



Flow Control/ Check Valves

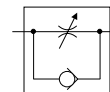
Series F flow control valves from Pioneer allow the end user to utilize the color-band reference on the valve stem as a great convenience and time-saver when resetting the valves. The Series N needle valves have the same Colorflow feature and are ideal as speed controls on hydraulic and pneumatic circuits where a reverse flow check is not needed. Finally, Pioneer offers Series C and Series DT check valves to allow free flow in one direction and shut-off in the reverse direction. The Series C has a soft-seal option and Series DT is very small and compact to fit into any application.

Flow Control Valves

F Series.....	B-2
N Series.....	B-5

Check Valves

C Series.....	B-8
DT Series.....	B-10



General Description

Series "F" flow control valves provide precise control of flow and shut-off in one direction, and automatically permit full flow in the opposite direction.

Operation

A two-step needle allows fine adjustment at low flow by using the first three turns of the adjusting knob; the next three turns open the valve to full flow, and also provide standard throttling adjustments.

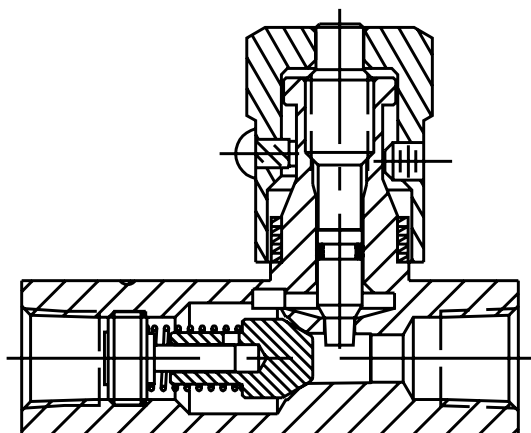
Features

- The exclusive "Colorflow" color-band reference scale on the valve stem is a great convenience and time-saver in setting the valve originally and in returning it to any previous setting.
- A simple set screw locks the valve on any desired setting.
- A tamperproof option (T) feature is also available to prevent accidental or intentional adjustment of flow setting.

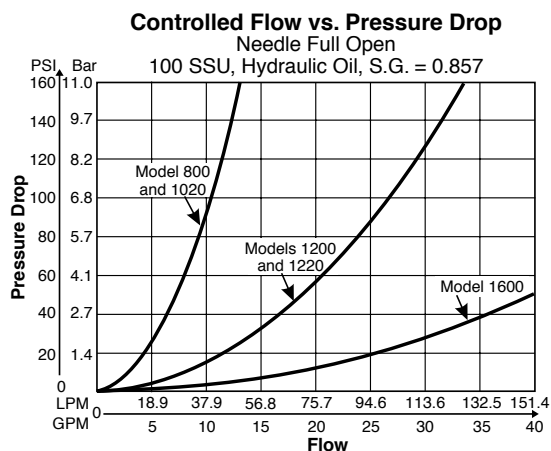
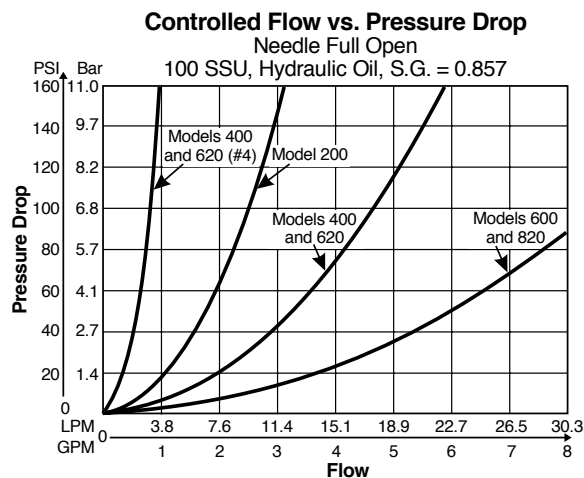


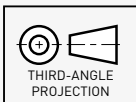
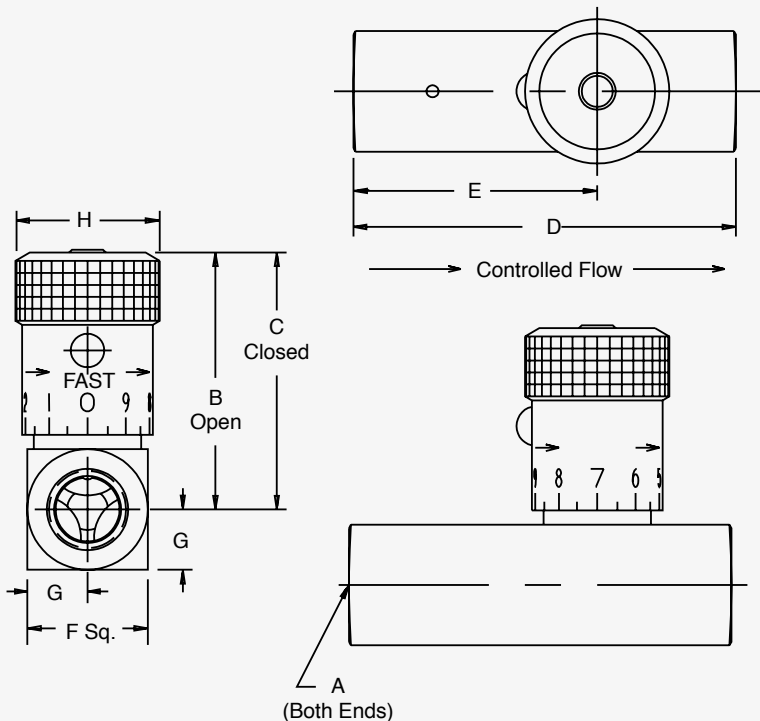
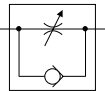
Specifications

Maximum Operating Pressure	Brass: 140 Bar (2000 PSI); except for F1600 brass which is 35 Bar (500 psi) Steel & Stainless: 345 Bar (5000 psi) for 200 thru 820; 207 Bar (3000 psi) for all other sizes
Return Check Poppet, Nominal Cracking Pressure	0.4 Bar (5 PSI)
Poppets	Soft seal poppet in brass 200-1020 sizes Solid metal 416 stainless steel poppet on all other sizes and styles
Operating Temperature	-40°C to +121°C (-40°F to +250°F)



