

Hydraulic Expansion Locating Pin

Model VFL

Model VFM

Model VFJ

Model VFK

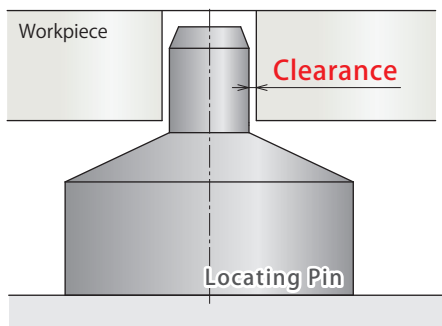


Locating Repeatability VFL/VFM : $3\mu\text{m}$ VFJ/VFK : $10\mu\text{m}$

Zero Clearance between Reference Hole and Expansion Locating Pin

Hydraulic expansion locating pin locates a workpiece with high accuracy by **expanding and releasing diameter**.

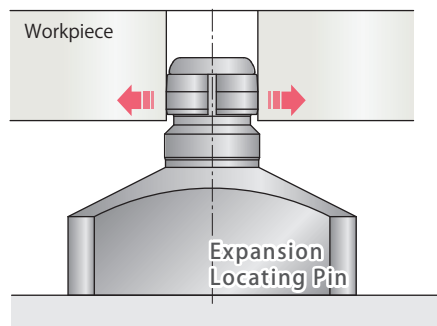
A general locating pin has some clearance between the pin and a workpiece hole.



General Locating Pin

Expansion locating pin has **zero clearance** between the pin and a reference hole!!

High Accuracy, Setup Time and Total Cost Reduction

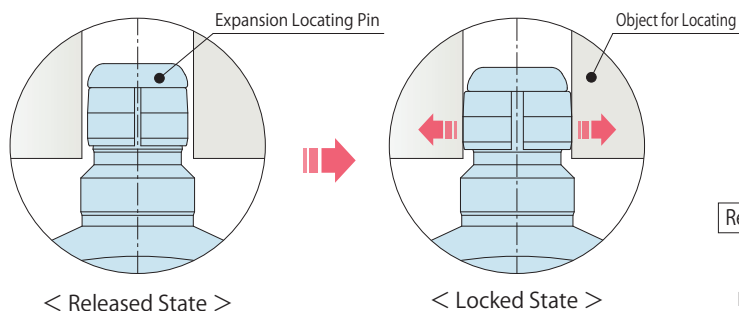


The World's First Locating Mechanism

When expanded : Zero clearance between the pin and a workpiece hole allows for high accuracy locating.

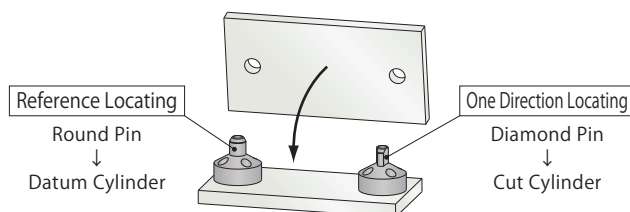
When released : The pin diameter is retracted so there is enough clearance for easy loading and unloading of a workpiece.

Action Description



※ This drawing shows VFL and VFM.

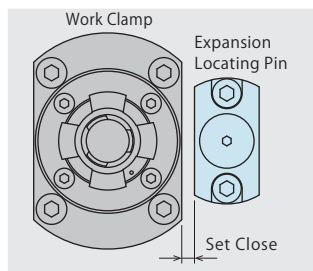
General Locating Pin consists of : Round Pin and Diamond Pin.
Kosmek Expansion Locating Pin consists of : Datum Cylinder and Cut Cylinder.



Features

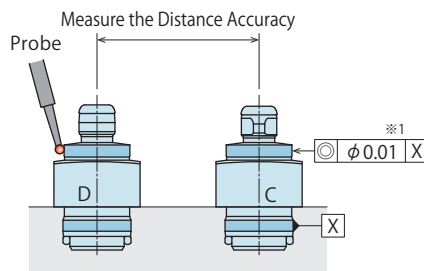
• Simple Arrangement

The compact body can be installed close to the clamp, so fixture design is more simple.



• Easy to Check the Accuracy

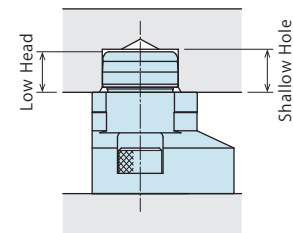
The same core part with X on the flange top allows to determine the origin and measure the distance accuracy.



※ 1. It is $\phi 0.02$ for VFJ / VFK.

• For Shallow Workpiece Hole

The low head pin can be used for shallow workpiece hole.

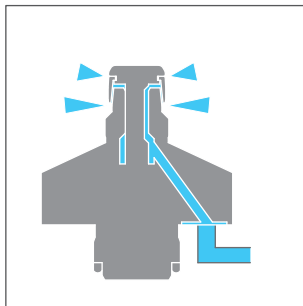


Functions

• Air Blow Function

Equipped to All Options

Prevent contamination.

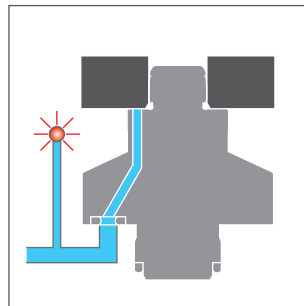


※ This drawing shows VFL.

• With Seating Surface (Seat Check)

Only for -B : With Seating Surface

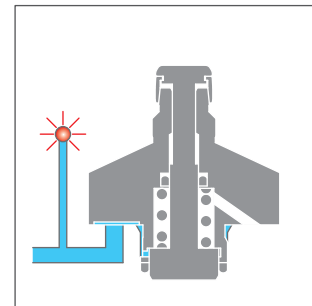
Seating confirmation is available by using a gap sensor.



• Release Confirmation

Only for -M : Release Confirmation

Release confirmation is available by using a gap sensor.



High-Power Series

Pneumatic Series

Hydraulic Series

Valve / Coupler Hydraulic Unit

Manual Operation Accessories

Cautions / Others

Hole Clamp

SFA
SFC

Swing Clamp

LHA
LHC
LHS
LHW
LG/LT
TLA-2
TLB-2
TLA-1

Link Clamp

LKA
LKC
LKW
LJ/LM
TMA-2
TMA-1

Work Support

LD
LC
TNC
TC

Air Sensing Lift Cylinder

LLW

Linear Cylinder / Compact Cylinder

LL
LLR
LLU
DP
DR
DS
DT

Block Cylinder

DBA/DBC

Centering Vise

FVA
FVD
FVC

Control Valve

BZL
BZT
BZX/JZG
BZS

Pallet Clamp

VS/VT

Expansion Locating Pin

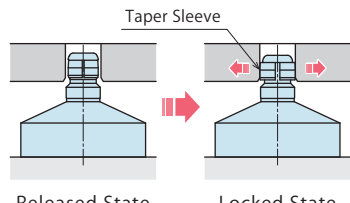
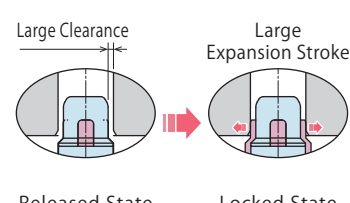
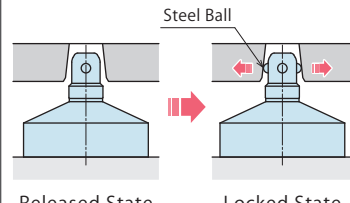
VFL/VFM
VFJ/VFK

Pull Stud Clamp

FP
FQ

Customized Spring Cylinder

DWA/DWB

Low Pressure MAX. 7MPa					
	Model VFL → P.1003	Model VFM → P.1019	Model VFH Refer to the catalog on the website.	Model VFJ → P.1037	Model VFK → P.1053
	High Accuracy Model 3 μ m		Multi-Purpose Model 10 μ m		Casting Material Model 10 μ m
	Model/ Locating Repeatability				
Control Method	Single Action (Spring Lock/Hyd. Release)	Double Action (Hyd. Lock/Hyd. Release)	Double Action (Hyd. Lock/Hyd. Release)	Single Action (Hyd. Lock/Spring Release)	Double Action (Hyd. Lock/Hyd. Release)
Op. Pressure	2.5 ~ 7 MPa		1.5 ~ 7 MPa		2.5 ~ 7 MPa 1.5 ~ 7 MPa
Action	 Taper Sleeve Released State Locked State The taper sleeve expands.		 Large Clearance Large Expansion Stroke Released State Locked State Large Gripper Expansion		 Steel Ball Released State Locked State The steel balls come out from the pin.
Application Examples	Finishing Line / Dividing Operation Line			Locating Casting Core Holes / First Process	

Hydraulic Expansion Locating Pin

PAT.

Model VFL/VFM

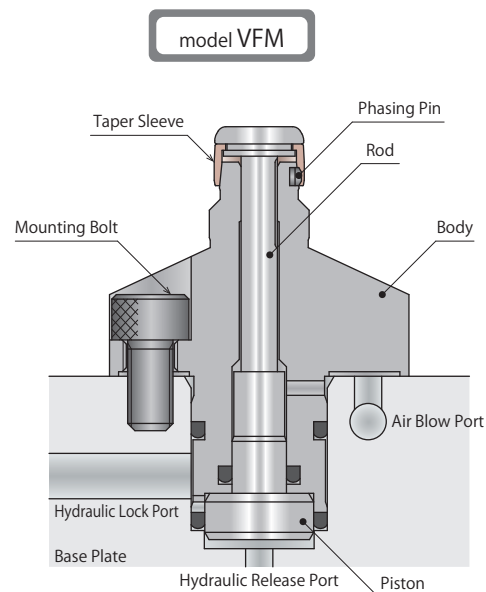
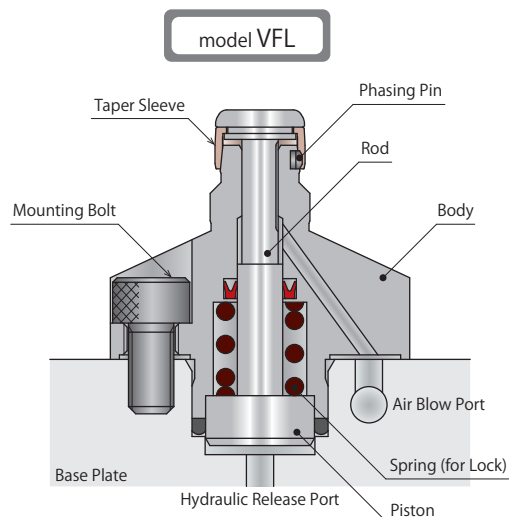
Hydraulic Single Action/Double Action
Locating Repeatability : 3 μ m



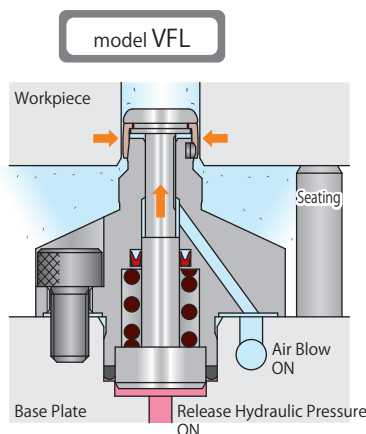
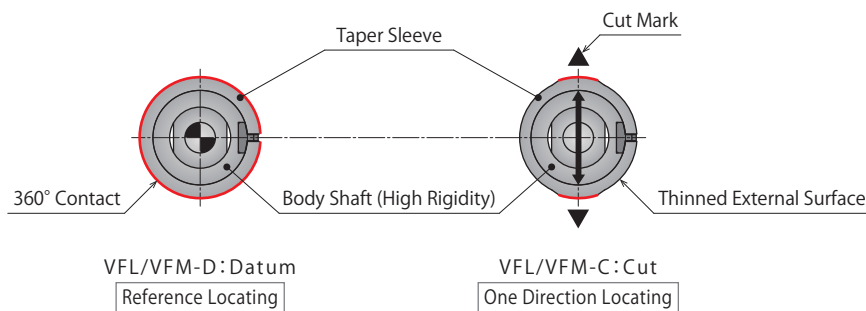
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Action Description This is a simplified drawing of VFL / VFM (Standard).



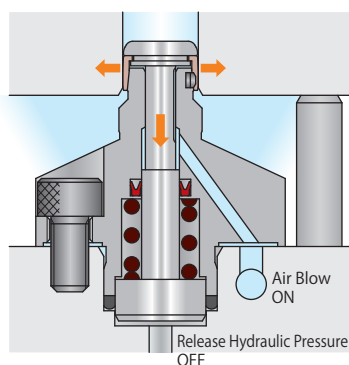
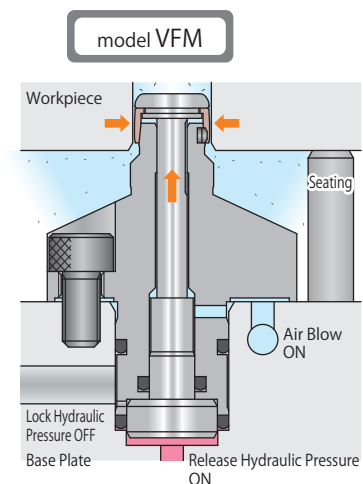
About Reference Locating and Orientation



- VFL: When release hydraulic pressure is ON, the taper sleeve ascends with piston/rod and shrinks with its own elasticity.
- VFM: When lock hydraulic pressure is OFF and release hydraulic pressure is ON, the taper sleeve ascends with piston/rod and shrinks with its own elasticity.
- Air blow prevents debris contamination.
- Rod head and taper sleeve are designed to load/unload workpiece smoothly and prevent scratches.

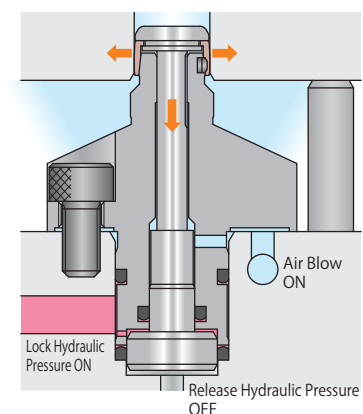
When loading workpiece

When unloading workpiece



- VFL: When release hydraulic pressure is OFF, the piston/rod descend and the taper sleeve is expanded to locate the workpiece with high accuracy.
- VFM: When release hydraulic pressure is OFF and lock hydraulic pressure is ON, the piston/rod descend and the taper sleeve is expanded to locate the workpiece with high accuracy. (Seating is required for standard and release confirmation models.)

When locating



High-Power Series

Pneumatic Series

Hydraulic Series

Valve / Coupler Hydraulic Unit

Manual Operation Accessories

Cautions / Others

Hole Clamp

SFA
SFC

Swing Clamp

LHA
LHC
LHS
LHW
LG/LT
TLA-2
TLB-2
TLA-1

Link Clamp

LKA
LKC
LKW
LJ/LM
TMA-2
TMA-1

Work Support

LD
LC
TNC
TC

Air Sensing Lift Cylinder

LLW

Linear Cylinder / Compact Cylinder

LL
LLR
LLU
DP
DR
DS
DT

Block Cylinder

DBA/DBC

Centering Vise

FVA
FVD
FVC

Control Valve

BZL
BZT
BZX/JZG
BZS

Pallet Clamp

VS/VT

Expansion Locating Pin

VFL/VFM
VFJ/VFK

Pull Stud Clamp

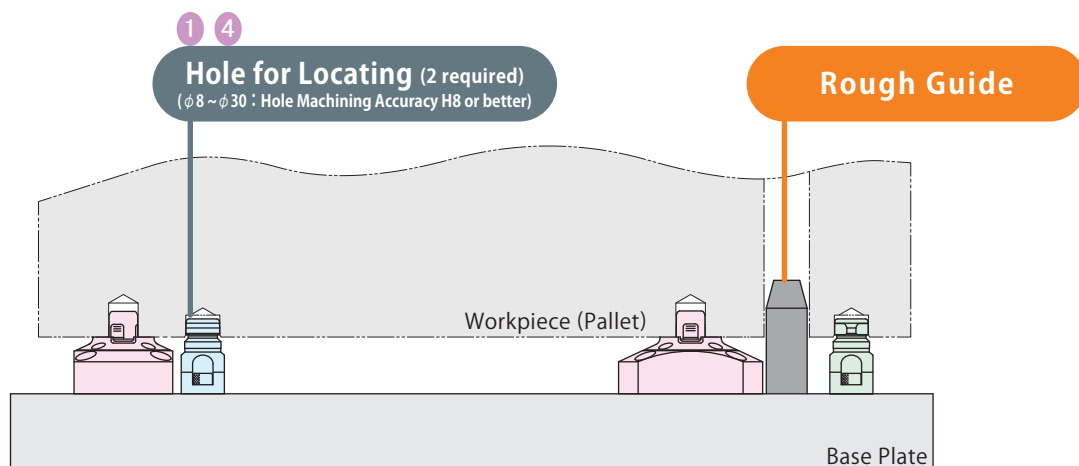
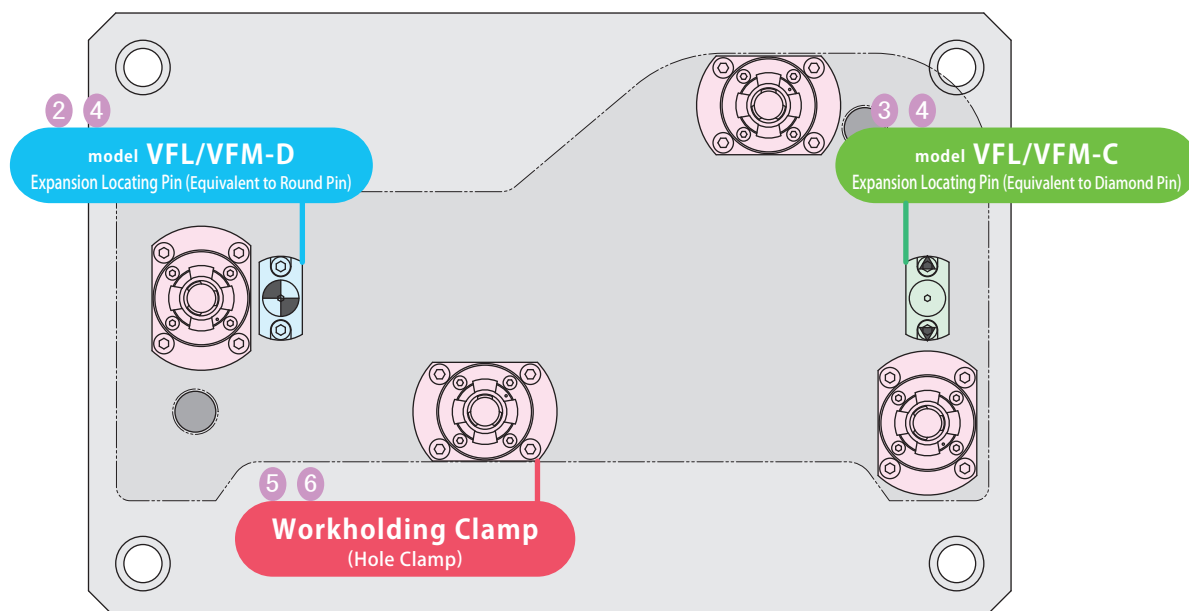
FP
FQ

Customized Spring Cylinder

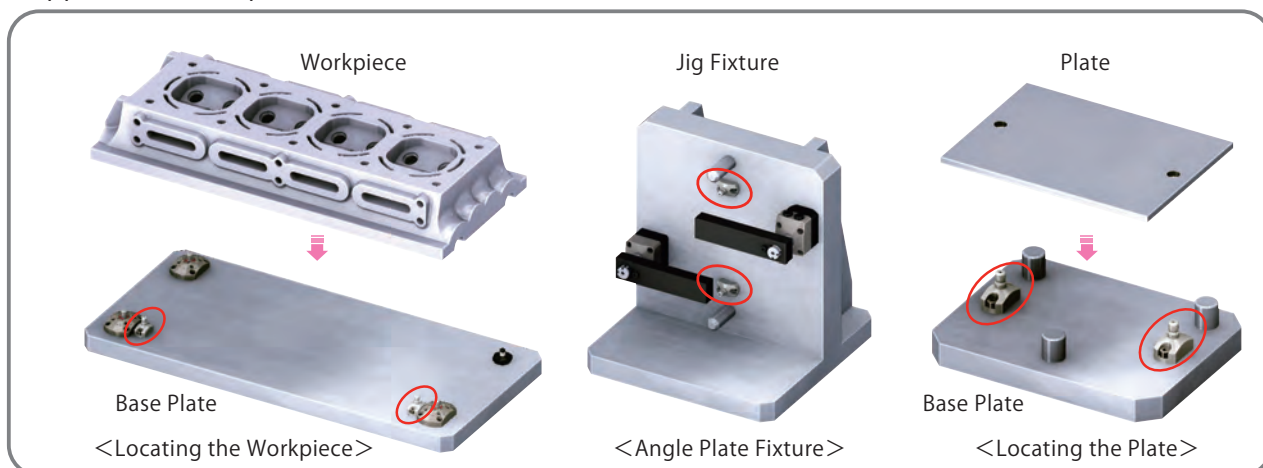
DWA/DWB

System References

- High accuracy ($3\mu\text{m}$) + one-touch locating pin **reduces setup time!**
- When dividing operations into different fixtures, **prevents deterioration of workpiece accuracy!**
- Using with hole clamps enables 5-face machining, **integrated operation and more compact fixture!**



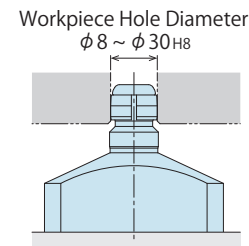
Application Examples



Essential Points

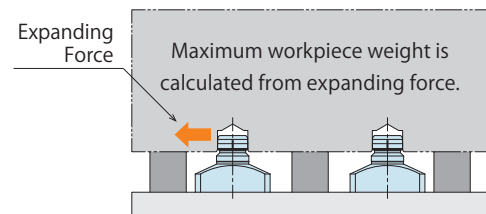
1 Workpiece Hole for Locating

- Workpiece hole diameter is $\phi 8 \sim \phi 30$ (in 1mm increments).
- Hole machining accuracy for locating hole (two holes) is H8 or better.



2 Workpiece Weight

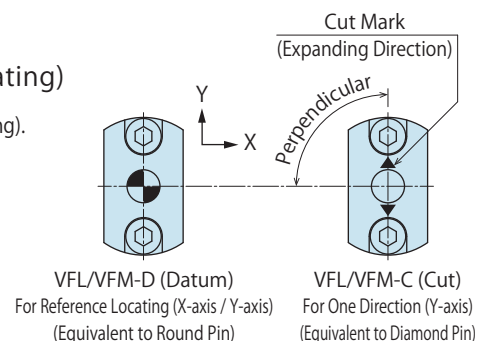
- Workpiece weight that expansion locating pin is able to locate with is calculated from expanding force.
- Expanding force is the force with which the expansion locating pin pushes out (expands) against the workpiece.
- Refer to the specification page for each model's calculation method of expansion force and allowable workpiece weight for locating.



3 Mounting Phase of VFL/VFM-C (Cut : For One Direction Locating)

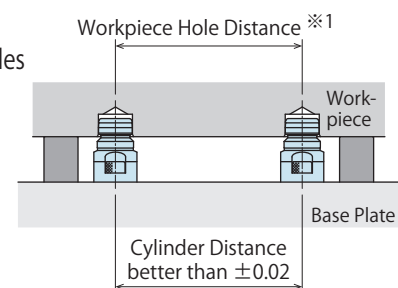
- The reference position (origin) is determined by VFL/VFM-D (Datum: for reference locating).
- VFL/VFM-C (Cut: for one direction locating) locates in one direction (Y-axis), so phasing is necessary. When mounting, ensure the VFL/VFM-C (cut) cut mark is perpendicular to VFL/VFM-D (datum).

(There is a cut mark (▲) on top of the flange on the VFL/VFM-C unit that shows the locating direction.)



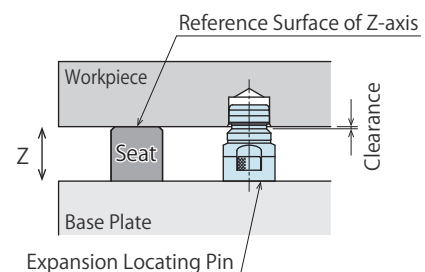
4 Distance Accuracy between Expansion Locating Pins and between Workpiece Holes

- The distance accuracy for the expansion locating pin should be better than $\pm 0.02\text{mm}$.
- The distance accuracy of workpiece holes (pallet holes) ($\times 1$) should be within allowable difference. (Refer to "Notes for Design".)



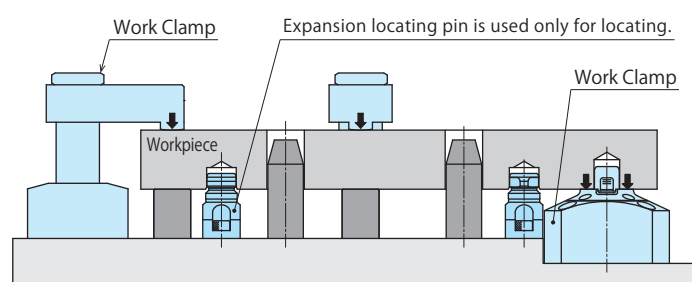
5 Setting an Additional Seat

- Standard model and -M : Release Confirmation model have no seating surface (reference surface towards Z-axis). Please prepare an additional seat.



6 Setting Additional Work Clamps

- Expansion locating pin has no clamping function.
- Additional clamps should be added to clamp a workpiece.



High-Power Series

Pneumatic Series

Hydraulic Series

Valve / Coupler Hydraulic Unit

Manual Operation Accessories

Cautions / Others

Hole Clamp

SFA
SFC

Swing Clamp

LHA
LHC
LHS
LHW
LG/LT
TLA-2
TLB-2
TLA-1

Link Clamp

LKA
LKC
LKW
LJ/LM
TMA-2
TMA-1

Work Support

LD
LC
TNC
TC

Air Sensing Lift Cylinder

LLW

Linear Cylinder / Compact Cylinder

LL
LLR
LLU
DP
DR
DS
DT

Block Cylinder

DBA/DBC

Centering Vise

FVA
FVD
FVC

Control Valve

BZL
BZT
BZX/JZG
BZS

Pallet Clamp

VS/VT

Expansion Locating Pin

VFL/VFM
VFJ/VFK

Pull Stud Clamp

FP
FQ

Customized Spring Cylinder

DWA/DWB

Model No. Indication

VFL **2** **00** **0** - **080** - **D** - **H20** - **M** **R**

1 2 3 4 5 6 7

1 Body Size

- 2 : Select from Workpiece Hole Diameter $\phi 8$ / $\phi 9$ / $\phi 10$ / $\phi 11$
- 3 : Select from Workpiece Hole Diameter $\phi 12$ / $\phi 13$ / $\phi 14$ / $\phi 15$
- 4 : Select from Workpiece Hole Diameter $\phi 16$ / $\phi 17$ / $\phi 18$ / $\phi 19$ / $\phi 20$
- 5 : Select from Workpiece Hole Diameter $\phi 21$ / $\phi 22$ / $\phi 23$ / $\phi 24$ / $\phi 25$
- 6 : Select from Workpiece Hole Diameter $\phi 26$ / $\phi 27$ / $\phi 28$ / $\phi 29$ / $\phi 30$

2 Design No.

- 0 : Revision Number

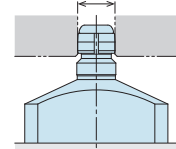
3 Workpiece Hole Diameter

Contact us for unlisted workpiece hole diameters.
(Workpiece hole machining accuracy should be H8 or better.)

