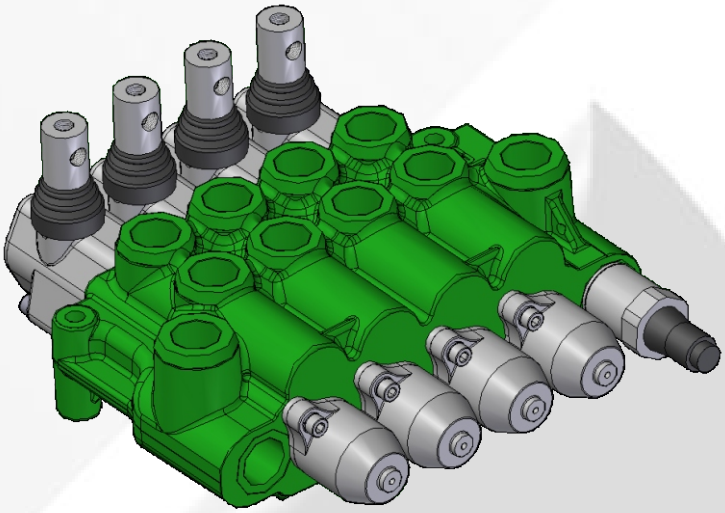
MONOBLOCK VALVE

VDM09

Technical catalogue



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

salami™

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GENERAL FEATURES

Among all hydraulic directional control valves used in the field of mobile equipment applications, the spool valve is the most popular.
The monoblock valve type offers an excellent performance price ratio.

FEATURES

VDM09 directional control valve has the following:
- cast-iron monoblock construction up to 6 spools
- parallel circuit, load check valve protection on down-stream of the pressure "P" line
- possibility of power beyond
- spool construction in steel, hardened and nichel-plated to obtain a higher surface hardness and a better corrosion resistance
- several types of spool: double, single acting, spool motor, float position etc.
- minimum tolerance between the spools and the body to obtain a minimum internal leakage
- interchangeabilty of all the spools
- several spool control devices and spool positioning devices

VALVE AND DEVICE TYPES

In order to meet the most stringent demands and to offer a wider range of applications, the following types of valves and devices are available:

Valves
- direct main relief valve: controls the maximum pressure in the circuit when one or more spools are on end stroke located on "A" port side, can be:
  direct type version up to 280 bar - *4060 psi*
- check valve avoids the returnof the fluid to the pump
- flow restrictor: directly fitted on the "A/B" ports orifice
- double-single acting conversion valve CV: this manual selector changes the working section from double to single acting (A ports).

Devices
- handle controls
- cross lever: allows to acting two spools with one manual joystick
- cable remote control
- control device for microswitches: for the operation with electric d.c. motor driven pumps at one or more rotation speeds
- hydraulic kick-out: returns the spool automatically to the neutral position when the pre-set pressure of port "A" or "B" is exceeded
- pneumatic proportional control available also with float position
- electropneumatic control
- hydraulic proportional control
- several spool positionings device to return the spool to neutral position or to lock the spool on working position

TECHNICAL DATA

Spools	from 1 to 6		
Nominal flow	Q	75 l/min	(*20 gpm US*)
☞ Max flow		90 l/min	(*24 gpm US*)
Max pressure	port P	280 bar	(*4060 psi*)
	ports A/B	280 bar	(*4060 psi*)
	☞ port T	25 bar	(*363 psi*)
Internal leakage at 160 bar (*2285 psi*)	ports A/B → T	30 ÷ 45 cm^3/min	(*1.8 ÷ 2.74 cu.in./min*)
For lower leakage please contact our sales dept.			
Spool stroke (positions 1 and 2)		± 8 mm	(*0,315 in.*)
Spool stroke (position 4, float or regenerative)		± 7.5 + 4.5 mm	(*0.295 + 0.177 in.*)

☞ In case you need flows from 75 l/min to 90 l/min please contact our sales dept.

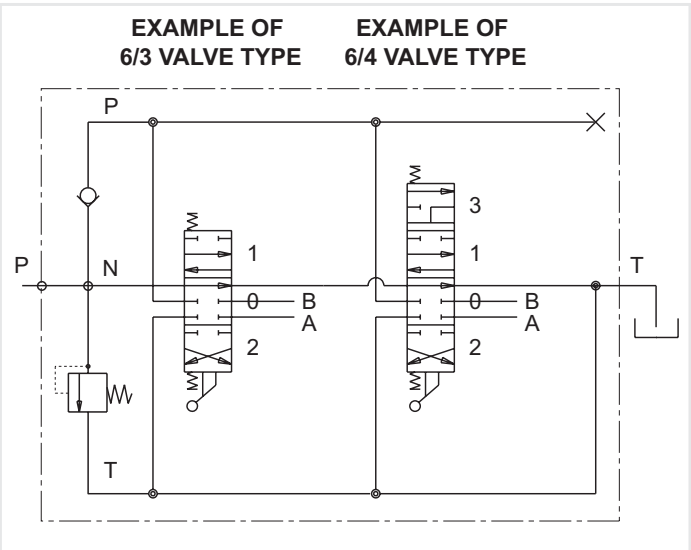
☞ For higher back pressure please contact our sales dept.

All technical data carried out using mineral oil with viscosity of 16 cSt and contamination level 19/16 as ISO 4406.

