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## GRIT AND OIL REMOVAL SYSTEMS

The second mechanical treatment of the waste water is the grit and sand removal; sometimes the grit removal tank contains also the oil removal system. The grit removal process consists in removing the substances which have a specific weight and hydrodynamic characteristics similar to true sands, such as glass and metal pieces, egg-shells, seeds, fruits-stones, coffee-beans, ashes, clay, mould, etc... Many of these substances are abrasive and may cause damages to the equipments.

There are a few types of Grit Removal Systems:

- channel type, normally aerated and with a lateral oil removal zone;
- “pista” type, in a circular tank;
- detritor type, in a square tank

The size of the solids separated by the Grit Removal System is larger than 200 microns. These solids contain some water. The solids can be separated from water through a sand filter, drying bed type, or by means of solid/water separators.

Our range of production includes the following types of Grit Removal Systems:

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Grit and oil removal scraper bridge for rectangular tank, aerated type - mod. EM54  
Grit and oil removal scraper bridge for rectangular tank, suction type - mod. EM55  
Grit and oil removal system for rectangular tank, suitable for covered tanks - mod. EM52A  
“PISTA” type grit removal system mod. EM40A  
“PISTA” type grit and oil removal system mod. EM40B  
Grit removal system, detritor type, with scraper - mod. EM42

Accessories:

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### **Grit separators:**

Screw type grit separator mod. EM39  
Reciprocating grit separator with scrapers mod. EM41  
Air-lift mod. EM77

## OUTLINES OF THE GRIT REMOVAL PROCESS

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The waste water often contains a large quantity of inert materials, mainly inorganic, which are generally defined as grit, even if actually the quantity of sand/grit is only a part of this type of materials. In fact, in the waste water treatment field, the words “grit” or “sand” do not refer only to the siliceous sands, of various sizes, but they are more commonly intended as the group of heavy inert materials which can be found in the waste water. The greatest quantity of grit reaches the waste water treatment plant during rainy periods, also because the cities sewer systems usually have a slight slope, and then a slow speed, and the sediments are dragged when the flow rate is rising.

A good grit removal system should sediment all and only the grits, of any size. The sedimentation of the organic materials should be avoided because the presence of putrescible materials in the removed grit would make them unusable or would not allow a direct elimination because it should be thoroughly washed.

Anyway in the grit removal systems, even if well sized and designed, there is always a small quantity of organic material.

To achieve a good grit separation there must be some specific physical conditions which allow to exploit the phenomenon of the difference of sedimentation speed between the particles of inert material, which sediment more quickly, and the particles of organic material.

There are a few types of Grit Removal Systems:

**gravity grit removal systems**

where the grit separation is achieved only by gravity (channel type systems)

**mechanized grit removal systems**

where the grit separation is helped by the rotation of a turbine (PISTA type systems)

