



Oval Gear Flowmeter with Mechanical Batching



measuring
•
monitoring
•
analysing

DOL



- Measuring range:
30...450 L/min ... 150...2500 L/min
- Viscosity range: 0 ... 1 000 cP
(higher with special cut rotors)
- Accuracy:
 ± 0.5 % of reading
- p_{\max} : 20 bar; t_{\max} : 80 °C
- Material: aluminium or ductile iron
- mechanical register, preset batch register, mech. control valve, printer



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Principle of Operation

The Oval Gear meters are positive displacement flowmeters where the passage of liquid causes two oval gears to rotate within a precision measuring chamber and with each rotation a fixed volume of liquid passes through the meter. The motion of the rotors is transmitted to the mechanical register totaliser and mechanical Preset batch counter via an interfacing reduction gear drive train and vertical drive shaft, which includes a Vernier accuracy adjuster.

This technology allows precise flow measurement and dispensing of most clean liquids regardless of their conductivity, with other liquid characteristics having no or minimal effect on meter performance. This metering technology does not require flow profile conditioning or straightline runs as required with alternative flow technologies making the installation relatively compact and low cost.

Positive displacement flowmeters are an inexpensive means to accurately meter high viscosity clean liquids as high as 1 million centipoise however, the appropriate meter must be sized so that the pressure drop across the primary measuring elements (oval rotor), does not exceed the maximum capability.

The DOL mechanical batching option is for mechanical Oval gear Meters from 2" and larger (2" to 4" meters). The preset register has 1 or 2 stage knock-off action which allows for opening and closing action of Mechanically, Electrically or Pneumatically actuated shut-off valves. The shut-off valves must be manually opened as they are not mechanically opened by the preset batcher. When the preset batch quantity counts down to the First Stage Knock-off preset, it releases a latch mechanism allowing the linkage to close slowly to approximately 10-20% of full flow. When the preset batcher reaches Zero, the Second stage Knock-off allows the linkage to fully close the valve.

The Preset has Interlock features. The preset buttons cannot be actuated until the SET button is depressed (Latched). The SET button cannot be latched with the valve load applied, therefore the preset number cannot be changed while fluid is flowing. The two stage closure reduces the effects of induced hammer & variable overrun as the valve closes.

First stage knock-off: Can be factory preset at 90, 80, 70, 60, 50, 40, 30, 20, 10, 9, 8, 7, 6, 5, 4 or 3 units before Zero (final knock-off).

Final stage knock-off: May be finetuned to account for action delay of knock-off valve.

Factory Default setting for First Knock-off action is 5 Units.

Note: The minimum batch set quantity on the Preset batcher is 1 unit (where 1 unit = 10 litres on the registers in litres), the First stage knock-off value is a minimum of 3 units (30 litres) with factory default of 5 units (50 litres). The First Stage Knock-off setting can be changed in the factory from the default setting of 5 units, by request (see page 6 for picture illustration).

Areas of Application

For all viscous, non abrasive clean liquids like:

- Petroleum
- Plant and Vegetable Oils
- Grease
- Fuels
- Alcohol etc.

DOL mechanical batching meter is only suitable for use with petroleum based products.

Technical Details

Material

DOL-A

Body/flanges:	aluminium
Gear wheels:	aluminium
Bearing:	hardened steel rollers (only for lubricating fuels or oil)

DOL-D

Body/flanges:	ductile iron
Gear wheels:	aluminium
Bearing:	hardened steel rollers (only for lubricating fuels or oil)

O-Rings:

FPM (standard):	-15 ... +120 °C
EPR (ethylene propylene rubber):	-20 ... +120 °C (for ketones only)
PTFE encapsulated FPM:	-20 ... +120 °C
NBR:	-20 ... +100 °C

