SPECIFICATIONS

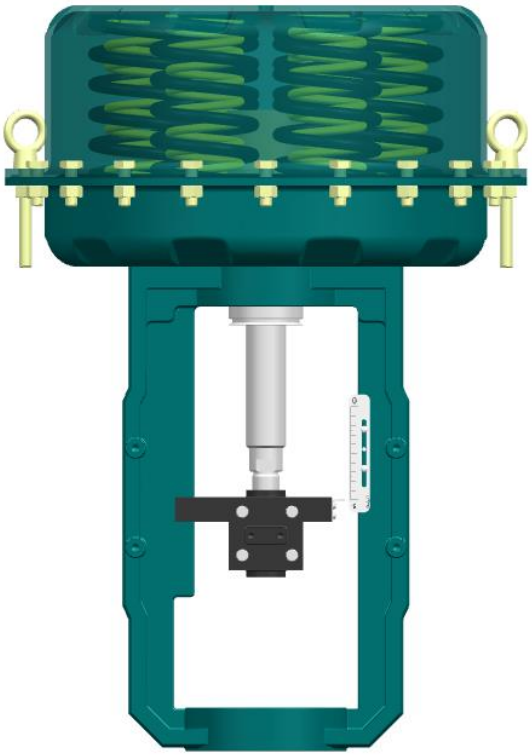
HA Modular Diaphragm Actuator

HA modular diaphragm actuator

HA[1] **modular diaphragm actuator ,** a new modular pneumatic straight stroke multi-spring film structure., has small volume, light weight, high performance, high output force and other advantages.

HA modular diaphragm actuator transfers output pressure of the pneumatic instrument to changes of the rod displacement. Therefore, the valve core can be moved to the position corresponding to input signal as long as it is connected with the body of the control valve.

High accuracy position control can be realized by matching the actuator with the positioner of the company.



Structure characteristics

Modular design

HA series uses modular design and features strong universality. Various combinations can be realized by changing different action modes, strokes, spring ranges and handwheels slightly. It has replaceability, storability and other characteristics to improve the supply cycle.

Note [1]: HA corresponding to old model HA. See Appendix 1 for the comparison table of specific models

Design of high strength and small volume

Its housing that is punched from quality steel plates has light weight, high strength and other characteristics; its interior uses multiple springs to make the structure compact, the volume small and the appearance exquisite.

Design of high quality and sensitivity diaphragm

With rubber and nylon fabric structure and abrasion resistance treatment, the diaphragm has good abrasion resistance, good oxidation resistance, long service life and other characteristics. And the rubber has good intake sensitivity, high overall regulation accuracy and other characteristics. It can be applied to -40°-120° ambient temperature by using different rubbers.

High quality spring and wide spring range

a. Good service life and corrosion resistance of the spring are guaranteed by using quality spring steel, proper heat treatment process and quality coating treatment technology;

b. Different spring ranges and thrust outputs can be realized by using combined multi-spring mode and changing spring quantity to meet air supply pressure demands of various occasions;

High performance grease

The imported lubricating grease is used to ensure long-term stable lubricating effect of the guiding part, which features good thermostability, infusibility, low volatilization, resistance to chemical corrosion and moisture, no reaction with rubber, and good oxidation and ageing resistances.

Optional manual function

Side-mounted handwheel on the yoke and top-mounted handwheel on the diaphragm case are optional to meet demands of different applications, featuring good selectivity.

Excellent corrosion resistance

The housing and the yoke undergo powder coating treatment and the rod is made of stainless steel, with standard corrosion-proof grade above C3. And special surface painting process is used to meet above C5 corrosion-proof grade and corrosion demands of different environments.

