



**MECHANIZED SEWER RAKE TYPE SCREEN**

# **KW SERIES**

**OPERATION MANUAL  
ORIGINAL INSTRUCTION**

**TSURUMI MANUFACTURING CO.,LTD.**



## CONTENTS

<b>1 INTRODUCTION .....</b>	<b>3</b>
1.1 How to use the present manual .....	3
1.2 Information containing in the manual .....	3
1.3 Responsibility and guarantee of manufacturer.....	3
2. Safety measures .....	5
2.1 The general instructions according to the safety measures .....	5
2.2 Instructions according to the safety measures during operation .....	5
3. Specification .....	7
3.1 Application and purpose.....	7
3.2 Data about product acceptance .....	7
3.3 Specifications of mechanical part of equipment.....	7
3.4 Dimensional types of the screen.....	8
3.5 Construction.....	9
3.5.1 Placement of the main areas and elements.....	9
3.5.2 Safety device.....	10
3.6 Operation of the wastage-intercepting mesh.....	10
4. Transportation and storage.....	11
4.1 Storage.....	11
4.2 Transportation.....	11
5. Mounting.....	12
5.1 The main safety measures.....	12
5.2 Requirements to the ground.....	12
5.3 Preliminary works.....	12
5.4 Screen mounting at the channel.....	13
5.5 Mounting of electrical equipment.....	13
5.5.1 Requirements to the placement of electrical equipment and power supply parameters.....	13
5.5.2 Recommendation about selection of a cable and cable safety device.....	15
5.5.3 Recommended connection scheme of the screen.....	15
5.6 Safety device setting.....	16
6. Commissioning.....	18
6.1 Checking before start up.....	18
6.2 Screen start in no-operating mode.....	18
6.3 Start up and adjustment under load.....	19
7. Operation.....	19
7.1 Operation requirements.....	19
8. Utilization.....	21



## 1. INTRODUCTION

### 1.1 How to use the present operation manual

Present operation manual (hereinafter OM) is intended for mechanized sewer rake type screen KW series (hereinafter screen) produced by “TSURUMI MANUFACTURING CO.,LTD.” (hereinafter Tsurumi) Company and spread to the all overall sizes of device.

It is forbidden to destroy this manual or its contents in any case. Don't delete, tear or rewrite any part of this guide to any reason. Manual should be stored in a safe and dry place protected from moisture and high temperatures.

**This document should be always available for any consultation in the case of necessity. In the case of manual loss contact our representation and request the duplicate, please.**

### 1.2 Information containing in the manual

You will find all necessary information on mounting, service, setup, and operation, repair of a screen and personnel safety in this manual. For more information, or in case of the problems which have not been considered here in detail, please, address directly to the “Tsurumi” Company.

The qualified personnel of mounting and service of the screen should be acquainted with information about screen service.

Due to the continuous work about screen perfecting so can be made the design changes which have not been reflected in the present document. The producer reserves the right to itself of making changes in the manual at any time. Changes don't demand the notification in advance.

### 1.3 Responsibility and manufacturer's warranty

- **Responsibility** Information, data and instructions containing in the operation manual, corresponded to the last level at the moment of the manual print. Data, figures and describing cannot be used as the basis for recovery of claims to already put devices.
- **Producer doesn't bear responsibility** for actions for which the consumer carries out, without following the safety instruction mentioned in this manual.
- **Producer doesn't bear responsibility** for a damage and the outage of production caused by the following reasons:
  - Misuse;
  - make an errors at device installation;
  - unwarranted changes in mechanical and electric parts;
  - application of unoriginal with the exception of standardized, equal and normalized spare parts during the repair;
  - carry out of service and repair by unqualified and unskilled personnel;
  - Incorrect work performance of operation, service and device repair;
  - Incorrect connection of electric supply to equipment;
  - Incorrect transporting and storage of device;



- non-compliance with requirements of the operation manual;

### **Warranty**

- Warranty conditions are specified in the Contract of delivery of the concrete device;
- It is necessary to prefer claims about warranty service to “Tsurumi” company right after detection of defect or device malfunction;
- The warranty becomes invalid also in all those cases in which responsibility of the manufacturer is excluded.

**ATTENTION! Warranty package doesn't extend on the purchased products which have failed for a reason for rejection of parameters of a power line more than admissible, disregarding of service conditions and disregarding of requirements of this manual.**



## 2. SAFETY MEASURES

### 2.1 The general instructions according to the safety measures

The screen of “Tsurumi” company is made and designed subject to international safety requirements. At intended use and fulfilling the requirements of this manual it provides with maximum safety level for the service personnel.

This operation manual contains the main instructions of safety which should be carried out at installation, operation and screen maintenance. Please, address to "Tsurumi's" representative office if you have any questions or difficulties.

