24,55 | 120,00 | 5,68 | 10,17 | 16,46 | 24,55 |
| | | 5 | 0,61 | 147,77 | 5,73 | 120,00 | 2,54 | 4,20 | 4,63 | 5,73 |
| | | 10 | 0,61 | 297,29 | 7,54 | 120,00 | 2,98 | 4,99 | 6,18 | 7,54 |
| | | 15 | 0,61 | 446,81 | 10,42 | 120,00 | 3,49 | 6,07 | 8,25 | 10,42 |
| | | 20 | 0,61 | 596,33 | 14,57 | 120,00 | 4,08 | 7,23 | 10,57 | 14,57 |
| | | 25 | 0,61 | 745,85 | 20,23 | 120,00 | 4,91 | 8,84 | 13,96 | 20,23 |
| | | 30 | 0,61 | 895,37 | 30,69 | 120,00 | 5,95 | 10,98 | 18,87 | 30,69 |
| | | 5 | 0,61 | 147,77 | 5,81 | 120,00 | 2,58 | 4,25 | 4,71 | 5,81 |
| | | 10 | 0,61 | 297,29 | 7,88 | 120,00 | 3,06 | 5,15 | 6,45 | 7,88 |
| | | 15 | 0,61 | 446,81 | 10,99 | 120,00 | 3,63 | 6,32 | 8,66 | 10,99 |
| | | 20 | 0,61 | 596,33 | 15,43 | 120,00 | 4,29 | 7,58 | 11,14 | 15,43 |
| | | 25 | 0,61 | 745,85 | 21,11 | 120,00 | 5,24 | 9,39 | 14,81 | 21,11 |
| | | 30 | 0,61 | 895,37 | 30,78 | 120,00 | 6,40 | 11,74 | 19,94 | 30,78 |

Systems (from top to bottom):
- System 1: single load F, dimensions 0.116 / 0.159 / 0.025 (1.16a / 1.59a / 0.25a) [m]
- System 2: two loads F, dimensions 0.05 / 0.175 / 0.05 / 0.025 (0.5a / 1.75a / 0.5a / 0.25a) [m]
- System 3: two loads F, dimensions 0.087 / 0.10 / 0.087 / 0.025 (0.87a / 1.0a / 0.87a / 0.25a) [m]

$^{1)}$ Momentum degree of fullness without contribution from channel dead weight
$^{2)}$ Size of designated system's single load

Symbols and designation see Annex D1

| Suspended Hilti cantilevers MT-BR-30, MT-BR-40 and MT-BR-40 D with load introduction component | **Annex D12** |
|---|---|
| **Bending characteristics of the suspended cantilver in case of fire** | |

**Table D30: Calculation-based deformation in case of fire for Hilti MT-BR-40 450 and MT-BR-40 450 OC cantilevers with suspension**

| System | Load direction | $\sigma_B$ MPa | $V^{1)}$ - | $F^{2)}$ N | $\delta_{tmax;B}$ mm | $t_{max,B}$ min | $\delta_{30}$ mm | $\delta_{60}$ mm | $\delta_{90}$ mm | $\delta_{120}$ mm |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 5 | 0,50 | 169,30 | 6,27 | 120,00 | 2,87 | 4,58 | 5,12 | 6,27 |
| | | 10 | 0,50 | 342,91 | 9,78 | 120,00 | 3,71 | 6,13 | 8,04 | 9,78 |
| | | 15 | 0,50 | 516,51 | 15,00 | 120,00 | 4,68 | 8,07 | 11,71 | 15,00 |
| | | 20 | 0,50 | 690,11 | 26,16 | 120,00 | 5,84 | 10,27 | 16,31 | 26,16 |
| | | 25 | 0,50 | 863,72 | 75,61 | 120,00 | 7,45 | 13,46 | 39,54 | 75,61 |
| | | 30 | 0,50 | 1037,32 | 102,21 | 120,00 | 9,41 | 18,03 | 67,35 | 102,21 |
| | | 5 | 0,50 | 169,30 | 6,46 | 120,00 | 2,94 | 4,67 | 5,28 | 6,46 |
| | | 10 | 0,50 | 342,91 | 10,36 | 120,00 | 3,86 | 6,40 | 8,47 | 10,36 |
| | | 15 | 0,50 | 516,51 | 15,96 | 120,00 | 4,92 | 8,47 | 12,36 | 15,96 |
| | | 20 | 0,50 | 690,11 | 23,70 | 120,00 | 6,25 | 10,93 | 17,05 | 23,70 |
| | | 25 | 0,50 | 863,72 | 33,96 | 120,00 | 8,03 | 14,32 | 23,77 | 33,96 |
| | | 30 | 0,50 | 1037,32 | 49,47 | 120,00 | 10,13 | 18,59 | 32,31 | 49,47 |
| | | 5 | 0,46 | 198,61 | 6,10 | 120,00 | 2,79 | 4,48 | 4,95 | 6,10 |
| | | 10 | 0,46 | 402,27 | 8,41 | 120,00 | 3,52 | 5,57 | 7,08 | 8,41 |
| | | 15 | 0,46 | 605,93 | 13,04 | 120,00 | 4,30 | 7,39 | 10,51 | 13,04 |
| | | 20 | 0,46 | 809,59 | 18,90 | 120,00 | 5,23 | 9,29 | 14,20 | 18,90 |
| | | 25 | 0,46 | 1013,24 | 27,82 | 120,00 | 6,25 | 11,27 | 18,42 | 27,82 |
| | | 30 | 0,46 | 1216,90 | 52,47 | 120,00 | 7,63 | 14,01 | 25,59 | 52,47 |
| | | 5 | 0,46 | 198,61 | 6,15 | 120,00 | 2,81 | 4,51 | 4,99 | 6,15 |
| | | 10 | 0,46 | 402,27 | 8,54 | 120,00 | 3,56 | 5,66 | 7,18 | 8,54 |
| | | 15 | 0,46 | 605,93 | 12,92 | 120,00 | 4,36 | 7,46 | 10,48 | 12,92 |
| | | 20 | 0,46 | 809,59 | 17,94 | 120,00 | 5,30 | 9,32 | 13,90 | 17,94 |
| | | 25 | 0,46 | 1013,24 | 24,54 | 120,00 | 6,32 | 11,23 | 17,59 | 24,54 |
| | | 30 | 0,46 | 1216,90 | 32,47 | 120,00 | 7,66 | 13,61 | 22,36 | 32,47 |
| | | 5 | 0,61 | 69,51 | 6,23 | 120,00 | 2,88 | 4,58 | 5,08 | 6,23 |
| | | 10 | 0,61 | 140,78 | 9,65 | 120,00 | 3,71 | 6,09 | 7,99 | 9,65 |
| | | 15 | 0,61 | 212,06 | 14,72 | 120,00 | 4,67 | 8,07 | 11,70 | 14,72 |
| | | 20 | 0,61 | 283,33 | 22,00 | 120,00 | 5,75 | 10,19 | 15,88 | 22,00 |
| | | 25 | 0,61 | 354,61 | 31,11 | 120,00 | 7,26 | 12,98 | 21,47 | 31,11 |
| | | 30 | 0,61 | 425,88 | 46,97 | 120,00 | 9,21 | 16,86 | 29,82 | 46,97 |
| | | 5 | 0,61 | 69,51 | 6,32 | 120,00 | 2,92 | 4,63 | 5,15 | 6,32 |
| | | 10 | 0,61 | 140,78 | 10,03 | 120,00 | 3,80 | 6,27 | 8,29 | 10,03 |
| | | 15 | 0,61 | 212,06 | 15,39 | 120,00 | 4,83 | 8,37 | 12,20 | 15,39 |
| | | 20 | 0,61 | 283,33 | 22,99 | 120,00 | 6,00 | 10,60 | 16,56 | 22,99 |
| | | 25 | 0,61 | 354,61 | 32,04 | 120,00 | 7,65 | 13,62 | 22,46 | 32,04 |
| | | 30 | 0,61 | 425,88 | 45,86 | 120,00 | 9,73 | 17,74 | 30,92 | 45,86 |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load

Symbols and designation see Annex D1

| Suspended Hilti cantilevers MT-BR-30, MT-BR-40 and MT-BR-40 D with load introduction component | |
|---|---|
| **Bending characteristics of the suspended cantilver in case of fire** | **Annex D13** |

**Table D31: Calculation-based deformation in case of fire for Hilti MT-BR-40 600, MT-BR-40 600 OC and MT-BR-40 O4 600 OC cantilevers with suspension**

| System | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| | | MPa | - | N | mm | min | mm | mm | mm | mm |
| | | 5 | 0,50 | 114,64 | 7,30 | 120,00 | 3,50 | 5,30 | 6,02 | 7,30 |
| | | 10 | 0,50 | 235,46 | 13,71 | 120,00 | 5,07 | 8,17 | 11,35 | 13,71 |
| | | 15 | 0,50 | 356,28 | 24,93 | 120,00 | 6,88 | 11,77 | 18,31 | 24,93 |
| | | 20 | 0,50 | 477,10 | 70,05 | 120,00 | 9,05 | 16,04 | 32,96 | 70,05 |
| | | 25 | 0,50 | 597,92 | 102,29 | 120,00 | 12,01 | 24,04 | 69,43 | 102,29 |
| | | 30 | 0,50 | 718,74 | 147,48 | 120,00 | 15,92 | 43,00 | 93,83 | 147,48 |
| | | 5 | 0,50 | 114,64 | 7,47 | 120,00 | 3,58 | 5,41 | 6,18 | 7,47 |
| | | 10 | 0,50 | 235,46 | 14,16 | 120,00 | 5,17 | 8,38 | 11,69 | 14,16 |
| | | 15 | 0,50 | 356,28 | 23,61 | 120,00 | 7,05 | 12,04 | 18,41 | 23,61 |
| | | 20 | 0,50 | 477,10 | 36,21 | 120,00 | 9,32 | 16,19 | 26,23 | 36,21 |
| | | 25 | 0,50 | 597,92 | 52,43 | 120,00 | 12,31 | 21,75 | 36,94 | 52,43 |
| | | 30 | 0,50 | 718,74 | 76,55 | 120,00 | 15,86 | 28,73 | 50,61 | 76,55 |
| | | 5 | 0,43 | 185,17 | 6,86 | 120,00 | 3,28 | 5,05 | 5,61 | 6,86 |
| | | 10 | 0,43 | 380,32 | 10,68 | 120,00 | 4,58 | 6,88 | 9,12 | 10,68 |
| | | 15 | 0,43 | 575,47 | 18,83 | 120,00 | 5,96 | 10,04 | 15,16 | 18,83 |
| | | 20 | 0,43 | 770,63 | 31,10 | 120,00 | 7,57 | 13,41 | 21,86 | 31,10 |
| | | 25 | 0,43 | 965,78 | 74,47 | 120,00 | 9,36 | 16,99 | 31,90 | 74,47 |
| | | 30 | 0,43 | 1160,93 | 100,16 | 120,00 | 11,68 | 22,18 | 67,92 | 100,16 |
| | | 5 | 0,43 | 185,17 | 6,88 | 120,00 | 3,29 | 5,07 | 5,63 | 6,88 |
| | | 10 | 0,43 | 380,32 | 10,56 | 120,00 | 4,59 | 6,89 | 9,03 | 10,56 |
| | | 15 | 0,43 | 575,47 | 17,74 | 120,00 | 5,95 | 9,92 | 14,58 | 17,74 |
| | | 20 | 0,43 | 770,63 | 25,75 | 120,00 | 7,51 | 13,07 | 20,26 | 25,75 |
| | | 25 | 0,43 | 965,78 | 35,48 | 120,00 | 9,21 | 16,27 | 26,18 | 35,48 |
| | | 30 | 0,43 | 1160,93 | 46,14 | 120,00 | 11,23 | 19,85 | 32,98 | 46,14 |
| | | 5 | 0,61 | 31,06 | 7,19 | 120,00 | 3,50 | 5,30 | 5,92 | 7,19 |
| | | 10 | 0,61 | 63,79 | 13,28 | 120,00 | 5,04 | 8,03 | 11,15 | 13,28 |
| | | 15 | 0,61 | 96,52 | 22,19 | 120,00 | 6,81 | 11,66 | 17,75 | 22,19 |
| | | 20 | 0,61 | 129,25 | 34,04 | 120,00 | 8,76 | 15,42 | 25,03 | 34,04 |
| | | 25 | 0,61 | 161,98 | 48,65 | 120,00 | 11,29 | 19,94 | 33,72 | 48,65 |
| | | 30 | 0,61 | 194,71 | 67,95 | 120,00 | 14,64 | 26,33 | 46,37 | 67,95 |
| | | 5 | 0,61 | 31,06 | 7,24 | 120,00 | 3,53 | 5,33 | 5,96 | 7,24 |
| | | 10 | 0,61 | 63,79 | 13,57 | 120,00 | 5,11 | 8,18 | 11,39 | 13,57 |
| | | 15 | 0,61 | 96,52 | 22,64 | 120,00 | 6,93 | 11,89 | 18,14 | 22,64 |
| | | 20 | 0,61 | 129,25 | 34,62 | 120,00 | 8,94 | 15,73 | 25,51 | 34,62 |
| | | 25 | 0,61 | 161,98 | 48,90 | 120,00 | 11,59 | 20,39 | 34,24 | 48,90 |
| | | 30 | 0,61 | 194,71 | 66,32 | 120,00 | 15,06 | 26,94 | 46,74 | 66,32 |

System diagram 1 dimensions: 0.412 / 0.563 / 0.025 (4.12a / 5.63a / 0.25a) [m]

System diagram 2 dimensions: 0.05 / 0.475 / 0.05 / 0.025 (0.5a / 4.75a / 0.5a / 0.25a) [m]

System diagram 3 dimensions: 0.087 / 4x0.10 / 0.087 / 0.025 (0.87a / 4.0a / 0.87a / 0.25a) [m]
Number of single forces = 5

$^{1)}$ Momentum degree of fullness without contribution from channel dead weight
$^{2)}$ Size of designated system's single load

Symbols and designation see Annex D1

| Suspended Hilti cantilevers MT-BR-30, MT-BR-40 and MT-BR-40 D with load introduction component | **Annex D14** |
|---|---|
| **Bending characteristics of the suspended cantilver in case of fire** | |

**Table D32: Calculation-based deformation in case of fire for Hilti MT-BR-40 1000, MT-BR-40 1000 OC and MT-BR-40 O4 600 OC cantilevers with suspension**

| System | Load direction | $\sigma_B$ MPa | $V^{1)}$ - | $F^{2)}$ N | $\delta_{tmax;B}$ mm | $t_{max,B}$ min | $\delta_{30}$ mm | $\delta_{60}$ mm | $\delta_{90}$ mm | $\delta_{120}$ mm |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 5 | 0,50 | 60,76 | 10,87 | 120,00 | 5,74 | 7,89 | 9,15 | 10,87 |
| | | 10 | 0,50 | 132,00 | 27,50 | 120,00 | 9,71 | 14,95 | 22,67 | 27,50 |
| | | 15 | 0,50 | 203,24 | 57,19 | 120,00 | 14,34 | 24,75 | 42,26 | 57,19 |
| | | 20 | 0,50 | 274,48 | 125,43 | 120,00 | 20,49 | 37,31 | 71,56 | 125,43 |
| | | 25 | 0,50 | 345,72 | 199,56 | 120,00 | 28,68 | 54,70 | 129,38 | 199,56 |
| | | 30 | 0,50 | 416,96 | 274,54 | 120,00 | 38,73 | 90,08 | 184,08 | 274,54 |
| | | 5 | 0,50 | 60,76 | 10,85 | 120,00 | 5,75 | 7,89 | 9,14 | 10,85 |
| | | 10 | 0,50 | 132,00 | 26,18 | 120,00 | 9,69 | 14,91 | 21,98 | 26,18 |
| | | 15 | 0,50 | 203,24 | 47,59 | 120,00 | 14,19 | 23,73 | 38,09 | 47,59 |
| | | 20 | 0,50 | 274,48 | 75,61 | 120,00 | 19,30 | 33,22 | 55,78 | 75,61 |
| | | 25 | 0,50 | 345,72 | 109,15 | 120,00 | 25,96 | 45,11 | 77,76 | 109,15 |
| | | 30 | 0,50 | 416,96 | 156,66 | 120,00 | 34,00 | 60,17 | 107,07 | 156,66 |
| | | 5 | 0,41 | 160,19 | 9,49 | 120,00 | 4,94 | 6,99 | 7,87 | 9,49 |
| | | 10 | 0,41 | 348,02 | 18,02 | 120,00 | 8,09 | 11,17 | 15,66 | 18,02 |
| | | 15 | 0,41 | 535,85 | 40,15 | 120,00 | 11,29 | 18,36 | 30,47 | 40,15 |
| | | 20 | 0,41 | 723,68 | 93,36 | 120,00 | 15,01 | 26,54 | 52,68 | 93,36 |
| | | 25 | 0,41 | 911,51 | 136,77 | 120,00 | 19,23 | 36,58 | 96,74 | 136,77 |
| | | 30 | 0,41 | 1099,34 | 166,76 | 120,00 | 25,08 | 67,35 | 131,28 | 166,76 |
| | | 5 | 0,41 | 160,19 | 9,47 | 120,00 | 4,93 | 6,98 | 7,86 | 9,47 |
| | | 10 | 0,41 | 348,02 | 17,25 | 120,00 | 8,03 | 10,99 | 15,06 | 17,25 |
| | | 15 | 0,41 | 535,85 | 32,78 | 120,00 | 11,08 | 17,68 | 27,44 | 32,78 |
| | | 20 | 0,41 | 723,68 | 49,51 | 120,00 | 14,58 | 24,82 | 39,91 | 49,51 |
| | | 25 | 0,41 | 911,51 | 66,75 | 120,00 | 18,36 | 31,93 | 52,17 | 66,75 |
| | | 30 | 0,41 | 1099,34 | 83,21 | 120,00 | 22,55 | 39,31 | 64,34 | 83,21 |
| | | 5 | 0,61 | 9,63 | 10,77 | 120,00 | 5,83 | 7,98 | 9,04 | 10,77 |
| | | 10 | 0,61 | 20,93 | 25,19 | 120,00 | 9,64 | 14,57 | 21,53 | 25,19 |
| | | 15 | 0,61 | 32,23 | 46,28 | 120,00 | 13,94 | 23,40 | 37,55 | 46,28 |
| | | 20 | 0,61 | 43,52 | 71,23 | 120,00 | 18,70 | 32,61 | 54,54 | 71,23 |
| | | 25 | 0,61 | 54,82 | 100,81 | 120,00 | 24,35 | 42,50 | 72,42 | 100,81 |
| | | 30 | 0,61 | 66,12 | 130,16 | 120,00 | 31,85 | 55,66 | 94,81 | 130,16 |
| | | 5 | 0,61 | 9,63 | 10,75 | 120,00 | 5,83 | 7,97 | 9,03 | 10,75 |
| | | 10 | 0,61 | 20,93 | 25,50 | 120,00 | 9,71 | 14,72 | 21,80 | 25,50 |
| | | 15 | 0,61 | 32,23 | 46,95 | 120,00 | 14,11 | 23,73 | 38,12 | 46,95 |
| | | 20 | 0,61 | 43,52 | 72,43 | 120,00 | 18,97 | 33,10 | 55,37 | 72,43 |
| | | 25 | 0,61 | 54,82 | 102,42 | 120,00 | 24,81 | 43,20 | 73,53 | 102,42 |
| | | 30 | 0,61 | 66,12 | 131,81 | 120,00 | 32,57 | 56,87 | 96,67 | 131,81 |

System 1 dimensions: 0.412 | 0.563 | 0.025 ; 4.12a | 5.63a | 0.25a [m]

System 2 dimensions: 0.05 | 0.875 | 0.05 | 0.025 ; 0.5a | 8.75a | 0.5a | 0.25a [m]

System 3 dimensions: 0.087 | 8x0.10 | 0.087 | 0.025 ; 0.87a | 8.0a | 0.87a | 0.25a [m] ; Number of single forces = 9

$^{1)}$ Momentum degree of fullness without contribution from channel dead weight
$^{2)}$ Size of designated system's single load

Symbols and designation see Annex D1

| Suspended Hilti cantilevers MT-BR-30, MT-BR-40 and MT-BR-40 D with load introduction component | Annex D14 |
|---|---|
| Bending characteristics of the suspended cantilver in case of fire | |

**Table D33: Calculation-based deformation in case of fire for Hilti MT-BR-40D 600, MT-BR-40D 600 OC and MT-BR-40D O4 600 OC cantilevers with suspension**

| System | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 0.243 / 0.332 / 0.025 (2.43a / 3.32a / 0.25a) [m] | ↓F | 5 | 0,50 | 308,08 | 5,14 | 120,00 | 0,83 | 2,11 | 5,14 | 5,14 |
| | | 10 | 0,50 | 628,54 | 8,10 | 120,00 | 1,75 | 3,72 | 8,10 | 8,10 |
| | | 15 | 0,50 | 949,01 | 13,13 | 106,67 | 2,80 | 5,81 | 12,47 | - |
| | | 20 | 0,50 | 1269,48 | 10,90 | 66,67 | 4,09 | 8,62 | - | - |
| | | 25 | 0,50 | 1589,94 | 9,52 | 46,67 | 5,88 | - | - | - |
| | | 30 | 0,50 | 1910,41 | 9,97 | 33,33 | 8,70 | - | - | - |
| | ↓F | 5 | 0,50 | 308,08 | 5,44 | 120,00 | 0,97 | 2,31 | 5,44 | 5,44 |
| | | 10 | 0,50 | 628,54 | 8,86 | 120,00 | 2,06 | 4,21 | 8,86 | 8,86 |
| | | 15 | 0,50 | 949,01 | 13,38 | 120,00 | 3,33 | 6,63 | 13,38 | 13,38 |
| | | 20 | 0,50 | 1269,48 | 24,40 | 120,00 | 4,87 | 9,58 | 19,54 | 24,40 |
| | | 25 | 0,50 | 1589,94 | 57,59 | 120,00 | 6,87 | 13,69 | 30,59 | 57,59 |
| | | 30 | 0,50 | 1910,41 | 114,87 | 113,33 | 9,31 | 19,37 | 51,28 | - |
| 0.05 / 0.475 / 0.05 / 0.025 (0.5a / 4.75a / 0.5a / 0.25a) [m] | ↓F | 5 | 0,43 | 497,61 | 5,18 | 120,00 | 0,79 | 2,11 | 5,18 | 5,18 |
| | | 10 | 0,43 | 1015,24 | 8,89 | 93,33 | 1,70 | 3,63 | 8,65 | - |
| | | 15 | 0,43 | 1532,87 | 5,81 | 53,33 | 2,84 | - | - | - |
| | | 20 | 0,43 | 2050,49 | 1,32 | 20,00 | - | - | - | - |
| | | 25 | 0,43 | 2568,12 | 2,08 | 20,00 | - | - | - | - |
| | | 30 | 0,43 | 3085,74 | 1,18 | 13,33 | - | - | - | - |
| | ↓F | 5 | 0,43 | 497,61 | 5,08 | 120,00 | 0,75 | 2,06 | 5,08 | 5,08 |
| | | 10 | 0,43 | 1015,24 | 7,30 | 120,00 | 1,57 | 3,30 | 7,30 | 7,30 |
| | | 15 | 0,43 | 1532,87 | 10,96 | 120,00 | 2,48 | 5,19 | 10,96 | 10,96 |
| | | 20 | 0,43 | 2050,49 | 18,75 | 100,00 | 3,58 | 7,48 | 16,06 | - |
| | | 25 | 0,43 | 2568,12 | 16,37 | 73,33 | 4,91 | 10,36 | - | - |
| | | 30 | 0,43 | 3085,74 | 16,00 | 53,33 | 8,20 | - | - | - |
| 0.087 / 4x0.10 / 0.087 / 0.025 (0.87a / 4.0a / 0.87a / 0.25a) [m] Number of single forces = 5 | ↓F | 5 | 0,61 | 83,46 | 5,08 | 120,00 | 0,83 | 2,12 | 5,08 | 5,08 |
| | | 10 | 0,61 | 170,28 | 7,91 | 120,00 | 1,74 | 3,63 | 7,91 | 7,91 |
| | | 15 | 0,61 | 257,09 | 11,89 | 120,00 | 2,77 | 5,73 | 11,89 | 11,89 |
| | | 20 | 0,61 | 343,91 | 18,28 | 120,00 | 3,91 | 8,04 | 16,55 | 18,28 |
| | | 25 | 0,61 | 430,72 | 30,10 | 120,00 | 5,42 | 10,89 | 22,70 | 30,10 |
| | | 30 | 0,61 | 517,54 | 39,01 | 100,00 | 7,45 | 15,13 | 34,08 | - |
| | ↓F | 5 | 0,61 | 83,46 | 5,17 | 120,00 | 0,89 | 2,18 | 5,17 | 5,17 |
| | | 10 | 0,61 | 170,28 | 8,20 | 120,00 | 1,86 | 3,82 | 8,20 | 8,20 |
| | | 15 | 0,61 | 257,09 | 12,32 | 120,00 | 2,96 | 6,03 | 12,32 | 12,32 |
| | | 20 | 0,61 | 343,91 | 19,23 | 120,00 | 4,19 | 8,44 | 17,13 | 19,23 |
| | | 25 | 0,61 | 430,72 | 42,31 | 120,00 | 5,82 | 11,50 | 24,34 | 42,31 |
| | | 30 | 0,61 | 517,54 | 125,09 | 120,00 | 7,93 | 15,92 | 42,43 | 125,09 |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load

Symbols and designation see Annex D1

| Suspended Hilti cantilevers MT-BR-30, MT-BR-40 and MT-BR-40 D with load introduction component | Annex D15 |
|---|---|
| Bending characteristics of the suspended cantilver in case of fire | |

**Table D34:** **Calculation-based deformation in case of fire for Hilti MT-BR-40D 1000, MT-BR-40D 1000 OC and MT-BR-40D O4 1000 OC cantilevers with suspension**

| System | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| | | MPa | - | N | mm | min | mm | mm | mm | mm |
| System 1 (0.412 / 0.563 / 0.025; 4.12a / 5.63a / 0.25a) [m] | ↓ F | 5 | 0,50 | 167,95 | 6,67 | 120,00 | 1,93 | 3,39 | 6,67 | 6,67 |
| | | 10 | 0,50 | 356,91 | 13,47 | 120,00 | 4,02 | 7,03 | 13,47 | 13,47 |
| | | 15 | 0,50 | 545,86 | 43,11 | 120,00 | 6,49 | 12,01 | 27,07 | 43,11 |
| | | 20 | 0,50 | 734,82 | 75,11 | 120,00 | 9,66 | 21,32 | 53,69 | 75,11 |
| | | 25 | 0,50 | 923,78 | 103,49 | 100,00 | 14,49 | 41,32 | 81,99 | - |
| | | 30 | 0,50 | 1112,74 | 109,75 | 80,00 | 29,36 | 55,73 | - | - |
| | ↓ F | 5 | 0,50 | 167,95 | 6,80 | 120,00 | 2,00 | 3,47 | 6,80 | 6,80 |
| | | 10 | 0,50 | 356,91 | 13,81 | 120,00 | 4,21 | 7,32 | 13,81 | 13,81 |
| | | 15 | 0,50 | 545,86 | 24,46 | 120,00 | 6,71 | 12,19 | 22,78 | 24,46 |
| | | 20 | 0,50 | 734,82 | 45,21 | 120,00 | 9,70 | 17,71 | 33,79 | 45,21 |
| | | 25 | 0,50 | 923,78 | 111,91 | 113,33 | 13,60 | 25,26 | 56,84 | - |
| | | 30 | 0,50 | 1112,74 | 147,52 | 93,33 | 18,30 | 35,90 | 127,25 | - |
| System 2 (0.05 / 0.875 / 0.05 / 0.025; 0.5a / 8.75a / 0.5a / 0.25a) [m] | ↓ F | 5 | 0,41 | 442,80 | 6,24 | 120,00 | 1,59 | 3,04 | 6,24 | 6,24 |
| | | 10 | 0,41 | 941,00 | 10,11 | 80,00 | 3,43 | 5,74 | - | - |
| | | 15 | 0,41 | 1439,20 | 7,16 | 40,00 | 5,63 | - | - | - |
| | | 20 | 0,41 | 1937,40 | 2,39 | 20,00 | - | - | - | - |
| | | 25 | 0,41 | 2435,60 | 3,98 | 20,00 | - | - | - | - |
| | | 30 | 0,41 | 2933,81 | 2,36 | 13,33 | - | - | - | - |
| | ↓ F | 5 | 0,41 | 442,80 | 6,15 | 120,00 | 1,56 | 2,99 | 6,15 | 6,15 |
| | | 10 | 0,41 | 941,00 | 10,18 | 120,00 | 3,29 | 5,32 | 10,18 | 10,18 |
| | | 15 | 0,41 | 1439,20 | 17,36 | 120,00 | 5,11 | 9,09 | 17,36 | 17,36 |
| | | 20 | 0,41 | 1937,40 | 27,41 | 100,00 | 7,22 | 13,46 | 25,86 | - |
| | | 25 | 0,41 | 2435,60 | 31,69 | 80,00 | 9,60 | 18,35 | - | - |
| | | 30 | 0,41 | 2933,81 | 24,93 | 60,00 | 12,45 | 24,93 | - | - |
| System 3 (0.087 / 8x0.10 / 0.087 / 0.025; 0.87a / 8.0a / 0.87a / 0.25a) [m] — Number of single forces = 9 | ↓ F ...... ↓ F | 5 | 0,61 | 26,63 | 6,56 | 120,00 | 1,96 | 3,40 | 6,56 | 6,56 |
| | | 10 | 0,61 | 56,60 | 13,06 | 120,00 | 3,99 | 6,83 | 13,06 | 13,06 |
| | | 15 | 0,61 | 86,56 | 22,78 | 120,00 | 6,37 | 11,69 | 21,97 | 22,78 |
| | | 20 | 0,61 | 116,52 | 38,83 | 120,00 | 9,00 | 16,84 | 32,03 | 38,83 |
| | | 25 | 0,61 | 146,49 | 61,55 | 120,00 | 12,20 | 22,58 | 43,96 | 61,55 |
| | | 30 | 0,61 | 176,45 | 96,92 | 106,67 | 16,66 | 31,37 | 65,12 | - |
| | ↓ F | 5 | 0,61 | 26,63 | 6,61 | 120,00 | 1,99 | 3,44 | 6,61 | 6,61 |
| | | 10 | 0,61 | 56,60 | 13,27 | 120,00 | 4,07 | 6,97 | 13,27 | 13,27 |
| | | 15 | 0,61 | 86,56 | 23,08 | 120,00 | 6,51 | 11,90 | 22,26 | 23,08 |
| | | 20 | 0,61 | 116,52 | 39,54 | 120,00 | 9,19 | 17,11 | 32,37 | 39,54 |
| | | 25 | 0,61 | 146,49 | 89,25 | 120,00 | 12,51 | 23,03 | 45,81 | 89,25 |
| | | 30 | 0,61 | 176,45 | 211,45 | 120,00 | 17,02 | 32,04 | 89,43 | 211,45 |

[1] Momentum degree of fullness without contribution from channel dead weight

[2] Size of designated system's single load

Symbols and designation see Annex D1

| | |
|---|---|
| **Suspended Hilti cantilevers MT-BR-30, MT-BR-40 and MT-BR-40 D with load introduction component** | **Annex D16** |
| **Bending characteristics of the suspended cantilver in case of fire** | |

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according to
Article 29 of
Regulation (EU)
No 305/2011

# European Technical Assessment

# ETA-23/0104 of 04/09/2023

*English translation prepared by CSTB - Original version in French language*

## General Part

**Technical Assessment Body issuing the European Technical Assessment:**

Centre Scientifique et Technique du Bâtiment (CSTB)

| | |
|---|---|
| Trade name of the construction product: | Hilti Frame Trapeze of MT System with load introduction component |
| Product family to which the construction product belongs: | Products for installation systems for supporting technical building equipment |
| Manufacturer: | Hilti AG Liechtenstein<br>Feldkircherstraße 100<br>9494 Schaan<br>FÜRSTENTUM LIECHTENSTEIN |
| Manufacturing plants: | L 1000446, L 1027881, L 1124303, L 1087643,<br>L 1006522, L 1128868, L 1066663 |
| This European Technical Assessment contains: | 59 pages including 56 pages of annexes which form an integral part of this assessment |
| This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of: | European Assessment Document (EAD)<br>280016-00-0602 version June 2020 |
| This version replaces: | - |

**Specific Part**

### 1 Technical description of the product

This European Technical Assessment covers HILTI MT frame trapezes with load introduction component. Hilti MT frame trapezes consists of at least three installation channels. In a typical setup one horizontally aligned MT installation channel is positioned in-between two vertically aligned MT installation channels. The vertical and horizontal channels are attached to each other by using corresponding angle connectors and channel connectors. The frame trapeze is fixed to the ceiling using corresponding baseplates.

A MT frame trapeze with open profile channels consists of at least two vertical MT-50 S, MT-50, MT-50 S OC or MT-50 OC channels and at least one horizontal MT-40 D, MT-40 D S, MT-40 D OC, or MT-40 D S OC channel connected by using either MT-C-GS OC angle connector and MT-TL M10 or MT-TL M10 OC channel connectors. Alternatively a horizontal MT-50 S, MT-50,MT-50 S OC, MT-50 OC channel can be used, which is connected to the vertical channels by using either MT-C-GS OC angle connector and MT-TL M10 or MT-TL M10 OC channel connectors or alternatively the MT-AB A set or MT-AB A OC set. The MT-40 D, MT-40 D S, MT-40 D OC and MT-40 D S OC channel consists of two profiles, which are connected in the area of the holes in the back of the channels in a shape-fitting and force-fitting way as a kind of riveted connection. The vertical channels are connected to the ceiling with MT-B-T, MT-B-T OC, MT-B-O2, MT-B-O2 OC, MT-B-O2B, MT-B-O2B OC, MT-B-O4 or MT-B-O4 OC baseplates and two MT-TL M10 or MT-TL M10 OC channel connectors. Alternatively, the MT-AB A set or MT-AB A OC set can be used. The span width corresponds to the clear distance between the vertical channels and can be up to 2,10 m for MT-40 D, MT-40 D S, MT-40 D OC, MT-40 D S OC and maximum 1,50 m for MT-50 S, MT-50, MT-50 S OC and MT-50 OC. The load is applied to the horizontal channel by means of Hilti threaded rod(s), which are fastened to the channel by using MQZ-L drilled plates and hexagonal nuts or MQA-B saddle nuts.

The MT frame trapeze with closed profile channels consists of at least two vertical MT-70 OC or MT-70 S OC channels and at least either one MT-70 OC or MT-70 S OC or one MT-80 OC or MT-80 S OC channel which are connected by using MT-C-GSP L A angles and MT-TFB connectors. The vertical channels are connected to the ceiling using either MT-B-GS O4U OC or MT-B-GS T OC baseplates with MT-TFB connectors. The span width corresponds to the clear distance between the vertical channels and can be up to 2,0 m for MT-70 S OC, MT-70 OC and max. 2,50 m for MT-80 S OC, MT-80 OC. The load is applied to the horizontal channel by means of Hilti threaded rod(s), which are fixed to the channel by MT-PCC-G, MT-CTR-GS or MT-CTR-GL saddle nuts and MT-TFB connectors.

The MT frame trapeze may also consist of more than only two vertical and one horizontal frame (i.e. in case of multi-layer frame trapeze).

Annex A describes the dimensions and materials of above mentioned Hilti MT frame trapezes.

### 2 Specification of the intended use

The performance given in Section 3 can only be assumed if the Hilti MT frame trapezes are used in compliance with the specifications and under boundary conditions set out in Annexes A to C. The test and assessment methods on which this European Technical Assessment is based lead to an assumption of a working life of the Hilti cantilevers of MT System of at least 50 years in final use under ambient temperatures in indoor areas. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

In accordance with the European Assessment Document EAD 280016-00-0602, the product is intended to be used in

a) installations for the support of sprinkler kits,

b) installations for the support of pipes for the transport of gas/fuel intended for the supply of building heating/cooling systems.

## 3 Performance of the product and references to the methods used for its assessment

### 3.1 Safety in case of fire (BWR 2)

| No. | Essential characteristic | Performance |
|-----|--------------------------|-------------|
| 1 | Reaction to fire | Class A1 |
| 2 | Resistance and deformation under fire exposure | See Annex C<br>See Annex D |

### 3.2 Safety and accessibility in use (BWR 4)

| No. | Essential characteristic | Performance |
|-----|--------------------------|-------------|
| 3 | Shape | See Annex A |
| 4 | Dimension | See Annex A |
| 5 | Material | See Annex A |

## 4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

In accordance with the European Assessment Document EAD 280016-00-0602, the following legal bases apply:

- In case of intended use a) specified in Section 2:
  Decision of the commission N° 1996/577/EC as amended by Commission Decision 2002/592/EC.:
  System 1 applies for the assessment and verification of constancy of performance (AVCP).
- In case of intended use b) specified in Section 2:
  Decision of the commission N° 1999/472/EC as amended by Commission Decision 001/596/EC:
  System 3 applies for the assessment and verification of constancy of performance (AVCP).

## 5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

The technical details necessary for the implementation of the system for the assessment and verification of constancy of performance are laid down in the control plan (confidential part of this European Technical Assessment) deposited at Centre Scientifique et Technique du Bâtiment.

The manufacturer shall, on the basis of a contract, involve a notified body approved in the field of supporting systems for issuing the certificate of conformity CE based on the control plan.

**The original French version is signed by**

La cheffe de division, Anca CRONOPOL

**Table A1:** Dimensions and materials of Hilti MT-50 S, MT-50, MT-50 S OC, MT-50 OC, MT-40D S. MT-40D, MT-40D S OC, MT-40 D OC, MT-70 S OC, MT-70 OC, MT-80 S OC and MT-80 OC, installation channels

| Item number | Designation | Length [m] | Materials and coatings | Illustration (Dimensions in mm and inch) |
|---|---|---|---|---|
| 2268509 | MT-50 S | 3 | S280GD or equivalent as defined in HN704 + Z275-M-A-C acc. to EN 10346 |  |
| 2268510 | MT-50 | 6 | | |
| 2268511 | MT-50 S OC | 3 | S280GD or equivalent as defined in HN704 + ZM310-A-C acc. to EN 10346 | |
| 2268512 | MT-50 OC | 6 | | |
| 2268517 | MT-40D S | 3 | S280GD or equivalent as defined in HN704 + Z275-M-A-C acc. to EN 10346 |  |
| 2268518 | MT-40D | 6 | | |
| 2268519 | MT-40D S OC | 3 | S280GD or equivalent as defined in HN704 + ZM310-A-C acc. to EN 10346 | Two profiles of MT-40 channel are connected in the area of the holes in the back of the channels in a shape-fitting and force-fitting way as a kind of riveted connection. |
| 2268520 | MT-40D OC | 6 | | |
| 2268364 | MT-70 S OC | 3 | S350GD+ ZM310-A-C acc. to EN 10346 |  |
| 2268365 | MT-70 OC | 6 | | |
| 2268366 | MT-80 S OC | 3 | S350GD+ ZM310-A-C acc. to EN 10346 |  |
| 2268367 | MT-80 OC | 6 | | |

| Hilti MT frame trapezes with load introduction component | |
|---|---|
| **Product Description** <br> Dimensions and materials | **Annex A1** |

**Table A2:    Dimensions and materials of Hilti MQA-B saddle nuts**

| Item number | Designation | M thread | Materials | Illustration |
|---|---|---|---|---|
| 2199452 | MQA-M10-B | M10 | Plate: DD11 according to DIN EN 10111 [1] or S235JR according to DIN EN 10025-2 |  |
| 2199453 | MQA-M12-B | M12 | Nut: C4C according to DIN EN 10263-2 | |
| 2199454 | MQA-M16-B | M16 | Plastic part: PET | |

[1] with $235 < R_{eL} < 340$ N/mm², Deoxidisation type: fully deoxidised

**Table A3:    Dimensions of the components of the MQA-M10-B and MQA-M12-B saddle nuts in mm**

| Plate | Nut | Spring section |
|---|---|---|
|  |  |  |

**Hilti MT frame trapezes with load introduction component**

**Product Description**
Dimensions and materials

**Annex A2**

**Table A4:** Dimensions of the components of the MQA-M16-B saddle nut in mm
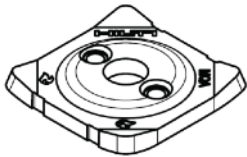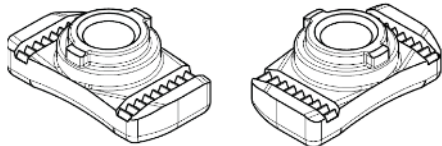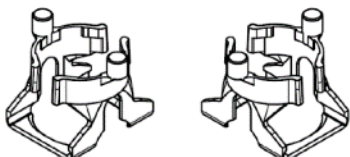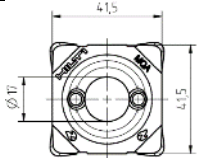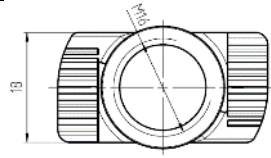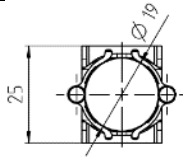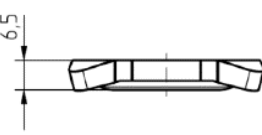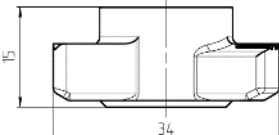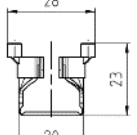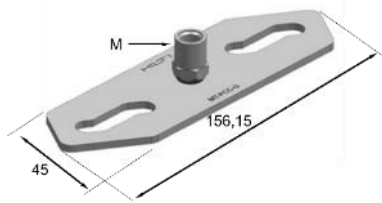
| Plate | Nut | Spring |
|---|---|---|
|  |  |  |

**Table A5:** Dimensions and materials of the components of the MT-PCC-G M8/M10 OC, MT-PCC-G M12 OC and MT-PCC-G M16 OC saddle nut

| Item number | Designation | M thread | Baseplate thickness | Materials | Illustration (Dimensions in mm) |
|---|---|---|---|---|---|
| 2353801 | MT-PCC-G M8/M10 OC | M10 | 4 mm | Baseplate: Q355B acc. to GB/T 1591 hot dipped galv.  Connection piece: 9SMN28 acc. to DIN 1651 hot dipped galv. |  |
| 2354564 | MT-PCC-G M12 OC | M12 | 4 mm | | |
| 2354155 | MT-PCC-G M16 OC | M16 | 6 mm | | |

| **Hilti MT frame trapezes with load introduction component** | |
|---|---|
| **Product Description** Dimensions and materials | **Annex A3** |

**Table A6:** **Dimensions and materials of MT-CTR GS M12 OC, MT-CTR GS M16 OC, MT-CTR GL M12 OC and MT-CTR-GL M16 OC saddle nut**

| Item number | Designation | M thread | Materials | Illustration (Dimensions in mm and inch) |
|---|---|---|---|---|
| 2332789 | MT-CTR-GS M12 OC | M12 | U-shape steel plate: Q355B acc. to GB/T 1591 Hot dipped galvanized<br><br>Hexagonal Nut: Strength class 8 acc. to ISO898-2 |  |
| 2332790 | MT-CTR-GS M16 OC | M16 | | |
| 2332793 | MT-CTR-GL M12 OC | M12 | Washer 12/40 and 16/40 acc. to ISO 7089-200HV<br><br>Plate: Q235B acc. to GB/T 700 Hot dipped galvanized |  |
| 2332796 | MT-CTR-GL M16 OC | M16 | | |

**Hilti MT frame trapezes with load introduction component**

**Product Description**
Dimensions and materials

**Annex A4**

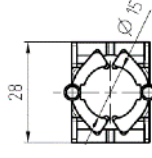**Table A7:** Dimensions and materials of Hilti MT-B-T, MT-B-T OC, MT-B-O2, MT-B-O2 OC, MT-B-O2B, MT-B-O2B OC, MT-B-O4 and MT-B-O4 OC baseplates for use with Hilti MT-50 installation channel product family
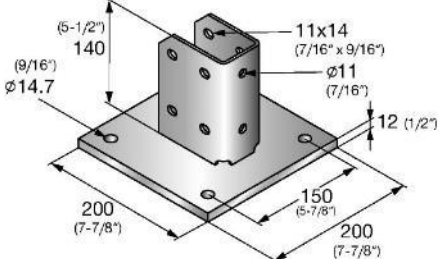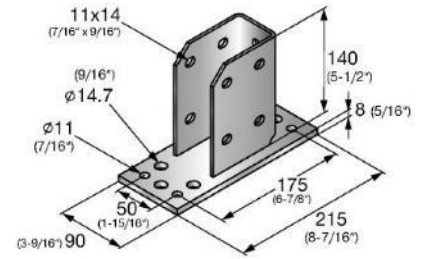
| Item number | Designation | Materials | Illustration (Dimensions in mm and inch) |
|---|---|---|---|
| 2272090 | MT-B-T | Steel Q235B acc. to GB/T 700; galvanized | |
| 2272092 | MT-B-T OC | Steel Q235B acc. to GB/T 700; hot dip galvanized | |
| 2272094 | MT-B-O2 | Steel Q235B acc. To GB/T 700; galvanized | |
| 2272096 | MT-B-O2 OC | Steel Q235B acc. to GB/T 700; hot dip galvanized | |
| 2282212 | MT-B-O2B | Steel Q235B acc. to GB/T 700; galvanized | |
| 2282213 | MT-B-O2B OC | Steel Q235B acc. to GB/T 700; hot dip galvanized | |
| 2272098 | MT-B-O4 | Steel Q235B acc. to GB/T 700 galvanized | |
| 2272099 | MT-B-O4 OC | Steel Q235B acc. to GB/T 700 hot dip galvanized | |

**Hilti MT frame trapezes with load introduction component**

**Product Description**
Dimensions and materials

**Annex A5**

**Table A8:** **Dimensions and materials of Hilti MT-B-GS O4U OC, MT-B-GS T OC baseplates for use with Hilti MT-70 and MT-80 installation channel product family**
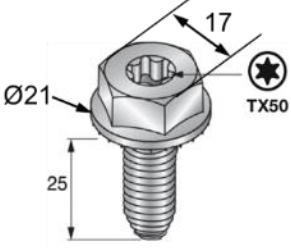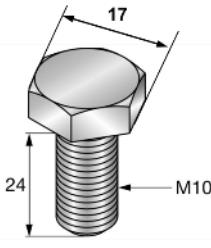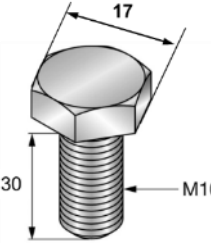
| Item number | Designation | Materials and coatings | Illustration (Dimensions in mm and inch) |
|---|---|---|---|
| 2272101 | MT-B-GS O4U OC | Steel Q355B acc. to GB/T 1591; hot dip galvanized |  |
| 2272100 | MT-B-GS T OC | Q355B acc. to GB/T 1591; hot dip galvanized |  |

**Hilti MT frame trapezes with load introduction component**

**Product Description**
Dimensions and materials

**Annex A6**

**Table A9:** **Dimensions and materials of Hilti MT-TL M10, MT-TL M10 OC, MT-TFB OC, MT-TLB, MT-TLB OC, MT-TLB 30 and MT-TLB 30 OC channel connector**
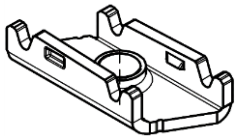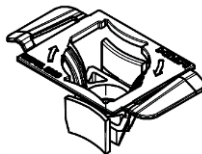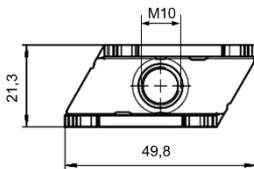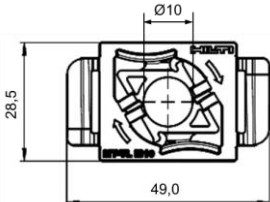
| Item number | Designation | Materials and coatings | Illustration (Dimensions in mm) |
|---|---|---|---|
| 2272080 | MT-TL M10 | Steel part: S460MC acc. to EN10149-2 zinc coated  Plastic part: Polyamid |  |
| 2272082 | MT-TL M10 OC | Steel part: S460MC acc. to EN10149-2 zinc coated with organic topcoat  Plastic part: Polyamid |  |
| 2272084 | MT-TFB OC | C10B21 acc. to SAE J403,  Surface hardness min. 530 HV, Core hardness min. 32-39 HRC  zinc coated with organic topcoat |  |
| 2273254 | MT-TLB | strength class 8.8 acc. to EN ISO 898-1, zinc coated |  |
| 2273256 | MT-TLB OC | strength class 8.8 acc. to EN ISO 898-1, zinc coated with organic topcoat | |
| 2282190 | MT-TLB 30 | strength class 8.8 acc. to EN ISO 898-1, zinc coated |  |
| 2282191 | MT-TLB 30 OC | strength class 8.8 acc. to EN ISO 898-1, zinc coated with organic topcoat | |

| Hilti MT frame trapezes with load introduction component | |
|---|---|
| **Product Description** Dimensions and materials | **Annex A7** |

**Table A10: Dimensions and material of components of Hilti MT-TL M10 and MT-TL M10 OC, channel connectors**

| Item number | Designation | Illustration of nut (Dimensions in mm) | Illustration of plastic part (Dimensions in mm) |
|---|---|---|---|
| 2272080 2272082 | MT-TL M10 MT-TL M10 OC |  M10, 21,3, 49,8  18,1  12,0 |   Ø10, 28,5, 49,0 |

**Hilti MT frame trapezes with load introduction component**

**Product Description**
Dimensions and materials

**Annex A8**

**Table A11:  Dimensions and material MT-C-GS OC and MT-C-GSP L A connectors**

| Item number | Designation | Materials and coatings | Illustration (Dimensions in mm and inch) |
|---|---|---|---|
| 2272064 | MT-C-GS OC | Steel Q355B acc. to GB/T 1591 hot dip galvanized | (1/8") 3 / Ø14.7 (9/16") / 122.5 (4-13/16") / (7/16") ø11 / 122.5 (4-13/16") / (2") 50 |
| 2332786 | MT-C-GSP L A | Steel Q355B acc. to GB/T 1591 hot dip galvanized | 4 (3/16") / Ø8 (5/16") / 165 (6-1/2") / 11x31 (7/16"x1-1/4") / 45 (1-3/4") / 230 (9-1/16") |

**Hilti MT frame trapezes with load introduction component**

**Product Description**
Dimensions and materials

**Annex A9**

**Table A12:** **Dimensions and materials of Hilti adjustable angle brace MT-AB A set and MT-AB A OC set**

| Item number | Designation | Materials and coatings | Illustration (Dimensions in mm) |
|---|---|---|---|
| 2346395 | MT-AB A set | Steel Q235B acc. to GB/T700 galvanized |  |
| 2346396 | MT-AB A OC set | Steel Q235B acc. to GB/T700 hot dip galvanized | |
| **Additional components of MT-AB A set and MT-AB A OC set** | | | |
| - | - | Bolt M10x65: strength class 8.8 acc. to ISO 898-1, hot dip galvanized |  |
| | | Flanged nut: strength class 8 acc. to ISO 898-2, galvanized ~~with seal~~ |  |
| | | Spacer Steel Q235B acc. to GB/T700 zinc coated |  |

**Hilti MT frame trapezes with load introduction component**

**Product Description**
Dimensions and materials

**Annex A10**

**Table A13: Dimensions and materials of Hilti threaded rods for use with Hilti frame trapezes of MT System**

| Item number | Designation | M thread | L [mm] | Materials | Illustration (Dimensions in mm) |
|---|---|---|---|---|---|
| 339795 | AM10x1000 4.8 | M10 | 1000 | Strength class 4.8 in accordance with DIN976-1, zinc coated | |
| 339796 | AM10x2000 4.8 | M10 | 2000 | | |
| 216418 | AM10x3000 4.8 | M10 | 3000 | | |
| 339797 | AM12x1000 4.8 | M12 | 1000 | | |
| 216420 | AM12x2000 4.8 | M12 | 2000 | | |
| 216421 | AM12x3000 4.8 | M12 | 3000 | | |
| 407497 | AM 8.8 M10x1000 | M10 | 1000 | Strength class 8.8 in accordance with DIN976-1, zinc coated |  |
| 2008566 | AM 8.8 M10x3000 | M10 | 3000 | | |
| 407498 | AM 8.8 M12x1000 | M12 | 1000 | | |
| 2008567 | AM 8.8 M12x3000 | M12 | 3000 | | |
| 58670 | AM10x1000 A4-70 | M10 | 1000 | Strength class A4-70 in accordance with DIN976-1, Stainless steel | |
| 58707 | AM10x3000 A4-70 | M10 | 3000 | | |
| 58671 | AM12x1000 A4-70 | M12 | 1000 | | |
| 58709 | AM12x3000 A4-70 | M12 | 3000 | | |

**Hilti MT frame trapezes with load introduction component**

**Product Description**
Dimensions and materials

**Annex A11**

**Table A14:** **Dimensions and materials of Hilti hexagonal nuts for use with Hilti frame trapezes of MT System**
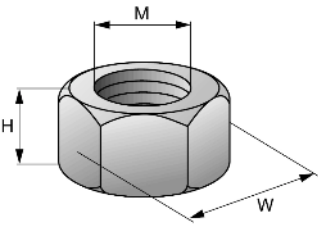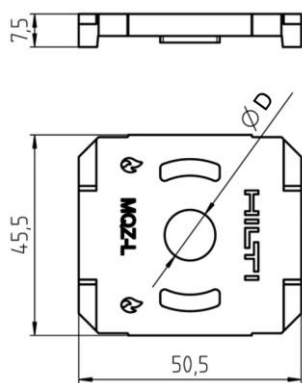
| Illustration (Dimensions in mm) | Item number | Designation | M thread | W [mm] | H [mm] | Material and coating |
|---|---|---|---|---|---|---|
| | 216466 | M10 hexagonal nut | M10 | 17 | 8 | Strength class 8 in accordance with DIN 934, zinc coated |
| | 2184554 | M12 hexagonal nut | M12 | 19 | 10 | |
| | 2184474 | M10 hexagonal nut | M10 | 17 | 8 | Strength class 70 in accordance with DIN 934, stainless steel |
| | 2184475 | M12 hexagonal nut | M12 | 19 | 10 | |

**Table A15:** **Geometry and dimensions of MQZ-L11 and MQZ-L13 drilled plates for use with Hilti trapeze frames of MT System**

| Item number | Designation | D [mm] | Materials | Illustration (Dimensions in mm) |
|---|---|---|---|---|
| 2199455 | MQZ-L11 | 11,5 | S235JR in accordance with DIN EN 10025-2 | |
| 2199456 | MQZ-L13 | 13,5 | | |

**Hilti MT frame trapezes with load introduction component**

**Product Description**
Dimensions and materials

**Annex A12**

**Specification of intended use**

- Hilti frame trapezes of MT System are used to transfer building services component loads such as ducts and equipment for sprinklers, wafter, heating, cooling, ventilation, electrical and other systems in case of fire.

- Hilti frame trapezes of MT System are performing this loadbearing function under the conditions described in Section 2 of this European Technical Assessment.

- The resistance and deformation in case of fire are referring to the boundary conditions of the standard temperature / time curve (STTC) in accordance with EN 1363-1.

- The resistance of Hilti frame trapezes of MT System in case of fire applies for static and centric actions according to Annex C.

- Prior to installation, it has to be ensured that the component to be supported by the frame trapeze, the anchoring of the frame trapeze to the base material and the base material itself are suitable to withstand the resistance values given in Annex C in this European Technical Assessment in case of fire.

- MT-C-GS OC connector is made of zinc coated steel. Two leg angles are arranged at 90 ° between each other and with stiffening ribs. Various openings in different size and shape are located on the leg angles.

- MT-C-GSP L A OC connector is made of flat zinc coated steel in L-shape with 6 openings in total.

- MT-AB A set and MT-AB A OC set connectors are made of zinc coated steel. The connectors are in U-shape with two parallel flanges in trapezoid shape and in total with 5 openings.

- The Hilti channel connectors MT-TL M10 and MT-TL M10 OC, and MT-TFB OC are used to fix the channels to connectors or baseplates and transfer the loads. MT-TL M10 and MT-TL M10 OC channels connectors are used for open profile MT channels. MT-TFB OC thread forming bolts are used for closed profile MT channels.

- The Hilti channel connectors are suitable for undertaking this load-transfering function under the conditions described in Section 2 of this European Technical Assessment.

- The nuts MT-TL M10 and MT-TL M10 OC are connected to the installation channel according to the manufacturers instructions (see Figure A1) and the attached component by tightening an appropriate bolt acc. to Table A10 and A11. Installation torque for MT-TL M10 a is 30 Nm, for MT-TL M10 OC is 40 Nm (see Table B4).
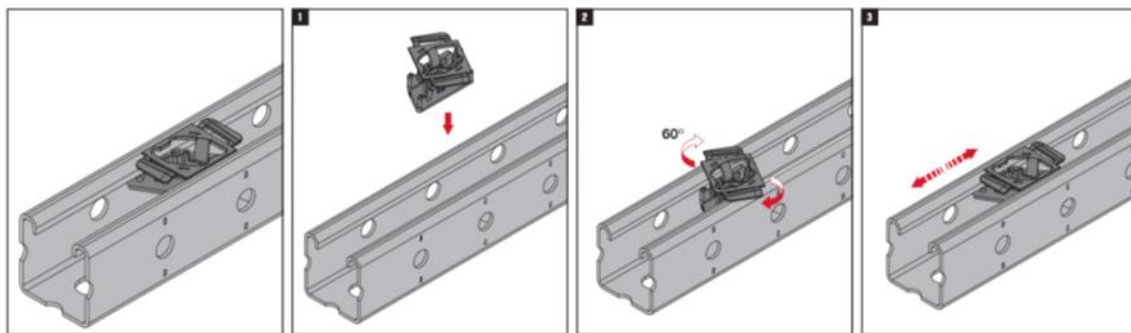


**Figure A1:    Installation instructions for Hilti channel connectors MT-TL M10 and MT-TL M10 OC**

- The required torques may be applied with electrical or non-electrical devices.MT-TFB OC thread forming bolts is used to screw together installation channels and attached angle connectors or base connectors by screwing them together through the appropriate openings of these components. For the thread forming bolt MT-TFB OC a torque of 60 Nm applies.

| Hilti MT frame trapezes with load introduction component | |
|---|---|
| **Description of products for intended use** | **Annex A13** |
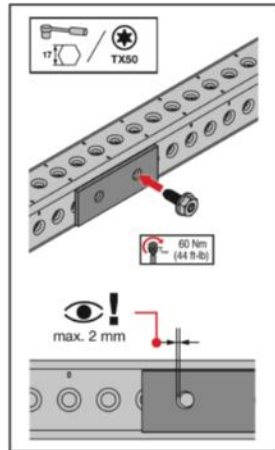
**Figure A2:**    **Installation instructions for Hilti MT-TFB OC thread forming bolts**

- The MT installation open profile channels and closed profiles (girders) can be cut along the entire length following the manufacturers instructions without compromising the declared performances.

- Hilti Installation channels are used in combination with Hilti channel connectors and are cut to length centrally between the longholes or the roundholes at the installation channel marking.

- For girders the distance between the cut of the girder and start of the dome shaped hole has to be at a minimum distance of 10 mm.
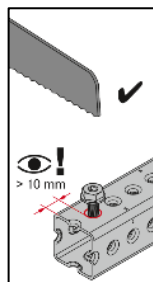


- For channels the distance between the cut of the channel and center of the closest hole has to be at a minimum distance of 25 mm.
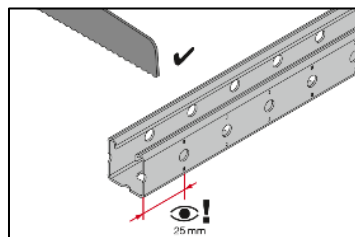


| **Hilti MT frame trapezes with load introduction component** | |
| --- | --- |
| **Description of products for intended use** | **Annex A14** |

- The fastening of the base connector to the base material is made with appropriate anchors. The anchoring used with the base material must be suitable and have a fireproof certificate.

- The cross section and material properties of the channels are shown in Annex B3.

- The Hilti frame trapezes of MT System must be installed by appropriately qualified personnel and under the supervision of the site manager. The general installation instructions of the manufacturer apply.

