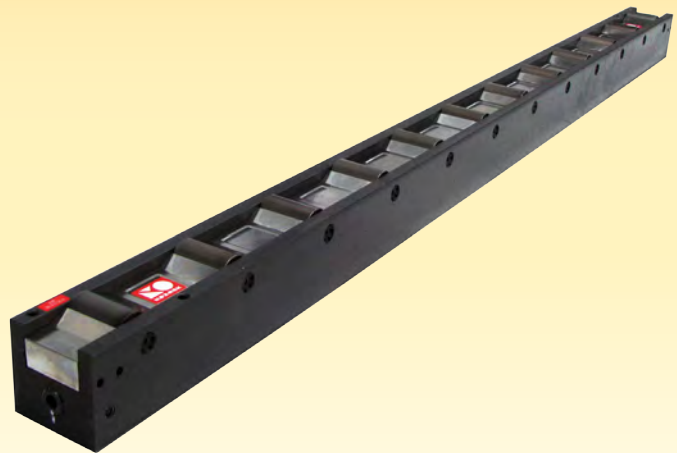


# Hydraulic Die Lifter

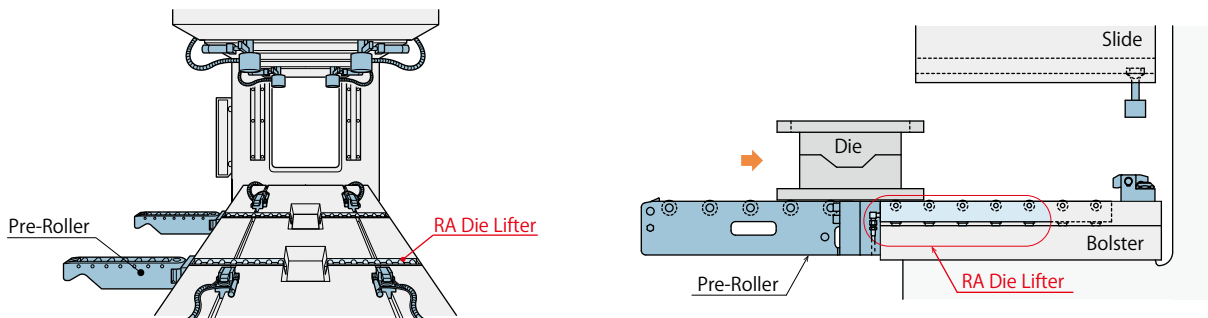
Model RA



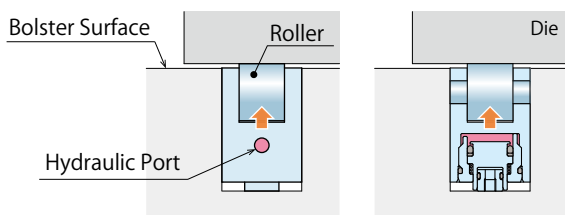
Set in the T-slot or U-slot.

Easy to load / unload the die with hydraulic lifting rollers.

The die is easily moved to the bolster on the roller of die lifter.



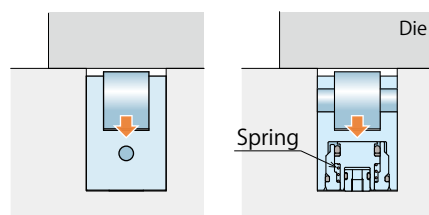
## Action Description



Up

Die lifter lifts up by supplying hydraulic pressure to hydraulic port.

The roller ascends above the bolster surface and the die is smoothly moved by the roller.

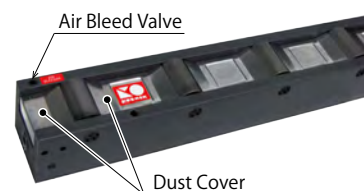


Down

Die lifter moves down by spring force when hydraulic pressure is cut off.

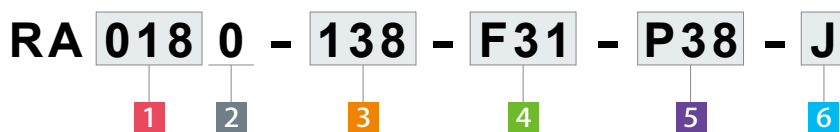
The roller descends under the bolster and the die contacts the bolster.

- Includes dust covers that prevent foreign substances from entering roller housing.
- Includes air bleed valve. (Only for RA0500/RA0800)
- Free Roller (Model RAF) is also available. No hydraulic pressure is required, and rollers are always up. Refer to P.081~P.084 for further information.



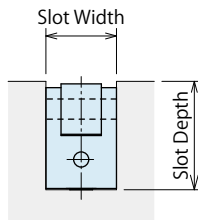


Model No. Indication



**1** Applicable Slot Width

- 018** : Slot Width  $18^{+0.25}_{+0.05}$  mm
- 022** : Slot Width  $22^{+0.25}_{+0.05}$  mm
- 028** : Slot Width  $28^{+0.25}_{+0.05}$  mm
- 050** : Slot Width  $50^{+0.25}_{+0.05}$  mm
- 080** : Slot Width  $80^{+0.25}_{+0.05}$  mm



**2** Design No.

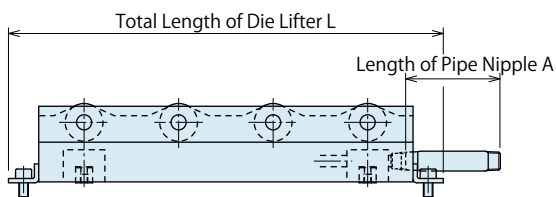
**0** : Revision Number

**3** Total Length of Die Lifter

Length of die lifter that you can select differs depending on choosing

**1** Applicable Slot Width or **6** Option G: Pin Specifications.

For details, please refer to each external dimensions.



**4** Applicable Slot Depth

**Blank** : For **1** Slot Width **028, 050, 080** ※1

For **1** Slot Width **018**

**F31** : Slot Depth  $31^{+0.5}_0$  mm

**F34** : Slot Depth  $34^{+0.5}_0$  mm

For **1** Slot Width **022**

**F36** : Slot Depth  $36^{+0.5}_0$  mm

**F39** : Slot Depth  $39^{+0.5}_0$  mm

Note

※1. For **1** Slot Width **028, 050, 080**,

**4** Slot Depth cannot be selected.

Slot depth is one type for each size.

**5** Length of Pipe Nipple

**Blank** : Elbow Fitting (Only for **6 G**: Pin Specifications)※3

**50** : Standard Length of Pipe Nipple 50 mm

**75** : Standard Length of Pipe Nipple 75 mm

**100** : Standard Length of Pipe Nipple 100 mm

**125** : Standard Length of Pipe Nipple 125 mm

**150** : Standard Length of Pipe Nipple 150 mm

**P[25~149]** : Special Length of Pipe Nipple 25~149 mm※2

**E** : No Pipe Nipple

Note

※2. Special length can be set within the range of 25-149mm by every 1mm except for the standard length of pipe nipple.

(Ex.) **50** : When length of pipe nipple is 50mm

**P45** : When length of pipe nipple is 45mm

**6** Option

**Blank** : Standard

**D** : Hydraulic Ports on Both Ends

**G** : Pin Specifications ※3

**J** : Crowning Roller

**N** : Hydraulic Port NPT Thread

**S** : Long Stroke

**V** : High Temperature (0 ~ 120°C)

Note

※3. When selecting **6** Option **G**: Pin Specifications, **5** Length of Pipe Nipple **Blank**: Elbow Fitting can be selected.

If required, select **5** Length of Pipe Nipple.

## Specifications

Model No.	RA0180		RA0220		RA0280	RA0500	RA0800	
Applicable Slot Width	mm	18 <sup>+0.25</sup> <sub>+0.05</sub>		22 <sup>+0.25</sup> <sub>+0.05</sub>		28 <sup>+0.25</sup> <sub>+0.05</sub>	50 <sup>+0.25</sup> <sub>+0.05</sub>	80 <sup>+0.25</sup> <sub>+0.05</sub>
Applicable Slot Depth ※4	mm	31 <sup>+0.5</sup> <sub>0</sub>	34 <sup>+0.5</sup> <sub>0</sub>	36 <sup>+0.5</sup> <sub>0</sub>	39 <sup>+0.5</sup> <sub>0</sub>	43 <sup>+0.5</sup> <sub>0</sub>	53 <sup>+0.5</sup> <sub>0</sub>	80 <sup>+0.5</sup> <sub>0</sub>
Full Stroke	mm	2.2		2.2		3	3	4
Lift-Up Stroke	mm	1.5		1.5		2	2	3
Allowable Die Weight per Roller	※5, ※6 Die Material	Flat Roller ※7	kg	25	45	80	200	500
		SS400	Crowning Roller ※7	kg	17.5	30	50	110
	Die Material	Flat Roller ※7	kg	45	80	140	350	800
		S45C • FC250	Crowning Roller ※7	kg	30	50	90	200
Lifting Force (per cylinder)	kN	2.2		3.8		4.9	11.1	24.5
Cylinder Capacity (per cylinder)	cm <sup>3</sup>	0.2		0.34		0.6	1.4	4.1
Hydraulic Port		Rc1/8				Rc1/4		
Working Hydraulic Pressure	MPa	24.5						
Operating Temperature	°C	0 ~ 70 (V : High Temperature 0 ~ 120 °C)						
Use Frequency		20 cycles / day						

### Notes

- ※4. RA0180 and RA 0220 are available with two choices of slot depths.
- ※5. The number of rollers and cylinders per die lifter varies depending on the total length of the die lifter.  
Please refer to the external dimensions.
- ※6. The listed weight is based on bottom of die (rolling surface) hardness.
- ※7. Flat roller : [6](#) Option **Blank, D, G, N, S, V**  
Crowning roller : [6](#) Option **J**

Clamp  
Hydraulic Unit  
Operation Control PanelDie Lifter  
Pre-Roller

Accessories

Cautions  
Company Profile

Die Lifter

RA

RB

Pre-Roller

MRC

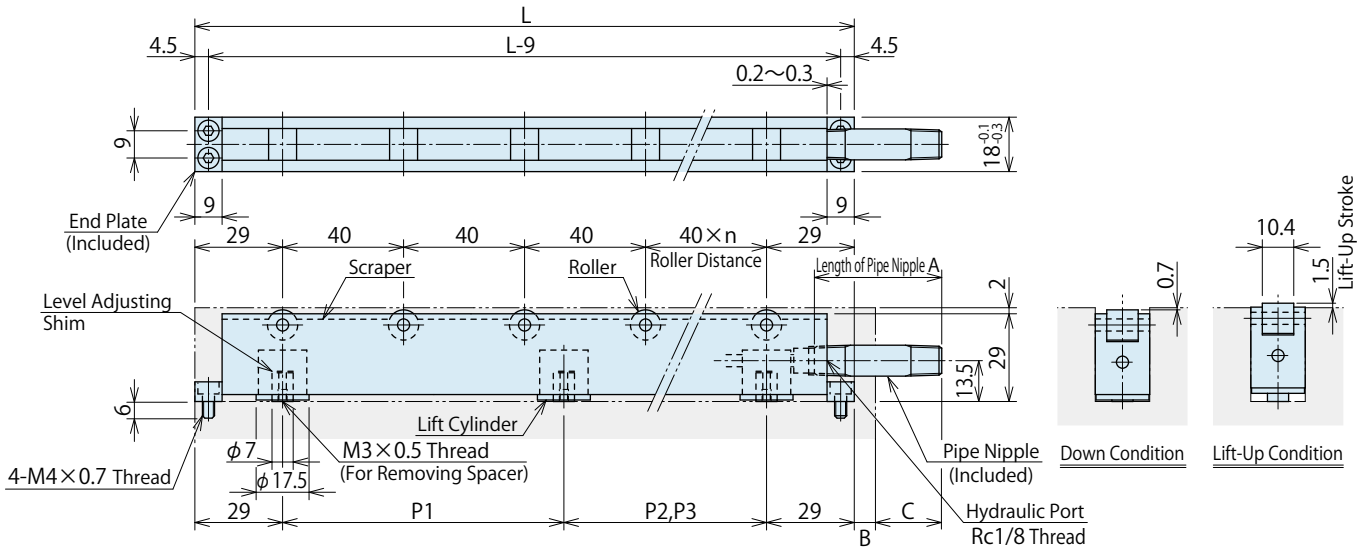
MRD

MRE/MRF

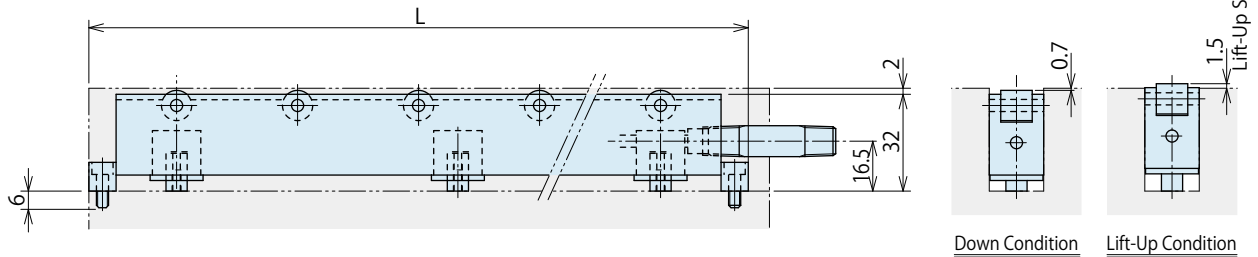
MRG

MRJ/MRK

External Dimension : RA0180-□-F31-□



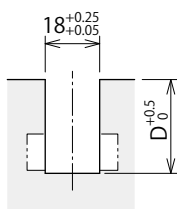
External Dimension : RA0180-□-F34-□ ※ Dimensions not listed are the same as RA0180-□-F31-□.



