

**MANUFACTURING LINE FOR XPS BOARDS**

<b>Pos.</b>	<b>Description</b>	<b>Qty</b>
100	<b>Loss-in-weight feeding system</b>	<b>1</b>
110	Vacuum loading system	1
120	Dosing system	5
130	Silos and platform	1
200	<b>Extrusion system</b>	
210	TDS75D twin screw extruder	1
211	Screen exchanger and adaptor	1
220	TDD200R cooling extruder	1
221	Active sealing extruder	1
230	Static mixer	1
240	Slot die	1
300	<b>Liquid heating/cooling system</b>	
310	Heating/cooling units for extrusion	6
320	Heating/cooling units for calibration	3
400	<b>Blowing agent injection system</b>	
411	Dosing system for CO2	1
412	Dosing system for ethanol	1
413	Dosing unit for HFC/DME/LPG	1
420	CO2 booster system	1
430	Piping, valve and control	1
500	<b>Central control station</b>	<b>1</b>
600	<b>Down stream</b>	
610	Calibrator	1
611	First take-off	1
620	Cooling section	1
621	Passive cooling rollers	20
622	Active cooling rollers	6
630	Second take-off	1
631	Edge hogger	1
632	Surface planner	1
633	Printer	1
640	Main cut-off machine	1
650	Side and end milling sections	
651	Side-trimming section	1
652	End-trimming section	1
660	<b>Stacker and lifter</b>	<b>1</b>
700	<b>Recycling system</b>	<b>1</b>
	<b>Vertical Cryogenic Liquid Co2 Storage Tank Pressur Vessel 20m3 / 2.16Mpa</b>	<b>1</b>

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## 1. Technical Part

### 1-1. General Description

#### Material data:

Polymer:

GPPS (virgin or recycled)

Blowing agent:

CO<sub>2</sub> and Ethanol

Or HFCs, HCs, HFO

Additives:

Flame retardant

Color masterbatch

Nucleating agent

#### Product data:

Product: Polystyrene foam boards

Board width 600mm after trimming (600mm optional)

Board thickness: 20-100mm

Obtainable density: 30 – 50±2 kg/m<sup>3</sup>

Compressive strength: 150-800kpa

#### Performance data:

Capacity of the line: 600 - 1000 kg/h

#### Factory condition

Footprint: 80mX15mX8m (LXWXH) with straight layout

*Or 60mX15mX8m with rotary cooling towers*

Electricity: 300KVA; 380V; 50Hz

Water: 4-6bar; 10-25C; Free from solid matters, inlet filtered;

Air: 0.8Mpa, 3.5m<sup>3</sup>/min

## 1.2 Technical Specifications

S/N	Specifications	Qty
100	<b>Raw material handling system</b>	1
110	<b>Vacuum loading system</b>	1
	Total processing capacity:800-1100Kg/h, according to different processing conditions; 5 loading units for pellets; 5 receivers for pellets Receivers made of Stainless-Steel Two tandem silencer Blower: 7.5KW,	
120	<b>Loss-in-weight dosing system</b>	5
	5 automatic feeding units for the following specific ranges: Polystyrene granules: 70-700kg/hr Polystyrene granules: 20-200kg/hr Granule nucleation granules: 3-30kg/hr Granule flame retardant: 3-30kg/hr Granule color MB: 3-30kg/hr Load cell: METTLER TOLEDO Drive: Delta Servo-motor Control accuracy: $\pm 0,5\%$	
130	<b>Silos and platform</b>	1
	Transit silos made of Stainless-Steel Platform made of heavy-duty structural steel With stairs and guarding fences; Special painting for safety labels; Detachable design	
200	<b>Extrusion system</b>	1
210	<b>TDS75D twin screw extruder</b>	1
	Main motor AC motor, 132KW;  Power transmission Elastic safety pin  Gearbox Precise balancing principle applied to increase torque level; Specific torque level up to 10.3 defined by torque/centerline distance; High safety factor design; Latest steel alloy material for gears applied with special heat treatment and manufactured at high precision level; FAG bearings and imported seals applied, High-efficient lubricating system Latest fin-plate heat exchanger to provide sufficient cooling;	

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Input/output rotary speed:980/330rpm;

Extrusion unit

Screw Diameter: 72mm, L/D: 40:1;

Maximum Screw speed: 330rpm;

Screw configuration: with modular structure, torque transmission by spline;

Screw material:

before injection nozzle: anti-wearing Alloy-W6Mo5Cr4V2; surface-hardness HRC58~62; after injection:

after injection nozzle: anti-corrosion material, 38CrMoAlA with nitriding treatment


Barrel configuration: with modular structure, each one with length of 6D, and the barrels connected together by bolts and pins;

Extended edge to facilitate maintenance, enhanced liner

Barrel material: with linear design, all inner surface material of the linear is Alfa 101, surface-hardness at HRC62-65;

Anti-leakage design

Barrels configuration



No.	1	2	3	4	5	6	7	8
Heat	Water	6.4KW	6.4KW	6.4KW	6.4KW		6.4KW	6.4KW
Length	4D	6D	6D	6D	6D		6D	6D
Task	Feed	Plasticizing				Homogenization		

No1 barrel is 4D with one feeding port, between No.5 and No. 7 is injection disc with two injection holes for PBA, one injection nozzle equipped.

