Smart Valve Positioner 200 Series HART + Travel Transmission

Model AVP207

Overview

Smart Valve Positioner 200 Series model AVP207 is a current-pneumatic smart valve positioners with a separate valve travel detector, and compatible with HART communication and travel transmission output.
The valve detector and positioner are interconnected with a remote cable.
By installing only its valve detector onto the valve body, it will drastically make positioner maintenance easier as well as improving anti-vibration characteristics.

Features

Anti-vibration characteristics 10 G, 2000 Hz

Vibration resistance has been improved so that it is five times more durable than conventional current-pneumatic positioners.
It is suitable for valves that are located in an environment with strong vibration, which previously could use only pneumatic positioners.

Easy to use

- **Auto setup**
  The auto-setup function is a fully-automatic configuration program which specifies the actuator and adjusts the zero and span of the valve. The program can be turned on simply from an external switch so that adjustments to the valve can be performed quickly and safely in hazardous areas.

High reliability

- **Positive seating**
  The positive seating function completely shuts off the valve if the input signal becomes lower than previously set. This in turn enhances the full shut-off capabilities of the valves.
- **Self-diagnostic**
  The self-diagnostic function provides with the ability to check the status of the positioner at any time and to alert in case of failure.

Single model for multiple specifications

The 200 Series' settings can be changed without replacing any parts. A single model can be modified to suit any application.

- **Input range:**
  Configurable to any required range for split range
- **Flow characteristic:**
  Linear, EQ%, Quick opening or custom user characteristics
- **Actuator type:**
  Single or double acting actuator (optional reversing relay required)

Travel transmission

The model AVP207 transmits a 4-20 mA signal proportional to the valve travel. The valve travel can be monitored from the control room.

Wiring Connection

The wiring method differs depending on whether this device is used as a normal current-pneumatic positioner or as a positioner with a travel transmission function. When using this device as a normal current-pneumatic positioner, it is necessary only to connect the positioner to the host controller with an input signal cable (4-20 mA DC) as with previous models. Figures 1 and 2 show the wiring diagrams.

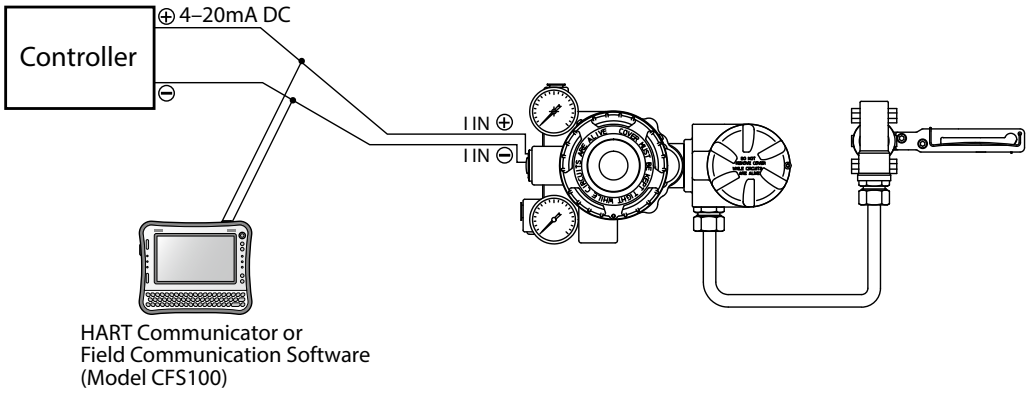


Figure 1. Normal current-pneumatic positioner

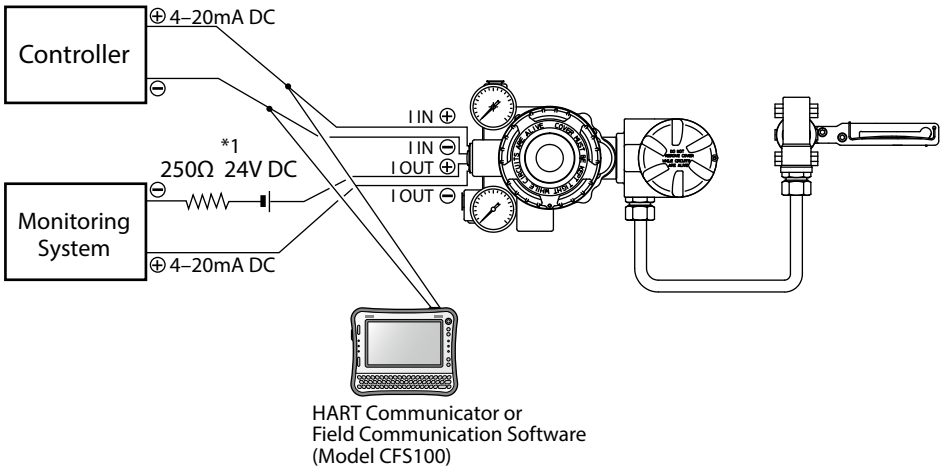


Figure 2. Positioner with travel transmission function

**1. For load resistance, refer to Figure 3.*

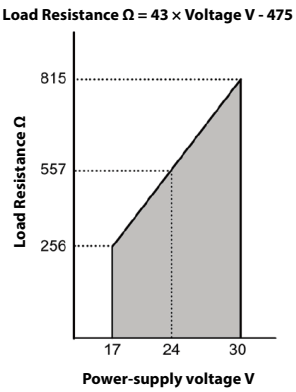


Figure 3. Supply voltage for travel transmission vs. load resistance characteristic

Note) Supply voltage shall be limited to 30 V DC

**2. Load resistance = Resistance for Monitoring system + 250 Ω*1 + Resistance of supply voltage*1*

List of Features

Item	Function
Desired input signal range	Any split-range value can be specified.
Forced fully open/closed	The control valve can be fully closed or opened securely when the desired percentage of input signal is reached.
Desired flow characteristics	The relationship between input signal and valve travel that is appropriate for the process can be defined by using a 16-point line graph.
Travel transmission	Valve motion can be reliably monitored by transmitting the valve travel.