Workpiece Hole Diam. Code	080	090	100	110	120	130	140	150	160	170	180	190	200
Workpiece Hole Diam. ϕ WA H8	8 $^{+0.022}_0$	9 $^{+0.022}_0$	10 $^{+0.022}_0$	11 $^{+0.027}_0$	12 $^{+0.027}_0$	13 $^{+0.027}_0$	14 $^{+0.027}_0$	15 $^{+0.027}_0$	16 $^{+0.027}_0$	17 $^{+0.027}_0$	18 $^{+0.027}_0$	19 $^{+0.033}_0$	20 $^{+0.033}_0$
VFL2000	Selection Range												
VFL3000					Selection Range								
VFL4000									Selection Range				

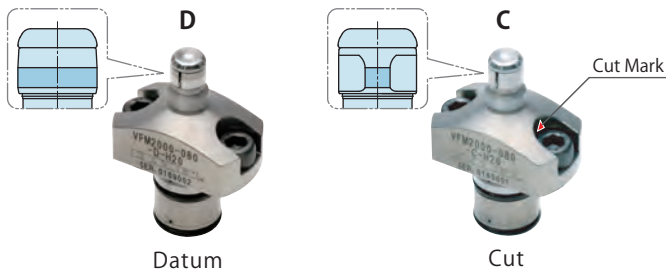
Workpiece Hole Diam. Code	210	220	230	240	250	260	270	280	290	300
Workpiece Hole Diam. ϕ WA H8	21 $^{+0.033}_0$	22 $^{+0.033}_0$	23 $^{+0.033}_0$	24 $^{+0.033}_0$	25 $^{+0.033}_0$	26 $^{+0.033}_0$	27 $^{+0.033}_0$	28 $^{+0.033}_0$	29 $^{+0.033}_0$	30 $^{+0.033}_0$
VFL5000	Selection Range									
VFL6000						Selection Range				

Workpiece Hole Diameter ϕ WA



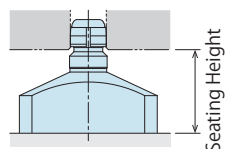
4 Functions

- D : Datum (for Reference Locating)
- C : Cut (for One Direction Locating)



5 Seating Height

Model No.	Seating Height H (mm)			
	15	20	25	30
VFL2000	Selection Range			
VFL3000	Selection Range			
VFL4000	Selection Range			
VFL5000	Selection Range			
VFL6000		Selection Range		



Note :

Prepare an additional seat for **6** Option **Blank** : Standard
and **M** : Release Confirmation Model.

6 Options

Blank : None (Standard)

B : with Seating Surface

M : Release Confirmation Model

Note :

Contact us for combined use of **B** : with Seating Surface
and **M** : Release Confirmation model.

7 Port Position Required only when selecting 6 Option : **B** (with Seating Surface), **M** (Release Confirmation Model).

R : Refer to External Dimensions

L : Refer to External Dimensions

Note :

Refer to  **Port Position** on each External Dimension page for details.

Hole Clamp

SFA
SFC

Swing Clamp

LHA
LHC
LHS
LHW
LG/LT
TLA-2
TLB-2
TLA-1

Link Clamp

LKA
LKC
LKW
LJ/LM
TMA-2
TMA-1

Work Support

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Air Sensing Lift Cylinder

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Control Valve

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BZX/JZG
BZS

Pallet Clamp

VS/VT

Expansion Locating Pin

VFL/VFM
VFJ/VFK

Pull Stud Clamp

FP
FQ

Customized Spring Cylinder

DWA/DWB

Specifications : VFL2000 / VFL3000 / VFL4000

Model No.	VFL2000				VFL3000				VFL4000				
3 Workpiece Hole Diam. Code	080	090	100	110	120	130	140	150	160	170	180	190	200
Workpiece Hole Diam. (Standard Diam.) mm	$\phi 8_{H8}^{+0.022}_0$	$\phi 9_{H8}^{+0.022}_0$	$\phi 10_{H8}^{+0.022}_0$	$\phi 11_{H8}^{+0.027}_0$	$\phi 12_{H8}^{+0.027}_0$	$\phi 13_{H8}^{+0.027}_0$	$\phi 14_{H8}^{+0.027}_0$	$\phi 15_{H8}^{+0.027}_0$	$\phi 16_{H8}^{+0.027}_0$	$\phi 17_{H8}^{+0.027}_0$	$\phi 18_{H8}^{+0.027}_0$	$\phi 19_{H8}^{+0.033}_0$	$\phi 20_{H8}^{+0.033}_0$
Locating Repeatability mm	0.003												
Allowable Offset (C : Cut) mm	±0.05	±0.05	±0.10	±0.10	±0.10	±0.10	±0.10	±0.10	±0.15	±0.15	±0.15	±0.15	±0.15
Expanding Force (F) ※ ¹ N	190	200	220	200	180	200	190	180	280	290	290	290	290
Allowable Thrust Load ※ ² N	1500	1500	2000	2000	2500	2500	2500	2500	3500	3500	3500	3500	4000
Cylinder Capacity (Empty Action) cm ³	0.07				0.08				0.18				
Operating Pressure Range MPa	2.5 ~ 7.0												
Withstanding Pressure MPa	10.5												
Recommended Air Blow Pressure MPa	0.3 ~ 0.4												
Operating Temperature Range °C	0 ~ 70												
Usable Fluid	General Hydraulic Oil Equivalent to ISO-VG-32												

Specifications : VFL5000 / VFL6000

Model No.	VFL5000					VFL6000				
3 Workpiece Hole Diam. Code	210	220	230	240	250	260	270	280	290	300
Workpiece Hole Diam. (Standard Diam.) mm	$\phi 21_{H8}^{+0.033}_0$	$\phi 22_{H8}^{+0.033}_0$	$\phi 23_{H8}^{+0.033}_0$	$\phi 24_{H8}^{+0.033}_0$	$\phi 25_{H8}^{+0.033}_0$	$\phi 26_{H8}^{+0.033}_0$	$\phi 27_{H8}^{+0.033}_0$	$\phi 28_{H8}^{+0.033}_0$	$\phi 29_{H8}^{+0.033}_0$	$\phi 30_{H8}^{+0.033}_0$
Locating Repeatability mm	0.003									
Allowable Offset (C : Cut) mm	±0.15	±0.15	±0.15	±0.15	±0.15	±0.15	±0.15	±0.15	±0.15	±0.15
Expanding Force (F) ※1 N	640	640	640	640	640	1080	1080	1080	1080	1080
Allowable Thrust Load ※2 N	5500	5500	5500	5500	6500	7500	7500	7500	9000	9000
Cylinder Capacity (Empty Action) cm ³	0.35					0.47				
Operating Pressure Range MPa	2.5 ~ 7.0									
Withstanding Pressure MPa	10.5									
Recommended Air Blow Pressure MPa	0.3 ~ 0.4									
Operating Temperature Range °C	0 ~ 70									
Usable Fluid	General Hydraulic Oil Equivalent to ISO-VG-32									

Notes :

- ※1. Expanding force shows the calculated value when coefficient friction is $\mu 0.2$.
Refer to the following for the relative equation of expanding force and allowable workpiece weight for locating.
- ※2. Exceeding allowable thrust load leads to accuracy failure and/or damages to the product.
 1. This product locates with spring and releases with hydraulic pressure. (Hydraulic Pressure Single Acting Model)
 2. This cylinder is used only for locating and does not have a clamping function.

Relative Equation of Expanding Force and Allowable Workpiece Weight for Locating

Horizontal Attitude

$$\text{Workpiece Weight (W)} \leq \frac{\text{Expanding Force per Expansion Locating Pin (F)} \times \text{Efficiency } 0.5}{\text{Friction Coefficient of Workpiece Seat Face } (\mu)}$$

Vertical Attitude

$$\text{Workpiece Weight (W)} \leq \text{Expanding Force per Expansion Locating Pin (F)} \times \text{Efficiency } 0.5$$

Thrust Load/Displacement Curve

This graph shows the relationship between thrust load and displacement.

Thrust load is the static load applied perpendicular to the center axis of the VFL (Hydraulic Expansion Locating Pin).

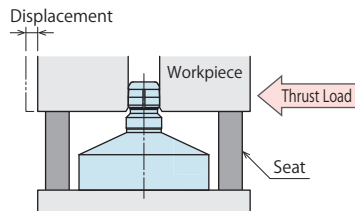
Note :

This graph shows the thrust load (static load) on a single datum (VFL-D) cylinder that is not used with any other cylinders, etc.

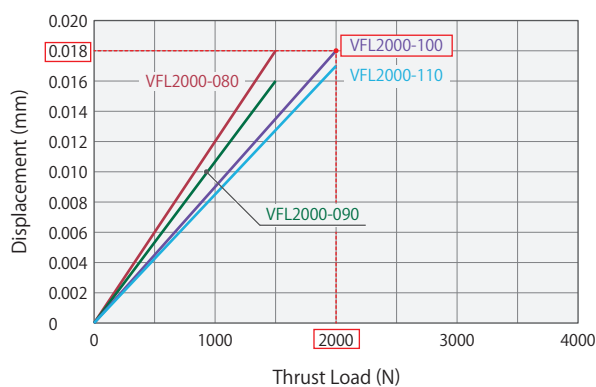
[How to Read the Thrust Load/Displacement Curve]

ex.) In case of VFL2000-100

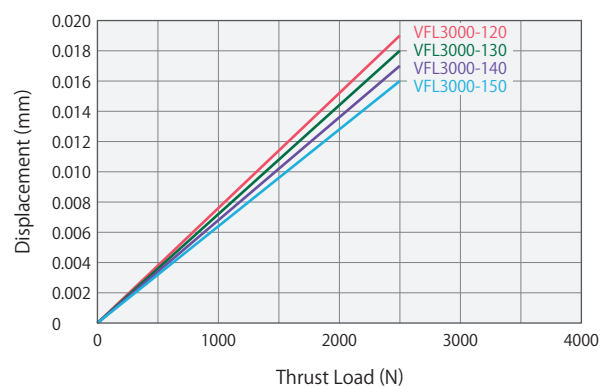
Requirement : When a 2000N thrust load is applied to an expanded VFL2000-100, the displacement will be about 0.018mm.



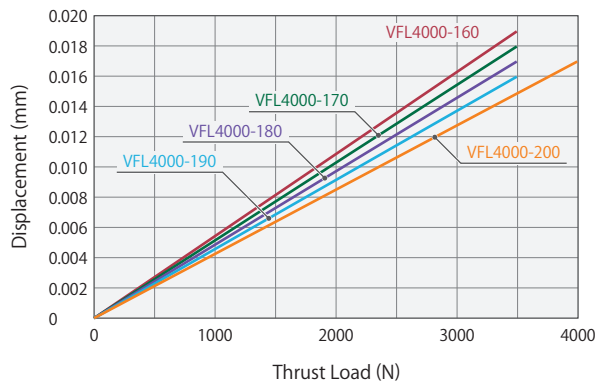
VFL2000



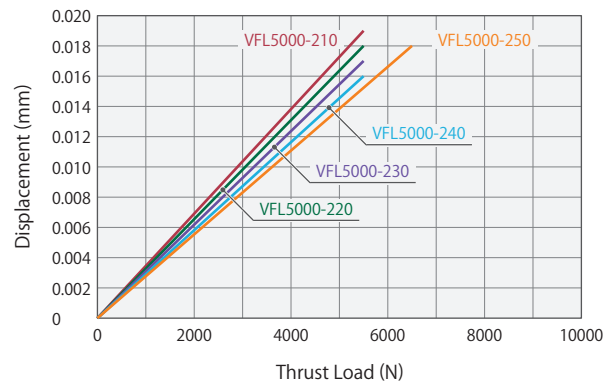
VFL3000



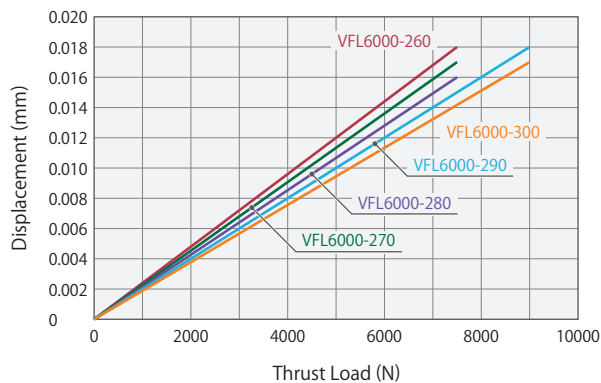
VFL4000



VFL5000



VFL6000



High-Power
Series

Pneumatic Series

Hydraulic Series

Valve / Coupler
Hydraulic Unit

Manual Operation
Accessories

Cautions / Others

Hole Clamp

SFA
SFC

Swing Clamp

LHA
LHC
LHS
LHW
LG/LT
TLA-2
TLB-2
TLA-1

Link Clamp

LKA
LKC
LKW
LJ/LM
TMA-2
TMA-1

Work Support

LD
LC
TNC
TC

Air Sensing
Lift Cylinder

LLW

Linear Cylinder /
Compact Cylinder

LL
LLR
LLU
DP
DR
DS
DT

Block Cylinder

DBA/DBC

Centering Vise

FVA
FVD
FVC

Control Valve

BZL
BZT
BZX/JZG
BZS

Pallet Clamp

VS/VT

Expansion
Locating Pin

VFL/VFM
VFJ/VFK

Pull Stud Clamp

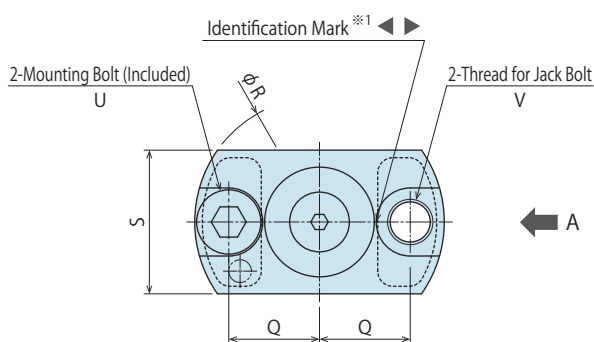
FP
FQ

Customized
Spring Cylinder

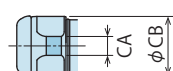
DWA/DWB

External Dimensions

※ The drawing shows the released state of VFL2000 / VFL3000 / VFL4000.



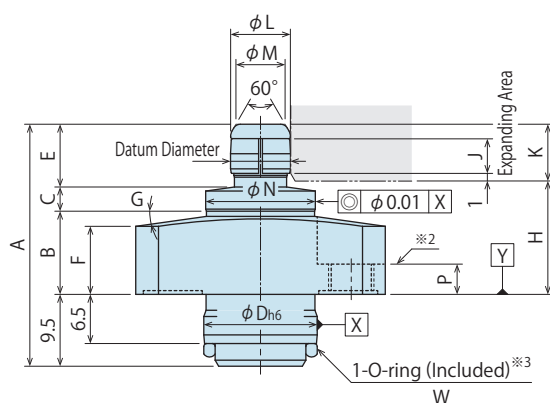
VFL-D
(Datum : Reference Locating)



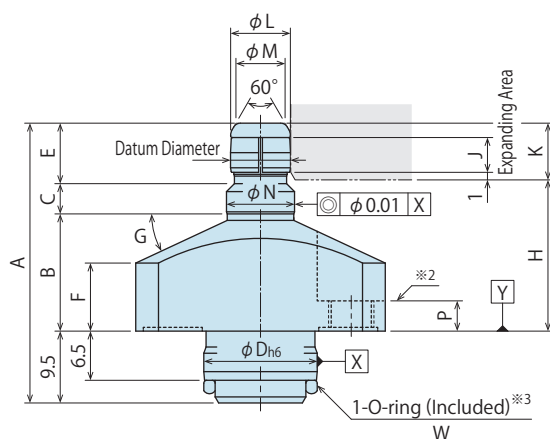
VFL-C
(Cut : One Direction Locating)

View A

5 Seating Height : H15



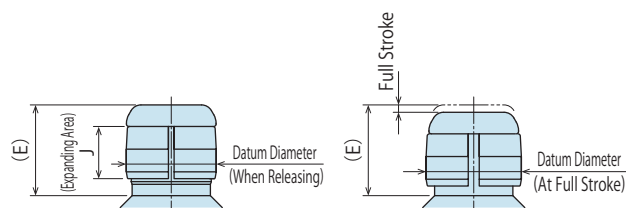
5 Seating Height : H20 / H25



Expanding Area Detail

When Releasing

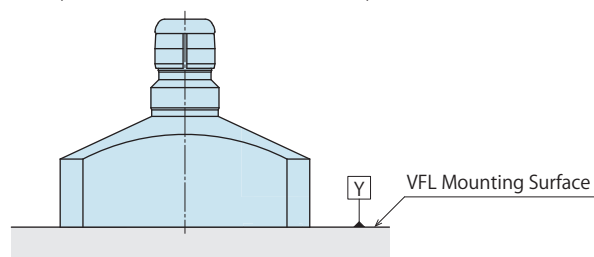
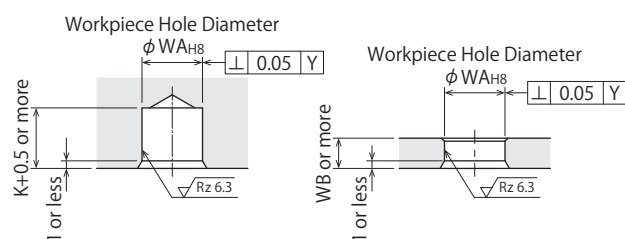
When Locking (At Full Stroke)



Workpiece Hole Dimensions

Blind Hole

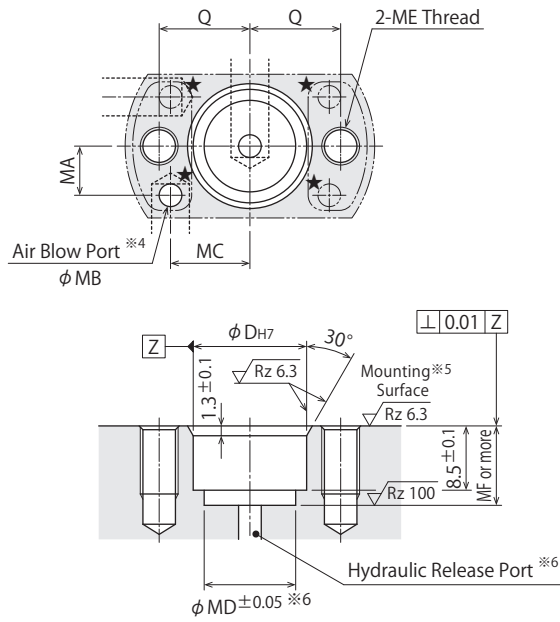
Through Hole



Notes :

- ※1. Identification mark is only marked on -C : Cut (for one direction locating). ◀ ▶ indicates the locating direction.
 - ※2. Do not use spring washer or toothed lock washer.
 - ※3. Set the O-ring to the mounting hole side (fixture side) before mounting the body.
1. When mounting the product, use two mounting bolts (Strength Grade 12.9) and tighten them evenly. Use two jack bolts to remove the product, keeping it parallel to the mounting surface.
 2. This product has no seat. Choose option -B : with Seating Surface or prepare additional seat if necessary.

Machining Dimensions for Mounting



Notes :

- ※4. Install the air blow port choosing one port from four ★ parts.
 - ※5. There might be foam near the flange bottom depending on roughness of mounting surface, but this is not a malfunction.
 - ※6. Prepare the hydraulic release port on the bottom within the range of φ MD.
1. Make sure to check the cautions for cylinder mounting distance accuracy, workpiece hole distance accuracy and mounting phase before installation. (Refer to P.1071.)

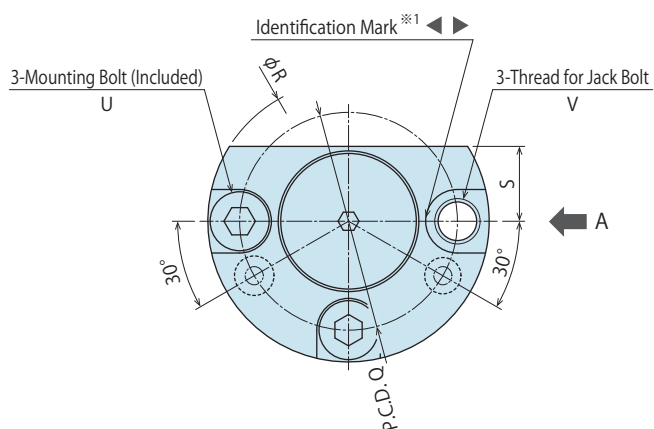
External Dimensions and Machining Dimensions for Mounting

(mm)

Model No.		VFL2000-□-□-□												VFL3000-□-□-□												VFL4000-□-□-□															
3 Workpiece Hole Diam. Code		080			090			100			110			120			130			140			150			160			170			180			190			200			
5 Seating Height		H15	H20	H25	H15	H20	H25	H15	H20	H25	H15	H20	H25	H15	H20	H25	H15	H20	H25	H15	H20	H25	H15	H20	H25	H15	H20	H25	H15	H20	H25	H15	H20	H25							
Workpiece Hole Diam. (Standard Diam.)		φ 8 ^{+0.022} ₀			φ 9 ^{+0.022} ₀			φ 10 ^{+0.022} ₀			φ 11 ^{+0.027} ₀			φ 12 ^{+0.027} ₀			φ 13 ^{+0.027} ₀			φ 14 ^{+0.027} ₀			φ 15 ^{+0.027} ₀			φ 16 ^{+0.027} ₀			φ 17 ^{+0.027} ₀			φ 18 ^{+0.027} ₀			φ 19 ^{+0.033} ₀			φ 20 ^{+0.033} ₀			
Datum	At Releasing	φ 7.94 or less			φ 8.94 or less			φ 9.94 or less			φ 10.94 or less			φ 11.92 or less			φ 12.92 or less			φ 13.92 or less			φ 14.92 or less			φ 15.89 or less			φ 16.89 or less			φ 17.89 or less			φ 18.89 or less			φ 19.89 or less			
Diameter	At Full Stroke	φ 8.05 or more			φ 9.05 or more			φ 10.05 or more			φ 11.05 or more			φ 12.05 or more			φ 13.05 or more			φ 14.05 or more			φ 15.05 or more			φ 16.07 or more			φ 17.07 or more			φ 18.07 or more			φ 19.07 or more			φ 20.07 or more			
Full Stroke		0.65												0.75												1.0															
A		32	37	42	32	37	42	32	37	42	32	37	42	32	37	42	32.5	37.5	42.5	32.5	37.5	42.5	32.5	37.5	42.5	32.5	37.5	42.5	34	39	44	34	39	44	34	39	44	34	39	44	
B		11	15.5	20.5	11	15.5	20.5	11	15	20	11	15	20	11	15.5	20.5	11	15.5	20.5	11	15.5	20.5	11	15	20	11	15	20	10.5	15.5	20.5	10.5	15.5	20.5	10.5	15.5	20.5	10.5	15.5	20.5	
C		3.2	4	4	3.2	4	4	3.2	4.5	4.5	3.2	4.5	4.5	3.2	4	4	3.2	4.5	4.5	3.2	4.5	4.5	3.2	4.5	4.5	3.7	4	4	3.7	4	4	3.7	4	4	3.7	4	4	3.7	4	4	
D h6 (Body Side)		15 ^{-0.011} ₀												15 ^{-0.011} ₀												18 ^{-0.011} ₀															
D H7 (Machining Hole)		15 ^{+0.018} ₀												15 ^{+0.018} ₀												18 ^{+0.018} ₀															
E		8.3	8	8	8.3	8	8	8.3	8	8	8.3	8	8	8.8	8.5	8.5	8.8	8.5	8.5	8.8	8.5	8.5	8.8	8.5	8.5	10.3	10	10	10.3	10	10	10.3	10	10	10.3	10	10	10.3	10	10	
F		9	9	9.5	9	9	9.5	9	9	9.5	9	9	9.5	9	9	9.5	9	9	9.5	9	9	9.5	9	9	9.5	8	11	11	8	11	11	8	11	11	8	11	11	8	11	11	
G		8°	25°	40°	8°	25°	40°	8°	25°	40°	8°	25°	40°	8°	25°	40°	8°	25°	40°	8°	25°	40°	8°	25°	40°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°	
H		15	20	25	15	20	25	15	20	25	15	20	25	15	20	25	15	20	25	15	20	25	15	20	25	15	20	25	15	20	25	15	20	25	15	20	25	15	20	25	
J		4.6												5.1												6															
K		7.5												8												9.5															
L		7.9			8.9			9.8			10.8			11.8			12.8			13.8			14.8			15.7			16.7			17.7			18.7			19.7			
M		6.5			7.5			8.5			9.5			10.5			11.5			12.5			13.5			14			15			16			17			18			
N		14.5	9	9	14.5	10	10	14.5	11	11	14.5	12	12	18.5	13	13	18.5	14	14	18.5	15	15	18.5	16	16	22.5	17	17	22.5	18	18	22.5	19	19	22.5	20	20	22.5	21	21	
P		4												4												5															
Q		12												14												17.5															
R		33												37												47															
S		19												19												23															
U		M5×0.8×12												M5×0.8×12												M6×1×16															
V		M6×1												M6×1												M8×1.25															
W		AS568-013 (90)												AS568-013 (90)												AS568-015 (90)															
CA		2.5			2.5			3			3			3.5			3.5			4			4			4.5			4.5			5			5			5			
CB		7.8			8.8			9.7			10.7			11.7			12.7			13.7			14.7			15.5			16.5			17.5			18.5			19.5			
MA		6.5												6.5												7.5															
MB		3												3												4															
MC		10.5												10.5												13															
MD		12.1												12.1												15.1															
ME		M5×0.8 Thread Depth 9 or more												M5×0.8 Thread Depth 9 or more												M6×1 Thread Depth 12 or more															
MF		10.5												10.5												11															
WA		8 ^{+0.022} ₀	9 ^{+0.022} ₀			10 ^{+0.022} ₀			11 ^{+0.027} ₀			12 ^{+0.027} ₀			13 ^{+0.027} ₀			14 ^{+0.027} ₀			15 ^{+0.027} ₀			16 ^{+0.027} ₀			17 ^{+0.027} ₀			18 ^{+0.027} ₀			19 ^{+0.033} ₀			20 ^{+0.033} ₀					
WB		4												4.5												5.5															
Weight		q	60	70	80	60	70	80	60	70	80	60	70	80	70	80	90	70	80	100	70	80	100	70	80	100	110	130	150	110	130	150	110	130	150	110	130	160	120	140	160

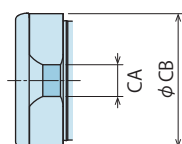
External Dimensions

※ The drawing shows the released state of VFL5000 / VFL6000.



