



# MODEL APHD HYDRAULIC DOUBLE ACTING ACTUATOR FOR API 6A WELLHEAD GATE VALVES

## GENERAL DESCRIPTION:

The Model APHD actuator is a piston type, hydraulically-powered gate valve actuator designed to operate a slab gate valve in both open and close directions. It is ideally suited for choke-and-kill, fracture or other drilling manifold applications where complete hydraulic control of gate valve position is required.

The Model APHD actuator is compact, easy to maintain and engineered to ensure years of trouble-free service in the harshest of environments and operating conditions.

The Model APHD actuator can be delivered as an actuated valve assembly ready to be placed in service or as an actuated bonnet assembly ready to mount on another manufacturer's valve.



## FEATURES AND BENEFITS:

**Housing:** The pressurized housing is designed as a protective member for the piston and stem. The design is symmetrical thereby simplifying assembly. A hard plated wear surface protects and ensures seal integrity.

**Over-Pressurization Protection:** Dual pressure relief devices protect the piston and cylinder assembly from over-pressurization and protect personnel from injury. They are located externally for easy field inspection and replacement.

**Ease of Maintenance:** Top Shaft can be replaced by removal of top cylinder head. To replace piston seal, remove piston from actuator housing. This concept provides easy removal and seal replacement.

**Longer Top Shaft Seal Life:** The top shaft seals are Polypak™ designed for dynamic sealing applications. The top shaft seals are protected from dirt and debris by a molythane rod wiper. These two design features guarantee a longer seal life requiring minimal maintenance.

**Permanent and Tamper Proof Drift Setting:** The valve drift is provided by an external drift adjustment. The rotation of the lower cylinder base internally adjusts the piston stroke for proper gate bore alignment. The bonnet bushing secures the lower cylinder base by means of heavy duty fasteners.

**Improved Corrosion Control:** All non-stainless components are coated with Xylan and Polyester TGIC providing resistance against the corrosive effect of harsh environments.

**Multiple Safeguards Against Well Fluids Contamination:** The bonnet incorporates multiple safeguards against the invasion of well fluids into the actuator housing. These safeguards are:

- Multiple Polypak™ bonnet stem seals
- Packing integrity port
- Secondary backup seals that utilize o-rings and back up rings

MODEL	SIZE	STROKES AVAILABLE
APHD 035	3½"	Up to 4 1/16" bore
APHD 045	4½"	Up to 7 1/16" bore
APHD 065	6½"	Up to 7 1/16" bore
APHD 095	9½"	Up to 7 1/16" bore





