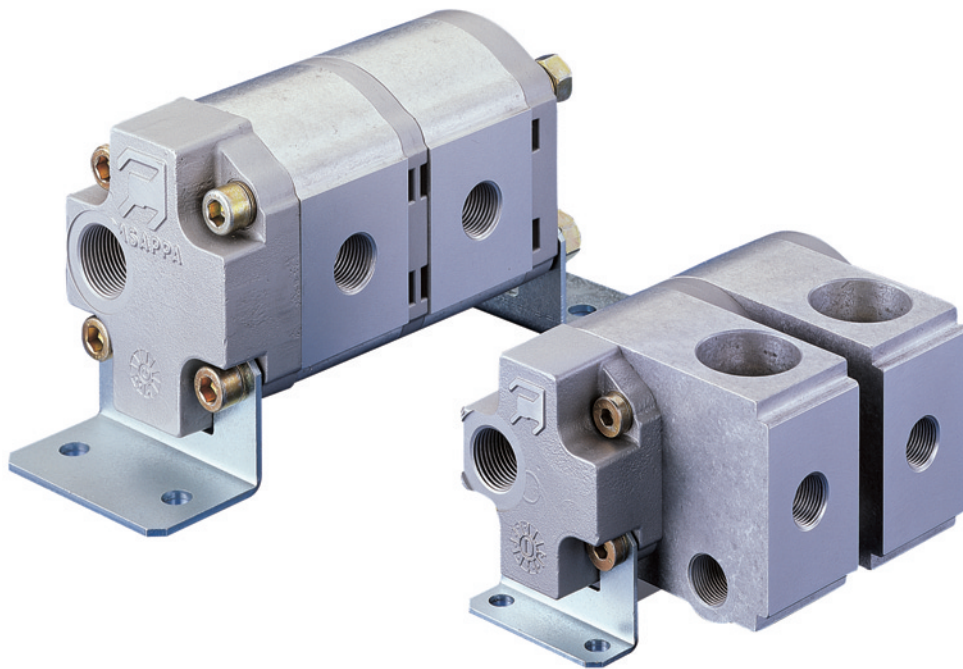




Gear flow dividers

DISPLACEMENTS

From	0.12 cu in/rev
To	1.99 cu in/rev



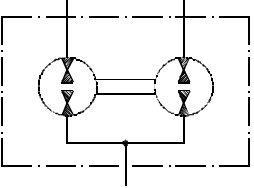
- Modular design
- Accurate division of flow
- Compact overall dimension
- Built-in relief valve

PRESSURE

Max. continuous	3600 psi
Max. peak	4000 psi

GENERAL FEATURES

Modern machinery with increasingly complex circuits often needs combinations of separate and independent movements. POLARIS 10 and POLARIS 20 flow dividers provide technically advanced, low cost power transmission and solve application problems where ever hydraulic flow has divided. In line with our policy of simplifying the design of hydraulic circuits, our flow dividers have relief valves built in to limit pressure and prevent cavitation. These components permit hydraulic circuits to be cleverly optimised and reduce installation costs. The POLARIS flow dividers are two or more section dividers with a common internal connecting shaft. This maintains a constant ratio between the flows through each section in accordance with section displacement. Theoretical working of rotary flow dividers do not dissipate energy in fact if the outlet pressure of one section drops below input pressure, that section operates as a motor and takes energy from the fluid. This energy is not wasted but transferred by the common shaft to the other sections which operate as pumps and therefore need outlet pressure to be greater than inlet pressure. In working conditions, overall efficiencies depend on the sum of the single sections efficiency. These products can therefore be used as flow equalizers, flow dividers and pressure intensifiers as shown in the table below.

	Outlet pressure	Sections with same displacement	Sections with different displacement
	Same	Flow equalizers	Flow dividers
	Different	Flow equalizers	Flow dividers
Pressure intensifiers			

Fluid	Mineral oil based hydraulic fluids to DIN 51524. For other fluids please consult our sales department.	
Fluid temperature range [°F]	-13 to +176 with Buna N seals	
	-13 to +230 with Viton V seals	
Fluid viscosity range [SSU]	55 to 455 recommended	
	Up to 3409 permitted	

Filtering requirement	$\Delta p > 3000$ psi	$\Delta p < 3000$ psi
Contamination class NAS 1638	8	10
Contamination class ISO 4406	17/14	19/16
Achieved with filter $\beta_{x=75}$	10 μm	25 μm

01/02.00

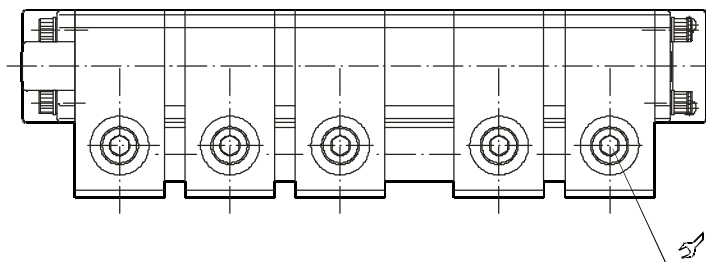
GENERAL FEATURES OF RELIEF VALVES

Relief valves allow the actuators to realign at the end of each cycle in both flow directions. As an example when the cylinders extend, they may not all reach their end stops exactly at the same time. In this case as soon as one cylinder reaches its stop, the relief valve in that section directs fluid to tank until all the other cylinders reach their stops. While retracting the relief valve acts as check valve and opens to prevent cavitation.

Relief settings valve and their identification code are listed in the table below.

Stamp code	Δp nominal setting (2.64 US gpm)	Δp minimum begin opening valve
	[psi]	[psi]
34	508	465
4	725	667
22	870	783
23	1015	957
6	1160	1102
7	1450	1392
17	1740	1682
8	1813	1740
9	2030	1958
26	2175	2103
10	2320	2248
11	2538	2465
35	2610	2523
12	2755	2668
33	2987	2886
14	3045	2944
15	3335	3219
16	3625	3509
27	3770	3654
20	4060	3930

Adjustable relief valves are available on request.



D024-D62 / 0200

**TIGHTENING
TORQUE**



442 lbf in

GENERAL DATA

PLD 10

Type	Displacement	Max. outlet pressure		Max. outlet Δp between sections (1)	Speed		Flow per section	
		p_1	p_2		min.	max.	min.	max.
	cu in/rev	psi		psi	min ⁻¹		US gpm	
PLD 10•2	0.12	3600	4000	3000	1250	4200	0.70	2.35
PLD 10•3,15	0.19	3600	4000	3000	1205	3990	1.05	3.49
PLD 10•4	0.24	3600	4000	3000	1175	3840	1.32	4.28
PLD 10•5	0.30	3600	4000	3000	1140	3680	1.60	5.15
PLD 10•6,3	0.38	3600	4000	3000	1100	3500	1.93	6.13

 p_1 = Max. continuous pressure

 p_2 = Max. peak pressure

(1): Pressure intensifiers can work at higher pressure between sections.

For working conditions outside the recommended limits shown in the table, please consult our sales department.

**MAX. FLOW
FOR INLET SECTION**
9.25 US gpm

01/02.00

GENERAL DATA

PLD 20

Type	Displacement	Max. outlet pressure		Max. outlet Δp between sections (1)	Speed		Flow per section	
		p_1	p_2		min.	max.	min.	max.
	cu in/rev	psi		psi	min ⁻¹		US gpm	
PLD 20•4	0.29	3600	4000	3000	1250	4100	1.63	5.34
PLD 20•6,3	0.39	3600	4000	3000	1235	3970	2.15	6.90
PLD 20•8	0.50	3600	4000	3000	1220	3850	2.66	8.36
PLD 20•11,2	0.67	3600	4000	3000	1200	3660	3.55	10.79
PLD 20•14	0.87	3600	4000	3000	1175	3460	4.50	13.22
PLD 20•16	1.01	3000	3300	3000	1160	3335	5.14	14.76
PLD 20•20	1.27	3000	3300	3000	1130	3125	6.30	17.36
PLD 20•25	1.58	3000	3300	3000	1100	2900	7.64	20.13
PLD 20•31,5	1.99	3000	3300	3000	1060	2660	9.20	23.09

 p_1 = Max. continuous pressure p_2 = Max. peak pressure

(1): Pressure intensifiers can work at higher pressure between sections.

