

Brooks® MT3600 Series Metal Tube Variable Area Flowmeters

Features and Benefits

- Flanged, NPT or socket-welded connections
- 10% full scale accuracy
- Disassembly for cleaning without removal from the process line
- Standard direct reading, detachable scales
- Permanent magnetic link between metering float and indicator/alarm
- CSA- US and Canada

Description

The Brooks® MT3600, MT3601 and MT3602 armored flowmeters are designed to be reliable and economical high flow rate purge meters with 10% accuracy. These meters are especially useful for metering coolants, pump seal fluids, lubricants under pressure, and opaque fluids. The flow rate is measured by the movement of a tapered plug in a fixed orifice. Indication is by an external tubular follower coupled magnetically to an extension of the tapered plug. A certified explosion-proof/intrinsically safe alarm is optional.

Specifications

Capacities and Pressure Drops

Refer to Table 1

Accuracy

Standard Flow Accuracy: $\pm 10\%$ Full Scale from 100% to 10% of scale reading

Optional Flow Accuracy: $\pm 5\%$ accuracy

Repeatability

1.0% Full Scale

Pressure Ratings

Refer to Table 2 for maximum non-shock pressure

Scales

Standard: Detachable aluminum plate

Length: 1.5 inches (38 mm)

Graduations: Choice of direct reading units, millimeter or percentage of maximum flow with regulator tag

Optional: Dual scales

Ambient Temperature Limits

-20°F to 122°F (-29°C to 50°C)



Model MT3602
 Armored Flowmeter
 with Indicator

Model MT3600
 with AP Alarm

Table 1 Capacities and Pressure Drop

Air scfh	Size 8		Size 10 (1")		Size 12 (1-1/2")	
	Water gph	Pressure Drop psi	Water gpm	Pressure Drop psi	Water gpm	Pressure Drop psi
23	5	-	5	1.75	20	2.00
58	15	1.25	-	-	30	2.75
120	30	1.50	10	3.75	40	4.75
195	50	1.00	15	4.75	50	5.75
425	100	1.50	-	-	-	-
790	180	3.25	-	-	-	-
1660	300	5.00	-	-	-	-

1. All air flows given are at 14.7 psia and 70°F.
2. 1" and 1-1/2" meters not recommended for gas service, due to stability of float.
3. Minimum operating pressure (downstream) on gas service is 35 psig for 1/2" size. Consult factory for other conditions.

Models MT3600, MT3601 & MT3602

Table 2 Maximum Non-Shock Pressure Table

Maximum Pressure: Threaded and socket-welded meters: Up to 1500 psig at 200°F (93.3°C).

Maximum non-shock pressure (psi) versus temperature for ANSI standard pipe flanges:

Flange Rating	-20°F to 100°F (-29°C to 37.8°C)	200°F (93.3°C)	300°F (148.9°C)	400°F (204.4°C)
150 lb. (316 SS)	275	240	215	195
300 lb. (316 SS)	720	620	560	515
600 lb. (316 SS)	1440	1240	1120	1030

Note: For pressure ratings of alternate materials consult the factory.

Operating Fluid Temperature Limits

Maximum: 500°F (260°C)

Minimum: -20°F (-29°C)

Minimum/Maximum temperature with:

Buna O-ring: -20°F (-29°C) to 250°F (121°C)

EPR O-ring: -20°F (-29°C) to 300°F (149°C)

Kalrez® O-ring: -20°F (-29°C) to 400°F (204°C)

Metal (316SS) O-ring: -20°F (-29°C) to 400°F (204°C)

Silicone O-ring: -20°F (-29°C) to 400°F (204°C)

Teflon® O-ring: -20°F (-29°C) to 400°F (204°C)

Viton® fluoroelastomers O-ring: -20°F (-29°C) to 400°F (204°C)

Optional all welded construction: 500°F (260°C)

Note: Maximum Temperature Rating for all meters with alarm option is 250°F (121°C)

