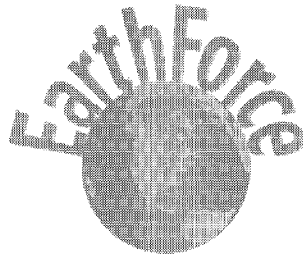


**EF1, EF1D, EF100,  
EF2, EF200, EF250,  
SSK, EF2, EF4,  
EF400, EF4SP, EF5,  
EF500**



# **Loader Backhoe Service Manual**

- \* Machine - hydraulic system
  
- \* Axial Pumps - EF1, 2, SSK (V250), EF3 (V650), EF4 (M4PV21-28), EF4SP, EF5, EF500 (A4VG28 Rexroth)
  
- \* Engines - EF1 (Kohler 25HP), EFD (Kubota 1105), EF2, SSK (Kubota 1105T), EF3 (Kubota 1703), EF4 (Kubota V2203), EF4SP, EF5, EF500 (V2203T)
  
- \* Carrarro Axles

## Hydraulic system

### I. Hydraulic Oil Cooler

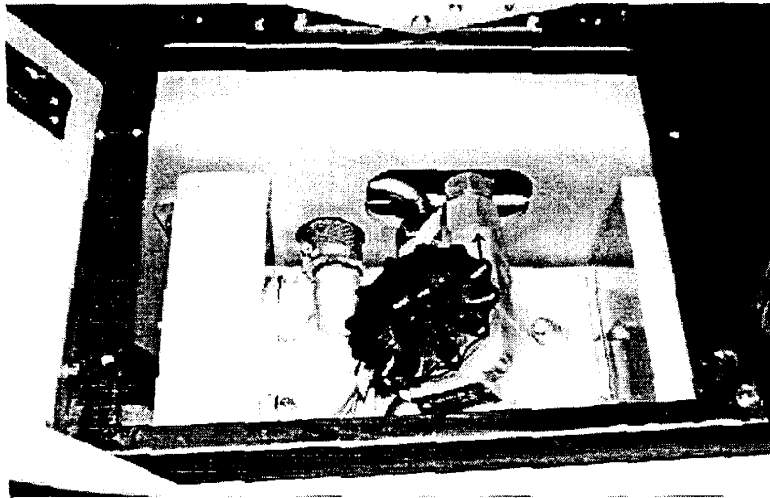
Hydraulic tank location:

Hydraulic tank is located on the right side of the machine (in travel direction).

Tank capacity of EF1, EF2, and EF3 is 51 liters or 13.4 gal , capacity of EF4 is 74 liters or 19.3 gal.

Filter element replacement:

1) By dismounting the side cover of the front floor you will be able to access the filter body with the hydraulic oil filter. (pict.1)



2) Loosen the plastic seal (pict.2), it is not necessary to dismount the filter body.



3) Pull out the plastic holder with the oil element from the filter body. (The oil element is inside of the body.) (pict. 3)

4) Remove the plastic holder from the filter element and replace it with a new element and mount it back.



## II. Axial pump

The axial pump is connected by two bolts to the rear flange of the engine. The axial pump ensures the machine travel. It is a hydrostatic circuit where hydraulic oil pressure is generated by the axial pump and is brought by pressure hose into the hydraulic motor where this energy is transformed into a torsional moment, which is then mechanically transformed to the wheels of the machine. It is not recommended to adjust the pump, all the values are set up by the manufacturer and unprofessional intervention can easily damage the axial pump.

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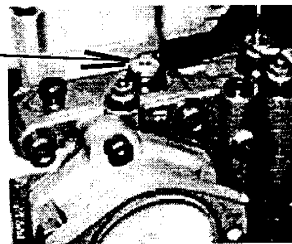
**<https://www.ebooklibonline.com>**

## **Axial pump replacement:**

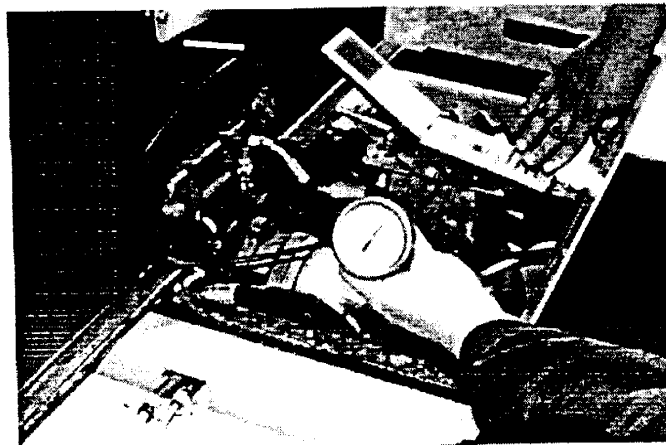
- 1) Remote the front floor cover.
- 2) Disconnect the hydraulic hoses including the gear pump hoses. Secure all hose openings against impurities and penetration into the hydraulic system.
- 3) Remove the two bolts that connect the pump to the rear flange of the axial pump.
- 4) Remove the pump from the machine carefully.
- 5) Dismount the gear pump and coupling from the axial pump (which is connected onto the input shaft of the gear pump and on the output part of crankshaft engine).

### **A) Axial pump pressure control for machine travel .**

- 1) To access the axial pump remove the floor cover.
- 2) On the top part of the pump remove the plug of the control point for measuring pump pressure. (pict. 7.)



- 3) Connect on this point the fitting with a control pressure manometer .
- 4) Block the machine against any possible movement .
- 5) Adjust RPM of engine by throttle cable to approximately the middle position.
- 6) Select the backward machine movement by pedal for EF1, EF2 or by lever for EF3, EF4.  
(pict.8.)

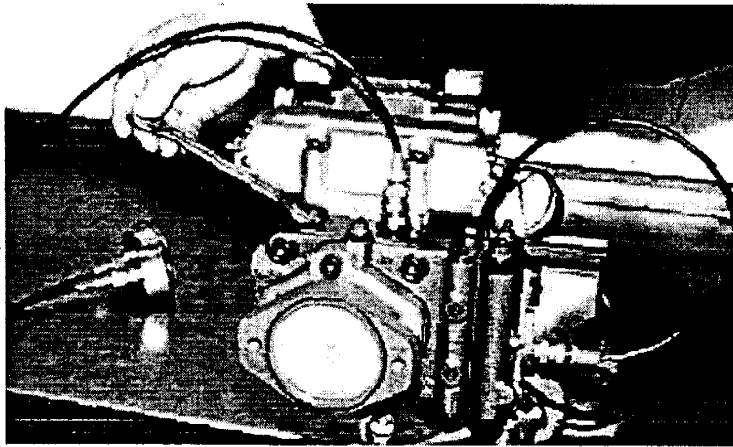


- 7). Pointer of control manometer should show 250 bar for EF1D, EF2, EF3, 350 bar for EF4 and 400 bar for EF4 SP.
- 8) For the pressure control of the reverse direction use the same process, only that the control point is on the reverse side of axial pump from the bottom part of machine.

