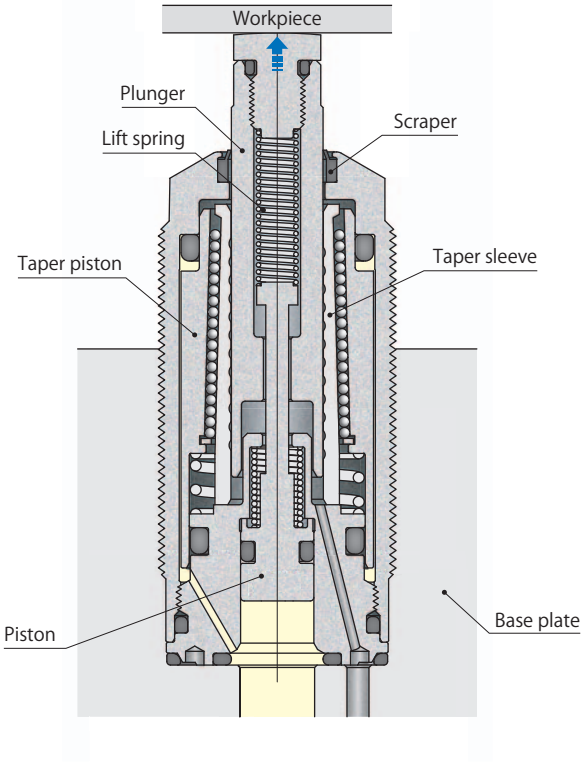
Hydraulic lift

Standard model **CSN□-□□**
Support force enhanced model **CSY□-□□**



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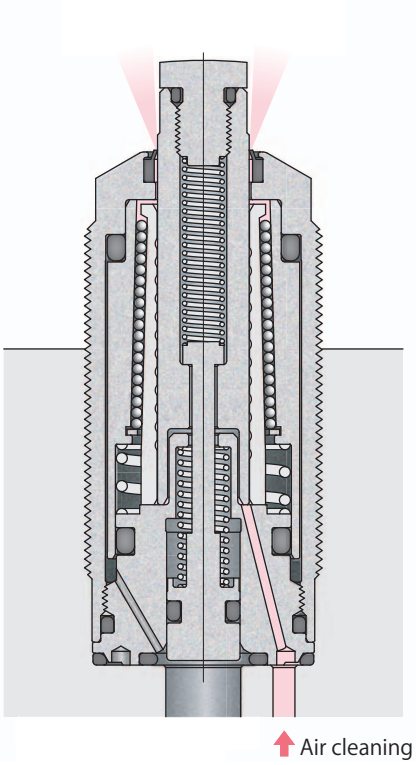

Unlock

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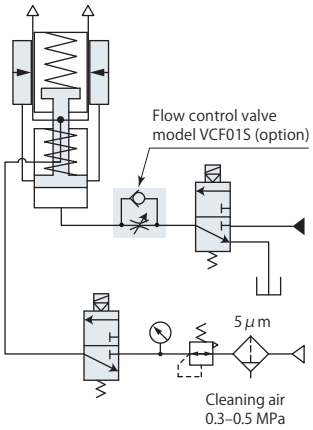
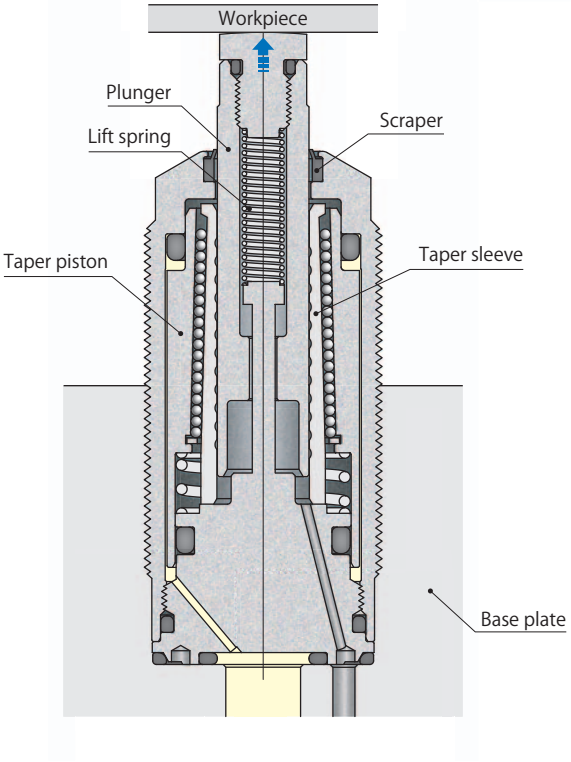
Applied load & deformation page → 151
Dimensions pages → 152, 154
Mounting details pages → 152, 154
Air sensor page → 156

Hydraulic and pneumatic circuit diagram



Spring lift

model CSK□-□



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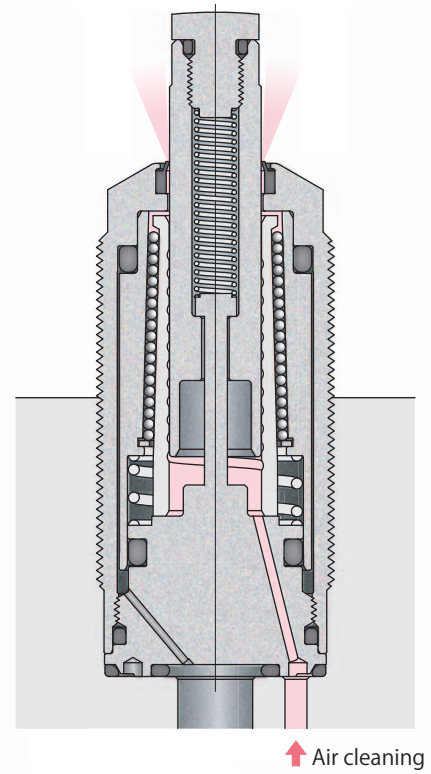

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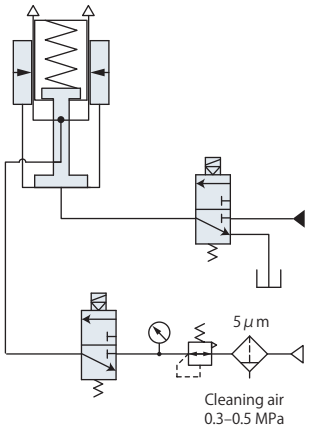
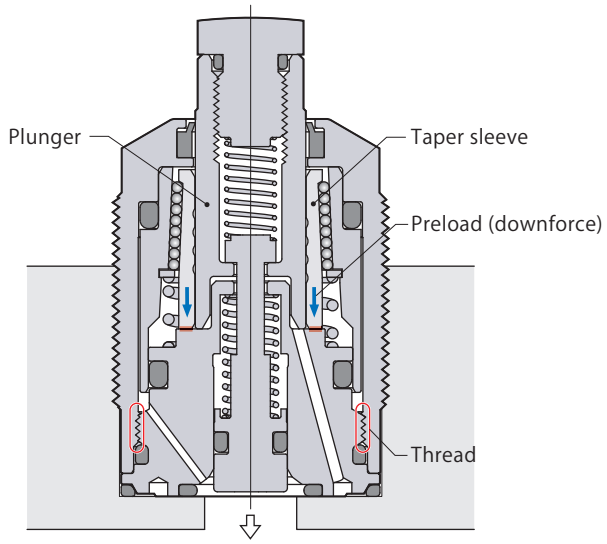
Hydraulic and pneumatic circuit diagram



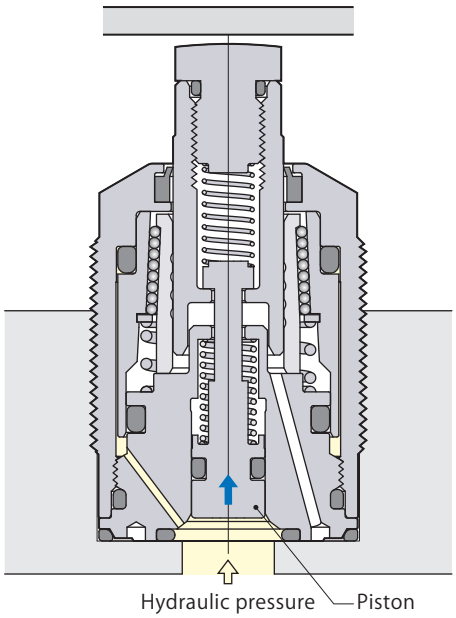
Hydraulic lift (model CSN, CSY)

Plunger is locked after it stroked by the structure containing sequencetial movement, which enables a workpiece to hold securely.