VFL-D

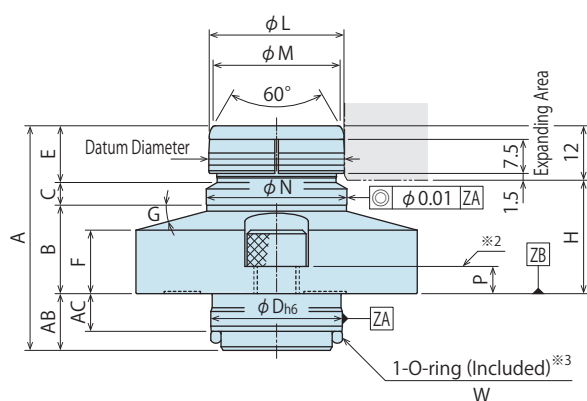
(Datum : Reference Locating)



VFL-C

(Cut : One Direction Locating)

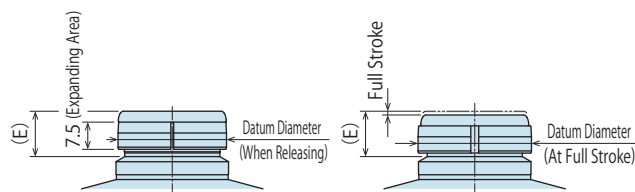
View A



Expanding Area Detail

When Releasing

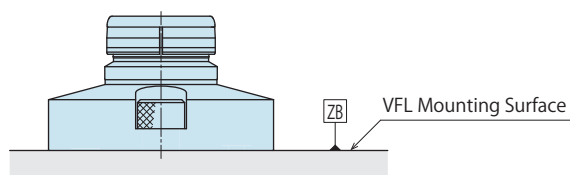
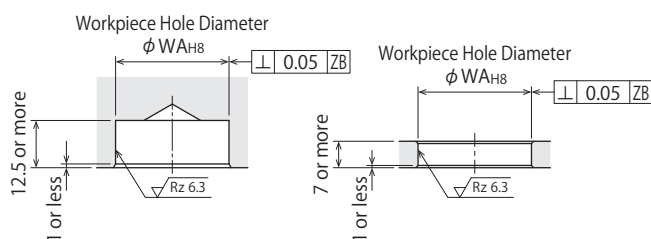
When Locking (At Full Stroke)



Workpiece Hole Dimensions

Blind Hole

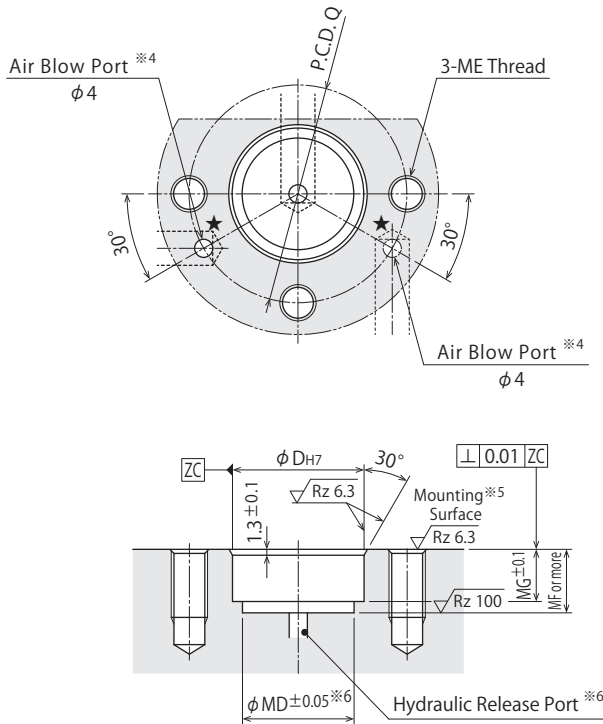
Through Hole



Notes :

- ※1. Identification mark is only marked on -C : Cut (for one direction locating). ◀ ▶ indicates the locating direction.
 - ※2. Do not use spring washer or toothed lock washer.
 - ※3. Set the O-ring to the mounting hole side (fixture side) before mounting the body.
1. When mounting the product, use three mounting bolts (Strength Grade 12.9) and tighten them evenly. Use three jack bolts to remove the product, keeping it parallel to the mounting surface.
 2. This product has no seat. Choose option -B : with Seating Surface or prepare an additional seat if necessary.

Machining Dimensions for Mounting



Notes :

- ※4. Install the air blow port choosing one port from two ★ parts.
 - ※5. There might be foam near the flange bottom depending on roughness of mounting surface, but this is not a malfunction.
 - ※6. Prepare the hydraulic release port on the bottom within the range of φ MD.
- Make sure to check the cautions for cylinder mounting distance accuracy, workpiece hole distance accuracy and mounting phase before installation. (Refer to P.1071.)

External Dimensions and Machining Dimensions for Mounting

(mm)

Model No.		VFL5000-□-□															VFL6000-□-□																
3 Workpiece Hole Diam. Code		210			220			230			240			250			260			270			280			290			300				
5 Seating Height		H15	H20	H25	H15	H20	H25	H15	H20	H25	H15	H20	H25	H15	H20	H25	H20	H25	H30	H20	H25	H30	H20	H25	H30	H20	H25	H30	H20	H25	H30		
Workpiece Hole Diam. (Standard Diam.)		φ 21H8 ^{+0.033} ₀			φ 22H8 ^{+0.033} ₀			φ 23H8 ^{+0.033} ₀			φ 24H8 ^{+0.033} ₀			φ 25H8 ^{+0.033} ₀			φ 26H8 ^{+0.033} ₀			φ 27H8 ^{+0.033} ₀			φ 28H8 ^{+0.033} ₀			φ 29H8 ^{+0.033} ₀			φ 30H8 ^{+0.033} ₀				
Datum	At Releasing	φ 20.89 or less			φ 21.89 or less			φ 22.89 or less			φ 23.89 or less			φ 24.89 or less			φ 25.89 or less			φ 26.89 or less			φ 27.89 or less			φ 28.89 or less			φ 29.89 or less				
Diameter	At Full Stroke	φ 21.07 or more			φ 22.07 or more			φ 23.07 or more			φ 24.07 or more			φ 25.07 or more			φ 26.07 or more			φ 27.07 or more			φ 28.07 or more			φ 29.07 or more			φ 30.07 or more				
Full Stroke		1																															
A		38	43	48	38	43	48	38	43	48	38	43	48	38	43	48	44.5	49.5	54.5	44.5	49.5	54.5	44.5	49.5	54.5	44.5	49.5	54.5	44.5	49.5	54.5		
B		10.5	15.5	20.5	10.5	15.5	20.5	10.5	15.5	20.5	10.5	15.5	20.5	10.5	15.5	20.5	14.5	20	25	14.5	20	25	14.5	20	25	14.5	19.5	24.5	14.5	19.5	24.5		
C		3.7	4	4	3.7	4	4	3.7	4	4	3.7	4	4	3.7	4	4	4.7	4.5	4.5	4.7	4.5	4.5	4.7	4.5	4.5	4.7	4.5	4.7	5	5	4.7	5	5
D h6 (Body Side)		24 ⁰ _{-0.013}															29 ⁰ _{-0.013}																
D H7 (Machining Hole)		24 ^{+0.021} ₀															29 ^{+0.021} ₀																
E		12.8	12.5	12.5	12.8	12.5	12.5	12.8	12.5	12.5	12.8	12.5	12.5	12.8	12.5	12.5	12.8	12.5	12.5	12.8	12.5	12.5	12.8	12.5	12.5	12.8	12.5	12.5	12.8	12.5	12.5		
F		8	11	11	8	11	11	8	11	11	8	11	11	8	11	11	11	14	14	11	14	14	11	14	14	11	14	14	11	14	14		
G		8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°		
H		15	20	25	15	20	25	15	20	25	15	20	25	15	20	25	20	25	30	20	25	30	20	25	30	20	25	30	20	25	30		
L		20.7			21.7			22.7			23.7			24.7			25.7			26.7			27.7			28.7			29.7				
M		19			20			21			22			23			24			25			26			27			28				
N		27.5	22	22	27.5	23	23	27.5	24	24	27.5	25	25	27.5	26	26	32.5	27	27	32.5	28	28	32.5	29	29	32.5	30	30	32.5	31	31		
P		5															6																
Q		40															48																
R		51															62																
S		14															16.5																
U		M6×1×16															M8×1.25×20																
V		M8×1.25															M10×1.5																
W		AS568-019 (90)															AS568-119 (90)																
AB		11															12.5																
AC		8															8.3																
CA		5.5			5.5			6			6			6			6.5			6.5			7			7			7				
CB		20.5			21.5			22.5			23.5			24.5			25.5			26.5			27.5			28.5			29.5				
MD		21.1															24.6																
ME		M6×1 Thread Depth 12 or more															M8×1.25 Thread Depth 15 or more																
MF		12.5															14																
MG		10															11.5																
WA		21 ^{+0.033} ₀	22 ^{+0.033} ₀			23 ^{+0.033} ₀			24 ^{+0.033} ₀			25 ^{+0.033} ₀			26 ^{+0.033} ₀			27 ^{+0.033} ₀			28 ^{+0.033} ₀			29 ^{+0.033} ₀			30 ^{+0.033} ₀						
Weight g		190	220	250	190	220	260	190	230	260	200	230	260	200	230	270	350	400	440	350	400	450	350	400	450	360	410	460	360	410	460		

High-Power Series

Pneumatic Series

Hydraulic Series

Valve / Coupler Hydraulic Unit

Manual Operation Accessories

Cautions / Others

Hole Clamp

SFA

SFC

Swing Clamp

LHA

LHC

LHS

LHW

LG/LT

TLA-2

TLB-2

TLA-1

Link Clamp

LKA

LKC

LKW

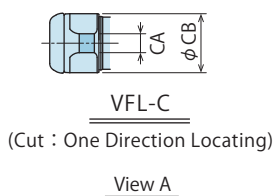
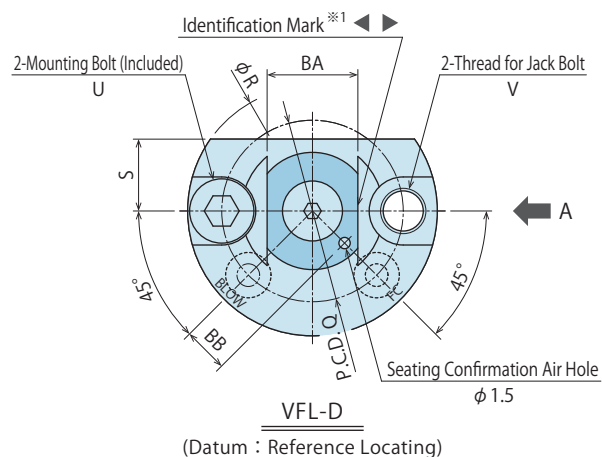
LJ/LM

TMA-2

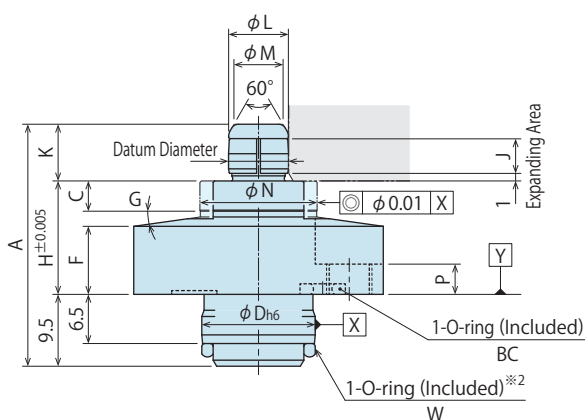
External Dimensions

※ The drawing shows the released state of VFL2000-BR / VFL3000-BR / VFL4000-BR.

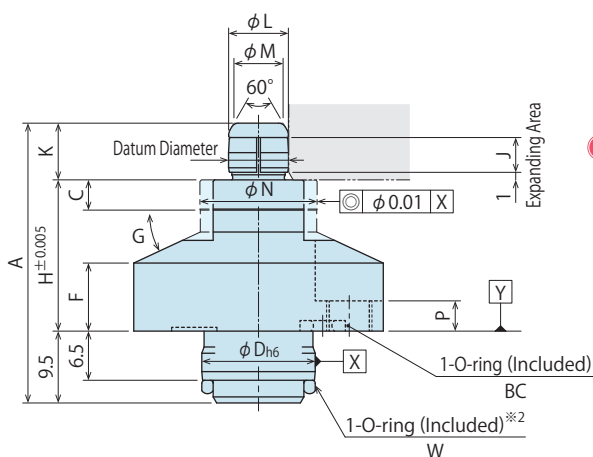
The ports of VFL2000-BL / VFL3000-BL / VFL4000-BL are placed to the symmetrical positions of this drawing.



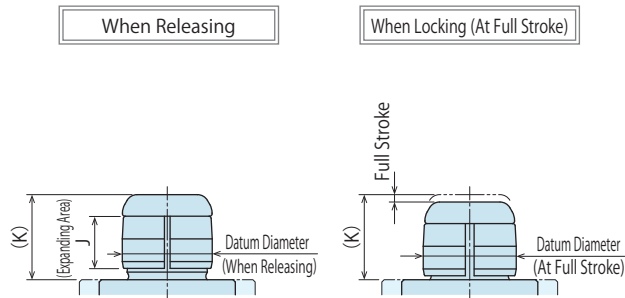
5 Seating Height : H15



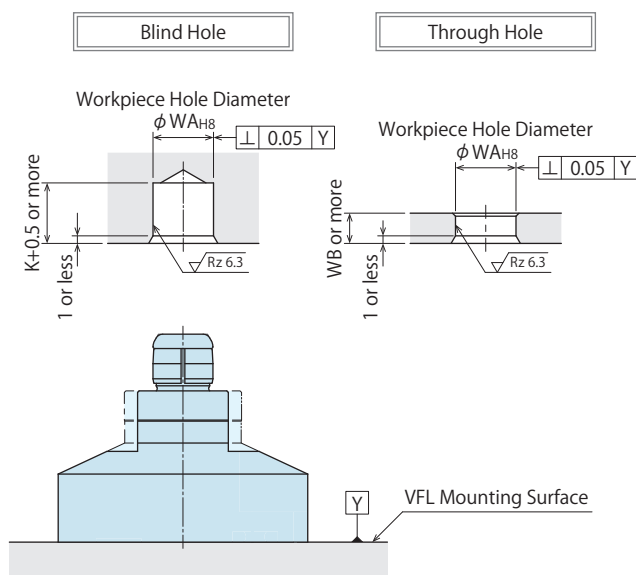
5 Seating Height : H20 / H25



Expanding Area Detail



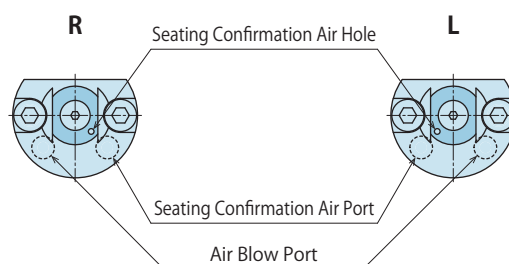
Workpiece Hole Dimensions



Notes :

- ※1. Identification mark is only marked on -C : Cut (for one direction locating). ◀ ▶ indicates the locating direction.
 - ※2. Set the O-ring to the mounting hole side (fixture side) before mounting the body.
1. When mounting the product, use two mounting bolts (Strength Grade 12.9) and tighten them evenly. Use two jack bolts to remove the product, keeping it parallel to the mounting surface.
 2. The port names are marked on the product surface. (BLOW : Air Blow Port, FC : Seating Confirmation Air Port) Continuously supply air pressure to the air blow port and seating confirmation air port.

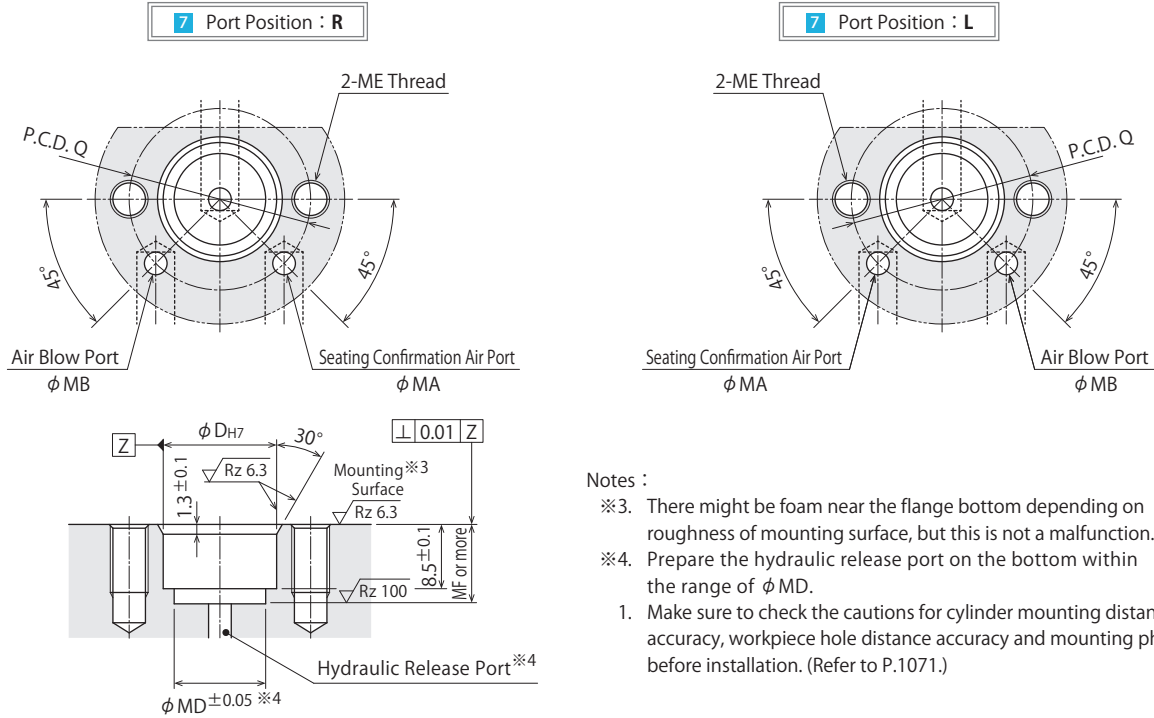
Port Position



Note :

3. Please make sure that the port positions are correct.

Machining Dimensions for Mounting

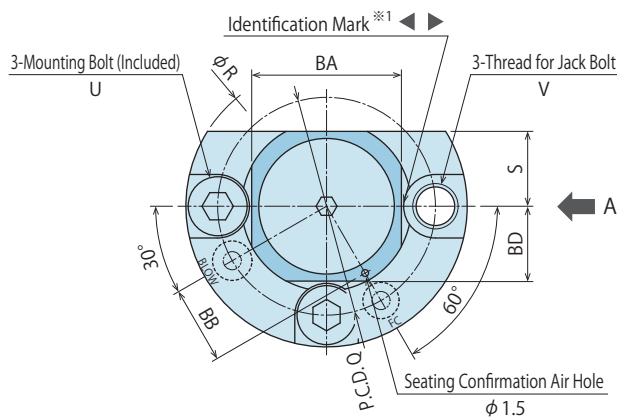


External Dimensions and Machining Dimensions for Mounting

Model No.		VFL2000-□-□-□-□-□												VFL3000-□-□-□-□-□												VFL4000-□-□-□-□-□																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
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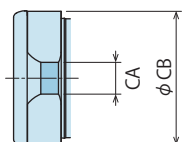
External Dimensions

※ The drawing shows the released state of VFL5000-BR / VFL6000-BR.
The ports of VFL5000-BL / VFL6000-BL are placed to the symmetrical positions of this drawing.



VFL-D

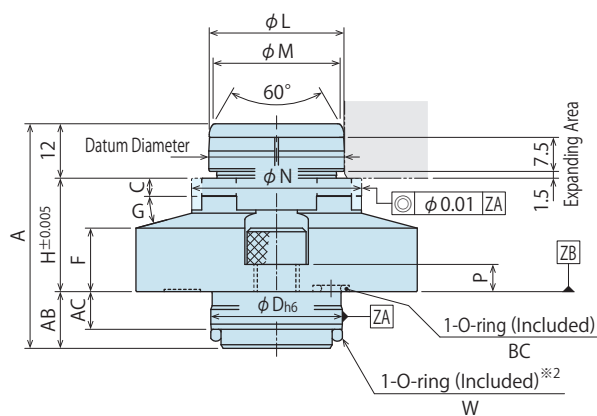
(Datum : Reference Locating)



VFL-C

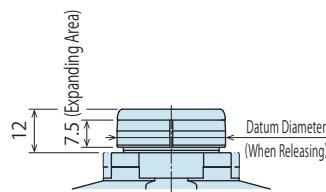
(Cut : One Direction Locating)

View A

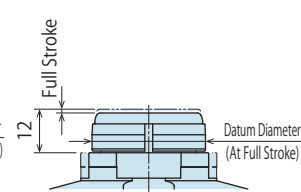


Expanding Area Detail

When Releasing

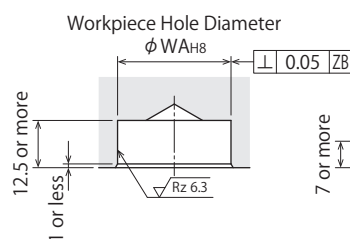


When Locking (At Full Stroke)

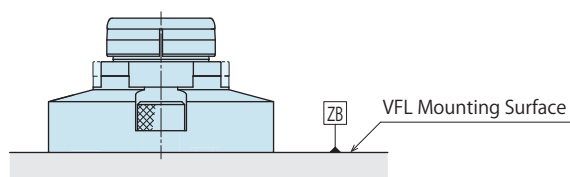
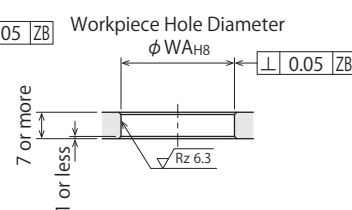


Workpiece Hole Dimensions

Blind Hole



Through Hole



Notes :

- ※1. Identification mark is only marked on -C : Cut (for one direction locating). ◀ ▶ indicates the locating direction.
 - ※2. Set the O-ring to the mounting hole side (fixture side) before mounting the body.
1. When mounting the product, use three mounting bolts (Strength Grade 12.9) and tighten them evenly. Use three jack bolts to remove the product, keeping it parallel to the mounting surface.
 2. The port names are marked on the product surface. (BLOW : Air Blow Port, FC : Seating Confirmation Air Port) Continuously supply air pressure to the air blow port and seating confirmation air port.

Port Position

R

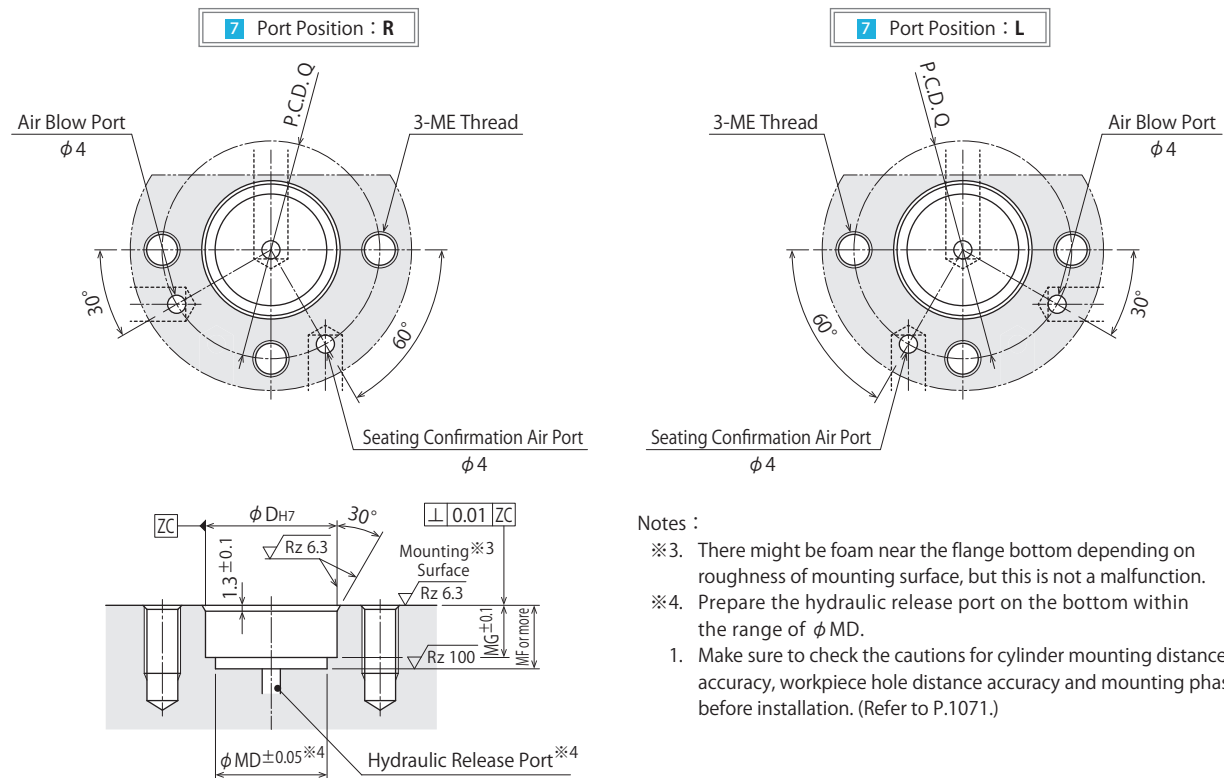
L



Note :

3. Please make sure that the port positions are correct.

Machining Dimensions for Mounting



External Dimensions and Machining Dimensions for Mounting

(mm)

Model No.		VFL5000-□-□-□-□															VFL6000-□-□-□-□														
3	Workpiece Hole Diam. Code	210			220			230			240			250			260			270			280			290			300		
5	Seating Height	H15	H20	H25	H15	H20	H25	H15	H20	H25	H15	H20	H25	H15	H20	H25	H20	H25	H30	H20	H25	H30	H20	H25	H30	H20	H25	H30	H20	H25	H30
Workpiece Hole Diam. (Standard Diam.)		φ 21H8 ^{+0.033} ₀			φ 22H8 ^{+0.033} ₀			φ 23H8 ^{+0.033} ₀			φ 24H8 ^{+0.033} ₀			φ 25H8 ^{+0.033} ₀			φ 26H8 ^{+0.033} ₀			φ 27H8 ^{+0.033} ₀			φ 28H8 ^{+0.033} ₀			φ 29H8 ^{+0.033} ₀			φ 30H8 ^{+0.033} ₀		
Datum	At Releasing	φ 20.89 or less			φ 21.89 or less			φ 22.89 or less			φ 23.89 or less			φ 24.89 or less			φ 25.89 or less			φ 26.89 or less			φ 27.89 or less			φ 28.89 or less			φ 29.89 or less		
Diameter	At Full Stroke	φ 21.07 or more			φ 22.07 or more			φ 23.07 or more			φ 24.07 or more			φ 25.07 or more			φ 26.07 or more			φ 27.07 or more			φ 28.07 or more			φ 29.07 or more			φ 30.07 or more		
Full Stroke		1																													
A		38	43	48	38	43	48	38	43	48	38	43	48	38	43	48	44.5	49.5	54.5	44.5	49.5	54.5	44.5	49.5	54.5	44.5	49.5	54.5	44.5	49.5	54.5
C		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
D h6 (Body Side)		24 ⁰ _{-0.013}															29 ⁰ _{-0.013}														
D H7 (Machining Hole)		24 ⁰ _{+0.021}															29 ⁰ _{+0.021}														
F		8	11	11	8	11	11	8	11	11	8	11	11	8	11	11	11	14	14	11	14	14	11	14	14	11	14	14	11	14	14
G		8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°
H		15	20	25	15	20	25	15	20	25	15	20	25	15	20	25	20	25	30	20	25	30	20	25	30	20	25	30	20	25	30
L		20.7			21.7			22.7			23.7			24.7			25.7			26.7			27.7			28.7			29.7		
M		19			20			21			22			23			24			25			26			27			28		
N		28.5			29.5			30.5			31.5			32.5			33.5			34.5			35.5			36.5			37.5		
P		5															6														
Q		40															48														
R		51															62														
S		14															16.5														
U		M6×1×16															M8×1.25×20														
V		M8×1.25															M10×1.5														
W		AS568-019 (90)															AS568-119 (90)														
AB		11															12.5														
AC		8															8.3														
BA		24			25			26			27			28			29			30			31			32			33		
BB		12.5			13			13.5			14			14.5			15			15.5			16			16.5			17		
BC		AS568-007 (90)															OR NBR-90 P5-N														
BD		12.5			13			13.5			14			14.3			15			15.5			16			16.5			16.5		
CA		5.5			5.5			6			6			6			6.5			6.5			7			7			7		
CB		20.5			21.5			22.5			23.5			24.5			25.5			26.5			27.5			28.5			29.5		
MD		21.1															24.6														
ME		M6×1 Thread Depth 12 or more															M8×1.25 Thread Depth 15 or more														
MF		12.5															14														
MG		10															11.5														
WA		21 ^{+0.033} ₀			22 ^{+0.033} ₀			23 ^{+0.033} ₀			24 ^{+0.033} ₀			25 ^{+0.033} ₀			26 ^{+0.033} ₀			27 ^{+0.033} ₀			28 ^{+0.033} ₀			29 ^{+0.033} ₀			30 ^{+0.033} ₀		
Weight g		190	220	250	190	220	260	190	230	260	200	230	260	200	230	270	350	400	440	350	400	450	350	400	450	360	410	460	360	410	460

High-Power Series

Pneumatic Series

Hydraulic Series

Valve / Coupler Hydraulic Unit

Manual Operation Accessories

Cautions / Others

Hole Clamp

SFA
SFC

Swing Clamp

LHA
LHC
LHS
LHW
LG/LT
TLA-2
TLB-2
TLA-1

Link Clamp

LKA
LKC
LKW
LJ/LM
TMA-2
TMA-1

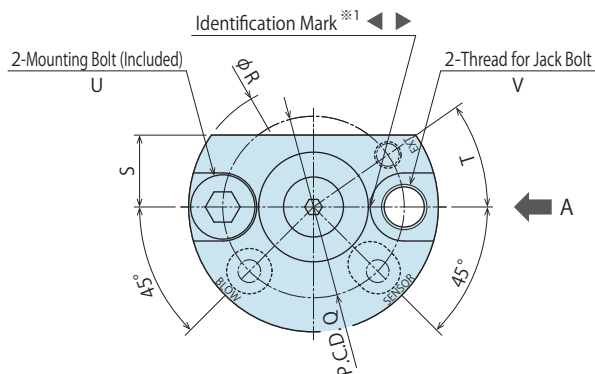
Work Support

LD
LC
TNC
TC

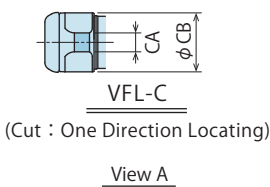
Air Sensing

External Dimensions

※ The drawing shows the released state of VFL2000-MR / VFL3000-MR / VFL4000-MR.
The ports of VFL2000-ML / VFL3000-ML / VFL4000-ML are placed to the symmetrical positions of this drawing.



