



VARIABLE DISPLACEMENT PUMPS RECOMMENDATIONS BEFORE START-UP



Manufacturer's Declaration

ABER ensures compliance of its products with the essential health and safety requirements of the harmonized standards EN ISO 12100:2010 and EN ISO 4413:2010.

General information

VDP pumps are variable displacement axial piston pumps designed to use in open circuits. They are available from 40 to 109 cm³/rev and with a maximum pressure of 450 bar. They can be assembled directly into the PTO's with the exception of the PTO's of two shafts without support.

Features:

- adaptable pressure
- fast reaction
- flow reset
- high pressure
- long service life
- low noise
- high efficiency
- efficient cooling

Pump selection

To ensure that the PTO will not be overloaded, and get the correct flow requirements with the speed of the engine chosen, it is important to use a pump with the right capacity. Pump capacity (D), expressed in cm³/rev, can be calculated using the following expressions:

$$D = \frac{Q \times 1000}{N \times Z}$$

D-Pump displacement [cm³/rev]

Q-Flow required [l/min]

N-Engine speed [rpm]

Z-Engine to PTO ratio (see PTO technical sheet)

In order to not overload the PTO's mechanical units, it is important to calculate the torque and power consumed by the pumps. Torque and power are calculated with the following expressions:

$$M = \frac{D \times P_b}{63} \quad P = \frac{D \times N \times Z \times P_b}{600 \times 0,95 \times 1000}$$

M-Torque [Nm]

P_b-Pressure [bar]

P-Power [kW]

N-Engine speed [rpm]

Z-PTO ratio

0,95-Pump efficiency (can change from one pump to another)

ATTENTION

If the calculated load exceeds the maximum allowed for the PTO, a different combination should be selected.

ATTENTION

Make sure that the working speed of the pump does not exceed the max. allowed speed.

Hose selection

In order to avoid intense heat generation and cavitation phenomenon that causes noise and deterioration of the pump, ABER recommends the following speeds and dimensions of the hoses. Inlet pressure range is from 0,85 to 3 bar abs. LS line should be 10% pressure line dimension

Admission line

0,5...1 m/s

Return line

2...3 m/s

Pressure line

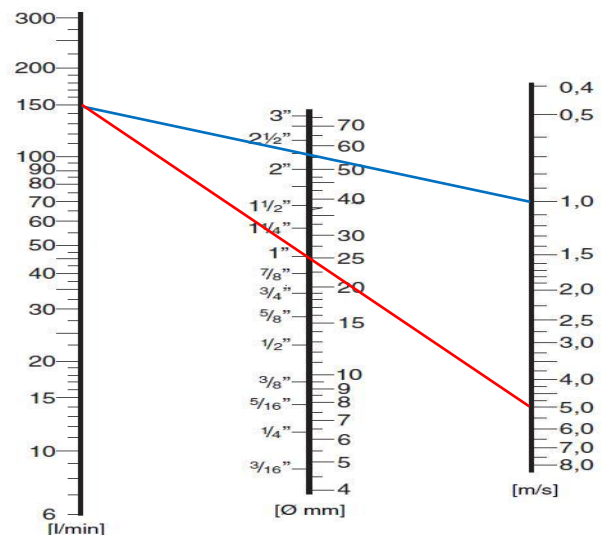
P = 0...50 bar - 3,5 m/s

P = 50...100 bar - 3,5...4,5 m/s

P = 50...100 bar - 3,5...4,5 m/s

P = 150...200 bar - 5...5,5 m/s

P = 200...300 bar - 5,5...6 m/s



ATTENTION

The recommended speeds and dimensions specified may not be enough when the temperatures are too low, the tank is below the level of the pump, the inlet hose is long or there are many valves and fittings in the inlet hosing. In these cases we recommend increasing the diameter of the hoses, keeping the suction hose as short and straight as possible and reducing the pump rotation speed.

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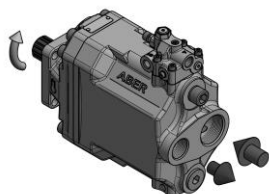
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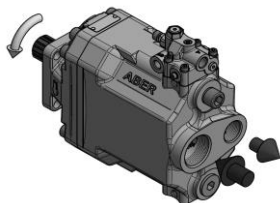
VARIABLE DISPLACEMENT PUMPS RECOMMENDATIONS BEFORE START-UP

Direction of rotation

The direction of rotation of the pump must be according to the PTO rotation. Pumps must be ordered CCW or CW and it can't be changed.



Left hand (CCW)



Right hand (CW)

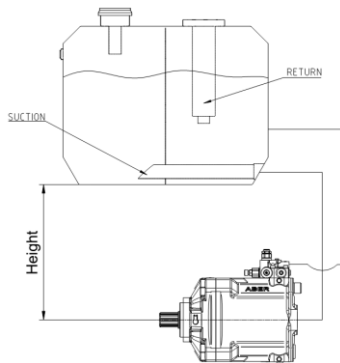
i Rotation sense is defined from drive shaft

Tank

The oil tank is a very important component in the hydraulic system and for the pump.

Generally, oil level inside the tank must be higher than the pump.

It is also recommended that the suction and return lines are separated and have a long distance between them, to prevent the oil in the return line from entering immediately in the suction line.



In order to prevent the overheating of the system it is referenced a minimum oil volume of:

Type of work	Tank volume (minimum)
Short working cycles	Equal to oil flow (l/min)
Long working cycles	1.5 times the oil flow (l/min)
Continuous operation	2 times the oil flow (l/min)

ATTENTION

Regardless of the tank volume, the max. oil temperatures or viscosities values shall not be exceeded.

Controller

Load-sensing controller (LS) with integrated pressure limitation and drain line. This command allows control of the required flow regardless of the pump working speed. The differential pressure between the load (signal obtained in the directional control valve) and the pump outlet is controlled by the LS set adjuster. The pressure limiter allows control of the maximum pressure. This controller permits high fuel saving.

LS pressure set:

Factory set: 30 bar

Range: 30 to 80 bar

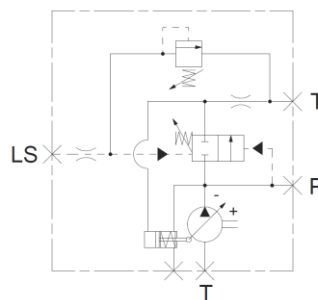
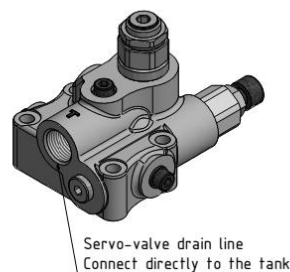
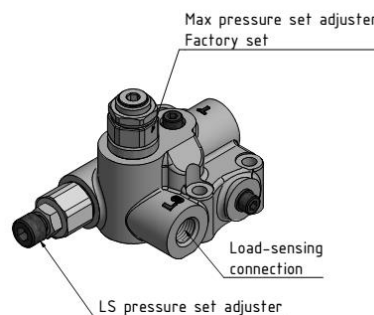
1 Turn to adjuster screw: 20 bar

Pressure limiter set:

Factory set: 350 bar

Range: 30 to 410 bar

1 Turn to adjuster screw: 70 bar



ATTENTION

Incorrect pressure settings can overload components, creating potential danger situations. Please always monitor pressure gauge during setting operations.

