Design V250 Rotary Control Valve

The Design V250 Hi-Ball rotary control valve (figure 1) is designed for heavy-duty throttling and on-off applications. Depending on size, this valve installs between two CL600 or CL900 pipeline flanges. The Design V250 valve is available with a single ball seal, flow ring, or dual-seal construction. Single-seal constructions are used in tight shutoff applications; the flow ring construction can satisfy higher temperature requirements. The dual-seal construction, with a seal in the inlet and outlet openings, is used in bidirectional flow-shutoff applications. The Design V250 Hi-Ball valve is typically used for throttling and controlled flow applications in gas transmission lines, gas distribution, or liquid pipelines.

Note

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W4177 / IL

Figure 1. Design V250 Valve with Type 1061 Actuator

Features

- **High Pressure Drop Capabilities—**Depending on the construction, a Design V250 valve is capable of a maximum static pressure differential of 103 bar (1500 psi) at 82°C (180°F) for CL600, and 155 bar (2250 psi) for CL900 constructions at 38°C (100°F) for LCC steel and CF8M (316 stainless steel).

- **Efficient Operation—**Tapered-polygon ball-to-shaft connection (see figure 5) and clamped splined actuator connection (see figure 6) remove lost motion or deadband from the drive train for throttling control applications.

- **Excellent Flow Control—**Reduced ball port design provides a modified equal percentage flow characteristic and an excellent response characteristic.

- **Tight Shutoff—**Shutoff with the Design V250 ball seal is 0.0001 percent of maximum capacity.

- **Greater Capacities—**Design V250 ball valve construction offers greater capacities than conventional globe valves for both compressible and incompressible fluids.

- **Sour Service Capability—**Materials are available for applications handling sour service. These materials comply with the requirements of NACE MR0175-2002.

- **Long Service Life—**Pressure-balanced drive shaft design with PTFE-lined bearings and pressure-assisted shaft sealing arrangement provides for a long life of reliable service.

- **Minimum Maintenance—**Two-piece ball and shaft assembly allows for complete trim overhaul; parts replacement is kept to a minimum.

- **Excellent Environmental Capabilities—**The optional live loaded packing system is designed with very smooth shaft surfaces and live loading to provide excellent sealing.

D100053X012

Specifications

Available Configuration

Flangeless ball valve assembly with ■ single ball seal, ■ flow ring, or ■ dual ball seal

Valve Body Sizes and End Connection Styles

NPS 4 through 12 flangeless valves retained by line flange bolts and designed to fit between CL600 or CL900 ■ raised-face or ■ ring-type joint flanges (ASME B16.5)

NPS 16 through 24 flangeless valves retained by line flange bolts and designed to fit between CL600 ■ raised-face or ■ ring-type joint flanges (ASME B16.5)

Maximum Inlet Pressure(1)

NPS 4 through 12 consistent with CL600 or CL900 (ASME B16.34)
NPS 16 through 24 consistent with CL600 (ASME B16.34)

Maximum Allowable Shutoff Pressure Drop(1,2)

Single-Seal and Dual-Seal Construction: See figure 3.
Flow Ring Construction: Limited by the pressure-temperature rating of the valve body

Shutoff Classification

Single-Seal and Dual-Seal Constructions: 0.0001% of maximum valve capacity (less than 1% of Class IV, ANSI/FCI 70-2 and IEC 60534-4)
Flow Ring Construction: 1% of maximum valve capacity

Construction Materials

See table 1

Seal Material Temperature Capability(1)

Single-Seal and Dual-Seal Construction: ■ –46 to 82°C (–50 to 180°F) for LCC steel and CF8M [316 stainless steel (SST)] valve bodies
Flow Ring with Nitrile O-Rings: ■ –46 to 93°C (–50 to 200°F) for LCC steel and CF8M valve bodies
Flow Ring with Fluorocarbon O-Rings: ■ –46 to 204°C (–50 to 400°F) for LCC steel and CF8M valve bodies

Flow Characteristic

Modified equal percentage

Flow Direction

Single Seal Construction: Forward-flow only (see figure 4)

Flow Ring Construction: Forward- or reverse-flow (see figure 4)

Dual Seal Construction: Required to provide shutoff for bi-directional flow

Flow Coefficients

See the section titled Coefficients in this bulletin, or see Catalog 12

Noise Levels

See Catalog 12 for sound pressure level prediction

Maximum Ball Rotation

90 degrees

Actuator Mounting

■ Right-hand or ■ left-hand mounted as viewed from the valve inlet for forward-flow

