SUGINO

# Hydro-Speed Regulator

## INSTRUCTION MANUAL

Model RB-2412
RB-2430
RB-2460
RB-3140
RB-3160
RB-3860

SUGINO

## Table of Contents

# To Customers

Thank you for purchasing the Sugino Hydro-Speed Regulator.

This manual concerns only the purpose of using the Hydro-Speed regulator.
We are not responsible for any difficulties that arise due to the purpose and the methods of use not stated in this manual.

This manual states "what you are prohibited to do, what you cannot do" as far as possible.
However it is impossible to cover all dangers, please understand the items that are not specified as "what you can do" in this manual as "you cannot do".

For product improvement, the appearance and specifications of this unit is subject to change without notice.
In that case, differences may occur between this operation manual and this unit. We appreciate your understanding.

When reselling or renting this unit, please attach this manual to this unit.
In case of exporting this unit, please inquire in advance to our sales office listed on the back cover of this manual.



# A. Safety instructions

Before starting to use this regulator, make sure to read and understand the contents of the manual thoroughly.
Keep this manual at a designated place for easy access at all times.

The manual states safety instructions for user safety and accident precautions separately in the following stages.

⚠ WARNING : Indicates a potentially hazardous situation that could result in death or serious injury if not complied.

⚠ CAUTION : Indicates a potentially hazardous situation that may result in minor injury or damaging other physical property if not complied.

## B. Features

The hydro-speed regulator hydraulically controls feed speed to achieve precise and constant feed of the air cylinder. Feed speed can be adjusted as required within the low and high levels using the speed adjusting knob. In spite of the compact size and light weight, a change in braking speed is minimized even when the load changes abruptly. Therefore, a speed change according to the load change when starting and immediately after finishing drilling, milling, cut-off or grinding operation using the air cylinder can be minimized by mounting this hydro-speed regulator. This will also contribute to the prevention of tool breakage and extension of tool life. Hydraulic oil is completely sealed inside, eliminating the supply of hydraulic oil.



## C. Specification

### C-1. Specification(mm)

| Model | Max. Stroke (mm) | Load Range (N) | Speed Adjustment Range per Thrust (mm/sec) | Allowable Impact Energy Ek(J) | Weight (Unit only)(kg) |
|---|---|---|---|---|---|
| RB-2412 | 12 | 98~490 | F= 98 N: 0.2~20<br>F= 290 N: 0.3~30<br>F= 490 N: 0.4~35 | 1.47 | 0.35 |
| RB-2430 | 30 | 200~1500 | F= 200 N: 0.1~5<br>F= 490 N: 0.2~25<br>F= 980 N: 0.3~40<br>F= 1500 N: 0.4~50 | 2.45 | 0.41 |
| RB-2460 | 60 | | | | 0.58 |
| RB-3140 | 40 | 490~2900 | F= 490 N: 0.4~10<br>F= 1500 N: 0.2~25<br>F= 2200 N: 0.3~35<br>F= 2900 N: 0.5~40 | 3.92 | 0.95 |
| RB-3160 | 60 | | | | 1.20 |
| RB-3860 | 60 | 2200~5400 | F= 2200 N: 0.2~15<br>F= 3700 N: 0.3~25<br>F= 5400 N: 0.4~30 | 5.88 | 1.80 |

Other models of hydro-speed regulators than the above are also available.

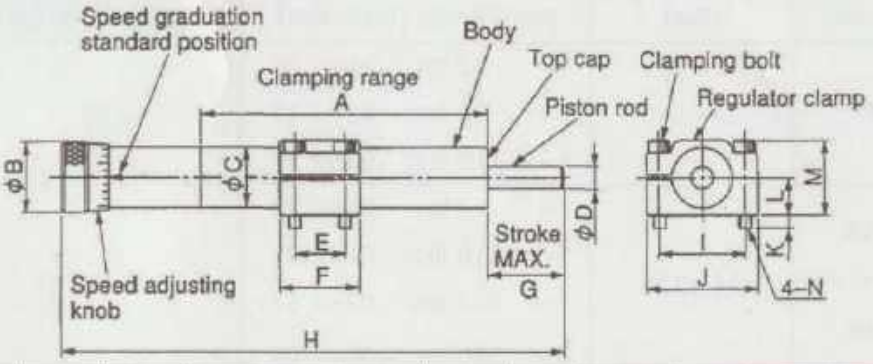
## C-2. Specification(inch)