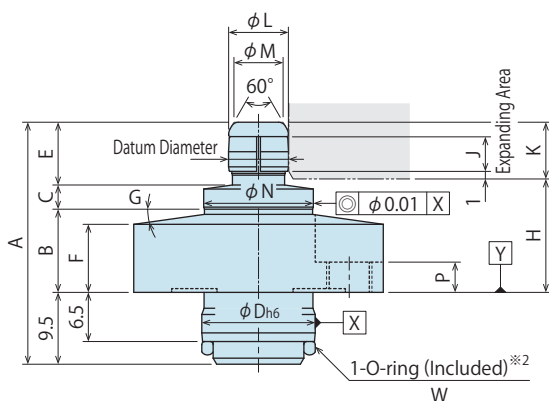
VFL-D
(Datum : Reference Locating)



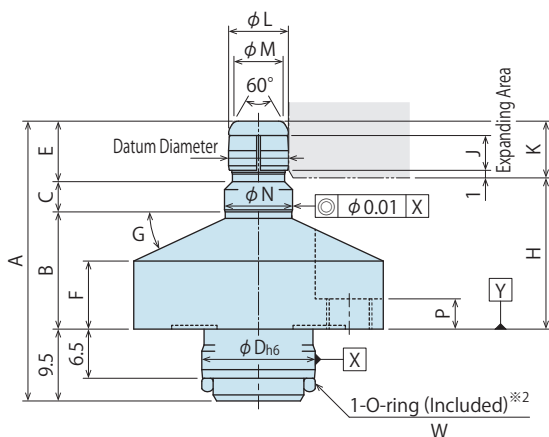
VFL-C
(Cut : One Direction Locating)

View A

5 Seating Height : H15



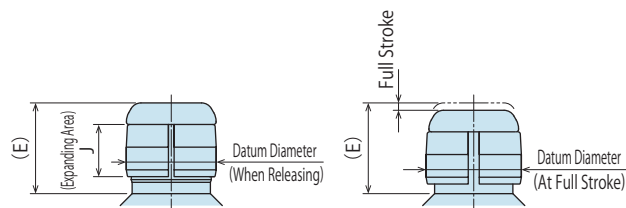
5 Seating Height : H20 / H25



Expanding Area Detail

When Releasing

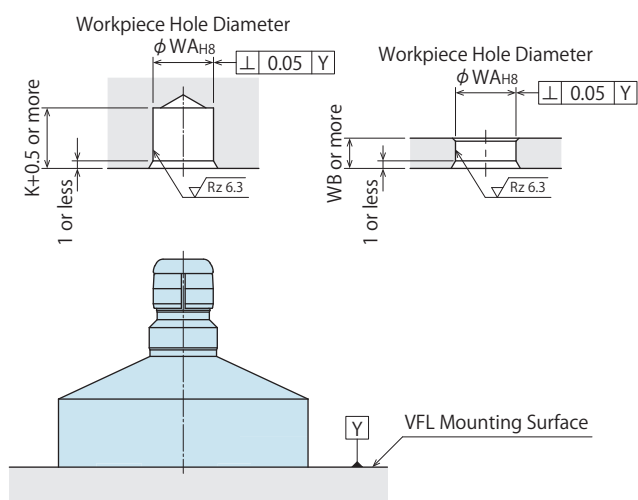
When Locking (At Full Stroke)



Workpiece Hole Dimensions

Blind Hole

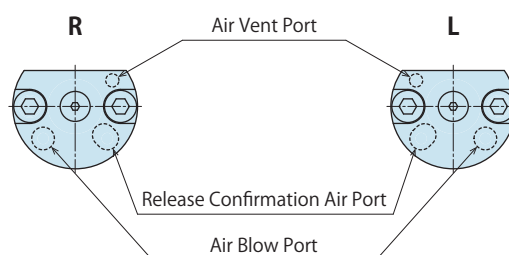
Through Hole



Notes :

- ※1. Identification mark is only marked on -C : Cut (for one direction locating). ◀ ▶ indicates the locating direction.
- ※2. Set the O-ring to the mounting hole side (fixture side) before mounting the body.
- 1. When mounting the product, use two mounting bolts (Strength Grade 12.9) and tighten them evenly. Use two jack bolts to remove the product, keeping it parallel to the mounting surface.
- 2. The port names are marked on the product surface. (EXT : Air Vent Port, BLOW : Air Blow Port, SENSOR : Release Confirmation Air Port) Continuously supply air pressure to the air blow port and release confirmation air port.
- 3. This product has no seat. Choose option -B : with Seating Surface or prepare an additional seat if necessary.

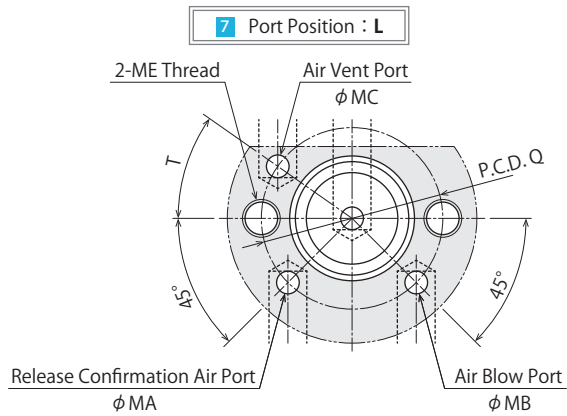
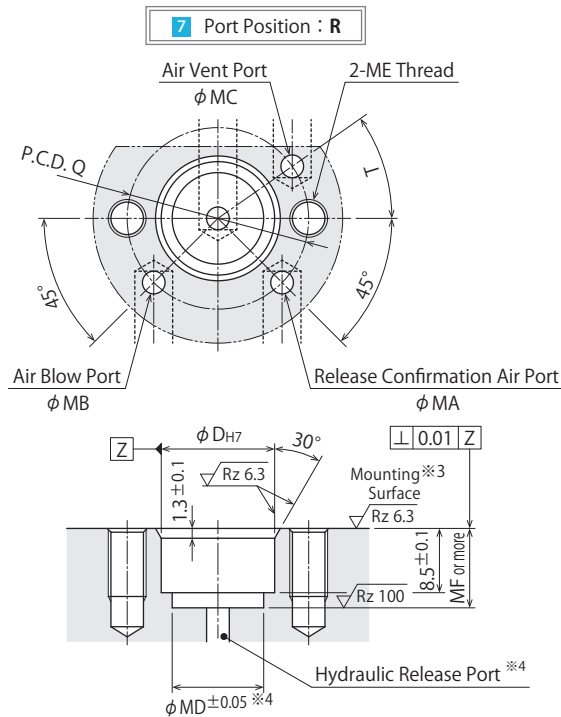
Port Position



Note :

- 4. Please make sure that the port positions are correct.

Machining Dimensions for Mounting



Notes :

- ※3. There might be foam near the flange bottom depending on roughness of mounting surface, but this is not a malfunction.
 - ※4. Prepare the hydraulic release port on the bottom within the range of φMD.
1. Make sure to check the cautions for cylinder mounting distance accuracy, workpiece hole distance accuracy and mounting phase before installation. (Refer to P.1071.)

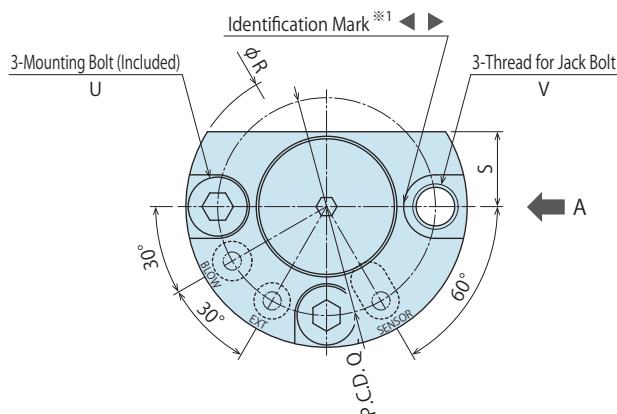
External Dimensions and Machining Dimensions for Mounting

(mm)

Model No.		VFL2000-□-□-□-□-□												VFL3000-□-□-□-□-□												VFL4000-□-□-□-□-□															
3 Workpiece Hole Diam. Code		080			090			100			110			120			130			140			150			160			170			180			190			200			
5 Seating Height		H15	H20	H25	H15	H20	H25	H15	H20	H25	H15	H20	H25	H15	H20	H25	H15	H20	H25	H15	H20	H25	H15	H20	H25	H15	H20	H25	H15	H20	H25	H15	H20	H25	H15	H20	H25				
Workpiece Hole Diam. (Standard Diam.)		φ 8H ₈ ^{+0.022} ₀			φ 9H ₈ ^{+0.022} ₀			φ 10H ₈ ^{+0.022} ₀			φ 11H ₈ ^{+0.027} ₀			φ 12H ₈ ^{+0.027} ₀			φ 13H ₈ ^{+0.027} ₀			φ 14H ₈ ^{+0.027} ₀			φ 15H ₈ ^{+0.027} ₀			φ 16H ₈ ^{+0.027} ₀			φ 17H ₈ ^{+0.027} ₀			φ 18H ₈ ^{+0.027} ₀			φ 19H ₈ ^{+0.033} ₀			φ 20H ₈ ^{+0.033} ₀			
Datum	At Releasing	φ 7.94 or less			φ 8.94 or less			φ 9.94 or less			φ 10.94 or less			φ 11.92 or less			φ 12.92 or less			φ 13.92 or less			φ 14.92 or less			φ 15.89 or less			φ 16.89 or less			φ 17.89 or less			φ 18.89 or less			φ 19.89 or less			
Diameter	At Full Stroke	φ 8.05 or more			φ 9.05 or more			φ 10.05 or more			φ 11.05 or more			φ 12.05 or more			φ 13.05 or more			φ 14.05 or more			φ 15.05 or more			φ 16.07 or more			φ 17.07 or more			φ 18.07 or more			φ 19.07 or more			φ 20.07 or more			
Full Stroke		0.65												0.75												1.0															
A		32	37	42	32	37	42	32	37	42	32	37	42	32.5	37.5	42.5	32.5	37.5	42.5	32.5	37.5	42.5	32.5	37.5	42.5	34	39	44	34	39	44	34	39	44	34	39	44				
B		11	15.5	20.5	11	15.5	20.5	11	15	20	11	15	20	11	15.5	20.5	11	15.5	20.5	11	15	20	11	15	20	10.5	15.5	20.5	10.5	15.5	20.5	10.5	15.5	20.5	10.5	15.5	20.5				
C		3.2	4	4	3.2	4	4	3.2	4.5	4.5	3.2	4.5	4.5	3.2	4	4	3.2	4.5	4.5	3.2	4.5	4.5	3.2	4.5	4.5	3.7	4	4	3.7	4	4	3.7	4	4	3.7	4	4				
D h6 (Body Side)		15 ₀ ^{-0.011}												15 ₀ ^{-0.011}												18 ₀ ^{-0.011}															
D H7 (Machining Hole)		15 ₀ ^{+0.018}												15 ₀ ^{+0.018}												18 ₀ ^{+0.018}															
E		8.3	8	8	8.3	8	8	8.3	8	8	8.3	8	8	8.8	8.5	8.5	8.8	8.5	8.5	8.8	8.5	8.5	8.8	8.5	8.5	10.3	10	10	10.3	10	10	10.3	10	10	10.3	10	10				
F		9	9	9.5	9	9	9.5	9	9	9.5	9	9	9.5	9	9	9.5	9	9	9.5	9	9	9.5	9	9	9.5	8	11	11	8	11	11	8	11	11	8	11	11				
G		8°	25°	40°	8°	25°	40°	8°	25°	40°	8°	25°	40°	8°	25°	40°	8°	25°	40°	8°	25°	40°	8°	25°	40°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°				
H		15	20	25	15	20	25	15	20	25	15	20	25	15	20	25	15	20	25	15	20	25	15	20	25	15	20	25	15	20	25	15	20	25	15	20	25				
J		4.6												5.1												6															
K		7.5												8												9.5															
L		7.9			8.9			9.8			10.8			11.8			12.8			13.8			14.8			15.7			16.7			17.7			18.7			19.7			
M		6.5			7.5			8.5			9.5			10.5			11.5			12.5			13.5			14			15			16			17			18			
N		14.5	9	9	14.5	10	10	14.5	11	11	14.5	12	12	18.5	13	13	18.5	14	14	18.5	15	15	18.5	16	16	22.5	17	17	22.5	18	18	22.5	19	19	22.5	20	20	22.5	21	21	
P		4												4												5															
Q		24												28												35															
R		33												37												47															
S		9.5												9.5												11.5															
T		35°												30°												30°															
U		M5×0.8×12												M5×0.8×12												M6×1×16															
V		M6×1												M6×1												M8×1.25															
W		AS568-013 (90)												AS568-013 (90)												AS568-015 (90)															
CA		2.5			2.5			3			3			3.5			3.5			4			4			4.5			4.5			5			5			5			
CB		7.8			8.8			9.7			10.7			11.7			12.7			13.7			14.7			15.5			16.5			17.5			18.5			19.5			
MA		3												3												4															
MB		3												3												4															
MC		3												3												4															
MD		12.1												12.1												15.1															
ME		M5×0.8 Thread Depth 9 or more												M5×0.8 Thread Depth 9 or more												M6×1 Thread Depth 12 or more															
MF		10.5												10.5												11															
WA		8 ₀ ^{+0.022}			9 ₀ ^{+0.022}			10 ₀ ^{+0.022}			11 ₀ ^{+0.027}			12 ₀ ^{+0.027}			13 ₀ ^{+0.027}			14 ₀ ^{+0.027}			15 ₀ ^{+0.027}			16 ₀ ^{+0.027}			17 ₀ ^{+0.027}			18 ₀ ^{+0.027}			19 ₀ ^{+0.033}			20 ₀ ^{+0.033}			
WB		4												4.5												5.5															
Weight		q	70	80	100	70	80	100	70	80	100	70	80	100	80	100	110	80	100	110	80	100	120	80	100	120	130	160	180	130	160	190	130	160	190	140	160	190	140	160	190

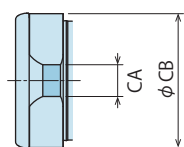
External Dimensions

※ The drawing shows the released state of VFL5000-MR / VFL6000-MR.
The ports of VFL5000-ML / VFL6000-ML are placed to the symmetrical positions of this drawing.



VFL-D

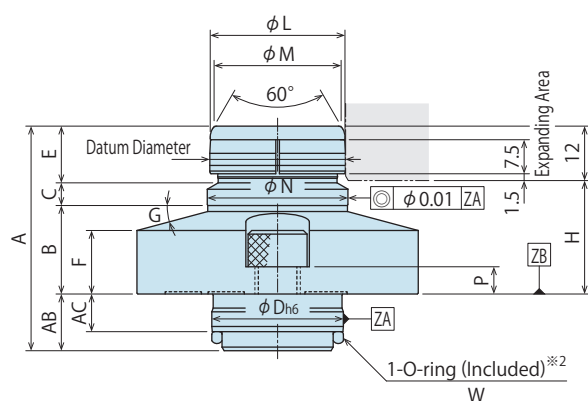
(Datum : Reference Locating)



VFL-C

(Cut : One Direction Locating)

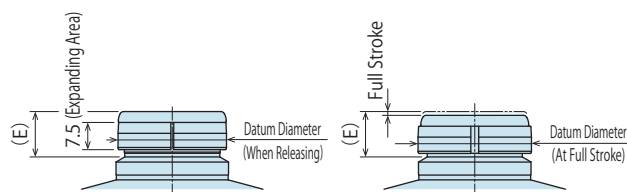
View A



Expanding Area Detail

When Releasing

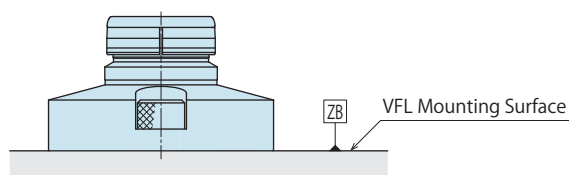
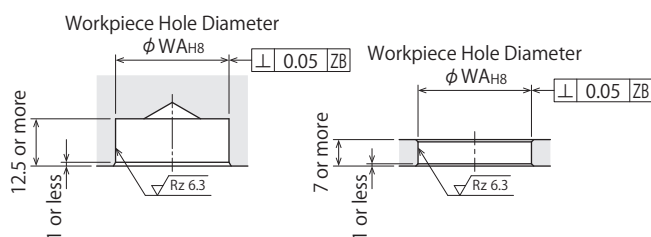
When Locking (At Full Stroke)



Workpiece Hole Dimensions

Blind Hole

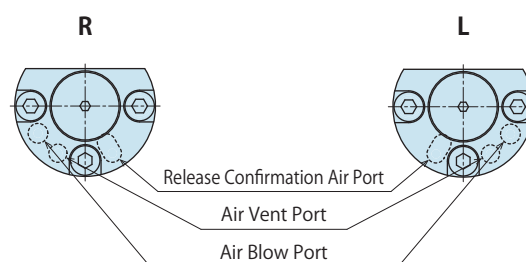
Through Hole



Notes :

- ※1. Identification mark is only marked on -C : Cut (for one direction locating). ◀ ▶ indicates the locating direction.
- ※2. Set the O-ring to the mounting hole side (fixture side) before mounting the body.
- 1. When mounting the product, use three mounting bolts (Strength Grade 12.9) and tighten them evenly. Use three jack bolts to remove the product, keeping it parallel to the mounting surface.
- 2. The port names are marked on the product surface. (EXT : Air Vent Port, BLOW : Air Blow Port, SENSOR : Release Confirmation Air Port) Continuously supply air pressure to the air blow port and release confirmation air port.
- 3. This product has no seat. Choose option -B : with Seating Surface or prepare an additional seat if necessary.

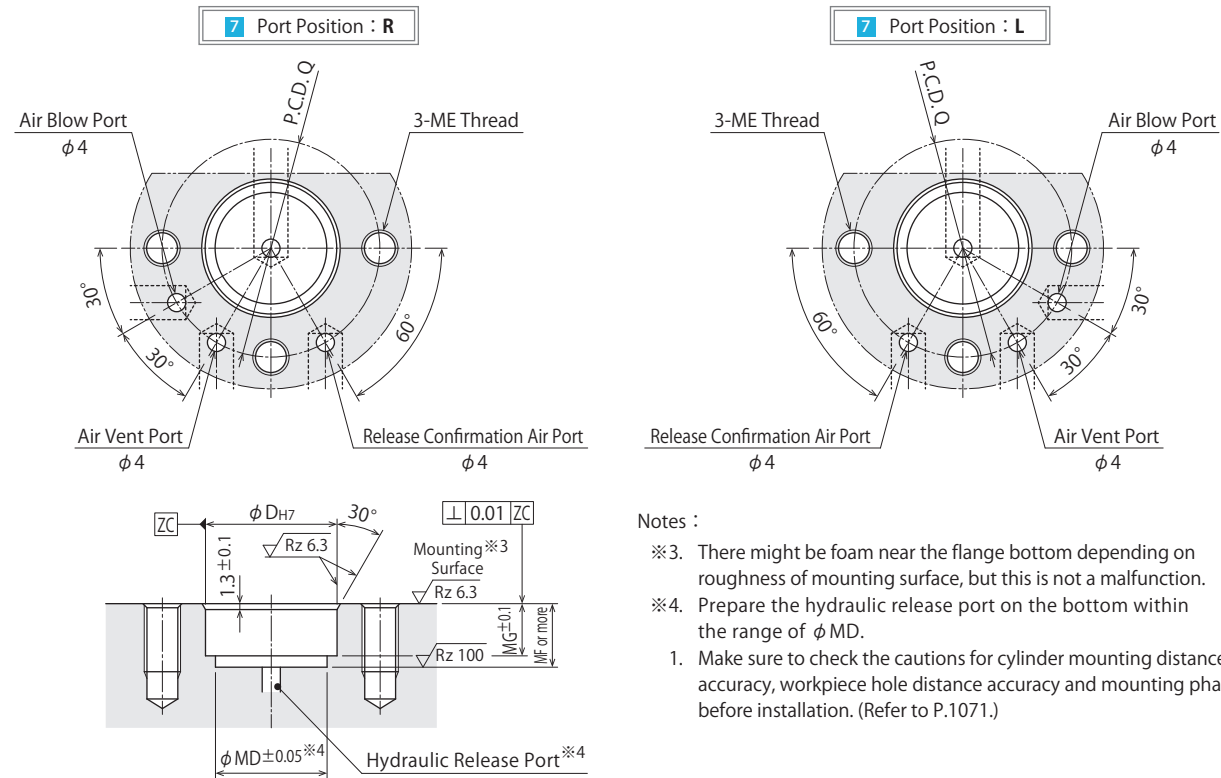
Port Position



Note :

- 4. Please make sure that the port positions are correct.

Machining Dimensions for Mounting



External Dimensions and Machining Dimensions for Mounting

(mm)

Model No.		VFL5000-□-□-M□															VFL6000-□-□-M□																
3 Workpiece Hole Diam. Code		210			220			230			240			250			260			270			280			290			300				
5 Seating Height		H15	H20	H25	H15	H20	H25	H15	H20	H25	H15	H20	H25	H15	H20	H25	H20	H25	H30	H20	H25	H30	H20	H25	H30	H20	H25	H30					
Workpiece Hole Diam. (Standard Diam.)		φ21H8 ^{+0.033} ₀			φ22H8 ^{+0.033} ₀			φ23H8 ^{+0.033} ₀			φ24H8 ^{+0.033} ₀			φ25H8 ^{+0.033} ₀			φ26H8 ^{+0.033} ₀			φ27H8 ^{+0.033} ₀			φ28H8 ^{+0.033} ₀			φ29H8 ^{+0.033} ₀			φ30H8 ^{+0.033} ₀				
Datum	At Releasing	φ20.89 or less			φ21.89 or less			φ22.89 or less			φ23.89 or less			φ24.89 or less			φ25.89 or less			φ26.89 or less			φ27.89 or less			φ28.89 or less			φ29.89 or less				
Diameter	At Full Stroke	φ21.07 or more			φ22.07 or more			φ23.07 or more			φ24.07 or more			φ25.07 or more			φ26.07 or more			φ27.07 or more			φ28.07 or more			φ29.07 or more			φ30.07 or more				
Full Stroke		1																															
A		38	43	48	38	43	48	38	43	48	38	43	48	38	43	48	44.5	49.5	54.5	44.5	49.5	54.5	44.5	49.5	54.5	44.5	49.5	54.5					
B		10.5	15.5	20.5	10.5	15.5	20.5	10.5	15.5	20.5	10.5	15.5	20.5	10.5	15.5	20.5	14.5	20	25	14.5	20	25	14.5	20	25	14.5	19.5	24.5	14.5	19.5	24.5		
C		3.7	4	4	3.7	4	4	3.7	4	4	3.7	4	4	3.7	4	4	4.7	4.5	4.5	4.7	4.5	4.5	4.7	4.5	4.5	4.7	4.5	4.7	5	5	4.7	5	5
D h6 (Body Side)		24 ⁰ _{-0.013}															29 ⁰ _{-0.013}																
D H7 (Machining Hole)		24 ^{+0.021} ₀															29 ^{+0.021} ₀																
E		12.8	12.5	12.5	12.8	12.5	12.5	12.8	12.5	12.5	12.8	12.5	12.5	12.8	12.5	12.5	12.8	12.5	12.5	12.8	12.5	12.5	12.8	12.5	12.5	12.8	12.5	12.5	12.8	12.5	12.5		
F		8	11	11	8	11	11	8	11	11	8	11	11	8	11	11	11	14	14	11	14	14	11	14	14	11	14	14	11	14	14		
G		8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°		
H		15	20	25	15	20	25	15	20	25	15	20	25	15	20	25	20	25	30	20	25	30	20	25	30	20	25	30	20	25	30		
L		20.7			21.7			22.7			23.7			24.7			25.7			26.7			27.7			28.7			29.7				
M		19			20			21			22			23			24			25			26			27			28				
N		27.5	22	22	27.5	23	23	27.5	24	24	27.5	25	25	27.5	26	26	32.5	27	27	32.5	28	28	32.5	29	29	32.5	30	30	32.5	31	31		
P		5															6																
Q		40															48																
R		51															62																
S		14															16.5																
U		M6×1×16															M8×1.25×20																
V		M8×1.25															M10×1.5																
W		AS568-019 (90)															AS568-119 (90)																
AB		11															12.5																
AC		8															8.3																
CA		5.5			5.5			6			6			6			6.5			6.5			7			7			7				
CB		20.5			21.5			22.5			23.5			24.5			25.5			26.5			27.5			28.5			29.5				
MD		21.1															24.6																
ME		M6×1 Thread Depth 12 or more															M8×1.25 Thread Depth 15 or more																
MF		12.5															14																
MG		10															11.5																
WA		21 ^{+0.033} ₀	22 ^{+0.033} ₀			23 ^{+0.033} ₀			24 ^{+0.033} ₀			25 ^{+0.033} ₀			26 ^{+0.033} ₀			27 ^{+0.033} ₀			28 ^{+0.033} ₀			29 ^{+0.033} ₀			30 ^{+0.033} ₀						
Weight	q	190	220	250	190	220	260	190	230	260	200	230	260	200	230	270	350	400	440	350	400	450	350	400	450	360	410	460	360	410	460		

Model No. Indication

VFM **2** **00** **0** - **080** - **D** - **H20** - **M** **R**

1 2 3 4 5 6 7

1 Body Size

- 2** : Select from Workpiece Hole Diameter $\phi 8$ / $\phi 9$ / $\phi 10$ / $\phi 11$
- 3** : Select from Workpiece Hole Diameter $\phi 12$ / $\phi 13$ / $\phi 14$ / $\phi 15$
- 4** : Select from Workpiece Hole Diameter $\phi 16$ / $\phi 17$ / $\phi 18$ / $\phi 19$ / $\phi 20$
- 5** : Select from Workpiece Hole Diameter $\phi 21$ / $\phi 22$ / $\phi 23$ / $\phi 24$ / $\phi 25$
- 6** : Select from Workpiece Hole Diameter $\phi 26$ / $\phi 27$ / $\phi 28$ / $\phi 29$ / $\phi 30$

2 Design No.

- 0** : Revision Number

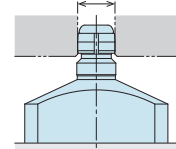
3 Workpiece Hole Diameter

Contact us for unlisted workpiece hole diameters.
(Workpiece hole machining accuracy should be H8 or better.)