Functional Specifications

Item	Specification
Applicable actuator	Pneumatic single and double acting, linear and rotary motion actuator
Input signal	4-20 mA DC (Configurable to any required range for split range minimum span 4 mA DC.) Min. current for normal operation: 3.85 mA *1
Communication system	HART6 communication only *2
Output signal	4-20 mA DC (Travel transmission)
Input resistance	370 Ω typically / 20 mA DC (Waterproof and Flameproof, models)
Lightning protection	Peak value of voltage surge: 12 kV Peak value of current surge: 1000 A
Flow characteristics	Linear, Equal percentage, Quick opening Custom user characteristics (16 points)
Manual operation	Auto/Manual external switch (For single acting actuator only)
Supply air pressure	140 to 700 kPa
Air consumption	for single acting actuator 4 L/min (N) or less: with steady supply air pressure of 140 kPa {1.4 kgf/cm²} and output of 50 % 5 L/min (N) or less: with steady supply air pressure of 280 kPa {2.8 kgf/cm²} and output of 50 % 6 L/min (N) or less: with steady supply air pressure of 500 kPa {5.0 kgf/cm²} and output of 50 % for double acting actuator 10 L/min (N) or less: with steady supply air pressure of 400 kPa {4.0 kgf/cm²}
Output balanced pressure	55±5 % for double acting actuator only
Maximum air deliver flowrate	for single acting actuator 110 L/min (N) maximum at 140 kPa {1.4 kgf/cm²} for double acting actuator 250 L/min (N) maximum at 400 kPa {4.0 kgf/cm²}
Air connections	Rc1/4 or 1/4NPT internal thread
Electrical connections	G1/2, 1/2NPT or M20 × 1.5 internal thread
Ambient temperature limits	General models: -40 to +80 °C TIIS Flameproof: -20 to +55 °C
Ambient humidity limits	10 to 90 %RH
Vibration characteristics	Body: 20 m/s², 5 to 400 Hz Valve travel detector: 100 m/s², 5 to 2000 Hz (with standard mounting kit on Azbil Corporation's HA actuator)
Finish	Baked acrylic
Color	Dark blue
Material	Body case: Cast aluminum Case of valve travel detector: Stainless steel Cable: Polyvinyl chloride for ambient temperature up to 80 °C
Weight	Body For single acting actuator Without Pressure regulator with filter: 3.3 kg With Pressure regulator with filter model RA1B: 3.8 kg With Pressure regulator with filter model KZ03: 4.0 kg For double acting actuator Without Pressure regulator with filter: 3.6 kg With Pressure regulator with filter model RA1B: 4.1 kg With Pressure regulator with filter model KZ03: 4.3 kg Valve travel detector: 1.0 kg Cable: 0.2 kg/m Outer diameter: 9.8 mm Sheath material: PDC (PVC)

**1: If the input signal falls below this value, the travel transmission output may became indefinite.*

**2: The KC mark is not required for this product if HART communication is not continuously used. Therefore, in Korea, do not use HART communication continuously.*

<table>
<tr><th colspan="2">Item</th><th>Specification</th></tr>
<tr><td rowspan="3">Performance</td><td>Accuracy</td><td>±1 % F.S. (±2.5 % with custom output characteristics)
Depending on cable length, the accuracy varies as follows:
<table><tr><th>Cable length</th><th>Accuracy</th></tr><tr><td>5 m</td><td>±1.2 % F.S.</td></tr><tr><td>10 m</td><td>±1.7 % F.S.</td></tr><tr><td>20 m</td><td>±2.7 % F.S.</td></tr></table>For 4 mA ≤ input signal span < 8 mA, ±1.5 % F.S.
Note) Depend on the air pipe diameter, or pipe length, the auto setup program will not properly operate.</td></tr>
<tr><td>Travel transmission accuracy</td><td>±1 % F.S. (±2.5 % with output characteristics modification)</td></tr>
<tr><td>Stroke coverage</td><td>14.3 to 100 mm Stroke (Feedback Lever Angle ±4° to ±20°)</td></tr>
<tr><td colspan="2">Enclosure classification</td><td>JIS C 0920 watertight</td></tr>
<tr><td colspan="2">Stracture</td><td>TIIS Flameproof Body: Ex d IIC T6 Gb Approval No. TC22723X
Valve Travel Detector: Ex d IIC T6 Approval No. TC20454</td></tr>
<tr><td colspan="2">Configuration tools</td><td>Field Communication Software (Model CFS100 Software Version 3.3 or later)
Control Valve Maintenance Support System PLUG-IN Valstaff (Software Version R43 or later)</td></tr>
</table>

Conditions of supply air (JIS C 1805-1 (2001))

Item	Specification
Particles	Maximum diameter 3 μmm
Oil mist	Less than 1 ppm at mass
Humidity of the air supply	The dew point should be at least 10 °C lower than the temperature of this device.

To meet the above specifications for instrument air, install the air purification devices listed below properly in the specified installation location.

Examples of air purification devices

Installation	Air purification device	SMC corporation	CKD corporation
Compressor outlet or main line	Line filter	AFF series	AF series
	Mist separator	AM series	
Terminal device	Mist separator	AM150 or AM250 series	M3000S type

Model Selection

Basic model number

AVP207	Analog signal (4 to 20 mA DC) with HART Communication + Travel Transmission		(1)	(2)	(3)	(4)	(5)
		(Air pipes, conduit connections)					
(1) Structure	Water-proof	(Rc1/4, G1/2)	X				
	Water-proof	(1/4NPT, 1/2NPT)	P				
	TIIS Flameproof with cable gland *1	(Rc1/4, G1/2)	E				
(2) Finish	Standard (Baked acrylic) *2			S			
	Corrosion proof (Baked epoxy) *2			B			
	Silver finish (Baked acrylic)			D			
(3) Positioner action *4	Direct action - Air pressure increases with control signal increase				D		
	Reverse action - Air pressure decreases with control signal increase				R		
		(pressure gauge range, max. voltage setting of regulator)					
(4) Supply air pressure classification	140 ≤ Ps ≤ 150 kPa	(200 kPa, 400 kPa)				1	
	150 < Ps ≤ 300 kPa	(400 kPa, 400 kPa)				2	
	300 < Ps ≤ 400 kPa	(600 kPa, 400 kPa)				3	
	400 < Ps ≤ 450 kPa	(600 kPa, 700 kPa)				4	
	450 < Ps ≤ 700 kPa	(1000 kPa, 700 kPa)				5	
(5) Scale unit (Pressure gauge)	kPa						A
	(kgf/cm^2) *3						(B)
	MPa						C
	bar						D
	(psi) *3						(E)

*1. *Two sets of TIIS Flameproof cable gland shall be attached.*

*2. *Standard finish is equal to previous Y138A. Corrosion proof is equal to previous Y138B.*

*3. *No domestic sales in Japan due to Non-SI unit.*

*4. *When the input signal (power) is shut off, select direct action to make the output air pressure of this device zero, and reverse action to make the output at the maximum air pressure (supply air pressure).*
Positioner action differs from actuator and control valve action, so be careful in selecting the positioner's action.

Individual specifications

Following shows default and optional settings of each configurable parameter of AVP.
Unless otherwise specified, the Smart Valve Positioner will be shipped in the following configuration.

Input control signal	4-20 mA	The minimal span for custom range = 4 mA
Output characteristic *1	Liner	EQ or QO can be ordered or set by user.
Valve action *2	Direct (Plug above seat)	Reverse (Plug below seat) can be ordered or set by use
Output signal for position transmission	4-20 mA	

**1. Refer to the following when selecting the input/output characteristics.*

**2. Positioner action differs from actuator and control valve action, so be careful in selecting the positioner's action.*

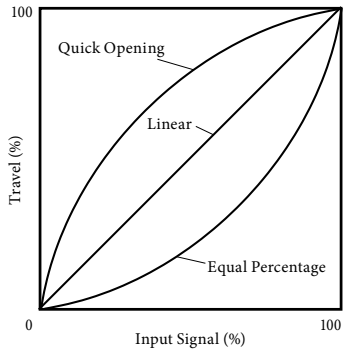


Figure 4. Input-output characterization

Selection of input characterization

The flow characteristic of a control valve is set by selecting the valve plug characteristic, and the input-output characteristics of the positioner must be specified as linear. However, if the valve plug flow characteristic, which depends on the control valve's shape and structure, does not meet requirements, you can correct the overall flow characteristic of the control valve by specifying "equal percentage" or "quick opening" for the input-output characteristics of the positioner, as shown in Table 1.