**Hilti MT frame trapezes with load introduction component**

**Description of products for intended use**

**Annex A15**

**Figure A3:   Hilti frame trapeze of MT System with load introduction components, MT-50 and MT-40D channels**
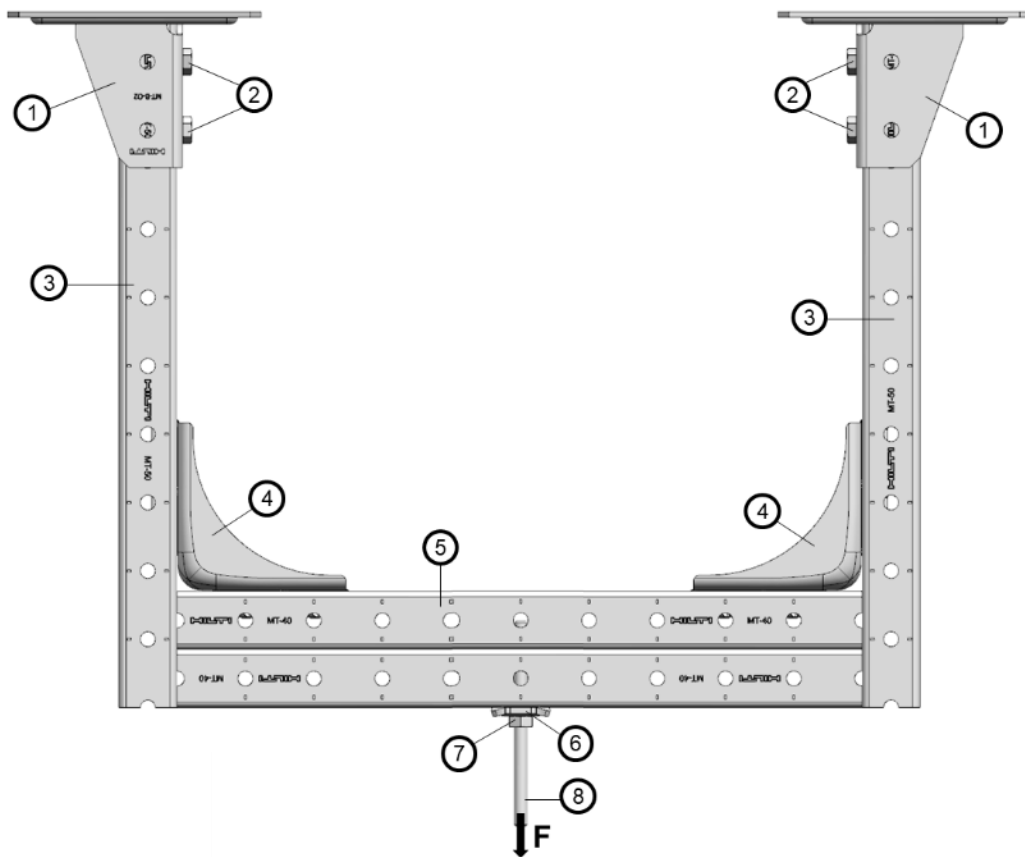


| Legend | | Annex |
|---|---|---|
| 1 | MT-B-O2, MT-B-O4, MT-B-T, or MT-AB A set baseplates | Annex A5 |
| 2 | MT-TL M10 with MT-TLB channel connectors | Annex A7 and A8 |
| 3 | MT-50 | Annex A1 |
| 4 | MT-C-GS OC | Annex A10 |
| 5 | MT-40D | Annex A1 |
| 6 | MQA-B saddle nut or threaded rod with MQZ-L drilled plates | Annex A2, A3 and A13 |
| 7 | hexagonal nut | Annex A13 |
| 8 | Threaded rod | Annex A12 |
| F | applied load | |

| Hilti MT frame trapezes with load introduction component | |
|---|---|
| Description of products for intended use | **Annex A16** |

**Figure A4: Hilti frame trapeze of MT System with load introduction components, MT-50 and MT-50 channels**
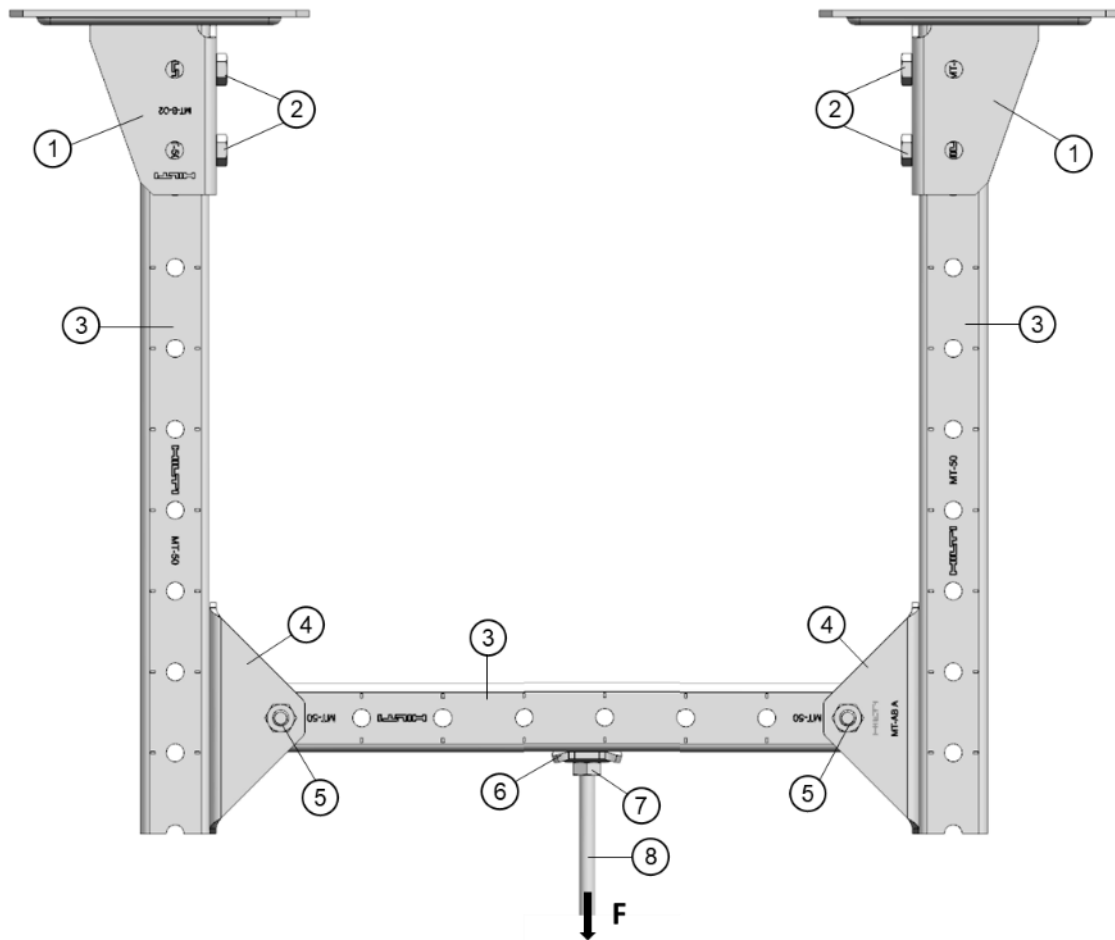


**Legend**

| | | Annex |
|---|---|---|
| 1 | MT-B-O2, MT-B-O4, MT-B-T or MT-AB A set baseplates | Annex A5 |
| 2 | MT-TL M10 with MT-TLB channel connectors | Annex A7 and A8 |
| 3 | MT-50 | Annex A1 |
| 4 | MT-AB A set | Annex A11 |
| 5 | M10 8.8 bolt with M10 hexagonal nut as part of MT-AB A set | Annex A11 |
| 6 | MQA-B saddle nut | Annex A2, A3 and A13 |
| 7 | hexagonal nut | Annex A13 |
| 8 | Threaded rod | Annex A12 |
| F | applied load | |

| Hilti MT frame trapezes with load introduction component | |
|---|---|
| Description of products for intended use | **Annex A17** |

**Figure A5:  Hilti frame trapeze of MT System with load introduction components, closed profiles**
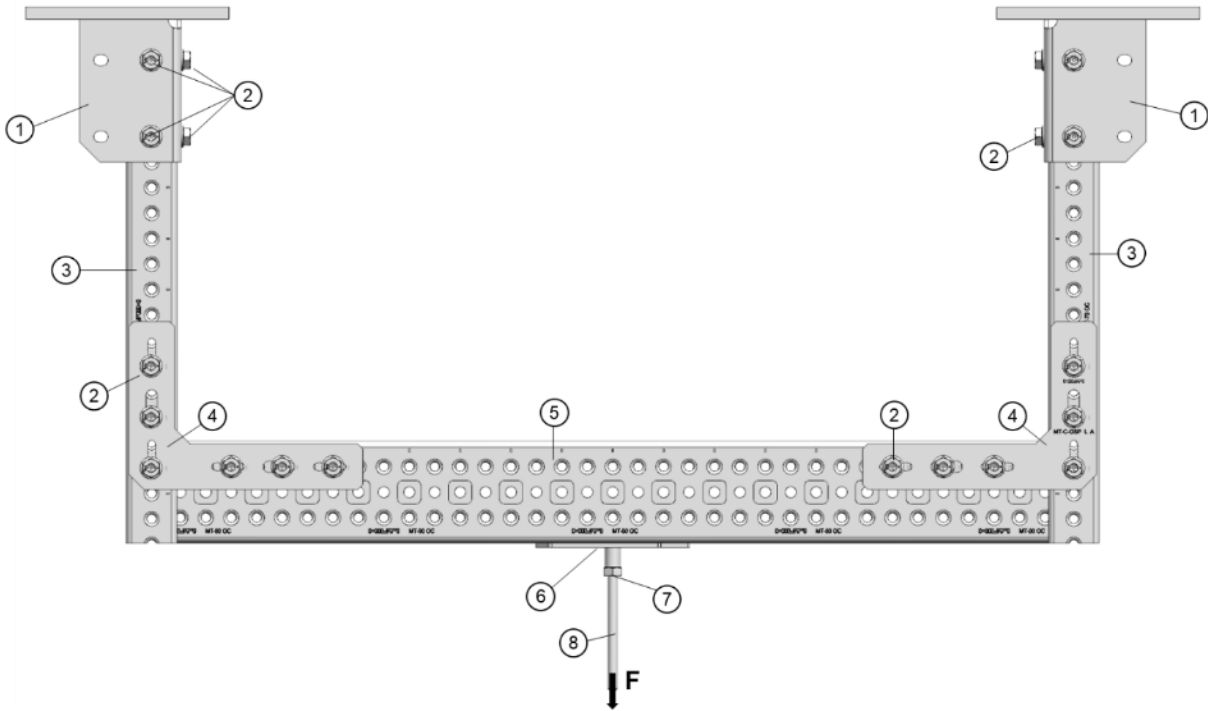


| Legend | | Annex |
|---|---|---|
| 1 | MT-B-GS T OC or MT-B-GS O4U OC | Annex A6 |
| 2 | MT-TFB | Annex A7 |
| 3 | MT-70 | Annex A1 |
| 4 | MT-C-GSP L A OC | Annex A10 |
| 5 | MT-70 OC or MT-80 OC | Annex A1 |
| 6 | MT-PCC-G | Annex A5 |
| 7 | hexagonal nut | Annex A13 |
| 8 | Threaded rod | Annex A12 |
| F | applied load | |

| Hilti MT frame trapezes with load introduction component | |
|---|---|
| Description of products for intended use | **Annex A18** |

**Table B1:** **Installation torque of MT-TLB bolt in combination with MT-TL M10 and MT-TL M10 OC**
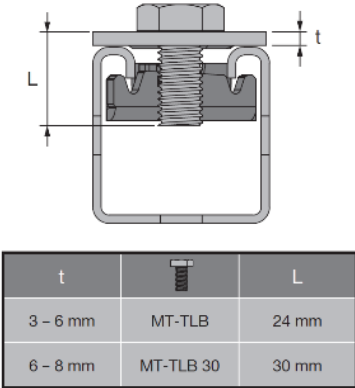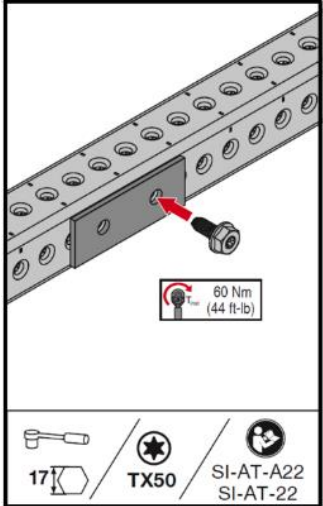
| Item number | Designation | Installation torque | Illustration |
|---|---|---|---|
| 2272080 | MT-TL M10 | 30 Nm | |
| 2272082 | MT-TL M10 OC | 40 Nm | |

| t | | L |
|---|---|---|
| 3 – 6 mm | MT-TLB | 24 mm |
| 6 – 8 mm | MT-TLB 30 | 30 mm |

**Table B2:** **Installation torque of MT-TFB OC thread forming bolt combination with MT-70 and MT-80 installation channel families**
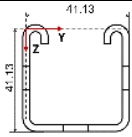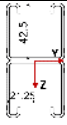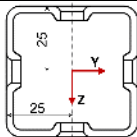
| Item number | Designation | Installation torque | Illustration |
|---|---|---|---|
| 2272084 | MT-TFB OC | 60 Nm | |

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| Hilti MT-TL and M channel connectors for use with MT frame trapezes | |
|---|---|
| **Requirements for performance assessment** | **Annex B1** |

**Table B3: Properties of the cross section of Hilti channels MT-50 S, MT-50 S OC, MT-50, MT-50 OC, MT-60 S, MT-60 S OC, MT-60, MT-60 OC, MT-70 S OC, MT-70 OC, MT-80 S OC and MT-80 OC**

| Description | Symbol | Unit | MT-50 S / MT-50 / MT-50 U / MT-50 S OC / MT-50 OC | MT-40D S / MT-40D / MT-40D S OC / MT-40D OC | MT-70 S OC / MT-70 OC | MT-80 S OC / MT-80 OC |
|---|---|---|---|---|---|---|
| Cross section (dimensions in mm) | - | - | | | | |
| Classification cross section in accordance with EN 1993-1-1 | - | - | 3 | 3 | 3 | 3 |
| Cross section areas | $A$ | cm$^2$ | 2.77 | 4.31 | 4.32 | 5.96 |
| | $A_{tot}$ | cm$^2$ | 2.77 | 4.31 | 4.32 | 5.96 |
| Shear areas | $A_y$ | cm$^2$ | NPA | NPA | NPA | NPA |
| | $A_z$ | cm$^2$ | NPA | NPA | NPA | NPA |
| Centroid position | $y_{C,0}$ | cm | 1.99 | 0.00 | 0.00 | 0.00 |
| | $z_{C,0}$ | cm | 2.07 | 0.00 | 0.00 | 0.00 |
| Moments of inertia | $I_y$ | cm$^4$ | 7.07 | 30.13 | 15.96 | 88.39 |
| | $I_z$ | cm$^4$ | 8.30 | 13.22 | 15.96 | 24.61 |
| Polar moments of inertia | $I_p$ | cm$^4$ | 15.36 | 43.35 | 31.93 | 113.00 |
| | $I_{p,M}$ | cm$^4$ | 66.91 | 43.35 | 31.93 | 113.00 |
| Radii of gyration | $i_y$ | cm | 1.60 | 2.64 | 1.92 | 3.85 |
| | $i_z$ | cm | 1.73 | 1.75 | 1.92 | 2.03 |
| Polar radii of gyration | $i_p$ | cm | 2.35 | 3.17 | 2.72 | 4.36 |
| | $i_{p,M}$ | cm | 4.91 | 3.17 | 2.72 | 4.36 |
| Warping radius of gyration | $i_{\omega,M}$ | cm | NPA | NPA | NPA | NPA |
| Torsional constant | $J$ | cm$^4$ | NPA | NPA | NPA | NPA |
| Secondary torsional constant | $J_s$ | cm$^4$ | NPA | NPA | NPA | NPA |
| Location of the shear center | $y_{M,0}$ | cm | NPA | NPA | NPA | NPA |
| | $z_{M,0}$ | cm | NPA | NPA | NPA | NPA |
| | $y_M$ | cm | NPA | NPA | NPA | NPA |
| | $z_M$ | cm | NPA | NPA | NPA | NPA |
| Warping constants | $I_{\omega,C}$ | cm$^6$ | NPA | NPA | NPA | NPA |
| | $I_{\omega,M}$ | cm$^6$ | NPA | NPA | NPA | NPA |
| Section moduli | $S_{y,max}$ | cm$^3$ | 3.46 | 7.09 | 6.39 | 17.68 |
| | $S_{y,min}$ | cm$^3$ | -3.21 | -7.09 | -6.39 | -17.68 |
| | $S_{z,max}$ | cm$^3$ | 3.90 | 6.22 | 6.39 | 9.84 |
| | $S_{z,min}$ | cm$^3$ | -3.90 | -6.22 | -6.39 | -9.84 |
| Torsional section modulus | $S_t$ | cm$^3$ | NPA | NPA | NPA | NPA |
| Max. plastic bending moment | $M_{pl,y,k}$ | kNm | NPA | NPA | NPA | NPA |
| | $M_{pl,z,k}$ | kNm | NPA | NPA | NPA | NPA |
| Max. plastic section moduli | $Z_y$ | cm$^3$ | NPA | NPA | NPA | NPA |
| | $Z_z$ | cm$^3$ | NPA | NPA | NPA | NPA |
| Plastic shear areas | $A_{pl,y}$ | cm$^2$ | NPA | NPA | NPA | NPA |
| | $A_{pl,z}$ | cm$^2$ | NPA | NPA | NPA | NPA |
| Area bisecting axis position | $f_{y,0}$ | cm | NPA | NPA | NPA | NPA |
| | $f_{z,0}$ | cm | NPA | NPA | NPA | NPA |
| Plastic shear forces | $V_{pl,y,k}$ | kN | NPA | NPA | NPA | NPA |
| | $V_{pl,z,k}$ | kN | NPA | NPA | NPA | NPA |
| Plastic axial forces | $N_{pl,k}$ | kN | NPA | NPA | NPA | NPA |
| Buckling curves | $BC_y$ | - | c | c | c | c |
| | $BC_z$ | - | c | c | c | c |

**Properties of Hilti MT-50, MT-40D, MT-70 and MT-80 channel cross sections**

| Requirements for performance assessment | Annex B2 |
|---|---|

**Figure C1:** **Definition of Hilti MT-B-GS T OC and MT-B-GS O4U OC baseplate local coordinate System for use with Hilti MT-70 S OC, MT-70 OC, MT-80 S OC and MT-80 OC installation channels**



**Table C2:** **Resistance $F_{Rk,t}$ and $M_{Rk,t}$ in case of fire after t = 30, 60, 90 and 120 minutes of Hilti MT-B-GS T OC and MT-B-GS O4U OC baseplate in combination with Hilti MT-70 S OC, MT-70 OC, MT-80 S OC and MT-80 OC installation channels**

| t | $+F_{x,Rk,t}$ | $-F_{x,Rk,t}$ | $+F_{y,Rk,t}$ | $-F_{y,Rk,t}$ | $+F_{z,Rk,t}$ | $-F_{z,Rk,t}$ | $+M_{x,Rk,t}$ | $-M_{x,Rk,t}$ | $+M_{y,Rk,t}$ | $-M_{y,Rk,t}$ | $+M_{z,Rk,t}$ | $-M_{z,Rk,t}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| min | N | N | N | N | N | N | Nm | Nm | Nm | Nm | Nm | Nm |
| 30 | 3500,0 | | 3600,0 | 3600,0 | 3600,0 | 3600,0 | | | 421,9 | 421,9 | 421,9 | 421,9 |
| 60 | 3500,0 | NPA | 2786,9 | 2786,9 | 2786,9 | 2786,9 | NPA | NPA | 337,5 | 337,5 | 337,5 | 337,5 |
| 90 | 3500,0 | | 2500,0 | 2500,0 | 2250,0 | 2500,0 | | | 337,5 | 337,5 | 337,5 | 337,5 |
| 120 | 3500,0 | | 2500,0 | 2500,0 | 2250,0 | 2500,0 | | | 337,5 | 337,5 | 337,5 | 337,5 |

| | |
|---|---|
| **Characteristic resistance of Hilti MT-B-GS T OC baseplate in case of fire** | **Annex C1** |
| **Characteristic resistance of Hilti frame trapeze in case of fire** | |

**Figure C25: Definition of Hilti MT-AB A set and MT-AB A OC set local coordinate System for use with Hilti MT-50 S, MT-50, MT-50 S OC and MT-50 OC installation channels**



**Table C3:** Resistance $F_{Rk,t}$ and $M_{Rk,t}$ in case of fire after t = 30, 60, 90 and 120 minutes of Hilti MT-AB A and MT-AB A OC angel brace as baseplate application in combination with Hilti MT-50 S, MT-50, MT-50 S OC and MT-50 OC installation channels

| t | $+F_{x,Rk,t}$ | $-F_{x,Rk,t}$ | $+F_{y,Rk,t}$ | $-F_{y,Rk,t}$ | $+F_{z,Rk,t}$ | $-F_{z,Rk,t}$ | $+M_{x,Rk,t}$ | $-M_{x,Rk,t}$ | $+M_{y,Rk,t}$ | $-M_{y,Rk,t}$ | $+M_{z,Rk,t}$ | $-M_{z,Rk,t}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| min | N | N | N | N | N | N | Nm | Nm | Nm | Nm | Nm | Nm |
| 30 | 3600,0 | | 3165,1 | 3165,1 | | | | | | | | |
| 60 | 2302,5 | NPA | 1627,8 | 1627,8 | NPA | NPA | NPA | NPA | NPA | NPA | NPA | NPA |
| 90 | 1804,0 | | 1115,4 | 1115,4 | | | | | | | | |
| 120 | 1554,8 | | 859,1 | 859,1 | | | | | | | | |

**Figure C3:** Definition of Hilti MT-B O2, MT-B O2 OC, MT-B O4, MT-B O4 OC, MT-B O2B and MT-B O2B OC baseplate local coordinate System for use with Hilti MT-50 S, MT-50, MT-50 S OC and MT-50 OC installation channels



**Table C4:** Resistance $F_{Rk,t}$ and $M_{Rk,t}$ in case of fire after t = 30, 60, 90 and 120 minutes of Hilti MT-B O2, MT-B O2 OC, MT-B O4, MT-B O4 OC, MT-B O2B and MT-B O2B OC baseplate in combination with Hilti MT-50 S, MT-50, MT-50 S OC and MT-50 OC installation channels

| t | $+F_{x,Rk,t}$ | $-F_{x,Rk,t}$ | $+F_{y,Rk,t}$ | $-F_{y,Rk,t}$ | $+F_{z,Rk,t}$ | $-F_{z,Rk,t}$ | $+M_{x,Rk,t}$ | $-M_{x,Rk,t}$ | $+M_{y,Rk,t}$ | $-M_{y,Rk,t}$ | $+M_{z,Rk,t}$ | $-M_{z,Rk,t}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| min | N | N | N | N | N | N | Nm | Nm | Nm | Nm | Nm | Nm |
| 30 | 2250,0 | | 1338,0 | 1338,0 | 1216,8 | 1338,0 | | | 134,0 | 134,0 | 134,0 | 134,0 |
| 60 | 1000,0 | NPA | 793,3 | 793,3 | 450,0 | 793,3 | NPA | NPA | 64,6 | 64,6 | 64,6 | 64,6 |
| 90 | 1000,0 | | 611,7 | 611,7 | 450,0 | 611,7 | | | 64,6 | 64,6 | 64,6 | 64,6 |
| 120 | 1000,0 | | 521,0 | 521,0 | 450,0 | 521,0 | | | 64,6 | 64,6 | 64,6 | 64,6 |

| Characteristic resistance of Hilti MT-AB A set and MT-B-O2baseplate in case of fire | |
|---|---|
| **Characteristic resistance of Hilti frame trapeze in case of fire** | **Annex C2** |

**Figure C4:** **Definition of Hilti MT-B T and MT-B T OC baseplate local coordinate System for use with Hilti MT-50 S, MT-50, MT-50 S OC and MT-50 OC installation channels**



**Table C5:** **Resistance $F_{Rk,t}$ and $M_{Rk,t}$ in case of fire after t = 30, 60, 90 and 120 minutes of Hilti MT-B T and MT-B T OC, baseplate in combination with Hilti MT-50 S, MT-50, MT-50 S OC and MT-50 OC installation channels**

| t | $+F_{x,Rk,t}$ | $-F_{x,Rk,t}$ | $+F_{y,Rk,t}$ | $-F_{y,Rk,t}$ | $+F_{z,Rk,t}$ | $-F_{z,Rk,t}$ | $+M_{x,Rk,t}$ | $-M_{x,Rk,t}$ | $+M_{y,Rk,t}$ | $-M_{y,Rk,t}$ | $+M_{z,Rk,t}$ | $-M_{z,Rk,t}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| min | N | N | N | N | N | N | Nm | Nm | Nm | Nm | Nm | Nm |
| 30 | 1160,5 | | 1232,2 | 1232,2 | | | | | | | 84,4 | 84,4 |
| 60 | 623,0 | NPA | 756,3 | 756,3 | NPA | NPA | NPA | NPA | NPA | NPA | 0,0 | 0,0 |
| 90 | 500,0 | | 597,6 | 597,6 | | | | | | | 0,0 | 0,0 |
| 120 | 500,0 | | 518,3 | 518,3 | | | | | | | 0,0 | 0,0 |

| | |
|---|---|
| **Characteristic resistance of Hilti MT-B-T baseplate in case of fire** | |
| **Characteristic resistance of Hilti frame trapeze in case of fire** | **Annex C3** |

**Figure C5:** Definition of Hilti MT-C-GSP L A OC connector local coordinate System and viewpoints for use with Hilti MT-70 S OC, MT-70 OC, MT-80 S OC and MT-80 OC installation channels



**Table C6:** Resistance $F_{Rk,t}$ and $M_{Rk,t}$ in case of fire after t = 30, 60, 90 and 120 minutes of Hilti MT-C-GSP L A OC connector in combination with Hilti MT-70 S OC and MT-70 OC installation channels, view A-A

| t | +$F_{x,Rk,t}$ | -$F_{x,Rk,t}$ | +$F_{y,Rk,t}$ | -$F_{y,Rk,t}$ | +$F_{z,Rk,t}$ | -$F_{z,Rk,t}$ | +$M_{x,Rk,t}$ | -$M_{x,Rk,t}$ | +$M_{y,Rk,t}$ | -$M_{y,Rk,t}$ | +$M_{z,Rk,t}$ | -$M_{z,Rk,t}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| min | N | N | N | N | N | N | Nm | Nm | Nm | Nm | Nm | Nm |
| 30 | 3200 | | | | | 2000 | | | 140 | | | |
| 60 | 3200 | NPA | NPA | NPA | NPA | 2000 | NPA | NPA | 140 | NPA | NPA | NPA |
| 90 | 3200 | | | | | 2000 | | | 140 | | | |
| 120 | 3200 | | | | | 2000 | | | 140 | | | |

**Table C7:** Resistance $F_{Rk,t}$ and $M_{Rk,t}$ in case of fire after t = 30, 60, 90 and 120 minutes of Hilti MT-C-GSP L A OC connector in combination with Hilti MT-70 S OC and MT-70 OC installation channels, view B-B

| t | +$F_{x,Rk,t}$ | -$F_{x,Rk,t}$ | +$F_{y,Rk,t}$ | -$F_{y,Rk,t}$ | +$F_{z,Rk,t}$ | -$F_{z,Rk,t}$ | +$M_{x,Rk,t}$ | -$M_{x,Rk,t}$ | +$M_{y,Rk,t}$ | -$M_{y,Rk,t}$ | +$M_{z,Rk,t}$ | -$M_{z,Rk,t}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| min | N | N | N | N | N | N | Nm | Nm | Nm | Nm | Nm | Nm |
| 30 | | 3000 | | | 3200 | | | | | 140 | | |
| 60 | NPA | 3000 | NPA | NPA | 3200 | NPA | NPA | NPA | NPA | 140 | NPA | NPA |
| 90 | | 3000 | | | 3200 | | | | | 140 | | |
| 120 | | 3000 | | | 3200 | | | | | 140 | | |

| Characteristic resistance of Hilti MT-C-GSP L A OC connector in case of fire | |
|---|---|
| Characteristic resistance of Hilti frame trapeze in case of fire | **Annex C4** |

**Table C8:** Resistance $F_{Rk,t}$ and $M_{Rk,t}$ in case of fire after t = 30, 60, 90 and 120 minutes of Hilti MT-C-GSP L A OC connector in combination with Hilti MT-70 S OC, MT-70 OC and MT-80 C OC and MT-80 OC installation channels, view A-A

| t | $+F_{x,Rk,t}$ | $-F_{x,Rk,t}$ | $+F_{y,Rk,t}$ | $-F_{y,Rk,t}$ | $+F_{z,Rk,t}$ | $-F_{z,Rk,t}$ | $+M_{x,Rk,t}$ | $-M_{x,Rk,t}$ | $+M_{y,Rk,t}$ | $-M_{y,Rk,t}$ | $+M_{z,Rk,t}$ | $-M_{z,Rk,t}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| min | N | N | N | N | N | N | Nm | Nm | Nm | Nm | Nm | Nm |
| 30 | 3200 | NPA | NPA | NPA | NPA | 1500 | NPA | NPA | 140 | NPA | NPA | NPA |
| 60 | 3200 | | | | | 1500 | | | 140 | | | |
| 90 | 3200 | | | | | 1500 | | | 140 | | | |
| 120 | 3200 | | | | | 1500 | | | 140 | | | |

**Table C9:** Resistance $F_{Rk,t}$ and $M_{Rk,t}$ in case of fire after t = 30, 60, 90 and 120 minutes of Hilti MT-C-GSP L A OC connector in combination with Hilti MT-70 S OC, MT-70 OC and MT-80 C OC and MT-80 OC installation channels, view B-B

| t | $+F_{x,Rk,t}$ | $-F_{x,Rk,t}$ | $+F_{y,Rk,t}$ | $-F_{y,Rk,t}$ | $+F_{z,Rk,t}$ | $-F_{z,Rk,t}$ | $+M_{x,Rk,t}$ | $-M_{x,Rk,t}$ | $+M_{y,Rk,t}$ | $-M_{y,Rk,t}$ | $+M_{z,Rk,t}$ | $-M_{z,Rk,t}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| min | N | N | N | N | N | N | Nm | Nm | Nm | Nm | Nm | Nm |
| 30 | NPA | 1500 | NPA | NPA | 2900 | NPA | NPA | NPA | NPA | 140 | NPA | NPA |
| 60 | | 1500 | | | 2900 | | | | | 140 | | |
| 90 | | 1500 | | | 2900 | | | | | 140 | | |
| 120 | | 1500 | | | 2900 | | | | | 140 | | |

| Characteristic resistance of Hilti MT-C-GSP L A OC connector in case of fire | |
|---|---|
| **Characteristic resistance of Hilti frame trapeze in case of fire** | **Annex C5** |

**Figure C6:** **Definition of Hilti MT-AB A set and MT-AB A OC set local coordinate System and viewpoints for use with Hilti MT-50 S, MT-50, MT-50 S OC and MT-50 OC installation channels**
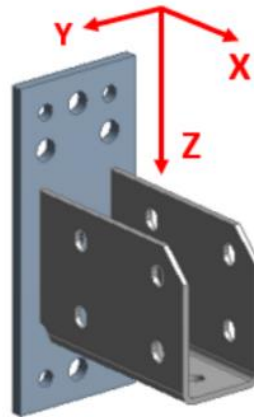


**Table C10:** **Resistance $F_{Rk,t}$ and $M_{Rk,t}$ in case of fire after t = 30, 60, 90 and 120 minutes of Hilti MT-AB A set and MT-AB A OC set angel brace used as connector in combination with Hilti MT-50 S, MT-50, MT-50 S OC and MT-50 OC installation channels, view A-A**

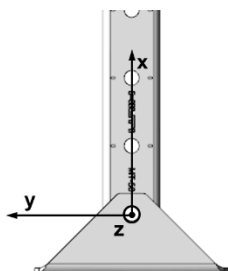| t | $+F_{x,Rk,t}$ | $-F_{x,Rk,t}$ | $+F_{y,Rk,t}$ | $-F_{y,Rk,t}$ | $+F_{z,Rk,t}$ | $-F_{z,Rk,t}$ | $+M_{x,Rk,t}$ | $-M_{x,Rk,t}$ | $+M_{y,Rk,t}$ | $-M_{y,Rk,t}$ | $+M_{z,Rk,t}$ | $-M_{z,Rk,t}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| min | N | N | N | N | N | N | Nm | Nm | Nm | Nm | Nm | Nm |
| 30 | 1566,1 | | | 1750,0 | | | | | | | | |
| 60 | 808,1 | NPA | NPA | 926,1 | NPA | NPA | NPA | NPA | NPA | NPA | NPA | NPA |
| 90 | 555,5 | | | 647,3 | | | | | | | | |
| 120 | 429,2 | | | 507,9 | | | | | | | | |

**Table C11:** **Resistance $F_{Rk,t}$ and $M_{Rk,t}$ in case of fire after t = 30, 60, 90 and 120 minutes of Hilti MT-AB A set and MT-AB A OC set angel brace used as connector in combination with Hilti MT-50 S, MT-50, MT-50 S OC and MT-50 OC installation channels, view B-B**

| t | $+F_{x,Rk,t}$ | $-F_{x,Rk,t}$ | $+F_{y,Rk,t}$ | $-F_{y,Rk,t}$ | $+F_{z,Rk,t}$ | $-F_{z,Rk,t}$ | $+M_{x,Rk,t}$ | $-M_{x,Rk,t}$ | $+M_{y,Rk,t}$ | $-M_{y,Rk,t}$ | $+M_{z,Rk,t}$ | $-M_{z,Rk,t}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| min | N | N | N | N | N | N | Nm | Nm | Nm | Nm | Nm | Nm |
| 30 | | 1566,1 | 1750,0 | | | | | | | | | |
| 60 | NPA | 808,1 | 926,1 | NPA | NPA | NPA | NPA | NPA | NPA | NPA | NPA | NPA |
| 90 | | 555,5 | 647,3 | | | | | | | | | |
| 120 | | 429,2 | 507,9 | | | | | | | | | |

| Characteristic resistance of Hilti MT-AB A set angle brace in case of fire | |
|---|---|
| Characteristic resistance of Hilti frame trapeze in case of fire | **Annex C6** |

**Figure C7:** Definition of Hilti MT-C-GS OC connector local coordinate System and viewpoints for use with vertical Hilti MT-50 S, MT-50, MT-50 S OC or MT-50 OC and horizontal MT-50 S, MT-50, MT-50 S OC, MT-50 OC, MT-40D S, MT-40D, MT-40D S OC or MT-40D OC installation channels
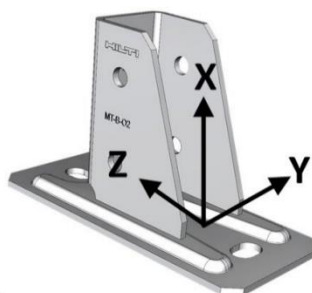


**Table C12:** Resistance $F_{Rk,t}$ and $M_{Rk,t}$ in case of fire after t = 30, 60, 90 and 120 minutes of Hilti MT-C-GS OC connector for use with vertical Hilti MT-50 S, MT-50, MT-50 S OC or MT-50 OC and horizontal MT-50 S, MT-50, MT-50 S OC, MT-50 OC, MT-40D S, MT-40D, MT-40D S OC or MT-40D OC installation channels, view A-A

| t | $+F_{x,Rk,t}$ | $-F_{x,Rk,t}$ | $+F_{y,Rk,t}$ | $-F_{y,Rk,t}$ | $+F_{z,Rk,t}$ | $-F_{z,Rk,t}$ | $+M_{x,Rk,t}$ | $-M_{x,Rk,t}$ | $+M_{y,Rk,t}$ | $-M_{y,Rk,t}$ | $+M_{z,Rk,t}$ | $-M_{z,Rk,t}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| min | N | N | N | N | N | N | Nm | Nm | Nm | Nm | Nm | Nm |
| 30 | 935,5 | | | | | 782,3 | | | 216,0 | | | |
| 60 | 615,9 | NPA | NPA | NPA | NPA | 559,8 | NPA | NPA | 137,7 | NPA | NPA | NPA |
| 90 | 509,3 | | | | | 485,6 | | | 111,6 | | | |
| 120 | 456,1 | | | | | 448,6 | | | 98,6 | | | |

**Table C13:** Resistance $F_{Rk,t}$ and $M_{Rk,t}$ in case of fire after t = 30, 60, 90 and 120 minutes of Hilti MT-C-GS OC connector for use with vertical Hilti MT-50 S, MT-50, MT-50 S OC or MT-50 OC and horizontal MT-50 S, MT-50, MT-50 S OC, MT-50 OC, MT-40D S, MT-40D, MT-40D S OC or MT-40D OC installation channels, view B-B

| t | $+F_{x,Rk,t}$ | $-F_{x,Rk,t}$ | $+F_{y,Rk,t}$ | $-F_{y,Rk,t}$ | $+F_{z,Rk,t}$ | $-F_{z,Rk,t}$ | $+M_{x,Rk,t}$ | $-M_{x,Rk,t}$ | $+M_{y,Rk,t}$ | $-M_{y,Rk,t}$ | $+M_{z,Rk,t}$ | $-M_{z,Rk,t}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| min | N | N | N | N | N | N | Nm | Nm | Nm | Nm | Nm | Nm |
| 30 | | 689,6 | | | 935,5 | | | | | 216,0 | | |
| 60 | NPA | 300,0 | NPA | NPA | 615,9 | NPA | NPA | NPA | NPA | 137,7 | NPA | NPA |
| 90 | | 300,0 | | | 509,3 | | | | | 111,6 | | |
| 120 | | 300,0 | | | 456,1 | | | | | 98,6 | | |

| | |
|---|---|
| **Characteristic resistance of Hilti MT-C-GS connector in case of fire** | |
| **Characteristic resistance of Hilti frame trapeze in case of fire** | **Annex C7** |

**Figure C8:** Definition of Hilti MT-C-GS OC connector local coordinate System and viewpoints for use with vertical Hilti MT-50 S, MT-50, MT-50 S OC or MT-50 OC and horizontal MT-40D S, MT-40D, MT-40D S OC or MT-40D OC installation channels
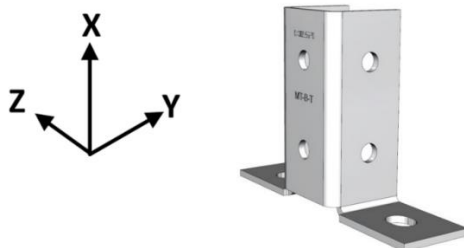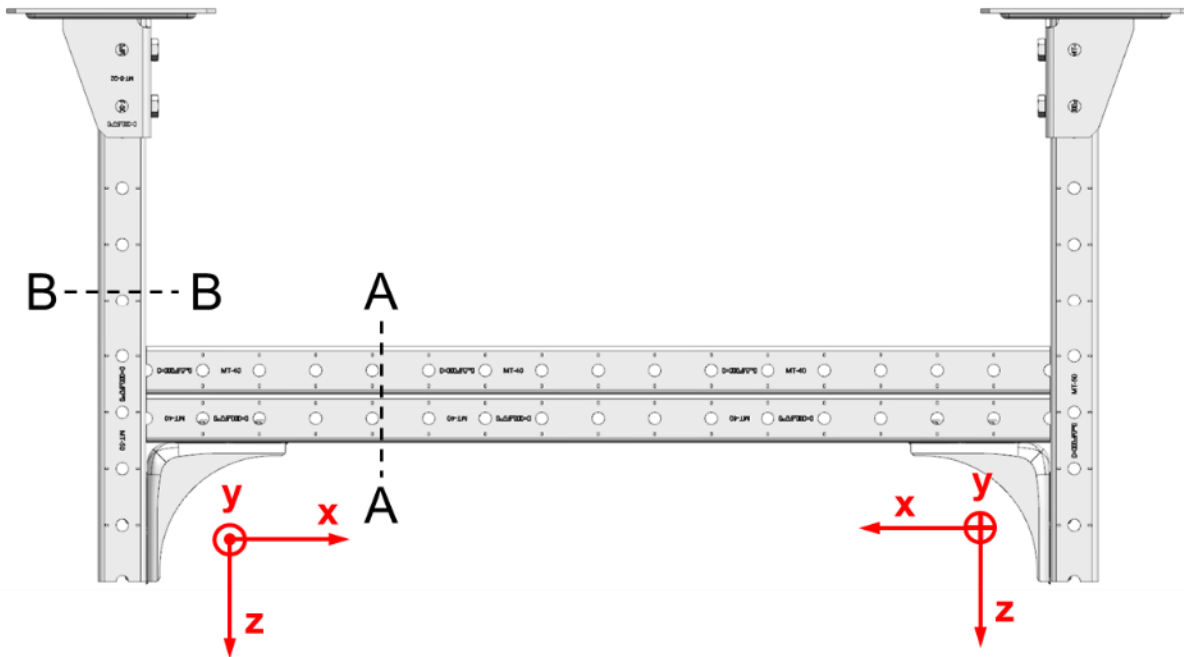


**Table C14:** Resistance $F_{Rk,t}$ and $M_{Rk,t}$ in case of fire after t = 30, 60, 90 and 120 minutes of Hilti MT-C-GS OC connector for use with vertical Hilti MT-50 S, MT-50, MT-50 S OC or MT-50 OC and horizontal MT-40D S, MT-40D, MT-40D S OC or MT-40D OC installation channels, view A-A

| t | $+F_{x,Rk,t}$ | $-F_{x,Rk,t}$ | $+F_{y,Rk,t}$ | $-F_{y,Rk,t}$ | $+F_{z,Rk,t}$ | $-F_{z,Rk,t}$ | $+M_{x,Rk,t}$ | $-M_{x,Rk,t}$ | $+M_{y,Rk,t}$ | $-M_{y,Rk,t}$ | $+M_{z,Rk,t}$ | $-M_{z,Rk,t}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| min | N | N | N | N | N | N | Nm | Nm | Nm | Nm | Nm | Nm |
| 30 | 426,1 | | | | 877,4 | | | | | 125,0 | | |
| 60 | 300,0 | NPA | NPA | NPA | 580,1 | NPA | NPA | NPA | NPA | 0,0 | NPA | NPA |
| 90 | 300,0 | | | | 481,0 | | | | | 0,0 | | |
| 120 | 300,0 | | | | 431,4 | | | | | 0,0 | | |

**Table C15:** Resistance $F_{Rk,t}$ and $M_{Rk,t}$ in case of fire after t = 30, 60, 90 and 120 minutes of Hilti MT-C-GS OC connector for use with vertical Hilti MT-50 S, MT-50, MT-50 S OC or MT-50 OC and horizontal MT-40D S, MT-40D, MT-40D S OC or MT-40D OC installation channels, view B-B

| t | $+F_{x,Rk,t}$ | $-F_{x,Rk,t}$ | $+F_{y,Rk,t}$ | $-F_{y,Rk,t}$ | $+F_{z,Rk,t}$ | $-F_{z,Rk,t}$ | $+M_{x,Rk,t}$ | $-M_{x,Rk,t}$ | $+M_{y,Rk,t}$ | $-M_{y,Rk,t}$ | $+M_{z,Rk,t}$ | $-M_{z,Rk,t}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| min | N | N | N | N | N | N | Nm | Nm | Nm | Nm | Nm | Nm |
| 30 | | 689,6 | | | | 1025,1 | | | 125,0 | | | |
| 60 | NPA | 300,0 | NPA | NPA | NPA | 553,8 | NPA | NPA | 0,0 | NPA | NPA | NPA |
| 90 | | 300,0 | | | | 396,7 | | | 0,0 | | | |
| 120 | | 300,0 | | | | 318,1 | | | 0,0 | | | |

| Characteristic resistance of Hilti MT-C-GS connector in case of fire | |
|---|---|
| Characteristic resistance of Hilti frame trapeze in case of fire | **Annex C8** |

**Figure C9: Definition of Hilti MT-C-GS OC connector local coordinate System and viewpoints for use with Hilti MT-50 S, MT-50, MT-50 S OC and MT-50 OC, installation channels**
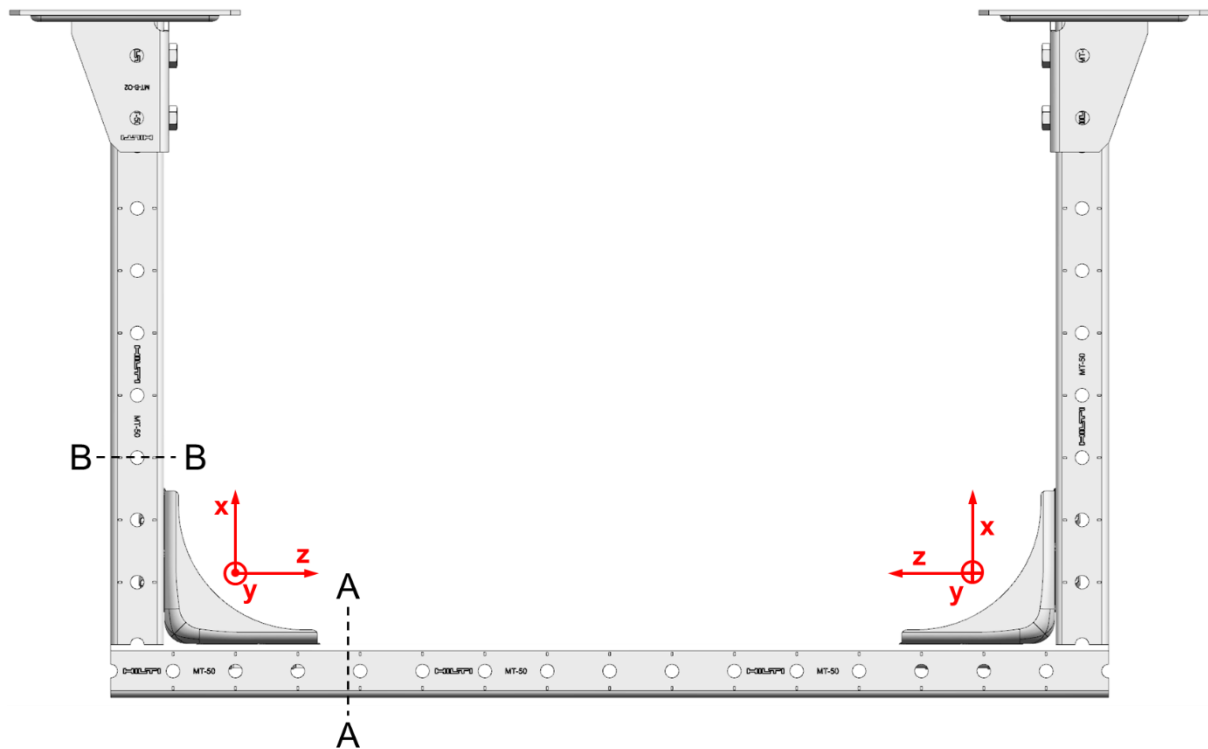


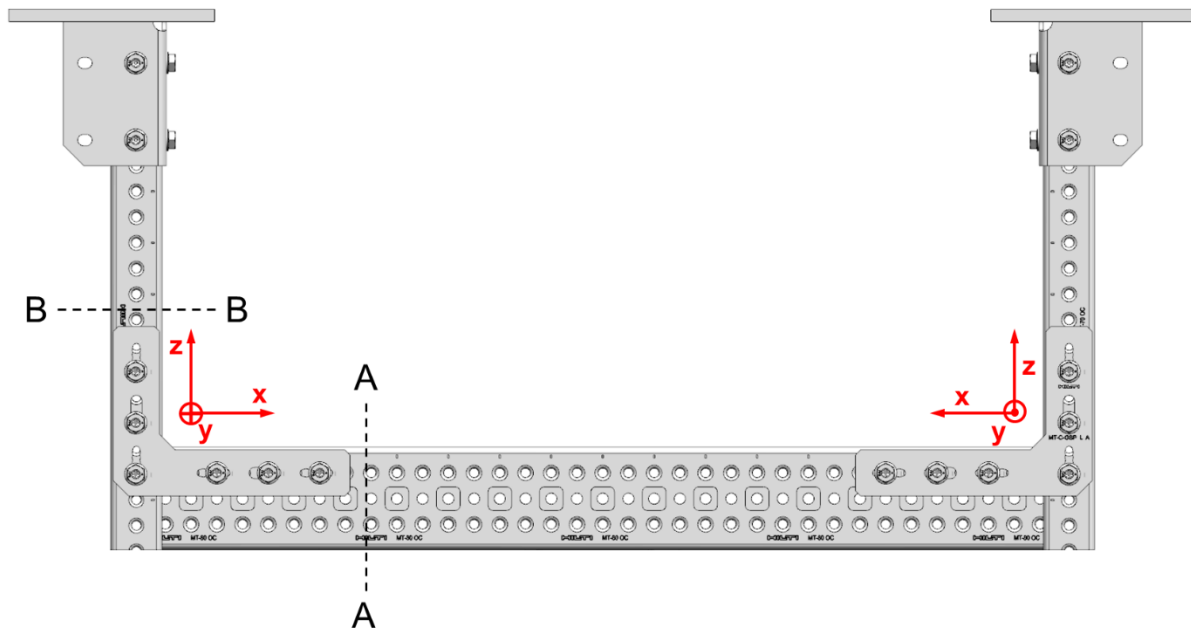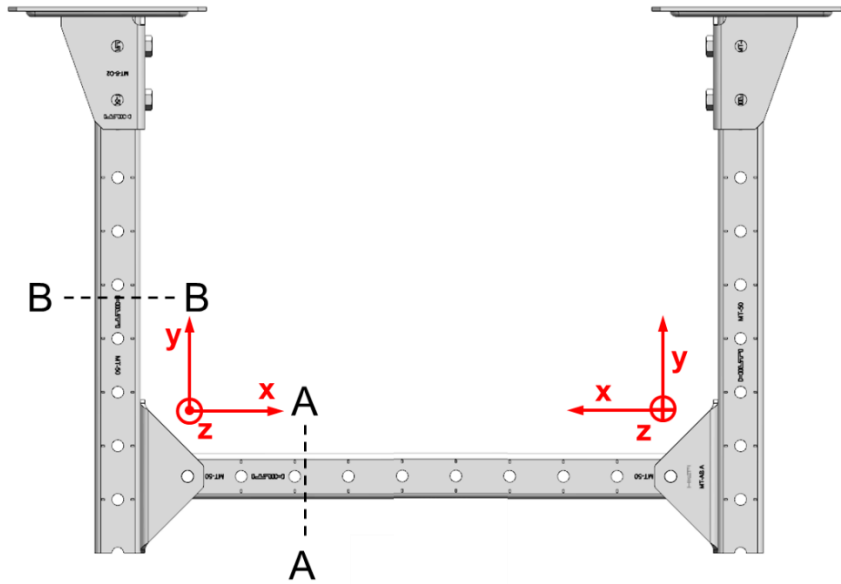**Table C16: Resistance $F_{Rk,t}$ and $M_{Rk,t}$ in case of fire after t = 30, 60, 90 and 120 minutes of Hilti MT-C-GS OC connector in combination with Hilti MT-50 S, MT-50, MT-50 S OC and MT-50 OC installation channels, view A-A**

| t | $+F_{x,Rk,t}$ | $-F_{x,Rk,t}$ | $+F_{y,Rk,t}$ | $-F_{y,Rk,t}$ | $+F_{z,Rk,t}$ | $-F_{z,Rk,t}$ | $+M_{x,Rk,t}$ | $-M_{x,Rk,t}$ | $+M_{y,Rk,t}$ | $-M_{y,Rk,t}$ | $+M_{z,Rk,t}$ | $-M_{z,Rk,t}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| min | N | N | N | N | N | N | Nm | Nm | Nm | Nm | Nm | Nm |
| 30 | | 782,3 | | | 935,5 | | | | | 132,1 | | |
| 60 | NPA | 559,8 | NPA | NPA | 615,9 | NPA | NPA | NPA | NPA | 122,6 | NPA | NPA |
| 90 | | 485,6 | | | 509,3 | | | | | 0,0 | | |
| 120 | | 448,6 | | | 456,1 | | | | | 0,0 | | |

**Table C17: Resistance $F_{Rk,t}$ and $M_{Rk,t}$ in case of fire after t = 30, 60, 90 and 120 minutes of Hilti MT-C-GS OC connector in combination with Hilti MT-50 S, MT-50, MT-50 S OC and MT-50 OC installation channels, view B-B**

| t | $+F_{x,Rk,t}$ | $-F_{x,Rk,t}$ | $+F_{y,Rk,t}$ | $-F_{y,Rk,t}$ | $+F_{z,Rk,t}$ | $-F_{z,Rk,t}$ | $+M_{x,Rk,t}$ | $-M_{x,Rk,t}$ | $+M_{y,Rk,t}$ | $-M_{y,Rk,t}$ | $+M_{z,Rk,t}$ | $-M_{z,Rk,t}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| min | N | N | N | N | N | N | Nm | Nm | Nm | Nm | Nm | Nm |
| 30 | 935,5 | | | | | 782,3 | | | 132,1 | | | |
| 60 | 615,9 | NPA | NPA | NPA | NPA | 559,8 | NPA | NPA | 122,6 | NPA | NPA | NPA |
| 90 | 509,3 | | | | | 485,6 | | | 0,0 | | | |
| 120 | 456,1 | | | | | 448,6 | | | 0,0 | | | |

| Characteristic resistance of Hilti MT-C-GS connector in case of fire | |
|---|---|
| **Characteristic resistance of Hilti frame trapeze in case of fire** | **Annex C9** |

**Figure C10:** **Definition of Hilti MT-C-GS OC connector local coordinate System for use with Hilti MT-50 S, MT-50, MT-50 S OC and MT-50 OC, installation channels**
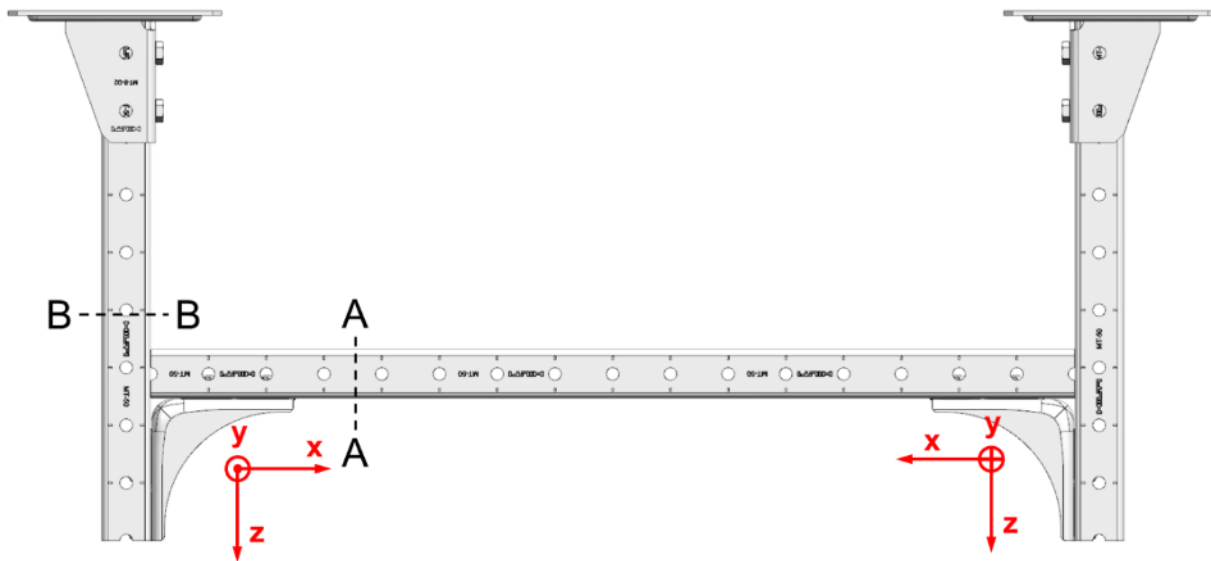


**Table C18:** **Resistance $F_{Rk,t}$ and $M_{Rk,t}$ in case of fire after t = 30, 60, 90 and 120 minutes of Hilti MT-C-GS OC connector in combination with Hilti MT-50 S, MT-50, MT-50 S OC and MT-50 OC installation channels, view A-A**

| t | $+F_{x,Rk,t}$ | $-F_{x,Rk,t}$ | $+F_{y,Rk,t}$ | $-F_{y,Rk,t}$ | $+F_{z,Rk,t}$ | $-F_{z,Rk,t}$ | $+M_{x,Rk,t}$ | $-M_{x,Rk,t}$ | $+M_{y,Rk,t}$ | $-M_{y,Rk,t}$ | $+M_{z,Rk,t}$ | $-M_{z,Rk,t}$ |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| min | N | N | N | N | N | N | Nm | Nm | Nm | Nm | Nm | Nm |
| 30 | 426,1 | | | | 877,4 | | | | | 125,0 | | |
| 60 | 300,0 | NPA | NPA | NPA | 580,1 | NPA | NPA | NPA | NPA | 0,0 | NPA | NPA |
| 90 | 300,0 | | | | 481,0 | | | | | 0,0 | | |
| 120 | 300,0 | | | | 431,4 | | | | | 0,0 | | |

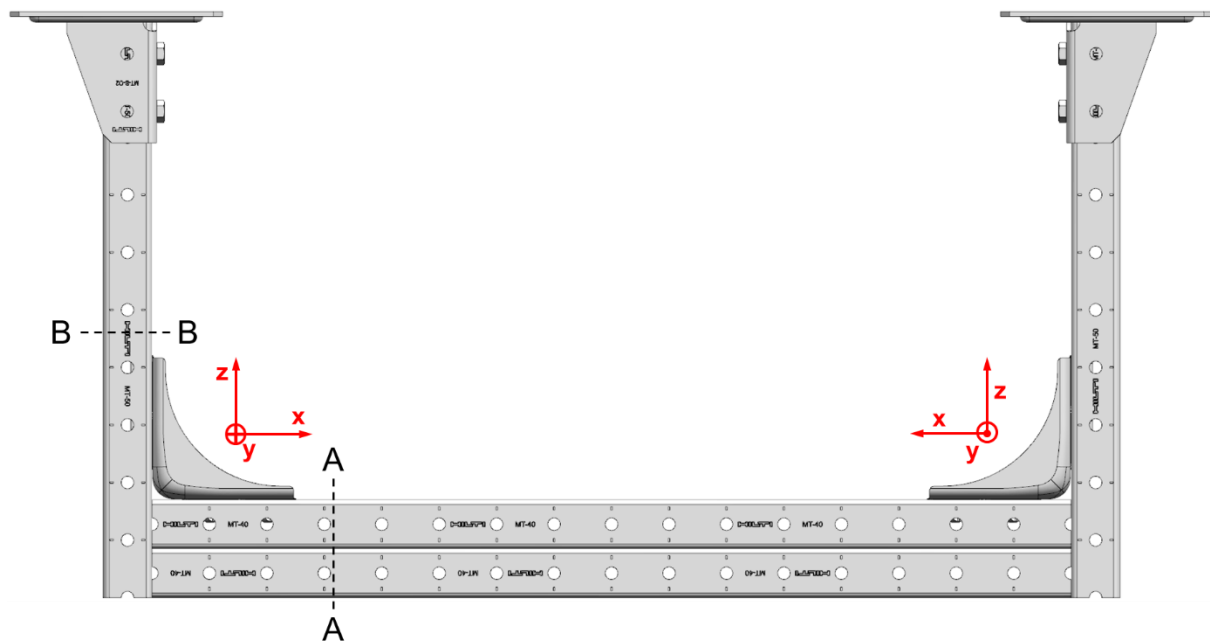**Table C19:** **Resistance $F_{Rk,t}$ and $M_{Rk,t}$ in case of fire after t = 30, 60, 90 and 120 minutes of Hilti MT-C-GS OC connector in combination with Hilti MT-50 S, MT-50, MT-50 S OC and MT-50 OC installation channels, view B-B**
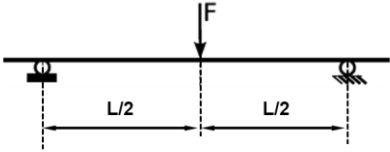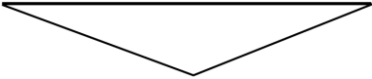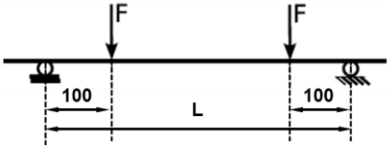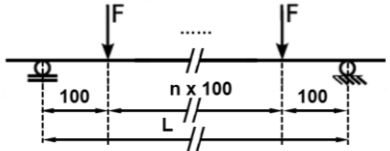
| t | $+F_{x,Rk,t}$ | $-F_{x,Rk,t}$ | $+F_{y,Rk,t}$ | $-F_{y,Rk,t}$ | $+F_{z,Rk,t}$ | $-F_{z,Rk,t}$ | $+M_{x,Rk,t}$ | $-M_{x,Rk,t}$ | $+M_{y,Rk,t}$ | $-M_{y,Rk,t}$ | $+M_{z,Rk,t}$ | $-M_{z,Rk,t}$ |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| min | N | N | N | N | N | N | Nm | Nm | Nm | Nm | Nm | Nm |
| 30 | | 689,6 | | | | 1025,1 | | | 125,0 | | | |
| 60 | NPA | 300,0 | NPA | NPA | NPA | 553,8 | NPA | NPA | 0,0 | NPA | NPA | NPA |
| 90 | | 300,0 | | | | 396,7 | | | 0,0 | | | |
| 120 | | 300,0 | | | | 318,1 | | | 0,0 | | | |

| Characteristic resistance of Hilti MT-C-GS connector in case of fire | |
|---|---|
| **Characteristic resistance of Hilti frame trapeze in case of fire** | **Annex C10** |

**Table D1:    Loading characteristics of Hilti channels**

| Loadcase | System | Resulting torque curve shape |
|---|---|---|
| 1 |  F, L/2, L/2 |  |
| 2 |  F, F, 100, L, 100 |  |
| 3 |  F, F, 100, n x 100, 100, L |  |

**Symbols and designation**

| | |
|---|---|
| L | Distance between the supports in mm |
| n | number of 100 mm gaps between loads |
| F | Load |

**Hilti MT installation channels MT-40D, MT-50, MT-70 and MT-80**

**Bending characteristics of Hilti MT channels in case of fire**

**Annex D1**

**Table D2: Calculation-based deformation in case of fire for installation channels MT-40D, MT-40D S, MT-40D OC and MT-40D S OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | $n^{4)}$ | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 600 | - | | 5 | 0,50 | 225,04 | 29,03 | 120,00 | 20,77 | 21,10 | 27,93 | 29,03 |
| | | | | 10 | 0,50 | 459,99 | 34,30 | 106,67 | 22,57 | 24,76 | 32,96 | - |
| | | | | 15 | 0,50 | 694,95 | 29,63 | 46,67 | 24,85 | - | - | - |
| | | | | 20 | 0,50 | 929,90 | 24,07 | 26,67 | - | - | - | - |
| | | | | 25 | 0,50 | 1164,86 | 16,09 | 20,00 | - | - | - | - |
| | | | | 30 | 0,50 | 1399,81 | 16,76 | 20,00 | - | - | - | - |
| 1 | 600 | - | | 5 | 0,50 | 225,04 | 29,76 | 120,00 | 21,01 | 21,55 | 28,54 | 29,76 |
| | | | | 10 | 0,50 | 459,99 | 37,13 | 120,00 | 23,13 | 25,86 | 34,48 | 37,13 |
| | | | | 15 | 0,50 | 694,95 | 51,07 | 93,33 | 25,89 | 32,55 | 48,92 | - |
| | | | | 20 | 0,50 | 929,90 | 45,48 | 53,33 | 29,67 | - | - | - |
| | | | | 25 | 0,50 | 1164,86 | 51,18 | 33,33 | 40,07 | - | - | - |
| | | | | 30 | 0,50 | 1399,81 | 38,07 | 26,67 | - | - | - | - |
| 2 | 600 | - | | 5 | 0,67 | 450,07 | 31,95 | 120,00 | 21,70 | 22,84 | 30,27 | 31,95 |
| | | | | 10 | 0,67 | 919,98 | 49,52 | 100,00 | 25,55 | 32,51 | 45,49 | - |
| | | | | 15 | 0,67 | 1389,89 | 41,81 | 40,00 | 31,78 | - | - | - |
| | | | | 20 | 0,67 | 1859,80 | 33,88 | 26,67 | - | - | - | - |
| | | | | 25 | 0,67 | 2329,71 | 19,03 | 20,00 | - | - | - | - |
| | | | | 30 | 0,67 | 2799,62 | 11,26 | 13,33 | - | - | - | - |
| 2 | 600 | - | | 5 | 0,67 | 450,07 | 31,23 | 120,00 | 21,54 | 22,50 | 29,74 | 31,23 |
| | | | | 10 | 0,67 | 919,98 | 70,61 | 120,00 | 24,83 | 30,22 | 42,27 | 70,61 |
| | | | | 15 | 0,67 | 1389,89 | 109,11 | 73,33 | 29,76 | 71,64 | - | - |
| | | | | 20 | 0,67 | 1859,80 | 102,70 | 33,33 | 66,52 | - | - | - |
| | | | | 25 | 0,67 | 2329,71 | 18,22 | 20,00 | - | - | - | - |
| | | | | 30 | 0,67 | 2799,62 | 20,29 | 20,00 | - | - | - | - |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load
[3] dimensions in mm
[4] distance between loads is 75 mm

**Symbols and designation**

| | |
|---|---|
| $\varepsilon_{B,\theta a}$ | Channel bending strain at elevated temperatures $\theta_a$ |
| $\sigma_B$ | Channel bending stress |
| V | Momentum degree of fullness |
| F | Load |
| $\delta_{tmax;B}$ | Deformation of the channel at the point in time of stability failure or of the plastic hinging |
| $t_{max,B}$ | Time in which loss of rigidity or plastic hinging of the channel occurs under bending stress |
| $\delta_{30}$ | Displacement after exposure time of 30 minutes to elevated temperatures |
| $\delta_{60}$ | Displacement after exposure time of 60 minutes to elevated temperatures |
| $\delta_{90}$ | Displacement after exposure time of 90 minutes to elevated temperatures |
| $\delta_{120}$ | Displacement after exposure time of 120 minutes to elevated temperatures |

Thermal analyses as well as calculations are referring to the boundary conditions of STTC.

| | |
|---|---|
| **Hilti MT installation channels MT-40D, MT-50, MT-70 and MT-80** | |
| **Bending characteristics of Hilti MT channels in case of fire** | **Annex D2** |

**Table D3:** Calculation-based deformation in case of fire for installation channels MT-40D, MT-40D S, MT-40D OC and MT-40D S OC

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | $n^{4)}$ | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 3 | 600 | 6 | | 5 | 0,88 | 56,26 | 29,88 | 120,00 | 21,08 | 21,63 | 28,62 | 29,88 |
| | | | | 10 | 0,88 | 115,00 | 39,10 | 120,00 | 23,46 | 26,83 | 36,01 | 39,10 |
| | | | | 15 | 0,88 | 173,74 | 59,36 | 93,33 | 26,60 | 35,39 | 55,68 | - |
| | | | | 20 | 0,88 | 232,48 | 53,74 | 53,33 | 31,27 | - | - | - |
| | | | | 25 | 0,88 | 291,21 | 54,25 | 33,33 | 42,38 | - | - | - |
| | | | | 30 | 0,88 | 349,95 | 42,81 | 26,67 | - | - | - | - |
| 3 | 600 | 6 | | 5 | 0,88 | 56,26 | 30,13 | 120,00 | 21,18 | 21,80 | 28,83 | 30,13 |
| | | | | 10 | 0,88 | 115,00 | 39,64 | 120,00 | 23,67 | 27,13 | 36,30 | 39,64 |
| | | | | 15 | 0,88 | 173,74 | 88,93 | 73,33 | 26,88 | 37,36 | - | - |
| | | | | 20 | 0,88 | 232,48 | 39,56 | 33,33 | 32,91 | - | - | - |
| | | | | 25 | 0,88 | 291,21 | 31,49 | 26,67 | - | - | - | - |
| | | | | 30 | 0,88 | 349,95 | 17,92 | 20,00 | - | - | - | - |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load
[3] dimensions in mm
[4] distance between loads is 75 mm

Symbols and designation see Annex D1

| | |
|---|---|
| **Hilti MT installation channels MT-40D, MT-50, MT-70 and MT-80** | |
| **Bending characteristics of Hilti MT channels in case of fire** | **Annex D3** |

**Table D4:** Calculation-based deformation in case of fire for installation channels MT-40D, MT-40D S, MT-40D OC and MT-40D S OC

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | $n^{4)}$ | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 900 | - | | 5 | 0,50 | 141,76 | 32,60 | 120,00 | 22,02 | 23,26 | 30,77 | 32,60 |
| | | | | 10 | 0,50 | 298,40 | 45,36 | 120,00 | 25,68 | 30,86 | 41,26 | 45,36 |
| | | | | 15 | 0,50 | 455,03 | 61,61 | 93,33 | 30,33 | 42,56 | 60,15 | - |
| | | | | 20 | 0,50 | 611,67 | 60,56 | 60,00 | 36,58 | 60,56 | - | - |
| | | | | 25 | 0,50 | 768,31 | 57,06 | 33,33 | 46,26 | - | - | - |
| | | | | 30 | 0,50 | 924,94 | 45,50 | 26,67 | - | - | - | - |
| 1 | 900 | - | | 5 | 0,50 | 141,76 | 33,02 | 120,00 | 22,16 | 23,52 | 31,12 | 33,02 |
| | | | | 10 | 0,50 | 298,40 | 46,90 | 120,00 | 26,03 | 31,56 | 42,27 | 46,90 |
| | | | | 15 | 0,50 | 455,03 | 83,81 | 73,33 | 30,99 | 44,65 | - | - |
| | | | | 20 | 0,50 | 611,67 | 99,25 | 40,00 | 38,05 | - | - | - |
| | | | | 25 | 0,50 | 768,31 | 37,11 | 26,67 | - | - | - | - |
| | | | | 30 | 0,50 | 924,94 | 20,15 | 20,00 | - | - | - | - |
| 2 | 900 | - | | 5 | 0,67 | 425,28 | 37,28 | 120,00 | 23,63 | 26,18 | 34,56 | 37,28 |
| | | | | 10 | 0,67 | 895,19 | 216,07 | 120,00 | 30,87 | 44,28 | 172,94 | 216,07 |
| | | | | 15 | 0,67 | 1365,10 | 352,83 | 120,00 | 42,55 | 224,71 | 322,16 | 352,83 |
| | | | | 20 | 0,67 | 1835,01 | 48,14 | 26,67 | - | - | - | - |
| | | | | 25 | 0,67 | 2304,92 | 22,94 | 20,00 | - | - | - | - |
| | | | | 30 | 0,67 | 2774,83 | 12,84 | 13,33 | - | - | - | - |
| 2 | 900 | - | | 5 | 0,67 | 425,28 | 36,50 | 120,00 | 23,46 | 25,81 | 33,99 | 36,50 |
| | | | | 10 | 0,67 | 895,19 | 171,23 | 120,00 | 30,02 | 41,24 | 57,99 | 171,23 |
| | | | | 15 | 0,67 | 1365,10 | 269,20 | 120,00 | 39,22 | 124,11 | 227,73 | 269,20 |
| | | | | 20 | 0,67 | 1835,01 | 324,85 | 93,33 | 88,86 | 269,31 | 321,21 | - |
| | | | | 25 | 0,67 | 2304,92 | 22,07 | 20,00 | - | - | - | - |
| | | | | 30 | 0,67 | 2774,83 | 25,60 | 20,00 | - | - | - | - |
| 3 | 900 | 10 | | 5 | 0,92 | 23,63 | 34,39 | 120,00 | 22,69 | 24,42 | 32,23 | 34,39 |
| | | | | 10 | 0,92 | 49,73 | 53,46 | 120,00 | 27,56 | 35,26 | 47,63 | 53,46 |
| | | | | 15 | 0,92 | 75,84 | 99,13 | 106,67 | 33,89 | 52,19 | 78,29 | - |
| | | | | 20 | 0,92 | 101,94 | 105,46 | 66,67 | 43,24 | 83,43 | - | - |
| | | | | 25 | 0,92 | 128,05 | 78,01 | 33,33 | 60,60 | - | - | - |
| | | | | 30 | 0,92 | 154,16 | 63,45 | 26,67 | - | - | - | - |
| 3 | 900 | 10 | | 5 | 0,92 | 23,63 | 34,40 | 120,00 | 22,70 | 24,44 | 32,25 | 34,40 |
| | | | | 10 | 0,92 | 49,73 | 54,30 | 120,00 | 27,61 | 35,20 | 47,41 | 54,30 |
| | | | | 15 | 0,92 | 75,84 | 302,03 | 120,00 | 33,89 | 56,23 | 241,46 | 302,03 |
| | | | | 20 | 0,92 | 101,94 | 354,07 | 120,00 | 46,82 | 249,66 | 322,40 | 354,07 |
| | | | | 25 | 0,92 | 128,05 | 46,17 | 26,67 | - | - | - | - |
| | | | | 30 | 0,92 | 154,16 | 21,64 | 20,00 | - | - | - | - |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load
[3] dimensions in mm
[4] distance between loads is 75 mm

Symbols and designation see Annex D1

**Hilti MT installation channels MT-40D, MT-50, MT-70 and MT-80**

**Bending characteristics of Hilti MT channels in case of fire**

**Annex D4**

**Table D5:** Calculation-based deformation in case of fire for installation channels MT-40D, MT-40D S, MT-40D OC and MT-40D S OC

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | $n^{4)}$ | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 1200 | - | | 5 | 0,50 | 97,64 | 38,03 | 120,00 | 23,92 | 26,56 | 35,10 | 38,03 |
| | | | | 10 | 0,50 | 215,12 | 60,76 | 120,00 | 30,31 | 40,02 | 53,76 | 60,76 |
| | | | | 15 | 0,50 | 332,60 | 100,54 | 93,33 | 38,43 | 60,69 | 94,64 | - |
| | | | | 20 | 0,50 | 450,07 | 96,88 | 60,00 | 49,42 | 96,88 | - | - |
| | | | | 25 | 0,50 | 567,55 | 98,24 | 33,33 | 73,19 | - | - | - |
| | | | | 30 | 0,50 | 685,03 | 67,35 | 26,67 | - | - | - | - |
| 1 | 1200 | - | | 5 | 0,50 | 97,64 | 38,33 | 120,00 | 24,03 | 26,75 | 35,35 | 38,33 |
| | | | | 10 | 0,50 | 215,12 | 63,62 | 120,00 | 30,58 | 40,57 | 54,82 | 63,62 |
| | | | | 15 | 0,50 | 332,60 | 124,16 | 66,67 | 38,98 | 77,89 | - | - |
| | | | | 20 | 0,50 | 450,07 | 82,47 | 33,33 | 60,51 | - | - | - |
| | | | | 25 | 0,50 | 567,55 | 50,68 | 26,67 | - | - | - | - |
| | | | | 30 | 0,50 | 685,03 | 24,23 | 20,00 | - | - | - | - |
| 2 | 1200 | - | | 5 | 0,67 | 390,57 | 44,88 | 120,00 | 26,35 | 30,91 | 40,66 | 44,88 |
| | | | | 10 | 0,67 | 860,48 | 297,70 | 120,00 | 38,46 | 62,61 | 236,26 | 297,70 |
| | | | | 15 | 0,67 | 1330,39 | 451,21 | 120,00 | 89,14 | 266,52 | 361,85 | 451,21 |
| | | | | 20 | 0,67 | 450,07 | 82,47 | 33,33 | 60,51 | - | - | - |
| | | | | 25 | 0,67 | 567,55 | 50,68 | 26,67 | - | - | - | - |
| | | | | 30 | 0,67 | 685,03 | 24,23 | 20,00 | - | - | - | - |
| 2 | 1200 | - | | 5 | 0,67 | 390,57 | 44,06 | 120,00 | 26,17 | 30,51 | 40,07 | 44,06 |
| | | | | 10 | 0,67 | 860,48 | 245,42 | 120,00 | 37,38 | 57,47 | 128,19 | 245,42 |
| | | | | 15 | 0,67 | 1330,39 | 337,90 | 120,00 | 56,50 | 215,81 | 296,46 | 337,90 |
| | | | | 20 | 0,67 | 1800,30 | 356,63 | 93,33 | 148,97 | 303,55 | 351,38 | - |
| | | | | 25 | 0,67 | 2270,21 | 27,52 | 20,00 | - | - | - | - |
| | | | | 30 | 0,67 | 2740,12 | 33,24 | 20,00 | - | - | - | - |
| 3 | 1200 | 14 | | 5 | 0,94 | 12,21 | 41,25 | 120,00 | 25,15 | 28,69 | 37,76 | 41,25 |
| | | | | 10 | 0,94 | 26,89 | 74,91 | 120,00 | 33,66 | 47,82 | 64,97 | 74,91 |
| | | | | 15 | 0,94 | 41,57 | 215,97 | 120,00 | 44,62 | 76,85 | 119,32 | 215,97 |
| | | | | 20 | 0,94 | 56,26 | 404,68 | 120,00 | 60,71 | 135,49 | 330,01 | 404,68 |
| | | | | 25 | 0,94 | 70,94 | 417,72 | 120,00 | 92,26 | 299,78 | 378,43 | 417,72 |
| | | | | 30 | 0,94 | 85,63 | 435,77 | 120,00 | 183,39 | 334,63 | 396,70 | 435,77 |
| 3 | 1200 | 14 | | 5 | 0,94 | 12,21 | 41,05 | 120,00 | 25,08 | 28,57 | 37,59 | 41,05 |
| | | | | 10 | 0,94 | 26,89 | 77,11 | 120,00 | 33,59 | 47,51 | 64,45 | 77,11 |
| | | | | 15 | 0,94 | 41,57 | 320,15 | 120,00 | 44,48 | 79,83 | 267,60 | 320,15 |
| | | | | 20 | 0,94 | 56,26 | 406,31 | 120,00 | 68,73 | 274,25 | 360,25 | 406,31 |
| | | | | 25 | 0,94 | 70,94 | 471,09 | 120,00 | 168,76 | 357,24 | 431,36 | 471,09 |
| | | | | 30 | 0,94 | 85,63 | 27,26 | 20,00 | - | - | - | - |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load
[3] dimensions in mm
[4] distance between loads is 75 mm

Symbols and designation see Annex D1

| | |
|---|---|
| **Hilti MT installation channels MT-40D, MT-50, MT-70 and MT-80** | **Annex D5** |
| **Bending characteristics of Hilti MT channels in case of fire** | |