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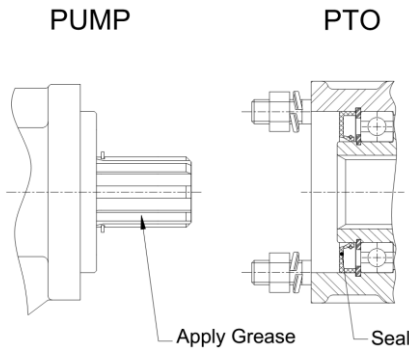


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Installation instructions

1. Check PTO direction of rotation and fit the pump according to PTO sense of rotation. Make sure that the assembly does not generate axial or radial load on the pump main shaft.

2. Grease spline shaft with heat-resistant grease before installation when the PTO contains an output shaft seal.



3. Connect the pump to the PTO (apply 80Nm torque in the tightening nuts).

ATTENTION Check the tightness periodically.

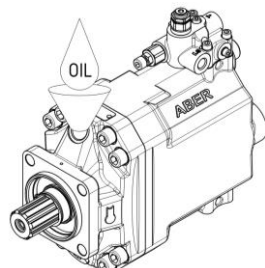
Elevated efforts or shocks are not recommended during the installation. The pump must be connected without making use of any type of tool that forces its assembly. In driving gear application and couplings, use circlips and/ or washers with one M10 screw and locking fluid (70Nm).

ATTENTION During the installation always leave the inlet port in a higher or equal level than outlet port. This increases the pump's life.

4. Remove all protection covers from the threaded holes (inlet/outlet). Apply the inlet and outlet fittings into the pump (ask for the tightening informations from the fittings manufacturer). Connect the outlet and the inlet hoses to the accessories (always respect recommended hoses dimensions and thread dimensions). Be sure that all connections are robust and well-sealed.

5. Ensure that the pressure line contains a pressure relief valve to control the max. system pressure.

6. Before start-up, the housing must be filled with the same hydraulic fluid used in the system, bleeding the air by the drain plug. Re-fit drain plug and apply a tightening torque of 50N.m.



ATTENTION
The omission of this step may cause the damage of the pump.

Fluids

Quality

-High quality mineral oil ISO type HM VG 32-68 or DIN 51524-2 HLP

The designation 32, 46, 68, etc. denotes the viscosity at 40°C of the oil

(It is possible to use other fluids but only after consulting and getting authorization from ABER)

Viscosity ranges:

-Recommend: 16 to 36mm²/s (cSt)

-Limits: 10 to 400mm²/s (cSt)

- Start-up viscosity range, without load: 400 to 1500mm²/s (cSt)

When choosing the oil, it is necessary to be aware of the low viscosity with the increase of the temperature. Therefore, we recommend that when you want to work above temperature, you should choose an oil with higher viscosity (thicker) in order to compensate the reduction of viscosity when the temperature increases.

Temperatures:

Oil temperature range: -25°C to +90°C.

Ambient temperature range: -40°C to +60°C.

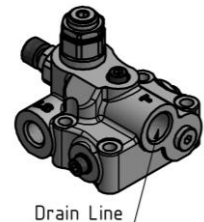
We advise you to use an oil cooler (in the return line or in a separated circuit) when you verify that the system's temperature is higher than these values.

Oil changing

The oil must be replaced after 1000 working hours or at least once a year, so as filter's elements.

Drain line

VDP pumps use an exterior drain line in the LS valve (T connection). Drain line nominal diameter must be at least 15mm, and connected directly to the tank. The drain hose must be connected to the tank at a point between the lowest oil level and the bottom of the tank



Filtration

The filtration is extremely important and may influence or even determine the life of the equipment. ABER recommends the use of a return filter and an air filter with an absolute filtration degree of 10µm, as according to the ISO 4406 class 19/17/14. The first filter to be applied into the system must be replaced as soon as it reaches the 50 working hours; after the first replacement, it must be replaced along with the oil or when pressures out of the common are verified in the return.

ATTENTION
Be sure that the whole system is perfectly clean before filling it with oil. Never mix water or other liquids, different oil qualities, viscosities or brands with the oil in the system. If any oil leaks out from below the nameplate of the pump, stop the system immediately to determine the cause of the leak and correct the problem source. Make sure that there is no gearbox contamination.

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Rua Francisco de Almeida, Nº 30 – Vila Nova da Telha – 4470-410 Maia - Portugal

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VARIABLE DISPLACEMENT PUMPS RECOMMENDATIONS BEFORE START-UP

Faults causes and remedies

Faults	Causes	Remedies
No oil flow	<ol style="list-style-type: none"> 1. Empty tank 2. Closed valve in inlet hose 3. Air in inlet hose 4. Wrong sense of rotation 5. Reversed hoses 6. PTO not engaged 7. Pump damaged 	<ol style="list-style-type: none"> 1. Fill tank with recommended fluid 2. Open valve 3. Put tank above the pump level 4. Change pump's rotation sense 5. Change inlet and pressure hoses 6. See "PTO Troubleshooting" 7. Replace pump
Equipment works with irregular movements	<ol style="list-style-type: none"> 1. Air in housing 2. Air leakage in inlet hose 3. Low oil level 4. Pump damaged 	<ol style="list-style-type: none"> 1. Fill housing with recommended fluid 2. Repair air leakage 3. Fill tank with recommended fluid 4. Replace pump
Pump is noisy	<ol style="list-style-type: none"> 1. Cavitation 2. Very thick oil 3. Air in inlet hose 4. Pump damaged 	<ol style="list-style-type: none"> 1. Replace inlet hose for another with a larger diameter 1. Remove inlet restrictions 1. Check for clogged tank breather or clogged admission filter 2. Replace for an oil with lower viscosity 3. Put tank above the pump level and check air pressure in the tank 4. Replace pump
Oil is too hot	<ol style="list-style-type: none"> 1. Small diameter or restrictions in pressure and return hoses 2. Low oil level 3. Small tank 4. Dirty oil 5. Relief valve improperly set 6. Relief valve stuck in open position 7. Very thin oil 8. Too much flow 9. High output power 	<ol style="list-style-type: none"> 1. Replace the hoses with a larger diameter and remove unnecessary restrictions 2. Fill tank with recommended fluid 3. Replace for a bigger tank 4. Replace oil and filter 5. Adjust to equipment specifications or replace if necessary 6. Clean and re-set to equipment specifications 7. Replace for an oil with higher viscosity 8. Reduce speed or replace for a smaller displacement pump 9. Fit an oil cooler
Equipment works very slow compared with the usual	<ol style="list-style-type: none"> 1. Small diameter suction in hose 2. Restriction in inlet hose 3. Relief valve improperly set 4. Relief valve stuck in open position 5. Pump damaged 	<ol style="list-style-type: none"> 1. Replace inlet hose for another with a larger diameter 2. Remove restrictions 3. Adjust to equipment specifications or replace if necessary 4. Clean and re-set to equipment specifications 5. Replace pump
Oil leakage	<ol style="list-style-type: none"> 1. From inlet/outlet lines 2. From below the nameplate 3. From body sections 	<ol style="list-style-type: none"> 1. Tighten fittings and hoses or replace if necessary 2. Stop the system immediately to determine the cause of the leak and correct the problem source 3. Tighten bolts for specified torque, or replace damaged o'ring or body