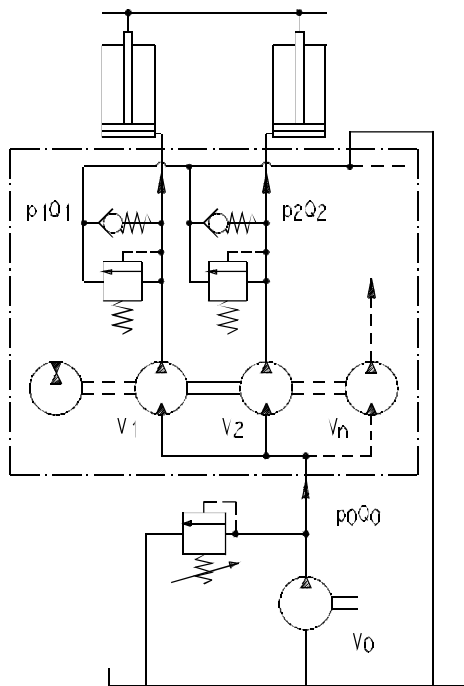
For working conditions outside the recommended limits shown in the table, please consult our sales department.

MAX. FLOW
FOR INLET SECTION

21.14 US gpm

FLOW EQUALIZERS (WITH EQUAL DISPLACEMENTS)

Flow accuracy equalizers is within $\pm 2\%$ if they are rotating in the recommended speed range and the differential pressure between sections is less than 1450 psi. When several single acting cylinders are operated together, acting on loads have not sufficient mass to win the circuit's resistance, we recommend a further gear section acting as a motor in order to guarantee the cylinders retract. The displacement of this motor should be roughly equal to the sum of the displacements of the other sections. Two typical circuit diagrams of applications where flow equalizers are utilized will be found on page 10.



D024-D02/1099

V = Displacement [cu in/rev]

Q = Flow [US gpm]

p = Pressure [psi]

n = Speed [min^{-1}]

$$Q_0 = Q_1 + Q_2 \dots + Q_n$$

$$p_0 Q_0 = p_1 Q_1 + p_2 Q_2 \dots + p_n Q_n$$

$$V_{(\dots)} = \frac{1000 Q_{(\dots)}}{n}$$

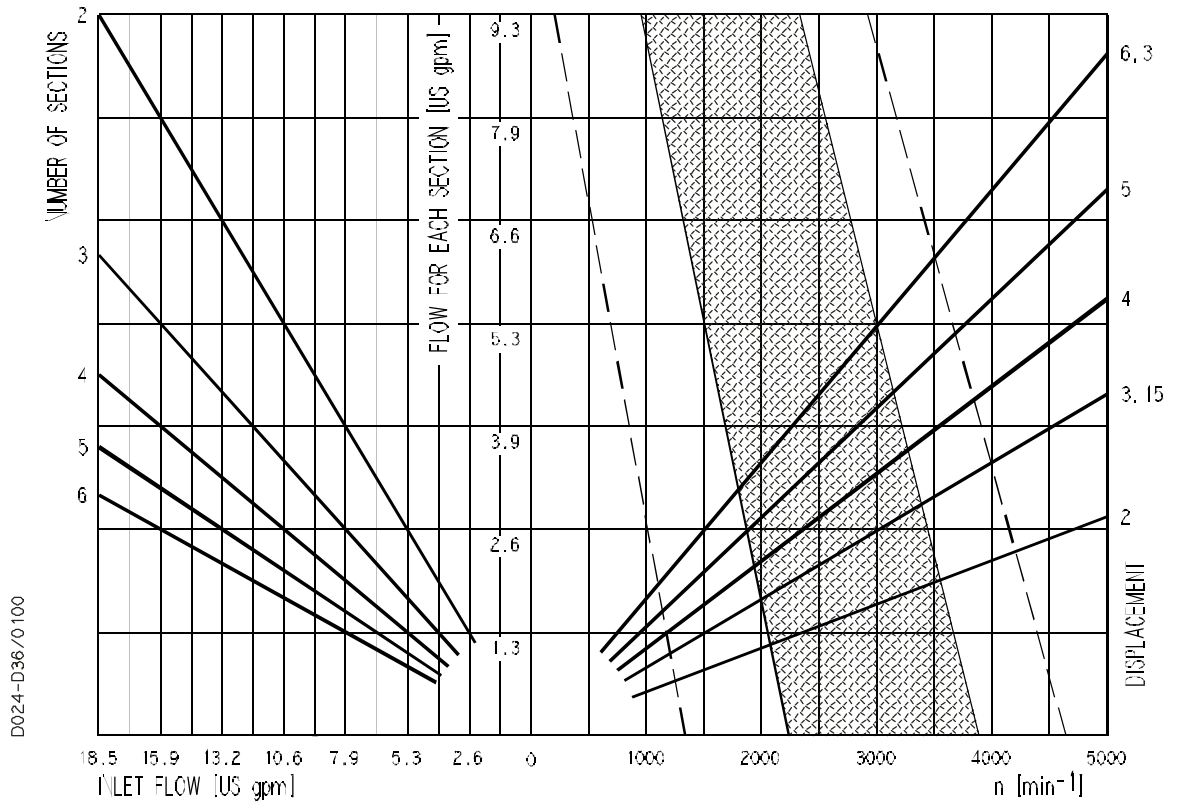
DISPLACEMENT SELECTION GUIDE EXAMPLE

Assume that it is necessary to supply power to two cylinders that require a flow rate of 10.6 [US gpm] each. For simplicity's sake we will ignore pressure losses and the compression factor of the fluid. The pump must deliver a flow equal to: $Q_0 = Q_1 + Q_2 = 21.2$ [US gpm]. To find the displacement of the two sections of the flow equalizer, simply locate the flow rate 21.2 [US gpm] on the X axis and then ascend vertically until the line corresponding to the number of sections (2) is encountered; now trace a horizontal line to the right until encountering the lines referring to displacement. Select the displacement with the point of intersection on the graph that lies nearest to the maximum speed in optimum performance range.