| Model | Max. Stroke (inch) | Load Range (lbs) | Speed Adjustment Range per Thrust (inch/sec) | Allowable Impact Energy Ek(ft·lbs) | Weight (Unit only)(lbs) |
|---|---|---|---|---|---|
| RB-2412 | .47 | 22~110 | F= 22 lbs: .01~ .79<br>F= 66 lbs: .01~1.18<br>F= 110 lbs: .02~1.38 | 1.10 | .77 |
| RB-2430 | 1.18 | 44~330 | F= 44 lbs: .01~ .20<br>F= 110 lbs: .01~1.00<br>F= 220 lbs: .02~1.57<br>F= 330 lbs: .02~2.00 | 1.80 | .90 |
| RB-2460 | 2.36 | | | | 1.28 |
| RB-3140 | 1.57 | 110~680 | F= 110 lbs: .01~ .40<br>F= 330 lbs: .01~ .80<br>F= 460 lbs: .02~1.00<br>F= 680 lbs: .02~1.18 | 2.90 | 2.09 |
| RB-3160 | 2.36 | | | | 2.64 |
| RB-3860 | 2.36 | 480~1170 | F= 480 lbs: .01~ .59<br>F= 850 lbs: .01~ .98<br>F= 1170 lbs: .02~1.18 | 4.30 | 3.96 |