The personnel responsible for installation, operation, and service and screen supervision should possess the corresponding qualification. Persons at the age from 16 to 18 years should work under the direction of skilled experts.

During the any said operations should follow the operation manual. The operation manual should be close with device.

The service personnel should pass test for gnosis of the main requirements for the safety measures stated in this operation manual isn't more than two times a year. It is forbidden to allow to operation with the device the personnel who have not passed testing for gnosis of requirements for safety measures stated in this operation manual.

It is necessary to observe not only the general safety measures mentioned in this chapter but also the special instructions provided in the main sections.

All requirements for safety measures for electric equipment operation are extending for the device.

Device application should be designed so that at appropriate installation and proper use and it continuously carries out the functions and doesn't generate danger to people.

### 2.2 Instructions according to the safety measures during operation

All works such as transporting, storage, installation, electrical connection, commissioning, maintenance and repair should be carried out only by qualified personnel.

**Screen installation, electrical connection, repair and demounting operations should be done only when the screen was disconnected away from electric network (isn't energized) and it was protected against accidental actuation.**

**DANGER!** Don't switch on repeatedly the screen right after it was switched off for the unclear reasons for you. Someone of the personnel could stop it to make manual adjustment and forgot to block it against actuation. Unexpected restart can lead to serious traumas of the personnel!

**DANGER!** Presence of deflection from a normal operating mode (the increased power consumption, vibration, noise, temperature, actuation of safety devices etc.) can lead to the wrong functioning. In that case in order to avoid of faultiness which directly or indirectly can lead for its part to heavy injuries of the personnel or drawing of a material damage, it is necessary to inform immediately responsible for carrying out maintenance the personnel. It's immediately to disconnect the device in the case of doubts.



**DANGER!** For transportation and installation of the screen to use only the elevating eyes provided for this purpose.

**DANGER!** It is strictly forbidden to be on and under the lifted equipment.

**DANGER!** It is forbidden to carry out repair and adjusting work at the operating screen.

**ATTENTION!** It is forbidden to continue screen operation at detection of failures.

**DANGER!** It is forbidden to put the head, extremities and various objects into kick out window at screen operation.

**DANGER!** It is forbidden to put extremities and various objects into the safety device at device operation.

**ATTENTION!** It is strictly forbidden to start up the gear motor at the feeding power supply network more than on  $\pm 5\%$ .

Use special working clothes, headdress and gloves for equipment maintenance.

It is in your own interests before work to carry out sanitary processing of installation in order to avoid infection. It is necessary to put on always water-proof protective clothes, boots, gloves and, whenever possible, a protective mask during washing of the screen— in particular at washing installation under a high pressure in order to avoid effect of wastewater, organic substances etc.

It is forbidden to direct a water stream under pressure upon the person and animals!

Your protective clothes can be cleared easily if it will be soften up right after the completion of work for avoiding of drying up of pollution on it.

There is a possibility of inhalation of steams and gases containing in wastewater during the maintenance of the screen. Therefore it is necessary to put on means of individual protection of respiratory organs and mucous membranes of a body and to such works to allow the personnel which have no allergic reaction to evaporations from wastewater.



### 3. SPECIFICATION

#### 3.1 Application and purpose

The screen is intended for an extraction of large and middle course – dispersion impurities (wastage) from industrial and household wastewater with further mechanical discharge to the transporting device or to the waste bin.

It is forbidden to use screen in wastewater with pH less than 6,5 and more than 8,5.

It is forbidden to use the screen for wastewater treatment with large amount of big building waste (brush of concrete, stones, fittings, scrubs of pipe, metal, etc), textile and fibrous waste, for avoiding of the screen damage and failing. The installation of manual or mechanized screen with bar spacing at 5 – 10 times bigger than bar spacing selected by “Tsurumi” company are recommended to provide, if nevertheless there is a probability of hitting on screen of the above-stated waste.

**ATTENTION!! The manufacturer is not responsible for damages arisen as a result of unintended screen application and at unauthorized changes of construction which are not agreed with producer.**

#### 3.2 Data about product acceptance.

The plant – manufacturer take through the technical control and screen acceptance for readiness to operation before the delivery:

1. General inspection of the screen;
2. Lagging of bolt connections;
3. Checking of presence and condition of factory plates;
4. Checking of presence of all delivery set components;
5. Checking of the control cabinet operation;
6. Checking of package used for product delivery.

Data about screen acceptance are pointed in the list of specifications the concrete product.

#### 3.3 Specifications of mechanical part of equipment

The screen and prop are made of stainless steel AISI 304 of different dimensional sizes. Dimensional size selects depending from required throughput, wastewater compound and geometrical dimensions of wastewater headrace channels.