**Table D6:** Calculation-based deformation in case of fire for installation channels MT-40D, MT-40D S, MT-40D OC and MT-40D S OC

| Loadcase | L[3] | n[4] | Load direction | $\sigma_B$ MPa | $V^{[1]}$ - | $F^{[2]}$ N | $\delta_{tmax;B}$ mm | $t_{max,B}$ min | $\delta_{30}$ mm | $\delta_{60}$ mm | $\delta_{90}$ mm | $\delta_{120}$ mm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1500 | - | | 5 | 0,50 | 69,19 | 45,74 | 120,00 | 26,63 | 31,26 | 41,26 | 45,74 |
| | | | | 10 | 0,50 | 163,17 | 82,38 | 120,00 | 36,66 | 52,69 | 71,13 | 82,38 |
| | | | | 15 | 0,50 | 257,15 | 535,47 | 120,00 | 49,36 | 85,67 | 365,37 | 535,47 |
| | | | | 20 | 0,50 | 351,13 | 614,33 | 120,00 | 66,93 | 397,13 | 559,35 | 614,33 |
| | | | | 25 | 0,50 | 445,12 | 65,42 | 26,67 | - | - | - | - |
| | | | | 30 | 0,50 | 539,10 | 100,62 | 26,67 | - | - | - | - |
| 1 | 1500 | - | | 5 | 0,50 | 69,19 | 45,96 | 120,00 | 26,71 | 31,40 | 41,44 | 45,96 |
| | | | | 10 | 0,50 | 163,17 | 142,87 | 120,00 | 36,88 | 53,38 | 74,25 | 142,87 |
| | | | | 15 | 0,50 | 257,15 | 158,32 | 60,00 | 50,17 | 158,32 | - | - |
| | | | | 20 | 0,50 | 351,13 | 50,18 | 26,67 | - | - | - | - |
| | | | | 25 | 0,50 | 445,12 | 82,42 | 26,67 | - | - | - | - |
| | | | | 30 | 0,50 | 539,10 | 29,74 | 20,00 | - | - | - | - |
| 2 | 1500 | - | | 5 | 0,67 | 345,94 | 54,93 | 120,00 | 29,88 | 37,06 | 48,72 | 54,93 |
| | | | | 10 | 0,67 | 815,85 | 369,45 | 120,00 | 48,57 | 131,06 | 308,28 | 369,45 |
| | | | | 15 | 0,67 | 1285,76 | 459,22 | 120,00 | 138,22 | 337,06 | 414,37 | 459,22 |
| | | | | 20 | 0,67 | 1755,67 | 28,80 | 20,00 | - | - | - | - |
| | | | | 25 | 0,67 | 2225,58 | 35,81 | 20,00 | - | - | - | - |
| | | | | 30 | 0,67 | 2695,49 | 47,51 | 20,00 | - | - | - | - |
| 2 | 1500 | - | | 5 | 0,67 | 345,94 | 53,90 | 120,00 | 29,66 | 36,58 | 47,98 | 53,90 |
| | | | | 10 | 0,67 | 815,85 | 306,27 | 120,00 | 46,97 | 92,37 | 228,43 | 306,27 |
| | | | | 15 | 0,67 | 1285,76 | 399,57 | 120,00 | 96,73 | 281,78 | 358,66 | 399,57 |
| | | | | 20 | 0,67 | 1755,67 | 419,41 | 93,33 | 218,19 | 356,20 | 415,04 | - |
| | | | | 25 | 0,67 | 2225,58 | 34,54 | 20,00 | - | - | - | - |
| | | | | 30 | 0,67 | 2695,49 | 43,76 | 20,00 | - | - | - | - |
| 3 | 1500 | 18 | | 5 | 0,95 | 6,92 | 50,87 | 120,00 | 28,62 | 34,72 | 45,53 | 50,87 |
| | | | | 10 | 0,95 | 16,32 | 103,91 | 120,00 | 41,90 | 64,82 | 88,37 | 103,91 |
| | | | | 15 | 0,95 | 25,72 | 260,97 | 120,00 | 58,88 | 109,10 | 172,36 | 260,97 |
| | | | | 20 | 0,95 | 35,11 | 446,80 | 120,00 | 83,63 | 185,15 | 363,88 | 446,80 |
| | | | | 25 | 0,95 | 44,51 | 492,69 | 120,00 | 127,97 | 320,20 | 439,26 | 492,69 |
| | | | | 30 | 0,95 | 53,91 | 524,41 | 120,00 | 212,58 | 389,87 | 476,04 | 524,41 |
| 3 | 1500 | 18 | | 5 | 0,95 | 6,92 | 50,28 | 120,00 | 28,40 | 34,33 | 45,04 | 50,28 |
| | | | | 10 | 0,95 | 16,32 | 105,82 | 120,00 | 41,66 | 64,16 | 87,48 | 105,82 |
| | | | | 15 | 0,95 | 25,72 | 373,86 | 120,00 | 58,58 | 120,45 | 302,62 | 373,86 |
| | | | | 20 | 0,95 | 35,11 | 454,01 | 120,00 | 93,96 | 310,78 | 404,32 | 454,01 |
| | | | | 25 | 0,95 | 44,51 | 506,10 | 120,00 | 204,98 | 392,10 | 464,26 | 506,10 |
| | | | | 30 | 0,95 | 53,91 | 34,71 | 20,00 | - | - | - | - |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load
[3] dimensions in mm
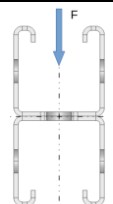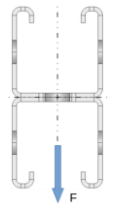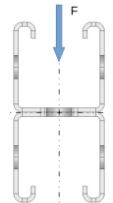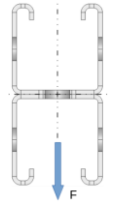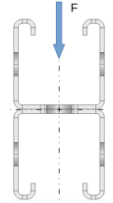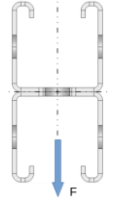[4] distance between loads is 75 mm
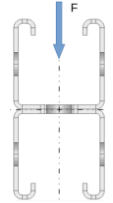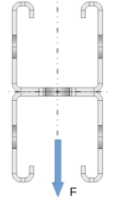
Symbols and designation see Annex D1

**Hilti MT installation channels MT-40D, MT-50, MT-70 and MT-80**

**Bending characteristics of Hilti MT channels in case of fire**

**Annex D6**

**Table D7:** Calculation-based deformation in case of fire for installation channels MT-40D, MT-40D S, MT-40D OC and MT-40D S OC

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | $n^{4)}$ | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 1800 | - | | 5 | 0,50 | 48,56 | 56,23 | 120,00 | 30,35 | 37,73 | 49,67 | 56,23 |
| | | | | 10 | 0,50 | 126,88 | 112,31 | 120,00 | 44,97 | 69,47 | 94,33 | 112,31 |
| | | | | 15 | 0,50 | 205,20 | 643,50 | 120,00 | 63,43 | 120,15 | 465,60 | 643,50 |
| | | | | 20 | 0,50 | 283,52 | 736,31 | 120,00 | 90,50 | 481,96 | 671,69 | 736,31 |
| | | | | 25 | 0,50 | 361,84 | 88,15 | 26,67 | - | - | - | - |
| | | | | 30 | 0,50 | 440,16 | 36,39 | 20,00 | - | - | - | - |
| 1 | 1800 | - | | 5 | 0,50 | 48,56 | 56,56 | 120,00 | 30,40 | 37,84 | 49,89 | 56,56 |
| | | | | 10 | 0,50 | 126,88 | 215,20 | 113,33 | 45,24 | 71,56 | 114,86 | 0,00 |
| | | | | 15 | 0,50 | 205,20 | 255,72 | 60,00 | 66,42 | 255,72 | - | - |
| | | | | 20 | 0,50 | 283,52 | 66,43 | 26,67 | - | - | - | - |
| | | | | 25 | 0,50 | 361,84 | 31,28 | 20,00 | - | - | - | - |
| | | | | 30 | 0,50 | 440,16 | 36,80 | 20,00 | - | - | - | - |
| 2 | 1800 | - | | 5 | 0,67 | 291,39 | 68,72 | 120,00 | 34,23 | 44,74 | 59,13 | 68,72 |
| | | | | 10 | 0,67 | 761,30 | 453,17 | 120,00 | 64,04 | 215,19 | 383,81 | 453,17 |
| | | | | 15 | 0,67 | 1231,21 | 555,84 | 120,00 | 187,63 | 414,88 | 503,93 | 555,84 |
| | | | | 20 | 0,67 | 1701,12 | 35,05 | 20,00 | - | - | - | - |
| | | | | 25 | 0,67 | 2171,03 | 45,16 | 20,00 | - | - | - | - |
| | | | | 30 | 0,67 | 2640,94 | 84,77 | 20,00 | - | - | - | - |
| 2 | 1800 | - | | 5 | 0,67 | 291,39 | 67,40 | 120,00 | 33,98 | 44,17 | 58,23 | 67,40 |
| | | | | 10 | 0,67 | 761,30 | 382,16 | 120,00 | 60,71 | 155,72 | 306,30 | 382,16 |
| | | | | 15 | 0,67 | 1231,21 | 485,94 | 120,00 | 137,04 | 348,57 | 437,59 | 485,94 |
| | | | | 20 | 0,67 | 1701,12 | 531,10 | 106,67 | 283,26 | 434,52 | 503,20 | - |
| | | | | 25 | 0,67 | 2171,03 | 43,39 | 20,00 | - | - | - | - |
| | | | | 30 | 0,67 | 2640,94 | 63,40 | 20,00 | - | - | - | - |
| 3 | 1800 | 22 | | 5 | 0,96 | 4,05 | 63,87 | 120,00 | 33,35 | 42,93 | 56,10 | 63,87 |
| | | | | 10 | 0,96 | 10,57 | 141,47 | 120,00 | 52,50 | 86,66 | 118,34 | 141,47 |
| | | | | 15 | 0,96 | 17,10 | 297,70 | 120,00 | 76,83 | 148,75 | 222,35 | 297,70 |
| | | | | 20 | 0,96 | 23,63 | 484,26 | 120,00 | 112,32 | 231,99 | 367,82 | 484,26 |
| | | | | 25 | 0,96 | 30,15 | 555,64 | 120,00 | 165,54 | 324,29 | 477,35 | 555,64 |
| | | | | 30 | 0,96 | 36,68 | 621,82 | 120,00 | 264,33 | 485,90 | 571,73 | 621,82 |
| 3 | 1800 | 22 | | 5 | 0,96 | 4,05 | 62,58 | 120,00 | 32,85 | 42,06 | 55,01 | 62,58 |
| | | | | 10 | 0,96 | 10,57 | 152,86 | 120,00 | 51,97 | 85,49 | 116,95 | 152,86 |
| | | | | 15 | 0,96 | 17,10 | 515,00 | 120,00 | 76,35 | 283,85 | 442,53 | 515,00 |
| | | | | 20 | 0,96 | 23,63 | 533,27 | 120,00 | 129,86 | 365,09 | 474,43 | 533,27 |
| | | | | 25 | 0,96 | 30,15 | 594,47 | 120,00 | 268,94 | 459,35 | 544,96 | 594,47 |
| | | | | 30 | 0,96 | 36,68 | 44,07 | 20,00 | - | - | - | - |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load
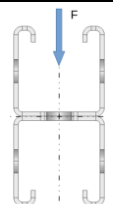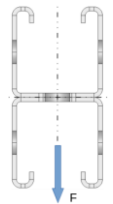[3] dimensions in mm
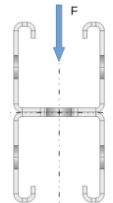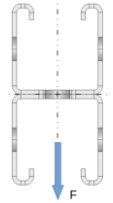[4] distance between loads is 75 mm

Symbols and designation see Annex D1

| | |
|---|---|
| **Hilti MT installation channels MT-40D, MT-50, MT-70 and MT-80** | |
| **Bending characteristics of Hilti MT channels in case of fire** | **Annex D7** |

**Table D8:** Calculation-based deformation in case of fire for installation channels MT-40D, MT-40D S, MT-40D OC and MT-40D S OC

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | $n^{4)}$ | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 2100 | - | | 5 | 0,50 | 32,42 | 70,26 | 120,00 | 35,34 | 46,42 | 60,99 | 70,26 |
| | | | | 10 | 0,50 | 99,55 | 160,00 | 120,00 | 55,57 | 91,18 | 125,20 | 160,00 |
| | | | | 15 | 0,50 | 166,68 | 754,89 | 120,00 | 81,09 | 179,27 | 586,20 | 754,89 |
| | | | | 20 | 0,50 | 233,81 | 844,22 | 120,00 | 126,46 | 578,16 | 775,90 | 844,22 |
| | | | | 25 | 0,50 | 300,94 | 914,22 | 120,00 | 345,59 | 761,26 | 866,24 | 914,22 |
| | | | | 30 | 0,50 | 368,07 | 44,97 | 20,00 | - | - | - | - |
| 1 | 2100 | - | | 5 | 0,50 | 32,42 | 71,58 | 120,00 | 35,38 | 46,62 | 61,65 | 71,58 |
| | | | | 10 | 0,50 | 99,55 | 306,50 | 106,67 | 56,18 | 99,29 | 193,76 | 0,00 |
| | | | | 15 | 0,50 | 166,68 | 320,74 | 53,33 | 92,19 | - | - | - |
| | | | | 20 | 0,50 | 233,81 | 91,87 | 26,67 | - | - | - | - |
| | | | | 25 | 0,50 | 300,94 | 37,93 | 20,00 | - | - | - | - |
| | | | | 30 | 0,50 | 368,07 | 45,68 | 20,00 | - | - | - | - |
| 2 | 2100 | - | | 5 | 0,67 | 226,92 | 95,31 | 120,00 | 39,45 | 54,31 | 73,91 | 95,31 |
| | | | | 10 | 0,67 | 696,83 | 534,70 | 120,00 | 92,83 | 283,75 | 456,00 | 534,70 |
| | | | | 15 | 0,67 | 1166,74 | 655,13 | 120,00 | 240,96 | 490,69 | 594,40 | 655,13 |
| | | | | 20 | 0,67 | 1636,65 | 42,70 | 20,00 | - | - | - | - |
| | | | | 25 | 0,67 | 2106,56 | 59,09 | 20,00 | - | - | - | - |
| | | | | 30 | 0,67 | 2576,47 | 157,74 | 20,00 | - | - | - | - |
| 2 | 2100 | - | | 5 | 0,67 | 226,92 | 92,91 | 120,00 | 39,20 | 53,76 | 73,15 | 92,91 |
| | | | | 10 | 0,67 | 696,83 | 460,35 | 120,00 | 84,99 | 218,41 | 378,63 | 460,35 |
| | | | | 15 | 0,67 | 1166,74 | 575,80 | 120,00 | 184,46 | 415,51 | 519,45 | 575,80 |
| | | | | 20 | 0,67 | 1636,65 | 638,73 | 113,33 | 340,41 | 515,23 | 595,97 | - |
| | | | | 25 | 0,67 | 2106,56 | 55,93 | 20,00 | - | - | - | - |
| | | | | 30 | 0,67 | 2576,47 | 107,34 | 20,00 | - | - | - | - |
| 3 | 2100 | 26 | | 5 | 0,96 | 2,32 | 81,18 | 120,00 | 39,61 | 53,87 | 70,32 | 81,18 |
| | | | | 10 | 0,96 | 7,11 | 186,73 | 120,00 | 65,82 | 113,93 | 155,64 | 186,73 |
| | | | | 15 | 0,96 | 11,91 | 341,37 | 120,00 | 98,81 | 193,17 | 272,87 | 341,37 |
| | | | | 20 | 0,96 | 16,70 | 509,61 | 120,00 | 145,00 | 279,39 | 390,52 | 509,61 |
| | | | | 25 | 0,96 | 21,50 | 650,97 | 120,00 | 206,30 | 363,26 | 582,77 | 650,97 |
| | | | | 30 | 0,96 | 26,29 | 693,53 | 120,00 | 278,93 | 515,32 | 632,55 | 693,53 |
| 3 | 2100 | 26 | | 5 | 0,96 | 2,32 | 78,70 | 120,00 | 38,65 | 52,19 | 68,17 | 78,70 |
| | | | | 10 | 0,96 | 7,11 | 220,87 | 120,00 | 64,84 | 112,07 | 153,58 | 220,87 |
| | | | | 15 | 0,96 | 11,91 | 581,64 | 120,00 | 98,03 | 308,03 | 499,02 | 581,64 |
| | | | | 20 | 0,96 | 16,70 | 608,72 | 120,00 | 166,38 | 416,71 | 540,47 | 608,72 |
| | | | | 25 | 0,96 | 21,50 | 679,83 | 120,00 | 319,85 | 522,61 | 622,08 | 679,83 |
| | | | | 30 | 0,96 | 26,29 | 55,43 | 20,00 | - | - | - | - |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load
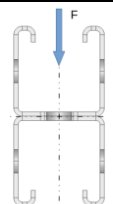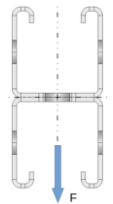[3] dimensions in mm
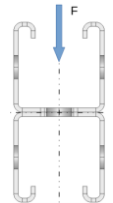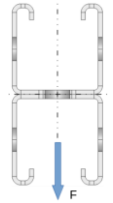[4] distance between loads is 75 mm

Symbols and designation see Annex D1

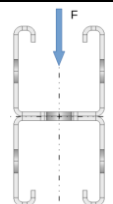| | |
|---|---|
| **Hilti MT installation channels MT-40D, MT-50, MT-70 and MT-80** | |
| **Bending characteristics of Hilti MT channels in case of fire** | **Annex D8** |

**Table D9:** Calculation-based deformation in case of fire for installation channels MT-50, MT-50 U, MT-50 S, MT-50 OC and MT-50 S OC

| Loadcase | L[3] | n | Load direction | $\sigma_B$ MPa | V[1] - | F[2] N | $\delta_{tmax;B}$ mm | $t_{max,B}$ min | $\delta_{30}$ mm | $\delta_{60}$ mm | $\delta_{90}$ mm | $\delta_{120}$ mm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 500 | - | | 5 | 0,50 | 122,79 | 9,93 | 120,00 | 7,50 | 7,50 | 9,93 | 9,93 |
| | | | | 10 | 0,50 | 250,89 | 17,22 | 120,00 | 10,28 | 13,00 | 17,22 | 17,22 |
| | | | | 15 | 0,50 | 379,00 | 36,62 | 120,00 | 13,10 | 19,74 | 28,87 | 36,62 |
| | | | | 20 | 0,50 | 507,11 | 121,28 | 120,00 | 15,97 | 27,73 | 75,78 | 121,28 |
| | | | | 25 | 0,50 | 635,22 | 140,57 | 120,00 | 18,95 | 39,35 | 115,74 | 140,57 |
| | | | | 30 | 0,50 | 763,33 | 160,60 | 120,00 | 22,61 | 89,52 | 141,98 | 160,60 |
| 1 | 500 | - | | 5 | 0,50 | 122,79 | 10,02 | 120,00 | 7,54 | 7,55 | 10,02 | 10,02 |
| | | | | 10 | 0,50 | 250,89 | 17,36 | 120,00 | 10,36 | 13,16 | 17,36 | 17,36 |
| | | | | 15 | 0,50 | 379,00 | 31,72 | 120,00 | 13,21 | 19,80 | 27,84 | 31,72 |
| | | | | 20 | 0,50 | 507,11 | 59,92 | 106,67 | 16,08 | 27,08 | 45,86 | - |
| | | | | 25 | 0,50 | 635,22 | 48,63 | 73,33 | 19,04 | 35,76 | - | - |
| | | | | 30 | 0,50 | 763,33 | 49,46 | 60,00 | 22,31 | 49,46 | - | - |
| 2 | 500 | - | | 5 | 0,67 | 153,48 | 12,25 | 120,00 | 8,53 | 9,34 | 12,25 | 12,25 |
| | | | | 10 | 0,67 | 313,62 | 29,54 | 106,67 | 12,39 | 17,67 | 24,46 | - |
| | | | | 15 | 0,67 | 473,75 | 24,19 | 53,33 | 16,29 | - | - | - |
| | | | | 20 | 0,67 | 633,89 | 15,74 | 26,67 | - | - | - | - |
| | | | | 25 | 0,67 | 794,02 | 6,73 | 20,00 | - | - | - | - |
| | | | | 30 | 0,67 | 954,16 | 7,64 | 20,00 | - | - | - | - |
| 2 | 500 | - | | 5 | 0,67 | 153,48 | 12,40 | 120,00 | 8,58 | 9,46 | 12,40 | 12,40 |
| | | | | 10 | 0,67 | 313,62 | 24,65 | 120,00 | 12,53 | 17,95 | 23,70 | 24,65 |
| | | | | 15 | 0,67 | 473,75 | 54,72 | 120,00 | 16,53 | 27,87 | 43,02 | 54,72 |
| | | | | 20 | 0,67 | 633,89 | 57,89 | 80,00 | 20,56 | 38,74 | - | - |
| | | | | 25 | 0,67 | 794,02 | 52,52 | 60,00 | 24,82 | 52,52 | - | - |
| | | | | 30 | 0,67 | 954,16 | 51,68 | 46,67 | 30,86 | - | - | - |
| 3 | 500 | 33 | | 5 | 0,80 | 51,16 | 11,35 | 120,00 | 8,12 | 8,60 | 11,35 | 11,35 |
| | | | | 10 | 0,80 | 104,54 | 20,99 | 120,00 | 11,55 | 15,76 | 20,89 | 20,99 |
| | | | | 15 | 0,80 | 157,92 | 38,93 | 93,33 | 15,05 | 24,35 | 37,73 | - |
| | | | | 20 | 0,80 | 211,30 | 39,18 | 66,67 | 18,59 | 34,19 | - | - |
| | | | | 25 | 0,80 | 264,67 | 33,21 | 46,67 | 22,26 | - | - | - |
| | | | | 30 | 0,80 | 318,05 | 34,27 | 33,33 | 27,21 | - | - | - |
| 3 | 500 | 33 | | 5 | 0,80 | 51,16 | 11,46 | 120,00 | 8,17 | 8,70 | 11,46 | 11,46 |
| | | | | 10 | 0,80 | 104,54 | 21,15 | 120,00 | 11,66 | 15,98 | 21,11 | 21,15 |
| | | | | 15 | 0,80 | 157,92 | 46,92 | 120,00 | 15,19 | 24,60 | 36,86 | 46,92 |
| | | | | 20 | 0,80 | 211,30 | 68,02 | 93,33 | 18,76 | 34,11 | 64,24 | - |
| | | | | 25 | 0,80 | 264,67 | 55,44 | 66,67 | 22,46 | 46,32 | - | - |
| | | | | 30 | 0,80 | 318,05 | 57,75 | 53,33 | 27,30 | - | - | - |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load
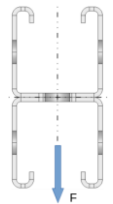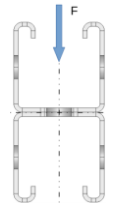[3] dimensions in mm

Symbols and designation see Annex D1

| **Hilti MT installation channels MT-40D, MT-50, MT-70 and MT-80** | |
|---|---|
| **Bending characteristics of Hilti MT channels in case of fire** | **Annex D9** |

**Table D10: Calculation-based deformation in case of fire for installation channels MT-50, MT-50 U, MT-50 S, MT-50 OC and MT-50 S OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 700 | - | | 5 | 0,50 | 84,06 | 15,96 | 120,00 | 10,15 | 12,34 | 15,96 | 15,96 |
| | | | | 10 | 0,50 | 175,56 | 31,24 | 120,00 | 15,46 | 23,06 | 30,07 | 31,24 |
| | | | | 15 | 0,50 | 267,07 | 110,67 | 120,00 | 20,88 | 35,87 | 52,26 | 110,67 |
| | | | | 20 | 0,50 | 358,57 | 171,86 | 120,00 | 26,37 | 50,61 | 141,00 | 171,86 |
| | | | | 25 | 0,50 | 450,08 | 203,36 | 120,00 | 32,00 | 114,31 | 178,10 | 203,36 |
| | | | | 30 | 0,50 | 541,58 | 229,95 | 120,00 | 38,73 | 153,52 | 207,78 | 229,95 |
| 1 | 700 | - | | 5 | 0,50 | 84,06 | 16,00 | 120,00 | 10,18 | 12,38 | 16,00 | 16,00 |
| | | | | 10 | 0,50 | 175,56 | 30,84 | 120,00 | 15,51 | 23,02 | 29,88 | 30,84 |
| | | | | 15 | 0,50 | 267,07 | 59,05 | 120,00 | 20,90 | 35,50 | 49,33 | 59,05 |
| | | | | 20 | 0,50 | 358,57 | 95,65 | 106,67 | 26,31 | 48,86 | 79,15 | - |
| | | | | 25 | 0,50 | 450,08 | 99,89 | 80,00 | 31,79 | 63,88 | - | - |
| | | | | 30 | 0,50 | 541,58 | 96,53 | 60,00 | 40,22 | 96,53 | - | - |
| 2 | 700 | - | | 5 | 0,67 | 147,10 | 20,84 | 120,00 | 12,31 | 16,28 | 20,84 | 20,84 |
| | | | | 10 | 0,67 | 307,23 | 115,84 | 120,00 | 20,01 | 34,24 | 97,06 | 115,84 |
| | | | | 15 | 0,67 | 467,37 | 105,04 | 60,00 | 27,88 | 105,04 | - | - |
| | | | | 20 | 0,67 | 627,50 | 26,84 | 26,67 | - | - | - | - |
| | | | | 25 | 0,67 | 787,64 | 9,97 | 20,00 | - | - | - | - |
| | | | | 30 | 0,67 | 947,77 | 11,79 | 20,00 | - | - | - | - |
| 2 | 700 | - | | 5 | 0,67 | 147,10 | 20,93 | 120,00 | 12,34 | 16,36 | 20,93 | 20,93 |
| | | | | 10 | 0,67 | 307,23 | 47,57 | 120,00 | 20,12 | 32,93 | 42,72 | 47,57 |
| | | | | 15 | 0,67 | 467,37 | 86,89 | 120,00 | 27,91 | 51,31 | 73,61 | 86,89 |
| | | | | 20 | 0,67 | 627,50 | 120,84 | 113,33 | 35,66 | 69,31 | 105,06 | - |
| | | | | 25 | 0,67 | 787,64 | 117,95 | 80,00 | 43,53 | 87,39 | - | - |
| | | | | 30 | 0,67 | 947,77 | 119,64 | 66,67 | 53,39 | 106,26 | - | - |
| 3 | 700 | 5 | | 5 | 0,86 | 24,52 | 18,74 | 120,00 | 11,38 | 14,57 | 18,74 | 18,74 |
| | | | | 10 | 0,86 | 51,21 | 40,15 | 120,00 | 17,97 | 28,24 | 36,84 | 40,15 |
| | | | | 15 | 0,86 | 77,89 | 68,81 | 93,33 | 24,62 | 44,09 | 66,48 | - |
| | | | | 20 | 0,86 | 104,58 | 69,64 | 66,67 | 31,30 | 61,24 | - | - |
| | | | | 25 | 0,86 | 131,27 | 58,57 | 46,67 | 38,14 | - | - | - |
| | | | | 30 | 0,86 | 157,96 | 59,47 | 33,33 | 46,96 | - | - | - |
| 3 | 700 | 5 | | 5 | 0,86 | 24,52 | 18,81 | 120,00 | 11,41 | 14,65 | 18,81 | 18,81 |
| | | | | 10 | 0,86 | 51,21 | 40,15 | 120,00 | 18,06 | 28,46 | 36,99 | 40,15 |
| | | | | 15 | 0,86 | 77,89 | 78,46 | 120,00 | 24,76 | 44,37 | 63,93 | 78,46 |
| | | | | 20 | 0,86 | 104,58 | 131,24 | 120,00 | 31,46 | 60,84 | 98,26 | 131,24 |
| | | | | 25 | 0,86 | 131,27 | 131,04 | 86,67 | 38,27 | 78,89 | - | - |
| | | | | 30 | 0,86 | 157,96 | 119,58 | 66,67 | 46,49 | 101,36 | - | - |

[1] Momentum degree of fullness without contribution from channel dead weight
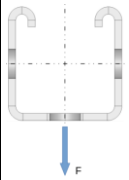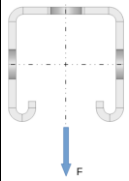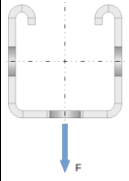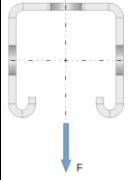[2] Size of designated system's single load
[3] dimensions in mm

Symbols and designation see Annex D1

| Hilti MT installation channels MT-40D, MT-50, MT-70 and MT-80 | |
|---|---|
| Bending characteristics of Hilti MT channels in case of fire | Annex D10 |

**Table D11:** Calculation-based deformation in case of fire for installation channels MT-50, MT-50 U, MT-50 S, MT-50 OC and MT-50 S OC

| Loadcase | L [3] | n | Load direction | $\sigma_B$ MPa | $V$ [1] - | $F$ [2] N | $\delta_{tmax;B}$ mm | $t_{max,B}$ min | $\delta_{30}$ mm | $\delta_{60}$ mm | $\delta_{90}$ mm | $\delta_{120}$ mm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 900 | - | | 5 | 0,50 | 61,59 | 24,43 | 120,00 | 13,87 | 19,18 | 24,43 | 24,43 |
| | | | | 10 | 0,50 | 132,76 | 51,51 | 120,00 | 22,59 | 36,65 | 47,25 | 51,51 |
| | | | | 15 | 0,50 | 203,93 | 181,22 | 120,00 | 31,40 | 57,08 | 93,17 | 181,22 |
| | | | | 20 | 0,50 | 275,10 | 238,05 | 120,00 | 40,22 | 87,12 | 205,02 | 238,05 |
| | | | | 25 | 0,50 | 346,28 | 273,17 | 120,00 | 49,20 | 179,15 | 245,05 | 273,17 |
| | | | | 30 | 0,50 | 417,45 | 299,31 | 120,00 | 61,64 | 217,52 | 273,58 | 299,31 |
| 1 | 900 | - | | 5 | 0,50 | 61,59 | 24,33 | 120,00 | 13,86 | 19,13 | 24,33 | 24,33 |
| | | | | 10 | 0,50 | 132,76 | 50,70 | 120,00 | 22,54 | 36,41 | 46,84 | 50,70 |
| | | | | 15 | 0,50 | 203,93 | 92,90 | 120,00 | 31,28 | 56,33 | 77,08 | 92,90 |
| | | | | 20 | 0,50 | 275,10 | 150,23 | 113,33 | 39,99 | 76,97 | 118,85 | - |
| | | | | 25 | 0,50 | 346,28 | 141,64 | 80,00 | 48,74 | 98,85 | - | - |
| | | | | 30 | 0,50 | 417,45 | 144,02 | 66,67 | 58,12 | 124,90 | - | - |
| 2 | 900 | - | | 5 | 0,67 | 138,58 | 32,30 | 120,00 | 17,34 | 25,49 | 32,30 | 32,30 |
| | | | | 10 | 0,67 | 298,72 | 138,36 | 120,00 | 30,16 | 86,28 | 121,58 | 138,36 |
| | | | | 15 | 0,67 | 458,85 | 133,34 | 60,00 | 54,29 | 133,34 | - | - |
| | | | | 20 | 0,67 | 618,99 | 42,60 | 26,67 | - | - | - | - |
| | | | | 25 | 0,67 | 779,12 | 14,30 | 20,00 | - | - | - | - |
| | | | | 30 | 0,67 | 939,26 | 17,35 | 20,00 | - | - | - | - |
| 2 | 900 | - | | 5 | 0,67 | 138,58 | 32,19 | 120,00 | 17,34 | 25,50 | 32,19 | 32,19 |
| | | | | 10 | 0,67 | 298,72 | 75,18 | 120,00 | 30,14 | 52,02 | 66,44 | 75,18 |
| | | | | 15 | 0,67 | 458,85 | 120,51 | 120,00 | 42,72 | 79,34 | 106,02 | 120,51 |
| | | | | 20 | 0,67 | 618,99 | 160,37 | 120,00 | 54,92 | 103,27 | 141,79 | 160,37 |
| | | | | 25 | 0,67 | 779,12 | 184,14 | 113,33 | 66,89 | 124,93 | 168,09 | - |
| | | | | 30 | 0,67 | 939,26 | 192,17 | 93,33 | 79,93 | 143,82 | 189,30 | - |
| 3 | 900 | 7 | | 5 | 0,89 | 13,86 | 28,86 | 120,00 | 15,87 | 22,76 | 28,86 | 28,86 |
| | | | | 10 | 0,89 | 29,87 | 64,52 | 120,00 | 26,58 | 44,64 | 57,52 | 64,52 |
| | | | | 15 | 0,89 | 45,89 | 101,76 | 93,33 | 37,28 | 68,73 | 98,39 | - |
| | | | | 20 | 0,89 | 61,90 | 104,37 | 66,67 | 47,84 | 92,86 | - | - |
| | | | | 25 | 0,89 | 77,91 | 88,04 | 46,67 | 58,39 | - | - | - |
| | | | | 30 | 0,89 | 93,93 | 88,40 | 33,33 | 70,66 | - | - | - |
| 3 | 900 | 7 | | 5 | 0,89 | 13,86 | 28,88 | 120,00 | 15,87 | 22,81 | 28,88 | 28,88 |
| | | | | 10 | 0,89 | 29,87 | 64,84 | 120,00 | 26,71 | 45,06 | 57,91 | 64,84 |
| | | | | 15 | 0,89 | 45,89 | 114,33 | 120,00 | 37,52 | 69,61 | 96,13 | 114,33 |
| | | | | 20 | 0,89 | 61,90 | 166,59 | 120,00 | 48,17 | 93,27 | 137,86 | 166,59 |
| | | | | 25 | 0,89 | 77,91 | 210,62 | 120,00 | 58,77 | 116,54 | 172,96 | 210,62 |
| | | | | 30 | 0,89 | 93,93 | 211,25 | 93,33 | 70,68 | 140,46 | 205,51 | - |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load
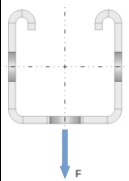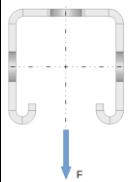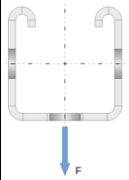[3] dimensions in mm

Symbols and designation see Annex D1

| **Hilti MT installation channels MT-40D, MT-50, MT-70 and MT-80** | |
|---|---|
| **Bending characteristics of Hilti MT channels in case of fire** | **Annex D11** |

**Table D12:** Calculation-based deformation in case of fire for installation channels MT-50, MT-50 U, MT-50 S, MT-50 OC and MT-50 S OC

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 1100 | - | | 5 | 0,50 | 46,52 | 35,51 | 120,00 | 18,79 | 28,18 | 35,51 | 35,51 |
| | | | | 10 | 0,50 | 104,75 | 77,38 | 120,00 | 31,69 | 53,79 | 68,91 | 77,38 |
| | | | | 15 | 0,50 | 162,98 | 232,92 | 120,00 | 44,59 | 83,58 | 186,12 | 232,92 |
| | | | | 20 | 0,50 | 221,22 | 102,01 | 53,33 | 57,42 | - | - | - |
| | | | | 25 | 0,50 | 279,45 | 98,91 | 40,00 | 70,55 | - | - | - |
| | | | | 30 | 0,50 | 337,68 | 62,35 | 26,67 | - | - | - | - |
| 1 | 1100 | - | | 5 | 0,50 | 46,52 | 35,29 | 120,00 | 18,72 | 28,01 | 35,29 | 35,29 |
| | | | | 10 | 0,50 | 104,75 | 75,65 | 120,00 | 31,55 | 53,45 | 68,27 | 75,65 |
| | | | | 15 | 0,50 | 162,98 | 132,07 | 120,00 | 44,40 | 82,01 | 110,31 | 132,07 |
| | | | | 20 | 0,50 | 221,22 | 201,86 | 113,33 | 57,09 | 110,50 | 163,46 | - |
| | | | | 25 | 0,50 | 279,45 | 190,74 | 80,00 | 69,69 | 139,21 | - | - |
| | | | | 30 | 0,50 | 337,68 | 192,59 | 66,67 | 82,91 | 170,74 | - | - |
| 2 | 1100 | - | | 5 | 0,67 | 127,94 | 69,64 | 120,00 | 23,63 | 37,28 | 51,26 | 69,64 |
| | | | | 10 | 0,67 | 288,07 | 166,94 | 120,00 | 45,83 | 118,04 | 151,28 | 166,94 |
| | | | | 15 | 0,67 | 448,21 | 208,96 | 120,00 | 82,64 | 161,63 | 194,51 | 208,96 |
| | | | | 20 | 0,67 | 608,34 | 66,45 | 26,67 | - | - | - | - |
| | | | | 25 | 0,67 | 768,48 | 19,72 | 20,00 | - | - | - | - |
| | | | | 30 | 0,67 | 928,61 | 24,44 | 20,00 | - | - | - | - |
| 2 | 1100 | - | | 5 | 0,67 | 127,94 | 46,58 | 120,00 | 23,57 | 36,80 | 46,06 | 46,58 |
| | | | | 10 | 0,67 | 288,07 | 105,86 | 120,00 | 42,44 | 74,43 | 93,66 | 105,86 |
| | | | | 15 | 0,67 | 448,21 | 156,11 | 120,00 | 60,57 | 110,19 | 139,76 | 156,11 |
| | | | | 20 | 0,67 | 608,34 | 198,07 | 120,00 | 77,62 | 139,15 | 179,18 | 198,07 |
| | | | | 25 | 0,67 | 768,48 | 228,57 | 120,00 | 93,81 | 163,52 | 207,93 | 228,57 |
| | | | | 30 | 0,67 | 928,61 | 246,28 | 113,33 | 109,65 | 184,15 | 229,66 | - |
| 3 | 1100 | 9 | | 5 | 0,91 | 8,53 | 42,16 | 120,00 | 21,72 | 33,36 | 41,93 | 42,16 |
| | | | | 10 | 0,91 | 19,20 | 93,20 | 120,00 | 37,46 | 64,70 | 82,35 | 93,20 |
| | | | | 15 | 0,91 | 29,88 | 169,49 | 100,00 | 52,91 | 97,12 | 141,99 | - |
| | | | | 20 | 0,91 | 40,56 | 154,49 | 73,33 | 68,64 | 127,81 | - | - |
| | | | | 25 | 0,91 | 51,23 | 121,70 | 46,67 | 82,41 | - | - | - |
| | | | | 30 | 0,91 | 61,91 | 121,60 | 33,33 | 98,42 | - | - | - |
| 3 | 1100 | 9 | | 5 | 0,91 | 8,53 | 42,02 | 120,00 | 21,67 | 33,37 | 41,88 | 42,02 |
| | | | | 10 | 0,91 | 19,20 | 94,22 | 120,00 | 37,63 | 65,57 | 83,31 | 94,22 |
| | | | | 15 | 0,91 | 29,88 | 152,44 | 120,00 | 53,35 | 99,12 | 131,42 | 152,44 |
| | | | | 20 | 0,91 | 40,56 | 209,35 | 120,00 | 68,55 | 129,35 | 179,23 | 209,35 |
| | | | | 25 | 0,91 | 51,23 | 251,75 | 120,00 | 83,34 | 157,13 | 217,57 | 251,75 |
| | | | | 30 | 0,91 | 61,91 | 287,79 | 120,00 | 98,86 | 182,88 | 248,92 | 287,79 |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load
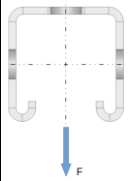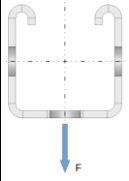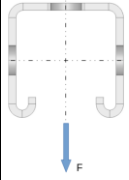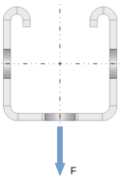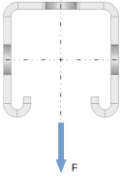[3] dimensions in mm

Symbols and designation see Annex D1

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**Hilti MT installation channels MT-40D, MT-50, MT-70 and MT-80**

**Bending characteristics of Hilti MT channels in case of fire**

**Annex D12**

**Table D13:** Calculation-based deformation in case of fire for installation channels MT-50, MT-50 U, MT-50 S, MT-50 OC and MT-50 S OC

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 1300 | - | | 5 | 0,50 | 35,44 | 50,34 | 120,00 | 25,05 | 39,53 | 49,47 | 50,34 |
| | | | | 10 | 0,50 | 84,71 | 110,76 | 120,00 | 42,85 | 74,60 | 95,11 | 110,76 |
| | | | | 15 | 0,50 | 133,98 | 299,78 | 120,00 | 60,52 | 117,38 | 254,76 | 299,78 |
| | | | | 20 | 0,50 | 183,25 | 115,26 | 46,67 | 77,98 | - | - | - |
| | | | | 25 | 0,50 | 232,52 | 119,54 | 33,33 | 95,25 | - | - | - |
| | | | | 30 | 0,50 | 281,80 | 84,75 | 26,67 | - | - | - | - |
| 1 | 1300 | - | | 5 | 0,50 | 35,44 | 50,00 | 120,00 | 24,90 | 39,29 | 49,17 | 50,00 |
| | | | | 10 | 0,50 | 84,71 | 105,56 | 120,00 | 42,67 | 74,21 | 94,15 | 105,56 |
| | | | | 15 | 0,50 | 133,98 | 175,33 | 120,00 | 60,29 | 112,15 | 148,12 | 175,33 |
| | | | | 20 | 0,50 | 183,25 | 256,98 | 113,33 | 77,52 | 148,52 | 211,44 | - |
| | | | | 25 | 0,50 | 232,52 | 242,90 | 80,00 | 94,39 | 183,66 | - | - |
| | | | | 30 | 0,50 | 281,80 | 244,50 | 66,67 | 111,70 | 219,94 | - | - |
| 2 | 1300 | - | | 5 | 0,67 | 115,16 | 102,17 | 120,00 | 31,30 | 56,59 | 87,55 | 102,17 |
| | | | | 10 | 0,67 | 275,30 | 197,57 | 120,00 | 68,95 | 145,84 | 179,80 | 197,57 |
| | | | | 15 | 0,67 | 435,43 | 241,56 | 120,00 | 110,98 | 190,82 | 224,88 | 241,56 |
| | | | | 20 | 0,67 | 595,57 | 262,49 | 120,00 | 152,69 | 216,30 | 248,21 | 262,49 |
| | | | | 25 | 0,67 | 755,70 | 281,76 | 120,00 | 181,47 | 238,04 | 268,71 | 281,76 |
| | | | | 30 | 0,67 | 915,84 | 301,03 | 120,00 | 210,25 | 259,79 | 289,21 | 301,03 |
| 2 | 1300 | - | | 5 | 0,67 | 115,16 | 64,39 | 120,00 | 31,00 | 50,14 | 62,34 | 64,39 |
| | | | | 10 | 0,67 | 275,30 | 138,69 | 120,00 | 56,87 | 99,42 | 123,47 | 138,69 |
| | | | | 15 | 0,67 | 435,43 | 194,19 | 120,00 | 81,02 | 142,85 | 175,09 | 194,19 |
| | | | | 20 | 0,67 | 595,57 | 237,81 | 120,00 | 103,06 | 176,41 | 217,72 | 237,81 |
| | | | | 25 | 0,67 | 755,70 | 270,36 | 120,00 | 123,41 | 203,12 | 249,10 | 270,36 |
| | | | | 30 | 0,67 | 915,84 | 297,44 | 120,00 | 142,23 | 225,47 | 272,82 | 297,44 |
| 3 | 1300 | 11 | | 5 | 0,92 | 5,48 | 59,91 | 120,00 | 29,08 | 46,52 | 58,07 | 59,91 |
| | | | | 10 | 0,92 | 13,11 | 125,36 | 120,00 | 50,63 | 87,98 | 110,62 | 125,36 |
| | | | | 15 | 0,92 | 20,73 | 292,41 | 120,00 | 71,27 | 128,12 | 205,04 | 292,41 |
| | | | | 20 | 0,92 | 28,36 | 348,80 | 120,00 | 90,79 | 184,70 | 310,77 | 348,80 |
| | | | | 25 | 0,92 | 35,99 | 384,34 | 120,00 | 109,53 | 262,82 | 350,60 | 384,34 |
| | | | | 30 | 0,92 | 43,61 | 186,45 | 40,00 | 127,94 | - | - | - |
| 3 | 1300 | 11 | | 5 | 0,92 | 5,48 | 59,64 | 120,00 | 28,91 | 46,47 | 57,95 | 59,64 |
| | | | | 10 | 0,92 | 13,11 | 127,34 | 120,00 | 50,90 | 89,60 | 112,53 | 127,34 |
| | | | | 15 | 0,92 | 20,73 | 191,96 | 120,00 | 72,07 | 131,68 | 168,55 | 191,96 |
| | | | | 20 | 0,92 | 28,36 | 252,24 | 120,00 | 92,15 | 167,59 | 221,11 | 252,24 |
| | | | | 25 | 0,92 | 35,99 | 298,34 | 120,00 | 111,27 | 199,12 | 262,65 | 298,34 |
| | | | | 30 | 0,92 | 43,61 | 334,07 | 120,00 | 130,15 | 226,91 | 296,39 | 334,07 |

[1] Momentum degree of fullness without contribution from channel dead weight
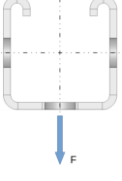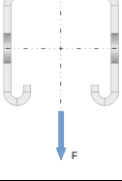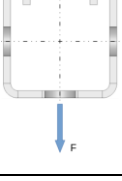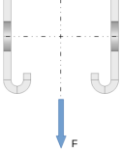[2] Size of designated system's single load
[3] dimensions in mm
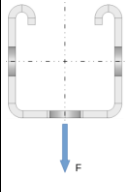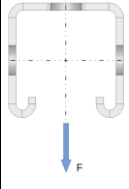
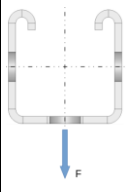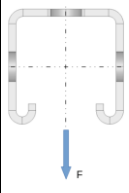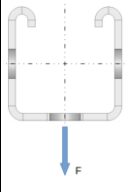Symbols and designation see Annex D1

| Hilti MT installation channels MT-40D, MT-50, MT-70 and MT-80 | |
|---|---|
| Bending characteristics of Hilti MT channels in case of fire | **Annex D13** |

**Table D14:** Calculation-based deformation in case of fire for installation channels MT-50, MT-50 U, MT-50 S, MT-50 OC and MT-50 S OC

| Loadcase | L[3] | n | Load direction | $\sigma_B$ MPa | $V^{[1]}$ - | $F^{[2]}$ N | $\delta_{tmax;B}$ mm | $t_{max,B}$ min | $\delta_{30}$ mm | $\delta_{60}$ mm | $\delta_{90}$ mm | $\delta_{120}$ mm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1500 | - | | 5 | 0,50 | 26,74 | 69,18 | 120,00 | 32,82 | 53,55 | 66,66 | 69,18 |
| | | | | 10 | 0,50 | 69,44 | 156,55 | 120,00 | 56,23 | 99,36 | 128,32 | 156,55 |
| | | | | 15 | 0,50 | 112,14 | 367,21 | 120,00 | 79,27 | 211,60 | 319,11 | 367,21 |
| | | | | 20 | 0,50 | 154,84 | 138,88 | 40,00 | 102,11 | - | - | - |
| | | | | 25 | 0,50 | 197,55 | 92,90 | 26,67 | - | - | - | - |
| | | | | 30 | 0,50 | 240,25 | 110,95 | 26,67 | - | - | - | - |
| 1 | 1500 | - | | 5 | 0,50 | 26,74 | 68,76 | 120,00 | 32,60 | 53,23 | 66,29 | 68,76 |
| | | | | 10 | 0,50 | 69,44 | 140,16 | 120,00 | 56,02 | 98,71 | 124,36 | 140,16 |
| | | | | 15 | 0,50 | 112,14 | 221,93 | 120,00 | 78,99 | 146,31 | 189,72 | 221,93 |
| | | | | 20 | 0,50 | 154,84 | 313,11 | 113,33 | 101,16 | 190,30 | 262,15 | - |
| | | | | 25 | 0,50 | 197,55 | 297,15 | 80,00 | 122,62 | 231,42 | - | - |
| | | | | 30 | 0,50 | 240,25 | 298,68 | 66,67 | 144,11 | 271,93 | - | - |
| 2 | 1500 | - | | 5 | 0,67 | 100,26 | 127,09 | 120,00 | 40,94 | 85,50 | 114,48 | 127,09 |
| | | | | 10 | 0,67 | 260,40 | 236,47 | 120,00 | 90,37 | 173,01 | 214,01 | 236,47 |
| | | | | 15 | 0,67 | 420,53 | 282,98 | 120,00 | 138,78 | 223,88 | 263,32 | 282,98 |
| | | | | 20 | 0,67 | 580,67 | 294,93 | 120,00 | 175,48 | 244,97 | 279,04 | 294,93 |
| | | | | 25 | 0,67 | 740,80 | 314,56 | 120,00 | 205,20 | 268,02 | 300,53 | 314,56 |
| | | | | 30 | 0,67 | 900,94 | 337,27 | 120,00 | 236,15 | 293,12 | 324,57 | 337,27 |
| 2 | 1500 | - | | 5 | 0,67 | 100,26 | 84,66 | 120,00 | 39,59 | 65,40 | 80,89 | 84,66 |
| | | | | 10 | 0,67 | 260,40 | 173,32 | 120,00 | 73,24 | 126,50 | 155,31 | 173,32 |
| | | | | 15 | 0,67 | 420,53 | 234,91 | 120,00 | 103,71 | 176,89 | 212,13 | 234,91 |
| | | | | 20 | 0,67 | 580,67 | 279,58 | 120,00 | 130,71 | 214,67 | 257,60 | 279,58 |
| | | | | 25 | 0,67 | 740,80 | 314,39 | 120,00 | 155,03 | 243,98 | 291,77 | 314,39 |
| | | | | 30 | 0,67 | 900,94 | 341,28 | 120,00 | 176,90 | 267,89 | 317,62 | 341,28 |
| 3 | 1500 | 13 | | 5 | 0,93 | 3,58 | 81,20 | 120,00 | 38,13 | 62,43 | 77,46 | 81,20 |
| | | | | 10 | 0,93 | 9,30 | 161,03 | 120,00 | 66,02 | 113,81 | 141,50 | 161,03 |
| | | | | 15 | 0,93 | 15,02 | 302,22 | 120,00 | 92,10 | 161,24 | 225,03 | 302,22 |
| | | | | 20 | 0,93 | 20,74 | 386,93 | 120,00 | 116,20 | 215,37 | 334,92 | 386,93 |
| | | | | 25 | 0,93 | 26,46 | 429,91 | 120,00 | 139,35 | 282,47 | 389,36 | 429,91 |
| | | | | 30 | 0,93 | 32,18 | 461,08 | 120,00 | 170,29 | 351,56 | 423,66 | 461,08 |
| 3 | 1500 | 13 | | 5 | 0,93 | 3,58 | 80,83 | 120,00 | 37,77 | 62,32 | 77,29 | 80,83 |
| | | | | 10 | 0,93 | 9,30 | 163,12 | 120,00 | 66,46 | 116,60 | 144,74 | 163,12 |
| | | | | 15 | 0,93 | 15,02 | 232,89 | 120,00 | 93,49 | 166,35 | 206,97 | 232,89 |
| | | | | 20 | 0,93 | 20,74 | 295,33 | 120,00 | 118,50 | 207,12 | 263,13 | 295,33 |
| | | | | 25 | 0,93 | 26,46 | 344,69 | 120,00 | 141,84 | 241,72 | 307,81 | 344,69 |
| | | | | 30 | 0,93 | 32,18 | 383,46 | 120,00 | 163,95 | 271,88 | 343,97 | 383,46 |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load
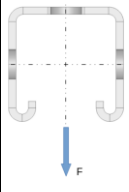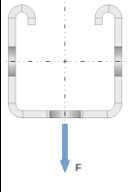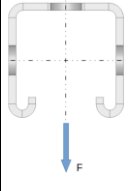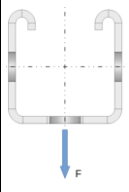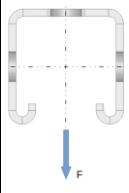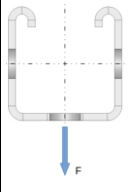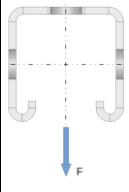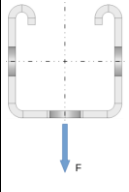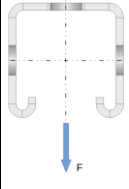[3] dimensions in mm

Symbols and designation see Annex D1

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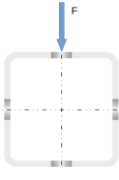
**Hilti MT installation channels MT-40D, MT-50, MT-70 and MT-80**

**Bending characteristics of Hilti MT channels in case of fire**

**Annex D14**

**Table D15: Calculation-based deformation in case of fire for installation channels MT-70 S OC and MT-70 OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 500 | - | | 5 | 0,50 | 247,05 | 32,35 | 120,00 | 7,01 | 32,35 | 32,35 | 32,35 |
| | | | | 10 | 0,50 | 502,41 | 38,36 | 120,00 | 8,14 | 38,36 | 38,36 | 38,36 |
| | | | | 15 | 0,50 | 757,77 | 51,59 | 120,00 | 9,72 | 46,90 | 46,90 | 51,59 |
| | | | | 20 | 0,50 | 1013,13 | 156,46 | 120,00 | 12,34 | 62,06 | 80,63 | 156,46 |
| | | | | 25 | 0,50 | 1268,49 | 195,33 | 120,00 | 17,55 | 88,46 | 170,56 | 195,33 |
| | | | | 30 | 0,50 | 1523,85 | 210,65 | 120,00 | 27,60 | 155,54 | 199,01 | 210,65 |
| 1 | 500 | - | | 5 | 0,50 | 247,05 | 33,21 | 120,00 | 7,35 | 33,21 | 33,21 | 33,21 |
| | | | | 10 | 0,50 | 502,41 | 40,17 | 120,00 | 9,05 | 40,17 | 40,17 | 40,17 |
| | | | | 15 | 0,50 | 757,77 | 48,64 | 120,00 | 11,37 | 48,64 | 48,64 | 48,64 |
| | | | | 20 | 0,50 | 1013,13 | 87,28 | 120,00 | 14,52 | 61,32 | 66,88 | 87,28 |
| | | | | 25 | 0,50 | 1268,49 | 152,03 | 120,00 | 19,08 | 80,44 | 107,53 | 152,03 |
| | | | | 30 | 0,50 | 1523,85 | 204,09 | 120,00 | 26,54 | 107,19 | 158,87 | 204,09 |
| 2 | 500 | - | | 5 | 0,67 | 308,81 | 34,80 | 120,00 | 7,45 | 34,80 | 34,80 | 34,80 |
| | | | | 10 | 0,67 | 628,01 | 44,09 | 120,00 | 9,33 | 44,09 | 44,09 | 44,09 |
| | | | | 15 | 0,67 | 947,21 | 89,44 | 120,00 | 12,11 | 62,12 | 71,78 | 89,44 |
| | | | | 20 | 0,67 | 1266,41 | 126,51 | 120,00 | 17,81 | 92,92 | 111,00 | 126,51 |
| | | | | 25 | 0,67 | 1585,61 | 146,44 | 120,00 | 32,42 | 123,99 | 136,97 | 146,44 |
| | | | | 30 | 0,67 | 1904,81 | 151,99 | 90,91 | 58,28 | 146,85 | 151,37 | - |
| 2 | 500 | - | | 5 | 0,67 | 308,81 | 34,60 | 120,00 | 7,44 | 34,60 | 34,60 | 34,60 |
| | | | | 10 | 0,67 | 628,01 | 42,86 | 120,00 | 9,23 | 42,86 | 42,86 | 42,86 |
| | | | | 15 | 0,67 | 947,21 | 64,64 | 120,00 | 11,58 | 55,84 | 55,84 | 64,64 |
| | | | | 20 | 0,67 | 1266,41 | 99,95 | 120,00 | 15,83 | 75,67 | 84,86 | 99,95 |
| | | | | 25 | 0,67 | 1585,61 | 124,97 | 117,77 | 25,13 | 100,20 | 111,00 | - |
| | | | | 30 | 0,67 | 1904,81 | 132,35 | 86,10 | 40,33 | 120,99 | - | - |
| 3 | 500 | 3 | | 5 | 0,80 | 102,94 | 33,77 | 120,00 | 7,27 | 33,77 | 33,77 | 33,77 |
| | | | | 10 | 0,80 | 209,34 | 41,46 | 120,00 | 8,80 | 41,46 | 41,46 | 41,46 |
| | | | | 15 | 0,80 | 315,74 | 76,61 | 120,00 | 10,82 | 53,94 | 57,32 | 76,61 |
| | | | | 20 | 0,80 | 422,14 | 138,95 | 120,00 | 14,43 | 78,29 | 107,97 | 138,95 |
| | | | | 25 | 0,80 | 528,54 | 184,65 | 120,00 | 22,94 | 115,77 | 155,14 | 184,65 |
| | | | | 30 | 0,80 | 634,94 | 206,49 | 120,00 | 40,89 | 155,52 | 188,56 | 206,49 |
| 3 | 500 | 3 | | 5 | 0,80 | 102,94 | 33,74 | 120,00 | 7,28 | 33,74 | 33,74 | 33,74 |
| | | | | 10 | 0,80 | 209,34 | 41,12 | 120,00 | 8,81 | 41,12 | 41,12 | 41,12 |
| | | | | 15 | 0,80 | 315,74 | 58,64 | 120,00 | 10,77 | 51,80 | 51,80 | 58,64 |
| | | | | 20 | 0,80 | 422,14 | 101,04 | 120,00 | 14,07 | 69,47 | 81,67 | 101,04 |
| | | | | 25 | 0,80 | 528,54 | 138,89 | 120,00 | 20,88 | 94,70 | 117,43 | 138,89 |
| | | | | 30 | 0,80 | 634,94 | 167,03 | 120,00 | 33,06 | 122,34 | 145,78 | 167,03 |

[1] Momentum degree of fullness without contribution from channel dead weight

[2] Size of designated system's single load
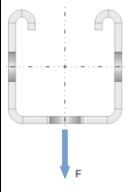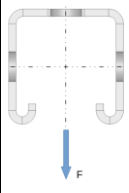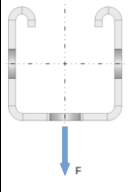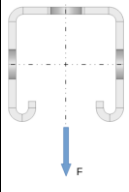
[3] dimensions in mm
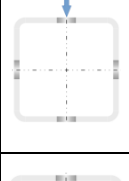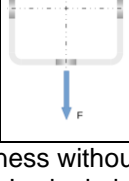
Symbols and designation see Annex D1

| **Hilti MT installation channels MT-40D, MT-50, MT-70 and MT-80** | |
|---|---|
| **Bending characteristics of Hilti MT channels in case of fire** | **Annex D15** |

**Table D16: Calculation-based deformation in case of fire for installation channels MT-70 S OC and MT-70 OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 800 | - | | 5 | 0,50 | 146,30 | 37,15 | 120,00 | 8,03 | 37,15 | 37,15 | 37,15 |
| | | | | 10 | 0,50 | 305,90 | 51,36 | 120,00 | 10,79 | 51,36 | 51,36 | 51,36 |
| | | | | 15 | 0,50 | 465,50 | 104,98 | 120,00 | 14,35 | 70,27 | 83,77 | 104,98 |
| | | | | 20 | 0,50 | 625,10 | 188,53 | 120,00 | 19,81 | 101,73 | 143,75 | 188,53 |
| | | | | 25 | 0,50 | 784,70 | 287,59 | 120,00 | 30,42 | 146,59 | 216,85 | 287,59 |
| | | | | 30 | 0,50 | 944,30 | 328,95 | 120,00 | 50,99 | 199,96 | 291,64 | 328,95 |
| 1 | 800 | - | | 5 | 0,50 | 146,30 | 37,59 | 120,00 | 8,21 | 37,59 | 37,59 | 37,59 |
| | | | | 10 | 0,50 | 305,90 | 52,26 | 120,00 | 11,24 | 52,26 | 52,26 | 52,26 |
| | | | | 15 | 0,50 | 465,50 | 97,60 | 120,00 | 15,13 | 70,67 | 81,20 | 97,60 |
| | | | | 20 | 0,50 | 625,10 | 166,31 | 120,00 | 20,78 | 99,10 | 132,52 | 166,31 |
| | | | | 25 | 0,50 | 784,70 | 230,37 | 120,00 | 30,49 | 138,44 | 189,70 | 230,37 |
| | | | | 30 | 0,50 | 944,30 | 288,75 | 120,00 | 47,64 | 181,46 | 240,91 | 288,75 |
| 2 | 800 | - | | 5 | 0,67 | 292,60 | 43,33 | 120,00 | 9,08 | 43,33 | 43,33 | 43,33 |
| | | | | 10 | 0,67 | 611,80 | 90,19 | 120,00 | 13,76 | 67,02 | 75,78 | 90,19 |
| | | | | 15 | 0,67 | 931,00 | 160,84 | 120,00 | 20,48 | 110,06 | 140,50 | 160,84 |
| | | | | 20 | 0,67 | 1250,20 | 205,97 | 120,00 | 34,67 | 159,09 | 187,44 | 205,97 |
| | | | | 25 | 0,67 | 1569,40 | 228,43 | 120,00 | 71,07 | 198,04 | 215,41 | 228,43 |
| | | | | 30 | 0,67 | 1888,60 | 232,96 | 96,35 | 114,76 | 223,65 | 231,31 | - |
| 2 | 800 | - | | 5 | 0,67 | 292,60 | 42,77 | 120,00 | 9,05 | 42,77 | 42,77 | 42,77 |
| | | | | 10 | 0,67 | 611,80 | 75,64 | 120,00 | 13,56 | 63,70 | 66,53 | 75,64 |
| | | | | 15 | 0,67 | 931,00 | 121,54 | 120,00 | 19,51 | 93,48 | 108,82 | 121,54 |
| | | | | 20 | 0,67 | 1250,20 | 161,78 | 120,00 | 30,49 | 128,95 | 148,58 | 161,78 |
| | | | | 25 | 0,67 | 1569,40 | 185,20 | 119,26 | 53,27 | 159,84 | 174,52 | - |
| | | | | 30 | 0,67 | 1888,60 | 192,40 | 86,74 | 82,82 | 183,55 | - | - |
| 3 | 800 | 6 | | 5 | 0,88 | 36,57 | 39,96 | 120,00 | 8,52 | 39,96 | 39,96 | 39,96 |
| | | | | 10 | 0,88 | 76,47 | 66,72 | 120,00 | 12,13 | 58,08 | 58,37 | 66,72 |
| | | | | 15 | 0,88 | 116,37 | 135,21 | 120,00 | 16,79 | 84,91 | 109,54 | 135,21 |
| | | | | 20 | 0,88 | 156,27 | 206,64 | 120,00 | 24,72 | 127,76 | 171,73 | 206,64 |
| | | | | 25 | 0,88 | 196,17 | 258,44 | 120,00 | 42,19 | 178,22 | 226,12 | 258,44 |
| | | | | 30 | 0,88 | 236,07 | 301,74 | 120,00 | 74,97 | 221,82 | 266,99 | 301,74 |
| 3 | 800 | 6 | | 5 | 0,88 | 36,57 | 39,97 | 120,00 | 8,56 | 39,97 | 39,97 | 39,97 |
| | | | | 10 | 0,88 | 76,47 | 63,97 | 120,00 | 12,21 | 57,74 | 57,74 | 63,97 |
| | | | | 15 | 0,88 | 116,37 | 119,67 | 120,00 | 16,86 | 82,23 | 100,40 | 119,67 |
| | | | | 20 | 0,88 | 156,27 | 182,25 | 120,00 | 24,53 | 118,83 | 153,63 | 182,25 |
| | | | | 25 | 0,88 | 196,17 | 225,13 | 120,00 | 40,12 | 161,71 | 198,90 | 225,13 |
| | | | | 30 | 0,88 | 236,07 | 257,18 | 120,00 | 67,32 | 198,63 | 234,53 | 257,18 |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load
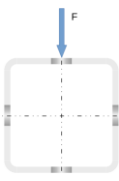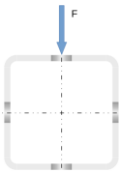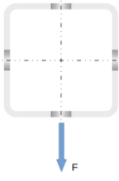[3] dimensions in mm
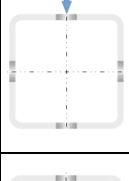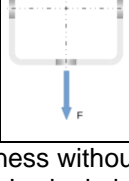
Symbols and designation see Annex D1

| **Hilti MT installation channels MT-40D, MT-50, MT-70 and MT-80** | |
|---|---|
| **Bending characteristics of Hilti MT channels in case of fire** | **Annex D16** |

**Table D17: Calculation-based deformation in case of fire for installation channels MT-70 S OC and MT-70 OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 1100 | - | | 5 | 0,50 | 97,78 | 44,47 | 120,00 | 9,57 | 44,47 | 44,47 | 44,47 |
| | | | | 10 | 0,50 | 213,85 | 90,08 | 120,00 | 14,71 | 70,67 | 79,48 | 90,08 |
| | | | | 15 | 0,50 | 329,93 | 170,78 | 120,00 | 21,23 | 103,99 | 140,03 | 170,78 |
| | | | | 20 | 0,50 | 446,00 | 265,95 | 120,00 | 31,02 | 154,31 | 218,39 | 265,95 |
| | | | | 25 | 0,50 | 562,07 | 357,23 | 120,00 | 49,47 | 216,07 | 294,52 | 357,23 |
| | | | | 30 | 0,50 | 678,15 | 429,03 | 120,00 | 83,56 | 277,03 | 366,09 | 429,03 |
| 1 | 1100 | - | | 5 | 0,50 | 97,78 | 44,71 | 120,00 | 9,68 | 44,71 | 44,71 | 44,71 |
| | | | | 10 | 0,50 | 213,85 | 89,97 | 120,00 | 14,98 | 71,12 | 79,75 | 89,97 |
| | | | | 15 | 0,50 | 329,93 | 164,55 | 120,00 | 21,69 | 103,81 | 137,45 | 164,55 |
| | | | | 20 | 0,50 | 446,00 | 253,90 | 120,00 | 31,52 | 151,68 | 210,69 | 253,90 |
| | | | | 25 | 0,50 | 562,07 | 322,83 | 120,00 | 49,02 | 209,61 | 278,99 | 322,83 |
| | | | | 30 | 0,50 | 678,15 | 382,96 | 120,00 | 79,99 | 264,61 | 335,99 | 382,96 |
| 2 | 1100 | - | | 5 | 0,67 | 268,90 | 55,51 | 120,00 | 11,38 | 55,51 | 55,51 | 55,51 |
| | | | | 10 | 0,67 | 588,10 | 155,74 | 120,00 | 20,19 | 100,15 | 131,71 | 155,74 |
| | | | | 15 | 0,67 | 907,30 | 236,04 | 120,00 | 32,82 | 169,15 | 213,11 | 236,04 |
| | | | | 20 | 0,67 | 1226,50 | 289,73 | 120,00 | 59,95 | 229,94 | 269,43 | 289,73 |
| | | | | 25 | 0,67 | 1545,70 | 316,31 | 120,00 | 118,75 | 272,79 | 301,35 | 316,31 |
| | | | | 30 | 0,67 | 1864,90 | 324,77 | 99,78 | 177,03 | 304,89 | 322,28 | - |
| 2 | 1100 | - | | 5 | 0,67 | 268,90 | 54,19 | 120,00 | 11,32 | 54,19 | 54,19 | 54,19 |
| | | | | 10 | 0,67 | 588,10 | 128,59 | 120,00 | 19,76 | 92,55 | 112,91 | 128,59 |
| | | | | 15 | 0,67 | 907,30 | 183,94 | 120,00 | 30,85 | 139,04 | 166,72 | 183,94 |
| | | | | 20 | 0,67 | 1226,50 | 226,11 | 120,00 | 51,05 | 186,85 | 212,57 | 226,11 |
| | | | | 25 | 0,67 | 1545,70 | 249,89 | 120,00 | 88,10 | 221,42 | 241,50 | 249,89 |
| | | | | 30 | 0,67 | 1864,90 | 258,55 | 88,59 | 128,57 | 246,83 | - | - |
| 3 | 1100 | 9 | | 5 | 0,91 | 17,93 | 49,62 | 120,00 | 10,47 | 49,62 | 49,62 | 49,62 |
| | | | | 10 | 0,91 | 39,21 | 119,82 | 120,00 | 17,31 | 83,49 | 102,56 | 119,82 |
| | | | | 15 | 0,91 | 60,49 | 210,61 | 120,00 | 26,21 | 131,06 | 178,51 | 210,61 |
| | | | | 20 | 0,91 | 81,77 | 295,09 | 120,00 | 41,55 | 194,51 | 255,54 | 295,09 |
| | | | | 25 | 0,91 | 103,05 | 350,43 | 120,00 | 74,72 | 257,63 | 313,76 | 350,43 |
| | | | | 30 | 0,91 | 124,33 | 389,04 | 120,00 | 128,76 | 307,45 | 359,45 | 389,04 |
| 3 | 1100 | 9 | | 5 | 0,91 | 17,93 | 49,45 | 120,00 | 10,47 | 49,45 | 49,45 | 49,45 |
| | | | | 10 | 0,91 | 39,21 | 114,95 | 120,00 | 17,26 | 82,45 | 99,51 | 114,95 |
| | | | | 15 | 0,91 | 60,49 | 193,74 | 120,00 | 26,01 | 126,18 | 166,73 | 193,74 |
| | | | | 20 | 0,91 | 81,77 | 270,45 | 120,00 | 40,72 | 183,19 | 236,88 | 270,45 |
| | | | | 25 | 0,91 | 103,05 | 322,62 | 120,00 | 70,47 | 239,32 | 288,62 | 322,62 |
| | | | | 30 | 0,91 | 124,33 | 358,62 | 120,00 | 117,19 | 285,40 | 329,77 | 358,62 |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load
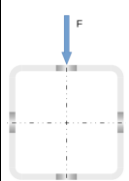[3] dimensions in mm

Symbols and designation see Annex D1

| | |
|---|---|
| **Hilti MT installation channels MT-40D, MT-50, MT-70 and MT-80** | |
| **Bending characteristics of Hilti MT channels in case of fire** | **Annex D17** |

