# Flow divider 9V053202 (group 1)

Manufacturer: Vivoil

Manufacturer part number / published order designation: 9V053202

Published model: 9V053202

## About this compilation

Prepared by Hydmaster from selected manufacturer documentation. Original technical pages follow without cropped drawings, rewritten data or altered units. This cover and index are Hydmaster editorial material, not a manufacturer-issued exact-execution datasheet.

Coverage: supplementary historical manufacturer family reference. Current article specifications remain in its separately linked primary technical sheet. Historical nominal values or example ordering codes do not establish the current exact execution.

## Execution notes and conditions

Historical manufacturer family reference (Catalogue of Flow Dividers2000). Current SKU specifications remain in the existing exact DICSA technical sheet; dated nominal/specification values are not inherited.

Several technical/dimension pages explicitly say OUT OF PRODUCTION. They document historical family construction, not current availability or an exact modern delivered execution.

Exact current article is independently proven by the retained DICSA complete model row. Vivoil code tables only explain that existing model; no model combinations are generated.

Page28-30 coding examples, unrelated groups, motor variants and unrelated valve options are excluded.

## Source-page index

Source page numbers below are physical pages of each complete original PDF. The original printed page labels and technical content remain unchanged. Compiled page numbers count this cover/index.

## Source A: Vivoil Flow Dividers Official

| Original pages | Compiled pages | Relevant content |
|---|---|---|
| 7 | 2 | Historical gear-section operating principle and applications. |
| 17 | 3 | Historical group1 family technical table and explicit test/fluid conditions; printedOUTOFPRODUCTION notice is retained. |
| 19 | 4 | Correct historical group1 DFVvalved hydraulic symbol, port/dimension and section-count configuration table; no motor variant substitution. |
| 25-26 | 5-6 | Original9D/9V composition-code meanings for this existing independently documented article, not generation of a new SKU.; Originalgroup/displacement code matrix linking the already documented code; historical nominal and actual displacement may differ. |
| 33-34 | 7-8 | Historical installation/cleanliness/equal-line/valve-drainage instructions.; Historical connection, breaking-in and phase-correction setting procedure; valve procedure onlyapplies9V. |
| 51 | 9 | Historical phase-correction relief-valve operating principle. |
| 53 | 10 | VM50DIF groups1/2 historical valve family, seal/fluid/setting-range limitations; not a current exact-SKU rating. |
| 64 | 11 | Dated03Feb2000 external-drainage technical notice and correctvalved circuit symbols. |

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# 1 INTRODUCTION

## 1.1 Summary description of flow dividers

A flow divider is made up of *two or more* modular elements (sections) with gears mechanically linked by an internal shaft 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 of a fluid-mechanical nature, i.e. a flow of oil under pressure parallelly supplies the modular elements, which are in turn connected to the hydraulic circuits serving the users.

The portion of flow utilized 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 an interval 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.

## 1.2 Most frequent applications of flow dividers:

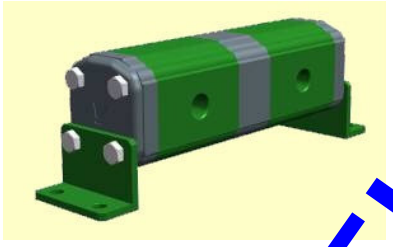
**1.2.1** Supply of two or more independent hydraulic circuits by means of a single pump, with an overall flow rate equal to the sum of the flow rates.

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.

