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POLNA Automatic Machinery Plant

CENTRAL LUBRICATION EQUIPMENT

2009

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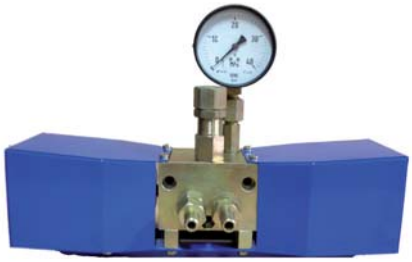
Central Lubrication Equipment
INTRODUCTION



Introduction

Friction, which occurs in all mechanisms, is, with few exceptions, an undesirable phenomenon which causes serious losses of energy used to overcome movement resistance and results in wear and tear of the machine elements by abrasion; in extreme situations it may make the mechanism seize and be damaged. In order to limit the negative effects of friction lubrication is used. The idea of lubrication is to separate, entirely or partially, the mating faces of machine elements by introducing a lubricating medium between them. Effective lubrication may be ensured only if the lubricant medium, of characteristics suitable for the friction pair, is fed reliably, in preset amounts and in required time intervals. Such requirements may only be met if a central lubrication system is used with the machine or device.

The devices and elements covered by the present manufacturing design of the POLNA Automatic Machinery Plant make it possible to construct many basic variations of central lubricating systems used in various branches of industry. These are two-way oiling systems, multi-way oiling systems, progressive oiling systems, systems for lubricating chain links of horizontal transport conveyors, equipment of lubrication stands in vehicle and machine service stations, as well as other executions for special applications (e.g. for applying to underground mine workings with no threat of explosion).

Continuous improvement of design and manufacturing technology means the systems have excellent functional characteristics and high quality.

Two-Way Force Feed Oiling Systems

The two-way force feeding oiling systems are mainly recommended to lubricate high-load machines and devices operating in difficult conditions, having a large number of friction nodes located at long distances and requiring intensive lubrication.

So far the equipment has been used in ironworks, steelworks, non-ferrous metal smelters, strip mine equipment, underground mine workings, cement mills, sugar factories, forging plants and other complexes with similar equipment and work conditions.

Construction

The two-way oiling systems consist of the following elements (Fig. 1):

- central lubrication pumps (with electric or manual drive) (1),
- controlling distributor (hydraulic or electromagnetic) which changes the direction of the lubricator feeding (2),
- dosing distributors (two-way feeders) located on the lubrication main conduit lines at the points where the grease is received and passed to the reception points (3),
- system operation controller (4),
- filling pump (5),
- pipes (I and II) and connectors (6).

The choice of an oiling system with a manual or electric drive pump depends mainly on the frequency of lubrication and the number of lubricating points. If there are only a few points which need lubrication and the frequency of lubrication is once a shift or less, a system containing the pump with manual drive is recommended but if the system feeds a lot of lubrication points located at great distance and/or requiring frequent lubrication, the electric drive pump with automatic operation should be used in the system.

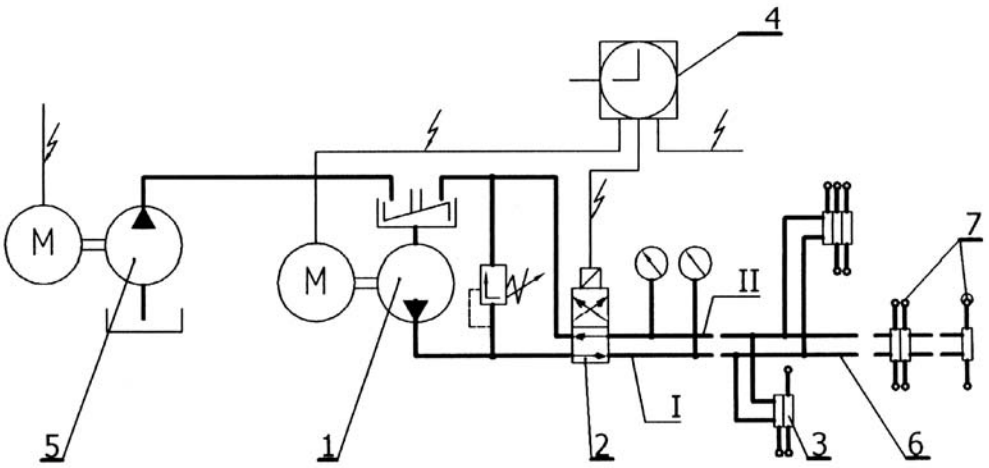


Fig. 1 Construction diagram of the two-way force feed oiling systems

If there is a large distance between lubrication points and they are arranged in a line, a system with an electromagnetic control distributor is recommended. If the lubrication points are grouped in a limited area, the system with a hydraulic distributor has more advantages. Schemes of the systems are available with individual catalogue cards.

Operation

The pump with an electric drive forces the grease through the control distributor to one of the two main lubrications conduit lines and then to the dosing distributors (feeders). After the grease is fed by dispensers to the lubrication points and pressure in the filled line increases up to the preset value, the control distributor starts and directs the forced lubricant to the other line, with simultaneous „relief" as a result of connecting with the overflow of the first one. The moment the distributor starts, the pump engine stops. In this condition, the lubrication system is prepared to complete the next cycle.

After the preset (with a time relay of the control device) time lag the pump engine starts again and the system operating cycle repeats analogically with the other lubrication line.

The pump engine may also be started manually by turning the hand wheel of the control device connector into position. The lubricant pressure in the main conduit lines at which feeders start operating and then the distributor sets is preset, in the case of the system with a hydraulic distributor, with an overflow valve located in the distributor. In systems with an electromagnetic distributor, the lubricant pressure is determined with electric contact manometers or with pressure relays located at the end of the longest branch of the lubrication main conduit line. Any damage to the oiling system which results in extending the time of pump engine operation, as compared to the preset time value (e.g. pipe leakages, damage to the pump forcing assembly, etc.) are signalled by an acoustic or optical alarm system located in the control device.

The moment the alarm is activated, the pump engine stops.

The lubricating system used un the machine or technical device, in order to ensure efficient lubrication, should have appropriate construction elements selected and other values which condition proper operation determined.

Preparatory works for using the lubrication system are being designed now.

For detailed instructions on the selection of elements and parameters refer to “Two-Way Force Feed Oiling Systems. How to Select Elements and Basic Parameters” at the end of this catalogue.

Multi-Way Force Feed Oiling Systems

The multi-way systems (Fig. 2) are often used on the same objects as the two-way systems. Sometimes they serve as a supplement, however, compared to the two-way systems, they reach a fewer number of lubrication points and cover a smaller area. They are recommended for use in locations where continuous feeding of a small amount of grease is required.

In these systems, the lubricating medium is fed to each reception point with a separate line directly from the pump, under the pressure which depends on flow resistance. They are used in machines for plastic metalworking, plastic and rubber forming, to lubricate hoist and transport devices, industrial pumps, pulp and paper making machines, etc. An advantage of the multi-way systems, in comparison to others, is their simple construction (pump and grease feeding lines), as well as being easy to drive. The Pumps are usually driven by the machine they lubricate, which enables avoiding unnecessary control devices. The lubricating process starts and ceases automatically as the lubricated machine is activated or stops. There are also pumps with their own electric drive. In such cases, the pump engine also starts and stops together with the machine.

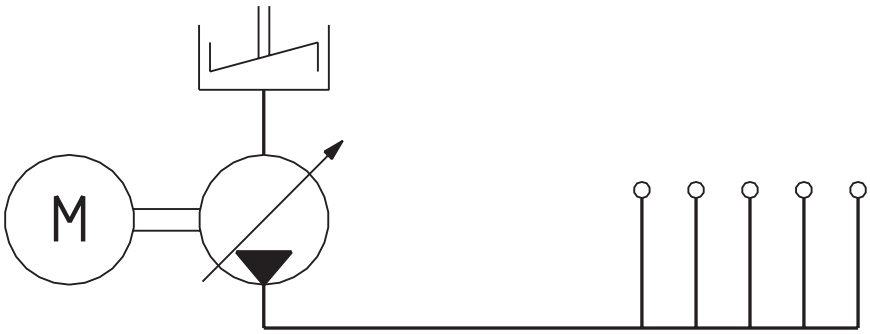


Fig. 2 Scheme of a multi-way oiling system

Progressive Force Feed Oiling Systems

In progressive lubrication systems lubricating medium is fed to the reception points by distributors in a fixed order and present amounts. They may operate continuously or periodically and, depending on the forcing device used, these may be systems for oil or plastic lubrication. These systems are recommended for use in machining centres, plastic forming machines, textile machines and many others of similar construction and working conditions.

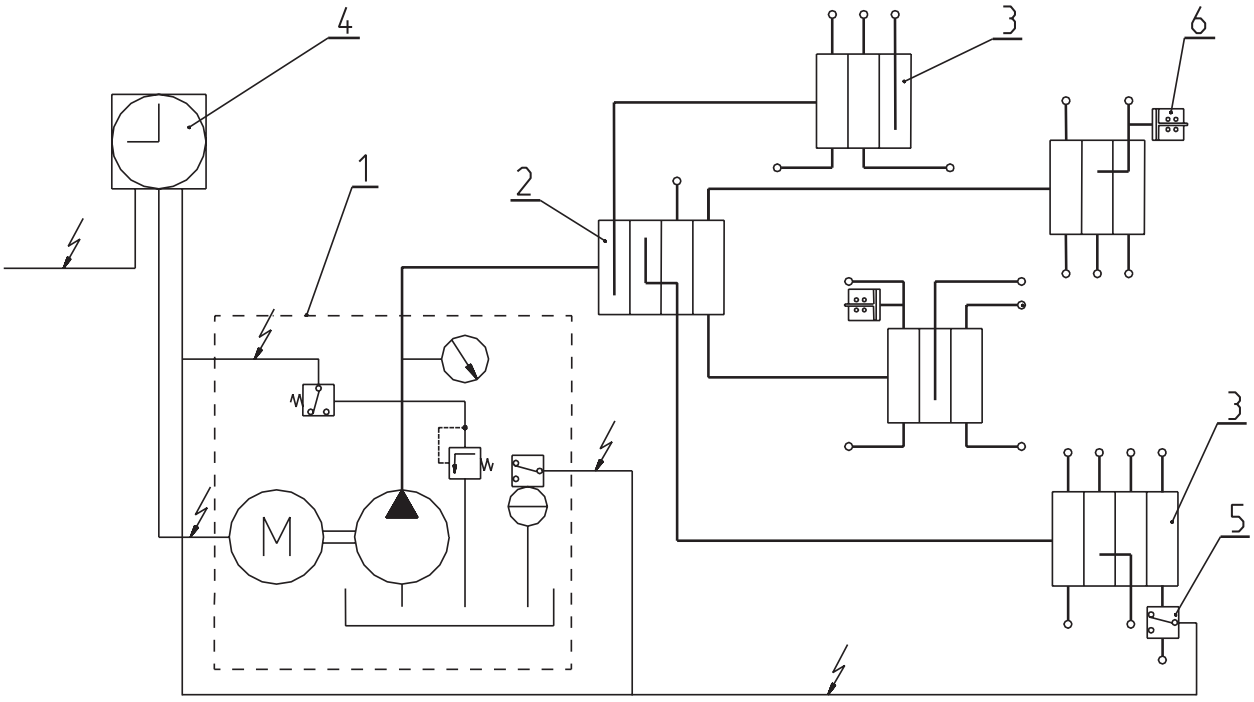


Fig. 3 Example scheme of a progressive force feed oiling systems

1 – lubricating unit, 2 – primary distributor, 3 – secondary distributor, 4 – control device, 5 – piston movement indicator, 6 – pressure indicator.

Construction and operation

A lubrication system (Fig. 3) consists of a forcing device (1) (lubricating unit, pump or other) feeding the central lubrication system with the grease, of progressive primary (2) and secondary (3) dosing distributors which distribute and feed the lubrication medium to the reception points of the device controlling the system operation (4) as well as of elements which control and ensure proper operation (5 & 6).

The principle of operation of these systems is that the lubrication medium is distributed gradually by the primary distributors and then by the secondary and subsequent distributors. The lubrication medium may be fed to the reception points from the outlets of each row of distributors. The lubricating system cycle ends when the slides of all distributors have completed the reciprocating movement and the grease has been fed through all the outlets. The next cycle operation cycle may start only after the previous one has finished. In order to detect and locate points of the system inefficiency (a choked line, restrained slide in the distributor e.g. due to seizure, etc.), indicators and/or pressure relays (6) are used on the distributors. The indicators show pressure growth in the lubrication system above the value necessary to its proper operation. In order to control completion of each operation cycle, the piston movement indicator (5) is used in the system.

Lubrication Systems of Horizontal Transport Conveyor Chain

Lubrication systems are designed to lubricate elements of roll sets in horizontal transport conveyor chains. They may also be used to lubricate other types of transport chains.

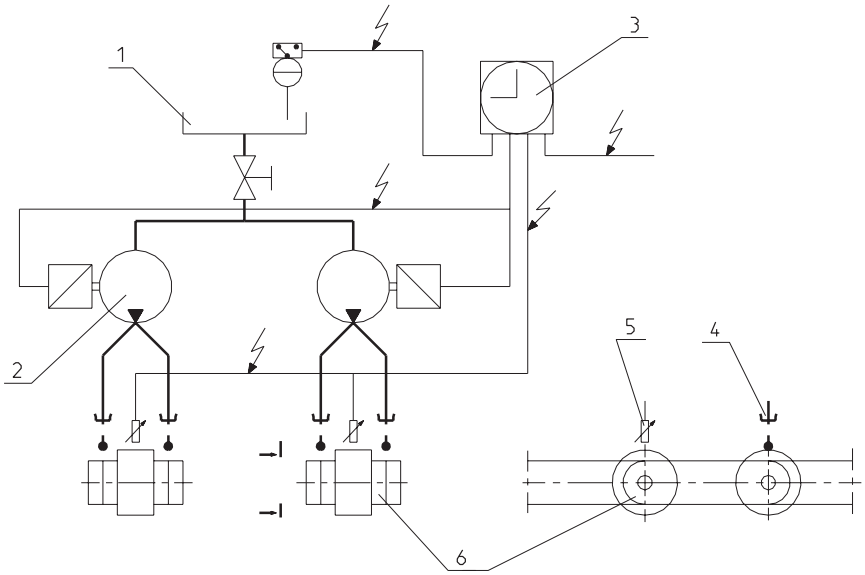


Fig. 4 Constriction of a lubrication system

A lubrication system consists of (Fig. 4) an oil tank (1), separate or connected to a pump, a piston pump activated with an electromagnet (2), a control device (3), dosing valves (nozzles) (4), as well as an inductive proximity switch (5). The system operation works with the proximity switch, responding to the approaching chain roll (6) (or other protruding element), with the pump feeding oil to lubrication areas through dosing valves. The system operation cycle is repeated until oil is fed to all sets of chain rolls and then switches off.

Variations

- A system with one four-outlet pump of 0.05 cm3/stroke or 0.075 cm3/stroke efficiency with independently installed tank of 6.3 dm3 capacity and one proximity detector. Recommended for a conveyor with a short distance between chains and little possibility of uneven chain tension.
- A system with two two-outlet pumps of 0.05 cm3/stroke or 0.075 cm3/stroke efficiency, with two tanks of 2.5 dm3 capacity each, connected to pumps and two proximity detectors. Recommended for short conveyors (up to 10m).
- A system with two two-outlet pumps of 0.05 cm3/stroke or 0.075 cm3/stroke efficiency, independently installed tank of 6.3 dm3 capacity and two proximity detectors. Recommended for long conveyors.
- A system with one two-outlet pump of 0.05 cm3/stroke or 0.075 cm3/stroke efficiency with a tank of 2.5 dm3 capacity and one proximity detector. Recommended for short one-chain conveyors.

Note:

Descriptions of devices included in progressive force feed oiling systems and in horizontal transport conveyor chains are available in separate catalogues of POLNA Automatic Machinery Plant.

Equipment of Lubrication stands in Vehicle and Machine Service Stations

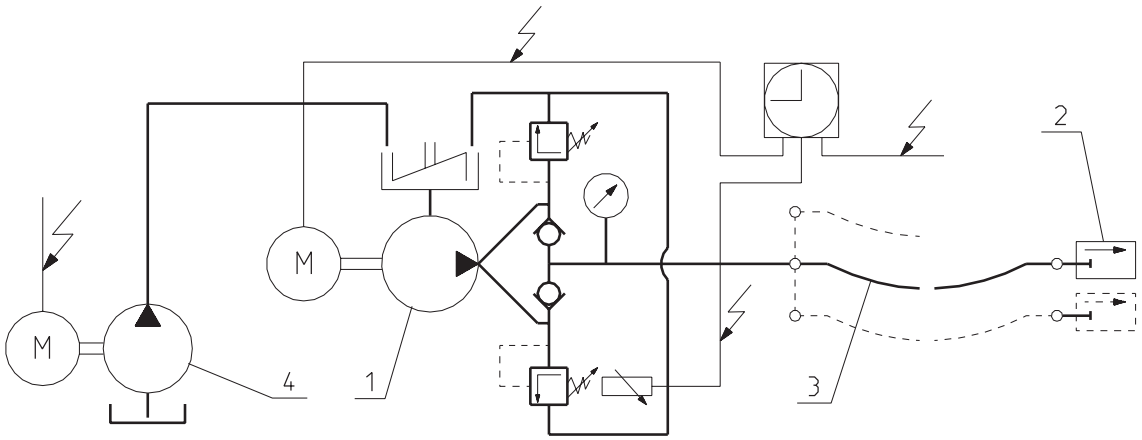


Fig. 5 Constructional diagram of equipment of lubrication stands in vehicle and machine service stations

Such a device consists of (Fig. 5) a PA12 lubricating pump (1) of two efficiency and pressure ranges, with an electric programmer and lubrication gun (2) connected to the hydraulic pump by a flexible hose (3). The lubrication gun has a set of couplers adjustable to various ball lubricators. The grease from the pump to the lubrication point fitted with a ball lubricator is fed while the lubrication gun opens. The accessories to the lubrication unit may include a pump trolley and a tank-filling pump (4).

Using such a system instead of widely used various lubricators with a manual, foot-operated or air-operated drive has the following advantages:

- improvement of industrial safety conditions,
- increase efficiency of lubrication maintenance,
- ensuring high lubrication efficiency, especially in not easily accessible nodes of vehicle chasses.

The pump electric drive makes it possible to use this device in various conditions. This may be a stationary system, a system movable on its own chassis or even located in stand-by service vehicles.

Equipment for Two-Way Force Feed Oiling Systems

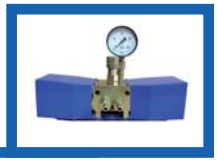
Central lubrication pump PD 11 i 31

Central lubrication pump PD 20 i PD 30

Central lubrication pump PD 40

Pump with manual drive PR 14

Four-way electromagnetic distributor ER



Two-way feeders DD

Control unit SAS

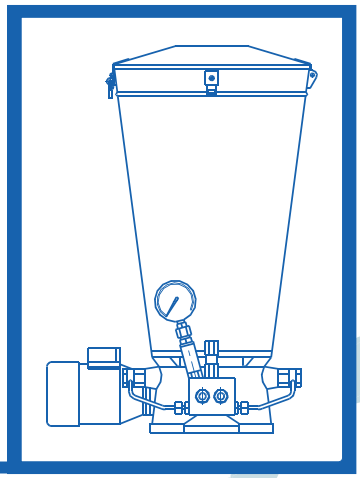
Loading pump PZ 20

Loading pump PZ 31

Loading pump PZ 40

~~Screwed pipe couplings with a ball end~~

CENTRAL LUBRICATION PUMP
PD 11, PD 31 Type



Central lubrication pump PD 11& PD 31

Central Lubrication pump PD11 & PD 31

Application

The pump is designed to lubricate friction nodes in machines and devices through dosing distributors (two-way feeders). It is recommended for use in high-load machines and devices, with a large number of lubrication points located at long distances and requiring intensive lubrication, e.g. in ironworks, steelworks, non-ferrous metal smelters, strip mines, building material plants, cement mills, sugar factories and other complexes with similar equipment and work conditions The pump in overflow valve execution (PD 11), working with an electromagnetic distributor located in the lubricating system outside the pump, is recommended to serve machines and devices set in a line and a long distance from each other. In the hydraulic distributor execution (PD 31), the pump is recommended to serve machines and devices not located in a line and at short distances from each other. The pump with an overflow valve (PD 11) may be used in other types of lubrication systems.

Construction

The pump consists of the following units (Fig. 1):

- a tank with a grease feeding device,
- a drive unit comprising an electrical motor, single-stage worm gear put into a common body with a cam power transmission system,
- two forcing units comprising forcing elements in which pistons receive power from the cam power transmission system, return valves and pressure conduits,
- an overflow valve located on the body of the power transmission system at the grease outlets from the forcing units or from the hydraulic distributor with an overflow valve and miniature connector mating one of the distributor's slides,
- an electric device signalling the minimum and maximum level of lubricant in the tank (special accessory).

Operation

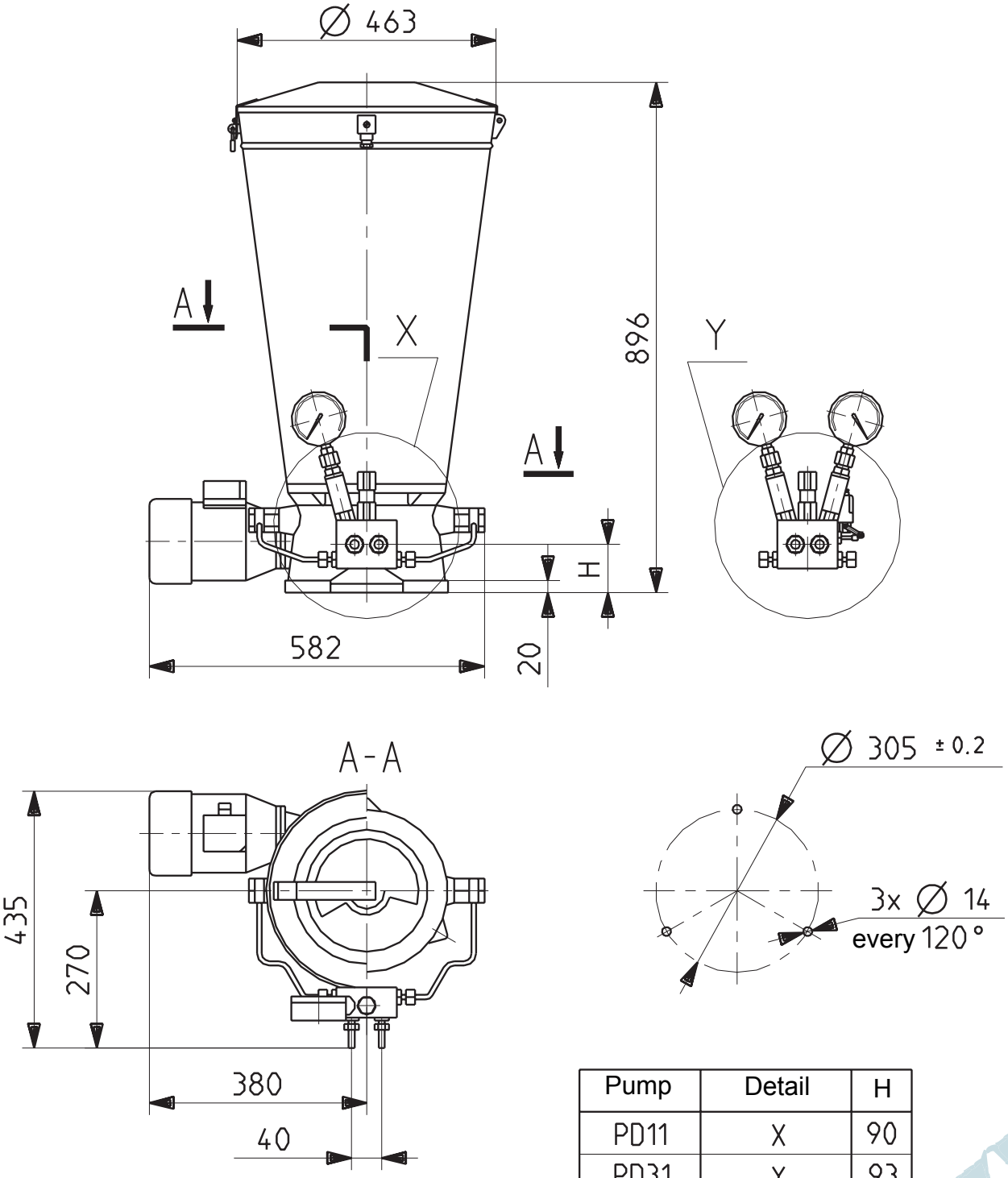
The pump is powered by an electric motor. The engine shaft rotation is transmitted through a worm gear to the eccentric system and grease feeding device. The feeding device drift fender separates the lubricant from the tank face, while the feeding screw of the device kneads it initially and passes to the sucking area of the forcing units. Pistons of the forcing units, activated to reciprocating movement by the eccentric system, force the lubricant through to the overflow valve or distributor and then to the lubrication system.

Depending on the position of control elements in the distributor, the grease is directed to one of the two main lubrication conduit lines and then to the dosing distributors.

After the grease is fed to the reception points by the dosing distributors and the lubricant pressure increases up to the preset value, the control distributor is activated and directs the forced grease to the other line. The moment the distributor is activated, the pump engine stops and starts again only after the preset time-lag passes. The pump may also operate the moment the distributor is activated, without stopping the engine.

