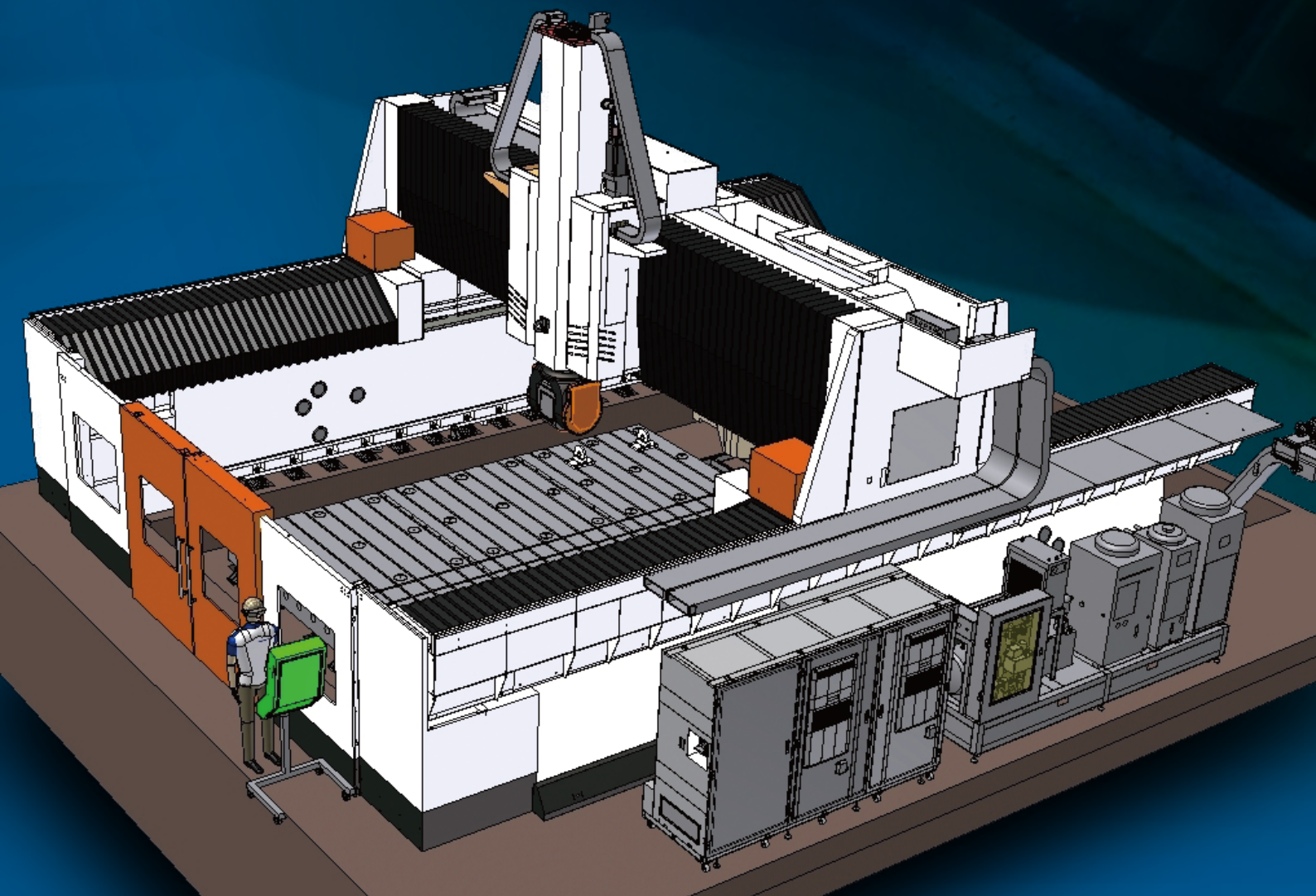


**GF** *series*

ASIA PACIFIC ELITE CORP PRODUCTION





ASIA PACIFIC ELITE CORP PRODUCTION

The driving mechanisms are designed symmetrically on both sides of ram; the principle of driving in the gravity center can reduce vibration during high speed movement.

The ram of Z-axis, made of ductile cast iron with appropriate damping feature, supplies high anti-bending strength and stable cutting condition for large Z-axis ranges.

25% working area is saved compared with conventional type machine for more flexibility of manufacturing and application.

Complete foundation plan and standard for customers carries out permanent working performance perfectly.

