



Detailed description of components and assemblies of the MARTin type A

The MARTin type A technology comprises:

- * delivery of washing out water into a tank ;
- * hydro-jet cleaning ;
- * dilution and stirring of the bottom sediments ;
- * discharge and transportation of diluted bottom sediments out of a tank with a help of discharge positive displacement pump (booster or rotor) that is fixed on the robot.

Volume of AST that can be cleaned: from 1,000 cbm to 100, 000 cbm.

Types of tanks: floating or fixed roof.

Type of sludge that can be cleaned: crude oil sludge, oil products sludge

Capacity

- * from 25 up to 60 cbm of sludge per hour (depending on type and viscosity of sludge);
- * time of equipment deployment: not more than 4 hours.

Required utilities

- *electrical power, max: 48 kW, 380 VAC, 3 -phase, 50 Hz.
- *process water.

Ambient temperature for operation: from - 20 °C to + 60 °C.

Operation stuff: two operators.

Explosion-proof ATEX: robot ROTC-TD3  II 1 G Ex d IIC T5..T6 Ga/Gb, **enclosure of the video-surveillance system**  II1G Ex d+px

IIC T6 Ga/Gb X, **control station (20-ft container)**  II 2 G Ex c IIB T3 Gb

Service life: 10 years.

Warranty: 24 months from putting the equipment into operation.

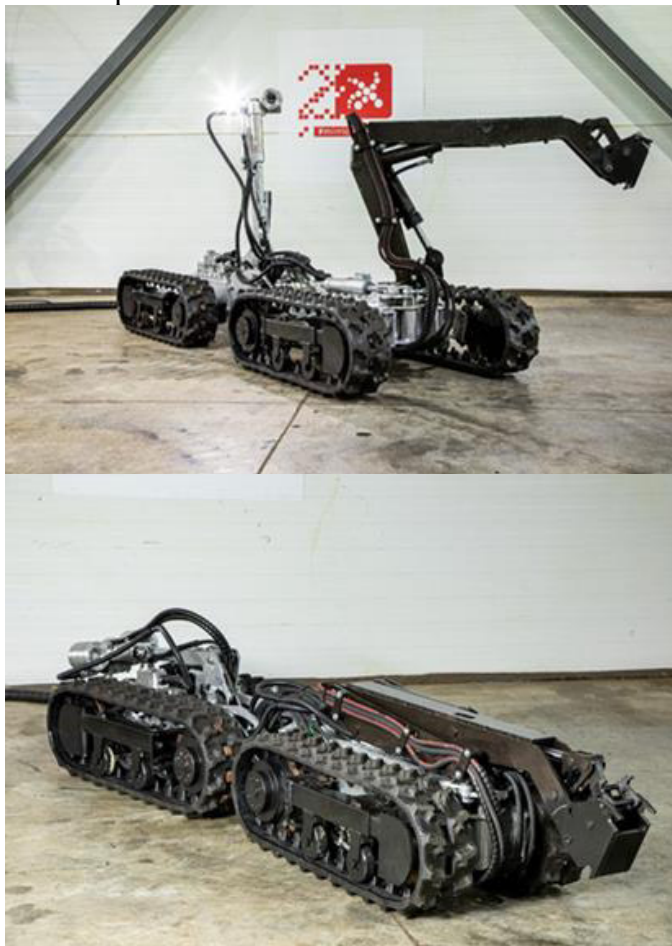
Training of the Customer's staff: 5 days, at the Mirrico's production facility in Kazan.

n	Item	Assembly's Description	Features
1	ROTC-TD robotic cleaner	ROTC-TD is a robot to provide a no-man entry oil tanks cleaning. It is designated for: - delivery of washing out water into a tank ; - hydro-jet cleaning ; - dilution and stirring of the bottom sediments ; - discharge and transportation of diluted bottom sediments out of a tank with a help of discharge positive displacement pump (booster or rotor) that is fixed on	- zone '0 ' certified - min. diameter of man-hole to enter is 600 mm - opportunity to clean walls, roof, floor – up to 20 m. high (or even higher as per a special Seller's requirement) - external operating temperature, from - 20 °C to + 60 °C - explosion-proof ATEX marking of the robot:  II 1 G Ex d IIC T5..T6 Ga/Gb



the robot.

1.1. Robotic platform



- quantity of sections : 2 crawlers
- drive type – hydraulic
- undercarriage type – crawler
- lighting & video shooting CCTV system (real time mode, 360 ° rotation, night vision, 4K, 3,000 lm searchlight , ATEX explosion-proof enclosure  II 1 G Ex d+px IIC T6 Ga/Gb X)
- capability to move straight, back, right, left
- capability to override barriers with 45 cm height, i.e. heat battery tubes, etc. on the bottom of a tank
- hydraulic power consumption - 8 kW
- consumption of electrical power, W - 0
- weight (without outboard equipment): 450 kg
- dimensions in minimized form ,mm :2,000 (L) x 550 (W) x 450 (H) mm
- dimensions in deployed form, mm : 2,206 (L) x 808 (W) x 1,120 (H) mm
- robot is equipped with a manipulator-arm
- plated with copper sheets underneath to prevent and protect from sparkles
- equipped with on-board hydraulic electric generator and batteries (with charger) to provide redundancy of electrical power supply



