



FASTENING ON STEEL

Installation Typicals



APPLICATION SELECTOR

	X-BT-MR Threaded stud (new generation)		S-BT-MR Threaded stud		X-BT-MF Threaded stud		S-BT-MF Threaded stud		X-ST-GR Threaded stud	
	Light / Medium duty		Light duty		Light duty		Light duty		Light duty	
	Base material thickness ≥ 8 mm (5/16")		Base material thickness ≥ 6 mm (15/64")		Base material thickness ≥ 8 mm (5/16")		Base material thickness ≥ 6 mm (15/64")		Base material thickness ≥ 6 mm (15/64")	
	Metric	Imperial	Metric	Imperial	Metric	Imperial	Metric	Imperial	Metric	Imperial
 Cantilever	Page 15	Page 71	Page 29	Page 85	Page 43	Page 99	Page 29	Page 85	Page 57	Page 113
 Braced cantilever	Page 16	Page 72	Page 30	Page 86	Page 44	Page 100	Page 30	Page 86	Page 58	Page 114
 Strut to steel	Page 17	Page 73	Page 31	Page 87	Page 45	Page 101	Page 31	Page 87	Page 59	Page 115
 Strut to steel	Page 18	Page 74	Page 32	Page 88	Page 46	Page 102	Page 32	Page 88	Page 60	Page 116
 T-Post (ceiling)	Page 19	Page 75	Page 33	Page 89	Page 47	Page 103	Page 33	Page 89	Page 61	Page 117
 T-Post (floor)	Page 20	Page 76	Page 34	Page 90	Page 48	Page 104	Page 34	Page 90	Page 62	Page 118
 U-Frame (ceiling)	Page 21	Page 77	Page 35	Page 91	Page 49	Page 105	Page 35	Page 91	Page 63	Page 119
 L-Post	Page 22	Page 78	Page 36	Page 92	Page 50	Page 106	Page 36	Page 92	Page 64	Page 120
 Inclined cantilever	Page 23	Page 79	Page 37	Page 93	Page 51	Page 107	Page 37	Page 93	Page 65	Page 121
 Junction boxes / switches	Page 24	Page 80	Page 38	Page 94	Page 52	Page 108	Page 38	Page 94	Page 66	Page 122

USAGE / STRUCTURAL DESIGN DISCLAIMER — 2018/05/04

- This document is updated regularly—please check for an update before using the document and always use the latest version. Please make sure to not use the document later than the indicated expiry date (left lower corner).
- Mentioned values are ONLY reflecting capacity of the fasteners / studs themselves. Structural analysis of support / structure is NOT in Hilti scope as Hilti is not aware of the relevant data.
- The user has to make sure that all instructions (for tools, fasteners and auxiliary material used) are followed strictly to achieve the required performance.
- All typical calculations are based on the capacity that is mentioned in the description of the fasteners—please refer to the respective detailed technical description. Results are rounded for simplification and to harmonize metric and imperial units.
- **Assumption:** calculation is based on rigid system model, without deformation of baseplate or cantilever.
- **Assumption:** in applications which introduce tensile and shear load to the fastener, the shear loads are assumed to be carried only by the top threaded stud(s) which also carry the tensile load, this is therefore a worst-case scenario.
- **Assumption:** considered loadings are only the static loads of the cable tray, pipe or other installed elements and the weight of the support itself.
 - Load is always acting in the center of the cable tray, pipe or installed elements, the dimension L1 is from that point to the fasteners plane—please see the description in the respective examples.
 - No other loads (e.g. wind load or loads due to installation / transportation) are known and in scope of the calculation.
- **Assumption:** there is no load in axis of the cable tray or pipe due to thermal expansion or other phenomena.

USAGE / STRUCTURAL DESIGN EXAMPLE LOADS* — CABLE TRAY AND PIPE

Example loads* can be calculated based on a standard cable tray with 50 mm height or pipe (see example tables to the right)

*Loads are typically stated in technical documents as “Force [kN]”, however it is more comprehensible to state the loads as “Weight [kg]” conversion as follows:

1 kg = 9.81 N / (weight to force);
 100 kg = 0.98 kN;
 1000 kg = 9.8 kN / (force to weight);
 1 kN = 102 kg;
 10 kN = 1019 kg

Pipe	Diameter [mm]	Load [kg/m]	Load [lb/ft]
25 DN x 33.4 OD	25	3.6	2.4
40 DN x 48.3 OD	40	6.1	4.1
50 DN x 60.3 OD	50	9.8	6.6
80 DN x 88.9 OD	80	15.8	10.6
100 DN x 114.3 OD	100	31.0	20.8
125 DN x 141.3 OD	125	45.9	30.8
150 DN x 168.3 OD	150	63.6	42.7
200 DN x 219.1 OD	200	96.9	65.1






- Load [kg/m] includes the pipe and media (by simplified calculation)
- Pipe weight is in the range of 3.0–57 kg/m (for diameter of 25–200 mm; with 1 mm pipe insulation)
- Media weight is calculated based on density of water 1.0 kg/l (per pipe cross-section) density dependent on media (e.g. oil 0.6–0.9 kg/l)

Cable tray	Width [mm]	Load [kg/m]	Load [lb/ft]
50 W x 50 H	50	7.7	5.2
100 W x 50 H	100	14.5	9.7
150 W x 50 H	150	21.2	14.2
200 W x 50 H	200	27.9	18.7
300 W x 50 H	300	41.4	27.8
450 W x 50 H	450	61.6	41.4
600 W x 50 H	600	81.9	55.0
900 W x 50 H	900	122.3	82.2

- Load [kg/m] includes the cable tray and cable carried by the cable tray (by simplified calculation)
- Cable tray weight (steel, t = 1.25 mm) is in the range of 1.5–9.8 kg/m (for width of 50–900 mm)
- Cable weight is calculated based on an average filling density of 0.25 kg/m/cm² cable tray cross-section typical cable range from 0.15–0.35 kg/m/cm²

FASTENERS USED FOR TYPICALS CALCULATION

Blunt Tip / Sharp Tip Fasteners

Key Questions	Fastener	X-BT-MR Threaded stud (new generation)	S-BT-MR Threaded stud	X-BT-MF Threaded stud	S-BT-MF Threaded stud	X-ST-GR Threaded stud
						
	Material	Stainless steel A4, 316	Stainless steel A4, 316	Stainless steel A2, FRP	Hot-dip galvanized	Stainless steel A2, 304
1	Corrosive environment	Highly corrosive C4, C5	Highly corrosive C4, C5	Mildly corrosive C3	Mildly corrosive C3	Mildly corrosive C3
2	Damage to coating	No @ ≥ 8 mm (5/16")	No @ ≥ 6 mm (1/4")	No @ ≥ 8 mm (5/16")	No @ ≥ 6 mm (1/4")	Yes
3	Application Limit*	≥ 8 mm (5/16") full steel	≥ 6 mm (1/4") full steel	≥ 8 mm (5/16") full steel	≥ 6 mm (1/4") full steel	6 mm (1/4") full steel
	Base material	<ul style="list-style-type: none"> • Steel • Stainless Steel • Cast iron 	<ul style="list-style-type: none"> • Steel • Aluminum 	<ul style="list-style-type: none"> • Steel • Stainless Steel • Cast iron 	<ul style="list-style-type: none"> • Steel • Aluminum 	<ul style="list-style-type: none"> • Steel
	Tensile load (N_{rec})	3.6 kN (810 lb)	Steel 1.8 kN (405 lb) Alu 1.0 kN (225 lb)	1.5 kN (340 lb)	Steel 1.8 kN (405 lb) Alu 1.0 kN (225 lb)	1.8 kN (405 lb)
	Shear load (V_{rec})	4.3 kN (970 lb)	Steel 2.6 kN (585 lb) Alu 1.5 kN (340 lb)	2.2 kN (500 lb)	Steel 2.6 kN (585 lb) Alu 1.5 kN (340 lb)	1.8 kN (405 lb)
	Tightening torque	20 Nm (14.8 ft-lb)	8 Nm (5.9 ft-lb)	8 Nm (5.9 ft-lb)	8 Nm (5.9 ft-lb)	8.5 Nm (6.3 ft-lb)
	Pilot hole required	Yes	Yes	Yes	Yes	No
	Available thread diameter	M8 MW6 MW10	M8 MW10	MW10	M8 MW10	M8
	Max. fastened material height	$t_1 \leq 15$ mm (5/16") Removable	$t_1 \leq 15$ mm (5/16") Removable	$t_1 \leq 10$ mm (3/8") Removable	$t_1 \leq 15$ mm (5/16") Removable	$t_1 \leq 10$ mm (3/8") Removable
	Required equipment	SF BT 22-A and DX 351-BT	SBT 4-A22	SF BT 22-A and DX 351-BT	SBT 4-A22	DX 5 and DX 76 PTR
	Approvals	DNV GL, ABS, LR, BV, ICC-ES	DNV GL, ABS, LR, BV, ICC-ES	ICC, UL	DNV GL, ABS, LR, BV, ICC-ES	ICC-ES, ABS

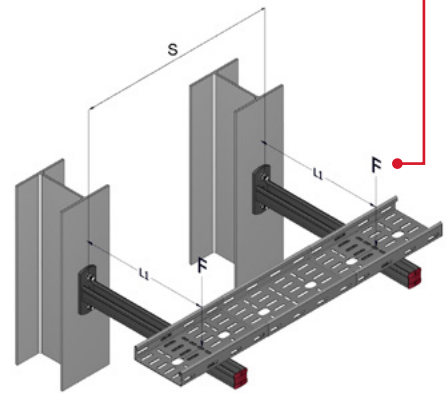
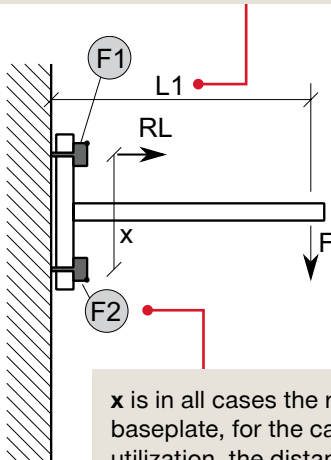
*Application Limit @ S275 | Grade A36 Steel | Refer to the Direct Fastening Technology Manual (DTFM) for detailed technical data

HOW TO USE THIS DOCUMENT

How to interpret the sketches

L1 is in all cases the relevant dimension of the lever arm / cantilever “distance from fastener to load”

F is in all cases the total load which has to be borne by the structure and it includes the pay load and the load of the structure itself



x is in all cases the relevant dimension of the baseplate, for the calculation of the fastener utilization, the distance of the involved fasteners

How to read the technical tables

Result parameter L1 in [mm]	Result: L1 [mm]	F [kg]							
		50	75	100	125	150	200	250	300
	→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
2 nd base parameter x in [mm]	80	585	390	285	210	165	105	70	50
	100	730	485	355	265	205	135	90	60
	125	915	610	445	335	260	170	115	75
	150	1100	730	530	400	310	200	135	90
	175	1280	855	620	470	365	235	160	110
	200	1465	975	710	535	415	270	180	125

Result parameter Load in [kg]	Result: Load F [kg]	L1 [mm]							
		150	200	250	400	600	800	1000	1200
2 nd base parameter x in [mm]	80	160	130	110	70	45	35	25	20
	100	185	155	130	90	60	45	35	30
	125	215	180	155	105	75	55	45	35
	150	235	200	175	125	90	65	55	45
	175	255	220	190	140	100	80	60	50
	200	275	235	210	155	110	90	70	60

HOW TO USE THIS DOCUMENT

We can utilize the following tables to solve different typical use cases

Application	Customer's typical use cases					Typical customer task
	Use Case	L1	x	F	RL	
	A	?	✓	✓	✓	▶ "I know the loads and use existing baseplates, I have different lever-arm length, so what is the maximum L1 ?"
	B	✓	?	✓	✓	▶ "I know loads and the required lever-arm. I want to minimize the baseplate size, so what is minimum x ?"
	C	✓	✓	?	✓	▶ "I already have supports available and want to know maximum allowable load, so what maximum F can I use?"
D	✓	✓	✓	?	▶ "I already have supports available and want to minimize the number of supports, so how do I use RL for that?"	

- F1 - F4 fasteners
- F load on the support
- RL resulting load (tensile and shear load)
- L1 support lever length
- x support basis (=distance of fasteners)

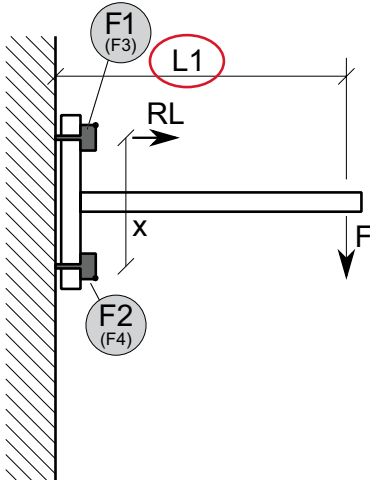
It is recommended to position the support lever half way between the fasteners to ease installation

✓ Parameter is known; ? Parameter is the table output

USE CASES IN DETAIL

Use Case A: maximize L1 and achieve a required length

Application



L1	x	F	RL
?	✓	✓	✓
✓	?	✓	✓
✓	✓	?	✓
✓	✓	✓	?

F1 – F4 fasteners
 F load on the support
 RL resulting load
 (tensile and shear load)
 L1 support lever length
 x support basis
 (=distance of fasteners)

Example – Use Case A

Outset situation

- Cable tray type 450 W x 50 H; span $s = 2.2 \text{ m}$ → results in load of 140 kg per support (example table: $2.2 \text{ m} \times 63.63 \text{ kg/m}$)
- N is defined by 4 fasteners (e.g. X-BT-MR)
- $x = 175 \text{ mm}$ (baseplates are already available and by thus the distance x is already given)

Task

The lever-arm length should be as long as possible to gain flexibility. It needs to be at least 0.3 m

Solution

Step 1: select the typical slide for the right application and number of fasteners (2 or 4 studs)

Step 2: select the table (preferred one for this task is the table which gives “L1” as result)

Step 3: select the appropriate column with the load F (which is equal or greater than the given load)

Step 4: select the appropriate row with the support distance x (which is equal or smaller than the given support distance)

Result: $x = 855 \text{ mm}$ the maximum length L1 is 380 mm

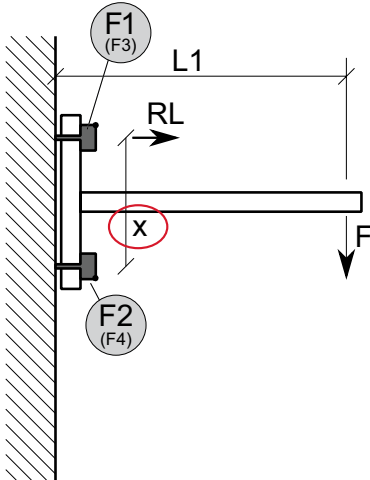
Result:	F [kg]								
L1 [mm]	50	75	100	150	200	250	300		
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94	
x [mm]	80	1170	780	585	465	390	285	210	165
	100	1465	975	730	585	485	355	265	205
	125	1830	1220	915	730	610	445	335	260
	150	2200	1465	1100	880	730	530	400	310
	175	2665	1740	1280	1020	855	620	470	365
	2935	1955	1465	1170	975	710	535	415	

Ⓡ L1 is 855 mm — meets requirement

USE CASES IN DETAIL

Use Case B: minimize x and determine required baseplate

Application



L1	x	F	RL
?	✓	✓	✓
✓	?	✓	✓
✓	✓	?	✓
✓	✓	✓	?

F1 – F4 fasteners
 F load on the support
 RL resulting load (tensile and shear load)
 L1 support lever length
 x support basis (=distance of fasteners)

Example – Use Case B

Outlet situation

- Cable tray type 450 W x 50 H; span $s = 2.2$ m → results in load of 140 kg per support (example table: 2.2 m x 63.63 kg/m)
- N is defined by 4 fasteners (e.g. X-BT-MR)
- L1 = 300 mm (required position of the cable tray, existing cantilever supports)

Task

The size of the baseplate, distance of fasteners (e.g. X-BT-MR) should be as short as possible, existing baseplates provide $x = 80$ mm

Solution

Step 1: select the typical slide for the right application and number of fasteners (2 or 4 studs)

Step 2: select the table (preferred one for this task is the table which gives “L1” as result; the right table would also work)

Step 3: select the appropriate column with the load F (which is equal or greater than the given load)

Step 4: select the appropriate row with the lever arm distance L1 (which is equal or greater than the given lever arm distance)

Result: the minimum required support distance x is 80 mm → the existing baseplate with $x = 80$ mm works fine

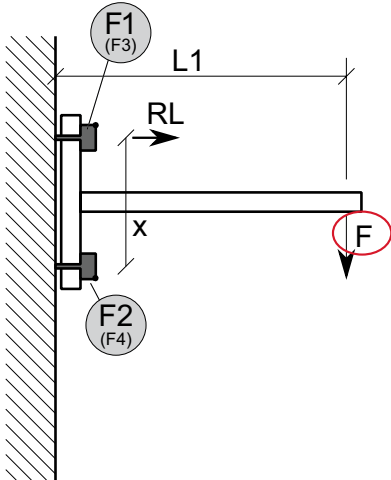
Result: L1 [mm]	F [kg]								
	50	75	100	125	150	200	250	300	
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94	
R	80	1170	780	585	485	390	4	210	165
x [mm]	100	1465	975	730	585	485	355	265	205
	125	1830	1220	915	730	610	445	335	260
	150	2200	1465	1100	880	730	530	400	310
	175	2565	1710	1280	1025	855	620	470	365
	200	2935	1955	1465	1170	975	710	535	415

R x is 80 mm—meets requirement

USE CASES IN DETAIL

Use Case C: determine allowed load

Application



L1	x	F	RL
?	✓	✓	✓
✓	?	✓	✓
✓	✓	?	✓
✓	✓	✓	?

- F1 – F4 fasteners
- F load on the support
- RL resulting load (tensile and shear load)
- L1 support lever length
- x support basis (=distance of fasteners)

Example – Use Case C

Outset situation

- **x = 175 mm** (existing cantilever supports)
- **L1 = 400 mm** (required position of the cable tray, existing cantilever supports)
- **N is defined by 4 fasteners** (e.g. X-BT-MR)

Task

How much load **F** is allowed

Solution

Step 1: select the typical slide for the right application and number of fasteners (2 or 4 studs)

Step 2: select the table (preferred one for this task is the table which gives “**F**” as result)

Step 3: select the appropriate column with the lever arm length **L1** (which is equal or greater than the given length)

Step 4: select the appropriate row with the support distance **x** (which is equal or smaller than the given support distance)

Result: the maximum allowed **F** is 140 kg (allows e.g. 2.2 m * 63.63 kg/m = cable tray 450 W x 50 H, see example table)

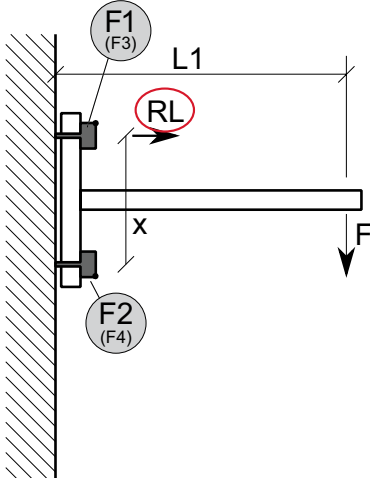
Result:		L1 [mm]							
Load F [kg]		150	200	300	400	600	800	1000	1200
x [mm]	80	320	260	220	145	95	70	55	45
	100	375	310	260	180	120	90	70	60
	125	430	360	310	215	150	110	90	75
	150	475	405	350	250	185	135	110	90
	175	515	440	385	280	205	160	125	105
	200	550	475	420	310	225	180	145	120

Ⓜ F is 280 kg

USE CASES IN DETAIL

Use Case D: determine required fastener

Application



L1	x	F	RL
?	✓	✓	✓
✓	?	✓	✓
✓	✓	?	✓
✓	✓	✓	?

- F1 – F4 fasteners
- F load on the support
- RL resulting load (tensile and shear load)
- L1 support lever length
- x support basis (=distance of fasteners)

Example – Use Case D

Outset situation

- **x = 175 mm** (existing cantilever supports)
- **L1 = 400 mm** (required position of the cable tray, existing cantilever supports)
- **F is 100 kg**

Task

How many fasteners (e.g. X-BT-MR) are required (2 or 4 supported by the existing cantilever supports)

Solution

Step 1: select the typical slide for the right application and number of fasteners (here you need 2 and 4 studs) Follow the steps 1–4 through for both cases “2 X-BT-MR” and “4 X-BT-MR”

Step 2: select the table (preferred one for this task is the table which gives “F” as result)

Step 3: select the appropriate column with the lever arm length L1 (which is equal or greater than the given length)

Step 4: select the appropriate row with the support distance x (which is equal or smaller than the given support distance)

Result: the maximum load is 140 kg (2 X-BT-MR). You can use 2 X-BT-MR with the given load 100 kg

1 **HILTI** X-BT-MR • Metric

FASTENING CANTILEVER SUPPORT WITH X-BT-MR®

Two / Four X-BT-MR Threaded studs

Application

- Fastening of cable trays, pipes on a horizontal cantilever support, fastened on a vertical structure
- Support is fastened by two / four X-BT-MR on both support and brace baseplate with distance x
- L1 is the distance of the load center to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of X-BT-MR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer – 2019/06/04
- Shear load fully carried by one / two top X-BT-MR (worst case)
- Load F acting at the distance of L1 from structure surface

2 **Technical assessment – maximum of F (depending on load F or lever arm length L1 and baseplate distance x)**

L1 [mm]	F [kg]										
	50	75	100	125	150	200	250	300	400	500	600
80	160	130	110	70	45	35	25	20			
100	185	155	130	90	60	45	35	30			
125	215	180	155	105	75	55	45	35			
150	235	200	175	125	90	65	55	45			
175	255	220	195	140	100	80	60	50			
200	275	235	210	155	110	90	70	60			

3 **Result: Load F [kg]**

L1 [mm]	F [kg]										
	50	75	100	125	150	200	250	300	400	500	600
80	160	130	110	70	45	35	25	20			
100	185	155	130	90	60	45	35	30			
125	215	180	155	105	75	55	45	35			
150	235	200	175	125	90	65	55	45			
175	255	220	195	140	100	80	60	50			
200	275	235	210	155	110	90	70	60			

4 **Result: the maximum load is 140 kg (2 X-BT-MR). You can use 2 X-BT-MR with the given load 100 kg**

NOTE: load capacity used for calculation $N_{t,s} = 3.6 \text{ kN (tensile)}$; $V_{s,R} = 4.3 \text{ kN (shear)}$

Issued August 2018, expiry January 2021

x [mm]	L1 [mm]									
	150	200	300	400	600	800	1000	1200		
80	160	130	110	70	45	35	25	20		
100	185	155	130	90	60	45	35	30		
125	215	180	155	105	75	55	45	35		
150	235	200	175	125	90	65	55	45		
175	255	220	195	140	100	80	60	50		
200	275	235	210	155	110	90	70	60		

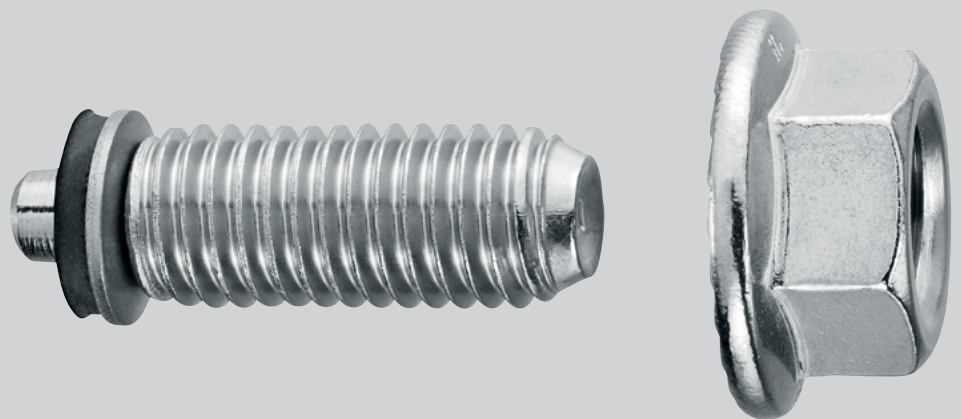
3 4 X-BT-MR: F is 280 kg
2 X-BT-MR: F is 140 kg → 2 X-BT-MR





X-BT-MR THREADED STUD (NEW GENERATION)

Metric



X-BT-MR (NEW GENERATION) TECHNICAL DATA

X-BT-MR technical data

- **Drill hole type / base material:** Pilot hole, $t_{II} \geq 8$ mm (0.31")
- **Base material:** Steel S235 / A36 (higher steel strength is possible, increases the rec. load)
- **Recommended interaction for combined load:** $N_{rec} = 3.6$ kN (axial) / $V_{rec} = 4.3$ kN (shear)

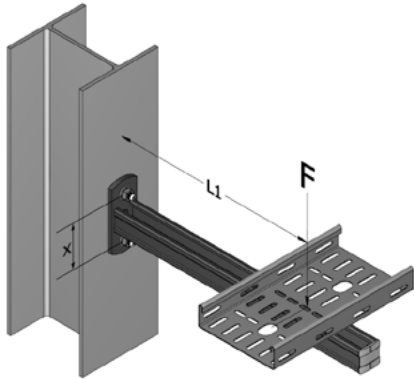
V-N (shear and tension)

$$\frac{V}{V_{rec}} + \frac{N}{N_{rec}} \leq 1.2 \quad \text{with} \quad \frac{V}{V_{rec}} \leq 1.0 \quad \text{and} \quad \frac{N}{N_{rec}} \leq 1.0$$

For further technical data refer to DFTM / New Generation Hilti X-BT-GR, X-BT-MR and X-BT-ER Threaded Fastener Specification [June 2018]

FASTENING CANTILEVER SUPPORT WITH X-BT-MR*

Two / Four X-BT-MR Threaded studs



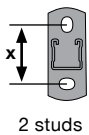
Application

- Fastening of cable trays, pipes on a horizontal cantilever support, fastened on a vertical structure
- Support is fastened by two / four X-BT-MR on both support and brace baseplate with distance x
- L1 is the distance of the load center to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

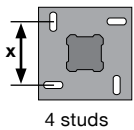
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- Shear load fully carried by one / two top X-BT-MR (worst-case)
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of F (depending on load F or lever arm length L1 and baseplate distance x)



Result: L1 [mm]	F [kg]								
	50	75	100	125	150	200	250	300	
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94	
x [mm]	80	585	390	285	210	165	105	70	50
	100	730	485	355	265	205	135	90	60
	125	915	610	445	335	260	170	115	75
	150	1100	730	530	400	310	200	135	90
	175	1280	855	620	470	365	235	160	110
	200	1465	975	710	535	415	270	180	125

Result: Load F [kg]	L1 [mm]								
	150	200	250	400	600	800	1000	1200	
x [mm]	80	160	130	110	70	45	35	25	20
	100	185	155	130	90	60	45	35	30
	125	215	180	155	105	75	55	45	35
	150	235	200	175	125	90	65	55	45
	175	255	220	190	140	100	80	60	50
	200	275	235	210	155	110	90	70	60



Result: L1 [mm]	F [kg]								
	50	75	100	125	150	200	250	300	
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94	
x [mm]	80	1170	780	585	465	390	285	210	165
	100	1465	975	730	585	485	355	265	205
	125	1830	1220	915	730	610	445	335	260
	150	2200	1465	1100	880	730	530	400	310
	175	2565	1710	1280	1025	855	620	470	365
	200	2935	1955	1465	1170	975	710	535	415

Result: Load F [kg]	L1 [mm]								
	150	200	250	400	600	800	1000	1200	
x [mm]	80	320	260	220	145	95	70	55	45
	100	375	310	260	180	120	90	70	60
	125	430	360	310	215	150	110	90	75
	150	475	405	350	250	180	135	110	90
	175	515	440	385	280	205	160	125	105
	200	550	475	420	310	225	180	145	120

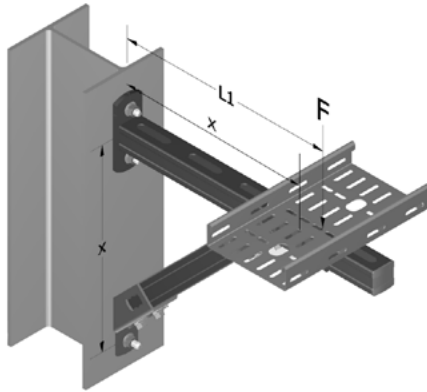
NOTE: load capacity used for calculation $N_{rec} = 3.6 \text{ kN}$ (axial) / $V_{rec} = 4.3 \text{ kN}$ (shear)

*X-BT-MR is the new generation X-BT

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FASTENING BRACED CANTILEVER SUPPORT WITH X-BT-MR*

Two / Four X-BT-MR Threaded studs



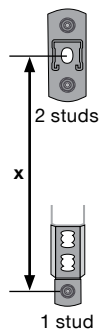
Application

- Fastening of cable trays, pipes on a horizontal, braced cantilever support, fastened on a vertical structure
- Support is fastened by three / six X-BT-MR on both support and brace baseplate with distance x
- L1 is the distance of the load center to the vertical structure surface, the angle of the brace is 45°
- Load F is the acceptable total load (all dead load including)

Boundary conditions

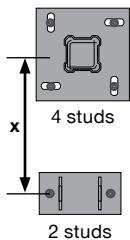
- These values are ONLY reflecting capacity of X-BT-MR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Shear load fully carried by one / two top X-BT-MR (worst-case)
- Load F acting at the distance of L1 from structure surface

Technical assessment — maximum of F (depending on load F or lever arm length L1 and baseplate distance x)



Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	100	500	390	325	280	215	175	145
	150	750	585	485	420	325	260	215
	200	1000	780	650	560	435	350	290
	350	1755	1370	1140	985	765	610	510
	500	2505	1955	1630	1410	1095	875	730
	800	4010	3135	2605	2255	1750	1400	1165

Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	100	290	215	175	105	70		
	150	435	325	260	160	105		
	200		435	350	215	145		
	350				380	255		
	500					365		
	800							



Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	100			585	500	390	325	280
	150			880	750	585	485	420
	200			1175	1000	780	650	560
	350			2060	1755	1370	1140	985
	500			2945	2505	1955	1630	1410
	800			4715	4010	3135	2605	2255

Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	100	580	435	350	215	145		
	150	875	655	525	325	215	160	130
	200		875	700	435	290	215	175
	350				765	510	380	305
	500					730	545	435
	800						875	700

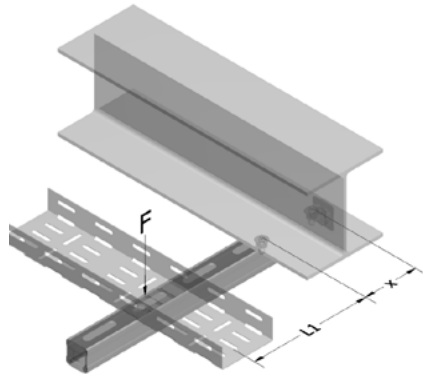
NOTE: load capacity used for calculation $N_{rec} = 3.6 \text{ kN}$ (axial) / $V_{rec} = 4.3 \text{ kN}$ (shear)

*X-BT-MR is the new generation X-BT

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FASTENING STRUT TO STEEL WITH X-BT-MR*

Two X-BT-MR Threaded studs



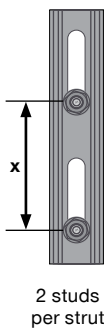
Application

- Fastening of cable trays, pipes on a horizontal cantilever support, fastened on a horizontal structure
- Support is fastened by two X-BT-MR (horizontal distance x)
- L1 is the distance of the load center to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of X-BT-MR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-BT-MR distance x)



Result: L1 [mm]	F [kg]								
	50	75	100	125	150	200	250	300	
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94	
x [mm]	80	505	310	210	150	115	65	35	15
	100	630	385	265	190	140	80	45	20
	125	790	485	330	240	180	100	55	25
	150	950	580	400	290	215	125	70	30
	175	1105	680	465	335	250	145	80	35
	200	1265	775	530	385	285	165	90	40

Result: Load F [kg]	L1 [mm]								
	150	200	250	400	600	800	1000	1200	
x [mm]	80	125	100	85	60	40	30	25	20
	100	145	120	100	70	50	40	30	25
	125	165	140	120	85	60	45	40	30
	150	180	155	135	100	70	55	45	40
	175	195	170	150	110	80	65	50	45
	200	205	180	160	120	90	70	60	50

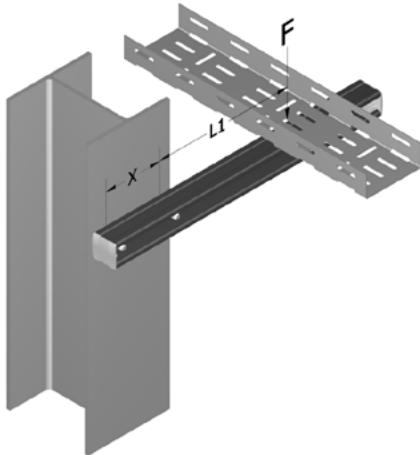
NOTE: load capacity used for calculation $N_{rec} = 3.6 \text{ kN (axial)} / V_{rec} = 4.3 \text{ kN (shear)}$

*X-BT-MR is the new generation X-BT

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FASTENING STRUT TO STEEL WITH X-BT-MR*

