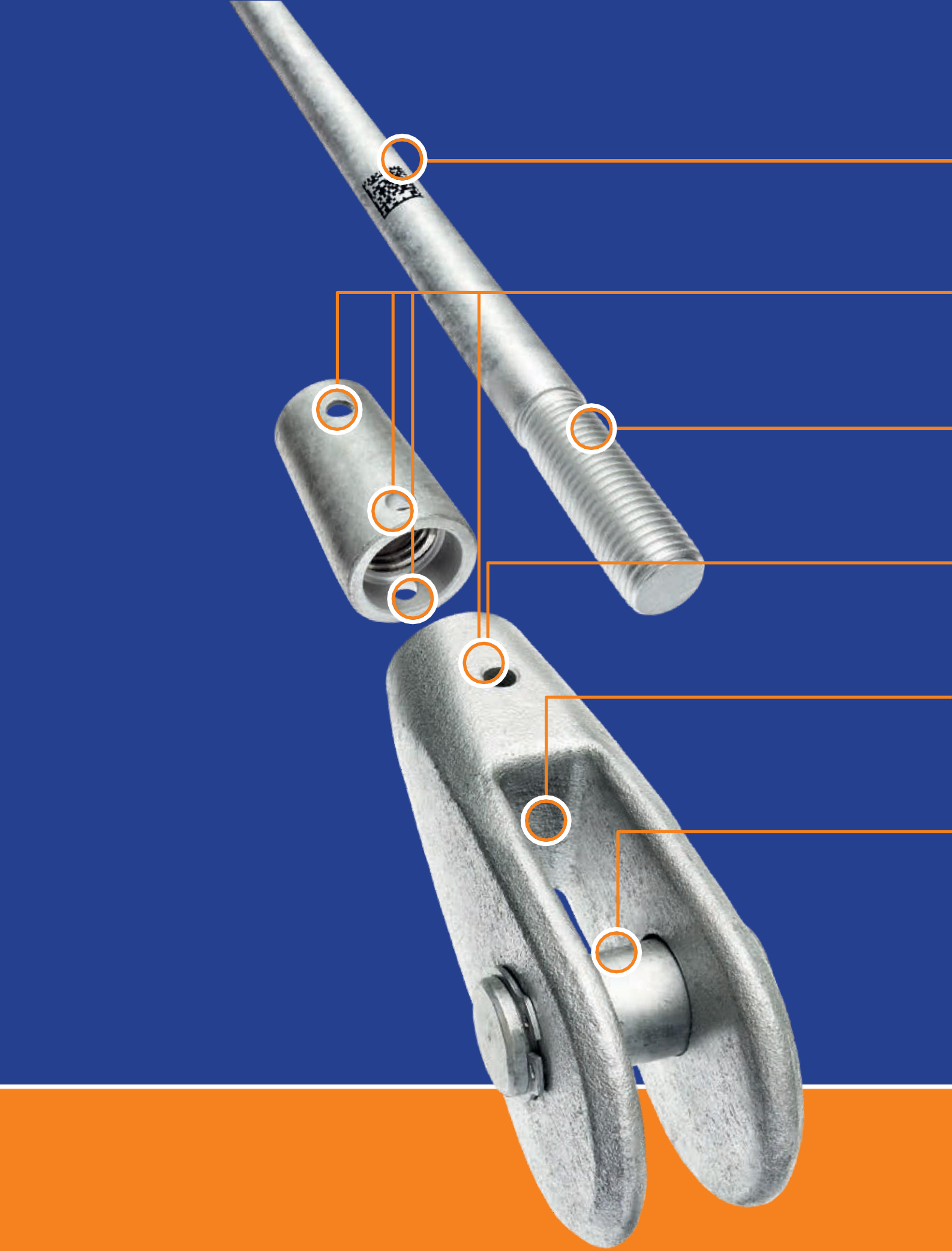
cort@rtec

HMR750

Tie Rod System

Your structures will be guaranteed



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Data Matrix Code
*For **individual** identification and quality assurance.*

Sealant injection openings for prevent corrosion in clamping areas.

Special protection against corrosion on the rod thread*Corresponds to long C3 corrosion class.

Controlled clamping depth for greater assembly safety.

Blind hole for better protection against corrosion.

Resistant to a very high marginal loads.

Inovation

On Tie Rod System

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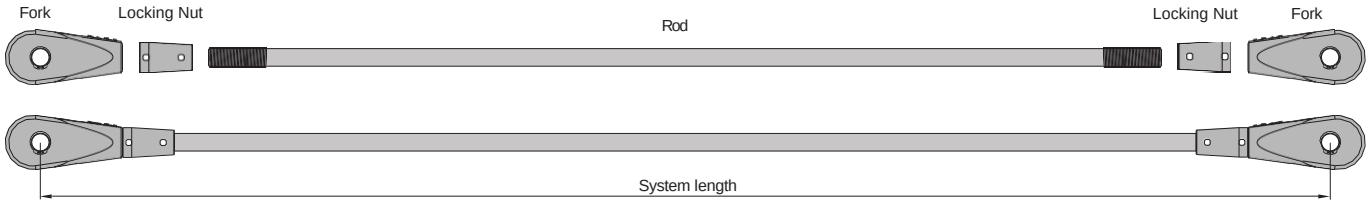
HMR 750 Tie-rod system

HMR 750 tie rod system offers modern architecture an innovative and attractive product, with excellent protection against corrosion, high load capacity and greater safety in its installation.



