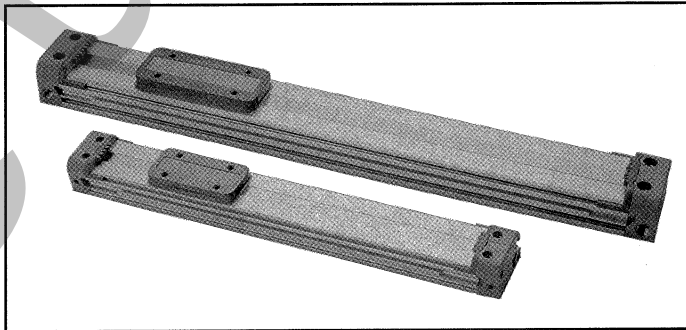
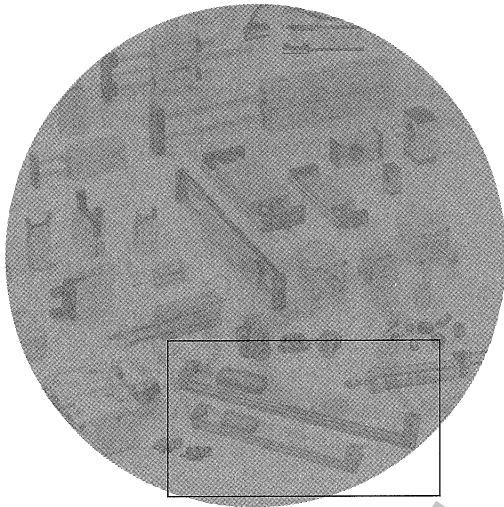


HORV Series Rodless Cylinders



BAND-TYPE RODLESS CYLINDER HORV SERIES

• Lighter

The lightweight body of the band-type rodless cylinder HORV series places no loads on either the actuator axis or the stand, even when using a Y-Z axis. The HORV contributes space savings and a lighter weight to the overall device.

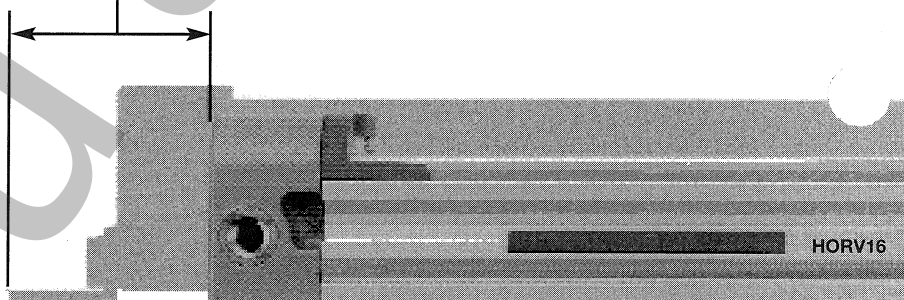
40%

• Shorter

Achieves a dead stroke shorter than conventional band-type rodless cylinder. It has further reduced zero stroke dimensions by approximately 35%.

35% *Dead stroke-reduction ratio*

Actual dimensional comparisons of
HORV 16X100
(in photograph) and
Conventional Rodless Cylinder
16X100
(in silhouette)



• High-strength Stainless Steel Seal Band

The original-design stainless seal band is the result of many years of experience. The HORV achieves long life and low leakage compared with plastic seal bands.

• Direct mount

The block type end cap allows for direct mounting without the need for mounting brackets.

Note The socket headcap screw shown in the illustration is not provided with the product.

• **Port Options**
NPT or Metric G-TAP (tapper) ports.

• Flat piston

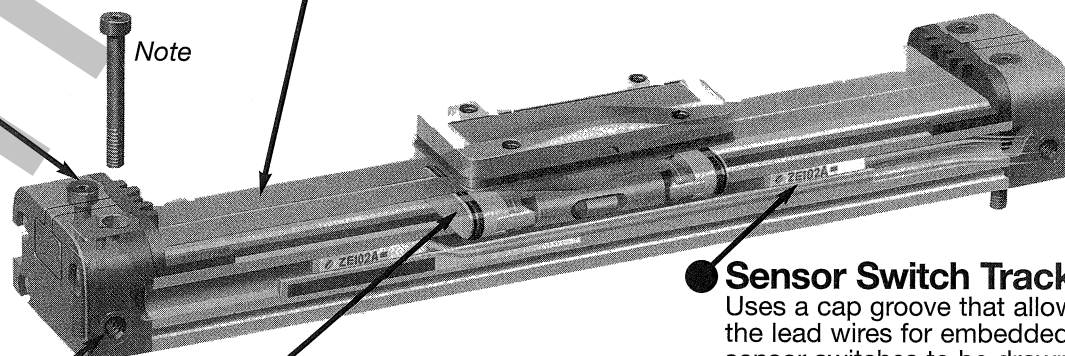
A flat piston shape achieves an extremely thin profile.

• Sensor Switch Track

Uses a cap groove that allows the lead wires for embedded sensor switches to be drawn out from a single surface.

Sensor switch

Lead wire protection



New World Standard for Rodless Cylinders

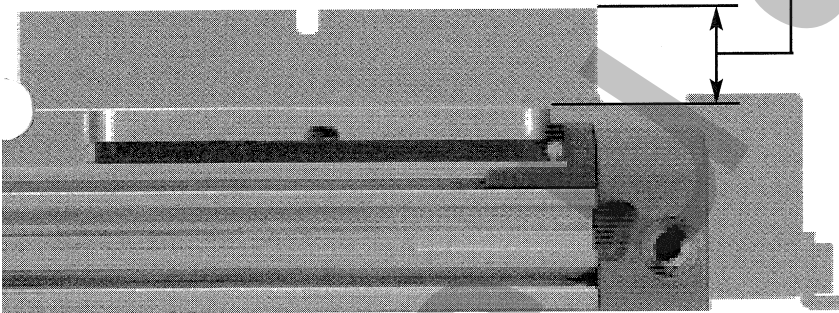
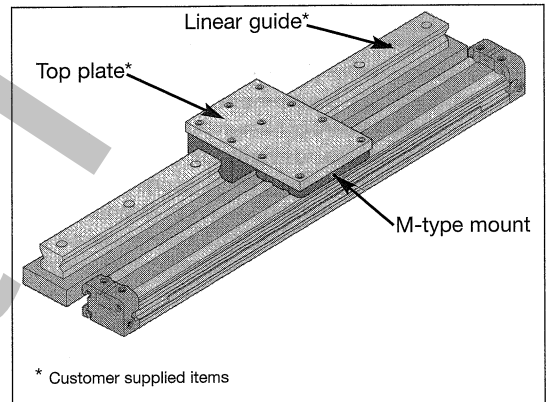
The HORV series is developed on the concept of making rodless cylinders "shorter and thinner." The use of our own flat piston mechanism design opens up a new territory in rodless cylinder design.

Thinner ●

The lower table position compared to conventional rodless cylinders makes possible a compact, simple design.

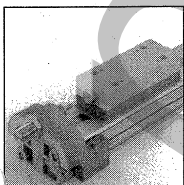
Height-reduction ratio
40%

Design Solution incorporating a linear guide rail



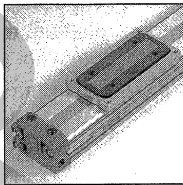
Featured Options

● Shock absorber unit



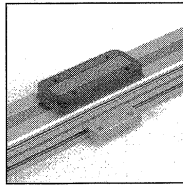
See page 247

● M-mount



See page 247

● F-tube support

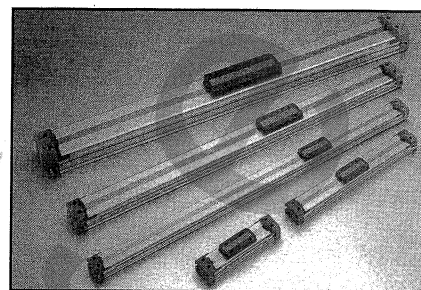
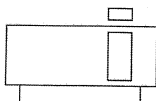


See page 247

Band-Type Rodless Cylinder HORV SERIES

Specifications

Symbol



All bore sizes available in 1/2" stroke increments

Specifications

Item	Model	HORV16	HORV25	HORV40
Bore size	in.	5/8	1	1 1/2
Media		Clean dry air		
Operating type		Double-acting		
Operating pressure range	PSI	21~115		
Proof pressure	PSI	170		
Operating temperature range	°F	32~140		
Operating speed range	in./sec.	Rubber bumper 3~20, with shock absorber 3~32 ^{Note 1}		
Cushion	Standard	Rubber bumper		
	Option	Shock absorber		
Lubrication		Not required, but if used, specify turbine oil type 1 (ISO VG32 or equivalent, or lithium grease)		
Stroke adjustment range	in. with shock absorber	One side 0~-.78 One side 0~-.118		
Maximum stroke		1/2" stroke increments ~ 78" 2000(mm) maximum standard stroke		
Filtration		40 microns		
Port size (NPT)	GTAP (parallel/tapper)	10~32	1/8"	1/4"
Leak Rate		1 liter per minute		

Notes 1: Select shock option, see page 239.