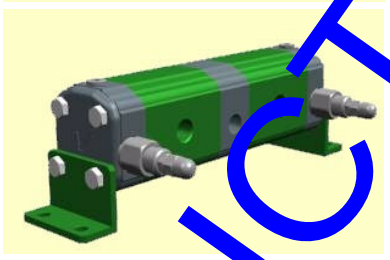
## KV-1DF

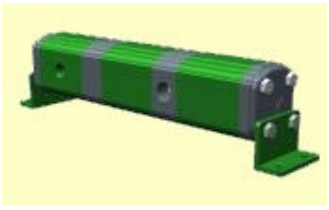
**FLOW DIVIDER**

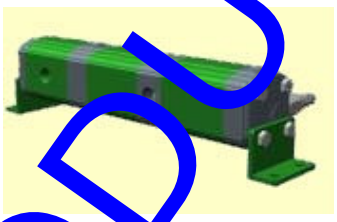


## KV-1DFV

**FLOW DIVIDER WITH PHASE CORRECTION VALVES**







## KV-1DF+1M

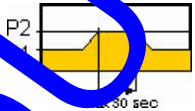
**FLOW DIVIDER WITH MOTOR**

## KV-1DFV+1M

**FLOW DIVIDER WITH VALVES AND MOTOR**

| TYPE | Disp. cm3/rev. | Flow rate of the element l/min. | | | Number of gear revolutions rpm | | | D P (*) bars | MAX pressure bars | | Weight kg |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Min. | Rec. | Max | Min. | Rec. | Max | | P1 | P2 | |
| KV-1DF 1DFV /0.9 | 0.91 | 1.08 | 1.63 | 2.43 | 1200 | 1800 | 2700 | 40 | 220 | 270 | 0.950 |
| KV-1DF 1DFV /1.2 | 1.17 | 1.4 | 2.10 | 3.24 | 1200 | 1800 | 2700 | 40 | 220 | 270 | 0.970 |
| KV-1DF 1DFV /1.7 | 1.6 | 2.04 | 2.81 | 4.59 | 1200 | 1800 | 2700 | 40 | 220 | 270 | 1.010 |
| KV-1DF 1DFV /2.2 | 2.08 | 2.64 | 3.74 | 5.94 | 1200 | 1800 | 2700 | 40 | 220 | 270 | 1.030 |
| KV-1DF 1DFV /2.6 | 2.6 | 3.12 | 4.68 | 7.02 | 1200 | 1800 | 2700 | 40 | 220 | 270 | 1.060 |
| KV-1DF 1DFV /3.2 | 3.1 | 3.84 | 5.61 | 8.64 | 1200 | 1800 | 2700 | 40 | 220 | 270 | 1.090 |
| KV-1DF 1DFV /3.8 | 3.64 | 4.56 | 6.55 | 10.26 | 1200 | 1800 | 2700 | 40 | 220 | 270 | 1.120 |
| KV-1DF 1DFV /4.3 | 4.1 | 5.16 | 7.48 | 11.61 | 1200 | 1800 | 2700 | 40 | 220 | 270 | 1.170 |
| KV-1DF 1DFV /4.4 | 4.4 | 5.88 | 8.89 | 13.23 | 1200 | 1800 | 2700 | 40 | 220 | 270 | 1.200 |
| KV-1DF 1DFV /5.9 | 5.85 | 7.08 | 10.06 | 15.93 | 1200 | 1800 | 2700 | 40 | 220 | 270 | 1.260 |
| KV-1DF 1DFV /6.5 | 6.50 | 7.80 | 11.70 | 17.55 | 1200 | 1800 | 2700 | 40 | 220 | 270 | 1.300 |
| KV-1DF 1DFV /7.8 | 7.54 | 9.36 | 13.57 | 21.06 | 1200 | 1800 | 2700 | 40 | 210 | 250 | 1.360 |
| KV-1DF 1DFV /9.8 | 9.88 | 11.76 | 17.78 | 26.46 | 1200 | 1800 | 2700 | 40 | 200 | 240 | 1.500 |

(*) Max. pressure difference between the various sections




P1 = Operating pressure
P2 = Peak pressure

**The flow division error between one element and another is <= 3%**

Provided that the values of the table and the data indicated below are complied with
Ambient temperature: -10°c ÷ +60°c
Oil temperature: +30°c ÷ +60°c
Mineral-base hydraulic oil hlp, hv (din 51524)
Oil viscosity 20 ÷ 40 cSt
Oil filtering 10 ÷ 25 µ

