



CAUTION! Carefully read this manual and safety instructions before using the machine. If you are unsure how to use this machine, please contact Enexia for more information. If you use the machine without following the instructions, there is a risk of electric shock, fire and/or personal injury and financial loss.

General notes:

- Enexia reserves the right to change specifications, designs and/or standard equipment without notice and without incurring in any obligations.

User Manual - NordicFlow® Roll Grooving Machine

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I. Applications

This machine is used to make a groove to the end of the seamless welded steel pipes, galvanized pipes, plastic-coated pipes and stainless steel pipes to allow installation of grooved couplings and grooved fittings. It's an ideal tool for building industry and pipeline construction sectors. As our latest model, it has many advantages compared to other similar products; the base can go up and down, the whole unit can be easily moved and automatic locating is available during processing. The model is patent protected.

II. Technical Specifications

Model	RGM
Pipe Diameter Range	33-325 mm
Max. Wall Thickness	10 mm
Max. Working Pressure	9300kg
Max. Oil Cylinder Pressure	30Mpa
Capacity of Oil Cylinder	150ml
Spindle Speed	36 RPM
Voltage	Single Phase 220V
Power	1500W
Dimensions (WxDxH)	1400 mm x 760 mm x 1060 mm
Weight	208 kg

Standard Equipment:

- Pipe support for 1"-12" pipes
- Pinch rollers for 1"-12" pipes, 4 pcs
- Knurl shafts for 1"-12" pipes, 4 pcs
- 5mm and 12mm hex head wrenches
- Special purpose tool for changing knurl shafts

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III. Unpacking and Installation

1. Unpacking

Inspect the outside of the machine after unpacking and ensure that accessories and tools are consistent with the equipment list in this manual.

Upon delivery and unpacking the machine is folded so that the upper part of the machine is level with the front wheel stand. Before movement can take place, slide the upper part to its rear position on the wheel frame (see **Picture 1**).

Loosen the four locking handles (see **Figure 2**), slide the top back as far as it will go and then tighten the locking handles again. Tighten and loosen the lock handles by first lifting them up, rotating half a turn, then pressing them down until they lock into the teeth, and tighten or loosen. To move the machine, keep a firm hold of the front support leg on the wheel stand and lean the machine backward until the red rear steering wheel reaches the floor (see **Figure 1**).

2. Installation

Move the machine to an appropriate location before conducting the preparation work. First rotate the two telescopic handles and pull them out to full extent. Hold the telescopic handle to raise the machine while simultaneously raising the stopper plate to release it from the stop pin (see **Figure 2**). Raise the machine to enable Slot A on the stopper plate to engage with the stop pin (see **Figure 3**). Push the telescopic handles and rotate them to place.

To move the upper part of the machine forward, loosen the four locking handles, grab both side handles and pull forward. When the upper part is in its place, retighten the four locking handles.

When grooving long pipes turn the locating handle up (between the left locking handles, see **figure 3**). This allows the machine housing to swing ± 5 degrees around the main shaft, which reduces the risk of parallel errors.

Pull down the oil pump pin with round red handle (**Figure 4**) and turn the oil pump 90 degrees relative to the machine. Then release the pin so that it springs back to its original position.

3. Moving the machine

To move the machine, you must first turn down the locating handle so that the body of the machine can no longer swing. Loosen the four locking handles, hold the side handles and pull the upper part of the machine body backwards before once again fastening the four locking handles (see **Figure 2**). Rotate and completely pull out the two telescopic handles. Grab the telescopic handles and lift the machine up slightly to release stopper plate from stop pin. Then press down firmly and lower the machine to the lowest position. Hook the front hole of the stopper plate (slot B) on the locking pin. Push back the two telescopic handles and rotate them into place. Pull down the oil pump pin and fold in the oil pump 90 degrees so that it is parallel with the machine.



Picture 1

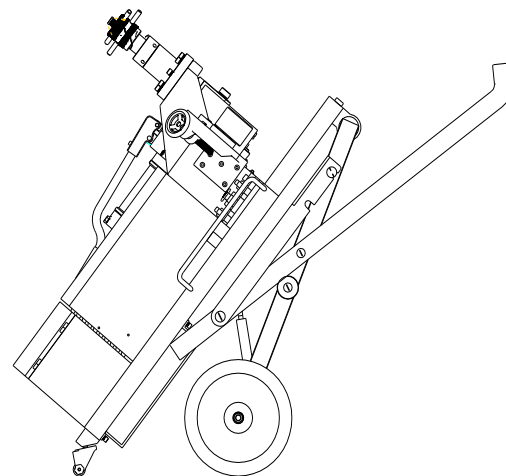


Figure 1

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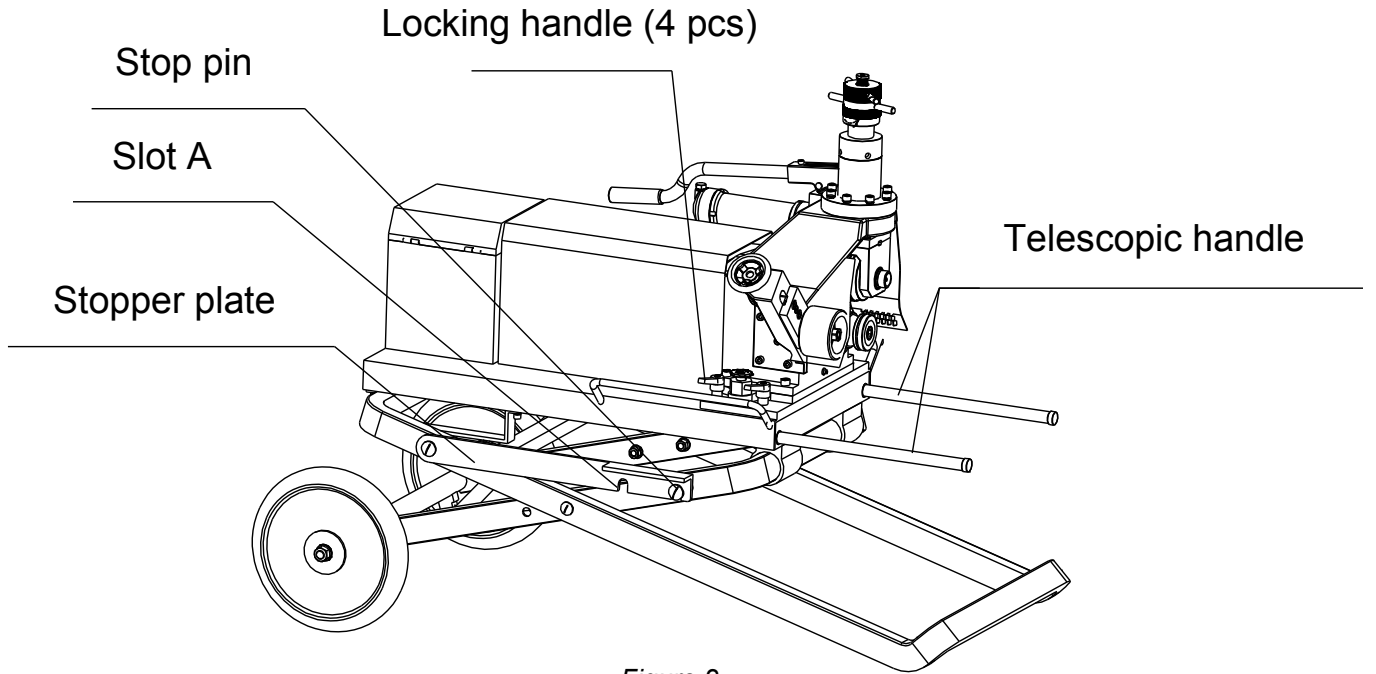