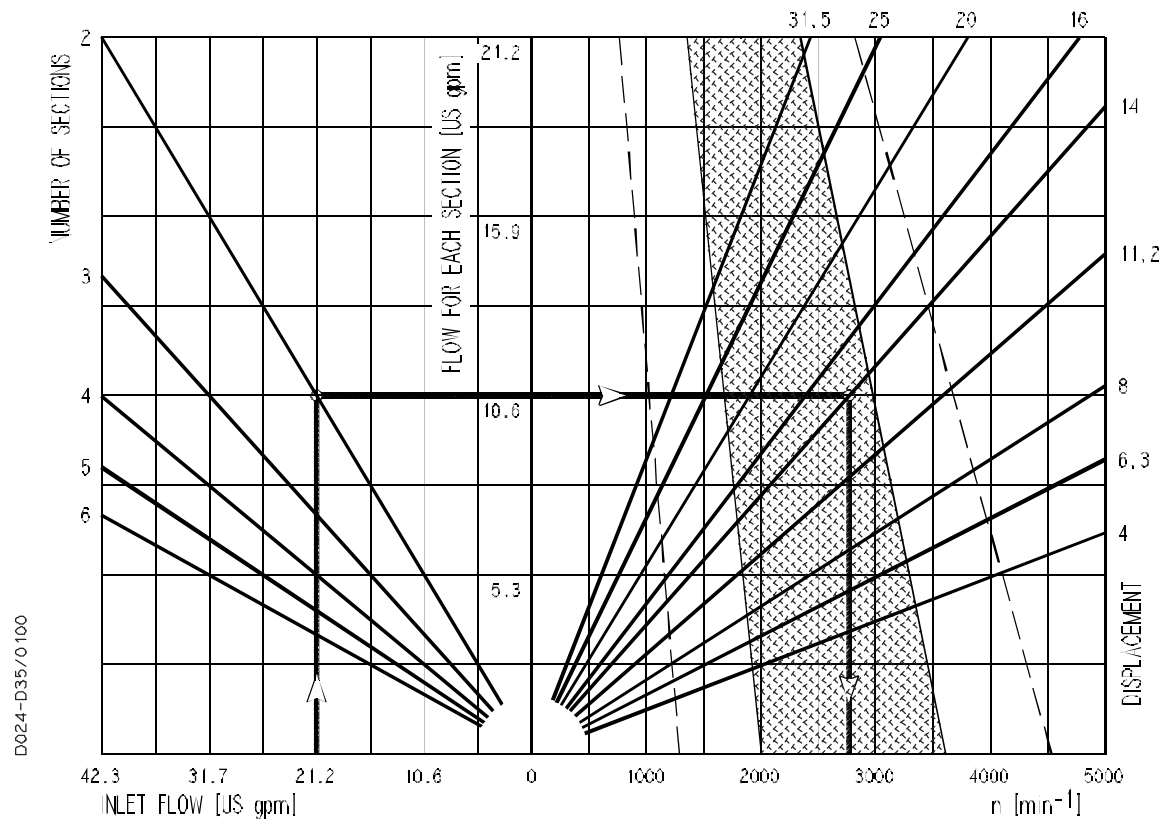
01/02.00

DISPLACEMENT SELECTION GUIDE

PLD 10



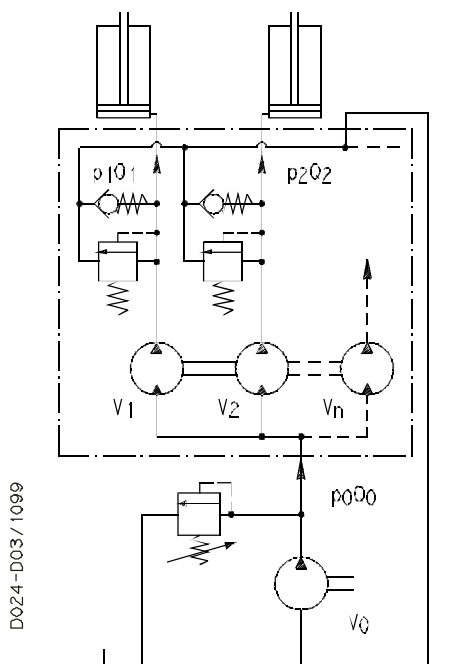
PLD 20



Each curve has been obtained at 122°F, using oil with viscosity 212 SSU at 104°F.

FLOW DIVIDERS (WITH UNEQUAL DISPLACEMENTS)

Flow dividers are used where the same pump must drive several different actuators requiring different pressures and flow rates. The displacement of each section must be proportional to the flow rate required by the actuator to which it is connected. Two typical circuit diagrams of applications where flow dividers are utilized will be found on page 11.



V = Displacement [cu in/rev]

Q = Flow [US gpm]

p = Pressure [psi]

n = Speed [min^{-1}]

$$Q_0 = Q_1 + Q_2 + \dots + Q_n$$

$$p_0 Q_0 = p_1 Q_1 + p_2 Q_2 + \dots + p_n Q_n$$

$$V_{(\dots)} = \frac{1000 Q_{(\dots)}}{n}$$

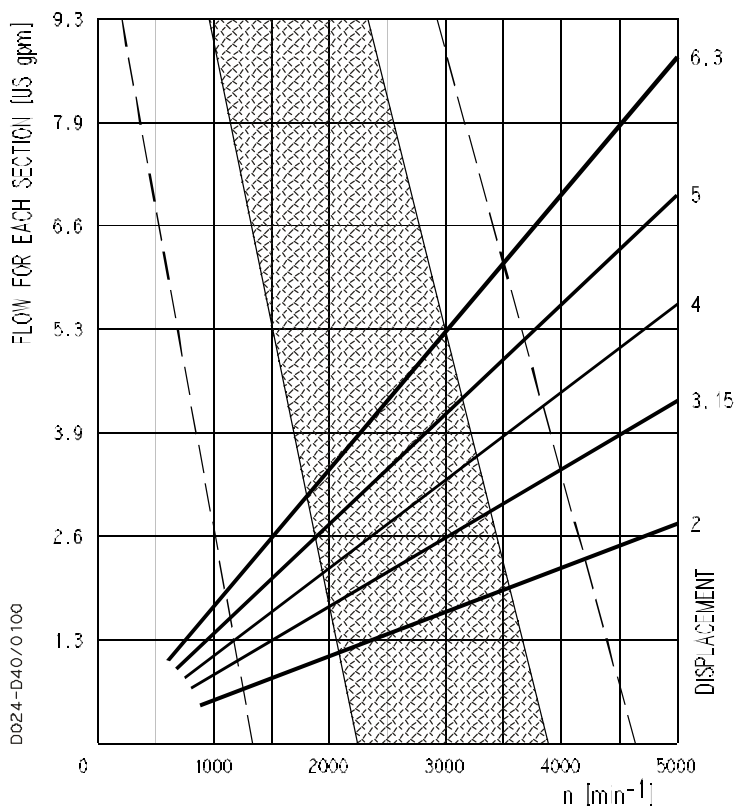
DISPLACEMENT SELECTION GUIDE EXAMPLE

Assume two actuators must be driven using 13.2 [US gpm] and 5.3 [US gpm] respectively. To find the displacement of the flow divider sections, simply locate the flow rates in question on the Y axis and then move across horizontally until the lines corresponding to the displacement are encountered. Select a displacement with points of intersection aligned as near as possible vertically, and the nearest to the maximum speed in optimum performance range.

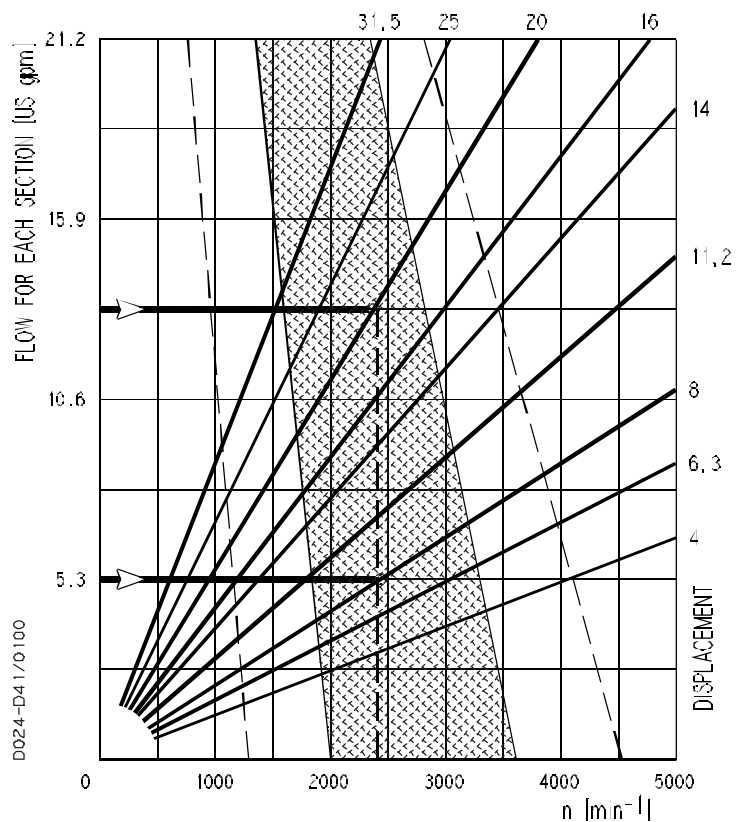
03/02.00

DISPLACEMENT SELECTION GUIDE

PLD 10



PLD 20




 Performance range
  Optimum performance range

Each curve has been obtained at 122°F, using oil with viscosity 212 SSU at 104°F.

