AIR TORQUE HEAVY DUTY AT-HDC COMPACT SERIES

Scotch yoke actuator
"manufactured in Italy"

AIR TORQUE®

DESIGN AND INNOVATION

The Air Torque AT-HDC Heavy Duty Actuators Compact Series is designed for on/off and modulating duties. The AT-HDC Series completes the Air Torque range of the scotch yoke actuators, covering also small and medium valves torques requirements (up to 4.000Nm).

The AT-HDC Series is ready for automation, with all the ancillary attachments in compliance with the international standards. The AT-HDC actuators can be equipped with various accessories and panels directly mounted on board or supplied free standing.
All is completed in the Air Torque factory.

The Air Torque AT-HDC Series incorporates several technical features which make these actuators unique for construction details and functionality properties.

HIGH QUALITY LEVEL PRODUCTION

The AT-HDC Series has been designed to obtain the highest cycling life and the most reliable performance with very reduced maintenance and service.

ROBUST AND INNOVATIVE DESIGN

The AT-HDC Series includes special technical features and materials grade which allows to withstand to the heaviest working conditions.
The unique technical features developed and incorporated in the AT-HDC Series, permits to have the best product for on-off and modulating application, long life expectation and output torques stability for long run.

INTERNATIONAL STANDARD

The AT-HDC Series has been designed, manufactured and tested in Air Torque facilities in full compliance with the latest and most severe applicable International standards.

QUALITY PROVED BY TESTING

Thanks to the recognized know-how, reliability and strong experience in valve automation, Air Torque performs tests in house in order to guarantee compliance with the technical specification related to the quality and reliability of the AT-HDC actuators.

RANGE AND OPTIONS

The AT-HDC Actuator Series is available in:

- Spring return and double acting versions;
- Torque up to 4.000 Nm / 35.400 Lb-In;
- Low, standard and high temperature constructions;
- 90° rotation both in double acting and spring return;
- Fast acting option;
- Hydraulic damper option;
- Manual overrides options.

ACTUATOR OPERATING CONDITIONS

OPERATING MEDIA

Dry or lubricated air, inert/non-corrosive gases or hydraulic oil provided that they are compatible with the internal actuator parts and lubricant.

SUPPLY PRESSURE (For standard actuators)

Pneumatic version: Up to 12 bar / 175 psi

Hydraulic version: Up to 207 bar / 3.000 psi

WORKING TEMPERATURE

	Pneumatic version:	Hydraulic version:
Standard actuator (S)	-40 °C (-40 °F) to +80 °C (+176 °F)	-30 °C (-22 °F) to +80 °C (+176 °F)
High temperature actuator (H)	-15 °C (+5 °F) to +150 °C (+302 °F)	-15 °C (+5 °F) to +110 °C (+230 °F)
Low temperature actuator (L)	-60 °C (-76 °F) to +80 °C (+176 °F)	-60 °C (-76 °F) to +80 °C (+176 °F)

LUBRICATION

Actuators are factory lubricated for life under normal operating conditions.

ACTUATOR DESIGNATION AND MARKING

The actuator selection which reflects the operating conditions and the product designation, is marked on the actuator identification label.

Each single actuator has a QR code marked on the actuator label for easy identification and traciability of the product.

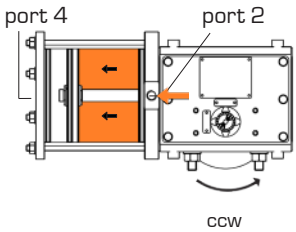
ACTUATOR FUNCTION, ROTATION & TORQUE CURVES

Unless defined, the standard actuator models rotation is clockwise to close.

DOUBLE ACTING ACTUATORS

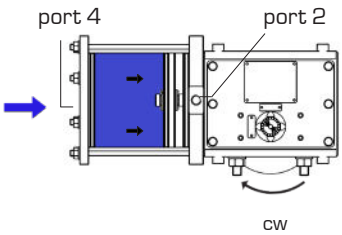
FUNCTIONING (top view)

Port 2 pressurized



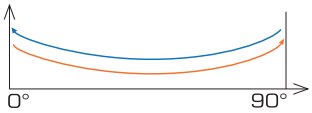
Air supplied to Port 2 forces the piston towards the actuator end flange, exhaust air exits from Port 4.

Port 4 pressurized



Air supplied to Port 4 forces the piston towards the actuator body, with the exhaust air exiting from Port 2.

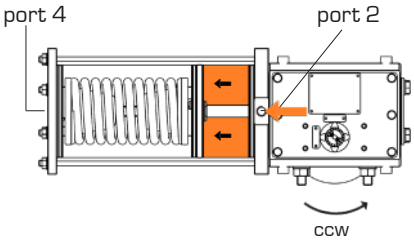
OUTPUT TORQUE



SINGLE ACTING ACTUATORS

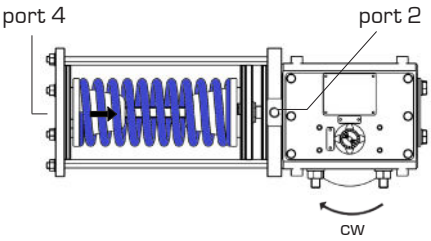
FUNCTIONING (top view)

Port 2 pressurized



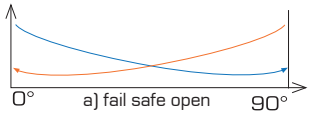
Air supplied to Port 2 forces the piston toward the actuator end flange, compressing the springs, with the exhaust air exiting from Port 4.

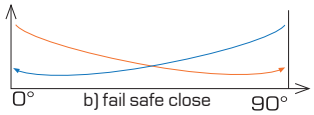
Spring released



The loss of air pressure (air or electric failure) at Port 2 allows the springs to force the piston inward with the exhaust air exiting from Port 2.

OUTPUT TORQUE

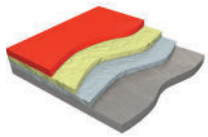




TECHNICAL FEATURES

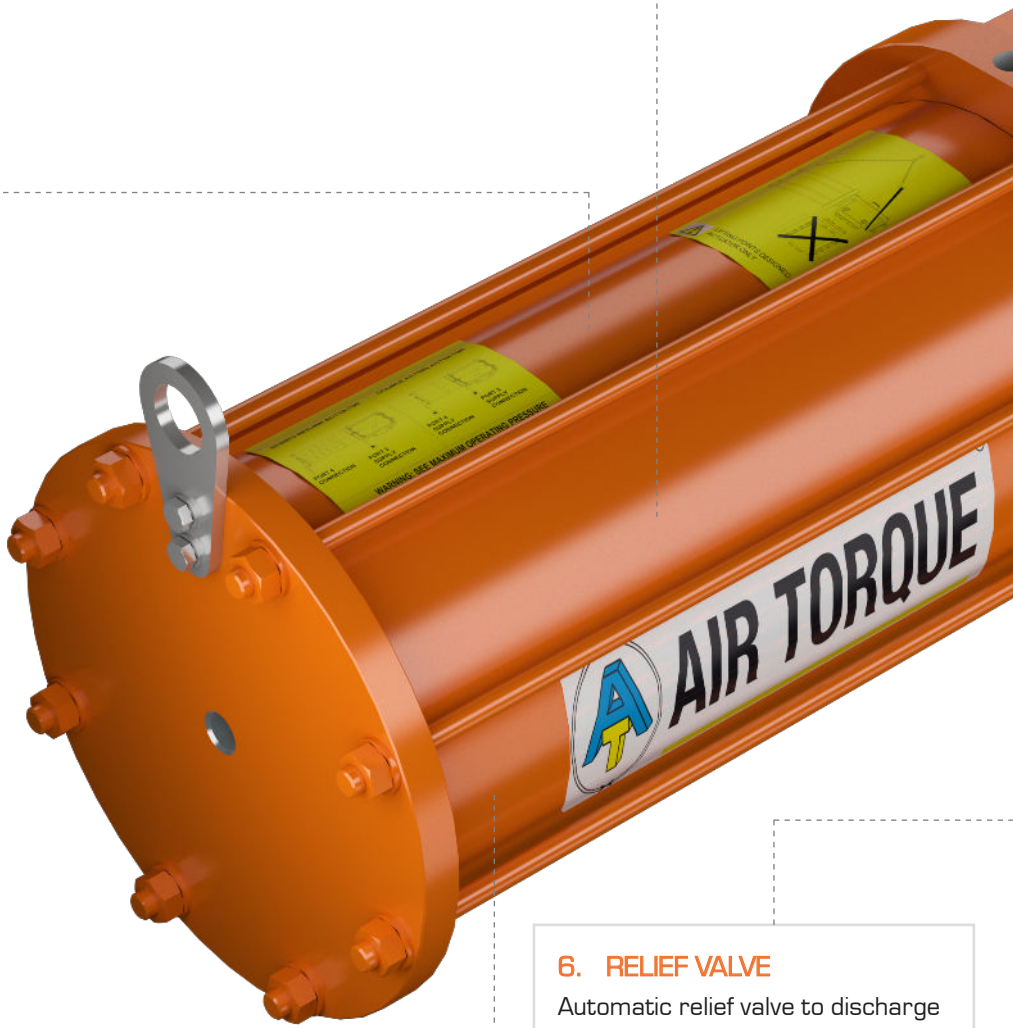
1. CORROSION PROTECTION

The AT-HDC series is weatherproof. The actuator shaft is offered with coating, adhering to Air Torque's attention to detail commitment maximun level of protection possible. High corrosion resistance material, coupled with multilayer coating of the components, improve the longevity.



2. SELECTED AND HIGH QUALITY BEARINGS AND SEALS

A wide operating temperature range provided with low friction and high cycle life for efficient operation.
Bearings on pistons and drive shaft for precise operation, low friction, high cycle life.



8. MODULAR PRELOADED SPRING CARTRIDGES

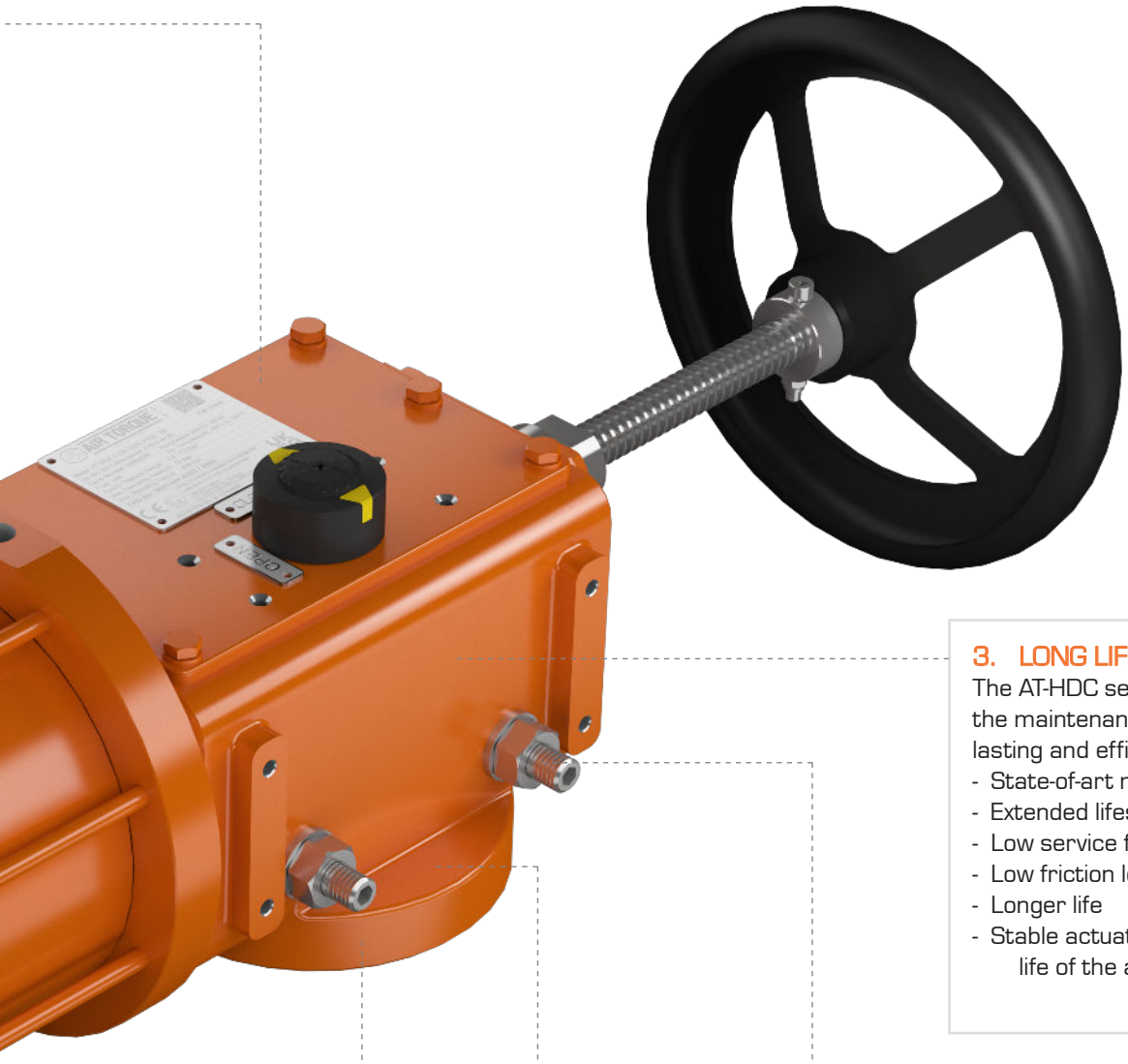
All the springs in the AT-HDC are coated and preloaded by cartridges.
- Actuator range modulability
- Versatile design
- Highly safer maintenance operation

7. GREASED FOR LIFE

The unique design of the scotch yoke mechanism coupled with special grease selection, delivers a long grease retention and less maintenance over the life of the actuator.