1.2. Lighting and video surveillance system



- overview – 360 degrees
- camera – 4K, zoom and night vision mode.
- 3,000 lumen, LED spotlight
- explosion-proof enclosure suitable for the zone '0'

1.3. Manipulator-arm



- it is designed to fix/unfix and to bear outboard equipment such as rotor pump, booster pump etc;
- it can be moved 360 degrees, up & down, right & left ;
- lifting capacity is 100 kg



1.4. Hydro-jet nozzle



- It is configured to clean inner surface of the tank
- Pressure of washing out water not more than 2.1 MPa
- Converging type of nozzle, length 200 mm, diam. 13 mm

1.5. ROTC-TD robot umbilical

- Umbilical connection (harness) between control station (20 ft container) and robot ROTC- TD
- Umbilical harness consists of :
 - a) three hydraulic hoses to delivery hydraulic energy (pressurized hydraulic oil) to the robot's tracks, robot's hydraulic electro generator, and on-board pumps
 - b) low-current control STP cable (interface RS-485)
 - c) coaxial cable to deliver a video signal
 - d) earthing copper wire
- outer oil resistant antistatic spiral cover
- 100 m length

1.6. High pressure hose for water

- 100 m length
- internal diameter 32 mm
- outer oil resistant and antistatic cover



		1.7. Hydraulic hoses for operation of the outboard pumps (gear or booster)	- 1" diam. - 100 m, 3/4" diam. - 100 m length - equipped with quick- release connections - outer oil resistant and antistatic
		1.8. Gear pump is configured to discharge (pump out) high viscosity sludge  	- Capacity from 15 to 25 cbm/hour (depends on sludge viscosity, density etc) - It is equipped with nozzles to deliver the water for dilution of the high viscosity sludge - Hydraulic drive type - Max. operation hydraulic pressure - 15 MPa



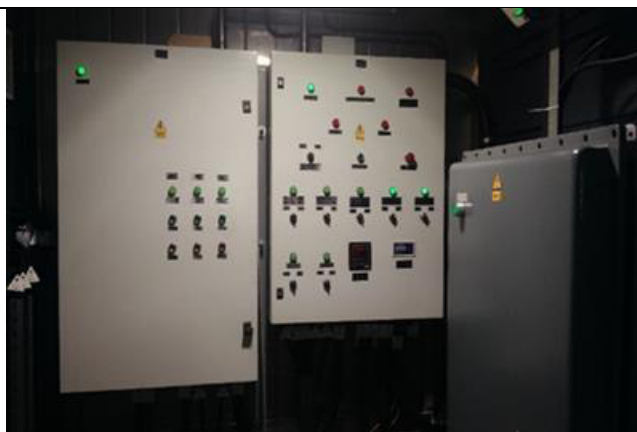
1.9. Booster (centrifugal) pump to discharge (pump out) low viscosity sludge



- Capacity from 30 up to 60 m³/hour (depends on sludge viscosity, density etc)
- Hydraulic drive type
- max. operation hydraulic pressure - 15 MPa



2	Transportable unit	2.1. 20-ft container 	- ISO container - 6.06 (L) x 2.44 (W) x 2.6 (H) m - net weight 2,200 kg - it is equipped with an additional door - explosion-proof ATEX marking  II 2 G Ex c IIB T3 Gb
		2.2. Instrumentation system and control cabinets 	The instrumentation, power supply, lighting and earthing of the container consists of explosion-proof devices and components for operation in the zone "1. Control cabinets are: - explosion-proof cabinet for power distribution (completed circuit breakers, terminals, cable glands etc) - 1 set; - explosion-proof control cabinet to control electric motors of the hydraulic station (equipped with frequency converters - 3 pcs, circuit breaker, explosion-proof cable glands etc.) - 1 set; - explosion-proof cabinet to control the electric motor of the water supply pump (equipped with a frequency converter - 1 pc, circuit breaker, etc.) - 1 set; - explosion-proof LED-lights , fan, junction and distribution boxes etc.



2.3. Operator's console



- completed with viewing windows made of polycarbonate and includes explosion-proof enclosure, two monitors, explosion-proof keyboard, two explosion-proof computer mice, two joysticks completed with IS-barriers, video recorder, UPS, CPU, operator's chair and table



2.4. Hydraulic Power Pack



- Three - circuits hydraulic pack
- 45 kW, 380 VAC, 50 Hz
- Weight 450 kg
- Operating pressure max 15 MPa, min 3 MPa
- Hydraulic oil tank capacity 0. 450 m3
- Overall dimensions 1409 x 605 x 1403 mm

2.5. Reel for the umbilical



- Welded steel
- Completed with a rotary joint to prevent entanglement of the umbilical



2.6.Reel for the hydraulic hoses for operation of the outboard pumps (gear or booster)



- Welded steel
- Completed with a rotary joint to prevent entanglement of the hydraulic hoses

2.7. Ramp to move the robot through a man-hole



- Ladder: 4 pieces, length of each one is 1.0 m;
- Width of ladder - 600 mm;
- Height - 500 mm;
- Material : aluminum and painted steel;
- Assembling and dissembling is effected with no-man entry into a tank