Two / Four X-BT-MR Threaded studs



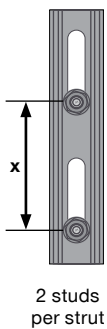
Application

- Fastening of cable trays, pipes on a horizontal cantilever support, fastened on a vertical structure
- Support is fastened by two X-BT-MR (horizontal distance x)
- L1 is the distance of the load center to the center of the fasteners
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of X-BT-MR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Shear load fully carried by one X-BT-MR (worst-case)
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-BT-MR distance x)



Result: L1 [mm]	F [kg]								
	50	75	100	125	150	200	250	300	
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94	
x [mm]	80	620	385	270	200	150	95	60	35
	100	775	480	335	250	190	115	75	45
	125	970	605	420	310	240	145	90	55
	150	1160	725	505	375	285	175	110	65
	175	1355	845	590	435	335	205	130	80
	200	1550	965	675	500	380	235	150	90

Result: Load F [kg]	L1 [mm]								
	150	200	250	400	600	800	1000	1200	
x [mm]	80	150	125	105	70	50	35	30	25
	100	175	145	125	85	60	45	35	30
	125	195	165	145	100	75	55	45	40
	150	215	185	160	115	85	65	55	45
	175	235	200	180	130	95	75	65	55
	200	250	215	190	145	105	85	70	60

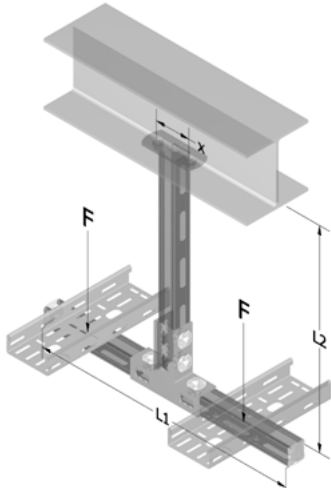
NOTE: load capacity used for calculation $N_{rec} = 3.6 \text{ kN (axial)} / V_{rec} = 4.3 \text{ kN (shear)}$

*X-BT-MR is the new generation X-BT

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FASTENING T-POST (CEILING) SUPPORT WITH X-BT-MR*

Two / Four X-BT-MR Threaded studs



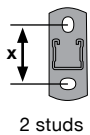
Application

- Fastening of cable trays, pipes on a T-Post support, which is fastened on a horizontal structure
- Support is fastened by two / four X-BT-MR (horizontal distance x)
- L1 is the total width of the T-Post, L2 is fix set to 1000 mm
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of X-BT-MR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- 2 Load cases: load asymmetric acting in the center of one arm only, 30% acting as horizontal load

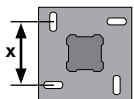
Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-BT-MR distance x)



2 studs

Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	80	2185	1405					
	100	2735	1755	1265				
	125	3415	2195	1580				
	150	4100	2635	1900	1460			
	175	4785	3075	2215	1705	1360		
	200	5470	3510	2535	1945	1555		

Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	85	85	85	85	85	85	85
	100	100	100	100	100	100	100	100
	125	125	125	125	125	125	125	125
	150	145	145	145	145	145	145	145
	175	165	165	165	165	165	165	165
	200	180	180	180	180	180	180	180



4 studs

Result: L1 [mm]	F [kg]								
	50	75	100	125	150	200	250	300	
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94	
x [mm]	80	4535	2970	2185	1715	1405			
	100	5670	3710	2735	2145	1755	1265		
	125	7085	4640	3415	2685	2195	1580		
	150	8505	5570	4100	3220	2635	1900	1460	
	175	9925	6500	4785	3760	3075	2215	1705	1360
	200	11340	7425	5470	4295	3510	2535	1945	1555

Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	150	150	150	150	150	150	150
	100	180	180	180	180	180	180	180
	125	215	215	215	215	215	215	215
	150	240	240	240	240	240	240	240
	175	270	270	270	270	270	270	270
	200	290	290	290	290	290	290	290

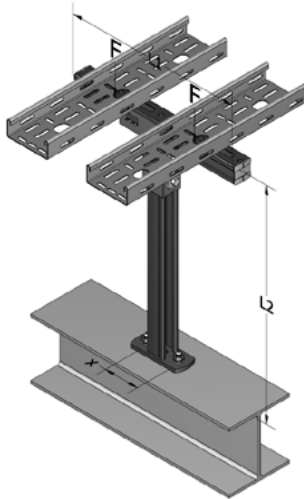
NOTE: load capacity used for calculation $N_{rec} = 3.6$ kN (axial) / $V_{rec} = 4.3$ kN (shear)

*X-BT-MR is the new generation X-BT

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FASTENING T-POST (FLOOR) SUPPORT WITH X-BT-MR*

Two / Four X-BT-MR Threaded studs



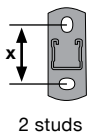
Application

- Fastening of cable trays, pipes on a T-Post support, which is fastened on a horizontal structure
- Support is fastened by two / four X-BT-MR (horizontal distance x)
- L1 is the total width of the T-Post, L2 is fix set to 1000 mm
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of X-BT-MR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- 2 Load cases: load asymmetric acting in the center of one arm only, 30% acting as horizontal load

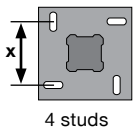
Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-BT-MR distance x)



2 studs

Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	80	2505	1725					
	100	3135	2155	1665				
	125	3915	2695	2080	1715	1470		
	150	4700	3235	2500	2060	1765		
	175	5485	3775	2915	2405	2060	1630	
	200	6270	4310	3335	2745	2355	1865	

Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	95	95	95	95	95	95	95
	100	120	120	120	120	120	120	120
	125	150	150	150	150	150	150	150
	150	180	180	180	180	180	180	180
	175	210	210	210	210	210	210	210
	200	240	240	240	240	240	240	240



4 studs

Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	80	4855	3290					
	100	6070	4110	3135				
	125	7585	5140	3915	3185	2695		
	150	9105	6170	4700	3820	3235		
	175	10625	7200	5485	4460	3775	2915	
	200	12140	8225	6270	5095	4310	3335	

Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	195	195	195	195	195	195	195
	100	240	240	240	240	240	240	240
	125	305	305	305	305	305	305	305
	150	365	365	365	365	365	365	365
	175	425	425	425	425	425	425	425
	200	485	485	485	485	485	485	485

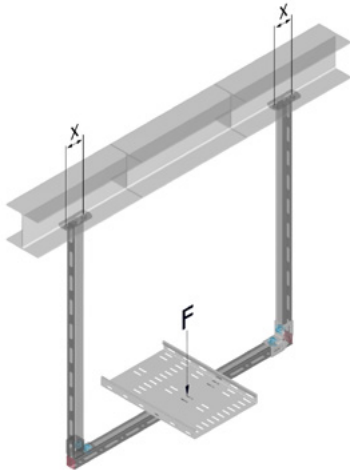
NOTE: load capacity used for calculation $N_{rec} = 3.6 \text{ kN}$ (axial) / $V_{rec} = 4.3 \text{ kN}$ (shear)

*X-BT-MR is the new generation X-BT

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FASTENING U-FRAME (CEILING) / TRAPEZE SUPPORT WITH X-BT-MR*

Two / Four X-BT-MR Threaded studs



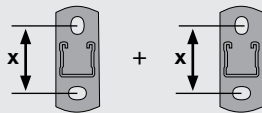
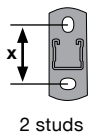
Application

- Fastening of cable trays, pipes on a U-Frame support, which is fastened on a horizontal structure
- Support is fastened by four X-BT-MR (2 fasteners per baseplate)
- Load F is the acceptable total load (all dead load including, acting in the center of the U-Frame)

Boundary conditions

- These values are ONLY reflecting capacity of X-BT-MR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Load acting in the center (U-Frame)

Technical assessment — maximum of F



$$F = N_{rec} \cdot \text{\#fasteners per post}$$

$$F = 3.6 \text{ kN} \cdot 4$$

$$F = 14.4 \text{ kN} / F = 1470 \text{ kg}$$

NOTE: load capacity used for calculation $N_{rec} = 3.6 \text{ kN}$ (axial) / $V_{rec} = 4.3 \text{ kN}$ (shear)

*X-BT-MR is the new generation X-BT

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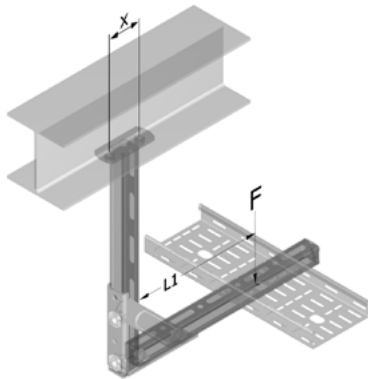
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FASTENING L-POST SUPPORT WITH X-BT-MR*

Two / Four X-BT-MR Threaded studs



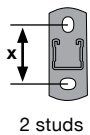
Application

- Fastening of cable trays, pipes on a L-Post support, which is fastened on a horizontal structure
- Support is fastened by two / four X-BT-MR (horizontal distance x)
- L1 is the distance of the load center to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

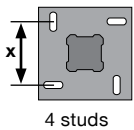
- These values are ONLY reflecting capacity of X-BT-MR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-BT-MR distance x)



Result: L1 [mm]	F [kg]								
	50	75	100	125	150	200	250	300	
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94	
x [mm]	80	545	350	250	190	155	105	75	55
	100	680	435	315	240	190	130	95	70
	125	850	545	395	300	240	165	120	90
	150	1025	655	475	365	290	200	145	105
	175	1195	765	550	425	340	230	165	125
	200	1365	875	630	485	385	265	190	140

Result: Load F [kg]	L1 [mm]								
	150	200	250	400	600	800	1000	1200	
x [mm]	80	150	120	100	65	45	30	25	20
	100	180	145	120	80	55	40	30	25
	125	215	170	145	95	65	50	40	35
	150	240	200	165	115	80	60	50	40
	175	270	220	190	130	90	70	55	45
	200	290	240	205	145	100	80	65	55



Result: L1 [mm]	F [kg]								
	50	75	100	125	150	200	250	300	
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94	
x [mm]	80	1130	740	545	425	350	250	190	155
	100	1415	925	680	535	435	315	240	190
	125	1770	1160	850	670	545	395	300	240
	150	2125	1390	1025	805	655	475	365	290
	175	2480	1625	1195	940	765	550	425	340
	200	2835	1855	1365	1070	875	630	485	385

Result: Load F [kg]	L1 [mm]								
	150	200	250	400	600	800	1000	1200	
x [mm]	80	305	240	200	130	90	65	55	45
	100	365	290	240	160	110	85	65	55
	125	430	345	290	195	135	105	85	70
	150	485	400	335	230	160	125	100	85
	175	540	445	380	260	185	140	115	95
	200	585	485	415	290	205	160	130	110

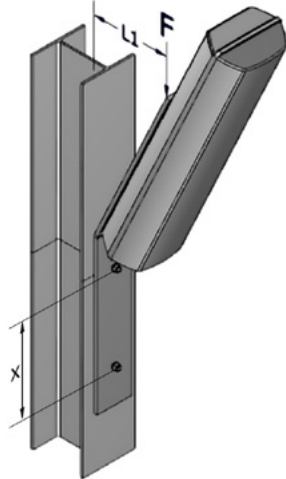
NOTE: load capacity used for calculation $N_{rec} = 3.6 \text{ kN}$ (axial) / $V_{rec} = 4.3 \text{ kN}$ (shear)

*X-BT-MR is the new generation X-BT

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FASTENING EQUIPMENT SUPPORT WITH X-BT-MR*

Two / Four X-BT-MR Threaded studs



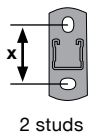
Application

- Fastening of lamps, signals, sensors on inclined cantilever support, fastened on a vertical structure
- Support is fastened by two / four X-BT-MR (vertical distance x)
- L1 is the distance of the load center (~middle of the load) to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

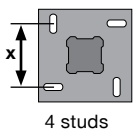
- These values are ONLY reflecting capacity of X-BT-MR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Shear load fully carried by one / two top X-BT-MR (worst-case)
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-BT-MR distance x)



Result: L1 [mm]	F [kg]								
	50	75	100	125	150	200	250	300	
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94	
x [mm]	80	585	390	285	210	165	105	70	50
	100	730	485	355	265	205	135	90	60
	125	915	610	445	335	260	170	115	75
	150	1100	730	530	400	310	200	135	90
	175	1280	855	620	470	365	235	160	110
	200	1465	975	710	535	415	270	180	125

Result: Load F [kg]	L1 [mm]								
	150	200	250	400	600	800	1000	1200	
x [mm]	80	160	130	110	70	45	35	25	20
	100	185	155	130	90	60	45	35	30
	125	215	180	155	105	75	55	45	35
	150	235	200	175	125	90	65	55	45
	175	255	220	190	140	100	80	60	50
	200	275	235	210	155	110	90	70	60



Result: L1 [mm]	F [kg]								
	50	75	100	125	150	200	250	300	
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94	
x [mm]	80	1170	780	570	425	335	215	145	100
	100	1465	975	710	535	415	270	180	125
	125	1830	1220	890	670	520	340	230	155
	150	2200	1465	1065	805	625	405	275	185
	175	2565	1710	1245	940	730	475	320	220
	200	2935	1955	1425	1070	835	545	365	250

Result: Load F [kg]	L1 [mm]								
	150	200	250	400	600	800	1000	1200	
x [mm]	80	320	260	220	145	95	70	55	45
	100	375	310	260	180	120	90	70	60
	125	430	360	310	215	150	110	90	75
	150	475	405	350	250	180	135	110	90
	175	515	440	385	280	205	160	125	105
	200	550	475	420	310	225	180	145	120

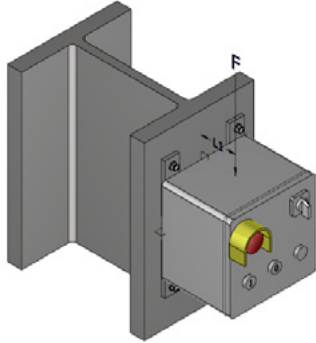
NOTE: load capacity used for calculation $N_{rec} = 3.6$ kN (axial) / $V_{rec} = 4.3$ kN (shear)

*X-BT-MR is the new generation X-BT

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FASTENING JUNCTION BOXES / SWITCHES WITH X-BT-MR*

X-BT-MR Threaded stud



Application

- Fastening of junction boxes, switches on a vertical structure
- Element is fastened by X-BT-MR

Boundary conditions

- These values are ONLY reflecting capacity of X-BT-MR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Technical data are based on technical data binder for X-BT-MR (06 / 2018), always refer to latest technical data binder for X-BT-MR

Technical data — always refer to latest technical data binder for X-BT-MR

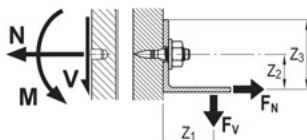
Recommended load	X-BT-MR		
Drill hole type and base material thickness	Pilot hole, $t_{II} \geq 8 \text{ mm (0.31")}$		
Base material	Steel S235 A36	Steel S355 Grade 50	Cast iron with spheroidal graphite
Tension, N_{rec} [kN / lb]	3.6 / 810	4.6 / 1030	1.0 / 230
Shear, V_{rec} [kN / lb]	4.3 / 970	5.3 / 1190	1.5 / 340
Moment, M_{rec} [Nm / ft-lb]	20.0 / 14.8	20.0 / 14.8	16.0 / 11.5

Design resistance	X-BT-MR		
Drill hole type and base material thickness	Pilot hole, $t_{II} \geq 8 \text{ mm (0.31")}$		
Base material	Steel S235 A36	Steel S355 Grade 50	Cast iron with spheroidal graphite
Tension, N_{Rd} [kN / lb]	5.0	6.5	1.6
Shear, V_{Rd} [kN / lb]	6.0	7.5	2.4
Moment, M_{Rd} [Nm / ft-lb]	28.0	28.0	26.0

Conditions for recommended loads

- Global factor of safety for static pull-out > 3 (based on 5% fractile value), ≥ 5 (based on mean value)
- Minimum edge distance = 6 mm [$\frac{1}{4}$ "]
- Effect of base metal vibration and stress considered
- Redundancy (multiple fastening) must be provided
- Recommended loads in the table refer to the resistance of the individual fastening and may not be the same as the loads F_N and F_V acting on the fastened part

Note: if relevant, prying forces need to be considered in design, see example. Moment acting on fastener shank only in case of a gap between base and fastened material.



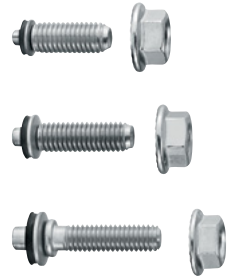
Recommended interaction formula for combined loading — steel and cast iron base material

Combined loading situation	Interaction formula
V-N (shear and tension)	$\frac{V}{V_{rec}} + \frac{N}{N_{rec}} \leq 1.2$ with $\frac{V}{V_{rec}} \leq 1.0$ and $\frac{N}{N_{rec}} \leq 1.0$
V-M (shear and bending)	$\frac{V}{V_{rec}} + \frac{M}{M_{rec}} \leq 1.2$ with $\frac{V}{V_{rec}} \leq 1.0$ and $\frac{M}{M_{rec}} \leq 1.0$
N-M (tension and bending)	$\frac{N}{N_{rec}} + \frac{M}{M_{rec}} \leq 1.0$
V-N-M (shear, tension and bending)	$\frac{V}{V_{rec}} + \frac{N}{N_{rec}} + \frac{M}{M_{rec}} \leq 1.0$

*X-BT-MR is the new generation X-BT

X-BT-MR* CATALOG PAGES

Description	Base Material	Environment	Item Number
Threaded stud X-BT-MR M8/14 SN 8	Steel	Highly corrosive	2194339
Threaded stud X-BT-MR M6/14 SN 8	Steel	Highly corrosive	2194337
Threaded stud X-BT-MR W6/14 SN 8	Steel	Highly corrosive	2194338
Threaded stud X-BT-MR M10/15 SN 8	Steel	Highly corrosive	2194340
Threaded stud X-BT-MR W10/15 SN 8	Steel	Highly corrosive	2194341



Tool Kit	Item Number
X-BT tool set*	Local item
DX 351-BT powder-actuated tool	Local item
Piston X-351 BT	378676
Fastener guide BT FG M1024 for metric studs	378674
Fastener guide BT FG W1024 for Whitworth studs	378673
6.8/11 M10 brown cartridge	412689
SF BT 22-A cordless drill	2123719



Accessories	Item Number
Stepped drill bit TX-BT 4.7/7-80	2197930
Nut setter S-NS 13C (for use with M8 flange nuts)	2149244
Socket wrench insert X-NSD 1/4" - 10 mm (for M6)	2197934
Socket wrench insert X-NSD 1/4" - 25/64" (for W6)	2197935
Nut setter S-NS 15C (for M10)	2149245
Nut setter S-NS 9/16"C95/3 3/4" (for W10)	2149246
Torque tool X-BT 1/4" 20 Nm / 14.8 ft-lb	2212510



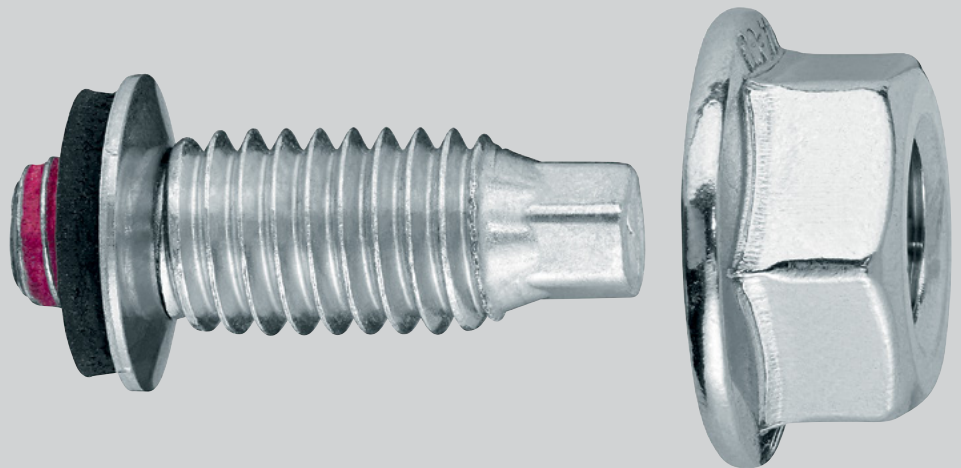
*X-BT-MR is the new generation X-BT





S-BT-MR / S-BT-MF THREADED STUD

Metric



S-BT TECHNICAL DATA USED FOR THE FOLLOWING CALCULATIONS

S-BT technical data

- **Drill hole type / base material:** Pilot hole, $t_{II} \geq 6 \text{ mm (0.24")}$ or drill through hole, $5 \text{ mm (0.20")} \leq t_{II} < 6 \text{ mm (0.24")}$
- **Base material:** Steel S235 / A36 (higher steel strength is possible, increases the rec. load)
- **Recommended interaction for combined load:** $N_{rec} = 1.8 \text{ kN (axial)}$ / $V_{rec} = 2.6 \text{ kN (shear)}$

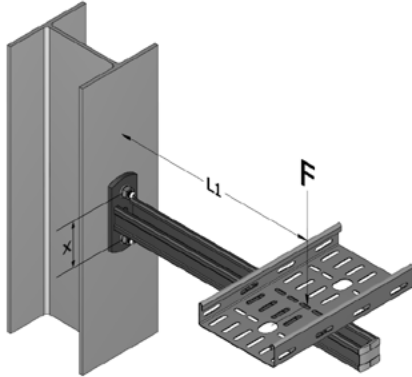
V-N (shear and tension)

$$\frac{V}{V_{rec}} + \frac{N}{N_{rec}} \leq 1.2 \quad \text{with} \quad \frac{V}{V_{rec}} \leq 1.0 \quad \text{and} \quad \frac{N}{N_{rec}} \leq 1.0$$

For further technical data refer to the latest technical information (DFTM and S-BT specification binder)

FASTENING CANTILEVER SUPPORT WITH S-BT

Two / Four S-BT-MR / S-BT-MF Threaded studs



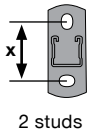
Application

- Fastening of cable trays, pipes on a horizontal cantilever support, fastened on a vertical structure
- Support is fastened by two / four S-BT on both support and brace baseplate with distance x
- L1 is the distance of the load center to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of S-BT threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Shear load fully carried by one / two top S-BT (worst-case)
- Load F acting at the distance of L1 from structure surface

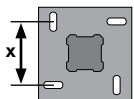
Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and S-BT distance x)



2 studs

Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	80	290	175	120	85	60	30	15
	100	365	220	150	105	75	40	15
	125	455	280	185	130	95	50	20
	150	550	335	225	160	115	60	25
	175	640	390	260	185	135	70	30
	200	730	445	300	210	155	80	35

Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	85	65	55	35	20	15	10
	100	100	80	65	45	30	20	15
	125	115	95	80	55	35	25	15
	150	130	105	90	65	45	30	20
	175	140	115	100	70	50	40	30
	200	150	130	110	80	55	45	35



4 studs

Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	80	585	390	290	225	175	120	85
	100	730	485	365	280	220	150	105
	125	915	610	455	350	280	185	130
	150	1100	730	550	420	335	225	160
	175	1280	855	640	495	390	260	185
	200	1465	975	730	565	445	300	210

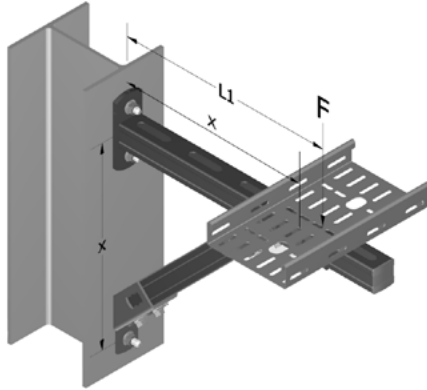
Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	170	135	115	70	45	35	20
	100	200	160	135	90	60	45	30
	125	230	190	160	110	75	55	45
	150	260	215	185	130	90	65	55
	175	280	235	205	145	105	80	60
	200	305	260	225	160	115	90	70

NOTE: load capacity used for calculation $N_{rec} = 1.8 \text{ kN (axial)} / V_{rec} = 2.6 \text{ kN (shear)}$

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FASTENING BRACED CANTILEVER SUPPORT WITH S-BT

Two / Four S-BT-MR / S-BT-MF Threaded studs



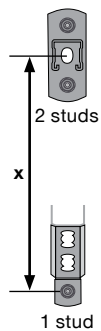
Application

- Fastening of cable trays, pipes on a horizontal, braced cantilever support, fastened on a vertical structure
- Support is fastened by three / six S-BT on both support and brace baseplate with distance x
- L1 is the distance of the load center to the vertical structure surface, the angle of the brace is 45°
- Load F is the acceptable total load (all dead load including)

Boundary conditions

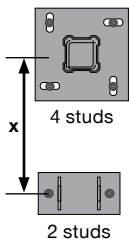
- These values are ONLY reflecting capacity of S-BT threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Shear load fully carried by one / two top S-BT (worst-case)
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and baseplate distance x)



Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	100	425	300	240	205	175	130	105
	150	640	455	360	305	265	195	155
	200	850	605	485	410	350	265	210
	350	1495	1065	845	720	615	460	370
	500	2135	1520	1210	1025	880	660	530
	800	3415	2430	1940	1645	1410	1060	845

Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	100	175	130	105	65	40		
	150	265	195	155	95	65		
	200		265	210	130	85		
	350				230	150		
	500					220		
	800							



Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	100	550	425	350	300	240	205	175
	150	825	640	530	455	360	305	265
	200	1100	850	705	605	485	410	350
	350	1925	1495	1235	1065	845	720	615
	500	2750	2135	1765	1520	1210	1025	880
	800	4400	3415	2825	2430	1940	1645	1410

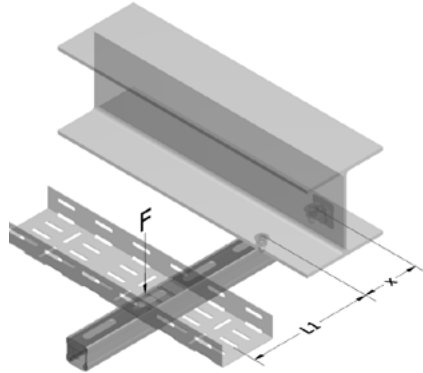
Result: Load F [kg]	L1 [mm]								
	150	200	250	400	600	800	1000	1200	
x [mm]	100	350	265	210	130	85			
	150	530	395	315	195	130	95	75	
	200		530	420	265	175	130	105	85
	350				460	305	230	185	150
	500					440	330	265	220
	800						530	420	350

NOTE: load capacity used for calculation $N_{rec} = 1.8 \text{ kN (axial)} / V_{rec} = 2.6 \text{ kN (shear)}$

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FASTENING STRUT TO STEEL WITH S-BT

Two S-BT-MR / S-BT-MF Threaded studs



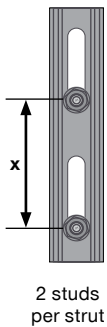
Application

- Fastening of cable trays, pipes on a horizontal cantilever support, fastened on a horizontal structure
- Support is fastened by two S-BT (horizontal distance x)
- L1 is the distance of the load center to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of S-BT threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and S-BT distance x)



Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	80	210	115	65	35	15		
	100	265	140	80	45	20		
	125	330	180	100	55	25		
	150	400	215	125	70	30		
	175	465	250	145	80	35		
	200	530	285	165	90	40		

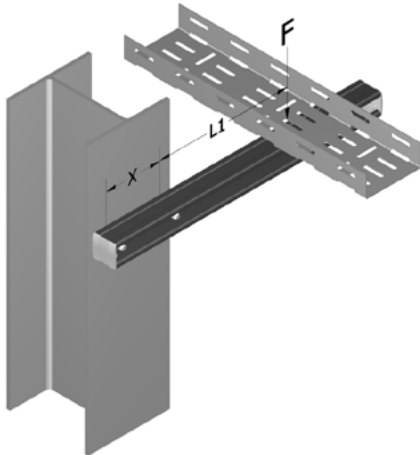
Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	60	50	40	30	20	15	10
	100	70	60	50	35	25	20	15
	125	80	70	60	40	30	20	15
	150	90	75	65	50	35	25	20
	175	95	85	75	55	40	30	25
	200	100	90	80	60	45	35	30

NOTE: load capacity used for calculation $N_{rec} = 1.8 \text{ kN (axial)} / V_{rec} = 2.6 \text{ kN (shear)}$

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FASTENING STRUT TO STEEL WITH S-BT

Two / Four S-BT-MR / S-BT-MF Threaded studs



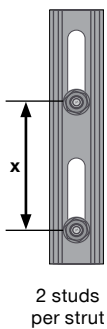
Application

- Fastening of cable trays, pipes on a horizontal cantilever support, fastened on a vertical structure
- Support is fastened by two S-BT (horizontal distance x)
- L1 is the distance of the load center to the center of the fasteners
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of S-BT threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Shear load fully carried by one S-BT (worst-case)
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and S-BT distance x)



Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	80	340	200	130	85	60	25	
	100	430	250	165	110	75	30	5
	125	535	315	205	140	95	40	5
	150	645	380	245	165	115	45	5
	175	750	440	285	195	130	55	10
	200	860	505	330	220	150	65	10

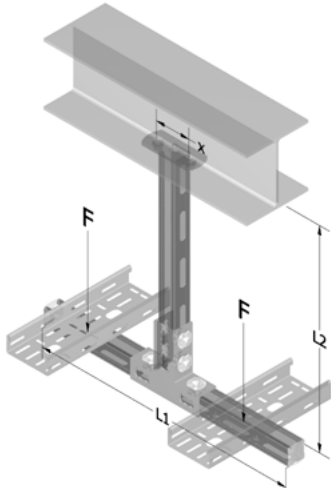
Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	90	75	60	40	30	20	15
	100	105	85	75	50	35	25	20
	125	120	100	85	60	45	35	25
	150	130	110	95	70	50	40	30
	175	140	120	105	80	55	45	35
	200	150	130	115	85	65	50	40

NOTE: load capacity used for calculation $N_{rec} = 1.8 \text{ kN (axial)} / V_{rec} = 2.6 \text{ kN (shear)}$

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FASTENING T-POST (CEILING) SUPPORT WITH S-BT

Two / Four S-BT-MR / S-BT-MF Threaded studs



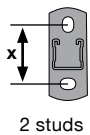
Application

- Fastening of cable trays, pipes on a T-Post support, which is fastened on a horizontal structure
- Support is fastened by two / four S-BT (horizontal distance x)
- L1 is the total width of the T-Post, L2 is fix set to 1000 mm
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of S-BT threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- 2 Load cases: load asymmetric acting in the center of one arm only, 30% acting as horizontal load

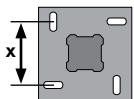
Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and S-BT distance x)



2 studs

Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	80							
	100	1265						
	125	1580						
	150	1900						
	175	2215	1360					
	200	2535	1555					

Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	40	40	40	40	40	40	40
	100	50	50	50	50	50	50	50
	125	60	60	60	60	60	60	60
	150	70	70	70	70	70	70	70
	175	80	80	80	80	80	80	80
	200	90	90	90	90	90	90	90



4 studs

Result: L1 [mm]	F [kg]					
	50	75	100	125	150	200
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96
x [mm]	80	2185	1405			
	100	2735	1755	1265		
	125	3415	2195	1580		
	150	4100	2635	1900	1460	
	175	4785	3075	2215	1705	1360
	200	5470	3510	2535	1945	1555

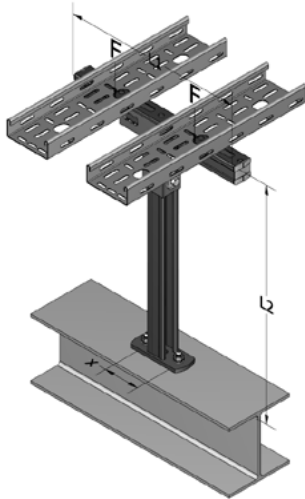
Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	75	75	75	75	75	75	75
	100	90	90	90	90	90	90	90
	125	105	105	105	105	105	105	105
	150	120	120	120	120	120	120	120
	175	135	135	135	135	135	135	135
	200	145	145	145	145	145	145	145

NOTE: load capacity used for calculation $N_{rec} = 1.8 \text{ kN (axial)} / V_{rec} = 2.6 \text{ kN (shear)}$

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FASTENING T-POST (FLOOR) SUPPORT WITH S-BT

Two / Four S-BT-MR / S-BT-MF Threaded studs



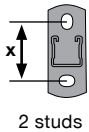
Application

- Fastening of cable trays, pipes on a T-Post support, which is fastened on a horizontal structure
- Support is fastened by two / four S-BT (horizontal distance x)
- L1 is the total width of the T-Post, L2 is fix set to 1000 mm
- Load F is the acceptable total load (all dead load including)

Boundary conditions

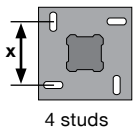
- These values are ONLY reflecting capacity of S-BT threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- 2 Load cases: load asymmetric acting in the center of one arm only, 30% acting as horizontal load

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and S-BT distance x)



Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	80							
	100	1665						
	125	2080	1470					
	150	2500	1765					
	175	2915	2060	1630				
	200	3335	2355	1865				

Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	45	45	45	45	45	45	45
	100	60	60	60	60	60	60	60
	125	75	75	75	75	75	75	75
	150	90	90	90	90	90	90	90
	175	105	105	105	105	105	105	105
	200	120	120	120	120	120	120	120



Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	80							
	100	3135						
	125	3915	2695					
	150	4700	3235					
	175	5485	3775	2915				
	200	6270	4310	3335				

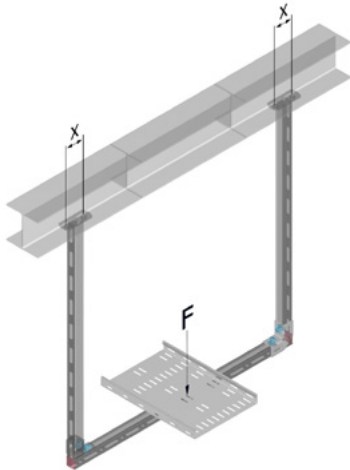
Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	95	95	95	95	95	95	95
	100	120	120	120	120	120	120	120
	125	150	150	150	150	150	150	150
	150	180	180	180	180	180	180	180
	175	210	210	210	210	210	210	210
	200	240	240	240	240	240	240	240

NOTE: load capacity used for calculation $N_{rec} = 1.8 \text{ kN (axial)} / V_{rec} = 2.6 \text{ kN (shear)}$

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FASTENING U-FRAME (CEILING) / TRAPEZE SUPPORT WITH S-BT

Two / Four S-BT-MR / S-BT-MF Threaded studs



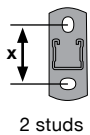
Application

- Fastening of cable trays, pipes on a U-Frame support, which is fastened on a horizontal structure
- Support is fastened by four S-BT (2 fasteners per baseplate)
- Load F is the acceptable total load (all dead load including, acting in the center of the U-Frame)

Boundary conditions

- These values are ONLY reflecting capacity of S-BT threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Load acting in the center (U-Frame)

Technical assessment — maximum of F



$$F = N_{rec} \cdot \text{\#fasteners per post}$$

$$F = 1.8 \text{ kN} \cdot 4$$

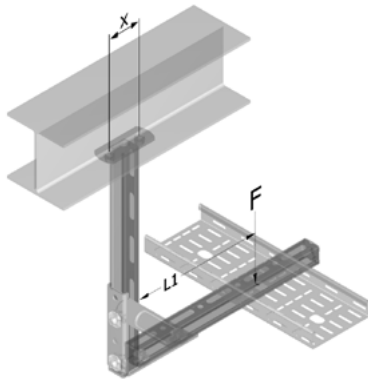
$$F = 7.2 \text{ kN} / F = 730 \text{ kg}$$

NOTE: load capacity used for calculation $N_{rec} = 1.8 \text{ kN}$ (axial) / $V_{rec} = 2.6 \text{ kN}$ (shear)

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FASTENING L-POST SUPPORT WITH S-BT

Two / Four S-BT-MR / S-BT-MF Threaded studs



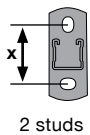
Application

- Fastening of cable trays, pipes on a L-Post support, which is fastened on a horizontal structure
- Support is fastened by two / four S-BT (horizontal distance x)
- L1 is the distance of the load center to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

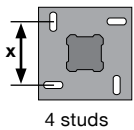
- These values are ONLY reflecting capacity of S-BT threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and S-BT distance x)



Result:		F [kg]							
L1 [mm]		50	75	100	125	150	200	250	300
→ Load in [kN]		0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	80	250	155	105	75	55	30	15	5
	100	315	190	130	95	70	40	20	10
	125	395	240	165	120	90	50	25	10
	150	475	290	200	145	105	60	35	15
	175	550	340	230	165	125	70	40	15
	200	630	385	265	190	140	80	45	20

Result:		L1 [mm]							
Load F [kg]		150	200	250	400	600	800	1000	1200
x [mm]	80	75	60	50	30	20	15	10	10
	100	90	70	60	40	25	20	15	10
	125	105	85	70	45	30	25	20	15
	150	120	100	80	55	40	30	25	20
	175	135	110	95	65	45	35	25	20
	200	145	120	100	70	50	40	30	25



Result:		F [kg]							
L1 [mm]		50	75	100	125	150	200	250	300
→ Load in [kN]		0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	80	545	350	250	190	155	105	75	55
	100	680	435	315	240	190	130	95	70
	125	850	545	395	300	240	165	120	90
	150	1025	655	475	365	290	200	145	105
	175	1195	765	550	425	340	230	165	125
	200	1365	875	630	485	385	265	190	140

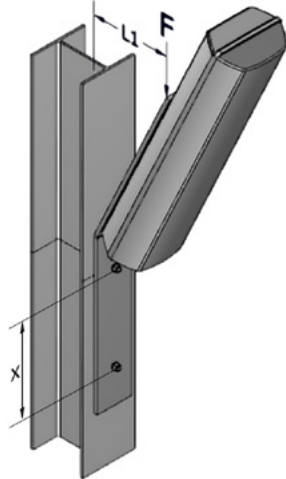
Result:		L1 [mm]							
Load F [kg]		150	200	250	400	600	800	1000	1200
x [mm]	80	150	120	100	65	45	30	25	20
	100	180	145	120	80	55	40	30	25
	125	215	170	145	95	65	50	40	35
	150	240	200	165	115	80	60	50	40
	175	270	220	190	130	90	70	55	45
	200	290	240	205	145	100	80	65	55

NOTE: load capacity used for calculation $N_{rec} = 1.8 \text{ kN (axial)} / V_{rec} = 2.6 \text{ kN (shear)}$

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FASTENING EQUIPMENT SUPPORT WITH S-BT

Two / Four S-BT-MR / S-BT-MF Threaded studs



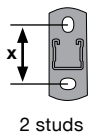
Application

- Fastening of lamps, signals, sensors on inclined cantilever support, fastened on a vertical structure
- Support is fastened by two / four S-BT (vertical distance x)
- L1 is the distance of the load center (~middle of the load) to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of S-BT threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Shear load fully carried by one / two top S-BT (worst-case)
- Load F acting at the distance of L1 from structure surface

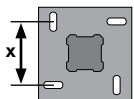
Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and S-BT distance x)



2 studs

Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	80	290	175	120	85	60	30	15
	100	365	220	150	105	75	40	15
	125	455	280	185	130	95	50	20
	150	550	335	225	160	115	60	25
	175	640	390	260	185	135	70	30
	200	730	445	300	210	155	80	35

Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	85	65	55	35	20	15	10
	100	100	80	65	45	30	20	15
	125	115	95	80	55	35	25	15
	150	130	105	90	65	45	30	25
	175	140	115	100	70	50	40	30
	200	150	130	110	80	55	45	35



4 studs

Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	80	585	355	240	170	120	65	30
	100	730	445	300	210	155	80	35
	125	915	560	375	265	190	100	45
	150	1100	670	450	320	230	120	55
	175	1280	785	525	370	270	140	65
	200	1465	895	600	425	310	160	75

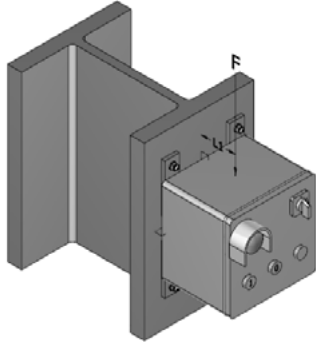
Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	170	135	115	70	45	35	20
	100	200	160	135	90	60	45	30
	125	230	190	160	110	75	55	35
	150	260	215	185	130	90	65	45
	175	280	235	205	145	105	80	60
	200	305	260	225	160	115	90	70

NOTE: load capacity used for calculation $N_{rec} = 1.8 \text{ kN (axial)} / V_{rec} = 2.6 \text{ kN (shear)}$

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FASTENING JUNCTION BOXES / SWITCHES WITH S-BT

S-BT-MR / S-BT-MF Threaded stud



Application

- Fastening of junction boxes, switches on a vertical structure
- Element is fastened by S-BT

Boundary conditions

- These values are ONLY reflecting capacity of S-BT threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Technical data are based on technical data binder for S-BT (06 / 2018), always refer to latest technical data binder for S-BT

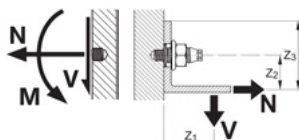
Technical data — always refer to latest technical data binder for S-BT

Recommended load	S-BT						S-BT	
	Pilot hole, $t_{II} \geq 6 \text{ mm (0.24")}$ Drill through hole, $5 \text{ mm (0.20")} \leq t_{II} < 6 \text{ mm (0.24")}$			Drill through hole, $3 \text{ mm (0.12")} \leq t_{II} < 5 \text{ mm (0.20")}$			Pilot hole, $5 \text{ mm (0.20")} \leq t_{II} < 6 \text{ mm (0.24")}$	
Base material	Steel S235 A36	Steel S355 Grade 50	Aluminum $f_u \geq 270 \text{ mPa}$	Steel S235 A36	Steel S355 Grade 50	Steel S235 A36	Steel S355 Grade 50	
Tension, N_{rec} [kN / lb]	1.8 / 405	2.3 / 520	1.0 / 225	1.0 / 225	1.3 / 290	1.0 / 225	1.3 / 290	
Shear, V_{rec} [kN / lb]	2.6 / 585	3.2 / 720	1.5 / 340	1.5 / 340	1.9 / 430	1.5 / 340	1.9 / 430	
Moment, M_{rec} [Nm / ft-lb]	7.0 / 5.2	7.0 / 5.2	4.8 / 3.5	4.8 / 3.5	7.0 / 5.2	6.2 / 4.6	6.2 / 4.6	

Design resistance	S-BT						S-BT	
	Pilot hole, $t_{II} \geq 6 \text{ mm (0.24")}$ Drill through hole, $5 \text{ mm (0.20")} \leq t_{II} < 6 \text{ mm (0.24")}$			Drill through hole, $3 \text{ mm (0.12")} \leq t_{II} < 5 \text{ mm (0.20")}$			Pilot hole, $5 \text{ mm (0.20")} \leq t_{II} < 6 \text{ mm (0.24")}$	
Base material	Steel S235 A36	Steel S355 Grade 50	Aluminum $f_u \geq 270 \text{ mPa}$	Steel S235 A36	Steel S355 Grade 50	Steel S235 A36	Steel S355 Grade 50	
Tension, N_{Rd} [kN / lb]	2.5 / 560	3.2 / 720	1.4 / 315	1.4 / 315	1.8 / 405	1.4 / 315	1.8 / 405	
Shear, V_{Rd} [kN / lb]	3.6 / 810	4.5 / 1010	2.1 / 470	2.1 / 470	2.7 / 610	2.1 / 470	2.7 / 610	
Moment, M_{Rd} [Nm / ft-lb]	9.8 / 7.2	9.8 / 7.2	6.7 / 4.9	9.8 / 7.2	9.8 / 7.2	8.7 / 6.4	8.7 / 6.4	

Conditions for recommended loads

- Use S-BT-MR and S-BT-MF (multi-purpose fastening) only with the supplied Hilti serrated flange nuts M8, M10 and W10 (© or ©) as per according to General Information—Material specifications
- Global factor of safety Ω for static pull-out and static shear ≥ 3 (based on mean ultimate test value)
- Minimum edge distance = 6 mm [0.24"], minimum spacing = 15 mm [0.59"]
- Effect of base metal vibration and stress (e.g. areas with tensile stress) considered
- Redundancy (multiple fastening) must be provided
- If eccentric loading exists (e.g. use of an angle clip), moments caused by off-center loading must be considered



Recommended interaction formula for combined loading — steel and aluminum base material

$$\mathbf{V-N} \text{ (shear and tension)} \quad \frac{V}{V_{rec}} + \frac{N}{N_{rec}} \leq 1.2 \text{ with } \frac{V}{V_{rec}} \leq 1.0 \text{ and } \frac{N}{N_{rec}} \leq 1.0$$

$$\mathbf{V-M} \text{ (shear and bending)} \quad \frac{V}{V_{rec}} + \frac{M}{M_{rec}} \leq 1.2 \text{ with } \frac{V}{V_{rec}} \leq 1.0 \text{ and } \frac{M}{M_{rec}} \leq 1.0$$

$$\mathbf{N-M} \text{ (tension and bending)} \quad \frac{N}{N_{rec}} + \frac{M}{M_{rec}} \leq 1.0$$

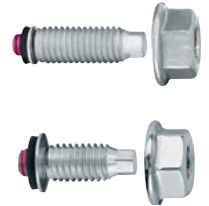
$$\mathbf{V-N-M} \text{ (shear, tension and bending)} \quad \frac{V}{V_{rec}} + \frac{N}{N_{rec}} + \frac{M}{M_{rec}} \leq 1.0$$

Cyclic loading

S-BT threaded studs are only to be used for fastenings subject to static or quasi-static loading. Enquire at Hilti for test data if cyclic loading has to be considered in the design.

S-BT CATALOG PAGES

Description	Base Material	Environment	Item Number
Threaded stud S-BT-MR M10/15 SN 6	Steel	Highly corrosive	2140740
Threaded stud S-BT-MR W10/15 SN 6	Steel	Highly corrosive	2140741
Threaded stud S-BT-MF M10/15 AN 6	Steel	Mildly corrosive	2140528
Threaded stud S-BT-MF W10/15 AN 6	Steel	Mildly corrosive	2139173
Threaded stud S-BT-MR M8/7 SN 6	Steel	Highly corrosive	2139172
Threaded stud S-BT-MF M8/7 AN 6	Steel	Mildly corrosive	2139174
Threaded stud S-BT-MR M8/7 SN 6 AL	Aluminum	Highly corrosive	2140743
Threaded stud S-BT-MR M10/15 SN 6 AL	Aluminum	Highly corrosive	2140744



Description	Item Number
Battery drill SBT 4A-22	Local item
Battery drill SF BT 22-A	Local item
Battery drill SFC 22-A	Local item
Depth gauge S-DG BT MW10/15 Long 6	2143261
Stepped drill bit TS-BT 5.5-74 S (for steel)	2143137
Stepped drill bit TS-BT 5.5-74 AL (for aluminum)	2143138
Calibration card S-CC BT 6	2143270
Torque tool S-BT 1/4" - 8 Nm (for studs on steel)	2119272
Torque tool S-BT 1/4" - 5 Nm (for studs on aluminum)	2143271
Nut setter S-NS 13 C 95/3 3/4" S-BT (for M8)	2149244
Nut setter S-NS 15 C 95/3 3/4" S-BT (for M10)	2149245
Nut setter S-NS 9/16" C 95/3 3/4" S-BT (for W10)	2149246





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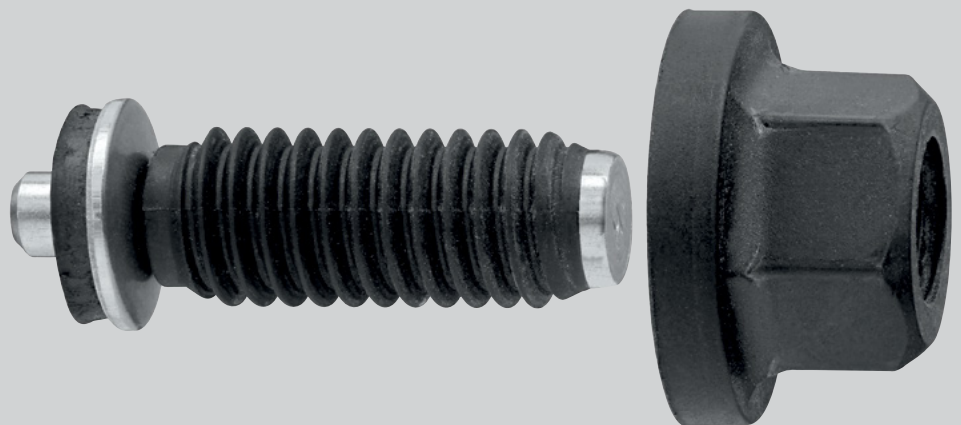
6PCH4134072191
B16128011093

AEG
C50N
B16



X-BT-MF THREADED STUD

Metric



X-BT-MF TECHNICAL DATA USED FOR THE FOLLOWING CALCULATIONS

X-BT-MF technical data

- **Drill hole type / base material:** Pilot hole, $t_{II} \geq 8 \text{ mm}$ (0.31")
- **Base material:** Steel S235 / A36 (higher steel strength is possible)
- **Recommended interaction for combined load:** $N_{rec} = 1.5 \text{ kN}$ (axial) / $V_{rec} = 2.2 \text{ kN}$ (shear)

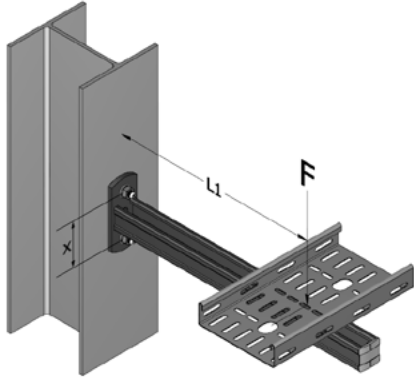
V-N (shear and tension)

$$\frac{V}{V_{rec}} + \frac{N}{N_{rec}} \leq 1.2 \quad \text{with} \quad \frac{V}{V_{rec}} \leq 1.0 \quad \text{and} \quad \frac{N}{N_{rec}} \leq 1.0$$

For further technical data refer to the latest technical information (DFTM / binder)

FASTENING CANTILEVER SUPPORT WITH X-BT-MF

Two / Four X-BT-MF Threaded studs



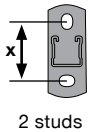
Application

- Fastening of cable trays, pipes on a horizontal cantilever support, fastened on a vertical structure
- Support is fastened by two / four X-BT-MF on both support and brace baseplate with distance x
- L1 is the distance of the load center to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of X-BT-MF threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Shear load fully carried by one / two top X-BT-MF (worst-case)
- Load F acting at the distance of L1 from structure surface

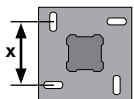
Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-BT-MF distance x)



2 studs

Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	80	235	140	90	60	40	15	
	100	295	175	115	75	50	20	
	125	370	220	140	95	65	25	
	150	445	260	170	115	80	35	
	175	520	305	200	135	90	40	
	200	595	350	230	155	105	45	

Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	70	55	45	30	20	15	10
	100	80	65	55	35	25	15	10
	125	95	80	65	45	30	20	15
	150	105	90	75	50	35	25	20
	175	115	100	85	60	40	30	25
	200	125	105	90	65	45	35	30



4 studs

Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	80	485	325	235	180	140	90	60
	100	610	405	295	225	175	115	75
	125	760	505	370	280	220	140	95
	150	915	610	445	335	260	170	115
	175	1070	710	520	390	305	200	135
	200	1220	815	595	450	350	230	155

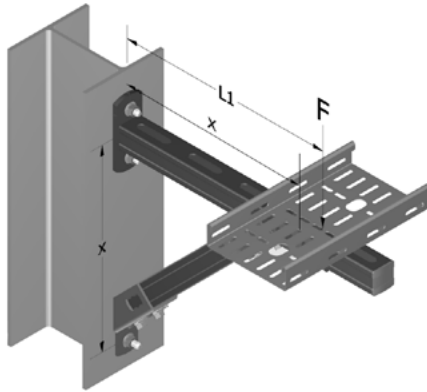
Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	140	115	95	60	40	30	20
	100	165	135	115	75	50	35	25
	125	195	160	135	90	60	45	35
	150	215	180	155	105	75	55	45
	175	235	200	170	120	85	65	50
	200	255	215	185	135	95	75	60

NOTE: load capacity used for calculation $N_{rec} = 1.5 \text{ kN (axial)} / V_{rec} = 2.2 \text{ kN (shear)}$

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FASTENING BRACED CANTILEVER SUPPORT WITH X-BT-MF

Two / Four X-BT-MF Threaded studs



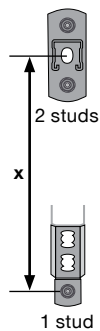
Application

- Fastening of cable trays, pipes on a horizontal, braced cantilever support, fastened on a vertical structure
- Support is fastened by three / six X-BT-MF on both support and brace baseplate with distance x
- L1 is the distance of the load center to the vertical structure surface, the angle of the brace is 45°
- Load F is the acceptable total load (all dead load including)

Boundary conditions

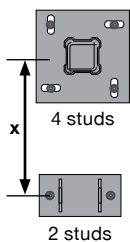
- These values are ONLY reflecting capacity of X-BT-MF threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Shear load fully carried by one / two top X-BT-MF (worst-case)
- Load F acting at the distance of L1 from structure surface

Technical assessment — maximum of F (depending on load F or lever arm length L1 and baseplate distance x)



Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	100	365	260	210	175	145	110	
	150	550	395	315	265	220	165	
	200	735	525	425	355	295	220	
	350	1285	925	745	625	520	390	
	500	1840	1320	1060	895	745	560	
	800	2945	2115	1700	1435	1195	895	

Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	100	145	110	85	55	35		
	150	220	165	130	80	55		
	200		220	175	110	70		
	350				195	130		
	500					185		
	800							



Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	100		470	365	305	260	210	175
	150		705	550	455	395	315	265
	200		940	735	610	525	425	355
	350		1650	1285	1070	925	745	625
	500		2355	1840	1530	1320	1060	895
	800		3770	2945	2445	2115	1700	1435

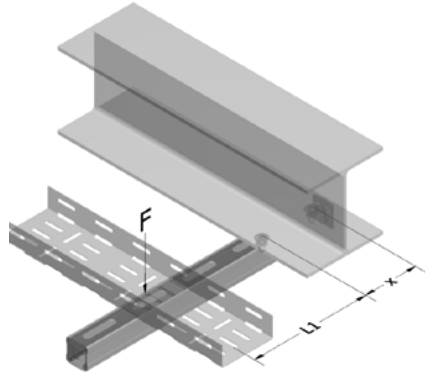
Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	100	295	220	175	110	70		
	150	445	335	265	165	110	80	65
	200		445	355	220	145	110	85
	350				390	260	195	155
	500					370	280	220
	800						445	355

NOTE: load capacity used for calculation $N_{rec} = 1.5 \text{ kN (axial)} / V_{rec} = 2.2 \text{ kN (shear)}$

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FASTENING STRUT TO STEEL WITH X-BT-MF

Two X-BT-MF Threaded studs



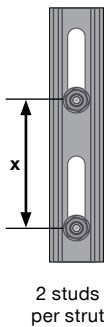
Application

- Fastening of cable trays, pipes on a horizontal cantilever support, fastened on a horizontal structure
- Support is fastened by two X-BT-MF (horizontal distance x)
- L1 is the distance of the load center to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of X-BT-MF threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-BT-MF distance x)



Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	80	160	80	40	15			
	100	205	100	50	20			
	125	255	125	65	25			
	150	305	155	75	30			
	175	360	180	90	35			
	200	410	205	105	40			

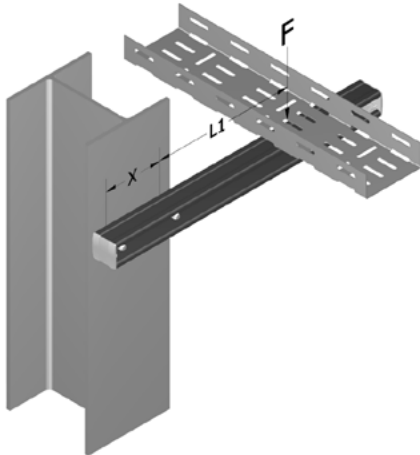
Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	50	40	35	25	15	10	5
	100	60	50	40	30	20	15	10
	125	65	55	50	35	25	20	15
	150	75	65	55	40	30	20	15
	175	80	70	60	45	30	25	20
	200	85	75	65	50	35	30	25

NOTE: load capacity used for calculation $N_{rec} = 1.5 \text{ kN (axial)} / V_{rec} = 2.2 \text{ kN (shear)}$

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FASTENING STRUT TO STEEL WITH X-BT-MF

Two / Four X-BT-MF Threaded studs



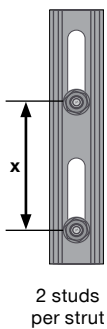
Application

- Fastening of cable trays, pipes on a horizontal cantilever support, fastened on a vertical structure
- Support is fastened by two X-BT-MF (horizontal distance x)
- L1 is the distance of the load center to the center of the fasteners
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of X-BT-MF threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Shear load fully carried by one X-BT-MF (worst-case)
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-BT-MF distance x)



Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	80	275	155	95	60	35	5	
	100	345	195	120	75	45	10	
	125	435	245	155	95	60	15	
	150	520	295	185	115	70	15	
	175	605	345	215	135	85	20	
	200	695	395	245	155	95	20	

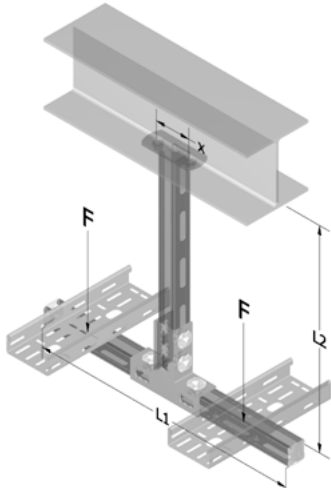
Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	75	60	50	35	25	20	15
	100	85	70	60	40	30	20	15
	125	100	85	70	50	35	30	20
	150	110	95	80	60	40	35	25
	175	120	100	90	65	50	40	30
	200	125	110	95	70	55	40	35

NOTE: load capacity used for calculation $N_{rec} = 1.5 \text{ kN (axial)} / V_{rec} = 2.2 \text{ kN (shear)}$

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FASTENING T-POST (CEILING) SUPPORT WITH X-BT-MF

Two / Four X-BT-MF Threaded studs



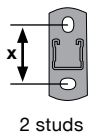
Application

- Fastening of cable trays, pipes on a T-Post support, which is fastened on a horizontal structure
- Support is fastened by two / four X-BT-MF (horizontal distance x)
- L1 is the total width of the T-Post, L2 is fix set to 1000 mm
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of X-BT-MF threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- 2 Load cases: load asymmetric acting in the center of one arm only, 30% acting as horizontal load

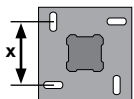
Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-BT-MF distance x)



2 studs

Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	80							
	100							
	125	1275						
	150	1530						
	175	1790						
	200	2045						

Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	35	35	35	35	35	35	35
	100	40	40	40	40	40	40	40
	125	50	50	50	50	50	50	50
	150	60	60	60	60	60	60	60
	175	65	65	65	65	65	65	65
	200	75	75	75	75	75	75	75



4 studs

Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	80	1795						
	100	2245	1430					
	125	2805	1785	1275				
	150	3365	2145	1530				
	175	3930	2500	1790	1360			
	200	4490	2860	2045	1555			

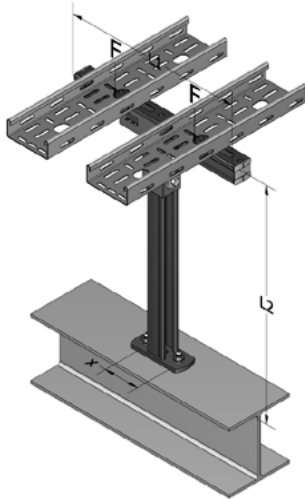
Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	60	60	60	60	60	60	60
	100	75	75	75	75	75	75	75
	125	85	85	85	85	85	85	85
	150	100	100	100	100	100	100	100
	175	110	110	110	110	110	110	110
	200	120	120	120	120	120	120	120

NOTE: load capacity used for calculation $N_{rec} = 1.5 \text{ kN (axial)} / V_{rec} = 2.2 \text{ kN (shear)}$

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FASTENING T-POST (FLOOR) SUPPORT WITH X-BT-MF

Two / Four X-BT-MF Threaded studs



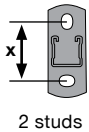
Application

- Fastening of cable trays, pipes on a T-Post support, which is fastened on a horizontal structure
- Support is fastened by two / four X-BT-MF (horizontal distance x)
- L1 is the total width of the T-Post, L2 is fix set to 1000 mm
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of X-BT-MF threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- 2 Load cases: load asymmetric acting in the center of one arm only, 30% acting as horizontal load

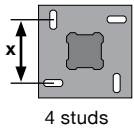
Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-BT-MF distance x)



2 studs

Result: L1 [mm]	F [kg]								
	50	75	100	125	150	200	250	300	
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94	
x [mm]	80								
	100	1420							
	125	1775							
	150	2130 1520							
	175	2490 1775							
	200	2845 2030 1620							

Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	40	40	40	40	40	40	40
	100	50	50	50	50	50	50	50
	125	60	60	60	60	60	60	60
	150	75	75	75	75	75	75	75
	175	85	85	85	85	85	85	85
	200	100	100	100	100	100	100	100



4 studs

Result: L1 [mm]	F [kg]								
	50	75	100	125	150	200	250	300	
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94	
x [mm]	80								
	100	2645							
	125	3305							
	150	3965 2745							
	175	4630 3200							
	200	5290 3660 2845							

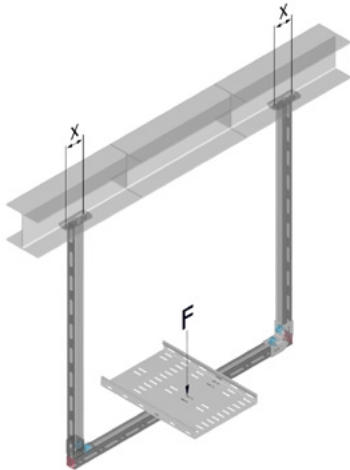
Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	80	80	80	80	80	80	80
	100	100	100	100	100	100	100	100
	125	125	125	125	125	125	125	125
	150	150	150	150	150	150	150	150
	175	175	175	175	175	175	175	175
	200	200	200	200	200	200	200	200

NOTE: load capacity used for calculation $N_{rec} = 1.5 \text{ kN (axial)} / V_{rec} = 2.2 \text{ kN (shear)}$

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FASTENING U-FRAME (CEILING) / TRAPEZE SUPPORT WITH X-BT-MF

Two / Four X-BT-MF Threaded studs



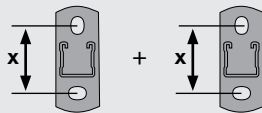
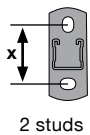
Application

- Fastening of cable trays, pipes on a U-Frame support, which is fastened on a horizontal structure
- Support is fastened by four X-BT-MF (2 fasteners per baseplate)
- Load F is the acceptable total load (all dead load including, acting in the center of the U-Frame)

Boundary conditions

- These values are ONLY reflecting capacity of X-BT-MF threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Load acting in the center (U-Frame)

Technical assessment — maximum of F



$$F = N_{rec} \cdot \text{\#fasteners per post}$$

$$F = 1.5 \text{ kN} \cdot 4$$

$$F = 6.0 \text{ kN} / F = 610 \text{ kg}$$

NOTE: load capacity used for calculation $N_{rec} = 1.5 \text{ kN}$ (axial) / $V_{rec} = 2.2 \text{ kN}$ (shear)

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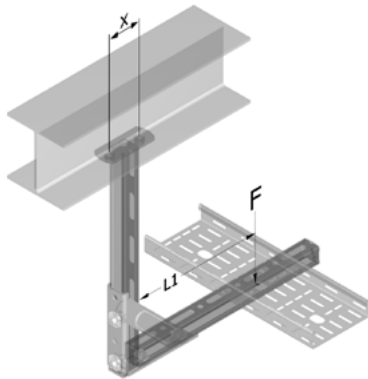
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FASTENING L-POST SUPPORT WITH X-BT-MF

Two / Four X-BT-MF Threaded studs



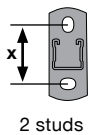
Application

- Fastening of cable trays, pipes on a L-Post support, which is fastened on a horizontal structure
- Support is fastened by two / four X-BT-MF (horizontal distance x)
- L1 is the distance of the load center to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of X-BT-MF threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Load F acting at the distance of L1 from structure surface

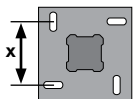
Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-BT-MF distance x)



2 studs

Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	80	200	120	80	55	40	20	5
	100	255	150	100	70	50	25	10
	125	315	190	125	90	60	30	10
	150	380	230	150	105	75	35	15
	175	445	265	180	125	90	45	15
	200	510	305	205	140	100	50	20

Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	60	50	40	25	15	10	5
	100	75	60	50	30	20	15	10
	125	85	70	60	40	25	20	15
	150	100	80	70	45	30	25	20
	175	110	90	75	50	35	30	20
	200	120	100	85	60	40	30	25



4 studs

Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	80	445	285	200	155	120	80	55
	100	560	355	255	190	150	100	70
	125	700	445	315	240	190	125	90
	150	840	535	380	290	230	150	105
	175	980	625	445	340	265	180	125
	200	1120	715	510	385	305	205	140

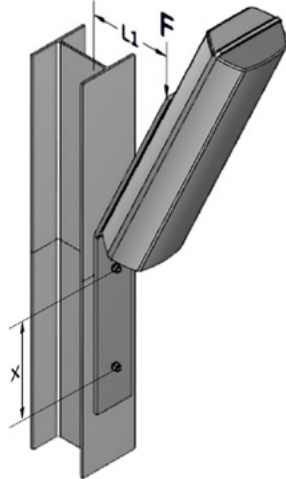
Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	125	100	80	55	35	25	15
	100	150	120	100	65	45	35	20
	125	175	145	120	80	55	40	35
	150	200	165	140	95	65	50	40
	175	225	185	155	105	75	60	45
	200	240	200	170	120	85	65	55

NOTE: load capacity used for calculation $N_{rec} = 1.5 \text{ kN (axial)} / V_{rec} = 2.2 \text{ kN (shear)}$

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FASTENING EQUIPMENT SUPPORT WITH X-BT-MF

Two / Four X-BT-MF Threaded studs



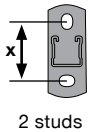
Application

- Fastening of lamps, signals, sensors on inclined cantilever support, fastened on a vertical structure
- Support is fastened by two / four X-BT-MF (vertical distance x)
- L1 is the distance of the load center (~middle of the load) to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

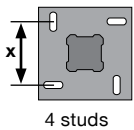
- These values are ONLY reflecting capacity of X-BT-MF threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Shear load fully carried by one / two top X-BT-MF (worst-case)
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-BT-MF distance x)



Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	80	235	140	90	60	40	15	
	100	295	175	115	75	50	20	
	125	370	220	140	95	65	25	
	150	445	260	170	115	80	35	
	175	520	305	200	135	90	40	
	200	595	350	230	155	105	45	

Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	70	55	45	30	20	15	10
	100	80	65	55	35	25	15	10
	125	95	80	65	45	30	20	15
	150	105	90	75	50	35	25	20
	175	115	100	85	60	40	30	25
	200	125	105	90	65	45	35	30



Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	80	475	280	180	125	85	35	
	100	595	350	230	155	105	45	
	125	745	440	285	195	135	55	
	150	895	525	345	235	160	70	
	175	1045	615	400	275	185	80	
	200	1195	705	460	310	215	90	

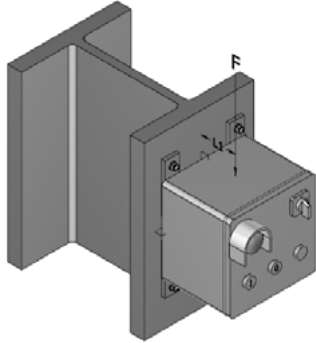
Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	140	115	95	60	40	30	20
	100	165	135	115	75	50	35	25
	125	195	160	135	90	60	45	30
	150	215	180	155	105	75	55	45
	175	235	200	170	120	85	65	50
	200	255	215	185	135	95	75	60

NOTE: load capacity used for calculation $N_{rec} = 1.5 \text{ kN (axial)} / V_{rec} = 2.2 \text{ kN (shear)}$

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FASTENING JUNCTION BOXES / SWITCHES WITH X-BT-MF

X-BT-MF Threaded stud



Application

- Fastening of junction boxes, switches on a vertical structure
- Element is fastened by X-BT-MF

Boundary conditions

- These values are ONLY reflecting capacity of X-BT-MF threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Technical data are based on technical data binder for X-BT-MF (06 / 2018), always refer to latest technical data binder for X-BT-MF

Technical data — always refer to latest technical data binder for X-BT-MF

Recommended load	X-BT-MF	
Drill hole type and base material thickness	Pilot hole, $t_{II} \geq 8 \text{ mm (0.31")}$	
Base material	Steel $R_m \geq 350 \text{ MPa}$ Service Temp. $-40 \text{ °C to } 60 \text{ °C}$	Steel $R_m \geq 350 \text{ MPa}$ Service Temp. $60 \text{ °C to } 100 \text{ °C}$
Tension, N_{rec} [kN / lb]	1.5 / 340	1.0 / 225
Shear, V_{rec} [kN / lb]	2.2 / 500	1.4 / 315
Moment, M_{rec} [Nm / ft-lb]	8.2 / 6.0	8.2 / 6.0

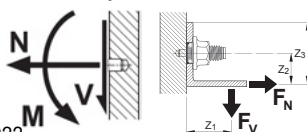
Design resistance	X-BT-MF	
Drill hole type and base material thickness	Pilot hole, $t_{II} \geq 8 \text{ mm (0.31")}$	
Base material	Steel $R_m \geq 350 \text{ MPa}$ Service Temp. $-40 \text{ °C to } 60 \text{ °C}$	Steel $R_m \geq 350 \text{ MPa}$ Service Temp. $60 \text{ °C to } 100 \text{ °C}$
Tension, N_{Rd} [kN / lb]	2.0 / 450	1.35 / 300
Shear, V_{Rd} [kN / lb]	3.0 / 675	1.9 / 425
Moment, M_{Rd} [Nm / ft-lb]	18.4 / 13.6	18.4 / 13.6

Conditions for recommended loads

- Use with Hilti glass-fiber reinforced polyamide material nuts, M10 and W10 (© as per according to General Information—Material specifications)
- Not to be used with any additional washer which provide an axial force when deformed, e.g. spring or lock washer, etc.
- Global factor of safety > 3 (based on 5% fractile value)
- Minimum edge distance = 6 mm (1/4")
- Effect of base metal vibration and stress considered
- Redundancy (multiple fastening) must be provided
- Recommended loads in the table refer to the resistance of the individual fastening and may not be the same as the loads F_N and F_V acting on the fastened part

Note: if relevant, prying forces need to be considered in design, see example. Moment acting on fastener shank only in case of a gap between base and fastened material.