- ✓ A piston pump should be mounted by qualified personnel;
- ✓ When the pump is working, never touch or pull hoses or intermediate shaft when applied. When intermediate shaft is applied take into account that parts can be ejected;
- ✓ To install a piston pump or perform maintenance, the vehicle must be parked on a flat surface with the engine off and parking brake applied;
- ✓ Ensure that there are no leaks and that everything is properly tightened before starting;
- ✓ For the assembly of the cardan shaft, it is necessary to use all the precautions and protections set out by the current regulation on safety in the workplace;
- ✓ The pumps may attain high very temperatures after prolonged use. It is therefore necessary to take all the necessary measure to prevent burns or wait for the mechanical parts to cool down to temperatures appropriate for skin contact;
- ✓ The application of the pumps must follow all the instructions hereby mentioned in order to assure the safety of all personal working with the equipment including its surroundings, assure a long lifespan of the product and preserve the warranty of the brand. All applications that do not follow the hereby instruction are solely the user's responsibility. If the equipment has any malfunctioning, it is strictly forbidden the disassembly of the product except if it is being made by a qualified technician of the brand or if there is a special authorization to do so. If this specification is not followed, warranty can be lost.

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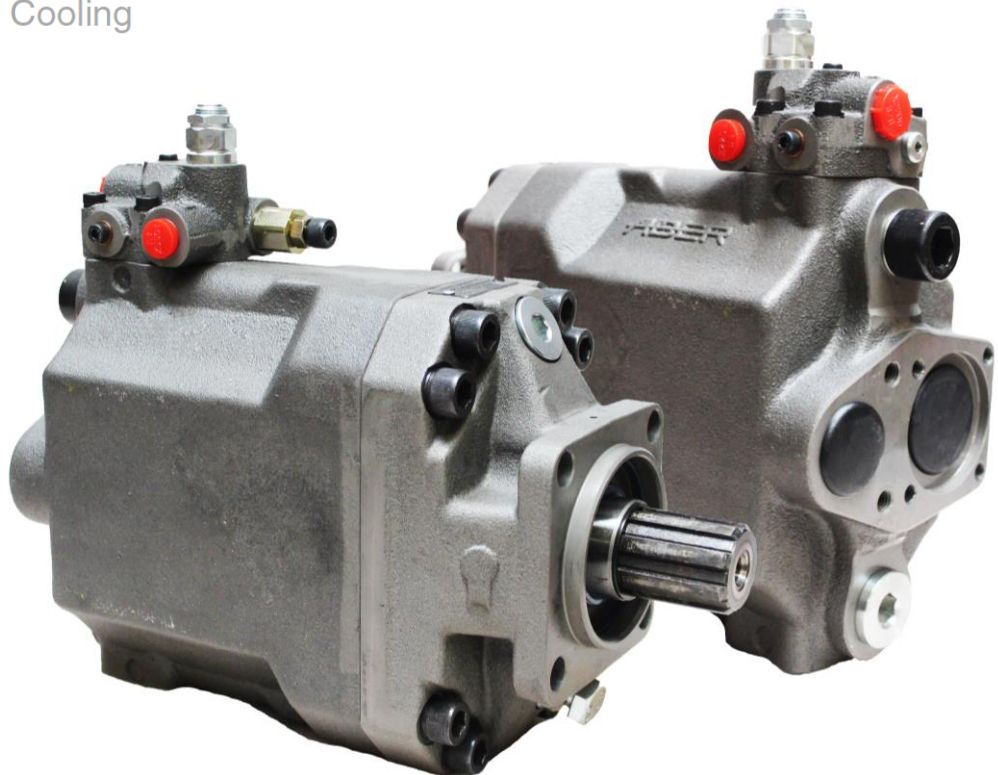
HYDRAULIC PISTON PUMPS
VDP | VARIABLE DISPLACEMENT PUMPS
VDPT | VARIABLE DISPLACEMENT PUMPS TANDEM
40cm³/rev. to 121cm³/rev.

Efficiency and robustness



VDP SERIES

- Adaptable pressure
- Fast Reaction
- Flow Reset
- High Pressure
- Long Service life
- Low Noise
- Compact Design
- High Efficiency
- Efficient Cooling



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General Information

VDP Series is a variable displacement axial piston pump designed to use in open circuits. They are available from 40 to 120 cm³/rev. and with a nominal pressure of 400 and 410 bar. They can be assembled directly into the truck power take off (PTO).

Contents

Ordering Code	3
Technical Data	4
Rotation Sense	5
Controller	6
Characteristic Diagrams	6
Dimensions	7
Mounting Flanges and Drive Shaft Options	8
VDP Tandem Applications	10
Pump Selection	11
Hose Selection	11
Recommendations Before Start up	12
Faults / Causes / Remedies	13



Ordering Code

VDP	92	R					
01	02	03	04	05	06	07	08

Series

		40	60	76	92	109	120	
01	Variable displacement pump, swash plate design, open circuit	●	●	●	●	●	●	VDP
	Variable displacement pump thru-shaft, swash plate design, open circuit	○	○	○	○	○	●	VDPT

Size

02	Displacement, cm ³ /rev.	40	60	76	92	109	120
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Rotation sense

03	Viewed from drive shaft	Right (clockwise)	R
		Left (counterclockwise)	L

Mounting flange and drive Shaft

		40	60	76	92	109	120	
04	ISO 7653-1985, type D direct coupling - Splined DIN 5462, B8x32x36	●	●	●	●	●	●	0
	SAE J744, C 2 holes - Splined SAEJ744, 14T 12/24 DP-SAE C	○	○	○	○	○	○	C2
	SAE J744, C 4 holes - Splined SAEJ744, 14T 12/24 DP-SAE C	○	○	○	○	○	○	C4
	ISO 3019, 4-h Ø125 - Splined DIN 5480, W30x2x14x9g	○	○	○	○	○	○	IW

Line ports

		40	60	76	92	109	120	
05	ISO DIN 228, G threads (BSP)	●	●	●	●	●	●	0
	SAE J514	○	○	○	○	○	○	4

Controllers

06	Load-sensing controller with pressure limitation	0
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Special Functions

		40	60	76	92	109	120	
07	Without stroke limitation	●	●	●	●	●	○	0
	With stroke limitation (120 – 90 cm ³ /rev)	○	○	○	○	○	●	Y

Seals

		40	60	76	92	109	120	
08	NBR seals	●	●	●	●	●	●	0
	FKM Seals	○	○	○	○	○	○	V

● Standard version ○ Available under request

Other combinations can be made, for more information please consult ABER.