Minimum Preset

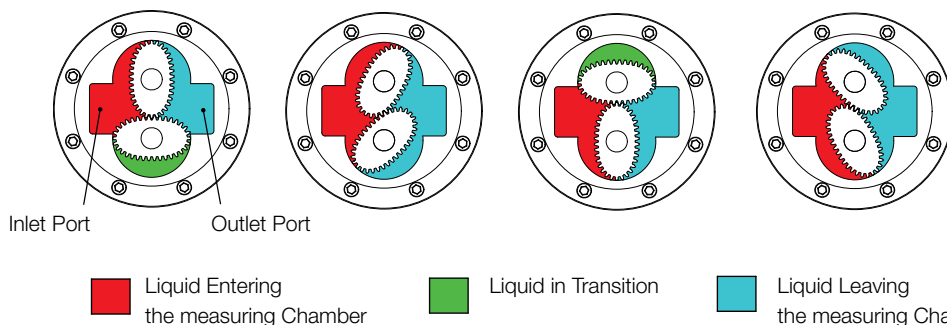
Batch increment for preset batcher: 10 litres

Accuracy: ±0.5 % of reading

Repeatability: typ. ±0.03 %

Protection class: IP 65

Temperature range: -40 °C ... +80 °C





Mechanical shut-off (Piston) valve (included in options VU & VV)

Body material: Cast Aluminium Housing
 Piston Valve, Shaft and Spring: Carbon Steel
 Valve Seat: Rubber coated Steel
 Maximum flow rates:
 2": 550 L/min
 3": 1 135 L/min
 4": 2 270 L/min

Back pressure check valve (included in Option "R")

Back pressure: approx. 1 bar

Material

Check Valve Plate and Poppet Check Valve: 316 stainless steel
 Check Valve Spring: 303 stainless steel
 Check Valve Washer and Split Pin: 304 stainless steel

Air eliminator (model ZAL)

Materials

Air Eliminator Housing and vent port cover plates: Cast Aluminium
 Float Assembly: Stainless steel
 Valve Plates: Steel with rubber material vent port seals
 Reed Valves: Stainless Steel
 Baffle Cup: Plated Steel
 Mesh size: 80 mesh (180 microns)

Strainer Materials

Housing and blanking plate material: Cast Aluminium
 Mesh: Stainless steel

Mechanical Registers and Modules

V1 /V2 Mechanical Register

5 Digit resettable totaliser and 8 Digit non resettable totaliser
 Repeatability: 0.05 % of reading over entire range and beyond.
 Linearity: Capable of ±0.125 % or better over a 5:1 range from maximum nominal meter capacity.

The mechanical counter registers total volume of liquid. Finished in corrosion resistant epoxy, the housing protects the

register in demanding environments and extremes in weather. Positive action reset knob.

NOTE: Accuracy obtainable when all variables remain constant. Reading/ measurements must be equal to a minimum of one minute of flow at selected rate(s). All accuracy statements based on metering Stoddard Solvent, approximate viscosity 1 cP. On higher viscosity products, the average deviation in accuracy will be even less.

V3/V4 Mechanical Register and Ticket Printer

Provides an imprinted ticket record of each transaction. Printer is incorporated with V1 /V2 mechanical register and must be ordered together.

Tamper proof design seals ticket in printer during delivery Security is provided by before and after imprinting of consecutive sales (transactions) number.

Magnetic latch and gasketed cover keep out dirt and weather. Right hand reset feature.

Printer accepts standard 128.8 x 196.9 mm carbon packs and receipt tickets. Reset knob resets both printer and register.

V5/V6 Mechanical Preset Counter

Enables you to select and automatically control Preset Valve closure so that an exact predetermined volume will be delivered. Single stage valve operation is used in low velocity systems and/or high viscosity applications.

Preset Counter includes red emergency stop button to abort preset deliveries.

V7/V8 Mechanical Register, Preset & Ticket Printer

Meter register, Printer and Preset combine to control, display and print detailed records of fluid deliveries. Ideal for increased efficiency in all kinds of liquid inventory monitoring and control installations.

Operating Temperature: -40 °C to 80 °C
 Preset: 5 Digits 13 mm High numbers
 Register: 5 Digit Reset 19 mm high numbers
 8 Digit non reset 3 mm high numbers