Maintenance-free work

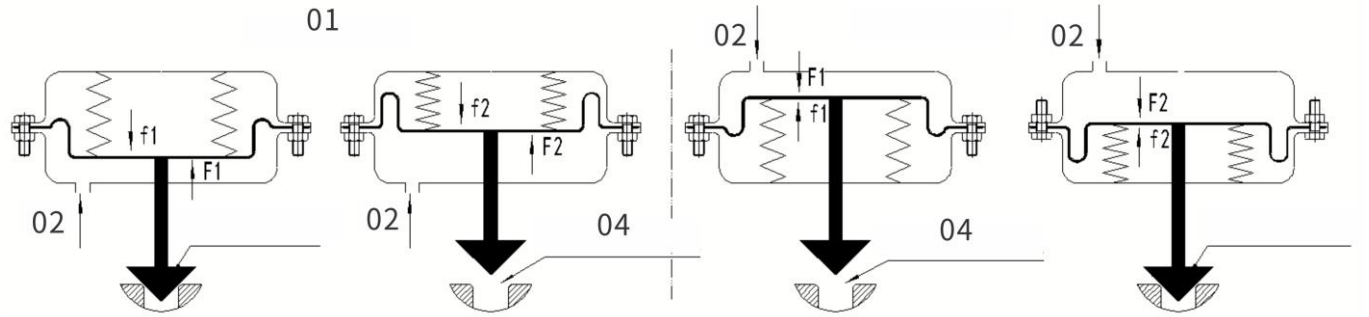
Each HA actuator can provide long-term and efficient work under the maintenance-free circumstance.

Standard specification

Series	HA
Type	Modular diaphragm type
Model	HA11, HA21, HA31, HA41
Size	See Table 4, 5 and 6 and Fig. 1
Action type	Direct action: HA11D, HA21D, HA31D, HA41D Reverse action: HA11R, HA21R, HA31R, HA41R Direct action: air supply pressure of the diaphragm air chamber increases and the actuator rod goes down Reverse action: air supply pressure of the diaphragm air chamber increases and the actuator rod goes up
Output force	Please see Table 1 and 2
Stroke	Please see Table 1 and 2
Air source pressure	300-500kPa
Spring range	Please see Table 1 and 2
Air source connector	HA11-41: NPT1/4"
Performance	Hysteresis error With positioner: <1% of total stroke Without positioner: <3% of total stroke Intrinsic error With positioner: < ±1% of total stroke Without positioner: <±5% of total stroke
Ambient temperature	Standard type: -30-＋70℃ High temperature type -15-+120℃ Low temperature type -40-+70℃ Ultra-low temperature -52-+70℃
Material	Diaphragm case …… Q235B Diaphragm …… Nitrile and nylon fabric NBR Low temperature nitrile and nylon fabric NBR Fluororubber FKM Rod …… SUS304, SUS420 Yoke …… SCPH2
Surface coating	Powder coating, RAL7035 light grey
Accessories	Positioner, air filtration reducer, lock-up valve, stroke switch, hand wheel, etc.

Fig. 1 Schematic diagram of thrust and valve core switch position

Table 1 HA11-41 actuator stroke range and output force



01	Schematic diagram of reverse action R thrust	04	Schematic diagram of direction action R thrust
02	Air source	05	0% opening position of valve core
03	100% opening position of valve core		

