
OPERATING INSTRUCTIONS

ENDLESS-BELT SCREEN

type: 1000_CP_3370_1760_3,5

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I. GENERAL SCREEN DESCRIPTION

I.1 TERMINOLOGY

The fully automatic screen with endless belt is the equipment serving for removal of solid substances out of waste waters. They are used as the mechanical pre-treatment stage, e.g. in the waste water treatment plants.

The IN-EKO screen is of chain design with endless circulating belt.

The screen consists of the frame - supporting structure, chain filtering belt, equipment for removal of deposited impurities, individual drives, protection and control assemblies.

Screen Frame

represents the supporting structure and is made of stainless steel; its top part is equipped by the draw-out guard for check of sweeping and the face and rear parts are usually provided by the removable guards for elimination of odour and prevention of unfavourable climatic conditions. The screen frame is fixed to the concrete channel by 4 brackets and two struts, enabling height installation of the screen, depending on the real channel dimensions. Each bracket is mounted to the channel by two stainless steel dowels 10 mm.

If more screens are installed side by side, the adjacent screens have common special brackets, the width of which depends on the concrete wall between the screens. The screen is sealed to the walls and to the channel bottom by the rubber, representing the integral part of the supporting structure.

If function of the screen is endangered by frost, automatic heating assembly can be installed in the screen internals.

Screen Head

consists of the screen drive, sweeping belt assembly, screenings discharge hopper and guard. The screen drive consists of el. motor, worm-gear unit, overload switch, driving shaft and wheels, which the screen plates belt is suspended on.

Screen Plate Belt

endless belt consisting of individual screen plates seated on horizontal pins and creating the grid by which solid substances are caught and put out of water. The plates are sealed on both sides by the sealing plates. Each pin is ended by the guiding roller and a terminal on both sides. The whole filtering belt travels on rollers. Tightening bolts and nuts installed on the side parts of the supporting structure serve for filtering belt tightening.

Screen Plates

individual plastic plates create the screen plate belt. Distance between individual plates is named screen spacing.

Sweeping Assembly

equipment for removal of deposited impurities consists of the rotary brush, sliding fit and drive. Nuts on the bolts placed on the supporting structure sides are specified for moving the rotary brush towards the screen belt, the filtering belt tensioning alike.

Drives

the filtering belt is driven by the el. motor and the worm-gear (and/or cone-pulley) unit creating one common assembly with the el. motor seated directly on the shaft; it consists of two gears which the filtering chain belt driven by the side rollers is suspended on.

The rotating brush is driven by a separate el. motor with the worm-gear unit.

Overload Switch

the overload switch, representing the integral part of the screen, prevents destruction of the screen and the filtering belt. It consists of the mechanism measuring the driving torque on the shaft driving the filtering belt. As soon as the preset torque is exceeded, all screen drives are stopped.

Protection and Control Screen Assembly

is placed in a separate switchboard connected with the external voltage, driving motors, with the probe determining water height in the channel, safety switch and/or heating unit.

I.2 DESCRIPTION OF FUNCTION

The screen is mounted in the channel so that the screen plate belt (grid) creates the obstacle for the running water carrying the solid substances which are entrapped on the grid; the grid is fouled which results in reduction of the passage section of the channel and in increase of the water level upstream the screen. The screenings are removed by the screen belt out of the water level and up to the screen head where they fall into the discharge hopper. To prevent depositing of screenings on the plates, the screen is equipped by the rotating sweeping brush scraping the plate surface and leading the screenings away into the discharge hopper.

This way the fouled screen belt is cleaned continuously.

For more perfect screen plate belt cleaning the screen is equipped by the belt spraying unit which removes the impurities by the pressure water. Belt spraying can be done either in the automatic mode, depending on the belt run or manually, if necessary.

The screen also comprises the overload switch and the el. switchboard with built in automatic control unit. The screen also comprises the level switch immersed in the inlet channel. If the screen is installed outdoors, it is usually equipped by the guards where the heating assembly can be installed. The screenings can fall into the container or into the screen conveyance system. The screen can be completed by the screw press of the screenings.

