

# Limitorque

*Pneumatic  
valve control  
SMB type*

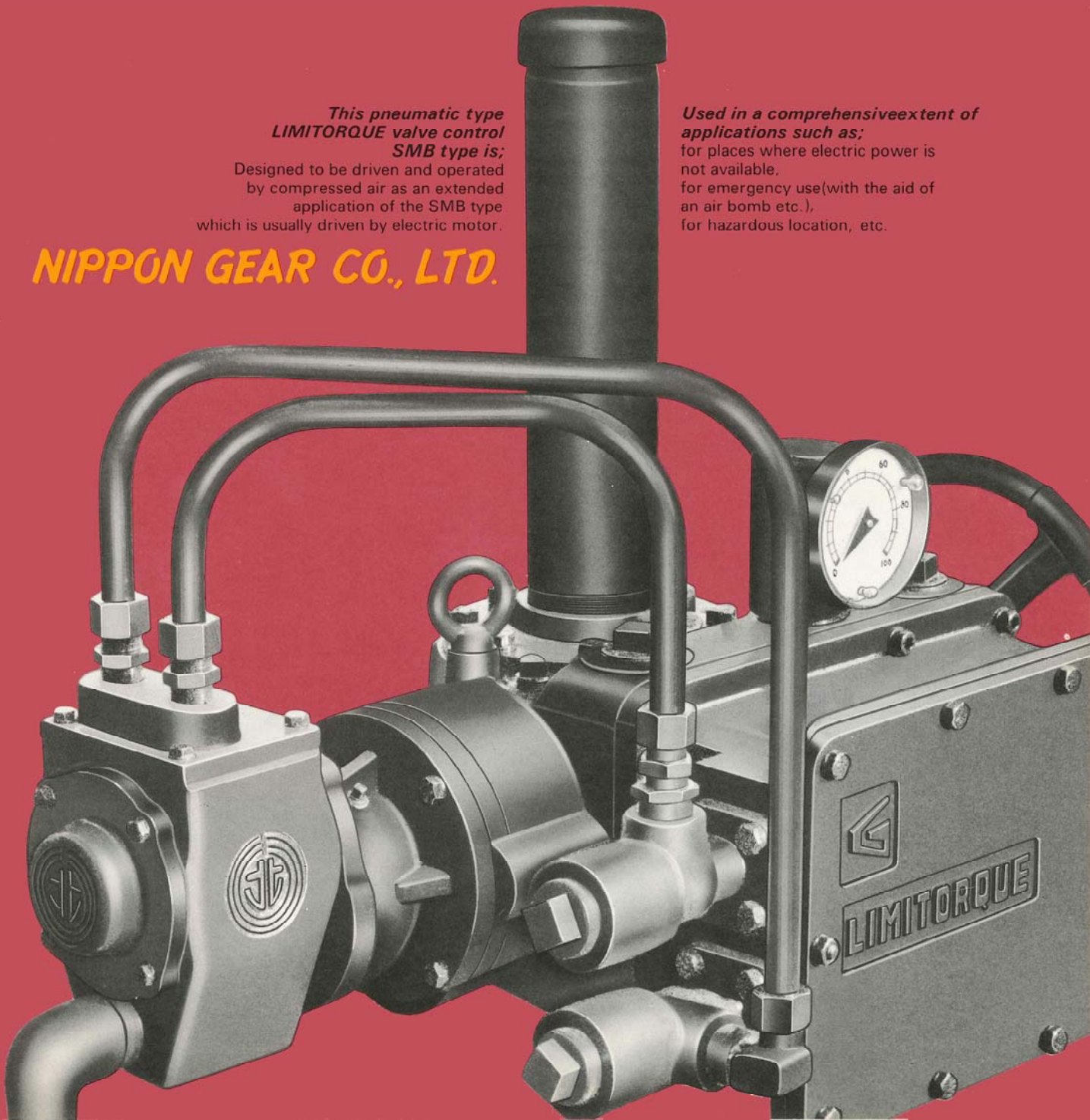
*This pneumatic type  
LIMITORQUE valve control  
SMB type is;*

Designed to be driven and operated  
by compressed air as an extended  
application of the SMB type  
which is usually driven by electric motor.

*Used in a comprehensive extent of  
applications such as;*

for places where electric power is  
not available,  
for emergency use (with the aid of  
an air bomb etc.),  
for hazardous location, etc.