03/02.00

TYPICAL CIRCUITS FOR FLOW EQUALIZERS (WITH EQUAL DISPLACEMENTS)

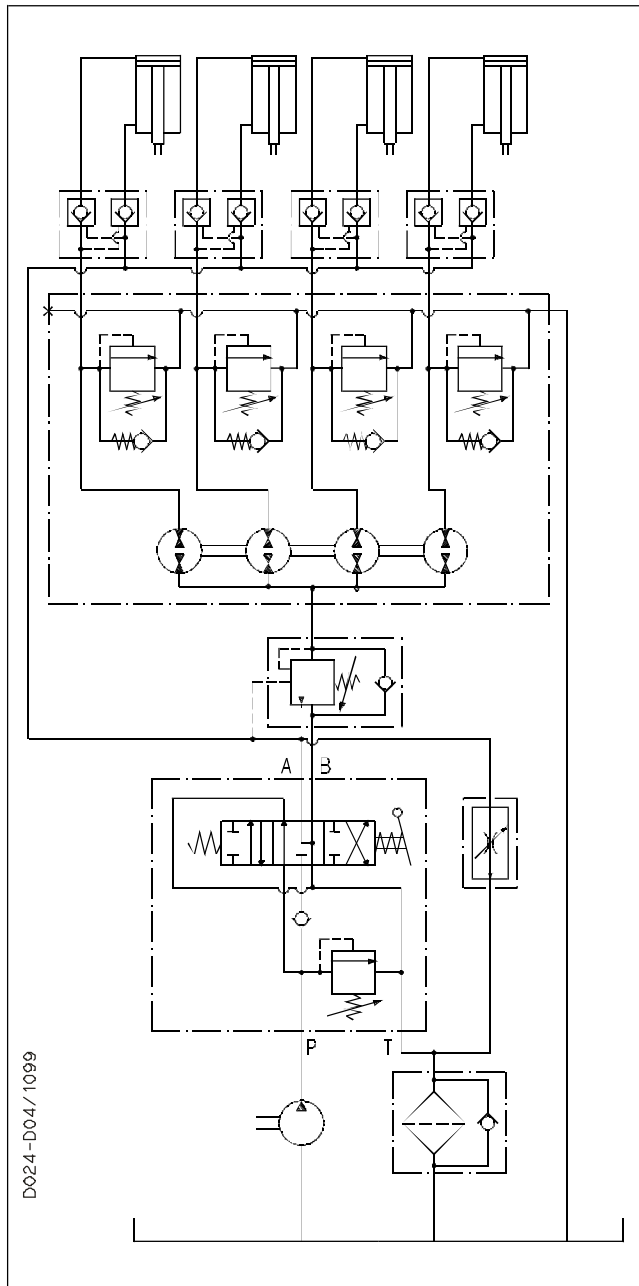


Diagram with a flow equalizer operating double acting cylinders.

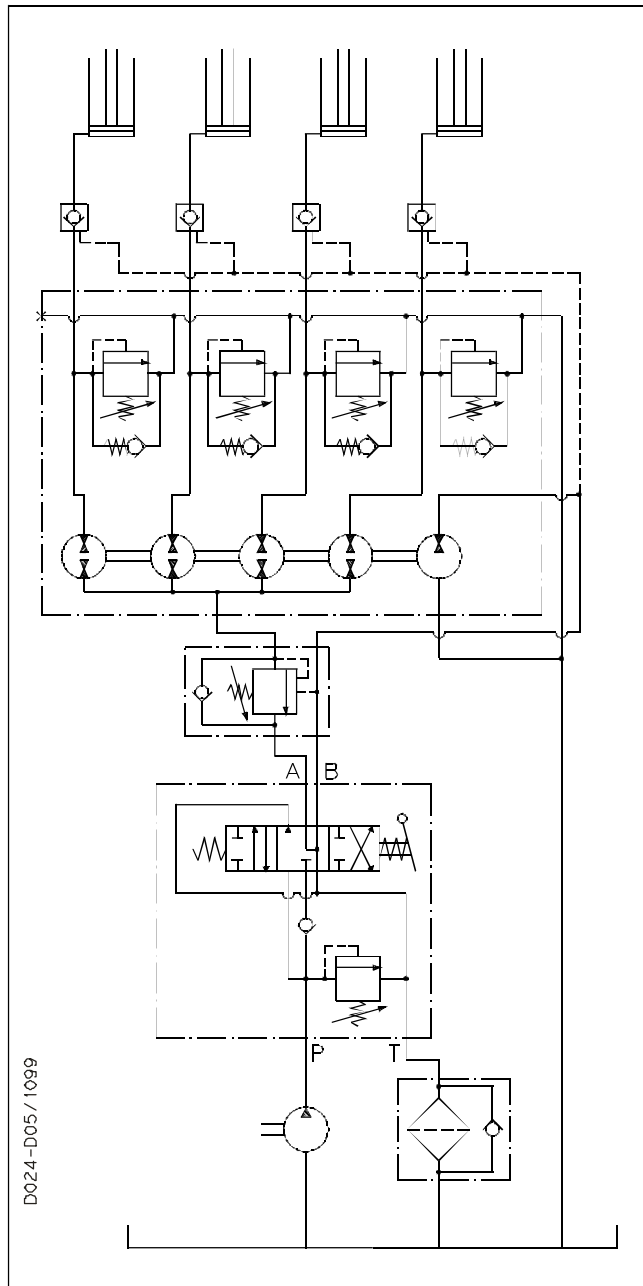


Diagram with a flow equalizer operating single acting cylinders.

01/02.00

TYPICAL CIRCUITS FOR FLOW DIVIDERS (WITH UNEQUAL DISPLACEMENTS)