The lubricant pressure in the main conduit lines at which the direction of forcing switches is preset, in the case of the system with an electromagnetic distributor – with pressure relays or electro-contact manometers located at the ends of the main lubrication conduit line and in the case of the system with a hydraulic distributor – with an overflow valve located in the distributor.

The pump tank should be filled through a filtered loading coupling with a PZ 31 or PZ 40 filling pump.



Pump	Detail	H
PD11	X	90
PD31	Y	93

Fig. 1 Central lubrication pump of PD 1 & PD 11 type

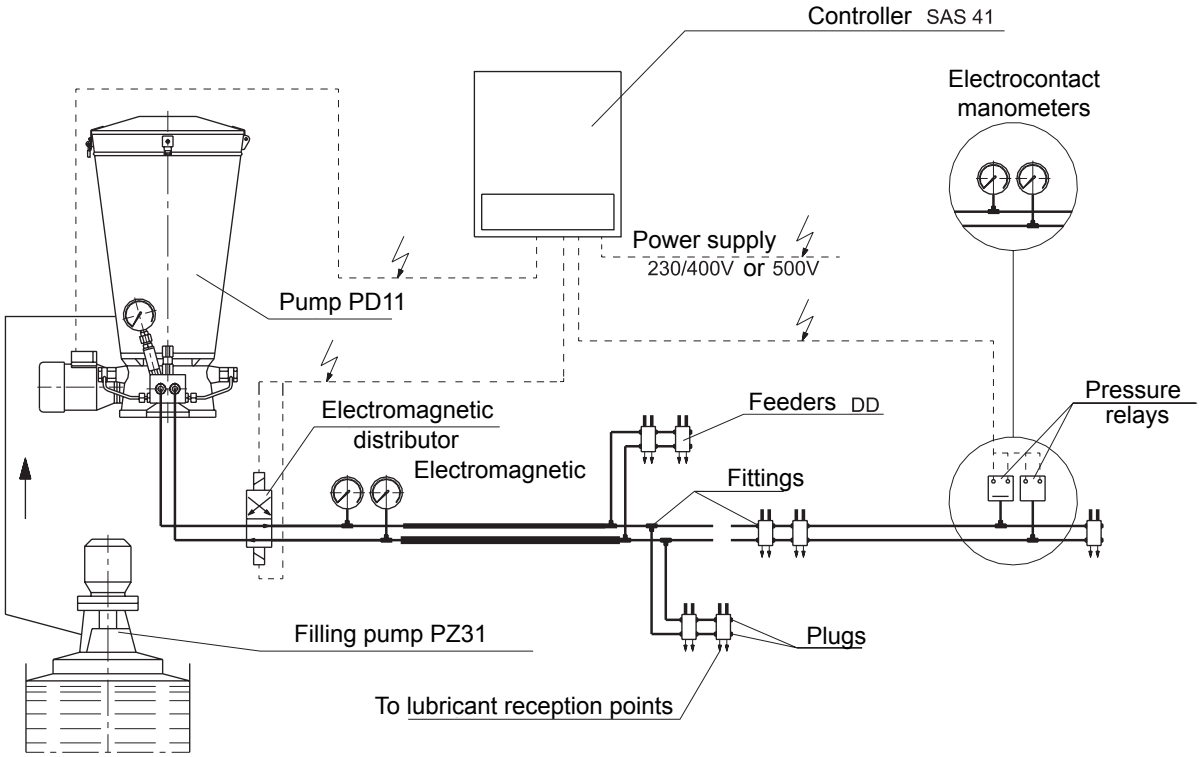


Fig. 2 Construction diagram of the central lubrication system with a PD 11 pump

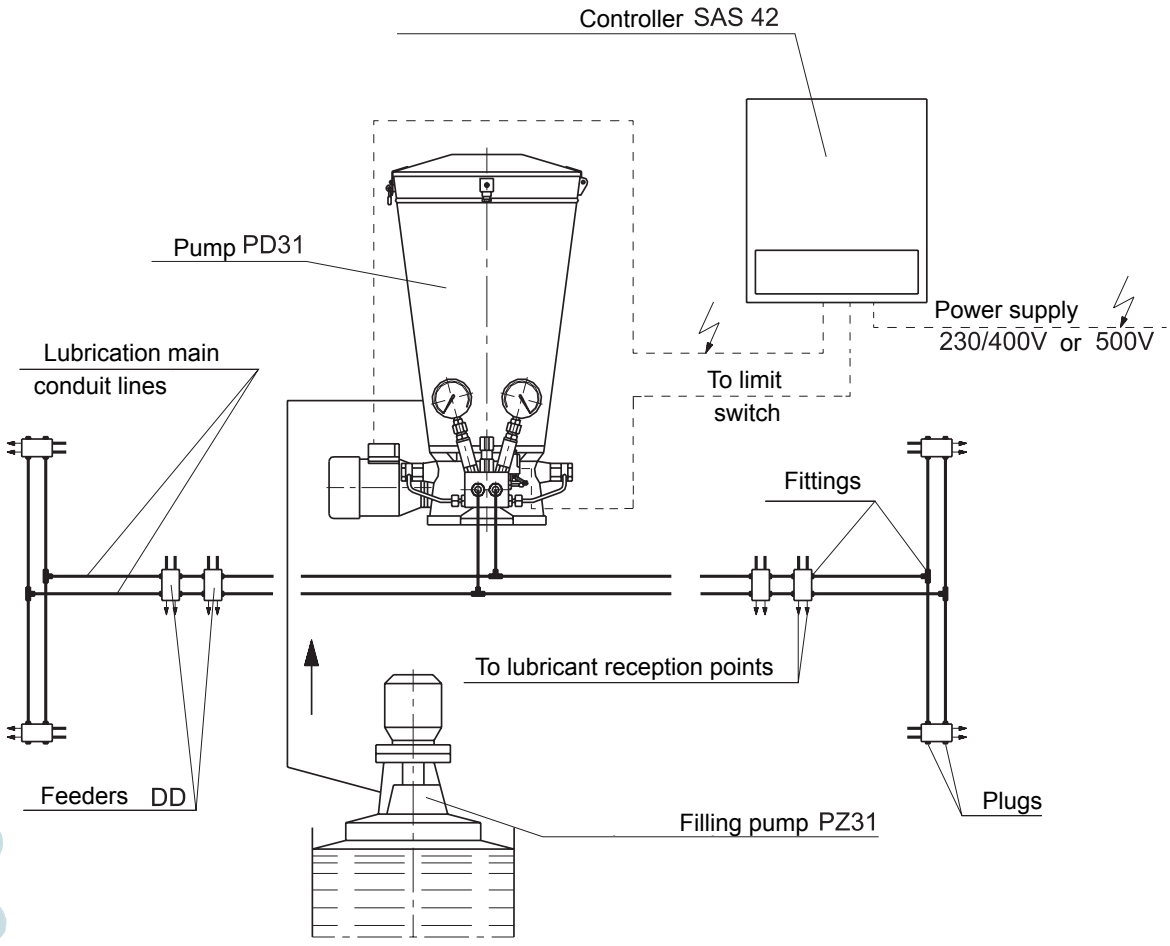
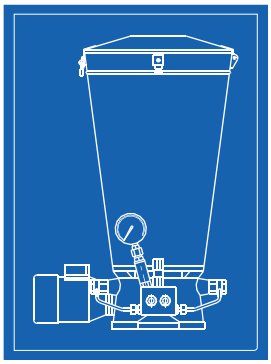


Fig. 3 Construction diagram of the central lubrication system with a PD 31 pump

Technical details



Delivery	
at the pressure up to 20 MPa	250 cm^3/min
at the pressure up to 40 MPa	150 cm^3/min
Nominal pressure	20 MPa or 40 MPa
Power demand	0,75 kW
Rated voltage	230/400 V or 500 V, 50 Hz
Lubricants forced	plastic grease of the consistence class $\leqslant 2$ acc. to PN/72 C-04095 (NLGI) or lubricating oils of $\geqslant$ 30 cSt. /50°C viscosity
Ambient temperature	-10 ... 60°C
Tank capacity	63 dm^3
Weight	65 kg
Pipe connection couplings	straight couplings 320-10 wg. PN-65 M-73126

Execution

Central lubrication pump is made in the construction varieties mentioned in the table and marked as follows:

- **type of the pump**

PD 11 - central lubrication pump with an overflow valve, mating an electromagnetic distributor
PD 31 - central lubrication pump with a hydraulic control distributor

- **types of lubricants forced**

A - oil
B - plastic grease

- **pump delivery**

1- 150 cm^3/min
2- 250 cm^3/min

- **level gauge used / not used**

1 - used
2 - not used

- **rated voltages**

1 - 230/400 V
2 - 500 V

Type of pump	Type of lubricant	Delivery	Level gauge	Rated voltage
PD 11	A	1	1	1
				2
			2	1
				2
		2	1	1
				2
			2	1
				2
	B	1	1	1
				2
			2	1
				2
		2	1	1
				2
			2	1
				2
PD 31	A	1	1	1
				2
			2	1
				2
		2	1	1
				2
			2	1
				2
	B	1	1	1
				2
			2	1
				2
		2	1	1
				2
			2	1
				2

Placing orders

The order should include name and symbol of the pump according to the table.

Examples of pump symbols:

- central lubrication pump with an overflow valve, oil-forcing, with delivery of 250 cm^3/min, with a level gauge in the tank, with 230/400 V rated voltage 230/400 V

PD 11A-2-1-1

- central lubrication pump with a hydraulic distributor forcing plastic grease, with delievery of 150 cm^3/min,without a level gauge, with 500 V rated voltage.

PD 31B-1-2-2

Manufacturer and Distributor
Zakłady Automatyki „Polna” S.A.
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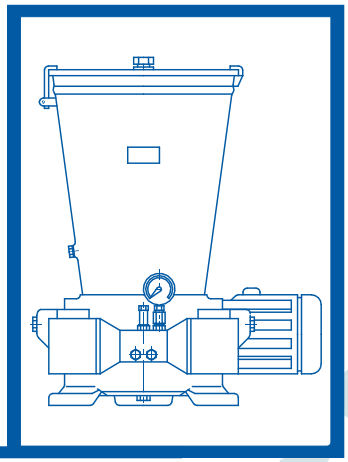
www.polna.com.pl
e-mail: marketing@polna.com.pl

CENTRAL LUBRICATION PUMP
PD 20 & PD 30 Type



Central lubrication pump PD 20 & PD 30

Central lubrication pump PD 20 & PD 30

Application

The pump is used for periodical plastic grease feeding to machine friction nodes through two-way feeders. It is recommended for use in high-load machines and devices, with a large number of lubrication points located at long distances and requiring intensive lubrication (e.g. in ironworks, steelworks, non-ferrous metal smelters, strip mines, cement mills, sugar factories etc.). Central lubricating system with the PD 20 pump (with an electromagnetic distributor) is recommended to serve machines and devices located in a line and at significant distances from each other. The central lubricating system with the PD 30 pump (with a hydraulic distributor) is recommended to serve machines and devices not located in a line and at short distances from each other.

Construction

Central lubrication pump consists of the following basic assemblies:

- lubricator tank with a feed mechanism
- power unit comprising an electric motor, two gears: a roll and a worm one, as well as a connecting rod assembly with a crosshead all assembled in a common body,
- two forcing units comprising working pistons coupled with the crosshead assembly slide, return valves and filters,
- electromagnetic distributor with an overflow valve, manometer and connections (Fig. 3 Detail X) or hydraulic distributor (Fig. 3 Detail Y).

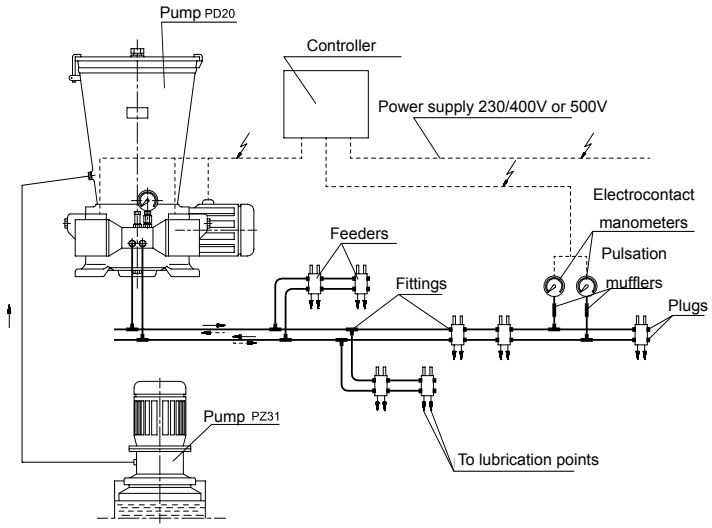


Fig. 1 Construction diagram of the central lubrication system with a PD 20 pump

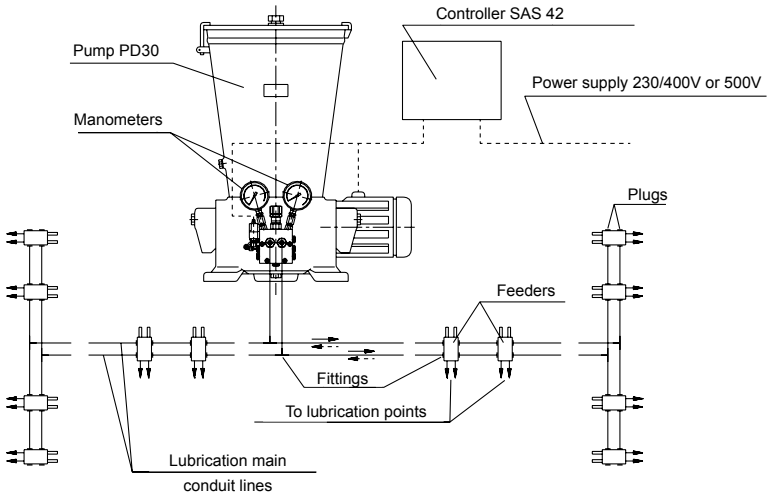
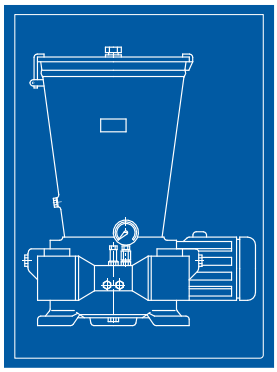


Fig. 2 Construction diagram of the central lubrication system with a PD 30 pump

Operation

The pump is powered by an electric motor. The engine shaft rotation is transmitted through a clutch and reduction gear to the connecting rod assembly with a crosshead and grease feeding device. The feeding device drift fender separates the lubricant from the tank face, while the feeding screw of the device kneads it initially and passes to the sucking area of the forcing units.
Pistons of the forcing units, with a reciprocating movement induced by the connecting rod assembly with a crosshead, force the lubricant through filters to the distributor.
Depending on the position of slides in the distributor, the grease is directed to one of the two main lubrication conduit lines and then to the dosing feeders. After the grease is fed to the reception points by the dosing distributors and the lubricant pressure increases up to the preset value, the distributor is activated and directs the forced grease to the other line. At the moment the distributor is activated, the pump engine stops and starts again only after the preset time-lag passes, automatically or manually (if the lubrication system is not equipped with a control device).
The pump may also remain operating the moment the distributor is activated, without stopping the engine.
The pressure level in the main lines, at which the grease forcing direction switches is determined by pressure relays or electrocontact manometers installed at the ends of lubrication main conduit lines, while in the PD30 pump systems - by the overflow valve installed on the distributor.
The pump tank is filled with lubricant through the loading coupling by the filling pump of PZ 31 or PZ 40 type.

Technical details



Delivery	
at the pressure up to 20 MPa	400 cm^3/min
at the pressure up to 32 MPa	200 cm^3/min
at the pressure up to 40 MPa	100 cm^3/min
Nominal pressure	20, 32, 40 MPa
Power demand	1,1 kW
Rated voltage at 50 Hz	230/400 V or 3x500 V
Lubricants forced	plastic grease of the consistence class $\leqslant 2$ acc. to PN/72 C-04095 (NLGI)
Ambient temperature	-10 ... 60°C
Tank capacity	70 dm^3

Placing orders

The order should include name and symbol of the pump according to the table.

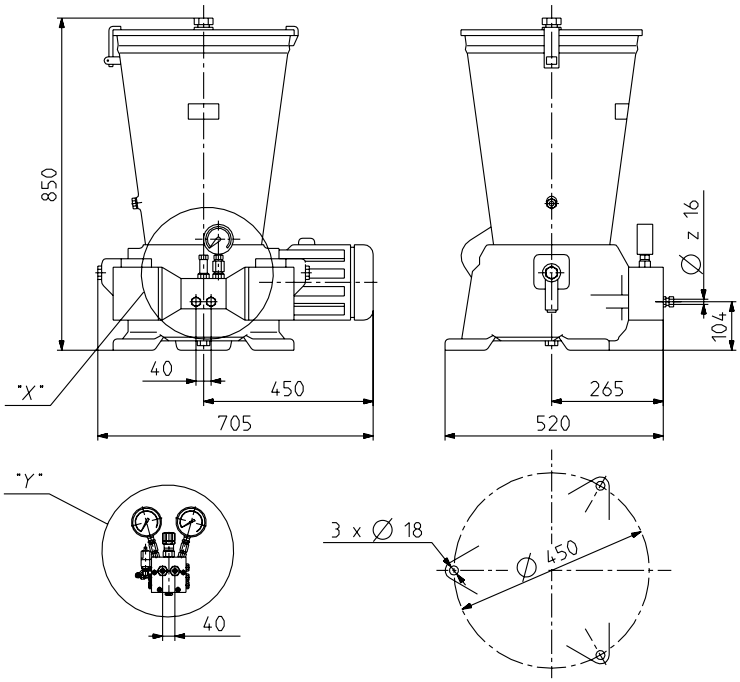


Fig. 3 Overall and linkage dimensions of the pump

Execution

Central lubrication pump of PD type is made in construction varieties listed in the table and marked as follows:

- type of pump
  - PD 20 – central lubrication pump with an electromagnetic distributor
  - PD 30 – central lubrication pump with a hydraulic distributor

- nominal pressure
  - 1 – up to 20 MPa
  - 2 – up to 32 MPa
  - 3 – up to 40 MPa

- rated voltage
  - 1 - 230/400 V at 50 Hz
  - 2 - 500 V at 50 Hz

- construction varieties of hydraulic distributor
  - A – distributor without a limit switch
  - B – distributor with a limit switch

Delivery

Type of pump	Nominal pressure	Rated voltage	Construction variety of hydraulic distributor
PD 20	1	1	NA
		2	
	2	1	
		2	
PD 30	1	1	A
		2	
		1	B
		2	
	2	1	A
		2	
		1	B
		2	
	3	1	A
		2	
		1	B
		2	

Manufacturer and Distributor
Zakłady Automatyki „Polna” S.A.
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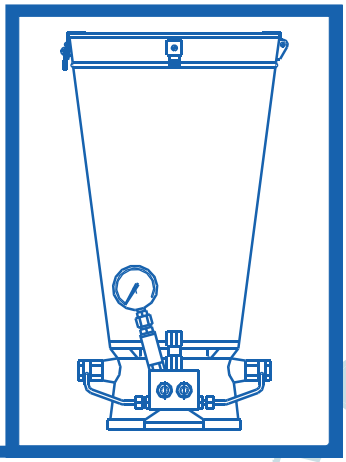
www.polna.com.pl
e-mail: marketing@polna.com.pl

CENTRAL LUBRICATION PUMP
PD 40 Type



Central lubrication pump PD 40

Central lubrication pump PD 40

Application

The pump is used for periodical plastic grease or oil feeding to machine friction nodes through two-way feeders (dosing distributors). It is recommended for use in high-load machines and devices with up to 50 lubrication points, located short distances from each other and requiring intensive lubrication (e.g. machines and devices in ironworks, steelworks, non-ferrous metal smelters, mining industry, building material plants, on ships etc.).

The pumps in overflow valve execution (PD 40A-10-…or PD 40B-10-…), working with an electromagnetic distributor located in the lubricating system outside the pump are recommended to serve machines and devices set in a line and a long distance from each other. Pumps in the hydraulic distributor execution (PD 40A-30-… or PD 40B- 30-…) are recommended to serve machines and devices not located in a line and at short distances from each other. The pumps of PD 40-10 execution may also be used in other systems, e.g. progressive ones.

Construction

The pump consists of the following assemblies:

- lubricator tank with a feed mechanism
- power unit comprising an engine, two gears: a roll and a worm one, as well as a connecting rod assembly with a crosshead all assembled in a common body,
- two forcing units comprising bodies, pistons coupled with slides of the connecting rod assembly with a crosshead and return valves,
- an overflow valve located at the outlet of the pump or hydraulic control distributor comprising a body, slides and an overflow valve.

Operation

The pump is powered by an electric motor. The engine shaft rotation is transmitted through reduction gears to the connecting rod assembly with a crosshead and grease feeding device. The feeding device drift fender separates the lubricant from the tank face, while the feeding screw kneads it initially and passes to the sucking area of the forcing units. Pistons of the forcing units, with a reciprocating movement induced by the connecting rod assembly with a crosshead, force the lubricant through from the tank to the distributor. Depending on the position of control elements in the distributor, the lubricant is directed to one of the two main lubrications conduit lines and then to the dosing distributors. After the grease is fed to the reception points by the feeders and the lubricant pressure increases up to the preset value, the distributor is activated and directs the forced grease to the other line. At the moment the distributor is activated, the pump engine stops and starts again only after the preset time-lag passes, automatically or manually (if the lubrication system is not equipped with a control device). The pump may also remain operating the moment the distributor is activated, without stopping the engine.
The lubricant pressure in the main conduit lines at which the direction of forcing switches is preset, in the case of the system with an electromagnetic distributor – with pressure relays or electro-contact manometers located at the ends of the main lubrication conduit line and in the case of the system with a hydraulic distributor – with an overflow valve located in the distributor. The pump tank is filled with lubricant through the loading coupling by the filling pump of PZ 31 or PZ 40 type.

