

- ATHENS, GREECE -- VELODROME
Vasoflon bearings for roof covering

Cover photo:

- U.K. -- CHANNEL TUNNEL RAIL LINK

INTRODUCTION

CE MARKING

FIP Industriale is proud to be the first Italian manufacturer of structural bearings, anti-seismic devices and expansion joints boasting a Quality Assurance System certified at the highest level - from design to customer service assistance. Certification has been achieved via rigorous evaluation by an internationally recognized Third Party Organisation, thus internationally validating the quality assurance system.

FIP Industriale designs and manufactures its devices in accordance with the most widely adopted and stringent international specifications: EN, AASHTO, CNR, British Standards, DIN, NF. Moreover, **FIP Industriale** meets the most recent requirements by supplying bearings and anti-seismic devices with CE marking.

The certification ISO 9001, obtained in 1992, guarantees that the same quality level is kept from the design stage through manufacture to installation, while the Certificate OHS 618800 guarantees that **FIP Industriale** operates an Occupational Health and Safety Management System which complies with the requirements of BS OHSAS 18001:2007.

FIP Industriale's quality system is also certified to perform welding activities in accordance with EN ISO 3834-2 and DIN 18800-7.



OHS 618800



PRODUCT

Vasoflon® are structural pot bearings, in which the rotations about any horizontal axis are ensured by the deformability of the elastomeric pad confined in a monolithic steel pot.

The elastomer behaves like a fluid that, under a tri-axial pressure, offers low resistance to deformations but high vertical stiffness.

In addition to vertical compressive loads, **Vasoflon®** bearings are capable of transferring forces and/or slide in one or more directions of the horizontal plane depending on the different bearing types.

In the sliding bearings, translational movements are achieved through the mutual sliding of two flat mating surfaces, one of stainless steel and the other of PTFE.

CLASSIFICATION

Vasoflon® bearings are classified using two letters followed by two or three groups of numbers with the following meanings:

VF	=>	Vasoflon® bearing, fixed type
VU	=>	Vasoflon® bearing, guided type, longitudinally sliding
VU*	=>	Vasoflon® bearing, guided type, transversally sliding
VM	=>	Vasoflon® bearing, free sliding type

The first group of numbers represents the vertical load in kN/10 (t); the second group represents the total movement in mm (VU, VM), or the horizontal force in (kN/10) acting in the longitudinal direction (VU*) or in all directions (VF); the third group of numbers represents the total transverse movement in mm (VU*, VM) or the transverse horizontal force in kN/10 (VU). The loads and forces are at the Ultimate Limit State.

For example:

VF 3000-240	Vasoflon® bearing, fixed type, with a vertical capacity of 30000 kN able to transfer both longitudinally and transversally horizontal forces of 2400 kN.
VU 400/100-120	Vasoflon® bearing, guided type, longitudinally sliding, with a vertical capacity of 4000 kN, that permits longitudinal movements of ± 50 mm and it is able to transfer transversally horizontal forces of 1200 kN.
VU* 600-180/50	Vasoflon® bearing, guided type, transversally sliding, with a vertical capacity of 6000 kN able to transfer longitudinally horizontal forces of 1800 kN and it permits transverse movements of ± 25 mm.
VM 1500/550/50	Vasoflon® bearing, free sliding type, with a vertical capacity of 15000 kN that permits longitudinal movements of ± 275 mm and transverse movements of ± 25 mm.

DESCRIPTION

VASOFLON® FIXED TYPE

This bearing comprises:

- a lower steel element with a cylindrical recess (pot);
- an elastomeric pad contained in the pot;
- an upper steel element (piston) that is inserted into the pot.



VASOFLON® GUIDED SLIDING TYPE

This bearing comprises:

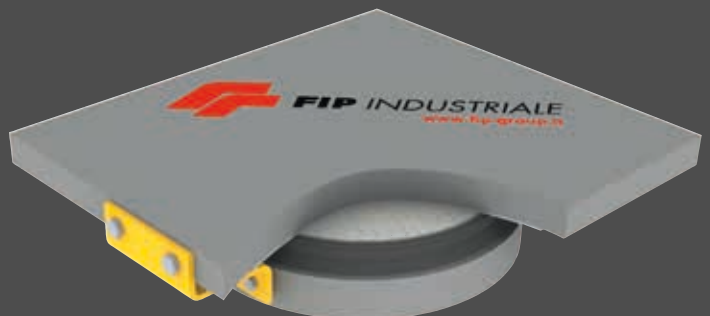
- a lower steel element with a cylindrical recess (pot);
- an elastomeric pad contained in the pot;
- an intermediate circular steel element (piston) that is inserted into the pot. Its upper side has a machined recess to house a dimpled PTFE sheet and a centrally arranged key (guide) capable of resisting forces perpendicular to it and determining the sliding direction of the bearing. Two CM1 type composite low friction material strips are bonded to the sides and screwed to the front ends of the guide to assure smooth sliding in the keyway of the upper sliding element covered with stainless steel;
- an upper sliding element, whose underside is covered with a pair of stainless steel sheets, which also cover the sides of the central keyway for the guide.



VASOFLON® FREE SLIDING TYPE

This bearing comprises:

- a lower steel element with a cylindrical recess (pot);
- an elastomeric pad contained in the pot;
- an intermediate circular steel element (piston) that is inserted into the pot. Its upper side has a machined recess to house a dimpled PTFE sheet;
- an upper sliding element, whose underside is covered with stainless steel sheet.



ANCHORING SYSTEMS

Applicable construction codes permitting, and if the ratio between the horizontal forces and the concurrent vertical loads is low enough, a mechanical anchoring system is not required; the friction itself is enough to secure the bearing to the the super and/or substructure. In this case, the surface of the bearing in contact with the concrete is provided with grooves to enhance bonding with epoxy resin.