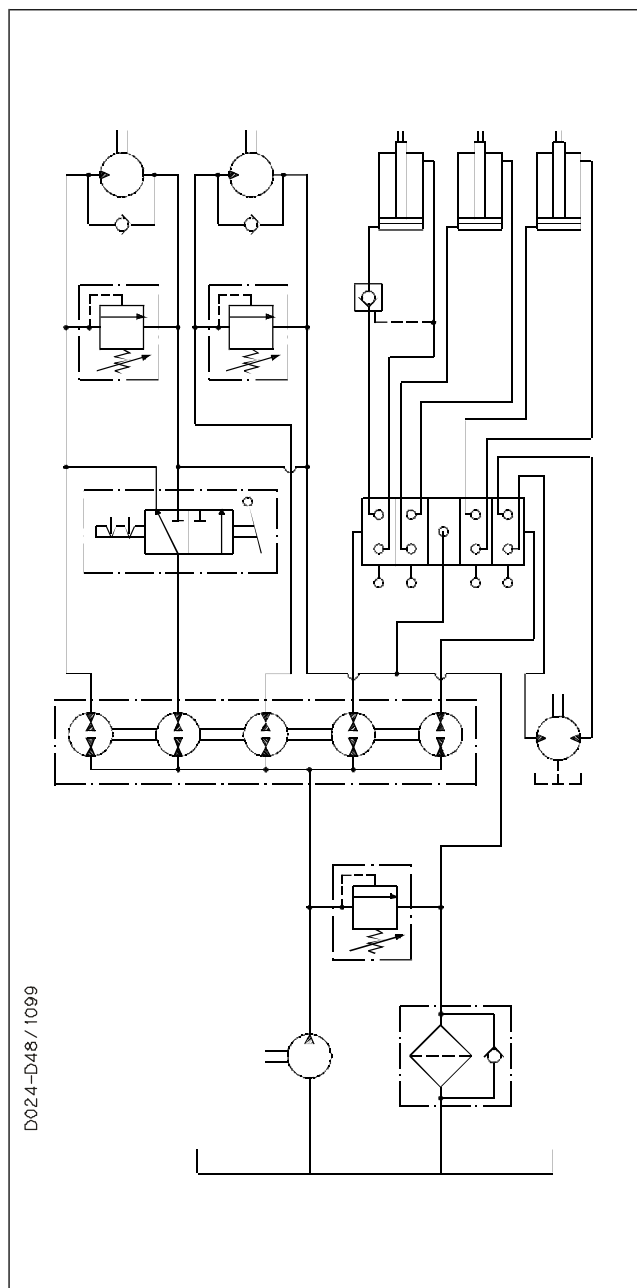
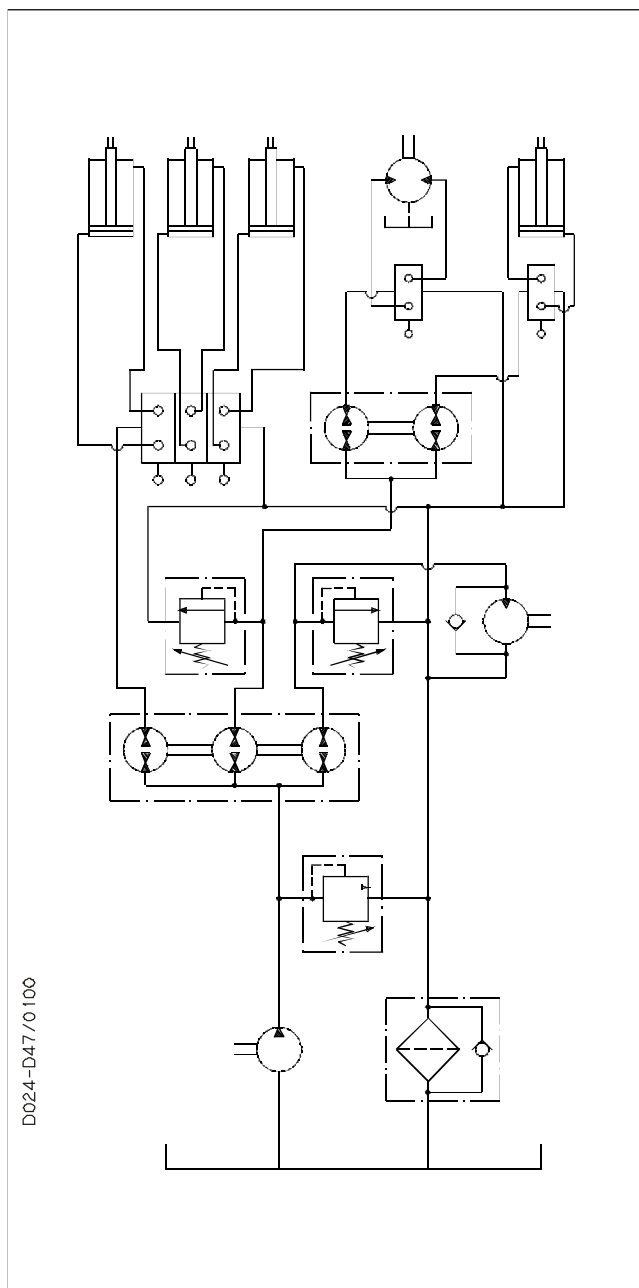
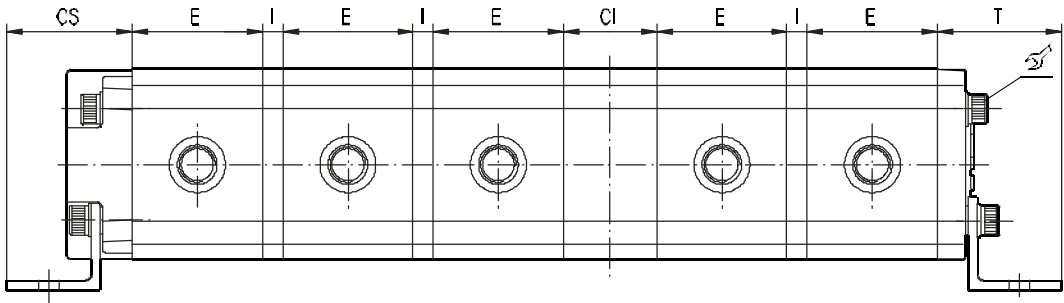


Diagram with a flow divider permitting the use of a single pump to drive a number of different actuators requiring flows at different pressures.

NOTES ABOUT COMPOSITION

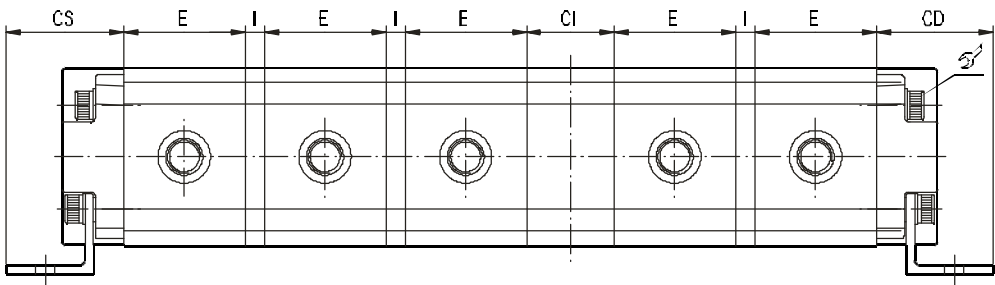
Flow divider sections are arranged in descending displacements or groups with the largest displacement to the left as viewed from the out let ports side. Stan dard for mats of flow di vid ers are given beneath; for different configurations please consult our sales department.

STANDARD COMPOSITION FOR 5 SECTIONS



D024-D44/1099

COMPOSITION WITH ADDITIONAL INLET SECTION



D024-D25/0100

- CS** Left inlet section kit
- E** Section
- I** Intermediate kit flange
- CI** Intermediate inlet section kit
- T** End cover kit
- CD** Additional right inlet section kit (only for high delivery)

Type	Max. flow for inlet section
	l/min
PLD 10	35
PLD 20	80

Type	Tightening torque
	lbf in
PLD 10	221
PLD 20	442

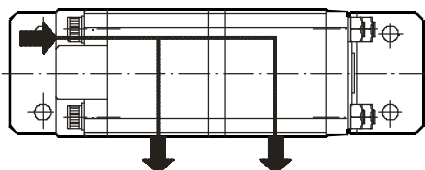
Replaces: 01/02.00

02/11.00

STANDARD COMPOSITIONS FOR SECTIONS WITH OR WITHOUT VALVE

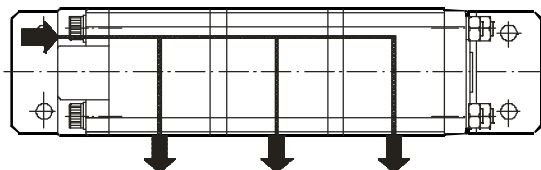
2 SECTIONS WITH 1 INLET SECTION

D024-D26 / 1099



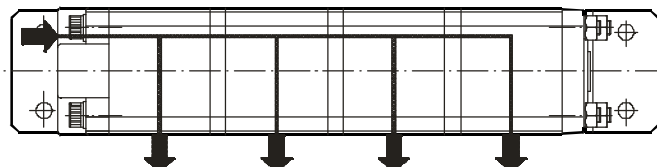
3 SECTIONS WITH 1 INLET SECTION

D024-D27 / 1099



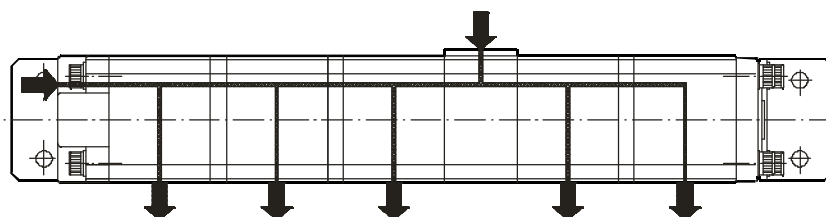
4 SECTIONS WITH 1 INLET SECTION

D024-D28 / 1099



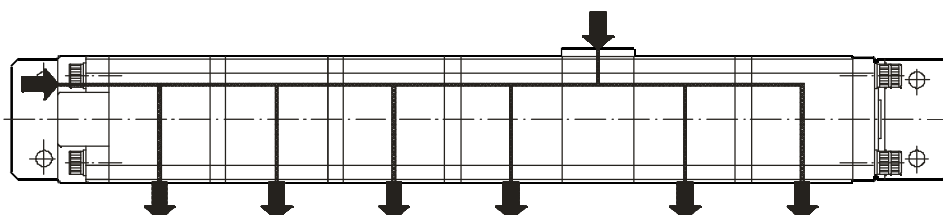
5 SECTIONS WITH 2 INLET SECTIONS

D024-D29 / 1099



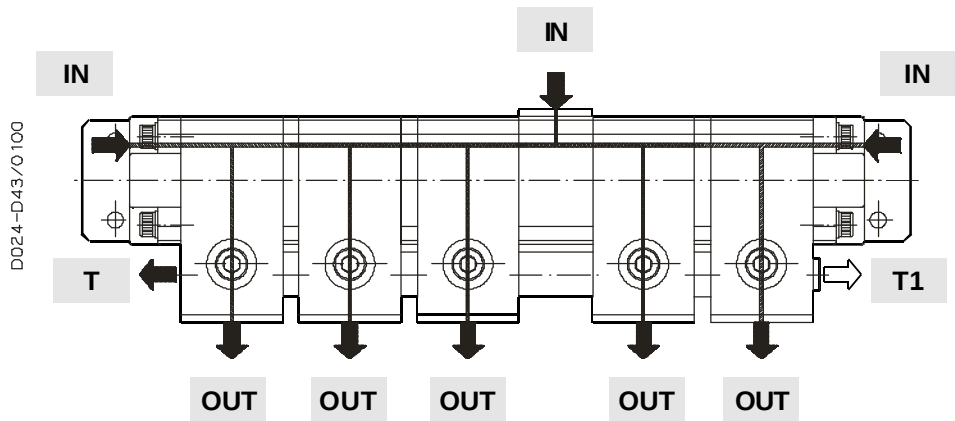
6 SECTIONS WITH 2 INLET SECTION

D024-D30 / 1099



Note: Combinations between different groups (PLD10 / PLD20) are available.
For more informations please consult our technical sales department.

