



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 ISO 4413:2010.

General information

BI pumps are bent axis piston pumps with single and double fixed displacement. They are available from 17 to 172 cm³/rev and with a maximum pressure of 450 bar. They can be assembled directly into the PTO, with the exception of the PTO of two shafts without support.

Features:

- high precision
- good performance
- maximum efficiency
- light weighted
- robust
- low environmental temperatures
- low noise
- less pulse
- changeable direction of rotation
- wide range of piston pumps

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 formula:

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

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 0,8 to 2 bar abs.

Admission line

0,5...1 m/s

Return line

2...3 m/s

Pressure line

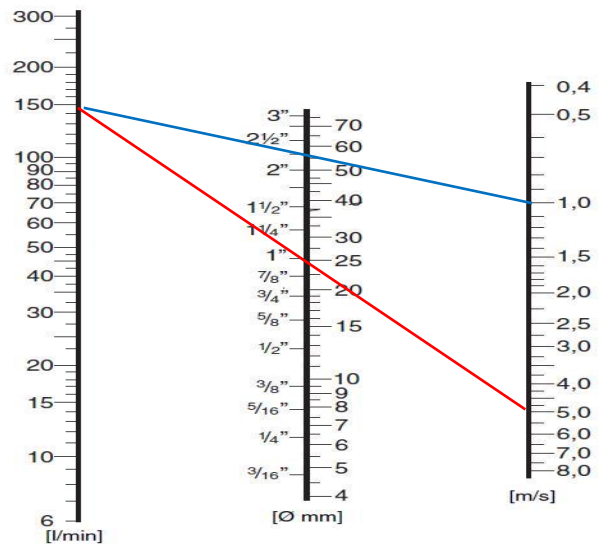
P = 0...50 bar - 3,5 m/s

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 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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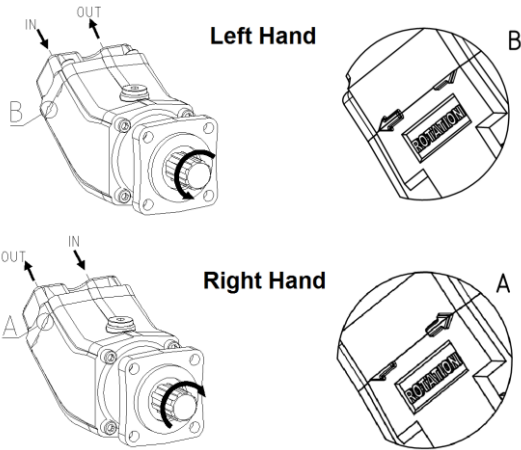
Rua Francisco de Almeida, Nº 30 – Vila Nova da Telha – 4470-410 Maia - Portugal
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BENT AXIS PISTON PUMPS RECOMMENDATIONS BEFORE START-UP

Direction of rotation

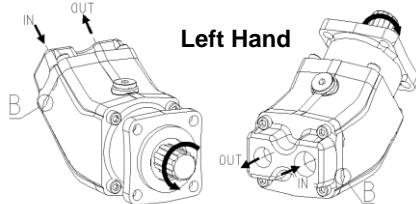
The direction of rotation of the pump must be according to the PTO rotation. ABER normally supplies pumps with left hand rotation, changeable if necessary.



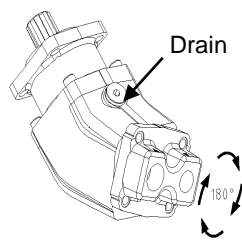
i Rotation sense is defined from drive shaft

Changing the rotation

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

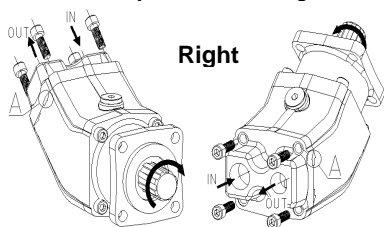


1. Fully unscrew the four end cover screws



2. Turn the end cover 180°

ATTENTION Paper gasket between cover and body, do not damage it.