### B) Operating pressure control of the travel pedal

Control point is on the right lateral side of axial pump in travel direction.

- 1) Unbolt the plug of the control point. (pict. 8a)



- 2) Bolt on the fitting with control manometer.
- 3) After starting the machine and selecting travel direction, either forward or backward, the pointer of manometer should show value 22 bar.

### III. Gear pump

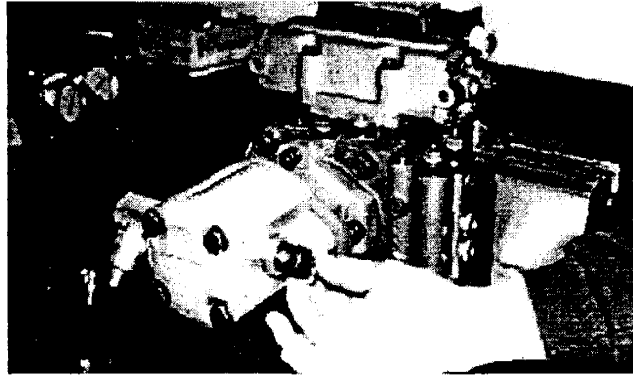
The machine is fitted by a gear pump, which drives linear operation hydromotors (hydraulic cylinder). Pump is tandem connected to the axial pump and is accessible after dismounting the middle floor cover. Max. output of the gear pump is specified in the table below :

Tab.1

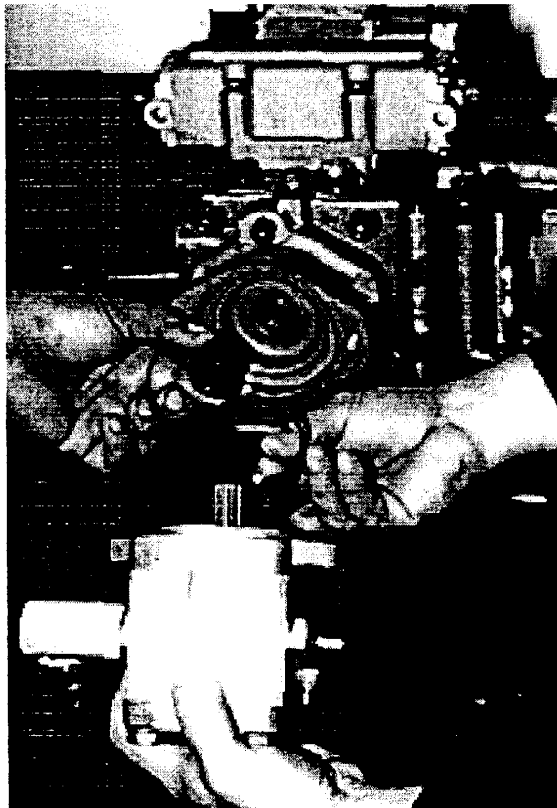
Earthforce	EF1	EF2	EF3	EF4	EF4 SP
Gear pump	15 ccm/r	17,7 ccm/r	17,7 ccm/r	20,4 ccm/r	20,4 ccm/r
Max. rate of flow	40,5 l/min	47,8 l/min	47,8 l/min	51,4 l/min	55,4 l/min
Pressure by-passing	160 bar	170 bar	170 bar	180bar	200 bar

**G**ear pump replacement:

- 1) Remove the floor cover.
- 2) Disconnect the hydraulic hoses. Secure all hose openings against impurities penetration.
- 3) Loosen the two bolts which connect the pump to axial pump (pict. 4).



- 4) Pull the pump body horizontally to remove, being careful to protect the coupling and sealing collar (pict. 5)



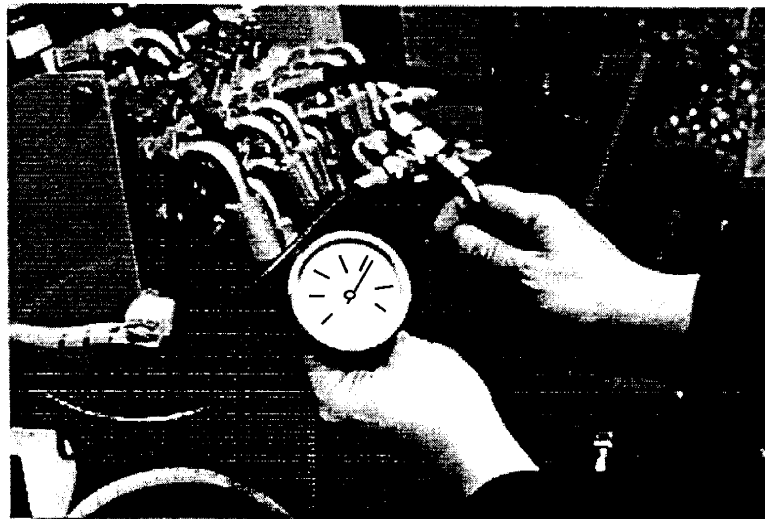
- 5) Remount the pump by reversing the step 5.

Pressure control of working system hydraulics cylinders:

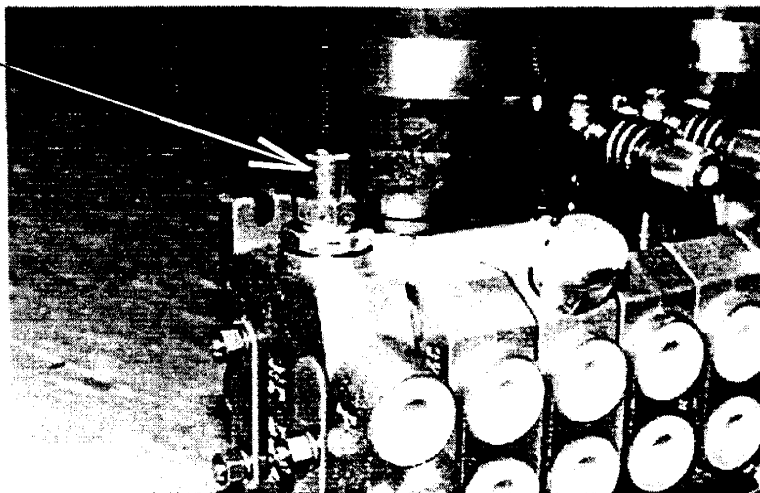
- 1) Dismount the front and rear distributor cover.
- 2) Dismount the hoses on the measured section pointing to the controlled hydraulic cylinder.
- 3) Between the hose and distributor fitting mount the manometer with hose and "T" fitting.
- 4) Tighten the fittings and start the machine. By the distributor lever let the oil into the the measured section.
- 5) The value of measured pressure on the swing hydraulic cylinder should be 150 bar, on the all other cylinder the measured value should be 160-200 bar.