**NIPPON GEAR CO., LTD.**



# PNEUMATIC LIMITORQUE VALVE CONTROL SMB TYPE

Pneumatic LIMITORQUE Valve Control, SMB type  
Manufactured under license from Limitorque Corp., U.S.A.

## FEATURES

- LIMITORQUE gearing has the same construction as those in SMB type to be driven by an electric motor, except for prime motors — — — here, pneumatic employed are which operated by the pneumatic pressure. Turning the air on or off is conducted by a limit valve, which is operated by a geared limit and a torque limit device installed inside the LIMITORQUE.
  - This is, different from those in air cylinder system, driven by an pneumatic so that a usual screw type valve stem can be used, which assures self locking capacity.
  - The pneumatic is of rotary vane type, which is small-sized and gives high power.
  - The construction of this geared limit device consists, same as those of electric type, of a counter mechanism employing intermittent gears and is evaluated with its stable and secure performance.
  - The setting of this torque limit valve can be made in any direction, "open" or "closed", easily and securely.
  - In the field, valve operation can be made not only through air but with a hand wheel. Remote operation with the aid of an air pilot valve and a solenoid valve is also possible.
  - A device for proportional control can be attached for a signal pressure of 0.2 – 1.0 kg/cm<sup>2</sup>. (Note 1)
  - In combination with electrical systems, a wide extent of applications are possible.
  - It is possible also to introduce the air system only to the motor and control with an electrical system, that is applicable to every unit size including SMB-000 and SMB-4.
- Note 1: In case a proportional control is requested, consult with us.

## SPECIFICATIONS

Designation			SMB-00	SMB-0	SMB-1	SMB-2	SMB-3
Item							
Rated thrust (kg)			6,300	10,500	20,500	32,000	63,000
Rated torque (kg-m)			36	100	152	270	620
Maximum and minimum stem diameter (mm)	Screw type	2 P.C. stem nut	20 ~ 45	32 ~ 58	40 ~ 73	46 ~ 86	57 ~ 127
		1 P.C. stem nut	44 ~ 51	55 ~ 70	72 ~ 83	85 ~ 98	125 ~ 146
	Key type	2 P.C. maximum key way	20 ~ 36 10 × 8	25 ~ 47 12 × 8	30 ~ 60 15 × 10	35 ~ 70 18 × 12	35 ~ 100 28 × 18
		1 P.C. maximum key way	25 ~ 44 12 × 8	47 ~ 58 15 × 10	60 ~ 67 18 × 12	70 ~ 80 20 × 13	100 ~ 120 32 × 20
Standard reduction ratio(self looking worm)			23 ~ 109	27.2 ~ 98.8	27.2 ~ 88.4	23.3 ~ 82.5	35.9 ~ 95.5
Pneumatic motor size applicable			KMF - 2R	- 2R - 3R	- 3R - 5R - 7R	- 5R - 7R - 10R	- 7R - 10R

- Motor speed: 1500 rpm (at 6 kg/cm<sup>2</sup>)
- Pressure: Can be used in a range of 4 ~ 7 kg/cm<sup>2</sup>.



# PNEUMATIC MOTOR

## 1. Construction

This pneumatic motor is of rotary vane type and the approximate construction is shown in Fig. 1. The rotor which is supported by bearing equipped with seat discs at its both sides, rotates in the sealed cylinder. Five grooves are provided on the periphery of the rotor, divided equally in the axial direction, to house five vanes, which are to stay loose in respective grooves.

These vanes are pressed by air against the inside surface of the eccentric cylinder, forming compartments in each groove and perform rotary movement. The revolution of the motor is reduced by the pinion at the end of rotor shaft and the intermediate gear to be transmitted for the output shaft.

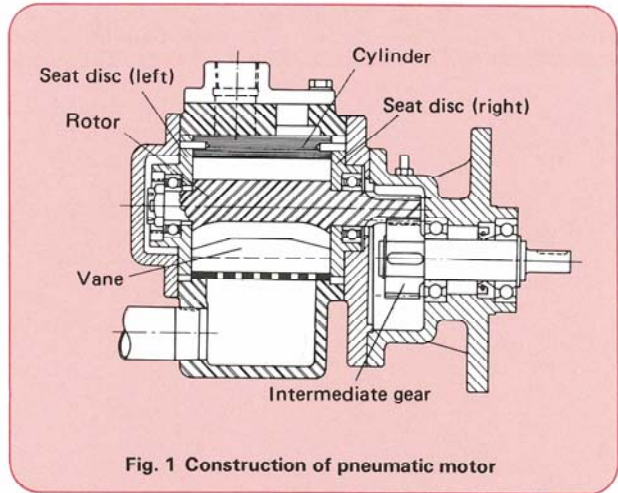


Fig. 1 Construction of pneumatic motor

## 2. Function

In Fig. 2, the direction of air flow in the case of clockwise revolutions is shown by solid lines while those in the case of anticlockwise revolutions by broken lines.