It should be noted that *"In case of dynamically stressed structures where extreme load fluctuations can occur, e.g. railway bridges and earthquakes, the horizontal forces shall not be resisted by friction (EN 1337-1 §5.2)"*.

If mechanical anchoring is required in order to transfer the horizontal forces, the different types of upper and lower anchoring systems indicated below represent the most commonly adopted configurations.

STEEL STRUCTURE

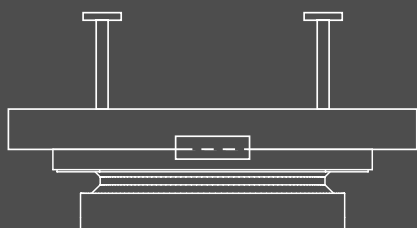
1. Shear pin in counterplate
2. Bolts connected to the structure or to counterplates

PRECAST CONCRETE STRUCTURE

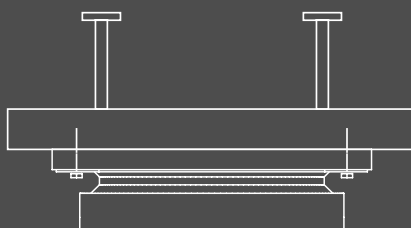
1. Shear pin in counterplate
2. Bolts connected to counterplates
3. Bolts and dowels (with pre-formed pockets in the structure)

CAST IN SITU STRUCTURE

1. Shear pin in counterplate
2. Bolts connected to counterplates
3. Bolts and dowels



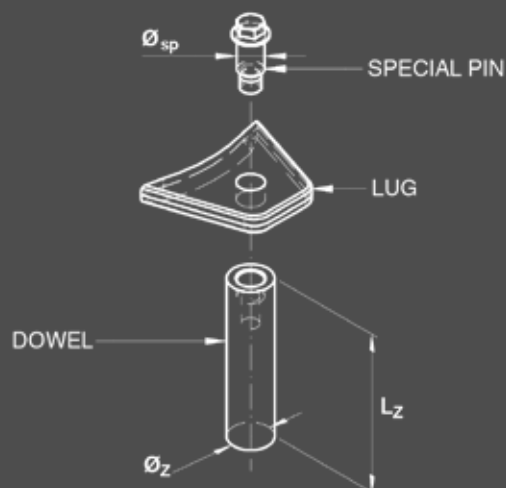
1. Shear pin in counterplate



2. Bolts connected to counterplates



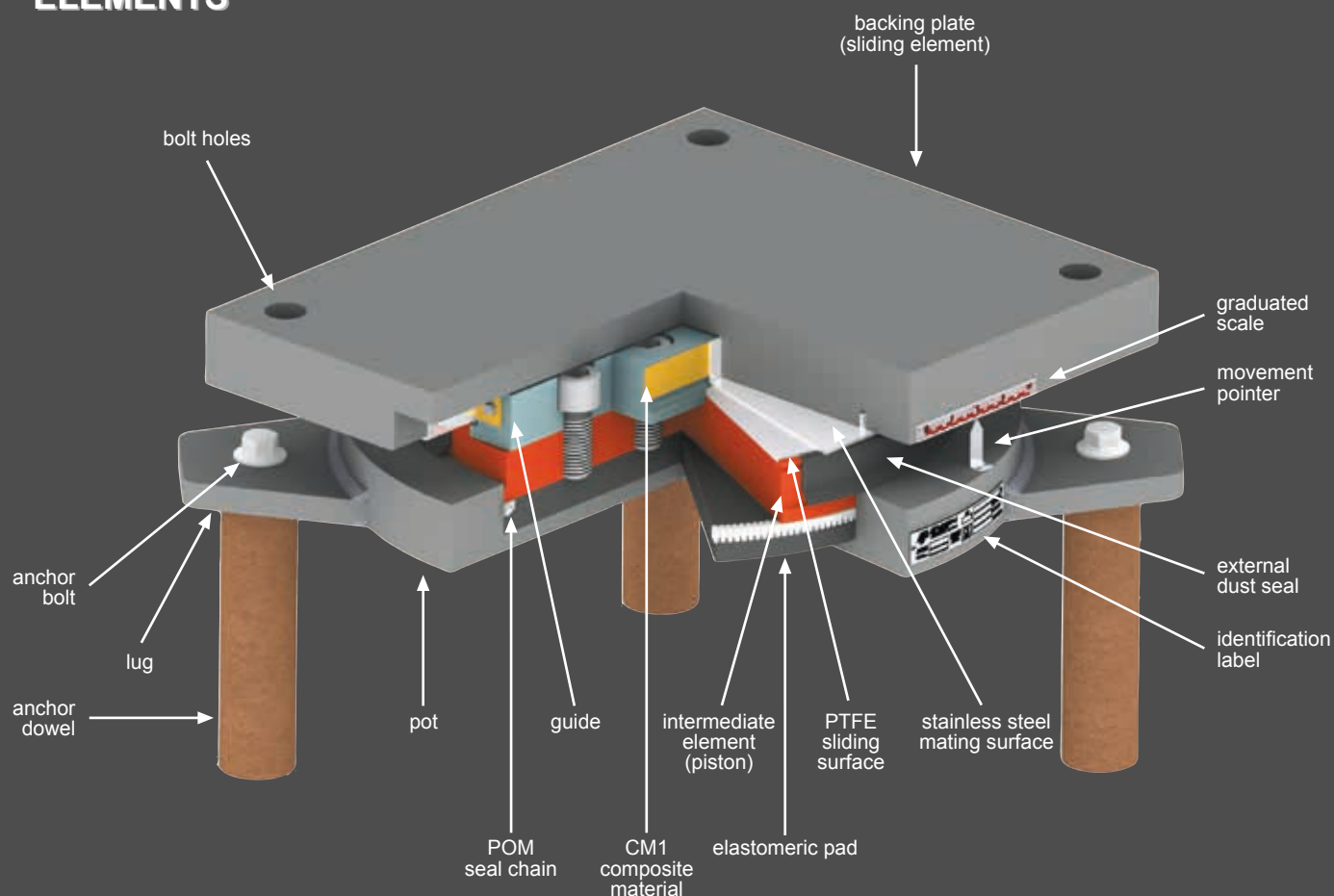
3. Bolts and dowels



DOWEL TYPE	Ø _{sp} (mm)	Ø _z (mm)	L _z (mm)
1	14	25	100
2	20	35	140
3	30	55	220
4	54	100	400

BEARING COMPONENTS

ELEMENTS



MATERIALS

The materials used are in accordance with European standard EN 1337. In particular, the structural parts are made of S355 grade steel. Class X5CrNiMo 17-12-2 stainless steel with a minimum thickness of 2.5 mm is used for the sliding surfaces.