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Technical Data

		40	60	76	92	109	120	T120
Displacement	cm ³ /rev.	40.1	60.6	76.4	92.6	109.4	121.4	121.4
Nominal pressure	bar	410	410	410	410	410	400	400
Max intermittent pressure ⁽¹⁾	bar	460	460	460	460	460	450	450
Max. rotation speed ⁽²⁾	rpm	3100	2600	2300	2000	1700	2100	2100
Min. rotation speed	rpm	500	500	500	500	500	500	500
Mass inertia torque (rotary group)	kg.m ²	0.009	0.009	0.009	0.009	0.009	0.010	0.010
Weight torque	Nm	34.99	35.02	35.03	35.05	35.07	39.09	61.27
Weight	kg	27	27	27	27	27	29	36
Recommended fluids		mineral oils type ISO HM or DIN 51524-2 HLP						
Recommended viscosity range		16 to 36 cSt (mm ² /s) at working temperature						
Limits viscosity range		10 to 400 cSt (mm ² /s)						
Start-up viscosity range, without load		400 to 1500 cSt (mm ² /s)						
Filtration requirements ⁽³⁾		ISO 4406 19/17/14						
Ambient temperature		-40°C to +60°C						
Oil temperature		-25°C to +90°C						
Max. housing pressure		3 bar						
Min. inlet pressure		0.85 bar abs						

Data contained in this table are rounded, theoretical and without efficiency or tolerances.

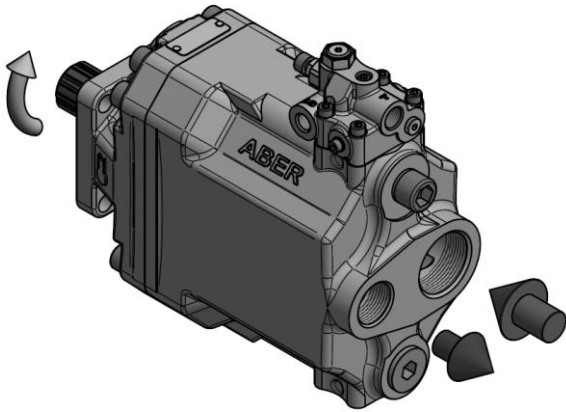
(1) Max. 6 seconds per minute.

(2) These values are valid at an absolute pressure of 1 bar in suction port when operating with a mineral oil at a viscosity of 30 mm²/s (cSt) and max swash plate angle.

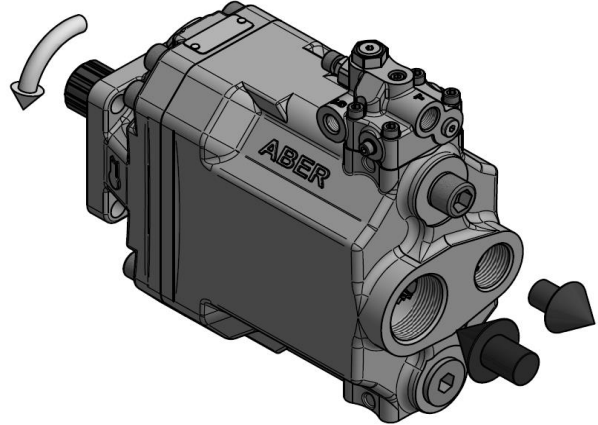
(3) The first filter to be applied into the system must be replaced as soon as it reaches the 50 working hours; after the first replacement, it must be replaced along with the oil or when pressures out of the common are verified in the return.

Rotation Sense

VDP Rotation Sense

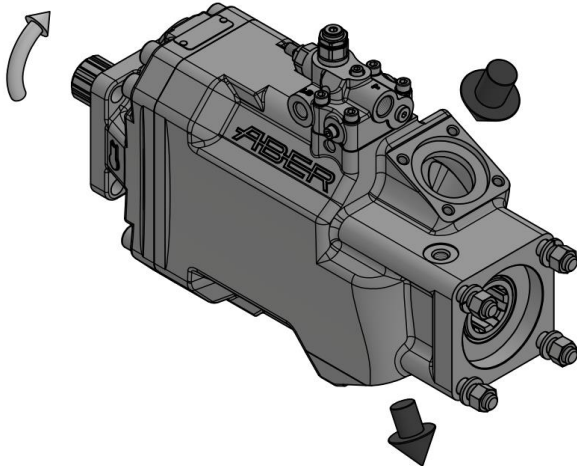


Left hand (CCW)

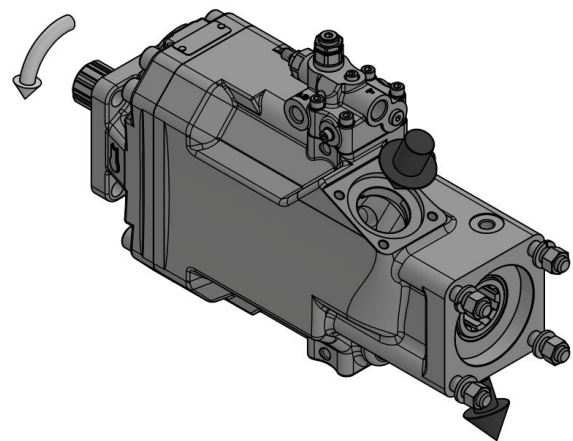


Right hand (CW)

VDPT Rotation Sense



Left hand (CCW)

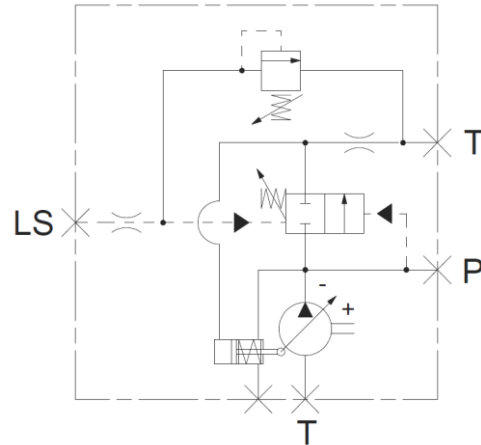
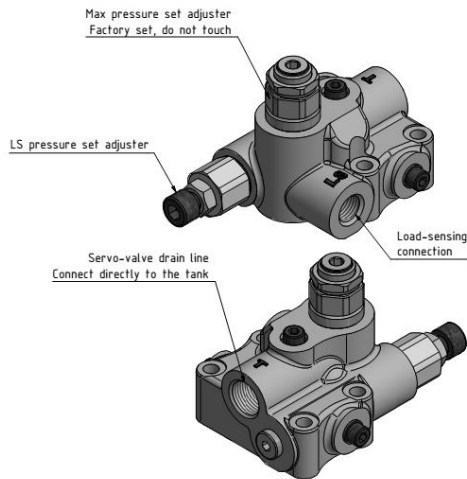


Right hand (CW)

i Rotation sense is defined viewed from drive shaft. Pumps must be ordered CCW or CW, and it can't be changed.

Controller

Load-sensing controller with integrated pressure limitation and drain line. This command allows control of the required flow regardless of the pump working speed. The differential pressure between the load and the pump outlet is controlled by the LS set adjuster. The pressure limiter allows control of the maximum pressure. Drain line must be connected directly to the tank. This controller permits high fuel saving.