The screen is made for operation in the following environmental conditions:

- 1) For operation in premises (volumes) with artificially regulated climatic conditions, for example, in a closed heated or cooled premises and ventilated manufacturing and others, included good ventilated underground premises (absence of influence of direct sunlight, an atmospheric precipitation, wind, sand and dust of external air; absence or essential reduction of influence of scattered sunlight and moisture condensation);
- 2) a range of limiting operating air temperature during the operation +1...+40°C;
- 3) The screen is not intended for operation in winter on the open air at temperature lower than 0°C because of existence of ice – covering and freezing danger.



- 4) There are always weeping in screen house so it provided of moisture protection:
- assemblies of the screen are made of stainless steel and of polymeric materials;
  - gear motor of the screen is made with Ingress Protection Rating not less than IP 55, that's why it is protected from hitting of dust and sprays from all sides.

### 3.4 Dimensional types of screens.

Dimensional – types for screens presented in the table 3.1

**Table 3.1**

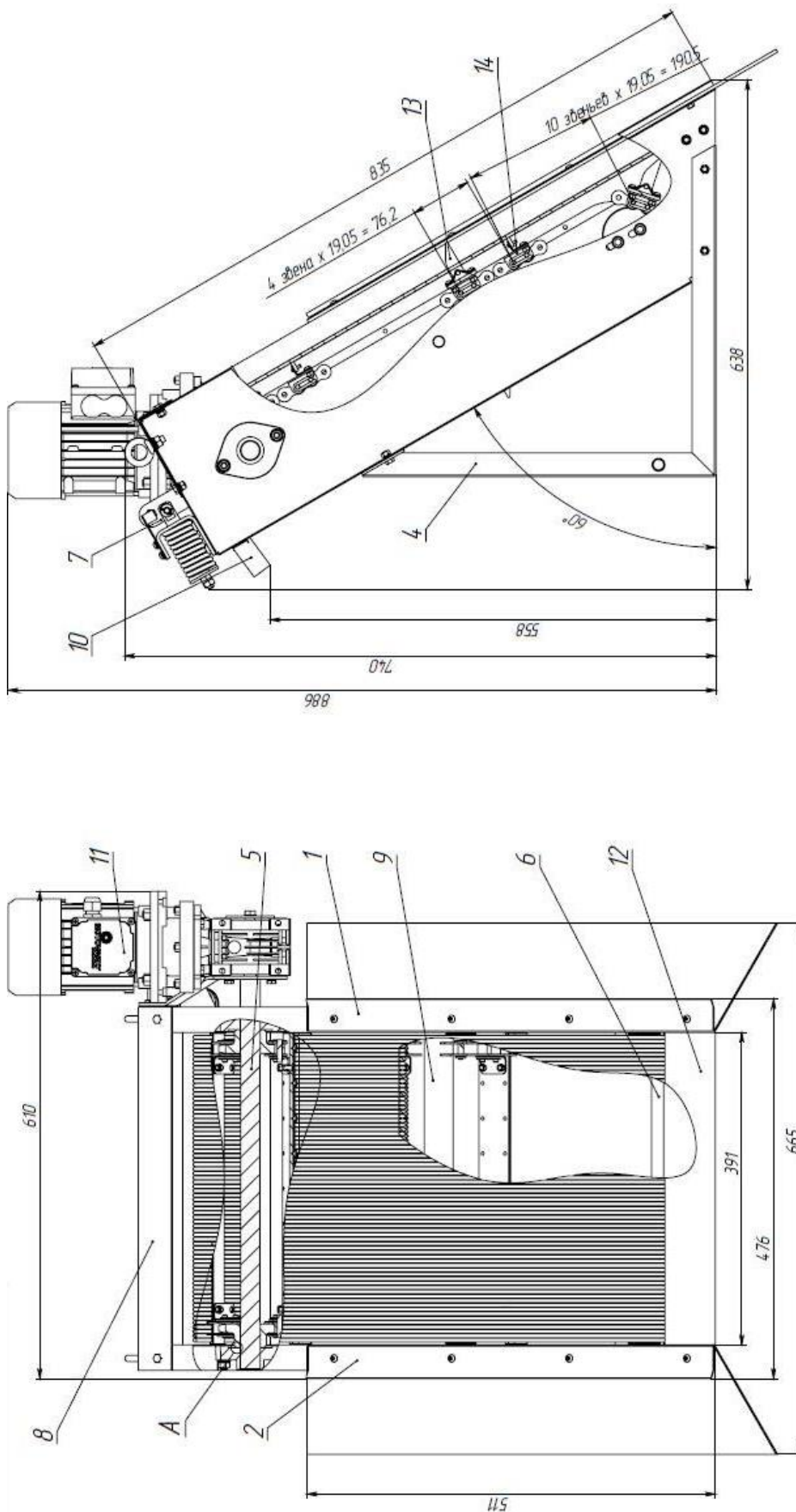
Model range	Power, kW	Capability m <sup>3</sup> /h, with spacing, mm				High, mm			Channel width, mm	Installation angle	Weight, kg
		1	2	2,5	5	Channel	Screen	Discharge			
KW-4027	0,09	17	29	34	47	270	659	323	upto 400	60	23.5
KW-5027	0,09	26	45	52	73	270	659	323	400-500	60	27
KW-6027	0,09	36	61	70	98	270	659	323	500-600	60	30.5
KW-4038	0,09	27	45	52	73	380	842	506	Upto 400	60	27.75
KW-5038	0,09	41	69	81	113	380	842	506	400-500	60	32.1
KW-6038	0,09	56	95	109	153	380	842	506	500-600	60	36.5
KW-4049	0,09	39	66	76	105	490	1057	722	Upto 400	60	31.8
KW-5049	0,09	60	101	117	164	490	1057	722	400-500	60	37.1
KW-6049	0,09	81	138	158	223	490	1057	722	500-600	60	42.3