The elastomeric pad, with 50 ± 5 Shore A hardness, has a POM (polyoxymethylene) seal chain vulcanised to its upper rim that prevents the extrusion of the elastomer from the pot, in accordance with EN 1337-5, Appendix A, section A 1.2. This makes **FIP Industriale**'s bearings especially suitable for roadway, highway, and railway bridges (EN 1337-5 Appendix G).

The flat sliding surfaces (sliding bearings) are made of sheets of pure PTFE (polytetrafluoroethylene) free sintered without regenerated or filler materials.

The protrusion from the recess and the total thickness of the PTFE sheet, minimum 5 mm, are in compliance with EN 1337-2. Two CM1 type composite low friction material strips are bonded to the sides and screwed to the front ends of the guide in accordance with the requirements of EN 1337-2 (guided sliding bearings).

ACCESSORIES

Every bearing is provided with an identification label showing its main technical information. Other accessories are the graduated scale and the movement pointer for the sliding bearings.

 FIP INDUSTRIALE via Scapacchio 41 • Selvazzano PD • Italy • fipindustriale.it		ANNO YEAR <input type="text"/>	TIPO TYPE <input type="text"/>
N° COMMESSA ORDER NUMBER <input type="text"/>	SISTEMA QUALITÀ ISO 9001 / EN 3834	CARICO VERTICALE MAX VERTICAL LOAD kN ULS <input type="text"/>	
N° SERIALE SERIAL NUMBER <input type="text"/>	CERTIFICATO ICIM N. 0057/0941	CARICO LATERALE MAX LATERAL LOAD kN ULS <input type="text"/>	
 0672		SCORRIMENTO TOTALE MAX DISPLACEMENT mm <input type="text"/>	

INDICATIONS

CORROSION PROTECTION

The corrosion protection follows the indications given in EN 1337-9. The bearings are finished with light grey (RAL 7035) unless otherwise requested. Bridge bearings are supplied with an external dust seal and a dust scraper for the sliding surfaces.

PRE-SETTING

The sliding plate of the sliding bearings can be pre-set in the workshop to cater for special construction requirements. The pre-setting values must be defined and communicated to **FIP Industriale** before the production process starts.

HANDLING

Bridge bearings are delivered assembled. Yellow fixing brackets must not be removed before the device is installed and in any case not before the Engineer deems it fit.

Use pallets to move the packaged bearings. They shall be properly harnessed and lifted using suitable mechanical equipment (crane, forklift). To handle the individual bearing use eyebolts to be screwed into the threaded holes on the upper side of the bearing. Dismounting bridge bearings on site is not permitted for any reason.

STORAGE

Bridge bearings are delivered assembled and ready for installation. If they are not installed immediately, the Customer is responsible for ensuring that they are properly stored in order to prevent mechanical damages and harmful effects of dust, dirt, humidity, heat, pollutants, and other.

INSTALLATION

Bridge bearings are supplied with drawings and installation instructions. Customers and Engineers should feel free to contact **FIP Industriale**'s Technical Department for information on the most appropriate installation procedure based on the type of structure and its construction phases.



• U.K. -- KINCARDINE BRIDGE

DESIGN CRITERIA

DIMENSIONING DATA

FIP Industriale shall be provided with at least the following data to prepare an adequate technical **proposal**:

... maximum axial force (vertical load) \longrightarrow $N_{sd, ULS}$

... axial force (vertical load) concurrent with the maximum horizontal force

... permanent axial force (vertical load)

... maximum longitudinal horizontal force \longrightarrow $V_{long, ULS}$

... maximum transverse horizontal force \longrightarrow $V_{trans, ULS}$

... horizontal force concurrent with N_{sd}

... maximum rotation due to permanent actions

... maximum rotation due to variable actions

... maximum longitudinal movement in the worst Limit State condition (VU and VM bearings)

... maximum transverse movement in the worst Limit State condition (VU* and VM bearings)

... type of deck (steel, cast *in situ* concrete, precast concrete)

... characteristic compressive cylinder strength of upper concrete (for cast *in situ* or precast concrete)

... characteristic compressive cylinder strength of lower concrete

... longitudinal slope to be compensated for by the bearing (if any)

... transverse slope to be compensated for by the bearing (if any)

... type of upper anchoring system

... type of lower anchoring system

It is also useful to clarify whether the maximum horizontal force at ULS has to be considered seismic.

SLIDING MOVEMENTS

Standard EN 1337 requires that the total design movement be increased by 40 mm and establishes a total minimum movement of 100 mm in the longitudinal direction. Therefore, the sliding bearings in the tables below provide the following movements:

VU: longitudinally = 100mm (± 50 mm)

transversally = 0

VU*: longitudinally = 0

transversally = 50mm (± 25 mm)

VM: longitudinally = 100mm (± 50 mm)

transversally = 50mm (± 25 mm)

ROTATIONS

Maximum design rotation due to permanent actions at ULS = 0.005 rad.

Maximum rotation due to variable actions at ULS = 0.005 rad.

Total maximum rotation, sum of the previous = 0.010 rad.

