



# GEAR 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

ABER gear pumps are single fixed displacement pumps. They are available from 12 to 154 cm<sup>3</sup>/rev. over different range series. They can be assembled directly into the PTO, with the exception of the PTO of two shafts without support.

### Features:

- Bidirectional
- Good performance
- Small dimensions
- Fast to mount
- Low noise
- Light weighted
- Changeable direction of rotation (unidirectional version)

## Pump selection

To ensure that the PTO will not be overloaded, and to 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>/rev, can be calculated using the following expressions:

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

D-Pump displacement [cm<sup>3</sup>/rev]  
Q-Flow required [l/min]  
N-Motor speed  
Z-Engine to PTO ratio (see PTO technical sheet)

In order not to 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 formula:

$$M = \frac{D \times P_b}{63} \quad P = \frac{D \times N \times Z \times P_b}{600 \times 0,90 \times 1000}$$

M-Torque [Nm]  
P<sub>b</sub>-Pressure [bar]  
P-Power [kW]  
N-Motor speed [rpm]  
Z-PTO ratio  
0,90-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 pump deterioration, ABER recommends the following speeds and dimensions of the hoses. Inlet pressure range is from 0,8 to 2 bar abs.

### Admission line

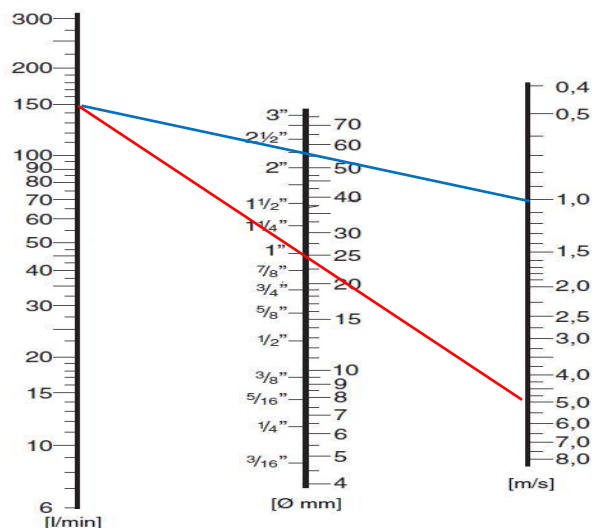
0,5...1 m/s

### 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 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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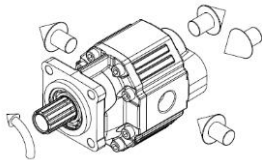
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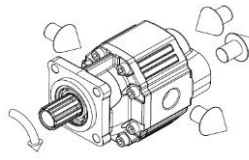
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## Direction of rotation

The direction of rotation of the pump must be according to the PTO rotation. ABER can supply bidirectional or unidirectional pumps. Unidirectional gear pumps must be ordered CCW or CW



Left Hand (CCW)



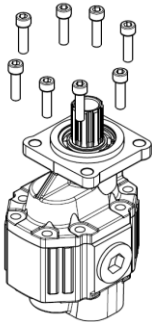
Right hand (CW)

**i** Rotation sense is defined from drive shaft.

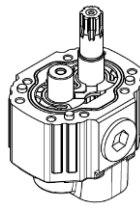
## Changing the rotation

To change the rotation of the unidirectional pump it is necessary to follow the next steps:

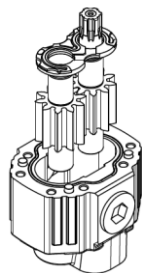
(B3 Series: example of how to change the rotation)



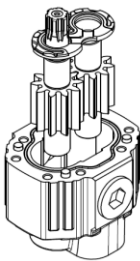
1st- Loosen and remove the top screws and washers



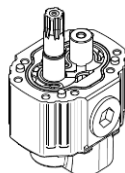
2nd- Remove the cover. If the cover is stuck tap around the edge with a rubber mallet to disconnect the cover



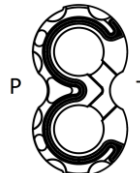
3rd- Remove the top plate and the gears. The rear plate should not be removed.