		2.8.Floodgate unit	- It is used when the sludge level in the tank is higher than lower level of the man-hole. It is used to remove that excessive quantity of sludge in automatic way. The floodgate unit requires only hydraulic power and designed for the zone '0'; - made of hard aluminum alloy sheet material; - welding seams are made by argon-arc welding; - the centrifugal (booster) pump is used; - equipped with a movable nozzle for supply of washing out water (the nozzle is designed for operating pressure not more than 2.0 MPa), - equipped with hydraulic cylinders (4 pcs., that provide non-contact remove of the man-hole cover).
--	--	--------------------	---



MIRRICO
GROUP OF COMPANIES

General view of the Process Compartment



Three-circuits Hydraulic Power Pack



Three-circuits Hydraulic Power Pack



Reels with umbilical of the robot and hydraulic hoses of high pressure



General view of the Control Compartment (Electrical Control Cabinets)



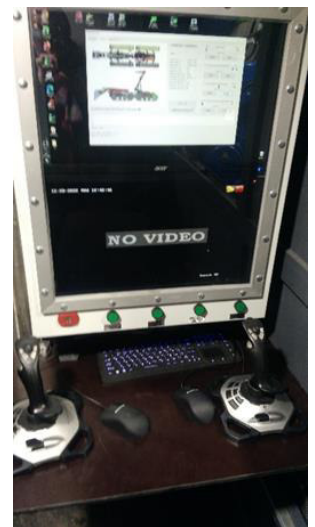


MIRRICO
GROUP OF COMPANIES

Explosion-proof air conditioner and supply fan



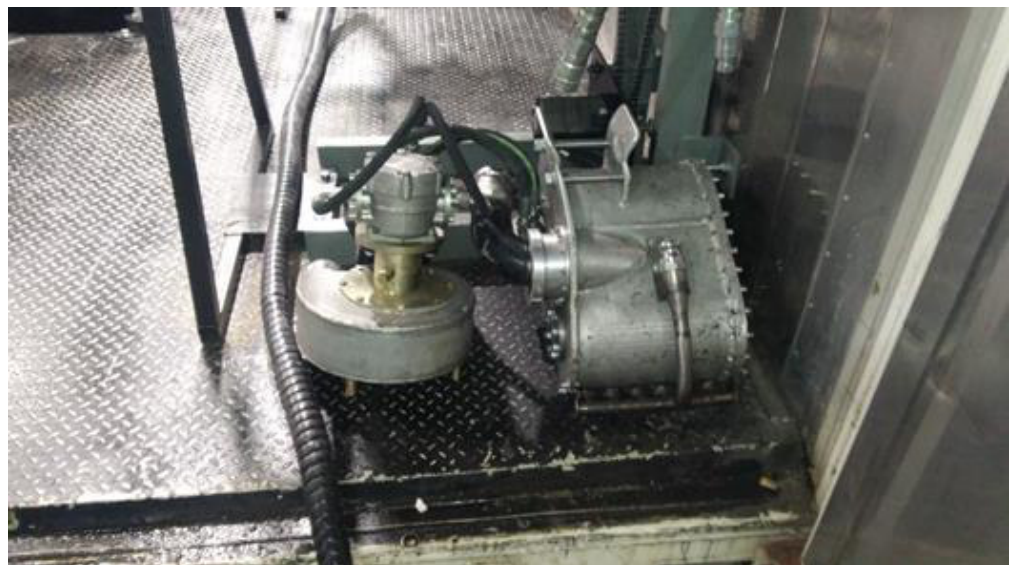
Operator's console



Robot



Rotor and booster pumps





MIRRICO
GROUP OF COMPANIES

Video surveillance and searchlight system of the robot



Booster (centrifugal) pump of the robot for low viscosity sludge (capacity up to 60 cbm of oil sludge per hour)





