Haslinger
HMR Jacob

HMR 750

Tension Rod System
Compression Strut System

A strong connection that lasts.

CE
ETA-18/0104

www.hmr-jacob.de

Data Matrix code
Is used for individual bar marking and quality assurance

Sealant injection holes
Prevents crevice corrosion

Special corrosion protection on bar thread area
Class C3 high corrosion compliant

Easy control of thread engagement
For safer installation

Blind hole
Improves corrosion protection

Very high load capacities

Innovation
in a tension rod system

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***Haslinger** Group* 16

ISO 9001:2015
Quality Management System Certificate by DEKRA
EN 1090-2:2018 EXC4
Welding Certificate for Execution of structural steel components by SLV Munich
OHRIS Certificate No. 09-00553
Management System Certificate for Occupational Health and Plant Safety
by the Bavarian State Ministry of Family, Labour and Social Affairs

Further Certifications:
In-house UT2-controller for ultrasonic inspections,
MT2-controller for magnetic participle testings,
VT2-controller for visual examinations and
PT2-controller for dye penetrant testings
to guarantee quality assurance of all manufactured
and deliverable components

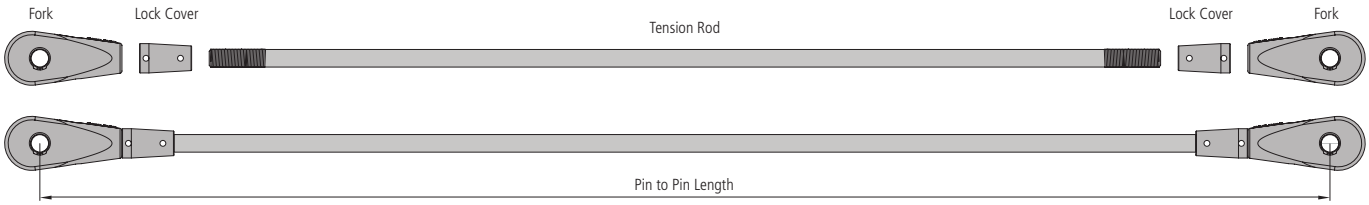
CE
ETA-18/0104

Version 07-2021

Bild Metalloberfläche: @ Wolfgang Kruck - fotolia.com

HMR 750 Tension Rod System

The HMR 750 tension rod system offers modern architecture, an innovative and elegant design, improved corrosion protection, higher capacity loads and improved safety during installation.



Mechanical Properties

Table 1

Thread size	Unit	M12	M16	M20	M24	M30	M36	M42	M48	M56	M64	M76	M85	M90	M100
Minimum Yield Stress	N/mm^2	540						540							
Minimum Breaking Stress	N/mm^2	720						750							
Min. Elongation	%	17						17							

Capacity Loads

Table 2

Thread size	Unit	M12	M16	M20	M24	M30	M36	M42	M48	M56	M64	M76	M85	M90	M100
Bar diameter	mm	12	15	19	23	28	34	40	45	54	62	74	83	88	100
Capacity Load	kN	43	81	126	182	290	423	605	795	1157	1539	2213	2799	3154	3928
Bar weight	kg/m	0.89	1.39	2.23	3.26	4.83	7.13	9.87	12.49	17.98	23.70	33.76	42.47	47.75	61.65
Maximum bar length	mm	7,850	8,850	11,800											

Capacity loads of tension rods as per DIN EN 1993-1-8, Table 3.4 and DIN EN 1993-1-1 section 6.2.3 with partial safety factors $\gamma_{M0} = 1.0$ and $\gamma_{M2} = 1.25$

Longer lengths can be achieved by using coupler or turnbuckle joints. All system components are designed to take the full capacity of the tension rod.

Length Adjustments / Minimum thread engagement

Table 3

Thread size	Unit	M12	M16	M20	M24	M30	M36	M42	M48	M56	M64	M76	M85	M90	M100
System with two fork connectors	mm	± 12	± 16	± 20	± 24	± 30	± 36	± 42	± 48	± 56	± 61	± 71	± 78	± 80	± 85
Turnbuckle	mm	± 20	± 25	± 25	± 30	± 30	± 40	± 40	± 40	± 50	± 50	± 50	± 50	± 60	± 60
Cross Coupler	mm	±11	±15	±16	±19	±22	±27	±32	±35	±42	±48	±57	±62	±67	±74

The pin to pin length is the distance between the centre of each pin. Once installed the tendons can be adjusted by rotating the rod.

Further adjustment can be achieved by using a turnbuckle.

Corrosion Protection

HMR tension rod systems are available in the following surface finishes:

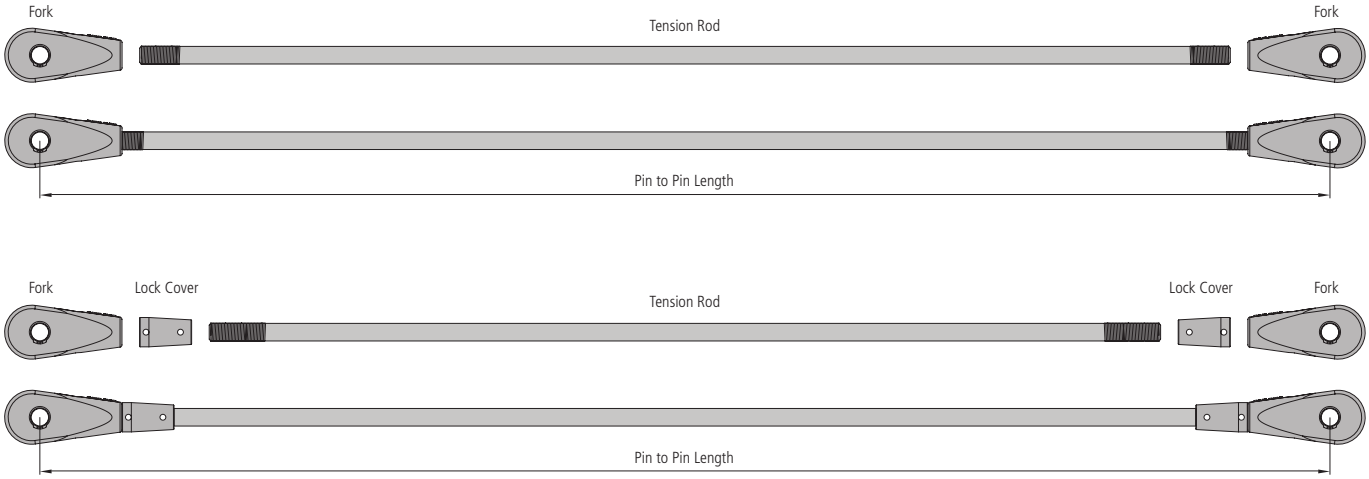
- **Carbon steel**
- **Hot dip galvanised**
- **Powder coated**
- **Painted**
- **Duplex coated**

** All fittings are supplied in a hot dip galvanised finish to EN 1461.*

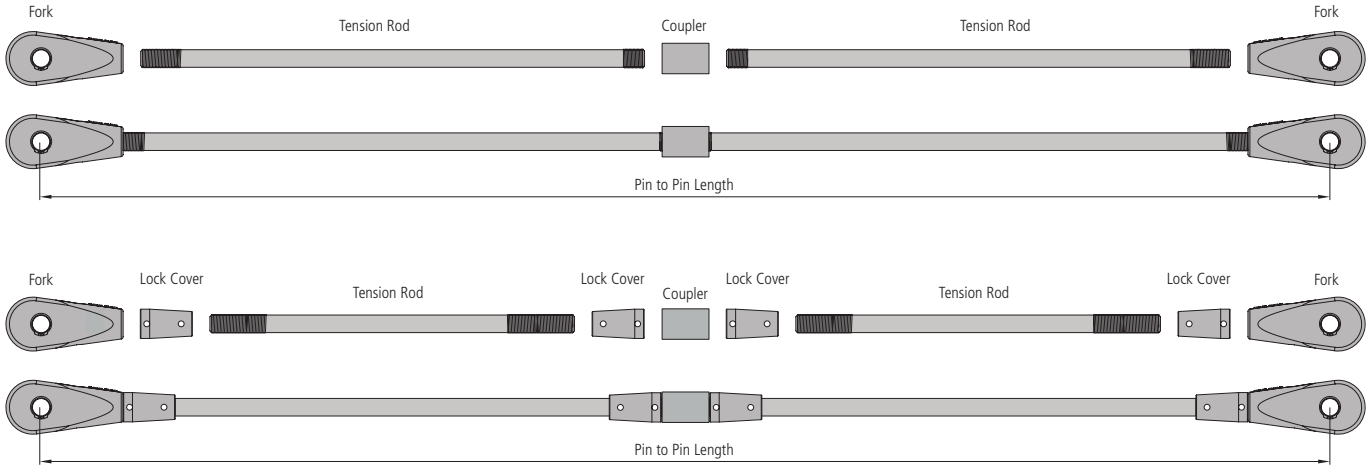
System Overview

Whether it be truss systems, back-braced façades, suspensions or cross bracings' the diversity of applications of HMR750 tension rods provide a high-quality solution for virtually any application.