40 to 121 cm³/rev

	LS	Pressure limitation
Factory set (bar)	30	350
Range (bar)	30 to 80	30 to 410
1 Turn to adjuster screw (bar)	20	70



Incorrect pressure settings can overload components creating potential danger situations, please always monitor pressure gauge during setting operations.

Characteristic Diagrams

Diagram
Flow - Speed

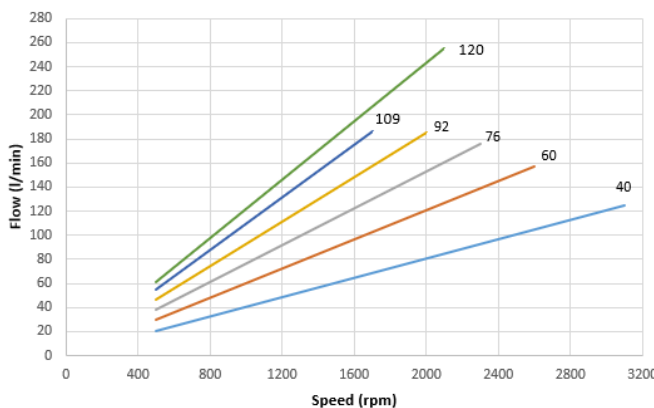
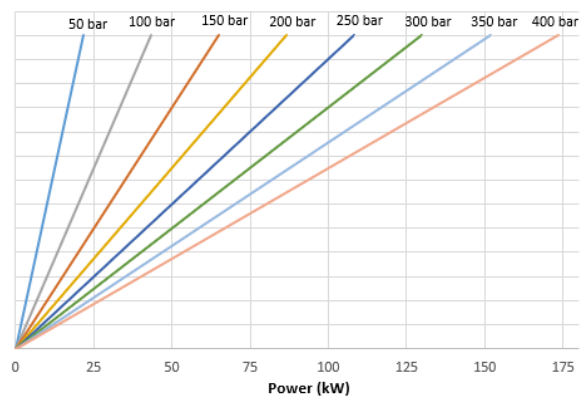


Diagram
Input Power - Flow - Pressure



These diagrams illustrates theoretical values when operating with max swash plate angle.

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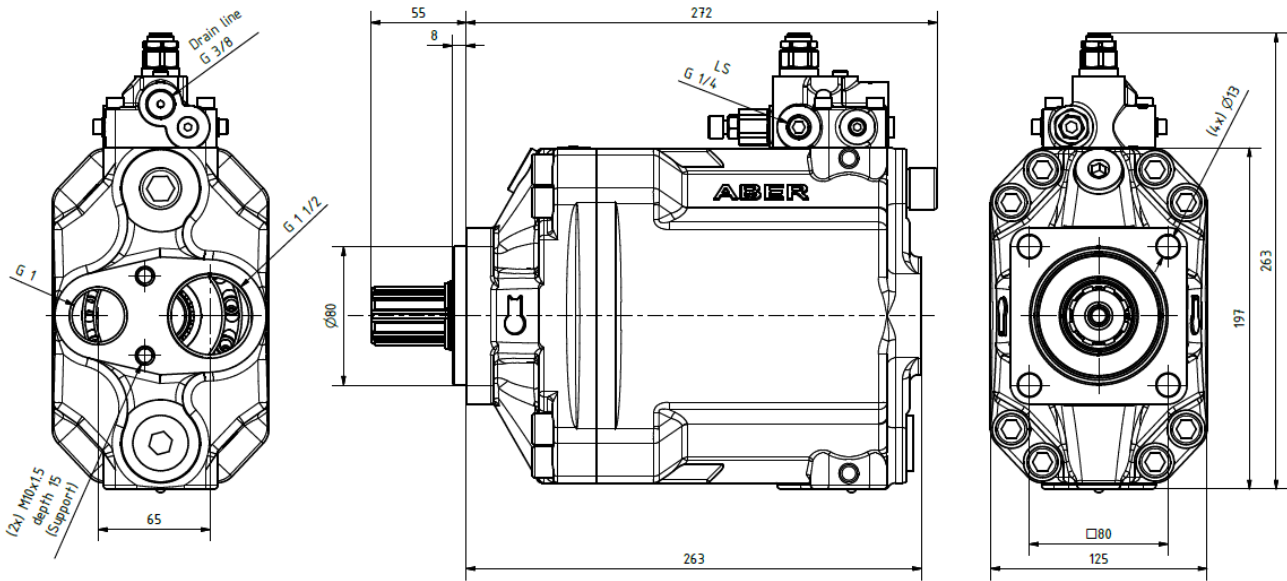
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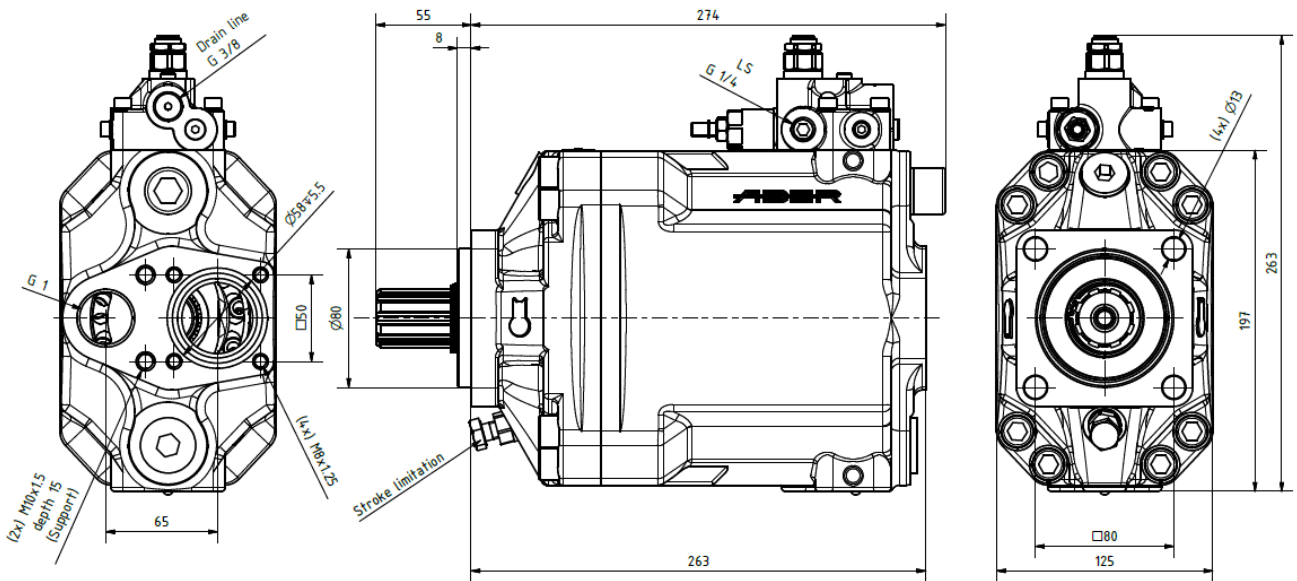
Dimensions

Standard version - Mounting flange ISO 7653-1985, type D direct coupling / Splined drive shaft DIN 5462, B8x32x36 / Line ports ISO DIN 228, G threads (BSP).
Dimensions in mm.

