



# Pipe Shoes

## Technical Data

Version 1.3  
February 2022



## INDEX

Content	Page
<b>CHANGE HISTORY</b>	<b>3</b>
<b>PIPE SHOE MP-PS L1-1</b>	<b>4-7</b>
<b>PIPE SHOE MP-PS M1-1</b>	<b>8-11</b>
<b>PIPE SHOE MP-PS H1-1</b>	<b>12 -15</b>
<b>PIPE SHOE MP-PS L2-2</b>	<b>16 - 19</b>
<b>PIPE SHOE MP-PS M2-2</b>	<b>20 - 23</b>
<b>PIPE SHOE MP-PS H2-2</b>	<b>24 - 27</b>
<b>PIPE SHOE MP-PS L4-2</b>	<b>28 - 31</b>
<b>PIPE SHOE MP-PS M4-2</b>	<b>32 - 35</b>
<b>PIPE SHOE MP-PS H4-2</b>	<b>36 - 39</b>
<b>MT-FPS-FF OC</b>	<b>40</b>
<b>MT-FPS-FZL OC</b>	<b>41</b>
<b>MT-FPS-SF OC</b>	<b>42</b>
<b>MT-FPS-SZ1 OC</b>	<b>43</b>
<b>MT-FPS-SZ2 OC</b>	<b>44</b>
<b>MT-FPS-GF OC</b>	<b>45</b>
<b>MT-FPS-GL1 OC</b>	<b>46</b>
<b>MT-FPS-GL2 OC</b>	<b>47</b>
<b>MIA-BO90/120-M12</b>	<b>48</b>
<b>MI-DGC 90</b>	<b>49</b>
<b>MI-DGC 120</b>	<b>50</b>
<b>MIC-PS90/120</b>	<b>51</b>
<b>MP-PS IXG</b>	<b>52 - 53</b>

## CHANGE HISTORY

Historie	Creator	Date
Created the Editorial Load Table for Pipe Shoes & Connectors	Bruno da Silva	01.09.2021
Added Wave 2.2.1 and adapted tables	Rocas Denis	18.01.2022
Edited tables, general information and notes	Rocas Denis	14.02.2022

## LEGENDS

$E_{exp}$  = Expected

$R_{rec}$  = Recommended

## PIPE SHOE MP-PS L1-1

R14230970

### General

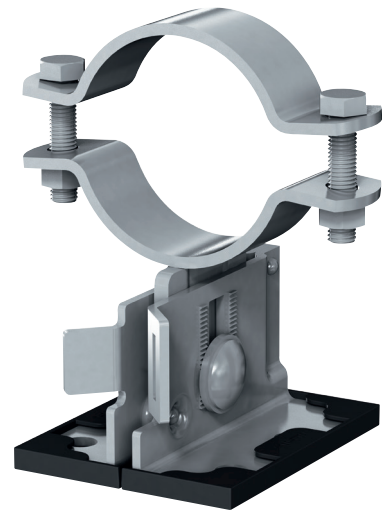
Media temperature limits: -20 °C to +300 °C

Height adjustability: 88.5 - 116 mm (with sliding plate)  
85.5 - 113 mm (without sliding plate)

Slope adjustability: 12° (21%)

### Mass per Pipe Shoe version:

Item no.	Pipe Shoe version	Nominal height	DN (mm)	Mass (kg)
2330922	MP-PS L1-1 21-26 1/2" OC	90	DN15	1.50
2330923	MP-PS L1-1 26-31 3/4" OC	90	DN20	1.52
2330924	MP-PS L1-1 32-37 1" OC	90	DN25	1.54
2330925	MP-PS L1-1 38-44 1-1/4" OC	90	DN32	1.56
2330926	MP-PS L1-1 45-51 1-1/2" OC	90	DN40	1.59
2330927	MP-PS L1-1 52-58 OC	90	OD52-58	1.78
2330928	MP-PS L1-1 59-65 2" OC	90	DN50	1.81
2330929	MP-PS L1-1 68-74 OC	90	OD68-74	1.86
2330930	MP-PS L1-1 75-81 2-1/2" OC	90	DN65	1.89
2330931	MP-PS L1-1 88-94 3" OC	90	DN80	1.95
2330932	MP-PS L1-1 100-108 3-1/2" OC	90	OD100-108	2.01
2330933	MP-PS L1-1 110-118 4" OC	90	DN100	2.04
2330934	MP-PS L1-1 125-133 OC	90	OD125-133	2.13
2330935	MP-PS L1-1 136-144 5" OC	90	DN125	2.18
2330936	MP-PS L1-1 152-162 OC	90	OD152-162	2.27
2330937	MP-PS L1-1 163-173 6" OC	90	DN150	2.33



### Corrosion protection:

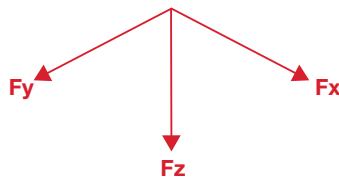
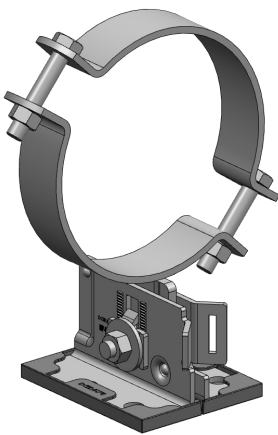
Component	Coating system	Zinc thickness, min. local (µm)
Top pipe ring	HDG per ISO 1461	55
Bottom pipe ring and midplate	HDG per ISO 1461	70
Baseplate	Continuously hot-dip Zinc-Magnesium coated per EN 10346	17
Serrated washers	Continuously hot-dip Zinc-Magnesium coated per EN 10346	17
Bolts; Nuts	HDG per ISO 10684	40;45



**Material properties:**

Component/Material	min. Yield strength	min. Ultimate strength	Modulus of elasticity	Shear modulus
Pipe rings and midplate S235JR (DIN EN10025-2)	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Baseplate and serrated washer S280GD (EN 10346) POSMAC-C MOD	$f_y = 280 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Bolts; Nuts F Class 8.8 (ISO 898-1); Grade 8 (ISO 898-2)	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Sliding plates PA66-GF30	Static friction coefficient values: Hot Dip Galvanized mating surface: 0.13 Zinc-Magnesium mating surface: 0.15 Zinc Electrogalvanised mating surface: 0.18			
Values for Modulus of Elasticity and Shear Modulus are according to EN 1993-1-1 and used for all Eurocode calculations Friction coefficient per ASTM D1894-14				

## DESIGN LOADING CAPACITY – 3D


**Notes for load data**

Load capacity given at delivery height = 90mm BOP (Bottom of pipe).

Point of load application = pipe center line (X-axis).

Load capacity given at room temperature.

Temperature correction factors apply:

- Per VGB-R-510 for load reported acc to EN13480-3
  - Per EN 1993-1-2 for loads reported acc to EN1993-1-1
- Temperature distribution on pipe shoe components per EN13480-3

Failure locations per force direction:

F<sub>x</sub> – deformation of pipe ring

F<sub>y</sub> – deformation of baseplate

+F<sub>z</sub>, -F<sub>z</sub> – ultimate failure at baseplate serrations

Published loads are based on static loading conditions and mounting according to IFU. Non-static forces must be separately considered during design.

Below published load data are applicable for:

- piece parts
- welded to steel according to IFU
- mounted with MT-TFB OC bolts on MT girders
- mounted with Hex M10 8.8 class bolts on I-beams
- mounted with HST3 Stud Anchors
- mounted with X-BT threaded stud

For all other required loads (i.e. different height, -slope,...) please use Fixpoint Calculator

**Recommended loads per EN13480-3**

Item No.	Pipe Shoe version	+/-F <sub>x,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN]	+F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN]
2330922	Pipe shoe MP-PS L1-1 21-26 1/2" OC	0.71	2.51	9.87	7.58
2330923	Pipe shoe MP-PS L1-1 26-31 3/4" OC	0.76	2.44	9.87	7.58
2330924	Pipe shoe MP-PS L1-1 32-37 1" OC	0.82	2.36	9.87	7.58
2330925	Pipe shoe MP-PS L1-1 38-44 1-1/4" OC	0.89	2.27	9.87	7.58
2330926	Pipe shoe MP-PS L1-1 45-51 1-1/2" OC	0.95	2.21	9.87	7.58
2330927	Pipe shoe MP-PS L1-1 52-58 OC	1.00	2.16	9.87	7.58
2330928	Pipe shoe MP-PS L1-1 59-65 2" OC	1.05	2.10	9.87	7.58
2330929	Pipe shoe MP-PS L1-1 68-74 OC	1.14	2.02	9.87	7.58
2330930	Pipe shoe MP-PS L1-1 75-81 2-1/2" OC	1.16	1.97	9.87	7.58
2330931	Pipe shoe MP-PS L1-1 88-94 3" OC	1.30	1.88	9.87	7.58
2330932	Pipe shoe MP-PS L1-1 100-108 3-1/2" OC	1.42	1.79	9.87	7.58
2330933	Pipe shoe MP-PS L1-1 110-118 4" OC	1.53	1.72	9.87	7.58
2330934	Pipe shoe MP-PS L1-1 125-133 OC	1.62	1.66	9.87	7.58
2330935	Pipe shoe MP-PS L1-1 136-144 5" OC	1.76	1.58	9.87	7.58
2330936	Pipe shoe MP-PS L1-1 152-162 OC	1.92	1.49	9.87	7.58
2330937	Pipe shoe MP-PS L1-1 163-173 6" OC	2.00	1.45	9.87	7.58

**Notes**

Shown load data for piece parts (without considering mounting and load capacity of the sub-structure)

**Interaction formula**

$$\frac{F_{x,exp}}{F_{x,rec}} + \frac{F_{y,exp}}{F_{y,rec}} + \frac{F_{z,exp}}{F_{z,rec}} \leq 1.0$$

**Recommended loads per EN1993-1-1**

Item No.	Pipe Shoe version	+/-F <sub>x,rec</sub> [kN]	+/-F <sub>x,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN]	+F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN]
			in combination with X-BT only		in combination with X-BT only			in combination with X-BT only	in combination with MT-TFB only	in combination with HST3 only
2330922	Pipe shoe MP-PS L1-1 21-26 1/2" OC	1.13	0.56	3.31	0.40	14.31	10.95	1.58	10.86	8.40
2330923	Pipe shoe MP-PS L1-1 26-31 3/4" OC	1.21	0.56	3.22	0.40	14.31	10.95	1.58	10.86	8.40
2330924	Pipe shoe MP-PS L1-1 32-37 1" OC	1.30	0.56	3.12	0.39	14.31	10.95	1.58	10.86	8.40
2330925	Pipe shoe MP-PS L1-1 38-44 1-1/4" OC	1.43	0.56	2.99	0.39	14.31	10.95	1.58	10.86	8.40
2330926	Pipe shoe MP-PS L1-1 45-51 1-1/2" OC	1.51	0.56	2.92	0.39	14.31	10.95	1.58	10.86	8.40
2330927	Pipe shoe MP-PS L1-1 52-58 OC	1.59	0.56	2.85	0.38	14.31	10.95	1.58	10.86	8.40
2330928	Pipe shoe MP-PS L1-1 59-65 2" OC	1.68	0.56	2.77	0.38	14.31	10.95	1.58	10.86	8.40
2330929	Pipe shoe MP-PS L1-1 68-74 OC	1.82	0.56	2.66	0.38	14.31	10.95	1.58	10.86	8.40
2330930	Pipe shoe MP-PS L1-1 75-81 2-1/2" OC	1.86	0.56	2.60	0.37	14.31	10.95	1.58	10.86	8.40
2330931	Pipe shoe MP-PS L1-1 88-94 3" OC	2.09	0.56	2.48	0.37	14.31	10.95	1.58	10.86	8.40
2330932	Pipe shoe MP-PS L1-1 100-108 3-1/2" OC	2.26	0.56	2.36	0.36	14.31	10.95	1.58	10.86	8.40
2330933	Pipe shoe MP-PS L1-1 110-118 4" OC	2.44	0.56	2.26	0.36	14.31	10.95	1.58	10.86	8.40
2330934	Pipe shoe MP-PS L1-1 125-133 OC	2.59	0.56	2.18	0.35	14.31	10.95	1.58	10.86	8.40
2330935	Pipe shoe MP-PS L1-1 136-144 5" OC	2.82	0.56	2.08	0.34	14.31	10.95	1.58	10.86	8.40
2330936	Pipe shoe MP-PS L1-1 152-162 OC	3.07	0.56	1.96	0.34	14.31	10.95	1.58	10.86	8.40
2330937	Pipe shoe MP-PS L1-1 163-173 6" OC	3.20	0.56	1.91	0.33	14.31	10.95	1.58	10.86	8.40

**Notes**

Shown EN1993-1-1 load values are recommended values with partial safety factors for action and resistance included. Design value in X & Y directions = 1.0 x recommended value. Design value in Z direction = 1.35 x recommended value.

**MT-TFB OC and Hex M10 8.8 bolts:** partial safety factors on reaction side of 1.0 in X and Y directions and 1.35 in Z direction

**HST3:** no edge distance and spacing influence, minimum base material thickness considered, cracked concrete C 20/25, f<sub>ck,cube</sub>=25 N/mm<sup>2</sup>, partial safety factors on reaction side of 1.0 in X and Y directions and 1.35 in Z direction.

**Interaction formula**

$$\frac{F_{x,exp}}{F_{x,rec}} + \frac{F_{y,exp}}{F_{y,rec}} + \frac{F_{z,exp}}{F_{z,rec}} \leq 1.0$$

## PIPE SHOE MP-PS M1-1

R14230970

### General

Media temperature limits: -20 °C to +300 °C

Height adjustability: 116 - 171 mm (with sliding plate)  
113 - 168 mm (without sliding plate)

Slope adjustability: 12° (21%)

### Mass per Pipe Shoe version:

Item no.	Pipe Shoe version	Nominal height	DN (mm)	Mass (kg)
2330938	Pipe shoe MP-PS M1-1 21-26 1/2" OC	150	DN15	1.78
2330939	Pipe shoe MP-PS M1-1 26-31 3/4" OC	150	DN20	1.80
2330940	Pipe shoe MP-PS M1-1 32-37 1" OC	150	DN25	1.82
2330941	Pipe shoe MP-PS M1-1 38-44 1-1/4" OC	150	DN32	1.84
2330942	Pipe shoe MP-PS M1-1 45-51 1-1/2" OC	150	DN40	1.87
2330943	Pipe shoe MP-PS M1-1 52-58 OC	150	OD52-58	2.06
2330944	Pipe shoe MP-PS M1-1 59-65 2" OC	150	DN50	2.09
2330945	Pipe shoe MP-PS M1-1 68-74 OC	150	OD68-74	2.14
2330946	Pipe shoe MP-PS M1-1 75-81 2-1/2" OC	150	DN65	2.17
2330947	Pipe shoe MP-PS M1-1 88-94 3" OC	150	DN80	2.23
2330948	Pipe shoe MP-PS M1-1 100-108 3-1/2" OC	150	OD100-108	2.29
2330949	Pipe shoe MP-PS M1-1 110-118 4" OC	150	DN100	2.32
2330950	Pipe shoe MP-PS M1-1 125-133 OC	150	OD125-133	2.41
2330951	Pipe shoe MP-PS M1-1 136-144 5" OC	150	DN125	2.46
2330952	Pipe shoe MP-PS M1-1 152-162 OC	150	OD152-162	2.55
2330953	Pipe shoe MP-PS M1-1 163-173 6" OC	150	DN150	2.61



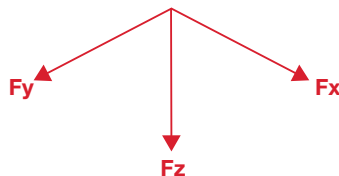
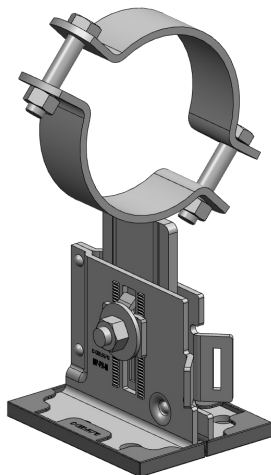
### Corrosion protection:

Component	Coating system	Zinc thickness, min. local (µm)
Top pipe ring	HDG per ISO 1461	55
Bottom pipe ring and midplate	HDG per ISO 1461	70
Baseplate	Continuously hot-dip Zinc-Magnesium coated per EN 10346	17
Serrated washers	Continuously hot-dip Zinc-Magnesium coated per EN 10346	17
Bolts; Nuts	HDG per ISO 10684	40;45

**Material properties:**

Component/Material	min. Yield strength	min. Ultimate strength	Modulus of elasticity	Shear modulus
Pipe rings and midplate S235JR (DIN EN10025-2)	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Baseplate and serrated washer S280GD (EN 10346) POSMAC-C MOD	$f_y = 280 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Bolts; Nuts F Class 8.8 (ISO 898-1); Grade 8 (ISO 898-2)	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Sliding plates PA66-GF30	Static friction coefficient values: Hot Dip Galvanized mating surface: 0.13 Zinc-Magnesium mating surface: 0.15 Zinc Electrogalvanised mating surface: 0.18			
Values for Modulus of Elasticity and Shear Modulus are according to EN 1993-1-1 and used for all Eurocode calculations Friction coefficient per ASTM D1894-14				

## DESIGN LOADING CAPACITY – 3D


**Notes for load data**

Load capacity given at delivery height = 150mm BOP (Bottom of pipe).

Point of load application = pipe center line (X-axis).

Load capacity given at room temperature.

Temperature correction factors apply:

- Per VGB-R-510 for load reported acc to EN13480-3
  - Per EN 1993-1-2 for loads reported acc to EN1993-1-1
- Temperature distribution on pipe shoe components per EN13480-3

Failure locations per force direction:

F<sub>x</sub> – deformation of pipe ring

F<sub>y</sub> – deformation of baseplate

+F<sub>z</sub>, -F<sub>z</sub> – ultimate failure at baseplate serrations

Published loads are based on static loading conditions and mounting according to IFU. Non-static forces must be separately considered during design.