Cross rail drives on both side walls keep moving units away from the dirt area, and linear guides on both side walls are designed with optimized span for working stability.





Two-axis head with torque motor driving system is the best solution to achieve extreme precision and high efficiency production in multi-axis machining field.

Working table is made of cast iron with T-slot and anchored with foundation.

The stiffness-optimized structure design for moving cross beam in X-axis direction is able to realize the high dynamic movement and powerful cutting ability at the same time.

The working area fully enveloped by side walls and splash guards provides operators security while working, the front doors have transparent windows for inspection..

Twin electronically preloaded servo motors with high strength rack and pinion drives in X-axis and Y-axis direction ensure minimum backlash and maximum stability.

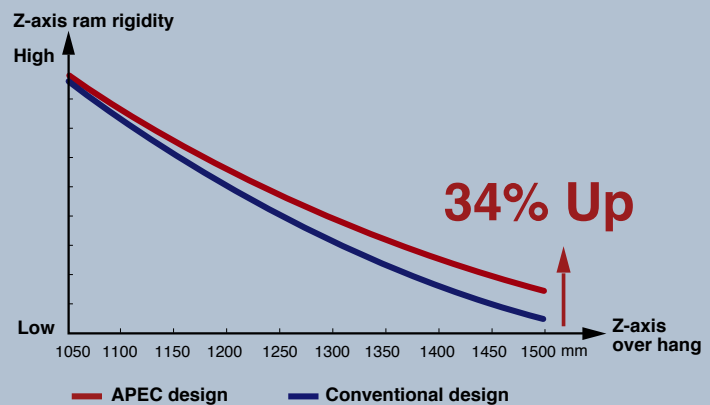
# Magic Vertical Slider

In order to achieve large working space for GF series to carry out flexible manufacturing, the stroke of Z-direction has been upgraded up to 1500 mm. In this condition, the rigidity of ram becomes a very critical issue especially as the travel over 1000 mm. A complete innovative structure design has been created through FEM analysis. Not only the structure design is optimized but also the high strength material ductile cast iron is integrated to totally bring the powerful built-in spindle ability in to play.

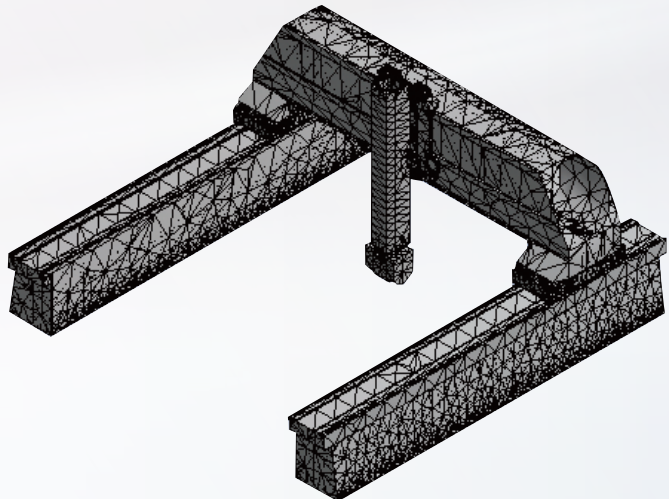
By means of the innovation of GF series vertical slider, about 34% stiffness is raised compare with other conventional design and also 18% mass less. The obvious innovation improvement makes large component machining with excellent performance and high accuracy come true.



Item	Weight	Rigidity
Conventional ram	100%	100%
Magic ram	82%	134%



FEM analysis is integrated with 3D CAD structure design, and the dynamic feature is also concerned such as structure stability, heat symmetrization design, geometry accuracy and high speed characteristic. With excellent technical analysis and long term experience in gantry machine design, the maximum machine precision and performance are guaranteed.



## APH-10

The compact body design of APH-10 is the best solution for machining complex shape work piece. Direct drive system in B-axis & C-axis provides excellent performance and accuracy during multi-axis movement.