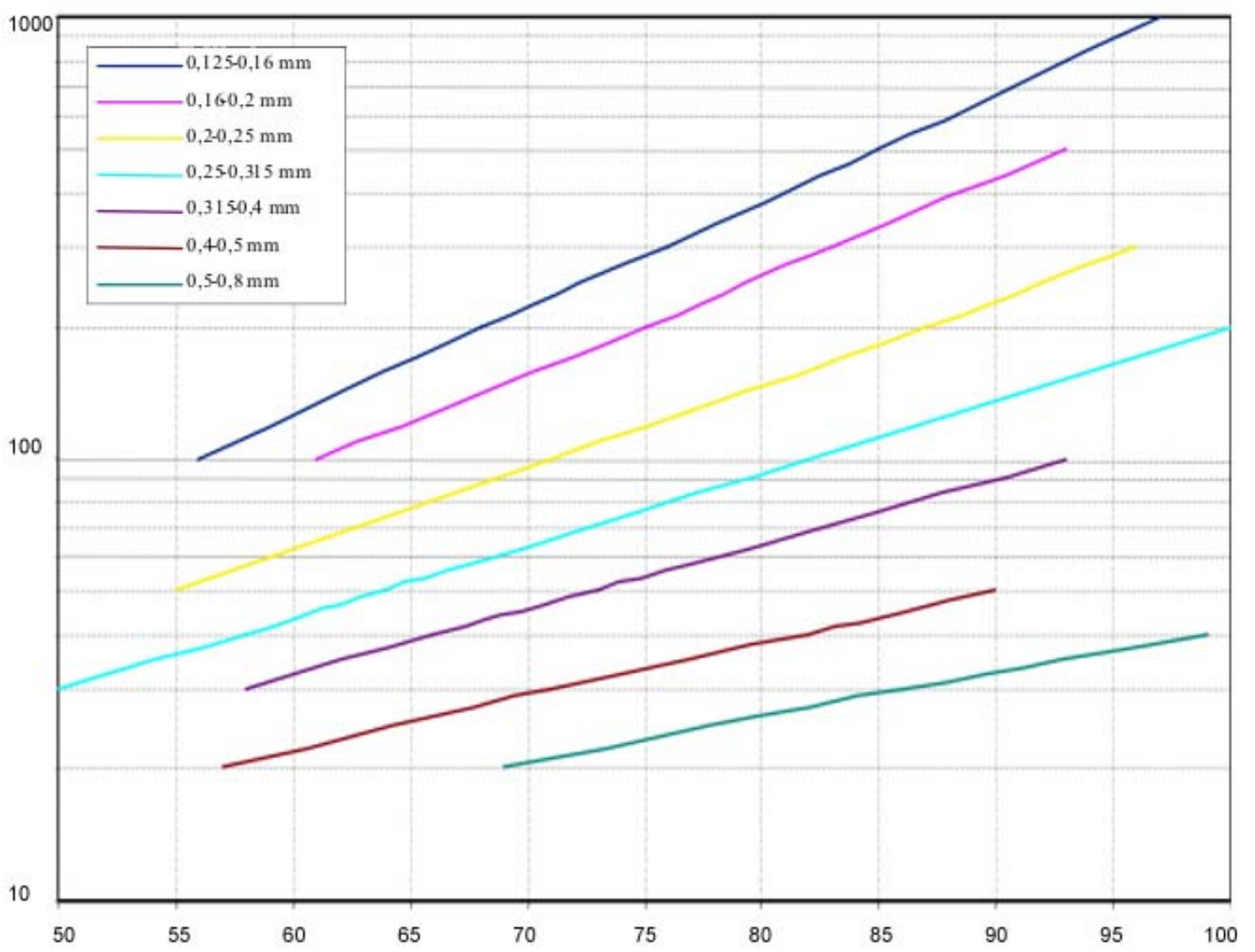
**aerated grit removal systems**

where the grit separation is helped by the air blown from the bottom

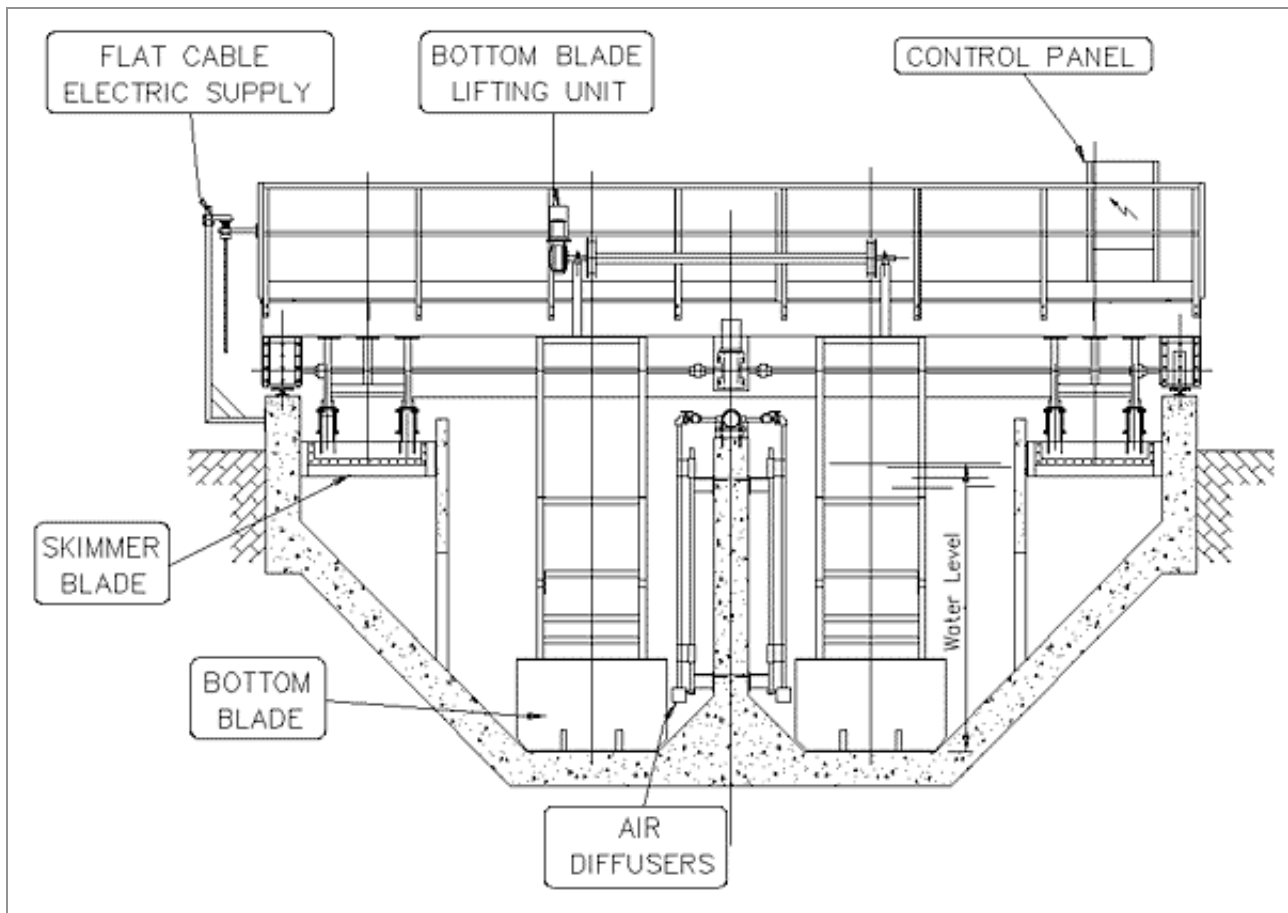
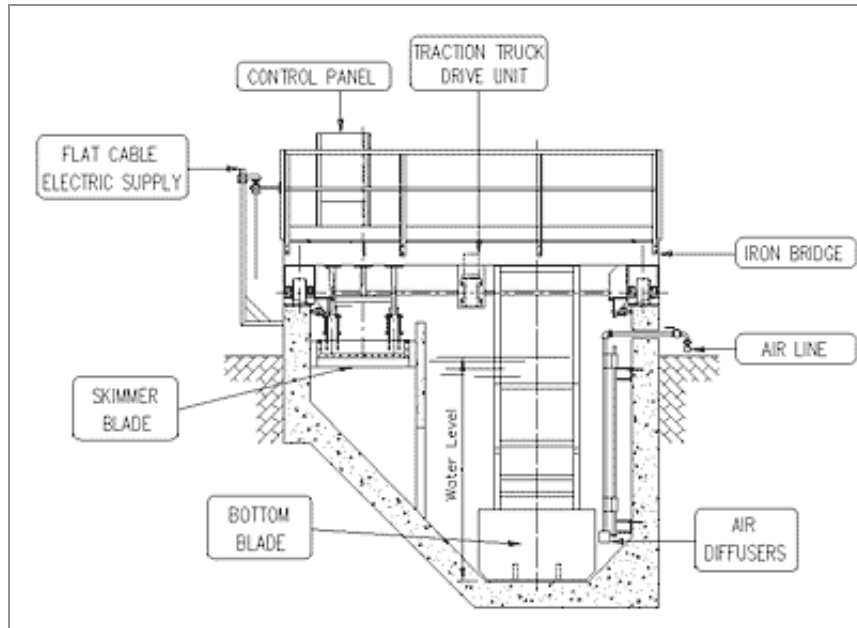
In the aerated grit removal systems the turbulence due to the air helps the grit separation and the suspension of the organic material.

