

*TECHNICAL DATA SHEETS*  
*and*  
*RECOMMENDATIONS*

**ABER**

Manufacturing Hydraulic Excellence since 1972

[www.ABER.pt](http://www.ABER.pt)



# BENT AXIS PISTON 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 809:1998+A1:2009.

## General information

BI pumps are axial piston pumps with single and double fixed displacement. They are available from 25 to 172 cm<sup>3</sup>/rot. and with a maximum pressure of 400bar. They can be assembled directly into the PTO's, with the exception of the PTO's of two shafts without support.

Features:

- high precision
- good performance
- small dimensions
- light
- robust
- low environmental temperatures
- low noise
- low weight
- changeable direction of rotation without risk of breaking the pump

## 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 cm<sup>3</sup>/rot, can be calculated using the following formula:

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

D-Pump displacement [cm<sup>3</sup>/rot]

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:

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

M-Torque [Nm]

P<sub>b</sub>-Pressure [bar]

P-Power [kW]

N-Motor 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.

## 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 0,8 to 2 bar abs.

Inlet hose	Max. 1m/s
Outlet hose	Max. 5m/s

Inlet Hose	
Flow (l/min)	Internal pipe diameter (inch)
30-50	1"1/2
50-70	1"3/4
70-90	2"
90-110	2"1/4
110-140	2"1/2
140-170	2"3/4
170-200	3"
200-240	3"1/4

Flow (l/min)	Outlet Hose				
	Internal pipe diameter (inch)				
30	1/2"	1/2"	1/2"	1/2"	1/2"
40	5/8"	1/2"	1/2"	1/2"	1/2"
50	5/8"	5/8"	5/8"	1/2"	1/2"
60	3/4"	5/8"	5/8"	5/8"	5/8"
70	1"	3/4"	3/4"	5/8"	5/8"
80	1"	3/4"	3/4"	3/4"	3/4"
90	1"	1"	1"	3/4"	3/4"
100	1"	1"	1"	1"	3/4"
110	1"	1"	1"	1"	1"
120	1"	1"	1"	1"	1"
130	1"	1"	1"	1"	1"
140	1"1/4	1"	1"	1"	1"
150	1"1/4	1"	1"	1"	1"
160	1"1/4	1"1/4	1"	1"	1"
170	1"1/4	1"1/4	1"	1"	1"
180	1"1/4	1"1/4	1"1/4	1"	1"
190	1"1/4	1"1/4	1"1/4	1"	1"
200	1"1/2	1"1/4	1"1/4	1"1/4	1"
210	1"1/2	1"1/4	1"1/4	1"1/4	1"1/4
220	1"1/2	1"1/4	1"1/4	1"1/4	1"1/4
230	1"1/2	1"1/2	1"1/4	1"1/4	1"1/4
	50-100	100-150	150-200	200-300	300-350
	P (bar)				

**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 and reducing the pump rotation speed.

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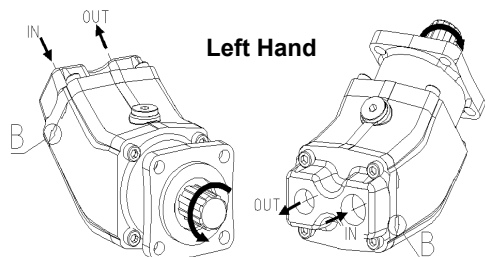
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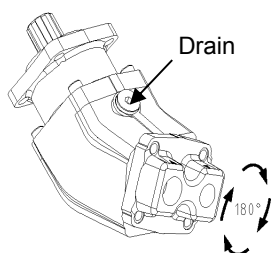
# BENT AXIS PISTON PUMPS RECOMMENDATIONS BEFORE START-UP

## Direction of rotation

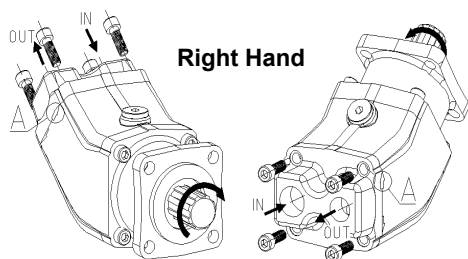
1. Check PTO direction of rotation.
2. The direction of rotation of the pump must be according to the PTO rotation. ABER normally supplies pumps with left hand rotation, change it if needed.