### B-Axis (Swiveling Axis)

Pivoting angle :  $\pm 100^\circ$   
 Continuous torque : 600 Nm  
 Clamping torque : 2800 Nm  
 Max. swivel speed : 50 rpm  
 Position accuracy : 15"  
 Repeatability : 10"

### C-Axis (Rotating Axis)

Pivoting angle :  $\pm 270^\circ$   
 Continuous torque : 600 Nm  
 Clamping torque : 2800 Nm  
 Max. rotating speed : 50 rpm  
 Position accuracy : 15"  
 Repeatability : 10"



## APH-20

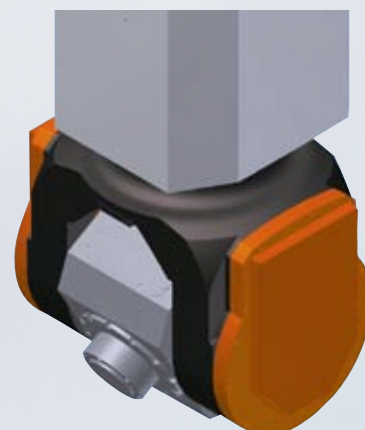
APH-20 is a representative of flexible manufacturing. Through powerful clamping force and high torque cutting capability, it is suitable for all fields of application.

### B-Axis (Swiveling Axis)

Pivoting angle :  $\pm 120^\circ$   
 Continuous torque : 1200 Nm  
 Clamping torque : 4100 Nm  
 Max. swivel speed : 30 rpm  
 Position accuracy : 15"  
 Repeatability : 10"

### C-Axis (Rotating Axis)

Pivoting angle :  $\pm 360^\circ$   
 Continuous torque : 2650 Nm  
 Clamping torque : 6000 Nm  
 Max. rotating speed : 30 rpm  
 Position accuracy : 15"  
 Repeatability : 10"



Spindle Application	APH-10	APH-20
Specification	42 kW, 67 Nm, 24000 rpm	53 kW, 225 Nm, 12000 rpm
Steel, casting (Roughing)	■	■
Steel, casting (Finishing)	■	■
Aluminum (High volume)	■	■
Aluminum (Finishing)	■	■
Composite materials	With suction system (Option)	■
Plastic, resin, wood	■	■
Titanium	■	■

Better ■ ■ ■ ■ Worse



**GF** series

# Makes Brilliant Quality Come True

All axes are equipped with  
**“Twin Power”**

**High Precision  
Excellent Dynamic  
Balanced Drive**

**Max. Rigidity  
Less Vibration  
Less Maintenance**

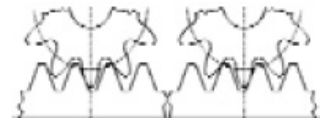
MAX. Acceleration : **4 m/s<sup>2</sup>**

Velocity : **40 m/min**



## X/Y-axis - Twin pinion with double driving power

GF series is a 5-axis machine with gantry driven technology in cross rail movement. High quality **Rack and Pinion** system is applied in X-axis and Y-axis transmission with each two preloaded servo motors. Through this driving technology, high machining quality is expected.



## Z-axis - Twin ball screws with double driving power

In order to achieve the best response in Z-axis movement, not only hydraulic balancing compensation has been applied, the principle of drive in the gravity center must be also remained. **Twin Ball Screws** drive with master-slave control has achieved the requirement on that.



## Swiveling axis - Twin direct torque motors

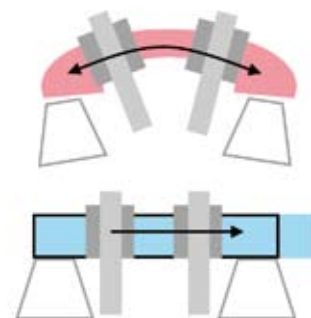
The driving system for tilting head is mounted with two symmetric direct drive motors through a strong forked structure. The feature is obviously dynamic, high precision, backlash and vibration free without mechanism transmission.



## Ensured Permanent Precision

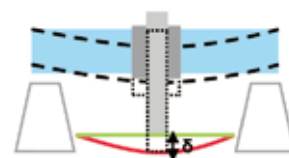
### Thermal expansion prevention strategy

The temperature variation is always a challenge for big machine tools. The expansion of material is difficult to be compensated with software. All the geometry precision will be lost and the stress caused by expansion also damages some important components of machine. Thermal expansion prevention strategy is concerned in cross rail and side wall design of GF series. It makes components of machine well protected and also ensures long term mechanism stability.



### Minimize the possible errors

For a long travel of cross rail in Y-axis direction up to 5000 mm, the geometry deviation in Z-axis direction caused by gravity during the Y-axis movement must be concerned especially in 5-axis machining process. It is necessary to improve the stiffness and fine adjustment of cross beam to prevent any dropping error due to weakness in the middle of cross rail.