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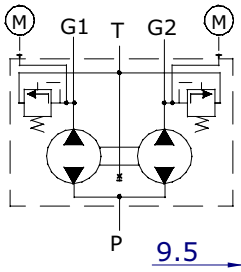
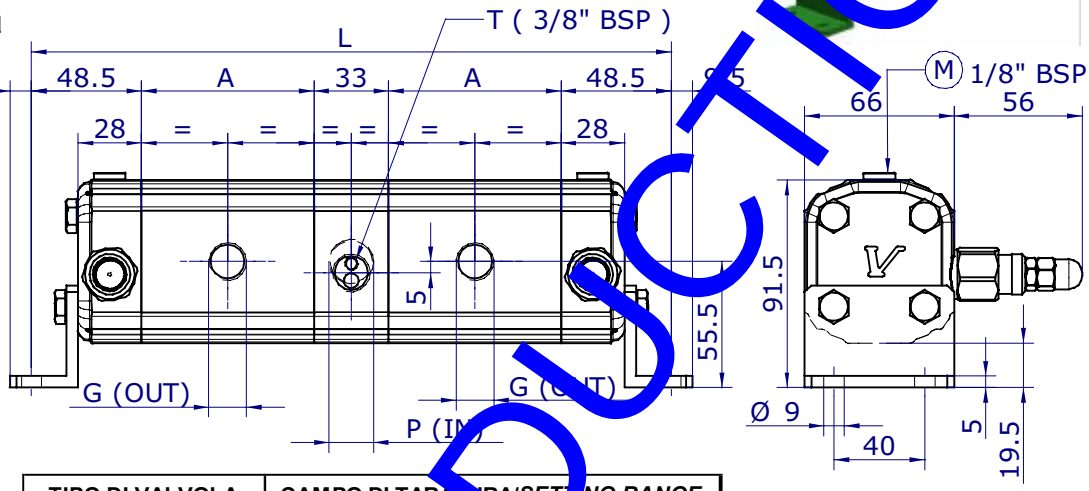
# DIVISORI DI FLUSSO Serie Verde
# FLOW DIVIDERS Green series

Web address: www.vivoil.com

**Gruppo - Group 1**




## KV-1DFV




| TIPO/Type | A | G (OUT) |
|---|---|---|
| KV1 DF/0.9 | 41,5 | 3/8" BSPP |
| KV1 DF/1.2 | 42,5 | 3/8" BSPP |
| KV1 DF/1.7 | 44 | 3/8" BSPP |
| KV1 DF/2.2 | 46 | 3/8" BSPP |
| KV1 DF/2.6 | 48 | 3/8" BSPP |
| KV1 DF/3.2 | 50 | 3/8" BSPP |
| KV1 DF/3.8 | 52 | 3/8" BSPP |
| KV1 DF/4.3 | 54 | 3/8" BSPP |
| KV1 DF/4.9 | 57 | 3/8" BSPP |
| KV1 DF/5.9 | 60,5 | 3/8" BSPP |
| KV1 DF/6.5 | 63 | 3/8" BSPP |
| KV1 DF/7.8 | 67 | 3/8" BSPP |
| KV1 DF/9.8 | 76 | 3/8" BSPP |

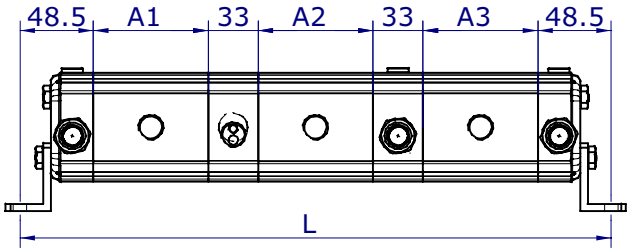
| TIPO DI VALVOLA VALVE TYPE | CAMPO DI TARATURA/SETTING RANGE | | |
|---|---|---|---|
| | CODE 01 | CODE | CODE 03 |
| VM 50 DIF | 10 ÷ 105 bar | 70 ÷ 210 bar | 140 ÷ 350 bar |

