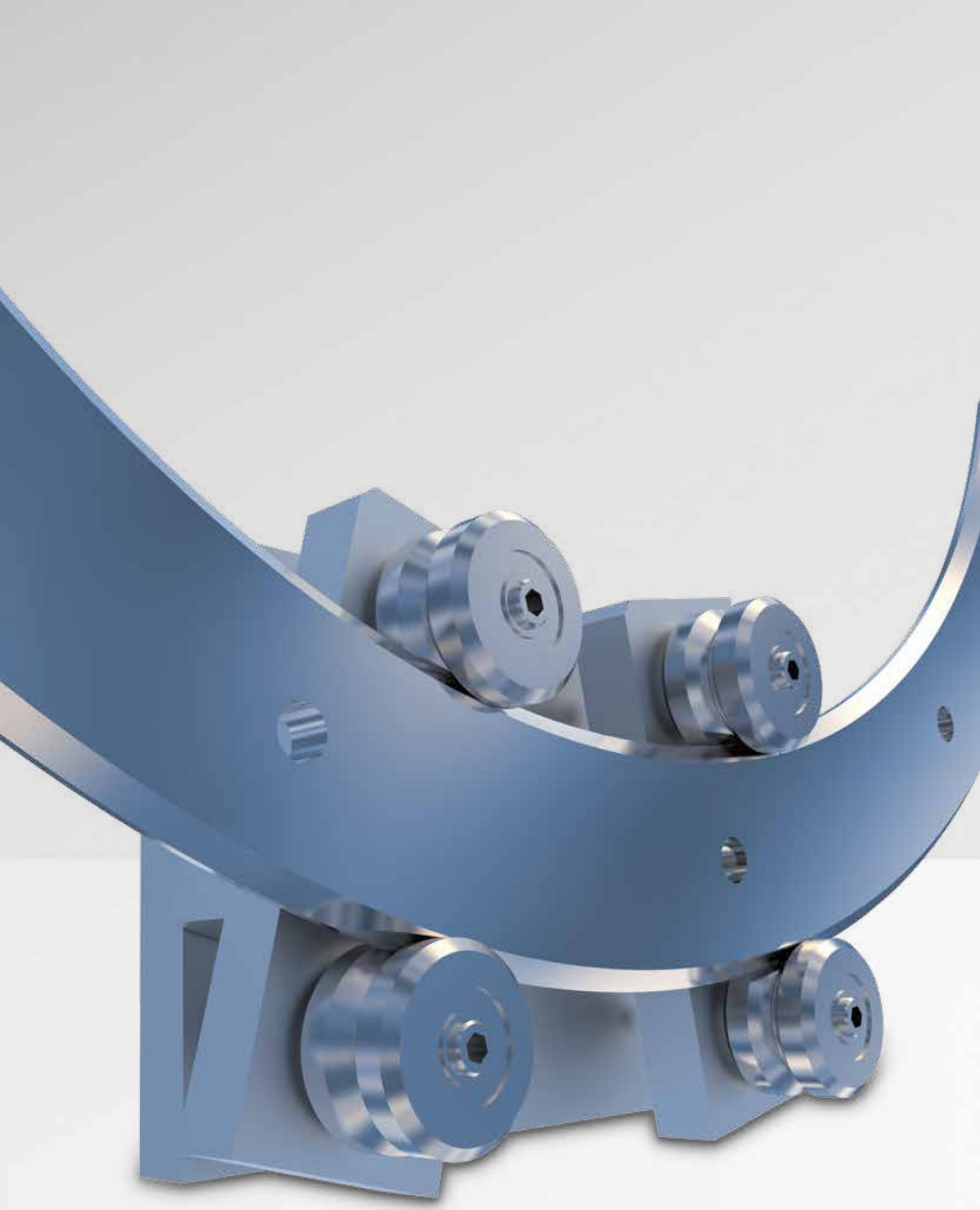


MULTI-MOTION-LINE

6

PAGE 72 — 6.1 CIRCULAR SYSTEMS

PAGE 73 — 6.2 FSR SYSTEM
- Circular rails FSR ... M
- Alignment blocks for FSR
- Oval circuit FSRO
- Ring circuit FSRQ
- Carriages with fixed guide rollers T4R ...
- Steering carriage T4R ...
- Lubrication system LUBR.. for circular systems

PAGE 79 — 6.3 MOUNTING EXAMPLES

MULTI-MOTION-LINE
CIRCULAR SYSTEMS

6.1

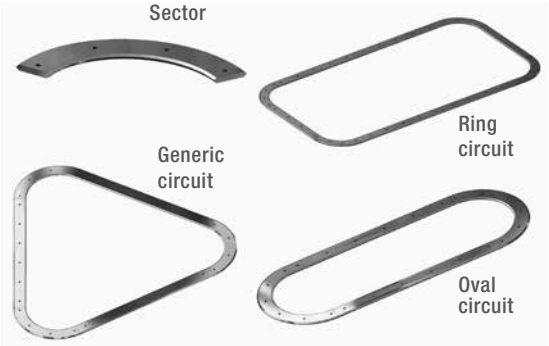
KEY BENEFITS

- Circular rails based on the profiles of V-Line (FS guides)
- Circular rails, oval circuits and ring circuits
- Rolled vertical guides for oversized radii
- Protection against corrosion by special surface treatment

NX

NADELLA proposes several circular rails based on the FS family of profiles. The rails can be used as an entire circumference, or single sectors, or joined together with straight pieces of rail in order to obtain oval or ring circuits.

