

Comprehensive solutions  
on production organization  
arrangement



RESEARCH AND PRODUCTION COMPANY

**TECHVAGONMASH**



Manufacturing process organization of attached  
implements and towed vehicles for trucks



## From project to turnkey

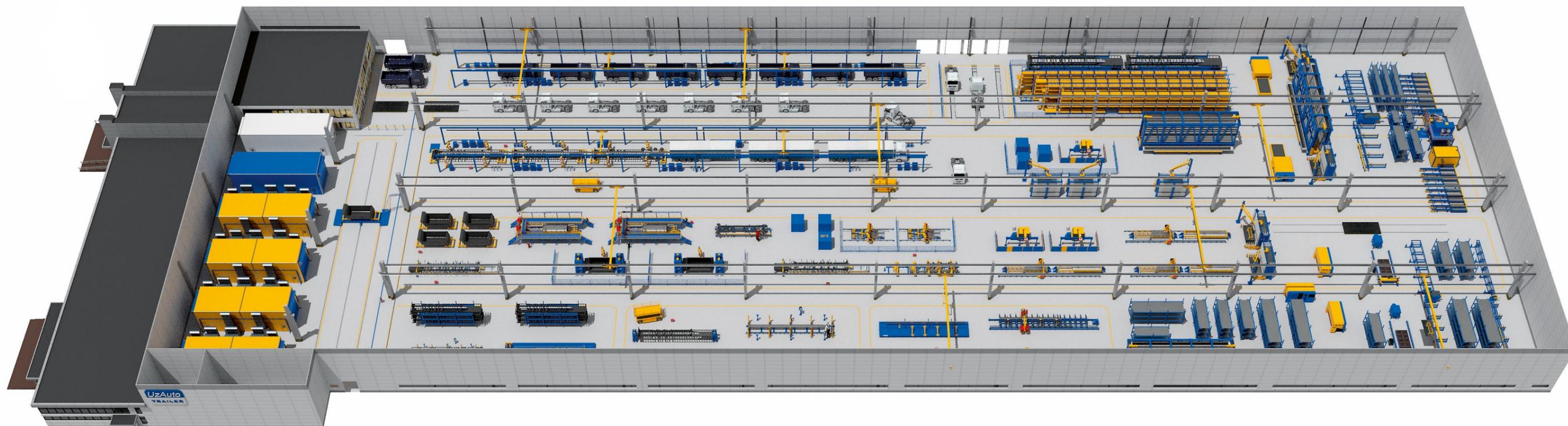
Research and Production Enterprise “Techvagonmash” has a huge experience in implementing of large-scale projects in the sphere of transport engineering. Engineering and production capabilities allow us to implement turn-key projects.

We perform works in the following scope:

1. Business plan for production performance evaluation.
2. Development of project documents and detail design of a new factory.
3. Development of a manufacturing technology of the items planned for output.
4. Development of equipment specifications (specifications can be developed in several options upon the Customer’s request):
  - Standard equipment;
  - special process equipment;
  - production accessories.
5. Standard equipment supply.
6. Development of design documents, manufacture and supply of special process equipment and production accessories.
7. We perform team-work on construction support together with the general contractor and the company performing construction operations.
9. Supervised installation, commissioning, training of the Customer’s personnel to operate the equipment.
10. Engineering and manufacturing development, output of the first batch of the product
11. We perform warranty and post warranty service maintenance.



As a basis of the production creation we put technique flexibility principles, ability of fast transfer from one product model to another, minimum human factor influence, rational use of production space.



## Project on manufacturing process organization of attached implements and towed vehicles for commercial vehicles

Designed capacity: 2000 pcs. of towed vehicles  
1000 pcs. Attached implements  
Implementation period: 2 years  
Workers number: 580 people

Model range of the output products:  
– dump trucks and semitrailers,  
– container trucks,  
– car transporters,  
– garbage trucks,  
– truck cranes,  
– tarpaulin and refrigerated semitrailers.

Product range makes up 26 items, constant work is being performed in order to increase it.



The total area of the production department makes up 54400 m<sup>2</sup>. It comprises the following production sectors:  
– blank preparation department;  
– mechanical department;  
– assembly-welding department;  
– painting department together with a paint preparation sector;

– towed vehicles and attached implements assembly department;  
– central factory warehouse;  
– central factory laboratory;  
– storerooms, pneumatics sector, electricity sector, tool storeroom, etc.;  
– office building.

# Multipurpose line for assembly and automatic welding of girders

The line is a multipurpose equipment allowing to manufacture semitrailer girders with the height 380–700 mm, length – up to 14000 mm.

Girders assembly and their automatic welding from the front side is performed on the first position, then an integrated positioner rotates the item by 180° and the welding of the girder from the reverse side takes place.

In order to ensure a necessary clamping force, hydraulic clamps are used.

By moving hydraulic clamps mounted on the line, by changing supporting elements involved in forming of girder flange configuration, an opportunity to assembly items of different geometry in the dimensions range stated above is created.

Automatic welding is performed by means of a mobile gantry plant. Actuating of a gantry and torches is performed by means of servo drives, which ensures travel and positioning accuracy. Due to the secure fixation of all the girder elements, there is no more need in subsequent straightening and leveling of the welded item.



Overall dimensions of the item to be assembled	14200x220x700
Parts fixation principle	Hydraulic
Welding speed, m/min	0,5...0,6
Inoperative speed, m/min	15
Speed regulation principle	Frequency
Seam tracking principle	Mechanical
Number of seams welded simultaneously	2
Installed capacity, kW	40
Number of welding semiautomatic device, pcs	2
Welding power source of semiautomatic device	Fronius VS 5000
Line overall dimensions, mm	18300x4156x2988
Weight, kg	12000



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# Robotic center for assembly and welding of a dump truck backboard

Robotic center represents an equipment complex providing automatic welding of 4 models of dump truck backboards.