Temperature controlling

Heating system: electric heaters, total heating power with approx... 55kw (No.1 Section cooled by water);

Cooling system: soft-water cooling system;

Temperature controller: PID or Temp. controller PLC modular;

Soft-water cooling system including one 1.1kw water-pump, stainless steel water-box (with water Temp. gauge), heat exchanger, imported solenoid valves, water pressure indicator etc.

Steel base

Welded by heavy duty structural steel

Base wheeled

Railway for TDS75D Included.

	<p>Inner diameter: 70 mm;  Heating: electrically in 1 zone;  Hydraulic drive  Number of mesh holders: 4  Special anti-leakage design;</p>	
<b>220</b>	<b>TDD200R cooling extruder</b>	<b>1</b>
	<p>Main motor  AC motor, 90KW;</p> <p>Power transmission  Torque limiter protection unit;  Overloading signal for protection;  Patented torque-protective coupling</p> <p>Gearbox  Precise balancing principle applied to increase torque level;  High safety factor design;  Special lubricating system equipped combined with immersing and forcing solutions;  Latest fin-plate heat exchanger configured to provide best cooling;  Input/output rotary speed: 750/9rpm;</p> <p>Extrusion unit  Screw Diameter: 200mm, L/D: 33:1;  Maximum Screw speed: 9rpm;  Screw configuration: one piece design with special cooling profile design;  Screw material: 38CrMoAIA with nitriding treatment  Internal temperature controlling design with central holes for whole length;  Barrel material: 38CrMoAIA with nitriding treatment</p> <p>Temperature controlling  Heating/Cooling system: OTCU (oil temperature control unit)  Temperature controller: PID or Temp. controller PLC modular;</p> <p>Steel base  Welding base by heavy load structural steel;</p>	
<b>221</b>	<b>Active sealing extruder</b>	<b>1</b>
	<p>Type: single screw  Screw diameter: 25mm  Motor: 2.5kw  <b>Patent Nr. CN205439173U</b></p>	
<b>230</b>	<b>Static mixer</b>	<b>1</b>
	<p>Diameter: 200 mm  Length: Approx... 6x D</p>	

	Length of relaxing section: Approx... 2 x D No. of mixing elements: 4 Jacket design for the housing of mixer and relaxing section;	
<b>240</b>	<b>Slot Die</b>	<b>1</b>
	Made of Alloy-P20, with coating of Ni-Alloy; Effective die lip width: 600mm, for production of 1220mm foam boards; Heating/cooling with oil circulator; Heating/cooling channels for the lips; Heating/cooling channels for the die body; Enforced body design;	
<b>300</b>	<b>Liquid heating/cooling units</b>	<b>1</b>
<b>310</b>	<b>Liquid heating/cooling system for extrusion</b>	<b>6</b>
	Media: hi-temp heating oil Heating power: 24kw Temp control range: up to 200°C Circulating pump: 4kwX2; 3kwX2; 2.2kwX2; High efficiency heat exchanger Cooling method: external water cooling PID calculation Precision: +/-1°C Control: 485 communication with central control station Integrated control with main operation station Operation data log and retrieval One unit for 200 screw Four units for TDD200 extruder One unit for static mixer	
<b>320</b>	<b>Liquid heating/cooling system for calibration</b>	<b>3</b>
	Media: hi-temp heating oil Heating power: 9kw Temp control range: up to 200°C Circulating pump: 3kw High efficiency heat exchanger Cooling method: external water cooling PID calculation Precision: +/-1°C Control: 485 communication with central control station Integrated control with main operation station Operation data log and retrieval 1# for slot die body 2# for die lips 3# for calibrator plates	
<b>400</b>	<b>High pressure blowing agent pump system</b>	<b>1</b>
<b>410</b>	<b>Dosing unit for CO2</b>	<b>1</b>
	Quantity of flow: max. 60 liter/hr;	