PORTS DIMENSIONS



IN Inlet port
OUT Outlet port
T Drain port
T1 Additional drain port

PORTS	BSPP			ODT		
Type	IN	OUT	T - T1	IN	OUT	T - T1
PLD 10•2	GD	GC	GC	OB	OA	OA
PLD 10•3,15						
PLD 10•4						
PLD 10•5						
PLD 10•6,3						
PLD 20•4	GE	GD	GD	OD	OC	OB
PLD 20•6,3						
PLD 20•8						
PLD 20•11,2						
PLD 20•14						
PLD 20•16						
PLD 20•20						
PLD 20•25						
PLD 20•31,5						

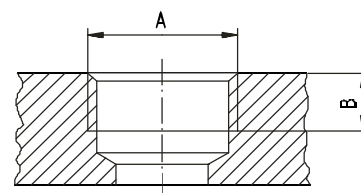
01/02.00

PORTS DIMENSIONS

BRITISH STANDARD PIPE PARALLEL (BSPP)

Code	Nominal size	A	B
			mm (in)
GC	3/8	G 3/8	14 (0.551)
GD	1/2	G 1/2	14 (0.551)
GE	3/4	G 3/4	18 (0.709)

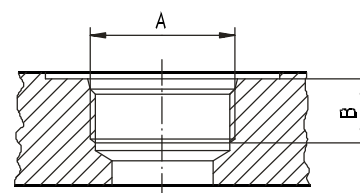
D024-D45/1099



SAE STRAIGHT THREAD PORTS (ODT)

Codce	Nominal size	A	B
			mm (in)
OA	3/8	9/16-18 UNF-2B	15 (0.591)
OB	1/2	3/4-16 UNF-2B	14 (0.551)
OC	5/8	7/8-14 UNF-2B	17 (0.669)
OD	3/4	1-1/16-12 UN-2B	20 (0.787)

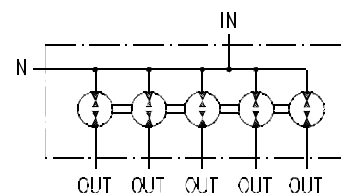
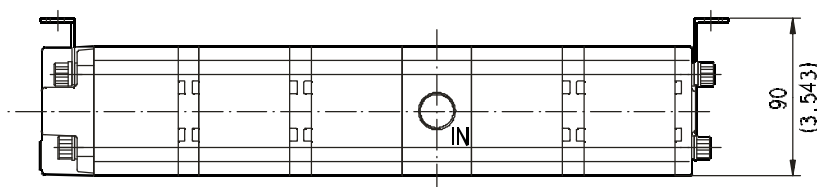
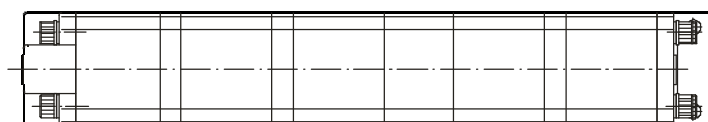
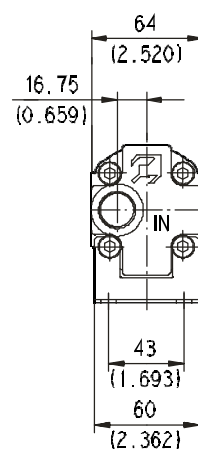
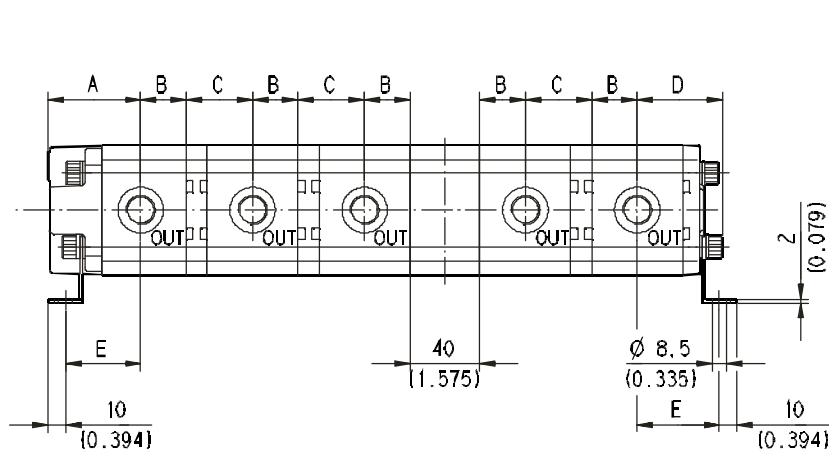
D024-D46/1099



01/02.00

SAME GROUP DIMENSIONS

PLD 10



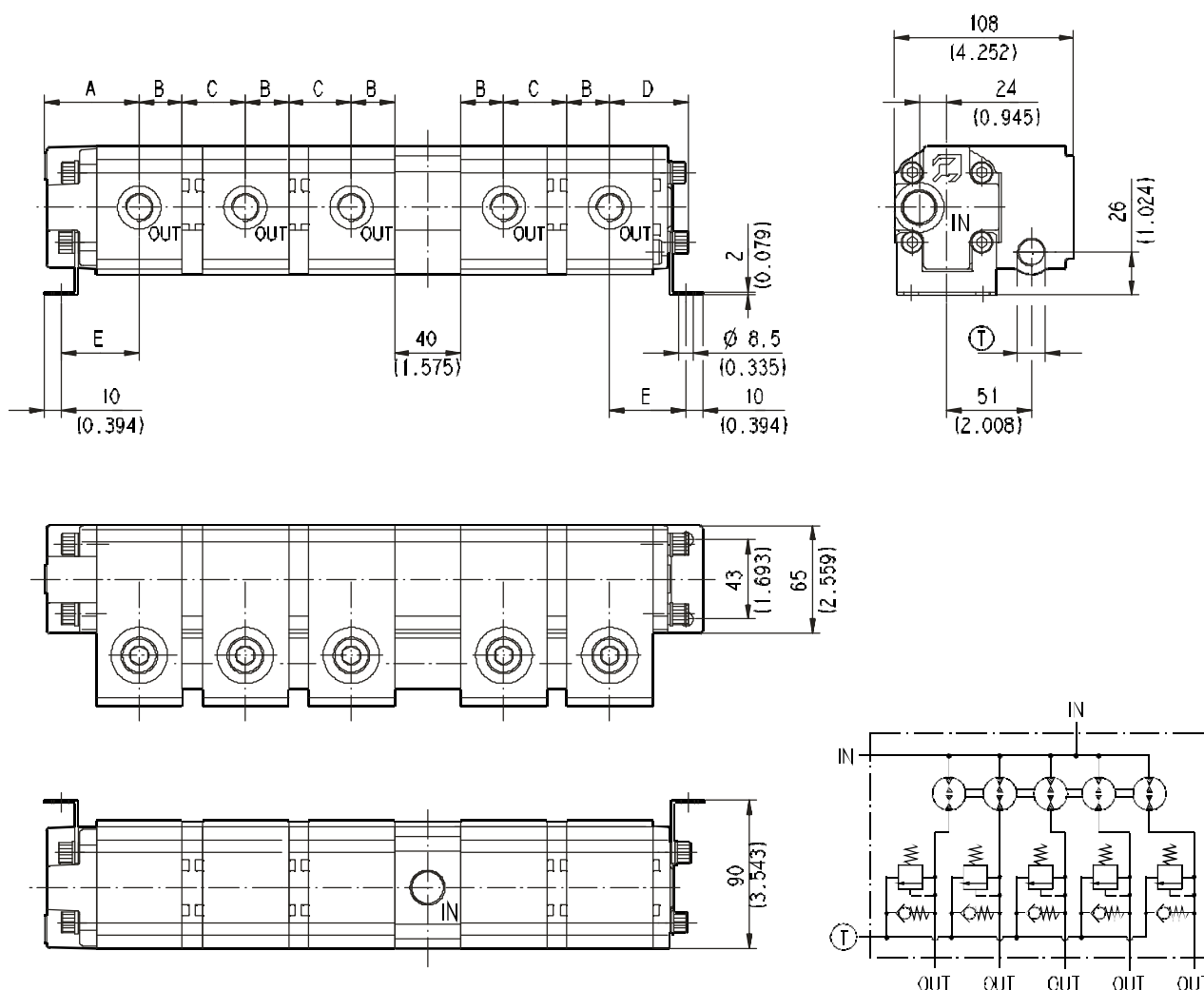
IN and OUT ports dimensions are shown on page 14 and page 15.