System Details

Table 1

Screw thread	Ø	M12	M16	M20	M24	M30	M36	M42	M48	M56	M64	M76	M85	M90	M100
Rod diameter	mm	12	15	19	23	28	34	40	45	54	62	74	83	88	100
Tensile limit load	kN	43	81	126	182	290	423	605	795	1157	1539	2213	2799	3154	3928
Tensile limit load	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 rod length	mm	12.000													

Tensile strength of the tie rods complies with the standard DINEN 1993-1-8, Table 3.4 and DINEN 1993-1-1 Section 6.2.3 Partial safety factor M0 = 1,0 e M2 = 1,25

HMR tie rod systems are produced in thread sizes from M12 to M100. The round rod is supplied as standard in the HMR 750 system and is characterized by very high working tensile forces. End fittings are molded which results in more economical structural design solutions.

The ties can be delivered in a single rod length, without rectification, up to 12 m. Longer lengths are possible with the help of tensionable unions and couplers. All accessories are designed so that they can absorb the limit tensile load of the bars.

Adjustment

Table 2

Screw thread	Ø	M12	M16	M20	M24	M30	M36	M42	M48	M56	M64	M76	M85	M90	M100
System with 2 forks	mm	± 12	± 16	± 20	± 24	± 30	± 36	± 42	± 48	± 56	± 61	± 71	± 78	± 80	± 85
Tightener	mm	± 20	± 25	± 25	± 30	± 30	± 40	± 40	± 40	± 50	± 50	± 50	± 50	± 60	± 60
Central coupler	mm	±21	±29	±32	±38	±43	±53	±64	±69	±84	±96	±113	±123	±133	±148

The system length is defined by the distance from pin to pin to center. By turning the right/left thread on the fork ends, the system lengths can be precisely adjusted.

The use of tensioners allows for additional adjustability.

Corrosion protection

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

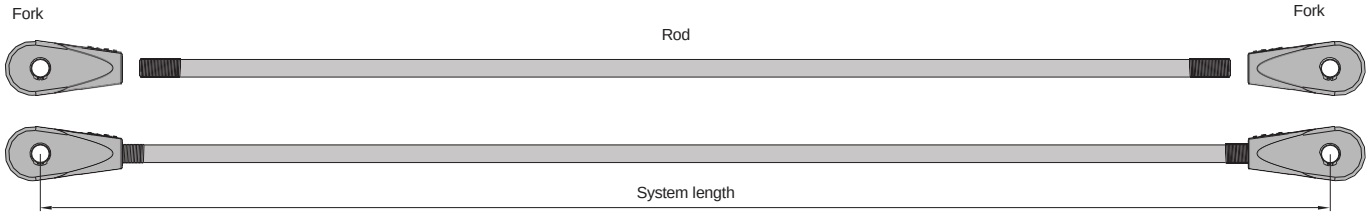
- **Bright gross***
- **Galvanized**
- **Thermolacquered**
- **Painted**
- **coated duplex**

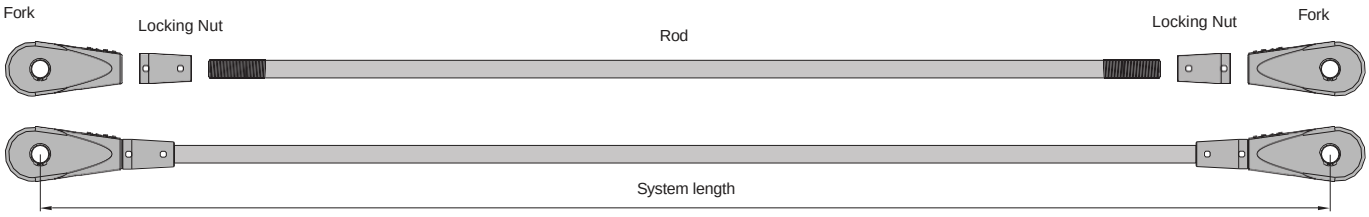
**Accessories will be supplied galvanized*

System Variants

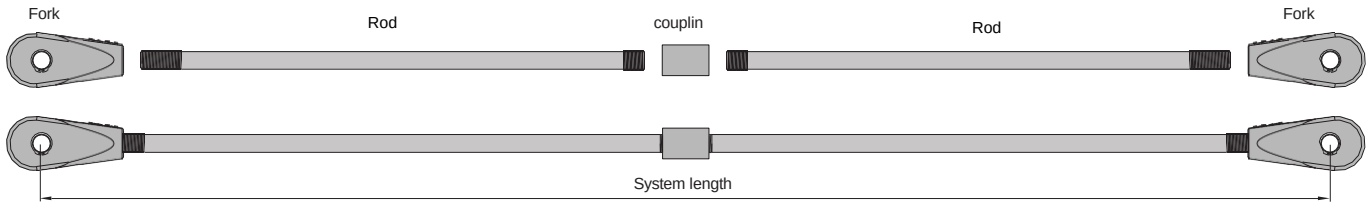
Whether it is underground structures, facades, canopy suspensions or roof suspensions, the variety of design options of the HMR 750 tie system allows for an architectural and qualitative solution for almost any type of application.

