YAMATAKE

CM2-APN100-2001

Multifunction Pulse-to-Pneumatic Pressure Converter Model J-APN11

User's Manual

Yamatake Corporation

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For Safe Operation

Preface

Safe equipment use requires accurate installation, operation and maintenance. Be sure to read and understand the section on "Important Items" thoroughly before attempting installation, operation or maintenance.

Checkup

- Upon arrival, check equipment specifications and ensure there is no damage in transit. Equipment is tested by strict quality control programs before shipment.

  For oversights in quality or specifications, contact Yamatake Corporation, providing equipment information and serial No.

- The nameplate is on the top of the case.

Message Conventions

This manual uses the following message conventions:

⚠ Warning Personal injury could occur if procedures are not followed closely.

⚠ Caution Minor personal injury could occur if procedures are not followed closely. Inconvenience such as equipment damage could occur if procedures are not followed closely.

Other indications

	An illustration in a white circle with a back slash ○ indicates an action to avoid. A detailed explanation of the action is given in the circle or near the mark.
	An illustration in a black circle ● indicates an instruction regarding a specific action to avoid. A detailed explanation is given in the circle. The illustration at left means to pull the plug from the socket.

Notes on Handling

Notes on Installation

⚠Warning

- Do not use equipment outside the range determined in the specifications. Serious accident could occur.

⚠Caution

- After installation, do not step or climb on this product. Equipment may be damaged or personal injury occur.
- Do not press or hit door glass. Glass may be broken or personal injury occur.
- Ground correctly. Incomplete grounding violates rules and may cause output errors.
- Equipment is heavy. Wear safety shoes.

Notes on Wiring

⚠Warning

- Electrical shock may occur if working with wet hands or power on.

⚠Caution

- Perform wiring according to wiring specifications. Incorrect wiring may damage equipment or lead to operation errors.
- Operate the power supply according to specifications. Incorrect operation may damage equipment.

Notes on Maintenance

⚠Caution

- Do not modify equipment. Modification may damage equipment.

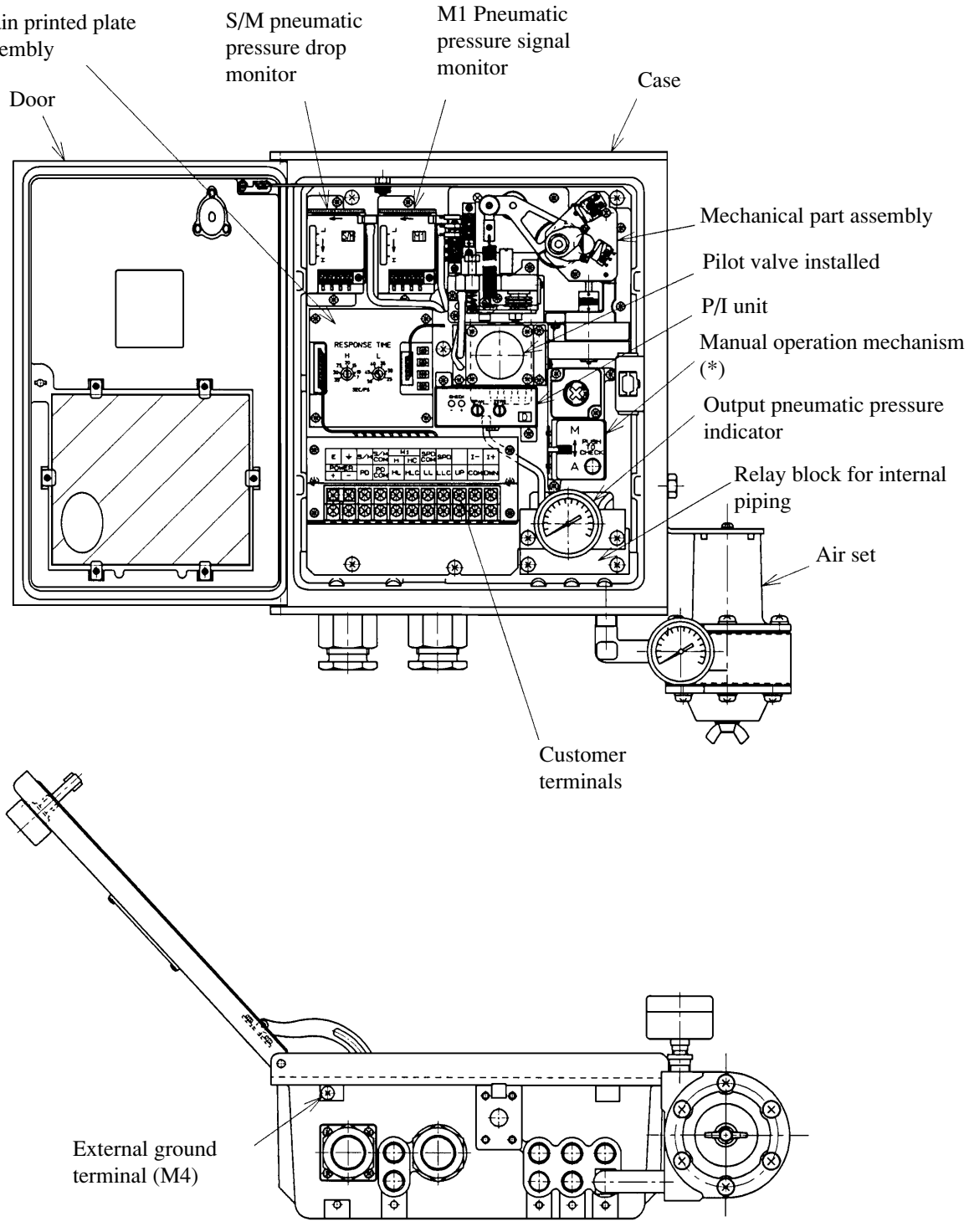
Contents

1. Outline

The J-APN 11 Multifunction Rulse-to-Pneumatic Pressure Converter responds to up (upward)and down (downward)pulse signals. It drives pulses and a (four-phase) motor to send out pneumatic pressure signals of 20 to 100[kPa] and current signals of 4 to 20 [mA] DC via a nozzle and a flapper mechanism.

In case of power failure, the converter automatically keeps the pneumatic pressure signal at its pre-failure position (provided that the pneumatic source is in normal operation).

2. Converter Configuration and Parts



(*): If manual operation is not used, a pneumatic pressure signal monitor (M2) can be installed.