Performance Curves



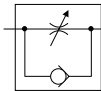


Ordering Information

Model Number	Max Flow LPM (gpm)	A	B	C	D	E	F	G	H
F400	19 (5)	1/4-18 NPTF	45.5 (1.79)	40.4 (1.59)	66.8 (2.63)	42.2 (1.66)	20.6 (0.81)	10.4 (0.41)	20.6 (0.81)
F600	30 (8)	3/8-18 NPTF	55.4 (2.18)	49.5 (1.95)	69.9 (2.75)	44.5 (1.75)	25.4 (1.00)	12.7 (0.50)	25.4 (1.00)
F800	57 (15)	1/2-14 NPTF	68.6 (2.70)	61.5 (2.42)	87.4 (3.44)	56.6 (2.23)	31.8 (1.25)	16.0 (0.63)	30.2 (1.19)
F1200	95 (25)	1/2-14 NPTF	85.9 (3.38)	71.4 (2.81)	98.6 (3.88)	65.5 (2.58)	38.1 (1.50)	19.1 (0.75)	35.1 (1.38)

*Inch equivalents for millimeter dimensions are shown in (**)





Ordering Information



Options

Code	Description
Omit	NPTF
8	BSPT
9	BSPP



Series



Size

Sizes available: Brass			
400	600	800	1200
Sizes available: Stainless Steel			
400	600	800	



Material

Code	Description
Omit	Standard Knob
B	Brass
S	Steel
*SS	Stainless Steel

Series F Brass Valves can be used for both air and oil service.
* Available in 400, 600 and 800 sizes.



Needle Options

Code	Description
Omit	Standard Knob
4	Fine Metering (200, 400, 600, 620 sizes)

* Not available above 1200 size.



Other Options

Code	Description
Omit	Standard Knob
T*	Tamperproof
F	Finger Screw



Seal Compound

Code	Description
Omit	Nitrile (Standard)
V	Fluorocarbon

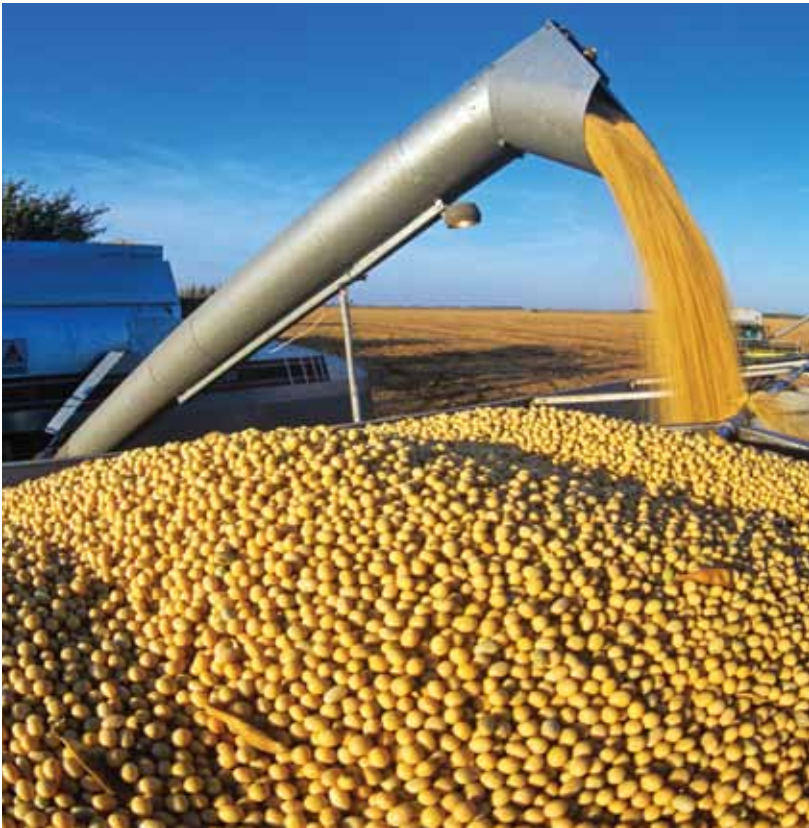


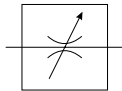
Design Series

NOTE: Not required when ordering.

Flow Control / Check Valves

Model Number	Weight Kg (lbs.)
F400	0.2 (0.5)
F600	0.3 (0.7)
F800	0.7 (1.5)
F1200	1.2 (2.6)





General Description

Series "N" needle valves are ideal as speed controls on hydraulic and pneumatic systems where a reverse flow check is not needed. They provide excellent control and a reliable shutoff in a very small envelope.

Operation

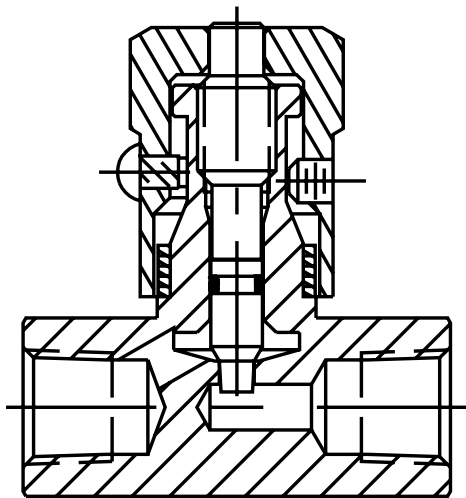
A two-step needle allows fine adjustment at low flow by using the first three turns of the adjusting knob; the next three turns open the valve to full flow, and also provide standard throttling adjustments.

Features

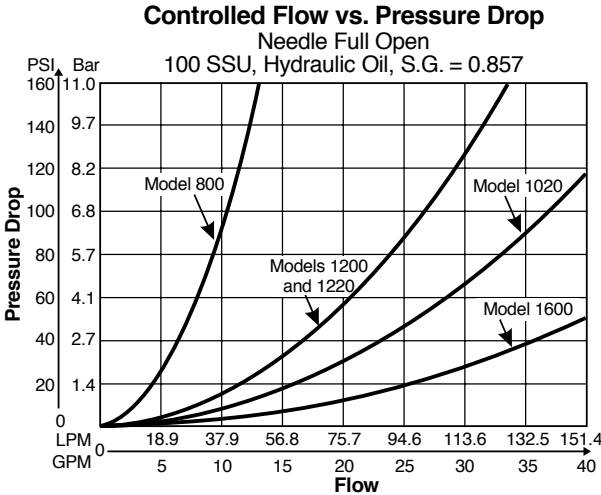
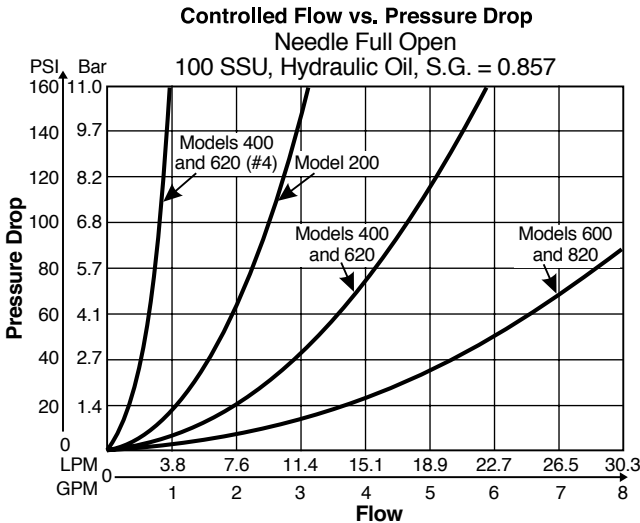
- The exclusive "Colorflow" color-band reference scale on the valve stem is a great convenience and time-saver in setting the valve originally and in returning it to any previous setting.
- A simple set screw locks the valve on any desired setting.
- A tamperproof option (T) feature is also available to prevent accidental or intentional adjustment of flow setting.