The addition of a vertical baffle in the aerated grit removal systems makes the oils separation easier. They are collected in a calm zone, after the baffle.

The following table shows the percentage of the grit separation, depending on the granules size and the time of permanence in the tank.



# GRIT AND OIL REMOVAL SCRAPER BRIDGE, AERATED TYPE MOD EM54



<b>Application</b>	Grit and oil removal from municipal and industrial waste water.
<b>Characteristics</b>	Longitudinal flow channel, with tapered section (downwards). The channel is divided into two zones: the grit removal zone (normally aerated) the oil removal zone. The two zones are separated by a longitudinal baffle.
<b>Operation</b>	The waste water goes through the grit removal system longitudinally; the grit which sediments on the bottom is scraped and conveyed into a hopper and then lifted by air-lifts or submersible pumps. The floating substances in the oil removal zone are conveyed to the hopper by a surface scraper.
<b>Materials</b>	Compact equipment in hot dip galvanized carbon steel or stainless steel.
<b>Installation</b>	In a concrete channel.
<b>Separation</b>	Grit particles larger than 200 microns.
<b>Optional</b>	Separation between grit removal-oil removal zones. Power supply by cable winding reel. Air blowing system.

## Operation description

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The water speed in the grit removal channel is lower than 0.3 m/sec., therefore the grit having a larger size than 200 microns settles on the bottom. The air distributed by the diffusers fluidifies the grit before it sediments and removes the organic substances which deposit on it. These organic substances and the other substances in the water, thanks to the air effect, float and flow together to the oil removal zone which is on the channel side and is not aerated, then they are taken away by a surface scraper.

The grit settled on the bottom is conveyed to the hopper by the bottom scraper.

The recommended air delivery is of 10-15 Nm<sup>3</sup>/h per metre of length of the grit removal channel.

## Mechanical solutions for the scraper bridges:

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- scraper bridge with concrete runways, equipped with tyred wheels and contrast wheels
- scraper bridge with rails

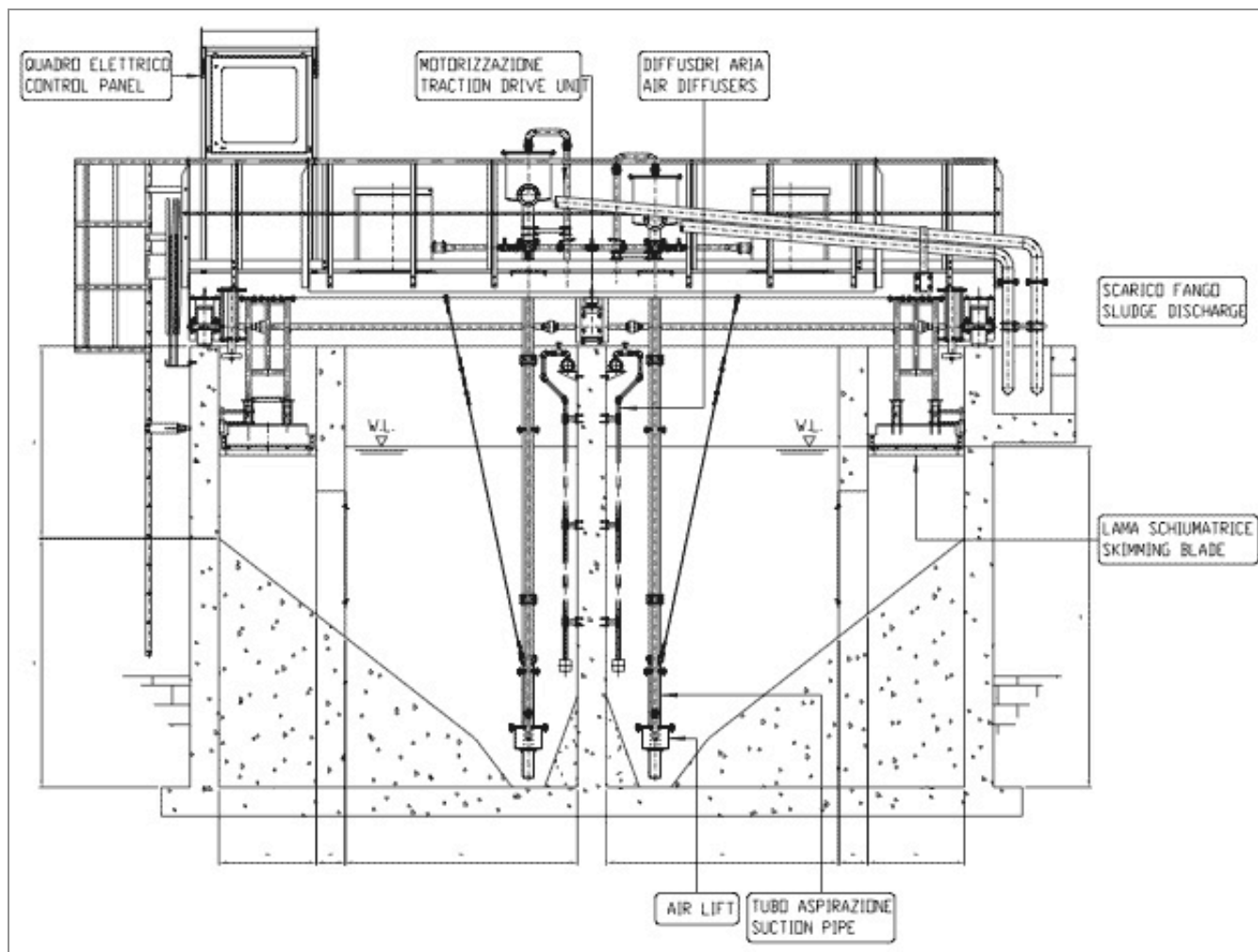
## Technical data

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1.1	Max. flow rate in the channel	:m <sup>3</sup> /h	(*)
1.2	Width of the grit removal zone	:mm.	(*)
1.3	Width of the oil removal zone	:mm.	(*)
1.4	Channel length	:mm.	(*)
1.5	Aeration zone air flow rate	:m <sup>3</sup> /h	

