Sensing Work lift cylinder

Double acting 7 MPa

model CNB

Pull sensor model
model CNB02-15TB

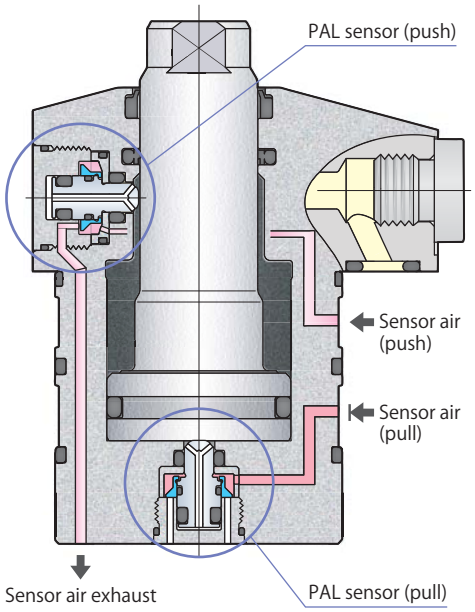
Compact model
model CNB02-15TN

Push, pull sensor model
model CNB02-15TD

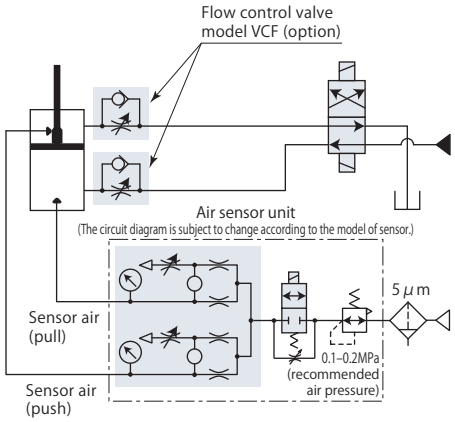
Push sensor model
model CNB02-15TU

Push, pull sensor model D

model **CNB□-□□D** PAT.

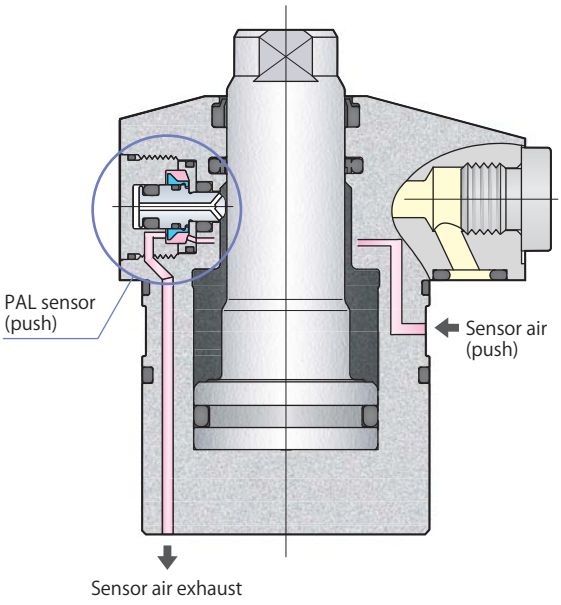


Hydraulic and pneumatic circuit diagram

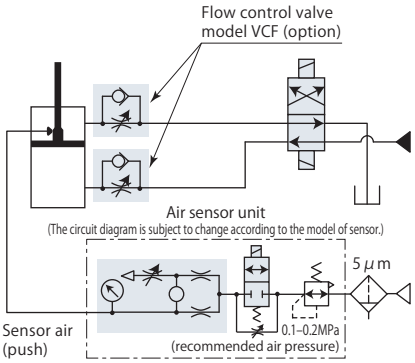


Push sensor model U

model **CNB□-□□U** PAT.

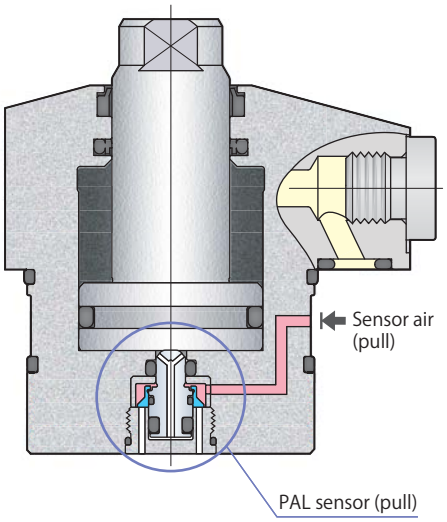


Hydraulic and pneumatic circuit diagram

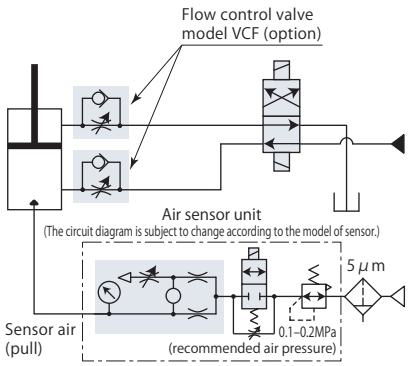


Pull sensor model B

model **CNB□-□□B** PAT.



Hydraulic and pneumatic circuit diagram



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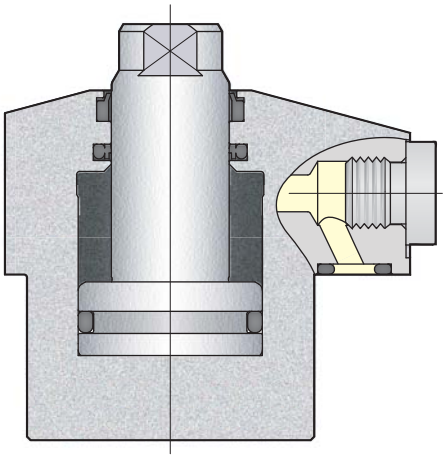
Piping page → 177
PAL sensor page → 199
Dimensions page → 202
Mounting details page → 206

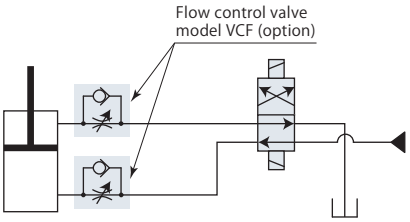
Compact model N

model **CNB□-□□N**

No sensors available on compact model



Hydraulic circuit diagram



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Piping page → 177
Dimensions page → 210
Mounting details page → 214

Specifications

	Size		Stroke	Rod tip section shapes	
CNB	01	—	10	T : Female thread rod	D : Push, pull sensor model
	02		15		U : Push sensor model
	04		20		B : Pull sensor model
			25	P : Pin rod	N : Compact model
			30		
			35		
			40		
			45		
			50		

indicates made to order. Inquire for details about bottom piping specifications.

Rod tip section shapes

T : Female thread rod

P : Pin rod

Model			CNB01	CNB02	CNB04
Cylinder force (hydraulic pressure 7MPa)	Push	kN	2.7	3.4	4.9
	Pull	kN	1.6	2.0	3.2
Cylinder force calculation formula*1	Push		F=0.38×P	F=0.49×P	F=0.71×P
	Pull		F=0.23×P	F=0.29×P	F=0.45×P
Cylinder inner diameter		mm	22	25	30
Rod diameter		mm	14	16	18
Effective area	Push	cm^2	3.8	4.9	7.1
	Pull	cm^2	2.3	2.9	4.5
Max. oil flow rate		L/min	0.8	1.0	1.6
Recommended tightening torque of mounting screws*2		N·m	3.5	7	7

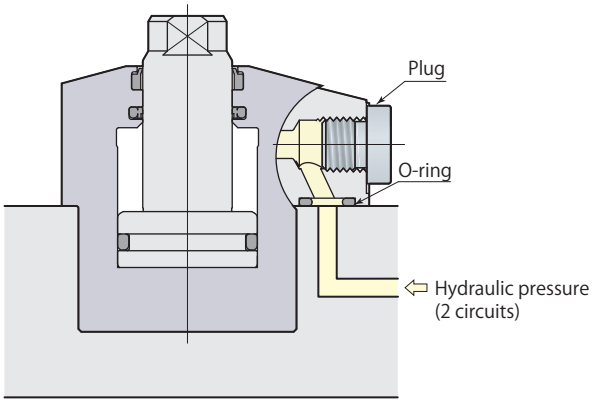
- Pressure range : 1.5–7 MPa (model CNB-D, CNB-U, CNB-B), 0.5–7 MPa (model CNB-N)
- Proof pressure : 10.5 MPa
- Operating temperature : 0–70 ℃
- Fluid used : General mineral based hydraulic oil (ISO-VG32 equivalent)
- Seals are resistant to chlorine-based cutting fluid. (not thermal resistant specification)

*1 : F=Cylinder force (kN), P=Hydraulic pressure (MPa) *2 : ISO R898 class 12.9

Manifold piping and G port piping are available.

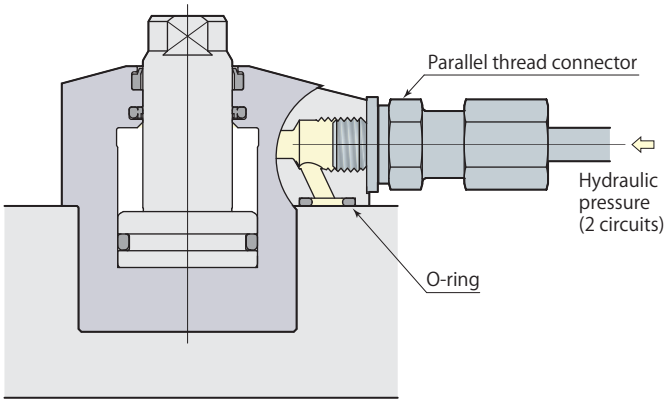
Manifold piping

When choosing manifold piping, a flow control valve (model VCF) and an air bleeding valve (model VCE) are mountable on the G ports of the cylinder.



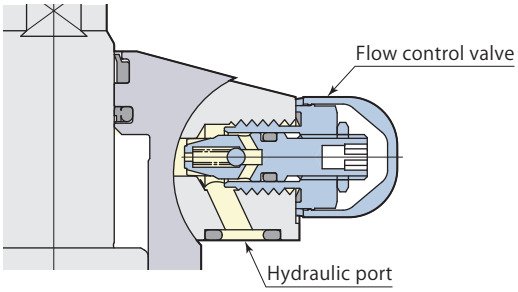
G port piping

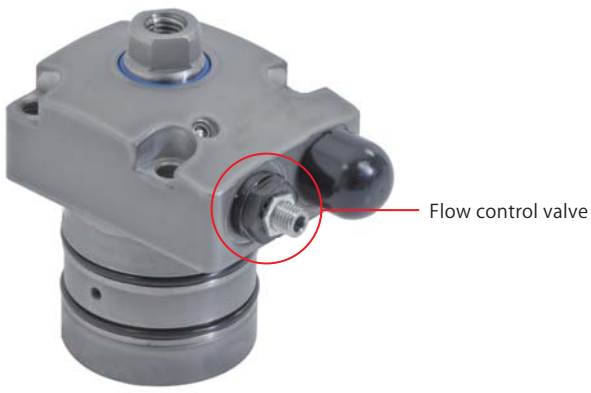
Remove plugs when choosing G port piping. (O-ring must be used.) Refer to **page →220** for details on G port piping flareless fitting. The flow control valve and the air bleeding valve should be installed in the middle of oil path.



Flow control valve model VCF

Page →216





Air bleeding valve model VCE

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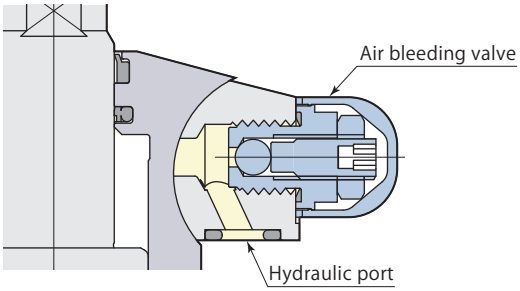
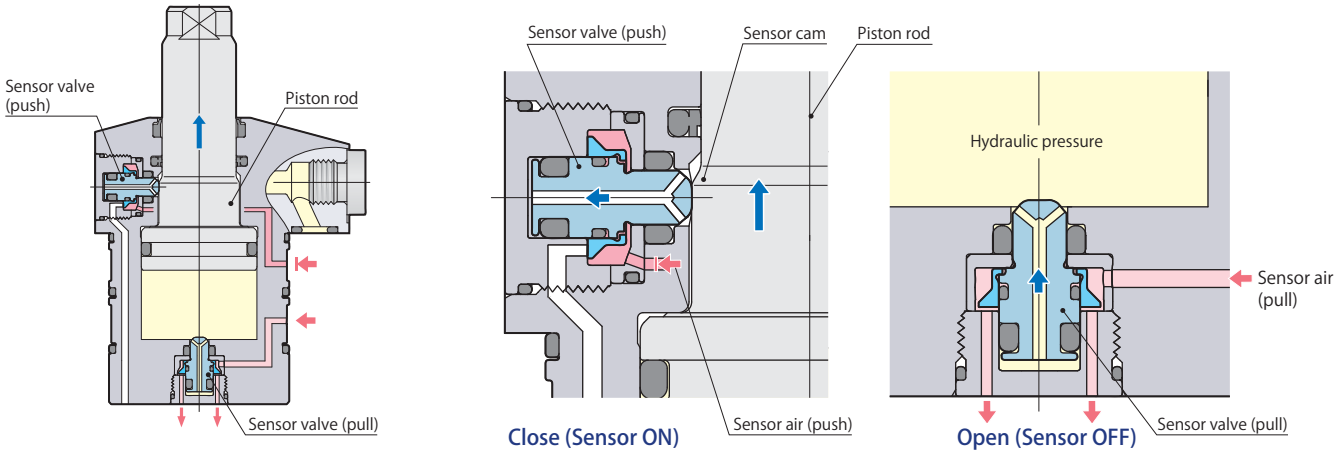


● In case of mounting flow control valve model VCF on the G port of the cylinder, air bleeding valve should be installed in the piping to the cylinder. (VCE Mounting details. Refer to **page →218**)

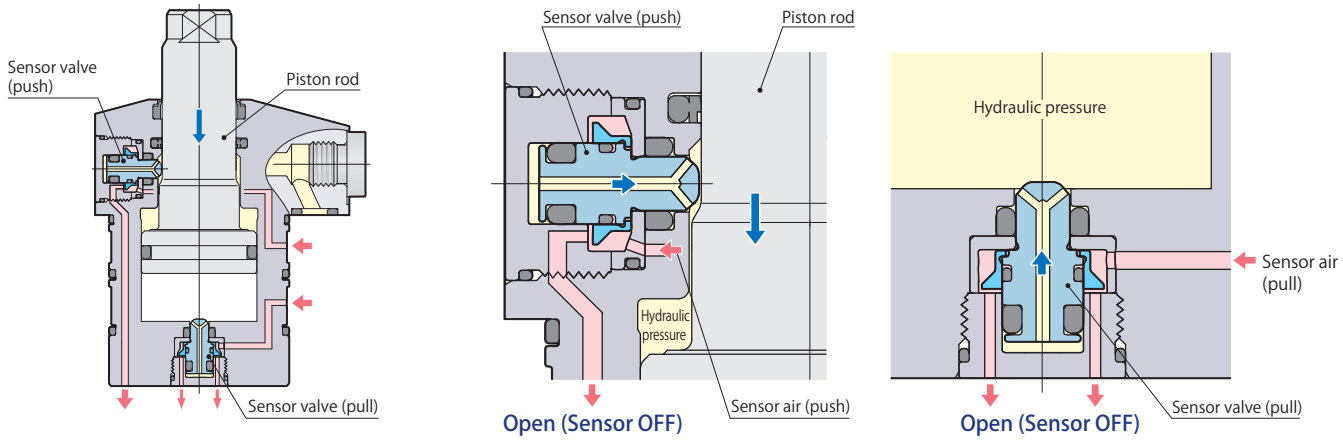
PAL sensor function and structure

Push end detection



● The sensor valve (push) is pushed down by the sensor cam and shuts off the sensor air flow when the piston rod reaches the push end position. The sensor valve (pull) is pushed up by the hydraulic force to open for air exhaust and detects the push end position.