Shaft and Bore Diameters

See figure 8

(continued)

Specifications (continued)

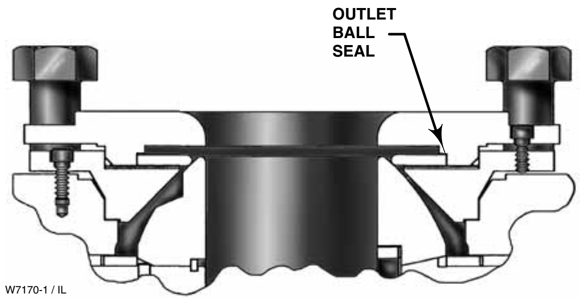
Approximate Weights

See table 2

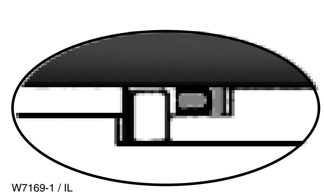
Options

■ Line flange bolts, ■ Sour service trim(3), ■ Buried service actuator adaptation, and ■ Dual seal configuration for bi-directional shutoff (this configuration incorporates a tapped and plugged connection which can be used in a double block and bleed system to test seal integrity), ■ Live Loaded PTFE Packing

1. The pressure or temperature limits in this bulletin and any applicable standard or code limitations should not be exceeded.
2. The maximum allowable shutoff pressure drops are further limited for the following constructions. The NPS 12 with S20910 drive shaft is limited to 128 bar (1862 psi) from –46 to 59°C (–50 to 139°F) and to 103 bar (1490 psi) at 93°C (200°F). The NPS 16 with 17-4PH steel, with 2-1/2 inch splined driveshaft is limited to 1000 psi (69 bar), and with the S20910, 2-1/2 inch splined drive shaft is limited to 55 bar (795 psi) at all service temperatures. The NPS 24 with S20910 drive shaft is limited to 92 bar (1336 psi) at all service temperatures.
3. See table 1 for sour service trim materials.