Table 1. Control valve flow characteristics correction by the positioner

Characteristic of valve plug	Input-output characterization of positioner	Overall flow characteristic of control valve
Linear	Quick opening	Quick opening
Linear	EQ%	EQ%
EQ%	Quick opening	Linear

Note: If the valve plug characteristic is "quick opening," the overall flow characteristic of the control valve cannot be linear even if "equal percentage" is set for the positioner's input-output characteristics. (This is because when the valve plug characteristic is "quick opening," the control valve works as an ON/OFF valve and it is difficult to correct its characteristics by changing the setting of the positioner.)

Accessory Selection	-	(6)	(7)	(8)	(9)	-	(10)

(6) Pressure regulator with filter	Without regulator	X		
	Model RA1B pressure regulator with filter (Mounted on positioner) *1	A		
	Model KZ03 pressure regulator with filter (Mounted on positioner) *1	1		
(7) Cable length	3 m		3	
	5 m		5	
	10 m		T	
	20 m		W	

(8)(9) Actuators (for bracket)		No mounting plate	XX
	Single-acting actuators	PSA1, PSA2, PSK1	YS
		New model of PSA3, PSA4 / VA1 to VA3 produced after 2000 *2	YQ
		Previous model of PSA3, PSA4 for existing valves produced on/before 1999	YY
		PSA6 / VA4 to VA6 produced after Apr.'83 *2	YL
		HA1	YA
		HA2, HA3, HL2, HL3	YT
		HA4, HL4	YN
		HK1, VM1 *10 (material SS400 zinc plated)	YK
		VR1	YV
		VR2, VR3	YR
		VR3H	Y6
		RSA1	YF
		RSA2	YU
		GOM83S, GOM84S, GOM103S	YG
		GOM124S	YM
		VA1 - VA3 (for old-model motion connectors) produced on/before Apr.'83 800-1, 800-3 *3	YW
		VA4, VA5 (for old-model motion connectors) produced on/before Apr.'83 800-4, 800-5 *3	YJ
		Actuators of other manufacturers	See Table 2
	Double-acting actuators	VP5, 6 *11	Y1
		SLOP560, 1000, 1000X *11 *12	Y2
		SLOP1500, 1500X *11 *12	Y3
		DAP560, 1000, 1000X *11 *12	Y4
		DAP1500, 1500X *11 *12	Y5
		GOM44L, 44LM (Springless horizontal) *11	G1
		GOM410L, 410LM (Springless horizontal) *11	G2
		GOM64L, 64LM (Springless horizontal) *11	G3
		GOM66L, 66LM (Springless horizontal) *11	G4
		GOM610L, 610LM (Springless horizontal) *11	G5
		GOM84L, 84LM (Springless horizontal) *11	G6
		GOM86L, 86LM (Springless horizontal) *11	G7
		GOM810L, 810LM (Springless horizontal) *11	G8
		GOM1210L, 1210LM (Springless horizontal) *11	GT
		GOM1510L, 1510LM (Springless horizontal) *11	GU
		GOM44L, 44LM (Springless horizontal) with restoration feedback lever *11 *13	GE
		GOM410L, 410LM (Springless horizontal) with restoration feedback lever *11 *13	GF
		GOM64L, 64LM (Springless horizontal) with restoration feedback lever *11 *13	GG
		GOM66L, 66LM (Springless horizontal) with restoration feedback lever *11 *13	GH
		GOM610L, 610LM (Springless horizontal) with restoration feedback lever *11 *13	GJ
		GOM84L, GOM84LM (Springless horizontal) with restoration feedback lever *11 *13	GK
		GOM86L, GOM86LM (Springless horizontal) with restoration feedback lever *11 *13	GL
		GOM810L, GOM810LM (Springless horizontal) with restoration feedback lever *11 *13	GM
		GOM1210L, GOM1210LM (Springless horizontal) with restoration feedback lever *11 *13	GN
		GOM1510L, GOM1510LM (Springless horizontal) with restoration feedback lever *11 *13	GP
		GOM84LM (Springless vertical) *11	GB
		GOM124LM (Springless vertical) *11	GC
		Actuators of other manufacturers	See Table 3

(10) Option	With terminal box for remote cable assembly (This code must be selected.)	M
	Double bearing valve travel detector (This code must be selected.)	L
	Stainless mounting bracket to 2-inch stanchion (This code must be selected.)	U
	Universal elbow explosion-proof (SUS304 G1/2) 1 pc. *4	A
	Universal elbow explosion-proof (SUS304 G1/2) 2 pcs. *4	C
	Stainless filter for KZ03 (Pressure regulator with filter)	K
	Filter (Screen for air-exhaust port)	H
	Seal tape prohibited	J
	Mounting bracket for accessories on GOM actuator (in case of replacing GOP) *13	8
	Reversing relay for double acting actuator	W

**1. Select the code "A" or "1" only when the direction of drain of the pressure regulator with filter on the control valve is downward (ground).*

**2. Select "YW" or "YJ" for old-type motion connectors. (Produced on/before Apr.'83)*

**3. Consult a sales representative in case of no mounting hole on the side of valve yoke.*

**4. For TIIS Flameproof model, these elbows should be put on the supplied cable gland. Code "A" and "C" can not be selected simultaneously.*

**10. In case "VM" type actuator is required following conditions,*
1. select model "VCT" for the body,
2. the existing positioner should be HEP or VPE,
3. yoke should be model HK. If another specification is required, contact your sales representative.

**11. For the double acting actuator, code "W" of option (10) must be selected.*

**12. If the valve body is for VFR (FloWing) or a butterfly valve, for the mounting bracket requirement consult to our sales.*

**13. Select the option with the restoration feedback lever, if GOM manufactured before April, 1988.*
Select the option '8' (Accessory bracket for GOM actuator - Use the case of existing GOP) if the existing control valve assembled with GOP and the accessories such as the Lock-up valves and solenoid valves.