A robotic center consists of a gantry with a welding robot and welding equipment, a guide, a control panel and guarding.

**Operation principle:**

The components of a dump car backboard are placed on the stand according the technological process, fixed with the clamps and then a tack welding is performed.

Positioning and fixation of the backboard components is performed with by means of a rammer and clamps which are actuated from the control panels. After that the command is given from the control panel, the robot performs welding. Upon completion of welding the item is taken off by the workshop crane and transferred to the storage place.



Item to be assembled	Dump car backboard
Stand type	Two-position, flexible
Parts fixation principle	Pneumatic
Stand realignment principle	Mechanical
Stand control principle	Control panel
Robot model	Fanuc AM-100iC 6L
Air pressure in the pneumatic circuit, MPa	0,6
Rotator electrical motor power, kW	3
Load capacity of the positioner lifting arm, kg	600
Stand overall dimensions, mm	7400x4800x1700
Weight, kg	5044



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## Robotic center for assembly and welding of a dump truck sideboards

Robotic center represents an equipment complex providing automatic welding of dump truck sideboards. The complex is multipurpose and has a possibility to be realigned for manufacturing of bodies advanced models.



Robotic center consists of two stands. Assembly and robotic welding of left and right dump truck sideboards.

### Operation principle:

The components of a dump car sideboard are placed on the stand according the technological process, fixed with the clamps and then a tack welding is performed. Automatic welding is performed with Fanuc robot mounted on the gantry.

Item to be assembled	Dump car sideboard
Stand type	Flexible
Parts fixation principle	Pneumatic
Stand realignment principle	Mechanical
Stand control principle	Control panel
Robot model	Fanuc AM-100iC 6L
Air pressure in the pneumatic circuit, MPa	0,6
Power consumption, kW	3
Stand overall dimensions, mm	18400x4800x2200
Weight, kg	14000

## Robotic welding center for dump truck sideboards elements welding

A robotic center represents a set of equipment providing automatic welding of such structures as beams, posts, etc.

A welding robotic center is equipped with a path correction system during welding which allows to make the system less sensible to edge displacement of the welded workpieces. Besides there is no need in weld dressing after welding as the dynamic robot model comprises smooth arc ignition function which considerably reduces splatter at the initial moment of welding.

The stand is equipped with a security system which prevents unauthorized entry of people to the working zone.



Overall dimensions of the welded item, mm	1950x1000x650
Weight, kg	300
Robot model	MOTOMAN MA1900
Welding equipment	Fronius TPS 500i
Welding method	MIG/MAG
Positioner type	Two-position
Overall dimensions, mm	6000x4000x2000
Weight, kg	2760

# Multipurpose stand of semitrailer frame assembly

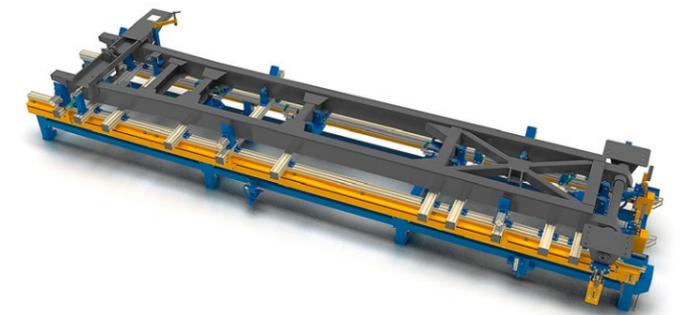
In our developments and design we stick to the following concept of assembly equipment construction:

- the equipment has to be multipurpose one;
- minimum dependence on the human factor has to be ensured;
- the equipment has to forbid defective products making (the equipment informs the operator about the defective part or subassembly);
- the equipment has to be highly efficient and flexible.

When the repurposing is not long – its time takes less than an hour – there is a possibility to assemble a tent semitrailer and an insulated semitrailer frame on a multipurpose flexible stand of frame assembly. The structure of a tent semitrailer and an insulated semitrailer frame differs by availability of an additional set of cross beams.

The structure of the stand is arranged in such a way that cross stiffeners are possible to mount and assemble in any necessary place according to the design documents, moving stops and clamps along longitudinal aluminum guides.

The equipment is constructed on the basis of intellectual pneumatic automation. Pneumatic clamps have advantages over mechanical ones: action speed, possibility to control several clamps from one point, different space position, etc. Pneumatic clamps possess a considerable resilience which compensates deformations of welded parts.



Items to be assembled	semitrailer frames (length up to 12 m)
Clamps type	manual and pneumatic
Number of pneumatic clamps, pcs.	16
Pneumatic clamps control method	manual distributor
Number of pneumatic throw-out stops	11
Number of manual distributors	10
Number of manual clamps, pcs	24
Operating pressure in the air system, MPa	0,6...0,8



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## Multipurpose stand of dump trucks semitrailer frame assembly

The stand provides the assembly of the frames of 3 dump truck semitrailer frames models. Modular structure of the stand allows to carry out fast readjustment to another frame model.

The drive of basing and clamping devices is pneumatic which considerably decreases labour intensiveness and performance time of assembly process operations.