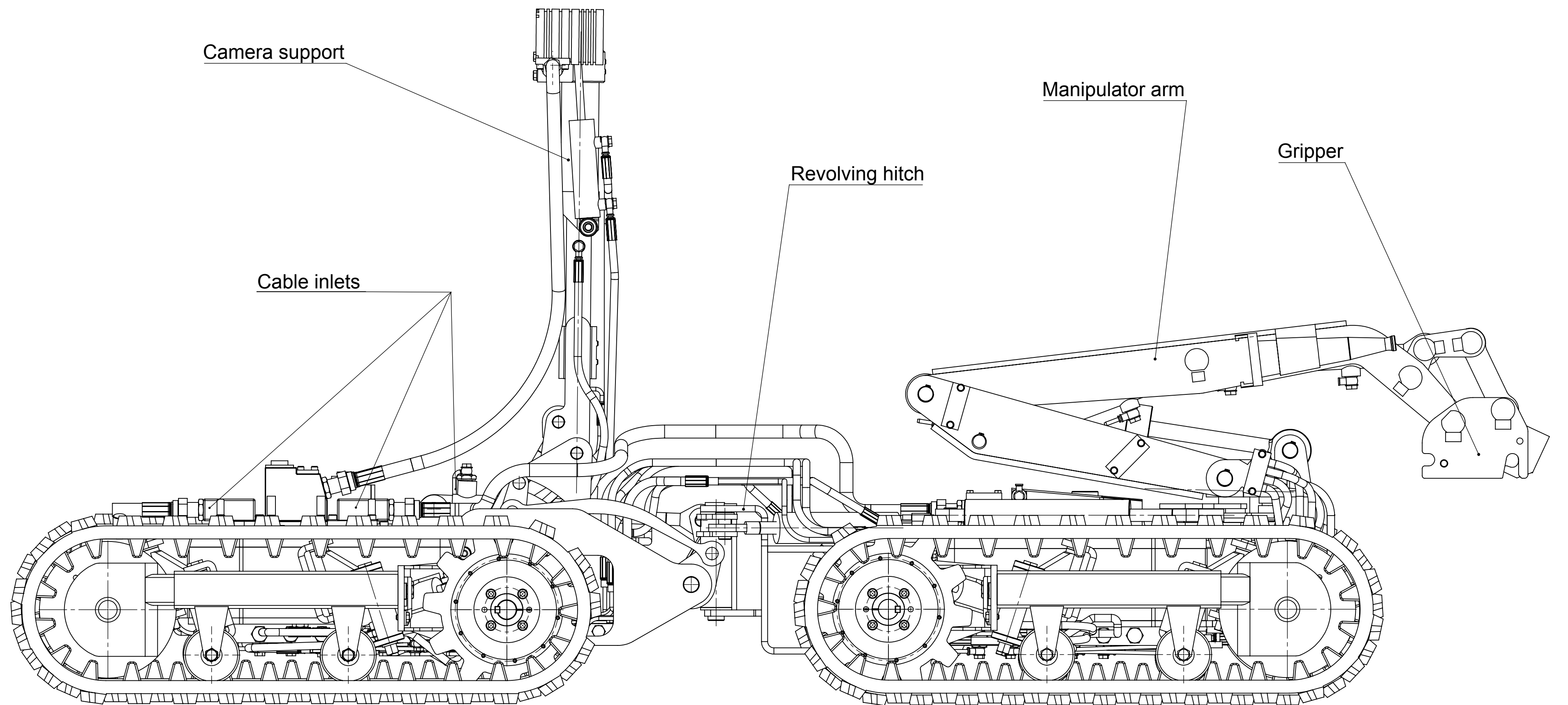
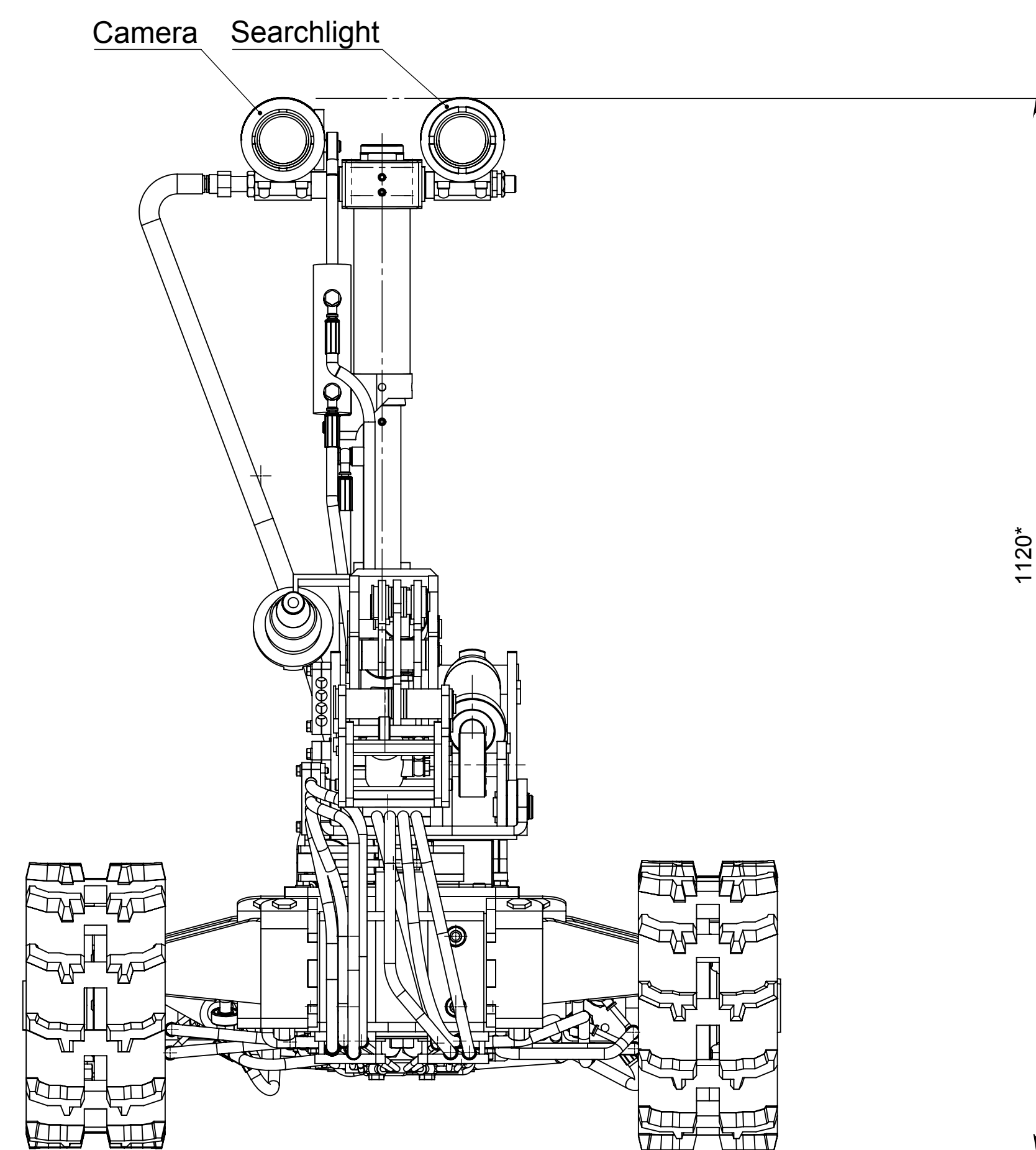
MIRRICO
GROUP OF COMPANIES