(\*) To be advised when asking for a quotation

# GRIT AND OIL REMOVAL SCRAPER BRIDGE, SUCTION TYPEE MOD EM55



<b>Application</b>	Grit and oil removal from municipal and industrial waste water.
<b>Characteristics</b>	Longitudinal flow channel, with tapered section (downwards). The channel is divided into two zones: the grit removal zone (normally aerated) the oil removal zone. The two zones are separated by a longitudinal baffle.
<b>Operation</b>	The waste water goes through the grit removal system longitudinally; the grit which sediments on the bottom is lifted and conveyed to a lateral channel by air-lifts or submersible pumps. The floating substances in the oil removal zone are conveyed to the hopper by a surface scraper.
<b>Materials</b>	Compact equipment in hot dip galvanized carbon steel or stainless steel.
<b>Installation</b>	In a concrete channel.
<b>Separation</b>	Grit particles larger than 200 microns.
<b>Grit lifting systems</b>	Air-lift Submersible pump Vertical pump
<b>Optional</b>	Separation between grit removal-oil removal zones. Power supply by cable winding reel. Air blowing system.

## Operation description

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The water speed in the grit removal channel is lower than 0.3 m/sec., therefore the grit having a larger size than 200 microns settles on the bottom. The air distributed by the diffusers fluidifies the grit before it sediments and removes the organic substances which deposit on it. These organic substances and the other substances in the water, thanks to the air effect, float and flow together to the oil removal zone which is on the channel side and is not aerated, then they are taken away by a surface scraper.

The grit settled on the bottom is lifted by a submersible pump or air-lift and conveyed to the lateral channel.

The recommended air delivery is of 10-15 Nm<sup>3</sup>/h per metre of length of the grit removal channel.

## Mechanical solutions for the scraper bridges:

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- scraper bridge with concrete runways, equipped with tyred wheels and contrast wheels
- scraper bridge with rails

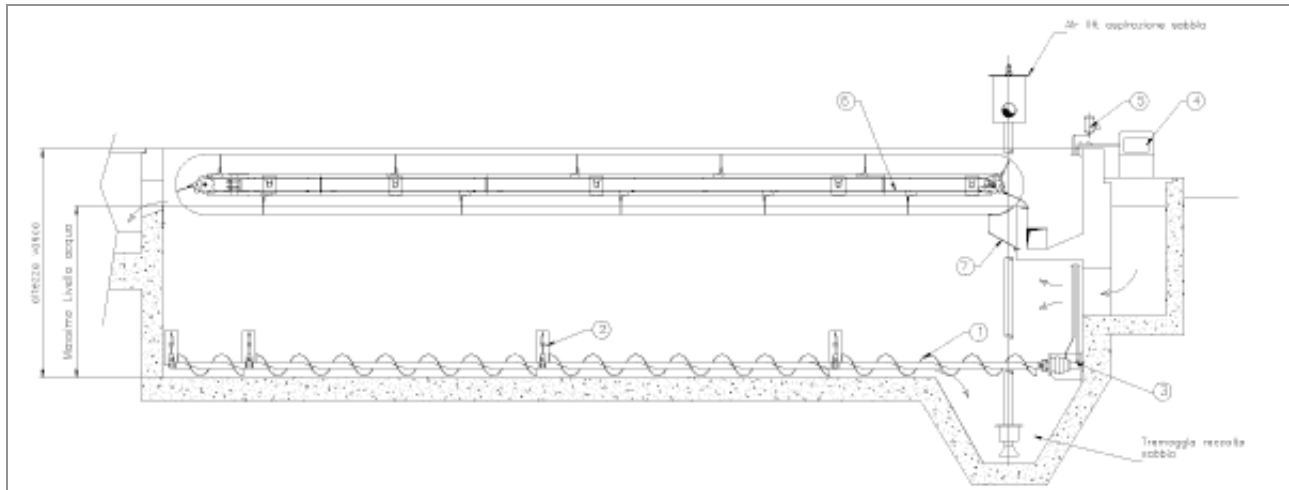
## Technical data

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1.1	Max. flow rate in the channel	:m <sup>3</sup> /h	(*)
1.2	Width of the grit removal zone	:mm.	(*)
1.3	Width of the oil removal zone	:mm.	(*)
1.4	Channel length	:mm.	(*)
1.5	Aeration zone air flow rate	:m <sup>3</sup> /h	

(\*) to be advised when asking for a quotation

# GRIT AND OIL REMOVAL SUBMERSIBLE SYSTEM MOD EM4953



<b>Application</b>	Grit and oil removal from municipal and industrial waste water.
<b>Characteristics</b>	The machine is equipped with a bottom screw to collect and convey the grit and with oil removal blades in the upper part.
<b>Operation</b>	The grit settled on the bottom is removed in continuous and taken to the drain trap. The floating substances are conveyed in continuous by the surface blades.
<b>Materials</b>	Equipment with standard components of easy installation, normally in stainless steel
<b>Installation</b>	In a concrete channel, even covered.
<b>Separation</b>	Grit particles larger than 200 microns.
<b>Advantages</b>	The tank can be covered, the continuous operation of the bottom screw and surface blades allow to treat successfully waste waters with high loads of solids and oily substances.
<b>Optional</b>	Separation between grit removal-oil removal zones. Air blowing system.

## Operation description

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The water speed in the grit removal channel is lower than 0.3 m/sec., therefore the grit having a larger size than 200 microns settles on the bottom. The air distributed by the diffusers fluidifies the grit before it sediments and removes the organic substances which deposit on it. These organic substances and the other substances in the water, thanks to the air effect, float and flow together to the oil removal zone which is on the channel side and is not aerated, then they are taken away by surface blades.

The grit settled is removed by a bottom screw.

The recommended air delivery is of 10-15 Nm<sup>3</sup>/h per metre of length of the grit removal channel.