In its basic version the screen is controlled by the preset running time and dwell time. The running and the dwell time of the screen can be set directly in the screen switchboard. The time is set, depending on experience in the specific conditions. Should inlet of impurities during the dwell time exceed the screen capacity, the channel contains the switch monitoring the channel level and switching the screen on separately in case of high level. As soon as high inflow of impurities and the water level upstream the screen goes down, the preset discontinuous screen operation will be restarted automatically. Besides the basic equipment the screen can be equipped (for the extra payment) by continuous monitoring of water level upstream and downstream the screen and switched on/off, depending on water level difference. The level gradient is adjustable smoothly. Water level monitoring can be done either on the ultrasound or pressure principle. Both systems are delivered as special accessories and a specially modified switchboard is needed for them.

I.3 SCREEN FEATURES, SCOPE OF USE

The screen is made only and exclusively of high-quality stainless steel and high-quality wear resistant plastics. Low weight and design guarantee smooth screen installation. Use of high-quality materials and simple design guarantee reliable operation and high screen efficiency.

The screen can be used wherever the solid substances have to be removed out of water. Suitable spacing size (2, 3, 6, 12 mm as a standard) has to be selected for the specific purpose. The fully automatic screen finds its firm place as the mechanical pre-treatment stage in the waste (municipal as well as industrial) water treatment plants.

If the inlet water contains large solid things (e.g. pieces of wood, etc.) the size of which exceeds 80 mm, then the coarse rack has to be installed upstream the mechanically scraped screen as its protection (e.g. the manually scraped coarse rack with the spacing of 60 mm).

I.4 SCREEN EQUIPMENT

The fully automatic screen IN-EKO is equipped by the overload switch, by the spraying nozzles for belt flushing by pressure water and by the rear belt guard as the standard.

At the customer's wish the screen can be equipped by the front belt guard an/or by the heating unit enabling winter operation of the screen installed outdoors.

I.5 SAFETY RULES

The screen operator has to be trained and has to observe the safety rules in the valid wording.

II. TESTING

Prior to dispatch, the screen is set and tested by the manufacturing plant. The final control consists of visual inspection (welds, guards, etc.) and of the operating test - the screen is connected to the switchboard and started. During operation the screen is subject to overload - the weight of ca 120 kg (size of the weight depends on screen dimensions) is placed on the screen belt; the belt must remove the weight without any break or interruption. During overload particularly the movable screen assemblies and the drive are monitored.

III. PACKING, TRANSPORTATION, STORAGE

The screen is delivered in the assembled state. The screen dismantled for purpose of installation or transportation is delivered in three pieces, namely two pieces of frame + the screen plate belt. They are transported in horizontal position seated on a special structure.

Prior to assembly the screen can be stored on a dry place seated on the transport structure.

IV. SCREEN INSTALLATION

The screen is designed by the channel cross section determined by its width **W** and depth **D** and by the requested minimum height of the screen discharge hopper **V** above the floor. The screen is anchored in the channel by four brackets fixed to the concrete channel edge by the dowels. The brackets are mounted to the screen by the bolts M 20 and M 16 and enable height setting, depending on the real channel depth.

IV.1 PROCEDURE OF INSTALLATION:

- remove side brackets and struts D, E, F see Fig. 1
- connect the frame parts A and B, using the screws and the connecting sheet C
- lower the screen into the channel, using the crane or another lifting device
- seat and level the screen - the may not be tilted to any side
- fix the side supporting structures and the struts D, E, F to the screen
- fix the brackets to the channel edge, using the anchor bolts M10
- check and/or correct screen seating

V. OPERATION

The screen must be installed and operated under the conditions approved by the supplier.

The screen is designed for automatic operation with the possibility of switching to the manual mode. The caught impurities are removed on the screen plate belt. Sticking of impurities on the belt and their bringing into the treated water is prevented by the rotating sweeping brush. The screen is also equipped by the device for belt flushing by pressure water. The screen is provided by the overload switch with the possibility of switching-off force setting.

The screen has been designed and manufactured based on the experience of the most different screen types and in view of the simplest possible maintenance of this kind of screen for the user. Sticking of impurities on the belt is also minimized by the screen design. All parts and assemblies are accessible easily for their possible replacement. The sweeping device is the heavy-duty screen part; brush wear has to be monitored thoroughly - the worn brush must be moved towards the belt to restore efficiency of stuck impurities removal. The fully worn brush has to be replaced.