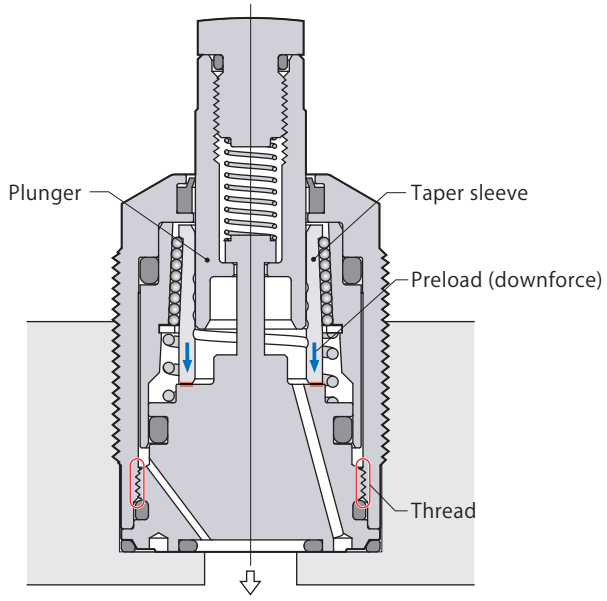
● The taper sleeve is preloaded by the thread and is kept the position lower.

①The piston moves upward



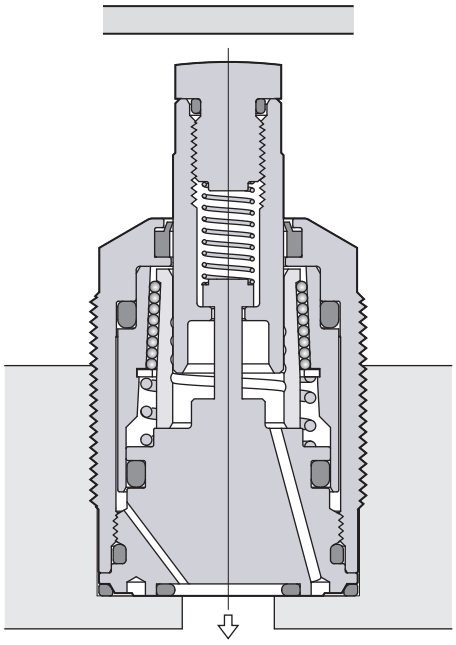
● Piston moves upward by the hydraulic force.

Spring lift (model CSK)

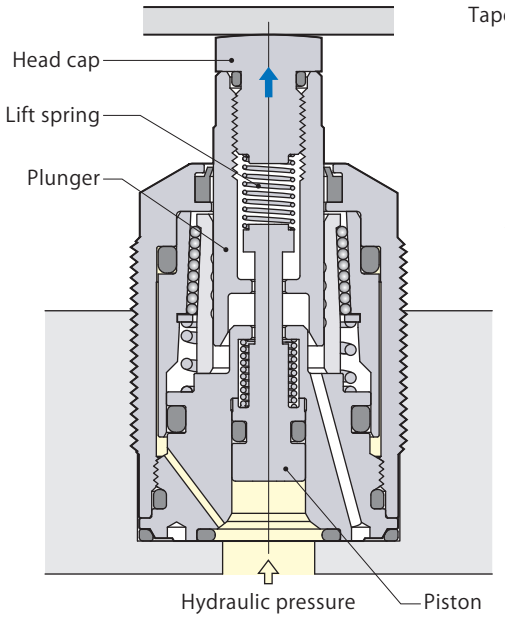


● The taper sleeve is preloaded by the thread and is kept the position lower.

①Before the workpiece approaches

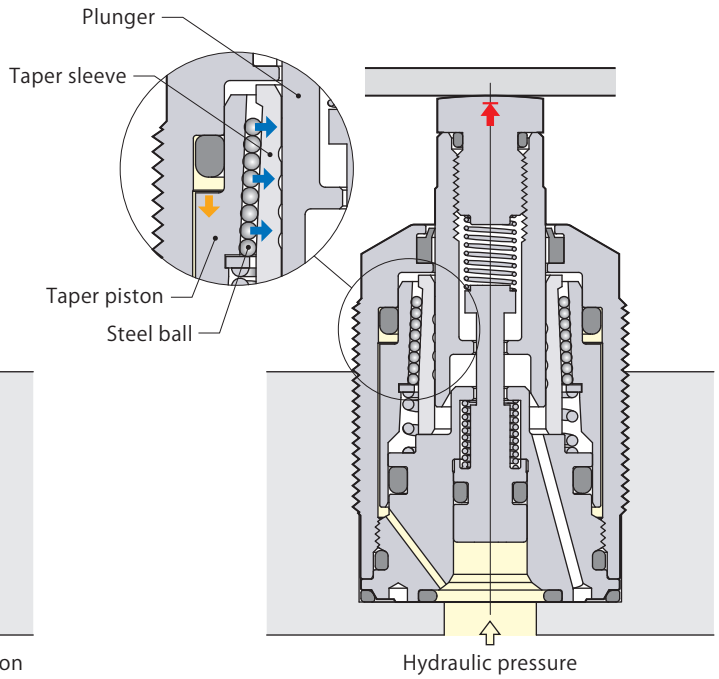


②Contact with the workpiece



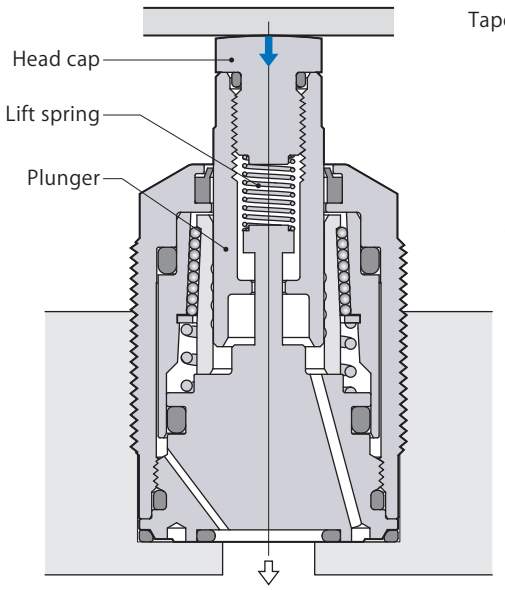
- The plunger with a head cap strokes upward by the lift spring to contact the workpiece. The plunger puts a load on the workpiece since the piston continues to move upward to the end of its stroke.