**Table D18: Calculation-based deformation in case of fire for installation channels MT-70 S OC and MT-70 OC**

| Loadcase | L[3] | n | Load direction | $\sigma_B$ MPa | $V^{1)}$ - | $F^{2)}$ N | $\delta_{tmax;B}$ mm | $t_{max,B}$ min | $\delta_{30}$ mm | $\delta_{60}$ mm | $\delta_{90}$ mm | $\delta_{120}$ mm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1400 | - | | 5 | 0,50 | 67,92 | 54,74 | 120,00 | 11,73 | 54,74 | 54,74 | 54,74 |
| | | | | 10 | 0,50 | 159,12 | 142,09 | 120,00 | 20,02 | 96,57 | 123,77 | 142,09 |
| | | | | 15 | 0,50 | 250,32 | 245,97 | 120,00 | 30,50 | 147,49 | 207,15 | 245,97 |
| | | | | 20 | 0,50 | 341,52 | 355,17 | 120,00 | 46,11 | 217,35 | 301,21 | 355,17 |
| | | | | 25 | 0,50 | 432,72 | 441,62 | 120,00 | 74,90 | 293,35 | 384,18 | 441,62 |
| | | | | 30 | 0,50 | 523,92 | 518,66 | 120,00 | 125,26 | 361,86 | 453,77 | 518,66 |
| 1 | 1400 | - | | 5 | 0,50 | 67,92 | 54,85 | 120,00 | 11,79 | 54,85 | 54,85 | 54,85 |
| | | | | 10 | 0,50 | 159,12 | 141,66 | 120,00 | 20,19 | 96,74 | 123,69 | 141,66 |
| | | | | 15 | 0,50 | 250,32 | 241,24 | 120,00 | 30,76 | 146,97 | 204,90 | 241,24 |
| | | | | 20 | 0,50 | 341,52 | 346,34 | 120,00 | 46,31 | 215,08 | 296,28 | 346,34 |
| | | | | 25 | 0,50 | 432,72 | 424,05 | 120,00 | 74,09 | 288,31 | 373,15 | 424,05 |
| | | | | 30 | 0,50 | 523,92 | 484,16 | 120,00 | 121,76 | 353,68 | 437,07 | 484,16 |
| 2 | 1400 | - | | 5 | 0,67 | 237,72 | 78,46 | 120,00 | 14,30 | 70,84 | 78,29 | 78,46 |
| | | | | 10 | 0,67 | 556,92 | 227,82 | 120,00 | 28,54 | 141,73 | 196,03 | 227,82 |
| | | | | 15 | 0,67 | 876,12 | 314,93 | 120,00 | 49,05 | 233,09 | 288,77 | 314,93 |
| | | | | 20 | 0,67 | 1195,32 | 377,06 | 120,00 | 92,91 | 305,91 | 353,78 | 377,06 |
| | | | | 25 | 0,67 | 1514,52 | 410,55 | 120,00 | 177,30 | 354,16 | 392,80 | 410,55 |
| | | | | 30 | 0,67 | 1833,72 | 419,50 | 102,67 | 241,32 | 388,45 | 415,60 | - |
| 2 | 1400 | - | | 5 | 0,67 | 237,72 | 71,32 | 120,00 | 14,20 | 68,54 | 71,32 | 71,32 |
| | | | | 10 | 0,67 | 556,92 | 187,55 | 120,00 | 27,75 | 128,14 | 166,28 | 187,55 |
| | | | | 15 | 0,67 | 876,12 | 255,33 | 120,00 | 45,48 | 189,49 | 229,68 | 255,33 |
| | | | | 20 | 0,67 | 1195,32 | 296,37 | 120,00 | 76,79 | 247,30 | 280,33 | 296,37 |
| | | | | 25 | 0,67 | 1514,52 | 320,84 | 120,00 | 127,33 | 287,74 | 312,36 | 320,84 |
| | | | | 30 | 0,67 | 1833,72 | 330,23 | 91,17 | 178,19 | 315,43 | 329,56 | - |
| 3 | 1400 | 12 | | 5 | 0,93 | 9,70 | 61,83 | 120,00 | 12,96 | 61,83 | 61,83 | 61,83 |
| | | | | 10 | 0,93 | 22,73 | 180,34 | 120,00 | 23,85 | 114,95 | 154,70 | 180,34 |
| | | | | 15 | 0,93 | 35,76 | 285,87 | 120,00 | 38,00 | 182,92 | 249,05 | 285,87 |
| | | | | 20 | 0,93 | 48,79 | 381,63 | 120,00 | 62,04 | 263,59 | 339,37 | 381,63 |
| | | | | 25 | 0,93 | 61,82 | 446,39 | 120,00 | 111,17 | 335,73 | 403,85 | 446,39 |
| | | | | 30 | 0,93 | 74,85 | 490,85 | 120,00 | 183,11 | 393,90 | 453,15 | 490,85 |
| 3 | 1400 | 12 | | 5 | 0,93 | 9,70 | 61,63 | 120,00 | 12,96 | 61,63 | 61,63 | 61,63 |
| | | | | 10 | 0,93 | 22,73 | 174,43 | 120,00 | 23,80 | 113,57 | 150,82 | 174,43 |
| | | | | 15 | 0,93 | 35,76 | 270,16 | 120,00 | 37,76 | 177,01 | 237,14 | 270,16 |
| | | | | 20 | 0,93 | 48,79 | 358,58 | 120,00 | 60,93 | 252,16 | 320,95 | 358,58 |
| | | | | 25 | 0,93 | 61,82 | 420,09 | 120,00 | 105,68 | 317,90 | 381,99 | 420,09 |
| | | | | 30 | 0,93 | 74,85 | 463,10 | 120,00 | 170,07 | 372,41 | 426,98 | 463,10 |

[1] Momentum degree of fullness without contribution from channel dead weight
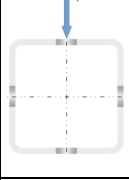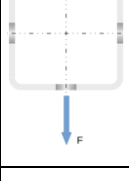[2] Size of designated system's single load
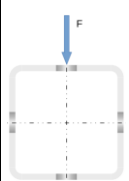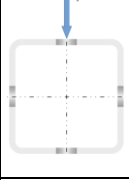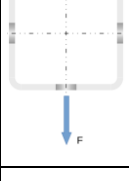[3] dimensions in mm

Symbols and designation see Annex D1

| **Hilti MT installation channels MT-40D, MT-50, MT-70 and MT-80** | |
|---|---|
| **Bending characteristics of Hilti MT channels in case of fire** | **Annex D18** |

**Table D19: Calculation-based deformation in case of fire for installation channels MT-70 S OC and MT-70 OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 1700 | - | | 5 | 0,50 | 46,84 | 69,94 | 120,00 | 14,60 | 68,64 | 69,94 | 69,94 |
| | | | | 10 | 0,50 | 121,94 | 204,84 | 120,00 | 26,85 | 129,43 | 178,09 | 204,84 |
| | | | | 15 | 0,50 | 197,05 | 328,64 | 120,00 | 42,31 | 199,97 | 282,63 | 328,64 |
| | | | | 20 | 0,50 | 272,16 | 449,22 | 120,00 | 65,25 | 288,58 | 390,65 | 449,22 |
| | | | | 25 | 0,50 | 347,26 | 538,95 | 120,00 | 106,73 | 376,39 | 479,49 | 538,95 |
| | | | | 30 | 0,50 | 422,37 | 614,38 | 120,00 | 175,02 | 452,62 | 553,18 | 614,38 |
| 1 | 1700 | - | | 5 | 0,50 | 46,84 | 69,89 | 120,00 | 14,64 | 68,66 | 69,89 | 69,89 |
| | | | | 10 | 0,50 | 121,94 | 204,21 | 120,00 | 26,94 | 129,39 | 177,78 | 204,21 |
| | | | | 15 | 0,50 | 197,05 | 325,06 | 120,00 | 42,44 | 199,21 | 280,66 | 325,06 |
| | | | | 20 | 0,50 | 272,16 | 442,39 | 120,00 | 65,22 | 286,64 | 386,88 | 442,39 |
| | | | | 25 | 0,50 | 347,26 | 529,51 | 120,00 | 105,59 | 372,33 | 471,65 | 529,51 |
| | | | | 30 | 0,50 | 422,37 | 592,73 | 120,00 | 171,58 | 447,06 | 541,47 | 592,73 |
| 2 | 1700 | - | | 5 | 0,67 | 199,06 | 109,90 | 120,00 | 17,78 | 88,73 | 108,26 | 109,90 |
| | | | | 10 | 0,67 | 518,26 | 303,22 | 120,00 | 38,71 | 189,58 | 264,87 | 303,22 |
| | | | | 15 | 0,67 | 837,46 | 401,53 | 120,00 | 69,02 | 299,93 | 367,24 | 401,53 |
| | | | | 20 | 0,67 | 1156,66 | 466,63 | 120,00 | 132,09 | 384,16 | 440,74 | 466,63 |
| | | | | 25 | 0,67 | 1475,86 | 507,07 | 120,00 | 236,40 | 438,46 | 485,68 | 507,07 |
| | | | | 30 | 0,67 | 1795,06 | 518,54 | 105,72 | 307,91 | 474,73 | 511,91 | - |
| 2 | 1700 | - | | 5 | 0,67 | 199,06 | 98,73 | 120,00 | 17,63 | 85,46 | 98,73 | 98,73 |
| | | | | 10 | 0,67 | 518,26 | 251,34 | 120,00 | 37,44 | 169,29 | 224,87 | 251,34 |
| | | | | 15 | 0,67 | 837,46 | 330,79 | 120,00 | 63,23 | 243,87 | 300,24 | 330,79 |
| | | | | 20 | 0,67 | 1156,66 | 376,42 | 120,00 | 107,01 | 311,08 | 351,88 | 376,42 |
| | | | | 25 | 0,67 | 1475,86 | 401,45 | 120,00 | 169,95 | 356,87 | 388,11 | 401,45 |
| | | | | 30 | 0,67 | 1795,06 | 408,28 | 94,69 | 230,59 | 388,17 | 407,08 | - |
| 3 | 1700 | 15 | | 5 | 0,94 | 5,53 | 86,08 | 120,00 | 16,16 | 77,60 | 86,08 | 86,08 |
| | | | | 10 | 0,94 | 14,40 | 250,27 | 120,00 | 32,25 | 154,14 | 216,36 | 250,27 |
| | | | | 15 | 0,94 | 23,26 | 369,34 | 120,00 | 53,18 | 243,65 | 327,36 | 369,34 |
| | | | | 20 | 0,94 | 32,13 | 473,79 | 120,00 | 88,56 | 340,78 | 428,77 | 473,79 |
| | | | | 25 | 0,94 | 41,00 | 546,64 | 120,00 | 157,03 | 420,45 | 501,97 | 546,64 |
| | | | | 30 | 0,94 | 49,86 | 597,20 | 120,00 | 246,32 | 485,67 | 554,77 | 597,20 |
| 3 | 1700 | 15 | | 5 | 0,94 | 5,53 | 85,23 | 120,00 | 16,15 | 77,31 | 85,23 | 85,23 |
| | | | | 10 | 0,94 | 14,40 | 243,38 | 120,00 | 32,14 | 152,23 | 211,60 | 243,38 |
| | | | | 15 | 0,94 | 23,26 | 354,74 | 120,00 | 52,77 | 236,62 | 315,20 | 354,74 |
| | | | | 20 | 0,94 | 32,13 | 451,39 | 120,00 | 86,89 | 328,37 | 410,16 | 451,39 |
| | | | | 25 | 0,94 | 41,00 | 520,79 | 120,00 | 149,86 | 402,53 | 479,92 | 520,79 |
| | | | | 30 | 0,94 | 49,86 | 569,71 | 120,00 | 231,67 | 464,05 | 530,59 | 569,71 |

[1] Momentum degree of fullness without contribution from channel dead weight

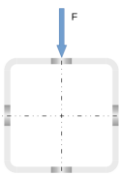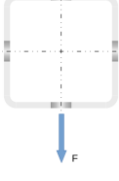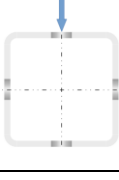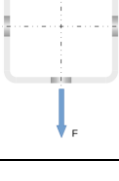[2] Size of designated system's single load

[3] dimensions in mm

Symbols and designation see Annex D1

| Hilti MT installation channels MT-40D, MT-50, MT-70 and MT-80 | |
|---|---|
| **Bending characteristics of Hilti MT channels in case of fire** | **Annex D19** |

**Table D20: Calculation-based deformation in case of fire for installation channels MT-70 S OC and MT-70 OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 2000 | - | | 5 | 0,50 | 30,58 | 99,99 | 120,00 | 18,35 | 86,97 | 99,99 | 99,99 |
| | | | | 10 | 0,50 | 94,42 | 277,12 | 120,00 | 35,40 | 169,60 | 241,74 | 277,12 |
| | | | | 15 | 0,50 | 158,26 | 417,36 | 120,00 | 56,88 | 260,37 | 364,62 | 417,36 |
| | | | | 20 | 0,50 | 222,10 | 546,67 | 120,00 | 88,66 | 366,19 | 484,33 | 546,67 |
| | | | | 25 | 0,50 | 285,94 | 644,10 | 120,00 | 144,85 | 463,89 | 579,38 | 644,10 |
| | | | | 30 | 0,50 | 349,78 | 717,60 | 120,00 | 231,73 | 547,96 | 657,26 | 717,60 |
| 1 | 2000 | - | | 5 | 0,50 | 30,58 | 99,86 | 120,00 | 18,36 | 86,93 | 99,86 | 99,86 |
| | | | | 10 | 0,50 | 94,42 | 276,38 | 120,00 | 35,43 | 169,40 | 241,26 | 276,38 |
| | | | | 15 | 0,50 | 158,26 | 414,68 | 120,00 | 56,89 | 259,45 | 362,91 | 414,68 |
| | | | | 20 | 0,50 | 222,10 | 541,40 | 120,00 | 88,43 | 364,44 | 481,24 | 541,40 |
| | | | | 25 | 0,50 | 285,94 | 636,96 | 120,00 | 143,42 | 460,56 | 574,24 | 636,96 |
| | | | | 30 | 0,50 | 349,78 | 706,05 | 120,00 | 228,32 | 543,49 | 648,44 | 706,05 |
| 2 | 2000 | - | | 5 | 0,67 | 152,92 | 142,95 | 120,00 | 21,71 | 108,34 | 139,97 | 142,95 |
| | | | | 10 | 0,67 | 472,12 | 380,79 | 120,00 | 50,55 | 241,64 | 336,23 | 380,79 |
| | | | | 15 | 0,67 | 791,32 | 493,91 | 120,00 | 92,41 | 368,74 | 448,30 | 493,91 |
| | | | | 20 | 0,67 | 1110,52 | 559,08 | 120,00 | 175,95 | 464,18 | 530,48 | 559,08 |
| | | | | 25 | 0,67 | 1429,72 | 603,59 | 120,00 | 297,78 | 525,98 | 581,32 | 603,59 |
| | | | | 30 | 0,67 | 1748,92 | 621,31 | 110,18 | 377,74 | 566,21 | 611,58 | - |
| 2 | 2000 | - | | 5 | 0,67 | 152,92 | 130,08 | 120,00 | 21,55 | 104,58 | 129,38 | 130,08 |
| | | | | 10 | 0,67 | 472,12 | 320,01 | 120,00 | 48,73 | 215,12 | 288,09 | 320,01 |
| | | | | 15 | 0,67 | 791,32 | 410,89 | 120,00 | 83,92 | 302,36 | 375,57 | 410,89 |
| | | | | 20 | 0,67 | 1110,52 | 461,69 | 120,00 | 141,12 | 378,54 | 429,59 | 461,69 |
| | | | | 25 | 0,67 | 1429,72 | 489,49 | 120,00 | 215,65 | 429,74 | 467,18 | 489,49 |
| | | | | 30 | 0,67 | 1748,92 | 492,54 | 99,12 | 285,81 | 464,59 | 489,30 | - |
| 3 | 2000 | 18 | | 5 | 0,95 | 3,06 | 117,05 | 120,00 | 19,99 | 96,34 | 116,61 | 117,05 |
| | | | | 10 | 0,95 | 9,44 | 323,90 | 120,00 | 42,11 | 198,53 | 282,73 | 323,90 |
| | | | | 15 | 0,95 | 15,83 | 456,93 | 120,00 | 70,87 | 307,58 | 407,78 | 456,93 |
| | | | | 20 | 0,95 | 22,21 | 565,98 | 120,00 | 118,62 | 418,93 | 518,14 | 565,98 |
| | | | | 25 | 0,95 | 28,59 | 646,13 | 120,00 | 205,08 | 505,78 | 599,47 | 646,13 |
| | | | | 30 | 0,95 | 34,98 | 702,80 | 120,00 | 309,33 | 577,22 | 658,49 | 702,80 |
| 3 | 2000 | 18 | | 5 | 0,95 | 3,06 | 116,03 | 120,00 | 19,98 | 96,04 | 115,76 | 116,03 |
| | | | | 10 | 0,95 | 9,44 | 316,78 | 120,00 | 41,99 | 196,33 | 277,64 | 316,78 |
| | | | | 15 | 0,95 | 15,83 | 444,49 | 120,00 | 70,38 | 300,16 | 396,15 | 444,49 |
| | | | | 20 | 0,95 | 22,21 | 545,12 | 120,00 | 116,55 | 406,31 | 500,28 | 545,12 |
| | | | | 25 | 0,95 | 28,59 | 621,64 | 120,00 | 196,92 | 489,01 | 578,10 | 621,64 |
| | | | | 30 | 0,95 | 34,98 | 676,52 | 120,00 | 294,36 | 556,41 | 635,14 | 676,52 |

[1] Momentum degree of fullness without contribution from channel dead weight

[2] Size of designated system's single load
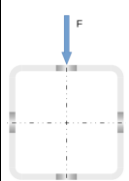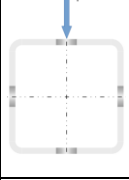
[3] dimensions in mm

Symbols and designation see Annex D1

| **Hilti MT installation channels MT-40D, MT-50, MT-70 and MT-80** | |
|---|---|
| **Bending characteristics of Hilti MT channels in case of fire** | **Annex D20** |

**Table D21: Calculation-based deformation in case of fire for installation channels MT-80 S OC and MT-80 OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 500 | - | | 5 | 0,50 | 695,64 | 33,01 | 120,00 | 3,91 | 30,49 | 30,49 | 33,01 |
| | | | | 10 | 0,50 | 1402,76 | 50,48 | 120,00 | 4,84 | 33,95 | 37,76 | 50,48 |
| | | | | 15 | 0,50 | 2109,88 | 45,66 | 70,00 | 6,15 | 39,48 | - | - |
| | | | | 20 | 0,50 | 2817,00 | 32,97 | 46,67 | 8,58 | - | - | - |
| | | | | 25 | 0,50 | 3524,12 | 12,65 | 26,67 | - | - | - | - |
| | | | | 30 | 0,50 | 4231,24 | 5,59 | 20,00 | - | - | - | - |
| 1 | 500 | - | | 5 | 0,50 | 382,28 | 33,62 | 120,00 | 4,06 | 31,01 | 31,01 | 33,62 |
| | | | | 10 | 0,50 | 776,04 | 47,93 | 120,00 | 5,26 | 35,86 | 40,97 | 47,93 |
| | | | | 15 | 0,50 | 1169,80 | 83,59 | 120,00 | 6,89 | 42,92 | 58,57 | 83,59 |
| | | | | 20 | 0,50 | 1563,56 | 166,18 | 120,00 | 9,55 | 54,26 | 102,55 | 166,18 |
| | | | | 25 | 0,50 | 1957,32 | 196,80 | 120,00 | 14,50 | 74,38 | 162,61 | 196,80 |
| | | | | 30 | 0,50 | 2351,08 | 213,12 | 120,00 | 24,49 | 128,76 | 188,32 | 213,12 |
| 2 | 500 | - | | 5 | 0,67 | 869,55 | 37,31 | 120,00 | 4,50 | 32,31 | 33,44 | 37,31 |
| | | | | 10 | 0,67 | 1753,45 | 47,60 | 80,00 | 6,22 | 38,77 | - | - |
| | | | | 15 | 0,67 | 2637,35 | 35,52 | 48,33 | 9,35 | - | - | - |
| | | | | 20 | 0,67 | 3521,25 | 22,29 | 30,00 | 22,29 | - | - | - |
| | | | | 25 | 0,67 | 4405,15 | 14,87 | 21,67 | - | - | - | - |
| | | | | 30 | 0,67 | 5289,05 | 7,96 | 18,33 | - | - | - | - |
| 2 | 500 | - | | 5 | 0,67 | 477,85 | 37,91 | 120,00 | 4,87 | 33,34 | 34,55 | 37,91 |
| | | | | 10 | 0,67 | 970,05 | 59,61 | 120,00 | 6,90 | 40,77 | 49,86 | 59,61 |
| | | | | 15 | 0,67 | 1462,25 | 92,47 | 120,00 | 10,00 | 51,18 | 71,92 | 92,47 |
| | | | | 20 | 0,67 | 1954,45 | 125,08 | 120,00 | 14,78 | 66,66 | 99,64 | 125,08 |
| | | | | 25 | 0,67 | 2446,65 | 145,57 | 120,00 | 22,73 | 85,89 | 122,61 | 145,57 |
| | | | | 30 | 0,67 | 2938,85 | 157,86 | 120,00 | 35,77 | 104,68 | 138,40 | 157,86 |
| 3 | 500 | 3 | | 5 | 0,80 | 289,85 | 34,53 | 120,00 | 4,24 | 31,42 | 31,47 | 34,53 |
| | | | | 10 | 0,80 | 584,48 | 49,08 | 120,00 | 5,42 | 35,90 | 41,32 | 49,08 |
| | | | | 15 | 0,80 | 879,12 | 55,15 | 78,33 | 7,09 | 42,91 | - | - |
| | | | | 20 | 0,80 | 1173,75 | 48,14 | 55,00 | 9,69 | - | - | - |
| | | | | 25 | 0,80 | 1468,38 | 34,51 | 40,00 | 14,38 | - | - | - |
| | | | | 30 | 0,80 | 1763,02 | 23,40 | 28,33 | - | - | - | - |
| 3 | 500 | 3 | | 5 | 0,80 | 159,28 | 35,97 | 120,00 | 4,61 | 32,55 | 32,94 | 35,97 |
| | | | | 10 | 0,80 | 323,35 | 53,63 | 120,00 | 6,31 | 38,76 | 45,94 | 53,63 |
| | | | | 15 | 0,80 | 487,42 | 89,12 | 120,00 | 8,53 | 47,23 | 66,05 | 89,12 |
| | | | | 20 | 0,80 | 651,48 | 153,84 | 120,00 | 11,72 | 60,54 | 99,99 | 153,84 |
| | | | | 25 | 0,80 | 815,55 | 189,53 | 120,00 | 16,84 | 81,27 | 150,90 | 189,53 |
| | | | | 30 | 0,80 | 979,62 | 209,16 | 120,00 | 25,74 | 111,49 | 180,91 | 209,16 |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load
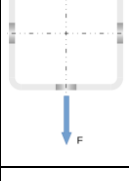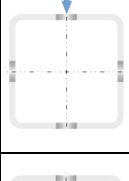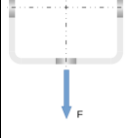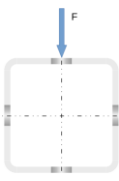[3] dimensions in mm

Symbols and designation see Annex D1

**Hilti MT installation channels MT-40D, MT-50, MT-70 and MT-80**

**Bending characteristics of Hilti MT channels in case of fire**

**Annex D21**

**Table D22: Calculation-based deformation in case of fire for installation channels MT-80 S OC and MT-80 OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 900 | - | | 5 | 0,50 | 372,18 | 38,41 | 120,00 | 5,01 | 34,19 | 35,16 | 38,41 |
| | | | | 10 | 0,50 | 765,03 | 62,99 | 120,00 | 7,48 | 43,31 | 53,95 | 62,99 |
| | | | | 15 | 0,50 | 1157,87 | 96,15 | 95,00 | 10,55 | 55,06 | 87,24 | - |
| | | | | 20 | 0,50 | 1550,72 | 100,05 | 68,33 | 14,79 | 74,99 | - | - |
| | | | | 25 | 0,50 | 1943,56 | 73,57 | 48,33 | 21,83 | - | - | - |
| | | | | 30 | 0,50 | 2336,41 | 43,88 | 30,00 | 43,88 | - | - | - |
| 1 | 900 | - | | 5 | 0,50 | 198,10 | 41,58 | 120,00 | 5,97 | 36,76 | 38,35 | 41,58 |
| | | | | 10 | 0,50 | 416,85 | 72,90 | 120,00 | 9,71 | 49,38 | 63,00 | 72,90 |
| | | | | 15 | 0,50 | 635,61 | 133,11 | 120,00 | 14,01 | 64,46 | 98,39 | 133,11 |
| | | | | 20 | 0,50 | 854,36 | 267,87 | 120,00 | 19,39 | 87,31 | 158,89 | 267,87 |
| | | | | 25 | 0,50 | 1073,12 | 347,89 | 120,00 | 27,13 | 121,99 | 267,63 | 347,89 |
| | | | | 30 | 0,50 | 1291,87 | 380,84 | 120,00 | 40,86 | 184,85 | 336,11 | 380,84 |
| 2 | 900 | - | | 5 | 0,67 | 837,42 | 48,42 | 120,00 | 6,39 | 38,70 | 44,35 | 48,42 |
| | | | | 10 | 0,67 | 1721,32 | 66,96 | 70,00 | 10,40 | 55,05 | - | - |
| | | | | 15 | 0,67 | 2605,22 | 45,18 | 41,67 | 17,10 | - | - | - |
| | | | | 20 | 0,67 | 3489,12 | 27,43 | 28,33 | - | - | - | - |
| | | | | 25 | 0,67 | 4373,02 | 19,41 | 21,67 | - | - | - | - |
| | | | | 30 | 0,67 | 5256,92 | 11,67 | 18,33 | - | - | - | - |
| 2 | 900 | - | | 5 | 0,67 | 445,72 | 50,58 | 120,00 | 7,73 | 41,73 | 46,94 | 50,58 |
| | | | | 10 | 0,67 | 937,92 | 98,64 | 120,00 | 13,24 | 60,94 | 84,16 | 98,64 |
| | | | | 15 | 0,67 | 1430,12 | 146,26 | 120,00 | 20,95 | 82,99 | 121,73 | 146,26 |
| | | | | 20 | 0,67 | 1922,32 | 181,70 | 120,00 | 31,11 | 111,00 | 158,99 | 181,70 |
| | | | | 25 | 0,67 | 2414,52 | 207,74 | 120,00 | 44,91 | 138,12 | 187,90 | 207,74 |
| | | | | 30 | 0,67 | 2906,72 | 222,06 | 120,00 | 62,64 | 161,27 | 204,55 | 222,06 |
| 3 | 900 | 7 | | 5 | 0,89 | 83,74 | 41,91 | 120,00 | 5,68 | 36,24 | 38,79 | 41,91 |
| | | | | 10 | 0,89 | 172,13 | 73,67 | 120,00 | 8,68 | 47,62 | 62,54 | 73,67 |
| | | | | 15 | 0,89 | 260,52 | 89,81 | 80,00 | 12,68 | 63,50 | - | - |
| | | | | 20 | 0,89 | 348,91 | 80,90 | 56,67 | 17,95 | - | - | - |
| | | | | 25 | 0,89 | 437,30 | 63,43 | 41,67 | 26,29 | - | - | - |
| | | | | 30 | 0,89 | 525,69 | 51,85 | 31,67 | 41,51 | - | - | - |
| 3 | 900 | 7 | | 5 | 0,89 | 44,57 | 46,58 | 120,00 | 7,02 | 39,74 | 43,22 | 46,58 |
| | | | | 10 | 0,89 | 93,79 | 87,63 | 120,00 | 11,88 | 56,25 | 75,43 | 87,63 |
| | | | | 15 | 0,89 | 143,01 | 147,23 | 120,00 | 17,94 | 75,70 | 115,14 | 147,23 |
| | | | | 20 | 0,89 | 192,23 | 230,52 | 120,00 | 25,64 | 102,55 | 169,76 | 230,52 |
| | | | | 25 | 0,89 | 241,45 | 303,99 | 120,00 | 36,37 | 137,46 | 232,77 | 303,99 |
| | | | | 30 | 0,89 | 290,67 | 349,64 | 120,00 | 52,31 | 179,76 | 291,60 | 349,64 |

[1] Momentum degree of fullness without contribution from channel dead weight
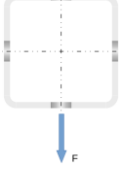[2] Size of designated system's single load
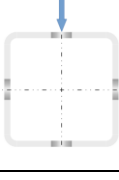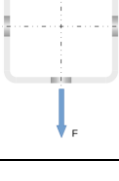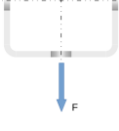[3] dimensions in mm

Symbols and designation see Annex D1

| **Hilti MT installation channels MT-40D, MT-50, MT-70 and MT-80** | |
|---|---|
| **Bending characteristics of Hilti MT channels in case of fire** | **Annex D22** |

**Table D23: Calculation-based deformation in case of fire for installation channels MT-80 S OC and MT-80 OC**

| Loadcase | System L[3] | n | Load direction | $\sigma_B$ MPa | $V^{1)}$ - | $F^{2)}$ N | $\delta_{tmax;B}$ mm | $t_{max,B}$ min | $\delta_{30}$ mm | $\delta_{60}$ mm | $\delta_{90}$ mm | $\delta_{120}$ mm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1300 | - | | 5 | 0,50 | 242,13 | 48,00 | 120,00 | 6,89 | 40,54 | 44,63 | 48,00 |
| | | | | 10 | 0,50 | 514,10 | 93,62 | 120,00 | 11,70 | 58,34 | 80,65 | 93,62 |
| | | | | 15 | 0,50 | 786,07 | 182,71 | 105,00 | 17,63 | 80,59 | 136,98 | - |
| | | | | 20 | 0,50 | 1058,03 | 170,61 | 71,67 | 25,37 | 115,22 | - | - |
| | | | | 25 | 0,50 | 1330,00 | 146,32 | 53,33 | 36,74 | - | - | - |
| | | | | 30 | 0,50 | 1601,97 | 116,13 | 38,33 | 57,23 | - | - | - |
| 1 | 1300 | - | | 5 | 0,50 | 121,60 | 55,00 | 120,00 | 9,06 | 45,88 | 51,29 | 55,00 |
| | | | | 10 | 0,50 | 273,05 | 110,47 | 120,00 | 16,58 | 70,40 | 97,16 | 110,47 |
| | | | | 15 | 0,50 | 424,50 | 191,47 | 120,00 | 25,26 | 97,19 | 148,91 | 191,47 |
| | | | | 20 | 0,50 | 575,94 | 349,22 | 120,00 | 35,81 | 131,23 | 234,63 | 349,22 |
| | | | | 25 | 0,50 | 727,39 | 481,09 | 120,00 | 49,14 | 177,04 | 354,21 | 481,09 |
| | | | | 30 | 0,50 | 878,83 | 542,78 | 120,00 | 66,96 | 253,28 | 464,02 | 542,78 |
| 2 | 1300 | - | | 5 | 0,67 | 786,91 | 66,81 | 120,00 | 9,38 | 48,96 | 62,36 | 66,81 |
| | | | | 10 | 0,67 | 1670,81 | 92,03 | 63,33 | 17,16 | 83,42 | - | - |
| | | | | 15 | 0,67 | 2554,71 | 57,77 | 36,67 | 29,96 | - | - | - |
| | | | | 20 | 0,67 | 3438,61 | 31,31 | 26,67 | - | - | - | - |
| | | | | 25 | 0,67 | 4322,51 | 16,66 | 20,00 | - | - | - | - |
| | | | | 30 | 0,67 | 5206,41 | 17,81 | 18,33 | - | - | - | - |
| 2 | 1300 | - | | 5 | 0,67 | 395,21 | 68,02 | 120,00 | 11,77 | 53,30 | 63,88 | 68,02 |
| | | | | 10 | 0,67 | 887,41 | 150,59 | 120,00 | 22,44 | 89,05 | 130,10 | 150,59 |
| | | | | 15 | 0,67 | 1379,61 | 224,65 | 120,00 | 36,85 | 127,11 | 189,90 | 224,65 |
| | | | | 20 | 0,67 | 1871,81 | 277,82 | 120,00 | 54,93 | 169,19 | 241,90 | 277,82 |
| | | | | 25 | 0,67 | 2364,01 | 312,83 | 120,00 | 77,30 | 209,95 | 286,49 | 312,83 |
| | | | | 30 | 0,67 | 2856,21 | 336,03 | 120,00 | 103,18 | 244,03 | 317,92 | 336,03 |
| 3 | 1300 | 11 | | 5 | 0,92 | 37,47 | 55,11 | 120,00 | 8,10 | 44,38 | 51,70 | 55,11 |
| | | | | 10 | 0,92 | 79,56 | 118,64 | 120,00 | 14,04 | 67,09 | 98,97 | 118,64 |
| | | | | 15 | 0,92 | 121,65 | 227,10 | 81,67 | 22,06 | 99,30 | - | - |
| | | | | 20 | 0,92 | 163,74 | 165,27 | 58,33 | 32,63 | - | - | - |
| | | | | 25 | 0,92 | 205,83 | 145,36 | 43,33 | 49,41 | - | - | - |
| | | | | 30 | 0,92 | 247,92 | 107,85 | 31,67 | 81,90 | - | - | - |
| 3 | 1300 | 11 | | 5 | 0,92 | 18,82 | 63,47 | 120,00 | 10,91 | 50,93 | 59,51 | 63,47 |
| | | | | 10 | 0,92 | 42,26 | 137,34 | 120,00 | 20,46 | 82,23 | 118,36 | 137,34 |
| | | | | 15 | 0,92 | 65,70 | 225,20 | 120,00 | 32,26 | 117,06 | 182,86 | 225,20 |
| | | | | 20 | 0,92 | 89,13 | 327,58 | 120,00 | 46,92 | 161,79 | 258,81 | 327,58 |
| | | | | 25 | 0,92 | 112,57 | 414,57 | 120,00 | 66,30 | 213,35 | 333,03 | 414,57 |
| | | | | 30 | 0,92 | 136,01 | 479,56 | 120,00 | 93,02 | 267,96 | 401,27 | 479,56 |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load
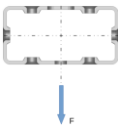[3] dimensions in mm

Symbols and designation see Annex D1

| **Hilti MT installation channels MT-40D, MT-50, MT-70 and MT-80** | |
|---|---|
| **Bending characteristics of Hilti MT channels in case of fire** | **Annex D23** |

**Table D24: Calculation-based deformation in case of fire for installation channels MT-80 S OC and MT-80 OC**

| Loadcase | L[3] | n | Load direction | $\sigma_B$ MPa | V[1] - | F[2] N | $\delta_{tmax;B}$ mm | $t_{max,B}$ min | $\delta_{30}$ mm | $\delta_{60}$ mm | $\delta_{90}$ mm | $\delta_{120}$ mm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1700 | - | | 5 | 0,50 | 168,95 | 62,44 | 120,00 | 9,66 | 49,82 | 58,75 | 62,44 |
| | | | | 10 | 0,50 | 376,93 | 136,59 | 120,00 | 17,59 | 79,31 | 117,83 | 136,59 |
| | | | | 15 | 0,50 | 584,91 | 269,94 | 105,00 | 27,46 | 115,47 | 206,03 | - |
| | | | | 20 | 0,50 | 792,88 | 260,64 | 71,67 | 39,97 | 170,27 | - | - |
| | | | | 25 | 0,50 | 1000,86 | 250,27 | 55,00 | 57,92 | - | - | - |
| | | | | 30 | 0,50 | 1208,83 | 185,75 | 40,00 | 86,70 | - | - | - |
| 1 | 1700 | - | | 5 | 0,50 | 76,79 | 74,67 | 120,00 | 13,61 | 58,99 | 70,21 | 74,67 |
| | | | | 10 | 0,50 | 192,60 | 163,74 | 120,00 | 26,10 | 98,74 | 143,60 | 163,74 |
| | | | | 15 | 0,50 | 308,41 | 268,90 | 120,00 | 40,58 | 141,54 | 221,80 | 268,90 |
| | | | | 20 | 0,50 | 424,22 | 400,99 | 120,00 | 58,11 | 193,51 | 313,55 | 400,99 |
| | | | | 25 | 0,50 | 540,03 | 552,73 | 120,00 | 80,02 | 254,05 | 412,05 | 552,73 |
| | | | | 30 | 0,50 | 655,85 | 639,97 | 120,00 | 108,54 | 320,86 | 535,96 | 639,97 |
| 2 | 1700 | - | | 5 | 0,67 | 718,05 | 92,79 | 120,00 | 13,45 | 63,16 | 87,66 | 92,79 |
| | | | | 10 | 0,67 | 1601,95 | 131,09 | 60,00 | 26,60 | 131,09 | - | - |
| | | | | 15 | 0,67 | 2485,85 | 76,15 | 33,33 | 48,44 | - | - | - |
| | | | | 20 | 0,67 | 3369,75 | 35,67 | 25,00 | - | - | - | - |
| | | | | 25 | 0,67 | 4253,65 | 24,91 | 20,00 | - | - | - | - |
| | | | | 30 | 0,67 | 5137,55 | 26,85 | 18,33 | - | - | - | - |
| 2 | 1700 | - | | 5 | 0,67 | 326,35 | 89,58 | 120,00 | 16,82 | 67,55 | 84,64 | 89,58 |
| | | | | 10 | 0,67 | 818,55 | 212,46 | 120,00 | 34,24 | 123,48 | 184,75 | 212,46 |
| | | | | 15 | 0,67 | 1310,75 | 317,02 | 120,00 | 57,17 | 180,56 | 270,07 | 317,02 |
| | | | | 20 | 0,67 | 1802,95 | 391,17 | 120,00 | 85,25 | 237,59 | 338,87 | 391,17 |
| | | | | 25 | 0,67 | 2295,15 | 441,73 | 120,00 | 118,23 | 293,09 | 397,10 | 441,73 |
| | | | | 30 | 0,67 | 2787,35 | 473,10 | 120,00 | 154,02 | 339,46 | 439,80 | 473,10 |
| 3 | 1700 | 15 | | 5 | 0,94 | 19,95 | 73,56 | 120,00 | 11,49 | 55,67 | 69,72 | 73,56 |
| | | | | 10 | 0,94 | 44,50 | 176,48 | 120,00 | 21,36 | 93,42 | 147,01 | 176,48 |
| | | | | 15 | 0,94 | 69,05 | 744,33 | 120,00 | 34,81 | 145,87 | 436,38 | 744,33 |
| | | | | 20 | 0,94 | 93,60 | 802,13 | 120,00 | 52,43 | 282,52 | 764,75 | 802,13 |
| | | | | 25 | 0,94 | 118,16 | 392,10 | 46,67 | 80,08 | - | - | - |
| | | | | 30 | 0,94 | 142,71 | 169,01 | 31,67 | 130,63 | - | - | - |
| 3 | 1700 | 15 | | 5 | 0,94 | 9,07 | 85,70 | 120,00 | 16,14 | 65,59 | 80,89 | 85,70 |
| | | | | 10 | 0,94 | 22,74 | 197,60 | 120,00 | 31,68 | 114,89 | 171,05 | 197,60 |
| | | | | 15 | 0,94 | 36,41 | 315,56 | 120,00 | 50,73 | 167,78 | 261,79 | 315,56 |
| | | | | 20 | 0,94 | 50,08 | 433,69 | 120,00 | 74,13 | 230,93 | 357,41 | 433,69 |
| | | | | 25 | 0,94 | 63,75 | 533,46 | 120,00 | 103,95 | 298,66 | 445,25 | 533,46 |
| | | | | 30 | 0,94 | 77,43 | 607,61 | 120,00 | 142,80 | 366,38 | 520,21 | 607,61 |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load
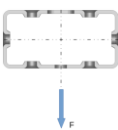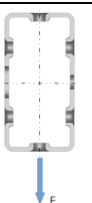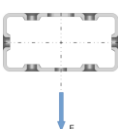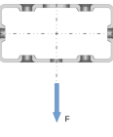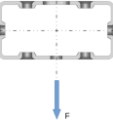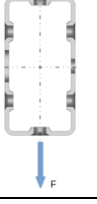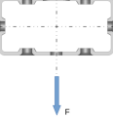[3] dimensions in mm
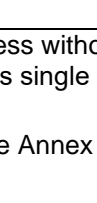
Symbols and designation see Annex D1

**Hilti MT installation channels MT-40D, MT-50, MT-70 and MT-80**

**Bending characteristics of Hilti MT channels in case of fire**

**Annex D24**

**Table D25: Calculation-based deformation in case of fire for installation channels MT-80 S OC and MT-80 OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 2100 | - | | 5 | 0,50 | 120,16 | 83,18 | 120,00 | 13,57 | 62,85 | 79,02 | 83,18 |
| | | | | 10 | 0,50 | 288,52 | 193,72 | 120,00 | 25,42 | 107,14 | 167,11 | 193,72 |
| | | | | 15 | 0,50 | 456,88 | 432,28 | 103,33 | 40,38 | 160,91 | 301,21 | - |
| | | | | 20 | 0,50 | 625,24 | 454,54 | 71,67 | 59,13 | 242,29 | - | - |
| | | | | 25 | 0,50 | 793,60 | 335,47 | 53,33 | 85,54 | - | - | - |
| | | | | 30 | 0,50 | 961,97 | 271,62 | 40,00 | 126,41 | - | - | - |
| 1 | 2100 | - | | 5 | 0,50 | 45,55 | 101,80 | 120,00 | 19,93 | 76,75 | 96,25 | 101,80 |
| | | | | 10 | 0,50 | 139,30 | 229,82 | 120,00 | 38,54 | 134,63 | 201,42 | 229,82 |
| | | | | 15 | 0,50 | 233,05 | 368,17 | 120,00 | 60,14 | 195,86 | 307,61 | 368,17 |
| | | | | 20 | 0,50 | 326,80 | 519,87 | 120,00 | 86,18 | 267,21 | 421,96 | 519,87 |
| | | | | 25 | 0,50 | 420,56 | 660,20 | 120,00 | 118,30 | 345,93 | 534,50 | 660,20 |
| | | | | 30 | 0,50 | 514,31 | 785,76 | 120,00 | 159,04 | 428,46 | 643,89 | 785,76 |
| 2 | 2100 | - | | 5 | 0,67 | 630,82 | 125,99 | 120,00 | 18,61 | 81,22 | 119,80 | 125,99 |
| | | | | 10 | 0,67 | 1514,72 | 165,38 | 56,67 | 38,79 | - | - | - |
| | | | | 15 | 0,67 | 2398,62 | 106,50 | 31,67 | 73,38 | - | - | - |
| | | | | 20 | 0,67 | 3282,52 | 54,07 | 25,00 | - | - | - | - |
| | | | | 25 | 0,67 | 4166,42 | 35,86 | 20,00 | - | - | - | - |
| | | | | 30 | 0,67 | 5050,32 | 24,72 | 16,67 | - | - | - | - |
| 2 | 2100 | - | | 5 | 0,67 | 239,12 | 115,35 | 120,00 | 22,89 | 84,53 | 109,37 | 115,35 |
| | | | | 10 | 0,67 | 731,32 | 284,17 | 120,00 | 48,45 | 163,56 | 247,68 | 284,17 |
| | | | | 15 | 0,67 | 1223,52 | 421,52 | 120,00 | 81,50 | 242,04 | 360,67 | 421,52 |
| | | | | 20 | 0,67 | 1715,72 | 515,33 | 120,00 | 121,55 | 315,26 | 448,60 | 515,33 |
| | | | | 25 | 0,67 | 2207,92 | 577,86 | 120,00 | 166,77 | 386,33 | 517,77 | 577,86 |
| | | | | 30 | 0,67 | 2700,12 | 617,24 | 120,00 | 213,99 | 444,99 | 569,82 | 617,24 |
| 3 | 2100 | 19 | | 5 | 0,95 | 11,47 | 98,15 | 120,00 | 16,00 | 70,61 | 93,75 | 98,15 |
| | | | | 10 | 0,95 | 27,54 | 248,72 | 120,00 | 30,85 | 127,22 | 207,64 | 248,72 |
| | | | | 15 | 0,95 | 43,61 | 783,34 | 120,00 | 51,22 | 204,64 | 527,36 | 783,34 |
| | | | | 20 | 0,95 | 59,68 | 949,12 | 120,00 | 77,86 | 400,37 | 857,93 | 949,12 |
| | | | | 25 | 0,95 | 75,75 | 993,65 | 120,00 | 119,18 | 799,47 | 960,24 | 993,65 |
| | | | | 30 | 0,95 | 91,82 | 258,19 | 31,67 | 193,61 | - | - | - |
| 3 | 2100 | 19 | | 5 | 0,95 | 4,35 | 114,10 | 120,00 | 22,88 | 84,18 | 108,11 | 114,10 |
| | | | | 10 | 0,95 | 13,30 | 268,38 | 120,00 | 45,75 | 154,39 | 233,47 | 268,38 |
| | | | | 15 | 0,95 | 22,25 | 417,27 | 120,00 | 73,52 | 227,60 | 351,66 | 417,27 |
| | | | | 20 | 0,95 | 31,19 | 548,65 | 120,00 | 107,21 | 309,42 | 465,17 | 548,65 |
| | | | | 25 | 0,95 | 40,14 | 659,76 | 120,00 | 148,89 | 393,45 | 566,36 | 659,76 |
| | | | | 30 | 0,95 | 49,09 | 741,32 | 120,00 | 200,63 | 473,38 | 648,91 | 741,32 |

[1] Momentum degree of fullness without contribution from channel dead weight

[2] Size of designated system's single load
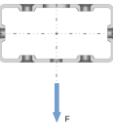
[3] dimensions in mm
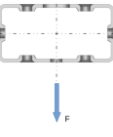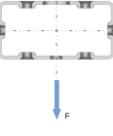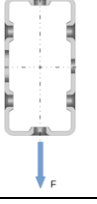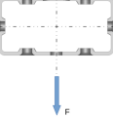
Symbols and designation see Annex D1

| **Hilti MT installation channels MT-40D, MT-50, MT-70 and MT-80** | |
|---|---|
| **Bending characteristics of Hilti MT channels in case of fire** | **Annex D25** |

**Table D26: Calculation-based deformation in case of fire for installation channels MT-80 S OC and MT-80 OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 2500 | - | | 5 | 0,50 | 84,04 | 111,94 | 120,00 | 18,91 | 80,51 | 107,14 | 111,94 |
| | | | | 10 | 0,50 | 225,46 | 266,28 | 120,00 | 35,47 | 142,67 | 229,51 | 266,28 |
| | | | | 15 | 0,50 | 366,88 | 802,33 | 110,00 | 56,71 | 217,73 | 444,31 | - |
| | | | | 20 | 0,50 | 508,31 | 773,69 | 75,00 | 83,20 | 335,07 | - | - |
| | | | | 25 | 0,50 | 649,73 | 553,35 | 53,33 | 120,18 | - | - | - |
| | | | | 30 | 0,50 | 791,16 | 357,60 | 38,33 | 176,40 | - | - | - |
| 1 | 2500 | - | | 5 | 0,50 | 21,36 | 138,02 | 120,00 | 28,38 | 100,04 | 130,94 | 138,02 |
| | | | | 10 | 0,50 | 100,12 | 308,53 | 120,00 | 54,19 | 178,52 | 270,72 | 308,53 |
| | | | | 15 | 0,50 | 178,87 | 479,18 | 120,00 | 84,29 | 260,12 | 405,06 | 479,18 |
| | | | | 20 | 0,50 | 257,62 | 648,90 | 120,00 | 120,30 | 351,28 | 540,54 | 648,90 |
| | | | | 25 | 0,50 | 336,37 | 799,48 | 120,00 | 164,15 | 447,94 | 668,01 | 799,48 |
| | | | | 30 | 0,50 | 415,12 | 920,41 | 120,00 | 218,40 | 545,27 | 783,93 | 920,41 |
| 2 | 2500 | | | 5 | 0,67 | 525,22 | 167,24 | 120,00 | 25,23 | 104,23 | 159,69 | 167,24 |
| | | | | 10 | 0,67 | 1409,12 | 232,67 | 56,67 | 54,14 | - | - | - |
| | | | | 15 | 0,67 | 2293,02 | 104,86 | 30,00 | 104,86 | - | - | - |
| | | | | 20 | 0,67 | 3176,92 | 74,04 | 25,00 | - | - | - | - |
| | | | | 25 | 0,67 | 4060,82 | 49,16 | 20,00 | - | - | - | - |
| | | | | 30 | 0,67 | 4944,72 | 33,95 | 16,67 | - | - | - | - |
| 2 | 2500 | | | 5 | 0,67 | 133,52 | 145,36 | 120,00 | 30,03 | 104,44 | 138,15 | 145,36 |
| | | | | 10 | 0,67 | 625,72 | 364,93 | 120,00 | 64,95 | 208,49 | 318,19 | 364,93 |
| | | | | 15 | 0,67 | 1117,92 | 537,66 | 120,00 | 109,40 | 310,87 | 461,33 | 537,66 |
| | | | | 20 | 0,67 | 1610,12 | 651,27 | 120,00 | 163,48 | 401,99 | 569,29 | 651,27 |
| | | | | 25 | 0,67 | 2102,32 | 724,49 | 120,00 | 222,40 | 489,01 | 648,80 | 724,49 |
| | | | | 30 | 0,67 | 2594,52 | 770,14 | 120,00 | 282,41 | 560,63 | 708,64 | 770,14 |
| 3 | 2500 | 23 | | 5 | 0,96 | 6,73 | 129,65 | 120,00 | 21,75 | 89,60 | 124,51 | 129,65 |
| | | | | 10 | 0,96 | 18,07 | 334,26 | 120,00 | 42,67 | 168,76 | 280,38 | 334,26 |
| | | | | 15 | 0,96 | 29,40 | 832,28 | 120,00 | 71,46 | 275,19 | 646,73 | 832,28 |
| | | | | 20 | 0,96 | 40,73 | 1062,42 | 120,00 | 109,03 | 529,85 | 903,31 | 1062,42 |
| | | | | 25 | 0,96 | 52,06 | 1146,38 | 120,00 | 166,63 | 807,77 | 1085,21 | 1146,38 |
| | | | | 30 | 0,96 | 63,39 | 1202,27 | 120,00 | 271,92 | 1102,39 | 1176,33 | 1202,27 |
| 3 | 2500 | 23 | | 5 | 0,96 | 1,71 | 149,31 | 120,00 | 31,32 | 107,01 | 141,74 | 149,31 |
| | | | | 10 | 0,96 | 8,02 | 348,26 | 120,00 | 62,61 | 200,36 | 304,42 | 348,26 |
| | | | | 15 | 0,96 | 14,33 | 527,60 | 120,00 | 100,39 | 295,27 | 450,39 | 527,60 |
| | | | | 20 | 0,96 | 20,64 | 672,83 | 120,00 | 145,71 | 395,98 | 581,12 | 672,83 |
| | | | | 25 | 0,96 | 26,95 | 792,97 | 120,00 | 200,13 | 496,13 | 694,65 | 792,97 |
| | | | | 30 | 0,96 | 33,26 | 881,96 | 120,00 | 265,20 | 587,86 | 785,50 | 881,96 |

[1] Momentum degree of fullness without contribution from channel dead weight
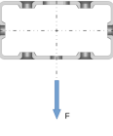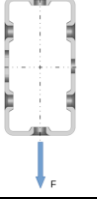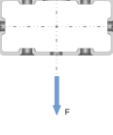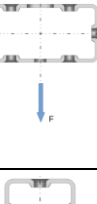[2] Size of designated system's single load
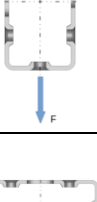[3] dimensions in mm
Symbols and designation see Annex D1

**Hilti MT installation channels MT-40D, MT-50, MT-70 and MT-80**

**Bending characteristics of Hilti MT channels in case of fire**

**Annex D26**

# CSTB
*le futur en construction*

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| | |
|---|---|
| # European Technical Assessment | # ETA-23/0105 of 18/08/2023 |

*English translation prepared by CSTB - Original version in French language*

## General Part

| **Technical Assessment Body issuing the European Technical Assessment:** | |
|---|---|
| Centre Scientifique et Technique du Bâtiment (CSTB) | |
| Trade name of the construction product: | Hilti installation channels of MT System |
| Product family to which the construction product belongs: | Products for installation systems for supporting technical building equipment |
| Manufacturer: | Hilti AG Liechtenstein<br>Feldkircherstraße 100<br>9494 Schaan<br>FÜRSTENTUM LIECHTENSTEIN |
| Manufacturing plants: | L 8321, L 1138282 |
| This European Technical Assessment contains: | 57 pages including 54 pages of annexes which form an integral part of this assessment |
| This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of: | European Assessment Document (EAD) 280016-00-0602 version June 2020 |
| This version replaces:<br>*Corrigendum* | - |

**Specific Part**

## 1 Technical description of the product

This European Technical Assessment covers Hilti installation channels of MT System: MT-10, MT-15, MT-15 OC, MT-20, MT-20 OC, MT-30 S, MT-30, MT-30 S OC, MT-30 OC, MT-40 S, MT-40, MT-40 S OC, MT-40 T, MT-40 T OC, MT-40 OC, MT-40D S, MT-40D, MT-40D S OC, MT-40D OC MT-50 S, MT-50, MT-50 S OC, MT-50 OC, MT-70 S OC,MT-70 OC, MT-80 S OC, MT-80 OC, MT-90 S OC, MT-90 OC, MT-100 S OC and MT-100 OC.

The Hilti installation channels MT-10, MT-15, MT-15 OC, MT-20, MT-20 OC, MT-40 T and MT-40 T OC are made of thin-walled steel in L- or C-shape. Recesses in the form of oblong and round holes allow the use of fasteners and fixtures.

The Hilti installation channels MT-30 S, MT-30, MT-30 S OC, MT-30 OC, MT-40 S, MT-40, MT-40 S OC, MT-40 OC, MT-50 S, MT-50, MT-50 S OC, MT-50 OC, MT-60, MT-60 S, MT-60 OC and MT-60 S OC are made of thin-walled steel with parallel flanges. The flanges are turned at the end which makes it possible to force-fit the channels to specific channel system fixtures. Recesses in the back and/or in the flanges of the channels in the form of oblong holes and round holes allow the use of fasteners and fixtures.

The HILTI installation channels MT-70 S OC, MT-70 OC, MT-80 S OC, MT-80 OC, MT-90 S OC, MT-90 OC, MT-100 S OC and MT-100 OC are made of thin-walled steel closed profiles in square or rectangular shape with recesses in the form of dome shape round holes on the inner sides to allow use of fasteners and fixtures.

The HILTI installation channels MT-40D S, MT-40D, MT-40D S OC and MT-40D OC consists of two profiles of similar types as MT-40 S, MT-40, MT-40 S OC and MT-40 OC which are connected in the area of the holes in the back of the channels in a shape-fitting and force-fitting way.

The MT installation open profile channels and closed profiles (girders) can be cut along the entire length following the manufacturers instructions without compromising the declared performances.

The drawings, dimensions and materials of the Hilti installation channels of MT System are given in Annex A.

## 2 Specification of the intended use

The performances given in clause 3 are only valid if HILTI installation channels of MT System are in compliance with the specifications and conditions given in Annex B.

The provisions made in this European Technical Assessment are based on an assumed working life of the HILTI installation channels of MT System of 50 years when installed in the works (provided that the installation systems products are subject to appropriate installation). The indications given on the working life cannot be interpreted as a guarantee given by the producer or Technical Assessment Body, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

In accordance with the European Assessment Document EAD 280016-00-0602, the product is intended to be used in:

a) installations for the support of sprinkler kits,

b) installations for the support of pipes for the transport of gas/fuel intended for the supply of building heating/cooling systems.

## 3 Performance of the product and references to the methods used for its assessment

### 3.1 Safety in case of fire (BWR 2)

| No. | Essential characteristic | Performance |
|-----|--------------------------|-------------|
| 1 | Reaction to fire | Class A1 |
| 2 | Pull-through resistance of channel back holes under fire exposure | See Annex C |
| 3 | Bending characteristics under fire exposure | See Annex D |

### 3.2 Safety and accessibility in use (BWR 4)

| No. | Essential characteristic | Performance |
|-----|--------------------------|-------------|
| 4 | Shape | See Annex A |
| 5 | Dimensions | See Annex A |
| 6 | Material and cross-section characteristics | See Annex A and B |
| 7 | Characteristic pull-through resistance of channel back holes at ambient temperatures | No Performance Assessed |

## 4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

In accordance with the European Assessment Document EAD 280016-00-0602, the following legal bases apply:

- In case of intended use a) specified in Section 2:
  Decision of the commission N° 1996/577/EC as amended by Commission Decision 2002/592/EC:
  System 1 applies for the assessment and verification of constancy of performance (AVCP).
- In case of intended use b) specified in Section 2:
  Decision of the commission N° 1999/472/EC as amended by Commission Decision 001/596/EC:
  System 3 applies for the assessment and verification of constancy of performance (AVCP).

## 5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

The technical details necessary for the implementation of the system for the assessment and verification of constancy of performance are laid down in the control plan (confidential part of this European Technical Assessment) deposited at Centre Scientifique et Technique du Bâtiment.

The manufacturer shall, on the basis of a contract, involve a notified body approved in the field of supporting systems for issuing the certificate of conformity CE based on the control plan.

**The original French version is signed by**

La cheffe de division, Anca CRONOPOL

**Table A1:** Dimensions and materials of Hilti MT-10, MT-15, MT-15 OC, MT-20, MT-20 OC, MT-30 S, MT-30, MT-30 S OC and MT-30 OC installation channels

| Illustration (Dimensions in mm and inch) | Item number | Designation | Length [m] | Materials and coatings |
|---|---|---|---|---|
|  | 2268492 | MT-10 | 2 | S280GD or equivalent as defined in HN704 + Z275-M-A-C acc. to EN 10346 |
|  | 2268493 | MT-15 | 2 | S280GD or equivalent as defined in HN704 + Z275-M-A-C acc. to EN 10346 |
| | 2268494 | MT-15 OC | 2 | S280GD or equivalent as defined in HN704 + ZM310-A-C acc. to EN 10346 |
|  | 2268495 | MT-20 | 2 | S280GD or equivalent as defined in HN704 + Z275-M-A-C acc. to EN 10346 |
| | 2268496 | MT-20 OC | 2 | S280GD or equivalent as defined in HN704 + ZM310-A-C acc. to EN 10346 |
|  | 2268497 | MT-30 S | 3 | S280GD or equivalent as defined in HN704 + Z275-M-A-C acc. to EN 10346 |
| | 2268498 | MT-30 | 6 | |
| | 2268499 | MT-30 S OC | 3 | S280GD or equivalent as defined in HN704 + ZM310-A-C acc. to EN 10346 |
| | 2268500 | MT-30 OC | 6 | |

| Hilti MT channels | |
|---|---|
| **Product description** | **Annexe A1** |

**Table A2:** Dimensions and materials of Hilti MT-40 S, MT-40, MT-40 S OC, MT-40 OC, MT-40 T, MT-40 T OC, MT-50 S, MT-50, MT-50 S OC, MT-50 OC, MT-60 S, MT-60, MT-60 S OC, and MT-60 OC, installation channels
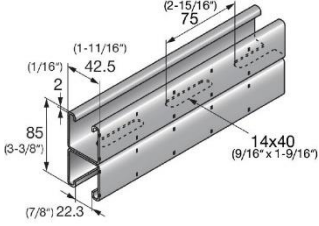
| Illustration (Dimensions in mm and inch) | Item number | Designation | Length [m] | Materials and coatings |
|---|---|---|---|---|
|  | 2268505 | MT-40 S | 3 | S280GD or equivalent as defined in HN704 + Z275-M-A-C acc. to EN 10346 |
| | 2268506 | MT-40 | 6 | |
| | 2268507 | MT-40 S OC | 3 | S280GD or equivalent as defined in HN704 + ZM310-A-C acc. to EN 10346 |
| | 2268508 | MT-40 OC | 6 | |
|  | 2268502 | MT-40 T | 6 | S280GD or equivalent as defined in HN704 + Z275-M-A-C acc. to EN 10346 |
| | 2268504 | MT-40 T OC | 6 | S280GD or equivalent as defined in HN704 + ZM310-A-C acc. to EN 10346 |
|  | 2268509 | MT-50 S | 3 | S280GD or equivalent as defined in HN704 + Z275-M-A-C acc. to EN 10346 |
| | 2268510 | MT-50 | 6 | |
| | 2268511 | MT-50 S OC | 3 | S280GD or equivalent as defined in HN704 + ZM310-A-C acc. to EN 10346 |
| | 2268512 | MT-50 OC | 6 | |
|  | 2268513 | MT-60 S | 3 | S280GD or equivalent as defined in HN704 + Z275-M-A-C acc. to EN 10346 |
| | 2268514 | MT-60 | 6 | |
| | 2268515 | MT-60 S OC | 3 | S280GD or equivalent as defined in HN704 + ZM310-A-C acc. to EN 10346 |
| | 2268516 | MT-60 OC | 6 | |

**Hilti MT channels**

**Product description**

**Annexe A2**

**Table A3:** Dimensions and materials of Hilti, MT-40D S. MT-40D, MT-40D S OC and MT-40 D OC installation channels
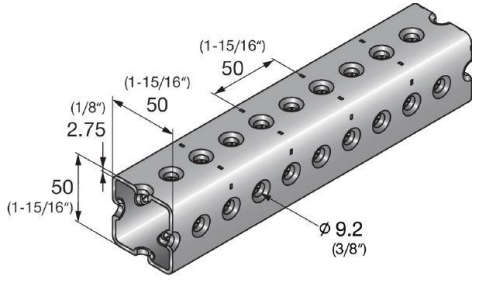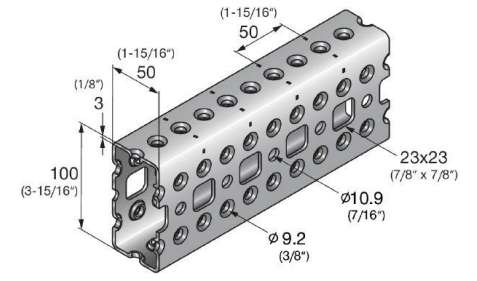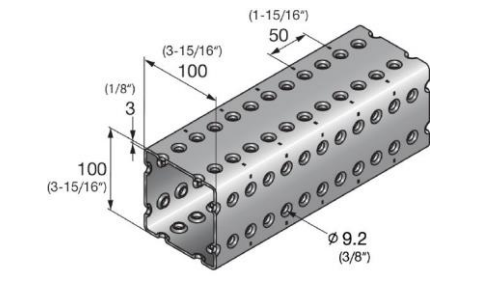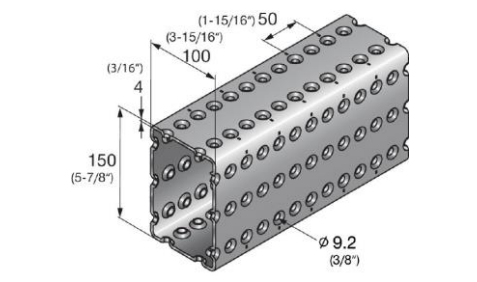
| Illustration (Dimensions in mm and inch) | Item number | Designation | Length [m] | Materials and coatings |
|---|---|---|---|---|
|  Two profiles of MT-40 channel are connected in the area of the holes in the back of the channels in a shape-fitting and force-fitting way as a kind of riveted connection. | 2268517 | MT-40D S | 3 | S280GD or equivalent as defined in HN704 + Z275-M-A-C acc. to EN 10346 |
| | 2268518 | MT-40D | 6 | |
| | 2268519 | MT-40D S OC | 3 | S280GD or equivalent as defined in HN704 + ZM310-A-C acc. to EN 10346 |
| | 2268520 | MT-40D OC | 6 | |

**Hilti MT channels**

**Product description**

**Annexe A3**

**Table A4:** Dimensions and materials of Hilti MT-70 S OC, MT-70 OC, MT-80 S OC, MT-80 OC, MT-90 S OC, MT-90 OC, MT-100 S OC and MT-100 OC installation channels
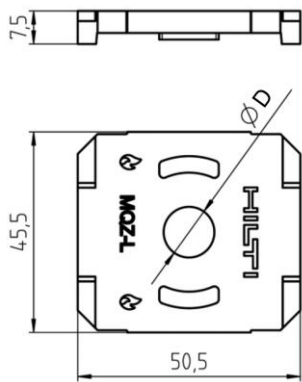
| Illustration (Dimensions in mm and inch) | Item number | Designation | Length [m] | Materials and coatings |
|---|---|---|---|---|
|  | 2268364 | MT-70 S OC | 3 | S350GD+ ZM310-A-C acc. to EN 10346 |
|  | 2268365 | MT-70 OC | 6 |  |
|  | 2268366 | MT-80 S OC | 3 | S350GD+ ZM310-A-C acc. to EN 10346 |
|  | 2268367 | MT-80 OC | 6 |  |
|  | 2268368 | MT-90 S OC | 3 | S350GD+ ZM310-A-C acc. to EN 10346 |
|  | 2268369 | MT-90 OC | 6 |  |
|  | 2268490 | MT-100 S OC | 3 | S350GD+ ZM310-A-C acc. to EN 10346 |
|  | 2268491 | MT-100 OC | 6 |  |

| **Hilti MT channels** | |
|---|---|
| **Product description** | **Annexe A4** |

**Table B1:** **Dimensions and materials of Hilti MQZ-L11 and MQZ-L13 drilled plates**
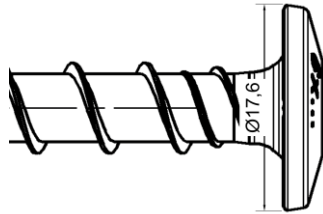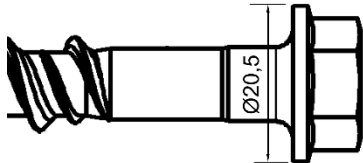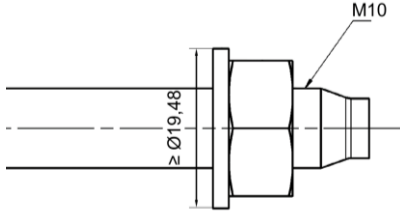
| Item number | Designation | D [mm] | Materials | Illustration (Dimensions in mm and inch) |
|---|---|---|---|---|
| 2199455 | MQZ-L11 | 11,5 | S235JR in accordance with DIN EN 10025-2, zinc coated |  |
| 2199456 | MQZ-L13 | 13,5 | | |

**Hilti MQZ-L drilled plates**

**Requirements for performance assessment**

**Annex B1**

**Table B2:  Fasteners for channel fixation through round back holes**

| Designation | Description | Dimensions of anchor head (in mm) |
|---|---|---|
| HUS3-P6 x L[1] | Screw anchor | Ø17,63 |
| HUS4-H8 x L[1] | Screw anchor | Ø20,5 |
| HST3-M10 x L[1] | Stud anchor with M10 thread | M10 ≥ Ø19,48 |
| Bolt M10 + 10.5 washer | M10 threaded bolt ≥ 4.8 and A4-70 | Washer EN ISO 7089-10.5-200HV with M10 hexagonal nut strength class ≥ 8 ISO 4032 |
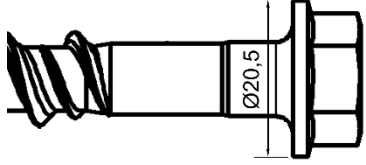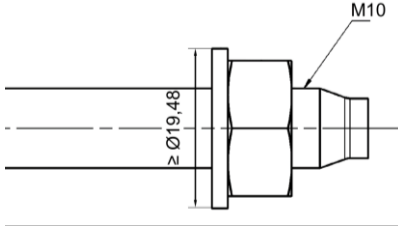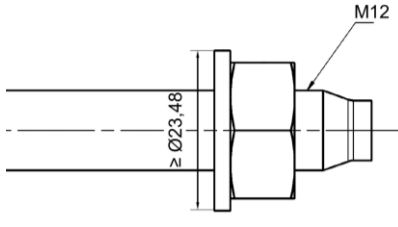
[1] L = length of anchor, see manufacturers brochures

**Hilti anchors for channel fastening**

**Requirements for performance assessment**

**Annex B2**

**Table B3:** **Fasteners for channel fixation through slotted back holes with MQZ-L 11 and MQZ-L 13 drilled plates**

| Designation | Description | Dimensions of anchor head (in mm) | Drilled plate |
|---|---|---|---|
| HUS4-H10 x L[2] | Screw anchor |  Ø20,5 | MQZ-L13 |
| HST3-M10 x L[2] | Stud anchor with M10 thread |  ≥ Ø19,48 — M10 | MQZ-L11 |
| HST3-M12 x L[2] | Stud anchor with M12 thread |  ≥ Ø23,48 — M12 | MQZ-L13 |
| Bolt M10 | M10 threaded bolt ≥ 4.8 and A4-70 | Washer EN ISO 7089-10.5-200HV with M10 hexagonal nut strength class ≥ 8 ISO 4032 | MQZ-L11 |
| Bolt M12 | M12 threaded bolt ≥ 4.8 and A4-70 | Washer EN ISO 7089-13-200HV with M12 hexagonal nut strength class ≥ 8 ISO 4032 | MQZ-L13 |

[2] L = length of anchor, see manufacturers brochures

**Hilti anchors for channel fastening**

**Requirements for performance assessment**

**Annex B3**

## Specifications of intended use

- Hilti channels of MT System are used to transfer building services components loads such as ducts and equipment for water, heating, cooling, ventilation, electrical and other systems. Hilti MT channels are performing this loadbearing function under conditions described in Section 2 of this European Technical Assessment.

- Hilti MT-30, MT-40, MT-40D, MT-50, MT-70 and MT-80 installation channels (regardless of length and coating) in the scope of this European Technical Assessment are used for applications at ambient temperature and in case of fire.

- Hilti MT-10, MT-15, MT-20, MT-90 and MT-100 installation channels (regardless of length and coating) in the scope of this European Technical Assessment are used only for applications at ambient temperature.

- The resistance and deformation at ambient temperatures apply for static and centric loads.

