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# **SZ-16**

**Universal device to force  
jerks of powered wheels of vehicles  
for the purpose of inspection of play  
or slack in suspension and steering  
system components  
type SZ-16**

**OPERATION AND MAINTENANCE MANUAL**

Edition: September 2011



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## **Introduction**

Carefully read this operation and maintenance manual before the first start-up and use of the machine.

In order to ensure the proper functioning of the machine, observe the following:

- protect the machine from moisture and humidity,
- the interior of the control cabinet must be dry and free from dust,
- the machine should be securely connected to the power supply,
- only authorized persons are allowed to operate and repair the machine.

### **WARNING!**

Start-up and repairs of the machine may be performed only by an authorised service. Electrical work may be performed only by a certified electrician. Improper use or accidental damage to equipment may void the warranty. Starting the equipment and their use is allowed only by trained personnel. In case of failure or faulty operation of equipment, the service must be notified in writing.

#### **MANUFACTURER**

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## 1. Safety and accident prevention

For own safety and safety of customers, observe the following safety rules:

- the equipment can be operated only by persons familiar with this manual and trained by the manufacturer's service department,
- drive onto the plates softly, at a very low speed, to minimise impact loads,
- periodically check tightness of foundation screws in order to make sure that no looseness emerged as a result of operation; in case looseness is determined, tighten the nuts immediately,
- access to the wiring is only allowed for authorised personnel bearing appropriate certificates,
- protect the machine from moisture and humidity,
- during operation, unauthorised persons are not allowed near the test vehicle,
- the machine ensures safe operation in working environments of vehicle inspection stations in Poland.

### **WARNING!**

Oil in hydraulic lines is under high pressure. Extreme caution is advised.

## 2. Technical description

### 2.1. Purpose and scope of use

The universal device, type SZ-16, for forcing vibrations of powered wheels on vehicles, enables the determination through visual and auditory inspection of slackness in components of suspension and the steering system of stopped passenger cars and trucks as well as buses, with an axle load of up to 180 kN.

The examination of slack takes place after driving on with the vehicle wheels on the movable plates of the vibration actuator, through motion of the movable plates in four directions, with simultaneous observation of the components of the suspension and steering system being inspected (joints, bolts and bearings), lit with the strong light beam of the halogen control lamp.

The device is operated individually by a trained operator.

## 2.2. Specifications

### 2.2.1. General data

- Max. pressure of the tested wheel on the plate 90 kN
- Plate movements synchronous
- Weight of the mechanical part 2x280 kg
- Total installed power at 3 x 400V, 50 Hz 1,7 kW

### 2.2.2. Mechanical part - drive-on plate

- Vibrating plate width 1000 mm
- Vibrating plate length 870 mm
- Total height 220 mm
- Base width 730 mm
- Base length 680 mm
- Test shift of the moving plate: 100 mm
- Test force exciting a wheel jerk 3000 daN
- Moving plate spacing 900 – 2600 mm

### 2.2.3. Hydraulic power supply

- Voltage 3x400 V
- Power frequency 50 Hz
- Oil type Hydrol LHL-68 or equivalent
- Width 420 mm
- Height 590 mm
- Depth 400 mm
- Power 1,5 kW
- Maximum power supply pressure 16 MPa
- Operating pressure 15,2 MPa
- Oil volume min. 20 dm<sup>3</sup>
- Weight 60 kg

#### 2.2.4. Control cabinet

• Voltage	3x400 V
• Power frequency	50 Hz
• Installed capacity	0,2 kW
• Width	290 mm
• Height	370 mm
• Depth	130 mm
• Weight	5 kg