6. RELIEF VALVE

Automatic relief valve to discharge excessive or unwanted pressure is a standard component for the AT-HDC Actuators.



3. LONG LIFE - MINIMIZED MAINTENANCE

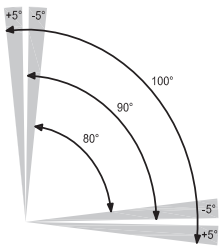
The AT-HDC series is designed to minimize the maintenance frequency and so to provide lasting and efficient performance.

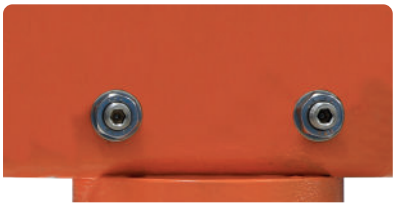
- State-of-art materials and surface treatments
- Extended lifespan
- Low service frequency
- Low friction level
- Longer life
- Stable actuators output torque through the life of the actuator

4. FRONTAL STROKE ADJUSTMENT

The stroke adjustment is possible through screws located in the frontal area of the actuator.

- Simpler stroke adjustment
- Shorter actuator
- Less extended area of potential corrosion





5. FULL COMPLIANCE

Full compliance with ISO 5211, EN 15714-3, VDI/VDE 3845 specifications, providing the product changeability, easiest valve automation and accessories installation.

DIMENSIONS AND TECHNICAL DATA

Technical data (Metric Unit - Dimensions in mm)

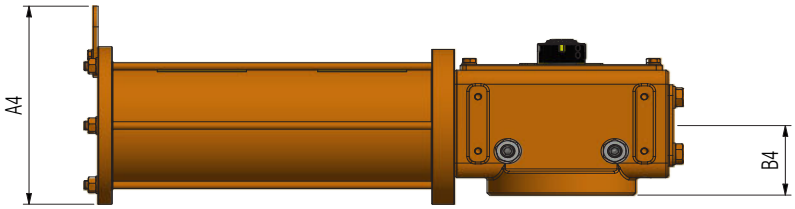
ACTUATOR MODEL	AT-HDC 035								AT-HDC 045								AT-HDC 055								AT-HDC 065							
	80		100		125		150		125		150		175		200		175		200		225		250		225		250		280		330	
	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D	S
A1	268	402	268	402	268	402	268	402	306	456	306	456	306	456	306	456	390	620	390	620	390	620	390	620	457	726	457	726	457	726	457	726
A2	178	312	178	312	178	312	178	312	203	353	203	353	203	353	203	353	240	472	254	476	254	476	254	476	284	553	284	553	284	553	284	553
A3	130		145		170		195		170		195		225		250		232		257		287		315		287		298,5		323,9		381	
A4	165		183		205		223		205		223		263		283		270		295		325		353		325		353		378		435	
A5	100		100		100		100		113		113		113		113		158		158		158		158		183		183		183		183	
A6	163		170		183		195		205		209		222		235		269		282		270		315		322		336		348		397	
A7	143		143		143		143		148		148		148		148		214		214		214		214		227		227		227		227	
B1	371	503	371	503	371	503	371	503	421	572	421	572	421	572	421	572	552	785	552	785	552	785	552	785	647	916	647	916	647	916	647	916
B2	103		103		103		103		116		116		116		116		165		165		165		165		190		190		190		190	
B3	63		63		63		63		75		75		75		75		88		88		88		88		105		105		105		105	
B4	64		64		64		64		70		70		70		70		99		99		99		99		106		106		106		106	
Q	102		102		102		102		125		125		125		125		140		140		140		140		165		165		165		165	
W	M10		M10		M10		M10		M12		M12		M12		M12		M16		M16		M16		M16		M20		M20		M20		M20	
E	M5		M5		M5		M5		M5		M5		M5		M5		M5		M5		M5		M5		M5		M5		M5		M5	
F	80		80		80		80		80		80		80		80		130		130		130		130		F12		F12		F12		F12	
G	30		30		30		30		30		30		30		30		30		30		30		30		165		165		165		165	
N	17		17		17		17		17		17		17		17		27		27		27		27		27		27		27		27	
P	20		20		20		20		20		20		20		20		30		30		30		30		33		33		33		33	
CH	22		22		22		22		27		27		27		27		36		36		36		36		46		46		46		46	
Air Volume Opening (l)	0,46		0,73		1,15		1,66		1,39		2,01		2,74		3,59		3,24		4,25		5,38		8,35		6,17		7,63		9,57		13,31	
Air Volume Closing (l)	0,47	-	0,73	-	1,14	-	1,64	-	1,39	-	2,00	-	2,72	-	3,55	-	3,42	-	4,46	-	5,65	-	8,74	-	6,44	-	7,95	-	9,98	-	13,86	-
Approx. Weight (kg)	16,2	19,5	18,1	21,8	21,1	26,6	24,4	32,6	25,4	35,5	28,9	44,4	32,8	42,9	37,2	48,8	58,5	86,4	65,2	93,4	72,9	111,7	90,4	140,4	86,2	127	105,0	155,1	112,6	164,8	131,8	187,2

Technical data (Imperial Unit - Dimensions in inch)

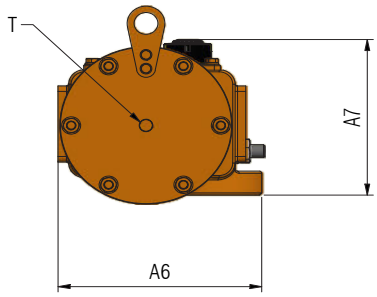
A1	10,55	15,83	10,55	15,83	10,55	15,83	10,55	15,83	12,05	17,95	12,05	17,95	12,05	17,95	12,05	17,95	15,35	24,41	15,35	24,41	15,35	24,41	15,35	24,41	17,99	28,58	17,99	28,58	17,99	28,58	17,99	28,58
A2	7,01	12,28	7,01	12,28	7,01	12,28	7,01	12,28	7,99	13,90	7,99	13,90	7,99	13,90	7,99	13,90	9,45	18,58	10,00	18,74	10,00	18,74	10,00	18,74	11,18	21,77	11,18	21,77	11,18	21,77	11,18	21,77
A3	5,12		5,70		6,69		7,68		6,69		7,68		8,86		9,84		9,13		10,12		11,30		12,40		11,29		11,75		12,75		15	
A4	6,50		7,21		8,07		8,78		8,07		8,78		10,35		11,14		10,63		11,61		12,80		13,89		12,80		13,90		14,88		17,13	
A5	3,94		3,94		3,94		3,94		4,44		4,44		4,44		4,44		6,22		6,22		6,22		6,22		7,20		7,20		7,20		7,20	
A6	6,42		6,69		7,21		7,68		8,07		8,23		8,74		9,25		10,59		11,10		10,63		12,40		12,68		13,23		13,70		15,63	
A7	5,63		5,63		5,63		5,63		5,83		5,83		5,83		5,83		8,43		8,43		8,43		8,43		8,94		8,94		8,94		8,94	
B1	14,61	19,80	14,61	19,80	14,61	19,80	14,61	19,80	16,58	22,52	16,58	22,52	16,58	22,52	16,58	22,52	21,73	30,91	21,73	30,91	21,73	30,91	21,73	30,91	25,47	36,06	25,47	36,06	25,47	36,06	25,47	36,06
B2	4,06		4,06		4,06		4,06		4,57		4,57		4,57		4,57		6,50		6,50		6,50		6,50		7,48		7,48		7,48		7,48	
B3	2,48		2,48		2,48		2,48		2,95		2,95		2,95		2,95		3,46		3,46		3,46		3,46		4,13		4,13		4,13		4,13	
B4	2,52		2,52		2,52		2,52		2,76		2,76		2,76		2,76		3,90		3,90		3,90		3,90		4,17		4,17		4,17		4,17	
Q	4,02		4,02		4,02		4,02		4,92		4,92		4,92		4,92		5,51		5,51		5,51		5,51		6,50		6,50		6,50		6,50	
W	M10		M10		M10		M10		M12		M12		M12		M12		M16		M16		M16		M16		M20		M20		M20		M20	
E	M5		M5		M5		M5		M5		M5		M5		M5		M5		M5		M5		M5		M5		M5		M5		M5	
F	3,15		3,15		3,15		3,15		3,15		3,15		3,15		3,15		5,12		5,12		5,12		5,12		F12		F12		F12		F12	
G	1,18		1,18		1,18		1,18		1,18		1,18		1,18		1,18		1,18		1,18		1,18		1,18		6,50		6,50		6,50		6,50	
N	0,67		0,67		0,67		0,67		0,67		0,67		0,67		0,67		1,06		1,06		1,06		1,06		1,06		1,06		1,06		1,06	
P	0,79		0,79		0,79		0,79		0,79		0,79		0,79		0,79		1,18		1,18		1,18		1,18		1,30		1,30		1,30		1,30	
CH	0,87		0,87		0,87		0,87		1,06		1,06		1,06		1,06		1,42		1,42		1,42		1,42		1,81		1,81		1,81		1,81	
Air Volume Opening (in^3)	28,07		44,55		70,18		101,30		84,82		122,66		167,20		219,08		197,72		259,35		328,31		509,55		376,52		465,61		584,00		812,23	
Air Volume Closing (in^3)	28,7	-	44,5	-	69,6	-	100,1	-	84,8	-	122,0	-	166,0	-	216,6	-	208,7	-	272,2	-	344,8	-	533,3	-	393,0	-	485,1	-	609,0	-	845,8	-
Approx. Weight (lb)	35,7	42,9	39,9	48,1	46,5	58,6	53,8	32,6	71,9	78,3	63,7	97,9	72,3	94,6	82,0	107,6	128,9	190,5	143,7	205,9	160,7	246,2	199,2	230,2	190,0	279,9	231,5	341,9	248,2	363,3	290,6	412,7

CONNECTION																
T NPT	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
ISO Flange	F07 + F10	F07 + F10	F07 + F10	F07 + F10	F10 + F12	F10 + F12	F10 + F12	F10 + F12	F14	F14	F14	F14	F16	F16	F16	F16
OPTIONAL ISO Flange									F12	F12	F12	F12	F14	F14	F14	F14

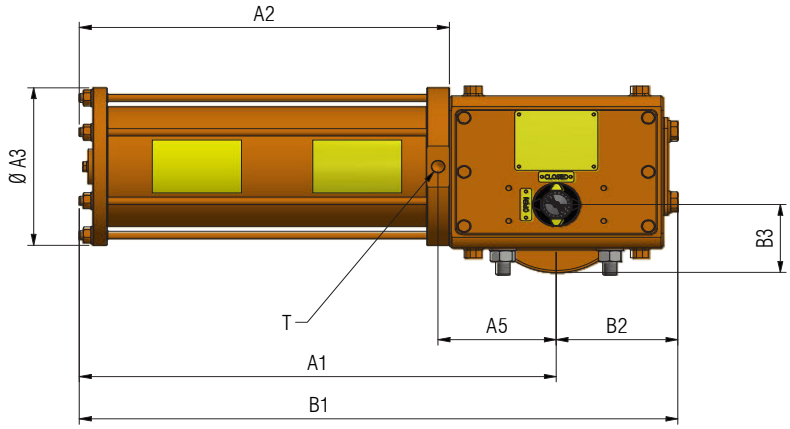
FRONT VIEW



SIDE VIEW

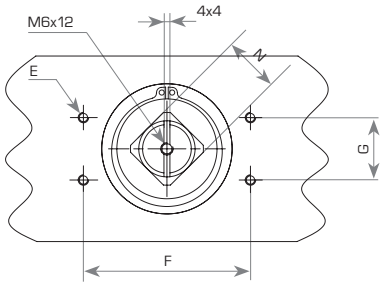


TOP VIEW

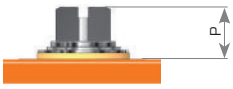


ANCILLARY ATTACHMENT

Ancillary attachment
VDI/VDE 3845-1

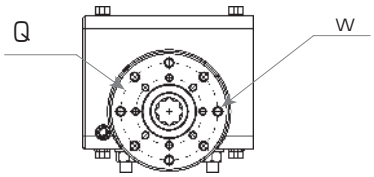


Scotch Yoke upper connection

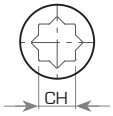


BOTTOM VIEW ISO 5211

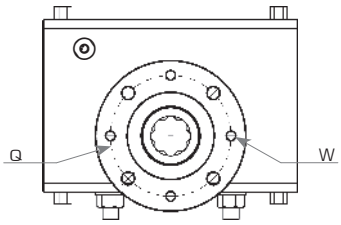
DOUBLE FLANGE CONNECTION ISO 5211



DOUBLE SQUARE (DS)