Materials of Construction

Metering Tube, Floats, Flanges, and Extension Well

Standard: 316 stainless steel

Optional: Monel™, Hastelloy C-276™, "Mill Certificates" (316 stainless steel only), meter body per NACE Spec MR-01-75 (316 stainless steel only)

O-rings

Standard: Viton® fluoroelastomers

Optional: Silicone, Buna-N, Kalrez, EPR, Teflon, Metal (Teflon and Metal are limited to Size 8 and 10, 316SS only)

Indicator Housing

Standard Housing: Aluminum with clear anodized finish and glass window

Optional Housing: 316 polished stainless steel and glass window

Alarm Housing, Cover and Isolation Well

Standard: Cast aluminum alarm housing and cover with aluminum isolation well, gasket seal, polyurethane paint.

Optional: Epoxy painted alarm housing and cover

Connections

Standard:

Model 3600: Socket-weld connections.

Model 3601: Flanged connections (150 lbs, 300 lbs or 600 lbs RF ANSI B 16.5).

Model 3602: NPT threaded connections.

Connection Orientation

Vertical inlet, horizontal outlet

Meter Dimensions

Refer to Figures 1 and 2.

Ordering Information and Model Code

Refer to Table 3.

Pressure Equipment Directive (PED) 97/23/EC

Flow meter complies under Sound Engineering Practices (SEP), except for size 12. Size 12 does not conform to Pressure Equipment Directive 97/23/EC, therefore it cannot be sold or used in the EU/EFTA.

Optional Equipment:

Alarm Limit Switches

Up to two reed switches provide initiation of alarm signal at preset flow values. Settings can be adjusted by removing the alarm housing cover, loosening, moving and retightening of the reed switch holders, and replacement of the alarm housing cover. For greater power handling capability, optional electromechanical relays are available.

Alarm Electrical Classification

All alarms are CSA; Canada and USA certified intrinsically safe, explosion-proof or in non-incendive. All alarm configurations are suitable for indoor and out door operation.

REED SWITCH ONLY UNITS

Refer to control drawing, Figure 10, for details on IS and Division 2 installations and entity parameters.

IS for Division 1, Class I, Groups A,B,C,D
Class II, Groups E,F,G

Class III

Enclosure 4X



C US Non-Incendive for Division 2, Class I, Groups A,B,C, D

Class II, Groups E, F, G
 Class III
 Enclosure 4X
 Explosion Proof for Division 1 & 2, Class I, Groups C,D
 Class II, Groups E, F, G
 Class III
 Enclosure 4X

Reed Switch Specifications

(Refer to control drawing, Figure 10, for limits that apply to IS applications)
 Voltage: 140 Vac maximum, 50-60 Hz, 200 Vdc maximum
 Power: 10 Watts maximum
 Current: Determined by calculation so that power does not exceed 10 watts, however the current is never to exceed 0.5 amps.

RELAY UNITS

Explosion Proof for Division 1 & 2, Class I, Groups C, D
 Class II, Groups E, F, G
 Class III
 Enclosure 4X

Example: $I \text{ (amps)} = \text{(watts)} / \text{(operating voltage)}$
 $I \text{ (amps)} = (10) / (120)$
 $I \text{ (amps)} = 0.083$

Electromechanical Relay Specifications

Coil operating voltage: 220 or 120 Vac -15% + 10%, 45-60 Hz

Reed Switches Only: For intrinsically safe applications, remotely mounted, switch isolator/power supplies are available in single channel or dual channel configuration with 110 or 220 Volt supply options. Output is via SPDT relays rated at 250 Vac, 4A, 24 Vdc, 4A.