Table 2. Mounting bracket for single acting actuator

(8)(9) Mounting bracket for pneumatic actuator	Code
Motoyama Mfg. 2800 series 240, 280, 330, NIHON KOSO A100 series 270, 320 *2	TA
Motoyama Mfg. 2800 series 400, 500S, 500L, NIHON KOSO A100 series 400, 500 *2	TB
Motoyama Mfg. 2800 series 650S, 650L	TC
Motoyama Mfg. 2800 series 240, 280, 330 (with side manual)	TD
Motoyama Mfg. 2800 series 400, 500S, 500L (with side manual)	TE
Motoyama Mfg. 2800 series 650S, 650L (with side manual)	TF
Motoyama Mfg. 3800 series (multi-spring type) N24, N28, N33S *2	TJ
Motoyama Mfg. 2922 series (Gyrol-I) G.R.I 280H, 330H, 400HS, 400H, 500H *3	TL
Motoyama Mfg. 3993 series (Gyrol-II) 2911-1M series 280, 330, 400 *3	TG
Masoneilan 37, 38 series #9, #11 *2	MA
Masoneilan 37, 38 series #13 *2	MB
Masoneilan 37, 38 series #15, #18 *2	MC
Masoneilan 37, 38 series #15, #18 (with side manual)	MF
Masoneilan type 35002 series Camflex II #4-1/2, #6, #7 *3	MG

(8)(9) Mounting bracket for pneumatic actuator	Code
NIHON KOSO TC-500 series TC520S *3	TP
NIHON KOSO TC-700 series TC-713S *3	TS
NIHON KOSO TC-700 series TC-722SS *3	TT
EMERSON Valve and Control Japan AK05, AK09S, AK12S, AK15S *3	KA
EMERSON Valve and Control Japan AG06S, AGN06S *3	KG
EMERSON Valve and Control Japan AG09S, AGN09S *3	KH
EMERSON Valve and Control Japan AG13S, AGN13S *3	KJ
EMERSON Valve and Control Japan AW13S *3	KV
EMERSON Valve and Control Japan AW17S *3	KW
Tomoe Valve Z series Z-06S, 08S, 11S, 13S *3	EA
Tomoe Valve T-matic 3Q-1, 2, 3, 4 *3	E3
Fisher 657, 667 series size 45, 50	FC
Fisher 657, 667 series size 60	FD
Nakakita Seisakusho Co. 410DA, 465RB	JB

**1 If no suitable mounting bracket can be found, contact a sales representative.*

**2 Select in the case of without manual handle or with manual handle mounted on top of the actuators.*

**3 Anti-abrasion feedback structure.*

Table 3. Mounting bracket for double acting actuator

(8)(9) Mounting bracket for pneumatic actuator		Code
NIHON KOSO 6300 series 63A2, AT series AT20	*1*3	T2
NIHON KOSO 6300 series 63A3, B2, BA, B3, BB, B5, AT series AT-30, 200, 250, 300, 350, 500	*1*3	T3
NIHON KOSO 6300 series 63A4, A5, A6, AT series AT40, AT50, AT60	*1*3	T4
NIHON KOSO 6300 series AT series AT25	*1*3	T5
NIHON KOSO TC-500 series TC-520W	*1 *2*3	TP
NIHON KOSO TC-700 series TC-713W	*1*3	TS
EMERSON Valve and Control Japan AK09, AK12, AK15	*1*3	KA
EMERSON Valve and Control Japan AG06, AGN06	*1*3	KG
EMERSON Valve and Control Japan AG09, AGN09	*1*3	KH
EMERSON Valve and Control Japan AG13, AGN13	*1*3	KJ
EMERSON Valve and Control Japan AW13	*1*3	KV
EMERSON Valve and Control Japan AW17	*1*3	KW
EMERSON Valve and Control Japan AW20	*1	KT
KITZ B series B-2*3	*1*3	B2
KITZ B series B-3*3	*1*3	B3
KITZ B series B-4*3	*1*3	B4
KITZ B series B-5*3	*1*3	B5
KITZ B series B-6*3	*1*3	B6
EMERSON (EL-O-MATIC) E25, 40, 65, 100, 200, 350	*1	RA
EMERSON (EL-O-MATIC) E600, 950, 1600, P2500, P4000	*1	RB
Tomoe Valve Z series Z-06, 08, 11, 13*3	*1*3	EA
Tomoe Valve T-matic 3I-1, 2, 3, 4*3	*1*3	E3
T. V. VALVE AT4-80	*1	V1
T. V. VALVE AT4-100	*1	V2
T. V. VALVE AT4-120	*1	V3
T. V. VALVE AT4-150	*1	V4
T. V. VALVE AT4-180	*1	V5

**1 For the double acting actuator, a reversing relay unit required.*

**2 Confirm that boss's pitch of the actuator side is 69 mm, if it is required to assemble the mounting bracket to the actuator.*

**3 Anti-abrasion feedback structure.*

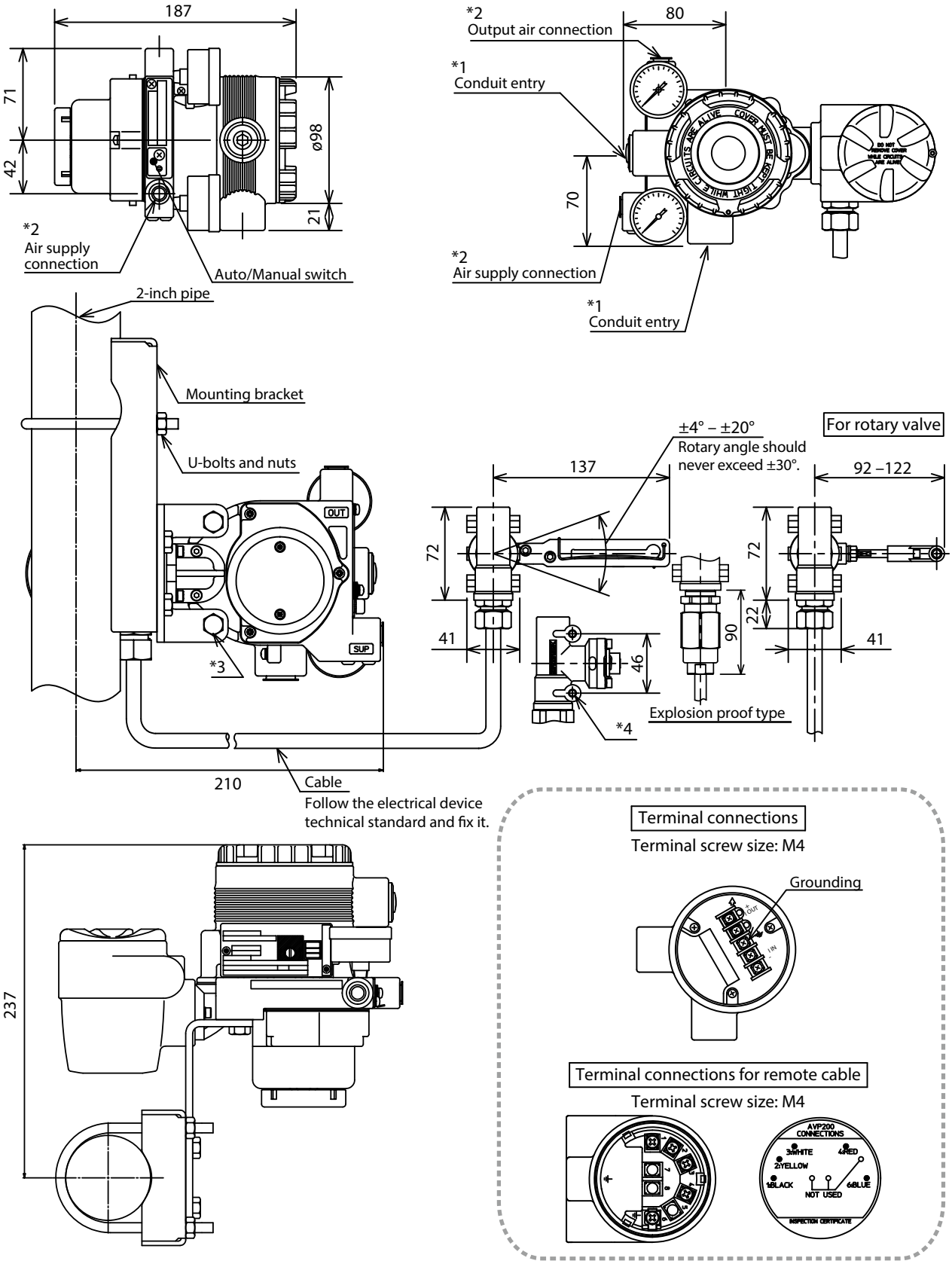
Table 4. Standard travel range and accuracy