Type	A	B	C	D	E
	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)
PLD 10•2	50,2 (1.976)	19,2 (0.756)	31,2 (1.228)	41,8 (1.646)	40,3 (1.587)
PLD 10•3,15	52 (2.047)	21 (0.827)	33 (1.299)	43,6 (1.717)	42,1 (1.657)
PLD 10•4	53,4 (2.102)	22,4 (0.882)	34,4 (1.354)	45 (1.772)	43,5 (1.713)
PLD 10•5	55 (2.165)	24 (0.945)	36 (1.417)	46,6 (1.835)	45,1 (1.776)
PLD 10•6,3	57 (2.244)	26 (1.024)	38 (1.496)	48,6 (1.913)	47,1 (1.854)

SAME GROUP DIMENSIONS WITH VALVE

PLD 10

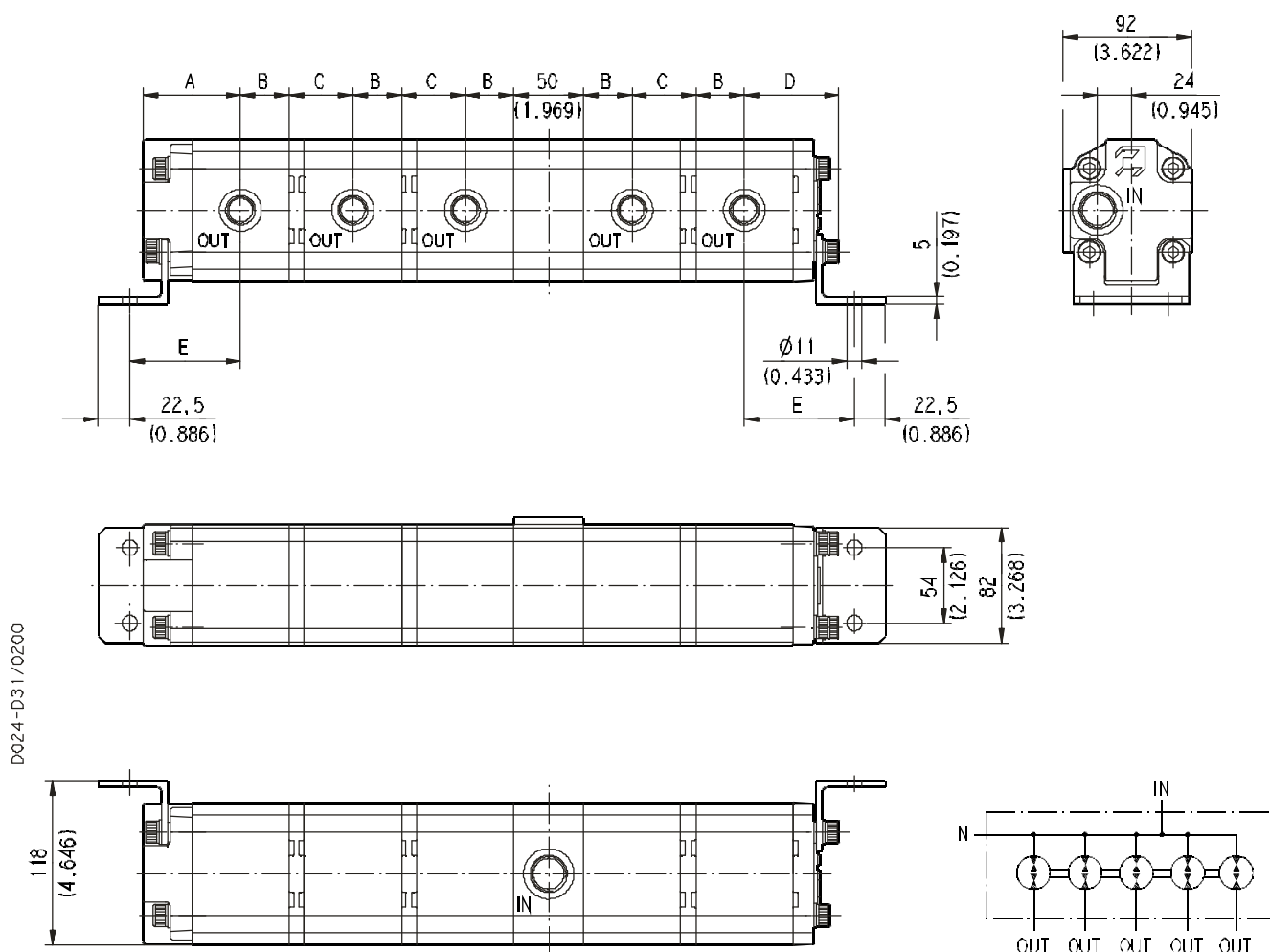
D024-D38/0200



IN, OUT and T ports dimensions are shown on page 14 and page 15.

Type	A	B	C	D	E
	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)
PLD 10-2	50,2 (1.976)	19,2 (0.756)	31,2 (1.228)	41,8 (1.646)	40,3 (1.587)
PLD 10-3,15	52 (2.047)	21 (0.827)	33 (1.299)	43,6 (1.717)	42,1 (1.657)
PLD 10-4	53,4 (2.102)	22,4 (0.882)	34,4 (1.354)	45 (1.772)	43,5 (1.713)
PLD 10-5	55 (2.165)	24 (0.945)	36 (1.417)	46,6 (1.835)	45,1 (1.776)
PLD 10-6,3	57 (2.244)	26 (1.024)	38 (1.496)	48,6 (1.913)	47,1 (1.854)