V.1 CHAIN BELT ITSELF

After a certain time of operation the chain links can be loosened in the joints moderately (particularly in case of a new screen). It is therefore necessary to check the chain belt from time to time, mainly its tensioning, i.e. deflection of the second - bottom part of the chain belt which goes down into water (see Fig. 1G).

It is also necessary to check precise distance of the rotary brush from the screen plate belt. Too small distance could result in driving motor overload and in excessive rotating brush wear. The optimum state is when the rotating brush touches the screen plate belt with a moderate down-pressure.

Do not let the screen run continuously for a long time period, if it is not necessary. Continuous rotating of the sweeping brush leads to its excessive wear. The screen should always be operated in the automatic mode and switched by the time switch or by the level switch for the necessary time only!!

The screen does not have any point of lubrication. All rotating parts have the lubricant enough for the whole screen service life.

Despite high strength a relatively low weight, enabling easy removal out of the channel, is a great advantage of the screen. The bottom part of the screen is sealed by special strips. After unscrewing of the side screws M 20 and M 16 the screen can be lifted and taken out of the channel. During this operation, which should be carried out once a year, the state of screen, state of brushes in the bottom part (Fig. 2.14 and 2.15) and wear of the brushes has to be checked; the brushes have to be replaced, if necessary. The bottom screen part made of a special abrasion resistant plastic has to be checked as well.

V.2 MAINTENANCE WORK

Works carried out daily:

- carry out flushing of screen belt by pressure water for at least one full belt cycle (more frequently, if necessary)
- monitor level of screenings in the container, periodicity of screenings removal depends on the character of treated water

Works carried out weekly:

- remove the rear screen head guard (Fig. 2.5)
- remove possible impurities out of the discharge hopper
- check the rotating brush state (Fig. 2.3)
- flush the flushing unit by opening the flushing ball valve for 15 seconds

