

# REGULATORS

## HD Series

### Pilot-Operated Regulating Valves

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The HD-Series is the upgraded model for the D-Series Regulator. HD & D internal components and pilots are interchangeable.

#### HD Series features & benefits

- Ductile Iron body for higher pressures
- Full port strainer & blowdown valve on pilot adapter for ultimate protection from dirt & scale
- Hardened stainless steel trim for extended life
- Pre-mounted tubing & field reversible pilot adapter

#### TYPICAL APPLICATIONS

The Watson McDaniel **HD-Series** and **D-Series** pilot operated regulators were designed for **extremely accurate control** of **temperature** and **pressure** in steam service applications. The **D-Series** is made of **Cast-Iron**. The **HD-Series** is made of **Ductile-iron** for extended pressure and temperature ratings. These regulators use several different control pilots, which can be attached to the valve to control pressure, temperature, or a combination of both. The different control pilots can be added or removed from the regulator body. This modular design adds to the versatility of this product. This product line offers a complete range of overlapping pressure ranges with clearly marked color-coded springs. The most common options include the **P-Pilot** for pressure reducing, and the **T-Pilot** for temperature control.

#### CONTROL PILOTS

##### Pilot Mounting

Standard pilot mounting is on the right side of the regulator when looking into the outlet port (See diagrams on opposite page which are all right mounted). For opposite mounting, please specify when ordering. Pilot mounting on HD regulators are field reversible.

##### Pressure

When controlling pressure there are several options you can use for a pilot. The **P-Pilot** and the **P5-Pilot** are both **spring adjusted** pressure pilots. The **P-Pilot** is used on typical general-purpose pressure reducing applications. The **P5-Pilot** is used when added accuracy is required. The **P5** is capable of maintaining a control pressure window of less than 1 psi. The **A-Pilot** is air controlled and generally used when adjustment of the regulator and pressure reducing station is done remotely.

##### Temperature

The **T-Pilot** is used to control temperature. The **T-Pilot** is filled with a temperature sensitive liquid, which expands when heated. The expansion of this liquid actuates a bellows that controls the temperature-regulating valve. The **T-Pilot** is equipped with an overheat bellows that protects the pilot in case of an over temperature condition. The **T-Pilot** controls temperature through a range from **60-260°F**.

##### On-Off

**On-off control** of the regulator is possible by using the **S-Solenoid Pilot**. The **S-Pilot** allows the regulator to be shut down or turned on **electrically**. Normally the regulator is equipped with either a **P-Pressure Pilot** or **T-Temperature Pilot** in addition to the **S-Solenoid Pilot**.

##### Pressure-Temperature

The **PT-Pilot** combination is used when it is desirable to control both the **pressure** and **temperature** of a system with only one regulating valve. The unique features of this modular valve allow this to be accomplished quite easily. When the **PT-Pilot** combination is used, the down stream pressure is limited to a maximum setting by the pressure pilot, while the temperature pilot maintains the correct temperature.

##### Back-Pressure

When controlling the back pressure in a steam system, **BP-Pilot** is used in conjunction with the **HD-Series** Regulator. This controls the pressure on the up-stream side of the regulator.

#### COMBINATION PILOTS

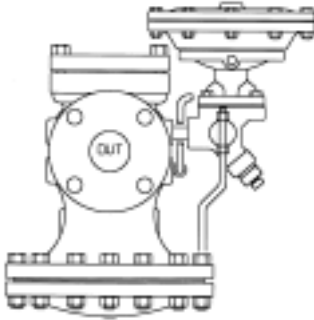
One of the advantages of the **HD-Series** regulating valve is that it can be used with many different variations of control pilots. Up to three pilots can be used simultaneously to control the operation of these valves. The most common is the **Temperature-Pressure** combination pilot. In addition to these pilots being used together the **S-Solenoid Pilot** can be used for turning the system on and off.