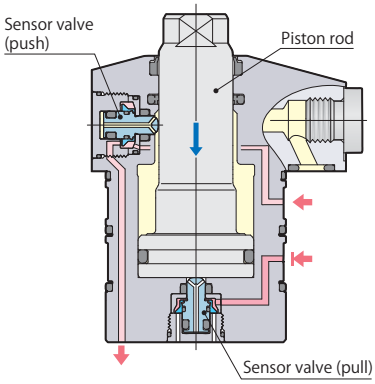
In the middle of stroke

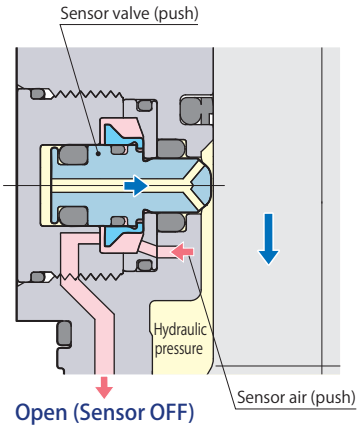


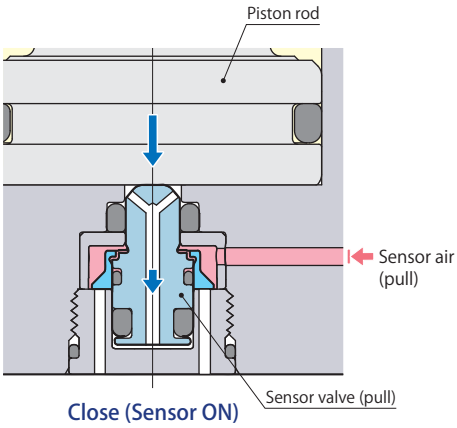
● The sensor valve (push) is pushed up by the hydraulic force while piston rod strokes and exhausts the sensor air. The sensor valve (pull) is pushed up by the hydraulic force and exhausts the sensor air.

PAL sensor function and structure

Pull end detection



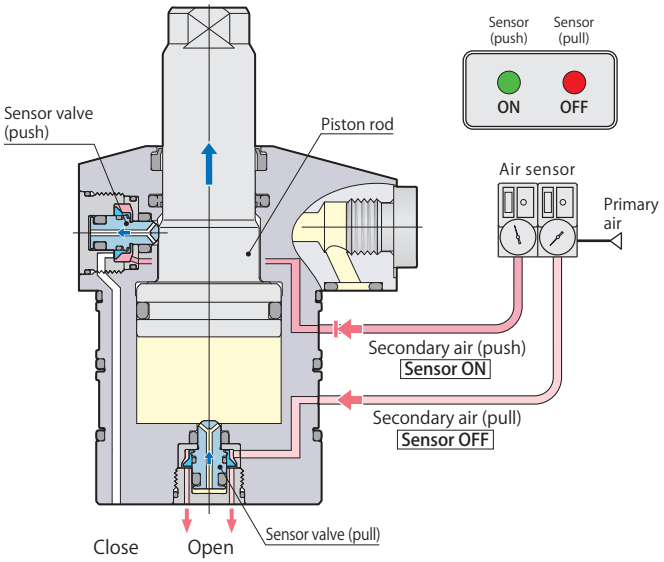




● The sensor valve (pull) is pushed down by the piston rod and shuts off the sensor air flow when the piston rod reaches the pull end position. The sensor valve (push) is pushed up by the hydraulic force to open for air exhaust and detects the pull end position.

Push end, Pull end detection signal

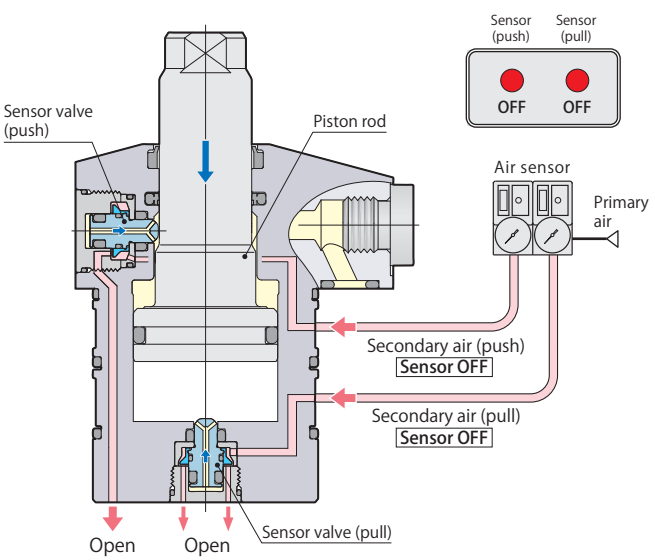
Push end detection



The sensor may not work correctly when the cylinder is not pressurized by hydraulic force because the piston of the clamp moves under such environment. Keep supplying hydraulic force the cylinder all the times.

Sensor signal (push)	ON	Push end
Sensor signal (pull)	OFF	

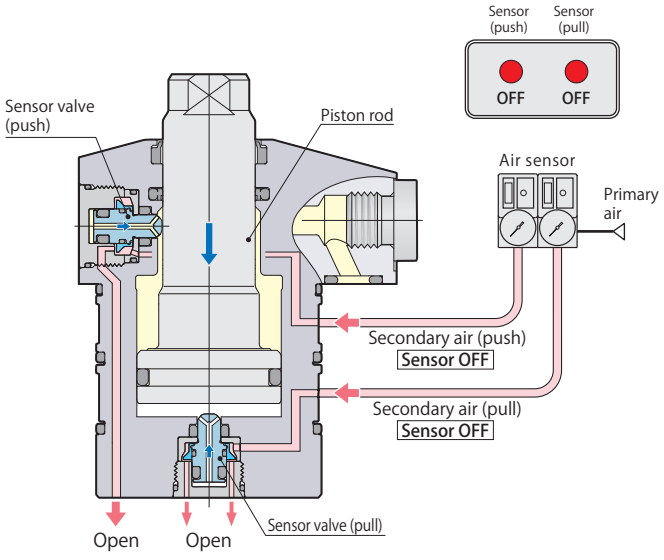
In the middle of stroke



Sensor signal (push)	OFF	In the middle of stroke
Sensor signal (pull)	OFF	

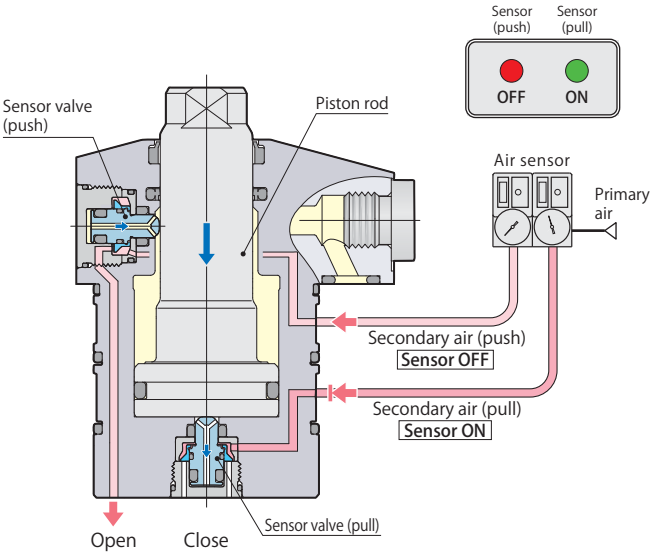
More than 1.5MPa hydraulic pressure is required to operate the sensor valve. To obtain OFF signal in the middle of the valve stroke, over 1.5MPa of back pressure should be produced by using a meter-out type of flow control valve.

In the middle of stroke



Sensor signal (push)	OFF	In the middle of stroke
Sensor signal (pull)	OFF	

Pull end detection

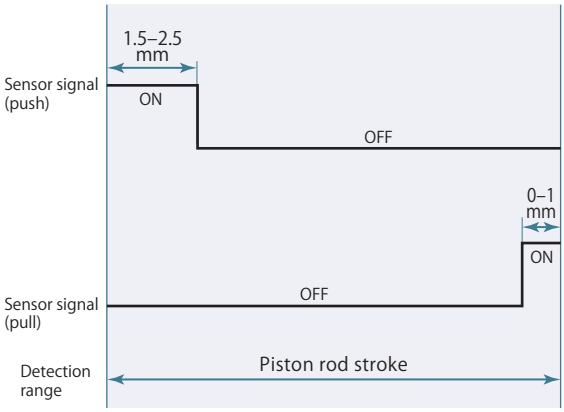


The sensor may not work correctly when the cylinder is not pressurized by hydraulic force because the piston of the clamp moves under such environment. Keep supplying hydraulic force the cylinder all the times.

Sensor signal (push)	OFF	Pull end
Sensor signal (pull)	ON	

More than 1.5MPa hydraulic pressure is required to operate the sensor valve. To obtain OFF signal in the middle of the valve stroke, over 1.5MPa of back pressure should be produced by using a meter-out type of flow control valve.

Air sensor triggering point



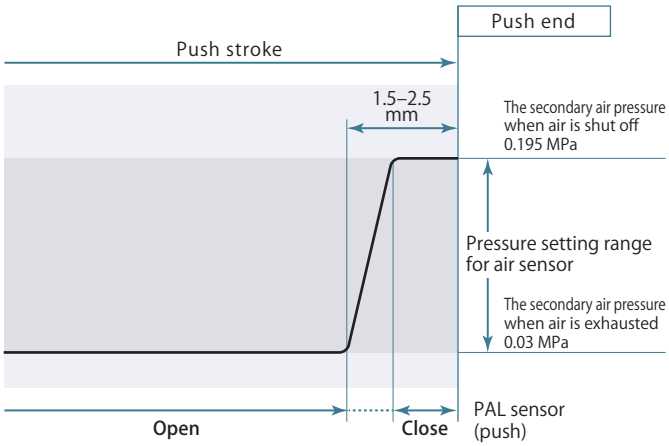
- Refer to the sensor supplier's instruction manual for the details of setting.
- Sensing performance such as detectable time and pressure differs depending on the supplier and model number of the sensor. Select the right model referring to sensor's application and characteristics.

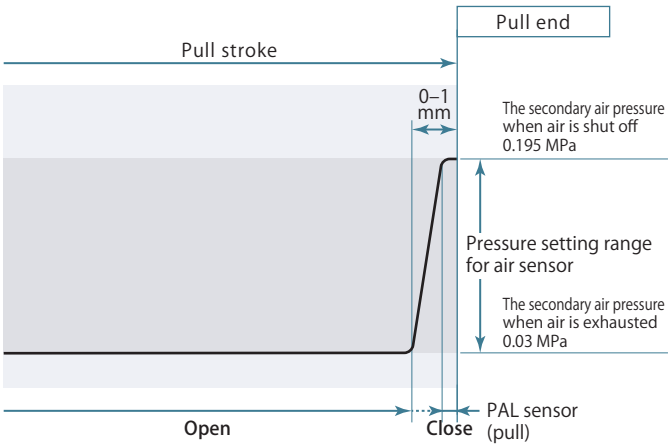
Air sensor unit recommended condition of use

Supplier and model	ISA3-F/G series manufactured by SMC
	GPS2-05, GPS3-E series manufactured by CKD
Air supply pressure	0.1–0.2 MPa
Inner diameter of piping	ø4 mm (ISA3-F : ø2.5 mm)
Overall piping length	5 m or less

- Supply the dry and filtered air. Particulate size 5 μm or less is recommended.
- 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.

Relation between sensor air pressure, PAL sensor and piston stroke



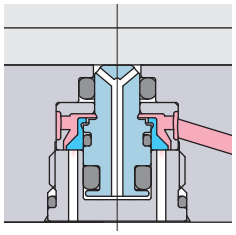


The diagram shown on the left indicates the relation between the PAL sensor, piston stroke, and secondary air pressure. (The pressure shown in the diagram is a reference based on the 0.2 MPa of primary air pressure for one piece of cylinder.)

Since the new PAL sensor works with less air-leakage compared to previous sensor valve,

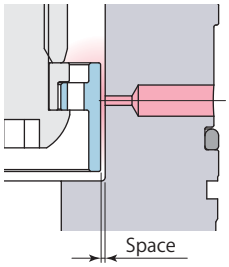
- Enhances the pressure setting range of the sensor which enables the sensor to set easily.
  (Ex. Pressure setting range 0.03–0.195 MPa in the diagram)
- Allows the use for a number of cylinders by one air sensor because of better pressure holding when air is shut off. (Maximum number of cylinders to be detected by one sensor is 10.)
- Allows to choose less air-consumed, i.e. small orifice diameter type, air sensor.
- Can create large differential-pressure when opening and closing the PAL sensor so that sensor primary pressure can be set as low as possible and reduce the consumption of air.

New PAL sensor



Poppet structure ensures superior sealing performance and can create large differential-pressure when the valve is opening and closing, and air leakage can be minimized.

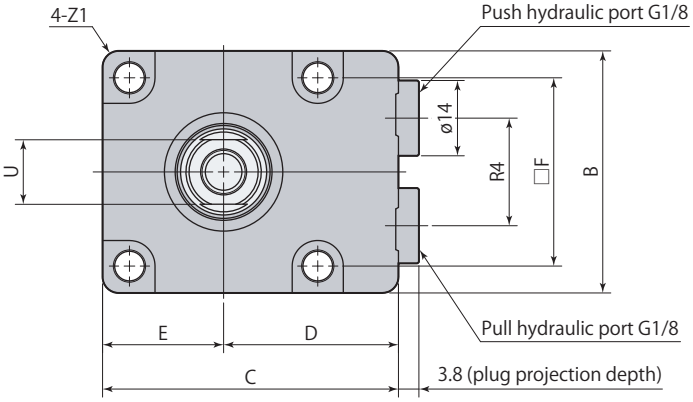
Previous sensor valve

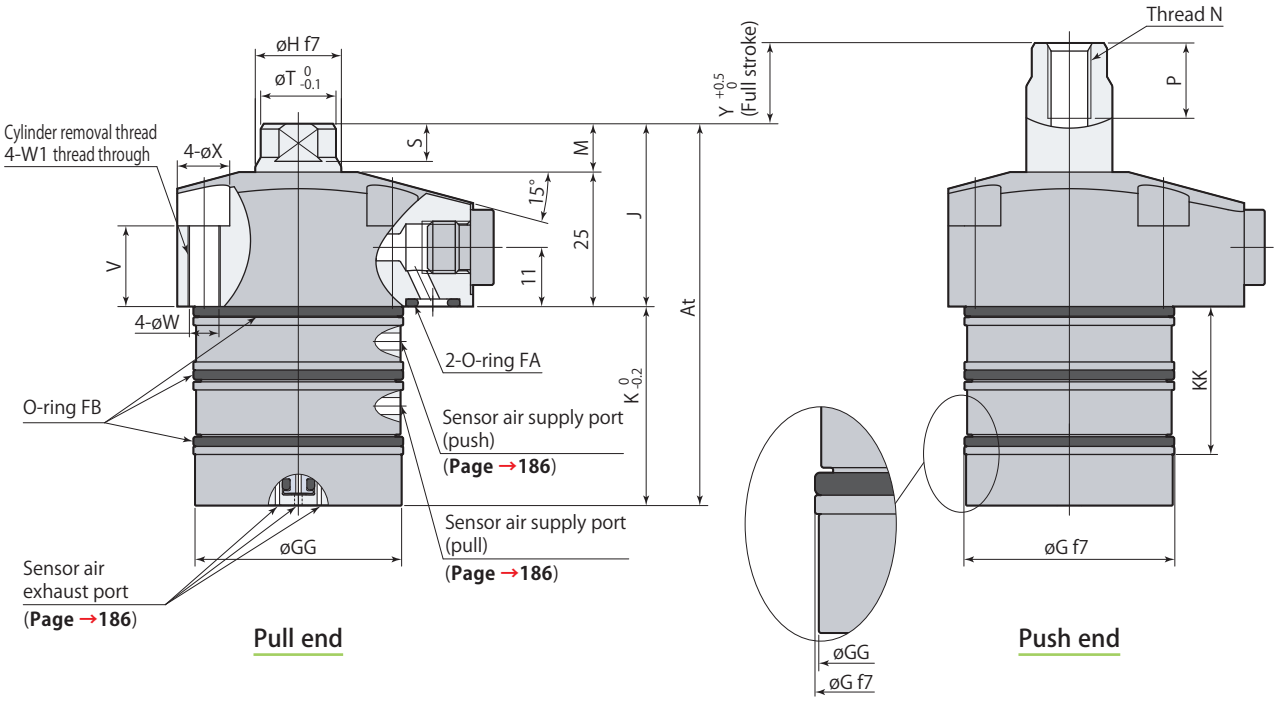


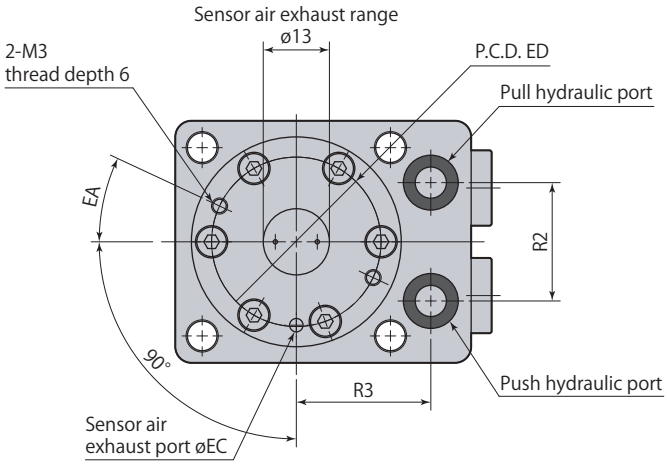
Air leaks easily due to a large space.