External Dimension List

Model No.	Length of Die Lifter L (mm)	Number of Rollers	Allowable Die Weight (kg) <sup>※1</sup>				Lift Cylinder		Distance between each Lift Cylinder (mm)		
			Flat Roller S45C <sup>※2</sup>	Flat Roller SS400 <sup>※2</sup>	Crowning Roller S45C <sup>※2</sup>	Crowning Roller SS400 <sup>※2</sup>	Number	Lift Force (kN)	P1	P2	P3
RA0180-138-F□-□	138	3	75	135	52.5	90	2	4.4	80		
RA0180-178-F□-□	178	4	100	180	70	120					
RA0180-218-F□-□	218	5	125	225	87.5	150			160		
RA0180-258-F□-□	258	6	150	270	105	180			200		
RA0180-298-F□-□	298	7	175	315	122.5	210			240		
RA0180-338-F□-□	338	8	200	360	140	240			280		
RA0180-378-F□-□	378	9	225	405	157.5	270	3	6.6	160	160	
RA0180-418-F□-□	418	10	250	450	175	300			180	180	
RA0180-458-F□-□	458	11	275	495	192.5	330			200	200	
RA0180-498-F□-□	498	12	300	540	210	360			220	220	
RA0180-538-F□-□	538	13	325	585	227.5	390			240	240	
RA0180-578-F□-□	578	14	350	630	245	420			260	260	
RA0180-618-F□-□	618	15	375	675	262.5	450	4	8.8	185	190	185
RA0180-658-F□-□	658	16	400	720	280	480			200	200	200
RA0180-698-F□-□	698	17	425	765	297.5	510			210	220	210

Machining Dimension of Mounting Area



Model No.	Slot Depth D (mm)
RA0180-□-F31-□	31
RA0180-□-F34-□	34

Projection on Pipe Nipple C

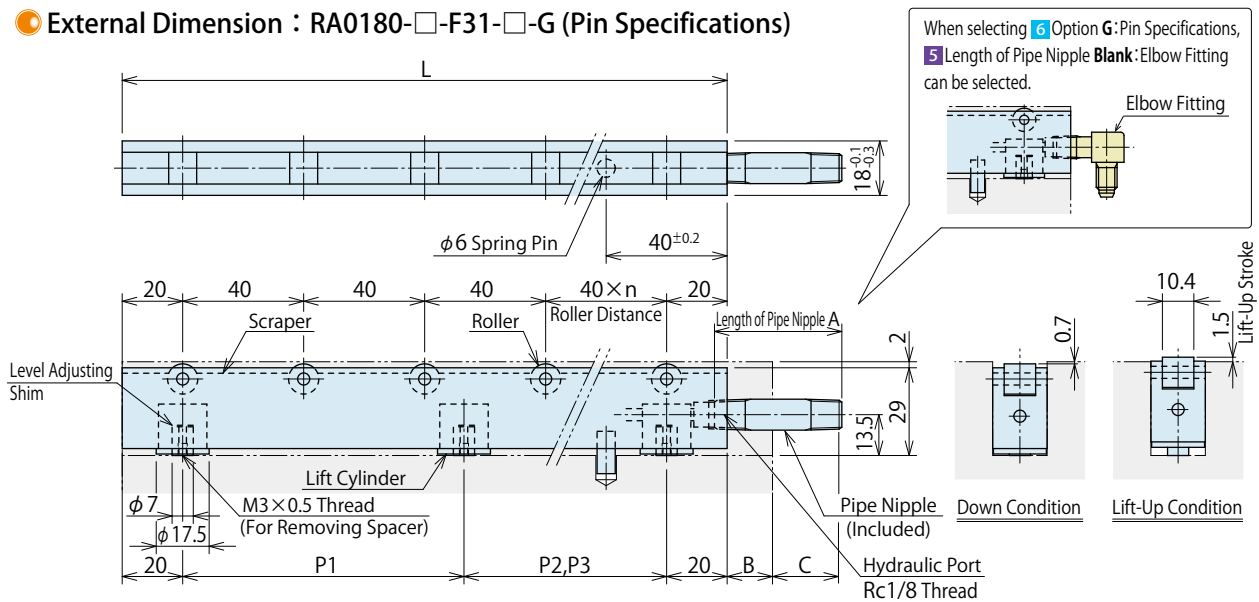
Select the length of pipe nipple according to required projection on pipe nipple.

Length of Pipe Nipple A	B	Projection on Pipe Nipple C <sup>※3</sup>
50	0 ~ 23	12 ~ 36
75	24 ~ 48	
100	49 ~ 73	
125	74 ~ 98	
150	99 ~ 123	

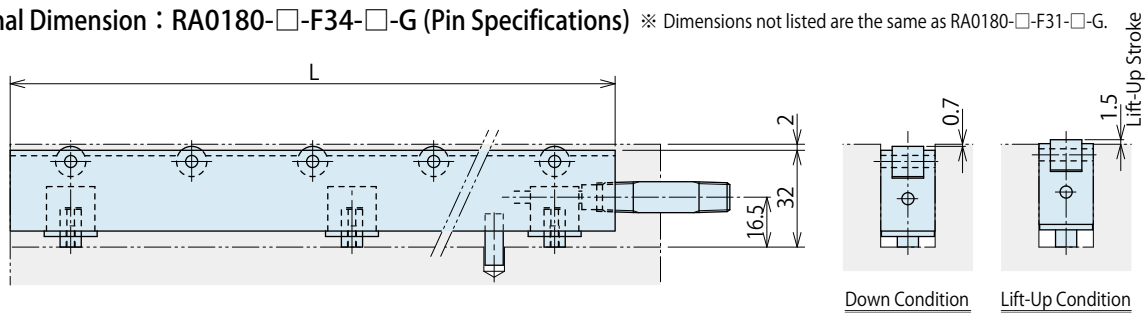
Notes

- ※1. The allowable die weight is for when the die rests on all rollers.
- ※2. Die material. Allowable die weight of material : FC250 is same as S45C.
- ※3. Tolerance of projection on pipe nipple C is ±1.5mm depending on screwing amount of R thread. Calculation formula : C=A-B-15

### External Dimension : RA0180-□-F31-□-G (Pin Specifications)



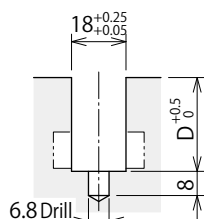
### External Dimension : RA0180-□-F34-□-G (Pin Specifications) ※ Dimensions not listed are the same as RA0180-□-F31-□-G.



### External Dimension List

Model No.	Length of Die Lifter L (mm)	Number of Rollers	Allowable Die Weight (kg) <sup>※1</sup>				Lift Cylinder		Distance of each Lift Cylinder (mm)		
			Flat Roller SS400 <sup>※2</sup>	Flat Roller S45C <sup>※2</sup>	Crowning Roller SS400 <sup>※2</sup>	Crowning Roller S45C <sup>※2</sup>	Number	Lift Force (kN)	P1	P2	P3
RA0180-120-F□-□-G	120	3	75	135	52.5	90	2	4.4	80		
RA0180-160-F□-□-G	160	4	100	180	70	120			120		
RA0180-200-F□-□-G	200	5	125	225	87.5	150			160		
RA0180-240-F□-□-G	240	6	150	270	105	180			200		
RA0180-280-F□-□-G	280	7	175	315	122.5	210			240		
RA0180-320-F□-□-G	320	8	200	360	140	240			280		
RA0180-360-F□-□-G	360	9	225	405	157.5	270	3	6.6	160	160	
RA0180-400-F□-□-G	400	10	250	450	175	300			180	180	
RA0180-440-F□-□-G	440	11	275	495	192.5	330			200	200	
RA0180-480-F□-□-G	480	12	300	540	210	360			220	220	
RA0180-520-F□-□-G	520	13	325	585	227.5	390	4	8.8	240	240	
RA0180-560-F□-□-G	560	14	350	630	245	420			260	260	
RA0180-600-F□-□-G	600	15	375	675	262.5	450	185	190	185		
RA0180-640-F□-□-G	640	16	400	720	280	480	200	200	200		
RA0180-680-F□-□-G	680	17	425	765	297.5	510	210	220	210		

### Machining Dimension of Mounting Area



Model No.	Slot Depth D (mm)
RA0180-□-F31-□-G	31
RA0180-□-F34-□-G	34

### Projection on Pipe Nipple C

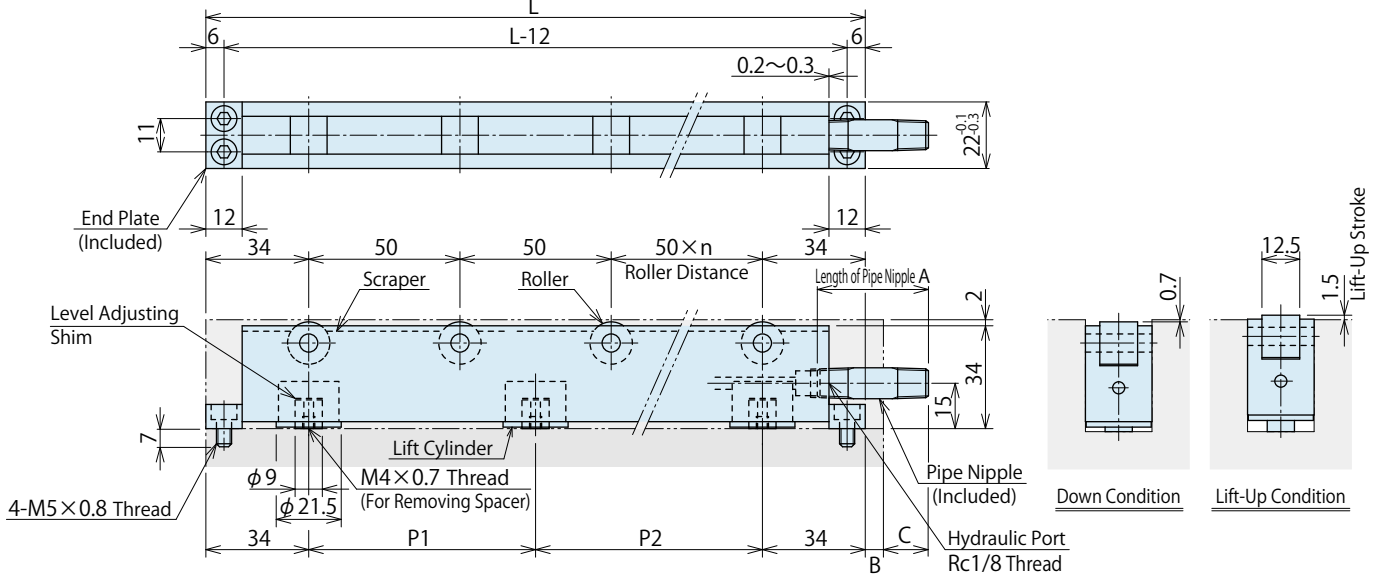
Select the length of pipe nipple according to required projection on pipe nipple.