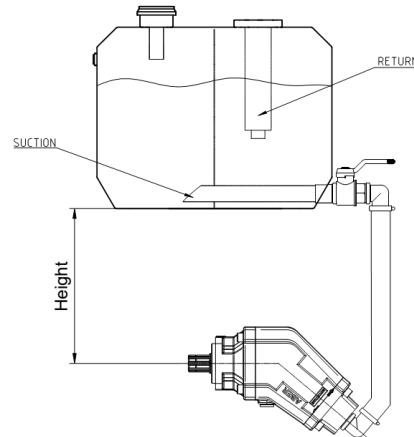
3. Screw again the four screws:
-Tightening torque M10 screws = 80Nm
-Tightening torque M12 screws = 110Nm

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)

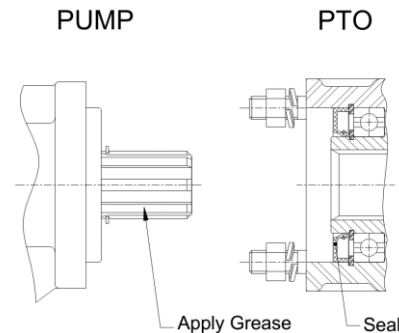
ATTENTION

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

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.





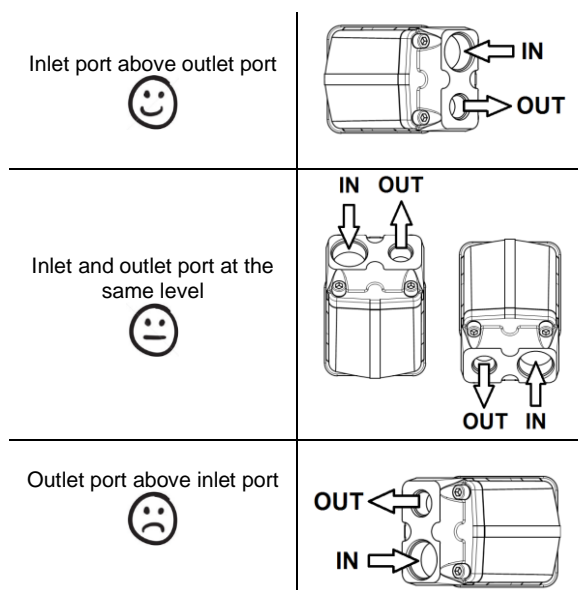
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3. Connect the pump to the PTO (apply 80Nm torque in the tightening nuts).

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. 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 50Nm.



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: 20 to 40mm²/s (cSt)

-Limits: 10 to 750mm²/s (cSt)

- Start-up viscosity range, without load: 750 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:

The maximum oil 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 higher than this value.

Oil changing

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

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 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 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.



BENT AXIS PISTON 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



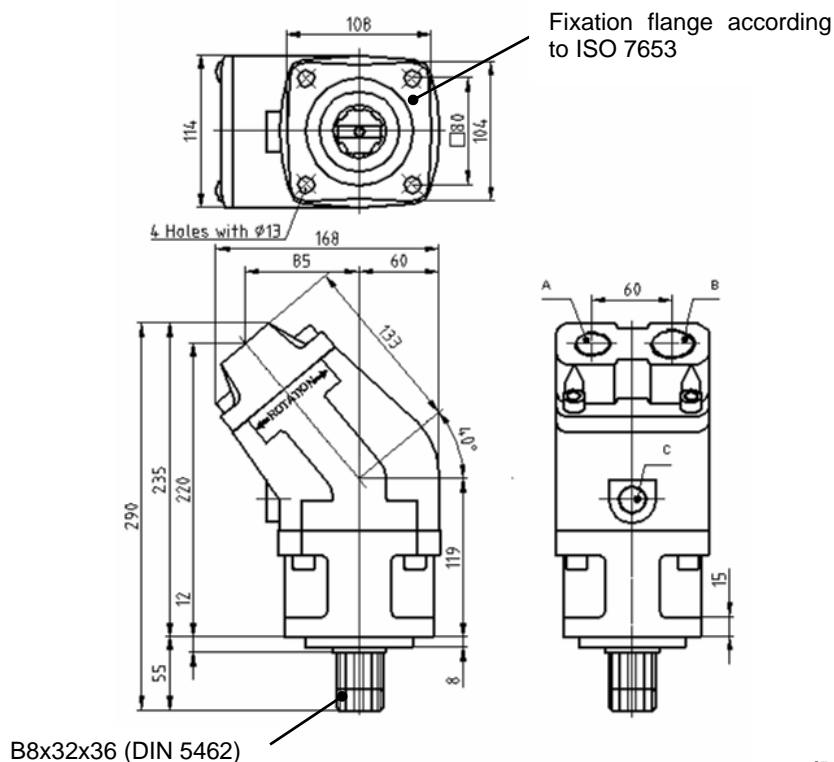
- ✓ A piston pump should be mounted by qualified personnel;
- ✓ When the pump is working, never touch or pull hoses or intermediate shaft when applied. When intermediate shaft is applied take into account that parts can be ejected;
- ✓ To install a piston pump or perform maintenance, the vehicle must 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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ABER HYDRAULICS S.A.