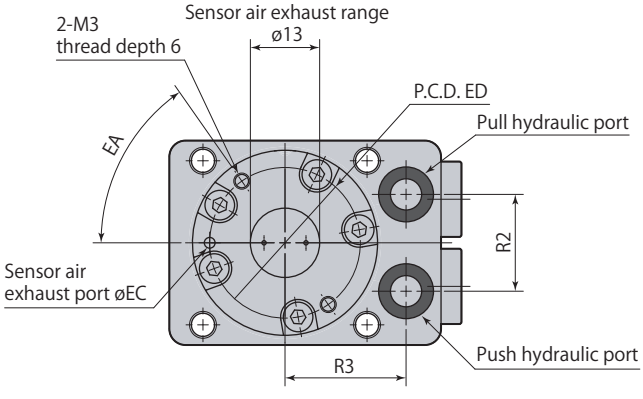
Dimensions

(Female thread rod)









CNB01-□TD

● Mounting screws are not included.

mm

Model		CNB01-□TD		CNB02-□TD		CNB04-□TD		
Y (stroke)		10, 15, 20, 25, 30, 35, 40, 45, 50						
Cylinder capacity (cm³)	Push	0.38×Y		0.49×Y		0.71×Y		
	Pull	0.23×Y		0.29×Y		0.45×Y		
At		Y=10	Y=15–50	Y=10	Y=15–50	Y=10	Y=15–50	
		70	Y+55	71	Y+56	73.5	Y+58.5	
B		38		45		50		
C		50.5		55		60		
D		29		32.5		35		
E		21.5		22.5		25		
F		30.5		35		40		
øG		35 $^{-0.025}_{-0.050}$		39 $^{-0.025}_{-0.050}$		47 $^{-0.025}_{-0.050}$		
øGG		34.4		38.4		46.4		
øH		14 $^{-0.016}_{-0.034}$		16 $^{-0.016}_{-0.034}$		18 $^{-0.016}_{-0.034}$		
J		33		34		35		
K		Y=10	Y=15–50	Y=10	Y=15–50	Y=10	Y=15–50	
		37	Y+22	37	Y+22	38.5	Y+23.5	
KK		Y=10, 15	Y=20–50	Y=10, 15	Y=20–50	Y=10, 15	Y=20	Y=25–50
		27.5	32.5	27.5	32.5	29	34	32.5
M		8		9		10		
N		M6×1		M8×1.25		M8×1.25		
P		11		14		14		
R2		18		22		24		
R3		22.5		25		28		
R4		16.2		20		22		
S (width across flats height)		6		7		8		
øT		12		14		16		
U (width across flats)		10		12		14		
V		17		15		15		
øW		4.5		5.5		5.5		
W1		M5×0.8		M6×1		M6×1		
øX		8		9.5		9.5		
Z1		R3		R3		R5		
EA		55°		25°		20°		
øEC		2		2.5		3.3		
ED		28		31.5		38		
O-ring FA (fluorocarbon hardness Hs90)		P7		P7		P7		
O-ring FB (fluorocarbon hardness Hs70)		AS568-026		AS568-028		AS568-030		
Flow control valve*	Meter-in	VCF01S		VCF01		VCF01		
	Meter-out	VCF01S-O		VCF01-O		VCF01-O		
Air bleeding valve		VCE01		VCE01		VCE01		

∗: Select the right model of VCF according to the size of the cylinder.

Refer to each page for the details of options. ● Flow control valve **page →216** ● Air bleeding valve **page →218**

● CNB□-□TD (Push, pull sensor model, Female thread rod) stroke 25, 35, 45 mm are made to order.

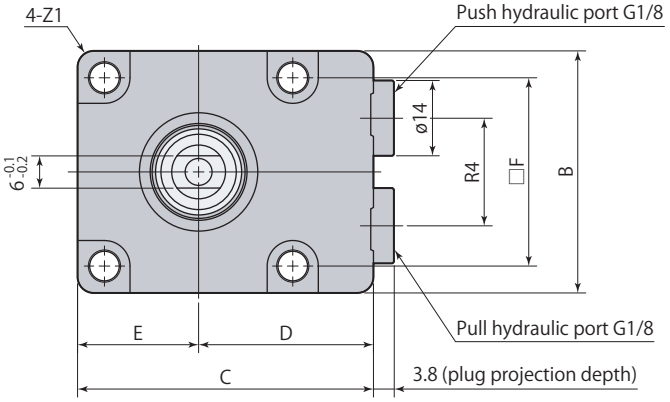
Mass

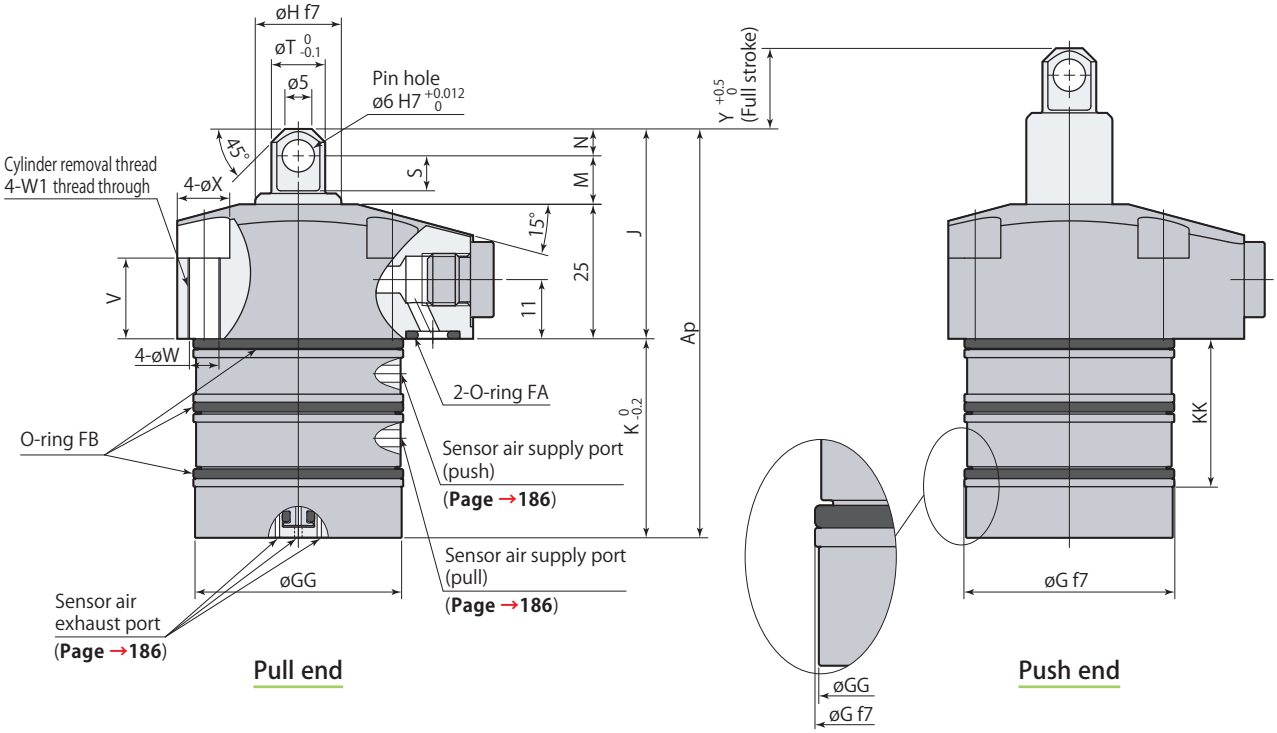
kg

Stroke	10	15	20	25	30	35	40	45	50
CNB01-□TD	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8
CNB02-□TD	0.7	0.7	0.7	0.8	0.8	0.9	0.9	1.0	1.0
CNB04-□TD	0.9	0.9	1.0	1.0	1.1	1.1	1.2	1.2	1.3

Dimensions

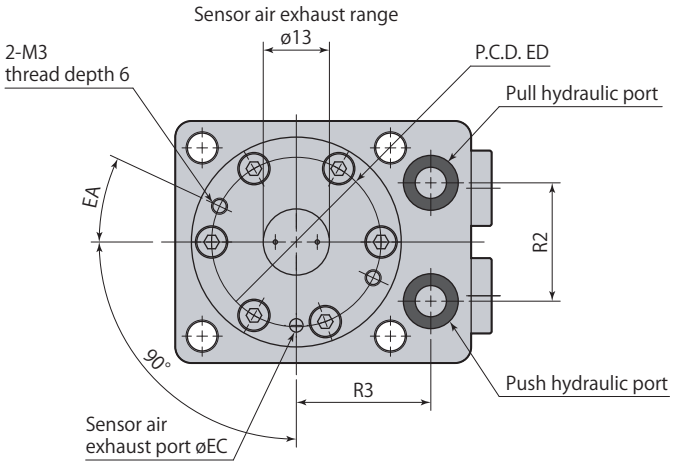
(Pin rod)

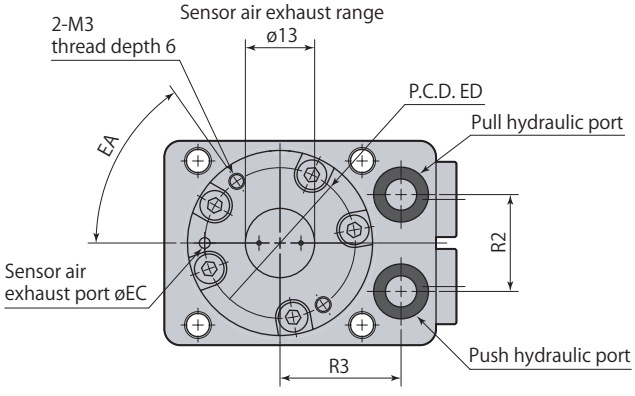




Pull end

Push end





CNB01-□PD

- Mounting screws are not included.
- Recommended material for pin : SCM435-H (HB269–331)

mm

Model		CNB01-□PD		CNB02-□PD		CNB04-□PD		
Y (stroke)		10, 15, 20, 25, 30, 35, 40, 45, 50						
Cylinder capacity (cm³)	Push	0.38×Y		0.49×Y		0.71×Y		
	Pull	0.23×Y		0.29×Y		0.45×Y		
Ap		Y=10	Y=15–50	Y=10	Y=15–50	Y=10	Y=15–50	
		76	Y+61	76	Y+61	79	Y+64	
B		38		45		50		
C		50.5		55		60		
D		29		32.5		35		
E		21.5		22.5		25		
F		30.5		35		40		
øG		35 $^{-0.025}_{-0.050}$		39 $^{-0.025}_{-0.050}$		47 $^{-0.025}_{-0.050}$		
øGG		34.4		38.4		46.4		
øH		14 $^{-0.016}_{-0.034}$		16 $^{-0.016}_{-0.034}$		18 $^{-0.016}_{-0.034}$		
J		39		39		40.5		
K		Y=10	Y=15–50	Y=10	Y=15–50	Y=10	Y=15–50	
		37	Y+22	37	Y+22	38.5	Y+23.5	
KK		Y=10, 15	Y=20–50	Y=10, 15	Y=20–50	Y=10, 15	Y=20	Y=25–50
		27.5	32.5	27.5	32.5	29	34	32.5
M		9		9		9.5		
N		5		5		6		
R2		18		22		24		
R3		22.5		25		28		
R4		16.2		20		22		
S		6.5		6.5		7		
øT		10		10		12		
V		17		15		15		
øW		4.5		5.5		5.5		
W1		M5×0.8		M6×1		M6×1		
øX		8		9.5		9.5		
Z1		R3		R3		R5		
EA		55°		25°		20°		
øEC		2		2.5		3.3		
ED		28		31.5		38		
O-ring FA (fluorocarbon hardness Hs90)		P7		P7		P7		
O-ring FB (fluorocarbon hardness Hs70)		AS568-026		AS568-028		AS568-030		
Flow control valve*	Meter-in	VCF01S		VCF01		VCF01		
	Meter-out	VCF01S-O		VCF01-O		VCF01-O		
Air bleeding valve		VCE01		VCE01		VCE01		

∗: Select the right model of VCF according to the size of the cylinder.

Refer to each page for the details of options. ● Flow control valve **page →216** ● Air bleeding valve **page →218**

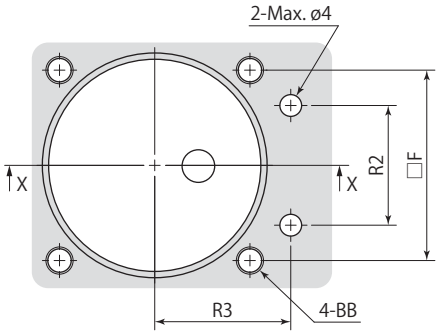
● CNB□-□PD (Push, pull sensor model, Pin rod) are made to order.

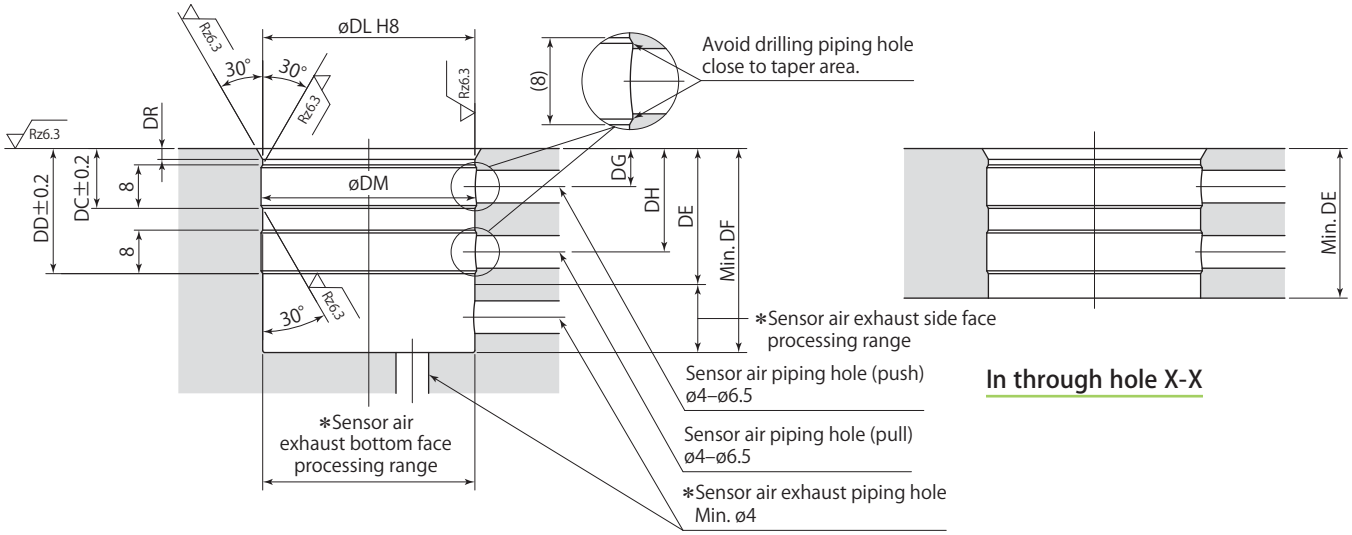
Mass

kg

Stroke	10	15	20	25	30	35	40	45	50
CNB01-□PD	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8
CNB02-□PD	0.7	0.7	0.7	0.8	0.8	0.9	0.9	1.0	1.0
CNB04-□PD	0.9	0.9	1.0	1.0	1.1	1.1	1.2	1.2	1.3

Mounting details





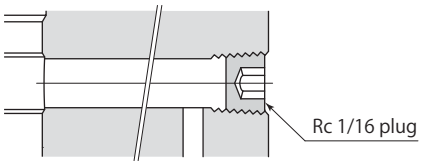
In through hole X-X

In blind hole X-X

∗: Sensor air exhaust piping hole must be made on either side or bottom face.