Actuator model	mm Stroke mm	Number of springs	kpa Spring range kpa	Effective area of diaphragm (cm^2)	Minimum air source pressure kpa	**Output thrust of air source overcoming spring** (KN)						**Spring reset thrust** (KN)	
						Air supply pressure (100kPa)							
						3		4		5			
						F1	F2	F1	F2	F1	F2	f1	f2
HA11R40	**14.3**	4	132-253	87	400	—	—	2.35	1.25	3.20	2.15	**1.15**	2.2
HA11R60		6	198-380		500	—	—	—	—	2.63	1.04	**1.72**	3.31
HA21R40	**14.3**	4	126-230	180	400	3.12	1.26	4.92	3.06	6.72	4.86	**2.28**	4.14
HA21R60		6	190-346		500	—	—	—	—	5.58	2.77	**3.42**	6.23
HA21R40	**25**	4	105-244		400	3.51	1.02	5.31	2.82	7.11	4.62	**1.89**	4.38
HA21R60		6	158-366		500	—	—	—	—	6.16	2.41	**2.84**	6.59
HA31R40	**14.3**	4	137-210	320	350	5.20	2.85	8.40	6.05	11.60	9.25	**4.40**	6.75
HA31R60		6	206-316		400	—	—	6.21	2.69	9.41	5.89	**6.59**	10.11
HA31R40	**25**	4	104-210		350	6.27	2.85	9.47	6.05	12.67	9.25	**3.33**	6.75
HA31R60		6	156-316		400	—	—	7.81	2.69	11.01	5.89	**4.99**	10.11
HA31R40	**38**	4	97-210		350	6.48	2.85	9.68	6.05	12.88	9.25	**3.12**	6.75
HA31R60		6	146-316		400	—	—	8.13	2.69	11.33	5.89	**4.67**	10.11
HA41R40	**14.3**	4	116-180	800	300	14.72	9.6	22.72	17.60	30.72	25.60	**9.28**	14.40
HA41R60		6	174-270		400	—	—	18.08	10.40	26.08	18.40	**13.92**	21.60
HA41R63		9	209-325		400	—	—	15.28	6.00	23.28	14.00	**16.72**	26.00
HA41R66		12	244-380		500	—	—	—	—	20.48	9.60	**19.52**	30.40
HA41R40	**25**	4	97-173		300	16.21	10.14	24.21	18.14	32.21	26.14	**7.79**	13.86
HA41R60		6	146-260		400	—	—	20.32	11.20	28.32	19.20	**11.68**	20.80
HA41R63		9	183-326		450	—	—	17.36	5.92	25.36	13.92	**14.64**	26.08
HA41R66		12	220-392		500	—	—	—	—	22.40	8.64	**17.60**	31.36
HA41R40	**38**	4	90-190		300	16.85	8.85	24.85	16.85	32.85	24.85	**7.15**	15.15
HA41R60		6	134-288		400	—	—	21.28	8.96	29.28	16.96	**10.72**	23.04
HA41R63		9	164-352		500	—	—	—	—	26.88	11.84	**13.12**	28.16
HA41R66		12	194-416		500	—	—	—	—	24.48	6.72	**15.52**	33.28
HA41R40	**50**	4	81-160		300	17.50	11.20	25.50	19.20	33.50	27.20	**6.50**	12.80
HA41R60		6	122-240		400	—	—	22.24	12.80	30.24	20.80	**9.76**	19.20
HA41R63		9	146-291		400	—	—	20.32	8.72	28.32	16.72	**11.68**	23.28
HA41R66		12	174-346		500	—	—	—	—	26.08	12.32	**13.92**	27.68
HA41R40	**75**	4	81-196		300	17.50	8.32	25.5	16.32	33.50	24.32	**6.50**	15.68
HA41R60		6	122-294		400	—	—	22.24	8.48	30.24	16.48	**9.76**	23.52
HA41R63		9	146-357		500	—	—	—	—	28.32	11.44	**11.68**	28.56
HA41R66		12	174-425		500	—	—	—	—	26.08	6.00	**13.92**	34.00

Actuator model	mm Stroke mm	Number of springs	Spring range kpa	Effective area of diaphragm (cm^2)	Minimum air source pressure kpa	**Output thrust of air source overcoming spring** (KN)						**Spring reset thrust** (KN)	
						Air supply pressure (100kPa)							
						3		4		5			
						F1	F2	F1	F2	F1	F2	f1	f2
HA11D40	14.3	4	132-253	87	400	—	—	2.35	**1.25**	3.20	**2.15**	1.15	2.2
HA11D60		6	198-380		500	—	—	—	—	2.63	**1.04**	1.72	3.31
HA21D40	14.3	4	126-230	180	400	3.12	**1.26**	4.92	**3.06**	6.72	**4.86**	2.28	4.14
HA21D60		6	190-346		500	—	**—**	—	**—**	5.58	**2.77**	3.42	6.23
HA21D40	25	4	105-244		400	3.51	**1.02**	5.31	**2.82**	7.11	**4.62**	1.89	4.38
HA21D60		6	158-366		500	—	**—**	—	**—**	6.16	**2.41**	2.84	6.59
HA31D40	14.3	4	137-210	320	350	5.20	**2.85**	8.40	**6.05**	11.60	**9.25**	4.40	6.75
HA31D60		6	206-316		400	—	**—**	6.21	**2.69**	9.41	**5.89**	6.59	10.11
HA31D40	25	4	104-210		350	6.27	**2.85**	9.47	**6.05**	12.67	**9.25**	3.33	6.75
HA31D60		6	156-316		400	—	**—**	7.81	**2.69**	11.01	**5.89**	4.99	10.11
HA31D40	38	4	97-210		350	6.48	**2.85**	9.68	**6.05**	12.88	**9.25**	3.12	6.75
HA31D60		6	146-316		400	—	**—**	8.13	**2.69**	11.33	**5.89**	4.67	10.11
HA41D40	14.3	4	116-180	800	300	14.72	**9.6**	22.72	**17.60**	30.72	**25.60**	9.28	14.40
HA41D60		6	174-270		400	—	**—**	18.08	**10.40**	26.08	**18.40**	13.92	21.60
HA41D40	25	4	97-173		300	16.21	**10.14**	24.21	**18.14**	32.21	**26.14**	7.79	13.86
HA41D60		6	146-260		400	—	—	20.32	**11.20**	28.32	**19.20**	11.68	20.80
HA41D40	38	4	90-190		300	16.85	**8.85**	24.85	**16.85**	32.85	**24.85**	7.15	15.15
HA41D60		6	134-288		400	—	**—**	21.28	**8.96**	29.28	**16.96**	10.72	23.04
HA41D40	50	4	81-160		300	17.50	**11.20**	25.50	**19.20**	33.50	**27.20**	6.50	12.80
HA41D60		6	122-240		400	—	**—**	22.24	**12.80**	30.24	**20.80**	9.76	19.20
HA41D40	75	4	81-196		300	17.50	**8.32**	25.5	**16.32**	33.50	**24.32**	6.50	15.68
HA41D60		6	122-294		400	—	—	22.24	**8.48**	30.24	**16.48**	9.76	23.52