See Tab.1 - *Value P(max) Pressure measure*

(pict. 6)



- 6) Pressure regulation to the correct value is provided by adjusting bypassing valve on the front or rear distributor. (pic.5)



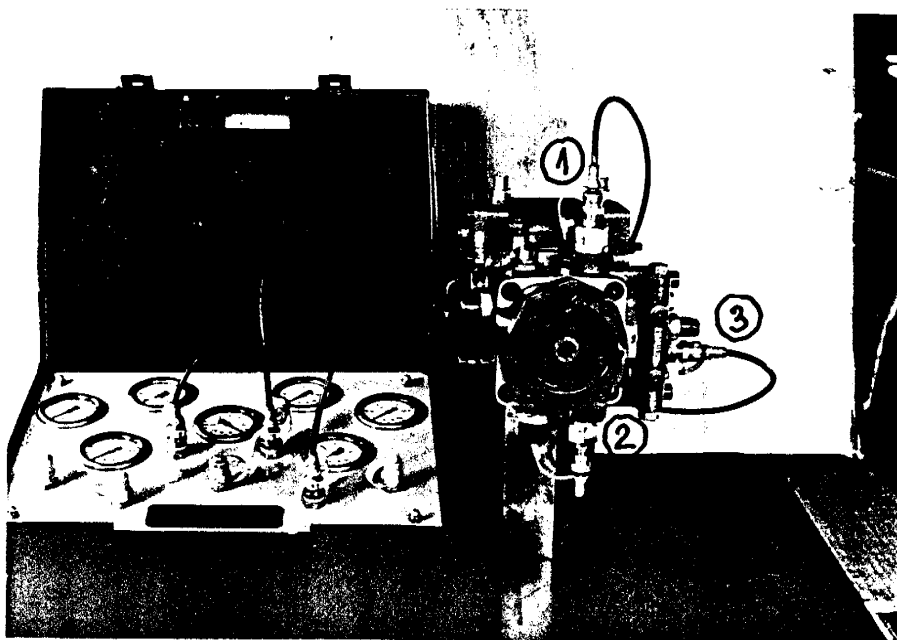
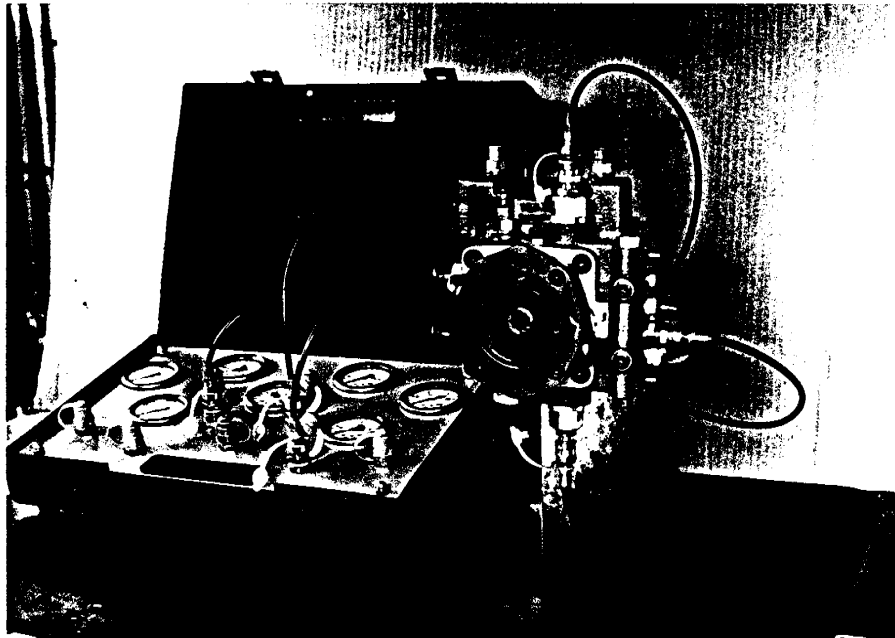
#### IV. Axial pump control points EF1, EF2, SSK

Manometer No. 1 - backward travel pressure control - (250 bar),

Manometer No. 2 - forward travel pressure control - (250 bar),

Manometer No. 3 - pressure control by hydraulic pedal control (22 bar)

Control points of axial pump series V 250 (EF1, EF2, SSK)



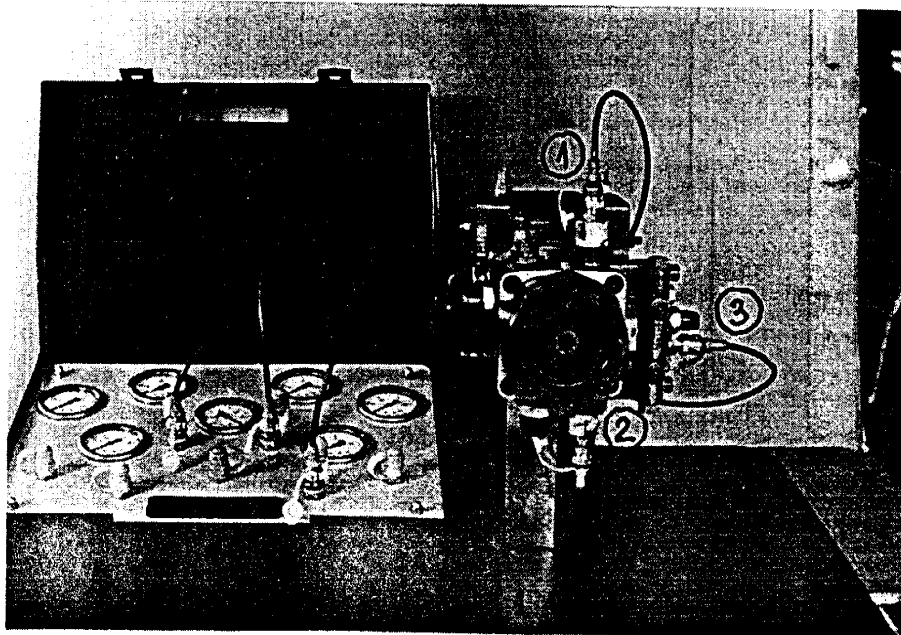
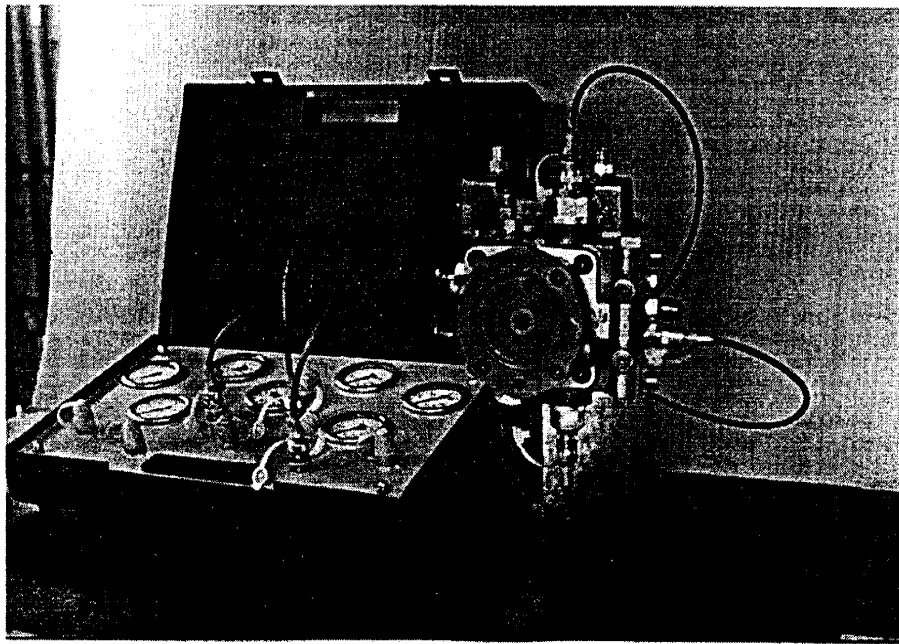
#### IV. Axial pump control points EF1, EF2, SSK