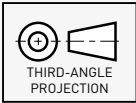
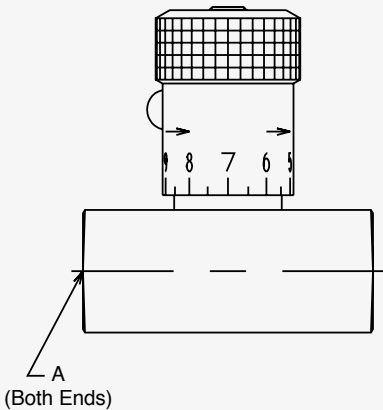
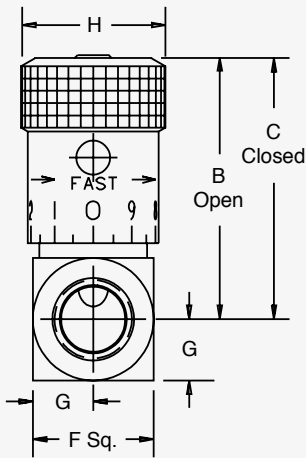
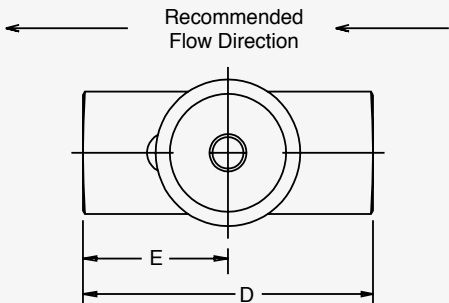
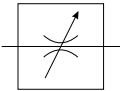


Specifications	
Maximum Operating Pressure	Brass: 140 Bar (2000 PSI); except for N1600 brass which is 35 Bar (500 psi)
	Steel & Stainless: 345 Bar (5000 psi) for 200 thru 1220; 207 Bar (3000 psi) for all other sizes
Operating Temperature	-40°C to +121°C (-40°F to +250°F)



Performance Curves





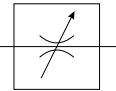
Flow Control / Check Valves

Needle Valves - Series N

Model Number	Max Flow LPM (gpm)	A	B	C	D	E	F	G	H
N400	19 (5)	1/4-18 NPTF	45.5 (1.79)	40.4 (1.59)	50.8 (2.00)	25.4 (1.00)	20.6 (0.81)	10.4 (0.41)	20.6 (0.81)
N600	30 (8)	3/8-18 NPTF	55.4 (2.18)	49.5 (1.95)	63.5 (2.50)	31.8 (1.25)	25.4 (1.00)	12.7 (0.50)	25.4 (1.00)
N800	57 (15)	1/2-14 NPTF	68.6 (2.70)	61.5 (2.42)	66.5 (2.62)	33.3 (1.31)	31.8 (1.25)	15.7 (0.62)	30.2 (1.19)
N1200	95 (25)	3/4-14 NPTF	85.9 (3.38)	71.4 (2.81)	82.6 (3.25)	41.1 (1.62)	38.1 (1.50)	19.1 (0.75)	35.1 (1.38)

*Inch equivalents for millimeter dimensions are shown in (**)





Ordering Information



Options

Code	Description
Omit	NPTF
8	BSPT
9	BSPP



Series



Size

Sizes available: Brass			
400	600	800	1200
Sizes available: Stainless Steel			
400	600	800	



Material

Code	Description
Omit	Standard Knob
B	Brass
S	Steel
*SS	Stainless Steel

Series F Brass Valves can be used for both air and oil service.
* Available in 400, 600 and 800 sizes.



Needle Options

Code	Description
Omit	Standard Knob
T*	Tamperproof
F	Finger Screw

* Not available above 1200 size.

Code	Description
Omit	Standard Knob
4	Fine Metering (200, 400, 600, 620 sizes)



Other Options

Code	Description
Omit	Nitrile (Standard)
V	Fluorocarbon



Seal Compound

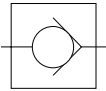


Design Series

NOTE: Not required when ordering.

Model Number	Weight Kg (lbs.)
N400	0.2 (0.5)
N600	0.3 (0.7)
N800	0.7 (1.5)
N1200	1.0 (2.3)





General Description

Series “C” check valves permit free flow in one direction, and dependable shut-off in the reverse direction.

Operation

When pressure going through the valve is increased to the cracking level the valve opens. When the pressure is reduced to below the cracking level the valve closes.

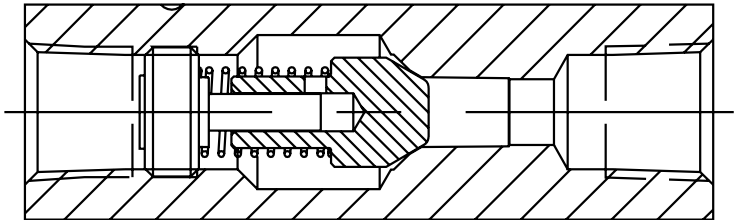
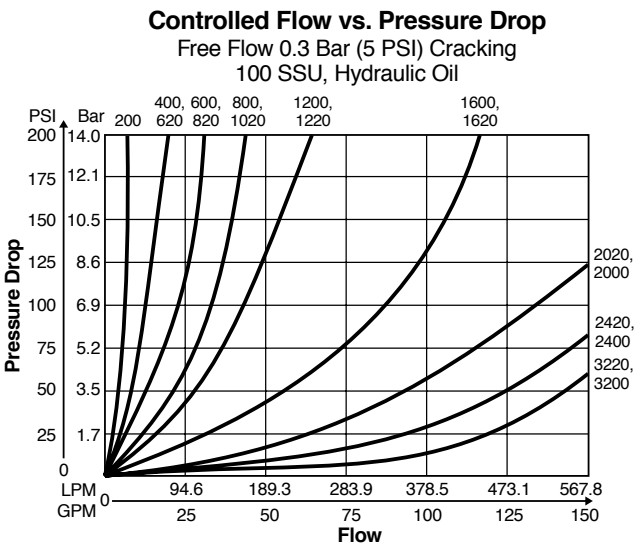
Features