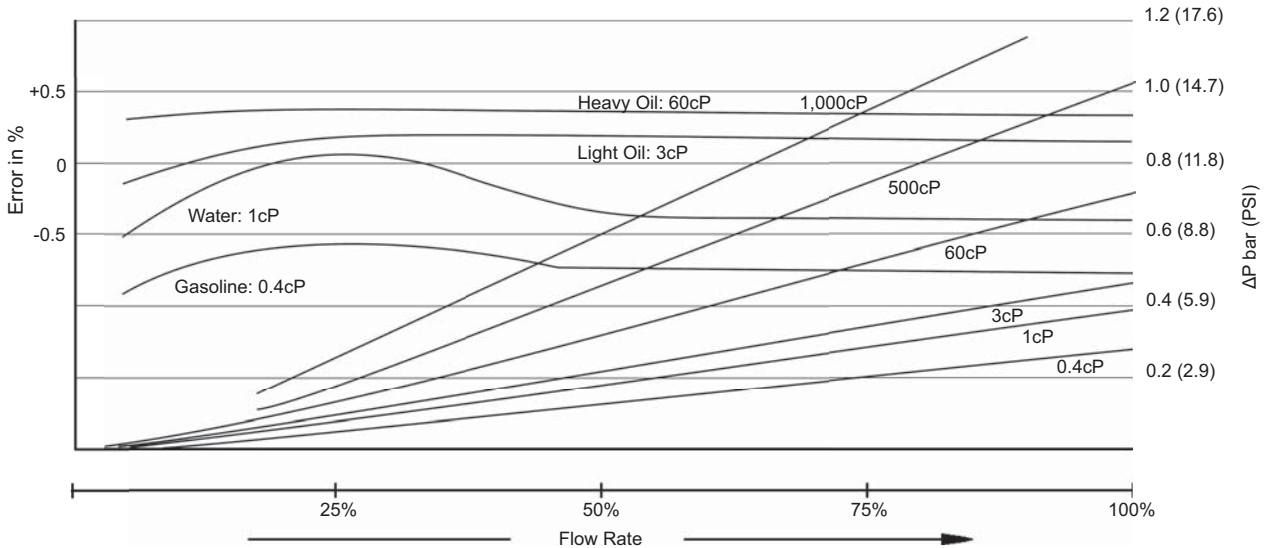
Maximum Pressure (threaded version)

Model	Maximum pressure [bar]	
	DOL-A..	DOL-D..
DOL-x35..	20	-
DOL-x40..	20	-
DOL-x45..	12	12
DOL-x50..	12	-
DOL-x55..	10	10
DOL-x60..	10	-

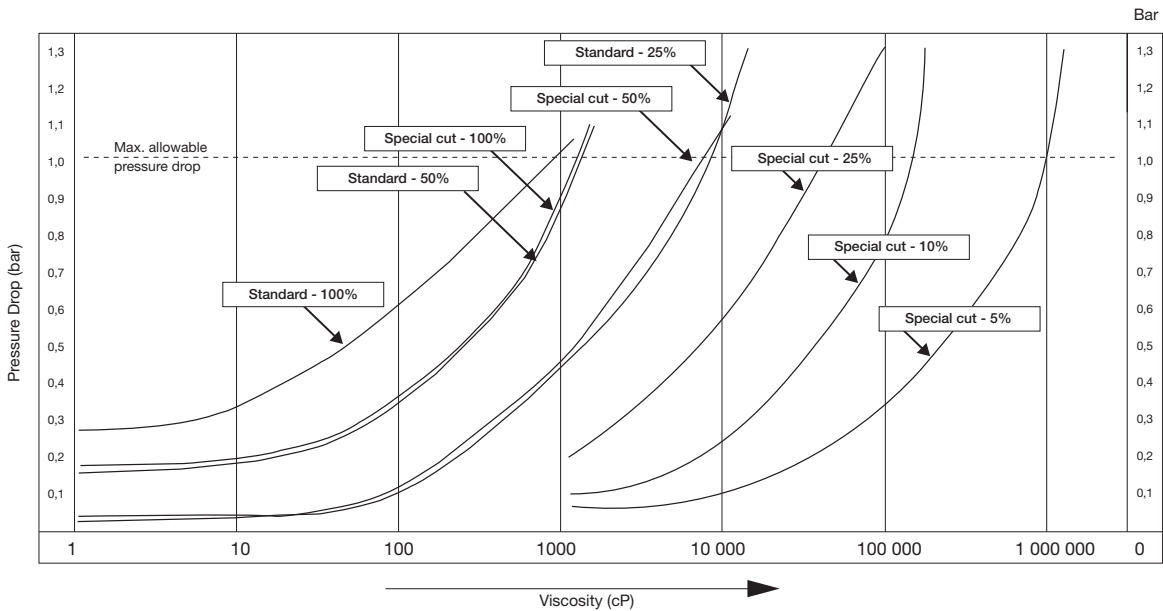
with flanges, maximum pressure rating as above or as per flange rating, whichever is lower