Basis system

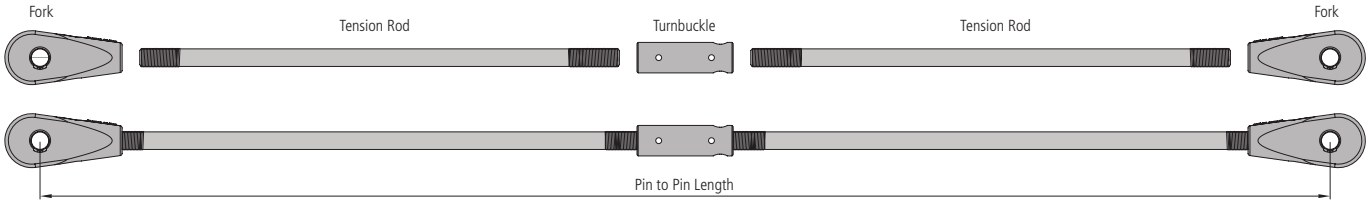


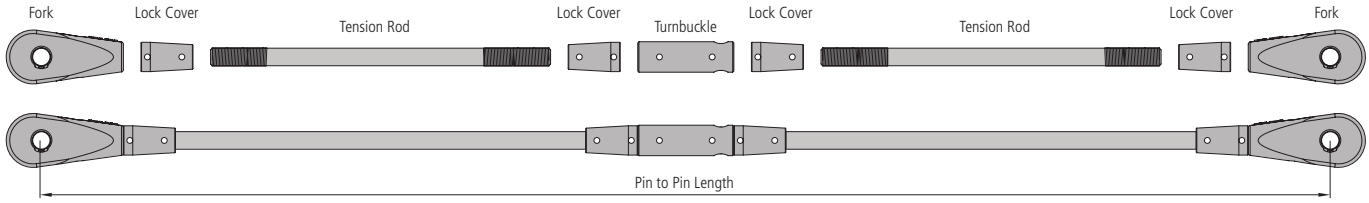
System with coupler

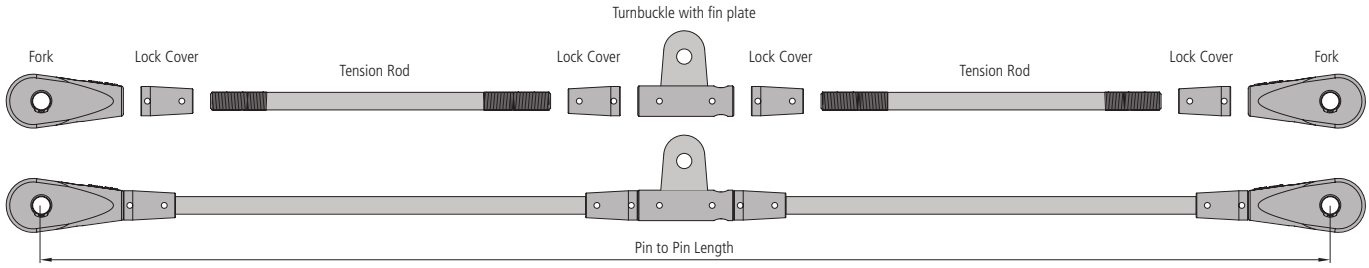


System Overview

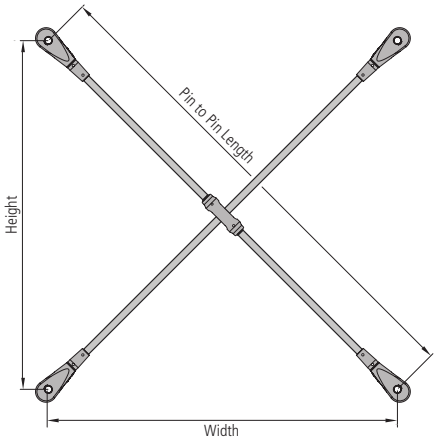
System with turnbuckle



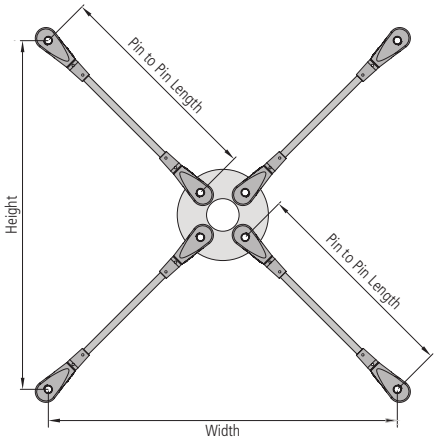




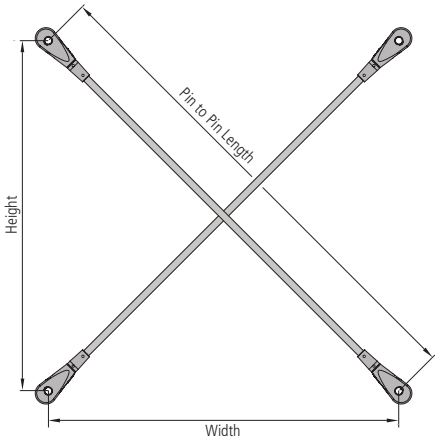
Cross Bracings



With Cross Coupler



With Connection Disc



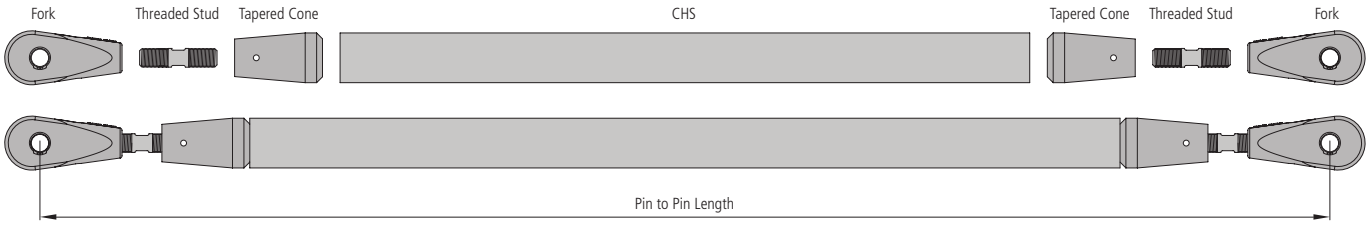
Basic Cross Bracing

HMR Compression Strut System

In addition to our innovative product range, HMR have introduced an architectural compression strut system which can be perfectly integrated into any structural application.

Compression struts consist of standard fork connectors plus a central hollow section with a welded tapered cone at each end.

Threaded studs are used to connect the forks with the tapered hollow section. The system is designed to enable transmission of both tensile and compressive forces.