Note:

1. F1 indicates pre-tightening output force of the spring, f2 indicates spring output force when the maximum work stroke of the spring compresses;
2. F1 indicates the output force when the air source overcomes pre-tightening force of the spring, F2 indicates the output force when the air source overcomes the maximum work stroke compressing force of the spring;
3. Fig. 1 is just a position expression of the actuator output thrust that takes a common valve core structure instead of using as a general valve pattern.

Table 2 Configuration of handwheel mechanism

Actuator model	HA11	HA21	HA31	HA41
Side-mounted handwheel mechanism	-	-	SHM-3M	SHM-4M
Top-mounted handwheel mechanism	THM-1M	THM-2M	THM-3M	THM-4M

Table 3 Overall size and weight **mm**

Actuator	Stroke	L	H	Φd	t	Stem thread	ΦB	C	Effective area of diaphragm cm^2	Air chamber capacity /L	Weight Kg	Connecting size code
HA11R, HA11D	14.3	121(105)	270	56	22	M9×1	160	160	87	0.2	4.5	A1
HA21R, HA21D	14.3	133(116)	326	65	26	M12×1.25	230	245	180	0.7	9	B2
	25	144(116)										
HA31R, HA31D	14.3	133(116)	371	65	26	M12×1.25	280	296	320	2.3	16	B2
	25	144(116)										
	38	157(116)	395							2.8	17	
	14.3	189(172)	426	90	35	M15×1.5				2.3	17	C3
	25	200(172)										
	38	213(172)	450							2.8	18	
HA41R, HA41D	14.3	189(172)	532	90	35	M15×1.5	426	440	800	6.5	56	C3
	25	200(172)										
	38	213(172)										
	50	225(172)	602							10	62	
	75	250(172)										
	14.3	189(172)	532			M18×1.5				6.5	56	C4
	25	200(172)										
	38	213(172)										
	50	225(172)	602							10	62	
	75	250(172)										

Note: L is the size when air supply pressure is zero, the figure in the brackets is the size of reverse action actuator and the figure outside the brackets is the size of direct action actuator

Table 4 Accessory installation size

Model	Connecting size code	Stroke, mm	a1, mm	a2, mm	a3, mm	b1, mm	b2, mm	M1
HA11R，HA11D	A1	14.3	80	–	–	–	–	M8
HA21R，HA21D	B2	14.3~25	80	115	83	32	32	
HA31R，HA31D	B2	14.3~38	80	140	122	35	35	
	C3				178			
HA41R，HA41D	C3、C4	14.3~75	80	210	164	50	50	

