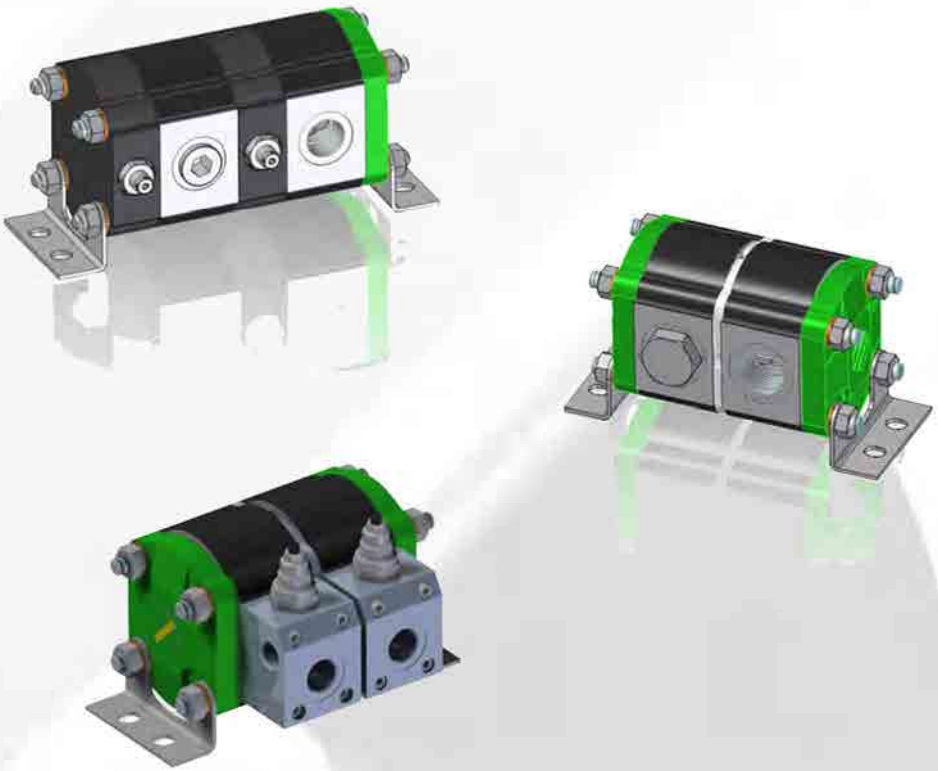
GEAR FLOW DIVIDERS

Technical Catalogue



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COMPANY
WITH QUALITY SYSTEM
CERTIFIED BY DNV
=ISO 9001/2000=

salami™

GENERAL FEATURES

A flow divider is composed of two or more modular elements (stages) with gears mechanically linked by an internal coupling sleeve, between the shafts, that causes them to turn at the same speed.Unlike multiple pumps, in which the input power is mechanical (shaft connected to a motor), in a flow divider the input power is hydraulic, i.e. a flow of oil under pressure supplies the modular elements, which are in turn connected to the hydraulic circuits serving the users.

The portion of flow elaborated by each element is solely determined by its nominal flow rate. Therefore, unlike standard static dividers with variable ports, the flow dividers do not cause dissipation and are also much more precise.
The use of flow dividers in a system reduces the number of pumps necessary as well as the associated individual mechanical power takeoffs and complex mechanical couplers (with greater losses).Leaving aside small losses for the time being, at any given moment the total input power is equal to the sum of the powers supplied by all elements making up the flow divider.

Therefore, if in a portion of time the power required by a hydraulic circuit is equal to zero (inactive drained circuit), the power supplied by the element feeding that circuit becomes available for the other elements, which may use it in their own circuits, also operating at higher pressures than the intake pressure.

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WORKING CONDITIONS

- Minimum operating fluid viscosity	**12 mm²/sec**
- Max starting viscosity	**800 mm²/sec**
- Suggested fluid viscosity range	**17 - 65 mm²/sec**
- Fluid operating temperature range	**-15 to 85°C**
- Hydraulic fluid	**mineral oil**

FILTRATION INDEX

Working pressure	**> 200 bar / *2900 psi***	**< 200 bar / *2900 psi***
Contamination class NAS 1638	9	10
Contamination class ISO 4406	19/18/15	20/19/16
Achieved with filter $ß_x$ =75	15 µm	25 µm

Typical applications of flow dividers

Supply of two or more independent hydraulic circuits by means of a single pump, with an overall flow rate equal to the sum of the flow rates.

Examples of this kind of application:
- lifting platforms and bridges;
- hydraulic bending presses and shearing machines;
- hoisting of freight containers;
- lubrication systems;
- hydraulic opening / closing of gates;
- automatic hydraulically-driven machines;
- actuation of formwork for construction;
- wood processing machinery;
- conveyance of trolleys driven by hydraulic cylinders or motors;
- equipment for the food industry;
- military installations.

Pressure amplifiers.
When in a hydraulic system one user requires a much higher operating or peak pressure than all the others, it is more convenient to supply it by means of a flow divider than to upgrade the whole system to work with higher pressure.
With a two-element flow divider flow may be discharged from the outlet of one element so that the pressure in the other will become much higher than that of the pump supplying the system.

Examples of this kind of application:
- presses with rapid approach
- machine tools