In the case of clockwise revolutions:

- 1, 2 . . . . .air charging stroke
- 3 . . . . .intermediate exhaust stroke
- 4, 5 . . . . .residual air exhaust stroke

The intermediate exhaust air is exhausted from the outlet provided on the cylinder case while the residual air is returned to the control valve and exhausted from the outlet provided on it.

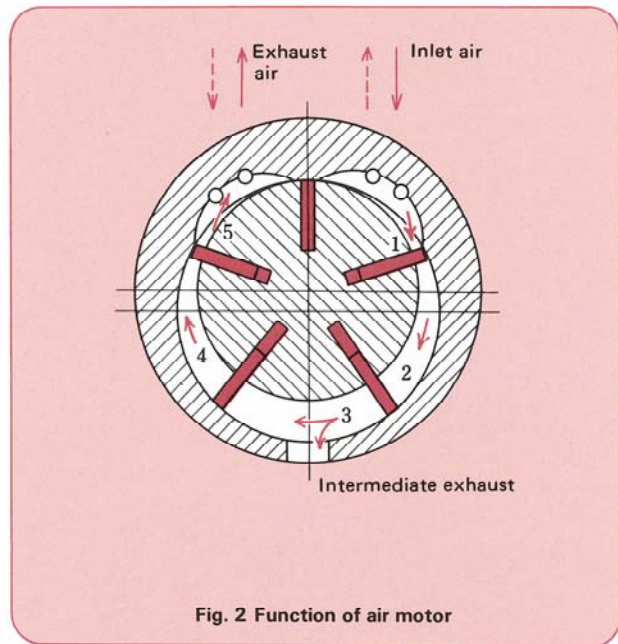


Fig. 2 Function of air motor

## 3. Characteristics

The standard air pressure is 6 kg/cm<sup>2</sup> at the inlet of air motor but a pressure in an extent of 4 ~ 7 kg/cm<sup>2</sup> is available according to its performance curve.

The output characteristics etc. in the case of low pressure are shown by broken lines in Fig. 3. The selection shall be made on the basis of the locked rotor torque.