SINGLE FLANGE CONNECTION ISO 5211

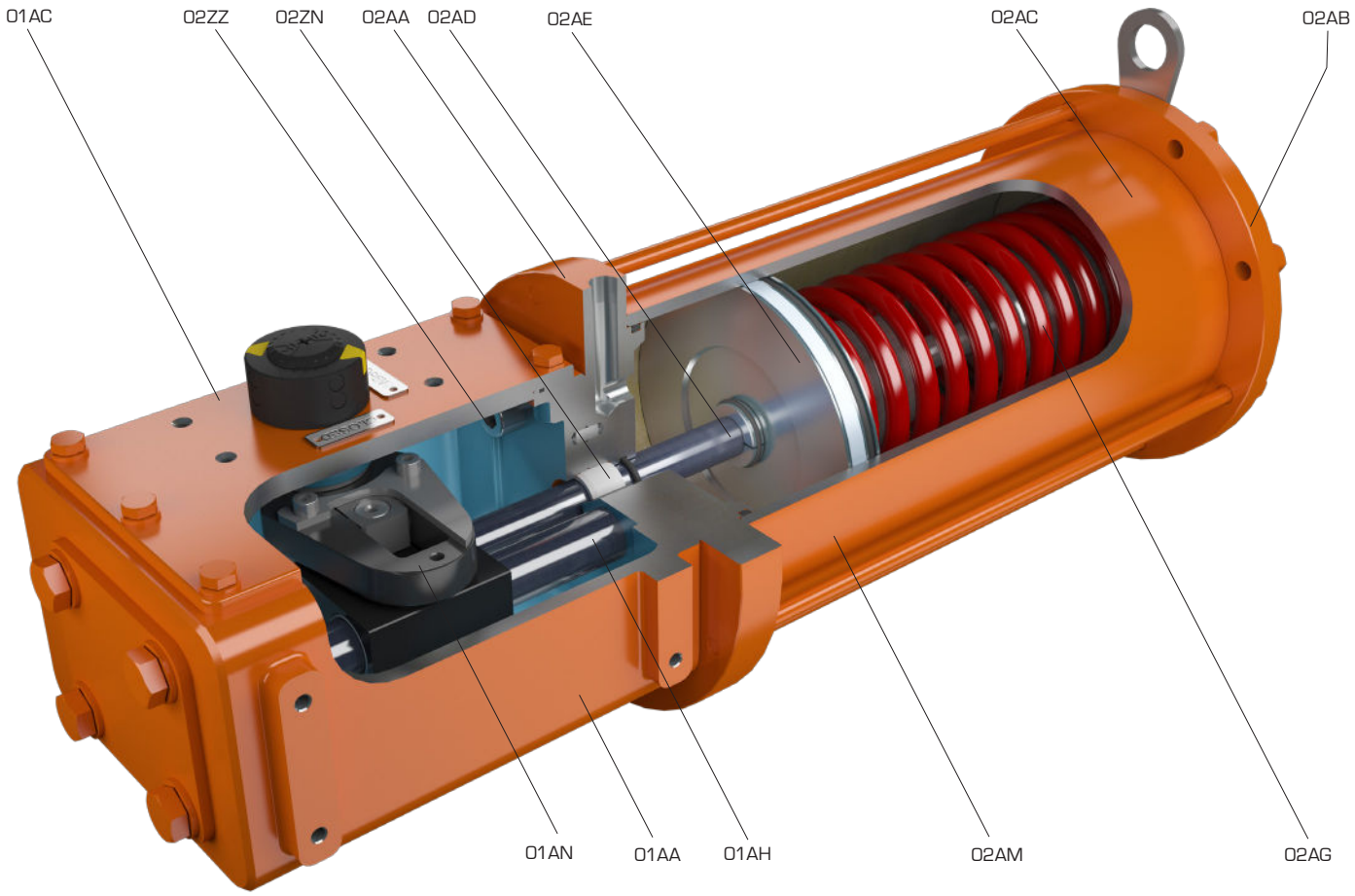


CERTIFICATIONS/COMPLIANCE

Air Torque S.p.A. is fully complying with the standard international requirements.
The management and quality system is certified according to the ISO 9001. Together with this certification the Air Torque complete range of actuators has been awarded with additional approvals and certifications.

- ATEX 2014/34/EU
- SIL3 capable
- EC Declaration of conformity
- IP67 - Degree of protection
- UKSI 2016:1107 Regulation

PARTS AND MATERIALS



Spring cartridge

PART N°	PART DESCRIPTION	STANDARD MATERIAL
01AA	HOUSING (Central module)	Carbon steel
01AC	COVER (Central module)	Carbon steel
01AH	DRIVE SHAFT	Alloy steel
01AN	SCOTCH YOKE	Carbon steel
02AA	CYLINDER CONNECTION FLANGE	Carbon steel
02AB	END CYLINDER FLANGE	Carbon steel
02AC	CYLINDER	Carbon steel
02AD	PISTON SHAFT	Carbon steel
02AE	PISTON	Carbon steel
02AG	SPRING	Alloy steel
02AM	GASKET (Module)	Syntetyc fibers
02ZN	Sleeve (piston shaft)	High-grade polymers
02ZZ	Screw (Power module connections)	Stainless steel

PRODUCT OPTIONS

FAST ACTING

for specific applications Air Torque can supply the AT-HDC actuator series with the ability to stroke rapidly (opening and closing)

DEDICATED VALVE INTERFACE

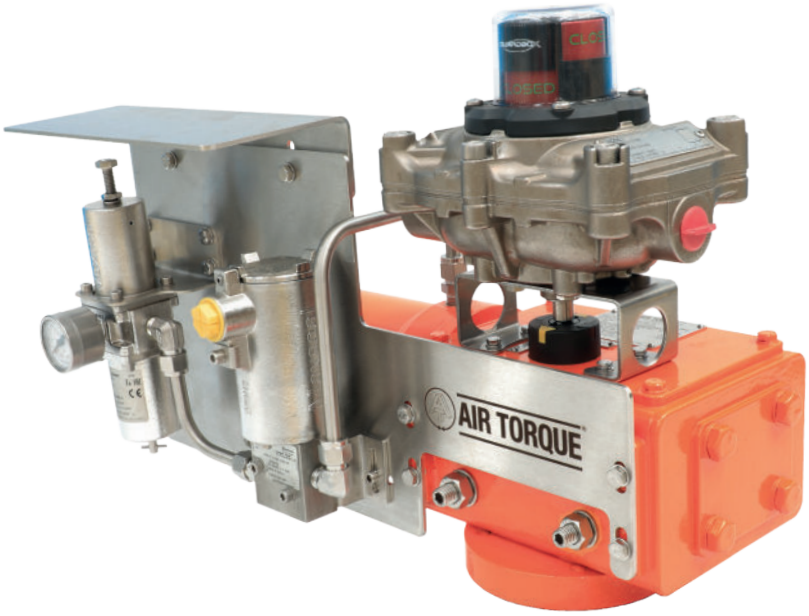
AT-HDC actuators can be supplied with linkage to the valve. As alternative the valve interface of the actuator can be designed specifically to fit the valve top mounting

CONTROL SYSTEMS

The control panels and control systems package is an added value Air Torque can offer. With extensive field experience in valve automation we are able to satisfay almost all the customers requirements.
The AT-HDC actuators can be supplied with control systems sized, designed and manufactured by Air Torque

MANUAL OVERRIDE

Different options are available for emergency operations.
The mechanical manual overrides can be supplied integrated into the actuator design or applied between the actuator and the valve



DECLUTCHABLE GEAR

MANUAL JACKSCREW

MANUAL DECLUTCHABLE JACKSCREW

HOW TO ORDER

AVAILABLE OPTIONS AND ORDERING CODES:

The most relevant information in the How To Order are transferred in the product label and in other Air Torque documents (as order acknowledgment, packing list, invoice and certificates). The position of the information can change respect the How To Order. Contact Air Torque for further details.

1 AT-HDC [1]

2 **Operating temperature:**

S: Pneumatic actuator with standard seals suitable for -40°C (-40°F) to +80°C (+176°F)

S: Hydraulic actuator with standard seals suitable for -30°C (-22°F) to +80°C (+176°F)

H: Pneumatic actuator with standard seals suitable for -15°C (-5°F) to +150°C (+320°F)

H: Hydraulic actuator with standard seals suitable for -15°C (-5°F) to +110°C (+230°F)

L: Pneumatic actuator with standard seals suitable for -60°C (-76°F) to +80°C (+176°F)

L: Hydraulic actuator with standard seals suitable for -60°C (-76°F) to +80°C (+176°F)

3 **Actuator rotation:**

A: 0°-90° Standard

X: Special to be specified

4 **Actuator central module:**

035 045 055 065

5 **Action:**

SC: Spring to Close

SO: Spring to Open

DA: Double Acting

6 **Spring set configuration:** (only for Spring to Close or Spring to Open)

02: spring set 02
04: spring set 04
06: spring set 06

08: spring set 08
10: spring set 10
(available on some sizes)

00: Double Acting

7 **Actuator orientations:** (according to Tab. n° HDC51700E)

Spring to close		Spring to open		Double acting	
1A: Standard	**1M**	**2A:** Standard	**2M**	**3A:** Standard	**3M**
1B	**1N**	**2B**	**2N**	**3B**	**3N**
1C	**1O**	**2C**	**2O**	**3C**	**3O**
1D	**1P**	**2D**	**2P**	**3D**	**3P**
1E	**1Q**	**2E**	**2Q**	**3E**	**3Q**
1F	**1R**	**2F**	**2R**	**3F**	**3R**
1G	**1S**	**2G**	**2S**	**3G**	**3S**
1H	**1T**	**2H**	**2T**	**3H**	**3T**
1I	**1U**	**2I**	**2U**	**3I**	**3U**
1L	**1V**	**2L**	**2V**	**3L**	**3V**

8 **Drive connections:**

Standard:
T: Double square

Optional type connection (Available on request):
X: Double keys at 180°
L: Parallel square
D: Diagonal square
H: Flat head
W: Double keys at 90°
Q: Four keys at 90°

Standard Drive connections:

035	045	055	065
T-022	**T-027**	**T-036**	**T-046**

Keys according to UNI 6604 A.

9 **ISO Flange-ISO 5211:**

Model	035	045	055	065
Standard	**F07-F10**	**F10-F12**	**F12**	**F14**
Option			**F14**	**F16**

10 **Supply Medium:** [2]

P: Dry or lubricated air, inert gas and sweet dry natural gas

H: Hydraulic

11	**Pneumatic cylinder size:**			
	035	045	055	065
	0080 **0100** **0125** **0150**	**0125** **0150** **0175** **0200**	**0175** **0200** **0225** **0250**	**0225** **0250** **0280** **0330**
	Hydraulic cylinder size:			
	035	045	055	065
	0030 **0035**	**0035** **0040**	**0040** **0045**	**0045** **0050**
12	**PED requirement:** **00:** PED not applicable (standard)	**01:** PED applicable		
13	**Connections:** [3] **ST:** Standard supply connections	**FA:** Fast connections		
14	**Damper requirement:** **00:** Without damper (standard)	**DP:** With damper		
15	**Manual override:** **00:** Standard without manual ovveride	**DJS:** Declutchable jackscrew Available only for double acting **JS:** Jackscrew Available only for spring return actuator	**HP:** Hydraulic pump Hydraulic manual override (For high temperature contact Air Torque S.p.a)	
16	**Manual override orientation:** (according to Tab. n° HDC51700E) Without manual override **00:** No manual override	With Hydraulic manual override **3A:** Standard for spring to close **4A:** Standard for spring to open **3B** **5B** **4B** **6A** **5A** **6B**		
17	**Manual override options:** Jackscrew: **01:** Standard **02:** Locking system	Declutchable Jackscrew: **01:** Standard **02:** Locking system	Hydraulic: **01:** Removable lever **02:** Lever + Locking system	
18	**Actuator painting system:** **C4:** Standard painting C4 category according to ISO 12944 **C5:** Painting C5 category according to ISO 12944 **XX:** Different options are available on request to be specified.			
19	**Actuator color:** **A:** RAL 2008 (Standard color) **X:** Different options are available on request to be specified.			

(1) In case the product is customized, the suffix may be different and must be agreed in advance.

(2) Make sure the operating media is compatible with the actuator internal parts and lubricants.

(3) The standard connection is NPT type.

Connection size is shown in OA description and other avaible on datasheet.

X/XX: Letters for specials proper feature will be specified in OA.

If not specified Air Torque STD Indicator will be provided.