VDP 40 to 109



VDP 120



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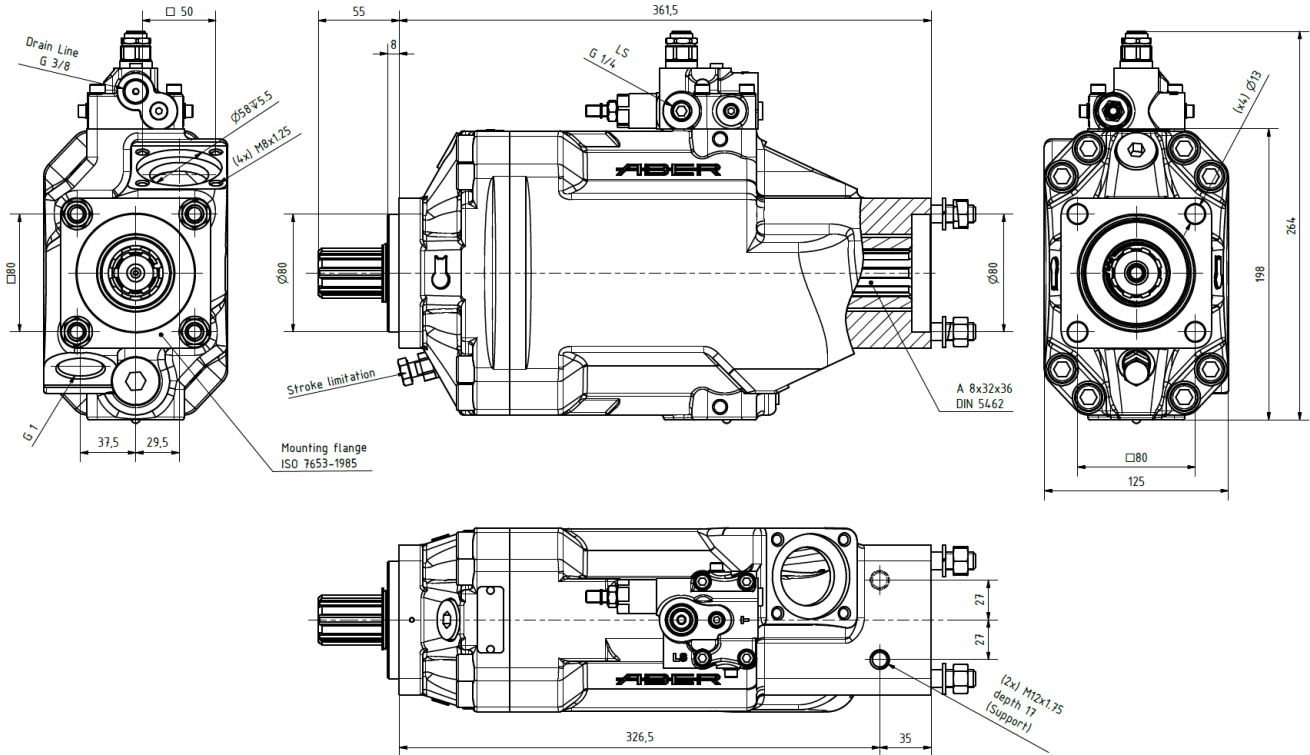
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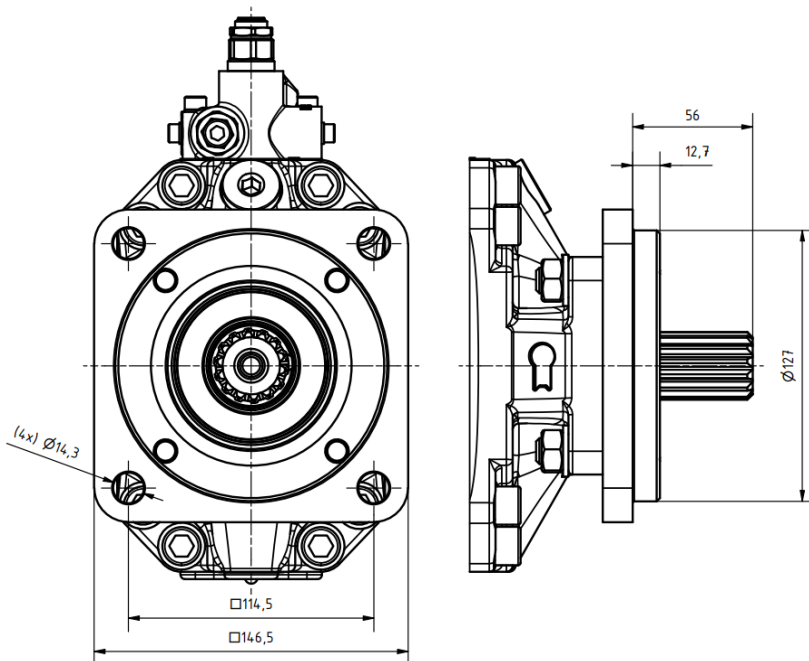


VDPT 120



Mounting Flanges and Drive Shaft Options

ISO 3019-1 127-4 SAE C4 FLANGE & SAE C 14T 12/24DP SHAFT



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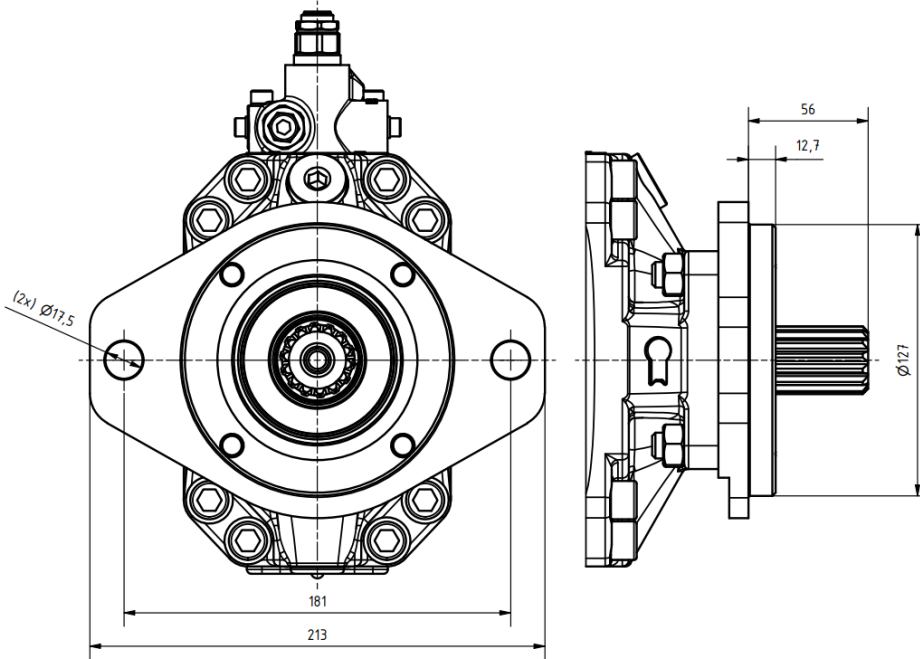
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ISO 3019-1 127-4 SAE C2 FLANGE & SAE C 14T 12/24DP SHAFT