#### 2.2.5. Operating conditions

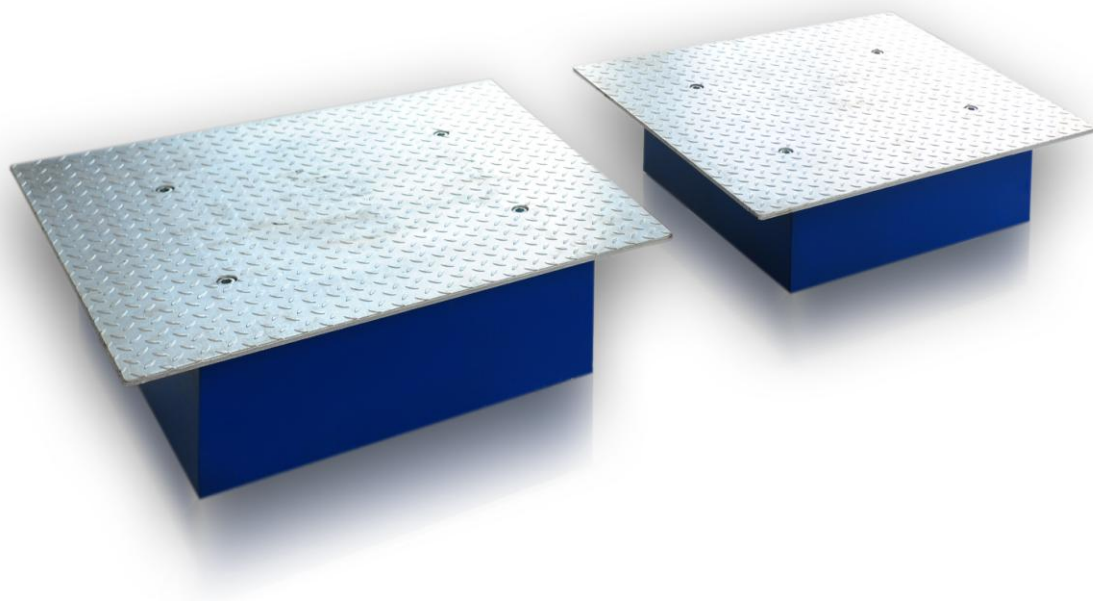
• Character of operation	in an enclosed space
• Ambient temperature range	from 5 °C to 40 °C
• RH	below 90% at +30 °C
• Atmospheric pressure	from 860 hPa to 1060 hPa
• Insolation	no insolation
• Air humidity and ventilation	negligible
• Permitted grid voltage variation	± 10%
• Permitted grid frequency variation	± 1%
• Radio interference	negligible

### 2.3. Structure

The universal jerking device, type SZ-16, is made of two jerking plates (jerkers), hydraulic power supply with splitters and junction cabinet, control cabinet and control lamp.

#### 2.3.1. Vibration actuators (marked: Left „L”, Right „P”)

They are placed symmetrically on both sides of the inspection channel, and affixed to the ground by means of foundation bolts. The pattern approach plate of each jerking unit is set on guides, which ensure motion parallel and perpendicular to the channel. The motion of the approach plate is forced by one of the single-direction actuators. A view of the central plate with the operational actuator set is presented in fig. 1, and a general view of the jerking unit is provided in fig. 2.



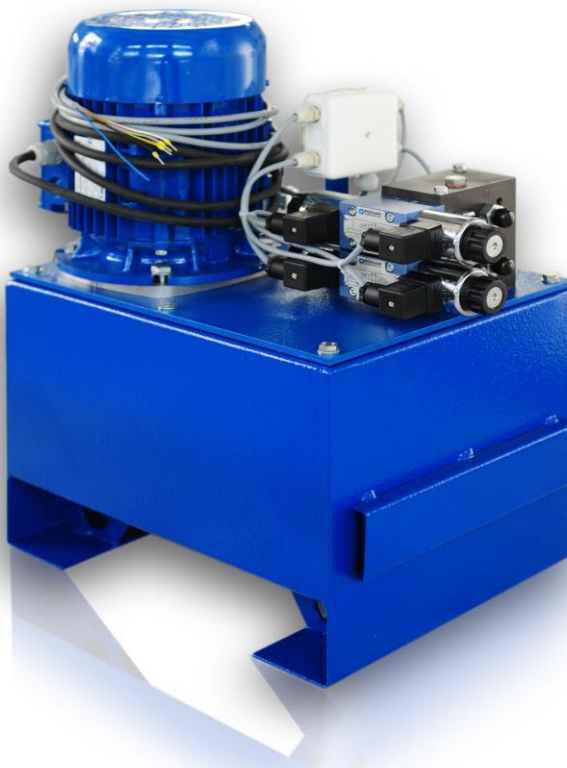
**Fig. 2.** General view of SZ-16 system



### 2.3.2. Hydraulic power supply with splitters

The hydraulic power supply needs to be placed in the recess in the wall of the inspection channel (fig. 7 - recommended placement), or outside of the channel, and it needs to be connected by hydraulic hoses with actuators of the jerking unit according to the plan (fig. 6).