WORKING CONDITIONS

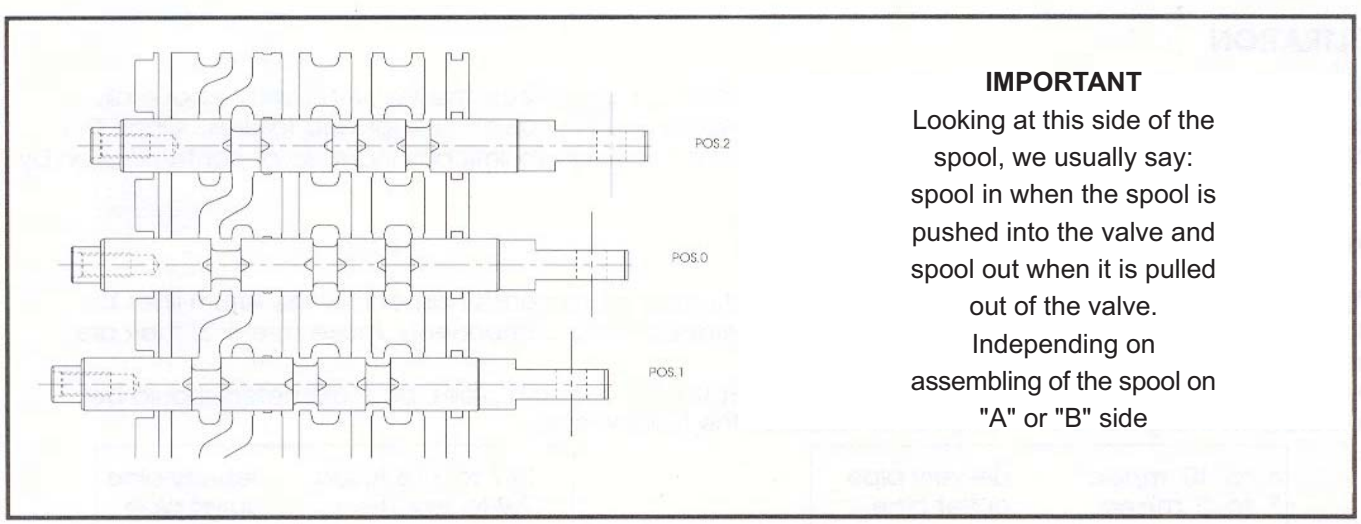
Hydraulic fluid	mineral oil according to DIN 51524		
Viscosity			
	viscosity range	10...400 mm^2/sec	(*0.15...7.13 sq.in./sec*)
	optimal viscosity	12...75 mm^2/sec	(*0.19...1.16 sq.in./sec*)
Temperature			
	fluid range temperature	-20...85 °C	(*-4...185 °F*) NBR seals
	suggested range	30...60 °C	(*86...140 °F*) NBR seals
Maximum contamination level		NAS 1683: class 9	ISO 4406: 19/16
Room temperature		-30...60 °C	(-22...140 °F)
Working limits		see diagrams at page 6	
Pressure drop		see diagrams at page 7	
For operation with fire resistant fluid, please contact our sales department			

OPERATING PRINCIPLE



Salami directional control valves belong to the 6/3 (or 6/4) type; they can control 6 gallery in 3 (or 4) spool positions simultaneously.
They are open circuit types: when the spool is in neutral position, the fluid flows directly to the tank with minimum internal pressure drops (approximatively 1 bar / 14.5 psi for each spool at nominal flow).
When the spool is moved from this position, the neutral gallery is gradually throttled and the connection between pump and actuator, through the corresponding port, is made.
When pressure exceeds the value of the pressure existing in port A or B, the fluid flows through the load check valve to the actuator.

There are 3 characteristic phases in the spool stroke:



IMPORTANT
Looking at this side of the spool, we usually say: spool in when the spool is pushed into the valve and spool out when it is pulled out of the valve.
Independing on assembling of the spool on "A" or "B" side

There are two characteristic phases in the spool stroke (8 mm - 0,315 in.):
a) the overlap phase (about 18% of the stroke) guarantees minimum internal leakages in neutral position;
b) the progressive flow regulation phase (82% of the stroke).
Both pictures show a 6/3 valve type with double acting spool only as principle of functioning.
Salami VDM09 is available in different solutions.

INSTALLATION

When proceeding to mount the unit on the structure and to connect fittings to work ports, it is necessary to comply with the values of tightening torques.
The attachment of linkages to spools should not affect their operation. The mounting position can be vertical with inlet module on the top or horizontal.

Standard tightening torques - Nm / *lbft*

FITTING TYPE	P and PL ports	A and B ports	T and TL ports
BSP (ISO 228/1)	G 3/4	G 1/2	G 3/4
with o-ring seal	**60 / *44.2***	50 / *36.9*	**60 / *44.2***
with copper washer	70 / *51.6*	60 / *44.3*	70 / *51.6*
with steel washer	70 / *51.6*	60 / *44.3*	70 / *51.6*
SAE	**SAE 10 (7/8-14 UNF)**	SAE 10 (7/8-14 UNF)	SAE 12 (1 1/16-12 UN)
with o-ring seal	**60 / *44.2***	60 / *44.2*	95 / *70.1*

FILTRATION

The contamination of the fluid in the system greatly affects the life of the unit. Above all, contamination may result in irregular operation, wear of seals in valve housings and failures. Once the initial contamination level of the system has been reached, it is necessary to limit any increase of contamination installing an efficient filtration system (see working conditions page 3).

PIPES

Pipes should be as short as possible, without restrictions or sharp bends (especially the return lines). Before connecting pipes to the fittings of the corresponding components, make sure that they are free from burrs and other contamination.
As a first approximation, for a mobile machine with standard length pipes, their width should guarantee the following values of fluid speed*:

6 ÷ 10 m/sec	inlet pipe
3 ÷ 5 m/sec	outlet pipe

19,7 ÷ 32,8 ft/sec	inlet pipe
9,9 ÷ 16,4 ft/sec	outlet pipe

the lowest values of fluid speed are required in case of wide temperature range and/or for continuous duty.

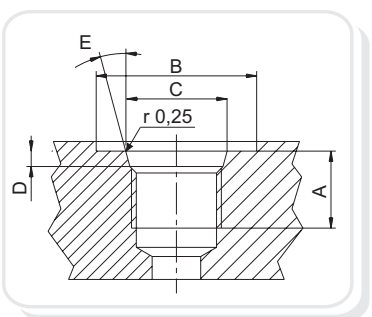
* $[v = \frac{21{,}2 \times Q}{d^2}$ v = fluid speed [m/sec], Q = flow [l/min], d = pipe internal diameter [mm]

HYDRAULIC FLUIDS

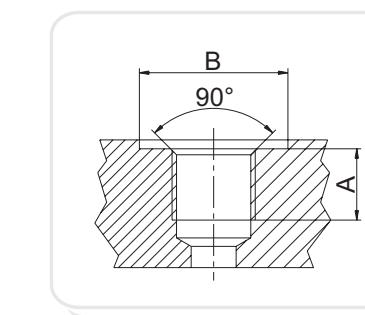
Usually a mineral-base oil with a good viscosity index should be used, preferably with good lubricating properties and corrosion, oxidation and foaming resistant.
Sometimes the fluids supplied by the manufacturers do not satisfy purity requirements (see page 3 WORKING CONDITIONS). It is therefore necessary to filter the fluid carefully before filling. Your supplier can give you the information about NAS class of its fluids. To maintain the proper purity class, the use of filters of high dirt capacity with clogging indicator is recommended.
Under humidity conditions it is necessary to use hygroscopic salts.
For operation with fire resistant and ecological fluids, please contact our technical department.