Fig. 2 HA overall view

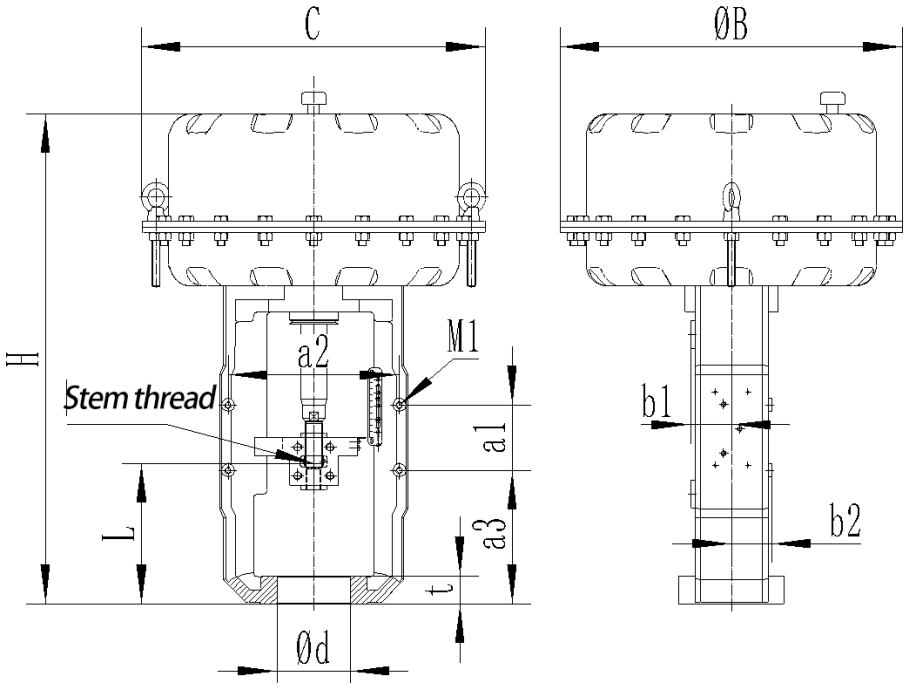


Fig. 1-1 HA11-41 Overall view (without handwheel)

Table 5 HA11-41 with top-mounted handwheel THM-1-4X overall size and weight

Actuator	Maximum stroke	φB	C	φD	H	Weight (kg) (with handwheel)	Connecting size code
HA11R，HA11D	14.3	160	160	140	-	-	A1
HA21R，HA21D	14.3-25	230	245	200	487	-	B2
					515	-	
HA31R	14.3-25	280	296	355	567	-	B2
	38				605	-	
	14.3-25				605	-	C3
	38				660	-	
HA31D	14.3-25				626	-	B2
	38				650	-	
	14.3-25				682	-	C3
	38				706	-	
HA41R	14.3-38	426	440	470	790	-	C3/C4
	50-75				932	-	
HA41D	14.3-38				839	-	
	50-75				983	-	

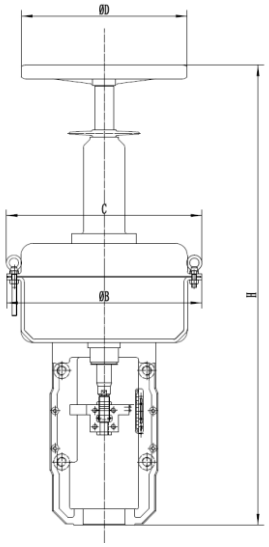


Table 6 HA31-41 with side-mounted handwheel SHM-3-4X overall size and weight

Actuator	Side-mounted handwheel configuration	Maximum stroke	A	C	T	φD	H	Weight (kg) (with handwheel)	Connecting size code
HA31D、HA31R	SHM-3M	38	220	280	120	300	395	32	B2
		38			175		450	33	C3
HA41R，HA41D	SHM-4M	14.3-38	312	426	185	400	532	90	C3/C4
		50-75					602	96	

