Deutsches Institut für Bautechnik

Approval body for construction products and types of construction

Bautechnisches Prüfamt

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European Technical Assessment ETA-18/0130 of 1 June 2018

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	Hilti heavy-duty pipe rings MP-MI M10/M12 and Hilti heavy-duty pipe rings MP-MI M16
Product family to which the construction product belongs	Products related to installation systems supporting technical equipment for building services such as pipes, conduits, ducts and cables
Manufacturer	Hilti AG Feldkircherstraße 100 9494 Schaan FÜRSTENTUM LIECHTENSTEIN
Manufacturing plant	L 1000446
This European Technical Assessment contains	23 pages including 19 annexes which form an integral part of this assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	EAD 280016-00-0602

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Specific Part

1 Technical description of the product

Objects of this European Technical Assessment are Hilti heavy-duty pipe rings MP-MI M10/M12 and Hilti heavy-duty pipe rings MP-MI M16. The MP-MI M10/M12 and MP-MI M16 pipe clamps consist of two profiled steel strips, which are designed to be able to surround a pipe circularly. The clamping strips are connected together by steel screws and are pressed onto the outside of the pipe to be fastened by tightening the screws. The flanges of the upper clamping strips of MP-MI 3/8" G through MP-MI 2" G are incorporated with a thread to tighten the screw plugs. To tighten the screw plugs of MP-MI 68/72 G through MP-MI 244.5 C, nuts M8 are welded to the flanges of the upper clamping strips. Each pipe clamp has a designated clamping range. The top clamping strip features a welded connection head with M10/M12 combi-thread or M16 connection thread version. The clamping strips are fitted with an EDPM profile on the inside to aid structure-borne sound insulation, to balance unevenness and to prevent contact corrosion.

Annex A describes the dimensions and materials of the Hilti heavy-duty pipe rings MP-MI M10/M12 and MP-MI M16. The requirements for performance assessment are given in Annex B.

2 Specification of the intended use in accordance with the applicable European Assessment Document (EAD)

The performance given in Section 3 can only be assumed if the Hilti heavy-duty pipe rings MP-MI M10/M12 and MP-MI M16 are used in compliance with the specifications and under boundary conditions set out in Annexes A to D. The test and assessment methods on which this European Technical Assessment is based lead to an assumption of a working life of the Hilti heavy-duty pipe rings MP-MI M10/M12 and MP-MI M16 of at least 50 years in final use under ambient temperatures in indoor areas. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

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

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

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

3.1 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire: Steel parts	Class A1
Reaction to fire: Plastic parts	not relevant for fire growth in accordance with TR021 and therefore do not need to be classified

3.2 Safety and accessibility in use (BWR 4)

Essential characteristic	Performance
Dimensions and materials of Hilti heavy-duty pipe rings MP-MI M10/M12 and MP-MI M16	see Annex A
Characteristics of Hilti heavy-duty pipe rings MP-MI M10/M12 and MP-MI M16 at ambient temperature	see Annex C
Resistance and deformations of Hilti heavy-duty pipe rings MP-MI M10/M12 and MP-MI M16 at elevated temperature	see Annex D

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

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

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

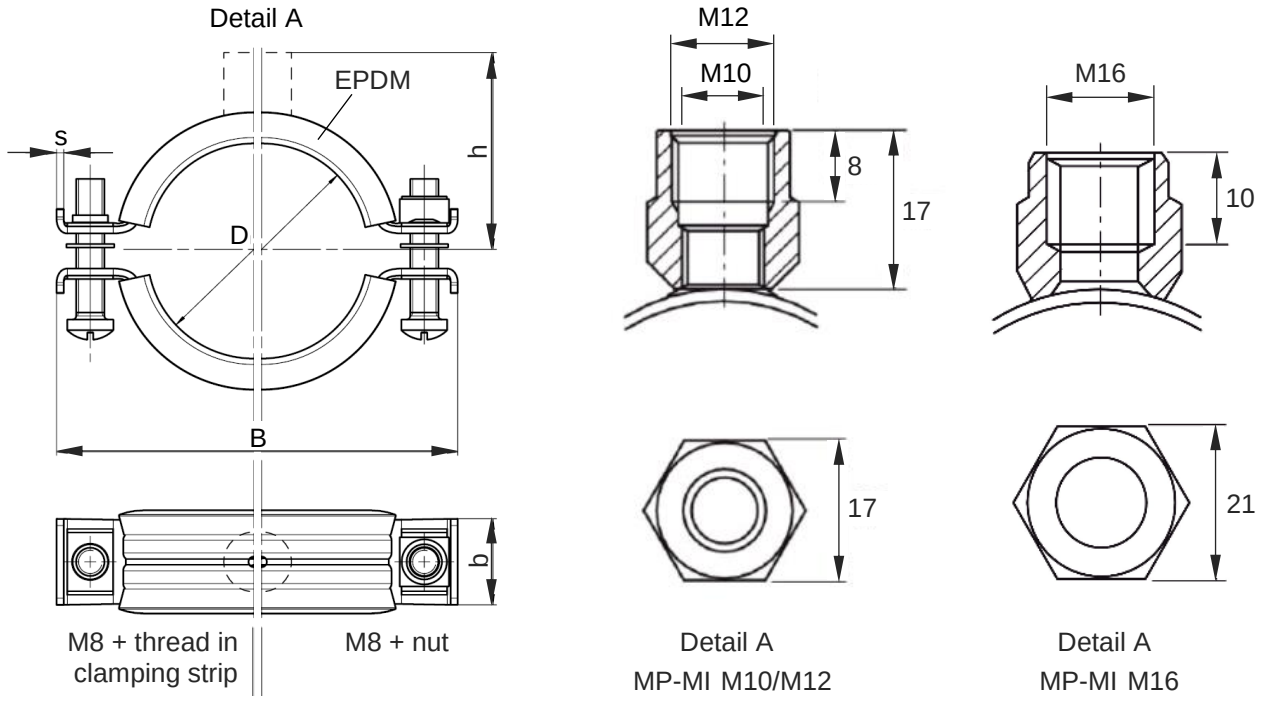
5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

The technical details necessary for the implementation of the system for the assessment and verification of constancy of performance are laid down in the control plan (confidential part of this European Technical Assessment) deposited at Deutsches Institut für Bautechnik.

Issued in Berlin on 1 June 2018 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
Häßler



Dimensions in mm

Figure A1: Geometry und dimensions of heavy-duty pipe rings MP-MI

Table A1: Materials of heavy-duty pipe rings MP-MI

Components of pipe rings	**Materials**
Clamping strip	DD11 in accordance with EN 10111[1)]
Connection head	C10C+U+C in accordance with EN 10263-2, zinc coated
Screw plugs	MP-MI 3/8" G - MP-MI 78/84 G: Strength class 4.8 in accordance with EN ISO 898-1, zinc coated MP-MI 3" G - MP-MI 244.5 C: Strength class 8.8 in accordance with EN ISO 898-1, zinc coated
Nut of screw plug	MP-MI 68/72 G - MP-MI 244.5 C: Square weld nut in accordance with DIN 928-M8-St, zinc coated
Plastic inlays	EPDM

[1)] with 235 N/mm^2 ≤ R_{eL} ≤ 340 N/mm^2, Method of deoxidation: fully killed

Table A2.1: Dimensions of heavy-duty pipe rings MP-MI M10/M12

Item number	Designation	D [mm]	B [mm]	b x s [mm]	h [mm]	Closing mechanism
20843	MP-MI 3/8" G	15-19	64	24 x 2.0	33	M8 + thread in clamping strip
20845	MP-MI 1/2" G	20-25	69	24 x 2.0	36	
20847	MP-MI 3/4" G	25-30	75	24 x 2.0	39	
20849	MP-MI 1" G	32-38	83	24 x 2.0	42	
20851	MP-MI 1 1/4" G	40-45	92	24 x 2.0	47	
20853	MP-MI 1 1/2" G	48-54	101	24 x 2.0	50	
20855	MP-MI 54/57 G	54-57	107	24 x 2.0	53	
20857	MP-MI 2" G	57-64	111	24 x 2.0	55	
20860	MP-MI 68/72 G	68-72	123	24 x 2.0	60	M8 + nut
20862	MP-MI 2 1/2" G	70-77	130	24 x 2.0	64	
20865	MP-MI 78/84 G	80-84	139	24 x 2.0	68	
20866	MP-MI 3" G	82-90	144	24 x 2.0	71	
20869	MP-MI 101.6 G	97-103	163	30 x 2.5	78	
20871	MP-MI 4" G	108-114	174	30 x 2.5	84	
20874	MP-MI 117 G	114-119	179	30 x 2.5	86	
20876	MP-MI 125 G	122-127	187	30 x 2.5	90	
20879	MP-MI 133 G	132-137	198	30 x 2.5	95	
20882	MP-MI 5" G	137-142	203	30 x 2.5	98	
20885	MP-MI 159 G	156-162	223	30 x 2.5	107	
20887	MP-MI 6" G	162-168	229	30 x 2.5	110	

Table A2.2: Dimensions of heavy-duty pipe rings MP-MI M16

Item number	Designation	D [mm]	B [mm]	b x s [mm]	h [mm]	Closing mechanism
20872	MP-MI 4" C	108-114	174	30 x 2.5	84	M8 + nut
20880	MP-MI 133 C	132-137	198	30 x 2.5	96	
229087	MP-MI 159 C	156-162	223	30 x 2.5	107	
20888	MP-MI 6" C	162-168	229	30 x 2.5	111	
20890	MP-MI 177.8 C	175-180	244	30 x 3.0	117	
20892	MP-MI 193.7 C	190-200	263	30 x 3.0	127	
20894	MP-MI 212 C	210-219	283	30 x 3.0	136	
20896	MP-MI 219.1 C	217-224	288	30 x 3.0	139	
20898	MP-MI 244.5 C	242-250	314	30 x 3.0	152	

- Hilti heavy-duty pipe rings MP-MI M10/M12 und MP-MI M16 are used to transfer the loads of building services components such as ducts and equipment for sprinkler, water, heating, cooling, ventilation, electrical and other installations. The Hilti heavy-duty pipe rings MP-MI M10/M12 und MP-MI M16 are suitable for undertaking this load-bearing function under the conditions described in Section 2 of this European Technical Assessment.
- The resistance and deformation at ambient and elevated temperatures applies for static and centric actions.
- The resistance and deformation at elevated temperatures are referring to the boundary conditions of the standard temperature / time curve (STTC) in accordance with EN 1363-1.
- The screw plugs for the heavy-duty pipe rings must be tightened consistently with a torque of 3 Nm.
- The performance data for the MP-MI heavy-duty pipe ring results in conjunction with the threaded rods as per Table B1.
- Prior to installation, it must be ensured that the pipe to be inserted, the anchoring of the threaded rods to the base material and the base material itself are suitable to withstand the resistance values of the MP-MI heavy-duty pipe rings and that they have a fireproof certificate.
- The heavy-duty pipe rings must be installed by appropriately qualified personnel and under the supervision of the site manager.