ANCHORING SYSTEMS

The bearings listed in the tables consider the following anchoring options:

- upper anchoring system: bolts and dowels;
epoxy resin bonding for free sliding bearings.
- lower anchoring system: bolts and dowels for fixed and guided sliding bearings;
epoxy resin bonding for free sliding bearings.

The choice of anchoring systems other than the assumed ones might require a change in the bearing dimensions.

SUPER AND SUBSTRUCTURE

Upper concrete class (if present) \geq C45/55

Upper concrete class (if present) \geq C35/45

$\sqrt{A_{c1}/A_{c0}}$ ratio = 2 where:

A_{c0} = circular area of concrete loaded by the bearing or by the lower/upper counterplate

A_{c1} = A_{c0} distribution into the upper/lower concrete

Permanent vertical load $N_{Gd} = 0.6 N_{Sd}$

Effective temperatures between -5°C y and 30°C

No longitudinal or transverse slopes



• CROATIA -- KRKA BRIDGE
Vasoflon bearings with fuse restraints

FIP Industriale also designs and manufactures non-standard CE marked bearings, based on loads other than those tabulated.

In order to easily select the most appropriate bridge bearings for a correct restraint system for the different types of structures, the following tables covering the “standard” fixed, longitudinally guided sliding, transversally guided sliding, and free sliding **Vasoflon®** bearings can be consulted.

The position of the anchoring elements and the final overall bearing dimensions are to be considered as indicative and have to be confirmed when defining the final bridge bearing. To cover the greatest number of cases, the two bearing types that transmit horizontal forces have been further divided into **Normal** and **High**, depending on the lower or higher horizontal forces resisted.

TABLES

VASOFLO[®] FIXED TYPE

VF
NORMAL

BEARING TYPE	DESIGN VERTICAL LOAD N_{ed} kN	MAXIMUM HORIZONTAL LOAD V_{ULS} kN	BASE ELEMENT DIAMETER D_o mm	DOWELS (UPPER/LOWER) n_b n type	UPPER ELEMENT DIAMETER B mm	UPPER OVERALL DIMENSIONS		LOWER OVERALL DIMENSIONS		BEARING TOTAL HEIGHT H_{tot} mm	BEARING WEIGHT (EXCEPT ANCHORING) W kg
						TRANSVERSAL C mm	LONGITUDINAL D mm	TRANSVERSAL G mm	LONGITUDINAL F mm		
VF 50-5	500	50	160	2/2 1	150	150	250	160	270	69	9
VF 100-10	1.000	100	210	4/4 1	200	250	250	250	250	69	15
VF 150-15	1.500	150	245	4/4 1	235	270	270	280	280	73	22
VF 200-20	2.000	200	285	4/4 1	265	290	290	310	310	73	28
VF 250-25	2.500	250	320	4/4 1	295	320	320	330	330	77	38
VF 300-30	3.000	300	350	4/4 2	320	380	380	400	400	81	47
VF 350-35	3.500	350	380	4/4 2	345	400	400	420	420	86	59
VF 400-40	4.000	400	405	4/4 2	365	410	410	440	440	85	65
VF 450-45	4.500	450	430	4/4 2	385	430	430	460	460	89	77
VF 500-50	5.000	500	455	4/4 2	405	440	440	480	480	89	85
VF 600-60	6.000	600	495	2/2 3	440	500	730	440	670	103	116
VF 700-70	7.000	700	535	4/4 3	470	550	550	600	600	102	131
VF 800-80	8.000	800	580	4/4 3	510	580	580	630	630	106	171
VF 900-90	9.000	900	610	4/4 3	530	590	590	650	650	110	185
VF 1000-100	10.000	1.000	640	4/4 3	560	620	620	680	680	118	206
VF 1100-110	11.000	1.100	675	4/4 3	595	640	640	700	700	118	229
VF 1200-120	12.000	1.200	705	4/4 3	620	660	660	720	720	122	274
VF 1300-130	13.000	1.300	735	4/4 3	650	680	680	750	750	131	295
VF 1400-140	14.000	1.400	765	6/6 3	680	830	920	910	1.010	130	314
VF 1500-150	15.000	1.500	790	6/6 3	705	850	950	930	1.040	135	348
VF 1600-160	16.000	1.600	815	6/6 3	735	880	980	950	1.060	134	406
VF 1700-170	17.000	1.700	840	6/6 3	755	900	1.000	970	1.090	143	425
VF 1800-180	18.000	1.800	865	6/6 3	780	920	1.020	1.000	1.110	143	448
VF 1900-190	19.000	1.900	885	6/6 3	805	940	1.050	1.010	1.130	142	461
VF 2000-200	20.000	2.000	910	8/8 3	825	1.010	1.010	1.090	1.090	146	499
VF 2250-210	22.500	2.100	970	8/8 3	890	1.070	1.070	1.150	1.150	155	615
VF 2500-220	25.000	2.200	1.020	8/8 3	945	1.130	1.130	1.200	1.200	153	667
VF 2750-230	27.500	2.300	1.065	8/8 3	985	1.160	1.160	1.240	1.240	166	800
VF 3000-240	30.000	2.400	1.105	8/8 3	1.030	1.200	1.200	1.280	1.280	175	848
VF 3250-250	32.500	2.500	1.150	8/8 3	1.070	1.240	1.240	1.320	1.320	184	965
VF 3500-260	35.000	2.600	1.190	8/8 3	1.115	1.280	1.280	1.360	1.360	183	1.104
VF 3750-270	37.500	2.700	1.230	12/12 3	1.190	1.190	1.390	1.450	1.230	192	1.179
VF 4000-280	40.000	2.800	1.270	12/12 3	1.230	1.230	1.430	1.490	1.270	190	1.218
VF 4500-320	45.000	3.200	1.345	12/12 3	1.305	1.310	1.510	1.570	1.350	199	1.445
VF 5000-350	50.000	3.500	1.425	12/12 3	1.355	1.360	1.580	1.650	1.430	208	1.571
VF 5500-390	55.000	3.900	1.500	4/4 4	1.375	1.380	1.380	1.500	1.500	237	2.157
VF 6000-420	60.000	4.200	1.565	4/4 4	1.440	1.440	1.440	1.570	1.570	245	2.301
VF 6500-460	65.000	4.600	1.630	6/6 4	1.500	1.700	1.900	1.810	2.030	254	2.610
VF 7000-490	70.000	4.900	1.690	6/6 4	1.560	1.740	1.960	1.860	2.100	253	2.768
VF 7500-530	75.000	5.300	1.755	6/6 4	1.630	1.810	2.030	1.920	2.160	262	3.145
VF 8000-560	80.000	5.600	1.820	6/6 4	1.690	1.860	2.090	1.970	2.230	261	3.314
VF 9000-630	90.000	6.300	1.925	6/6 4	1.790	1.950	2.190	2.070	2.330	269	3.839
VF 10000-700	100.000	7.000	2.040	8/8 4	1.915	2.180	2.180	2.290	2.290	277	4.500