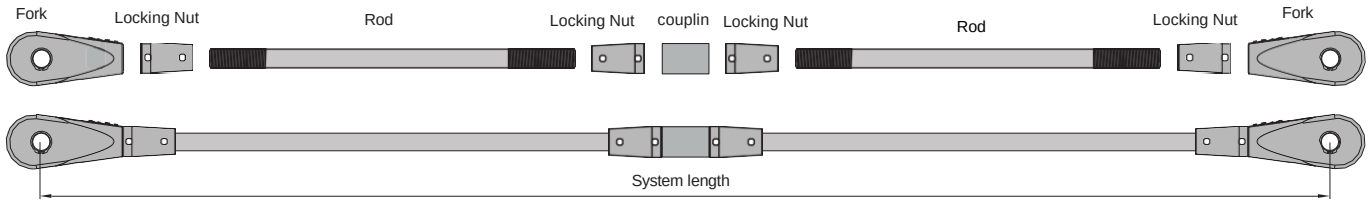
Basic versions

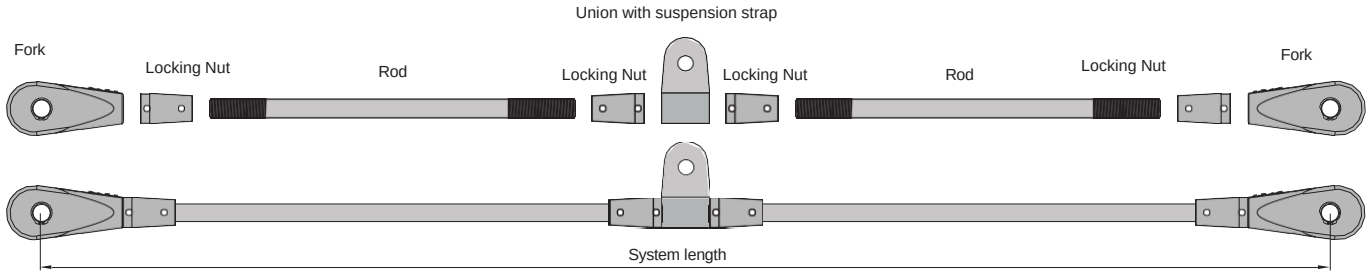




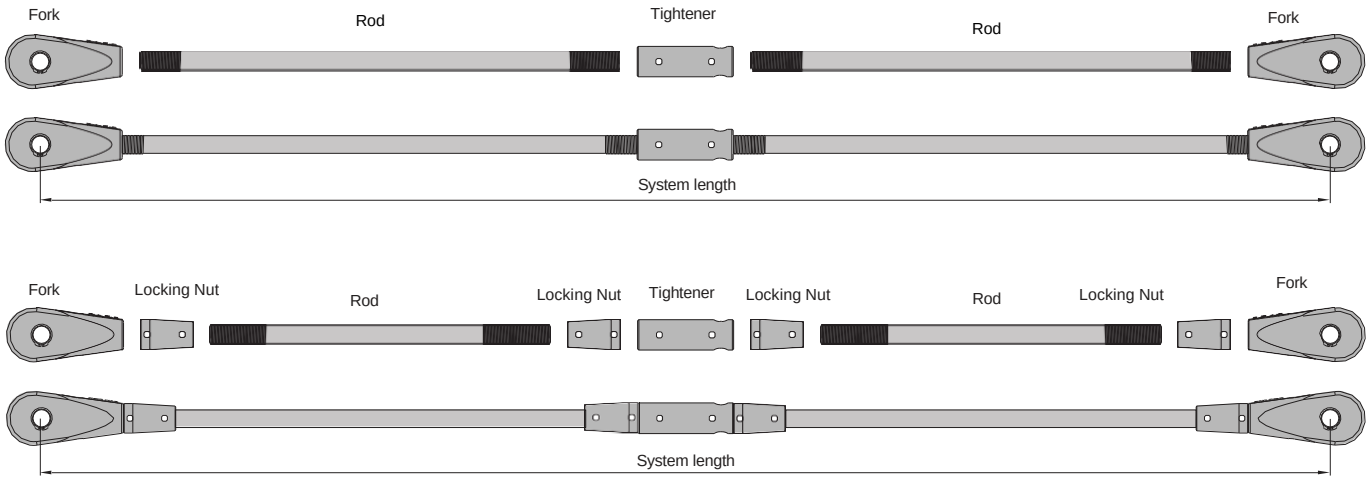
System with central union or with union and locking nuts