Table B1: Threaded rods for use with heavy-duty pipe rings MP-MI

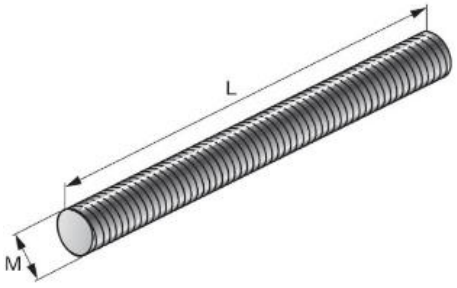
Illustration	Item number	Designation	M thread	L [mm]	Material
	216418	AM10x3000 4.8	M10	3000	Strength class 4.8 in accordance with DIN 976-1, zinc coated
	339796	AM10x2000 4.8	M10	2000	
	339795	AM10x1000 4.8	M10	1000	
	216421	AM12x3000 4.8	M12	3000	
	216420	AM12x2000 4.8	M12	2000	
	339797	AM12x1000 4.8	M12	1000	
	216424	AM16x3000 4.8	M16	3000	
	216423	AM16x2000 4.8	M16	2000	
	216422	AM16x1000 4.8	M16	1000	

Table C1: Characteristic tensile strength at ambient temperature

Item number	Designation	Characteristic tensile strength	Partial safety coefficient[2)]
		F_{Rk} [kN]	γ_M
20843	MP-MI 3/8" G	8.38	3.33
20845	MP-MI 1/2" G		
20847	MP-MI 3/4" G		
20849	MP-MI 1" G		
20851	MP-MI 1 1/4" G		
20853	MP-MI 1 1/2" G		
20855	MP-MI 54/57 G		
20857	MP-MI 2" G		
20860	MP-MI 68/72 G	11.24	4.46
20862	MP-MI 2 1/2" G		
20865	MP-MI 78/84 G		
20866	MP-MI 3" G	10.07	3.99
20869	MP-MI 101.6 G	12.55	3.73
20871	MP-MI 4" G		
20874	MP-MI 117 G		
20876	MP-MI 125 G		
20879	MP-MI 133 G		
20882	MP-MI 5" G		
20885	MP-MI 159 G		
20887	MP-MI 6" G		
20872	MP-MI 4" C	13.92	4.14
20880	MP-MI 133 C		
229087	MP-MI 159 C		
20888	MP-MI 6" C		
20890	MP-MI 177.8 C	11.62	1.85
20892	MP-MI 193.7 C		
20894	MP-MI 212 C		
20896	MP-MI 219.1 C		
20898	MP-MI 244.5 C		

[2)] provided that no other national regulations apply

Hilti heavy-duty pipe rings MP-MI M10/M12 and Hilti heavy-duty pipe rings MP-MI M16	Annex C1
Characteristic tensile strength at ambient temperature	

Table C2: Service loads and deformations at ambient temperature

Item number	Designation	Service load F_{SLS} [kN]	Associated deformation [mm]
20843	MP-MI 3/8" G	2.67	1.5
20845	MP-MI 1/2" G		
20847	MP-MI 3/4" G		
20849	MP-MI 1" G		
20851	MP-MI 1 1/4" G		
20853	MP-MI 1 1/2" G		
20855	MP-MI 54/57 G		
20857	MP-MI 2" G		
20860	MP-MI 68/72 G	2.16	1.5
20862	MP-MI 2 1/2" G		
20865	MP-MI 78/84 G		
20866	MP-MI 3" G	2.22	1.8
20869	MP-MI 101.6 G	2.43	3.4
20871	MP-MI 4" G		
20874	MP-MI 117 G		
20876	MP-MI 125 G		
20879	MP-MI 133 G		
20882	MP-MI 5" G		
20885	MP-MI 159 G		
20887	MP-MI 6" G		
20872	MP-MI 4" C	2.40	3.4
20880	MP-MI 133 C		
229087	MP-MI 159 C		
20888	MP-MI 6" C		
20890	MP-MI 177.8 C	4.56	5.0
20892	MP-MI 193.7 C		
20894	MP-MI 212 C		
20896	MP-MI 219.1 C		
20898	MP-MI 244.5 C		

Hilti heavy-duty pipe rings MP-MI M10/M12 and Hilti heavy-duty pipe rings MP-MI M16	Annex C2
Service loads and deformations at ambient temperature	

Table D1: Resistance of $F_{Rk,t}$ of heavy-duty pipe rings MP-MI 3/8" G - MP-MI 2" G at elevated temperatures after t = 30, 60, 90 and 120 minutes

Item number	Designation	Parameter of regression curve $F_{Rk}(t) = c_3 (c_1 + c_2 / t)$	$F_{Rk,t}$ [N]			
			$F_{Rk,30}$	$F_{Rk,60}$	$F_{Rk,90}$	$F_{Rk,120}$
20843	MP-MI 3/8" G	c_1 = 375.852 c_2 = 24736.410 c_3 = 0.60663 18 min ≤ t ≤ 143 min	728	478	395	353
20845	MP-MI 1/2" G					
20847	MP-MI 3/4" G					
20849	MP-MI 1" G					
20851	MP-MI 1 1/4" G					
20853	MP-MI 1 1/2" G					
20855	MP-MI 54/57 G					
20857	MP-MI 2" G					

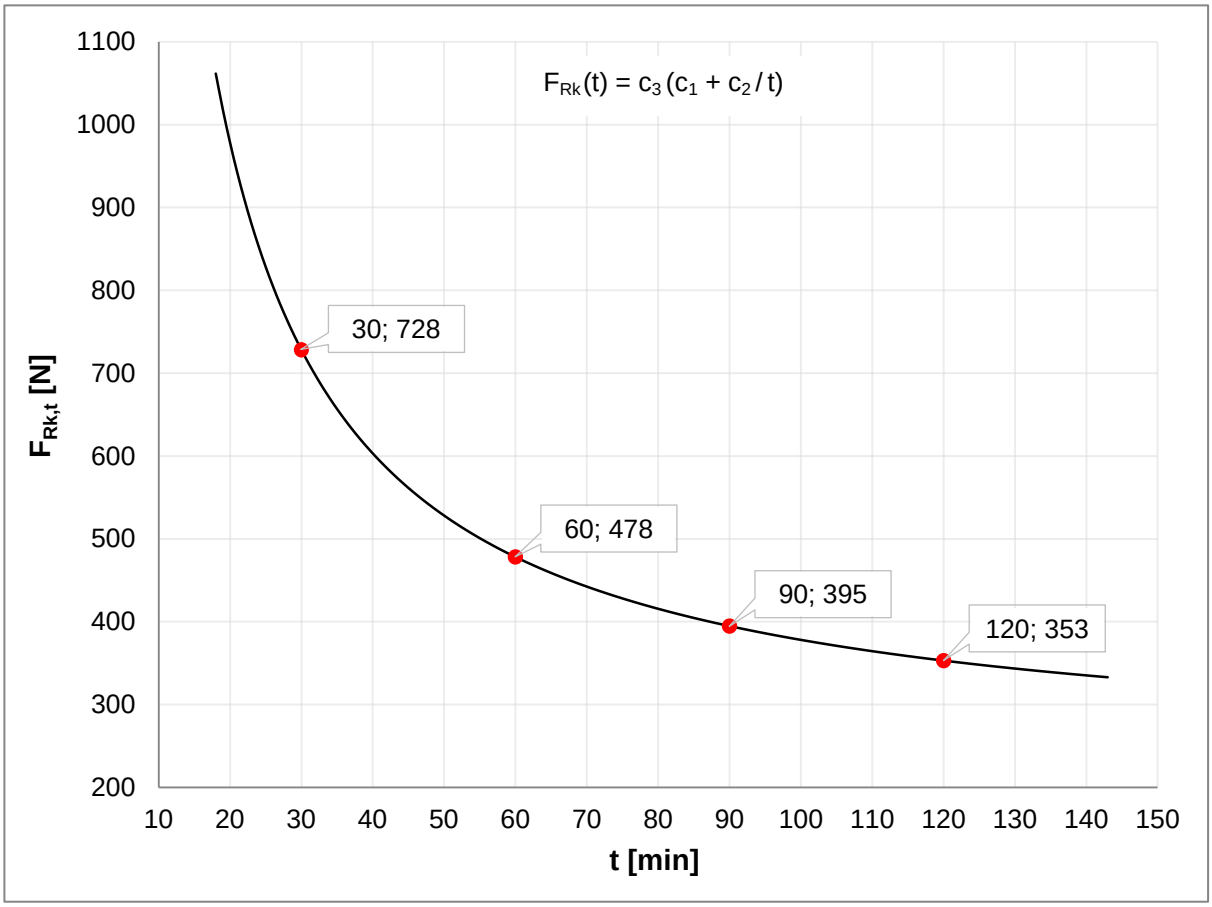


Figure D1: Regression curve according to Table D1

Hilti heavy-duty pipe rings MP-MI M10/M12 and Hilti heavy-duty pipe rings MP-MI M16	Annex D1
Resistance at elevated temperatures of heavy-duty pipe rings MP-MI 3/8" G - MP-MI 2" G	