Actuator	Travel (mm)	accuracy [% F.S.]
PSA1, 2	14.3, 20, 25	1
PSA3, 4	20, 38	1
HA1	6, 8, 10	3
	14.3, 25	1
HA2	10	3
	14.3, 25, 38	1
HA3	14.3	3
	25, 38, 50	1
HA4	14.3	3
	25, 38, 50, 75	1
VA5	25, 37.5, 50, 75, 100	1
VA6 PSA6, 7	14.3	3
	25, 37.5, 50, 75, 100	1
HK1 PSK1	10	3
	19	1

Dimensions

For single acting actuator without pressure regulator

[Unit: mm]

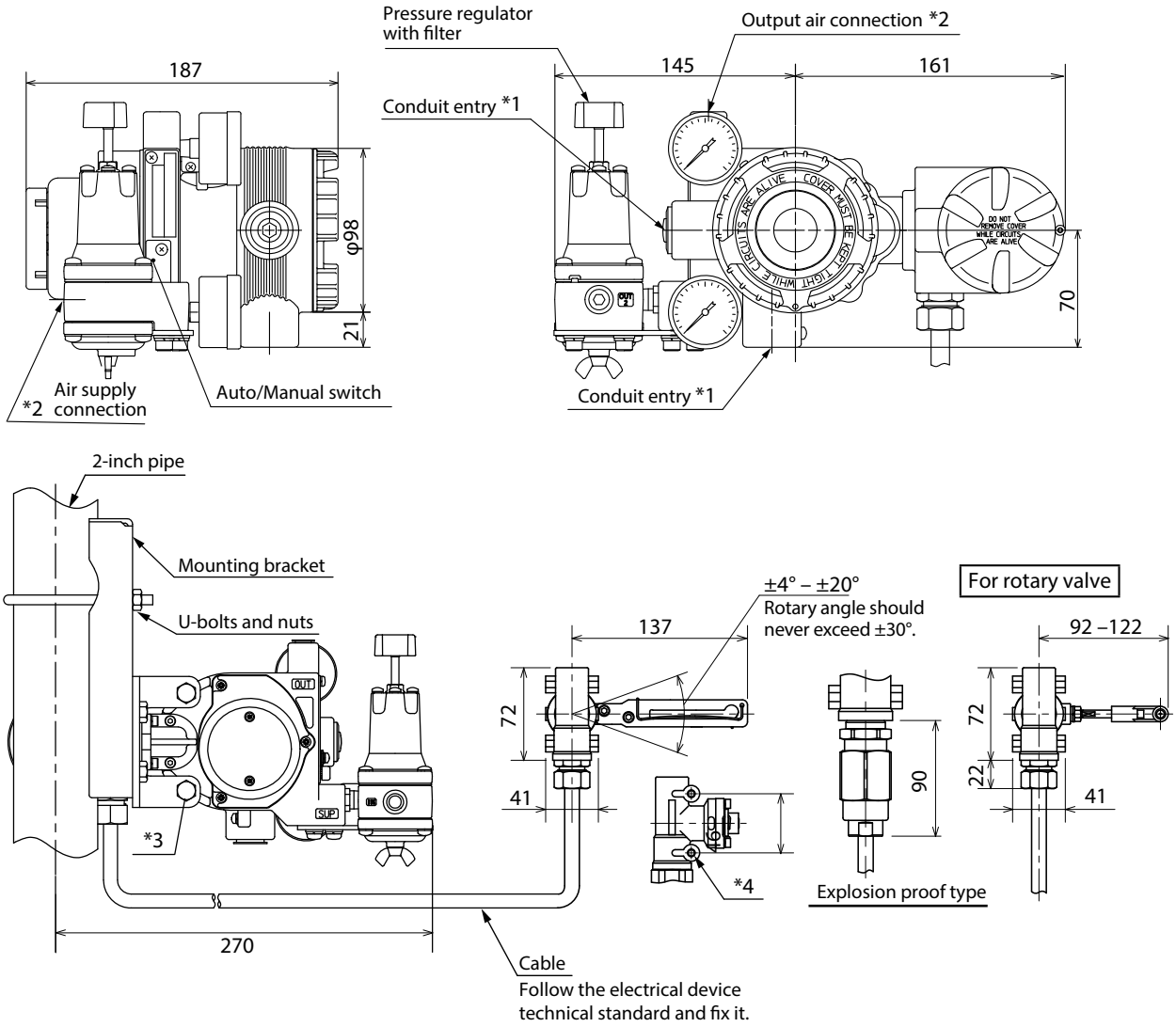


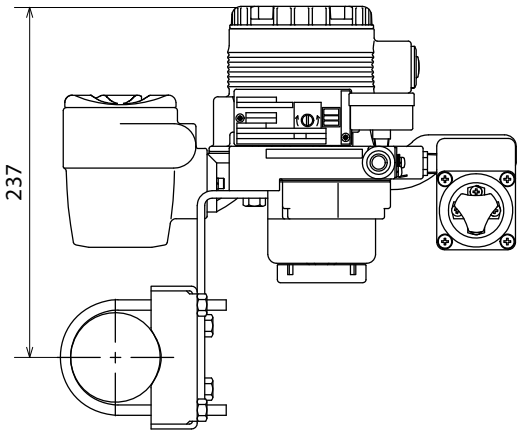
Electrical connection *1	Air piping connection *2	Mounting thread	
		AVP body *3	Valve travel detector *4
G1/2	Rc1/4	M8	M6
1/2NPT	1/4NPT	5/16-18UNC	1/4-20UNC

For single acting actuator with pressure regulator

With pressure regulator model RA1B

[Unit: mm]