Manometer No. 1 - backward travel pressure control - (250 bar),

Manometer No. 2 - forward travel pressure control - (250 bar),

Manometer No. 3 - pressure control by hydraulic pedal control (22 bar)

Control points of axial pump series V 250 (EF1, EF2, SSK)



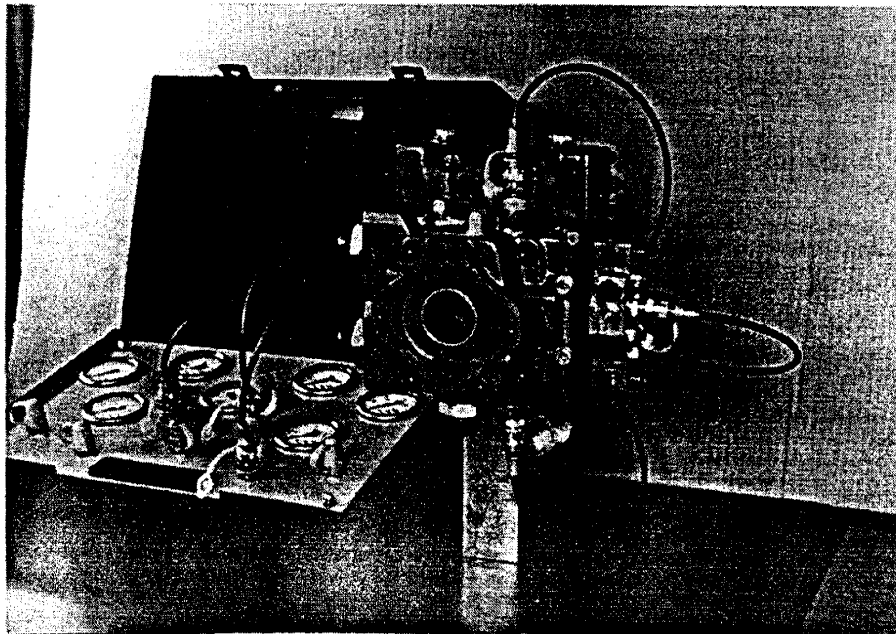
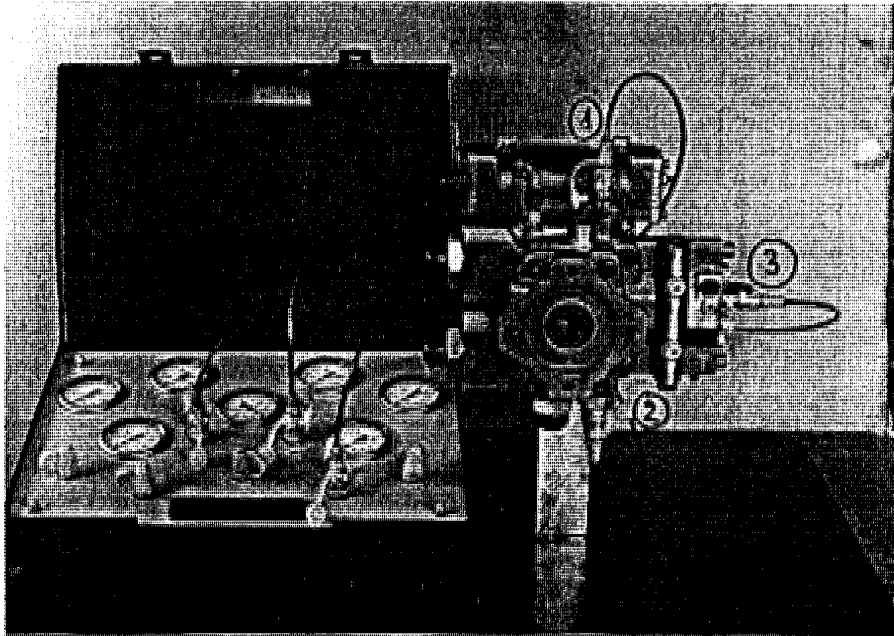
#### IV. Axial pump control points EF3

Manometer No. 1 - backward travel pressure control - (250 bar),

Manometer No. 2 - forward travel pressure control - (250 bar),

Manometer No. 3 - pressure control by hydraulic pedal control (22 bar)