Thrust

(Lbf)

Model	Pressure area inch ²	PSI						
		28.5	42.5	57	71	85	99.5	113.5
HORV16	.311	9	13.5	18	22.5	27	31.5	36
HORV25	.759	22	33	44	55	66	77	88
HORV40	1.947	56.5	85	113	141	169.5	197.5	226

Weight

(Lbs)

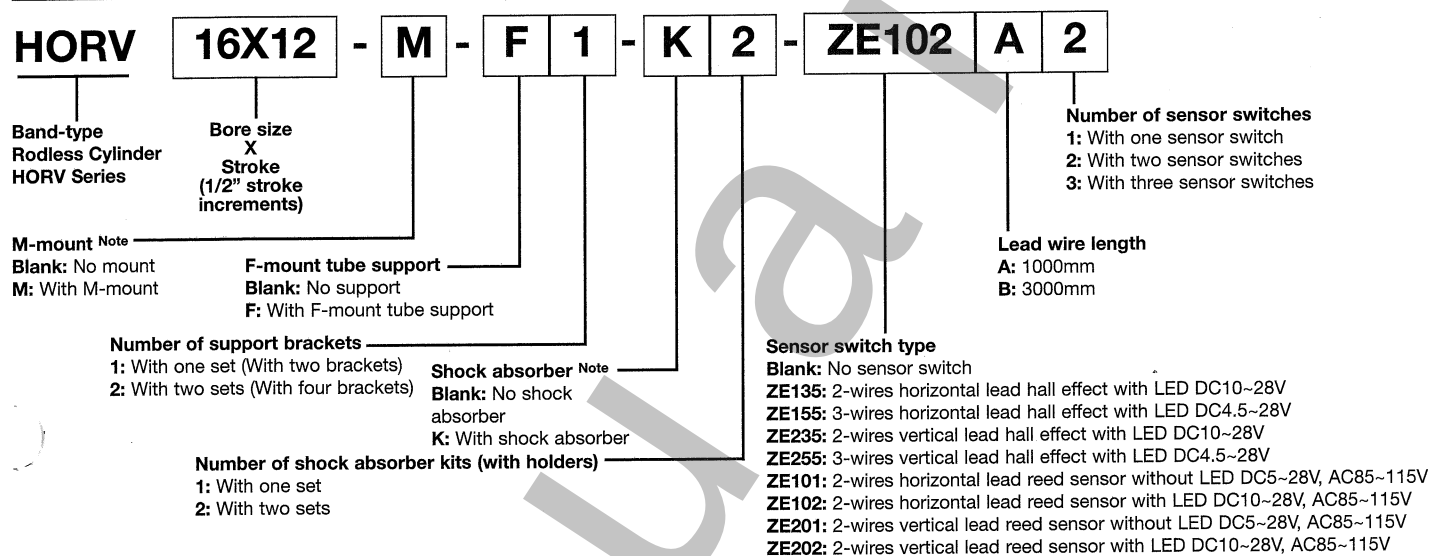
Model	Zero stroke weight (lbs.)	Additional weight for each 1" stroke (lbs.)	F-mount	M-mount	Shock absorber unit			Additional weight of sensor switch ^{Note 1}	
					Table	One side	Both sides	ZE□□□ A	ZE□□□ B
HORV16	0.44	0.07	0.08	0.04	0.17	0.13	0.27	0.03	0.08
HORV25	1.1	0.10	0.13	0.08	0.44	0.40	0.80		
HORV40	4.15	0.28	0.26	0.29	1.5	1.0	2.0		

Note 1: Sensor switch types A and B show the lead wire length.
A: 1000mm B: 3000mm

Shock Absorber Specification

Item	Model	HKSHGV 10X10	HKSHGV 14X12	HKSHGV 20X16
Appropriate cylinder		HORV16	HORV25	HORV40
Maximum absorption	J	3	8	25
Absorbing stroke	inch	.4	.5	.63
Maximum impact speed	in./sec.	31.5		
Maximum frequency	cycle/min	30		
Spring return force	lbs.	1.1	20	4.0
Angle variation		2.5° or less		
Temperature range	°F	32~140		

How To Order



Note: The combination of M-mount and shock absorber not allowed.

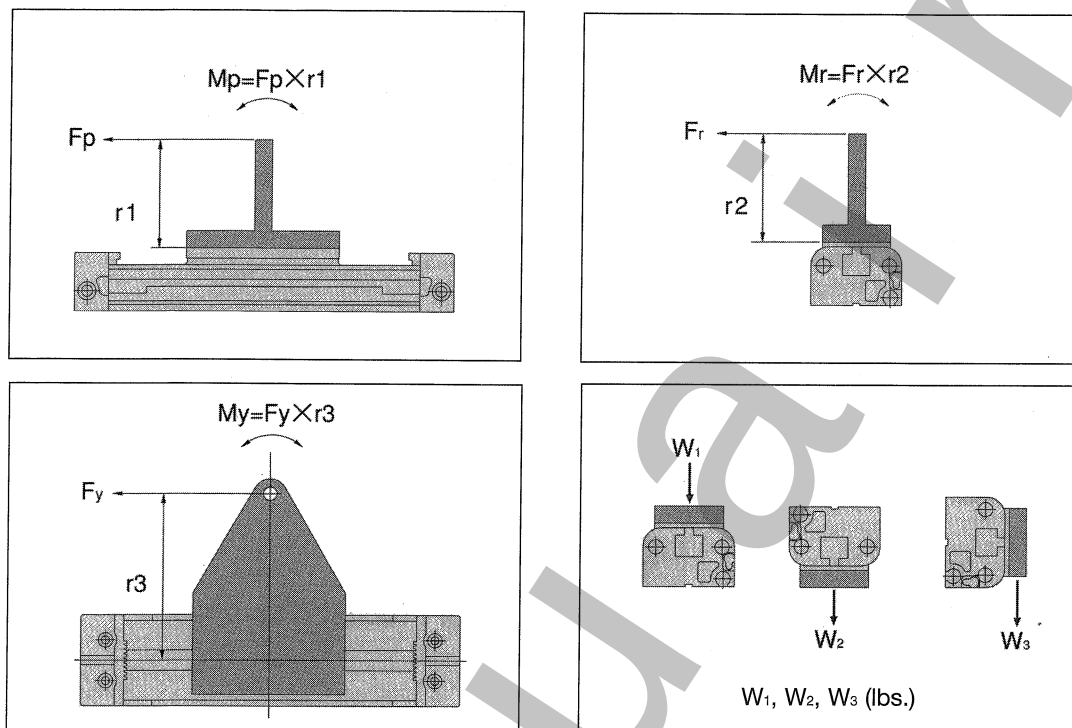
Handling Instructions, and Precautions



Selection and Mounting

Maximum load and moment

While the band-type rodless cylinder HORV series can be used while subjected to direct loads, do not let the load or moment exceed the values shown in the table below. In addition, since the conveyance load may vary depending on the speed, check the rubber bumper and shock absorber options on page 239 before use.



Pitching direction moment : $M_p = F_p \times r_1$

Rolling direction moment : $M_r = F_r \times r_2$

Yawing direction moment : $M_y = F_y \times r_3$

Moment direction	M_p	M_r	M_y	W_1	W_2	W_3
Model	lb·in	lb·in	lb·in	lbs.	lbs.	lbs.
HORV16	28.3	4.4	4.4	9	9	4.5
HORV25	106	14	14	27	27	13.5
HORV40	531	56	56	67	67	33.5

Caution: Do not exceed the maximum capabilities of the rubber bumper and/or shock absorber specifications.

Cushion capability

Rubber bumper capability

Do not use when the maximum impact speed exceeds 19 inch/sec.

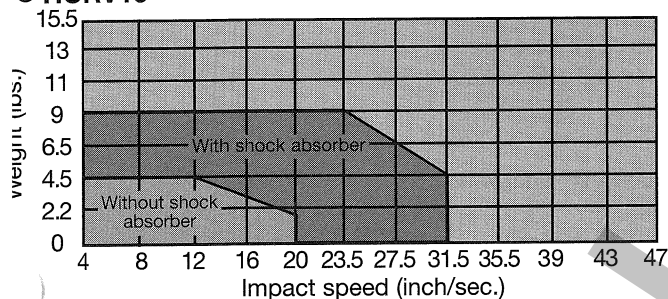
Shock absorber capability

Do not use when the maximum impact speed exceeds 31.5 inch/sec.

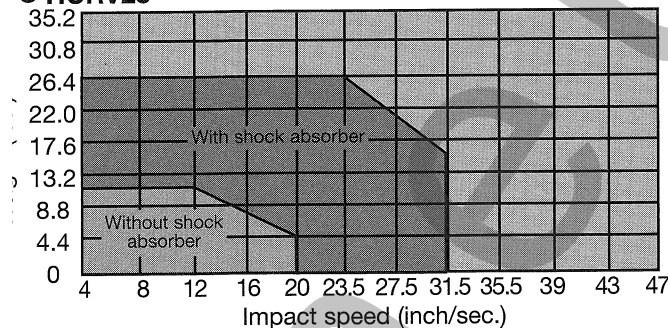
Rubber bumper and shock absorber performance curve (In horizontal use, at a pressure of 70PSI)

The "weight" in the graph refers to the weight conveyable by the HORV series. "Impact speed" refers to the speed immediately before striking the rubber bumper or shock absorber.