GUIDE



The rails are steel, induction hardened on the raceways, with the same section dimensions as straight FS ... M rails. In the circuits the rails are joined together with alignment blocks that allow easy precise mounting. All the pieces of the circuit are supplied appropriately marked in order to avoid mistakes during joining. For protection against corrosion NADELLA proposes nickel plating (option NW) for both straight and circular pieces. On request, guides can be supplied in stainless steel (NX option). In addition to the standard dimensions in the table it is possible to realize rings with different sections or radii in order to satisfy specific demands.

GUIDE ROLLERS

Any guide rollers of the FS family of products can be used in combination with the circular rails.

CARRIAGE

Carriages for circular rails can be realized with guide rollers in fixed position or mounted on steering arms.

CARRIAGES WITH GUIDE ROLLERS IN FIXED POSITIONS

You can set up the distance between the centres of the guide rollers of a carriage with fixed guide rollers in order to obtain clearance-free running both on the straight and on the circular stretch of a circuit. The resulting carriage, normally a simple table with four holes for the housing of the guide rollers, will be simple and compact; there are however, some contraindications:

- In the passage from the straight stretch to the circular one (and vice versa), when two guide rollers are engaged on the straight portion and two on the circular one, there will be clearance between the carriage and the rail. The extent of the clearance depends on the dimensions of the rail, of the roller guides and of the carriage. Because of this clearance it is not possible to have an accurate positioning of the carriage during the passage between straight and circular stretch and therefore, in fast application, there will be vibration, noise and overload of the roller guides.
- This kind of carriages, with fixed guide rollers, can be used only for a single specific radius throughout the circuit. To use a carriage with fixed guide roller positions you can't have circular stretches with different radii.

To define the design for holes of the fixed rollers please contact the NADELLA Technical Service.

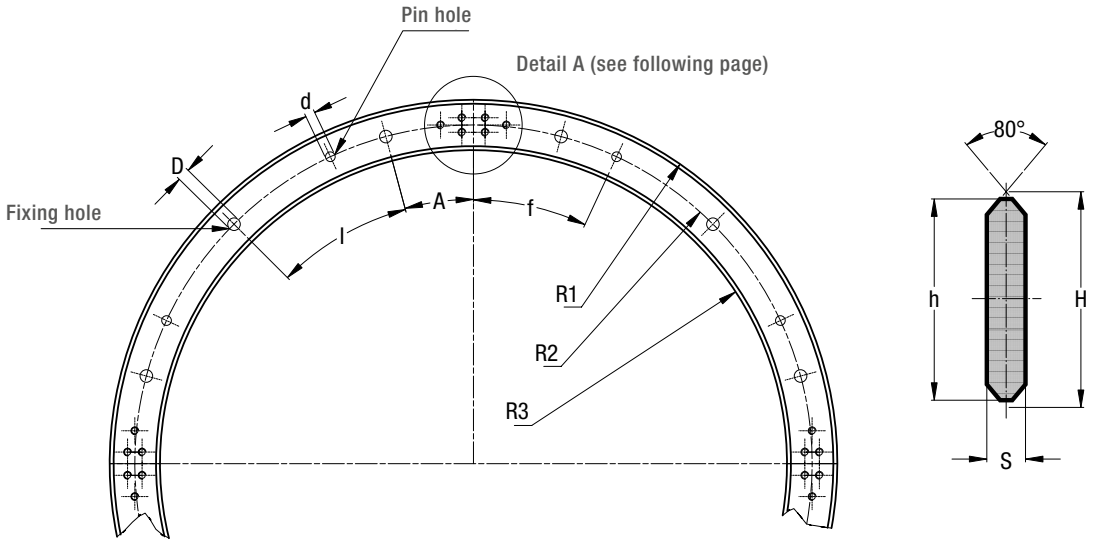
STEERING CARRIAGES

The contraindications for the carriage with guide rollers in fixed positions can be resolved by using the steering carriage. Guide rollers are mounted in pairs on steering arms that are free to rotate in order to always be transversal to the rail in every point of the circuit. The carriage won't have clearance at any point in the circuit improving transition area accuracy and reduce running noise. The studs of the steering carriage are fitted with needle bearings and seals for lubricant retention and protection. The tightening of the stud is obtained by the full tightening of the nut, and guarantees the best locking.

