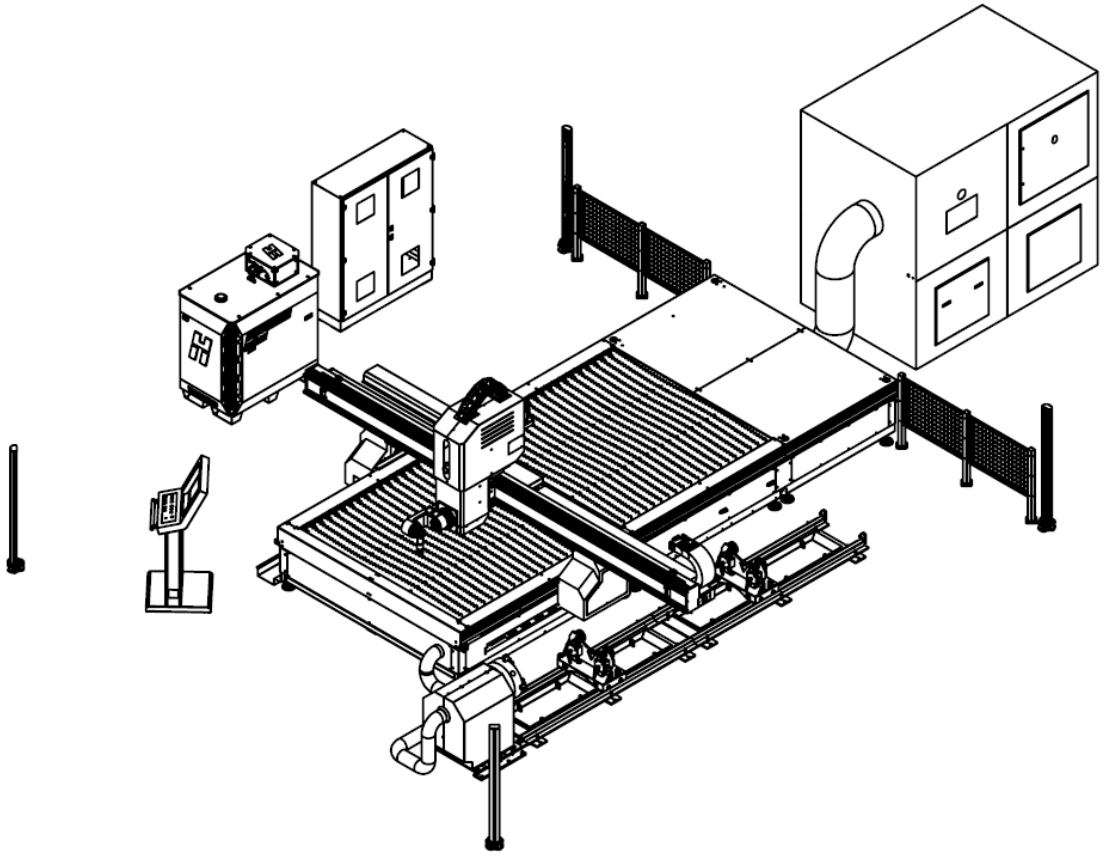
1. Properties of the Machine



1.1. General Description of the Machine

- High-performance Durma Kopmak Plasma Cutting Machines are designed for cutting metal sheet plates. High positioning rates, velocities and torch height setting control provides precision cutting and time-saving.

- DURMA Kopmak Plasma Cutting series is a 2D system and it can be manufactured from 1500x3000 mm to 4000x12000 mm. Various size applications are possible in accordance with the customer requests. While, the cut plate is on the special process tray, X1-X2 axes of the plasma cutting torch perform the cutting process by moving through a bridge on it. Y axis on the bridge is precision-control rack driven and it provides high-quality cutting. Body and bridge of the machine are manufactured by welding and all fallouts are prevented by detensioning and proper processing technologies. Dual synchronized motion system, precision control rack and wheels and void-free reducer groups allow high-precision cutting results.
- Dust and gas wastes arising during cutting processes are filtered and discharged in accordance with the gas discharge and filtering system. The axis movements are conducted by high-torque, AC digital-controlled servo motors.