PORTS

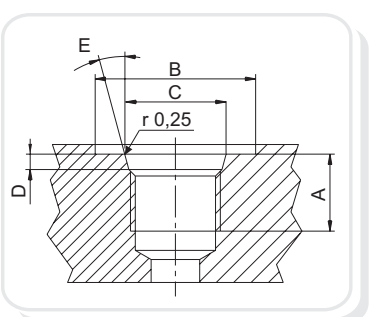
Following are standard ports. For different port types, please contact our sales department.



SAE UN-UNF (ISO 725)						
Dimensions		7/8 -14 UNF SAE10		1”1/16 -12 UN SAE12		1”5/16 -12 UN SAE16	
mm	In.						
A		17	0,67	20	0,79	20	0,79
B		34	1,34	41	1,61	49	1,92
C		23,9	0,94	29,2	1,15	35,5	1,40
D		2,5	0,10	3,3	0,13	3,3	0,13
E		15°		15°		15°	



BSP (ISO 228)						
Dimensions		G1/2		G3/4		G1	
mm	In.						
A		16	0,63	18	0,71	20	0,79
B		27	1,06	33	1,30	40	1,57



METRIC (ISO 262 - ISO 6149)*								
Dimensions		M22 x 1.5				M27 x 2			
mm	In.	ISO 262		ISO 6149		ISO 262		ISO 6149	
A		16	0.63	16	0,63	18	0,71	19	1,75
B		31,5	1.24	34	1,34	37,7	1,48	40	1,57
C				23,8	0,94			29,4	1,16
D				2,4	0.09			3,1	0,12

*Available for quantity, please contact our sales dept.

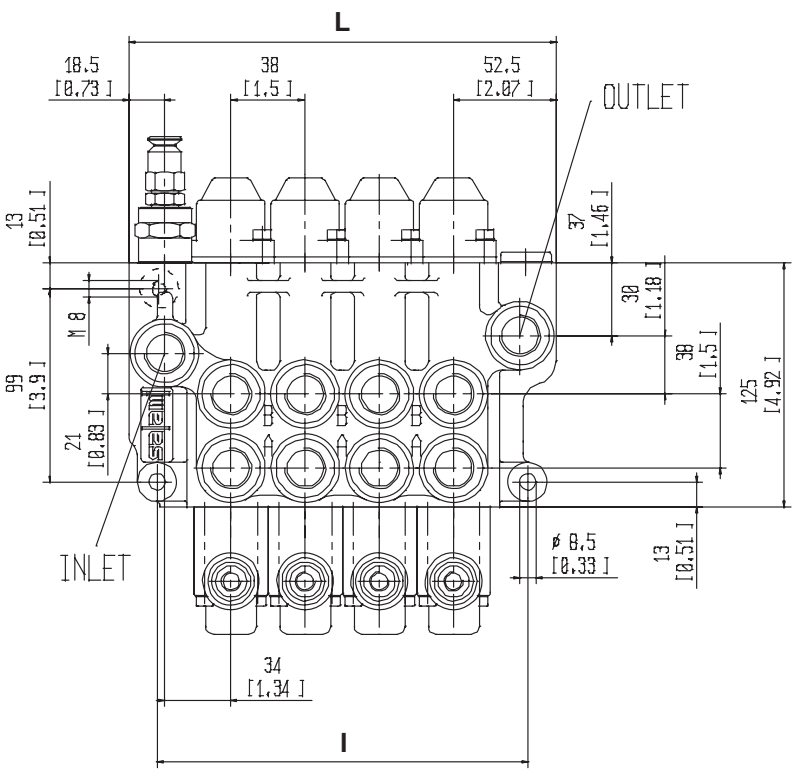
DIMENSIONS FROM 1 TO 6 SECTIONS MONOBLOCK

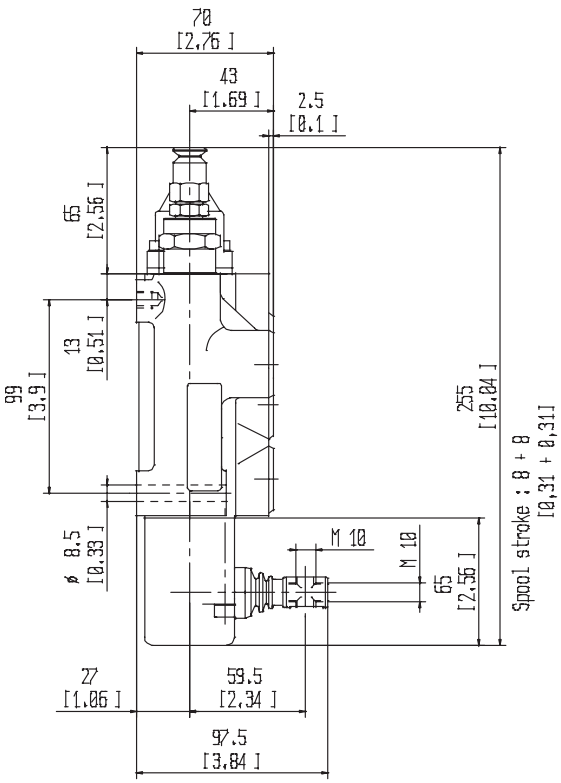
Nominal flow: 75 l/min.
Pressure on P port: 280 bar
Pressure on A/B port: 315 bar

Nominal flow: 21 gpm US
Pressure on P port: 4000 psi
Pressure on A/B port: 4560 psi