p_1 Max continuous pressure	p_2 Max peak pressure

Type	Displacement		Max. outlet pressure				Max. outlet p		Speed		Flow per section		Flow per section	
			p_1	p_2	p_1	p_2	between sections		min.	max.	min.	max.	min.	max.
	cm^3/rev	cu.in./ rev	bar	bar	psi	psi	bar	psi	min^{-1}		l/min		gpm	
2DRE - 4,5	4.60	0.27	250	280	3600	4000	50	725	1250	3900	6.05	18.88	1.59	4.97
2DRE - 6,5	6.50	0.40	250	280	3600	4000	50	725	1250	3750	8.55	25.66	2.25	6.75
2DRE - 8,3	8.20	0.50	250	280	3600	4000	50	725	1200	3600	10.36	31.07	2.73	8.18
2DRE - 10,5*	10.60	0.65	250	280	3600	4000	50	725	1200	3500	13.39	39.05	3.52	10.28
2DRE - 11,3	11.50	0.68	250	280	3600	4000	50	725	1200	3500	14.53	42.37	3.82	11.15
2DRE - 12,5*	12.70	0.77	250	280	3600	4000	50	725	1200	3400	16.04	45.45	4.22	11.96
2DRE - 13,8	13.80	0.84	250	280	3600	4000	50	725	1200	3400	17.43	49.39	4.59	13.00
2DRE - 16	16.60	1.01	250	280	3600	4000	50	725	1100	3200	19.22	55.92	5.06	14.71
2DRE - 19	19.40	1.15	220	240	3150	3450	50	725	1100	3200	22.46	65.35	5.91	17.20
2DRE - 22,5	22.90	1.37	220	240	3150	3450	50	725	1100	3000	26.52	72.32	6.98	19.03
2DRE - 26	25.80	1.58	200	220	2900	3150	50	725	1100	2850	29.87	77.40	7.86	20.37
2DRE - 30*	30.10	1.84	200	220	2900	3150	50	725	1100	2700	34.85	85.55	9.17	22.51

*These displacements are not commonly in production, for this reason we can sell them only for quantity.

Max. flow for each inlet section
When the inlet flow exceed the 80 l/min, please get in touch with our technical dept.

When the flow divider is used as pressure intensifier, the pressure between sections can be higher.
For different working conditions, please get in touch with our technical department.

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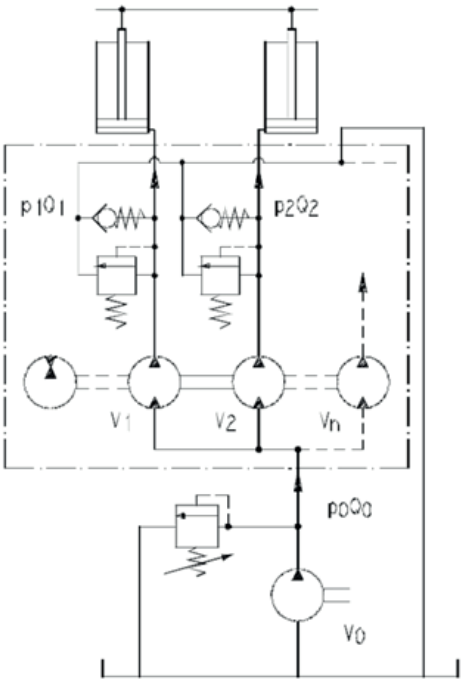
DISPLACEMENT SELECTION

In order to equalize the flow, it needs to maintain the speed within the suggested speed range, with a Δp max. of 50 bar (725 psi) between the different stages.Keeping these conditions, we can assure a flow deviation, within ± 2% on the different stages.

- n = number of section
- $V_{1,2...n}$ = displacement sections [cm^3/rev]
- $Q_{1,2...n}$ = flow sections [l/min]
- $P_{1,2...n}$ = pressure sections [bar]
- N = speed [rpm]
- $Q_0 = Q_1+Q_2+ \ldots +Q_n$ pump flow [l/min]
- $P_0Q_0 = P_1Q_1+P_2Q_2+\ldots+P_nQ_n$

$$V_i = \frac{1000 Q_i}{N}$$



CALCULATION EXAMPLE

Flow equalizer (diagram page 4):
suppose we have to supply two cylinders, both with the same flow of 30l/min.
The flow equalizer's inlet flow Q0, delivered by the pump, will be 60 l/min.
Follow the vertical line corresdonding to the inlet flow of 60 l/min up to cross the line which matches the 2 stages flow divider.Then we trace an horizontal line matching the flow of 30 l/min for each stage on the Y axis up to the recommended speeds area where we intercept the line corresponding to the displacement of 10.5 cm3.
We suggest you to choice the displacement with the highest rpm, within the recommended speeds area.

Flow divider (diagram page 4):
suppose we have to supply two cylinders, the one with the flow of 30 l/min, the other with 50 l/min.
The flow equalizer inlet flow Q0, delivered by the pump, will be 60 l/min.
Starting from the Y axis, we trace 2 horizontal lines corresponding to the flows of 30 l/min and 50 l/min until we intercept the displacement lines with the highest value of rpm, within the recommended speeds area.

Pressure intensifier:
The working principle of rotary flow dividers do not dissipate energy, in fact if the pressure of outlet line of one stage is lower than the inlet pressure, this stage works as a motor and uses the the energy of the inlet flow. This energy is not wasted but transferred, by the common shaft, to the other stage which operate as a pump therefore the outlet pressure will be higher than the inlet pressure.