# HD Series

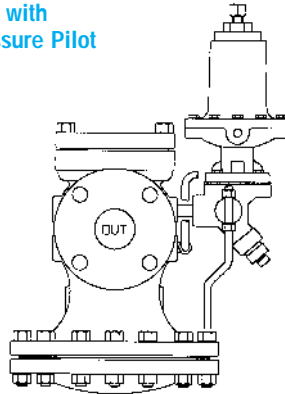
Pilot-Operated Regulating Valves

## TYPICAL REGULATOR & PILOT COMBINATIONS

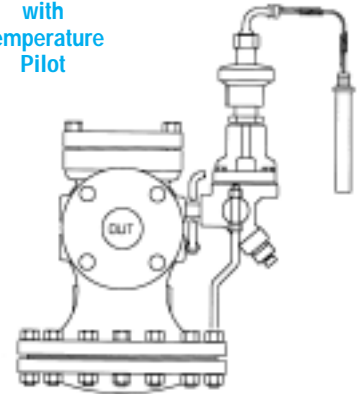
**HDA**  
Regulator  
with  
Air Pilot



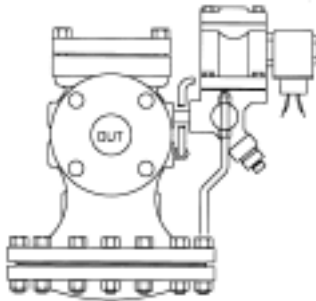
**HDP**  
Regulator  
with  
Pressure Pilot



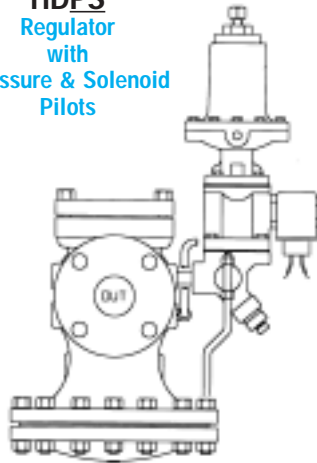
**HDT**  
Regulator  
with  
Temperature  
Pilot



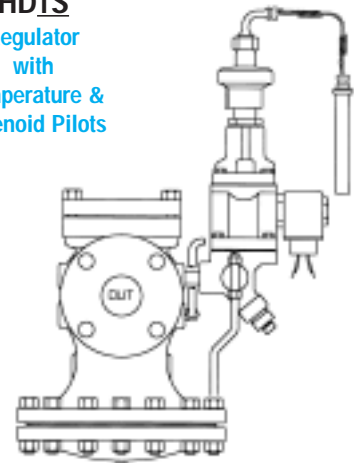
**HDS**  
Regulator  
with  
Solenoid Pilot



**HDPS**  
Regulator  
with  
Pressure & Solenoid  
Pilots

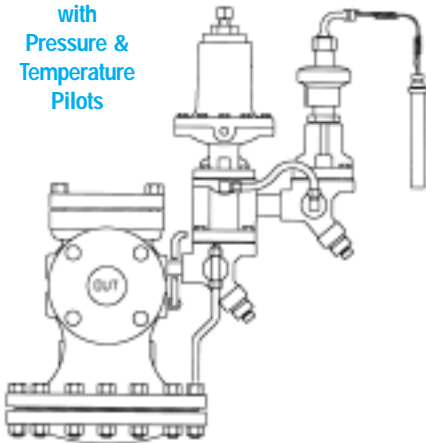


**HDTS**  
Regulator  
with  
Temperature &  
Solenoid Pilots

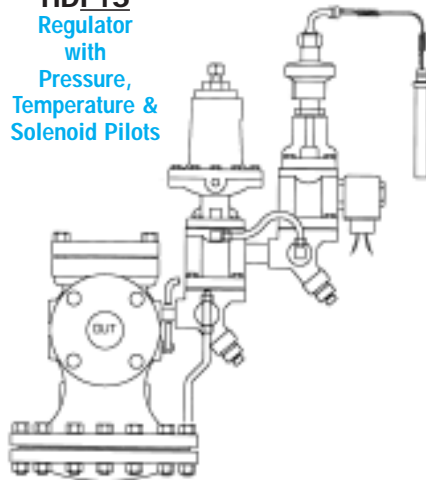


REGULATORS

**HDPT**  
Regulator  
with  
Pressure &  
Temperature  
Pilots



**HDPTS**  
Regulator  
with  
Pressure,  
Temperature &  
Solenoid Pilots



### OTHER PILOTS COMBINATIONS

- Temperature Regulating Pilot
- Air / Solenoid
- Air / Pneumatic Temperature Controller
- Air / Solenoid / Pneumatic Temperature Controller
- Back Pressure
- Back Pressure / Solenoid