Maximum girder height, mm	700
Clamps type	Pneumatic, mechanical
Pneumatic clamps control method	Manual control valve
Operating pressure in the air system. MPa	0,6-0,8
Overall dimensions of the stand, mm	13750x3294x1602
Weight, kg	11535

## Stand for assembly and welding of a semitrailer frame cantilever



The stand is designed for assembly of a semitrailer frame cantilever as well as assembly of a frame cantilever with a flooring.  
The equipment is a multipurpose one and can make units of 4 types of semitrailers frames.  
Pneumatic actuators are used as drives of clamping and basing elements.

Parts fixation principle	Pneumatic
Stand realignment principle	Mechanical
Stand control method	Manual, with buttons
Clamping gantry	
Travel drive	Electromechanical
Drive capacity, kW	0,18
Number of drives, pcs.	1
Travel speed, m/min	2,23
Clamping pressure, kg/f	200
Power consumption, kW	0,4

## Stand for assembly of dump trucks side flaps



The stand is designed for assembly of dump truck body side flaps in normal position. The stand is multipurpose: 12 dimension-type dump truck body side flaps are assembled on it.  
Pneumatic actuators are used as drives of clamping and basing elements.  
For transverse posts fixation the stand is equipped with a trolley I-beam with pneumatic clamps.

Clamps type	Manual and pneumatic
Number of pneumatic clamps, pcs.	10
Pneumatic clamps control method	Manual control valve
Manual control valves number	2
Manual clamps number, pcs.	15
Work pressure in air system, MPa	0,6...0,8

# Stand for dump truck semitrailer frames alignment

The stand is designed for alignment of transversal, longitudinal deformations, semitrailer frames twist deformations.

The stand provides straightening of frames of different dimension types and represents a floor frame with the item mounted on it and equipment for straightening. The frame straightening is performed by means of hydraulic fixtures.

The stand is fitted with laser meters for frame geometry control.

The stand can be used for the manufacture of new products as well as in auto repair companies.



Stand type	Flexible
Item straightening drive	Hydraulic
Straightening force (max), t	20
Hydraulic pump drive air work pressure, MPa	0,17...0,86
Pneumatic hydraulic pump work pressure (max), MPa	60
Stand overall dimensions, mm	15210x4870x1840
Weight, kg	14056

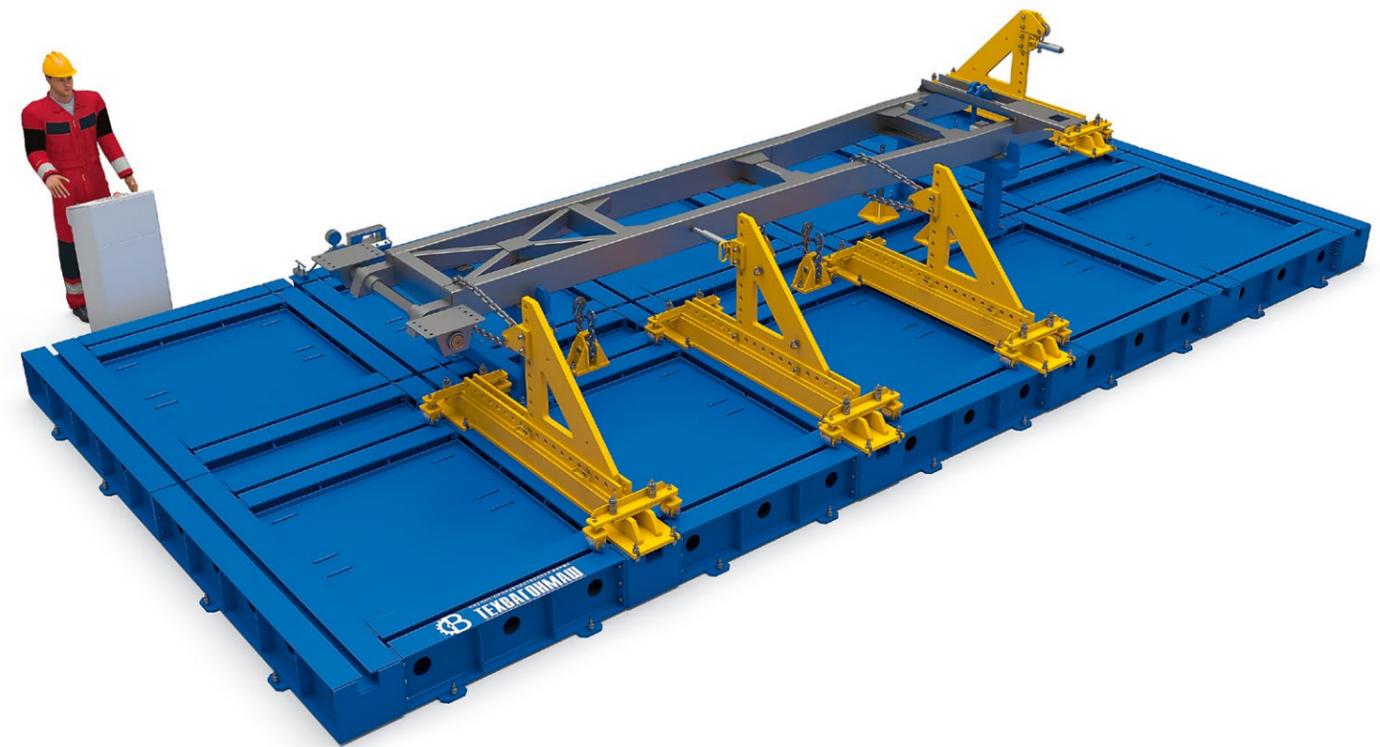
## Dump truck underbody control and straightening stand

The stand is designed for installation, measurement and straightening (if necessary) of a dump truck underbody.