Figure 2

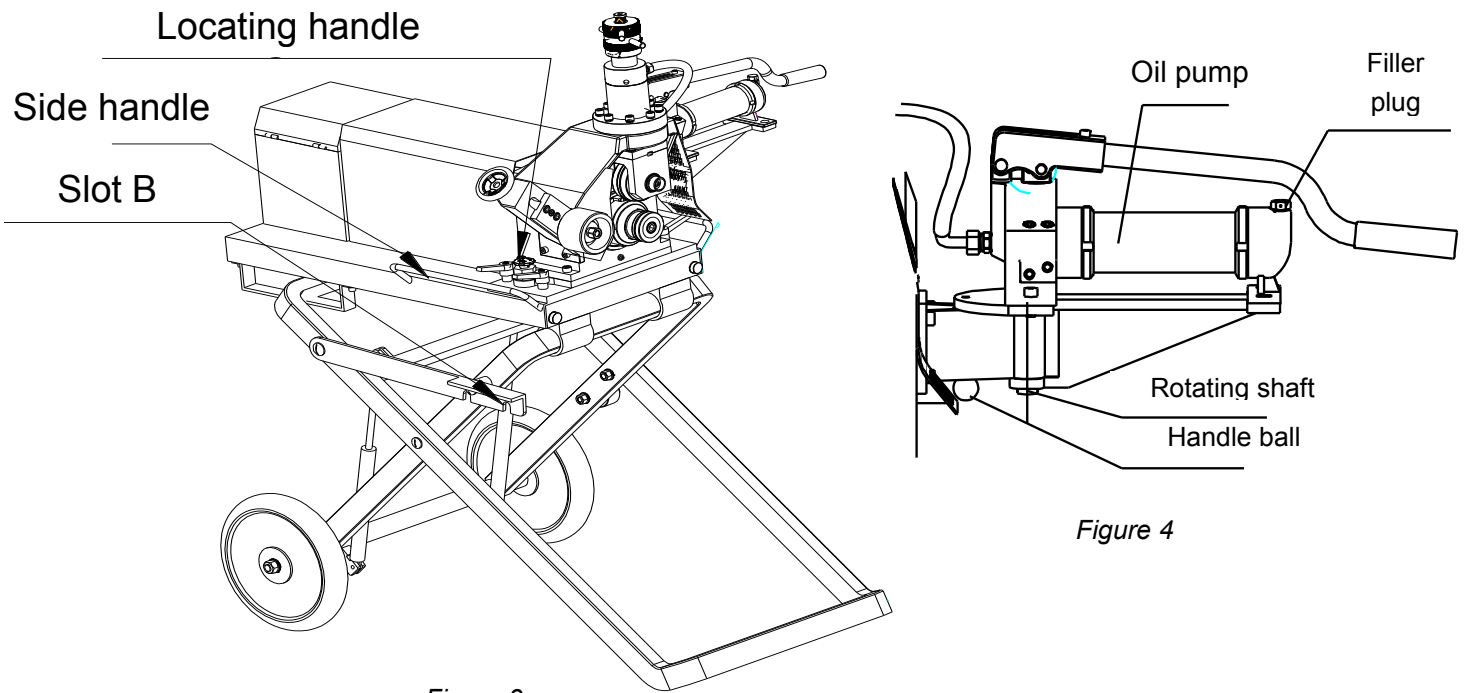


Figure 3

Figure 4

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IV. Driving System

The moving unit of this machine is a rotating spindle driven by a reducing motor through an internal spline groove, contributing to the reduced loss of mechanic power. The feed is realized by manual hydraulic system.

V. Electric System

The electric system consists of an electric motor, AC contactor, thermal protectors, a foot switch and cables (see **Figure 5**). The foot switch is equipped with a return spring function for increased safety: push the pedal and hold to start the machine and release to turn it off. The power-supply shall be consistent with the design specifications. The machine must be connected to a grounded wall outlet.

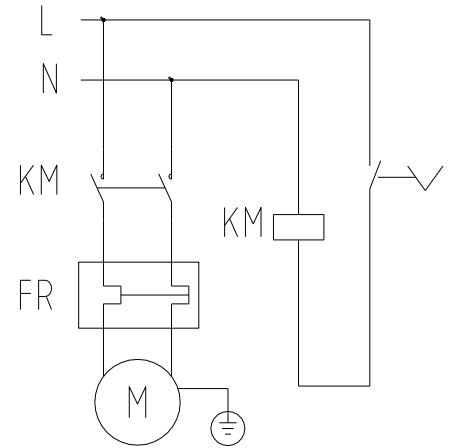


Figure 5

VI. Operation and Adjustment

Before first grooving

Test drive the machine always before the first grooving to check that everything seems normal. When servicing, setting groove depth or changing pinch rollers/knurl shafts the machine should always be switched off.

Cutting the pipe

Pipes are square cut. After cutting it is important to make sure that pipe end is free from burrs, dirt and oil. Control especially the area from the pipe end to the groove end. Chamfer must not exceed 1.5 mm. With hot-dip galvanized and powder coated pipes ensure that no flaking occurs on the gasket seating surface. If so, the entire surface is sanded clean and afterwards treated with anti-rust paint for powder-coated pipes and zinc paint for galvanized pipes. Note that powder-coated pipes have plastic coating which may crack when machining is performed. We recommend that the surface is first sanded, then grooved and treated with anti-rust paint.

Placing the pipe

Place the end of the pipe on the knurl shaft of the machine and the other end on the pipe support. Pipe support should be placed on $\frac{3}{4}$ of the total pipe length from the grooving machine. Target support for the pipe so that the pipe is aligned towards the machine. Turn height adjustment handle on the pipe support (see **Figure 6**) so that the pipe is horizontally level or slopes 1-2 degrees towards the pipe support.

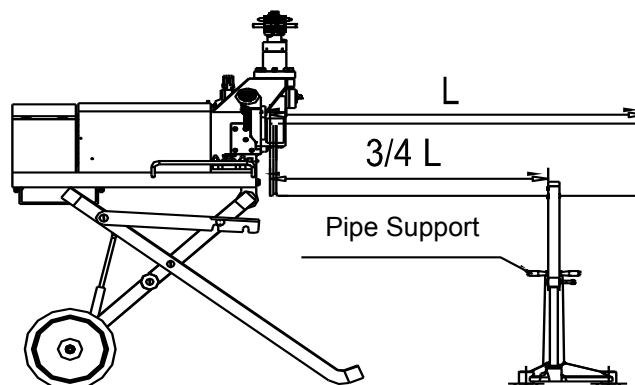


Figure 6

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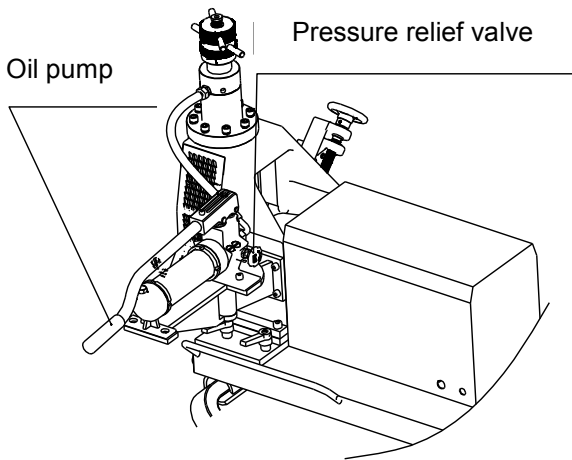


Figure 7

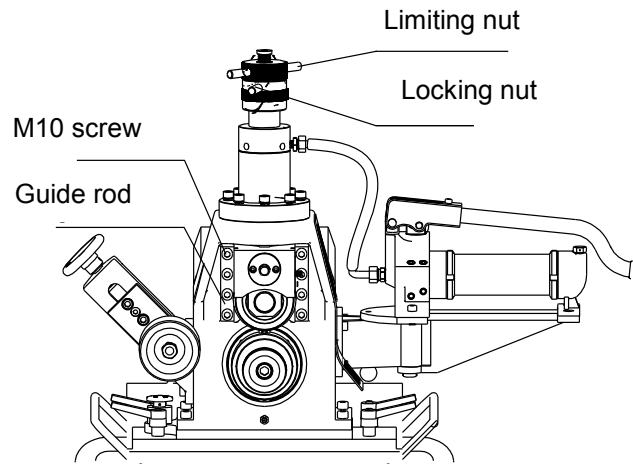


Figure 8

Groove depth adjustment

Test grooving should always be performed after setting groove depth and after changing pipe size.

When adjusting groove depth, start by loosening both locking nut and limiting nut (see **Figure 8**). Tighten the pressure relief valve and use the pump handle to lower pinch roller downward until it meets the top of the pipe. Screw down the locking nut until it goes to the bottom, and then follow suit with the limiting nut. Start from 0 in limiting nut's scale and unscrew it until the correct groove depth is reached. The scale is in tenths of a millimeter. Screw back the locking nut upwards until it meets and locks the limiting nut.



Grooving

Start grooving by switching the machine on and then pressing the foot pedal. Pump oil pump handle quickly to lower the pinch roller on the pipe to make a mark and then pump down with an even and steady pressure over the rest of grooving. When groove depth is reached the foot pedal is released and the machine is switched off at the button. Oil pressure valve opens so that the pressure is released and pinch roller will go up to its highest position. After grooving, use groove measuring tape to make sure that groove diameter is within specifications. Also check the gasket seating surface and groove width.

Stabilizing pipe

With larger pipes (over 168 mm in diameter) it is possible that the pipe may swing considerably in the grooving process due to irregularities in shape, which can lead to poor grooving result. To solve this problem there is pipe stabilizer in the left side of the machine body. By turning the handwheel, stabilizer roller moves down to touch the pipe. The roller is then locked with the lock nut on the back (see **Figure 16**).