A junction cabinet is attached to the container, which links electric subsystems of the hydraulic power supply with an output running to the control cabinet (fig. 3).



**Fig. 3.** Hydraulic power supply unit

Basic components of the hydraulic power supply:

- electric motor,  $N=1,5$  kW,  $n=1420$  RPM,
- geared pump, turning right,  $Q=5,1$  dm<sup>3</sup>/min,  $p_{\max}=16$  MPa,
- splitter valves
- overflow valve type DBDSP13/200.

All components are placed in the top cover of the container.

Splitter valves allow changing of the direction of motion and stopping of hydraulic receivers (approach plates).

### **2.3.3. Control cabinet**

The control cabinet contains elements of the control system.

- microprocessor control unit,
- 230 V AC/24 V DC power supply,
- 230/12V ring transformer,
- contactor with thermal relay for power supply pump engine,
- installation connector.

The face plate of the housing hosts the main power off switch and a control diode.

### 2.3.4. Cordless control lamp

The cordless control lamp forms an integral component of the system. The lamp is powered by four rechargeable Ni-Mh batteries (4 x 1,2V, 2500 mAh). Communication with the device control unit takes place via radio using the 433 MHz band. The mean work time on a fully charged battery pack is eight hours. Batteries are charged using the special-purpose microprocessor charger unit attached to the lamp. The charging time is approx. three hours. The synthetic material body hosts a LED lamp, the lamp panel has a thin film keyboard with buttons controlling the movement of the drive-on plates.



**Fig. 4.** Cordless control torch

### 2.3.5. Control torch (option)

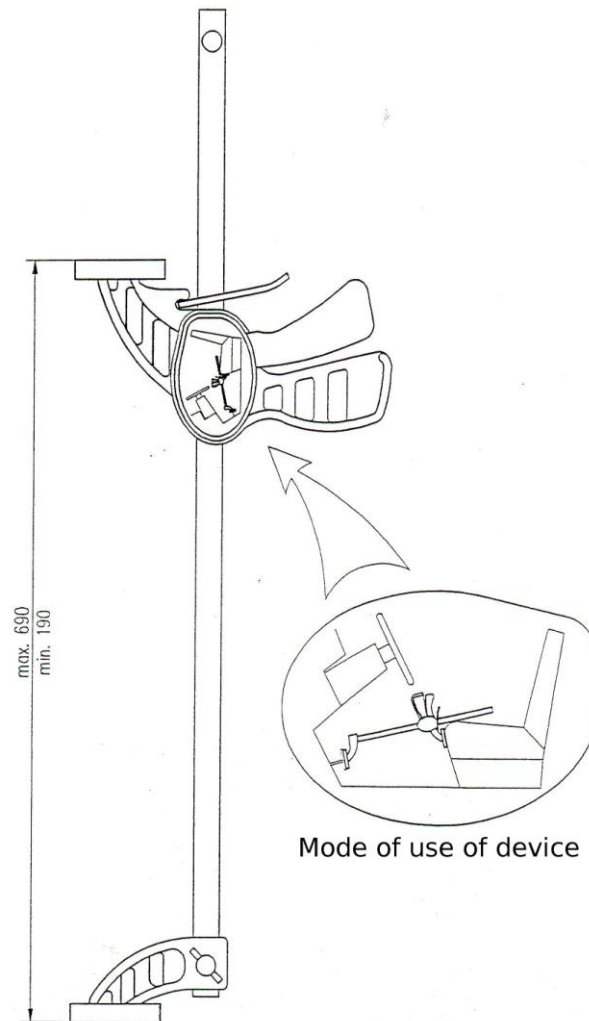
The control torch (fig. 4) is an integral part of the jerking system, and it is connected to the control cabinet. The synthetic material body houses a 1,7 W LED lamp and buttons to control the movement of the approach plates.



**Fig. 4.** Control torch with cord and connector

### 2.3.6. Device for locking the depressed brake pedal

This device, placed on the brake pedal, locks against the driver's seat and is used to immobilise the vehicle during the suspension test (fig. 5).