The underbody straightening is performed by means of hydraulic fixtures.

The stand is fitted with laser meters for frame geometry control.

The stand can be used for the manufacture of new products as well as in auto repair companies.



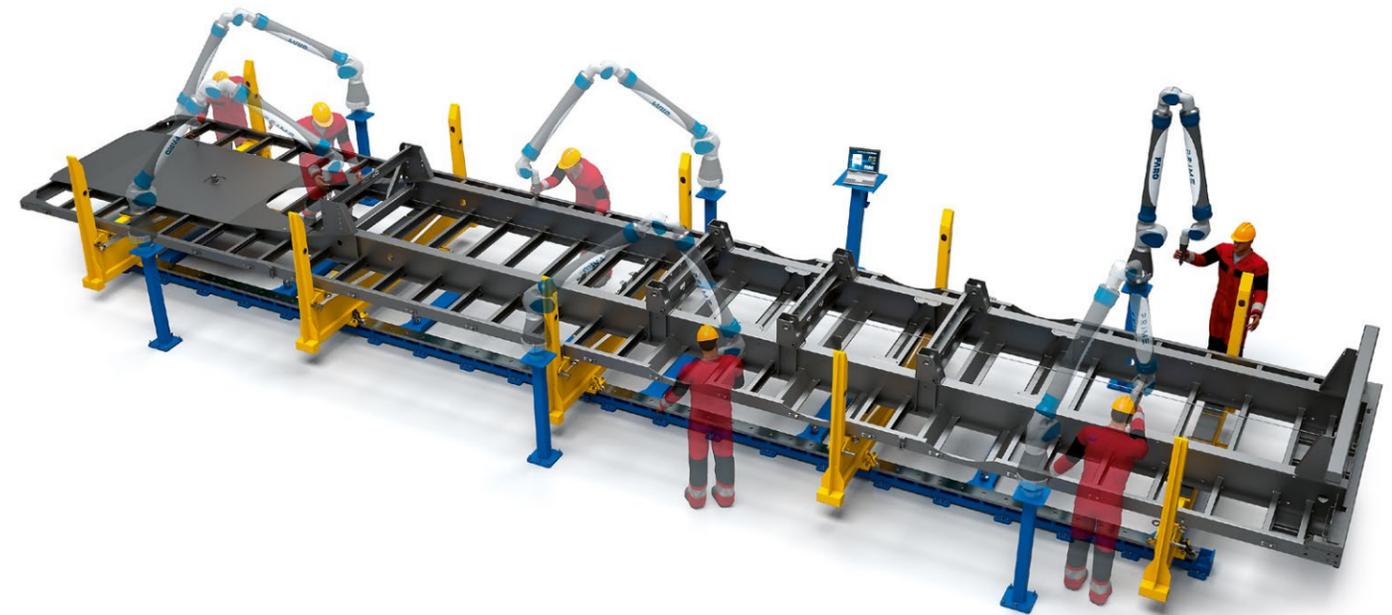
Stand type	Multiorpurpose
Item straightening drive	Hydraulic
Straightening force (max), t	10
Hydraulic pump drive air work pressure, MPa	0,17...0,86
Pneumatic hydraulic pump work pressure (max), MPa	60
Stand overall dimensions, mm	8650x4310x1280
Weight, kg	8212

## Multipurpose frames control stand

Welded frames control is performed by means of FARO inspection and measuring machine "arm" type – with accuracy up to  $\pm 0,036$  mm.

Portable FARO controlling and measuring "arms" have a number of advantages compared to stationary controlling and measuring machines: high mobility at reasonably accuracy of measurement, simplicity of use, possibility to use in severe operating conditions. This equipment is especially urgent in the conditions of modern production and market saturation, when the companies which can perform a minimum time quality control have the advantages.

Apart from the probe, measurement is performed by means of a laser 3D scanner Laser Line Probe. Laser 3D scanner opens a wide range of opportunities for inspection of complex curvilinear surfaces by comparing of a received point cloud and CAD-model, scanning and 3D-modelling.



Model	FARO Fusion 12
Number of degrees of freedom	7
Working zone, mm	3700
Point measurement repeatability, mm	0,124
Linear error, mm	$\pm 0,175$
Weight, kg	10,21

# Multipurpose stand for bodies assembly

Mounting and assembly of dump trucks bodies takes place on a multipurpose flexible stand for bodies assembly. Dump trucks bodies of a round shape, 6000 mm long and up to 2100 mm high can be assembled on the stand.

## Operation principle:

The body assembly is carried out on special stocks. The sidewalls of the dump truck body are placed on corresponding reference surfaces, automatically pushed in the original position and are fixed with pneumatic clamps. The front wall mounted and positioned on a special platform is brought to the sidewall and

pressed to it by means of pneumatic clamps. The worker performs tack welding of the body elements. Then the bottom of the body is brought on the stand. A movable clamping gantry is applied for assembly of the bottom and walls of the body.



Spatial position of the item assembly	Reverse
Item length (along the bottom) (min/max), mm	5000 / 8000
Min. Inner width of the item, mm	2155
Max. Outer width of the item, mm	2550
Item height (along the sidewall), (min/max), mm	1120 / 2070
Item front wall tilting angle, (min/max), degrees	0 / 15
Front wall tilting adjustment	Stepless
Clamps and rammers	Pneumatic
Work pressure in air system, MPa	0,6...0,7



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# Stand for insulated bodies assembly

The multipurpose stand for the body assembly with lifting platforms has a possibility to assemble items of two dimension types: 8000 mm and 13340 mm long.