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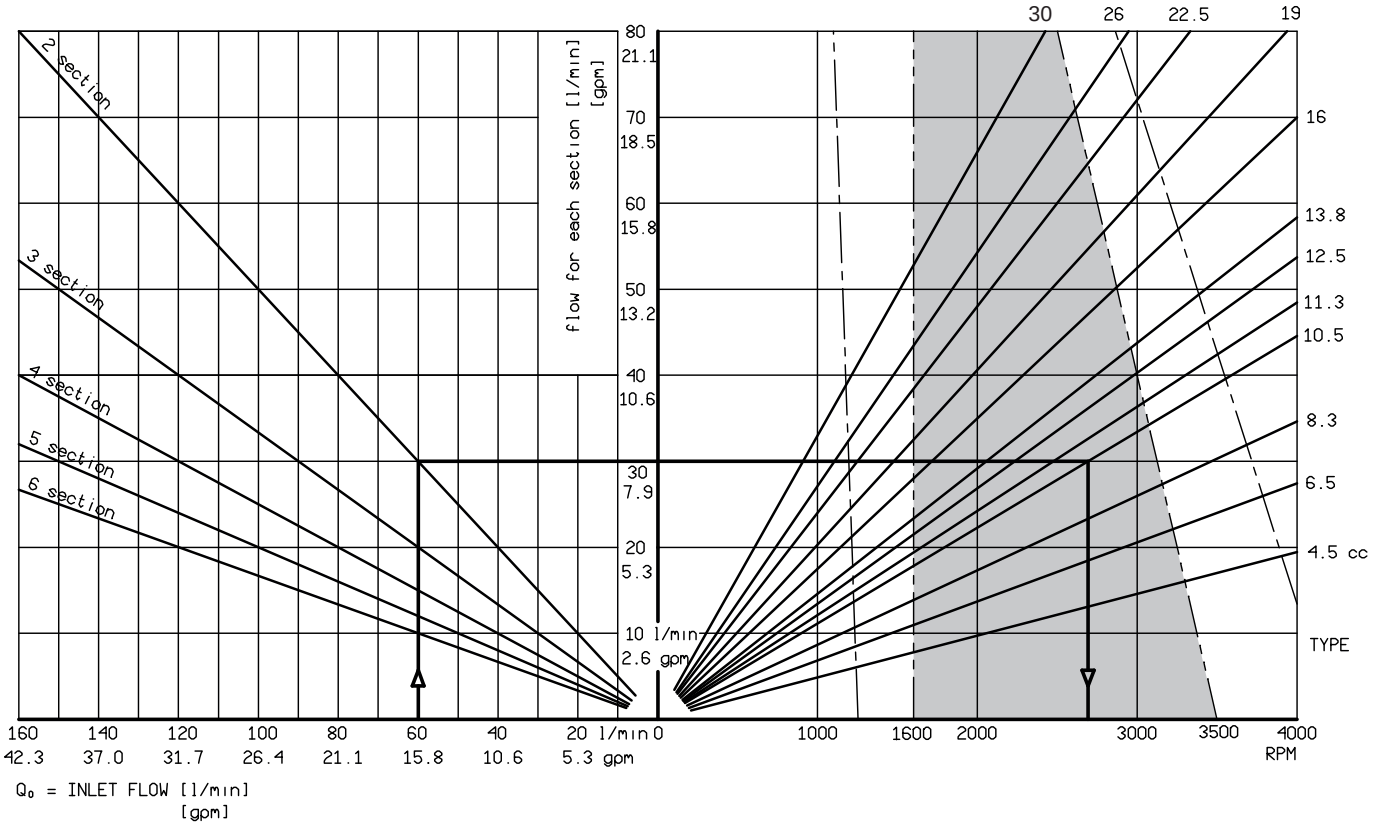
FLOW EQUALIZER

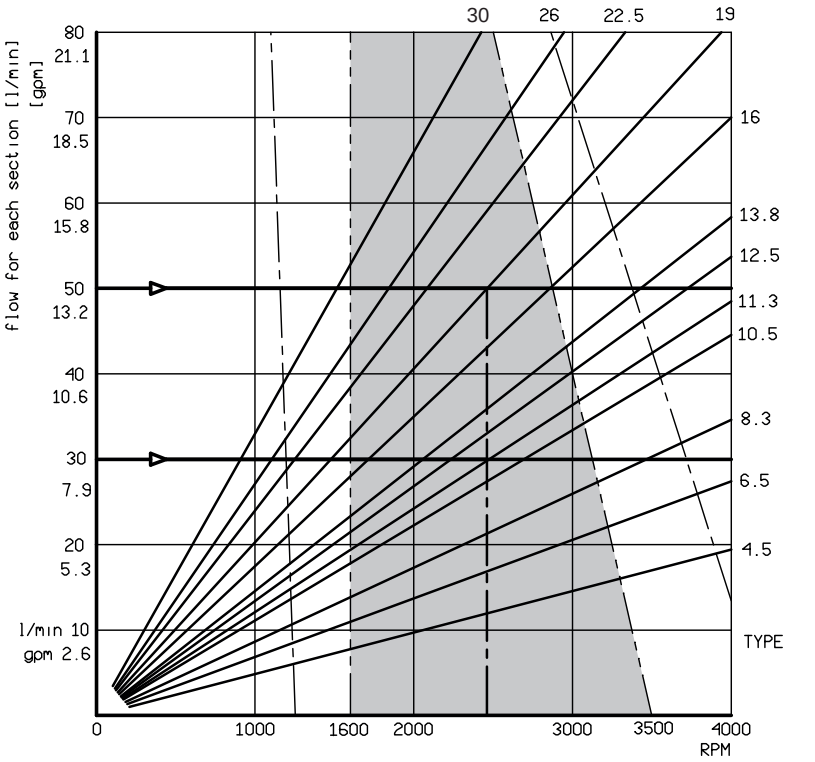
Allt he data here showed were carried outw ithm ineral oila tt he temperatureo f 50°Cw ithv iscosity of 22 cSt



FLOW DIVIDER

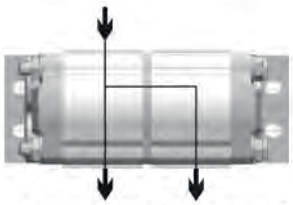
Performancer ange

Recommended performancea rea

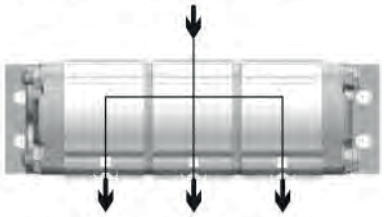


GUIDELINE FOR THE COMBINATION OF THE PORTS

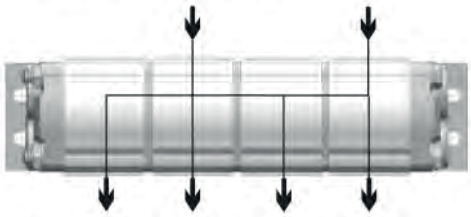
2 SECTIONS WITH 1 INLET



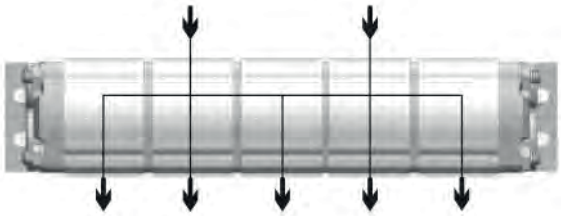
3 SECTIONS WITH 1 INLET



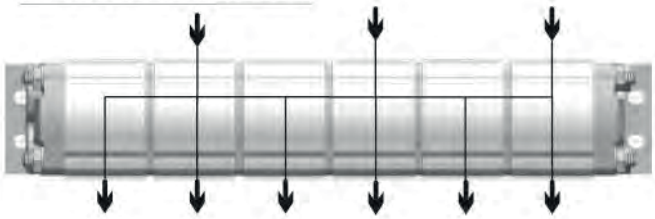
4 SECTIONS WITH 2 INLETS



5 SECTIONS WITH 2 INLETS



6 SECTIONS WITH 3 INLETS



These drawings give only an overview of the different combinations of inlet and outlet working ports.
Anyway, to fix the correct number and size of inlet working ports, please get in touch with our technical dept.

