

MILROYAL® Series

API 675 Metering Pump

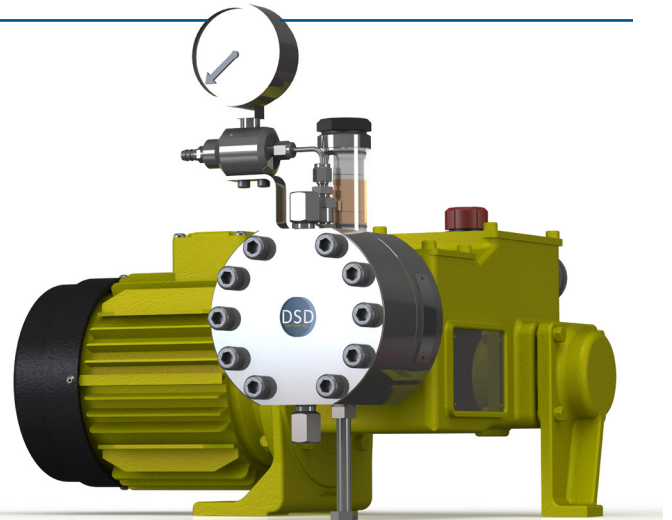
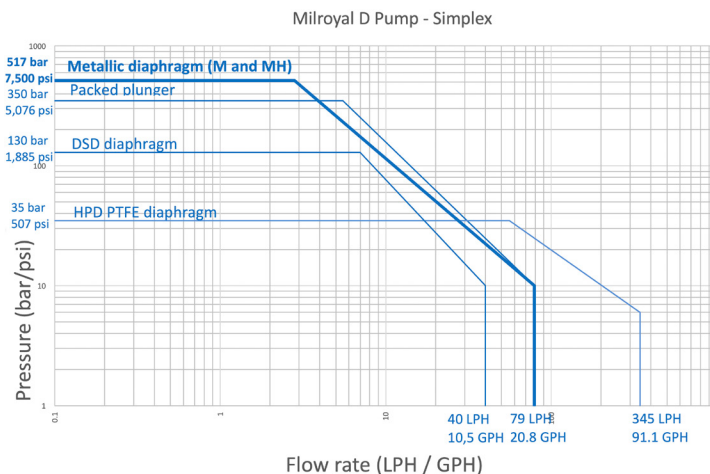
Milroyal D Pumps

The MILROYAL D pumps are renowned for their robustness and longevity. They are suitable for sustained intensive use. Optimized service life of moving parts in oil bath. Moreover fewer parts mean reduced maintenance; in addition the removable cover provides easy access to all pump parts.

The MILROYAL D design is modular thus allowing it to accept a variety of liquid ends and other options that perfectly tune it to process requirements. Multiplex configurations provide even greater application flexibility.

The MILROYAL D is a robust industrial duty metering pump for use in critical processes in oil and gas, chemical and hydrocarbon processes, water and waste treatment, and in most industries where chemical injection is required.

Simplex MILROYAL D Metering Series



	50 Hz motor	60 Hz motor
Flow rate	Up to 345 l/h	Up to 91.1 gph
Pressure	Up to 517 bar	Up to 7,500 psi
Thrust	110 daN	247 lbf
100% stroke	25.4 mm	1.0 in
Ambient T° Standard	-10 to +50 °C	+14 to +122 °F
Low T° design	-40 to +50 °C	-40 to +122 °F

Typical applications

- **Oil & Gas:** injection of biocide, corrosion/scale inhibitors, H₂S scavengers, at wellheads to protect piping and other assets and maintaining production rates, transfer of condensates
- **Gas treatment:** gas odorization (injecting mercaptan or THT)
- **Refinery/Downstream:** Injection of chemicals for separation and treatment of refined products, injection of paraffin, injection of additives and catalysts into fuels storage tanks
- **Chemicals / Petrochemicals:** injection of additives, injection of co-catalyst, injection of sulphuric acid into water to produce diluted sulphuric acid, injecting bromine, acid or organic solvent
- **Boiler water treatment:** treatment of make-up, circuit and discharge water (injecting corrosion inhibitor, biocide, anti-foaming agent, scale inhibitor, lime inhibitor, phosphate, hydrazine, ammonia, etc.)
- **Municipal drinking/wastewater plants:** Coagulation/flocculation (injection of ferric chloride, aluminium sulphate, etc.), pH regulation (injection of acids and alkalis), water conditioning before and/or after RO treatment in desalination plant
- **Industrial water treatment:** protection of installation such as boilers and hydraulic systems (corrosion inhibitors, biocides, scale inhibitors, amines...)
- **Food and beverage industry:** Injection of enzymes in starch production, injection of caustic soda for process water neutralization in refining and distilling applications
- **Paper-making pulp colouring:** injecting dyes