The stand comprises stationary platforms on which the drop traverse beam are located – they fix and clamp upper longitudinal angles of the item. There are movable fixing devices on the platforms for fixing of the item side panels.

The stand has a panel vertical clamping device on the front size, as well as an upper angle clamping device. All the clamps work pneumatic actuators-operated, their control is performed through the pneumatic cabinet.



Overall dimensions of the items to be assemble, mm	13520x2590x2750	8000x2590x2750
Compressed air pressure in the mains, atm	6	
Carrying capacity of crossbeams, kg	600	
Overall dimensions of the stand, mm	16960x6960x7014	

1. Positioner for frames welding.
2. Positioner for dump truck body welding.
3. Positioner for overframe welding.

## Welding positioners

Welding positioners are designed for mounting, lifting and rotation of metalware into the position necessary for performance of welding operations.

Welding positioners provide welding in a position convenient for a welder, which positively reflects on the quality of the product and work performance efficiency. The positioner is equipped with light and audio alarm system.

Ballscrew with a securing nut is applied as a lifting mechanism. Control system provides lift drives synchronization. One of the positioner columns has a travel mechanism in order to weld frames different in length.



### Advantages:

- possibility of integration into robotic welding centers;
- possibility of different-length products welding;
- when using fixtures, welding of such items as roof, body, etc. is possible;
- designing of positioners taking into account specific characteristics of the welded item (displaced gravity center, structural flexibility, etc.)



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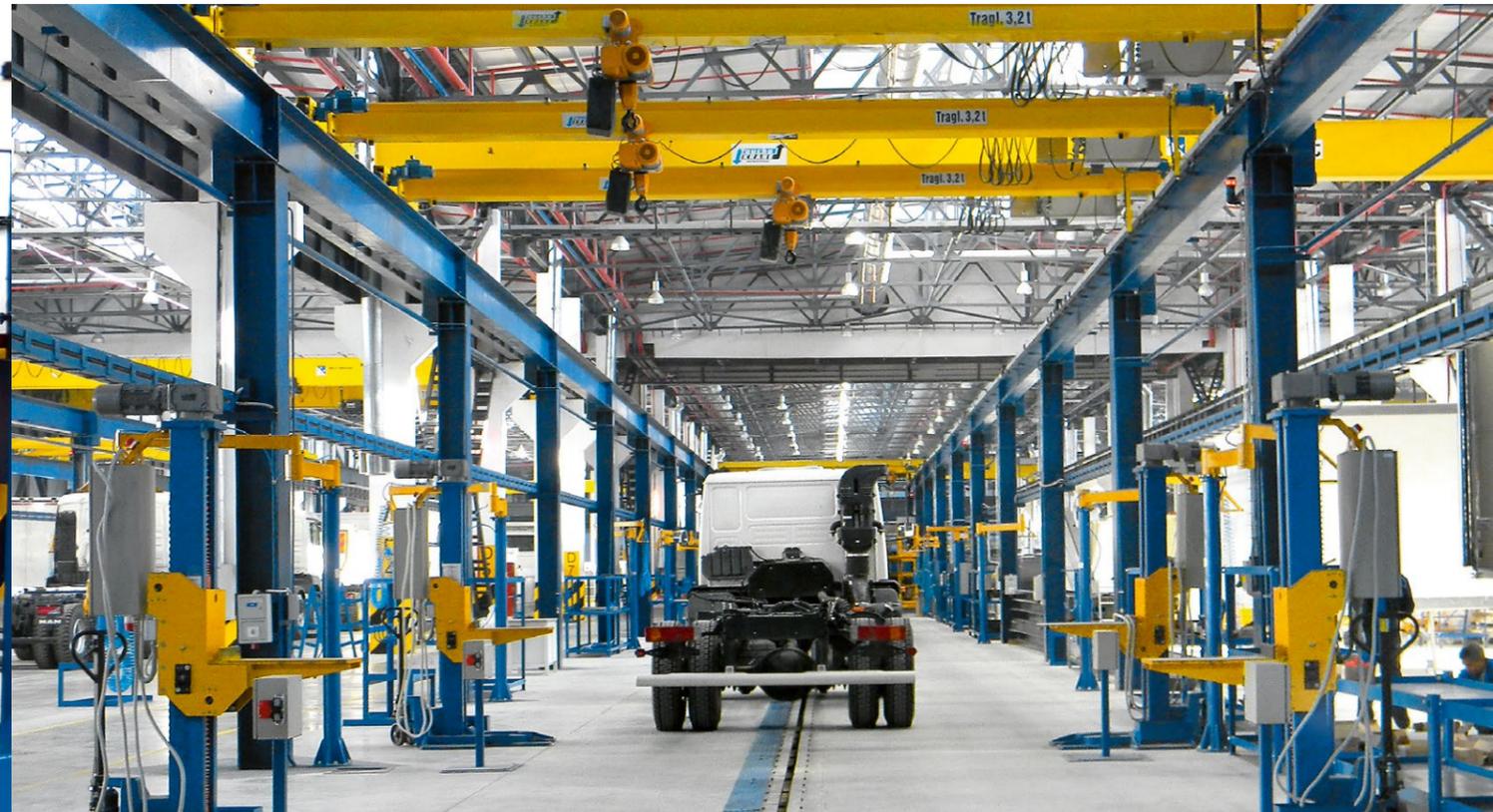
## Chain positioners



Chain positioners are designed for rotation of a welded item about the horizontal axis in a convenient position for semiautomatic and manual arc welding.