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Table: in this table the number of inlets in function of the number of elements are indicated.

Number of elements	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
"IN" Number of inlets	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8

In this table, the number of inlets in function of the number of elements are indicated.
For flow dividers with many inlets, as they are all communicating it is even possible to use only one of them, by plugging the other ones.
We suggest to make configurations with one inlet every 80 l/min of flow elaborated.

To obtain errors of division inferior to 4% there must be no difference of pressure between the elements superior to 50 bar. To obtain high precisions the respect of the following parametres is also important:

- Enviroment temperature: -1 0°c ÷ +60°c
- Hydraulic oil based on hlp, hv (din 51 524) minerals
- Oil filtering 10 ÷ 25 µ
- Oil temperature: +30°c ÷ +60°c
- Oil Viscosity 20 ÷ 40 cSt

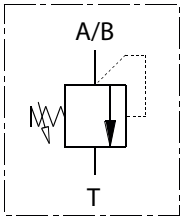
AVAILABLE VALVES

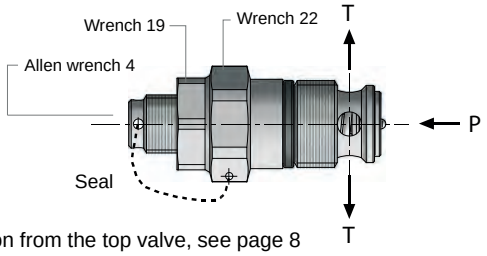
Relief valves are used in order to realign the cylinders when they reach the end of the cycle.For example, when the cylinders extend, they may not reach the end of stroke at the same time, due to the differences of internal leakage between the stages.When the first one of a system of cylinders reaches its stroke end, the relief valve in this stage opens and by-pass the flow to tank, in this way it allows the other to reach their stop without causing damages in the system.

VA

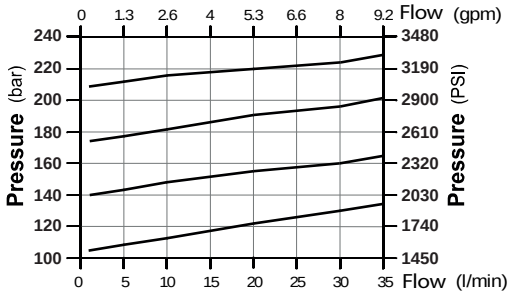
OVERLOAD VALVE
(setting range from 50 to 275 bar - 725 to 4000 psi)

On the 2DRE-VA, this valve is available just set 50 bar



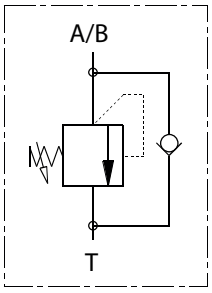


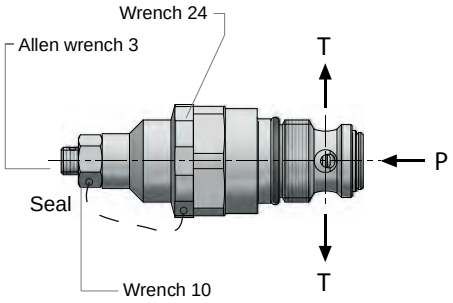
Dimension from the top valve, see page 8

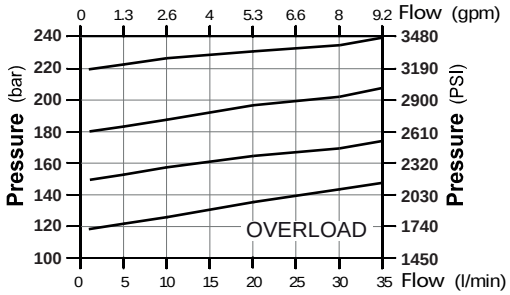


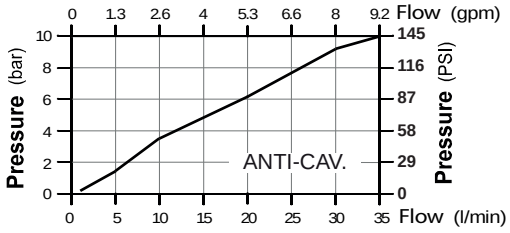
AR

OVERLOAD AND ANTI-CAVITATION VALVE
(setting range from 50 to 275 bar - 725 to 40 00 psi)





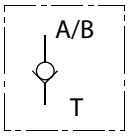


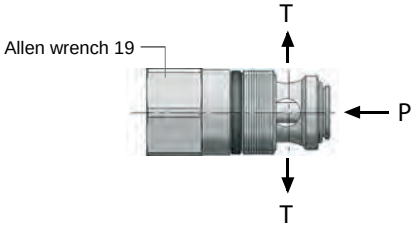


Both valves VA and AR are adjustable without oil leaking.
Further more both have a security device to avoid valve sticking

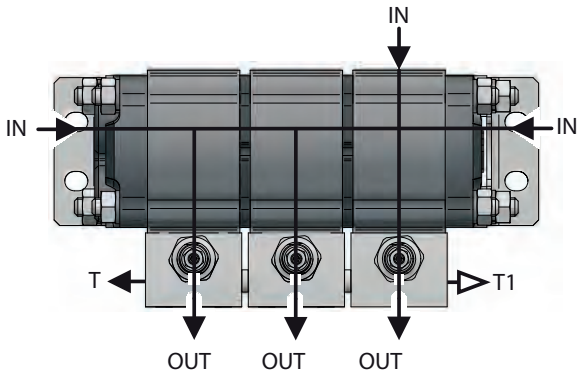
VR

ANTI-CAVITATION VALVE





AVAILABLE PORTS

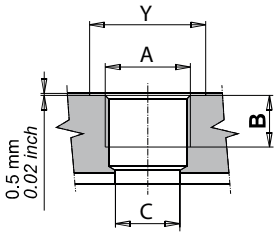


PORTS	BSPP			ODT		
Type	IN	OUT	T - T1	IN	OUT	T - T1
2DRE - 4,5	G 3/4	G 1/2	G 1/2	SAE 12	SAE 10	SAE 10
2DRE - 6,5						
2DRE - 8,3						
2DRE - 10,5						
2DRE - 11,3						
2DRE - 12,5						
2DRE - 13,8						
2DRE - 16						
2DRE - 19						
2DRE - 22,5						
2DRE - 26						
2DRE - 30						