Table D2: Load displacement function and deformations of heavy-duty pipe rings MP-MI 3/8" G - MP-MI 2" G under elevated temperatures

Item number	Designation	Parameter of regression curve	$F_{Rk,30}(\delta)$ [N]				$\delta_{max,t}$ [mm]		
		$F_{Rk,30}(\delta) = a_3 (a_1 * \delta^{a_2})$	$F_{Rk,30}(20)$	$F_{Rk,30}(30)$	$F_{Rk,30}(40)$	$F_{Rk,30}(50)$	$\delta_{max,60}$	$\delta_{max,90}$	$\delta_{max,120}$
20843	MP-MI 3/8" G	a_1 = 7.0564 a_2 = 1.2896 a_3 = 0.65031 14 mm ≤ δ ≤ 61 mm	219	369	534	712	72	72	88
20845	MP-MI 1/2" G								
20847	MP-MI 3/4" G								
20849	MP-MI 1" G								
20851	MP-MI 1 1/4" G								
20853	MP-MI 1 1/2" G								
20855	MP-MI 54/57 G								
20857	MP-MI 2" G								

Symbols and designation

δ	Deformation
$\delta_{max,t}$	Maximum deformation after an exposure time ≤ t minutes to elevated temperatures
$F_{Rk,30}(\delta)$	Load displacement function for an exposure time t = 30 minutes to elevated temperatures

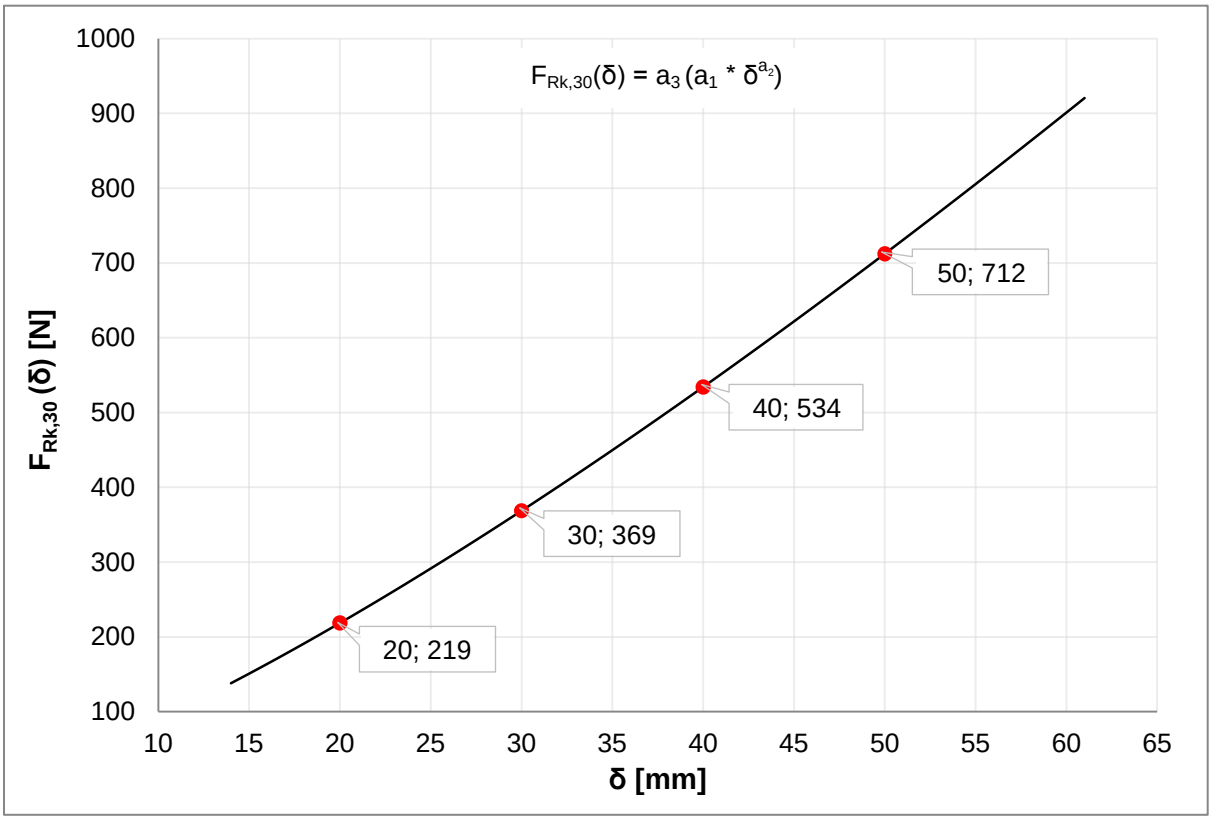


Figure D2: Regression curve according to Table D2

Hilti heavy-duty pipe rings MP-MI M10/M12 and Hilti heavy-duty pipe rings MP-MI M16	Annex D2
Load displacement function and deformations at elevated temperatures of heavy-duty pipe rings MP-MI 3/8" G - MP-MI 2" G	

Table D3: Resistance $F_{Rk,t}$ of heavy-duty pipe rings MP-MI 68/72 G - MP-MI 78/84 G at elevated temperatures after t = 30, 60, 90 and 120 minutes

Item number	Designation	Parameter of regression curve	$F_{Rk,t}$ [N]			
		$F_{Rk}(t) = c_3 (c_1 + c_2 / t)$	$F_{Rk,30}$	$F_{Rk,60}$	$F_{Rk,90}$	$F_{Rk,120}$
20860	MP-MI 68/72 G	c_1 = 343.934 c_2 = 29526.426 c_3 = 0.675613 23 min ≤ t ≤ 142 min	897	565	454	399
20862	MP-MI 2 1/2" G					
20865	MP-MI 78/84 G					

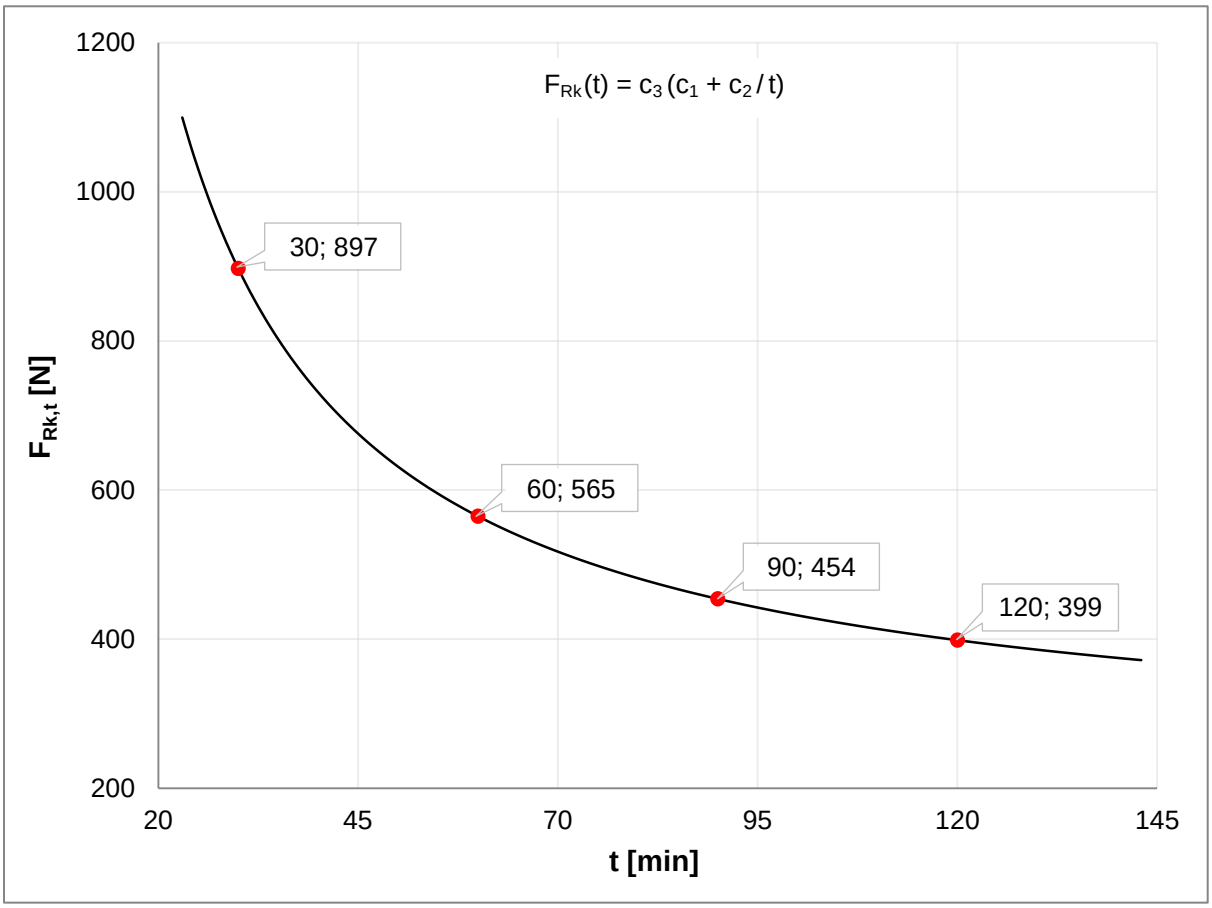


Figure D3: Regression curve according to Table D3

Hilti heavy-duty pipe rings MP-MI M10/M12 and Hilti heavy-duty pipe rings MP-MI M16	Annex D3
Resistance at elevated temperatures of heavy-duty pipe rings MP-MI 68/72 G - MP-MI 78/84 G	

Table D4: Load displacement function and deformations of heavy-duty pipe rings MP-MI 68/72 G - MP-MI 78/84 G under elevated temperatures