## C-3. External Dimensions and Name of Each Component

■ Models RB-2412, 2430, 2460, 3140 and 3160



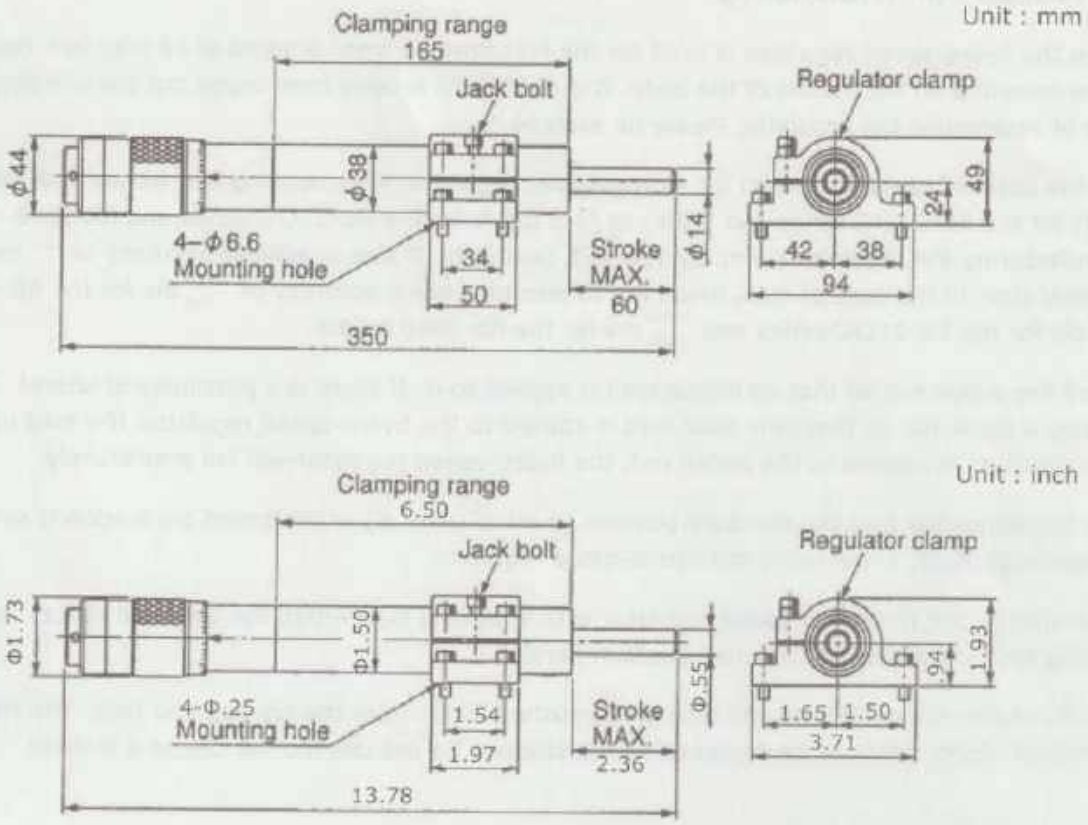

Unit : mm

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RB-2412 | 93 | 28 | 24 | 9 | 20 | 32 | 12 | 160 | 34 | 44 | 5 | 15 | 30 | M5×0.8 |
| RB-2430 | 115 | | | | | | 30 | 200 | | | | | | |
| RB-2460 | 196 | | | | | | 60 | 311 | | | | | | |
| RB-3140 | 150 | 36 | 31 | 12 | 24 | 40 | 40 | 270 | 42 | 58 | 7 | 20 | 40 | M6×1 |
| RB-3160 | 190 | | | | | | 60 | 331 | | | | | | |

Unit : inch

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RB-2412 | 3.66 | 1.10 | .94 | .35 | .79 | 1.26 | .47 | 6.30 | 1.34 | 1.73 | .20 | .59 | 1.18 | M5×0.8 |
| RB-2430 | 4.53 | | | | | | 1.18 | 7.87 | | | | | | |
| RB-2460 | 7.72 | | | | | | 2.36 | 12.24 | | | | | | |
| RB-3140 | 5.91 | 1.42 | 1.22 | .47 | .94 | 1.57 | 1.57 | 10.63 | 1.65 | 2.28 | .28 | .79 | 1.57 | M6×1 |
| RB-3160 | 7.48 | | | | | | 2.36 | 13.03 | | | | | | |

■ Model RB-3860






# D. Notes

## D-1. Notes for mounting

1) When the hydro-speed regulator is used for the first time, a small amount of oil may leak from the set screw mounted on the middle of the body. It is not the oil leaking from inside but the one applied at the time of assembling the regulator. Please be assured.

2) Use the optional regulator clamp for mounting the regulator. The clamping bolt torque is 3-4N · m /2.5-3 lbs·ft for the RB-24○○series and 5-6N · m /4-5 lbs·ft for the RB-31○○series and RB-3860 model. When manufacturing the regulator clamp by yourself, finish the ID size to achieve accuracy of $^{+0.1}_{0}$ mm of the body nominal size. In the case of inch, finish the ID size to achieve accuracy of $^{.9469}_{.9449}$ dia for the RB-24○○series, $^{1.2244}_{1.2205}$ dia for the RB-31○○series and $^{1.5000}_{1.4961}$ dia for the RB-3860 model.

3) Mount the piston rod so that no lateral load is applied to it. If there is a possibility of lateral load, regulate it using a guide bar so that only axial load is applied to the hydro-speed regulator. If a load other than the axial direction is applied to the piston rod, the hydro-speed regulator will fail prematurely.

4) It is recommended that the standard position (marked with ▲) of the speed graduation is set at a conspicuous place, when fixing the hydro-speed regulator.

5) Make sure to use the hydro-speed regulator with a braking load within the specified range. In case of over braking load, do not use two or more sets in parallel.

6) Use the piston rod so that its end face is not pushed inside from the top cap end face. The stroke end of a controlled object needs to be equipped with a stopper. Do not use the top cap as a stopper.

## D-2. Notes for use

| ⚠ WARNING |
|---|
| 1) Never put your hand or part of your body between a controlled object and the hydro-speed regulator. Arrange a secure safety cover to prevent accidents. |

| ⚠ CAUTION |
|---|
| 2) Continuous operation causes the hydro-speed regulator to heat. This is because kinetic energy transforms into heat. The body surface may heat excessively (over 60°C /140°F) depending on the ambient circumstances. In that case, blow air to the body surface for cooling and use the hydro-speed regulator at surface temperature of 60°C /140°F or lower. |