Pinch rollers and knurl shafts

Pinch rollers and knurl shafts are always changed as a pair (see **Table 1**). Always check before grooving that the correct pairs are mounted by the markings on the rolls. Improper combinations can lead to incorrect grooves and damage to both rolls and grooving machine.

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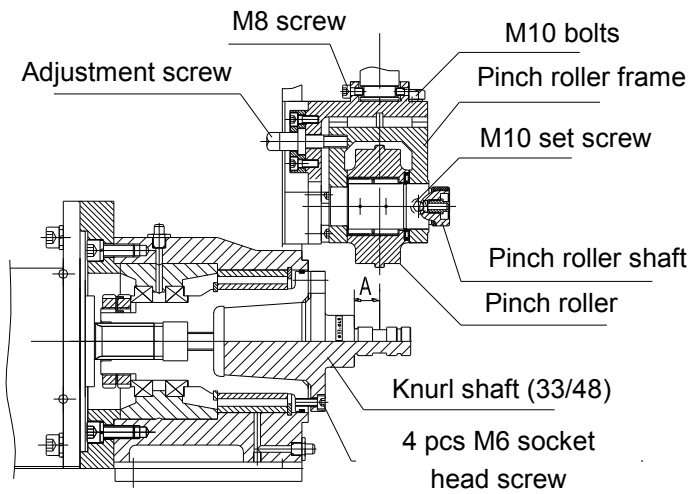


Figure 9

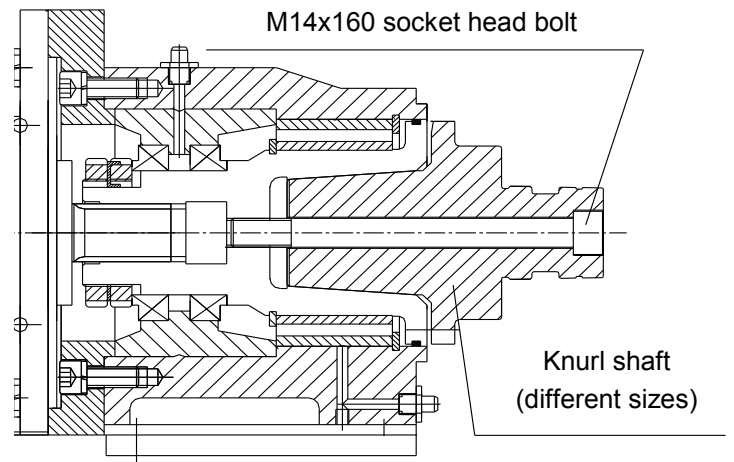


Figure 10

Replacing pinch roller

The machine must always be switched off and the power cable pulled out when changing the roller pair.

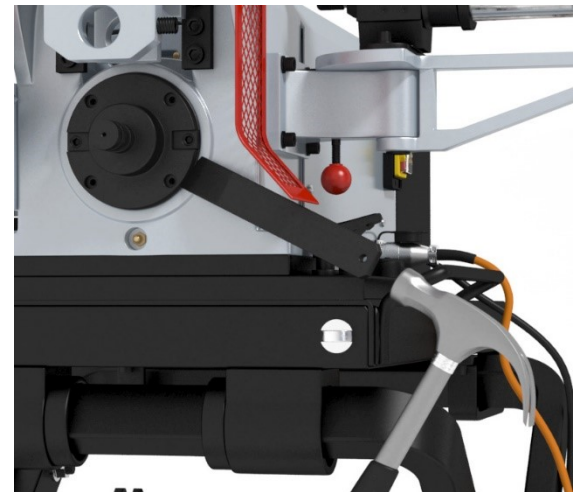
To change a pinch roller, return the pinch roller to its highest position by opening the oil pressure valve. Then unscrew the set screw on the side of the pinch roller frame. Pull out the pinch roller shaft while holding the pinch roller with other hand. Move over needle roller bearing and washer to the new pinch roller and install it in pinch roller frame, insert pinch roller shaft and tighten the M10 set screw.

To adjust pinch roller, loosen the two M10 bolts on pinch roller frame and turn the adjustment screw (see **Figure 9**) to move the roller forward or backward. See **Table 1** for specific groove requirements. When pinch roller is in the right place tighten the two M10 bolts on the pinch roller frame again.

Replacing knurl shaft

When the pinch roller is replaced, the coupled knurl shaft shall be replaced correspondingly (see **Table 1**). The knurl shaft works in cooperation with the spindle. For small knurl shafts, the end is fastened by 4 M6 socket head screws (see **Figure 9**).

Large and medium knurl shafts are connected to the spindle with a M14x160 socket head bolt (see **Figure 10**). To remove the knurl shaft, insert a special purpose tool into the space between the spindle and knurl shaft and knock it gently with a hammer (see **Picture 2**).



Picture 2

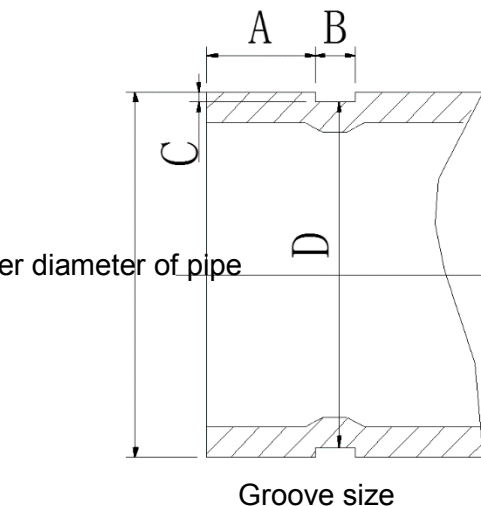
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Table 1 – Groove Specifications

Roll pair		Nominal pipe size	Pipe outer diameter	Gasket seating surface A ± 0.5	Groove width B ± 0.5	Groove depth C ± 0.5	Groove bottom diameter D	
Pinch roller	Knurl shaft	(inches)	(mm)	(mm)	(mm)	(mm)	Max.(mm)	Min.(mm)
Pinch roller 33/48	Knurl shaft 33/48	1"	33.7	15.88	7.14	1.65	30.23	29.85
		1 1/4"	42.4	15.88	7.14	1.65	38.99	38.61
		1 1/2"	48.3	15.88	7.14	1.65	45.09	44.70
Pinch roller 60/89	Knurl shaft 60/89	2"	60.3	15.88	8.74	1.65	57.15	56.77
		2-1/2"	76.1	15.88	8.74	1.98	72.26	71.80
		3"	88.9	15.88	8.74	1.98	84.94	84.48
		4"	108.0	15.88	8.74	2.11	103.73	103.22
		4"	114.3	15.88	8.74	2.11	110.08	109.57
		5"	133.0	15.88	8.74	2.11	129.13	128.62
Pinch roller 114/168	Knurl shaft 114/168	5"	139.7	15.88	8.74	2.11	135.48	134.97
		6"	159.0	15.88	8.74	2.16	153.21	152.45
		6"	165.1	15.88	8.74	2.16	160.78	160.22
		6"	168.3	15.88	8.74	2.16	163.96	163.40
		8"	219.1	19.05	11.91	2.34	214.40	213.76
Pinch roller 219/325	Knurl shaft 219/325	10"	273.0	19.05	11.91	2.39	268.28	267.59
		12"	323.9	19.05	11.91	2.77	318.29	317.53



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Dismounting the oil cylinder

If you want to loosen the hydraulic oil cylinder from the grooving machine, unscrew the two M8 bolts used to fasten the piston and the eight M10 screws on the base plate (see **Figure 9**).

Dismantling the pinch roller frame

If you want to remove the pinch roller frame, first loosen off the two M8 bolts used to fasten the piston (see **Figure 9**) and then the eight M10 screws (Figure 9) on the two guide rails.

Filling of hydraulic oil

To fill with hydraulic oil, unscrew the filler plug on the oil pump and wipe off dust and dirt around the opening before filling. Always release the pressure before filling oil by opening the oil pressure valve on the oil pump!

Dismantling the top of the machine for moving

The upper part of the machine can be detached from the wheel stand for transportation and movement. First loosen the four locking handles (see **Figure 2**). Two persons, standing on both sides of the machine, will hold the side handles firmly to move the top forward 35 mm (mark available) from the front edge and lift it forcibly to separate the two parts.