Length of Pipe Nipple A	B	Projection on Pipe Nipple C <sup>※3</sup>
50	0 ~ 32	12 ~ 44
75	33 ~ 57	
100	58 ~ 82	
125	83 ~ 107	
150	108 ~ 132	12 ~ 36

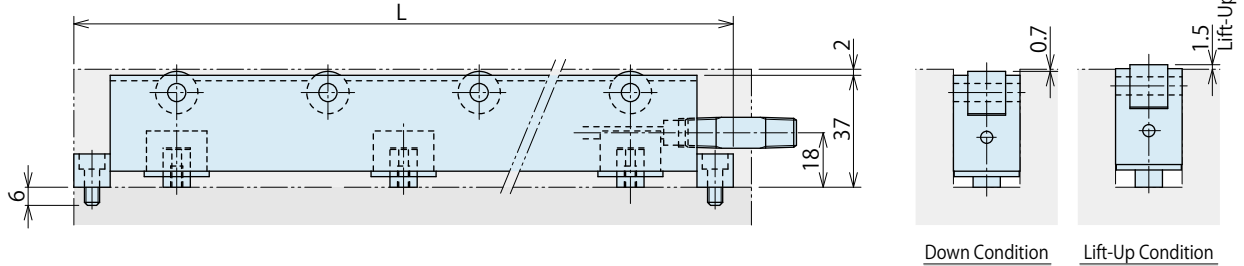
#### Notes

- ※1. The allowable die weight is for when the die rests on all rollers.
- ※2. Die material. Allowable die weight of material : FC250 is same as S45C.
- ※3. Tolerance of projection on pipe nipple C is ±1.5mm depending on screwing amount of R thread. Calculation formula : C=A-B-6

External Dimension : RA0220-□-F36-□



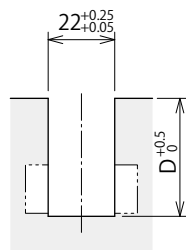
External Dimension : RA0220-□-F39-□ ※ Dimensions not listed are the same as RA0220-□-F36-□.



External Dimension List

Model No.	Length of Die Lifter L (mm)	Number of Rollers	Allowable Die Weight (kg) <sup>※1</sup>				Lift Cylinder		Distance between each Lift Cylinder (mm)	
			Flat Roller S45C <sup>※2</sup>	Flat Roller FC250 <sup>※2</sup>	Crowning Roller S45C <sup>※2</sup>	Crowning Roller FC250 <sup>※2</sup>	Number	Lift Force (kN)	P1	P2
RA0220-168-F□-□	168	3	135	240	90	150	2	7.6	100	
RA0220-218-F□-□	218	4	180	320	120	200			150	
RA0220-268-F□-□	268	5	225	400	150	250			200	
RA0220-318-F□-□	318	6	270	480	180	300			250	
RA0220-368-F□-□	368	7	315	560	210	350			300	
RA0220-418-F□-□	418	8	360	640	240	400	3	11.4	175	175
RA0220-468-F□-□	468	9	405	720	270	450			200	200
RA0220-518-F□-□	518	10	450	800	300	500			225	225
RA0220-568-F□-□	568	11	495	880	330	550			250	250
RA0220-618-F□-□	618	12	540	960	360	600			275	275
RA0220-668-F□-□	668	13	585	1040	390	650			300	300
RA0220-718-F□-□	718	14	630	1120	420	700	325	325		

Machining Dimension of Mounting Area



Model No.	Slot Depth D (mm)
RA0220-□-F36-□	36
RA0220-□-F39-□	39

Projection on Pipe Nipple C

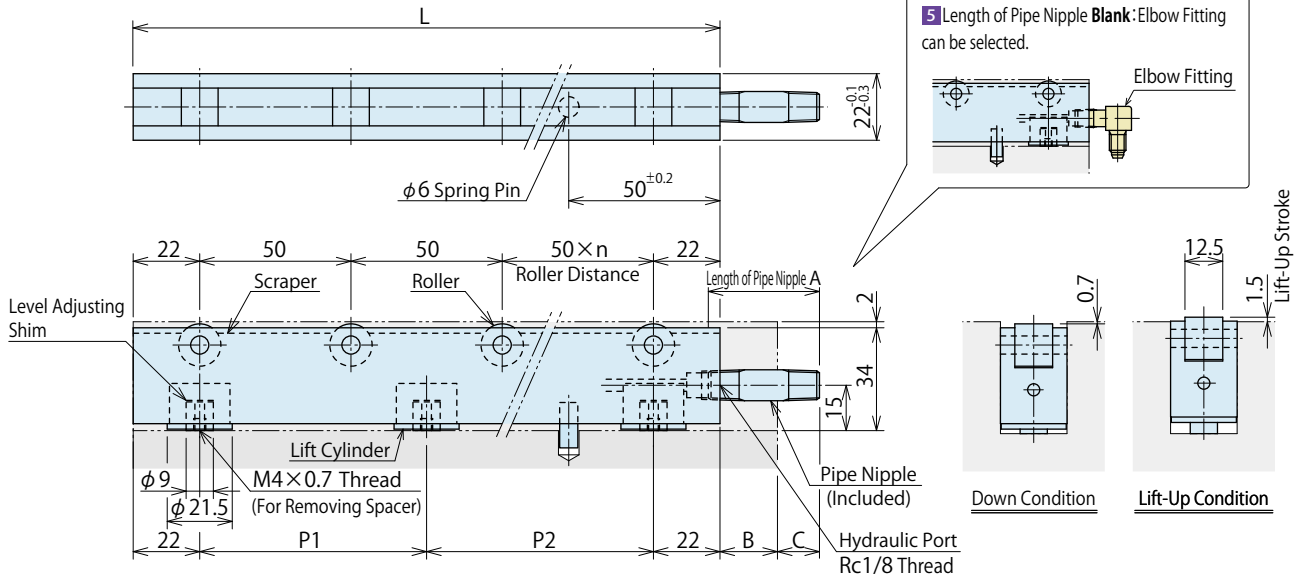
Select the length of pipe nipple according to required projection on pipe nipple.

Length of Pipe Nipple A	B	Projection on Pipe Nipple C <sup>※3</sup>
50	0 ~ 20	12 ~ 32
75	21 ~ 45	12 ~ 36
100	46 ~ 70	
125	71 ~ 95	
150	96 ~ 120	

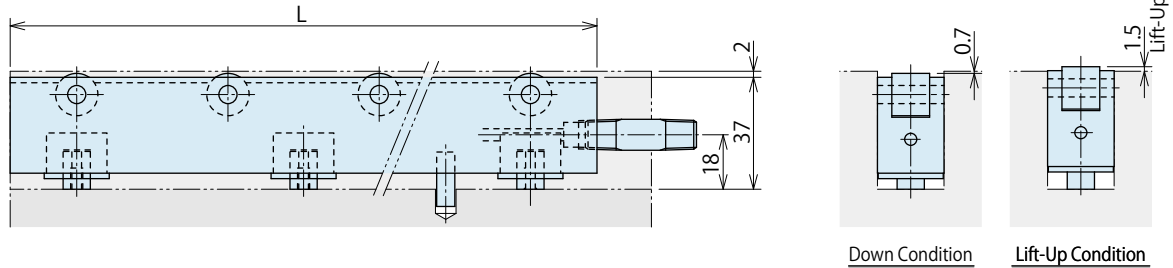
Notes

- ※1. The allowable die weight is for when the die rests on all rollers.
- ※2. Die material. Allowable die weight of material : FC250 is same as S45C.
- ※3. Tolerance of projection on pipe nipple C is ± 1.5mm depending on screwing amount of R thread. Calculation formula : C=A-B-18

### External Dimension : RA0220-□-F36-□-G (Pin Specifications)



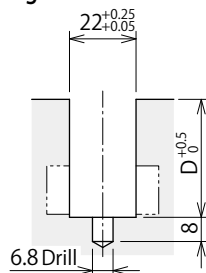
### External Dimension : RA0220-□-F39-□-G (Pin Specifications) ※ Dimensions not listed are the same as RA0220-□-F36-□-G.



### External Dimension List

Model No.	Length of Die Lifter L (mm)	Number of Rollers	Allowable Die Weight (kg) <sup>※1</sup>				Lift Cylinder		Distance between each Lift Cylinder (mm)	
			SS400 <sup>※2</sup>	S45C <sup>※2</sup>	SS400 <sup>※2</sup>	S45C <sup>※2</sup>	Number	Lift Force (kN)	P1	P2
RA0220-144-F□-□-G	144	3	135	240	90	150	2	7.6	100	
RA0220-194-F□-□-G	194	4	180	320	120	200			150	
RA0220-244-F□-□-G	244	5	225	400	150	250			200	
RA0220-294-F□-□-G	294	6	270	480	180	300			250	
RA0220-344-F□-□-G	344	7	315	560	210	350			300	
RA0220-394-F□-□-G	394	8	360	640	240	400	3	11.4	175	175
RA0220-444-F□-□-G	444	9	405	720	270	450			200	200
RA0220-494-F□-□-G	494	10	450	800	300	500			225	225
RA0220-544-F□-□-G	544	11	495	880	330	550			250	250
RA0220-594-F□-□-G	594	12	540	960	360	600			275	275
RA0220-644-F□-□-G	644	13	585	1040	390	650			300	300
RA0220-694-F□-□-G	694	14	630	1120	420	700			325	325

### Machining Dimension of Mounting Area



Model No.	Slot Depth D (mm)
RA0220-□-F36-□-G	36
RA0220-□-F39-□-G	39

### Projection on Pipe Nipple C

Select the length of pipe nipple according to required projection on pipe nipple.

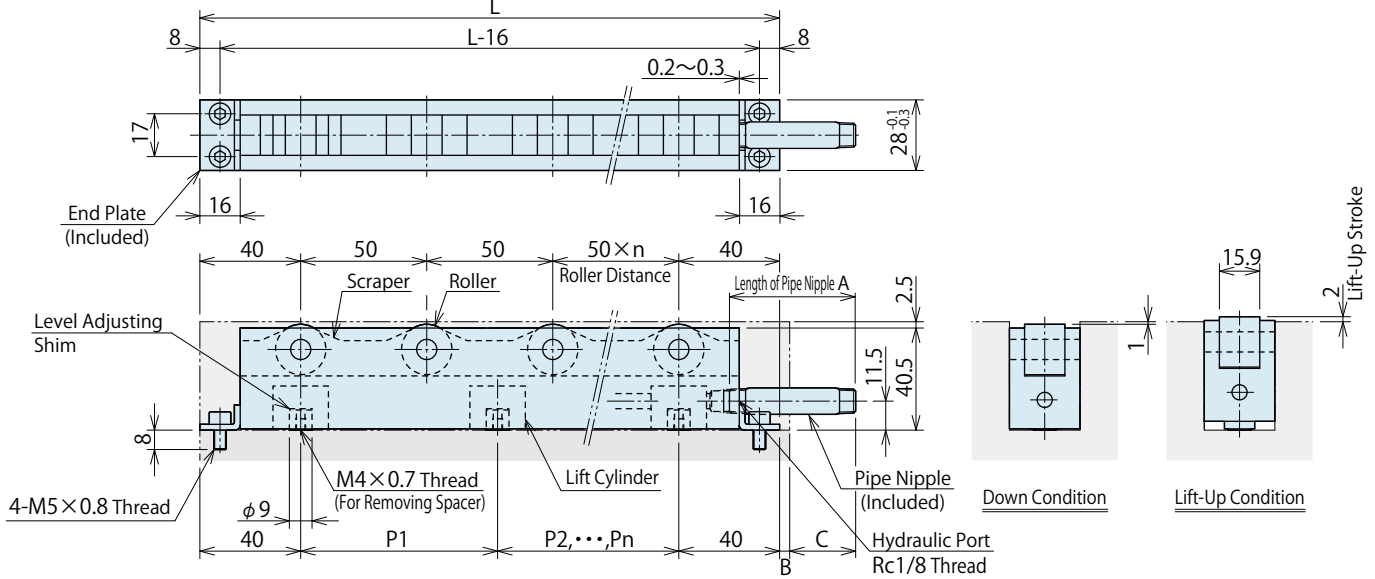
Length of Pipe Nipple A	B	Projection on Pipe Nipple C <sup>※3</sup>
50	0 ~ 32	12 ~ 44
75	33 ~ 57	12 ~ 36
100	58 ~ 82	
125	83 ~ 107	
150	108 ~ 132	