**Fig. 5.** Device for locking the depressed brake pedal

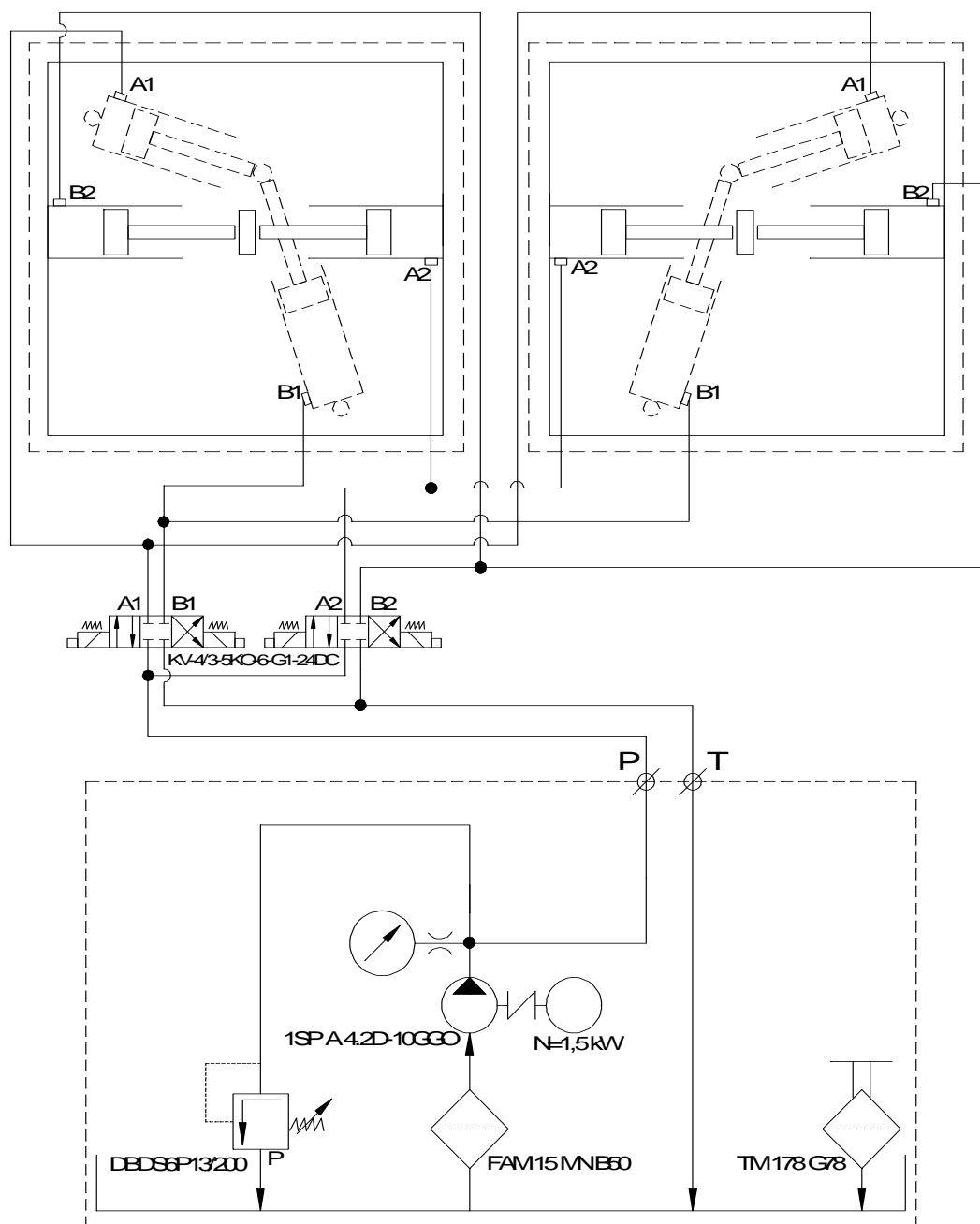


Fig.6. Hydraulic diagram

### **3. INSTALLATION**

#### **3.1. Location**

The SZ-16 play detector should be installed in an enclosed space, heated in the winter and having a fume hood. It is necessary for the room to be equipped with an inspection channel, for the hydraulic power supply unit with the control cabinet to be placed inside it. The location of the jerking unit on the inspection channel should ensure unhindered observation of the vehicle suspension by the diagnostics specialist.