CHS sizes

Table 4

Fork size	Unit	M 12	M 16	M 20	M 24	M 30	M 36	M 42	M 48	M 56	M 64	M 76	M 85	M 90	M 100
Recommended CHS Ø	mm	33.7	42.4	60.3	76.1	88.9	114.3	139.7	168.3	193.7	219.1	244.5	323.9	323.9	323.9
Wall thickness	mm	4	5	5	5	5	6.3	10	10	10	12.5	16	16	16	16

Notes: Compressive load is calculated according to EN 1993. In all cases a structural calculation should be carried out by the contractor.

Maximum Capacities (kN)

Table 5

Pin-to-pin length (m)	M 12	M 16	M 20	M 24	M 30	M 36	M 42	M 48	M 56	M 64	M 76	M 85	M 90	M 100
1 (max. compressive force)	16	62	100	149	241	360	520	691	995	1334	1934	2427	2753	3408
2	16	37	100	149	241	360	520	691	995	1334	1934	2427	2753	3408
3	9	17	62	125	194	360	520	691	995	1334	1934	2427	2753	3408
4	–	10	36	74	119	297	520	691	995	1334	1934	2427	2753	3408
5	–	6	24	49	79	203	520	691	995	1334	1934	2427	2753	3408
6	–	–	17	34	56	145	388	666	973	1334	1934	2427	2753	3408
7	–	–	12	26	41	109	293	512	765	1296	1934	2427	2753	3408
8	–	–	–	20	32	85	229	403	610	1049	1748	2427	2753	3408
9	–	–	–	16	26	67	183	324	494	857	1445	2427	2753	3029
10	–	–	–	13	21	55	150	266	407	711	1206	2427	2630	2630
11	–	–	–	11	17	45	125	222	341	597	1017	2278	2278	2454
12	–	–	–	–	15	39	105	188	290	508	868	1978	1978	1978

Notes: Compressive load is calculated according to EN 1993. In all cases a structural calculation should be carried out by the contractor.

Length adjustments

Table 6

Unit	M12	M16	M20	M24	M30	M36	M42	M48	M56	M64	M76	M85	M90	M100
System with two fork connectors mm	± 12	± 16	± 20	± 24	± 30	± 36	± 42	± 48	± 56	± 64	± 76	± 85	± 90	± 100

The pin to pin length is the distance between the centres of the pins.

The exact length can be set by rotating the spanner flat on the threaded stud.

Corrosion Protection

HMR Compression struts can be supplied in the following surface finishes:

- **Carbon steel***
- **Galvanised**
- **Powder coated**
- **Painted**
- **Duplex coated**

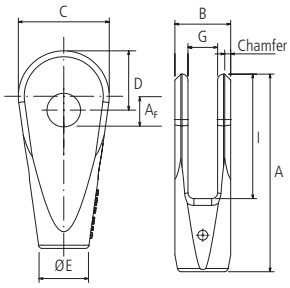
** Fork and pin are supplied in a hot dip galvanised finish to EN 1461. Threaded studs are supplied in a galvanised coating.*

System Components

The slim and elegant design of our system components guarantees a smooth transition to the tension rod. This allows a perfect fit into any form of architectural concept such as steel, timber and glass façade constructions.

Fork

Table 7

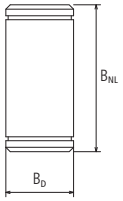


Thread size	M 12	M 16	M 20	M 24	M 30	M 36	M 42	M 48	M 56	M 64	M 76	M 85	M 90	M 100
A_F (mm)	13	17	23	27	33	39	45	51	60	68	80	93	98	113
Thread pitch	1.75	2	2.5	3	3.5	4	4.5	5	4	4	4	4	4	4
A (mm)	77	100	122	144	181	210	246	279	334	378	444	509	534	611
B (mm)	22.0	28.2	36.8	44.0	50.4	65.0	76.6	89.2	99.8	119.6	150.0	155.4	174.2	179.2
C (mm)	35	46	55	66	83	97	112	127	151	174	207	243	255	298
D (mm)	23	30	36	44	55	64	72	83	100	115	136	153	163	188
E (mm)	19	25	29	35	44	52	60	69	80	91	108	121	129	143
G (mm)	12	15	18	23	25	33	38	43	48	59	74	74	84	89
I (mm)	48	63	77	91	116	133	157	178	217	245	287	334	349	406
M_{EL} Set-up point (mm)	18	24	30	36	45	54	63	72	84	94.5	111.5	124	130	142.5
A_F ⇒ Pin hole diameter (± 0,50 mm)														

Notes: If spades are required, please contact HMR Jacob.

Pin with circlip (standard)

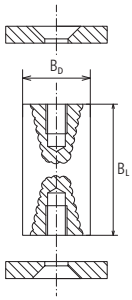
Table 8



Thread size	M 12	M 16	M 20	M 24	M 30	M 36	M 42	M 48	M 56	M 64	M 76	M 85	M 90	M 100
B_D (mm)	12.0	16.0	21.0	25.0	31.0	37.0	43.0	49.0	58.0	66.0	78.0	91.0	95.0	110.0
B_{NL} (mm)	31.6	38.8	49.0	57.2	67.0	82.2	96.8	112.0	122.6	145.4	175.8	183.2	203.0	211.2
B_D ⇒ Pin diameter B_{NL} ⇒ Pin length														

Pin with washer (on request)

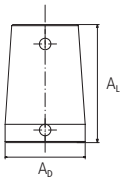
Table 9



Thread size	M 12	M 16	M 20	M 24	M 30	M 36	M 42	M 48	M 56	M 64	M 76	M 85	M 90	M 100
B_D (mm)	12.0	16.0	21.0	25.0	31.0	37.0	43.0	49.0	58.0	66.0	78.0	91.0	95.0	110.0
B_L (mm)	25	31	40	47	53	68	81	93	104	126	156	161	181	186
B_D ⇒ Diameter pin body B_L ⇒ Length														