OUTLET SIDE OF VALVE BODY FOR OPTIONAL DUAL SEAL CONSTRUCTION



VIEW A SEAL DETAIL

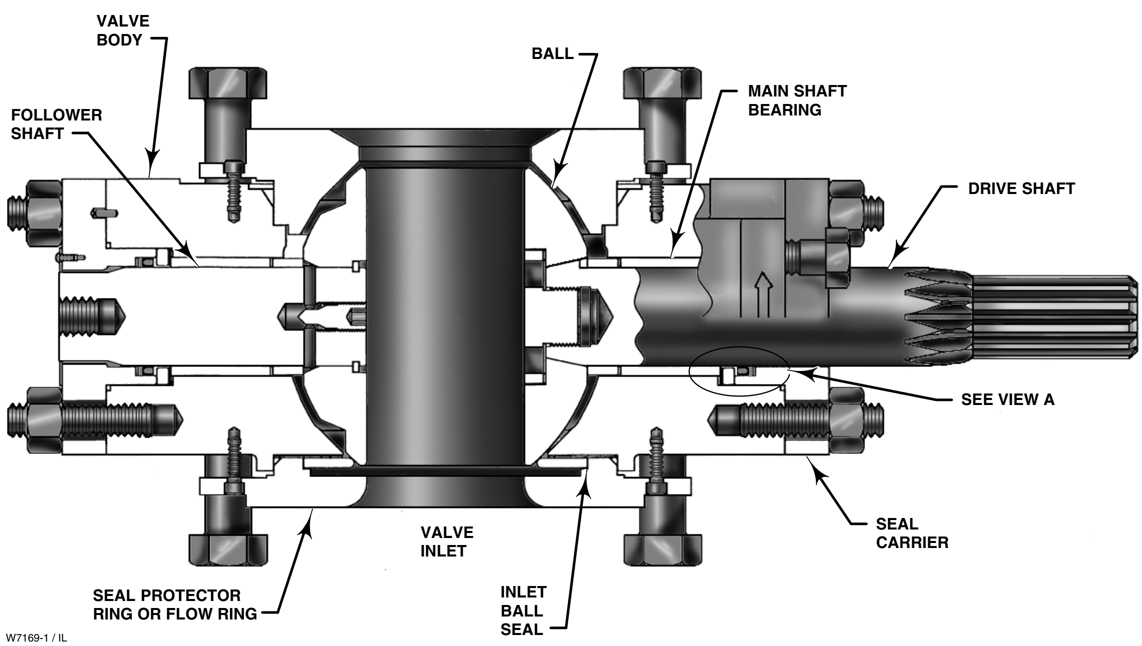


Figure 2. Sectional View of Design V250 Valve

Table 1. Construction Materials

Part		Construction Material
Valve Body, Body Outlet, and Seal Protector Ring or Flow Ring	Standard	LCC carbon steel
	Sour Service Trim(1)	LCC steel, heat-treated
	Optional	WCC carbon steel or S31600 [316 stainless steel (SST)]
Drive Shaft, Follower Shaft, and Shaft Retainer	Standard	S17400 (17-4PH SST)
	Sour Service Trim(1)	S17400 (17-4PH SST) H1150 DBL
	Optional	S20910 stainless steel
Ball	Standard	Chrome-plated WCC steel
	Sour Service Trim(1)	Chrome-plated WCC steel, heat-treated
	Optional	Chrome-plated S31600
Ball Seal	All Trims	POM (polyoxymethylene)
Bearings	All Trims	PTFE/Composition-lined S31600
O-Rings	Standard	Nitrile
	Sour Service Trim(1)	Fluorocarbon
	Optional	Fluorocarbon
Shaft Seal	Std. with Backup Ring	PTFE R30003 / PEEK
	Live Loaded Packing	PTFE / SST
Seal Carrier	All Trims	S31600 SST
Seal Carrier Stud Bolts	Standard	Grade B7 steel
	Sour Service Trim(1)	Grade B7M steel
	Optional	Grade B8M stainless steel
Seal Carrier Hex Nuts	Standard	Grade 2H steel
	Sour Service Trim(1)	Grade 2HM steel
	Optional	Grade 8M stainless steel
Line Bolts(2)	Standard	Grade B7 steel
	Sour Service Trim(1)	Grade B7M steel
Line Nuts(2)	Standard	Grade 2H steel
	Sour Service Trim(1)	Grade 2HM

1. As detailed in NACE MR0175-2002.
2. Line bolts and nuts are not included as part of the standard package. Specify line bolts and nuts as an option.

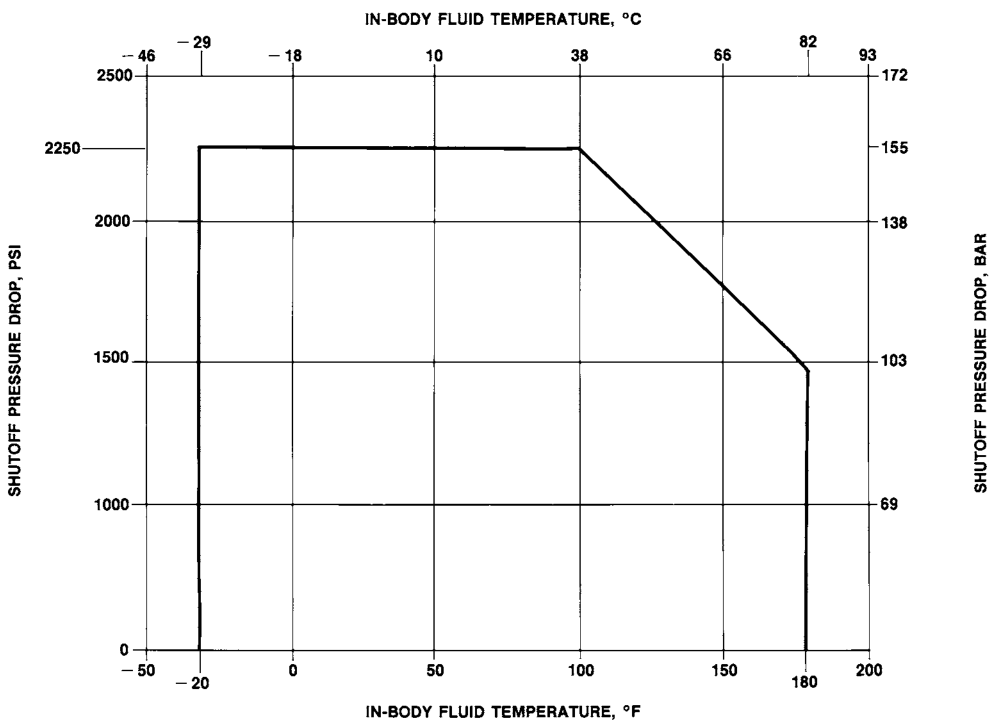
Table 2. Approximate Weights

VALVE SIZE, NPS	WEIGHT	
	Kilograms	Pounds
4	73	160
6	132	290
8	222	490
10	345	760
12	431	950
16	771	1700
20	1814	4000
24	2404	5300