VF HIGH

BEARING TYPE	DESIGN VERTICAL LOAD	MAXIMUM HORIZONTAL LOAD	BASE ELEMENT DIAMETER	DOWELS (UPPER/LOWER)		UPPER ELEMENT DIAMETER	UPPER OVERALL DIMENSIONS		LOWER OVERALL DIMENSIONS		BEARING TOTAL HEIGHT	BEARING WEIGHT (EXCEPT ANCHORING)
	N_{sd} ULS kN	kN	D_o mm	n_b n	type	B mm	C mm	D mm	G mm	F mm	H_{tot} mm	W kg
VF 50-15	500	150	160	4/4	1	150	210	210	220	220	69	8
VF 100-30	1.000	300	225	4/4	2	200	280	280	300	300	77	19
VF 150-45	1.500	450	280	4/4	2	255	320	320	350	350	76	29
VF 200-60	2.000	600	325	4/4	3	265	380	380	440	440	90	41
VF 250-75	2.500	750	365	4/4	3	315	530	530	470	470	89	53
VF 300-90	3.000	900	400	4/4	3	350	570	570	500	500	93	71
VF 350-105	3.500	1.050	440	4/4	3	385	600	600	530	530	92	85
VF 400-120	4.000	1.200	465	4/4	3	405	630	630	550	550	97	100
VF 450-135	4.500	1.350	495	6/6	3	425	600	650	670	730	96	110
VF 500-150	5.000	1.500	520	6/6	3	450	620	680	690	760	100	129
VF 600-180	6.000	1.800	570	6/6	3	500	670	730	730	810	108	178
VF 700-210	7.000	2.100	620	8/8	3	580	580	760	800	620	112	215
VF 800-240	8.000	2.400	670	8/8	3	630	630	810	850	670	111	246
VF 900-270	9.000	2.700	705	12/12	3	645	650	870	930	710	119	304
VF 1000-300	10.000	3.000	740	12/12	3	680	700	900	960	740	123	330
VF 1100-330	11.000	3.300	785	12/12	3	720	950	720	990	790	132	367
VF 1200-360	12.000	3.600	815	12/12	3	780	980	780	1.020	820	135	411
VF 1300-390	13.000	3.900	850	12/12	4	815	1.030	820	1.050	850	134	487
VF 1400-420	14.000	4.200	885	16/16	4	850	1.070	850	1.110	890	144	524
VF 1500-450	15.000	4.500	920	16/16	4	920	1.140	920	1.140	920	143	573
VF 1600-480	16.000	4.800	940	6/6	4	830	1.210	1.090	1.200	1.330	167	654
VF 1700-510	17.000	5.100	985	6/6	4	875	1.250	1.130	1.240	1.380	175	776
VF 1800-540	18.000	5.400	1.020	6/6	4	910	1.290	1.160	1.270	1.410	174	833
VF 1900-570	19.000	5.700	1.045	6/6	4	935	1.320	1.190	1.290	1.440	173	867
VF 2000-600	20.000	6.000	1.075	6/6	4	965	1.350	1.210	1.320	1.470	192	959
VF 2250-630	22.500	6.300	1.125	6/6	4	1.015	1.400	1.260	1.360	1.520	191	1.113
VF 2500-660	25.000	6.600	1.245	8/8	4	1.135	1.440	1.440	1.640	1.640	190	1.363
VF 2750-690	27.500	6.900	1.225	8/8	4	1.115	1.420	1.420	1.620	1.620	199	1.278
VF 3000-720	30.000	7.200	1.265	8/8	4	1.155	1.460	1.460	1.660	1.660	197	1.443
VF 3250-750	32.500	7.500	1.310	8/8	4	1.200	1.500	1.500	1.710	1.710	205	1.522
VF 3500-780	35.000	7.800	1.350	8/8	4	1.240	1.540	1.540	1.750	1.750	204	1.713
VF 3750-820	37.500	8.200	1.400	8/8	4	1.290	1.590	1.590	1.800	1.800	205	1.842
VF 4000-860	40.000	8.600	1.440	8/8	4	1.330	1.620	1.620	1.840	1.840	225	2.015
VF 4500-900	45.000	9.000	1.520	8/8	4	1.410	1.780	1.780	1.890	1.890	231	2.319
VF 5000-1000	50.000	10.000	1.605	12/12	4	1.495	1.870	1.870	1.980	1.980	240	2.556
VF 5500-1100	55.000	11.000	1.690	12/12	4	1.580	1.950	1.950	2.060	2.060	239	2.977
VF 6000-1200	60.000	12.000	1.765	12/12	4	1.655	2.030	2.030	2.140	2.140	247	3.207
VF 6500-1300	65.000	13.000	1.840	16/16	4	1.730	2.100	2.100	2.210	2.210	246	3.656
VF 7000-1400	70.000	14.000	1.905	16/16	4	1.795	2.170	2.170	2.280	2.280	254	3.867
VF 7500-1500	75.000	15.000	1.980	16/16	4	1.870	2.240	2.240	2.350	2.350	273	4.512
VF 8000-1600	80.000	16.000	2.055	16/16	4	1.945	2.320	2.320	2.430	2.430	272	4.800
VF 9000-1700	90.000	17.000	2.170	16/16	4	2.060	2.430	2.430	2.540	2.540	280	5.548
VF 10000-1800	100.000	18.000	2.275	20/20	4	2.165	2.540	2.540	2.650	2.650	288	6.306