CIRCULAR RAILS FSR ... M

Circular rail in steel.

Available in stainless steel version. NX



Type	Dimensions (mm)											n° fixing holes / 360°	n° pin holes / 360°
	A	l	f	d H7	D	R1 1)	R2 1)	R3 1)	h	H	S		
FSR 22 M 075	22.5°	45°	45°	5	6.5	88	75	62	26	27.86	5	8	4
FSR 22 M 125	15°	30°	25°	5	6.5	138	125	112	26	27.86	5	12	8
FSR 22 M 175	15°	30°	25°	5	6.5	188	175	162	26	27.86	5	12	8
FSR 35 M 225	11.25°	22.5°	7.5°	8	9	248	225	202	46	47.86	8	16	8
FSR 35 M 300	11.25°	22.5°	7.5°	8	9	323	300	277	46	47.86	8	16	8
FSR 47 M 400	9°	18°	18°	10	11.5	438	400	362	76	78.58	10	20	8
FSR 47 M 500	9°	18°	18°	10	11.5	538	500	462	76	78.58	10	20	8

1) R1, R2, R3 are radius

RAILS FINISHING

- Steel
- Induction hardened on the raceways

HOLE LAYOUT

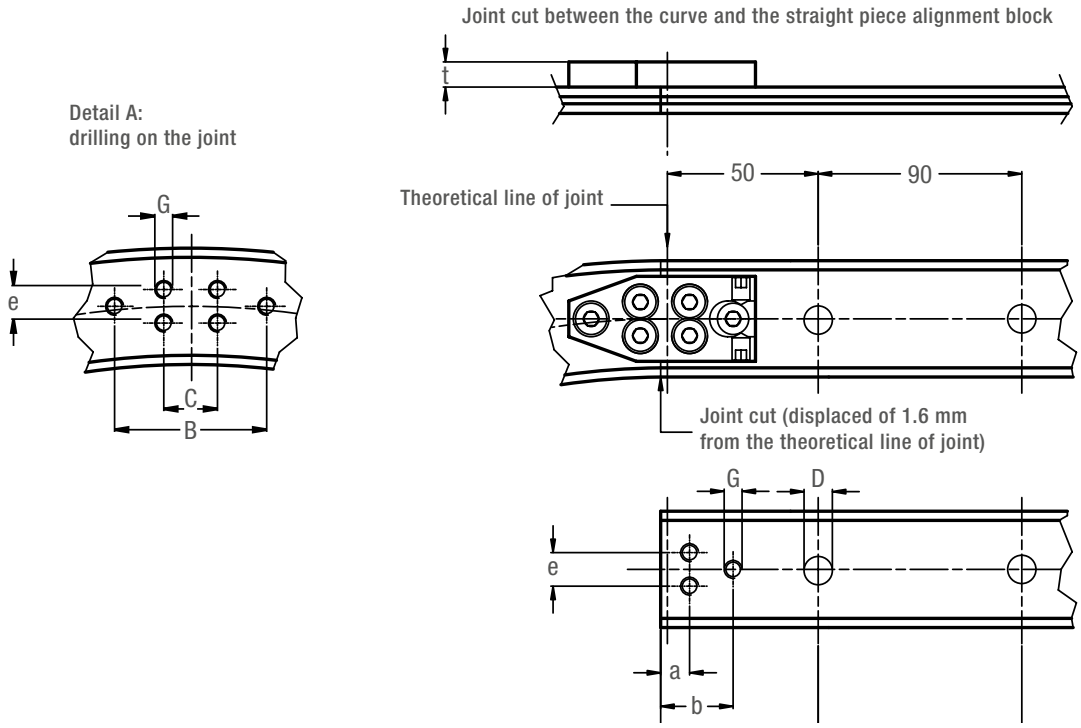
- Holes according to catalogue (SB)
- Finishes to drawing (NZ)

OPTIONAL FEATURES

- Stainless steel (NX)
- Nickel plating (NW)
- Spacers for rails FS and FSH

Example of standard designation: FSR 35 M 225 180
Circular rail sector FSR 35 M, radius R2 225 mm, sector angle 180°