*Watson McDaniel's Pilots will fit other Manufacturers' Regulators.*

# REGULATORS

## HD Series

### Pilot-Operated Regulating Valves

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Revised 9/2004

## Ductile Iron (HD) Cast Iron (D)

- Pressure Regulating
- Temperature Regulating
- Back Pressure Control

Model	D-Series	HD-Series
Sizes	1/2" - 3"	1/2" - 6"
Connections	Threaded 1/2" - 2" Flanged 125# 2" - 3" Flanged 250# 2" - 3"	Threaded 1/2" - 2" Flanged 150# 1" - 6" Flanged 300# 1" - 6"
Body Material	Cast Iron	Ductile Iron
PMO Max. Operating Pressure	250 PSIG	300 PSIG
Design Pressure/ Temperature Ratings TMA/PMA	NPT 250 PSIG @ 450° F 125# FLG 125 PSIG @ 450° F 250# FLG 250 PSIG @ 450° F	NPT 450 PSIG @ 650° F 150# FLG 150 PSIG @ 566° F 300# FLG 450 PSIG @ 650° F

### FEATURES

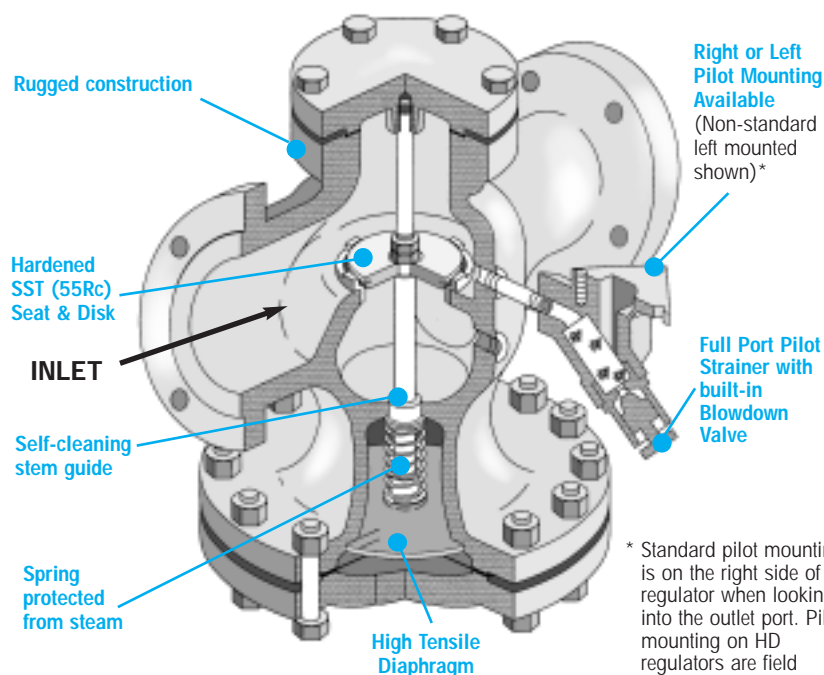
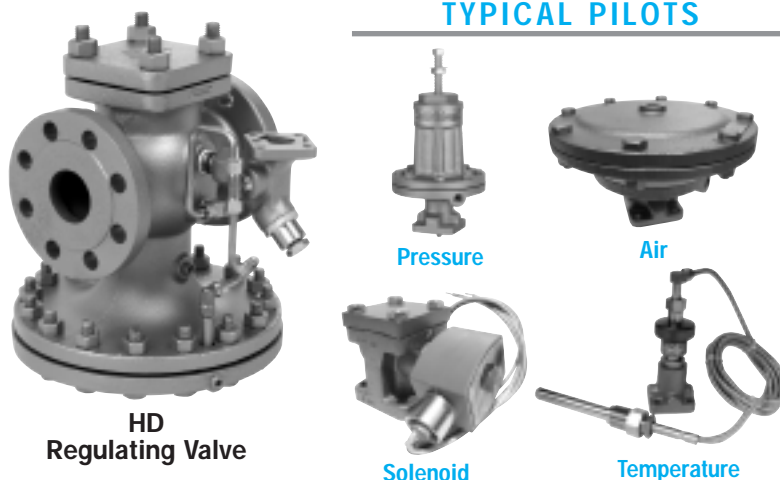
- No external power source is required. This simplifies the valve and minimizes installation and maintenance costs.
- Pressure and temperature pilots can be used in combination eliminating the need for a separate pressure and temperature regulator.
- The modular design allows any pilot to be added to the main regulating valve. This adds flexibility and reduces inventory.
- Available in Ductile iron for higher-pressure ranges and increased safety. Ductile Iron is a better choice than cast-iron for steam applications.
- The HD regulators come standard with full port strainers and blow down valve on the pilot mount to guard against dirt in the steam system which cause other regulators to fail.
- Hardened stainless steel trim (55Rc) for extended life even in the most demanding applications.
- The innovative design allows the pilot to be mounted on either side of the regulator and is easily field reversible.
- Comes fully assembled with tubing and pilot adapter. The control pilot requires only four bolts to complete the installation.