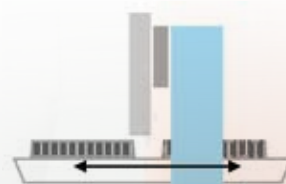
### High dynamic characteristic

The design concept of structure for high dynamic movement is very important. The cross beam moving structure of GF series is the optimal solution for that. All the moving parts are overhead and work piece is mounted on the fixed table. It makes the work pieces transportation easier and the movement characteristic does not reduce due to the extra-loading, and also saves energy consumption.

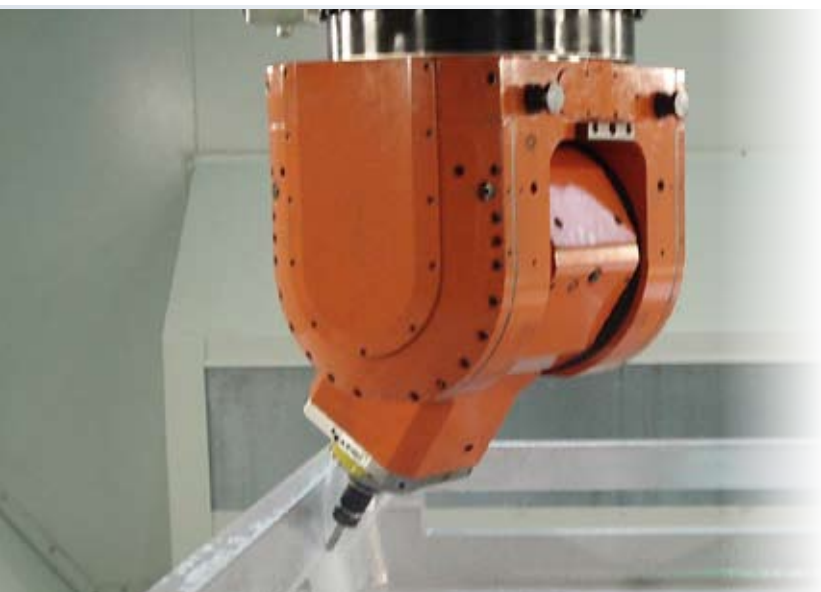
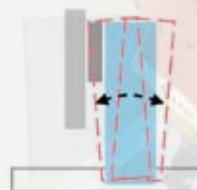
- High dynamic & space saved



- Dynamic characteristic is not permanently stable due to the loading from different work pieces



- Low dynamic characteristic







## Your Success, Our achievement

GF series is a revolutionary equipment of machining center with a gantry structure and moving crossbeam designed by APEC to realize new manufacturing requirement. It will be the most suitable equipment for high speed machining industry such as Aerospace and Vacuum chamber. The characteristic of 5-axis simultaneous movement is a good solution for complex work pieces like mold and die and energy industry. It is also applicable for all large part machining applications such as Railway, Ship building, Earth moving industry and so on. With 5-axis machining capability and wide range of configuration, the features of GF series will carry out excellent flexibility and performance in engineering to achieve maximum benefit.



**Aerospace**



**Ship building**



**Automotive**



**Railway**



**Energy**



**Solar**



# Accuracy Guarantee

Precise has already become one attitude and pattern to APEC employees. Complete inspection for all the parts will be taken on the machine. Exactly geometry accuracy has been measured before delivered from APEC factory and also after re-assembly on customer site. In order to ensure the precision of machining, lots of efforts have been put to achieve one step ahead of competitors. Especially in multi-axis simultaneous movement, the measurement of ISO and NASA standard has been well verified in all of APEC 5-axis machines.



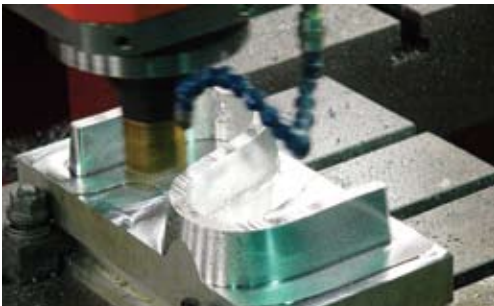
## Collision Protected

In the case of collision protection during manufacturing process especially in complex work pieces machining, the "DCM" (Dynamic Collision Monitoring) function in Heidenhain control system is working to protect the whole machine structure against collision between each units, and it's also possible to include the customized work piece into the collision protection system. The spindle is also mounted with vibration sensor near the front bearing to detect the over level oscillation and immediately stops if any crash happens.