Properties:

- Motion elements are selected from high-precision elements to have minimum deviation from the total length and ±0.05 mm gap.
- Double-sided (X1, X2) precision control rack and low-gap planet reducer are used as the drive group.
- By means of its modular design, easy and precision assembly becomes possible.
- It is enabled to assembly the plasma and oxygen cutting heads on the same bridge on the construction acquired as a result of the design studies and by this means, precision of plasma cutting and high-thickness capacity properties are combined.
- Skid junction surfaces on the axes are processed with ±0.02 mm tolerance range and by this means the size errors which might arise during full length capacity cutting processes are minimized.
- By means of the AC servo motor with high-precision and dynamic properties, speed, velocity, torque values and

ramps can be controlled efficiently. By this means, smoother transitions are provided especially for corners and this improves the quality of cutting.

- By means of its dynamic filtering feature, suction is only done from the active chambers in the active cutting section and all gas and dust particles arising from the cutting process are collected before they spread.
- Due to its automatic and manual gas control options, cutting quality is improved by means of the parameters in its database.
- By means of its proportional valves, the automatic gas control unit apply the required gas mixtures and pressure adjustments precisely and reads all required parameters automatically from the database of the control unit. Operator can enter the shape, material and thickness details of the required piece either directly through the control panel or from his/her office.
- By means of automatic torch height control feature, hitting risk of the plasma head due to rotation of a piece or any foreign matter in the process is eliminated.
- It is possible to continue any cutting process from any point. This is another feature of the high-capacity CNC control unit.
- The system can open DXF and DWG file formats.

1.2. Technical Information

	PL-C 2040	
Cutting Axes		
X Axis	4100	mm
Y Axis	2050	mm
Z Axis	200	mm
Max. Plate dimensions	4100x2050	mm
Max Plate Weight	950	kg/m^2
Dynamic		
Max. speed X-axis	35	m/min.
Max. speed Y-axis	35	m/min.
Spacial Accuracy	± 0,1	mm
Repeatability	± 0,1	mm
Control Unit		
CNC	BECKOFF CP 2919	
Display	19'' MULTI TOUCH SCREEN	
Filter	**Durma PL-6000**	
Capacity	6000	m^3/h
Power	7.5	kW

Tab 1-02

Power Supply	
Product Code	Hypertherm XPR 300
Maximum open-circuit voltage	360 V
Maximum output current	300 A
Output voltage	50 V -210 V
Duty cycle rating	%100 at 63 kW, 40° (104°F)
Operational ambient temperature range	(-)10 C - 40° C (14° F-104° F)
Power factor	0.98 at 63 kW
Cooling	Forced air (Class F)
Insulation	Class H
EMC emissions classification (CE models only)	Class A
Lift points	Top lift eye
Bottom lift truck slots	Lift eye weight rating 680 kg

Tab 1-03

Electric Consumption			
		Power	Current
Power Supply	XPR 300	63 kW	300 A
Filter	PL-6000	7,5 kW	10 A
Electricity Terminal		15 kW	27 A
Total Power	300 XPR	85,5 kW	337 A

Tab 1-04

Maximum Cutting Thickness Values based on Power Supply (mm)		
MATERIAL	Hypertherm XPR 300	
	Pierce Capacity	Severance capacity
Mild Steel (Argon-assit)	50	80
Mild Steel (standard 0_2)	45	80
Corrosion Resistant/Stainless Steel	38	75
Aluminum (AlMg3)	38	50

Tab 1-05

Operating Criteria									
Mild Steel					Stainless Steel				
Console	Cutting gases	Current (A)	Cut chart thickness (mm)	Approximate cutting speed (mm)	Console	Cutting gases	Current (A)	Cut chart thickness (mm)	Cut chart thickness (mm)
Core, VWI, and OptiMix	0_2 plasma 0_2 shield	30	0.5 3 5	5348 1153 521	Core, VWI, and OptiMix	N_2 plasma N_2 shield	40	0.8 3 6	6100 2683 981
	0_2 plasma Air shield	80	3 6 12	5582 3048 1405	VWI and OptiMix	F5 plasma N_2 shield	80	3 6 12	4248 1916 864
	0_2 plasma Air shield	130	3 10 38	6502 2680 256	OptiMix	H_2-Ar-N_2 plasma N_2 shield	170	10 12 38	1975 1735 256
	0_2 plasma Air shield	170	6 12 25 50	5080 3061 1175 267		H_2-Ar-N_2 plasma N_2 shield	300	12 25 50 75	2038 1040 387 162
	0_2 plasma Air shield	300	12 25 50 80	3940 1950 560 165	VWI and OptiMix	N_2 plasma H_2O shield	300	12 25 50	2159 1302 403