Lock cover

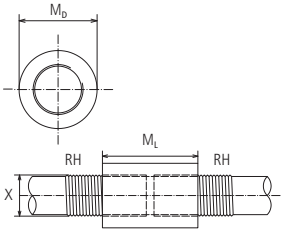
Table 10



Thread size	M 12	M 16	M 20	M 24	M 30	M 36	M 42	M 48	M 56	M 64	M 76	M 85	M 90	M 100
A_D (mm)	19	25	29	35	44	52	60	69	80	91	108	121	129	143
A_L (mm)	36.3	44.4	51.0	57.6	67.0	80.4	89.8	99.2	110.4	120.6	135.4	148.0	152.0	161.0
A_D ⇒ Diameter A_L ⇒ Length														

Pedestrian bridge across the laguna at Kluczbork, Poland (Zem Labedy)

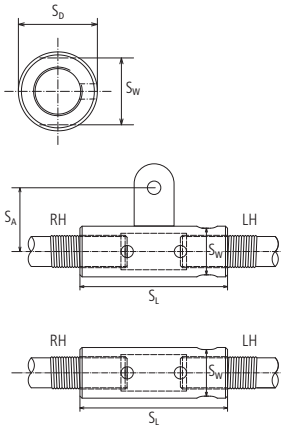
Pedestrian and cyclist bridge across the Innbach river at Alkoven, Austria (Corporation of Alkoven)



Coupler

Table 11

Thread size	M 12	M 16	M 20	M 24	M 30	M 36	M 42	M 48	M 56	M 64	M 76	M 85	M 90	M 100
M_D (mm)	20	26	32	38	47	56	66	75	87	99	119	135	143	160
M_L (mm)	32	40	48	56	68	80	92	104	120	136	160	178	188	208
	M_D ⇒ Diameter M_L ⇒ Length													



Turnbuckle (also with fin plate)

Table 12

Thread size	M 12	M 16	M 20	M 24	M 30	M 36	M 42	M 48	M 56	M 64	M 76	M 85	M 90	M 100
S_D (mm)	20	26	32	38	47	57	67	76	90	103	122	137	145	161
S_L (mm)	64	82	90	108	120	152	164	176	212	228	252	270	300	320
S_W (mm)	18	23	28	32	41	50	60	70	80	92	112	125	135	150
Adjustment (mm)	± 20	± 25	± 25	± 30	± 30	± 40	± 40	± 40	± 50	± 50	± 50	± 50	± 60	± 60
A_L (mm)	–	10	10	10	10	10	10	12	12	12	12	15	15	15
S_A	–	51	54	57	61,5	66,5	71,5	86	93	99,5	109	126,5	130,5	138,5
	S_D ⇒ Diameter S_L ⇒ Length S_W ⇒ width across flats A_L => plate thickness S_A => offset of suspension hole													

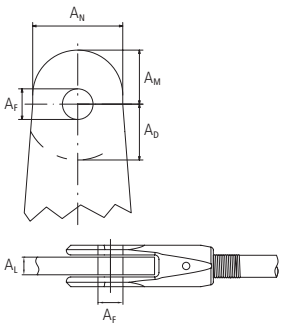
Notes: For more details concerning the fin plate, please contact HMR Jacob.

Fare Pote'e in the Vaitupa Parc at Faa'a, Tahiti (Compas)

Gusset Plates

Tension rods are attached by sliding a gusset plate, which, in turn, is fastened to the structure in between the fork. The fabrication of gusset plate connections are subject to static and structural requirements. The design should be in line with dimensions as shown in table 12.
The plate should be fabricated in grade S355J2+N material in accordance with DIN EN 10025 .

As part of our portfolio HMR Jacob can offer fabricated gusset plates and unique design solutions. Furthermore, we supply a broad range of products within the steel construction sector.



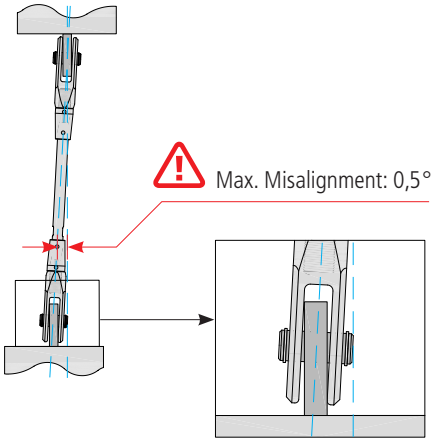
Gusset plate

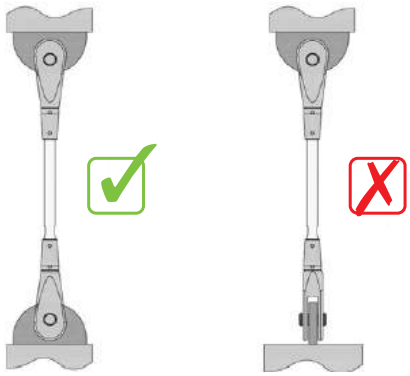
Table 13

Thread size	M 12	M 16	M 20	M 24	M 30	M 36	M 42	M 48	M 56	M 64	M 76	M 85	M 90	M 100
A_L (mm)	10	12	15	20	22	30	35	40	45	55	70	70	80	85
A_D (mm)	23	30	36	44	55	64	72	83	100	115	136	153	163	188
A_F (mm)	13	17	23	27	33	39	45	51	60	68	80	93	98	113
A_M (mm)	22	30	37	43	56	64	79	89	109	122	143	171	176	206
A_N (mm)	35	50	60	70	90	105	128	147	178	198	232	280	288	338