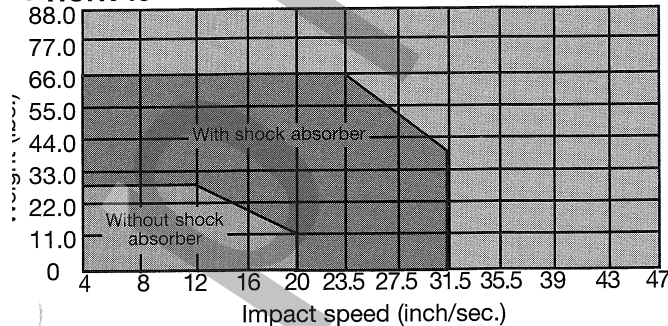
● HORV16



● HORV25



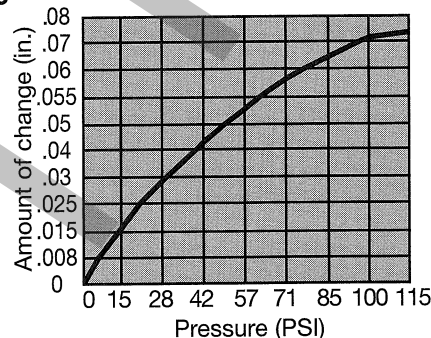
● HORV40



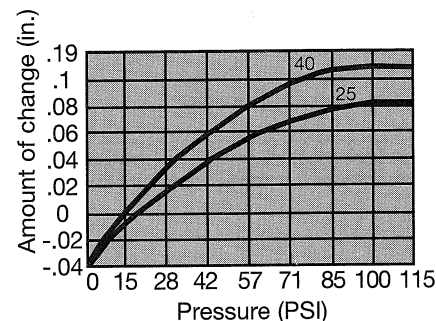
Amount of stroke change due to bumper compression at the end of stroke

In the band-type rodless cylinder HORV series, note that use of the rubber bumper results in the stroke varying according to pressure as shown in the figure below.

● HORV16

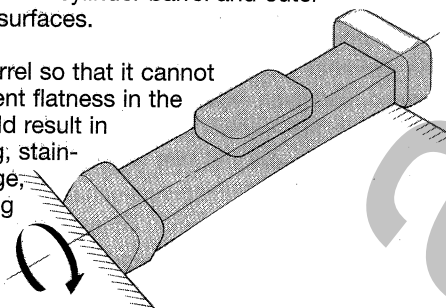


● HORV25, 40



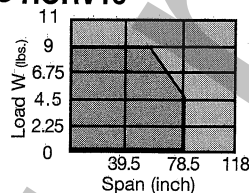
Mounting

1. While there are no particular restrictions on mounting stance in the HORV series, mount the piston yoke so that it faces downward or protect with a cover, etc., when mounting in locations subject to dripping water or oil, etc., or to large amounts of dust.
2. Never engage in electric welding either during or after mounting the band-type rodless cylinder HORV series. Flows of welding current to the cylinder could generate arcs that result in damage or depositions.
3. Be careful to avoid generating scratches or dents, etc., in the cylinder barrel.
4. If using in locations where the cylinder can easily become soiled, conduct cleaning at regular intervals. After cleaning, always apply grease to the cylinder barrel and outer sealing band rubbing surfaces.
5. Mount the cylinder barrel so that it cannot twist around. Insufficient flatness in the mounting surface could result in cylinder barrel twisting; stainless steel band damage, air leaks, and operating malfunctions.

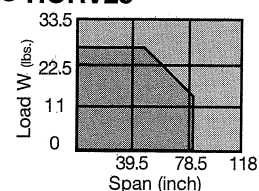


7. With longer cylinder lengths, the load could generate a large deflection that could result in operating malfunctions. If the relationship between the load on a two-point support at both ends and the stroke exceeds the range shown in the figure below, always use an intermediate F-tube support.

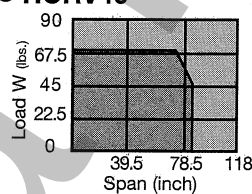
● HORV16



● HORV25

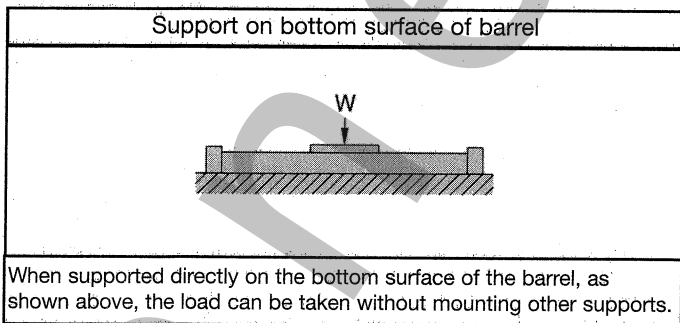
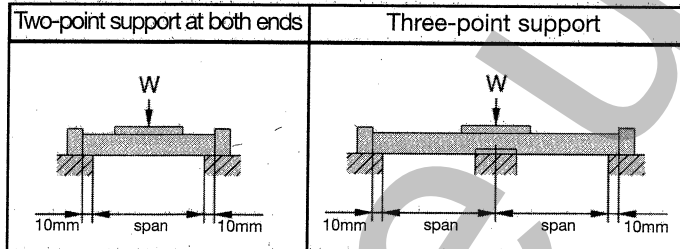


● HORV40

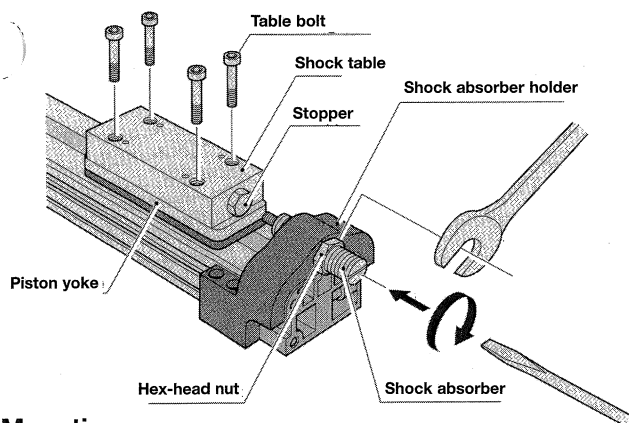


Load W¹ and/or W²

6. Precautions for the support types.



Mounting the shock absorber, and stroke adjustment



Mounting

1. There are no particular restrictions on mounting position so long as the end surface of the shock absorber holder does not protrude beyond the cylinder end surface. (Can also be used at an intermediate position.)
2. Mount so that the shock absorber and the stopper on the table side are completely in contact along the entire surface.
3. Use the shock absorber within the range of the shock absorber performance limits (the range of its performance curve).
4. Maximum impact speed of the shock absorber is 31.5 inch/sec. Note that this is not the same as the average speed. The speed at time of impact should not exceed 31.5 inch/sec.
5. Do not use the shock absorber in locations subject to dripping water or oil, or to large amounts of dust. If using in such locations, use a cover, etc., to prevent the unit from being directly subjected to dripping water, etc., It could result in operating malfunctions, or in reduced absorption energy.
6. Do not loosen the setscrew placed in the center of the shock absorber's back end surface. The oil charged inside the unit could flow out, reducing shock absorber performance.
7. Use the table bolt provided to attach the shock table to the piston yoke.

Torque Table

Model	Tightening torque lb-in	Mounting bolt
HORV16	18	M4X0.7
HORV25	36	M5X0.8
HORV40	61.8	M6X1

Note: Tighten the table fixing bolt in line with the above values.

Stroke adjustment

1. Shock absorber position adjustment
 - a) Loosen the hex-head nut holding the shock absorber.
 - b) Use a screwdriver to rotate the shock absorber and adjust its position.
 - c) When the desired position has been reached, tighten the hex-head nut to fix in place.

Hex-head nut tightening torque

Model	Tightening torque ft. lbs.	Hex-head opposite side mm
HORV16	5.90	13
HORV25	7.40	17
HORV40	22.10	24

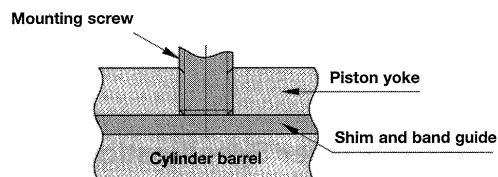
Mounting the workpiece

1. When using the piston yoke to mount a workpiece, mount within the tightening torques shown in the table below.

Mounting bolt tightening torques

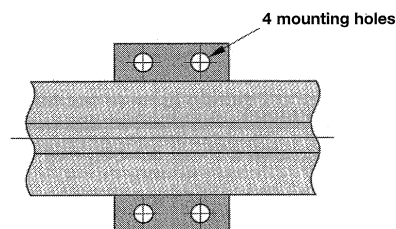
Model	Tightening torque ft. lbs.	Mounting bolt
HORV16	1.5	M4X0.7
HORV25	3.0	M5X0.8
HORV40	5.15	M6X1

2. Pay attention to the length of the mounting bolt threads. Screwing in a bolt longer than the thread hole depth could result in its bumping against the shim and tape guide, causing operation malfunctions.