Item number	Designation	Parameter of regression curve	$F_{Rk,30}(\delta)$ [N]				$\delta_{max,t}$ [mm]		
		$F_{Rk,30}(\delta) = a_3 (a_1 * \delta^{a_2})$	$F_{Rk,30}(20)$	$F_{Rk,30}(30)$	$F_{Rk,30}(40)$	$F_{Rk,30}(50)$	$\delta_{max,60}$	$\delta_{max,90}$	$\delta_{max,120}$
20860	MP-MI 68/72 G	a_1 = 20.860 a_2 = 0.9443 a_3 = 0.6584 20 mm ≤ δ ≤ 61 mm	232	341	447	552	88	88	88
20862	MP-MI 2 1/2" G								
20865	MP-MI 78/84 G								

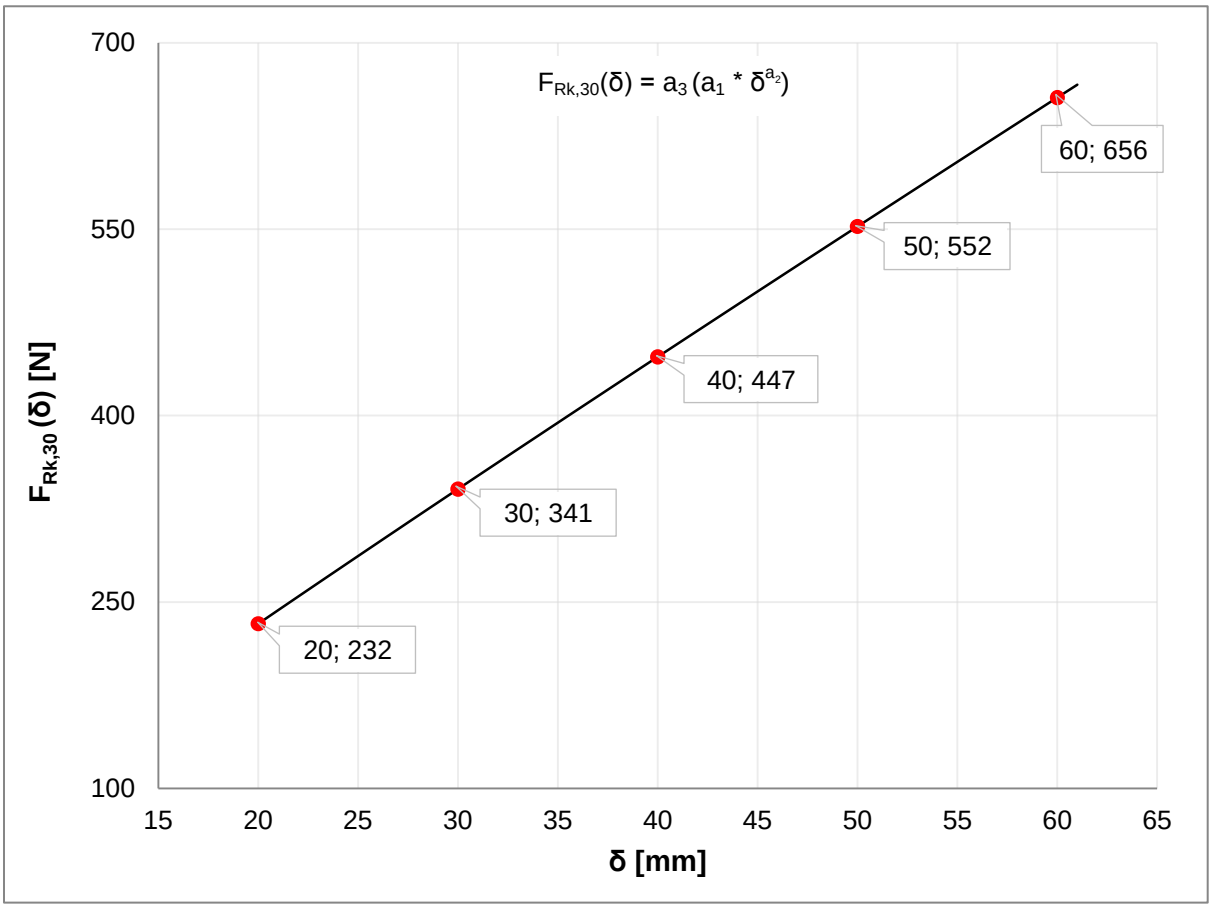


Figure D4: Regression curve according to Table D4

Symbols and designation see Annex D2

Hilti heavy-duty pipe rings MP-MI M10/M12 and Hilti heavy-duty pipe rings MP-MI M16	Annex D4
Load displacement function and deformations at elevated temperatures of heavy-duty pipe rings MP-MI 68/72 G - MP-MI 78/84 G	

Table D5: Resistance $F_{Rk,t}$ of heavy-duty pipe rings MP-MI 3" G at elevated temperatures after t = 30, 60, 90 and 120 minutes

Item number	Designation	Parameter of regression curve $F_{Rk}(t) = c_3 (c_1 + c_2 / t)$	$F_{Rk,t}$ [N]			
			$F_{Rk,30}$	$F_{Rk,60}$	$F_{Rk,90}$	$F_{Rk,120}$
20866	MP-MI 3" G	c_1 = 491.322 c_2 = 16847.386 c_3 = 0.7578 16 min ≤ t ≤ 131 min	798	585	514	479

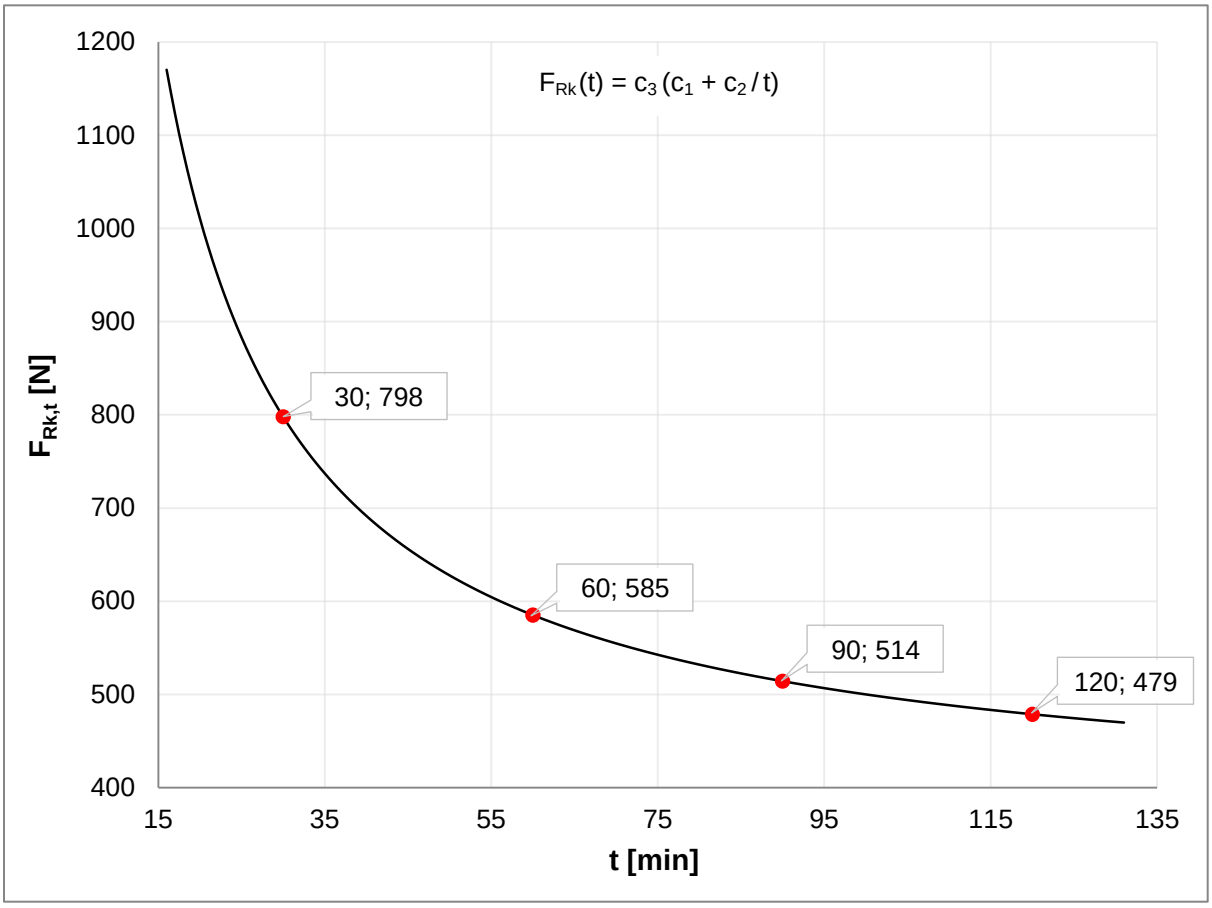


Figure D5: Regression curve according to Table D5

Hilti heavy-duty pipe rings MP-MI M10/M12 and Hilti heavy-duty pipe rings MP-MI M16	Annex D5
Resistance at elevated temperatures of heavy-duty pipe ring MP-MI 3" G	

Table D6: Load displacement function and deformations of heavy-duty pipe rings MP-MI 3" G under elevated temperatures

Item number	Designation	Parameter of regression curve	$F_{Rk,30}(\delta)$ [N]			$\delta_{max,t}$ [mm]		
		$F_{Rk,30}(\delta) = a_3 (a_1 * \delta^{a_2})$	$F_{Rk,30}(20)$	$F_{Rk,30}(30)$	$F_{Rk,30}(40)$	$\delta_{max,60}$	$\delta_{max,90}$	$\delta_{max,120}$
20866	MP-MI 3" G	a_1 = 52.971 a_2 = 0.720 a_3 = 0.685 20 mm ≤ δ ≤ 46 mm	314	420	517	59	59	59