A_L ⇒ Thickness A_D ⇒ clearance refers to dimension D (Fork Table 7, page 8)
A_F ⇒ Pin hole diameter (± 0,50 mm) A_M ⇒ Clearance (+2/-0 mm) A_N ⇒ Minimum width

When installing the Tension Rod System ensure that the maximum misalignment does not exceed 0,5°. Forks should be kept in plane to each other. This prevents bending on the forks and gusset plates. For bigger misalignement, please contact HMR Jacob.

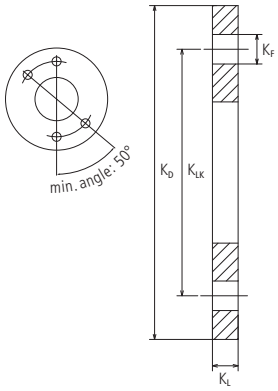




Adventure wooden sphere at Steinberg am See, Germany (Hess Timber)

Pedestrian bridge across the laguna at Kluczbork, Poland (Zem Labedy)

Cross bracings provide stability to a structure and have the ability to resist horizontal forces.
Components such as connection discs or cross couplers provide attractive connection solutions for bracing applications. HMR cross couplers offer a more cost-effective and streamlined alternative by minimising the number of fork connectors required.

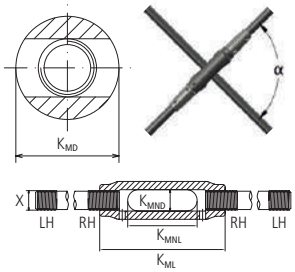


Connection Disc

Table 14

Thread size	M 12	M 16	M 20	M 24	M 30	M 36	M 42	M 48	M 56	M 64	M 76	M 85	M 90	M 100
K_L (mm)	10	12	15	20	22	30	35	40	45	55	70	70	80	85
K_F (mm)	13	17	23	27	33	39	45	51	60	68	80	93	98	113
K_D (mm)	151	196	233	274	350	402	477	541	644	740	869	1029	1071	1243
Inner Diameter (mm)	50	70	80	90	120	140	160	180	230	250	300	350	375	400
K_{LK} (mm)	107	136	159	188	238	274	319	363	426	496	583	687	719	831

K_L ⇒ Thickness = A_L K_F ⇒ Pin hole diameter (± 0,50 mm)
K_D ⇒ Overall Diameter Inner Diameter K_{LK} ⇒ Diameter of outer holes



Cross Coupler

Table 15

Thread size	M 12	M 16	M 20	M 24	M 30	M 36	M 42	M 48	M 56	M 64	M 76	M 85	M 90	M 100
K_{MD} (mm)	23	31	38	46	57	69	81	92	110	125	149	168	178	198
K_{ML} (mm)	76	103	124	149	181	219	258	290	343	318	376	417	444	494
K_{MNL} (mm)	42	57	70	85	105	127	149	169	201	155	184	207	219	244
K_{MND} (mm)	13.0	17.5	21.5	26.0	32.0	38.0	44.0	50.5	59.0	67.0	79.0	89.0	94.0	105.0
Minimum angle α	45°	45°	45°	45°	45°	45°	45°	45°	45°	60°	60°	60°	60°	60°

K_{MD} ⇒ Overall Diameter K_{ML} ⇒ Length K_{MNL} ⇒ slot length K_{MND} ⇒ slot width

Storck Bicycle Store and Showroom at Wertheim, Germany (Storck Bicycle)

Adventure wooden sphere at Steinberg am See, Germany (Hess Timber)

HMR750 – Fatigue Resistance

Dynamic projects – now feasible with the HMR750 Tension Rod System.
For further information, please contact: dynamic@hmr-jacob.de

New bridge at Kamyk, Poland (Mostmarpal Spolka)

HMR750 – Fire Protection

Custom-made solutions for R30 fire protection projects available. Quick and simple.
For further information, please contact: R30@hmr-jacob.de

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Corrosion Protection

With its guaranteed 480 hours corrosion resistance in salt spray exposure, the HMR corrosion protection package offers durability compliant to C3 high and C4 moderate environments. This applies to the full range of the HMR tension rod system including bar threads.

HMR Jacob has introduced a new method that ensures long-term corrosion protection on bar threads that represents a galvanised coating in accordance with DIN EN ISO 1461.

Advantages on the bar thread

- New method of corrosion protection applied
- Durability compliant to corrosion class C3 high and Class C4 moderate, see table
- No Brushing or re-rolling of the excess zinc from the thread

HMR bar threads after 480 hours of salt spray test.