#### **WARNING!**

The location of the individual device components should be dried and free from access by groundwater. Protect the control cabinet from direct exposure to water. In case of failure to comply with these guidelines, the warranty is void.

#### **3.2. Foundation**

The foundation should be prepared by a specialist company. The foundation should be constructed based on the figure included in this manual. Dimensions of the foundation for the SZ-16 system are given in fig. 7. The connection cable (power cable) should be run in a tube with a diameter of 50 mm.

#### **3.3. Establishing wired connections**

An electrical connection providing 3x400 V, 50 Hz to the terminals in the control cabinet should be executed using YDY 5x2,5 mm<sup>2</sup> cable. The power cable should be routed to the place of installation in a tube according to Section 3.2. The electrical system should be connected in accordance with the diagram shown in Figure 8.

### 3.4. Establishing hydraulic connections

The connection of the hydraulic system should be executed according to the diagram (fig. 6). The connection of the hydraulic power unit with the left and right jerking device actuators is executed by hydraulic hoses with appropriate connectors and equipment. It is recommended to run the hydraulic hoses in a channel according to dimensions given in fig. 7.

The assembly of the system and installation components for a standard power unit setup (inside channel recess) is provided by the manufacturer's service department.

**WARNING!**

**All expenses (material, workmanship) stemming from a non-standard setup of components of the SZ-16 jerking system, i. e. placement of the hydraulic power supply outside of the inspection channel, are borne by the Ordering Party.**