**P ( N x IN ) BSPP**

| TIPO Type | NUMERO DI ELEMENTI CHE COMPONGONO IL DIVISORE / QUANTITY OF ELEMENTS COMPOSING THE DIVIDER | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 1DF / 0.9 | 1 x 3/8" | 1 x 3/8" | 1 x 3/8" | 1 x 3/8" | 1 x 3/8" | x 3/8" | 2 x 3/8" | 2 x 3/8" | 2 x 3/8" | 2 x 3/8" | 2 x 3/8" | 3 x 1/2" | 3 x 1/2" | 3 x 1/2" | 3 x 1/2" |
| 1DF / 1.2 | 1 x 3/8" | 1 x 3/8" | 1 x 3/8" | 1 x 3/8" | 1 x 3/8" | 2 x | 2 x 3/8" | 2 x 3/8" | 2 x 3/8" | 2 x 3/8" | 2 x 3/8" | 3 x 1/2" | 3 x 1/2" | 3 x 1/2" | 3 x 1/2" |
| 1DF / 1.7 | 1 x 3/8" | 1 x 3/8" | 1 x 3/8" | 1 x 3/8" | 1 x | x 3/8 | x 3/8" | 2 x 3/8" | 2 x 3/8" | 2 x 3/8" | 2 x 3/8" | 3 x 1/2" | 3 x 1/2" | 3 x 1/2" | 3 x 1/2" |
| 1DF / 2.2 | 1 x 3/8" | 1 x 3/8" | 1 x 3/8" | 1 x 1/2" | x 1/2" | x 3/8" | 2 x 3/8" | 2 x 3/8" | 2 x 3/8" | 2 x 3/8" | 2 x 3/8" | 3 x 1/2" | 3 x 1/2" | 3 x 1/2" | 3 x 1/2" |
| 1DF / 2.6 | 1 x 3/8" | 1 x 3/8" | 1 x 1/2" | 1 x 1/2" | 1/2" | 2 x 3/8" | 2 x 3/8" | 2 x 3/8" | 2 x 1/2" | 2 x 1/2" | 2 x 1/2" | 3 x 1/2" | 3 x 1/2" | 3 x 1/2" | 3 x 1/2" |
| 1DF / 3.2 | 1 x 3/8" | 1 x 3/8" | 1 x 1/2" | 1 x 1/2" | 1 x | 2 x 3/8" | 2 x 1/2" | 2 x 1/2" | 2 x 1/2" | 2 x 1/2" | 2 x 1/2" | 3 x 1/2" | 3 x 1/2" | 3 x 1/2" | 3 x 1/2" |
| 1DF / 3.8 | 1 x 3/8" | 1 x 1/2" | 1 x 1/2" | 1 x 1/2" | 1 x 1/2" | 3/8" | 2 x 1/2" | 2 x 1/2" | 2 x 1/2" | 2 x 1/2" | 2 x 1/2" | 3 x 1/2" | 3 x 1/2" | 3 x 1/2" | 3 x 1/2" |
| 1DF / 4.3 | 1 x 1/2" | 1 x 1/2" | 1 x 1/2" | x 1/2" | 1 x 3/4" | 2 x 3/8" | 2 x 3/4" | 2 x 3/4" | 2 x 3/4" | 2 x 3/4" | 2 x 3/4" | 3 x 3/4" | 3 x 3/4" | 3 x 3/4" | 3 x 3/4" |
| 1DF / 4.9 | 1 x 1/2" | 1 x 1/2" | 1 x 1/2" | 1 x 1/2" | 1 x 3/4" | 2 x 3/4" | 2 x 3/4" | 2 x 3/4" | 2 x 3/4" | 2 x 3/4" | 2 x 3/4" | 3 x 3/4" | 3 x 3/4" | 3 x 3/4" | 3 x 3/4" |
| 1DF / 5.9 | 1 x 1/2" | 1 x 1/2" | 1 x 1/2" | x 3/4" | 1 x 3/4" | 2 x 3/4" | 2 x 3/4" | 2 x 3/4" | 2 x 3/4" | 2 x 3/4" | 2 x 3/4" | 3 x 3/4" | 3 x 3/4" | 3 x 3/4" | 3 x 3/4" |
| 1DF / 6.5 | 1 x 1/2" | 1 x 1/2" | 1 x 3/4" | 2 x 1/2" | 2 x 1/2" | 2 x 3/4" | 2 x 3/4" | 2 x 3/4" | 2 x 3/4" | 2 x 3/4" | 2 x 3/4" | 3 x 3/4" | 3 x 3/4" | 3 x 3/4" | 3 x 3/4" |
| 1DF / 7.8 | 1 x 1/2" | 1 x 3/4" | x 3/4" | x 1/2" | 2 x 1/2" | 2 x 3/4" | 2 x 3/4" | 2 x 3/4" | 2 x 3/4" | 2 x 3/4" | 2 x 3/4" | 3 x 3/4" | 3 x 3/4" | 3 x 3/4" | 3 x 3/4" |
| 1DF / 9.8 | 1 x 3/4" | 1 x 3/4" | 1 x 3/4" | 2 x 1/2" | 2 x 1/2" | 2 x 3/4" | 2 x 3/4" | 2 x 3/4" | 2 x 3/4" | 2 x 3/4" | 2 x 3/4" | 3 x 3/4" | 3 x 3/4" | 3 x 3/4" | 3 x 3/4" |