## Customized Solution

Long term relationship is always expected between APEC and end users. Different kind of manufacturing needs different machining strategy such as high speed machining, CAD/CAM programming and machining simulation. These can be fully supported by APEC as if customers request. It will realize the high efficiency and quality production through flexible customer service and cooperation.





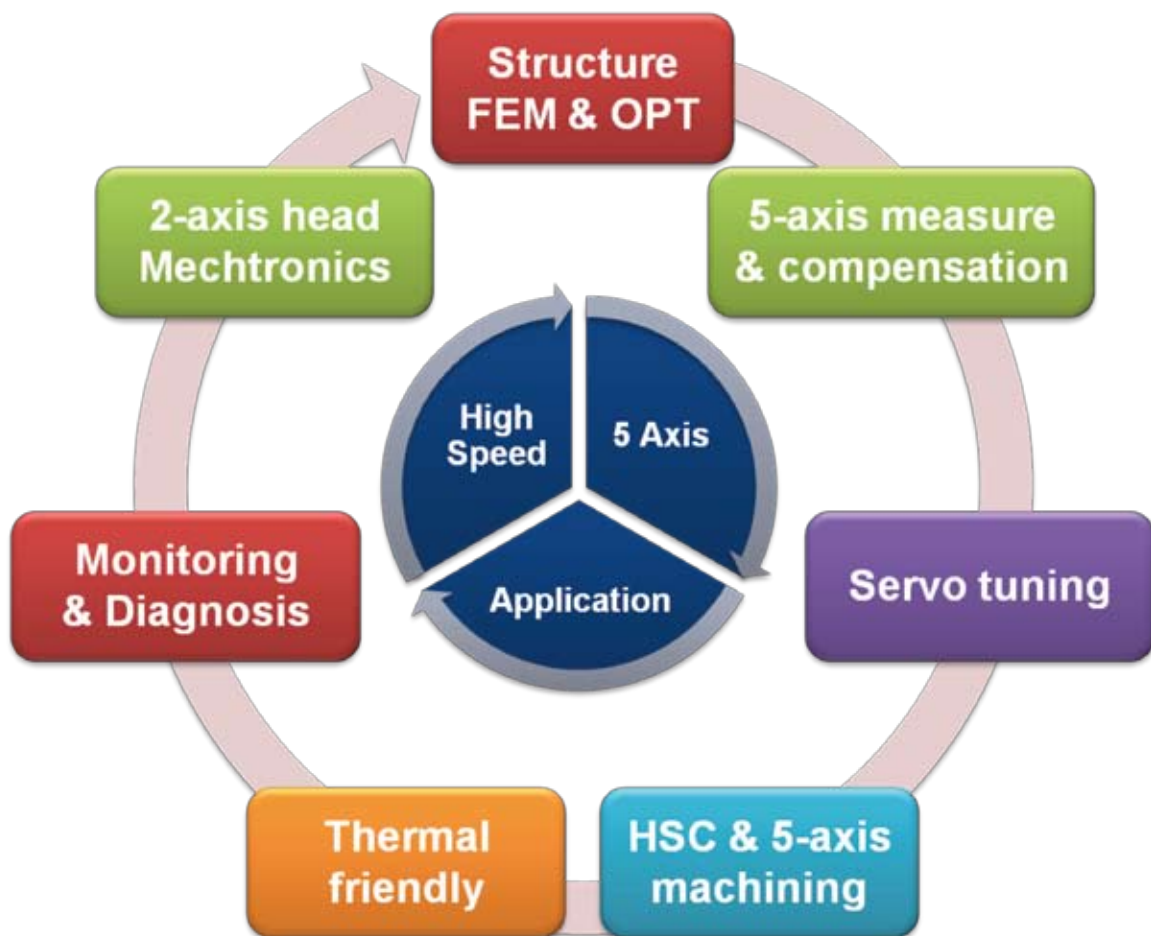
# Driving Productivity

GF series is the pioneer machine of new generation for machining wide range working area up to 20 m in X-axis, 5 m in Y-axis and 1.5 m in Z-axis. By means of rapid traverse 40 m/min and acceleration 4 m/s<sup>2</sup>, a brilliant new production will be realized.