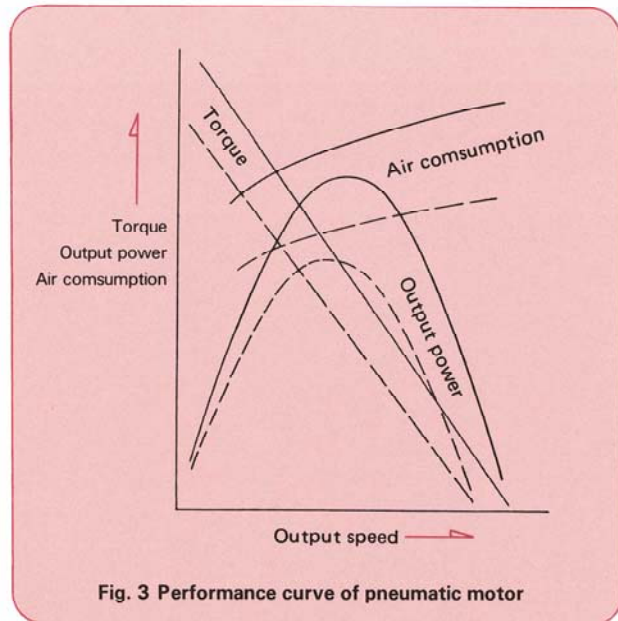


Fig. 3 Performance curve of pneumatic motor

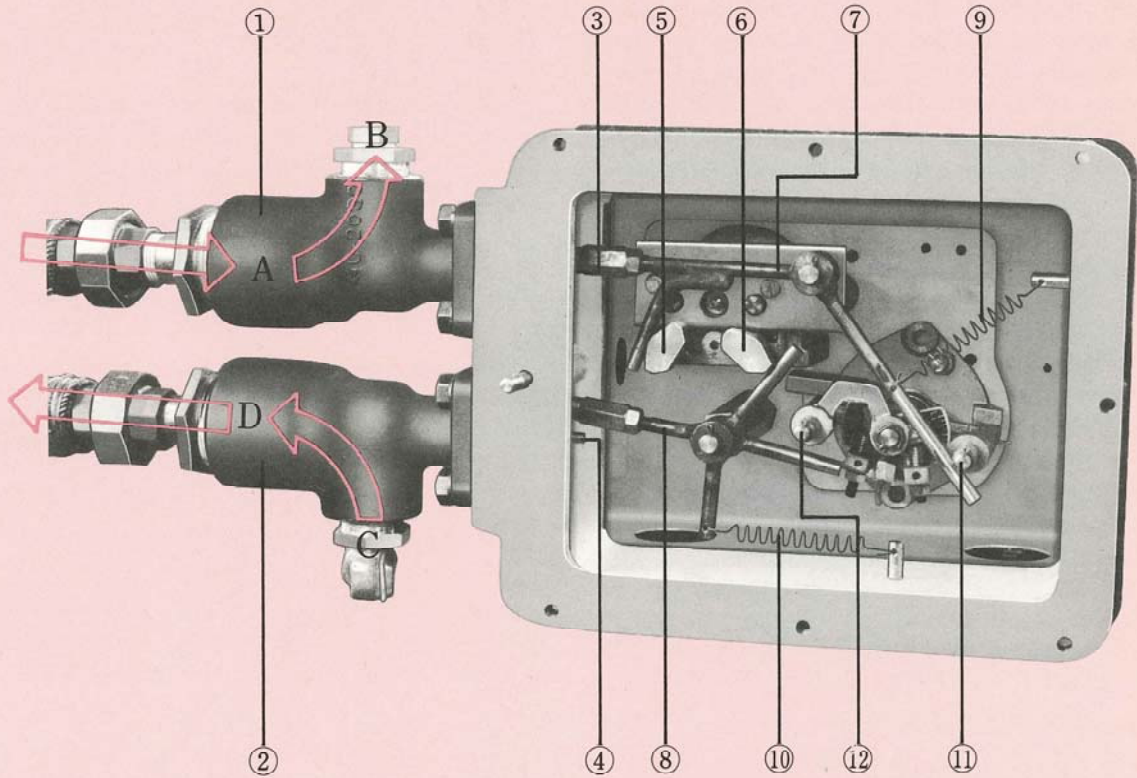


Fig. 4

Part No.	Nomenclature	Part No.	Nomenclature
1, 2	Limit valve	7, 8	Tripper latch
3, 4	Limit valve stem	9, 10	Tripper latch spring
5, 6	Geared limit device	11, 12	Torque limit device

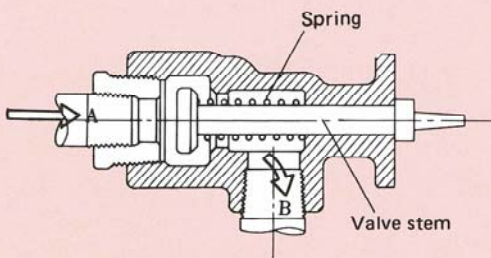


Fig. 5 Construction of limit valve

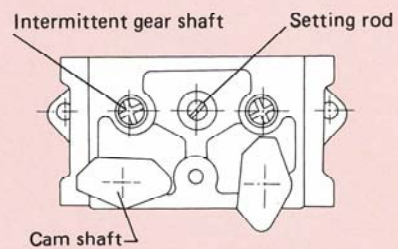


Fig. 6 Front view of geared limit device

## 1. Function

Description will be made under assumption that the limit valve 1, shown in Fig. 4, is used in the "open" side while the limit valve 2 in the "closed" side. First, the air introduced into the limit valve 1 from

A to actuate the valve in the direction of "open" by operating the control valve is delivered to the motor through the port B. (Part of the air is thus exhausted through the motor while the rest is, passing through



C and D, exhausted from the control valve). At this time, the valve stem 3 is pressed by the air pressure and is going to be closed by itself but prevented from moving to the right because the right hand tip of the stem runs against the tripper latch 7, which is positioned horizontally.

On the other hand, the motor continues to rotate in the direction of "open" until the valve becomes fully open, when the cam shaft is turned for 90° in angle by the internal counter mechanism to flip up the tripper latch 7. The valve stem 3 loses then its stopper and is protruded to the right to close the valve seat, that checks the air outflow in the direction of B and stops the motor. Beside the function of the "open" side geared limit device, the torque limit device 11 is actuated if any excessive torque is applied on the way of a motion in the direction of "open", to flip up likewise the tipper latch 7 and thereby stop the motor.