## 3.5 Construction

### 3.5.1 Placement of main areas and elements



- 7. Safety device
- 8. – Top pad
- 9. – Rigidity shaft
- 10. – Gravity slide
- 11. – Gear motor

- 1. Right sidewall
- 2. Left sidewall
- 3,4. – Support
- 5. – Ready-fitted shaft
- 6. – Bridge

Figure 1 – Location of the screen's components



### **3.5.2 Safety device**

The safety device is intended for avoiding of mechanical failure of the screen, stretching and breakdown of chain as result of rake blocking.

Safety device is based on the principle of reactive lever.

Rotational force of the shaft is conveyed to the gear motor casing at chain jamming. During this the gear motor casing is turning around of axis of drive shaft in opposite direction to the shaft rotation.

Reactive lever fastened to the gear motor casing is lifted with spring pressing. The inductive sensor is removed relative to the control plate. The sensor activates a break of electric line and switches off the gear motor at reaching of edge of the control plate.

**ATTENTION!!** It is forbidden the screen operation with untuned or defected safety device.

### **3.6 Operation of the wastage – intercepting mesh**

Wastewater stream flows through the wastage-intercepting mesh of the screen. Rubber-fabric shields direct the wastewater stream into operating zone of the screen obstructing the passing of large mechanical wastages under the screen and in spacing between the screen and channel walls.

Wastewater streams pass through wastage-intercepting device. Contaminations are intercepted on the mesh and removed by rakes symmetrized to laminated chains from both sides.



## 4. TRANSPORTATION AND STORAGE

### 4.1 Storage

To supply the following conditions of storage for all delivery set:

- To lubricate slightly grinded surfaces of body and shafts of reducer;
- To store in dry premises;
- Without big temperature fluctuation in the range from  $-5^{\circ}\text{C}$  to  $+40^{\circ}\text{C}$ ;
- Relatively humidity of air lower than 60%;
- Don't allow a direct hit of solar or ultra-violet beams;
- Absence of aggressive and corrosive matters (polluted air, ozone, gas, solvents, acids, alkali, salts, radioactivity etc.) in environment;
- Absence of shocks and vibration;
- The screen assemblies should be protected against hitting of mud or construction waste

Technical documentation should be stored with CC. Maintenance should include the periodical check of package and conservation for a storage period.

### 4.2 Transportation

**DANGER! Don't stand under equipment at the moment of loading – discharging operations. Don't stand between transporting screen and wall if there is a danger of pressing.**

Avoid the jerks or swaying of load during the lifting of equipment. Lifting and dropping of load to do slowly without blows or jerks.



## 5. MOUNTING

### 5.1 The main safety measures

Control performance of the following safety measures for mounting of the device in order to avoid damages:

- Maintenance operation should be carried out only by qualified personnel at following of all safety measures.
- Check the machinery for object of any damages before carrying out of any mounting operations.
- To be sure that only authorized personnel are accepted to operating area and nobody is endangered during carrying out mounting works.
- Watch over of bending radiuses of cables/hoses/pipelines.
- Pay attention to instructions for handling mediums, lubricants, applied auxiliary materials.

**DANGER!** Assembling works are necessary for carrying out using means of individual protection (a helmet, working gloves, at welding works – welding mask, special clothes and gloves).

### 5.2 Requirements to the ground

To block all channels, not necessary for assembling of installation and open sites to fence.

To follow instruction of the safety mentioned in this manual.

Requirements to channel where the screen is installed:

- The channel must be dry and clean;
- The sizes of the channel should correspond to the sizes specified in the adjusting drawings of the screen.

**ATTENTION!** The angle between the basis and walls of the channel should be equal to  $90^{\circ}$ .

**ATTENTION!** Installation and the screen fastening in the channel are necessary to carry out after complete hardening of the concrete basis and channel walls.