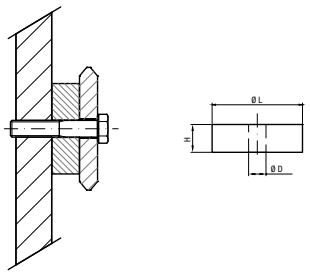
MULTI-MOTION-LINE – FSR SYSTEM
ALIGNMENT BLOCKS FOR FSR



Type	Dimensions (mm)								Suggested combinations
	C	B	e	G	D	a	b	t	
FSR 22 M 075	12	34	7.5	M4	6.5	7.6	18.6	5.8	FR 22 EU, FRN 22 EI
FSR 22 M 125	12	34	7.5	M4	6.5	7.6	18.6	5.8	FR 22 EU, FRN 22 EI
FSR 22 M 175	12	34	7.5	M4	6.5	7.6	18.6	5.8	FR 22 EU, FRN 22 EI
FSR 35 M 225	18	38	20	M6	9	10.6	19.6	8	FR 32 EU, FRN 32 EI, FR 40 EU, FRN 40 EI
FSR 35 M 300	18	38	20	M6	9	10.6	19.6	8	FR 32 EU, FRN 32 EI, FR 40 EU, FRN 40 EI
FSR 47 M 400	18	58	43	M6	11.5	8.6	18.1	9	FR 40 EU, FRN 40 EI, FR 52 EU, RKY 52
FSR 47 M 500	18	58	43	M6	11.5	8.6	18.1	9	FR 40 EU, FRN 40 EI, FR 52 EU, RKY 52

The joint cut is displaced of 1.6 mm from the theoretical line of joint.
The alignment block allows an easy mounting of the joint.

SPACERS FOR FSR

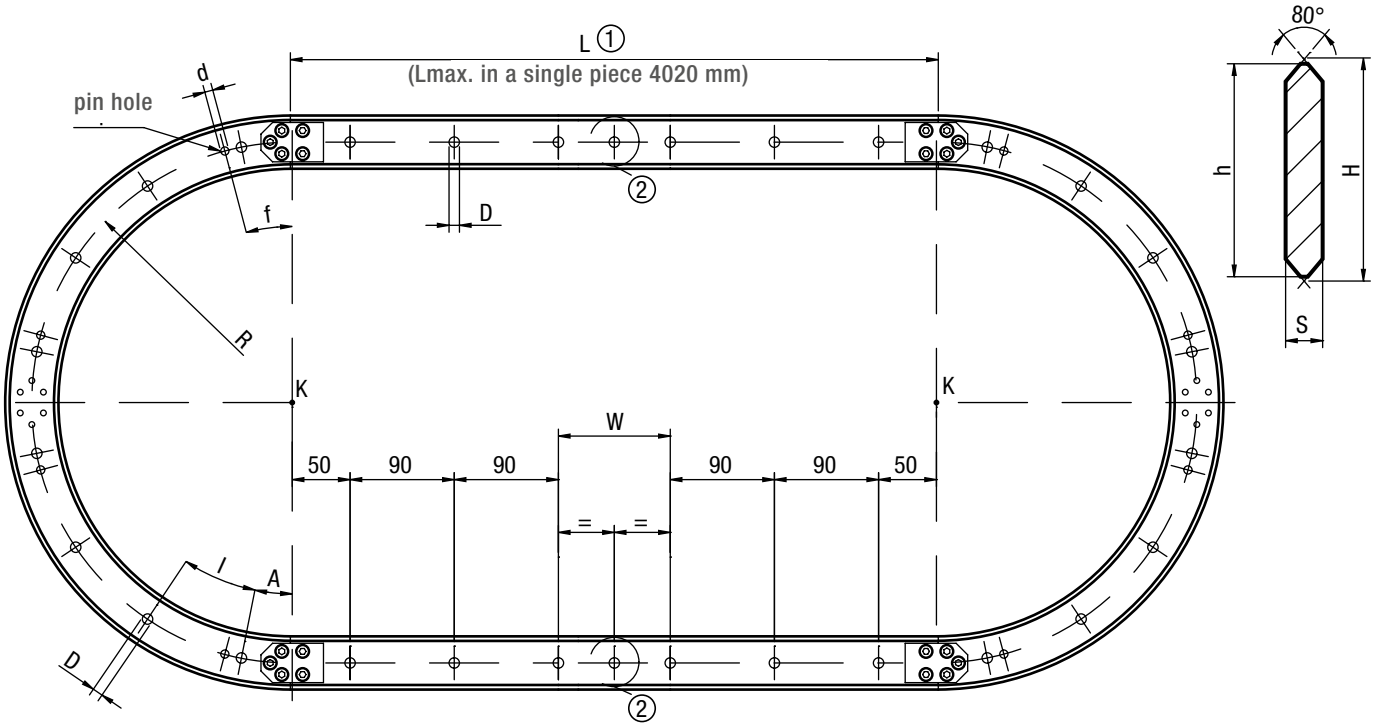


Spacers DIST FS can be used to mount the rails FSR (spacers for rails FS and FSH). See page 61

OVAL CIRCUIT FSRO

Oval circuit composed of linear and circular pieces of rail.