- **Minimum temperature for installation and adjustments = -10 °C**



Recommended interaction formula for combined loading

Combined loading situation	Interaction formula
V-N (shear and tension)	$\frac{V}{V_{rec}} + \frac{N}{N_{rec}} \leq 1.2$ with $\frac{V}{V_{rec}} \leq 1.0$ and $\frac{N}{N_{rec}} \leq 1.0$
V-M (shear and bending)	$\frac{V}{V_{rec}} + \frac{M}{M_{rec}} \leq 1.2$ with $\frac{V}{V_{rec}} \leq 1.0$ and $\frac{M}{M_{rec}} \leq 1.0$
N-M (tension and bending)	$\frac{N}{N_{rec}} + \frac{M}{M_{rec}} \leq 1.0$
V-N-M (shear, tension and bending)	$\frac{V}{V_{rec}} + \frac{N}{N_{rec}} + \frac{M}{M_{rec}} \leq 1.0$

X-BT-MF CATALOG PAGES

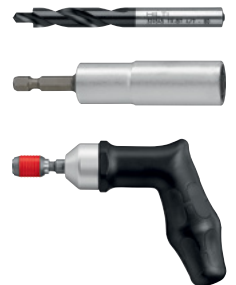
Description	Base Material	Environment	Item Number
Composite stud X-BT-MF M10/10 SN 4	Steel	Mildly corrosive	2083549
Composite stud X-BT-MF W10/10 SN 4	Steel	Mildly corrosive	2083620



Tool Kit	Item Number
X-BT tool set*	Local item
DX 351-BT powder-actuated tool	Local item
Piston X-351 BT	378676
Fastener guide BT FG M1024 for metric studs	378674
Fastener guide BT FG W1024 for Whitworth studs	378673
6.8/11 M10 brown cartridge	412689
SF BT 22-A cordless drill	2123719



Accessories	Item Number
Stepped drill bit TX-BT 4/7-80	377079
Socket X-NSD 1/4" - 16 mm for M10	2097397
Socket X-NSD 1/4" - 9/16" for W10	2107229
Torque tool X-BT 1/4" 8 Nm	2119272
T-Handle X-NSD 1/4"	2115130





SAUTER

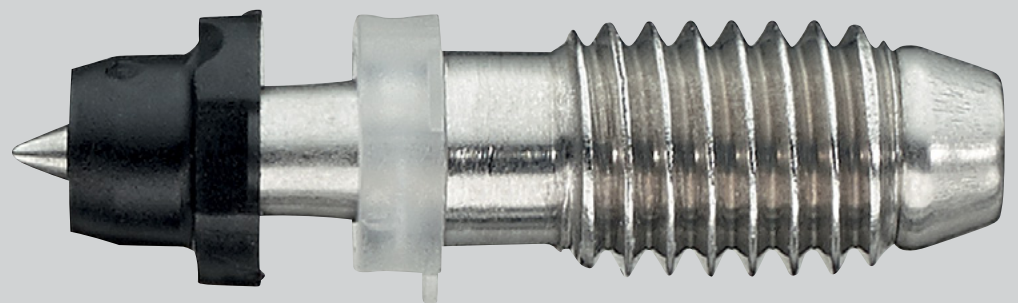
Type	100 100 100	A-NO	1
No.	1 750 1	W	
V	250	A	
V	220	Hz	50

Made in Switzerland



X-ST-GR THREADED STUD

Metric



X-ST-GR TECHNICAL DATA USED FOR THE FOLLOWING CALCULATIONS

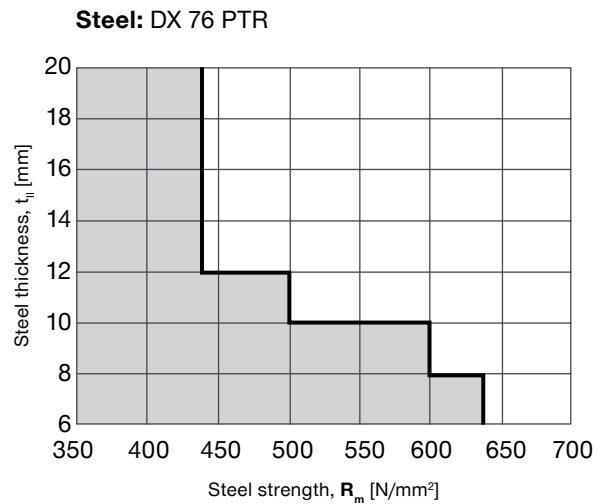
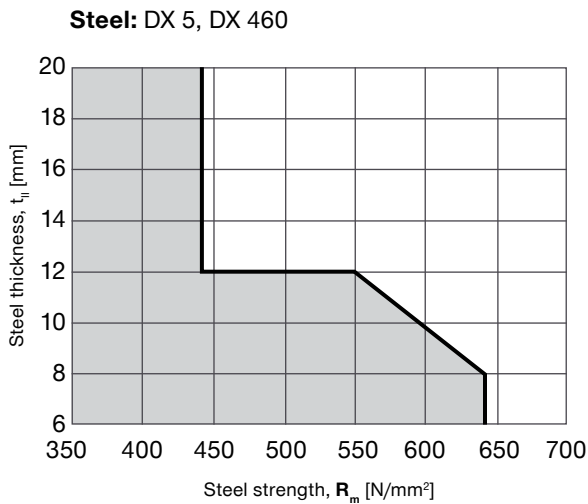
X-ST-GR technical data

- **Drill hole type / base material:** no predrilling, $t_{II} \geq 6 \text{ mm}$ (0.24")
- **Base material:** Steel S235 / A36 (higher steel strength is possible, see application limit)
- **Recommended interaction for combined load:** $N_{rec} = 1.8 \text{ kN}$ (axial) / $V_{rec} = 1.8 \text{ kN}$ (shear)

V-N (shear and tension)

$$\frac{V}{V_{rec}} + \frac{N}{N_{rec}} \leq 1.2 \quad \text{with} \quad \frac{V}{V_{rec}} \leq 1.0 \quad \text{and} \quad \frac{N}{N_{rec}} \leq 1.0$$

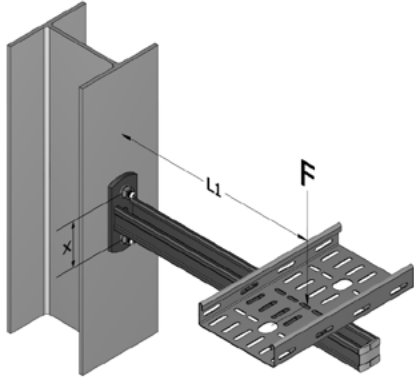
Application limit



For further technical data refer to the latest technical information (DFTM / binder)

FASTENING CANTILEVER SUPPORT WITH X-ST-GR

Two / Four X-ST-GR Threaded studs



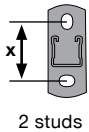
Application

- Fastening of cable trays, pipes on a horizontal cantilever support, fastened on a vertical structure
- Support is fastened by two / four X-ST-GR on both support and brace baseplate with distance x
- L1 is the distance of the load center to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

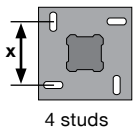
- These values are ONLY reflecting capacity of X-ST-GR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Shear load fully carried by one / two top X-ST-GR (worst-case)
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-ST-GR distance x)



Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	80	270	150	95	60	35		
	100	340	190	120	75	45		
	125	425	240	150	95	55		
	150	510	290	180	110	70		
	175	595	335	210	130	80		
	200	680	385	240	150	90		

Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	75	60	50	35	20	15	10
	100	85	70	60	40	30	20	15
	125	100	80	70	50	35	25	20
	150	110	90	80	60	40	30	25
	175	115	100	90	65	45	35	30
	200	125	110	95	70	55	40	35



Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	80	585	385	270	200	150	95	60
	100	730	485	340	250	190	120	75
	125	915	605	425	315	240	150	95
	150	1100	730	510	375	290	180	110
	175	1280	850	595	440	335	210	130
	200	1465	970	680	500	385	240	150

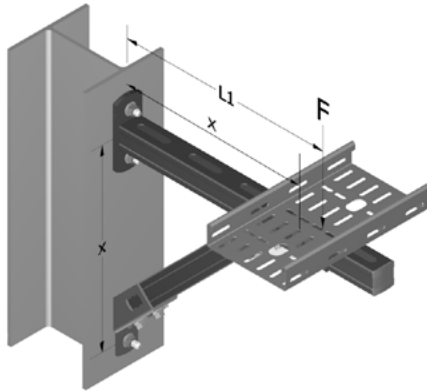
Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	150	125	105	70	45	35	25
	100	175	145	125	85	60	45	35
	125	200	165	145	100	75	55	45
	150	220	185	165	120	85	65	55
	175	235	205	180	130	95	75	60
	200	250	220	195	145	110	85	70

NOTE: load capacity used for calculation $N_{rec} = 1.8 \text{ kN (axial)} / V_{rec} = 1.8 \text{ kN (shear)}$

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FASTENING BRACED CANTILEVER SUPPORT WITH X-ST-GR

Two / Four X-ST-GR Threaded studs



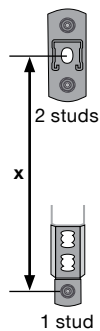
Application

- Fastening of cable trays, pipes on a horizontal, braced cantilever support, fastened on a vertical structure
- Support is fastened by three / six X-ST-GR on both support and brace baseplate with distance x
- L1 is the distance of the load center to the vertical structure surface, the angle of the brace is 45°
- Load F is the acceptable total load (all dead load including)

Boundary conditions

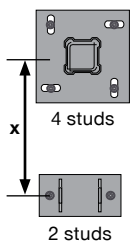
- These values are ONLY reflecting capacity of X-ST-GR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Shear load fully carried by one / two top X-ST-GR (worst-case)
- Load F acting at the distance of L1 from structure surface

Technical assessment — maximum of F (depending on load F or lever arm length L1 and baseplate distance x)



Result:	F [kg]							
L1 [mm]	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	100	360	240	180	145	120		
	150	540	365	275	220	180		
	200	720	485	365	290	240		
	350	1260	855	640	510	425		
	500	1800	1220	915	730	610		
	800	2880	1955	1465	1170	975		

Result:	L1 [mm]							
Load F [kg]	150	200	250	400	600	800	1000	1200
x [mm]	100	120	90	70	45	30		
	150	180	135	110	65	45		
	200		180	145	90	60		
	350				160	105		
	500					150		
	800							



Result:	F [kg]							
L1 [mm]	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	100	650	455	360	290	240	180	145
	150	980	685	540	440	365	275	220
	200	1305	915	720	585	485	365	290
	350	2285	1600	1260	1025	855	640	510
	500	3265	2290	1800	1465	1220	915	730
	800	5230	3660	2880	2345	1955	1465	1170

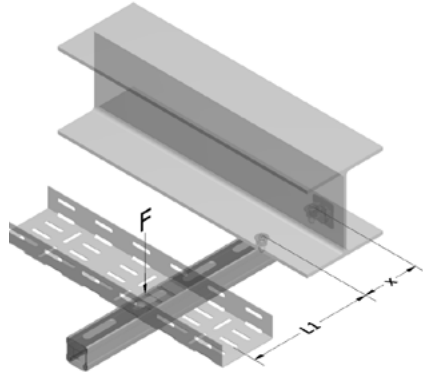
Result:	L1 [mm]							
Load F [kg]	150	200	250	400	600	800	1000	1200
x [mm]	100	240	180	145	90	60		
	150	365	275	220	135	90	65	55
	200		365	290	180	120	90	70
	350				320	210	160	125
	500					305	225	180
	800						365	290

NOTE: load capacity used for calculation $N_{rec} = 1.8 \text{ kN (axial)} / V_{rec} = 1.8 \text{ kN (shear)}$

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FASTENING STRUT TO STEEL WITH X-ST-GR

Two X-ST-GR Threaded studs



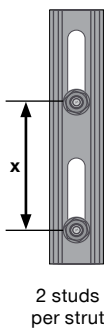
Application

- Fastening of cable trays, pipes on a horizontal cantilever support, fastened on a horizontal structure
- Support is fastened by two X-ST-GR (horizontal distance x)
- L1 is the distance of the load center to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of X-ST-GR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-ST-GR distance x)



Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	80	210	115	65	35	15		
	100	265	140	80	45	20		
	125	330	180	100	55	25		
	150	400	215	125	70	30		
	175	465	250	145	80	35		
	200	530	285	165	90	40		

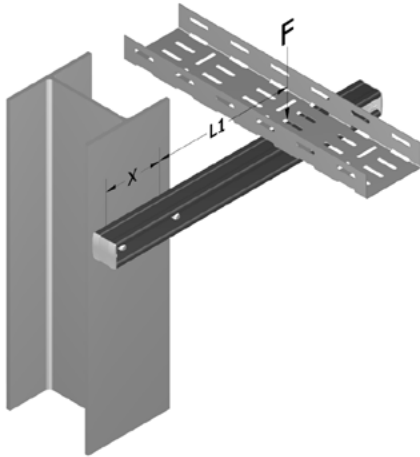
Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	60	50	40	30	20	15	10
	100	70	60	50	35	25	20	15
	125	80	70	60	40	30	20	15
	150	90	75	65	50	35	25	20
	175	95	85	75	55	40	30	25
	200	100	90	80	60	45	35	30

NOTE: load capacity used for calculation $N_{rec} = 1.8 \text{ kN (axial)} / V_{rec} = 1.8 \text{ kN (shear)}$

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FASTENING STRUT TO STEEL WITH X-ST-GR

Two / Four X-ST-GR Threaded studs



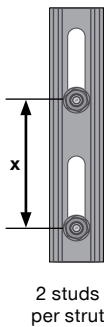
Application

- Fastening of cable trays, pipes on a horizontal cantilever support, fastened on a vertical structure
- Support is fastened by two X-ST-GR (horizontal distance x)
- L1 is the distance of the load center to the center of the fasteners
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of X-ST-GR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Shear load fully carried by one X-ST-GR (worst-case)
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-ST-GR distance x)



Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	80	210	115	65	35	15		
	100	265	140	80	45	20		
	125	330	180	100	55	25		
	150	400	215	125	70	30		
	175	465	250	145	80	35		
	200	530	285	165	90	40		

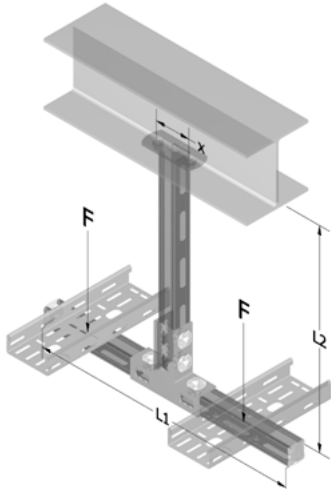
Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	60	50	40	30	20	15	10
	100	70	60	50	35	25	20	15
	125	80	70	60	40	30	20	15
	150	90	75	65	50	35	25	20
	175	95	85	75	55	40	30	25
	200	100	90	80	60	45	35	30

NOTE: load capacity used for calculation $N_{rec} = 1.8 \text{ kN (axial)} / V_{rec} = 1.8 \text{ kN (shear)}$

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FASTENING T-POST (CEILING) SUPPORT WITH X-ST-GR

Two / Four X-ST-GR Threaded studs



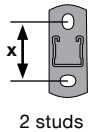
Application

- Fastening of cable trays, pipes on a T-Post support, which is fastened on a horizontal structure
- Support is fastened by two / four X-ST-GR (horizontal distance x)
- L1 is the total width of the T-Post, L2 is fix set to 1000 mm
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of X-ST-GR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- 2 Load cases: load asymmetric acting in the center of one arm only, 30% acting as horizontal load

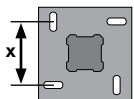
Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-ST-GR distance x)



2 studs

Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	80							
	100	1265						
	125	1580						
	150	1900						
	175	2215	1360					
	200	2535	1555					

Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	40	40	40	40	40	40	40
	100	50	50	50	50	50	50	50
	125	60	60	60	60	60	60	60
	150	70	70	70	70	70	70	70
	175	80	80	80	80	80	80	80
	200	90	90	90	90	90	90	90



4 studs

Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	80	2185	1405					
	100	2735	1755	1265				
	125	3415	2195	1580				
	150	4100	2635	1900	1460			
	175	4785	3075	2215	1705	1360		
	200	5470	3510	2535	1945	1555		

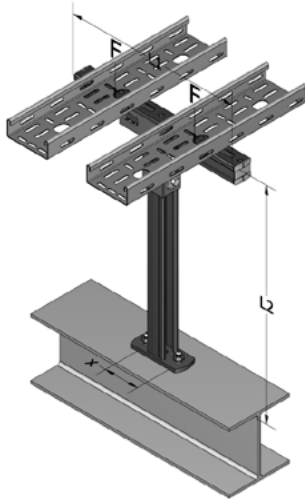
Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	75	75	75	75	75	75	75
	100	90	90	90	90	90	90	90
	125	105	105	105	105	105	105	105
	150	120	120	120	120	120	120	120
	175	135	135	135	135	135	135	135
	200	145	145	145	145	145	145	145

NOTE: load capacity used for calculation $N_{rec} = 1.8 \text{ kN (axial)} / V_{rec} = 1.8 \text{ kN (shear)}$

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FASTENING T-POST (FLOOR) SUPPORT WITH X-ST-GR

Two / Four X-ST-GR Threaded studs



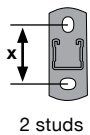
Application

- Fastening of cable trays, pipes on a T-Post support, which is fastened on a horizontal structure
- Support is fastened by two / four X-ST-GR (horizontal distance x)
- L1 is the total width of the T-Post, L2 is fix set to 1000 mm
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of X-ST-GR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- 2 Load cases: load asymmetric acting in the center of one arm only, 30% acting as horizontal load

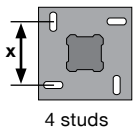
Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-ST-GR distance x)



2 studs

Result: L1 [mm]	F [kg]								
	50	75	100	125	150	200	250	300	
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94	
x [mm]	80								
	100	1665							
	125	2080	1470						
	150	2500	1765						
	175	2915	2060	1630					
	200	3335	2355	1865					

Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	45	45	45	45	45	45	45
	100	60	60	60	60	60	60	60
	125	75	75	75	75	75	75	75
	150	90	90	90	90	90	90	90
	175	105	105	105	105	105	105	105
	200	120	120	120	120	120	120	120



4 studs

Result: L1 [mm]	F [kg]								
	50	75	100	125	150	200	250	300	
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94	
x [mm]	80								
	100	3135							
	125	3915	2695						
	150	4700	3235						
	175	5485	3775	2915					
	200	6270	4310	3335					

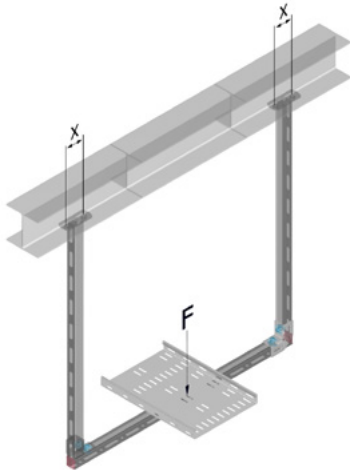
Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	95	95	95	95	95	95	95
	100	120	120	120	120	120	120	120
	125	150	150	150	150	150	150	150
	150	180	180	180	180	180	180	180
	175	210	210	210	210	210	210	210
	200	240	240	240	240	240	240	240

NOTE: load capacity used for calculation $N_{rec} = 1.8 \text{ kN}$ (axial) / $V_{rec} = 1.8 \text{ kN}$ (shear)

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FASTENING U-FRAME (CEILING) / TRAPEZE SUPPORT WITH X-ST-GR

Two / Four X-ST-GR Threaded studs



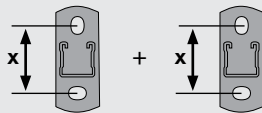
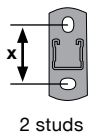
Application

- Fastening of cable trays, pipes on a U-Frame support, which is fastened on a horizontal structure
- Support is fastened by four X-ST-GR (2 fasteners per baseplate)
- Load F is the acceptable total load (all dead load including, acting in the center of the U-Frame)

Boundary conditions

- These values are ONLY reflecting capacity of X-ST-GR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Load acting in the center (U-Frame)

Technical assessment — maximum of F



$$F = N_{rec} \cdot \text{\#fasteners per post}$$

$$F = 1.8 \text{ kN} \cdot 4$$

$$F = 7.2 \text{ kN} / F = 730 \text{ kg}$$

NOTE: load capacity used for calculation $N_{rec} = 1.8 \text{ kN}$ (axial) / $V_{rec} = 1.8 \text{ kN}$ (shear)

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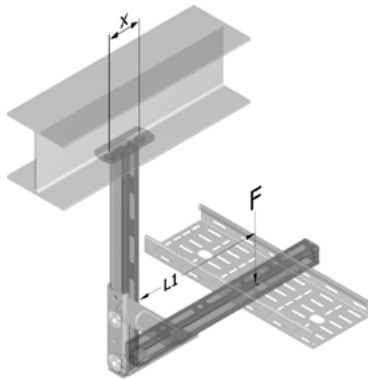
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FASTENING L-POST SUPPORT WITH X-ST-GR

Two / Four X-ST-GR Threaded studs



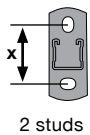
Application

- Fastening of cable trays, pipes on a L-Post support, which is fastened on a horizontal structure
- Support is fastened by two / four X-ST-GR (horizontal distance x)
- L1 is the distance of the load center to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of X-ST-GR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Load F acting at the distance of L1 from structure surface

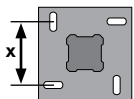
Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-ST-GR distance x)



2 studs

Result: L1 [mm]	F [kg]								
	50	75	100	125	150	200	250	300	
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94	
x [mm]	80	250	155	105	75	55	30	15	5
	100	315	190	130	95	70	40	20	10
	125	395	240	165	120	90	50	25	10
	150	475	290	200	145	105	60	35	15
	175	550	340	230	165	125	70	40	15
	200	630	385	265	190	140	80	45	20

Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	75	60	50	30	20	15	10
	100	90	70	60	40	25	20	15
	125	105	85	70	45	30	25	20
	150	120	100	80	55	40	30	25
	175	135	110	95	65	45	35	25
	200	145	120	100	70	50	40	30



4 studs

Result: L1 [mm]	F [kg]								
	50	75	100	125	150	200	250	300	
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94	
x [mm]	80	545	350	250	190	155	105	75	55
	100	680	435	315	240	190	130	95	70
	125	850	545	395	300	240	165	120	90
	150	1025	655	475	365	290	200	145	105
	175	1195	765	550	425	340	230	165	125
	200	1365	875	630	485	385	265	190	140

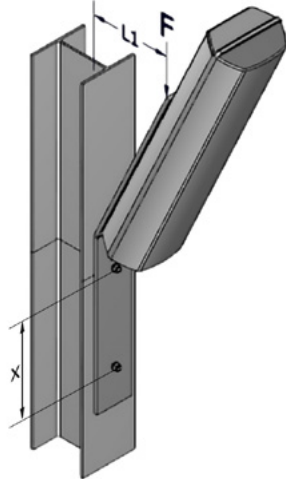
Result: Load F [kg]	L1 [mm]								
	150	200	250	400	600	800	1000	1200	
x [mm]	80	150	120	100	65	45	30	25	20
	100	180	145	120	80	55	40	30	25
	125	215	170	145	95	65	50	40	35
	150	240	200	165	115	80	60	50	40
	175	270	220	190	130	90	70	55	45
	200	290	240	205	145	100	80	65	55

NOTE: load capacity used for calculation $N_{rec} = 1.8 \text{ kN (axial)} / V_{rec} = 1.8 \text{ kN (shear)}$

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FASTENING EQUIPMENT SUPPORT WITH X-ST-GR

Two / Four X-ST-GR Threaded studs



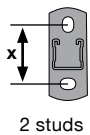
Application

- Fastening of lamps, signals, sensors on inclined cantilever support, fastened on a vertical structure
- Support is fastened by two / four X-ST-GR (vertical distance x)
- L1 is the distance of the load center (~middle of the load) to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

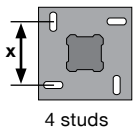
- These values are ONLY reflecting capacity of X-ST-GR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Shear load fully carried by one / two top X-ST-GR (worst-case)
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-ST-GR distance x)



Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	80	270	150	95	60	35		
	100	340	190	120	75	45		
	125	425	240	150	95	55		
	150	510	290	180	110	70		
	175	595	335	210	130	80		
	200	680	385	240	150	90		

Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	75	60	50	35	20	15	10
	100	85	70	60	40	30	20	15
	125	100	80	70	50	35	25	20
	150	110	90	80	60	40	30	25
	175	115	100	90	65	45	35	30
	200	125	110	95	70	55	40	35



Result: L1 [mm]	F [kg]							
	50	75	100	125	150	200	250	300
→ Load in [kN]	0.49	0.74	0.98	1.23	1.47	1.96	2.45	2.94
x [mm]	80	540	305	190	120	70		
	100	680	385	240	150	90		
	125	850	480	300	190	115		
	150	1020	580	360	225	140		
	175	1190	675	420	265	160		
	200	1360	770	480	300	185		

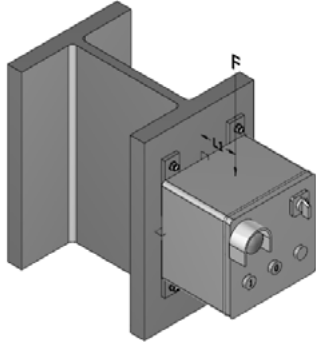
Result: Load F [kg]	L1 [mm]							
	150	200	250	400	600	800	1000	1200
x [mm]	80	150	125	105	70	45	35	25
	100	175	145	125	85	60	45	35
	125	200	165	145	100	75	55	45
	150	220	185	165	120	85	65	55
	175	235	205	180	130	95	75	60
	200	250	220	195	145	110	85	70

NOTE: load capacity used for calculation $N_{rec} = 1.8 \text{ kN}$ (axial) / $V_{rec} = 1.8 \text{ kN}$ (shear)

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FASTENING JUNCTION BOXES / SWITCHES WITH X-ST-GR

X-ST-GR Threaded stud



Application

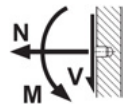
- Fastening of junction boxes, switches on a vertical structure
- Element is fastened by X-ST-GR

Boundary conditions

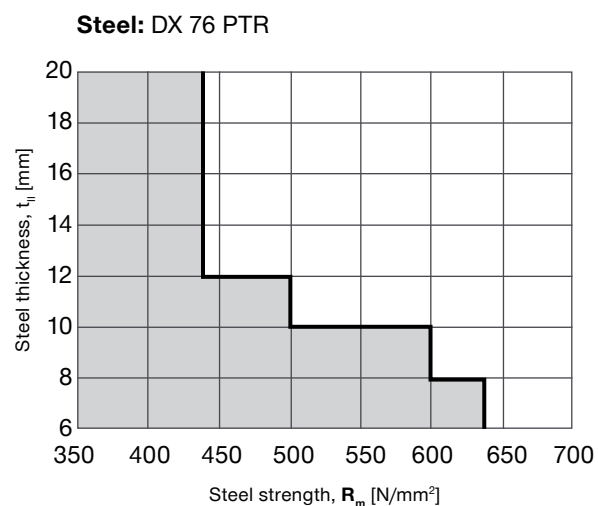
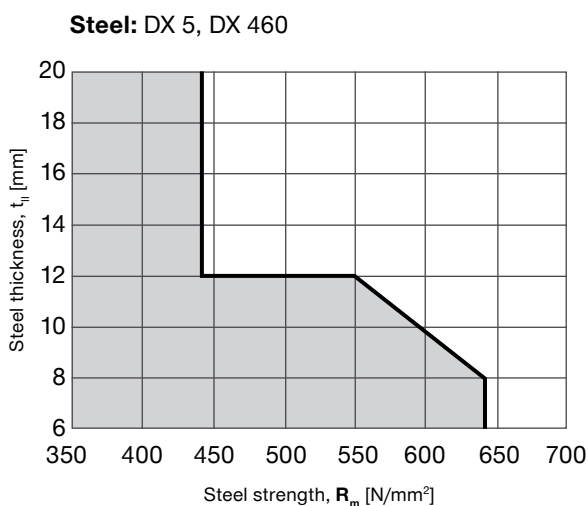
- These values are ONLY reflecting capacity of X-ST-GR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Technical data are based on technical data binder for X-ST-GR (06 / 2018), always refer to latest technical data binder for X-ST-GR

Technical data — always refer to latest technical data binder for X-ST

Recommended load	X-ST
Base material thickness	$t_{II} \geq 6 \text{ mm (0.24")}$
Base material	Steel $R_m \geq 350 \text{ MPa}$
Tension, N_{rec} [kN]	1.8
Shear, V_{rec} [kN]	1.8
Moment, M_{rec} [Nm]	5.5



Application limit



X-ST-GR CATALOG PAGES

Description	Base Material	Environment	Item Number
X-ST-GR M8/10 P8	Steel	Mildly corrosive	2122460



Description	Item Number
DX 76 PTR	Local item
DX 5 GR	Local item
X-5 460 F8 N15 Fastener guide	304530
X-5 460 P8 Piston	373297
Cartridge 6.8/11 M10 STD red	416474
Cartridge 6.8/11 M10 STD black	416475
X-76-F-8-GR-PTR Fastener guide	388852
Cartridge 6.8/18 M10 .27 cal C-T yellow	416483
Cartridge 6.8/18 M10 .27 cal C-T red	416484

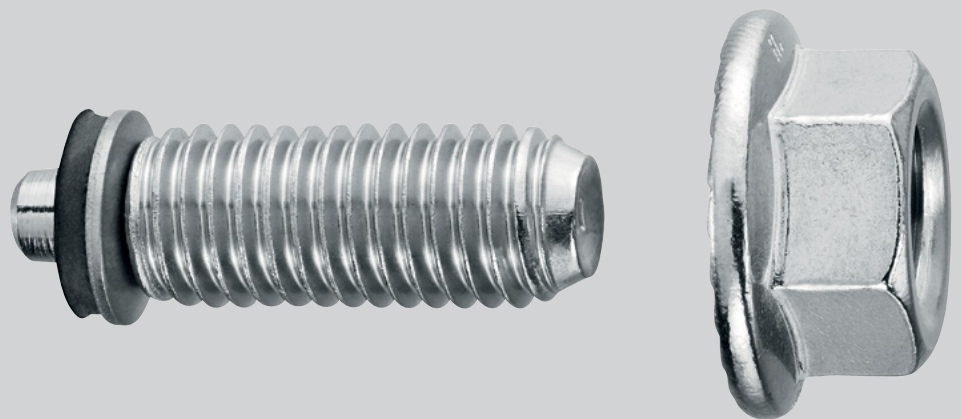






X-BT-MR THREADED STUD (NEW GENERATION)

Imperial



X-BT-MR (NEW GENERATION) TECHNICAL DATA

X-BT-MR technical data

- **Drill hole type / base material:** Pilot hole, $t_{II} \geq 8 \text{ mm}$ (0.31")
- **Base material:** Steel S235 / A36 (higher steel strength is possible, increases the rec. load)
- **Recommended interaction for combined load:** $N_{rec} = 810 \text{ lb}$ (axial) / $V_{rec} = 970 \text{ lb}$ (shear)

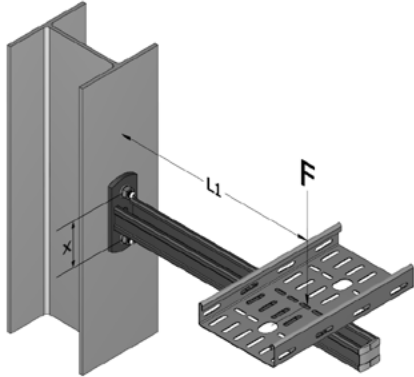
V-N (shear and tension)

$$\frac{V}{V_{rec}} + \frac{N}{N_{rec}} \leq 1.2 \quad \text{with} \quad \frac{V}{V_{rec}} \leq 1.0 \quad \text{and} \quad \frac{N}{N_{rec}} \leq 1.0$$

For further technical data refer to DFTM / New Generation Hilti X-BT-GR, X-BT-MR and X-BT-ER Threaded Fastener Specification [June 2018].