Before and after the screen sluices or gates should be installed for carrying out maintenance and repair of the screen.

### 5.3 Preliminary works

#### Operations carried out by Customer

- Inspection and repair (at necessarily) of load – lifting equipment, systems of lighting, heating and ventilation of the screen house.



- Supplying of electric power for carrying out of electric welding and others operations with using of electric tool.
- Solution of the problem of waste utilization.
- Studying of technical documentation, preparation of necessary materials and equipment, development and coordination of the plan- schedule of operations.
- Check of completeness and preparation of assembling and fixing materials.
- A channel emptying where the screen will be installed, its cleaning of dirt, check of a condition of its bottom and walls, especially in the places of an adjunction of the screen's rubber - screen schedules (repair of walls and the canal bottoms and also other works of channels if they are provided by the project should be executed at necessity).

#### **5.4 Screen mounting at the channel**

- 1) The screen falls to the channel and centered on a channel axis. Filtering mesh should be directed towards to flow;
- 2) strictly vertical position of the screen is exposed by the construction level attached to the support;
- 3) is fixed to the channel bottom by anchor bolts in the four points;
- 4) rubber – screen shields of the screen should bear against to walls of the channel;

Described method determines a basic principle of prop fastening in the channel. There is can be another method according to specific conditions.

Openings for anchor bolts in concrete base are carried out with using of perforator and bit diameter of which exceed the diameters of anchor bolts not more than for 2 mm.

#### **5.5 Mounting of electrical equipment**

The general information on mounting of electric equipment is stated in this chapter.

**DANGER!** Mounting of electrical equipment should be carried out only by qualified personnel having the acceptance to operation with electrical equipment.

**DANGER!** Electric installation works should carry out at strict observance of rules according to the safety measures at operation with electric equipment.

##### **5.5.1 Requirements to placement of electrical equipment and power supply parameters**

##### **Placement of elements of electric equipment:**

1. Control cabinet –to place out of a premise where the screen is installed (for example, operating and dimmer room) for reduction of influence of corrosive medium. A cabinet of hinged implementation with a forward door, IP55, a supply of cables from below through hermetic inputs. Temperature of operation 0 ...



40°C, storage (-5 ... +40°C). Environmental humidity not more than 95 % (93 % without condensate and dripping water according to IEC 60068-2-78). Placement of cabinet should be carry out according to standard requirements EN 60204-1-2006:

- to be readily available in the operation process and at the service;
  - is mounted so that to minimize possibility of its damage at service or moving of any other mobile equipment;
  - is mounted so that main switch was at height from 0.6 m to 1.7 m over floor level;
  - don't create dangerous situations for the operator during movement and to minimize possibility of unforeseen movement.
2. Pendant – should be located near with screen from the side of the gear motor on a distance 0,3-0,5m from gear motor and subject to standard requirements EN 60204-1-2006 (the same as for control cabinet).

Cable supplying to the screen is from the bottom through the hermetic input.

3. Overload sensor of the screen – it is installed in the intended opening in the reactive lever on the screen's gear - motor drive.

### **Requirements to parameters of power supply of installation**

1. Supply voltage – 400V $\pm$ 5%
2. Supply voltage rate – 50Hz $\pm$ 2%
3. Connection scheme of power supply – 5-wires (3x400B+N+PE)



### 5.5.2 Recommendations about selection of cable and cable safety devices

1. A cable for power supplying to CC – a cable with copper strands, number of strands – not less than 5 (3x400V + N + PE), section – not less than 1,5 mm<sup>2</sup>.
2. A cable for gear motor connection – a flexible cable with copper strands, quantity of strands – not less than 5 (the strand of blue color isn't used), section - not less than 1,5 mm<sup>2</sup>.
3. A cable for connection of the pendant – a control cable with copper strands, quantity of strands not less than 11, section – not less than 0,75 mm<sup>2</sup>.
4. A cable for connection of the overload sensor– a flexible cable with copper strands, quantity of strands – not less than 4, section - not less 1mm<sup>2</sup> (the strand of white color isn't used).

To lay a cable in a cable - channels (steel or plastic) the size of 80x80 mm along a wall is recommended. From a cable channel to the gear motor, the sensor and the pendant of a cable it is recommended to lie in a steel pipe DN of 40 mm. Distance from a pipe to the connected device a cable it is recommended to lay in corrugated PVC pipe DN 20 mm