The innovative direct drive two-axis head APH-10 and APH-20 achieve flexible applications. No matter simultaneous 5-axis machining or 5-face machining operation, it may minimize the machining setup and reach high precision done in one process.

The power spindle can continuously provide high metal-removing capacity up to 2500 cm<sup>3</sup>/min, and be applied on steel, cast iron, light alloy, composite material and so on.

When the maximum quality and precision are required, it is possible to mount a laser measuring system for tool preset and tool condition verified. A probe system for work piece on-line inspection is also available. APEC delivers not only standard machine but also completes technical service to be responsible for our customers are in the right way to high efficiency solution.



# GF series Technical Specification

## Design

GF series is a kind of gantry structure with moving crossbeam without other external loading from work pieces that offers significant advantages for high dynamic movement. The compact design only occupies limited factory area. The machine bed and side walls are fixed with foundation through anchors to ensure the permanent stability. The ram of Z-axis slide is made of ductile cast iron to supply high stiffness and suitable damping feature to avoid vibration during cutting. The force flow path has been minimized also from the cutting point to the structure and the design increases the cutting rigidity and stability.



## Drive system

All axes are designed with “**Twin power**” philosophy. By means of master-slave control method, the high rigidity **Rack and Pinion** is applied in X-axis and Y-axis direction with each two servo preloaded motors ensuring the minimum backlash and maximum stiffness during movement. The control system with feedback encoders makes sure that two driving systems in X-axis direction (X-axis & U-axis) are perfectly synchronized.

Also through master-slave control method, two ground and precise Ball Screws are applied in Z-axis direction and gravity center driving strategy has been remained. The extra loading cause of gravity is completely compensated by 2 hydraulic cylinders to make high dynamic movement has been carried out.

High quality pre-loaded linear roller guides supply extremely stability for different kind of manufacturing. Total 27 roller pads have been applied to guarantee the high rigidity and stability.



## Measuring system

The four linear axes, X-axis (U-axis), Y-axis and Z-axis, are equipped with Heidenhain linear scale measuring system and the rotary axes are combined with grid encoder as well. The compressed air barrier is applied to protect the scale from pollution, ex. dust, dirt.





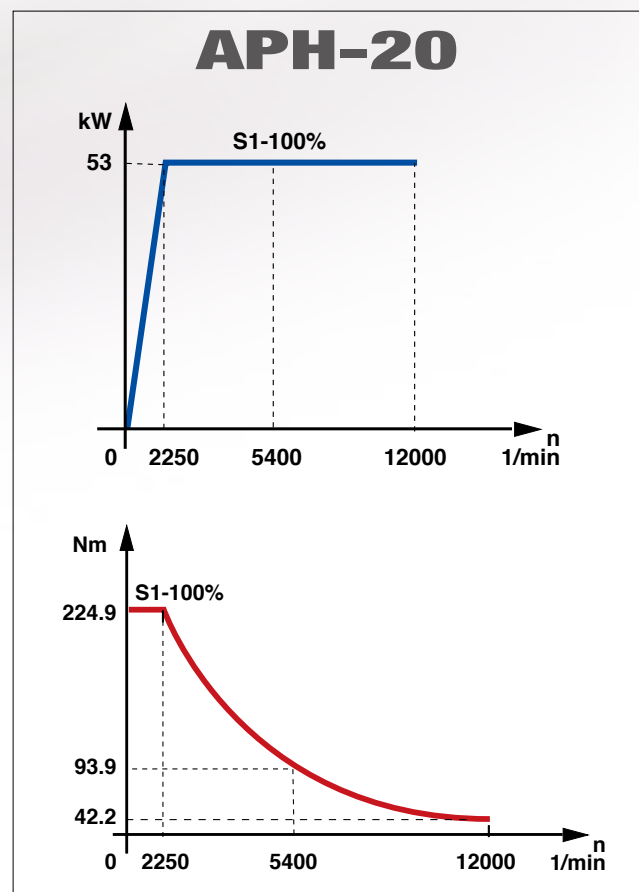
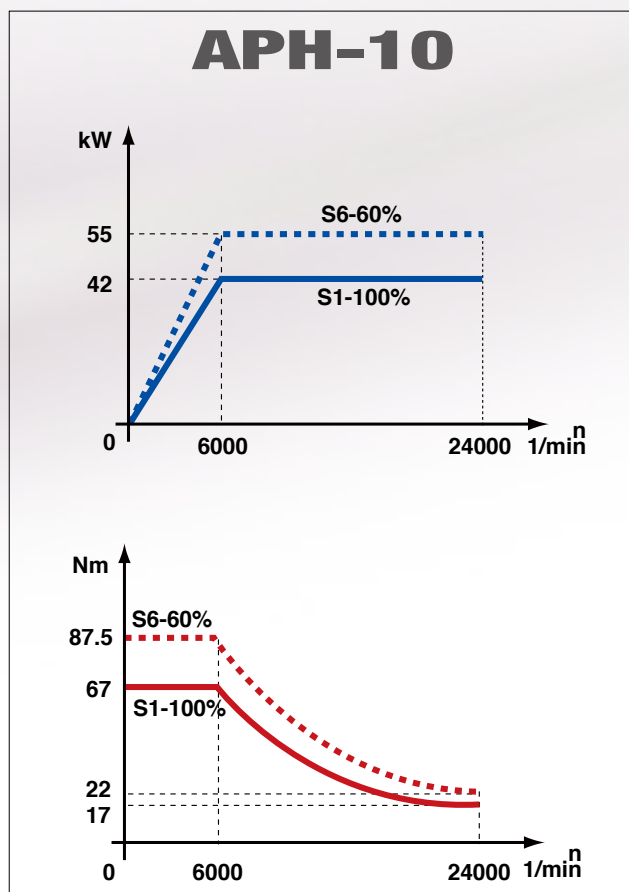
## Controls