### TYPICAL APPLICATIONS

The Watson McDaniel **HD-Series** pilot-operated regulators were designed for steam applications. Pilot-operated pressure regulating valves are the best choice when downstream pressure must be accurately controlled regardless of variations in upstream pressure and varying steam load conditions. There are several types of control pilots that can be used with these regulators to control pressure, temperature, on/off control, or a combination of all three.

The HD-Series is the upgraded model for the D-Series Regulator. HD & D internal components and pilots are interchangeable.

### TYPICAL PILOTS



\* Standard pilot mounting is on the right side of the regulator when looking into the outlet port. Pilot mounting on HD regulators are field reversible.

## HD Series

### Pilot-Operated Regulating Valves

Revised 9/2004

#### DIMENSIONS D-Series – inches / pounds

Size	(A) Face-To-Face			B	C	D	Weight (lbs)		
	NPT	125#	250#				NPT	125#	250#
1/2"	5 1/8			5 1/8	2 1/2	5 7/8	18		
3/4"	5 1/2			5 1/2	3 3/8	6 1/2	21		
1"	6 1/8			6 1/8	3 3/8	7	25		
1 1/4"	8 1/2			7	3 1/2	8 3/4	45		
1 1/2"	9 1/2			7 1/8	4 5/8	8 3/4	55		
2"	9 3/4	9 1/2	9 5/8	7 1/8	5	10 7/8	90	95	105
2 1/2"		10	10 5/8	8 3/4	5 1/2	11 3/4		120	135
3"		11	11 3/4	9 1/8	6 1/2	13 3/4		165	180

#### DIMENSIONS HD-Series – inches / pounds

Size	(A) Face-To-Face			B	C	D	Weight (lbs)		
	NPT	150#	300#				NPT	150#	300#
1/2"	4 3/8			5 1/2	3 3/8	6 1/2	18		
3/4"	4 3/8			5 1/2	3 3/8	6 1/2	18		
1"	5 3/8	5 1/2	6	6 1/4	3 1/2	7	23	40	45
1 1/4"	7 1/4			7 3/8	4 7/8	8 3/4	43		
1 1/2"	7 1/4	6 7/8	7 3/8	7 3/8	4 7/8	8 3/4	43	55	60
2"	7 1/2	8 1/2	9	8 1/4	5 3/8	10 7/8	65	75	85
2 1/2"		9 3/8	10	9	5 3/4	11 3/4		100	105
3"		10	10 3/4	8 7/8	6 3/4	13 1/4		130	145
4"		11 7/8	12 1/2	10 7/8	7 1/2	14 3/4		215	235
6"		15 1/8	16	14 1/8	10	19 3/4		420	470

#### RECOMMENDED PRESSURE

Differential Pressure: 10 PSIG minimum

Minimum Inlet Pressure: 15 PSIG\*

\*Minimum Inlet Pressure for Temperature Regulator: 5 PSIG

#### HOW TO ORDER

##### REGULATOR BODY

Specify: • **HD** or **D** regulator body  
 • Regulator size or capacity of steam required  
 • End connections  
 (threaded, 125/150/250/300# flanged).