③Supporting the workpiece



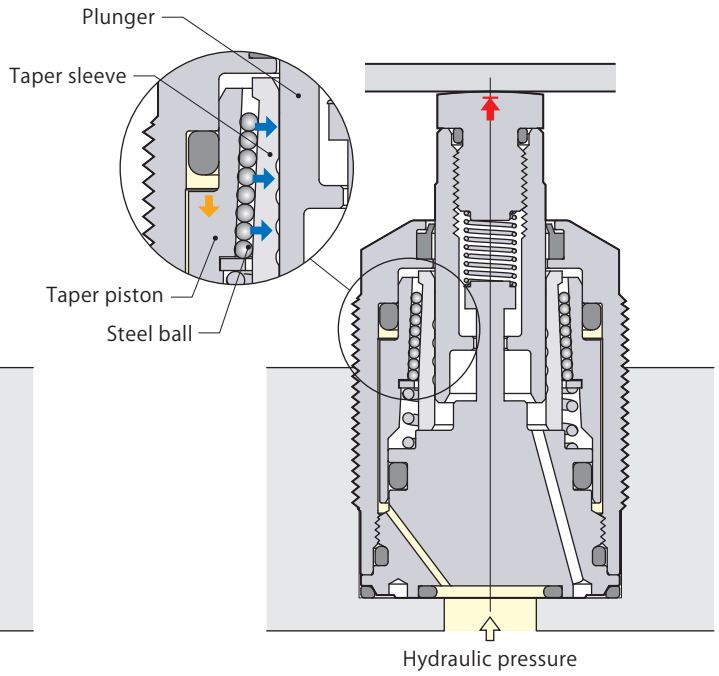
- After piston stroking, the taper piston moves down by the hydraulic force to depress the taper sleeve by means of the steel balls. Then the taper sleeve locks the plunger firmly.

②Contact with the workpiece



- The workpiece touches head cap then depresses the plunger until it reaches to the seating surface. The lift spring puts a load onto the workpiece.

③Supporting the workpiece



- The taper piston is pushed down by the hydraulic force to depress the taper sleeve by means of the steel balls. Then the taper sleeve locks the plunger firmly.

Specifications

CSN : Hydraulic lift, standard

CSY : Hydraulic lift, support force enhanced

CSK* : Spring lift

Size: -S005 *, 005 *, 00, 01, 03, 04, 06

Lift spring force: **L** : Standard, **H** : Strong

(Nil) : Standard, **B** : Air sensor

*: Air sensor is not applicable for model CSN-S005, CSN005, CSY-S005, CSY005, CSK.

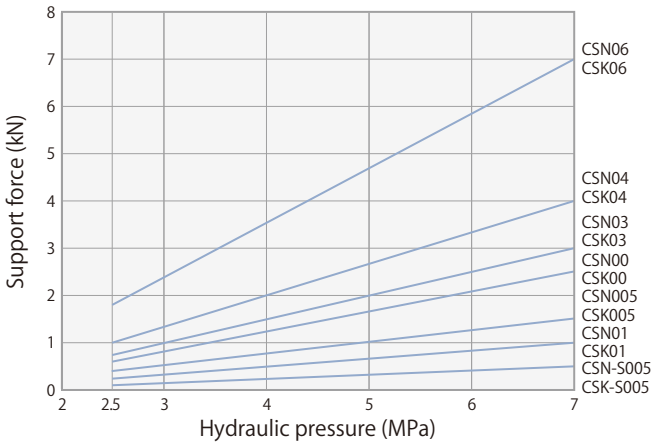
Model				CSN-S005-□ / CSY-S005-□ / CSK-S005-□	CSN005-□ / CSY005-□ / CSK005-□	CSN00-□ / CSY00-□ / CSK00-□	CSN01-□ / CSY01-□ / CSK01-□	CSN03-□ / CSY03-□ / CSK03-□	CSN04-□ / CSY04-□ / CSK04-□	CSN06-□ / CSY06-□ / CSK06-□
Support force (hydraulic pressure 7MPa)*1		CSN, CSK	kN	0.5	1.5	2.5	1	3	4	7
		CSY	kN	0.6	2	3	1.2	4	5.5	10
Cylinder capacity		CSN, CSY	cm^3	0.2	0.4	0.6	0.4	0.8	1.2	2.0
		CSK	cm^3	0.1	0.2	0.3	0.1	0.4	0.7	1.2
Lift spring force*2	L:Standard	CSN, CSK	N	1–2		2–4			3–6	
		CSY	N	1–3	2–3	2–4		4–6	5–8	
	H:Strong	CSN, CSK	N	1–3	2–3	3–6			5–8	
		CSY	N	2–4		3–6		5–8	6–11	8–14
Plunger stroke			mm	5	6.5	6.5	6	8	8	10
Max. allowable mass of head cap			kg	0.05					0.1	
Mass			kg	0.1	0.1	0.2	0.2	0.3	0.4	0.7
Recommended tightening torque of body			N·m	20–25	20–25	35–45	40–50	40–50	45–55	55–65

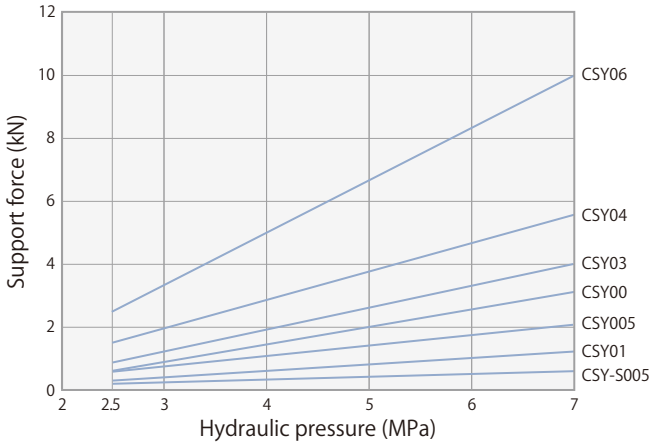
- Pressure range : 2.5–7 MPa
- Proof pressure : 10.5 MPa
- Operating temperature : 0–70 ℃
- Fluid used : General mineral based hydraulic oil (ISO-VG32 equivalent)
- Seals are resistant to chlorine-based cutting fluid. (not thermal resistant specification)

*1 : When work support and clamp are used facing each other, work support and clamp must be selected in such a way that the support force is 1.5 times the applied load (clamping force + machining force).

*2 : Figures are for "upper end to lower end" of plunger action.

Hydraulic pressure & support force

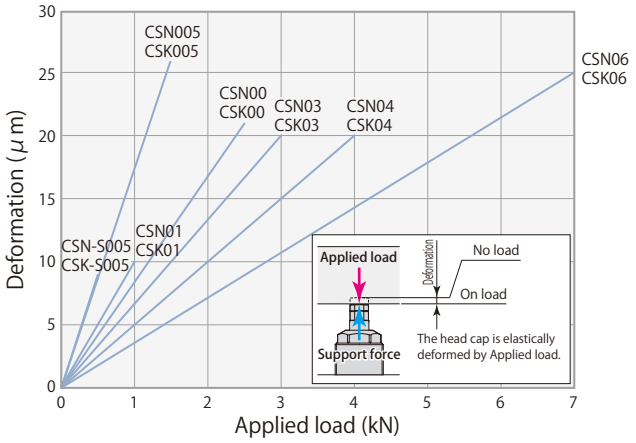


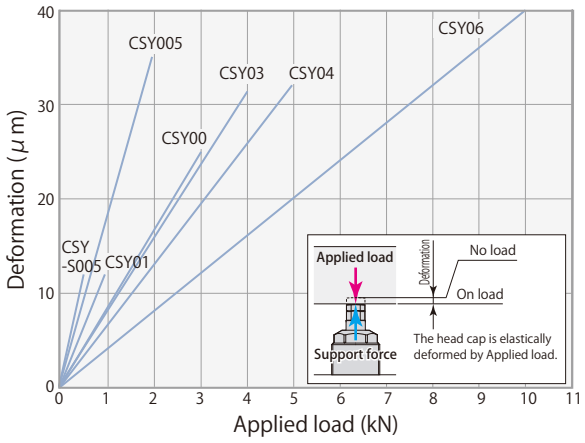


Hydraulic pressure MPa	CSN, CSK support force kN						
	CS□-S005	CS□005	CS□00	CS□01	CS□03	CS□04	CS□06
2.5	0.1	0.4	0.6	0.3	0.8	1.0	1.8
3.0	0.2	0.5	0.8	0.3	1.0	1.3	2.3
3.5	0.2	0.6	1.0	0.4	1.3	1.7	3.0
4.0	0.2	0.8	1.2	0.5	1.5	2.0	3.5
4.5	0.3	0.9	1.4	0.6	1.8	2.3	4.1
5.0	0.3	1.0	1.7	0.7	2.0	2.7	4.7
5.5	0.3	1.1	1.9	0.8	2.3	3.0	5.3
6.0	0.4	1.3	2.1	0.8	2.5	3.3	5.9
6.5	0.4	1.4	2.3	0.9	2.8	3.6	6.4
7.0	0.5	1.5	2.5	1.0	3.0	4.0	7.0