Contact rating: 10 amps resistive, 7 amps inductive at 115 Vac

Relay Configuration: Single channel (1) DPDT, Dual Channel (2) SPDT

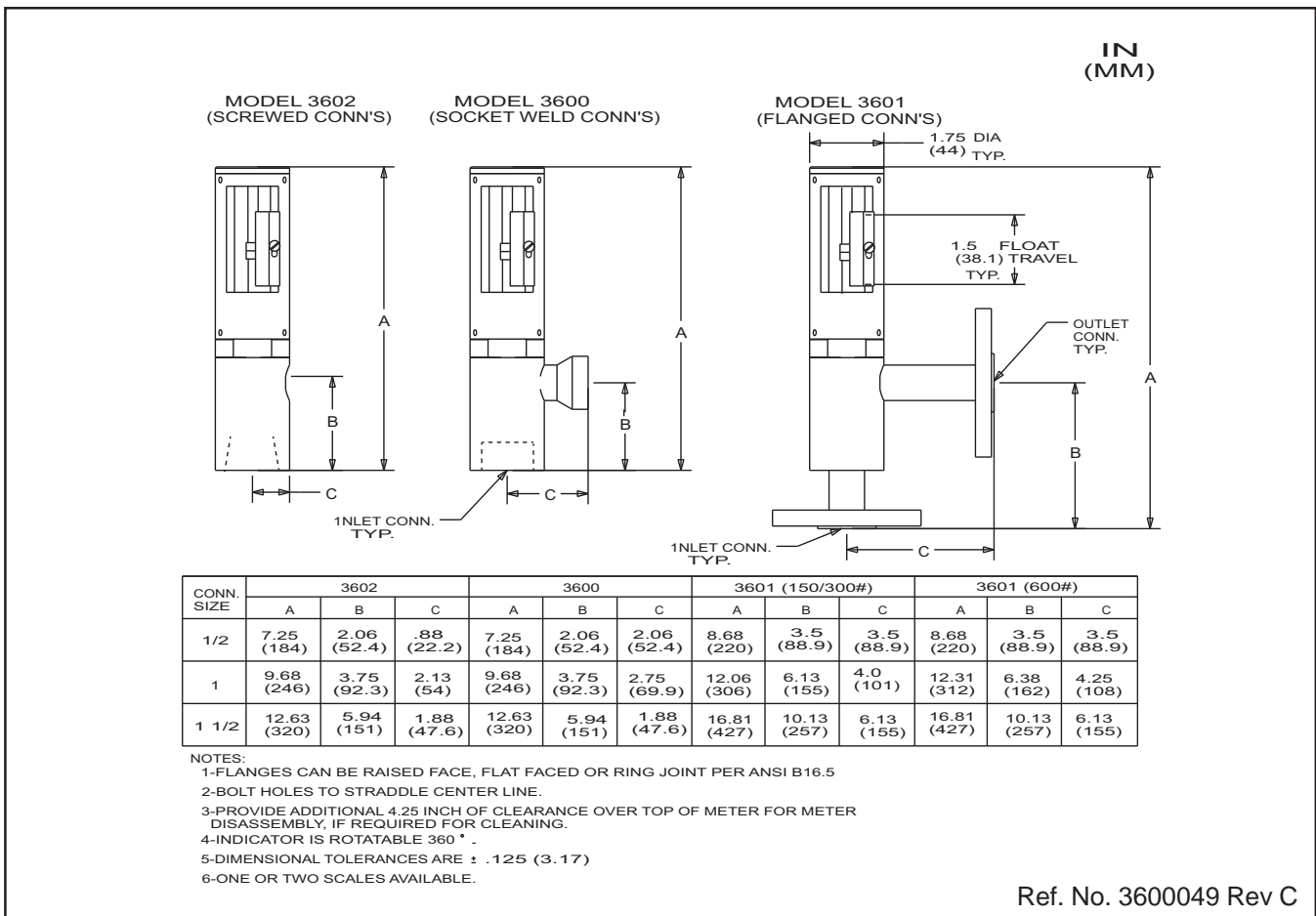


Figure 1 MT3600 Series with Indicator Dimensions

Models MT3600, MT3601 & MT3602

Alarm Hysteresis

Approximately 4 mm (0.16 inch) of float travel

Alarm Altitude

2,000 meters

Alarm Humidity

50 - 80% Relative Humidity

Pollution Degree

2 Degrees

Installation

Category II

Ambient Operating Temperature

-20°F to 122°F (-29°C to 50°C)

Operating Fluid Temperature Limits

-20°F (-29°C) to 250°F (121°C)

Alarm Dimensions

See Figure 2.