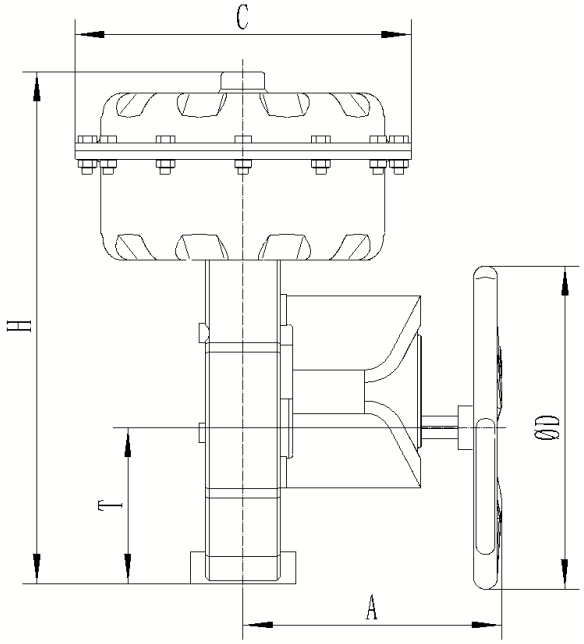


Fig. 3 HA structure view

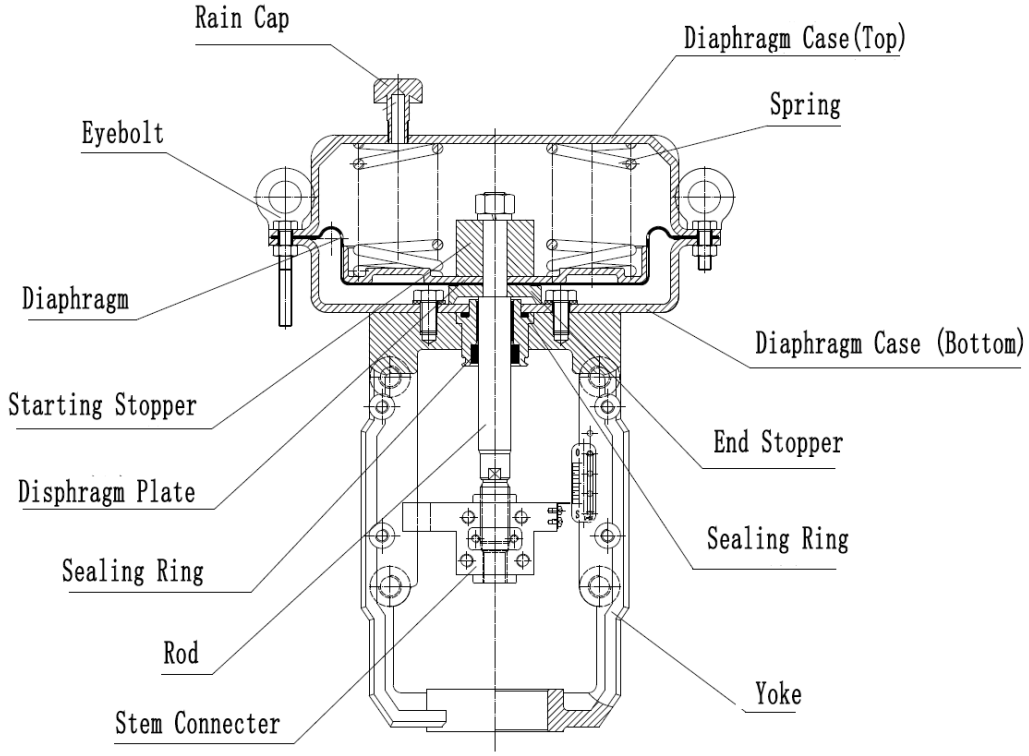


Fig. 2 2-1 HA reverse action structure view

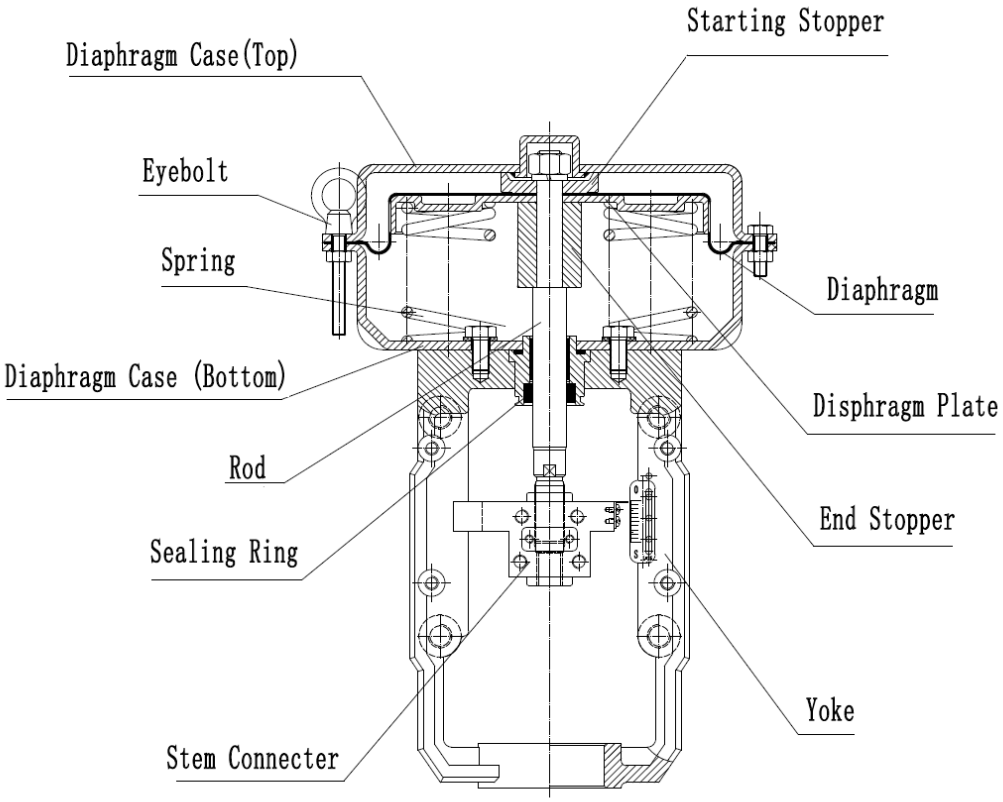


Fig. 2-2 HA direct action structure view

Spectrum											
Series	HA						-		-		Pneumatic multi-spring diaphragm actuator
Specification and size		1	1								HA11 modular
		2	1								HA21 modular
		3	1								HA31 modular
		4	1								HA41 modular
Action mode				D							Direct action
				R							Reverse action
Number of springs					3	0					3 outer springs, no inner spring
					4	0					4 outer springs, no inner spring
					6	0					6 outer springs, no inner spring
					6	3					6 outer springs, 3 inner springs (for HA41R only)
					6	6					6 outer springs, 6 inner springs (for HA41R only)
Material								None			Standard
								B			Overall 304 material
Ultra-low temperature environment									None		（-40° ~120° C） normal（-40° ~120° C）
									L		-52~70° C

Ordering Notice

Please specify the following items during ordering:

1. Actuator model (including size, action mode and spring specification)；
2. Air supply pressure;
3. Please indicate the standard stroke in Table 1; please remark other strokes;