Rotor pump of the robot for high viscosity sludge with an attachment for dilution of sludge with water (capacity up to 25 cbm of sludge per hour)

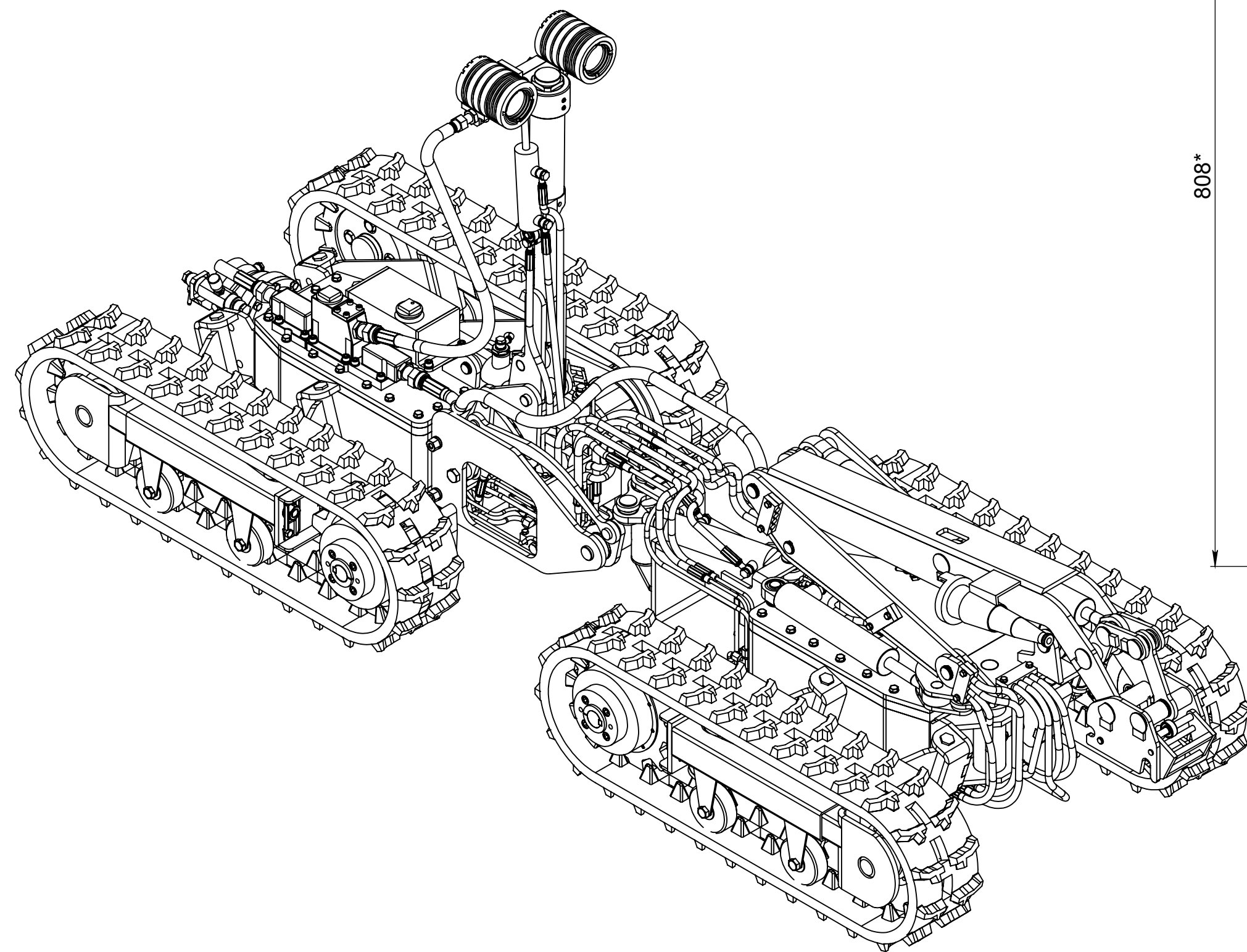
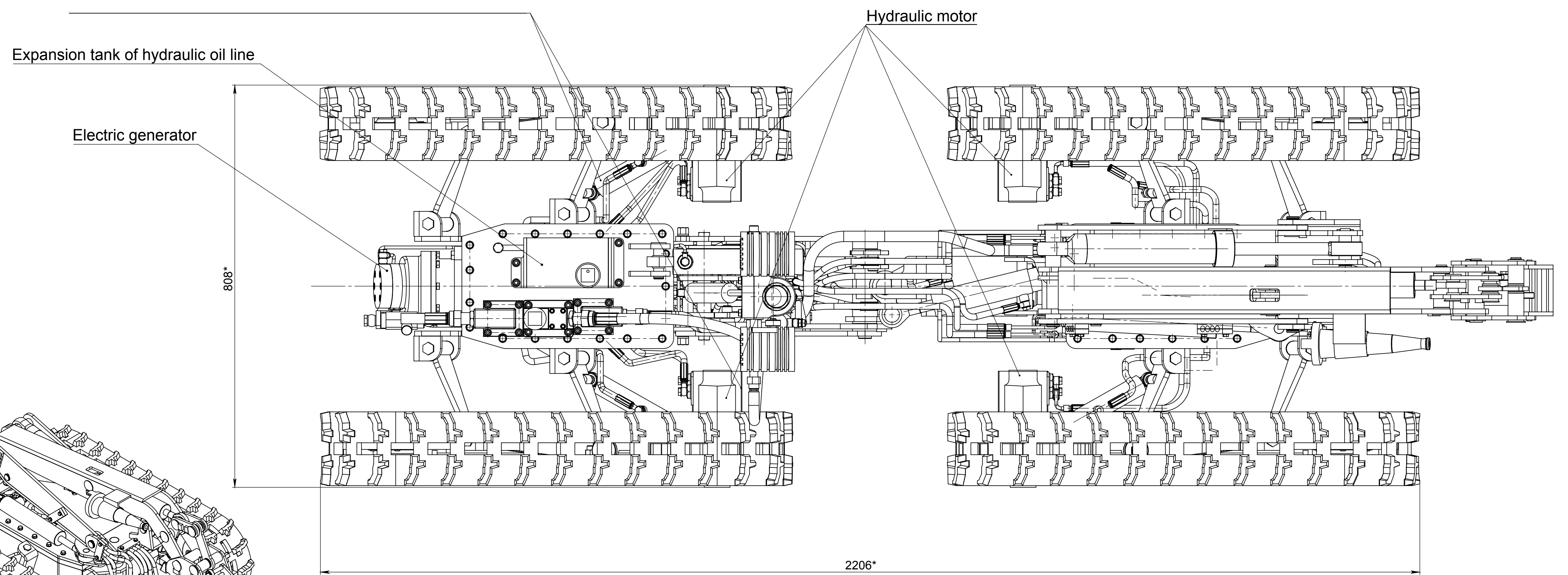