- The resistance and deformation in case of fire are referring to the boundary conditions of the standard temperature / time curve (STTC) in accordance with EN 1363-1.

- MT channels used in headrail systems are installed with the channel profile opening facing away from the ceiling. In case of fire approved fire tested components are attached underneath using Hilti MQA-M10-B, MQA-M12-B or MQA-M16-B pipe ring saddles. The channels are mounted to the base material for use in case of fire using MQZ-L11 or MQZ-L13 drilled plates in conjunction with suitable approved fasteners. MT channels can be mounted on the base material for use at ambient temperatures with suitable fasteners through the longhole without using MQZ-L11 or MQZ-L13 drilled plates. MT-30, MT-40 and MT-50 channels can be mounted to the base material for use at ambient and in case of fire with suitable fasteners through the roundhole without using MQZ-L11 or MQZ-L13 drilled plates.

- The pull-through resistance of the round-holes in the back of the channels in case of fire results in combination with the fasteners specified in Table B2.

- In the case of suspended channel systems (e.g. rod-trapeze), the open side of the channel profile can be orientated upwards or downwards.

- The MT installation open profile channels and closed profiles (girders) can be cut along the entire length following the manufacturers instructions without compromising the declared performances.

- For girders the distance between the end of the girder and start of the dome shaped hole has to be minimum 10 mm.
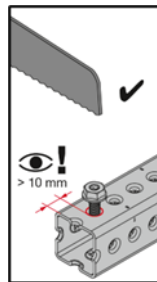


- For channels the distance between the end of the channel and center of the first hole from channel end has to be minimum 25 mm.
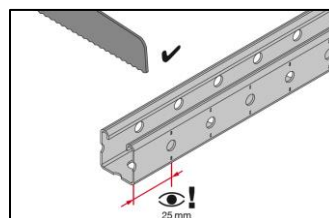


- Threaded rods and other fixtures are only to be guided through the roundholes or longholes of the channel.

| **Hilti MT channels** | |
|---|---|
| **Intended use**<br>Specifications | **Annex B4** |
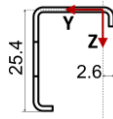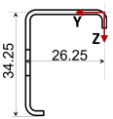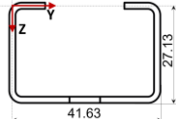
- The fastening of the base connector to the base material is made with appropriate anchors. The anchoring used with the base material must be suitable and have a fireproof certificate.
- Prior to installation, it must be ensured that the supported component, the anchoring of the threaded rod to the base material and the base material itself are suitable to withstand the resistance values of the installation system and that they have a fireproof certificate.
- The installation channels must be installed by appropriately qualified personnel and under the supervision of the site manager. The general installation instructions of the manufacturer apply

**Hilti MT channels**

**Intended use**
Specifications

**Annex B5**

**Table B4: Properties of the cross section of Hilti channels MT-10, MT-15, MT-15 OC, MT-20, and MT-20 OC**
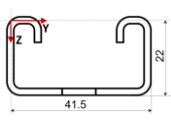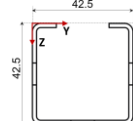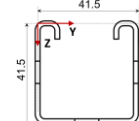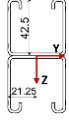
| Description | Symbol | Unit | MT-10 | MT-15 / MT-15 OC | MT-20 / MT-20 OC |
|---|---|---|---|---|---|
| Cross section (Dimensions in mm and inch) | - | - |  |  |  |
| Classification cross section in accordance with EN 1993-1-1 | - | - | 3 | 3 | 3 |
| Cross section areas | $A$ | cm² | 0.49 | 0.85 | 1.49 |
| | $A_{tot}$ | cm² | 0.49 | 0.85 | 1.49 |
| Shear areas | $A_y$ | cm² | NPA | NPA | NPA |
| | $A_z$ | cm² | NPA | NPA | NPA |
| Centroid position | $y_{C,0}$ | cm | 1.22 | 1.93 | 2.02 |
| | $z_{C,0}$ | cm | 0.92 | 1.19 | 1.64 |
| Moments of interia | $I_y$ | cm⁴ | 0.41 | 1.27 | 1.86 |
| | $I_z$ | cm⁴ | 0.23 | 0.72 | 3.66 |
| Polar moments of interia | $I_p$ | cm⁴ | 0.64 | 1.98 | 5.52 |
| | $I_{p,M}$ | cm⁴ | 1.26 | 3.80 | 14.71 |
| Radii of gyration | $i_y$ | cm | 0.91 | 1.22 | 1.12 |
| | $i_z$ | cm | 0.69 | 0.92 | 1.57 |
| Polar radii of gyration | $i_p$ | cm | 1.14 | 1.53 | 1.92 |
| | $i_{p,M}$ | cm | 1.61 | 2.11 | 3.14 |
| Warping radius of gyration | $i_{\omega,M}$ | cm | NPA | NPA | NPA |
| Torsional constant | $J$ | cm⁴ | NPA | NPA | NPA |
| Secondary torsional constant | $J_s$ | cm⁴ | NPA | NPA | NPA |
| Location of the shear center | $y_{M,0}$ | cm | NPA | NPA | NPA |
| | $z_{M,0}$ | cm | NPA | NPA | NPA |
| | $y_M$ | cm | NPA | NPA | NPA |
| | $z_M$ | cm | NPA | NPA | NPA |
| Warping constant | $I_{\omega,C}$ | cm⁶ | NPA | NPA | NPA |
| | $I_{\omega,M}$ | cm⁶ | NPA | NPA | NPA |
| Section moduli | $S_{y,max}$ | cm³ | 0.25 | 0.57 | 1.78 |
| | $S_{y,min}$ | cm³ | -0.41 | -1.00 | -1.08 |
| | $S_{z,max}$ | cm³ | 0.45 | 1.03 | 1.73 |
| | $S_{z,min}$ | cm³ | -0.16 | -0.36 | -1.73 |
| Torsional section modulus | $S_t$ | cm³ | NPA | NPA | NPA |
| Max. plastic bending moment | $M_{pl,y,k}$ | kNm | NPA | NPA | NPA |
| | $M_{pl,z,k}$ | kNm | NPA | NPA | NPA |
| Max. plastic section moduli | $Z_y$ | cm³ | NPA | NPA | NPA |
| | $Z_z$ | cm³ | NPA | NPA | NPA |
| Plastic shear areas | $A_{pl,y}$ | cm² | NPA | NPA | NPA |
| | $A_{pl,z}$ | cm² | NPA | NPA | NPA |
| Area bisecting axis position | $f_{y,0}$ | cm | NPA | NPA | NPA |
| | $f_{z,0}$ | cm | NPA | NPA | NPA |
| Plastic shear forces | $V_{pl,y,k}$ | kN | NPA | NPA | NPA |
| | $V_{pl,z,k}$ | kN | NPA | NPA | NPA |
| Plastic axial forces | $N_{pl,k}$ | kN | NPA | NPA | NPA |
| Buckling curves | $BC_y$ | - | c | c | c |
| | $BC_z$ | - | c | c | c |

| Hilti MT channels | |
|---|---|
| **Intended use**<br>Specifications | **Annex B6** |

**Table B5:** Properties of the cross section of Hilti channels MT-30 S, MT-30, MT-30 S OC, MT-30 OC, MT-40 S, MT-40, MT-40 S OC, MT-40 OC, MT-40 T, MT-40 T OC, MT-40D S, MT-40D, MT-40D S OC and MT-40D OC
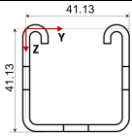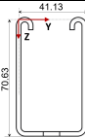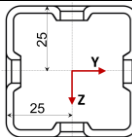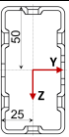
| Description | Symbol | Unit | MT-30 S / MT-30 / MT-30 S OC / MT-30 OC | MT-40 T / MT-40 T OC | MT-40 S / MT-40 / MT-40 S OC / MT-40 OC | MT-40D S / MT-40D / MT-40D S OC / MT-40D OC |
|---|---|---|---|---|---|---|
| Cross section (Dimensions in mm and inch) | - | - | | | | |
| Classification cross section in accordance with EN 1993-1-1 | - | - | 3 | 3 | 3 | 3 |
| Cross section areas | $A$ | cm$^2$ | 1.81 | 1.76 | 2.15 | 4.31 |
| | $A_{tot}$ | cm$^2$ | 1.81 | 1.76 | 2.15 | 4.31 |
| Shear areas | $A_y$ | cm$^2$ | NPA | NPA | NPA | NPA |
| | $A_z$ | cm$^2$ | NPA | NPA | NPA | NPA |
| Centroid position | $y_{C,0}$ | cm | 2.02 | 2.13 | 2.02 | 0.00 |
| | $z_{C,0}$ | cm | 1.10 | 2.30 | 2.07 | 0.00 |
| Moments of interia | $I_y$ | cm$^4$ | 1.22 | 4.85 | 5.80 | 30.13 |
| | $I_z$ | cm$^4$ | 5.22 | 5.73 | 6.61 | 13.22 |
| Polar moments of interia | $I_p$ | cm$^4$ | 6.43 | 10.58 | 12.41 | 43.35 |
| | $I_{p,M}$ | cm$^4$ | 16.42 | 40.93 | 55.83 | 43.35 |
| Radii of gyration | $i_y$ | cm | 0.82 | 1.66 | 1.64 | 2.64 |
| | $i_z$ | cm | 1.70 | 1.80 | 1.75 | 1.75 |
| Polar radii of gyration | $i_p$ | cm | 1.89 | 2.45 | 2.40 | 3.17 |
| | $i_{p,M}$ | cm | 3.01 | 4.82 | 5.10 | 3.17 |
| Warping radius of gyration | $i_{\omega,M}$ | cm | NPA | NPA | NPA | NPA |
| Torsional constant | $J$ | cm$^4$ | NPA | NPA | NPA | NPA |
| Secondary torsional constant | $J_s$ | cm$^4$ | NPA | NPA | NPA | NPA |
| Location of the shear center | $y_{M,0}$ | cm | NPA | NPA | NPA | NPA |
| | $z_{M,0}$ | cm | NPA | NPA | NPA | NPA |
| | $y_M$ | cm | NPA | NPA | NPA | NPA |
| | $z_M$ | cm | NPA | NPA | NPA | NPA |
| Warping constant | $I_{\omega,C}$ | cm$^6$ | NPA | NPA | NPA | NPA |
| | $I_{\omega,M}$ | cm$^6$ | NPA | NPA | NPA | NPA |
| Section moduli | $S_{y,max}$ | cm$^3$ | 1.11 | 2.49 | 2.79 | 7.09 |
| | $S_{y,min}$ | cm$^3$ | -1.01 | -2.11 | -2.67 | -7.09 |
| | $S_{z,max}$ | cm$^3$ | 2.45 | 2.69 | 3.11 | 6.22 |
| | $S_{z,min}$ | cm$^3$ | -2.45 | -2.69 | -3.11 | -6.22 |
| Torsional section modulus | $S_t$ | cm$^3$ | NPA | NPA | NPA | NPA |
| Max. plastic bending moment | $M_{pl,y,k}$ | kNm | NPA | NPA | NPA | NPA |
| | $M_{pl,z,k}$ | kNm | NPA | NPA | NPA | NPA |
| Max. plastic section moduli | $Z_y$ | cm$^3$ | NPA | NPA | NPA | NPA |
| | $Z_z$ | cm$^3$ | NPA | NPA | NPA | NPA |
| Plastic shear areas | $A_{pl,y}$ | cm$^2$ | NPA | NPA | NPA | NPA |
| | $A_{pl,z}$ | cm$^2$ | NPA | NPA | NPA | NPA |
| Area bisecting axis position | $f_{y,0}$ | cm | NPA | NPA | NPA | NPA |
| | $f_{z,0}$ | cm | NPA | NPA | NPA | NPA |
| Plastic shear forces | $V_{pl,y,k}$ | kN | NPA | NPA | NPA | NPA |
| | $V_{pl,z,k}$ | kN | NPA | NPA | NPA | NPA |
| Plastic axial forces | $N_{pl,k}$ | kN | NPA | NPA | NPA | NPA |
| Buckling curves | $BC_y$ | - | c | c | c | c |
| | $BC_z$ | - | c | c | c | c |

| | |
|---|---|
| **Hilti MT channels** | |
| **Requirements for performance assessment** | **Annex B7** |

**Table B6:** **Properties of the cross section of Hilti channels MT-50 S, MT-50 S OC, MT-50, MT-50 OC, MT-60 S, MT-60 S OC, MT-60, MT-60 OC, MT-70 S OC, MT-70 OC, MT-80 S OC and MT-80 OC**
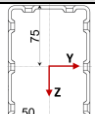
| Description | Symbol | Unit | MT-50 S / MT-50 / MT-50 S OC / MT-50 OC | MT-60 S / MT-60 S OC / MT-60 / MT-60 OC | MT-70 S OC / MT-70 OC | MT-80 S OC / MT-80 OC |
|---|---|---|---|---|---|---|
| Cross section (Dimensions in mm and inch) | - | - | | | | |
| Classification cross section in accordance with EN 1993-1-1 | - | - | 3 | 4 | 3 | 3 |
| Cross section areas | $A$ | cm$^2$ | 2.77 | 4.70 | 4.32 | 5.96 |
| | $A_{tot}$ | cm$^2$ | 2.77 | 4.70 | 4.32 | 5.96 |
| Shear areas | $A_y$ | cm$^2$ | NPA | NPA | NPA | NPA |
| | $A_z$ | cm$^2$ | NPA | NPA | NPA | NPA |
| Centroid position | $y_{C,0}$ | cm | 1.99 | 1.99 | 0.00 | 0.00 |
| | $z_{C,0}$ | cm | 2.07 | 3.66 | 0.00 | 0.00 |
| Moments of interia | $I_y$ | cm$^4$ | 7.07 | 26.81 | 15.96 | 88.39 |
| | $I_z$ | cm$^4$ | 8.30 | 16.04 | 15.96 | 24.61 |
| Polar moments of interia | $I_p$ | cm$^4$ | 15.36 | 42.85 | 31.93 | 113.00 |
| | $I_{p,M}$ | cm$^4$ | 66.91 | 267.95 | 31.93 | 113.00 |
| Radii of gyration | $i_y$ | cm | 1.60 | 2.39 | 1.92 | 3.85 |
| | $i_z$ | cm | 1.73 | 1.85 | 1.92 | 2.03 |
| Polar radii of gyration | $i_p$ | cm | 2.35 | 3.02 | 2.72 | 4.36 |
| | $i_{p,M}$ | cm | 4.91 | 7.55 | 2.72 | 4.36 |
| Warping radius of gyration | $i_{\omega,M}$ | cm | NPA | NPA | NPA | NPA |
| Torsional constant | $J$ | cm$^4$ | NPA | NPA | NPA | NPA |
| Secondary torsional constant | $J_s$ | cm$^4$ | NPA | NPA | NPA | NPA |
| Location of the shear center | $y_{M,0}$ | cm | NPA | NPA | NPA | NPA |
| | $z_{M,0}$ | cm | NPA | NPA | NPA | NPA |
| | $y_M$ | cm | NPA | NPA | NPA | NPA |
| | $z_M$ | cm | NPA | NPA | NPA | NPA |
| Warping constant | $I_{\omega,C}$ | cm$^6$ | NPA | NPA | NPA | NPA |
| | $I_{\omega,M}$ | cm$^6$ | NPA | NPA | NPA | NPA |
| Section moduli | $S_{y,max}$ | cm$^3$ | 3.46 | 7.89 | 6.39 | 17.68 |
| | $S_{y,min}$ | cm$^3$ | -3.21 | -7.09 | -6.39 | -17.68 |
| | $S_{z,max}$ | cm$^3$ | 3.90 | 7.55 | 6.39 | 9.84 |
| | $S_{z,min}$ | cm$^3$ | -3.90 | -7.55 | -6.39 | -9.84 |
| Torsional section modulus | $S_t$ | cm$^3$ | | NPA | NPA | NPA |
| Max. plastic bending moment | $M_{pl,y,k}$ | kNm | NPA | NPA | NPA | NPA |
| | $M_{pl,z,k}$ | kNm | NPA | NPA | NPA | NPA |
| Max. plastic section moduli | $Z_y$ | cm$^3$ | NPA | NPA | NPA | NPA |
| | $Z_z$ | cm$^3$ | NPA | NPA | NPA | NPA |
| Plastic shear areas | $A_{pl,y}$ | cm$^2$ | NPA | NPA | NPA | NPA |
| | $A_{pl,z}$ | cm$^2$ | NPA | NPA | NPA | NPA |
| Area bisecting axis position | $f_{y,0}$ | cm | NPA | NPA | NPA | NPA |
| | $f_{z,0}$ | cm | NPA | NPA | NPA | NPA |
| Plastic shear forces | $V_{pl,y,k}$ | kN | NPA | NPA | NPA | NPA |
| | $V_{pl,z,k}$ | kN | NPA | NPA | NPA | NPA |
| Plastic axial forces | $N_{pl,k}$ | kN | NPA | NPA | NPA | NPA |
| Buckling curves | $BC_y$ | - | c | c | c | c |
| | $BC_z$ | - | c | c | c | c |

**Hilti MT channels**

**Requirements for performance assessment**

**Annex B8**

**Table B7:** **Properties of the cross section of Hilti channels MT-90 S OC, MT-90 OC, MT-100 S OC, MT-100 OC**

| Description | Symbol | Unit | MT-90 S OC / MT-90 OC | MT-100 S OC / MT-100 OC |
|---|---|---|---|---|
| Cross section (Dimensions in mm and inch) | - | - |  |  |
| Classification cross section in accordance with EN 1993-1-1 | - | - | 3 | 3 |
| Cross section areas | $A$ | cm$^2$ | 9.80 | 15.63 |
| | $A_{tot}$ | cm$^2$ | 9.80 | 15.63 |
| Shear areas | $A_y$ | cm$^2$ | NPA | NPA |
| | $A_z$ | cm$^2$ | NPA | NPA |
| Centroid position | $y_{C,0}$ | cm | 0.00 | 0.00 |
| | $z_{C,0}$ | cm | 0.00 | 0.00 |
| Moments of interia | $I_y$ | cm$^4$ | 151.49 | 490.02 |
| | $I_z$ | cm$^4$ | 151.49 | 262.25 |
| Polar moments of interia | $I_p$ | cm$^4$ | 302.97 | 752.27 |
| | $I_{p,M}$ | cm$^4$ | 302.97 | 752.27 |
| Radii of gyration | $i_y$ | cm | 3.93 | 5.60 |
| | $i_z$ | cm | 3.93 | 4.10 |
| Polar radii of gyration | $i_p$ | cm | 5.56 | 6.94 |
| | $i_{p,M}$ | cm | 5.56 | 6.94 |
| Warping radius of gyration | $i_{\omega,M}$ | cm | NPA | NPA |
| Torsional constant | $J$ | cm$^4$ | NPA | NPA |
| Secondary torsional constant | $J_s$ | cm$^4$ | NPA | NPA |
| Location of the shear center | $y_{M,0}$ | cm | NPA | NPA |
| | $z_{M,0}$ | cm | NPA | NPA |
| | $y_M$ | cm | NPA | NPA |
| | $z_M$ | cm | NPA | NPA |
| Warping constants | $I_{\omega,C}$ | cm$^6$ | NPA | NPA |
| | $I_{\omega,M}$ | cm$^6$ | NPA | NPA |
| Section moduli | $S_{y,max}$ | cm$^3$ | 30.30 | 65.34 |
| | $S_{y,min}$ | cm$^3$ | -30.30 | -65.34 |
| | $S_{z,max}$ | cm$^3$ | 30.30 | 52.45 |
| | $S_{z,min}$ | cm$^3$ | -30.30 | -52.45 |
| Torsional section modulus | $S_t$ | cm$^3$ | NPA | NPA |
| Max. plastic bending moment | $M_{pl,y,k}$ | kNm | NPA | NPA |
| | $M_{pl,z,k}$ | kNm | NPA | NPA |
| Max. plastic section moduli | $Z_y$ | cm$^3$ | NPA | NPA |
| | $Z_z$ | cm$^3$ | NPA | NPA |
| Plastic shear areas | $A_{pl,y}$ | cm$^2$ | NPA | NPA |
| | $A_{pl,z}$ | cm$^2$ | NPA | NPA |
| Area bisecting axis position | $f_{y,0}$ | cm | NPA | NPA |
| | $f_{z,0}$ | cm | NPA | NPA |
| Plastic shear forces | $V_{pl,y,k}$ | kN | NPA | NPA |
| | $V_{pl,z,k}$ | kN | NPA | NPA |
| Plastic axial forces | $N_{pl,k}$ | kN | NPA | NPA |
| Buckling curves | $BC_y$ | - | c | c |
| | $BC_z$ | - | c | c |

**Hilti MT channels**

**Requirements for performance assessment**

**Annex B9**

**Table C1:** Pull-through resistance $F_{Rk,t}$ from the round holes in the back of the channels in case of fire

| Anchor | Installation channel | Parameter of regression curve | Pull through resistance $F_{Rk,t}$ in N | | | |
|---|---|---|---|---|---|---|
| | | $F_{Rk}(t) = c_3(c_1 + c_2/t)$ | $F_{Rk,30}$ | $F_{Rk,60}$ | $F_{Rk,90}$ | $F_{Rk,120}$ |
| HUS3-P6 x L[*)]<br>HUS4-H8 x L[*)]<br>HST4-M10 x L[*)]<br>M10 threaded rod + 10.5 washer | MT-30<br>MT-30 S<br>MT-30 OC<br>MT-30 S OC<br>MT-40<br>MT-40 S<br>MT-40 OC<br>MT-40 S OC<br>MT-40D<br>MT-40D S<br>MT-40D OC<br>MT-40D S OC<br>MT-50<br>MT-50 S<br>MT-50 OC<br>MT-50 S OC | $c_1 = 971,5536$<br>$c_2 = 34991,5717$<br>$c_3 = 0,71824$<br>$22\ min \leq t \leq 130\ min$ | 1535,6 | 1116,7 | 997,1 | 907,2 |

[*)] L = length of anchors, see manufacturers brochures.

**Designation**

$F_{Rk,t}$      Resistance after an exposure time t in case of fire [N]
$F_{Rk}(t)$      Resistance time function in case of fire [N]

| | |
|---|---|
| **Hilti anchors for channel fixation** | **Annex C1** |
| **Characteristic pull-through resistance in case of fire** | |

**Table C2: Pull-through resistance $F_{Rk,t}$ of MQZ-L drilled plates through slotted holes in the back of the channels in case of fire**

| Drilled plates | Installation channel | Parameter of regression curve $F_{Rk}(t) = c_3(c_1 + c_2/t)$ | Pull through resistance $F_{Rk,t}$ in N | | | |
|---|---|---|---|---|---|---|
| | | | $F_{Rk,30}$ | $F_{Rk,60}$ | $F_{Rk,90}$ | $F_{Rk,120}$ |
| MQZ-L11 MQZ-L13 | MT-30 MT-30 S MT-30 OC MT-30 S OC MT-40 MT-40 S MT-40 OC MT-40 S OC MT-40D MT-40D S MT-40D OC MT-40D S OC MT-50 MT-50 S MT-50 OC MT-50 S OC | $c_1 = 427{,}2416$ $c_2 = 130158{,}0662$ $c_3 = 0{,}910073$ 33 min ≤ t ≤ 130 min | 2168,65 | 1181,5 | 852,5 | 687,95 |

**Designation**
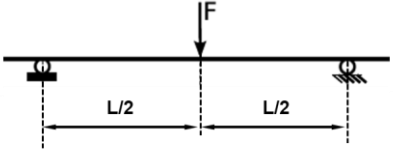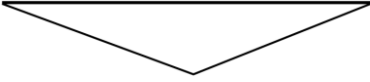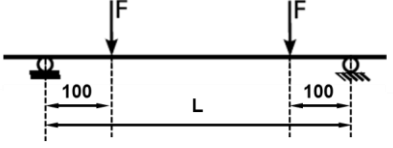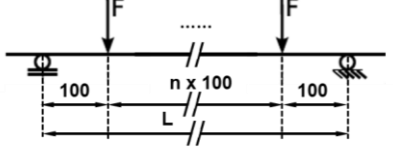
$F_{Rk,t}$      Resistance after an exposure time t in case of fire [N]
$F_{Rk}(t)$      Resistance time function in case of fire [N]

| | |
|---|---|
| **Hilti MQZ-L drilled plates** | **Annex C2** |
| **Characteristic pull-through resistance in case of fire** | |

**Table D19: Loading characteristics of Hilti channels**

| Loadcase | System | Resulting torque curve shape |
|----------|--------|------------------------------|
| 1 | F, L/2, L/2 | |
| 2 | F, F, 100, L, 100 | |
| 3 | F, F, 100, n x 100, 100, L | |

**Symbols and designation**
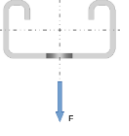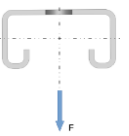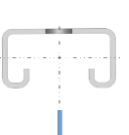
L       Distance between the supports in mm

n       number of 100 mm gaps between loads

F       Load

**Hilti MT installation channels**

**Bending characteristics of the channel in case of fire**

**Annex D1**

**Table D20: Calculation-based deformation in case of fire for installation channels MT-30, MT-30 S, MT-30 OC and MT-30 S OC**

| System | | | Load direction | $\sigma_B$ | V[1] | F[2] | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | L[3] | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 300 | - | | 5 | 0,50 | 65,69 | 12,03 | 120,00 | 12,03 | 12,03 | 12,03 | 12,03 |
| | | | | 10 | 0,50 | 133,47 | 22,23 | 120,00 | 13,21 | 14,03 | 16,61 | 22,23 |
| | | | | 15 | 0,50 | 201,24 | 43,04 | 120,00 | 14,75 | 19,22 | 29,00 | 43,04 |
| | | | | 20 | 0,50 | 269,02 | 68,57 | 120,00 | 16,30 | 25,55 | 44,79 | 68,57 |
| | | | | 25 | 0,50 | 336,80 | 90,40 | 120,00 | 17,92 | 33,17 | 62,02 | 90,40 |
| | | | | 30 | 0,50 | 404,58 | 104,49 | 120,00 | 19,77 | 42,43 | 79,77 | 104,49 |
| 1 | 300 | - | | 5 | 0,50 | 65,69 | 12,15 | 120,00 | 12,15 | 12,15 | 12,15 | 12,15 |
| | | | | 10 | 0,50 | 133,47 | 26,38 | 120,00 | 13,54 | 14,98 | 18,84 | 26,38 |
| | | | | 15 | 0,50 | 201,24 | 56,39 | 120,00 | 15,24 | 20,89 | 34,63 | 56,39 |
| | | | | 20 | 0,50 | 269,02 | 76,00 | 100,00 | 17,00 | 28,40 | 57,33 | - |
| | | | | 25 | 0,50 | 336,80 | 45,84 | 66,67 | 18,88 | 38,20 | - | - |
| | | | | 30 | 0,50 | 404,58 | 52,03 | 60,00 | 21,05 | 52,03 | - | - |
| 2 / 3 | 300 | 1 | | 5 | 0,67 | 49,27 | 12,30 | 120,00 | 12,30 | 12,30 | 12,30 | 12,30 |
| | | | | 10 | 0,67 | 100,10 | 40,58 | 120,00 | 14,03 | 16,98 | 24,66 | 40,58 |
| | | | | 15 | 0,67 | 150,93 | 88,84 | 120,00 | 16,06 | 25,21 | 53,29 | 88,84 |
| | | | | 20 | 0,67 | 201,77 | 108,13 | 120,00 | 18,13 | 37,20 | 91,35 | 108,13 |
| | | | | 25 | 0,67 | 252,60 | 111,26 | 120,00 | 20,67 | 58,86 | 100,51 | 111,26 |
| | | | | 30 | 0,67 | 303,43 | 113,86 | 120,00 | 24,11 | 80,63 | 105,77 | 113,86 |
| 2 / 3 | 300 | 1 | | 5 | 0,67 | 49,27 | 12,38 | 120,00 | 12,38 | 12,38 | 12,38 | 12,38 |
| | | | | 10 | 0,67 | 100,10 | 38,30 | 120,00 | 14,23 | 17,44 | 25,20 | 38,30 |
| | | | | 15 | 0,67 | 150,93 | 71,97 | 120,00 | 16,36 | 25,77 | 48,27 | 71,97 |
| | | | | 20 | 0,67 | 201,77 | 104,92 | 120,00 | 18,55 | 37,17 | 71,75 | 104,92 |
| | | | | 25 | 0,67 | 252,60 | 116,31 | 120,00 | 21,22 | 52,59 | 94,32 | 116,31 |
| | | | | 30 | 0,67 | 303,43 | 120,47 | 120,00 | 24,70 | 70,86 | 106,36 | 120,47 |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load
[3] Dimensions in mm and inch

**Symbols and designation**

| | |
|---|---|
| $\varepsilon_{B,\theta a}$ | Channel bending strain at elevated temperatures $\theta_a$ |
| $\sigma_B$ | Channel bending stress |
| V | Momentum degree of fullness |
| F | Load |
| $\delta_{tmax;B}$ | Deformation of the channel at the point in time of stability failure or of the plastic hinging |
| $t_{max,B}$ | Time in which loss of rigidity or plastic hinging of the channel occurs under bending stress |
| $\delta_{30}$ | Displacement after exposure time of 30 minutes to elevated temperatures |
| $\delta_{60}$ | Displacement after exposure time of 60 minutes to elevated temperatures |
| $\delta_{90}$ | Displacement after exposure time of 90 minutes to elevated temperatures |
| $\delta_{120}$ | Displacement after exposure time of 120 minutes to elevated temperatures |

Thermal analyses as well as calculations are referring to the boundary conditions of STTC.

| **Hilti MT installation channels** | **Annex D2** |
|---|---|
| **Bending characteristics of the channel in case of fire** | |

**Table D21: Calculation-based deformation in case of fire for installation channels MT-30, MT-30 S, MT-30 OC and MT-30 S OC**

| Loadcase | L[3] | n | Load direction | $\sigma_B$ MPa | $V^{1)}$ - | $F^{2)}$ N | $\delta_{tmax;B}$ mm | $t_{max,B}$ min | $\delta_{30}$ mm | $\delta_{60}$ mm | $\delta_{90}$ mm | $\delta_{120}$ mm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 500 | - | | 5 | 0,50 | 37,18 | 24,77 | 120,00 | 13,78 | 15,84 | 20,42 | 24,77 |
| | | | | 10 | 0,50 | 77,85 | 59,18 | 120,00 | 17,03 | 26,52 | 44,24 | 59,18 |
| | | | | 15 | 0,50 | 118,52 | 100,97 | 120,00 | 21,16 | 40,40 | 73,37 | 100,97 |
| | | | | 20 | 0,50 | 159,18 | 142,76 | 120,00 | 25,35 | 56,88 | 103,87 | 142,76 |
| | | | | 25 | 0,50 | 199,85 | 178,58 | 120,00 | 29,80 | 75,06 | 131,94 | 178,58 |
| | | | | 30 | 0,50 | 240,52 | 191,69 | 120,00 | 35,00 | 94,43 | 161,25 | 191,69 |
| 1 | 500 | - | | 5 | 0,50 | 37,18 | 25,93 | 120,00 | 13,89 | 16,21 | 21,31 | 25,93 |
| | | | | 10 | 0,50 | 77,85 | 65,50 | 120,00 | 17,37 | 27,69 | 47,57 | 65,50 |
| | | | | 15 | 0,50 | 118,52 | 121,73 | 120,00 | 21,69 | 42,84 | 81,15 | 121,73 |
| | | | | 20 | 0,50 | 159,18 | 142,64 | 100,00 | 26,15 | 61,33 | 122,05 | - |
| | | | | 25 | 0,50 | 199,85 | 113,38 | 73,33 | 30,98 | 82,60 | - | - |
| | | | | 30 | 0,50 | 240,52 | 127,84 | 66,67 | 36,72 | 107,29 | - | - |
| 2 | 500 | - | | 5 | 0,80 | 46,48 | 35,05 | 120,00 | 14,87 | 19,48 | 28,74 | 35,05 |
| | | | | 10 | 0,80 | 97,31 | 106,99 | 120,00 | 20,42 | 38,33 | 70,22 | 106,99 |
| | | | | 15 | 0,80 | 148,15 | 162,42 | 120,00 | 26,75 | 61,80 | 122,64 | 162,42 |
| | | | | 20 | 0,80 | 198,98 | 181,97 | 120,00 | 33,16 | 88,40 | 157,42 | 181,97 |
| | | | | 25 | 0,80 | 249,81 | 186,83 | 120,00 | 41,37 | 127,50 | 172,98 | 186,83 |
| | | | | 30 | 0,80 | 300,65 | 191,24 | 120,00 | 52,07 | 153,03 | 180,82 | 191,24 |
| 2 | 500 | - | | 5 | 0,80 | 46,48 | 35,03 | 120,00 | 14,89 | 19,52 | 28,74 | 35,03 |
| | | | | 10 | 0,80 | 97,31 | 90,19 | 120,00 | 20,49 | 38,12 | 67,44 | 90,19 |
| | | | | 15 | 0,80 | 148,15 | 131,24 | 120,00 | 26,81 | 60,77 | 106,95 | 131,24 |
| | | | | 20 | 0,80 | 198,98 | 177,45 | 120,00 | 33,19 | 84,42 | 156,77 | 177,45 |
| | | | | 25 | 0,80 | 249,81 | 186,95 | 120,00 | 41,10 | 107,18 | 170,60 | 186,95 |
| | | | | 30 | 0,80 | 300,65 | 193,19 | 120,00 | 51,13 | 143,98 | 180,14 | 193,19 |
| 3 | 500 | 3 | | 5 | 0,67 | 15,49 | 31,73 | 120,00 | 14,52 | 18,30 | 26,03 | 31,73 |
| | | | | 10 | 0,67 | 32,44 | 84,32 | 120,00 | 19,18 | 33,93 | 60,56 | 84,32 |
| | | | | 15 | 0,67 | 49,38 | 161,52 | 120,00 | 24,69 | 54,17 | 101,12 | 161,52 |
| | | | | 20 | 0,67 | 66,33 | 187,22 | 120,00 | 30,24 | 77,47 | 157,22 | 187,22 |
| | | | | 25 | 0,67 | 83,27 | 199,19 | 120,00 | 36,84 | 103,26 | 179,64 | 199,19 |
| | | | | 30 | 0,67 | 100,22 | 207,27 | 120,00 | 45,36 | 140,95 | 192,44 | 207,27 |
| 3 | 500 | 3 | | 5 | 0,67 | 15,49 | 31,74 | 120,00 | 14,53 | 18,33 | 26,07 | 31,74 |
| | | | | 10 | 0,67 | 32,44 | 82,25 | 120,00 | 19,26 | 34,07 | 60,36 | 82,25 |
| | | | | 15 | 0,67 | 49,38 | 124,65 | 120,00 | 24,84 | 54,12 | 96,57 | 124,65 |
| | | | | 20 | 0,67 | 66,33 | 166,73 | 120,00 | 30,42 | 76,51 | 130,16 | 166,73 |
| | | | | 25 | 0,67 | 83,27 | 185,55 | 120,00 | 36,97 | 99,56 | 155,21 | 185,55 |
| | | | | 30 | 0,67 | 100,22 | 197,65 | 120,00 | 45,31 | 120,08 | 174,81 | 197,65 |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load
[3] Dimensions in mm and inch
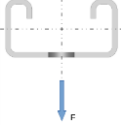
Symbols and designation see Annex D1

**Hilti MT installation channels**

**Bending characteristics of the channel in case of fire**

**Annex D3**

**Table D22: Calculation-based deformation in case of fire for installation channels MT-30, MT-30 S, MT-30 OC and MT-30 S OC**

| System Loadcase | L[3] | n | Load direction | $\sigma_B$ MPa | $V^{1)}$ - | $F^{2)}$ N | $\delta_{tmax;B}$ mm | $t_{max,B}$ min | $\delta_{30}$ mm | $\delta_{60}$ mm | $\delta_{90}$ mm | $\delta_{120}$ mm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 700 | - | | 5 | 0,50 | 24,17 | 48,85 | 120 | 16,54 | 24,78 | 40,11 | 48,85 |
| | | | | 10 | 0,50 | 53,22 | 107,18 | 120 | 22,95 | 45,47 | 83,06 | 107,18 |
| | | | | 15 | 0,50 | 82,27 | 167,86 | 120 | 31,01 | 71,47 | 128,69 | 167,86 |
| | | | | 20 | 0,50 | 111,32 | 232,67 | 120 | 39,13 | 99,74 | 171,01 | 232,67 |
| | | | | 25 | 0,50 | 140,36 | 261,63 | 120 | 47,67 | 128,05 | 213,55 | 261,63 |
| | | | | 30 | 0,50 | 169,41 | 276,65 | 120 | 57,65 | 155,32 | 245,41 | 276,65 |
| 1 | 700 | - | | 5 | 0,50 | 24,17 | 49,88 | 120 | 16,61 | 25,02 | 40,86 | 49,88 |
| | | | | 10 | 0,50 | 53,22 | 113,53 | 120 | 23,20 | 46,60 | 86,49 | 113,53 |
| | | | | 15 | 0,50 | 82,27 | 178,05 | 120 | 31,49 | 73,99 | 135,88 | 178,05 |
| | | | | 20 | 0,50 | 111,32 | 211,04 | 106,67 | 39,87 | 104,32 | 181,63 | 0,00 |
| | | | | 25 | 0,50 | 140,36 | 219,3 | 86,67 | 48,84 | 135,31 | - | - |
| | | | | 30 | 0,50 | 169,41 | 207,99 | 73,33 | 59,44 | 165,64 | - | - |
| 2 | 700 | - | | 5 | 0,86 | 42,3 | 66,68 | 120 | 18,64 | 31,77 | 55,09 | 66,68 |
| | | | | 10 | 0,86 | 93,13 | 161,33 | 120 | 29,89 | 67,72 | 115,44 | 161,33 |
| | | | | 15 | 0,86 | 143,97 | 222,62 | 120 | 42,56 | 104,84 | 179,38 | 222,62 |
| | | | | 20 | 0,86 | 194,8 | 242,38 | 120 | 55,17 | 138,96 | 211,48 | 242,38 |
| | | | | 25 | 0,86 | 245,64 | 237,22 | 120 | 70,51 | 179,8 | 221,51 | 237,22 |
| | | | | 30 | 0,86 | 296,47 | 242,94 | 120 | 88,71 | 202,98 | 231,52 | 242,94 |
| 2 | 700 | - | | 5 | 0,86 | 42,3 | 65,55 | 120 | 18,59 | 31,48 | 54,23 | 65,55 |
| | | | | 10 | 0,86 | 93,13 | 133,79 | 120 | 29,7 | 65,91 | 111,12 | 133,79 |
| | | | | 15 | 0,86 | 143,97 | 179,74 | 120 | 42,13 | 100,7 | 152,24 | 179,74 |
| | | | | 20 | 0,86 | 194,8 | 236,52 | 120 | 54,27 | 130,4 | 207,38 | 236,52 |
| | | | | 25 | 0,86 | 245,64 | 246,03 | 120 | 68,36 | 153,58 | 224,33 | 246,03 |
| | | | | 30 | 0,86 | 296,47 | 252,16 | 120 | 84,89 | 173,37 | 235,27 | 252,16 |
| 3 | 700 | 5 | | 5 | 0,67 | 7,05 | 61,33 | 120 | 18,05 | 29,68 | 50,54 | 61,33 |
| | | | | 10 | 0,67 | 15,52 | 131,71 | 120 | 27,18 | 59 | 104,47 | 131,71 |
| | | | | 15 | 0,67 | 23,99 | 184,84 | 120 | 37,81 | 92,05 | 149,19 | 184,84 |
| | | | | 20 | 0,67 | 32,47 | 241,07 | 120 | 48,36 | 123,77 | 186,22 | 241,07 |
| | | | | 25 | 0,67 | 40,94 | 267,77 | 120 | 60,46 | 152,09 | 219,72 | 267,77 |
| | | | | 30 | 0,67 | 49,41 | 281,46 | 120 | 75,04 | 176,76 | 249,36 | 281,46 |
| 3 | 700 | 5 | | 5 | 0,67 | 7,05 | 60,2 | 120 | 17,88 | 29,16 | 49,57 | 60,20 |
| | | | | 10 | 0,67 | 15,52 | 131,64 | 120 | 26,93 | 58,2 | 104,17 | 131,64 |
| | | | | 15 | 0,67 | 23,99 | 183,85 | 120 | 37,55 | 91,47 | 150,05 | 183,85 |
| | | | | 20 | 0,67 | 32,47 | 217,3 | 120 | 48,02 | 123,74 | 185,45 | 217,30 |
| | | | | 25 | 0,67 | 40,94 | 242,20 | 120 | 59,9 | 152,26 | 211,45 | 242,20 |
| | | | | 30 | 0,67 | 49,41 | 260,81 | 120 | 74,26 | 176,42 | 232,05 | 260,81 |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load
[3] Dimensions in mm and inch

Symbols and designation see Annex D1

**Hilti MT installation channels**

**Bending characteristics of the channel in case of fire**

**Annex D4**

**Table D23:** Calculation-based deformation in case of fire for installation channels MT-30, MT-30 S, MT-30 OC and MT-30 S OC

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 900 | - | | 5 | 0,50 | 16,32 | 81,17 | 120,00 | 20,44 | 37,27 | 66,89 | 81,17 |
| | | | | 10 | 0,50 | 38,92 | 162,08 | 120,00 | 31,11 | 70,95 | 130,43 | 162,08 |
| | | | | 15 | 0,50 | 61,51 | 238,77 | 120,00 | 44,36 | 110,76 | 189,86 | 238,77 |
| | | | | 20 | 0,50 | 84,10 | 312,81 | 120,00 | 57,58 | 150,49 | 241,50 | 312,81 |
| | | | | 25 | 0,50 | 106,69 | 344,89 | 120,00 | 71,35 | 187,18 | 292,21 | 344,89 |
| | | | | 30 | 0,50 | 129,29 | 362,39 | 120,00 | 87,16 | 220,63 | 325,98 | 362,39 |
| 1 | 900 | - | | 5 | 0,50 | 16,32 | 82,19 | 120,00 | 20,45 | 37,44 | 67,63 | 82,19 |
| | | | | 10 | 0,50 | 38,92 | 168,04 | 120,00 | 31,33 | 72,25 | 133,98 | 168,04 |
| | | | | 15 | 0,50 | 61,51 | 244,11 | 120,00 | 44,88 | 113,56 | 196,03 | 244,11 |
| | | | | 20 | 0,50 | 84,10 | 304,09 | 120,00 | 58,43 | 155,18 | 247,98 | 304,09 |
| | | | | 25 | 0,50 | 106,69 | 310,91 | 100,00 | 72,75 | 193,84 | 288,41 | - |
| | | | | 30 | 0,50 | 129,29 | 319,97 | 86,67 | 89,33 | 228,91 | - | - |
| 2 | 900 | - | | 5 | 0,89 | 36,73 | 103,12 | 120,00 | 23,51 | 47,39 | 86,29 | 103,12 |
| | | | | 10 | 0,89 | 87,56 | 200,41 | 120,00 | 42,18 | 101,73 | 162,23 | 200,41 |
| | | | | 15 | 0,89 | 138,40 | 253,12 | 120,00 | 62,98 | 149,50 | 215,52 | 253,12 |
| | | | | 20 | 0,89 | 189,23 | 277,67 | 120,00 | 83,02 | 188,18 | 249,78 | 277,67 |
| | | | | 25 | 0,89 | 240,06 | 291,24 | 120,00 | 105,52 | 220,40 | 269,41 | 291,24 |
| | | | | 30 | 0,89 | 290,90 | 299,69 | 120,00 | 130,67 | 243,19 | 282,26 | 299,69 |
| 2 | 900 | - | | 5 | 0,89 | 36,73 | 101,33 | 120,00 | 23,39 | 46,80 | 84,90 | 101,33 |
| | | | | 10 | 0,89 | 87,56 | 179,16 | 120,00 | 41,69 | 98,58 | 156,53 | 179,16 |
| | | | | 15 | 0,89 | 138,40 | 225,03 | 120,00 | 61,96 | 143,30 | 200,91 | 225,03 |
| | | | | 20 | 0,89 | 189,23 | 259,46 | 120,00 | 81,08 | 177,17 | 228,72 | 259,46 |
| | | | | 25 | 0,89 | 240,06 | 299,64 | 120,00 | 101,57 | 201,98 | 248,09 | 299,64 |
| | | | | 30 | 0,89 | 290,90 | 309,09 | 120,00 | 124,26 | 220,60 | 262,32 | 309,09 |
| 3 | 900 | 9 | | 5 | 0,67 | 3,67 | 99,15 | 120,00 | 23,08 | 45,73 | 82,79 | 99,15 |
| | | | | 10 | 0,67 | 8,76 | 182,18 | 120,00 | 38,37 | 91,14 | 152,76 | 182,18 |
| | | | | 15 | 0,67 | 13,84 | 238,42 | 120,00 | 55,54 | 135,50 | 203,10 | 238,42 |
| | | | | 20 | 0,67 | 18,92 | 275,71 | 120,00 | 72,26 | 173,70 | 239,71 | 275,71 |
| | | | | 25 | 0,67 | 24,01 | 306,13 | 120,00 | 90,60 | 204,63 | 268,36 | 306,13 |
| | | | | 30 | 0,67 | 29,09 | 341,64 | 120,00 | 111,52 | 230,48 | 291,65 | 341,64 |
| 3 | 900 | 9 | | 5 | 0,67 | 3,67 | 97,14 | 120,00 | 22,59 | 44,25 | 80,76 | 97,14 |
| | | | | 10 | 0,67 | 8,76 | 185,15 | 120,00 | 37,60 | 89,77 | 154,22 | 185,15 |
| | | | | 15 | 0,67 | 13,84 | 245,04 | 120,00 | 54,79 | 135,97 | 207,98 | 245,04 |
| | | | | 20 | 0,67 | 18,92 | 281,80 | 120,00 | 71,49 | 176,24 | 246,51 | 281,80 |
| | | | | 25 | 0,67 | 24,01 | 306,87 | 120,00 | 89,79 | 208,80 | 275,26 | 306,87 |
| | | | | 30 | 0,67 | 29,09 | 326,28 | 120,00 | 110,88 | 235,72 | 296,86 | 326,28 |

[1] Momentum degree of fullness without contribution from channel dead weight

[2] Size of designated system's single load

[3] Dimensions in mm and inch

Symbols and designation see Annex D1

| **Hilti MT installation channels** | |
|---|---|
| **Bending characteristics of the channel in case of fire** | **Annex D5** |

**Table D24: Calculation-based deformation in case of fire for installation channels MT-30, MT-30 S, MT-30 OC and MT-30 S OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 1100 | - | | 5 | 0,50 | 10,82 | 121,25 | 120,00 | 25,61 | 53,72 | 100,77 | 121,25 |
| | | | | 10 | 0,50 | 29,31 | 221,36 | 120,00 | 41,65 | 102,64 | 183,83 | 221,36 |
| | | | | 15 | 0,50 | 47,79 | 310,11 | 120,00 | 61,33 | 156,61 | 254,91 | 310,11 |
| | | | | 20 | 0,50 | 66,28 | 392,70 | 120,00 | 80,74 | 206,59 | 312,74 | 392,70 |
| | | | | 25 | 0,50 | 84,76 | 429,13 | 120,00 | 100,63 | 250,17 | 369,51 | 429,13 |
| | | | | 30 | 0,50 | 103,25 | 448,96 | 120,00 | 122,89 | 288,51 | 407,48 | 448,96 |
| 1 | 1100 | - | | 5 | 0,50 | 10,82 | 122,14 | 120,00 | 25,55 | 53,79 | 101,39 | 122,14 |
| | | | | 10 | 0,50 | 29,31 | 226,42 | 120,00 | 41,84 | 104,00 | 187,14 | 226,42 |
| | | | | 15 | 0,50 | 47,79 | 312,76 | 120,00 | 61,89 | 159,42 | 259,92 | 312,76 |
| | | | | 20 | 0,50 | 66,28 | 369,75 | 120,00 | 81,71 | 211,01 | 317,00 | 369,75 |
| | | | | 25 | 0,50 | 84,76 | 420,46 | 120,00 | 102,22 | 255,85 | 361,16 | 420,46 |
| | | | | 30 | 0,50 | 103,25 | 412,98 | 100,00 | 125,34 | 295,02 | 395,20 | - |
| 2 | 1100 | - | | 5 | 0,91 | 29,76 | 142,03 | 120,00 | 29,32 | 65,56 | 120,27 | 142,03 |
| | | | | 10 | 0,91 | 80,60 | 248,82 | 120,00 | 56,88 | 138,17 | 209,95 | 248,82 |
| | | | | 15 | 0,91 | 131,43 | 306,44 | 120,00 | 87,24 | 195,00 | 265,98 | 306,44 |
| | | | | 20 | 0,91 | 182,26 | 334,88 | 120,00 | 115,45 | 237,58 | 302,52 | 334,88 |
| | | | | 25 | 0,91 | 233,10 | 351,66 | 120,00 | 144,95 | 270,21 | 325,56 | 351,66 |
| | | | | 30 | 0,91 | 283,93 | 363,14 | 120,00 | 176,36 | 294,06 | 341,48 | 363,14 |
| 2 | 1100 | - | | 5 | 0,91 | 29,76 | 140,43 | 120,00 | 29,13 | 64,84 | 118,98 | 140,43 |
| | | | | 10 | 0,91 | 80,60 | 228,49 | 120,00 | 56,09 | 134,19 | 204,50 | 228,49 |
| | | | | 15 | 0,91 | 131,43 | 277,05 | 120,00 | 85,61 | 187,99 | 253,39 | 277,05 |
| | | | | 20 | 0,91 | 182,26 | 304,61 | 120,00 | 112,37 | 225,43 | 283,23 | 304,61 |
| | | | | 25 | 0,91 | 233,10 | 321,78 | 120,00 | 139,31 | 252,54 | 303,29 | 321,78 |
| | | | | 30 | 0,91 | 283,93 | 333,02 | 120,00 | 167,84 | 272,58 | 317,40 | 333,02 |
| 3 | 1100 | 9 | | 5 | 0,67 | 1,98 | 143,55 | 120,00 | 29,95 | 67,04 | 121,73 | 143,55 |
| | | | | 10 | 0,67 | 5,37 | 234,36 | 120,00 | 53,00 | 128,74 | 203,56 | 234,36 |
| | | | | 15 | 0,67 | 8,76 | 295,00 | 120,00 | 77,92 | 182,24 | 259,21 | 295,00 |
| | | | | 20 | 0,67 | 12,15 | 334,67 | 120,00 | 101,65 | 225,26 | 297,80 | 334,67 |
| | | | | 25 | 0,67 | 15,54 | 363,40 | 120,00 | 126,48 | 259,09 | 327,42 | 363,40 |
| | | | | 30 | 0,67 | 18,93 | 385,92 | 120,00 | 153,50 | 286,36 | 350,97 | 385,92 |
| 3 | 1100 | 9 | | 5 | 0,67 | 1,98 | 140,86 | 120,00 | 28,81 | 63,85 | 118,62 | 140,86 |
| | | | | 10 | 0,67 | 5,37 | 240,99 | 120,00 | 51,29 | 127,12 | 207,70 | 240,99 |
| | | | | 15 | 0,67 | 8,76 | 307,46 | 120,00 | 76,44 | 184,66 | 268,69 | 307,46 |
| | | | | 20 | 0,67 | 12,15 | 348,73 | 120,00 | 100,39 | 231,31 | 310,14 | 348,73 |
| | | | | 25 | 0,67 | 15,54 | 376,80 | 120,00 | 125,56 | 267,73 | 341,25 | 376,80 |
| | | | | 30 | 0,67 | 18,93 | 397,09 | 120,00 | 153,59 | 296,81 | 364,96 | 397,09 |

[1] Momentum degree of fullness without contribution from channel dead weight
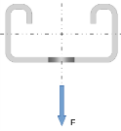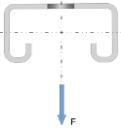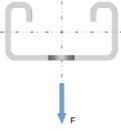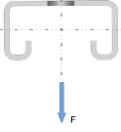[2] Size of designated system's single load
[3] Dimensions in mm and inch

Symbols and designation see Annex D1

| | |
|---|---|
| **Hilti MT installation channels** | |
| **Bending characteristics of the channel in case of fire** | **Annex D6** |

**Table D25: Calculation-based deformation in case of fire for installation channels MT-30, MT-30 S, MT-30 OC and MT-30 S OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 1300 | - | | 5 | 0,50 | 6,59 | 168,28 | 120,00 | 32,25 | 74,60 | 141,39 | 168,28 |
| | | | | 10 | 0,50 | 22,23 | 283,86 | 120,00 | 54,84 | 140,29 | 241,83 | 283,86 |
| | | | | 15 | 0,50 | 37,87 | 381,06 | 120,00 | 82,11 | 207,64 | 322,76 | 381,06 |
| | | | | 20 | 0,50 | 53,51 | 471,73 | 120,00 | 108,55 | 266,47 | 384,66 | 471,73 |
| | | | | 25 | 0,50 | 69,15 | 514,45 | 120,00 | 135,23 | 315,84 | 445,11 | 514,45 |
| | | | | 30 | 0,50 | 84,79 | 536,28 | 120,00 | 164,21 | 358,05 | 489,44 | 536,28 |
| 1 | 1300 | - | | 5 | 0,50 | 6,59 | 168,85 | 120,00 | 32,10 | 74,51 | 141,74 | 168,85 |
| | | | | 10 | 0,50 | 22,23 | 287,81 | 120,00 | 54,97 | 141,54 | 244,67 | 287,81 |
| | | | | 15 | 0,50 | 37,87 | 383,07 | 120,00 | 82,69 | 210,26 | 326,95 | 383,07 |
| | | | | 20 | 0,50 | 53,51 | 444,72 | 120,00 | 109,60 | 270,41 | 388,27 | 444,72 |
| | | | | 25 | 0,50 | 69,15 | 489,87 | 120,00 | 136,95 | 320,66 | 435,95 | 489,87 |
| | | | | 30 | 0,50 | 84,79 | 513,98 | 113,33 | 166,79 | 363,31 | 472,22 | - |
| 2 | 1300 | - | | 5 | 0,92 | 21,41 | 182,49 | 120,00 | 35,88 | 85,55 | 155,94 | 182,49 |
| | | | | 10 | 0,92 | 72,24 | 289,66 | 120,00 | 73,51 | 176,16 | 259,73 | 289,66 |
| | | | | 15 | 0,92 | 123,07 | 362,73 | 120,00 | 115,18 | 241,69 | 318,74 | 362,73 |
| | | | | 20 | 0,92 | 173,91 | 396,90 | 120,00 | 151,36 | 286,93 | 356,90 | 396,90 |
| | | | | 25 | 0,92 | 224,74 | 417,33 | 120,00 | 187,92 | 320,56 | 382,43 | 417,33 |
| | | | | 30 | 0,92 | 275,57 | 430,64 | 120,00 | 224,10 | 345,03 | 399,75 | 430,64 |
| 2 | 1300 | - | | 5 | 0,92 | 21,41 | 182,17 | 120,00 | 35,64 | 84,98 | 155,59 | 182,17 |
| | | | | 10 | 0,92 | 72,24 | 282,31 | 120,00 | 72,52 | 172,01 | 255,26 | 282,31 |
| | | | | 15 | 0,92 | 123,07 | 334,13 | 120,00 | 113,00 | 234,72 | 309,25 | 334,13 |
| | | | | 20 | 0,92 | 173,91 | 363,43 | 120,00 | 147,15 | 275,57 | 341,19 | 363,43 |
| | | | | 25 | 0,92 | 224,74 | 381,80 | 120,00 | 180,75 | 305,08 | 362,69 | 381,80 |
| | | | | 30 | 0,92 | 275,57 | 393,97 | 120,00 | 213,65 | 326,95 | 377,83 | 393,97 |
| 3 | 1300 | 11 | | 5 | 0,67 | 1,02 | 193,11 | 120,00 | 39,14 | 94,27 | 166,31 | 193,11 |
| | | | | 10 | 0,67 | 3,44 | 288,54 | 120,00 | 71,58 | 170,77 | 256,38 | 288,54 |
| | | | | 15 | 0,67 | 5,86 | 351,99 | 120,00 | 104,96 | 231,02 | 315,80 | 351,99 |
| | | | | 20 | 0,67 | 8,28 | 394,78 | 120,00 | 136,02 | 277,50 | 357,26 | 394,78 |
| | | | | 25 | 0,67 | 10,70 | 425,69 | 120,00 | 167,72 | 313,91 | 388,38 | 425,69 |
| | | | | 30 | 0,67 | 13,12 | 449,28 | 120,00 | 200,26 | 343,09 | 413,17 | 449,28 |
| 3 | 1300 | 11 | | 5 | 0,67 | 1,02 | 190,31 | 120,00 | 36,81 | 88,47 | 162,43 | 190,31 |
| | | | | 10 | 0,67 | 3,44 | 299,44 | 120,00 | 68,37 | 169,45 | 264,09 | 299,44 |
| | | | | 15 | 0,67 | 5,86 | 370,82 | 120,00 | 102,50 | 236,35 | 330,97 | 370,82 |
| | | | | 20 | 0,67 | 8,28 | 416,19 | 120,00 | 134,29 | 288,06 | 375,84 | 416,19 |
| | | | | 25 | 0,67 | 10,70 | 447,28 | 120,00 | 166,93 | 327,99 | 408,83 | 447,28 |
| | | | | 30 | 0,67 | 13,12 | 469,94 | 120,00 | 201,07 | 359,44 | 434,37 | 469,94 |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load
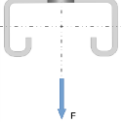[3] Dimensions in mm and inch

Symbols and designation see Annex D1

**Hilti MT installation channels**

**Bending characteristics of the channel in case of fire**

**Annex D7**

**Table D26: Calculation-based deformation in case of fire for installation channels MT-40, MT-40 S, MT-40 OC and MT-40 S OC**

| Loadcase | L³⁾ | n | Load direction | σB (MPa) | V¹⁾ (-) | (factor) (-) | F²⁾ (N) | δtmax;B (mm) | tmax,B (min) | δ30 (mm) | δ60 (mm) | δ90 (mm) | δ120 (mm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 500 | - | F ↓ | 5 | 0,50 | | 102,77 | 14,27 | 120,00 | 5,98 | 11,19 | 14,27 | 14,27 |
| | | | | 10 | 0,50 | | 209,68 | 22,33 | 120,00 | 8,44 | 17,10 | 22,33 | 22,33 |
| | | | | 15 | 0,50 | | 316,59 | 35,91 | 120,00 | 11,05 | 24,32 | 35,73 | 35,91 |
| | | | | 20 | 0,50 | | 423,50 | 115,16 | 120,00 | 14,48 | 34,17 | 75,97 | 115,16 |
| | | | | 25 | 0,50 | | 530,42 | 141,80 | 120,00 | 20,41 | 96,85 | 132,55 | 141,80 |
| | | | | 30 | 0,50 | | 637,33 | 159,48 | 120,00 | 49,13 | 122,99 | 151,91 | 159,48 |
| 1 | 500 | - | F ↓ | 5 | 0,50 | | 102,77 | 14,46 | 120,00 | 6,07 | 11,36 | 14,46 | 14,46 |
| | | | | 10 | 0,50 | | 209,68 | 22,92 | 120,00 | 8,61 | 17,52 | 22,92 | 22,92 |
| | | | | 15 | 0,50 | | 316,59 | 36,03 | 120,00 | 11,37 | 24,92 | 36,03 | 36,03 |
| | | | | 20 | 0,50 | | 423,50 | 58,42 | 86,67 | 14,99 | 34,01 | - | - |
| | | | | 25 | 0,50 | | 530,42 | 45,10 | 46,67 | 21,02 | - | - | - |
| | | | | 30 | 0,50 | | 637,33 | 18,88 | 26,67 | - | - | - | - |
| 2 | 500 | - | F ↓ | 5 | 0,80 | | 128,46 | 16,06 | 120,00 | 6,85 | 12,85 | 16,06 | 16,06 |
| | | | | 10 | 0,80 | | 262,10 | 33,83 | 93,33 | 10,34 | 22,56 | 33,28 | - |
| | | | | 15 | 0,80 | | 395,74 | 8,95 | 26,67 | - | - | - | - |
| | | | | 20 | 0,80 | | 529,38 | 12,80 | 26,67 | - | - | - | - |
| | | | | 25 | 0,80 | | 663,02 | 6,25 | 20,00 | - | - | - | - |
| | | | | 30 | 0,80 | | 796,66 | 8,54 | 20,00 | - | - | - | - |
| 2 | 500 | - | F ↓ | 5 | 0,80 | 0,67 | 128,46 | 16,17 | 120,00 | 6,91 | 12,96 | 16,17 | |
| | | | | 10 | 0,80 | 0,67 | 262,10 | 31,39 | 120,00 | 10,49 | 22,86 | 31,39 | |
| | | | | 15 | 0,80 | 0,67 | 395,74 | 57,07 | 113,33 | 14,57 | 32,85 | 51,38 | |
| | | | | 20 | 0,80 | 0,67 | 529,38 | 50,83 | 60,00 | 21,32 | 50,83 | - | |
| | | | | 25 | 0,80 | 0,67 | 663,02 | 51,74 | 33,33 | 36,48 | - | - | |
| | | | | 30 | 0,80 | 0,67 | 796,66 | 39,49 | 26,67 | - | - | - | |
| 3 | 500 | 3 | F ↓ | 5 | 0,67 | 0,80 | 42,82 | 15,48 | 120,00 | 6,57 | 12,32 | 15,48 | |
| | | | | 10 | 0,67 | 0,80 | 87,37 | 42,60 | 100,00 | 9,75 | 21,23 | 34,97 | |
| | | | | 15 | 0,67 | 0,80 | 131,91 | 25,50 | 40,00 | 13,67 | - | - | |
| | | | | 20 | 0,67 | 0,80 | 176,46 | 11,55 | 26,67 | - | - | - | |
| | | | | 25 | 0,67 | 0,80 | 221,01 | 5,60 | 20,00 | - | - | - | |
| | | | | 30 | 0,67 | 0,80 | 265,55 | 7,41 | 20,00 | - | - | - | |
| 3 | 500 | 3 | F ↓ | 5 | 0,67 | 0,80 | 42,82 | 15,55 | 120,00 | 6,61 | 12,38 | 15,55 | |
| | | | | 10 | 0,67 | 0,80 | 87,37 | 28,06 | 120,00 | 9,80 | 20,83 | 28,06 | |
| | | | | 15 | 0,67 | 0,80 | 131,91 | 50,30 | 106,67 | 13,32 | 29,96 | 46,55 | |
| | | | | 20 | 0,67 | 0,80 | 176,46 | 47,12 | 60,00 | 18,73 | 47,12 | - | |
| | | | | 25 | 0,67 | 0,80 | 221,01 | 17,32 | 26,67 | - | - | - | |
| | | | | 30 | 0,67 | 0,80 | 265,55 | 32,10 | 26,67 | - | - | - | |

¹⁾ Momentum degree of fullness without contribution from channel dead weight
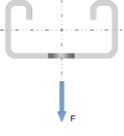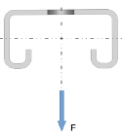²⁾ Size of designated system's single load
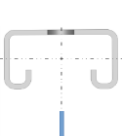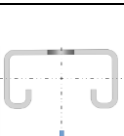³⁾ Dimensions in mm and inch

Symbols and designation see Annex D1

| | |
|---|---|
| **Hilti MT installation channels** | |
| **Bending characteristics of the channel in case of fire** | **Annex D8** |

**Table D27:** Calculation-based deformation in case of fire for installation channels MT-40, MT-40 S, MT-40 OC and MT-40 S OC

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 700 | - | | 5 | 0,50 | 70,56 | 18,73 | 120,00 | 8,22 | 15,38 | 18,73 | 18,73 |
| | | | | 10 | 0,50 | 146,93 | 34,64 | 120,00 | 12,92 | 26,90 | 34,64 | 34,64 |
| | | | | 15 | 0,50 | 223,29 | 109,06 | 120,00 | 17,96 | 40,64 | 61,44 | 109,06 |
| | | | | 20 | 0,50 | 299,66 | 165,36 | 120,00 | 24,61 | 77,92 | 149,10 | 165,36 |
| | | | | 25 | 0,50 | 376,03 | 197,18 | 120,00 | 57,97 | 131,91 | 183,96 | 197,18 |
| | | | | 30 | 0,50 | 452,39 | 229,01 | 120,00 | 91,33 | 185,90 | 218,83 | 229,01 |
| 1 | 700 | - | | 5 | 0,50 | 70,56 | 18,85 | 120,00 | 8,28 | 15,49 | 18,85 | 18,85 |
| | | | | 10 | 0,50 | 146,93 | 34,83 | 120,00 | 13,03 | 27,12 | 34,83 | 34,83 |
| | | | | 15 | 0,50 | 223,29 | 63,97 | 120,00 | 18,12 | 40,75 | 58,79 | 63,97 |
| | | | | 20 | 0,50 | 299,66 | 89,80 | 86,67 | 24,72 | 56,91 | - | - |
| | | | | 25 | 0,50 | 376,03 | 82,96 | 53,33 | 35,59 | - | - | - |
| | | | | 30 | 0,50 | 452,39 | 32,71 | 26,67 | - | - | - | - |
| 2 | 700 | - | | 5 | 0,86 | 123,49 | 22,54 | 120,00 | 10,07 | 18,92 | 22,54 | 22,54 |
| | | | | 10 | 0,86 | 257,13 | 87,95 | 106,67 | 17,07 | 41,40 | 78,41 | - |
| | | | | 15 | 0,86 | 390,77 | 14,65 | 26,67 | - | - | - | - |
| | | | | 20 | 0,86 | 524,41 | 24,08 | 26,67 | - | - | - | - |
| | | | | 25 | 0,86 | 658,05 | 10,10 | 20,00 | - | - | - | - |
| | | | | 30 | 0,86 | 791,69 | 14,92 | 20,00 | - | - | - | - |
| 2 | 700 | - | | 5 | 0,86 | 123,49 | 22,53 | 120,00 | 10,09 | 18,93 | 22,53 | 22,53 |
| | | | | 10 | 0,86 | 257,13 | 51,78 | 120,00 | 17,13 | 38,33 | 51,78 | 51,78 |
| | | | | 15 | 0,86 | 390,77 | 90,78 | 120,00 | 24,97 | 56,47 | 83,20 | 90,78 |
| | | | | 20 | 0,86 | 524,41 | 111,88 | 86,67 | 37,21 | 79,01 | - | - |
| | | | | 25 | 0,86 | 658,05 | 102,42 | 53,33 | 56,57 | - | - | - |
| | | | | 30 | 0,86 | 791,69 | 108,72 | 40,00 | 82,15 | - | - | - |
| 3 | 700 | 5 | | 5 | 0,67 | 20,58 | 21,18 | 120,00 | 9,38 | 17,62 | 21,18 | 21,18 |
| | | | | 10 | 0,67 | 42,85 | 65,63 | 106,67 | 15,50 | 35,22 | 54,63 | - |
| | | | | 15 | 0,67 | 65,13 | 58,24 | 46,67 | 23,20 | - | - | - |
| | | | | 20 | 0,67 | 87,40 | 19,68 | 26,67 | - | - | - | - |
| | | | | 25 | 0,67 | 109,67 | 8,61 | 20,00 | - | - | - | - |
| | | | | 30 | 0,67 | 131,95 | 12,36 | 20,00 | - | - | - | - |
| 3 | 700 | 5 | | 5 | 0,67 | 20,58 | 21,00 | 120,00 | 9,34 | 17,50 | 21,00 | 21,00 |
| | | | | 10 | 0,67 | 42,85 | 44,78 | 120,00 | 15,37 | 33,56 | 44,78 | 44,78 |
| | | | | 15 | 0,67 | 65,13 | 92,43 | 113,33 | 21,98 | 50,66 | 78,18 | - |
| | | | | 20 | 0,67 | 87,40 | 93,01 | 66,67 | 31,98 | 78,07 | - | - |
| | | | | 25 | 0,67 | 109,67 | 29,65 | 26,67 | - | - | - | - |
| | | | | 30 | 0,67 | 131,95 | 55,37 | 26,67 | - | - | - | - |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load
[3] Dimensions in mm and inch