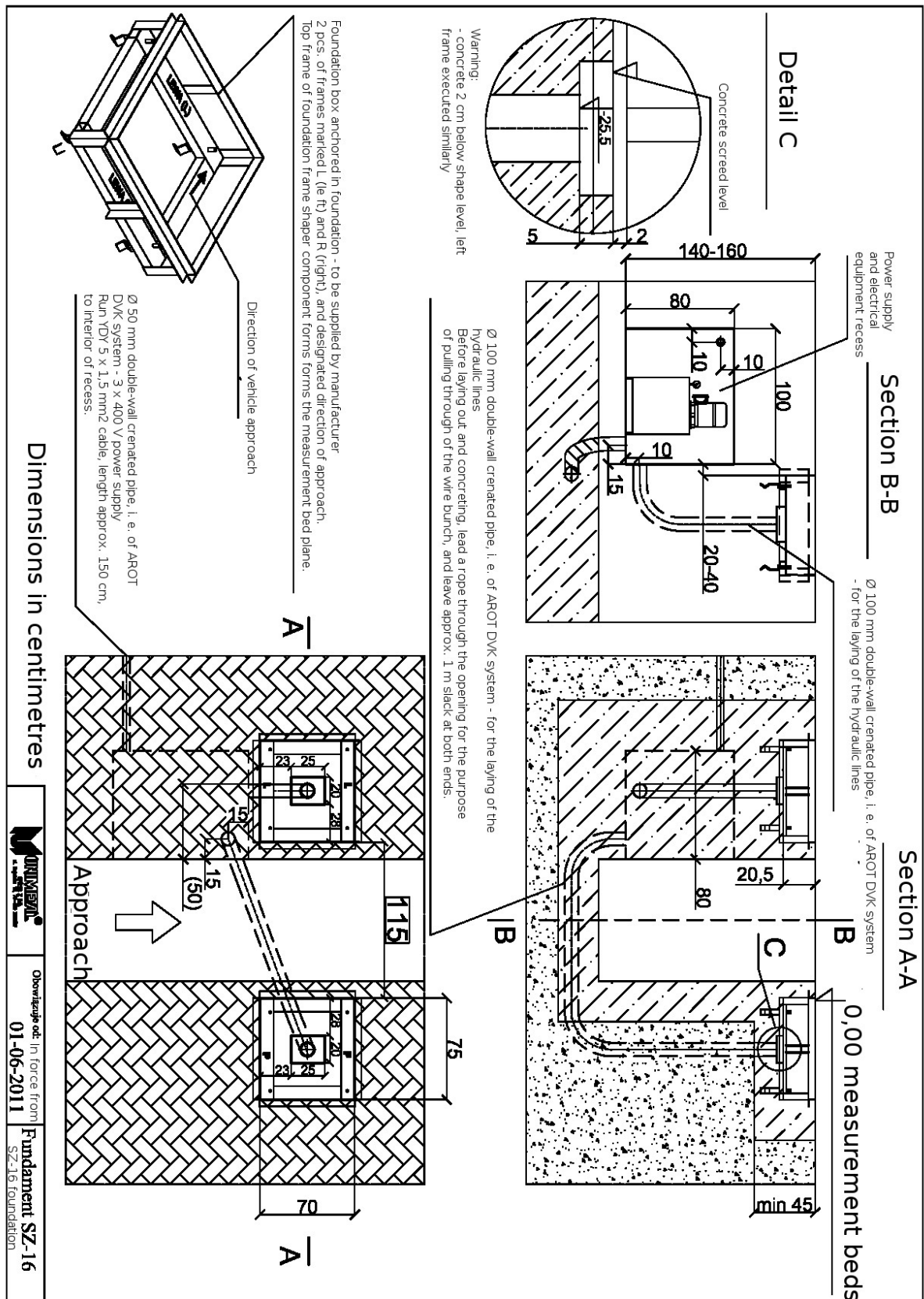
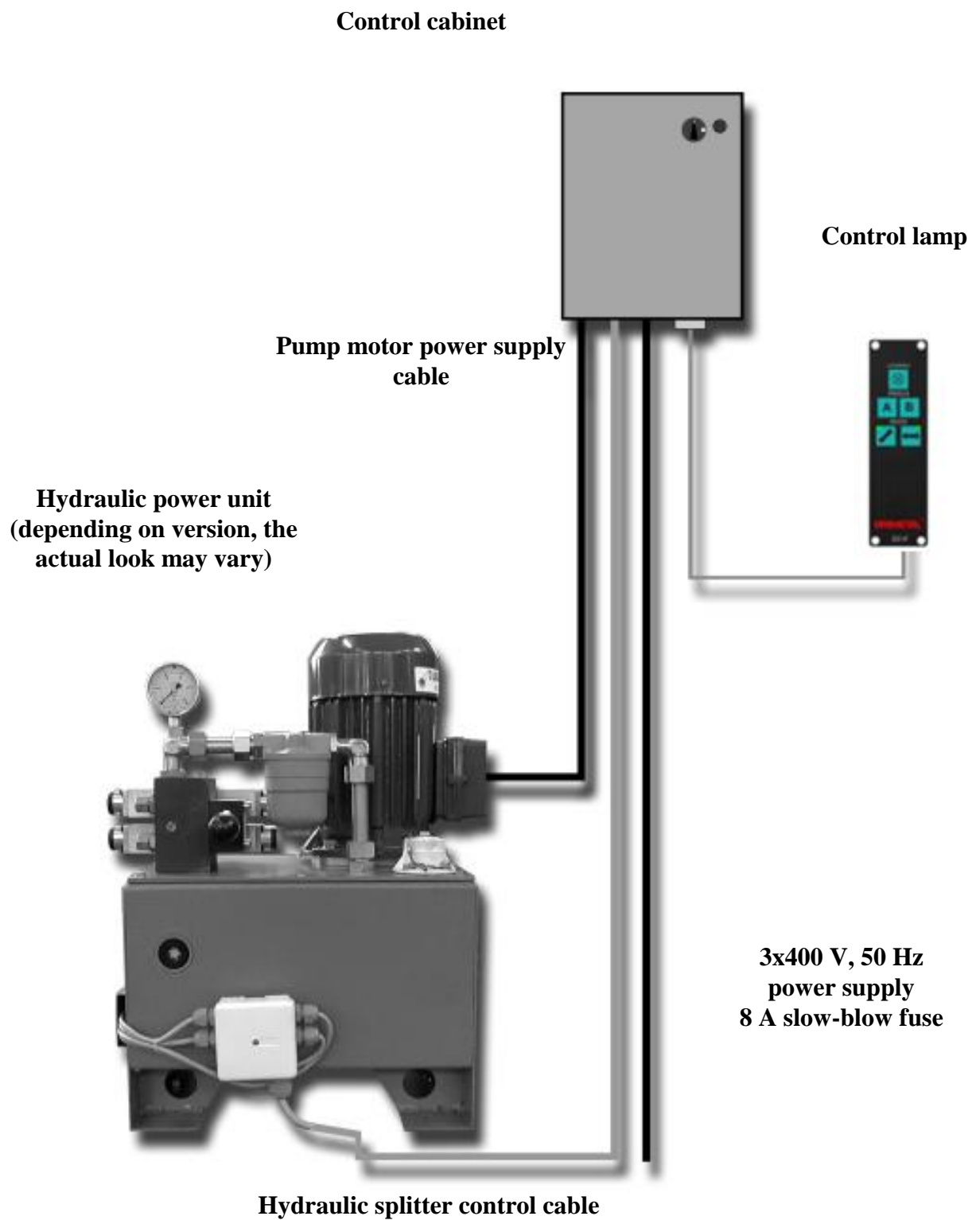