### 5.5.3. Recommended connection scheme of the screen

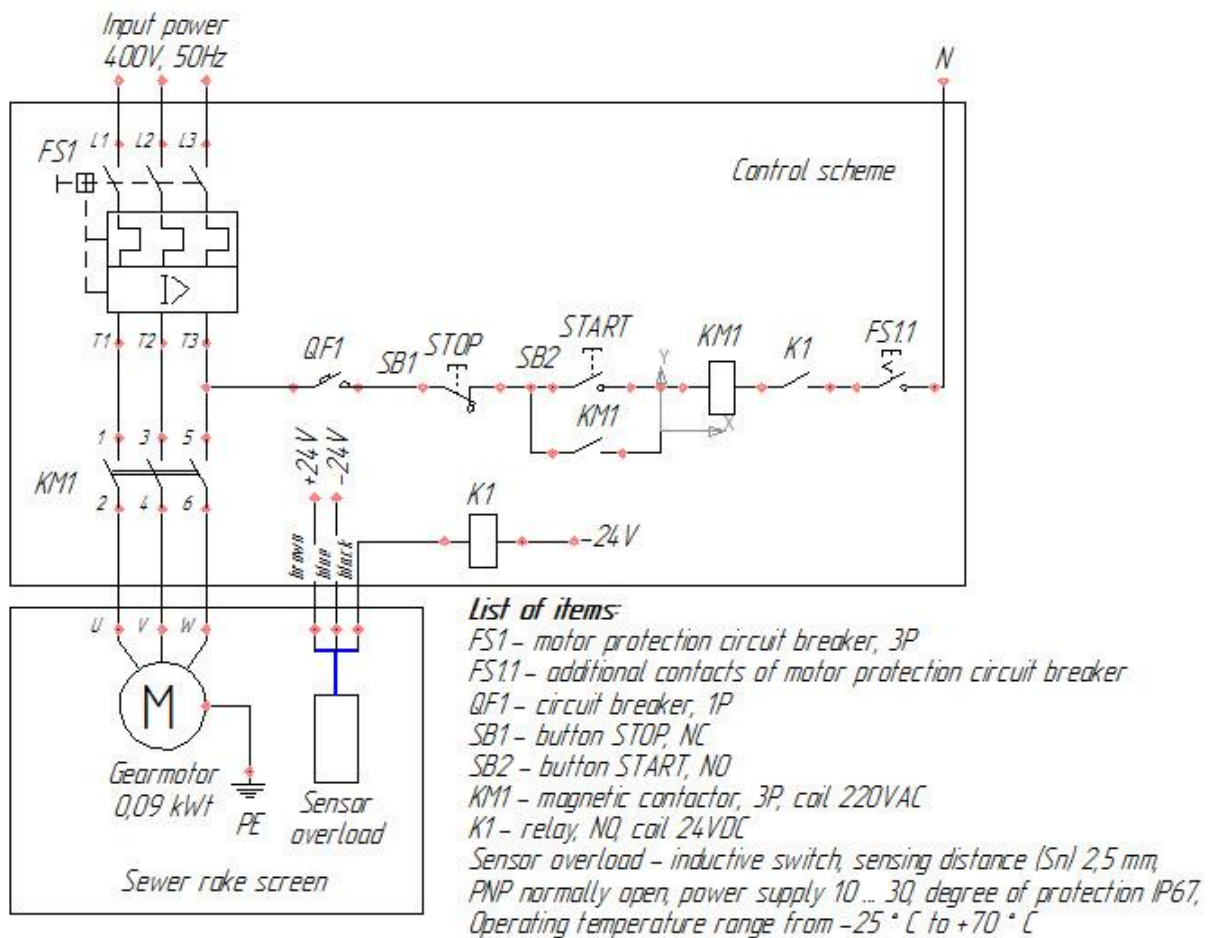


Figure 5.1 – Recommended connection scheme of the screen





## 5.6 Safety device setting

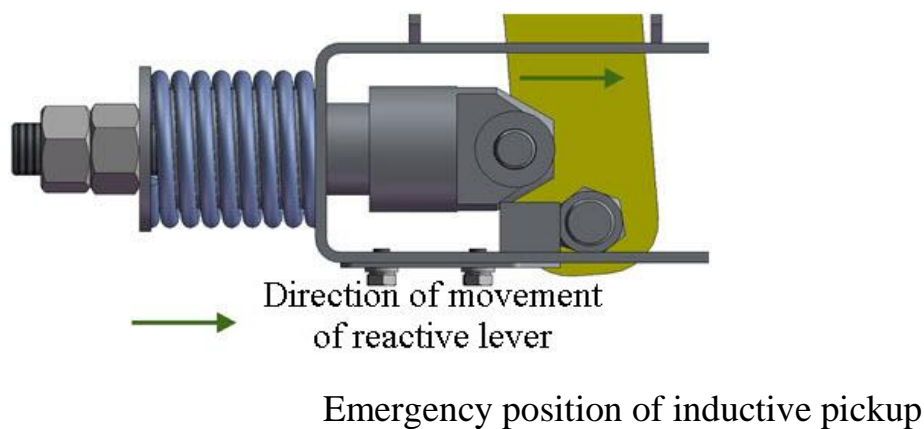
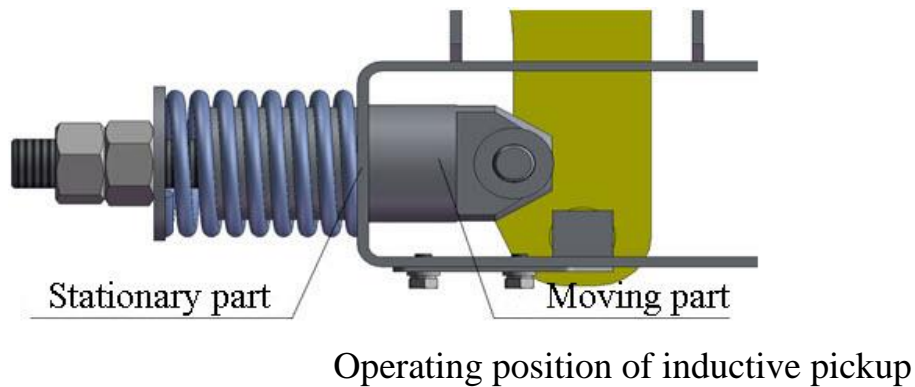