Examples of model designation

1	2	3	4	5	6	7	8	9	10
AT-HDC	**S**	**0-90°**	**035**	**SC**	**02**	**1A**	**T-022**	**F07-F10**	**P**
11	12	13	14	15	16	17	18	19	
0125	**00**	**ST**	**00**	**00**	**00**	**00**	**C4**	**A**	

OUTPUT TORQUE (Nm)

SPRING RETURN TORQUE

Supply pressure		AT-HDC 035 SR - P080		AT-HDC 035 SR - P100				AT-HDC 035 SR - P125					AT-HDC 035 SR - P150			
		SC02	SC04	SC02	SC04	SC06	SC08	SC02	SC04	SC06	SC08	SC10	SC04	SC06	SC08	SC10
2,5 bar	Start							109	81				155	105		
	Run							43	21				60	29		
	End							69	22				95	31		
3 bar	Start			70				143	115				203	154		
	Run			23				60	40				85	55		
	End			30				102	55				144	79		
3,5 bar	Start			92				176	148				252	202	173	
	Run			34				77	57				109	79	53	
	End			51				136	89				192	127	65	
4 bar	Start			113	85			210	182	132			300	250	221	
	Run			45	24			93	74	44			133	104	79	
	End			73	26			169	122	58			240	175	114	
4,5 bar	Start	65		135	107			243	215	166			348	298	269	216
	Run	20		56	35			110	91	61			157	128	103	63
	End	25		94	47			203	156	91			288	224	162	73
5 bar	Start	79		156	128			277	249	199	170		396	347	317	264
	Run	27		66	46			127	107	78	52		181	152	128	89
	End	38		116	68			236	189	125	63		337	272	210	121
5,5 bar	Start	93		177	150			310	282	233	204		445	395	366	313
	Run	34		77	57			144	124	95	70		205	176	152	114
	End	52		137	90			270	223	158	96		385	320	258	169
6 bar	Start	106		199	171	122		344	316	266	237		493	443	414	361
	Run	41		88	68	38		160	141	112	87		230	201	176	139
	End	66		158	111	47		303	256	192	130		433	368	307	218
6,5 bar	Start	120	92	220	193	143		377	349	300	271	217		491	462	409
	Run	48	28	99	79	49		177	158	129	104	64		225	201	163
	End	79	32	180	133	68		337	290	225	163	74		417	355	266
7 bar	Start	134	106	242	214	164		411	383	333	304	251				457
	Run	55	35	109	90	60		194	175	145	121	82				187
	End	93	46	201	154	90		370	323	259	197	108				314
7,5 bar	Start	147	120	263	236	186	157	444	416	367	338	284				
	Run	62	42	120	101	71	45	211	191	162	138	100				
	End	107	60	223	176	111	49	404	357	292	230	141				
8 bar	Start	161	133	285	257	207	178	478	450	400	371	318				
	Run	69	49	131	111	82	56	228	208	179	155	117				
	End	121	74	244	197	133	71	437	390	326	264	175				
8,5 bar	Start	175	147	306	278	229	200		483	434	405	351				
	Run	76	56	142	122	93	68		225	196	172	134				
	End	134	87	266	219	154	92		424	359	297	208				
9 bar	Start	189	161	328	300	250	221			467	438	385				
	Run	83	63	152	133	104	79			213	188	151				
	End	148	101	287	240	175	114			393	331	242				
9,5 bar	Start	202	175	349	321	272	242				472	418				
	Run	90	70	163	144	114	90				205	168				
	End	162	115	308	261	197	135				364	275				
10 bar	Start	216	188	370	343	293	264					452				
	Run	97	77	174	154	125	101					185				
	End	176	129	330	283	218	157					309				
10,5 bar	Start	230	202	392	364	315	285					485				
	Run	103	84	185	165	136	111					202				
	End	189	142	351	304	240	178					342				
11 bar	Start	244	216	413	386	336	307									
	Run	110	91	195	176	147	122									
	End	203	156	373	326	261	199									
11,5 bar	Start	257	230	435	407	357	328									
	Run	117	98	206	187	158	133									
	End	217	170	394	347	283	221									
12 bar	Start	271	243	456	428	379	350									
	Run	124	105	217	197	168	144									
	End	230	183	416	369	304	242									
Spring	Start	99	146	99	146	211	272	99	146	211	272	361	146	211	272	361
	Run	40	59	40	59	88	110	40	59	88	110	146	59	88	110	146
	End	58	86	58	86	136	165	58	86	136	165	218	86	136	165	218

OUTPUT TORQUE (Nm)

SPRING RETURN TORQUE

Supply pressure		AT-HDC 045 SR - P125			AT-HDC 045 SR - P150					AT-HDC 045 SR - P175					AT-HDC 045 SR - P200				
		SC02	SC04	SC06	SC02	SC04	SC06	SC08	SC10	SC02	SC04	SC06	SC08	SC10	SC02	SC04	SC06	SC08	SC10
2,5 bar	Start									197					326	275			
	Run									56					123	85			
	End									61					190	104			
3 bar	Start									282					437	385	322		
	Run									100					179	142	98		
	End									146					301	214	118		
3,5 bar	Start				209					366	314				547	495	432	368	
	Run				62					143	106				235	198	156	111	
	End				73					230	144				411	325	228	133	
4 bar	Start				271					451	399	336			657	606	543	478	423
	Run				95					186	149	105			290	254	212	169	118
	End				135					314	228	131			521	435	338	243	126
4,5 bar	Start				333	282				535	483	420	356		768	716	653	589	534
	Run				127	89				229	192	149	105		345	309	268	226	177
	End				197	111				399	313	216	121		631	545	449	353	236
5 bar	Start	206			395	344	281			619	568	505	440		878	826	763	699	644
	Run	61			158	121	75			271	235	193	150		401	365	323	281	234
	End	70			259	173	76			483	397	300	205		742	655	559	464	347
5,5 bar	Start	249			457	406	343			704	652	589	525	470	988	936	873	809	754
	Run	83			190	153	109			313	277	235	193	143	456	420	379	337	290
	End	113			321	235	138			568	481	385	290	173	852	766	669	574	457
6 bar	Start	292	240		519	468	405	340		788	737	673	609	554			984	919	865
	Run	106	66		221	184	141	96		356	320	278	236	188			434	393	346
	End	156	70		383	297	200	105		652	566	469	374	257			779	684	567
6,5 bar	Start	335	283		581	530	467	402		873	821	758	694	639					975
	Run	128	90		252	216	173	130		398	362	321	279	232					402
	End	199	113		445	359	262	167		737	650	554	458	342					678
7 bar	Start	378	327		643	592	529	464	410	957	905	842	778	723					
	Run	150	112		283	247	205	162	110	440	404	363	321	275					
	End	242	156		507	421	324	229	112	821	735	638	543	426					
7,5 bar	Start	421	370	306	706	654	591	527	472		990	927	862	808					
	Run	171	134	89	314	278	236	194	144		447	405	364	318					
	End	285	199	102	569	483	386	291	174		819	722	627	510					
8 bar	Start	464	413	350	768	716	653	589	534				947	892					
	Run	193	156	113	345	309	268	226	177				406	360					
	End	328	242	145	631	545	449	353	236				712	595					
8,5 bar	Start	507	456	393	830	778	715	651	596					977					
	Run	215	178	135	376	341	299	257	209					403					
	End	371	285	188	693	607	511	415	299					679					
9 bar	Start	550	499	436	892	840	777	713	658										
	Run	236	200	157	408	372	330	288	241										
	End	414	328	231	755	669	573	477	361										
9,5 bar	Start	594	542	479	954	902	839	775	720										
	Run	258	222	179	439	403	361	320	273										
	End	457	371	274	818	731	635	539	423										
10 bar	Start	637	585	522		964	901	837	782										
	Run	280	243	201		434	392	351	304										
	End	500	414	318		793	697	601	485										
10,5 bar	Start	680	628	565			963	899	844										
	Run	301	265	223			424	382	336										
	End	544	457	361			759	663	547										
11 bar	Start	723	671	608				961	906										
	Run	323	287	245				413	367										
	End	587	500	404				725	609										
11,5 bar	Start	766	714	651					968										
	Run	344	308	267					398										
	End	630	543	447					671										
12 bar	Start	809	757	694															
	Run	366	330	288															
	End	673	586	490															
Spring	Start	361	447	544	361	447	544	639	756	361	447	544	639	756	361	447	544	639	756
	Run	148	183	223	148	183	223	264	307	148	183	223	264	307	148	183	223	264	307
	End	225	277	340	225	277	340	404	459	225	277	340	404	459	225	277	340	404	459

OUTPUT TORQUE (Nm)

SPRING RETURN TORQUE

Supply pressure		AT-HDC 055 SR - P175			AT-HDC 055 SR - P200					AT-HDC 055 SR - P225					AT-HDC 055 SR - P250			
		SC02	SC04	SC06	SC02	SC04	SC06	SC08	SC10	SC02	SC04	SC06	SC08	SC10	SC04	SC06	SC08	SC10
2,5 bar	Start				331					510	406				606			
	Run				96					190	112				218			
	End				110					289	119				319			
3 bar	Start				465					680	576				817	680		
	Run				167					277	203				325	227		
	End				245					460	289				529	306		
3,5 bar	Start	379			600	496				851	747	611			1.027	891		
	Run	123			236	161				362	290	190			431	336		
	End	158			380	209				630	460	236			740	516		
4 bar	Start	482			735	631				1.021	918	781			1.238	1.102	850	
	Run	176			304	231				448	376	280			537	442	262	
	End	262			514	344				801	630	407			950	727	321	
4,5 bar	Start	585	482		870	766	630			1.192	1.088	952			1.448	1.312	1.061	925
	Run	229	153		372	299	201			534	462	367			643	549	373	270
	End	365	194		649	479	255			971	801	577			1.161	937	532	308
5 bar	Start	689	585		1.005	901	765			1.362	1.259	1.123	871		1.659	1.523	1.272	1.135
	Run	281	207		440	368	271			619	548	453	274		748	655	481	382
	End	468	298		784	614	390			1.142	972	748	342		1.372	1.148	742	519
5,5 bar	Start	792	688	552	1.139	1.036	899			1.533	1.429	1.293	1.042	906	1.869	1.733	1.482	1.346
	Run	333	260	158	507	436	340			705	633	539	363	259	854	760	588	491
	End	571	401	177	919	748	525			1.312	1.142	918	513	289	1.582	1.358	953	729
6 bar	Start	895	791	655	1.274	1.170	1.034	783		1.704	1.600	1.464	1.213	1.076		1.944	1.693	1.557
	Run	385	312	214	575	503	408	226		790	719	625	451	351		866	694	598
	End	674	504	280	1.053	883	659	254		1.483	1.313	1.089	683	460		1.569	1.164	940
6,5 bar	Start	998	894	758	1.409	1.305	1.169	918	782	1.874	1.770	1.634	1.383	1.247			1.903	1.767
	Run	436	364	268	642	571	476	298	165	875	804	711	538	440			800	705
	End	778	607	383	1.188	1.018	794	389	165	1.654	1.483	1.260	854	630			1.374	1.150
7 bar	Start	1.101	998	861	1.544	1.440	1.304	1.053	916		1.941	1.805	1.554	1.418				1.978
	Run	488	416	321	710	639	544	369	265		890	796	624	527				811
	End	881	710	487	1.323	1.153	929	523	300		1.654	1.430	1.025	801				1.361
7,5 bar	Start	1.205	1.101	965	1.678	1.575	1.438	1.187	1.051			1.975	1.724	1.588				
	Run	540	468	373	777	706	612	438	338			882	710	614				
	End	984	814	590	1.458	1.287	1.064	658	434			1.601	1.195	971				
8 bar	Start	1.308	1.204	1.068	1.813	1.709	1.573	1.322	1.186				1.895	1.759				
	Run	592	520	425	845	774	680	507	408				796	701				
	End	1.087	917	693	1.593	1.422	1.198	793	569				1.366	1.142				
8,5 bar	Start	1.411	1.307	1.171	1.948	1.844	1.708	1.457	1.321					1.929				
	Run	643	572	478	912	841	748	575	478					787				
	End	1.190	1.020	796	1.727	1.557	1.333	928	704					1.313				
9 bar	Start	1.514	1.410	1.274		1.979	1.843	1.592	1.455									
	Run	695	624	530		909	815	643	547									
	End	1.294	1.123	899		1.692	1.468	1.062	839									
9,5 bar	Start	1.617	1.514	1.377			1.978	1.726	1.590									
	Run	747	676	582			883	711	615									
	End	1.397	1.226	1.003			1.603	1.197	974									
10 bar	Start	1.720	1.617	1.481				1.861	1.725									
	Run	798	727	633				779	684									
	End	1.500	1.330	1.106				1.332	1.108									
10,5 bar	Start	1.824	1.720	1.584				1.996	1.860									
	Run	850	779	685				847	752									
	End	1.603	1.433	1.209				1.467	1.243									
11 bar	Start	1.927	1.823	1.687					1.995									
	Run	902	831	737					820									
	End	1.706	1.536	1.312					1.378									
11,5 bar	Start		1.926	1.790														
	Run		882	789														
	End		1.639	1.415														
12 bar	Start			1.893														
	Run			841														
	End			1.519														
Spring	Start	564	734	958	564	734	958	1.363	1.587	564	734	958	1.363	1.587	734	958	1.363	1.587
	Run	229	298	389	229	298	389	555	646	229	298	389	555	646	298	389	555	646
	End	343	447	583	343	447	583	834	970	343	447	583	834	970	447	583	834	970

OUTPUT TORQUE (Nm)