Mounting the F-mount

For the F-mount, use mounting holes in four places to fix in place with bolts.



Note: Refer to Page 247 dimensions.

Order Codes

Additional Parts

● **Shock absorber unit**

(With shock absorber, table and holder)

HK-ORV

16

Equivalent bore size
16: For ORV16
25: For ORV25
40: For ORV40

● **M-type mounting brackets**

HM-ORV

16

Equivalent bore size
16: For ORV16
25: For ORV25
40: For ORV40

● **F-type support tube brackets**

(With two units)

HF-ORV

16

Equivalent bore size
16: For ORV16
25: For ORV25
40: For ORV40

● **Shock absorber**

HKSHGV

10X10

Mounting outer screw size X stroke
10X10: For ORV16
14X12: For ORV25
20X16: For ORV40

Multi-orifice fixed aperture shock absorber

● **Shock absorber holder**

HC-ORV

16

Equivalent bore size
16: For ORV16
25: For ORV25
40: For ORV40

● **Shock absorber table (With bolt)**

HT-ORV

16

Equivalent bore size
16: For ORV16
25: For ORV25
40: For ORV40

● For the sensor switches, see page 248

Repair Kit

● **Sealing Kit** Note

HMK1-ORV

16

Equivalent bore size
16: For ORV16
25: For ORV25
40: For ORV40

● **Sealing band kit**

HMK2-ORV

16X200

Equivalent bore size
16: For ORV16
25: For ORV25
40: For ORV40

● **Rebuild Kit**

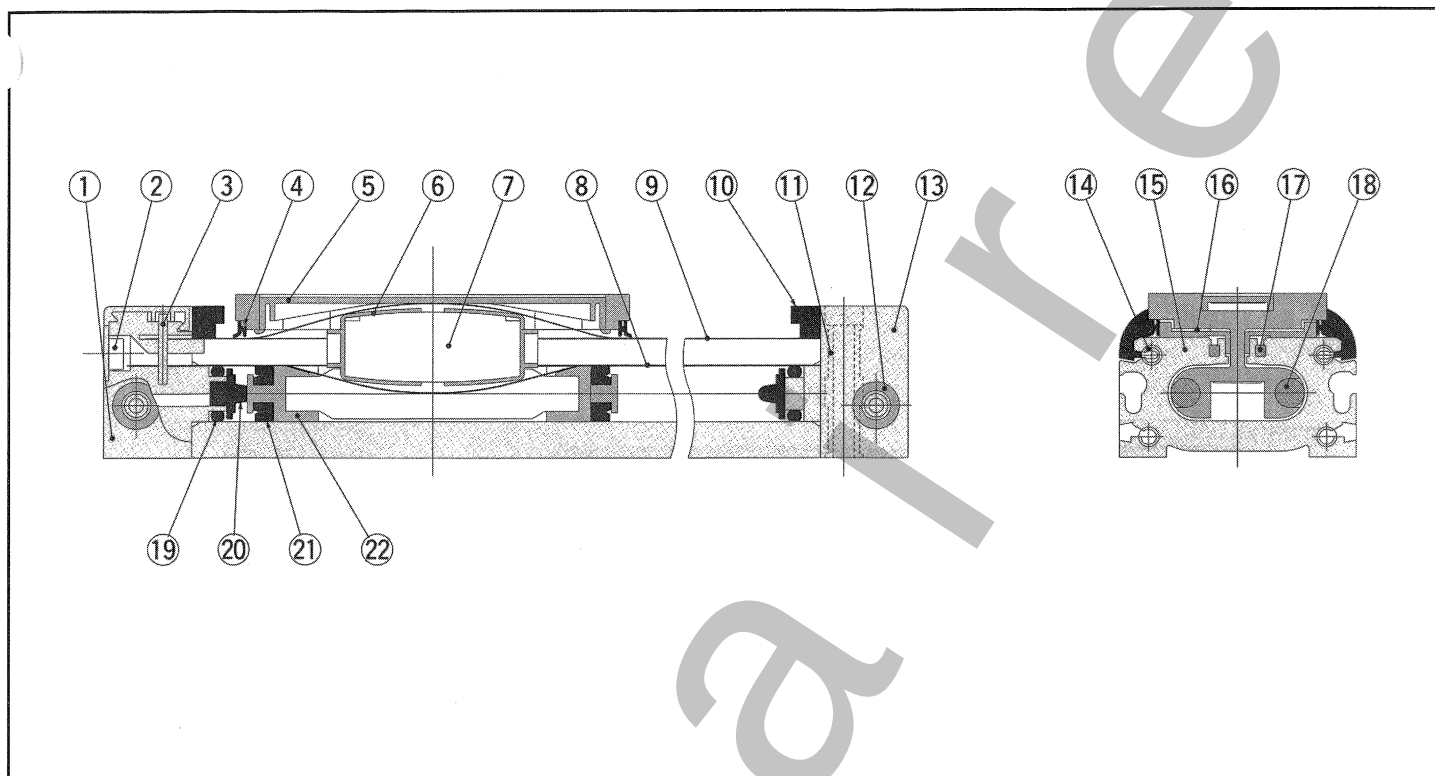
HMK6-ORV

16

Equivalent bore size
16: For ORV16
25: For ORV25
40: For ORV40

Note: The fewest order unit of the seal kit is every five sets.

Internal Construction



Names of Parts, and Major Materials

No.	Name	Material	Quantity	Remarks
①	End cap R	Polybutylene terephthalate	1	
②	Cap cover	Polypropylene	2	
③	Band stop pin	Stainless steel	2	Parallel pins
④	Scraper	Nylon	1	
⑤	Mount cover	Polybutylene terephthalate	1	
⑥	Tape guide	Polyacetal	2	
⑦	Piston yoke	Aluminum alloy	1	Anodized
⑧	Inner sealing band	Stainless steel	1	
⑨	Outer sealing band	Stainless steel	1	
⑩	Mount bumper	Urethane rubber	2	
⑪	Sled insert B	Brass	4	Nickel-plated
⑫	Sled insert A	Brass	2	Nickel-plated

No.	Name	Material	Quantity	Remarks
⑬	End cap L	Polybutylene terephthalate	1	
⑭	Button bolt with hex-head hole	Steel	6	Zinc chromate
⑮	Cylinder barrel	Aluminum alloy	1	Anodized
⑯	Shim	Polyester	-	
⑰	Magnet strip	Rubber magnet	2	
⑱	Magnet	Rare earth magnet	2	Aluminum chromate treated
⑲	Cylinder gasket	Synthetic rubber (NBR)	2	
⑳	Piston bumper	Synthetic rubber (NBR)	2	
㉑	Piston seal	Synthetic rubber (NBR)	2	
㉒	Piston	Polyacetal	2	

Maintenance Kit Order Codes, and Parts Composition

● Sealing kit

HMK1-ORV Equivalent bore size : ④-1, ⑤-1, ⑥-2, ⑲-2, ㉑-2

● Sealing band kit

HMK2-ORV Equivalent bore size X Stroke : ③-1, ⑧-1, ⑨-1

● Rebuild Kit

HMK6-ORV Equivalent bore size : ①-1, ②-2, ③-2, ④-1, ⑤-1, ⑥-2, ⑦-1, ⑩-2, ⑪-4, ⑫-2, ⑬-1, ⑭-6, ⑯-2, ⑰-2, ⑱-2, ㉑-2, ㉒-2

Stop Pin ③

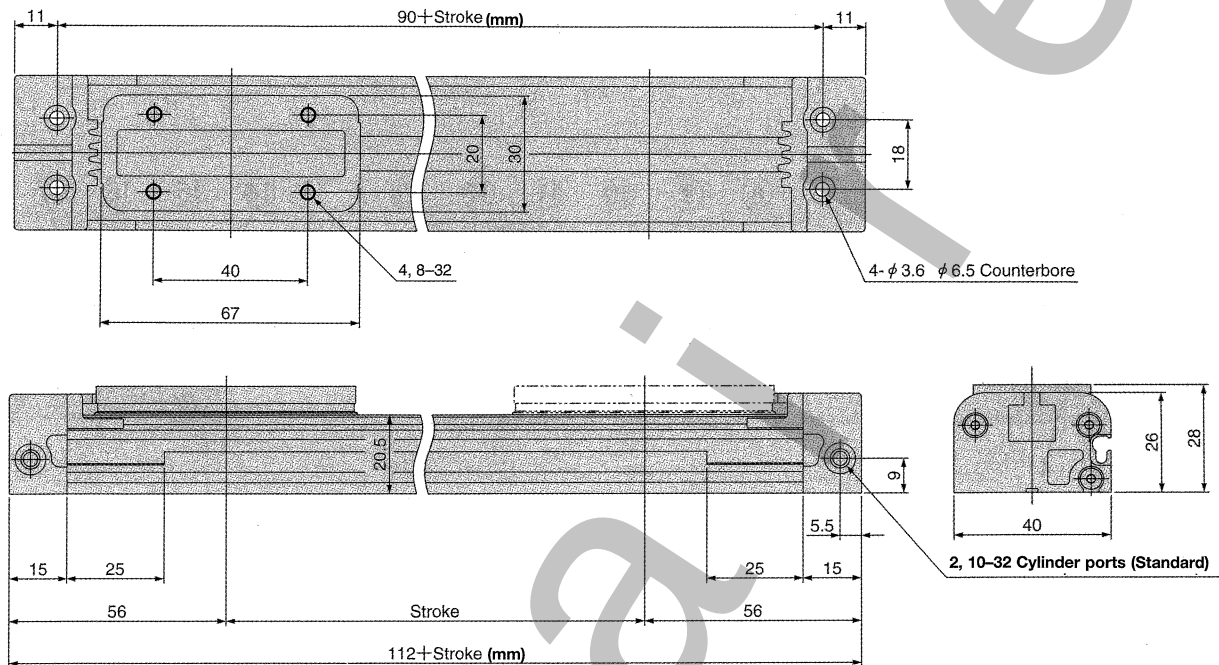
Bore	Part Number
16	X980212
25	X980217
40	X980222

Note: ④ -1
Quantity
Inner construction No.