Benefits

A practical answer for the most diverse applications thanks to a high degree of modularity:

- **4 technologies of liquid ends:** Packed plunger, PTFE or metallic diaphragm liquid ends and patented DSD liquid ends (Dynamic Stiffness Diaphragm)
- **Long experience with polar crank drive technology (over 45 years of return of experience)**

Compact and robust design

- Ease of integration into all types of plant and/or packages
- Low maintenance and operating cost

Reliability and safety

- Compliant with **API 675 standards**
- Safety: leak-resistant diaphragm liquid ends with service life over 20,000 hours.
- **Overpressure protection:** integrated safety valve to protect the pump on diaphragm liquid ends in case of potential pressure surges
- **Global design:** complies with major global certifications and systems: EC, UKCA, ATEX, NACE, Customs Union, etc.

Adaptability and accuracy

- Capacity adjustable while running and stopped (stroke micrometric adjustment, ten (10) turns only from 0 to 100%, graduation scale in %)
- Precision within $\pm 1\%$
- Linearity and repeatability $\pm 3\%$

Operates in the most extreme conditions:

Specific configurations to operate in saline/offshore conditions, desert, or low temperature environment

- **Large chemical compatibility:** Suitable for most fluids used in industrial processes with large chemical compatibility on the liquid end and diaphragm material.
- Suitable for accurate dosing application with many stroke speeds and controls

Modular design to precisely fit your needs: multiple options for liquid ends, check valves, connection types, and control

Multiplexing capability: provides cost savings in power consumption and asset footprint while reducing pulsation and required NPSH, capable of injection several different products at multiple specific flow rates

Long life: high-quality materials engineered to a robust and proven construction, oil bath lubrication to ensure reliability during continuous operation

Efficient maintenance: easy access to internal parts

Micrometric adjustment of nominal flow rate from 0 to 100% both running and at a standstill

Technical features

- Cast housing, Standard painting RAL 1018, 100 μm
- Maximum temperature of pumped fluids: $+110\text{ }^{\circ}\text{C}$ ($+230\text{ }^{\circ}\text{F}$)
- Protection level: IP65 class F
- Multiplexable version up to 13 heads
- **4 technologies of liquid ends:**
 - DSD® Technology (Dynamic Stiffness Diaphragm)
 - Packed Plunger
 - Metallic diaphragm
 - PTFE diaphragm (HPD: High Pressure Diaphragm)
- Liquid end body in 316L SS, PVC. Other materials such as Alloy 20, Hastelloy®, super Duplex available upon request
- Diaphragms in PTFE or 316L S.S.; plunger in ceramic
- 5 stroke speeds / 5 gear ratios available with 50 Hz motor: 23, 46, 93, 117 and 140 spm
- 4 stroke speeds / 4 gear ratios available with 60 Hz motor: 28, 55, 112 and 140 spm.
- Manual or electrical stroke length adjustment
- IEC or NEMA mounting, motor for frequency variation
- Electric equipment for non-hazardous or hazardous area, large variety of protections and insulations
- Conforms to ATEX II 2G Ex h IIC T4 Gb X with ATEX motor
- Optimum protection for critical processes or pumped fluids: double or triple diaphragm, diaphragm failure detection, temperature probes
- Special valves for any type of fluid (including concentrated sulphuric acid and slurries)
- Remote head, cooling/heating jacket to operate in processes requiring low/extreme fluid temperatures
- Full set of connections: screwed or flanged connectors (ANSI, DIN or ISO)
- Wide range of accessories available to complete your installation

Design Specifications

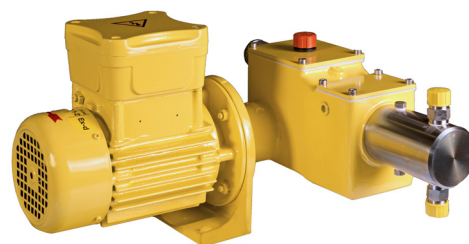
According to your process, we advise you on the best design of liquids ends to meet your specific requirements. The following charts demonstrate the minimum and maximum flow rate and pressure of the pump for a single head on a basic configuration. To obtain the flow rate for multiplex head, multiply the flow rate by the number of heads. For other applications, please consult us.

Standard connections are depending on the plunger diameter; a full set of connections are available upon request. Please consult us for details.