Workpiece Hole Diam. Code	080	090	100	110	120	130	140	150	160	170	180	190	200
Workpiece Hole Diam. ϕ WA H8	8 $^{+0.022}_0$	9 $^{+0.022}_0$	10 $^{+0.022}_0$	11 $^{+0.027}_0$	12 $^{+0.027}_0$	13 $^{+0.027}_0$	14 $^{+0.027}_0$	15 $^{+0.027}_0$	16 $^{+0.027}_0$	17 $^{+0.027}_0$	18 $^{+0.027}_0$	19 $^{+0.033}_0$	20 $^{+0.033}_0$
VFM2000	Selection Range												
VFM3000					Selection Range								
VFM4000									Selection Range				

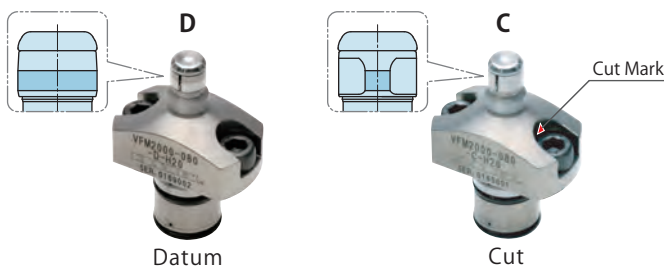
Workpiece Hole Diam. Code	210	220	230	240	250	260	270	280	290	300
Workpiece Hole Diam. ϕ WA H8	21 $^{+0.033}_0$	22 $^{+0.033}_0$	23 $^{+0.033}_0$	24 $^{+0.033}_0$	25 $^{+0.033}_0$	26 $^{+0.033}_0$	27 $^{+0.033}_0$	28 $^{+0.033}_0$	29 $^{+0.033}_0$	30 $^{+0.033}_0$
VFM5000	Selection Range									
VFM6000						Selection Range				

Workpiece Hole Diameter ϕ WA



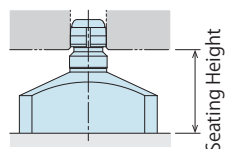
4 Functions

- D** : Datum (for Reference Locating)
- C** : Cut (for One Direction Locating)



5 Seating Height

Model No.	Seating Height H (mm)			
	15	20	25	30
VFM2000	Selection Range			
VFM3000	Selection Range			
VFM4000	Selection Range			
VFM5000	Selection Range			
VFM6000		Selection Range		



Note :

Prepare an additional seat for **6** Option **Blank** : Standard
and **M** : Release Confirmation Model.

High-Power
Series

Pneumatic Series

Hydraulic Series

Valve / Coupler
Hydraulic UnitManual Operation
Accessories

Cautions / Others

6 Options

Blank : None (Standard)

B : with Seating Surface

M : Release Confirmation Model

Note :

Contact us for combined use of **B** : with Seating Surface
and **M** : Release Confirmation model.

7 Port Position

 Not required only when selecting 6 Option : Blank (Standard) of VFM2000 / VFM3000 / VFM4000.

R : Refer to External Dimensions

L : Refer to External Dimensions

Note :

Refer to  **Port Position** on each External Dimension page for details.

Hole Clamp

SFA

SFC

Swing Clamp

LHA

LHC

LHS

LHW

LG/LT

TLA-2

TLB-2

TLA-1

Link Clamp

LKA

LKC

LKW

LJ/LM

TMA-2

TMA-1

Work Support

LD

LC

TNC

TC

Air Sensing
Lift Cylinder

LLW

Linear Cylinder /
Compact Cylinder

LL

LLR

LLU

DP

DR

DS

DT

Block Cylinder

DBA/DBC

Centering Vise

FVA

FVD

FVC

Control Valve

BZL

BZT

BZX/JZG

BZS

Pallet Clamp

VS/VT

Expansion
Locating Pin

VFL/VFM

VFJ/VFK

Pull Stud Clamp

FP

FQ

Customized
Spring Cylinder

DWA/DWB

Specifications : VFM2000 / VFM3000 / VFM4000

Model No.		VFM2000				VFM3000				VFM4000				
3 Workpiece Hole Diam. Code		080	090	100	110	120	130	140	150	160	170	180	190	200
Workpiece Hole Diam. (Standard Diam.) mm		$\phi 8_{H8}^{+0.022}_0$	$\phi 9_{H8}^{+0.022}_0$	$\phi 10_{H8}^{+0.022}_0$	$\phi 11_{H8}^{+0.027}_0$	$\phi 12_{H8}^{+0.027}_0$	$\phi 13_{H8}^{+0.027}_0$	$\phi 14_{H8}^{+0.027}_0$	$\phi 15_{H8}^{+0.027}_0$	$\phi 16_{H8}^{+0.027}_0$	$\phi 17_{H8}^{+0.027}_0$	$\phi 18_{H8}^{+0.027}_0$	$\phi 19_{H8}^{+0.033}_0$	$\phi 20_{H8}^{+0.033}_0$
Locating Repeatability mm		0.003												
Allowable Offset (C : Cut) mm		±0.05	±0.05	±0.10	±0.10	±0.10	±0.10	±0.10	±0.10	±0.15	±0.15	±0.15	±0.15	±0.15
Expanding Force (F)※1 N	at 2.5MPa	260	260	280	260	260	290	270	260	390	400	400	400	400
	at 5.0MPa	680	680	700	680	680	710	690	680	980	990	990	990	1000
	at 7.0MPa	1010	1020	1040	1020	1020	1040	1030	1020	1450	1460	1460	1460	1470
Allowable Thrust Load※2 N		1500	1500	2000	2000	2500	2500	2500	2500	3500	3500	3500	3500	4000
Cylinder Capacity	Release side	0.07				0.08				0.18				
(Empty Action)	cm3 Lock side	0.06				0.06				0.12				
Operating Pressure Range MPa		2.5 ~ 7.0												
Withstanding Pressure MPa		10.5												
Recommended Air Blow Pressure MPa		0.3 ~ 0.4												
Operating Temperature Range °C		0 ~ 70												
Usable Fluid		General Hydraulic Oil Equivalent to ISO-VG-32												

Specifications : VFM5000 / VFM6000

Model No.		VFM5000					VFM6000				
3 Workpiece Hole Diam. Code		210	220	230	240	250	260	270	280	290	300
Workpiece Hole Diam. (Standard Diam.) mm		$\phi 21_{H8}^{+0.033}_0$	$\phi 22_{H8}^{+0.033}_0$	$\phi 23_{H8}^{+0.033}_0$	$\phi 24_{H8}^{+0.033}_0$	$\phi 25_{H8}^{+0.033}_0$	$\phi 26_{H8}^{+0.033}_0$	$\phi 27_{H8}^{+0.033}_0$	$\phi 28_{H8}^{+0.033}_0$	$\phi 29_{H8}^{+0.033}_0$	$\phi 30_{H8}^{+0.033}_0$
Locating Repeatability mm		0.003									
Allowable Offset (C : Cut) mm		±0.15	±0.15	±0.15	±0.15	±0.15	±0.15	±0.15	±0.15	±0.15	±0.15
Expanding Force (F)※1 N	at 2.5MPa	750	750	750	750	750	1210	1220	1220	1220	1220
	at 5.0MPa	1690	1690	1690	1690	1690	2620	2630	2630	2630	2630
	at 7.0MPa	2440	2440	2440	2440	2440	3740	3750	3750	3750	3750
Allowable Thrust Load※2 N		5500	5500	5500	5500	6500	7500	7500	7500	9000	9000
Cylinder Capacity	Release side	0.27					0.4				
(Empty Action) cm3	Lock side	0.19					0.28				
Operating Pressure Range MPa		2.5 ~ 7.0									
Withstanding Pressure MPa		10.5									
Recommended Air Blow Pressure MPa		0.3 ~ 0.4									
Operating Temperature Range °C		0 ~ 70									
Usable Fluid		General Hydraulic Oil Equivalent to ISO-VG-32									

Notes :

- ※1. Expanding force shows the calculated value when coefficient friction is $\mu 0.2$.
Refer to the following for the relative equation of expanding force and allowable workpiece weight for locating.
- ※2. Exceeding allowable thrust load leads to accuracy failure and/or damages on the product.
 1. This product locates and releases with hydraulic pressure. (Hydraulic Pressure Double Action)
 2. This cylinder is used only for locating and does not have a clamping function.

Relative Equation of Expanding Force and Allowable Workpiece Weight for Locating

Horizontal Attitude

$$\text{Workpiece Weight (W)} \leq \frac{\text{Expanding Force per Expansion Locating Pin (F)} \times \text{Efficiency } 0.5}{\text{Friction Coefficient of Workpiece Seat Face } (\mu)}$$

Vertical Attitude

$$\text{Workpiece Weight (W)} \leq \text{Expanding Force per Expansion Locating Pin (F)} \times \text{Efficiency } 0.5$$

Thrust Load/Displacement Curve

This graph shows the relationship between thrust load and displacement.

Thrust load is the static load applied perpendicular to the center axis of the VFM (Hydraulic Expansion Locating Pin).

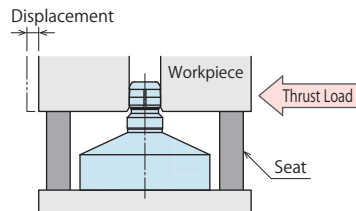
Note :

This graph shows the thrust load (static load) on a single datum (VFM-D) cylinder that is not used with any other cylinders, etc.

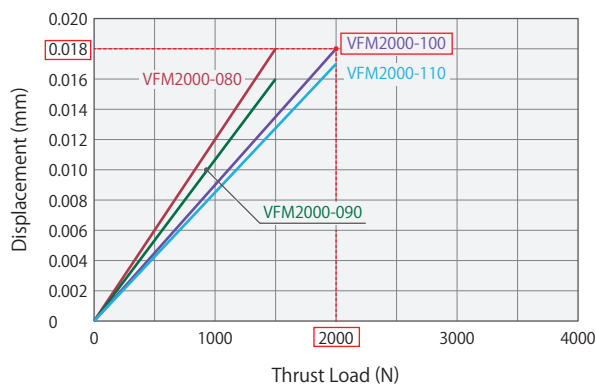
[How to Read the Thrust Load/Displacement Curve]

ex.) In case of VFM2000-100

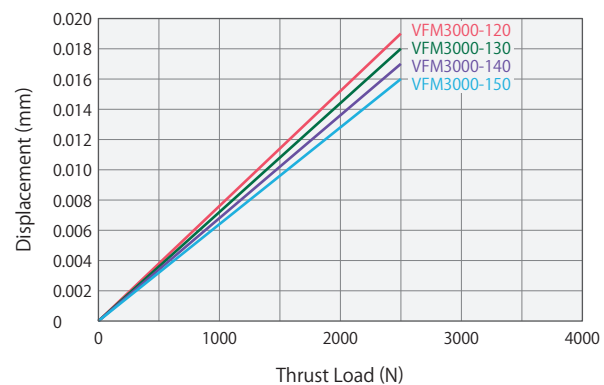
Requirement : When a 2000N thrust load is applied to an expanded VFM2000-100, the displacement will be about 0.018mm.



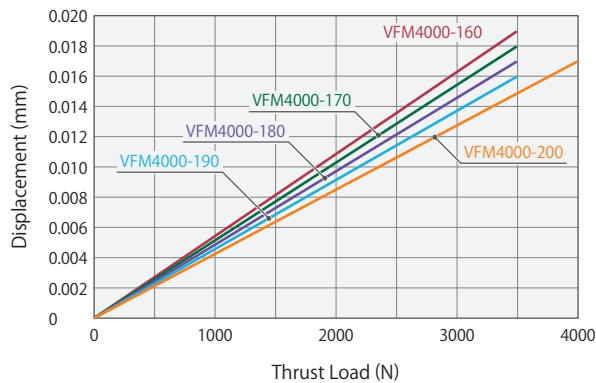
VFM2000



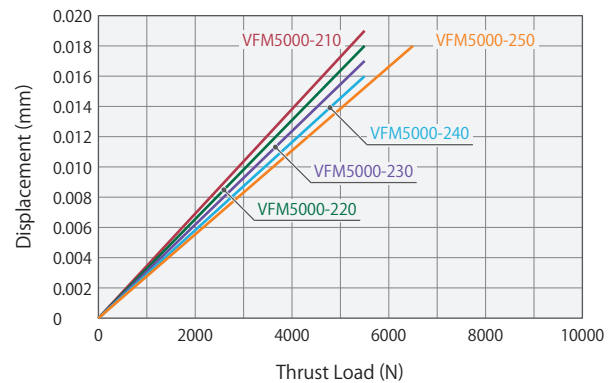
VFM3000



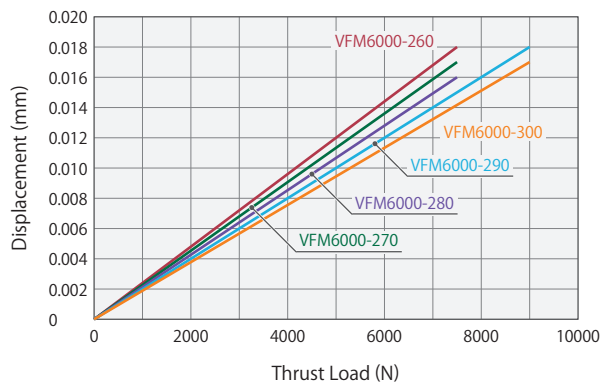
VFM4000



VFM5000



VFM6000



High-Power
Series

Pneumatic Series

Hydraulic Series

Valve / Coupler
Hydraulic Unit

Manual Operation
Accessories

Cautions / Others

Hole Clamp

SFA
SFC

Swing Clamp

LHA
LHC
LHS
LHW
LG/LT
TLA-2
TLB-2
TLA-1

Link Clamp

LKA
LKC
LKW
LJ/LM
TMA-2
TMA-1

Work Support

LD
LC
TNC
TC

Air Sensing
Lift Cylinder

LLW

Linear Cylinder /
Compact Cylinder

LL
LLR
LLU
DP
DR
DS
DT

Block Cylinder

DBA/DBC

Centering Vise

FVA
FVD
FVC

Control Valve

BZL
BZT
BZX/JZG
BZS

Pallet Clamp

VS/VT

Expansion
Locating Pin

VFL/VFM
VFJ/VFK

Pull Stud Clamp

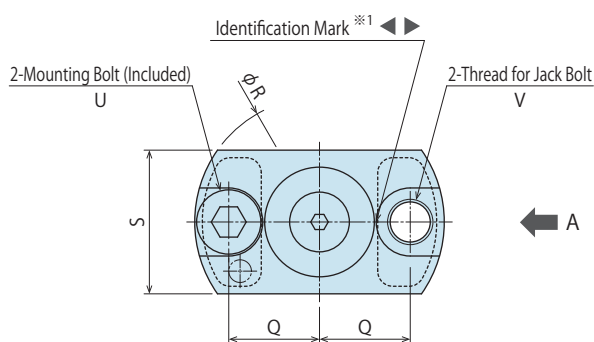
FP
FQ

Customized
Spring Cylinder

DWA/DWB

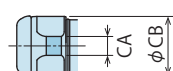
External Dimensions

※ The drawing shows the released state of VFM2000 / VFM3000 / VFM4000.



VFM-D

(Datum : Reference Locating)

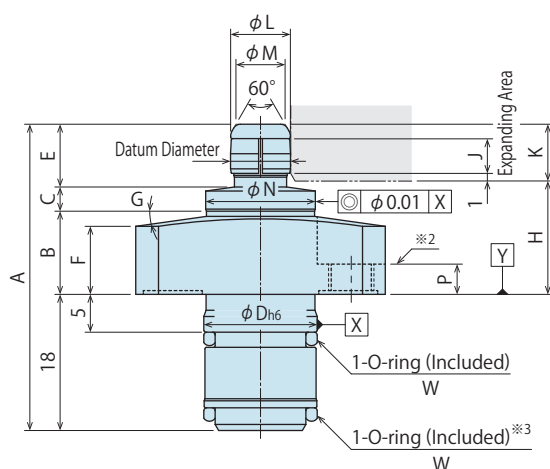


VFM-C

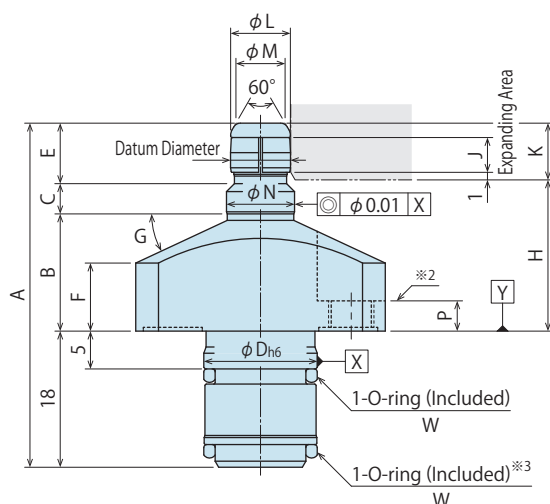
(Cut : One Direction Locating)

View A

5 Seating Height : H15



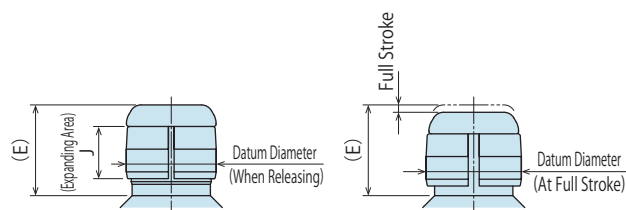
5 Seating Height : H20 / H25



Expanding Area Detail

When Releasing

When Locking (At Full Stroke)

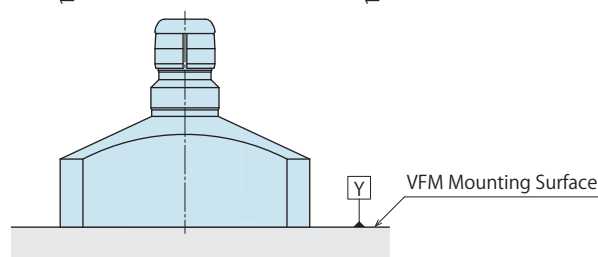
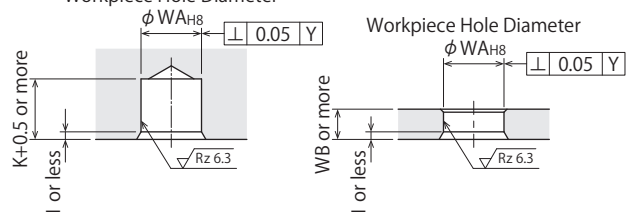


Workpiece Hole Dimensions

Blind Hole

Through Hole

Workpiece Hole Diameter

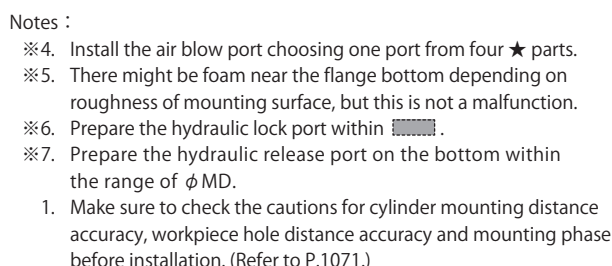


Notes :

- ※1. Identification mark is only marked on -C : Cut (for one direction locating). ◀ ▶ indicates the locating direction.
- ※2. Do not use spring washer or toothed lock washer.
- ※3. Set the O-ring to the mounting hole side (fixture side) before mounting the body.

1. When mounting the product, use two mounting bolts (Strength Grade 12.9) and tighten them evenly. Use two jack bolts to remove the product, keeping it parallel to the mounting surface.
2. This product has no seat. Choose option -B : with Seating Surface or prepare an additional seat if necessary.

Hole Clamp
SFA
SFC
Swing Clamp
LHA
LHC
LHS
LHW
LG/LT
TLA-2
TLB-2
TLA-1
Link Clamp
LKA
LKC
LKW
LJ/LM
TMA-2
TMA-1

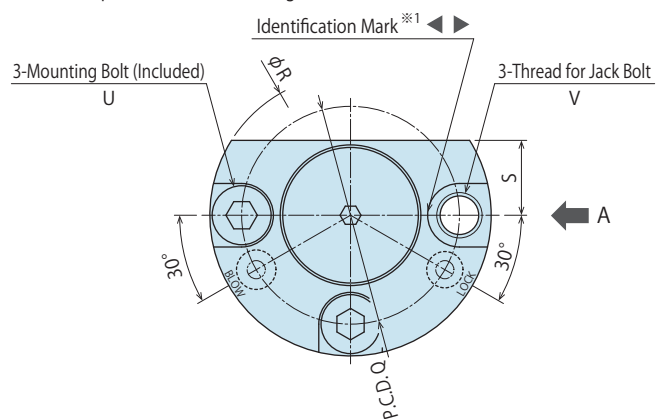


(mm)

Work Support	LD
	LC
	TNC
	TC
Air Sensing Lift Cylinder	LLW
Linear Cylinder / Compact Cylinder	LL
	LLR
	LLU
	DP
	DR
	DS
	DT
Block Cylinder	DBA/DBC
Centering Vise	FVA
	FVD
	FVC
Control Valve	BZL
	BZT
	BZX/JZG
	BZS
Pallet Clamp	V5/VT
Expansion Locating Pin	VFL/VFM
	VFJ/VFK
Pull Stud Clamp	FP
	FQ
Customized Spring Cylinder	DWA/DWB

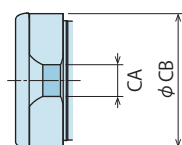
External Dimensions

※ The drawing shows the released state of VFM5000-R / VFM6000-R.
The ports of VFM5000-L / VFM6000-L are placed to the symmetrical positions of this drawing.



VFM-D

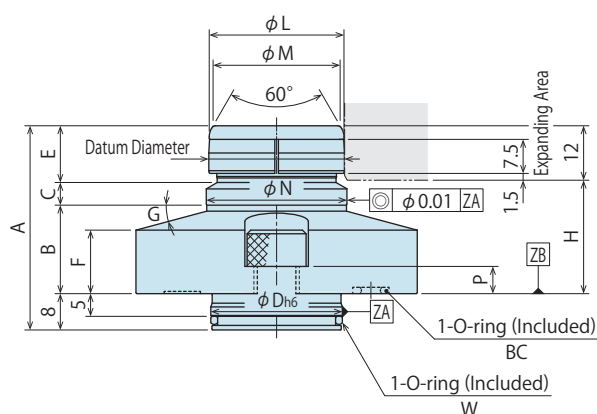
(Datum : Reference Locating)



VFM-C

(Cut : One Direction Locating)

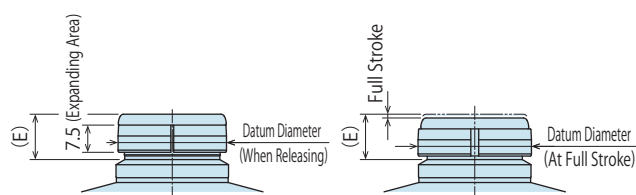
View A



Expanding Area Detail

When Releasing

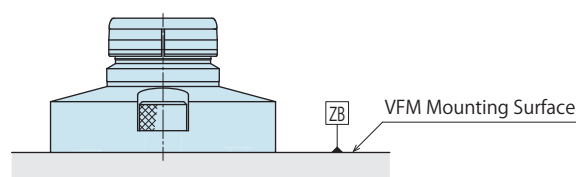
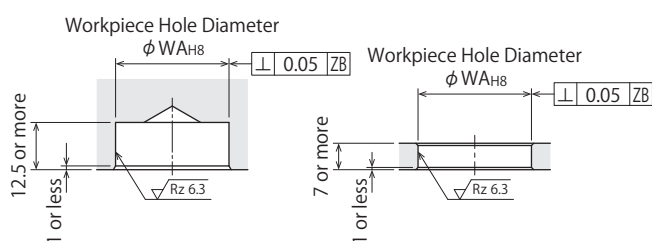
When Locking (At Full Stroke)



Workpiece Hole Dimensions

Blind Hole

Through Hole



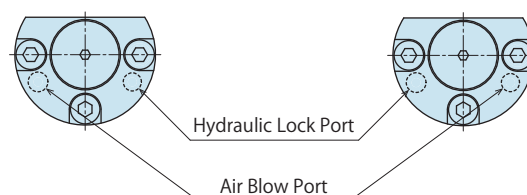
Notes :

- ※1. Identification mark is only marked on -C : Cut (for one direction locating). ◀ ▶ indicates the locating direction.
- 1. When mounting the product, use three mounting bolts (Strength Grade 12.9) and tighten them evenly.
Use three jack bolts to remove the product, keeping it parallel to the mounting surface.
- 2. This product has no seat. Choose option -B : with Seating Surface or prepare an additional seat if necessary.