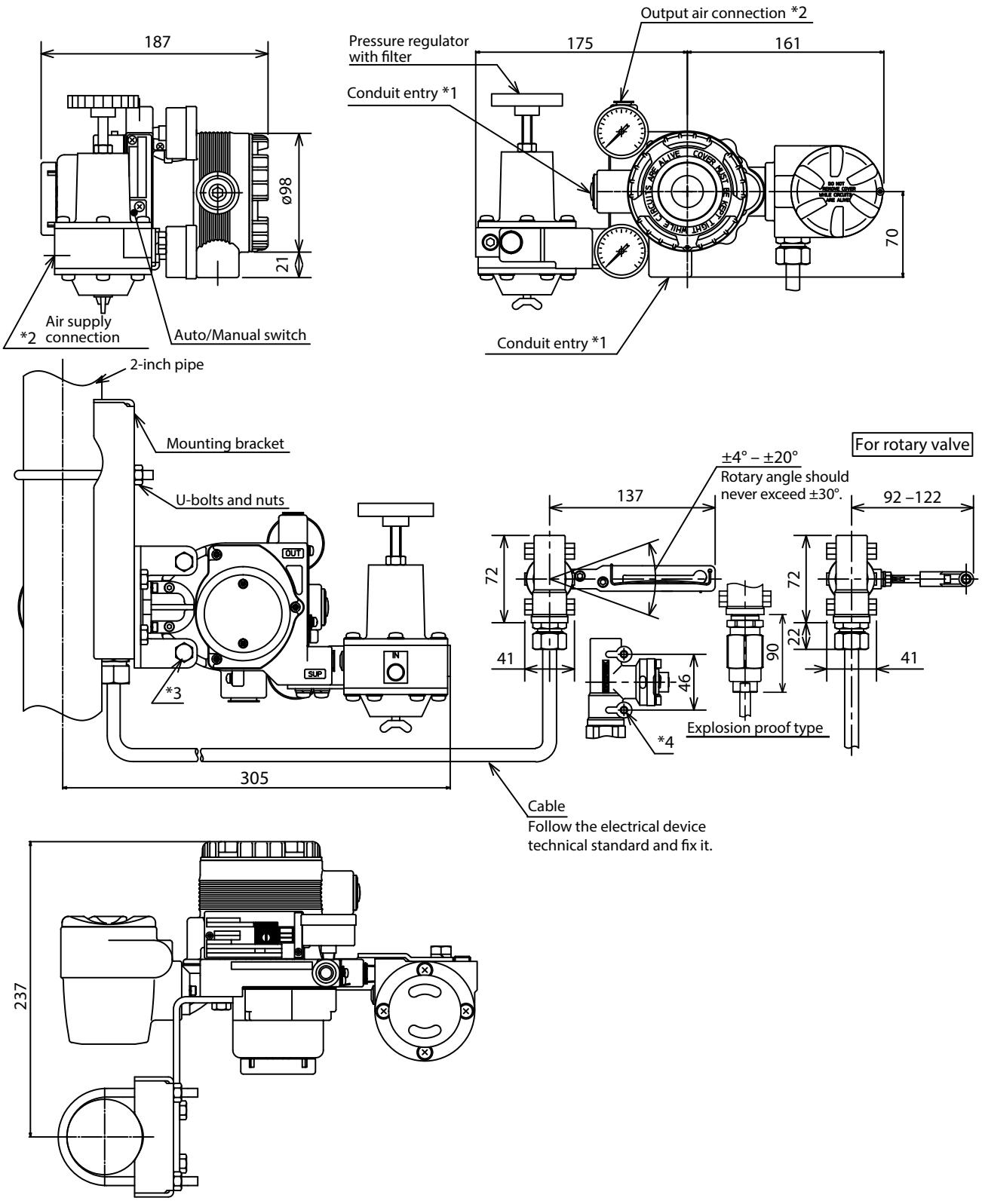


Electrical connection *1	Air piping connection *2	Mounting thread	
		AVP body *3	Valve travel detector *4
G1/2	Rc1/4	M8	M6
1/2NPT	1/4NPT	5/16-18UNC	1/4-20UNC

For single acting actuator with pressure regulator

With pressure regulator model KZ03

[Unit: mm]