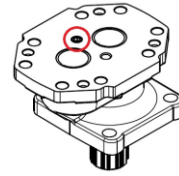
4th- Reassemble the gears in the opposite position and the plate in the same position



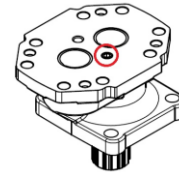
5th- With the use of grease, reapply the oring



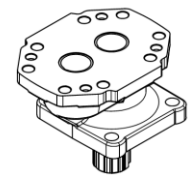
6th- Be sure that the plate seal is assembled on the pressure side (P side). Be aware that the seal tips should not be damaged when inserting the plate



7th- Replace the hex bolt in the cover from one hole to another. Tighten the hex bolt with 20N.m torque.

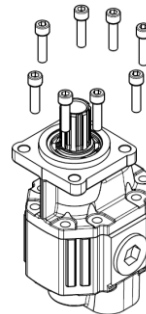


8th- Be aware that hex bolt stays in the pump pressure side (P side)

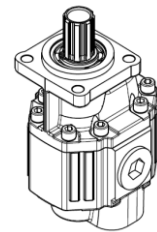


NOTE:

If the cover in 7<sup>th</sup>/steps and 8<sup>th</sup> does not contained holes and a hex bolt both are not applicable (Cover, 3rd Image on the right)



9th- Assemble the pump cover (turned 180° from its original position) and tighten the top screws and washers with 80 N.m



10th - By hand, rotate the main shaft to ensure that the pump rotates freely. The pump is now ready for working with the original rotation reversed.

## Torque tightness plugs

3/4" BSP	60 N.m
1" BSP	75 N.m
1 1/4" BSP	115 N.m

## 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 recommended 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.

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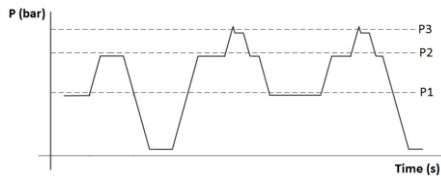
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## Pressure definition

Maximum allowed pressure can change according to the time that the pump is under load. Continuous, intermittent and pike pressures can occur. For their maximum values and times consult technical sheet and/or contact ABER.



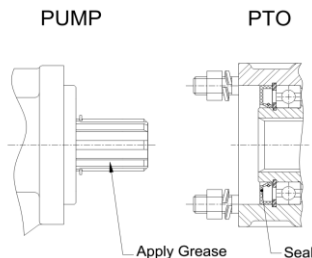
- P1 – Continuous pressure
- P2 – Intermittent pressure
- P3 – Peak pressure

## Axial and radial load

Gear pumps that are subjected to axial and radial loads (such as driving gears and couplings) must be fitted with double tapered roller bearings to support the loads (ABER reinforced gear pump versions). In driving gear application and couplings use circlips or washers with a M10 screw and locking fluid (70Nm).

## 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.

**ATTENTION** During the installation always leave the inlet port in a higher or equal level than the 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 pipes to the accessories (always respect recommended hoses dimensions and thread dimensions). Be sure that all connections are robust and well-sealed.

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ABER HAS A QUALITY MANAGEMENT SYSTEM CERTIFIED ACCORDING TO THE STANDARD ISO 9001 BY APCER

## 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: 10 to 100 mm<sup>2</sup>/s (cSt)

-Permit: up to 750 mm<sup>2</sup>/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 +80°C.

We advise you to use an oil cooler when you verify that the 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 filters elements.

## Leakage safety system

ABER gear pumps do not need to use an exterior drain line because they are drained from the inside. These pumps have two shaft seals to guarantee protection and to avoid the oil exchange between the hydraulic circuit and the gear box. In case of failure, a safety system between the shaft seals of the pump allows the oil to escape, but doesn't allow the entry of contamination into the pump.