If the air charging from A into the limit valve 1 is ceased through the operation of the control valve and the chamber is opened to the atmosphere, the valve stem 3 returns to the left by the action of the inner spring. When either operating the valve from the full open position to the medium open position to return the "open" side cam for 90° in angle or removing the excessive torque to return the lever 11, the tripper latch 7 returns into the horizontal position. The above description is carried on the basis of the limit valve 1 used on the "open" side, and function is likewise about the limit valve 2 used on the "closed" side. The figure shows the state where the tripper latch 8 is flipped up by the geared limit device 6 and the valve stem 4 is consequently protruded to the right.

## 2. Adjustment of limit switch

Procedures for adjusting the geared limit devices illustrated in Fig. 6, are the same as those of electric motor type. Adjust with the setting rod and the intermittent gear shaft in the same manner as the one for electric type except for substituting the electric-contact rotor with a cam shaft. Procedures for adjusting the torque limit device 11, 12 are also the same as those of electric type. (Refer to the instruction manual for Type SMB.)

## 3. Usage of Limit Valve

The Limit Valve is provided for temporary shut-off, and it is not intended for complete shut-off of air over a long period of time. For an ordinary use of the pneumatic LIMITORQUE, please refer to the piping diagram shown at the right, and plan the switch valve which is in the main air exhaust pipe and used for driving the pneumatic motor.