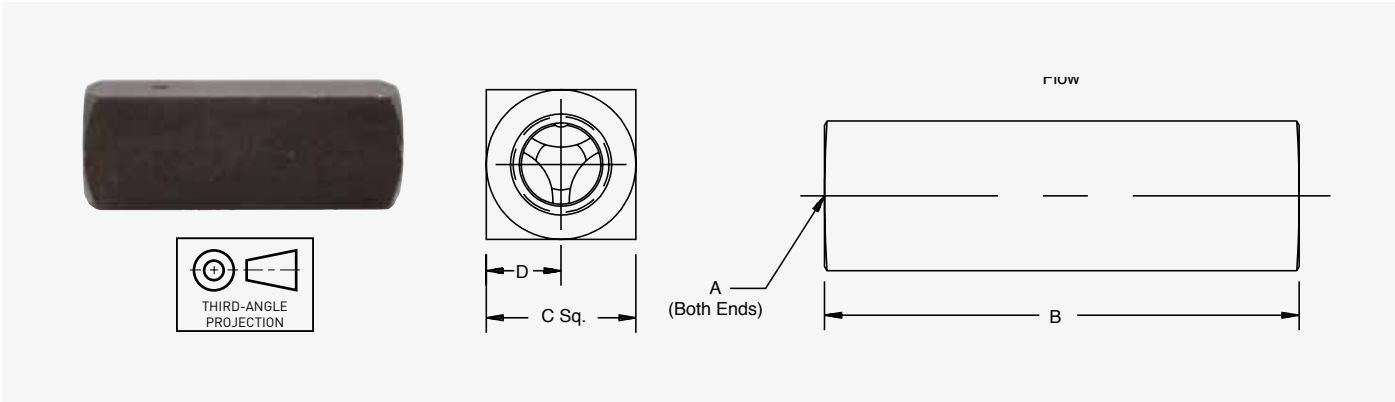
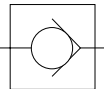
- Stainless steel poppets standard.
- Soft seal poppets are available.
- Triangular retainers guide the poppets, and hold the spring firmly in place even under high velocity and shock.



Specifications			
Maximum Operating Pressure	Brass:	140 Bar (2000 PSI); except for C1600 brass which is 35 Bar (500 psi)	
	Steel & Stainless Steel:	345 Bar (5000 psi) for 200 thru 820; 207 Bar (3000 psi) for all other sizes	
Maximum Flow	C400:	19 LPM	(5 GPM)
	C600:	30 LPM	(8 GPM)
	C800:	57 LPM	(15 GPM)
	C1200:	95 LPM	(25 GPM)
Poppets	Soft seal poppet is standard for 200 through 800/1020 size.		
	For cracking pressures > 15 PSI, solid metal poppets are standard		

Performance Curves





Needle Valves - Series C				
Model Number	A	B	C	D
C400	1/4-18 NPTF	66.8 [2.63]	20.6 [0.81]	10.4 [0.41]
C600	3/8-18 NPTF	69.9 [2.75]	25.4 [1.00]	12.7 [0.50]
C800	1/2-14 NPTF	87.4 [3.44]	31.8 [1.25]	16.0 [0.63]
C1200	3/4-14 NPTF	98.6 [3.88]	38.1 [1.50]	19.1 [0.75]

*Inch equivalents for millimeter dimensions are shown in (**)

Ordering Information

Options

Code	Description
Omit	NPTF
8	BSPT
9	BSPP

C

Series

Size

Sizes available in Brass	
400	800
600	1200

Sizes available in Stainless Steel	
400	800
600	-

Material

Code	Description
Omit	Standard Knob
B	Brass
S	Steel
*SS	Stainless Steel

Cracking Pressure

Code	Description
Omit	Standard 0.4 Bar (5 PSI)
65	4.5 Bar (65 PSI)

Seal Compound

Code	Description
Omit	Nitrile [Standard]
V	Fluorocarbon

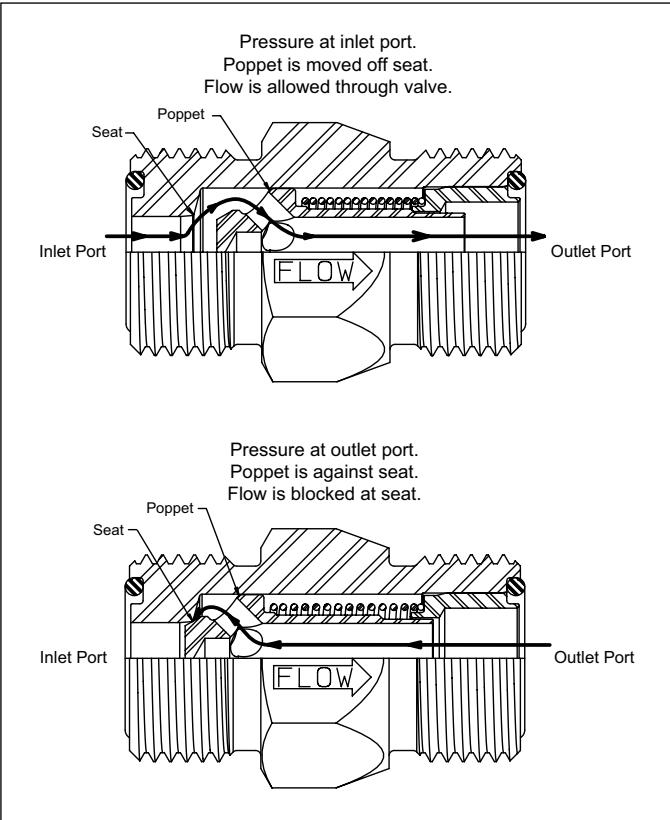
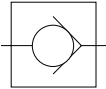
Design Series

NOTE: Not required when ordering.

Series C Brass Valves can be used for both air and oil service.
* Available in 400, 600 and 800 sizes.

Model Number	Weight Kg (lbs.)	Model Number	Weight Kg (lbs.)	Model Number	Weight Kg (lbs.)	Model Number	Weight Kg (lbs.)
C400	0.2 [0.4]	C800	0.6 [1.3]	C1620	1.5 [3.3]	C2420	3.8 [8.4]
C600	0.2 [0.5]	C1020	0.6 [1.3]	C2000	2.8 [6.2]	C3200	7.0 [15.4]





Features

Parker’s Check Valves employ several unique features that insure years of trouble-free operation.

Crack Pressure

Crack pressure refers to the amount of fluid pressure in the free flow direction required to move the poppet off the seat. The normal crack pressure setting is 5 PSI; however, other crack pressures are available to allow the check valve to perform special circuit functions, or operate under unique conditions.