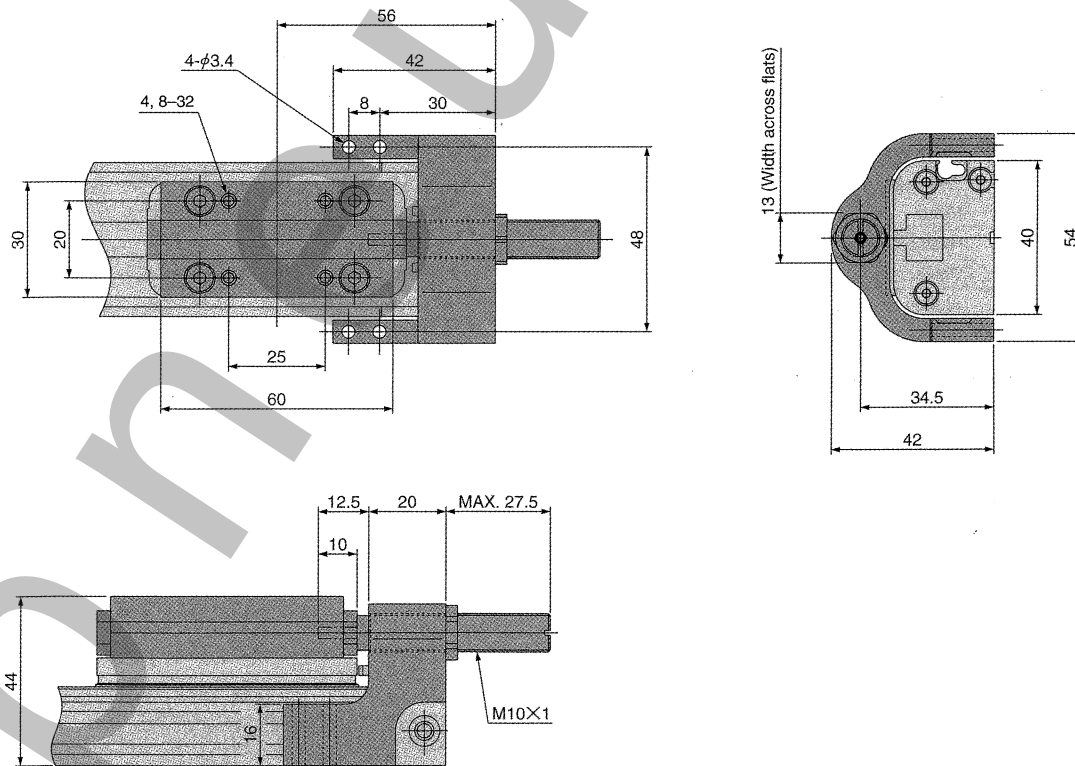
Dimensions (Unit mm)

● HORV16X Stroke

1 inch = 25.4 mm



● With shock absorber

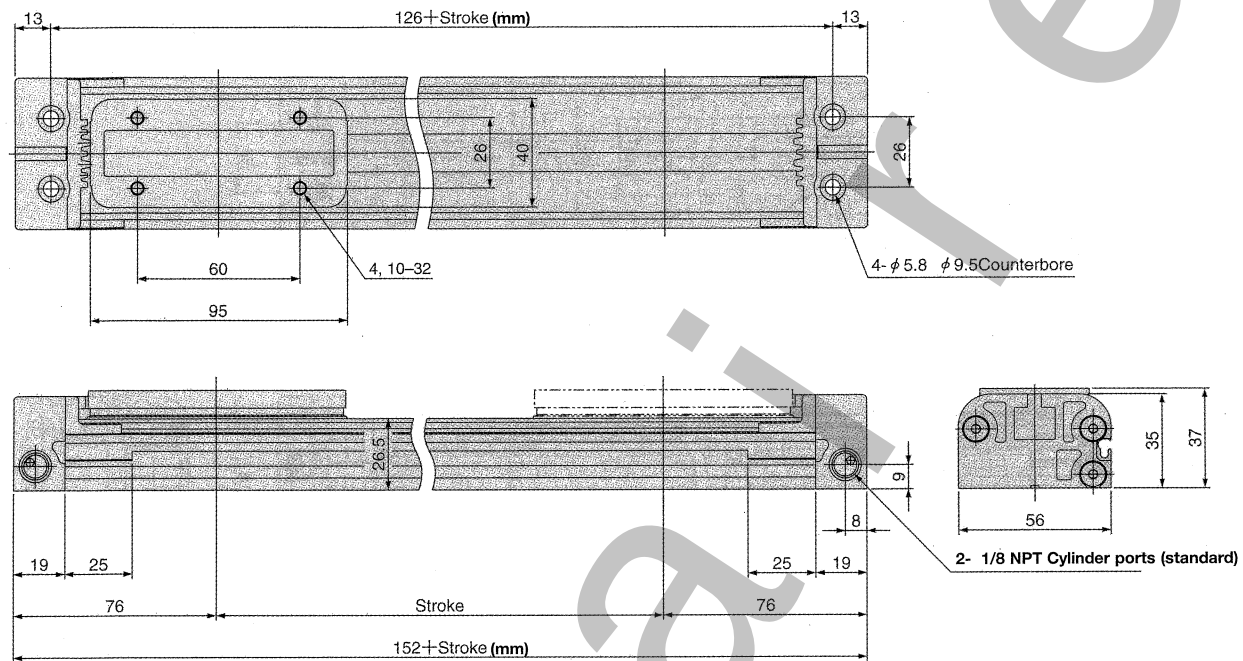


Note: For the M-type mount and F-type support, see page 247.

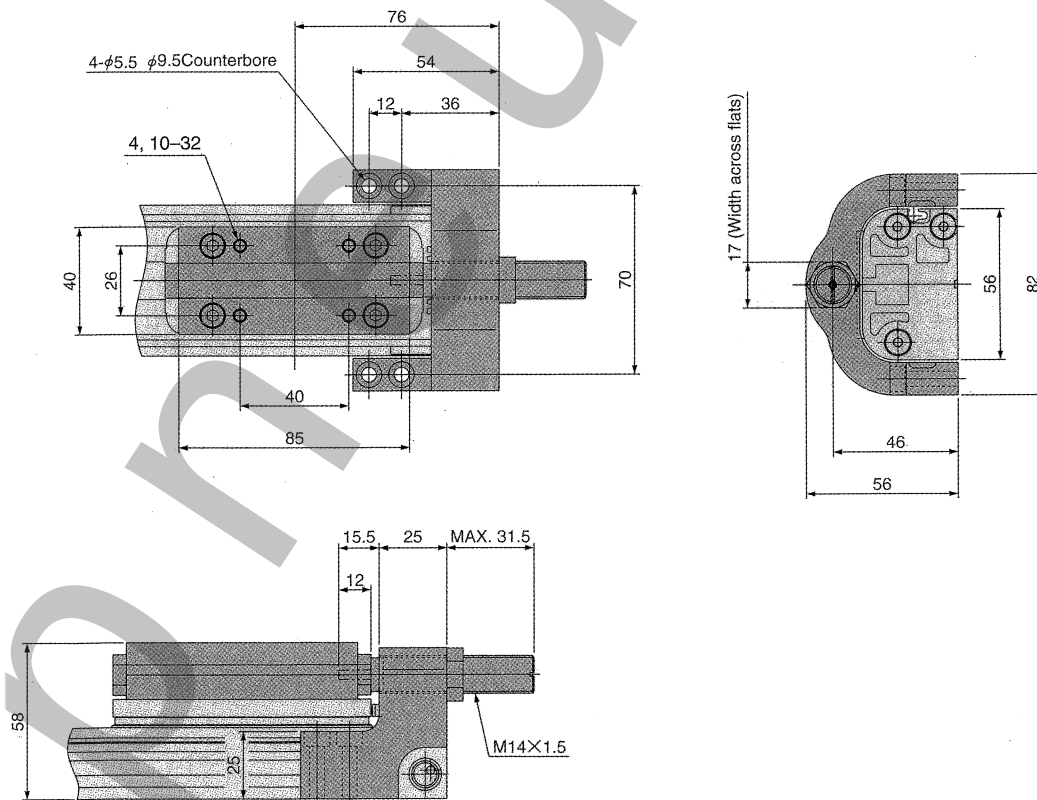
Dimensions (Unit mm)