Below published load data are applicable for:

- piece parts
- welded to steel according to IFU
- mounted with MT-TFB OC bolts on MT girders
- mounted with Hex M10 8.8 class bolts on I-beams
- mounted with HST3 Stud Anchors
- mounted with X-BT threaded stud

For all other required loads (i.e. different height, -slope,...) please use Fixpoint Calculator

**Recommended loads per EN13480-3**

Item no.	Pipe Shoe version	+/-F <sub>x,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN]	+F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN]
2330938	Pipe shoe MP-PS M1-1 21-26 1/2" OC	0.80	1.57	9.87	7.58
2330939	Pipe shoe MP-PS M1-1 26-31 3/4" OC	0.85	1.54	9.87	7.58
2330940	Pipe shoe MP-PS M1-1 32-37 1" OC	0.91	1.51	9.87	7.58
2330941	Pipe shoe MP-PS M1-1 38-44 1-1/4" OC	0.98	1.47	9.87	7.58
2330942	Pipe shoe MP-PS M1-1 45-51 1-1/2" OC	1.03	1.45	9.87	7.58
2330943	Pipe shoe MP-PS M1-1 52-58 OC	1.08	1.43	9.87	7.58
2330944	Pipe shoe MP-PS M1-1 59-65 2" OC	1.14	1.40	9.87	7.58
2330945	Pipe shoe MP-PS M1-1 68-74 OC	1.23	1.36	9.87	7.58
2330946	Pipe shoe MP-PS M1-1 75-81 2-1/2" OC	1.28	1.34	9.87	7.58
2330947	Pipe shoe MP-PS M1-1 88-94 3" OC	1.39	1.30	9.87	7.58
2330948	Pipe shoe MP-PS M1-1 100-108 3-1/2" OC	1.50	1.26	9.87	7.58
2330949	Pipe shoe MP-PS M1-1 110-118 4" OC	1.61	1.22	9.87	7.58
2330950	Pipe shoe MP-PS M1-1 125-133 OC	1.71	1.19	9.87	7.58
2330951	Pipe shoe MP-PS M1-1 136-144 5" OC	1.84	1.15	9.87	7.58
2330952	Pipe shoe MP-PS M1-1 152-162 OC	2.01	1.10	9.87	7.58
2330953	Pipe shoe MP-PS M1-1 163-173 6" OC	2.09	1.08	9.87	7.58

**Notes**

Shown load data for piece parts (without considering mounting and load capacity of the sub-structure)

**Interaction formula**

$$\frac{F_{x,exp}}{F_{x,rec}} + \frac{F_{y,exp}}{F_{y,rec}} + \frac{F_{z,exp}}{F_{z,rec}} \leq 1.0$$

**Recommended loads per EN1993-1-1**

Item no.	Pipe Shoe version	+/-F <sub>x,rec</sub> [kN]	+/-F <sub>x,rec</sub> [kN] in combination with X-BT only	+/-F <sub>y,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN] in combination with X-BT only	+F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN] in combination with X-BT only	-F <sub>z,rec</sub> [kN] in combination with MT-TFB only	-F <sub>z,rec</sub> [kN] in combination with HST3 only
2330938	Pipe shoe MP-PS M1-1 21-26 1/2" OC	1.27	0.56	2.07	0.34	14.31	10.95	1.58	10.86	8.40
2330939	Pipe shoe MP-PS M1-1 26-31 3/4" OC	1.35	0.56	2.04	0.34	14.31	10.95	1.58	10.86	8.40
2330940	Pipe shoe MP-PS M1-1 32-37 1" OC	1.45	0.56	2.00	0.34	14.31	10.95	1.58	10.86	8.40
2330941	Pipe shoe MP-PS M1-1 38-44 1-1/4" OC	1.57	0.56	1.94	0.34	14.31	10.95	1.58	10.86	8.40
2330942	Pipe shoe MP-PS M1-1 45-51 1-1/2" OC	1.65	0.56	1.91	0.33	14.31	10.95	1.58	10.86	8.40
2330943	Pipe shoe MP-PS M1-1 52-58 OC	1.73	0.56	1.88	0.33	14.31	10.95	1.58	10.86	8.40
2330944	Pipe shoe MP-PS M1-1 59-65 2" OC	1.82	0.56	1.85	0.33	14.31	10.95	1.58	10.86	8.40
2330945	Pipe shoe MP-PS M1-1 68-74 OC	1.96	0.56	1.80	0.32	14.31	10.95	1.58	10.86	8.40
2330946	Pipe shoe MP-PS M1-1 75-81 2-1/2" OC	2.05	0.56	1.77	0.32	14.31	10.95	1.58	10.86	8.40
2330947	Pipe shoe MP-PS M1-1 88-94 3" OC	2.23	0.56	1.71	0.32	14.31	10.95	1.58	10.86	8.40
2330948	Pipe shoe MP-PS M1-1 100-108 3-1/2" OC	2.40	0.56	1.66	0.31	14.31	10.95	1.58	10.86	8.40
2330949	Pipe shoe MP-PS M1-1 110-118 4" OC	2.58	0.56	1.61	0.31	14.31	10.95	1.58	10.86	8.40
2330950	Pipe shoe MP-PS M1-1 125-133 OC	2.73	0.56	1.57	0.31	14.31	10.95	1.58	10.86	8.40
2330951	Pipe shoe MP-PS M1-1 136-144 5" OC	2.94	0.56	1.51	0.30	14.31	10.95	1.58	10.86	8.40
2330952	Pipe shoe MP-PS M1-1 152-162 OC	3.21	0.56	1.45	0.29	14.31	10.95	1.58	10.86	8.40
2330953	Pipe shoe MP-PS M1-1 163-173 6" OC	3.34	0.56	1.42	0.29	14.31	10.95	1.58	10.86	8.40

**Notes**

Shown EN1993-1-1 load values are recommended values with partial safety factors for action and resistance included. Design value in X & Y directions = 1.0 x recommended value. Design value in Z direction = 1.35 x recommended value.

**MT-TFB OC and Hex M10 8.8 bolts:** partial safety factors on reaction side of 1.0 in X and Y directions and 1.35 in Z direction

**HST3:** no edge distance and spacing influence, minimum base material thickness considered, cracked concrete C 20/25, f<sub>ck,cube</sub>=25 N/mm<sup>2</sup>, partial safety factors on reaction side of 1.0 in X and Y directions and 1.35 in Z direction.

**Interaction formula**

$$\frac{F_{x,exp}}{F_{x,rec}} + \frac{F_{y,exp}}{F_{y,rec}} + \frac{F_{z,exp}}{F_{z,rec}} \leq 1.0$$

## PIPE SHOE MP-PS H1-1

R14230970

### General

Media temperature limits: -20 °C to +300 °C

Height adjustability: 171 - 223.5 mm (with sliding plate)  
168 - 220.5 mm (without sliding plate)

Slope adjustability: 12° (21%)

### Mass per Pipe Shoe version:

Item no.	Pipe Shoe version	Nominal height	DN (mm)	Mass (kg)
2330954	Pipe shoe MP-PS H1-1 21-26 1/2" OC	200	DN15	2.19
2330955	Pipe shoe MP-PS H1-1 26-31 3/4" OC	200	DN20	2.20
2330956	Pipe shoe MP-PS H1-1 32-37 1" OC	200	DN25	2.23
2330957	Pipe shoe MP-PS H1-1 38-44 1-1/4" OC	200	DN32	2.25
2330958	Pipe shoe MP-PS H1-1 45-51 1-1/2" OC	200	DN40	2.27
2330959	Pipe shoe MP-PS H1-1 52-58 OC	200	OD52-58	2.46
2330960	Pipe shoe MP-PS H1-1 59-65 2" OC	200	DN50	2.50
2330961	Pipe shoe MP-PS H1-1 68-74 OC	200	OD68-74	2.54
2330962	Pipe shoe MP-PS H1-1 75-81 2-1/2" OC	200	DN65	2.58
2330963	Pipe shoe MP-PS H1-1 88-94 3" OC	200	DN80	2.64
2330964	Pipe shoe MP-PS H1-1 100-108 3-1/2" OC	200	OD100-108	2.69
2330965	Pipe shoe MP-PS H1-1 110-118 4" OC	200	DN100	2.73
2330966	Pipe shoe MP-PS H1-1 125-133 OC	200	OD125-133	2.81
2330967	Pipe shoe MP-PS H1-1 136-144 5" OC	200	DN125	2.87
2330968	Pipe shoe MP-PS H1-1 152-162 OC	200	OD152-162	2.96
2330969	Pipe shoe MP-PS H1-1 163-173 6" OC	200	DN150	3.01



### Corrosion protection:

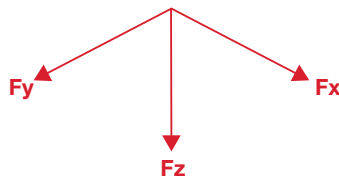
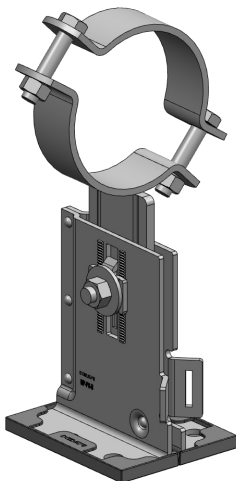
Component	Coating system	Zinc thickness, min. local (µm)
Top pipe ring	HDG per ISO 1461	55
Bottom pipe ring and midplate	HDG per ISO 1461	70
Baseplate	Continuously hot-dip Zinc-Magnesium coated per EN 10346	17
Serrated washers	Continuously hot-dip Zinc-Magnesium coated per EN 10346	17
Bolts; Nuts	HDG per ISO 10684	40;45



**Material properties:**

Component/Material	min. Yield strength	min. Ultimate strength	Modulus of elasticity	Shear modulus
Pipe rings and midplate S235JR (DIN EN10025-2)	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Baseplate and serrated washer S280GD (EN 10346) POSMAC-C MOD	$f_y = 280 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Bolts; Nuts F Class 8.8 (ISO 898-1); Grade 8 (ISO 898-2)	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Sliding plates PA66-GF30	Static friction coefficient values: Hot Dip Galvanized mating surface: 0.13 Zinc-Magnesium mating surface: 0.15 Zinc Electrogalvanised mating surface: 0.18			
Values for Modulus of Elasticity and Shear Modulus are according to EN 1993-1-1 and used for all Eurocode calculations Friction coefficient per ASTM D1894-14				

## DESIGN LOADING CAPACITY – 3D


**Notes for load data**

Load capacity given at delivery height = 200mm BOP (Bottom of pipe).

Point of load application = pipe center line (X-axis).

Load capacity given at room temperature.

Temperature correction factors apply:

- Per VGB-R-510 for load reported acc to EN13480-3
  - Per EN 1993-1-2 for loads reported acc to EN1993-1-1
- Temperature distribution on pipe shoe components per EN13480-3

Failure locations per force direction:

F<sub>x</sub> – deformation of pipe ring

F<sub>y</sub> – deformation of baseplate

+F<sub>z</sub>, -F<sub>z</sub> – ultimate failure at baseplate serrations

Published loads are based on static loading conditions and mounting according to IFU. Non-static forces must be separately considered during design.

Below published load data are applicable for:

- piece parts
- welded to steel according to IFU
- mounted with MT-TFB OC bolts on MT girders
- mounted with Hex M10 8.8 class bolts on I-beams
- mounted with HST3 Stud Anchors
- mounted with X-BT threaded stud

For all other required loads (i.e. different height, -slope,...) please use Fixpoint Calculator

**Recommended loads per EN13480-3**

Item no.	Pipe Shoe version	+/-F <sub>x,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN]	+F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN]
2330954	Pipe shoe MP-PS H1-1 21-26 1/2" OC	0.75	1.20	9.87	7.58
2330955	Pipe shoe MP-PS H1-1 26-31 3/4" OC	0.80	1.18	9.87	7.58
2330956	Pipe shoe MP-PS H1-1 32-37 1" OC	0.86	1.16	9.87	7.58
2330957	Pipe shoe MP-PS H1-1 38-44 1-1/4" OC	0.94	1.14	9.87	7.58
2330958	Pipe shoe MP-PS H1-1 45-51 1-1/2" OC	0.99	1.13	9.87	7.58
2330959	Pipe shoe MP-PS H1-1 52-58 OC	1.04	1.11	9.87	7.58
2330960	Pipe shoe MP-PS H1-1 59-65 2" OC	1.10	1.10	9.87	7.58
2330961	Pipe shoe MP-PS H1-1 68-74 OC	1.18	1.07	9.87	7.58
2330962	Pipe shoe MP-PS H1-1 75-81 2-1/2" OC	1.24	1.06	9.87	7.58
2330963	Pipe shoe MP-PS H1-1 88-94 3" OC	1.35	1.03	9.87	7.58
2330964	Pipe shoe MP-PS H1-1 100-108 3-1/2" OC	1.46	1.01	9.87	7.58
2330965	Pipe shoe MP-PS H1-1 110-118 4" OC	1.57	0.98	9.87	7.58
2330966	Pipe shoe MP-PS H1-1 125-133 OC	1.67	0.96	9.87	7.58
2330967	Pipe shoe MP-PS H1-1 136-144 5" OC	1.79	0.94	9.87	7.58
2330968	Pipe shoe MP-PS H1-1 152-162 OC	1.96	0.90	9.87	7.58
2330969	Pipe shoe MP-PS H1-1 163-173 6" OC	2.05	0.89	9.87	7.58

**Notes**

Shown load data for piece parts (without considering mounting and load capacity of the sub-structure)

**Interaction formula**

$$\frac{F_{x,exp}}{F_{x,rec}} + \frac{F_{y,exp}}{F_{y,rec}} + \frac{F_{z,exp}}{F_{z,rec}} \leq 1.0$$

**Recommended loads per EN1993-1-1**

Item no.	Pipe Shoe version	+/-F <sub>x,rec</sub> [kN]	+/-F <sub>x,rec</sub> [kN] in combination with X-BT only	+/-F <sub>y,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN] in combination with X-BT only	+F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN] in combination with X-BT only	-F <sub>z,rec</sub> [kN] in combination with MT-TFB only	-F <sub>z,rec</sub> [kN] in combination with HST3 only
2330954	Pipe shoe MP-PS H1-1 21-26 1/2" OC	1.20	0.56	1.58	0.31	14.31	10.95	1.58	10.86	8.40
2330955	Pipe shoe MP-PS H1-1 26-31 3/4" OC	1.28	0.56	1.56	0.30	14.31	10.95	1.58	10.86	8.40
2330956	Pipe shoe MP-PS H1-1 32-37 1" OC	1.38	0.56	1.54	0.30	14.31	10.95	1.58	10.86	8.40
2330957	Pipe shoe MP-PS H1-1 38-44 1-1/4" OC	1.50	0.56	1.50	0.30	14.31	10.95	1.58	10.86	8.40
2330958	Pipe shoe MP-PS H1-1 45-51 1-1/2" OC	1.58	0.56	1.49	0.30	14.31	10.95	1.58	10.86	8.40
2330959	Pipe shoe MP-PS H1-1 52-58 OC	1.66	0.56	1.47	0.30	14.31	10.95	1.58	10.86	8.40
2330960	Pipe shoe MP-PS H1-1 59-65 2" OC	1.75	0.56	1.45	0.29	14.31	10.95	1.58	10.86	8.40
2330961	Pipe shoe MP-PS H1-1 68-74 OC	1.89	0.56	1.42	0.29	14.31	10.95	1.58	10.86	8.40
2330962	Pipe shoe MP-PS H1-1 75-81 2-1/2" OC	1.97	0.56	1.40	0.29	14.31	10.95	1.58	10.86	8.40
2330963	Pipe shoe MP-PS H1-1 88-94 3" OC	2.15	0.56	1.36	0.29	14.31	10.95	1.58	10.86	8.40
2330964	Pipe shoe MP-PS H1-1 100-108 3-1/2" OC	2.33	0.56	1.33	0.28	14.31	10.95	1.58	10.86	8.40
2330965	Pipe shoe MP-PS H1-1 110-118 4" OC	2.51	0.56	1.29	0.28	14.31	10.95	1.58	10.86	8.40
2330966	Pipe shoe MP-PS H1-1 125-133 OC	2.66	0.56	1.27	0.28	14.31	10.95	1.58	10.86	8.40
2330967	Pipe shoe MP-PS H1-1 136-144 5" OC	2.87	0.56	1.23	0.27	14.31	10.95	1.58	10.86	8.40
2330968	Pipe shoe MP-PS H1-1 152-162 OC	3.14	0.56	1.19	0.27	14.31	10.95	1.58	10.86	8.40
2330969	Pipe shoe MP-PS H1-1 163-173 6" OC	3.27	0.56	1.17	0.26	14.31	10.95	1.58	10.86	8.40

**Notes**

Shown EN1993-1-1 load values are recommended values with partial safety factors for action and resistance included. Design value in X & Y directions = 1.0 x recommended value. Design value in Z direction = 1.35 x recommended value.

**MT-TFB OC and Hex M10 8.8 bolts:** partial safety factors on reaction side of 1.0 in X and Y directions and 1.35 in Z direction

**HST3:** no edge distance and spacing influence, minimum base material thickness considered, cracked concrete C 20/25, f<sub>ck,cube</sub>=25 N/mm<sup>2</sup>, partial safety factors on reaction side of 1.0 in X and Y directions and 1.35 in Z direction.