<p>Counter-pressure: max. 300 bar;          Required pre-pressure: min. 80 bar;          2-head diaphragm pump          Scope includes:          1 diaphragm pump with manually adjustable strokes;          1 high pressure mass flow meter with signal transducer;          Flow meter: <b>KEM made in Germany</b>          Explosion-proof pump          The dosing device is mounted on a steel rack and is pre-piped for easy installation.</p>	
<b>420 Dosing unit for ethanol</b>	<b>1</b>
<p>Quantity of flow: max. 60 liter/hr;          Counter-pressure: max. 300 bar;          Required pre-pressure: min. 8 bar;          2-head piston pump          Scope includes:          1 piston pump with manually adjustable strokes.          1 high pressure mass flow meter with signal transducer;          Flow meter: <b>KEM made in Germany</b>          Explosion-proof pump          The dosing device is mounted on a steel rack and is pre-piped for easy installation.</p>	
<b>430 Dosing unit for DME/LPG//Butane/HFO</b>	<b>1</b>
<p>Quantity of flow: max. 60 liter/hr;          Counter-pressure: max. 300 bar          Required pre-pressure: min. 116 psi (8 bar)          2-head piston pump          Scope includes:          1 piston pump with manually adjustable strokes.          1 mass flow meter with signal transducer;          Flow meter: <b>KEM made in Germany</b>          Explosion-proof pump          The dosing device is mounted on a steel rack and is pre-piped for easy installation.</p>	
<b>440 Piping, valve and control</b>	<b>1</b>
<p>High pressure injection valve,          Back pressure valve included,          Static mixer included          SS made high pressure piping and valves          SS made valves control cabinet          3-in-1 dosing system panel is mounted on a metal panel and is pre-piped for easy installation.</p> <p>Note:</p>	

We suggest putting all blowing agent dosing devices with flammable blowing agents separately in an ex-protected room.		
<b>500</b>	<b>Central Control Station</b>	<b>1</b>
<p>           SCİYON DCS system            Schneider LV components            Industrial PC control            21' industrial touch screen monitor            CPU: Intel i5            SSD: 256G            Memory: 8G            Data storage: more than two years            Historic data retrievable and traceable            Related software to access data (both dat and csv format) provided            Data can be downloaded to removable storage devices            Remote control applicable            Intelligent error alarm            Flow chart display            Interlock alarm display            With internet access and remote technical analysis and support            Predictive maintenance reminder            Production data and stock status can be seen through mobile App with authorized user name and password            CE certificate            LSZH cables inside of cabinets            Gefran pressure sensors <b>made in Italy</b> </p> <p>           Operating conditions and technical execution:            Ambient temperatures: motors + 5 °C to + 40 °C            switch cabinet+ 5 °C to + 45 °C            according EN 60204-1-§-4.4.3            Humidity stress: maximum value 85 %; annual average 75 %            Altitude of site: 1,000 m MSL max            Note: Cables and cable trays and small material for the connection between main switch cabinet and machine will be provided by the customer. We suggest putting all control cabinets into an independent air-conditioned room, especially for hot weather area.         </p> <p> <b>Note: we suggest that all cabinets should be put in a positive pressurized and air-conditioned room.</b> </p>		
<b>600</b>	<b>Down stream</b>	
<b>610</b>	<b>Calibrator</b>	<b>1</b>
<p>           Welded frame with heavy-load steel profiles;            Upside and downside plates with temperature controlling circulation systems;         </p>		



	<p>The plates are height-adjustable by means of 4 AC drives of 3KW and lifting gears. The plates can be moved parallel or conical.</p> <p>Plate gap adjustment by frequency inverter</p> <p>Position switches for mechanical protection</p> <p>Wheels equipped for quick-removing fro and back;</p> <p>Pro-back movement controlled by frequency inverter</p> <p>Calibration plate length: 1340mm;</p> <p>Calibration plate width: 1200mm;</p> <p>Min. and max. opening space: 10-300mm;</p> <p>Centerline height: 1140mm;</p> <p>The complete calibrator is moveable in production direction together with the take-off roller device. Driven by 3KW AC motor</p>	
<b>611</b>	<b>1<sup>st</sup> Take-off</b>	<b>1</b>
	<p>Effective roller width: 1500 mm</p> <p>Roller diameter: 150 mm, rubber coated</p> <p>Number of rolls: 2 x 13</p> <p>Take-off speed: -30 m/min at production, at start up 50 m/min for a short time is possible</p> <p>Roller gap min/max. 10/210 mm</p> <p>Roller gap adjustment by screw and worm</p> <p>The device mainly consists of a base frame, the upper and the lower roller train. The rollers are equipped with a temperature resistant rubber layer.</p> <p>The measuring and control instruments are mounted in the control panel of the calibrator. The roller take-off is moveable in production direction together with the calibrator</p> <p>Line speed read through rotary encoder</p> <p>Speed control by frequency inverter</p> <p>Pneumatic quick open system for safety</p>	
<b>620</b>	<b>Cooling section</b>	
<b>621</b>	<b>Passive cooling rollers</b>	<b>15</b>
	<p>Effective width: 1500mm</p> <p>Passive rollers: 2mx20</p> <p>Roller material: chrome coated;</p>	
<b>622</b>	<b>Active separating rollers and conveyors</b>	<b>6</b>
	<p>Effective width: 1500mm</p> <p>Active conveyors: 3mx6</p> <p>Motor: 0.75kw</p> <p>Max speed: 30m/min</p> <p>Roller material: chrome coated;</p>	
<b>630</b>	<b>2<sup>nd</sup> Take-off</b>	<b>1</b>
	<p>1 unit of take-in guiding rollers for automatic centralization</p> <p>Fir board from 550-650mm</p> <p>Pneumatic balance of width tolerance of 200mm,</p>	