TABLES

VASOFLO[®] LONGITUDINALLY GUIDED SLIDING TYPE

VU
NORMAL

BEARING TYPE	DESIGN VERTICAL LOAD N_{sd} ULS kN	MAXIMUM HORIZONTAL LOAD V_{ULS} kN	BASE ELEMENT DIAMETER D_o mm	DOWELS (UPPER/LOWER) n_b type	UPPER OVERALL DIMENSIONS		LOWER OVERALL DIMENSIONS		BEARING TOTAL HEIGHT H_{tot} mm	BEARING WEIGHT (EXCEPT ANCHORINGS) W kg
					TRANSVERSAL C mm	LONGITUDINAL D mm	TRANSVERSAL G mm	LONGITUDINAL F mm		
VU 50/100-5	500	50	160	4/2 1	270	315	270	160	108	23
VU 100/100-10	1.000	100	245	4/4 1	270	335	280	280	98	36
VU 150/100-15	1.500	150	275	4/4 1	275	365	300	300	97	44
VU 200/100-20	2.000	200	310	4/4 1	305	395	330	330	104	59
VU 250/100-25	2.500	250	335	4/4 1	320	410	350	350	104	66
VU 300/100-30	3.000	300	370	4/4 2	355	445	420	420	108	85
VU 350/100-35	3.500	350	395	4/4 2	380	470	430	430	111	97
VU 400/100-40	4.000	400	420	4/4 2	395	485	450	450	120	117
VU 450/100-45	4.500	450	445	4/4 2	415	505	470	470	120	130
VU 500/100-50	5.000	500	480	4/4 2	450	540	500	500	124	154
VU 600/100-60	6.000	600	520	4/4 3	480	570	750	520	123	180
VU 700/100-70	7.000	700	570	4/4 3	490	495	630	630	122	204
VU 800/100-80	8.000	800	580	4/4 3	525	615	630	630	127	224
VU 900/100-90	9.000	900	610	4/4 3	540	630	650	650	136	257
VU 1000/100-100	10.000	1.000	640	4/4 3	575	665	680	680	134	282
VU 1100/100-110	11.000	1.100	675	4/4 3	610	700	700	700	149	364
VU 1200/100-120	12.000	1.200	705	4/4 3	635	725	720	720	153	404
VU 1300/100-130	13.000	1.300	735	4/4 3	645	735	750	750	177	493
VU 1400/100-140	14.000	1.400	765	8/8 3	665	890	910	1.010	176	558
VU 1500/100-150	15.000	1.500	790	8/8 3	690	900	930	1.040	176	589
VU 1600/100-160	16.000	1.600	815	8/8 3	710	915	950	1.060	175	614
VU 1700/100-170	17.000	1.700	840	8/8 3	730	935	970	1.090	184	687
VU 1800/100-180	18.000	1.800	865	8/8 3	750	950	1.000	1.110	184	721
VU 1900/100-190	19.000	1.900	885	8/8 3	770	955	1.010	1.130	188	756
VU 2000/100-200	20.000	2.000	910	8/8 3	790	970	1.090	1.090	187	789
VU 2250/100-210	22.500	2.100	970	8/8 3	835	1.010	1.150	1.150	201	947
VU 2500/100-220	25.000	2.200	1.020	8/8 3	880	1.035	1.200	1.200	200	1.015
VU 2750/100-230	27.500	2.300	1.065	8/8 3	930	1.050	1.240	1.240	214	1.178
VU 3000/100-240	30.000	2.400	1.105	8/8 3	955	1.080	1.280	1.280	223	1.317
VU 3250/100-250	32.500	2.500	1.150	8/8 3	995	1.095	1.320	1.320	252	1.630
VU 3500/100-260	35.000	2.600	1.190	8/8 3	1.040	1.140	1.360	1.360	256	1.773
VU 3750/100-270	37.500	2.700	1.230	12/12 3	1.065	1.165	1.450	1.230	265	1.933
VU 4000/100-280	40.000	2.800	1.270	12/12 3	1.100	1.200	1.490	1.270	264	2.052
VU 4500/100-320	45.000	3.200	1.345	12/12 3	1.170	1.270	1.570	1.350	278	2.425
VU 5000/100-350	50.000	3.500	1.425	12/12 3	1.230	1.330	1.670	1.430	287	2.789
VU 5500/100-390	55.000	3.900	1.500	4/4 4	1.290	1.380	1.500	1.500	286	3.069
VU 6000/100-420	60.000	4.200	1.565	4/4 4	1.345	1.435	1.570	1.570	298	3.478
VU 6500/100-460	65.000	4.600	1.630	8/8 4	1.405	1.695	1.810	2.030	307	4.082
VU 7000/100-490	70.000	4.900	1.690	8/8 4	1.445	1.740	1.860	2.100	306	4.306
VU 7500/100-530	75.000	5.300	1.755	8/8 4	1.505	1.770	1.920	2.160	325	4.886
VU 8000/100-560	80.000	5.600	1.820	8/8 4	1.565	1.805	1.970	2.230	324	5.163
VU 9000/100-630	90.000	6.300	1.925	8/8 4	1.645	1.870	2.070	2.330	332	5.839
VU 10000/100-700	100.000	7.000	2.040	8/8 4	1.725	1.955	2.290	2.290	340	6.657

For the **transversally guided sliding type (VU*)** general characteristics shall be taken from the tables for VU, except for the length of the upper element "D", which shall be reduced by 50 mm.