Figure 5.2 – Inductive pickup position

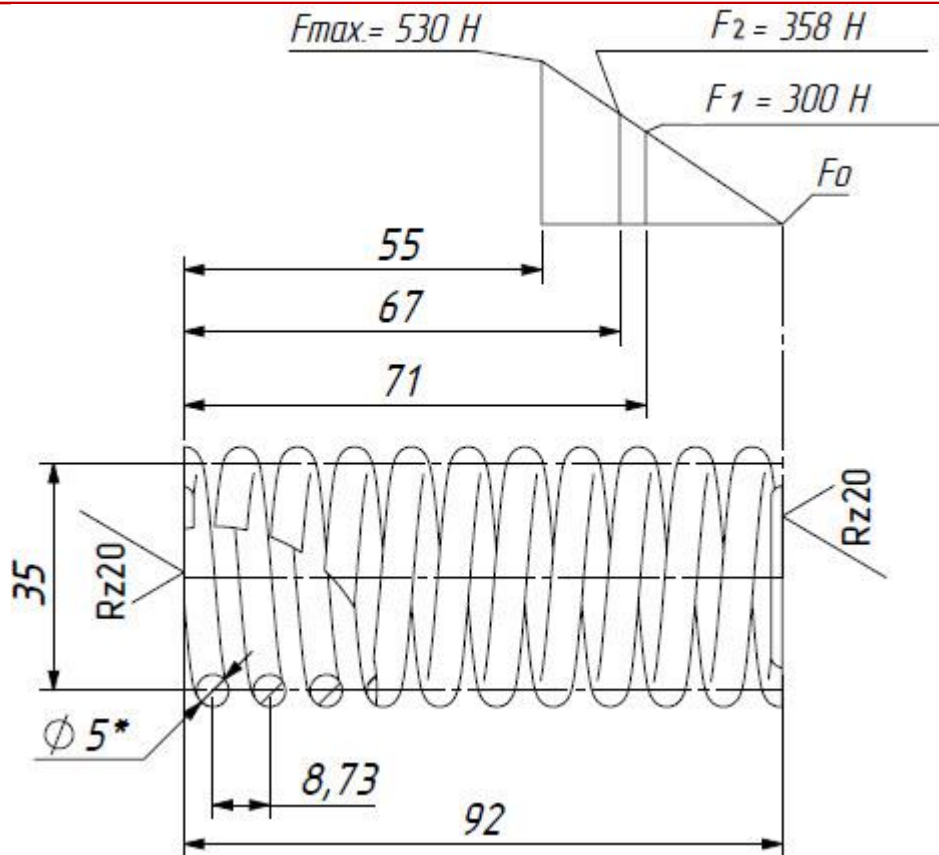
### **Correct adjusted safety device:**

The spring compensates loading below 70 kg on the reactive lever thus there is no rising of the reactive lever and replacing of the inductive sensor. The safety device reacts to increase in loading from 358N thus the reactive lever freely compresses a spring and displaces the inductive sensor from the operating zone of the control plate. Such conditions guarantee instant shutdown of the gear – motor drive at emergency situations at operating conditions.



**ATTENTION!** It is forbidden to change the settings of the safety device carried out at starting – up and adjustment operations.





$F_1$  – initial force;

$F_2$  – actuation force of the emergency;

$F_{max}$  – maximal spring compressing.

Figure 5.3 – Adjustment



## 6 COMMISSIONING

### 6.1 Checking before start - up

It is necessary to check correctness of the screen assembling before the starting of operation.