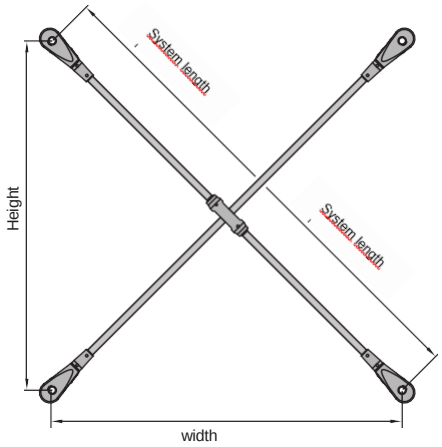




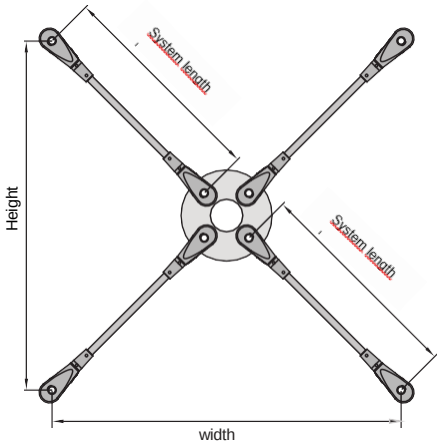
System with central tensioning union and with tensioning union and locking nuts



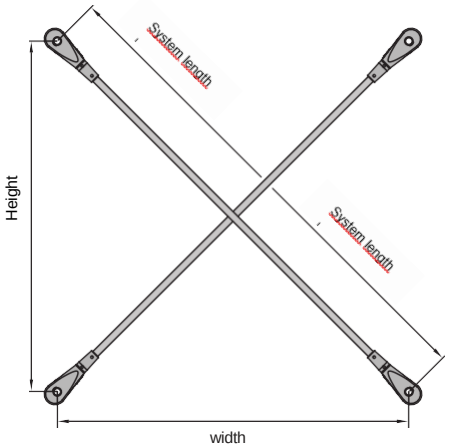
Crossings



With crossover coupler



With intersecting disc



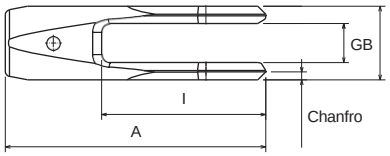
Simple encounter

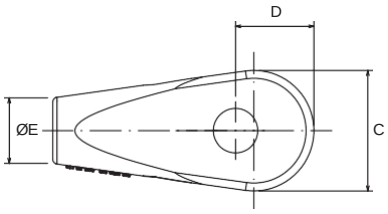
The elegant design of the system components allows for a smooth rail transition that fits perfectly into the overall architectural concept of a steel, wood or glass construction.

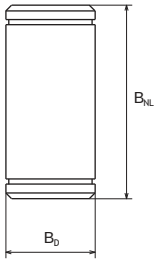
Fork

Table 3

X	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
W (mm)	12	15	19	23	28	34	40	45	54	62	74	83	88	100
slope	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} av. Coupling (mm)	18	24	30	36	45	54	63	72	84	94,5	111,5	124	130	142,5



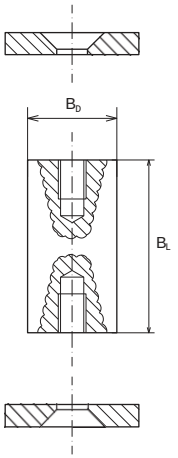




Union with retaining ring DIN 471 (standard)

Table 4

X	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
X Screw thread (M) B_D => Ø of the screw B_{NL} => Screw length														



Screws with washers (per order)

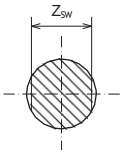
Table 5

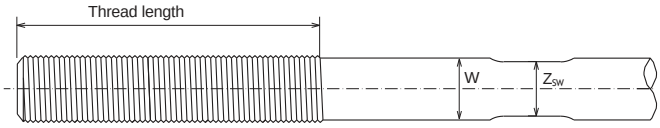
X	M 12	M 16	M 20	M 24	M 30	M 36	M 42	M 48	M 56	M 64	M 76	M 85	M 90	M 100
B_D (mm)	12,0	16,0	21,0	25,0	31,0	37,0	43,0	49,0	58,0	66,0	78,0	91,0	95,0	110,0
B_L (mm)	25	31	40	47	53	68	81	93	104	126	156	161	181	186
X Screw thread (M) B_D => Ø Screw B_L => Screw length														

Rolled thread traction system rod (with /without SW)

Table 6

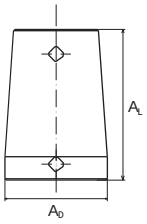
X	M 12	M 16	M 20	M 24	M 30	M 36	M 42	M 48	M 56	M 64	M 76	M 85	M 90	M 100
Z_{SW} (mm)	10	13	16	20	25	30	36	42	49	56	68	78	82	91
W (mm)	12	15	19	23	28	34	40	45	54	62	74	83	88	100
X Screw thread (M) Z_{SW} => Faceted to the key														