Rz: ISO4287(1997)

- Apply an appropriate amount of grease to the chamfer and the bore when mounting. Excessive grease may be a blockage in the air passage, causing malfunction of the sensor.
- The 30° taper machining must be provided to avoid the damage of the O-ring. Ensure that there are no interference on taper area when drilling the hole for sensor air.
- The sensor air piping hole can be used for a pilot hole of Rc 1/16 plug.



mm

Model	CNB01-□TD CNB01-□PD								
Stroke	10	15	20	25	30	35	40	45	50
DC	11	11	16	16	16	16	16	16	16
DD	23	23	28	28	28	28	28	28	28
DE	27.5	27.5	32.5	32.5	32.5	32.5	32.5	32.5	32.5
DF	37.5	37.5	42.5	47.5	52.5	57.5	62.5	67.5	72.5
DG	7	7	12	12	12	12	12	12	12
DH	19	19	24	24	24	24	24	24	24
øDL	35 $^{+0.039}_{0}$								
øDM	35.6								
DR	2	2	1	1	1	1	1	1	1
BB	M4								
F	30.5								
R2	18								
R3	22.5								

mm

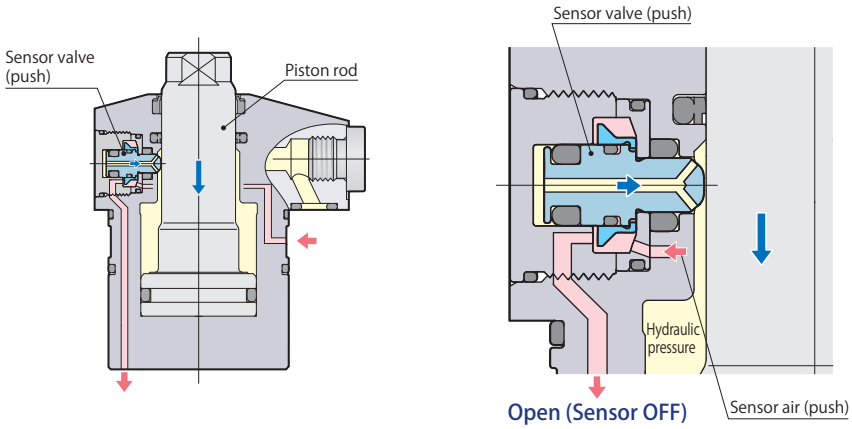
Model	CNB02-□TD CNB02-□PD								
Stroke	10	15	20	25	30	35	40	45	50
DC	11	11	16	16	16	16	16	16	16
DD	23	23	28	28	28	28	28	28	28
DE	27.5	27.5	32.5	32.5	32.5	32.5	32.5	32.5	32.5
DF	37.5	37.5	42.5	47.5	52.5	57.5	62.5	67.5	72.5
DG	7	7	12	12	12	12	12	12	12
DH	19	19	24	24	24	24	24	24	24
øDL	39 $^{+0.039}_{0}$								
øDM	39.6								
DR	2	2	1	1	1	1	1	1	1
BB	M5								
F	35								
R2	22								
R3	25								

mm

Model	CNB04-□TD CNB04-□PD								
Stroke	10	15	20	25	30	35	40	45	50
DC	11	11	16	16	16	16	16	16	16
DD	23	23	28	28	28	28	28	28	28
DE	27.5	27.5	32.5	32.5	32.5	32.5	32.5	32.5	32.5
DF	39	39	44	49	54	59	64	69	74
DG	7	7	12	12	12	12	12	12	12
DH	19	19	24	24	24	24	24	24	24
øDL	47 $^{+0.039}_{0}$								
øDM	47.6								
DR	2	2	1	1	1	1	1	1	1
BB	M5								
F	40								
R2	24								
R3	28								

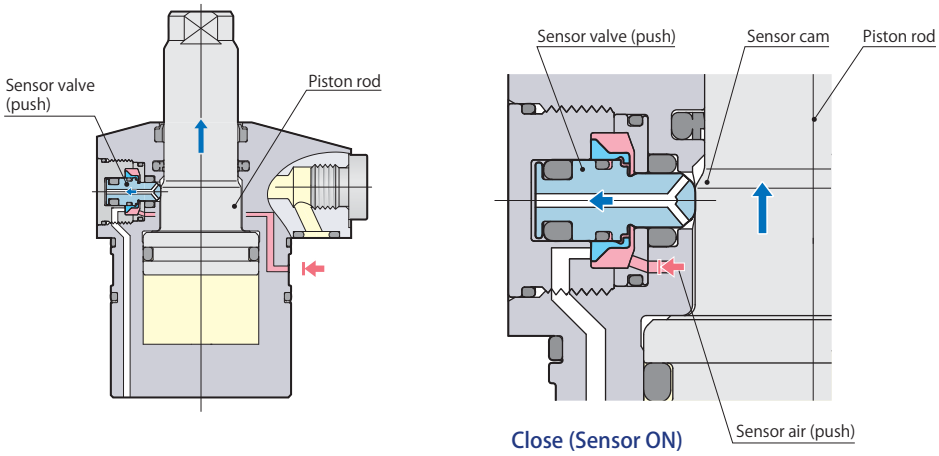
Push PAL sensor function and structure

In the middle of stroke



- The sensor valve (push) is pushed up by the hydraulic force and exhausts the sensor air while piston rod strokes.

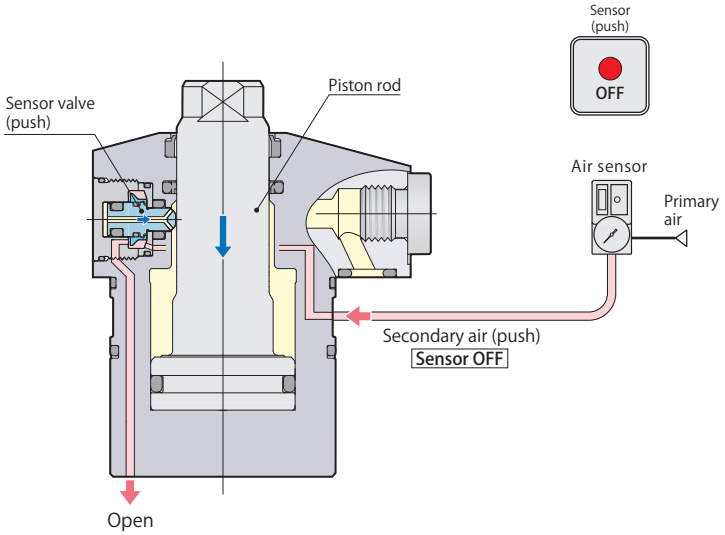
Push end detection



- The sensor valve (push) is pushed down by the sensor cam and shuts off the sensor air flow when the piston rod reaches the push end position, and detects the push end position.

Push end detection signal

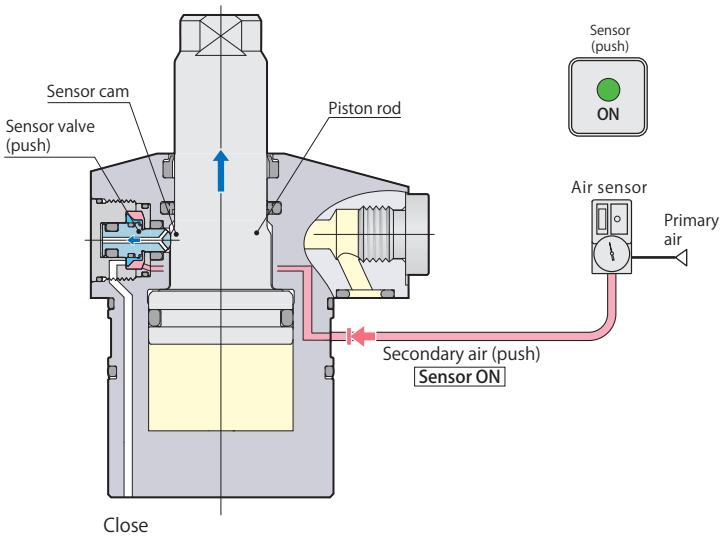
In the middle of stroke



Sensor signal (push)	OFF	Pull end, in the middle of stroke

More than 1.5MPa hydraulic pressure is required to operate the sensor valve. To obtain OFF signal in the middle of the valve stroke, over 1.5MPa of back pressure should be produced by using a meter-out type of flow control valve.

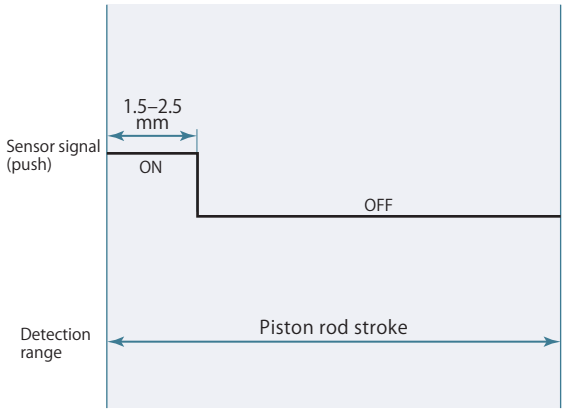
Push end detection



The sensor may not work correctly when the cylinder is not pressurized by hydraulic force because the piston of the clamp moves under such environment. Keep supplying hydraulic force the cylinder all the times.

Sensor signal (push)	ON	Push end

Air sensor triggering point



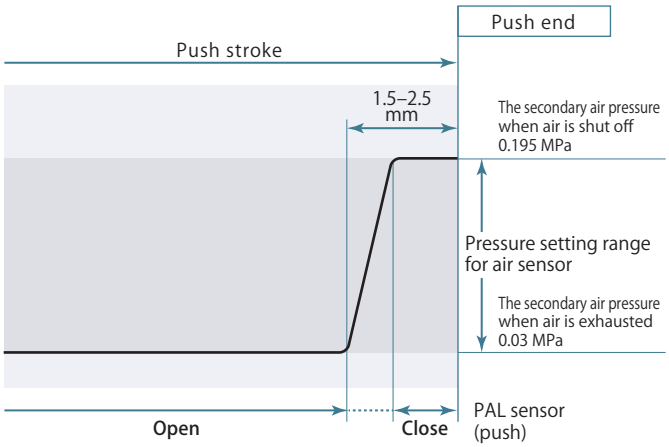
- Refer to the sensor supplier's instruction manual for the details of setting.
- Sensing performance such as detectable time and pressure differs depending on the supplier and model number of the sensor. Select the right model referring to sensor's application and characteristics.

Air sensor unit recommended condition of use

Supplier and model	ISA3-F/G series manufactured by SMC
	GPS2-05, GPS3-E series manufactured by CKD
Air supply pressure	0.1–0.2 MPa
Inner diameter of piping	ø4 mm (ISA3-F：ø2.5 mm)
Overall piping length	5 m or less

- Supply the dry and filtered air. Particulate size 5 μm or less is recommended.
- 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.

Relation between sensor air pressure, PAL sensor and piston stroke

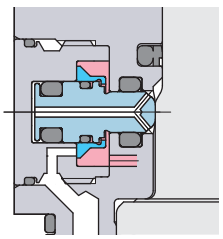


The diagram shown above indicates the relation between the PAL sensor, piston stroke, and secondary air pressure. (The pressure shown in the diagram is a reference based on the 0.2 MPa of primary air pressure for one piece of cylinder.)

Since the new PAL sensor works with less air-leakage compared to previous sensor valve,

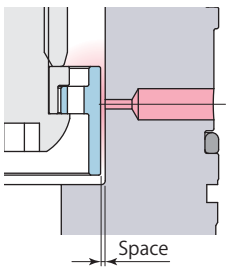
- Enhances the pressure setting range of the sensor which enables the sensor to set easily.
  (Ex. Pressure setting range 0.03–0.195 MPa in the diagram)
- Allows the use for a number of cylinders by one air sensor because of better pressure holding when air is shut off. (Maximum number of cylinders to be detected by one sensor is 10.)
- Allows to choose less air-consumed, i.e. small orifice diameter type, air sensor.
- Can create large differential-pressure when opening and closing the PAL sensor so that sensor primary pressure can be set as low as possible and reduce the consumption of air.

New PAL sensor



Poppet structure ensures superior sealing performance and can create large differential-pressure when the valve is opening and closing, and air leakage can be minimized.

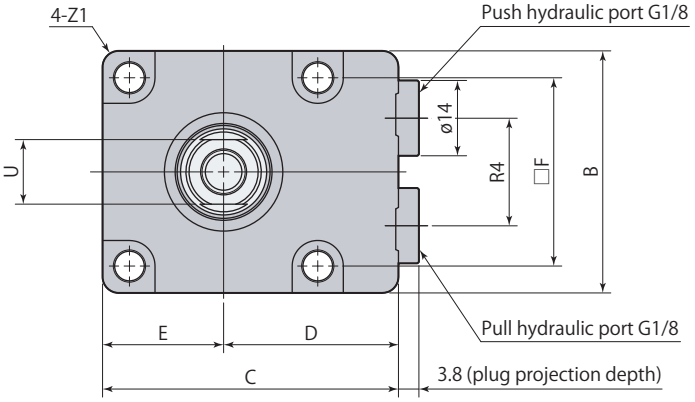
Previous sensor valve

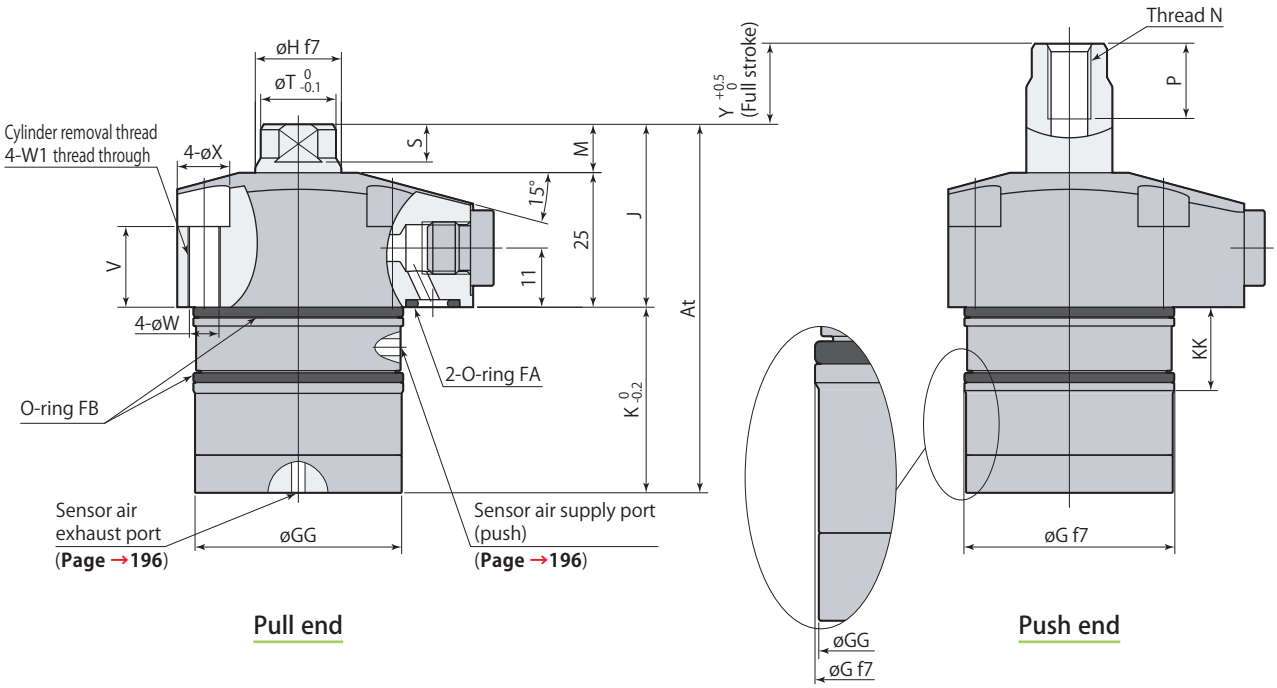


Air leaks easily due to a large space.