Figure 2-1 Converter configuration and parts

3. Installation and Operation

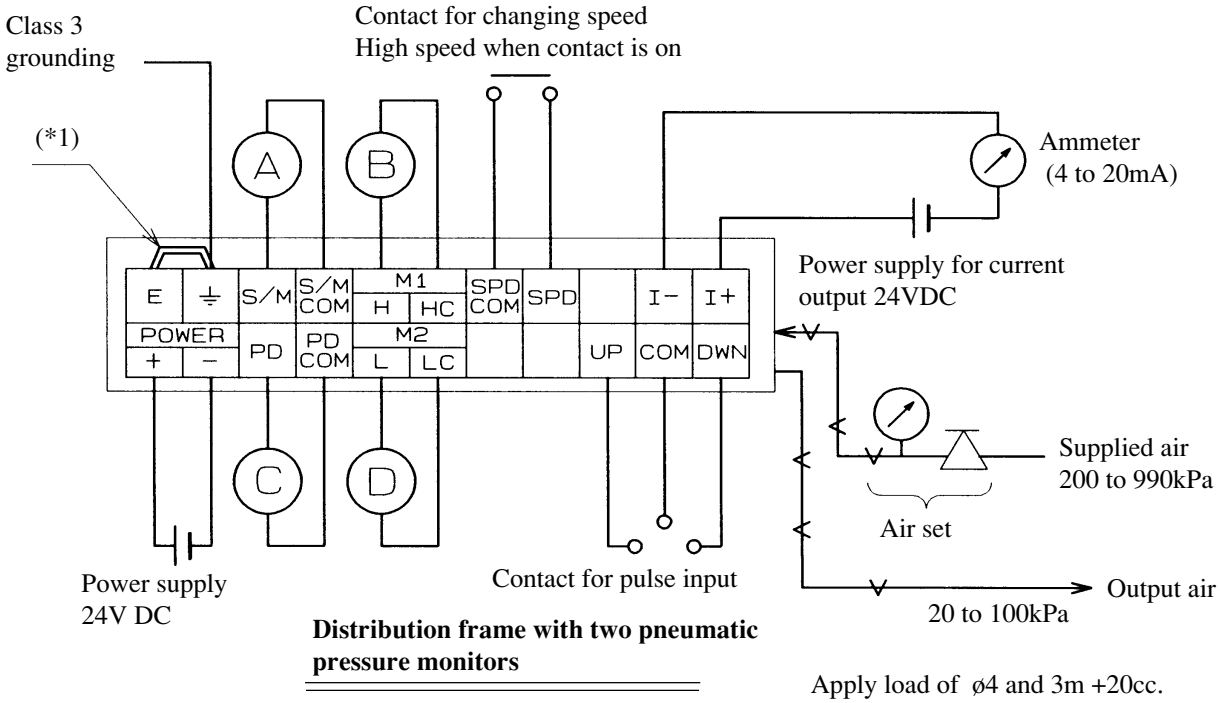
3-1. Installation

Mount the converter securely on a 2B pipe or on a wall. (refer to Appendix A : the figure for external dimensions.)

3-2. Operation

Complete wiring and piping according to Figure 3-2-1. Warm up the converter for about 30 minutes before operating.

For air supply, please use the prescribed instrumentation air.



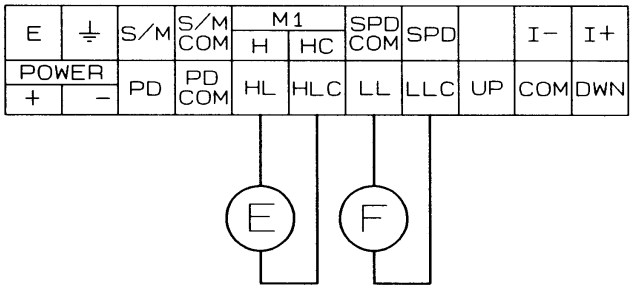
Distribution frame with two pneumatic pressure monitors

Apply load of ø4 and 3m +20cc.

Contacts

A: Supplied air drop monitor
B: Output pneumatic pressure signal monitor (high)
C: Power supply down monitor
D: Output pneumatic pressure signal monitor (low)
E: High
F: Low

(*1): Remove jumper plate when testing withstand voltage or insulation resistance.



Distribution frame with limit contact output

Figure 3-2-1 Customer terminal wiring and air piping

3-3. Connection

(a) Contact output

Figure 3-3-1

Combine the contact with a surge suppression device for safety.