## Illustrated Examples of Piping Using Pneumatic Motor Type LIMITORQUE

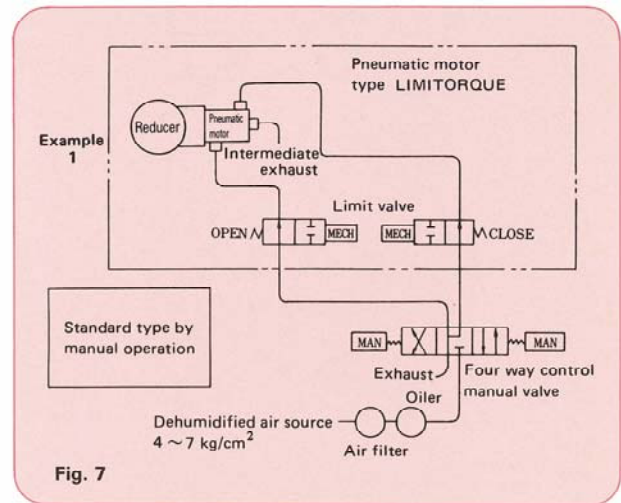


Fig. 7

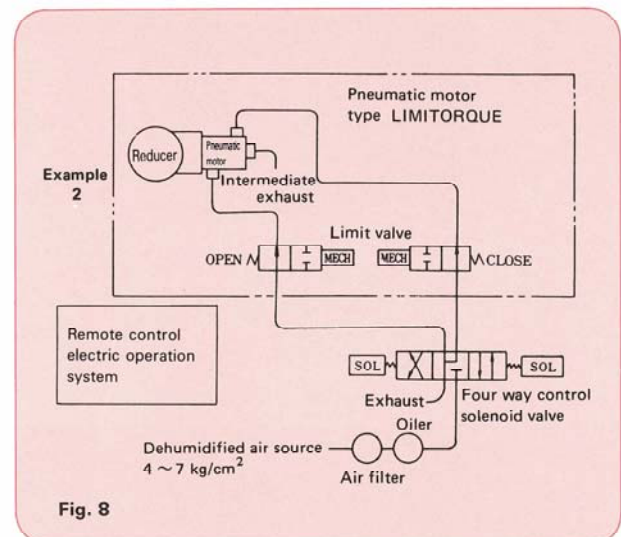


Fig. 8

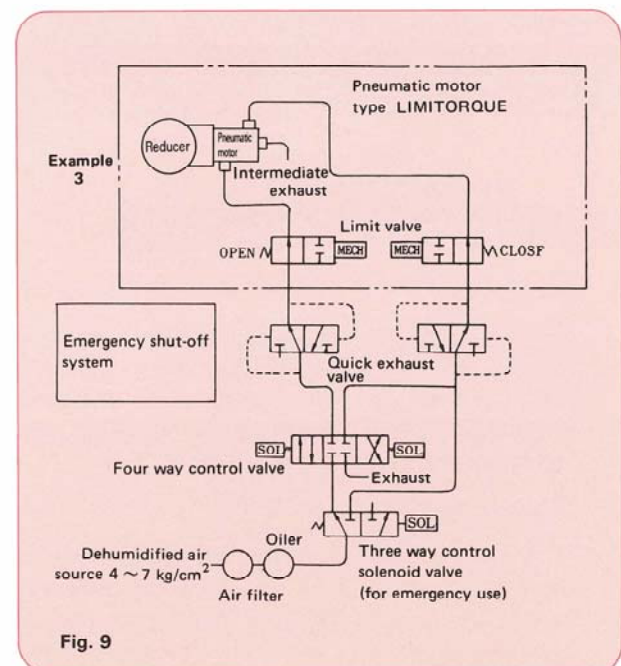


Fig. 9

## OUTSIDE DIMENSIONS

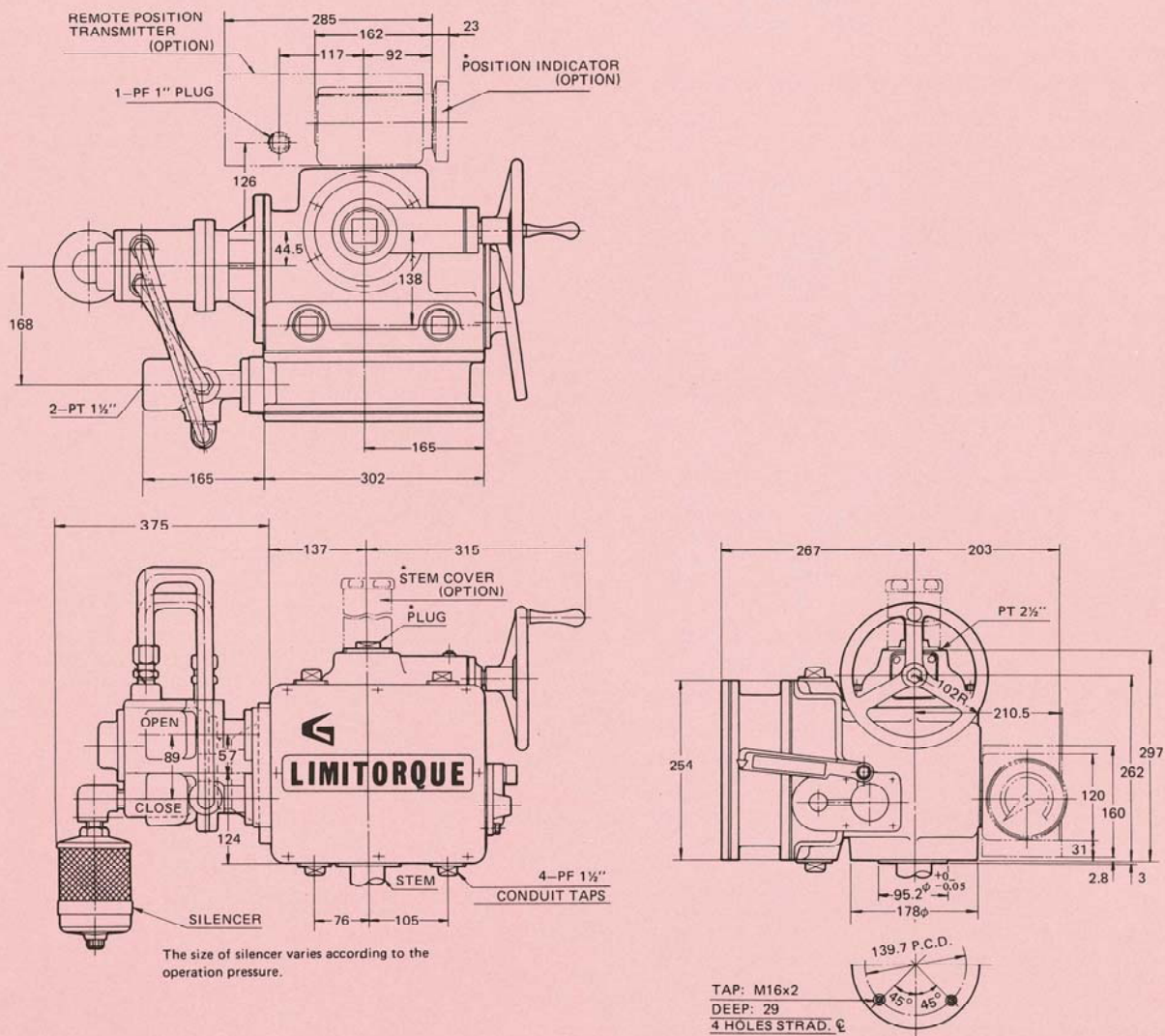


Fig. 10 Outside dimensions of SMB-00

## NOTES ABOUT ATTACHMENT PARTS

### 1. Air source

An air tank or the like shall be furnished in order to suppress the pressure deviation during operation. Equipment with a dehumidifier is recommended for the purpose of preventing the air motor, the limit valve and other parts from rusting.