Ports	P	T	A - B
BSP ISO 228	1/2	1/2	1/2
*METRICA ISO 6149	M 22X1.5	M 22X1.5	M 22X1.5
SAE ISO 725	7/8 - 16 UNF	7/8 - 16 UNF	7/8 - 16 UNF

* Available on request





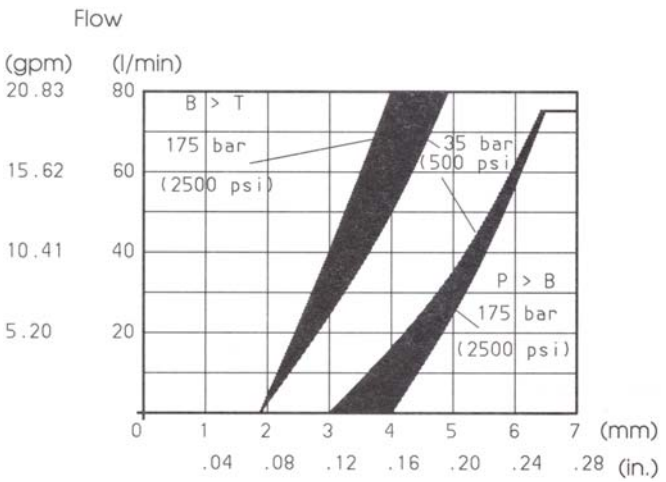
Spool		1	2	3	4	5	6
I	mm.	76	114	152	190	228	266
	in.	2.90	4.48	5.98	7.48	8.98	10.47
L	mm.	105	143	181	219	257	295
	in.	4.13	5.62	7.12	8.62	10.12	11.61
M	kg	4.2	6.5	8.9	11.3	13.7	16.1
	lb	9.24	14.3	19.58	24.86	30.14	35.42

PERFORMANCE DATA

Performance curves carried out with oil viscosity at 16cSt

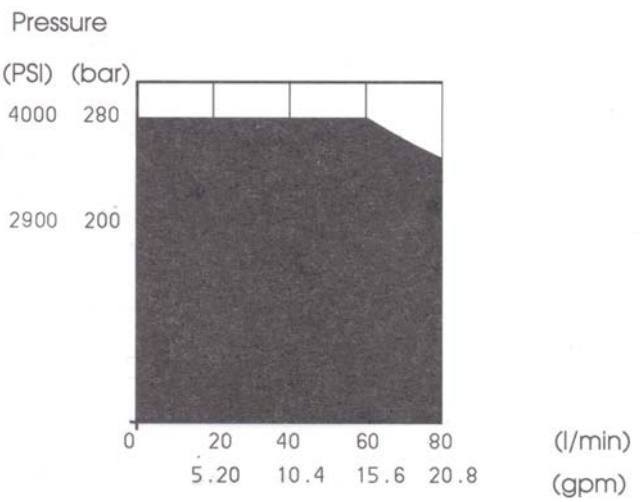
Internal leakages
A/B → T **35** cm^3/min. (0.92 cu. in./min.)
at 200 bar (2900 psi)

Meetering



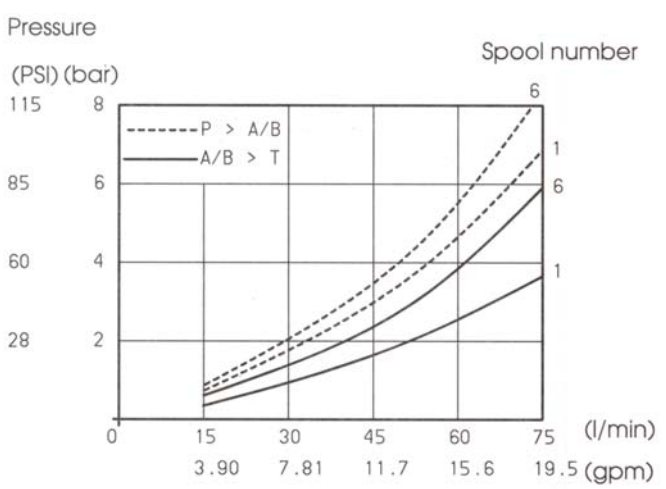
Stroke

Working limits



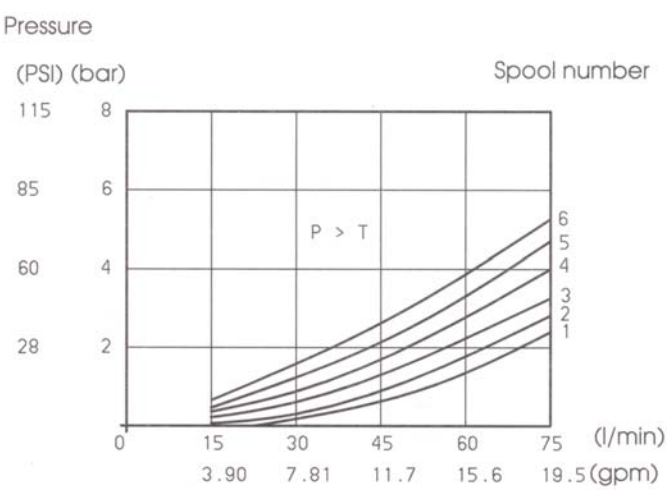
Flow

Pressure drop



Flow

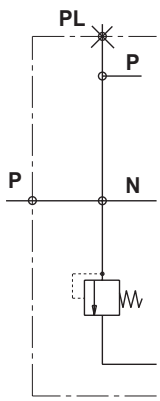
Pressure drop



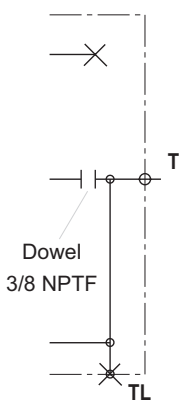
Flow

INLET AND OUTLET TYPES

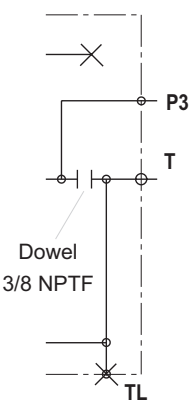
Top port side port plugged **01**



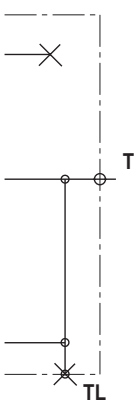
Closed center configuration **U7**



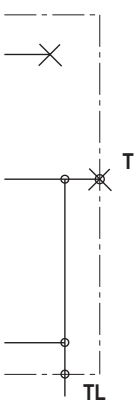
Power beyond configuration (side P3) **U5**