Hydraulic pressure MPa	CSY support force kN						
	CSY-S005	CSY005	CSY00	CSY01	CSY03	CSY04	CSY06
2.5	0.2	0.5	0.8	0.3	1.0	1.4	2.5
3.0	0.2	0.7	1.0	0.4	1.3	1.8	3.3
3.5	0.3	0.8	1.3	0.5	1.7	2.3	4.2
4.0	0.3	1.0	1.5	0.6	2.0	2.8	5.0
4.5	0.4	1.2	1.8	0.7	2.3	3.2	5.8
5.0	0.4	1.3	2.0	0.8	2.7	3.7	6.7
5.5	0.5	1.5	2.3	0.9	3.0	4.1	7.5
6.0	0.5	1.7	2.5	1.0	3.3	4.6	8.3
6.5	0.6	1.8	2.8	1.1	3.7	5.0	9.2
7.0	0.6	2.0	3.0	1.2	4.0	5.5	10.0

Applied load & deformation

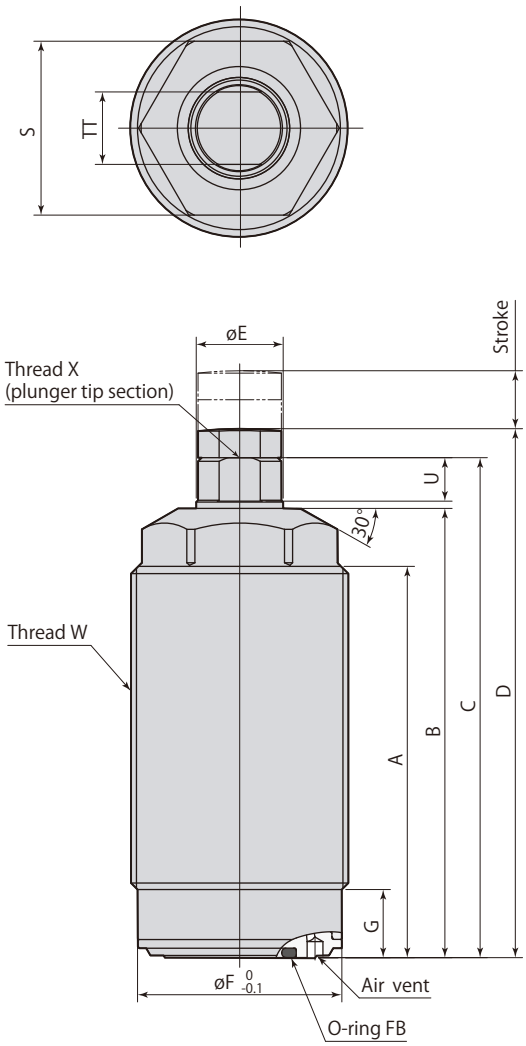




Applied load kN	CSN, CSK deformation μm						
	CS□-S005	CS□005	CS□00	CS□01	CS□03	CS□04	CS□06
0	0	0	0	0	0	0	0
0.5	9	8.7	4.2	5.0	3.3	2.5	1.8
1		17.3	8.4	10	6.7	5	3.6
2			16.8		13.3	10	7.1
3					20	15	10.7
4						20	14.3
5			Nonusable range				17.9
6							21.4
7							25

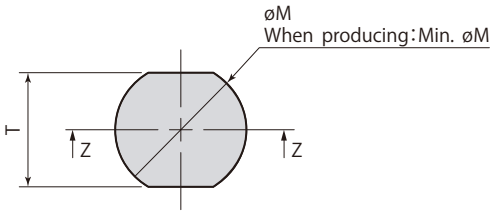
Applied load kN	CSY deformation μm						
	CSY-S005	CSY005	CSY00	CSY01	CSY03	CSY04	CSY06
0	0	0	0	0	0	0	0
0.5	12	8.8	4.2	6	4	3.2	2
1		18	8	12	8	6	4
2		35	17		16	13	8
3			25		24	19	12
4					32	26	16
5						32	20
6							24
7			Nonusable range				28
8							32
9							36
10							40

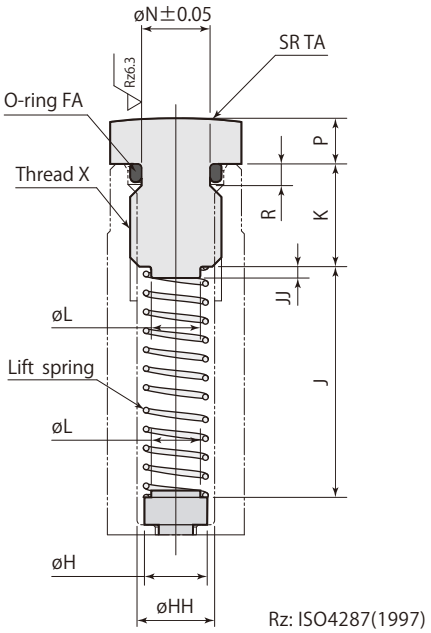
Dimensions



Head cap details

Hardness：HRC52

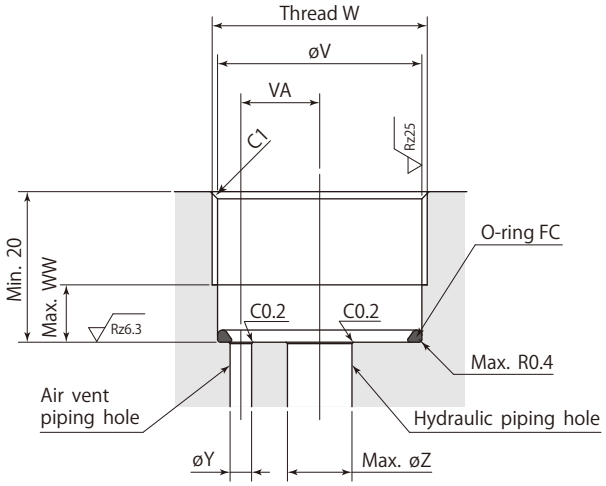




Rz: ISO4287(1997)

Z-Z

Mounting details



Rz: ISO4287(1997)