Reed Switches Only: For Intrinsically safe and explosion proof applications, remotely mounted, switch isolator/power supplies are available in single channel or dual channel configuration with 110 or 220 Volt supply options. Output is via SPDT relays rated at 250 Cac, 4A, 24 Vdc, 4A.

Control Valves

Model 3602: Size 8 only, 316 stainless steel material only- on inlet or outlet

Dimensions: Figures 3, 4, 5 and 6

Minimum/maximum operating temperature:

-20°F (-29°C) to 400°F (204°C)

Cv factor: 1.2

Materials of Construction:

316 stainless steel body and stem, Kel-F™ seat, Teflon packing

Flow Controllers

Model MT3602: Size 8 only, 316 stainless steel material only- on inlet or outlet.

Refer to DS-VA-FC-eng for Flow Controller information

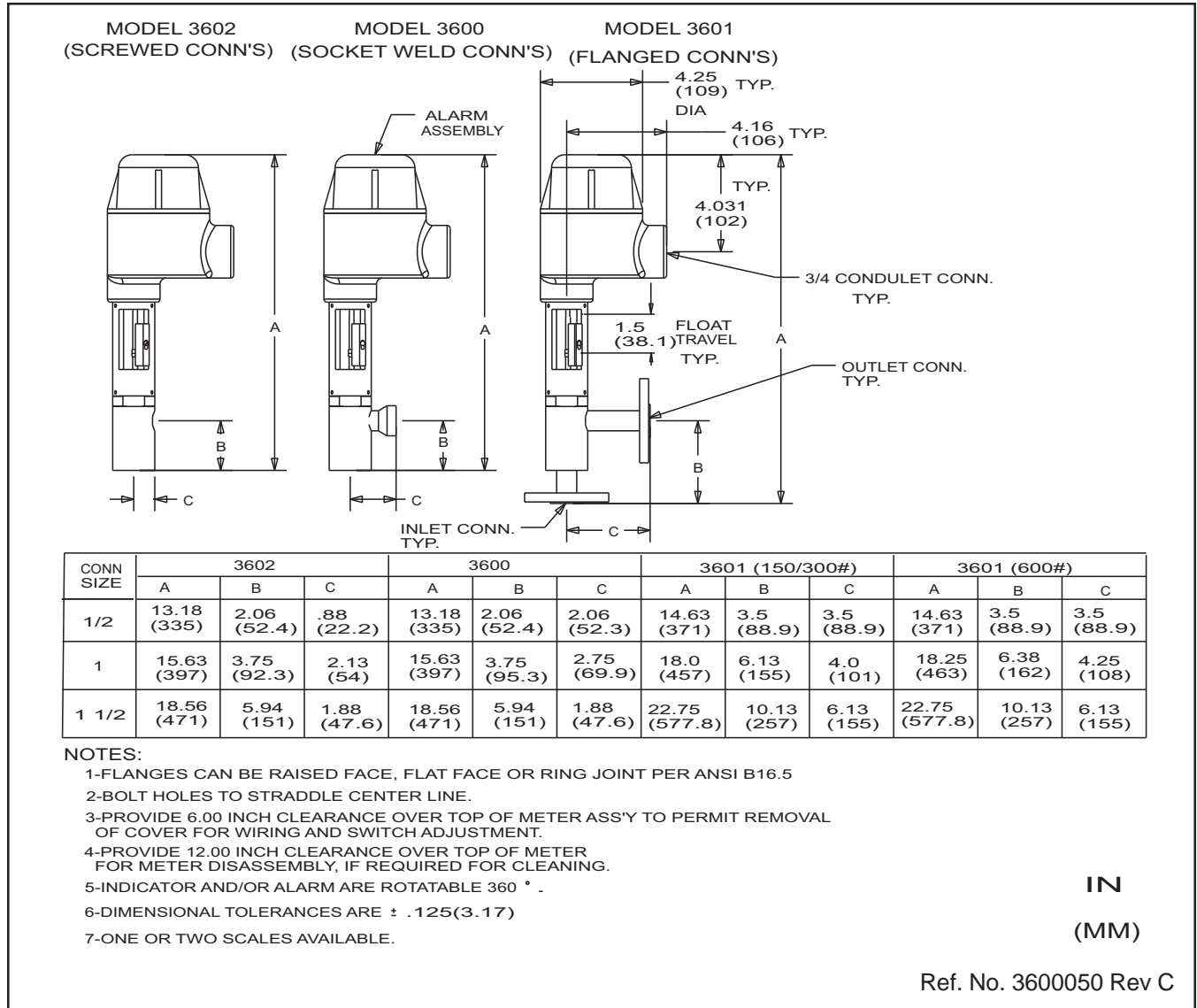


Figure 2 MT3600 Series Meter with Alarm Dimensions

Models MT3600, MT3601 & MT3602

Approximate Shipping Weight (lbs):

Model	SIZE		
	8	10	12
3600	5	7	12
3601	6	11	21
3602	5	7	12
w/Alarm Add	6	6	6

Table 3 Ordering Information and Model Code

MODEL	ARMORED PURGE METER			
3600B	SOCKET CONNECTION			
3601B	FLANGE CONNECTION			
3602B	THREADED CONNECTION (FEMALE)			
CODE	METER & CONNECTION SIZE			
2	SIZE 8 (1/2")			
3	SIZE 10 (1")			
4	SIZE 12 (1 1/2")			
CODE	CONNECTION TYPE			
B	NPT (female)		(MODEL SELECTION 3602 ONLY)	
C	ANSI 150# RF		(MODEL SELECTION 3601 ONLY)	
D	ANSI 300# RF		(MODEL SELECTION 3601 ONLY)	