Accuracy and Pressure Drop



Pressure Drop Curves for Standard and Special Cut Rotors (option "S") in %age of Max. Flow



Pressure drop limit versus flowrate

The curves above represent the pressure drop for standard and special cut high viscosity oval rotors at various viscosities. Special cut rotors have alternate tooth relieve which

effectively reduces the pressure drop by 50%. When sizing a meter, be sure your selection falls on or below the 1 bar maximum allowable pressure drop line on the graph.



Maximum Flowrate Multiplier (for higher viscosities)

Viscosities (cP)	Standard rotor	Special cut rotor
≤ 1 000	1	1
≤ 2 000	0.5	1
≤ 4 000	0.42	0.84
≤ 6 000	0.33	0.66
≤ 8 000	0.25	0.5
≤ 30 000	0.15	0.3
≤ 60 000	0.12	0.25
≤ 150 000	0.1	0.2
≤ 250 000	0.05	0.1
≤ 1 000 000	0.025	0.05

Special Cut Rotors for higher viscosities

For viscosity > 1000 cP, special cut rotors option "S" should be used to reduce pressure drop. For higher viscosities, the flowmeter max. flowrate is de-rated according to the attached chart.

Example: DOL-x35 measuring oil at 6000 cP, max. flow 450 LPM x 0.66 = 297 LPM new maximum flow rate.

Order Details Thread Connection (Example: **DOL-A50H RB 1 V2 0**)

Meas. range [L/min]	Connection female	Housing material		O-ring material	Mechanical Registers	Option
		Aluminium	Ductile iron			
30 - 450	G 2	DOL-A35H R9	-	1 = FPM (standard) 2 = EPDM 3 = PTFE encaps. FPM 4 = NBR	V1 = 5 digit mechanical reset register (Liter) V2 = 5 digit mechanical reset register (US gallons) V3 = 5 digit mech. reset register, ticket printer (Liter) V4 = 5 digit mech. reset register, ticket printer (US gallons) V5 = 5 digit mech. reset register, batch register (Liter) V6 = 5 digit mech. reset register, batch register (US gallons) V7 = 5 digit mech. reset register, batch register, printer (Liter) V8 = 5 digit mech. reset register, batch register, printer (US gallons) VV = 5 digit mechanical reset register (Liter) batch register, mechanical control valve VU = 5 digit mechanical reset register batch register (US gallons), mechanical control valve XX = special option, specified in clear text	0 = without A = coupled with air eliminator-strainer ZAL R = option A + check valve S = special cut rotors for higher viscosities Y = special option, specified in clear text
50 - 580	G 2	DOL-A40H R9	-			
35 - 750	G 3	DOL-A45H RB	DOL-D45H RB	1 = FPM (standard) 2 = EPDM 4 = NBR		
50 - 1000	G 3	DOL-A50H RB	-			
75 - 1500	G 4	DOL-A55H RC	DOL-D55H RC			
150 - 2500	G 4	DOL-A60H RC	-			

For NPT connection change "DOL-xxxx Rx..." into "DOL-xxxx Nx"
 Specify the 'units before zero (final knock-off)' if other than '5' (factory default).