Rua Francisco de Almeida, Nº 30 – Vila Nova da Telha – 4470-410 Maia - Portugal
Phone: +351.22.9438070 | E-mail: aber@aber.pt | <http://www.aber.pt>

Main Dimensions



(Dimensions in mm)

Main Data

Pumps BI	17M	25M	30M	40M	50M	60M7	80M7
Displacement (cm ³ /rot.)	17.5	26	32	42	50	60	81
Max. operating pressure (bar)	400	400	400	400	400	400	300
Operating rotation ¹ (rpm)	2500	2500	2300	2300	2300	2000	1500
Max. rotation without load ¹ (rpm)	3200	3200	3000	3000	3000	2600	2000
Weight (approx.) (kg)	9.3	9.5	9.7	9.9	10.0	10.5	10.5
Pistons quantity	5					7	
A-Oil outlet (DIN ISO 228)	3/4" BSP	3/4" BSP	3/4" BSP	3/4" BSP	3/4" BSP	3/4" BSP	1" BSP
B-Oil inlet (DIN ISO 228)	1" BSP	1" BSP	1" BSP	1" BSP	1" BSP	1" BSP	1 1/4" BSP
C	Drain hole						

How to order:

Example: Pump 50cm³/rot; max. operating pressure up to 400 bar; ref. BI_M_ → BI50M

Fluids	mineral oils type ISO HM or DIN 51524-2 HLP
Recommended viscosity range	20 to 40 cSt (mm ² /s) at working temperature
Limits viscosity range	10 to 750 cSt (mm ² /s)
Start-up viscosity range, without load	750 to 1500 cSt (mm ² /s)
Filtration	10µm ISO4406 18/13
Inlet pressure range	0,8 to 2 bar abs
In the application of any of these pumps; the use of these data does not exempt the reading of the instruction "BI pumps recommendations before start-up"	

¹ 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).

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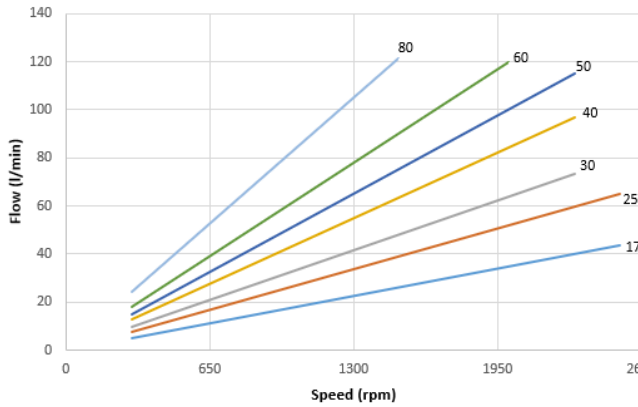
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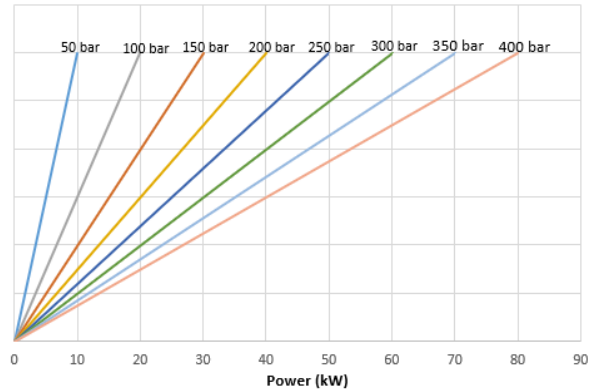
OIL-HYDRAULIC BENT PUMP AXIAL PISTONS

Ref. BI_M_

**Diagram
Flow - Speed**



**Diagram
Input Power - Flow – Pressure**



Hose dimensions

Inlet Hose	
Flow (l/min)	Internal pipe diameter (inch)
20-30	1"1/4
30-40	1"1/4
50-60	1"1/2
70-90	1"3/4
100-120	2"

Outlet Hose					
Flow (l/min)	Internal pipe diameter (inch)				
	20	1/2"	1/2"	1/2"	1/2"
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"
	50-100	100-150	150-200	200-300	300-350
	Pressure (bar)				

Important notes:

- To install one of these pumps, please consult and respect the instruction "BI pumps recommendations before start-up";
- Other axis available, please consult "Axel options".