1 unit of pullers Driving motor: AC motor 5.5kw; Pneumatic clamping unit; Rubber rollers equipped;	
<b>631 Edge hogger</b>	<b>1</b>
2 units of edge cut hogging units Rated speed of motor 3000 RPM Motor power: 5.5kw; Thickness range: up to 150mm Horizontal adjustment by hand wheel from 550 – 1250 mm with indicator; Pneumatic clampers for boards, with 4 pressing wheels; Side guiding plates; Dust sucking hoods with 120mm connection ports Frequency inverter control	
<b>632 Surface planner</b>	<b>1</b>
Fit width: 600-1200mm Online offline mode Both sides planning and grooving Number of grooving sluts: adjustable Planning motor: 2X7.5KW Haul-off motor: 2.2KW Lift motor: 2X1.5KW Tolerance: <=0.3mm	
<b>633 Printer</b>	<b>1</b>
Single color ink Top side print Max height of LOGO: 15cm	
<b>640 Main cut-off unit</b>	<b>1</b>
Double fly knives cutting Distance between two knives: 600-1800mm Moving motor: 5.5KW servomotor Cutting motor: 2X3KW servomotor Pneumatic metal clampers equipped. Cutting frequency: 20 cuts per minute; Accuracy: <3mm Thickness range: up to 150mm Independent control cabinet	
<b>650 Side and end milling machine</b>	<b>1</b>
<b>651 Length-side milling machine</b>	
Effective working width: 550-1250mm Fit board thickness: 150mm Horizontal adjustment by hand wheels with distance indicators Vertical adjustment by hand wheels with distance indicators Two sides guide plate adjustable	

	<p>Four pieces of clamp press rubber rollers  Chain driven motor: 4KW  Milling motor: 4X3kw; 2940rpm  Milling shape: flat and shiplap (tongue and groove optional)  Dust sucking hoods connection port diameter: 150 mm;</p>	
<b>652</b>	<b>End-trim milling section</b>	<b>1</b>
	<p>Effective working length: 1100-2400mm  Fit board thickness: 150mm  Horizontal adjustment by hand wheels with distance indicators  Vertical adjustment by hand wheels with distance indicators  Two sides guide plate adjustable  Four pieces of clamp press rubber rollers  Chain driven motor: 4KW  Milling motor: 4X3kw; 2940rpm  Milling shape: flat and shiplap (tongue and groove optional)  Dust sucking hoods connection port diameter: 150 mm;</p>	
<b>660</b>	<b>Stacker</b>	<b>1</b>
	<p>Fit boards length: 1100 - 1200mm  Fit boards width: 600-650mm  Max. pile height 500 mm  Push paw driven by air cylinder  Framed welded by heavy load structural steel</p>	
<b>700</b>	<b>Recycling system</b>	<b>1</b>
	<p>Capacity: 250 kg/h  Grinder: 15KW  Primary extruder: 300mm  Motor: 30KW  Secondary extruder: 150mm  Motor: 15KW  Strand die pelletizer</p>	
<b>2</b>	<b>General Conditions of Factory Requirements</b>	
<b>2-1</b>	<b>Electrical power</b>	
	<p>380V -5/+10%, 50Hz ±2%, 3 phase, 400KVA  Control voltage standard: 220V AC (contactors, instruments, solenoid valves)</p>	
<b>2-2</b>	<b>Water 4-6bar; 10-25C; Free from solid matters, inlet filtered;</b>	
<b>2-3</b>	<b>Air ≥0.8Mpa, 3.5m<sup>3</sup> /min</b>	