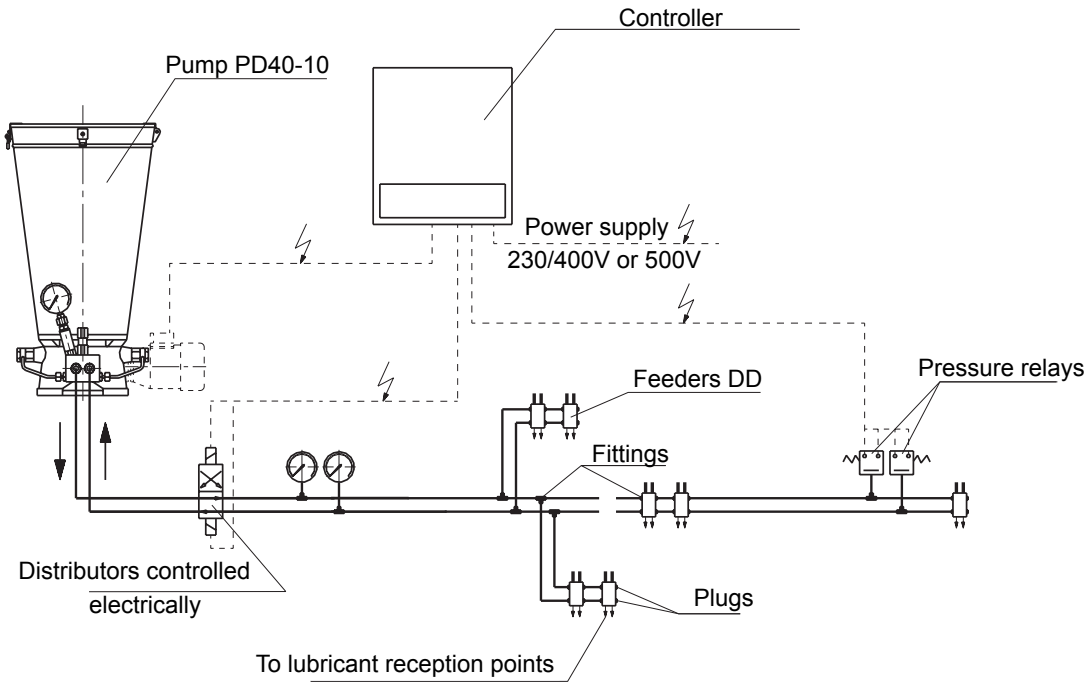


Fig. 1 Construction diagram of the central lubrication system with a PD 40-10 pump

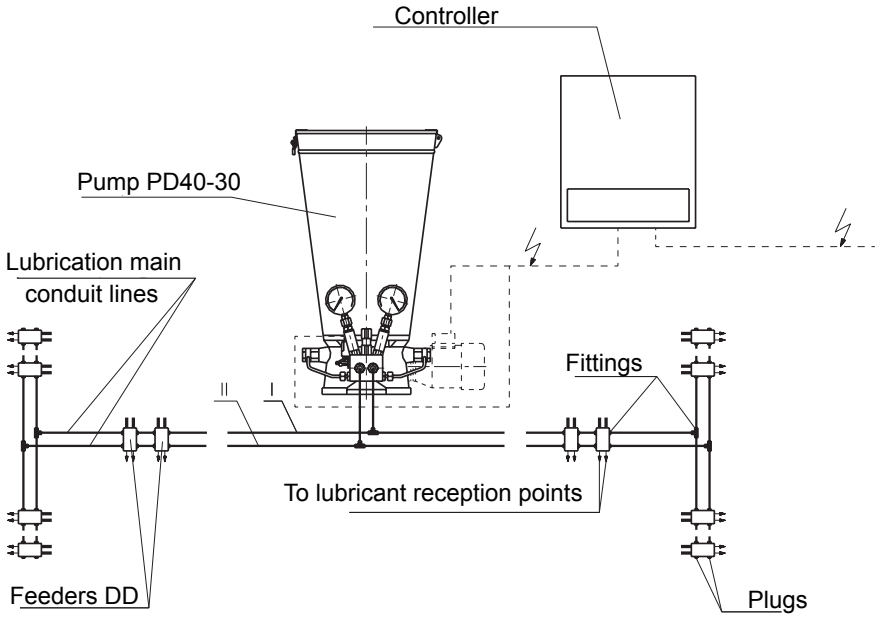
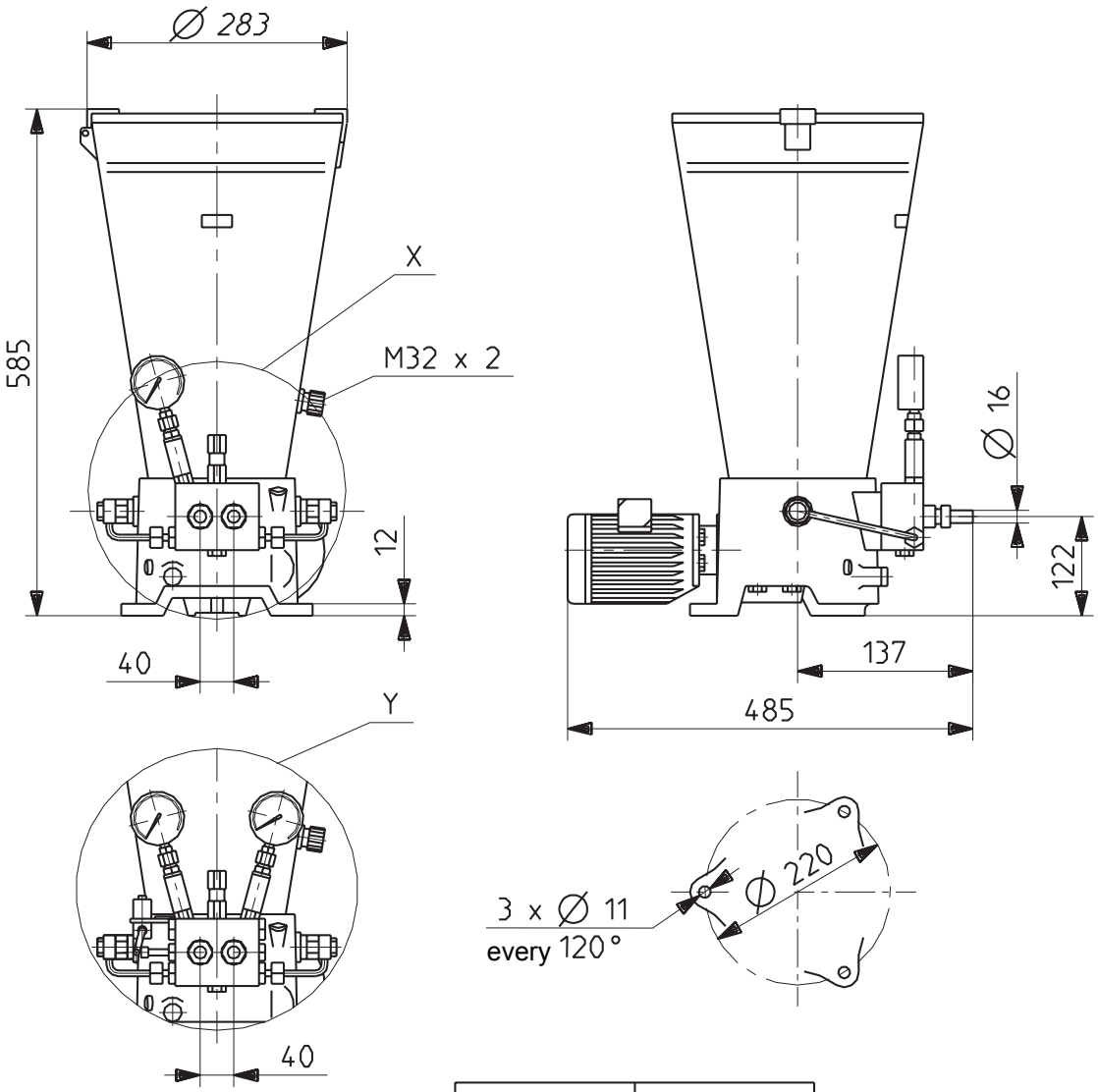


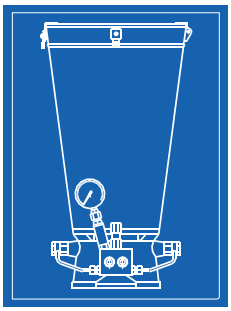
Fig. 2 Construction diagram of the central lubrication system with a PD 40-30 pump



Type of pump	Detail
PD40-10	X
PD40-30	Y

Fig. 3 Overall and linkage dimensions of the pump

Technical details



Delivery	60 cm^3/min or 30 cm^3/min
Nominal pressure	20 MPa
Power demand	0,38 kW
Rated voltage at 50 Hz	230/400 V lub 500 V
Lubricants forced	plastic grease of the consistence class $\leqslant 2$ acc. to PN/72 C-04095 (NLGI) or lubricating oils of $\geqslant$ 30 cSt./50°C viscosity
Ambient temperature	-10 ... 60°C
Tank capacity	15 dm^3
Weight	27 kg

Execution

The pump is made in the construction varieties listed in the table; they differ in the type of control distributor used in the oiling system, type of the lubricant forced, as well as their engines' nominal voltage.

Pump execution	Type of distributor	Lubricant	Rated voltage [V]
PD 40A-10-1	pump with overflow valve	oils	230/400
PD 40A-10-2			3x500
PD 40B-10-1		plastic grease	230/400
PD 40B-10-2			3x500
PD 40A-30-1	pump with hydraulic distributor	oils	230/400
PD 40A-30-2			3x500
PD 40B-30-1		plastic grease	230/400
PD 40B-30-2			3x500

Placing orders

The order should include name and execution of the pump.

Manufacturer and Distributor
Zakłady Automatyki „Polna" S.A.
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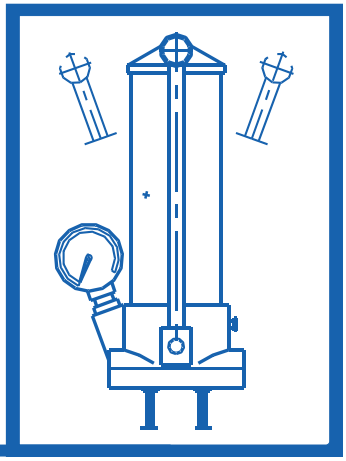
PUMP WITH MANUAL DRIVE
PR 14 Type

Pump with manual drive PR 14



Pump with manual drive PR 14

Application

The pump is used for periodical plastic grease feeding to machine mating faces through distributors (two-way feeders). It is recommended for use in machines and devices with up to 50 lubrication points, operating periodically and requiring not very frequent lubrication.

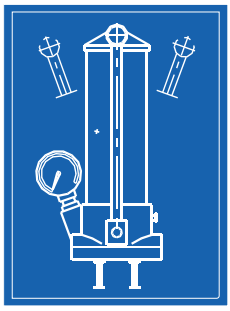
Construction

The pump consists of the following assemblies: lubricant tank, pump body with forcing system elements, distribution slide altering the lubricant feeding direction, drive lever, manometer with pulsation muffler and a tank-filling coupling. In the lubricant tank, there is a spring piston connected to a shank with marks indicating the maximum and minimum content of the tank.

Operation

The pump is driven by the lever. The power is transmitted with a gear wheel sector to the bi-directional piston. During the piston reciprocating movement, the lubricant is sucked from the tank and forced through the return valve to the distribution slide chamber. The distribution slide is set manually with a handle in one of the extreme positions.
Depending on the position of distribution slide, the grease is forced to one of the two main lubrication conduit lines and then to the dosing feeders. After the lubricant is fed to the reception points, forcing is continued and lubricant pressure increases which is indicated by the manometer located on the pump. At this moment the pump operation stops and the distribution slide is switched into the other extreme position. After the preset time-lag the pump is activated again and the operation cycle repeats analogically with the other lubrication main conduit line. The spring piston falls down as the content of lubricant in the tank decreases, which facilitates sucking the lubricant by the forcing system. The pump tank is filled with lubricant by the filling pump PZ 20.

Technical details



Delivery	8 cm^3 /double piston stroke
Nominal pressure	10 MPa
Tank capacity	3 dm^3
Thrust force on the lever an nominal pressure	ok. 120 N
Types of lubricant forced	plastic grease of the consistence class ≤ 1 acc. to PN-72/C-04095 (NLGI)
Ambient temperature	-10 ... 60°C
Weight	9,8 kg

Placing orders

The order should specify the name and type of the pump.

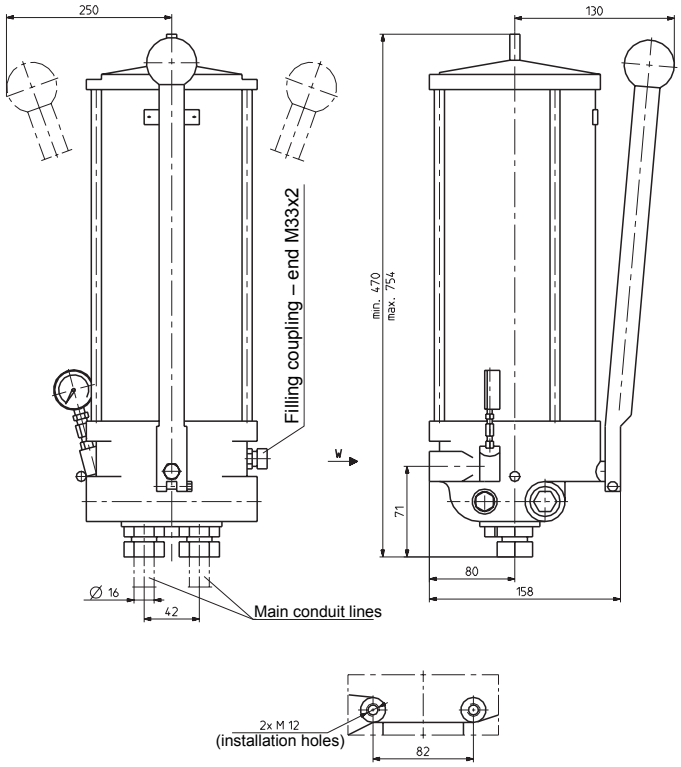


Fig. 1 Overall and linkage dimensions of the pump

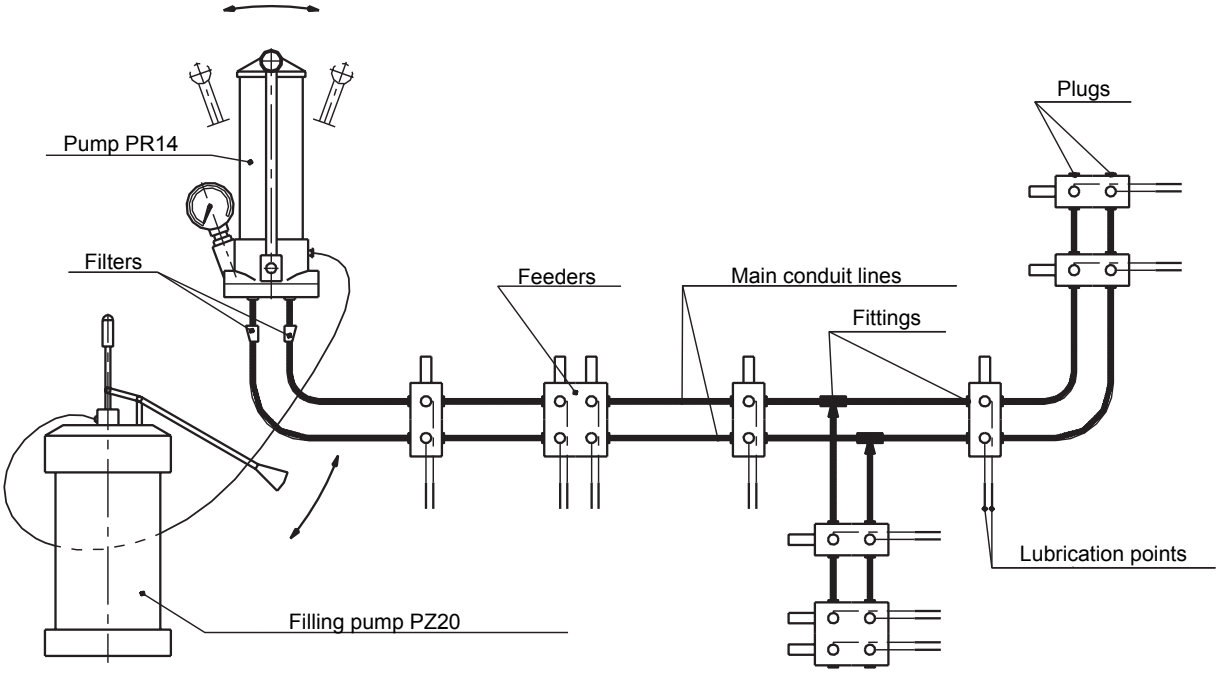


Fig. 2 Example scheme of an oiling system

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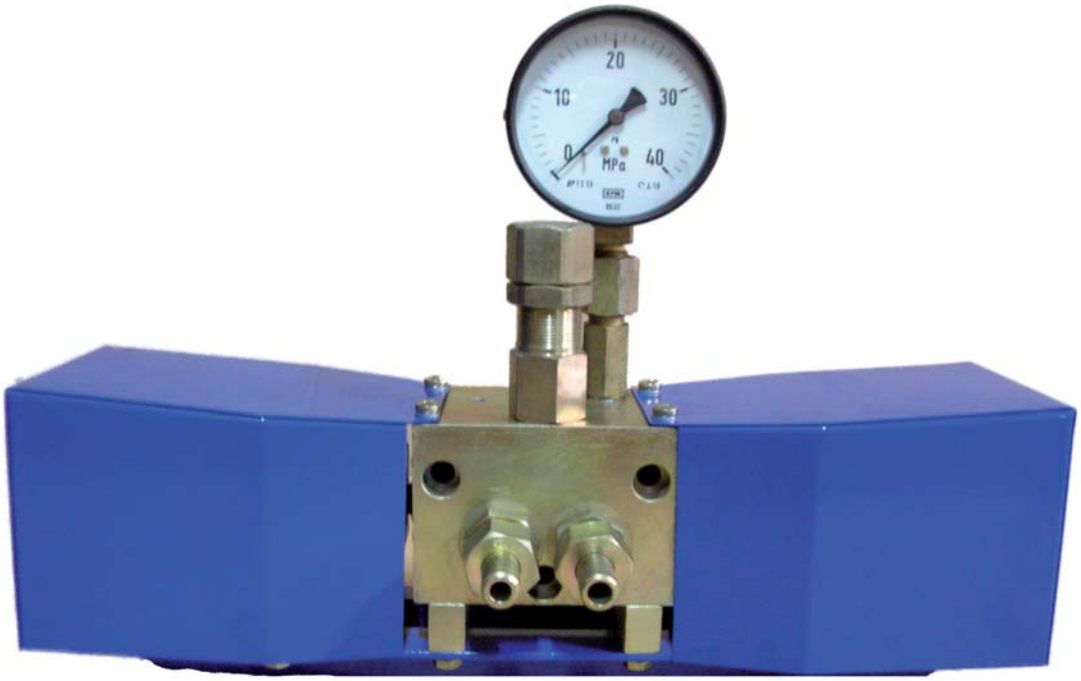
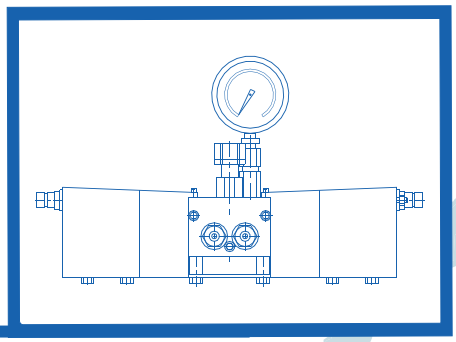
FOUR-WAY ELECTROMAGNETIC DISTRIBUTOR
ER Type



Four-way electromagnetic distributor ER



Four-way electromagnetic distributor ER

Application

The distributor is designed to alter direction of the lubricant flow in the two-way central lubrication system. It is used in a lubrication system (close to a pump) where the pump has no distributor.

Construction and operation

The distributor consists of the following assemblies and elements:

- slide distributor fitted with an overflow valve and a manometer with a pulsation muffler,
- two electromagnets whose armatures are connected with the distributor slide and core housings with the distributor body – with brackets,
- mounting plate connected with the distributor body,
- four straight switches for connecting lines feeding and carrying the lubricant off.

Depending on the position of control elements in the distributor, the lubricant is directed to one of the two main lubrication conduit lines (Fig. 1) and then to the dosing distributors (feeders). While one of the lines is being fed with lubricant, the other is connected to the tank. After the distributors feed the lubricant to the reception points and the lubricant pressure increases up to the preset value, voltage is applied to the electromagnet coil and the distributor is reset. When the slide moves from one extreme position to the other, the lubricant is directed to the other line of the main conduit and at the same time the first line is connected to the tank. After each lubrication cycle finishes, the distributor operation repeats analogically.

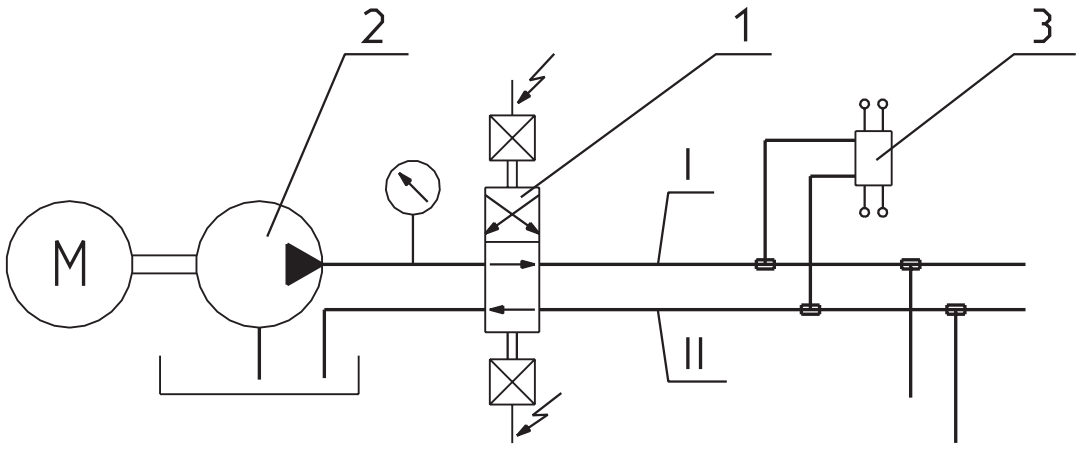


Fig. 1 Scheme of a lubrication system with the electromagnetic distributor
1 - Distributor, 2 – Pump, 3 – Feeders, I – II – lubrication main conduit lines

Four-way electromagnetic distributor ER

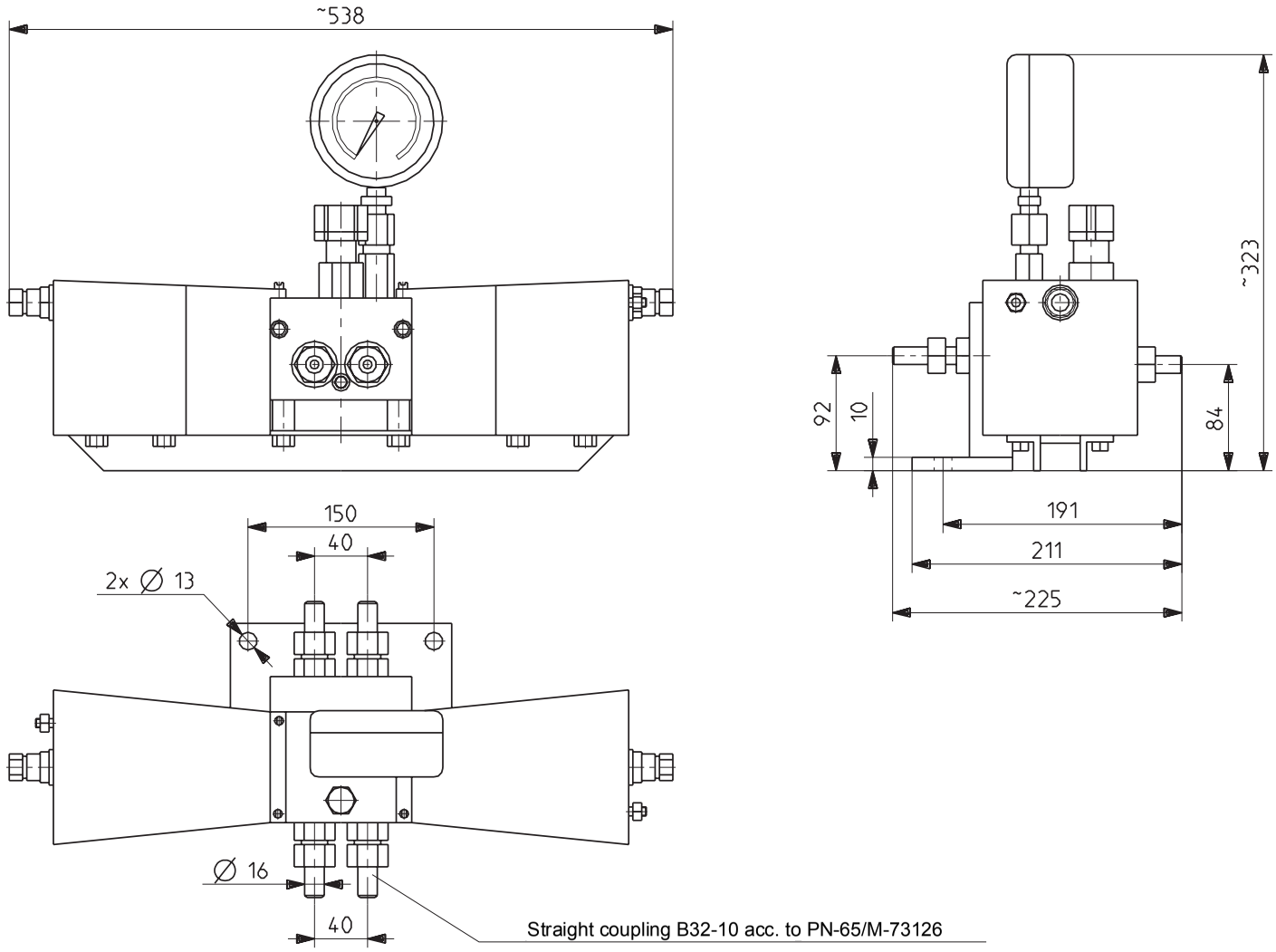
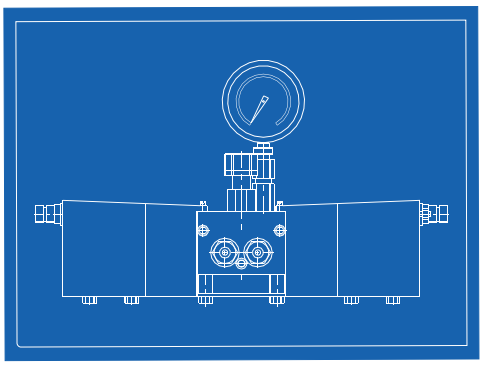


Fig. 2 Overall and linkage dimensions of the ER distributor

Technical details



Maximum flow rate	approx. 1 dm^3/min.
Nominal pressure	20 MPa or 32 MPa
Time of resetting	approx. 0,5 s
Starting/holding power	3500/270 VA
Rated voltage at 50 Hz	400 V or 500 V
Ambient temperature	-10 ... 60°C
Weight	25 kg
Overall and linkage dimensions	acc. to Fig. 2

Executions and symbols

The electromagnetic distributor, depending on the nominal pressure and rated voltage, is made in four varieties.

Symbol of distributor	Nominal pressure	Rated voltage
ER-1-1	20 MPa	400 V
ER-1-2		500 V
ER-2-1	32 MPa	400 V
ER-2-2		500 V

Examples of symbols

Four-way electromagnetic distributor of nominal pressure 32 MPa and rated voltage 400 V:

Electromagnetic distributor ER-2-1

Manufacturer and Distributor
Zakłady Automatyki „Polna” S.A.
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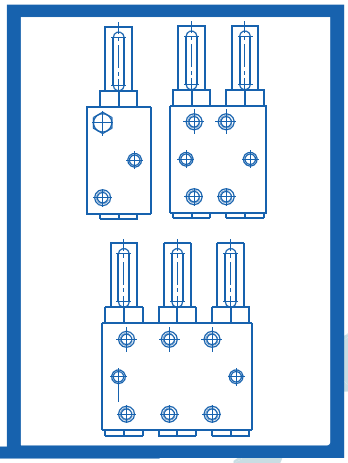
e-mail: marketing@polna.com.pl

TWO-WAY FEEDERS
(dosing distributors)
DD Type

Two-way feeders DD



Two-way feeders DD

Application

Two-way feeders (dosing distributors) are designed to feed certain portions of lubricant to the lubrication points in machines and devices. They are component parts of two-way force feed oiling systems.