Available in stainless steel version. NX



Type				Dimensions (mm)					
	A	I	f	Radius R	D	d H7	S	h	H
FSRO 22 M 075 ...	22.5°	45°	45°	75	6.5	5	5	26	27.86
FSRO 22 M 125 ...	15°	30°	25°	125	6.5	5	5	26	27.86
FSRO 22 M 175 ...	15°	30°	25°	175	6.5	5	5	26	27.86
FSRO 35 M 225 ...	11.25°	22.5°	7.5°	225	9	8	8	46	47.86
FSRO 35 M 300 ...	11.25°	22.5°	7.5°	300	9	8	8	46	47.86
FSRO 47M 400 ...	9°	18°	18°	400	11.5	10	10	76	78.58
FSRO 47M 500 ...	9°	18°	18°	500	11.5	10	10	76	78.58

The oval circuit is composed by: two sectors of circular rails (180° with center in K) and two straight pieces of rails. The circuit is supplied complete of alignment blocks (with the proper screws), and all the pieces are marked in order to obtain the correct sequence during the mounting.

① The length of the straight pieces is higher than the distance between the centers K (1.6 mm x 2) in order to cover the thickness of rail lost during the cutting of the circular sectors.

STANDARD HOLE LAYOUT (SB) FOR THE STRAIGHT RAILS

- First and last hole of 50 mm, starting from the centers K
- Hole pitch 90 mm
- Central hole ② only if the last hole pitch W is ≥ 120 mm
- The W pitch can not be less than 60 mm

RAILS FINISHING

- Circular rail FSR ... M
- Guide rail FS ... M
- Aligment blocks for FSR

HOLE LAYOUT

- Standard holes according to catalogue (SB)
- Finishes to drawing (NZ)

OPTIONAL FEATURES

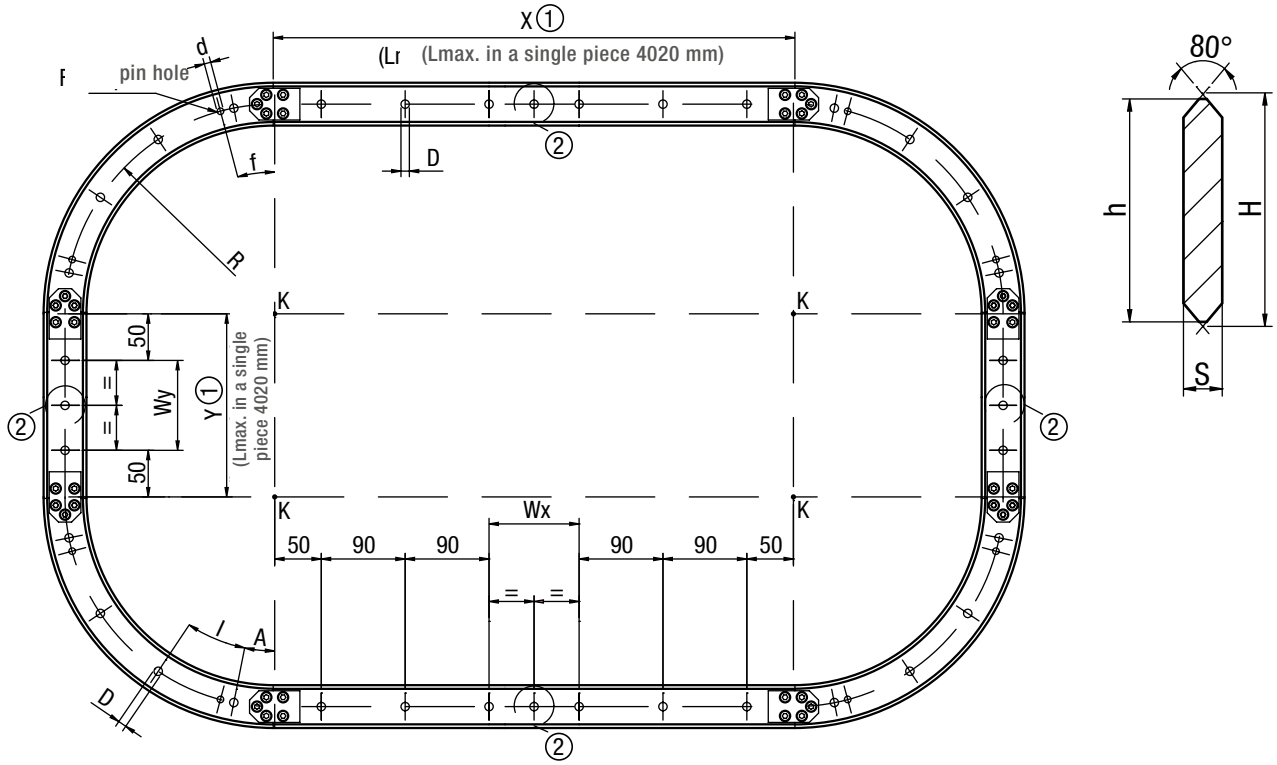
- Stainless steel (NX)
- Nickel plating (NW)

Example of standard designation: FSRO 35 M 225 2000 SB
Oval circuit, size 35, radius 225 mm, distance between the centers K equal to 2000 mm ①, standard holes.