E	ANSI 600# RF		(MODEL SELECTION 3601 ONLY)	
F	SOCKET WELD		(MODEL SELECTION 3600 ONLY)	
CODE	FLOAT & ORIFICE CAPACITY <small>(CAPACITIES SHOWN ARE AIR @ STP OR WATER)</small>			
	SIZE 8	SIZE 8	SIZE 10*	SIZE 12*
A	23 SCFH	5 GPH	5 GPM	20 GPM
B	58 SCFH	15 GPH		
C	120 SCFH	30 GPH	10 GPM	30 GPM
D	195 SCFH	50 GPH	15 GPM	
E	425 SCFH	100 GPH		40 GPM
F	790 SCFH	180 GPH		50 GPM
G	1660 SCFH	300 GPH		
*SIZE 10 & SIZE 12 NOT RECOMMENDED FOR GAS SERVICE				
CODE	BODY & FLOAT MATERIAL			
2	ALL 316 STN. STL.			
5	MONEL			
6	HASTELLOY C-276			
CODE	INDICATION CONFIGURATION			
A	STANDARD INDICATOR ONLY (ALUMINUM)			
K	SS/INDICATOR ONLY			
L	ALUMINUM INDICATOR W/XP ALARM, 1 SWITCH & NO RELAY			
M	ALUMINUM INDICATOR W/XP ALARM, 2 SWITCH & NO RELAY			
N	ALUMINUM INDICATOR W/XP ALARM, 1 SWITCH & 1 RELAY (NOTE 1)			
P	ALUMINUM INDICATOR W/XP ALARM, 2 SWITCH & 2 RELAY (NOTE 2)			
CODE	SCALE/METER ACCURACY			
D	NO INSCRIPTION (BLANK SCALE)			
E	SCFH AIR @ STANDARD 10% ACCURACY			
F	GPH OR GPM WATER, STANDARD 10% ACCURACY			
G	MM SCALE			
H	% SCALE			
J	SPECIAL INSCRIPTION, LIQUID (UNCALIB.) STD. 10% ACCURACY			
K	SPECIAL INSCRIPTION, GAS (UNCALIB.) STD 10% ACCURACY			
L	SPECIAL INSCRIPTION, VISCOSITY, STD 10% ACCURACY			
M	SPECIAL INSCRIPTION, GAS CALIBRATION, 5% ACCURACY			
N	SPECIAL INSCRIPTION, LIQUID CALIBRATION, 5% ACCURACY			
P	SPECIAL INSCRIPTION, VISCOSITY CALIBRATION, 5% ACCURACY			