Dimensions

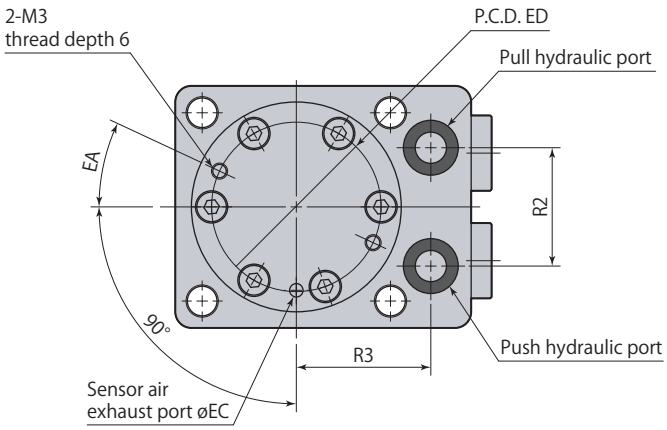
(Female thread rod)

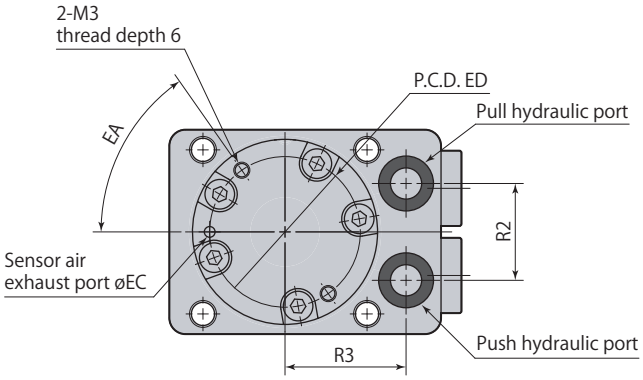




Pull end

Push end





CNB01-□TU

● Mounting screws are not included.

mm

Model		CNB01-□TU		CNB02-□TU		CNB04-□TU	
Y (stroke)		10, 15, 20, 25, 30, 35, 40, 45, 50					
Cylinder capacity (cm³)	Push	0.38×Y		0.49×Y		0.71×Y	
	Pull	0.23×Y		0.29×Y		0.45×Y	
At		Y+51.5		Y+53.5		Y+57.5	
B		38		45		50	
C		50.5		55		60	
D		29		32.5		35	
E		21.5		22.5		25	
F		30.5		35		40	
øG		$35^{-0.025}_{-0.050}$		$39^{-0.025}_{-0.050}$		$47^{-0.025}_{-0.050}$	
øGG		34.4		38.4		46.4	
øH		$14^{-0.016}_{-0.034}$		$16^{-0.016}_{-0.034}$		$18^{-0.016}_{-0.034}$	
J		33		34		35	
K		Y+18.5		Y+19.5		Y+22.5	
KK		Y=10, 15	Y=20–50	Y=10, 15	Y=20–50	Y=10, 15	Y=20–50
		15.5	20.5	15.5	20.5	15.5	20.5
M		8		9		10	
N		M6×1		M8×1.25		M8×1.25	
P		11		14		14	
R2		18		22		24	
R3		22.5		25		28	
R4		16.2		20		22	
S (width across flats height)		6		7		8	
øT		12		14		16	
U (width across flats)		10		12		14	
V		17		15		15	
øW		4.5		5.5		5.5	
W1		M5×0.8		M6×1		M6×1	
øX		8		9.5		9.5	
Z1		R3		R3		R5	
EA		55°		25°		20°	
øEC		2		2.5		3.3	
ED		28		31.5		38	
O-ring FA (fluorocarbon hardness Hs90)		P7		P7		P7	
O-ring FB (fluorocarbon hardness Hs70)		AS568-026		AS568-028		AS568-030	
Flow control valve*	Meter-in	VCF01S		VCF01		VCF01	
	Meter-out	VCF01S-O		VCF01-O		VCF01-O	
Air bleeding valve		VCE01		VCE01		VCE01	

∗: Select the right model of VCF according to the size of the cylinder.

Refer to each page for the details of options. ● Flow control valve **page →216** ● Air bleeding valve **page →218**

● CNB□-□TU (Push sensor model, Female thread rod) stroke 25, 35, 45 mm are made to order.

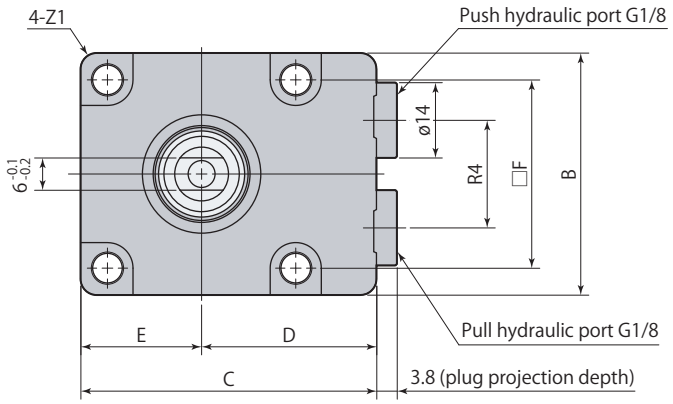
Mass

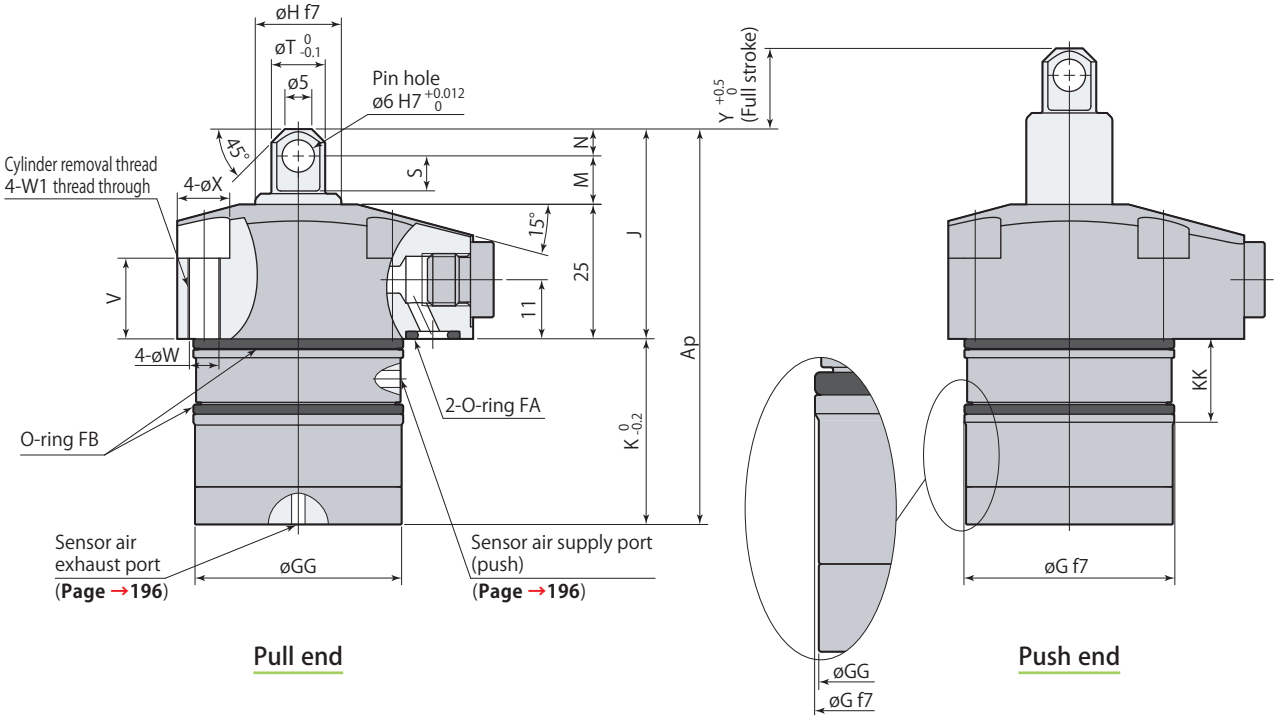
kg

Stroke	10	15	20	25	30	35	40	45	50
CNB01-□TU	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7
CNB02-□TU	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.9	0.9
CNB04-□TU	0.9	0.9	1.0	1.0	1.1	1.1	1.2	1.2	1.3

Dimensions

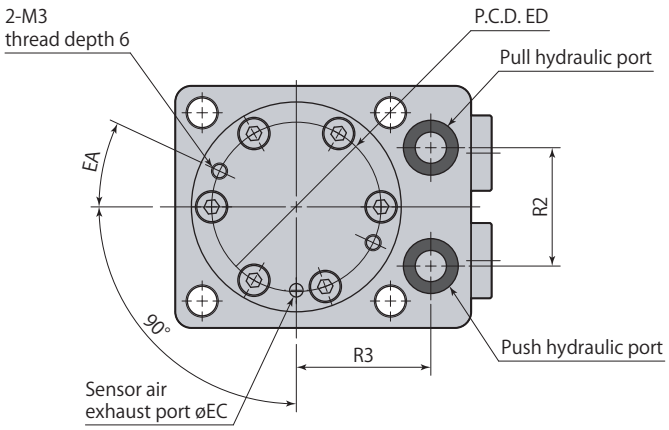
(Pin rod)

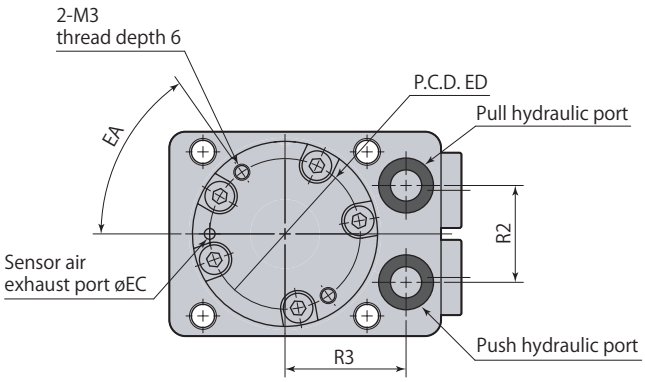




Pull end

Push end





CNB01-□PU

- Mounting screws are not included.
- Recommended material for pin : SCM435-H (HB269–331)

mm

Model		CNB01-□PU		CNB02-□PU		CNB04-□PU	
Y (stroke)		10, 15, 20, 25, 30, 35, 40, 45, 50					
Cylinder capacity (cm³)	Push	0.38×Y		0.49×Y		0.71×Y	
	Pull	0.23×Y		0.29×Y		0.45×Y	
Ap		Y+57.5		Y+58.5		Y+63	
B		38		45		50	
C		50.5		55		60	
D		29		32.5		35	
E		21.5		22.5		25	
F		30.5		35		40	
øG		$35^{-0.025}_{-0.050}$		$39^{-0.025}_{-0.050}$		$47^{-0.025}_{-0.050}$	
øGG		34.4		38.4		46.4	
øH		$14^{-0.016}_{-0.034}$		$16^{-0.016}_{-0.034}$		$18^{-0.016}_{-0.034}$	
J		39		39		40.5	
K		Y+18.5		Y+19.5		Y+22.5	
KK		Y=10, 15	Y=20–50	Y=10, 15	Y=20–50	Y=10, 15	Y=20–50
		15.5	20.5	15.5	20.5	15.5	20.5
M		9		9		9.5	
N		5		5		6	
R2		18		22		24	
R3		22.5		25		28	
R4		16.2		20		22	
S		6.5		6.5		7	
øT		10		10		12	
V		17		15		15	
øW		4.5		5.5		5.5	
W1		M5×0.8		M6×1		M6×1	
øX		8		9.5		9.5	
Z1		R3		R3		R5	
EA		55°		25°		20°	
øEC		2		2.5		3.3	
ED		28		31.5		38	
O-ring FA (fluorocarbon hardness Hs90)		P7		P7		P7	
O-ring FB (fluorocarbon hardness Hs70)		AS568-026		AS568-028		AS568-030	
Flow control valve*	Meter-in	VCF01S		VCF01		VCF01	
	Meter-out	VCF01S-O		VCF01-O		VCF01-O	
Air bleeding valve		VCE01		VCE01		VCE01	

∗: Select the right model of VCF according to the size of the cylinder.

Refer to each page for the details of options. ● Flow control valve **page →216** ● Air bleeding valve **page →218**

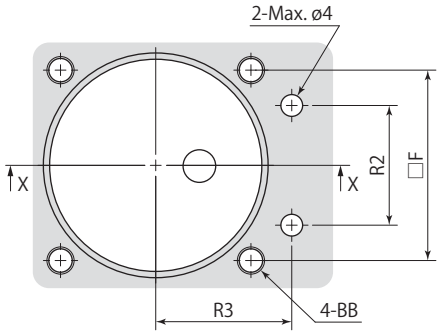
● CNB□-□PU (Push sensor model, Pin rod) are made to order.

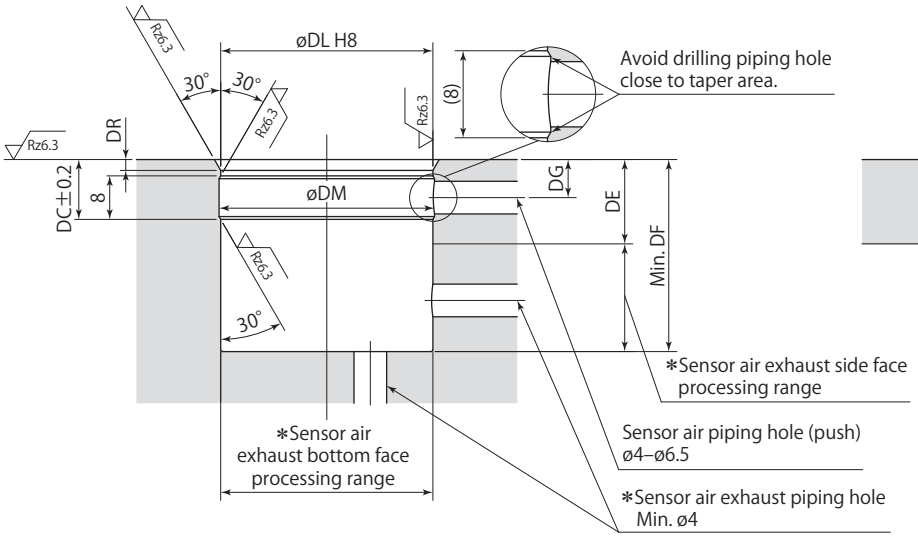
Mass

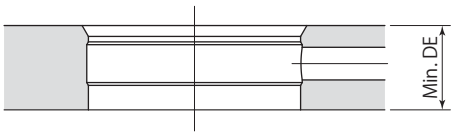
kg

Stroke	10	15	20	25	30	35	40	45	50
CNB01-□PU	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7
CNB02-□PU	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.9	0.9
CNB04-□PU	0.9	0.9	1.0	1.0	1.1	1.1	1.2	1.2	1.3

Mounting details







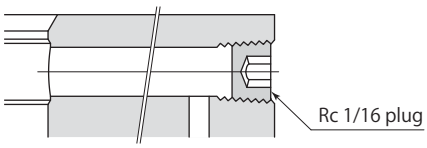
In through hole X-X

In blind hole X-X

*: Sensor air exhaust piping hole must be made on either side or bottom face.