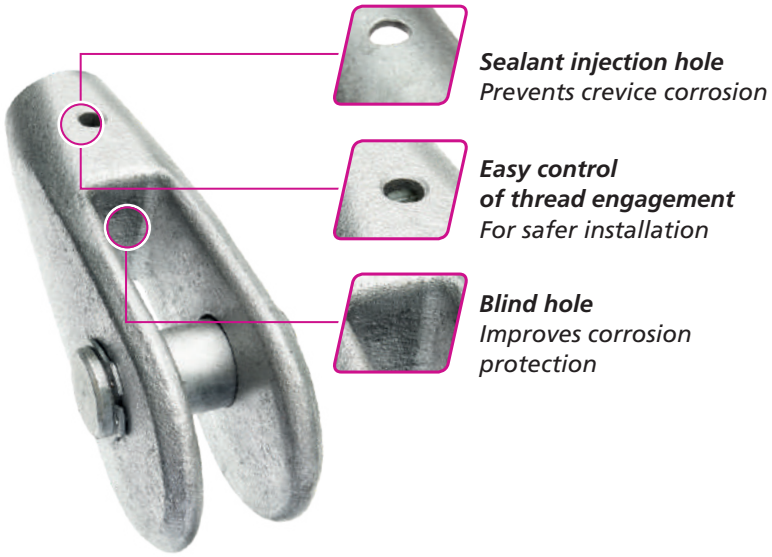
Corrosivity Categories to DIN EN ISO 12944

Corrosion class	Corrosivity	Durability (class)	Durability (years)*	Salt spray test in hours (h)	Examples of typical environments
C1 very low	very low less agressive interior	low	2 to 5 Years	-	Heated buildings with clean atmospheres, e.g. offices, shops, schools, hotels
		moderate	5 to 15 Years	-	
		high	more than 15 Years	-	
C2 low	low less agressive exterior/interior	low	2 to 5 Years	-	Unheated buildings where condensation may occur e.g. depots, sports halls
		moderate	5 to 15 Years	-	
		high	more than 15 Years	-	
C3 moderate	moderate moderately aggressive exterior/interior	low	2 to 5 Years	120	Production rooms with high humidity and some air pollution e.g. food-processing plants, laundries, breweries, dairies
		moderate	5 to 15 Years	240	
		high	more than 15 Years	480	
C4 high	high moderately aggressive exterior/interior	low	2 to 5 Years	240	Chemical plants, swimming pools, coastal, ship and boatyards
		moderate	5 to 15 Years	480	
		high	more than 15 Years	720	
C5-I very high (industrial)	high agressive exterior/interior	low	2 to 5 Years	480	Buildings or areas with almost permanent condensation and high pollution
		moderate	5 to 15 Years	720	
		high	more than 15 Years	1440	
C5-M very high (marine)	very high marine exterior/interior	low	2 to 5 Years	480	Buildings or areas with almost permanent condensation and high pollution
		moderate	5 to 15 Years	720	
		high	more than 15 Years	1440	

*Durability is no „warranty period"

Advantages of the fork end

- Blind hole to prevent moisture to reach the bar thread
- Inspection hole to determine the minimum engagement of the bar
- Easy to apply the sealant when necessary



Sealant injection hole
Prevents crevice corrosion

Easy control of thread engagement
For safer installation

Blind hole
Improves corrosion protection

In-house surface finishes

- One of the largest facility for powder coating in Southern Germany
- QIB-Certification according to EN 1090-2 (Steel) and EN 1090-3 (Aluminum)
- CO2-neutral coating
- Coating of galvanised steel up to corrosivity category C5-high
- Powder coating to any standard RAL colour or DB colour
- Workpieces of up to a length of 13 m, a height of 3,50 m, a width of 2,50 m and a maximum weight of 4 tons each

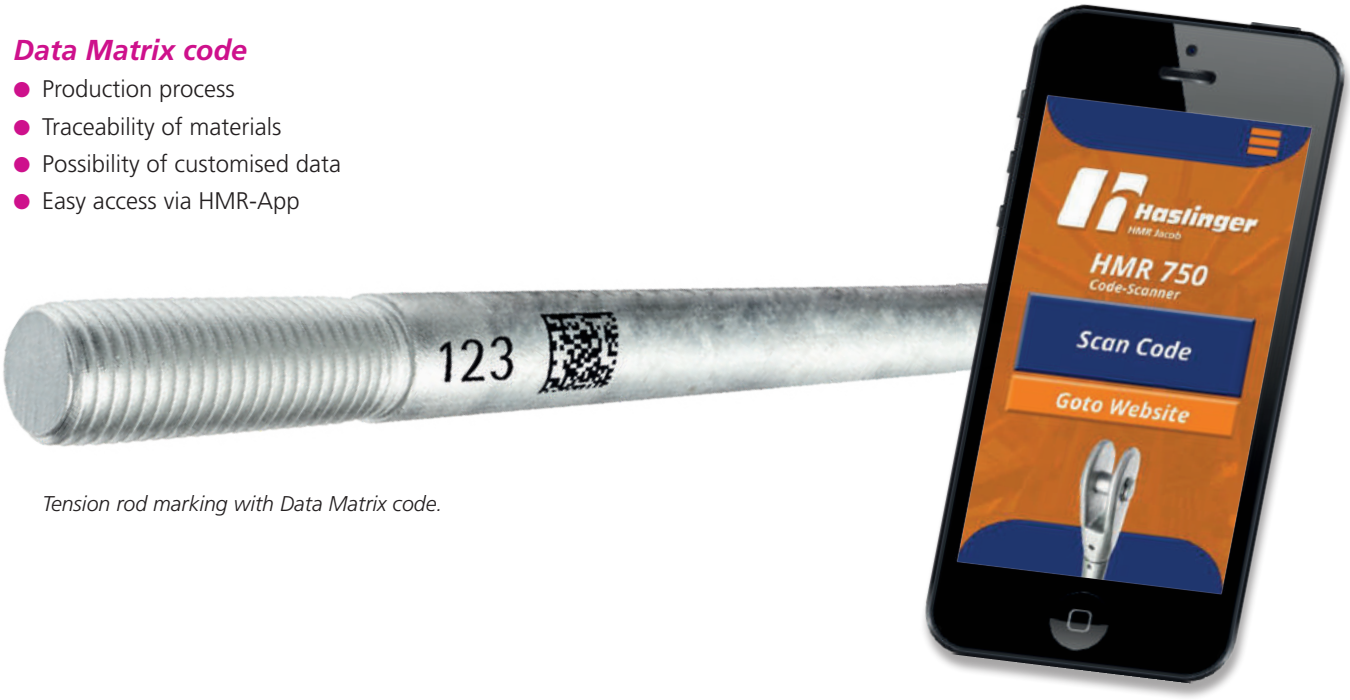
Tension rod systems of sizes M24-42, recently powder coated in RAL6021.