(b) UP/down signals

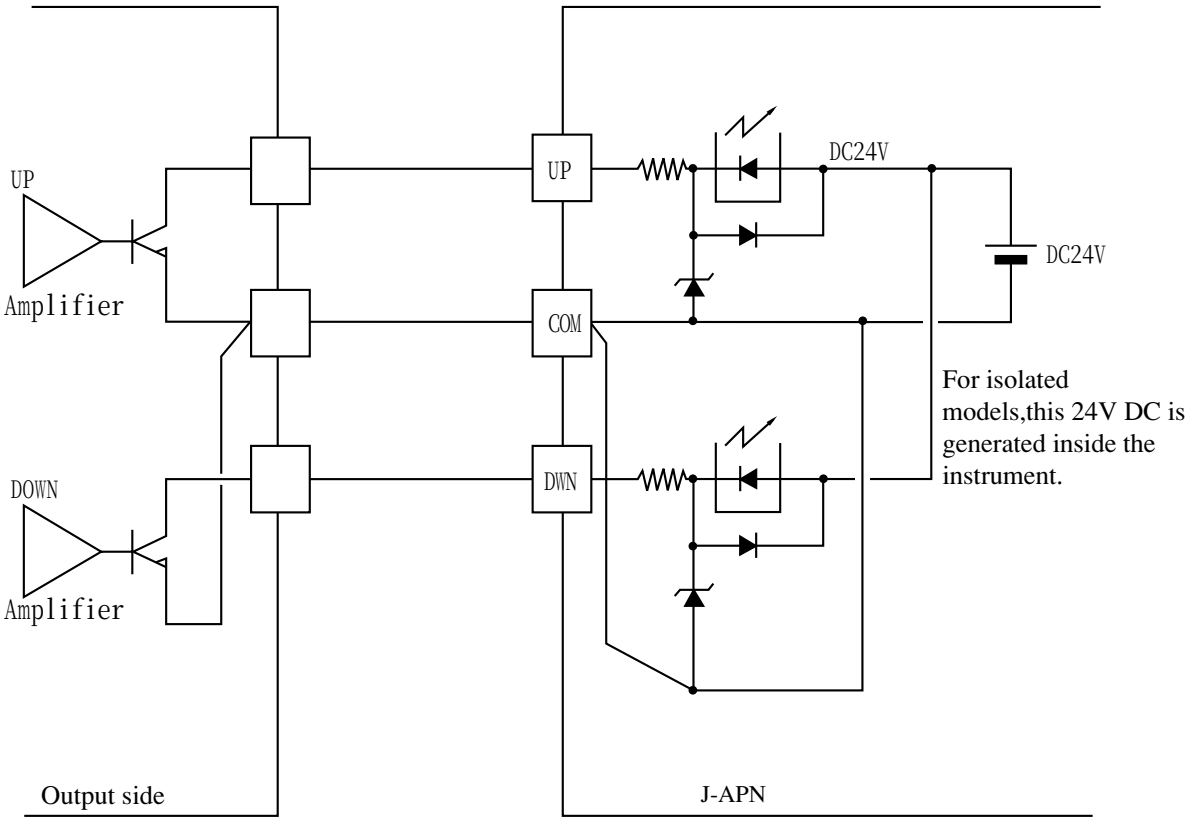


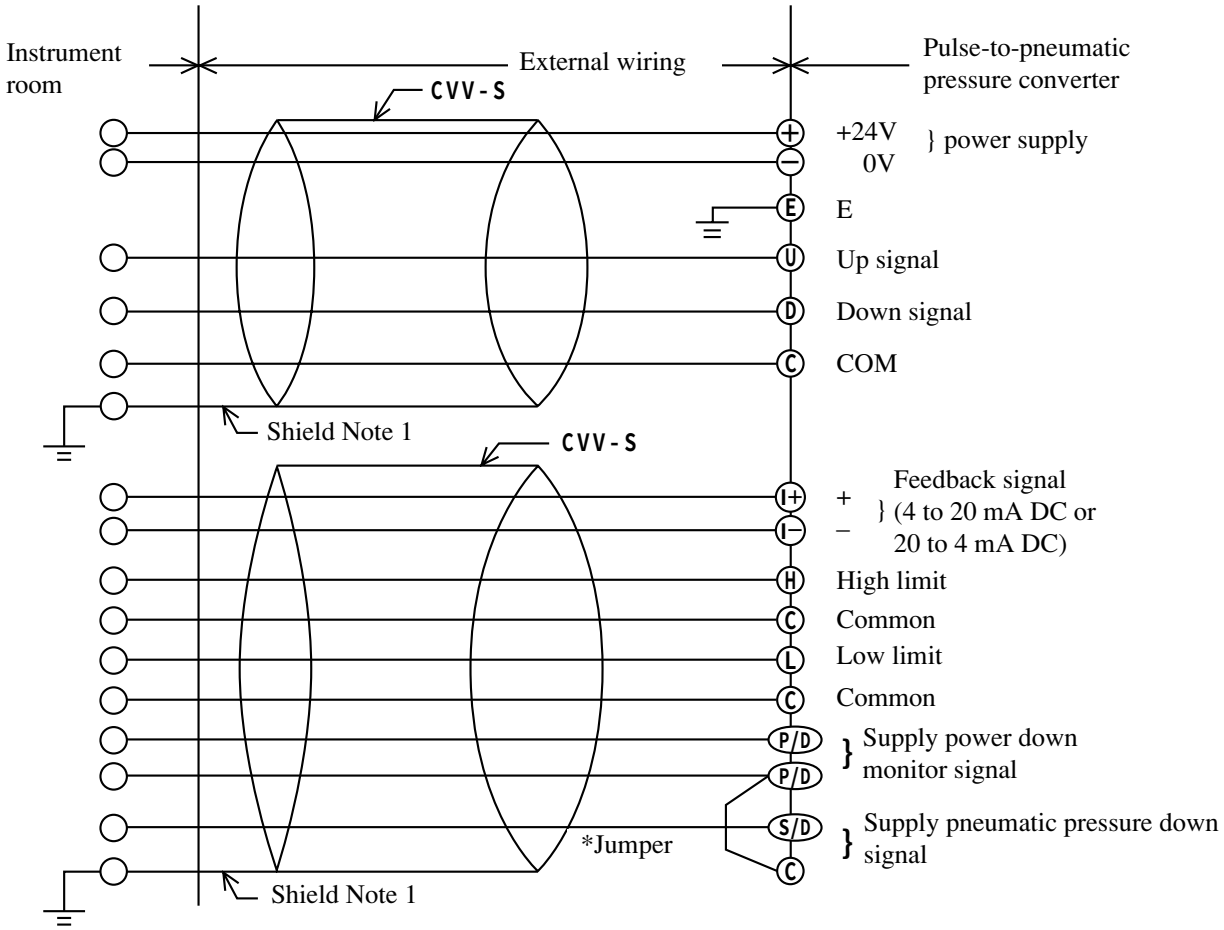
Figure 3-3-2 Connection method

Open collector output is desirable for up/down signals.

For contact output, use a mercury relay.

3-4. Wiring Procedure

1) Recommended wiring for pulse width input



Note 1: Ground the cable shield only on the instrument room side (Class 3 or higher).

Note 2: Install the jumpers on the external wiring.

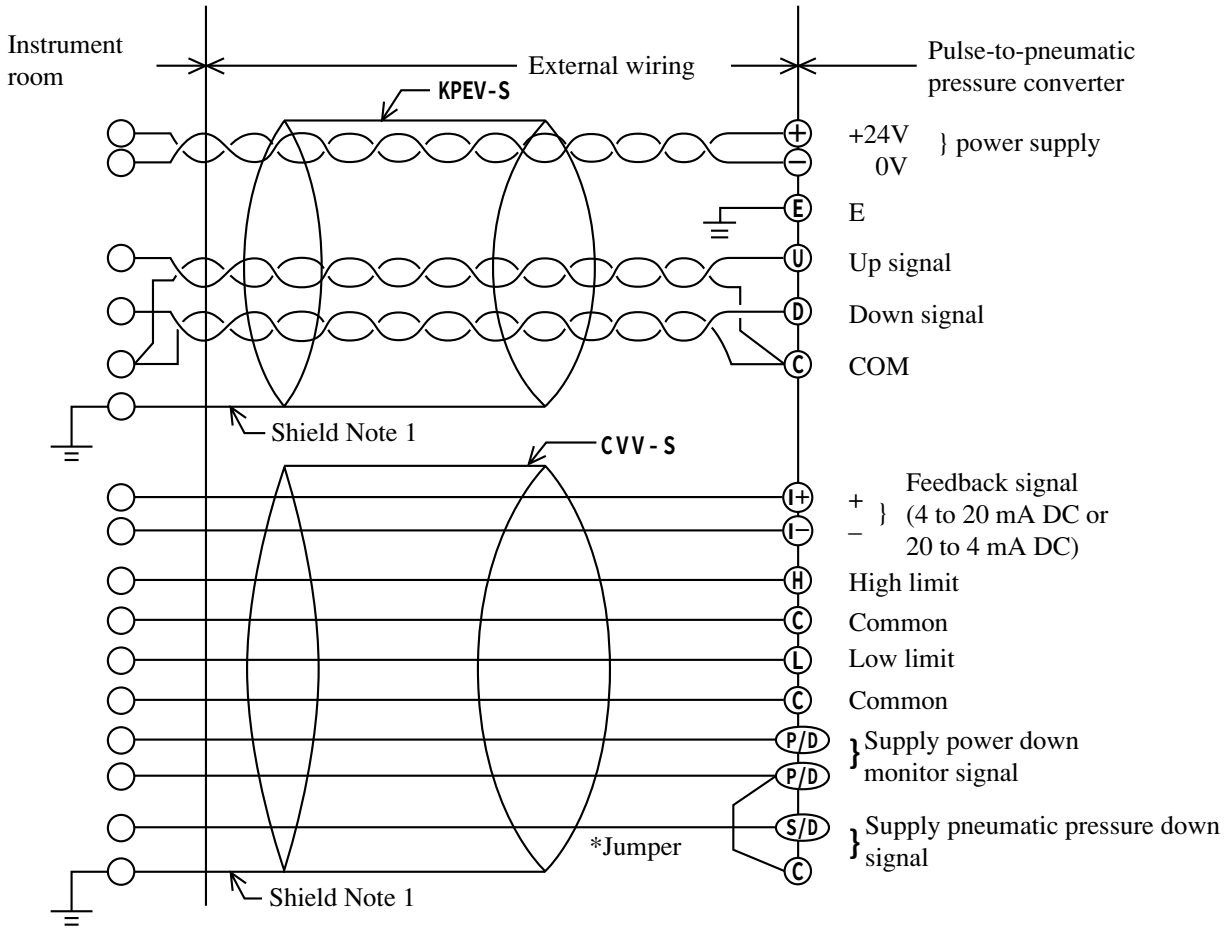
Note 3: Although a large number of additional functions can be selected on the pulse-to-pneumatic pressure converter, the number of external wires may be limited depending on the conduit dimensions. The cable shapes and the number of wire cores should be your guides when selecting functions.

Note 4: Ground the main unit to Class 3 or higher.

Figure 3-4-1 Wiring Procedure (for pulse width input)

2) Recommended wiring for pulse train input

Use KPEV-S for up and down signals and CVV-S for other signals.



Note 1: Ground the cable shield only on the instrument room side (Class 3 or higher).

Note 2: Install the jumpers on the external wiring.

Note 3: Although a large number of additional functions can be selected on the pulse-to-pneumatic pressure converter, the number of external wires may be limited depending on the conduit dimensions. The cable shapes and the number of wire cores should be your guides when selecting functions.

Note 4: Ground the main unit to Class 3 or higher.

Figure 3-4-2 Wiring Procedure (for pulse train input)

3) Recommended cables

Up and down signals

Pulse train input cable : KPEV-S.

Pulse width input cable : CVV-S.

Signals other than up and down signals : CVV-S.