### ATTENTION

If any oil leaks out from the pump, stop the system immediately to determine the cause of the leak and correct the problem source.

## Filtration

The filtration is extremely important and may influence or even determine the durability of the equipment. ABER recommends the use of a return filter and an air filter with an absolute filtration degree of 10µm if the pressure system is higher than 200 bar as according to the ISO 4406 class 18/15 and an absolute filtration degree of 25µm if the pressure system is lower than 200 bar, as according to the ISO 4406 class 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 uncommon pressures 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. Make sure that there is no gearbox contamination.



## GEAR PUMPS RECOMMENDATIONS BEFORE START-UP

### Faults, causes and remedies

Faults	Causes	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. PTO not engaged</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 pump rotation sense</li> <li>5. Change inlet and pressure hoses</li> <li>6. See "PTO Troubleshooting"</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. Cavitation</li> <li>2. Very thick oil</li> <li>3. Air in inlet hose</li> <li>4. Pump damaged</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace inlet hose for another with a larger diameter</li> <li>1. Remove inlet restrictions</li> <li>1. Check for clogged tank breather or clogged admission filter</li> <li>2. Replace for an oil with lower viscosity</li> <li>3. Put tank above the pump level, check air pressure in the tank</li> <li>4. Replace pump</li> </ol>
Oil is too hot	<ol style="list-style-type: none"> <li>1. Small diameter or restrictions in pressure and return hoses</li> <li>2. Low oil level</li> <li>3. Small tank</li> <li>4. Dirty oil</li> <li>5. Relief valve improperly set</li> <li>6. Relief valve stuck in open position</li> <li>7. Very thin oil</li> <li>8. Too much flow</li> <li>9. High output power</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace the hoses with a larger diameter and remove unnecessary restrictions</li> <li>2. Fill tank with recommended fluid</li> <li>3. Replace for a bigger tank</li> <li>4. Replace oil and filter</li> <li>5. Adjust to equipment specifications or replace if necessary</li> <li>6. Clean and re-set to equipment specifications</li> <li>7. Replace for an oil with higher viscosity</li> <li>8. Reduce speed or replace for a smaller displacement pump</li> <li>9. Fit an oil cooler</li> </ol>
Equipment works very slow compared with the usual	<ol style="list-style-type: none"> <li>1. Small diameter suction in hose</li> <li>2. Restriction in inlet hose</li> <li>3. Relief valve improperly set</li> <li>4. Relief valve stuck in open position</li> <li>5. Pump damaged</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace inlet hose for another with a larger diameter</li> <li>2. Remove restrictions</li> <li>3. Adjust to equipment specifications or replace if necessary</li> <li>4. Clean and re-set to equipment specifications</li> <li>5. Replace pump</li> </ol>
Oil leakage	<ol style="list-style-type: none"> <li>1. From inlet/outlet lines</li> <li>2. From drain hole</li> <li>3. From shaft seal</li> <li>4. 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. Replace shaft seal</li> <li>4. Tighten bolts for specified torque, or replace damaged oring or body</li> </ol>



- ✓ A gear 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 gear 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.