● HORV25X Stroke

1 inch = 25.4 mm



With shock absorber

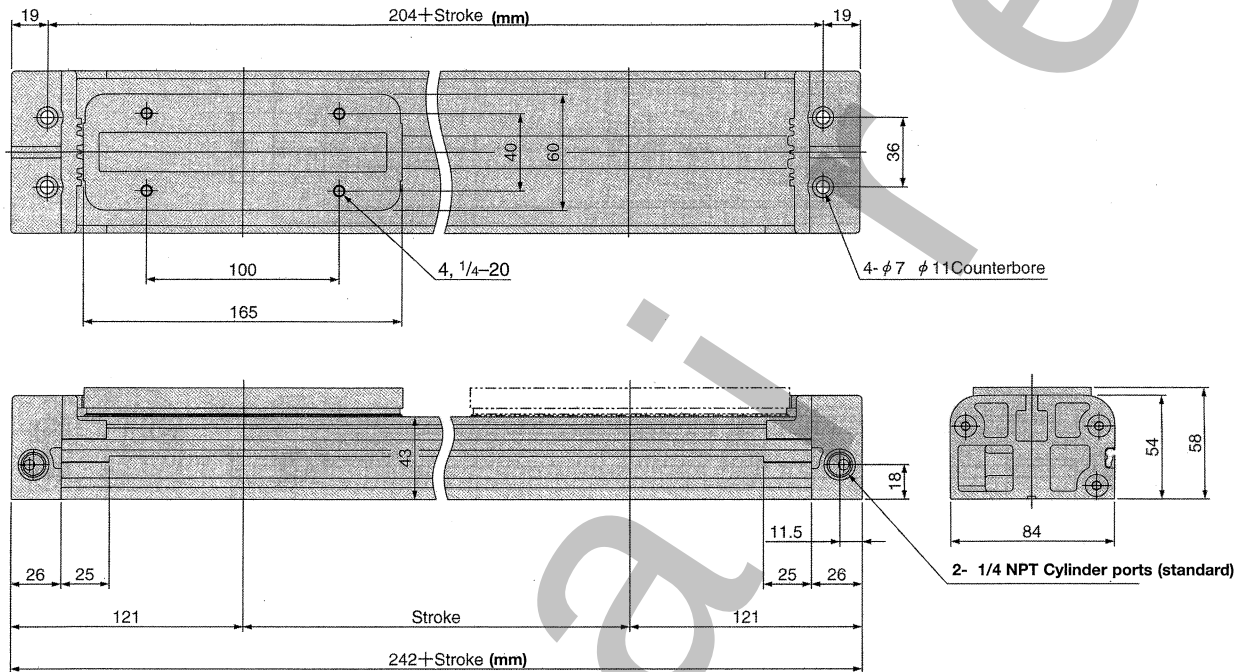


Note: For the M-type mount and F-type support, see page 247.

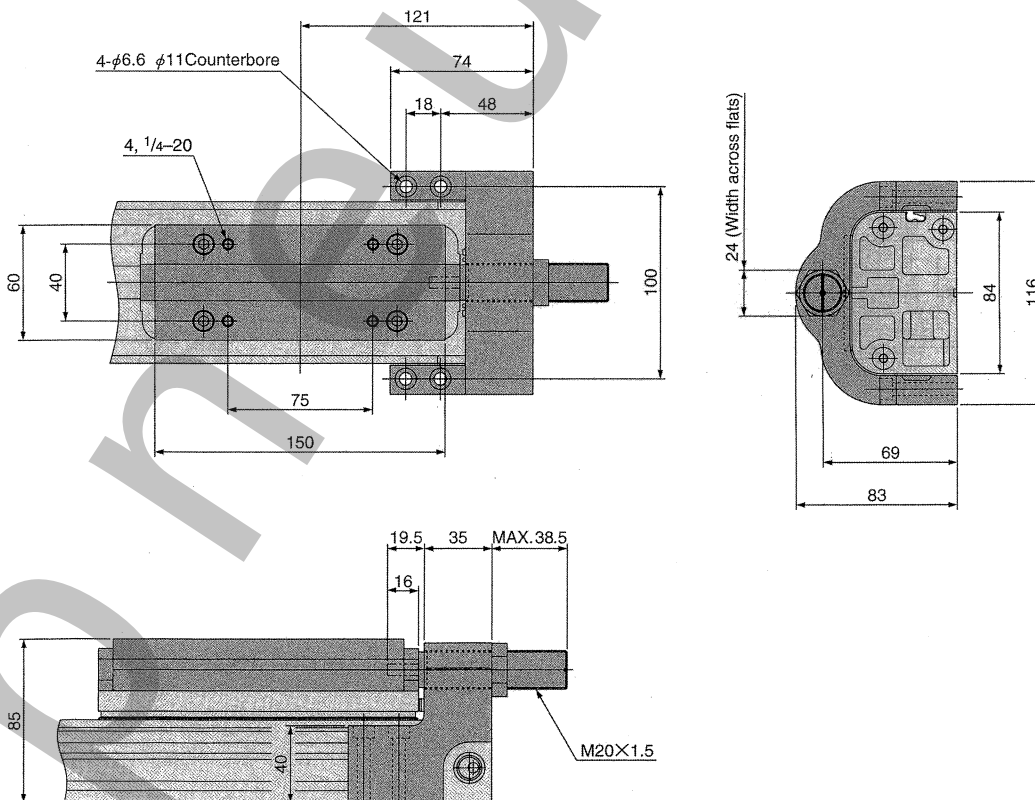
Dimensions (Unit mm)

● HORV40X Stroke

1 inch = 25.4 mm



● With shock absorber

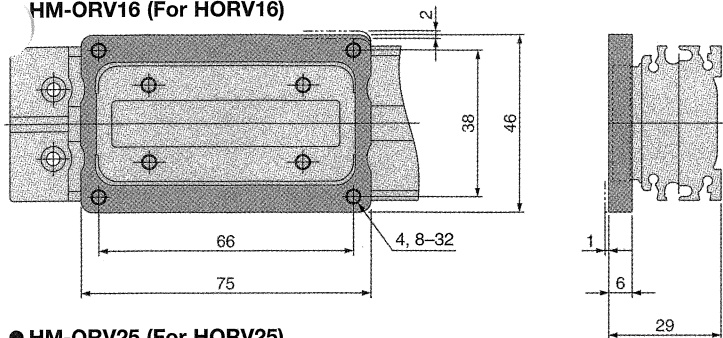


Note: For the M-type mount and F-type support, see page 247.

Optional Dimensions (Unit mm)

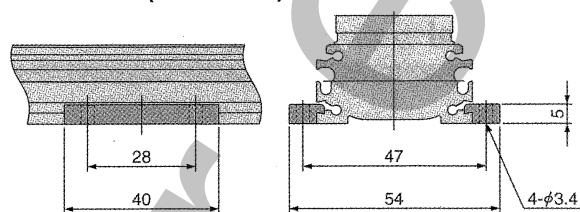
● M-mount

HM-ORV16 (For HORV16)

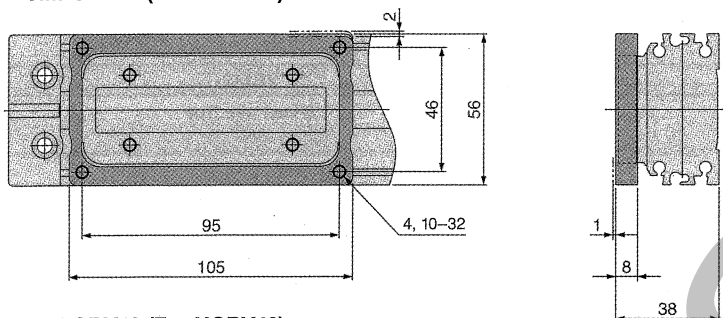


● F-mount

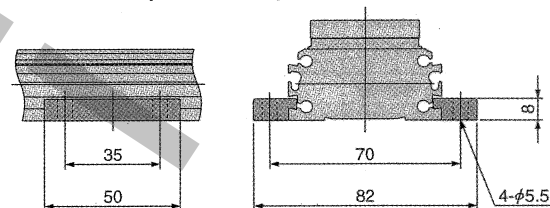
HF-ORV16 (For HORV16)



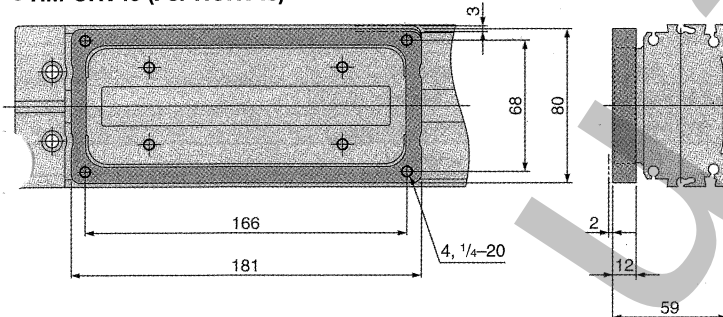
● HM-ORV25 (For HORV25)