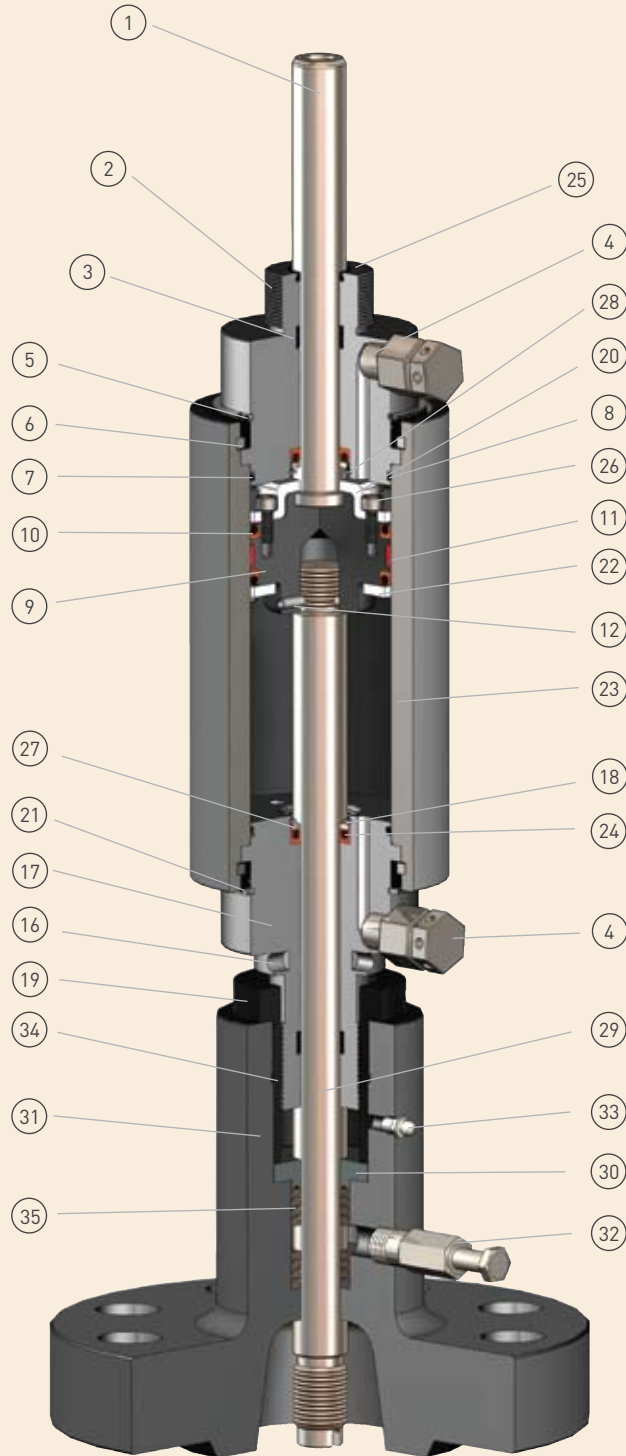
# MODEL APHD HYDRAULIC DOUBLE ACTING ACTUATOR PARTS LIST

#	DESCRIPTION
1	Top Shaft
2	Top Cylinder Head
3	Wear Bearing (AK)
4	Burst Disc (AK)
5	Housing Lock Ring
6	Housing Shear Ring
7	O-Ring (AK)
8	Back Up Ring (AK)
9	Piston
10	Polypak™ Seal (AK)
11	Wear Bearing (AK)
12	Roll Pin (AK)
13	Caution Tag (NS, AK)
14	Nameplate Screws (NS)
15	Nameplate (NS)
16	Socket Head Set Screw
17	Cylinder Base - Lower
18	Retainer Ring (AK)
19	Bonnet Bushing
20	Seal Retainer - Upper
21	Retainer Ring (AK)
22	Seal Retainer - Lower
23	Cylinder
24	Polypak™ Seal (AK)
25	Rod Wiper (AK)
26	Socket Head Cap Screw
27	Seal Retainer Plate
28	Retainer Ring (AK)
29	Bonnet Stem
30	Packing Retainer Bushing
31	Bonnet
32	Test Fitting
33	Weep Fitting
34	Socket Head Set Screws
35	Packing Set (BK)

(NS) = Not Shown

(AK) = Actuator Redress Kit Items

(BK) = Bonnet Redress Kit Items



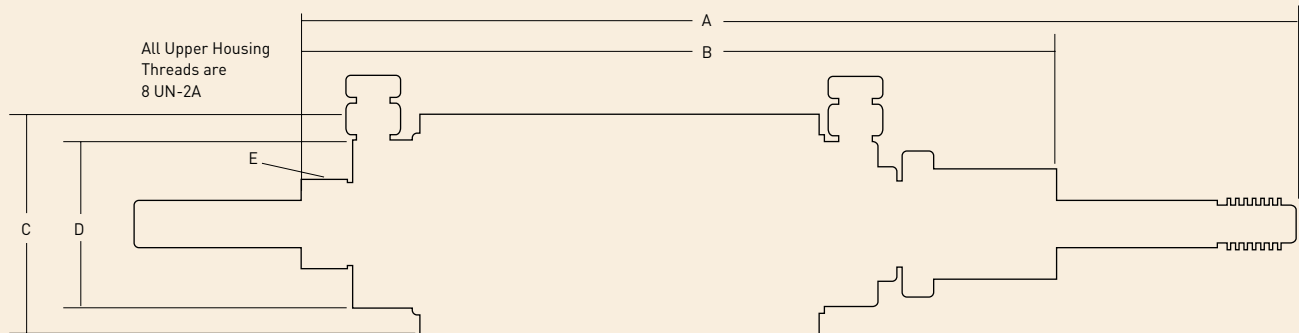
Parts list includes items in a typical handwheel bonnet assembly. Some differences may exist in bonnets for valves manufactured by companies other than Array. In those cases the specific differences are usually limited to the design of the bottom of the bonnet, operating stem, and nose geometry.