① KPEV-S cable specifications

(Used for up and down signals for pluse train input)

Polyethylene insulated vinyl sheath cable for shielded instrumentation

Performance :

Conductor : twisted soft copper wire for electrical use (JIS C 3102)

Insulator : polyethylene

Pair twisting : two wire cores twisted together at a proper pitch

Structure : 2P×3, blanket shielding

Electrical characteristics

Conductor :	Nominal cross area :	2 mm^2
	Structure :	7 cores/0.6 mm
	Conductor resistance :	9.61 ohms/km
	Line capacity (reference value) :	0.08 μF
Sheath thickness :		1.5 mm
External diameter :		15.0 mm

② CVV-S cable specifications

(Used for signals other than up and down signals for pulse train input)

Vinyl insulated vinyl sheath cable for shielded instrumentation

Performance :

Conductor : twisted soft copper wire for electrical use (JIS C 3102)

Insulator : vinyl

Structure : 6 cores or 8 cores, blanket shielding

Electrical characteristics

Conductor :	Nominal cross area :	2 mm^2
	Structure :	7 cores/0.6 mm
	Outside shape :	1.8 mm
	Conductor resistance :	9.42 ohms/km
	Line capacity (reference value) :	0.12 μF/km
Sheath thickness :		1.5 mm
External diameter :		14.0 to 15.0 mm (depends on the number of cores)

4) Outside cable diameter and number of wire cores

Structure table CVV-S (2-30 × 1.25 mm²)

No.of cores	Conductor			Insulator thickness	Copper tape thickness (approximate)	Sheath thickness	External diameter (approximate)	Approximate mass
	Nominal profile	Structure	Diameter					
	mm²	Cores/mm	mm	mm	mm	mm	mm	kg/km
2	1.25	7/0.45	1.35	0.8	0.1	1.5	9.6	120
3	1.25	7/0.45	1.35	0.8	0.1	1.5	10.5	140
4	1.25	7/0.45	1.35	0.8	0.1	1.5	11.0	160
5	1.25	7/0.45	1.35	0.8	0.1	1.5	12.0	190
6	1.25	7/0.45	1.35	0.8	0.1	1.5	13.0	220
7	1.25	7/0.45	1.35	0.8	0.1	1.5	13.0	230
8	1.25	7/0.45	1.35	0.8	0.1	1.5	13.5	260
10	1.25	7/0.45	1.35	0.8	0.1	1.5	15.5	320
12	1.25	7/0.45	1.35	0.8	0.1	1.5	16.0	355
15	1.25	7/0.45	1.35	0.8	0.1	1.5	17.0	420
20	1.25	7/0.45	1.35	0.8	0.1	1.5	19.0	525
30	1.25	7/0.45	1.35	0.8	0.1	1.6	23	750

Structure table CVV-S (2-30 × 2 mm²)

No.of cores	Conductor			Insulator thickness	Copper tape thickness (approximate)	Sheath thickness	External diameter (approximate)	Approximate mass
	Nominal profile	Structure	Diameter					
	mm²	Cores/mm	mm	mm	mm	mm	mm	kg/km
2	2	7/0.6	1.8	0.8	0.1	1.5	10.5	150
3	2	7/0.6	1.8	0.8	0.1	1.5	11.5	180
4	2	7/0.6	1.8	0.8	0.1	1.5	12.0	210
5	2	7/0.6	1.8	0.8	0.1	1.5	13.0	250
6	2	7/0.6	1.8	0.8	0.1	1.5	14.0	290
7	2	7/0.6	1.8	0.8	0.1	1.5	14.0	310
8	2	7/0.6	1.8	0.8	0.1	1.5	15.0	355
10	2	7/0.6	1.8	0.8	0.1	1.5	17.5	430
12	2	7/0.6	1.8	0.8	0.1	1.5	18.0	490
15	2	7/0.6	1.8	0.8	0.1	1.5	19.5	585
20	2	7/0.6	1.8	0.8	0.1	1.6	22	745
30	2	7/0.6	1.8	0.8	0.1	1.7	26	1,080

Packings applicable to waterproof glands

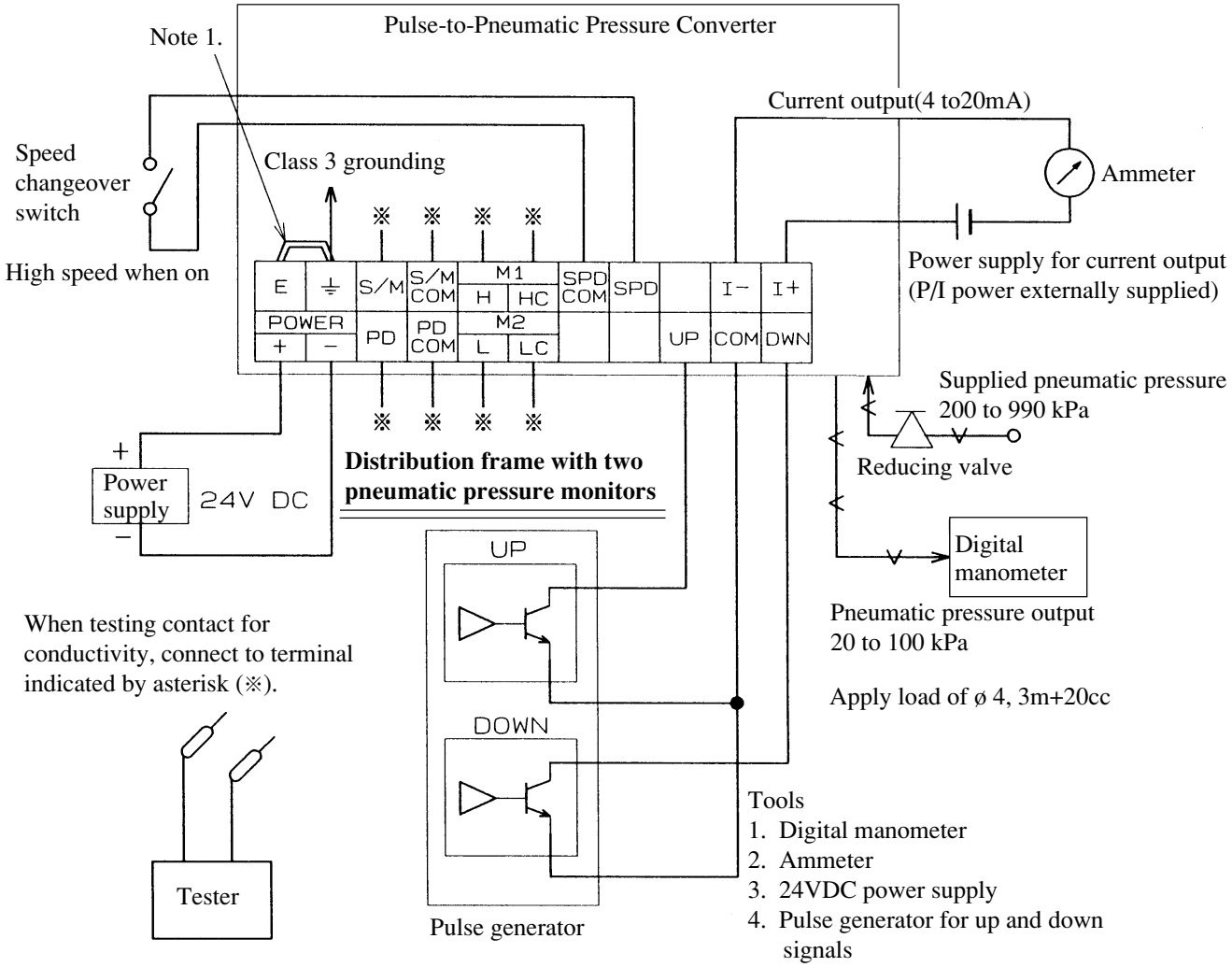
Use one of three kinds : 12,13, and 15 in diameter.

4. Adjustment and Setting

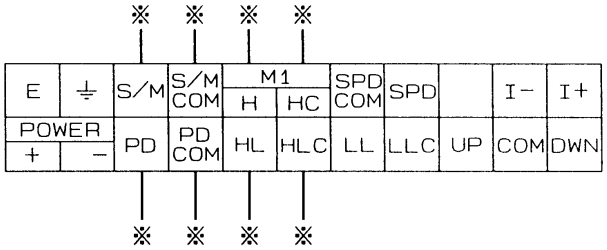
4-1. Preparation

Connect as shown below.

To stabilize, warm up for at least 30 minutes before operation.



Note 1 Remove jumper plate when testing withstand voltage or insulation resistance.