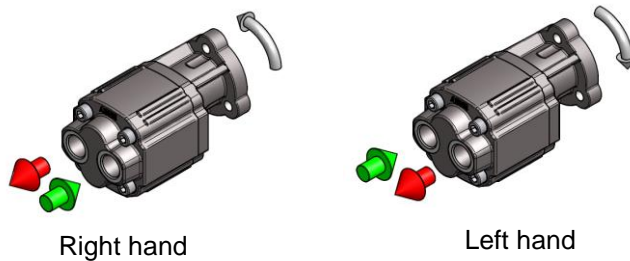
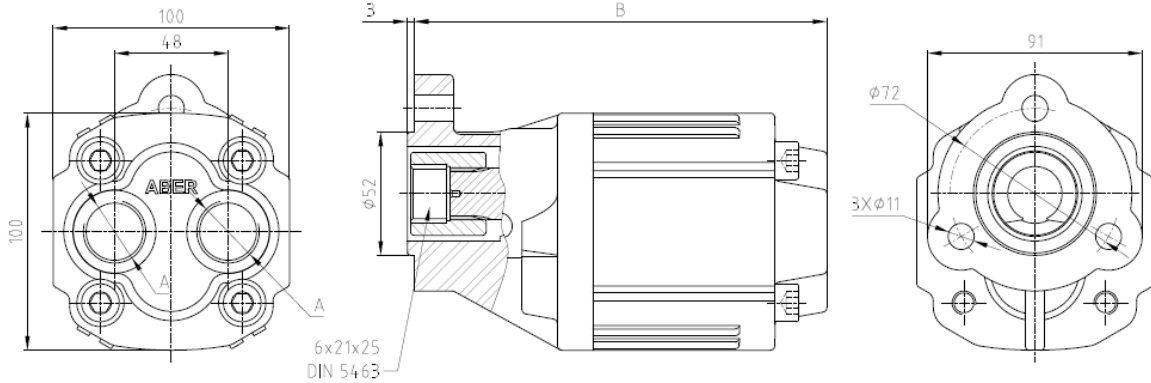
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Main Dimensions



Right hand

Left hand

(Dimensions in mm)

Main Data

Pumps B23T		12	16	20	25	32	40
Displacement	cm <sup>3</sup> /rev	12	16	20	26	32	39
Max. rotation speed	rpm	2200	2000	2000	2000	1800	1800
Min. rotation speed	rpm	500	500	500	500	500	500
Max. continuous pressure	bar	280	280	260	240	220	170
Max. intermittent pressure (max. 20s)	bar	300	300	280	260	240	190
Max. peak pressure (max. 6s)	bar	315	315	295	275	265	205
Weight	kg	5.0	5.4	5.7	6.1	6.7	7.3
Sense of rotation		Bi-directional					
A - Inlet /Outlet (DIN ISO 228)	G (BSP)	3/4"					
C	mm	142	148	154	161	171	182

How to order:

Example: Pump 20cm<sup>3</sup>/rev, continuous pressure up to 260 bar; peak pressure up to 295 bar, ref.B23T → B23T20

Fluids	mineral oils type ISO HM or DIN 51524-2 HLP	
Operating viscosity range	10 to 100 cSt (mm <sup>2</sup> /s) at working temperature	
Máx operating limits viscosity	750 cSt	
Oil temperature range	-25°C to 80°C	
Filtration	>200bar = 10µm	<200bar = 25 µm
In the application of any of these pumps; the use of these data does not exempt the reading of the instruction "Gear pumps recommendations before start-up".		

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Diagram  
Flow - Speed

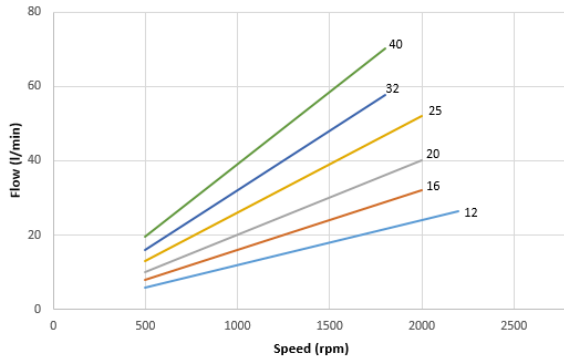
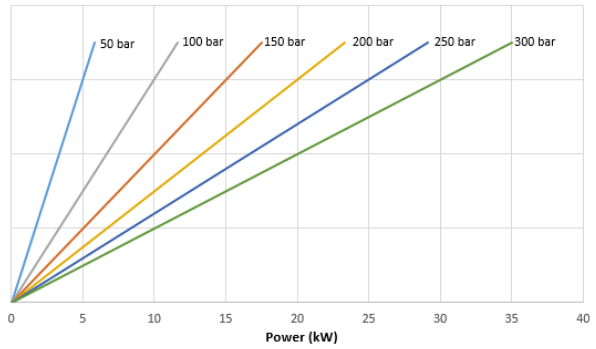