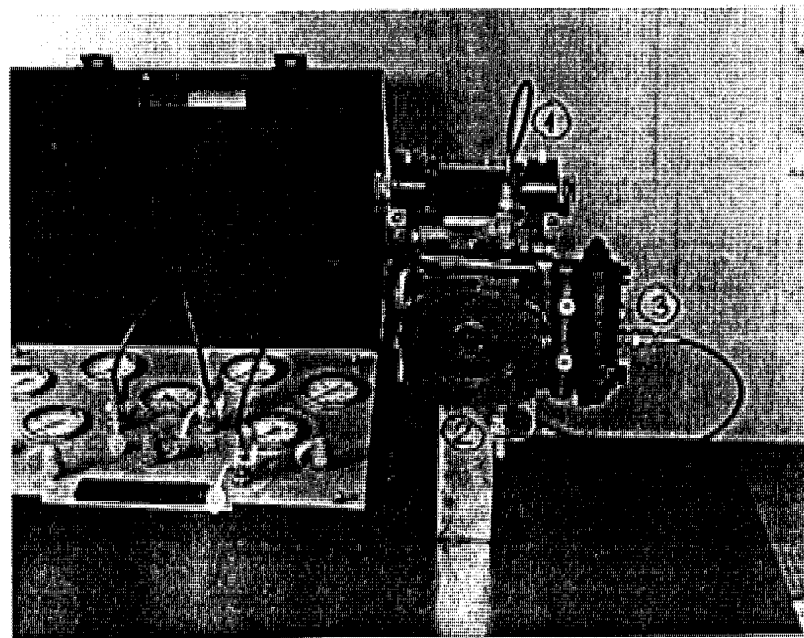
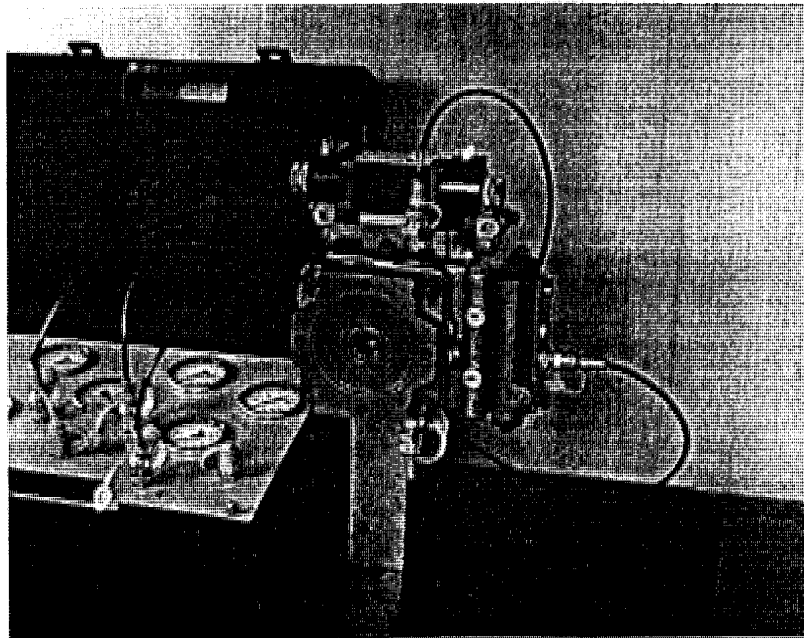
Control points of axial pump series V650 (EF3)



#### IV. Axial pump control points EF4

- No. 1 - backward travel pressure control - (350 bar EF4)
- No. 2 - forward travel pressure control - (350 bar EF4)
- No. 3 - pressure control by hydraulic pedal control (22 bar)

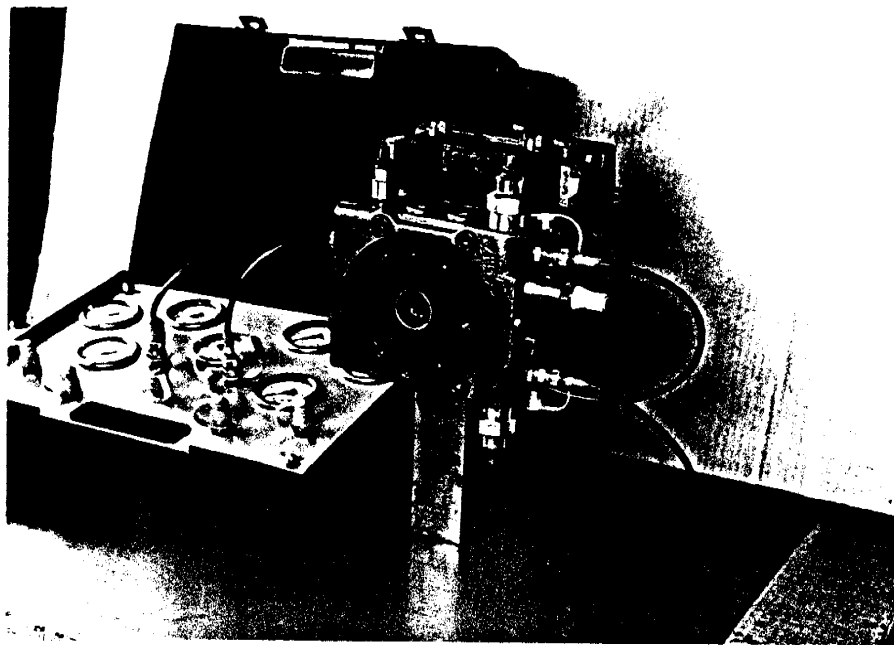
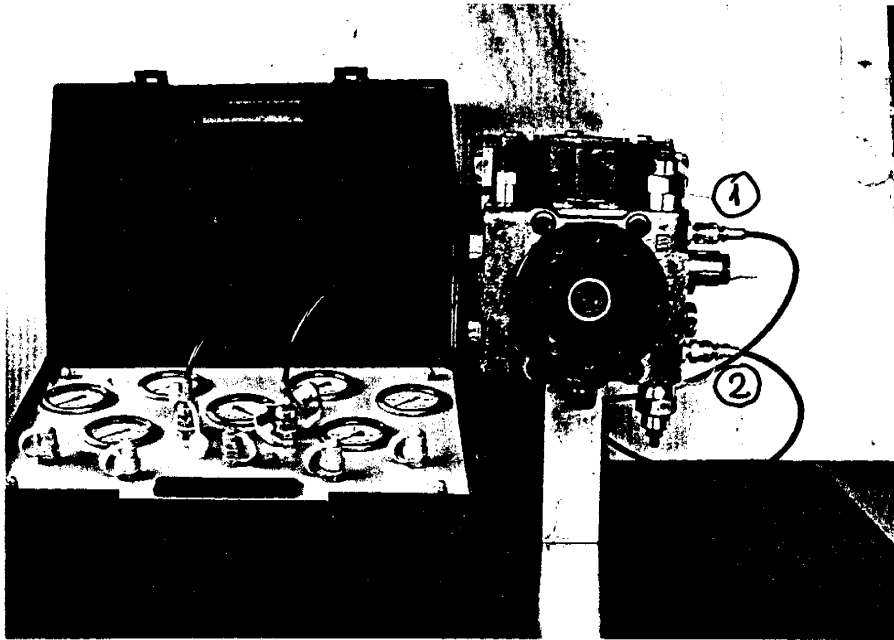
Points of axial pump series M4PV21-28 (EF4)