Lock nut

Table 7

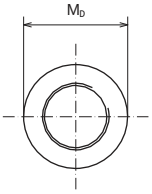


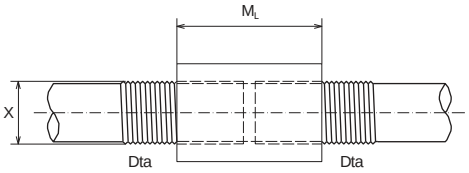
X	M 12	M 16	M 20	M 24	M 30	M 36	M 42	M 48	M 56	M 64	M 76	M 85	M 90	M 100
A_D (mm)	19	25	29	35	44	52	60	69	80	91	108	121	129	143
A_L (mm)	36,3	44,4	51,0	57,6	67,0	80,4	89,8	99,2	110,4	120,6	135,4	148,0	152,0	161,0
X Screw thread (M) A_D => Ø Locking Nut A_L => length of Locking Nut														

Coupling

Tabela 8

X	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
X Screw thread (M) M_D => Ø of coupling M_L => length of coupling														

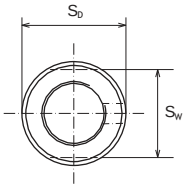


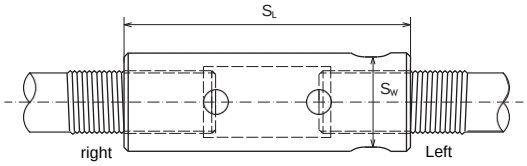


Tension union (tensor)

Tabela 9

X	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
Ajuste (mm)	± 20	± 25	± 25	± 30	± 30	± 40	± 40	± 40	± 50	± 50	± 50	± 50	± 60	± 60
X Screw thread (M) S_D => Ø of tensor S_L => length of tensor S_W => Key Size														





Connection plates

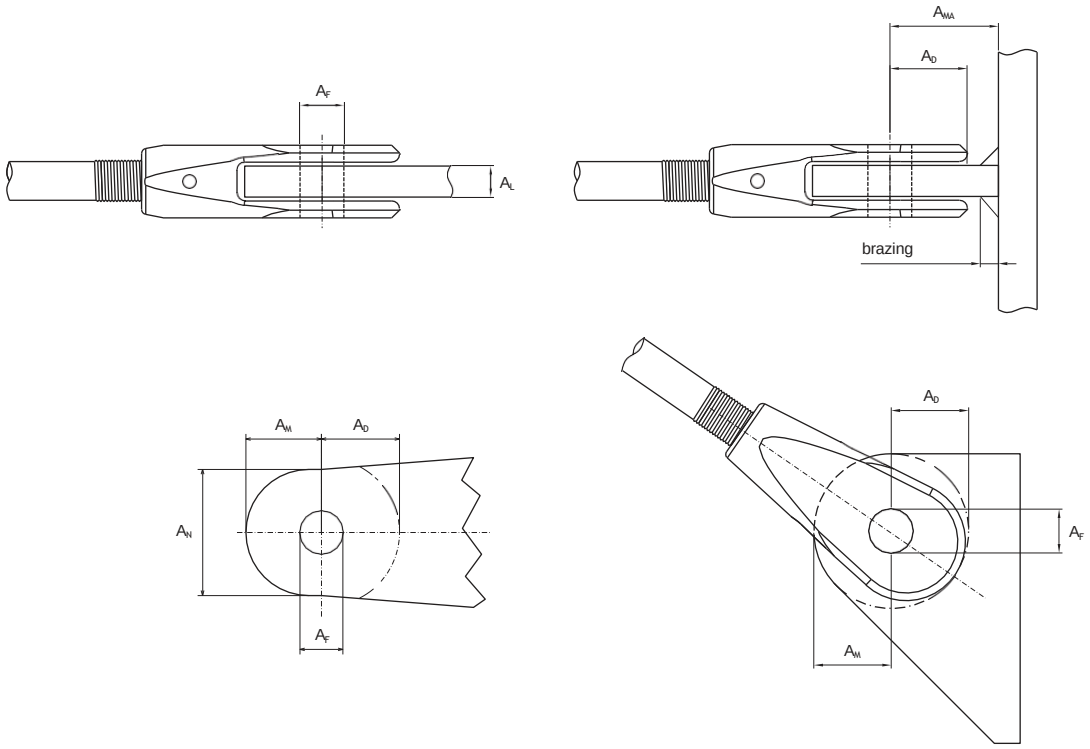
The rods are connected to the structure through the connection plates. The connection plates are designed in accordance with the static and constructional requirements, however, the details for the yoke connection must be considered as presented in table 10. The material must comply with the quality S355J2 + N in accordance with the DIN EN 10025.