Rz: ISO4287(1997)

- Apply an appropriate amount of grease to the chamfer and the bore when mounting. Excessive grease may be a blockage in the air passage, causing malfunction of the sensor.
- The 30° taper machining must be provided to avoid the damage of the O-ring. Ensure that there are no interference on taper area when drilling the hole for sensor air.
- The sensor air piping hole can be used for a pilot hole of Rc 1/16 plug.



mm

Model	CNB01-□TU CNB01-□PU								
Stroke	10	15	20	25	30	35	40	45	50
DC	11	11	16	16	16	16	16	16	16
DE	15.5	15.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5
DF	29	34	39	44	49	54	59	64	69
DG	7	7	12	12	12	12	12	12	12
øDL	35 $^{+0.039}_{0}$								
øDM	35.6								
DR	2	2	1	1	1	1	1	1	1
BB	M4								
F	30.5								
R2	18								
R3	22.5								

mm

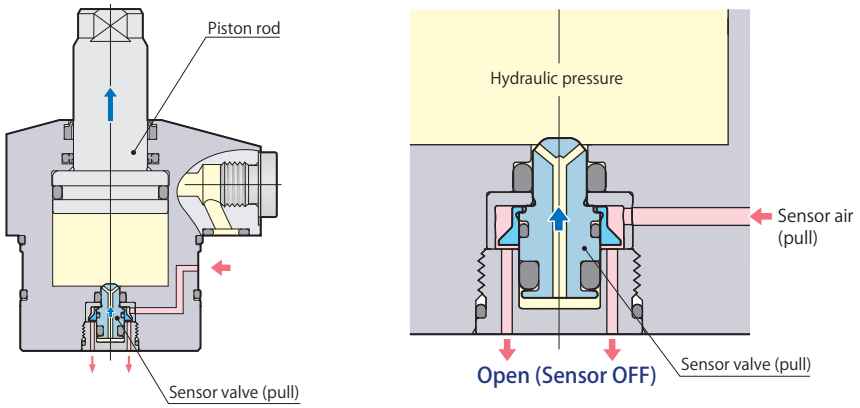
Model	CNB02-□TU CNB02-□PU								
Stroke	10	15	20	25	30	35	40	45	50
DC	11	11	16	16	16	16	16	16	16
DE	15.5	15.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5
DF	30	35	40	45	50	55	60	65	70
DG	7	7	12	12	12	12	12	12	12
øDL	39 $^{+0.039}_{0}$								
øDM	39.6								
DR	2	2	1	1	1	1	1	1	1
BB	M5								
F	35								
R2	22								
R3	25								

mm

Model	CNB04-□TU CNB04-□PU								
Stroke	10	15	20	25	30	35	40	45	50
DC	11	11	16	16	16	16	16	16	16
DE	15.5	15.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5
DF	33	38	43	48	53	58	63	68	73
DG	7	7	12	12	12	12	12	12	12
øDL	47 $^{+0.039}_{0}$								
øDM	47.6								
DR	2	2	1	1	1	1	1	1	1
BB	M5								
F	40								
R2	24								
R3	28								

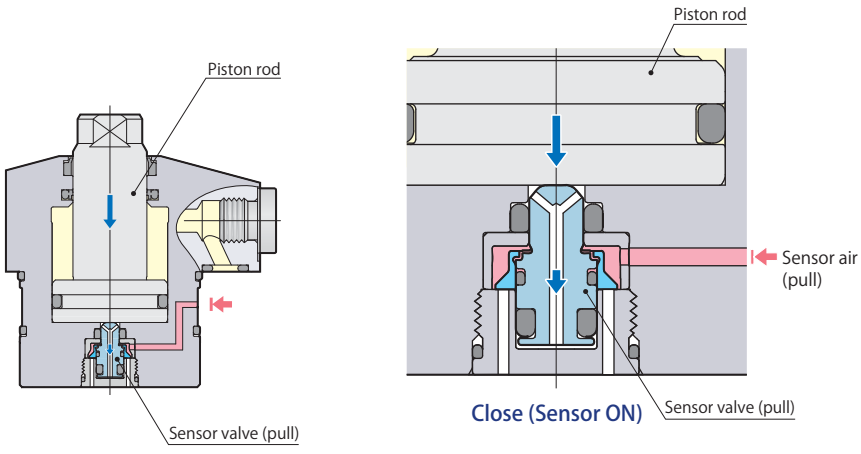
Pull PAL sensor function and structure

In the middle of stroke



- The sensor valve (pull) is pushed up by the hydraulic force and exhausts the sensor air while piston rod strokes.

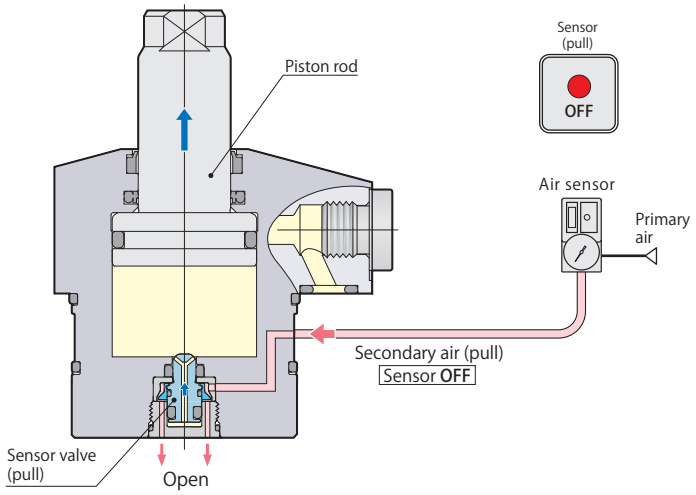
Pull end detection



- The sensor valve (pull) is pushed down by the piston rod and shuts off the sensor air flow when the piston rod reaches the pull end position, and detects the pull end position.

Pull end detection signal

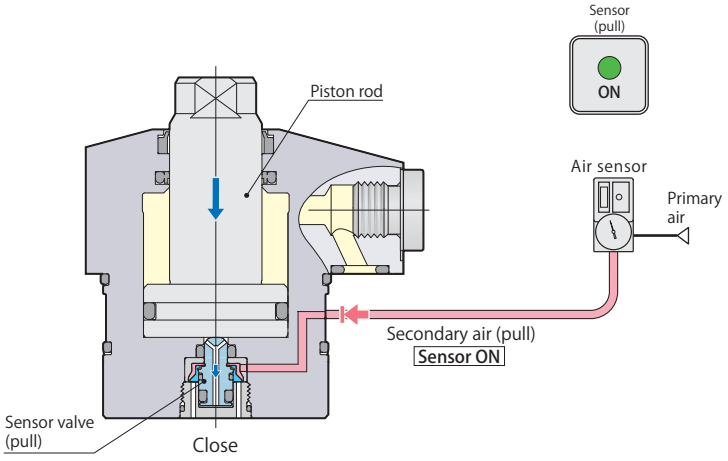
In the middle of stroke



Sensor signal (pull)	OFF	Push end, in the middle of stroke

More than 1.5MPa hydraulic pressure is required to operate the sensor valve. To obtain OFF signal in the middle of the valve stroke, over 1.5MPa of back pressure should be produced by using a meter-out type of flow control valve.

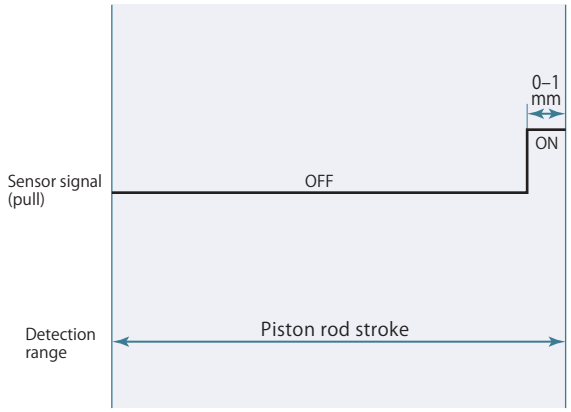
Pull end detection



The sensor may not work correctly when the cylinder is not pressurized by hydraulic force because the piston of the clamp moves under such environment. Keep supplying hydraulic force the cylinder all the times.

Sensor signal (pull)	ON	Pull end

Air sensor triggering point



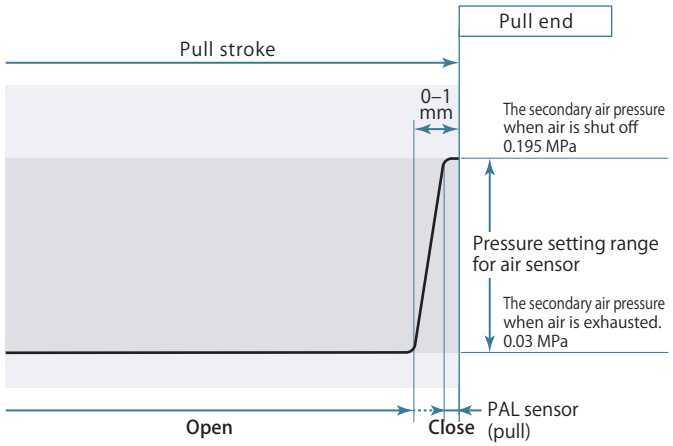
- Refer to the sensor supplier's instruction manual for the details of setting.
- Sensing performance such as detectable time and pressure differs depending on the supplier and model number of the sensor. Select the right model referring to sensor's application and characteristics.

Air sensor unit recommended condition of use

Supplier and model	ISA3-F/G series manufactured by SMC
	GPS2-05, GPS3-E series manufactured by CKD
Air supply pressure	0.1–0.2 MPa
Inner diameter of piping	ø4 mm (ISA3-F：ø2.5 mm)
Overall piping length	5 m or less

- Supply the dry and filtered air. Particulate size 5 μm or less is recommended.
- 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.

Relation between sensor air pressure, PAL sensor and piston stroke

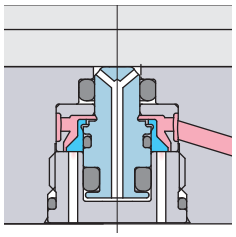


The diagram shown above indicates the relation between the PAL sensor, piston stroke, and secondary air pressure. (The pressure shown in the diagram is a reference based on the 0.2 MPa of primary air pressure for one piece of cylinder.)

Since the new PAL sensor works with less air-leakage compared to previous sensor valve,

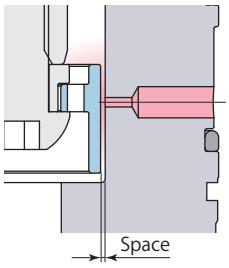
- Enhances the pressure setting range of the sensor which enables the sensor to set easily.
  (Ex. Pressure setting range 0.03–0.195 MPa in the diagram)
- Allows the use for a number of cylinders by one air sensor because of better pressure holding when air is shut off. (Maximum number of cylinders to be detected by one sensor is 10.)
- Allows to choose less air-consumed, i.e. small orifice diameter type, air sensor.
- Can create large differential-pressure when opening and closing the PAL sensor so that sensor primary pressure can be set as low as possible and reduce the consumption of air.

New PAL sensor



Poppet structure ensures superior sealing performance and can create large differential-pressure when the valve is opening and closing, and air leakage can be minimized.

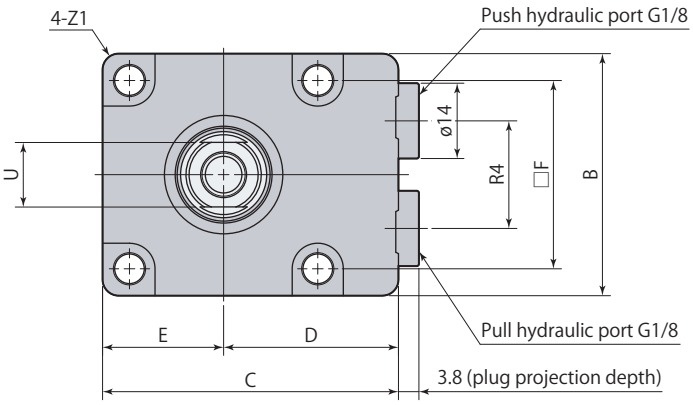
Previous sensor valve

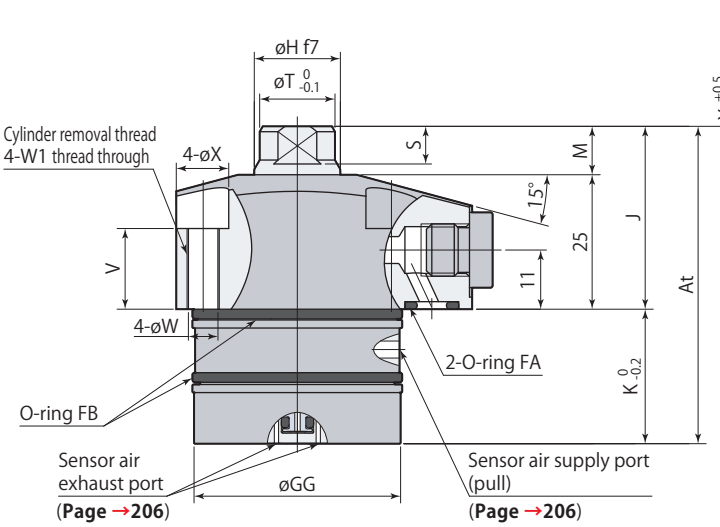


Air leaks easily due to a large space.

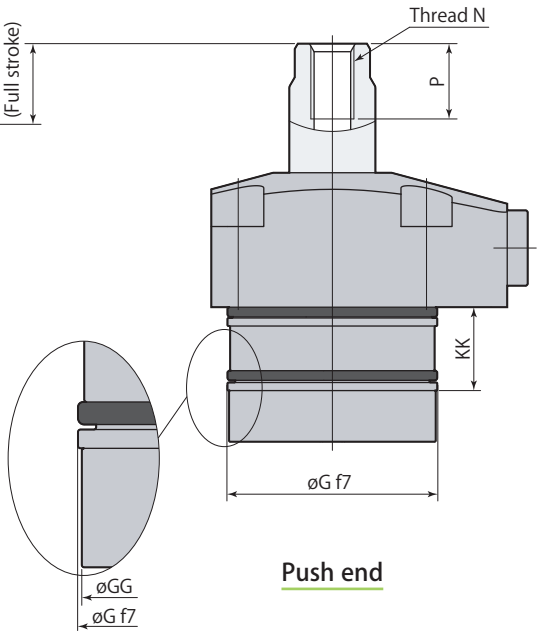
Dimensions

(Female thread rod)

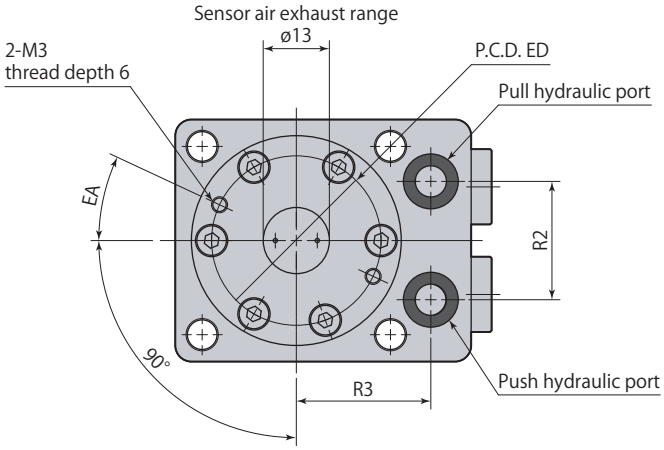


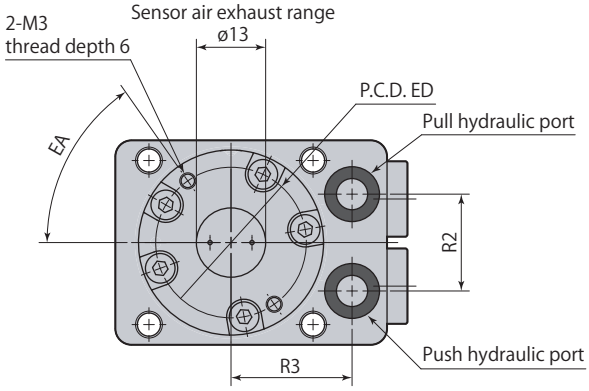


Pull end



Push end





CNB01-□TB

● Mounting screws are not included.

mm

Model		CNB01-□TB		CNB02-□TB		CNB04-□TB	
Y (stroke)		10, 15, 20, 25, 30, 35, 40, 45, 50					
Cylinder capacity (cm³)	Push	0.38×Y		0.49×Y		0.71×Y	
	Pull	0.23×Y		0.29×Y		0.45×Y	
At		Y=10	Y=15–50	Y=10	Y=15–50	Y=10	Y=15–50
		58	Y+43	59	Y+44	61.5	Y+46.5
B		38		45		50	
C		48		55		60	
D		29		32.5		35	
E		19		22.5		25	
F		30.5		35		40	
øG		$35^{-0.025}_{-0.050}$		$39^{-0.025}_{-0.050}$		$47^{-0.025}_{-0.050}$	
øGG		34.4		38.4		46.4	
øH		$14^{-0.016}_{-0.034}$		$16^{-0.016}_{-0.034}$		$18^{-0.016}_{-0.034}$	
J		33		34		35	
K		Y=10	Y=15–50	Y=10	Y=15–50	Y=10	Y=15–50
		25	Y+10	25	Y+10	26.5	Y+11.5
KK		Y=10, 15	Y=20–50	Y=10, 15	Y=20–50	Y=10, 15	Y=20–50
		15.5	20.5	15.5	20.5	15.5	20.5
M		8		9		10	
N		M6×1		M8×1.25		M8×1.25	
P		11		14		14	
R2		18		22		24	
R3		22.5		25		28	
R4		16.2		20		22	
S (width across flats height)		6		7		8	
øT		12		14		16	
U (width across flats)		10		12		14	
V		17		15		15	
øW		4.5		5.5		5.5	
W1		M5×0.8		M6×1		M6×1	
øX		8		9.5		9.5	
Z1		R3		R3		R5	
EA		55°		25°		20°	
ED		28		31.5		38	
O-ring FA (fluorocarbon hardness Hs90)		P7		P7		P7	
O-ring FB (fluorocarbon hardness Hs70)		AS568-026		AS568-028		AS568-030	
Flow control valve*	Meter-in	VCF01S		VCF01		VCF01	
	Meter-out	VCF01S-O		VCF01-O		VCF01-O	
Air bleeding valve		VCE01		VCE01		VCE01	

*: Select the right model of VCF according to the size of the cylinder.