L = (n-1) x 33 + 97 + A1 + A2 + A3 +.....+An

n = Numero degli elementi del Divisore
n = Number of elements making up Divider




ESEMPIO:
Per ottenere la lunghezza totale (L) di un divisore a tre elementi (n=3), di TIPO KV-1DFV/4.3 x 3
L = (n-1) x 33 + 97+ A1 + A2 + A3 = (3-1) x 33 + 97 + 54 + 54 + 54 = 325 mm

EXAMPLE:
To obtain the total length (L) of a three-element divider (n=3), the element being TYPE KV-1DFV/4.3 x 3
L = (n-1) x 33 + 97+ A1 + A2 + A3 = (3-1) x 33 + 97 + 54 + 54 + 54 = 325 mm

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## 2.4 General structure of codes

A COMPOSITION CODE identifies a divider made up of elements with identical displacements and valves (if requested). To order a divider with motor you must also indicate the displacement.

| 9X | NN | CC | MM | LL |
|---|---|---|---|---|

| | |
|---|---|
| **9X** | **Type of divider** |
| **NN** | **Total number of divider elements (from 01 to** |
| **CC** | **Displacement code of divider element** |
| **MM** | **Displacement code of motor** |
| **LL** | **Valve code** |

The type of divider may be one of the following:

| | |
|---|---|
| **9D** | Flow divider |
| **9V** | Flow divider with valves |
| **9G** | Flow divider with motor |
| **9N** | Flow divider with motor and valves |

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The displacement of the divider elements may be one of the following:

**Table of divider element codes**

| Cod. | Group 0 |
|---|---|
| 02 | 0.25 $cm^3$/rev. |
| 04 | 0.45 $cm^3$/rev. |
| 05 | 0.57 $cm^3$/rev. |
| 06 | 0.76 $cm^3$/rev. |
| 07 | 0.98 $cm^3$/rev. |
| 09 | 1.27 $cm^3$/rev. |
| 11 | 1.52 $cm^3$/rev. |
| 13 | 2.30 $cm^3$/rev. |

| Cod. | Group 1 |
|---|---|
| 16 | 0.9 $cm^3$/rev. |
| 17 | 1.2 $cm^3$/rev. |
| 18 | 1.7 $cm^3$/rev. |
| 20 | 2.2 $cm^3$/rev. |
| 21 | 2.6 $cm^3$/rev. |
| 23 | 3.2 $cm^3$/rev. |
| 25 | 3.8 $cm^3$/rev. |
| 27 | 4.3 $cm^3$/rev. |
| 29 | 4.9 $cm^3$/rev. |
| 31 | 5.9 $cm^3$/rev. |
| 32 | 6.5 $cm^3$/rev. |
| 34 | 7.8 $cm^3$/rev. |
| 36 | 9.8 $cm^3$/rev. |