Connection plates

Table 10

X	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) plate space	10	12	15	20	22	30	35	40	45	55	70	70	80	85
A_F(mm)Bohr lochØ	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_D(mm)	23	30	36	44	55	64	72	83	100	115	136	153	163	188
A_{MA}(mm)	38	48	58	74	88	108	124	142	167	196	240	257	281	314

Screw thread X (M) AL => plate thickness AF => perforation hole Ø (± 0,50 mm)
AM => distance from edge (+ 2 / -0 mm) AN => connecting plate min.
AD => Distance dimension corresponds to the dimension
D Recommended minimum distance from the Fork head AMA



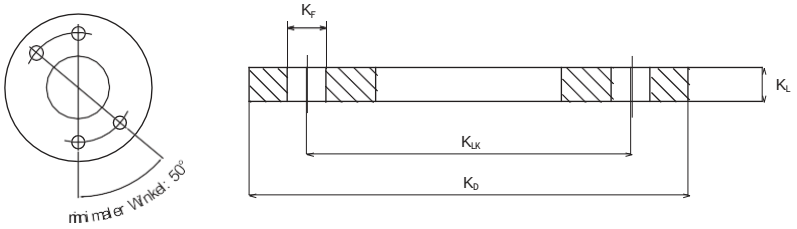
To ensure the stability of a structure, stiffness reinforcement is necessary to stabilize the structure against horizontally acting forces. The HMR tie rod can be used in different project situations to reinforce and harmoniously fit any structure giving it a touch of modernity.

System components, such as circular discs or crossover couplers, allow the central connection at the meeting and crossover points. Furthermore, the HMR crossover couplers offer a low-cost alternative because this component minimizes the number of forks to be applied.

Intersecting discs

Table 11

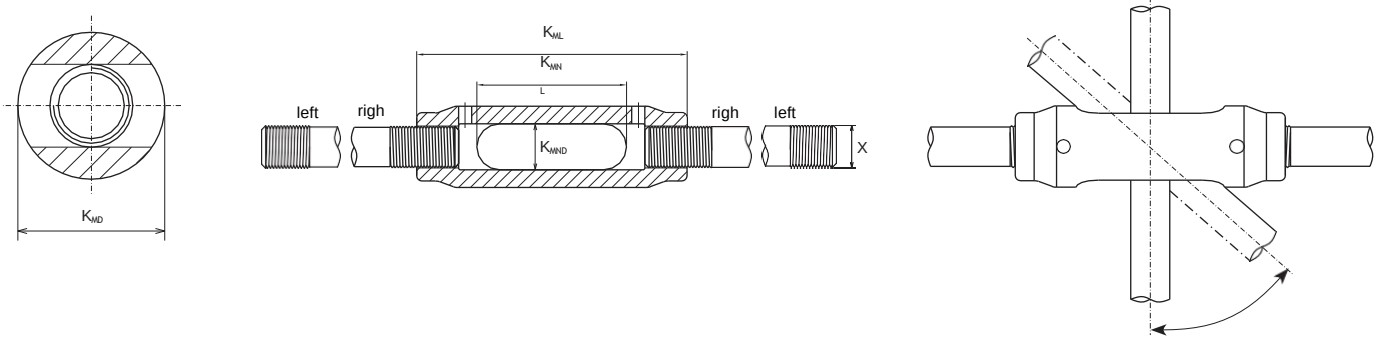
X	M 12	M 16	M 20	M 24	M 30	M 36	M 42	M 48	M 56	M 64	M 76	M 85	M 90	M 100
K_L (mm)	10	12	15	20	22	30	35	40	45	55	70	70	80	85
K_F (mm)	13	17	23	27	33	39	45	51	60	68	80	93	98	113
K_D (mm)	151	196	233	274	350	402	477	541	644	740	869	1029	1071	1243
Øfrom the central hole	50	70	80	90	120	140	160	180	230	250	300	350	375	400
K_{LK} (mm)	107	136	159	188	238	274	319	363	426	496	583	687	719	831
X Screw thread (M) K_L=>Thickness = ALK$_F$ Ø of the hole (±0,50mm) K_D => Ø from disk e Ø from the center K_{LK} => Ø of the drilling axis														



Crossover coupler

Tabela 12

X	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
Ângulo mínimo	45°	45°	45°	45°	45°	45°	45°	45°	45°	30°	30°	30°	30°	30°
X Screw thread (M) K_{MD} => Ø outer K_{ML} => Length K_{MNL} => Groove length K_{MND} => Groove width														



Cross contravention without using specially designed system components such as the disc or crossover couplers should be avoided. If this solution can still be tolerated with thin and very long ties, the curvature of the bars will result in undesirable lateral forces causing stress in the forks and lateral loads with unauthorized bending moments.

Displaced connection plates may prevent these unauthorized fork efforts, however, this arrangement can produce displacement moments in the structure. Furthermore, the contact of the intersecting bars damages the surface of the ties due to movement (see Fig. Right).

Anti-corrosion protection

The corrosion protection of the HMR 750 tie rod system resists exposure to salt spray for 480 hours, which guarantees a protection period of C3L or C4M for the entire tie system, including the threads.

Often, the threads at the top of rods in tie systems represent the weakest point in corrosion protection.

“Holders - Hot dip galvanizing" performs the galvanizing of the thread. It is assumed that the threads are turned (threaded) immediately after leaving the zinc bath. This process ensures that the zinc coating on the threads has, under suitable conditions, a minimum zinc coating thickness of 50 µm).