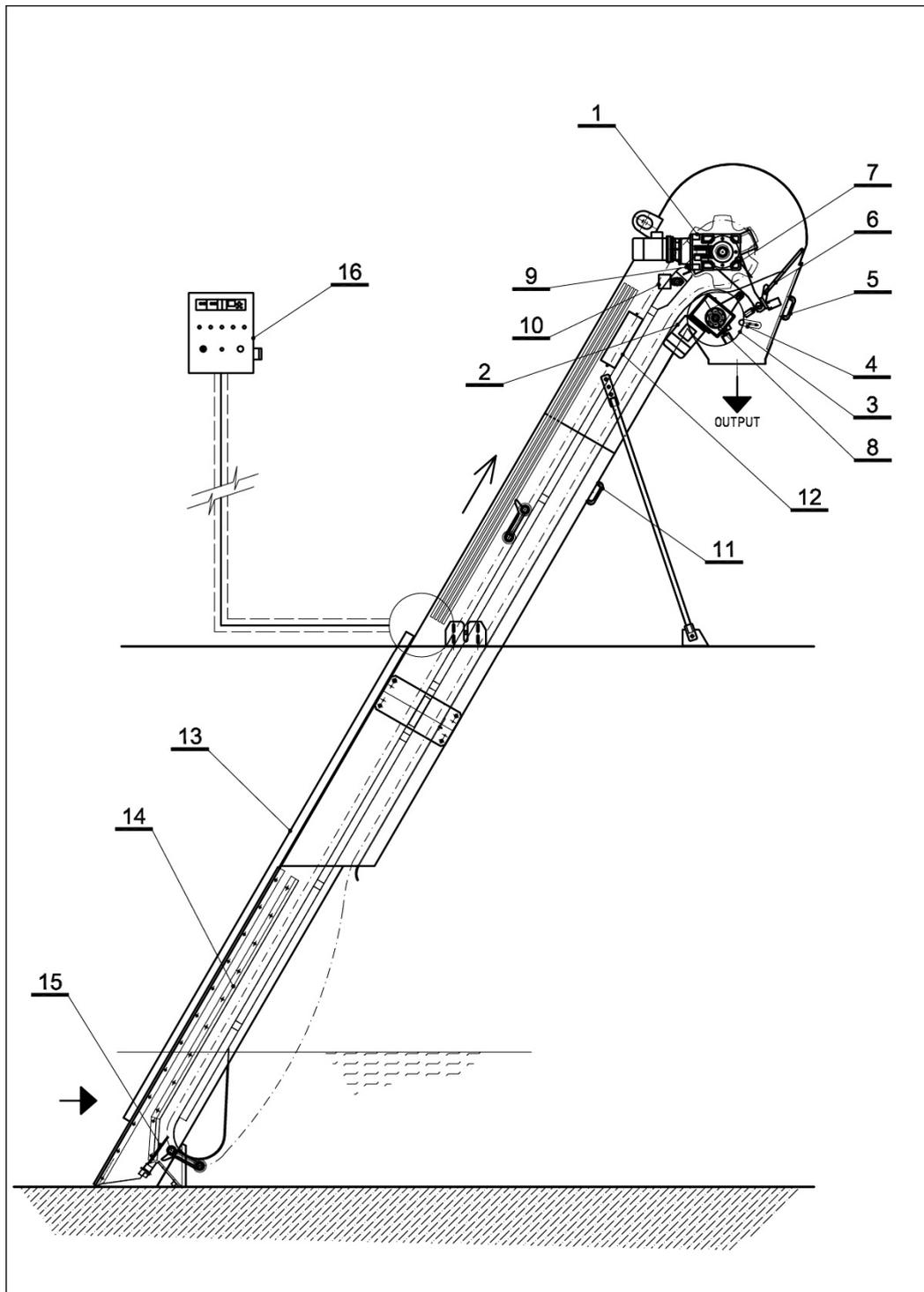


Fig.2

Attention: Prior to removing the rear screen head guard, switch the screen off, using the main switch on the screen switchboard !!!

The sweeping device is the heavy-duty screen assembly. It is necessary to monitor the rotating brush state; the worn brush can be moved easily towards the belt to restore efficiency of stuck impurities removal. For this purpose rotate the nuts on both screen sides (Fig. 3) to move the rotating brush towards the screen belt. Take care to move the brush uniformly on both screen sides. Uniform setting is checked by measurement of the distance from bolt and nut supports on both screen sides. The distances should differ by max. 3 mm.

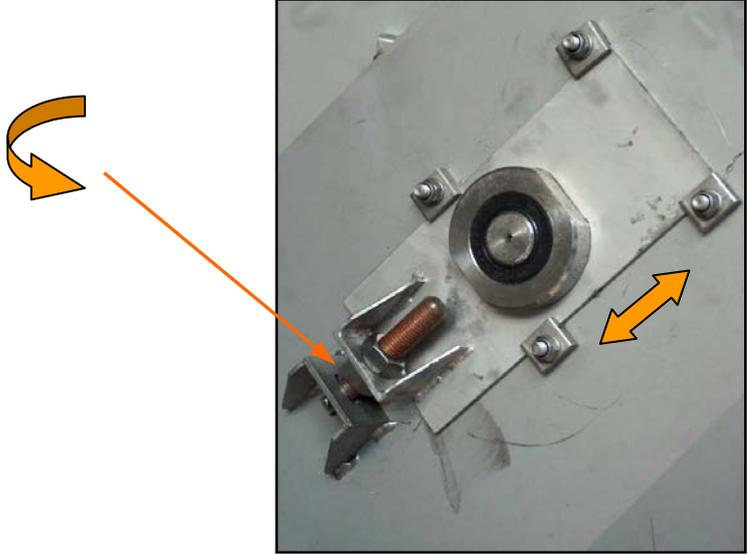


Fig. 3

Individual screen plates (chain links) are made of high-quality plastic and their shape guarantees reliable resistance to break. After a certain time of operation the links may be loosened in the joints moderately (particularly in case of a new screen). It is therefore necessary to check the chain belt for its tensioning. The down-coming free part of the belt must be deflected moderately (see Fig. 1G). If this belt part is deflected materially, it has to be tensioned by the nuts on both screen sides (Fig. 2.9). Take care to tension the belt uniformly on both sides. Check by measuring the distance between the fixed and movable part of driving shaft seating on both screen parts. Difference of these distances may not exceed 2 mm. Never tension the belt too much, let it loose moderately not to impair function of the safety device which prevents screen destruction in case of its overload. Correctly tensioned belt can be seen in the Fig. 4.