GF series can be employed with Heidenhain, Fanuc or Siemens control system. All controllers are equipped with modern control method such as "tool center point control" for 5-axis simultaneous movement, "look ahead", "jerk limitation", "modern spline interpolation" for high performance machining.

## Spindle

The tool taper HSK 63A type and HSK 100A type can be applied to GF series. Both spindles are driven by powerful built-in motor which can supply 42 kw and 53 kw for high efficiency machining. The maximum spindle speed for each type of spindle is 24000 rpm and 12000 rpm. The spindle coolant through function and external coolant unit can be the options for both. The seals with air blow are properly applied on the spindle for water proof.

## Spindle Characteristic



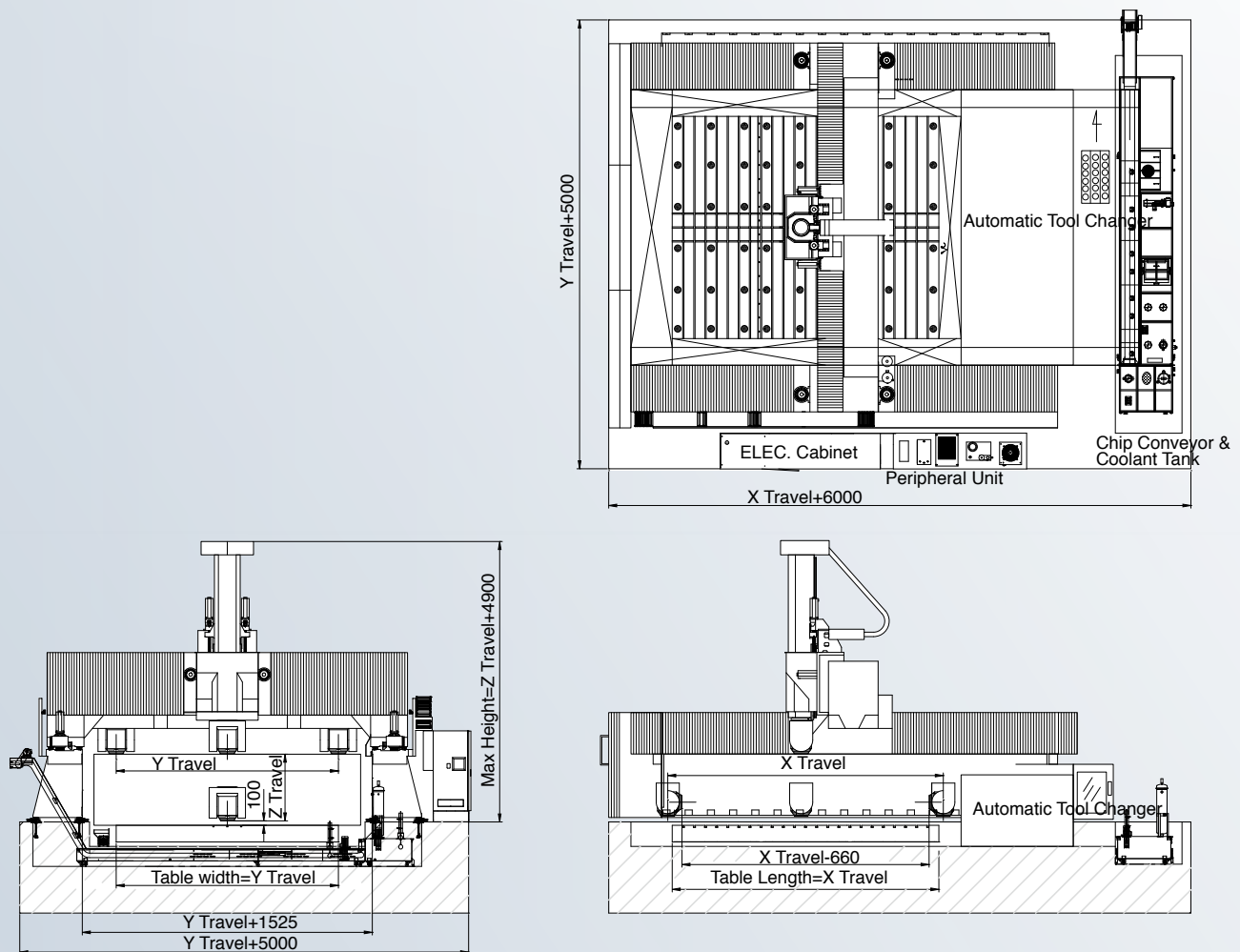
# Specification

	Unit	GF35 / 40 / 45 / 50	
Travel			
X-axis	mm	5000 - 30000	
Y-axis	mm	3000 / 3500 / 4000 / 4500 / 5000	
Z-axis	mm	1000 / 1300 / 1500	
Distance between spindle nose to table surface	mm	100-1100 / 1400 / 1600	
Distance between table surface to floor	mm	-100	
Distance between side walls	mm	5000 / 5500 / 6000 / 6500	
Table			
Table length	mm	5000 - 30000	
Table width	mm	3500 / 4000 / 4500 / 5000	
T-slot size	mm	28	
Max. table load	kg/m²	5000	
B-Axis		APH-10	APH-20
Swivel speed	rpm	50	30
Max. torque (S1-100%)	Nm	600	1200
Clamping torque	Nm	2800	4100
Swivel range	degree	±100°	±120°
C-Axis			
Rotation speed	rpm	50	30