Aluminum				
Console	Cutting gases	Current (A)	Cut chart thickness (mm)	Approximate cutting speed (mm)
Core, VWI, and OptiMix	Air plasma Air shield	40	1.5 3 6	4799 2596 911
VWI and OptiMix	N_2 plasma H_2O shield	80	3 6 10	3820 2203 956
	N_2 plasma H_2O shield	130	6 10 20	2413 1702 870
	N_2 plasma H_2O shield	300	12 25 50	2286 1302 524
OptiMix	H_2-Ar-N_2 plasma N_2 shield	300	12 25 50	3810 2056 391

Tab 1-06

- High- performance Durma Compact Plasma Cutting Machines are within 4th Cutting range in accordance with the ISO 9013 standards. Cutting quality might be influenced from the machine parameters and grounding.
- 30The cutting precision of angular cuttings up to 30° is ± 0.5 mm.
- 30Error margin of angular cuttings up to 30° is 1 mm.
- Error margin of angular flange cutting is up to 2 mm.

1.3. Introduction of Equipments of the Machine

1.3.1. Plasma Power Source

Picture 1-01

- HyPerformance Plasma systems reduces Hydefinition cutting costs in half. Performance, efficiency and profitability of Hyperformance Plasma of Hyperterm is increased by means of Hydefinition, long-lasting, strong drilling and Accurate Tapping technologies. These systems presents unique process flexibility needed for cutting, bending and marking metals up to 160 mm (6-1/4'') thickness.

- HyPerformance Plasma brings together high cutting speeds, fast process cycle, rapid changes and high reliability together for high-level productivity.
- HyPerformance Plasma decresaes operating costs and increases profitability.
- LongLife technology significantly increases the life of consumables and provides consistent HyDefinition cutting quality for longer.

1.3.2. Filter

Picture 1-02

- Filter is a ready-to-use compact filter equipment with its filter, fan and motor, automatic cleaning system and control panel.
- Electric Supply 400V,3P N PE,50 Hz.
- Panel filters produced from polyester non-woven materials are coated with PTFE membrane. Panel filters have the ability to filter the particles in 0.2-2 micron range with 99.9% efficiency. It provides Class: M filtration according to DIN EN 60335 standard Class: H13 quality filtration according to DIN EN 1822 standard. Average filter life is approximately 20000 hours of operation.
- PL series devices have cleaning system with automatically-pressurized air (jet-pulse).
- A pressurized air regulator (0-10 bars) is installed inside the filter unit.
- There is a manometer on the device showing the contamination level of the filter.
- Filter control panel enables automatic activation and deactivation of the filter through the signal to be sent from the plasma bench.
- Easily detacthable fully-impermeable wheel-dust bin. Dust bin volume 80 liters.
- Separator minimizing fire risk by separating heavy particles.
- Low noise level ≤ 70dB (A) by means of its advanced silencer structure.

1.3.3. Control Unit

Picture 1-03

- IT has an industrial PC with EMBEDDED PC BECKOFF – BASIC CPU MODULE XP2030, WINDOWS EMBEDDED STANDARD 7 P, 32 BIT characters;

- and a useful and easily accessible display panel with its capacitive touch-operated screen and DURMA AURORA interface.
- Durma has an original software which has height control and where the user can access all cutting parameters (database).
- Although, there are more than one options within the same interface, all functions can be activated or deactivated upon the request of the user by the help of the service personnel.

- The machine can be restored to the factory defaults or service defaults. BOOT and RESTORE processes can be done through AURORA.
- The system has an original software and operating platform designed under DURMA control panel with True Hole, Angular Cutting, Pipe Cutting, Drilling and Tapping (extra 4-6 turret) and Oxygen Cutting options.