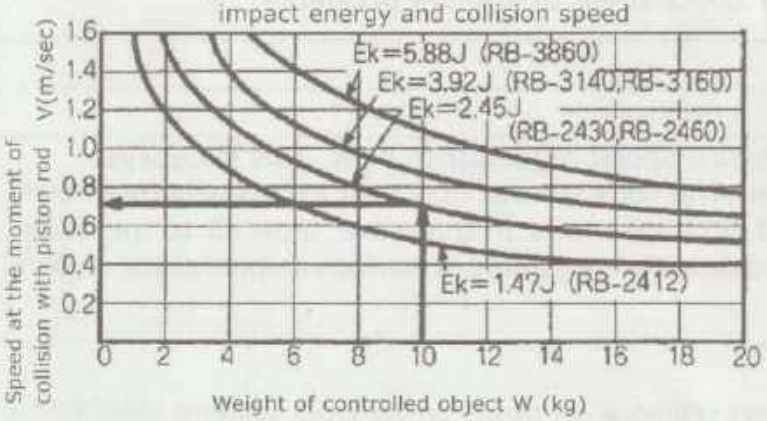
3) Set the desirable feed speed within the range of graduation marked on the speed adjusting knob. Setting the knob closer to zero (0) decreases the speed and setting it closer to 30 increases the speed. The speed graduation does not indicate actual speed. Use it only for your reference for adjustment. The load cannot be stopped completely even when the knob is turned to zero. The speed adjusting knob should be adjusted only while the piston rod is free from any thrust.

4) The piston rod is keyed to prevent rotation during stroke movement. However, do not distort or pull out the rod intentionally. Do not put a dent or scratch on the piston rod. Do not hit the speed adjusting knob with a hammer either. It may deteriorate its function.



5) The impact energy Ek applied to the piston rod is determined by the weight of the controlled object and instantaneous speed when the controlled object collides with the piston rod. The relationship between the weight at each impact energy and the collision speed can graphically be displayed as below.

Relationship between weight at each impact energy and collision speed

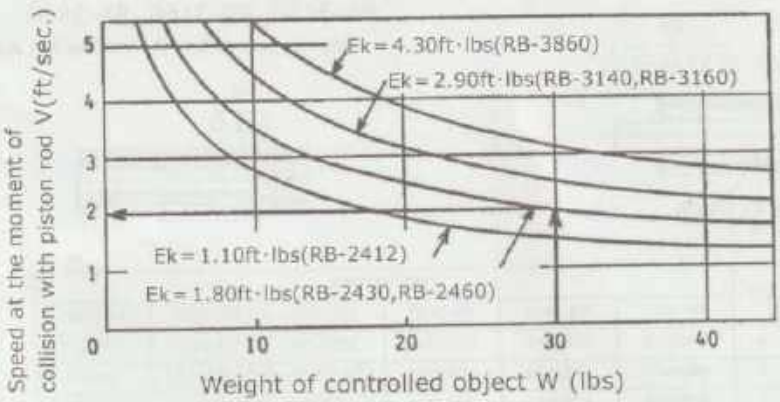



Note :
The hydro-speed regulator is not a damper to absorb impact. Set the collision speed lower than the value obtained from the left chart.

[Example]
When controlling an object which weighs 10kg using the RB-2430 hydro-speed regulator, set the speed of the object to 0.7 m/sec or less when it collides with the piston rod.
The impact energy Ek is calculated by the following expression.

$$Ek=\frac{W}{2}\times V^2$$

Relationship between weight at each impact energy and collision speed




[Example]
When controlling an object which weighs 30 lbs using the RB-2430 hydro-speed regulator, set the speed of the object to 2 ft/sec or less when it collides with the piston rod.
The impact energy Ek is calculated by the following expression.

$$Ek = \frac{W}{2 \cdot g} \times V^2$$

g = Gravity acceleration

6) The piston rod reciprocating section uses a special rubber scraper. Be aware that this material may cause swelling and adhesion deterioration when exposed to some cutting oil.

## E. Maintenance

As the RB-type hydro-speed regulators have a completely sealed structure, no regular maintenance is required. However, if the sealed part attached to the sliding part of the piston rod to prevent invasion of chips and cutting oil wears out, or the internal working oil flows out due to breakage of the rubber and the stroke length of the piston rod does not reach the designated amount, you need to disassemble /repair to replace parts. In the case of repairing the RB-type hydro-speed regulators by yourselves, repair kit with consumable parts and dedicated tool for disassembling/assembling are required.
As for items of repair kit and disassembly/assembly tool, refer to page 23 and 24.
Each work of disassembly/assembly will be shown below by each step, please proceed according to the order.