**Interaction formula**

$$\frac{F_{x,exp}}{F_{x,rec}} + \frac{F_{y,exp}}{F_{y,rec}} + \frac{F_{z,exp}}{F_{z,rec}} \leq 1.0$$

## PIPE SHOE MP-PS L2-2

## R14230971

### General

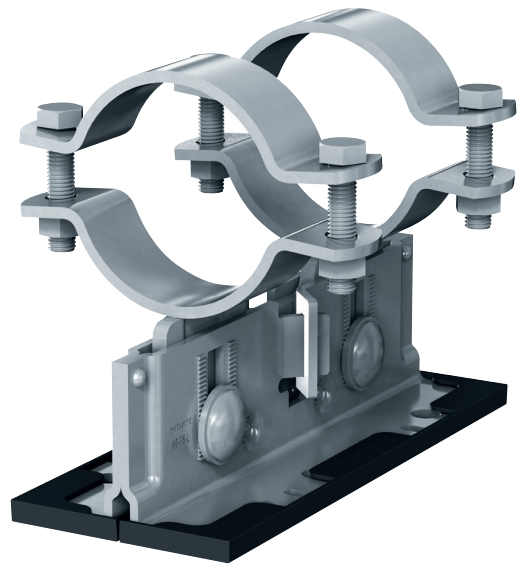
Media temperature limits: -20 °C to +300 °C

Height adjustability: 88.5 - 116 mm (with sliding plate)  
85.5 - 113 mm (without sliding plate)

Slope adjustability: 12° (21%)

### Mass per Pipe Shoe version:

Item no.	Pipe Shoe version	Nominal height	DN (mm)	Mass (kg)
2330973	MP-PS L2-2 21-26 1/2" OC	90	DN15	3.12
2330974	MP-PS L2-2 26-31 3/4" OC	90	DN20	3.15
2330975	MP-PS L2-2 32-37 1" OC	90	DN25	3.20
2330976	MP-PS L2-2 38-44 1-1/4" OC	90	DN32	3.24
2330977	MP-PS L2-2 45-51 1-1/2" OC	90	DN40	3.29
2330978	MP-PS L2-2 52-58 OC	90	OD52-58	3.67
2330979	MP-PS L2-2 59-65 2" OC	90	DN50	3.74
2330980	MP-PS L2-2 68-74 OC	90	OD68-74	3.83
2330981	MP-PS L2-2 75-81 2-1/2" OC	90	DN65	3.90
2330982	MP-PS L2-2 88-94 3" OC	90	DN80	4.02
2330983	MP-PS L2-2 100-108 3-1/2" OC	90	OD100-108	4.13
2330984	MP-PS L2-2 110-118 4" OC	90	DN100	4.22
2330985	MP-PS L2-2 125-133 OC	90	OD125-133	4.37
2330986	MP-PS L2-2 136-144 5" OC	90	DN125	4.48
2330987	MP-PS L2-2 152-162 OC	90	OD152-162	4.66
2330988	MP-PS L2-2 163-173 6" OC	90	DN150	4.77
2330989	MP-PS L2-2 192-202 7" OC	90	OD192-202	6.11
2330990	MP-PS L2-2 217-227 8" OC	90	DN200	6.48
2330991	MP-PS L2-2 244-254 OC	90	OD244-254	7.35
2330992	MP-PS L2-2 267-277 10" OC	90	DN250	7.68
2330993	MP-PS L2-2 318-328 12" OC	90	DN300	8.43



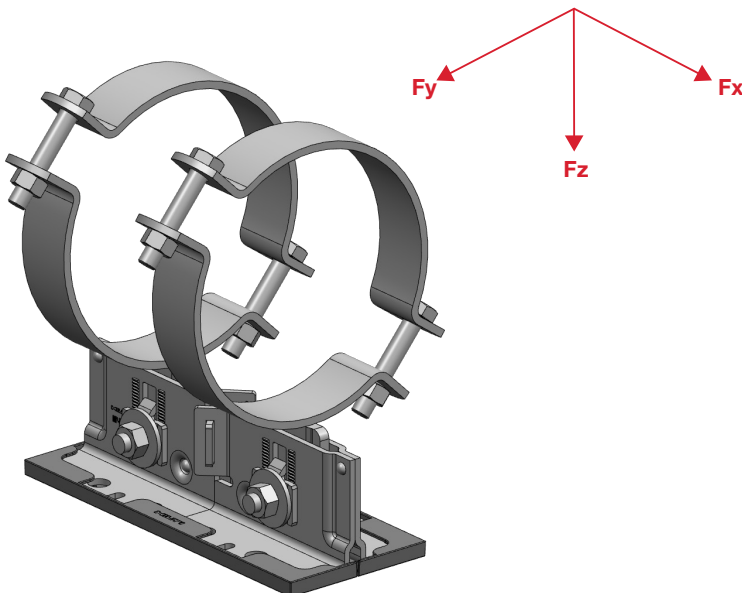
### Corrosion protection:

Component	Coating system	Zinc thickness, min. local (µm)
Top pipe ring	HDG per ISO 1461	55
Bottom pipe ring and midplate	HDG per ISO 1461	70
Baseplate	Continuously hot-dip Zinc-Magnesium coated per EN 10346	17
Serrated washers	Continuously hot-dip Zinc-Magnesium coated per EN 10346	17
Bolts; Nuts	HDG per ISO 10684	40;45

**Material properties:**

Component/Material	min. Yield strength	min. Ultimate strength	Modulus of elasticity	Shear modulus
Pipe rings and midplate S235JR (DIN EN10025-2)	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Baseplate and serrated washer S280GD (EN 10346) POSMAC-C MOD	$f_y = 280 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Bolts; Nuts F Class 8.8 (ISO 898-1); Grade 8 (ISO 898-2)	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Sliding plates PA66-GF30	Static friction coefficient values: Hot Dip Galvanized mating surface: 0.13 Zinc-Magnesium mating surface: 0.15 Zinc Electrogalvanised mating surface: 0.18			
Values for Modulus of Elasticity and Shear Modulus are according to EN 1993-1-1 and used for all Eurocode calculations Friction coefficient per ASTM D1894-14				

## DESIGN LOADING CAPACITY – 3D


**Notes for load data**

Load capacity given at delivery height = 90mm BOP (Bottom of pipe).

Point of load application = pipe center line (X-axis).

Load capacity given at room temperature.

Temperature correction factors apply:

- Per VGB-R-510 for load reported acc to EN13480-3
  - Per EN 1993-1-2 for loads reported acc to EN1993-1-1
- Temperature distribution on pipe shoe components per EN13480-3

Failure locations per force direction:

Fx – deformation of pipe ring

Fy – deformation of baseplate

+Fz, -Fz – ultimate failure at baseplate serrations

Published loads are based on static loading conditions and mounting according to IFU. Non-static forces must be separately considered during design.

Below published load data are applicable for:

- piece parts
- welded to steel according to IFU
- mounted with MT-TFB OC bolts on MT girders
- mounted with Hex M10 8.8 class bolts on I-beams
- mounted with HST3 Stud Anchors
- mounted with X-BT threaded stud

For all other required loads (i.e. different height, -slope,...) please use Fixpoint Calculator

**Recommended loads per EN13480-3**

Item No.	Pipe Shoe version	+/-F <sub>x,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN]	+F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN]
2330973	Pipe shoe MP-PS L2-2 21-26 1/2" OC	11.29	3.85	17.57	13.44
2330974	Pipe shoe MP-PS L2-2 26-31 3/4" OC	11.42	3.75	17.57	13.44
2330975	Pipe shoe MP-PS L2-2 32-37 1" OC	11.58	3.63	17.57	13.44
2330976	Pipe shoe MP-PS L2-2 38-44 1-1/4" OC	11.79	3.49	17.57	13.44
2330977	Pipe shoe MP-PS L2-2 45-51 1-1/2" OC	11.94	3.40	17.57	13.44
2330978	Pipe shoe MP-PS L2-2 52-58 OC	12.08	3.31	17.57	13.44
2330979	Pipe shoe MP-PS L2-2 59-65 2" OC	12.23	3.23	17.57	13.44
2330980	Pipe shoe MP-PS L2-2 68-74 OC	12.47	3.10	17.57	13.44
2330981	Pipe shoe MP-PS L2-2 75-81 2-1/2" OC	12.54	3.03	17.57	13.44
2330982	Pipe shoe MP-PS L2-2 88-94 3" OC	12.93	2.88	17.57	13.44
2330983	Pipe shoe MP-PS L2-2 100-108 3-1/2" OC	13.23	2.75	17.57	13.44
2330984	Pipe shoe MP-PS L2-2 110-118 4" OC	13.54	2.63	17.57	13.44
2330985	Pipe shoe MP-PS L2-2 125-133 OC	13.80	2.54	17.57	13.44
2330986	Pipe shoe MP-PS L2-2 136-144 5" OC	14.20	2.42	17.57	13.44
2330987	Pipe shoe MP-PS L2-2 152-162 OC	14.63	2.29	17.57	13.44
2330988	Pipe shoe MP-PS L2-2 163-173 6" OC	14.85	2.23	17.57	13.44
2330989	Pipe shoe MP-PS L2-2 192-202 7" OC	15.47	2.07	17.57	13.44
2330990	Pipe shoe MP-PS L2-2 217-227 8" OC	16.09	1.94	17.57	13.44
2330991	Pipe shoe MP-PS L2-2 244-254 OC	16.84	1.80	17.57	13.44
2330992	Pipe shoe MP-PS L2-2 267-277 10" OC	17.40	1.71	17.57	13.44
2330993	Pipe shoe MP-PS L2-2 318-328 12" OC	18.58	1.54	17.57	13.44

**Notes**

Shown load data for piece parts (without considering mounting and load capacity of the sub-structure)

**Interaction formula**

$$\frac{F_{x,exp}}{F_{x,rec}} + \frac{F_{y,exp}}{F_{y,rec}} + \frac{F_{z,exp}}{F_{z,rec}} \leq 1.0$$

**Recommended loads per EN1993-1-1**

Item No.	Pipe Shoe version	$\pm F_{x,rec}$ [kN]	$\pm F_{x,rec}$ [kN] in combina- tion with X-BT only	$\pm F_{y,rec}$ [kN]	$\pm F_{y,rec}$ [kN] in combina- tion with X-BT only	$F_{z,rec}$ [kN]	$-F_{z,rec}$ [kN]	$-F_{z,rec}$ [kN] in combina- tion with X-BT only
2330973	Pipe shoe MP-PS L2-2 21-26 1/2" OC	16.25	1.12	3.91	0.80	19.76	15.20	4.74
2330974	Pipe shoe MP-PS L2-2 26-31 3/4" OC	16.44	1.12	3.81	0.80	19.76	15.20	4.74
2330975	Pipe shoe MP-PS L2-2 32-37 1" OC	16.67	1.12	3.69	0.79	19.76	15.20	4.74
2330976	Pipe shoe MP-PS L2-2 38-44 1-1/4" OC	16.98	1.12	3.54	0.78	19.76	15.20	4.74
2330977	Pipe shoe MP-PS L2-2 45-51 1-1/2" OC	17.20	1.12	3.45	0.77	19.76	15.20	4.74
2330978	Pipe shoe MP-PS L2-2 52-58 OC	17.39	1.12	3.37	0.77	19.76	15.20	4.74
2330979	Pipe shoe MP-PS L2-2 59-65 2" OC	17.61	1.12	3.28	0.76	19.76	15.20	4.74
2330980	Pipe shoe MP-PS L2-2 68-74 OC	17.95	1.12	3.15	0.75	19.76	15.20	4.74
2330981	Pipe shoe MP-PS L2-2 75-81 2-1/2" OC	18.06	1.12	3.08	0.75	19.76	15.20	4.74
2330982	Pipe shoe MP-PS L2-2 88-94 3" OC	18.61	1.12	2.93	0.73	19.76	15.20	4.74
2330983	Pipe shoe MP-PS L2-2 100-108 3-1/2" OC	19.06	1.12	2.80	0.72	19.76	15.20	4.74
2330984	Pipe shoe MP-PS L2-2 110-118 4" OC	19.50	1.12	2.68	0.71	19.76	15.20	4.74
2330985	Pipe shoe MP-PS L2-2 125-133 OC	19.88	1.12	2.58	0.70	19.76	15.20	4.74
2330986	Pipe shoe MP-PS L2-2 136-144 5" OC	20.45	1.12	2.46	0.69	19.76	15.20	4.74
2330987	Pipe shoe MP-PS L2-2 152-162 OC	21.06	1.12	2.32	0.67	19.76	15.20	4.74
2330988	Pipe shoe MP-PS L2-2 163-173 6" OC	21.39	1.12	2.26	0.67	19.76	15.20	4.74
2330989	Pipe shoe MP-PS L2-2 192-202 7" OC	22.28	1.12	2.11	0.65	19.76	15.20	4.74
2330990	Pipe shoe MP-PS L2-2 217-227 8" OC	23.16	1.12	1.97	0.63	19.76	15.20	4.74
2330991	Pipe shoe MP-PS L2-2 244-254 OC	24.24	1.12	1.83	0.61	19.76	15.20	4.74
2330992	Pipe shoe MP-PS L2-2 267-277 10" OC	25.05	1.12	1.74	0.59	19.76	15.20	4.74
2330993	Pipe shoe MP-PS L2-2 318-328 12" OC	26.48	1.12	1.56	0.56	19.76	15.20	4.74

**Notes**

Shown EN1993-1-1 load values are recommended values with partial safety factors for action and resistance included. Design value in X & Y directions = 1.0 x recommended value. Design value in Z direction = 1.35 x recommended value

**MT-TFB OC and Hex M10 8.8 bolts:** partial safety factors on reaction side of 1.0 in X and Y directions and 1.35 in Z direction

**HST3:** no edge distance and spacing influence, minimum base material thickness considered, cracked concrete C 20/25,  $f_{ck,cube}=25$  N/mm<sup>2</sup>, partial safety factors on reaction side of 1.0 in X and Y directions and 1.35 in Z direction.

**Interaction formula**

$$\frac{F_{x,exp}}{F_{x,rec}} + \frac{F_{y,exp}}{F_{y,rec}} + \frac{F_{z,exp}}{F_{z,rec}} \leq 1.0$$

## PIPE SHOE MP-PS M2-2

## R14230971

### General

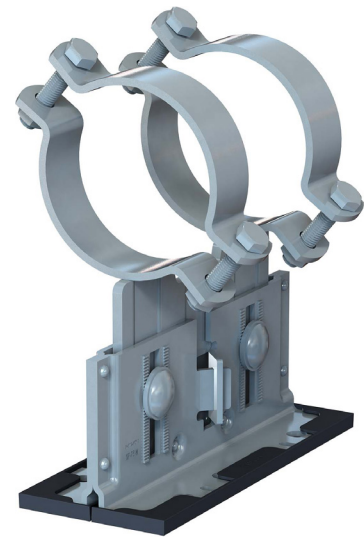
Media temperature limits: -20 °C to +300 °C

Height adjustability: 116 - 171 mm (with sliding plate)  
113 - 168 mm (without sliding plate)

Slope adjustability: 12° (21%)

### Mass per Pipe Shoe version:

Item no.	Pipe Shoe version	Nominal height	DN (mm)	Mass (kg)
2330994	Pipe shoe MP-PS M2-2 21-26 1/2" OC	150	DN15	3.76
2330995	Pipe shoe MP-PS M2-2 26-31 3/4" OC	150	DN20	3.80
2330996	Pipe shoe MP-PS M2-2 32-37 1" OC	150	DN25	3.85
2330997	Pipe shoe MP-PS M2-2 38-44 1-1/4" OC	150	DN32	3.88
2330998	Pipe shoe MP-PS M2-2 45-51 1-1/2" OC	150	DN40	3.94
2330970	Pipe shoe MP-PS M2-2 52-58 OC	150	OD52-58	4.31
2330971	Pipe shoe MP-PS M2-2 59-65 2" OC	150	DN50	4.39
2330972	Pipe shoe MP-PS M2-2 68-74 OC	150	OD68-74	4.48
2330999	Pipe shoe MP-PS M2-2 75-81 2-1/2" OC	150	DN65	4.55
2331000	Pipe shoe MP-PS M2-2 88-94 3" OC	150	DN80	4.66
2331001	Pipe shoe MP-PS M2-2 100-108 3-1/2" OC	150	OD100-108	4.77
2331002	Pipe shoe MP-PS M2-2 110-118 4" OC	150	DN100	4.86
2331003	Pipe shoe MP-PS M2-2 125-133 OC	150	OD125-133	5.01
2331004	Pipe shoe MP-PS M2-2 136-144 5" OC	150	DN125	5.13
2331005	Pipe shoe MP-PS M2-2 152-162 OC	150	OD152-162	5.31
2331006	Pipe shoe MP-PS M2-2 163-173 6" OC	150	DN150	5.42
2331007	Pipe shoe MP-PS M2-2 192-202 7" OC	150	OD192-202	6.75
2331008	Pipe shoe MP-PS M2-2 217-227 8" OC	150	DN200	7.13
2331009	Pipe shoe MP-PS M2-2 244-254 OC	150	OD244-254	7.99
2331010	Pipe shoe MP-PS M2-2 267-277 10" OC	150	DN250	8.33
2331011	Pipe shoe MP-PS M2-2 318-328 12" OC	150	DN300	9.07



### Corrosion protection:

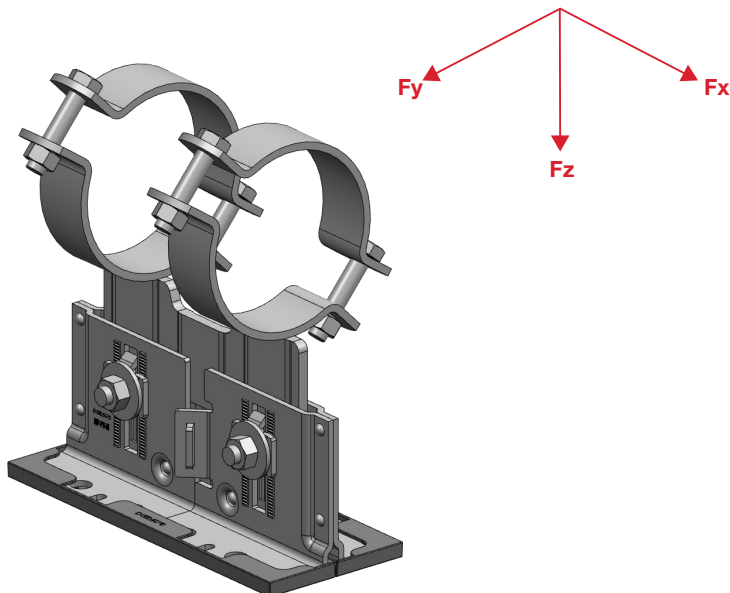
Component	Coating system	Zinc thickness, min. local (µm)
Top pipe ring	HDG per ISO 1461	55
Bottom pipe ring and midplate	HDG per ISO 1461	70
Baseplate	Continuously hot-dip Zinc-Magnesium coated per EN 10346	17
Serrated washers	Continuously hot-dip Zinc-Magnesium coated per EN 10346	17
Bolts; Nuts	HDG per ISO 10684	40;45



**Material properties:**

Component/Material	min. Yield strength	min. Ultimate strength	Modulus of elasticity	Shear modulus
Pipe rings and midplate S235JR (DIN EN10025-2)	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Baseplate and serrated washer S280GD (EN 10346) POSMAC-C MOD	$f_y = 280 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Bolts; Nuts F Class 8.8 (ISO 898-1); Grade 8 (ISO 898-2)	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Sliding plates PA66-GF30	Static friction coefficient values: Hot Dip Galvanized mating surface: 0.13 Zinc-Magnesium mating surface: 0.15 Zinc Electrogalvanised mating surface: 0.18			
Values for Modulus of Elasticity and Shear Modulus are according to EN 1993-1-1 and used for all Eurocode calculations Friction coefficient per ASTM D1894-14				

## DESIGN LOADING CAPACITY – 3D


**Notes for load data**

Load capacity given at delivery height = 150mm BOP (Bottom of pipe).

Point of load application = pipe center line (X-axis).

Load capacity given at room temperature.

Temperature correction factors apply:

- Per VGB-R-510 for load reported acc to EN13480-3
  - Per EN 1993-1-2 for loads reported acc to EN1993-1-1
- Temperature distribution on pipe shoe components per EN13480-3

Failure locations per force direction:

Fx – deformation of pipe ring

Fy – deformation of baseplate

+Fz, -Fz – ultimate failure at baseplate serrations

Published loads are based on static loading conditions and mounting according to IFU. Non-static forces must be separately considered during design.