Performance

Packed plunger liquid ends

- High pressure capabilities
- Lowest NPSH requirements
- Ideal for viscous fluids and slurries
- Cost effective solution
- **Economical solution**, with U and N type, manual adjustment for ease of assembly and service



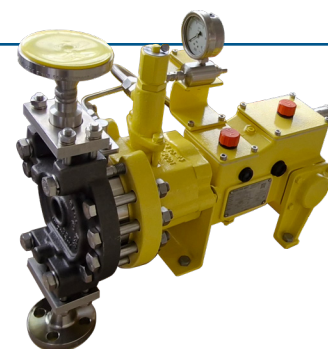
		50 Hz Motor					60 Hz Motor					Connections
Plunger diameter code	Swept volume	Stroke speed max	Motor speed max	Flow rate max		Pressure max	Stroke speed max	Motor speed max	Flow rate max		Pressure max	
				10 bar	P. max				145 psi	P. max		
Ø	cm³	spm	rpm	l/h		bar	spm	rpm	gph		psi	
Packed plunger liquid ends - Stainless steel 316L - Type N												
3.2	0.2	140	1440	1.7	1.4	350	140	1680	0.43	0.37	5076	1/4"- VV2 f
6	0.7	140	1440	5.8	5.0	350	140	1680	1.5	1.3	5076	1/4"- VV2 f
8	1.3	140	1440	10.1	9.4	200	140	1680	2.7	2.5	2900	1/4"- VV2 f
Packed plunger liquid ends - Stainless steel 316L - Type U												
11.1	2.5	140	1400	19.9	19.4	70	140	1680	5.2	5.1	1015	1/2" - VV2 m
15.9	5.0	140	1400	40	39	45	140	1680	11.6	10.5	652	1/2" - VV2 m
22.2	9.8	140	1400	79	79	10	140	1680	21.0	21.0	145	1" - VV2 m

PTFE diaphragm liquid ends

- **Suitable for high flow rates**
- Widest chemical compatibility
- Improved lifecycle costs
- 100% leakage-free
- High operational safety: integrated relief valve

TYPE H (316L Stainless steel liquid end) and TYPE P (PVC liquid end)

- Universal solution
- High hydraulic efficiency



		50 Hz Motor					60 Hz Motor					Connections
Plunger diameter code	Swept volume	Stroke speed max	Motor speed max	Flow rate max		Pressure max	Stroke speed max	Motor speed max	Flow rate max		Pressure max	
				10 bar	P. max				145 psi	P. max		
Ø	cm³	spm	rpm	l/h		bar	spm	rpm	gph		psi	
Stainless steel 316L liquid end with PTFE diaphragm - Type H												
20	8	140	1440	62	59.8	35	140	1680	16.2	15.8	507	1/2" - VV1 m
25	12.5	140	1440	98	94.7	22	140	1680	24.5	25.1	319	1/2" - VV1 m
32	20.4	140	1440	157	157	13	140	1680	41.8	41.5	188	1/2" - VV1 m
40	31.9	140	1400	-	247	8	140	1680	-	65.6	116	1/2" - VV1 m
45	40.4	140	1400	-	347	7	140	1680	-	83.1	87	1/2" - VV1 m
PVC liquid end with PTFE diaphragm - Type P												
20	8	140	1400	62.0	62.0	10	140	1680	-	16.3	145	1/2" - VV1 f
25	12.5	140	1400	96.4	96.4	10	140	1680	-	25.5	145	1/2" - VV1 f
32	20.4	140	1400	161.3	161.3	10	140	1680	-	41.8	145	1/2" - VV1 f
40	31.9	140	1400	-	247.0	8	140	1680	-	65.6	116	1/2" - VV1 f
45	40.4	140	1400	-	347.0	7	140	1680	-	83.1	87	1/2" - VV1 f

Metallic diaphragm liquid end

- High pressures
- Challenging dosing products: diffusing, radioactive
- “Metal to Metal” sealing design assures leak free operation
- High operation safety: integrated relief valve



TYPE M and MH (New Metallic diaphragm design)