VII. Safety Guidelines

1. You are required to familiarize yourself with structure and the the security warning signs of the machine, functions of various handles as well as the driving and lubrication system through reading the user manual prior to operation.
2. The grooving machine must be installed on a flat and stable area and the wheel brakes need to lowered during grooving. Make sure that the machine can not tip over. Long pipes must be supported with the pipe support.
3. It is not allowed to touch the moving parts of the machine or pipe with hands during grooving process.
4. In case of defects in workmanship or materials are found during normal use of the machine, please contact your local dealer or the manufacturer. Unauthorized disassembly by non-professional staff is absolutely forbidden.
5. Before starting the machine, check that the oil cylinder has been filled with oil (Grade 20 oil is used during the summer months and grade 10 oil during the winter months). Fill hydraulic oil according to instructions.
6. Make sure the machine is properly connected before grooving, grounded power socket must be used. Check that the voltage and frequency comply with motor specifications.
7. Select the correct pinch roller and knurl shaft (see **Table 1**) to ensure correct grooving result. Improper combinations of rolls can lead to incorrect grooves and damage to pipes and the machine.
8. The pipe must be perpendicularly cut and should have smooth edges and surfaces before grooving. Otherwise the pipe may become loose during grooving process.

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VIII. Care and Maintenance

1. Make sure that the machine and the moving parts are functioning normally and that there is enough hydraulic oil in the oil pump. Fill the oil pump when needed. Continuously watch over knurl shafts and pinch rollers and replace worn or damaged parts. After each use clean work surfaces and apply anti-corrosion oil. Add lubrication grease to all the joints of the moving parts.
2. The grease nozzle in front of the pinch roller shaft should be lubricated after each shift. The other moving parts should be lubricated at least 1-2 times per shift.
3. The replaced pinch rollers and knurl shafts are kept in the box in the back of the machine and treated with anti-rust oil for the next use.
4. Use the correct hydraulic oil according to the manual.
5. When changing the pinch roller, make sure the internal needle bearing is clean and coated with lubrication grease.

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IX. Troubleshooting

Problem	Probable causes	Solutions
No pressure in the oil cylinder. No action resulted from turning the handle.	1. Insufficient hydraulic oil.	Add hydraulic oil.
	2. Dirt in the oil blocks the hole.	Replace hydraulic oil, clean the oil filtering screen.
	3. Leakage occurs to the check valve.	Remove screws and springs. Tap the ball bearing lightly to force out air bubbles.
The piston will move forward when the handle is forced downward, but it will return when the handle is released	1. Dirt in the oil blocks the hole.	Replace hydraulic oil.
	2. Leakage occurs to the check valve.	Remove screws and springs. Tap the ball bearing lightly to force out air bubbles.
	3. Leakage occurs in other position.	Trace the position and re-assemble.
Insufficient Oil Cylinder Pressure.	1. The spring of safety valve breaks down	Replace the safety valve spring
Pipe escapes during grooving.	1. Improper direction and height of the pipe support.	Vary direction and height of the pipe support.
	2. Rough end face of steel pipe.	Grind the end face.
Groove is too wide or narrow.	1. Wrong size roll pair	Install right size pinch roller and knurl shaft.
	2. False combination of pinch roller and knurl shaft.	Install right size pinch roller and knurl shaft.
	3. Defect pinch roller or knurl shaft.	Change the damaged part.
The groove is not perpendicular to the pipe.	1. Pipe is not straight.	Use straight pipe.
	2. The pipe end is not perpendicular to the pipe axis.	Cut the pipe end straight.
The groove does not match the specifications	1. Maximum pipe diameter exceeded	Use pipes with allowable diameter.
	2. False combination of pinch roller and knurl shaft.	Install right size pinch roller and knurl shaft.
	3. Pipe material is too hard.	Change pipe.
	4. Groove depth adjusted incorrectly or not adjusted at all.	Set correct groove depth.
Pipe slips on the knurl shaft.	1. Knurl shaft grooves are clogged with metal, or have been damaged.	Clean or replace the knurl shaft.

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X. General Safety Notes

NOTE! Read all instructions!

Failure to follow these safety instructions can result in electric shock, fire and/or serious injury.

TAKE GOOD CARE OF THE SAFETY INSTRUCTIONS.

1) Workplace

- a) Keep work area clean and well lit. Cluttered and dark areas invite accidents.
- b) Do not operate the machine in explosive atmospheres of flammable liquids, gases or dust. Power tools create sparks which may ignite the dust or fumes.
- c) Keep children and bystanders away while operating the machine. If you are disturbed by unauthorized persons, you can lose control of the machine.

2) Electrical safety

- a) Machine's power plug must match the outlet. Do not modify the plug. Do not use adapter plugs with grounded power tools. Unmodified plugs and matching outlets will reduce risk of electric shock.
- b) Avoid body contact with grounded surfaces such as pipes, radiators, stoves and refrigerators. There is an increased risk of electric shock if your body is grounded.
- c) Do not expose the machine to rain or wet conditions. Water entering the machine will increase the risk of electric shock.
- d) Do not abuse the power cord and use it to carry or hang up parts of the machine or to pull the plug out of the socket. Keep cord away from heat, oil, sharp edges or moving parts. Damaged or entangled cords increase the risk of electric shock.
- e) When operating the machine outdoors, use an extension cord suitable for outdoor use.

3) Personal safety

- a) Stay alert, watch what you are doing and use the machine with reason. Do not use the machine while you are tired or under the influence of drugs, alcohol or medication. When using power tools, even a short period of inattention may lead to serious injury.
- b) Use personal protective equipment and protective glasses. Personal protective equipment such as dust mask, non-skid safety shoes, hard hat, or hearing protection used for appropriate conditions - reduces the risk of injury.
- c) Avoid accidental starting. Check that the power switch is in "OFF" position before plugging the plug into the wall socket. Connecting the switched machine to the mains may cause accidents.

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- d) Remove any adjusting key or wrench before turning the machine on. A wrench or a key in a rotating component can result in an injury.
- e) Do not overestimate your abilities. Make sure you are standing firmly and in balance. This enables better control of the machine in unexpected situations.
- f) Dress properly. Do not wear loose clothing or jewelry. Keep your hair, clothing and gloves away from moving parts. Loose clothes, jewelry or long hair can be caught in moving parts.

4) Careful handling and use of the machine

- a) Do not force or overload the machine. With the correct power tool for the indicated power range you will do the job better and safer.
- b) A machine with a defective switch can not be used. Any power tool that can not be switched on or off is dangerous and must be repaired.
- c) Disconnect the plug from the wall outlet to prevent inadvertently switching on the tool before making any adjustments, changing accessories, or storing the machine.
- d) Store idle machine out of the reach of children. Do not let the machine be used by people who are not familiar with it or have not read this user manual. Power tools are dangerous in the hands of untrained users.
- e) Maintain the machine carefully. Check that moving parts function faultlessly and do not jam, and that the components are not broken or damaged. Damaged parts have to be repaired or replaced before the machine is reused. Many accidents are caused by poorly maintained power tools.
- f) Use the machine, accessories, tool bits etc. in accordance with these instructions. Take into account the working conditions and the work to be performed. DO NOT use the machine in a way that can lead to hazardous situations.

5) Service

- a) Have your machine repaired only by qualified specialist personnel using original spare parts. This ensures that the power tool safety is maintained.