Below published load data are applicable for:

- piece parts
- welded to steel according to IFU
- mounted with MT-TFB OC bolts on MT girders
- mounted with Hex M10 8.8 class bolts on I-beams
- mounted with HST3 Stud Anchors
- mounted with X-BT threaded stud

For all other required loads (i.e. different height, -slope,...) please use Fixpoint Calculator

**Recommended loads per EN13480-3**

Item No.	Pipe Shoe version	+/-F <sub>x,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN]	+F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN]
2330994	Pipe shoe MP-PS M2-2 21-26 1/2" OC	14.20	2.41	17.57	13.44
2330995	Pipe shoe MP-PS M2-2 26-31 3/4" OC	14.33	2.37	17.57	13.44
2330996	Pipe shoe MP-PS M2-2 32-37 1" OC	14.50	2.32	17.57	13.44
2330997	Pipe shoe MP-PS M2-2 38-44 1-1/4" OC	14.71	2.26	17.57	13.44
2330998	Pipe shoe MP-PS M2-2 45-51 1-1/2" OC	14.85	2.23	17.57	13.44
2330970	Pipe shoe MP-PS M2-2 52-58 OC	14.99	2.19	17.57	13.44
2330971	Pipe shoe MP-PS M2-2 59-65 2" OC	15.14	2.15	17.57	13.44
2330972	Pipe shoe MP-PS M2-2 68-74 OC	15.38	2.09	17.57	13.44
2330999	Pipe shoe MP-PS M2-2 75-81 2-1/2" OC	15.53	2.06	17.57	13.44
2331000	Pipe shoe MP-PS M2-2 88-94 3" OC	15.84	1.99	17.57	13.44
2331001	Pipe shoe MP-PS M2-2 100-108 3-1/2" OC	16.15	1.93	17.57	13.44
2331002	Pipe shoe MP-PS M2-2 110-118 4" OC	16.46	1.87	17.57	13.44
2331003	Pipe shoe MP-PS M2-2 125-133 OC	16.71	1.82	17.57	13.44
2331004	Pipe shoe MP-PS M2-2 136-144 5" OC	17.07	1.76	17.57	13.44
2331005	Pipe shoe MP-PS M2-2 152-162 OC	17.54	1.69	17.57	13.44
2331006	Pipe shoe MP-PS M2-2 163-173 6" OC	17.77	1.66	17.57	13.44
2331007	Pipe shoe MP-PS M2-2 192-202 7" OC	18.38	1.57	17.57	13.44
2331008	Pipe shoe MP-PS M2-2 217-227 8" OC	18.58	1.49	17.57	13.44
2331009	Pipe shoe MP-PS M2-2 244-254 OC	18.58	1.41	17.57	13.44
2331010	Pipe shoe MP-PS M2-2 267-277 10" OC	18.58	1.35	17.57	13.44
2331011	Pipe shoe MP-PS M2-2 318-328 12" OC	18.58	1.24	17.57	13.44

**Notes**

Shown load data for piece parts (without considering mounting and load capacity of the sub-structure)

**Interaction formula**

$$\frac{F_{x,exp}}{F_{x,rec}} + \frac{F_{y,exp}}{F_{y,rec}} + \frac{F_{z,exp}}{F_{z,rec}} \leq 1.0$$

**Recommended loads per EN1993-1-1**

Item No.	Pipe Shoe version	+/-F <sub>x,rec</sub> [kN]	+/-F <sub>x,rec</sub> [kN] in combi- nation with X-BT only	+/-F <sub>y,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN] in combi- nation with X-BT only	+F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN] in combi- nation with X-BT only
2330994	Pipe shoe MP-PS M2-2 21-26 1/2" OC	20.45	1.12	2.45	0.69	19.76	15.20	4.74
2330995	Pipe shoe MP-PS M2-2 26-31 3/4" OC	20.64	1.12	2.41	0.68	19.76	15.20	4.74
2330996	Pipe shoe MP-PS M2-2 32-37 1" OC	20.88	1.12	2.36	0.68	19.76	15.20	4.74
2330997	Pipe shoe MP-PS M2-2 38-44 1-1/4" OC	21.18	1.12	2.30	0.67	19.76	15.20	4.74
2330998	Pipe shoe MP-PS M2-2 45-51 1-1/2" OC	21.39	1.12	2.26	0.67	19.76	15.20	4.74
2330970	Pipe shoe MP-PS M2-2 52-58 OC	21.59	1.12	2.23	0.66	19.76	15.20	4.74
2330971	Pipe shoe MP-PS M2-2 59-65 2" OC	21.81	1.12	2.19	0.66	19.76	15.20	4.74
2330972	Pipe shoe MP-PS M2-2 68-74 OC	22.15	1.12	2.13	0.65	19.76	15.20	4.74
2330999	Pipe shoe MP-PS M2-2 75-81 2-1/2" OC	22.36	1.12	2.09	0.65	19.76	15.20	4.74
2331000	Pipe shoe MP-PS M2-2 88-94 3" OC	22.81	1.12	2.03	0.64	19.76	15.20	4.74
2331001	Pipe shoe MP-PS M2-2 100-108 3-1/2" OC	23.25	1.12	1.96	0.63	19.76	15.20	4.74
2331002	Pipe shoe MP-PS M2-2 110-118 4" OC	23.70	1.12	1.90	0.62	19.76	15.20	4.74
2331003	Pipe shoe MP-PS M2-2 125-133 OC	24.07	1.12	1.85	0.61	19.76	15.20	4.74
2331004	Pipe shoe MP-PS M2-2 136-144 5" OC	24.58	1.12	1.79	0.60	19.76	15.20	4.74
2331005	Pipe shoe MP-PS M2-2 152-162 OC	25.26	1.12	1.72	0.59	19.76	15.20	4.74
2331006	Pipe shoe MP-PS M2-2 163-173 6" OC	25.58	1.12	1.68	0.58	19.76	15.20	4.74
2331007	Pipe shoe MP-PS M2-2 192-202 7" OC	26.47	1.12	1.60	0.57	19.76	15.20	4.74
2331008	Pipe shoe MP-PS M2-2 217-227 8" OC	26.48	1.12	1.52	0.56	19.76	15.20	4.74
2331009	Pipe shoe MP-PS M2-2 244-254 OC	26.48	1.12	1.43	0.54	19.76	15.20	4.74
2331010	Pipe shoe MP-PS M2-2 267-277 10" OC	26.48	1.12	1.37	0.53	19.76	15.20	4.74
2331011	Pipe shoe MP-PS M2-2 318-328 12" OC	26.48	1.12	1.26	0.50	19.76	15.20	4.74

**Notes**

Shown EN1993-1-1 load values are recommended values with partial safety factors for action and resistance included. Design value in X & Y directions = 1.0 x recommended value. Design value in Z direction = 1.35 x recommended value.

**MT-TFB OC and Hex M10 8.8 bolts and X-BT-MR M10/W10:** partial safety factors on reaction side of 1.0 in X and Y directions and 1.35 in Z direction

**HST3:** no edge distance and spacing influence, minimum base material thickness considered, cracked concrete C 20/25, f<sub>ck,cube</sub>=25 N/mm<sup>2</sup>, partial safety factors on reaction side of 1.0 in X and Y directions and 1.35 in Z direction.

**Interaction formula**

$$\frac{F_{x,exp}}{F_{x,rec}} + \frac{F_{y,exp}}{F_{y,rec}} + \frac{F_{z,exp}}{F_{z,rec}} \leq 1.0$$

## PIPE SHOE MP-PS H2-2

## R14230971

### General

Media temperature limits: -20 °C to +300 °C

Height adjustability: 171 - 223.5 mm (with sliding plate)  
168 - 220.5 mm (without sliding plate)

Slope adjustability: 12° (21%)

### Mass per Pipe Shoe version:

Item no.	Pipe Shoe version	Nominal height	DN (mm)	Mass (kg)
2331012	Pipe shoe MP-PS H2-2 21-26 1/2" OC	200	DN15	4.57
2331013	Pipe shoe MP-PS H2-2 26-31 3/4" OC	200	DN20	4.61
2331014	Pipe shoe MP-PS H2-2 32-37 1" OC	200	DN25	4.66
2331015	Pipe shoe MP-PS H2-2 38-44 1-1/4" OC	200	DN32	4.69
2331016	Pipe shoe MP-PS H2-2 45-51 1-1/2" OC	200	DN40	4.75
2331017	Pipe shoe MP-PS H2-2 52-58 OC	200	OD52-58	5.12
2331018	Pipe shoe MP-PS H2-2 59-65 2" OC	200	DN50	5.20
2331019	Pipe shoe MP-PS H2-2 68-74 OC	200	OD68-74	5.29
2331020	Pipe shoe MP-PS H2-2 75-81 2-1/2" OC	200	DN65	5.36
2331021	Pipe shoe MP-PS H2-2 88-94 3" OC	200	DN80	5.47
2331022	Pipe shoe MP-PS H2-2 100-108 3-1/2" OC	200	OD100-108	5.58
2331023	Pipe shoe MP-PS H2-2 110-118 4" OC	200	DN100	5.67
2331024	Pipe shoe MP-PS H2-2 125-133 OC	200	OD125-133	5.82
2331025	Pipe shoe MP-PS H2-2 136-144 5" OC	200	DN125	5.94
2331026	Pipe shoe MP-PS H2-2 152-162 OC	200	OD152-162	6.12
2331027	Pipe shoe MP-PS H2-2 163-173 6" OC	200	DN150	6.23
2331028	Pipe shoe MP-PS H2-2 192-202 7" OC	200	OD192-202	7.56
2331029	Pipe shoe MP-PS H2-2 217-227 8" OC	200	DN200	7.94
2331030	Pipe shoe MP-PS H2-2 244-254 OC	200	OD244-254	8.80
2331031	Pipe shoe MP-PS H2-2 267-277 10" OC	200	DN250	9.14
2331032	Pipe shoe MP-PS H2-2 318-328 12" OC	200	DN300	9.88



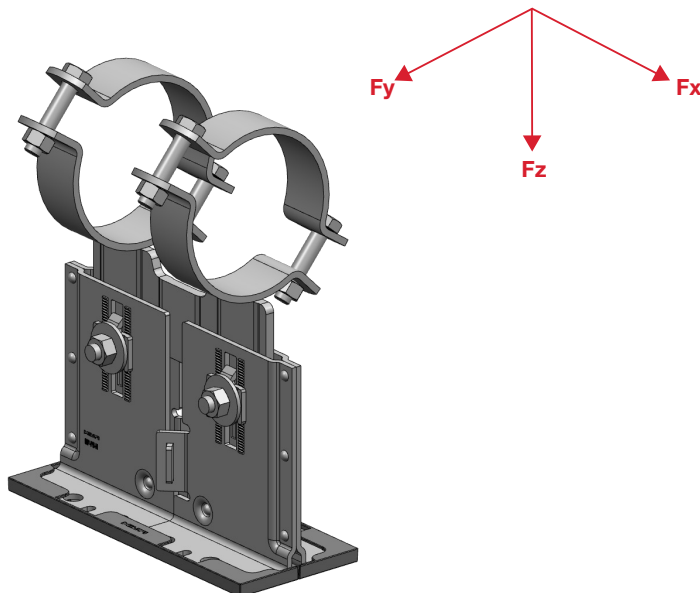
### Corrosion protection:

Component	Coating system	Zinc thickness, min. local (µm)
Top pipe ring	HDG per ISO 1461	55
Bottom pipe ring and midplate	HDG per ISO 1461	70
Baseplate	Continuously hot-dip Zinc-Magnesium coated per EN 10346	17
Serrated washers	Continuously hot-dip Zinc-Magnesium coated per EN 10346	17
Bolts; Nuts	HDG per ISO 10684	40;45

**Material properties:**

Component/Material	min. Yield strength	min. Ultimate strength	Modulus of elasticity	Shear modulus
Pipe rings and midplate S235JR (DIN EN10025-2)	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Baseplate and serrated washer S280GD (EN 10346) POSMAC-C MOD	$f_y = 280 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Bolts; Nuts F Class 8.8 (ISO 898-1); Grade 8 (ISO 898-2)	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Sliding plates PA66-GF30	Static friction coefficient values: Hot Dip Galvanized mating surface: 0.13 Zinc-Magnesium mating surface: 0.15 Zinc Electrogalvanised mating surface: 0.18			
Values for Modulus of Elasticity and Shear Modulus are according to EN 1993-1-1 and used for all Eurocode calculations Friction coefficient per ASTM D1894-14				

## DESIGN LOADING CAPACITY – 3D


**Notes for load data**

Load capacity given at delivery height = 200mm BOP (Bottom of pipe).

Point of load application = pipe center line (X-axis).

Load capacity given at room temperature.

Temperature correction factors apply:

- Per VGB-R-510 for load reported acc to EN13480-3
  - Per EN 1993-1-2 for loads reported acc to EN1993-1-1
- Temperature distribution on pipe shoe components per EN13480-3

Failure locations per force direction:

Fx – deformation of pipe ring

Fy – deformation of baseplate

+Fz, -Fz – ultimate failure at baseplate serrations

Published loads are based on static loading conditions and mounting according to IFU. Non-static forces must be separately considered during design.

Below published load data are applicable for:

- piece parts
- welded to steel according to IFU
- mounted with MT-TFB OC bolts on MT girders
- mounted with Hex M10 8.8 class bolts on I-beams
- mounted with HST3 Stud Anchors
- mounted with X-BT threaded stud

For all other required loads (i.e. different height, -slope,...) please use Fixpoint Calculator

**Recommended loads per EN13480-3**

Item No.	Pipe Shoe version	+/-F <sub>x,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN]	+F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN]
2331012	Pipe shoe MP-PS H2-2 21-26 1/2" OC	16.62	1.84	17.57	13.44
2331013	Pipe shoe MP-PS H2-2 26-31 3/4" OC	16.76	1.82	17.57	13.44
2331014	Pipe shoe MP-PS H2-2 32-37 1" OC	16.93	1.79	17.57	13.44
2331015	Pipe shoe MP-PS H2-2 38-44 1-1/4" OC	17.14	1.75	17.57	13.44
2331016	Pipe shoe MP-PS H2-2 45-51 1-1/2" OC	17.28	1.73	17.57	13.44
2331017	Pipe shoe MP-PS H2-2 52-58 OC	17.42	1.71	17.57	13.44
2331018	Pipe shoe MP-PS H2-2 59-65 2" OC	17.57	1.68	17.57	13.44
2331019	Pipe shoe MP-PS H2-2 68-74 OC	17.81	1.65	17.57	13.44
2331020	Pipe shoe MP-PS H2-2 75-81 2-1/2" OC	17.95	1.63	17.57	13.44
2331021	Pipe shoe MP-PS H2-2 88-94 3" OC	18.27	1.59	17.57	13.44
2331022	Pipe shoe MP-PS H2-2 100-108 3-1/2" OC	18.58	1.55	17.57	13.44
2331023	Pipe shoe MP-PS H2-2 110-118 4" OC	18.58	1.51	17.57	13.44
2331024	Pipe shoe MP-PS H2-2 125-133 OC	18.58	1.48	17.57	13.44
2331025	Pipe shoe MP-PS H2-2 136-144 5" OC	18.58	1.44	17.57	13.44
2331026	Pipe shoe MP-PS H2-2 152-162 OC	18.58	1.39	17.57	13.44
2331027	Pipe shoe MP-PS H2-2 163-173 6" OC	18.58	1.36	17.57	13.44
2331028	Pipe shoe MP-PS H2-2 192-202 7" OC	18.58	1.31	17.57	13.44
2331029	Pipe shoe MP-PS H2-2 217-227 8" OC	18.58	1.25	17.57	13.44
2331030	Pipe shoe MP-PS H2-2 244-254 OC	18.58	1.19	17.57	13.44
2331031	Pipe shoe MP-PS H2-2 267-277 10" OC	18.58	1.15	17.57	13.44
2331032	Pipe shoe MP-PS H2-2 318-328 12" OC	18.58	1.07	17.57	13.44

**Notes**

Shown load data for piece parts (without considering mounting and load capacity of the sub-structure)

**Interaction formula**

$$\frac{F_{x,exp}}{F_{x,rec}} + \frac{F_{y,exp}}{F_{y,rec}} + \frac{F_{z,exp}}{F_{z,rec}} \leq 1.0$$

**Recommended loads per EN1993-1-1**

Item No.	Pipe Shoe version	+/-F <sub>x,rec</sub> [kN]	+/-F <sub>x,rec</sub> [kN] in combi- nation with X-BT only	+/-F <sub>y,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN] in combi- nation with X-BT only	+F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN] in combi- nation with X-BT only
2331012	Pipe shoe MP-PS H2-2 21-26 1/2" OC	23.94	1.12	1.87	0.61	19.76	15.20	4.74
2331013	Pipe shoe MP-PS H2-2 26-31 3/4" OC	24.14	1.12	1.85	0.61	19.76	15.20	4.74
2331014	Pipe shoe MP-PS H2-2 32-37 1" OC	24.37	1.12	1.82	0.61	19.76	15.20	4.74
2331015	Pipe shoe MP-PS H2-2 38-44 1-1/4" OC	24.68	1.12	1.78	0.60	19.76	15.20	4.74
2331016	Pipe shoe MP-PS H2-2 45-51 1-1/2" OC	24.88	1.12	1.76	0.60	19.76	15.20	4.74
2331017	Pipe shoe MP-PS H2-2 52-58 OC	25.08	1.12	1.74	0.59	19.76	15.20	4.74
2331018	Pipe shoe MP-PS H2-2 59-65 2" OC	25.30	1.12	1.71	0.59	19.76	15.20	4.74
2331019	Pipe shoe MP-PS H2-2 68-74 OC	25.64	1.12	1.68	0.58	19.76	15.20	4.74
2331020	Pipe shoe MP-PS H2-2 75-81 2-1/2" OC	25.86	1.12	1.65	0.58	19.76	15.20	4.74
2331021	Pipe shoe MP-PS H2-2 88-94 3" OC	26.30	1.12	1.61	0.57	19.76	15.20	4.74
2331022	Pipe shoe MP-PS H2-2 100-108 3-1/2" OC	26.48	1.12	1.57	0.56	19.76	15.20	4.74
2331023	Pipe shoe MP-PS H2-2 110-118 4" OC	26.48	1.12	1.53	0.56	19.76	15.20	4.74
2331024	Pipe shoe MP-PS H2-2 125-133 OC	26.48	1.12	1.50	0.55	19.76	15.20	4.74
2331025	Pipe shoe MP-PS H2-2 136-144 5" OC	26.48	1.12	1.46	0.54	19.76	15.20	4.74
2331026	Pipe shoe MP-PS H2-2 152-162 OC	26.48	1.12	1.41	0.53	19.76	15.20	4.74
2331027	Pipe shoe MP-PS H2-2 163-173 6" OC	26.48	1.12	1.39	0.53	19.76	15.20	4.74
2331028	Pipe shoe MP-PS H2-2 192-202 7" OC	26.48	1.12	1.33	0.52	19.76	15.20	4.74
2331029	Pipe shoe MP-PS H2-2 217-227 8" OC	26.48	1.12	1.27	0.51	19.76	15.20	4.74
2331030	Pipe shoe MP-PS H2-2 244-254 OC	26.48	1.12	1.21	0.49	19.76	15.20	4.74
2331031	Pipe shoe MP-PS H2-2 267-277 10" OC	26.48	1.12	1.17	0.48	19.76	15.20	4.74
2331032	Pipe shoe MP-PS H2-2 318-328 12" OC	26.48	1.12	1.09	0.46	19.76	15.20	4.74

**Notes**

Shown EN1993-1-1 load values are recommended values with partial safety factors for action and resistance included. Design value in X & Y directions = 1.0 x recommended value. Design value in Z direction = 1.35 x recommended value.

**MT-TFB OC and Hex M10 8.8 bolts and X-BT-MR M10/W10:** partial safety factors on reaction side of 1.0 in X and Y directions and 1.35 in Z direction

**HST3:** no edge distance and spacing influence, minimum base material thickness considered, cracked concrete C 20/25, f<sub>ck,cube</sub>=25 N/mm<sup>2</sup>, partial safety factors on reaction side of 1.0 in X and Y directions and 1.35 in Z direction.