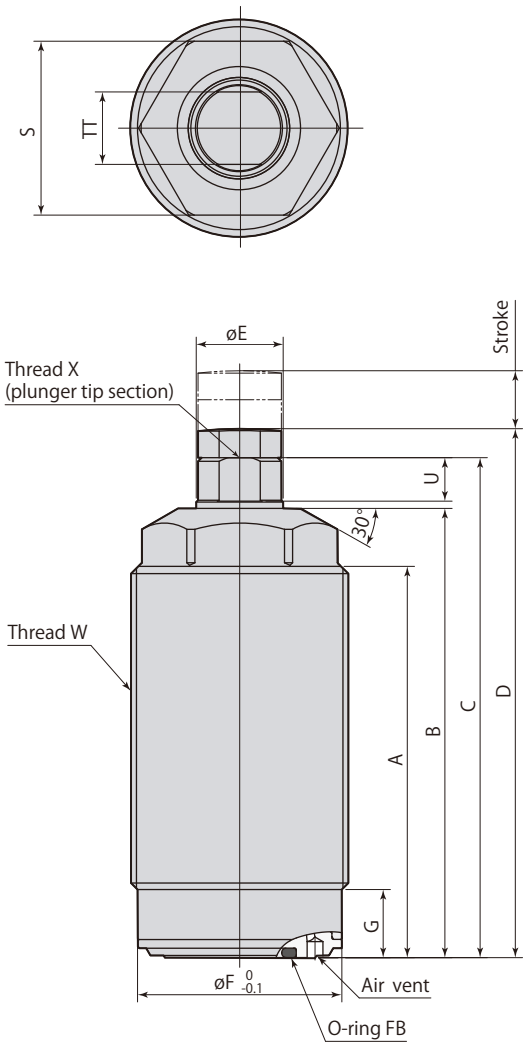
- When fixing the hexagon part of body with a vise, etc., make sure the tightening force is 2.5 kN or less.
- Always attach head cap (lift spring cannot be retained). When fabricating head cap, ensure that O-ring slot, spring spot facing and guide are made by referring to head cap details. Be sure to always use O-ring.
- When fabricating a lift spring, determine dimensions by referring to head cap details. Furthermore, rustproofing must be implemented (however, there is no guarantee for operation).
- Install O-ring FC at the bottom of the hole. The O-ring FC is packed with a work support.
- This diagram indicates a situation where head cap has been fitted into plunger with no pressure applied.

mm

Model	CSN-S005-□	CSN005-□	CSN00-□	CSN01-□	CSN03-□	CSN04-□	CSN06-□
A	30	44.5	49	33	54	48	60
B	38	52.5	57	41	62	58	71
C	42.5	57	63	48	69	65	78
D	45	59.5	66	52	73	69	82
øE	8	8	10	12	12	15	16
øF	20.3	20.3	24.3	28.2	28.2	34.2	43.2
G	8.4	8.4	8.4	9.4	9.4	9.4	9.4
øH	3.8	3.8	4.5	5.5	5.5	7.2	7.2
øHH	4.3	4.3	5.1	6.8	6.8	8.5	8.5
J	9.9	15.5	20.6	11.2	23.2	24.1	32.5
JJ	0.5	0.5	1	1	1	1	1
K	6	7	7.5	9	9	9	9
øL	2.8	2.8	3.5	4.3	4.3	5	5
øM	8	8	9.5	11.5	11.5	12.5	12.5
Min. øM	7.5	7.5	8.5	10	10	12.5	12.5
øN	4	4	4.5	6	6	7.8	7.8
P	2.5	2.5	3	4	4	4	4
R	1	1	1.5	1.9	1.9	1.9	1.9
S	19	19	22	24	24	30	36
T (width across flats)	7	7	8	10	10	11	11
TA	30	30	50	50	50	50	50
TT (plunger width across flats)	7	7	8	10	10	13	13
U	3.5	3.5	5	6	6	6	6
øV	20.5	20.5	24.5	28.5	28.5	34.5	43.5
VA	7	7	9	11	11	13	16
W	M22×1.5	M22×1.5	M26×1.5	M30×1.5	M30×1.5	M36×1.5	M45×1.5
WW	8	8	8	9	9	9	9
X (recommended tightening torque)	M5×0.8 depth 7 (6 N·m)	M5×0.8 depth 8 (6 N·m)	M6×1 depth 9 (10 N·m)	M8×1.25 depth 12 (20 N·m)	M8×1.25 depth 12 (20 N·m)	M10×1.5 depth 11 (30 N·m)	M10×1.5 depth 11 (30 N·m)
øY	2–2.5	2–2.5	2.6–3	2.6–3	2.6–3	2.6–3	2.6–3
øZ	6	6	9	9	9	9	9
O-ring FA (FKM-70)	SS4.5 (4.0×1.0)*	SS4.5 (4.0×1.0)*	S5	S6	S6	S8	S8
O-ring FB (FKM-90)	AS568-011	AS568-011	AS568-013	AS568-014	AS568-014	AS568-014	AS568-015
O-ring FC (FKM-90)	AS568-017	AS568-017	S22	AS568-022	AS568-022	AS568-026	AS568-030

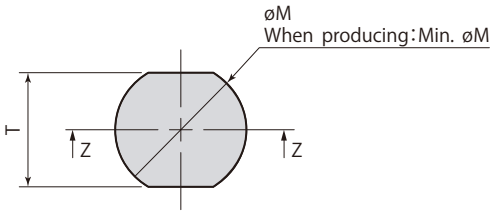
∗: Inner diameter × Thickness

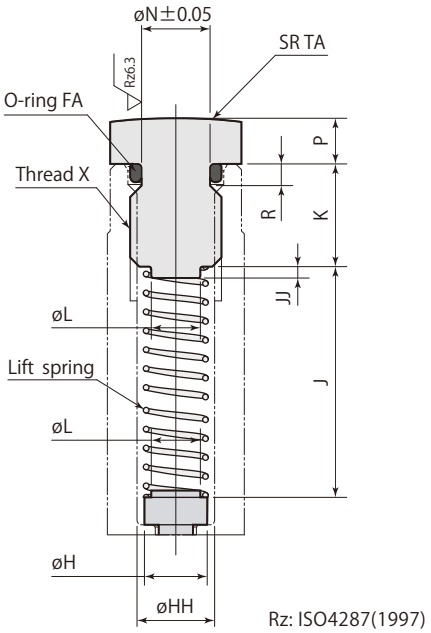
Dimensions



Head cap details

Hardness：HRC52

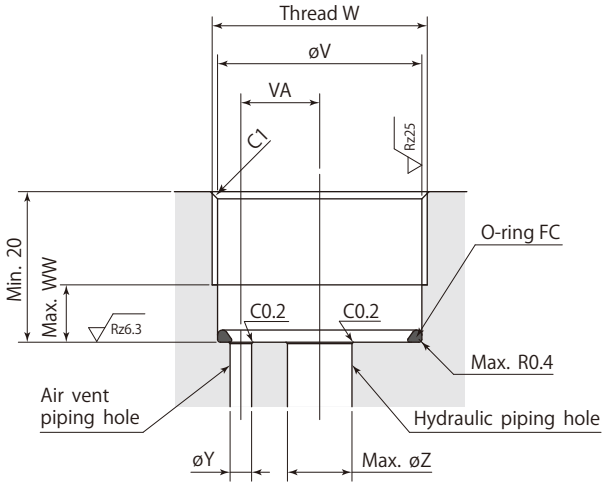




Rz: ISO4287(1997)

Z-Z

Mounting details



Rz: ISO4287(1997)

- When fixing the hexagon part of body with a vise, etc., make sure the tightening force is 2.5 kN or less.
- Always attach head cap (lift spring cannot be retained). When fabricating head cap, ensure that O-ring slot, spring spot facing and guide are made by referring to head cap details. Be sure to always use O-ring.
- When fabricating a lift spring, determine dimensions by referring to head cap details. Furthermore, rustproofing must be implemented (however, there is no guarantee for operation).
- Install O-ring FC at the bottom of the hole. The O-ring FC is packed with a work support.
- This diagram indicates a situation where head cap has been fitted into plunger with no pressure applied.