# MODEL APHD HYDRAULIC DOUBLE ACTING ACTUATOR

## ACTUATOR SIZES, DIMENSIONS, WEIGHT & VOLUME



MODEL	A		B		C		D		E
	in.	mm	in.	mm	in.	mm	in.	mm	
APHD 035 x 020	27.50	698	18.50	470	5.00	127	3.50	89	2 1/2"
APHD 035 x 030	27.50	698	18.50	470	5.00	127	3.50	89	2 1/2"
APHD 045 x 020	26.06	662	18.50	470	5.89	150	4.50	114	2 1/2"
APHD 045 x 030	26.21	666	19.26	489	5.89	150	4.50	114	2 1/2"
APHD 045 x 040	27.16	690	19.23	488	5.89	150	4.50	114	2 1/2"
APHD 045 x 050	29.24	743	22.47	571	5.89	150	4.50	114	2 1/2"
APHD 045 x 070	31.24	793	22.47	571	5.89	150	4.50	114	2 1/2"
APHD 065 x 040	31.50	800	24.18	614	7.89	200	6.50	165	3"
APHD 065 x 050	32.50	826	24.18	614	7.89	200	6.50	165	3"
APHD 065 x 070	34.48	876	24.18	614	7.89	200	6.50	165	3"
APHD 095 x 070	36.02	915	29.00	737	11.25	286	9.50	241	3"



MODEL	SWEPT VOLUME		WEIGHT	
	in <sup>3</sup>	cm <sup>3</sup>	lbs	kgs
APHD 035 x 020	40	670	50	23
APHD 035 x 030	68	1122	50	23
APHD 045 x 020	47	770	80	23
APHD 045 x 030	73	1201	80	36
APHD 045 x 040	86	1414	80	36
APHD 045 x 050	108	1763	90	41
APHD 045 x 070	151	2475	90	41
APHD 065 x 040	198	3237	180	82
APHD 065 x 050	224	3679	180	82
APHD 065 x 070	342	5605	180	82
APHD 095 x 070	578	9472	420	191

Note: Swept volumes represent the maximum actuator stroke.