Installation

Install the Design V250 valve in any position, but the recommended orientation is in a horizontal pipeline with the shaft positioned horizontally and the ball closing in the downward direction (see figure 1). The actuator can be either right- or left-hand mounted as viewed from the valve inlet for forward-flow. For bidirectional flow, install the valve so that the highest pressure condition will flow as shown by the flow direction arrow on the valve body.

Dimensions are shown in figure 8.



NOTE:

A4947-1 / IL DO NOT EXCEED THE LIMITS IN THIS CURVE OR THE BODY RATING, WHICHEVER IS LOWER.

Figure 3. Maximum Allowable Shutoff Pressure Drop for Single and Dual POM Seal Construction

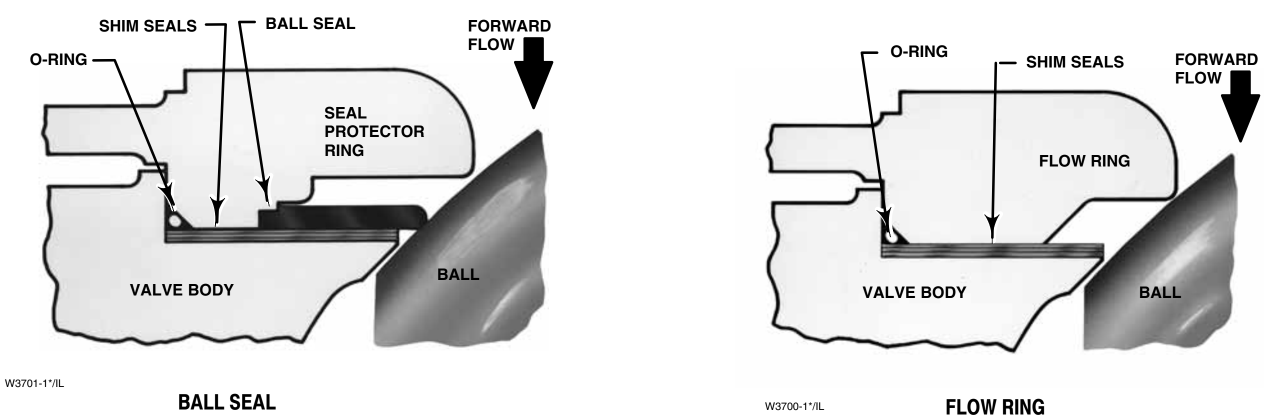


Figure 4. Ball Seal and Flow Ring Constructions

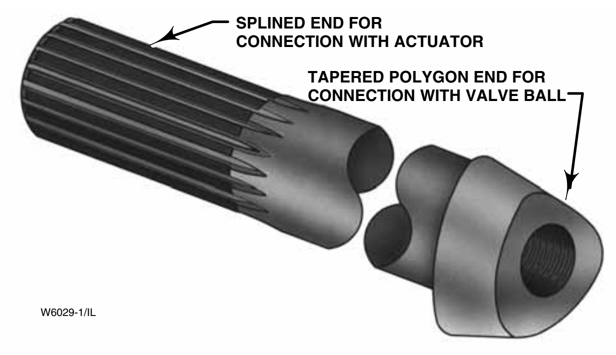


Figure 5. Drive Shaft for Design V250 Valve

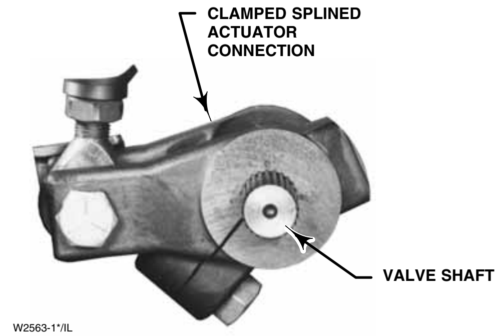


Figure 6. Clamped Splined Actuator Connection on Type 1061 Actuator

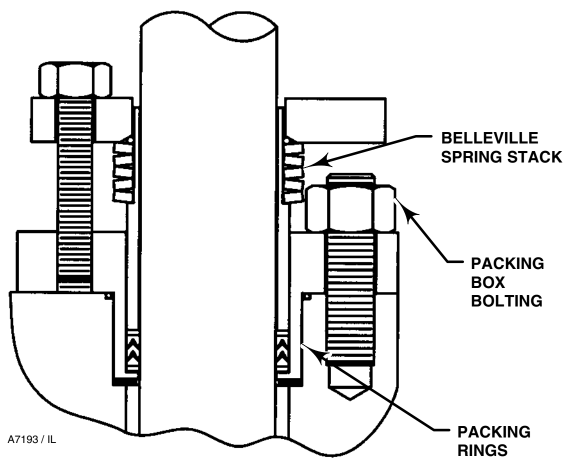
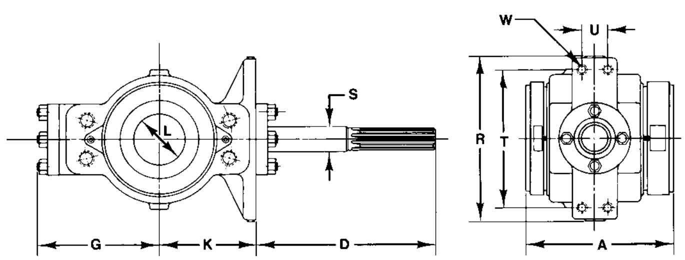


Figure 7. Live Loaded PTFE Packing

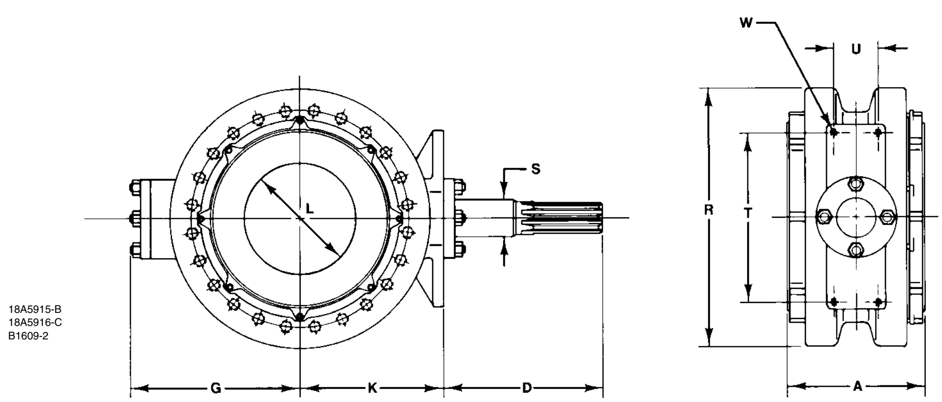