British standard pipe parallel (BSPP)

code G

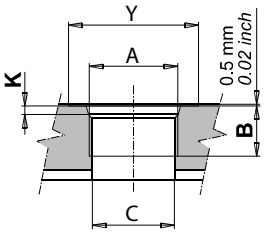
INLET				OUTLET			
A	B	C	Y	A	B	C	Y
G3/4	16 (0.62")	20 (0.78")	36 (1.42")	G1/2	15 (0.58")	15 (0.58")	30 (1.18")



SAE threaded (ODT)

code R

INLET					OUTLET				
A	B	C	Y	K	A	B	C	Y	K
1-1/16 12 UN	19 (0.74")	20 (0.78")	41 (1.16")	3.3 (0.12")	7/8 14 UN	16.7 (0.66")	15 (0.58")	34 (1.34")	2.5 (0.10")



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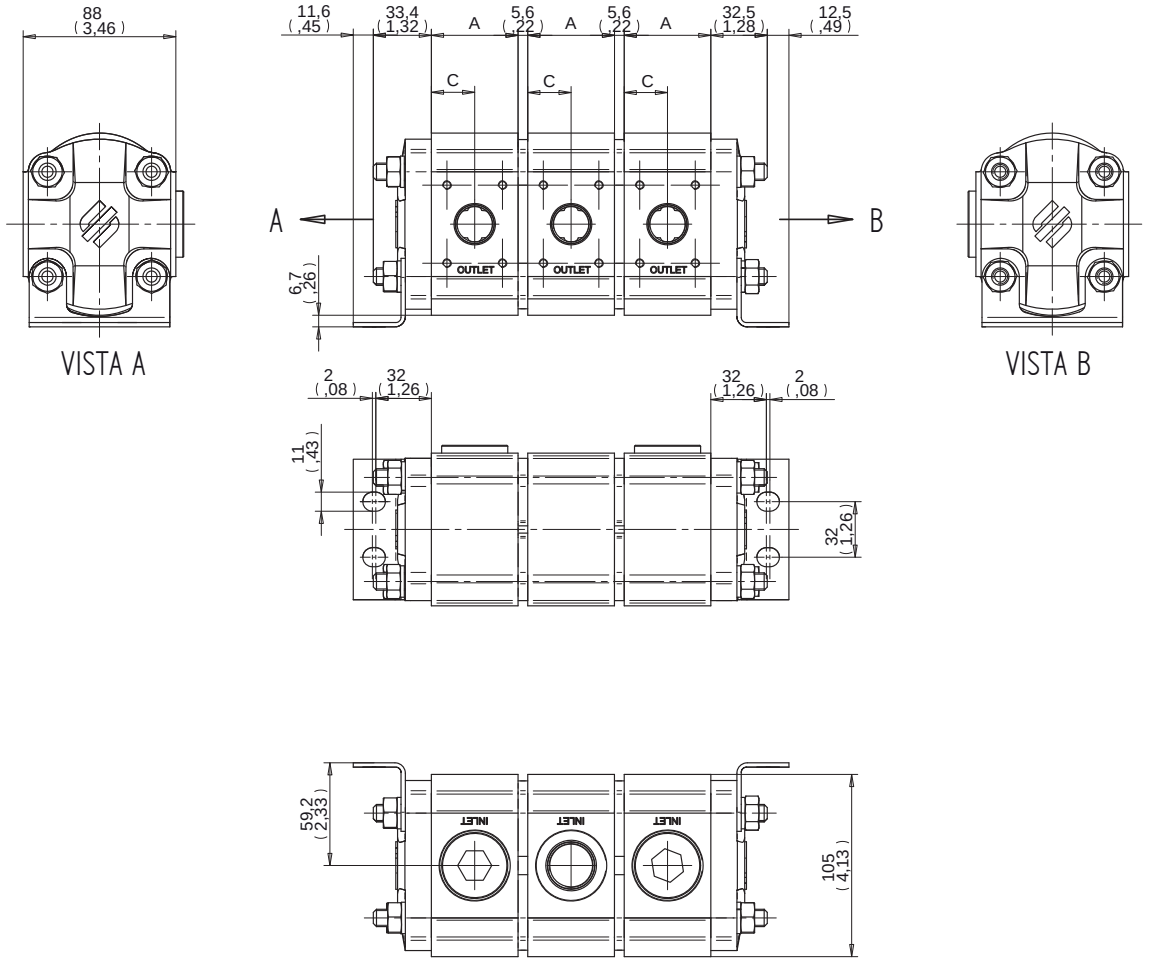
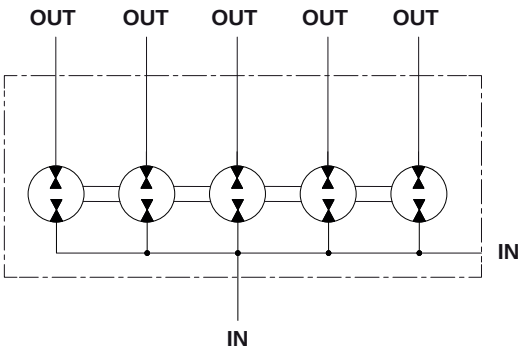
ASSEMBLING DIMENSIONS (release without valves)