**Interaction formula**

$$\frac{F_{x,exp}}{F_{x,rec}} + \frac{F_{y,exp}}{F_{y,rec}} + \frac{F_{z,exp}}{F_{z,rec}} \leq 1.0$$

## PIPE SHOE MP-PS L4-2

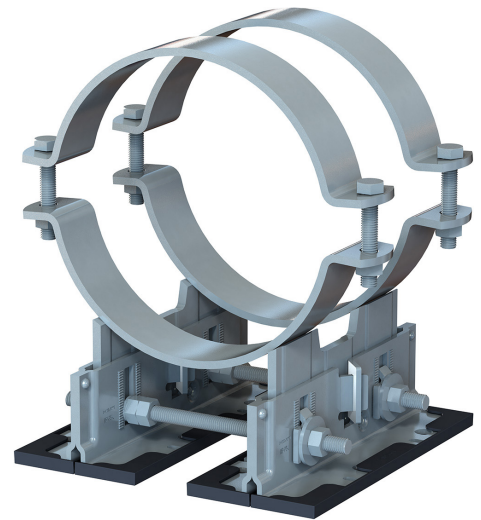
R14230972

### General

Media temperature limits: -20 °C to +300 °C  
 Height adjustability: 88.5 - 116 mm (with sliding plate)  
 85.5 - 113 mm (without sliding plate)  
 Slope adjustability: 12° (21%)

### Mass per Pipe Shoe version:

Item no.	Pipe Shoe version	Nominal height	DN (mm)	Mass (kg)
2331033	Pipe shoe MP-PS L4-2 217-227 8" OC	90	DN200	9.88
2331034	Pipe shoe MP-PS L4-2 244-254 OC	90	OD244-254	11.12
2331035	Pipe shoe MP-PS L4-2 267-277 10" OC	90	DN250	11.46
2331036	Pipe shoe MP-PS L4-2 318-328 12" OC	90	DN300	12.20
2331037	Pipe shoe MP-PS L4-2 350-360 14" OC	90	DN350	13.81
2331038	Pipe shoe MP-PS L4-2 401-411 16" OC	90	DN400	14.68
2331039	Pipe shoe MP-PS L4-2 452-462 18" OC	90	DN450	15.56
2331040	Pipe shoe MP-PS L4-2 503-513 20" OC	90	DN500	16.47
2331041	Pipe shoe MP-PS L4-2 605-615 24" OC	90	DN600	18.26



### Corrosion protection:

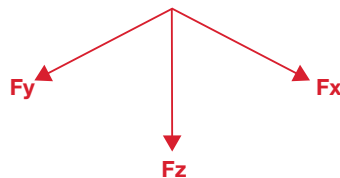
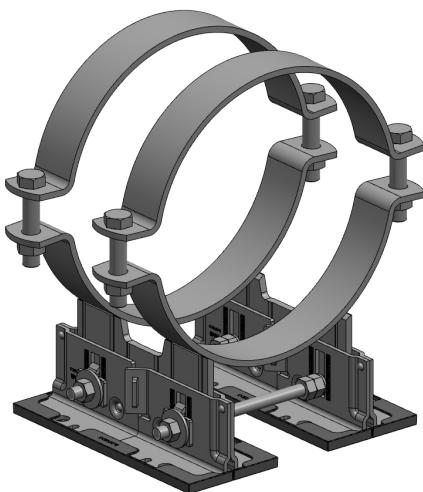
Component	Coating system	Zinc thickness, min. local (µm)
Top pipe ring	HDG per ISO 1461	55
Bottom pipe ring and midplate	HDG per ISO 1461	70
Baseplate	Continuously hot-dip Zinc-Magnesium coated per EN 10346	17
Serrated washers	Continuously hot-dip Zinc-Magnesium coated per EN 10346	17
Bolts; Nuts	HDG per ISO 10684	40;45



**Material properties:**

Component/Material	min. Yield strength	min. Ultimate strength	Modulus of elasticity	Shear modulus
Pipe rings and midplate S235JR (DIN EN10025-2)	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Baseplate and serrated washer S280GD (EN 10346) POSMAC-C MOD	$f_y = 280 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Bolts; Nuts; Threaded rods F Class 8.8 (ISO 898-1); Grade 8 (ISO 898-2)	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Sliding plates PA66-GF30	Static friction coefficient values: Hot Dip Galvanized mating surface: 0.13 Zinc-Magnesium mating surface: 0.15 Zinc Electrogalvanised mating surface: 0.18			
Values for Modulus of Elasticity and Shear Modulus are according to EN 1993-1-1 and used for all Eurocode calculations Friction coefficient per ASTM D1894-14				

## DESIGN LOADING CAPACITY – 3D


**Notes for load data**

Load capacity given at delivery height = 90mm BOP (Bottom of pipe).

Point of load application = pipe center line (X-axis).

Load capacity given at room temperature.

Temperature correction factors apply:

- Per VGB-R-510 for load reported acc to EN13480-3
  - Per EN 1993-1-2 for loads reported acc to EN1993-1-1
- Temperature distribution on pipe shoe components per EN13480-3

Failure locations per force direction:

Fx – deformation of pipe ring

Fy – deformation of baseplate

+Fz, -Fz – ultimate failure at baseplate serrations

Published loads are based on static loading conditions and mounting according to IFU. Non-static forces must be separately considered during design.

Below published load data are applicable for:

- piece parts
- welded to steel according to IFU
- mounted with MT-TFB OC bolts on MT girders
- mounted with Hex M10 8.8 class bolts on I-beams
- mounted with HST3 Stud Anchors
- mounted with X-BT threaded stud

For all other required loads (i.e. different height, -slope,...) please use Fixpoint Calculator

**Recommended loads per EN13480-3**

Item No.	Pipe Shoe version	+/-F <sub>x,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN]	+F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN]
2331033	Pipe shoe MP-PS L4-2 217-227 8" OC	17.29	13.74	28.90	17.29
2331034	Pipe shoe MP-PS L4-2 244-254 OC	17.29	12.75	28.90	17.29
2331035	Pipe shoe MP-PS L4-2 267-277 10" OC	17.29	12.11	28.90	17.29
2331036	Pipe shoe MP-PS L4-2 318-328 12" OC	17.29	10.88	28.90	17.29
2331037	Pipe shoe MP-PS L4-2 350-360 14" OC	17.29	10.25	28.90	17.29
2331038	Pipe shoe MP-PS L4-2 401-411 16" OC	17.29	9.36	28.90	17.29
2331039	Pipe shoe MP-PS L4-2 452-462 18" OC	17.29	8.61	28.90	17.29
2331040	Pipe shoe MP-PS L4-2 503-513 20" OC	17.29	7.97	28.90	17.29
2331041	Pipe shoe MP-PS L4-2 605-615 24" OC	17.29	6.94	28.90	17.29

**Notes**

Shown load data for piece parts (without considering mounting and load capacity of the sub-structure)

**Interaction formula**

$$\frac{F_{x,exp}}{F_{x,rec}} + \frac{F_{y,exp}}{F_{y,rec}} + \frac{F_{z,exp}}{F_{z,rec}} \leq 1.0$$

**Recommended loads per EN1993-1-1**

Item No.	Pipe Shoe version	+/-F <sub>x,rec</sub> [kN]	+/-F <sub>x,rec</sub> [kN] in combi- nation with X-BT only	+/-F <sub>y,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN] in combi- nation with X-BT only	+F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN] in combi- nation with X-BT only
2331033	Pipe shoe MP-PS L4-2 217-227 8" OC	41.50	2.24	13.67	1.64	34.92	30.74	9.48
2331034	Pipe shoe MP-PS L4-2 244-254 OC	41.50	2.24	12.69	1.61	34.92	30.74	9.48
2331035	Pipe shoe MP-PS L4-2 267-277 10" OC	41.50	2.24	12.05	1.58	34.92	30.74	9.48
2331036	Pipe shoe MP-PS L4-2 318-328 12" OC	41.50	2.24	10.83	1.53	34.92	30.74	9.48
2331037	Pipe shoe MP-PS L4-2 350-360 14" OC	41.50	2.24	10.20	1.50	34.92	30.74	9.48
2331038	Pipe shoe MP-PS L4-2 401-411 16" OC	41.50	2.24	9.31	1.46	34.92	30.74	9.48
2331039	Pipe shoe MP-PS L4-2 452-462 18" OC	41.50	2.24	8.57	1.41	34.92	30.74	9.48
2331040	Pipe shoe MP-PS L4-2 503-513 20" OC	41.50	2.24	7.93	1.37	34.92	30.74	9.48
2331041	Pipe shoe MP-PS L4-2 605-615 24" OC	41.50	2.24	6.91	1.30	34.92	30.74	9.48

**Notes**

Shown EN1993-1-1 load values are recommended values with partial safety factors for action and resistance included. Design value in X & Y directions = 1.0 x recommended value. Design value in Z direction = 1.35 x recommended value.

**MT-TFB OC and Hex M10 8.8 bolts and X-BT-MR M10/W10:** partial safety factors on reaction side of 1.0 in X and Y directions and 1.35 in Z direction

**HST3:** no edge distance and spacing influence, minimum base material thickness considered, cracked concrete C 20/25, f<sub>ck,cube</sub>=25 N/mm<sup>2</sup>, partial safety factors on reaction side of 1.0 in X and Y directions and 1.35 in Z direction.

**Interaction formula**

$$\frac{F_{x,exp}}{F_{x,rec}} + \frac{F_{y,exp}}{F_{y,rec}} + \frac{F_{z,exp}}{F_{z,rec}} \leq 1.0$$

## PIPE SHOE MP-PS M4-2

R14230972

### General

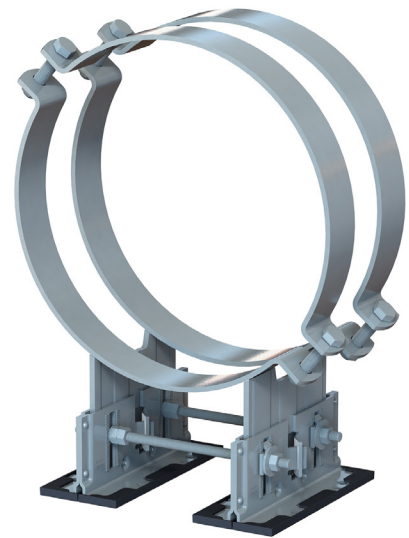
Media temperature limits: -20 °C to +300 °C

Height adjustability: 116 - 171 mm (with sliding plate)  
113 - 168 mm (without sliding pate)

Slope adjustability: 12° (21%)

### Mass per Pipe Shoe version:

Item no.	Pipe Shoe version	Nominal height	DN (mm)	Mass (kg)
2331042	Pipe shoe MP-PS M4-2 217-227 8" OC	150	DN200	11.16
2331043	Pipe shoe MP-PS M4-2 244-254 OC	150	OD244-254	12.40
2331044	Pipe shoe MP-PS M4-2 267-277 10" OC	150	DN250	12.74
2331045	Pipe shoe MP-PS M4-2 318-328 12" OC	150	DN300	13.48
2331046	Pipe shoe MP-PS M4-2 350-360 14" OC	150	DN350	15.09
2331047	Pipe shoe MP-PS M4-2 401-411 16" OC	150	DN400	15.95
2331048	Pipe shoe MP-PS M4-2 452-462 18" OC	150	DN450	16.84
2331049	Pipe shoe MP-PS M4-2 503-513 20" OC	150	DN500	17.75
2331050	Pipe shoe MP-PS M4-2 605-615 24" OC	150	DN600	19.54



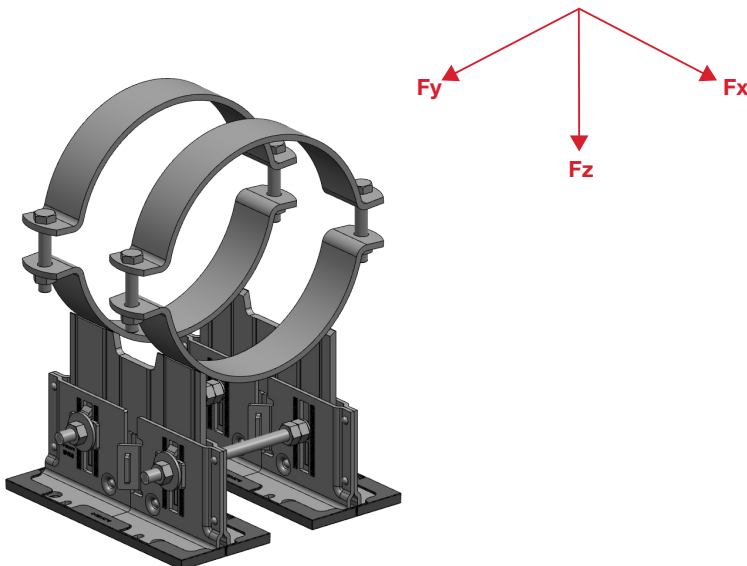
### Corrosion protection:

Component	Coating system	Zinc thickness, min. local (µm)
Top pipe ring	HDG per ISO 1461	55
Bottom pipe ring and midplate	HDG per ISO 1461	70
Baseplate	Continuously hot-dip Zinc-Magnesium coated per EN 10346	17
Serrated washers	Continuously hot-dip Zinc-Magnesium coated per EN 10346	17
Bolts; Nuts	HDG per ISO 10684	40;45

**Material properties:**

Component/Material	min. Yield strength	min. Ultimate strength	Modulus of elasticity	Shear modulus
Pipe rings and midplate S235JR (DIN EN10025-2)	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Baseplate and serrated washer S280GD (EN 10346) POSMAC-C MOD	$f_y = 280 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Bolts; Nuts; Threaded rods F Class 8.8 (ISO 898-1); Grade 8 (ISO 898-2)	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Sliding plates PA66-GF30	Static friction coefficient values: Hot Dip Galvanized mating surface: 0.13 Zinc-Magnesium mating surface: 0.15 Zinc Electrogalvanised mating surface: 0.18			
Values for Modulus of Elasticity and Shear Modulus are according to EN 1993-1-1 and used for all Eurocode calculations Friction coefficient per ASTM D1894-14				

## DESIGN LOADING CAPACITY – 3D


**Notes for load data**

Load capacity given at delivery height = 150mm BOP (Bottom of pipe).

Point of load application = pipe center line (X-axis).

Load capacity given at room temperature.

Temperature correction factors apply:

- Per VGB-R-510 for load reported acc to EN13480-3
  - Per EN 1993-1-2 for loads reported acc to EN1993-1-1
- Temperature distribution on pipe shoe components per EN13480-3

Failure locations per force direction:

Fx – deformation of pipe ring

Fy – deformation of baseplate

+Fz, -Fz – ultimate failure at baseplate serrations

Published loads are based on static loading conditions and mounting according to IFU. Non-static forces must be separately considered during design.

Below published load data are applicable for:

- piece parts
- welded to steel according to IFU
- mounted with MT-TFB OC bolts on MT girders
- mounted with Hex M10 8.8 class bolts on I-beams
- mounted with HST3 Stud Anchors
- mounted with X-BT threaded stud

For all other required loads (i.e. different height, -slope,...) please use Fixpoint Calculator

**Recommended loads per EN13480-3**

Item No.	Pipe Shoe version	+/-F <sub>x,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN]	+F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN]
2331042	Pipe shoe MP-PS M4-2 217-227 8" OC	13.83	10.57	28.90	17.29
2331043	Pipe shoe MP-PS M4-2 244-254 OC	13.83	9.97	28.90	17.29
2331044	Pipe shoe MP-PS M4-2 267-277 10" OC	13.83	9.57	28.90	17.29
2331045	Pipe shoe MP-PS M4-2 318-328 12" OC	13.83	8.79	28.90	17.29
2331046	Pipe shoe MP-PS M4-2 350-360 14" OC	13.83	8.37	28.90	17.29
2331047	Pipe shoe MP-PS M4-2 401-411 16" OC	13.83	7.77	28.90	17.29
2331048	Pipe shoe MP-PS M4-2 452-462 18" OC	13.83	7.25	28.90	17.29
2331049	Pipe shoe MP-PS M4-2 503-513 20" OC	13.83	6.79	28.90	17.29
2331050	Pipe shoe MP-PS M4-2 605-615 24" OC	13.83	6.03	28.90	17.29

**Notes**

Shown load data for piece parts (without considering mounting and load capacity of the sub-structure)

**Interaction formula**

$$\frac{F_{x,exp}}{F_{x,rec}} + \frac{F_{y,exp}}{F_{y,rec}} + \frac{F_{z,exp}}{F_{z,rec}} \leq 1.0$$

**Recommended loads per EN1993-1-1**

Item No.	Pipe Shoe version	+/-F <sub>x,rec</sub> [kN]	+/-F <sub>x,rec</sub> [kN] in combi- nation with X-BT only	+/-F <sub>y,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN] in combi- nation with X-BT only	+F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN] in combi- nation with X-BT only
2331042	Pipe shoe MP-PS M4-2 217-227 8" OC	33.20	2.24	10.51	1.52	34.92	30.74	9.48
2331043	Pipe shoe MP-PS M4-2 244-254 OC	33.20	2.24	9.92	1.49	34.92	30.74	9.48
2331044	Pipe shoe MP-PS M4-2 267-277 10" OC	33.20	2.24	9.52	1.47	34.92	30.74	9.48
2331045	Pipe shoe MP-PS M4-2 318-328 12" OC	33.20	2.24	8.75	1.42	34.92	30.74	9.48
2331046	Pipe shoe MP-PS M4-2 350-360 14" OC	33.20	2.24	8.33	1.40	34.92	30.74	9.48
2331047	Pipe shoe MP-PS M4-2 401-411 16" OC	33.20	2.24	7.73	1.36	34.92	30.74	9.48
2331048	Pipe shoe MP-PS M4-2 452-462 18" OC	33.20	2.24	7.21	1.32	34.92	30.74	9.48
2331049	Pipe shoe MP-PS M4-2 503-513 20" OC	33.20	2.24	6.75	1.29	34.92	30.74	9.48
2331050	Pipe shoe MP-PS M4-2 605-615 24" OC	33.20	2.24	6.00	1.22	34.92	30.74	9.48

**Notes**

Shown EN1993-1-1 load values are recommended values with partial safety factors for action and resistance included. Design value in X & Y directions = 1.0 x recommended value. Design value in Z direction = 1.35 x recommended value.

**MT-TFB OC and Hex M10 8.8 bolts and X-BT-MR M10/W10:** partial safety factors on reaction side of 1.0 in X and Y directions and 1.35 in Z direction

**HST3:** no edge distance and spacing influence, minimum base material thickness considered, cracked concrete C 20/25, f<sub>ck,cube</sub>=25 N/mm<sup>2</sup>, partial safety factors on reaction side of 1.0 in X and Y directions and 1.35 in Z direction.