Distribution frame with limit contact output

Figure 4-1 Instrument connection

4-2. Adjustment of Pneumatic Pressure Output (Figure 4-2)

Perform zero and span adjustments of pneumatic output with mechanical stoppers for upper and lower limits (between the 56T helical gear and base) in contact.

Use the fine-zero adjustment screw and fine-span adjustment nuts on the transmitter.

1) At the lower contact with mechanical stopper

   Pneumatic pressure output: 16kPa (-5%F.S.)±1%F.S.

2) At the upper limit of contact with mechanical stopper

   Pneumatic pressure output: 104kPa (105%F.S.)±1%F.S.

   Repeat zero and span adjustments until conditions (1) and (2) are met.

   - Turn off power and remove the pulse motor connector, so that coupling can be done easily by hand.
   - Pneumatic pressure output is measured by connecting a tube to the pneumatic pressure output check plug.

Note 1 : Upper and lower limits are set to -3+/-1%F.S. and 103+/-1%F.S. The output value must not exceed the mechanical stopper range.

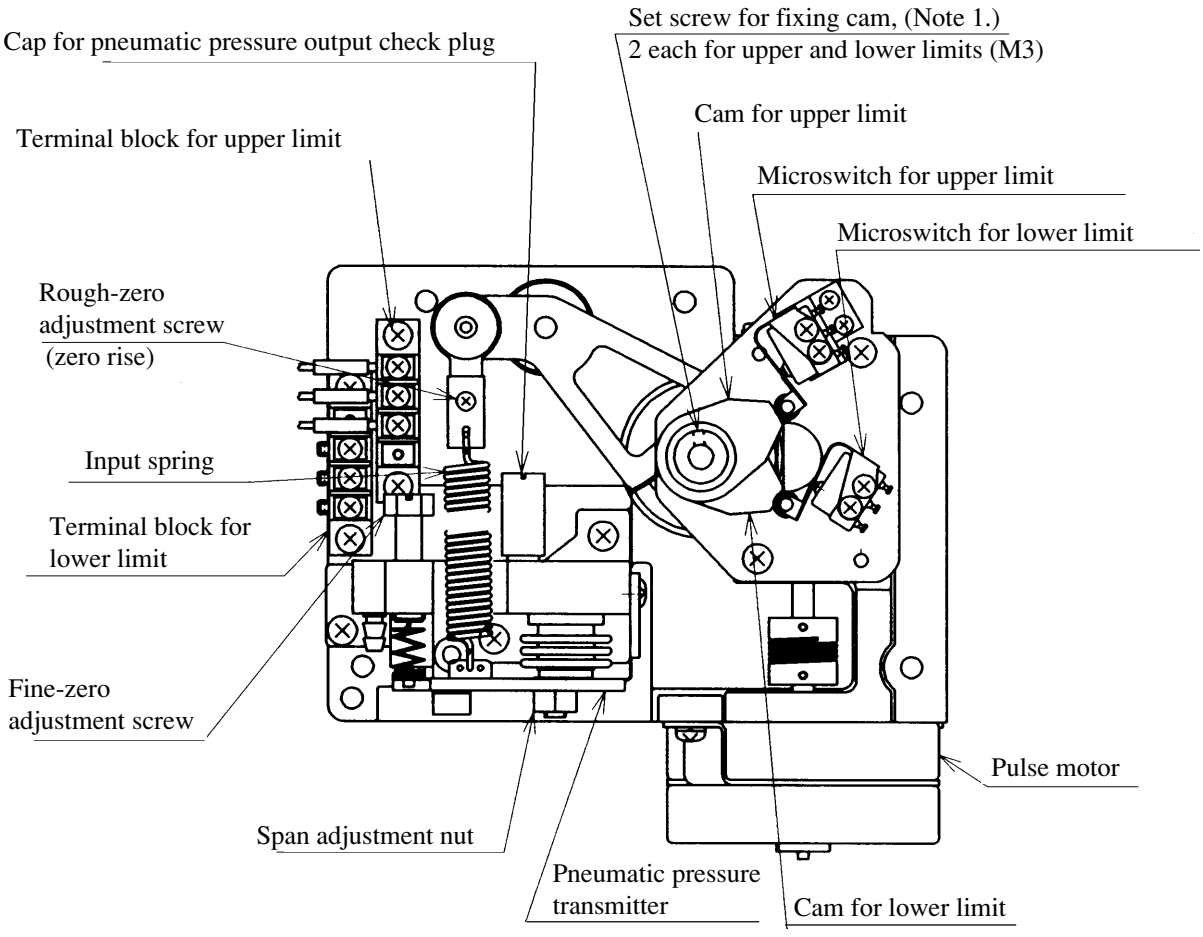


Figure 4-2 Mechanical assembly

4-2-1. Changing contact of limit contact signal

The following are contacts between the limit contact signal terminal block and customer terminal connection cables.

Customer terminal cables

HL ..... Upper limit contact cable
HL .C ..... Upper limit common cable
LL ..... Lower limit contact cable
LL .C ..... Lower limit common cable

Upper limit contact (terminal block)

- When using at NC (normally closed) (type H or E)
  HL → NC (terminal board)
  HL .C → C (terminal board)
- When using at NO (normally opened) (type K or F)
  HL → NO (terminal block)
  HL .C → C (terminal block)

Lower limit contact (terminal block)

- When using at NC (normally closed) (type H or E)
  LL → NC (terminal board)
  LL .C → C (terminal board)
- When using at NO (normally opened)
  LL → NO (terminal board)
  LL .C → C (terminal board)

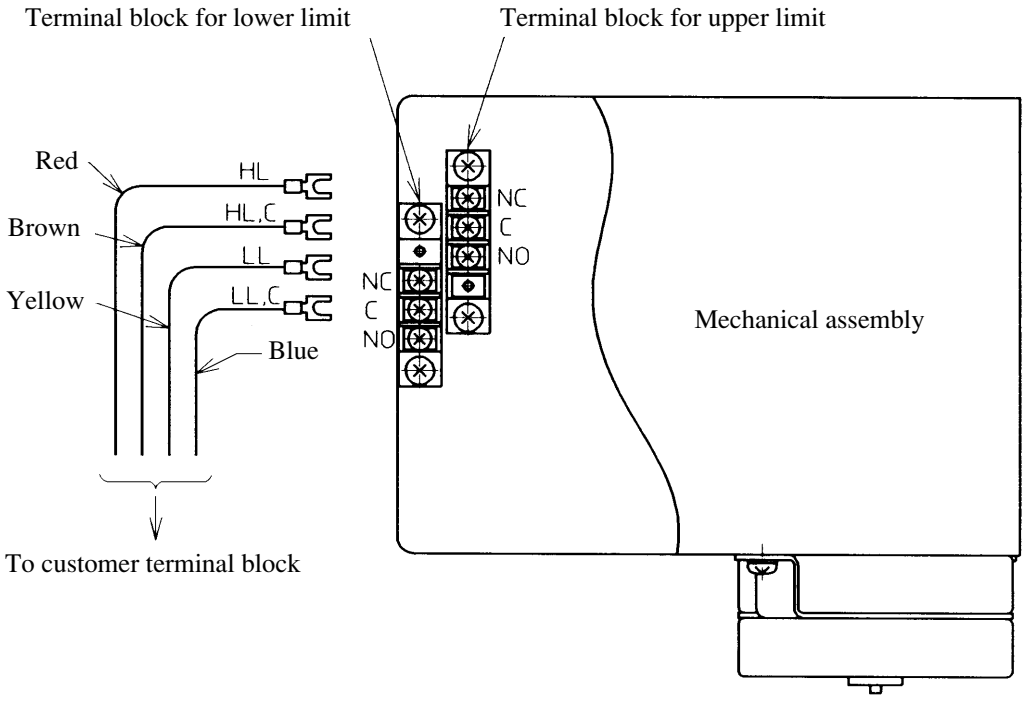


Figure 4-2-1 Connecting limit contact signal terminal block with customer terminals

4-3. Adjustment of Current Output (Figure 4-3)

4-3-1. For direct feature

Conduct wiring and piping as shown in Figure 3-2-1.