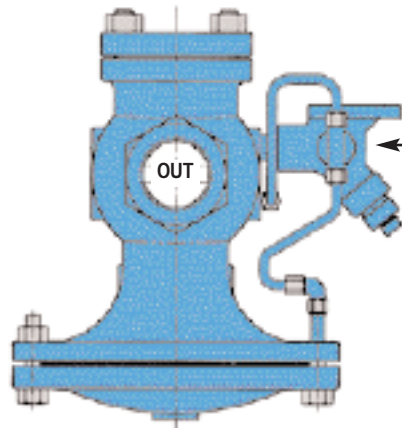
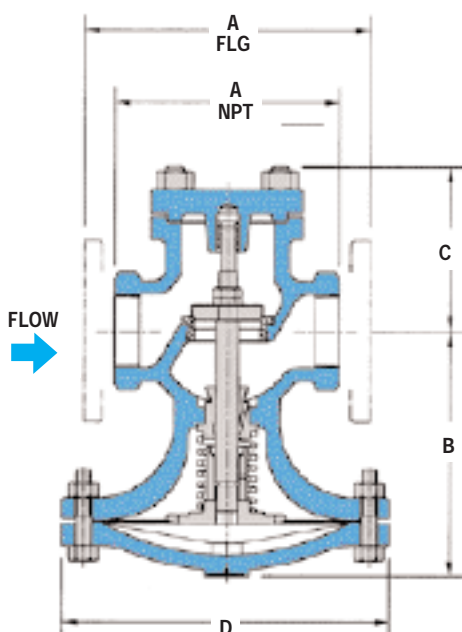
##### PILOT REQUIRED TO OPERATE THIS VALVE

Note: See "How to Order" in specific Pilot Section

- **T** Temperature Pilot
- **P** Pressure Pilot
- **A** Air Pilot
- **S** Solenoid Pilot
- **BP** Back-pressure Pilot

#### MATERIALS

	D-SERIES	HD-SERIES
Body	Cast Iron	<b>Ductile Iron</b>
Cover	Cast Iron	<b>Ductile Iron</b>
Gasket	Garlock 3400	Garlock 3400
Cover Screws	Steel	Steel
Pilot Adapter	Cast Iron	<b>Ductile Iron</b>
Screen	Stainless Steel	Stainless Steel
Tubing	Copper	Copper
Valve Seat	Hardened SST (55Rc)	Hardened SST (55Rc)
Valve Disc	Hardened SST (55Rc)	Hardened SST (55Rc)
Diaphragm	Phosphor Bronze	Phosphor Bronze



Standard pilot mounting is on the right side of the regulator when looking into the outlet port (shown). Pilot mounting on HD regulators are field reversible.