1.3.4 Properties of the Software (CAD/CAM)

- Same or various cutting programs can be uploaded to the Task by means of the TASK structure through AURORA and it is possible to intercept the programs automatically through start command of the operator.
- The cutting parameters are loaded automatically from the database and operator does not have to perform any additional work. If, the operator desires, he/she can make changes on parameters and save them. This saving process can be done for the currently intercepted program or in a way to permanently cover all programs.
- The users can register new material in the database. If, it is required, the default Durma factory parameters can be loaded automatically.
- All parameters for Plasma cutting, Oxygen cutting, Drilling, Tapping, Angular cutting, Pipe cutting and True Hole are automatically loaded when machine begins a cutting process.
- In the Workpiece screen where cutting programs are listed, the geometry of programs are shown and the user can see the program he/she selects without loading it.
- In the simulation page, cutting can be followed real-time and if it is required, the cutting process can be continued from the last phase.
- By means of the Macro program on the Control Unit where the predetermined cutting library is located, some simple shapes can be used and cut without needing to make a program by going to office. The user can also add new shapres in this library.
- Touch-operated screens provide facility for the users. Several buttons and keyboard of the control unit are transferred to display, simplicity is provided and an easy operating interface is established for the user.
- It is possible to transfer/import programs from another computer to the control unit through Ethernet.

- Plate search can be conducted through Aurora and by this way the plate zero point and angle value can be found automatically.
- Several cutting technologies specific to Durma are applied as we establish our own cutting codes (GCode) on Aurora.
- Precision cutting quality is achieved by means of Durma height control (AVC Control).
- It is possible to change the leadin/leadout sizes of a contour through the Durma control unit and pieces can be moved to a different position and removed if required.
- The system has also manual cutting (Pruning) option.
- Active alarms and warnings are shown in all pages and listed in Alarms pages in detail.
- There is a diagnostic screen showing the status of Input/Output modules.
- Durmazlar has the TRUE HOLE technology certification. It is possible to perform TRUE HOLE through the Durma control unit Aurora.

1.3.5. Cutting Tray

Picture 1-04

- Tray system establishing the cutting section consists of a modular structure. This structure also establishes the main body of the machine and has the movement axes on it. Modular tray system brings together some advantages such as high-precision, easy-installation and easy-transport. By means of dynamic filtering feature, modular trays increase filter capatiy and decrease energy comsumption.

1.3.6. Pneumatic System

Picture 1-05

Pneumatic system consists of the following elements:

- Main air inlet unit
- Pressure regulator and conditioner group
- Pressurized air distribution network