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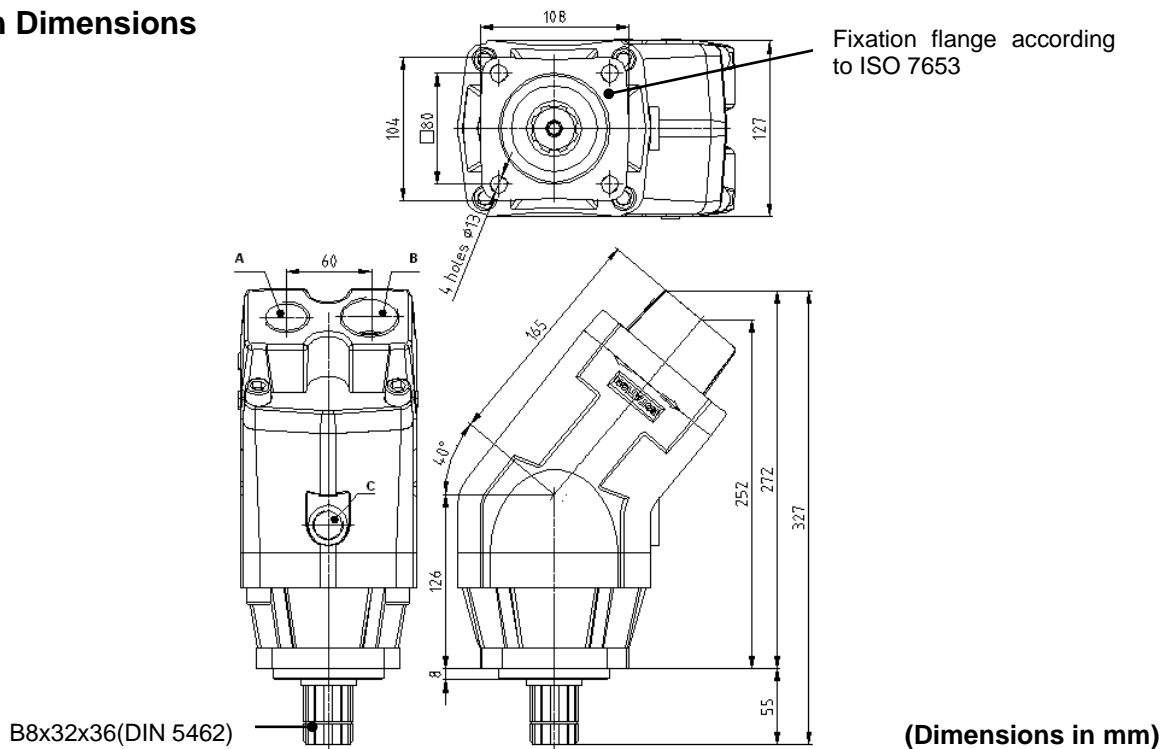
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OIL-HYDRAULIC BENT PUMP AXIAL PISTONS

Ref. BI_P7

Main Dimensions



Main Data

Pumps BI	80P7	110P7	125P7	135P7
Displacement (cm ³ /rot.)	80	108	126	136
Max. operating pressure (bar)	400	350	350	250
Operating rotation ¹ (rpm)	1800	1600	1500	1500
Max. rotation without load ¹ (rpm)	2000	1800	1700	1700
Weight (approx.) (kg)	13.0	13.4	13.6	13.8
Pistons quantity	7			
A-Oil outlet (DIN ISO 228)	1" BSP	1" BSP	1" BSP	1" BSP
B-Oil inlet (DIN ISO 228)	1 1/4" BSP	1 1/2" BSP	1 1/2" BSP	1 1/2" BSP
C	Drain hole			

How to order:

Example: Pump 80cm³/rot, max. operating pressure up to 400 bar; ref. BI_P7 → BI80P7

Fluids	mineral oils type ISO HM or DIN 51524-2 HLP
Recommended viscosity range	20 to 40 cSt (mm ² /s) at working temperature
Limits viscosity range	10 to 750 cSt (mm ² /s)
Start-up viscosity range, without load	750 to 1500 cSt (mm ² /s)
Filtration	10µm ISO4406 18/13
Inlet pressure range	0,8 to 2 bar abs

In the application of any of these pumps; the use of these data does not exempt the reading of the instruction "BI pumps recommendations before start-up"

¹ 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).