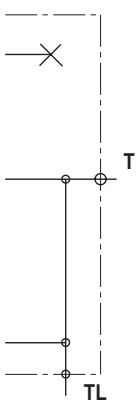
Top port side port plugged **U4**



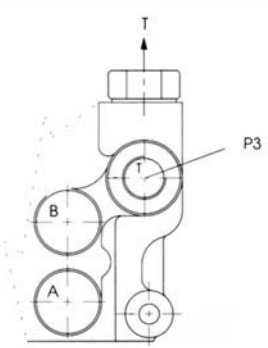
Side port top port plugged **U3**



Top and side ports **U2**



code U5

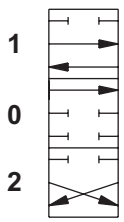


U5 configuration is achieveable by U2 - U3 - U4 with the power beyond kit.

CIRCUIT AND SPOOL TYPES

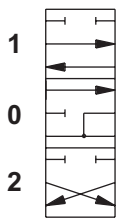
As you can read at page xx, the spools can be types "A" nominal flow or "C" 2/3 of nominal flow.

01



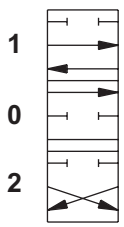
Double acting spool

Double acting
motor spool



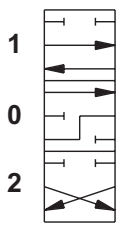
02

03



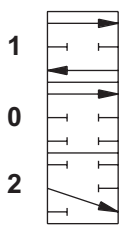
Double acting
motor spool
("B" port blocked)

Double acting
motor spool
("A" port blocked)



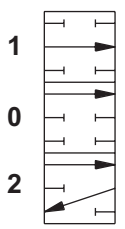
04

05



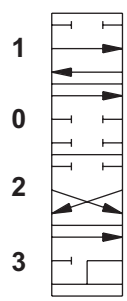
Single acting spool
"A" working port

Single acting spool
"B" working port



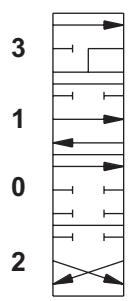
06

11



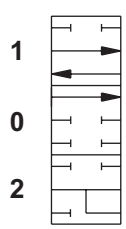
Double acting spool with
float function
in 3rd position (spool in)

Double acting spool with
float function
in 3rd position (spool out)



12

17

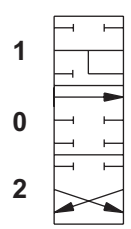


Double acting spool with
regenerative function
in position 2 (spool in)

With this type of spool
a special machining of
the body is required

Double acting spool with
regenerative function
in position 1 (spool out)

With this type of spool
a special machining of
the body is required

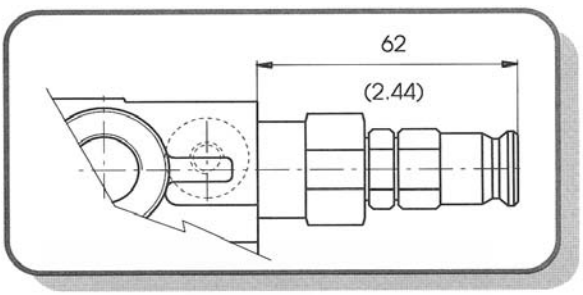


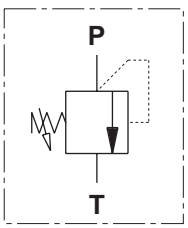
18

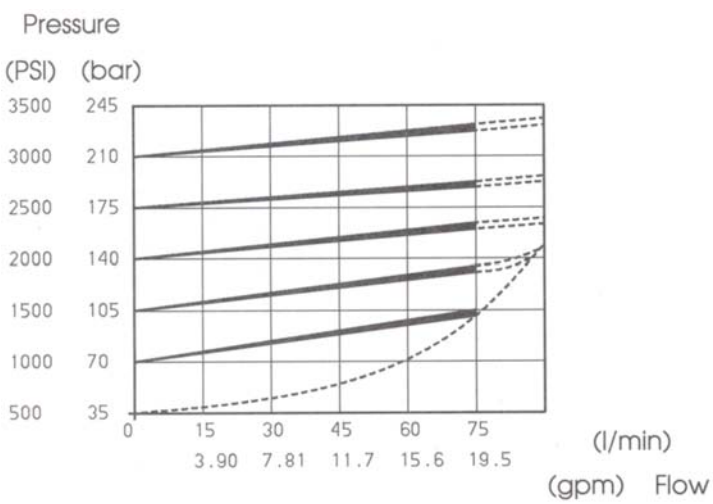
MAIN RELIEF VALVE

MAIN RELIEF VALVE DIRECT OPERATED
(setting range from 40 to 280 bar - *580 to 4060 psi*)

D

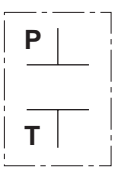




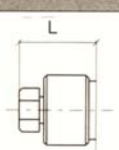
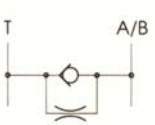
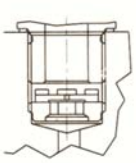
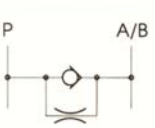


PLUG FOR MAIN RELIEF SEAT
WITHOUT VALVE

W

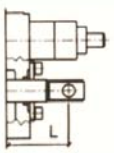
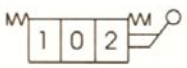
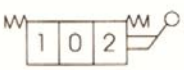
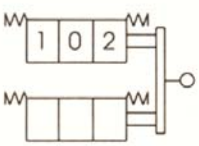
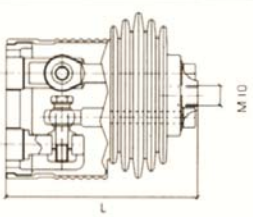
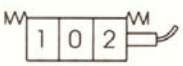
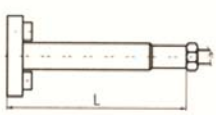
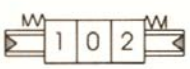
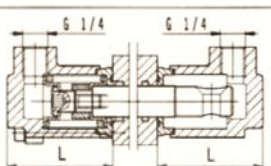
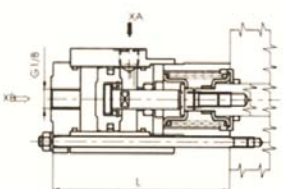
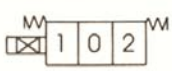