2.1. Fully unscrew the four end cover



2.2. Turn the connection cover 180°



2.3. Screw again the four screws:

- torque BI\_M / BI\_M7 = 80Nm
- torque BI\_P / BI\_P7 / BI\_H9 = 110Nm

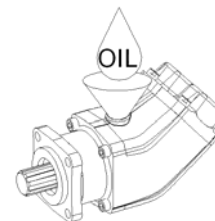
3. Grease spline shaft with solid lubricant before installation. Connect the pump to the PTO (apply 80Nm torque in the tightening nuts). High efforts or shocks are not recommended during the installation. The pump must be connected without making use of any type of tool that forces its assembly. In driving gear application and couplings use circlips and/ or washers with one M10 screw and locking fluid (70Nm).

### ATTENTION

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

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

5. 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.



## Fluids

For BI pumps range, ABER recommends the use of high quality mineral oil type ISO HM or DIN 51524-2 HLP, with viscosities from 20 to 40mm<sup>2</sup>/s (cSt) at working temperature. The working viscosity limits stay between minimum 10mm<sup>2</sup>/s (cSt) and maximum 400mm<sup>2</sup>/s (cSt). In situations, when the viscosities stay between 400mm<sup>2</sup>/s (cSt) and 1500mm<sup>2</sup>/s (cSt), the system can be turned on, but cannot be loaded. It is possible to use other oils with the same characteristics, but only after consulting and getting authorization from ABER. The designation 32, 46, 68, etc. denotes the viscosity at 40°C of the oil. 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 that temperature, you should choose an oil with more viscosity (thicker) in order to compensate the reduction of viscosity when the temperature increases. The maximum temperature allowed in the circuit is 75°C. We advise you to use an oil cooler when you verify that the system's temperature is about or higher than these values. The oil must be replaced after 1000 working hours or at least once a year, change filters elements as well.

## Drain line

BI pumps range is of fixed flow and do not need to use an exterior drain line because they are drained from the inside. If they are to be applied in an engine PTO, it is mandatory to use a by-pass valve and it is recommendable the use of a drain line directly from the by-pass valve to the oil 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 18/13. 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 cleaned 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 shore that there was no gearbox contamination.

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## BENT AXIS PISTON PUMPS RECOMMENDATIONS BEFORE START-UP

### Faults; cause and remedies

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



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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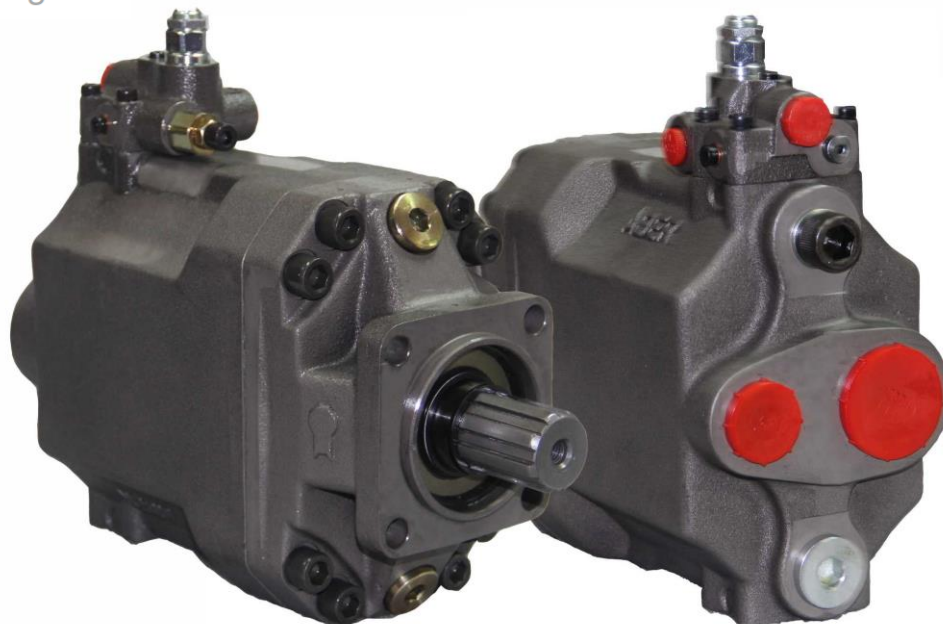
## HYDRAULIC PISTON PUMPS VDP | VARIABLE DISPLACEMENT PUMPS 40cm<sup>3</sup>/rev. to 109cm<sup>3</sup>/rev.