Port Position

R

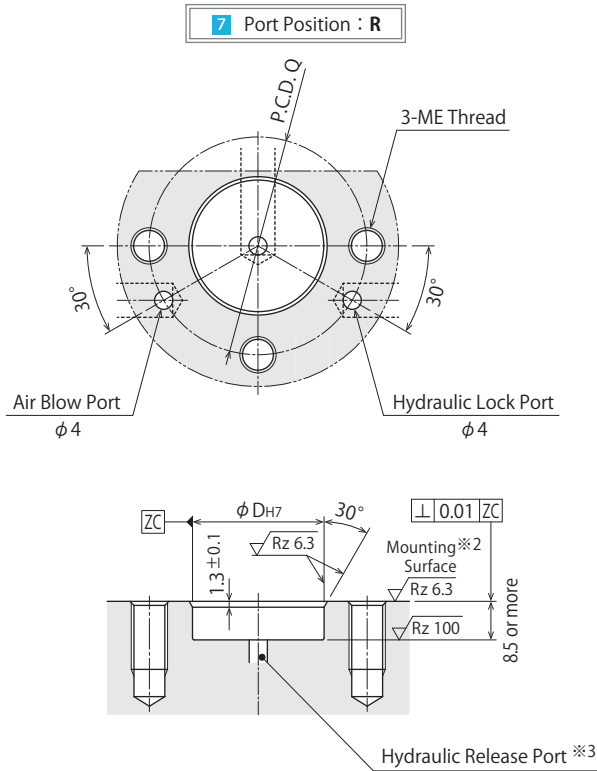
L



Note :

- 4. Please make sure that the port positions are correct.

Machining Dimensions for Mounting



Notes :

- ※2. There might be foam near the flange bottom depending on roughness of mounting surface, but this is not a malfunction.
 - ※3. Prepare the hydraulic release port on the bottom within the range of $\phi DH7$.
1. Make sure to check the cautions for cylinder mounting distance accuracy, workpiece hole distance accuracy and mounting phase before installation. (Refer to P.1071.)

External Dimensions and Machining Dimensions for Mounting

(mm)

Model No.		VFM5000-□-□-□-□															VFM6000-□-□-□-□																
3 Workpiece Hole Diam. Code		210			220			230			240			250			260			270			280			290			300				
5 Seating Height		H15	H20	H25	H15	H20	H25	H15	H20	H25	H15	H20	H25	H15	H20	H25	H20	H25	H30	H20	H25	H30	H20	H25	H30	H20	H25	H30	H20	H25	H30		
Workpiece Hole Diam. (Standard Diam.)		φ 21H8 ^{+0.033} ₀			φ 22H8 ^{+0.033} ₀			φ 23H8 ^{+0.033} ₀			φ 24H8 ^{+0.033} ₀			φ 25H8 ^{+0.033} ₀			φ 26H8 ^{+0.033} ₀			φ 27H8 ^{+0.033} ₀			φ 28H8 ^{+0.033} ₀			φ 29H8 ^{+0.033} ₀			φ 30H8 ^{+0.033} ₀				
Datum	At Releasing	φ 20.89 or less			φ 21.89 or less			φ 22.89 or less			φ 23.89 or less			φ 24.89 or less			φ 25.89 or less			φ 26.89 or less			φ 27.89 or less			φ 28.89 or less			φ 29.89 or less				
Diameter	At Full Stroke	φ 21.07 or more			φ 22.07 or more			φ 23.07 or more			φ 24.07 or more			φ 25.07 or more			φ 26.07 or more			φ 27.07 or more			φ 28.07 or more			φ 29.07 or more			φ 30.07 or more				
Full Stroke		1																															
A		35	40	45	35	40	45	35	40	45	35	40	45	35	40	45	40	45	50	40	45	50	40	45	50	40	45	50	40	45	50		
B		10.5	15.5	20.5	10.5	15.5	20.5	10.5	15.5	20.5	10.5	15.5	20.5	10.5	15.5	20.5	14.5	20	25	14.5	20	25	14.5	20	25	14.5	19.5	24.5	14.5	19.5	24.5		
C		3.7	4	4	3.7	4	4	3.7	4	4	3.7	4	4	3.7	4	4	4.7	4.5	4.5	4.7	4.5	4.5	4.7	4.5	4.5	4.7	4.5	4.7	5	5	4.7	5	5
D h6 (Body Side)		24 ⁰ _{-0.013}															29 ⁰ _{-0.013}																
D H7 (Machining Hole)		24 ^{+0.021} ₀															29 ^{+0.021} ₀																
E		12.8	12.5	12.5	12.8	12.5	12.5	12.8	12.5	12.5	12.8	12.5	12.5	12.8	12.5	12.5	12.8	12.5	12.5	12.8	12.5	12.5	12.8	12.5	12.5	12.8	12.5	12.5	12.8	12.5	12.5		
F		8	11	11	8	11	11	8	11	11	8	11	11	8	11	11	11	14	14	11	14	14	11	14	14	11	14	14	11	14	14		
G		8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°		
H		15	20	25	15	20	25	15	20	25	15	20	25	15	20	25	20	25	30	20	25	30	20	25	30	20	25	30	20	25	30		
L		20.7			21.7			22.7			23.7			24.7			25.7			26.7			27.7			28.7			29.7				
M		19			20			21			22			23			24			25			26			27			28				
N		27.5	22	22	27.5	23	23	27.5	24	24	27.5	25	25	27.5	26	26	32.5	27	27	32.5	28	28	32.5	29	29	32.5	30	30	32.5	31	31		
P		5															6																
Q		40															48																
R		51															62																
S		14															16.5																
U		M6×1×16															M8×1.25×20																
V		M8×1.25															M10×1.5																
W		AS568-019 (90)															AS568-022 (90)																
BC		AS568-007 (90)															OR NBR-90 P5-N																
CA		5.5			5.5			6			6			6			6.5			6.5			7			7			7				
CB		20.5			21.5			22.5			23.5			24.5			25.5			26.5			27.5			28.5			29.5				
ME		M6×1 Thread Depth 12 or more															M8×1.25 Thread Depth 15 or more																
WA		21 ^{+0.033} ₀			22 ^{+0.033} ₀			23 ^{+0.033} ₀			24 ^{+0.033} ₀			25 ^{+0.033} ₀			26 ^{+0.033} ₀			27 ^{+0.033} ₀			28 ^{+0.033} ₀			29 ^{+0.033} ₀			30 ^{+0.033} ₀				
Weight g		180	210	250	180	220	250	190	220	250	190	220	260	190	220	260	320	370	420	330	380	420	330	380	430	340	380	430	340	380	440		

High-Power Series

Pneumatic Series

Hydraulic Series

Valve / Coupler Hydraulic Unit

Manual Operation Accessories

Cautions / Others

Hole Clamp

SFA
SFC

Swing Clamp

LHA
LHC
LHS
LHW
LG/LT
TLA-2
TLB-2
TLA-1

Link Clamp

LKA
LKC
LKW
LJ/LM
TMA-2
TMA-1

Work Support

LD
LC
TNC
TC

Air Sensing Lift Cylinder

LLW

Linear Cylinder / Compact Cylinder

LL
LLR
LLU
DP
DR
DS
DT

Block Cylinder

DBA/DBC

Centering Vise

FVA
FVD
FVC

Control Valve

BZL
BZT
BZX/JZG
BZS

Pallet Clamp

VS/VT

Expansion Locating Pin

VFL/VFM
VFJ/VFK

Pull Stud Clamp

FP
FQ

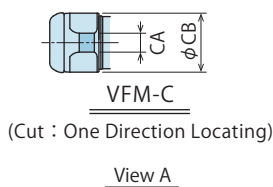
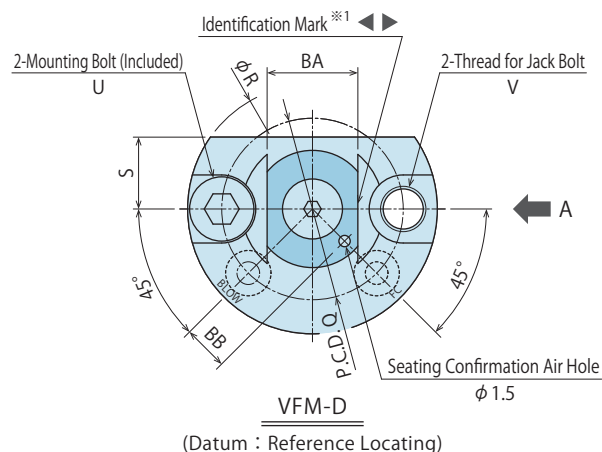
Customized Spring Cylinder

DWA/DWB

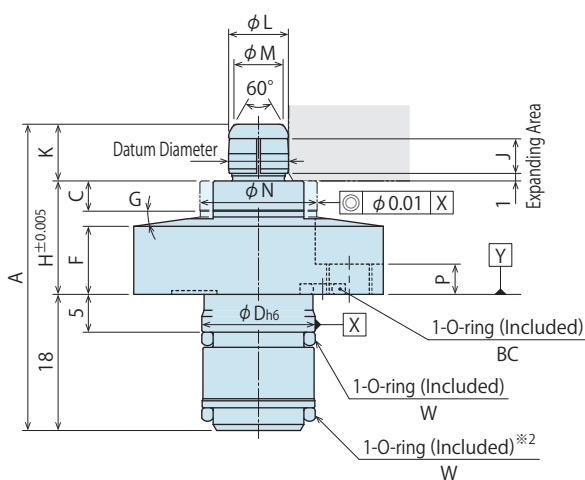
External Dimensions

※ The drawing shows the released state of VFM2000-BR / VFM3000-BR / VFM4000-BR.

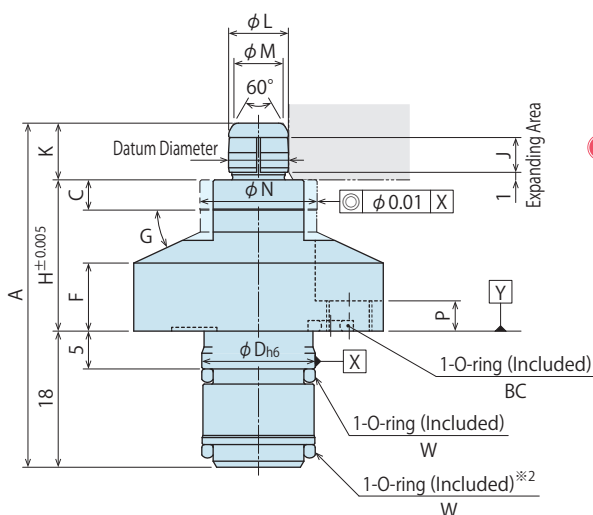
The ports of VFM2000-BL / VFM3000-BL / VFM4000-BL are placed to the symmetrical positions of this drawing.



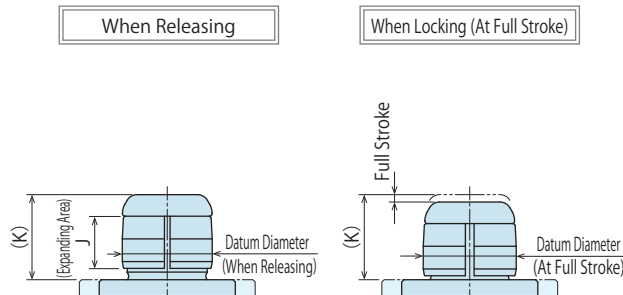
5 Seating Height : H15



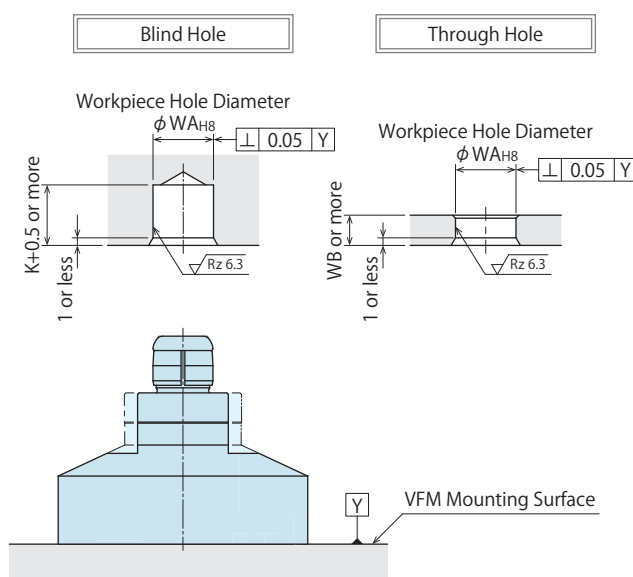
5 Seating Height : H20 / H25



Expanding Area Detail



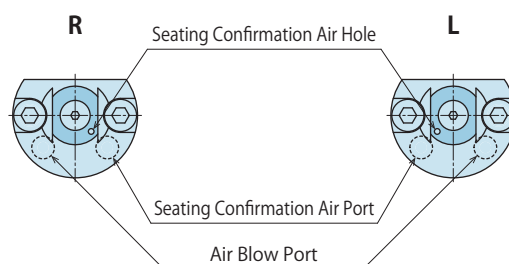
Workpiece Hole Dimensions



Notes :

- ※1. Identification mark is only marked on -C : Cut (for one direction locating). $\blacktriangleleft \blacktriangleright$ indicates the locating direction.
 - ※2. Set the O-ring to the mounting hole side (fixture side) before mounting the body.
1. When mounting the product, use two mounting bolts (Strength Grade 12.9) and tighten them evenly. Use two jack bolts to remove the product, keeping it parallel to the mounting surface.
 2. The port names are marked on the product surface. (BLOW : Air Blow Port, FC : Seating Confirmation Air Port) Continuously supply air pressure to the air blow port and seating confirmation air port.

Port Position

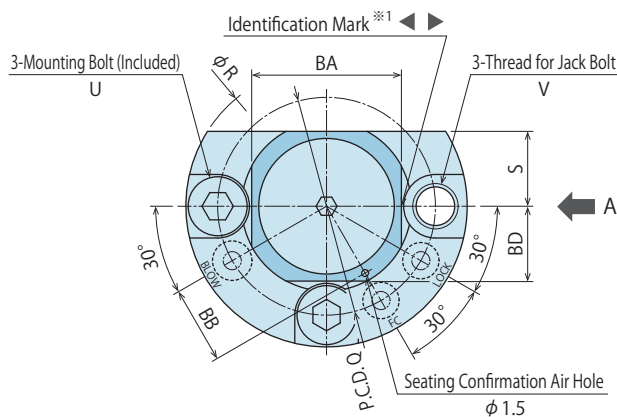


Note :

4. Please make sure that the port positions are correct.

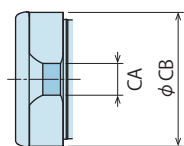
External Dimensions

※ The drawing shows the released state of VFM5000-BR / VFM6000-BR.
The ports of VFM5000-BL / VFM6000-BL are placed to the symmetrical positions of this drawing.



VFM-D

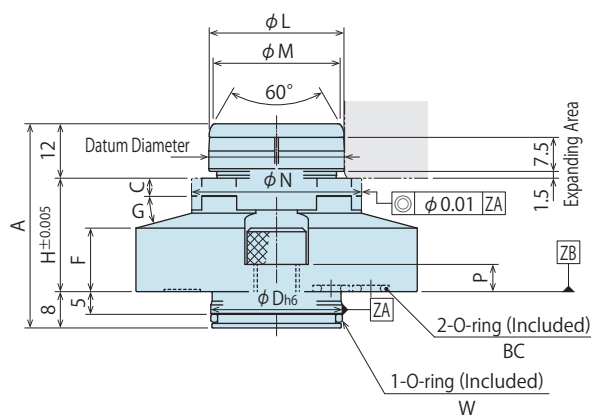
(Datum : Reference Locating)



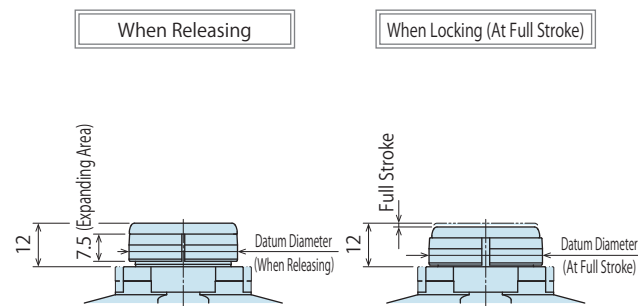
VFM-C

(Cut : One Direction Locating)

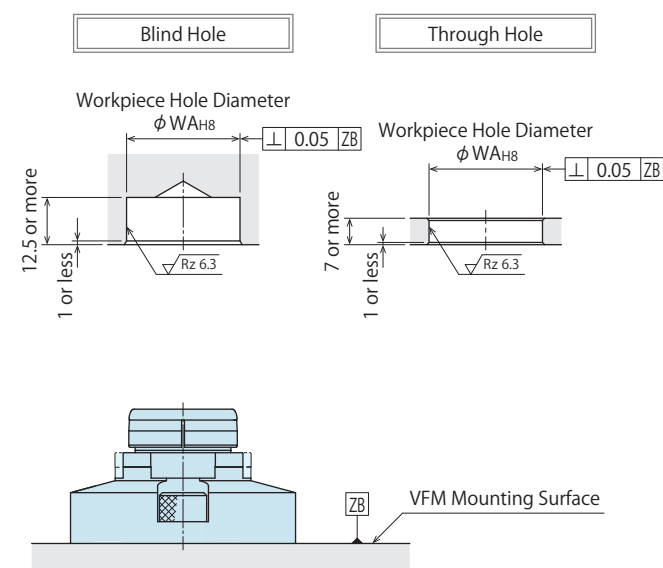
View A



Expanding Area Detail



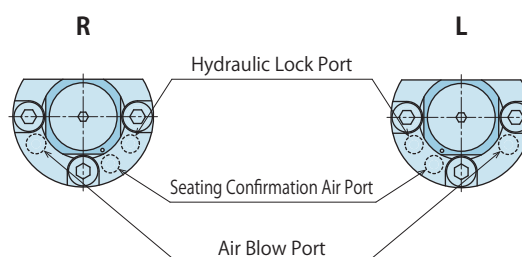
Workpiece Hole Dimensions



Notes :

- ※1. Identification mark is only marked on -C : Cut (for one direction locating). $\blacktriangleleft \blacktriangleright$ indicates the locating direction.
- 1. When mounting the product, use three mounting bolts (Strength Grade 12.9) and tighten them evenly.
Use three jack bolts to remove the product, keeping it parallel to the mounting surface.
- 2. The port names are marked on the product surface.
(BLOW : Air Blow Port, FC : Seating Confirmation Air Port, LOCK : Hydraulic Lock Port) Continuously supply air pressure to the air blow port and seating confirmation air port.

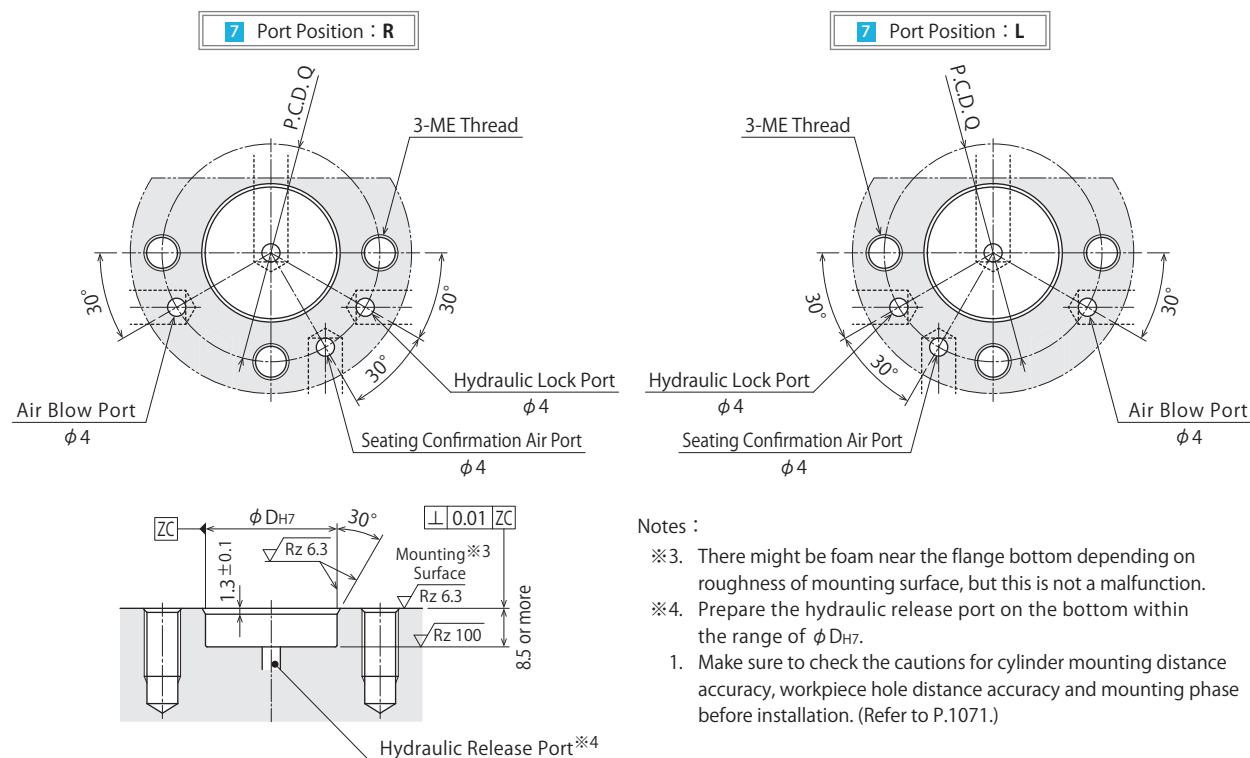
Port Position



Note :

- 3. Please make sure that the port positions are correct.

Machining Dimensions for Mounting



External Dimensions and Machining Dimensions for Mounting

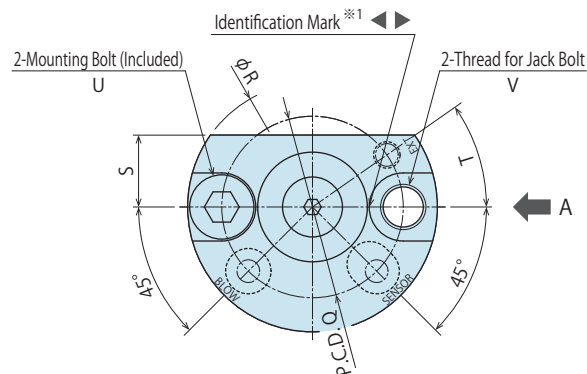
(mm)

Model No.		VFM5000-□-□-B□															VFM6000-□-□-B□														
		210			220			230			240			250			260			270			280			290			300		
		H15	H20	H25	H15	H20	H25	H15	H20	H25	H15	H20	H25	H15	H20	H25	H20	H25	H30	H20	H25	H30	H20	H25	H30	H20	H25	H30	H20	H25	H30
3 Workpiece Hole Diam. Code																															
5 Seating Height																															
Workpiece Hole Diam. (Standard Diam.)		φ 21H8 ^{+0.033} ₀ φ 22H8 ^{+0.033} ₀ φ 23H8 ^{+0.033} ₀ φ 24H8 ^{+0.033} ₀ φ 25H8 ^{+0.033} ₀ φ 26H8 ^{+0.033} ₀ φ 27H8 ^{+0.033} ₀ φ 28H8 ^{+0.033} ₀ φ 29H8 ^{+0.033} ₀ φ 30H8 ^{+0.033} ₀																													
Datum	At Releasing	φ 20.89 or less φ 21.89 or less φ 22.89 or less φ 23.89 or less φ 24.89 or less φ 25.89 or less φ 26.89 or less φ 27.89 or less φ 28.89 or less φ 29.89 or less																													
Diameter	At Full Stroke	φ 21.07 or more φ 22.07 or more φ 23.07 or more φ 24.07 or more φ 25.07 or more φ 26.07 or more φ 27.07 or more φ 28.07 or more φ 29.07 or more φ 30.07 or more																													
Full Stroke		1																													
A		35 40 45 35 40 45 35 40 45 35 40 45 35 40 45 40 45 50 40 45 50 40 45 50 40 45 50 40 45 50																													
C		4 4																													
D h6 (Body Side)		24 ⁰ _{-0.013}															29 ⁰ _{-0.013}														
D H7 (Machining Hole)		24 ^{+0.021} ₀															29 ^{+0.021} ₀														
F		8 11 11 8 11 11 8 11 11 8 11 11 8 11 11 11 14 14 11 14 14 11 14 14 11 14 14 11 14 14																													
G		8° 15° 30° 8° 15° 30° 8° 15° 30° 8° 15° 30° 8° 15° 30° 8° 15° 30° 8° 15° 30° 8° 15° 30° 8° 15° 30° 8° 15° 30°																													
H		15 20 25 15 20 25 15 20 25 15 20 25 15 20 25 20 25 30 20 25 30 20 25 30 20 25 30 20 25 30																													
L		20.7 21.7 22.7 23.7 24.7 25.7 26.7 27.7 28.7 29.7																													
M		19 20 21 22 23 24 25 26 27 28																													
N		28.5 29.5 30.5 31.5 32.5 33.5 34.5 35.5 36.5 37.5																													
P		5															6														
Q		40															48														
R		51															62														
S		14															16.5														
U		M6×1×16															M8×1.25×20														
V		M8×1.25															M10×1.5														
W		AS568-019 (90)															AS568-022 (90)														
BA		24 25 26 27 28 29 30 31 32 33																													
BB		12.5 13 13.5 14 14.5 15 15.5 16 16.5 17																													
BC		AS568-007 (90)															OR NBR-90 P5-N														
BD		12.5 13 13.5 14 14.3 15 15.5 16 16.5 16.5																													
CA		5.5 5.5 6 6 6 6.5 6.5 7 7 7																													
CB		20.5 21.5 22.5 23.5 24.5 25.5 26.5 27.5 28.5 29.5																													
ME		M6×1 Thread Depth 12 or more															M8×1.25 Thread Depth 15 or more														
WA		21 ^{+0.033} ₀ 22 ^{+0.033} ₀ 23 ^{+0.033} ₀ 24 ^{+0.033} ₀ 25 ^{+0.033} ₀ 26 ^{+0.033} ₀ 27 ^{+0.033} ₀ 28 ^{+0.033} ₀ 29 ^{+0.033} ₀ 30 ^{+0.033} ₀																													
Weight	g	180 210 250 180 220 250 190 220 250 190 220 260 190 220 260 320 370 420 330 380 420 330 380 430 340 380 430 340 380 440																													

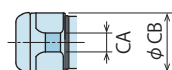
High-Power Series
Pneumatic Series
Hydraulic Series
Valve / Coupler Hydraulic Unit
Manual Operation Accessories
Cautions / Others
Hole Clamp
SFA
SFC
Swing Clamp
LHA
LHC
LHS
LHW
LG/LT
TLA-2
TLB-2
TLA-1
Link Clamp
LKA
LKC
LKW
LJ/LM
TMA-2
TMA-1
Work Support
LD
LC
TNC
TC
Air Sensing Lift Cylinder
LLW
Linear Cylinder / Compact Cylinder
LL
LLR
LLU
DP
DR
DS
DT
Block Cylinder
DBA/DBC
Centering Vise
FVA
FVD
FVC
Control Valve
BZL
BZT
BZX/JZG

External Dimensions

※ The drawing shows the released state of VFM2000-MR / VFM3000-MR / VFM4000-MR.
The ports of VFM2000-ML / VFM3000-ML / VFM4000-ML are placed to the symmetrical positions of this drawing.