# REGULATORS

## D & HD Series

### Full-Port Regulating Valves

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REGULATORS

CAPACITIES – Steam (lbs/hr)											
Inlet Pressure (PSIG)	Outlet Pressure (PSIG)	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	6"
C <sub>v</sub> Factors		3.8	6.7	11	15	21	37	55	71	113	241
+5*	0	85	150	250	350	500	800	1200	1600	2600	5500
	2	80	140	230	310	440	770	1100	1500	2400	5100
+7*	0	115	200	325	450	600	1100	1650	2100	3600	7800
	2	105	180	300	400	575	1000	1500	2000	3100	6700
	3	90	160	275	375	525	900	1300	1800	2800	6000
+10*	0	150	260	425	575	850	1500	2200	2800	4600	9900
	2	140	240	400	550	800	1400	2100	2700	4300	9100
	5	100	175	300	400	600	1000	1600	2000	3200	6900
+12*	0	160	280	475	600	900	1600	2400	3100	4900	10300
	4	140	240	400	550	800	1400	2100	2700	4300	9100
	7	125	200	375	500	700	1200	1900	2400	3800	8200
15	0-3	190	325	550	750	1000	1800	2700	3500	5600	12000
	5	175	300	500	700	900	1700	2500	3200	5200	11100
	8	140	250	400	500	800	1300	2000	2600	4200	8900
20	0-5	210	375	625	850	1200	2100	3100	4000	6400	13700
	10	190	325	550	750	1000	1800	2700	3500	5600	12000
	12	170	300	500	675	950	1600	2500	3200	5100	10800
25	0-7	250	450	775	1050	1500	2600	3800	5000	7900	16900
	10	225	425	700	975	1300	2400	3600	4600	7300	15600
	15	200	350	600	800	1100	2000	3000	3900	6200	13200
30	0-12	275	500	800	1100	1500	2700	4100	5200	8300	17800
	15	250	450	750	1000	1400	2500	3800	4900	7800	16600
	20	225	375	650	850	1200	2100	3200	4100	6500	14000
40	0-18	350	600	1000	1350	1900	3300	5000	6400	10300	21900
	25	300	500	850	1150	1600	2800	4200	5400	8700	18500
	30	250	425	700	1000	1400	2500	3700	4700	7600	16100
50	0-20	400	700	1200	1650	2300	4100	6000	7800	12400	26500
	30	350	650	1100	1500	2000	3600	5400	6900	11000	23600
	40	275	500	800	1100	1500	2700	4100	5200	8300	17800
60	0-30	475	850	1350	1900	2600	4600	6900	8900	14200	30300
	35	425	775	1250	1700	2400	4300	6400	8200	13100	27900
	50	300	525	850	1200	1600	2900	4300	5600	8900	19000
75	0-35	575	1000	1650	2300	3200	5600	8300	10800	17200	36600
	50	475	825	1350	1900	2600	4600	6900	8900	14100	30100
	60	400	700	1150	1600	2200	3900	5800	7400	11800	25200
90	0-45	675	1200	1950	2700	3700	6600	9800	12700	20200	43100
	60	575	1000	1700	2300	3200	5700	8500	10900	17400	37100
	75	425	750	1200	1700	2300	4100	6100	7900	12600	27000
100	0-50	750	1300	2100	3000	4100	7300	10800	14000	22200	47500
	60	700	1200	2000	2700	3800	6700	10000	12900	20500	43800
	80	500	875	1400	1900	2700	4800	7100	9200	14700	31300
125	0-60	925	1650	2700	3700	5200	9100	14000	17500	28000	59500
	75	825	1475	2400	3300	4600	8200	12200	15700	25000	53500
	100	625	1100	1800	2500	3500	6200	9200	11900	19000	40400
150	0-75	1100	1900	3100	4300	6000	10600	15800	20400	32400	69100
	100	925	1600	2700	3600	5100	9000	13400	17400	27700	59000
	125	650	1150	1900	2600	3600	6400	9500	12300	19600	41900
175	0-85	1275	2250	3700	5000	7100	12500	18600	24000	38200	81400
	125	1000	1800	2900	4000	5600	9900	14700	18900	30100	64300
	150	750	1300	2100	2900	4100	7300	10800	14000	22200	47500
200	0-100	1450	2500	4200	5700	8000	14100	21000	27100	43100	92000
	125	1300	2300	3700	5100	7100	12600	18700	24100	38400	81900
	150	1075	1900	3100	4300	6000	10600	15700	20300	32300	68900
225	0-120	1575	2800	4600	6200	8700	15400	22900	29500	47000	100200
	150	1450	2500	4200	5700	8000	14100	21000	27200	43300	92300
	175	1350	2400	3900	5300	7400	13100	19500	25200	40100	85500
250	0-130	1750	3100	5100	6900	9700	17100	25500	32900	53400	111800
	150	1650	2900	4700	6500	9100	16000	23800	30800	49000	104600
	200	1200	2100	3500	4800	6700	11900	17600	22800	36200	77300
300**	0-160	2045	3605	5920	8075	11310	19220	29610	38230	60840	129750
	175	1945	3425	5625	7670	10740	18925	28130	36320	57800	123270
	200	1780	3140	5155	7030	9840	17340	25780	33275	52960	112950

\* Shaded portion is for sizing temperature pilot, solenoid, or temperature-solenoid combination valves only.