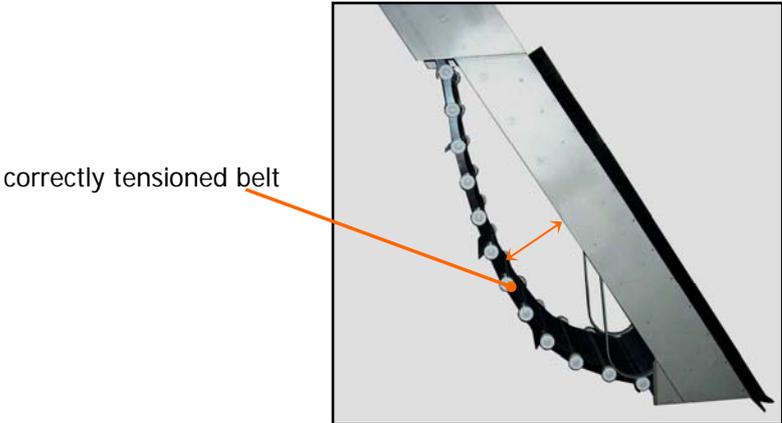


Fig. 4

Screen overload can be caused randomly, for instance by prevented movement of the belt link by a large thing, stuck in the bottom part, or the belt can be stopped by a solid rope or wire wound on the links in the bottom part and on the screen structure. Though such situation can occur only exceptionally, the screen is equipped by the overload switch. If the force on the belt rises so that any part of the screen is endangered by destruction, the device switches screen operation automatically off and the operator is notified (acoustic or light signal) of screen overload which has to be removed.

Cleaning of the belt by the rotating brush, pressure water

Fouling of gaps in the belt depends on the character of impurities removed by the screen out of the inlet water. In the majority of cases the impurities fall into the discharge hopper by gravity. Smaller stuck impurities are swept away from the filtering screen belt by the rotating brush 2.3 into the discharge hopper.

In certain cases fouling is so intensive that efficiency of the rotating brush has to be increased and supported by pressure water flow. For this purpose the screen is equipped by the spraying device consisting of the tube where the nozzles are installed, of the electromagnetic valve 2.10 controlling pressure water supply and of the ball valve placed on the opposite end of the tube with the nozzles.

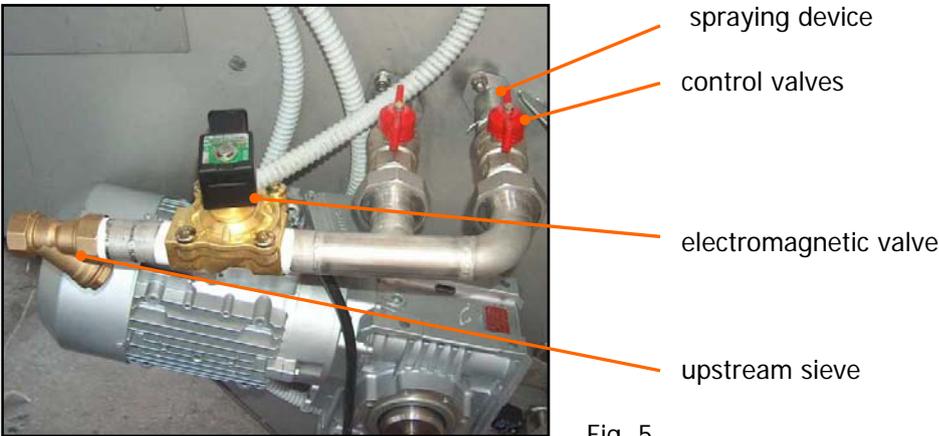


Fig. 5

After release of two screws M8, fixing sleeve of the tube with the nozzles placed next to the electromagnetic valve, the pressure water direction, i.e. the water flow falling on the rotating brush, can be changed by swiveling the nozzles - starting from the zero flow when the nozzles are directed vertically downwards and ending by the max. water flow when the nozzles are directed above the point of contact of the rotating brush and the screen belt.