CTI VDP/VDPT 2109-6

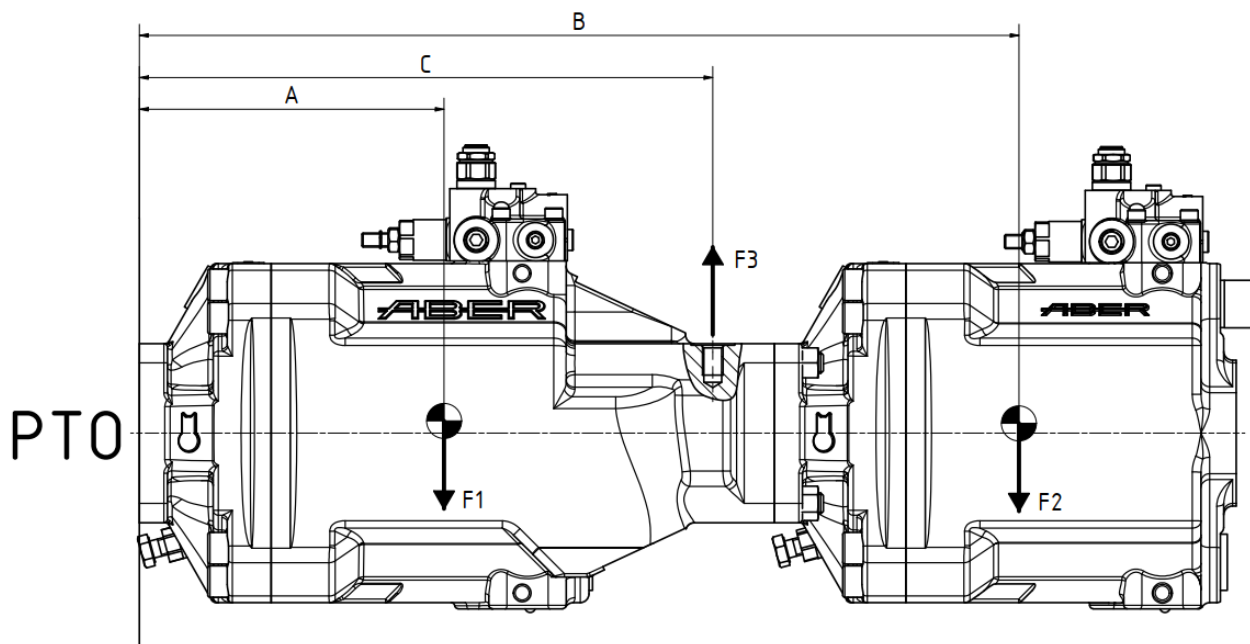
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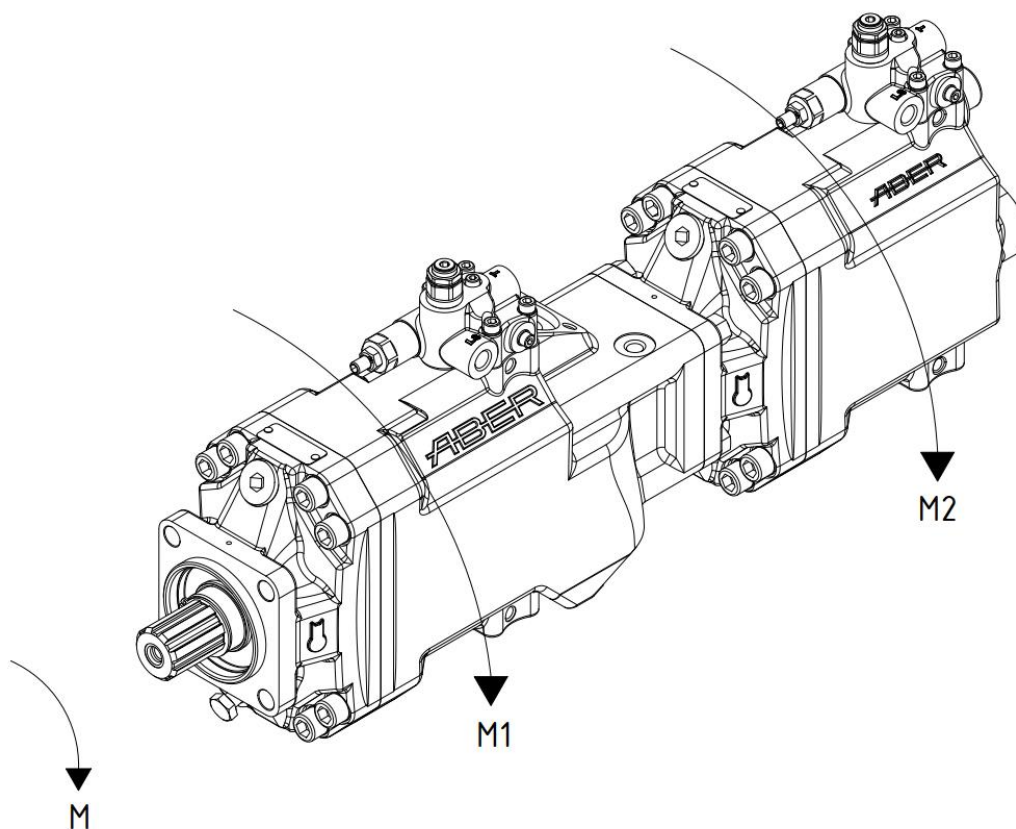
Rua Francisco de Almeida, Nº 30 – Vila Nova da Telha – 4470-410 Maia - Portugal

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VDP Tandem Applications



$$\sum M = F1xA + F2xB + \dots - F3xC \leq 50N.m$$



$$M_{\max} = 900Nm \geq M1 + M2 + \dots$$

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Pump Selection

To ensure that the PTO will not be overloaded, and gets the correct flow requirements with the speed of the engine chosen, it is important to use a pump with the right capacity. Pump capacity (D), expressed in cm³/rev., can be calculated using the following formula:

$$D = \frac{Q \times 1000}{N \times Z}$$

D-Pump displacement [cm³/rev.]
 Q-Flow required [l/min]
 N-Motor speed
 Z-Engine to PTO ratio

In order to not overload the PTO's mechanical units, it is important to calculate the torque and power consumed by the pumps. Torque and power are calculated with the following expressions:

$$M = \frac{D \times P_b}{63}$$

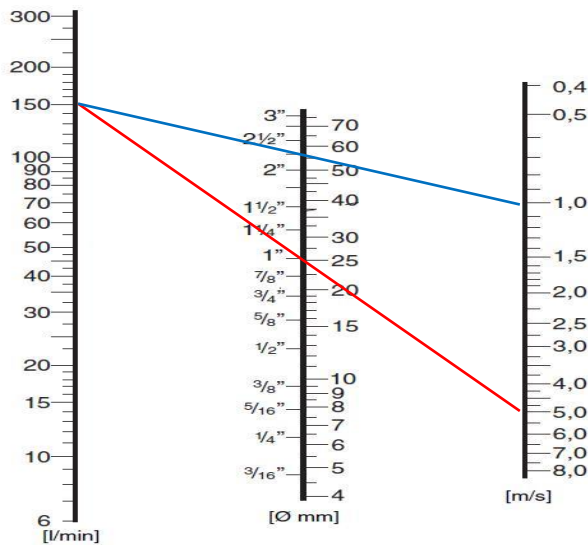
$$P = \frac{D \times N \times Z \times P_b}{600 \times 0,95 \times 1000}$$

M-Torque [Nm]
 P_b-Pressure [bar]
 P-Power [kW]
 N-Motor speed [rpm]
 Z-PTO ratio
 0,95-Pump efficiency (can change from one pump to another)

i If the calculated load exceeds the maximum allowed for the PTO, a different combination should be selected.