**Interaction formula**

$$\frac{F_{x,exp}}{F_{x,rec}} + \frac{F_{y,exp}}{F_{y,rec}} + \frac{F_{z,exp}}{F_{z,rec}} \leq 1.0$$

## PIPE SHOE MP-PS H4-2

R14230972

### General

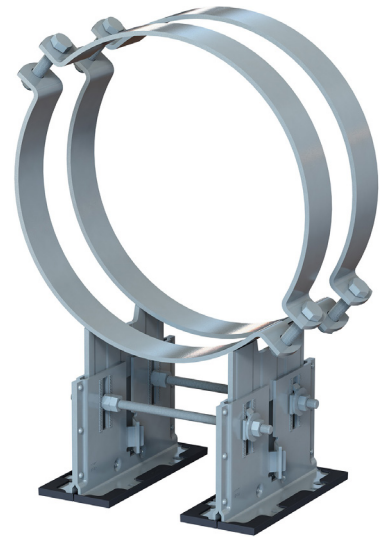
Media temperature limits: -20 °C to +300 °C

Height adjustability: 171 - 223.5 mm (with sliding plate)  
168 - 220.5 mm (without sliding plate)

Slope adjustability: 12° (21%)

### Mass per Pipe Shoe version:

Item no.	Pipe Shoe version	Nominal height	DN (mm)	Mass (kg)
2331051	Pipe shoe MP-PS H4-2 217-227 8" OC	200	DN200	12.78
2331052	Pipe shoe MP-PS H4-2 244-254 OC	200	OD244-254	14.02
2331053	Pipe shoe MP-PS H4-2 267-277 10" OC	200	DN250	14.36
2331054	Pipe shoe MP-PS H4-2 318-328 12" OC	200	DN300	15.10
2331055	Pipe shoe MP-PS H4-2 350-360 14" OC	200	DN350	16.71
2331056	Pipe shoe MP-PS H4-2 401-411 16" OC	200	DN400	17.57
2331057	Pipe shoe MP-PS H4-2 452-462 18" OC	200	DN450	18.46
2331058	Pipe shoe MP-PS H4-2 503-513 20" OC	200	DN500	19.37
2331059	Pipe shoe MP-PS H4-2 605-615 24" OC	200	DN600	21.16



### Corrosion protection:

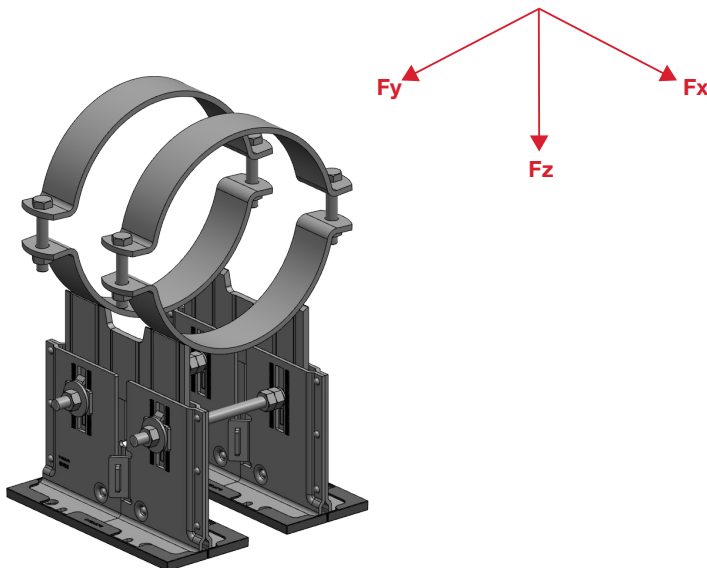
Component	Coating system	Zinc thickness, min. local (µm)
Top pipe ring	HDG per ISO 1461	55
Bottom pipe ring and midplate	HDG per ISO 1461	70
Baseplate	Continuously hot-dip Zinc-Magnesium coated per EN 10346	17
Serrated washers	Continuously hot-dip Zinc-Magnesium coated per EN 10346	17
Bolts; Nuts	HDG per ISO 10684	40;45



**Material properties:**

Component/Material	min. Yield strength	min. Ultimate strength	Modulus of elasticity	Shear modulus
Pipe rings and midplate S235JR (DIN EN10025-2)	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Baseplate and serrated washer S280GD (EN 10346) POSMAC-C MOD	$f_y = 280 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Bolts; Nuts; Threaded rods F Class 8.8 (ISO 898-1); Grade 8 (ISO 898-2)	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Sliding plates PA66-GF30	Static friction coefficient values: Hot Dip Galvanized mating surface: 0.13 Zinc-Magnesium mating surface: 0.15 Zinc Electrogalvanised mating surface: 0.18			
Values for Modulus of Elasticity and Shear Modulus are according to EN 1993-1-1 and used for all Eurocode calculations Friction coefficient per ASTM D1894-14				

## DESIGN LOADING CAPACITY – 3D


**Notes for load data**

Load capacity given at delivery height = 200mm BOP (Bottom of pipe).

Point of load application = pipe center line (X-axis).

Load capacity given at room temperature.

Temperature correction factors apply:

- Per VGB-R-510 for load reported acc to EN13480-3
  - Per EN 1993-1-2 for loads reported acc to EN1993-1-1
- Temperature distribution on pipe shoe components per EN13480-3

Failure locations per force direction:

Fx – deformation of pipe ring

Fy – deformation of baseplate

+Fz, -Fz – ultimate failure at baseplate serrations

Published loads are based on static loading conditions and mounting according to IFU. Non-static forces must be separately considered during design.

Below published load data are applicable for:

- piece parts
- welded to steel according to IFU
- mounted with MT-TFB OC bolts on MT girders
- mounted with Hex M10 8.8 class bolts on I-beams
- mounted with HST3 Stud Anchors
- mounted with X-BT threaded stud

For all other required loads (i.e. different height, -slope,...) please use Fixpoint Calculator

**Recommended loads per EN13480-3**

Item No.	Pipe Shoe version	+/-F <sub>x,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN]	+F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN]
2331051	Pipe shoe MP-PS H4-2 217-227 8" OC	13.83	8.86	28.90	17.29
2331052	Pipe shoe MP-PS H4-2 244-254 OC	13.83	8.44	28.90	17.29
2331053	Pipe shoe MP-PS H4-2 267-277 10" OC	13.83	8.15	28.90	17.29
2331054	Pipe shoe MP-PS H4-2 318-328 12" OC	13.83	7.58	28.90	17.29
2331055	Pipe shoe MP-PS H4-2 350-360 14" OC	13.83	7.26	28.90	17.29
2331056	Pipe shoe MP-PS H4-2 401-411 16" OC	13.83	6.80	28.90	17.29
2331057	Pipe shoe MP-PS H4-2 452-462 18" OC	13.83	6.40	28.90	17.29
2331058	Pipe shoe MP-PS H4-2 503-513 20" OC	13.83	6.04	28.90	17.29
2331059	Pipe shoe MP-PS H4-2 605-615 24" OC	13.83	5.43	28.90	17.29

**Notes**

Shown load data for piece parts (without considering mounting and load capacity of the sub-structure)

**Interaction formula**

$$\frac{F_{x,exp}}{F_{x,rec}} + \frac{F_{y,exp}}{F_{y,rec}} + \frac{F_{z,exp}}{F_{z,rec}} \leq 1.0$$

**Recommended loads per EN1993-1-1**

Item No.	Pipe Shoe version	+/-F <sub>x,rec</sub> [kN]	+/-F <sub>x,rec</sub> [kN] in combi- nation with X-BT only	+/-F <sub>y,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN] in combi- nation with X-BT only	+F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN] in combi- nation with X-BT only
2331051	Pipe shoe MP-PS H4-2 217-227 8" OC	33.20	2.24	8.81	1.43	34.92	30.74	9.48
2331052	Pipe shoe MP-PS H4-2 244-254 OC	33.20	2.24	8.40	1.40	34.92	30.74	9.48
2331053	Pipe shoe MP-PS H4-2 267-277 10" OC	33.20	2.24	8.11	1.39	34.92	30.74	9.48
2331054	Pipe shoe MP-PS H4-2 318-328 12" OC	33.20	2.24	7.54	1.35	34.92	30.74	9.48
2331055	Pipe shoe MP-PS H4-2 350-360 14" OC	33.20	2.24	7.23	1.32	34.92	30.74	9.48
2331056	Pipe shoe MP-PS H4-2 401-411 16" OC	33.20	2.24	6.77	1.29	34.92	30.74	9.48
2331057	Pipe shoe MP-PS H4-2 452-462 18" OC	33.20	2.24	6.37	1.25	34.92	30.74	9.48
2331058	Pipe shoe MP-PS H4-2 503-513 20" OC	33.20	2.24	6.01	1.22	34.92	30.74	9.48
2331059	Pipe shoe MP-PS H4-2 605-615 24" OC	33.20	2.24	5.40	1.16	34.92	30.74	9.48

**Notes**

Shown EN1993-1-1 load values are recommended values with partial safety factors for action and resistance included. Design value in X & Y directions = 1.0 x recommended value. Design value in Z direction = 1.35 x recommended value.

**MT-TFB OC and Hex M10 8.8 bolts and X-BT-MR M10/W10:** partial safety factors on reaction side of 1.0 in X and Y directions and 1.35 in Z direction

**HST3:** no edge distance and spacing influence, minimum base material thickness considered, cracked concrete C 20/25, f<sub>ck,cube</sub>=25 N/mm<sup>2</sup>, partial safety factors on reaction side of 1.0 in X and Y directions and 1.35 in Z direction.

**Interaction formula**

$$\frac{F_{x,exp}}{F_{x,rec}} + \frac{F_{y,exp}}{F_{y,rec}} + \frac{F_{z,exp}}{F_{z,rec}} \leq 1.0$$

# MT-FPS-FF OC

# R1416271

Item no.	Material Description
2331076	Connector Pipe shoe MT-FPS-FF OC

### General

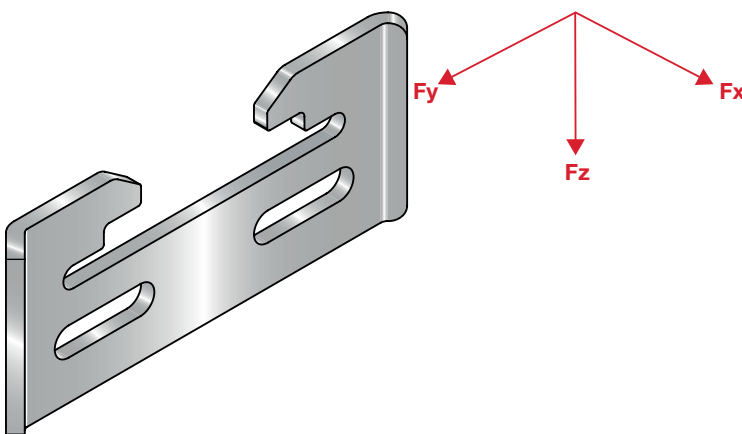
- Media temperature limits: -20 °C to +300 °C
- Mass per single item: 0.275kg
- Continuously hot-dip Zinc-Magnesium coated per EN 10346

### Material properties:

Component/Material	min. Yield strength	min. Ultimate strength	Modulus of elasticity	Shear modulus
S280GD (EN 10346)	$f_y = 280 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Values for Modulus of Elasticity and Shear Modulus are according to EN 1993-1-1 and used for all Eurocode calculations

## DESIGN LOADING CAPACITY – 3D



### Notes for load data

Point of load application = pipe center line (X-axis). Load data per configuration (2 items or 4 items) of the brackets installed with MP-PS x1-1, MP-PS x2-2, or MP-PS x4-2 according to IFU. Load capacity given at room temperature. Temperature correction factors apply:

- Per VGB-R-510 for load reported acc to EN13480-3
- Per EN 1993-1-2 for loads reported acc to EN1993-1-1

Temperature distribution on pipe shoe components per EN13480-3. Published loads are based on static loading conditions. Non-static forces must be separately considered during design.

### Recommended loads per EN13480-3

Configuration	+/-F <sub>x,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN]	+F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN]
2 brackets	7.43	227.73/h*	not decisive	6.31
4 brackets	14.86	871.53/h*	not decisive	12.62

\*h – Height of pipe neutral axis in mm from pipe shoe base

### Recommended loads per EN1993-1-1<sup>(2)</sup>

Configuration	+/-F <sub>x,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN]	+F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN]
2 brackets	16.39	471.23/h*	not decisive	10.98
4 brackets	32.78	1803.40/h*	not decisive	21.96

\*h – Height of pipe neutral axis in mm from pipe shoe base

### <sup>(2)</sup> Notes

Shown EN1993-1-1 load values are recommended values with partial safety factors for action and resistance included. Design value in X & Y directions = 1.0 x recommended value. Design value in Z direction = 1.35 x recommended value.

### Interaction formula

$$\frac{F_{x,exp}}{F_{x,rec}} + \frac{F_{y,exp}}{F_{y,rec}} + \frac{F_{z,exp}}{F_{z,rec}} \leq 1.0$$

## MT-FPS-FZL OC

## R1416262

Item no.	Material Description
2331077	Connector Pipe shoe MT-FPS-FZL OC

### General

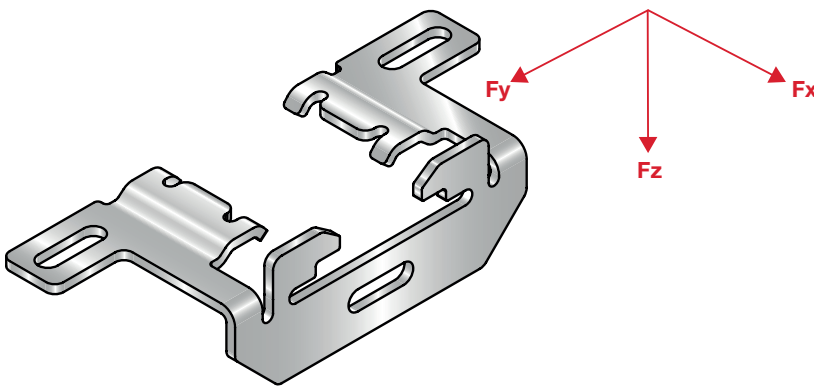
- Media temperature limits: -20 °C to +300 °C
- Mass per single item: 0.583 kg
- HDG: 55µm minimum local thickness - ISO 1461

### Material properties:

Component/Material	min. Yield strength	min. Ultimate strength	Modulus of elasticity	Shear modulus
S280GD (EN 10346)	$f_y = 280 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Values for Modulus of Elasticity and Shear Modulus are according to EN 1993-1-1 and used for all Eurocode calculations

## DESIGN LOADING CAPACITY – 3D



### Notes for load data

Point of load application = pipe center line (X-axis). Load capacity given at room temperature. Temperature correction factors apply:

- Per VGB-R-510 for load reported acc to EN13480-3
- Per EN 1993-1-2 for loads reported acc to EN1993-1-1

Temperature distribution on pipe shoe components per EN13480-3  
Published loads are based on static loading conditions. Non-static forces must be separately considered during design.

### Recommended loads per EN13480-3

$\pm F_{x,rec}$ [kN]	$\pm F_{y,rec}$ [kN]	$+F_{z,rec}$ [kN]	$-F_{z,rec}$ [kN]
9.23	243.37/h*	not decisive	3.53

\*h – Height of pipe neutral axis in mm from pipe shoe base

### Recommended loads per EN1993-1-1 <sup>(2)</sup>

$\pm F_{x,rec}$ [kN]	$\pm F_{y,rec}$ [kN]	$+F_{z,rec}$ [kN]	$-F_{z,rec}$ [kN]
18.84	450.00/h*	not decisive	6.87

\*h – Height of pipe neutral axis in mm from pipe shoe base

### <sup>(2)</sup> Notes

Shown EN1993-1-1 load values are recommended values with partial safety factors for action and resistance included. Design value in X & Y directions = 1.0 x recommended value. Design value in Z direction = 1.35 x recommended value.

### Interaction formula

$$\frac{F_{x,exp}}{F_{x,rec}} + \frac{F_{y,exp}}{F_{y,rec}} + \frac{F_{z,exp}}{F_{z,rec}} \leq 1.0$$

# MT-FPS-SF OC

# R14162629

Item no.	Material Description
2330920	Connector Pipe shoe MT-FPS-SF OC

### General

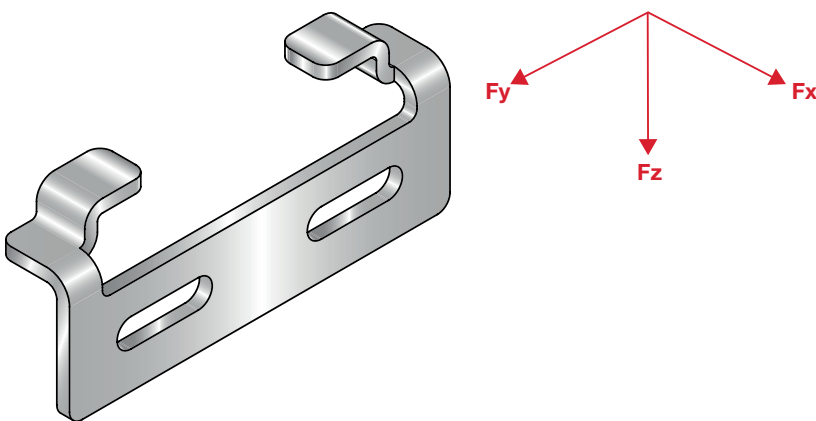
- Media temperature limits: -20 °C to +300 °C
- Mass per single item: 0.273 kg
- Continuously hot-dip Zinc-Magnesium coated per EN 10346

### Material properties:

Component/Material	min. Yield strength	min. Ultimate strength	Modulus of elasticity	Shear modulus
S235JR Yield280 (HN 707)	$f_y = 280 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Values for Modulus of Elasticity and Shear Modulus are according to EN 1993-1-1 and used for all Eurocode calculations

## DESIGN LOADING CAPACITY – 3D



### Notes for load data

Point of load application = pipe center line (X-axis). Load data per configuration (2 items or 4 items) of the brackets installed with MP-PS x1-1, MP-PS x2-2, or MP-PS x4-2 according to IFU. Load capacity given at room temperature. Temperature correction factors apply:

- Per VGB-R-510 for load reported acc to EN13480-3
- Per EN 1993-1-2 for loads reported acc to EN1993-1-1

Temperature distribution on pipe shoe components per EN13480-3  
Published loads are based on static loading conditions. Non-static forces must be separately considered during design.

### Recommended loads per EN13480-3

Configuration	+/-F <sub>x,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN]	+F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN]
2 brackets	not decisive	138.30/h*	not decisive	3.10
4 brackets	not decisive	529.30/h*	not decisive	6.20

\*h – Height of pipe neutral axis in mm from pipe shoe base

### Recommended loads per EN1993-1-1<sup>(2)</sup>

Configuration	+/-F <sub>x,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN]	+F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN]
2 brackets	not decisive	290.80/h*	not decisive	4.96
4 brackets	not decisive	1112.90/h*	not decisive	9.92

\*h – Height of pipe neutral axis in mm from pipe shoe base

### <sup>(2)</sup>Notes

Shown EN1993-1-1 load values are recommended values with partial safety factors for action and resistance included. Design value in Y direction = 1.0 x recommended value. Design value in Z direction = 1.35 x recommended value.