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XI. Parts and Components

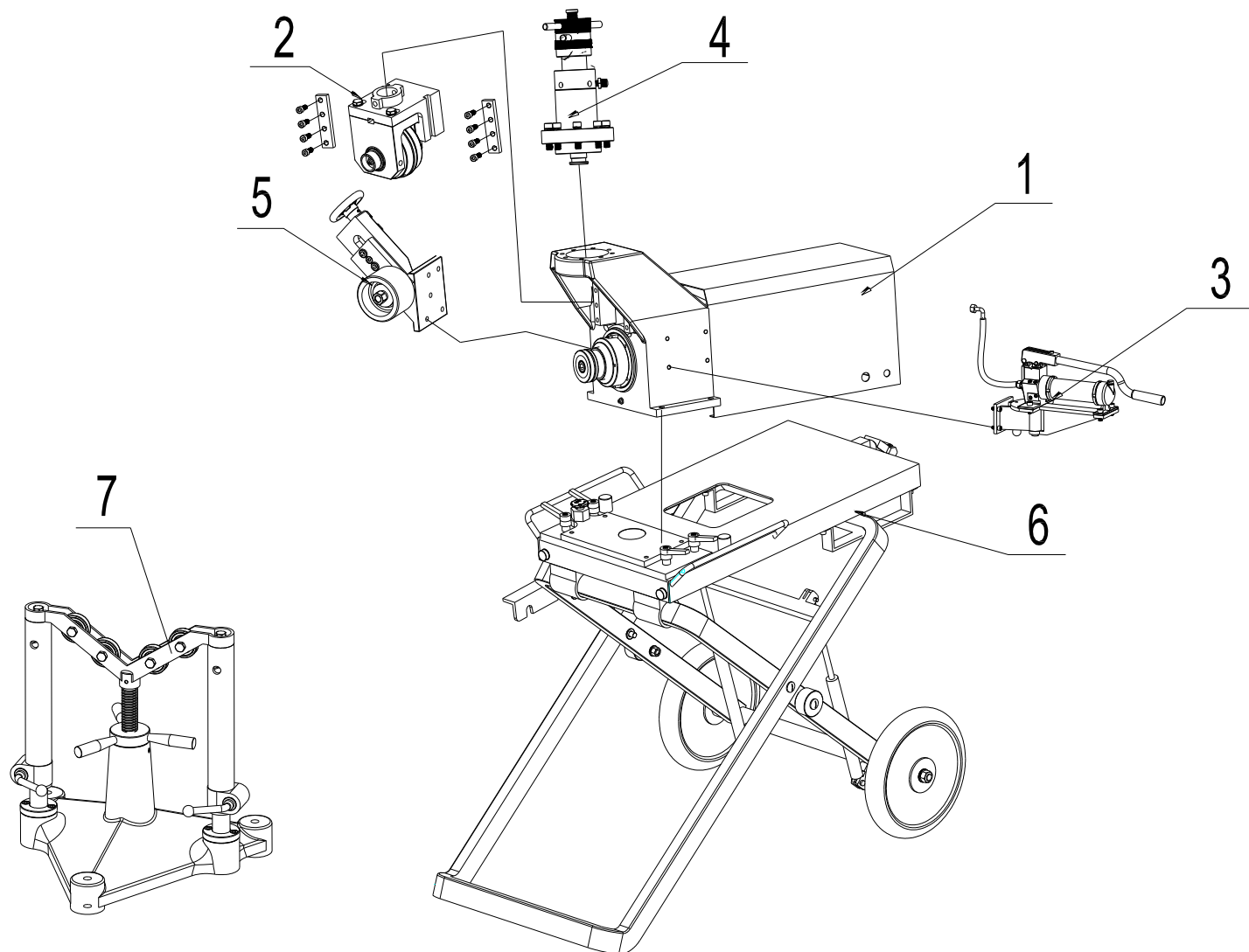


Figure 11

1. Power unit assembly
2. Pinch roller frame assembly
3. Oil pump assembly
4. Oil tank assembly
5. Wheel frame assembly
6. Rack assembly
7. Pipe support assembly

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1. Power unit assembly (Figure 12) parts list

Nr.	Code	Name	Qty	Material
1	GB67-2000 M4X16	Slotted pan head screw	2	
2		AC contactor	1	
3	GB67-2000 M6X10	Slotted pan head screw	4	
4	TWG/6-01-007	Shield	1	A3
5	GV-28-750	Reduction motor	1	
6	GB/T70.1 M10X30	Hexagonal cheese head screw	4	
7	GB/T93-1987 10	Spring washer	16	
8	TWG/6-01-006	Flange	1	HT200
9	GB/T70.1 M10X25	Hexagonal socket head cap screw	4	
10	GB/T810 M52X1.5	Small round nuts	2	
11	GB/T858-1988 52	Tab washers for round nut	1	
12	GB/T279-1994 32912	Tapered roller bearing	2	
13	TWG/6-01-004	Bushing block	1	Q235A
14	GB/T70.1 M10X50	Hexagonal socket head cap screw	4	
15	GB/T95-1987 10	Flat washer	8	
16	GB/T7940 M10X1	oil Cup	2	
17	GB/T77-2000 M6X8	Hexagon flat end screw	2	
18	TWG/6-01-007	Unit head shield	1	A3
19	TWG/6-01-001	Unit head	1	HT200
20	GB/T894.1-1986 80	Circlips for shaft	1	
21	GB/T5801 NA6916	Needle Roller Bearings single row	1	
22	GB/T893.1-1986 110	Circlips for hole	1	
23	TWG/6-01-002	Spindle	1	40Cr
24	TWG/6-01-003	Transmission block	2	
25	GB/T70.1 M6X16	Hexagonal socket head cap screw	2	
26	TWG/6-01-05(33-48)	Small knurl shaft	1	20CrMnTi
	TWG/6-01-05(60-168)	Medium knurl shaft	1	20CrMnTi
	TWG/6-01-05(219-325)	Large knurl shaft	1	20CrMnTi
27	∅ 105X∅ 3.1	"O"-ring	1	Rubber
28	GB/T70.1 M14X160	Hexagonal socket head cap screw	1	
29	GB/T70.1 M6X20	Hexagonal socket head cap screw	4	
30		Footswitch	1	

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2. Pinch roller frame assembly

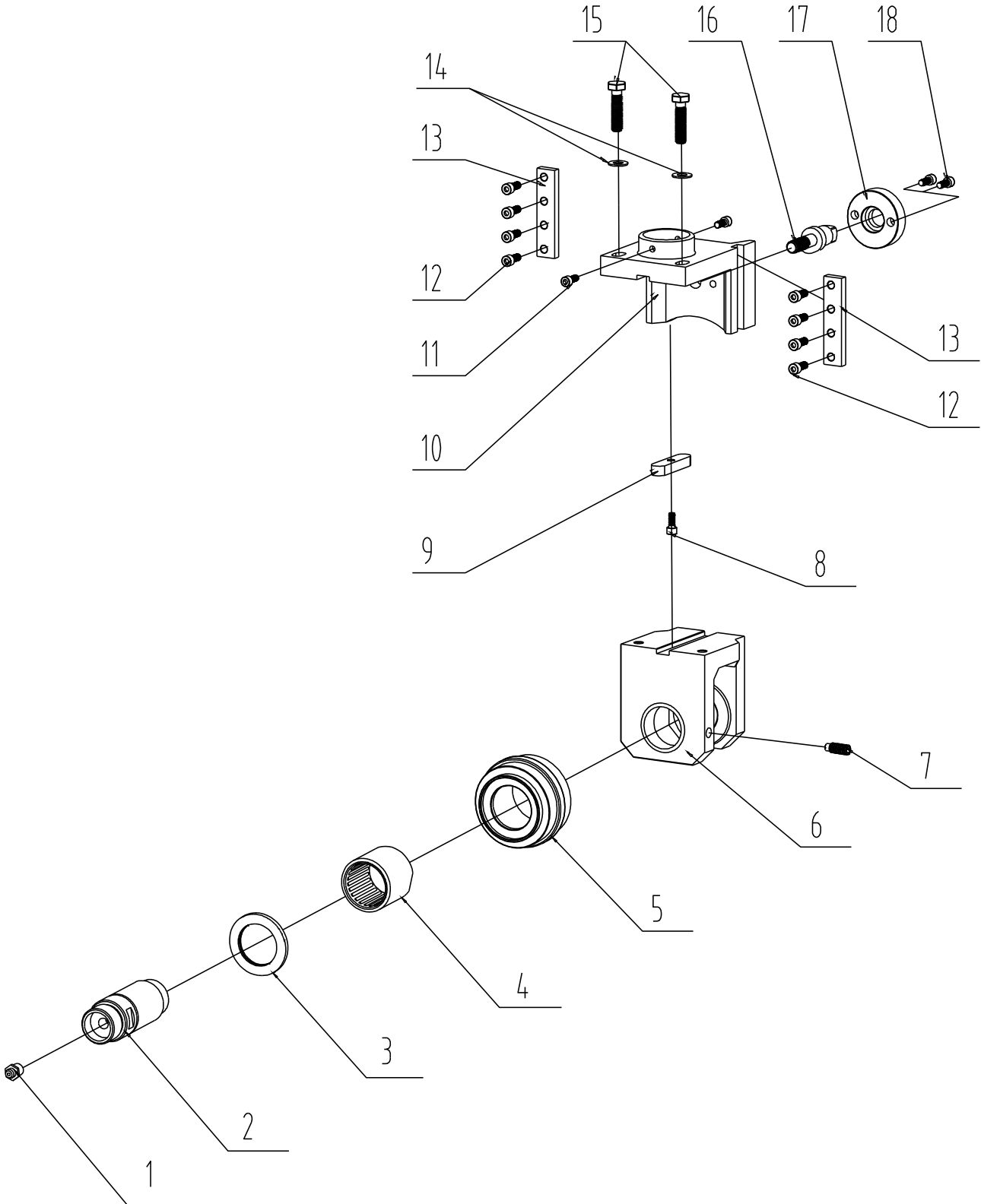


Figure 13

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2. Pinch roller frame assembly (Figure 13) parts list