FASTENING CANTILEVER SUPPORT WITH X-BT-MR*

Two / Four X-BT-MR Threaded studs



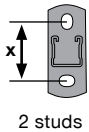
Application

- Fastening of cable trays, pipes, on a horizontal cantilever support, fastened on a vertical structure
- Support is fastened by two / four X-BT-MR on both support and brace baseplate with distance x
- L1 is the distance of the load center to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

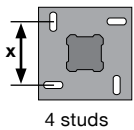
- These values are ONLY reflecting capacity of X-BT-MR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Shear load fully carried by one / two top X-BT-MR (worst-case)
- Load F acting at the distance of L1 from structure surface

Technical assessment — maximum of F (depending on load F or lever arm length L1 and baseplate distance x)



Result: L1 [inch]	F [lbs]								
	100	150	200	300	400	500	600	700	
x [inch]	3.0	21.75	13.75	9.75	5.50	3.50	2.25	1.50	1.00
	4.0	29.00	18.25	12.75	7.50	4.75	3.00	2.00	1.25
	5.0	36.25	22.75	16.00	9.25	6.00	4.00	2.50	1.50
	6.0	43.50	27.25	19.25	11.25	7.00	4.75	3.00	2.00
	7.0	50.75	32.00	22.50	13.00	8.25	5.50	3.50	2.25
	8.0	58.00	36.50	25.75	15.00	9.50	6.25	4.00	2.50

Result: Load F [lbs]	L1 [inch]								
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0	
x [inch]	3.0	285	167	118	91	75	63	54	48
	4.0	346	211	151	118	97	82	71	63
	5.0	397	250	182	143	118	101	88	77
	6.0	440	285	211	167	138	118	103	91
	7.0	477	317	237	190	158	135	118	105
	8.0	510	346	262	211	176	151	133	118



Result: L1 [inch]	F [lbs]								
	100	150	200	300	400	500	600	700	
x [inch]	3.0	46.00	29.75	21.75	13.50	9.50	7.00	5.50	4.25
	4.0	61.25	39.75	29.00	18.00	12.75	9.50	7.25	5.75
	5.0	76.50	49.75	36.25	22.75	16.00	12.00	9.25	7.25
	6.0	92.00	59.50	43.50	27.25	19.25	14.25	11.00	8.75
	7.0	107.25	69.50	50.75	31.75	22.25	16.75	13.00	10.25
	8.0	122.75	79.50	58.00	36.25	25.50	19.00	14.75	11.75

Result: Load F [lbs]	L1 [inch]								
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0	
x [inch]	3.0	570	334	237	183	149	126	109	96
	4.0	692	422	303	237	194	164	143	126
	5.0	794	500	365	287	237	201	175	155
	6.0	881	570	422	334	277	237	206	183
	7.0	955	634	475	379	316	271	237	210
	8.0	1,019	692	524	422	353	303	266	237

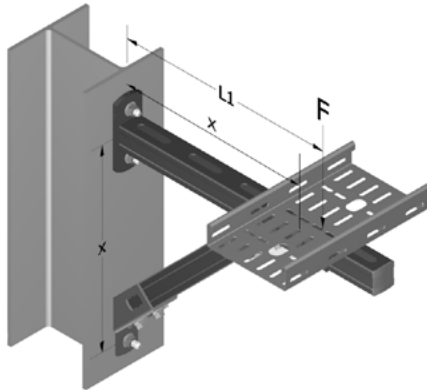
NOTE: load capacity used for calculation $N_{rec} = 810 \text{ lb (axial)} / V_{rec} = 970 \text{ lb (shear)}$

*X-BT-MR is the new generation X-BT

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FASTENING BRACED CANTILEVER SUPPORT WITH X-BT-MR*

Two / Four X-BT-MR Threaded studs



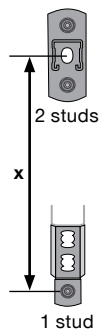
Application

- Fastening of cable trays, pipes on a horizontal, braced cantilever support, fastened on a vertical structure
- Support is fastened by three / six X-BT-MR on both support and brace baseplate with distance x
- L1 is the distance of the load center to the vertical structure surface, the angle of the brace is 45°
- Load F is the acceptable total load (all dead load including)

Boundary conditions

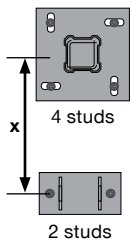
- These values are ONLY reflecting capacity of X-BT-MR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Shear load fully carried by one / two top X-BT-MR (worst-case)
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of F (depending on load F or lever arm length L1 and baseplate distance x)



Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x 4.0 [inch]	18.50	14.50	10.50	8.50	7.25	6.25	5.50	
6.0	27.75	21.75	15.75	12.75	11.00	9.50	8.25	
8.0	37.25	29.00	21.00	17.00	14.50	12.75	11.00	
14.0	65.25	51.00	37.00	29.75	25.50	22.50	19.25	
20.0	93.00	73.00	52.75	42.75	36.50	32.00	27.50	
32.0	149.00	116.75	84.50	68.25	58.75	51.50	44.00	

Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
x 4.0 [inch]	644	322	215	161				
6.0	966	483	322	241				
8.0	644	429	322					
14.0			752	564				
20.0				805				
32.0								



Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x 4.0 [inch]				18.50	14.50	12.00	10.50	9.25
6.0				27.75	21.75	18.25	15.75	14.00
8.0				37.25	29.00	24.25	21.00	18.75
14.0				65.25	51.00	42.50	37.00	32.75
20.0				93.00	73.00	60.75	52.75	47.00
32.0				149.00	116.75	97.50	84.50	75.25

Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
x 4.0 [inch]	1,288	644	429	322				
6.0	1,933	966	644	483	386	322		
8.0	1,288	859	644	515	429	368	322	
14.0			1,503	1,127	902	752	644	564
20.0				1,610	1,288	1,074	920	805
32.0						1,718	1,472	1,288

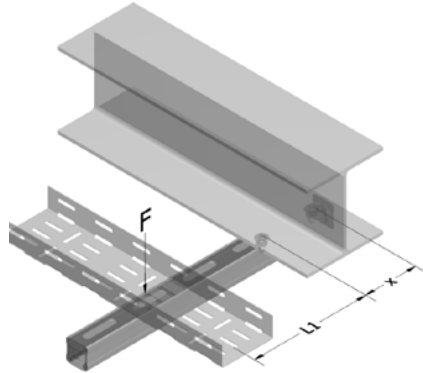
NOTE: load capacity used for calculation $N_{rec} = 810 \text{ lb (axial)} / V_{rec} = 970 \text{ lb (shear)}$

*X-BT-MR is the new generation X-BT

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FASTENING STRUT TO STEEL WITH X-BT-MR*

Two X-BT-MR Threaded studs



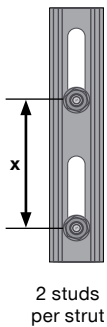
Application

- Fastening of cable trays, pipes on a horizontal cantilever support, fastened on a horizontal structure
- Support is fastened by two X-BT-MR (horizontal distance x)
- L1 is the distance of the load center to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of X-BT-MR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-BT-MR distance x)



Result: L1 [inch]		F [lbs]							
		100	150	200	300	400	500	600	700
x [inch]	3.0	21.25	13.00	9.00	5.00	3.00	1.75	1.00	0.25
	4.0	28.25	17.50	12.00	6.75	4.00	2.25	1.25	0.50
	5.0	35.25	21.75	15.00	8.25	5.00	3.00	1.50	0.75
	6.0	42.50	26.25	18.25	10.00	6.00	3.50	2.00	0.75
	7.0	49.50	30.75	21.25	11.75	7.00	4.25	2.25	1.00
	8.0	56.50	35.00	24.25	13.50	8.00	4.75	2.75	1.00

Result: Load F [lbs]		L1 [inch]							
		6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
x [inch]	3.0	270	162	116	90	73	62	54	47
	4.0	323	202	147	116	95	81	70	62
	5.0	368	238	176	139	116	99	86	76
	6.0	404	270	202	162	135	116	101	90
	7.0	436	298	226	183	153	132	116	103
	8.0	462	323	249	202	170	147	129	116

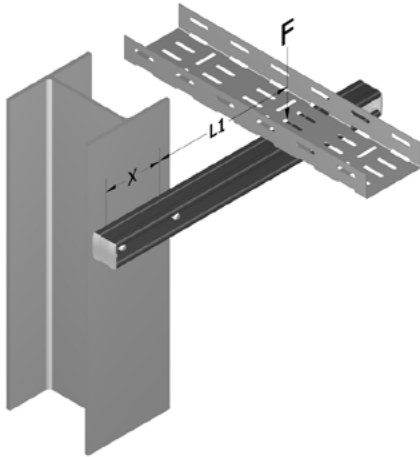
NOTE: load capacity used for calculation $N_{rec} = 810 \text{ lb (axial)} / V_{rec} = 970 \text{ lb (shear)}$

*X-BT-MR is the new generation X-BT

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FASTENING STRUT TO STEEL WITH X-BT-MR*

Two / Four X-BT-MR Threaded studs



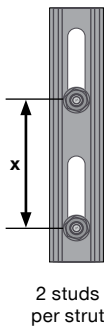
Application

- Fastening of cable trays, pipes on a horizontal cantilever support, fastened on a vertical structure
- Support is fastened by two X-BT-MR (horizontal distance x)
- L1 is the distance of the load center to the center of the fasteners
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of X-BT-MR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Shear load fully carried by one X-BT-MR (worst-case)
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-BT-MR distance x)



Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
3.0	26.00	16.25	11.50	6.50	4.00	2.75	1.75	1.00
4.0	34.50	21.75	15.25	8.75	5.50	3.50	2.25	1.50
5.0	43.25	27.00	19.00	11.00	7.00	4.50	3.00	1.75
6.0	52.00	32.50	23.00	13.25	8.50	5.50	3.50	2.25
7.0	60.50	38.00	26.75	15.50	9.75	6.50	4.25	2.50
8.0	69.25	43.50	30.50	17.75	11.25	7.25	4.75	3.00

Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
3.0	322	193	138	107	88	74	64	57
4.0	386	241	175	138	114	97	84	74
5.0	439	284	210	166	138	118	103	91
6.0	483	322	241	193	161	138	121	107
7.0	520	356	271	218	183	157	138	123
8.0	552	386	297	241	203	175	155	138

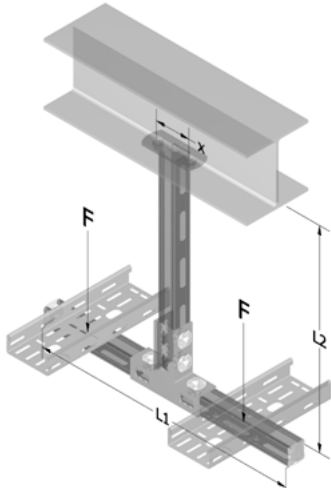
NOTE: load capacity used for calculation $N_{rec} = 810 \text{ lb (axial)} / V_{rec} = 970 \text{ lb (shear)}$

*X-BT-MR is the new generation X-BT

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FASTENING T-POST (CEILING) SUPPORT WITH X-BT-MR*

Two / Four X-BT-MR Threaded studs



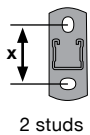
Application

- Fastening of cable trays, pipes on a T-Post support, which is fastened on a horizontal structure
- Support is fastened by two / four X-BT-MR (horizontal distance x)
- L1 is the total width of the T-Post, L2 is fix set to 1000 mm
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of X-BT-MR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- 2 Load cases: load asymmetric acting in the center of one arm only, 30% acting as horizontal load

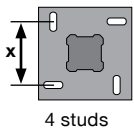
Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-BT-MR distance x)



2 studs

Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x [inch]	3.0	91.00	58.50					
	4.0	121.25	78.25	56.50				
	5.0	151.75	97.75	70.75				
	6.0	182.00	117.25	85.00				
	7.0	212.50	137.00	99.25	61.50			
	8.0	242.75	156.50	113.25	70.25			

Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
x [inch]	3.0	172	172	172	172	172	172	172
	4.0	218	218	218	218	218	218	218
	5.0	260	260	260	260	260	260	260
	6.0	297	297	297	297	297	297	297
	7.0	332	332	332	332	332	332	332
	8.0	363	363	363	363	363	363	363



4 studs

Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x [inch]	3.0	188.00	123.25	91.00	58.50			
	4.0	250.75	164.50	121.25	78.25	56.50		
	5.0	313.50	205.75	151.75	97.75	70.75	54.50	
	6.0	376.25	246.75	182.00	117.25	85.00	65.50	
	7.0	439.00	288.00	212.50	137.00	99.25	76.50	61.50
	8.0	501.75	329.25	242.75	156.50	113.25	87.50	70.25

Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
x [inch]	3.0	312	312	312	312	312	312	312
	4.0	385	385	385	385	385	385	385
	5.0	448	448	448	448	448	448	448
	6.0	502	502	502	502	502	502	502
	7.0	550	550	550	550	550	550	550
	8.0	593	593	593	593	593	593	593

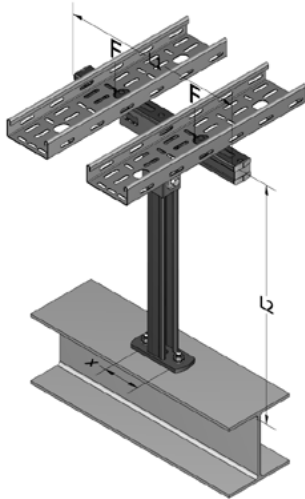
NOTE: load capacity used for calculation $N_{rec} = 810 \text{ lb (axial)} / V_{rec} = 970 \text{ lb (shear)}$

*X-BT-MR is the new generation X-BT

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FASTENING T-POST (FLOOR) SUPPORT WITH X-BT-MR*

Two / Four X-BT-MR Threaded studs



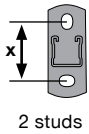
Application

- Fastening of cable trays, pipes on a T-Post support, which is fastened on a horizontal structure
- Support is fastened by two / four X-BT-MR (horizontal distance x)
- L1 is the total width of the T-Post, L2 is fix set to 1000 mm
- Load F is the acceptable total load (all dead load including)

Boundary conditions

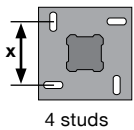
- These values are ONLY reflecting capacity of X-BT-MR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- 2 Load cases: load asymmetric acting in the center of one arm only, 30% acting as horizontal load

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-BT-MR distance x)



Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x [inch]	3.0	103.00	70.50					
	4.0	137.25	94.25	72.50				
	5.0	171.75	117.75	90.75	63.75			
	6.0	206.00	141.25	109.00	76.50			
	7.0	240.50	165.00	127.25	89.50	70.50		
	8.0	274.75	188.50	145.25	102.25	80.50		

Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
x [inch]	3.0	193	193	193	193	193	193	193
	4.0	252	252	252	252	252	252	252
	5.0	310	310	310	310	310	310	310
	6.0	364	364	364	364	364	364	364
	7.0	417	417	417	417	417	417	417
	8.0	468	468	468	468	468	468	468



Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x [inch]	3.0	200.00	135.25					
	4.0	266.75	180.50	137.25				
	5.0	333.50	225.75	171.75	117.75			
	6.0	400.25	270.75	206.00	141.25			
	7.0	467.00	316.00	240.50	165.00	127.25		
	8.0	533.75	361.25	274.75	188.50	145.25	119.50	

Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
x [inch]	3.0	386	386	386	386	386	386	386
	4.0	505	505	505	505	505	505	505
	5.0	619	619	619	619	619	619	619
	6.0	729	729	729	729	729	729	729
	7.0	835	835	835	835	835	835	835
	8.0	937	937	937	937	937	937	937

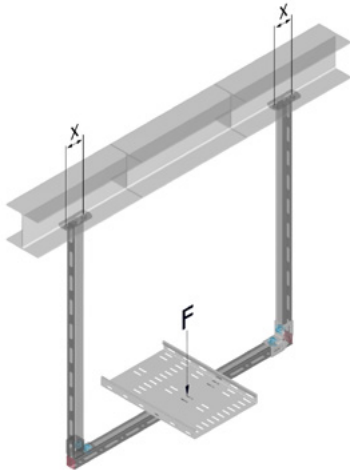
NOTE: load capacity used for calculation $N_{rec} = 810 \text{ lb (axial)} / V_{rec} = 970 \text{ lb (shear)}$

*X-BT-MR is the new generation X-BT

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FASTENING U-FRAME (CEILING) / TRAPEZE SUPPORT WITH X-BT-MR*

Two / Four X-BT-MR Threaded studs



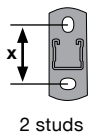
Application

- Fastening of cable trays, pipes on a U-Frame support, which is fastened on a horizontal structure
- Support is fastened by four X-BT-MR (2 fasteners per baseplate)
- Load F is the acceptable total load (all dead load including, acting in the center of the U-Frame)

Boundary conditions

- These values are ONLY reflecting capacity of X-BT-MR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Load acting in the center (U-Frame)

Technical assessment — maximum of F



$$F = N_{rec} \cdot \text{\#fasteners per post}$$

$$F = 810 \text{ lb} \cdot 4$$

$$F = 3240 \text{ lb}$$

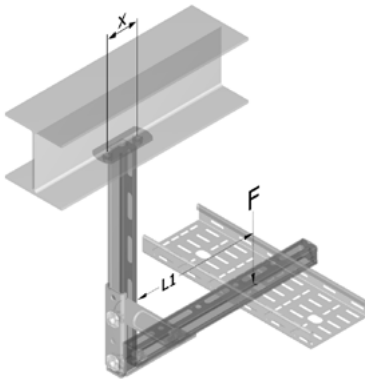
NOTE: load capacity used for calculation $N_{rec} = 810 \text{ lb}$ (axial) / $V_{rec} = 970 \text{ lb}$ (shear)

*X-BT-MR is the new generation X-BT

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FASTENING L-POST SUPPORT WITH X-BT-MR*

Two / Four X-BT-MR Threaded studs



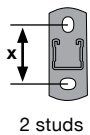
Application

- Fastening of cable trays, pipes on a L-Post support, which is fastened on a horizontal structure
- Support is fastened by two / four X-BT-MR (horizontal distance x)
- L1 is the distance of the load center to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

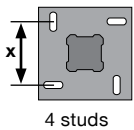
- These values are ONLY reflecting capacity of X-BT-MR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-BT-MR distance x)



Result: L1 [inch]	F [lbs]								
	100	150	200	300	400	500	600	700	
x [inch]	3.0	22.75	14.50	10.50	6.50	4.50	3.25	2.50	1.75
	4.0	30.25	19.50	14.00	8.75	6.00	4.25	3.25	2.50
	5.0	37.75	24.25	17.50	10.75	7.50	5.50	4.00	3.25
	6.0	45.50	29.25	21.25	13.00	9.00	6.50	5.00	3.75
	7.0	53.00	34.25	24.75	15.25	10.50	7.75	5.75	4.50
	8.0	60.50	39.00	28.25	17.50	12.00	8.75	6.75	5.00

Result: Load F [lbs]	L1 [inch]								
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0	
x [inch]	3.0	323	180	124	95	77	65	56	49
	4.0	404	231	162	124	101	85	73	65
	5.0	476	279	197	153	124	105	91	80
	6.0	539	323	231	180	147	124	108	95
	7.0	596	365	263	206	169	143	124	110
	8.0	647	404	294	231	190	162	141	124



Result: L1 [inch]	F [lbs]								
	100	150	200	300	400	500	600	700	
x [inch]	3.0	47.00	30.75	22.75	14.50	10.50	8.00	6.50	5.25
	4.0	62.50	41.00	30.25	19.50	14.00	10.75	8.75	7.00
	5.0	78.25	51.25	37.75	24.25	17.50	13.50	10.75	9.00
	6.0	94.00	61.50	45.50	29.25	21.25	16.25	13.00	10.75
	7.0	109.75	72.00	53.00	34.25	24.75	19.00	15.25	12.50
	8.0	125.25	82.25	60.50	39.00	28.25	21.75	17.50	14.25

Result: Load F [lbs]	L1 [inch]								
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0	
x [inch]	3.0	647	359	249	190	154	129	112	98
	4.0	809	462	323	249	202	170	147	129
	5.0	952	558	395	305	249	210	182	160
	6.0	1,079	647	462	359	294	249	216	190
	7.0	1,192	731	527	412	338	287	249	220
	8.0	1,294	809	588	462	381	323	281	249

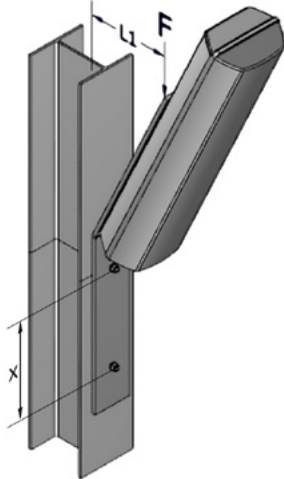
NOTE: load capacity used for calculation $N_{rec} = 810 \text{ lb (axial)} / V_{rec} = 970 \text{ lb (shear)}$

*X-BT-MR is the new generation X-BT

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FASTENING EQUIPMENT SUPPORT WITH X-BT-MR*

Two / Four X-BT-MR Threaded studs



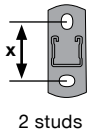
Application

- Fastening of lamps, signals, sensors on inclined cantilever support, fastened on a vertical structure
- Support is fastened by two / four X-BT-MR (vertical distance x)
- L1 is the distance of the load center (~middle of the load) to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

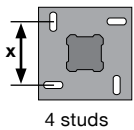
- These values are ONLY reflecting capacity of X-BT-MR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Shear load fully carried by one / two top X-BT-MR (worst-case)
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-BT-MR distance x)



Result: L1 [inch]	F [lbs]								
	100	150	200	300	400	500	600	700	
x [inch]	3.0	21.75	13.50	9.50	5.50	3.50	2.25	1.50	0.75
	4.0	29.00	18.00	12.75	7.25	4.50	3.00	2.00	1.25
	5.0	36.25	22.75	16.00	9.25	5.75	3.75	2.50	1.50
	6.0	43.50	27.25	19.25	11.00	7.00	4.50	3.00	1.75
	7.0	50.75	31.75	22.25	13.00	8.25	5.25	3.50	2.00
	8.0	58.00	36.25	25.50	14.75	9.25	6.00	4.00	2.50

Result: Load F [lbs]	L1 [inch]								
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0	
x [inch]	3.0	285	167	118	91	75	63	54	48
	4.0	346	211	151	118	97	82	71	63
	5.0	397	250	182	143	118	101	88	77
	6.0	440	285	211	167	138	118	103	91
	7.0	477	317	237	190	158	135	118	105
	8.0	510	346	262	211	176	151	133	118



Result: L1 [inch]	F [lbs]								
	100	150	200	300	400	500	600	700	
x [inch]	3.0	43.50	27.25	19.25	11.00	7.00	4.50	3.00	1.75
	4.0	58.00	36.25	25.50	14.75	9.25	6.00	4.00	2.50
	5.0	72.50	45.50	32.00	18.50	11.75	7.75	5.00	3.00
	6.0	87.00	54.50	38.50	22.25	14.00	9.25	6.00	3.75
	7.0	101.50	63.75	44.75	26.00	16.50	10.75	7.00	4.25
	8.0	116.00	72.75	51.25	29.75	18.75	12.50	8.00	5.00

Result: Load F [lbs]	L1 [inch]								
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0	
x [inch]	3.0	570	334	237	183	149	126	109	96
	4.0	692	422	303	237	194	164	143	126
	5.0	794	500	365	287	237	201	175	155
	6.0	881	570	422	334	277	237	206	183
	7.0	955	634	475	379	316	271	237	210
	8.0	1,019	692	524	422	353	303	266	237

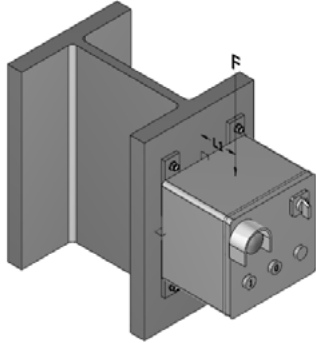
NOTE: load capacity used for calculation $N_{rec} = 810 \text{ lb (axial)} / V_{rec} = 970 \text{ lb (shear)}$

*X-BT-MR is the new generation X-BT

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FASTENING JUNCTION BOXES / SWITCHES WITH X-BT-MR*

X-BT-MR Threaded stud



Application

- Fastening of junction boxes, switches on a vertical structure
- Element is fastened by X-BT-MR

Boundary conditions

- These values are ONLY reflecting capacity of X-BT-MR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Technical data are based on technical data binder for X-BT-MR (06 / 2018), always refer to latest technical data binder for X-BT-MR

Technical data — always refer to latest technical data binder for X-BT-MR

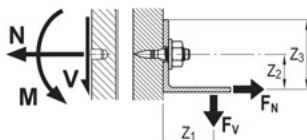
Recommended load	X-BT-MR		
Drill hole type and base material thickness	Pilot hole, $t_{II} \geq 8 \text{ mm (0.31")}$		
Base material	Steel S235 A36	Steel S355 Grade 50	Cast iron with spheroidal graphite
Tension, N_{rec} [kN / lb]	3.6 / 810	4.6 / 1030	1.0 / 230
Shear, V_{rec} [kN / lb]	4.3 / 970	5.3 / 1190	1.5 / 340
Moment, M_{rec} [Nm / ft-lb]	20.0 / 14.8	20.0 / 14.8	16.0 / 11.5

Design resistance	X-BT-MR		
Drill hole type and base material thickness	Pilot hole, $t_{II} \geq 8 \text{ mm (0.31")}$		
Base material	Steel S235 A36	Steel S355 Grade 50	Cast iron with spheroidal graphite
Tension, N_{Rd} [kN / lb]	5.0	6.5	1.6
Shear, V_{Rd} [kN / lb]	6.0	7.5	2.4
Moment, M_{Rd} [Nm / ft-lb]	28.0	28.0	26.0

Conditions for recommended loads

- Global factor of safety for static pull-out > 3 (based on 5% fractile value), ≥ 5 (based on mean value)
- Minimum edge distance = 6 mm [$\frac{1}{4}$ "]
- Effect of base metal vibration and stress considered
- Redundancy (multiple fastening) must be provided
- Recommended loads in the table refer to the resistance of the individual fastening and may not be the same as the loads F_N and F_V acting on the fastened part.

Note: if relevant, prying forces need to be considered in design, see example. Moment acting on fastener shank only in case of a gap between base and fastened material.