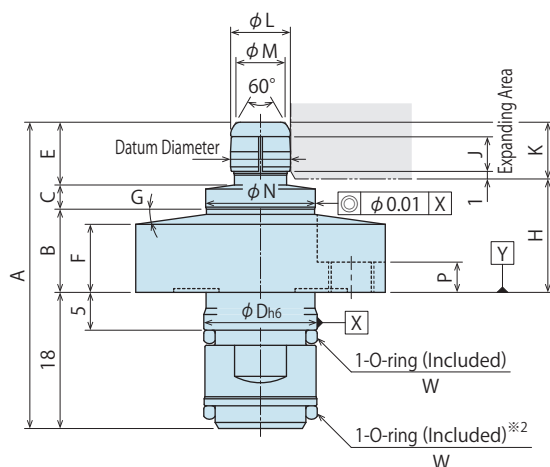
VFM-D
(Datum : Reference Locating)



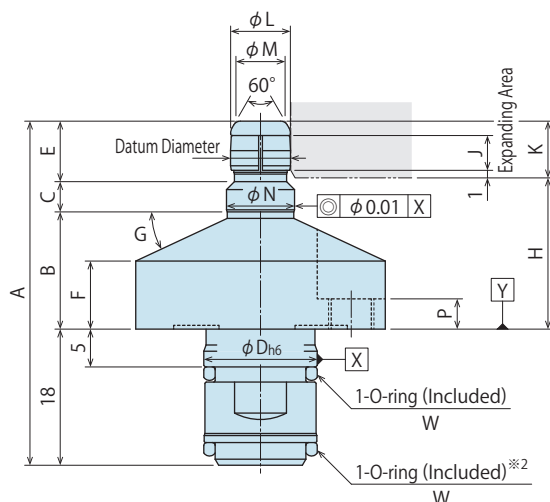
VFM-C
(Cut : One Direction Locating)

View A

5 Seating Height : H15



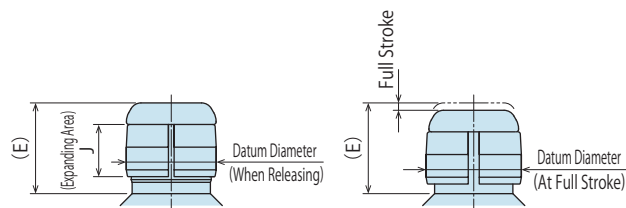
5 Seating Height : H20 / H25



Expanding Area Detail

When Releasing

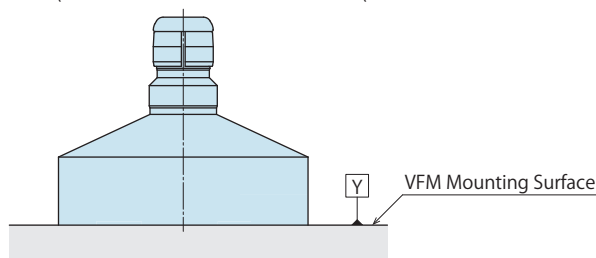
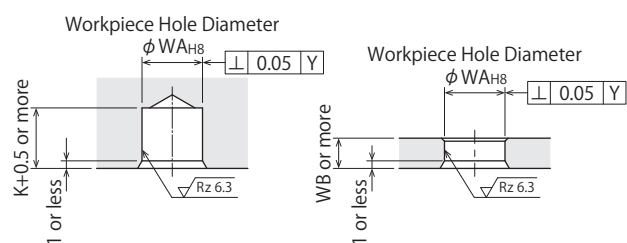
When Locking (At Full Stroke)



Workpiece Hole Dimensions

Blind Hole

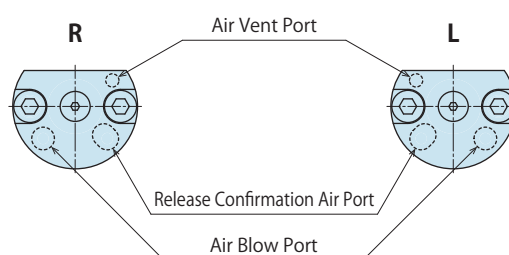
Through Hole



Notes :

- ※1. Identification mark is only marked on -C : Cut (for one direction locating). ◀ ▶ indicates the locating direction.
- ※2. Set the O-ring to the mounting hole side (fixture side) before mounting the body.
- 1. When mounting the product, use two mounting bolts (Strength Grade 12.9) and tighten them evenly. Use two jack bolts to remove the product, keeping it parallel to the mounting surface.
- 2. The port names are marked on the product surface. (EXT : Air Vent Port, BLOW : Air Blow Port, SENSOR : Release Confirmation Air Port) Continuously supply air pressure to the air blow port and release confirmation air port.
- 3. This product has no seat. Choose option -B : with Seating Surface or prepare an additional seat if necessary.

Port Position

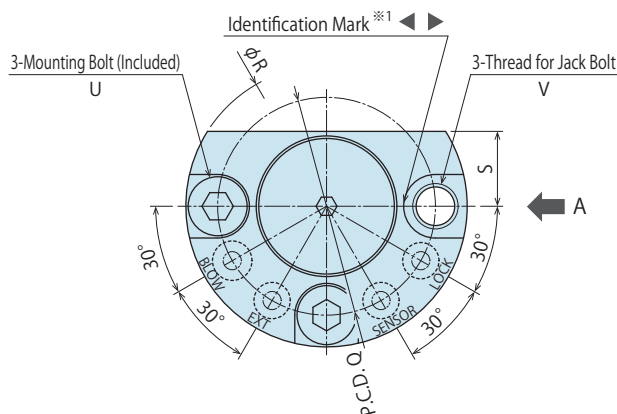


Note :

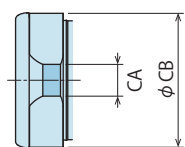
- 4. Please make sure that the port positions are correct.

External Dimensions

※ The drawing shows the released state of VFL5000-MR / VFL6000-MR.
The ports of VFL5000-ML / VFL6000-ML are placed to the symmetrical positions of this drawing.

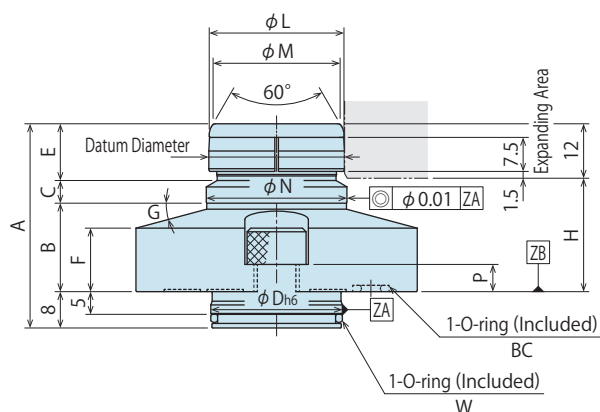


VFM-D
(Datum : Reference Locating)



VFM-C
(Cut : One Direction Locating)

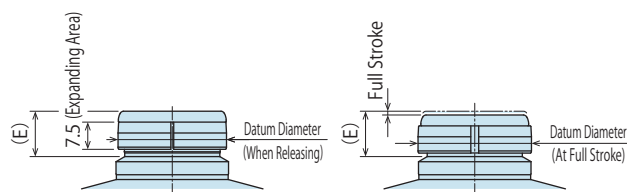
View A



Expanding Area Detail

When Releasing

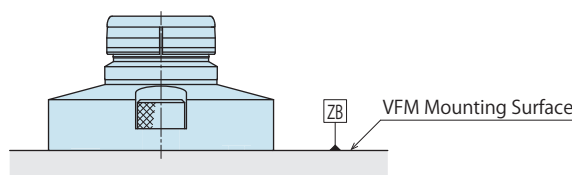
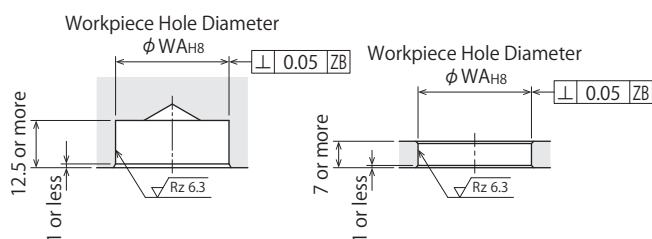
When Locking (At Full Stroke)



Workpiece Hole Dimensions

Blind Hole

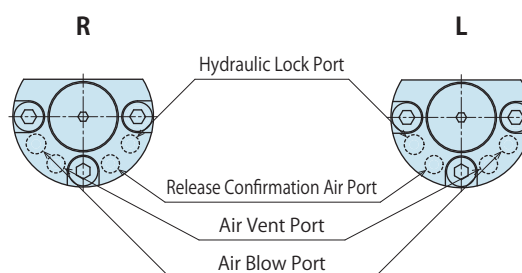
Through Hole



Notes :

- ※1. Identification mark is only marked on -C : Cut (for one direction locating). ◀ ▶ indicates the locating direction.
1. When mounting the product, use three mounting bolts (Strength Grade 12.9) and tighten them evenly.
Use three jack bolts to remove the product, keeping it parallel to the mounting surface.
2. The port names are marked on the product surface.
(EXT : Air Vent Port, BLOW : Air Blow Port, SENSOR : Release Confirmation Air Port, LOCK : Air Lock Port)
Continuously supply air pressure to the air blow port and release confirmation air port.
3. This product has no seat. Choose option -B : with Seating Surface or prepare an additional seat if necessary.

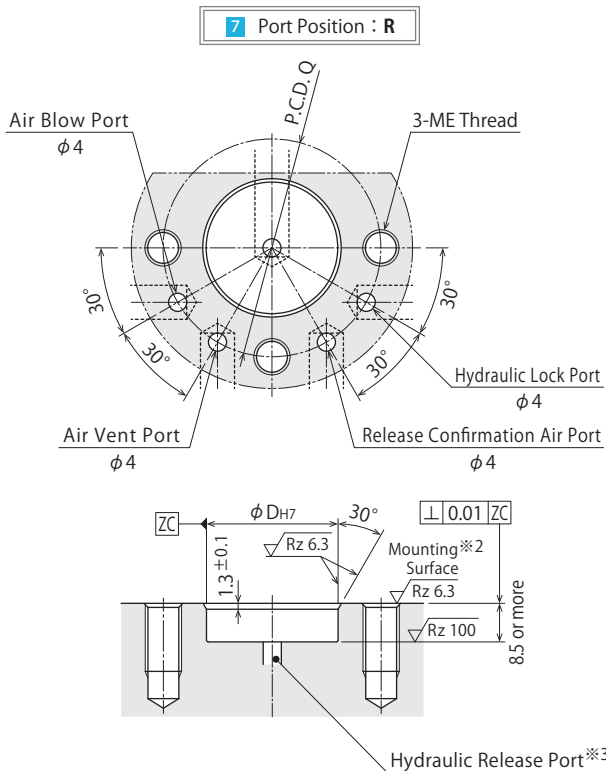
Port Position



Note :

4. Please make sure that the port positions are correct.

Machining Dimensions for Mounting



External Dimensions and Machining Dimensions for Mounting

(mm)

Model No.		VFM5000-□-□-□-□															VFM6000-□-□-□-□														
3 Workpiece Hole Diam. Code		210			220			230			240			250			260			270			280			290			300		
5 Seating Height		H15	H20	H25	H15	H20	H25	H15	H20	H25	H15	H20	H25	H15	H20	H25	H20	H25	H30	H20	H25	H30	H20	H25	H30	H20	H25	H30	H20	H25	H30
Workpiece Hole Diam. (Standard Diam.)		φ21 _{H8} ^{+0.033} ₀			φ22 _{H8} ^{+0.033} ₀			φ23 _{H8} ^{+0.033} ₀			φ24 _{H8} ^{+0.033} ₀			φ25 _{H8} ^{+0.033} ₀			φ26 _{H8} ^{+0.033} ₀			φ27 _{H8} ^{+0.033} ₀			φ28 _{H8} ^{+0.033} ₀			φ29 _{H8} ^{+0.033} ₀			φ30 _{H8} ^{+0.033} ₀		
Datum	At Releasing	φ20.89 or less			φ21.89 or less			φ22.89 or less			φ23.89 or less			φ24.89 or less			φ25.89 or less			φ26.89 or less			φ27.89 or less			φ28.89 or less			φ29.89 or less		
Diameter	At Full Stroke	φ21.07 or more			φ22.07 or more			φ23.07 or more			φ24.07 or more			φ25.07 or more			φ26.07 or more			φ27.07 or more			φ28.07 or more			φ29.07 or more			φ30.07 or more		
Full Stroke		1																													
A		35	40	45	35	40	45	35	40	45	35	40	45	35	40	45	40	45	50	40	45	50	40	45	50	40	45	50	40	45	50
B		10.5	15.5	20.5	10.5	15.5	20.5	10.5	15.5	20.5	10.5	15.5	20.5	10.5	15.5	20.5	14.5	20	25	14.5	20	25	14.5	20	25	14.5	19.5	24.5	14.5	19.5	24.5
C		3.7	4	4	3.7	4	4	3.7	4	4	3.7	4	4	3.7	4	4	4.7	4.5	4.5	4.7	4.5	4.5	4.7	4.5	4.5	4.7	4.5	4.7	5	5	4.7
D h6 (Body Side)		24 ⁰ _{-0.013}															29 ⁰ _{-0.013}														
D H7 (Machining Hole)		24 ^{+0.021} ₀															29 ^{+0.021} ₀														
E		12.8	12.5	12.5	12.8	12.5	12.5	12.8	12.5	12.5	12.8	12.5	12.5	12.8	12.5	12.5	12.8	12.5	12.5	12.8	12.5	12.5	12.8	12.5	12.5	12.8	12.5	12.5	12.8	12.5	12.5
F		8	11	11	8	11	11	8	11	11	8	11	11	8	11	11	11	14	14	11	14	14	11	14	14	11	14	14	11	14	14
G		8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°	8°	15°	30°
H		15	20	25	15	20	25	15	20	25	15	20	25	15	20	25	20	25	30	20	25	30	20	25	30	20	25	30	20	25	30
L		20.7			21.7			22.7			23.7			24.7			25.7			26.7			27.7			28.7			29.7		
M		19			20			21			22			23			24			25			26			27			28		
N		27.5	22	22	27.5	23	23	27.5	24	24	27.5	25	25	27.5	26	26	32.5	27	27	32.5	28	28	32.5	29	29	32.5	30	30	32.5	31	31
P		5															6														
Q		40															48														
R		51															62														
S		14															16.5														
U		M6×1×16															M8×1.25×20														
V		M8×1.25															M10×1.5														
W		AS568-019 (90)															AS568-022 (90)														
BC		AS568-007 (90)															OR NBR-90 P5-N														
CA		5.5			5.5			6			6			6			6.5			6.5			7			7			7		
CB		20.5			21.5			22.5			23.5			24.5			25.5			26.5			27.5			28.5			29.5		
ME		M6×1 Thread Depth 12 or more															M8×1.25 Thread Depth 15 or more														
WA		21 ^{+0.033} ₀			22 ^{+0.033} ₀			23 ^{+0.033} ₀			24 ^{+0.033} ₀			25 ^{+0.033} ₀			26 ^{+0.033} ₀			27 ^{+0.033} ₀			28 ^{+0.033} ₀			29 ^{+0.033} ₀			30 ^{+0.033} ₀		
Weight g		180	210	250	180	220	250	190	220	250	190	220	260	190	220	260	320	370	420	330	380	420	330	380	430	340	380	430	340	380	440

High-Power Series

Pneumatic Series

Hydraulic Series

Valve / Coupler Hydraulic Unit

Manual Operation Accessories

Cautions / Others

Hole Clamp

SFA
SFC

Swing Clamp

LHA
LHC
LHS
LHW
LG/LT
TLA-2
TLB-2
TLA-1

Link Clamp

LKA
LKC
LKW
LJ/LM
TMA-2
TMA-1

Work Support

LD
LC
TNC
TC

Air Sensing Lift Cylinder

LLW

Linear Cylinder / Compact Cylinder

LL
LLR
LLU
DP
DR
DS
DT

Block Cylinder

DBA/DBC

Centering Vise

FVA
FVD
FVC

Control Valve

BZL
BZT
BZX/JZG
BZS

Pallet Clamp

VS/VT

Expansion Locating Pin

VFL/VFM
VFJ/VFK

Pull Stud Clamp

FP
FQ

Customized Spring Cylinder

DWA/DWB

● Cautions

● Notes for Design Regarding VFL/VFM/VFJ/VFK

1) Check Specifications

- Please use each product according to the specifications.
VFL locates with spring and releases with hydraulic pressure.
VFM locates and releases with hydraulic pressure.
VFJ locates with hydraulic pressure and releases with spring.
VFK locates and releases with hydraulic pressure.

2) Notes for Circuit Design

- Please read "Circuit Reference" for proper hydraulic circuit design.
Improper circuit design may lead to malfunctions and damages.

3) Air Supply

- Continuously supply air pressure to the air blow port.
If air supply is shut off during operation, contaminants enter into the cylinder leading to malfunctions.
- Continuously supply air pressure to the seating confirmation air port for **-B** : with Seating Surface, and to the release confirmation air port for **-M** : Release Confirmation model.

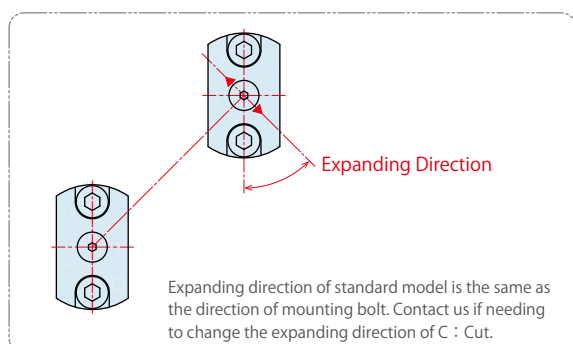
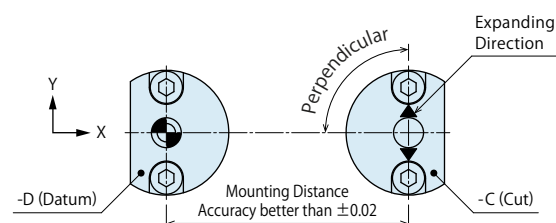
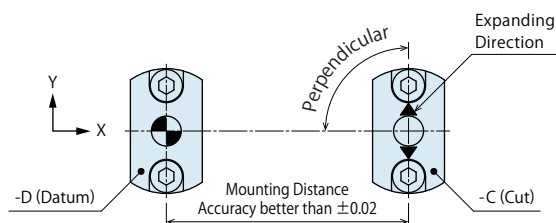
4) Setting Up a Clamp

- The expansion locating pin is a positioning cylinder and has no clamping mechanism. A clamp must be provided separately.

5) Expansion Locating Pin Mounting Direction (Phase)

- The Cut (VF□-C) locates a workpiece in the direction of rotation, based on the datum (VF□-D). VF□-C (Cut : for locating in one direction) locates in one direction (Y-axis), so phasing is necessary.

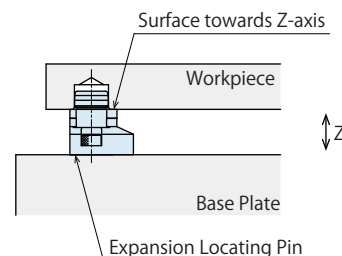
When mounting the product, make sure that expanding direction of -C (Cut) is perpendicular to -D (Datum).



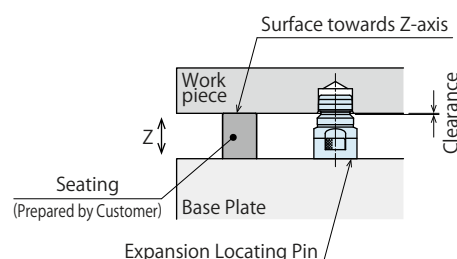
6) Reference Surface towards Z-axis

- **-B** : with Seating Surface has seating on the flange surface, but Standard and **-M** : Release Confirmation models have no seating (reference surface towards Z-axis). Please prepare an additional seat.

-B : with Seating Surface

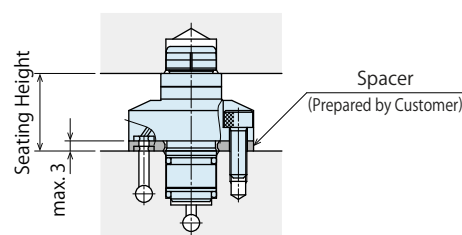


Standard / **-M** : Release Confirmation Model

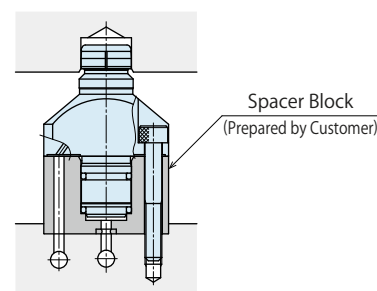


7) Adjusting Height of Expansion Locating Pin

- Seating height can be selected from 15mm / 20mm / 25mm / 30mm.
- For slight adjustment of seating height and expanding part height, install a spacer (3mm or less) under the flange.

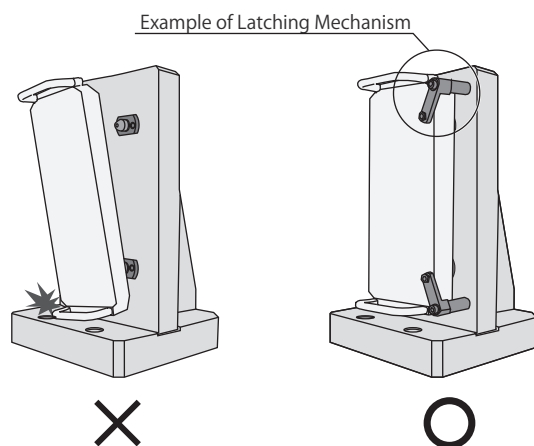


- Install a spacer block under the flange if the height of expansion locating pin is not enough.



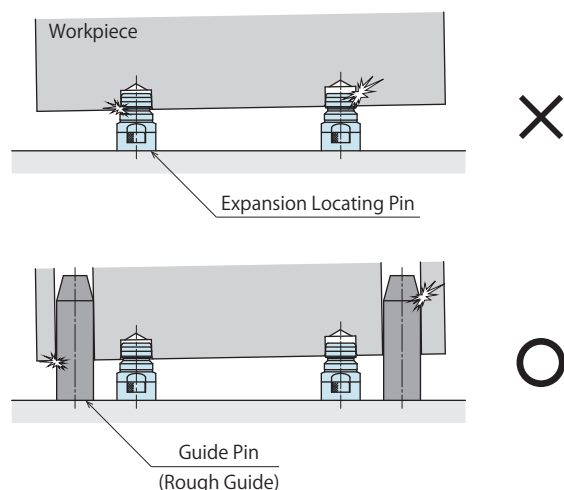
8) When the workpiece is in vertical position.

- When setting a workpiece, make sure it is in proper proximity and square to the expansion locating pins.
If it is locked out of position, the products may be damaged.
- As the workpiece may fall down during releasing, it is recommended to set up the latching mechanism to prevent it from falling down.
- When the workpiece is used in vertical position (hanging on the wall), the internal moving parts tend to wear out. Check the locating accuracy regularly, and if exceeding the allowable range, replace the product.



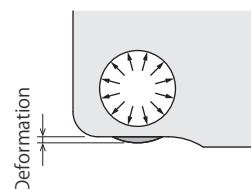
9) Inclination in the Z-axis direction.

- If a workpiece is tilted when loading/unloading, expanded part of expansion locating pin and workpiece hole will get stuck and the cylinder and workpiece will be damaged. Workpiece should be loaded and unloaded with less than $4/100 \sim 5/100$ (approx. $2 \sim 3^\circ$) of tilt between workpiece and expansion locating pin plane.
- If necessary, provide guide pins to keep the workpiece level during loading and unloading. Please prepare guide pin (rough guide) etc.



10) Thickness around the Workpiece Hole

- Thin wall around the workpiece hole could be deformed by expanding force, and locating accuracy would not fill the specification. Please conduct trial testing and adjust to proper hydraulic pressure before use.



High-Power Series

Pneumatic Series

Hydraulic Series

Valve / Coupler Hydraulic Unit

Manual Operation Accessories

Cautions / Others

Hole Clamp

SFA
SFC

Swing Clamp

LHA
LHC
LHS
LHW
LG/LT
TLA-2
TLB-2
TLA-1

Link Clamp

LKA
LKC
LKW
LJ/LM
TMA-2
TMA-1

Work Support

LD
LC
TNC
TC

Air Sensing Lift Cylinder

LLW

Linear Cylinder / Compact Cylinder

LL
LLR
LLU
DP
DR
DS
DT

Block Cylinder

DBA/DBC

Centering Vise

FVA
FVD
FVC

Control Valve

BZL
BZT
BZX/JZG
BZS

Pallet Clamp

VS/VT

Expansion Locating Pin

VFL/VFM
VFJ/VFK

Pull Stud Clamp

FP
FQ

Customized Spring Cylinder

DWA/DWB

Cautions

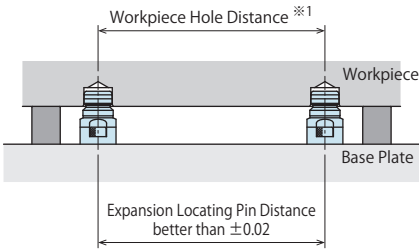
Notes for Design Regarding VFL / VFM

- 1) Distance Accuracy of VFL / VFM
- Distance accuracy of the VFL / VFM's mounting hole should be better than $\pm 0.02\text{mm}$.
 - ※ 1. The distance accuracy of each workpiece hole should be within the center distance accuracy on the following list "JIS B 0613 Class 2" considering the allowable offset (VFL / VFM-C : Cut) and the datum cylinder distance accuracy (VFL / VFM-D : Datum).

Allowable Offset (C : Cut) $\geq$ Datum Cylinder Distance Accuracy
+ Workpiece Hole Distance Accuracy
(Listed in JIS B 0613)

The following shows the center distance accuracy [Class 2] (JIS B 0613).

[JIS B 0613 Excerpt]		unit : mm
Center Distance Classification		Center Distance Accuracy
Greater than	or less	Class 2
50	80	± 0.023
80	120	± 0.027
120	180	± 0.032
180	250	± 0.036
250	315	± 0.041
315	400	± 0.045
400	500	± 0.049
500	630	± 0.055
630	800	± 0.063
800	1000	± 0.070



Notes for Design Regarding VFJ / VFK

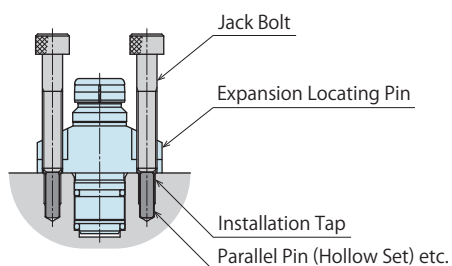
- 1) Distance Accuracy of VFJ / VFK
- Distance accuracy between VFJ / VFK mounting holes (-D/-C) and between workpiece holes has to be determined according to the allowable offset (VFJ / VFK-C : Cut).

● Installation Notes

- 1) Check the Usable Fluid
 - Please use the appropriate fluid by referring to the Hydraulic Fluid List (P.1355).
- 2) Procedure before Piping
 - The pipeline, piping connector and fixture circuits should be cleaned and flushed thoroughly.
The dust and cutting chips in the circuit may lead to fluid leakage and malfunction.
- 3) Applying Sealing Tape
 - Wrap with tape 1 to 2 times following the screwing direction.
Wrapping in the wrong direction will cause leaks and malfunction.
 - Pieces of the sealing tape can lead to oil leaks and malfunction.
 - When piping, be careful that contaminant such as sealing tape does not enter in products.
- 4) Installation / Removal of the Expansion Locating Pin
 - Use all bolts with hex holes (Strength Grade 12.9) and tighten them with a torque shown in the table below.
Tighten them evenly to prevent twisting or jamming.