SPRING RETURN TORQUE

Supply pressure		AT-HDC 065 SR - P225			AT-HDC 065 SR - P250					AT-HDC 065 SR - P280					AT-HDC 065 SR - P330			
		SC02	SC04	SC06	SC02	SC04	SC06	SC08	SC10	SC02	SC04	SC06	SC08	SC10	SC04	SC06	SC08	SC10
2,5 bar	Start				674					991	750				1.357	1.093		
	Run				239					400	230				543	358		
	End				345					662	281				888	471		
3 bar	Start	640			923	682				1.303	1.062				1.790	1.526	1.202	
	Run	221			366	193				558	393				761	581	348	
	End	310			594	213				974	593				1.322	905	394	
3,5 bar	Start	841			1.172	931				1.615	1.374	1.110			2.224	1.960	1.636	
	Run	325			492	326				714	551	367			979	801	577	
	End	512			843	462				1.286	905	488			1.755	1.339	827	
4 bar	Start	1.043	801		1.421	1.180	916			1.928	1.686	1.422			2.658	2.394	2.070	1.704
	Run	427	258		617	453	263			871	709	528			1.197	1.019	799	540
	End	713	332		1.092	711	294			1.598	1.217	801			2.189	1.772	1.261	684
4,5 bar	Start	1.244	1.003		1.670	1.428	1.164			2.240	1.998	1.734	1.410		3.091	2.827	2.503	2.137
	Run	528	363		742	579	396			1.027	866	687	460		1.414	1.237	1.019	766
	End	915	534		1.341	960	543			1.910	1.529	1.113	602		2.623	2.206	1.695	1.117
5 bar	Start	1.446	1.205	940	1.919	1.677	1.413	1.089		2.552	2.311	2.046	1.722	1.357	3.525	3.261	2.937	2.571
	Run	629	466	277	867	704	524	281		1.184	1.022	845	622	336	1.631	1.455	1.237	988
	End	1.117	736	319	1.589	1.209	792	281		2.223	1.842	1.425	914	336	3.056	2.640	2.128	1.551
5,5 bar	Start	1.648	1.406	1.142	2.168	1.926	1.662	1.338		2.864	2.623	2.359	2.035	1.669	3.959	3.695	3.371	3.005
	Run	731	568	384	991	830	650	422		1.340	1.179	1.002	781	522	1.848	1.672	1.455	1.207
	End	1.318	937	521	1.838	1.457	1.041	530		2.535	2.154	1.737	1.226	649	3.490	3.073	2.562	1.985
6 bar	Start	1.849	1.608	1.344	2.417	2.175	1.911	1.587		3.176	2.935	2.671	2.347	1.981			3.804	3.438
	Run	832	669	488	1.116	955	776	552		1.496	1.336	1.159	939	686			1.673	1.426
	End	1.520	1.139	722	2.087	1.706	1.290	778		2.847	2.466	2.049	1.538	961			2.996	2.418
6,5 bar	Start	2.051	1.809	1.545	2.665	2.424	2.160	1.836	1.470	3.488	3.247	2.983	2.659	2.293				3.872
	Run	933	771	591	1.240	1.079	902	680	413	1.652	1.492	1.315	1.097	846				1.645
	End	1.721	1.340	924	2.336	1.955	1.538	1.027	450	3.159	2.778	2.362	1.850	1.273				2.852
7 bar	Start	2.252	2.011	1.747	2.914	2.673	2.409	2.085	1.719	3.801	3.559	3.295	2.971	2.605				
	Run	1.034	872	693	1.365	1.204	1.027	807	548	1.808	1.648	1.472	1.254	1.005				
	End	1.923	1.542	1.125	2.585	2.204	1.787	1.276	699	3.471	3.090	2.674	2.163	1.585				
7,5 bar	Start	2.454	2.212	1.948	3.163	2.922	2.658	2.334	1.968		3.871	3.607	3.283	2.917				
	Run	1.135	973	795	1.490	1.329	1.152	933	679		1.804	1.628	1.411	1.163				
	End	2.125	1.744	1.327	2.834	2.453	2.036	1.525	948		3.403	2.986	2.475	1.897				
8 bar	Start	2.655	2.414	2.150	3.412	3.171	2.907	2.583	2.217			3.920	3.596	3.230				
	Run	1.235	1.074	897	1.614	1.454	1.277	1.059	807			1.785	1.568	1.321				
	End	2.326	1.945	1.529	3.083	2.702	2.285	1.774	1.197			3.298	2.787	2.210				
8,5 bar	Start	2.857	2.616	2.352	3.661	3.419	3.155	2.831	2.466				3.908	3.542				
	Run	1.336	1.175	998	1.739	1.578	1.402	1.184	934				1.725	1.478				
	End	2.528	2.147	1.730	3.332	2.951	2.534	2.023	1.445				3.099	2.522				
9 bar	Start	3.059	2.817	2.553	3.910	3.668	3.404	3.080	2.714					3.854				
	Run	1.437	1.277	1.100	1.863	1.703	1.527	1.309	1.061					1.636				
	End	2.729	2.348	1.932	3.580	3.200	2.783	2.272	1.694					2.834				
9,5 bar	Start	3.260	3.019	2.755		3.917	3.653	3.329	2.963									
	Run	1.538	1.378	1.201		1.827	1.651	1.434	1.187									
	End	2.931	2.550	2.133		3.448	3.032	2.521	1.943									
10 bar	Start	3.462	3.220	2.956			3.902	3.578	3.212									
	Run	1.639	1.478	1.302			1.776	1.559	1.312									
	End	3.132	2.752	2.335			3.281	2.769	2.192									
10,5 bar	Start	3.663	3.422	3.158				3.827	3.461									
	Run	1.740	1.579	1.403				1.684	1.438									
	End	3.334	2.953	2.536				3.018	2.441									
11 bar	Start	3.865	3.624	3.359					3.710									
	Run	1.841	1.680	1.504					1.563									
	End	3.536	3.155	2.738					2.690									
11,5 bar	Start		3.825	3.561					3.959									
	Run		1.781	1.605					1.688									
	End		3.356	2.940					2.939									
12 bar	Start			3.763														
	Run			1.706														
	End			3.141														
Spring	Start	899	1.280	1.697	899	1.280	1.697	2.208	2.785	899	1.280	1.697	2.208	2.785	1.280	1.697	2.208	2.785
	Run	371	529	701	371	529	701	912	1.150	371	529	701	912	1.150	529	701	912	1.150
	End	570	811	1.075	570	811	1.075	1.399	1.765	570	811	1.075	1.399	1.765	811	1.075	1.399	1.765

OUTPUT TORQUE (Nm)

DOUBLE ACTING TORQUE

Supply pressure			AT-HDC 035 DA				AT-HDC 045 DA				AT-HDC 055 DA				AT-HDC 065 DA			
			080	100	125	150	125	150	175	200	175	200	225	250	225	250	280	330
2,5 bar	OPEN	Start	69	107	168	241	215	310	422	551	516	674	853	1053	1.008	1.244	1.561	2.168
		Run	34	54	84	121	108	155	211	276	258	337	426	526	504	622	780	1.084
		End	69	107	168	241	215	310	422	551	516	674	853	1053	1.008	1.244	1.561	2.168
	CLOSE	Start	66	104	165	238	212	307	419	548	509	667	846	1046	1.000	1.236	1.553	2.160
		Run	33	52	82	119	106	153	209	274	255	334	423	523	500	618	776	1.080
		End	66	104	165	238	212	307	419	548	509	667	846	1046	1.000	1.236	1.553	2.160
3 bar	OPEN	Start	82	129	201	289	258	372	507	662	619	809	1023	1264	1.210	1.493	1.873	2.602
		Run	41	64	101	145	129	186	253	331	310	404	512	632	605	747	937	1.301
		End	82	129	201	289	258	372	507	662	619	809	1023	1264	1.210	1.493	1.873	2.602
	CLOSE	Start	79	125	198	286	254	368	502	657	611	801	1015	1255	1.200	1.484	1.864	2.592
		Run	40	63	99	143	127	184	251	329	306	400	508	628	600	742	932	1.296
		End	79	125	198	286	254	368	502	657	611	801	1015	1255	1.200	1.484	1.864	2.592
3,5 bar	OPEN	Start	96	150	235	338	302	434	591	772	722	943	1194	1474	1.411	1.742	2.185	3.035
		Run	48	75	117	169	151	217	295	386	361	472	597	737	706	871	1.093	1.518
		End	96	150	235	338	302	434	591	772	722	943	1194	1474	1.411	1.742	2.185	3.035
	CLOSE	Start	92	146	231	334	297	429	586	767	713	934	1185	1465	1.400	1.731	2.174	3.024
		Run	46	73	115	167	148	215	293	383	356	467	592	732	700	865	1.087	1.512
		End	92	146	231	334	297	429	586	767	713	934	1185	1465	1.400	1.731	2.174	3.024
4 bar	OPEN	Start	110	172	268	386	345	496	675	882	825	1.078	1365	1685	1.613	1.991	2.497	3.469
		Run	55	86	134	193	172	248	338	441	413	539	682	842	806	995	1.249	1.735
		End	110	172	268	386	345	496	675	882	825	1.078	1365	1685	1.613	1.991	2.497	3.469
	CLOSE	Start	105	167	264	382	339	491	670	877	815	1.067	1354	1674	1.600	1.978	2.485	3.456
		Run	53	84	132	191	169	245	335	438	407	534	677	837	800	989	1.242	1.728
		End	105	167	264	382	339	491	670	877	815	1.067	1354	1674	1.600	1.978	2.485	3.456
4,5 bar	OPEN	Start	124	193	302	434	388	558	760	992	929	1.213	1535	1895	1.814	2.240	2.810	3.903
		Run	62	96	151	217	194	279	380	496	464	606	768	948	907	1.120	1.405	1.951
		End	124	193	302	434	388	558	760	992	929	1.213	1535	1895	1.814	2.240	2.810	3.903
	CLOSE	Start	119	188	297	429	381	552	753	986	917	1.201	1523	1883	1.800	2.226	2.795	3.888
		Run	59	94	148	215	191	276	377	493	458	600	762	942	900	1.113	1.398	1.944
		End	119	188	297	429	381	552	753	986	917	1.201	1523	1883	1.800	2.226	2.795	3.888
5 bar	OPEN	Start	137	214	335	482	431	620	844		1.032	1.348	1706		2.016	2.489	3.122	
		Run	69	107	168	241	215	310	422		516	674	853		1.008	1.244	1.561	
		End	137	214	335	482	431	620	844		1.032	1.348	1706		2.016	2.489	3.122	
	CLOSE	Start	132	209	330	477	424	613	837		1.018	1.334	1692		2.000	2.473	3.106	
		Run	66	104	165	238	212	307	419		509	667	846		1.000	1.236	1.553	
		End	132	209	330	477	424	613	837		1.018	1.334	1692		2.000	2.473	3.106	
5,5 bar	OPEN	Start	151	236	369		474	682	929		1.135	1.483	1876		2.217	2.738	3.434	
		Run	75	118	184		237	341	464		568	741	938		1.109	1.369	1.717	
		End	151	236	369		474	682	929		1.135	1.483	1876		2.217	2.738	3.434	
	CLOSE	Start	145	230	362		466	675	921		1.120	1.468	1861		2.200	2.720	3.417	
		Run	72	115	181		233	337	460		560	734	931		1.100	1.360	1.708	
		End	145	230	362		466	675	921		1.120	1.468	1861		2.200	2.720	3.417	
6 bar	OPEN	Start	165	257	402		517	744			1.238	1.617			2.419	2.986	3.746	
		Run	82	129	201		258	372			619	809			1.210	1.493	1.873	
		End	165	257	402		517	744			1.238	1.617			2.419	2.986	3.746	
	CLOSE	Start	158	251	395		508	736			1.222	1.601			2.400	2.967	3.727	
		Run	79	125	198		254	368			611	801			1.200	1.484	1.864	
		End	158	251	395		508	736			1.222	1.601			2.400	2.967	3.727	
6,5 bar	OPEN	Start	178	279	436		560	806			1.341	1.752			2.621	3.235		
		Run	89	139	218		280	403			671	876			1.310	1.618		
		End	178	279	436		560	806			1.341	1.752			2.621	3.235		
	CLOSE	Start	171	272	428		551	797			1.324	1.735			2.600	3.215		
		Run	86	136	214		275	399			662	867			1.300	1.607		
		End	171	272	428		551	797			1.324	1.735			2.600	3.215		
7 bar	OPEN	Start	192	300	469		603	868			1.445	1.887			2.822	3.484		
		Run	96	150	235		302	434			722	943			1.411	1.742		
		End	192	300	469		603	868			1.445	1.887			2.822	3.484		
	CLOSE	Start	184	292	461		593	858			1.426	1.868			2.800	3.462		
		Run	92	146	231		297	429			713	934			1.400	1.731		
		End	184	292	461		593	858			1.426	1.868			2.800	3.462		

OUTPUT TORQUE (Nm)

DOUBLE ACTING TORQUE

Supply pressure			AT-HDC 035 DA				AT-HDC 045 DA				AT-HDC 055 DA				AT-HDC 065 DA			
			080	100	125	150	125	150	175	200	175	200	225	250	225	250	280	330
7,5 bar	OPEN	Start	206	322			646	930			1.548				3.024	3.733		
		Run	103	161			323	465			774				1.512	1.867		
		End	206	322			646	930			1.548				3.024	3.733		
	CLOSE	Start	198	313			636	920			1.528				3.000	3.709		
		Run	99	157			318	460			764				1.500	1.855		
		End	198	313			636	920			1.528				3.000	3.709		
8 bar	OPEN	Start	220	343			689	992			1.651				3.225	3.982		
		Run	110	172			345	496			825				1.613	1.991		
		End	220	343			689	992			1.651				3.225	3.982		
	CLOSE	Start	211	334			678	981			1.629				3.200	3.956		
		Run	105	167			339	491			815				1.600	1.978		
		End	211	334			678	981			1.629				3.200	3.956		
8,5 bar	OPEN	Start	233	365			732				1.754				3.427			
		Run	117	182			366				877				1.713			
		End	233	365			732				1.754				3.427			
	CLOSE	Start	224	355			720				1.731				3.400			
		Run	112	178			360				866				1.700			
		End	224	355			720				1.731				3.400			
9 bar	OPEN	Start	247	386			775				1.857				3.629			
		Run	124	193			388				929				1.814			
		End	247	386			775				1.857				3.629			
	CLOSE	Start	237	376			763				1.833				3.600			
		Run	119	188			381				917				1.800			
		End	237	376			763				1.833				3.600			
9,5 bar	OPEN	Start	261	407			818				1.961				3.830			
		Run	130	204			409				980				1.915			
		End	261	407			818				1.961				3.830			
	CLOSE	Start	250	397			805				1.935				3.800			
		Run	125	198			403				967				1.900			
		End	250	397			805				1.935				3.800			
10 bar	OPEN	Start	274	429			861											
		Run	137	214			431											
		End	274	429			861											
	CLOSE	Start	263	418			847											
		Run	132	209			424											
		End	263	418			847											
10,5 bar	OPEN	Start	288	450			905											
		Run	144	225			452											
		End	288	450			905											
	CLOSE	Start	277	439			890											
		Run	138	219			445											
		End	277	439			890											
11 bar	OPEN	Start	302	472			948											
		Run	151	236			474											
		End	302	472			948											
	CLOSE	Start	290	460			932											
		Run	145	230			466											
		End	290	460			932											
11,5 bar	OPEN	Start	316	493			991											
		Run	158	247			495											
		End	316	493			991											
	CLOSE	Start	303	481			974											
		Run	151	240			487											
		End	303	481			974											
12 bar	OPEN	Start	329	515														
		Run	165	257														
		End	329	515														
	CLOSE	Start	316	501														
		Run	158	251														
		End	316	501														