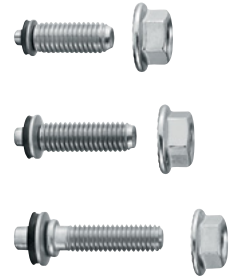
Recommended interaction formula for combined loading — steel and cast iron base material

Combined loading situation	Interaction formula
V-N (shear and tension)	$\frac{V}{V_{rec}} + \frac{N}{N_{rec}} \leq 1.2$ with $\frac{V}{V_{rec}} \leq 1.0$ and $\frac{N}{N_{rec}} \leq 1.0$
V-M (shear and bending)	$\frac{V}{V_{rec}} + \frac{M}{M_{rec}} \leq 1.2$ with $\frac{V}{V_{rec}} \leq 1.0$ and $\frac{M}{M_{rec}} \leq 1.0$
N-M (tension and bending)	$\frac{N}{N_{rec}} + \frac{M}{M_{rec}} \leq 1.0$
V-N-M (shear, tension and bending)	$\frac{V}{V_{rec}} + \frac{N}{N_{rec}} + \frac{M}{M_{rec}} \leq 1.0$

*X-BT-MR is the new generation X-BT

X-BT-MR* CATALOG PAGES

Description	Base Material	Environment	Item Number
Threaded stud X-BT-MR M8/14 SN 8	Steel	Highly corrosive	2194339
Threaded stud X-BT-MR M6/14 SN 8	Steel	Highly corrosive	2194337
Threaded stud X-BT-MR W6/14 SN 8	Steel	Highly corrosive	2194338
Threaded stud X-BT-MR M10/15 SN 8	Steel	Highly corrosive	2194340
Threaded stud X-BT-MR W10/15 SN 8	Steel	Highly corrosive	2194341



Tool Kit	Item Number
X-BT tool set*	Local item
DX 351-BT powder-actuated tool	Local item
Piston X-351 BT	378676
Fastener guide BT FG M1024 for metric studs	378674
Fastener guide BT FG W1024 for Whitworth studs	378673
6.8/11 M10 brown cartridge	412689
SF BT 22-A cordless drill	2123719



Accessories	Item Number
Stepped drill bit TX-BT 4.7/7-80	2197930
Nut setter S-NS 13C (for use with M8 flange nuts)	2149244
Socket wrench insert X-NSD 1/4" - 10 mm (for M6)	2197934
Socket wrench insert X-NSD 1/4" - 25/64" (for W6)	2197935
Nut setter S-NS 15C (for M10)	2149245
Nut setter S-NS 9/16" C95/3 3/4" (for W10)	2149246
Torque tool X-BT 1/4" 20 Nm / 14.8 ft-lb	2212510



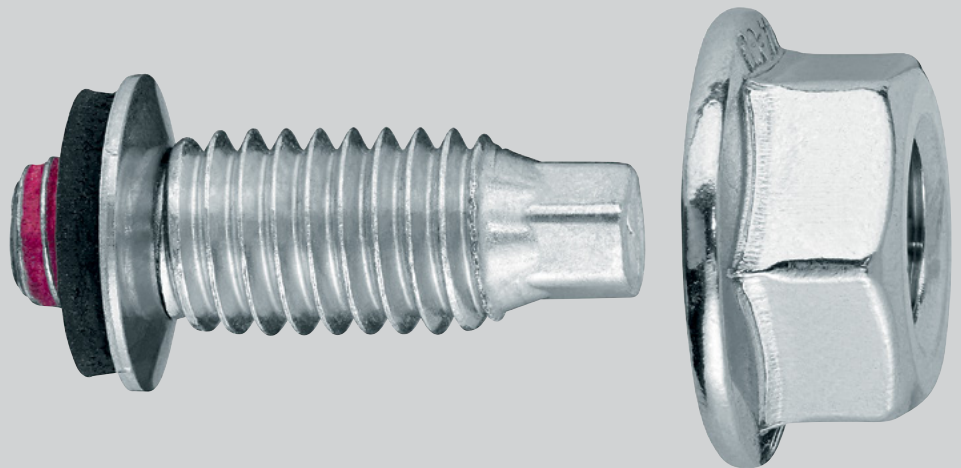
*X-BT-MR is the new generation X-BT





S-BT-MR / S-BT-MF THREADED STUD

Imperial



S-BT TECHNICAL DATA USED FOR THE FOLLOWING CALCULATIONS

S-BT technical data

- **Drill hole type / base material:** Pilot hole, $t_{II} \geq 6 \text{ mm (0.24")}$ or drill through hole, $5 \text{ mm (0.20")} \leq t_{II} < 6 \text{ mm (0.24")}$
- **Base material:** Steel S235 / A36 (higher steel strength is possible, increases the rec. load)
- **Recommended interaction for combined load:** $N_{rec} = 405 \text{ lb}$ (axial) / $V_{rec} = 585 \text{ lb}$ (shear)

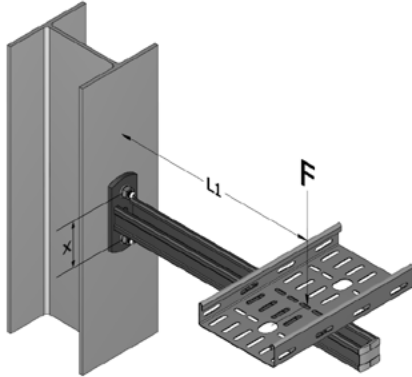
V-N (shear and tension)

$$\frac{V}{V_{rec}} + \frac{N}{N_{rec}} \leq 1.2 \quad \text{with} \quad \frac{V}{V_{rec}} \leq 1.0 \quad \text{and} \quad \frac{N}{N_{rec}} \leq 1.0$$

For further technical data refer to the latest technical information (DFTM and S-BT specification binder)

FASTENING CANTILEVER SUPPORT WITH S-BT

Two / Four S-BT-MR / S-BT-MF Threaded studs



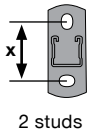
Application

- Fastening of cable trays, pipes on a horizontal cantilever support, fastened on a vertical structure
- Support is fastened by two / four S-BT on both support and brace baseplate with distance x
- L1 is the distance of the load center to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of S-BT threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Shear load fully carried by one / two top S-BT (worst-case)
- Load F acting at the distance of L1 from structure surface

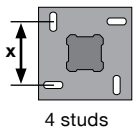
Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and S-BT distance x)



2 studs

Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x [inch]	3.0	10.00	6.00	4.00	2.00	1.00	0.25	
	4.0	13.50	8.00	5.25	2.75	1.25	0.50	
	5.0	16.75	10.00	6.75	3.25	1.50	0.50	
	6.0	20.00	12.00	8.00	4.00	2.00	0.75	
	7.0	23.50	14.00	9.25	4.50	2.25	0.75	
	8.0	26.75	16.00	10.75	5.25	2.50	1.00	

Result: Load F [lbs]	L1 [inch]								
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0	
x [inch]	3.0	150	86	60	47	38	32	27	24
	4.0	184	109	78	60	49	42	36	32
	5.0	214	131	94	74	60	51	44	39
	6.0	239	150	109	86	71	60	52	47
	7.0	261	168	124	98	81	69	60	54
	8.0	280	184	137	109	91	78	68	60



4 studs

Result: L1 [inch]	F [lbs]								
	100	150	200	300	400	500	600	700	
x [inch]	3.0	22.00	14.00	10.00	6.00	3.75	2.75	1.75	1.25
	4.0	29.50	18.75	13.25	8.00	5.25	3.50	2.50	1.75
	5.0	37.00	23.50	16.75	10.00	6.50	4.50	3.25	2.25
	6.0	44.25	28.00	20.00	12.00	7.75	5.50	3.75	2.75
	7.0	51.75	32.75	23.25	14.00	9.25	6.25	4.50	3.00
	8.0	59.00	37.50	26.75	16.00	10.50	7.25	5.25	3.50

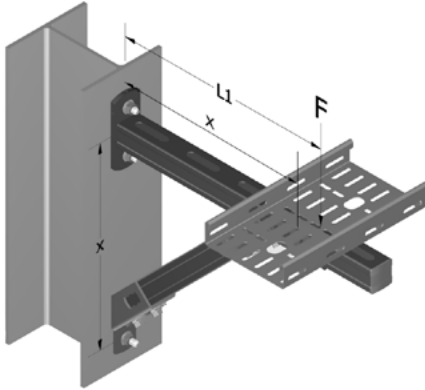
Result: Load F [lbs]	L1 [inch]								
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0	
x [inch]	3.0	300	172	121	93	76	64	55	48
	4.0	369	219	156	121	99	83	72	64
	5.0	427	261	188	147	121	102	89	78
	6.0	478	300	219	172	142	121	105	93
	7.0	522	336	248	196	162	138	121	107
	8.0	561	369	275	219	182	156	136	121

NOTE: load capacity used for calculation $N_{rec} = 405 \text{ lb (axial)} / V_{rec} = 585 \text{ lb (shear)}$

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FASTENING BRACED CANTILEVER SUPPORT WITH S-BT

Two / Four S-BT-MR / S-BT-MF Threaded studs



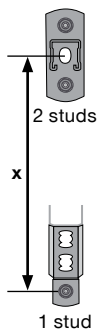
Application

- Fastening of cable trays, pipes on a horizontal, braced cantilever support, fastened on a vertical structure
- Support is fastened by three / six S-BT on both support and brace baseplate with distance x
- L1 is the distance of the load center to the vertical structure surface, the angle of the brace is 45°
- Load F is the acceptable total load (all dead load including)

Boundary conditions

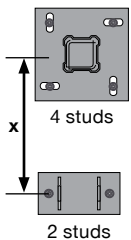
- These values are ONLY reflecting capacity of S-BT threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Shear load fully carried by one / two top S-BT (worst-case)
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and baseplate distance x)



Result: L1 [inch]	F [lbs]						
	100	150	200	300	400	500	700
x 4.0	15.75	11.25	9.00	6.75	5.50	4.50	
6.0	23.75	17.00	13.50	10.25	8.50	7.00	
8.0	31.75	22.50	18.00	13.50	11.25	9.25	
14.0	55.50	39.75	31.75	23.75	20.00	16.25	
20.0	79.25	56.75	45.50	34.00	28.50	23.25	
32.0	127.00	90.75	72.75	54.75	45.50	37.25	

Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
x 4.0	389	195	130	97				
6.0	584	292	195	146				
8.0	389	259	195					
14.0			454	341				
20.0				487				
32.0								



Result: L1 [inch]	F [lbs]						
	100	150	200	300	400	500	700
x 4.0	20.25	15.75	11.25	9.00	7.75	6.75	6.00
6.0	30.50	23.75	17.00	13.50	11.50	10.25	9.25
8.0	40.75	31.75	22.50	18.00	15.50	13.50	12.25
14.0	71.25	55.50	39.75	31.75	27.00	23.75	21.50
20.0	102.00	79.25	56.75	45.50	38.75	34.00	31.00
32.0	163.25	127.00	90.75	72.75	62.00	54.75	49.50

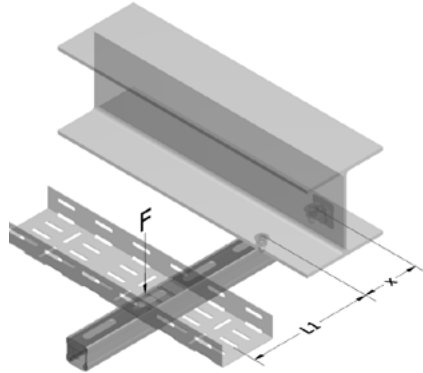
Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
x 4.0	779	389	259	195				
6.0	1,168	584	389	292	234	195		
8.0	779	519	389	312	259	222	195	
14.0			909	682	545	454	389	341
20.0				974	779	649	556	487
32.0						1,039	890	779

NOTE: load capacity used for calculation $N_{rec} = 405 \text{ lb (axial)} / V_{rec} = 585 \text{ lb (shear)}$

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FASTENING STRUT TO STEEL WITH S-BT

Two S-BT-MR / S-BT-MF Threaded studs



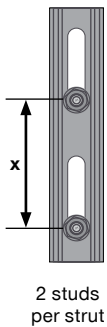
Application

- Fastening of cable trays, pipes on a horizontal cantilever support, fastened on a horizontal structure
- Support is fastened by two S-BT (horizontal distance x)
- L1 is the distance of the load center to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of S-BT threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and S-BT distance x)



Result: L1 [inch]		F [lbs]							
		100	150	200	300	400	500	600	700
x [inch]	3.0	9.00	5.00	3.00	1.00				
	4.0	12.00	6.75	4.00	1.25				
	5.0	15.00	8.25	5.00	1.50				
	6.0	18.25	10.00	6.00	2.00				
	7.0	21.25	11.75	7.00	2.25				
	8.0	24.25	13.50	8.00	2.75				

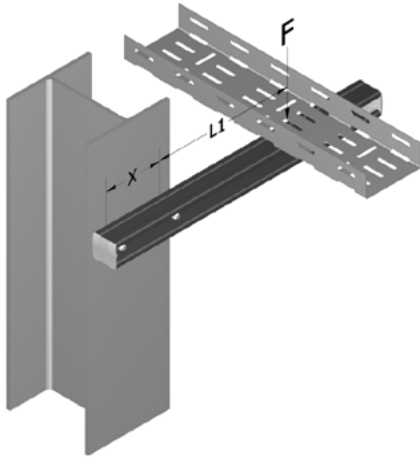
Result: Load F [lbs]		L1 [inch]							
		6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
x [inch]	3.0	135	81	58	45	37	31	27	24
	4.0	162	101	73	58	47	40	35	31
	5.0	184	119	88	70	58	49	43	38
	6.0	202	135	101	81	67	58	50	45
	7.0	218	149	113	91	77	66	58	51
	8.0	231	162	124	101	85	73	65	58

NOTE: load capacity used for calculation $N_{rec} = 405 \text{ lb (axial)} / V_{rec} = 585 \text{ lb (shear)}$

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FASTENING STRUT TO STEEL WITH S-BT

Two / Four S-BT-MR / S-BT-MF Threaded studs



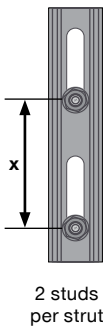
Application

- Fastening of cable trays, pipes on a horizontal cantilever support, fastened on a vertical structure
- Support is fastened by two S-BT (horizontal distance x)
- L1 is the distance of the load center to the center of the fasteners
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of S-BT threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Shear load fully carried by one S-BT (worst-case)
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and S-BT distance x)



Result: L1 [inch]	F [lbs]						
	100	150	200	300	400	500	700
3.0	14.50	8.50	5.75	2.75	1.25	0.50	
4.0	19.25	11.50	7.50	3.75	1.75	0.50	
5.0	24.00	14.25	9.50	4.50	2.25	0.75	
6.0	29.00	17.25	11.50	5.50	2.75	1.00	
7.0	33.75	20.25	13.25	6.50	3.00	1.00	
8.0	38.75	23.00	15.25	7.50	3.50	1.25	

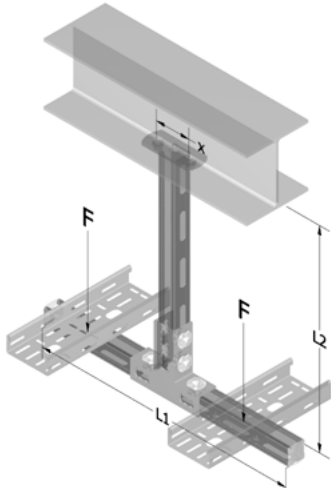
Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
3.0	195	117	83	65	53	45	39	34
4.0	234	146	106	83	69	58	51	45
5.0	265	172	127	101	83	71	62	55
6.0	292	195	146	117	97	83	73	65
7.0	315	215	164	132	110	95	83	74
8.0	334	234	180	146	123	106	93	83

NOTE: load capacity used for calculation $N_{rec} = 405 \text{ lb (axial)} / V_{rec} = 585 \text{ lb (shear)}$

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FASTENING T-POST (CEILING) SUPPORT WITH S-BT

Two / Four S-BT-MR / S-BT-MF Threaded studs



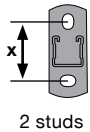
Application

- Fastening of cable trays, pipes on a T-Post support, which is fastened on a horizontal structure
- Support is fastened by two / four S-BT (horizontal distance x)
- L1 is the total width of the T-Post, L2 is fix set to 1000 mm
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of S-BT threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- 2 Load cases: load asymmetric acting in the center of one arm only, 30% acting as horizontal load

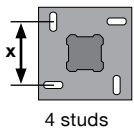
Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and S-BT distance x)



2 studs

Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x 3.0 [inch]								
4.0	56.50							
5.0	70.75							
6.0	85.00							
7.0	99.25	61.50						
8.0	113.25	70.25						

Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
x 3.0 [inch]	87	87	87	87	87	87	87	87
4.0	110	110	110	110	110	110	110	110
5.0	132	132	132	132	132	132	132	132
6.0	151	151	151	151	151	151	151	151
7.0	169	169	169	169	169	169	169	169
8.0	185	185	185	185	185	185	185	185



4 studs

Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x 3.0 [inch]	91.00	58.50						
4.0	121.25	78.25	56.50					
5.0	151.75	97.75	70.75					
6.0	182.00	117.25	85.00					
7.0	212.50	137.00	99.25	61.50				
8.0	242.75	156.50	113.25	70.25				

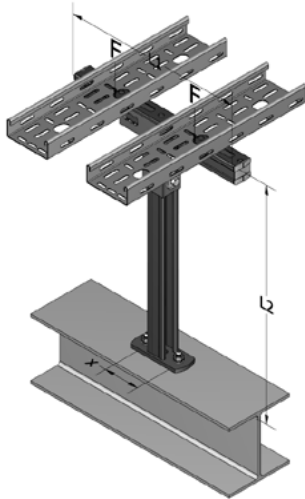
Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
x 3.0 [inch]	157	157	157	157	157	157	157	157
4.0	194	194	194	194	194	194	194	194
5.0	226	226	226	226	226	226	226	226
6.0	255	255	255	255	255	255	255	255
7.0	279	279	279	279	279	279	279	279
8.0	301	301	301	301	301	301	301	301

NOTE: load capacity used for calculation $N_{rec} = 450 \text{ lb (axial)} / V_{rec} = 585 \text{ lb (shear)}$

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FASTENING T-POST (FLOOR) SUPPORT WITH S-BT

Two / Four S-BT-MR / S-BT-MF Threaded studs



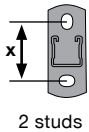
Application

- Fastening of cable trays, pipes on a T-Post support, which is fastened on a horizontal structure
- Support is fastened by two / four S-BT (horizontal distance x)
- L1 is the total width of the T-Post, L2 is fix set to 1000 mm
- Load F is the acceptable total load (all dead load including)

Boundary conditions

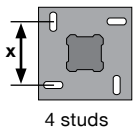
- These values are ONLY reflecting capacity of S-BT threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- 2 Load cases: load asymmetric acting in the center of one arm only, 30% acting as horizontal load

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and S-BT distance x)



Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x [inch]	3.0							
	4.0	72.50						
	5.0	90.75	63.75					
	6.0	109.00	76.50					
	7.0	127.25	89.50	70.50				
	8.0	145.25	102.25	80.50				

Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
x [inch]	3.0	97	97	97	97	97	97	97
	4.0	128	128	128	128	128	128	128
	5.0	157	157	157	157	157	157	157
	6.0	186	186	186	186	186	186	186
	7.0	213	213	213	213	213	213	213
	8.0	240	240	240	240	240	240	240



Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x [inch]	3.0	103.00						
	4.0	137.25						
	5.0	171.75	117.75					
	6.0	206.00	141.25					
	7.0	240.50	165.00	127.25				
	8.0	274.75	188.50	145.25				

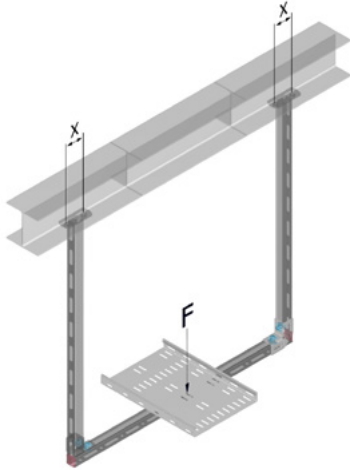
Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
x [inch]	3.0	195	195	195	195	195	195	195
	4.0	256	256	256	256	256	256	256
	5.0	315	315	315	315	315	315	315
	6.0	372	372	372	372	372	372	372
	7.0	427	427	427	427	427	427	427
	8.0	480	480	480	480	480	480	480

NOTE: load capacity used for calculation $N_{rec} = 450 \text{ lb (axial)} / V_{rec} = 585 \text{ lb (shear)}$

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FASTENING U-FRAME (CEILING) / TRAPEZE SUPPORT WITH S-BT

Two / Four S-BT-MR / S-BT-MF Threaded studs



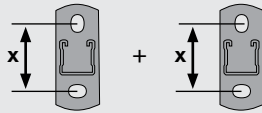
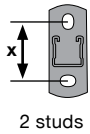
Application

- Fastening of cable trays, pipes on a U-Frame support, which is fastened on a horizontal structure
- Support is fastened by four S-BT (2 fasteners per baseplate)
- Load F is the acceptable total load (all dead load including, acting in the center of the U-Frame)

Boundary conditions

- These values are ONLY reflecting capacity of S-BT threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Load acting in the center (U-Frame)

Technical assessment — maximum of F



$$F = N_{rec} \cdot \text{\#fasteners per post}$$

$$F = 405 \text{ lb} \cdot 4$$

$$F = 1620 \text{ lb}$$

NOTE: load capacity used for calculation $N_{rec} = 450 \text{ lb}$ (axial) / $V_{rec} = 585 \text{ lb}$ (shear)

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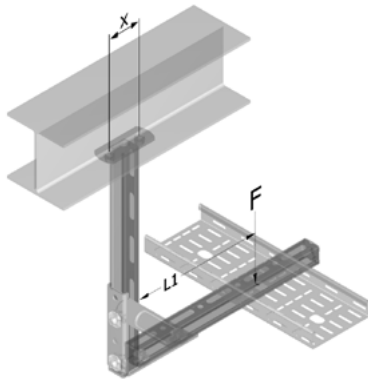
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FASTENING L-POST SUPPORT WITH S-BT

Two / Four S-BT-MR / S-BT-MF Threaded studs



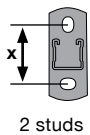
Application

- Fastening of cable trays, pipes on a L-Post support, which is fastened on a horizontal structure
- Support is fastened by two / four S-BT (horizontal distance x)
- L1 is the distance of the load center to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of S-BT threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Load F acting at the distance of L1 from structure surface

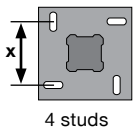
Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and S-BT distance x)



2 studs

Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x [inch]	3.0	10.50	6.50	4.50	2.50	1.50	0.75	0.50
	4.0	14.00	8.75	6.00	3.25	2.00	1.00	0.25
	5.0	17.50	10.75	7.50	4.00	2.50	1.50	0.75
	6.0	21.25	13.00	9.00	5.00	3.00	1.75	1.00
	7.0	24.75	15.25	10.50	5.75	3.50	2.00	1.00
	8.0	28.25	17.50	12.00	6.75	4.00	2.25	1.25

Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
x [inch]	3.0	162	90	62	47	38	32	24
	4.0	202	116	81	62	50	43	32
	5.0	238	139	99	76	62	52	40
	6.0	270	162	116	90	73	62	54
	7.0	298	183	132	103	84	72	62
	8.0	323	202	147	116	95	81	70



4 studs

Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x [inch]	3.0	22.75	14.50	10.50	6.50	4.50	3.25	2.50
	4.0	30.25	19.50	14.00	8.75	6.00	4.25	3.25
	5.0	37.75	24.25	17.50	10.75	7.50	5.50	4.00
	6.0	45.50	29.25	21.25	13.00	9.00	6.50	5.00
	7.0	53.00	34.25	24.75	15.25	10.50	7.75	5.75
	8.0	60.50	39.00	28.25	17.50	12.00	8.75	6.75

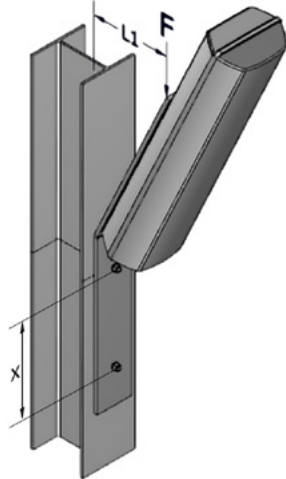
Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
x [inch]	3.0	323	180	124	95	77	65	49
	4.0	404	231	162	124	101	85	65
	5.0	476	279	197	153	124	105	91
	6.0	539	323	231	180	147	124	108
	7.0	596	365	263	206	169	143	124
	8.0	647	404	294	231	190	162	141

NOTE: load capacity used for calculation $N_{rec} = 450 \text{ lb (axial)} / V_{rec} = 585 \text{ lb (shear)}$

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FASTENING EQUIPMENT SUPPORT WITH S-BT

Two / Four S-BT-MR / S-BT-MF Threaded studs



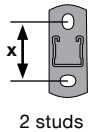
Application

- Fastening of lamps, signals, sensors on inclined cantilever support, fastened on a vertical structure
- Support is fastened by two / four S-BT (vertical distance x)
- L1 is the distance of the load center (~middle of the load) to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

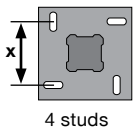
- These values are ONLY reflecting capacity of S-BT threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Shear load fully carried by one / two top S-BT (worst-case)
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and S-BT distance x)



Result: L1 [inch]	F [lbs]						
	100	150	200	300	400	500	700
x [inch]	3.0	10.00	6.00	3.75	1.75	0.75	0.25
	4.0	13.25	8.00	5.25	2.50	1.25	0.25
	5.0	16.75	10.00	6.50	3.25	1.50	0.50
	6.0	20.00	12.00	7.75	3.75	1.75	0.50
	7.0	23.25	14.00	9.25	4.50	2.00	0.75
	8.0	26.75	16.00	10.50	5.25	2.50	0.75

Result: Load F [lbs]	L1 [inch]								
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0	
x [inch]	3.0	150	86	60	47	38	32	27	24
	4.0	184	109	78	60	49	42	36	32
	5.0	214	131	94	74	60	51	44	39
	6.0	239	150	109	86	71	60	52	47
	7.0	261	168	124	98	81	69	60	54
	8.0	280	184	137	109	91	78	68	60



Result: L1 [inch]	F [lbs]						
	100	150	200	300	400	500	700
x [inch]	3.0	20.00	12.00	7.75	3.75	1.75	0.50
	4.0	26.75	16.00	10.50	5.25	2.50	0.75
	5.0	33.50	20.00	13.25	6.50	3.00	1.00
	6.0	40.00	24.00	15.75	7.75	3.75	1.25
	7.0	46.75	28.00	18.50	9.00	4.25	1.50
	8.0	53.50	32.00	21.25	10.50	5.00	1.75

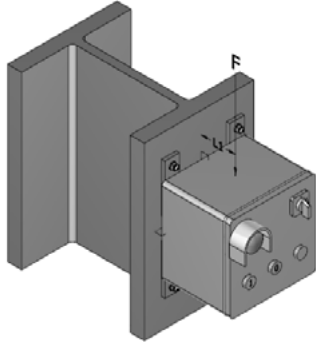
Result: Load F [lbs]	L1 [inch]								
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0	
x [inch]	3.0	300	172	121	93	76	64	55	48
	4.0	369	219	156	121	99	83	72	64
	5.0	427	261	188	147	121	102	89	78
	6.0	478	300	219	172	142	121	105	93
	7.0	522	336	248	196	162	138	121	107
	8.0	561	369	275	219	182	156	136	121

NOTE: load capacity used for calculation $N_{rec} = 450 \text{ lb (axial)} / V_{rec} = 585 \text{ lb (shear)}$

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FASTENING JUNCTION BOXES / SWITCHES WITH S-BT

S-BT-MR / S-BT-MF Threaded stud



Application

- Fastening of junction boxes, switches on a vertical structure
- Element is fastened by S-BT

Boundary conditions

- These values are ONLY reflecting capacity of S-BT threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Technical data are based on technical data binder for S-BT (06 / 2018), always refer to latest technical data binder for S-BT

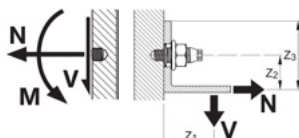
Technical data — always refer to latest technical data binder for S-BT

Recommended load	S-BT						S-BT	
	Pilot hole, $t_{II} \geq 6 \text{ mm (0.24")}$ Drill through hole, $5 \text{ mm (0.20")} \leq t_{II} < 6 \text{ mm (0.24")}$			Drill through hole, $3 \text{ mm (0.12")} \leq t_{II} < 5 \text{ mm (0.20")}$			Pilot hole, $5 \text{ mm (0.20")} \leq t_{II} < 6 \text{ mm (0.24")}$	
Drill hole type and base material thickness								
Base material	Steel S235 A36	Steel S355 Grade 50	Aluminum $f_u \geq 270 \text{ mPa}$	Steel S235 A36	Steel S355 Grade 50	Steel S235 A36	Steel S355 Grade 50	
Tension, N_{rec} [kN / lb]	1.8 / 405	2.3 / 520	1.0 / 225	1.0 / 225	1.3 / 290	1.0 / 225	1.3 / 290	
Shear, V_{rec} [kN / lb]	2.6 / 585	3.2 / 720	1.5 / 340	1.5 / 340	1.9 / 430	1.5 / 340	1.9 / 430	
Moment, M_{rec} [Nm / ft-lb]	7.0 / 5.2	7.0 / 5.2	4.8 / 3.5	4.8 / 3.5	7.0 / 5.2	6.2 / 4.6	6.2 / 4.6	

Design resistance	S-BT						S-BT	
	Pilot hole, $t_{II} \geq 6 \text{ mm (0.24")}$ Drill through hole, $5 \text{ mm (0.20")} \leq t_{II} < 6 \text{ mm (0.24")}$			Drill through hole, $3 \text{ mm (0.12")} \leq t_{II} < 5 \text{ mm (0.20")}$			Pilot hole, $5 \text{ mm (0.20")} \leq t_{II} < 6 \text{ mm (0.24")}$	
Drill hole type and base material thickness								
Base material	Steel S235 A36	Steel S355 Grade 50	Aluminum $f_u \geq 270 \text{ mPa}$	Steel S235 A36	Steel S355 Grade 50	Steel S235 A36	Steel S355 Grade 50	
Tension, N_{Rd} [kN / lb]	2.5 / 560	3.2 / 720	1.4 / 315	1.4 / 315	1.8 / 405	1.4 / 315	1.8 / 405	
Shear, V_{Rd} [kN / lb]	3.6 / 810	4.5 / 1010	2.1 / 470	2.1 / 470	2.7 / 610	2.1 / 470	2.7 / 610	
Moment, M_{Rd} [Nm / ft-lb]	9.8 / 7.2	9.8 / 7.2	6.7 / 4.9	9.8 / 7.2	9.8 / 7.2	8.7 / 6.4	8.7 / 6.4	

Conditions for recommended loads

- Use S-BT-MR and S-BT-MF (multi-purpose fastening) only with the supplied Hilti serrated flange nuts M8, M10 and W10 (Ⓒ) or Ⓓ as per according to General Information—Material specifications
- Global factor of safety Ω for static pull-out and static shear ≥ 3 (based on mean ultimate test value)
- Minimum edge distance = 6 mm [0.24"], minimum spacing = 15 mm [0.59"]
- Effect of base metal vibration and stress (e.g. areas with tensile stress) considered
- Redundancy (multiple fastening) must be provided
- If eccentric loading exists (e.g. use of an angle clip), moments caused by off-center loading must be considered



Recommended interaction formula for combined loading — steel and aluminum base material

$$\mathbf{V-N} \text{ (shear and tension)} \quad \frac{V}{V_{rec}} + \frac{N}{N_{rec}} \leq 1.2 \text{ with } \frac{V}{V_{rec}} \leq 1.0 \text{ and } \frac{N}{N_{rec}} \leq 1.0$$

$$\mathbf{V-M} \text{ (shear and bending)} \quad \frac{V}{V_{rec}} + \frac{M}{M_{rec}} \leq 1.2 \text{ with } \frac{V}{V_{rec}} \leq 1.0 \text{ and } \frac{M}{M_{rec}} \leq 1.0$$

$$\mathbf{N-M} \text{ (tension and bending)} \quad \frac{N}{N_{rec}} + \frac{M}{M_{rec}} \leq 1.0$$

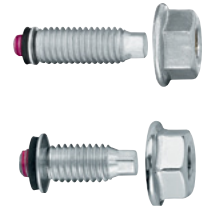
$$\mathbf{V-N-M} \text{ (shear, tension and bending)} \quad \frac{V}{V_{rec}} + \frac{N}{N_{rec}} + \frac{M}{M_{rec}} \leq 1.0$$

Cyclic loading

S-BT threaded studs are only to be used for fastenings subject to static or quasi-static loading. Inquire at Hilti for test data if cyclic loading has to be considered in the design.