AUXILIARY VALVES

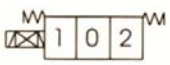
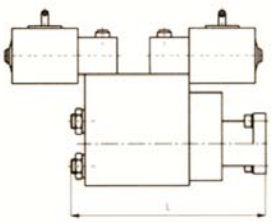
Code	Hydraulic symbol	Description	
CV		Double-single acting conversion valve Only on B side	
ST		Flow restrictor	
SP		Flow restrictor	

Note: the port valves for monoblock are optional and need a modification to the cast-iron body

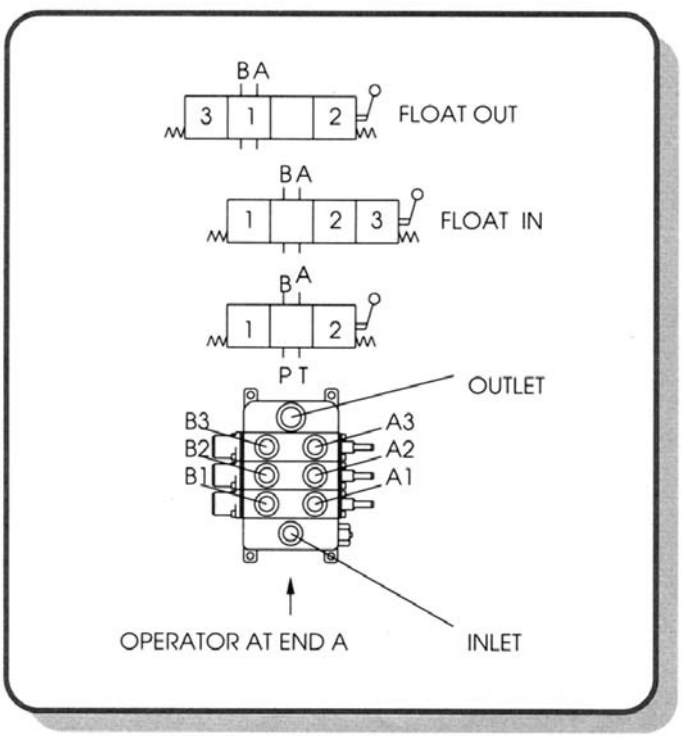
SPOOL CONTROLS

Code	Hydraulic symbol	Description	
SL		Without lever	
NL		With protected lever	
MP		With protected clamp lever	
L1		Cross lever for 2 spools with fulcrum on up-stream spool	
L2		Cross lever for 2 spools with fulcrum on down-stream spool	
TC		Cable control (with mounting kit on directional control valve)	
IP		Hydraulic proportional min: 57 psi (4 bar) max 357 psi (25 bar)	
PP		Pneumatic proportional min: 35 psi (2,5 bar) max 85 psi (6 bar)	
PO		Pneumatic ON-OFF min: 50 psi (3,5 bar)	

SPOOL CONTROLS

Code	Hydraulic symbol	Description	
P1		Electric pneumatic ON-OFF 12V c.c. (max 9 bar/130 psi) (induced current = 1,5A absorbed power = 18W)	
P2		Electric pneumatic ON-OFF 24V c.c. (max 9 bar/130 psi) (induced current = 0,75A absorbed power = 18W)	

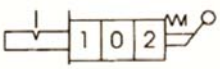
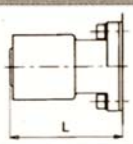
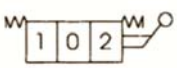
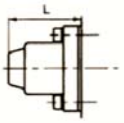
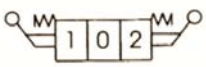
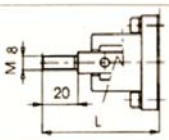
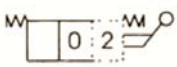
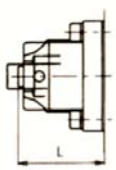
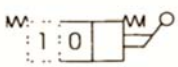
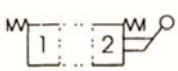
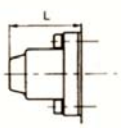
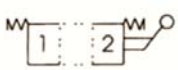
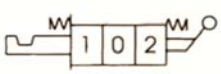
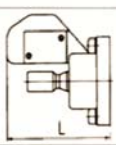
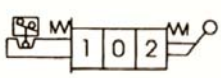
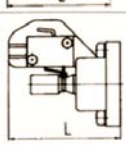
SPOOL CONTROL LOCATION SCHEMATIC VIEW



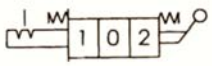
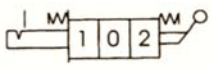
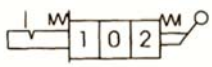
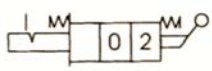
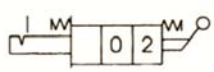
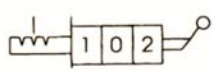
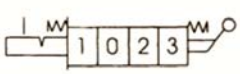
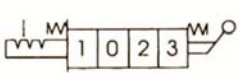
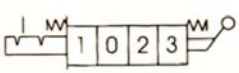
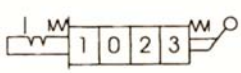
Positioning levers on B port is not standard but is possible using special spools.

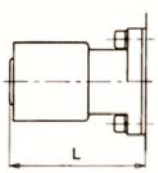
The electric, pneumatic and electro-pneumatic actings are usually on the B port side.