OUTPUT TORQUE (Lb-In)

SPRING RETURN TORQUE

Supply pressure		AT-HDC 035 SR - P080		AT-HDC 035 SR - P100				AT-HDC 035 SR - P125					AT-HDC 035 SR - P150			
		SC02	SC04	SC02	SC04	SC06	SC08	SC02	SC04	SC06	SC08	SC10	SC04	SC06	SC08	SC10
2,5 bar	Start							965	717				1.372	929		
	Run							381	186				531	257		
	End							611	195				841	274		
3 bar	Start			620				1.266	1.018				1.797	1.363		
	Run			204				531	354				752	487		
	End			266				903	487				1.275	699		
3,5 bar	Start			814				1.558	1.310				2.230	1.788	1.531	
	Run			301				682	504				965	699	469	
	End			451				1.204	788				1.699	1.124	575	
4 bar	Start			1.000	752			1.859	1.611	1.168			2.655	2.213	1.956	
	Run			398	212			823	655	389			1.177	920	699	
	End			646	230			1.496	1.080	513			2.124	1.549	1.009	
4,5 bar	Start	575		1.195	947			2.151	1.903	1.469			3.080	2.638	2.381	1.912
	Run	177		496	310			974	805	540			1.390	1.133	912	558
	End	221		832	416			1.797	1.381	805			2.549	1.983	1.434	646
5 bar	Start	699		1.381	1.133			2.452	2.204	1.761	1.505		3.505	3.071	2.806	2.337
	Run	239		584	407			1.124	947	690	460		1.602	1.345	1.133	788
	End	336		1.027	602			2.089	1.673	1.106	558		2.983	2.407	1.859	1.071
5,5 bar	Start	823		1.567	1.328			2.744	2.496	2.062	1.806		3.939	3.496	3.239	2.770
	Run	301		682	504			1.275	1.097	841	620		1.814	1.558	1.345	1.009
	End	460		1.213	797			2.390	1.974	1.398	850		3.408	2.832	2.283	1.496
6 bar	Start	938		1.761	1.513	1.080		3.045	2.797	2.354	2.098		4.363	3.921	3.664	3.195
	Run	363		779	602	336		1.416	1.248	991	770		2.036	1.779	1.558	1.230
	End	584		1.398	982	416		2.682	2.266	1.699	1.151		3.832	3.257	2.717	1.929
6,5 bar	Start	1.062	814	1.947	1.708	1.266		3.337	3.089	2.655	2.399	1.921		4.346	4.089	3.620
	Run	425	248	876	699	434		1.567	1.398	1.142	920	566		1.991	1.779	1.443
	End	699	283	1.593	1.177	602		2.983	2.567	1.991	1.443	655		3.691	3.142	2.354
7 bar	Start	1.186	938	2.142	1.894	1.452		3.638	3.390	2.947	2.691	2.222				4.045
	Run	487	310	965	797	531		1.717	1.549	1.283	1.071	726				1.655
	End	823	407	1.779	1.363	797		3.275	2.859	2.292	1.744	956				2.779
7,5 bar	Start	1.301	1.062	2.328	2.089	1.646	1.390	3.930	3.682	3.248	2.992	2.514				
	Run	549	372	1.062	894	628	398	1.868	1.690	1.434	1.221	885				
	End	947	531	1.974	1.558	982	434	3.576	3.160	2.584	2.036	1.248				
8 bar	Start	1.425	1.177	2.522	2.275	1.832	1.575	4.231	3.983	3.540	3.284	2.815				
	Run	611	434	1.159	982	726	496	2.018	1.841	1.584	1.372	1.036				
	End	1.071	655	2.160	1.744	1.177	628	3.868	3.452	2.885	2.337	1.549				
8,5 bar	Start	1.549	1.301	2.708	2.461	2.027	1.770		4.275	3.841	3.585	3.107				
	Run	673	496	1.257	1.080	823	602		1.991	1.735	1.522	1.186				
	End	1.186	770	2.354	1.938	1.363	814		3.753	3.177	2.629	1.841				
9 bar	Start	1.673	1.425	2.903	2.655	2.213	1.956			4.133	3.877	3.408				
	Run	735	558	1.345	1.177	920	699			1.885	1.664	1.336				
	End	1.310	894	2.540	2.124	1.549	1.009			3.478	2.930	2.142				
9,5 bar	Start	1.788	1.549	3.089	2.841	2.407	2.142				4.178	3.700				
	Run	797	620	1.443	1.275	1.009	797				1.814	1.487				
	End	1.434	1.018	2.726	2.310	1.744	1.195				3.222	2.434				
10 bar	Start	1.912	1.664	3.275	3.036	2.593	2.337					4.001				
	Run	859	682	1.540	1.363	1.106	894					1.637				
	End	1.558	1.142	2.921	2.505	1.929	1.390					2.735				
10,5 bar	Start	2.036	1.788	3.469	3.222	2.788	2.522					4.293				
	Run	912	743	1.637	1.460	1.204	982					1.788				
	End	1.673	1.257	3.107	2.691	2.124	1.575					3.027				
11 bar	Start	2.160	1.912	3.655	3.416	2.974	2.717									
	Run	974	805	1.726	1.558	1.301	1.080									
	End	1.797	1.381	3.301	2.885	2.310	1.761									
11,5 bar	Start	2.275	2.036	3.850	3.602	3.160	2.903									
	Run	1.036	867	1.823	1.655	1.398	1.177									
	End	1.921	1.505	3.487	3.071	2.505	1.956									
12 bar	Start	2.399	2.151	4.036	3.788	3.354	3.098									
	Run	1.097	929	1.921	1.744	1.487	1.275									
	End	2.036	1.620	3.682	3.266	2.691	2.142									
Spring	Start	876	1.292	876	1.292	1.868	2.407	876	1.292	1.868	2.407	3.195	1.292	1.868	2.407	3.195
	Run	354	522	354	522	779	974	354	522	779	974	1.292	522	779	974	1.292
	End	513	761	513	761	1.204	1.460	513	761	1.204	1.460	1.929	761	1.204	1.460	1.929

OUTPUT TORQUE (Lb-In)

SPRING RETURN TORQUE

Supply pressure		AT-HDC 045 SR - P125			AT-HDC 045 SR - P150					AT-HDC 045 SR - P175					AT-HDC 045 SR - P200				
		SC02	SC04	SC06	SC02	SC04	SC06	SC08	SC10	SC02	SC04	SC06	SC08	SC10	SC02	SC04	SC06	SC08	SC10
2,5 bar	Start									1.744					2.885	2.434			
	Run									496					1.089	752			
	End									540					1.682	920			
3 bar	Start									2.496					3.868	3.408	2.850		
	Run									885					1.584	1.257	867		
	End									1.292					2.664	1.894	1.044		
3,5 bar	Start				1.850					3.239	2.779				4.841	4.381	3.824	3.257	
	Run				549					1.266	938				2.080	1.752	1.381	982	
	End				646					2.036	1.275				3.638	2.876	2.018	1.177	
4 bar	Start				2.399					3.992	3.531	2.974			5.815	5.364	4.806	4.231	3.744
	Run				841					1.646	1.319	929			2.567	2.248	1.876	1.496	1.044
	End				1.195					2.779	2.018	1.159			4.611	3.850	2.992	2.151	1.115
4,5 bar	Start				2.947	2.496				4.735	4.275	3.717	3.151		6.797	6.337	5.780	5.213	4.726
	Run				1.124	788				2.027	1.699	1.319	929		3.054	2.735	2.372	2.000	1.567
	End				1.744	982				3.531	2.770	1.912	1.071		5.585	4.824	3.974	3.124	2.089
5 bar	Start	1.823			3.496	3.045	2.487			5.479	5.027	4.470	3.894		7.771	7.311	6.753	6.187	5.700
	Run	540			1.398	1.071	664			2.399	2.080	1.708	1.328		3.549	3.231	2.859	2.487	2.071
	End	620			2.292	1.531	673			4.275	3.514	2.655	1.814		6.567	5.797	4.948	4.107	3.071
5,5 bar	Start	2.204			4.045	3.593	3.036			6.231	5.771	5.213	4.647	4.160	8.745	8.284	7.727	7.160	6.673
	Run	735			1.682	1.354	965			2.770	2.452	2.080	1.708	1.266	4.036	3.717	3.354	2.983	2.567
	End	1.000			2.841	2.080	1.221			5.027	4.257	3.408	2.567	1.531	7.541	6.780	5.921	5.080	4.045
6 bar	Start	2.584	2.124		4.594	4.142	3.585	3.009		6.974	6.523	5.957	5.390	4.903			8.709	8.134	7.656
	Run	938	584		1.956	1.629	1.248	850		3.151	2.832	2.461	2.089	1.664			3.841	3.478	3.062
	End	1.381	620		3.390	2.629	1.770	929		5.771	5.010	4.151	3.310	2.275			6.895	6.054	5.018
6,5 bar	Start	2.965	2.505		5.142	4.691	4.133	3.558		7.727	7.266	6.709	6.142	5.656					8.629
	Run	1.133	797		2.230	1.912	1.531	1.151		3.523	3.204	2.841	2.469	2.053					3.558
	End	1.761	1.000		3.939	3.177	2.319	1.478		6.523	5.753	4.903	4.054	3.027					6.001
7 bar	Start	3.346	2.894		5.691	5.240	4.682	4.107	3.629	8.470	8.010	7.452	6.886	6.399					
	Run	1.328	991		2.505	2.186	1.814	1.434	974	3.894	3.576	3.213	2.841	2.434					
	End	2.142	1.381		4.487	3.726	2.868	2.027	991	7.266	6.505	5.647	4.806	3.770					
7,5 bar	Start	3.726	3.275	2.708	6.249	5.788	5.231	4.664	4.178		8.762	8.205	7.629	7.151					
	Run	1.513	1.186	788	2.779	2.461	2.089	1.717	1.275		3.956	3.585	3.222	2.815					
	End	2.522	1.761	903	5.036	4.275	3.416	2.576	1.540		7.249	6.390	5.549	4.514					
8 bar	Start	4.107	3.655	3.098	6.797	6.337	5.780	5.213	4.726				8.382	7.895					
	Run	1.708	1.381	1.000	3.054	2.735	2.372	2.000	1.567				3.593	3.186					
	End	2.903	2.142	1.283	5.585	4.824	3.974	3.124	2.089				6.302	5.266					
8,5 bar	Start	4.487	4.036	3.478	7.346	6.886	6.328	5.762	5.275					8.647					
	Run	1.903	1.575	1.195	3.328	3.018	2.646	2.275	1.850					3.567					
	End	3.284	2.522	1.664	6.134	5.372	4.523	3.673	2.646					6.010					
9 bar	Start	4.868	4.417	3.859	7.895	7.435	6.877	6.311	5.824										
	Run	2.089	1.770	1.390	3.611	3.292	2.921	2.549	2.133										
	End	3.664	2.903	2.045	6.682	5.921	5.071	4.222	3.195										
9,5 bar	Start	5.257	4.797	4.240	8.444	7.983	7.426	6.859	6.373										
	Run	2.283	1.965	1.584	3.885	3.567	3.195	2.832	2.416										
	End	4.045	3.284	2.425	7.240	6.470	5.620	4.771	3.744										
10 bar	Start	5.638	5.178	4.620		8.532	7.975	7.408	6.921										
	Run	2.478	2.151	1.779		3.841	3.469	3.107	2.691										
	End	4.425	3.664	2.815		7.019	6.169	5.319	4.293										
10,5 bar	Start	6.019	5.558	5.001			8.523	7.957	7.470										
	Run	2.664	2.345	1.974			3.753	3.381	2.974										
	End	4.815	4.045	3.195			6.718	5.868	4.841										
11 bar	Start	6.399	5.939	5.381				8.506	8.019										
	Run	2.859	2.540	2.168				3.655	3.248										
	End	5.195	4.425	3.576				6.417	5.390										
11,5 bar	Start	6.780	6.319	5.762					8.568										
	Run	3.045	2.726	2.363					3.523										
	End	5.576	4.806	3.956					5.939										
12 bar	Start	7.160	6.700	6.142															
	Run	3.239	2.921	2.549															
	End	5.957	5.187	4.337															
Spring	Start	3.195	3.956	4.815	3.195	3.956	4.815	5.656	6.691	3.195	3.956	4.815	5.656	6.691	3.195	3.956	4.815	5.656	6.691
	Run	1.310	1.620	1.974	1.310	1.620	1.974	2.337	2.717	1.310	1.620	1.974	2.337	2.717	1.310	1.620	1.974	2.337	2.717
	End	1.991	2.452	3.009	1.991	2.452	3.009	3.576	4.062	1.991	2.452	3.009	3.576	4.062	1.991	2.452	3.009	3.576	4.062