#### Notes

- ※1. The allowable die weight is for when the die rests on all rollers.
- ※2. Die material. Allowable die weight of material : FC250 is same as S45C.
- ※3. Tolerance of projection on pipe nipple C is ±1.5mm depending on screwing amount of R thread. Calculation formula : C=A-B-6



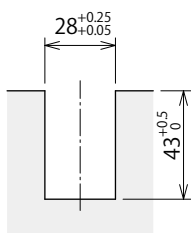
### External Dimension : RA0280-□-□



### External Dimension List

Model No.	Length of Die Lifter L (mm)	Number of Rollers	Allowable Die Weight (kg) <sup>※1</sup>				Lift Cylinder		Distance between each Lift Cylinder (mm)						
			Flat Roller SS400 <sup>※2</sup>	Flat Roller S45C <sup>※2</sup>	Crowning Roller SS400 <sup>※2</sup>	Crowning Roller S45C <sup>※2</sup>	Number	Lift Force (kN)	P1	P2	P3	P4	P5	P6	P7
RA0280-180-□	180	3	240	420	150	270	2	9.8	100						
RA0280-230-□	230	4	320	560	200	360			150						
RA0280-280-□	280	5	400	700	250	450			200						
RA0280-330-□	330	6	480	840	300	540			250						
RA0280-380-□	380	7	560	980	350	630			300						
RA0280-430-□	430	8	640	1120	400	720	3	14.7	175	175					
RA0280-480-□	480	9	720	1260	450	810			200	200					
RA0280-530-□	530	10	800	1400	500	900			225	225					
RA0280-580-□	580	11	880	1540	550	990	4	19.6	165	170	165				
RA0280-630-□	630	12	960	1680	600	1080			180	190	180				
RA0280-680-□	680	13	1040	1820	650	1170			200	200	200				
RA0280-730-□	730	14	1120	1960	700	1260	5	24.5	215	220	215				
RA0280-780-□	780	15	1200	2100	750	1350			175	175	175	175			
RA0280-830-□	830	16	1280	2240	800	1440			185	190	190	185			
RA0280-880-□	880	17	1360	2380	850	1530	6	29.4	200	200	200	200			
RA0280-930-□	930	18	1440	2520	900	1620			170	170	170	170	170		
RA0280-980-□	980	19	1520	2660	950	1710			180	180	180	180	180		
RA0280-1030-□	1030	20	1600	2800	1000	1800	7	34.3	190	190	190	190	190		
RA0280-1080-□	1080	21	1680	2940	1050	1890			200	200	200	200	200		
RA0280-1130-□	1130	22	1760	3080	1100	1980			175	175	175	175	175	175	
RA0280-1180-□	1180	23	1840	3220	1150	2070	8	39.2	180	185	185	185	185	180	
RA0280-1230-□	1230	24	1920	3360	1200	2160			190	190	195	195	190	190	
RA0280-1280-□	1280	25	2000	3500	1250	2250			200	200	200	200	200	200	
RA0280-1330-□	1330	26	2080	3640	1300	2340	8	39.2	175	180	180	180	180	180	175
RA0280-1380-□	1380	27	2160	3780	1350	2430			185	186	186	186	186	186	185
RA0280-1430-□	1430	28	2240	3920	1400	2520			190	194	194	194	194	194	190
RA0280-1480-□	1480	29	2320	4060	1450	2610	200	200	200	200	200	200	200		

### Machining Dimension of Mounting Area



### Projection on Pipe Nipple C

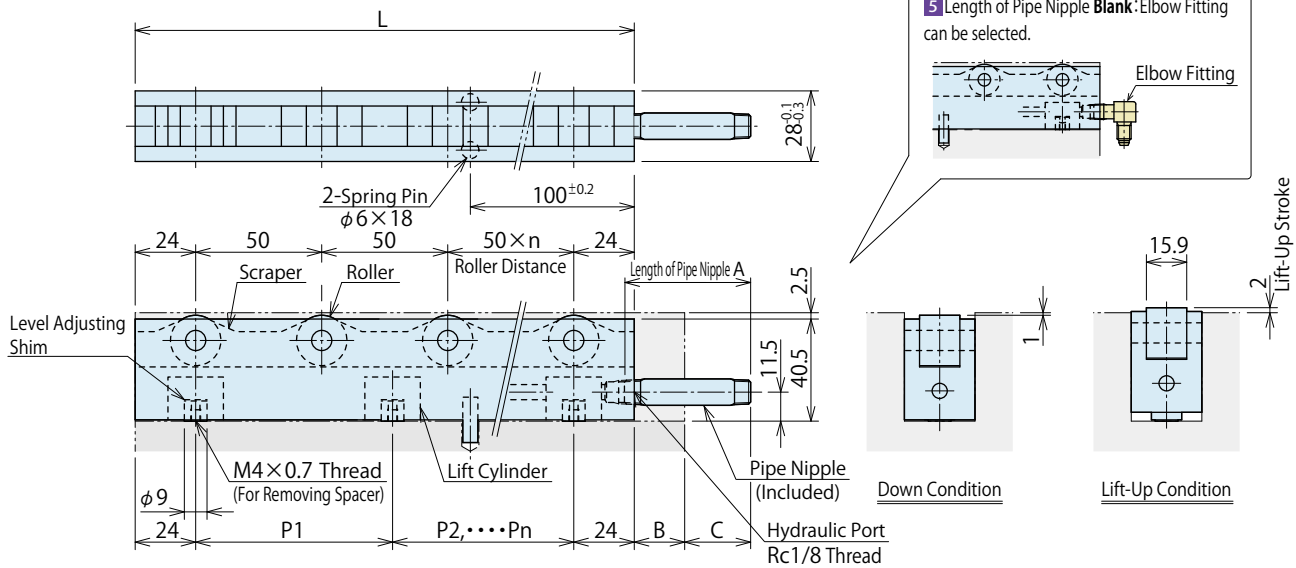
Select the length of pipe nipple according to required projection on pipe nipple.

Length of Pipe Nipple A	B	Projection on Pipe Nipple C <sup>※3</sup>
50	0 ~ 16	12 ~ 28
75	17 ~ 41	12 ~ 36
100	42 ~ 66	
125	67 ~ 91	
150	92 ~ 116	

#### Notes

- ※1. The allowable die weight is for when the die rests on all rollers.
- ※2. Die material. Allowable die weight of material : FC250 is same as S45C.
- ※3. Tolerance of projection on pipe nipple C is ±1.5mm depending on screwing amount of R thread. Calculation formula : C=A-B-22

### External Dimension : RA0280-□-□-G (Pin Specifications)


 Clamp  
 Hydraulic Unit  
 Operation Control Panel

 Die Lifter  
 Pre-Roller

Accessories

 Cautions  
 Company Profile

Die Lifter

RA

RB

Pre-Roller

MRC

MRD

MRE/MRF

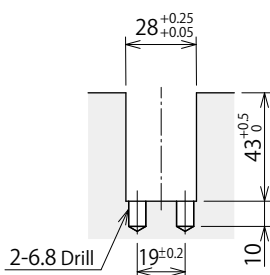
MRG

MRJ/MRK

### External Dimension List

Model No.	Length of Die Lifter L (mm)	Number of Rollers	Allowable Die Weight (kg) <sup>※1</sup>				Lift Cylinder		Distance between each Lift Cylinder (mm)								
			Flat Roller SS400 <sup>※2</sup>	Flat Roller S45C <sup>※2</sup>	Crowning Roller SS400 <sup>※2</sup>	Crowning Roller S45C <sup>※2</sup>	Number	Lift Force (kN)	P1	P2	P3	P4	P5	P6	P7		
RA0280-148-□-G	148	3	240	420	150	270	2	9.8	100								
RA0280-198-□-G	198	4	320	560	200	360			150								
RA0280-248-□-G	248	5	400	700	250	450			200								
RA0280-298-□-G	298	6	480	840	300	540			250								
RA0280-348-□-G	348	7	560	980	350	630			300								
RA0280-398-□-G	398	8	640	1120	400	720	3	14.7	175	175							
RA0280-448-□-G	448	9	720	1260	450	810			200	200							
RA0280-498-□-G	498	10	800	1400	500	900			225	225							
RA0280-548-□-G	548	11	880	1540	550	990	4	19.6	165	170	165						
RA0280-598-□-G	598	12	960	1680	600	1080			180	190	180						
RA0280-648-□-G	648	13	1040	1820	650	1170			200	200	200						
RA0280-698-□-G	698	14	1120	1960	700	1260			215	220	215						
RA0280-748-□-G	748	15	1200	2100	750	1350	5	24.5	175	175	175	175					
RA0280-798-□-G	798	16	1280	2240	800	1440			185	190	190	185					
RA0280-848-□-G	848	17	1360	2380	850	1530	6	29.4	200	200	200	200					
RA0280-898-□-G	898	18	1440	2520	900	1620			170	170	170	170	170				
RA0280-948-□-G	948	19	1520	2660	950	1710			180	180	180	180	180				
RA0280-998-□-G	998	20	1600	2800	1000	1800	7	34.3	190	190	190	190	190				
RA0280-1048-□-G	1048	21	1680	2940	1050	1890			200	200	200	200	200				
RA0280-1098-□-G	1098	22	1760	3080	1100	1980			175	175	175	175	175	175			
RA0280-1148-□-G	1148	23	1840	3220	1150	2070			180	185	185	185	185	185	180		
RA0280-1198-□-G	1198	24	1920	3360	1200	2160	8	39.2	190	190	195	195	190	190			
RA0280-1248-□-G	1248	25	2000	3500	1250	2250			200	200	200	200	200	200			
RA0280-1298-□-G	1298	26	2080	3640	1300	2340	8	39.2	175	180	180	180	180	180	175		
RA0280-1348-□-G	1348	27	2160	3780	1350	2430			185	186	186	186	186	186	186	185	
RA0280-1398-□-G	1398	28	2240	3920	1400	2520			190	194	194	194	194	194	194	190	
RA0280-1448-□-G	1448	29	2320	4060	1450	2610			200	200	200	200	200	200	200	200	200

### Machining Dimension of Mounting Area



### Projection on Pipe Nipple C

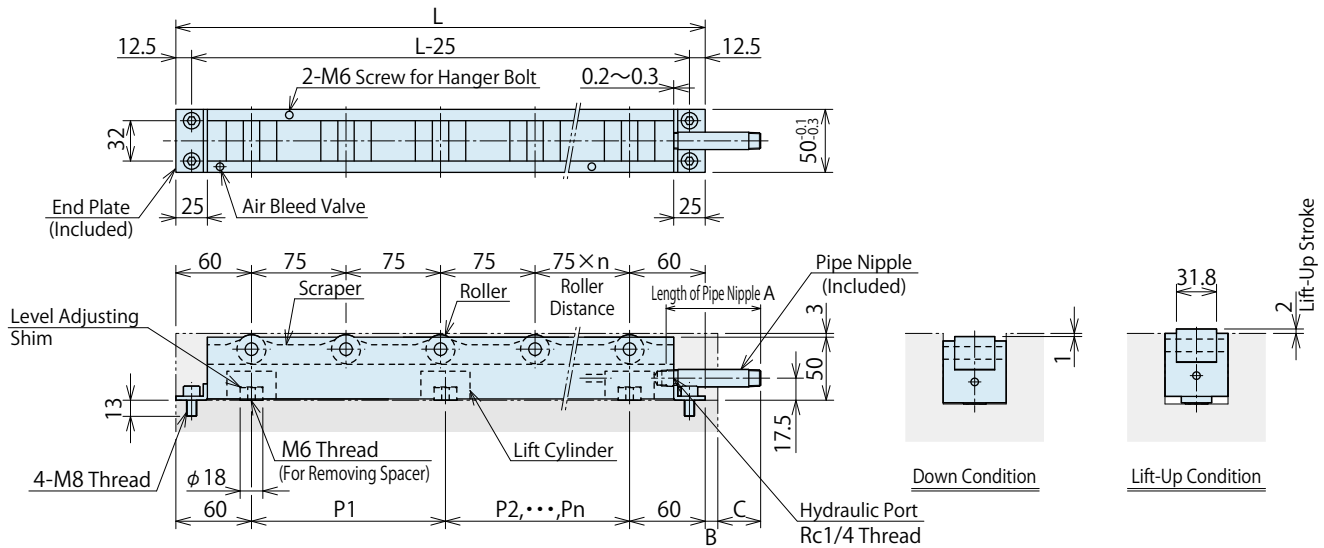
Select the length of pipe nipple according to required projection on pipe nipple.