Water-jetting nozzle installed on the robot

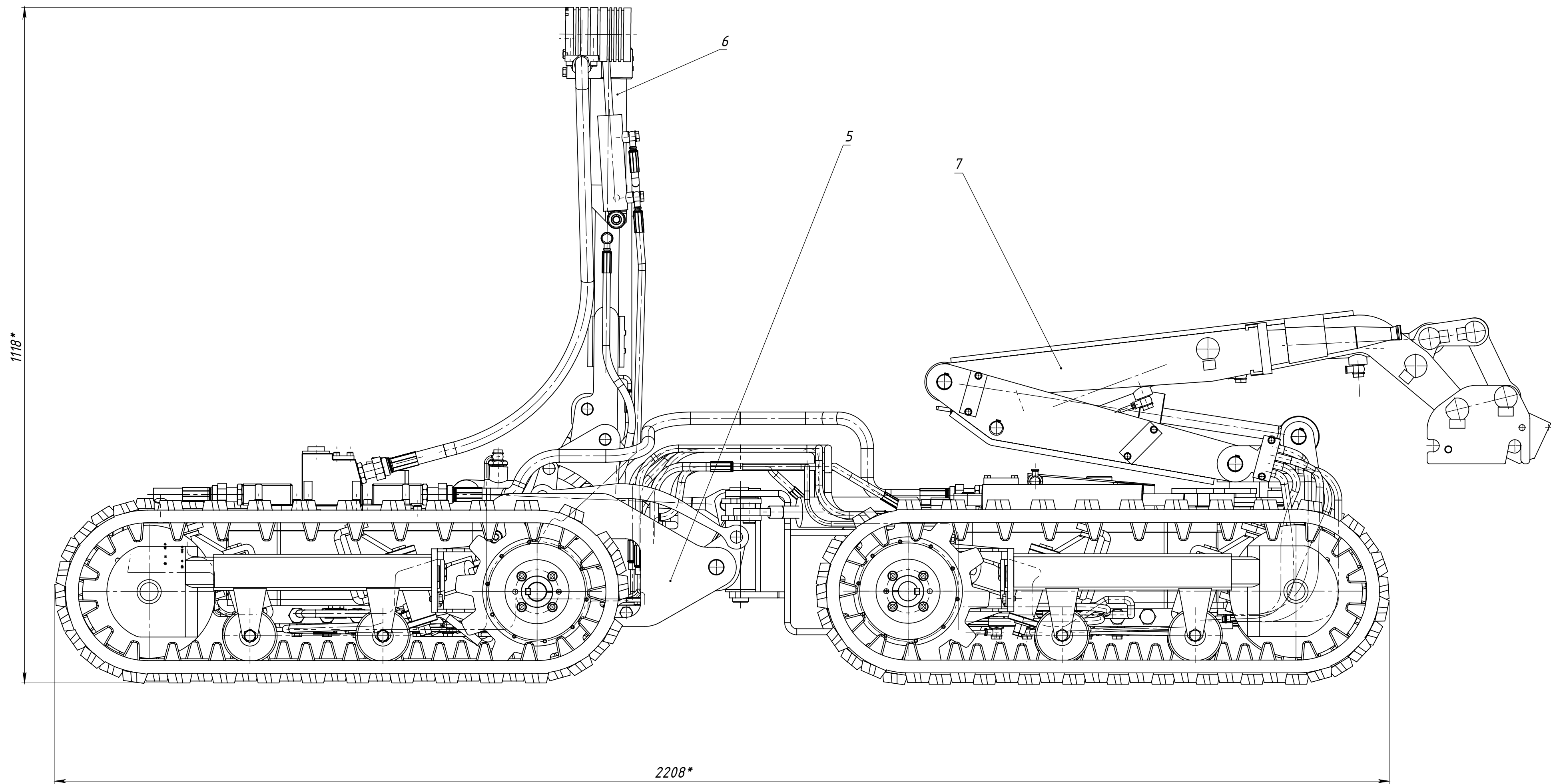




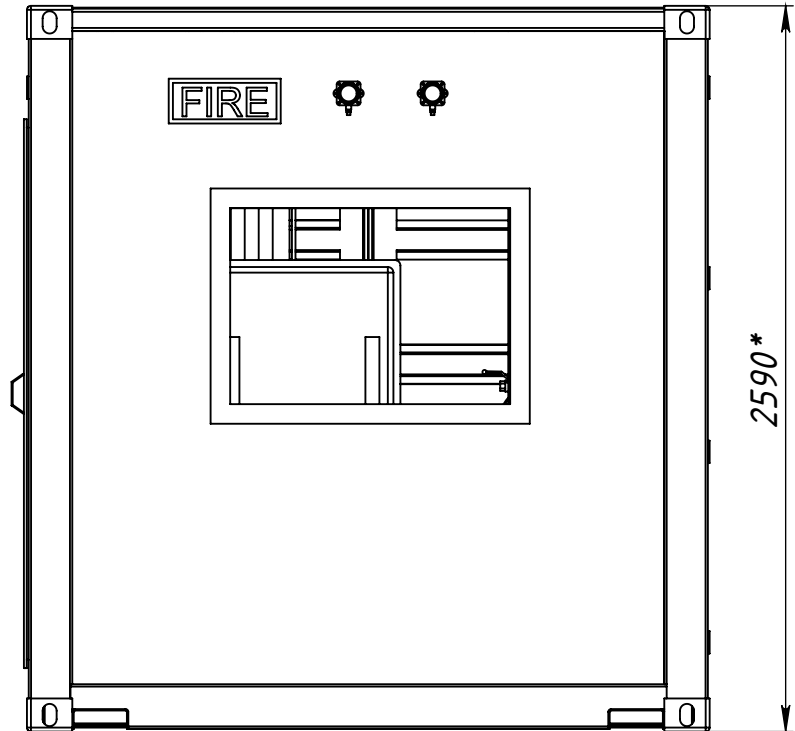