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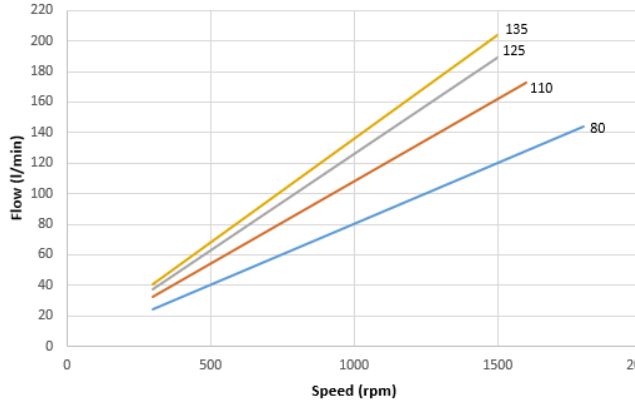
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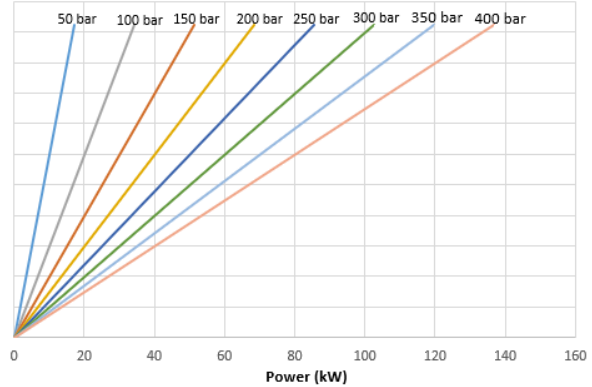
OIL-HYDRAULIC BENT PUMP AXIAL PISTONS

Ref. BI_P7

**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
100-120	2"
130-150	2"1/4
160-190	2"1/2
200-230	2"3/4

Outlet Hose					
Flow (l/min)	Internal pipe diameter (inch)				
	50-100	100-150	150-200	200-300	300-350
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
	Pressure (bar)				

Important notes:

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

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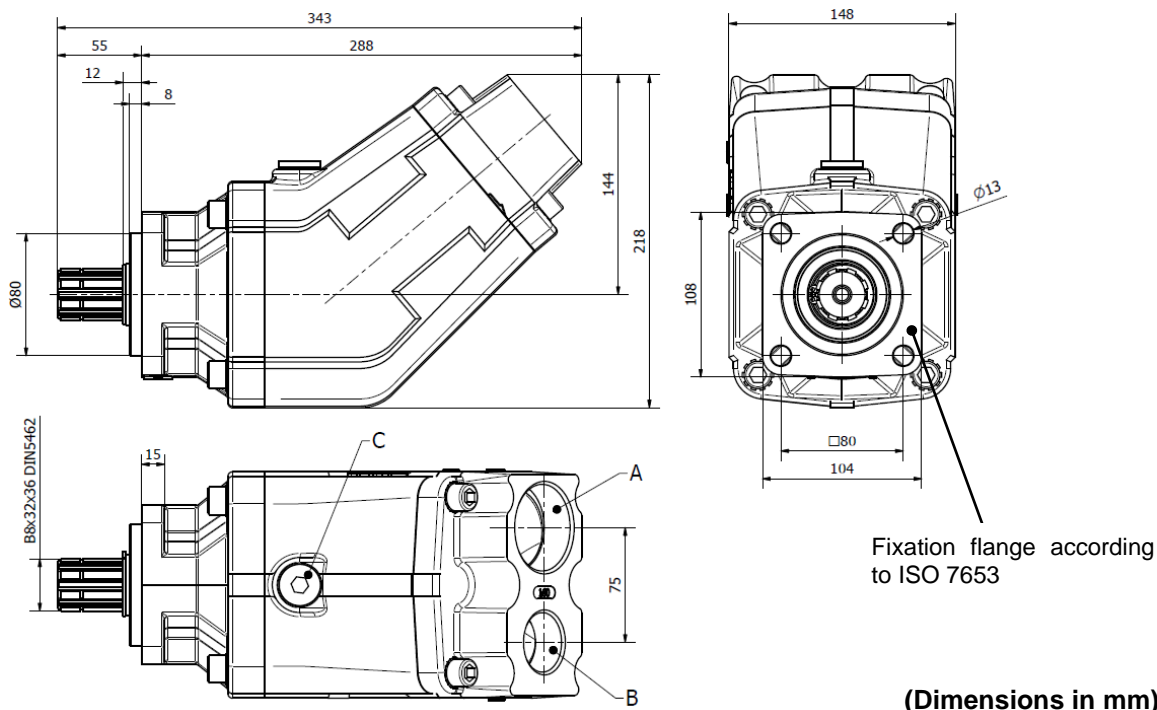
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Phone: +351.22.9438070 | E-mail: aber@aber.pt | <http://www.aber.pt>