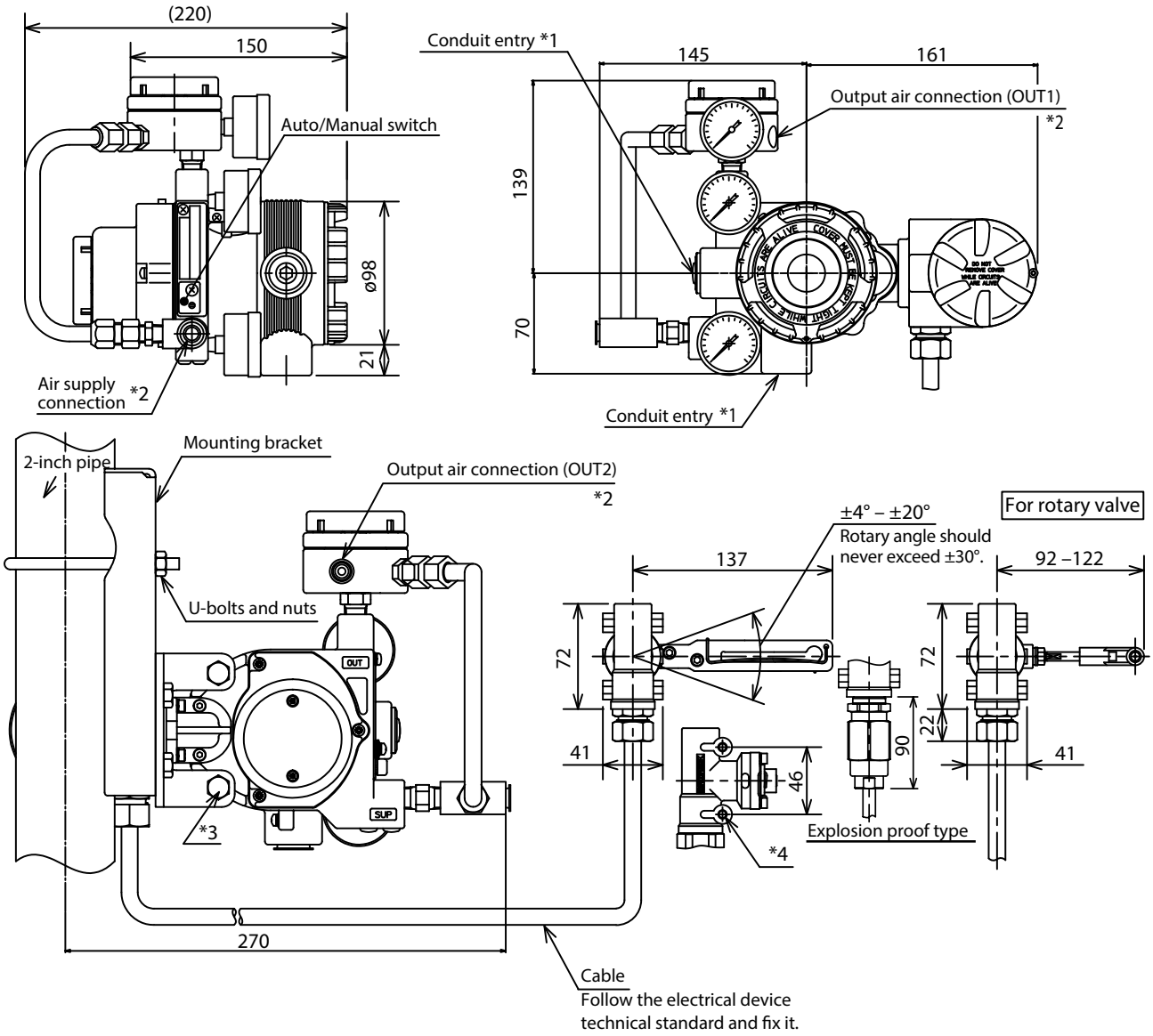


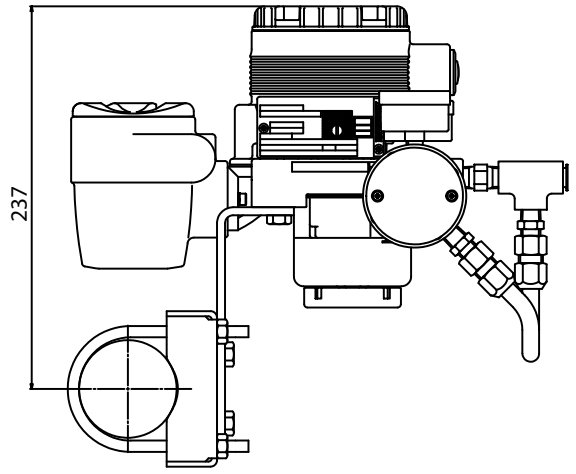
Electrical connection *1	Air piping connection *2	Mounting thread	
		AVP body *3	Valve travel detector *4
G1/2	Rc1/4	M8	M6
1/2NPT	1/4NPT	5/16-18UNC	1/4-20UNC

For double acting actuator with reversing-relay

Without pressure regulator

[Unit: mm]



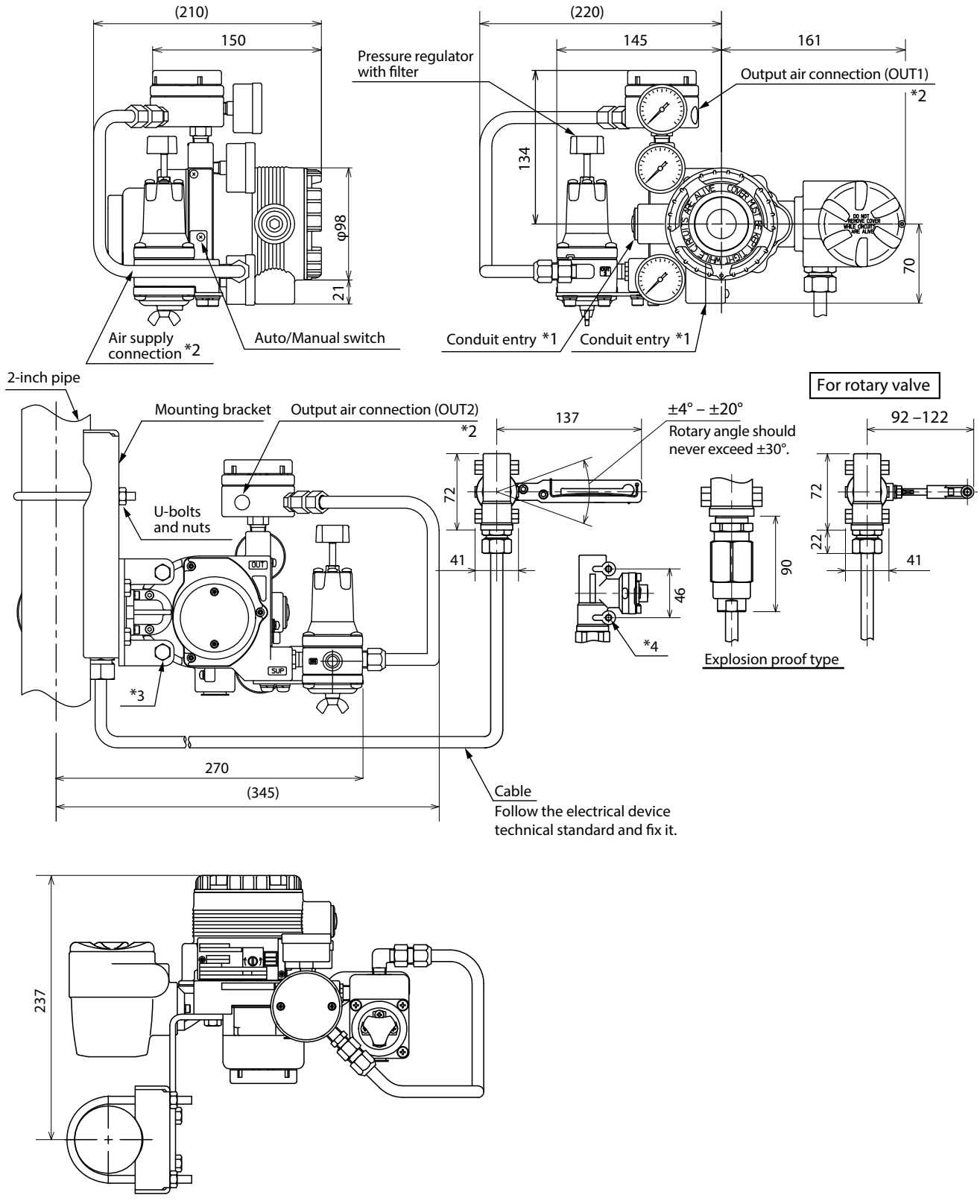


Electrical connection *1	Air piping connection *2	Mounting thread	
		AVP body *3	Valve travel detector *4
G1/2	Rc1/4	M8	M6
1/2NPT	1/4NPT	5/16-18UNC	1/4-20UNC

For double acting actuator with reversing-relay

With pressure regulator model RA1B

[Unit: mm]