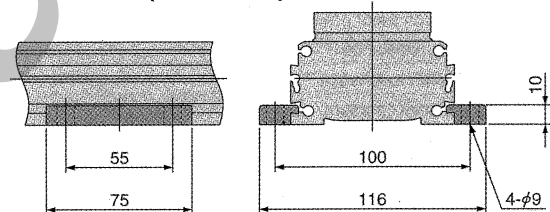
● HF-ORV25 (For HORV25)



● HM-ORV40 (For HORV40)



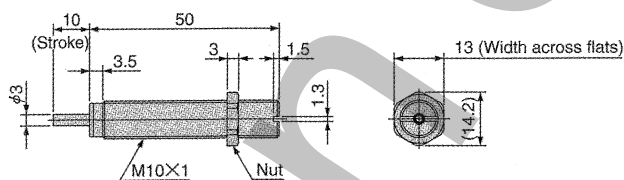
● HF-ORV40 (For HORV40)



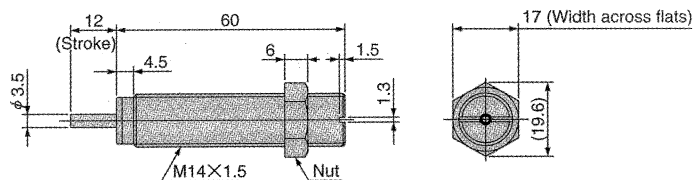
Note: Remove the mount bumper when mounting the M-type mount.

Shock Absorber Dimensions (Unit mm)

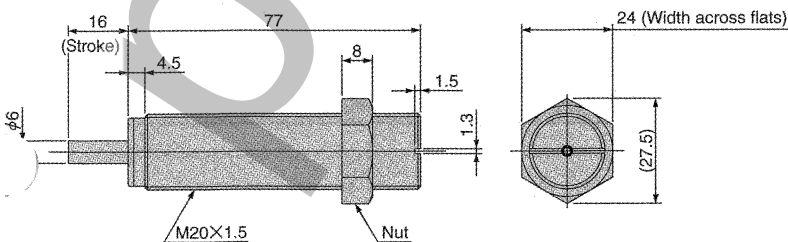
● HKSHGV10x10 (For HORV16)



● HKSHGV14x12 (For HORV25)



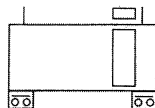
● HKSHGV20x16 (For HORV40)



Sensor Switch

Hall Effect Type and Reed Sensor Type

Symbol



Specifications

● Hall effect type

Item	Model	ZE135	ZE235	ZE155	ZE255
Wiring Method		2-lead wire type		3-lead wire type	
Direction of lead wire		Horizontal	Vertical	Horizontal	Vertical
Power source voltage		--		DC4.5~28V	
Load voltage		DC10~28V		DC4.5~28V	
Load current		4~20mA (At 25°C, 10mA at 60°C)		50mA MAX.	
Consumption current		--		10mA MAX. (DC24V)	
Voltage drop Note 1		4.5V MAX.		0.5V MAX. (At 20mA with voltage of 10V or less)	
Leakage current		1mA MAX. (DC24V, 25°C)		50μA MAX. (DC24V)	
Response time		1ms MAX.			
Insulation resistance		100M MIN. (At DC500V megas, between case and lead wire terminals)			
Dielectric strength		AC500V (50/60Hz) in one minute (Between case and lead wire terminals)			
Shock resistance Note 2		294.2m/s ² {30.0G} (Non-repeated)			
Vibration resistance Note 2		Total amplitude 1.5mm ·10~55Hz {88.3m/s ² (9.0G)}			
Protective structure		IEC IP67, JIS C0920 (Permeation proof type)			
Operating indicator		Red LED indicator lamp when ON			
Lead wire		PVC insulated cable 0.2 SQ x 2 wires (Brown, Blue) x ℓ Note 3		PVC insulated cable 0.15 SQ x 3 wires (Brown, Blue, Black) x ℓ Note 3	
Ambient temperature		32~140°F			
Storage temperature range		14~158°F			
Weight		15g (For lead wire length A: 1000mm), 35g (For lead wire length B: 3000mm)			

Notes 1: Internal drop voltage will vary according to the load current.

2: According to Koganei test standards

3: Lead wire length A; 1000mm, B; 3000mm

● Reed sensor type

Item	Model	ZE101	ZE201	ZE102	ZE202
Wiring Method		2-lead wire type			
Direction of lead wire		Horizontal	Vertical	Horizontal	Vertical
Low voltage		DC5~28V, AC85~115V (r.m.s.)		DC10~28V, AC85~115V (r.m.s.)	
Load current		40mA MAX., 20mA MAX.		5~40mA, 5~20mA	
Internal drop voltage ^{Note 1}		0.1V MAX. (At load current of DC40mA)		3.0V MAX.	
Leakage current		0mA			
Response time		1ms MAX.			
Dielectric strength		100M Ω ohms			
Insulation proof pressure		AC 500V (50/60Hz) in one minute (Between case and lead wire terminals)			
Shock resistance		294.2m/s ² {30.0G} (Non-repeated)			
Vibration resistance		Total amplitude 1.5mm · 10~55Hz {88.3m/s ² (9.0G)}, Resonant frequency 2750 +/- 250Hz			
Protective structure		IEC IP67, JIS C0920 (Permeation proof type)			
Operating indicator		None		Red LED indicator lamp when ON	
Lead wire		PVC insulated cable 0.2 SQ x 2 wires (Brown, Blue) x ℓ ^{Note 2}			
Ambient temperature		32~140°F			
Storage temperature range		14~158°F			
Contact protection measures		Required (See contact protection measures on page 17)			
Weight		15g (For lead wire length A: 1000mm), 35g (For lead wire length B: 3000mm)			

Notes 1: Internal drop voltage will vary according to the load current.

2: Lead wire length A; 1000mm, B; 3000mm

Sensor Switch Order Code - Specifications

ZE135

A

Lead wire length
A: 1000mm
B: 3000mm

Horizontal sensor switch type

ZE135: 2 wires, hall effect with LED (PNP, sourcing), DC10~28V
ZE155: 3 wires, hall effect with LED (NPN, sinking), DC4.5~28V
ZE101: 2 wires, reed sensor without LED, DC5~28V, AC85~115V
ZE102: 2 wires, reed sensor with LED, DC10~28V, AC85~115V

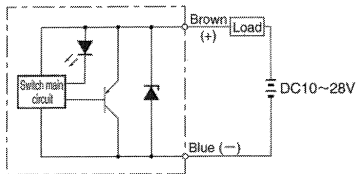
Vertical sensor switch type

ZE235: 2 wires, hall effect with LED (PNP, sourcing), DC10~28V
ZE255: 3 wires, hall effect with LED (NPN, sinking), DC4.5~28V
ZE201: 2 wires, reed sensor without LED, DC5~28V, AC85~115V
ZE202: 2 wires, reed sensor with LED, DC10~28V, AC85~115V

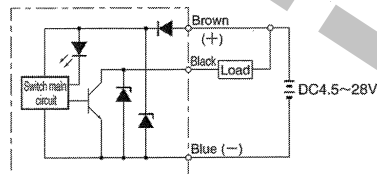
Internal Circuit Diagram

● Hall effect type

● 2-lead wire PNP type (ZE135, ZE235)

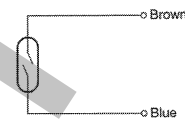


● 3-lead wire NPN type (ZE155, ZE255)

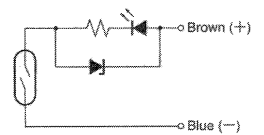


● Reed sensor type

● Without LED (ZE101, ZE201)



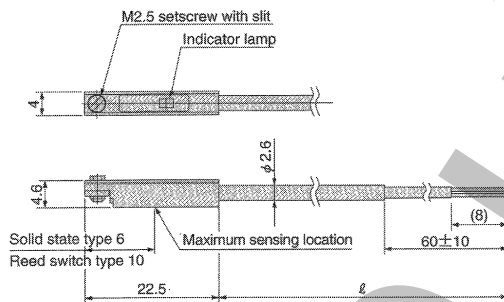
● With LED (ZE102, ZE202)



Sensor Switch Dimensions (Unit mm)

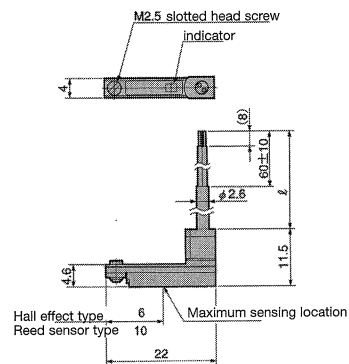
● Horizontal lead wire

● With LED (ZE135, ZE155, ZE102)

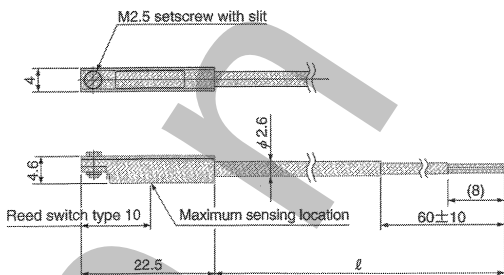


● Vertical lead wire

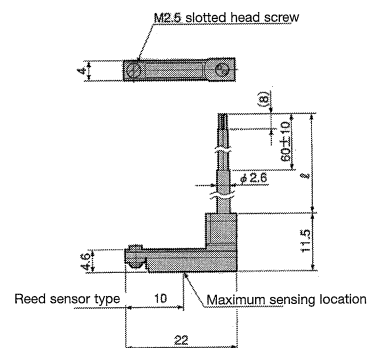
● With LED (ZE235, ZE255, ZE202)



● Without LED (ZE101)



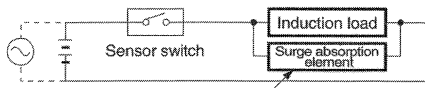
● Without LED (ZE201)



Contact Protection Measures for the Sensor Switch

To ensure stable use of the reed type sensor switch, implement the following contact protection measures.