Refer to each page for the details of options. ● Flow control valve **page →216** ● Air bleeding valve **page →218**

● CNB□-□TB (Pull sensor model, Female thread rod) stroke 25, 35, 45 mm are made to order.

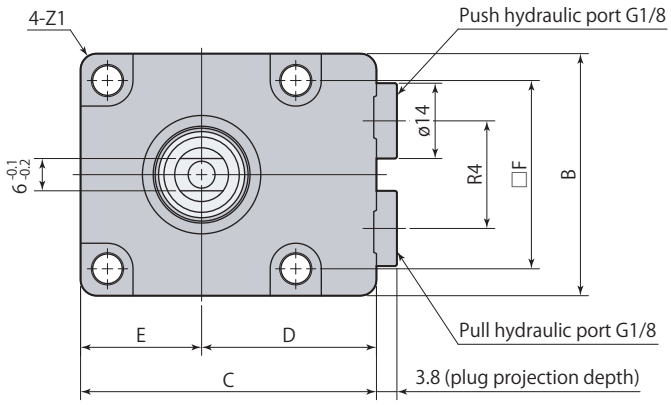
Mass

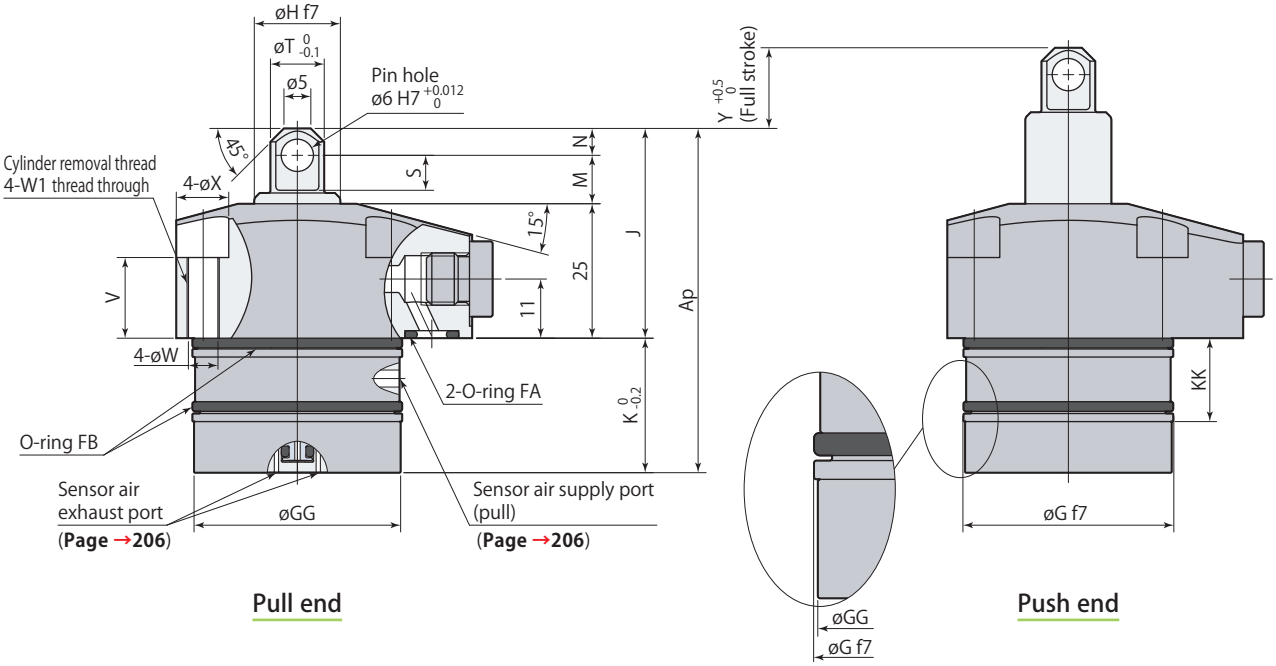
kg

Stroke	10	15	20	25	30	35	40	45	50
CNB01-□TB	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6
CNB02-□TB	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8
CNB04-□TB	0.8	0.8	0.8	0.9	0.9	1.0	1.0	1.1	1.1

Dimensions

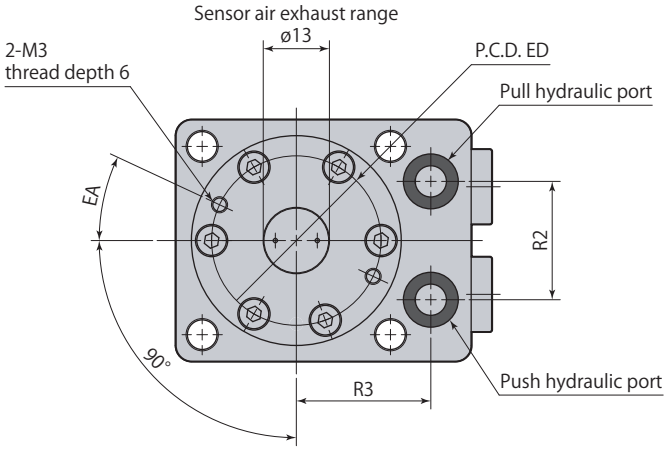
(Pin rod)

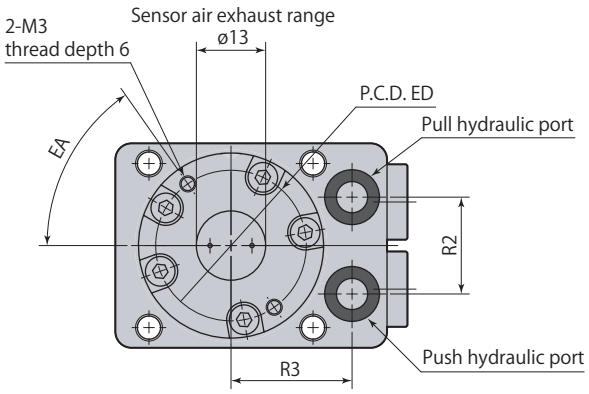




Pull end

Push end





CNB01-□PB

- Mounting screws are not included.
- Recommended material for pin : SCM435-H (HB269–331)

mm

Model		CNB01-□PB		CNB02-□PB		CNB04-□PB	
Y (stroke)		10, 15, 20, 25, 30, 35, 40, 45, 50					
Cylinder capacity (cm³)	Push	0.38×Y		0.49×Y		0.71×Y	
	Pull	0.23×Y		0.29×Y		0.45×Y	
Ap		Y=10	Y=15–50	Y=10	Y=15–50	Y=10	Y=15–50
		64	Y+49	64	Y+49	67	Y+52
B		38		45		50	
C		48		55		60	
D		29		32.5		35	
E		19		22.5		25	
F		30.5		35		40	
øG		$35^{-0.025}_{-0.050}$		$39^{-0.025}_{-0.050}$		$47^{-0.025}_{-0.050}$	
øGG		34.4		38.4		46.4	
øH		$14^{-0.016}_{-0.034}$		$16^{-0.016}_{-0.034}$		$18^{-0.016}_{-0.034}$	
J		39		39		40.5	
K		Y=10	Y=15–50	Y=10	Y=15–50	Y=10	Y=15–50
		25	Y+10	25	Y+10	26.5	Y+11.5
KK		Y=10, 15	Y=20–50	Y=10, 15	Y=20–50	Y=10, 15	Y=20–50
		15.5	20.5	15.5	20.5	15.5	20.5
M		9		9		9.5	
N		5		5		6	
R2		18		22		24	
R3		22.5		25		28	
R4		16.2		20		22	
S		6.5		6.5		7	
øT		10		10		12	
V		17		15		15	
øW		4.5		5.5		5.5	
W1		M5×0.8		M6×1		M6×1	
øX		8		9.5		9.5	
Z1		R3		R3		R5	
EA		55°		25°		20°	
ED		28		31.5		38	
O-ring FA (fluorocarbon hardness Hs90)		P7		P7		P7	
O-ring FB (fluorocarbon hardness Hs70)		AS568-026		AS568-028		AS568-030	
Flow control valve*	Meter-in	VCF01S		VCF01		VCF01	
	Meter-out	VCF01S-O		VCF01-O		VCF01-O	
Air bleeding valve		VCE01		VCE01		VCE01	

∗: Select the right model of VCF according to the size of the cylinder.

Refer to each page for the details of options. ● Flow control valve **page →216** ● Air bleeding valve **page →218**

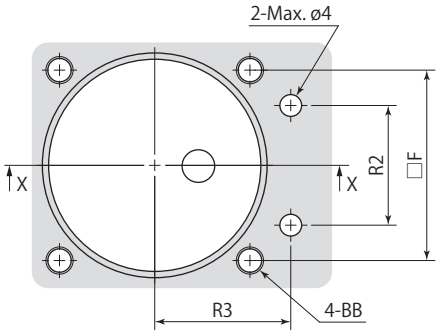
● CNB□-□PB (Pull sensor model, Pin rod) are made to order.

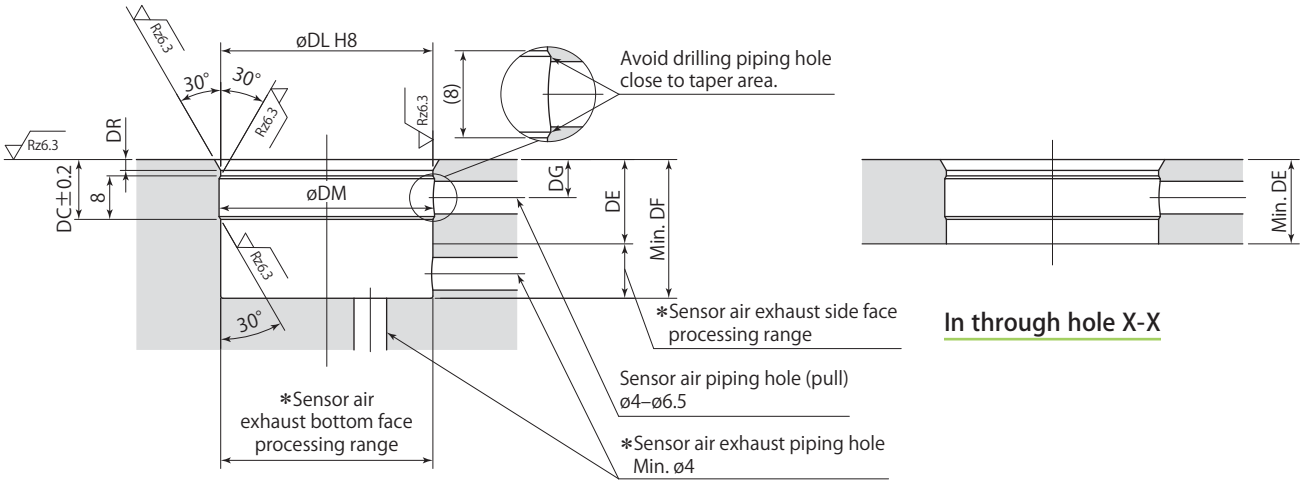
Mass

kg

Stroke	10	15	20	25	30	35	40	45	50
CNB01-□PB	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6
CNB02-□PB	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8
CNB04-□PB	0.8	0.8	0.8	0.9	0.9	1.0	1.0	1.1	1.1

Mounting details





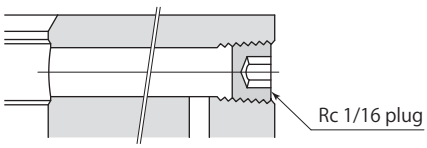
In blind hole X-X

In through hole X-X

∗: Sensor air exhaust piping hole must be made on either side or bottom face.

Rz: ISO4287(1997)

- Apply an appropriate amount of grease to the chamfer and the bore when mounting. Excessive grease may be a blockage in the air passage, causing malfunction of the sensor.
- The 30° taper machining must be provided to avoid the damage of the O-ring. Ensure that there are no interference on taper area when drilling the hole for sensor air.
- The sensor air piping hole can be used for a pilot hole of Rc 1/16 plug.



mm

Model	CNB01-□TB CNB01-□PB								
Stroke	10	15	20	25	30	35	40	45	50
DC	11	11	16	16	16	16	16	16	16
DE	15.5	15.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5
DF	25.5	25.5	30.5	35.5	40.5	45.5	50.5	55.5	60.5
DG	7	7	12	12	12	12	12	12	12
øDL	$35\ ^{+0.039}_{0}$								
øDM	35.6								
DR	2	2	1	1	1	1	1	1	1
BB	M4								
F	30.5								
R2	18								
R3	22.5								

mm

Model	CNB02-□TB CNB02-□PB								
Stroke	10	15	20	25	30	35	40	45	50
DC	11	11	16	16	16	16	16	16	16
DE	15.5	15.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5
DF	25.5	25.5	30.5	35.5	40.5	45.5	50.5	55.5	60.5
DG	7	7	12	12	12	12	12	12	12
øDL	$39\ ^{+0.039}_{0}$								
øDM	39.6								
DR	2	2	1	1	1	1	1	1	1
BB	M5								
F	35								
R2	22								
R3	25								

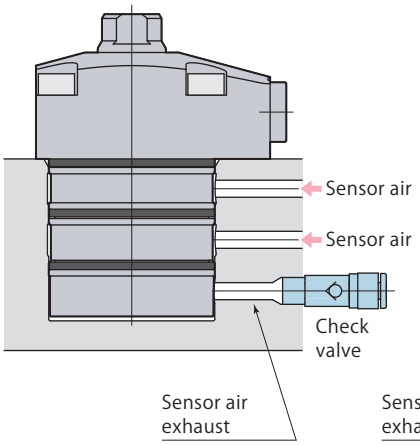
mm

Model	CNB04-□TB CNB04-□PB								
Stroke	10	15	20	25	30	35	40	45	50
DC	11	11	16	16	16	16	16	16	16
DE	15.5	15.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5
DF	27	27	32	37	42	47	52	57	62
DG	7	7	12	12	12	12	12	12	12
øDL	$47\ ^{+0.039}_{0}$								
øDM	47.6								
DR	2	2	1	1	1	1	1	1	1
BB	M5								
F	40								
R2	24								
R3	28								

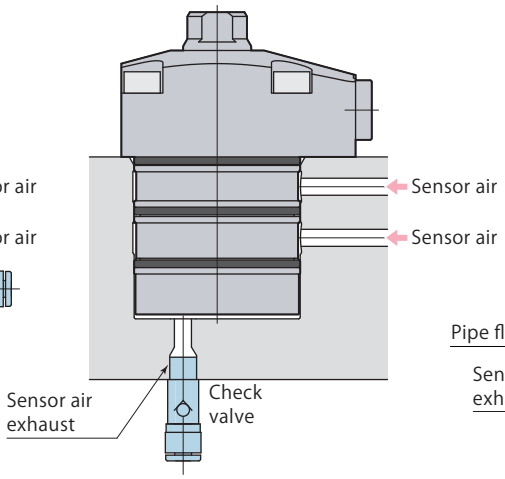
Caution for piping

Refer to the diagram shown below for the sensor air exhaust port.