### Product Warranty

**1. Warranty period**
**Warranty period is one year from the date of delivery or 2,400 running hours, whichever occurs first.**

**2. Coverage of warranty**
**During the warranty period, Sugino will repair, or replace any defective components without charge only if the cause of defect falls under Sugino's responsibility that will be determined by Sugino inspection. This warranty covers the product itself and does not cover any loss or consequential damage incurred by failure of the product.**

**3.Out of warranty**
**1) Failure caused by improper operation without following instruction manual.**
**Wearing parts which are indicated in manual as non-warranty items.**

**2) Failure caused by improper modification or maintenance.**

**3) Failure caused by operation which is beyond the specification.**

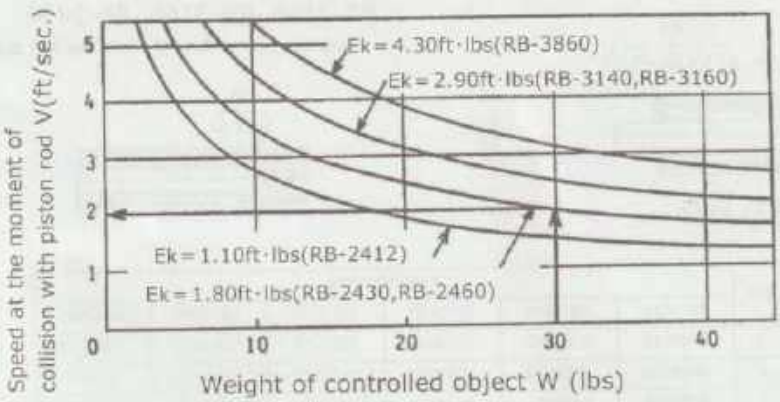
**4) Failure caused by disasters such as earthquake, flood, lightning, fire and unusual voltage.**

**5) Product with special specification which is manufactured based on individual agreement with customer.**

### Remarks :

**Sugino Machine Japan Ltd. is glad to serve all customers and all plants that use all Sugino Hydro Speed Regulator RB series operating on Sugino machines manufactured by Sugino Machine Ltd only with our Sugino's Term of Product Warranty However, if any Sugino Hydro Speed Regulator is used on any other machines not manufactured by Sugino Machine Japan Ltd. are not included in our product warranty because not using to sugino's machine is also out of warranty in the terms of the Sugino product warranty.**

Relationship between weight at each impact energy and collision speed




[Example]
When controlling an object which weighs 30 lbs using the RB-2430 hydro-speed regulator, set the speed of the object to 2 ft/sec or less when it collides with the piston rod.
The impact energy Ek is calculated by the following expression.

$$Ek = \frac{W}{2 \cdot g} \times V^2$$

g = Gravity acceleration

6) The piston rod reciprocating section uses a special rubber scraper. Be aware that this material may cause swelling and adhesion deterioration when exposed to some cutting oil.

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As the RB-type hydro-speed regulators have a completely sealed structure, no regular maintenance is required. However, if the sealed part attached to the sliding part of the piston rod to prevent invasion of chips and cutting oil wears out, or the internal working oil flows out due to breakage of the rubber and the stroke length of the piston rod does not reach the designated amount, you need to disassemble /repair to replace parts. In the case of repairing the RB-type hydro-speed regulators by yourselves, repair kit with consumable parts and dedicated tool for disassembling/assembling are required.
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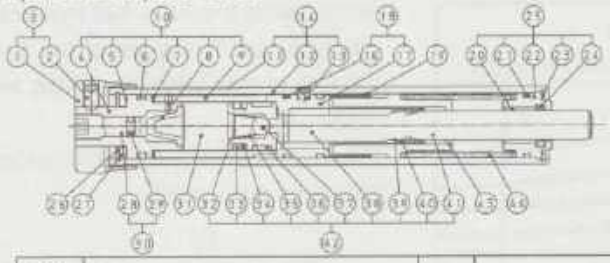
**is also out of warranty in the terms of the Sugino product warranty.**