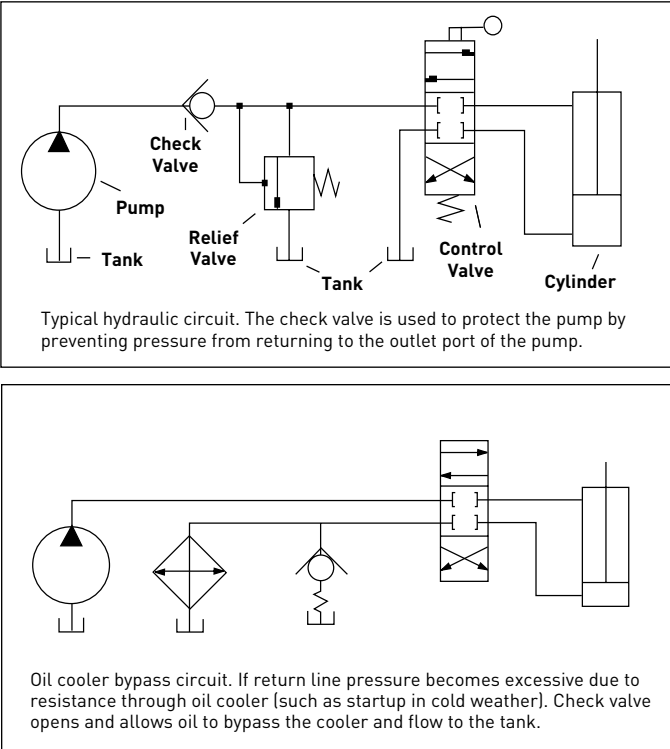
Check valves are not field repairable or adjustable. Crack pressure settings are made at the factory only.

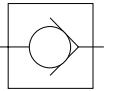
Specifications				
Series	Body Size (in.)	Material	Rated Pressure (psi)	Crack Pressure Range (psi)
DT Series	1/4 - 1 1/4	Steel	5000	5-200

DT Series Pressure Table (psi)				
Body Size	Max Rated Pressure	MF (Male JIC 37)	M0 (SAE O-Ring Boss)	MS (Male Seal-Lok)
1/4	5000	5000	5000	5000
3/8	5000	5000	5000	5000
1/2	5000	4500	5000	5000
5/8	5000	3500	5000	5000
3/4	5000	3500	5000	5000
1	5000	3000	5000	5000
1 1/4	4000	2500	4000	4000

DT Series Installation Assembly Torque (ft-lbs)			
Body Size	MF (Male JIC 37)	M0 (SAE O-Ring Boss)	MS (Male Seal-Lok)
1/4	Refer to Parker TFD Catalog 4300 for torque recommendation	13.3 +10% / -0%	Refer to Parker TFD Catalog 4300 for torque recommendation
3/8		22.1 +10% / -0%	
1/2		62.6 +10% / -0%	
5/8		84.8 +10% / -0%	
3/4		125.3 +10% / -0%	
1		199 +10% / -0%	
1 1/4		210 +10% / -0%	

Applications





Parker DT Series Check Valves Offer the Features of a Compact Body Size, and 5000 PSI Maximum Operating Pressure

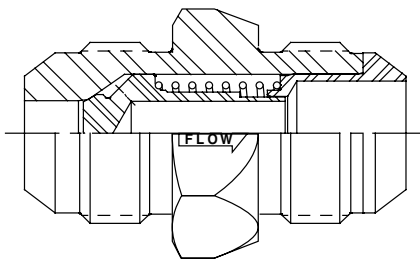
The DT Series check valves utilize the dependable, internal design features found in Parker check valves, but with the added benefit and convenience of compact design. Sizes are available from 1/4" to 1-1/4" with six different Fitting Styles.

The DT Series expands Parker's high quality product line of versatile and efficient check valves.



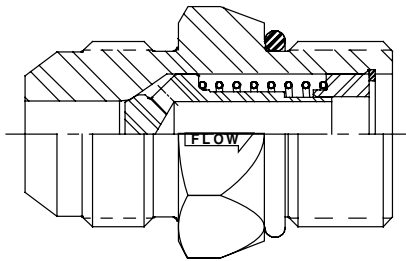
Features

1. Compact Design. Easy to plumb into tight circuits.
2. All steel construction. No internal gaskets or seals to wear out.
3. One-piece body eliminates threads and seals that may be potential leakage points.
4. Smooth flow stream. Poppet spring is isolated from flow stream.
5. Variety of end fittings.
6. Optional crack pressures available from 1 to 200 PSI.
7. Chromium-6 Free plated exterior finish.
8. Nitrile O-Ring included on MO and MS fittings.
9. Captive O-Ring Groove is standard on MS end fittings.



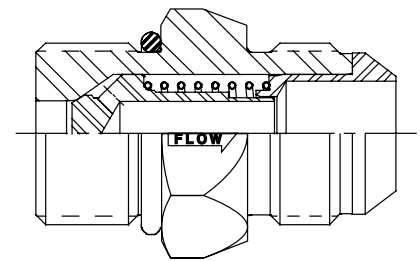
DT-MFMF

Male Flare 37° JIC Inlet to Male Flare 37° JIC Outlet



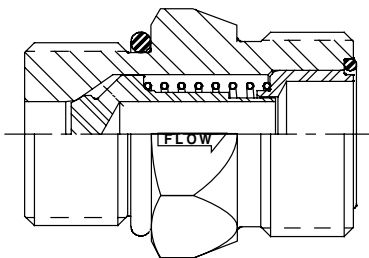
DT-MFMO

Male Flare 37° JIC Inlet to Male O-Ring Boss Outlet



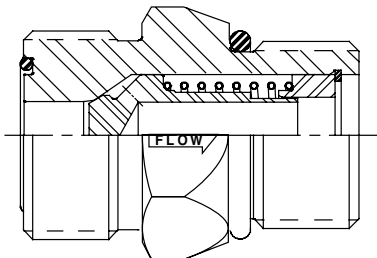
DT-MOMF

Male O-Ring Boss Inlet to Male Flare 37° JIC Outlet



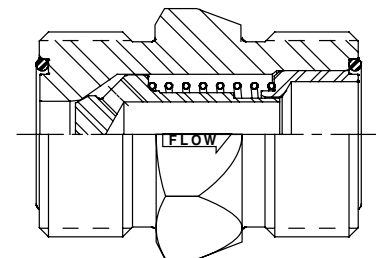
DT-MOMS

Male O-Ring Boss Inlet to Male Seal-Lok® Outlet



DT-MSMO

Male Seal-Lok® Inlet to Male O-Ring Boss Outlet



DT-MSMS

Male Seal-Lok® Inlet to Male Seal-Lok® Outletlet

1/8"

1/4"

3/8"

1/2"

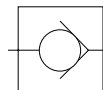
5/8"

3/4"

1"

1-1/4"

1-1/2"