Efficiency and robustness



### VDP SERIES

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



CTI VDP 1607-3

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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 109 cm<sup>3</sup>/rev. and with a nominal pressure of 410 bar. They can be assembled directly into the truck power take off (PTO).

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CTI VDP 1607- 3

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**Ordering code**

VDP	40	R						
01	02	03	04	05	06	07	08	09

Series

01	Variable displacement pump, swash plate design, open circuit	VDP
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Size

02	Displacement, cm <sup>3</sup> /rev.	40	60	76	92	109
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Rotation sense

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

Mounting flange

		40	60	76	92	109	
04	ISO 7653-1985, type D direct coupling	●	●	●	●	●	0
	SAE J744, C 2 holes	○	○	○	○	○	C2
	SAE J744, C 4 holes	○	○	○	○	○	C4
	ISO 3019, 4-h Ø125	○	○	○	○	○	I

Drive Shaft

		40	60	76	92	109	
05	Splined DIN 5462, B8x32x36	●	●	●	●	●	0
	Splined SAEJ744, 14T 12/24 DP-SAE C	○	○	○	○	○	C
	Splined DIN 5480, W35x2x16x9g	○	○	○	○	○	A

Line ports

		40	60	76	92	109	
06	ISO DIN 228, G threads (BSP)	●	●	●	●	●	0
	SAE J514	○	○	○	○	○	4
	Metric	○	○	○	○	○	3

Controllers

07	Load-sensing controller	0
----	-------------------------	---

Special functions

08	Without stroke limitation	0
----	---------------------------	---

Seals

09	NBR shaft seal	0
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● Standard version    ○ Available under request

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

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**Technical data**

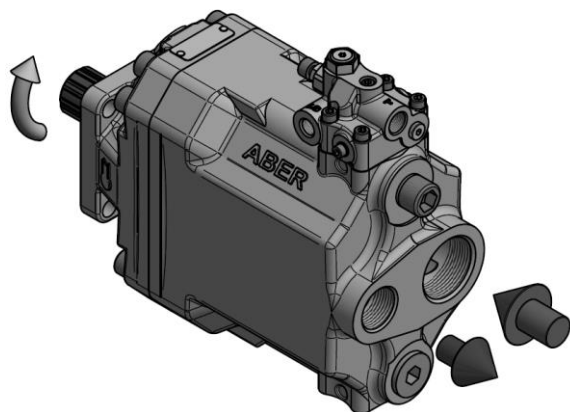
Displacement	cm <sup>3</sup> /rev.	40.1	60.6	76.4	92.6	109.4
Nominal pressure	bar	410	410	410	410	410
Max intermittent pressure <sup>(1)</sup>	bar	450	450	450	450	450
Max. rotation speed <sup>(2)</sup>	rpm	3100	2600	2300	2000	1700
Min. rotation speed	rpm	500	500	500	500	500
Mass inertia torque (rotary group)	kg.m <sup>2</sup>	0.009	0.009	0.009	0.009	0.009
Weight torque	Nm	34.99	35.02	35.03	35.05	35.07
Weight	kg	27	27	27	27	27
Recommended fluids	mineral oils type ISO HM or DIN 51524-2 HLP					
Recommended viscosity range	16 to 36 cSt (mm <sup>2</sup> /s) at working temperature					
Limits viscosity range	10 to 400 cSt (mm <sup>2</sup> /s)					
Start-up viscosity range, without load	400 to 1500 cSt (mm <sup>2</sup> /s)					
Filtration requirements <sup>(3)</sup>	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.

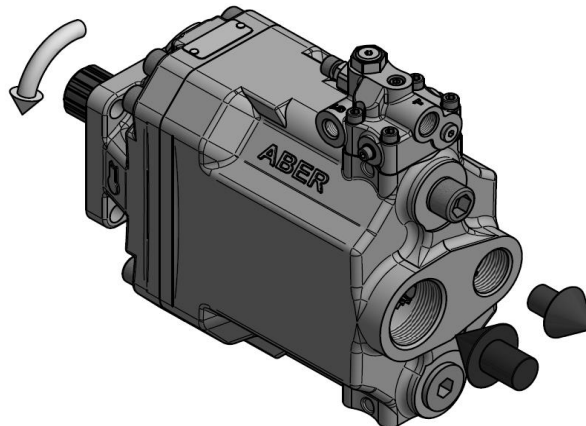
(1) Max. 6 seconds per minute.