The positioners can be used for rotation of an item about the horizontal axis when performing assembly and other operations preceding welding as well as during weld dressing and other finishing operations (cleaning, finishing, etc.), during performing of which metal products are necessary to rotate from time to time through a certain angle in the position favorable for processing and move it from one position to another. A welded beam can be rotated by 360° and fixed it at any angle.

## Roller-type jack

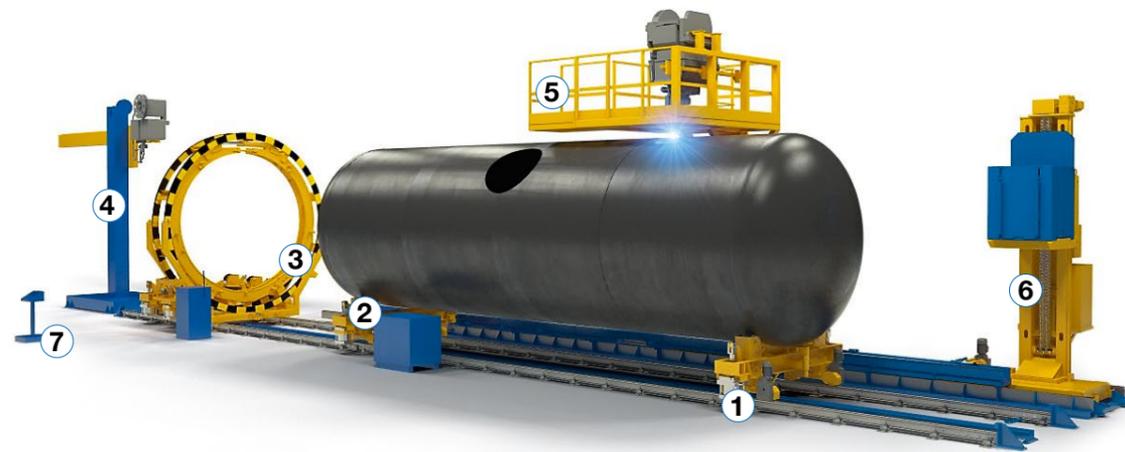


The unit is designed for performance of production operations on lifting.

Advantages of roller-type jacks:

- lifting control is performed from one of 4 panels (at a worker's option);
- full synchronization of lift drives operation;
- mobility;
- low power –intensity.

# Vessels assembly and automatic welding line



1. Roller supports for longitudinal motion;
2. Rotating roller supports;
3. Centralizer;
4. Internal welding seam welders;
5. External welding seam welders;
6. Mechanized carriage;
7. Control panel.

The line is multipurpose and gives an opportunity to locate the vessels production on a compact area. One unit can provide the production of a wide range of vessels after simple realignment. The line is equipped with external centralizers, which automatically provides the match of shells edges for welding. This reduces the assembly labor intensity guarantees the high quality of assembly for automatic welding. The assembled parts of the vessel are welded with automatic welders for internal and external welds, installed on welding columns. The vessel parts and the whole vessel are moved along assembly and welding work stations by transportation system, controlled from operator's panel. The welding of difficult internal link up weld is made by ESAB welder in completely automatic mode without welding operator. The welding tracking is made from the control panel display. High mechanization and automation level guarantees the high quality and production output, provides the high production standards.



1. Vessel assembly and automatic welding line.
2. Transportation system of the line.
3. Internal seam welding.

## Transfer car



Transfer car provides the linear and parallel transfer of the items, installed on the shop trucks. The traverser has been equipped with audio and light alarm insuring the safe operation.

Load capacity, kg	15000
Platform length, mm	16770
Travel distance, m	by agreement with the customer
Travel speed, m/min	3...23
Electric equipment installed capacity, kW	14
Overall dimensions:	18295x4590x5105

## Towing conveyer



Towing conveyer provides the items transfer. Conveyer is operated manually and controlled from remote control panel. In 5 seconds before conveyer starts running the sound signal turns on from the run button and turns off when conveyer stops.

Trucks travel speed, m/min	7,9
Trucks qt.	7
Pulling force, kN	39
Electric motor power, kW	5,5

1. Driven transport carriage.
2. Trucks with elevating platforms.
3. Handling carriage for dump truck bodies.

## Transport carriages

Transport carriages with electric drive – for section metal, blanks etc. transfer on blank production area. Can be used both indoors and outdoors.

Operator's trucks with elevating platforms provide safe and ergonomic position of the operator while overhead work. The truck platform has few compressed air connection points and tools storing position.

Handling carriage – for transportation of large assembly units from one operation to another. Have simple structure and wide range of realignments to transfer the products of all configurations and dimensions.



1. Shotblasting line for sheet and profile metal roll.
2. Shotblasting chamber.
3. Preliminary drying chamber.

## Shotblasting line for sheet and profile metal roll

Service life of paint-and-lacquer coating considerably depends on the quality of preliminary preparation of the surface for painting. Shot blasting is used as a primary preparation of metal roll with the aim to remove dross, rust, impurities.

Shotblasting line consists of a feed and receiving racks, transport system, preliminary drying chamber, shotblasting chamber. Preliminary drying chamber provides temperature up to 250°C which allows to burn down oily impurities and dry metal roll from moisture (snow, rain). Shotblasting chamber performs cleaning of a metal roll up to the 2nd degree according to GOST 9.402-80 (80 (PSA2½ ISO 8501-2). Depending on the required efficiency and dimensions of metal roll there are 4-8 shotblasters in the chamber.

Shotblasting chamber has a sucked air cleaning system. It provides cleaning of the sucked air from the dust. Transport system is designed for transfer of metal roll according to production operations. The transport system has a smooth speed regulation. The line control is fully automated during the production process and is performed by one operator from the control panel. The control system includes equipment operation troubleshooting system. The troubleshooting system shows error messages or failures of equipment operation on the operator's display.