**DT-MFMF** Male Flare 37° JIC Inlet to Male Flare 37° JIC Outlet

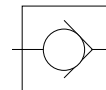
Body Size	Part Number	Inlet Port End	Outlet Port End	Inlet Port Length	Hex	Outlet Port Length	Wrench Flats	Standard Crack Pressure (psi)
3/8	DT-370-MFMF-**-**	9/16-18 UNF	9/16-18 UNF	0.56	0.44	0.56	0.75	1, 5, 65
1/2	DT-500-MFMF-**-**	3/4-16 UNF	3/4-16 UNF	0.66	0.50	0.66	0.88	5, 65
5/8	DT-620-MFMF-**-**	7/8-14 UNF	7/8-14 UNF	0.76	0.50	0.76	1.06	5
3/4	DT-750-MFMF-**-**	1-1/16 - 12 UN	1-1/16 - 12 UN	0.86	0.50	0.86	1.25	1, 5, 65
1	DT-1000-MFMF-**-**	1-5/16 - 12 UN	1-5/16 - 12 UN	0.91	0.62	0.91	1.50	5, 65
1 1/4	DT-1250-MFMF-**-**	1-5/8 - 12 UN	1-5/8 - 12 UN	0.96	1.06	0.96	1.88	1, 5 psi

DT-MFMO Male Flare 37° JIC Inlet to Male O-Ring Boss Outlet

Body Size	Part Number	Inlet Port End	Outlet Port End	Inlet Port Length	Hex	Outlet Port Length	Wrench Flats	Standard Crack Pressure (psi)
1/4	DT-250-MFMO-**-**	7/16-20 UNF	0.55	0.44	0.43	7/16-20 UNF	0.62	5
3/8	DT-370-MFMO-**-**	9/16-18 UNF	0.56	0.44	0.47	9/16-18 UNF	0.75	1, 5, 65
1/2	DT-500-MFMO-**-**	3/4-16 UNF	0.66	0.50	0.55	3/4-16 UNF	0.88	5, 65
5/8	DT-620-MFMO-**-**	7/8-14 UNF	0.76	0.50	0.63	7/8-14 UNF	1.06	5
3/4	DT-750-MFMO-**-**	1-1/16 - 12 UN	0.86	0.50	0.73	1-1/16 - 12 UN	1.25	1, 5, 65
1	DT-1000-MFMO-**-**	1-5/16 - 12 UN	0.91	0.62	0.73	1-5/16 - 12 UN	1.50	5, 65
1 1/4	DT-1250-MFMO-**-**	1-5/8 - 12 UN	0.96	1.06	0.73	1-5/8 - 12 UN	1.88	1, 5

DT-MOMF Male O-Ring Boss Inlet to Male Flare 37° JIC Outlet

Body Size	Part Number	Inlet Port End	Outlet Port End	Inlet Port Length	Hex	Outlet Port Length	Wrench Flats	Standard Crack Pressure (psi)
1/4	DT-250-MOMF-**-**	7/16-20 UNF	0.43	0.44	0.55	7/16-20 UNF	0.62	5
3/8	DT-370-MOMF-**-**	9/16-18 UNF	0.47	0.44	0.56	9/16-18 UNF	0.75	1, 5, 65
1/2	DT-500-MOMF-**-**	3/4-16 UNF	0.55	0.5	0.66	3/4-16 UNF	0.88	5, 65
5/8	DT-620-MOMF-**-**	7/8-14 UNF	0.63	0.5	0.76	7/8-14 UNF	1.06	5
3/4	DT-750-MOMF-**-**	1-1/16 - 12 UN	0.73	0.5	0.86	1-1/16 - 12 UN	1.25	1, 5, 65
1	DT-1000-MOMF-**-**	1-5/16 - 12 UN	0.73	0.62	0.91	1-5/16 - 12 UN	1.5	5, 65
1 1/4	DT-1250-MOMF-**-**	1-5/8 - 12 UN	0.73	1.06	0.96	1-5/8 - 12 UN	1.88	1, 5

**DT-MOMS** Male O-Ring Boss Inlet to Male Seal-Lok® Outlet

Body Size	Part Number	Inlet Port End	Outlet Port End	Inlet Port Length	Hex	Outlet Port Length	Wrench Flats	Standard Crack Pressure (psi)
1/4	DT-250-MOMS-**	7/16-20 UNF	0.43	0.45	0.39	9/16-18 UNF	0.62	5
3/8	DT-370-MOMS-**	9/16-18 UNF	0.47	0.44	0.44	11/16-16 UN	0.75	1, 5, 65
1/2	DT-500-MOMS-**	3/4-16 UNF	0.55	0.5	0.51	13/16-16 UN	0.88	5, 65
5/8	DT-620-MOMS-**	7/8-14 UNF	0.63	0.5	0.62	1-14 UNS	1.06	5
3/4	DT-750-MOMS-**	1-1/16 - 12 UN	0.73	0.5	0.68	1-3/16 - 12 UN	1.25	1, 5, 65
1	DT-1000-MOMS-**	1-5/16 - 12 UN	0.73	0.62	0.7	1-7/16 - 12 UN	1.5	5, 65
1 1/4	DT-1250-MOMS-**	1-5/8 - 12 UN	0.73	1.06	0.7	1-11/16 - 12 UN	1.88	1, 5

DT-MSMO Male Seal-Lok® Inlet to Male O-Ring Boss Outlet

Body Size	Part Number	Inlet Port End	Outlet Port End	Inlet Port Length	Hex	Outlet Port Length	Wrench Flats	Standard Crack Pressure (psi)
3/8	DT-370-MSMO-**	11/16-16 UN	0.44	0.44	0.47	9/16-18 UNF	0.75	1, 5, 65
1/2	DT-500-MSMO-**	13/16-16 UN	0.51	0.5	0.55	3/4-16 UNF	0.88	5, 65
5/8	DT-620-MSMO-**	1-14 UNS	0.62	0.49	0.63	7/8-14 UNF	1.06	5
3/4	DT-750-MSMO-**	1-3/16 - 12 UN	0.68	0.5	0.73	1-1/16 - 12 UN	1.25	1, 5, 65
1	DT-1000-MSMO-**	1-7/16 - 12 UN	0.7	0.62	0.73	1-5/16 - 12 UN	1.5	5, 65
1 1/4	DT-1250-MSMO-**	1-11/16 - 12 UN	0.7	1.06	0.73	1-5/8 - 12 UN	1.88	1,

DT-MSMS Male Seal-Lok® Inlet to Male Seal-Lok® Outlet

Body Size	Part Number	Inlet Port End	Outlet Port End	Inlet Port Length	Hex	Outlet Port Length	Wrench Flats	Standard Crack Pressure (psi)
3/8	DT-370-MSMS-**	11/16-16 UN	0.44	0.44	0.44	11/16-16 UN	0.75	1, 5, 65
1/2	DT-500-MSMS-**	13/16-16 UN	0.51	0.5	0.51	13/16-16 UN	0.88	5, 65
5/8	DT-620-MSMS-**	1-14 UNS	0.62	0.5	0.62	1-14 UNS	1.06	5
3/4	DT-750-MSMS-**	1-3/16 - 12 UN	0.68	0.5	0.68	1-3/16 - 12 UN	1.25	1, 5, 65
1	DT-1000-MSMS-**	1-7/16 - 12 UN	0.7	0.62	0.7	1-7/16 - 12 UN	1.5	5, 65
1 1/4	DT-1250-MSMS-**	1-11/16 - 12 UN	0.7	1.06	0.7	1-11/16 - 12 UN	1.88	1, 5