Diagram  
Input Power - Flow - Pressure



Hose dimensions

Inlet Hose	
Flow (l/min)	Internal pipe diameter (inch)
30-40	1"1/4
50-60	1"1/2
70-90	1"3/4

Outlet Hose				
Flow (l/min)	Internal pipe diameter (inch)			
	30	1/2"	1/2"	1/2"
40	5/8"	1/2"	1/2"	1/2"
50	5/8"	5/8"	5/8"	1/2"
60	3/4"	5/8"	5/8"	5/8"
70	1"	3/4"	3/4"	5/8"
80	1"	3/4"	3/4"	3/4"
90	1"	1"	1"	3/4"
	50-100	100-150	150-200	200-300
	<b>P (bar)</b>			

CTI B23T 2003- 04

**Important notes:**

- Other axis available, please consult "Axel options".

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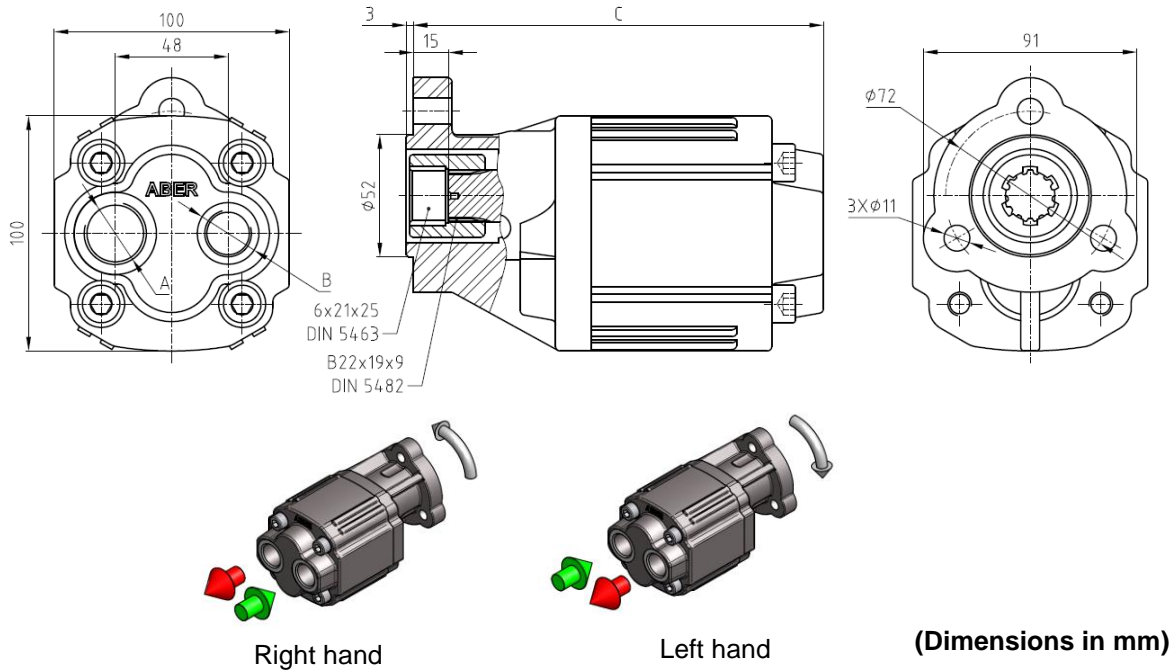
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Main Dimensions