Fig.7. Foundation for the installation of the play detector



**Fig. 8.** Jerking system control system - external connection diagram

## 4. Preparing the machine for operation

Before turning on the power supply, one should ensure whether there is no object in the area of movement of the jerk plates that would hinder their free motion.

Power flow is indicated by the control diode placed on the front panel of the control cabinet.

Before starting work, check the following:

- hydraulic power supply unit pump engine rotor turning direction (as marked on the motor body),
- oil level in hydraulic unit container (level indicator window is located on the front face of the hydraulic power supply unit),
- tightness of all hydraulic system connections,
- proper functioning of the control torch buttons in accordance with this manual.

## 5. Jerking unit control

The control torch allows for control of the play detector and simultaneous observation of the chassis elements by the operator. The control unit provides lengthwise and sidewise motion of both plates simultaneously.

### 5.1. Description of the control torch functions

Operation of the machine is very simple, in accordance with the physical characteristics of a man. Operation of the torch can be divided into two stages:

- selection of plate motion type (sidewise or lengthwise),
- activation of the plate drive,

Upon selection by one of the buttons marked *Praca* (Polish for 'work') of the direction of plate motion (sidewise or lengthwise), turn on the plate drive by one of the buttons marked *Ruch* (Polish - 'motion').

Then turn on the halogen light bulb - push the switch marked *Latarka* (Polish - 'torch') to position I and aim the light stream at the suspension and steering components being inspected.

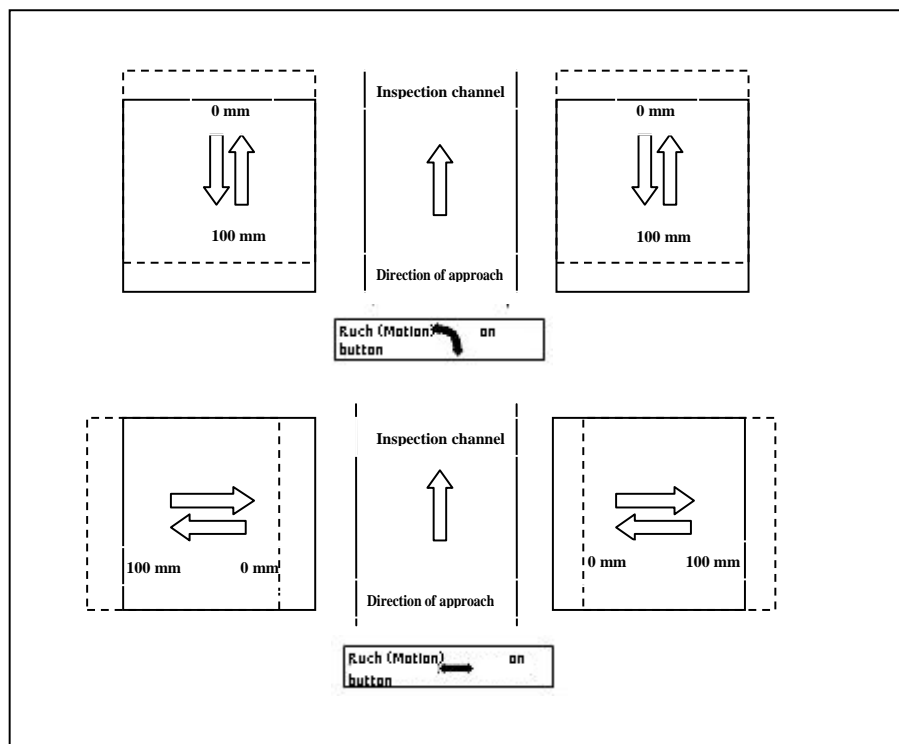
Distribution of the buttons along with orientation with respect to channel is indicated in fig. 9.