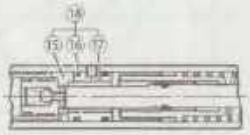
# E-1. Exploded Drawing and Parts List

RB-2412, RB-2430, RB-2460



RB-3140, RB-3160, RB-3860

Only the part different from the left drawing



| KEY NO. | PART NAME | QTY | PART NUMBER | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | RB-2412 | RB-2430 | RB-2460 | RB-3140 | RB-3160 | RB-3860 |
| 1 | SPEED ADJUSTING KNOB | 1 | 0350013 | 0350013 | 0350013 | 0360000 | 0360000 | 0370234 |
| 2 | SET SCREW | 1 | 9803670 | 9803670 | 9803670 | 9803670 | 9803670 | 9803670 |
| 3 | SPEED ADJUSTING KNOB ASS'Y | 1 | 0359994 | 0359994 | 0359994 | 0369998 | 0369998 | 0379991 |
| 4 | ADJUSTER VALVE | 1 | – | – | – | – | – | – |
| 5 | THRUST WASHER A | 2 | 0350119 | 0350119 | 0350119 | 0360081 | 0360081 | 0370091 |
| ※ 6 | "O" RING | 1 | 9200150 | 9200150 | 9200150 | 9200189 | 9200189 | 9200249 |
| 7 | THRUST WASHER B | 1 | 0350036 | 0350036 | 0350036 | 0360098 | 0360098 | 0370100 |
| 8 | FILTER | 1 | – | – | – | – | – | – |
| 9 | CYLINDER | 1 | – | – | – | – | – | – |
| 10 | ADJUSTER VALVE ASS'Y | 1 | 0359942 | 0359907 | 0359876 | 0369946 | 0369917 | 0379956 |
| 11 | NAME PLATE | 1 | – | – | – | – | – | – |
| 12 | BODY | 1 | – | – | – | – | – | – |
| 13 | SET SCREW | 1 | – | – | – | – | – | – |
| 14 | BODY PART | 1 | 0359681 | 0359698 | 0359706 | 0369082 | 0369099 | 0372397 |
| 15 | PISTON GUIDE | 1 | NOT USED | NOT USED | NOT USED | 0360052 | 0360052 | 0370040 |
| ※ 16 | "O" RING | 1 | 9220163 | 9220163 | 9220163 | 9220192 | 9220192 | 9220230 |
| 17 | DISTANCE RING | 1 | 0350378 | 0350378 | 0350378 | 0360371 | 0360371 | 0370369 |
| 18 | DISTANCE RING ASS'Y | 1 | 0359971 | 0359971 | 0359971 | 0369981 | 0369981 | 0379985 |



| KEY NO. | PART NAME | QTY | PART NUMBER | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | RB-2412 | RB-2430 | RB-2460 | RB-3140 | RB-3160 | RB-3860 |
| 19 | RUBBER | 1 | 0350007 | 0350007 | 0351113 | 0360135 | 0360135 | 0370145 |
| 20 | BUSH | 1 | – | – | – | – | – | – |
| ※ 21 | "O" RING | 1 | 9220163 | 9220163 | 9220163 | 9220192 | 9220192 | 9220230 |
| 22 | TOP CAP | 1 | – | – | – | – | – | – |
| 23 | SNAP RING | 1 | 9420117 | 9420117 | 9420117 | 9420152 | 9420152 | 9420181 |
| 24 | SCRAPER | 1 | 0350473 | 0350473 | 0350473 | 0360448 | 0360448 | 0370435 |
| 25 | TOP CAP ASS'Y | 1 | 0359959 | 0359959 | 0359959 | 0369969 | 0369969 | 0379962 |
| 26 | SNAP RING | 1 | 9400149 | 9400149 | 9400149 | 9400184 | 9400184 | 9400221 |
| 27 | SPACER | 1 | 0352414 | 0352414 | 0352414 | 0360610 | 0360610 | 0370470 |
| 28 | PLUG | 1 | 0350102 | 0350102 | 0350102 | 0350102 | 0350102 | 0350102 |
| ※ 29 | "O" RING | 1 | 9200002 | 9200002 | 9200002 | 9200002 | 9200002 | 9200002 |
| 30 | PLUG ASS'Y | 1 | 0359988 | 0359988 | 0359988 | 0359988 | 0359988 | 0359988 |
| 31 | OIL | – | R2OIL20CC (1bottle) | R1OIL20CC (1bottle) | R1OIL20CC (1bottle) | R1OIL20CC (2bottles) | R1OIL20CC (2bottles) | R1OIL20CC (3bottles) |
| 32 | SPRING STOPPER | 1 | 9463010 | 9463010 | 9463010 | 9463026 | 9463026 | 9463032 |
| ※ 33 | "O" RING | 1 | 9200090 | 9200090 | 9200090 | 9200150 | 9200150 | 9200189 |
| 34 | BACK UP RING | 1 | 0302333 | 0302333 | 0302333 | 0340316 | 0340316 | 0330306 |
| 35 | SPRING | 1 | 0350059 | 0350059 | 0350059 | 0360046 | 0360046 | 0360046 |
| 36 | WEAR RING | 1 | 0302327 | 0302327 | 0302327 | 0340300 | 0340300 | 0330298 |
| 37 | STEEL BALL | 1 | 8980133 | 8980133 | 8980133 | 8980156 | 8980156 | 8980185 |
| 38 | PISTON | 1 | – | – | – | – | – | – |
| 39 | "C" RING | 1 | 0350384 | 0350384 | 0350384 | 0360388 | 0360388 | 0370375 |
| 40 | SLEEVE | 1 | 0350390 | 0350390 | 0350390 | 0360394 | 0360394 | 0370381 |
| 41 | PISTON ROD | 1 | – | – | – | – | – | – |
| 42 | PISTON ASS'Y | 1 | 0359936 | 0359899 | 0350860 | 0369930 | 0369900 | 0379940 |
| 43 | RUBBER HOLDER | 1 | 0350266 | 0350266 | 0351254 | 0360075 | 0361028 | 0370062 |
| 44 | SPRING | 1 | 0352242 | 0350409 | 0351076 | 0360141 | 0361057 | 0370151 |