SPOOL POSITIONINGS

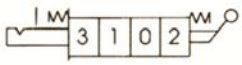
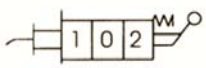
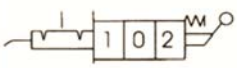
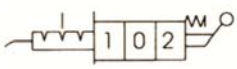
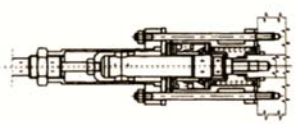
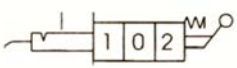
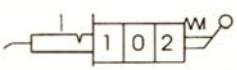
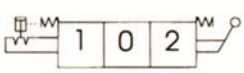
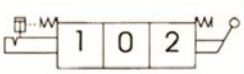
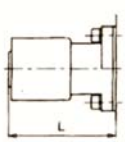
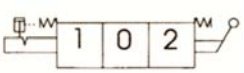
Code	Hydraulic symbol	Description	
C0		With friction on each position	
C2		Spring centered to NEUTRAL	
C3		Spring centered to NEUTRAL with double control (screw tap)	
C5		Two positions (NEUTRAL/spool-IN) with spring return in neutral	
C6		Two positions (NEUTRAL/spool-OUT) with spring return in neutral	
C7		Two positions-spool IN/spool OUT with spring return in spool OUT	
C8		Two positions-spool IN/spool OUT with spring return in spool IN	
CE		Pre-arrangement for electrical device	
CM		Microswitch to start an electric motor (Max current = 10A at 250 Vca)	
PE		Prearrangement for electrical/potentiometer device	
PM		Microswitch to start an electric motor and potentiometer device (Max current = 10A at 250 Vca)	

SPOOL POSITIONINGS

Code	Hydraulic symbol	Description
R2		Detent on spool IN-OUT position with spring return in NEUTRAL
R4		Detent on spool OUT position with spring return in NEUTRAL
R5		Detent on spool IN position with spring return in NEUTRAL
R6		Detent on spool IN, 2 positions with spring return in NEUTRAL
R7		Detent on spool OUT, 2 positions with spring return in NEUTRAL
R9		Detent on spool IN-NEUTRAL-OUT, 3 positions without spring
F1		Detent on float spool IN, with spring return in NEUTRAL
F2		Detent on spool FLOAT-IN-OUT, position with spring return in NEUTRAL
F3		Detent on spool FLOAT-OUT, position with spring return in NEUTRAL
F4		Detent on spool FLOAT-IN, position with spring return in NEUTRAL



SPOOL POSITIONINGS

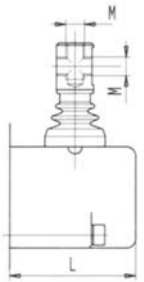
Code	Hydraulic symbol	Description	
F5		Detent on spool float OUT position with spring return in neutral	
D1		Cable remote control cap side	
D2		Cable remote control and detent on spool IN-OUT position	
D3		Cable remote control and detent on spool IN-NEUTRAL-OUT position	
D4		Cable remote control and detent on spool OUT position	
D5		Cable remote control and detent on spool IN position	
G2		Detent on spool IN-OUT position with hydraulic kick-out	
G4		Detent on spool OUT position with hydraulic kick-out	
G5		Detent on spool IN position with hydraulic kick-out	

DETENT IN/OUT EFFORT

	Detent IN	Detent OUT
1st and 2nd positions	250N/56,2 lb_f	33,72 lb_f (min) 150N (min)
3rd position	350N/78,7 lb_f	33,72 lb_f (min) 150N (min)

CLAMP LEVERS CODE NL - MP - SS

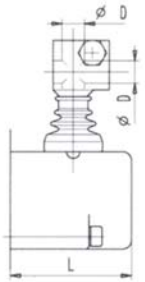
Protected lever



code NL

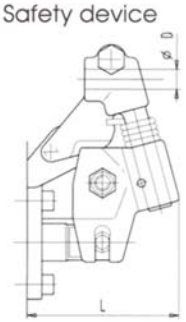
Protected lever NL

Protected clamp lever



code MP

Safety device



code SS

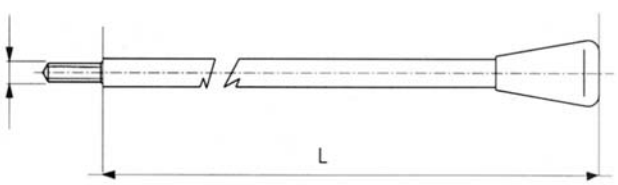
This code is not included in the codification: if requested, please add to the order

STANDARD SHAFTS FOR PROTECTED LEVERS CODE NL

	VDM07	VDM09
M	M8	M10
L	180 mm-7,1"	240 mm-9,5"

code LA

M



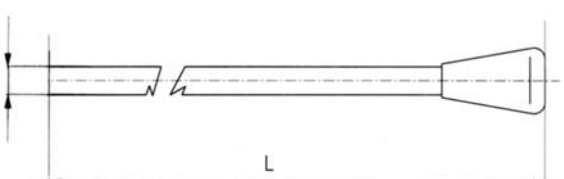
This code is not included in the codification: if requested, please add to the order

STANDARD SHAFTS FOR LEVERS CODE MP - SS

	VDM07	VDM09
D	8 mm-0,31"	10 mm-0,39"
L	180 mm-7,1"	240 mm-9,5"

code LB

D



This code is not included in the codification: if requested, please add to the order

How to order/VDM09

DIRECTIONAL CONTROL VALVE MONOBLOCK TYPE

VDM09 | 01 | D | 180 | – | / | 2 | X | P | 01 | A | – | ST | A | . | ST | B | – | NL | A | – | C2 | /

/ | P | 01 | A | – | ST | A | . | ST | B | – | NL | A | – | C2 | / | U1 | G

INLET CONFIGURATION
See page 9

MAIN RELIEF VALVE (PAG. 11)	
D	Direct main relief valve
W	Without main relief valve

MAIN RELIEF VALVE SETTING (bar)
See page 11

NUMBER OF IDENTICAL CONSECUTIVE SECTIONS

PARALLEL CIRCUIT

SPOOL TYPES (PAG. 10)	
01	Double acting spool
02	Double acting motor spool
03	Double acting motor spool ("B" port blocked)
04	Double acting motor spool ("A" port blocked)
05	Single acting spool "A" working port
06	Single acting spool "B" working port
11	Double acting spool with float function in 3rd pos. (spool in)
12	Double acting spool with float function in 3rd pos. (spool out)
17	Double acting spool with regenerative function in position 2 (spool in)
18	Double acting spool with regenerative function in position 1 (spool out)