MULTI-MOTION-LINE – FSR SYSTEM
RING CIRCUIT FSRQ

Ring circuit composed of linear and circular pieces of rail.

Available in stainless steel version. NX



Type				Dimensions (mm)					
	A	l	f	Radius R	D	d H7	S	h	H
FSRQ22 M 075 ...	22.5°	45°	45°	75	6.5	5	5	26	27.86
FSRQ22 M 125 ...	15°	30°	25°	125	6.5	5	5	26	27.86
FSRQ22 M 175 ...	15°	30°	25°	175	6.5	5	5	26	27.86
FSRQ35 M 225 ...	11.25°	22.5°	7.5°	225	9	8	8	46	47.86
FSRQ35 M 300 ...	11.25°	22.5°	7.5°	300	9	8	8	46	47.86
FSRQ47 M 400 ...	9°	18°	18°	400	11.5	10	10	76	78.58
FSRQ47 M 500 ...	9°	18°	18°	500	11.5	10	10	76	78.58

The ring circuit is composed by: four sectors of circular rails (180° with center in K) and four straight pieces of rails. The circuit is supplied complete of alignment blocks (with the proper screws), and all the pieces are marked in order to obtain the correct sequence during the mounting.

① The length of the straight pieces is higher than the distance between the centers K (1.6 mm x 2) in order to cover the thickness of rail lost during the cutting of the circular sectors

STANDARD HOLE LAYOUT (SB) FOR THE STRAIGHT RAILS

- First and last hole at 50 mm, starting from the centers K
- Hole pitch 90 mm
- Central hole ② only if the last hole pitch
  (Wx in horizontal and Wy in vertical) is ≥ 120 mm
  (Wx in horizontal and Wy in vertical) cannot be < 60 mm

RAILS FINISHING

- Circular rail FSR ... M
- Guide rail FS ... M
- Aligment blocks for FSR

HOLE LAYOUT

- Standard holes according to catalogue (SB)
- Finishes to drawing (NZ)

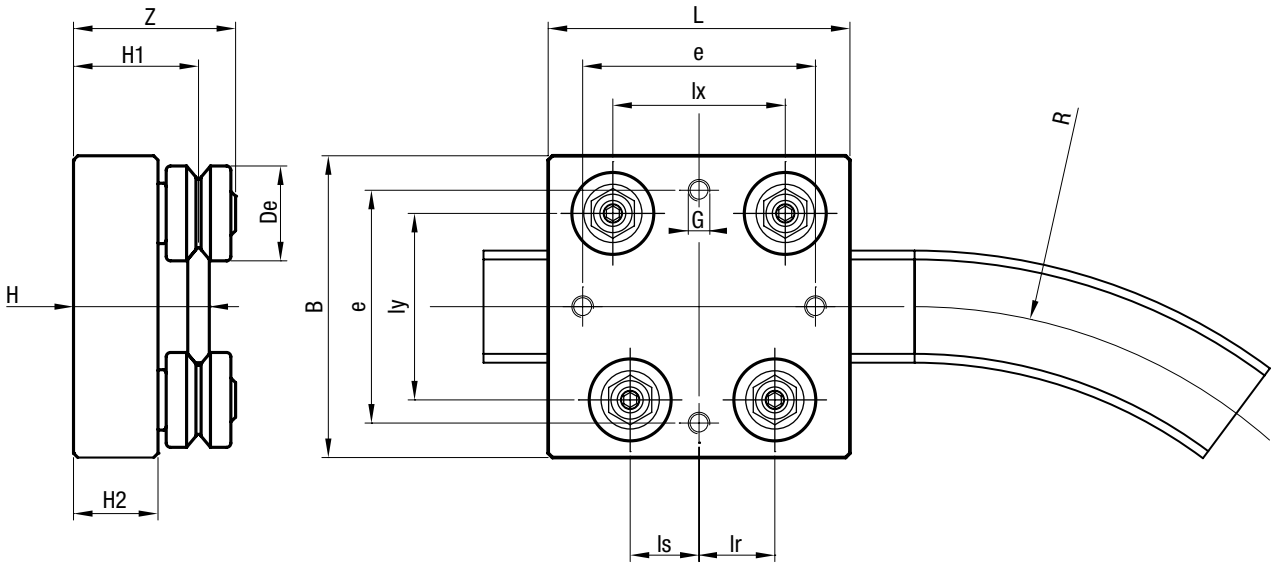
OPTIONAL FEATURES

- Stainless steel (NX)
- Nickel plating (NW)

Example of standard designation: FSRQ 35 M 225 2000 1000 / SB
Ring circuit, size 35, radius 225 mm, horizontal distance between the centers K equal to 2000 mm ①, vertical distance between the centers K equal to 1000 mm ①, standard holes.