Hose Selection

In order to avoid intense heat generation and cavitation phenomenon that causes noise and deterioration of the pump, ABER recommends the following speeds and dimensions of the hoses. Inlet pressure range must be always respected. LS line should be 10% of the pressure line. Drain line depends from the internal pump pressure it must be at least 15mm. All the hoses must be selected according the pressures.



Admission line
 0,5...1 m/s

Return line
 2...3 m/s

Pressure line
 P = 0...50 bar - 3,5 m/s
 P = 50...100 bar - 4,5...5 m/s
 P = 100...150 bar - 4,5...5 m/s
 P = 150...200 bar - 5...5,5 m/s
 P = 200...300 bar - 5,5...6 m/s

i The recommended speeds and dimensions specified may not be enough when the temperatures are too low, the tank is below the level of the pump, the inlet hose is long or there are many valves and fittings in the inlet hosing. In these cases we recommend increasing the diameter of the hoses and reducing the pump rotation speed.

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Recommended admission connector for rotations up to 1500rpm

	Reference	A	B (in)	VDP40	VDP60	VDP76	VDP92	VDP109	VDP120	VDPT120
	A45112112	1" 1/2 BSP	1" 1/2	•						
	A45112200	1" 1/2 BSP	2"		•	•				
	A45112212	1" 1/2 BSP	2" 1/2				•	•		
	A45058300	Ø58	3"						•	•
	A90112112	1" 1/2 BSP	1" 1/2	•						
	A90112200	1" 1/2 BSP	2"		•	•				
	AD112112	1" 1/2 BSP	1" 1/2	•						
	AD112200	1" 1/2 BSP	2"		•	•				
	AD112212	1" 1/2 BSP	2" 1/2				•	•		

⁴ Consult nomogram for select admission connector size.

⁵ For more informations please consult admission connector technical sheets.

Recommendations Before Start up

- Avoid pump installation above the minimum tank oil level.
- Check PTO direction of rotation. The direction of rotation of the pump must be according to the PTO rotation. Rotation sense is defined viewed from drive shaft. Pumps must be ordered CCW or CW, and it can't be changed.
- Grease spline shaft with solid lubricant before installation. Connect the pump to the PTO (apply 80Nm torque in the tightening nuts). High efforts or shocks are not recommended during the installation. The pump must be connected without making use of any type of tool that forces its assembly. In driving gear application and couplings use circlips and/ or washers with one M10 screw and locking fluid (70Nm). During the installation always leave the inlet port in a higher or equal level than outlet port. This increases the pump life.
- Remove all protection covers from the threaded holes (inlet/outlet/drain line/load-sensing). Apply the inlet and outlet fittings into the pump (query the tightening information from the fittings manufacturer). Connect the outlet and the inlet pipes to the accessories (always respect recommended hoses)
- Before start-up, the housing must be filled with the same hydraulic fluid used in the system. Re-fit drain plug and torque to 50Nm. Never run the pump dry.
- Use Heat Control Valve (HCV20) in hydraulic systems where the pump works continuously for long periods of time, for example engine PTO.

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Faults / Causes / Remedies

Faults	Causes	Remedies
No oil flow	<ol style="list-style-type: none"> 1.Empty tank 2.Closed valve in inlet hose 3.Air in inlet hose 4.Wrong sense of rotation 5.Reversed hoses 6.No input power 7.Pump damaged 	<ol style="list-style-type: none"> 1.Fill tank with recommended fluid 2.Open valve 3.Put tank above the pump level 4.Change rotation sense 5.Reverse hoses 6.Replace power source or other damaged equipment 7.Replace pump
Equipment works with irregular movements	<ol style="list-style-type: none"> 1.Air in housing 2.Air leakage in inlet hose 3.Low oil level 4.Pump damaged 	<ol style="list-style-type: none"> 1.Fill housing with recommended fluid 2.Repair air leakage 3.Fill tank with recommended fluid 4. Replace pump
Pump is noisy	<ol style="list-style-type: none"> 1.Small diameter hose 2.Restriction in inlet hose 3.Very thick oil 4.Air in inlet hose 5.Pump damaged 	<ol style="list-style-type: none"> 1.Replace inlet hose for other with a larger diameter 2.Remove restrictions 3.Replace for an recommended fluid 4.Put tank above the pump level, check air pressure in the tank 5.Replace pump
Oil is too hot	<ol style="list-style-type: none"> 1.Low oil level 2.Small tank 3.Dirty oil 4.Relief valve improperly set 5.Relief valve stuck in open position 6.Very thick oil 7.Too much flow 	<ol style="list-style-type: none"> 1.Fill tank with recommended fluid 2.Replace for a bigger tank 3.Replace oil and filter 4.Adjust for equipment specifications or replace if necessary 5.Clean and re-set for equipment specifications 6.Replace for an recommended fluid 7.Reduce speed or replace for a smaller displacement pump
Equipment works very slow compared with the usual	<ol style="list-style-type: none"> 1.Relief valve improperly set 2.Relief valve stuck in open position 3. LS pressure setting 4.Pump damaged 	<ol style="list-style-type: none"> 1.Adjust for equipment specifications or replace if necessary 2.Clean and re-set for equipment specifications 3.Change load sense (LS) factory setting. Tight LS pressure set adjuster 4.Replace pump
Oil leakage	<ol style="list-style-type: none"> 1.From inlet/outlet lines 2.From below the nameplate 3.From body sections 	<ol style="list-style-type: none"> 1.Tighten fittings and hoses, or replace if necessary 2.Stop the system immediately to determine the cause of the leak and correct the problem source 3.Tighten bolts for specified torque, or replace damaged o'ring or body



When the pump is working, never touch or pull hoses or intermediate shaft when applied. When intermediate shaft is applied take into account that parts can be ejected.

The application of the pumps must follow all the instructions hereby mentioned in order to assure the safety of all personal working with the equipment including its surroundings, assure a long life to the product and preserve the warranty of the brand. All applications that do not follow the hereby instruction are solely the users responsibility. If there should happen any malfunctioning, it is strictly forbidden the disassembly of the product except if it is being made by a qualified technician of the brand or if there is a special authorization to do that. If this specification should not be followed, all warranties might be lost.

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