Table 3. Dimensions

VALVE SIZE, NPS	A	D	G	K	L (BORE DIAMETER)	R	S		T	U	W
							Shaft Diameter	Spline Diameter(1)			
mm											
4	194	208	197	162	76.2	279	31.8	31.8	235	46	5/8-UNC
6	229	356	238	194	101.6	327	50.8	50.8	273	51	3/4-UNC
8	243	356	327	270	152.4	413	63.5	63.5	337	76	7/8-UNC
10	297	356	343	287	187.5	445	69.9	63.5	337	76	7/8-UNC
12	338	356	381	324	228.6	483	76.2	63.5	337	76	7/8-UNC
16	400	470	460	392	292.1	613	101.6	63.5	533	127	1-1/4—8UN
		508						88.9			
20	533	508	546	480	371.3	864	127.0	88.9	533	127	1-1/4—8UN
24	679	508	629	546	438.2	991	152.4	88.9	533	127	1-1/4—8UN
Inches											
4	7.62	8.19	7.75	6.38	3.00	11.00	1.25	1.25	9.25	1.81	5/8-UNC
6	9.00	14.00	9.38	7.62	4.00	12.88	2.00	2.00	10.75	2.00	3/4-UNC
8	9.56	14.00	12.88	10.62	6.00	16.25	2.50	2.50	13.25	3.00	7/8-UNC
10	11.69	14.00	13.50	11.31	7.38	17.50	2.75	2.50	13.25	3.00	7/8-UNC
12	13.31	14.00	15.00	12.75	9.00	19.00	3.00	2.50	13.25	3.00	7/8-UNC
16	15.75	18.50	18.12	15.44	11.50	24.12	4.00	2.50	21.00	5.00	1-1/4—8UN
		20.00						3.50			
20	21.00	20.00	21.50	18.88	14.62	34.00	5.00	3.50	21.00	5.00	1-1/4—8UN
24	26.75	20.00	24.75	21.50	17.25	39.00	6.00	3.50	21.00	5.00	1-1/4—8UN