1) Adjust input up and down so that pneumatic pressure output is about (*1) 20kPa (0% F.S.), then zero-adjust the P/I converter to attain current output corresponding to pneumatic pressure output (*2).

2) Adjust input up and down so that pneumatic pressure output is about 100kPa (100% F.S.), then span-adjust the P/I converter to attain current output corresponding to pneumatic pressure output.

   Repeat steps (1) and (2) until the specified accuracy is achieved.

   For reverse characteristics, start from step (3) below.

(*1): Pneumatic pressure output cannot be set precisely since it changes with a pulse motor.

(*2): To calculate the current output corresponding to pneumatic pressure output:

$$I = 4 + \left(\frac{P - 20}{80}\right) \times 16$$

I : corresponding current output [mA DC]
P: pneumatic pressure output [kPa]

4-3-2. For reverse feature

1) Set pneumatic pressure output to about 20kPa (0% F.S.). Zero-adjust so that current output becomes 20mA.

2) Set pneumatic pressure output to about 100kPa (100% F.S.). Span-adjust so that current output becomes 4mA. (See (2) note (*2) of Section 4-3-1.)

   Repeat steps (1) and (2) until the specified accuracy is achieved.

$$I = 20 - \left(\frac{P - 20}{80}\right) \times 16 \quad \text{(For reverse feature)}$$

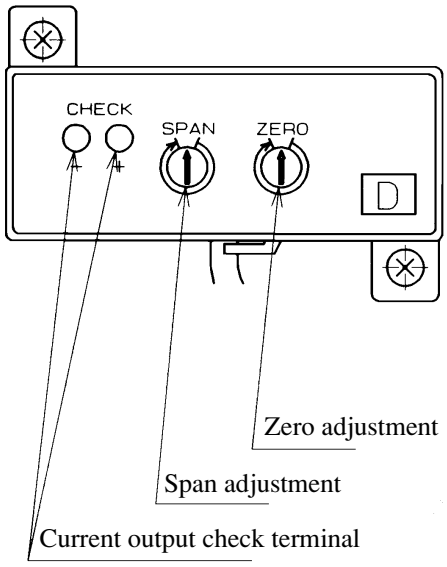


Figure 4-3 P/I conversion unit

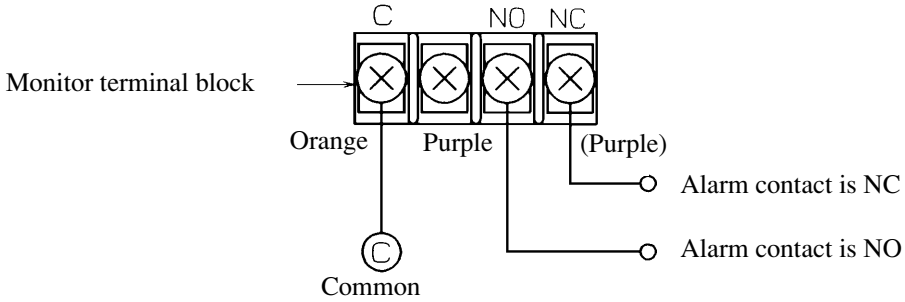
4-4. Setting Pneumatic Pressure Monitor

1) For models with both a pneumatic-pressure signal monitor (set at M1 (upper limit): 90±1%F.S., M2 (lower limit): 10±1%F.S.when shipping) and a supplied-air pressure drop monitor (set at 110kPa when shipping), alarm settings are changed by adjusting the setting wheel on each unit. To raise the set value, turn the setting wheel counterclockwise.

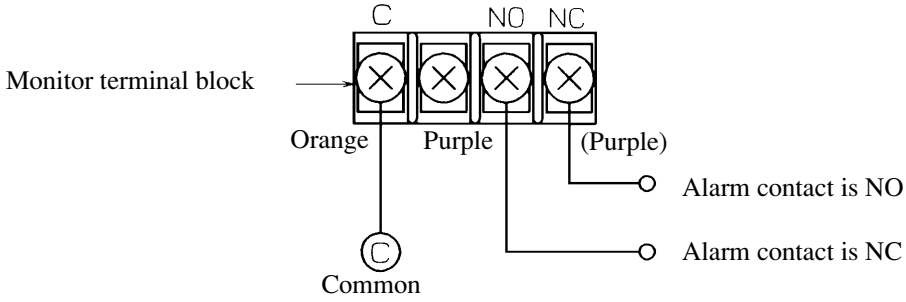
   When only one monitor is used, select the upper limit or lower limit alarm.

2) Connect the monitor unit terminal and customer terminal connection cable as shown below.

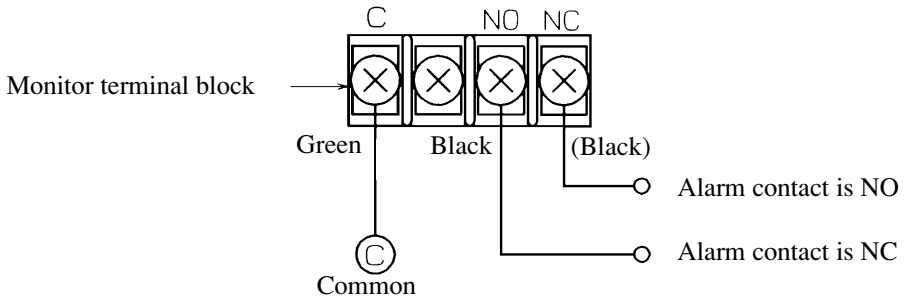
(When used as an upper limit alarm) M1 monitor



(When used as a lower limit alarm) M2 monitor (or when used M1 monitor as a lower limit alarm)



(When used as a supplied pneumatic pressure drop monitor) S/M monitor



4-5. Setting Output Speed

1) Setting high speed output

Turn on the section between the customer terminal block (SPD COM) and (SPD). Adjust the variable resistor for high speed on the main printed plate assembly to set the specified speed.

2) Setting low speed output

Turn off the section between customer terminal block (SPD COM) and (SPD). Adjust the variable resistor for low speed on the main printed plate assembly to set the specified speed.