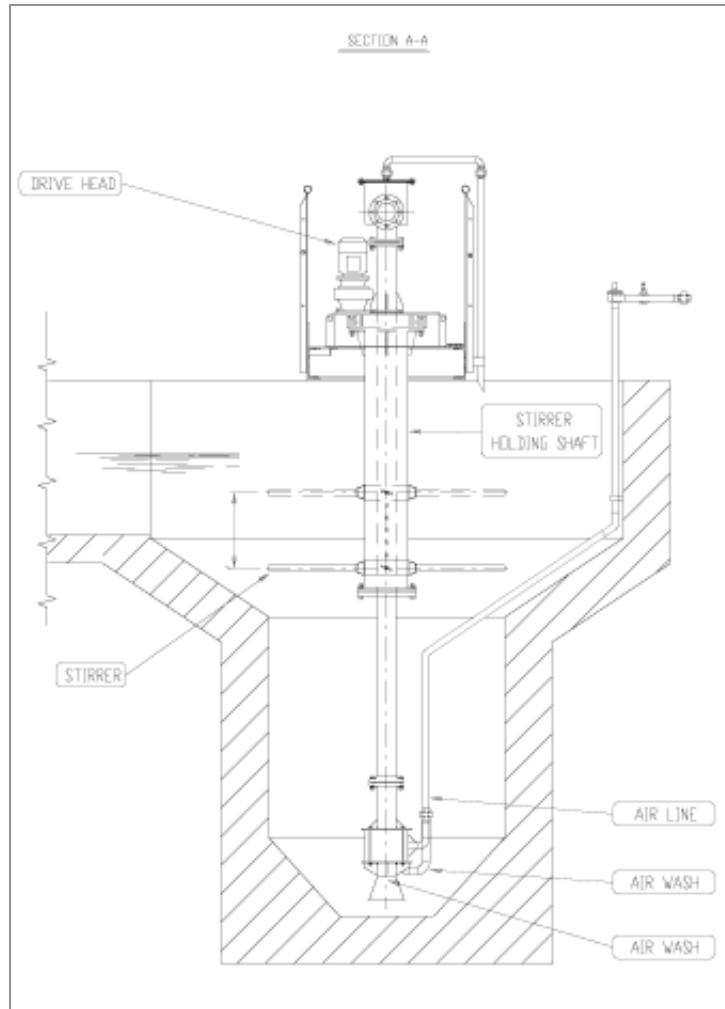
## Technical data

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1.1	Max. flow rate in the channel	:m <sup>3</sup> /h	(*)
1.2	Width of the grit removal zone	:mm.	(*)
1.3	Width of the oil removal zone	:mm.	(*)
1.4	Channel length	:mm.	(*)
1.5	Aeration zone air flow rate	:m <sup>3</sup> /h	
1.6	Electric motor for hydraulic unit	:Kw.	

(\*) to be advised when asking for a quotation

# PISTA TYPE GRIT REMOVAL SYSTEM MOD EM40A



<b>Application</b>	Grit and oil removal from municipal and industrial waste water.
<b>Characteristics</b>	The system is made up of a turbine and an air-lift.
<b>Operation</b>	The water to be treated goes through the grit removal system with a tangential flow; the grit which sediments on the bottom is lifted by an air-lift.
<b>Materials</b>	Compact equipment in hot dip galvanized carbon steel or stainless steel.
<b>Installation</b>	In a concrete channel.
<b>Tank diameter</b>	From 1000 to 5000 mm.
<b>Separation</b>	Grit particles larger than 200 microns.
<b>Advantages</b>	The grit moved by the turbine is partially separated from the organic substances.
<b>Disadvantages</b>	Limited capacity of treatment. It does not include any oil removal system.
<b>Optional</b>	Blower

## Operation description

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The water flows into the grit removal tank in a tangential way and the blades keep the liquid in motion at any level of flow rate. The tangential flow and the blades rotation make the grit particles sediment on the bottom.

The grit is lifted by an air-lift and is conveyed to a mechanical separator or to a simple draining and filtering bed.

The grit removed is clean enough thanks to the separation of the organic substances due to the effect of the rotary blades.

Sometimes, to avoid the arising of decomposition phenomena due to the inevitable presence of organic material, a certain number of washings by water or air are necessary before extracting the grit.

This type of grit removal system does not separate any oily substances.