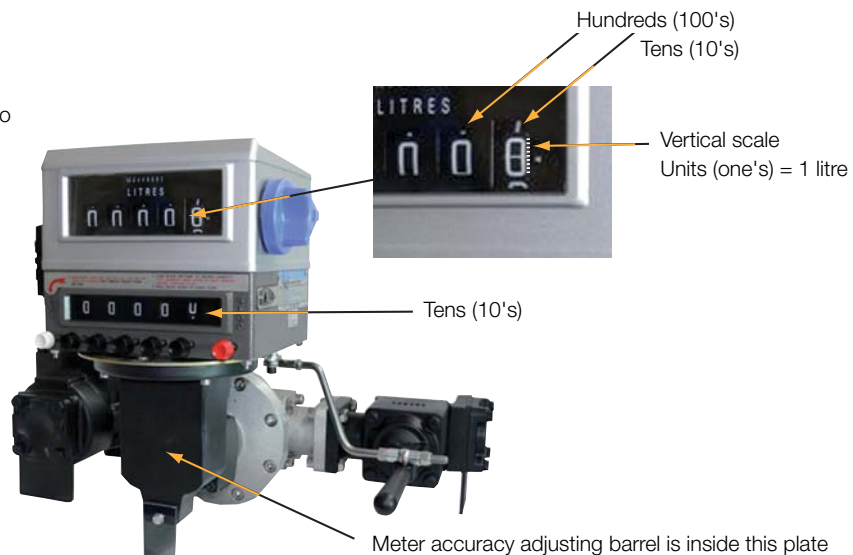
Oval Gear Flowmeter Model DOL

Order Details Flange Connection (Example: DOL-A45H FB 1 V3 0)

Meas. range [L/min]	Connection DIN flange PN16	Housing material		O-ring material	Mechanical Registers	Option
		Aluminium	Ductile iron			
30 - 450	DN 50/2"	DOL-A35H F9	-	1= FPM (standard) 2= EPR 3= PTFE encaps. FPM 4= NBR	V1 = 5 digit mechanical reset register (Liter) V2 = 5 digit mechanical reset register (US gallons) V3 = 5 digit mech. reset register, ticket printer (Liter) V4 = 5 digit mech. reset register, ticket printer (US gallons) V5 = 5 digit mech. reset register, batch register (Liter) V6 = 5 digit mech. reset register, batch register (US gallons) V7 = 5 digit mech. reset register, batch register, printer (Liter) V8 = 5 digit mech. reset register, batch register, printer (US gallons) VV = 5 digit mechanical reset register (Liter) batch register, mechanical control valve VU = 5 digit mechanical reset register batch register (US gallons), mechanical control valve XX = special option, specified in clear text	0 = without A = coupled with air eliminator-strainer ZAL R = option A + check valve S = special cut rotors for higher viscosities Y = special option, specified in clear text
50 - 580	DN 50/2"	DOL-A40H F9	-			
35 - 750	DN 80/3"	DOL-A45H FB	DOL-D45H FB	1= FPM (standard) 2= EPR 4= NBR		
50 - 1000	DN 80/3"	DOL-A50H FB	-			
75 - 1500	DN 100/4"	DOL-A55H FC	DOL-D55H FC			
150 - 2500	DN 100/4"	DOL-A60H FC	-			

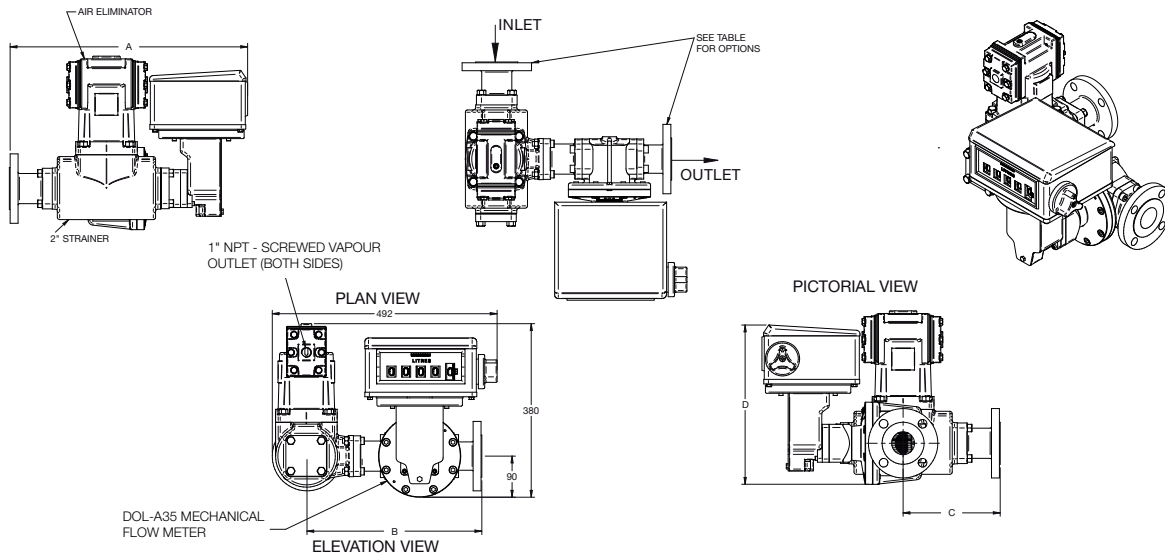
ANSI-150 RF flange change "DOL-xxxx Fx..." into "DOL-xxxx Ax",
ANSI-300 RF flange change "DOL-xxxx Fx..." into "DOL-xxxx Bx" (only 2").
Specify the 'units before zero (final knock-off)' if other than '5' (factory default).