#### IV. Axial pump control points EF4 SP

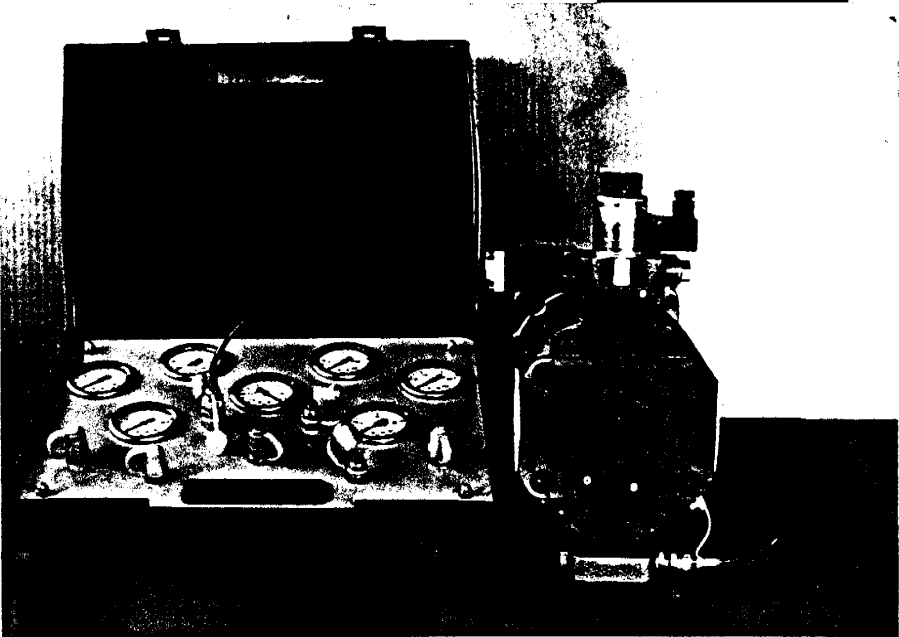
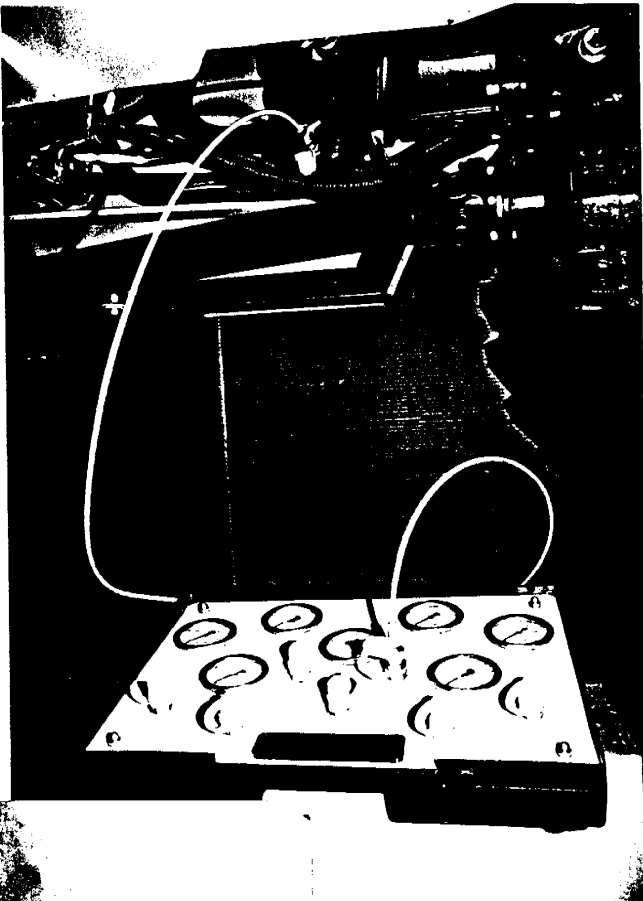
Manometer No. 1 - backward travel pressure control - (400 bar),  
Manometer No. 2 - forward travel pressure control - (400 bar),

Control points of axial pump series Mannesman Rexroth A4VG28 (EF4SP)



**IV-A. Hydromotor control point EF4 SP**

Control point of hydromotor EF4SP (400 bar)

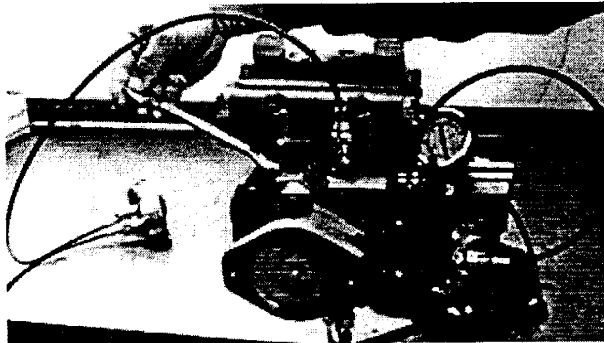


## V. Adjusting and operating elements of the axial pump

### 1) Machine towing.

By rotating the bolts on top surface of axial pump (key No.19), hydraulic channel will be opened, which turns off the pump and the machine can be towed.

(pic. 11)

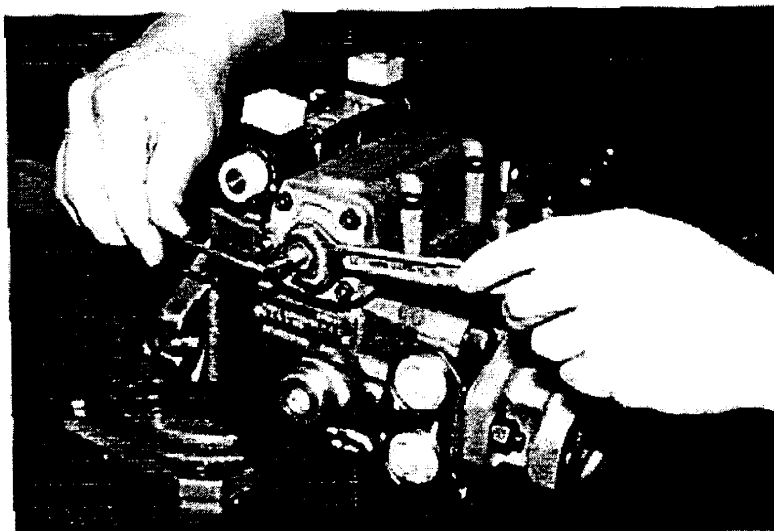


### 2) Zero position adjustment.

Loosen the secure nut (key No.17), then insert the hex key into the nut and adjust the zero position of machine by rotating the bolt.

(pict. 12).