\*\* For HD Series Regulator only

+ Specify Low Pressure T-Pilot

# D & HD Series

## Reduced Port Regulating Valves

Revised 9/2004

CAPACITIES – Steam (lbs/hr)											
Inlet Pressure (PSIG)	Outlet Pressure (PSIG)	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	6"
C <sub>v</sub> Factors		1.4	3.3	5.6	7.8	13.3	18.8	25.9	41.7	74	163
+5*	0	15	35	59	82	140	197	272	438	777	1712
	2	13	32	53	75	128	181	249	401	712	1569
+7*	0	21	48	82	115	195	276	381	613	1088	2396
	2	20	46	79	110	187	265	365	587	1042	2296
	3	19	44	74	104	177	250	344	554	983	2165
+10*	0	29	70	117	164	279	395	544	876	1554	3423
	2	28	68	115	160	274	387	533	858	1523	3354
	5	25	60	102	142	242	342	471	758	1346	2964
+12*	0	35	83	141	197	335	473	653	1051	1865	4108
	4	33	78	133	185	316	446	615	990	1758	3873
	7	29	68	115	160	272	385	530	854	1515	3336
15	0-3	43	102	173	241	410	580	800	1287	2284	5031
	5	41	98	166	232	395	558	769	1238	2198	4841
	8	37	88	149	208	354	500	690	1111	1972	4343
20	0-5	57	134	227	317	541	764	1053	1696	3009	6629
	10	51	120	204	284	483	684	942	1517	2692	5929
	12	47	111	188	262	447	632	870	1401	2486	5477
25	0-7	70	166	282	393	670	948	1305	2102	3730	8215
	10	67	158	269	375	640	905	1246	2006	3561	7843
	15	59	139	235	328	559	790	1088	1751	3108	6846
30	0-12	81	190	323	450	768	1085	1495	2408	4273	9411
	15	76	180	305	426	726	1025	1413	2275	4037	8892
	20	66	155	263	366	625	883	1216	1958	3475	7654
40	0-18	105	248	420	585	998	1410	1943	3128	5551	12227
	25	99	199	367	511	872	1232	1698	2734	4852	10688
	30	78	183	311	433	739	1044	1439	2317	4111	9056
50	0-20	135	318	539	751	1280	1809	2492	4013	7121	15686
	30	118	277	470	655	1117	1579	2175	3502	6216	13692
	40	88	208	353	491	838	1184	1632	2627	4662	10269
60	0-30	153	360	611	851	1451	2051	2826	4550	8074	17786
	35	143	338	573	798	1361	1924	2651	4268	7573	16682
	50	98	230	390	543	926	1309	1804	2904	5154	11353
75	0-35	195	460	780	1086	1853	2619	3608	5809	10308	22706
	50	164	387	657	916	1561	2207	3040	4895	8687	19135
	60	132	312	529	737	1257	1777	2448	3941	6993	15404
90	0-45	229	540	916	1277	2177	3077	4239	6825	12112	26680
	60	197	465	789	1100	1874	2648	3649	5874	10425	22962
	75	146	345	585	815	1389	1964	2705	4357	7731	17029
100	0-50	255	600	1018	1419	2419	3419	4710	7584	13458	29644
	60	235	554	940	1310	2234	3158	4351	7006	12432	27384
	80	176	416	706	983	1676	2367	3263	5254	9324	20538
125	0-60	322	760	1290	1796	3063	4329	5964	9603	17041	37536
	75	294	693	1176	1638	2793	3948	5439	8757	15540	34230
	100	221	518	882	1229	2095	2961	4079	6568	11655	25672
150	0-75	381	900	1527	2128	3628	5128	7065	11376	20187	44467
	100	329	775	1315	1831	3123	4414	6081	9791	17374	38270
	125	243	575	975	1385	2316	3274	4510	7261	12885	28382
175	0-85	449	1060	1800	2505	4272	6939	9320	13396	23771	52362
	125	360	849	1440	2006	3421	4835	6661	10725	19032	41923
	150	265	625	1060	1476	2518	3558	5006	7893	14008	30855
200	0-100	509	1200	2037	2837	4838	6838	9420	15168	26916	59288
	125	459	1082	1836	2557	4360	6164	8492	13672	24262	53442
	150	389	917	1556	2167	3695	5223	7195	11584	20557	45232
225	0-120	560	1319	2238	3117	5360	7514	10351	16667	29577	65150
	150	493	1162	1972	2747	4684	6621	9121	14686	26061	57405
	175	416	980	1663	2316	3950	5583	7692	12384	21976	48409
250	0-130	628	1480	2511	3498	5964	8431	11614	18700	33184	73095
	150	588	1386	2352	3276	5586	7896	10878	17514	31080	68460
	200	441	1040	1764	2457	4190	5922	8159	13136	23310	51345
300**	0-160	755	1775	3015	4200	7160	10120	13945	22450	39840	87760
	175	715	1690	2865	3990	6800	9615	13250	21330	37850	83370
	200	655	1550	2625	3655	6235	8810	12140	19545	34680	76400

\* Shaded portion is for sizing temperature pilot, solenoid, or temperature-solenoid combination valves only.

\*\* For HD Series Regulator only

+ Specify Low Pressure T-Pilot

REGULATORS