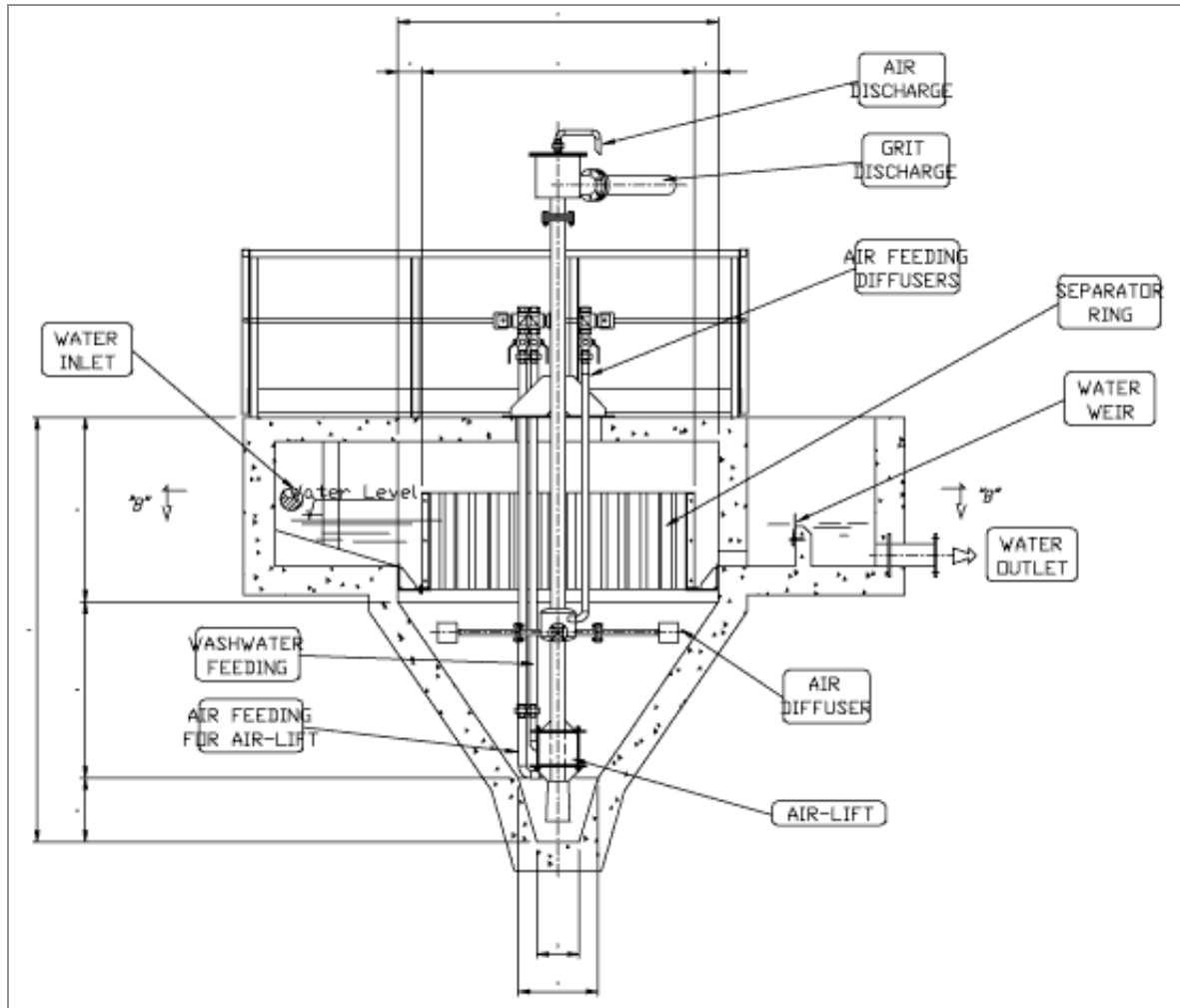
## Technical data

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1.1	Waste water delivery to the grit removal system	:m <sup>3</sup> /h	(*)
1.2	Useful diameter	:mm.	
1.3	Water and sand flow rate in the air-lift	:m <sup>3</sup> /h	(*)
1.4	Air-lift size	:DN.	
1.5	Rotation speed	:rpm	30

(\*) to be advised when asking for a quotation

# PISTA TYPE GRIT AND OIL REMOVAL SYSTEM MOD EM40B



<b>Application</b>	Grit and oil removal from municipal and industrial waste water.
<b>Characteristics</b>	The system is made up of a separation cylinder, air diffusers and an air-lift.
<b>Operation</b>	The water to be treated goes through the grit removal system with a tangential flow; the grit which sediments on the bottom is lifted by an air-lift. The oily substances which float due to the effect of the air blowing are evacuated by means of a valve, normally with a manual control.
<b>Materials</b>	Compact equipment in hot dip galvanized carbon steel or stainless steel.
<b>Installation</b>	In a concrete tank.
<b>Tank diameter</b>	From 1000 to 5000 mm.
<b>Separation</b>	Grit particles larger than 200 microns.
<b>Advantages</b>	It is equipped with oil removal system.
<b>Disadvantages</b>	Limited capacity of treatment

## Operation description

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The water flows into the grit removal tank in a tangential way. The tangential flow helps the grit particles sedimentation on the tank bottom.

Normally the suspension remains in the tank more than 30 seconds.

The flotation of the organic substances is due to the air blowing.

The grit is lifted by an air-lift and is conveyed to a mechanical separator or to a simple draining and filtering bed.

The oils flow together outside the separation ring and are regularly removed by means of a manual blade or gate valve.

The grit removed is clean enough thanks to the separation of the organic substances due to the effect of the air blowing.

To avoid the arising of decomposition phenomena due to the inevitable presence of organic material, a certain number of washings by water are necessary before extracting the grit.