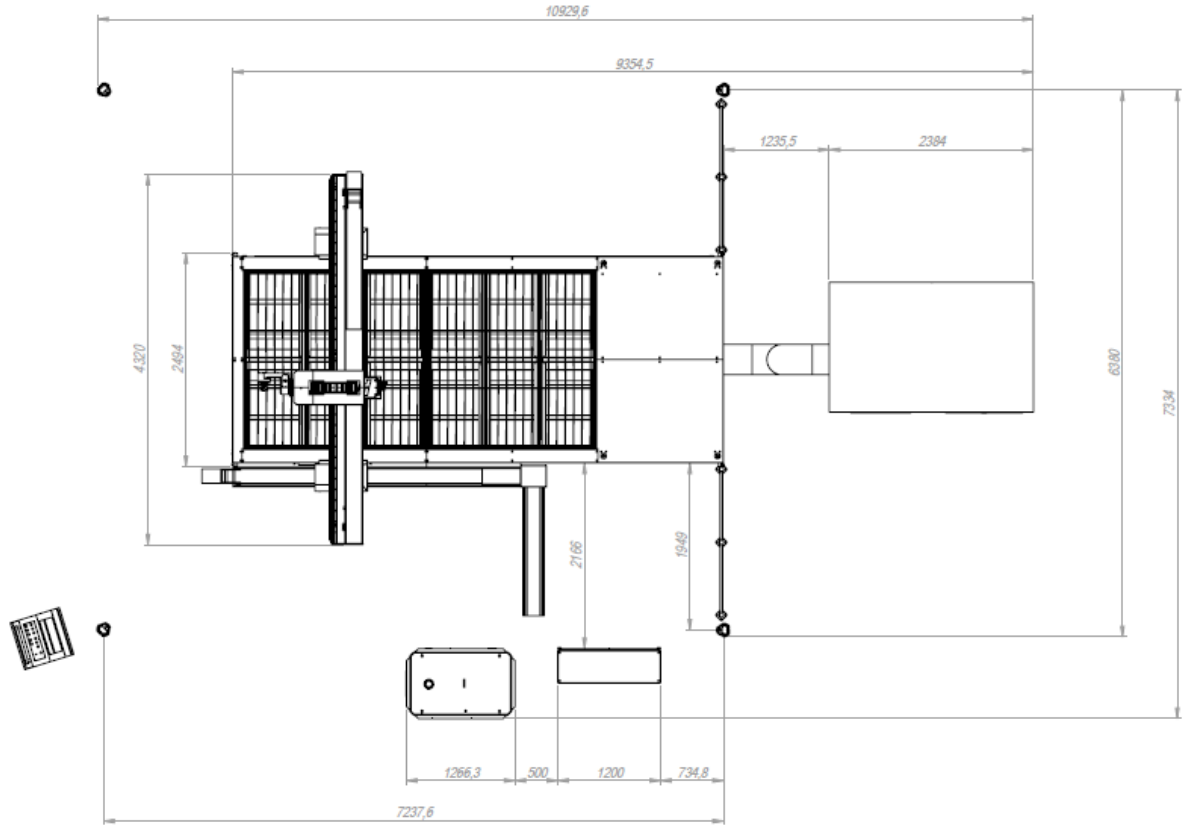
1.4. Safety

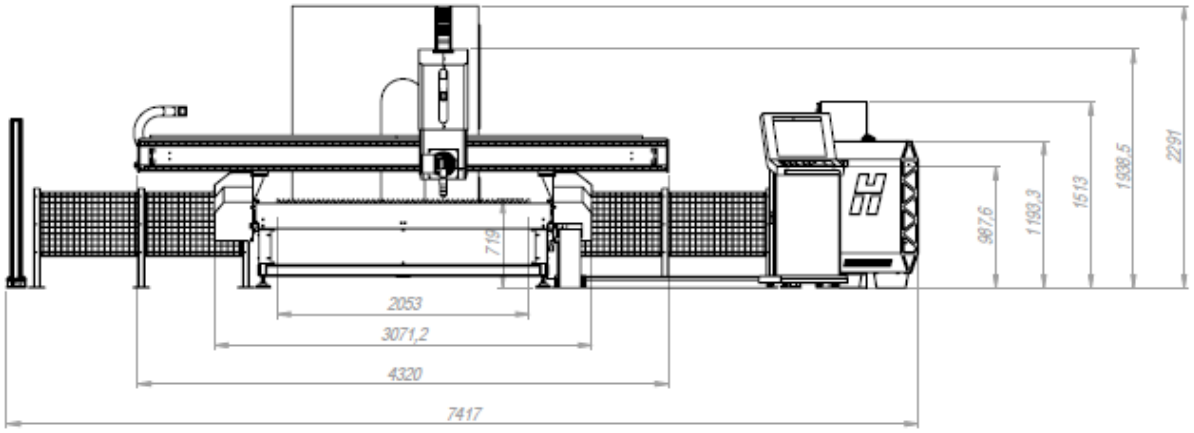
- The plasma cutting system, the machine and the CNC control unit are equipped with safety devices. These switch and sensors protect the operator from hazards on the other hand protect the plasma head and the machine from any damage which might arise due to programming wrong sizes or collision of plasma cutting head and piece. Existing troubleshooting system continuously informs operator about the status of the system and allows him/her to carry out necessary corrections. The steps to be followed upon warnings of the CNC Control Unit are clearly displayed on the control screen.

1.5. Protective Precautions

- There is a wired protection system on the axis movements of the machine for keeping the operator at a safe distance from the cutting site.

1.6. Dimensions of the Machine





Weight of the Machine: 7500 kg