OIL-HYDRAULIC BENT PUMP AXIAL PISTONS

Ref. BI_H9

Main Dimensions



Main Data

Pumps BI	140H9	160H9	170H9
Displacement (cm ³ /rot.)	142	156	172
Max. operating pressure (bar)	350	350	300
Operating rotation ¹ (rpm)	1500	1500	1500
Max. rotation without load ¹ (rpm)	1700	1700	1700
Weight (approx.) (kg)	19	19	19
Pistons quantity	9		
A-Oil inlet (DIN ISO 228)	2" BSP	2" BSP	2" BSP
B-Oil outlet (DIN ISO 228)	1"1/4 BSP	1"1/4 BSP	1"1/4 BSP
C	Drain hole		

How to order:

Example: Pump 140cm³/rot, max. operating pressure up to 350 bar; ref. BI_H9 → BI140H9

Fluids	mineral oils type ISO HM or DIN 51524-2 HLP
Recommended viscosity range	20 to 40 cSt (mm ² /s) at working temperature
Limits viscosity range	10 to 750 cSt (mm ² /s)
Start-up viscosity range, without load	750 to 1500 cSt (mm ² /s)
Filtration	10µm ISO4406 18/13
Inlet pressure range	0,8 to 2 bar abs
In the application of any of these pumps; the use of these data does not exempt the reading of the instruction "BI pumps recommendations before start-up"	

¹ 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).

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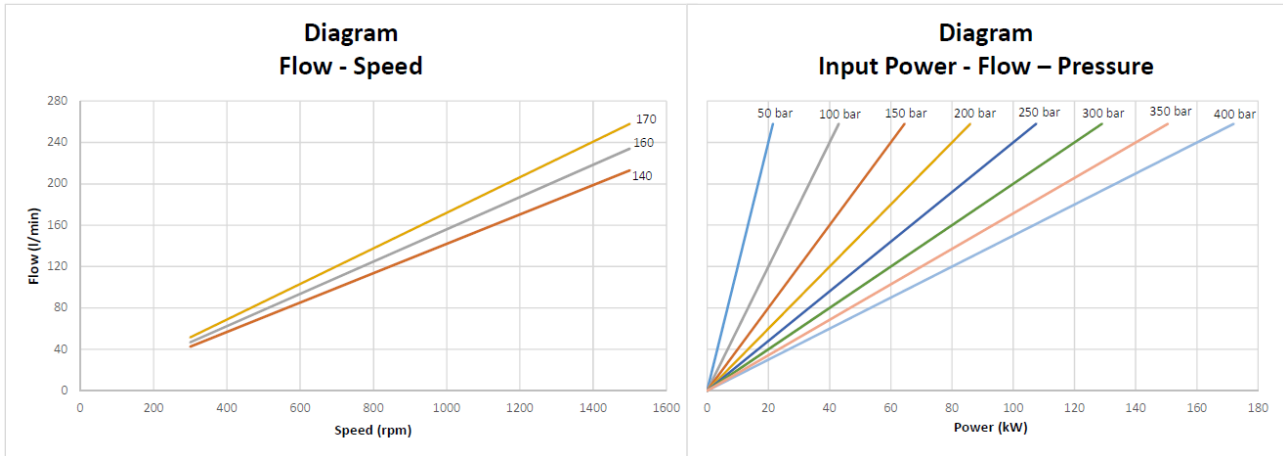
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OIL-HYDRAULIC BENT PUMP AXIAL PISTONS

Ref. BI_H9



Hose dimensions

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

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"	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
	Pressure (bar)				

Important notes:

- To install one of these pumps, please consult and respect the instruction "BI pumps recommendations before start-up";
- 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

ABER HYDRAULICS S.A.

Rua Francisco de Almeida, Nº 30 – Vila Nova da Telha – 4470-410 Maia - Portugal
Phone: +351.22.9438070 | E-mail: aber@aber.pt | <http://www.aber.pt>