mm

Model	CSY-S005-□	CSY005-□	CSY00-□	CSY01-□	CSY03-□	CSY04-□	CSY06-□
A	30	44.5	49	33	54	48	60
B	38	52.5	57	41	62	58	71
C	42.5	57	63	48	69	65	78
D	45	59.5	66	52	73	69	82
øE	8	8	10	12	12	15	16
øF	20.3	20.3	24.3	28.2	28.2	34.2	43.2
G	8.4	8.4	8.4	9.4	9.4	9.4	9.4
øH	3.8	3.8	4.5	5.5	5.5	7.2	7.2
øHH	4.3	4.3	5.1	6.8	6.8	8.5	8.5
J	9.9	15.5	20.6	11.2	23.2	24.1	32.5
JJ	0.5	0.5	1	1	1	1	1
K	6	7	7.5	9	9	9	9
øL	2.8	2.8	3.5	4.3	4.3	5	5
øM	8	8	9.5	11.5	11.5	12.5	12.5
Min. øM	7.5	7.5	8.5	10	10	12.5	12.5
øN	4	4	4.5	6	6	7.8	7.8
P	2.5	2.5	3	4	4	4	4
R	1	1	1.5	1.9	1.9	1.9	1.9
S	19	19	22	24	24	30	36
T (width across flats)	7	7	8	10	10	11	11
TA	30	30	50	50	50	50	50
TT (plunger width across flats)	7	7	8	10	10	13	13
U	3.5	3.5	5	6	6	6	6
øV	20.5	20.5	24.5	28.5	28.5	34.5	43.5
VA	7	7	9	11	11	13	16
W	M22×1.5	M22×1.5	M26×1.5	M30×1.5	M30×1.5	M36×1.5	M45×1.5
WW	8	8	8	9	9	9	9
X (recommended tightening torque)	M5×0.8 depth 7 (6 N·m)	M5×0.8 depth 8 (6 N·m)	M6×1 depth 9 (10 N·m)	M8×1.25 depth 12 (20 N·m)	M8×1.25 depth 12 (20 N·m)	M10×1.5 depth 11 (30 N·m)	M10×1.5 depth 11 (30 N·m)
øY	2–2.5	2–2.5	2.6–3	2.6–3	2.6–3	2.6–3	2.6–3
øZ	6	6	9	9	9	9	9
O-ring FA (FKM-70)	SS4.5 (4.0×1.0)*	SS4.5 (4.0×1.0)*	S5	S6	S6	S8	S8
O-ring FB (FKM-90)	AS568-011	AS568-011	AS568-013	AS568-014	AS568-014	AS568-014	AS568-015
O-ring FC (FKM-90)	AS568-017	AS568-017	S22	AS568-022	AS568-022	AS568-026	AS568-030

∗: Inner diameter × Thickness

Air sensor unit

Supplier and model	ISA3-G series manufactured by SMC
	GPS2-05, GPS3-E series manufactured by CKD
Air supply pressure	0.1 MPa
Inner diameter of piping	ø4 mm
Overall piping length	5 m or less

- Air supply to air sensor unit should be provided to the air vent port. Supplied air should be dried and filtered with particulate size 5 μm or less.
- Use a solenoid valve with needle for air sensor unit and control it supplying air all the time in order to eliminate intrusion of chips or coolant.
- There is a case that air sensing cannot be successfully made as designed when it is used out of the above usage. Contact Technical service center for more details.
- Refer to the sensor supplier's instruction manual for the details of setting.
- Sensing performance such as detectable time and pressure differs depending on the supplier and model number of the sensor. Select the right model referring to sensor's application and characteristics.
- When performing workpiece contact detection for multiple workpieces (in parallel fittings) using one air sensor, consider detection range of air sensor before determining the number of workpiece contacts to be detected.
- Setting air pressure that exceeds air pressure range results in leaking of air from scraper and accurate detection will not be possible.
- If the lowering operation slows down due to air pressure, stop air supply during lowering operation.

Workpiece contact force

Workpiece contact force (lift spring + air pressure lift) is exerted onto workpiece during workpiece setting. Lift spring force varies according to the stroke used. Use following formula to obtain lift spring force:

Lift spring force calculation formula $Ps = P1-(P1-P2)\times D2/D1$

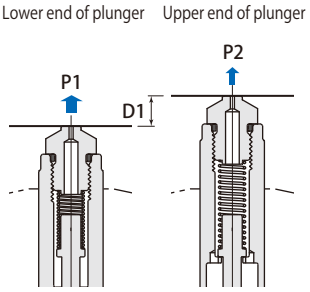
Example: model CSN03-LB using stroke of 5 mm:
Lift spring force = 4-(4-2)×5/8 = 2.75 (N)

Workpiece contact force varies according to the air pressure used. Use following formula to obtain workpiece contact force:

Workpiece contact force calculation formula $P = Ps + \eta \times Pa$

Example: model CSN03-LB using stroke of 5 mm and air pressure of 0.05 MPa,
Workpiece contact force = 2.75+110×0.05 = 8.25 (N)

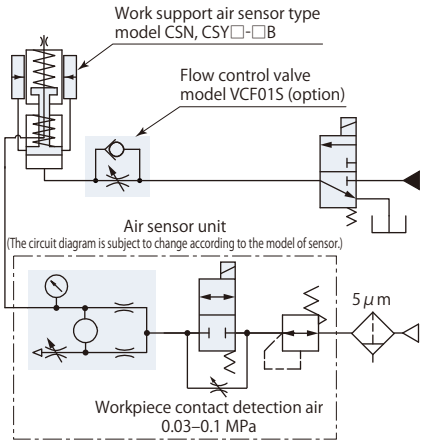
P1 : Lift spring force at lower end (N)
P2 : Lift spring force at upper end (N)
D1: Full stroke (mm)
D2: Used stroke (mm)
Ps : Lift spring force (N)
η : Push up coefficient (refer to table below)
Pa : Air pressure (MPa)
P : Workpiece contact force (N)



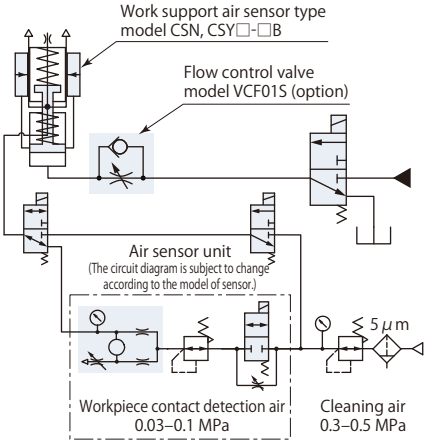
The workpiece contact force varies depending on sliding resistance of scraper. Use calculated figures only as reference.
Refer to **page →150** for specification list for details on lift spring force.

Model		CSN00-□B / CSY00-□B	CSN01-□B / CSY01-□B	CSN03-□B / CSY03-□B	CSN04-□B / CSY04-□B	CSN06-□B / CSY06-□B
Air pressure range	MPa	0.03–0.1				
Plunger stroke	mm	6.5	6	8	8	10
Push up coefficient η		80	110		180	200

Air sensor & hydraulic circuit diagram

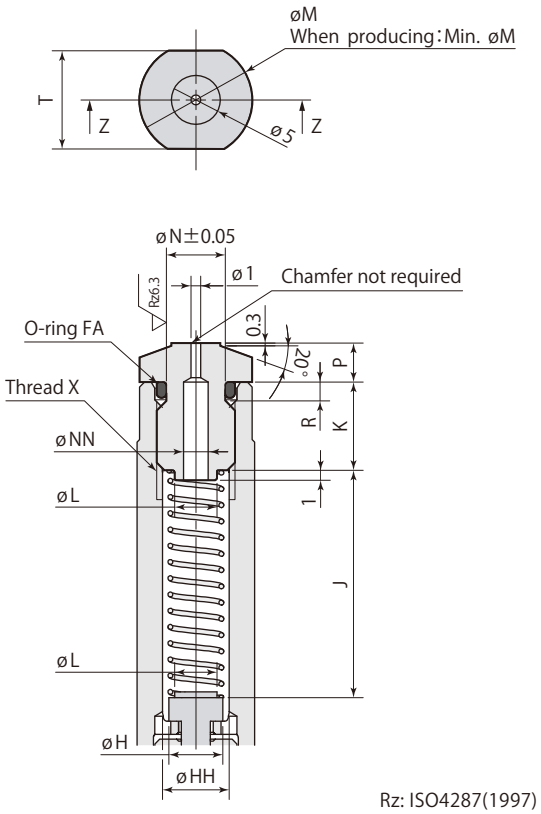


Air sensor & air cleaning & hydraulic circuit diagram



Air sensor head cap details

Hardness：HRC52



- Workpiece contact detection is not possible merely by replacing head cap of standard work support.
- This diagram indicates a situation where head cap has been fitted into plunger with no pressure applied.