S-BT CATALOG PAGES

Description	Base Material	Environment	Item Number
Threaded stud S-BT-MR M10/15 SN 6	Steel	Highly corrosive	2140740
Threaded stud S-BT-MR W10/15 SN 6	Steel	Highly corrosive	2140741
Threaded stud S-BT-MF M10/15 AN 6	Steel	Mildly corrosive	2140528
Threaded stud S-BT-MF W10/15 AN 6	Steel	Mildly corrosive	2139173
Threaded stud S-BT-MR M8/7 SN 6	Steel	Highly corrosive	2139172
Threaded stud S-BT-MF M8/7 AN 6	Steel	Mildly corrosive	2139174
Threaded stud S-BT-MR M8/7 SN 6 AL	Aluminum	Highly corrosive	2140743
Threaded stud S-BT-MR M10/15 SN 6 AL	Aluminum	Highly corrosive	2140744



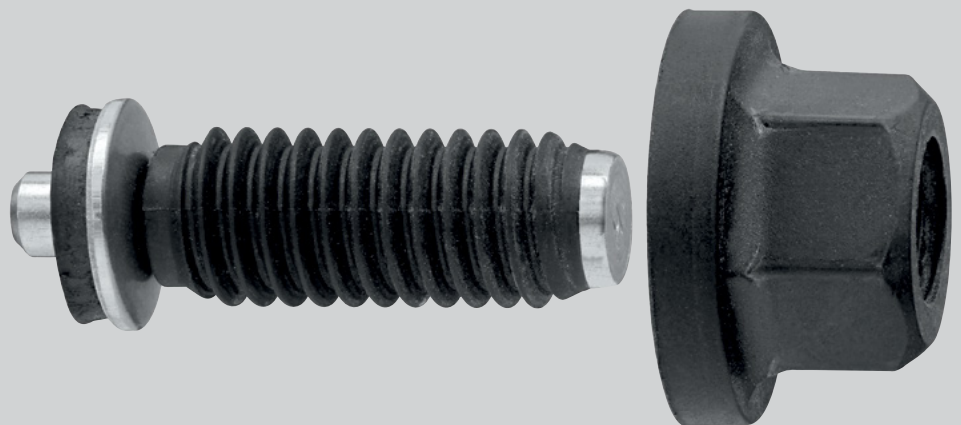
Description	Item Number
Battery drill SBT 4A-22	Local item
Battery drill SF BT 22-A	Local item
Battery drill SFC 22-A	Local item
Depth gauge S-DG BT MW10/15 Long 6	2143261
Stepped drill bit TS-BT 5.5-74 S (for steel)	2143137
Stepped drill bit TS-BT 5.5-74 AL (for aluminum)	2143138
Calibration card S-CC BT 6	2143270
Torque tool S-BT 1/4" — 8 Nm (for studs on steel)	2119272
Torque tool S-BT 1/4" — 5 Nm (for studs on aluminum)	2143271
Nut setter S-NS 13 C 95/3 3/4" S-BT (for M8)	2149244
Nut setter S-NS 15 C 95/3 3/4" S-BT (for M10)	2149245
Nut setter S-NS 9/16" C 95/3 3/4" S-BT (for W10)	2149246





X-BT-MF THREADED STUD

Imperial



X-BT-MF TECHNICAL DATA USED FOR THE FOLLOWING CALCULATIONS

X-BT-MF technical data

- **Drill hole type / base material:** Pilot hole, $t_{II} \geq 8 \text{ mm}$ (0.31")
- **Base material:** Steel S235 / A36 (higher steel strength is possible)
- **Recommended interaction for combined load:** $N_{rec} = 340 \text{ lb}$ (axial) / $V_{rec} = 500 \text{ lb}$ (shear)

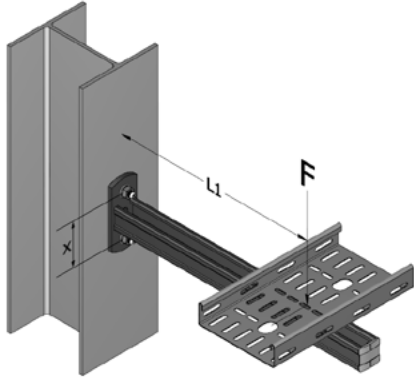
V-N (shear and tension)

$$\frac{V}{V_{rec}} + \frac{N}{N_{rec}} \leq 1.2 \quad \text{with} \quad \frac{V}{V_{rec}} \leq 1.0 \quad \text{and} \quad \frac{N}{N_{rec}} \leq 1.0$$

For further technical data refer to the latest technical information (DFTM / binder)

FASTENING CANTILEVER SUPPORT WITH X-BT-MF

Two / Four X-BT-MF Threaded studs



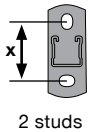
Application

- Fastening of cable trays, pipes on a horizontal cantilever support, fastened on a vertical structure
- Support is fastened by two / four X-BT-MF on both support and brace baseplate with distance x
- L1 is the distance of the load center to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

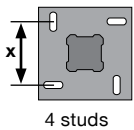
- These values are ONLY reflecting capacity of X-BT-MF threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Shear load fully carried by one / two top X-BT-MF (worst-case)
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-BT-MF distance x)



Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x [inch]	3.0	8.00	4.75	3.00	1.25	0.50		
	4.0	10.75	6.25	4.00	1.75	0.75		
	5.0	13.50	7.75	5.00	2.25	0.75		
	6.0	16.25	9.50	6.00	2.75	1.00		
	7.0	18.75	11.00	7.00	3.00	1.25		
	8.0	21.50	12.50	8.00	3.50	1.25		

Result: Load F [lbs]	L1 [inch]								
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0	
x [inch]	3.0	126	72	50	39	32	26	23	20
	4.0	154	91	65	50	41	35	30	26
	5.0	179	109	79	61	50	43	37	33
	6.0	200	126	91	72	59	50	44	39
	7.0	219	141	104	82	68	58	50	45
	8.0	235	154	115	91	76	65	57	50



Result: L1 [inch]	F [lbs]								
	100	150	200	300	400	500	600	700	
x [inch]	3.0	18.00	11.25	8.00	4.50	3.00	2.00	1.25	0.75
	4.0	24.00	15.25	10.75	6.25	4.00	2.50	1.75	1.00
	5.0	30.25	19.00	13.25	7.75	5.00	3.25	2.00	1.25
	6.0	36.25	22.75	16.00	9.25	6.00	4.00	2.50	1.50
	7.0	42.25	26.50	18.75	10.75	7.00	4.50	3.00	1.75
	8.0	48.25	30.50	21.50	12.50	8.00	5.25	3.50	2.25

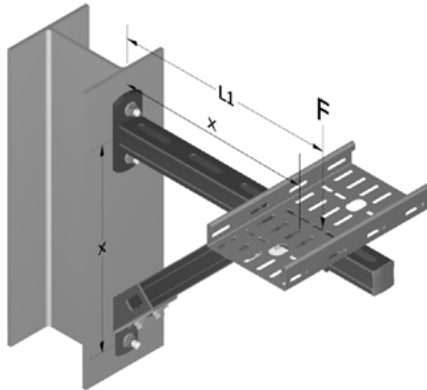
Result: Load F [lbs]	L1 [inch]								
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0	
x [inch]	3.0	251	144	101	78	63	53	46	40
	4.0	309	183	130	101	82	69	60	53
	5.0	358	219	157	123	101	85	74	65
	6.0	401	251	183	144	119	101	88	78
	7.0	438	281	207	164	136	116	101	89
	8.0	471	309	230	183	152	130	114	101

NOTE: load capacity used for calculation $N_{rec} = 340 \text{ lb (axial)} / V_{rec} = 500 \text{ lb (shear)}$

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FASTENING BRACED CANTILEVER SUPPORT WITH X-BT-MF

Two / Four X-BT-MF Threaded studs



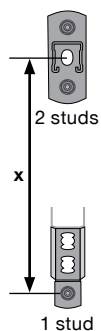
Application

- Fastening of cable trays, pipes on a horizontal, braced cantilever support, fastened on a vertical structure
- Support is fastened by three / six X-BT-MF on both support and brace baseplate with distance x
- L1 is the distance of the load center to the vertical structure surface, the angle of the brace is 45°
- Load F is the acceptable total load (all dead load including)

Boundary conditions

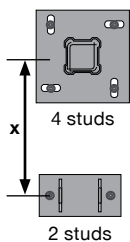
- These values are ONLY reflecting capacity of X-BT-MF threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Shear load fully carried by one / two top X-BT-MF (worst-case)
- Load F acting at the distance of L1 from structure surface

Technical assessment — maximum of F (depending on load F or lever arm length L1 and baseplate distance x)



Result: L1 [inch]	F [lbs]						
	100	150	200	300	400	500	700
x [inch]	4.0	13.50	9.75	8.00	6.00	4.75	
	6.0	20.50	14.75	12.00	9.00	7.25	
	8.0	27.25	19.75	16.00	12.00	9.75	
	14.0	48.00	34.50	28.00	21.25	17.25	
	20.0	68.50	49.50	40.00	30.50	24.50	
	32.0	109.75	79.25	64.00	48.75	39.50	

Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
x [inch]	4.0	330	165	110	82			
	6.0	494	247	165	123			
	8.0		330	220	165			
	14.0			384	288			
	20.0				412			
	32.0							



Result: L1 [inch]	F [lbs]								
	100	150	200	300	400	500	600	700	
x [inch]	4.0	25.00	17.50	13.50	9.75	8.00	6.75	6.00	5.50
	6.0	37.50	26.25	20.50	14.75	12.00	10.25	9.00	8.25
	8.0	50.25	35.00	27.25	19.75	16.00	13.50	12.00	11.00
	14.0	87.75	61.25	48.00	34.50	28.00	24.00	21.25	19.25
	20.0	125.50	87.50	68.50	49.50	40.00	34.25	30.50	27.75
	32.0	201.00	140.00	109.75	79.25	64.00	54.75	48.75	44.50

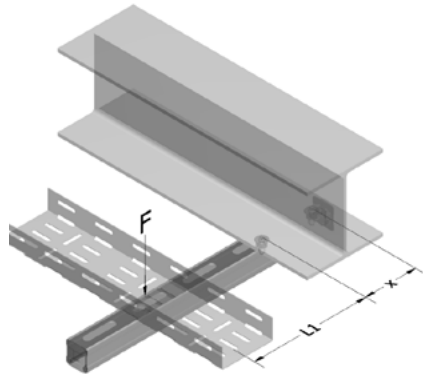
Result: Load F [lbs]	L1 [inch]								
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0	
x [inch]	4.0	659	330	220	165				
	6.0	989	494	330	247	198	165		
	8.0		659	439	330	264	220	188	165
	14.0			769	577	461	384	330	288
	20.0				824	659	549	471	412
	32.0						879	753	659

NOTE: load capacity used for calculation $N_{rec} = 340 \text{ lb (axial)} / V_{rec} = 500 \text{ lb (shear)}$

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FASTENING STRUT TO STEEL WITH X-BT-MF

Two X-BT-MF Threaded studs



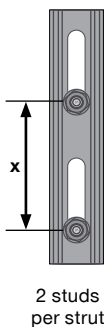
Application

- Fastening of cable trays, pipes on a horizontal cantilever support, fastened on a horizontal structure
- Support is fastened by two X-BT-MF (horizontal distance x)
- L1 is the distance of the load center to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of X-BT-MF threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-BT-MF distance x)



Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
3.0	7.00	3.50	2.00	0.25				
4.0	9.25	4.75	2.50	0.25				
5.0	11.75	6.00	3.25	0.50				
6.0	14.00	7.25	4.00	0.50				
7.0	16.50	8.50	4.75	0.75				
8.0	18.75	9.75	5.25	0.75				

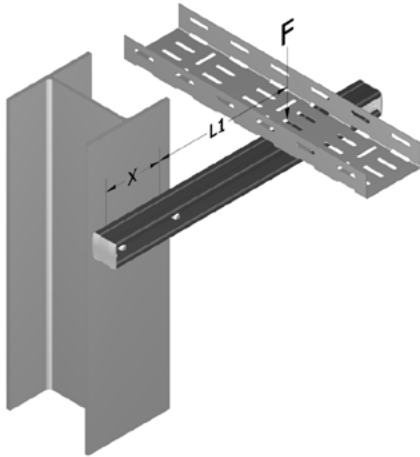
Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
3.0	112	67	48	37	31	26	22	20
4.0	135	84	61	48	39	34	29	26
5.0	153	99	73	58	48	41	36	32
6.0	168	112	84	67	56	48	42	37
7.0	181	124	94	76	64	55	48	43
8.0	192	135	104	84	71	61	54	48

NOTE: load capacity used for calculation $N_{rec} = 340 \text{ lb (axial)} / V_{rec} = 500 \text{ lb (shear)}$

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FASTENING STRUT TO STEEL WITH X-BT-MF

Two / Four X-BT-MF Threaded studs



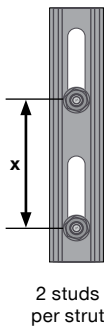
Application

- Fastening of cable trays, pipes on a horizontal cantilever support, fastened on a vertical structure
- Support is fastened by two X-BT-MF (horizontal distance x)
- L1 is the distance of the load center to the center of the fasteners
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of X-BT-MF threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Shear load fully carried by one X-BT-MF (worst-case)
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-BT-MF distance x)



Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
3.0	11.75	6.75	4.25	1.75	0.50			
4.0	15.75	9.00	5.75	2.50	0.75			
5.0	19.50	11.25	7.25	3.00	1.00			
6.0	23.50	13.75	8.75	3.75	1.25			
7.0	27.50	16.00	10.25	4.50	1.50			
8.0	31.50	18.25	11.75	5.00	1.75			

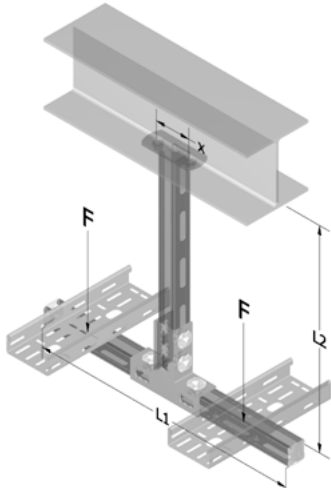
Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
3.0	165	99	71	55	45	38	33	29
4.0	198	123	90	71	58	49	43	38
5.0	225	145	107	85	71	60	52	47
6.0	247	165	123	99	82	71	62	55
7.0	266	182	138	112	93	80	71	63
8.0	282	198	152	123	104	90	79	71

NOTE: load capacity used for calculation $N_{rec} = 340 \text{ lb (axial)} / V_{rec} = 500 \text{ lb (shear)}$

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FASTENING T-POST (CEILING) SUPPORT WITH X-BT-MF

Two / Four X-BT-MF Threaded studs



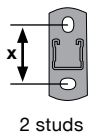
Application

- Fastening of cable trays, pipes on a T-Post support, which is fastened on a horizontal structure
- Support is fastened by two / four X-BT-MF (horizontal distance x)
- $L1$ is the total width of the T-Post, $L2$ is fix set to 1000 mm
- Load F is the acceptable total load (all dead load including)

Boundary conditions

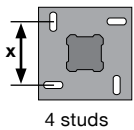
- These values are ONLY reflecting capacity of X-BT-MF threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- 2 Load cases: load asymmetric acting in the center of one arm only, 30% acting as horizontal load

Technical assessment – maximum of $L1$ and F (depending on load F or lever arm length $L1$ and X-BT-MF distance x)



Result: $L1$ [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x [inch]	3.0							
	4.0							
	5.0	57.25						
	6.0	68.75						
	7.0	80.25						
	8.0	91.75						

Result: Load F [lbs]	$L1$ [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
x [inch]	3.0	73	73	73	73	73	73	73
	4.0	92	92	92	92	92	92	92
	5.0	110	110	110	110	110	110	110
	6.0	126	126	126	126	126	126	126
	7.0	141	141	141	141	141	141	141
	8.0	155	155	155	155	155	155	155



Result: $L1$ [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x [inch]	3.0	74.75						
	4.0	99.75	63.75					
	5.0	124.75	79.75	57.25				
	6.0	149.75	95.75	68.75				
	7.0	174.75	111.75	80.25				
	8.0	199.75	127.75	91.75				

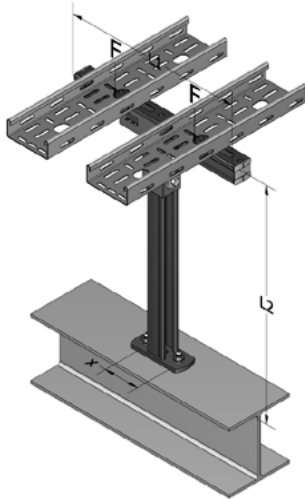
Result: Load F [lbs]	$L1$ [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
x [inch]	3.0	131	131	131	131	131	131	131
	4.0	162	162	162	162	162	162	162
	5.0	189	189	189	189	189	189	189
	6.0	212	212	212	212	212	212	212
	7.0	233	233	233	233	233	233	233
	8.0	251	251	251	251	251	251	251

NOTE: load capacity used for calculation $N_{rec} = 340 \text{ lb (axial)} / V_{rec} = 500 \text{ lb (shear)}$

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FASTENING T-POST (FLOOR) SUPPORT WITH X-BT-MF

Two / Four X-BT-MF Threaded studs



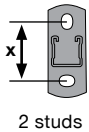
Application

- Fastening of cable trays, pipes on a T-Post support, which is fastened on a horizontal structure
- Support is fastened by two / four X-BT-MF (horizontal distance x)
- L1 is the total width of the T-Post, L2 is fix set to 1000 mm
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of X-BT-MF threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- 2 Load cases: load asymmetric acting in the center of one arm only, 30% acting as horizontal load

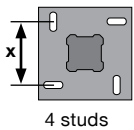
Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-BT-MF distance x)



2 studs

Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x [inch]	3.0							
	4.0	61.75						
	5.0	77.25						
	6.0	92.75	65.75					
	7.0	108.25	76.75					
	8.0	123.75	87.75	69.75				

Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
x [inch]	3.0	81	81	81	81	81	81	81
	4.0	107	107	107	107	107	107	107
	5.0	131	131	131	131	131	131	131
	6.0	155	155	155	155	155	155	155
	7.0	178	178	178	178	178	178	178
	8.0	200	200	200	200	200	200	200



4 studs

Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x [inch]	3.0							
	4.0	115.75						
	5.0	144.75						
	6.0	173.75	119.75					
	7.0	202.75	139.75					
	8.0	231.75	159.75	123.75				

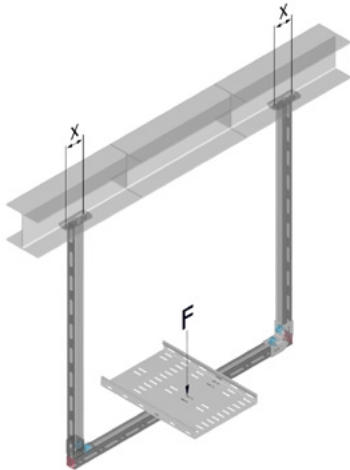
Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
x [inch]	3.0	163	163	163	163	163	163	163
	4.0	213	213	213	213	213	213	213
	5.0	263	263	263	263	263	263	263
	6.0	310	310	310	310	310	310	310
	7.0	356	356	356	356	356	356	356
	8.0	401	401	401	401	401	401	401

NOTE: load capacity used for calculation $N_{rec} = 340 \text{ lb (axial)} / V_{rec} = 500 \text{ lb (shear)}$

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FASTENING U-FRAME (CEILING) / TRAPEZE SUPPORT WITH X-BT-MF

Two / Four X-BT-MF Threaded studs



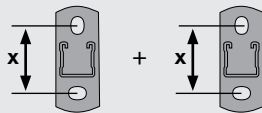
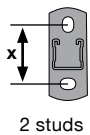
Application

- Fastening of cable trays, pipes on a U-Frame support, which is fastened on a horizontal structure
- Support is fastened by four X-BT-MF (2 fasteners per baseplate)
- Load F is the acceptable total load (all dead load including, acting in the center of the U-Frame)

Boundary conditions

- These values are ONLY reflecting capacity of X-BT-MF threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Load acting in the center (U-Frame)

Technical assessment — maximum of F



$$F = N_{rec} \cdot \text{\#fasteners per post}$$

$$F = 1.5 \text{ kN} \cdot 4$$

$$F = 6.0 \text{ kN} / F = 610 \text{ kg}$$

NOTE: load capacity used for calculation $N_{rec} = 340 \text{ lb (axial)} / V_{rec} = 500 \text{ lb (shear)}$

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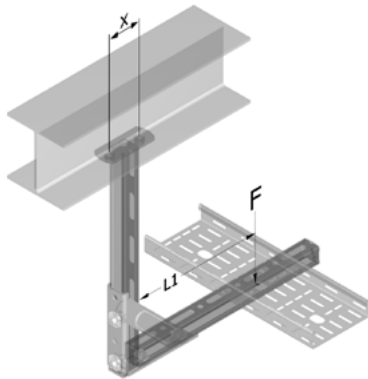
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FASTENING L-POST SUPPORT WITH X-BT-MF

Two / Four X-BT-MF Threaded studs



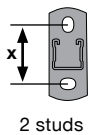
Application

- Fastening of cable trays, pipes on a L-Post support, which is fastened on a horizontal structure
- Support is fastened by two / four X-BT-MF (horizontal distance x)
- L1 is the distance of the load center to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of X-BT-MF threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Load F acting at the distance of L1 from structure surface

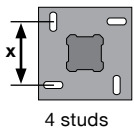
Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-BT-MF distance x)



2 studs

Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x [inch]	3.0	8.50	5.00	3.50	1.75	1.00	0.50	
	4.0	11.25	6.75	4.50	2.25	1.25	0.50	
	5.0	14.25	8.50	5.75	3.00	1.50	0.75	0.25
	6.0	17.00	10.25	7.00	3.50	2.00	1.00	0.25
	7.0	20.00	12.00	8.25	4.25	2.25	1.00	0.25
	8.0	22.75	13.75	9.25	4.75	2.50	1.25	0.25

Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
x [inch]	3.0	135	75	52	39	32	27	23
	4.0	168	96	67	52	42	35	31
	5.0	198	116	82	63	52	44	38
	6.0	225	135	96	75	61	52	45
	7.0	248	152	110	86	70	60	52
	8.0	270	168	123	96	79	67	58



4 studs

Result: L1 [inch]	F [lbs]								
	100	150	200	300	400	500	600	700	
x [inch]	3.0	18.50	11.75	8.50	5.00	3.50	2.50	1.75	1.25
	4.0	24.75	15.75	11.25	6.75	4.50	3.25	2.25	1.75
	5.0	31.00	19.75	14.25	8.50	5.75	4.00	3.00	2.25
	6.0	37.25	23.75	17.00	10.25	7.00	5.00	3.50	2.75
	7.0	43.50	27.75	20.00	12.00	8.25	5.75	4.25	3.00
	8.0	49.75	31.75	22.75	13.75	9.25	6.75	4.75	3.50

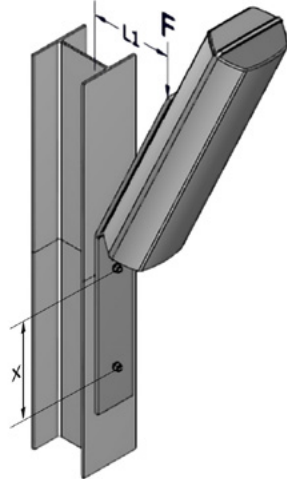
Result: Load F [lbs]	L1 [inch]								
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0	
x [inch]	3.0	270	150	104	79	64	54	46	41
	4.0	337	192	135	104	84	71	61	54
	5.0	396	232	164	127	104	88	76	67
	6.0	449	270	192	150	123	104	90	79
	7.0	497	304	219	172	141	119	104	91
	8.0	539	337	245	192	159	135	117	104

NOTE: load capacity used for calculation $N_{rec} = 340 \text{ lb (axial)} / V_{rec} = 500 \text{ lb (shear)}$

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FASTENING EQUIPMENT SUPPORT WITH X-BT-MF

Two / Four X-BT-MF Threaded studs



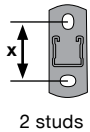
Application

- Fastening of lamps, signals, sensors on inclined cantilever support, fastened on a vertical structure
- Support is fastened by two / four X-BT-MF (vertical distance x)
- L1 is the distance of the load center (~middle of the load) to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

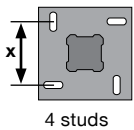
- These values are ONLY reflecting capacity of X-BT-MF threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Shear load fully carried by one / two top X-BT-MF (worst-case)
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-BT-MF distance x)



Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x [inch]	3.0	8.00	4.50	3.00	1.25	0.25		
	4.0	10.75	6.25	4.00	1.75	0.50		
	5.0	13.25	7.75	5.00	2.00	0.75		
	6.0	16.00	9.25	6.00	2.50	0.75		
	7.0	18.75	10.75	7.00	3.00	1.00		
	8.0	21.50	12.50	8.00	3.50	1.25		

Result: Load F [lbs]	L1 [inch]								
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0	
x [inch]	3.0	126	72	50	39	32	26	23	20
	4.0	154	91	65	50	41	35	30	26
	5.0	179	109	79	61	50	43	37	33
	6.0	200	126	91	72	59	50	44	39
	7.0	219	141	104	82	68	58	50	45
	8.0	235	154	115	91	76	65	57	50



Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x [inch]	3.0	16.00	9.25	6.00	2.50	0.75		
	4.0	21.50	12.50	8.00	3.50	1.25		
	5.0	26.75	15.50	10.00	4.25	1.50		
	6.0	32.25	18.75	12.00	5.25	1.75		
	7.0	37.50	21.75	14.00	6.00	2.25		
	8.0	43.00	25.00	16.00	7.00	2.50		

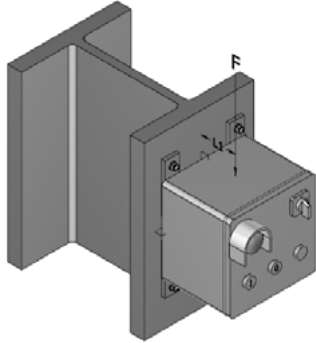
Result: Load F [lbs]	L1 [inch]								
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0	
x [inch]	3.0	251	144	101	78	63	53	46	40
	4.0	309	183	130	101	82	69	60	53
	5.0	358	219	157	123	101	85	74	65
	6.0	401	251	183	144	119	101	88	78
	7.0	438	281	207	164	136	116	101	89
	8.0	471	309	230	183	152	130	114	101

NOTE: load capacity used for calculation $N_{rec} = 340 \text{ lb (axial)} / V_{rec} = 500 \text{ lb (shear)}$

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FASTENING JUNCTION BOXES / SWITCHES WITH X-BT-MF

X-BT-MF Threaded stud



Application

- Fastening of junction boxes, switches on a vertical structure
- Element is fastened by X-BT-MF

Boundary conditions

- These values are ONLY reflecting capacity of X-BT-MF threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Technical data are based on technical data binder for X-BT-MF (06 / 2018), always refer to latest technical data binder for X-BT-MF

Technical data — always refer to latest technical data binder for X-BT-MF

Recommended load	X-BT-MF	
Drill hole type and base material thickness	Pilot hole, $t_{II} \geq 8 \text{ mm (0.31")}$	
Base material	Steel $R_m \geq 350 \text{ MPa}$ Service Temp. $-40 \text{ }^\circ\text{C}$ to $60 \text{ }^\circ\text{C}$	Steel $R_m \geq 350 \text{ MPa}$ Service Temp. $60 \text{ }^\circ\text{C}$ to $100 \text{ }^\circ\text{C}$
Tension, N_{rec} [kN / lb]	1.5 / 340	1.0 / 225
Shear, V_{rec} [kN / lb]	2.2 / 500	1.4 / 315
Moment, M_{rec} [Nm / ft-lb]	8.2 / 6.0	8.2 / 6.0

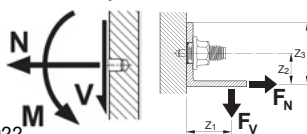
Design resistance	X-BT-MF	
Drill hole type and base material thickness	Pilot hole, $t_{II} \geq 8 \text{ mm (0.31")}$	
Base material	Steel $R_m \geq 350 \text{ MPa}$ Service Temp. $-40 \text{ }^\circ\text{C}$ to $60 \text{ }^\circ\text{C}$	Steel $R_m \geq 350 \text{ MPa}$ Service Temp. $60 \text{ }^\circ\text{C}$ to $100 \text{ }^\circ\text{C}$
Tension, N_{Rd} [kN / lb]	2.0 / 450	1.35 / 300
Shear, V_{Rd} [kN / lb]	3.0 / 675	1.9 / 425
Moment, M_{Rd} [Nm / ft-lb]	18.4 / 13.6	18.4 / 13.6

Conditions for recommended loads

- Use with Hilti glass-fiber reinforced polyamide material nuts, M10 and W10 (© as per according to General Information—Material specifications)
- Not to be used with any additional washer which provide an axial force when deformed, e.g. spring or lock washer, etc.
- Global factor of safety > 3 (based on 5% fractile value)
- Minimum edge distance = 6 mm (1/4")
- Effect of base metal vibration and stress considered
- Redundancy (multiple fastening) must be provided
- Recommended loads in the table refer to the resistance of the individual fastening and may not be the same as the loads F_N and F_V acting on the fastened part

Note: if relevant, prying forces need to be considered in design, see example. Moment acting on fastener shank only in case of a gap between base and fastened material.

- **Minimum temperature for installation and adjustments = $-10 \text{ }^\circ\text{C}$**



Recommended interaction formula for combined loading

Combined loading situation	Interaction formula
V-N (shear and tension)	$\frac{V}{V_{rec}} + \frac{N}{N_{rec}} \leq 1.2$ with $\frac{V}{V_{rec}} \leq 1.0$ and $\frac{N}{N_{rec}} \leq 1.0$
V-M (shear and bending)	$\frac{V}{V_{rec}} + \frac{M}{M_{rec}} \leq 1.2$ with $\frac{V}{V_{rec}} \leq 1.0$ and $\frac{M}{M_{rec}} \leq 1.0$
N-M (tension and bending)	$\frac{N}{N_{rec}} + \frac{M}{M_{rec}} \leq 1.0$
V-N-M (shear, tension and bending)	$\frac{V}{V_{rec}} + \frac{N}{N_{rec}} + \frac{M}{M_{rec}} \leq 1.0$

X-BT-MF CATALOG PAGES

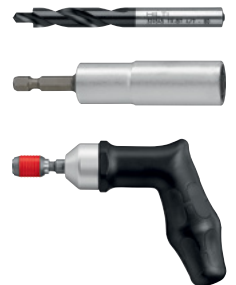
Description	Base Material	Environment	Item Number
Composite stud X-BT-MF M10/10 SN 4	Steel	Mildly corrosive	2083549
Composite stud X-BT-MF W10/10 SN 4	Steel	Mildly corrosive	2083620



Tool Kit	Item Number
X-BT tool set*	Local item
DX 351-BT powder-actuated tool	Local item
Piston X-351 BT	378676
Fastener guide BT FG M1024 for metric studs	378674
Fastener guide BT FG W1024 for Whitworth studs	378673
6.8/11 M10 brown cartridge	412689
SF BT 22-A cordless drill	2123719



Accessories	Item Number
Stepped drill bit TX-BT 4/7-80	377079
Socket X-NSD 1/4" - 16 mm for M10	2097397
Socket X-NSD 1/4" - 9/16" for W10	2107229
Torque tool X-BT 1/4" 8 Nm	2119272
T-Handle X-NSD 1/4"	2115130

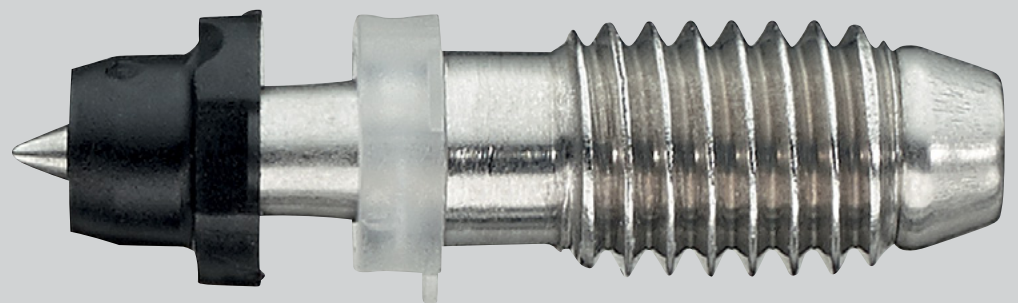






X-ST-GR THREADED STUD

Imperial



X-ST-GR TECHNICAL DATA USED FOR THE FOLLOWING CALCULATIONS

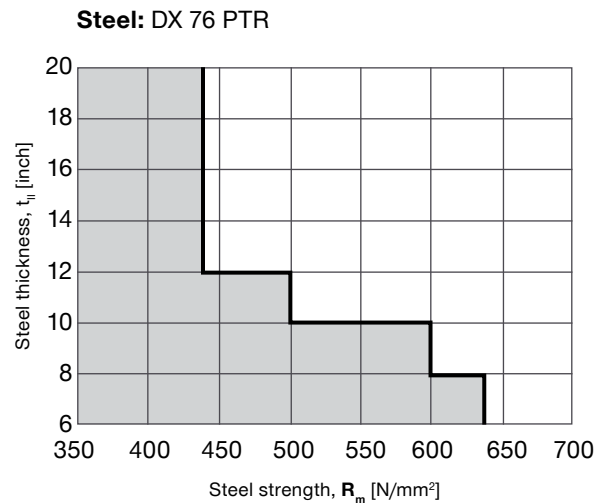
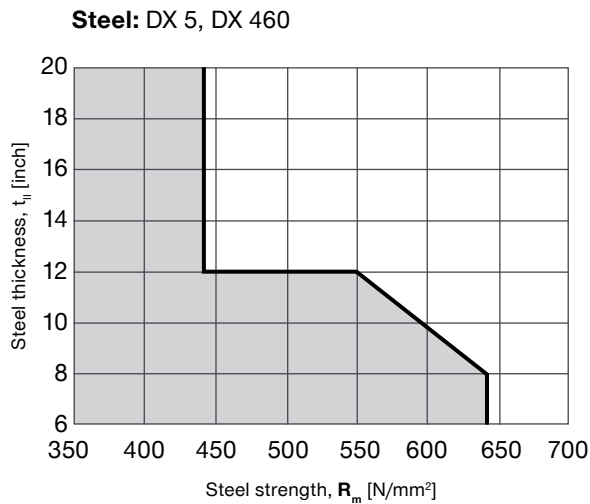
X-ST-GR technical data

- **Drill hole type / base material:** no predrilling, $t_{II} \geq 6 \text{ mm}$ (0.24")
- **Base material:** Steel S235 / A36 (higher steel strength is possible, see application limit)
- **Recommended interaction for combined load:** $N_{rec} = 405 \text{ lb}$ (axial) / $V_{rec} = 405 \text{ lb}$ (shear)

V-N (shear and tension)

$$\frac{V}{V_{rec}} + \frac{N}{N_{rec}} \leq 1.2 \quad \text{with} \quad \frac{V}{V_{rec}} \leq 1.0 \quad \text{and} \quad \frac{N}{N_{rec}} \leq 1.0$$

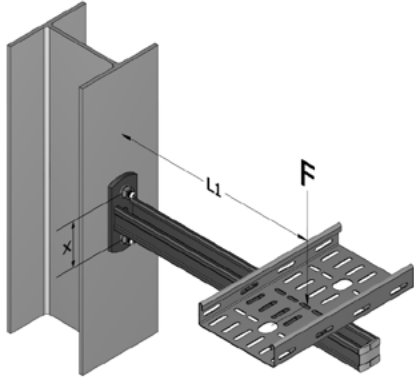
Application limit



For further technical data refer to the latest technical information (DFTM / binder)

FASTENING CANTILEVER SUPPORT WITH X-ST-GR

Two / Four X-ST-GR Threaded studs



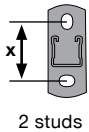
Application

- Fastening of cable trays, pipes on a horizontal cantilever support, fastened on a vertical structure
- Support is fastened by two / four X-ST-GR on both support and brace baseplate with distance x
- L1 is the distance of the load center to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

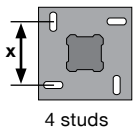
- These values are ONLY reflecting capacity of X-ST-GR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Shear load fully carried by one / two top X-ST-GR (worst-case)
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-ST-GR distance x)



Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x [inch]	3.0	9.25	5.00	3.00	1.00			
	4.0	12.25	6.75	4.00	1.50			
	5.0	15.25	8.50	5.00	1.75			
	6.0	18.25	10.25	6.25	2.00			
	7.0	21.25	12.00	7.25	2.50			
	8.0	24.25	13.50	8.25	2.75			

Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
x [inch]	3.0	135	81	58	45	37	31	27
	4.0	162	101	73	58	47	40	35
	5.0	184	119	88	70	58	49	43
	6.0	202	135	101	81	67	58	50
	7.0	218	149	113	91	77	66	58
	8.0	231	162	124	101	85	73	65



Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x [inch]	3.0	21.25	13.00	9.00	5.00	3.00	1.75	1.00
	4.0	28.25	17.50	12.00	6.75	4.00	2.25	1.25
	5.0	35.25	21.75	15.00	8.25	5.00	3.00	1.50
	6.0	42.50	26.25	18.25	10.00	6.00	3.50	2.00
	7.0	49.50	30.75	21.25	11.75	7.00	4.25	2.25
	8.0	56.50	35.00	24.25	13.50	8.00	4.75	2.75