Construction

A feeder consists of the following parts and assemblies: body, pistons articulated with shanks, distributing slides and delivery controllers' bodies with seals. In the controllers' bodies, there are oblong holes for visual control of the feeder operation; in the feeder's body (Fig. 1), there are holes with M16 x 1.5 threaded seats to connect main lubrication conduit lines and M14 x 1.5 to connect lines through which grease is fed to the reception points.

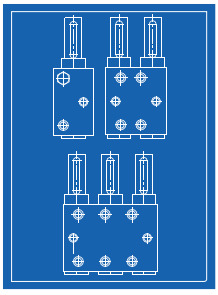
Operation

Lubricant forced by a pump to one of the lubrication main conduit lines reaches the feeder slide chamber which makes the slide move and open the hole connecting the slide chamber to the piston chamber. Under the pressure, the piston moves to the extreme position and the lubricant fills the space which occurs. During the piston movement, the lubricant from the previous operation cycle, present in the feeder, is pushed to the outlet (Fig. 4) and then through a line to the reception point.
In the next operation cycle of the lubrication system, the pump forces the lubricant to the other line of the lubrication main conduit. The operation phases described above are repeated, but the slide and piston move to the other extreme position and a new portion of grease is fed to the lubrication point. In feeders of one lubricant outlet, the grease of both operation cycles is directed to the one outlet, while in all others, to a different outlet after each cycle. Performance of each feeder outlet may be controlled by restricting the piston stroke with the control screw located in the controller body.

Feeder connectors

Types and sizes of connectors and crude lines which should be used to install the feeder in the lubrication system are indicated in Fig. 4.

Technical details



Number of lubricant outlets	1, 2 ,3 ,4 or 6
Max. delivery from one outlet	2, 4 or 8 cm^3/cycle
Nominal pressure	32 MPa
Min. activating pressure	1 MPa
Types of lubricants fed	plastic grease of the consistence class ≤ 2 acc. to PN-72/C-04095 (NLGI) and oils of ≥ 30 cSt. /50°C viscosity
Working temperature	-10 ... 60°C

Execution

Feeders are manufactured in varieties indicated in the drawings (Fig. 2) and the table (Table 2); they have a different number of lubricant outlets and delivery.

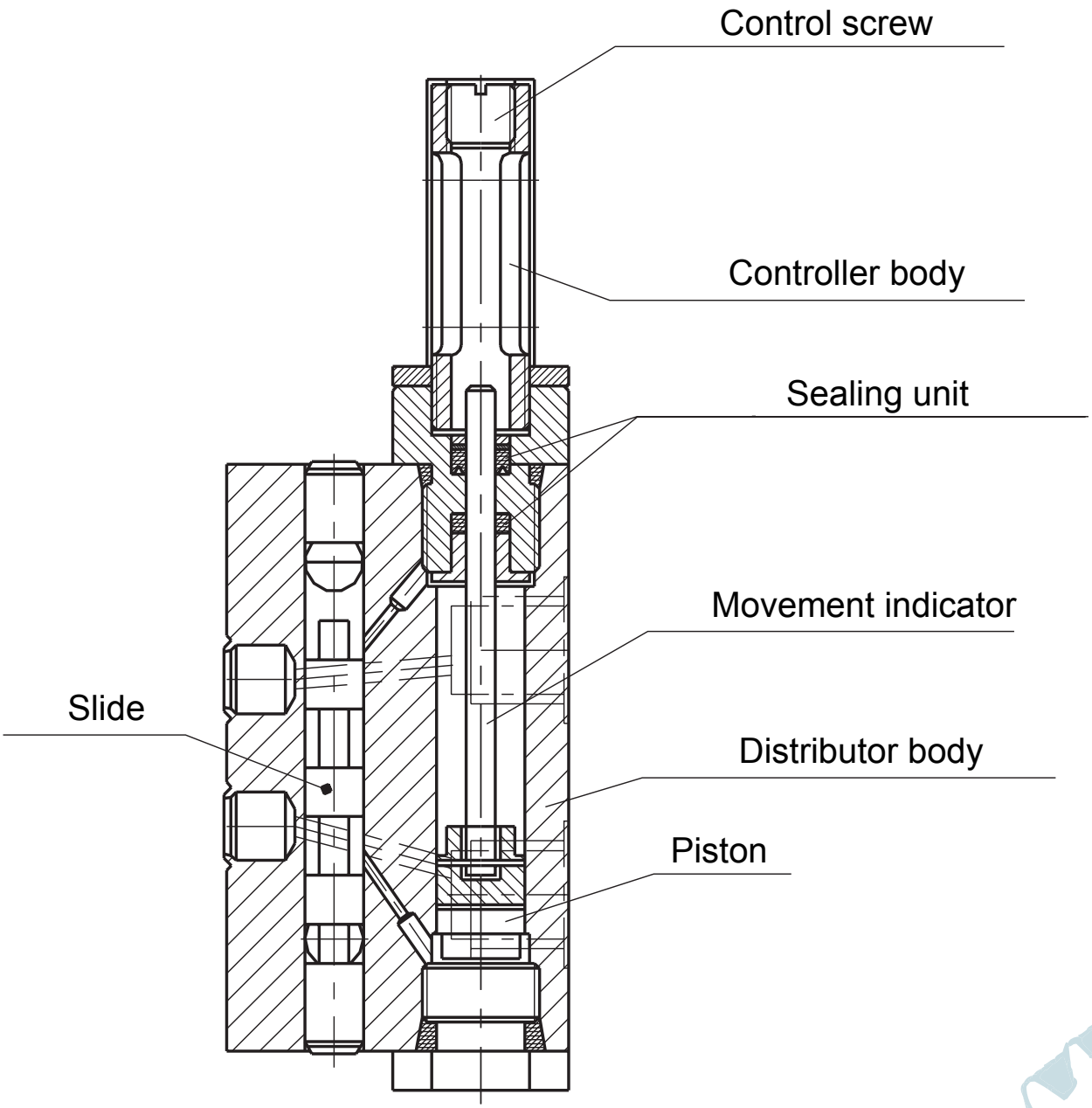


Fig. 1 Construction of a feeder

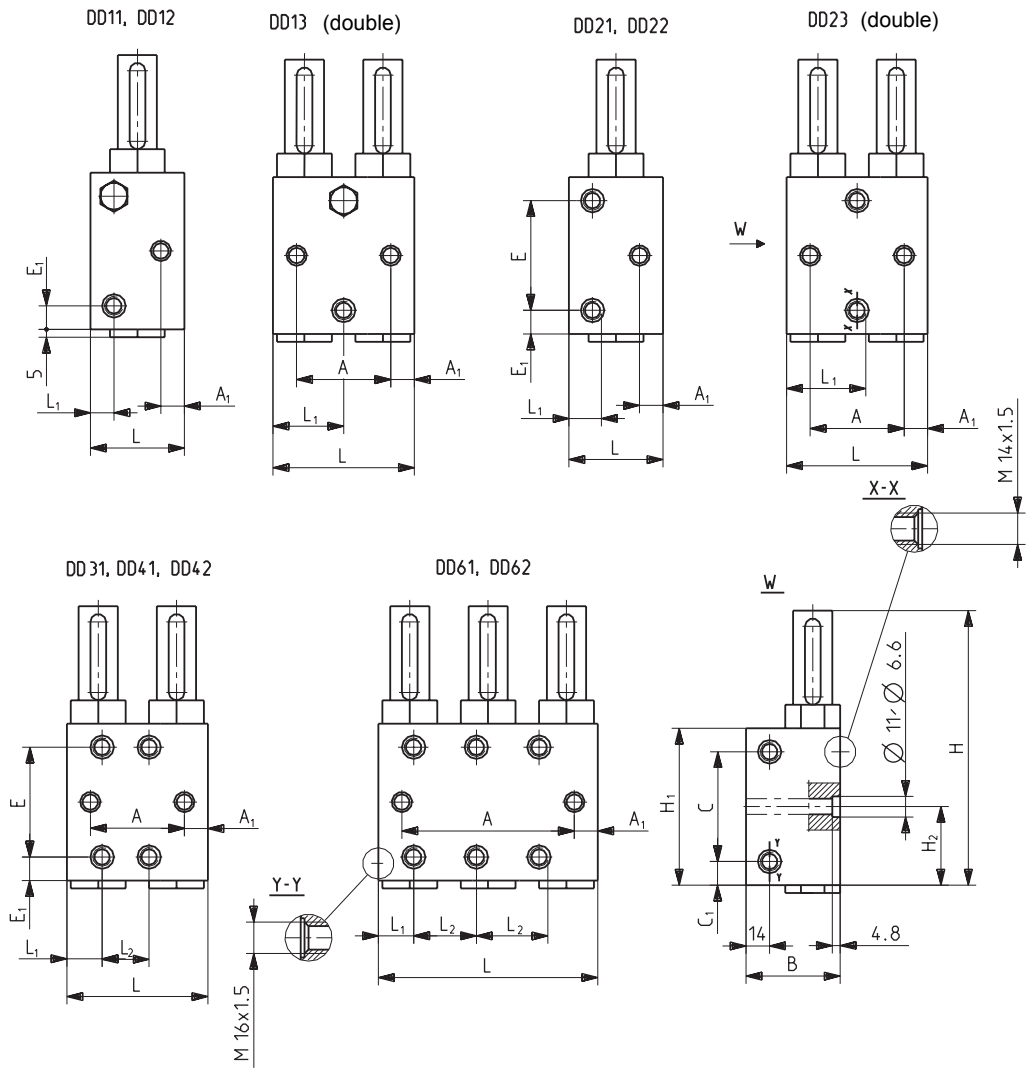


Fig. 2 Variations of distributors manufactured

Execution	Number of outlets	Delivery cm³/cycle		A	A_1	B	C	C_1	E	E_1	H	H_1	H_2	I	I_1	I_2	Weight
		min.	max.	mm													kg
DD11	1	0,5	2	-	7	40	42	12	30	18	112	66	33	45	10,5	-	0,78
DD21	2			-										45		-	0,78
DD31	3			61										75		30	1,33
DD41	4			61										75		30	1,33
DD61	6			91										105		30	1,90
DD12	1	1,15	4	-	7	45	52	12	34	21	122	76	38	47	10,5	-	1,25
DD22	2			-										47		-	1,25
DD42	4			67										81		34	1,93
DD62	6			101										115		34	2,77
DD13	1	2,3	8	59	7	45	52	12	34	21	122	76	38	73	36,5	-	1,77
DD23	2			59										73		-	1,73

Table 1. Dimensions of manufactured feeders

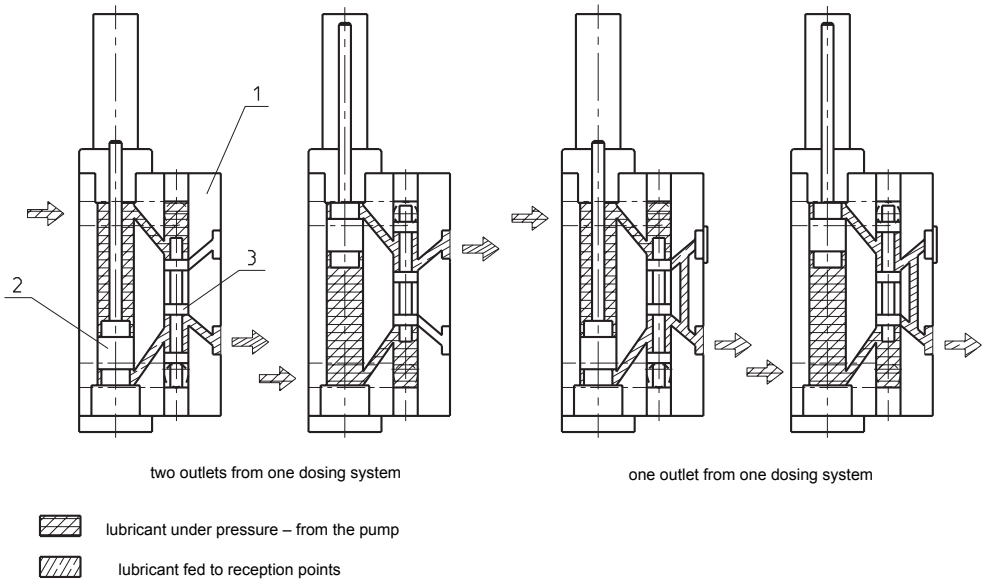
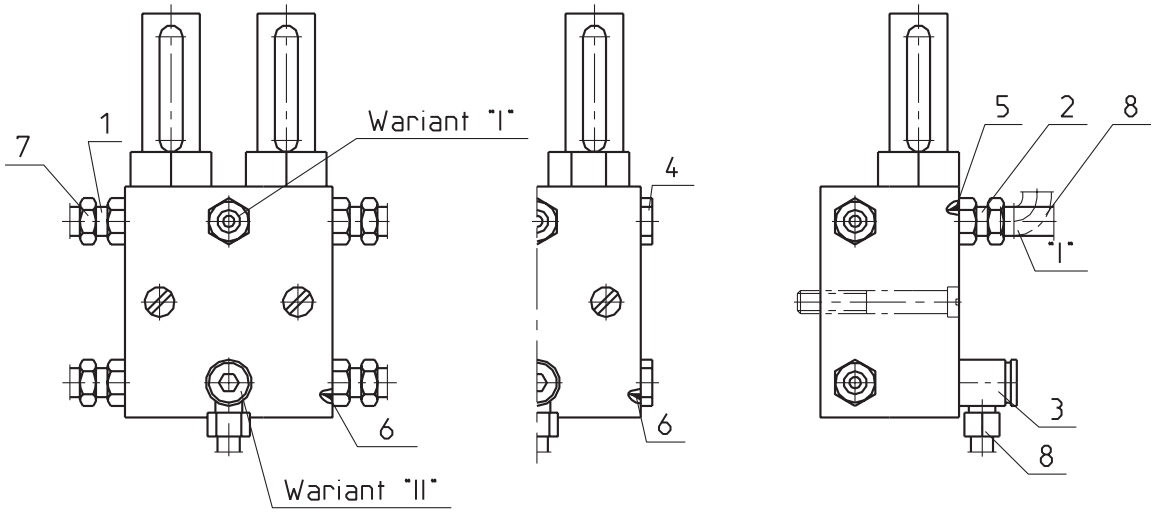


Fig. 3 Scheme of feeder operation



1. Straight coupling
   PP160-10 for pressure ≤ 16 MPa
   PP320-8 for pressure < 16 MPa
2. Straight coupling PP160-8
3. Angle coupling PK160-8
4. Plug M16x1.5
5. Gasket ring U14
6. Gasket ring 13.2x2.4-PN-60/M-86961
7. Precise pipe PN-73/H-74240-BZ-R35
   12x1 for pressure ≤ 16 MPa
   12x2 for pressure > 16 MPa
8. Precise pipe PN-73/H-74240-BZ-R35-10x1

Fig. 4 Feeder connectors

Manufacturer and Distributor
Zakłady Automatyki „Polna” S.A.
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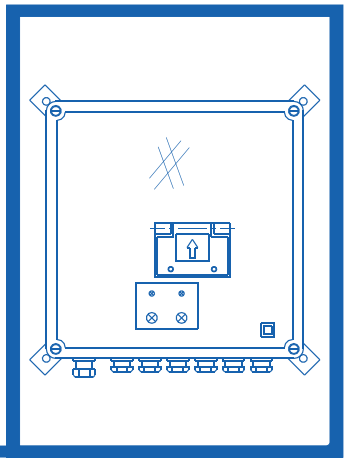
CONTROL UNIT
SAS Type



Control unit SAS

Control unit SAS

Application

The control unit is designed for automatic or manual control of the two-way force feed oiling systems and to signal their states of working or failure.
Depending on the variety, it may be used in a lubrication system with an electromagnetic or hydraulic control distributor. It may also be used in industrial automatics systems to control device operation versus time function.

Construction

The control unit has control and power systems which perform the following functions:

- activating the lubricating pump motor at preset time intervals,
- stopping the pump motor after the lubrication cycle is completed,
- stopping the pump motor in the case of a failure,
- applying voltage to the electromagnet coils while the distributor is reset,
- signalling the stage of work or failure of the lubricating system.

The above functions are performed with time relays, electromagnetic (auxiliary) relays, cam connector, contactors and signal lamps. Control and electromagnetic systems are protected with overvoltage and overload moulded-case circuit breakers.
Electrical elements are installed on the plate located in the device housing, accessible from the front side, after opening the cover. The device housing is made of grey polyester (RAL 9002) and the cover of transparent polyester. It is possible to mount the control unit housing on a wall.
na ścianie.

Operation

The power supply is switched on and type of control is selected with an “S” cam connector by setting it in the “A” position (automatic control) or “I/II” position (manual control).
Before switching the control unit on, it is necessary to preset the lubrication cycle time in relays K21 and K22 and in relay K23, after which time the pump motor stops in an emergency, if it does not stop after completing the lubrication cycle.
The moment the automatic control switches on, the pump motor activates and timing of the lubrication cycle starts. The pump forces grease to one of the two main lubrication conduit lines and then to the dosing feeders. After the lubricant is fed to the reception points and the pressure increases up to the preset value, the following take place:

- in the system with an electromagnetic distributor (and the SAS 41 control device), the pump motor stops and voltage is applied to the electromagnet coil in order to reset the distributor. The signal to stop the motor and reset the electromagnet is applied by the pressure relay installed at the end of the lubrication main conduit line;
- in the system with a hydraulic distributor (and the SAS 42 control device), resetting of the distributor takes place automatically and the signal to stop the pump motor is applied by the limit switch working with the distributor.

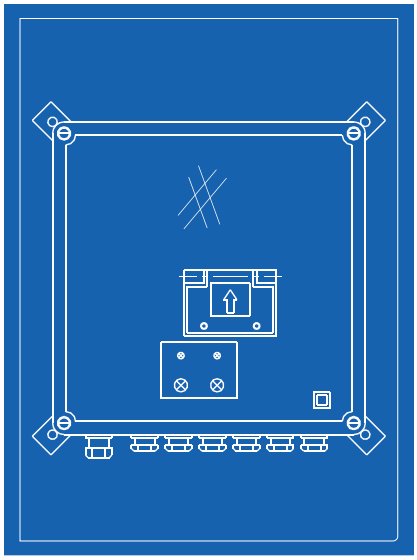
After the time-lag preset with the time relay, the pump motor is activated again and the operation cycle repeats analogically with the other lubrication main conduit line.
In the case of manual control, each time the pump is activated with a cam connector positioned to „I” or „II”. Activation of the pump motor and distributor operation is analogical to the automatic control operation.
If the time limit planned for the line pressure increase is exceeded (e.g. due to leakage), the light or sound (if it exists) emergency signal is activated and the pump motor stops. The control unit is also equipped with visual signalling of the lubrication system working states.

Technical details
(acc. to Table 1)

Variations and symbols
The control unit is made in variations listed in Table 2.The marking includes the following symbols: type of device, type of distributor in the lubricating system, conventional symbol of rated voltage range and conventional symbol of the pump engine power.

Examples of symbols
Control unit to control a pump with hydraulic distributor, with a motor of 500V voltage and 0.75 kW power.

CONTROL UNIT SAS 42-2A



Manufacturer and Distributor
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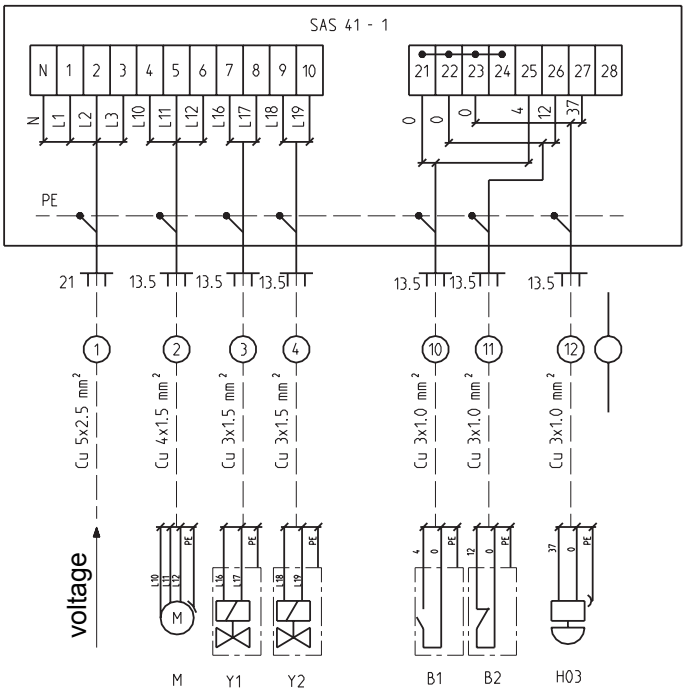
Type of control unit	SAS 41		SAS 42			
Type of central lubricating system	with electromagnetic distributor		with hydraulic distributor			
Execution	SAS 41-1	SAS 41-2	SAS 42-1		SAS 42-2	
Variation	-	-	A	B	A	B
Type of the pump	PD20 -1	PD20 -2	PD31 -1	PD40 -1	PD31 -2	PD40 -2
Three-phase motor Power [kW]	1.1	1.1	0.75	0.37	0.75	0.37
Voltage supply [V] +/- 5%	400V 50Hz TN-S or TN-C	500V 50Hz IT or TT	400V 50Hz TN-S or TN-C		500V 50Hz IT or TT	
Max cycle time	200 h					
Cable / terminals	Cu 2.5 mm² / 2.5 mm² , Un=660 V , In=30 A					
Control voltage [V]	230 V 50 Hz	230 V 50 Hz	230 V 50 Hz		230 V 50 Hz	
Main protections [A]	overvoltage type S193 B BA	overvoltage type M250 M2.5	overvoltage type S193 B 6A		overvoltage type M250 M2.5	
Power absorbed [kW]	1.1	1.1	0.75	0.37	0.75	0.37
Electric shock protection for outlet	quick trip-out, PE connection – terminals 4 mm² acc. to wiring diagrams					
Critical temp. of box accessories operation	temperate climate - 10°C ± +55°C					
Altitude over sea level [m]	1000					
Transport conditions storage	between -25°C and +55°C					
Weight [kg]	8	10	7		9	

Table 1

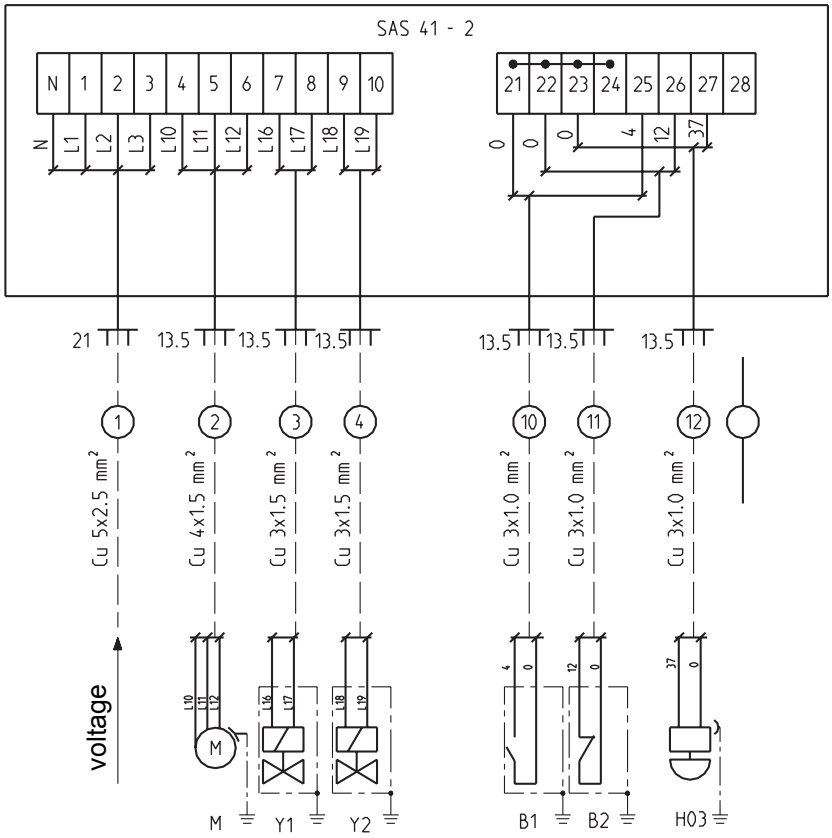


EXPLANATIONS:

PE – protection terminals
N – neutral terminal
M – pump engine

X1 + 28 – terminals of power and control circuits
Y1, Y2 – distributor electromagnets' coils
B1, B2 – pressure switches
H03 - bell