OUTPUT TORQUE (Lb-In)

SPRING RETURN TORQUE

Supply pressure		AT-HDC 055 SR - P175			AT-HDC 055 SR - P200					AT-HDC 055 SR - P225					AT-HDC 055 SR - P250			
		SC02	SC04	SC06	SC02	SC04	SC06	SC08	SC10	SC02	SC04	SC06	SC08	SC10	SC04	SC06	SC08	SC10
2,5 bar	Start				2.930					4.514	3.593				5.364			
	Run				850					1.682	991				1.929			
	End				974					2.558	1.053				2.823			
3 bar	Start				4.116					6.019	5.098				7.231	6.019		
	Run				1.478					2.452	1.797				2.876	2.009		
	End				2.168					4.071	2.558				4.682	2.708		
3,5 bar	Start	3.354			5.310	4.390				7.532	6.612	5.408			9.090	7.886		
	Run	1.089			2.089	1.425				3.204	2.567	1.682			3.815	2.974		
	End	1.398			3.363	1.850				5.576	4.071	2.089			6.550	4.567		
4 bar	Start	4.266			6.505	5.585				9.037	8.125	6.912			10.957	9.754	7.523	
	Run	1.558			2.691	2.045				3.965	3.328	2.478			4.753	3.912	2.319	
	End	2.319			4.549	3.045				7.089	5.576	3.602			8.408	6.434	2.841	
4,5 bar	Start	5.178	4.266		7.700	6.780	5.576			10.550	9.630	8.426			12.816	11.612	9.391	8.187
	Run	2.027	1.354		3.292	2.646	1.779			4.726	4.089	3.248			5.691	4.859	3.301	2.390
	End	3.231	1.717		5.744	4.240	2.257			8.594	7.089	5.107			10.276	8.293	4.709	2.726
5 bar	Start	6.098	5.178		8.895	7.975	6.771			12.055	11.143	9.939	7.709		14.683	13.480	11.258	10.046
	Run	2.487	1.832		3.894	3.257	2.399			5.479	4.850	4.009	2.425		6.620	5.797	4.257	3.381
	End	4.142	2.638		6.939	5.434	3.452			10.108	8.603	6.620	3.027		12.143	10.161	6.567	4.594
5,5 bar	Start	7.010	6.089	4.886	10.081	9.169	7.957			13.568	12.648	11.444	9.222	8.019	16.542	15.338	13.117	11.913
	Run	2.947	2.301	1.398	4.487	3.859	3.009			6.240	5.603	4.771	3.213	2.292	7.559	6.727	5.204	4.346
	End	5.054	3.549	1.567	8.134	6.620	4.647			11.612	10.108	8.125	4.540	2.558	14.002	12.019	8.435	6.452
6 bar	Start	7.921	7.001	5.797	11.276	10.355	9.152	6.930		15.082	14.161	12.957	10.736	9.523		17.206	14.984	13.781
	Run	3.408	2.761	1.894	5.089	4.452	3.611	2.000		6.992	6.364	5.532	3.992	3.107		7.665	6.142	5.293
	End	5.965	4.461	2.478	9.320	7.815	5.833	2.248		13.126	11.621	9.638	6.045	4.071		13.887	10.302	8.320
6,5 bar	Start	8.833	7.913	6.709	12.471	11.550	10.347	8.125	6.921	16.586	15.666	14.462	12.241	11.037			16.843	15.639
	Run	3.859	3.222	2.372	5.682	5.054	4.213	2.638	1.460	7.744	7.116	6.293	4.762	3.894			7.081	6.240
	End	6.886	5.372	3.390	10.515	9.010	7.027	3.443	1.460	14.639	13.126	11.152	7.559	5.576			12.161	10.178
7 bar	Start	9.745	8.833	7.620	13.666	12.745	11.541	9.320	8.107		17.179	15.976	13.754	12.550				17.507
	Run	4.319	3.682	2.841	6.284	5.656	4.815	3.266	2.345		7.877	7.045	5.523	4.664				7.178
	End	7.798	6.284	4.310	11.710	10.205	8.222	4.629	2.655		14.639	12.657	9.072	7.089				12.046
7,5 bar	Start	10.665	9.745	8.541	14.852	13.940	12.727	10.506	9.302			17.480	15.259	14.055				
	Run	4.779	4.142	3.301	6.877	6.249	5.417	3.877	2.992			7.806	6.284	5.434				
	End	8.709	7.205	5.222	12.904	11.391	9.417	5.824	3.841			14.170	10.577	8.594				
8 bar	Start	11.577	10.656	9.453	16.046	15.126	13.922	11.701	10.497				16.772	15.568				
	Run	5.240	4.602	3.762	7.479	6.850	6.019	4.487	3.611				7.045	6.204				
	End	9.621	8.116	6.134	14.099	12.586	10.603	7.019	5.036				12.090	10.108				
8,5 bar	Start	12.488	11.568	10.364	17.241	16.321	15.117	12.896	11.692					17.073				
	Run	5.691	5.063	4.231	8.072	7.443	6.620	5.089	4.231					6.966				
	End	10.532	9.028	7.045	15.285	13.781	11.798	8.213	6.231					11.621				
9 bar	Start	13.400	12.480	11.276		17.516	16.312	14.090	12.878									
	Run	6.151	5.523	4.691		8.045	7.213	5.691	4.841									
	End	11.453	9.939	7.957		14.975	12.993	9.399	7.426									
9,5 bar	Start	14.312	13.400	12.187			17.507	15.276	14.073									
	Run	6.612	5.983	5.151			7.815	6.293	5.443									
	End	12.364	10.851	8.877			14.188	10.594	8.621									
10 bar	Start	15.223	14.312	13.108				16.471	15.268									
	Run	7.063	6.434	5.603				6.895	6.054									
	End	13.276	11.771	9.789				11.789	9.807									
10,5 bar	Start	16.144	15.223	14.020				17.666	16.462									
	Run	7.523	6.895	6.063				7.497	6.656									
	End	14.188	12.683	10.701				12.984	11.001									
11 bar	Start	17.055	16.135	14.931					17.657									
	Run	7.983	7.355	6.523					7.258									
	End	15.099	13.595	11.612					12.196									
11,5 bar	Start		17.047	15.843														
	Run		7.806	6.983														
	End		14.506	12.524														
12 bar	Start			16.754														
	Run			7.443														
	End			13.444														
Spring	Start	4.992	6.496	8.479	4.992	6.496	8.479	12.064	14.046	4.992	6.496	8.479	12.064	14.046	6.496	8.479	12.064	14.046
	Run	2.027	2.638	3.443	2.027	2.638	3.443	4.912	5.718	2.027	2.638	3.443	4.912	5.718	2.638	3.443	4.912	5.718
	End	3.036	3.956	5.160	3.036	3.956	5.160	7.382	8.585	3.036	3.956	5.160	7.382	8.585	3.956	5.160	7.382	8.585

OUTPUT TORQUE (Lb-In)

SPRING RETURN TORQUE

Supply pressure		AT-HDC 065 SR - P225			AT-HDC 065 SR - P250					AT-HDC 065 SR - P280					AT-HDC 065 SR - P330			
		SC02	SC04	SC06	SC02	SC04	SC06	SC08	SC10	SC02	SC04	SC06	SC08	SC10	SC04	SC06	SC08	SC10
2,5 bar	Start				5.965					8.771	6.638				12.010	9.674		
	Run				2.115					3.540	2.036				4.806	3.169		
	End				3.054					5.859	2.487				7.859	4.169		
3 bar	Start	5.664			8.169	6.036				11.533	9.399				15.843	13.506	10.639	
	Run	1.956			3.239	1.708				4.939	3.478				6.735	5.142	3.080	
	End	2.744			5.257	1.885				8.621	5.248				11.701	8.010	3.487	
3,5 bar	Start	7.443			10.373	8.240				14.294	12.161	9.824			19.684	17.347	14.480	
	Run	2.876			4.355	2.885				6.319	4.877	3.248			8.665	7.089	5.107	
	End	4.532			7.461	4.089				11.382	8.010	4.319			15.533	11.851	7.320	
4 bar	Start	9.231	7.089		12.577	10.444	8.107			17.064	14.922	12.586			23.525	21.189	18.321	15.082
	Run	3.779	2.283		5.461	4.009	2.328			7.709	6.275	4.673			10.594	9.019	7.072	4.779
	End	6.311	2.938		9.665	6.293	2.602			14.143	10.771	7.089			19.374	15.684	11.161	6.054
4,5 bar	Start	11.010	8.877		14.781	12.639	10.302			19.826	17.684	15.347	12.480		27.358	25.021	22.153	18.914
	Run	4.673	3.213		6.567	5.125	3.505			9.090	7.665	6.080	4.071		12.515	10.948	9.019	6.780
	End	8.098	4.726		11.869	8.497	4.806			16.905	13.533	9.851	5.328		23.216	19.525	15.002	9.886
5 bar	Start	12.798	10.665	8.320	16.985	14.843	12.506	9.638		22.587	20.454	18.109	15.241	12.010	31.199	28.862	25.995	22.755
	Run	5.567	4.124	2.452	7.674	6.231	4.638	2.487		10.479	9.045	7.479	5.505	2.974	14.436	12.878	10.948	8.745
	End	9.886	6.514	2.823	14.064	10.701	7.010	2.487		19.675	16.303	12.612	8.090	2.974	27.048	23.366	18.834	13.728
5,5 bar	Start	14.586	12.444	10.108	19.188	17.047	14.710	11.842		25.349	23.216	20.879	18.011	14.772	35.040	32.704	29.836	26.596
	Run	6.470	5.027	3.399	8.771	7.346	5.753	3.735		11.860	10.435	8.868	6.912	4.620	16.356	14.798	12.878	10.683
	End	11.665	8.293	4.611	16.268	12.896	9.214	4.691		22.437	19.065	15.374	10.851	5.744	30.889	27.198	22.676	17.569
6 bar	Start	16.365	14.232	11.895	21.392	19.250	16.914	14.046		28.110	25.977	23.640	20.773	17.533			33.668	30.429
	Run	7.364	5.921	4.319	9.877	8.452	6.868	4.886		13.241	11.825	10.258	8.311	6.072			14.807	12.621
	End	13.453	10.081	6.390	18.472	15.099	11.417	6.886		25.198	21.826	18.135	13.612	8.506			26.517	21.401
6,5 bar	Start	18.153	16.011	13.674	23.587	21.454	19.118	16.250	13.011	30.871	28.738	26.402	23.534	20.295				34.270
	Run	8.258	6.824	5.231	10.975	9.550	7.983	6.019	3.655	14.621	13.205	11.639	9.709	7.488				14.559
	End	15.232	11.860	8.178	20.675	17.303	13.612	9.090	3.983	27.960	24.587	20.905	16.374	11.267				25.242
7 bar	Start	19.932	17.799	15.462	25.791	23.658	21.321	18.454	15.214	33.642	31.500	29.163	26.296	23.056				
	Run	9.152	7.718	6.134	12.081	10.656	9.090	7.143	4.850	16.002	14.586	13.028	11.099	8.895				
	End	17.020	13.648	9.957	22.879	19.507	15.816	11.294	6.187	30.721	27.349	23.667	19.144	14.028				
7,5 bar	Start	21.720	19.578	17.241	27.995	25.862	23.525	20.658	17.418		34.261	31.925	29.057	25.818				
	Run	10.046	8.612	7.036	13.188	11.763	10.196	8.258	6.010		15.967	14.409	12.488	10.293				
	End	18.808	15.436	11.745	25.083	21.711	18.020	13.497	8.391		30.119	26.428	21.906	16.790				
8 bar	Start	23.499	21.366	19.029	30.199	28.066	25.729	22.861	19.622			34.695	31.827	28.588				
	Run	10.931	9.506	7.939	14.285	12.869	11.302	9.373	7.143			15.799	13.878	11.692				
	End	20.587	17.215	13.533	27.287	23.915	20.224	15.701	10.594			29.190	24.667	19.560				
8,5 bar	Start	25.287	23.154	20.817	32.403	30.261	27.924	25.056	21.826				34.589	31.349				
	Run	11.825	10.400	8.833	15.391	13.966	12.409	10.479	8.267				15.268	13.081				
	End	22.375	19.003	15.312	29.491	26.119	22.428	17.905	12.789				27.428	22.322				
9 bar	Start	27.074	24.933	22.596	34.606	32.465	30.128	27.260	24.021					34.111				
	Run	12.719	11.302	9.736	16.489	15.073	13.515	11.586	9.391					14.480				
	End	24.154	20.782	17.100	31.686	28.322	24.632	20.109	14.993					25.083				
9,5 bar	Start	28.853	26.720	24.384		34.668	32.332	29.464	26.225									
	Run	13.612	12.196	10.630		16.170	14.613	12.692	10.506									
	End	25.942	22.569	18.879		30.517	26.835	22.313	17.197									
10 bar	Start	30.641	28.499	26.163			34.536	31.668	28.429									
	Run	14.506	13.081	11.524			15.719	13.798	11.612									
	End	27.721	24.357	20.666			29.039	24.508	19.401									
10,5 bar	Start	32.420	30.287	27.951				33.872	30.632									
	Run	15.400	13.975	12.418				14.905	12.727									
	End	29.508	26.136	22.445				26.712	21.605									
11 bar	Start	34.208	32.075	29.730					32.836									
	Run	16.294	14.869	13.312					13.834									
	End	31.296	27.924	24.233					23.809									
11,5 bar	Start		33.854	31.518					35.040									
	Run		15.763	14.205					14.940									
	End		29.703	26.021					26.012									
12 bar	Start			33.305														
	Run			15.099														
	End			27.800														
Spring	Start	7.957	11.329	15.020	7.957	11.329	15.020	19.542	24.649	7.957	11.329	15.020	19.542	24.649	11.329	15.020	19.542	24.649
	Run	3.284	4.682	6.204	3.284	4.682	6.204	8.072	10.178	3.284	4.682	6.204	8.072	10.178	4.682	6.204	8.072	10.178
	End	5.045	7.178	9.515	5.045	7.178	9.515	12.382	15.622	5.045	7.178	9.515	12.382	15.622	7.178	9.515	12.382	15.622