Note 1: Internally mouted DPDT electromechanical relay but may be wired for SPDT.

Note 2: Internally mounted SPDT electromechanical relay only.

Table 3 Ordering Information and Model Code Cont'd

CODE	O'RING MATERIAL
A	BUNA
B	SILICONE
C	VITON
G	KALREZ
N	EPR
P	TEFLON (SIZE 8 & 10 IN 316SS ONLY. SIZE 12 USE ALL WELDED CONSTRUCTION)
Q	METAL (SIZE 8 & 10 IN 316SS ONLY. SIZE 12 USE ALL WELDED CONSTRUCTION)
R	ALL WELDED (NO O-RING, ALL WELDED, HI TEMP DESIGNS)
CODE	ACCESSORIES (CHOOSE UP TO THREE DIGITS)
A	NONE
H	INTEGRAL 1/2" NEEDLE VALVE ON INLET (OPTIONAL FOR SIZE 8 ONLY)
J	INTEGRAL 1/2" NEEDLE VALVE ON OUTLET (OPTIONAL FOR SIZE 8 ONLY)
K	HARDWARE FOR MOUNTING TO FLOW CONTROLLER (NOTE 3)
M	NACE SPEC. MR-01-75
N	ALL WELDED CONSTRUCTION
P	NIST TRACEABILITY
Q	DUAL SCALES
R	HIGH TEMPERATURE DESIGN
S	1 CHANNEL RELAY, SPDT, 120Vac (NOTE 4)
T	2 CHANNEL RELAY, SPDT, 120Vac (NOTE 4)
U	1 CHANNEL RELAY, SPDT, 220Vac (NOTE 4)
V	2 CHANNEL RELAY, SPDT, 220Vac (NOTE 4)

Note 3: Flow controller must be specified as a separate line item.

Note 4: NOT available for alarms with internally mounted relay(s).

Models MT3600, MT3601 & MT3602

BROOKS SERVICE AND SUPPORT

Brooks is committed to assuring all of our customers receive the ideal flow solution for their application, along with outstanding service and support to back it up. We operate first class repair facilities located around the world to provide rapid response and support. Each location utilizes primary standard calibration equipment to ensure accuracy and reliability for repairs and recalibration. The primary standard calibration equipment to calibrate our flow products is certified by our local Weights and Measures Authorities and traceable to the relevant International Standards.

Visit www.BrooksInstrument.com to locate the service location nearest to you.

START-UP SERVICE AND IN-SITU CALIBRATION



Brooks Instrument can provide start-up service prior to operation when required. For some process applications, where ISO-9001 Quality Certification is important, it is mandatory to verify and/or (re)calibrate the products periodically. In many cases this service can be provided under in-situ conditions, and the results will be traceable to the relevant international quality standards.

CUSTOMER SEMINARS AND TRAINING

Brooks Instrument can provide customer seminars and dedicated training to engineers, end users and maintenance persons. Please contact your nearest sales representative for more details.

HELP DESK

In case you need technical assistance:

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Due to Brooks Instrument's commitment to continuous improvement of our products, all specifications are subject to change without notice.

TRADEMARKS

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Hastelloy Haynes International
Kalrez DuPont Dow Elastomers
Kel-F 3M Corporation
Monel Inco Alloys International Inc.
Neoprene E.I. DuPont de Nemours & Co.
Teflon E.I. DuPont de Nemours & Co.
Viton DuPont Performance Elastomers



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