Fig. 1 Wiring diagram of control unit SAS 41-1

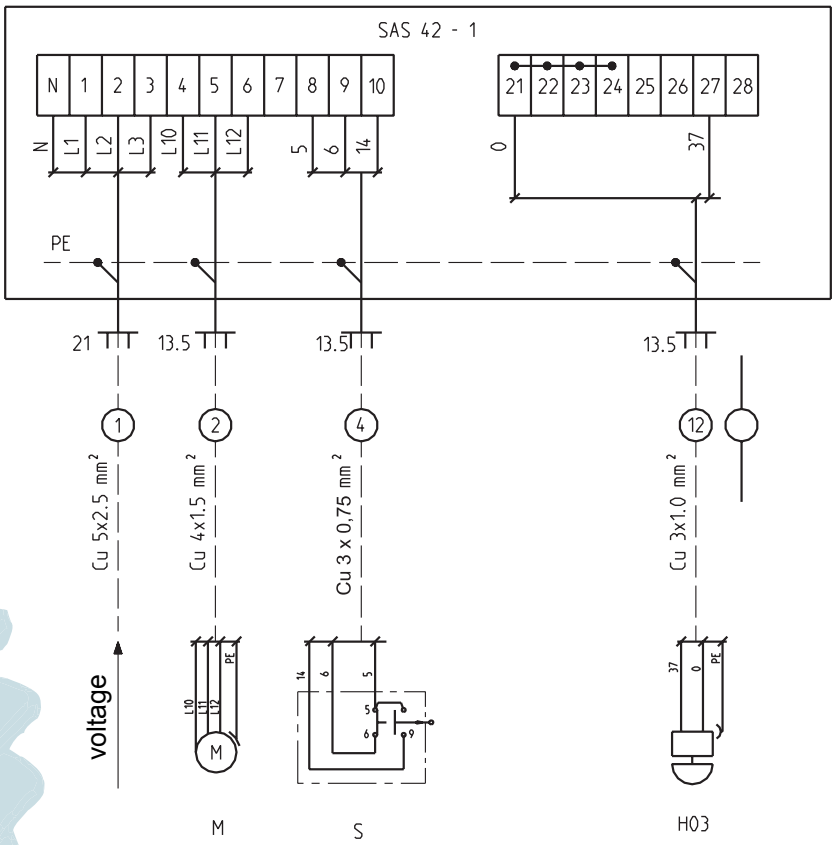


EXPLANATIONS:

N – neutral terminal
M – pump engine

X1 + 28 – terminals of power and control circuits
Y1, Y2 – distributor electromagnets' coils
B1, B2 – pressure switches
H03 - bell

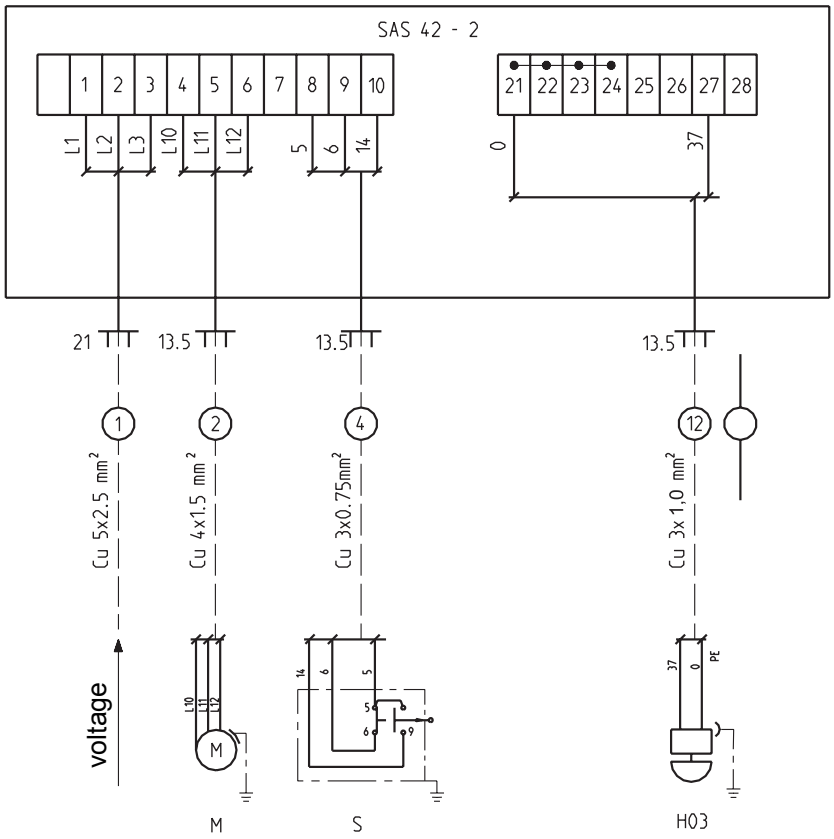
Fig. 2 Wiring diagram of control unit SAS 41-2



EXPLANATIONS:

PE – protection terminals
N – neutral terminal
M – pump engine
X1 + 28 – terminals of power and control circuits
S – limit switch
H03 - bell

Fig. 3 Wiring diagram of control unit SAS 42-1



EXPLANATIONS:

X1 + 28 – terminals of power and control circuits
M – pump engine
H03 – bell
S – limit switch

Fig. 4 Wiring diagram of control unit SAS 42-2

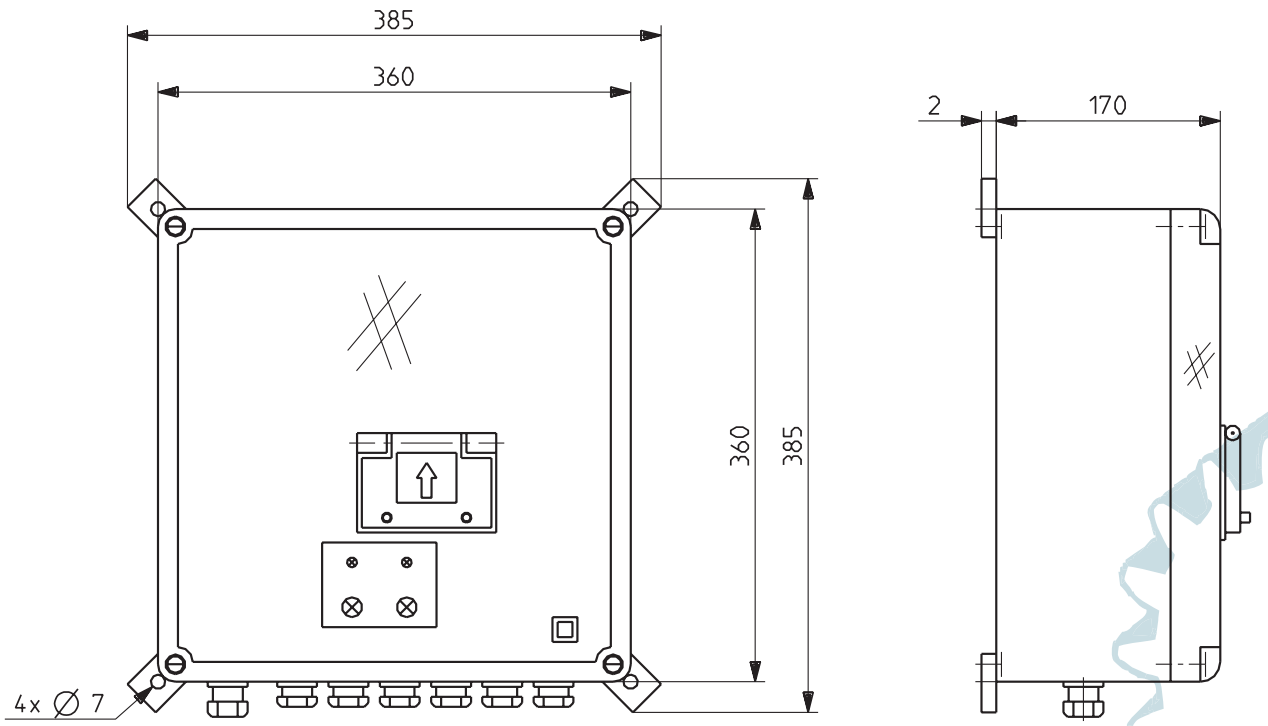
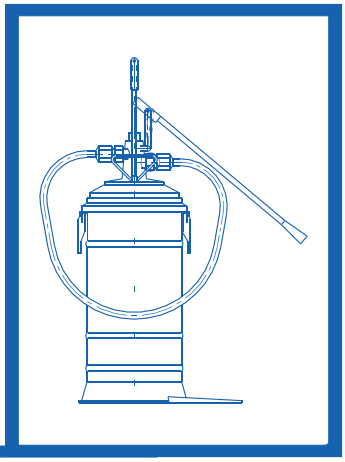


Fig. 5 Overall and linkage dimensions of SAS41; 42

LOADING PUMP
PZ 20 Type



Loading pump PZ 20

Loading pump PZ 20

Application

The pump is designed to fill central lubrication pumps (type PR 14 and others) with plastic grease. It may be used to fill other containers with lubrication media as well.

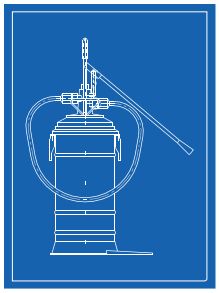
Construction

The filling pump is a piston pump with manual drive and consists of the following assemblies: grease tank with a pressure disk and a handle, drive lever connected with a piston, forcing unit connected with the tank cover; comprising a cylinder, a suction valve and a piston with a piston-type valve, flexible hose connectable to the loading coupling in the tank filled and with a screwed end.

Operation

The pump is driven by the lever. The power is transmitted to the piston which makes reciprocating movements. During the suction movement, grease is sucked from the tank to the stroke space in the cylinder. During the piston reciprocating movement, a portion of grease present in the cylinder is forced out through the tank-filling flexible hose. The pressure disk drops while the tank content decreases, which protects the forced grease against air locking and facilitates sucking.
To fill the tank of the loading pump with lubrication material, it is necessary to take the cover off together with the forcing unit.

Technical details



Pump delivery	30 cm^3/piston stroke
Nominal pressure	1,6 MPa
Tank capacity	12 dm^3
Lubricants forced	plastic grease of the consistence class ≤ 1 acc. to PN-72/C-04095 (NLGI)
Working temperature	-10 ... 60°C
Length of flexible hose	3 m
Pump weight without grease	~17 kg

Placing orders

The order should specify the name and type of the pump.

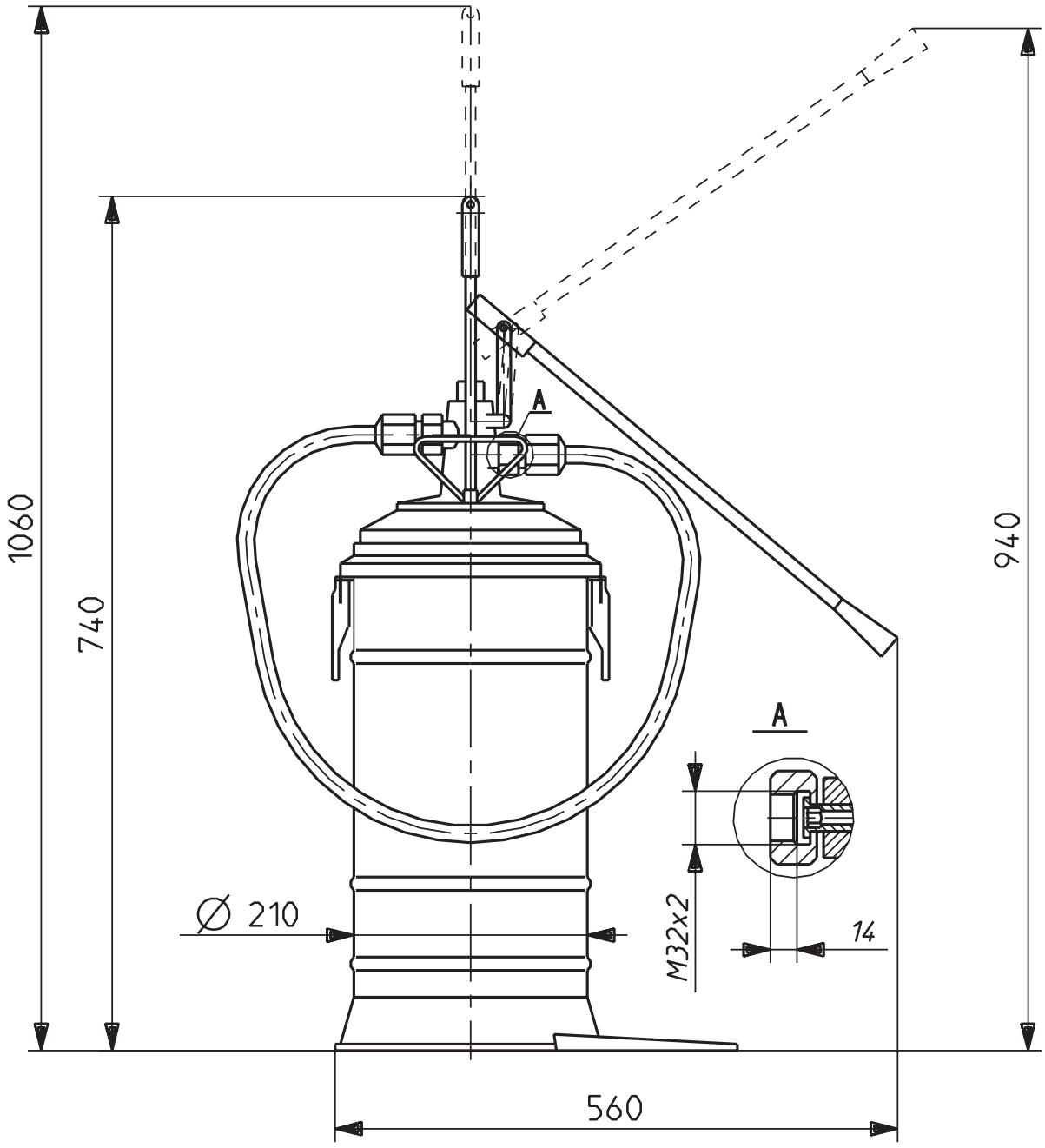


Fig. 1 Dimensions of the pump

Manufacturer and Distributor
Zakłady Automatyki „Polna” S.A.
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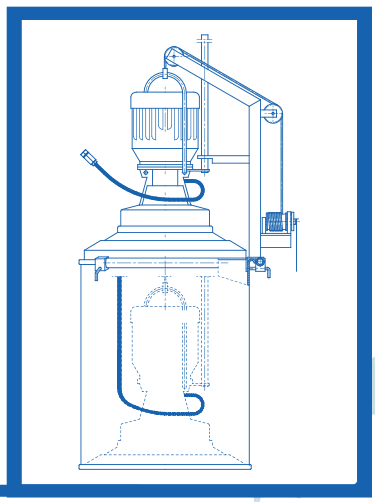
www.polna.com.pl
e-mail: marketing@polna.com.pl

FILLING CRANE PUMP
PZ 31 Type

FILLING CRANE PUMP PZ 31 Type



FILLING CRANE PUMP PZ 31 Type

Application

The pump is designed to force plastic grease from drums (barrels) of 200 dm3 capacity (acc. to BN-76/5046-03) to tanks of central lubrication pumps, e.g. type PA, PD and others. It may be used to fill other containers with plastic grease as well.

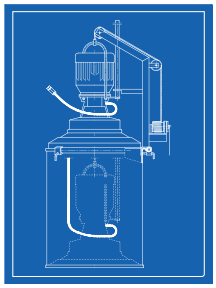
Construction

The filling pump consists of a gear pump being the forcing unit, an electrical motor, a clutch connecting the motor shaft with the gear pump shaft, a mantle with a rubber flange which makes the barrel cover, a feeding screw, double-speed gear transmission built in the pump body and a flexible hose with a screwed end. There are two aeration valves on the pump mantle while in the body, at the grease-forcing way, there is an overflow (safety) valve.
The crane consists of a job with pulleys, a rope, a clamping ring with clips and a cargo whip.
The cargo whip consists of a barrel, crank, ratchet coupling, clamp rope guide and a rope with a hook. The pump is suspended under the crane rope with a clamp.

Operation

The pump is powered by an electric motor. The engine shaft rotation is transmitted by a clutch to the gear wheels of the forcing assembly and through a system of transmission gears to the feeding screw. The feeding screw cuts into the grease present in the barrel, kneads it initially and passes through the reduction gear housing to the pump sucking area. The gear pump sucks the grease fed by the screw and forces it through the body holes and flexible hose to the filled tank. The pump falls as the amount of grease in the barrel decreases, until the barrel is empty. If the pressure in the forcing way increases above the maximum allowable value, the safety valve opens and the grease flows out of the pump.
After the grease is forced out of the barrel, the pump is taken out together with the crane and they are moved together to another barrel full of grease.

Technical details



Delivery	9 dm^3/min
Nominal pressure	2,5 MPa
Lubricants forced	plastic grease of the consistence class ≤ 2 acc. to PN-72/C-04095 (NLGI)
Engine rated voltage	230/400 V lub 500 V przy 50 Hz
Rated power	1,1 kW
Ambient temperature	-10...60°C
Length of flexible hose	~3 running metres
Pump weight	48 kg
Crane weight	16 kg

Execution

The pump is manufactured in two executions of different engine rated voltage and is marked as follows:

PZ 31-1 with an engine of 230/400 V voltage
PZ 31-2 with an engine of 500 V voltage

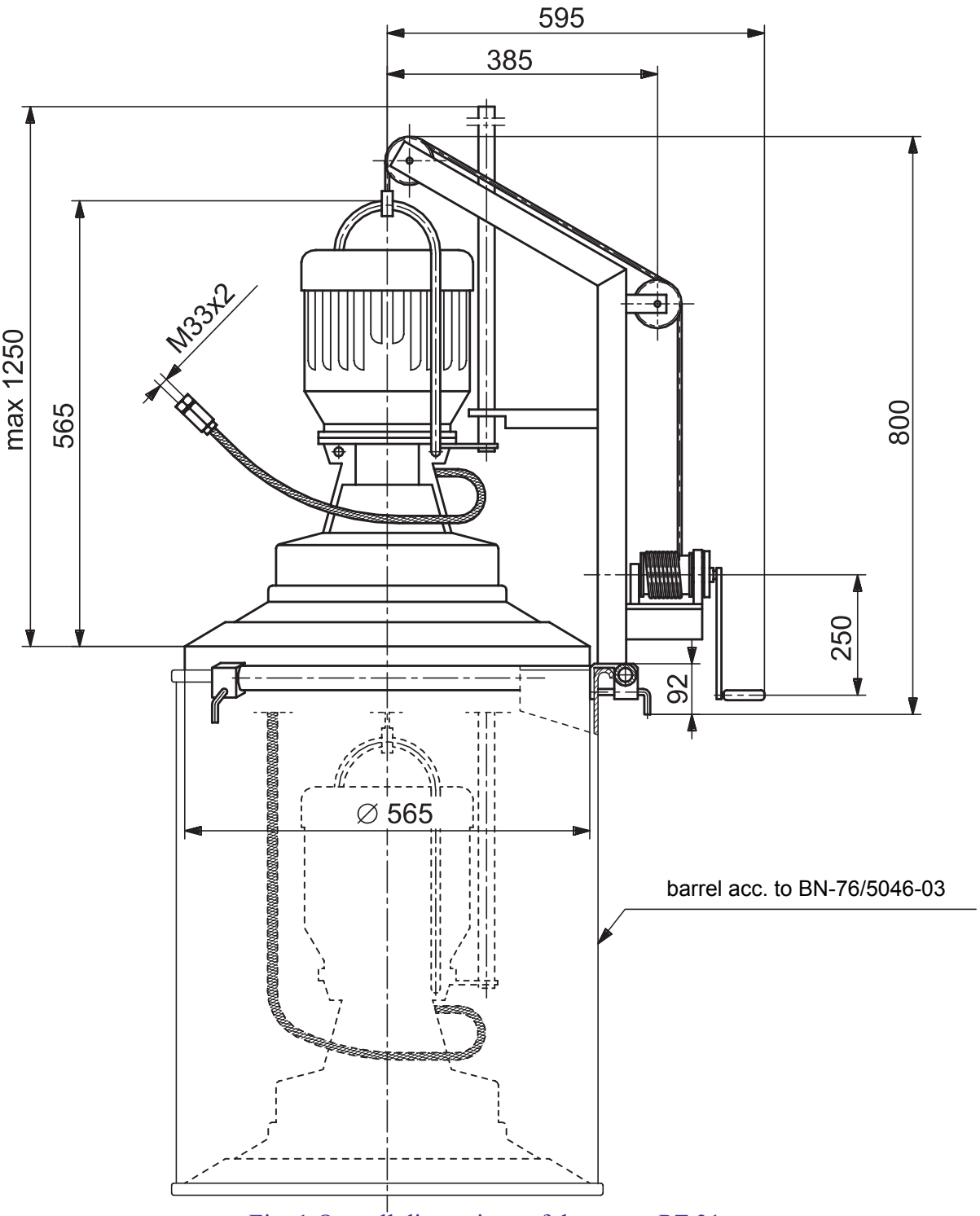


Fig. 1 Overall dimensions of the pump PZ 31

Placing orders

The order should specify the name and type of pump.

Manufacturer and Distributor
Zakłady Automatyki „Polna” S.A.
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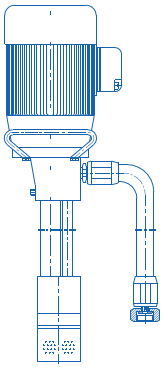
www.polna.com.pl
e-mail: marketing@polna.com.pl

FILLING PUMP
PZ 40 Type



Filling pump PZ 40

Filling pump PZ 40

Application

The pump is designed to force oils and plastic grease from barrels or other containers to tanks of central lubrication pumps type PA, PD and others. It may be used to fill other containers with lubrication media as well.

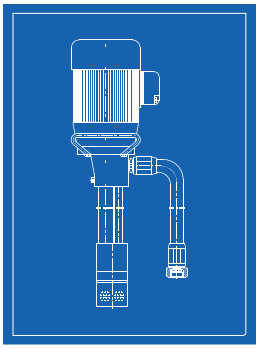
Construction

The filling pump is a gear pump driven by en electric motor. The pump consists of the following assemblies: body connected with the forcing assembly motor, clutch, two pipes integrating the forcing unit with the body (one of them is a clutch casing and the other is a forcing line) and a flexible hose with an attachable end.
Locating the forcing assembly at the pipe jib makes it possible to immerse the pump at significant depth, e.g. close to the bottom of the barrel with lubricant.

Operation

The pump gear wheels, receiving power from the engine through the clutch, suck oil or grease through a filtering cover and force it through the holes in the cylinder of the forcing assembly and through the forcing line to the body and then, through a flexible hose to the filled tank.

Technical details



Pump delivery	4 dm^3/min
Nominal pressure	1,6 MPa
Lubricants forced	oils of ≥ 30 cSt / cSt/50°C viscosity and plastic grease of the consistence class ≤ 1 acc. to PN-72/C-04095 (NLGI)
Engine rated voltage	230/400 V or 500 V , 50 Hz
Power demand	0,75 kW
Ambient temperature	-10 ... 60°C
Length of flexible hose	~3 m
Weight	19 kg

Execution

The pump is manufactured in two executions of different engine rated voltage and is marked as follows:

PZ 40-1 with an engine of 230/400 V voltage,
PZ 40-2 with an engine of 3 x 500 V voltage.

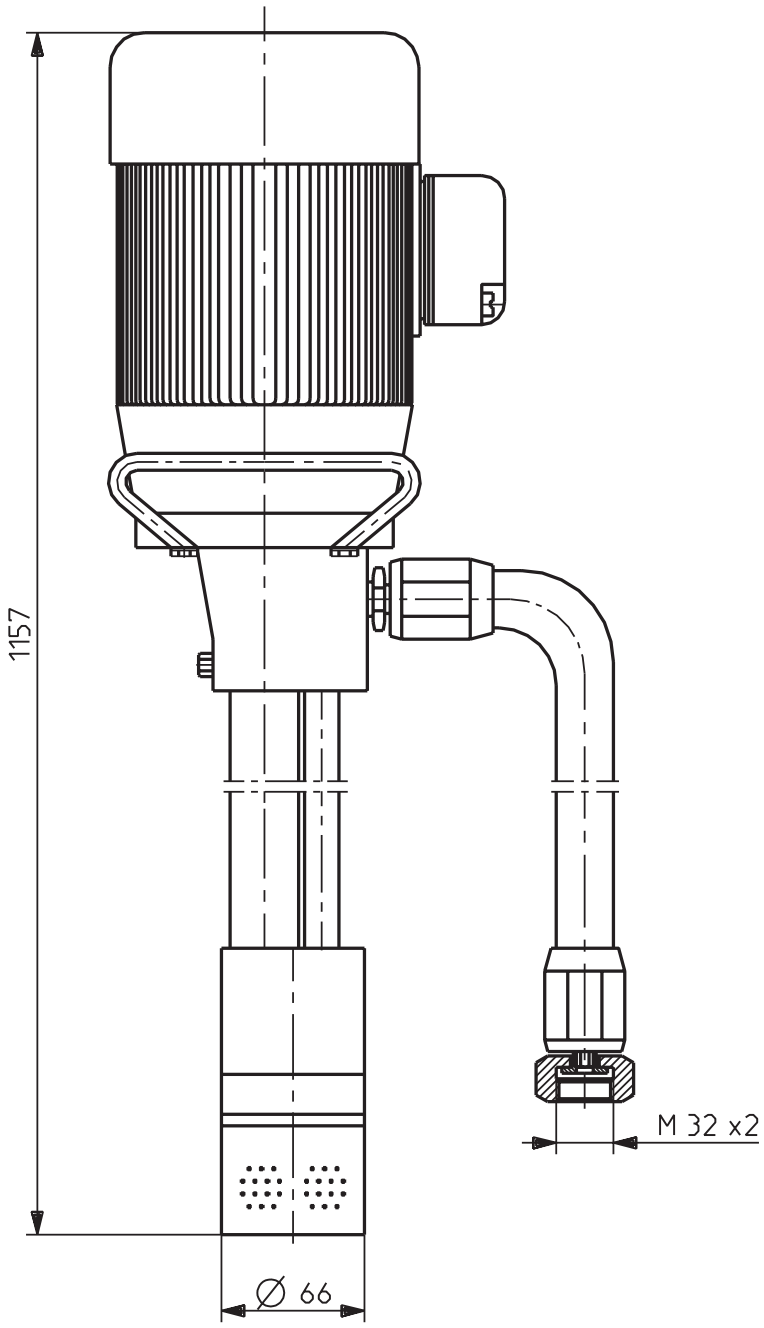


Fig. 1 Dimensions of the pump

Placing orders

The order should specify the name and type of the pump.