Symbols and designation see Annex D1

**Hilti MT installation channels**

**Bending characteristics of the channel in case of fire**

**Annex D9**

**Table D28: Calculation-based deformation in case of fire for installation channels MT-40, MT-40 S, MT-40 OC and MT-40 S OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 900 | - | | 5 | 0,50 | 51,94 | 24,99 | 120,00 | 11,35 | 21,25 | 24,99 | 24,99 |
| | | | | 10 | 0,50 | 111,33 | 51,35 | 120,00 | 19,05 | 40,19 | 51,35 | 51,35 |
| | | | | 15 | 0,50 | 170,73 | 175,90 | 120,00 | 27,28 | 62,37 | 140,45 | 175,90 |
| | | | | 20 | 0,50 | 230,12 | 202,00 | 120,00 | 47,70 | 100,20 | 170,82 | 202,00 |
| | | | | 25 | 0,50 | 289,52 | 241,15 | 120,00 | 78,33 | 156,93 | 216,37 | 241,15 |
| | | | | 30 | 0,50 | 348,91 | 306,39 | 120,00 | 129,38 | 251,49 | 292,29 | 306,39 |
| 1 | | - | | 5 | 0,50 | 51,94 | 24,99 | 120,00 | 11,36 | 21,27 | 24,99 | 24,99 |
| | | | | 10 | 0,50 | 111,33 | 51,07 | 120,00 | 19,08 | 40,18 | 51,07 | 51,07 |
| | | | | 15 | 0,50 | 170,73 | 98,86 | 120,00 | 27,26 | 61,73 | 87,85 | 98,86 |
| | | | | 20 | 0,50 | 230,12 | 149,48 | 100,00 | 37,73 | 85,61 | 130,73 | - |
| | | | | 25 | 0,50 | 289,52 | 125,25 | 60,00 | 54,24 | 125,25 | - | - |
| | | | | 30 | 0,50 | 348,91 | 51,14 | 26,67 | - | - | - | - |
| 2 | 900 | - | | 5 | 0,89 | 116,85 | 31,18 | 120,00 | 14,33 | 26,95 | 31,18 | 31,18 |
| | | | | 10 | 0,89 | 250,49 | 128,51 | 120,00 | 35,45 | 84,17 | 118,98 | 128,51 |
| | | | | 15 | 0,89 | 384,13 | 22,23 | 26,67 | - | - | - | - |
| | | | | 20 | 0,89 | 517,77 | 10,48 | 20,00 | - | - | - | - |
| | | | | 25 | 0,89 | 651,41 | 15,32 | 20,00 | - | - | - | -- |
| | | | | 30 | 0,89 | 785,05 | 27,35 | 20,00 | - | - | - | - |
| 2 | 900 | - | | 5 | 0,89 | 116,85 | 30,98 | 120,00 | 14,32 | 26,86 | 30,98 | 30,98 |
| | | | | 10 | 0,89 | 250,49 | 77,40 | 120,00 | 25,86 | 57,72 | 75,92 | 77,40 |
| | | | | 15 | 0,89 | 384,13 | 123,94 | 120,00 | 38,24 | 84,40 | 116,21 | 123,94 |
| | | | | 20 | 0,89 | 517,77 | 160,76 | 120,00 | 56,05 | 109,13 | 146,35 | 160,76 |
| | | | | 25 | 0,89 | 651,41 | 154,66 | 73,33 | 81,04 | 135,60 | - | - |
| | | | | 30 | 0,89 | 785,05 | 158,64 | 60,00 | 109,94 | 158,64 | - | - |
| 3 | 900 | 7 | | 5 | 0,67 | 11,69 | 29,19 | 120,00 | 13,30 | 25,04 | 29,19 | 29,19 |
| | | | | 10 | 0,67 | 25,05 | 99,35 | 120,00 | 23,36 | 53,83 | 78,83 | 99,35 |
| | | | | 15 | 0,67 | 38,41 | 86,96 | 53,33 | 35,75 | - | - | - |
| | | | | 20 | 0,67 | 51,78 | 30,37 | 26,67 | - | - | | - |
| | | | | 25 | 0,67 | 65,14 | 73,71 | 26,67 | - | - | - | - |
| | | | | 30 | 0,67 | 78,51 | 18,82 | 20,00 | - | - | - | - |
| 3 | 900 | 7 | | 5 | 0,67 | 11,69 | 28,59 | 120,00 | 13,13 | 24,63 | 28,59 | 28,59 |
| | | | | 10 | 0,67 | 25,05 | 68,59 | 120,00 | 22,95 | 50,89 | 67,47 | 68,59 |
| | | | | 15 | 0,67 | 38,41 | 148,66 | 120,00 | 33,67 | 78,07 | 118,19 | 148,66 |
| | | | | 20 | 0,67 | 51,78 | 132,52 | 66,67 | 49,68 | 117,14 | - | - |
| | | | | 25 | 0,67 | 65,14 | 116,32 | 33,33 | 81,36 | - | - | - |
| | | | | 30 | 0,67 | 78,51 | 85,24 | 26,67 | - | - | - | - |

[1] Momentum degree of fullness without contribution from channel dead weight
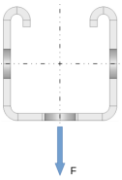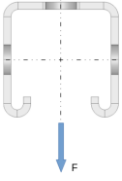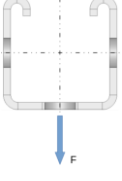[2] Size of designated system's single load
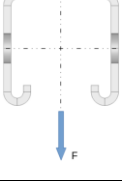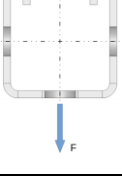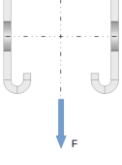[3] Dimensions in mm and inch
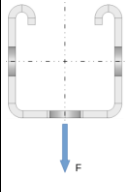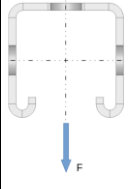
Symbols and designation see Annex D1

**Hilti MT installation channels**

**Bending characteristics of the channel in case of fire**

**Annex D10**

**Table D29: Calculation-based deformation in case of fire for installation channels MT-40, MT-40 S, MT-40 OC and MT-40 S OC**

| Loadcase | L[3] | n | Load direction | $\sigma_B$ MPa | V[1] - | F[2] N | $\delta_{tmax;B}$ mm | $t_{max,B}$ min | $\delta_{30}$ mm | $\delta_{60}$ mm | $\delta_{90}$ mm | $\delta_{120}$ mm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1100 | - | | 5 | 0,50 | 39,48 | 33,22 | 120,00 | 15,47 | 28,98 | 33,22 | 33,22 |
| | | | | 10 | 0,50 | 88,07 | 74,41 | 120,00 | 26,88 | 57,05 | 72,87 | 74,41 |
| | | | | 15 | 0,50 | 136,67 | 239,23 | 120,00 | 38,96 | 90,33 | 206,21 | 239,23 |
| | | | | 20 | 0,50 | 185,27 | 258,30 | 120,00 | 56,43 | 119,83 | 226,92 | 258,30 |
| | | | | 25 | 0,50 | 233,86 | 296,43 | 120,00 | 91,39 | 178,84 | 268,33 | 296,43 |
| | | | | 30 | 0,50 | 282,46 | 366,34 | 120,00 | 155,48 | 287,01 | 344,25 | 366,34 |
| 1 | 1100 | - | | 5 | 0,50 | 39,48 | 33,07 | 120,00 | 15,42 | 28,86 | 33,07 | 33,07 |
| | | | | 10 | 0,50 | 88,07 | 71,67 | 120,00 | 26,83 | 56,81 | 71,67 | 71,67 |
| | | | | 15 | 0,50 | 136,67 | 138,98 | 120,00 | 38,80 | 87,45 | 122,18 | 138,98 |
| | | | | 20 | 0,50 | 185,27 | 195,23 | 100,00 | 53,90 | 119,16 | 175,19 | - |
| | | | | 25 | 0,50 | 233,86 | 166,43 | 60,00 | 76,57 | 166,43 | - | - |
| | | | | 30 | 0,50 | 282,46 | 161,66 | 33,33 | 117,67 | - | - | - |
| 2 | 1100 | - | | 5 | 0,91 | 108,56 | 64,85 | 120,00 | 19,67 | 37,51 | 47,17 | 64,85 |
| | | | | 10 | 0,91 | 242,20 | 167,07 | 120,00 | 53,82 | 128,22 | 159,56 | 167,07 |
| | | | | 15 | 0,91 | 375,84 | 32,88 | 26,67 | - | - | - | - |
| | | | | 20 | 0,91 | 509,48 | 14,53 | 20,00 | - | - | - | - |
| | | | | 25 | 0,91 | 643,12 | 22,71 | 20,00 | - | - | - | - |
| | | | | 30 | 0,91 | 776,76 | 10,70 | 13,33 | - | - | - | - |
| 2 | 1100 | - | | 5 | 0,91 | 108,56 | 41,44 | 120,00 | 19,58 | 36,66 | 41,44 | 41,44 |
| | | | | 10 | 0,91 | 242,20 | 106,27 | 120,00 | 36,53 | 80,03 | 102,35 | 106,27 |
| | | | | 15 | 0,91 | 375,84 | 159,04 | 120,00 | 53,91 | 114,84 | 149,99 | 159,04 |
| | | | | 20 | 0,91 | 509,48 | 196,32 | 120,00 | 77,09 | 141,68 | 183,62 | 196,32 |
| | | | | 25 | 0,91 | 643,12 | 220,88 | 113,33 | 108,29 | 168,14 | 209,12 | - |
| | | | | 30 | 0,91 | 776,76 | 210,10 | 73,33 | 139,59 | 191,47 | - | - |
| 3 | 1100 | 9 | | 5 | 0,67 | 7,24 | 39,94 | 120,00 | 18,46 | 34,90 | 39,94 | 39,94 |
| | | | | 10 | 0,67 | 16,15 | 123,54 | 120,00 | 33,46 | 77,16 | 109,11 | 123,54 |
| | | | | 15 | 0,67 | 25,06 | 125,50 | 60,00 | 51,36 | 125,50 | - | - |
| | | | | 20 | 0,67 | 33,97 | 43,79 | 26,67 | - | - | - | - |
| | | | | 25 | 0,67 | 42,87 | 94,23 | 26,67 | - | - | - | - |
| | | | | 30 | 0,67 | 51,78 | 26,93 | 20,00 | - | - | - | - |
| 3 | 1100 | 9 | | 5 | 0,67 | 7,24 | 38,53 | 120,00 | 18,06 | 33,93 | 38,53 | 38,53 |
| | | | | 10 | 0,67 | 16,15 | 101,85 | 120,00 | 32,63 | 72,86 | 96,01 | 101,85 |
| | | | | 15 | 0,67 | 25,06 | 200,65 | 120,00 | 48,45 | 111,77 | 165,05 | 200,65 |
| | | | | 20 | 0,67 | 33,97 | 203,56 | 73,33 | 71,61 | 162,12 | - | - |
| | | | | 25 | 0,67 | 42,87 | 157,79 | 33,33 | 112,57 | - | - | - |
| | | | | 30 | 0,67 | 51,78 | 120,18 | 26,67 | - | - | - | - |

[1] Momentum degree of fullness without contribution from channel dead weight

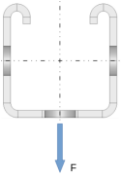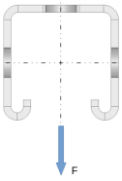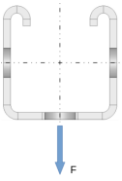[2] Size of designated system's single load
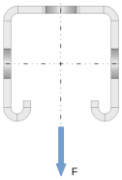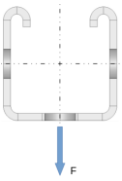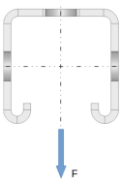
[3] Dimensions in mm and inch

Symbols and designation see Annex D1

**Hilti MT installation channels**

**Bending characteristics of the channel in case of fire**

**Annex D11**

**Table D30: Calculation-based deformation in case of fire for installation channels MT-40, MT-40 S, MT-40 OC and MT-40 S OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 1300 | - | | 5 | 0,50 | 30,34 | 43,60 | 120,00 | 20,70 | 38,71 | 43,60 | 43,60 |
| | | | | 10 | 0,50 | 71,46 | 112,78 | 120,00 | 36,48 | 77,59 | 99,91 | 112,78 |
| | | | | 15 | 0,50 | 112,58 | 302,96 | 120,00 | 53,02 | 131,77 | 265,87 | 302,96 |
| | | | | 20 | 0,50 | 153,70 | 327,10 | 120,00 | 77,44 | 175,90 | 292,86 | 327,10 |
| | | | | 25 | 0,50 | 194,82 | 375,39 | 120,00 | 126,29 | 264,16 | 346,84 | 375,39 |
| | | | | 30 | 0,50 | 235,94 | 463,92 | 120,00 | 215,85 | 400,97 | 445,81 | 463,92 |
| 1 | 1300 | - | | 5 | 0,50 | 30,34 | 43,32 | 120,00 | 20,57 | 38,47 | 43,32 | 43,32 |
| | | | | 10 | 0,50 | 71,46 | 99,22 | 120,00 | 36,36 | 77,03 | 96,56 | 99,22 |
| | | | | 15 | 0,50 | 112,58 | 182,83 | 120,00 | 52,73 | 117,41 | 160,72 | 182,83 |
| | | | | 20 | 0,50 | 153,70 | 248,19 | 100,00 | 72,97 | 156,41 | 223,40 | - |
| | | | | 25 | 0,50 | 194,82 | 211,25 | 60,00 | 101,99 | 211,25 | - | - |
| | | | | 30 | 0,50 | 235,94 | 200,01 | 33,33 | 150,01 | - | - | - |
| 2 | 1300 | - | | 5 | 0,92 | 98,62 | 97,40 | 120,00 | 26,24 | 63,24 | 93,40 | 97,40 |
| | | | | 10 | 0,92 | 232,26 | 193,18 | 120,00 | 70,38 | 154,26 | 185,57 | 193,18 |
| | | | | 15 | 0,92 | 365,90 | 239,93 | 120,00 | 125,32 | 194,98 | 229,14 | 239,93 |
| | | | | 20 | 0,92 | 499,54 | 269,84 | 120,00 | 165,60 | 223,13 | 257,30 | 269,84 |
| | | | | 25 | 0,92 | 633,18 | 294,54 | 120,00 | 196,07 | 248,44 | 281,67 | 294,54 |
| | | | | 30 | 0,92 | 766,82 | 308,59 | 120,00 | 217,20 | 265,80 | 296,93 | 308,59 |
| 2 | 1300 | - | | 5 | 0,92 | 98,62 | 53,87 | 120,00 | 25,84 | 48,28 | 53,87 | 53,87 |
| | | | | 10 | 0,92 | 232,26 | 136,51 | 120,00 | 48,96 | 104,44 | 130,41 | 136,51 |
| | | | | 15 | 0,92 | 365,90 | 196,00 | 120,00 | 71,65 | 146,83 | 184,74 | 196,00 |
| | | | | 20 | 0,92 | 499,54 | 235,22 | 120,00 | 100,18 | 177,06 | 221,83 | 235,22 |
| | | | | 25 | 0,92 | 633,18 | 269,50 | 120,00 | 137,08 | 203,09 | 249,35 | 269,50 |
| | | | | 30 | 0,92 | 766,82 | 280,35 | 100,00 | 170,89 | 228,08 | 270,77 | - |
| 3 | 1300 | 11 | | 5 | 0,67 | 4,70 | 53,87 | 120,00 | 25,06 | 47,65 | 53,87 | 53,87 |
| | | | | 10 | 0,67 | 11,06 | 201,67 | 120,00 | 45,88 | 105,13 | 145,10 | 201,67 |
| | | | | 15 | 0,67 | 17,42 | 216,61 | 73,33 | 70,01 | 173,48 | - | - |
| | | | | 20 | 0,67 | 23,79 | 162,54 | 33,33 | 111,09 | - | - | - |
| | | | | 25 | 0,67 | 30,15 | 121,52 | 26,67 | - | - | - | - |
| | | | | 30 | 0,67 | 36,52 | 36,81 | 20,00 | - | - | - | - |
| 3 | 1300 | 11 | | 5 | 0,67 | 4,70 | 51,15 | 120,00 | 24,28 | 45,69 | 51,15 | 51,15 |
| | | | | 10 | 0,67 | 11,06 | 141,25 | 120,00 | 44,48 | 99,51 | 130,22 | 141,25 |
| | | | | 15 | 0,67 | 17,42 | 256,59 | 120,00 | 66,26 | 151,14 | 217,05 | 256,59 |
| | | | | 20 | 0,67 | 23,79 | 279,82 | 80,00 | 97,46 | 211,49 | - | - |
| | | | | 25 | 0,67 | 30,15 | 239,46 | 40,00 | 147,96 | - | - | - |
| | | | | 30 | 0,67 | 36,52 | 159,28 | 26,67 | - | - | - | - |

[1] Momentum degree of fullness without contribution from channel dead weight
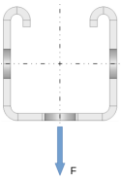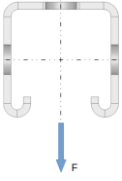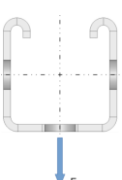[2] Size of designated system's single load
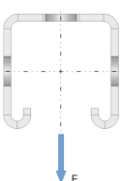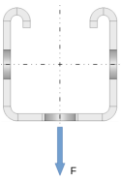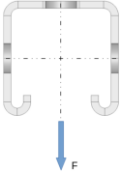[3] Dimensions in mm and inch

Symbols and designation see Annex D1

| **Hilti MT installation channels** | |
|---|---|
| **Bending characteristics of the channel in case of fire** | **Annex D12** |

**Table D31: Calculation-based deformation in case of fire for installation channels MT-40, MT-40 S, MT-40 OC and MT-40 S OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 1500 | - | | 5 | 0,50 | 23,20 | 56,41 | 120,00 | 27,14 | 50,70 | 56,41 | 56,41 |
| | | | | 10 | 0,50 | 58,84 | 214,05 | 120,00 | 47,91 | 101,60 | 140,22 | 214,05 |
| | | | | 15 | 0,50 | 94,48 | 346,77 | 120,00 | 69,39 | 223,90 | 310,06 | 346,77 |
| | | | | 20 | 0,50 | 130,12 | 374,41 | 120,00 | 101,89 | 292,56 | 341,71 | 374,41 |
| | | | | 25 | 0,50 | 165,75 | 429,68 | 120,00 | 166,90 | 344,86 | 405,02 | 429,68 |
| | | | | 30 | 0,50 | 201,39 | 531,02 | 120,00 | 286,09 | 480,93 | 518,58 | 531,02 |
| 1 | 1500 | - | | 5 | 0,50 | 23,20 | 56,01 | 120,00 | 26,96 | 50,37 | 56,01 | 56,01 |
| | | | | 10 | 0,50 | 58,84 | 131,92 | 120,00 | 47,75 | 100,84 | 125,60 | 131,92 |
| | | | | 15 | 0,50 | 94,48 | 229,81 | 120,00 | 69,03 | 151,09 | 202,67 | 229,81 |
| | | | | 20 | 0,50 | 130,12 | 303,49 | 100,00 | 94,76 | 196,85 | 274,61 | - |
| | | | | 25 | 0,50 | 165,75 | 258,09 | 60,00 | 130,26 | 258,09 | - | - |
| | | | | 30 | 0,50 | 201,39 | 241,27 | 33,33 | 185,29 | - | - | - |
| 2 | 1500 | - | | 5 | 0,93 | 87,01 | 120,23 | 120,00 | 35,67 | 94,50 | 118,16 | 120,23 |
| | | | | 10 | 0,93 | 220,65 | 223,72 | 120,00 | 86,15 | 180,58 | 214,32 | 223,72 |
| | | | | 15 | 0,93 | 354,29 | 271,31 | 120,00 | 147,41 | 224,17 | 260,30 | 271,31 |
| | | | | 20 | 0,93 | 487,93 | 304,59 | 120,00 | 191,90 | 257,55 | 293,32 | 304,59 |
| | | | | 25 | 0,93 | 621,57 | 326,22 | 120,00 | 222,90 | 281,83 | 315,54 | 326,22 |
| | | | | 30 | 0,93 | 755,21 | 341,37 | 120,00 | 245,92 | 300,21 | 331,67 | 341,37 |
| 2 | 1500 | - | | 5 | 0,93 | 87,01 | 68,17 | 120,00 | 33,08 | 61,62 | 68,17 | 68,17 |
| | | | | 10 | 0,93 | 220,65 | 168,22 | 120,00 | 62,97 | 130,45 | 159,92 | 168,22 |
| | | | | 15 | 0,93 | 354,29 | 234,63 | 120,00 | 91,22 | 179,77 | 220,70 | 234,63 |
| | | | | 20 | 0,93 | 487,93 | 276,44 | 120,00 | 125,02 | 214,06 | 261,22 | 276,44 |
| | | | | 25 | 0,93 | 621,57 | 308,63 | 120,00 | 166,96 | 241,07 | 291,16 | 308,63 |
| | | | | 30 | 0,93 | 755,21 | 331,56 | 106,67 | 203,66 | 268,45 | 315,30 | - |
| 3 | 1500 | 13 | | 5 | 0,67 | 3,11 | 71,56 | 120,00 | 33,30 | 63,70 | 71,56 | 71,56 |
| | | | | 10 | 0,67 | 7,88 | 231,73 | 120,00 | 60,74 | 137,88 | 186,56 | 231,73 |
| | | | | 15 | 0,67 | 12,65 | 318,10 | 80,00 | 91,82 | 212,84 | - | - |
| | | | | 20 | 0,67 | 17,43 | 206,39 | 33,33 | 142,75 | - | - | - |
| | | | | 25 | 0,67 | 22,20 | 152,49 | 26,67 | - | - | - | - |
| | | | | 30 | 0,67 | 26,97 | 48,56 | 20,00 | - | - | - | - |
| 3 | 1500 | 13 | | 5 | 0,67 | 3,11 | 66,83 | 120,00 | 31,90 | 60,22 | 66,83 | 66,83 |
| | | | | 10 | 0,67 | 7,88 | 186,48 | 120,00 | 58,63 | 130,92 | 170,04 | 186,48 |
| | | | | 15 | 0,67 | 12,65 | 315,67 | 120,00 | 87,19 | 195,73 | 273,24 | 315,67 |
| | | | | 20 | 0,67 | 17,43 | 382,97 | 93,33 | 127,09 | 264,33 | 369,84 | - |
| | | | | 25 | 0,67 | 22,20 | 345,70 | 53,33 | 187,00 | - | - | - |
| | | | | 30 | 0,67 | 26,97 | 201,57 | 26,67 | - | - | - | - |

[1] Momentum degree of fullness without contribution from channel dead weight

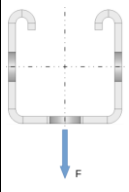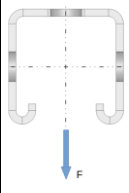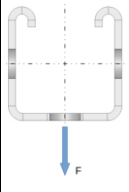[2] Size of designated system's single load
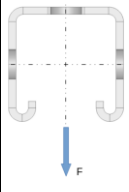
[3] Dimensions in mm and inch

Symbols and designation see Annex D1

| | |
|---|---|
| **Hilti MT installation channels** | |
| **Bending characteristics of the channel in case of fire** | **Annex D13** |

**Table D32:** Calculation-based deformation in case of fire for installation channels MT-40D, MT-40D S, MT-40D OC and MT-40D S OC

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | $n^{4)}$ | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 600 | - | | 5 | 0,50 | 225,04 | 29,03 | 120,00 | 20,77 | 21,10 | 27,93 | 29,03 |
| | | | | 10 | 0,50 | 459,99 | 34,30 | 106,67 | 22,57 | 24,76 | 32,96 | - |
| | | | | 15 | 0,50 | 694,95 | 29,63 | 46,67 | 24,85 | - | - | - |
| | | | | 20 | 0,50 | 929,90 | 24,07 | 26,67 | - | - | - | - |
| | | | | 25 | 0,50 | 1164,86 | 16,09 | 20,00 | - | - | - | - |
| | | | | 30 | 0,50 | 1399,81 | 16,76 | 20,00 | - | - | - | - |
| 1 | 600 | - | | 5 | 0,50 | 225,04 | 29,76 | 120,00 | 21,01 | 21,55 | 28,54 | 29,76 |
| | | | | 10 | 0,50 | 459,99 | 37,13 | 120,00 | 23,13 | 25,86 | 34,48 | 37,13 |
| | | | | 15 | 0,50 | 694,95 | 51,07 | 93,33 | 25,89 | 32,55 | 48,92 | - |
| | | | | 20 | 0,50 | 929,90 | 45,48 | 53,33 | 29,67 | - | - | - |
| | | | | 25 | 0,50 | 1164,86 | 51,18 | 33,33 | 40,07 | - | - | - |
| | | | | 30 | 0,50 | 1399,81 | 38,07 | 26,67 | - | - | - | - |
| 2 | 600 | - | | 5 | 0,88 | 450,07 | 31,95 | 120,00 | 21,70 | 22,84 | 30,27 | 31,95 |
| | | | | 10 | 0,88 | 919,98 | 49,52 | 100,00 | 25,55 | 32,51 | 45,49 | - |
| | | | | 15 | 0,88 | 1389,89 | 41,81 | 40,00 | 31,78 | - | - | - |
| | | | | 20 | 0,88 | 1859,80 | 33,88 | 26,67 | - | - | - | - |
| | | | | 25 | 0,88 | 2329,71 | 19,03 | 20,00 | - | - | - | - |
| | | | | 30 | 0,88 | 2799,62 | 11,26 | 13,33 | - | - | - | - |
| 2 | 600 | - | | 5 | 0,88 | 450,07 | 31,23 | 120,00 | 21,54 | 22,50 | 29,74 | 31,23 |
| | | | | 10 | 0,88 | 919,98 | 70,61 | 120,00 | 24,83 | 30,22 | 42,27 | 70,61 |
| | | | | 15 | 0,88 | 1389,89 | 109,11 | 73,33 | 29,76 | 71,64 | - | - |
| | | | | 20 | 0,88 | 1859,80 | 102,70 | 33,33 | 66,52 | - | - | - |
| | | | | 25 | 0,88 | 2329,71 | 18,22 | 20,00 | - | - | - | - |
| | | | | 30 | 0,88 | 2799,62 | 20,29 | 20,00 | - | - | - | - |
| 3 | 600 | 6 | | 5 | 0,67 | 56,26 | 29,88 | 120,00 | 21,08 | 21,63 | 28,62 | 29,88 |
| | | | | 10 | 0,67 | 115,00 | 39,10 | 120,00 | 23,46 | 26,83 | 36,01 | 39,10 |
| | | | | 15 | 0,67 | 173,74 | 59,36 | 93,33 | 26,60 | 35,39 | 55,68 | - |
| | | | | 20 | 0,67 | 232,48 | 53,74 | 53,33 | 31,27 | - | - | - |
| | | | | 25 | 0,67 | 291,21 | 54,25 | 33,33 | 42,38 | - | - | - |
| | | | | 30 | 0,67 | 349,95 | 42,81 | 26,67 | - | - | - | - |
| 3 | 600 | 6 | | 5 | 0,67 | 56,26 | 30,13 | 120,00 | 21,18 | 21,80 | 28,83 | 30,13 |
| | | | | 10 | 0,67 | 115,00 | 39,64 | 120,00 | 23,67 | 27,13 | 36,30 | 39,64 |
| | | | | 15 | 0,67 | 173,74 | 88,93 | 73,33 | 26,88 | 37,36 | - | - |
| | | | | 20 | 0,67 | 232,48 | 39,56 | 33,33 | 32,91 | - | - | - |
| | | | | 25 | 0,67 | 291,21 | 31,49 | 26,67 | - | - | - | - |
| | | | | 30 | 0,67 | 349,95 | 17,92 | 20,00 | - | - | - | - |

[1] Momentum degree of fullness without contribution from channel dead weight
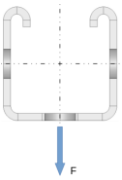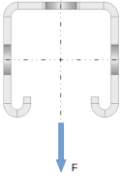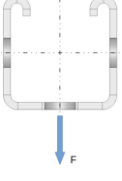[2] Size of designated system's single load
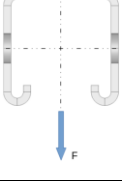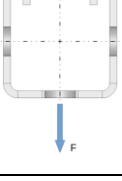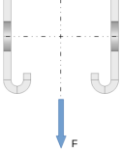[3] Dimensions in mm and inch
[4] distance between loads is 75 mm

Symbols and designation see Annex D1

**Hilti MT installation channels**

**Bending characteristics of the channel in case of fire**

**Annex D14**

**Table D33: Calculation-based deformation in case of fire for installation channels MT-40D, MT-40D S, MT-40D OC and MT-40D S OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | $n^{4)}$ | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 900 | - | | 5 | 0,50 | 141,76 | 32,60 | 120,00 | 22,02 | 23,26 | 30,77 | 32,60 |
| | | | | 10 | 0,50 | 298,40 | 45,36 | 120,00 | 25,68 | 30,86 | 41,26 | 45,36 |
| | | | | 15 | 0,50 | 455,03 | 61,61 | 93,33 | 30,33 | 42,56 | 60,15 | - |
| | | | | 20 | 0,50 | 611,67 | 60,56 | 60,00 | 36,58 | 60,56 | - | - |
| | | | | 25 | 0,50 | 768,31 | 57,06 | 33,33 | 46,26 | - | - | - |
| | | | | 30 | 0,50 | 924,94 | 45,50 | 26,67 | - | - | - | - |
| 1 | 900 | - | | 5 | 0,50 | 141,76 | 33,02 | 120,00 | 22,16 | 23,52 | 31,12 | 33,02 |
| | | | | 10 | 0,50 | 298,40 | 46,90 | 120,00 | 26,03 | 31,56 | 42,27 | 46,90 |
| | | | | 15 | 0,50 | 455,03 | 83,81 | 73,33 | 30,99 | 44,65 | - | - |
| | | | | 20 | 0,50 | 611,67 | 99,25 | 40,00 | 38,05 | - | - | - |
| | | | | 25 | 0,50 | 768,31 | 37,11 | 26,67 | - | - | - | - |
| | | | | 30 | 0,50 | 924,94 | 20,15 | 20,00 | - | - | - | - |
| 2 | 900 | - | | 5 | 0,92 | 425,28 | 37,28 | 120,00 | 23,63 | 26,18 | 34,56 | 37,28 |
| | | | | 10 | 0,92 | 895,19 | 216,07 | 120,00 | 30,87 | 44,28 | 172,94 | 216,07 |
| | | | | 15 | 0,92 | 1365,10 | 352,83 | 120,00 | 42,55 | 224,71 | 322,16 | 352,83 |
| | | | | 20 | 0,92 | 1835,01 | 48,14 | 26,67 | - | - | - | - |
| | | | | 25 | 0,92 | 2304,92 | 22,94 | 20,00 | - | - | - | - |
| | | | | 30 | 0,92 | 2774,83 | 12,84 | 13,33 | - | - | - | - |
| 2 | 900 | - | | 5 | 0,92 | 425,28 | 36,50 | 120,00 | 23,46 | 25,81 | 33,99 | 36,50 |
| | | | | 10 | 0,92 | 895,19 | 171,23 | 120,00 | 30,02 | 41,24 | 57,99 | 171,23 |
| | | | | 15 | 0,92 | 1365,10 | 269,20 | 120,00 | 39,22 | 124,11 | 227,73 | 269,20 |
| | | | | 20 | 0,92 | 1835,01 | 324,85 | 93,33 | 88,86 | 269,31 | 321,21 | - |
| | | | | 25 | 0,92 | 2304,92 | 22,07 | 20,00 | - | - | - | - |
| | | | | 30 | 0,92 | 2774,83 | 25,60 | 20,00 | - | - | - | - |
| 3 | 900 | 10 | | 5 | 0,67 | 23,63 | 34,39 | 120,00 | 22,69 | 24,42 | 32,23 | 34,39 |
| | | | | 10 | 0,67 | 49,73 | 53,46 | 120,00 | 27,56 | 35,26 | 47,63 | 53,46 |
| | | | | 15 | 0,67 | 75,84 | 99,13 | 106,67 | 33,89 | 52,19 | 78,29 | - |
| | | | | 20 | 0,67 | 101,94 | 105,46 | 66,67 | 43,24 | 83,43 | - | - |
| | | | | 25 | 0,67 | 128,05 | 78,01 | 33,33 | 60,60 | - | - | - |
| | | | | 30 | 0,67 | 154,16 | 63,45 | 26,67 | 0,00 | - | - | - |
| 3 | 900 | 10 | | 5 | 0,67 | 23,63 | 34,40 | 120,00 | 22,70 | 24,44 | 32,25 | 34,40 |
| | | | | 10 | 0,67 | 49,73 | 54,30 | 120,00 | 27,61 | 35,20 | 47,41 | 54,30 |
| | | | | 15 | 0,67 | 75,84 | 302,03 | 120,00 | 33,89 | 56,23 | 241,46 | 302,03 |
| | | | | 20 | 0,67 | 101,94 | 354,07 | 120,00 | 46,82 | 249,66 | 322,40 | 354,07 |
| | | | | 25 | 0,67 | 128,05 | 46,17 | 26,67 | - | - | - | - |
| | | | | 30 | 0,67 | 154,16 | 21,64 | 20,00 | - | - | - | - |

[1] Momentum degree of fullness without contribution from channel dead weight
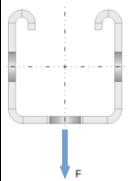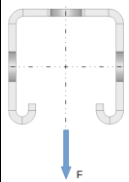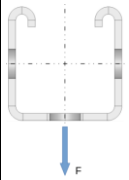[2] Size of designated system's single load
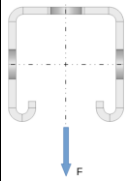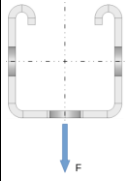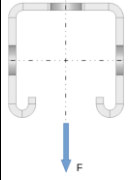[3] Dimensions in mm and inch
[4] distance between loads is 75 mm

Symbols and designation see Annex D1

**Hilti MT installation channels**

**Bending characteristics of the channel in case of fire**

**Annex D15**

**Table D34: Calculation-based deformation in case of fire for installation channels MT-40D, MT-40D S, MT-40D OC and MT-40D S OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | $n^{4)}$ | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 1200 | - | | 5 | 0,50 | 97,64 | 38,03 | 120,00 | 23,92 | 26,56 | 35,10 | 38,03 |
| | | | | 10 | 0,50 | 215,12 | 60,76 | 120,00 | 30,31 | 40,02 | 53,76 | 60,76 |
| | | | | 15 | 0,50 | 332,60 | 100,54 | 93,33 | 38,43 | 60,69 | 94,64 | - |
| | | | | 20 | 0,50 | 450,07 | 96,88 | 60,00 | 49,42 | 96,88 | - | - |
| | | | | 25 | 0,50 | 567,55 | 98,24 | 33,33 | 73,19 | - | - | - |
| | | | | 30 | 0,50 | 685,03 | 67,35 | 26,67 | - | - | - | - |
| 1 | 1200 | - | | 5 | 0,50 | 97,64 | 38,33 | 120,00 | 24,03 | 26,75 | 35,35 | 38,33 |
| | | | | 10 | 0,50 | 215,12 | 63,62 | 120,00 | 30,58 | 40,57 | 54,82 | 63,62 |
| | | | | 15 | 0,50 | 332,60 | 124,16 | 66,67 | 38,98 | 77,89 | - | - |
| | | | | 20 | 0,50 | 450,07 | 82,47 | 33,33 | 60,51 | - | - | - |
| | | | | 25 | 0,50 | 567,55 | 50,68 | 26,67 | - | - | - | - |
| | | | | 30 | 0,50 | 685,03 | 24,23 | 20,00 | - | - | - | - |
| 2 | 1200 | - | | 5 | 0,94 | 390,57 | 44,88 | 120,00 | 26,35 | 30,91 | 40,66 | 44,88 |
| | | | | 10 | 0,94 | 860,48 | 297,70 | 120,00 | 38,46 | 62,61 | 236,26 | 297,70 |
| | | | | 15 | 0,94 | 1330,39 | 451,21 | 120,00 | 89,14 | 266,52 | 361,85 | 451,21 |
| | | | | 20 | 0,94 | 450,07 | 82,47 | 33,33 | 60,51 | - | - | - |
| | | | | 25 | 0,94 | 567,55 | 50,68 | 26,67 | - | - | - | - |
| | | | | 30 | 0,94 | 685,03 | 24,23 | 20,00 | - | - | - | - |
| 2 | 1200 | - | | 5 | 0,94 | 390,57 | 44,06 | 120,00 | 26,17 | 30,51 | 40,07 | 44,06 |
| | | | | 10 | 0,94 | 860,48 | 245,42 | 120,00 | 37,38 | 57,47 | 128,19 | 245,42 |
| | | | | 15 | 0,94 | 1330,39 | 337,90 | 120,00 | 56,50 | 215,81 | 296,46 | 337,90 |
| | | | | 20 | 0,94 | 1800,30 | 356,63 | 93,33 | 148,97 | 303,55 | 351,38 | - |
| | | | | 25 | 0,94 | 2270,21 | 27,52 | 20,00 | - | - | - | - |
| | | | | 30 | 0,94 | 2740,12 | 33,24 | 20,00 | - | - | - | - |
| 3 | 1200 | 14 | | 5 | 0,67 | 12,21 | 41,25 | 120,00 | 25,15 | 28,69 | 37,76 | 41,25 |
| | | | | 10 | 0,67 | 26,89 | 74,91 | 120,00 | 33,66 | 47,82 | 64,97 | 74,91 |
| | | | | 15 | 0,67 | 41,57 | 215,97 | 120,00 | 44,62 | 76,85 | 119,32 | 215,97 |
| | | | | 20 | 0,67 | 56,26 | 404,68 | 120,00 | 60,71 | 135,49 | 330,01 | 404,68 |
| | | | | 25 | 0,67 | 70,94 | 417,72 | 120,00 | 92,26 | 299,78 | 378,43 | 417,72 |
| | | | | 30 | 0,67 | 85,63 | 435,77 | 120,00 | 183,39 | 334,63 | 396,70 | 435,77 |
| 3 | 1200 | 14 | | 5 | 0,67 | 12,21 | 41,05 | 120,00 | 25,08 | 28,57 | 37,59 | 41,05 |
| | | | | 10 | 0,67 | 26,89 | 77,11 | 120,00 | 33,59 | 47,51 | 64,45 | 77,11 |
| | | | | 15 | 0,67 | 41,57 | 320,15 | 120,00 | 44,48 | 79,83 | 267,60 | 320,15 |
| | | | | 20 | 0,67 | 56,26 | 406,31 | 120,00 | 68,73 | 274,25 | 360,25 | 406,31 |
| | | | | 25 | 0,67 | 70,94 | 471,09 | 120,00 | 168,76 | 357,24 | 431,36 | 471,09 |
| | | | | 30 | 0,67 | 85,63 | 27,26 | 20,00 | - | - | - | - |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load
[3] Dimensions in mm and inch
[4] distance between loads is 75 mm

Symbols and designation see Annex D1

**Hilti MT installation channels**

**Bending characteristics of the channel in case of fire**

**Annex D16**

**Table D35: Calculation-based deformation in case of fire for installation channels MT-40D, MT-40D S, MT-40D OC and MT-40D S OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | $n^{4)}$ | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 1500 | - | | 5 | 0,50 | 69,19 | 45,74 | 120,00 | 26,63 | 31,26 | 41,26 | 45,74 |
| | | | | 10 | 0,50 | 163,17 | 82,38 | 120,00 | 36,66 | 52,69 | 71,13 | 82,38 |
| | | | | 15 | 0,50 | 257,15 | 535,47 | 120,00 | 49,36 | 85,67 | 365,37 | 535,47 |
| | | | | 20 | 0,50 | 351,13 | 614,33 | 120,00 | 66,93 | 397,13 | 559,35 | 614,33 |
| | | | | 25 | 0,50 | 445,12 | 65,42 | 26,67 | - | - | - | - |
| | | | | 30 | 0,50 | 539,10 | 100,62 | 26,67 | - | - | - | - |
| 1 | 1500 | - | | 5 | 0,50 | 69,19 | 45,96 | 120,00 | 26,71 | 31,40 | 41,44 | 45,96 |
| | | | | 10 | 0,50 | 163,17 | 142,87 | 120,00 | 36,88 | 53,38 | 74,25 | 142,87 |
| | | | | 15 | 0,50 | 257,15 | 158,32 | 60,00 | 50,17 | 158,32 | - | - |
| | | | | 20 | 0,50 | 351,13 | 50,18 | 26,67 | - | - | - | - |
| | | | | 25 | 0,50 | 445,12 | 82,42 | 26,67 | - | - | - | - |
| | | | | 30 | 0,50 | 539,10 | 29,74 | 20,00 | - | - | - | - |
| 2 | 1500 | - | | 5 | 0,95 | 345,94 | 54,93 | 120,00 | 29,88 | 37,06 | 48,72 | 54,93 |
| | | | | 10 | 0,95 | 815,85 | 369,45 | 120,00 | 48,57 | 131,06 | 308,28 | 369,45 |
| | | | | 15 | 0,95 | 1285,76 | 459,22 | 120,00 | 138,22 | 337,06 | 414,37 | 459,22 |
| | | | | 20 | 0,95 | 1755,67 | 28,80 | 20,00 | - | - | - | - |
| | | | | 25 | 0,95 | 2225,58 | 35,81 | 20,00 | - | - | - | - |
| | | | | 30 | 0,95 | 2695,49 | 47,51 | 20,00 | - | - | - | - |
| 2 | 1500 | - | | 5 | 0,95 | 345,94 | 53,90 | 120,00 | 29,66 | 36,58 | 47,98 | 53,90 |
| | | | | 10 | 0,95 | 815,85 | 306,27 | 120,00 | 46,97 | 92,37 | 228,43 | 306,27 |
| | | | | 15 | 0,95 | 1285,76 | 399,57 | 120,00 | 96,73 | 281,78 | 358,66 | 399,57 |
| | | | | 20 | 0,95 | 1755,67 | 419,41 | 93,33 | 218,19 | 356,20 | 415,04 | - |
| | | | | 25 | 0,95 | 2225,58 | 34,54 | 20,00 | - | - | - | - |
| | | | | 30 | 0,95 | 2695,49 | 43,76 | 20,00 | - | - | - | - |
| 3 | 1500 | 18 | | 5 | 0,67 | 6,92 | 50,87 | 120,00 | 28,62 | 34,72 | 45,53 | 50,87 |
| | | | | 10 | 0,67 | 16,32 | 103,91 | 120,00 | 41,90 | 64,82 | 88,37 | 103,91 |
| | | | | 15 | 0,67 | 25,72 | 260,97 | 120,00 | 58,88 | 109,10 | 172,36 | 260,97 |
| | | | | 20 | 0,67 | 35,11 | 446,80 | 120,00 | 83,63 | 185,15 | 363,88 | 446,80 |
| | | | | 25 | 0,67 | 44,51 | 492,69 | 120,00 | 127,97 | 320,20 | 439,26 | 492,69 |
| | | | | 30 | 0,67 | 53,91 | 524,41 | 120,00 | 212,58 | 389,87 | 476,04 | 524,41 |
| 3 | 1500 | 18 | | 5 | 0,67 | 6,92 | 50,28 | 120,00 | 28,40 | 34,33 | 45,04 | 50,28 |
| | | | | 10 | 0,67 | 16,32 | 105,82 | 120,00 | 41,66 | 64,16 | 87,48 | 105,82 |
| | | | | 15 | 0,67 | 25,72 | 373,86 | 120,00 | 58,58 | 120,45 | 302,62 | 373,86 |
| | | | | 20 | 0,67 | 35,11 | 454,01 | 120,00 | 93,96 | 310,78 | 404,32 | 454,01 |
| | | | | 25 | 0,67 | 44,51 | 506,10 | 120,00 | 204,98 | 392,10 | 464,26 | 506,10 |
| | | | | 30 | 0,67 | 53,91 | 34,71 | 20,00 | - | - | - | - |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load
[3] Dimensions in mm and inch
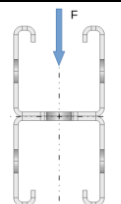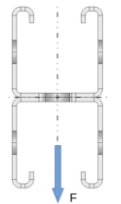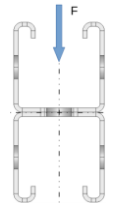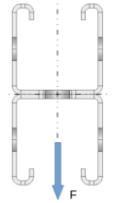[4] distance between loads is 75 mm

Symbols and designation see Annex D1

| **Hilti MT installation channels** | |
|---|---|
| **Bending characteristics of the channel in case of fire** | **Annex D17** |

**Table D36: Calculation-based deformation in case of fire for installation channels MT-40D, MT-40D S, MT-40D OC and MT-40D S OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | $n^{4)}$ | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 1800 | - | | 5 | 0,50 | 48,56 | 56,23 | 120,00 | 30,35 | 37,73 | 49,67 | 56,23 |
| | | | | 10 | 0,50 | 126,88 | 112,31 | 120,00 | 44,97 | 69,47 | 94,33 | 112,31 |
| | | | | 15 | 0,50 | 205,20 | 643,50 | 120,00 | 63,43 | 120,15 | 465,60 | 643,50 |
| | | | | 20 | 0,50 | 283,52 | 736,31 | 120,00 | 90,50 | 481,96 | 671,69 | 736,31 |
| | | | | 25 | 0,50 | 361,84 | 88,15 | 26,67 | - | - | - | - |
| | | | | 30 | 0,50 | 440,16 | 36,39 | 20,00 | - | - | - | - |
| 1 | 1800 | - | | 5 | 0,50 | 48,56 | 56,56 | 120,00 | 30,40 | 37,84 | 49,89 | 56,56 |
| | | | | 10 | 0,50 | 126,88 | 215,20 | 113,33 | 45,24 | 71,56 | 114,86 | 0,00 |
| | | | | 15 | 0,50 | 205,20 | 255,72 | 60,00 | 66,42 | 255,72 | - | - |
| | | | | 20 | 0,50 | 283,52 | 66,43 | 26,67 | - | - | - | - |
| | | | | 25 | 0,50 | 361,84 | 31,28 | 20,00 | - | - | - | - |
| | | | | 30 | 0,50 | 440,16 | 36,80 | 20,00 | - | - | - | - |
| 2 | 1800 | - | | 5 | 0,96 | 291,39 | 68,72 | 120,00 | 34,23 | 44,74 | 59,13 | 68,72 |
| | | | | 10 | 0,96 | 761,30 | 453,17 | 120,00 | 64,04 | 215,19 | 383,81 | 453,17 |
| | | | | 15 | 0,96 | 1231,21 | 555,84 | 120,00 | 187,63 | 414,88 | 503,93 | 555,84 |
| | | | | 20 | 0,96 | 1701,12 | 35,05 | 20,00 | - | - | - | - |
| | | | | 25 | 0,96 | 2171,03 | 45,16 | 20,00 | - | - | - | - |
| | | | | 30 | 0,96 | 2640,94 | 84,77 | 20,00 | - | - | - | - |
| 2 | 1800 | - | | 5 | 0,96 | 291,39 | 67,40 | 120,00 | 33,98 | 44,17 | 58,23 | 67,40 |
| | | | | 10 | 0,96 | 761,30 | 382,16 | 120,00 | 60,71 | 155,72 | 306,30 | 382,16 |
| | | | | 15 | 0,96 | 1231,21 | 485,94 | 120,00 | 137,04 | 348,57 | 437,59 | 485,94 |
| | | | | 20 | 0,96 | 1701,12 | 531,10 | 106,67 | 283,26 | 434,52 | 503,20 | - |
| | | | | 25 | 0,96 | 2171,03 | 43,39 | 20,00 | - | - | - | - |
| | | | | 30 | 0,96 | 2640,94 | 63,40 | 20,00 | - | - | - | - |
| 3 | 1800 | 22 | | 5 | 0,67 | 4,05 | 63,87 | 120,00 | 33,35 | 42,93 | 56,10 | 63,87 |
| | | | | 10 | 0,67 | 10,57 | 141,47 | 120,00 | 52,50 | 86,66 | 118,34 | 141,47 |
| | | | | 15 | 0,67 | 17,10 | 297,70 | 120,00 | 76,83 | 148,75 | 222,35 | 297,70 |
| | | | | 20 | 0,67 | 23,63 | 484,26 | 120,00 | 112,32 | 231,99 | 367,82 | 484,26 |
| | | | | 25 | 0,67 | 30,15 | 555,64 | 120,00 | 165,54 | 324,29 | 477,35 | 555,64 |
| | | | | 30 | 0,67 | 36,68 | 621,82 | 120,00 | 264,33 | 485,90 | 571,73 | 621,82 |
| 3 | 1800 | 22 | | 5 | 0,67 | 4,05 | 62,58 | 120,00 | 32,85 | 42,06 | 55,01 | 62,58 |
| | | | | 10 | 0,67 | 10,57 | 152,86 | 120,00 | 51,97 | 85,49 | 116,95 | 152,86 |
| | | | | 15 | 0,67 | 17,10 | 515,00 | 120,00 | 76,35 | 283,85 | 442,53 | 515,00 |
| | | | | 20 | 0,67 | 23,63 | 533,27 | 120,00 | 129,86 | 365,09 | 474,43 | 533,27 |
| | | | | 25 | 0,67 | 30,15 | 594,47 | 120,00 | 268,94 | 459,35 | 544,96 | 594,47 |
| | | | | 30 | 0,67 | 36,68 | 44,07 | 20,00 | - | - | - | - |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load
[3] Dimensions in mm and inch
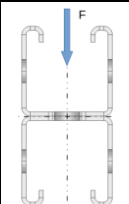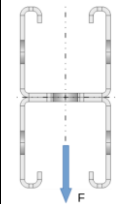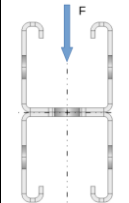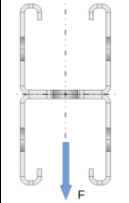[4] distance between loads is 75 mm

Symbols and designation see Annex D1

| **Hilti MT installation channels** | |
|---|---|
| **Bending characteristics of the channel in case of fire** | **Annex D18** |

**Table D37: Calculation-based deformation in case of fire for installation channels MT-40D, MT-40D S, MT-40D OC and MT-40D S OC**

| Loadcase | L[3] | n[4] | Load direction | $\sigma_B$ MPa | $V$[1] - | $F$[2] N | $\delta_{tmax;B}$ mm | $t_{max,B}$ min | $\delta_{30}$ mm | $\delta_{60}$ mm | $\delta_{90}$ mm | $\delta_{120}$ mm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2100 | - | (F ↓) | 5 | 0,50 | 32,42 | 70,26 | 120,00 | 35,34 | 46,42 | 60,99 | 70,26 |
| | | | | 10 | 0,50 | 99,55 | 160,00 | 120,00 | 55,57 | 91,18 | 125,20 | 160,00 |
| | | | | 15 | 0,50 | 166,68 | 754,89 | 120,00 | 81,09 | 179,27 | 586,20 | 754,89 |
| | | | | 20 | 0,50 | 233,81 | 844,22 | 120,00 | 126,46 | 578,16 | 775,90 | 844,22 |
| | | | | 25 | 0,50 | 300,94 | 914,22 | 120,00 | 345,59 | 761,26 | 866,24 | 914,22 |
| | | | | 30 | 0,50 | 368,07 | 44,97 | 20,00 | - | - | - | - |
| 1 | 2100 | - | (F ↓) | 5 | 0,50 | 32,42 | 71,58 | 120,00 | 35,38 | 46,62 | 61,65 | 71,58 |
| | | | | 10 | 0,50 | 99,55 | 306,50 | 106,67 | 56,18 | 99,29 | 193,76 | 0,00 |
| | | | | 15 | 0,50 | 166,68 | 320,74 | 53,33 | 92,19 | - | - | - |
| | | | | 20 | 0,50 | 233,81 | 91,87 | 26,67 | - | - | - | - |
| | | | | 25 | 0,50 | 300,94 | 37,93 | 20,00 | - | - | - | - |
| | | | | 30 | 0,50 | 368,07 | 45,68 | 20,00 | - | - | - | - |
| 2 | 2100 | - | (F ↓) | 5 | 0,96 | 226,92 | 95,31 | 120,00 | 39,45 | 54,31 | 73,91 | 95,31 |
| | | | | 10 | 0,96 | 696,83 | 534,70 | 120,00 | 92,83 | 283,75 | 456,00 | 534,70 |
| | | | | 15 | 0,96 | 1166,74 | 655,13 | 120,00 | 240,96 | 490,69 | 594,40 | 655,13 |
| | | | | 20 | 0,96 | 1636,65 | 42,70 | 20,00 | - | - | - | - |
| | | | | 25 | 0,96 | 2106,56 | 59,09 | 20,00 | - | - | - | - |
| | | | | 30 | 0,96 | 2576,47 | 157,74 | 20,00 | - | - | - | - |
| 2 | 2100 | - | (F ↓) | 5 | 0,96 | 226,92 | 92,91 | 120,00 | 39,20 | 53,76 | 73,15 | 92,91 |
| | | | | 10 | 0,96 | 696,83 | 460,35 | 120,00 | 84,99 | 218,41 | 378,63 | 460,35 |
| | | | | 15 | 0,96 | 1166,74 | 575,80 | 120,00 | 184,46 | 415,51 | 519,45 | 575,80 |
| | | | | 20 | 0,96 | 1636,65 | 638,73 | 113,33 | 340,41 | 515,23 | 595,97 | - |
| | | | | 25 | 0,96 | 2106,56 | 55,93 | 20,00 | - | - | - | - |
| | | | | 30 | 0,96 | 2576,47 | 107,34 | 20,00 | - | - | - | - |
| 3 | 2100 | 26 | (F ↓) | 5 | 0,67 | 2,32 | 81,18 | 120,00 | 39,61 | 53,87 | 70,32 | 81,18 |
| | | | | 10 | 0,67 | 7,11 | 186,73 | 120,00 | 65,82 | 113,93 | 155,64 | 186,73 |
| | | | | 15 | 0,67 | 11,91 | 341,37 | 120,00 | 98,81 | 193,17 | 272,87 | 341,37 |
| | | | | 20 | 0,67 | 16,70 | 509,61 | 120,00 | 145,00 | 279,39 | 390,52 | 509,61 |
| | | | | 25 | 0,67 | 21,50 | 650,97 | 120,00 | 206,30 | 363,26 | 582,77 | 650,97 |
| | | | | 30 | 0,67 | 26,29 | 693,53 | 120,00 | 278,93 | 515,32 | 632,55 | 693,53 |
| 3 | 2100 | 26 | (F ↓) | 5 | 0,67 | 2,32 | 78,70 | 120,00 | 38,65 | 52,19 | 68,17 | 78,70 |
| | | | | 10 | 0,67 | 7,11 | 220,87 | 120,00 | 64,84 | 112,07 | 153,58 | 220,87 |
| | | | | 15 | 0,67 | 11,91 | 581,64 | 120,00 | 98,03 | 308,03 | 499,02 | 581,64 |
| | | | | 20 | 0,67 | 16,70 | 608,72 | 120,00 | 166,38 | 416,71 | 540,47 | 608,72 |
| | | | | 25 | 0,67 | 21,50 | 679,83 | 120,00 | 319,85 | 522,61 | 622,08 | 679,83 |
| | | | | 30 | 0,67 | 26,29 | 55,43 | 20,00 | - | - | - | - |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load
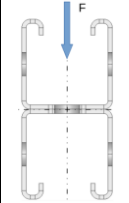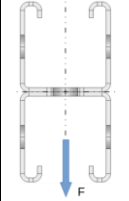[3] Dimensions in mm and inch
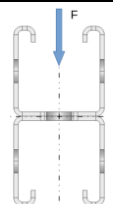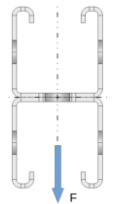[4] distance between loads is 75 mm

Symbols and designation see Annex D1

**Hilti MT installation channels**

**Bending characteristics of the channel in case of fire**

**Annex D19**

**Table D38:** Calculation-based deformation in case of fire for installation channels MT-50, MT-50 S, MT-50 OC and MT-50 S OC

| Loadcase | L[3] | n | Load direction | $\sigma_B$ MPa | $V^{1)}$ - | $F^{2)}$ N | $\delta_{tmax;B}$ mm | $t_{max,B}$ min | $\delta_{30}$ mm | $\delta_{60}$ mm | $\delta_{90}$ mm | $\delta_{120}$ mm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 500 | - | | 5 | 0,50 | 122,79 | 9,93 | 120,00 | 7,50 | 7,50 | 9,93 | 9,93 |
| | | | | 10 | 0,50 | 250,89 | 17,22 | 120,00 | 10,28 | 13,00 | 17,22 | 17,22 |
| | | | | 15 | 0,50 | 379,00 | 36,62 | 120,00 | 13,10 | 19,74 | 28,87 | 36,62 |
| | | | | 20 | 0,50 | 507,11 | 121,28 | 120,00 | 15,97 | 27,73 | 75,78 | 121,28 |
| | | | | 25 | 0,50 | 635,22 | 140,57 | 120,00 | 18,95 | 39,35 | 115,74 | 140,57 |
| | | | | 30 | 0,50 | 763,33 | 160,60 | 120,00 | 22,61 | 89,52 | 141,98 | 160,60 |
| 1 | 500 | - | | 5 | 0,50 | 122,79 | 10,02 | 120,00 | 7,54 | 7,55 | 10,02 | 10,02 |
| | | | | 10 | 0,50 | 250,89 | 17,36 | 120,00 | 10,36 | 13,16 | 17,36 | 17,36 |
| | | | | 15 | 0,50 | 379,00 | 31,72 | 120,00 | 13,21 | 19,80 | 27,84 | 31,72 |
| | | | | 20 | 0,50 | 507,11 | 59,92 | 106,67 | 16,08 | 27,08 | 45,86 | - |
| | | | | 25 | 0,50 | 635,22 | 48,63 | 73,33 | 19,04 | 35,76 | - | - |
| | | | | 30 | 0,50 | 763,33 | 49,46 | 60,00 | 22,31 | 49,46 | - | - |
| 2 | 500 | - | | 5 | 0,80 | 153,48 | 12,25 | 120,00 | 8,53 | 9,34 | 12,25 | 12,25 |
| | | | | 10 | 0,80 | 313,62 | 29,54 | 106,67 | 12,39 | 17,67 | 24,46 | - |
| | | | | 15 | 0,80 | 473,75 | 24,19 | 53,33 | 16,29 | - | - | - |
| | | | | 20 | 0,80 | 633,89 | 15,74 | 26,67 | - | - | - | - |
| | | | | 25 | 0,80 | 794,02 | 6,73 | 20,00 | - | - | - | - |
| | | | | 30 | 0,80 | 954,16 | 7,64 | 20,00 | - | - | - | - |
| 2 | 500 | - | | 5 | 0,80 | 153,48 | 12,40 | 120,00 | 8,58 | 9,46 | 12,40 | 12,40 |
| | | | | 10 | 0,80 | 313,62 | 24,65 | 120,00 | 12,53 | 17,95 | 23,70 | 24,65 |
| | | | | 15 | 0,80 | 473,75 | 54,72 | 120,00 | 16,53 | 27,87 | 43,02 | 54,72 |
| | | | | 20 | 0,80 | 633,89 | 57,89 | 80,00 | 20,56 | 38,74 | - | - |
| | | | | 25 | 0,80 | 794,02 | 52,52 | 60,00 | 24,82 | 52,52 | - | - |
| | | | | 30 | 0,80 | 954,16 | 51,68 | 46,67 | 30,86 | - | - | - |
| 3 | 500 | 3 | | 5 | 0,67 | 51,16 | 11,35 | 120,00 | 8,12 | 8,60 | 11,35 | 11,35 |
| | | | | 10 | 0,67 | 104,54 | 20,99 | 120,00 | 11,55 | 15,76 | 20,89 | 20,99 |
| | | | | 15 | 0,67 | 157,92 | 38,93 | 93,33 | 15,05 | 24,35 | 37,73 | - |
| | | | | 20 | 0,67 | 211,30 | 39,18 | 66,67 | 18,59 | 34,19 | - | - |
| | | | | 25 | 0,67 | 264,67 | 33,21 | 46,67 | 22,26 | - | - | - |
| | | | | 30 | 0,67 | 318,05 | 34,27 | 33,33 | 27,21 | - | - | - |
| 3 | 500 | 3 | | 5 | 0,67 | 51,16 | 11,46 | 120,00 | 8,17 | 8,70 | 11,46 | 11,46 |
| | | | | 10 | 0,67 | 104,54 | 21,15 | 120,00 | 11,66 | 15,98 | 21,11 | 21,15 |
| | | | | 15 | 0,67 | 157,92 | 46,92 | 120,00 | 15,19 | 24,60 | 36,86 | 46,92 |
| | | | | 20 | 0,67 | 211,30 | 68,02 | 93,33 | 18,76 | 34,11 | 64,24 | - |
| | | | | 25 | 0,67 | 264,67 | 55,44 | 66,67 | 22,46 | 46,32 | - | - |
| | | | | 30 | 0,67 | 318,05 | 57,75 | 53,33 | 27,30 | - | - | - |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load
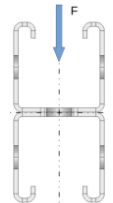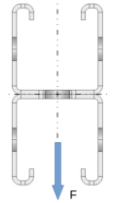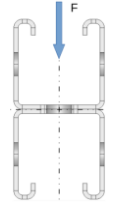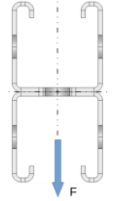[3] Dimensions in mm and inch

Symbols and designation see Annex D1

**Hilti MT installation channels**

**Bending characteristics of the channel in case of fire**

**Annex D20**

**Table D39: Calculation-based deformation in case of fire for installation channels MT-50, MT-50 S, MT-50 OC and MT-50 S OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 700 | - | | 5 | 0,50 | 84,06 | 15,96 | 120,00 | 10,15 | 12,34 | 15,96 | 15,96 |
| | | | | 10 | 0,50 | 175,56 | 31,24 | 120,00 | 15,46 | 23,06 | 30,07 | 31,24 |
| | | | | 15 | 0,50 | 267,07 | 110,67 | 120,00 | 20,88 | 35,87 | 52,26 | 110,67 |
| | | | | 20 | 0,50 | 358,57 | 171,86 | 120,00 | 26,37 | 50,61 | 141,00 | 171,86 |
| | | | | 25 | 0,50 | 450,08 | 203,36 | 120,00 | 32,00 | 114,31 | 178,10 | 203,36 |
| | | | | 30 | 0,50 | 541,58 | 229,95 | 120,00 | 38,73 | 153,52 | 207,78 | 229,95 |
| 1 | 700 | - | | 5 | 0,50 | 84,06 | 16,00 | 120,00 | 10,18 | 12,38 | 16,00 | 16,00 |
| | | | | 10 | 0,50 | 175,56 | 30,84 | 120,00 | 15,51 | 23,02 | 29,88 | 30,84 |
| | | | | 15 | 0,50 | 267,07 | 59,05 | 120,00 | 20,90 | 35,50 | 49,33 | 59,05 |
| | | | | 20 | 0,50 | 358,57 | 95,65 | 106,67 | 26,31 | 48,86 | 79,15 | - |
| | | | | 25 | 0,50 | 450,08 | 99,89 | 80,00 | 31,79 | 63,88 | - | - |
| | | | | 30 | 0,50 | 541,58 | 96,53 | 60,00 | 40,22 | 96,53 | - | - |
| 2 | 700 | - | | 5 | 0,86 | 147,10 | 20,84 | 120,00 | 12,31 | 16,28 | 20,84 | 20,84 |
| | | | | 10 | 0,86 | 307,23 | 115,84 | 120,00 | 20,01 | 34,24 | 97,06 | 115,84 |
| | | | | 15 | 0,86 | 467,37 | 105,04 | 60,00 | 27,88 | 105,04 | - | - |
| | | | | 20 | 0,86 | 627,50 | 26,84 | 26,67 | - | - | - | - |
| | | | | 25 | 0,86 | 787,64 | 9,97 | 20,00 | - | - | - | - |
| | | | | 30 | 0,86 | 947,77 | 11,79 | 20,00 | - | - | - | - |
| 2 | 700 | - | | 5 | 0,86 | 147,10 | 20,93 | 120,00 | 12,34 | 16,36 | 20,93 | 20,93 |
| | | | | 10 | 0,86 | 307,23 | 47,57 | 120,00 | 20,12 | 32,93 | 42,72 | 47,57 |
| | | | | 15 | 0,86 | 467,37 | 86,89 | 120,00 | 27,91 | 51,31 | 73,61 | 86,89 |
| | | | | 20 | 0,86 | 627,50 | 120,84 | 113,33 | 35,66 | 69,31 | 105,06 | - |
| | | | | 25 | 0,86 | 787,64 | 117,95 | 80,00 | 43,53 | 87,39 | - | - |
| | | | | 30 | 0,86 | 947,77 | 119,64 | 66,67 | 53,39 | 106,26 | - | - |
| 3 | 700 | 5 | | 5 | 0,67 | 24,52 | 18,74 | 120,00 | 11,38 | 14,57 | 18,74 | 18,74 |
| | | | | 10 | 0,67 | 51,21 | 40,15 | 120,00 | 17,97 | 28,24 | 36,84 | 40,15 |
| | | | | 15 | 0,67 | 77,89 | 68,81 | 93,33 | 24,62 | 44,09 | 66,48 | - |
| | | | | 20 | 0,67 | 104,58 | 69,64 | 66,67 | 31,30 | 61,24 | - | - |
| | | | | 25 | 0,67 | 131,27 | 58,57 | 46,67 | 38,14 | - | - | - |
| | | | | 30 | 0,67 | 157,96 | 59,47 | 33,33 | 46,96 | - | - | - |
| 3 | 700 | 5 | | 5 | 0,67 | 24,52 | 18,81 | 120,00 | 11,41 | 14,65 | 18,81 | 18,81 |
| | | | | 10 | 0,67 | 51,21 | 40,15 | 120,00 | 18,06 | 28,46 | 36,99 | 40,15 |
| | | | | 15 | 0,67 | 77,89 | 78,46 | 120,00 | 24,76 | 44,37 | 63,93 | 78,46 |
| | | | | 20 | 0,67 | 104,58 | 131,24 | 120,00 | 31,46 | 60,84 | 98,26 | 131,24 |
| | | | | 25 | 0,67 | 131,27 | 131,04 | 86,67 | 38,27 | 78,89 | - | - |
| | | | | 30 | 0,67 | 157,96 | 119,58 | 66,67 | 46,49 | 101,36 | - | - |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load
[3] Dimensions in mm and inch

Symbols and designation see Annex D1

**Hilti MT installation channels**

**Bending characteristics of the channel in case of fire**

**Annex D21**

**Table D40: Calculation-based deformation in case of fire for installation channels MT-50, MT-50 S, MT-50 OC and MT-50 S OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 900 | - | | 5 | 0,50 | 61,59 | 24,43 | 120,00 | 13,87 | 19,18 | 24,43 | 24,43 |
| | | | | 10 | 0,50 | 132,76 | 51,51 | 120,00 | 22,59 | 36,65 | 47,25 | 51,51 |
| | | | | 15 | 0,50 | 203,93 | 181,22 | 120,00 | 31,40 | 57,08 | 93,17 | 181,22 |
| | | | | 20 | 0,50 | 275,10 | 238,05 | 120,00 | 40,22 | 87,12 | 205,02 | 238,05 |
| | | | | 25 | 0,50 | 346,28 | 273,17 | 120,00 | 49,20 | 179,15 | 245,05 | 273,17 |
| | | | | 30 | 0,50 | 417,45 | 299,31 | 120,00 | 61,64 | 217,52 | 273,58 | 299,31 |
| 1 | 900 | - | | 5 | 0,50 | 61,59 | 24,33 | 120,00 | 13,86 | 19,13 | 24,33 | 24,33 |
| | | | | 10 | 0,50 | 132,76 | 50,70 | 120,00 | 22,54 | 36,41 | 46,84 | 50,70 |
| | | | | 15 | 0,50 | 203,93 | 92,90 | 120,00 | 31,28 | 56,33 | 77,08 | 92,90 |
| | | | | 20 | 0,50 | 275,10 | 150,23 | 113,33 | 39,99 | 76,97 | 118,85 | - |
| | | | | 25 | 0,50 | 346,28 | 141,64 | 80,00 | 48,74 | 98,85 | - | - |
| | | | | 30 | 0,50 | 417,45 | 144,02 | 66,67 | 58,12 | 124,90 | - | - |
| 2 | 900 | - | | 5 | 0,89 | 138,58 | 32,30 | 120,00 | 17,34 | 25,49 | 32,30 | 32,30 |
| | | | | 10 | 0,89 | 298,72 | 138,36 | 120,00 | 30,16 | 86,28 | 121,58 | 138,36 |
| | | | | 15 | 0,89 | 458,85 | 133,34 | 60,00 | 54,29 | 133,34 | - | - |
| | | | | 20 | 0,89 | 618,99 | 42,60 | 26,67 | - | - | - | - |
| | | | | 25 | 0,89 | 779,12 | 14,30 | 20,00 | - | - | - | - |
| | | | | 30 | 0,89 | 939,26 | 17,35 | 20,00 | - | - | - | - |
| 2 | 900 | - | | 5 | 0,89 | 138,58 | 32,19 | 120,00 | 17,34 | 25,50 | 32,19 | 32,19 |
| | | | | 10 | 0,89 | 298,72 | 75,18 | 120,00 | 30,14 | 52,02 | 66,44 | 75,18 |
| | | | | 15 | 0,89 | 458,85 | 120,51 | 120,00 | 42,72 | 79,34 | 106,02 | 120,51 |
| | | | | 20 | 0,89 | 618,99 | 160,37 | 120,00 | 54,92 | 103,27 | 141,79 | 160,37 |
| | | | | 25 | 0,89 | 779,12 | 184,14 | 113,33 | 66,89 | 124,93 | 168,09 | - |
| | | | | 30 | 0,89 | 939,26 | 192,17 | 93,33 | 79,93 | 143,82 | 189,30 | - |
| 3 | 900 | 7 | | 5 | 0,67 | 13,86 | 28,86 | 120,00 | 15,87 | 22,76 | 28,86 | 28,86 |
| | | | | 10 | 0,67 | 29,87 | 64,52 | 120,00 | 26,58 | 44,64 | 57,52 | 64,52 |
| | | | | 15 | 0,67 | 45,89 | 101,76 | 93,33 | 37,28 | 68,73 | 98,39 | - |
| | | | | 20 | 0,67 | 61,90 | 104,37 | 66,67 | 47,84 | 92,86 | - | - |
| | | | | 25 | 0,67 | 77,91 | 88,04 | 46,67 | 58,39 | - | - | - |
| | | | | 30 | 0,67 | 93,93 | 88,40 | 33,33 | 70,66 | - | - | - |
| 3 | 900 | 7 | | 5 | 0,67 | 13,86 | 28,88 | 120,00 | 15,87 | 22,81 | 28,88 | 28,88 |
| | | | | 10 | 0,67 | 29,87 | 64,84 | 120,00 | 26,71 | 45,06 | 57,91 | 64,84 |
| | | | | 15 | 0,67 | 45,89 | 114,33 | 120,00 | 37,52 | 69,61 | 96,13 | 114,33 |
| | | | | 20 | 0,67 | 61,90 | 166,59 | 120,00 | 48,17 | 93,27 | 137,86 | 166,59 |
| | | | | 25 | 0,67 | 77,91 | 210,62 | 120,00 | 58,77 | 116,54 | 172,96 | 210,62 |
| | | | | 30 | 0,67 | 93,93 | 211,25 | 93,33 | 70,68 | 140,46 | 205,51 | - |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load
[3] Dimensions in mm and inch