| Cod. | Group 2 |
|---|---|
| 41 | 4 $cm^3$/rev. |
| 43 | 6 $cm^3$/rev. |
| 45 | 9 $cm^3$/rev. |
| 47 | 11 $cm^3$/rev. |
| 49 | 14 $cm^3$/rev. |
| 51 | 17 $cm^3$/rev. |
| 53 | 19 $cm^3$/rev. |
| 55 | 22 $cm^3$/rev. |
| 57 | 26 $cm^3$/rev. |
| 59 | 30 $cm^3$/rev. |
| 61 | 34 $cm^3$/rev. |
| 61 | 40 $cm^3$/rev. |

The codes of the valves, if requested, are as follows:

**Table of valves codes**

| VM 25 | |
|---|---|
| Cod. | Group 0 |
| 01 | 20÷140 |
| 02 | 70÷315 |

| VM 50 | | |
|---|---|---|
| Cod. | Group 1 | Group 2 |
| 01 | 10÷105 bars | 10÷105 bars |
| 02 | 70÷210 bars | 70÷210 bars |
| 03 | 140÷350 | 140÷350 |

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# 3 INSTALLATION

## 3.1 General information

The dividers are very easy to install; you need only to connect the hydraulic pipes to them. However, you should closely abide by to the directions below to avoid subsequent problems.
As we have seen in paragraph 4 of the introduction, the dividers may be equipped with phase correction valves that correct any small errors occurring in the extension or return cycles of the hydraulic cylinders. In order for the valves to perform their function the cylinders must reach the end of their stroke.

## 3.2 Installation

**3.2.1** Preliminary checks and operations

- Make sure that the intake pipes and the pipes connecting the divider to the actuators have adequate sections and are **clean**.
- If dirt (dust, metal shavings, rubber fragments from the pipe unions, etc.) circulates inside the divider, it will prevent the latter from working efficiently.
- The pipes connecting the elements to the various actuators must have the same or very similar lengths. Otherwise they will increase the phase errors between actuators.
- Make sure that the fluid within the system is clean, suitable and has the recommended viscosity as shown in the fluid tables.
- An unsuitable fluid, besides undermining the efficiency of the divider, will also shorten its life.
- In dividers with phase correction valves, every time that the valve opens in an element, the flow of that element goes to be discharged.
- The discharge flow of the valves is conveyed to the outside by means of a drainage outlet to which must be connected a pipe that drains directly into the tank; thus you obtain external drainage.
- By removing the dowel set inside the drainage outlet and installing a plug made of BSP in the same outlet, you will direct the flow to the inlet of the divider, thereby obtaining internal drainage.
  **NOTE: In almost all cases external drainage is to be preferred.**
  **The dowel is always inserted by Vivoil.**
  Internal drainage is allowed only in very special cases, on prior consultation with our Technical Department.

| Type of Divider | Dowel | Plug |
|---|---|---|
| **0DFV** | M4 H=7 | 1/4" BSP |
| **1DFV** | M6 H=8 | 3/8" BSP |
| **2DFV** | M8 H=10 | 1/2" BSP |

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**3.2.2** Connection of pipes to the divider.

- Rest the divider on a clean table, preferably with an unpainted metal surface.
- Remove the plastic caps, making sure not to tear them so as to avoid the risk of fragments getting into the divider.
- Screw in the pipe unions by hand and complete the operation by tightening them with a suitable wrench, without using extensions that will increase the force exerted on the unions themselves.

## 3.3 Breaking in

The flow dividers are tried out one by one in our **test department** to ensure that they perform efficiently.
However, it is important to note that once the divider is connected to the system, it must operate for about an hour before it will reach full efficiency.
During this breaking in period you must also check for any leaks in the pipe unions. Tighten them further as necessary.
After the divider has been broken in, you may control its performance by checking whether the actuators move according to the specifications provided in the engineering design.
Dividers with valves should also be broken in as described above, though in addition you must set the phase correction valves.