Manufacturer and Distributor
Zakłady Automatyki „Polna” S.A.
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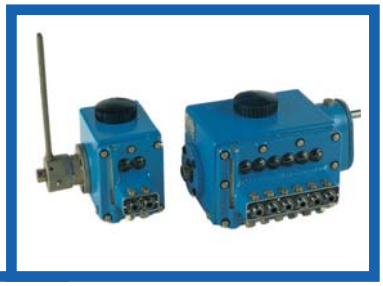
www.polna.com.pl
e-mail: marketing@polna.com.pl

Equipment for Multi-Way Force Feed Oiling Systems

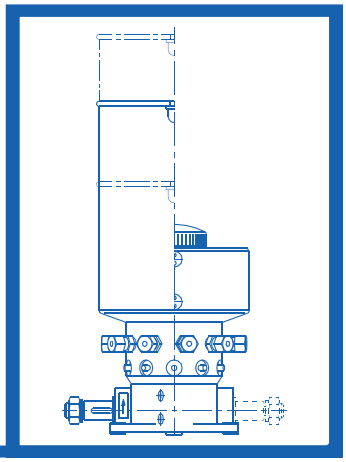


~~Oil multi-outlet pump PO~~

Lubrication pump MPS 10

~~Lubrication multi-outlet pump PRD~~

LUBRICATION PUMP
MPS 10 Type



Lubrication pump MPS 10

Lubrication pump MPS 10

Application

The pump is designed for oil or plastic grease lubrication of machines and devices which require continuous feeding of small amounts of lubricant. Lubricant is fed to each reception point through a separate line directly from the pump.
It is particularly recommended for lubricating machines for plastic metalworking, plastic and rubber forming, for lubricating construction, hoist and transport devices, industrial pumps, compressors, pulp and paper making machines, machines in inland navigation ships, agricultural machines etc.

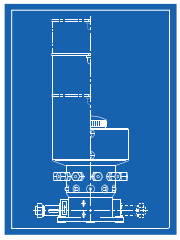
Construction

The pump consists of the following elements: a tank with a feeding device, forcing unit and drive unit. The forcing unit solution includes a suction-forcing section (comprising a piston and a pusher both located in a central shaft), forces lubricant successively to all outlets. There are control mandrels and radiating outlet couplings.
Balls driving the piston are built in the cylindrical body; their number corresponds to the number of outlets. Depending on the solution, the pump driving unit is adjusted to coupling the rotating, oscillating or reciprocating element of the machine on which the pump is installed or the pump has its own independent electrical motor drive.

Operation

Drive unit elements make the pump central shaft rotate. During this movement , the pusher located in the shaft hits the front of the control mandrel and shifts together with the piston which makes lubricant be sucked to the stroke chamber. In the next phases of the shaft turn, the piston contacts the ball built in the body, returns and forces the lubricant out of the outlet stroke chamber. The process of lubricant forcing described above repeats analogically in the case of other outlets.
Delivery regulation may be performed for each outlet individually by turning control mandrels which restricts the piston stroke.
In the pump plastic grease tank there is a feeding device which separates the grease from the tank wall and forces it, with the use of feeding screw, through the filter to suction holes in the forcing unit.

Technical details



Number of outlets	10 (special executions 2...9)
Nominal pressure	6,3 MPa
Stroke delivery from one outlet	0,16 cm^3/cycle
Time delivery from one outlet	acc. to the delivery chart
Rotational speeds	acc. to the delivery chart
Not recommended rotational speeds	
for the pump MPS 10-1	maximum
for the pump MPS 10-2	minimum
Lubricants forced	plastic grease of the consistence class ≤ 2 acc. to PN-72/C-04095 (NLGI) oils of ≥30 cSt/50°C viscosity

Ambient temperature	-10 ... 60°C
Power demand	0,18 kW
Rated voltage (drive S)	230/400 V or 500 V
Tank capacity	
pump MPS 10-1	2; 4,5; 6 dm^3
pump MPS 10-2 (oil)	2 dm^3
Weight	
pumps with drive A, B i C	10 kg
pumps with drive S	18 kg

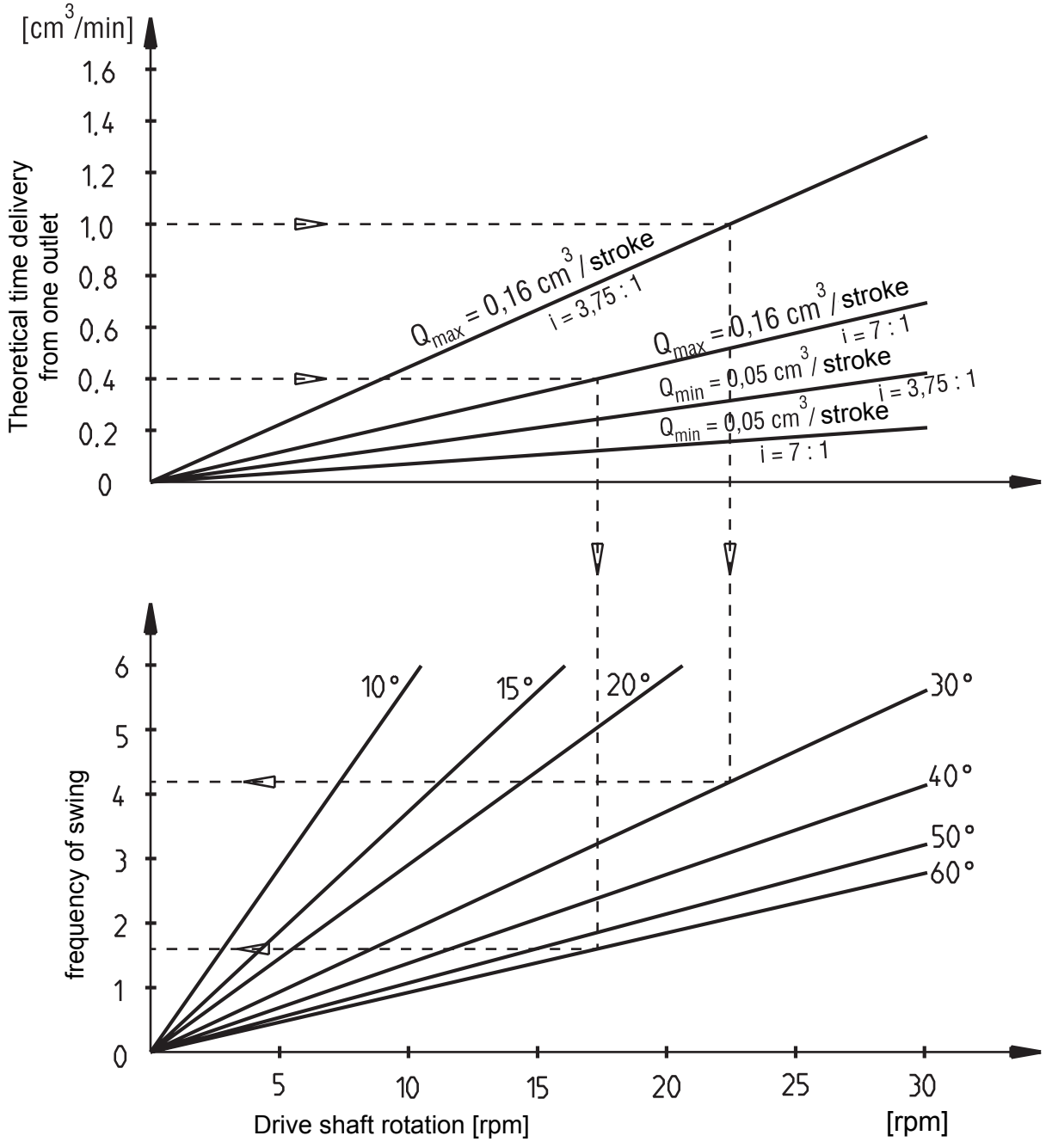


Fig. 1 Diagram of time delivery of pumps MPS 10-1 and MPS 10-2 type, with drive A

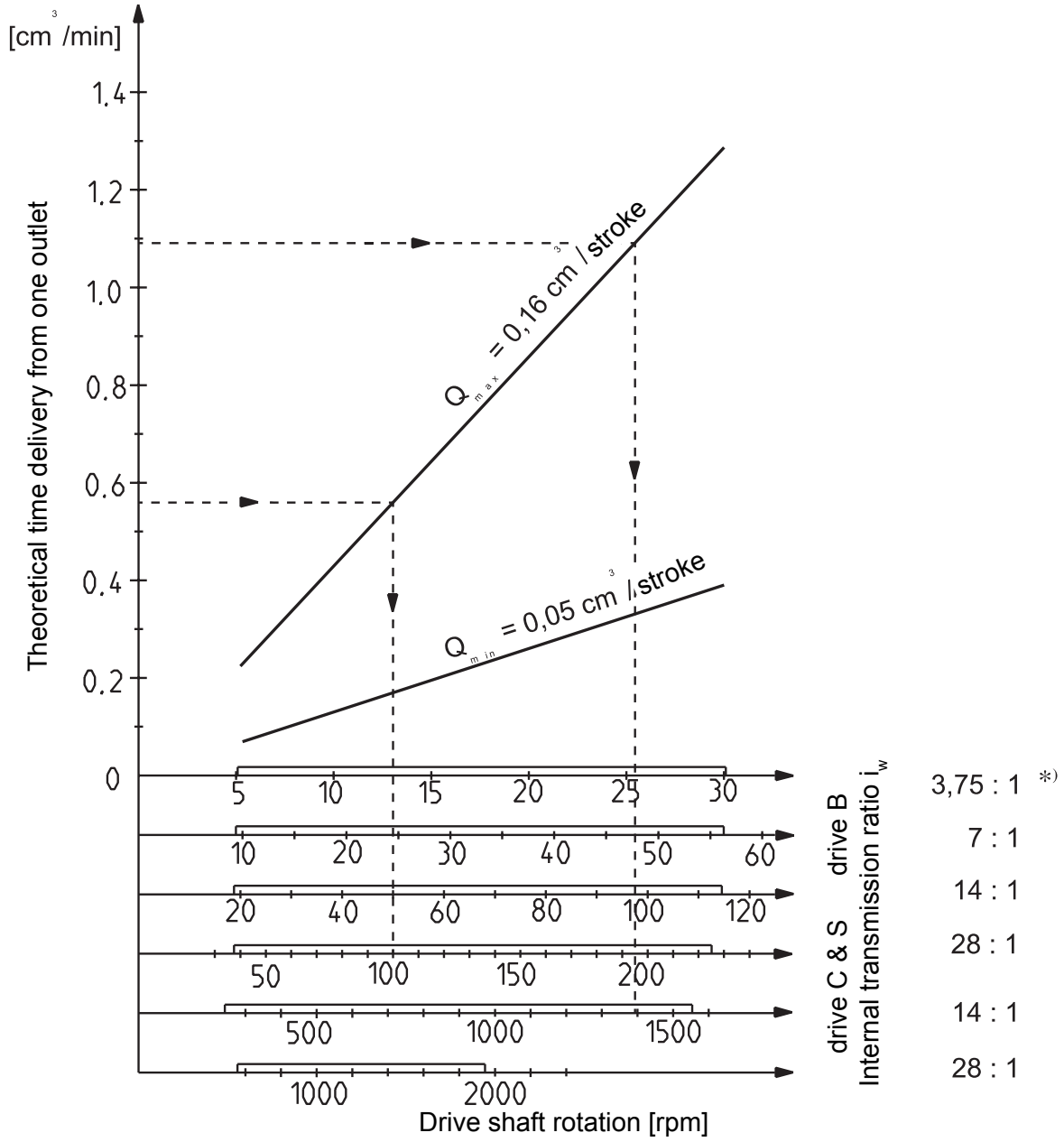


Fig. 2 Diagram of time delivery of pumps MPS 10-1 type, with drive B, C, S

*) **The values given apply to reduction of rotation**

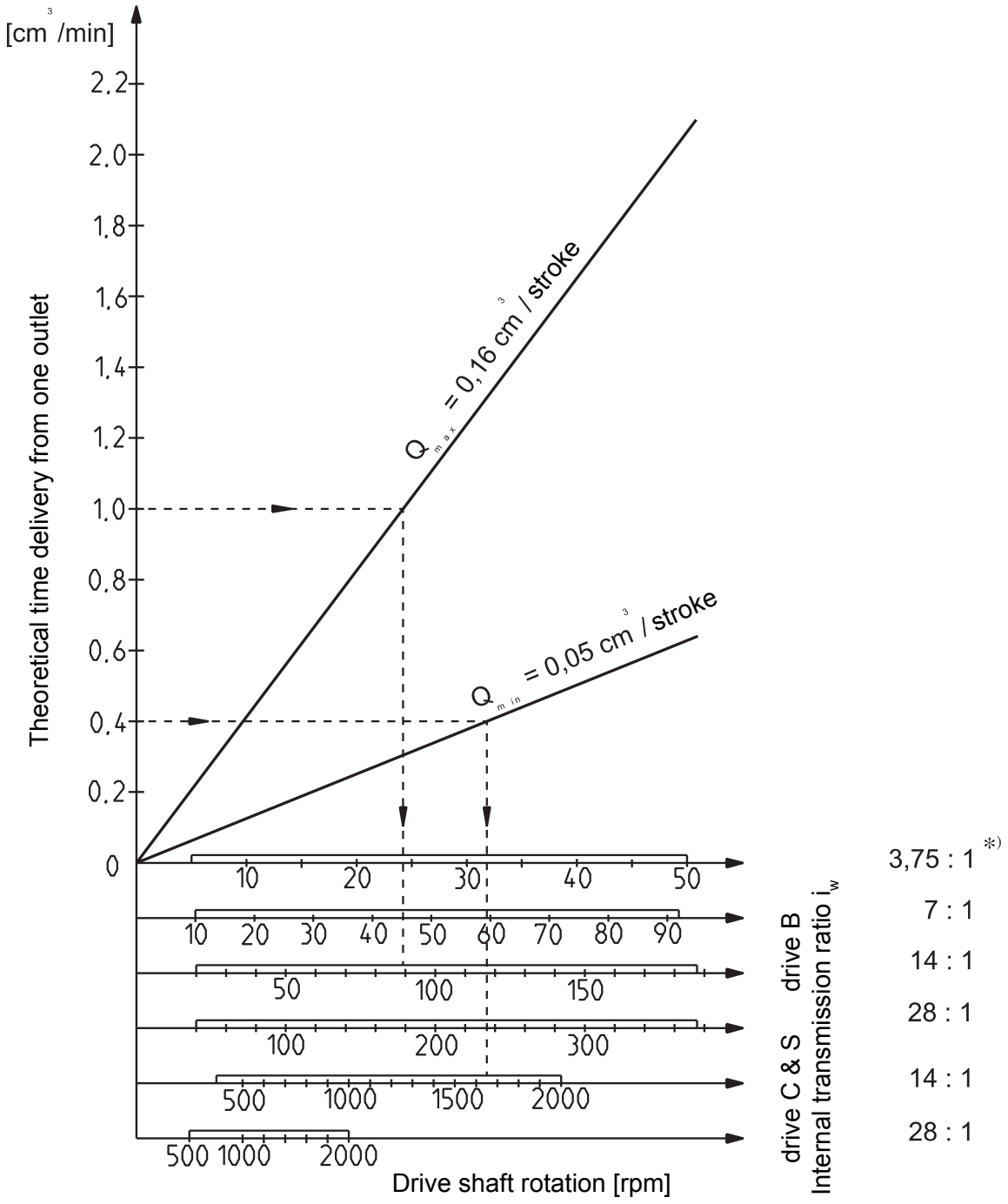


Fig. 3 Diagram of time delivery of pumps MPS 10-2 type, with drive B, C, S

⁎) **The values given apply to reduction of rotation**

Execution

Lubrication pump MPS 10 is made in variations which differ in:

- type of drive
  oscillating drive - A
  rotary drive - B
  rotary drive with additional reduction gear (14:1) - C
  drive for electric motor – S

- side of the drive installation
  left - L
  right - P

- position of driving shaft
  level –a
  upright - b

- direction of drive shaft rotation
  right - 1
  left – 2

- reduction gear inside the pump *)
  reduction 3.75 : 1 – 3.75
  reduction 7:1 - 7
  reduction 14 : 1 – 14
  reduction 28 : 1 – 28

- tank capacity
  capacity 3 dm3 - 3
  capacity 4.5 dm3 - 4
  capacity 6 dm3 - 6

- rated voltage
  230/400 V, 50 Hz - 1
  500 V, 50 Hz –2

*) The values given apply to reduction of rotation

Pump execution	Type of drive	Side of the drive installation	Position of driving shaft	Direction of rotating	Internal position	Tank capacity dm^3	Rated voltage
MPS 10-1	**A**	L, P	-	-	3,75; 7	3; 4,5; 6	-
	B	L, P	-	1, 2	3,75; 7 14; 28		-
	C	L, P	a, b	1, 2	14; 28		-
	S	-	-	-	14; 28		1,2
MPS 10-2	**A**	L, P	-	-	3,75; 7	2	-
	B	L, P	-	1, 2	3,75; 7 14; 28		-
	C	L, P	a, b	1, 2	14; 28		-
	S	-	-	-	14; 28		1,2

Symbols

Symbols should include the data concerning the type of execution in the order specified in the table.

Examples of symbols

1. Grease lubrication pump (MPS 10-1) with oscillatory drive (A) installed on the right-hand side of the pump (P), with internal reduction 1:7l and a tank of 4.5 dm3 capacity (4),

e.g.: **Lubrication pump MPS 10-1AP/7-4**

2. Grease lubrication pump (MPS 10-1) with additional reduction gear (C) installed on the left-hand side of the pump (L), upright driving shaft (b), left rotation (2), internal reduction 3.75 : 1 (3.75) and a tank of 6 dm3 capacity (6),

e.g.: **Lubrication pump MPS 10-1CLb2/3.75-6**

3. Oil lubrication pump (MPS 10-2) with rotary drive (B), installed on the left-hand side of the pump (L), right rotation (1) and internal reduction 28 : 1 (28),

e.g.: **Lubrication pump MPS 10-2BL1/28**

4. Grease lubrication pump (MPS 10-1), powered with an engine (S) of internal reduction 14:1 (14) and a tank of 6 capacity dm3 (6) and an engine of 230/400 V rated voltage (1),

e.g.: **Lubrication pump MPS 10-1S/14-6-1**

Placing orders

The order should specify the name, type and execution of the pump, according to the symbols indicated above.

Manufacturer and Distributor
Zakłady Automatyki „Polna” S.A.
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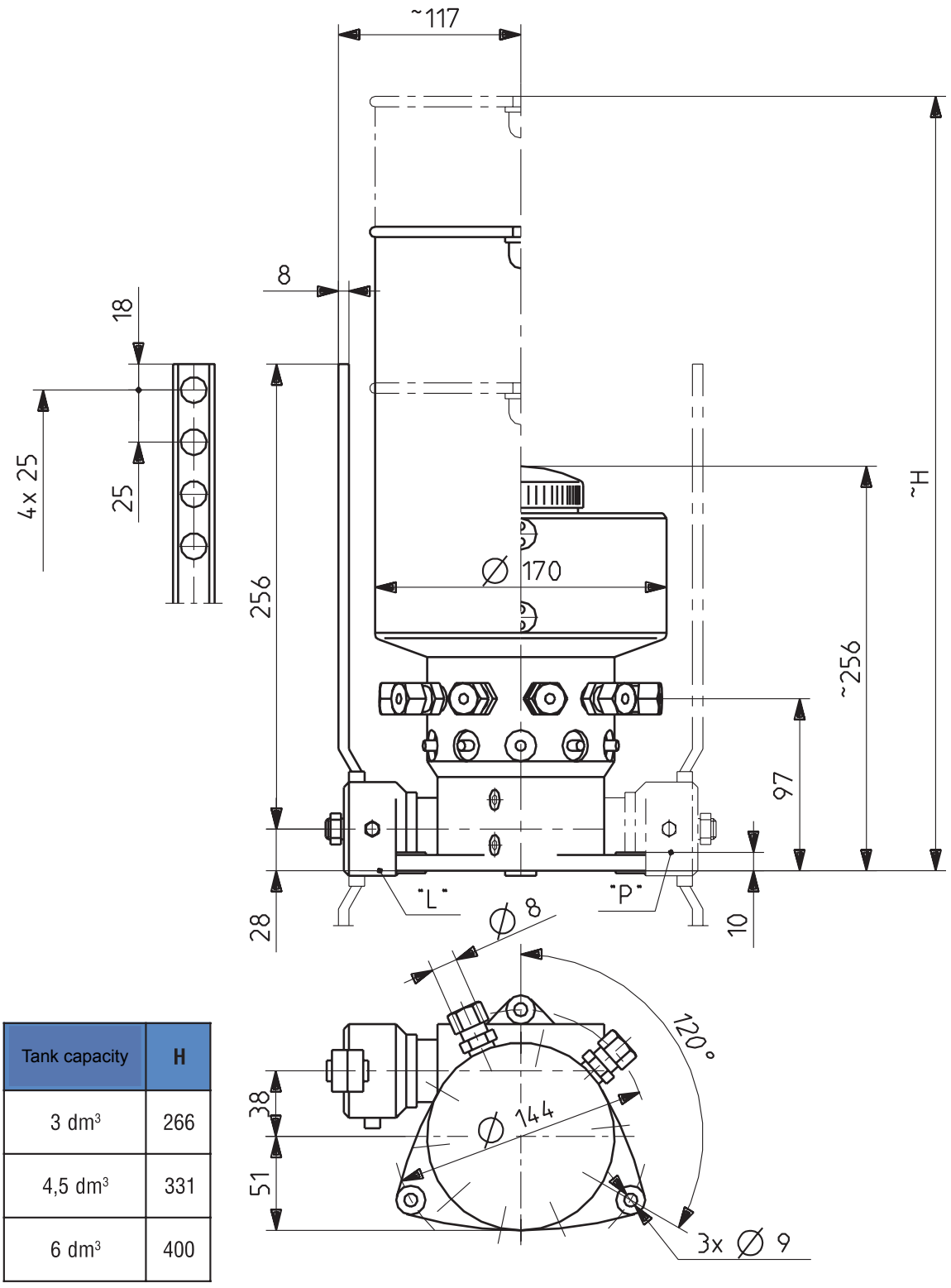
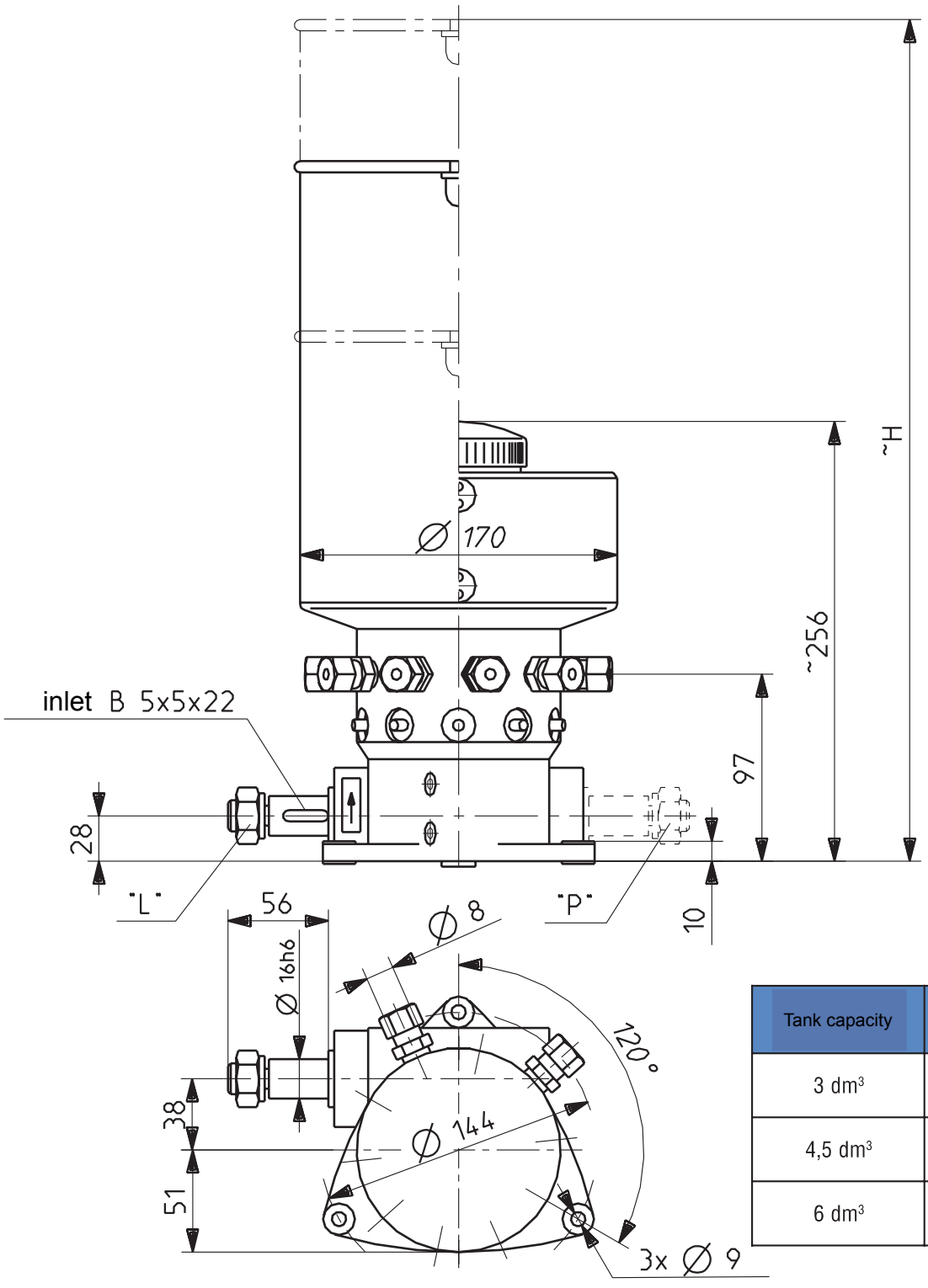
www.polna.com.pl
e-mail: marketing@polna.com.pl