Overall dimensions of the processed item, mm

Length	4000...12000
Width	1800...3200
Height	3...300
Weight of the item (max), kg	12000
Item supply speed, m/min	1...2,5 (0,6...3,0)
Rolled steel drying temperature, °C	250
Metal cleaning degree	Sa2 1/2
Shot blasters qt., pcs.	6
Installed capacity, kW	230*
Overall dimensions of the line, mm	42250x9110x6860

# Paint plant

The paint plant consists of four pain booths, surface preparation booth and a shotblasting chamber. Items transfer between the chambers is performed by means of a transfer car.

The quality of coating is defined by three principles:

1. Air purity in the chamber – it is determined by aerodynamical parameters of a paintbooth. For the purpose of obtaining a high-quality coating, the item has to be in the airflow (cleaned) which moves with the speed not less than 0.3 m/s. in addition to this the airflow has to be steady over the whole chamber area.

2. Temperature mode – it is necessary to paint at  $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$  in order to obtain a high-quality coating.

3. Illumination – in order to work in the chamber the illumination in in the working zone should not be less than 1000 lux. In addition to this the illumination should be without any shadow. The Paintbooths by RPE "Techvagonmash" fully correspond these principles.

1. Paint plant.
2. Transfer car.
3. Paint booth.



### Effective filtration system

Booths filtration system is meant for application of water-based paint as well as paint based on solvents. The booth is fitted with charcoal filters for cleaning air from solvents vapor.

### High heat power

The power of heat generators is meant for application in climatic conditions with low air temperature (down to  $-40^{\circ}\text{C}$ ). Reliability and operating convenience. Electrical motors of the booth are resistant to unstable power supply.

### Efficient ventilation system

Booths ventilation system is meant for air flow speed of not less than 0,3 m/s which guarantees high-quality coating and effective removal of paint spraying dust.

### Operating Convenience

The booths are equipped with roll-down door with electromechanical drive. As opposed to traditionally applied hinged gate, roll-down door do not warp during the operation.

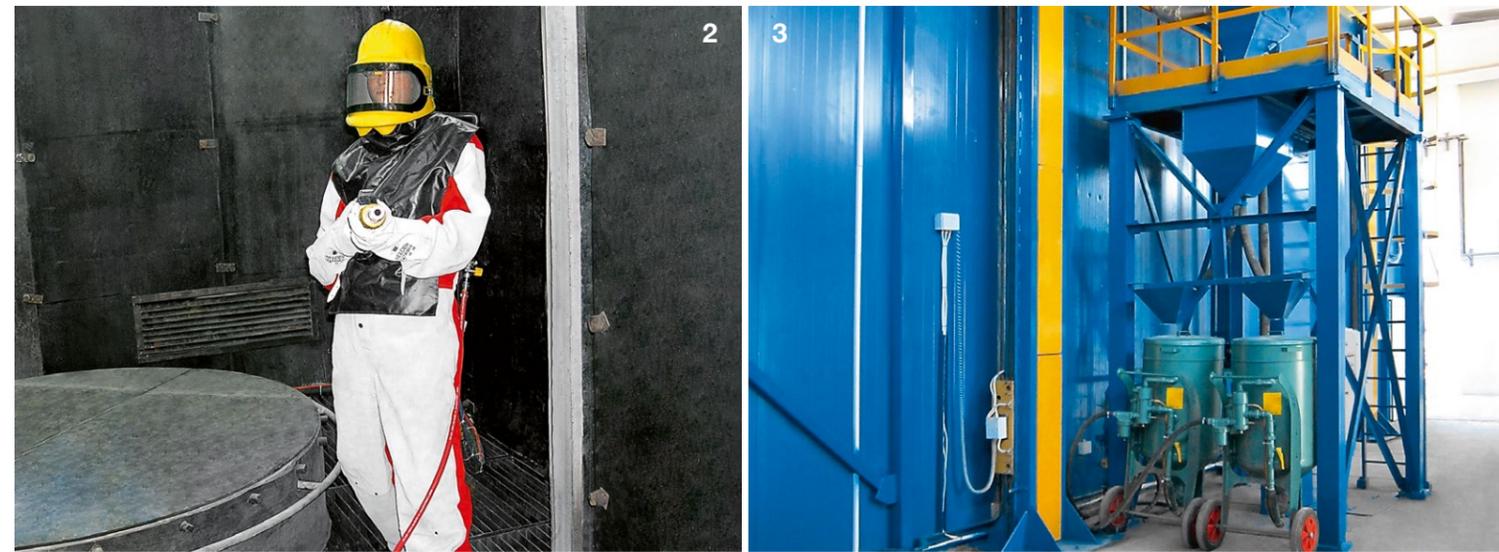
1. Shotblasting chambers with elevating platforms
2. Overalls for the operator
3. Shot circulation system

## Shotblasting chambers

Shotblasting chambers are applied for cleaning of different products – from small metalware and to truck bodies assembly, containers, vessels, etc. During the operation the operator (or several operators) is inside the chamber and he performs and controls the cleaning process.

Shotblasting chambers are equipped with a shot collection and cleaning system (for suction and filtration of the chamber air), overalls for the operator.

Transport carriages, transport carriages with a turntable, elevating platforms for cleaning of large items can be used as mechanical appliances.



Shotblasting chambers are designed and installed in accordance with individual projects depending on the customer's request.

1. Automated storage systems.
2. Automated storage system for profiled metal roll.
3. Automated storage system for sheet metal roll.