### Interaction formula

$$\frac{F_{y,exp}}{F_{y,rec}} + \frac{F_{z,exp}}{F_{z,rec}} \leq 1.0$$

## MT-FPS-SZ1 OC

## R14162629

Item no.	Material Description
2331078	Connector Pipe shoe MT-FPS-SZ1 OC

### General

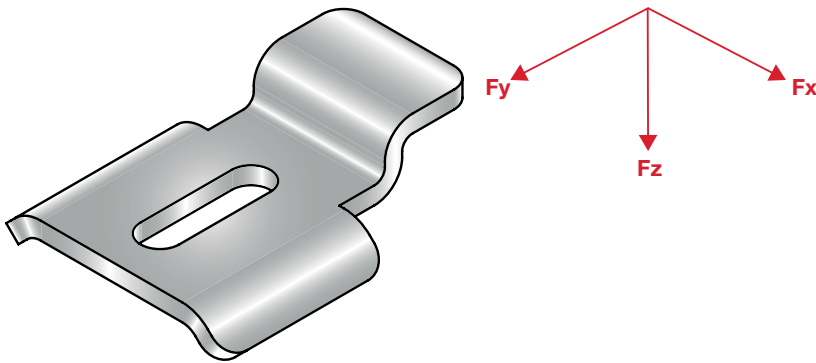
- Media temperature limits: -20 °C to +300 °C
- Mass per single item: 0.176 kg
- Continuously hot-dip Zinc-Magnesium coated per EN 10346

### Material properties:

Component/Material	min. Yield strength	min. Ultimate strength	Modulus of elasticity	Shear modulus
S280GD (EN 10346)	$f_y = 280 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Values for Modulus of Elasticity and Shear Modulus are according to EN 1993-1-1 and used for all Eurocode calculations

## DESIGN LOADING CAPACITY – 3D



### Notes for load data

Point of load application = pipe center line (X-axis). Load data per set (2 items) of the brackets installed with MP-PS x1-1, MP-PS x2-2, or MP-PS x4-2 according to IFU.

Load capacity given at room temperature. Temperature correction factors apply:

- Per VGB-R-510 for load reported acc to EN13480-3
- Per EN 1993-1-2 for loads reported acc to EN1993-1-1

Temperature distribution on pipe shoe components per EN13480-3

Published loads are based on static loading conditions. Non-static forces must be separately considered during design.

### Recommended loads per EN13480-3

+/-Fx, R <sub>rec</sub> [kN]	+/-Fy, R <sub>rec</sub> [kN]	+Fz, R <sub>rec</sub> [kN]	-Fz, R <sub>rec</sub> [kN]
not decisive	59.30/h*	not decisive	1.30

\*h – Height of pipe neutral axis in mm from pipe shoe base

### Recommended loads per EN1993-1-1<sup>(2)</sup>

+/-Fx, R <sub>rec</sub> [kN]	+/-Fy, R <sub>rec</sub> [kN]	+Fz, R <sub>rec</sub> [kN]	-Fz, R <sub>rec</sub> [kN]
not decisive	127.87/h*	not decisive	2.07

\*h – Height of pipe neutral axis in mm from pipe shoe base

### <sup>(2)</sup>Notes

Shown EN1993-1-1 load values are recommended values with partial safety factors for action and resistance included. Design value in Y direction = 1.0 x recommended value. Design value in Z direction = 1.35 x recommended value.

### Interaction formula

$$\frac{F_{y,exp}}{F_{y,rec}} + \frac{F_{z,exp}}{F_{z,rec}} \leq 1.0$$

# MT-FPS-SZ2 OC

# R14162629

Item no.	Material Description
2331079	Connector Pipe shoe MT-FPS-SZ2 OC

### General

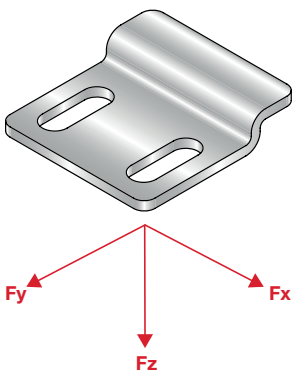
- Media temperature limits: -20 °C to +300 °C
- Mass per single item: 0.254 kg
- Continuously hot-dip Zinc-Magnesium coated per EN 10346

### Material properties:

Component/Material	min. Yield strength	min. Ultimate strength	Modulus of elasticity	Shear modulus
S280GD (EN 10346)	$f_y = 280 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Values for Modulus of Elasticity and Shear Modulus are according to EN 1993-1-1 and used for all Eurocode calculations

## DESIGN LOADING CAPACITY – 3D



### Notes for load data

Point of load application = pipe center line (X-axis)  
 Load data per configuration (2 items or 4 items) of the brackets installed with MP-PS x1-1, MP-PS x2-2, or MP-PS x4-2 according to IFU.  
 Load capacity given at room temperature. Temperature correction factors apply:  
 • Per VGB-R-510 for load reported acc to EN13480-3  
 • Per EN 1993-1-2 for loads reported acc to EN1993-1-1  
 Temperature distribution on pipe shoe components per EN13480-3  
 Published loads are based on static loading conditions. Non-static forces must be separately considered during design

### (2)Notes

Shown EN1993-1-1 load values are recommended values with partial safety factors for action and resistance included. Design value in Y direction = 1.0 x recommended value. Design value in Z direction = 1.35 x recommended value.

### Interaction formula

$$\frac{F_{y,exp}}{F_{y,rec}} + \frac{F_{z,exp}}{F_{z,rec}} \leq 1.0$$

### Recommended loads per EN13480-3

Configuration	+/-F <sub>x,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN] (in combination with X-BT)	+F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN] (in combination with X-BT)
MP-PS x1-1/x2-2		84.10/h*	0.40			
MP-PS x4-2	not decisive	214.9/h*		not decisive	1.83	0.83
MP-PS x4-2**			123.0/h*			

\*h – Height of pipe neutral axis in mm from pipe shoe base

\*\*only valid for h ≥ 310 mm

### Recommended loads per EN1993-1-1<sup>(2)</sup>

Configuration	+/-F <sub>x,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN] (in combination with X-BT)	+F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN] (in combination with X-BT)
MP-PS x1-1/x2-2		131.38/h*	0.56			
MP-PS x4-2	not decisive	463.40/h*		not decisive	2.93	0.98
MP-PS x4-2**			200.0/h*			

\*h – Height of pipe neutral axis in mm from pipe shoe base

\*\*only valid for h ≥ 384 mm



## MT-FPS-GF OC

## R14162712

Item no.	Material Description
2330921	Connector Pipe shoe MT-FPS-GF OC

### General

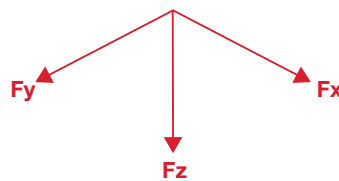
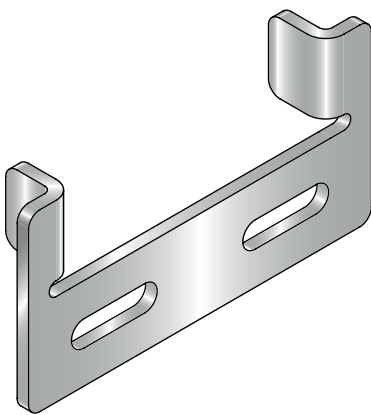
- Media temperature limits: -20 °C to +300 °C
- Mass per single item: 0.298 kg
- Continuously hot-dip Zinc-Magnesium coated per EN 10346

### Material properties:

Component/Material	min. Yield strength	min. Ultimate strength	Modulus of elasticity	Shear modulus
S280GD (EN 10346)	$f_y = 280 \frac{\text{N}}{\text{mm}^2}$	$f_u = 360 \frac{\text{N}}{\text{mm}^2}$	$E = 210000 \frac{\text{N}}{\text{mm}^2}$	$G = 80769 \frac{\text{N}}{\text{mm}^2}$

Values for Modulus of Elasticity and Shear Modulus are according to EN 1993-1-1 and used for all Eurocode calculations

## DESIGN LOADING CAPACITY – 3D



### Notes for load data

Point of load application = pipe center line (X-axis). Load data per configuration (2 items or 4 items) of the brackets installed with MP-PS x1-1, MP-PS x2-2, or MP-PS x4-2 according to IFU.

Load capacity given at room temperature. Temperature correction factors apply:

- Per VGB-R-510 for load reported acc to EN13480-3
- Per EN 1993-1-2 for loads reported acc to EN1993-1-1

Temperature distribution on pipe shoe components per EN13480-3

Published loads are based on static loading conditions. Non-static forces must be separately considered during design.

### Recommended loads per EN13480-3

Configuration	+/-F <sub>x,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN]	+F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN]
2 brackets	not decisive	2.33	not decisive	not decisive
4 brackets	not decisive	4.66	not decisive	not decisive

### (2)Notes

Shown EN1993-1-1 load values are recommended values with partial safety factors for action and resistance included. Design value in Y direction = 1.0 x recommended value.

### Recommended loads per EN1993-1-1<sup>(2)</sup>

Configuration	+/-F <sub>x,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN]	+F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN]
2 brackets	not decisive	4.62	not decisive	not decisive
4 brackets	not decisive	9.24	not decisive	not decisive

## MT-FPS-GL1 OC

## R14162712

Item no.	Material Description
2331080	Connector Pipe shoe MT-FPS-GL1 OC

### General

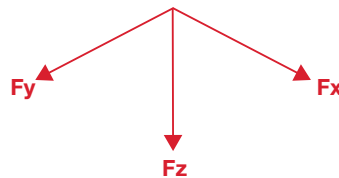
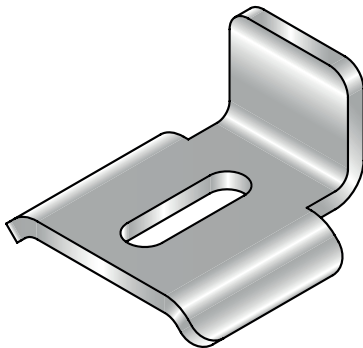
- Media temperature limits: -20 °C to +300 °C
- Mass per single item: 0.182 kg
- Continuously hot-dip Zinc-Magnesium coated per EN 10346

### Material properties:

Component/Material	min. Yield strength	min. Ultimate strength	Modulus of elasticity	Shear modulus
S280GD (EN 10346)	$f_y = 280 \frac{\text{N}}{\text{mm}^2}$	$f_u = 360 \frac{\text{N}}{\text{mm}^2}$	$E = 210000 \frac{\text{N}}{\text{mm}^2}$	$G = 80769 \frac{\text{N}}{\text{mm}^2}$

Values for Modulus of Elasticity and Shear Modulus are according to EN 1993-1-1 and used for all Eurocode calculations

## DESIGN LOADING CAPACITY – 3D



### Notes for load data

Point of load application = pipe center line (X-axis).  
 Load data per set (2 items) of the brackets installed with MP-PS x1-1 or MP-PS x2-2  
 Load capacity given at room temperature.  
 Temperature correction factors apply:

- Per VGB-R-510 for load reported acc to EN13480-3
- Per EN 1993-1-2 for loads reported acc to EN1993-1-1

Temperature distribution on pipe shoe components per EN13480-3  
 Published loads are based on static loading conditions. Non-static forces must be separately considered during design

### Recommended loads per EN13480-3

$+/-F_{x,rec}$ [kN]	$+/-F_{y,rec}$ [kN]	$+F_{z,rec}$ [kN]	$-F_{z,rec}$ [kN]
not decisive	2.21	not decisive	not decisive

### Recommended loads per EN1993-1-1<sup>(2)</sup>

$+/-F_{x,rec}$ [kN]	$+/-F_{y,rec}$ [kN]	$+F_{z,rec}$ [kN]	$-F_{z,rec}$ [kN]
not decisive	4.90	not decisive	not decisive

### <sup>(2)</sup>Notes

Shown EN1993-1-1 load values are recommended values with partial safety factors for action and resistance included. Design value in Y direction = 1.0 x recommended value.

# MT-FPS-GL2 OC

# R14162712

Item no.	Material Description
2331081	Connector Pipe shoe MT-FPS-GL2 OC

### General

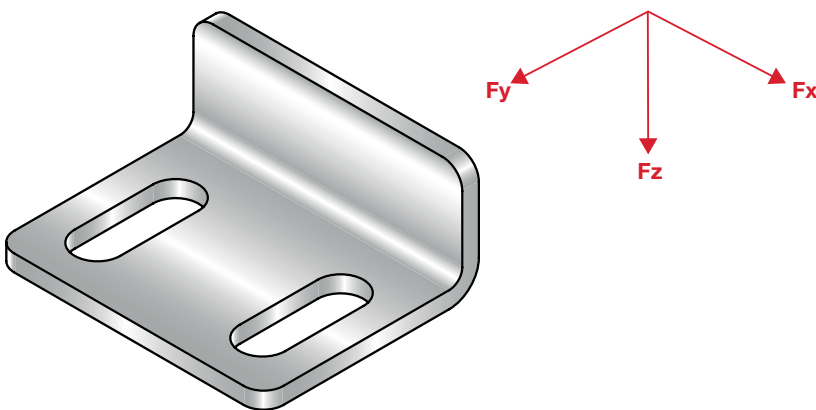
- Media temperature limits: -20 °C to +300 °C
- Mass per single item: 0.182 kg
- Continuously hot-dip Zinc-Magnesium coated per EN 10346

### Material properties:

Component/Material	min. Yield strength	min. Ultimate strength	Modulus of elasticity	Shear modulus
S280GD (EN 10346)	$f_y = 280 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Values for Modulus of Elasticity and Shear Modulus are according to EN 1993-1-1 and used for all Eurocode calculations

## DESIGN LOADING CAPACITY – 3D



### Notes for load data

Point of load application = pipe center line (X-axis). Load data per set (2 items) of the brackets installed with MP-PS x1-1, MP-PS x2-2, or MP-PS x4-2 according to IFU. Load capacity given at room temperature. Temperature correction factors apply:

- Per VGB-R-510 for load reported acc to EN13480-3
- Per EN 1993-1-2 for loads reported acc to EN1993-1-1

Temperature distribution on pipe shoe components per EN13480-3  
Published loads are based on static loading conditions. Non-static forces must be separately considered during design

### Recommended loads per EN13480-3

$\pm F_{x,rec}$ [kN]	$\pm F_{y,rec}$ [kN]	$\pm F_{y,rec}$ [kN] (in combination with X-BT)	$+F_{z,rec}$ [kN]	$-F_{z,rec}$ [kN]
not decisive	3.14	0.40	not decisive	not decisive

### Recommended loads per EN1993-1-1<sup>(2)</sup>

$\pm F_{x,rec}$ [kN]	$\pm F_{y,rec}$ [kN]	$\pm F_{y,rec}$ [kN] (in combination with X-BT)	$+F_{z,rec}$ [kN]	$-F_{z,rec}$ [kN]
not decisive	6.95	0.56	not decisive	not decisive

### <sup>(2)</sup>Notes

Shown EN1993-1-1 load values are recommended values with partial safety factors for action and resistance included. Design value in Y direction = 1.0 x recommended value.

## MIA-BO90/120-M12

## R6197

Item no.	Material Description
304840	Bow MIA-BO90-M12
304841	Bow MIA-BO120-M12

### General

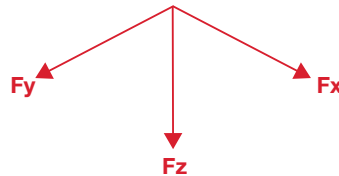
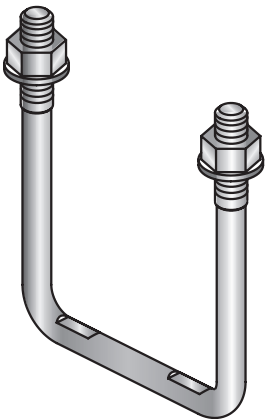
- Media temperature limits: -20 °C to +300 °C
- Mass per single item: 0.29 kg (MIA-BO90-M12); 0.33 kg (MIA-BO120-M12)
- Surface finish: HDG: 48 µm - DIN EN ISO 10684

### Material properties:

Component/Material	min. Yield strength	min. Ultimate strength	Modulus of elasticity	Shear modulus
U-Bolt F Class 8.8 (ISO 898-1)	$f_y = 640 \frac{\text{N}}{\text{mm}^2}$	$f_u = 800 \frac{\text{N}}{\text{mm}^2}$	$E = 210000 \frac{\text{N}}{\text{mm}^2}$	$G = 80769 \frac{\text{N}}{\text{mm}^2}$
Nuts Grade 8 (ISO 898-2)	$f_y = 640 \frac{\text{N}}{\text{mm}^2}$	$f_u = 800 \frac{\text{N}}{\text{mm}^2}$	$E = 210000 \frac{\text{N}}{\text{mm}^2}$	$G = 80769 \frac{\text{N}}{\text{mm}^2}$

Values for Modulus of Elasticity and Shear Modulus are according to EN 1993-1-1 and used for all Eurocode calculations

## DESIGN LOADING CAPACITY – 3D



### Notes for load data

Point of load application = pipe center line (X-axis). Load data per configuration (2 or 4 items) of the brackets installed with MP-PS x2-2, and MP-PS x4-2.

Load capacity given at room temperature. Temperature correction factors apply per EN 1993-1-2

Published loads are based on static loading conditions. Non-static forces must be separately considered during design. Installation in combination with MP-PS x2-2, and MP-PS x4-2 has to be done according to IFU of MP-PS

### Recommended loads per EN1993-1-1<sup>(2)</sup>

Configurations	+/-F <sub>x,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN]	+F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN]
2 brackets	18.00	5.40	not decisive	11.11
4 brackets	36.00	10.80	not decisive	22.22

### <sup>(2)</sup>Notes

Shown EN1993-1-1 load values are recommended values with partial safety factors for action and resistance included. Design value in X & Y directions = 1.0 x recommended value. Design value in Z direction = 1.35 x recommended value.

### Interaction formula

$$\frac{F_{x,exp}}{F_{x,rec}} + \frac{F_{y,exp}}{F_{y,rec}} + \frac{F_{z,exp}}{F_{z,rec}} \leq 1.0$$

## MI-DGC 90

## R3598

Item no.	Material Description
233860	Beam clamp MI-DGC 90

### General

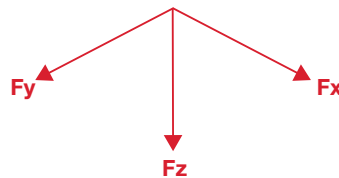
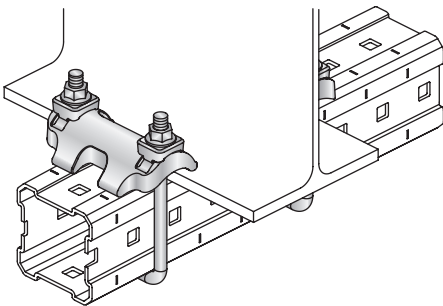
- Media temperature limits: -20 °C to +300 °C
- Mass per single item: 1.02 kg (MI-DGC 90)
- Surface finish: HDG: Clamp 55 µm - DIN EN ISO 1461; U-bolt, Nut 45 µm - DIN EN ISO 1461

### Material properties:

Component/Material	min. Yield strength	min. Ultimate strength	Modulus of elasticity	Shear modulus
U-Bolt, Nut F Class 8.8 (ISO 898-1); Grade 8 (ISO 898-2)	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Clamp Steel EN-GJMB-350-10 - DIN EN 1562, Steel EN-GJMW-400-5 - DIN EN 1562, Steel EN-GJMB-450-6 - EN 1562	$f_y = 270 \frac{N}{mm^2}$	$f_u = 450 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Values for Modulus of Elasticity and Shear Modulus are according to EN 1993-1-1 and used for all Eurocode calculations

## DESIGN LOADING CAPACITY – 3D



### Notes for load data

Point of load application = pipe center line (X-axis).  
Load data per set (2 items) of the brackets installed with MP-PS x1-1

Load capacity given at room temperature.  
Temperature correction factors apply per EN 1993-1-2

Published loads are based on static loading conditions. Non-static forces must be separately considered during design.