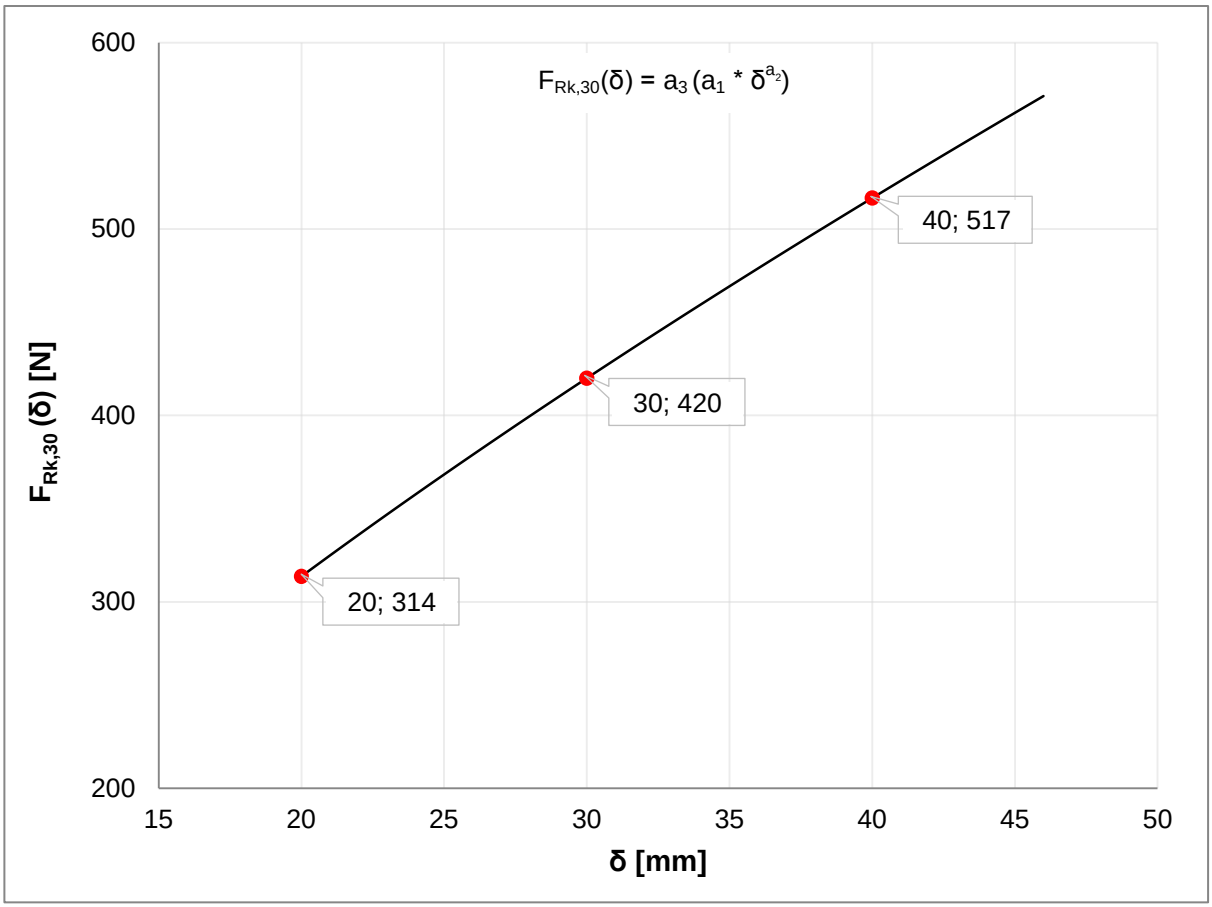


Figure D6: Regression curve according to Table D6

Symbols and designation see Annex D2

Hilti heavy-duty pipe rings MP-MI M10/M12 and Hilti heavy-duty pipe rings MP-MI M16	Annex D6
Load displacement function and deformations at elevated temperatures of heavy-duty pipe ring MP-MI 3" G	

Table D7: Resistance $F_{Rk,t}$ of heavy-duty pipe rings MP-MI 101.6 G - MP-MI 6" G at elevated temperatures after t = 30, 60, 90 and 120 minutes

Item number	Designation	Parameter of regression curve $F_{Rk}(t) = c_3 (c_1 + c_2 / t)$	$F_{Rk,t}$ [N]			
			$F_{Rk,30}$	$F_{Rk,60}$	$F_{Rk,90}$	$F_{Rk,120}$
20869	MP-MI 101.6 G	c_1 = 489.067 c_2 = 31566.912 c_3 = 0.8356 23 min ≤ t ≤ 147 min	1288	848	702	628
20871	MP-MI 4" G					
20874	MP-MI 117 G					
20876	MP-MI 125 G					
20879	MP-MI 133 G					
20882	MP-MI 5" G					
20885	MP-MI 159 G					
20887	MP-MI 6" G					

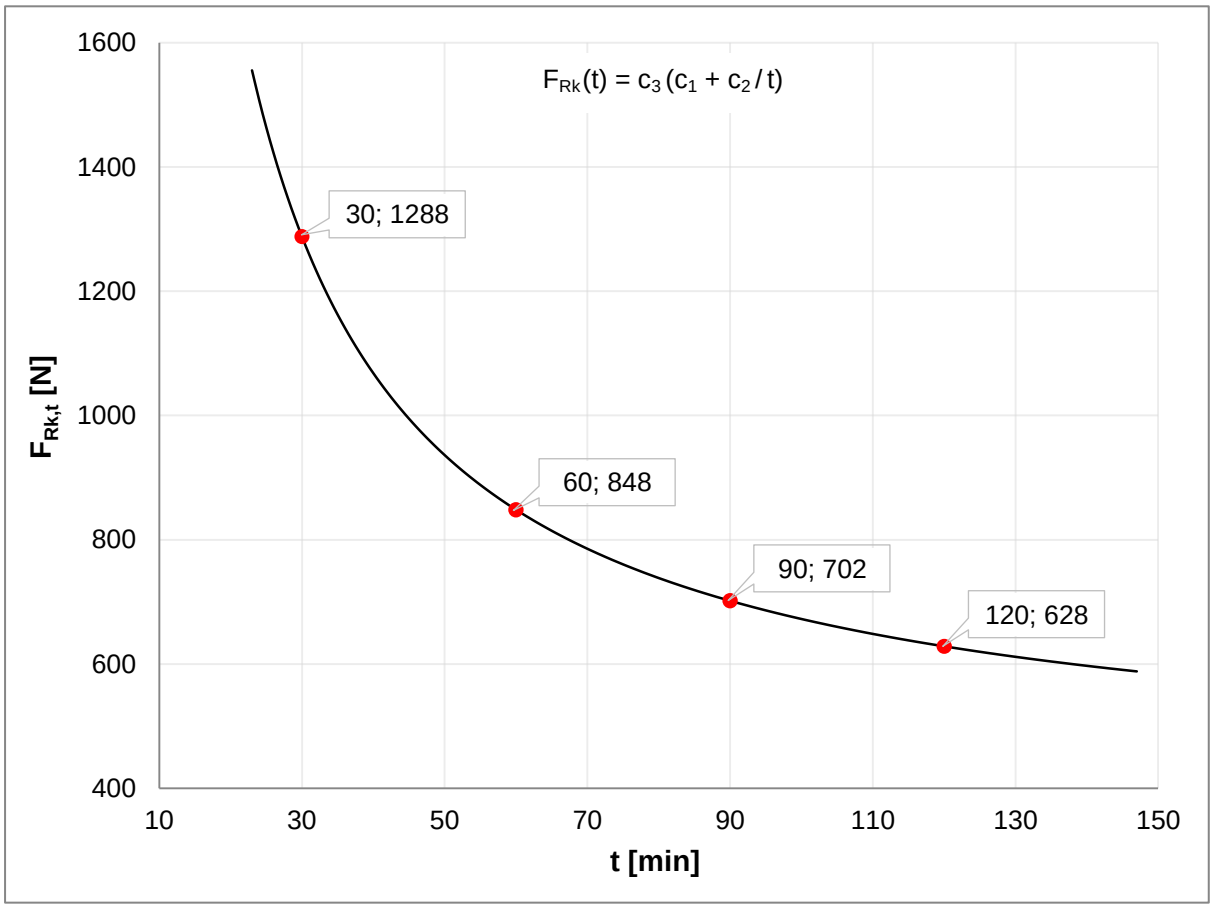


Figure D7: Regression curve according to Table D7

Hilti heavy-duty pipe rings MP-MI M10/M12 and Hilti heavy-duty pipe rings MP-MI M16	Annex D7
Resistance at elevated temperatures of heavy-duty pipe rings MP-MI 101.6 G - MP-MI 6" G	

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Table D8: Load displacement function and deformations of heavy-duty pipe rings MP-MI 101.6 G - MP-MI 6" G under elevated temperatures

Item number	Designation	Parameter of regression curve	$F_{Rk,30}(\delta)$ [N]				$\delta_{max,t}$ [mm]		
		$F_{Rk,30}(\delta) = a_3 (a_1 * \delta^{a_2})$	$F_{Rk,30}(30)$	$F_{Rk,30}(40)$	$F_{Rk,30}(50)$	$F_{Rk,30}(60)$	$\delta_{max,60}$	$\delta_{max,90}$	$\delta_{max,120}$
20869	MP-MI 101.6 G	a_1 = 6.060 a_2 = 1.2842 a_3 = 0.7250 30 mm ≤ δ ≤ 64 mm	347	501	668	844	94	109	111
20871	MP-MI 4" G								
20874	MP-MI 117 G								
20876	MP-MI 125 G								
20879	MP-MI 133 G								
20882	MP-MI 5" G								
20885	MP-MI 159 G								
20887	MP-MI 6" G								