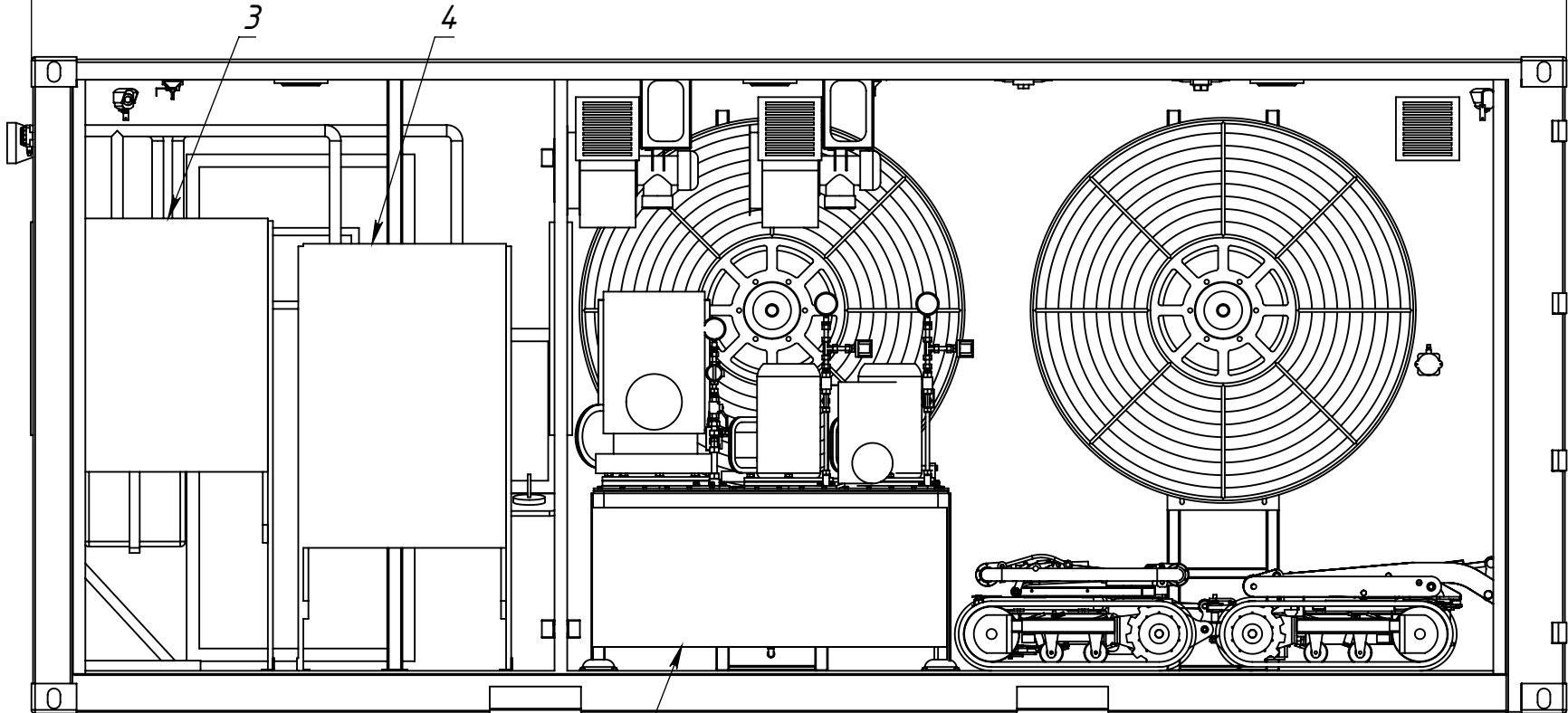
Mechanism to move the caterpillar propellers away from the body