CARRIAGES WITH FIXED GUIDE ROLLERS T4R ...

Available in stainless steel version. NX



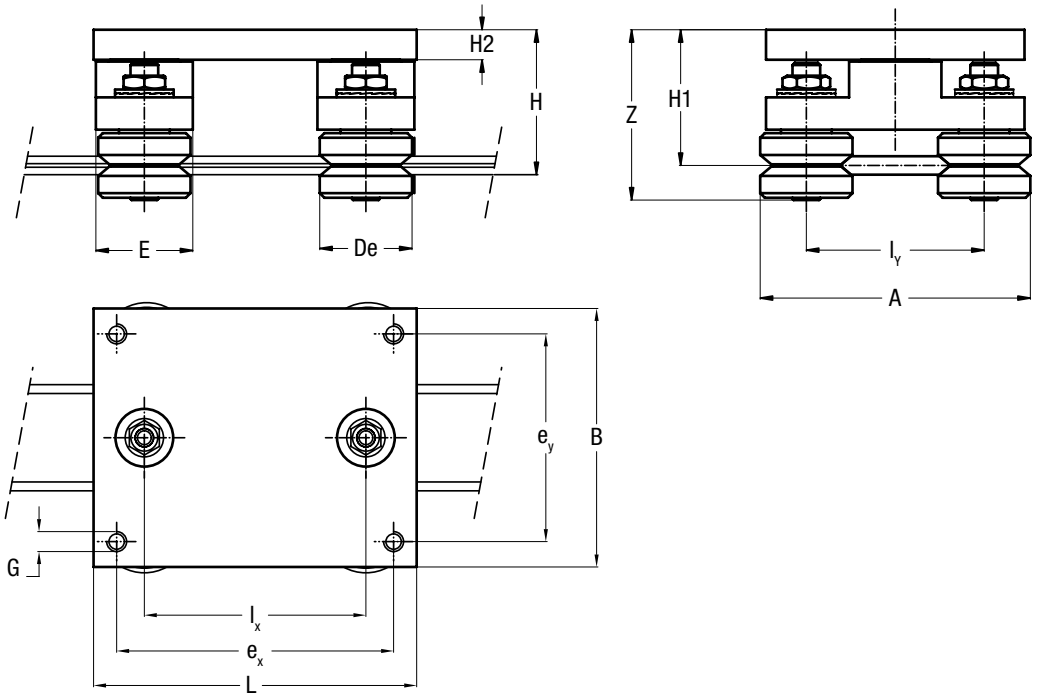
Type	Dimensions (mm)														Weight (kg)	Suggested combinations
	De	R	L	B	e	G	Ix	Is	Ir	Iy	H	H1	H2	Z		
T4R 075 FR 22 EU	22	75	70	70	54	M5	40	14.3	15.3	43.3	31.5	29	19.6	38	0.40	FSR ... 22 M 075
T4R 125 FR 22 EU	22	125	70	70	54	M5	40	16.3	17.3	43.3	31.5	29	19.6	38	0.40	FSR ... 22 M 125
T4R 175 FR 22 EU	22	175	70	70	54	M5	40	17.2	18.2	43.3	31.5	29	19.6	38	0.40	FSR ... 22 M 175
T4R 225 FR 32 EU	32	225	110	110	90	M8	70	28.8	30.8	71.5	44	40	27.4	51	1.22	FSR ... 35 M 225
T4R 225 FR 40 EU	40	225	120	120	100	M8	75	30.5	32.5	77	49	45	29.5	60	1.90	FSR ... 35 M 225
T4R 300 FR 32 EU	32	300	110	110	90	M8	70	30	32	71.5	44	40	27.4	51	1.22	FSR ... 35 M 300
T4R 300 FR 40 EU	40	300	120	120	100	M8	75	31.9	33.9	77	49	45	29.5	60	1.90	FSR ... 35 M 300
T4R 400 FR 40 EU	40	400	150	150	126	M10	104	44.4	46.4	107.8	50	45	29.5	60	2.5	FSR ... 47 M 400
T4R 400 FR 52 EU	52	400	180	180	156	M10	110	46	49	116.8	59	54	34.2	71	4.7	FSR ... 47 M 400
T4R 400 RKY 52	52	400	180	180	156	M10	110	46	49	116.8	59	54	34.2	76	5.1	FSR ... 47 M 400
T4R 500 FR 40 EU	40	500	150	150	126	M10	104	45.7	47.7	107.8	50	45	29.5	60	2.5	FSR ... 47 M 500
T4R 500 FR 52 EU	52	500	180	180	156	M10	110	47.4	50.4	116.8	59	54	34.2	71	4.7	FSR ... 47 M 500
T4R 500 RKY 52	52	500	180	180	156	M10	110	47.4	50.4	116.8	59	54	34.2	76	5.1	FSR ... 47 M 500