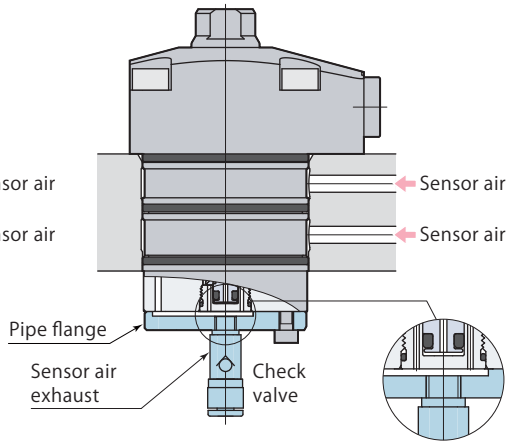
Mounting in blind hole
(Sensor air exhaust：side face)



Mounting in blind hole
(Sensor air exhaust：bottom face)



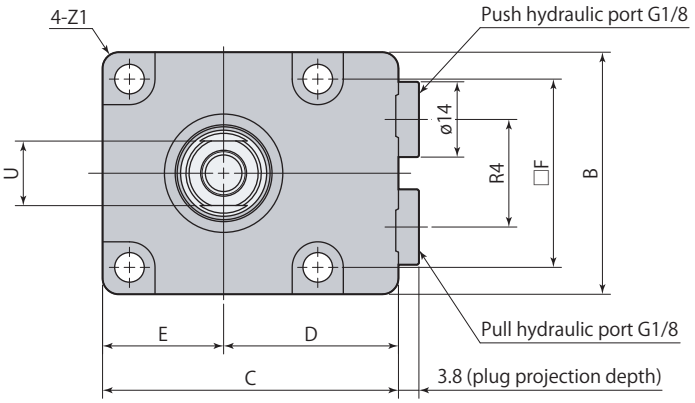
Mounting in through hole

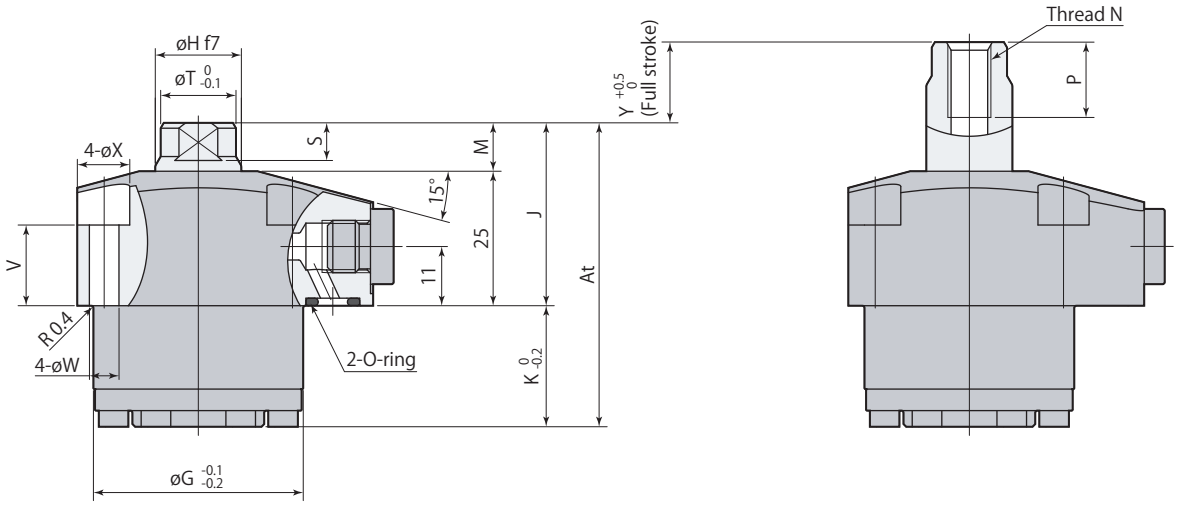


- Use a check valve with cracking pressure of 0.005 MPa or less if there is a risk of metal chips or coolant intrusion. Recommended check valve：AKH or AKB series manufactured by SMC.
- Furnish the piping by means of the pipe flange when mounting in a through hole. The flange is mountable with M3 threads at the bottom of the cylinder. Be sure to provide an opening not to cover the exhaust port. See the sketch shown above.

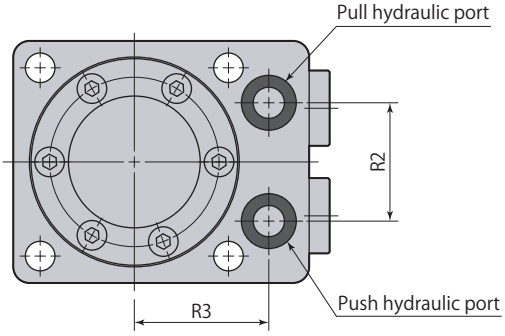
Dimensions

(Female thread rod)





Pull end **Push end**



● Mounting screws are not included.

mm

Model		CNB01-□TN	CNB02-□TN	CNB04-□TN
Y (stroke)		10, 15, 20, 25, 30, 35, 40, 45, 50		
Cylinder capacity (cm³)	Push	0.38×Y	0.49×Y	0.71×Y
	Pull	0.23×Y	0.29×Y	0.45×Y
At		Y+39.5	Y+41.5	Y+45.5
B		38	45	50
C		48	55	60
D		29	32.5	35
E		19	22.5	25
F		30.5	35	40
øG		35	39	47
øH		14 $^{-0.016}_{-0.034}$	16 $^{-0.016}_{-0.034}$	18 $^{-0.016}_{-0.034}$
J		33	34	35
K		Y+6.5	Y+7.5	Y+10.5
M		8	9	10
N		M6×1	M8×1.25	M8×1.25
P		11	14	14
R2		18	22	24
R3		22.5	25	28
R4		16.2	20	22
S (width across flats height)		6	7	8
øT		12	14	16
U (width across flats)		10	12	14
V		17	15	15
øW		4.5	5.5	5.5
øX		8	9.5	9.5
Z1		R3	R3	R5
O-ring (fluorocarbon hardness Hs90)		P7	P7	P7
Flow control valve*	Meter-in	VCF01S	VCF01	VCF01
	Meter-out	VCF01S-O	VCF01-O	VCF01-O
Air bleeding valve		VCE01	VCE01	VCE01

∗: Select the right model of VCF according to the size of the cylinder.

Refer to each page for the details of options. ● Flow control valve **page →216** ● Air bleeding valve **page →218**

● CNB□-□TN (Compact model, Female thread rod) stroke 25, 35, 45 mm are made to order.

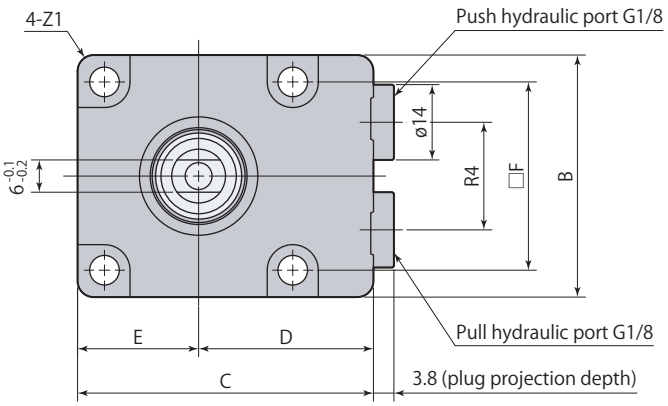
Mass

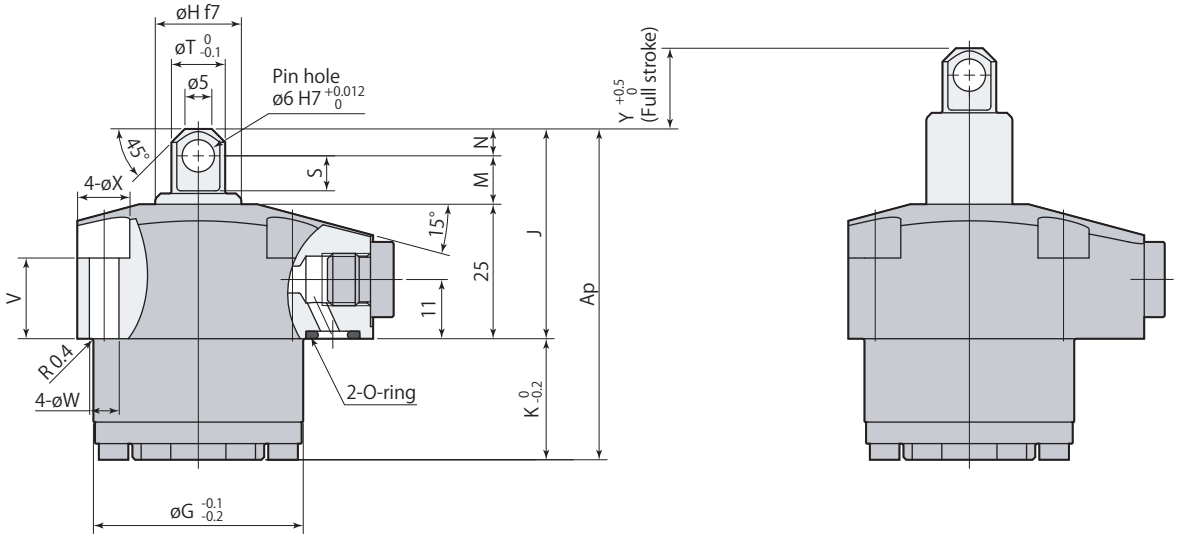
kg

Stroke	10	15	20	25	30	35	40	45	50
CNB01-□TN	0.4	0.4	0.5	0.5	0.5	0.5	0.6	0.6	0.6
CNB02-□TN	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.8
CNB04-□TN	0.8	0.8	0.8	0.9	0.9	1.0	1.0	1.1	1.1

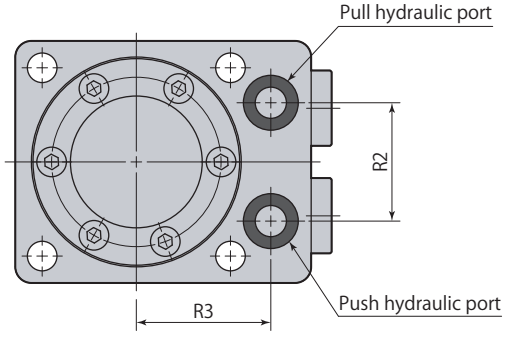
Dimensions

(Pin rod)





Pull end **Push end**



- Mounting screws are not included.
- Recommended material for pin : SCM435-H (HB269–331)

mm

Model		CNB01-□PN	CNB02-□PN	CNB04-□PN
Y (stroke)		10, 15, 20, 25, 30, 35, 40, 45, 50		
Cylinder capacity (cm³)	Push	0.38×Y	0.49×Y	0.71×Y
	Pull	0.23×Y	0.29×Y	0.45×Y
Ap		Y+45.5	Y+46.5	Y+51
B		38	45	50
C		48	55	60
D		29	32.5	35
E		19	22.5	25
F		30.5	35	40
øG		35	39	47
øH		$14^{-0.016}_{-0.034}$	$16^{-0.016}_{-0.034}$	$18^{-0.016}_{-0.034}$
J		39	39	40.5
K		Y+6.5	Y+7.5	Y+10.5
M		9	9	9.5
N		5	5	6
R2		18	22	24
R3		22.5	25	28
R4		16.2	20	22
S		6.5	6.5	7
øT		10	10	12
V		17	15	15
øW		4.5	5.5	5.5
øX		8	9.5	9.5
Z1		R3	R3	R5
O-ring (fluorocarbon hardness Hs90)		P7	P7	P7
Flow control valve*	Meter-in	VCF01S	VCF01	VCF01
	Meter-out	VCF01S-O	VCF01-O	VCF01-O
Air bleeding valve		VCE01	VCE01	VCE01

∗: Select the right model of VCF according to the size of the cylinder.

Refer to each page for the details of options. ● Flow control valve **page →216** ● Air bleeding valve **page →218**

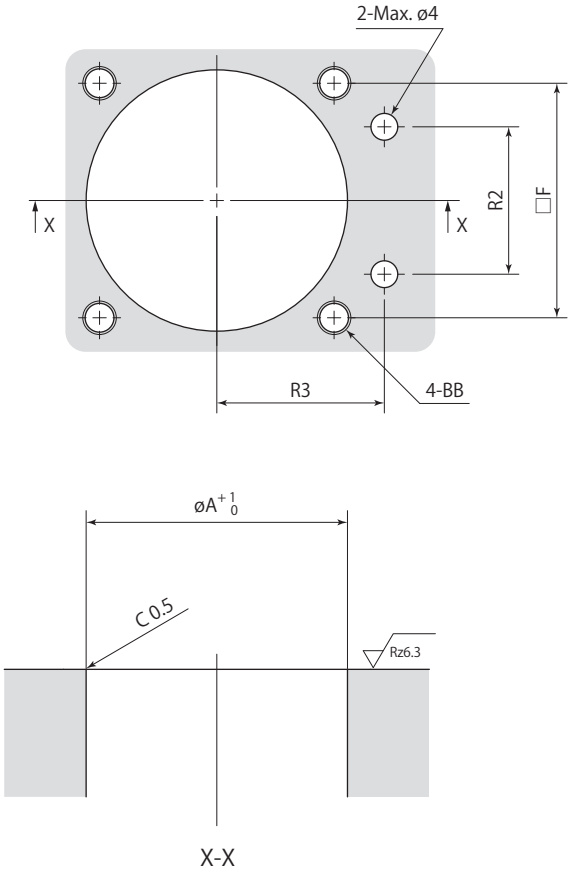
● CNB□-□PN (Compact model, Pin rod) are made to order.

Mass

kg

Stroke	10	15	20	25	30	35	40	45	50
CNB01-□PN	0.4	0.4	0.5	0.5	0.5	0.5	0.6	0.6	0.6
CNB02-□PN	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.8
CNB04-□PN	0.8	0.8	0.8	0.9	0.9	1.0	1.0	1.1	1.1

Mounting details



Rz: ISO4287(1997)

mm

Model	CNB01-□TN CNB01-□PN	CNB02-□TN CNB02-□PN	CNB04-□TN CNB04-□PN
øA	35	39	47
F	30.5	35	40
R2	18	22	24
R3	22.5	25	28
BB	M4	M5	M5

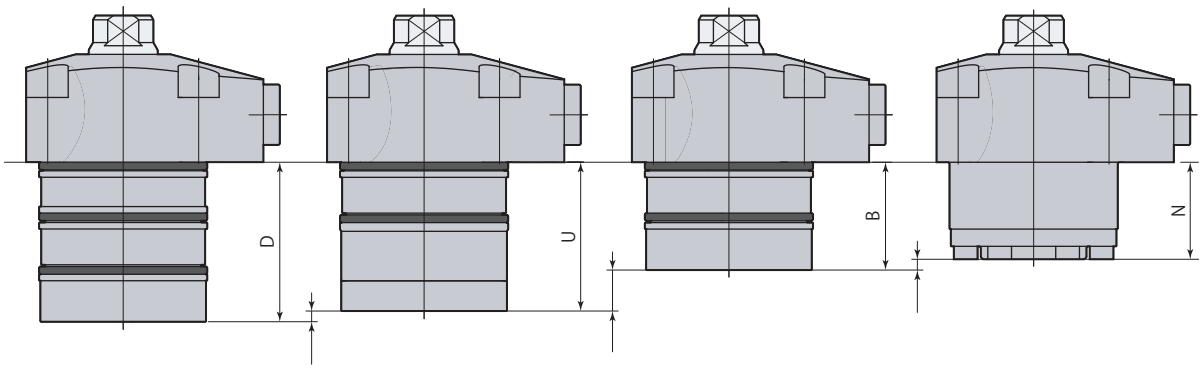
Comparison dimensional

model **CNB□-□□D**
Push, pull sensor model D

model **CNB□-□□U**
Push sensor model U

model **CNB□-□□B**
Pull sensor model B

model **CNB□-□□N**
Compact model N



mm

Model	CNB01-□		CNB02-□		CNB04-□	
Y (stroke)	10, 15, 20, 25, 30, 35, 40, 45, 50					
D	Y=10	Y=15–50	Y=10	Y=15–50	Y=10	Y=15–50
	37	Y+22	37	Y+22	38.5	Y+23.5
U	Y+18.5		Y+19.5		Y+22.5	
B	Y=10	Y=15–50	Y=10	Y=15–50	Y=10	Y=15–50
	25	Y+10	25	Y+10	26.5	Y+11.5
N	Y+6.5		Y+7.5		Y+10.5	