Check is carried out for identification and correction of errors and the discrepancies which have arisen at a stage of installation of a screen which in a consequence can affect to screen functioning.

At carrying out of checking the following provisions are estimated:

1. Absence of swash of the screen relatively to the channel;
2. The rubber-fabric shields of the screen should bear against to the channel walls.

#### **Before the first start – up it is necessary:**

1. Be sure of absence of building waste, instrument and etc. in the channel;
2. To check and to adjust chain tension of the screen;
3. To check quality of lubricant of bearings;
4. To check oil level in a reducer according to the operation manual of the gear motor;
5. To check the correctness of connection of electric equipment;
6. To check the correctness of connection of power supply 400V, 50Hz to gear motor according to factory plant ( star or triangle);
7. To check the parameters of power supply of installation according to technical characteristics;

**ATTENTION!** The qualified personnel observing safety rules are allowed to start-up only.

**ATTENTION!** It is necessary read this operation manual of the gear motor which enters into the delivery set thoroughly.

### 6.2 Screen start in no – operation mode

**ATTENTION!** Start of the screen in no – operation mode is carried out dry in empty channel.

It is necessary to check the correctness of rake movement along the mesh at first shutdown. The rakes should move in forward (operating) direction bottom – up along the mesh at correctness direction of movement.

**ATTENTION!** At movement of rakes in reverse direction – immediately to switch off the screen and change the direction of rake movement in the way of changing of places of two any phasic conductors in junction box of gear motor.

It is necessary to control the following parameters at operating process:

1. Chain run;
2. Free run of the rake;
3. Rake entering into spaces of the screening mesh.



---

**Then it is obligatory and necessary to check the correctness of setting of the screen's safety device according to ch. 6.4 "Setting of the safety device".**

If results of preliminary check are satisfactory it is possible to start a final stage of the screen preparation before the operation of starting – up and adjustment under load.

### **6.3 Start – up and adjustment under load**

Start – up and adjustment operations under load in a filled channel are carrying up after preliminary check and statement restricted operation of the screen.

On this level the changes in operation of separate parts of the screen are removed at full load in channel.

Thereby the estimate of the screen operation at the state of operational load and its adjustment of mechanisms under individual states is carried out on the final stage.

## **7. OPERATION**

### **7.1 Operation requirements**

It is necessary before operation:

To meet with all units of the present operation manual;

To carry out assembling and prepare works with obligatory checking of the screen operation and removing of possible malfunctions correctly according to units of the present operation manual;

To carry out the starting – up and adjustment operations according to unit 6 with setting of the screen mechanisms under concrete operational conditions with regulation of the safety device.

It is necessary at operation:

1. To follow the rules of the safety regulation at the screen service;
2. To carry out the obligatory maintenance according to the schedule of maintenance;
  1. To note down all provided operations of maintenance to the maintenance book;
  2. To inform the specialists of plant – manufacturer of the screen in the case of appearance of uncoverable failures or failures aren't described in the present manual.

It is necessary to follow the recommendations of operating manual of the screen's gear motor during the operation.

**DANGER!** It is necessary to observe strictly rules according to safety measures and meet with recommendations of this management at maintenance of the screen.

Work package by maintenance should be carried out by qualified specialists learned arrangement and principle of the screen operation and passed instruction and training in representatives of "Tsurumi".

As working liquid to apply oils specified in the gear motor passport.



---

### Schedule of maintenance

№	Kind of operation	Periodicity	Notes
1	External examination	Every day at the end of shift	1. The screen is in operating position in a channel. 2. To examine all visual parts and assemblies of the screen. 3. To check the operation of the screen for presence of jamming, shimming, knocks, squeaking, unwanted sounds.
2	Treatment and checking of the wastage – intercepting mesh	1 time per week or for measure of obstruction	1. To examine the wastage – intercepting mesh for presence of mechanical damages. 2. To clean the wastage – intercepting mesh from garbage
3	Checking of submersible part of the screen for mechanical damages	1 time per month	1. To transfer the screen into repair position above the channel. 2. To examine the submersible parts and assemblies of the screen.
4	Checking of integrity of rubber – fabric shields	1 time per month	1. To transfer the screen into repair position above the channel. 2. To examine the rubber – fabric shields and if it is necessary – to replace it one.
5	Bearing lubrication of the main shaft	1 time per month	1. The screen is at the operating mode in the channel. 2. To lubricate the bears by lubricant BP ENERGREASE LS 3 by lubricating gun
6	Checking of fastening of rakes to chain	1 time per month	To supply the free run of rake at tightening of bolts



## **7. UTILIZATION**

Observe following additional instructions before shutdown:

Merge oil from the gear motor.

This device consists of:

- steel;
- plastic;
- copper;
- electrical components

Product details utilizations must be provided according to effective standards.

Observe standards for ecologically admittable waste disposal!