mm

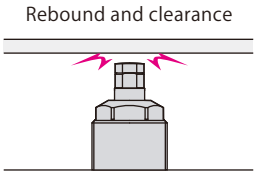
Model	CSN00-□B CSY00-□B	CSN01-□B CSY01-□B	CSN03-□B CSY03-□B	CSN04-□B CSY04-□B	CSN06-□B CSY06-□B
øH	4.5	5.5		7.2	
øHH	5.1	6.8		8.5	
J	20.6	11.2	23.2	24.1	32.5
K	7.5	9		9	
øL	3.5	4.3		5	
øM	9.5	11.5		12.5	
Min. øM	8.5	10		12.5	
øN	4.5	6		7.8	
øNN	2.5	2.5		3.4	
P	3	4		4	
R	1.5	1.9		1.9	
T (width across flats)	8	10		11	
X (recommended tightening torque)	M6×1 depth 9 (10 N·m)	M8×1.25 depth 12 (20 N·m)		M10×1.5 depth 11 (30 N·m)	
O-ring FA (FKM-70)	S5	S6		S8	

Caution in use

- The lift spring in the plunger may push the workpiece upward if it is light weight and seating detection cannot be complete. Review the weight of workpiece or lift spring force and make it appropriate to seat the workpiece perfectly and acutate the work support.

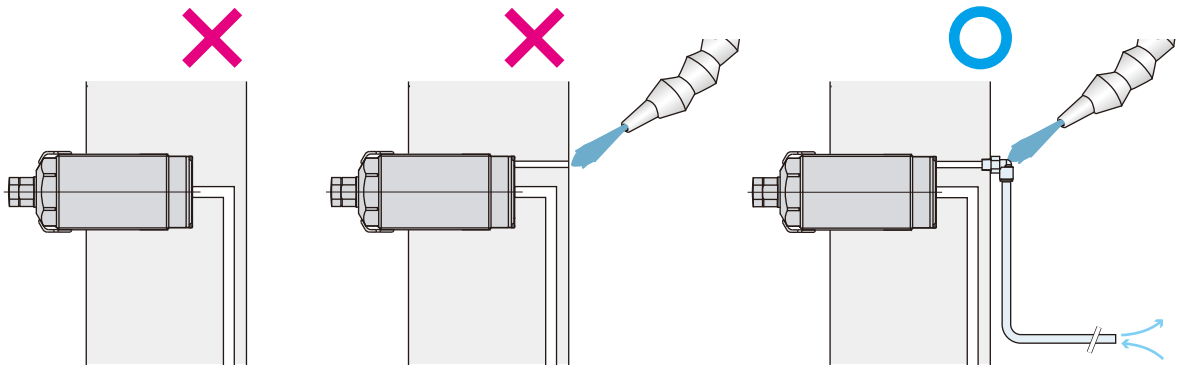
- Set the plunger lifting time to 0.5 seconds or longer by adjusting the flow control valve with check valve (meter-in). Reasonable plunger ascending speed can prevent the parts from breakage also curbs plunger contact false.
  Use a flow control valve with cracking pressure of 0.05MPa or less, in order to shorten plunger descending speed. (Cracking pressure of optional flow control valve model VCF01S is 0.04 MPa.)

  If the plunger ascends to reach a workpiece too fast, it rebounds after hitting the workpice and will create a small clearance between the two. The clearance may cause a supporting fault of the workpiece.

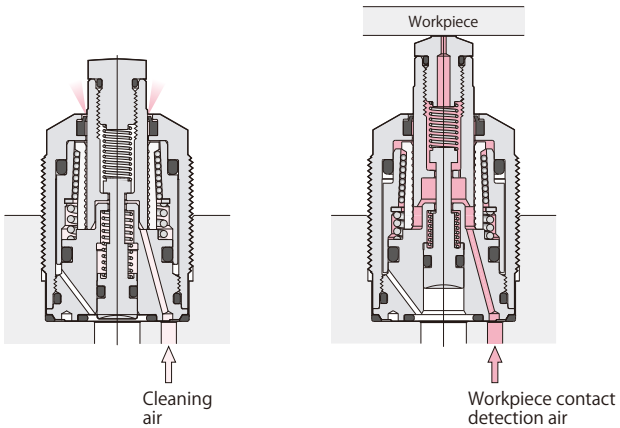


- Avoid following usages. These may cause sleeve deformation that could lead to malfunction of plunger or decreased support force.
  - ✕Applying eccentric load on plunger.
  - ✕Applying load that exceeds rated support force.
  - ✕Rotating plunger when locked.

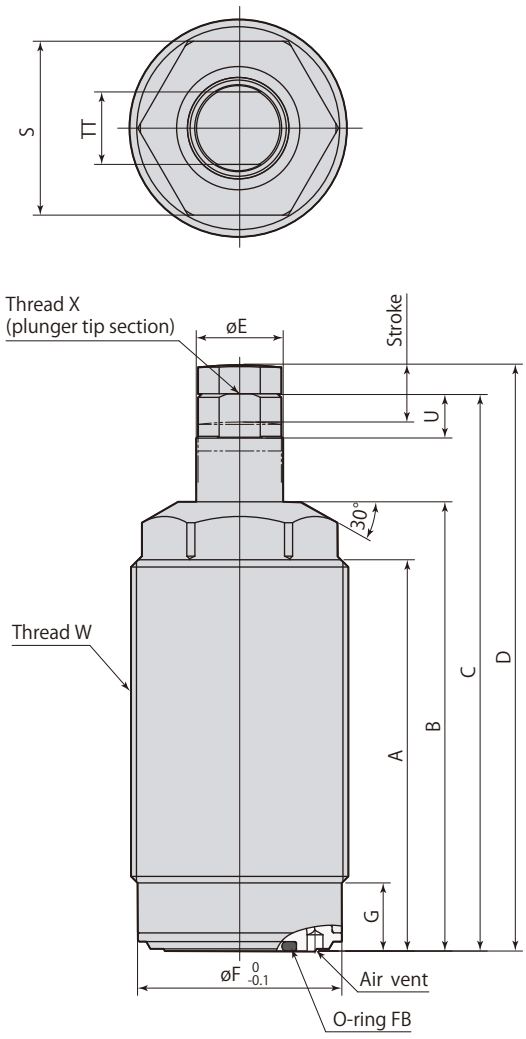
- Air vent must be opened to atmosphere. Any blockage on the vent results in malfunction. Provide the piping if there is a risk of coolant or metal chips intrusion. Allowing intrusion of cutting fluid may cause rusting and other problems.



- Air (oil free) must be fed through a 5 μm filter that is connected to an air vent port for air cleaning or workpiece contact detection (air sensor).
  Perform air cleaning only when replacing workpiece. Plunger will rise during air cleaning.