OPTIONAL FEATURES

- Available with stainless steel guide rollers (NX)
- Carriages are complete with guide rollers

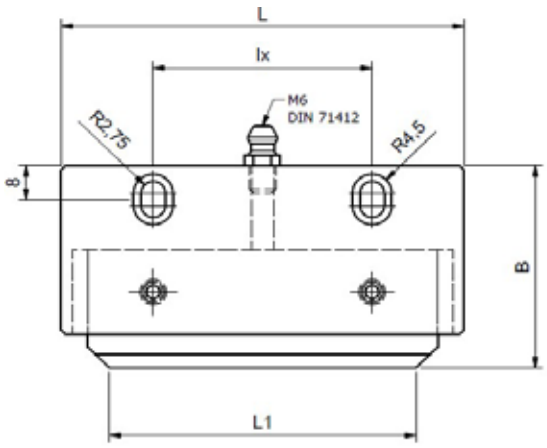
MULTI-MOTION-LINE – FSR SYSTEM
STEERING CARRIAGE T4R ...

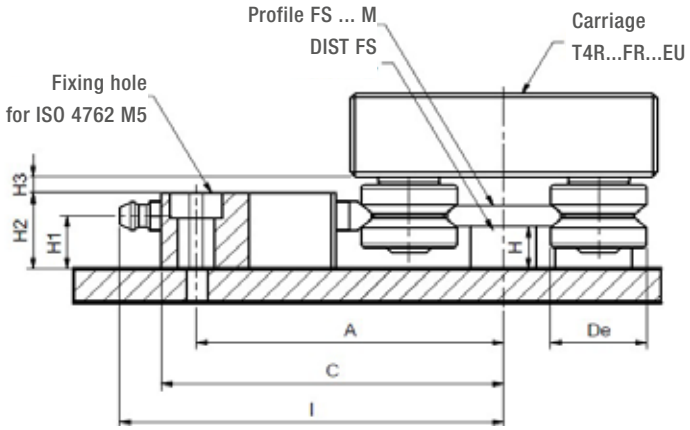
Steering carriage for FSR ... M circular rails



Type	Dimensions (mm)														Weight (kg)	Suggested combinations
	De	L	B	e_x	e_y	l_x	l_y	H	H1	H2	G	A	E	Z		
T4R 22 FR 22 EU T4R 22 FRN 22 EI	22	80	62	68	50	50	43.3	45.5	43	12	M5	65.3	27	51.6 53.6	0.5	FSR 22 M, FS 22 M
T4R 35 FR 32 EU T4R 35 FRN 32 EI	32	140	112	120	90	96	71.5	59.9	55.9	13	M8	103.5	42	66.2 69.3	1.1	FSR 35 M, FS 35 M
T4R 35 FR 40 EU T4R 35 FRN 40 EI	40	140	112	120	90	96	77	62.8	58.8	13	M8	117	42	72.8 74.3	1.6	FSR 35 M, FS 35 M
T4R 47 FR 40 EU T4R 47 FRN 40 EI	40	180	160	150	130	120	107.8	74.3	69.3	19	M10	147.8	56	83.3 84.8	2.4	FSR 47 M, FS 47 M
T4R 47 FR 52 EU T4R 47 RKY 52	52	180	160	150	130	120	116.8	78.6	73.6	19	M10	168.8	56	90.3 94.8	3.3	FSR 47 M, FS 47 M

LUBR
LUBRICATOR SYSTEM FOR CIRCULAR RAILS





Type	To couple with	Dimensions (mm)												Weight (kg)
		De	L	L1	A	B	C	l	l_x	H	H_1	H_2	H_3	
LUBR 22	FSR22M + FR22EU+DISTFS22	22	92	70	70	48	78.3	87.8	50	10	12.5	18	3.9	0.2
LUBR 35	FSR35M + FR32EU+ DISTFS35	32	160	130	88	48	96.5	106	100	15	19	26	5.6	0.4
	FSR35M + FR40EU+ DISTFS35	40	160	130	94	48	102	111.6	100	15	19	26	5.6	0.4
LUBR 47	FSR47M + FR40EU+ DISTFS47	40	202	170	110	48	117.8	127.3	120	20	25	33	7.5	0.7
	FSR47M + FR52EU+ DISTFS47	52	202	170	119	48	126.8	136.3	120	20	25	33	7.5	0.7
	FSR47M + RKY52+ DISTFS47	52	202	170	119	48	126.8	136.3	120	20	25	33	7.5	0.7

1) The lubricator is supplied with felt already soaked in oil. Lubricant based on mineral oil.

2) During assembly, use the aluminum body of the lubricant to adjust the distance between the felt and the rollers until they are in contact with each other. Then secure the body with the M5 screws.

OPTIONAL FEATURES

- Felt without lubricant (D)

MOUNTING EXAMPLE

Assembly line
Multi-Motion-Line