1. Use this dimension to select compatible Fisher® rotary actuators.



NPS 4 THROUGH 16



NPS 20 AND 24

Figure 8. Dimensions (also see table 3)

Coefficients

Table 4. Design V250

Forward or Reverse Flow										Approximately Equal Percentage Characteristic
Coefficients	Valve Size, NPS	Valve Rotation, Degrees								
		10	20	30	40	50	60	70	80	90
C_v	4	- - -	6.74	19.0	39.9	68.9	114	182	335	499
K_v		- - -	5.83	16.4	34.5	59.6	98.6	157	290	432
F_d		- - -	0.49	0.69	0.84	0.92	0.96	0.98	1.00	1.00
F_L		0.90	0.90	0.90	0.90	0.85	0.78	0.68	0.57	0.45
X_T		- - -	0.66	0.77	0.76	0.71	0.59	0.47	0.26	0.17
C_v	6	- - -	15.7	42.8	76.1	130	203	308	567	855
K_v		- - -	13.6	37.0	65.8	112	176	266	490	432
F_d		- - -	0.54	0.69	0.83	0.90	0.94	0.97	.098	0.99
F_L		0.90	0.90	0.90	0.90	0.85	0.78	0.68	0.57	0.45
X_T		- - -	0.99	0.83	0.90	0.76	0.64	0.54	0.28	0.17
C_v	8	1.48	27.9	91.8	177	308	478	720	1220	2190
K_v		1.28	24.1	79.4	153	266	413	623	1060	1890
F_d		- - -	0.59	0.75	0.85	0.92	0.96	0.98	0.99	0.99
F_L		0.90	0.90	0.90	0.90	0.85	0.78	0.68	0.57	0.45
X_T		0.35	0.92	0.81	0.85	0.63	0.58	0.48	0.29	0.14
C_v	10	42.8	85.5	174	306	484	764	1150	1800	3055
K_v		37.0	74.0	151	265	419	661	995	1560	2640
F_d		- - -	0.62	0.77	0.86	0.92	0.96	0.98	0.99	1.00
F_L		0.90	0.90	0.90	0.90	0.85	0.78	0.68	0.57	0.45
X_T		0.33	0.59	0.75	0.72	0.68	0.57	0.43	0.29	0.15
C_v	12	40.6	122	267	499	812	1230	1870	3060	5800
K_v		35.1	106	231	432	702	1060	1620	2650	5020
F_d		0.44	0.64	0.78	0.87	0.93	0.97	0.98	0.99	1.00
F_L		0.90	0.90	0.90	0.90	0.85	0.78	0.68	0.57	0.45
X_T		0.24	0.88	0.88	0.78	0.60	0.49	0.38	0.23	0.10
C_v	16	68.3	203	447	813	1340	2030	3010	4630	8130
K_v		59.1	176	387	703	1160	1760	2600	4000	7030
F_d		0.43	0.66	0.79	0.87	0.93	0.97	0.98	0.99	1.00
F_L		0.90	0.90	0.90	0.90	0.85	0.78	0.68	0.57	0.45
X_T		0.46	0.71	0.87	0.83	0.66	0.51	0.42	0.27	0.13
C_v	20	132	330	726	1320	2180	3300	4880	7520	13,200
K_v		114	285	628	1140	1890	2850	4220	6500	11,400
F_d		0.45	0.66	0.80	0.88	0.93	0.97	0.99	1.00	1.00
F_L		0.90	0.90	0.90	0.90	0.85	0.78	0.68	0.57	0.45
X_T		0.29	0.71	0.82	0.86	0.67	0.51	0.42	0.27	0.13
C_v	24	183	458	1010	1830	3020	4580	6770	10,400	18,300
K_v		158	396	874	1580	2610	3960	5860	9000	15,800
F_d		0.47	0.67	0.80	0.88	0.93	0.97	0.99	1.00	1.00
F_L		0.90	0.90	0.90	0.90	0.85	0.78	0.68	0.57	0.45
X_T		0.29	0.71	0.82	0.86	0.67	0.51	0.42	0.27	0.13

Note

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