Nr	Code	Name	Qty	Material
1	GB/T7940.1 M10X1	oil Cup	1	
2	TWG/6-02-004	Pinch roller shaft	1	20CrMnTi
3	JB/T7915 AXK3552AS3552	Needle roller thrust bearing	1	
4	GB/T5801 NK3520	No inner ring single needle bearing	2	
5	TWG/6-03-05(33-48)	Small pinch roller	1	40Cr
	TWG/6-03-05(60-168)	Medium pinch roller	1	40Cr
	TWG/6-03-05(219-325)	Large pinch roller	1	40Cr
6	TWG/6-02-002	Pinch roller frame	1	QT450-10
7	GB/T78-2000 M10X20	Hexagon set screws with cone point	1	
8	GB/T70.1 M5X10	Hexagonal socket head cap screw	1	
9	GB/T1096 12X8 L=50	Flat key	1	
10	TWG/6-02-001	Slider	1	QT450-10
11	TWG/2-02-020	Piston fixed ring screw	2	45#
12	GB/T70.1M10X20	Hexagon socket head screw	8	
13	TWG/6-02-003	Article Guide	2	45#
14	GB/T93-1987 10	Spring Washer	2	
15	GB/T5781 M10X40	Hexagon head bolt	2	
16	TWG/2-04-003	Adjustment screw	1	45#
17	TWG/2A-04-010	Screw fixed circle	1	Q235A
18	GB/T70.1-2000 M6X10	Hexagon Socket Head Screw	2	

General notes:

- Enxia reserves the right to change specifications, designs and/or standard equipment without notice and without incurring in any obligations.

3. Oil pump assembly

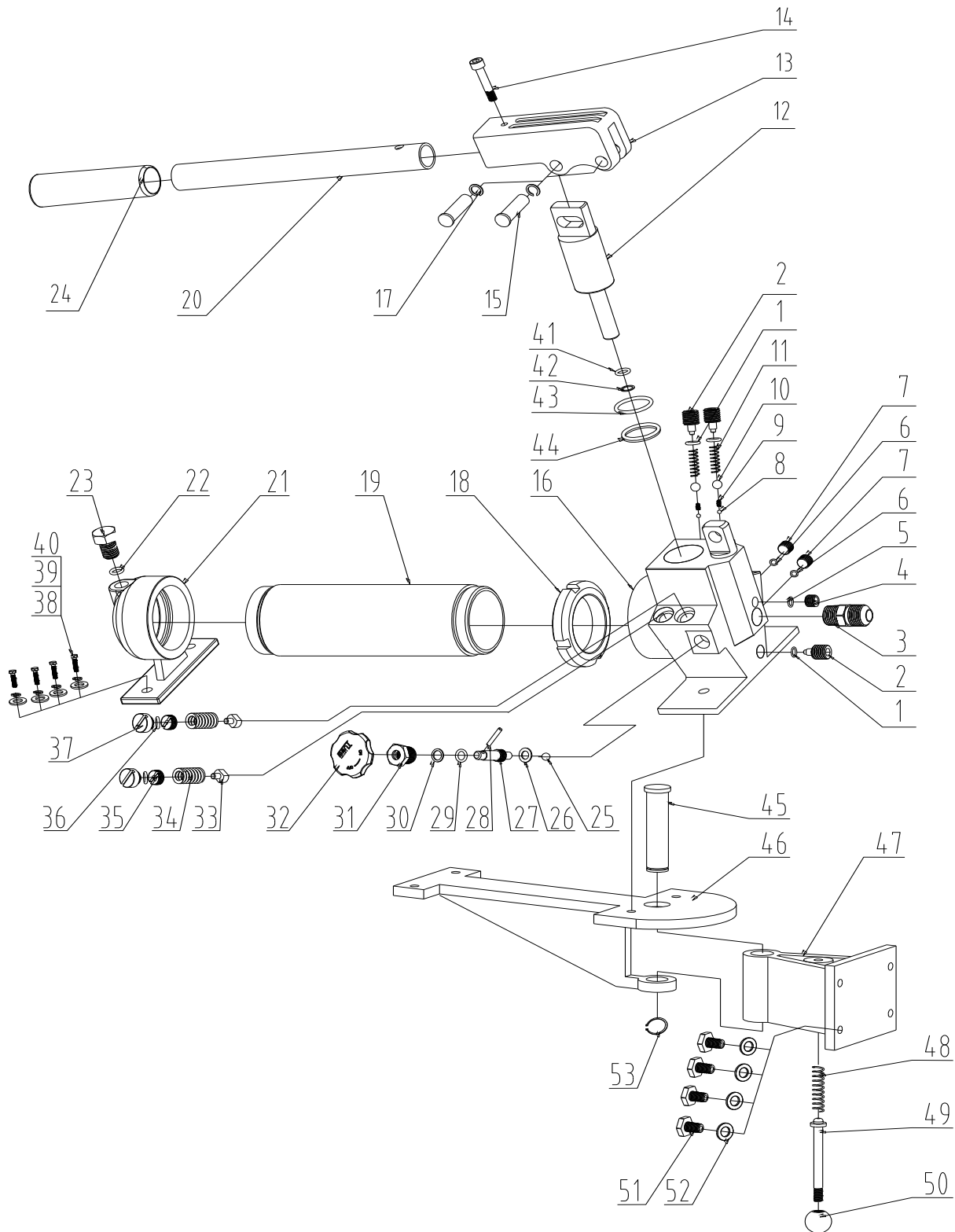


Figure 14

General notes:

- Enxia reserves the right to change specifications, designs and/or standard equipment without notice and without incurring in any obligations.

3. Oil pump assembly (Figure 14) parts list

Nr.	Code	Name	Qty	Material
1	GB1235-76	O-ring $\Phi 2.4 \times 11$	3	NBR
2	TWG/2-02-002	Oil pump screw	3	45#
3		Oil connection RC 3/8"	1	
4	JB/ZQ4446-1997	Plug R2 1/8"	1	
5	GB1235-76	O-ring $\Phi 1.9 \times 8$	1	NBR
6	GB1235-76	O-ring $\Phi 1.9 \times 8$	2	NBR
7	TWG/6-03-008	Plug	2	45#
8	GB308-84	Steel Ball $\Phi 5$	2	
9	TWG/2-02-001	Compression spring	2	65Mn
10	GB308-84	Ball $\Phi 8$	2	
11	TWG/2-02-003	Oil outlet spring	2	65Mn
12	TWG/6-03-009	Small piston rod	1	45#
13	TWG/6-03-010	Handle seat	1	
14	GB/T70.1 M10X35	Hexagon Socket Head Cap Screw	1	
15	TWG/6-03-007	Pin shaft	2	45#
16	TWG/6-03-006	Pump body	1	45#
17	GB/T894.1 8	Circlips for shaft	1	
18	GB/T810 M60X1.5	Small Round Nut	2	
19	TWG/6-03-011	Tank	1	45#
20	TWG/6-03-012	Handle	1	45#
21	TWG/6-03-013	Tank cover	1	HT200
22	GB1235-76	O-ring $\Phi 2.2 \times 11$	2	NBR
23	TWG/2-02-004	Oiling plug	1	45#
24		Handle cover	1	
25	GB308-84	Steel Ball $\Phi 5$	2	
26		Copper washer	1	Cu(1.5mm)
27	TWG/2-02-019 (2)	Pressure relief valve screw	1	45#
28	GB/T8792	Spring pin $\Phi 3 \times 12$	1	
29	GB1235-76	O-ring $\Phi 1.9 \times 11$	1	NBR
30	TWG/2-02-027	Sparfloxacin washer	1	
31	TWG/2-02-019 (1)	Pressure relief valve nut	1	45#
32	TWG/2-02-019 (3)	Pressure relief valve handle	1	ZL101
33	TWG/2-02-026	Cone Valve	2	Spring steel
34	TWG/2-02-025	Overflow valve spring	2	65Mn
35	TWG/2-02-023	Safety valve spring	2	65Mn
36	GB1235-76	O-ring $\Phi 2.2 \times 11$	2	NBR
37	TWG2-02-024	Safety valve bulkhead	2	45#
38	GB/T70.1 M8X25	Hexagon Socket Head Screw	4	
39	GB/T95-1987 8	Plain washer/flat washer	4	
40	GB/T93-1987 8	Spring Washer	4	
41	GB1235-76	Fluorine rubber O-ring $\Phi 2.4 \times 16$	1	NBR
42	TWG/2-02-028	Sparfloxacin washer	1	
43	GB1235-76	$\Phi 2.4 \times 30$ Viton O-ring $\Phi 2.4 \times 30$	1	NBR
44	TWG/6-03-014	Sparfloxacin Washer	1	
45	TWG/6-03-003	Rotation axis	1	45#
46	TWG/6-03-001	Pump bracket	1	45#
47	TWG/6-03-002	Oil pump bracket seat	1	45#
48	TWG/6-03-005	Spring	1	
49	TWG/6-03-004	Long stop pin	1	45#
50		Handle ball	1	
51	GB/T70.1 M8X25	Hexagon Socket Head Screw	4	
52	GB93-87	Spring pad $\Phi 8$	4	
53	GB/T894.2-1986	Circlips for shaft $\Phi 20$	1	