## 3.4 Setting the phase correction valves

The phase correction valves must be set; for this purpose the divider is provided with a 1/8” plugged threaded hole on each element or, on request, a mini pressure tap.

The **valves must be set** one at a time in succession according to the following procedure:

a. place a pressure gauge on the 1/8” BSP hole after removing the plug (DIN 908 5.8 1/8" cylindrical tap with a 10.5 x 14 x 1.5 washer made of soft copper), or on the mini pressure tap of the first of the elements that has a valve to be set;

b. discharge flow through the outlets of all the other elements, start the pump and adjust the valve until the pressure gauge indicates a pressure that is 10-15% lower than the setting of the system's pressure relief valve.

c. unscrew the pressure gauge and replace the plug in the hole, or else screw the cap back on the mini pressure tap;

d. repeat the operation for all the other valves.

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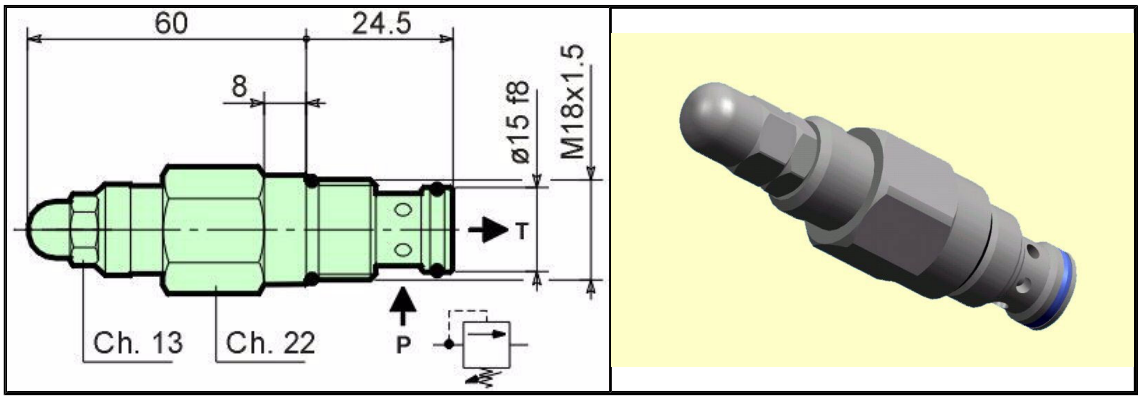
# 6 PRESSURE-RELIEF VALVES

## 6.1 Description

The phase correction valves fitted onto the dividers are pressure-relief valves with direct-acting differential plugging device.
If, in fact, we consider a group of cylinders in motion, it is highly unlikely that they will reach the end of their respective strokes at the same instant. The first cylinder to complete its stroke stops and the fluid coming from its section of the divider is discharged through its phase correction valve at the pressure set for the latter (which must be 20% lower than the setting of the pump's pressure-relief valve); the same thing subsequently occurs with the other cylinders on completion of their respective strokes.
As soon as all the cylinders have stopped, the reentry cycle may begin.

## 6.3 VM 50 DIF-type valves

Note: this valve is applied to the dividers belonging to groups 1 and 2: **KV-1DFV e KV-2DFV**




| TECHNICAL FEATURES | VM 50 DIF |
|---|---|
| Max. flow rate | 50 l/min. |
| Max. pressure in P | 350 bars |
| Max. pressure in T | 350 bars |
| Spring setting range: **type 01** | **10÷105 bars** |
| Spring setting range: **type 02** | **70÷210 bars** |
| Spring setting range: **type 03** | **140÷350 bars** |
| Filtering required | 10÷15 microns |
| Oil viscosity range | 2.8÷350 cSt |
| Recommended oil temperature | -20 +80 °C |
| Gasket material | Polyurethane<br>Buna N |
| Weight | 0.125 kg |
| Pressures with flow of 1 l/min:<br>Opening value as compared to set value | 95 % |
| Closing value as compared to set value | 75 % |
| Hydraulic oil | HM , HV<br>ISO 6074 |

| CHECK STANDARD SETTING | | | PRESSURE INCREASE bar x 1 turn screw |
|---|---|---|---|
| TYPE | pressure bar | flow rate l/min | |
| **10÷105 bar** | 50 | 5 | 15 |
| **70÷210 bar** | 130 | 5 | 32 |
| **140÷350 bar** | 200 | 5 | 67 |

When ordering, specify the maximum operating pressure and request the corresponding pressure-relief valve.