### 2. Pressure regulator

In case the pressure varies in large scale, motor is selected on the basis of the minimum pressure, so that the pressure regulator shall be adjusted in its minimum pressure to prevent excessive output torque.

### 3. Air filter

Purified air is essential for stable valve operation. (Standard mesh 40 $\mu$ )

### 4. Oiler

Needed for lubrication of the air motor. (Turbine oil #90)

### 5. Control valve for operation

A three way valve, four way valve etc. shall be furnished.

### 6. Throttle check valve

May be also installed at the exhaust opening of control valve to be used as a speed controller.



Designation	SMB-0	SMB-1	SMB-2	SMB-3
Symbol				
C $\begin{matrix} +0 \\ -0.076 \end{matrix}$	127	152.4	177.81	215.91
D	210	289	343	406
E	5	5	5	5
F P.C.D.	165.1	254	298.5	355.6
G	M20x2.5	M16x2	M20x2.5	M24x3
H	26	26	29	45
J	4	8	8	8
M	265	310	320	360
N	76	92	111	152
P	347	373	400	458
R	308	308	460	610
S	275	275	275	308
T	0	7	2	19
V	179	192	192	235
Y	PT3	PT3½	PT4	PT6
Z	160	173	168	206
AJ	332	320	382	445
AL	173	190	179	267
AM	211	194	205	278
AS	242	276	309	422
AW	94	94	94	94
AX	220	236	238	260
BA max.	356	440	487	487
Weight kg (approx.)	162	230	300	525

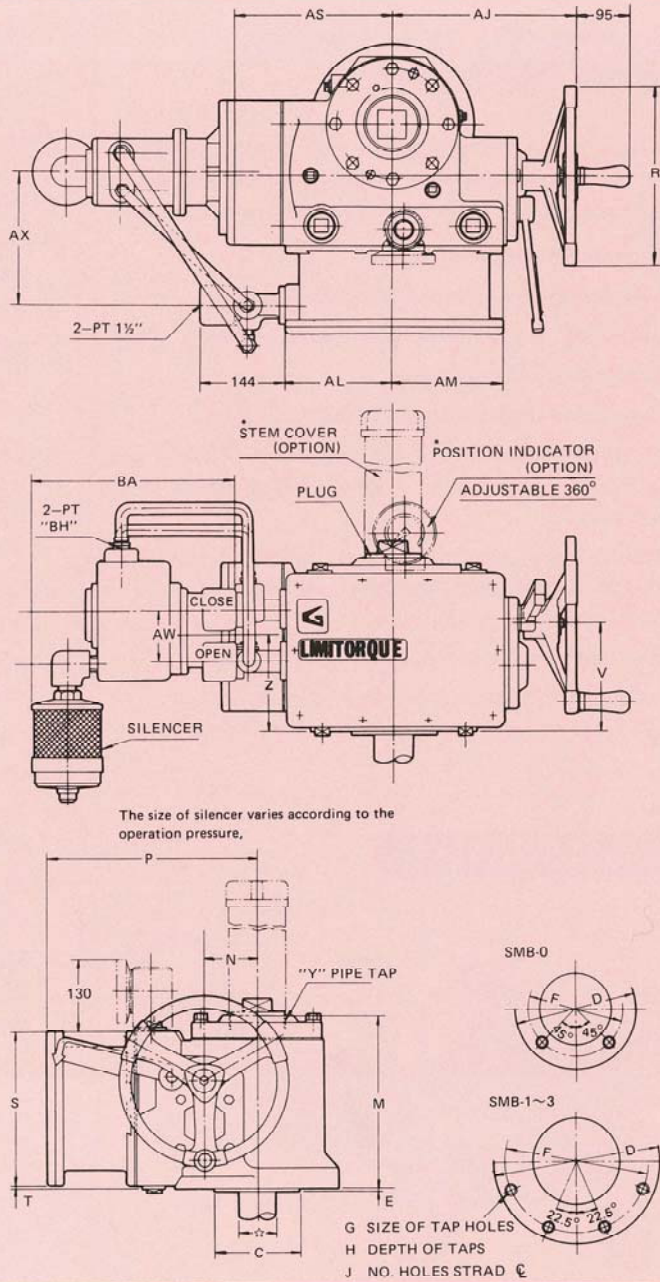


Fig. 11 Outside dimensions of SMB-00~3

### 7. Silencer

Installed at the exhaust opening of motor.