Type	Dimension A		Dimension C	
	mm	*in*	mm	*in*
2DRE - 4,5	**47.1**	*1.83*	**23.55**	*0.93*
2DRE - 6,5	**49.95**	*1.97*	**25**	*0.98*
2DRE - 8,3	**52.8**	*2.07*	**26.4**	*1.04*
2DRE - 10,5	**56.35**	*2.22*	**28.17**	*1.11*
2DRE - 11,3	**59.6**	*2.35*	**29.8**	*1.17*
2DRE - 12,5	**59.6**	*2.35*	**29.8**	*1.17*
2DRE - 13,8	**63.5**	*2.5*	**31.75**	*1.25*
2DRE - 16	**67.5**	*2.65*	**33.75**	*1.33*
2DRE - 19	**75.6**	*2.97*	**37.8**	*1.49*
2DRE - 22,5	**81**	*3.19*	**40.5**	*1.59*
2DRE - 26	**86.8**	*1.58*	**43.4**	*1.71*
2DRE - 30	**97.6**	*3.84*	**48.8**	*1.92*



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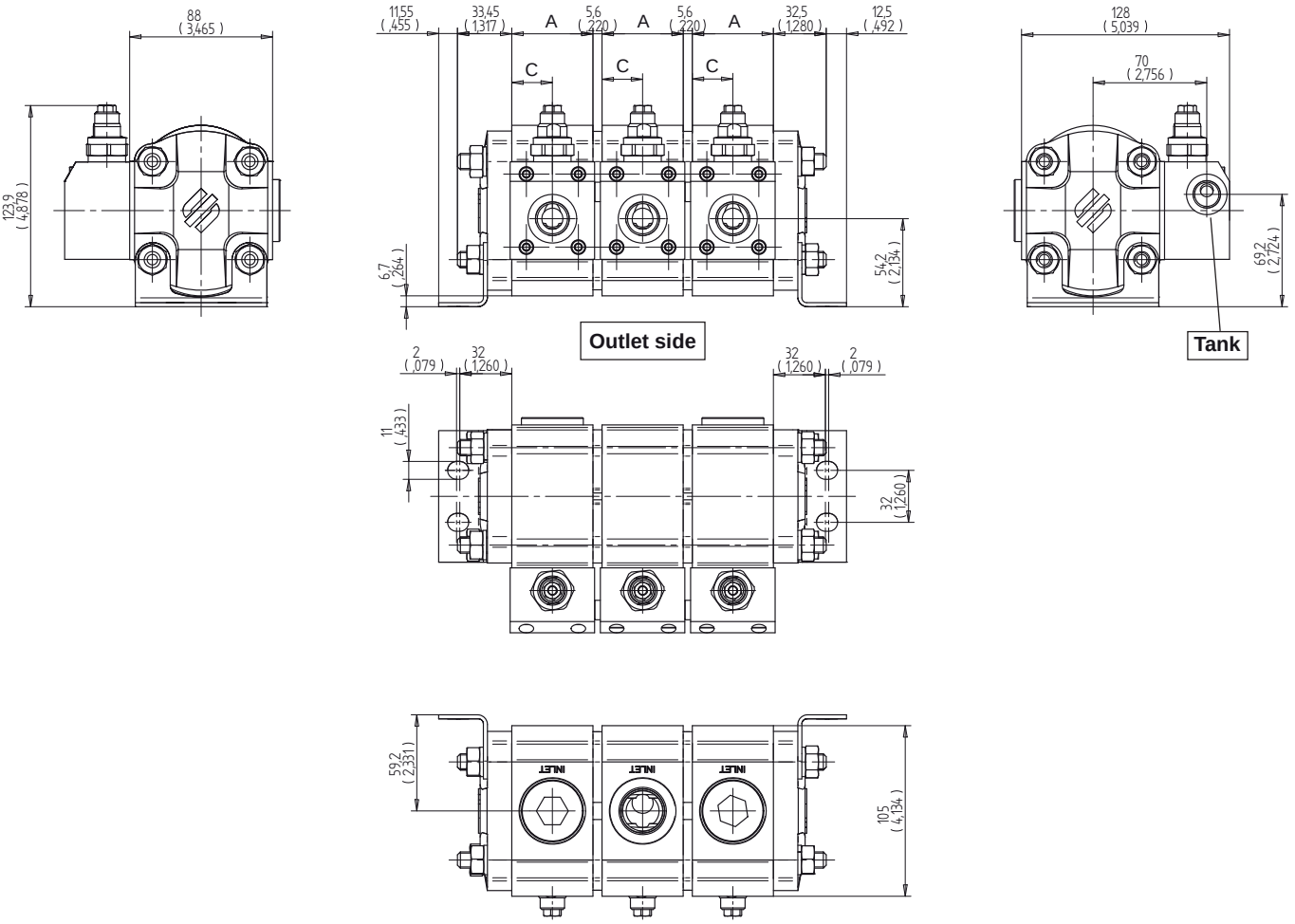
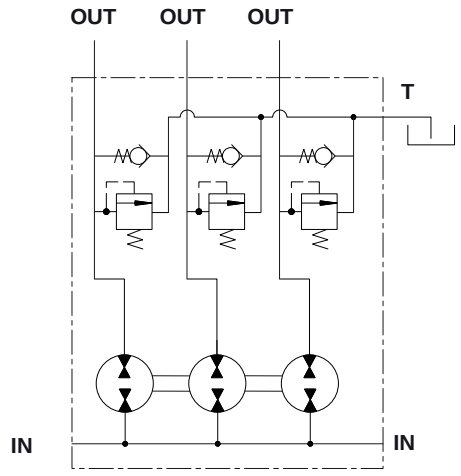
ASSEMBLING DIMENSIONS (release with valves/external discharge)