Length of Pipe Nipple A	B	Projection on Pipe Nipple C <sup>※3</sup>
50	0 ~ 32	12 ~ 44
75	33 ~ 57	12 ~ 36
100	58 ~ 82	
125	83 ~ 107	
150	108 ~ 132	

Notes

- ※1. The allowable die weight is for when the die rests on all rollers.
- ※2. Die material. Allowable die weight of material : FC250 is same as S45C.
- ※3. Tolerance of projection on pipe nipple C is  $\pm 1.5$ mm depending on screwing amount of R thread. Calculation formula :  $C=A-B-6$

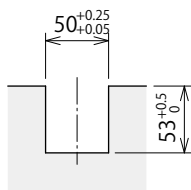
External Dimension : RA0500-□-□



External Dimension List

Model No.	Length of Die Lifter L (mm)	Number of Rollers	Allowable Die Weight (kg) <sup>※1</sup>				Lift Cylinder		Distance between each Lift Cylinder (mm)								
			Flat Roller SS400 <sup>※2</sup>	Flat Roller S45C <sup>※2</sup>	Crowning Roller SS400 <sup>※2</sup>	Crowning Roller S45C <sup>※2</sup>	Number	Lift Force (kN)	P1	P2	P3	P4	P5	P6	P7		
RA0500-195-□	195	2	400	700	220	400	2	22.2	75								
RA0500-270-□	270	3	600	1050	330	600			150								
RA0500-345-□	345	4	800	1400	440	800			225								
RA0500-420-□	420	5	1000	1750	550	1000			300								
RA0500-495-□	495	6	1200	2100	660	1200			375								
RA0500-570-□	570	7	1400	2450	770	1400	3	33.3	225	225							
RA0500-645-□	645	8	1600	2800	880	1600			262.5	262.5							
RA0500-720-□	720	9	1800	3150	990	1800			300	300							
RA0500-795-□	795	10	2000	3500	1100	2000	4	44.4	225	225	225						
RA0500-870-□	870	11	2200	3850	1210	2200			250	250	250						
RA0500-945-□	945	12	2400	4200	1320	2400	5	55.5	275	275	275						
RA0500-1020-□	1020	13	2600	4550	1430	2600			225	225	225	225					
RA0500-1095-□	1095	14	2800	4900	1540	2800			240	247.5	247.5	240					
RA0500-1170-□	1170	15	3000	5250	1650	3000	6	66.6	262.5	262.5	262.5	262.5					
RA0500-1245-□	1245	16	3200	5600	1760	3200			280	282.5	282.5	280					
RA0500-1320-□	1320	17	3400	5950	1870	3400	7	77.7	240	240	240	240	240				
RA0500-1395-□	1395	18	3600	6300	1980	3600			255	255	255	255	255				
RA0500-1470-□	1470	19	3800	6650	2090	3800			270	270	270	270	270				
RA0500-1545-□	1545	20	4000	7000	2200	4000	8	88.8	237.5	237.5	237.5	237.5	237.5	237.5			
RA0500-1620-□	1620	21	4200	7350	2310	4200			250	250	250	250	250	250			
RA0500-1695-□	1695	22	4400	7700	2420	4400	8	88.8	262.5	262.5	262.5	262.5	262.5	262.5			
RA0500-1770-□	1770	23	4600	8050	2530	4600			235	236	236	236	236	236	236	235	
RA0500-1845-□	1845	24	4800	8400	2640	4800			245	247	247	247	247	247	247	247	245

Machining Dimension of Mounting Area



Projection on Pipe Nipple C

Select the length of pipe nipple according to required projection on pipe nipple.

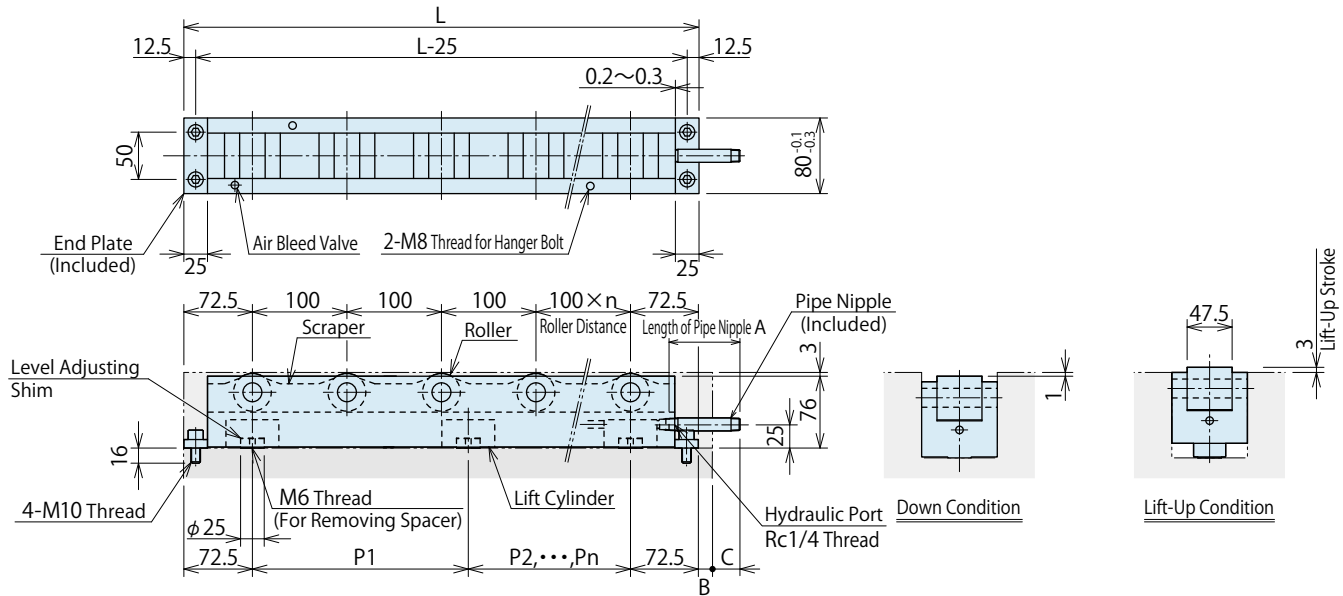
Length of Pipe Nipple A	B	Projection on Pipe Nipple C <sup>※3</sup>
50	0	16
75	1 ~ 25	16 ~ 40
100	26 ~ 50	
125	51 ~ 75	
150	76 ~ 100	

Notes

- ※1. The allowable die weight is for when the die rests on all rollers.
- ※2. Die material. Allowable die weight of material : FC250 is same as S45C.
- ※3. Tolerance of projection on pipe nipple C is  $\pm 1.5$ mm depending on screwing amount of R thread. Calculation formula :  $C=A-B-34$



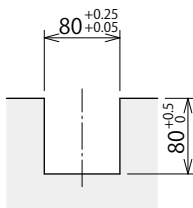
External Dimension : RA0800-□-□



External Dimension List

Model No.	Length of Die Lifter L (mm)	Number of Rollers	Allowable Die Weight (kg) <sup>※1</sup>		Lift Cylinder		Distance between each Lift Cylinder (mm)				
			Flat Roller		Number	Lift Force (kN)	P1	P2	P3	P4	P5
			SS400 <sup>※2</sup>	S45C <sup>※2</sup>							
RA0800-445-□	445	4	2000	3200	2	49	300				
RA0800-545-□	545	5	2500	4000			400				
RA0800-645-□	645	6	3000	4800			500				
RA0800-745-□	745	7	3500	5600	3	73.5	300	300			
RA0800-845-□	845	8	4000	6400			350	350			
RA0800-945-□	945	9	4500	7200			400	400			
RA0800-1045-□	1045	10	5000	8000	4	98	300	300	300		
RA0800-1145-□	1145	11	5500	8800			330	340	330		
RA0800-1245-□	1245	12	6000	9600			360	380	360		
RA0800-1345-□	1345	13	6500	10400	5	122.5	300	300	300	300	
RA0800-1445-□	1445	14	7000	11200			325	325	325	325	
RA0800-1545-□	1545	15	7500	12000			350	350	350	350	
RA0800-1645-□	1645	16	8000	12800	6	147	300	300	300	300	300
RA0800-1745-□	1745	17	8500	13600			320	320	320	320	320
RA0800-1845-□	1845	18	9000	14400			340	340	340	340	340

Machining Dimension of Mounting Area



Projection on Pipe Nipple C

Select the length of pipe nipple according to required projection on pipe nipple.

Length of Pipe Nipple A	B	Projection on Pipe Nipple C <sup>※3</sup>
50	0	16
75	1 ~ 25	16 ~ 40
100	26 ~ 50	
125	51 ~ 75	
150	76 ~ 100	

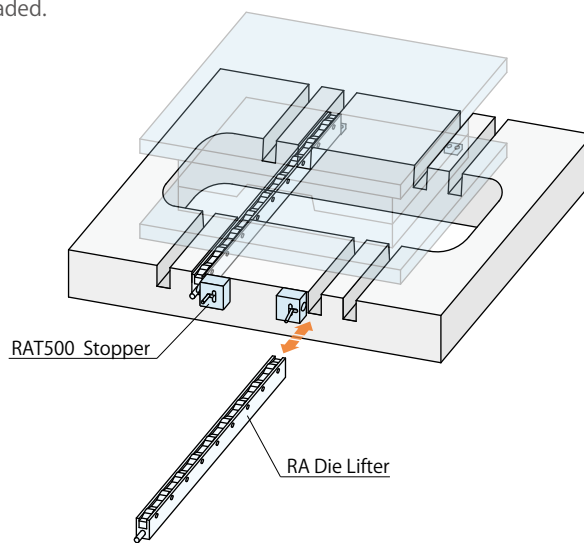
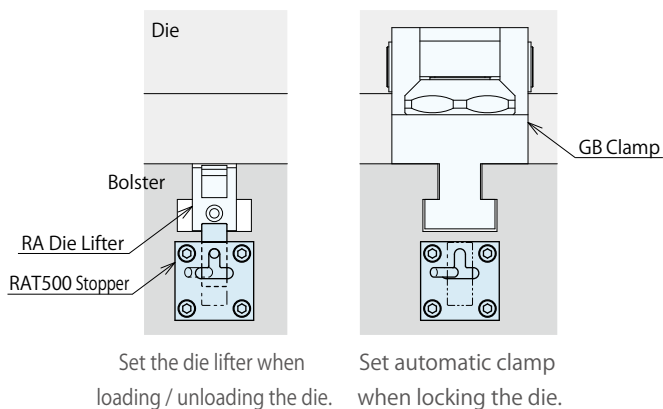
Notes

- ※1. The allowable die weight is for when the die rests on all rollers.
- ※2. Die material. Allowable die weight of material : FC250 is same as S45C.
- ※3. Tolerance of projection on pipe nipple C is  $\pm 1.5$ mm depending on screwing amount of R thread. Calculation formula : C=A-B-34

### Accessory : Stopper

When locked, RAT stopper prevents the die lifter from coming out of the bolster.  
When unlocked the stopper, the die lifter is freely loaded and unloaded.

- When sharing a die lifter with several press machines.
- When changing slots depending on the width of the die.
- For prevention of die dropping into scrap hole.
- When sharing T-slot with die lifter and automatic clamp.