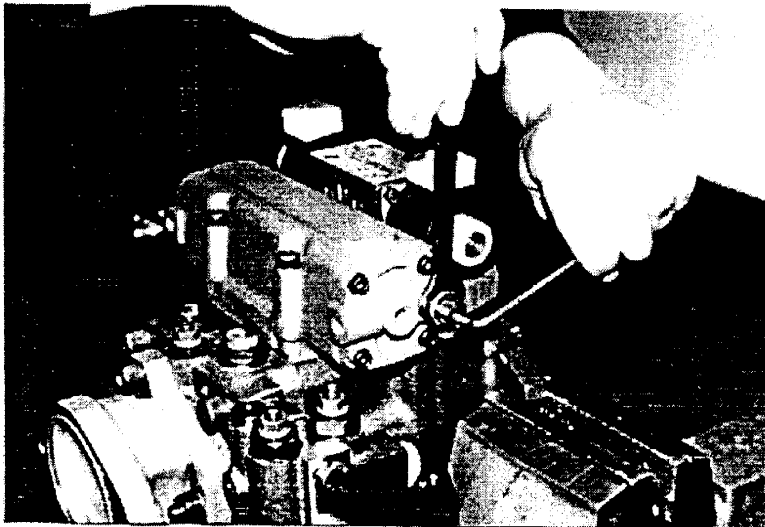
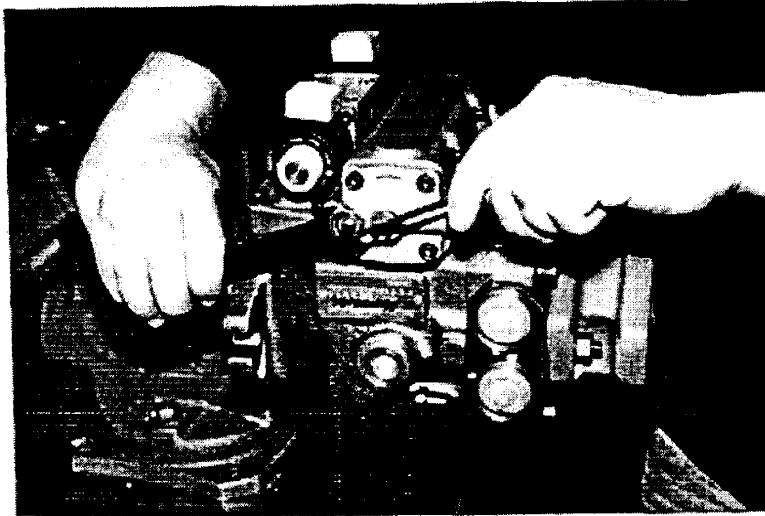
Zero position is given by the manufacturer.



### 3) Hydraulic oil flow volume adjustment:

Adjustment is provided by two adjusting bolts on the right and left side (pict.13, 14). The volume of the flow oil is regulated by this adjustment.

Note: Values are set up by the manufacturer and it is not recommend to change the values.

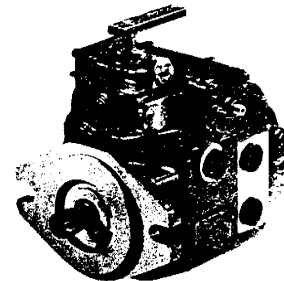


***Axial pump***

***V250***

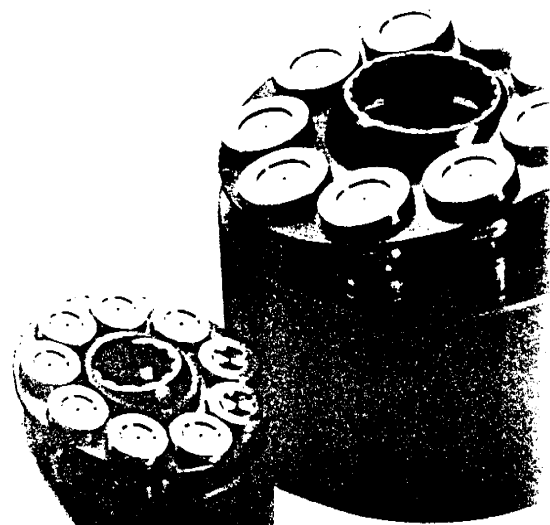
***EF1, EF2, SSK***

Descrizione prodotto  
Dati tecnici  
Diagramma rendimenti / Diagrammi valvole  
Formule di calcolo  
Installazione  
Fluido idraulico  
Filtrazione  
Come ordinare  
Esempio di ordinazione  
Servocomando meccanico A  
Comando meccanico diretto M  
Servocomando idraulico S  
Servocomando elettrico C - C12 - C24  
Servocomando elettrico On-Off B - B12 - B24  
Servocomando elettrico proporzionale P  
Servocomando Automotive D  
Dimensioni albero  
Predisposizioni  
Pompe tandem  
Filtro in pressione - Microinterruttore  
Valvola di scambio  
Limitatore di potenza "LP"  
Combinazioni di opzioni disponibili  
Manipolatori idraulici  
Avvertenze



# V250

*Product description*  
*Technical data*  
*Efficiencies diagram / Valves diagrams*  
*Calculation formula*  
*Installation*  
*Hydraulic Fluid*  
*Filtration*  
*How to order*  
*Order example*  
*Mechanical Servo Control A*  
*Direct Mechanical Control M*  
*Hydraulic Servo Control S*  
*Electrical Servo Control C - C12 - C24*  
*Electrical Servo Control On-Off B - B12 - B24*  
*Proportional Electrical Servo Control P*  
*Automotive Servo Control D*  
*Shaft dimensions*  
*Thru-drive options*  
*Tandem pumps*  
*Filter on pressure - Micro-switches*  
*Purge valve*  
*Power limiter "LP"*  
*Options combination available*  
*Hydraulic joysticks*  
*Warnings*