Max. torque (S1-100%)	Nm	600	2650
Clamping torque	Nm	2800	6000
Rotation range	degree	±270°	±360°
Spindle			
Spindle taper		HSK 63A	HSK 100A
Spindle speed	rpm	24000	12000
Spindle power (S1-100%)	kW	42	53
Spindle torque (S1-100%)	Nm	67	225
Feedrate			
X/Y/Z-axis rapid feedrate	m/min	40 / 40 / 40	
X/Y/Z-axis Max. acceleration	m/sec²	4 / 4 / 4	
Automatic Tool Changer			
Tool magazine capacity	pc	40	
Max. tool length	mm	300	400
Max. tool dimensions -with adjacent tools	mm	Ø100	Ø125
Max. tool dimensions -without adjacent tools	mm	Ø200	Ø250
Max. tool weight per piece	kg	7	12
Others			
Power supply	kVA	150	

All specifications and designs are subject to change without notice.



# Machine Layout



## Machine Accessories

### Standard

- Heidenhain iTNC530 CNC controller
- 2-Axis head with spindle
- Automatic tool change 40 Tools
- X, Y-axis with Rack & Pinion with servo preload
- Z-axis with Twin Ball Screws
- X/Y/Z-axis with roller linear guideway
- X/Y/Z-axis with linear scale
- Air conditioner for electrical cabinet
- Chiller for spindle
- Spindle Oil-Air lubrication system
- Chip disposal system

- Security door interlock
- Waterproof lamp

### Option

- Fanuc or Siemens CNC controller
- Cooling through spindle (30 Bar)
- External coolant supply unit
- Tooling measuring system
- Work piece touch probe measurement system
- Isolative type transformer
- Automatic voltage regulator



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