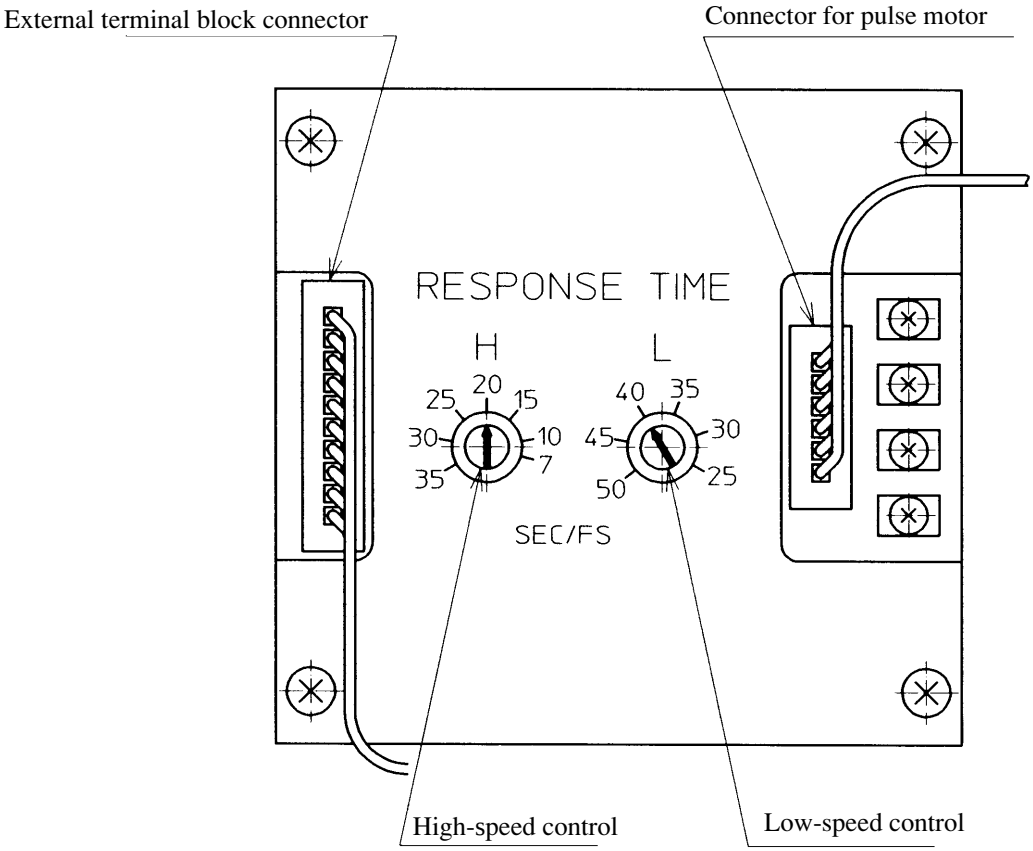


Figure 4-5 Setting output speed

4-6. Manual Operation (with A/M switch)

A manually-operated unit has a reducing valve for manual pneumatic-pressure setting and auto/manual switch.

From this unit, switch A→M and M→A following the procedure below.

Under automatic operation (lever set to A), the automatic adjustment output pneumatic pressure is displayed on the output pneumatic-pressure manometer. Pressing the check button displays output (manual adjustment output pressure) of the reducing valve. To switch to manual operation, operate the setting knob of the reducing valve to set the manual output to be the same as the automatic output, then switch the mode.

Under manual operation (lever set to M), the reducing valve output is displayed on the output pneumatic-pressure manometer, and remote operation of the valve is enabled. Pressing the check button displays automatic adjustment output. To switch to automatic operation, set automatic output to the same as manual output, then switch the mode.

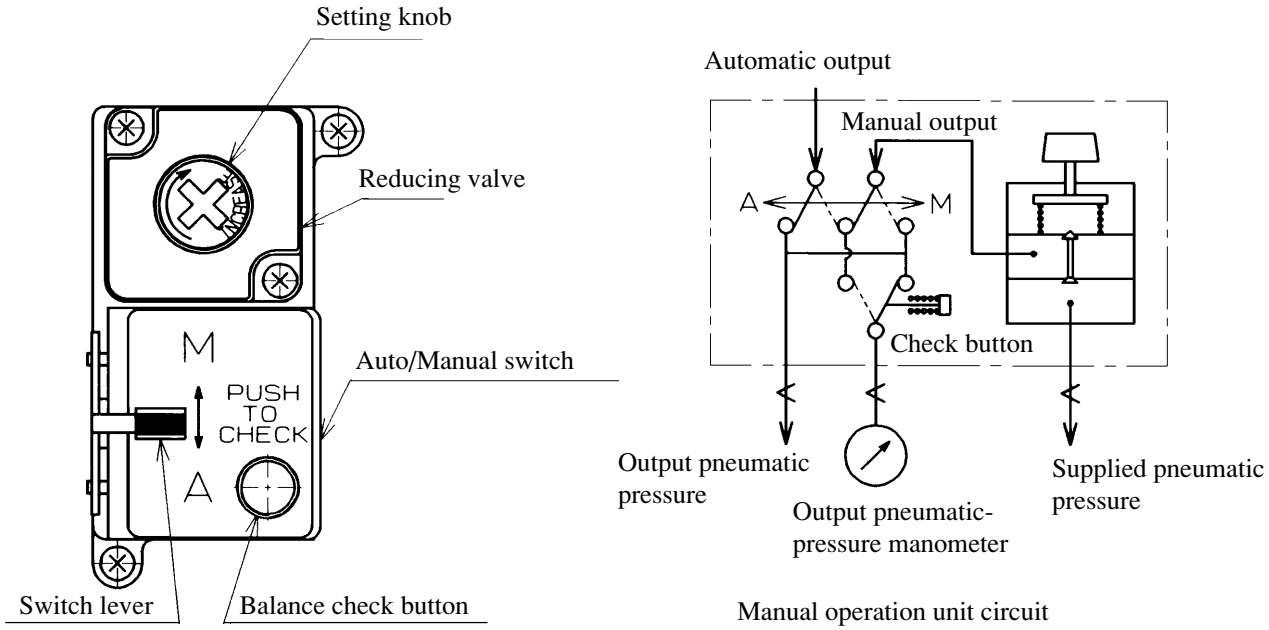


Figure 4-6 Manual operation

5. Parts List

KEY NO.	Part No.	Name	Quantity	Recommendation exchange period (years)
1	80345502–ITEM	Case Assembly	1a	10
2	80345454–001	Door Assembly	1a	7
3	80345503–001	Mechanical part assembly	1a	5
4	80345504–001	Pilot valve installed	1a	5
5	80250366–ITEM	Output pneumatic pressure indicator	1a	7
6	80345505–001	S/M pneumatic pressure drop monitor	1a	7
7	80345505–002	Pneumatic pressure signal monitor(M1)	1a	7
8	80345505–003	Pneumatic pressure signal monitor(M2)	1a	7
9	80353282–001	Manual operation mechanism	1a	5
10	80513486–ITEM	KF Air set	1a	5
11	80345506–ITEM	P/I	1a	7
12	80345437–ITEM	Main printed plate assembly	1a	5
13	80345442–ITEM	Customer terminals	1a	7
14	80510478–ITEM 80510497–001	SUS water-proof gland Plastic water-proof gland	1 1	10 10

Note 1 : "—ITEM" depends on instrument specifications.