Clamp  
Hydraulic Unit  
Operation Control Panel

Die Lifter  
Pre-Roller

Accessories

Cautions  
Company Profile

Die Lifter

RA

RB

Pre-Roller

MRC

MRD

MRE/MRF

MRG

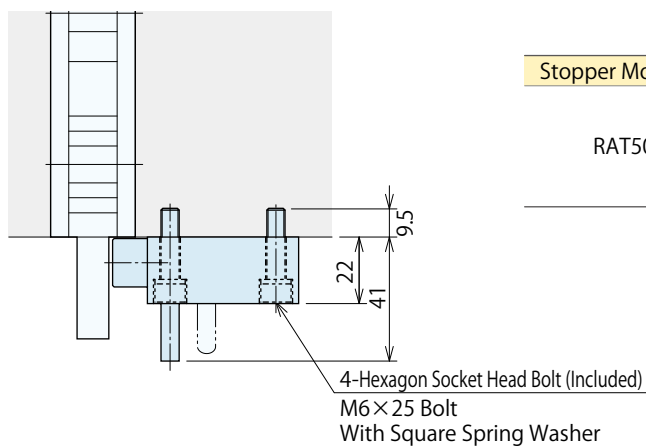
MRJ/MRK

### Model No. Indication

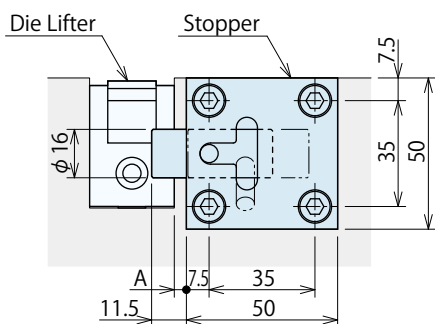
# RAT50 0

Design No.  
(Revision Number)

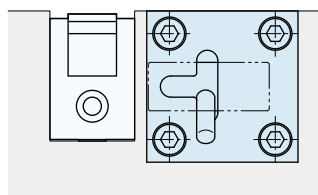
### External Dimension and Machining Dimension of Mounting Area



Stopper Model No.	Die Lifter Model No.	Dimension A (mm)
RAT500	RA0180	9
	RA0220	7
	RA0280	4
	RA0500	0



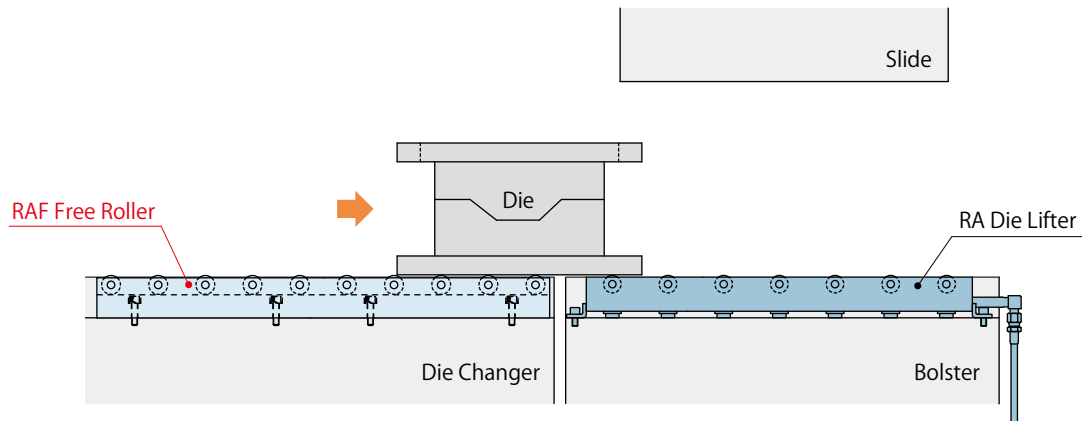
When locking the stopper  
Prevents die lifter from coming out



When unlocking the stopper  
Able to load / unload the die lifter

● Free Roller

Free roller which does not require hydraulic pressure is always lifted up.  
Suitable for specific applications where rollers do not have to be down.



● Model No. Indication

**RAF** **28** **0** - **230**

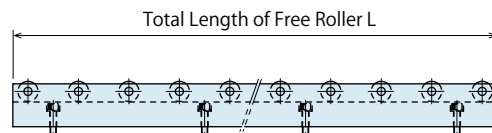
1      2                      3

**1** Free Roller Width

- 28** : Free Roller Width 28 mm
  - 50** : Free Roller Width 50 mm
  - 80** : Free Roller Width 80 mm
- 

**3** Total Length of Free Roller

**3** Total length of free roller that you can choose depends on **1** free roller width.  
Refer to external dimensions for further information.



**2** Design No.

**0** : Revision Number

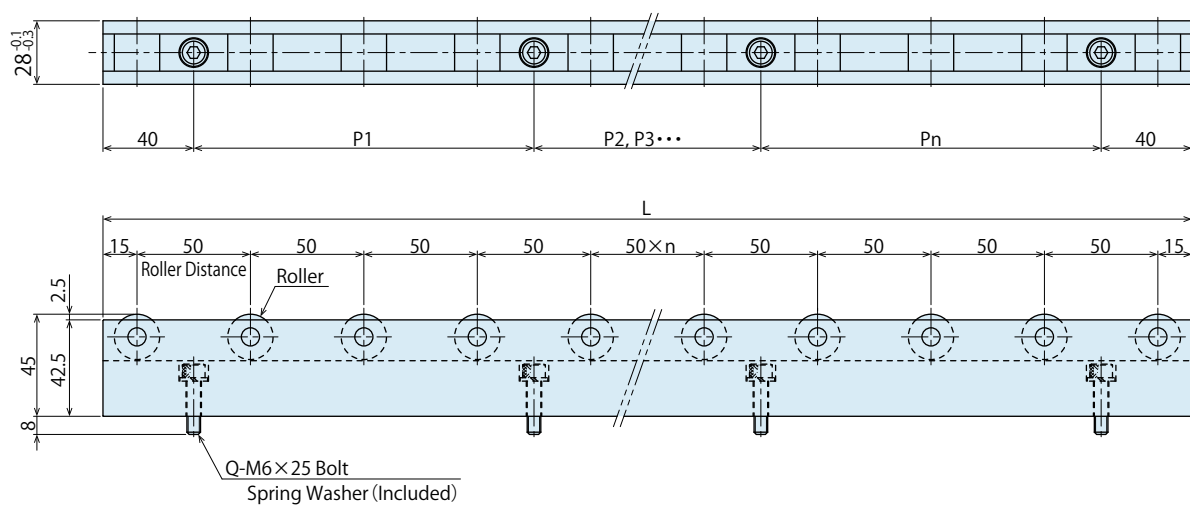
● Specifications

Model No.			RAF280	RAF500	RAF800
Allowable Die Weight per Roller ※1、※2	Die Material SS400	kg	80	200	500
	Die Material S45C・FC250	kg	140	350	800
Operating Temperature		°C	0 ~ 70		

Notes

- ※1. The number of rollers per free roller depends on the total length of free roller.  
Refer to the external dimensions for further information.
- ※2. The listed weight is based on bottom of die (rolling surface) hardness.

● External Dimension : RAF280-□



● External Dimension List

Model No.	Length of Free Roller L (mm)	Number of Rollers	Allowable Die Weight (kg) <sup>※1</sup>		Number of Mounting Bolts Q	Distance of Each Mounting Bolt (mm)				
			Die Material SS400	Die Material S45C・FC250		P1	P2	P3	P4	P5
RAF280-230	230	5	400	700	2	150				
RAF280-280	280	6	480	840		200				
RAF280-330	330	7	560	980		250				
RAF280-380	380	8	640	1120		300				
RAF280-430	430	9	720	1260		150	200			
RAF280-480	480	10	800	1400	3	200	200			
RAF280-530	530	11	880	1540		200	250			
RAF280-580	580	12	960	1680		250	250			
RAF280-630	630	13	1040	1820		250	300			
RAF280-680	680	14	1120	1960		300	300			
RAF280-730	730	15	1200	2100	4	200	250	200		
RAF280-780	780	16	1280	2240		200	250	250		
RAF280-830	830	17	1360	2380		250	250	250		
RAF280-880	880	18	1440	2520		250	300	250		
RAF280-930	930	19	1520	2660		250	300	300		
RAF280-980	980	20	1600	2800	5	300	300	300		
RAF280-1030	1030	21	1680	2940		200	250	250	250	
RAF280-1080	1080	22	1760	3080		250	250	250	250	
RAF280-1130	1130	23	1840	3220		250	250	300	250	
RAF280-1180	1180	24	1920	3360		250	300	300	250	
RAF280-1230	1230	25	2000	3500	6	250	300	300	300	
RAF280-1280	1280	26	2080	3640		300	300	300	300	
RAF280-1330	1330	27	2160	3780		250	250	250	250	250
RAF280-1380	1380	28	2240	3920		250	250	300	250	250
RAF280-1430	1430	29	2320	4060		250	250	300	300	250
RAF280-1480	1480	30	2400	4200	250	300	300	300	250	

Notes

※1. The allowable die weight is for when the die rests on all rollers.