### 8. Remote position indicator

An air type remote position indicator can be equipped at your option.

### 9. Piping material

Piping from the filter till the LIMITORQUE shall be made of stainless steel or white pipes.

## AIR CONSUMPTION

In case the air pressure is 6 kg/cm<sup>2</sup>:

Motor size	Air consumption m <sup>3</sup> /min (normal)
KMF - 2R	2.4
- 3R	3.6
- 5R	6.1
- 7R	8.5
-10R	11.8

## REQUIREMENTS TO BE INFORMED AT THE TIME OF ORDER

To choose the optimum unit size and pneumatic motor capacity is essential for appropriate operation of a valve. The following items shall be clear at the time of order:

1. Type and diameter of valve.
2. Pressure and maximum differential pressure.
3. Diameter, pitch, lead, and hand of valve stem.
4. Opening and closing time.
5. Stem travel from full open to full closed.
6. Air pressure (the standard is  $6 \text{ kg/cm}^2$  but any point in the extent of  $4 \sim 7 \text{ kg/cm}^2$  is available if so ordered).
7. Ambient temperatures of valve, max. temperature of the liquid, and description of the place the machine is to be used.
8. Frequency of use and method of operation.
9. Position indicator and other attachments.

## SPECIAL SPECIFICATION

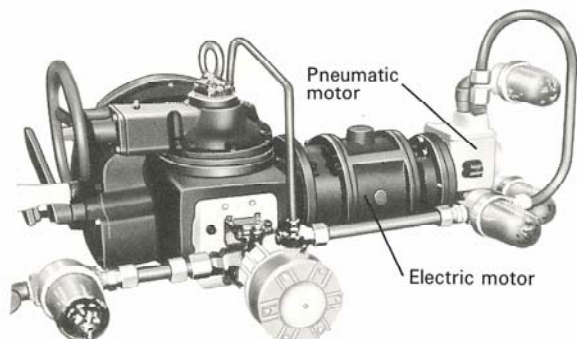


Fig. 12 Tandem type with an electric motor and a pneumatic motor

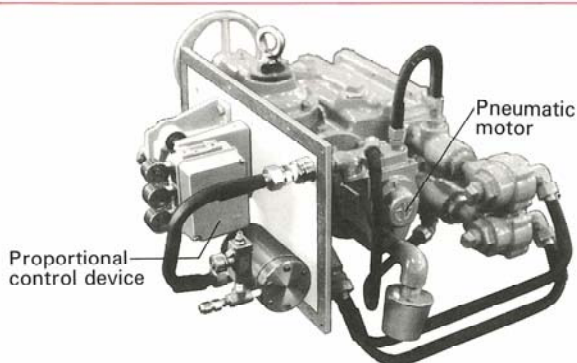


Fig. 13 Proportional control type

## PRECAUTIONS FOR HANDLING

When you are going to use the Pneumatic Motor Type LIMITORQUE, the following items shall be particularly noted:

- Make sure that the pressure of air source conforms to the rating;
- Adjust the oiler so that the rate of dripping will be 12 drops per minute in usual application. Too little rate may cause a malfunction due to out of lubrication in the vane of pneumatic motor;
- Before use, flush the piping thoroughly to avoid the pneumatic motor and limit valve from including any foreign matters. At this time, the inlet of limit valve shall be held disconnected;
- Start the operation with the exhaust of control valve held open;
- Supply grease to the gear of the pneumatic motor with the plug of gear case removed;
- Check the filter at times to make sure that there is no clogging;
- Install the oiler and the filter near the pneumatic motor as close as possible;
- Operate the machine once a month at least even though it is not requested so frequently;
- Refer to precautions given in the Instruction Manual for LIMITORQUE VALVE CONTROL (of standard electric type).

The sole agent in Japan of Philadelphia Gear Corp. and Limitorque Corp. Handles all products of the corporation and also the engineering of same.



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