(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 mm<sup>2</sup>/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**


Left hand (CCW)

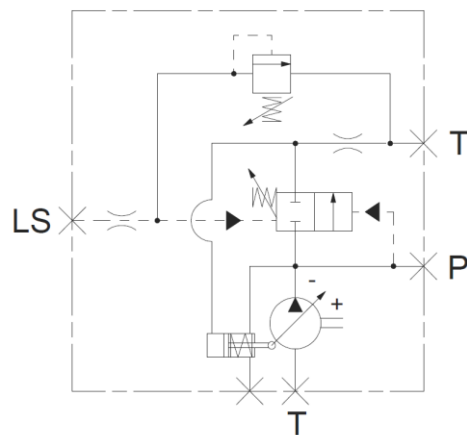
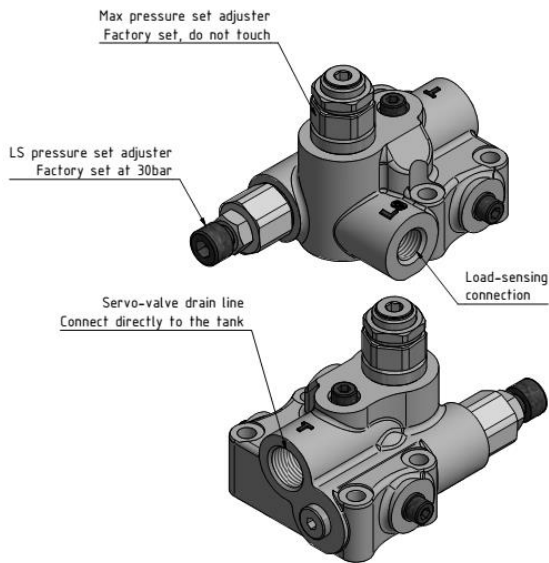



Right hand (CW)

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

### Controller

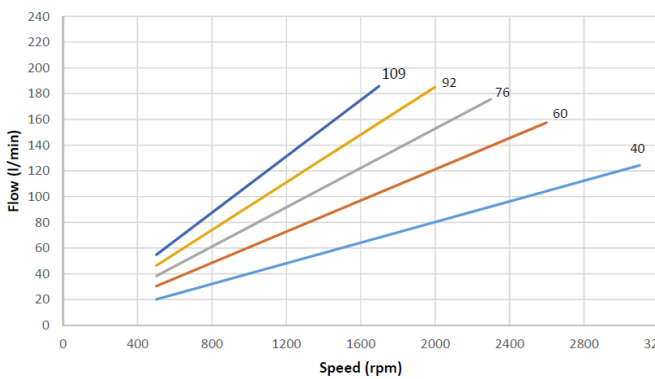
Load-sensing controller with integrated pressure limitation and drain line. This command allows control of the required flow regardless of the pump working speed. The differential pressure between the load and the pump outlet is controlled by the LS set adjuster. The pressure limiter allows control of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



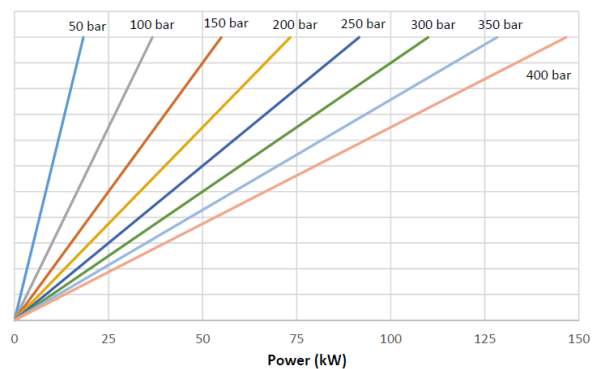
 Incorrect pressure settings can overload components creating potential danger situations, please always monitor pressure gauge during setting operations.