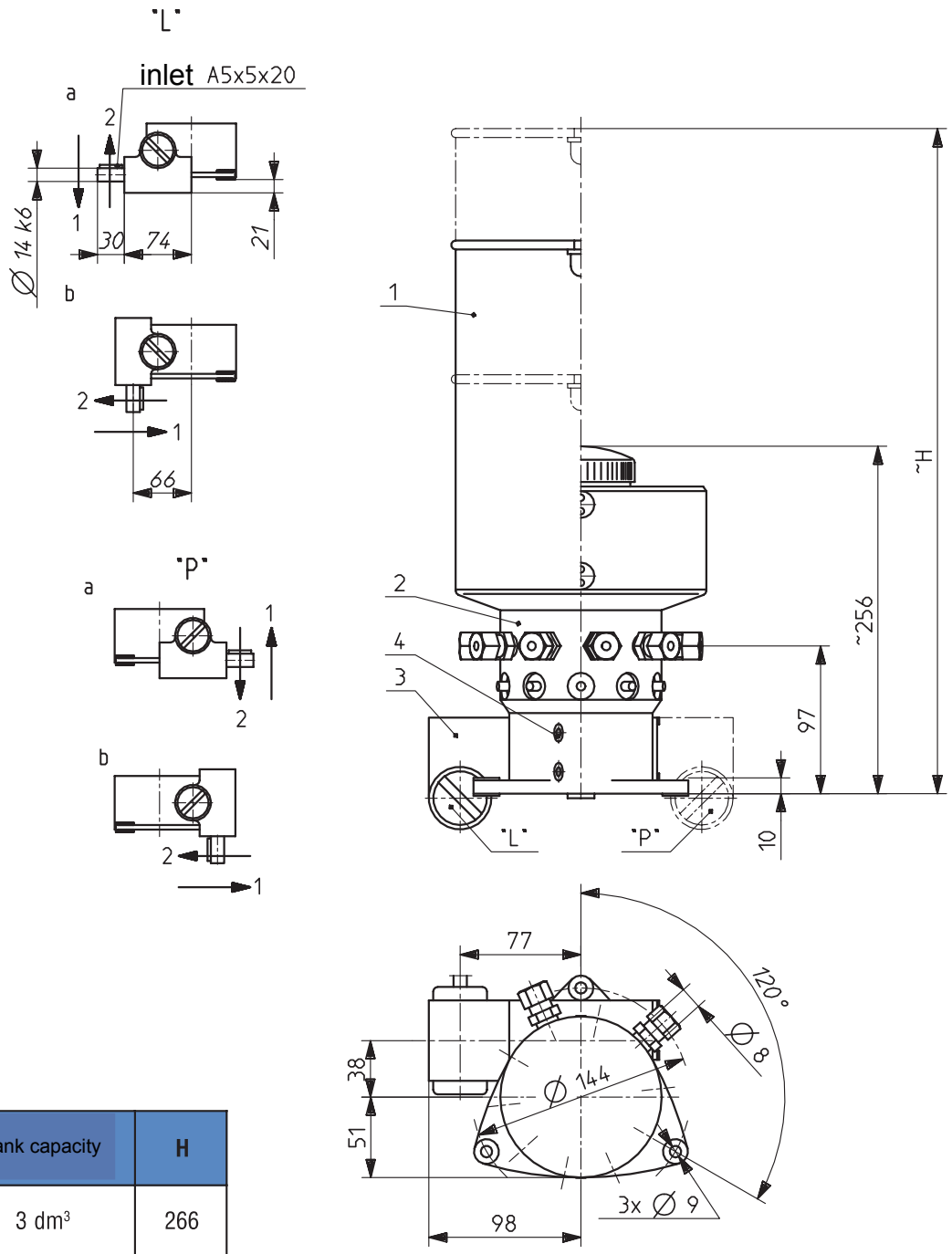
Tank capacity	H
3 dm³	266
4,5 dm³	331
6 dm³	400

Fig. 4 Grease and oil lubrication pump with oscillatory drive of MPS 10-A type



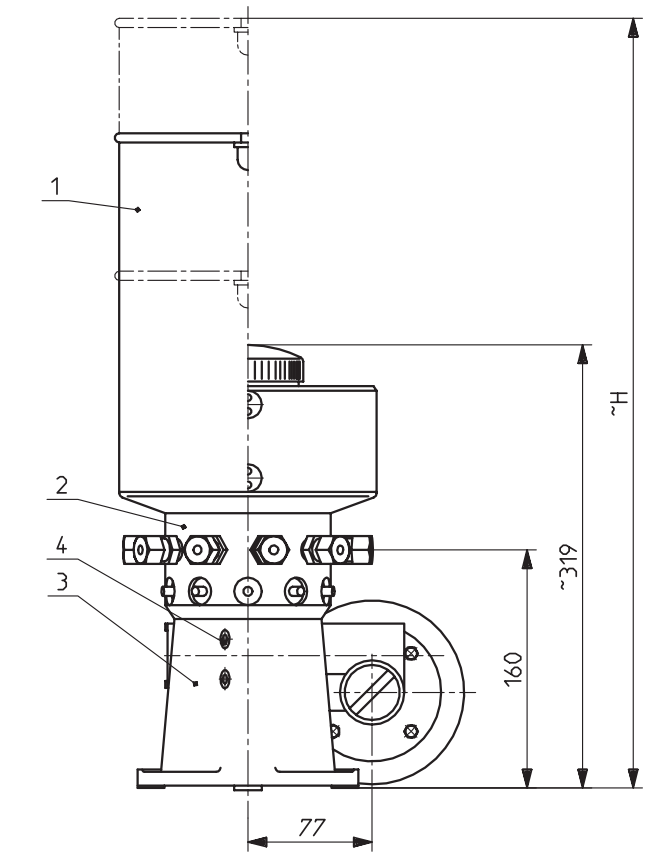
Tank capacity	H
3 dm³	266
4,5 dm³	331
6 dm³	400

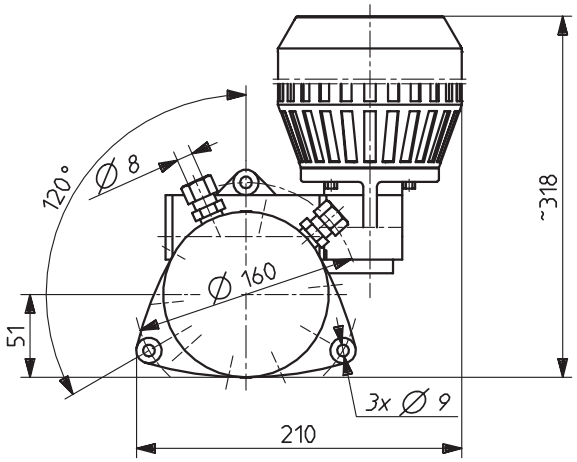
Fig. 5 Grease and oil lubrication pump with rotary drive of MPS 10-B type



Tank capacity	H
3 dm³	266
4,5 dm³	331
6 dm³	400

Fig. 6 Grease and oil lubrication pump with drive and additional reduction gear of MPS 10-C type





Tank capacity	H
3 dm³	266
4,5 dm³	331
6 dm³	400

Fig. 7 Grease and oil lubrication pump with drive of MPS 10-S type

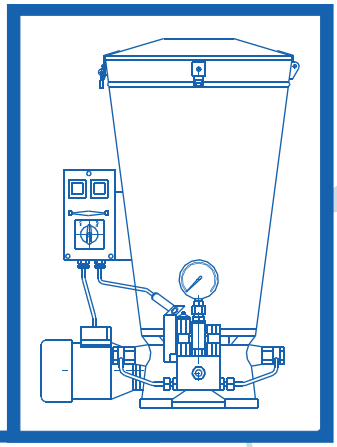
Equipment for Lubrication Stands in Vehicle and Machine Service Stations

Central lubrication pump PD 12 & PA12G

Lubrication gun SP 10 and flexible hose WP 10

Lubrication stand SA 1 and SA 1G

CENTRAL LUBRICATION PUMP
PA 12 and PA 12G Type



Central lubrication pump PD 12 & PA 12G

Central lubrication pump PD 12 & PA12G

Application

The pump is designed for lubricating friction nodes in vehicle chasses and machines. Lubricant is fed to the reception point equipped with a ball nipple by a lubrication gun joined to the pump by a flexible hose. The pump is recommended for equipping lubrication stands in vehicle and machine service stations. It may also be used to lubricate friction nodes in dredging excavators, dredgers and other equipment of strip mines, as well as in underground mine workings (e.g. in copper mines).

Construction

The pump consists of the following assemblies:

- a tank with a grease feeding device,
- a power transmission system comprising an electrical motor, single-stage worm gear put into a common body with an eccentric power transmission system,
- two forcing units of various capacity, comprising forcing elements in which pistons receive power from the eccentric power transmission system, return valves and pressure conduits,
- control valve comprising a control slide, two overflow valves (the left one equipped with a valve piston movement gauge), inductive contactless switch mating the piston movement gauge and pressure gauge,
- control device mating an inductive proximity sensor placed in the control valve,
- an electric device signalling the minimum and maximum level of lubricant in the tank (special accessory).

Operation

The pump is powered by an electric motor. The engine shaft rotation is transmitted through a worm gear to the eccentric power transmission system and grease feeding device. The feeding device drift fender separates the lubricant from the tank face , while the feeding screw of the device kneads it initially and passes to the sucking area of the forcing units. Pistons of the forcing units, with a reciprocating movement induced by the eccentric power transmission system, force the lubricant to the return valve. The left forcing unit forces 75 cm3/min and the right one 125 cm3/min.

The control valve is for directing the lubricant forced through the left and the right forcing unit to their joint outlet and maintaining the maximum pressure set with overflow valves for each forcing unit. Maximum pressure for the left unit may be set at 40 MPa, and for the right at 20 MPa. The pressure gauge installed on the control valve indicates momentary pressure induced by the forcing units.

The pump is designed to operate with two types of control: hydraulic and electro-hydraulic. The type of control is selected with a cam connector placed on the control device. If the connector is in position „1", only hydraulic control works. In this case, the pump operates continuously and the lubricant is forced according to the dependences shown in the diagram (Fig. 1).

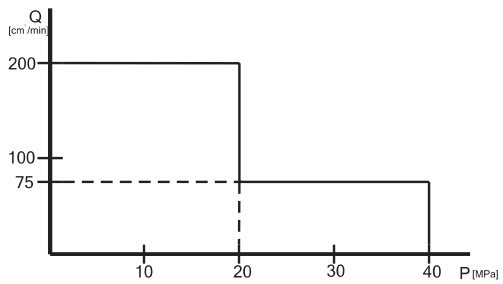
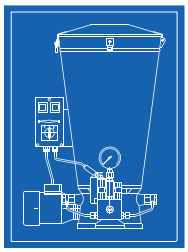


Fig. 1

If the connector is in position "2", the electro-hydraulic control system works. The pump forces lubricant until the maximum set pressure is achieved; then, the inductive proximity sensor activates and transmits a signal to the control device which stops the engine. The pump starts again when the pressure drops (e.g. if the lubrication gun opens) to the preset minimum value. The pressure boundary values at which the pump starts or stops are preset with the overflow valve with an adjusting nut of the valve piston movement gauge.
Because of stroke adjustment of the pump delivery it is possible to fill the lubricant reception point quickly at low pressure and force it at high pressure. This feature is also useful if there is a need to remove solids, which occur with the lubricant ageing or soiling, from the lubrication area (at high pressure and low delivery). When the line is unobstructed, further filling takes place at lower pressure and full pump delivery.

Technical details



Delivery	
- at pressure up to 20 MPa	200 cm^3/min
- at pressure 20...40 MPa	75 cm^3/min
Maximum pressure	
- for the right forcing unit	20 MPa
- for the left forcing unit	40 MPa
Pressure range during automatic operation	18...28 MPa
Power demand	0,75 kW
Rated voltage	230/400 V or 500 V, 50 Hz
Lubricants forced	plastic grease of the consistence class ≤ 2 acc. to PN-72/C-0490 (NLGI)
Ambient temperature	-10...60°C
Tank capacity	63 dm^3
Weight	65 kg
Pipe coupling	Straight coupling 320-10 acc. to PN-65/M-73126
Power lead choke	Db 11

Execution

The pump is manufactured in variations which differ in rated value and the use or not of the lubricant level in the tank gauge. Pump symbols are indicated in the table:

Pump symbol	Rated voltages	Level gauge used / not used	Execution
PA12-1	230 / 400 V	NO	Standard execution (Fig. 2)
PA12-2	500 V		
PA12-3	230 / 400 V	YES	
PA12-4	500 V		
PA12G-2	500 V	NO	Execution for applying to underground mine workings with no threat of explosion (Rys. 3)
PA12G-4		YES	

Note: Lubrication gun and flexible hose are not attached.

Placing orders

The order should specify the name and symbol of the pump.

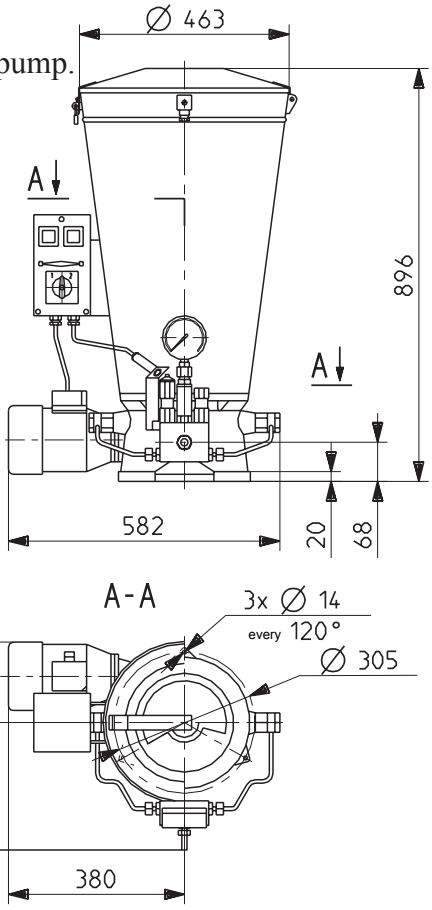


Fig. 2 Overall and linkage dimensions of the pump PA 12

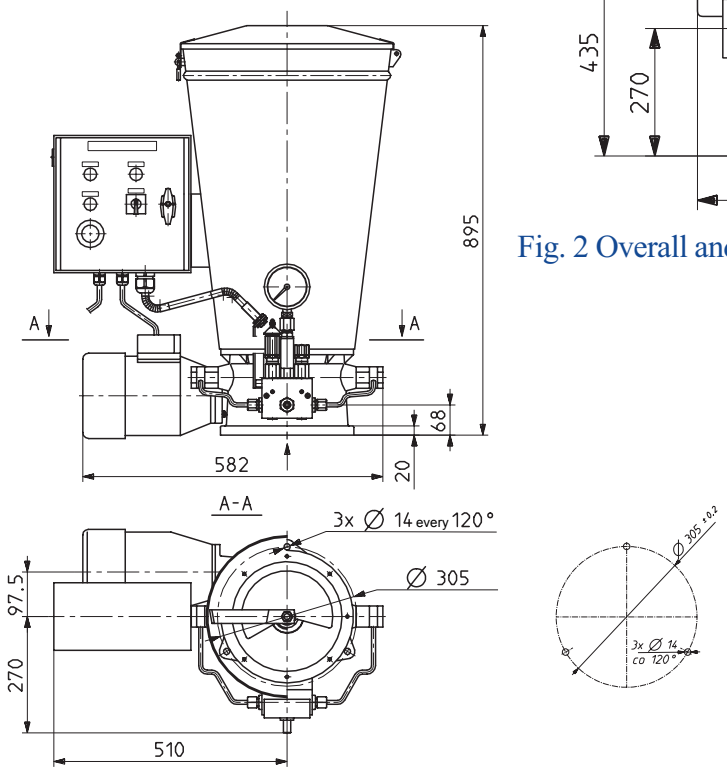


Fig. 3 Overall and linkage dimensions of the pump PA 12G

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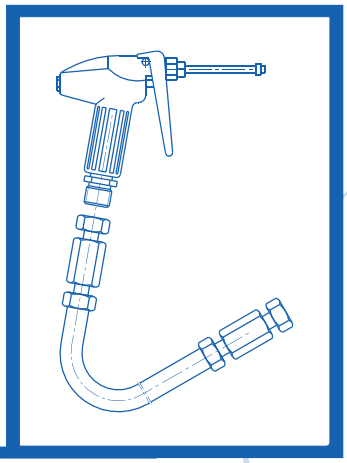
LUBRICATION GUN WITH FLEXIBLE HOSE SP 10 & WP 10 Type



Lubrication gun SP 10 and flexible hose WP 10

Lubrication gun SP 10 and flexible hose WP 10

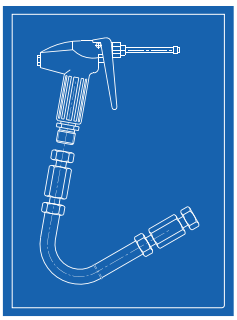
Application

Lubrication gun (connected to the pump outlet by a flexible hose) is designed to feed lubricant to friction nodes which have housings fitted with ball or other lubricating nipples.

Construction and operation

Lubrication gun consist of a body, cut-off valve built in the body, high pressure nozzle and trigger lever. The flexible hose is a hydraulic hose terminated with two couplings.
The lubricant is fed from the pump to the reception point at the moment the trigger level is applied (the cut-off valve opens).

Technical details



Maximum flow rate	1 dm^3/min
Nominal pressure	32 MPa
Gun weight	0,72 kg
Hose length	6...8 running metres (special execution up to 15 running metres)

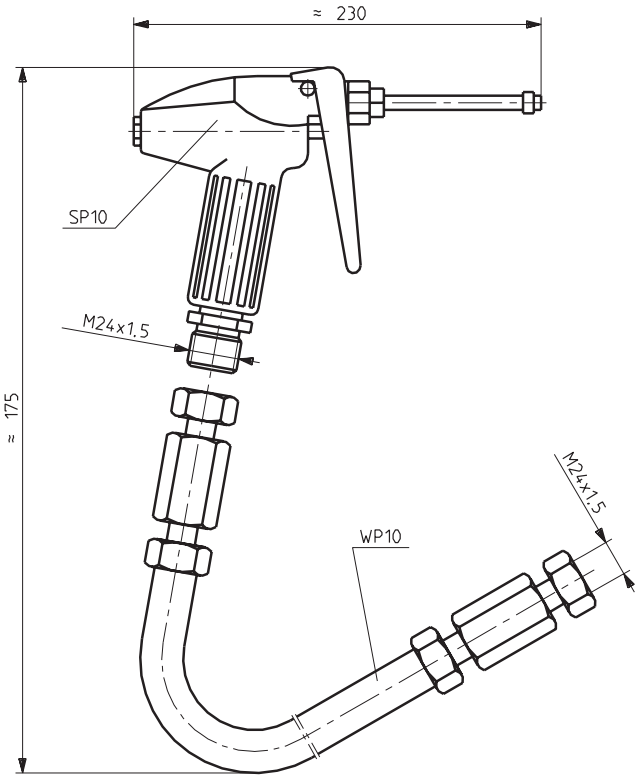


Fig. 1 Overall and linkage dimensions

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LUBRICATION STAND FOR FRICTION NODES IN TRANSPORT VEHICLES SA 1 & SA1G Type

Lubrication stand SA 1 and SA 1G

Lubrication stand SA 1 & SA1G

Application

The lubrication stand is designed to lubricate friction nodes in vehicle chasses and machines. Lubricant is fed to the reception point equipped with a ball nipple by a lubrication gun joined to the pump by a flexible hose.

Construction

The lubrication stand consists of a lubrication pump of PA 12 or PA 12G type (Fig. 2-1), lubrication gun connected to the pump by a flexible hose (Fig. 2-2) and a trolley to move the pump around (fig. 2-3). As an accessory, a filling (forcing) pump of PZ 31 type may be added (Fig. 2-4).
Pump PA 12 or PA 12G which is the basic device of the lubrication stand consists of the following assemblies:

- a tank with a grease feeding device,
- power transmission system comprising an engine, a worm gear and eccentric power transmission system
- two forcing units of different delivery, comprising forcing elements, return valves and pressure conduits,
- control valve comprising a control slide, two overflow valves (the left one equipped with a valve piston movement gauge), inductive contactless switch mating the piston movement gauge and pressure gauge,
- control device mating an inductive proximity sensor placed in the control valve,
- an electric device signalling the minimum and maximum level of lubricant in the tank (special accessory).

Operation

The pump is powered by an electric motor. The engine shaft rotation is transmitted through a worm gear to the eccentric power transmission system and grease feeding device. The feeding device drift fender separates the lubricant from the tank face, while the feeding screw of the device kneads it initially and passes to the sucking area of the forcing units. Pistons of the forcing units, with a reciprocating movement induced by the eccentric power transmission system, force the lubricant to the return valve. The left forcing unit forces 75 cm3/min/min and the right one 125 cm3/min.
The control valve is for directing the lubricant forced through the left and the right forcing unit to their joint outlet and maintaining the maximum pressure set with overflow valves for each forcing unit. Maximum pressure for the left unit may be set at 40 MPa, and for the right at 20 MPa. The pressure gauge installed on the control valve indicates momentary pressure induced by the forcing units. The pump is designed to operate with two types of control: hydraulic and electro-hydraulic. The type of control is selected with a cam connector placed on the control device. If the connector is in position “1”, only hydraulic control works. In this case, the pump operates continuously and the lubricant is forced according to the dependences shown in the diagram (Fig. 1).

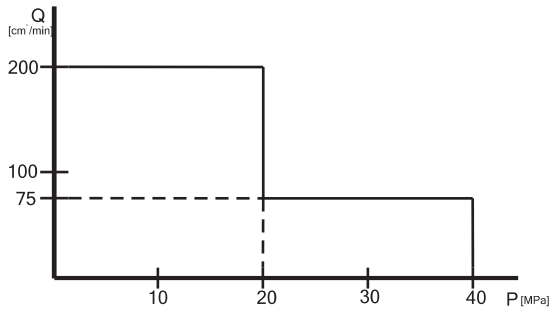
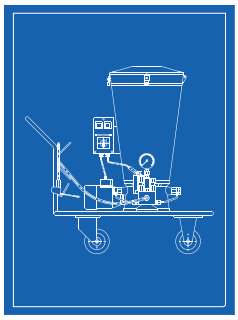


Fig. 1

If the connector is in position "2", the electro-hydraulic control system works. The pump forces lubricant until the maximum set pressure is achieved; then, the inductive proximity sensor activates and transmits a signal to the control device which stops the engine. The pump starts again when the pressure drops (e.g. if the lubrication gun opens) to the preset minimum value. The pressure boundary values at which the pump starts or stops are preset with the overflow valve with an adjusting nut of the valve piston movement gauge. Because of stroke adjustment of the pump delivery it is possible to fill the lubricant reception point quickly at low pressure and force it at high pressure. This feature is also useful if there is a need to remove solids, which occur with the lubricant ageing or soiling, from the lubrication area (at high pressure and low delivery). When the line is unobstructed, further filling takes place at lower pressure and full pump delivery.