Quality Assurance

Quality and quality assurance are the foundations of our success. Successful product development, process reliability, continuous monitoring, R&D commitment coupled with an experienced team guarantee the high quality standard of our products.

Data Matrix code

- Production process
- Traceability of materials
- Possibility of customised data
- Easy access via HMR-App



Tension rod marking with Data Matrix code.

HMR-Application for any mobile device.

Tensile testing

Brand new Tensile Test machine for all bar diameters

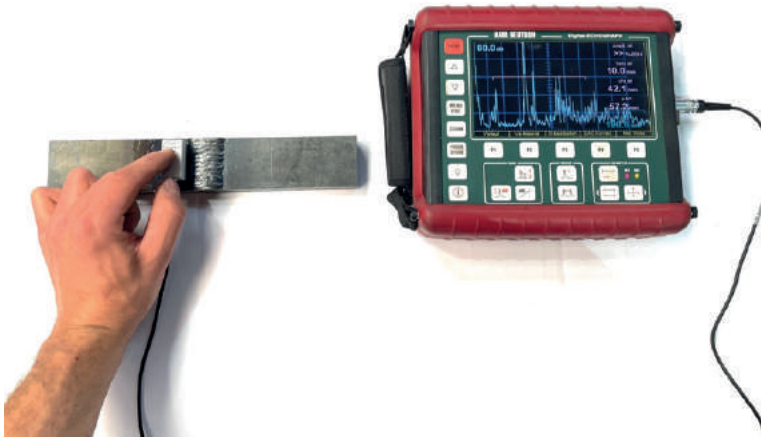
- In-house quality supervision on the basis of constant tests
- Monitoring of material and load capacities
- Ensuring quality products are delivered to customers

In-house tensile testing conducted by qualified staff.

Non-destructive testing

Various facilities of in-house quality control

- Ultrasonic tests
- Magnetic particle tests
- Dye penetrant tests



In-house ultrasonic testing.

Automated manufacturing

HMR Jacob has invested in automated manufacturing and has created an excellent new architectural tension rod and compression strut system with a multitude of advantages that the customers can hugely benefit from.

These are the main points:

- Focused Investment
- High-speed manufacturing
- Key innovation
- High quality products

Automated manufacturing plant Osterhofen

Engineering Support

Our team can provide support and advice for multitude of services:

- Stressing
- Installation
- Misalignment

Bespoke Systems

- Spade connection
- Cast and fabricated connection parts
- Welding parts
- Modified turnbuckle and cross coupler solutions

Site Services

- Equipment hire for tensioning including hydraulic jacks, torque wrenches and strain gauges

Pre-Stressing

The HMR Jacob Pre-Stresser allows you to induce the required load while using a turnbuckle on the tendons during the pre-stressing operation.

How it works:

The clamps will be positioned on the bar threads on either side of the turnbuckle, pulling the bars into tension and loosen the turnbuckle. The turnbuckle can then be tightened with a chain, strap or stilson wrench.

Pre-stresser unit

Haslinger Group

- **Metal Construction + Crane Technology**
  Steel Construction
- **Services**
  Powder Coating
  Laser Cutting
- **HMR Jacob**
  Steel Technology for Architectural Tension Structures

The heavy metal all-stars

The greatest strength of the Haslinger group lies within its cross-linked activities.
Turning and milling or welding and cutting are amongst the many things the Haslinger group can offer.
Other in-house processes include painting, powder coating and zinc plating.

Please visit our website to learn more:
www.metallbau-haslinger.de

Big ideas – quick response times

No matter how big the challenge, we will find the best possible solution. Our well-equipped factory and impressive range of machinery ensures quick deliveries to all our customers.

- Longitudinal welding unit (up to 36 m)
- Modern welding technologies
- Press break unit
- CNC turning and milling (up to 4 m lengths)
- Laser, flame cutting, plasma and punching machines for sheet processing (up to 100mm dia.)
- Sandblasting unit
- Powder coating facility (up to 13 m lengths)
- Painting
- Zinc plating of smaller parts (max. 5 kg; 950 mm long)
- Fire protection coatings

CO_2-neutral production

Supported by three woodchip heating systems our production has been completely CO_2 neutral since 2014.
Each of them has a capacity of 1400 kW which supply heat to seven production halls as well as the ovens for our powder coating facility and our offices.
Our electricity supply is supported by eight photovoltaic plants providing power to our machine park, forklift trucks and electric vehicles.

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