1/8"

1/4"

3/8"

1/2"

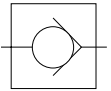
5/8"

3/4"

1"

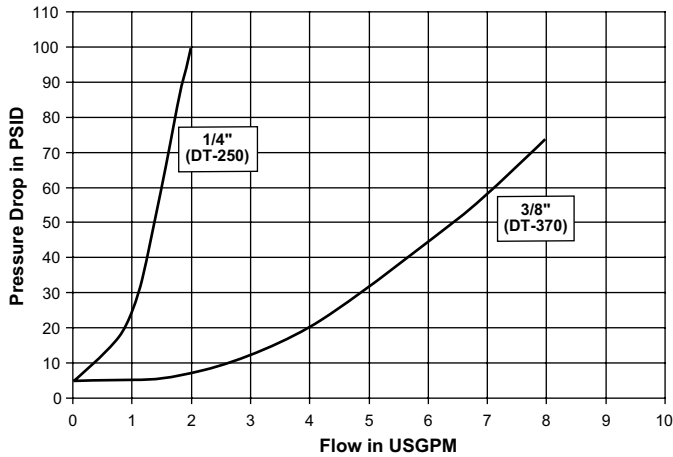
1-1/4"

1-1/2"

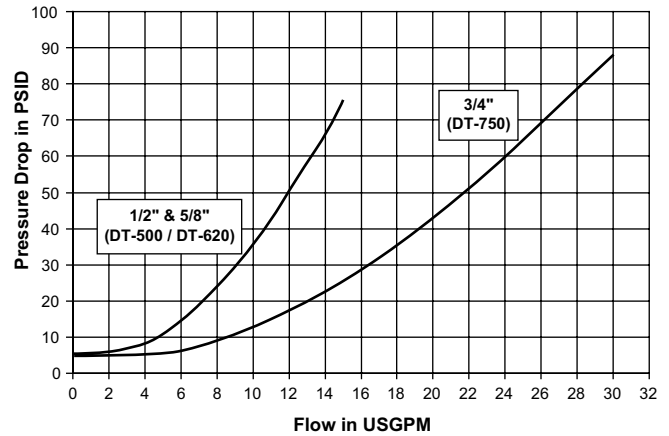


Flow Data

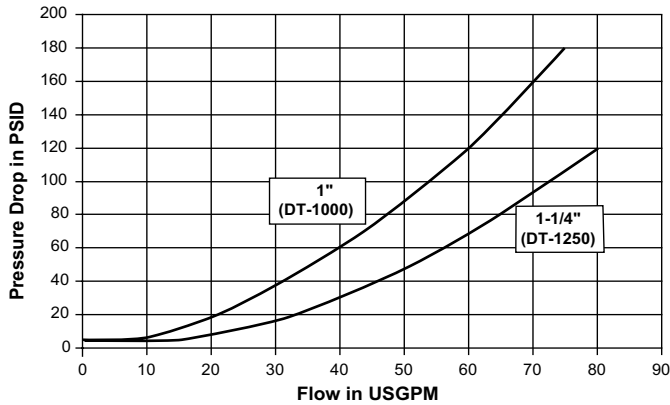
DT Series (1/4" & 3/8")
Test Fluid: Oil - 200 SUS



DT Series (1/2", 5/8" & 3/4")
Test Fluid: Oil - 200 SUS



DT Series (1" & 1-1/4")
Test Fluid: Oil - 200 SUS



Ordering Information

DT - XXX - XXXX - XX

Series

Crack Pressure

1 = 1 psi

5 = 5 psi

65 = 65 psi

Other Crack Pressures up to 200 PSI in 5 PSI increments are available.
Contact the Division for price and delivery on non-standard crack pressures.

Size

1/4	250
3/8	370
1/2	500
5/8	620
3/4	750
1	1000
1 1/4	1250

Fitting Style

MFMF	Male Flare Inlet to Male Flare Outlet
MFMO	Male Flare Inlet to Male O-Ring Boss Outlet
MOMF	Male O-Ring Boss Inlet to Male Flare Outlet
MOMS	Male O-Ring Boss Inlet to Male Face Seal Outlet
MSMO	Male Face Seal Inlet to Male O-Ring Boss Outlet
MSMS	Male Face Seal Inlet to Male Face Seal Outlet

Offer of Sale

The items described in this document and other documents and descriptions provided by Parker Hannifin Corporation, its subsidiaries and its authorized distributors ("Seller") are hereby offered for sale at prices to be established by Seller. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyer's order for any item described in its document, when communicated to Seller verbally, or in writing, shall constitute acceptance of this offer. All goods or work described will be referred to as "Products".

1. Terms and Conditions. Seller's willingness to offer Products, or accept an order for Products, to or from Buyer is expressly conditioned on Buyer's assent to these Terms and Conditions and to the terms and conditions found on-line at www.parker.com/saleterms/. Seller objects to any contrary or additional term or condition of Buyer's order or any other document issued by Buyer.

2. Price Adjustments; Payments. Prices stated on the reverse side or preceding pages of this document are valid for 30 days. After 30 days, Seller may change prices to reflect any increase in its costs resulting from state, federal or local legislation, price increases from its suppliers, or any change in the rate, charge, or classification of any carrier. The prices stated on the reverse or preceding pages of this document do not include any sales, use, or other taxes unless so stated specifically. Unless otherwise specified by Seller, all prices are F.O.B. Seller's facility, and payment is due 30 days from the date of invoice. After 30 days, Buyer shall pay interest on any unpaid invoices at the rate of 1.5% per month or the maximum allowable rate under applicable law.

3. Delivery Dates; Title and Risk; Shipment. All delivery dates are approximate and Seller shall not be responsible for any damages resulting from any delay. Regardless of the manner of shipment, title to any products and risk of loss or damage shall pass to Buyer upon tender to the carrier at Seller's facility (i.e., when it's on the truck, it's yours). Unless otherwise stated, Seller may exercise its judgment in choosing the carrier and means of delivery. No deferment of shipment at Buyers' request beyond the respective dates indicated will be made except on terms that will indemnify, defend and hold Seller harmless against all loss and additional expense. Buyer shall be responsible for any additional shipping charges incurred by Seller due to Buyer's changes in shipping, product specifications or in accordance with Section 13, herein.