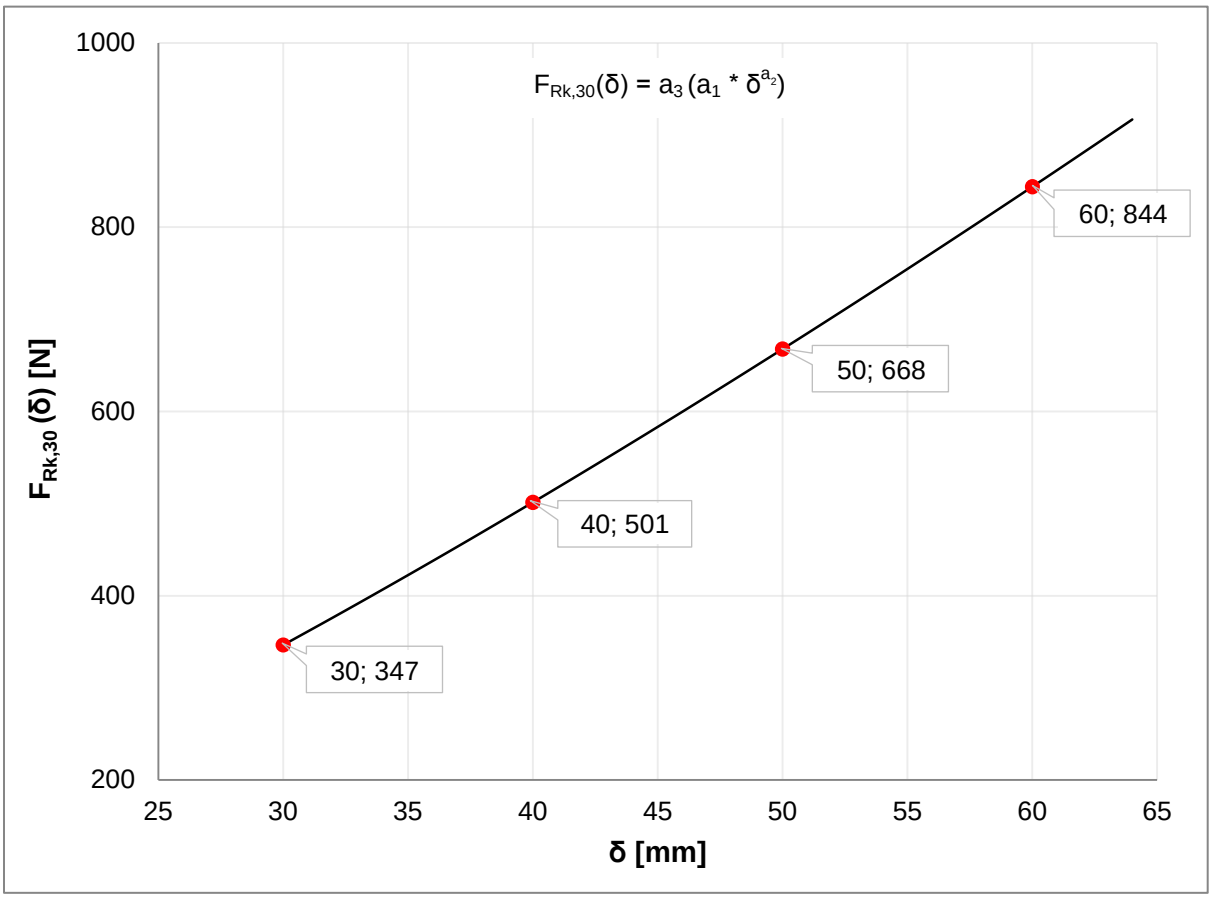


Figure D8: Regression curve according to Table D8

Symbols and designation see Annex D2

Hilti heavy-duty pipe rings MP-MI M10/M12 and Hilti heavy-duty pipe rings MP-MI M16	Annex D8
Load displacement function and deformations at elevated temperatures of heavy-duty pipe rings MP-MI 101.6 G - MP-MI 6" G	

Table D9: Resistance $F_{Rk,t}$ of heavy-duty pipe rings MP-MI 4" C - MP-MI 6" C at elevated temperatures after t = 30, 60, 90 and 120 minutes

Item number	Designation	Parameter of regression curve $F_{Rk}(t) = c_3 (c_1 + c_2 / t)$	$F_{Rk,t}$ [N]			
			$F_{Rk,30}$	$F_{Rk,60}$	$F_{Rk,90}$	$F_{Rk,120}$
20872	MP-MI 4" C	c_1 = 503.452 c_2 = 29045.631 c_3 = 0.65549 23 min ≤ t ≤ 131 min	965	647	542	489
20880	MP-MI 133 C					
229087	MP-MI 159 C					
20888	MP-MI 6" C					

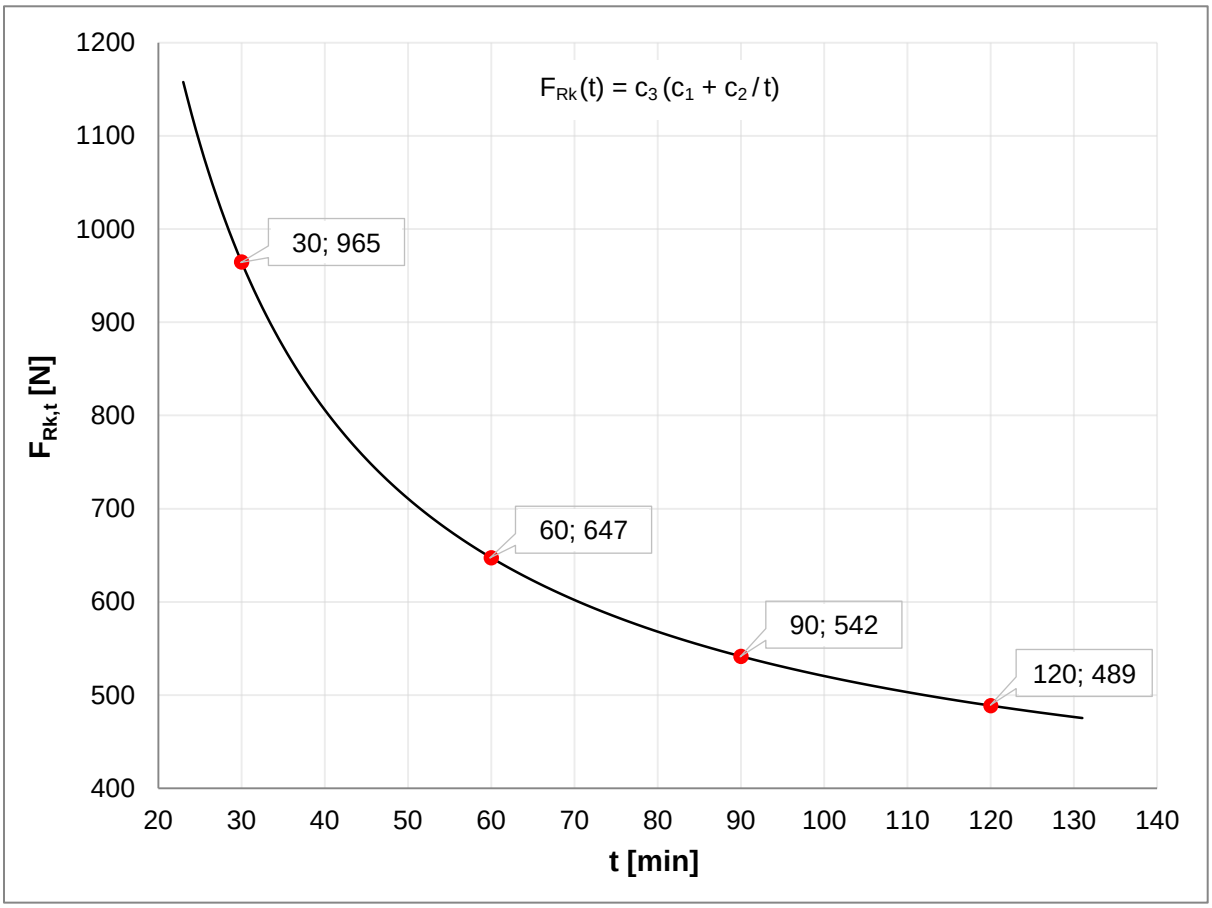


Figure D9: Regression curve according to Table D9

Hilti heavy-duty pipe rings MP-MI M10/M12 and Hilti heavy-duty pipe rings MP-MI M16	Annex D9
Resistance at elevated temperatures of heavy-duty pipe rings MP-MI 4" C - MP-MI 6" C	

Table D10: Load displacement function and deformations of heavy-duty pipe rings MP-MI 4" C - MP-MI 6" C under elevated temperatures

Item number	Designation	Parameter of regression curve	$F_{Rk,30}(\delta)$ [N]				$\delta_{max,t}$ [mm]		
		$F_{Rk,30}(\delta) = a_3 (a_1 * \delta^{a_2})$	$F_{Rk,30}(30)$	$F_{Rk,30}(40)$	$F_{Rk,30}(50)$	$F_{Rk,30}(60)$	$\delta_{max,60}$	$\delta_{max,90}$	$\delta_{max,120}$
20872	MP-MI 4" C	a_1 = 142.265 a_2 = 0.4671 a_3 = 0.5502 22 mm ≤ δ ≤ 62 mm	383	438	487	530	84	92	92
20880	MP-MI 133 C								
229087	MP-MI 159 C								
20888	MP-MI 6" C								