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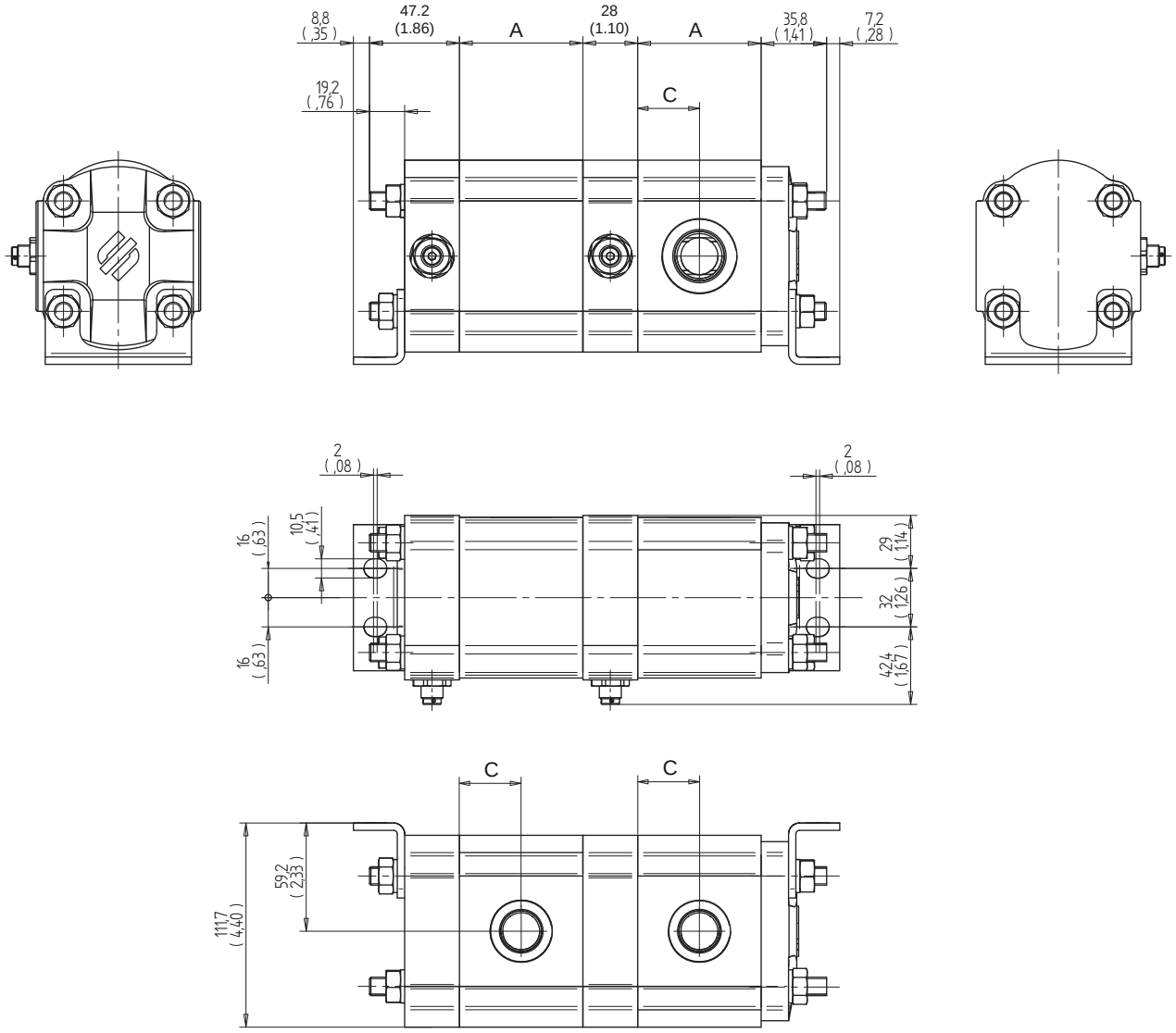
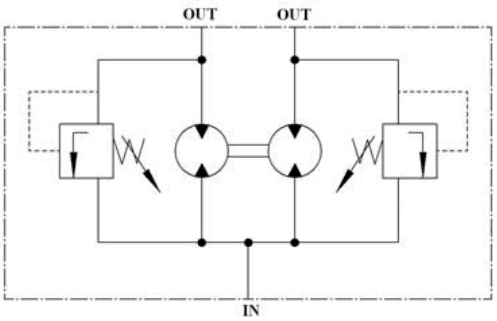
ASSEMBLING DIMENSIONS (release with valves/internal by-pass)





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2DRE - 13,8	63.5	2.5	31.75	1.25
2DRE - 16	67.5	2.65	33.75	1.33
2DRE - 19	75.6	2.97	37.8	1.49
2DRE - 22,5	81	3.19	40.5	1.59
2DRE - 26	86.8	1.58	43.4	1.71
2DRE - 30	97.6	3.84	48.8	1.92

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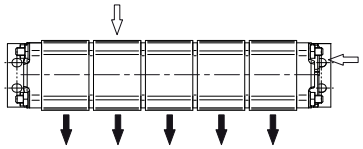
HOW TO ORDER



Keeping the above drawing as reference point, looking the flow divider from the height, maintaining the outlet ports always at the same side we will be able to fix all the features.Please, have a look on the example here below in order to understand the key code method.
Max number of stages 6, for assemblings which need of more steges, please get in touch with our technical dept.

2DRE	/	G	–	0	/	16	O	/	16	I	O	/	16	O	/	16	O	/	16	O	/	1	–	V
TYPE		PORTS		SIDE COVER		DISPLACEMENT	OUTLET PORT		DISPLACEMENT	INLET PORT	OUTLET PORT		DISPLACEMENT	OUTLET PORT		DISPLACEMENT	OUTLET PORT		DISPLACEMENT	OUTLET PORT		SIDE COVER		

DISPLACEMENTS		
4.5	4.6 cm^3/rev.	*0,27 cu.in/rev.*
6.5	6.5 cm^3/rev.	*0,40 cu.in/rev.*
8.3	8.2 cm^3/rev.	*0,50 cu.in/rev.*
10.5	10.6 cm^3/rev.	*0.65 cu.in/rev.*
11.3	11.5 cm^3/rev.	*0,68 cu.in/rev.*
12.5	12.7 cm^3/rev.	*0.77 cu.in/rev.*
13.8	13.8 cm^3/rev.	*0,84 cu.in/rev.*
16	16.6 cm^3/rev.	*1.01 cu.in/rev.*
19	19.4 cm^3/rev.	*1.15 cu.in/rev.*
22.5	22.9 cm^3/rev.	*1.37 cu.in/rev.*
26	25.8 cm^3/rev.	*1.58 cu.in/rev.*
30	30.1 cm^3/rev.	*1.84 cu.in/rev.*

SIDE COVERS	CODES
Without inlet port	0
With inlet port	1

BODIES	CODES
Body with outlet port only	O
Body with inlet and outlet ports	IO

PORTS (pag. 11)	CODES
GAS threaded ports (BSPP)	G
SAE Threaded ports (ODT)	R

SEALS	CODES
Buna Standard	
Viton	V

Proceding as per our example above, when you have to set up a 2DRE flow divider, beginning from the right side you have to specify:

- **type**
- **first cover (with or without inlet port)**
- **stages, and for each stage you have to put:**
  - **displacement**
  - **outlet port only or both inlet and outlet ports**
- **last cover (with or without inlet ports)**
- **“not specified” if you want our std. Buna nitrile seals, you have to put V if you want the Viton seals**

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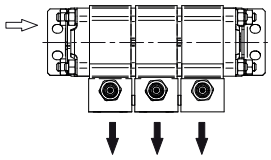
HOW TO ORDER

(release with valves/external discharge)



Keeping the above drawing as reference point, looking the flow divider from the height, maintaining the outlet ports always at the same side we will be able to fix all the features.Please, have a look on the example here below in order to understand the key code method.
Max number of stages 6, for assemblings which need of more steges, please get in touch with our technical dept.