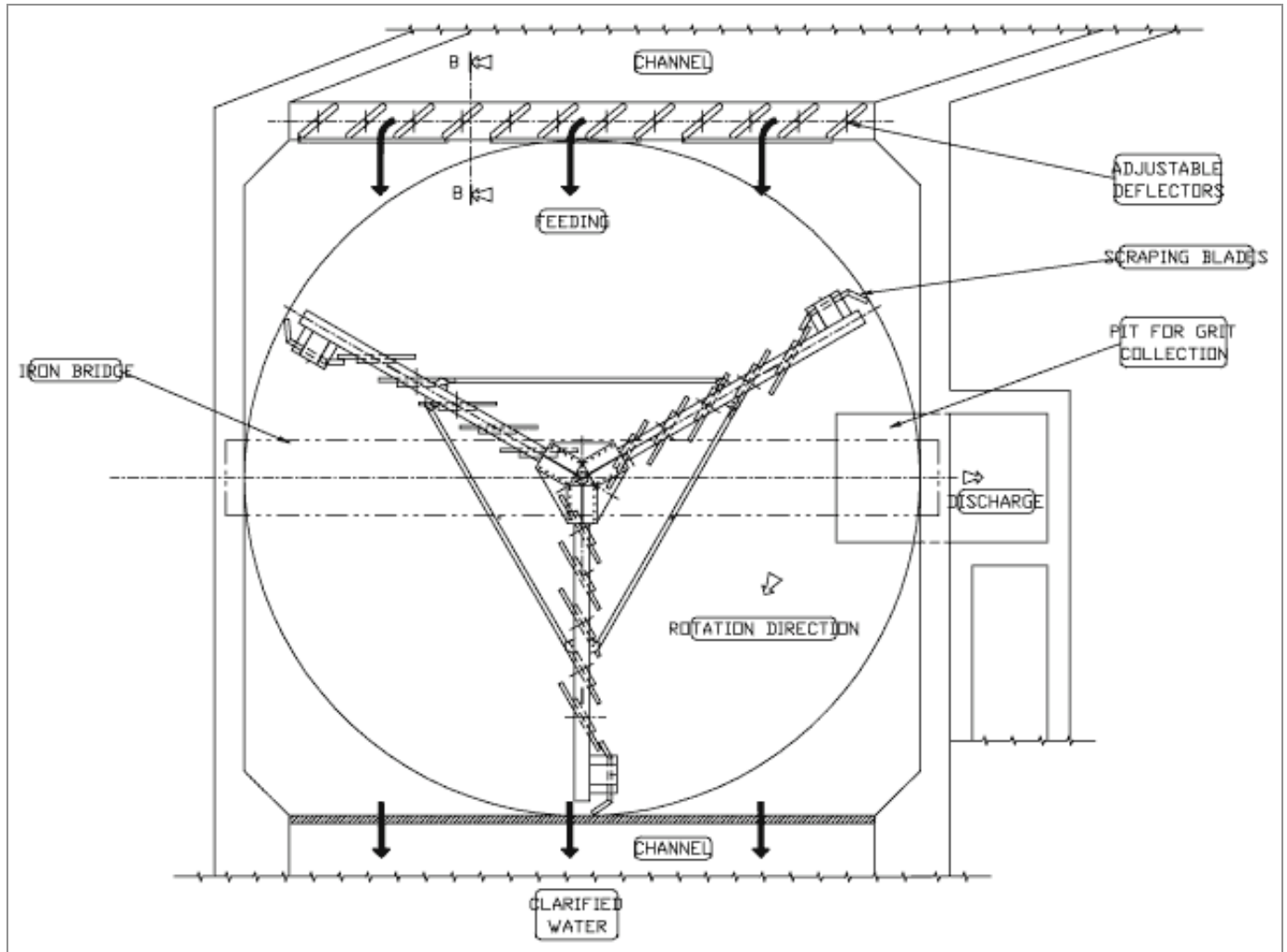
## Technical data

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1.1	Waste water delivery to the grit removal system	:m <sup>3</sup> /h	(*)
1.2	Useful diameter	:mm.	
1.3	Water and sand flow rate in the air-lift	:m <sup>3</sup> /h	(*)
1.4	Air-lift size	:DN.	
1.5	Air flow rate	:Nm <sup>3</sup> /h	

(\*) to be advised when asking for a quotation

# DETRITOR TYPE GRIT REMOVAL SYSTEM MOD EM42



<b>Application</b>	Grit removal from municipal and industrial waste water.
<b>Characteristics</b>	The system is equipped with baffles and grit scrapers.
<b>Operation</b>	The water to be treated goes through the grit removal system with a laminar flow; the grit which sediments on the bottom is conveyed to the sides and evacuated by an air-lift.
<b>Materials</b>	Compact equipment in hot dip galvanized carbon steel or stainless steel.
<b>Installation</b>	In a concrete tank.
<b>Tank diameter</b>	From 2000 to 16000 mm.
<b>Separation</b>	Grit particles larger than 200 microns.
<b>Optional</b>	Air-lift for grit evacuation

## Operation description

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The water flows into the grit removal tank from the side. The water flow must have a laminar motion.

The baffles placed at the entry are installed in such a way to distribute the water homogeneously, all over the tank width.

The grit which sediments on the bottom is scraped and conveyed to the periphery of the tank where it is lifted and evacuated by an air-lift.

The average water level in the tank is 700-1000 mm.

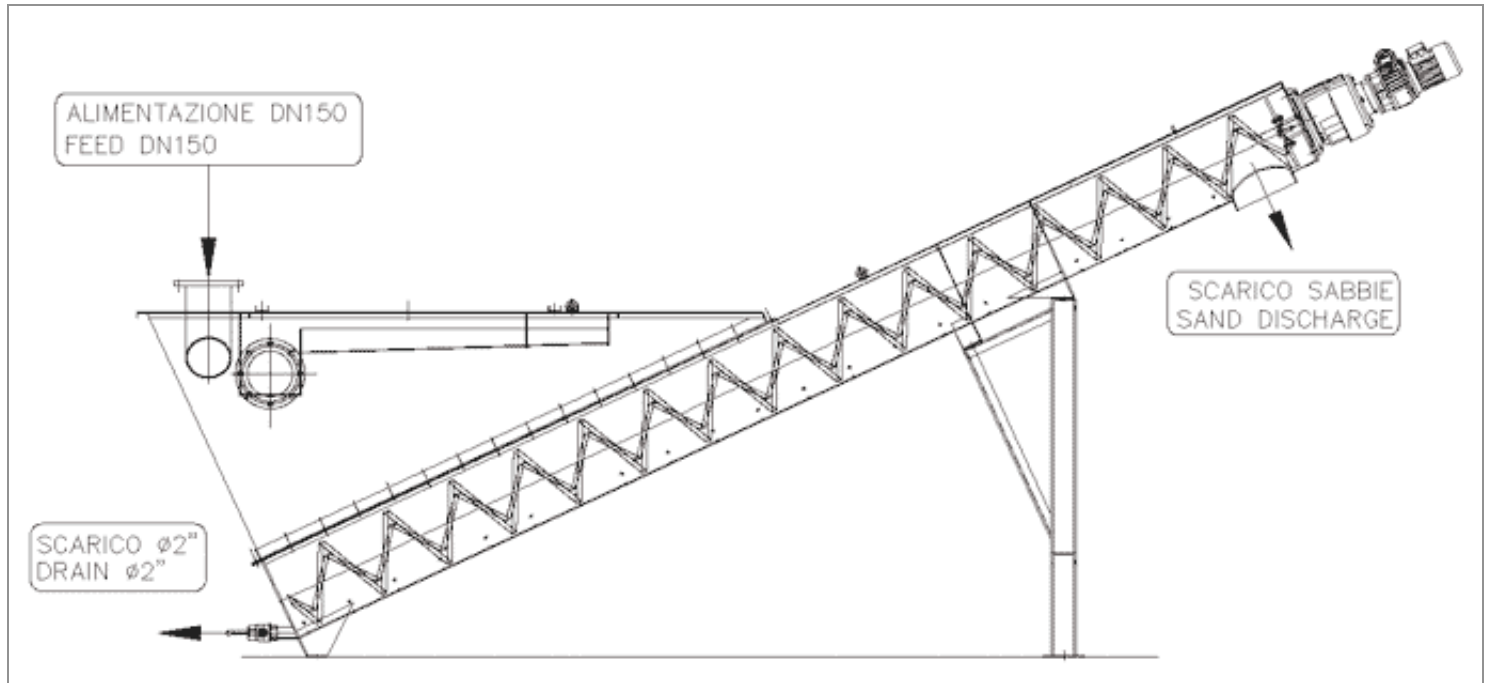
## Technical data

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1.1	Waste water delivery to the grit removal system	:m <sup>3</sup> /h	(*)
1.2	Width x length	:mm.	
1.3	Water and sand flow rate in the air-lift	:m <sup>3</sup> /h	(*)
1.4	Air-lift size	:DN.	
1.5	Rotation speed of the scrapers	:rpm	