To clean the nozzles and the related tube the ball valve has to be opened for ca 5 seconds with the electromagnetic valve opened on the opposite side of the spraying tubes (see Fig. 6); periodicity of cleaning depends on inlet water purity.

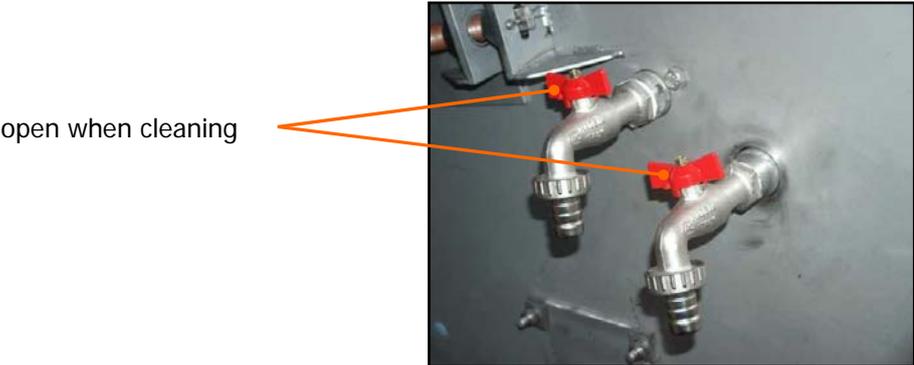


Fig. 6

The inlet pressure water can be of service quality, min. 0.3 MPa, max. pressure 0.6 MPa. The stainless sieve is installed upstream the valve (see Fig. 5) to prevent fouling of the nozzles and the electromagnetic valve. The sieve has to be cleaned at least monthly.

Notice:

Prior to removing the guards, always switch off the main screen switch. During inspection and repair of sweeping brush setting the screen has to be started with the removed rear head guard and /or with removed guard of the gears. In this case keep safe distance from uncovered movable parts. Let the screen run without the guards for the necessary time only. Switch off the main screen switch prior to continuing the normal operation !!!

V.3 SWITCHBOARD DESCRIPTION - SETTING

The belt screen is controlled by its own switchboard which contains all control, protection and switching elements necessary for automatic belt screen operation. The switchboard has to be placed on a suitable supporting structure, e.g. wall, stand. The switchboard has to be fed by the voltage 3 x 400V/50Hz + PEN led through the cable CYKY 5C x 4.

The basic control and signaling elements necessary for comfortable operation of the whole device + the main switch of the whole switchboard are installed in the external switchboard door side. Layout of these components - see Fig. 7