## Automated storage systems for metal roll

Automated storage system for metal roll is an up-to-date storage solution for storing of a wide range of metal roll, its control and identification.

Use of Automated storage system allows:

- Optimize shop logistics;
- Simplify manufacturing sequence;
- Shorten the time of metal-roll feed into production;
- Automate the system of control over the stock resources;
- Considerably reduce storage spaces;
- Reduce the number of maintenance staff.

### Technical specification (basic model)

Index	Value	
	Sheets storage	Profiles storage
Storage system load capacity, kg	75000	54000
Cassette load capacity, kg	5200	3000
Cassettes number, pcs	15	18
Inner cassette dimensions, mm	6100x2050x50	12450x600x240
Crossbeam lifting and lowering speed, m/min	18,4	14
Traction device type	chain	chain
Cassette moving-out speed along the crossbeam, m/min	7	6
Overall dimensions of the storage system, mm	6780x5200x5929(H)	13120x3515x5870(H)



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## Automated storage systems for component parts

Automated rack type storage is designed for storing of automobile production components on europallets or in other way on cassettes with their following placing into cells of the storage system.

Maximum allowable dimensions of the stored components are 2500x1200x1700 mm. The storage works in automatic mode. Accounting of the components is performed by the bar code or by manual input of the items.



### Technical specification (basic model)

Design capacity of the storage max., kg	505000
Number of cassettes, load capacity 2000 kg, pcs.	62
Number of cassettes, load capacity 1500 kg, pcs.	254
Cassette dimensions (load), mm	2550 x1200
Possible number of europallets on the cassette, pcs.	3
Number of racks of the storage system, pcs.	62
Number of rack rows, pcs.	4
Number of rack tiers, pcs.	5
Number of stackers, pcs	2
Stacker travel speed, m/min	80
Stacker cross-arm speed of lifting/lowering, m/min	16
Drives	Electromechanical
Overall dimensions of the storage system, mm	50500 x8000x8000(H)



Видео о работе этого оборудования смотрите на нашем видеоканале Youtube:  
[www.youtube.com/user/Techvagonmash](http://www.youtube.com/user/Techvagonmash)

1. Load gripping cross beam.
2. Welding of dump truck body in a multipurpose device.
3. Cross bar with vacuum grippers.



## Special load handling accessories

While manufacturing towed vehicles and attached implements different load handling accessories are used. Our company developed a number of special load handling accessories for operating with specific loads – taking in to account load parameters and design features.

Application of special load handling accessories considerably increases transport operations efficiency: increases productivity, ensures safety, exclude deformation of the items while carrying out operations.



1. Brake system and pneumatic equipment test stand.
2. Mobile stand for electrical equipment control and testing.
3. Test box for electrical, pneumatic and hydraulic systems.

## Equipment for testing of electrical, hydraulic and pneumatic equipment

The equipment system for manufacture of attached implements and towed vehicles comprises the following testing equipment:

- brake system and pneumatic equipment test stand;
- pipes assembly and test stand;
- mobile stand for electrical equipment control and testing;
- test box for electrical, pneumatic and hydraulic systems.



## ABOUT THE COMPANY



Research and production enterprise "Techvagonmash" has a forty-year experience of design and manufacturing of special process equipment for enterprises of transport machine building.

Our company is a legal successor of VNIPTIvagon (All-union scientific research design-technological institute of railwaycar building) – head technological organization on design of transport machine building enterprises.

The main areas of the company's activity are:

- ▶ comprehensive design and equipping of transport machine building enterprises;
- ▶ design and manufacturing of special process equipment for railroad cars manufacture;
- ▶ process equipment for railroad cars repair;
- ▶ robot-operated welding units;
- ▶ shotblasting, shotpeening equipment;
- ▶ paint booths;
- ▶ filter-ventilating equipment;
- ▶ automated storage systems for metal roll mad components.



Independent audit, performed by the representatives of Quality Austria – a world leader in the sphere of quality management systems certification confirmed the compliance of the Research and Production Enterprise "Techvagonmash" quality management system to the requirements of international standard ISO 9001:2008.

## SPHERES OF OUR ACTIVITY:

### FREIGHT CARS MANUFACTURING PROCESS ORGANIZATION

Integrated design and equipping with an up-to-date process equipment railroad car building factories manufacturing:

- ▶ different type freight cars;
- ▶ bogies;
- ▶ wheelsets.

### PASSENGER CARS AND SOCIAL TRANSPORT MANUFACTURING PROCESS ORGANIZATION

Integrated projects on equipping car building factories manufacturing:

- ▶ passenger cars;
- ▶ metro cars;
- ▶ trams.

### VESSELS MANUFACTURING PROCESS ORGANIZATION

Manufacturing process organization projects on vessel equipment output:

- ▶ tank containers;
- ▶ tank cars;
- ▶ railroad tank vessels.

### TRACTION ROLLING STOCK MANUFACTURING PROCESS ORGANIZATION

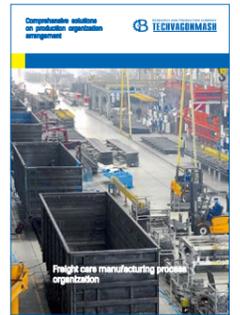
Integrated projects on manufacturing process organization and equipping o factories on output of:

- ▶ electric locomotives;
- ▶ diesel locomotives.

### EQUIPMENT FOR PIPE AND TUBE PRODUCTION

Complex mechanized lines for production of:

- ▶ pipes with various diameter;
- ▶ couplings;
- ▶ railway wheels tyres;
- ▶ railway axles.





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