# MODEL APHD HYDRAULIC DOUBLE ACTING ACTUATOR

## CONTROL PRESSURE EQUATIONS

### GATE VALVE SIZING MATRIX

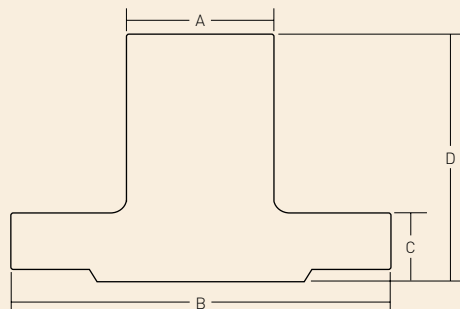
VALVE BORE SIZE	3,000 PSI	5,000 PSI	10,000 PSI	15,000 PSI
1 <sup>3</sup> / <sub>16</sub>			<b>APHD 035 x 020</b> 1528 psi .153 x wp (close)	<b>APHD 035 x 020</b> 2658 psi .153 x wp (close)
			<b>APHD 035 x 020</b> 593 psi .059 x wp (open)	<b>APHD 035 x 020</b> 883 psi .059 x wp (open)
2 <sup>1</sup> / <sub>16</sub>	<b>APHD 035 x 020</b> 539 psi .180 x wp (close)	<b>APHD 035 x 020</b> 898 psi .180 x wp (close)	<b>APHD 035 x 020</b> 1991 psi .199 x wp (close)	<b>APHD 035 x 020</b> 2987 psi .199 x wp (close)
	<b>APHD 035 x 020</b> 226 psi .075 x wp (open)	<b>APHD 035 x 020</b> 377 psi .075 x wp (open)	<b>APHD 035 x 020</b> 808 psi .081 x wp (open)	<b>APHD 035 x 020</b> 1211 psi .081 x wp (open)
2 <sup>3</sup> / <sub>16</sub>	<b>APHD 035 x 030</b> 632 psi .211 x wp (close)	<b>APHD 035 x 030</b> 1053 psi .211 x wp (close)	<b>APHD 035 x 030</b> 2640 psi .264 x wp (close)	<b>APHD 045 x 030</b> 2260 psi .151 x wp (close)
	<b>APHD 035 x 030</b> 351 psi .118 x wp (open)	<b>APHD 035 x 030</b> 586 psi .118 x wp (open)	<b>APHD 035 x 030</b> 1180 psi .118 x wp (open)	<b>APHD 045 x 030</b> 1012 psi .068 x wp (open)
3 <sup>1</sup> / <sub>8</sub>	<b>APHD 035 x 030</b> 781 psi .260 x wp (close)	<b>APHD 035 x 030</b> 1302 psi .260 x wp (close)	<b>APHD 045 x 030</b> 2131 psi .213 x wp (close)	<b>APHD 045 x 030</b> 3197 psi .213 x wp (close)
	<b>APHD 035 x 030</b> 501 psi .167 x wp (open)	<b>APHD 035 x 030</b> 834 psi .167 x wp (open)	<b>APHD 045 x 030</b> 928 psi .093 x wp (open)	<b>APHD 045 x 030</b> 1392 psi .093 x wp (open)
4 <sup>1</sup> / <sub>8</sub>	<b>APHD 035 x 040</b> 1268 psi .423 x wp (close)	<b>APHD 035 x 040</b> 2113 psi .423 x wp (close)	<b>APHD 045 x 040</b> 2422 psi .242 x wp (close)	<b>APHD 045 x 040</b> 3628 psi .242 x wp (close)
	<b>APHD 035 x 040</b> 830 psi .277 x wp (open)	<b>APHD 035 x 040</b> 1383 psi .277 x wp (open)	<b>APHD 045 x 040</b> 1586 psi .159 x wp (open)	<b>APHD 045 x 040</b> 2374 psi .159 x wp (open)
5 <sup>1</sup> / <sub>8</sub>	<b>APHD 045 x 050</b> 1114 psi .371 x wp (close)	<b>APHD 045 x 050</b> 1856 psi .371 x wp (close)	<b>APHD 065 x 050</b> 1703 psi .170 x wp (close)	<b>APHD 065 x 050</b> 2555 psi .170 x wp (close)
	<b>APHD 045 x 050</b> 753 psi .251 x wp (open)	<b>APHD 045 x 050</b> 1254 psi .251 x wp (open)	<b>APHD 065 x 050</b> 1151 psi .115 x wp (open)	<b>APHD 065 x 050</b> 1726 psi .115 x wp (open)
7 <sup>1</sup> / <sub>16</sub>	<b>APHD 045 x 070</b> 1832 psi .615 x wp (close)	<b>APHD 045 x 070</b> 3075 psi .651 x wp (close)	<b>APHD 065 x 070</b> 2821 psi .282 x wp (close)	<b>APHD 095 x 070</b> 2380 psi .159 x wp (close)
	<b>APHD 045 x 070</b> 1353 psi .451 x wp (open)	<b>APHD 045 x 070</b> 2256 psi .451 x wp (open)	<b>APHD 065 x 070</b> 2070 psi .210 x wp (open)	<b>APHD 095 x 070</b> 495 psi .033 x wp (open)

Note: The designed values provided above only apply to actuators manufactured for Array gate valves and are provided for reference only.

Open and close pressures shown reflect the use of a direct acting slab gate. If a reverse acting slab gate is used, the open and close pressures should be reversed.