(\*) to be advised when asking for a quotation

# GRIT SEPARATOR AND WASHER MOD EM39



<b>Application</b>	Separation of sand and other solids from waste water
<b>Characteristics</b>	The machine is equipped with a screw which carries the solid materials from the channel bottom to the top.
<b>Operation</b>	Continuous
<b>Materials</b>	Compact equipment in hot dip galvanized carbon steel or stainless steel.
<b>Installation</b>	Free standing
<b>Separation</b>	Starting from 200 micron
<b>Optional</b>	Air separator for sand coming from air-lift.

## Operation description

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The water to be treated is conveyed into the feed hopper where the sand and any other solid particles decantation process takes place.

The screw lifts the solid materials from the hopper to the discharge outlet.

After having been separated from water, the sand is washed with clean water by a spraying nozzle; the dirty water returns to the tank and the washed sand is lifted by the screw.

At the first starting, before the grit is lifted and evacuated outside the machine, the solid materials must begin settling down to form a bed of grit.

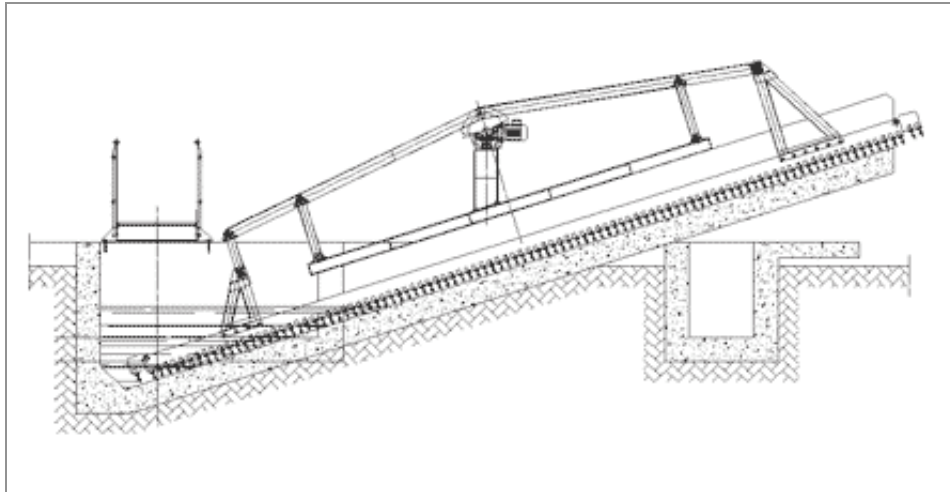
When a sufficiently thick bed of grit is formed, the equipment begins evacuating the solid material (grit).

## Technical data

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1.1	Waste water delivery to the sand classifier	:m <sup>3</sup> /h	35	50	80
1.2	Volume of the hopper	mm.	800	1400	2000
1.3	Sand flow rate that can be lifted	:m <sup>3</sup> /h	1	2	2
1.4	Spiral diameter	:mm.	200	280	280
1.5	Screw rotation speed	:rpm.	5	5	5
1.6	Electric motor	:kw	0,25	0,55	0,75
1.7	Power supply	V-f-Hz	380-3-50	380-3-50	380-3-50
1.8	Electric motor poles	:n°	4	4	4
1.9	Electric motor protection	:ip	55	55	55
1.10	Insulation class		F	F	F
1.11	Machine total weight	:kg	1250	1450	1950

# RECIPROCATING GRIT SEPARATOR AND WASHER MOD EM41



<b>Application</b>	Separation of sand and other solids from waste water
<b>Characteristics</b>	The machine is equipped with a series of parallel plates which lift the solid materials from the channel bottom to the top.
<b>Operation</b>	The grit settled on the bottom is dragged by the scrapers which have a reciprocating motion out of the water. Before being discharged, the grit is washed with water.
<b>Materials</b>	Compact equipment in hot dip galvanized carbon steel or stainless steel.
<b>Installation</b>	In a concrete channel.
<b>Channel width</b>	From 300 to 1500 mm.
<b>Separation</b>	Starting from 200 microns
<b>Advantages</b>	The grit scrapers do not lay on the bottom, therefore they are not subject to wear.

## Operation description

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The water to be treated is conveyed into the feed hopper where the sand and any other solid particles decantation process takes place.

The grit scrapers, thanks to their reciprocating motion, lifts the solid materials from the hopper to the discharge outlet.

After having been separated from water, the sand is washed with clean water by a spraying nozzle; the dirty water returns to the tank and the washed sand is lifted by the screw.

At the first starting, before the grit is lifted and evacuated outside the machine, the solid materials must begin settling down to form a bed of grit.

When a sufficiently thick bed of grit is formed, the equipment begins evacuating the solid material (grit).

## Technical data

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1.1	Waste water delivery to the grit separator	:m <sup>3</sup> /h	(*)
1.2	Suspended solids	:%	(*)
1.3	Size of the suspended solids to be separated	:micron	>200
1.4	Channel width	:mm.	(*)
1.5	Slope	:°	20°
1.6	Length of the channel or discharge elevation	:mm.	(*)
1.7	Scrapers stroke	:mm.	160
1.8	Scrapers lift	:mm.	80
1.9	Number of cycles per minute	:no.	12

(\*) to be advised when asking for a quotation