Main Data

Pumps B23TU		12	16	20	25	32	40
Displacement	cm <sup>3</sup> /rev	12	16	20	26	32	39
Max. rotation speed	rpm	2200	2000	2000	2000	1800	1800
Min. rotation speed	rpm	500	500	500	500	500	500
Max. continuous pressure	bar	280	280	260	240	220	170
Max. intermittent pressure (max. 20s)	bar	300	300	280	260	240	190
Max. peak pressure (max. 6s)	bar	315	315	295	275	265	205
Weight	kg	5.0	5.4	5.7	6.1	6.7	7.3
Sense of rotation		Unidirectional (Left [L] or Right [R])					
A - Inlet (DIN ISO 228)	G (BSP)	3/4"					
B - Outlet (DIN ISO 228)	G (BSP)	1/2"					
C	mm	142	148	154	161	171	182

How to order:

Example: Pump 20cm<sup>3</sup>/rev, continuous pressure up to 260 bar; peak pressure up to 295 bar, ref.B23TU, rotation left → B23TU20L

Fluids	mineral oils type ISO HM or DIN 51524-2 HLP
Operating viscosity range	10 to 100 cSt (mm <sup>2</sup> /s) at working temperature
Máx operating limits viscosity	750 cSt
Oil temperature range	-25°C to 80°C
Filtration	>200bar = 10µm      <200bar = 25 µm
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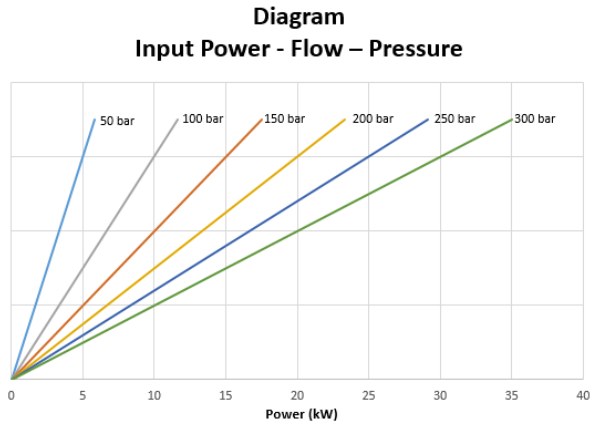
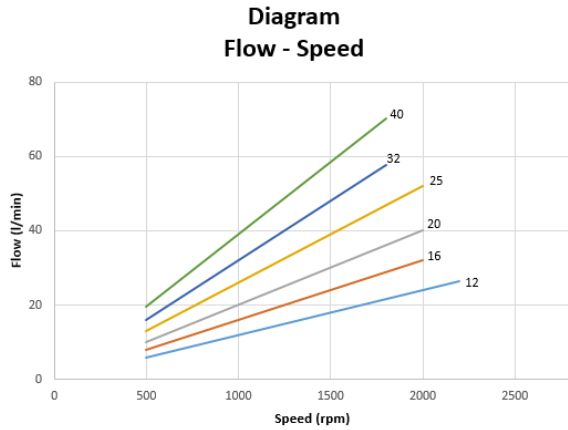
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**Hose dimensions**

Inlet Hose	
Flow (l/min)	Internal pipe diameter (inch)
30-40	1"1/4
50-60	1"1/2
70-90	1"3/4

Outlet Hose					
Flow (l/min)	Internal pipe diameter (inch)				
	30	1/2"	1/2"	1/2"	1/2"
40	5/8"	1/2"	1/2"	1/2"	
50	5/8"	5/8"	5/8"	1/2"	
60	3/4"	5/8"	5/8"	5/8"	
70	1"	3/4"	3/4"	5/8"	
80	1"	3/4"	3/4"	3/4"	
90	1"	1"	1"	3/4"	
		50-100	100-150	150-200	200-300
<b>P (bar)</b>					

**Important notes:**

- Other axis available, please consult "Axel options".

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



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