### Characteristic diagrams

**Diagram  
Flow - Speed**



**Diagram  
Input Power - Flow - Pressure**



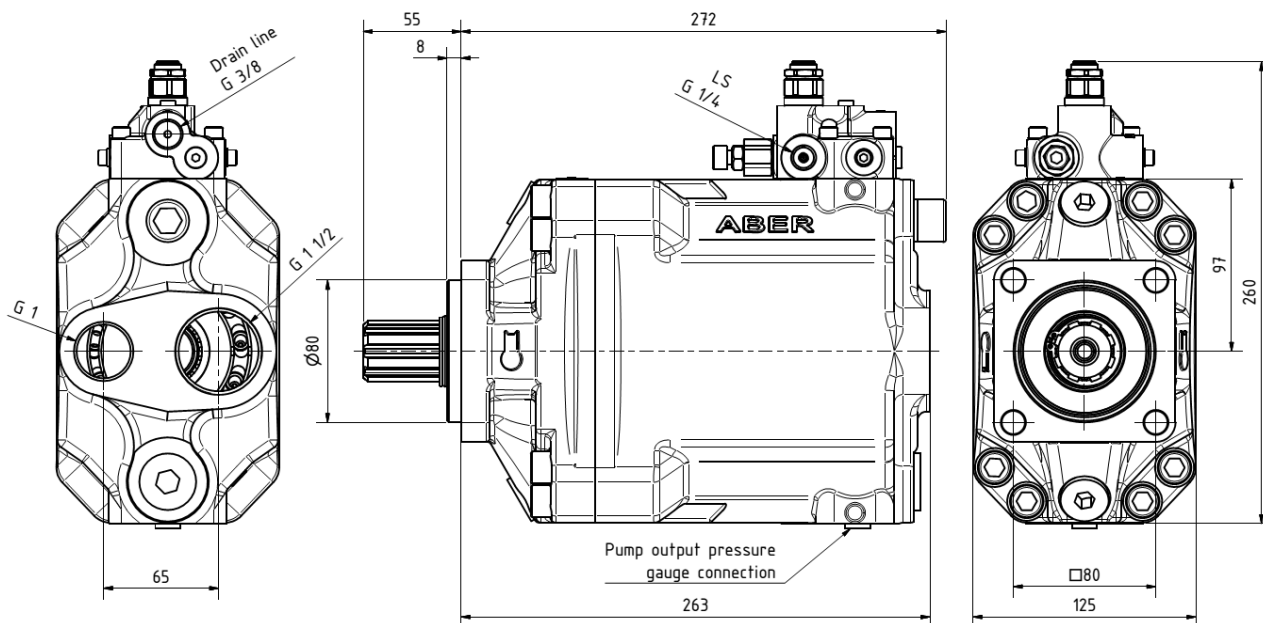
These diagrams illustrates theoretical values when operating with max swash plate angle.

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### 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.



### 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 cm<sup>3</sup>/rev., can be calculated using the following formula:

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

D-Pump displacement [cm<sup>3</sup>/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<sub>b</sub>-Pressure [bar]  
P-Power [kW]  
N-Motor speed [rpm]  
Z-PTO ratio  
0,95-Pump efficiency (can change from one pump to another)

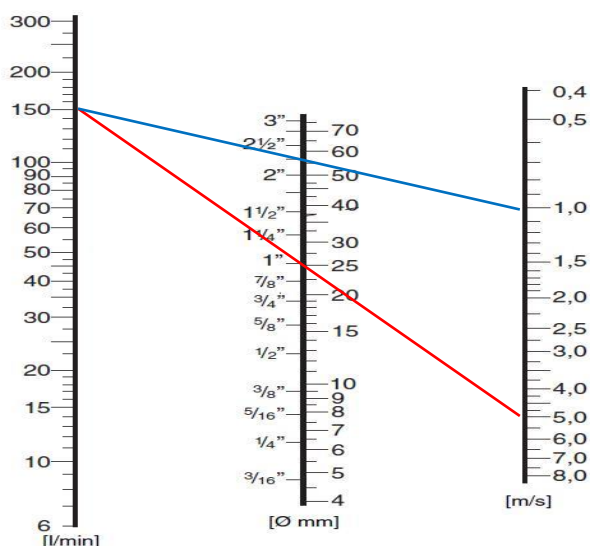


If the calculated load exceeds the maximum allowed for the PTO, a different combination should be selected.

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## 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 - 3,5...4,5 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



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.

## 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.

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**Faults / Causes / Remedies**

Faults	Causes	Remedies
No oil flow	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	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	1.Air in housing 2.Air leakage in inlet hose 3.Low oil level 4.Pump damaged	1.Fill housing with recommended fluid 2.Repair air leakage 3.Fill tank with recommended fluid 4. Replace pump
Pump is noisy	1.Small diameter hose 2.Restriction in inlet hose 3.Very thick oil 4.Air in inlet hose 5.Pump damaged	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	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	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	1.Relief valve improperly set 2.Relief valve stuck in open position 3. LS pressure setting 4.Pump damaged	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	1.From inlet/outlet lines 2.From below the nameplate 3.From body sections	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.

ABER is constantly engaged in improving its products and, therefore, reserves itself the right to modify without any further notice the characteristics shown