This method cannot be used due to the length of the rod. Therefore, the threads at the ends of the rods are brushed or post-threaded after hot-dip galvanizing.

Doubts about the guarantee of these production processes are absolutely justified, since both procedures impair the thickness of the hot-dip galvanizing layer and cannot be performed in a reliable or uniformly measurable manner.

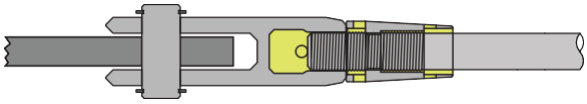
Consequently, these methods do not provide adequate protection against corrosion.

A Corrosion protection of the HMR tie-rod system is 100% guaranteed by a new manufacturing process, hot-dip galvanizing in accordance with DIN EN ISO 1461.

INCLUDING ON THE THREADS

HMR rod end thread after salt spray test for 480 h.

Outdoors, the rods are exposed to great weather and humidity demands. With forks in open passage areas, under the influence of the weather, corrosion spots may appear on the threads at the ends of the rods. The HMR system avoids this problem due to the shape of its fork in which the passage hole is blind, closed, therefore, moisture penetration is avoided.

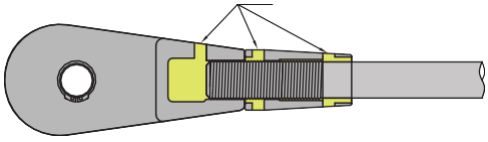


Fork with blind hole.

Once assembled, the ends of the tie rods may be subject to corrosion due to the breakdown of the protection barrier. Moisture penetrates the threads and if they are not sealed without additional measures. Galvanizing at these points, as protection against corrosion, is insufficient.

Corrosion in clamping areas can be definitively eliminated when using our HMR sealant which is permanently elastic. It is applied to specially designed injection openings in accessories (Forks, locking nuts, unions, etc.).

Sealing with the permanently elastic HMR sealant through the injection openings designed for this purpose.



Fork with permanently elastic sealant in cavities

Corrosion protection classes according to DIN EN ISO 12944

Degree of corrosion	Corrosion	Corrosion protection period (class)	Protection duration (years) *	Influence of salt spray on hours (h)	Example Typical environments
C1 insignificant	Very low, little aggressive interior	short	2-5 Years	-	Indoor only: isolated buildings (60% rel.F.)
		average	5 a 15 Years	-	
		long	+ 15 Years	-	
C2 low	Low - not very aggressive Interior exterior	short	2 A 5 Years	-	slightly polluted atmosphere, dry climate, and rural areas
		average	5 A 15 Years	-	
		long	+ 15 Years	-	
C3 moderate	moderately aggressive indoor/outdoor	short	2 a 5 Years	120	Urban and industrial atmosphere with moderate SO2 pollution or moderate climate
		average	5 a 15 Years	240	
		long	+ 15 Years	480	
C4 strong	Highly aggressive interior/exterior	short	2 a 5 Years	240	Industrial atmosphere and coastal atmosphere with moderate saline load
		average	5 a 15 Years	480	
		long	+ 15 Years	720	
C5-I Very strong (industry)	very aggressive Interior/exterior	short	2 a 5 Years	480	Industrial atmosphere with high relative humidity and aggressive atmosphere
		average	5 a 15 Years	720	
		long	+ 15 Years	1440	
C5-M very strong (sea)	very high interior and exterior maritime	short	2 a 5 Years	480	Coastal and offshore areas with high saline load
		average	5 a 15 Years	720	
		long	mais 15 Years	1440	

* The duration of corrosion protection is not the "warranty period"

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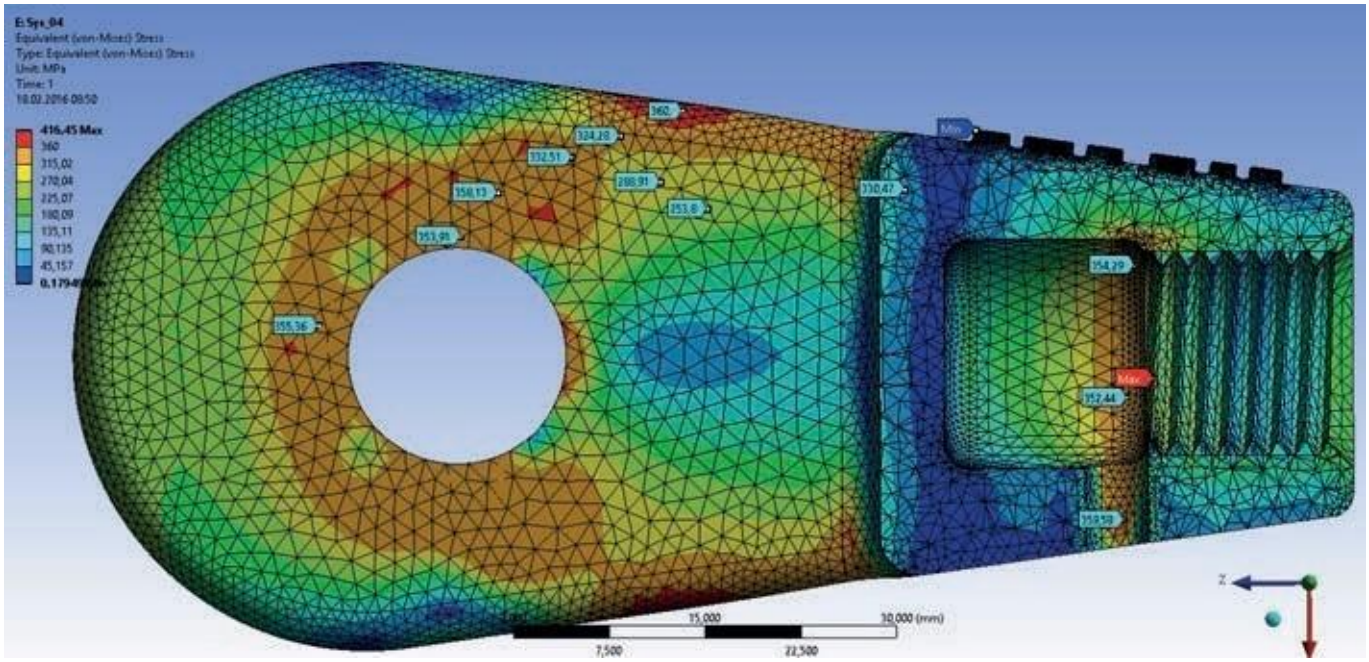
Quality assurance