● When connecting inductive loads (Solenoid relays, etc.)



For DC.....Diode or RC circuit, etc.

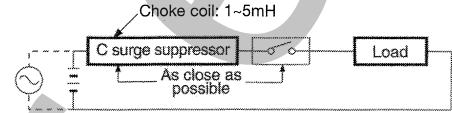
For AC.....RC circuit, etc.

Diode: For forward direction, use circuit current or higher, and for reverse direction, use reverse proof pressure 10 times or more the circuit voltage.

C : 0.01~0.1 μ F

R : 1~4k Ω

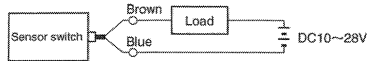
● When capacitive surges are generated (when lead wire length exceeds 10m)



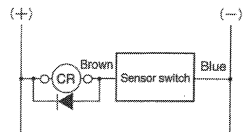
Instructions for Connecting Sensor Switch

● 2-lead wire type (ZE135, ZE235, ZE101, ZE102, ZE201, ZE202)

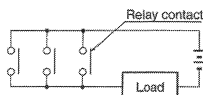
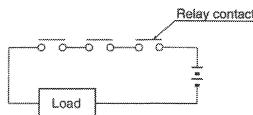
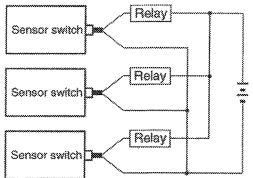
● Basic Connection



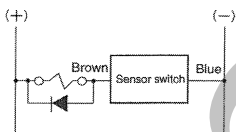
● Connection to relay



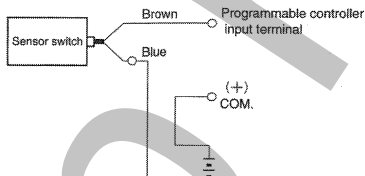
AND (straight) connection, OR (parallel) connection



● Connection to solenoid

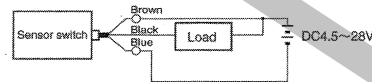


● Connection to programmable controller

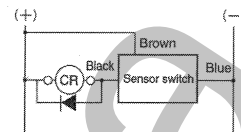


● 3-lead wire type (ZE155, ZE255)

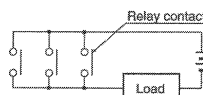
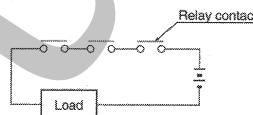
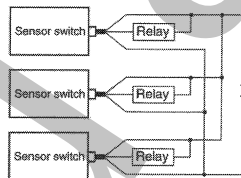
● Basic Connection



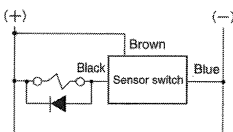
● Connection to relay



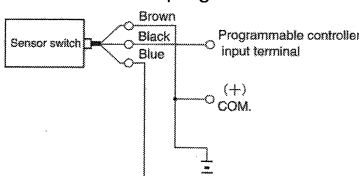
AND (straight) connection, OR (parallel) connection



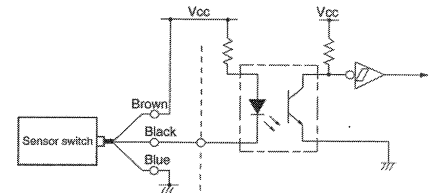
● Connection to solenoid



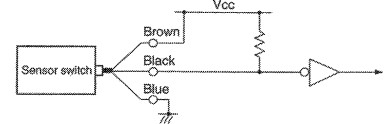
● Connection to programmable controller



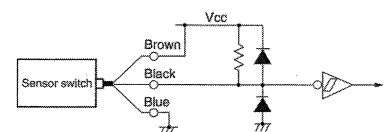
● Connection to TTL



Direct connection



● Connection to C-MOS



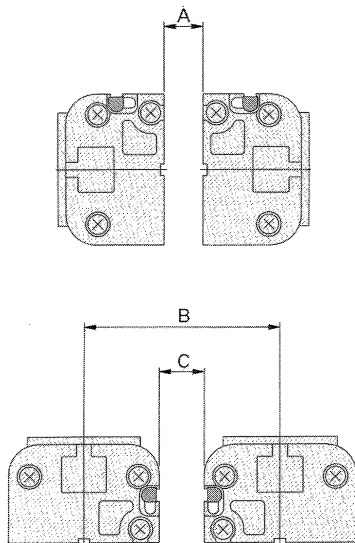
Cautions for Hall Effect Sensor Switch:

1. Be careful of the wiring colors for wiring connections. The lack of surge protection means that miswiring could damage the switch.
2. Do not connect the 2-wire reed solid state sensor switch to TTL or C-MOS.
3. We recommend the use of surge protection diodes for the induction loads of solenoid relays, etc.
4. Since the circuit voltage will drop in proportion to the number of sensor switches, avoid use of AND (straight) connections.
5. While it is possible to use pairs of sensor outputs (such as pairs of black wires) when using OR (parallel) connections, be aware that leakage voltage will increase by several times the number of sensor switches and may cause load return abnormalities.

6. Since the sensor switch is a magnetically sensitive type, avoid using in locations subject to strong external magnetic fields, or bringing it too close to power lines or other large electric flows.
7. Do not pull strongly on the lead wires, bend them too far, or subject them to excessive force.
8. Avoid use in environments subject to chemical products or gases, etc.
9. Consult factory for use in ambient atmospheres subject to water or oil.

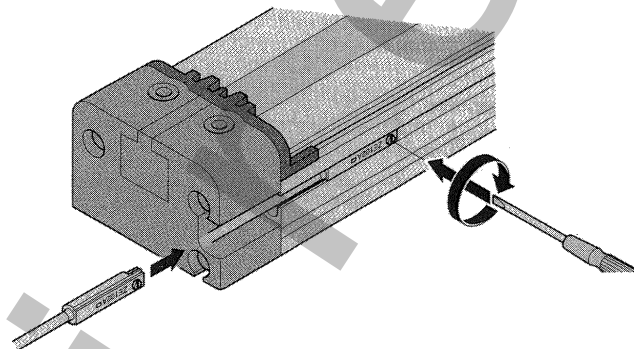
When Mounting Sensor Switches in Close Proximity

When mounting a sensor switch in close proximity to the HORV series, adjust the position so that the distance between it and the cylinder does not fall below the values in the table below.



Instructions for Sensor Switch Movement

Loosening the sensor switch setscrew allows the sensor switch to be moved along the switch mounting groove on the base. In addition, the lead wires can be inserted into the cap area of the groove.

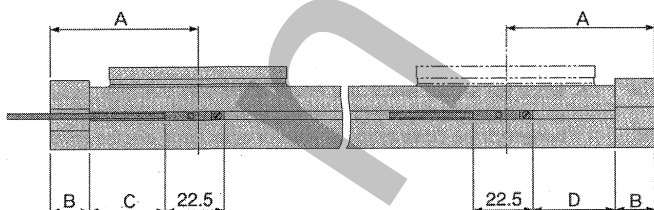


- Tightening torque for the setscrew is 1.8 in·lb ~ 2.65 in·lb

		mm		
Code		HORV16	HORV24	HORV40
A	Hall effect type	0	0	0
	Reed sensor type	0	0	0
B	Hall effect type	44	61	91
	Reed sensor type	49	69	102
C	Hall effect type	4	5	7
	Reed sensor type	9	13	16

Mounting Position for Stroke End Detection Sensor Switch (Unit mm)

When the sensor switch is mounted in the position shown in the figure, the magnet reaches the sensor's maximum sensitivity position at the stroke end.



- Reed sensor type (ZE101, ZE201, ZE102, ZE202)

Model	A	B	C	D
HORV16	56	15	28.5	31
HORV25	76	19	44.5	47
HORV40	121	26	82.5	85

- Hall effect type (ZE135, ZE235, ZE155, ZE255)

Model	A	B	C	D
HORV16	56	15	24.5	35
HORV25	76	19	40.5	51
HORV40	121	26	78.5	89