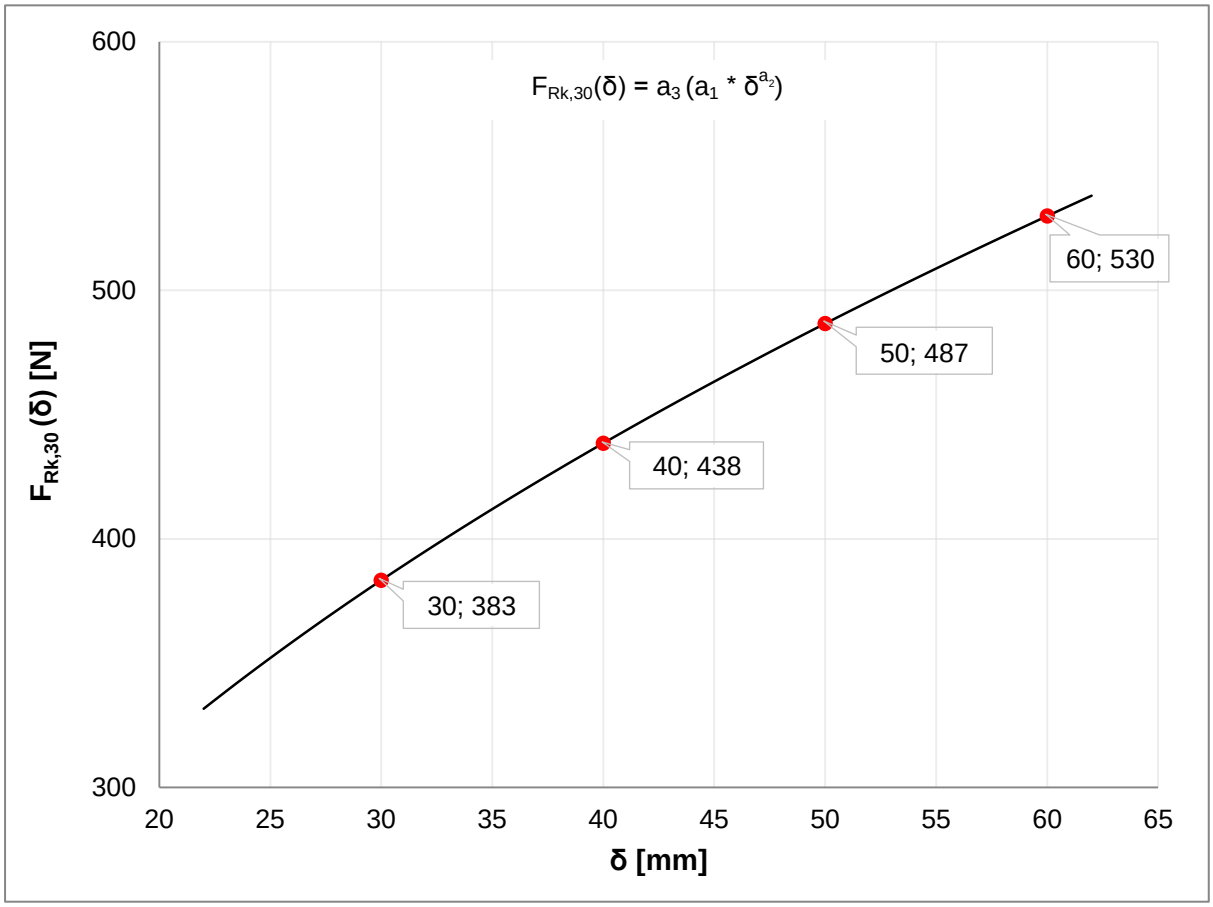


Figure D10: Regression curve according to Table D10

Symbols and designation see Annex D2

Hilti heavy-duty pipe rings MP-MI M10/M12 and Hilti heavy-duty pipe rings MP-MI M16	Annex D10
Load displacement function and deformations at elevated temperatures of heavy-duty pipe rings MP-MI 4" C - MP-MI 6" C	

Table D11: Resistance $F_{Rk,t}$ of heavy-duty pipe rings MP-MI 177.8 C - MP-MI 244.5 C at elevated temperatures after t = 30, 60, 90 and 120 minutes

Item number	Designation	Parameter of regression curve	$F_{Rk,t}$ [N]			
		$F_{Rk}(t) = c_3 (c_1 + c_2 / t)$	$F_{Rk,30}$	$F_{Rk,60}$	$F_{Rk,90}$	$F_{Rk,120}$
20890	MP-MI 177.8 C	c_1 = 457.914 c_2 = 58689.667 c_3 = 0.7436 26 min ≤ t ≤ 150 min	1795	1068	825	704
20892	MP-MI 193.7 C					
20894	MP-MI 212 C					
20896	MP-MI 219.1 C					
20898	MP-MI 244.5 C					

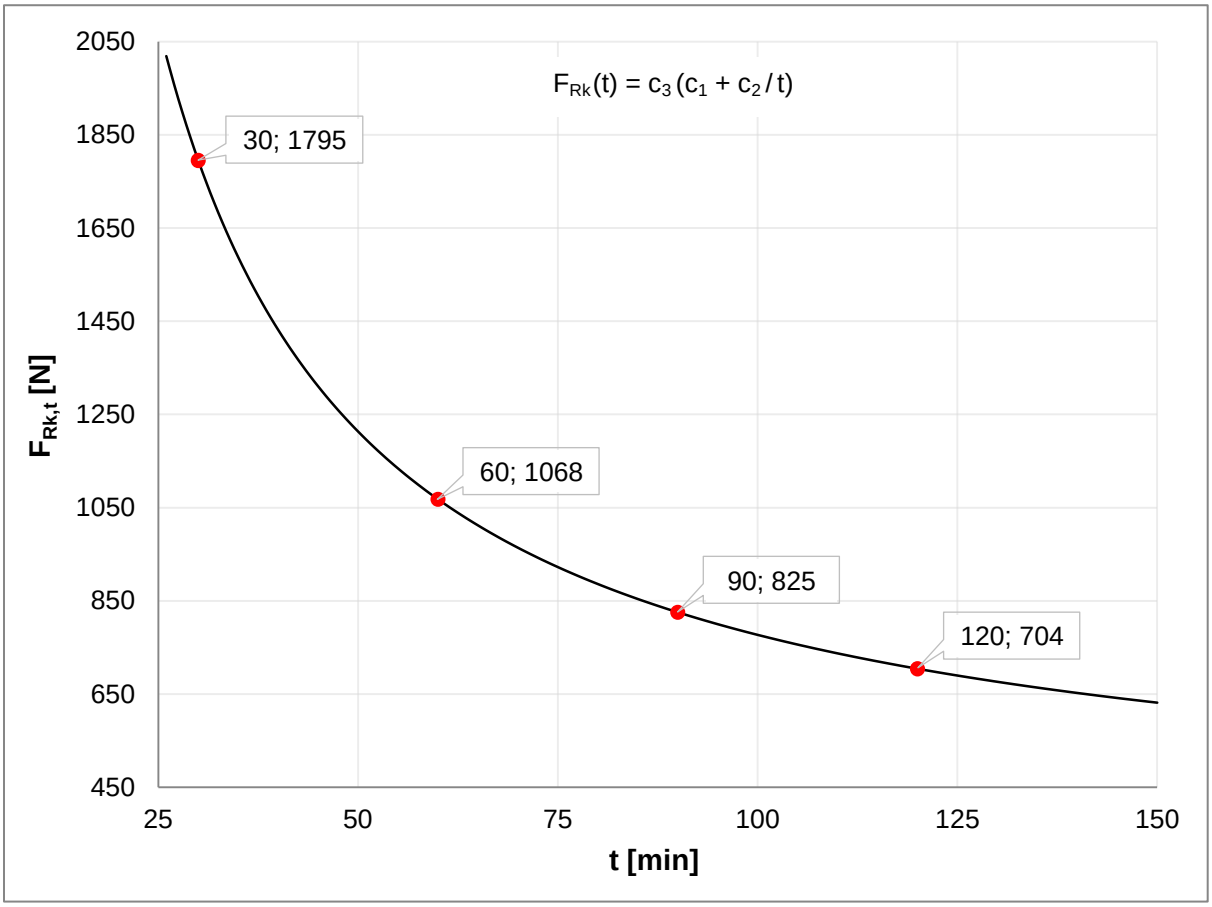


Figure D11: Regression curve according to Table D11

Table D12: Load displacement function and deformations of heavy-duty pipe rings MP-MI 177.8 C - MP-MI 244.5 C under elevated temperatures

Item number	Designation	Parameter of regression curve	$F_{Rk,30}(\delta)$ [N]				$\delta_{max,t}$ [mm]		
		$F_{Rk,30}(\delta) = a_3 (a_1 * \delta^{a_2})$	$F_{Rk,30}(20)$	$F_{Rk,30}(30)$	$F_{Rk,30}(40)$	$F_{Rk,30}(50)$	$\delta_{max,60}$	$\delta_{max,90}$	$\delta_{max,120}$
20890	MP-MI 177.8 C	a_1 = 18.197 a_2 = 1.0675 a_3 = 0.70999 16 mm ≤ δ ≤ 67 mm	316	488	663	841	118	118	118
20892	MP-MI 193.7 C								
20894	MP-MI 212 C								
20896	MP-MI 219.1 C								
20898	MP-MI 244.5 C								