Symbols and designation see Annex D1

**Hilti MT installation channels**

**Bending characteristics of the channel in case of fire**

**Annex D22**

**Table D41: Calculation-based deformation in case of fire for installation channels MT-50, MT-50 S, MT-50 OC and MT-50 S OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 1100 | - | | 5 | 0,50 | 46,52 | 35,51 | 120,00 | 18,79 | 28,18 | 35,51 | 35,51 |
| | | | | 10 | 0,50 | 104,75 | 77,38 | 120,00 | 31,69 | 53,79 | 68,91 | 77,38 |
| | | | | 15 | 0,50 | 162,98 | 232,92 | 120,00 | 44,59 | 83,58 | 186,12 | 232,92 |
| | | | | 20 | 0,50 | 221,22 | 102,01 | 53,33 | 57,42 | - | - | - |
| | | | | 25 | 0,50 | 279,45 | 98,91 | 40,00 | 70,55 | - | - | - |
| | | | | 30 | 0,50 | 337,68 | 62,35 | 26,67 | - | - | - | - |
| 1 | 1100 | - | | 5 | 0,50 | 46,52 | 35,29 | 120,00 | 18,72 | 28,01 | 35,29 | 35,29 |
| | | | | 10 | 0,50 | 104,75 | 75,65 | 120,00 | 31,55 | 53,45 | 68,27 | 75,65 |
| | | | | 15 | 0,50 | 162,98 | 132,07 | 120,00 | 44,40 | 82,01 | 110,31 | 132,07 |
| | | | | 20 | 0,50 | 221,22 | 201,86 | 113,33 | 57,09 | 110,50 | 163,46 | - |
| | | | | 25 | 0,50 | 279,45 | 190,74 | 80,00 | 69,69 | 139,21 | - | - |
| | | | | 30 | 0,50 | 337,68 | 192,59 | 66,67 | 82,91 | 170,74 | - | - |
| 2 | 1100 | - | | 5 | 0,91 | 127,94 | 69,64 | 120,00 | 23,63 | 37,28 | 51,26 | 69,64 |
| | | | | 10 | 0,91 | 288,07 | 166,94 | 120,00 | 45,83 | 118,04 | 151,28 | 166,94 |
| | | | | 15 | 0,91 | 448,21 | 208,96 | 120,00 | 82,64 | 161,63 | 194,51 | 208,96 |
| | | | | 20 | 0,91 | 608,34 | 66,45 | 26,67 | - | - | - | - |
| | | | | 25 | 0,91 | 768,48 | 19,72 | 20,00 | - | - | - | - |
| | | | | 30 | 0,91 | 928,61 | 24,44 | 20,00 | - | - | - | - |
| 2 | 1100 | - | | 5 | 0,91 | 127,94 | 46,58 | 120,00 | 23,57 | 36,80 | 46,06 | 46,58 |
| | | | | 10 | 0,91 | 288,07 | 105,86 | 120,00 | 42,44 | 74,43 | 93,66 | 105,86 |
| | | | | 15 | 0,91 | 448,21 | 156,11 | 120,00 | 60,57 | 110,19 | 139,76 | 156,11 |
| | | | | 20 | 0,91 | 608,34 | 198,07 | 120,00 | 77,62 | 139,15 | 179,18 | 198,07 |
| | | | | 25 | 0,91 | 768,48 | 228,57 | 120,00 | 93,81 | 163,52 | 207,93 | 228,57 |
| | | | | 30 | 0,91 | 928,61 | 246,28 | 113,33 | 109,65 | 184,15 | 229,66 | - |
| 3 | 1100 | 9 | | 5 | 0,67 | 8,53 | 42,16 | 120,00 | 21,72 | 33,36 | 41,93 | 42,16 |
| | | | | 10 | 0,67 | 19,20 | 93,20 | 120,00 | 37,46 | 64,70 | 82,35 | 93,20 |
| | | | | 15 | 0,67 | 29,88 | 169,49 | 100,00 | 52,91 | 97,12 | 141,99 | - |
| | | | | 20 | 0,67 | 40,56 | 154,49 | 73,33 | 68,64 | 127,81 | - | - |
| | | | | 25 | 0,67 | 51,23 | 121,70 | 46,67 | 82,41 | - | - | - |
| | | | | 30 | 0,67 | 61,91 | 121,60 | 33,33 | 98,42 | - | - | - |
| 3 | 1100 | 9 | | 5 | 0,67 | 8,53 | 42,02 | 120,00 | 21,67 | 33,37 | 41,88 | 42,02 |
| | | | | 10 | 0,67 | 19,20 | 94,22 | 120,00 | 37,63 | 65,57 | 83,31 | 94,22 |
| | | | | 15 | 0,67 | 29,88 | 152,44 | 120,00 | 53,35 | 99,12 | 131,42 | 152,44 |
| | | | | 20 | 0,67 | 40,56 | 209,35 | 120,00 | 68,55 | 129,35 | 179,23 | 209,35 |
| | | | | 25 | 0,67 | 51,23 | 251,75 | 120,00 | 83,34 | 157,13 | 217,57 | 251,75 |
| | | | | 30 | 0,67 | 61,91 | 287,79 | 120,00 | 98,86 | 182,88 | 248,92 | 287,79 |

[1] Momentum degree of fullness without contribution from channel dead weight
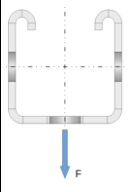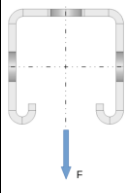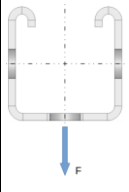[2] Size of designated system's single load
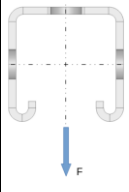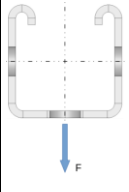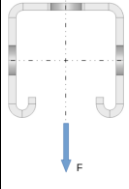[3] Dimensions in mm and inch

Symbols and designation see Annex D1

**Hilti MT installation channels**

**Bending characteristics of the channel in case of fire**

**Annex D23**

**Table D42:** Calculation-based deformation in case of fire for installation channels MT-50, MT-50 S, MT-50 OC and MT-50 S OC

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 1300 | - | | 5 | 0,50 | 35,44 | 50,34 | 120,00 | 25,05 | 39,53 | 49,47 | 50,34 |
| | | | | 10 | 0,50 | 84,71 | 110,76 | 120,00 | 42,85 | 74,60 | 95,11 | 110,76 |
| | | | | 15 | 0,50 | 133,98 | 299,78 | 120,00 | 60,52 | 117,38 | 254,76 | 299,78 |
| | | | | 20 | 0,50 | 183,25 | 115,26 | 46,67 | 77,98 | - | - | - |
| | | | | 25 | 0,50 | 232,52 | 119,54 | 33,33 | 95,25 | - | - | - |
| | | | | 30 | 0,50 | 281,80 | 84,75 | 26,67 | - | - | - | - |
| 1 | 1300 | - | | 5 | 0,50 | 35,44 | 50,00 | 120,00 | 24,90 | 39,29 | 49,17 | 50,00 |
| | | | | 10 | 0,50 | 84,71 | 105,56 | 120,00 | 42,67 | 74,21 | 94,15 | 105,56 |
| | | | | 15 | 0,50 | 133,98 | 175,33 | 120,00 | 60,29 | 112,15 | 148,12 | 175,33 |
| | | | | 20 | 0,50 | 183,25 | 256,98 | 113,33 | 77,52 | 148,52 | 211,44 | - |
| | | | | 25 | 0,50 | 232,52 | 242,90 | 80,00 | 94,39 | 183,66 | - | - |
| | | | | 30 | 0,50 | 281,80 | 244,50 | 66,67 | 111,70 | 219,94 | - | - |
| 2 | 1300 | - | | 5 | 0,92 | 115,16 | 102,17 | 120,00 | 31,30 | 56,59 | 87,55 | 102,17 |
| | | | | 10 | 0,92 | 275,30 | 197,57 | 120,00 | 68,95 | 145,84 | 179,80 | 197,57 |
| | | | | 15 | 0,92 | 435,43 | 241,56 | 120,00 | 110,98 | 190,82 | 224,88 | 241,56 |
| | | | | 20 | 0,92 | 595,57 | 262,49 | 120,00 | 152,69 | 216,30 | 248,21 | 262,49 |
| | | | | 25 | 0,92 | 755,70 | 281,76 | 120,00 | 181,47 | 238,04 | 268,71 | 281,76 |
| | | | | 30 | 0,92 | 915,84 | 301,03 | 120,00 | 210,25 | 259,79 | 289,21 | 301,03 |
| 2 | 1300 | - | | 5 | 0,92 | 115,16 | 64,39 | 120,00 | 31,00 | 50,14 | 62,34 | 64,39 |
| | | | | 10 | 0,92 | 275,30 | 138,69 | 120,00 | 56,87 | 99,42 | 123,47 | 138,69 |
| | | | | 15 | 0,92 | 435,43 | 194,19 | 120,00 | 81,02 | 142,85 | 175,09 | 194,19 |
| | | | | 20 | 0,92 | 595,57 | 237,81 | 120,00 | 103,06 | 176,41 | 217,72 | 237,81 |
| | | | | 25 | 0,92 | 755,70 | 270,36 | 120,00 | 123,41 | 203,12 | 249,10 | 270,36 |
| | | | | 30 | 0,92 | 915,84 | 297,44 | 120,00 | 142,23 | 225,47 | 272,82 | 297,44 |
| 3 | 1300 | 11 | | 5 | 0,67 | 5,48 | 59,91 | 120,00 | 29,08 | 46,52 | 58,07 | 59,91 |
| | | | | 10 | 0,67 | 13,11 | 125,36 | 120,00 | 50,63 | 87,98 | 110,62 | 125,36 |
| | | | | 15 | 0,67 | 20,73 | 292,41 | 120,00 | 71,27 | 128,12 | 205,04 | 292,41 |
| | | | | 20 | 0,67 | 28,36 | 348,80 | 120,00 | 90,79 | 184,70 | 310,77 | 348,80 |
| | | | | 25 | 0,67 | 35,99 | 384,34 | 120,00 | 109,53 | 262,82 | 350,60 | 384,34 |
| | | | | 30 | 0,67 | 43,61 | 186,45 | 40,00 | 127,94 | - | - | - |
| 3 | 1300 | 11 | | 5 | 0,67 | 5,48 | 59,64 | 120,00 | 28,91 | 46,47 | 57,95 | 59,64 |
| | | | | 10 | 0,67 | 13,11 | 127,34 | 120,00 | 50,90 | 89,60 | 112,53 | 127,34 |
| | | | | 15 | 0,67 | 20,73 | 191,96 | 120,00 | 72,07 | 131,68 | 168,55 | 191,96 |
| | | | | 20 | 0,67 | 28,36 | 252,24 | 120,00 | 92,15 | 167,59 | 221,11 | 252,24 |
| | | | | 25 | 0,67 | 35,99 | 298,34 | 120,00 | 111,27 | 199,12 | 262,65 | 298,34 |
| | | | | 30 | 0,67 | 43,61 | 334,07 | 120,00 | 130,15 | 226,91 | 296,39 | 334,07 |

[1] Momentum degree of fullness without contribution from channel dead weight
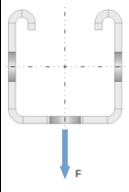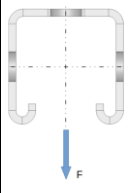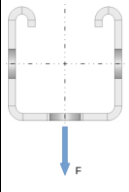[2] Size of designated system's single load
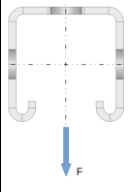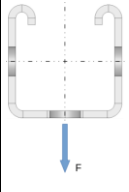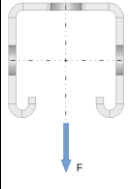[3] Dimensions in mm and inch

Symbols and designation see Annex D1

| **Hilti MT installation channels** | |
|---|---|
| **Bending characteristics of the channel in case of fire** | **Annex D24** |

**Table D43: Calculation-based deformation in case of fire for installation channels MT-50, MT-50 S, MT-50 OC and MT-50 S OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 1500 | - | | 5 | 0,50 | 26,74 | 69,18 | 120,00 | 32,82 | 53,55 | 66,66 | 69,18 |
| | | | | 10 | 0,50 | 69,44 | 156,55 | 120,00 | 56,23 | 99,36 | 128,32 | 156,55 |
| | | | | 15 | 0,50 | 112,14 | 367,21 | 120,00 | 79,27 | 211,60 | 319,11 | 367,21 |
| | | | | 20 | 0,50 | 154,84 | 138,88 | 40,00 | 102,11 | - | - | - |
| | | | | 25 | 0,50 | 197,55 | 92,90 | 26,67 | - | - | - | - |
| | | | | 30 | 0,50 | 240,25 | 110,95 | 26,67 | - | - | - | - |
| 1 | 1500 | - | | 5 | 0,50 | 26,74 | 68,76 | 120,00 | 32,60 | 53,23 | 66,29 | 68,76 |
| | | | | 10 | 0,50 | 69,44 | 140,16 | 120,00 | 56,02 | 98,71 | 124,36 | 140,16 |
| | | | | 15 | 0,50 | 112,14 | 221,93 | 120,00 | 78,99 | 146,31 | 189,72 | 221,93 |
| | | | | 20 | 0,50 | 154,84 | 313,11 | 113,33 | 101,16 | 190,30 | 262,15 | - |
| | | | | 25 | 0,50 | 197,55 | 297,15 | 80,00 | 122,62 | 231,42 | - | - |
| | | | | 30 | 0,50 | 240,25 | 298,68 | 66,67 | 144,11 | 271,93 | - | - |
| 2 | 1500 | - | | 5 | 0,93 | 100,26 | 127,09 | 120,00 | 40,94 | 85,50 | 114,48 | 127,09 |
| | | | | 10 | 0,93 | 260,40 | 236,47 | 120,00 | 90,37 | 173,01 | 214,01 | 236,47 |
| | | | | 15 | 0,93 | 420,53 | 282,98 | 120,00 | 138,78 | 223,88 | 263,32 | 282,98 |
| | | | | 20 | 0,93 | 580,67 | 294,93 | 120,00 | 175,48 | 244,97 | 279,04 | 294,93 |
| | | | | 25 | 0,93 | 740,80 | 314,56 | 120,00 | 205,20 | 268,02 | 300,53 | 314,56 |
| | | | | 30 | 0,93 | 900,94 | 337,27 | 120,00 | 236,15 | 293,12 | 324,57 | 337,27 |
| 2 | 1500 | - | | 5 | 0,93 | 100,26 | 84,66 | 120,00 | 39,59 | 65,40 | 80,89 | 84,66 |
| | | | | 10 | 0,93 | 260,40 | 173,32 | 120,00 | 73,24 | 126,50 | 155,31 | 173,32 |
| | | | | 15 | 0,93 | 420,53 | 234,91 | 120,00 | 103,71 | 176,89 | 212,13 | 234,91 |
| | | | | 20 | 0,93 | 580,67 | 279,58 | 120,00 | 130,71 | 214,67 | 257,60 | 279,58 |
| | | | | 25 | 0,93 | 740,80 | 314,39 | 120,00 | 155,03 | 243,98 | 291,77 | 314,39 |
| | | | | 30 | 0,93 | 900,94 | 341,28 | 120,00 | 176,90 | 267,89 | 317,62 | 341,28 |
| 3 | 1500 | 13 | | 5 | 0,67 | 3,58 | 81,20 | 120,00 | 38,13 | 62,43 | 77,46 | 81,20 |
| | | | | 10 | 0,67 | 9,30 | 161,03 | 120,00 | 66,02 | 113,81 | 141,50 | 161,03 |
| | | | | 15 | 0,67 | 15,02 | 302,22 | 120,00 | 92,10 | 161,24 | 225,03 | 302,22 |
| | | | | 20 | 0,67 | 20,74 | 386,93 | 120,00 | 116,20 | 215,37 | 334,92 | 386,93 |
| | | | | 25 | 0,67 | 26,46 | 429,91 | 120,00 | 139,35 | 282,47 | 389,36 | 429,91 |
| | | | | 30 | 0,67 | 32,18 | 461,08 | 120,00 | 170,29 | 351,56 | 423,66 | 461,08 |
| 3 | 1500 | 13 | | 5 | 0,67 | 3,58 | 80,83 | 120,00 | 37,77 | 62,32 | 77,29 | 80,83 |
| | | | | 10 | 0,67 | 9,30 | 163,12 | 120,00 | 66,46 | 116,60 | 144,74 | 163,12 |
| | | | | 15 | 0,67 | 15,02 | 232,89 | 120,00 | 93,49 | 166,35 | 206,97 | 232,89 |
| | | | | 20 | 0,67 | 20,74 | 295,33 | 120,00 | 118,50 | 207,12 | 263,13 | 295,33 |
| | | | | 25 | 0,67 | 26,46 | 344,69 | 120,00 | 141,84 | 241,72 | 307,81 | 344,69 |
| | | | | 30 | 0,67 | 32,18 | 383,46 | 120,00 | 163,95 | 271,88 | 343,97 | 383,46 |

[1] Momentum degree of fullness without contribution from channel dead weight
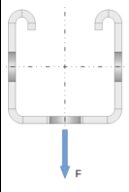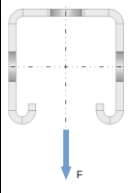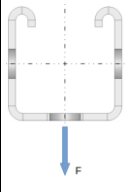[2] Size of designated system's single load
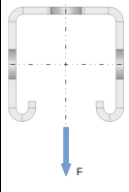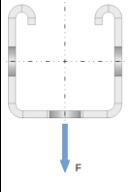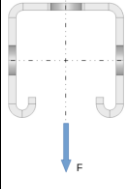[3] Dimensions in mm and inch

Symbols and designation see Annex D1

**Hilti MT installation channels**

**Bending characteristics of the channel in case of fire**

**Annex D25**

**Table D44: Calculation-based deformation in case of fire for installation channels MT-70 S OC and MT-70 OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 500 | - | | 5 | 0,50 | 247,05 | 32,35 | 120,00 | 7,01 | 32,35 | 32,35 | 32,35 |
| | | | | 10 | 0,50 | 502,41 | 38,36 | 120,00 | 8,14 | 38,36 | 38,36 | 38,36 |
| | | | | 15 | 0,50 | 757,77 | 51,59 | 120,00 | 9,72 | 46,90 | 46,90 | 51,59 |
| | | | | 20 | 0,50 | 1013,13 | 156,46 | 120,00 | 12,34 | 62,06 | 80,63 | 156,46 |
| | | | | 25 | 0,50 | 1268,49 | 195,33 | 120,00 | 17,55 | 88,46 | 170,56 | 195,33 |
| | | | | 30 | 0,50 | 1523,85 | 210,65 | 120,00 | 27,60 | 155,54 | 199,01 | 210,65 |
| 1 | 500 | - | | 5 | 0,50 | 247,05 | 33,21 | 120,00 | 7,35 | 33,21 | 33,21 | 33,21 |
| | | | | 10 | 0,50 | 502,41 | 40,17 | 120,00 | 9,05 | 40,17 | 40,17 | 40,17 |
| | | | | 15 | 0,50 | 757,77 | 48,64 | 120,00 | 11,37 | 48,64 | 48,64 | 48,64 |
| | | | | 20 | 0,50 | 1013,13 | 87,28 | 120,00 | 14,52 | 61,32 | 66,88 | 87,28 |
| | | | | 25 | 0,50 | 1268,49 | 152,03 | 120,00 | 19,08 | 80,44 | 107,53 | 152,03 |
| | | | | 30 | 0,50 | 1523,85 | 204,09 | 120,00 | 26,54 | 107,19 | 158,87 | 204,09 |
| 2 | 500 | - | | 5 | 0,80 | 308,81 | 34,80 | 120,00 | 7,45 | 34,80 | 34,80 | 34,80 |
| | | | | 10 | 0,80 | 628,01 | 44,09 | 120,00 | 9,33 | 44,09 | 44,09 | 44,09 |
| | | | | 15 | 0,80 | 947,21 | 89,44 | 120,00 | 12,11 | 62,12 | 71,78 | 89,44 |
| | | | | 20 | 0,80 | 1266,41 | 126,51 | 120,00 | 17,81 | 92,92 | 111,00 | 126,51 |
| | | | | 25 | 0,80 | 1585,61 | 146,44 | 120,00 | 32,42 | 123,99 | 136,97 | 146,44 |
| | | | | 30 | 0,80 | 1904,81 | 151,99 | 90,91 | 58,28 | 146,85 | 151,37 | - |
| 2 | 500 | - | | 5 | 0,80 | 308,81 | 34,60 | 120,00 | 7,44 | 34,60 | 34,60 | 34,60 |
| | | | | 10 | 0,80 | 628,01 | 42,86 | 120,00 | 9,23 | 42,86 | 42,86 | 42,86 |
| | | | | 15 | 0,80 | 947,21 | 64,64 | 120,00 | 11,58 | 55,84 | 55,84 | 64,64 |
| | | | | 20 | 0,80 | 1266,41 | 99,95 | 120,00 | 15,83 | 75,67 | 84,86 | 99,95 |
| | | | | 25 | 0,80 | 1585,61 | 124,97 | 117,77 | 25,13 | 100,20 | 111,00 | - |
| | | | | 30 | 0,80 | 1904,81 | 132,35 | 86,10 | 40,33 | 120,99 | - | - |
| 3 | 500 | 3 | | 5 | 0,67 | 102,94 | 33,77 | 120,00 | 7,27 | 33,77 | 33,77 | 33,77 |
| | | | | 10 | 0,67 | 209,34 | 41,46 | 120,00 | 8,80 | 41,46 | 41,46 | 41,46 |
| | | | | 15 | 0,67 | 315,74 | 76,61 | 120,00 | 10,82 | 53,94 | 57,32 | 76,61 |
| | | | | 20 | 0,67 | 422,14 | 138,95 | 120,00 | 14,43 | 78,29 | 107,97 | 138,95 |
| | | | | 25 | 0,67 | 528,54 | 184,65 | 120,00 | 22,94 | 115,77 | 155,14 | 184,65 |
| | | | | 30 | 0,67 | 634,94 | 206,49 | 120,00 | 40,89 | 155,52 | 188,56 | 206,49 |
| 3 | 500 | 3 | | 5 | 0,67 | 102,94 | 33,74 | 120,00 | 7,28 | 33,74 | 33,74 | 33,74 |
| | | | | 10 | 0,67 | 209,34 | 41,12 | 120,00 | 8,81 | 41,12 | 41,12 | 41,12 |
| | | | | 15 | 0,67 | 315,74 | 58,64 | 120,00 | 10,77 | 51,80 | 51,80 | 58,64 |
| | | | | 20 | 0,67 | 422,14 | 101,04 | 120,00 | 14,07 | 69,47 | 81,67 | 101,04 |
| | | | | 25 | 0,67 | 528,54 | 138,89 | 120,00 | 20,88 | 94,70 | 117,43 | 138,89 |
| | | | | 30 | 0,67 | 634,94 | 167,03 | 120,00 | 33,06 | 122,34 | 145,78 | 167,03 |

[1] Momentum degree of fullness without contribution from channel dead weight

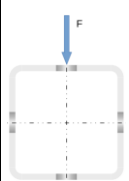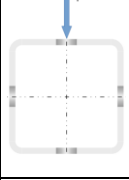[2] Size of designated system's single load
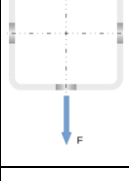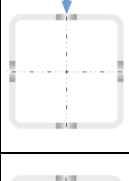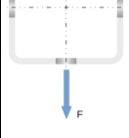
[3] Dimensions in mm and inch

Symbols and designation see Annex D1

**Hilti MT installation channels**

**Bending characteristics of the channel in case of fire**

**Annex D26**

**Table D45: Calculation-based deformation in case of fire for installation channels MT-70 S OC and MT-70 OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 800 | - | | 5 | 0,50 | 146,30 | 37,15 | 120,00 | 8,03 | 37,15 | 37,15 | 37,15 |
| | | | | 10 | 0,50 | 305,90 | 51,36 | 120,00 | 10,79 | 51,36 | 51,36 | 51,36 |
| | | | | 15 | 0,50 | 465,50 | 104,98 | 120,00 | 14,35 | 70,27 | 83,77 | 104,98 |
| | | | | 20 | 0,50 | 625,10 | 188,53 | 120,00 | 19,81 | 101,73 | 143,75 | 188,53 |
| | | | | 25 | 0,50 | 784,70 | 287,59 | 120,00 | 30,42 | 146,59 | 216,85 | 287,59 |
| | | | | 30 | 0,50 | 944,30 | 328,95 | 120,00 | 50,99 | 199,96 | 291,64 | 328,95 |
| 1 | 800 | - | | 5 | 0,50 | 146,30 | 37,59 | 120,00 | 8,21 | 37,59 | 37,59 | 37,59 |
| | | | | 10 | 0,50 | 305,90 | 52,26 | 120,00 | 11,24 | 52,26 | 52,26 | 52,26 |
| | | | | 15 | 0,50 | 465,50 | 97,60 | 120,00 | 15,13 | 70,67 | 81,20 | 97,60 |
| | | | | 20 | 0,50 | 625,10 | 166,31 | 120,00 | 20,78 | 99,10 | 132,52 | 166,31 |
| | | | | 25 | 0,50 | 784,70 | 230,37 | 120,00 | 30,49 | 138,44 | 189,70 | 230,37 |
| | | | | 30 | 0,50 | 944,30 | 288,75 | 120,00 | 47,64 | 181,46 | 240,91 | 288,75 |
| 2 | 800 | - | | 5 | 0,88 | 292,60 | 43,33 | 120,00 | 9,08 | 43,33 | 43,33 | 43,33 |
| | | | | 10 | 0,88 | 611,80 | 90,19 | 120,00 | 13,76 | 67,02 | 75,78 | 90,19 |
| | | | | 15 | 0,88 | 931,00 | 160,84 | 120,00 | 20,48 | 110,06 | 140,50 | 160,84 |
| | | | | 20 | 0,88 | 1250,20 | 205,97 | 120,00 | 34,67 | 159,09 | 187,44 | 205,97 |
| | | | | 25 | 0,88 | 1569,40 | 228,43 | 120,00 | 71,07 | 198,04 | 215,41 | 228,43 |
| | | | | 30 | 0,88 | 1888,60 | 232,96 | 96,35 | 114,76 | 223,65 | 231,31 | - |
| 2 | 800 | - | | 5 | 0,88 | 292,60 | 42,77 | 120,00 | 9,05 | 42,77 | 42,77 | 42,77 |
| | | | | 10 | 0,88 | 611,80 | 75,64 | 120,00 | 13,56 | 63,70 | 66,53 | 75,64 |
| | | | | 15 | 0,88 | 931,00 | 121,54 | 120,00 | 19,51 | 93,48 | 108,82 | 121,54 |
| | | | | 20 | 0,88 | 1250,20 | 161,78 | 120,00 | 30,49 | 128,95 | 148,58 | 161,78 |
| | | | | 25 | 0,88 | 1569,40 | 185,20 | 119,26 | 53,27 | 159,84 | 174,52 | - |
| | | | | 30 | 0,88 | 1888,60 | 192,40 | 86,74 | 82,82 | 183,55 | - | - |
| 3 | 800 | 6 | | 5 | 0,67 | 36,57 | 39,96 | 120,00 | 8,52 | 39,96 | 39,96 | 39,96 |
| | | | | 10 | 0,67 | 76,47 | 66,72 | 120,00 | 12,13 | 58,08 | 58,37 | 66,72 |
| | | | | 15 | 0,67 | 116,37 | 135,21 | 120,00 | 16,79 | 84,91 | 109,54 | 135,21 |
| | | | | 20 | 0,67 | 156,27 | 206,64 | 120,00 | 24,72 | 127,76 | 171,73 | 206,64 |
| | | | | 25 | 0,67 | 196,17 | 258,44 | 120,00 | 42,19 | 178,22 | 226,12 | 258,44 |
| | | | | 30 | 0,67 | 236,07 | 301,74 | 120,00 | 74,97 | 221,82 | 266,99 | 301,74 |
| 3 | 800 | 6 | | 5 | 0,67 | 36,57 | 39,97 | 120,00 | 8,56 | 39,97 | 39,97 | 39,97 |
| | | | | 10 | 0,67 | 76,47 | 63,97 | 120,00 | 12,21 | 57,74 | 57,74 | 63,97 |
| | | | | 15 | 0,67 | 116,37 | 119,67 | 120,00 | 16,86 | 82,23 | 100,40 | 119,67 |
| | | | | 20 | 0,67 | 156,27 | 182,25 | 120,00 | 24,53 | 118,83 | 153,63 | 182,25 |
| | | | | 25 | 0,67 | 196,17 | 225,13 | 120,00 | 40,12 | 161,71 | 198,90 | 225,13 |
| | | | | 30 | 0,67 | 236,07 | 257,18 | 120,00 | 67,32 | 198,63 | 234,53 | 257,18 |

[1] Momentum degree of fullness without contribution from channel dead weight

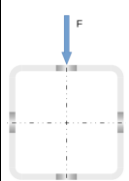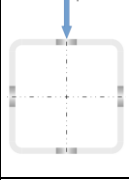[2] Size of designated system's single load
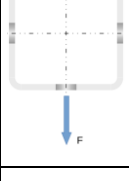
[3] Dimensions in mm and inch

Symbols and designation see Annex D1

| | |
|---|---|
| **Hilti MT installation channels** | |
| **Bending characteristics of the channel in case of fire** | **Annex D27** |

**Table D46: Calculation-based deformation in case of fire for installation channels MT-70 S OC and MT-70 OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 1100 | - | | 5 | 0,50 | 97,78 | 44,47 | 120,00 | 9,57 | 44,47 | 44,47 | 44,47 |
| | | | | 10 | 0,50 | 213,85 | 90,08 | 120,00 | 14,71 | 70,67 | 79,48 | 90,08 |
| | | | | 15 | 0,50 | 329,93 | 170,78 | 120,00 | 21,23 | 103,99 | 140,03 | 170,78 |
| | | | | 20 | 0,50 | 446,00 | 265,95 | 120,00 | 31,02 | 154,31 | 218,39 | 265,95 |
| | | | | 25 | 0,50 | 562,07 | 357,23 | 120,00 | 49,47 | 216,07 | 294,52 | 357,23 |
| | | | | 30 | 0,50 | 678,15 | 429,03 | 120,00 | 83,56 | 277,03 | 366,09 | 429,03 |
| 1 | 1100 | - | | 5 | 0,50 | 97,78 | 44,71 | 120,00 | 9,68 | 44,71 | 44,71 | 44,71 |
| | | | | 10 | 0,50 | 213,85 | 89,97 | 120,00 | 14,98 | 71,12 | 79,75 | 89,97 |
| | | | | 15 | 0,50 | 329,93 | 164,55 | 120,00 | 21,69 | 103,81 | 137,45 | 164,55 |
| | | | | 20 | 0,50 | 446,00 | 253,90 | 120,00 | 31,52 | 151,68 | 210,69 | 253,90 |
| | | | | 25 | 0,50 | 562,07 | 322,83 | 120,00 | 49,02 | 209,61 | 278,99 | 322,83 |
| | | | | 30 | 0,50 | 678,15 | 382,96 | 120,00 | 79,99 | 264,61 | 335,99 | 382,96 |
| 2 | 1100 | - | | 5 | 0,91 | 268,90 | 55,51 | 120,00 | 11,38 | 55,51 | 55,51 | 55,51 |
| | | | | 10 | 0,91 | 588,10 | 155,74 | 120,00 | 20,19 | 100,15 | 131,71 | 155,74 |
| | | | | 15 | 0,91 | 907,30 | 236,04 | 120,00 | 32,82 | 169,15 | 213,11 | 236,04 |
| | | | | 20 | 0,91 | 1226,50 | 289,73 | 120,00 | 59,95 | 229,94 | 269,43 | 289,73 |
| | | | | 25 | 0,91 | 1545,70 | 316,31 | 120,00 | 118,75 | 272,79 | 301,35 | 316,31 |
| | | | | 30 | 0,91 | 1864,90 | 324,77 | 99,78 | 177,03 | 304,89 | 322,28 | - |
| 2 | 1100 | - | | 5 | 0,91 | 268,90 | 54,19 | 120,00 | 11,32 | 54,19 | 54,19 | 54,19 |
| | | | | 10 | 0,91 | 588,10 | 128,59 | 120,00 | 19,76 | 92,55 | 112,91 | 128,59 |
| | | | | 15 | 0,91 | 907,30 | 183,94 | 120,00 | 30,85 | 139,04 | 166,72 | 183,94 |
| | | | | 20 | 0,91 | 1226,50 | 226,11 | 120,00 | 51,05 | 186,85 | 212,57 | 226,11 |
| | | | | 25 | 0,91 | 1545,70 | 249,89 | 120,00 | 88,10 | 221,42 | 241,50 | 249,89 |
| | | | | 30 | 0,91 | 1864,90 | 258,55 | 88,59 | 128,57 | 246,83 | - | - |
| 3 | 1100 | 9 | | 5 | 0,67 | 17,93 | 49,62 | 120,00 | 10,47 | 49,62 | 49,62 | 49,62 |
| | | | | 10 | 0,67 | 39,21 | 119,82 | 120,00 | 17,31 | 83,49 | 102,56 | 119,82 |
| | | | | 15 | 0,67 | 60,49 | 210,61 | 120,00 | 26,21 | 131,06 | 178,51 | 210,61 |
| | | | | 20 | 0,67 | 81,77 | 295,09 | 120,00 | 41,55 | 194,51 | 255,54 | 295,09 |
| | | | | 25 | 0,67 | 103,05 | 350,43 | 120,00 | 74,72 | 257,63 | 313,76 | 350,43 |
| | | | | 30 | 0,67 | 124,33 | 389,04 | 120,00 | 128,76 | 307,45 | 359,45 | 389,04 |
| 3 | 1100 | 9 | | 5 | 0,67 | 17,93 | 49,45 | 120,00 | 10,47 | 49,45 | 49,45 | 49,45 |
| | | | | 10 | 0,67 | 39,21 | 114,95 | 120,00 | 17,26 | 82,45 | 99,51 | 114,95 |
| | | | | 15 | 0,67 | 60,49 | 193,74 | 120,00 | 26,01 | 126,18 | 166,73 | 193,74 |
| | | | | 20 | 0,67 | 81,77 | 270,45 | 120,00 | 40,72 | 183,19 | 236,88 | 270,45 |
| | | | | 25 | 0,67 | 103,05 | 322,62 | 120,00 | 70,47 | 239,32 | 288,62 | 322,62 |
| | | | | 30 | 0,67 | 124,33 | 358,62 | 120,00 | 117,19 | 285,40 | 329,77 | 358,62 |

[1] Momentum degree of fullness without contribution from channel dead weight
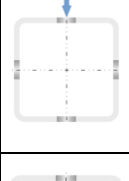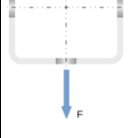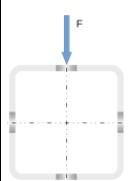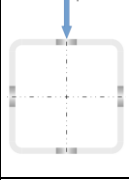[2] Size of designated system's single load
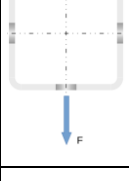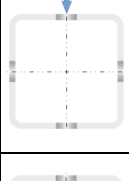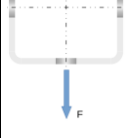[3] Dimensions in mm and inch

Symbols and designation see Annex D1

**Hilti MT installation channels**

**Bending characteristics of the channel in case of fire**

**Annex D28**

**Table D47: Calculation-based deformation in case of fire for installation channels MT-70 S OC and MT-70 OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 1400 | - | | 5 | 0,50 | 67,92 | 54,74 | 120,00 | 11,73 | 54,74 | 54,74 | 54,74 |
| | | | | 10 | 0,50 | 159,12 | 142,09 | 120,00 | 20,02 | 96,57 | 123,77 | 142,09 |
| | | | | 15 | 0,50 | 250,32 | 245,97 | 120,00 | 30,50 | 147,49 | 207,15 | 245,97 |
| | | | | 20 | 0,50 | 341,52 | 355,17 | 120,00 | 46,11 | 217,35 | 301,21 | 355,17 |
| | | | | 25 | 0,50 | 432,72 | 441,62 | 120,00 | 74,90 | 293,35 | 384,18 | 441,62 |
| | | | | 30 | 0,50 | 523,92 | 518,66 | 120,00 | 125,26 | 361,86 | 453,77 | 518,66 |
| 1 | 1400 | - | | 5 | 0,50 | 67,92 | 54,85 | 120,00 | 11,79 | 54,85 | 54,85 | 54,85 |
| | | | | 10 | 0,50 | 159,12 | 141,66 | 120,00 | 20,19 | 96,74 | 123,69 | 141,66 |
| | | | | 15 | 0,50 | 250,32 | 241,24 | 120,00 | 30,76 | 146,97 | 204,90 | 241,24 |
| | | | | 20 | 0,50 | 341,52 | 346,34 | 120,00 | 46,31 | 215,08 | 296,28 | 346,34 |
| | | | | 25 | 0,50 | 432,72 | 424,05 | 120,00 | 74,09 | 288,31 | 373,15 | 424,05 |
| | | | | 30 | 0,50 | 523,92 | 484,16 | 120,00 | 121,76 | 353,68 | 437,07 | 484,16 |
| 2 | 1400 | - | | 5 | 0,93 | 237,72 | 78,46 | 120,00 | 14,30 | 70,84 | 78,29 | 78,46 |
| | | | | 10 | 0,93 | 556,92 | 227,82 | 120,00 | 28,54 | 141,73 | 196,03 | 227,82 |
| | | | | 15 | 0,93 | 876,12 | 314,93 | 120,00 | 49,05 | 233,09 | 288,77 | 314,93 |
| | | | | 20 | 0,93 | 1195,32 | 377,06 | 120,00 | 92,91 | 305,91 | 353,78 | 377,06 |
| | | | | 25 | 0,93 | 1514,52 | 410,55 | 120,00 | 177,30 | 354,16 | 392,80 | 410,55 |
| | | | | 30 | 0,93 | 1833,72 | 419,50 | 102,67 | 241,32 | 388,45 | 415,60 | - |
| 2 | 1400 | - | | 5 | 0,93 | 237,72 | 71,32 | 120,00 | 14,20 | 68,54 | 71,32 | 71,32 |
| | | | | 10 | 0,93 | 556,92 | 187,55 | 120,00 | 27,75 | 128,14 | 166,28 | 187,55 |
| | | | | 15 | 0,93 | 876,12 | 255,33 | 120,00 | 45,48 | 189,49 | 229,68 | 255,33 |
| | | | | 20 | 0,93 | 1195,32 | 296,37 | 120,00 | 76,79 | 247,30 | 280,33 | 296,37 |
| | | | | 25 | 0,93 | 1514,52 | 320,84 | 120,00 | 127,33 | 287,74 | 312,36 | 320,84 |
| | | | | 30 | 0,93 | 1833,72 | 330,23 | 91,17 | 178,19 | 315,43 | 329,56 | - |
| 3 | 1400 | 12 | | 5 | 0,67 | 9,70 | 61,83 | 120,00 | 12,96 | 61,83 | 61,83 | 61,83 |
| | | | | 10 | 0,67 | 22,73 | 180,34 | 120,00 | 23,85 | 114,95 | 154,70 | 180,34 |
| | | | | 15 | 0,67 | 35,76 | 285,87 | 120,00 | 38,00 | 182,92 | 249,05 | 285,87 |
| | | | | 20 | 0,67 | 48,79 | 381,63 | 120,00 | 62,04 | 263,59 | 339,37 | 381,63 |
| | | | | 25 | 0,67 | 61,82 | 446,39 | 120,00 | 111,17 | 335,73 | 403,85 | 446,39 |
| | | | | 30 | 0,67 | 74,85 | 490,85 | 120,00 | 183,11 | 393,90 | 453,15 | 490,85 |
| 3 | 1400 | 12 | | 5 | 0,67 | 9,70 | 61,63 | 120,00 | 12,96 | 61,63 | 61,63 | 61,63 |
| | | | | 10 | 0,67 | 22,73 | 174,43 | 120,00 | 23,80 | 113,57 | 150,82 | 174,43 |
| | | | | 15 | 0,67 | 35,76 | 270,16 | 120,00 | 37,76 | 177,01 | 237,14 | 270,16 |
| | | | | 20 | 0,67 | 48,79 | 358,58 | 120,00 | 60,93 | 252,16 | 320,95 | 358,58 |
| | | | | 25 | 0,67 | 61,82 | 420,09 | 120,00 | 105,68 | 317,90 | 381,99 | 420,09 |
| | | | | 30 | 0,67 | 74,85 | 463,10 | 120,00 | 170,07 | 372,41 | 426,98 | 463,10 |

[1] Momentum degree of fullness without contribution from channel dead weight

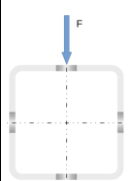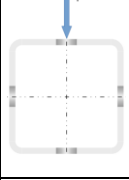[2] Size of designated system's single load

[3] Dimensions in mm and inch

Symbols and designation see Annex D1

| **Hilti MT installation channels** | |
|---|---|
| **Bending characteristics of the channel in case of fire** | **Annex D29** |

**Table D48: Calculation-based deformation in case of fire for installation channels MT-70 S OC and MT-70 OC**

| Loadcase | L[3] | n | Load direction | $\sigma_B$ MPa | V[1] - | F[2] N | $\delta_{tmax;B}$ mm | $t_{max,B}$ min | $\delta_{30}$ mm | $\delta_{60}$ mm | $\delta_{90}$ mm | $\delta_{120}$ mm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1700 | - | ↓F (top) | 5 | 0,50 | 46,84 | 69,94 | 120,00 | 14,60 | 68,64 | 69,94 | 69,94 |
| | | | | 10 | 0,50 | 121,94 | 204,84 | 120,00 | 26,85 | 129,43 | 178,09 | 204,84 |
| | | | | 15 | 0,50 | 197,05 | 328,64 | 120,00 | 42,31 | 199,97 | 282,63 | 328,64 |
| | | | | 20 | 0,50 | 272,16 | 449,22 | 120,00 | 65,25 | 288,58 | 390,65 | 449,22 |
| | | | | 25 | 0,50 | 347,26 | 538,95 | 120,00 | 106,73 | 376,39 | 479,49 | 538,95 |
| | | | | 30 | 0,50 | 422,37 | 614,38 | 120,00 | 175,02 | 452,62 | 553,18 | 614,38 |
| 1 | 1700 | - | ↓F (bottom) | 5 | 0,50 | 46,84 | 69,89 | 120,00 | 14,64 | 68,66 | 69,89 | 69,89 |
| | | | | 10 | 0,50 | 121,94 | 204,21 | 120,00 | 26,94 | 129,39 | 177,78 | 204,21 |
| | | | | 15 | 0,50 | 197,05 | 325,06 | 120,00 | 42,44 | 199,21 | 280,66 | 325,06 |
| | | | | 20 | 0,50 | 272,16 | 442,39 | 120,00 | 65,22 | 286,64 | 386,88 | 442,39 |
| | | | | 25 | 0,50 | 347,26 | 529,51 | 120,00 | 105,59 | 372,33 | 471,65 | 529,51 |
| | | | | 30 | 0,50 | 422,37 | 592,73 | 120,00 | 171,58 | 447,06 | 541,47 | 592,73 |
| 2 | 1700 | - | ↓F (top) | 5 | 0,94 | 199,06 | 109,90 | 120,00 | 17,78 | 88,73 | 108,26 | 109,90 |
| | | | | 10 | 0,94 | 518,26 | 303,22 | 120,00 | 38,71 | 189,58 | 264,87 | 303,22 |
| | | | | 15 | 0,94 | 837,46 | 401,53 | 120,00 | 69,02 | 299,93 | 367,24 | 401,53 |
| | | | | 20 | 0,94 | 1156,66 | 466,63 | 120,00 | 132,09 | 384,16 | 440,74 | 466,63 |
| | | | | 25 | 0,94 | 1475,86 | 507,07 | 120,00 | 236,40 | 438,46 | 485,68 | 507,07 |
| | | | | 30 | 0,94 | 1795,06 | 518,54 | 105,72 | 307,91 | 474,73 | 511,91 | - |
| 2 | 1700 | - | ↓F (bottom) | 5 | 0,94 | 199,06 | 98,73 | 120,00 | 17,63 | 85,46 | 98,73 | 98,73 |
| | | | | 10 | 0,94 | 518,26 | 251,34 | 120,00 | 37,44 | 169,29 | 224,87 | 251,34 |
| | | | | 15 | 0,94 | 837,46 | 330,79 | 120,00 | 63,23 | 243,87 | 300,24 | 330,79 |
| | | | | 20 | 0,94 | 1156,66 | 376,42 | 120,00 | 107,01 | 311,08 | 351,88 | 376,42 |
| | | | | 25 | 0,94 | 1475,86 | 401,45 | 120,00 | 169,95 | 356,87 | 388,11 | 401,45 |
| | | | | 30 | 0,94 | 1795,06 | 408,28 | 94,69 | 230,59 | 388,17 | 407,08 | - |
| 3 | 1700 | 15 | ↓F (top) | 5 | 0,67 | 5,53 | 86,08 | 120,00 | 16,16 | 77,60 | 86,08 | 86,08 |
| | | | | 10 | 0,67 | 14,40 | 250,27 | 120,00 | 32,25 | 154,14 | 216,36 | 250,27 |
| | | | | 15 | 0,67 | 23,26 | 369,34 | 120,00 | 53,18 | 243,65 | 327,36 | 369,34 |
| | | | | 20 | 0,67 | 32,13 | 473,79 | 120,00 | 88,56 | 340,78 | 428,77 | 473,79 |
| | | | | 25 | 0,67 | 41,00 | 546,64 | 120,00 | 157,03 | 420,45 | 501,97 | 546,64 |
| | | | | 30 | 0,67 | 49,86 | 597,20 | 120,00 | 246,32 | 485,67 | 554,77 | 597,20 |
| 3 | 1700 | 15 | ↓F (bottom) | 5 | 0,67 | 5,53 | 85,23 | 120,00 | 16,15 | 77,31 | 85,23 | 85,23 |
| | | | | 10 | 0,67 | 14,40 | 243,38 | 120,00 | 32,14 | 152,23 | 211,60 | 243,38 |
| | | | | 15 | 0,67 | 23,26 | 354,74 | 120,00 | 52,77 | 236,62 | 315,20 | 354,74 |
| | | | | 20 | 0,67 | 32,13 | 451,39 | 120,00 | 86,89 | 328,37 | 410,16 | 451,39 |
| | | | | 25 | 0,67 | 41,00 | 520,79 | 120,00 | 149,86 | 402,53 | 479,92 | 520,79 |
| | | | | 30 | 0,67 | 49,86 | 569,71 | 120,00 | 231,67 | 464,05 | 530,59 | 569,71 |

[1] Momentum degree of fullness without contribution from channel dead weight

[2] Size of designated system's single load
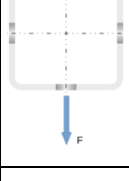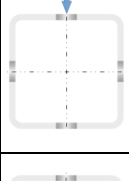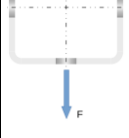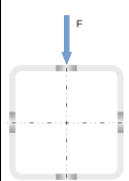
[3] Dimensions in mm and inch
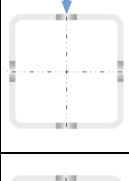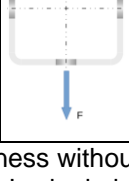
Symbols and designation see Annex D1

**Hilti MT installation channels**

**Bending characteristics of the channel in case of fire**

**Annex D30**

**Table D49: Calculation-based deformation in case of fire for installation channels MT-70 S OC and MT-70 OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 2000 | - | | 5 | 0,50 | 30,58 | 99,99 | 120,00 | 18,35 | 86,97 | 99,99 | 99,99 |
| | | | | 10 | 0,50 | 94,42 | 277,12 | 120,00 | 35,40 | 169,60 | 241,74 | 277,12 |
| | | | | 15 | 0,50 | 158,26 | 417,36 | 120,00 | 56,88 | 260,37 | 364,62 | 417,36 |
| | | | | 20 | 0,50 | 222,10 | 546,67 | 120,00 | 88,66 | 366,19 | 484,33 | 546,67 |
| | | | | 25 | 0,50 | 285,94 | 644,10 | 120,00 | 144,85 | 463,89 | 579,38 | 644,10 |
| | | | | 30 | 0,50 | 349,78 | 717,60 | 120,00 | 231,73 | 547,96 | 657,26 | 717,60 |
| 1 | 2000 | - | | 5 | 0,50 | 30,58 | 99,86 | 120,00 | 18,36 | 86,93 | 99,86 | 99,86 |
| | | | | 10 | 0,50 | 94,42 | 276,38 | 120,00 | 35,43 | 169,40 | 241,26 | 276,38 |
| | | | | 15 | 0,50 | 158,26 | 414,68 | 120,00 | 56,89 | 259,45 | 362,91 | 414,68 |
| | | | | 20 | 0,50 | 222,10 | 541,40 | 120,00 | 88,43 | 364,44 | 481,24 | 541,40 |
| | | | | 25 | 0,50 | 285,94 | 636,96 | 120,00 | 143,42 | 460,56 | 574,24 | 636,96 |
| | | | | 30 | 0,50 | 349,78 | 706,05 | 120,00 | 228,32 | 543,49 | 648,44 | 706,05 |
| 2 | 2000 | - | | 5 | 0,95 | 152,92 | 142,95 | 120,00 | 21,71 | 108,34 | 139,97 | 142,95 |
| | | | | 10 | 0,95 | 472,12 | 380,79 | 120,00 | 50,55 | 241,64 | 336,23 | 380,79 |
| | | | | 15 | 0,95 | 791,32 | 493,91 | 120,00 | 92,41 | 368,74 | 448,30 | 493,91 |
| | | | | 20 | 0,95 | 1110,52 | 559,08 | 120,00 | 175,95 | 464,18 | 530,48 | 559,08 |
| | | | | 25 | 0,95 | 1429,72 | 603,59 | 120,00 | 297,78 | 525,98 | 581,32 | 603,59 |
| | | | | 30 | 0,95 | 1748,92 | 621,31 | 110,18 | 377,74 | 566,21 | 611,58 | - |
| 2 | 2000 | - | | 5 | 0,95 | 152,92 | 130,08 | 120,00 | 21,55 | 104,58 | 129,38 | 130,08 |
| | | | | 10 | 0,95 | 472,12 | 320,01 | 120,00 | 48,73 | 215,12 | 288,09 | 320,01 |
| | | | | 15 | 0,95 | 791,32 | 410,89 | 120,00 | 83,92 | 302,36 | 375,57 | 410,89 |
| | | | | 20 | 0,95 | 1110,52 | 461,69 | 120,00 | 141,12 | 378,54 | 429,59 | 461,69 |
| | | | | 25 | 0,95 | 1429,72 | 489,49 | 120,00 | 215,65 | 429,74 | 467,18 | 489,49 |
| | | | | 30 | 0,95 | 1748,92 | 492,54 | 99,12 | 285,81 | 464,59 | 489,30 | - |
| 3 | 2000 | 18 | | 5 | 0,67 | 3,06 | 117,05 | 120,00 | 19,99 | 96,34 | 116,61 | 117,05 |
| | | | | 10 | 0,67 | 9,44 | 323,90 | 120,00 | 42,11 | 198,53 | 282,73 | 323,90 |
| | | | | 15 | 0,67 | 15,83 | 456,93 | 120,00 | 70,87 | 307,58 | 407,78 | 456,93 |
| | | | | 20 | 0,67 | 22,21 | 565,98 | 120,00 | 118,62 | 418,93 | 518,14 | 565,98 |
| | | | | 25 | 0,67 | 28,59 | 646,13 | 120,00 | 205,08 | 505,78 | 599,47 | 646,13 |
| | | | | 30 | 0,67 | 34,98 | 702,80 | 120,00 | 309,33 | 577,22 | 658,49 | 702,80 |
| 3 | 2000 | 18 | | 5 | 0,67 | 3,06 | 116,03 | 120,00 | 19,98 | 96,04 | 115,76 | 116,03 |
| | | | | 10 | 0,67 | 9,44 | 316,78 | 120,00 | 41,99 | 196,33 | 277,64 | 316,78 |
| | | | | 15 | 0,67 | 15,83 | 444,49 | 120,00 | 70,38 | 300,16 | 396,15 | 444,49 |
| | | | | 20 | 0,67 | 22,21 | 545,12 | 120,00 | 116,55 | 406,31 | 500,28 | 545,12 |
| | | | | 25 | 0,67 | 28,59 | 621,64 | 120,00 | 196,92 | 489,01 | 578,10 | 621,64 |
| | | | | 30 | 0,67 | 34,98 | 676,52 | 120,00 | 294,36 | 556,41 | 635,14 | 676,52 |

[1] Momentum degree of fullness without contribution from channel dead weight
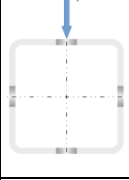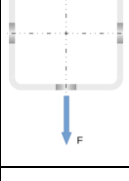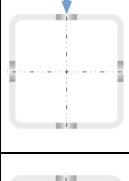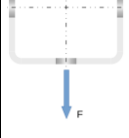[2] Size of designated system's single load
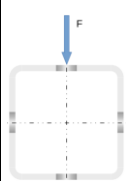[3] Dimensions in mm and inch
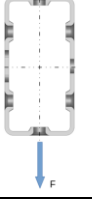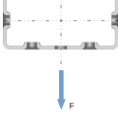
Symbols and designation see Annex D1

| **Hilti MT installation channels** | |
|---|---|
| **Bending characteristics of the channel in case of fire** | **Annex D31** |

**Table D50: Calculation-based deformation in case of fire for installation channels MT-80 S OC and MT-80 OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 500 | - | | 5 | 0,50 | 695,64 | 33,01 | 120,00 | 3,91 | 30,49 | 30,49 | 33,01 |
| | | | | 10 | 0,50 | 1402,76 | 50,48 | 120,00 | 4,84 | 33,95 | 37,76 | 50,48 |
| | | | | 15 | 0,50 | 2109,88 | 45,66 | 70,00 | 6,15 | 39,48 | - | - |
| | | | | 20 | 0,50 | 2817,00 | 32,97 | 46,67 | 8,58 | - | - | - |
| | | | | 25 | 0,50 | 3524,12 | 12,65 | 26,67 | - | - | - | - |
| | | | | 30 | 0,50 | 4231,24 | 5,59 | 20,00 | - | - | - | - |
| 1 | 500 | - | | 5 | 0,50 | 382,28 | 33,62 | 120,00 | 4,06 | 31,01 | 31,01 | 33,62 |
| | | | | 10 | 0,50 | 776,04 | 47,93 | 120,00 | 5,26 | 35,86 | 40,97 | 47,93 |
| | | | | 15 | 0,50 | 1169,80 | 83,59 | 120,00 | 6,89 | 42,92 | 58,57 | 83,59 |
| | | | | 20 | 0,50 | 1563,56 | 166,18 | 120,00 | 9,55 | 54,26 | 102,55 | 166,18 |
| | | | | 25 | 0,50 | 1957,32 | 196,80 | 120,00 | 14,50 | 74,38 | 162,61 | 196,80 |
| | | | | 30 | 0,50 | 2351,08 | 213,12 | 120,00 | 24,49 | 128,76 | 188,32 | 213,12 |
| 2 | 500 | - | | 5 | 0,80 | 869,55 | 37,31 | 120,00 | 4,50 | 32,31 | 33,44 | 37,31 |
| | | | | 10 | 0,80 | 1753,45 | 47,60 | 80,00 | 6,22 | 38,77 | - | - |
| | | | | 15 | 0,80 | 2637,35 | 35,52 | 48,33 | 9,35 | - | - | - |
| | | | | 20 | 0,80 | 3521,25 | 22,29 | 30,00 | 22,29 | - | - | - |
| | | | | 25 | 0,80 | 4405,15 | 14,87 | 21,67 | - | - | - | - |
| | | | | 30 | 0,80 | 5289,05 | 7,96 | 18,33 | - | - | - | - |
| 2 | 500 | - | | 5 | 0,80 | 477,85 | 37,91 | 120,00 | 4,87 | 33,34 | 34,55 | 37,91 |
| | | | | 10 | 0,80 | 970,05 | 59,61 | 120,00 | 6,90 | 40,77 | 49,86 | 59,61 |
| | | | | 15 | 0,80 | 1462,25 | 92,47 | 120,00 | 10,00 | 51,18 | 71,92 | 92,47 |
| | | | | 20 | 0,80 | 1954,45 | 125,08 | 120,00 | 14,78 | 66,66 | 99,64 | 125,08 |
| | | | | 25 | 0,80 | 2446,65 | 145,57 | 120,00 | 22,73 | 85,89 | 122,61 | 145,57 |
| | | | | 30 | 0,80 | 2938,85 | 157,86 | 120,00 | 35,77 | 104,68 | 138,40 | 157,86 |
| 3 | 500 | 3 | | 5 | 0,67 | 289,85 | 34,53 | 120,00 | 4,24 | 31,42 | 31,47 | 34,53 |
| | | | | 10 | 0,67 | 584,48 | 49,08 | 120,00 | 5,42 | 35,90 | 41,32 | 49,08 |
| | | | | 15 | 0,67 | 879,12 | 55,15 | 78,33 | 7,09 | 42,91 | - | - |
| | | | | 20 | 0,67 | 1173,75 | 48,14 | 55,00 | 9,69 | - | - | - |
| | | | | 25 | 0,67 | 1468,38 | 34,51 | 40,00 | 14,38 | - | - | - |
| | | | | 30 | 0,67 | 1763,02 | 23,40 | 28,33 | - | - | - | - |
| 3 | 500 | 3 | | 5 | 0,67 | 159,28 | 35,97 | 120,00 | 4,61 | 32,55 | 32,94 | 35,97 |
| | | | | 10 | 0,67 | 323,35 | 53,63 | 120,00 | 6,31 | 38,76 | 45,94 | 53,63 |
| | | | | 15 | 0,67 | 487,42 | 89,12 | 120,00 | 8,53 | 47,23 | 66,05 | 89,12 |
| | | | | 20 | 0,67 | 651,48 | 153,84 | 120,00 | 11,72 | 60,54 | 99,99 | 153,84 |
| | | | | 25 | 0,67 | 815,55 | 189,53 | 120,00 | 16,84 | 81,27 | 150,90 | 189,53 |
| | | | | 30 | 0,67 | 979,62 | 209,16 | 120,00 | 25,74 | 111,49 | 180,91 | 209,16 |

[1] Momentum degree of fullness without contribution from channel dead weight

[2] Size of designated system's single load
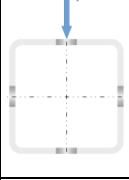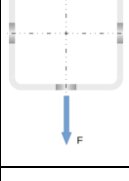
[3] Dimensions in mm and inch

Symbols and designation see Annex D1

| **Hilti MT installation channels** | |
|---|---|
| **Bending characteristics of the channel in case of fire** | **Annex D32** |

**Table D51: Calculation-based deformation in case of fire for installation channels MT-80 S OC and MT-80 OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 900 | - | | 5 | 0,50 | 372,18 | 38,41 | 120,00 | 5,01 | 34,19 | 35,16 | 38,41 |
| | | | | 10 | 0,50 | 765,03 | 62,99 | 120,00 | 7,48 | 43,31 | 53,95 | 62,99 |
| | | | | 15 | 0,50 | 1157,87 | 96,15 | 95,00 | 10,55 | 55,06 | 87,24 | - |
| | | | | 20 | 0,50 | 1550,72 | 100,05 | 68,33 | 14,79 | 74,99 | - | - |
| | | | | 25 | 0,50 | 1943,56 | 73,57 | 48,33 | 21,83 | - | - | - |
| | | | | 30 | 0,50 | 2336,41 | 43,88 | 30,00 | 43,88 | - | - | - |
| 1 | 900 | - | | 5 | 0,50 | 198,10 | 41,58 | 120,00 | 5,97 | 36,76 | 38,35 | 41,58 |
| | | | | 10 | 0,50 | 416,85 | 72,90 | 120,00 | 9,71 | 49,38 | 63,00 | 72,90 |
| | | | | 15 | 0,50 | 635,61 | 133,11 | 120,00 | 14,01 | 64,46 | 98,39 | 133,11 |
| | | | | 20 | 0,50 | 854,36 | 267,87 | 120,00 | 19,39 | 87,31 | 158,89 | 267,87 |
| | | | | 25 | 0,50 | 1073,12 | 347,89 | 120,00 | 27,13 | 121,99 | 267,63 | 347,89 |
| | | | | 30 | 0,50 | 1291,87 | 380,84 | 120,00 | 40,86 | 184,85 | 336,11 | 380,84 |
| 2 | 900 | - | | 5 | 0,89 | 837,42 | 48,42 | 120,00 | 6,39 | 38,70 | 44,35 | 48,42 |
| | | | | 10 | 0,89 | 1721,32 | 66,96 | 70,00 | 10,40 | 55,05 | - | - |
| | | | | 15 | 0,89 | 2605,22 | 45,18 | 41,67 | 17,10 | - | - | - |
| | | | | 20 | 0,89 | 3489,12 | 27,43 | 28,33 | - | - | - | - |
| | | | | 25 | 0,89 | 4373,02 | 19,41 | 21,67 | - | - | - | - |
| | | | | 30 | 0,89 | 5256,92 | 11,67 | 18,33 | - | - | - | - |
| 2 | 900 | - | | 5 | 0,89 | 445,72 | 50,58 | 120,00 | 7,73 | 41,73 | 46,94 | 50,58 |
| | | | | 10 | 0,89 | 937,92 | 98,64 | 120,00 | 13,24 | 60,94 | 84,16 | 98,64 |
| | | | | 15 | 0,89 | 1430,12 | 146,26 | 120,00 | 20,95 | 82,99 | 121,73 | 146,26 |
| | | | | 20 | 0,89 | 1922,32 | 181,70 | 120,00 | 31,11 | 111,00 | 158,99 | 181,70 |
| | | | | 25 | 0,89 | 2414,52 | 207,74 | 120,00 | 44,91 | 138,12 | 187,90 | 207,74 |
| | | | | 30 | 0,89 | 2906,72 | 222,06 | 120,00 | 62,64 | 161,27 | 204,55 | 222,06 |
| 3 | 900 | 7 | | 5 | 0,67 | 83,74 | 41,91 | 120,00 | 5,68 | 36,24 | 38,79 | 41,91 |
| | | | | 10 | 0,67 | 172,13 | 73,67 | 120,00 | 8,68 | 47,62 | 62,54 | 73,67 |
| | | | | 15 | 0,67 | 260,52 | 89,81 | 80,00 | 12,68 | 63,50 | - | - |
| | | | | 20 | 0,67 | 348,91 | 80,90 | 56,67 | 17,95 | - | - | - |
| | | | | 25 | 0,67 | 437,30 | 63,43 | 41,67 | 26,29 | - | - | - |
| | | | | 30 | 0,67 | 525,69 | 51,85 | 31,67 | 41,51 | - | - | - |
| 3 | 900 | 7 | | 5 | 0,67 | 44,57 | 46,58 | 120,00 | 7,02 | 39,74 | 43,22 | 46,58 |
| | | | | 10 | 0,67 | 93,79 | 87,63 | 120,00 | 11,88 | 56,25 | 75,43 | 87,63 |
| | | | | 15 | 0,67 | 143,01 | 147,23 | 120,00 | 17,94 | 75,70 | 115,14 | 147,23 |
| | | | | 20 | 0,67 | 192,23 | 230,52 | 120,00 | 25,64 | 102,55 | 169,76 | 230,52 |
| | | | | 25 | 0,67 | 241,45 | 303,99 | 120,00 | 36,37 | 137,46 | 232,77 | 303,99 |
| | | | | 30 | 0,67 | 290,67 | 349,64 | 120,00 | 52,31 | 179,76 | 291,60 | 349,64 |

[1] Momentum degree of fullness without contribution from channel dead weight
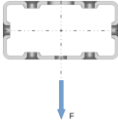[2] Size of designated system's single load
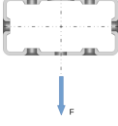[3] Dimensions in mm and inch

Symbols and designation see Annex D1

| **Hilti MT installation channels** | |
|---|---|
| **Bending characteristics of the channel in case of fire** | **Annex D33** |

**Table D52: Calculation-based deformation in case of fire for installation channels MT-80 S OC and MT-80 OC**

| Loadcase | L[3] | n | Load direction | $\sigma_B$ MPa | $V^{[1]}$ - | $F^{[2]}$ N | $\delta_{tmax;B}$ mm | $t_{max,B}$ min | $\delta_{30}$ mm | $\delta_{60}$ mm | $\delta_{90}$ mm | $\delta_{120}$ mm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1300 | - | | 5 | 0,50 | 242,13 | 48,00 | 120,00 | 6,89 | 40,54 | 44,63 | 48,00 |
| | | | | 10 | 0,50 | 514,10 | 93,62 | 120,00 | 11,70 | 58,34 | 80,65 | 93,62 |
| | | | | 15 | 0,50 | 786,07 | 182,71 | 105,00 | 17,63 | 80,59 | 136,98 | - |
| | | | | 20 | 0,50 | 1058,03 | 170,61 | 71,67 | 25,37 | 115,22 | - | - |
| | | | | 25 | 0,50 | 1330,00 | 146,32 | 53,33 | 36,74 | - | - | - |
| | | | | 30 | 0,50 | 1601,97 | 116,13 | 38,33 | 57,23 | - | - | - |
| 1 | 1300 | - | | 5 | 0,50 | 121,60 | 55,00 | 120,00 | 9,06 | 45,88 | 51,29 | 55,00 |
| | | | | 10 | 0,50 | 273,05 | 110,47 | 120,00 | 16,58 | 70,40 | 97,16 | 110,47 |
| | | | | 15 | 0,50 | 424,50 | 191,47 | 120,00 | 25,26 | 97,19 | 148,91 | 191,47 |
| | | | | 20 | 0,50 | 575,94 | 349,22 | 120,00 | 35,81 | 131,23 | 234,63 | 349,22 |
| | | | | 25 | 0,50 | 727,39 | 481,09 | 120,00 | 49,14 | 177,04 | 354,21 | 481,09 |
| | | | | 30 | 0,50 | 878,83 | 542,78 | 120,00 | 66,96 | 253,28 | 464,02 | 542,78 |
| 2 | 1300 | - | | 5 | 0,92 | 786,91 | 66,81 | 120,00 | 9,38 | 48,96 | 62,36 | 66,81 |
| | | | | 10 | 0,92 | 1670,81 | 92,03 | 63,33 | 17,16 | 83,42 | - | - |
| | | | | 15 | 0,92 | 2554,71 | 57,77 | 36,67 | 29,96 | - | - | - |
| | | | | 20 | 0,92 | 3438,61 | 31,31 | 26,67 | - | - | - | - |
| | | | | 25 | 0,92 | 4322,51 | 16,66 | 20,00 | - | - | - | - |
| | | | | 30 | 0,92 | 5206,41 | 17,81 | 18,33 | - | - | - | - |
| 2 | 1300 | - | | 5 | 0,92 | 395,21 | 68,02 | 120,00 | 11,77 | 53,30 | 63,88 | 68,02 |
| | | | | 10 | 0,92 | 887,41 | 150,59 | 120,00 | 22,44 | 89,05 | 130,10 | 150,59 |
| | | | | 15 | 0,92 | 1379,61 | 224,65 | 120,00 | 36,85 | 127,11 | 189,90 | 224,65 |
| | | | | 20 | 0,92 | 1871,81 | 277,82 | 120,00 | 54,93 | 169,19 | 241,90 | 277,82 |
| | | | | 25 | 0,92 | 2364,01 | 312,83 | 120,00 | 77,30 | 209,95 | 286,49 | 312,83 |
| | | | | 30 | 0,92 | 2856,21 | 336,03 | 120,00 | 103,18 | 244,03 | 317,92 | 336,03 |
| 3 | 1300 | 11 | | 5 | 0,67 | 37,47 | 55,11 | 120,00 | 8,10 | 44,38 | 51,70 | 55,11 |
| | | | | 10 | 0,67 | 79,56 | 118,64 | 120,00 | 14,04 | 67,09 | 98,97 | 118,64 |
| | | | | 15 | 0,67 | 121,65 | 227,10 | 81,67 | 22,06 | 99,30 | - | - |
| | | | | 20 | 0,67 | 163,74 | 165,27 | 58,33 | 32,63 | - | - | - |
| | | | | 25 | 0,67 | 205,83 | 145,36 | 43,33 | 49,41 | - | - | - |
| | | | | 30 | 0,67 | 247,92 | 107,85 | 31,67 | 81,90 | - | - | - |
| 3 | 1300 | 11 | | 5 | 0,67 | 18,82 | 63,47 | 120,00 | 10,91 | 50,93 | 59,51 | 63,47 |
| | | | | 10 | 0,67 | 42,26 | 137,34 | 120,00 | 20,46 | 82,23 | 118,36 | 137,34 |
| | | | | 15 | 0,67 | 65,70 | 225,20 | 120,00 | 32,26 | 117,06 | 182,86 | 225,20 |
| | | | | 20 | 0,67 | 89,13 | 327,58 | 120,00 | 46,92 | 161,79 | 258,81 | 327,58 |
| | | | | 25 | 0,67 | 112,57 | 414,57 | 120,00 | 66,30 | 213,35 | 333,03 | 414,57 |
| | | | | 30 | 0,67 | 136,01 | 479,56 | 120,00 | 93,02 | 267,96 | 401,27 | 479,56 |

[1] Momentum degree of fullness without contribution from channel dead weight
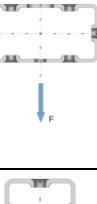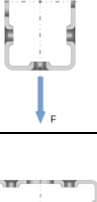[2] Size of designated system's single load
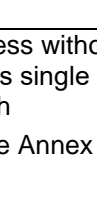[3] Dimensions in mm and inch