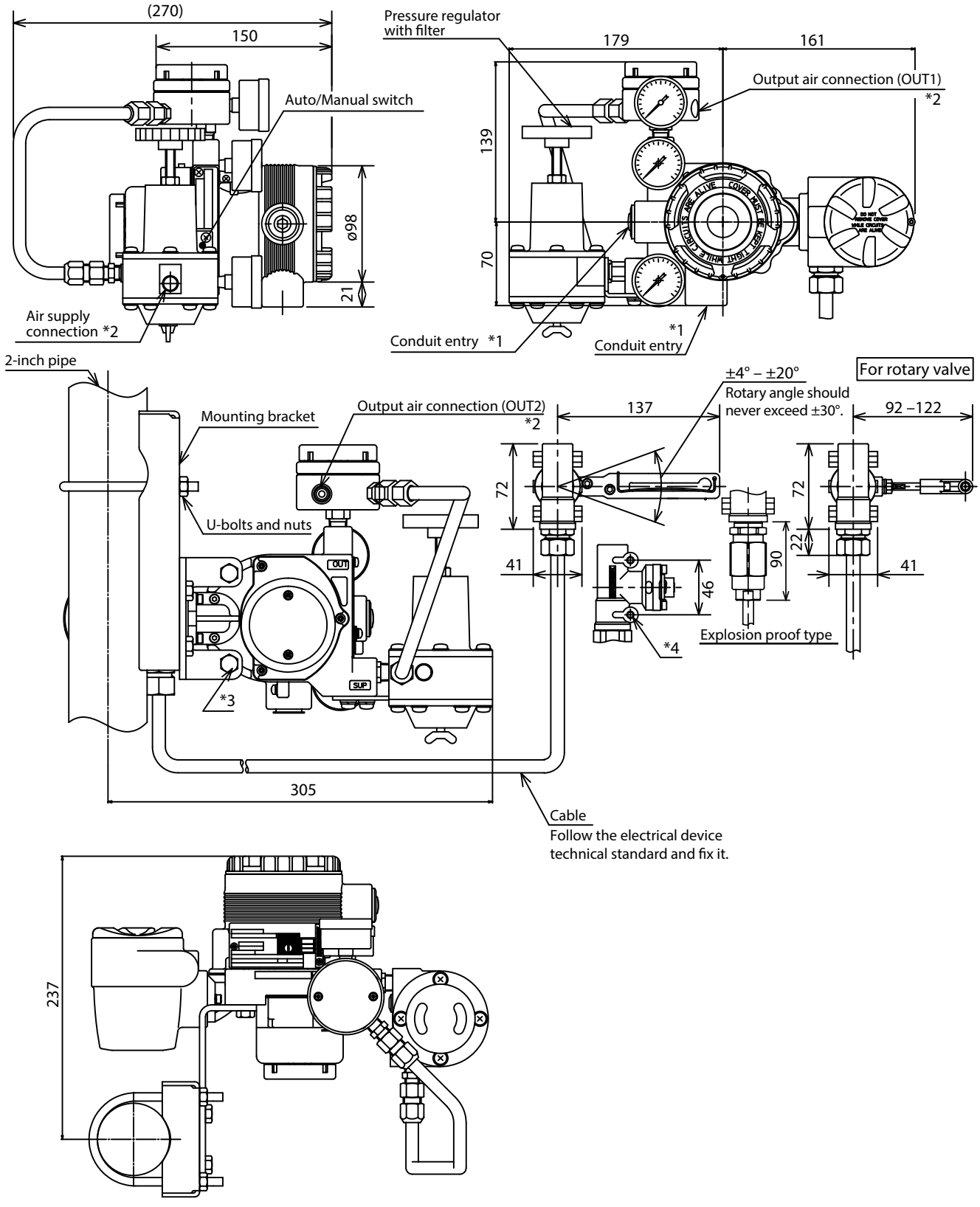


Electrical connection *1	Air piping connection *2	Mounting thread	
		AVP body *3	Valve travel detector *4
G1/2	Rc1/4	M8	M6
1/2NPT	1/4NPT	5/16-18UNC	1/4-20UNC

For double acting actuator with reversing-relay

With pressure regulator model KZ03

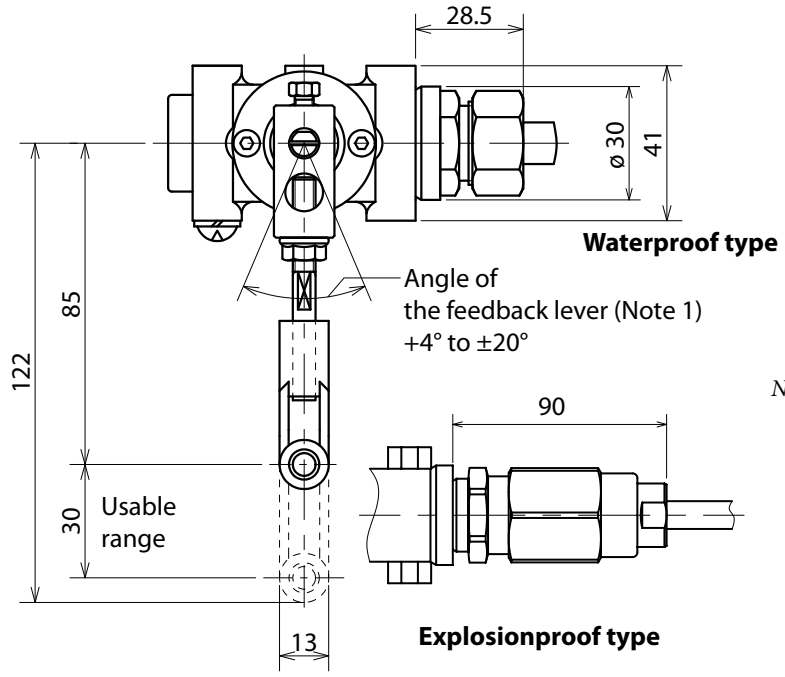
[Unit: mm]



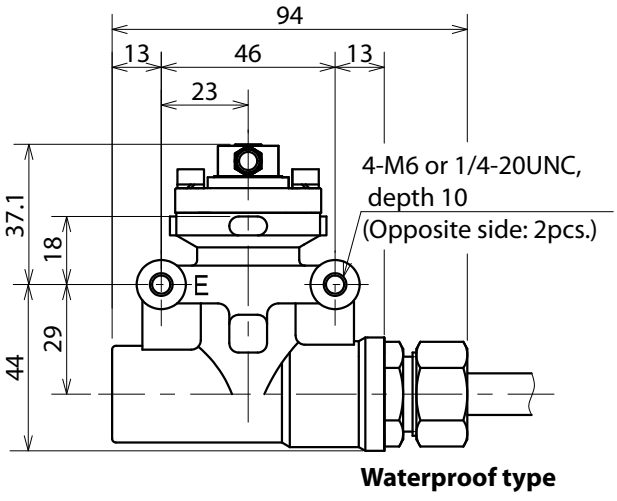
Electrical connection *1	Air piping connection *2	Mounting thread	
		AVP body *3	Valve travel detector *4
G1/2	Rc1/4	M8	M6
1/2NPT	1/4NPT	5/16-18UNC	1/4-20UNC

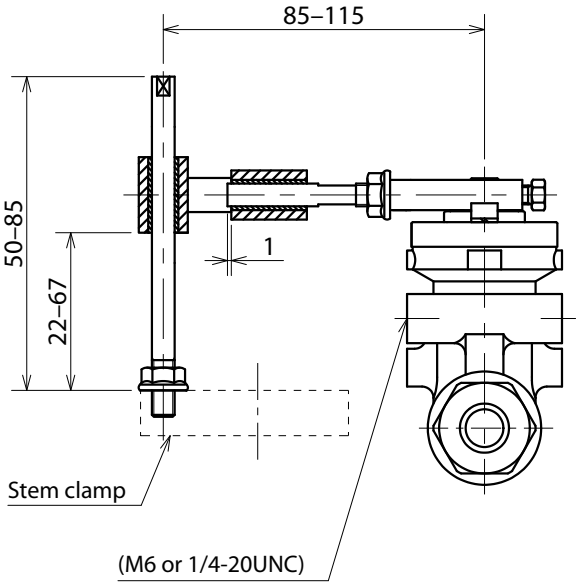
For rotary valve actuator

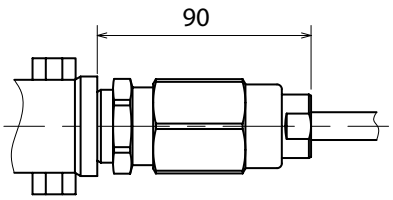
[Unit: mm]



Note 1. Rotary angle should never exceed ±30°.







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Specifications are subject to change without notice.

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