OUTPUT TORQUE (Lb-In)

DOUBLE ACTING TORQUE

Supply pressure			AT-HDC 035 DA				AT-HDC 045 DA				AT-HDC 055 DA				AT-HDC 065 DA			
			080	100	125	150	125	150	175	200	175	200	225	250	225	250	280	330
2,5 bar	OPEN	Start	611	947	1.487	2.133	1.903	2.744	3.735	4.877	4.567	5.965	7.550	9.320	8.922	11.010	13.816	19.188
		Run	301	478	743	1.071	956	1.372	1.868	2.443	2.283	2.983	3.770	4.655	4.461	5.505	6.904	9.594
		End	611	947	1.487	2.133	1.903	2.744	3.735	4.877	4.567	5.965	7.550	9.320	8.922	11.010	13.816	19.188
	CLOSE	Start	584	920	1.460	2.106	1.876	2.717	3.708	4.850	4.505	5.903	7.488	9.258	8.851	10.940	13.745	19.118
		Run	292	460	726	1.053	938	1.354	1.850	2.425	2.257	2.956	3.744	4.629	4.425	5.470	6.868	9.559
		End	584	920	1.460	2.106	1.876	2.717	3.708	4.850	4.505	5.903	7.488	9.258	8.851	10.940	13.745	19.118
3 bar	OPEN	Start	726	1.142	1.779	2.558	2.283	3.292	4.487	5.859	5.479	7.160	9.054	11.187	10.709	13.214	16.577	23.030
		Run	363	566	894	1.283	1.142	1.646	2.239	2.930	2.744	3.576	4.532	5.594	5.355	6.612	8.293	11.515
		End	726	1.142	1.779	2.558	2.283	3.292	4.487	5.859	5.479	7.160	9.054	11.187	10.709	13.214	16.577	23.030
	CLOSE	Start	699	1.106	1.752	2.531	2.248	3.257	4.443	5.815	5.408	7.089	8.984	11.108	10.621	13.135	16.498	22.941
		Run	354	558	876	1.266	1.124	1.629	2.222	2.912	2.708	3.540	4.496	5.558	5.310	6.567	8.249	11.471
		End	699	1.106	1.752	2.531	2.248	3.257	4.443	5.815	5.408	7.089	8.984	11.108	10.621	13.135	16.498	22.941
3,5 bar	OPEN	Start	850	1.328	2.080	2.992	2.673	3.841	5.231	6.833	6.390	8.346	10.568	13.046	12.488	15.418	19.339	26.862
		Run	425	664	1.036	1.496	1.336	1.921	2.611	3.416	3.195	4.178	5.284	6.523	6.249	7.709	9.674	13.435
		End	850	1.328	2.080	2.992	2.673	3.841	5.231	6.833	6.390	8.346	10.568	13.046	12.488	15.418	19.339	26.862
	CLOSE	Start	814	1.292	2.045	2.956	2.629	3.797	5.187	6.789	6.311	8.267	10.488	12.966	12.391	15.321	19.242	26.765
		Run	407	646	1.018	1.478	1.310	1.903	2.593	3.390	3.151	4.133	5.240	6.479	6.196	7.656	9.621	13.382
		End	814	1.292	2.045	2.956	2.629	3.797	5.187	6.789	6.311	8.267	10.488	12.966	12.391	15.321	19.242	26.765
4 bar	OPEN	Start	974	1.522	2.372	3.416	3.054	4.390	5.974	7.806	7.302	9.541	12.081	14.914	14.276	17.622	22.100	30.703
		Run	487	761	1.186	1.708	1.522	2.195	2.992	3.903	3.655	4.771	6.036	7.452	7.134	8.806	11.055	15.356
		End	974	1.522	2.372	3.416	3.054	4.390	5.974	7.806	7.302	9.541	12.081	14.914	14.276	17.622	22.100	30.703
	CLOSE	Start	929	1.478	2.337	3.381	3.000	4.346	5.930	7.762	7.213	9.444	11.984	14.816	14.161	17.507	21.994	30.588
		Run	469	743	1.168	1.690	1.496	2.168	2.965	3.877	3.602	4.726	5.992	7.408	7.081	8.753	10.993	15.294
		End	929	1.478	2.337	3.381	3.000	4.346	5.930	7.762	7.213	9.444	11.984	14.816	14.161	17.507	21.994	30.588
4,5 bar	OPEN	Start	1.097	1.708	2.673	3.841	3.434	4.939	6.727	8.780	8.222	10.736	13.586	16.772	16.055	19.826	24.871	34.544
		Run	549	850	1.336	1.921	1.717	2.469	3.363	4.390	4.107	5.364	6.797	8.391	8.028	9.913	12.435	17.268
		End	1.097	1.708	2.673	3.841	3.434	4.939	6.727	8.780	8.222	10.736	13.586	16.772	16.055	19.826	24.871	34.544
	CLOSE	Start	1.053	1.664	2.629	3.797	3.372	4.886	6.665	8.727	8.116	10.630	13.480	16.666	15.931	19.702	24.738	34.412
		Run	522	832	1.310	1.903	1.690	2.443	3.337	4.363	4.054	5.310	6.744	8.337	7.966	9.851	12.373	17.206
		End	1.053	1.664	2.629	3.797	3.372	4.886	6.665	8.727	8.116	10.630	13.480	16.666	15.931	19.702	24.738	34.412
5 bar	OPEN	Start	1.213	1.894	2.965	4.266	3.815	5.487	7.470		9.134	11.931	15.099		17.843	22.030	27.632	
		Run	611	947	1.487	2.133	1.903	2.744	3.735		4.567	5.965	7.550		8.922	11.010	13.816	
		End	1.213	1.894	2.965	4.266	3.815	5.487	7.470		9.134	11.931	15.099		17.843	22.030	27.632	
	CLOSE	Start	1.168	1.850	2.921	4.222	3.753	5.426	7.408		9.010	11.807	14.975		17.701	21.888	27.490	
		Run	584	920	1.460	2.106	1.876	2.717	3.708		4.505	5.903	7.488		8.851	10.940	13.745	
		End	1.168	1.850	2.921	4.222	3.753	5.426	7.408		9.010	11.807	14.975		17.701	21.888	27.490	
5,5 bar	OPEN	Start	1.336	2.089	3.266		4.195	6.036	8.222		10.046	13.126	16.604		19.622	24.233	30.393	
		Run	664	1.044	1.629		2.098	3.018	4.107		5.027	6.558	8.302		9.815	12.117	15.197	
		End	1.336	2.089	3.266		4.195	6.036	8.222		10.046	13.126	16.604		19.622	24.233	30.393	
	CLOSE	Start	1.283	2.036	3.204		4.124	5.974	8.152		9.913	12.993	16.471		19.472	24.074	30.243	
		Run	637	1.018	1.602		2.062	2.983	4.071		4.956	6.496	8.240		9.736	12.037	15.117	
		End	1.283	2.036	3.204		4.124	5.974	8.152		9.913	12.993	16.471		19.472	24.074	30.243	
6 bar	OPEN	Start	1.460	2.275	3.558		4.576	6.585			10.957	14.312			21.410	26.428	33.155	
		Run	726	1.142	1.779		2.283	3.292			5.479	7.160			10.709	13.214	16.577	
		End	1.460	2.275	3.558		4.576	6.585			10.957	14.312			21.410	26.428	33.155	
	CLOSE	Start	1.398	2.222	3.496		4.496	6.514			10.816	14.170			21.242	26.260	32.987	
		Run	699	1.106	1.752		2.248	3.257			5.408	7.089			10.621	13.135	16.498	
		End	1.398	2.222	3.496		4.496	6.514			10.816	14.170			21.242	26.260	32.987	
6,5 bar	OPEN	Start	1.575	2.469	3.859		4.956	7.134			11.869	15.507			23.198	28.632		
		Run	788	1.230	1.929		2.478	3.567			5.939	7.753			11.594	14.321		
		End	1.575	2.469	3.859		4.956	7.134			11.869	15.507			23.198	28.632		
	CLOSE	Start	1.513	2.407	3.788		4.877	7.054			11.718	15.356			23.012	28.455		
		Run	761	1.204	1.894		2.434	3.531			5.859	7.674			11.506	14.223		
		End	1.513	2.407	3.788		4.877	7.054			11.718	15.356			23.012	28.455		
7 bar	OPEN	Start	1.699	2.655	4.151		5.337	7.682			12.789	16.701			24.977	30.836		
		Run	850	1.328	2.080		2.673	3.841			6.390	8.346			12.488	15.418		
		End	1.699	2.655	4.151		5.337	7.682			12.789	16.701			24.977	30.836		
	CLOSE	Start	1.629	2.584	4.080		5.248	7.594			12.621	16.533			24.782	30.641		
		Run	814	1.292	2.045		2.629	3.797			6.311	8.267			12.391	15.321		
		End	1.629	2.584	4.080		5.248	7.594			12.621	16.533			24.782	30.641		

OUTPUT TORQUE (Lb-In)

DOUBLE ACTING TORQUE

Supply pressure			AT-HDC 035 DA				AT-HDC 045 DA				AT-HDC 055 DA				AT-HDC 065 DA			
			080	100	125	150	125	150	175	200	175	200	225	250	225	250	280	330
7,5 bar	OPEN	Start	1.823	2.850			5.718	8.231			13.701				26.765	33.040		
		Run	912	1.425			2.859	4.116			6.850				13.382	16.524		
		End	1.823	2.850			5.718	8.231			13.701				26.765	33.040		
	CLOSE	Start	1.752	2.770			5.629	8.143			13.524				26.552	32.827		
		Run	876	1.390			2.815	4.071			6.762				13.276	16.418		
		End	1.752	2.770			5.629	8.143			13.524				26.552	32.827		
8 bar	OPEN	Start	1.947	3.036			6.098	8.780			14.613				28.544	35.244		
		Run	974	1.522			3.054	4.390			7.302				14.276	17.622		
		End	1.947	3.036			6.098	8.780			14.613				28.544	35.244		
	CLOSE	Start	1.868	2.956			6.001	8.683			14.418				28.322	35.014		
		Run	929	1.478			3.000	4.346			7.213				14.161	17.507		
		End	1.868	2.956			6.001	8.683			14.418				28.322	35.014		
8,5 bar	OPEN	Start	2.062	3.231			6.479				15.524				30.332			
		Run	1.036	1.611			3.239				7.762				15.161			
		End	2.062	3.231			6.479				15.524				30.332			
	CLOSE	Start	1.983	3.142			6.373				15.321				30.093			
		Run	991	1.575			3.186				7.665				15.046			
		End	1.983	3.142			6.373				15.321				30.093			
9 bar	OPEN	Start	2.186	3.416			6.859				16.436				32.119			
		Run	1.097	1.708			3.434				8.222				16.055			
		End	2.186	3.416			6.859				16.436				32.119			
	CLOSE	Start	2.098	3.328			6.753				16.223				31.863			
		Run	1.053	1.664			3.372				8.116				15.931			
		End	2.098	3.328			6.753				16.223				31.863			
9,5 bar	OPEN	Start	2.310	3.602			7.240				17.356				33.898			
		Run	1.151	1.806			3.620				8.674				16.949			
		End	2.310	3.602			7.240				17.356				33.898			
	CLOSE	Start	2.213	3.514			7.125				17.126				33.633			
		Run	1.106	1.752			3.567				8.559				16.816			
		End	2.213	3.514			7.125				17.126				33.633			
10 bar	OPEN	Start	2.425	3.797			7.620											
		Run	1.213	1.894			3.815											
		End	2.425	3.797			7.620											
	CLOSE	Start	2.328	3.700			7.497											
		Run	1.168	1.850			3.753											
		End	2.328	3.700			7.497											
10,5 bar	OPEN	Start	2.549	3.983			8.010											
		Run	1.275	1.991			4.001											
		End	2.549	3.983			8.010											
	CLOSE	Start	2.452	3.885			7.877											
		Run	1.221	1.938			3.939											
		End	2.452	3.885			7.877											
11 bar	OPEN	Start	2.673	4.178			8.391											
		Run	1.336	2.089			4.195											
		End	2.673	4.178			8.391											
	CLOSE	Start	2.567	4.071			8.249											
		Run	1.283	2.036			4.124											
		End	2.567	4.071			8.249											
11,5 bar	OPEN	Start	2.797	4.363			8.771											
		Run	1.398	2.186			4.381											
		End	2.797	4.363			8.771											
	CLOSE	Start	2.682	4.257			8.621											
		Run	1.336	2.124			4.310											
		End	2.682	4.257			8.621											
12 bar	OPEN	Start	2.912	4.558														
		Run	1.460	2.275														
		End	2.912	4.558														
	CLOSE	Start	2.797	4.434														
		Run	1.398	2.222														
		End	2.797	4.434														

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