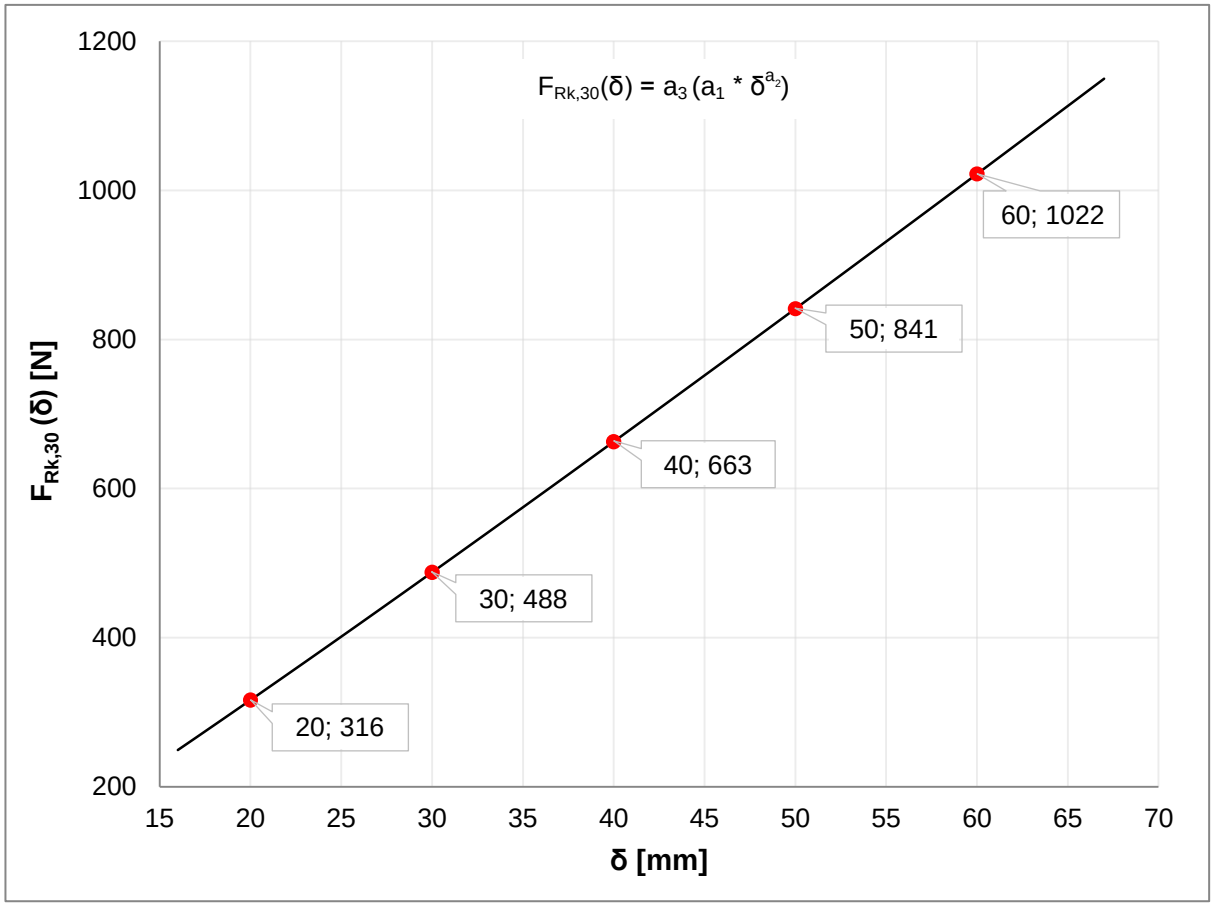
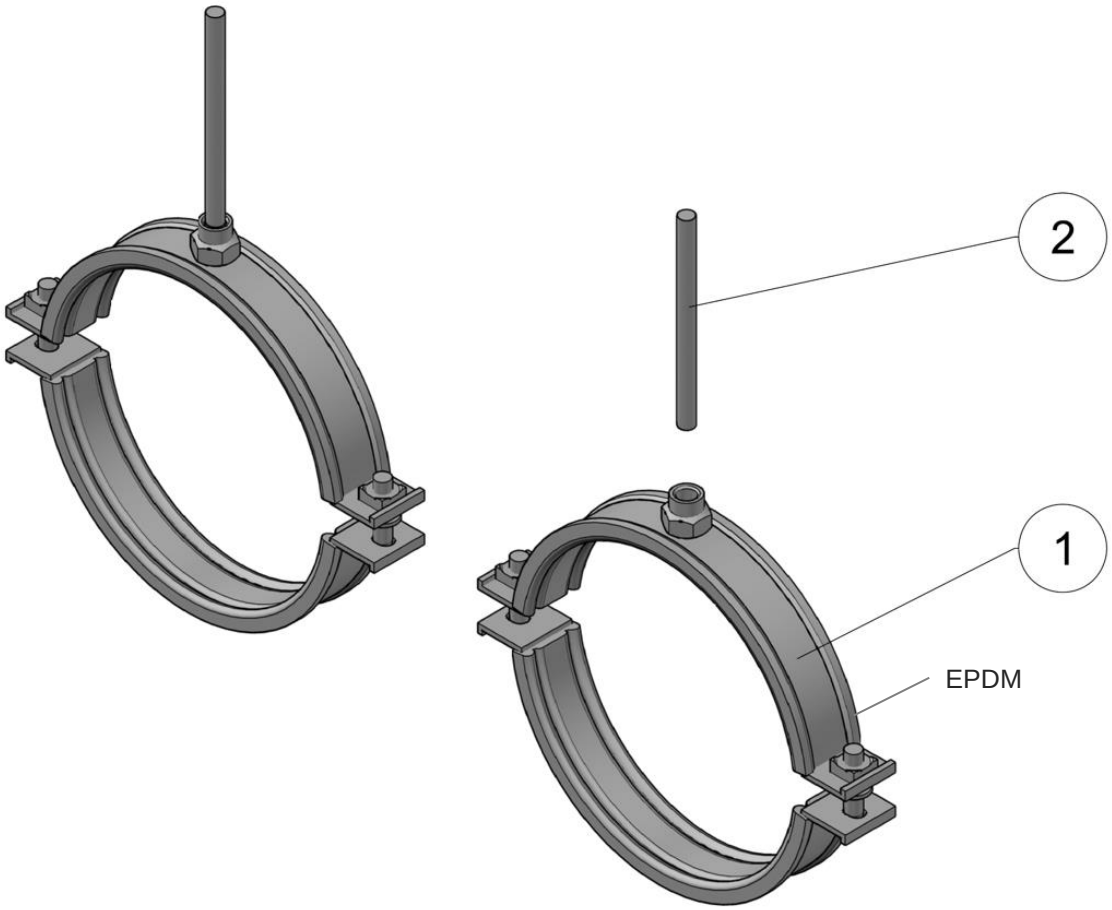


Figure D12: Regression curve according to Table D12

Symbols and designation see Annex D2

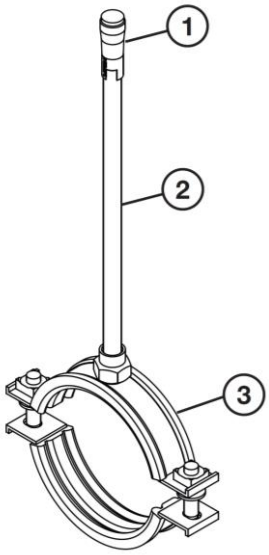
Hilti heavy-duty pipe rings MP-MI M10/M12 and Hilti heavy-duty pipe rings MP-MI M16	Annex D12
Load displacement function and deformations at elevated temperatures of heavy-duty pipe rings MP-MI 177.8 C - MP-MI 244.5 C	



Legend

1 Heavy-duty pipe rings MP-MI
2 Threaded rods M10, M12 or M16 (not an integral part of this ETA)

Hilti heavy-duty pipe rings MP-MI M10/M12 and Hilti heavy-duty pipe rings MP-MI M16	Annex E1 (informative)
Installation of heavy-duty pipe rings MP-MI with threaded rod Exemplary representation of closing mechanism: M8 + nut	



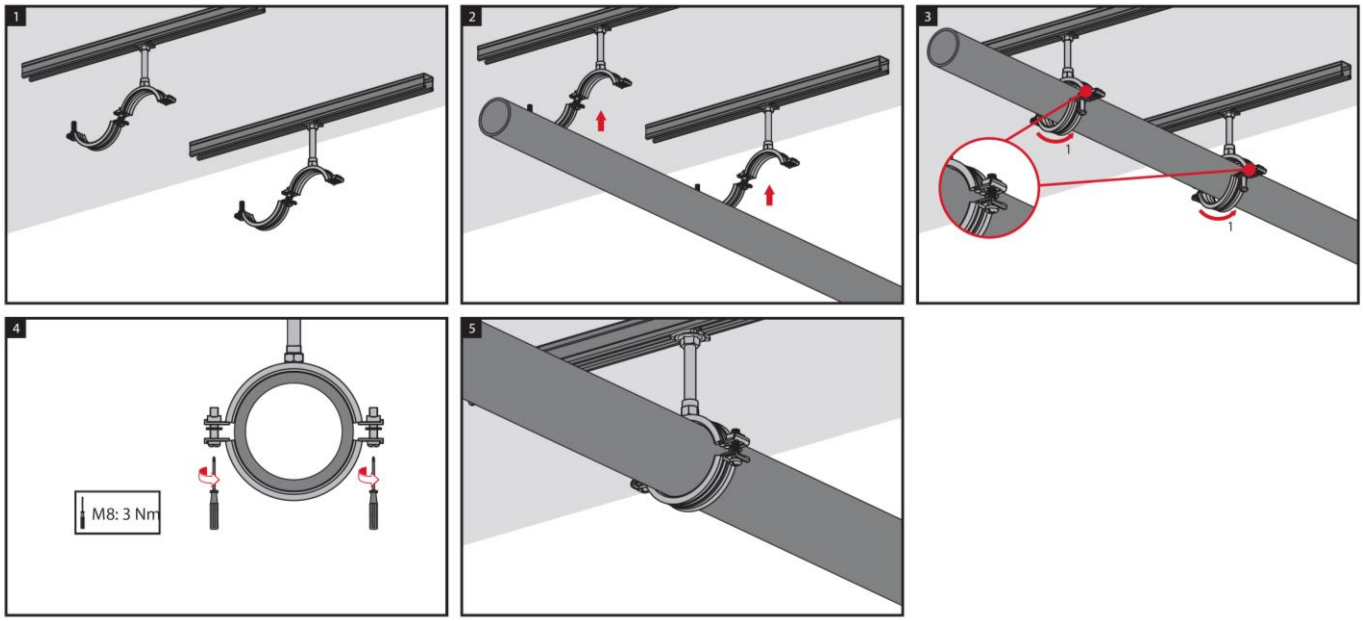
Bill of material / Stückliste

Part of typical/ Applikationselement		Ref.	Opt.	Item no. / Artikel Nr.	Description / Bezeichnung
Structure / Aufbau	Fixation / Befestigung	1	A	376967	HKD M10x40 drop-in anchor
		1	B	378544	HKD M12x50 drop-in anchor
		1	C	382941	HKD M16x65 drop-in anchor
		2	A	339795	AM10x1000 4.8 threaded rod*
		2	B	339797	AM12x1000 4.8 threaded rod*
		2	C	216422	AM16x1000 4.8 threaded rod*
Pipe Ring / Rohrschelle	M10/ M12/ M16	3		20843 - 20898	MP-MI (from 3/8" to 244.5C", with M10, 12, 16)

*** Threaded rod available in 1,2 & 3 meters / Gewindestange erhältlich in 1,2 & 3 Meter**

Assembly Instructions / Montagehinweise

3



Hilti heavy-duty pipe rings MP-MI M10/M12 and Hilti heavy-duty pipe rings MP-MI M16	Annex E2 (informative)
General assembly instructions	