### Recommended loads per EN1993-1-1<sup>(2)</sup>

+/-F <sub>x,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN]	+F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN]	M <sub>x,rec</sub> [kNm]	M <sub>y,rec</sub> [kNm]	M <sub>z,rec</sub> [kNm]
6.09	8.93	not decisive	25.80	1.95	1.77	0.34

### <sup>(2)</sup>Notes

Shown EN1993-1-1 load values are recommended values with partial safety factors for action and resistance included. Design value in X, Y, M<sub>x</sub>, M<sub>y</sub> & M<sub>z</sub> directions = 1.0 x recommended value. Design value in Z direction = 1.35 x recommended value.

### Interaction formula

$$\frac{F_{z.exp}}{F_{z.rec}} + \frac{M_{x.exp} + F_{y.exp} * \frac{(h+45)}{1000}}{M_{x.rec}} + \frac{M_{y.exp} + F_{x.exp} * \frac{(h+45)}{1000}}{M_{y.rec}} \leq 1.0$$

$$\sqrt{\left(\frac{F_{y.exp}}{F_{y.rec}}\right)^2 + \left(\frac{F_{x.exp} + \frac{M_{z.exp}}{M_{z.rec}}}{F_{x.rec}}\right)^2} \leq 1.0$$

## MI-DGC 120

## R3598

Item no.	Material Description
233861	Beam clamp MI-DGC 120

### General

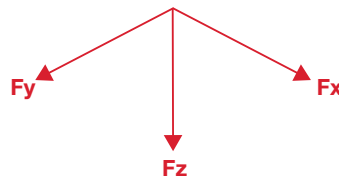
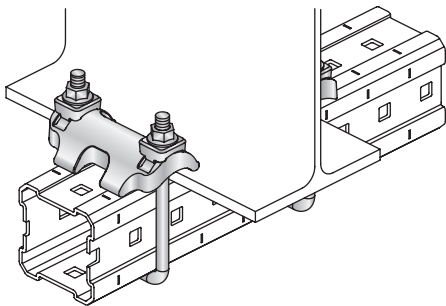
- Media temperature limits: -20 °C to +300 °C
- Mass per single item: 1.04 kg (MIC-DGC 120)
- Surface finish: HDG: Clamp 55 µm - DIN EN ISO 1461; U-bolt, Nut 45 µm - DIN EN ISO 1461

### Material properties:

Component/Material	min. Yield strength	min. Ultimate strength	Modulus of elasticity	Shear modulus
U-Bolt, Nut F Class 8.8 (ISO 898-1); Grade 8 (ISO 898-2)	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Clamp Steel EN-GJMB-350-10 - DIN EN 1562, Steel EN-GJMW-400-5 - DIN EN 1562, Steel EN-GJMB-450-6 - EN 1562	$f_y = 270 \frac{N}{mm^2}$	$f_u = 450 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Values for Modulus of Elasticity and Shear Modulus are according to EN 1993-1-1 and used for all Eurocode calculations

## DESIGN LOADING CAPACITY – 3D



### Notes for load data

Point of load application = pipe center line (X-axis).  
Load data per set (2 items) of the brackets installed with MP-PS x1-1

Load capacity given at room temperature.  
Temperature correction factors apply per EN 1993-1-2

Published loads are based on static loading conditions. Non-static forces must be separately considered during design.

### Recommended loads per EN1993-1-1<sup>(2)</sup>

+/-F <sub>x,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN]	+F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN]	M <sub>x,rec</sub> [kNm]	M <sub>y,rec</sub> [kNm]	M <sub>z,rec</sub> [kNm]
6.09	8.93	not decisive	25.80	1.95	1.77	0.34

### <sup>(2)</sup>Notes

Shown EN1993-1-1 load values are recommended values with partial safety factors for action and resistance included. Design value in X, Y, M<sub>x</sub>, M<sub>y</sub> & M<sub>z</sub> directions = 1.0 x recommended value. Design value in Z direction = 1.35 x recommended value.

### Interaction formula

$$\frac{F_{z.exp}}{F_{z.rec}} + \frac{M_{x.exp} + F_{y.exp} * \frac{(h+60)}{1000}}{M_{x.rec}} + \frac{M_{y.exp} + F_{x.exp} * \frac{(h+60)}{1000}}{M_{y.rec}} \leq 1.0$$

$$\sqrt{\left(\frac{F_{y.exp}}{F_{y.rec}}\right)^2 + \left(\frac{F_{x.exp} + \frac{M_{z.exp}}{M_{z.rec}}}{F_{x.rec}}\right)^2} \leq 1.0$$

## MIC-PS90/120

## R3143

Item no.	Material Description
304838	Connector pipe shoe MIA-BO90-M12
304839	Connector pipe shoe MIA-BO120-M12

### General

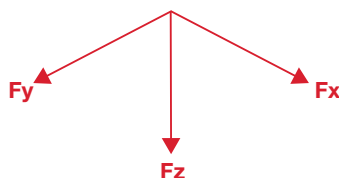
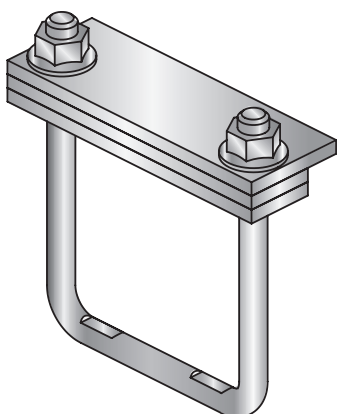
- Media temperature limits: -20 °C to +300 °C
- Mass per single item: 0.29 kg (MIA-BO90-M12); 0.33 kg (MIA-BO120-M12)
- Surface finish: HDG: U-bolt, nut 45 µm - DIN EN ISO 1461; plate: 55 µm - DIN EN ISO 1461

### Material properties:

Component/Material	min. Yield strength	min. Ultimate strength	Modulus of elasticity	Shear modulus
U-Bolt, Nut F Class 8.8 (ISO 898-1); Grade 8 (ISO 898-2)	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Plate DD11 MD - HN547 S235JR - DIN10025	$f_y = 235 \frac{N}{mm^2}$	$f_u = 350 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Values for Modulus of Elasticity and Shear Modulus are according to EN 1993-1-1 and used for all Eurocode calculations

## DESIGN LOADING CAPACITY – 3D



### Notes for load data

Point of load application = pipe center line (X-axis). Load data per configuration (2 items or 4 items) of the brackets installed with MP-PS x1-1, MP-PS x2-2, or MP-PS x4-2 according to IFU.

Load capacity given at room temperature. Temperature correction factors apply per EN 1993-1-2. Published loads are based on static loading conditions. Non-static forces must be separately considered during design.

### Recommended loads per EN1993-1-1<sup>(2)</sup>

Configurations	+/-F <sub>x,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN]	+F <sub>z,rec</sub> [kN]	-F <sub>z,rec</sub> [kN]
<b>2 brackets</b>	not decisive	6.30	not decisive	6.67
<b>4 brackets</b>	not decisive	12.60	not decisive	13.33

### <sup>(2)</sup>Notes

Shown EN1993-1-1 load values are recommended values with partial safety factors for action and resistance included. Design value in Y direction = 1.0 x recommended value. Design value in Z direction = 1.35 x recommended value.

### Interaction formula

$$\frac{F_{y,exp}}{F_{y,rec}} + \frac{F_{z,exp}}{F_{z,rec}} \leq 1.0$$

## MP-PS IFG

## R14230976

### MP-PS IFG:

Item no.	Material Description	Mass (kg)
2331072	Beam connector MP-PS IFG 80/160 OC	1.97
2331073	Beam connector MP-PS IFG 160/230 OC	2.23
2331074	Beam connector MP-PS IFG 230/300 OC	2.49

### General

- Media temperature limits: -20 °C to +300 °C

### Material properties:

Component/Material	min. Yield strength	min. Ultimate strength	Modulus of elasticity	Shear modulus
Beam Clamp Cast Iron (DIN EN 1562)	$f_y = 270 \frac{N}{mm^2}$	$f_u = 450 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Baseplate S280GD (EN 10346)	$f_y = 280 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Rectangular washer S235JR Yield280 (HN 707)	$f_y = 280 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Bolts; Nuts F Class 8.8 (ISO 898-1); Grade 8 (ISO 898-2)	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Cylindrical washers Stainless Steel X5CrNi18-10 (EN 10088-3)	$f_y = 190 \frac{N}{mm^2}$	$f_u = 500 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Retaining washers C60E (EN10132-3)	$f_y = 450 \frac{N}{mm^2}$	$f_u = 750 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

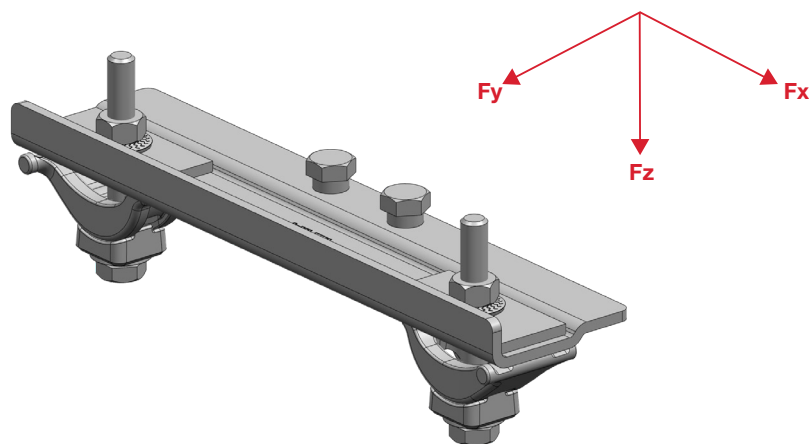
Values for Modulus of Elasticity and Shear Modulus are according to EN 1993-1-1 and used for all Eurocode calculations

### Corrosion protection:

Component	Coating system	Zinc thickness, min. local (µm)
Beam Clamp (Clamping Claw+Saddle)	HDG per ISO 1461	55
Retaining Washer	Non-electrolytically applied zinc flake coated per ISO 10683	5
Bolts; Nuts	HDG per ISO 10684	40
Baseplate	Continuously hot-dip Zinc-Magnesium coated per EN 10346	17
Rectangular washer	HDG per ISO 1461	55



## DESIGN LOADING CAPACITY – 3D



### Notes for load data

Point of load application = pipe center line (X-Axis)  
Load data of the brackets installed with MP-PS x1-1, MP-PS x2-2, and MP-PS x4-2

Load capacity given at room temperature

Temperature correction factors apply:

- Per VGB-R-510 for load reported acc to EN13480-3
- Per EN 1993-1-2 for loads reported acc to EN1993-1-1

Temperature distribution on pipe shoe components per EN13480-3

Published loads are based on static loading. Non-static forces must be separately considered during design

Installation in combination with MP-PS x1-1, MP-PS x2-2, and MP-PS x4-2 has to be done according to IFU of MP-PS and IFxG

### Interaction formula

**Fix Point:**

$$\frac{F_{x.exp}}{F_{x.rec}} + \frac{F_{y.exp}}{F_{y.rec}} + \frac{F_{z.exp}}{F_{z.rec}} \leq 1.0$$

**Line Guide:**

$$\frac{F_{y.exp}}{F_{y.rec}} + \frac{F_{z.exp}}{F_{z.rec}} \leq 1.0$$

**Plain Guide:**

$$\frac{F_{y.exp}}{F_{y.rec}} \leq 1.0$$

### (2)Notes

Shown EN1993-1-1 load values are recommended values with partial safety factors for action and resistance included. Design value in X & Y directions = 1.0 x recommended value. Design value in Z direction = 1.35 x recommended value.

### Recommended loads per EN13480-3

		+/-F <sub>x,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN]		-F <sub>z,rec</sub> [kN]	+F <sub>z,rec</sub> [kN]
MP-PS	Configuration	IFG Fix Point	IFG/ISG Plain Guide	IFG Fix Point/ ISG Line Guide	IFG Fix Point/ ISG Line Guide	all configurations
1x1 2x2	2 brackets	6.28	2.75	450.00/h*	10.68	not decisive
4x2	2 brackets			1149.75/h*		
	4 brackets	12.56	-	1722.19/h*	21.36	

\*h – Height of pipe neutral axis in mm from pipe shoe base

### Recommended loads per EN1993-1-1<sup>(2)</sup>

		+/-F <sub>x,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN]		-F <sub>z,rec</sub> [kN]	+F <sub>z,rec</sub> [kN]
MP-PS	Configuration	IFG Fix Point	IFG/ISG Plain Guide	IFG Fix Point/ ISG Line Guide	IFG Fix Point/ ISG Line Guide	all configurations
1x1 2x2	2 brackets	10.05	3.74	929.09/h*	15.20	not decisive
4x2	2 brackets			2373.83/h*		
	4 brackets	20.10	-	3555.72/h*	30.40	

\*h – Height of pipe neutral axis in mm from pipe shoe base

## MP-PS ISG

## R14230977

### MP-PS ISG:

Item no.	Material Description	Mass (kg)
2343972	Beam connector MP-PS ISG 80/160 OC	1.92
2343973	Beam connector MP-PS ISG 160/230 OC	2.18
2343974	Beam connector MP-PS ISG 230/300 OC	2.44

### General

- Media temperature limits: -20 °C to +300 °C

### Material properties:

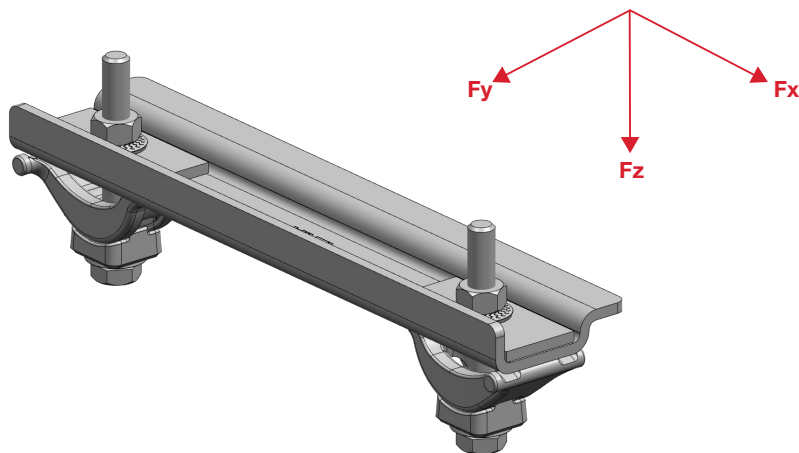
Component/Material	min. Yield strength	min. Ultimate strength	Modulus of elasticity	Shear modulus
Beam Clamp Cast Iron (DIN EN 1562)	$f_y = 270 \frac{N}{mm^2}$	$f_u = 450 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Baseplate S280GD (EN 10346)	$f_y = 280 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Rectangular washer S235JR Yield280 (HN 707)	$f_y = 280 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Bolts; Nuts F Class 8.8 (ISO 898-1); Grade 8 (ISO 898-2)	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Retaining washers C60E (EN10132-3)	$f_y = 450 \frac{N}{mm^2}$	$f_u = 750 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Values for Modulus of Elasticity and Shear Modulus are according to EN 1993-1-1 and used for all Eurocode calculations

### Corrosion protection:

Component	Coating system	Zinc thickness, min. local (µm)
Beam Clamp (Clamping Claw+Saddle)	HDG per ISO 1461	55
Retaining Washer	Non-electrolytically applied zinc flake coated per ISO 10683	5
Bolts; Nuts	HDG per ISO 10684	40
Baseplate	Continuously hot-dip Zinc-Magnesium coated per EN 10346	17
Rectangular washer	HDG per ISO 1461	55

## DESIGN LOADING CAPACITY – 3D



### Notes for load data

Point of load application = pipe center line (X-Axis)  
Load data of the brackets installed with MP-PS x1-1, MP-PS x2-2, and MP-PS x4-2

Load capacity given at room temperature

Temperature correction factors apply:

- Per VGB-R-510 for load reported acc to EN13480-3
- Per EN 1993-1-2 for loads reported acc to EN1993-1-1

Temperature distribution on pipe shoe components per EN13480-3

Published loads are based on static loading. Non-static forces must be separately considered during design

Installation in combination with MP-PS x1-1, MP-PS x2-2, and MP-PS x4-2 has to be done according to IFU of MP-PS and IFxG

### Interaction formula

**Fix Point:**

$$\frac{F_{x.exp}}{F_{x.rec}} + \frac{F_{y.exp}}{F_{y.rec}} + \frac{F_{z.exp}}{F_{z.rec}} \leq 1.0$$

**Line Guide:**

$$\frac{F_{y.exp}}{F_{y.rec}} + \frac{F_{z.exp}}{F_{z.rec}} \leq 1.0$$

**Plain Guide:**

$$\frac{F_{y.exp}}{F_{y.rec}} \leq 1.0$$

### (2)Notes

Shown EN1993-1-1 load values are recommended values with partial safety factors for action and resistance included. Design value in X & Y directions = 1.0 x recommended value. Design value in Z direction = 1.35 x recommended value.

### Recommended loads per EN13480-3

		+/-F <sub>x,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN]		-F <sub>z,rec</sub> [kN]	+F <sub>z,rec</sub> [kN]
MP-PS	Configuration	IFG Fix Point	IFG/ISG Plain Guide	IFG Fix Point/ ISG Line Guide	IFG Fix Point/ ISG Line Guide	all configurations
1x1 2x2	2 brackets	6.28	2.75	450.00/h*	10.68	not decisive
4x2	2 brackets			1149.75/h*		
	4 brackets	12.56	-	1722.19/h*	21.36	

\*h – Height of pipe neutral axis in mm from pipe shoe base

### Recommended loads per EN1993-1-1<sup>(2)</sup>

		+/-F <sub>x,rec</sub> [kN]	+/-F <sub>y,rec</sub> [kN]		-F <sub>z,rec</sub> [kN]	+F <sub>z,rec</sub> [kN]
MP-PS	Configuration	IFG Fix Point	IFG/ISG Plain Guide	IFG Fix Point/ ISG Line Guide	IFG Fix Point/ ISG Line Guide	all configurations
1x1 2x2	2 brackets	10.05	3.74	929.09/h*	15.20	not decisive
4x2	2 brackets			2373.83/h*		
	4 brackets	20.10	-	3555.72/h*	30.40	

\*h – Height of pipe neutral axis in mm from pipe shoe base



Hilti Aktiengesellschaft  
9494 Schaan, Liechtenstein  
P +423-234 2965

[www.facebook.com/hiltigroup](https://www.facebook.com/hiltigroup)  
[www.hilti.group](http://www.hilti.group)