Clamp  
Hydraulic Unit  
Operation Control Panel

Die Lifter  
Pre-Roller

Accessories

Cautions  
Company Profile

Die Lifter

RA

RB

Pre-Roller

MRC

MRD

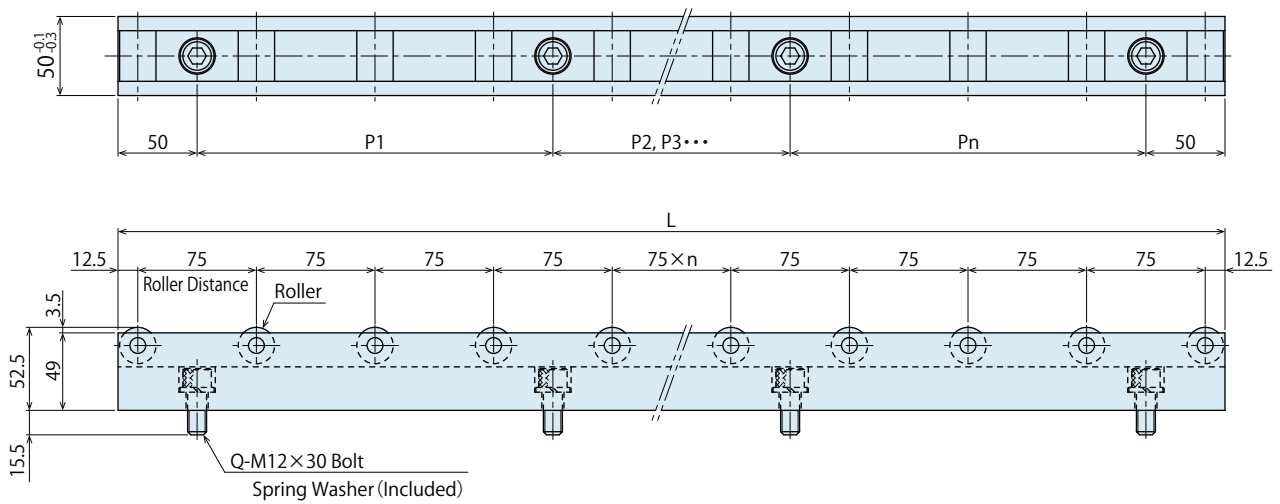
MRE/MRF

MRG

MRJ/MRK



● External Dimension : RAF500-□



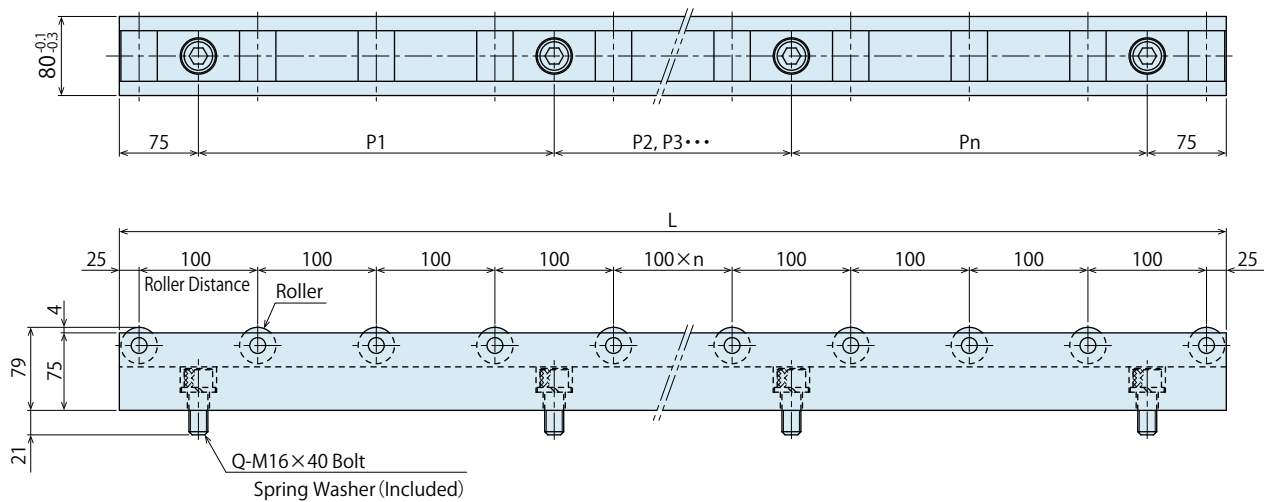
● External Dimension List

Model No.	Length of Free Roller L (mm)	Number of Rollers	Allowable Die Weight (kg) <sup>※1</sup>		Number of Mounting Bolts Q	Distance of Each Mounting Bolt (mm)					
			Die Material SS400	Die Material S45C・FC250		P1	P2	P3	P4	P5	P6
RAF500-250	250	4	800	1400	2	150					
RAF500-325	325	5	1000	1750		225					
RAF500-400	400	6	1200	2100		300					
RAF500-475	475	7	1400	2450	3	150	225				
RAF500-550	550	8	1600	2800		225	225				
RAF500-625	625	9	1800	3150		225	300				
RAF500-700	700	10	2000	3500	4	300	300				
RAF500-775	775	11	2200	3850		225	225	225			
RAF500-850	850	12	2400	4200		225	300	225			
RAF500-925	925	13	2600	4550	5	225	300	300			
RAF500-1000	1000	14	2800	4900		300	300	300			
RAF500-1075	1075	15	3000	5250		225	225	300	225		
RAF500-1150	1150	16	3200	5600	6	225	300	300	225		
RAF500-1225	1225	17	3400	5950		225	300	300	300		
RAF500-1300	1300	18	3600	6300		300	300	300	300		
RAF500-1375	1375	19	3800	6650	7	225	225	300	300	225	
RAF500-1450	1450	20	4000	7000		225	300	300	300	225	
RAF500-1525	1525	21	4200	7350		225	300	300	300	300	
RAF500-1600	1600	22	4400	7700	7	300	300	300	300	300	
RAF500-1675	1675	23	4600	8050		225	225	300	300	300	225
RAF500-1750	1750	24	4800	8400		225	300	300	300	300	225
RAF500-1825	1825	25	5000	8750	7	225	300	300	300	300	300
RAF500-1900	1900	26	5200	9100		300	300	300	300	300	300

Notes

※1. The allowable die weight is for when the die rests on all rollers.

● External Dimension : RAF800-□



● External Dimension List

Model No.	Length of Free Roller L (mm)	Number of Rollers	Allowable Die Weight (kg) <sup>※1</sup>		Number of Mounting Bolts Q	Distance of Each Mounting Bolt (mm)				
			Die Material SS400	Die Material S45C · FC250		P1	P2	P3	P4	P5
RAF800-450	450	5	2500	4000	2	300				
RAF800-550	550	6	3000	4800		400				
RAF800-650	650	7	3500	5600	3	200	300			
RAF800-750	750	8	4000	6400		300	300			
RAF800-850	850	9	4500	7200		300	400			
RAF800-950	950	10	5000	8000	4	400	400			
RAF800-1050	1050	11	5500	8800		300	300	300		
RAF800-1150	1150	12	6000	9600		300	400	300		
RAF800-1250	1250	13	6500	10400		300	400	400		
RAF800-1350	1350	14	7000	11200	5	400	400	400		
RAF800-1450	1450	15	7500	12000		300	300	400	300	
RAF800-1550	1550	16	8000	12800		300	400	400	300	
RAF800-1650	1650	17	8500	13600	5	300	400	400	400	
RAF800-1750	1750	18	9000	14400		400	400	400	400	
RAF800-1850	1850	19	9500	15200	6	300	300	400	400	300

Notes

※1. The allowable die weight is for when the die rests on all rollers.

Clamp  
Hydraulic Unit  
Operation Control Panel

Die Lifter  
Pre-Roller

Accessories

Cautions  
Company Profile

Die Lifter

RA

RB

Pre-Roller

MRC

MRD

MRE/MRF

MRG

MRJ/MRK

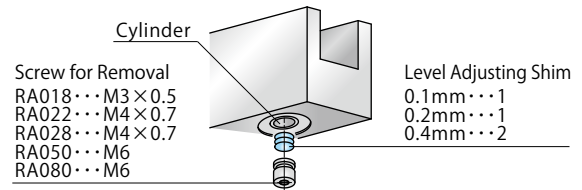
**Cautions**

● Notes for Design

- 1) Check the specifications
  - Working pressure of RA die lifter is 24.5MPa, and maximum operating pressure is 27MPa.
  - Please use the product according to each specification of RA/RB die lifter and RAF roller.
- 2) Check the die weight
  - Please use the product within the allowable die weight range. If weight of the die exceeds the allowable range, the bottom of the die may be damaged and it may cause lifting failure.
- 3) Check the positions of scrap hole and cylinders (only for RA die lifter).
  - If the bolster has a scrap hole, make sure that cylinders on the bottom of RA die lifter are not on the space of scrap hole. If cylinders are on the scrap hole, RA die lifter will be damaged resulting in malfunction and/or dangerous working conditions.
- 4) Check the positions of scrap hole and mounting bolts (only for RAF roller).
  - If the bolster has a scrap hole, make sure that mounting bolts of RAF roller are not on the space of scrap hole.

● Notes on Installation

- 1) Check the fluid to use (for RA die lifter only)
  - Please refer to Hydraulic Fluid List and use the appropriate fluid.
- 2) Procedure before piping (for RA die lifter only)
  - The pipeline and piping connector should be cleaned by thorough flushing.
- 3) Use hydraulic hose for piping (for RA die lifter only)
  - Please use a hydraulic hose since hydraulic connection port moves up and down.
- 4) Level adjustment
  - Set the die lifter into U-slot (T-slot) and adjust the level according to dimensions when moving upward and downward. Please refer to the external dimensions for U-slot (T-slot) dimensions and setting of level adjustment. If the level is not adjusted, the load may not be uniformly distributed, which could damage the die and die lifter. Use the level adjusting shims to adjust the RA roller level, and use the level adjusting bolt to adjust the RB roller level and fasten the level adjusting bolt with a lock nut tightened with 5.9-9.8 N · m of torque.



- 5) Air bleeding within hydraulic circuit (for RA die lifter only)
  - Excessive air in the hydraulic circuit will slow the reaction time and may result in pump continuous idling. After installing the hydraulic circuit, or if the pump run out of oil, be sure to bleed air from the nipple in the case of RA0180/0220/0280 or from the air bleed valve in the case of RA050/080.

● Hydraulic Fluid List

Maker	ISO Viscosity Grade ISO-VG-32	
	Anti-Wear Hydraulic Oil	Multi-Purpose Hydraulic Oil
Showa Shell Sekiyu	Tellus S2 M 32	Morlina S2 B 32
Idemitsu Kosan	Daphne Hydraulic Fluid 32	Daphne Super Multi Oil 32
JX Nippon Oil & Energy	Super Hyrando 32	Super Mulpus DX 32
Cosmo Oil	Cosmo Hydro AW32	Cosmo New Mighty Super 32
ExxonMobil	Mobil DTE 24	Mobil DTE 24 Light
Matsumura Oil	Hydol AW-32	
Castrol	Hyspin AWS 32	

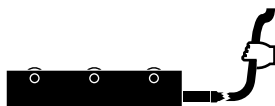
Note As it may be difficult to purchase the products as shown in the table from overseas, please contact the respective manufacturer.

## ● Notes on Handling

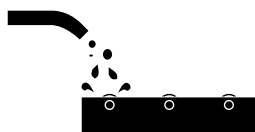
- 1) The product should be handled by qualified personnel.
- 2) Do not handle or remove the component unless the safety is ensured.
  - ① The machine and equipment can only be inspected or prepared when it is confirmed that the preventative devices are in place.
  - ② Before the component is removed, make sure that the above-mentioned safety measures are in place. Shut off the air of hydraulic source and make sure no pressure exists in the hydraulic and air circuit.
  - ③ After stopping the machine, do not remove until the temperature cools down.
  - ④ Make sure there is no abnormality in the bolts and respective parts before restarting the machine or equipment.
- 3) Do not disassemble or modify it.
  - If the equipment is taken apart or modified, the warranty will be void even within the warranty period.
- 4) Do not touch die lifters while they are working.
  - Injury may occur.



- 5) Hold the RA die lifter itself when moving or removing it.
  - If pulling on the hose, RA die lifter may fall off leading to accident. Also, rivet part of the hose will be loosened leading to fluid leakage.



- 6) Do not pour water or oil over the product.
  - It may lead to malfunction or deterioration of the product causing an accident.



## ● Maintenance / Inspection

- 1) Removal of equipment
  - Before the equipment is removed, make sure that the preventative devices are in place.
  - Make sure there is no abnormality in the bolts and respective parts before restarting.
- 2) Check to make sure that the rollers move smoothly and do not make noises.
- 3) Please contact us for overhaul and repairs.
- 4) Regularly tighten pipe lines to ensure proper use.
- 5) Regularly check to make sure that the supply hydraulic pressure is at the operating pressure.
- 6) Make sure hydraulic fluid is not deteriorated.
- 7) Make sure the operation is smooth without abnormal sounds.
  - Especially when the equipment has not used for a long period of time or when using for the first time, make sure it operates properly.
- 8) Regularly tighten the end plate mounting bolts to ensure proper use.
- 9) When storing the product, keep it out of direct sunlight in a cool location where it is protected from water.

※ Refer to P.145 for common cautions.

• Notes on Installation  
• Notes on Handling

• Hydraulic Fluid List  
• Maintenance / Inspection

• Speed Control Circuit of Hydraulic Cylinder & Notes  
• Warranty

## ● Cautions

### ● Notes on Installation (Cautions for Hydraulic Series)

#### 1) Check the fluid to use

- Please use the appropriate fluid by referring to the Hydraulic Fluid List.
- If hydraulic oil with viscosity grade higher than ISO-VG-32 is used, action time would be longer.
- If using it at low temperature, action time will be longer because the viscosity of hydraulic oil becomes higher.

#### 2) Procedure before piping

- The pipeline, piping connector and fixture circuits should be cleaned by thorough flushing.
- The dust and cutting chips in the circuit may lead to fluid leakage and malfunction.
- Our products except some valves are not equipped with protective function to prevent dust and cutting chips going into the hydraulic system and pipeline.

#### 3) Applying sealing tape

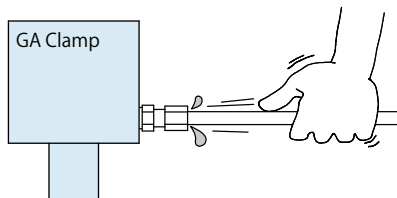
- Wrap with tape 1 to 2 times following the screwing direction.
- Pieces of the sealing tape can lead to air leaks and malfunction.
- In order to prevent a foreign substance from going into the product during piping, it should be carefully cleaned.

#### 4) Air bleeding in the hydraulic circuit

- If the hydraulic circuit has excessive air, the action time may become very long.

After installing the hydraulic circuit, or if the pump run out of oil, be sure to bleed air by the following step.

- ① Reduce hydraulic supply pressure to less than 2MPa.
- ② Please loosen the cap nut of pipe fitting that is closest to clamps · RA die lifters by one full turn.
- ③ Wiggle the pipeline to loosen the outlet of pipeline fitting. The hydraulic fluid mixed with air comes out.



- ④ Tighten the cap nut after bleeding.
- ⑤ It is more effective to bleed air at the highest point inside the circuit or at the end of the circuit.

#### 5) Checking looseness and retightening

- At the beginning of the machine installation, the bolt/nut may be tightened lightly. Check torque and re-tighten as required.