VU
HIGH

BEARING TYPE	DESIGN VERTICAL LOAD N_{sd} ULS kN	MAXIMUM HORIZONTAL LOAD V_{ULS} kN	BASE ELEMENT DIAMETER D_o mm	DOWELS (UPPER/LOWER) n_b n type	UPPER OVERALL DIMENSIONS		LOWER OVERALL DIMENSIONS		BEARING TOTAL HEIGHT H_{tot} mm	BEARING WEIGHT (EXCEPT ANCHORINGS) W kg
					TRANSVERSAL C mm	LONGITUDINAL D mm	TRANSVERSAL G mm	LONGITUDINAL F mm		
VU 50/100-15	500	150	290	4/4 1	305	395	310	310	102	53
VU 100/100-30	1.000	300	305	4/4 2	300	410	370	370	114	67
VU 150/100-45	1.500	450	350	4/4 2	355	445	400	400	133	91
VU 200/100-60	2.000	600	370	4/4 3	375	515	470	470	146	141
VU 250/100-75	2.500	750	385	4/4 3	355	505	480	480	145	135
VU 300/100-90	3.000	900	455	4/4 3	415	535	540	540	149	181
VU 350/100-105	3.500	1.050	485	4/4 3	415	545	560	560	148	190
VU 400/100-120	4.000	1.200	550	4/4 3	490	580	610	610	161	263
VU 450/100-135	4.500	1.350	570	8/8 3	510	770	730	810	160	317
VU 500/100-150	5.000	1.500	545	8/8 3	510	760	710	780	165	311
VU 600/100-180	6.000	1.800	600	8/8 3	535	775	760	840	168	354
VU 700/100-210	7.000	2.100	675	8/8 3	565	785	870	870	172	414
VU 800/100-240	8.000	2.400	705	8/8 3	595	795	900	900	191	499
VU 900/100-270	9.000	2.700	745	12/12 3	610	800	970	750	195	552
VU 1000/100-300	10.000	3.000	785	12/12 3	635	815	1.010	790	214	673
VU 1100/100-330	11.000	3.300	835	12/12 3	680	830	1.060	840	212	738
VU 1200/100-360	12.000	3.600	850	12/12 3	680	830	1.070	850	226	782
VU 1300/100-390	13.000	3.900	895	4/4 4	720	1.010	980	980	235	1.007
VU 1400/100-420	14.000	4.200	930	4/4 4	745	1.035	1.010	1.010	234	1.071
VU 1500/100-450	15.000	4.500	975	8/8 4	780	1.365	1.230	1.370	244	1.381
VU 1600/100-480	16.000	4.800	1.020	8/8 4	800	1.410	1.270	1.410	251	1.516
VU 1700/100-510	17.000	5.100	1.065	8/8 4	845	1.430	1.310	1.460	251	1.627
VU 1800/100-540	18.000	5.400	1.115	8/8 4	880	1.470	1.350	1.510	260	1.821
VU 1900/100-570	19.000	5.700	1.160	8/8 4	920	1.495	1.390	1.560	259	1.936
VU 2000/100-600	20.000	6.000	1.200	8/8 4	965	1.510	1.430	1.600	268	2.139
VU 2250/100-630	22.500	6.300	1.215	8/8 4	965	1.530	1.440	1.610	267	2.175
VU 2500/100-660	25.000	6.600	1.260	8/8 4	1.005	1.555	1.560	1.560	266	2.301
VU 2750/100-690	27.500	6.900	1.305	8/8 4	1.040	1.585	1.610	1.610	275	2.537
VU 3000/100-720	30.000	7.200	1.315	8/8 4	1.030	1.605	1.620	1.620	285	2.682
VU 3250/100-750	32.500	7.500	1.330	8/8 4	1.030	1.625	1.630	1.630	285	2.731
VU 3500/100-780	35.000	7.800	1.375	8/8 4	1.075	1.645	1.670	1.670	298	3.028
VU 3750/100-820	37.500	8.200	1.400	8/8 4	1.085	1.670	1.700	1.700	298	3.126
VU 4000/100-860	40.000	8.600	1.440	8/8 4	1.135	1.685	1.730	1.730	307	3.399
VU 4500/100-900	45.000	9.000	1.570	12/12 4	1.230	1.775	1.940	1.570	306	3.943
VU 5000/100-1000	50.000	10.000	1.650	12/12 4	1.290	1.830	2.020	1.650	333	4.634
VU 5500/100-1100	55.000	11.000	1.765	12/12 4	1.395	1.890	2.140	1.770	341	5.348
VU 6000/100-1200	60.000	12.000	1.840	12/12 4	1.445	1.945	2.210	1.840	349	5.912
VU 6500/100-1300	65.000	13.000	1.910	16/16 4	1.495	2.295	2.280	1.910	357	6.916
VU 7000/100-1400	70.000	14.000	1.990	16/16 4	1.555	2.350	2.360	1.990	376	7.758
VU 7500/100-1500	75.000	15.000	2.080	16/16 4	1.635	1.855	2.450	2.080	384	7.696
VU 8000/100-1600	80.000	16.000	2.195	16/16 4	1.720	1.890	2.570	2.200	393	8.659
VU 9000/100-1700	90.000	17.000	2.355	16/16 4	1.855	2.570	2.730	2.360	400	11.096
VU 10000/100-1800	100.000	18.000	2.370	20/20 4	1.855	2.890	2.740	2.370	409	12.107

For the **transversally guided sliding type (VU*)** general characteristics shall be taken from the tables for VU, except for the length of the upper element "D", which shall be reduced by 50 mm.