# ARRAY STANDARD BONNET

## DIMENSIONS AND WEIGHTS



SIZE	PRESS	A		B		C		D		WT.	
		in	mm	in	mm	in	mm	in	mm	lbs	kg
2 1/16"	2000	3.27	83	6.10	155	1.42	36	7.56	192	18	8
2 3/16"	2000	3.27	83	7.52	191	1.73	44	7.64	194	25	11
3 1/8"	2000	3.54	90	8.78	223	1.69	43	8.58	218	31	14
4 1/16"	2000	4.72	120	11.02	280	2.01	51	9.84	250	64	29
5 1/8"	2000	5.20	132	11.81	300	2.83	72	11.30	287	97	44
7 1/16"	2000	5.20	132	15.51	394	3.70	94	8.07	205	176	80
3 1/8"	3000	3.54	90	9.09	231	2.09	53	8.58	218	40	18
4 1/16"	3000	4.72	120	12.20	310	2.68	68	9.84	250	86	39
5 1/8"	3000	5.20	132	13.07	332	3.27	83	11.30	287	119	54
7 1/16"	3000	5.98	152	15.51	394	3.70	94	8.07	205	176	80
2 1/16"	5000	3.27	83	7.20	183	1.57	40	7.56	192	24	11
2 3/16"	5000	3.27	83	7.87	200	1.77	45	7.64	194	26	12
3 1/8"	5000	3.54	90	9.09	231	2.09	53	8.58	218	40	18
4 1/16"	5000	4.72	120	12.20	310	2.68	68	9.84	250	86	30
5 1/8"	5000	5.20	132	13.07	332	3.27	83	11.30	287	120	54
7 1/16"	5000	5.98	152	15.51	394	3.70	94	8.07	205	176	80
1 13/16"	10000	3.62	92	7.68	195	1.65	42	6.61	168	26	12
2 1/16"	10000	3.82	97	8.74	222	1.81	46	7.24	184	40	18
2 3/16"	10000	4.69	119	9.76	248	2.28	58	7.87	200	57	26
3 1/16"	10000	5.12	130	11.61	295	2.40	61	8.50	216	82	37
4 1/16"	10000	5.44	138	12.69	322	4.19	106	7.13	181	132	60
5 1/8"	10000	7.99	203	15.16	385	5.51	140	12.64	331	287	130
7 1/16"	10000	10.87	276	18.15	461	5.75	146	13.54	344	397	180
1 13/16"	15000	3.82	97	8.27	210	1.81	46	7.17	182	33	15
2 1/16"	15000	3.88	99	9.50	241	2.28	58	6.30	160	44	20
2 3/16"	15000	5.00	127	11.25	286	2.90	74	7.10	180	80	36
3 1/16"	15000	4.50	114	12.88	327	4.03	102	8.25	210	125	57
4 1/16"	15000	6.00	152	14.25	362	4.00	102	8.94	227	170	77
7 1/16"	15000	9.24	235	24.75	629	6.51	165	11.13	283	787	357

Note: Dimensions and weights provided above only apply to bonnets manufactured for Array gate valves and are provided for reference. Bonnets made for other manufacturers' valves will likely have different key dimensions and weights.



# MODEL APHD HYDRAULIC DOUBLE ACTING ACTUATOR

## ACTUATOR SPECIFICATIONS

Maximum Operating Pressure:	3,000 psi / 207 bars
Test Pressure:	4,500 psi / 311 bars
API Material Class:	BB
API Temperature Rating:	P -20° F to 180° F (-29° C to -82° C)

## BONNET SPECIFICATIONS

Bonnets Available for Valve Brands:	Any Manufacturer (with Current Interface Drawing)
Size Range Available:	API 6A 1 <sup>3</sup> / <sub>16</sub> " through 7 <sup>1</sup> / <sub>16</sub> "
Pressure Ranges Available:	See Control Pressure Chart
API Material Classes Available:	AA, BB, CC (non-NACE) DD-0,5 / DD-1,5 / DD-NL EE-0,5 / EE-1,5 / EE-NL FF-0,5 / FF-1,5 / FF-NL HH-NL
API Product Specification Levels Available:	PSL-1, 2 or 3
API Temperature Ratings Available:	L through X

## LIMITED PRODUCT WARRANTY

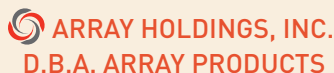
The following warranty is exclusive and in lieu of all other warranties whether expressed, implied or statutory, including, but not by way of limitation, any warranty or merchantability or fitness for any particular purpose.

Array warrants to each original buyer of products manufactured by Array that such products are free from defects in material and workmanship under normal use and service for a period of one (1) year from the date of shipment provided that no warranty is made in respect to: 1) any product which has been repaired or altered in such a way in Array's judgement,

as to effect the product adversely, 2) any product which has in Array's judgement, been subject to negligence, accident or improper storage, 3) any product which has not been operated or maintained in accordance with normal practice and in conformity with recommendations and public specifications of Array.

Array's obligation under this warranty is limited to use reasonable efforts to repair, replace or at its option, refunding the purchase price. The cost of labor for installing a repaired or replacement product shall be borne by the purchaser. Replacement parts provided under the terms of this warranty are warranted for the remainder of the warranty period of the products upon which they were installed to the same extent as if such parts were original components thereof. Warranty serviced provided hereunder do not assume any liability for damages caused by any delays involving warranty service.

For complete specification information, prices and name, address and telephone number of the Array representative nearest you, call or write to us at the address below.



15900 Morales Road, Houston, Texas 77032

Phone: 281.977.8500 • [www.array.com](http://www.array.com)