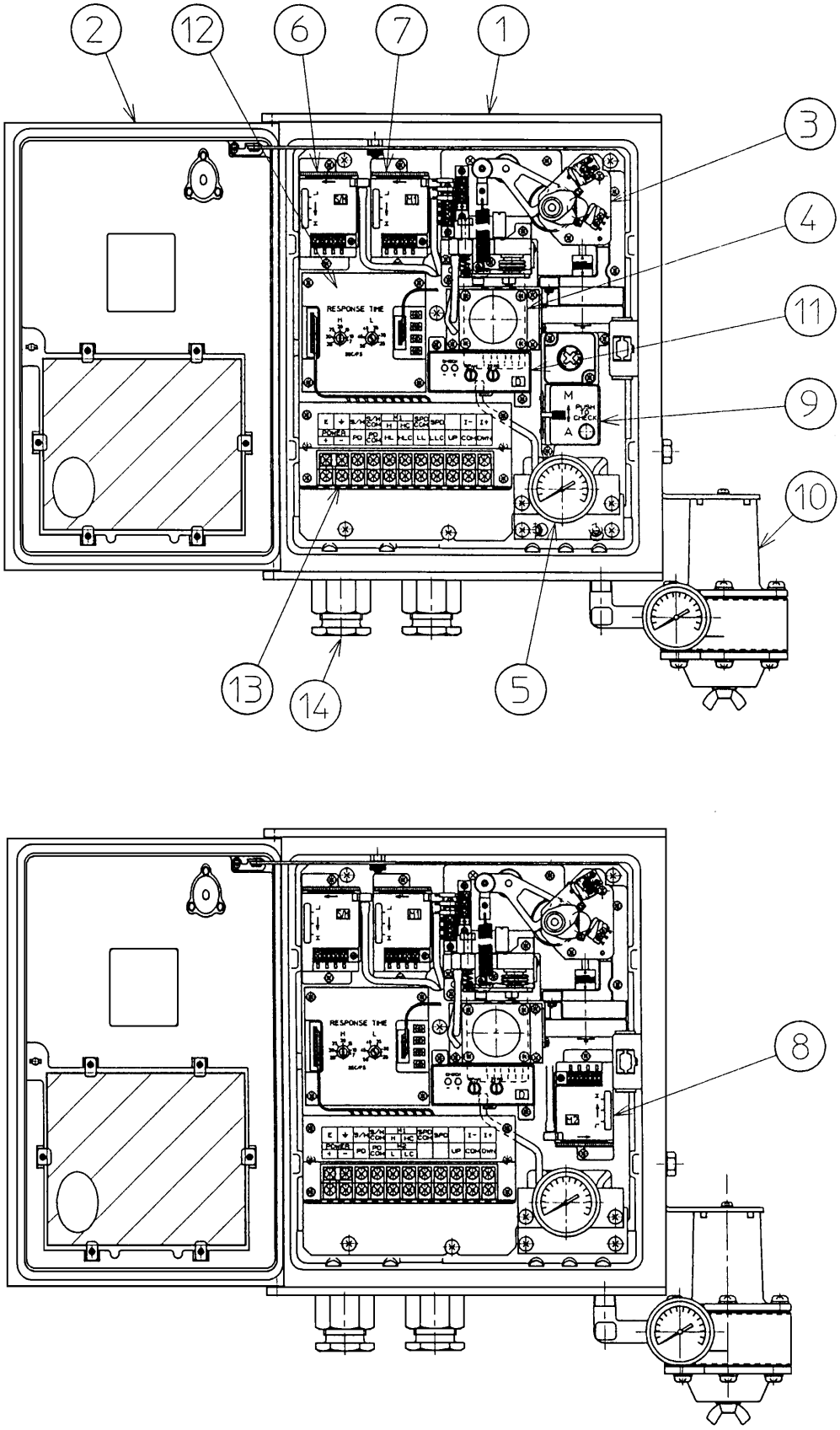


Fig 5-1 Parts key No.

6. Maintenance

6-1. Reguler Maintenance

1) Check the supplied air pressure

   Keep the supplied air pressure unit clean. Drain unit and check filters regularly. Check the compressor, the air cleaning and dehumidifying unit, and the tank.

6-2. Periodical Maintenance and Checking

1) Check for air leaks

   Make sure that there is no air leak from the air pipe or the connection joints.

2) Check the nozzle flapper for staining

   Remove stains on the nozzle flapper of the pneumatic pressure sending unit (mechanical parts assembly, see Figure 4-2, with a cloth impregnated with a solvent such as petroleum, naphtha or chlorosene 1, 1, 1-Trichloroethane (Chloroethene). Wipe gently to prevent damage to the flapper beam (plate spring).

3) Check the gear mechanism of the pulse motor for wear

   Damaged or worn gears, especially the worm gears and worm wheels must be replaced.

4) Check the pilot relay (Figure 6-1)

   (1) Remove the pilot relay from the manifold : remove the two screws (14), the spring washers (15), and the gaskets.

   (2) Disassemble the pilot relay : remove the two flat-head screws (13).

   (3) Dismount parts (6) to (12). Parts (2) to (5) need not be dismounted unless they need replacing.

   (4) Clean the metal parts with a solvent such as petroleum, naphtha or chlorosene. 1, 1, 1-Trichloroethane (Chloroethene).
   Do not stain the diaphragms with the solvent.
   Clean the valve stem (2) on the seal surface and the hole. Let solvent be absorbed by pressing the conic spring (4) to push the valve stem (2) in the compression direction.

   (5) Check the inside of the exhaust ring (10) for stains. If stained, clean with a cloth impregnated with a solvent.

   (6) Dry all the parts with clean compressed air.

   (7) Replace the rubber diaphragms (8) and (11) if they are worn or damaged.

   (8) Reassemble the pilot relay : replace all parts in correct order and tighten them with two flat-head screws (13).

   (9) Remount the pilot relay on the manifold, position the gasket (1) correctly.

   (10) Fix the pilot relay on the manifold using mounting screws (14) and two spring washers (15).

5) You are recommended to replace rubber parts (such as the diaphragms and gaskets on the pilot relay, the tube for piping, and the O-ring for the check plug of the pneumatic pressure sending unit) at intervals of about five years, though this may vary depending on conditions.

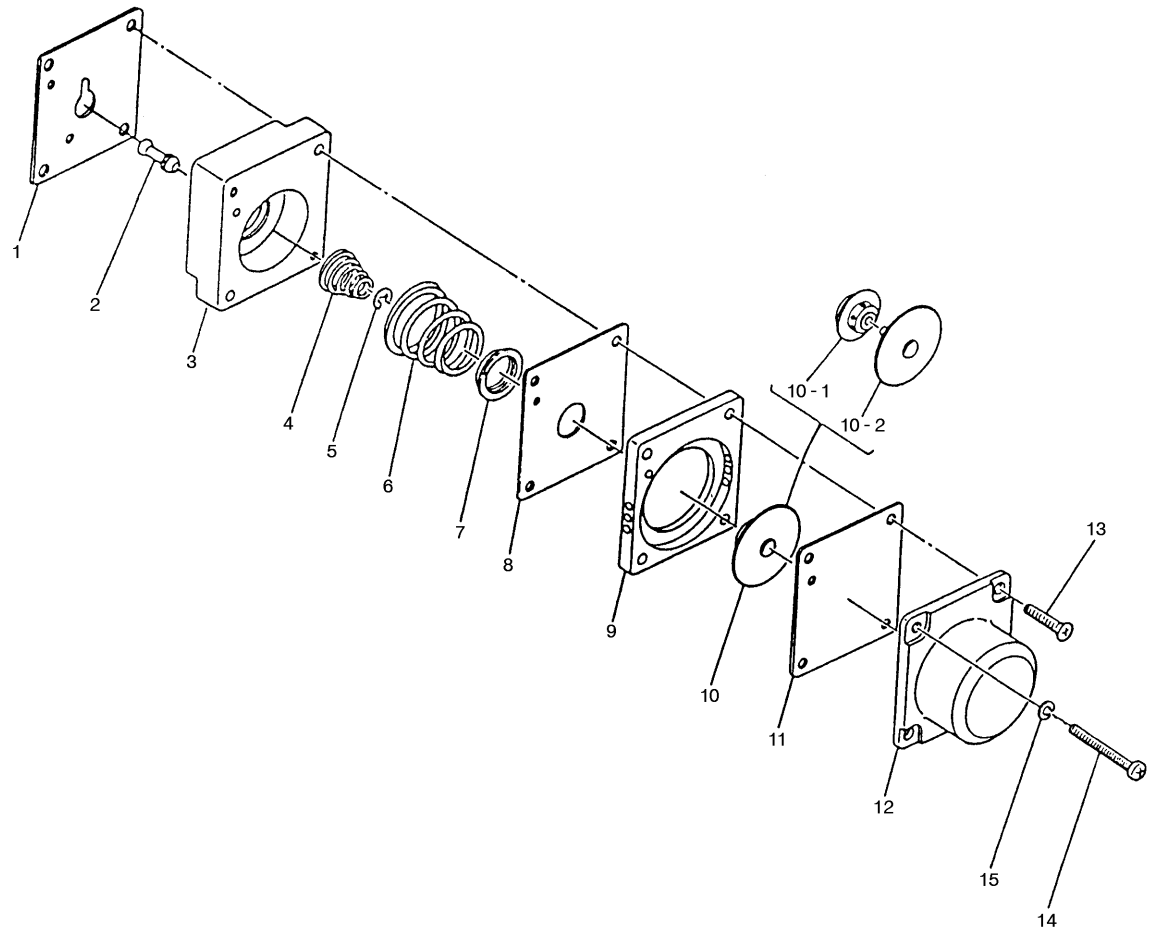


Figure 6-1 Pilot relay disassembled

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Savemation

Saving through Automation

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