Innovation and quality assurance is the basis of our business. Good development work, production process reliability, continuous control and an excellent team guarantee a consistently high standard of guaranteed quality.



FEM model of an M16 fork during development. *Abb. TUMünchen*

Our HMR 750 drawbar system was developed in cooperation with TU Munich.

Traction tests on an M16 fork with a breaking load of 150 kN. Fig. TU Munique

The latest thread cutting technology guarantees our manufacturing quality and refutes the claim that only hand-crafted threads are a good solution.

Each traction rod that leaves our production line is provided with an individual identification so that you can read the information necessary for assembly and manufacturing at any time. This guarantees complete traceability of the product, production stages and material.

Tension bar with Data Matrix code for unique identification.

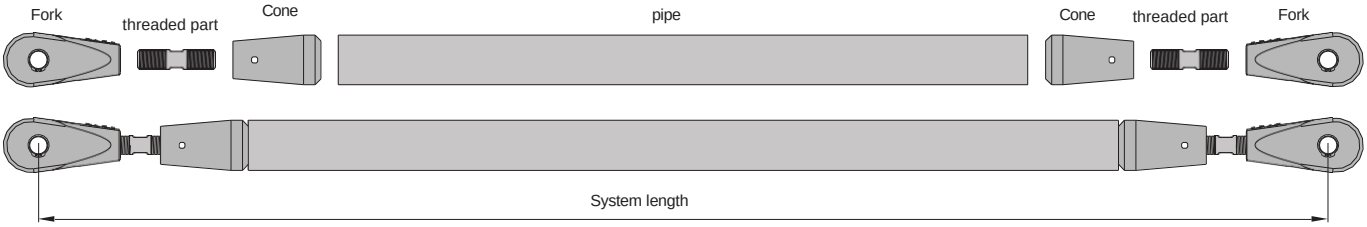
In addition to the usual manufacturing characteristics and specific material, it is possible to enter customer data. These include position number, system lengths, design data and much more. So that our customers can read this data, we provide a smartphone application.

HMR compression rod system

An innovative extension of our product range is the HMR compression tie system, which can be ideally integrated into almost all structural applications..

Compression bar systems combine standard forks with a round tube. The transition consists of a cone, which is welded to the round tube.

The connection of the cone to the fork is made with a threaded section and the compression rods are designed so that traction or compression forces can be absorbed.



Pipe dimensions and limit compression efforts

Table 13

Fork	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
Pipe Ø (mm)	33,7	42,4	48,3	60,3	76,1	88,9	114,3	139,7	168,3	193,7	219,1	244,5	273,0	323,9	323,9	323,9
Thickness (mm)	4	5	5		5	5	6,3	10	10	10	12,5	16	16		16	16
Maximum compression force (kN)	25,61	61,79	100,02		149,23	241,45	360,35	519,54	690,86	994,94	1333,95	1933,76	2427,32		2752,94	3407,59

Note: Limit pressure forces listed are acc. Determined in 1993. A static design of limit pressure loads must always be provided by the customer.

Adjustment

Table 14

	M12	M16	M20	M24	M30	M36	M42	M48	M56	M64	M76	M85	M90	M100
System with 2 forks	± 12	± 16	± 20	± 24	± 30	± 36	± 42	± 48	± 56	± 64	± 76	± 85	± 90	± 100

The length of the system is defined by the distance from pin to pin to center. By turning the right/left thread at the fork ends, system lengths can be precisely adjusted.

corrosion protection

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

- **Bright washed raw ***
- **Hot dip galvanized**
- **Thermolacquer**
- **Painted**
- **coated duplex**

* *The fork, screws and threaded screws are supplied with a hot-dip galvanized finish.*

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