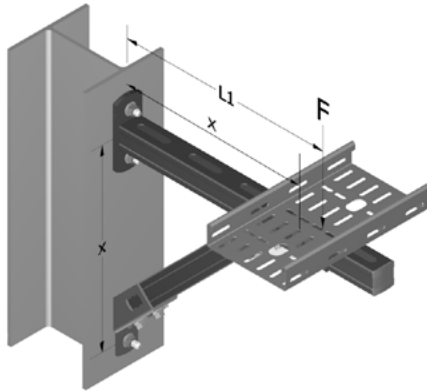
Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
x [inch]	3.0	270	162	116	90	73	62	54
	4.0	323	202	147	116	95	81	70
	5.0	368	238	176	139	116	99	86
	6.0	404	270	202	162	135	116	101
	7.0	436	298	226	183	153	132	116
	8.0	462	323	249	202	170	147	129

NOTE: load capacity used for calculation $N_{rec} = 405 \text{ lb (axial)} / V_{rec} = 405 \text{ lb (shear)}$

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FASTENING BRACED CANTILEVER SUPPORT WITH X-ST-GR

Two / Four X-ST-GR Threaded studs



Application

- Fastening of cable trays, pipes on a horizontal, braced cantilever support, fastened on a vertical structure
- Support is fastened by three / six X-ST-GR on both support and brace baseplate with distance x
- L1 is the distance of the load center to the vertical structure surface, the angle of the brace is 45°
- Load F is the acceptable total load (all dead load including)

Boundary conditions

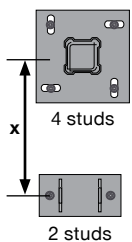
- These values are ONLY reflecting capacity of X-ST-GR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Shear load fully carried by one / two top X-ST-GR (worst-case)
- Load F acting at the distance of L1 from structure surface

Technical assessment — maximum of F (depending on load F or lever arm length L1 and baseplate distance x)



Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x 4.0	13.25	9.75	8.00	5.25	4.00			
6.0	20.00	14.75	12.00	8.00	6.00			
8.0	26.75	19.50	16.00	10.75	8.00			
14.0	47.00	34.50	28.00	18.75	14.00			
20.0	67.25	49.25	40.25	26.75	20.00			
32.0	107.50	78.75	64.25	43.00	32.25			

Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
x 4.0	270	135	90	67				
6.0	404	202	135	101				
8.0		270	180	135				
14.0			315	236				
20.0				337				
32.0								



Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x 4.0	24.00	17.00	13.25	9.75	8.00	6.25	5.25	4.50
6.0	36.25	25.50	20.00	14.75	12.00	9.50	8.00	6.75
8.0	48.25	34.00	26.75	19.50	16.00	12.75	10.75	9.00
14.0	84.75	59.50	47.00	34.50	28.00	22.50	18.75	16.00
20.0	121.00	85.25	67.25	49.25	40.25	32.25	26.75	23.00
32.0	193.75	136.25	107.50	78.75	64.25	51.75	43.00	36.75

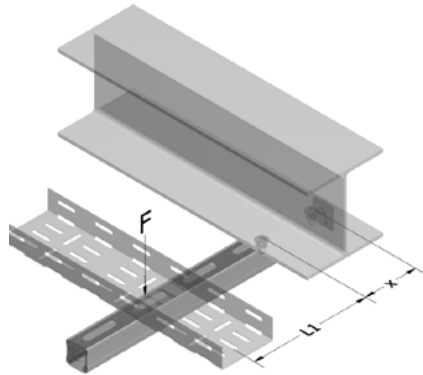
Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
x 4.0	539	270	180	135				
6.0	809	404	270	202	162	135		
8.0		539	359	270	216	180	154	135
14.0			629	472	377	315	270	236
20.0				674	539	449	385	337
32.0						719	616	539

NOTE: load capacity used for calculation $N_{rec} = 405 \text{ lb (axial)} / V_{rec} = 405 \text{ lb (shear)}$

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FASTENING STRUT TO STEEL WITH X-ST-GR

Two X-ST-GR Threaded studs



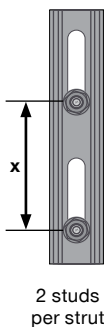
Application

- Fastening of cable trays, pipes on a horizontal cantilever support, fastened on a horizontal structure
- Support is fastened by two X-ST-GR (horizontal distance x)
- L1 is the distance of the load center to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of X-ST-GR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-ST-GR distance x)



Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
3.0	9.00	5.00	3.00	1.00				
4.0	12.00	6.75	4.00	1.25				
5.0	15.00	8.25	5.00	1.50				
6.0	18.25	10.00	6.00	2.00				
7.0	21.25	11.75	7.00	2.25				
8.0	24.25	13.50	8.00	2.75				

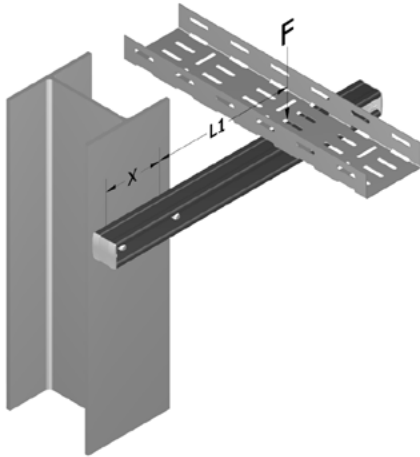
Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
3.0	135	81	58	45	37	31	27	24
4.0	162	101	73	58	47	40	35	31
5.0	184	119	88	70	58	49	43	38
6.0	202	135	101	81	67	58	50	45
7.0	218	149	113	91	77	66	58	51
8.0	231	162	124	101	85	73	65	58

NOTE: load capacity used for calculation $N_{rec} = 405 \text{ lb (axial)} / V_{rec} = 405 \text{ lb (shear)}$

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FASTENING STRUT TO STEEL WITH X-ST-GR

Two / Four X-ST-GR Threaded studs



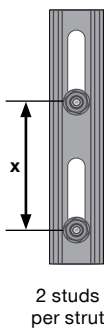
Application

- Fastening of cable trays, pipes on a horizontal cantilever support, fastened on a vertical structure
- Support is fastened by two X-ST-GR (horizontal distance x)
- L1 is the distance of the load center to the center of the fasteners
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of X-ST-GR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Shear load fully carried by one X-ST-GR (worst-case)
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-ST-GR distance x)



Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
3.0	9.00	5.00	3.00	1.00				
4.0	12.00	6.75	4.00	1.25				
5.0	15.00	8.25	5.00	1.50				
6.0	18.25	10.00	6.00	2.00				
7.0	21.25	11.75	7.00	2.25				
8.0	24.25	13.50	8.00	2.75				

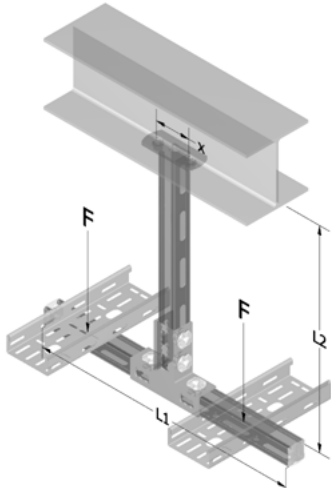
Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
3.0	135	81	58	45	37	31	27	24
4.0	162	101	73	58	47	40	35	31
5.0	184	119	88	70	58	49	43	38
6.0	202	135	101	81	67	58	50	45
7.0	218	149	113	91	77	66	58	51
8.0	231	162	124	101	85	73	65	58

NOTE: load capacity used for calculation $N_{rec} = 405 \text{ lb (axial)} / V_{rec} = 405 \text{ lb (shear)}$

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FASTENING T-POST (CEILING) SUPPORT WITH X-ST-GR

Two / Four X-ST-GR Threaded studs



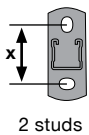
Application

- Fastening of cable trays, pipes on a T-Post support, which is fastened on a horizontal structure
- Support is fastened by two / four X-ST-GR (horizontal distance x)
- L1 is the total width of the T-Post, L2 is fix set to 1000 mm
- Load F is the acceptable total load (all dead load including)

Boundary conditions

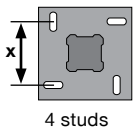
- These values are ONLY reflecting capacity of X-ST-GR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- 2 Load cases: load asymmetric acting in the center of one arm only, 30% acting as horizontal load

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-ST-GR distance x)



Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x [inch]	3.0							
	4.0	56.50						
	5.0	70.75						
	6.0	85.00						
	7.0	99.25	61.50					
	8.0	113.25	70.25					

Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
x [inch]	3.0	85	85	85	85	85	85	85
	4.0	108	108	108	108	108	108	108
	5.0	128	128	128	128	128	128	128
	6.0	146	146	146	146	146	146	146
	7.0	162	162	162	162	162	162	162
	8.0	178	178	178	178	178	178	178



Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x [inch]	3.0	91.00	58.50					
	4.0	121.25	78.25	56.50				
	5.0	151.75	97.75	70.75				
	6.0	182.00	117.25	85.00				
	7.0	212.50	137.00	99.25	61.50			
	8.0	242.75	156.50	113.25	70.25			

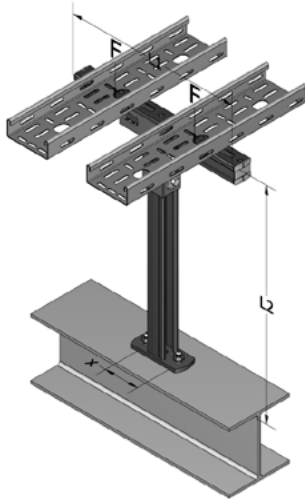
Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
x [inch]	3.0	154	154	154	154	154	154	154
	4.0	190	190	190	190	190	190	190
	5.0	221	221	221	221	221	221	221
	6.0	247	247	247	247	247	247	247
	7.0	271	271	271	271	271	271	271
	8.0	291	291	291	291	291	291	291

NOTE: load capacity used for calculation $N_{rec} = 405 \text{ lb (axial)} / V_{rec} = 405 \text{ lb (shear)}$

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FASTENING T-POST (FLOOR) SUPPORT WITH X-ST-GR

Two / Four X-ST-GR Threaded studs



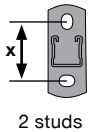
Application

- Fastening of cable trays, pipes on a T-Post support, which is fastened on a horizontal structure
- Support is fastened by two / four X-ST-GR (horizontal distance x)
- L1 is the total width of the T-Post, L2 is fix set to 1000 mm
- Load F is the acceptable total load (all dead load including)

Boundary conditions

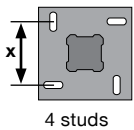
- These values are ONLY reflecting capacity of X-ST-GR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- 2 Load cases: load asymmetric acting in the center of one arm only, 30% acting as horizontal load

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-ST-GR distance x)



Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x [inch]	3.0							
	4.0	72.50						
	5.0	90.75	63.75					
	6.0	109.00	76.50					
	7.0	127.25	89.50	70.50				
	8.0	145.25	102.25	80.50				

Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
x [inch]	3.0	95	95	95	95	95	95	95
	4.0	124	124	124	124	124	124	124
	5.0	152	152	152	152	152	152	152
	6.0	178	178	178	178	178	178	178
	7.0	203	203	203	203	203	203	203
	8.0	228	228	228	228	228	228	228



Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x [inch]	3.0							
	4.0	137.25						
	5.0	171.75	117.75					
	6.0	206.00	141.25					
	7.0	240.50	165.00	127.25				
	8.0	274.75	188.50	145.25				

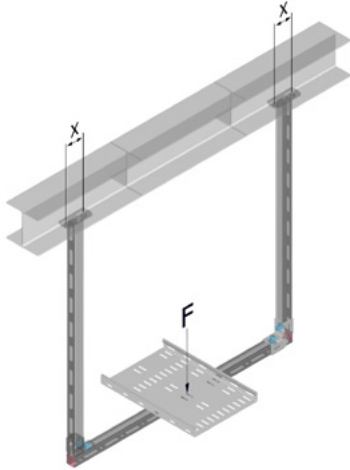
Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
x [inch]	3.0	191	191	191	191	191	191	191
	4.0	249	249	249	249	249	249	249
	5.0	304	304	304	304	304	304	304
	6.0	356	356	356	356	356	356	356
	7.0	407	407	407	407	407	407	407
	8.0	455	455	455	455	455	455	455

NOTE: load capacity used for calculation $N_{rec} = 405 \text{ lb (axial)} / V_{rec} = 405 \text{ lb (shear)}$

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FASTENING U-FRAME (CEILING) / TRAPEZE SUPPORT WITH X-ST-GR

Two / Four X-ST-GR Threaded studs



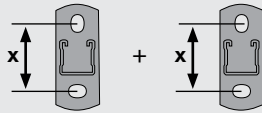
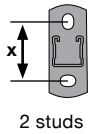
Application

- Fastening of cable trays, pipes on a U-Frame support, which is fastened on a horizontal structure
- Support is fastened by four X-ST-GR (2 fasteners per baseplate)
- Load F is the acceptable total load (all dead load including, acting in the center of the U-Frame)

Boundary conditions

- These values are ONLY reflecting capacity of X-ST-GR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Load acting in the center (U-Frame)

Technical assessment — maximum of F



$$F = N_{rec} \cdot \text{\#fasteners per post}$$

$$F = 405 \text{ lb} \cdot 4$$

$$F = 1620 \text{ lb}$$

NOTE: load capacity used for calculation $N_{rec} = 405 \text{ lb (axial)} / V_{rec} = 405 \text{ lb (shear)}$

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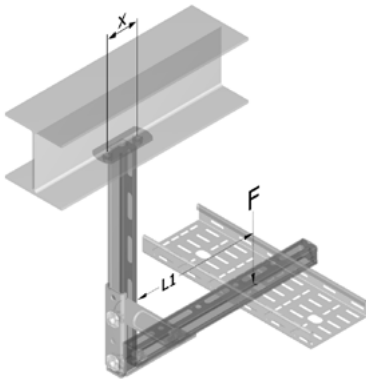
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FASTENING L-POST SUPPORT WITH X-ST-GR

Two / Four X-ST-GR Threaded studs



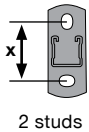
Application

- Fastening of cable trays, pipes on a L-Post support, which is fastened on a horizontal structure
- Support is fastened by two / four X-ST-GR (horizontal distance x)
- L1 is the distance of the load center to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

- These values are ONLY reflecting capacity of X-ST-GR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Load F acting at the distance of L1 from structure surface

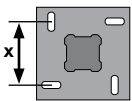
Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-ST-GR distance x)



2 studs

Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x [inch]	3.0	10.50	6.50	4.50	2.50	1.50	0.75	0.50
	4.0	14.00	8.75	6.00	3.25	2.00	1.00	0.25
	5.0	17.50	10.75	7.50	4.00	2.50	1.50	0.75
	6.0	21.25	13.00	9.00	5.00	3.00	1.75	1.00
	7.0	24.75	15.25	10.50	5.75	3.50	2.00	1.00
	8.0	28.25	17.50	12.00	6.75	4.00	2.25	1.25

Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
x [inch]	3.0	162	90	62	47	38	32	24
	4.0	202	116	81	62	50	43	32
	5.0	238	139	99	76	62	52	40
	6.0	270	162	116	90	73	62	54
	7.0	298	183	132	103	84	72	62
	8.0	323	202	147	116	95	81	70



4 studs

Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x [inch]	3.0	22.75	14.50	10.50	6.50	4.50	3.25	2.50
	4.0	30.25	19.50	14.00	8.75	6.00	4.25	3.25
	5.0	37.75	24.25	17.50	10.75	7.50	5.50	4.00
	6.0	45.50	29.25	21.25	13.00	9.00	6.50	5.00
	7.0	53.00	34.25	24.75	15.25	10.50	7.75	5.75
	8.0	60.50	39.00	28.25	17.50	12.00	8.75	6.75

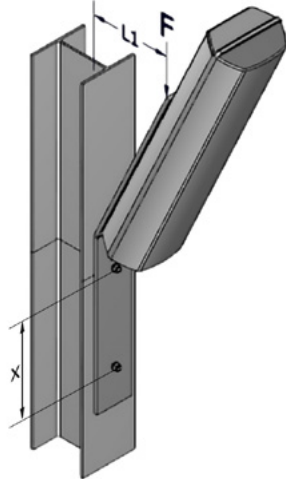
Result: Load F [lbs]	L1 [inch]							
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
x [inch]	3.0	323	180	124	95	77	65	49
	4.0	404	231	162	124	101	85	65
	5.0	476	279	197	153	124	105	91
	6.0	539	323	231	180	147	124	108
	7.0	596	365	263	206	169	143	124
	8.0	647	404	294	231	190	162	141

NOTE: load capacity used for calculation $N_{rec} = 405 \text{ lb (axial)} / V_{rec} = 405 \text{ lb (shear)}$

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FASTENING EQUIPMENT SUPPORT WITH X-ST-GR

Two / Four X-ST-GR Threaded studs



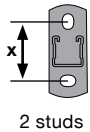
Application

- Fastening of lamps, signals, sensors, on inclined cantilever support, fastened on a vertical structure
- Support is fastened by two / four X-ST-GR (vertical distance x)
- L1 is the distance of the load center (~middle of the load) to the vertical structure surface
- Load F is the acceptable total load (all dead load including)

Boundary conditions

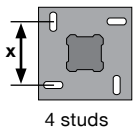
- These values are ONLY reflecting capacity of X-ST-GR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Shear load fully carried by one / two top X-ST-GR (worst-case)
- Load F acting at the distance of L1 from structure surface

Technical assessment – maximum of L1 and F (depending on load F or lever arm length L1 and X-ST-GR distance x)



Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x [inch]	3.0	9.00	5.00	3.00	1.00			
	4.0	12.00	6.75	4.00	1.25			
	5.0	15.00	8.25	5.00	1.50			
	6.0	18.25	10.00	6.00	2.00			
	7.0	21.25	11.75	7.00	2.25			
	8.0	24.25	13.50	8.00	2.75			

Result: Load F [lbs]	L1 [inch]								
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0	
x [inch]	3.0	135	81	58	45	37	31	27	24
	4.0	162	101	73	58	47	40	35	31
	5.0	184	119	88	70	58	49	43	38
	6.0	202	135	101	81	67	58	50	45
	7.0	218	149	113	91	77	66	58	51
	8.0	231	162	124	101	85	73	65	58



Result: L1 [inch]	F [lbs]							
	100	150	200	300	400	500	600	700
x [inch]	3.0	18.25	10.00	6.00	2.00			
	4.0	24.25	13.50	8.00	2.75			
	5.0	30.25	16.75	10.00	3.25			
	6.0	36.50	20.25	12.25	4.00			
	7.0	42.50	23.75	14.25	4.75			
	8.0	48.50	27.00	16.25	5.50			

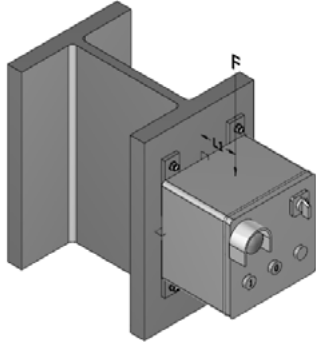
Result: Load F [lbs]	L1 [inch]								
	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0	
x [inch]	3.0	270	162	116	90	73	62	54	47
	4.0	323	202	147	116	95	81	70	62
	5.0	368	238	176	139	116	99	86	76
	6.0	404	270	202	162	135	116	101	90
	7.0	436	298	226	183	153	132	116	103
	8.0	462	323	249	202	170	147	129	116

NOTE: load capacity used for calculation $N_{rec} = 405 \text{ lb (axial)} / V_{rec} = 405 \text{ lb (shear)}$

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FASTENING JUNCTION BOXES / SWITCHES WITH X-ST-GR

X-ST-GR Threaded stud



Application

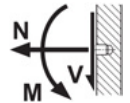
- Fastening of junction boxes, switches on a vertical structure
- Element is fastened by X-ST-GR

Boundary conditions

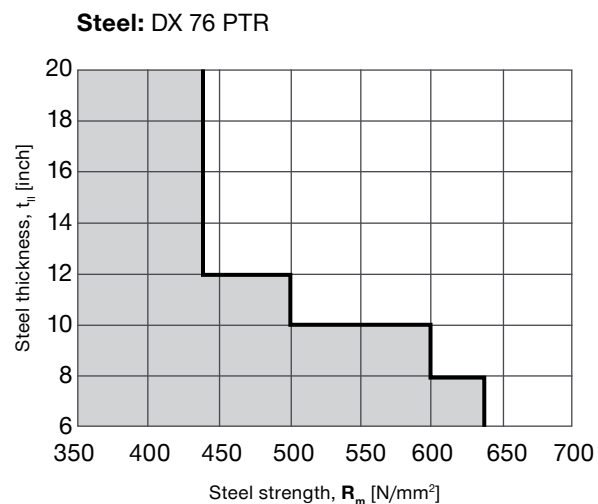
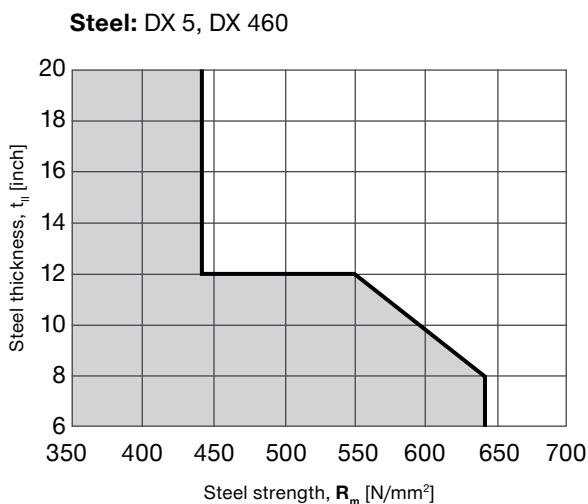
- These values are ONLY reflecting capacity of X-ST-GR threaded stud. Structural analysis of support / structure is NOT in Hilti scope. See the detailed statements in disclaimer—2018/05/04
- Technical data are based on technical data binder for X-ST-GR (06 / 2018), always refer to latest technical data binder for X-ST-GR

Technical data — always refer to latest technical data binder for X-ST

Recommended load	X-ST
Base material thickness	$t_{II} \geq 6 \text{ mm (0.24")}$
Base material	Steel $R_m \geq 350 \text{ MPa}$
Tension, N_{rec} [kN]	1.8
Shear, V_{rec} [kN]	1.8
Moment, M_{rec} [Nm]	5.5



Application limit



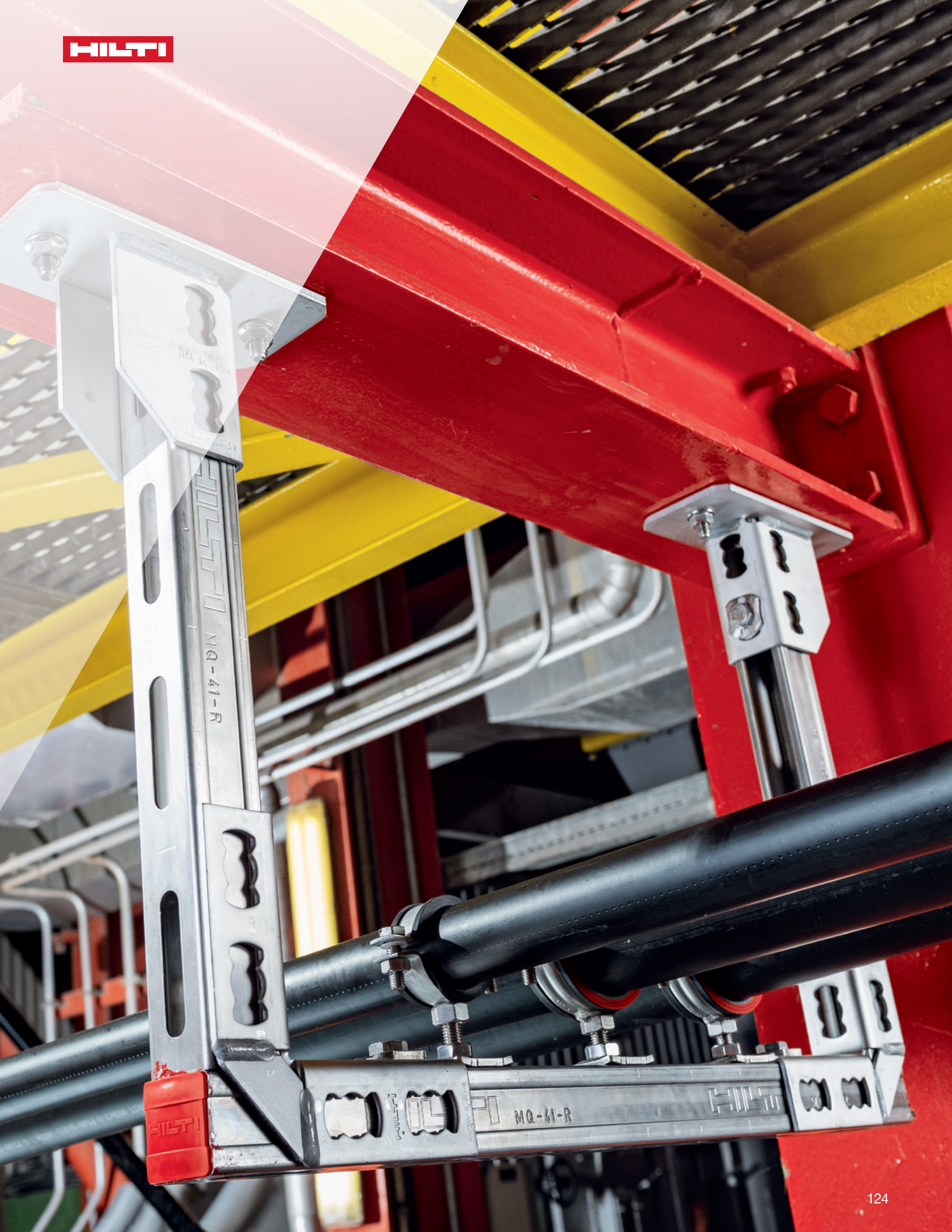
X-ST-GR CATALOG PAGES

Description	Base Material	Environment	Item Number
X-ST-GR M8/10 P8	Steel	Mildly corrosive	2122460



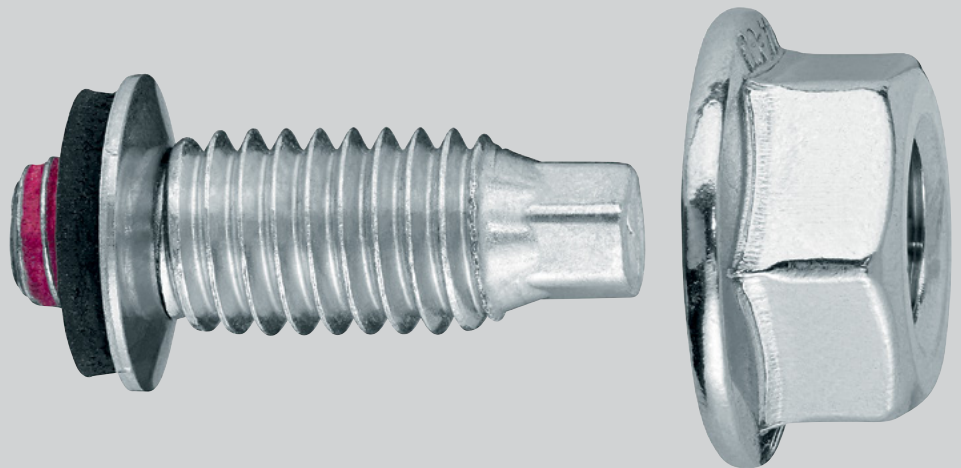
Description	Item Number
DX 76 PTR	Local item
DX 5 GR	Local item
X-5 460 F8 N15 Fastener guide	304530
X-5 460 P8 Piston	373297
Cartridge 6.8/11 M10 STD red	416474
Cartridge 6.8/11 M10 STD black	416475
X-76-F-8-GR-PTR Fastener guide	388852
Cartridge 6.8/18 M10 .27 cal C-T yellow	416483
Cartridge 6.8/18 M10 .27 cal C-T red	416484



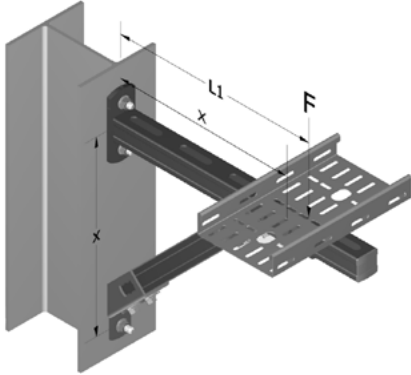


TYPICALS

Detail



BRACED CANTILEVER



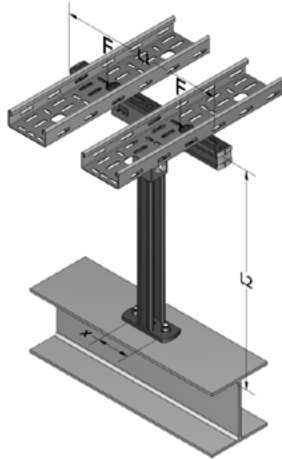
Application

- Fastening of cable trays, pipes on a horizontal, braced cantilever support, fastened on a vertical structure
- Support is fastened by two / four fasteners on both support and baseplate
- L1 is the distance of the load center to the vertical structure surface
- x is the distance of the baseplates (and of brace joint to vertical structure surface)
- The angle of the brace is assumed to be 45°
- Load F is the acceptable total load (all dead load including)

Boundary conditions and assumptions

- Results of calculation are ONLY reflecting capacity of Hilti fasteners. Structural analysis of support / base structure is NOT in Hilti scope.
- All typical calculations are based on the capacity that is mentioned in the description of the fasteners—please refer to the respective detailed technical description. Results are rounded for simplification and to harmonize metric and imperial units.
- **Load case:** acceptable load F is acting in the center of the cable tray, pipe in a distance of L1 to the support structure.
- **Assumption:** calculation is based on rigid system model, without deformation of baseplate or cantilever.
- **Assumption:** the shear loads in top and bottom baseplate are assumed to be carried only by the threaded stud(s) which also carry the tensile load, this is therefore a worst-case scenario.
- **Assumption:** considered loadings are only the static loads of the cable tray, pipe or other installed elements and the weight of the support itself. The load is always acting in the center of the cable tray, pipe or installed elements, the dimension L1 is from that point to the fasteners plane—please see the description in the respective examples. No other loads (e.g. wind load or loads due to installation / transportation) are known and in scope of the calculation.
- **Assumption:** there is no load in axis of the cable tray or pipe due to thermal expansion or other phenomena.

T-POST (FLOOR)



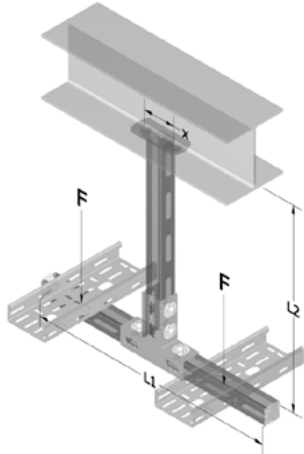
Application

- Fastening of cable trays, pipes on a T-Post, which is fastened on a horizontal structure
- Support is fastened by two / four fasteners (distance x)
- $L1$ is the total width of the T-Post, $L2$ is fix set to 1000 mm
- Load F is the acceptable total load (all dead load including)

Boundary conditions and assumptions

- Results of calculation are ONLY reflecting capacity of Hilti fasteners. Structural analysis of support / base structure is NOT in Hilti scope.
- All typical calculations are based on the capacity that is mentioned in the description of the fasteners—please refer to the respective detailed technical description. Results are rounded for simplification and to harmonize metric and imperial units.
- **Load case A:** 30% of acceptable load F is acting as shear load, perpendicular to the cable tray axis (F is not yet applied, as worst-case).
- **Load case B:** Load F is introduced asymmetrically, acting in the center of one of the upper arms of the T-Post.
- **Assumption:** calculation is based on rigid system model, without deformation of baseplate or cantilever.
- **Assumption:** shear loads in baseplate are assumed to be carried only by the threaded stud(s) which also carry the tensile load, this is therefore a worst-case scenario.
- **Assumption:** considered loadings are only the static loads of the cable tray, pipe or other installed elements and the weight of the support itself. No other loads (e.g. wind load or loads due to installation / transportation) are known and in scope of the calculation.
- **Assumption:** there is no load in axis of the cable tray or pipe due to thermal expansion or other phenomena.

T-POST (CEILING)



Application

- Fastening of cable trays, pipes on a T-Post, which is fastened on a horizontal structure
- Support is fastened by two / four fasteners (distance x)
- L1 is the total width of the T-Post, L2 is fix set to 1000 mm
- Load F is the acceptable total load (all dead load including)

Boundary conditions and assumptions

- Results of calculation are ONLY reflecting capacity of Hilti fasteners. Structural analysis of support / base structure is NOT in Hilti scope.
- All typical calculations are based on the capacity that is mentioned in the description of the fasteners—please refer to the respective detailed technical description. Results are rounded for simplification and to harmonize metric and imperial units.
- **Load case A:** 30% of acceptable load F is acting as shear load, perpendicular to the cable tray axis (F is yet applied, as worst-case).
- **Load case B:** Load F is introduced asymmetrically, acting in the center of one of the upper arms of the T-Post.
- **Assumption:** calculation is based on rigid system model, without deformation of baseplate or cantilever.
- **Assumption:** shear loads in baseplate are assumed to be carried only by the threaded stud(s) which also carry the tensile load, this is therefore a worst-case scenario.
- **Assumption:** considered loadings are only the static loads of the cable tray, pipe or other installed elements and the weight of the support itself. No other loads (e.g. wind load or loads due to installation / transportation) are known and in scope of the calculation.
- **Assumption:** there is no load in axis of the cable tray or pipe due to thermal expansion or other phenomena.



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