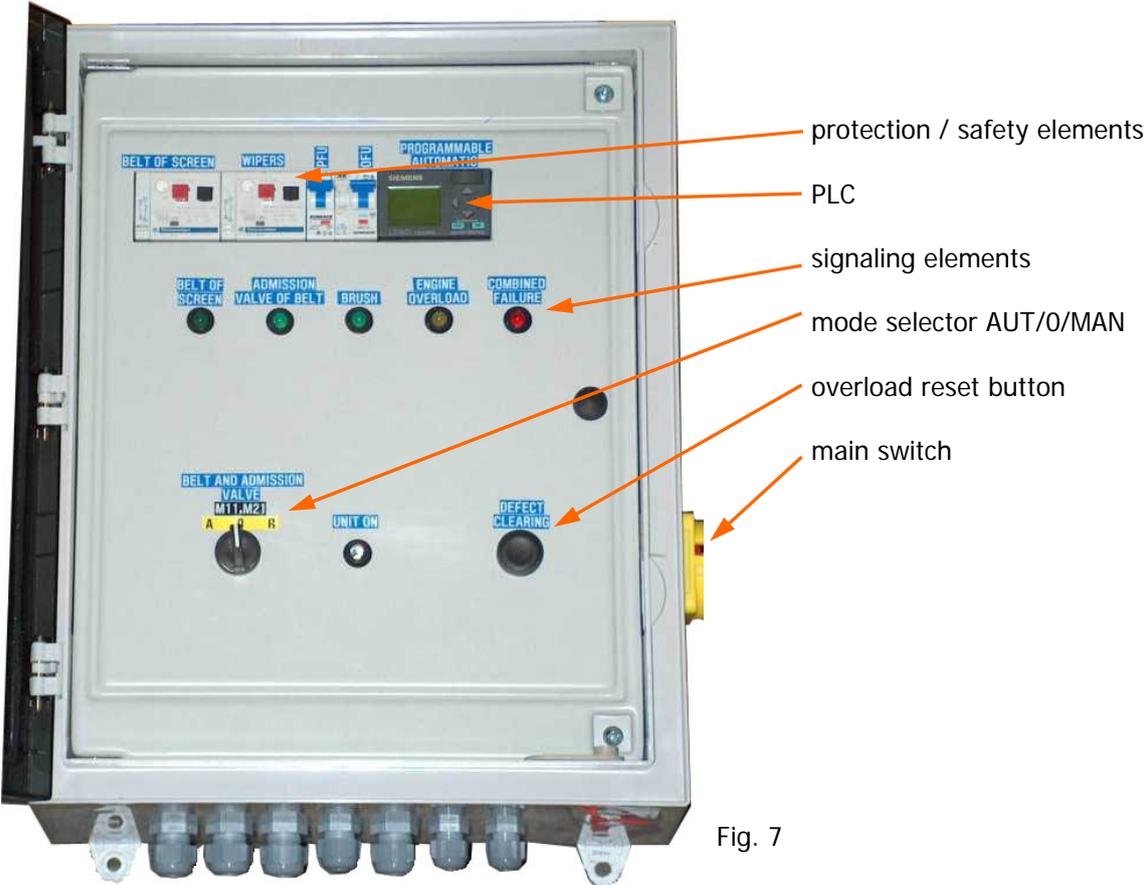


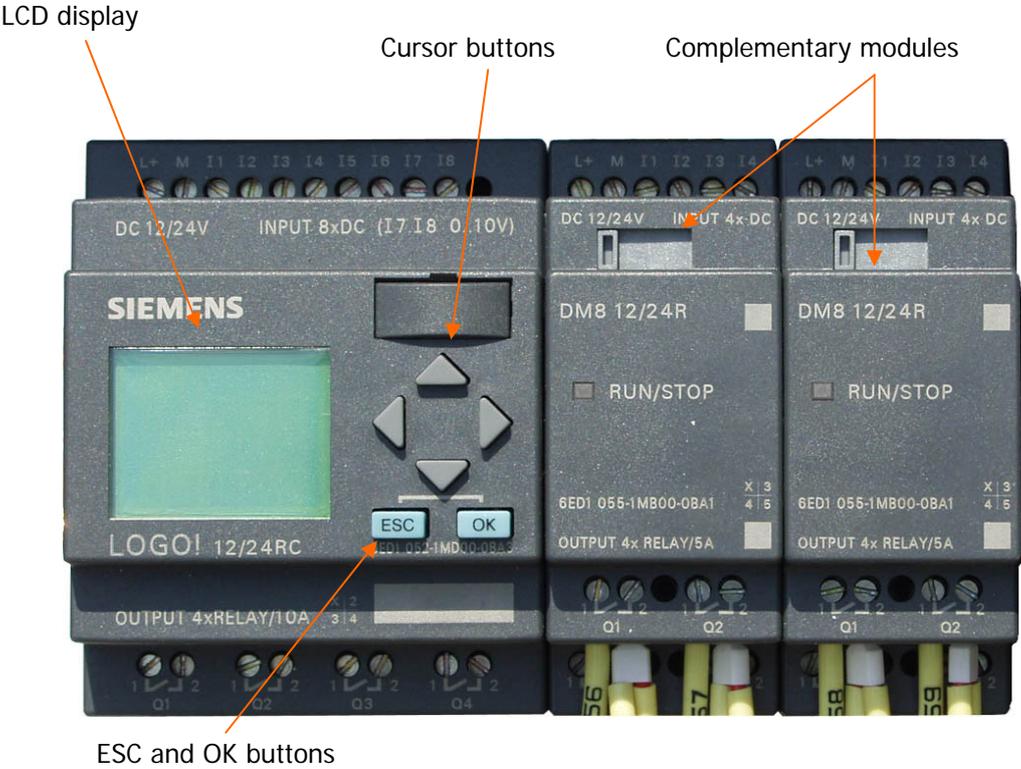
Fig. 7

Switching, protection and control parts of the belt screen are placed inside the switchboard. The PLC of the Siemens company LOGO! is the main control part. The PLC controls all processes for the automatic or manual belt screen operation. The button for reverse belt run is placed outside the switchboard. The button serves for possible service of the equipment or for release of the belt in case of its overload- blocking.

Switchboard Setting

Certain parameters have to be preset for the fully automatic belt screen operation. All parameters are set directly on the PLC unit except the current motor values. The PLC unit has the cursor buttons, the ESC and OK buttons on the front panel for parameter editing. The well-arranged LCD display (see Fig. below) serves for check and for monitoring of functions.

After switching on the main switch, the real time and the date can be seen on the display. Individual active and non-active inputs and outputs are contained in the menu described below which can be switched and changed by the cursor buttons. Table of inputs is I: and table of outputs is Q:. Their active state is highlighted. Structure of the menu and orientation - see Fig. 8.



PLC MENU STRUCTURE

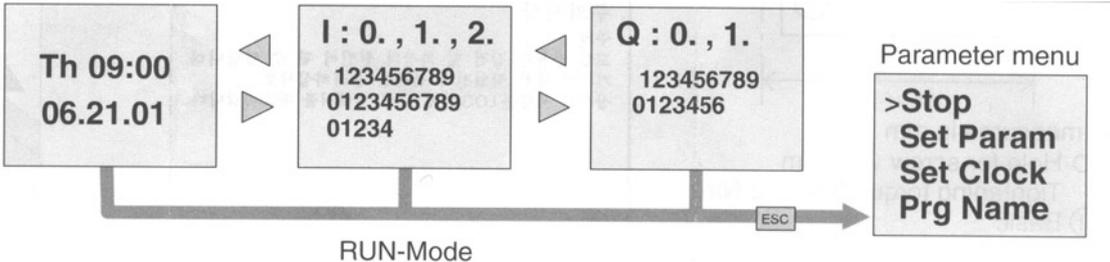


Fig. 8

By depressing the key ESC, we can enter the parameter setting menu. Choose the option Set parameter and the requested value for editing can be selected, using the cursor. In the menu Set parameter we can change individual settings for operation of the device. Individual items are broken down in the program into the blocks, designated by index B + numerical code. The numerical designation corresponds to the table below. The parameter is changed as follows: highlight the