Symbols and designation see Annex D1

**Hilti MT installation channels**

**Bending characteristics of the channel in case of fire**

**Annex D34**

**Table D53: Calculation-based deformation in case of fire for installation channels MT-80 S OC and MT-80 OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 1700 | - | | 5 | 0,50 | 168,95 | 62,44 | 120,00 | 9,66 | 49,82 | 58,75 | 62,44 |
| | | | | 10 | 0,50 | 376,93 | 136,59 | 120,00 | 17,59 | 79,31 | 117,83 | 136,59 |
| | | | | 15 | 0,50 | 584,91 | 269,94 | 105,00 | 27,46 | 115,47 | 206,03 | - |
| | | | | 20 | 0,50 | 792,88 | 260,64 | 71,67 | 39,97 | 170,27 | - | - |
| | | | | 25 | 0,50 | 1000,86 | 250,27 | 55,00 | 57,92 | - | - | - |
| | | | | 30 | 0,50 | 1208,83 | 185,75 | 40,00 | 86,70 | - | - | - |
| 1 | 1700 | - | | 5 | 0,50 | 76,79 | 74,67 | 120,00 | 13,61 | 58,99 | 70,21 | 74,67 |
| | | | | 10 | 0,50 | 192,60 | 163,74 | 120,00 | 26,10 | 98,74 | 143,60 | 163,74 |
| | | | | 15 | 0,50 | 308,41 | 268,90 | 120,00 | 40,58 | 141,54 | 221,80 | 268,90 |
| | | | | 20 | 0,50 | 424,22 | 400,99 | 120,00 | 58,11 | 193,51 | 313,55 | 400,99 |
| | | | | 25 | 0,50 | 540,03 | 552,73 | 120,00 | 80,02 | 254,05 | 412,05 | 552,73 |
| | | | | 30 | 0,50 | 655,85 | 639,97 | 120,00 | 108,54 | 320,86 | 535,96 | 639,97 |
| 2 | 1700 | - | | 5 | 0,94 | 718,05 | 92,79 | 120,00 | 13,45 | 63,16 | 87,66 | 92,79 |
| | | | | 10 | 0,94 | 1601,95 | 131,09 | 60,00 | 26,60 | 131,09 | - | - |
| | | | | 15 | 0,94 | 2485,85 | 76,15 | 33,33 | 48,44 | - | - | - |
| | | | | 20 | 0,94 | 3369,75 | 35,67 | 25,00 | - | - | - | - |
| | | | | 25 | 0,94 | 4253,65 | 24,91 | 20,00 | - | - | - | - |
| | | | | 30 | 0,94 | 5137,55 | 26,85 | 18,33 | - | - | - | - |
| 2 | 1700 | - | | 5 | 0,94 | 326,35 | 89,58 | 120,00 | 16,82 | 67,55 | 84,64 | 89,58 |
| | | | | 10 | 0,94 | 818,55 | 212,46 | 120,00 | 34,24 | 123,48 | 184,75 | 212,46 |
| | | | | 15 | 0,94 | 1310,75 | 317,02 | 120,00 | 57,17 | 180,56 | 270,07 | 317,02 |
| | | | | 20 | 0,94 | 1802,95 | 391,17 | 120,00 | 85,25 | 237,59 | 338,87 | 391,17 |
| | | | | 25 | 0,94 | 2295,15 | 441,73 | 120,00 | 118,23 | 293,09 | 397,10 | 441,73 |
| | | | | 30 | 0,94 | 2787,35 | 473,10 | 120,00 | 154,02 | 339,46 | 439,80 | 473,10 |
| 3 | 1700 | 15 | | 5 | 0,67 | 19,95 | 73,56 | 120,00 | 11,49 | 55,67 | 69,72 | 73,56 |
| | | | | 10 | 0,67 | 44,50 | 176,48 | 120,00 | 21,36 | 93,42 | 147,01 | 176,48 |
| | | | | 15 | 0,67 | 69,05 | 744,33 | 120,00 | 34,81 | 145,87 | 436,38 | 744,33 |
| | | | | 20 | 0,67 | 93,60 | 802,13 | 120,00 | 52,43 | 282,52 | 764,75 | 802,13 |
| | | | | 25 | 0,67 | 118,16 | 392,10 | 46,67 | 80,08 | - | - | - |
| | | | | 30 | 0,67 | 142,71 | 169,01 | 31,67 | 130,63 | - | - | - |
| 3 | 1700 | 15 | | 5 | 0,67 | 9,07 | 85,70 | 120,00 | 16,14 | 65,59 | 80,89 | 85,70 |
| | | | | 10 | 0,67 | 22,74 | 197,60 | 120,00 | 31,68 | 114,89 | 171,05 | 197,60 |
| | | | | 15 | 0,67 | 36,41 | 315,56 | 120,00 | 50,73 | 167,78 | 261,79 | 315,56 |
| | | | | 20 | 0,67 | 50,08 | 433,69 | 120,00 | 74,13 | 230,93 | 357,41 | 433,69 |
| | | | | 25 | 0,67 | 63,75 | 533,46 | 120,00 | 103,95 | 298,66 | 445,25 | 533,46 |
| | | | | 30 | 0,67 | 77,43 | 607,61 | 120,00 | 142,80 | 366,38 | 520,21 | 607,61 |

[1] Momentum degree of fullness without contribution from channel dead weight
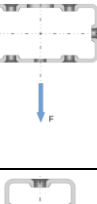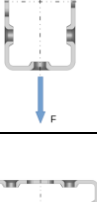[2] Size of designated system's single load
[3] Dimensions in mm and inch

Symbols and designation see Annex D1

| **Hilti MT installation channels** | |
|---|---|
| **Bending characteristics of the channel in case of fire** | **Annex D35** |

**Table D54: Calculation-based deformation in case of fire for installation channels MT-80 S OC and MT-80 OC**

| System | | | Load direction | $\sigma_B$ | $V^{1)}$ | $F^{2)}$ | $\delta_{tmax;B}$ | $t_{max,B}$ | $\delta_{30}$ | $\delta_{60}$ | $\delta_{90}$ | $\delta_{120}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loadcase | $L^{3)}$ | n | | MPa | - | N | mm | min | mm | mm | mm | mm |
| 1 | 2100 | - | | 5 | 0,50 | 120,16 | 83,18 | 120,00 | 13,57 | 62,85 | 79,02 | 83,18 |
| | | | | 10 | 0,50 | 288,52 | 193,72 | 120,00 | 25,42 | 107,14 | 167,11 | 193,72 |
| | | | | 15 | 0,50 | 456,88 | 432,28 | 103,33 | 40,38 | 160,91 | 301,21 | - |
| | | | | 20 | 0,50 | 625,24 | 454,54 | 71,67 | 59,13 | 242,29 | - | - |
| | | | | 25 | 0,50 | 793,60 | 335,47 | 53,33 | 85,54 | - | - | - |
| | | | | 30 | 0,50 | 961,97 | 271,62 | 40,00 | 126,41 | - | - | - |
| 1 | 2100 | - | | 5 | 0,50 | 45,55 | 101,80 | 120,00 | 19,93 | 76,75 | 96,25 | 101,80 |
| | | | | 10 | 0,50 | 139,30 | 229,82 | 120,00 | 38,54 | 134,63 | 201,42 | 229,82 |
| | | | | 15 | 0,50 | 233,05 | 368,17 | 120,00 | 60,14 | 195,86 | 307,61 | 368,17 |
| | | | | 20 | 0,50 | 326,80 | 519,87 | 120,00 | 86,18 | 267,21 | 421,96 | 519,87 |
| | | | | 25 | 0,50 | 420,56 | 660,20 | 120,00 | 118,30 | 345,93 | 534,50 | 660,20 |
| | | | | 30 | 0,50 | 514,31 | 785,76 | 120,00 | 159,04 | 428,46 | 643,89 | 785,76 |
| 2 | 2100 | - | | 5 | 0,95 | 630,82 | 125,99 | 120,00 | 18,61 | 81,22 | 119,80 | 125,99 |
| | | | | 10 | 0,95 | 1514,72 | 165,38 | 56,67 | 38,79 | - | - | - |
| | | | | 15 | 0,95 | 2398,62 | 106,50 | 31,67 | 73,38 | - | - | - |
| | | | | 20 | 0,95 | 3282,52 | 54,07 | 25,00 | - | - | - | - |
| | | | | 25 | 0,95 | 4166,42 | 35,86 | 20,00 | - | - | - | - |
| | | | | 30 | 0,95 | 5050,32 | 24,72 | 16,67 | - | - | - | - |
| 2 | 2100 | - | | 5 | 0,95 | 239,12 | 115,35 | 120,00 | 22,89 | 84,53 | 109,37 | 115,35 |
| | | | | 10 | 0,95 | 731,32 | 284,17 | 120,00 | 48,45 | 163,56 | 247,68 | 284,17 |
| | | | | 15 | 0,95 | 1223,52 | 421,52 | 120,00 | 81,50 | 242,04 | 360,67 | 421,52 |
| | | | | 20 | 0,95 | 1715,72 | 515,33 | 120,00 | 121,55 | 315,26 | 448,60 | 515,33 |
| | | | | 25 | 0,95 | 2207,92 | 577,86 | 120,00 | 166,77 | 386,33 | 517,77 | 577,86 |
| | | | | 30 | 0,95 | 2700,12 | 617,24 | 120,00 | 213,99 | 444,99 | 569,82 | 617,24 |
| 3 | 2100 | 19 | | 5 | 0,67 | 11,47 | 98,15 | 120,00 | 16,00 | 70,61 | 93,75 | 98,15 |
| | | | | 10 | 0,67 | 27,54 | 248,72 | 120,00 | 30,85 | 127,22 | 207,64 | 248,72 |
| | | | | 15 | 0,67 | 43,61 | 783,34 | 120,00 | 51,22 | 204,64 | 527,36 | 783,34 |
| | | | | 20 | 0,67 | 59,68 | 949,12 | 120,00 | 77,86 | 400,37 | 857,93 | 949,12 |
| | | | | 25 | 0,67 | 75,75 | 993,65 | 120,00 | 119,18 | 799,47 | 960,24 | 993,65 |
| | | | | 30 | 0,67 | 91,82 | 258,19 | 31,67 | 193,61 | - | - | - |
| 3 | 2100 | 19 | | 5 | 0,67 | 4,35 | 114,10 | 120,00 | 22,88 | 84,18 | 108,11 | 114,10 |
| | | | | 10 | 0,67 | 13,30 | 268,38 | 120,00 | 45,75 | 154,39 | 233,47 | 268,38 |
| | | | | 15 | 0,67 | 22,25 | 417,27 | 120,00 | 73,52 | 227,60 | 351,66 | 417,27 |
| | | | | 20 | 0,67 | 31,19 | 548,65 | 120,00 | 107,21 | 309,42 | 465,17 | 548,65 |
| | | | | 25 | 0,67 | 40,14 | 659,76 | 120,00 | 148,89 | 393,45 | 566,36 | 659,76 |
| | | | | 30 | 0,67 | 49,09 | 741,32 | 120,00 | 200,63 | 473,38 | 648,91 | 741,32 |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load
[3] Dimensions in mm and inch
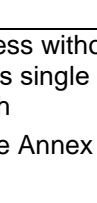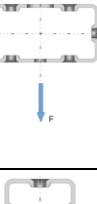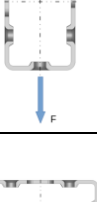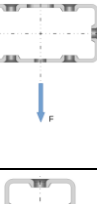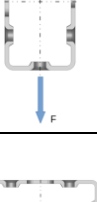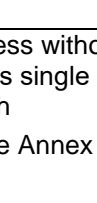
Symbols and designation see Annex D1

**Hilti MT installation channels**

**Bending characteristics of the channel in case of fire**

**Annex D36**

**Table D55: Calculation-based deformation in case of fire for installation channels MT-80 S OC and MT-80 OC**

| Loadcase | L[3] | n | Load direction | $\sigma_B$ MPa | $V$[1] - | $F$[2] N | $\delta_{tmax;B}$ mm | $t_{max,B}$ min | $\delta_{30}$ mm | $\delta_{60}$ mm | $\delta_{90}$ mm | $\delta_{120}$ mm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2500 | - | | 5 | 0,50 | 84,04 | 111,94 | 120,00 | 18,91 | 80,51 | 107,14 | 111,94 |
| | | | | 10 | 0,50 | 225,46 | 266,28 | 120,00 | 35,47 | 142,67 | 229,51 | 266,28 |
| | | | | 15 | 0,50 | 366,88 | 802,33 | 110,00 | 56,71 | 217,73 | 444,31 | - |
| | | | | 20 | 0,50 | 508,31 | 773,69 | 75,00 | 83,20 | 335,07 | - | - |
| | | | | 25 | 0,50 | 649,73 | 553,35 | 53,33 | 120,18 | - | - | - |
| | | | | 30 | 0,50 | 791,16 | 357,60 | 38,33 | 176,40 | - | - | - |
| 1 | 2500 | - | | 5 | 0,50 | 21,36 | 138,02 | 120,00 | 28,38 | 100,04 | 130,94 | 138,02 |
| | | | | 10 | 0,50 | 100,12 | 308,53 | 120,00 | 54,19 | 178,52 | 270,72 | 308,53 |
| | | | | 15 | 0,50 | 178,87 | 479,18 | 120,00 | 84,29 | 260,12 | 405,06 | 479,18 |
| | | | | 20 | 0,50 | 257,62 | 648,90 | 120,00 | 120,30 | 351,28 | 540,54 | 648,90 |
| | | | | 25 | 0,50 | 336,37 | 799,48 | 120,00 | 164,15 | 447,94 | 668,01 | 799,48 |
| | | | | 30 | 0,50 | 415,12 | 920,41 | 120,00 | 218,40 | 545,27 | 783,93 | 920,41 |
| 2 | 2500 | | | 5 | 0,96 | 525,22 | 167,24 | 120,00 | 25,23 | 104,23 | 159,69 | 167,24 |
| | | | | 10 | 0,96 | 1409,12 | 232,67 | 56,67 | 54,14 | - | - | - |
| | | | | 15 | 0,96 | 2293,02 | 104,86 | 30,00 | 104,86 | - | - | - |
| | | | | 20 | 0,96 | 3176,92 | 74,04 | 25,00 | - | - | - | - |
| | | | | 25 | 0,96 | 4060,82 | 49,16 | 20,00 | - | - | - | - |
| | | | | 30 | 0,96 | 4944,72 | 33,95 | 16,67 | - | - | - | - |
| 2 | 2500 | | | 5 | 0,96 | 133,52 | 145,36 | 120,00 | 30,03 | 104,44 | 138,15 | 145,36 |
| | | | | 10 | 0,96 | 625,72 | 364,93 | 120,00 | 64,95 | 208,49 | 318,19 | 364,93 |
| | | | | 15 | 0,96 | 1117,92 | 537,66 | 120,00 | 109,40 | 310,87 | 461,33 | 537,66 |
| | | | | 20 | 0,96 | 1610,12 | 651,27 | 120,00 | 163,48 | 401,99 | 569,29 | 651,27 |
| | | | | 25 | 0,96 | 2102,32 | 724,49 | 120,00 | 222,40 | 489,01 | 648,80 | 724,49 |
| | | | | 30 | 0,96 | 2594,52 | 770,14 | 120,00 | 282,41 | 560,63 | 708,64 | 770,14 |
| 3 | 2500 | 23 | | 5 | 0,67 | 6,73 | 129,65 | 120,00 | 21,75 | 89,60 | 124,51 | 129,65 |
| | | | | 10 | 0,67 | 18,07 | 334,26 | 120,00 | 42,67 | 168,76 | 280,38 | 334,26 |
| | | | | 15 | 0,67 | 29,40 | 832,28 | 120,00 | 71,46 | 275,19 | 646,73 | 832,28 |
| | | | | 20 | 0,67 | 40,73 | 1062,42 | 120,00 | 109,03 | 529,85 | 903,31 | 1062,42 |
| | | | | 25 | 0,67 | 52,06 | 1146,38 | 120,00 | 166,63 | 807,77 | 1085,21 | 1146,38 |
| | | | | 30 | 0,67 | 63,39 | 1202,27 | 120,00 | 271,92 | 1102,39 | 1176,33 | 1202,27 |
| 3 | 2500 | 23 | | 5 | 0,67 | 1,71 | 149,31 | 120,00 | 31,32 | 107,01 | 141,74 | 149,31 |
| | | | | 10 | 0,67 | 8,02 | 348,26 | 120,00 | 62,61 | 200,36 | 304,42 | 348,26 |
| | | | | 15 | 0,67 | 14,33 | 527,60 | 120,00 | 100,39 | 295,27 | 450,39 | 527,60 |
| | | | | 20 | 0,67 | 20,64 | 672,83 | 120,00 | 145,71 | 395,98 | 581,12 | 672,83 |
| | | | | 25 | 0,67 | 26,95 | 792,97 | 120,00 | 200,13 | 496,13 | 694,65 | 792,97 |
| | | | | 30 | 0,67 | 33,26 | 881,96 | 120,00 | 265,20 | 587,86 | 785,50 | 881,96 |

[1] Momentum degree of fullness without contribution from channel dead weight
[2] Size of designated system's single load
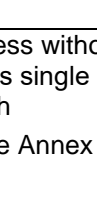[3] Dimensions in mm and inch

Symbols and designation see Annex D1

**Hilti MT installation channels**

**Bending characteristics of the channel in case of fire**

**Annex D37**

**Figure E1:   Example use case Hilti MT installation channel used as headrail**
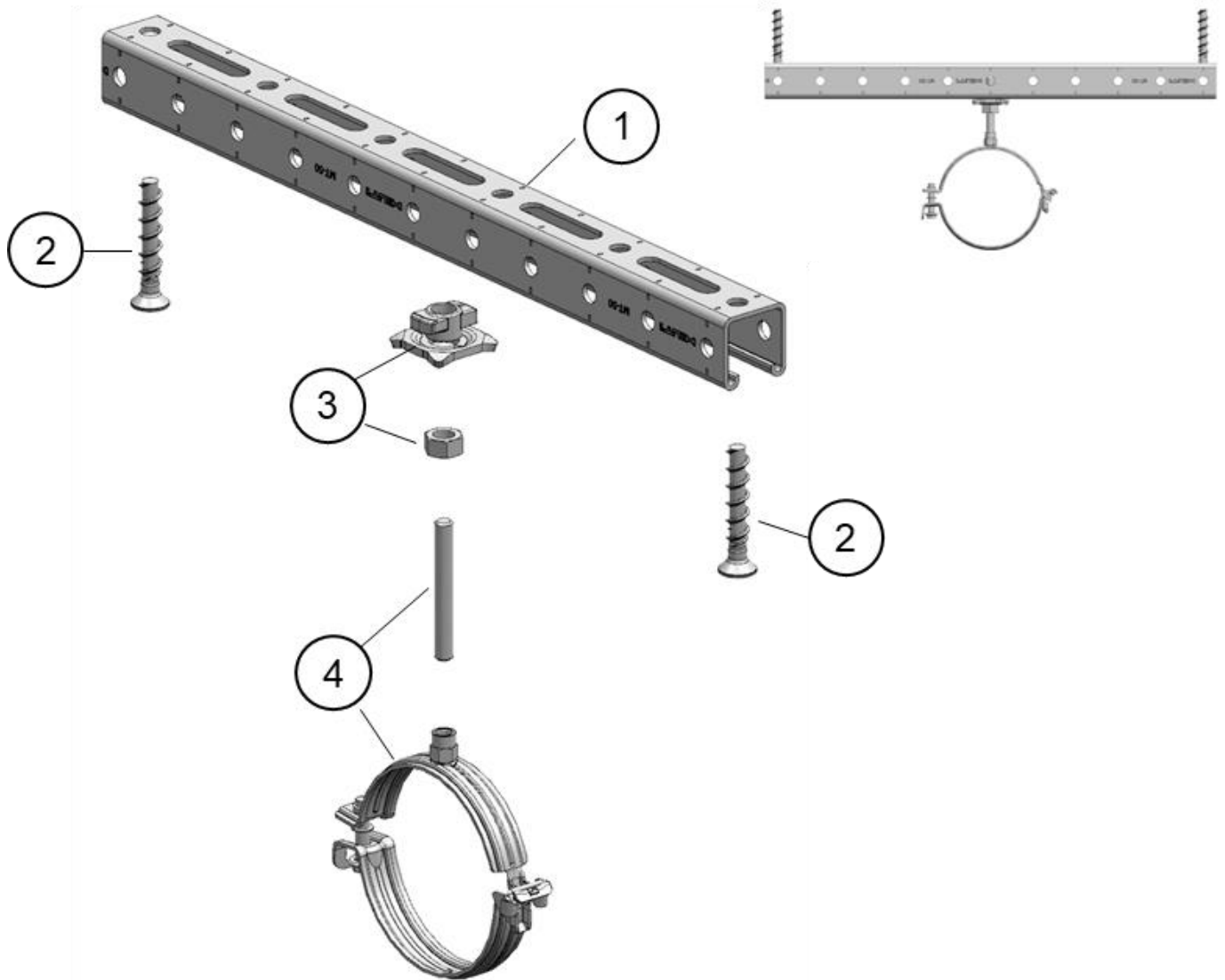


| Legend | | Annex |
|---|---|---|
| 1 | MT-30, MT-40, MT-40D or MT-50 | A1 |
| 2 | Fastener to the substructure | Not an integral part of this ETA |
| 3 | MQA-B with hexagonal nut | Not an integral part of this ETA |
| 4 | Pipe ring with threaded rod | Not an integral part of this ETA |

| Hilti MT installation channels | |
|---|---|
| Example usage: Hilti MT installation channel used as headrail | **Annex E1 (informative)** |

**Figure E2:   Example use case Hilti MT installation channel used as rod trapeze**
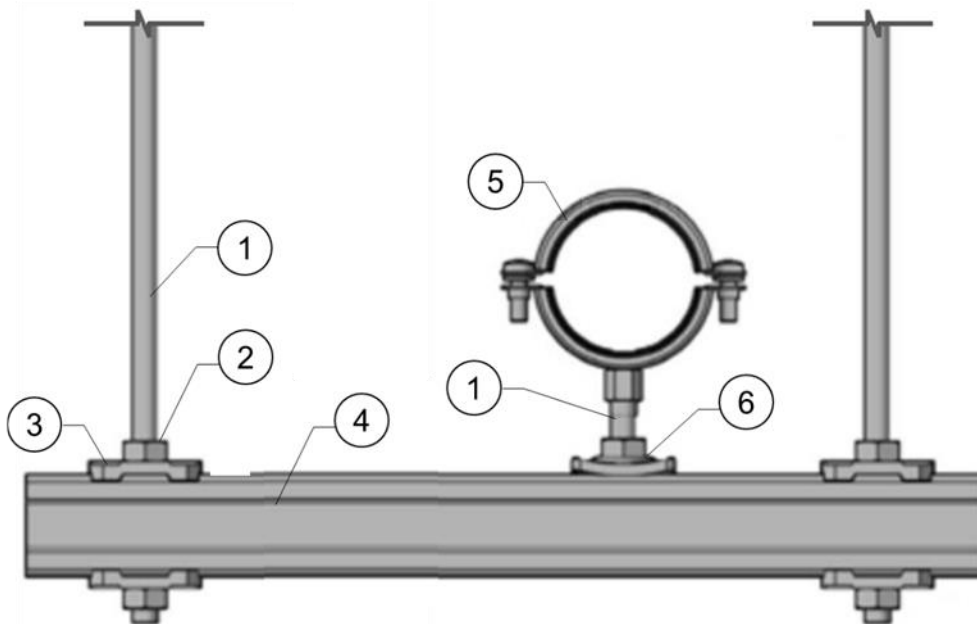


| Legend | | Annex |
|---|---|---|
| 1 | Threaded rod | Not an integral part of this ETA |
| 2 | Hexagonal nut | Not an integral part of this ETA |
| 3 | MQZ-L drilled plates | Not an integral part of this ETA |
| 4 | MT-30, MT-40, MT-40D or MT-50 | Annex A |
| 5 | Pipe ring | Not an integral part of this ETA |
| 6 | MQA-B saddle nut | Not an integral part of this ETA |

**Hilti MT installation channels**

**Example usage: Hilti MT installation channel used as rod-trapeze**

**Annex E2
(informative)**

# MP-L-I

Premium galvanized pipe clamp with quick closure for economical light-duty applications

**ETA-18/0570**  ☐☐ ☐ CE

| Clamping range | | M8 | M8/10 | Max. load capacity [N] | | | |
|---|---|---|---|---|---|---|---|
| | | | | F_rec at ambient temp. | in case of fire* | | |
| [mm] | [inch] | | | | 30min | 60min** | 90min** |
| 10 - 14 | 1/4" | 2179331 | 2172815 | 400 | 140 | 100 | 90 |
| 15 - 20 | 3/8" | 2179332 | 2172816 | | | | |
| 20 - 26 | 1/2" | 2179333 | 2172817 | | | | |
| 26 - 32 | 3/4" | 2179334 | 2172818 | | | | |
| 32 - 38 | 1" | 2179335 | 2172819 | | | | |
| 38 - 45 | 1-1/4" | 2179336 | 2172920 | | | | |
| 45 - 53 | 1-1/2" | 2179337 | 2172921 | 800 | 248 | 240 | 190 |
| 54 - 63 | 2" | 2179338 | 2172922 | | | | |
| 63 - 72 | | - | 2172923 | | | | |
| 73 - 82 | 2-1/2" | - | 2172924 | | | | |
| 83 - 92 | 3" | - | 2172925 | | | | |
| 93 - 103 | | - | 2172926 | | | | |
| 104 - 114 | 4" | - | 2172927 | | | | |
| 115 - 128 | | - | 2172928 | 1.400 | 360 | 280 | 240 |
| 129 - 142 | 5" | - | 2172929 | | | | |
| 143 - 156 | | - | 2172930 | | | | |
| 157 - 170 | 6" | - | 2172931 | | | | |

Link to ETA document(s)

<div style="border:1px solid red">

All approval details and the full scope of application must be taken from the respective ETA

</div>

\* Not applicable to M8 single connection head (not part of the ETA / Report)
\*\* FWD 60 & 90 not part of ETA but with an IBMB-Report

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# MP-HI

Premium galvanized pipe clamp with quick closure for light-duty applications

**ETA-21/0803**

| Clamping range | | M8 | M8/10 | Max. load capacity [N] | | | |
|---|---|---|---|---|---|---|---|
| | | | | $F_{rec}$ at ambient temp. | in case of fire | | |
| [mm] | [inch] | | | | 30min | 60min | 90min |
| 8 - 12 | | - | 386402 | 600 | 204 | 128 | 103 |
| 12 - 16 | 1/4" | - | 386403 | | | | |
| 16 - 20 | 3/8" | - | 386404 | | | | |
| 20 - 25 | 1/2" | - | 386405 | | | | |
| 25 - 31 | 3/4" | - | 386406 | | | | |
| 31 - 38 | 1" | - | 386407 | | | | |
| 38 - 45 | 1-1/4" | - | 386408 | 750 | 261 | 181 | 155 |
| 45 - 52 | 1-1/2" | - | 386409 | | | | |
| 52 - 59 | | - | 386410 | | | | |
| 59 - 66 | 2" | - | 386411 | | | | |
| 66 - 75 | | - | 386412 | 1.400 | 443 | 327 | 288 |
| 75 - 84 | 2-1/2" | - | 386413 | | | | |
| 84 - 93 | 3" | - | 386414 | | | | |
| 93 - 101 | | - | 386415 | | | | |
| 101 - 110 | | - | 386416 | | | | |
| 110 - 119 | 4" | - | 386417 | 1.800 | 518 | 373 | 324 |
| 119 - 129 | | - | 386418 | | | | |
| 129 - 137 | | - | 386419 | | | | |
| 137 - 145 | 5" | - | 386420 | | | | |
| 145 - 155 | | - | 386421 | | | | |
| 155 - 163 | | - | 386422 | | | | |
| 163 - 172 | 6" | - | 386423 | | | | |

Link to ETA document(s)

All approval details and the full scope of application must be taken from the respective ETA

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# MP-H

Standard galvanized pipe clamp without sound inlay for light-duty applications

**ETA-21/0803**  🔥 ⊞ ETA C E

| Clamping range | | | | Max. load capacity [N] | | | |
| [mm] | [inch] | M8 | M8/10 | $F_{rec}$ at ambient temp. | in case of fire | | |
| | | | | | 30min | 60min | 90min |
|---|---|---|---|---|---|---|---|
| 16 - 20 | 3/8" | - | 386424 | 600 | 204 | 128 | 103 |
| 20 - 25 | 1/2" | - | 386425 | | | | |
| 25 - 31 | 3/4" | - | 386426 | | | | |
| 31 - 38 | 1" | - | 386427 | | | | |
| 38 - 45 | 1-1/4" | - | 386428 | | | | |
| 45 - 52 | 1-1/2" | - | 386429 | 750 | 261 | 181 | 155 |
| 52 - 59 | | - | 386430 | | | | |
| 59 - 66 | 2" | - | 386431 | | | | |
| 66 - 74 | | - | 386432 | | | | |
| 74 - 83 | 2-1/2" | - | 386433 | 1.400 | 443 | 327 | 288 |
| 83 - 92 | 3" | - | 386434 | | | | |
| 92 - 101 | | - | 386435 | | | | |
| 101 - 110 | | - | 386436 | | | | |
| 110 - 119 | 4" | - | 386437 | | | | |
| 119 - 127 | | - | 386438 | 1.800 | 518 | 373 | 324 |
| 127 - 137 | | - | 386439 | | | | |
| 137 - 145 | 5" | - | 386440 | | | | |
| 145 - 155 | | - | 386441 | | | | |
| 155 - 163 | | - | 386442 | | | | |
| 163 - 172 | 6" | - | 386443 | | | | |

Link to ETA document(s)

All approval details and the full scope of application must be taken from the respective ETA

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# MP-U-I

Ultimate galvanized pipe clamp with sound insulation inlay and quick closure for maximum productivity in medium-duty applications

**ETA-20/0952** 🔥* [ETA] CE **NEW**

| Clamping range [mm] | [inch] | M8 | M8/10 | F$_{rec}$ at ambient temp. | 30min | 60min | 90min | M8/10/1/2" | M8/10/O16 | F$_{rec}$ at ambient temp. | 30min | 60min | 90min |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **Max. load capacity [N]** | **in case of fire*** | | | | | **Max. load capacity [N]** | **in case of fire** | | |
| 9 - 13 | 1/8" | 2242237 | 2242258 | 800 | 215 | 137 | 111 | 2242283 | 2242308 | 800 | 184 | 121 | 100 |
| 13 - 17 | 1/4" | 2242238 | 2242259 | | | | | 2242284 | 2242309 | | | | |
| 17 - 21 | 3/8" | 2242239 | 2242260 | | | | | 2242285 | 2242310 | | | | |
| 21 - 25 | 1/2" | 2242250 | 2242261 | | | | | 2242286 | 2242311 | | | | |
| 25 - 29 | 3/4" | 2242251 | 2242262 | | | | | 2242287 | 2242312 | | | | |
| 29 - 33 | | 2242252 | 2242263 | | | | | 2242288 | 2242313 | | | | |
| 33 - 37 | 1" | 2242253 | 2242264 | | | | | 2242289 | 2242314 | | | | |
| 37 - 42 | | 2242254 | 2242265 | | 314 | 182 | 138 | 2242290 | 2242315 | | 261 | 155 | 120 |
| 42 - 47 | 1 ¼" | 2242255 | 2242266 | | | | | 2242291 | 2242316 | | | | |
| 47 - 52 | 1 ½" | 2242256 | 2242267 | | | | | 2242292 | 2242317 | | | | |
| 52 - 57 | | 2305363 | 2242268 | | | | | 2242293 | 2242318 | | | | |
| 57 - 62 | 2" | 2305364 | 2242269 | | | | | 2242294 | 2242319 | | | | |
| 62 - 67 | | - | 2242270 | 1.400 | 689 | 392 | 293 | 2242295 | 2242320 | 1.400 | 570 | 333 | 253 |
| 67 - 72 | | - | 2242271 | | | | | 2242296 | 2242321 | | | | |
| 72 - 77 | 2 ½" | - | 2242272 | | | | | 2242297 | 2242322 | | | | |
| 78 - 84 | | - | 2242273 | | | | | 2242298 | 2242323 | | | | |
| 84 - 90 | 3" | - | 2242274 | | | | | 2242299 | 2242324 | | | | |
| 90 - 96 | | - | 2242275 | | | | | 2242300 | 2242325 | | | | |
| 97 - 103 | | - | 2242276 | 1.800 | 912 | 497 | 358 | 2242301 | 2242326 | 1.800 | 746 | 414 | 303 |
| 103 - 109 | | - | 2242277 | | | | | 2242302 | 2242327 | | | | |
| 109 - 115 | 4" | - | 2242278 | | | | | 2242303 | 2242328 | | | | |
| 115 - 121 | | - | 2242279 | | | | | 2242304 | 2242329 | | | | |
| 122 - 128 | | - | 2242280 | | | | | 2242305 | 2242330 | | | | |
| 129 - 135 | | - | 2242281 | | | | | 2242306 | 2242331 | | | | |
| 135 - 141 | 5" | - | 2305365 | | | | | 2305371 | 2305377 | | | | |
| 141 - 147 | | - | 2305366 | 2.400 | 993 | 563 | 419 | 2305372 | 2305378 | 2.400 | 821 | 477 | 362 |
| 147 - 153 | | - | 2305367 | | | | | 2305373 | 2305379 | | | | |
| 154 - 160 | | - | 2305368 | | | | | 2305374 | 2305380 | | | | |
| 160 - 166 | 6" | - | 2305369 | | | | | 2305375 | 2305381 | | | | |
| 164 - 170 | | - | 2305370 | | | | | 2305376 | 2305382 | | | | |

<u>Link to ETA document(s)</u>

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**All approval details and the full scope of application must be taken from the respective ETA**

\* Fire resistance not applicable to M8 connection head - ETA for M8 only valid at ambient temperature

# MP-U

Premium galvanized pipe clamp with quick closure for high productivity in medium-duty applications (no sound inlay)

**ETA-20/0952**  ▨▧ ⊞ CE

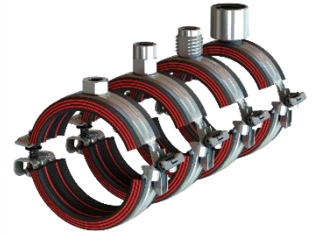| Clamping range [mm] | [inch] | M8 | M8/10 | Max. load capacity [N] F_rec at ambient temp. | in case of fire 30min | 60min | 90min | M8/10/1/2" | M8/10/O16 | Max. load capacity [N] F_rec at ambient temp. | in case of fire 30min | 60min | 90min |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 - 17 | 1/4" | - | 2242334 | | | | | 2242359 | - | | | | |
| 16 - 20 | 3/8" | - | 2242335 | | | | | 2242360 | - | | | | |
| 20 - 24 | 1/2" | - | 2242336 | | | | | 2242361 | - | | | | |
| 25 - 29 | 3/4" | - | 2242337 | | 215 | 137 | 111 | 2242362 | - | | 184 | 121 | 100 |
| 30 - 34 | 1" | - | 2242338 | | | | | 2242363 | - | | | | |
| 34 - 38 | | - | 2242339 | 800 | | | | 2242364 | - | 800 | | | |
| 38 - 42 | | - | 2242340 | | | | | 2242365 | - | | | | |
| 42 - 47 | 1 ¼" | - | 2242341 | | | | | 2242366 | - | | | | |
| 47 - 52 | 1 ½" | - | 2242342 | | | | | 2242367 | - | | | | |
| 52 - 57 | | - | 2242343 | | 314 | 182 | 138 | 2242368 | - | | 261 | 155 | 120 |
| 57 - 62 | 2" | - | 2242344 | | | | | 2242369 | - | | | | |
| 62 - 67 | | - | 2242345 | | | | | 2242370 | - | | | | |
| 67 - 72 | | - | 2242346 | | | | | 2242371 | - | | | | |
| 72 - 77 | 2 ½" | - | 2242347 | | | | | 2242372 | - | | | | |
| 77 - 82 | | - | 2242348 | 1.400 | 689 | 392 | 293 | 2242373 | - | 1.400 | 570 | 333 | 253 |
| 83 - 89 | 3" | - | 2242349 | | | | | 2242374 | - | | | | |
| 89 - 95 | | - | 2242350 | | | | | 2242375 | - | | | | |
| 95 - 101 | | - | 2242351 | | | | | 2242376 | - | | | | |
| 102 - 108 | | - | 2242352 | | | | | 2242377 | - | | | | |
| 109 - 115 | 4" | - | 2242353 | | | | | 2242378 | - | | | | |
| 115 - 121 | | - | 2242354 | | | | | 2242379 | - | | | | |
| 121 - 127 | | - | 2242355 | 1.800 | 912 | 497 | 358 | 2242380 | - | 1.800 | 746 | 414 | 303 |
| 128 - 134 | | - | 2242356 | | | | | 2242235 | - | | | | |
| 135 - 141 | 5" | - | 2242357 | | | | | 2242332 | - | | | | |
| 141 - 147 | | - | 2305351 | | | | | 2305357 | - | | | | |
| 147 - 153 | | - | 2305352 | | | | | 2305358 | - | | | | |
| 153 - 159 | | - | 2305353 | | | | | 2305359 | - | | | | |
| 160 - 166 | 6" | - | 2305354 | 2.400 | 993 | 563 | 419 | 2305360 | - | 2.400 | 821 | 477 | 362 |
| 166 - 172 | | - | 2305355 | | | | | 2305361 | - | | | | |
| 170 - 176 | | - | 2305356 | | | | | 2305362 | - | | | | |

Link to ETA document(s)

All approval details and the full scope of application must be taken from the respective ETA

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# MP-U-G

Ultimate galvanized slide pipe clamp with low-friction inlay and quick closure for maximum productivity in medium-duty applications

**ETA-20/0952**  [ETA] CE *  **NEW**

| Diameter | | M8 | M8/10 | M8/10/1/2" | M8/10/O16 | Max. load capacity [N] | | | |
|---|---|---|---|---|---|---|---|---|---|
| [mm] | [inch] | | | | | $F_{rec}$ at ambient temp. | in case of fire | | |
| | | | | | | | 30min | 60min | 90min |
| 16 | | 2275020 | 2275028 | - | - | 800 | - | - | - |
| 20 | | 2275021 | 2275029 | - | - | | | | |
| 25 | | 2275022 | 2275030 | - | - | | | | |
| 32 | | 2275023 | 2275031 | - | - | | | | |
| 40 | | 2275024 | 2275032 | - | - | | - | - | - |
| 50 | | 2275025 | 2275033 | 2275042 | - | | | | |
| 56 | | 2275026 | 2275034 | 2275043 | - | | | | |
| 63 | | - | 2275035 | 2275044 | - | 1.400 | - | - | - |
| 75 | | - | 2275036 | 2275045 | - | | | | |
| 90 | | - | 2275037 | 2275046 | - | 1.800 | - | - | - |
| 110 | | - | 2275038 | 2275047 | - | | | | |
| 125 | | - | 2275039 | 2275048 | - | | | | |
| 135 | | - | 2275040 | 2275049 | - | 2.400 | - | - | - |
| 160 | | - | 2275041 | 2274899 | - | | | | |

Link to ETA document(s)

All approval details and the full scope of application must be taken from the respective ETA

\* No fire resistance - ETA only valid at ambient temperature

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# HILTI

# MP-MI

Premium galvanized pipe clamp with sound inlay for heavy-duty piping applications

## ETA-18/0130  CE

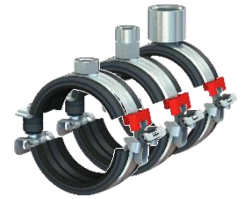| Clamping range | | | | | | Max. load capacity [N] | | | | |
| [mm] | [inch] | M10/12 | M16 | 1/2" | 3/4" | F_rec at ambient temp. | in case of fire | | | |
| | | | | | | | 30min | 60min | 90min | 120min |
| 15 - 19 | 3/8" | 20843 | - | 20844** | - | 1.800 | 840 | 500 | 350 | 270 |
| 20 - 25 | 1/2" | 20845 | - | 53132** | - | | | | | |
| 25 - 30 | 3/4" | 20847 | - | 53133** | - | | | | | |
| 32 - 38 | 1" | 20849 | - | 53134** | - | | | | | |
| 40 - 45 | 1-1/4" | 20851 | - | 53135** | - | | | | | |
| 48 - 54 | 1-1/2" | 20853 | - | 53136** | - | | | | | |
| 54 - 57 | | 20855 | - | 20856** | - | | | | | |
| 57 - 64 | 2" | 20857 | 20858* | 53137** | - | | | | | |
| 68 - 72 | | 20860 | - | 20861** | - | 1.800 | 850 | 560 | 430 | 350 |
| 70 - 77 | 2-1/2" | 20862 | 20863* | - | 53144** | | | | | |
| 80 - 84 | | 20865 | - | - | - | | | | | |
| 82 - 90 | 3" | 20866 | 20867* | - | 53149** | | | | | |
| 97 - 103 | | 20869 | - | - | 53150** | 2.400 | 1.320 | 910 | 730 | 620 |
| 108 - 114 | 4" | 20871 | 20872 | - | 53151** | | | | | |
| 114 - 119 | | 20874 | - | - | 20875** | | | | | |
| 122 - 127 | | 20876 | - | - | 20877** | | | | | |
| 125 - 133 | | - | - | - | 53164** | | | | | |
| 132 - 137 | | 20879 | 20880 | - | 20881** | | | | | |
| 137 - 142 | 5" | 20882 | - | - | 53165** | | | | | |
| 150 - 156 | | - | - | - | 20884** | | | | | |
| 156 - 162 | | 20885 | 229087 | - | 53168** | | | | | |
| 162 - 168 | 6" | 20887 | 20888 | - | 53170** | | | | | |
| 175 - 180 | | - | 20890 | - | 20891** | 4.500 | 1.780 | 1.080 | 790 | 630 |
| 190 - 200 | | - | 20892 | - | 53172** | | | | | |
| 210 - 219 | | - | 20894 | - | 20895** | | | | | |
| 217 - 224 | 8" | - | 20896 | - | 53174** | | | | | |
| 242 - 250 | | - | 20898 | - | - | | | | | |
| 267 - 273 | | - | 20900* | - | 53180** | | | | | |

Link to ETA document(s)

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All approval details and the full scope of application must be taken from the respective ETA

\* NOT part of ETA but Fire resistance approved/tested
\*\* NOT part of ETA and NOT Fire resistance approved/tested

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# MP-MIS

Premium galvanized pipe clamp with high temperature resistance inlay for heavy-duty piping applications

## No ETA

| Clamping range [mm] | [inch] | M10/12 | M16 | 1/2" | 3/4" | F_rec at ambient temp. | Max. load capacity [N] in case of fire | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 30min | 60min | 90min | 120min |
| 14 - 19 | 3/8" | 47407* | - | - | - | 1.800 | 850 | 700 | 430 | 350 |
| 20 - 25 | 1/2" | 47408* | - | - | - | | | | | |
| 25 - 30 | 3/4" | 47409* | - | - | - | | | | | |
| 32 - 38 | 1" | 47410* | - | - | - | | | | | |
| 40 - 45 | 1-1/4" | 47411* | - | - | - | | | | | |
| 48 - 54 | 1-1/2" | 47412* | - | - | - | | | | | |
| 54 - 57 | | 47413* | - | - | - | | | | | |
| 57 - 64 | 2" | 47414* | - | - | - | | | | | |
| 68 - 72 | | 47415* | - | - | - | | | | | |
| 70 - 77 | 2-1/2" | 47400* | - | - | - | | | | | |
| 78 - 84 | | 47401* | - | - | - | | | | | |
| 82 - 90 | 3" | 47402* | - | - | - | | | | | |
| 97 - 103 | | 47403* | - | - | - | 2.400 | 1.320 | 910 | 730 | 620 |
| 108 - 114 | 4" | 47404* | - | - | - | | | | | |
| 114 - 119 | | 47405* | - | - | - | | | | | |
| 122 - 127 | | 47406* | - | - | - | | | | | |
| 132 - 137 | | 47416* | - | - | - | | | | | |
| 137 - 142 | 5" | 47417* | - | - | - | | | | | |
| 156 - 162 | | 47418* | - | - | - | | | | | |
| 162 - 168 | 6" | 47419* | - | - | - | | | | | |
| 175 - 180 | | - | 47420* | - | - | 4.500 | 1.780 | 1.080 | 790 | 630 |
| 190 - 200 | | - | 47421* | - | - | | | | | |
| 210 - 219 | | - | 47422* | - | - | | | | | |
| 217 - 224 | 8" | - | 47423* | - | - | | | | | |
| 242 - 250 | | - | 47424* | - | - | | | | | |

All approval details and the full scope of application must be taken from the respective ETA

\* NOT part of ETA but Fire resistance approved/tested
\*\* NOT part of ETA and NOT Fire resistance approved/tested

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# MP-M

Standard galvanized pipe clamp without sound inlay for heavy-duty piping applications



## No ETA

| Clamping range [mm] | [inch] | M10/12 | M16 | 1/2" | 3/4" | F_rec at ambient temp. | in case of fire 30min | 60min | 90min | 120min |
|---|---|---|---|---|---|---|---|---|---|---|
| 15 - 19 | 3/8" | - | - | 53181** | - | 2.000 | - | - | - | - |
| 20 - 25 | 1/2" | - | - | 53185** | - | | | | | |
| 25 - 30 | 3/4" | - | - | 53190** | - | | | | | |
| 32 - 38 | 1" | - | - | 53215** | - | | | | | |
| 40 - 45 | 1-1/4" | - | - | 53216** | - | | | | | |
| 48 - 54 | 1-1/2" | - | - | 53217** | - | | | | | |
| 57 - 64 | 2" | - | 20909** | - | - | | | | | |
| 57 - 64 | 2" | - | - | 53218** | - | | | | | |
| 70 - 77 | 2-1/2" | - | 20911** | - | 20913** | | | | | |
| 82 - 90 | 3" | - | 20914** | - | 53220** | | | | | |
| 97 - 103 | | - | - | - | 53221** | 3.000 | - | - | - | - |
| 108 - 114 | 4" | - | 20917** | - | 53223** | | | | | |
| 122 - 127 | | - | - | - | 20920** | | | | | |
| 125 - 133 | | - | - | - | 53224** | | | | | |
| 132 - 137 | | - | - | - | 20922** | | | | | |
| 137 - 142 | 5" | - | 20923** | - | 53225** | | | | | |
| 150 - 156 | | - | - | - | 20925** | | | | | |
| 156 - 162 | | - | - | - | 53226** | | | | | |
| 162 - 168 | 6" | - | 20927** | - | 53228** | | | | | |
| 175 - 180 | | - | 20929** | - | 20930** | 5.000 | - | - | - | - |
| 190 - 200 | | - | 20931** | - | 53229** | | | | | |
| 210 - 219 | | - | - | - | 20933** | | | | | |
| 217 - 224 | 8" | - | 20934** | - | 53230** | | | | | |

<div style="border:1px solid red">
All approval details and the full scope of application must be taken from the respective ETA
</div>

\* NOT part of ETA but Fire resistance approved/tested
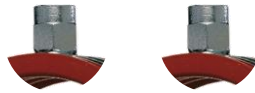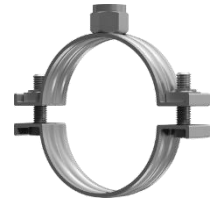\*\* NOT part of ETA and NOT Fire resistance approved/tested

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# Spacing distances for MP-L-I / -HI / -H

Below shown tables provide a calculated, theoretical maximum spacing based on a specific pipe type (material and standard). Any deviation or change in the pipe type or other parameters automatically leads to corresponding deviation in maximum spacing.

## MP-L-I  ETA-18/0570



| Clamping range [mm] | [inch] | Pipe weight* OD [mm] | [N/m] | $F_{rec}$ at ambient temp. | in case of fire*** 30min | 60min | 90min |
|---|---|---|---|---|---|---|---|
| 10 - 14 | 1/4" | 10,2 | 4,9 | 81,5 | 28,5 | 20,4 | 18,3 |
| 38 - 45 | 1-1/4" | 42,4 | 44,1 | 9,1 | 3,2 | 2,3 | 2,0 |
| 45 - 53 | 1-1/2" | 48,3 | 54,9 | 14,6 | 4,5 | 4,4 | 3,5 |
| 104 - 114 | 4" | 114,3 | 237,4 | 3,4 | 1,0 | 1,0 | 0,8 |
| 115 - 128 | | 127 | 284,5 | 4,9 | 1,3 | 1,0 | 0,8 |
| 157 - 170 | 6" | 168,3 | 440,5 | 3,2 | 0,8 | 0,6 | 0,5 |

## MP-HI  ETA-21/0803



| Clamping range [mm] | [inch] | Pipe weight* OD [mm] | [N/m] | $F_{rec}$ at ambient temp. | in case of fire 30min | 60min | 90min |
|---|---|---|---|---|---|---|---|
| 8 - 12 | | 10,2 | 4,9 | 122,3 | 41,5 | 26,2 | 21,0 |
| 31 - 38 | 1" | 33,7 | 30,4 | 19,7 | 6,7 | 4,2 | 3,4 |
| 38 - 45 | 1-1/4" | 42,4 | 44,1 | 17,0 | 5,9 | 4,1 | 3,5 |
| 59 - 66 | 2" | 60,3 | 81,4 | 9,2 | 3,2 | 2,2 | 1,9 |
| 66 - 75 | | 70 | 103,0 | 13,6 | 4,3 | 3,2 | 2,8 |
| 101 - 110 | | 108 | 220,7 | 6,3 | 2,0 | 1,5 | 1,3 |
| 110 - 119 | 4" | 114,3 | 237,4 | 7,6 | 2,2 | 1,6 | 1,4 |
| 163 - 172 | 6" | 168,3 | 440,5 | 4,1 | 1,2 | 0,8 | 0,7 |

## MP-H  ETA-21/0803



| Clamping range [mm] | [inch] | Pipe weight* OD [mm] | [N/m] | $F_{rec}$ at ambient temp. | in case of fire 30min | 60min | 90min |
|---|---|---|---|---|---|---|---|
| 16 - 20 | 3/8" | 17,2 | 9,8 | 61,2 | 20,8 | 13,1 | 10,5 |
| 38 - 45 | 1-1/4" | 42,4 | 44,1 | 13,6 | 4,6 | 2,9 | 2,3 |
| 45 - 52 | 1-1/2" | 48,3 | 54,9 | 13,7 | 4,8 | 3,3 | 2,8 |
| 66 - 74 | | 70 | 103,0 | 7,3 | 2,5 | 1,8 | 1,5 |
| 74 - 83 | 2-1/2" | 76,1 | 120,7 | 11,6 | 3,7 | 2,7 | 2,4 |
| 110 - 119 | 4" | 114,3 | 237,4 | 5,9 | 1,9 | 1,4 | 1,2 |
| 119 - 127 | | 127 | 284,5 | 6,3 | 1,8 | 1,3 | 1,1 |
| 163 - 172 | 6" | 168,3 | 440,5 | 4,1 | 1,2 | 0,8 | 0,7 |

| |
|---|
| ≥ 3,0m |
| < 3,0m - ≥ 1,5m |
| < 1,5m - ≥ 1,0m |
| < 1,0m |

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\* Steel pipe (DIN EN10220) + Water + Insulation
\*\* Max. spacing calculation not taking the allowed max. span of the pipe into account
\*\*\* Not applicable to M8 connection head (not part of the ETA / Report)

# Spacing distances for MP-U-I

Below shown tables provide a calculated, theoretical maximum spacing based on a specific pipe type (material and standard). Any deviation or change in the pipe type or other parameters automatically leads to corresponding deviation in maximum spacing.

## MP-U-I (M8 and M8/10)  ETA-20/0952  NEW

| Clamping range | | Pipe weight* | | Calculated max. spacing [m]** | | | |
| [mm] | [inch] | OD [mm] | [N/m] | $F_{rec}$ at ambient temp. | in case of fire*** | | |
| | | | | | 30min | 60min | 90min |
| 9 - 13 | 1/8" | 10,2 | 4,9 | 163,1 | 43,8 | 27,9 | 22,6 |
| 33 - 37 | 1" | 33,7 | 30,4 | 26,3 | 7,1 | 4,5 | 3,6 |
| 37 - 42 | | 40 | 38,3 | 20,9 | 8,2 | 4,7 | 3,6 |
| 57 - 62 | 2" | 60,3 | 81,4 | 9,8 | 3,9 | 2,2 | 1,7 |
| 62 - 67 | | 63,5 | 86,3 | 16,2 | 8,0 | 4,5 | 3,4 |
| 90 - 96 | | 88,9 | 165,8 | 8,4 | 4,2 | 2,4 | 1,8 |
| 97 - 103 | | 101,6 | 204,0 | 8,8 | 4,5 | 2,4 | 1,8 |
| 135 - 141 | 5" | 139,7 | 323,7 | 5,6 | 2,8 | 1,5 | 1,1 |
| 141 - 147 | | 141,3 | 329,6 | 7,3 | 3,0 | 1,7 | 1,3 |
| 164 - 170 | | 168,3 | 440,5 | 5,4 | 2,3 | 1,3 | 1,0 |

## MP-U-I (M8/10/½" and M8/10/O16)  ETA-20/0952

| Clamping range | | Pipe weight* | | Calculated max. spacing [m]** | | | |
| [mm] | [inch] | OD [mm] | [N/m] | $F_{rec}$ at ambient temp. | in case of fire | | |
| | | | | | 30min | 60min | 90min |
| 9 - 13 | 1/8" | 10,2 | 4,9 | 163,1 | 37,4 | 24,7 | 20,5 |
| 33 - 37 | 1" | 33,7 | 30,4 | 26,3 | 6,0 | 4,0 | 3,3 |
| 37 - 42 | | 40 | 38,3 | 20,9 | 6,8 | 4,1 | 3,1 |
| 57 - 62 | 2" | 60,3 | 81,4 | 9,8 | 3,2 | 1,9 | 1,5 |
| 62 - 67 | | 63,5 | 86,3 | 16,2 | 6,6 | 3,9 | 2,9 |
| 90 - 96 | | 88,9 | 165,8 | 8,4 | 3,4 | 2,0 | 1,5 |
| 97 - 103 | | 101,6 | 204,0 | 8,8 | 3,7 | 2,0 | 1,5 |
| 135 - 141 | 5" | 139,7 | 323,7 | 5,6 | 2,3 | 1,3 | 0,9 |
| 141 - 147 | | 141,3 | 329,6 | 7,3 | 2,5 | 1,4 | 1,1 |
| 164 - 170 | | 168,3 | 440,5 | 5,4 | 1,9 | 1,1 | 0,8 |

| |
| --- |
| ≥ 3,0m |
| < 3,0m - ≥ 1,5m |
| < 1,5m - ≥ 1,0m |
| < 1,0m |

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* Steel pipe (DIN EN10220) + Water + Insulation
** Max. spacing calculation not taking the allowed max. span of the pipe into account
*** Fire resistance not applicable to M8 connection head - ETA for M8 only valid at ambient temperature

# Spacing distances for MP-U

Below shown tables provide a calculated, theoretical maximum spacing based on a specific pipe type (material and standard). Any deviation or change in the pipe type or other parameters automatically leads to corresponding deviation in maximum spacing.

## MP-U (M8/10)    ETA-20/0952  CE

| Clamping range | | Pipe weight* | | Calculated max. spacing [m]** | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| | | | | $F_{rec}$ at ambient temp. | in case of fire | | |
| [mm] | [inch] | OD [mm] | [N/m] | | 30min | 60min | 90min |
| 13 - 17 | 1/4" | 13,5 | 7,8 | 101,9 | 27,3 | 17,4 | 14,1 |
| 38 - 42 | | 40 | 38,3 | 20,9 | 5,6 | 3,6 | 2,9 |
| 42 - 47 | 1 ¼" | 42,4 | 44,1 | 18,1 | 7,1 | 4,1 | 3,1 |
| 62 - 67 | | 63,5 | 86,3 | 9,3 | 3,6 | 2,1 | 1,6 |
| 67 - 72 | | 70 | 103,0 | 13,6 | 6,7 | 3,8 | 2,8 |
| 95 - 101 | | 101,6 | 204,0 | 6,9 | 3,4 | 1,9 | 1,4 |
| 102 - 108 | | 108 | 220,7 | 8,2 | 4,1 | 2,3 | 1,6 |
| 141 - 147 | | 141,3 | 329,6 | 5,5 | 2,8 | 1,5 | 1,1 |
| 147 - 153 | | 152,4 | 381,6 | 6,3 | 2,6 | 1,5 | 1,1 |
| 170 - 176 | | 177,8 | 494,4 | 4,9 | 2,0 | 1,1 | 0,8 |

## MP-U (M8/10/½")    ETA-20/0952  CE

| Clamping range | | Pipe weight* | | Calculated max. spacing [m]** | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| | | | | $F_{rec}$ at ambient temp. | in case of fire | | |
| [mm] | [inch] | OD [mm] | [N/m] | | 30min | 60min | 90min |
| 13 - 17 | 1/4" | 13,5 | 7,8 | 101,9 | 23,4 | 15,4 | 12,8 |
| 38 - 42 | | 40 | 38,3 | 20,9 | 4,8 | 3,2 | 2,6 |
| 42 - 47 | 1 ¼" | 42,4 | 44,1 | 18,1 | 5,9 | 3,5 | 2,7 |
| 62 - 67 | | 63,5 | 86,3 | 9,3 | 3,0 | 1,8 | 1,4 |
| 67 - 72 | | 70 | 103,0 | 13,6 | 5,5 | 3,2 | 2,5 |
| 95 - 101 | | 101,6 | 204,0 | 6,9 | 2,8 | 1,6 | 1,2 |
| 102 - 108 | | 108 | 220,7 | 8,2 | 3,4 | 1,9 | 1,4 |
| 141 - 147 | | 141,3 | 329,6 | 5,5 | 2,3 | 1,3 | 0,9 |
| 147 - 153 | | 152,4 | 381,6 | 6,3 | 2,2 | 1,2 | 0,9 |
| 170 - 176 | | 177,8 | 494,4 | 4,9 | 1,7 | 1,0 | 0,7 |

| |
| --- |
| ≥ 3,0m |
| < 3,0m - ≥ 1,5m |
| < 1,5m - ≥ 1,0m |
| < 1,0m |

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\* Steel pipe (DIN EN10220) + Water + Insulation
\*\* Max. spacing calculation not taking the allowed max. span of the pipe into account

# Spacing distances of plastic pipes

The tables below show a selection of the plastic pipes and aluminum composite pipes available on the market and their maximum spacing regulated by either the manufacturer or a standard. Thus, the load values of the MP-U-G are far from being fully utilized.

**NEW**
ETA-20/0952

*

## Wastewater pipes with increased sound insulation

**allowed max. spacing [m] — Horizontal**

| Diameter | Ke Kelit PhonEX AS | Geberit Silent-PP | Geberit Silent-Pro | Geberit Silent-db20 PP | Geberit Silent-db20 PP * | REHAU Raupiano | POLO-KAL NG | POLO-KAL 3S | Pipelife Master 3 Plus | Wavin AS | Max. spacing – all Pipes [m] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 32 | - | 0,50 | - | - | - | 0,48 | 0,50 | - | 0,45 | - | 0,50 |
| 40 | - | 0,60 | - | - | - | 0,60 | 0,60 | - | 0,55 | - | 0,60 |
| 50 | - | 0,75 | 0,75 | - | - | 0,75 | 0,75 | - | 0,65 | 0,75 | 0,75 |
| 56 | 0,58 | - | - | 0,80 | 1,00 | - | - | - | - | - | 0,58 |
| 63 | - | - | - | - | - | - | - | - | - | - | - |
| 75 | 0,78 | 1,10 | 1,10 | 0,80 | 1,20 | 1,13 | 1,10 | 1,10 | 0,90 | 1,13 | 1,13 |
| 90 | - | 1,35 | 1,35 | 0,90 | 1,40 | 1,35 | 1,35 | 1,35 | - | 1,35 | 1,35 |
| 110 | - | 1,65 | 1,65 | 1,10 | 1,70 | 1,65 | 1,65 | 1,65 | 1,45 | 1,50 | 1,65 |
| 125 | - | 1,85 | 1,85 | - | - | 1,88 | 1,85 | 1,85 | 1,65 | 1,63 | 1,88 |
| 135 | 1,35 | - | - | 1,40 | 1,90 | - | - | - | - | - | 1,35 |
| 160 | 1,60 | 2,40 | 2,40 | 1,70 | 2,40 | 2,40 | 2,40 | 2,40 | 2,10 | 2,00 | 2,40 |

**allowed max. spacing [m] — Vertical**

| Diameter | Ke Kelit PhonEX AS | Geberit Silent-PP | Geberit Silent-Pro | Geberit Silent-db20 PP | REHAU Raupiano | POLO-KAL NG | POLO-KAL 3S | Pipelife Master 3 Plus | Wavin AS | Max. spacing – all Pipes [m] |
|---|---|---|---|---|---|---|---|---|---|---|
| 32 | - | 1,5 | - | - | 1,5 | 1,5 | - | 1,5 | - | 1,50 |
| 40 | - | 1,5 | - | - | 1,5 | 1,5 | - | 1,5 | - | 1,50 |
| 50 | - | 1,5 | 1,5 | - | 1,5 | 1,5 | - | 1,5 | 1,3 | 1,50 |
| 56 | 2,0 | - | - | 1,5 | - | - | - | - | - | 2,00 |
| 63 | - | - | - | - | - | - | - | - | - | - |
| 75 | 2,0 | 2,0 | 2,0 | 1,5 | 2,0 | 2,0 | 2,0 | 2,0 | 1,9 | 2,00 |
| 90 | - | 2,0 | 2,0 | 1,5 | 2,0 | 2,0 | 2,0 | - | 2,0 | 2,00 |
| 110 | - | 2,0 | 2,0 | 1,7 | 2,0 | 2,0 | 2,0 | 2,0 | 2,0 | 2,00 |
| 125 | - | 2,0 | 2,0 | - | 2,0 | 2,0 | 2,0 | 2,0 | 2,0 | 2,00 |
| 135 | 2,0 | - | - | 1,9 | - | - | - | - | - | 2,00 |
| 160 | 2,0 | 2,0 | 2,0 | 2,4 | 2,0 | 2,0 | 2,0 | 2,0 | 2,0 | 2,40 |

* w/ support tray

## Plastic pipes

**allowed max. spacing [m]**

| Diameter | PVC-U (DIN 8062-3) | PE (DIN 8074 - SDR 17) | PP-SDR | PE 100 SDR-17 | Geberit PE | Geberit PE (w/ support tray) | Max. spacing – all Pipes [m] |
|---|---|---|---|---|---|---|---|
| 25 | - | - | 0,5 | - | - | - | 0,5 |
| 32 | - | 1,0 | 0,7 | - | - | - | 1,0 |
| 40 | - | 1,0 | 0,8 | - | 0,8 | 1,0 | 1,0 |
| 50 | 0,5 | 1,0 | 1,0 | - | 0,8 | 1,0 | 1,0 |
| 56 | - | - | - | - | 0,8 | 1,0 | 1,0 |
| 63 | 0,6 | 1,3 | 1,3 | - | - | - | 1,3 |
| 75 | 0,8 | 1,4 | 1,4 | - | 0,8 | 1,2 | 1,4 |
| 90 | 0,9 | 1,5 | 1,5 | 1,5 | 0,9 | 1,4 | 1,5 |
| 110 | 1,2 | 1,6 | 1,6 | 1,6 | 1,1 | 1,7 | 1,7 |
| 125 | 1,3 | 1,8 | 1,8 | 1,8 | 1,3 | 1,9 | 1,9 |
| 135 | 1,4 | 1,9 | 1,9 | 1,9 | - | - | 1,9 |
| 160 | 1,8 | 2,0 | 2,0 | 2,0 | 1,6 | 2,4 | 2,4 |

## Al-composite pipes

**allowed max. spacing [m]**

| Diameter | Wavin Tigris | KeKelit Kelox | Uponor Uni Pipe Plus / MLC | Geberit Mepla Verbundrohr | +GF+ JRG Sanipex | Viega Raxofix | Roth Alu-Laserplus | TECE TECEflex | Rehau Rautitan flex | Rehau Rautitan stabil | Pipelife RADOPRESS | Max. spacing – all Pipes [m] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16 | 1,0 | 1,2 | 2,0 | 1,5 | 1,2 | 1,0 | 1,0 | 1,0 | 1,0 | 1,0 | 1,0 | 2,0 |
| 20 | 1,2 | 1,3 | 2,3 | 1,5 | 1,2 | 1,0 | 1,0 | 1,2 | 1,0 | 1,3 | 1,0 | 2,3 |
| 25 | 1,5 | 1,5 | 2,6 | 1,5 | 1,2 | 1,5 | 1,5 | 1,3 | 1,2 | 1,5 | 1,5 | 2,6 |
| 32 | 1,5 | 1,6 | 2,6 | 2,0 | 1,5 | 2,0 | 1,5 | 1,5 | 1,4 | 1,8 | 2,0 | 2,6 |
| 40 | 1,8 | 1,7 | 2,0 | 2,0 | 1,5 | 2,0 | 1,8 | 1,8 | 1,5 | 2,0 | 2,0 | 2,0 |
| 50 | 1,8 | 2,0 | 2,0 | 2,5 | 1,5 | 2,5 | 1,8 | 2,0 | 1,5 | - | 2,5 | 2,5 |
| 63 | 2,0 | 2,2 | 2,2 | 2,5 | 1,5 | 2,5 | 2,0 | 2,0 | 1,5 | - | 2,5 | 2,5 |
| 75 | 2,2 | 2,4 | 2,4 | 2,5 | - | - | - | - | - | - | - | 2,5 |
| 90 | - | - | 2,4 | - | - | - | - | - | - | - | - | 2,4 |
| 110 | - | - | 2,4 | - | - | - | - | - | - | - | - | 2,4 |

* No fire resistance - ETA only valid at ambient temperature

# Spacing distances for MP-MI / -MIS / -M

Below shown tables provide a calculated, theoretical maximum spacing based on a specific pipe type (material and standard). Any deviation or change in the pipe type or other parameters automatically leads to corresponding deviation in maximum spacing.

## MP-MI (M10/12, M16, ½", ¾")  ETA-18/0130  CE

| Clamping range | | Pipe weight* | | $F_{rec}$ at ambient temp. | Calculated max. spacing [m]** | | | |
| | | | | | in case of fire*** | | | |
| [mm] | [inch] | OD [mm] | [N/m] | | 30min | 60min | 90min | 120min |
|---|---|---|---|---|---|---|---|---|
| 15 - 19 | 3/8" | 17,2 | 9,8 | 183,5 | 85,6 | 51,0 | 35,7 | 27,5 |
| 57 - 64 | 2" | 60,3 | 81,4 | 22,1 | 10,3 | 6,1 | 4,3 | 3,3 |
| 68 - 72 | | 70 | 103,0 | 17,5 | 8,3 | 5,4 | 4,2 | 3,4 |
| 82 - 90 | 3" | 88,9 | 165,8 | 10,9 | 5,1 | 3,4 | 2,6 | 2,1 |
| 97 - 103 | | 101,6 | 204,0 | 11,8 | 6,5 | 4,5 | 3,6 | 3,0 |
| 162 - 168 | 6" | 168,3 | 440,5 | 5,4 | 3,0 | 2,1 | 1,7 | 1,4 |
| 175 - 180 | | 177,8 | 494,4 | 9,1 | 3,6 | 2,2 | 1,6 | 1,3 |
| 267 - 273 | | 273 | 1021,2 | 4,4 | 1,7 | 1,1 | 0,8 | 0,6 |

## MP-MIS (M10/12, M16)  No ETA

| Clamping range | | Pipe weight* | | $F_{rec}$ at ambient temp. | Calculated max. spacing [m]** | | | |
| | | | | | in case of fire | | | |
| [mm] | [inch] | OD [mm] | [N/m] | | 30min | 60min | 90min | 120min |
|---|---|---|---|---|---|---|---|---|
| 14 - 19 | 3/8" | 17,2 | 9,8 | 183,5 | 86,6 | 71,4 | 43,8 | 35,7 |
| 82 - 90 | 3" | 88,9 | 165,8 | 10,9 | 5,1 | 4,2 | 2,6 | 2,1 |
| 97 - 103 | | 101,6 | 204,0 | 11,8 | 6,5 | 4,5 | 3,6 | 3,0 |
| 162 - 168 | 6" | 168,3 | 440,5 | 5,4 | 3,0 | 2,1 | 1,7 | 1,4 |
| 175 - 180 | | 177,8 | 494,4 | 9,1 | 3,6 | 2,2 | 1,6 | 1,3 |
| 242 - 250 | | 244,5 | 862,3 | 5,2 | 2,1 | 1,3 | 0,9 | 0,7 |

## MP-M (M16, ½", ¾")  No ETA

| Clamping range | | Pipe weight* | | $F_{rec}$ at ambient temp. | Calculated max. spacing [m]** | | | |
| | | | | | in case of fire | | | |
| [mm] | [inch] | OD [mm] | [N/m] | | 30min | 60min | 90min | 120min |
|---|---|---|---|---|---|---|---|---|
| 15 - 19 | 3/8" | 17,2 | 9,8 | 203,9 | n.a. | n.a. | n.a. | n.a. |
| 82 - 90 | 3" | 88,9 | 165,8 | 12,1 | | | | |
| 97 - 103 | | 101,6 | 204,0 | 14,7 | n.a. | n.a. | n.a. | n.a. |
| 162 - 168 | 6" | 168,3 | 440,5 | 6,8 | | | | |
| 175 - 180 | | 177,8 | 494,4 | 10,1 | n.a. | n.a. | n.a. | n.a. |
| 217 - 224 | 8" | 219,1 | 731,8 | 6,8 | | | | |

| Legend |
|---|
| ≥ 3,0m |
| < 3,0m - ≥ 1,5m |
| < 1,5m - ≥ 1,0m |
| < 1,0m |

* Steel pipe (DIN EN10220) + Water + Insulation
** Max. spacing calculation not taking the allowed max. span of the pipe into account
*** Not applicable to 1/2" and 3/4" connection head (not part of the ETA / Report)

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