4. Warranty. Seller warrants that the Products sold hereunder shall be free from defects in material or workmanship for a period of twelve months from the date of delivery to Buyer or 2,000 hours of normal use, whichever occurs first. This warranty is made only to Buyer and does not extend to anyone to whom Products are sold after purchased from Seller. The prices charged for Seller's products are based upon the exclusive limited warranty stated above, and upon the following disclaimer: **DISCLAIMER OF WARRANTY: THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO PRODUCTS PROVIDED HEREUNDER. SELLER DISCLAIMS ALL OTHER WARRANTIES, EXPRESS AND IMPLIED, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.**

5. Claims; Commencement of Actions. Buyer shall promptly inspect all Products upon delivery. No claims for shortages will be allowed unless reported to the Seller within 10 days of delivery. No other claims against Seller will be allowed unless asserted in writing within 60 days after delivery or, in the case of an alleged breach of warranty, within 30 days after the date within the warranty period on which the defect is or should have been discovered by Buyer. Any action based upon breach of this agreement or upon any other claim arising out of this sale (other than an action by Seller for any amount due to Seller from Buyer) must be commenced within thirteen months from the date of tender of delivery by Seller or, for a cause of action based upon an alleged breach of warranty, within thirteen months from the date within the warranty period on which the defect is or should have been discovered by Buyer.

6. LIMITATION OF LIABILITY. UPON NOTIFICATION, SELLER WILL, AT ITS OPTION, REPAIR OR REPLACE A DEFECTIVE PRODUCT, OR REFUND THE PURCHASE PRICE. IN NO EVENT SHALL SELLER BE LIABLE TO BUYER FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR AS THE RESULT OF, THE SALE, DELIVERY, NON-DELIVERY, SERVICING, USE OR LOSS OF USE OF THE PRODUCTS OR ANY PART THEREOF, OR FOR ANY CHARGES OR EXPENSES OF ANY NATURE INCURRED WITHOUT SELLER'S WRITTEN CONSENT, EVEN IF SELLER HAS BEEN NEGLIGENT, WHETHER IN CONTRACT, TORT OR OTHER LEGAL THEORY. IN NO EVENT SHALL SELLER'S LIABILITY UNDER ANY CLAIM MADE BY BUYER EXCEED THE PURCHASE PRICE OF THE PRODUCTS.

7. Contingencies. Seller shall not be liable for any default or delay in performance if caused by circumstances beyond the reasonable control of Seller.

8. User Responsibility. The user, through its own analysis and testing, is solely responsible for making the final selection of the system and Product and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application and follow applicable industry standards and Product information. If Seller provides Product or system options, the user is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the Products or systems.

9. Loss to Buyer's Property. Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which become Buyer's property, may be considered obsolete and may be destroyed by Seller after two consecutive years have elapsed without Buyer placing an order for the items which are manufactured using such property. Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

10. Special Tooling. A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture Products. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the Products, even if such apparatus has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

11. Buyer's Obligation; Rights of Seller. To secure payment of all sums due or otherwise, Seller shall retain a security interest in the goods delivered and this agreement shall be deemed a Security Agreement under the Uniform Commercial Code. Buyer authorizes Seller as its attorney to execute and file on Buyer's behalf all documents Seller deems necessary to perfect its security interest. Seller shall have a security interest in, and lien upon, any property of Buyer in Seller's possession as security for the payment of any amounts owed to Seller by Buyer.

12. Improper use and Indemnity. Buyer shall indemnify, defend, and hold Seller harmless from any claim, liability, damages, lawsuits, and costs (including attorney fees), whether for personal injury, property damage, patent, trademark or copyright infringement or any other claim, brought by or incurred by Buyer, Buyer's employees, or any other person, arising out of: (a) improper selection, improper application or other misuse of Products purchased by Buyer from Seller; (b) any act or omission, negligent or otherwise, of Buyer; (c) Seller's use of patterns, plans, drawings, or specifications furnished by Buyer to manufacture Product; or (d) Buyer's failure to comply with these terms and conditions. Seller shall not indemnify Buyer under any circumstance except as otherwise provided.

13. Cancellations and Changes. Orders shall not be subject to cancellation or change by Buyer for any reason, except with Seller's written consent and upon terms that will indemnify, defend and hold Seller harmless against all direct, incidental and consequential loss or damage. Seller may change product features, specifications, designs and availability with notice to Buyer.

14. Limitation on Assignment. Buyer may not assign its rights or obligations under this agreement without the prior written consent of Seller.

15. Entire Agreement. This agreement contains the entire agreement between the Buyer and Seller and constitutes the final, complete and exclusive expression of the terms of the agreement. All prior or contemporaneous written or oral agreements or negotiations with respect to the subject matter are herein merged.

16. Waiver and Severability. Failure to enforce any provision of this agreement will not waive that provision nor will any such failure prejudice Seller's right to enforce that provision in the future. Invalidation of any provision of this agreement by legislation or other rule of law shall not invalidate any other provision herein. The remaining provisions of this agreement will remain in full force and effect.

17. Termination. This agreement may be terminated by Seller for any reason and at any time by giving Buyer thirty (30) days written notice of termination. In addition, Seller may by written notice immediately terminate this agreement for the following: (a) Buyer commits a breach of any provision of this agreement (b) the appointment of a trustee, receiver or custodian for all or any part of Buyer's property (c) the filing of a petition for relief in bankruptcy of the other Party on its own behalf, or by a third party (d) an assignment for the benefit of creditors, or (e) the dissolution or liquidation of the Buyer.

18. Governing Law. This agreement and the sale and delivery of all Products hereunder shall be deemed to have taken place in and shall be governed and construed in accordance with the laws of the State of Ohio, as applicable to contracts executed and wholly performed therein and without regard to conflicts of laws principles. Buyer irrevocably agrees and consents to the exclusive jurisdiction and venue of the courts of Cuyahoga County, Ohio with respect to any dispute, controversy or claim arising out of or relating to this agreement. Disputes between the parties shall not be settled by arbitration unless, after a dispute has arisen, both parties expressly agree in writing to arbitrate the dispute.

19. Indemnity for Infringement of Intellectual Property Rights. Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Section. Seller will defend and indemnify Buyer against allegations of infringement of U.S. patents, U.S. trademarks, copyrights, trade dress and trade secrets ("Intellectual Property Rights"). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that a Product sold pursuant to this Agreement infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If a Product is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using the Product, replace or modify the Product so as to make it noninfringing, or offer to accept return of the Product and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to Products delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any Product sold hereunder. The foregoing provisions of this Section shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.

20. Taxes. Unless otherwise indicated, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of Products.

21. Equal Opportunity Clause. For the performance of government contracts and where dollar value of the Products exceed \$10,000, the equal employment opportunity clauses in Executive Order 11246, VEVRAA, and 41 C.F.R. §§ 60-1.4(a), 60-741.5(a), and 60-250.4, are hereby incorporated.