Notes : 1.Parts without parts number in the above list cannot be supplied separately.
2.Use R2 Oil (part number of R2 Oil is R2OIL20CC) only for RB-2412 model and R1 Oil (part number of R1 Oil is R1OIL20CC) for other regulators. The necessary quantity depends on the regulator model. Refer to above list.
3.The part models marked ※ are listed in E-2. Used "O" ring model list on page 14.

## E-2. Used "O" ring model list

"O" ring models marked ※ in the parts list on page 12 and 13 are as follows.

| Key No. | RB-24○○ series | RB-31○○ series | RB-3860 |
|---|---|---|---|
| 6 | P-16 | P-21 | P-25.5 |
| 16、21 | AS568-017 | AS568-020 | AS568-024 |
| 29 | P-3 | P-3 | P-3 |
| 33 | P-11 | P-16 | P-21 |

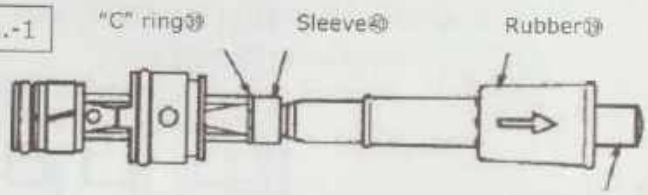
## E-3. Disassembly Procedure

1. Remove the snap ring㉑ with snap ring pliers, tool No.4.
   At this time, the top cap㉒ will jump out due to the internal spring㊹, so please work with care.
2. Remove the top cap㉒ and the spring㊹ from the body⑫.
3. After loosening the plug㉘ with 4mm and 2.5mm Allen key, loosen the set screw② and remove the speed adjusting knob①.
4. Remove the snap ring㉕ with snap ring pliers, tool No.4.
5. While holding the tip of the piston rod㊶ with your fingers so that the piston rod will not be drawn into the body inside, pull out the adjuster valve④ and the cylinder⑨ from the body.
   Note: Since the adjuster valve and cylinder are set parts, pay attention not to mix them up.
6. After draining hydraulic oil from the inside of the body, remove the body set screw⑬ with Allen key, which is 2mm for RB-24○○ series, 2.5mm for RB-31○○ series and 3mm for RB-3860.



7. Insert push bar, tool No.2, from the body adjuster valve④ side, push the tip of the piston㊳ and draw the piston Ass'y㊷.
8. After removing the rubber holder㊸ from the piston Ass'y, extend the rubber⑲ to the tip of the piston rod㊶ (Refer to Fig.-1). Next, move "C" ring㊴ and sleeve㊵ to piston㊳ side and remove the rubber from the piston Ass'y.

Fig.-1




9. Confirm that there is no scratch or wear on the "O" ring㉝, the back up ring㉞ and the wear ring㊱ in the piston part. Replace defective parts with new ones.
10. Remove all "O" rings and the scraper㉔ before washing parts. After washing, blow air to the parts for removing washing oil completely.
    Note: Do not soak the "O" rings, the scraper or the rubber in washing oil. They may expand and deteriorate because of washing oil. Wipe off the dirt of those parts with a clean cloth.