# DIVISORI DI FLUSSO
# FLOW DIVIDERS

**BOLOGNA** 03-02-2000

**Ogg.:** **NOTA TECNICA - *TECHNICAL NOTE***

Dal mese di dicembre 1999 i divisori di flusso con valvola vengono tutti predisposti dalla VIVOIL, in fase di montaggio, per lo scarico esterno (drenaggio esterno). FIG. –A -
Per ottenere lo scarico interno FIG.- B - (drenaggio interno) occorre:

1 - svitare e togliere il grano alloggiato nel foro di scarico
2 - tappare il foro di scarico

**N.B. Per un buon funzionamento del divisore consigliamo di adottare il drenaggio esterno**

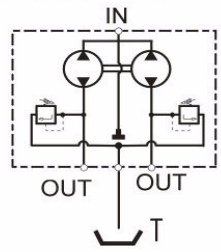
Since the month of December 1999, Flow-Dividers with valves are all arranged by VIVOIL, in the mounting phase, for the external unloading (external drainage). PICTURE A.

In order to obtain the internal unloading PICTURE B (internal drainage) it is necessary:

1 - to unscrew and remove the dowel located in the unloading port
2 - to cap the unloading port

**N.B.** ***For a good working of the divider, we suggest to adopt the external drainage***

FIG. -A-



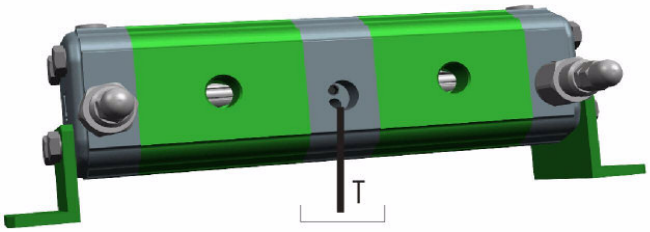
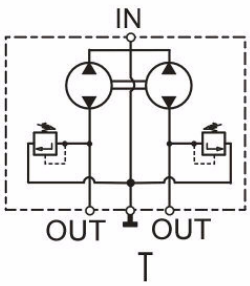
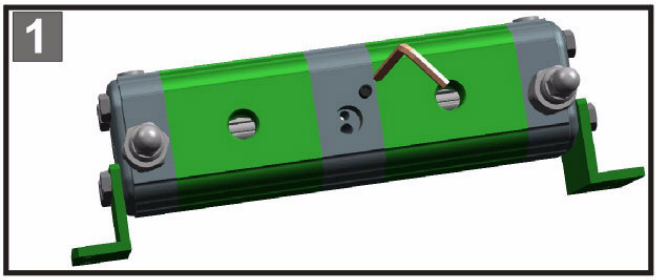
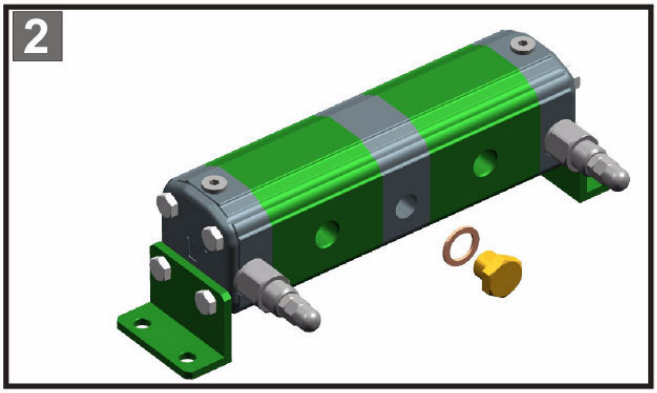




FIG. -B-

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