SPOOL CHOICE ACCORDING TO THE INLET FLOW (PAG. 10)	
A	Nominal flow
C	2/3 of the nominal flow

AUXILIARY VALVES (PAG. 11)	
CV	Conversion valve from double to single acting circuit
ST	Flow restrictor P ® A/B
SP	Flow restrictor A/B ® T

PORTS (PAG. 7)	
G	GAS threaded
S	SAE threaded
M*	METRIC threaded

OUTLET CONFIGURATION
See page 9

SPOOL POSITIONINGS
Page 14 C0 - C2 - C3 - C5 - C6 - C7 - C8 - CE - CM - PE - PM
Page 15 R2- R4 - R5 - R6 - R7 - R9 - F1 - F2 - F3 - F4
Page 16 F5 - D1 - D2 - D3 - D4 - D5 - G2 - G4 - G5

CONTROL SIDE (PAGE 13)

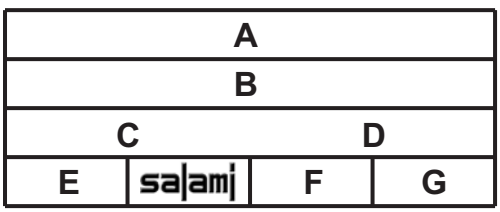
SPOOL CONTROLS (PAGE 12 - 13)
Without lever box - SL
Handle controls NL - MP - SS - L1/L2
Devices for cable remote control TC
Hydraulic control IP
Pneumatic and electro-pneumatic controls PP/P0 - P1/P2

PORT ON WHICH THE VALVE IS MOUNTED

*Available for quantity, please contact our sales dept.

DESCRIPTION OF THE NEW PRODUCT IDENTIFICATION LABEL

Based on the firm certification ISO 9001 - UNI EN 29001, section 4.8 (identification and tracebility of the product), we have adopted a new identification label starting from the 1st march 1995. Pls, see following example:



A = Product short descritpion (eg. VD8A/FDD/U4G).

B = Customer part number.

C = Salami part number (eg. 6235 0025 0).

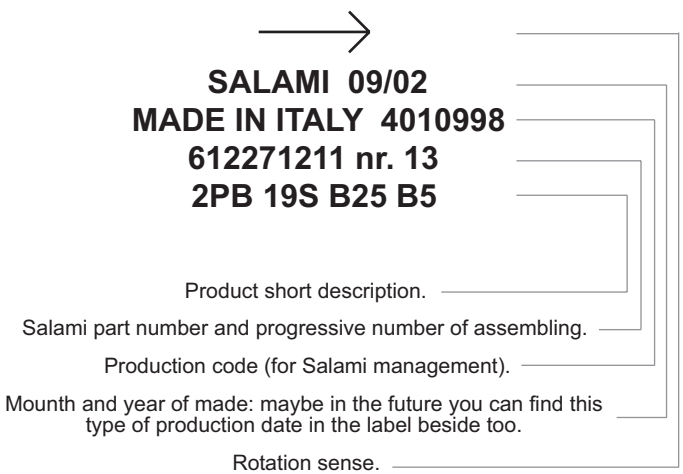
D = Production code (for Salami management)

E = Rotation sense (only for pumps).

F = Production date (see data sheet here below)

G = Progressive number of assembling.

Only for pumps 2PB and 2PZ (except triple 2PB) the identification product is marked on the top of the pump body as shown here below:



ASSEMBLED	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
JANUARY	7A	8M	9M	0M	1M	2M	3M	4M	5M	6M	7M	08M	09M	10M	11M	12M
FEBRUARY	7B	8N	9N	0N	1N	2N	3N	4N	5N	6N	7N	08N	09N	10N	11N	12N
MARCH	7C	8P	9P	0P	1P	2P	3P	4P	5P	6P	7P	08P	09P	10P	11P	12P
APRIL	7D	8Q	9Q	0Q	1Q	2Q	3Q	4Q	5Q	6Q	7Q	08Q	09Q	10Q	11Q	12Q
MAY	7E	8R	9R	0R	1R	2R	3R	4R	5R	6R	7R	08R	09R	10R	11R	12R
JUNE	7F	8S	9S	0S	1S	2S	3S	4S	5S	6S	7S	08S	09S	10S	11S	12S
JULY	7G	8T	9T	0T	1T	2T	3T	4T	5T	6T	7T	08T	09T	10T	11T	12T
AUGUST	7H	8U	9U	0U	1U	2U	3U	4U	5U	6U	7U	08U	09U	10U	11U	12U
SEPTEMBER	7I	8V	9V	0V	1V	2V	3V	4V	5V	6V	7V	08V	09V	10V	11V	12V
OCTOBER	7J	8Z	9Z	0Z	1Z	2Z	3Z	4Z	5Z	6Z	7Z	08Z	09Z	10Z	11Z	12Z
NOVEMBER	7K	8X	9X	0X	1X	2X	3X	4X	5X	6X	7X	08X	09X	10X	11X	12X
DECEMBER	7L	8Y	9Y	0Y	1Y	2Y	3Y	4Y	5Y	6Y	7Y	08Y	09Y	10Y	11Y	12Y

WARRANTY

- We warrant products sold by us to be free from defects in material and workmanship.

- Our sole obligation to buyer under this warranty is the repair or replacement, at our option, of any products or parts thereof which, under normal use and proper maintenance, have proven defective in material or workmanship, this warranty does not cover ordinary wear and tear, abuse, misuse, averloading, alteration.

- No claims under this warranty will be valid unless buyer notifies SALAMI in writing within a reasonable time of the buyer's discovery of such defects,but in no event later than twelve (12) mounths from date of shipment to buyer.

- Our obligation under this warranty shall not include any transportation charges or cost of installation, replacement, field repair, or other charges related to returning products to us; or any liability for directs, indirects or consequential damage or delay.If requested by us, products or parts for which a warranty claim is made are to be returned transportation prepaid to our factory. The risk of loss of any products or parts thereof returned to SALAMI will be on buyer.

- No employee or representative is authorized to change any warranty in any way or grant any other warranty unless such change is made in writing and signed by an officer of SALAMI.

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