		50 Hz Motor					60 Hz Motor					Connections
Plunger diameter code	Swept volume	Stroke speed max	Motor speed max	Flow rate max		Pressure max	Stroke speed max	Motor speed max	Flow rate max		Pressure max	
				10 bar	P. max				145 psi	P. max		
Ø	cm³	spm	rpm	l/h		bar	spm	rpm	gph		psi	
Stainless steel 316L liquid end with stainless steel 316L diaphragm - Type M												
3	0.2	140	1400	1.4	0.7	500	140	1680	0.4	0.2	7251	1/4" - VV2 f
4	0.3	140	1400	2.5	1.7	500	140	1680	0.7	0.5	7251	1/4" - VV2 f
Stainless steel 316L liquid end with stainless steel 316L diaphragm - Type MH												
5.2	0.5	140	1400	4.3	2.8	517	140	1680	1.1	0.7	7500	1/4" - VV2 f
6	0.7	140	1400	5.6	4.3	390	140	1680	1.5	1.1	5656	1/4" - VV2 f
Stainless steel 316L liquid end with stainless steel 316L diaphragm - Type M												
6	0.7	140	1400	5.6	3.7	350	140	1680	1.5	1.1	5076	1/4" - VV2 f
8	1.3	140	1400	9.9	7.8	220	140	1680	2.6	2.3	3173	1/2" - VV1 m
10	2.0	140	1400	15.4	13.4	140	140	1680	4.1	3.8	2030	1/2" - VV1 m

DSD® Liquid End Dynamic Stiffness Diaphragm

The concept of the DSD® Technology is based on the outstanding properties of its Dynamic Stiffness Diaphragm. Its mechanical properties mean that it will never bend forwards, does not leak and boasts a compact design. The hydraulic system has been simplified, and a new multifunction valve has been developed. Thus consumables are reduced as possible and maintenance operations are easier and cheaper.

- Patented technology
- Flow rate from 0.13 l/h to 40.3 l/h (from 0.03 to 10.7 gph)
- Max. pressure: 20 bar / 290 psi (PVDF) and 130 bar / 1885 psi (316L SS)
- Maximum temperature of pumped fluids:
Stainless steel 316L (XR/XV type) : -5° C to +100 °C (+23° F to +212 °F)
PVDF (VR type) : -5° C to +50 °C (+23° F to +122 °F)
- Single or double diaphragm (PTFE)
- Injection of viscous fluids up to 7,000 mPa.s
- High suction lift: up to 6 mWC
- Internal 6-function relief valve, patented
 1. Safety valve
 2. Intake valve
 3. Air bleed
 4. Oil tank - just 40 ml
 5. Visual overpressure indication
 6. Visual oil level indication
- Limited consumables (no more than 40 ml of oil in the liquid end)



DSD (Dynamic Stiffness Diaphragm) 316
Stainless steel liquid end - TYPE XR and XV

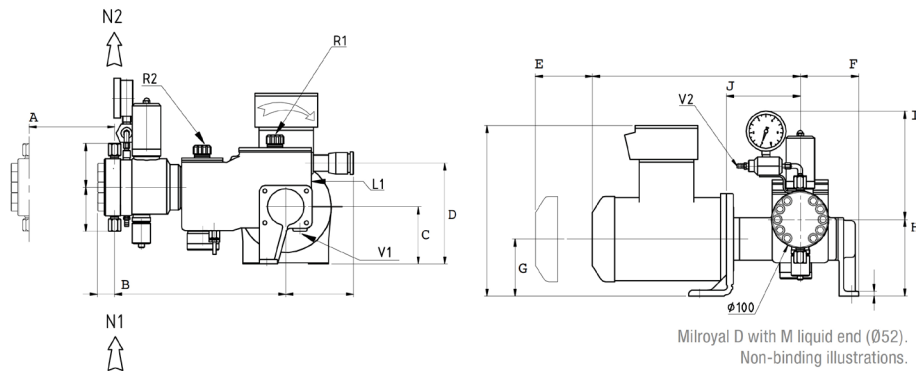
DSD® Technology - 316 S.S. liquid end with Type XR & XV - PVDF liquid end with Type VR