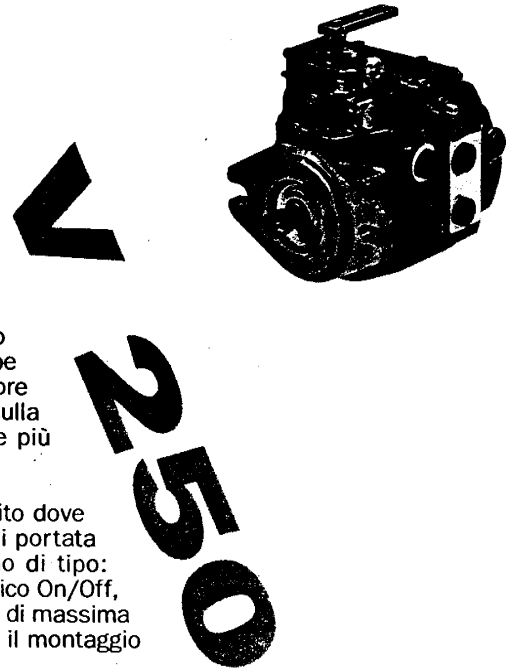


## V250 Pompe a pistoni assiali e cilindrata variabile per circuiti chiusi

## V250 Variable displacement Axial Piston – Pumps for closed loop

### Descrizioni Prodotto

- La V 250 è una pompa a cilindrata variabile, a pistoni assiali con sistema a piano inclinato, per trasmissioni idrostatiche in circuito chiuso.
- La portata è proporzionale alla velocità di rotazione ed alla cilindrata e varia in modo continuo. Essa aumenta con l'aumentare dell'inclinazione del piatto oscillante dalla posizione 0 alla posizione massima. Se il piatto oscillante della pompa viene posizionato oltre il punto neutro, si ottiene la portata in una delle due direzioni.
- La pompa V 250 è dotata di pompa di carico che, pressurizza il circuito, evita la cavitazione e reintegra i drenaggi assicurando il buon funzionamento della trasmissione. Questa serie di pompe è dotata di servocomando di serie il quale consente una migliore e più graduale regolazione della cilindrata, con minor sforzo sulla leva ed è disponibile in diverse versioni per soddisfare le più svariate esigenze.
- La versione standard è di tipo meccanico servo assistito dove mediante una leva meccanica si ottiene la variazione di portata nelle due direzioni. Le altre versioni disponibili sono di tipo: manuale, idraulico, elettroidraulico proporzionale, elettrico On/Off, automotive. La pompa ha inoltre incorporate le valvole di massima pressione e un by pass a vite ed è predisposta per il montaggio di pompe ausiliarie ad ingranaggi.
- Le pompe, in versione singola o tandem, sono disponibili con albero scanalato o cilindrico e prevedono accessori quali: valvola di scambio, filtro sulla linea di sovralimentazione, avviamento con micro-switch.



### Product Description

- V 250 is a variable displacement, axial piston pump, with swashplate system, for closed loop hydrostatic transmissions.
- Flow rate is proportional to rotation speed and displacement, and is continuously variable. It increases as the swashplate angle moves from "0" to maximum position. If the swashplate is positioned beyond the neutral point, the flow rate respectively follows one of the two directions.
- The new pump series V 250 is equipped with a charge pump which, by keeping the circuit pressurised, avoids the cavitation and assures a good performance of the transmission. This series of pumps has a servo control which allows a better and more gradual adjustment of the displacement with less effort on the lever and is available in different versions in order to satisfy a wide range of requirements.
- The standard version is of servo-actuated type on which, by means of a lever, the change of flow in the two directions is obtained. The other available versions are as follows: manual, hydraulic, proportional electrohydraulic, electrical on-off, automotive. Moreover the pump is fitted with relief valves and a screw by-pass and it is adapted for assembly of auxiliary gear pumps.
- The pumps in the single or tandem versions, are available with splined or parallel shaft and can be supplied with options such as heat exchange valve, filter on the auxiliary pressure line, and micro-switch starting.



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**DATI TECNICI****1) CILINDRATE MASSIME**

Pompa V250/25	25,7 cm <sup>3</sup> /giro
Pompa V250/20	20,5 cm <sup>3</sup> /giro
Pompa V250/28	28 cm <sup>3</sup> /giro
pompa alimentazione standard	9,4 cm <sup>3</sup> /giro

**2) CAMPO PRESSIONI D'ESERCIZIO**

<u>Pressione massima di uscita (attacchi A+B)</u>	
pressione continua	250 bar
pressione intermittente	320 bar
Taratura max. valvole di sicurezza	350 bar
<u>Pressione di alimentazione</u>	
per comando M (manuale)	10 bar
per servocomandi	22 bar
max. pressione di alimentazione	30 bar
<u>Pressione in aspirazione in condizioni standard</u>	
	≥ 0,8 bar assoluti
avviamento a freddo	≥ 0,5 bar assoluti
<u>Pressione di drenaggio massima</u>	1,5 bar

**3) REGIME DI ROTAZIONE**

massimo a vuoto	3900 RPM
massimo sotto carico	3600 RPM
minimo	700 RPM

**4) PORTATA TEORICA A 3600 RPM**

Pompa V250/25	l/min 92
Pompa V250/20	l/min 73

**5) POTENZA TEORICA ASSORBITA**

Pompa V250/25 a 3600 RPM e 320 bar	KW 48
------------------------------------	-------

**6) COPPIA TEORICA ASSORBITA**

Pompa V250/25 a 320 bar	Nm 127
-------------------------	--------

**7) TEMPERATURA**

Massima misurata sul circuito alta pressione con tenute standard	90°C
Minima misurata sul circuito d'aspirazione con tenute standard	-25°C

**8) FILTRAZIONE**

Vedere pagina "FiltraZIONE"

**9) MOMENTO DI INERZIA**

0,0245 Nm<sup>2</sup>

**10) MASSA**

Versione con servocomando A	Kg. 18
Versione con comando M	Kg. 13

**TECHNICAL DATA****1) DISPLACEMENTS**

Pump V250/25	25,7 cm <sup>3</sup> /rev
Pump V250/20	20,5 cm <sup>3</sup> /rev
Pump V250/28	28 cm <sup>3</sup> /rev
standard charge pump	9,4 cm <sup>3</sup> /rev

**2) RANGE OF WORKING PRESSURES**

<u>max. output pressure (ports A+B)</u>	
continuous pressure	250 bar
intermittent pressure	320 bar
max. relief valves setting	350 bar
<u>Charge pressure</u>	
for M control (manual)	10 bar
for servo controls	22 bar
max. charge pressure	30 bar
<u>Suction pressure in standard conditions</u>	≥ 0,8 bar absolute
cold starting	≥ 0,5 bar absolute
<u>Max. drain pressure</u>	1,5 bar

**3) SPEED**

max. without load	3900 RPM
max. with load	3600 RPM
minimum	700 RPM

**4) THEORETICAL FLOW RATE AT 3600 RPM**

pump V250/25	l/min 92
pump V250/20	l/min 73

**5) THEORETICAL ABSORBED POWER**

pump V250/25 at 3600 RPM and 320 bar	KW 48
--------------------------------------	-------

**6) THEORETICAL ABSORBED TORQUE**

pump V250/25 at 320 bar	Nm 127
-------------------------	--------

**7) TEMPERATURE**

max. temperature measured on the high pressure circuit with standard seals	90°C
min. temperature measured on the suction circuit with standard seals	-25°C

**8) FILTRATION**

see "Filtration" page

**9) MOMENT OF INERTIA**

0,0245 Nm<sup>2</sup>

**10) WEIGHT**

Version with servo control A	Kg. 18
Version with control M	Kg. 13

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