TABLES

VASOFLO[®] FREE SLIDING TYPE

VM	DESIGN VERTICAL LOAD	BASE ELEMENT DIAMETER	UPPER OVERALL DIMENSIONS		BEARING TOTAL HEIGHT	BEARING WEIGHT (EXCEPT ANCHORINGS)
			TRANSVERSAL	LONGITUDINAL		
BEARING TYPE	N _{sd} ULS kV	D _o mm	C mm	D mm	H _{tot} mm	W kg
VM 50/100/50	500	160	270	270	89	22
VM 100/100/50	1.000	210	270	335	89	30
VM 150/100/50	1.500	245	295	360	93	40
VM 200/100/50	2.000	275	315	365	93	48
VM 250/100/50	2.500	310	345	395	97	60
VM 300/100/50	3.000	330	375	425	98	68
VM 350/100/50	3.500	355	395	445	97	76
VM 400/100/50	4.000	380	415	465	105	90
VM 450/100/50	4.500	405	435	485	104	99
VM 500/100/50	5.000	425	455	505	104	108
VM 600/100/50	6.000	465	490	540	108	129
VM 700/100/50	7.000	505	520	570	117	165
VM 800/100/50	8.000	540	565	615	116	185
VM 900/100/50	9.000	570	585	635	121	210
VM 1000/100/50	10.000	600	615	665	125	237
VM 1100/100/50	11.000	630	640	690	129	265
VM 1200/100/50	12.000	660	665	715	138	316
VM 1300/100/50	13.000	685	685	735	143	350
VM 1400/100/50	14.000	710	710	760	147	380
VM 1500/100/50	15.000	735	730	780	157	436
VM 1600/100/50	16.000	760	750	800	152	438
VM 1700/100/50	17.000	780	770	820	155	474
VM 1800/100/50	18.000	805	790	840	160	514
VM 1900/100/50	19.000	825	810	860	170	576
VM 2000/100/50	20.000	850	830	880	169	602
VM 2250/100/50	22.500	900	875	925	173	678
VM 2500/100/50	25.000	955	920	970	186	823
VM 2750/100/50	27.500	1.000	970	1.020	191	912
VM 3000/100/50	30.000	1.040	995	1.045	198	1.022
VM 3250/100/50	32.500	1.085	1.035	1.085	212	1.206
VM 3500/100/50	35.000	1.125	1.080	1.130	211	1.284
VM 3750/100/50	37.500	1.165	1.115	1.165	215	1.387
VM 4000/100/50	40.000	1.210	1.150	1.200	225	1.562
VM 4500/100/50	45.000	1.280	1.210	1.260	239	1.869
VM 5000/100/50	50.000	1.355	1.270	1.320	248	2.157
VM 5500/100/50	55.000	1.425	1.330	1.380	252	2.409
VM 6000/100/50	60.000	1.485	1.385	1.435	261	2.711
VM 6500/100/50	65.000	1.545	1.445	1.495	269	3.007
VM 7000/100/50	70.000	1.605	1.485	1.535	278	3.339
VM 7500/100/50	75.000	1.660	1.545	1.595	277	3.538
VM 8000/100/50	80.000	1.730	1.605	1.655	285	3.933
VM 9000/100/50	90.000	1.825	1.685	1.735	304	4.669
VM 10000/100/50	100.000	1.935	1.760	1.810	321	5.533

VASOFLON® SPECIAL BEARINGS

To meet particular functional requirements, **FIP Industriale** also manufactures **Vasoflon®** bearings integrated with special elements and/or specially shaped. The main types are listed below. For further information see **FIP Industriale's** website.

VASOFLON® ANTI-LIFTING BEARINGS

Also known as “negative load” or “double-acting” bearings. These devices are capable of resisting also vertical traction loads, commonly called “uplift forces”.



VASOFLON® LOAD MEASURING BEARINGS

They permit *in situ* measuring of vertical loads acting on the bearings. Depending on the technology used, measurements can be read on the bearing itself or at a remote location at any time during the service life of the bearing.



VASOFLON® BEARINGS WITH DAMPERS

They combine a free sliding or guided sliding Vasoflon bearing and steel hysteretic (VEL, VEP) and/or fluid viscous (VOP, VOTP, VELOP, VELOTP) dampers into a single device. They are also called “flat surface sliders with dampers”.



VASOFLON® BEARINGS WITH SHOCK TRANSMITTERS (VOT)

Sliding bearings coupled with shock-transmitters (also called lock-up devices). In case of sudden movements, such as seismic shocks, shock transmitters prevent the relative movement of the bearing elements they connect, and thus temporarily transform the bearings from sliding into fixed in the desired direction.



VASOFLON® BEARINGS AT ELASTIC REACTION

They are fixed or guided sliding bearings, in which an elastomeric ring is placed between the outer circumference of the intermediate element and the pot wall, to reduce the horizontal stiffness of the bearing.

VASOFLON® BEARINGS FOR INCREMENTALLY LAUNCHED BRIDGES

Their design allows the sliding of the bridge deck during launching operation by means of a supplementary special stainless steel sheet fixed to the specially shaped upper side of the bearing, which can be removed after launching completion.



VASOFLON® TEMPORARILY FIXED BEARINGS

Sliding bearings with additional temporary restraints that permit them to be fixed in a first phase, e.g. during casting or launching of bridge decks, and subsequently become sliding after the removal of the temporary blocks.

VASOFLON® TEMPORARILY SLIDING BEARINGS

These bearings are initially free sliding, e.g. so as not to oppose displacements generated during the construction phase, and subsequently fixed or guided sliding after the addition of supplementary restraints or guides.



**BRIDGE
BEARINGS**

**ANTI-SEISMIC
DEVICES**

**EXPANSION
JOINTS**

**FITTINGS
FOR TUNNEL**

**NOISE
BARRIERS**

**DAMPING
SYSTEMS**



FIP INDUSTRIALE
leading technologies



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