		50 Hz Motor					60 Hz Motor					Connections
Plunger diameter code	Swept volume	Stroke speed max	Motor speed max	Flow rate max		Pressure max	Stroke speed max	Motor speed max	Flow rate max		Pressure max	
				10 bar	P. max				145 psi	P. max		
Ø	cm³	spm	rpm	l/h		bar	spm	rpm	gph		psi	
Stainless steel 316L liquid end - Type XR												
3	0.2	140	1400	1.3	0.5	130	140	1680	0.35	0.14	1885	1/4" - W2 f
4	0.3	140	1400	2.4	1.3	130	140	1680	0.64	0.33	1885	1/4" - W2 f
6	0.7	140	1400	5.7	4.0	130	140	1680	1.50	1.05	1885	1/4" - W2 f
8	1.3	140	1400	10.1	7.1	130	140	1680	2.67	1.87	1885	1/4" - W2 f
10	2.0	140	1400	15.8	11.0	130	140	1680	4.17	2.92	1885	1/4" - W2 f
12	2.9	140	1400	22.7	19.0	90	140	1680	6.01	5.05	1305	1/4" - W2 f
14	3.9	140	1400	30.8	27.6	63	140	1680	8.18	7.31	913	1/4" - W2 f
16	5.1	140	1400	40.3	36.6	47	140	1680	10.70	9.90	681	1/4" - W2 f
Stainless steel 316L liquid end - Type XV (for viscous fluids)												
3	0.2	23	1400	0.2	0.1	130	28	1680	0.07	0.02	1885	1/4" - W2 f
4	0.3	46	1400	0.8	0.4	130	55	1680	0.25	0.13	1885	1/4" - W2 f
6	0.7	46	1400	1.9	1.0	130	55	1680	0.59	0.31	1885	1/4" - W2 f
8	1.3	46	1400	3.3	1.7	130	55	1680	1.05	0.55	1885	1/4" - W2 f
10	2.0	46	1400	5.0	3.5	130	55	1680	1.57	1.08	1885	1/4" - W2 f
12	2.9	46	1400	7.1	6.0	90	55	1680	2.26	1.87	1305	1/4" - W2 f
14	3.9	46	1400	9.7	8.7	63	55	1680	3.08	2.73	913	1/4" - W2 f
16	5.1	117	1400	32.3	29.9	47	112	1680	8.13	7.51	681	1/4" - W2 f
PVDF liquid end - Type VR												
3	0.2	140	1400	1.1	0.9	20	140	1680	0.29	0.25	290	1/4" - W2 f
4	0.3	140	1400	2.0	1.8	20	140	1680	0.54	0.49	290	1/4" - W2 f
6	0.7	140	1400	5.7	5.3	20	140	1680	1.50	1.41	290	1/4" - W2 f
8	1.3	140	1400	10.1	9.5	20	140	1680	2.67	2.51	290	1/4" - W2 f

Dimensions, Weight and Packing

The general dimensions are given in mm and as an indication only.

The dimensions given correspond to the maximum dimensions (largest liquid ends, most powerful motor).



Dimensions

Dimension	DSD® (XR, XV, CR, VR code)	Plunger (N or U code)	Metallic diaphragm (M or MH code)	HPD diaphragm (H or P code)
A	150	25	32	150
B	278	-	296	363
C	134	134	134	134
D	177	177	177	177
E	100	100	100	100
F	103	103	103	103
G	100	100	100	100
H	134	134	134	134
I	213	92	156	215
J	130	130	130	130

N1: Suction
N2: Discharge
V1: Drain mechanic oil

L1: Mechanic oil level
R1: Mechanical oil filling
R2: Hydraulic oil filling

VERSION	NET WEIGHT (kg)	GROSS WEIGHT (kg)	PACKING (l x w x h) (mm)	Standard Packaging
Simplex	30	47	800 x 560 x 590	Solid wooden crate
Duplex	50	74	800 x 800 x 590	
Simplex + actuator	35	59	800 x 800 x 590	
Triplex	70	115	800 x 1310 x 590	

Options

Motor	For frequency variation, ATEX or in accordance with specification
Capacity control	Electronic : ATEX compliance (Zones 1-2-3) available, 4-20 mA or HART communication / Pneumatic : 0.2 to 1 bar (3-15 psi)
Rupture detection	By pressure gauge, pressure controller or pressure switch
Special valves	To suite your application - High viscosity (single or double ball)
Connections	NPT, GAS or ANSI or DIN flange connection, as per your specifications
Painting	Standard: C1 polyurethane or other paint systems (C2, C3, C4, C5) in options
Housing	Optional low temperature casting
Multiplexing	Up to 13 heads

Milton Roy and our trusted partners can help to:

- Guide in selecting the turnkey solution that best suits your needs
- Advise on the optimum installation of your equipment
- Propose a wide range of accessories to complete the installation of your pumps
- Advise on essential spare parts to keep on hand to optimize the performance of your equipment
- Provide turnkey dosing solutions, from a skid-mounted pump to a complex, 100% customized chemical injection package

About Ingersoll Rand Inc.

Ingersoll Rand Inc. (NYSE:IR), driven by an entrepreneurial spirit and ownership mindset, is dedicated to helping make life better for our employees, customers and communities. Customers lean on us for our technology-driven excellence in mission-critical flow creation and industrial solutions across 40+ respected brands where our products and services excel in the most complex and harsh conditions. Our employees develop customers for life through their daily commitment to expertise, productivity and efficiency. For more information, visit www.IRCO.com.