Technical details of pumps PA 12 & PA 12G

Delivery	
- at pressure up to 20MPa	200 cm^3/min
- at pressure 20...40MPa	75 cm^3/min
Maximum pressure	
- for the right forcing unit	20 MPa
- for the left forcing unit	40 MPa
Pressure range during automatic operation	18...28 MPa
Power demand	0,75 KW
Rated voltage	230/400V or 500V, 50 Hz
Lubricants forced	plastic grease of the consistence class ≤ 2 acc. to PN-72/C-04090 (NLGI)
Ambient temperature	-10...60 °C
Tank capacity	63 dm^3
Weight	65 kg

Technical details of PZ 31

Delivery	9 dm^3/min
Nominal pressure	2,5 MPa
Rated power	1,1 KW
Rated voltage	230/400 V or 500 V, 50 Hz
Weight of pump with crane	64 kg

Executions and symbols

The lubrication stand is made in variations listed in the following Table:

Stand symbol	Voltage	Execution
SA1-1	230 / 400 V	Standard execution (Fig. 1)
SA1-2	500 V	
SA1G	500 V	Execution for applying to underground mine workings, e.g. copper mines (Rys. 2) (EC Certificate 147 on the last page)

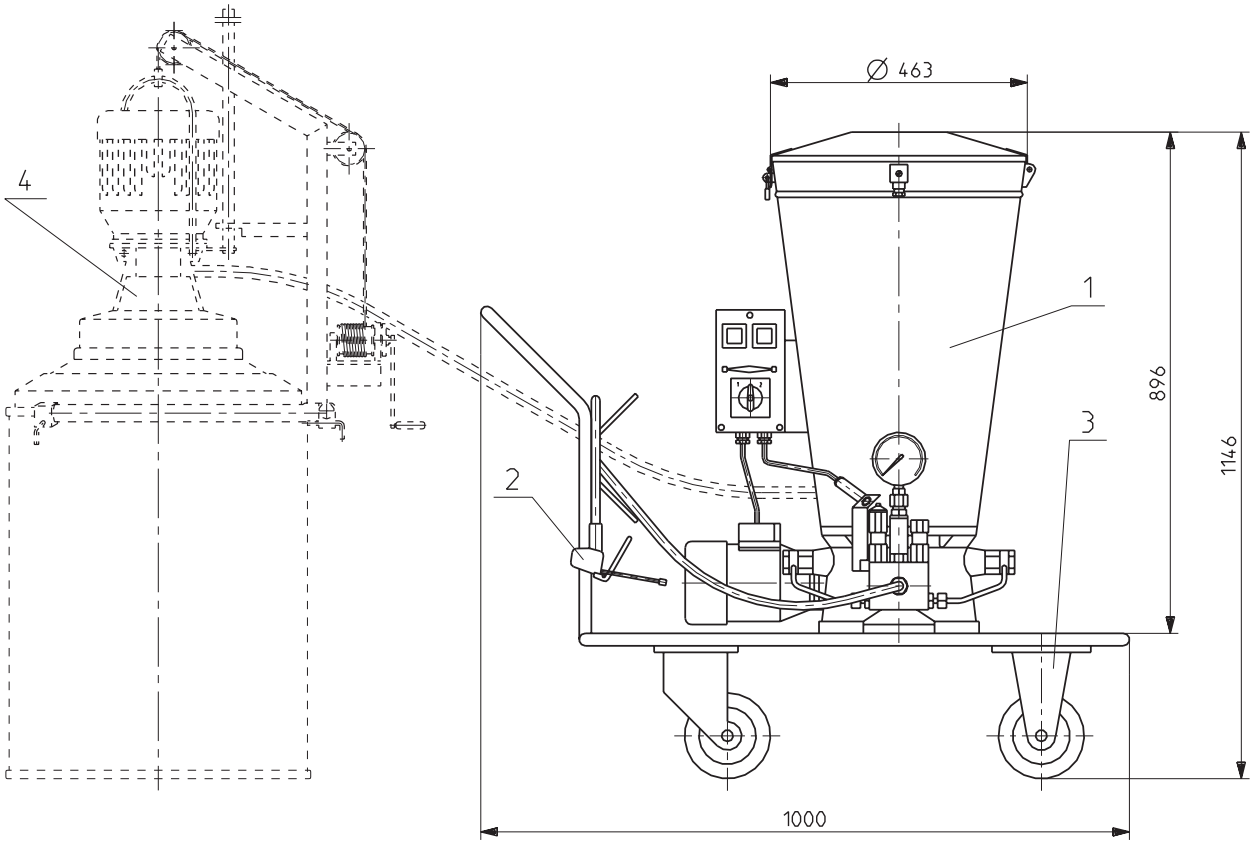


Fig. 2 Overall dimensions of the lubrication stand SA 1

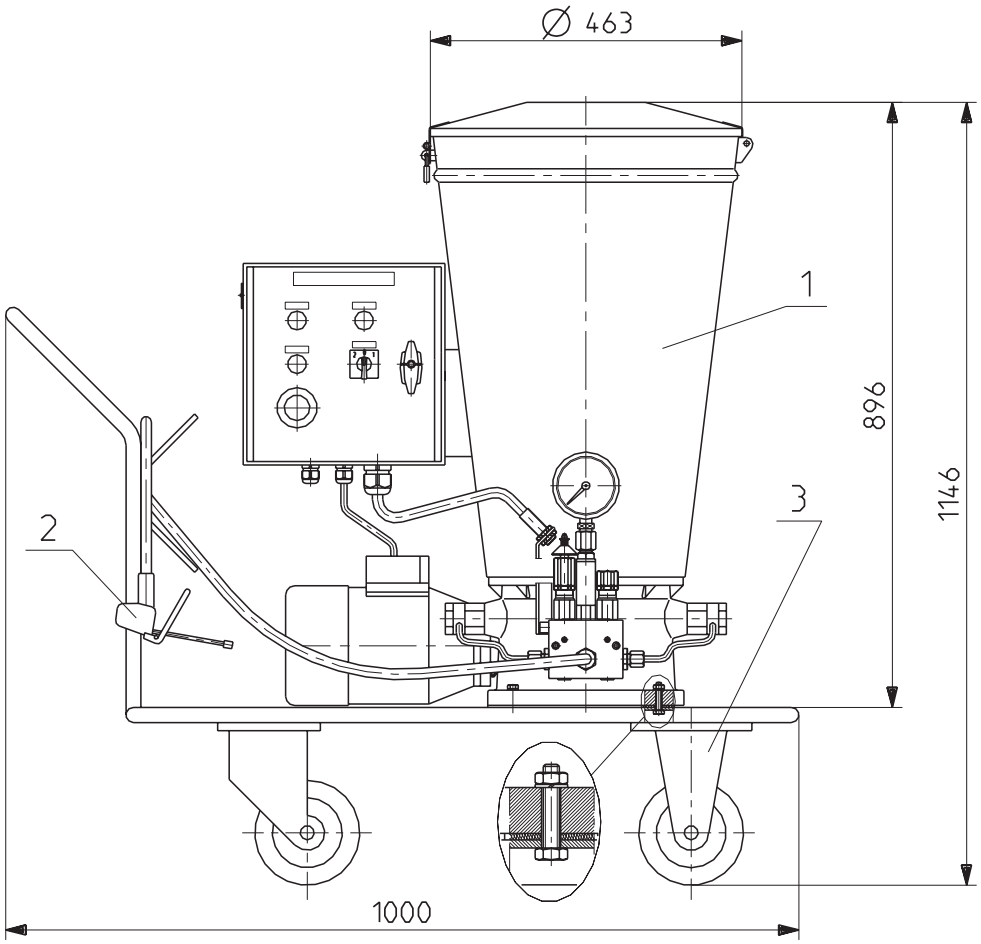


Fig. 3 Overall dimensions of the lubrication stand SA 1G

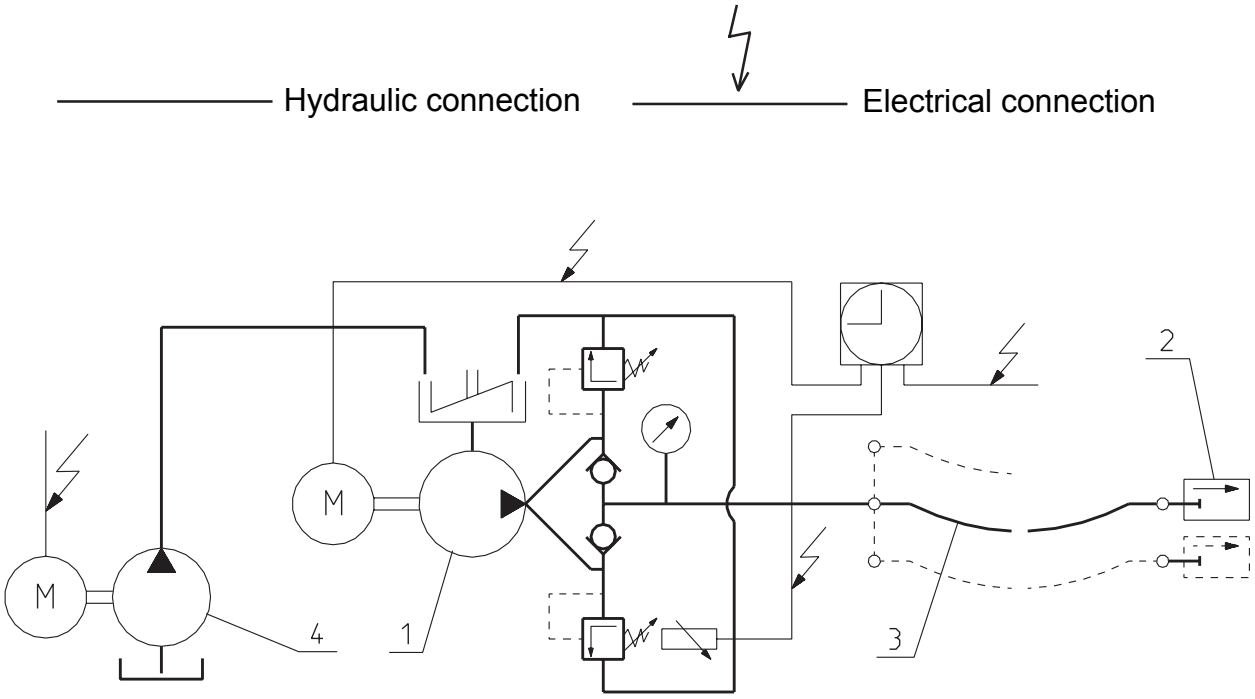


Fig. 4 Construction and operational scheme of the lubrication stand

Item	Specification
1.	Lubrication pump PA 12 or PA 12G
2.	Lubrication gun SP 10
3.	Flexible hose WP 10
4.	Loading pump PZ 31

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WŁADYSŁAW NAUMOWICZ

Two-way force feed oiling systems.
Selecting elements and basic parameters.

A lubricating system used on a machine or technical device, in order to ensure efficient lubrication, should have appropriate construction elements selected and other values which condition the determined proper operation. Preparatory works for using the lubrication system are conducted during designing and cover the following operations:

- selection of dosing distributors (feeders) of delivery corresponding to the demand of individual reception points for lubricating medium,
- setting frequency of lubrication
- selection of pipe diameters
- selection of pump according to its delivery and pressure produced.

1. APPLICATION, CONSTRUCTION AND OPERATION OF CENTRAL LUBRICATION SYSTEMS

The two-way force feeding oiling systems [3] are mainly recommended for lubricating high-load machines and devices operating in difficult conditions, having a large number of friction nodes located at large distances and requiring intensive lubrication. So far, the equipment has been used in ironworks, steelworks, non-ferrous metal smelters, strip mine equipment, cement mills, sugar factories, forging plants and other complexes with similar equipment and work conditions. The two-way oiling systems consist of the following elements (Fig. 1):

- central lubrication pump,
- controlling distributor (hydraulic or electromagnetic) which changes the direction of feeding lubricant,
- dosing distributors (two-way feeders) located on the lubrication main conduit lines at the points where the grease is received and passed to the reception points,
- system operation controller,
- filling pump,
- pipes and connectors.

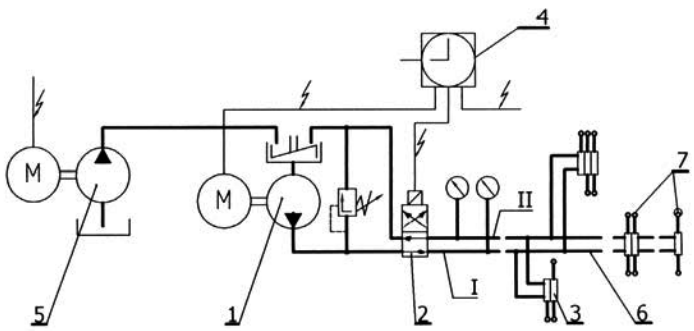

Fig. 1 Construction diagram of the two-way force feed oiling system:
1 - central lubrication pump, 2 - control distributor, 3 - dosing distributors, 4 - controller,
5 - tank-filling pump, 6 - lubrication main conduit lines (I,II), 7 - lubricant reception points

System operation consists of cyclical forcing of lubricant by a pump to one of two lubrication main conduit lines alternately. This cyclical change of pressure in the lines activates dosing distributors which feed lubricant to reception points. The amount of lubricating medium depends on variations of dosing distributors used in the system as well as their delivery preset with the controller programme.

The program of POLNA Automatic Machinery Plant covers all necessary devices to construct two-way systems in many variations [5].

2. SELECTING DOSING DISTRIBUTORS (TWO-WAY FEEDERS)

A feeder is selected according to the amount of lubricant which should be fed to the friction node in a specific period of time. The amount is estimated, according to various sources, at 10—40 g of lubricant per 1m^2 of lubricated surface, during one hour of operation.
More precise results may be calculated from the following dependence: [4]

$$q = 11\ k_1 k_2 k_3 k_4 k_5 \qquad \text{cm}^3/(\text{m}^2 \text{ x h}), \qquad (1)$$

where:

q - - the amount of lubricant (cm^3) which should be fed to 1m^2 g of lubricated surface, during one hour of operation,

11 - maximum consumption of lubricant (with reference to a bearing of diameter 100 mm and up to 100 rpm), cm^3/m^2 x h

k_1 - coefficient which takes into account the bearing diameter (Table 1)

k_2 - coefficient which takes into account demand for lubricant depending on the bearing speed of rotation (Table 2)

k_3 - coefficient which takes into account quality of execution of friction surfaces k_3=1-1,3

k_4 - coefficient taking into account temperature of bearing operation

for t<70°C k_4=1
for t=75-150°C k_4=1,2

k_5 - coefficient which takes into account the bearing loading

for regular load k_5=1
for high load k_5=1,1

Table 1 Coefficient k_1 for the dependence (1)

Specification	Bearing diameter [mm]				
	100	200	300	400	500
For slide bearings	1,0	1,4	1,8	2,2	2,5
For rolling bearings	1,0	1,1	1,2	1,25	1,3

Table 2 Coefficient k_2 for the dependence (1)

Specification	Bearing speed of rotation [rpm]			
	100	200	300	400
For slide and rolling bearings	1,0	1,4	1,8	2,2

On the basis of the above data it is possible to calculate delivery of the distributor's dosing section with the following dependence:

where: $$V = qAt \ cm^3/cycle \qquad (2)$$

A - bearing friction face, m^2,

t - frequency of lubrication, h.

Dosing feeder is selected according to the amount of lubricant required using the manufacturer's catalogue [6].

Example calculation of lubricant amount for bearings in the fire grate of steam boiler WR25.

Input data:

Bearing dimensions - 100x160x52 (rolling bearings)
Speed of rotation - approx. 10 rpm
Temperature of beaarings - approx. 50°C - 2 bearings of driving shaft
approx. 250°C - 2 bearings of rear shaft
Load - high
Quality of bearing face - good

Necessary amount of lubricant that has to be fed to the bearing during one lubrication cycle

Amount of lubricant per $1m^2$ of bearing face during 1 hour

$$q = 11 \ k_1 \ k_2 \ k_3 \ k_4 \ k_5 \qquad cm^3/m^2 \times h$$

k_1 - which takes into account the bearing diameter, for d=100 rpm -› $k_1 = 1$

k_2 - coefficient which takes into account demand for lubricant depending on speed of rotation
for $n \leqslant 100$ rpm -› $k_2 = 1$

k_3 - coefficient which takes into account quality of execution of friction surfaces
for rolling bearings -› $k_3 = 1$

k_4 - coefficient taking into account temperature of bearing
for $t \leqslant 70$ °C -› $k_4 = 1$ (1)
for $t \leqslant 250$ °C -› $k_4 = 2,5$ (2)

k_5 - coefficient taking into account type of load, for hard work -› $k_5 = 1,1$

Thus:

$q_{(1)} = 11 \times 1 \times 1 \times 1 \times 1 \times 1{,}1 = 12{,}10$ $cm^3/m^2 \times h$

$q_{(2)} = 11 \times 1 \times 1 \times 1 \times 2{,}5 \times 1{,}1 = 30{,}25$ $cm^3/m^2 \times h$

amount of lubricant fed by dosing distributors to the bearing during one lubrication cycle

$$V = F \ q \ T = m \ T \qquad cm^3/cycle$$

Face of the bearing

(In the case of rolling bearings "d", the diameter of the bearing hole is taken)

$$F = (\pi \times d \times L) / 2 = (3{,}14 \times 0{,}1 \times 0{,}052) / 2 = 0{,}008 \ m^2$$

Amount of lubricant that should be fed to the bearing during 1 hour of operation

$m = F \times q$ cm^3/h

$m_{(1)} = 0{,}008 \times 12{,}1 = 0{,}1$ cm^3/h

$m_{(2)} = 0{,}008 \times 30{,}25 = 0{,}24$ cm^3/h

Amount of lubricant that should be fed to the bearings during 1 lubrication cycle

$$V = m \times T \qquad cm^3/cycle$$

Lubrication frequency is set at:

T = 12 h

$V_{(1)} = m_{(1)} \times T = 0{,}1 \times 12 = 1{,}2$ $cm^3/cycle$

$V_{(2)} = m_{(2)} \times T = 0{,}24 \times 12 \cong 3$ $cm^3/cycle$

Selecting dosing distributors (feeders) of DD type

1) For bearings of drive shaft, feeders DD21 should be used (two-outlet of max. delivery 2 cm^3/cycle)
2) For bearings of rear shaft, feeders DD22 should be used (two-outlet of max. delivery 4 cm^3/cycle)

3. 3. SELECTING PIPE DIAMETERS

After working out the first concept of the pipelines' course, through which lubricant is to be fed in the lubrication system, it is necessary to determine precisely their diameters depending on flow duration and resistance.

At forcing lubricant, a pump must overcome the following resistance: [1]

1. Lubricant flow resistance in the feeding line (active), before the last distributor. In a correctly designed system, this resistance is: $p_1 = 0{,}1 - 0{,}3$ *MPa/rm*

2. Resistance in the dosing distributor: p_2=0,2 - 0,6 MPa

3. Resistance in the line after the distributor: p_3=0,1 - 0,3 MPa/rm

4. Resistance in the lubricant reception point: p_4=0,2 - 0,4 MPa

5. Local resistances in the active line (change of flow direction, change of pipe intersections, etc.): p_5

6. Resistance in the inactive line, at the lubricant return: p_6= aprox. 0,05 MPa/rm

Flow resistance in the pipe depends mainly on the flow intensity, type of lubricant (its penetration) and temperature. Diagrams [5] are used to determine losses. Examples of the diagrams, for the most frequent lines in lubrication systems, are indicated in fig. 2.The diagrams were made at forcing plastic grease of IP1-Z symbol (lime-soda grease on the basis of cylinder oil, of penetration 310-360/50°C, made in former ZSRR)

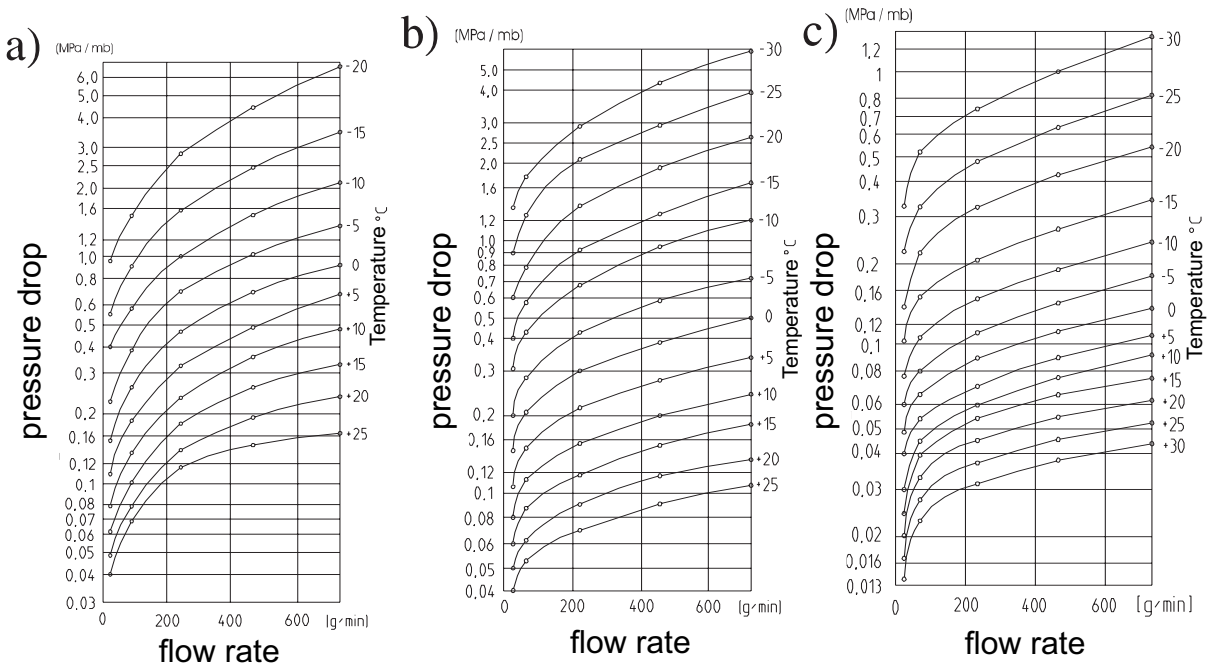

Fig. 2 Diagrams of pressure drops at forcing plastic grease IP1-Z through pipes of nominal diameters: a=9 mm; b=13 mm; c=25 mm.

Due to the complex rheological properties of lubricant (structural viscosity, tixotropic properties, as well as lubricant wall properties), accurate determination of actual flow resistance is very difficult [2]. Thus, the values indicated in paragraphs 1-6 above or read from diagrams (Fig. 2) should be treated as approximate and some excess pressure (generated by the pump) should be taken into account in the designed system to ensure proper operation of the lubrication system.

In order to verify the correctness of selected parameters in the designed system, it is necessary to prepare, on the basis of calculation results, a diagram of pressure drops according to Fig. 3 [1].

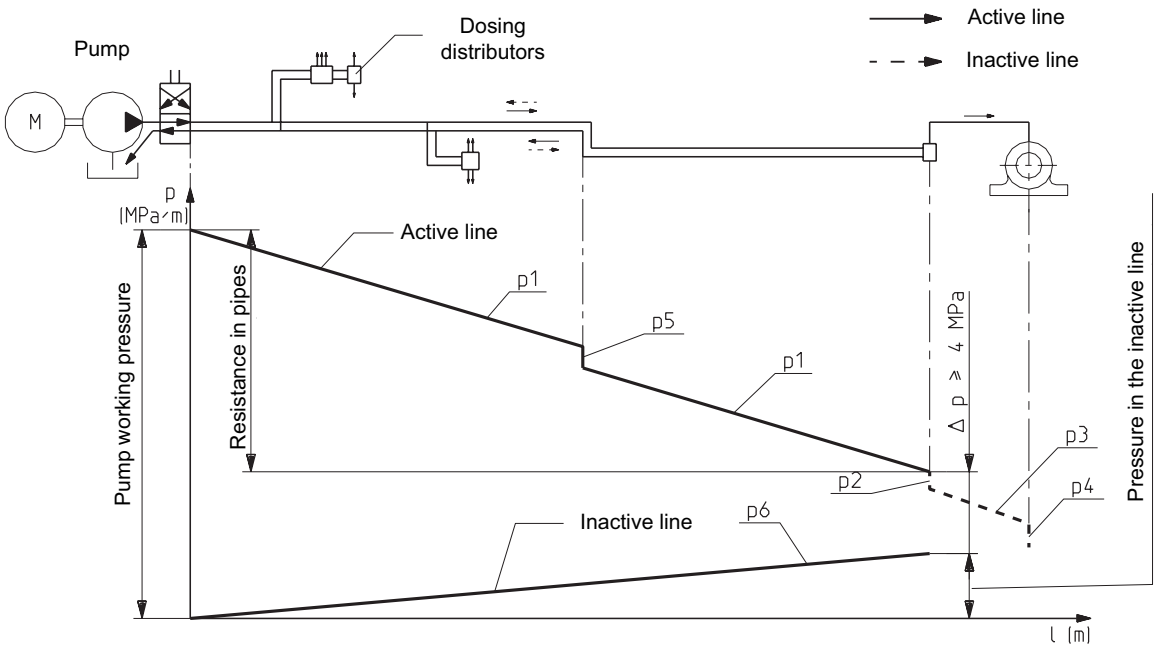

Fig. 3 Diagram of pressure drops in the lines of the central lubrication system.

Data from Table 3 [5] may be used to determine line diameters depending on their length.

Table 3. approximate diameters of lines in central lubrication systems with plastic grease, depending on their length.

Length of line measured from the working pump [m]	Nominal diameter [mm]
100 - 120	50
65 - 75	40
35 - 40	25
20	20
15	16
10	10

When constructing a lubrication system it is necessary to avoid pressure difference at the end of lines (active and inactive) - in the last dosing distributor - lower than 4 MPa (Fig. 3). This is the basic condition for proper operation of a two-way central lubrication system.

On the basis of experience gained in system construction, it has been noticed that the area of lubricated devices covered by one system should not be larger than 80m, and lengths of individual lines (distance from the pump to the last remote dosing distributor) must not exceed 40m. E.g. in a system in which pump PD 31 of 150 cm^3/min and pressure up to 32 MPa was used, the following pipeline dimensions worked:

- main conduit lines - d_w33 (pipe 38 x 2,5), length - 40 m,
- lines connecting distributors with the main conduit - d_w13 (pipe 16 x 1,5), length - 10 m
- lines connecting distributor outlets with bearing housings - d_w8 (pipe 10 x 1), length - 2,5 m.

4. SELECTING A PUMP

When designing a lubricating system it is necessary to select a pump so that it feeds lubrication medium in the amount corresponding to the need of machines and devices and produced pressure ensuring feeding of the medium to all reception points, according to the diagram (Fig. 3) [6].

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