### ● Hydraulic Fluid List

Maker	ISO Viscosity Grade ISO-VG-32	
	Anti-Wear Hydraulic Oil	Multi-Purpose Hydraulic Oil
Showa Shell Sekiyu	Tellus S2 M 32	Morlina S2 B 32
Idemitsu Kosan	Daphne Hydraulic Fluid 32	Daphne Super Multi Oil 32
JX Nippon Oil & Energy	Super Hyrando 32	Super Mulpus DX 32
Cosmo Oil	Cosmo Hydro AW32	Cosmo New Mighty Super 32
ExxonMobil	Mobil DTE 24	Mobil DTE 24 Light
Matsumura Oil	Hydol AW-32	
Castrol	Hyspin AWS 32	

Note As it may be difficult to purchase the products as shown in the table from overseas, please contact the respective manufacturer.

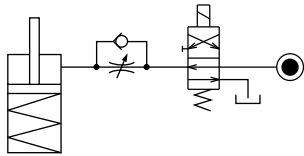
## ● Speed Control Circuit of Hydraulic Cylinder and Notes



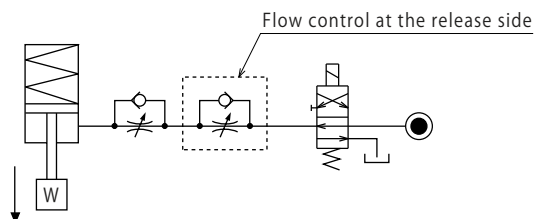
If the hydraulic cylinder speed is controlled, the circuit should be designed with the following points taken into consideration. Review these notes prior to installation as the wrong circuit design may lead to machine malfunction and damage.

### ● Flow control circuit for single acting cylinder.

For spring return type single acting cylinders, restricting flow during release can extremely slow down or prevent release action. The preferred method is to control the flow during the lock action and use a valve that has free-flow in the release direction. Also, it is preferred to provide a flow control valve at each actuator.



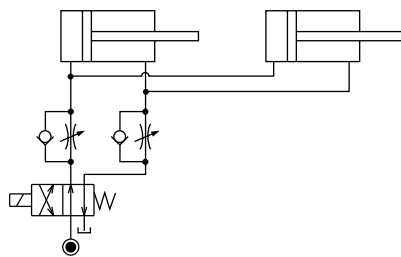
If the release action is accelerated by excessive hydraulic flow the cylinder may sustain damage. In this case add flow control to regulate flow.



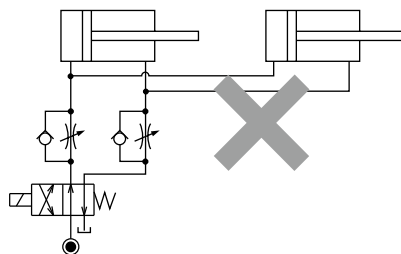
### ● Flow control circuit for double acting cylinder.

Flow control circuit for double acting cylinder should have meter-out circuits for both the lock and release sides. Meter-in control can have adverse effect by presence of air in the system.

#### 【Meter-out circuit】

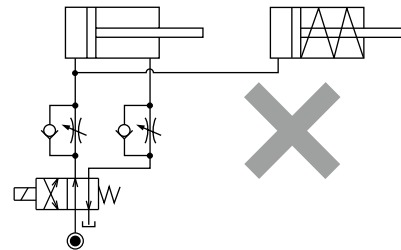


#### 【Meter-in circuit】



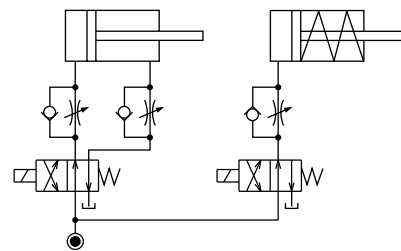
In the case of meter-out circuit, the hydraulic circuit should be designed with the following points.

- ① Single acting components should not be used in the same flow control circuit as the double acting components. The release action of the single acting cylinders may become erratic or very slow.

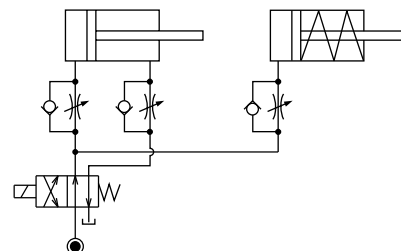


Refer to the following circuit when both the single acting cylinder and double acting cylinder are used together.

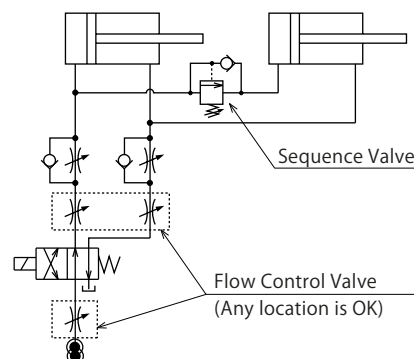
- Separate the control circuit.



- Reduce the influence of double acting cylinder control unit. However, due to the back pressure in tank line, single action cylinder is activated after double action cylinder work.



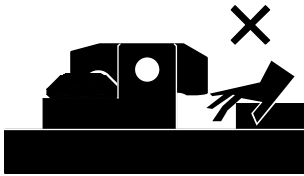
- ② In the case of meter-out circuit, the inner circuit pressure may increase during the cylinder action because of the fluid supply. The increase of the inner circuit pressure can be prevented by reducing the supplied fluid beforehand via the flow control valve. Especially when using sequence valve or pressure switches for clamping detection, if the back pressure is more than the set pressure then the system will not work as it is.



## ● Cautions

### ● Notes on Handling

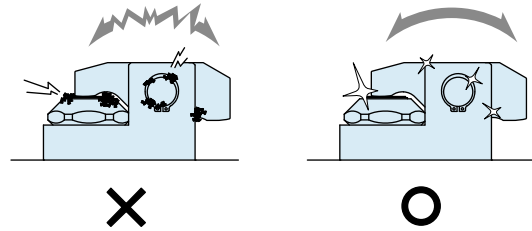
- 1) It should be handled by qualified personnel.
  - The hydraulic machine / air compressor should be handled and maintained by qualified personnel.
- 2) Do not handle or remove the machine unless the safety is ensured.
  - ① The machine and equipment can only be inspected or prepared when it is confirmed that the preventive devices are in place.
  - ② Before the machine is removed, make sure that the above-mentioned safety measures are in place. Shut off the air of hydraulic source and make sure no pressure exists in the hydraulic and air circuit.
  - ③ After stopping the machine, do not remove until the temperature cools down.
  - ④ Make sure there is no abnormality in the bolts and respective parts before restarting the machine or equipment.
- 3) Do not touch clamps (cylinders) while they are working. Otherwise, your hands may be injured.



- 4) Do not disassemble or modify it.
  - If the equipment is taken apart or modified, the warranty will be void even within the warranty period.

### ● Maintenance • Inspection

- 1) Removal of the machine and shut-off of pressure source
  - Before the machine is removed, make sure that the above-mentioned safety measures are in place. Shut off the air of hydraulic source and make sure no pressure exists in the hydraulic and air circuit.
  - Make sure there is no abnormality in the bolts and respective parts before restarting.
- 2) Regularly clean the area around the equipment.
  - If it is used when the surface is contaminated with dirt, it may lead to packing seal damage, malfunctioning, fluid leakage and air leaks.



- 3) If disconnecting by couplers on a regular basis, air bleeding should be carried out daily to avoid air mixed in the circuit.
- 4) Regularly tighten bolts and pipe line, mounting bolts, nuts, circlips and cylinders to ensure proper use.
- 5) Make sure the hydraulic fluid has not deteriorated.
- 6) Make sure there is smooth action and no abnormal noise.
  - Especially when it is restarted after left unused for a long period, make sure it can be operated properly.
- 7) The products should be stored in the cool and dark place without direct sunshine or moisture.
- 8) Please contact us for overhaul and repair.

## ● Warranty

### 1) Warranty period

- The product warranty period is 18 months from shipment from our factory or 12 months from initial use, whichever is earlier.

### 2) Warranty scope

- If the product is damaged or malfunctions during the warranty period due to faulty design, materials or workmanship, we will replace or repair the defective part at our expense. Defects or failures caused by the following are not covered.

- ① If the stipulated maintenance and inspection are not carried out.
- ② If the product is used while it is not suitable for use based on operator judgment, resulting in defect.
- ③ If it is used or handled in inappropriate way by the operator. (Including damage caused by the misconduct of a third party.)
- ④ If the defect is caused by reasons other than our responsibility.
- ⑤ If repair or modifications are carried out by anyone other than Kosmek, or without our approval and confirmation, it will void warranty.
- ⑥ Defects caused by natural disasters or calamities not attributable to our company.
- ⑦ Parts expenses or replacement expenses due to parts consumption and deterioration. (Such as rubber, plastic, seal material and some electric components.)

Damages from direct result of a product defect shall be excluded from the warranty.



# Sales Office

## Sales Offices Across the World

Japan Overseas Sales	<b>TEL. +81-78-991-5162</b>	<b>FAX. +81-78-991-8787</b>
	KOSMEK LTD. 1-5, 2-chome, Murotani, Nishi-ku, Kobe-city, Hyogo, 651-2241, Japan 〒651-2241 兵庫県神戸市西区室谷2丁目1番5号	
USA KOSMEK (USA) LTD.	<b>TEL. +1-630-241-3465</b>	<b>FAX. +1-630-241-3834</b>
	1441 Branding Avenue, Suite 110, Downers Grove, IL 60515 USA	
China KOSMEK (CHINA) LTD. 考世美(上海)貿易有限公司	<b>TEL. +86-21-54253000</b>	<b>FAX. +86-21-54253709</b>
	21/F, Orient International Technology Building, No.58, Xiangchen Rd, Pudong Shanghai 200122., P.R.China 中国上海市浦东新区向城路58号东方国际科技大厦21F室 200122	
Thailand Thailand Representative Office	<b>TEL. +66-2-715-3450</b>	<b>FAX. +66-2-715-3453</b>
	67 Soi 58, RAMA 9 Rd., Suanluang, Suanluang, Bangkok 10250, Thailand	
Europe (Europe Exclusive Distributors) KOS-MECH GmbH	<b>TEL. +43-463-287587-10</b>	<b>FAX. +43-463-287587-20</b>
	Schleppeplatz 2 9020 Klagenfurt Austria	
Taiwan (Taiwan Exclusive Distributors) Full Life Trading Co., Ltd. 盈生貿易有限公司	<b>TEL. +886-2-82261860</b>	<b>FAX. +886-2-82261890</b>
	16F-4, No.2, Jian Ba Rd., Zhonghe District, New Taipei City Taiwan 23511 台湾新北市中和區建八路2號 16F-4 (遠東世紀廣場)	
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Indonesia (Indonesia Exclusive Distributors) P.T PANDU HYDRO PNEUMATICS	<b>TEL.+62-21-5818632</b>	<b>FAX. +62-21-5814857</b>
	Ruko Green Garden Blok Z- II No.51 Rt.005 Rw.008 Kedoya Utara-Kebon Jeruk Jakarta Barat 11520 Indonesia	

## Sales Offices in Japan

Head Office Kansai Office Overseas Sales	<b>TEL. +81-78-991-5162</b>	<b>FAX. +81-78-991-8787</b>
	KOSMEK LTD. 1-5, 2-chome, Murotani, Nishi-ku, Kobe-city, Hyogo, 651-2241, Japan 〒651-2241 兵庫県神戸市西区室谷2丁目1番5号	
Kanto Office	<b>TEL. +81-48-652-8839</b>	<b>FAX. +81-48-652-8828</b>
	KOSMEK LTD. 81, 4-chome, Onari-cho, Kita-ku, Saitama City, Saitama, 331-0815, Japan 〒331-0815 埼玉県さいたま市北区大成町4丁目81番地	
Chubu Office	<b>TEL. +81-566-74-8778</b>	<b>FAX. +81-566-74-8808</b>
	KOSMEK LTD. 10-1, 2-chome, Misono-cho, Anjo City, Aichi, 446-0076, Japan 〒446-0076 愛知県安城市美園町2丁目10番地1	
Kyusyu Office	<b>TEL. +81-92-433-0424</b>	<b>FAX. +81-92-433-0426</b>
	KOSMEK LTD. 8-10-101, 1-chome, Kamimuta, Hakata-ku, Fukuoka City, Fukuoka, 812-0006, Japan 〒812-0006 福岡県福岡市博多区上牟田1丁目8-10-101	