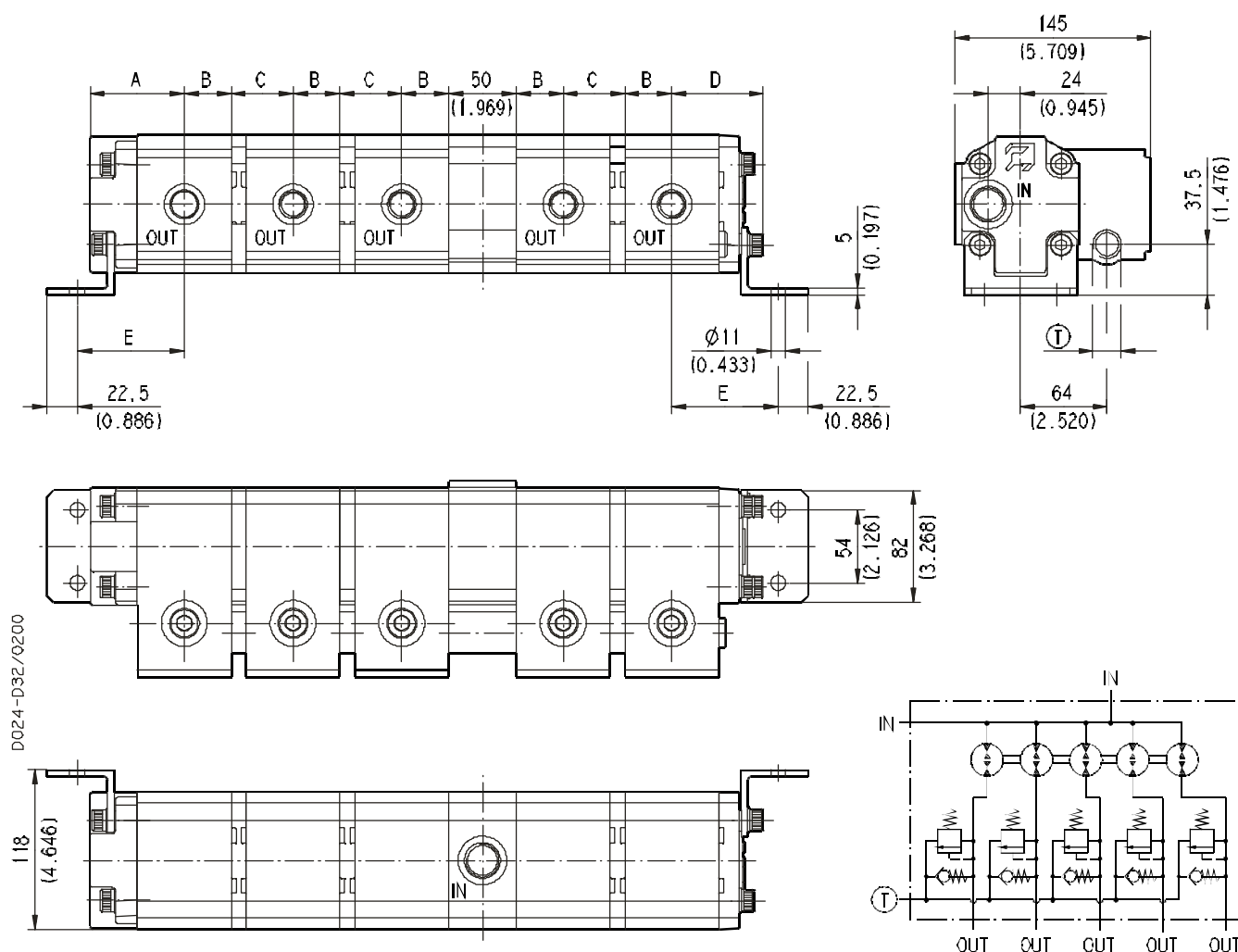
SAME GROUP DIMENSIONS

PLD 20


IN and OUT ports dimensions are shown on page 14 and page 15.

Type	A	B	C	D	E
	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)
PLD 20•4	60,8 (2.394)	25,5 (1.016)	36,8 (1.449)	58,8 (2.315)	69,8 (2.748)
PLD 20•6,3	62 (2.441)	27 (1.063)	38 (1.496)	60 (2.362)	71 (2.795)
PLD 20•8	63,3 (2.492)	28,3 (1.114)	39,3 (1.547)	61,3 (2.413)	72,3 (2.846)
PLD 20•9	63,9 (2.516)	28,9 (1.138)	39,9 (1.571)	61,9 (2.437)	72,9 (2.870)
PLD 20•11,2	65,5 (2.579)	30,5 (1.201)	41,5 (1.634)	63,5 (2.500)	74,5 (2.933)
PLD 20•14	68 (2.677)	33 (1.299)	44 (1.732)	66 (2.598)	77 (3.031)
PLD 20•16	69,8 (2.748)	34,8 (1.370)	45,8 (1.803)	67,8 (2.669)	78,8 (3.102)
PLD 20•20	73 (2.874)	38 (1.496)	49 (1.929)	71 (2.795)	82 (3.228)
PLD 20•25	77 (3.031)	42 (1.654)	53 (2.087)	75 (2.795)	86 (3.386)
PLD 20•31,5	82 (3.228)	47 (1.850)	58 (2.283)	80 (3.150)	91 (3.583)

SAME GROUP DIMENSIONS WITH VALVE

PLD 20


IN, OUT and T ports dimensions are shown on page 14 and page 15.

Type	A	B	C	D	E
	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)
PLD 20-4	60,8 (2.394)	25,5 (1.016)	36,8 (1.449)	58,8 (2.315)	69,8 (2.748)
PLD 20-6,3	62 (2.441)	27 (1.063)	38 (1.496)	60 (2.362)	71 (2.795)
PLD 20-8	63,3 (2.492)	28,3 (1.114)	39,3 (1.547)	61,3 (2.413)	72,3 (2.846)
PLD 20-9	63,9 (2.516)	28,9 (1.138)	39,9 (1.571)	61,9 (2.437)	72,9 (2.870)
PLD 20-11,2	65,5 (2.579)	30,5 (1.201)	41,5 (1.634)	63,5 (2.500)	74,5 (2.933)
PLD 20-14	68 (2.677)	33 (1.299)	44 (1.732)	66 (2.598)	77 (3.031)
PLD 20-16	69,8 (2.748)	34,8 (1.370)	45,8 (1.803)	67,8 (2.669)	78,8 (3.102)
PLD 20-20	73 (2.874)	38 (1.496)	49 (1.929)	71 (2.795)	82 (3.228)
PLD 20-25	77 (3.031)	42 (1.654)	53 (2.087)	75 (2.795)	86 (3.386)
PLD 20-31,5	82 (3.228)	47 (1.850)	58 (2.283)	80 (3.150)	91 (3.583)

01/02.00

HOW TO ORDER

Only for version
with valve

1	2	3	4	5	6	5	6	7	4	5	6	8	4	9	10	11	12
PLD 20 / 3 / CS - GE / 25 - GD / 25 - GD / CI - GE / 25 - GD / CD - GE / VPEF - 50 - GD - V																	
Series /		Left inlet section /		Section /		Section /		Interm. inlet section /		Section /		Right inlet section /		Relief valve			

1	Series	CODE
Polaris 10		PLD 10
Polaris 20		PLD 20

2	Number of sections	CODE
From 2 to 6 sections		2 ... 6

3	Standard side inlet section	CODE
Left inlet section (1)		CS

4	Inlet port dimensions	CODE
BRITISH STANDARD PIPE PARALLEL (BSPP)		
PLD 10		GD
PLD 20		GE
SAE STRAIGHT THREAD PORTS (ODT)		
PLD 10		OB
PLD 20		OD

5	Displacement	CODE
	cu in/rev	
Polaris 10		
	0.12	PLD 10-2
	0.19	PLD 10-3,15
	0.24	PLD 10-4
	0.30	PLD 10-5
	0.38	PLD 10-6,3
Polaris 20		
	0.29	PLD 20-4
	0.39	PLD 20-6,3
	0.50	PLD 20-8
	0.67	PLD 20-11,2
	0.87	PLD 20-14
	1.01	PLD 20-16
	1.27	PLD 20-20
	1.58	PLD 20-25
	1.99	PLD 20-31,5

CODE	Outlet port dimensions	6
BRITISH STANDARD PIPE PARALLEL (BSPP)		
GC	PLD 10	
GD	PLD 20	
SAE STRAIGHT THREAD PORTS (ODT)		
OA	PLD 10	
OC	PLD 20	

CODE	Intermediate inlet section (2)	7
CI	Intermediate inlet section	

CODE	Supplementary inlet section (2)	8
CD	Right inlet section (1)	

CODE	Relief valve	9
VPEF	Relief valve	

CODE	Valve setting [bar]	10
....	See page 3	

CODE	T Outlet port dimensions	11
BRITISH STANDARD PIPE PARALLEL (BSPP)		
GC	PLD 10	
GD	PLD 20	
SAE STRAIGHT THREAD PORTS (ODT)		
OA	PLD 10	
OB	PLD 20	

CODE	Seals	12
....	Buna (3)	
V	Viton	

(1) Looking at the sections from the outlet ports side.

(2) Choice the inlet sections number according to the general data on page 4 and 5.

(3) Omit this code for Buna seals.