4. **The standard is equipped with yoke and stem connecter** (i.e. the connecting part with the body part), select the connecting size code based on Table 3; others shall be specially customized and provided with connecting size drawing.
5. Ambient temperature standard is normal temperature (-30-+70°); low temperature (-40-+70°), high temperature (-15-+120°) are special orders and require remark;
   Ultra-low temperature needs to be specially selected according to the spectrum.
6. The standard is not equipped with handwheel; please remark if a handwheel is needed;
7. The standard is not equipped with mechanical limit; please indicate limit open (valve not totally opened) and limit close (valve not totally closed) and limit value for the mechanical limit.
8. The standard protection rating is C3; please remark if higher rating is needed;
9. The standard color is light grey, color code RAL7035; please remark for special requirement

Appendix 1: Comparison table of HA new model corresponding to HA old model

New model	Old model
HA11R40	HA1R、HA11R8
HA11R60	HA1R、HA11R8
HA11D40	HA1D、HA11D8
HA11D60	HA1D、HA11D8
HA21R40	HA2R、HA21R8
HA21R60	HA2R、HA21R8
HA21D40	HA2D、HA21D8
HA21D60	HA2D、HA21D8
HA31R430	HA3R、HA31R8
HA31R60	HA3R、HA31R8
HA31D40	HA3D、HA31D8
HA31D60	HA3D、HA31D8
HA41R40	HA4R、HA41R8
HA41R60	HA4R、HA41R8
HA41R63	HA4R、HA41R8
HA41R66	HA4Rx2、HA42R8
HA41D40	HA4DX2、HA42D8
HA41D60	HA4D、HA41D8