General notes:

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4. Oil tank assembly

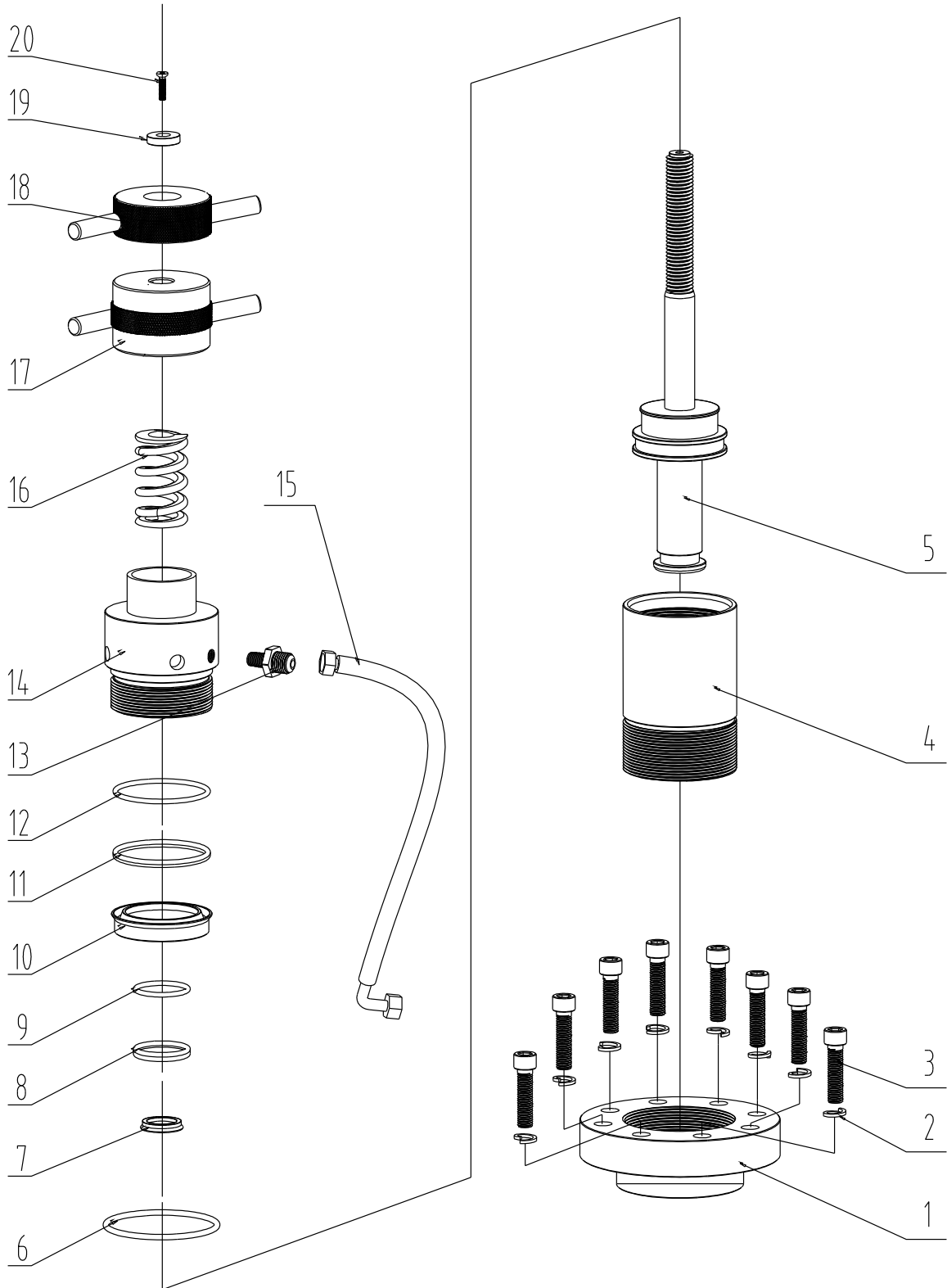


Figure 15

General notes:

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4. Oil tank assembly (Figure 15) parts list

Nr.	Code	Name	Qty	Material
1	TWG/6-04-001	Cylinder base	1	45#
2	GB93-87	Spring pad Φ 10	8	
3	GB/T70.1 M10X35	Hexagon Socket Head Screw	8	
4	TWG/6-04-002	Oil Cylinder	1	oil pipe Φ 65
5	TWG/6-04-003	Pistons	1	40Cr
6	GB1235-76	O-ring Φ 3.1X70	1	
7	Q/ZB249-77	V-PU seals D28	1	
8		Φ 26X Φ 20X1.2/ Washer	1	
9	GB1235-76	O-ring Φ 3.5X26	1	
10	Q/ZB249-77	V-PU seals D63	1	
11	GB1235-76	O-ring Φ 5.5X63	1	
12		Φ 63X Φ 54X1.2/Washer	1	
13		Oil connection RC 3/8"	1	
14	TWG/6-04-007	Oil cylinder cover	1	45#
15		Oil pipe	1	
16	TWG/6-04-006	Spring	1	65Mn
17	TWG/6-04-004	Limit Nut	1	45#
18	TWG/6-04-005	Limit locking nut	1	45#
19	TWG/6-04-008	Bead flange	1	45#
20	TB/T879-2000	Cross recessed countersunk head screw M8	1	

General notes:

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5. Wheel frame assembly

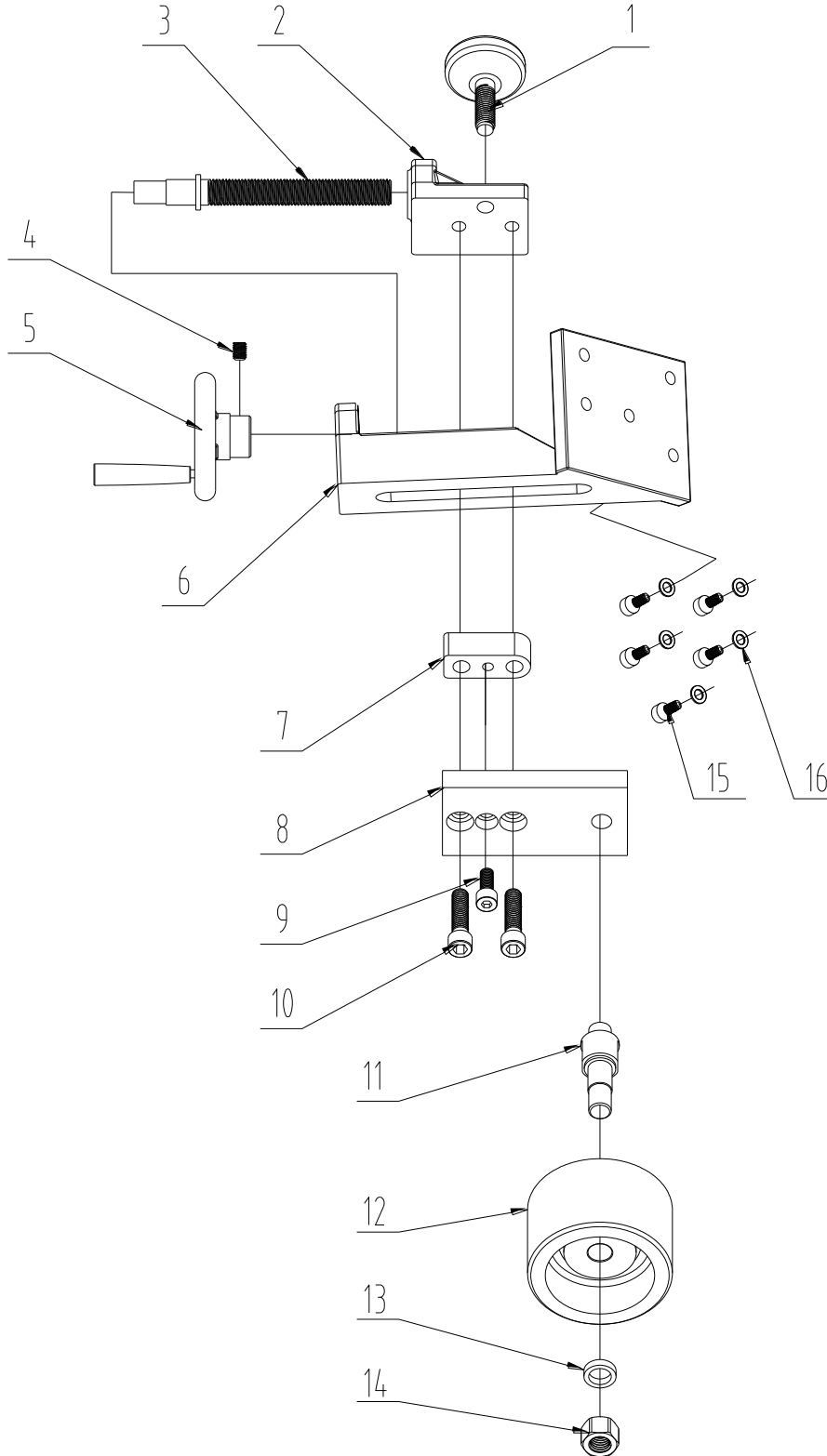


Figure 16

General notes:

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5. Wheel frame assembly (Figure 16) parts list

Nr.	Code	Name	Qty	Material
1	TWG/2-03-007	Knurling locking nut	1	45#
2	TWG/2-03-005	Screw rod slider	1	45#
3	TWG/6-05-003	Guide pulley screw rod	1	45#
4	GB75-85	Set screws M6X8	1	
5	TWG/2-03-009	Hand Wheel	1	Assembly
6	TWG/6-05-001	wheel frame	1	45#
7	TWG/2-03-004	Guide block	1	45#
8	TWG/2-03-004-01	Oriented slider	1	45#
9	GB70.1-2000	Hexagon screw M8X12	1	
10	GB70.1-2000	Hexagon screwM10X30	2	
11	TWG/2-03-003	Guide wheel shaft	1	45#
12	TWG/2-03-002	Guide pulley	1	Assembly
13	TWG/2-03-001	Gasket	1	45#
14	GB/T6175-2000	Nut M14	1	
15	GB70.1-2000	Hexagon screw M8X25	5	
16	GB/T95-1987 8	Flat washer	5	

General notes:

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6. Rack assembly

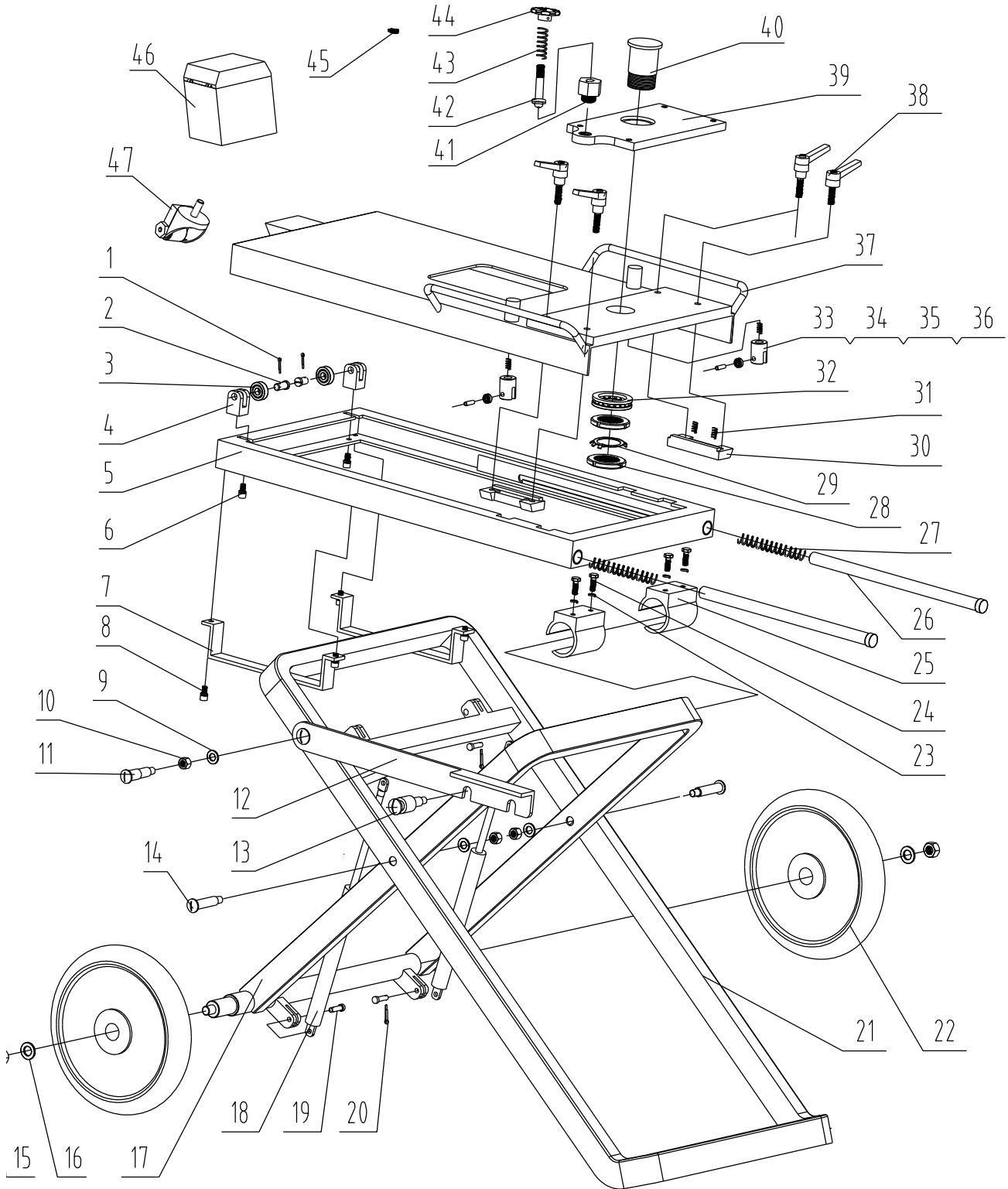


Figure 17

General notes:

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6. Rack assembly (Figure 17) parts list

Nr.	Code	Name	Qty	Material
1	GB/T91 4X30	Split pin	4	
2	GB/T882 12X28	Pin shaft	2	
3	GB/T276 6201	Deep Groove Ball Bearing	2	
4	TWG/6-07-01	Bearing Block	2	45#
5	TWG/6-07-02	pallet	1	component
6	GB/T70 M8X14	inner hexagon screw	4	
7	TWG/6-07-03	Article Limit	2	Q235
8	GB/T70 M8X25	inner hexagon screw	2	
9	GB/T97.2 16	Washers	4	
10	GB/41-2000 M12	Hex Nut	4	
11	TWG/6-07-05	Limit short-pin shaft	1	45#
12	TWG/6-07-06	Stopper plate	1	Q235A
13	TWG/6-07-07	Limit long pin shaft	1	45#
14	TWG/6-07-17	Stent rotation axis	2	45#
15	GB/41-2000 M16	Hex Nuts	2	
16	GB/T97.2 16	Washers	4	
17	TWG/6-07-08	Short stent	1	
18	ZDQG/1500N	Pneumatic pole	1	component
19	TWG/6-07-11	Gas spring under the pin	4	45#
20	GB/T91 4X30	Split pin	4	
21	TWG/6-07-04	Long stent	1	component
22	φ300	Wheels	2	component
23	GB/T5780 M8X20	hexagonal bolt	4	
24	GB/T93-1987 11	Spring Washer	4	
25	TWG/6-07-13	Hinge	2	
26	TWG/6-07-09	Telescopic handle	2	45#
27		Telescopic spring	2	
28	GB/T810 45	Small round nut 45	2	45#
29	GB/T858-1988 45	Tab washers for slotted round nuts	1	
30	TWG/6-07-18	Platen	2	Q235A
31	φ11Xφ1.2X20	Compression spring	2	
32	GB/T301 51110	Thrust Ball Bearings	1	45#
33	TWG/6-07-21	Panel small bearing seat	2	
34	TWG/2-02-25	spring		
35	GB/T276 626	Deep Groove Ball Bearing	2	
36		Pin φ6 X18	2	
37	TWG/6-07-21	Panel	1	component
38		Express locking handle	4	
39	TWG/6-07-19	Transitional Board	1	Q235A
40	TWG/6-07-12	Platform rotor shaft		component
41	TWG/6-07-22	Positioning nut	1	45#
42	TWG/6-07-23	Short locating pin	1	45#
43	φ17Xφ1.5X40	Compression spring	1	
44	TWG2-02-28 (3)	Location handle	1	
45	GB/T3098.3 M5X8	Set screws	1	
46	TWG/6-07-024	Tool box	1	
47		omni-directional wheel	1	

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