<i>Item</i>	<i>Name</i>	<i>Quantity</i>
1	Link	1
2	Link	1
3	Catepillar propeller #1	2
4	Catepillar prpeller #2	2
5	Revolving hitch	1
6	Video control unit	1
7	Manipulator arm	1

[illegible]

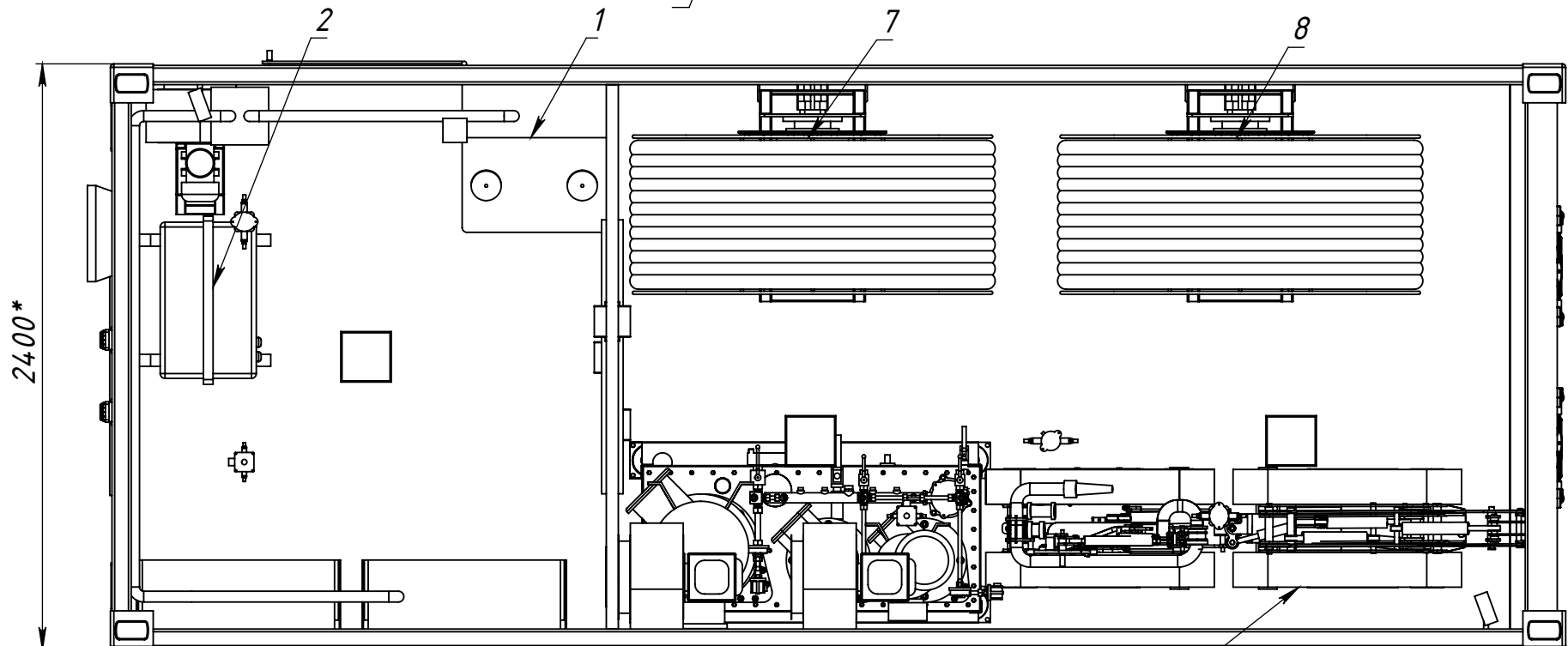
6055*



MARTin type "A"

- 1. Operator Console
- 2. Control panel #1
- 3. Control panel #2
- 4. Control panel #3
- 5. Hydraulic Power Pack
- 6. Robotic tank cleaner
- 7. Coil #1
- 8. Coil #2

* Dimensions for reference



Изм.	Лист	№ докум.	Подп.	Дата	MARTin	Лит.			Масса	Масштаб
Разраб.										1:100
Пров.										
Т. контр.						Лист 1		Листов 1		
Н. контр.						 МИРРИКО ГРУППА КОМПАНИЙ				
Утв.										