requested figure (using the cursor buttons in the form of the arrow to the right and to the left) and then, using the cursor buttons in the form of the arrow up and down, change value of the figure. If we are speaking about the time, then the time order can be changed after the preset time, e.g. s = seconds, m = minutes, h = hours.

TABLE OF BLOCKS „B „

- | | |
|--------------|---|
| Block B005 - | Cycling timer for belt flushing. Load the requested running and dwell time of the belt spraying valve. Cycling is repeated until the filtering belt moves. |
| Block B006 - | Time till switching the automatics to the time control after the level drops below the increased level. Load the requested time after expiration of which the time control will be activated. |
| Block B007 - | The basic cycling timer of the screen. Load the requested running and dwell time of the belt screen. Cycling is repeated until the automatic mode is selected. (Values of the timer have to be selected adequately, depending on the real conditions of filtering). |
| Block B015 - | The water level at which the continuous operation will be switched immediately to the time control pursuant to the block B007. Load the value measured by the level switch, when immersed at the depth where switching to the time control is requested. |
| Block B016 - | The water level at which the timer B006 is activated. Load the value measured by the level switch, when immersed at the depth where the time countdown for screen switching to the time control is requested. |
| Block B026 - | The water level at which the immediate switching to continuous operation from the time control pursuant to the block B007 takes place. Load the value measured by the level switch, when immersed at the depth where switching to the continuous screen operation is requested. |