2DRE-AR	/	G	–	1	/	8.3	O	.	AR	140	/	8.3	O	.	AR	140	/	8.3	O	.	AR	140	/	0
TYPE		PORTS		SIDE COVER		DISPLACEMENT	OUTLET PORT		VALVE	SETTING		DISPLACEMENT	OUTLET PORT		VALVE	SETTING		DISPLACEMENT	OUTLET PORT		VALVE	SETTING		SIDE COVER

DISPLACEMENTS		
4.5	4.6 cm^3/rev.	0,27 cu.in/rev.
6.5	6.5 cm^3/rev.	0,40 cu.in/rev.
8.3	8.2 cm^3/rev.	0,50 cu.in/rev.
6.5	10.6 cm^3/rev.	0.65 cu.in/rev.
11.3	11.5 cm^3/rev.	0,68 cu.in/rev.
12.5	12.7 cm^3/rev.	0.77 cu.in/rev.
13.8	13.8 cm^3/rev.	0,84 cu.in/rev.
16	16.6 cm^3/rev.	1.01 cu.in/rev.
19	19.4 cm^3/rev.	1.15 cu.in/rev.
22.5	22.9 cm^3/rev.	1.37 cu.in/rev.
26	25.8 cm^3/rev.	1.58 cu.in/rev.
30	30.1 cm^3/rev.	1.84 cu.in/rev.

VALVE TYPES	CODES
Adjustable overload valve (available settings at page 6)	VA
Adj. overload and anti-cavitation valve (av. settings at page 6)	AR
Anti-cavitation valve (page 6)	VR

SIDE COVERS	CODES
Without inlet port	0
With inlet port	1

BODIES	CODES
Body with outlet port only	O
Body with inlet and outlet ports	IO

SEALS	CODE
Buna Standard	
Viton	V

PORTS (pag. 11)	CODES
GAS threaded ports (BSPP)	G
SAE Threaded ports (ODT)	R

Proceding as per our example above, when you have to set up a 2DRE flow divider, beginning from the right side you have to specify:

- type
- first cover (with or without inlet port)
- stages, and for each stage you have to put:
  - displacement
  - outlet port only or both inlet and outlet ports
  - type of valve
  - pressure setting
- last cover (with or without inlet ports)
- “not specified” if you want our std. Buna nitrile seals, you have to put V if you want the Viton seals

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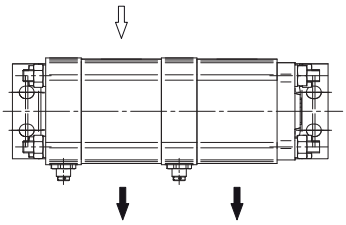
HOW TO ORDER

(release with valves/internal by-pass)



Keeping the above drawing as reference point, looking the flow divider from the height, maintaining the outlet ports always at the same side, we will be able to fix all the features.Please, have a look on the example here below in order to understand the key code method.
Max number of stages 6, for assemblings which need of more steges, please get in touch with our technical dept.

2DRE-VA	/	G	–	2	VA	50	/	8.3	I	O	/	3	VA	50	/	8.3	O	/	0
TYPE		PORTS		SIDE COVER	VALVE	SETTING		DISPLACEMENT	INLET PORT	OUTLET PORT		MID PLATE	VALVE	SETTING		DISPLACEMENT	OUTLET PORT		SIDE COVER

DISPLACEMENTS		
4.5	4.6 cm^3/rev.	0,27 cu.in/rev.
6.5	6.5 cm^3/rev.	0,40 cu.in/rev.
8.3	8.2 cm^3/rev.	0,50 cu.in/rev.
6.5 5	10.6 cm^3/rev.	0.65 cu.in/rev.
11.3	11.5 cm^3/rev.	0,68 cu.in/rev.
12.5	12.7 cm^3/rev.	0.77 cu.in/rev.
13.8	13.8 cm^3/rev.	0,84 cu.in/rev.
16	16.6 cm^3/rev.	1.01 cu.in/rev.
19	19.4 cm^3/rev.	1.15 cu.in/rev.
22.5	22.9 cm^3/rev.	1.37 cu.in/rev.
26	25.8 cm^3/rev.	1.58 cu.in/rev.
30	30.1 cm^3/rev.	1.84 cu.in/rev.

VALVE TYPES	CODES
Adjustable overload valve (available settings at page 6)	VA

BODIES	CODES
Body with outlet port only	O
Body with inlet and outlet ports	IO

SIDE COVERS	CODES
Without inlet port	0
With inlet port	1
Pre-arranged for valve VA	2

SEAL	CODE
Buna Standard	
Viton	V

MID PLATE	CODES
Pre-arranged for valve VA	3

PORTS (pag. 11)	CODES
GAS threaded ports (BSPP)	G
SAE Threaded ports (ODT)	R

Proceding as per our example above, when you have to set up a 2DRE flow divider, beginning from the right side you have to specify:

- type
- first cover (with or without inlet port or pre-arranged for overload valve VA)
- stages, and for each stage you have to put:
  - displacement
  - outlet port only or both inlet and outlet ports
- mid plate, and for each stage you have to put:
  - pressure setting of valve VA
- stages, and for each stage you have to put:
  - displacement
  - outlet port only or both inlet and outlet ports
- last cover (with or without inlet ports)
- "not specified" if you want our std. Buna nitrile seals, you have to put V if you want the Viton seals

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