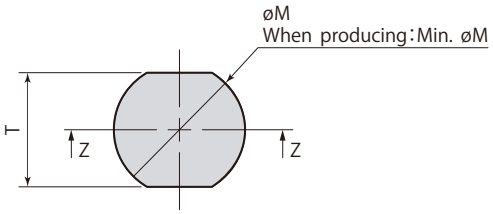


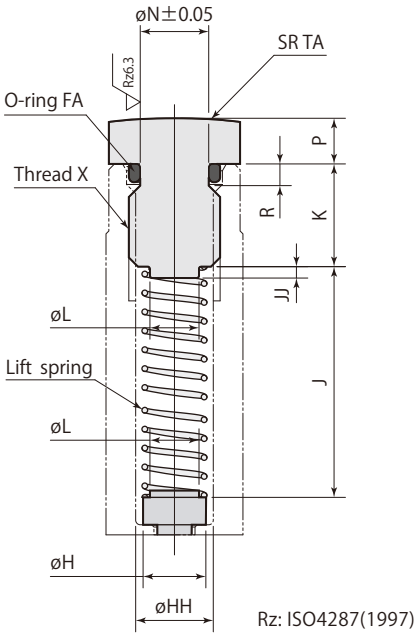
Dimensions



Head cap details

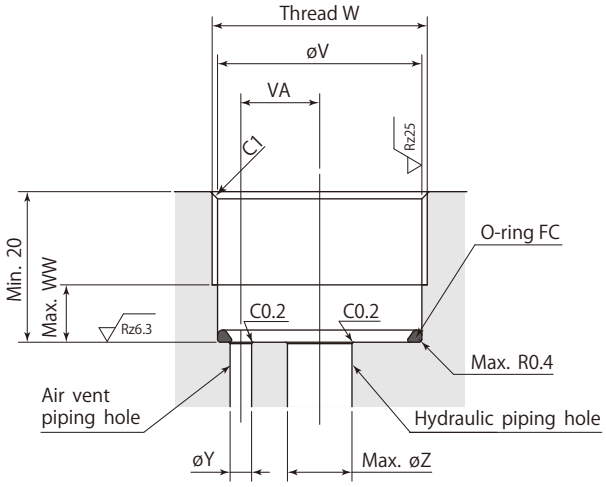
Hardness：HRC52





Z-Z

Mounting details



Rz: ISO4287(1997)

- When fixing the hexagon part of body with a vise, etc., make sure the tightening force is 2.5 kN or less.
- Always attach head cap (lift spring cannot be retained). When fabricating head cap, ensure that O-ring slot, spring spot facing and guide are made by referring to head cap details. Be sure to always use O-ring.
- When fabricating a lift spring, determine dimensions by referring to head cap details. Furthermore, rustproofing must be implemented (however, there is no guarantee for operation).
- Install O-ring FC at the bottom of the hole. The O-ring FC is packed with a work support.
- This diagram indicates a situation where head cap has been fitted into plunger with no pressure applied.

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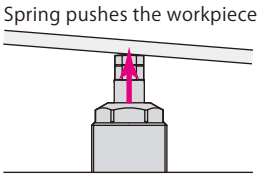
Model	CSK-S005-□	CSK005-□	CSK00-□	CSK01-□	CSK03-□	CSK04-□	CSK06-□
A	30	44.5	49	33	54	48	60
B	38	52.5	57	41	62	58	71
C	47.5	63.5	69.5	54	77	73	88
D	50	66	72.5	58	81	77	92
øE	8	8	10	12	12	15	16
øF	20.3	20.3	24.3	28.2	28.2	34.2	43.2
G	8.4	8.4	8.4	9.4	9.4	9.4	9.4
øH	3.8	3.8	4.5	5.5	5.5	7.2	7.2
øHH	4.3	4.3	5.1	6.8	6.8	8.5	8.5
J	9.9	15.5	20.6	11.2	23.2	24.1	32.5
JJ	0.5	0.5	1	1	1	1	1
K	6	7	7.5	9	9	9	9
øL	2.8	2.8	3.5	4.3	4.3	5	5
øM	8	8	9.5	11.5	11.5	12.5	12.5
Min. øM	7.5	7.5	8.5	10	10	12.5	12.5
øN	4	4	4.5	6	6	7.8	7.8
P	2.5	2.5	3	4	4	4	4
R	1	1	1.5	1.9	1.9	1.9	1.9
S	19	19	22	24	24	30	36
T (width across flats)	7	7	8	10	10	11	11
TA	30	30	50	50	50	50	50
TT (plunger width across flats)	7	7	8	10	10	13	13
U	3.5	3.5	5	6	6	6	6
øV	20.5	20.5	24.5	28.5	28.5	34.5	43.5
VA	7	7	9	11	11	13	16
W	M22×1.5	M22×1.5	M26×1.5	M30×1.5	M30×1.5	M36×1.5	M45×1.5
WW	8	8	8	9	9	9	9
X (recommended tightening torque)	M5×0.8 depth 7 (6 N·m)	M5×0.8 depth 8 (6 N·m)	M6×1 depth 9 (10 N·m)	M8×1.25 depth 12 (20 N·m)	M8×1.25 depth 12 (20 N·m)	M10×1.5 depth 11 (30 N·m)	M10×1.5 depth 11 (30 N·m)
øY	2–2.5	2–2.5	2.6–3	2.6–3	2.6–3	2.6–3	2.6–3
øZ	6	6	9	9	9	9	9
O-ring FA (FKM-70)	SS4.5 (4.0×1.0)*	SS4.5 (4.0×1.0)*	S5	S6	S6	S8	S8
O-ring FB (FKM-90)	AS568-011	AS568-011	AS568-013	AS568-014	AS568-014	AS568-014	AS568-015
O-ring FC (FKM-90)	AS568-017	AS568-017	S22	AS568-022	AS568-022	AS568-026	AS568-030

∗: Inner diameter × Thickness

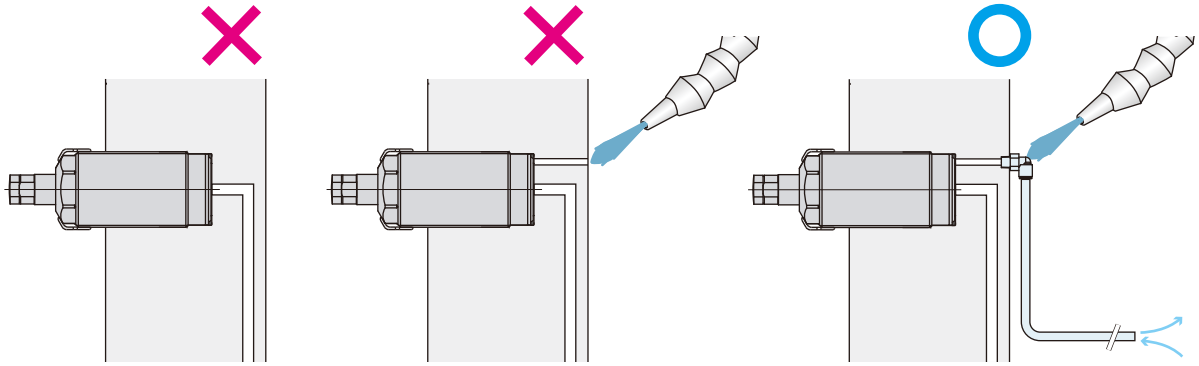
Caution in use

- If the workpiece is light weight, the plunger cannot be pressed down by the weight of workpiece and seating detection cannot be complete. Review the weight of workpiece or lift spring force to make the workpiece seat perfectly, and lock the work support.



- Avoid following usages. These may cause sleeve deformation that could lead to malfunction of plunger or decreased support force.
  - ×Applying eccentric load on plunger.
  - ×Applying load that exceeds rated support force.
  - ×Rotating plunger when locked.

- Air vent must be opened to atmosphere. Any blockage on the vent results in malfunction. Provide the piping if there is a risk of coolant or metal chips intrusion. Allowing intrusion of cutting fluid may cause rusting and other problems.



Air vent is blocked | Cutting fluid intrusion from air vent | Piping to metal chips or coolant free area

- Air (oil free) must be fed through a 5 μm filter that is connected to an air vent port for air cleaning. Perform air cleaning only when replacing workpiece.