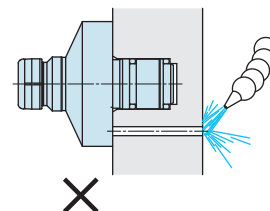
Model No.	Thread Size	Tightening Torque (N·m)
VFL2000	M5×0.8	6.3
VFL3000	M5×0.8	6.3
VFL4000	M6×1	10
VFL5000	M6×1	10
VFL6000	M8×1.25	25
VFM2000	M5×0.8	6.3
VFM3000	M5×0.8	6.3
VFM4000	M6×1	10
VFM5000	M6×1	10
VFM6000	M8×1.25	25
VFJ2000	M5×0.8	6.3
VFJ3000	M5×0.8	6.3
VFK2000	M5×0.8	6.3
VFK3000	M5×0.8	6.3

- Do not use spring washer or toothed lock washer.
- There might be foam near the flange bottom depending on roughness of mounting surface, but this is not a malfunction.
- When removing the product, use two jack bolts (two mounting bolt holes) in order not to damage the installation tap. The following shows the case in which the parallel pin (hollow set) is set in the tapped hole so that the installation tap will not be damaged.



5) Appropriate Measures for the Air Vent Port

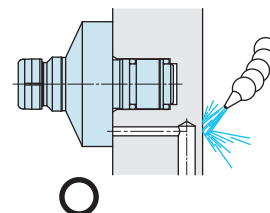
- For the air vent port of -M : Release Confirmation model, consider the environment and avoid coolant or any contaminants. If coolant or contaminants enter in the product, it will not function properly.



Examples

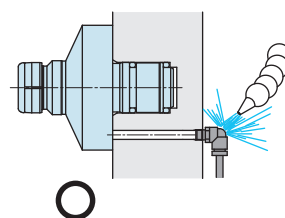
① Prepare a manifold piping.

Use the manifold piping and prepare the air vent port to the place without the influence of coolant or cutting chips.



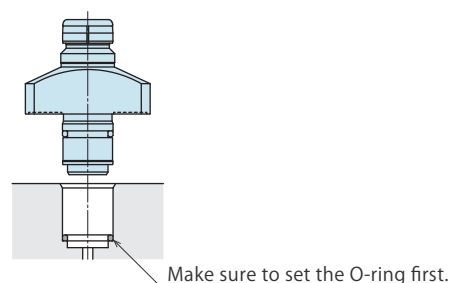
② Prepare an external piping.

If it is impossible to prepare manifold piping like the case ①, move the air vent port by using external piping to the place without the influence of coolant or any contaminants.



6) Installation of O-ring (Included)

- For VFL / VFM (VFM2000 / VFM3000 / VFM4000) / VFK, set the O-ring to the mounting hole side (fixture side) before mounting the body.



High-Power Series

Pneumatic Series

Hydraulic Series

Valve / Coupler Hydraulic Unit

Manual Operation Accessories

Cautions / Others

Hole Clamp

SFA
SFC

Swing Clamp

LHA
LHC
LHS
LHW
LG/LT
TLA-2
TLB-2
TLA-1

Link Clamp

LKA
LKC
LKW
LJ/LM
TMA-2
TMA-1

Work Support

LD
LC
TNC
TC

Air Sensing Lift Cylinder

LLW

Linear Cylinder / Compact Cylinder

LL
LLR
LLU
DP
DR
DS
DT

Block Cylinder

DBA/DBC

Centering Vise

FVA
FVD
FVC

Control Valve

BZL
BZT
BZX/JZG
BZS

Pallet Clamp

VS/VT

Expansion Locating Pin

VFL/VFM
VFJ/VFK

Pull Stud Clamp

FP
FQ

Customized Spring Cylinder

DWA/DWB

※ Please refer to P.1355 for common cautions.

• Installation Notes • Hydraulic Fluid List • Notes on Hydraulic Cylinder Speed Control Circuit
• Notes on Handling • Maintenance/Inspection • Warranty

Circuit Reference

Notes on Hydraulic Cylinder Speed Control Circuit

VFL (Standard)

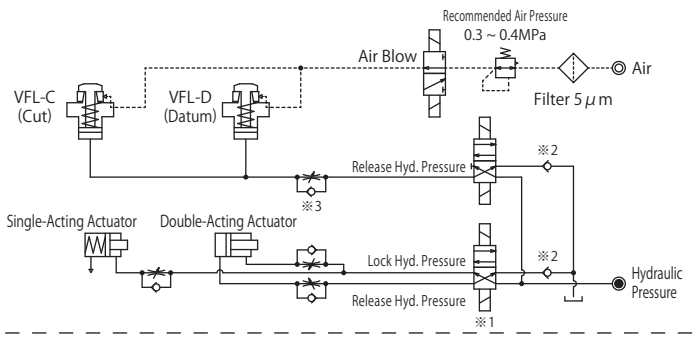
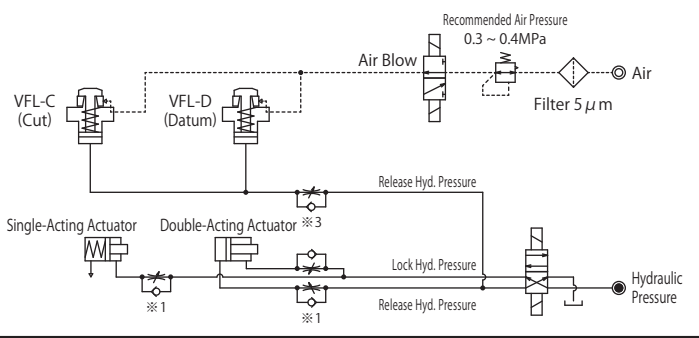
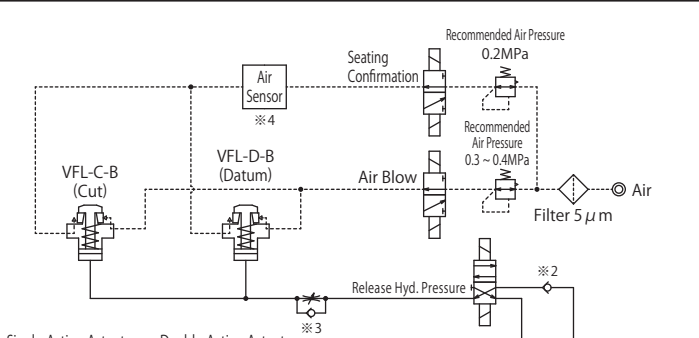
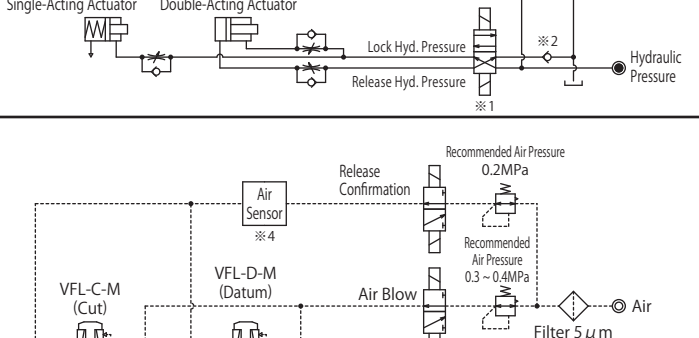
VFL-B (with Seating Surface)

VFL-M (Release Confirmation)



Please pay attention to the cautions below. Design the circuit for controlling the action speed of cylinder.
Improper circuit design may lead to malfunctions and damages. Please review the circuit design in advance.

Circuit Reference

Single Action model VFL Standard	Expansion Locating Pin and other actuators on different circuits. VFL Locates with Spring Releases with Hydraulic Pressure 
Single Action model VFL-B with Seating Surface	Expansion Locating Pin and other actuators on the same circuit. VFL Locates with Spring Releases with Hydraulic Pressure 
Single Action model VFL-B with Seating Surface	Expansion Locating Pin and other actuators on different circuits. VFL-B Locates with Spring Releases with Hydraulic Pressure 
Single Action model VFL-M Release Confirmation Model	Expansion Locating Pin and other actuators on different circuits. VFL-M Locates with Spring Releases with Hydraulic Pressure 

Notes :

- ※1. The procedure for lock operation should be "VFL (Expansion Locating Pin)" → "other actuators".
Otherwise there might be accuracy failure and/or damages on the product.
 - ※2. Use the check valve (Recommended cracking pressure : 0.04MPa or less)
if there is back pressure in the tank port.
 - ※3. Adjust the flow rate so that there is no surge pressure.
 - ※4. Refer to the table on the right for recommended air sensors.
1. This circuit reference is one example. It should be prepared depending on the fixture structure.

Maker	SMC	CKD
Name	Air Catch Sensor	Gap Switch
Model No.	ISA3-G	GPS3-E

● Notes on Hydraulic Cylinder Speed Control Circuit

VFM (Standard)

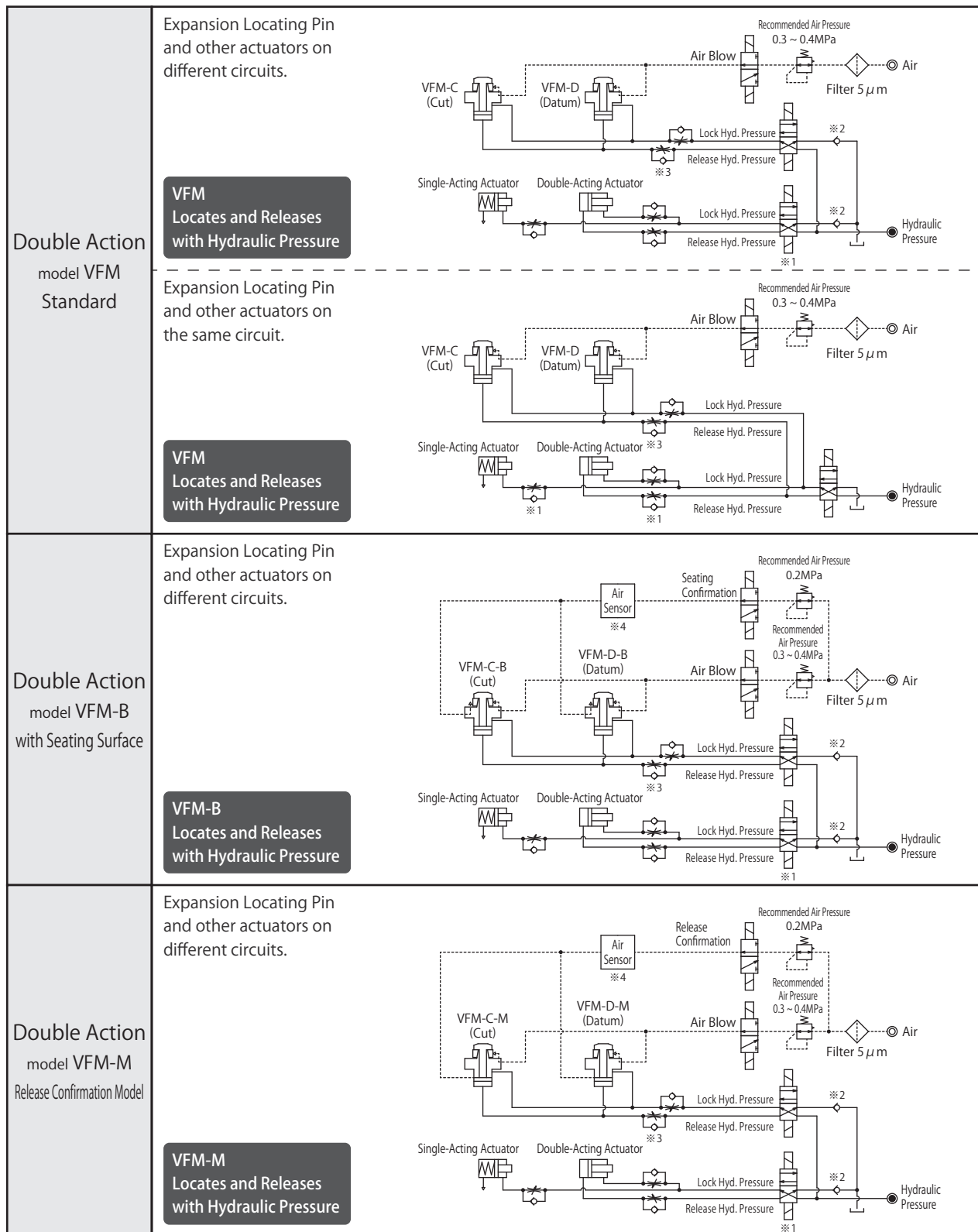
VFM-B (with Seating Surface)

VFM-M (Release Confirmation)



Please pay attention to the cautions below. Design the circuit for controlling the action speed of cylinder.
 Improper circuit design may lead to malfunctions and damages. Please review the circuit design in advance.

Circuit Reference



Notes :

- ※1. The procedure for lock operation should be "VFM (Expansion Locating Pin)" → "other actuators". Otherwise there might be accuracy failure and/or damages on the product.
 - ※2. Use the check valve (Recommended cracking pressure : 0.04MPa or less) if there is back pressure in the tank port.
 - ※3. Adjust the flow rate so that there is no surge pressure.
 - ※4. Refer to the table on the right for recommended air sensors.
1. This circuit reference is one example. It should be prepared depending on the fixture structure.

Maker	SMC	CKD
Name	Air Catch Sensor	Gap Switch
Model No.	ISA3-G	GPS3-E

High-Power Series
Pneumatic Series
Hydraulic Series
Valve / Coupler Hydraulic Unit
Manual Operation Accessories
Cautions / Others

Hole Clamp

SFA
SFC

Swing Clamp

LHA
LHC
LHS
LHW
LG/LT
TLA-2
TLB-2
TLA-1

Link Clamp

LKA
LKC
LKW
LJ/LM
TMA-2
TMA-1

Work Support

LD
LC
TNC
TC

Air Sensing Lift Cylinder

LLW

Linear Cylinder / Compact Cylinder

LL
LLR
LLU
DP
DR
DS
DT

Block Cylinder

DBA/DBC

Centering Vise

FVA
FVD
FVC

Control Valve

BZL
BZT
BZX/JZG
BZS

Pallet Clamp

VS/VT

Expansion Locating Pin

VFL/VFM
VFJ/VFK

Pull Stud Clamp

FP
FQ

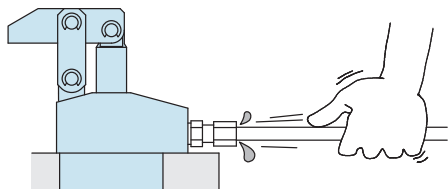
Customized Spring Cylinder

DWA/DWB

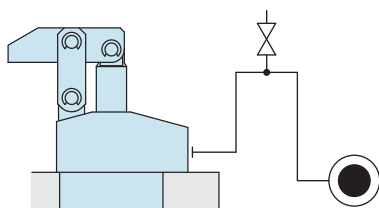
Cautions

● Installation Notes (For Hydraulic Series)

- 1) Check the Usable Fluid
 - Please use the appropriate fluid by referring to the Hydraulic Fluid List.
- 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.
 - There is no filter provided with Kosmek's product except for a part of valves which prevents foreign materials and contaminants from getting into the circuit.
- 3) Applying Sealing Tape
 - Wrap with tape 1 to 2 times following the screw direction.
 - Pieces of the sealing tape can lead to oil leakage and malfunction.
 - Please implement piping construction in a clear environment to prevent anything getting in products.
- 4) Air Bleeding of the Hydraulic Circuit
 - If the hydraulic circuit has excessive air, the action time may become very long. If air enters the circuit after connecting the hydraulic port or under the condition of no air in the oil tank, please perform the following steps.
 - ① Reduce hydraulic pressure to less than 2MPa.
 - ② Loosen the cap nut of pipe fitting closest to the clamp by one full turn.
 - ③ Shake the pipeline to loosen the outlet of pipe fitting.
Hydraulic fluid mixed with air comes out.



- ④ Tighten the cap nut after bleeding.
- ⑤ It is more effective to release air at the highest point inside the circuit or at the end of the circuit.
(Set an air bleeding valve at the highest point inside the circuit.)



5) Checking Looseness and Retightening

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

● Hydraulic Fluid List

ISO Viscosity Grade ISO-VG-32		
Maker	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 : Please contact manufacturers when customers require products in the list above.

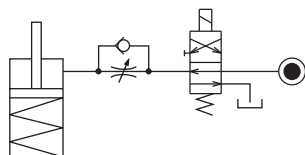
● Notes on Hydraulic Cylinder Speed Control Unit



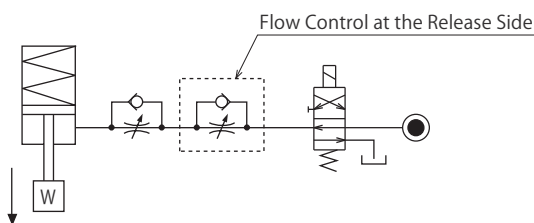
Please pay attention to the cautions below. Design the hydraulic circuit for controlling the action speed of hydraulic cylinder. Improper circuit design may lead to malfunctions and damages. Please review the circuit design in advance.

● Flow Control Circuit for Single Acting Cylinder

For spring return single acting cylinders, restricting flow during release can extremely slow down or disrupt release action. The preferred method is to control the flow during the lock action using a valve that has free-flow in the release direction. It is also preferred to provide a flow control valve at each actuator.



Accelerated clamping speed by excessive hydraulic flow to the cylinder may sustain damage. In this case add flow control to regulate flow. (Please add flow control to release flow if the lever weight is put on at the time of release action when using swing clamps.)



● Flow Control Circuit for Double Acting Cylinder

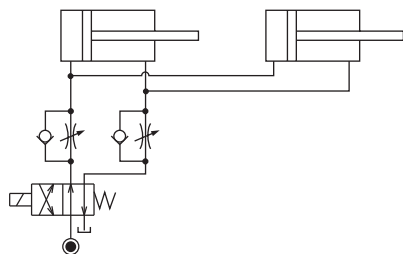
Flow control circuit for double acting cylinder should have meter-out circuits for both the lock and release sides. Meter-in control can have adverse effect by presence of air in the system.

However, in the case of controlling LKE, TMA, TLA, both lock side and release side should be meter-in circuit.

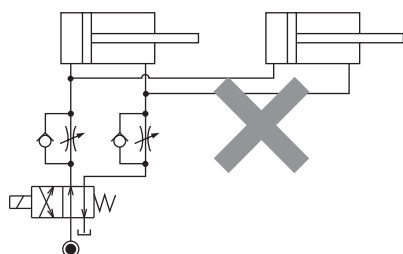
Refer to P.75 for speed adjustment of LKE.

For TMA and TLA, if meter-out circuit is used, abnormal high pressure is created, which causes oil leakage and damage.

【Meter-out Circuit】 (Except LKE/TMA/TLA)

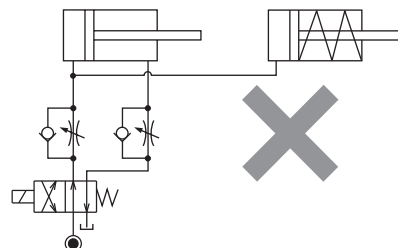


【Meter-in Circuit】 (LKE/TMA/TLA must be controlled with meter-in.)



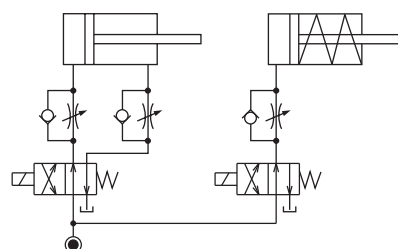
In the case of meter-out circuit, the hydraulic circuit should be designed with the following points.

- 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.

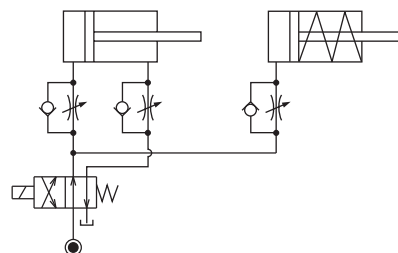


Refer to the following circuit when both the single acting cylinder and double acting cylinder are used together.

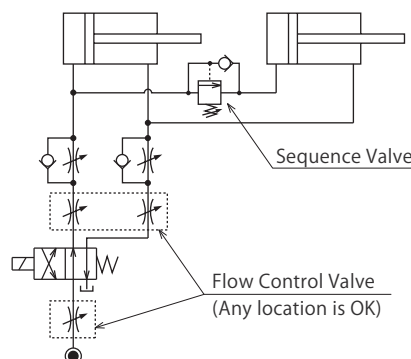
- Separate the control circuit.



- 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 works.



- 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 designed to.



High-Power
Series

Pneumatic Series

Hydraulic Series

Valve / Coupler
Hydraulic Unit

Manual Operation
Accessories

Cautions / Others

Cautions

Installation Notes
(For Hydraulic Series)

Hydraulic Fluid List

Notes on Hydraulic Cylinder
Speed Control Circuit

Notes on Handling

Maintenance/
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Company Profile

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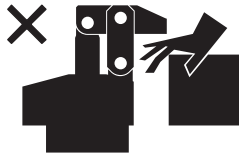
Search by
Alphabetical Order

Sales Offices

● Cautions

● Notes on Handling

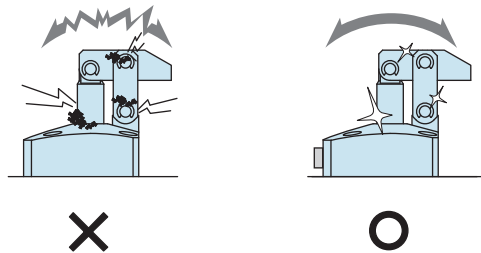
- 1) It should be operated by qualified personnel.
- The hydraulic machine and air compressor should be operated and maintained by qualified personnel.
- 2) Do not operate or remove the product unless the safety protocols are ensured.
 - ① The machine and equipment can only be inspected or prepared when it is confirmed that the safety devices are in place.
 - ② Before the product is removed, make sure that the above-mentioned safety devices are in place. Shut off the pressure and power source, and make sure no pressure exists in the air and hydraulic circuits.
 - ③ After stopping the product, do not remove until the temperature drops.
 - ④ Make sure there is no abnormality in the bolts and respective parts before restarting the machine or equipment.
- 3) Do not touch a clamp (cylinder) while it is working. Otherwise, your hands may be injured due to clinching.



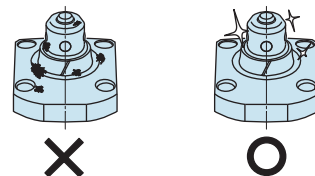
- 4) Do not disassemble or modify.
- If the equipment is taken apart or modified, the warranty will be voided even within the warranty period.

● Maintenance and Inspection

- 1) Removal of the Machine and Shut-off of Pressure Source
 - Before the machine is removed, make sure that safety devices and preventive devices are in place. Shut off the pressure and power source, and make sure no pressure exists in the air and hydraulic circuits.
 - Make sure there is no abnormality in the bolts and respective parts before restarting.
- 2) Regularly clean the area around the piston rod and plunger.
 - If it is used when the surface is contaminated with dirt, it may lead to packing seal damage, malfunctioning and fluid leakage.



- 3) Please clean out the reference surfaces on a regular basis (taper reference surface and seating surface) of the locating products. (VS/VT/VFL/VFM/VFJ/VFK/WVS/VWM/VWK/VX/VXE/VXF)
 - The locating products, except VX/VXE/VXF model, can remove contaminants with cleaning functions. However, hardened cutting chips, adhesive coolant and others may not be removed. Make sure there are no contaminants before installing a workpiece/pallet.
 - Continuous use with contaminant on components will lead to locating accuracy failure, malfunction and fluid leakage.



- 4) If disconnecting by couplers, air bleeding should be carried out on a regular basis to avoid air mixed in the circuit.
- 5) Regularly tighten nut, bolt, pin, cylinder, pipe line and others to ensure proper use.
- 6) Make sure the hydraulic fluid has not deteriorated.
- 7) Make sure there is a smooth action without an irregular noise.
 - Especially when it is restarted after left unused for a long period, make sure it can be operated correctly.
- 8) The products should be stored in the cool and dark place without direct sunshine or moisture.
- 9) Please contact us for overhaul and repair.

Cautions[Installation Notes
\(For Hydraulic Series\)](#)[Hydraulic Fluid List](#)[Notes on Hydraulic Cylinder
Speed Control Circuit](#)[Notes on Handling](#)[Maintenance/
Inspection](#)[Warranty](#)**Company Profile**[Company Profile](#)[Our Products](#)[History](#)**Index**[Search by](#)[Alphabetical Order](#)**Sales Offices**

● 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 the operator's judgment, resulting in defect.
- ③ If it is used or operated in an inappropriate way by the operator.
(Including damage caused by the misconduct of the 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 Other caused by natural disasters or calamities not attributable to our company.
- ⑦ Parts or replacement expenses due to parts consumption and deterioration.
(Such as rubber, plastic, seal material and some electric components.)

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

Sales Offices

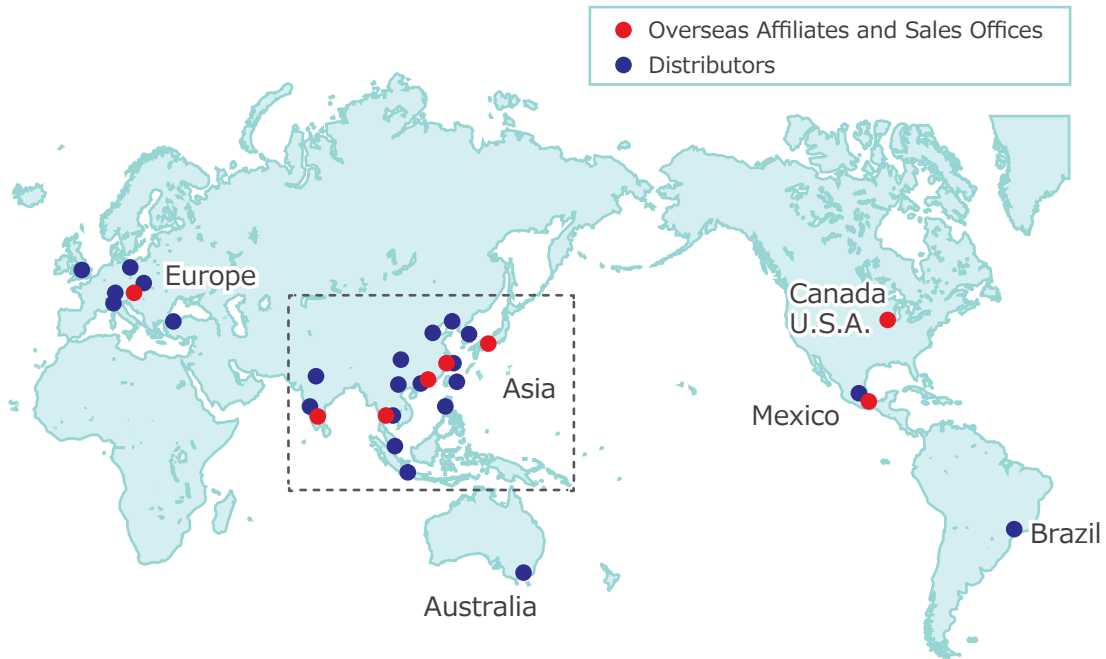
Sales Offices across the World

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	650 Springer Drive, Lombard, IL 60148 USA	
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