The mechanical coupling ratio of pre-set batcher to veeder root style register is 1 : 1



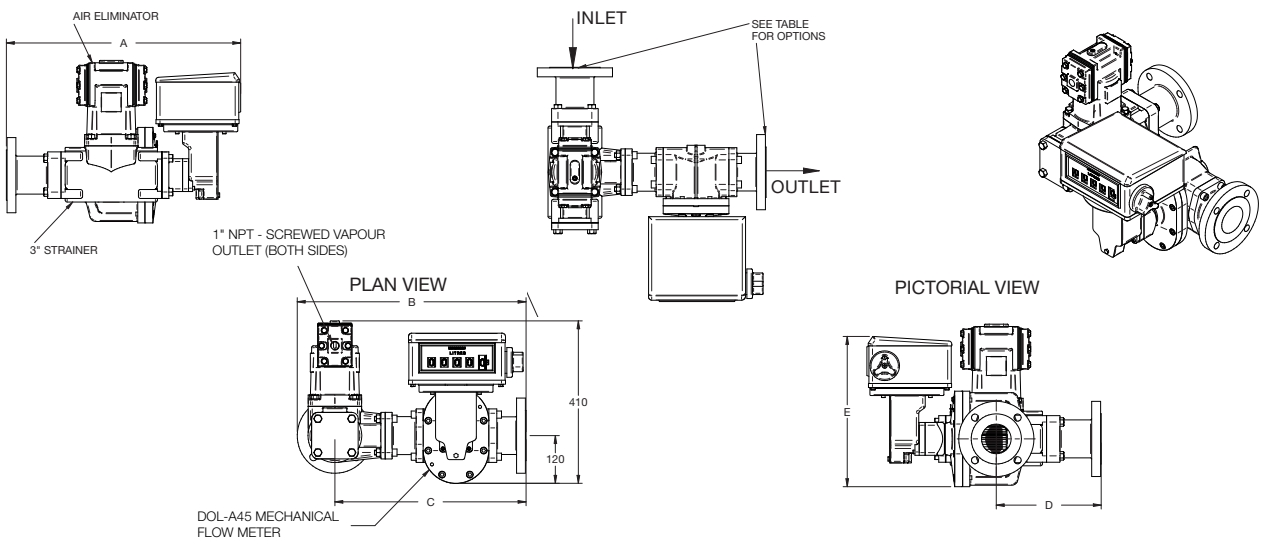


Dimensions for DOL-A35, A40 with integral options V1 ... V8 and close coupled option "A" (in mm)



Model	Thread Connection (G or NPT)			Flanged Connection DIN PN16 or ANSI 150RF			Thread or Flanged D		
	A	B	C	A	B	C	V1, V2	V3, V4, V5, V6	V7, V8
DOL-A35	460	353	153	520	383	213	349	437	527
DOL-A40	454	353	141	515	383	213	349	437	527

Dimensions for DOL-A45...A60/ DOL-D45/D55 with integral options V1 ... V8 and close coupled option "A" (in mm)



Model	Thread Connection (G or NPT)				Flanged Connection DIN PN16 or ANSI 150RF				Thread or Flanged D		
	A	B	C	D	A	B	C	D	V1, V2	V3, V4, V5, V6	V7, V8
DOL-A(D)45	498	543	439	161	592	578	483	265	380	468	558
DOL-A50	503	557	467	161	597	606	511	265	405	493	583
DOL-A(D)55	581	609	499	219	681	660	546	329	405	493	583
DOL-A60	583	624	525	219	683	686	572	329	397	485	575

Note: Dimensions of DOL-X...VU/VV on request