## 5.2. Control of the control torch bulb

It is possible to turn on the halogen torch and use the lamp for activities not related to the jerking unit. For this purpose move the switch marked *Latarka* (torch) to position I (main switch on control cabinet must be switched on).

## 5.3. Hydraulic power supply pump control

Pressing one of the buttons marked *Ruch* (Motion) controlling the motion of the plates causes simultaneous actuation of the hydraulic unit pump. The pump stays in operation as long as the button *Ruch* is depressed.





**Fig. 9.** Diagram accompanying description of mode of control of jerking device

#### 5.4. Description of inspection of vehicle suspension and steering system components using the SZ-16 vibration device

Scope of work	Operation of SZ-16
1. Device power supply on using the switch on the control cabinet.	
2. Slow approach of the inspected axle on the plates of the jerking unit. The wheels of the vehicle should be locked (use brake pedal lock).	
3. Selection of direction of movement of plates (lengthwise or sidewise) through pressing of one of the buttons marked <i>Praca</i> (work).	
4. Pressing one of the buttons marked <i>Ruch</i> (Motion) of the control torch.	Halogen lamp switched on, plates move in desired direction.
5. By aiming the stream of light on an inspected component check, during plate motion, appropriate connections in the suspension and steering systems, and determine their wear level.	Plates move in desired direction as long as long the switch is depressed.
6. In order to inspect further suspension components, select appropriate options and repeat the procedures.	

## **6. Maintenance and periodic inspection**

Proper operation of the device and maintenance of its proper technical condition depend to a large extent on proper servicing and unit care.

The SZ-16 jerking device is a high-quality product - adherence to the following recommendations should ensure trouble-free operation of the system:

- Intermittent operation is recommended, i. e. up to 5 minutes of continuous operation
- Keep the system and the area around it clean.
- Once per quarter grease the jerking unit guides using LT-4 grease or an equivalent.
- Periodically check the insulation and tightness of hydraulic connections.
- Do not operate the device if it is damaged, and report all damage in writing to manufacturer service department.
- Periodically inspect oil level in hydraulic power unit container.
- Keep container and hydraulic system clean.
- Every four months check the filter cartridge, and if necessary, replace it with a new one.
- If required supplement oil in container to required level (use the same type of oil!).
- Every 24 months replace oil, at the same time clean inside of container and the suction line filter.

### **Recommended hydraulic oils:**

- |                 |                    |
|-----------------|--------------------|
| • Hydrol LHL-68 | - PN-91/C-96057/04 |
| • Tellus S100   | - Shell            |
| • HL-100        | - PN-91/C-96057/04 |
| • HV-100        | - TWT-RNJe-3/87    |

All repairs and modifications of the device, as well as important adjustment procedures must always be documented through appropriate entries in the periodic operational inspection sheet of the system.

## 7. Parts list

### Basic equipment

- 2 complete sets of moving plates,
- hydraulic power unit,
- control cabinet
- corded control lamp,
- device for locking the depressed brake pedal,
- connection equipment: hoses, connectors - including related services.

## 8. Spare parts list (not including delivery)

### *Mechanical part - jerking unit*

No.	Part name	Figure name	Manufacturer
1	Guide support, set	SZ16-04.00.0	UNIMETAL Złotów
2	Hydraulic actuator, set	SZ16-07.00.0	UNIMETAL Złotów

### *Hydraulic part - hydraulic power supply unit*

No.	Part name	Type	Manufacturer / supplier
1	Isolating valve	4WE6E 32/GZ4NZ4	PONAR
2	Overflow valve	DBDS6P13/200	Ponar Wadowice
3	Inlet filter	WS1-16SM	Sędziszów
4	Suction line filter	FAM 15 MN B50	Sędziszów
5	Geared pump	1PZ4-4/22-2-776	Wrocław



*Control cabinet and control torch*

No.	Part name	Type	Manufacturer
1	LED bulb 12 V 1,7 W	MR16AC12V	
2	Control torch	SZ16-12.00.0	UNIMETAL Złotów

Spare parts are available from device manufacturer based on separate orders.

**9. Terms of service**

1. Maintenance services are provided by the manufacturer - "Unimetal" Sp. z o.o. in Złotów.
2. Should damage to the device be determined, please draw up a written report and contact a service department representative at:

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