YASKAWA

COMPASS™ 2

THE CNC SOFTWARE SOLUTION FOR iCUBE CONTROL™

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Compass 2 is engineered to combine the scalability of an industrial PC for user interface and path planning with the real-time motion and logic control of the iC9200, providing machine tool builders with a highly optimized CNC control solution.

FAST

Blazing fast G-Code processing, macro logic, and path planning delivers maximum productivity. Block look-ahead and high-speed contouring algorithms ensure high sustained feedrates, precise corner tolerances, and smooth cut quality.

FLEXIBLE

Use the included example user interface to start cutting quickly and modify it as you choose or create a fully customized user interface that reflects your own style. With Compass Designer, you can create a professional-looking Windows app with no code.

POWERFUL

Create G-code and macro programs for tool changers, probing, or canned cycles. From simple one-line commands to advanced PLC routines, customization is limited only by your imagination.

SIMPLE

PLC integration is easy with the iCube Engineer Library and starter project. Simply configure your servo axes and I/O, and the system is ready for motion.

COMPASS 2

SOLUTIONS FOR ROUTERS

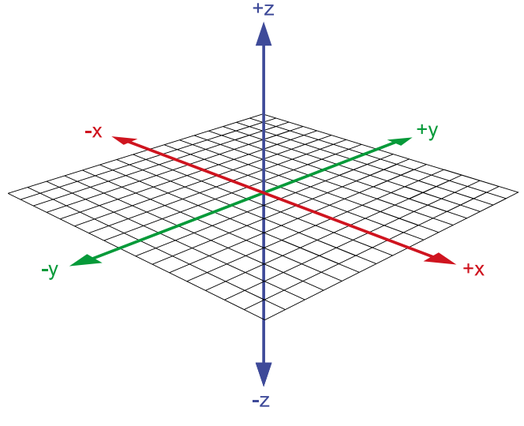
Whether your focus is on cutting nested parts, custom carvings, millwork, or sign making, Compass 2 offers exceptional speed and cut quality.

CUTTER COMPENSATION

Tool length and radius compensation allows one program to be run on multiple machines while automatically accounting for differences between individual tools.

COORDINATE SYSTEMS

Multiple coordinate systems allow programs to operate in machine coordinates, workpiece coordinates, or local coordinates. Stacked coordinate system transforms means it is easy to accurately locate parts in the machine and features on that part.



TOOL CHANGER

Use any style tool changer and even multiple tool changers. Customize the tool change sequence using tool changer macros and custom G-codes and M-codes to minimize cycle time and maximize tool capacity.

TANGENT KNIFE

Cut vinyl, corrugated, textiles, leather, foam, and other materials with clean edges and no tearing. Accurate tangent control improves cut quality and blade life.

AGGREGATE HEAD

Aggregate heads expand router capability to a CNC router by allowing access to hard-to-reach areas on the workpiece.

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HARDWARE ARCHITECTURE

An industrial PC with Windows 11 IoT, provides a scalable platform for Compass 2 and allows machine tool builders to offer their own CAD/CAM tools right on the machine.

The 3-core Triton processor in the iC9200 controller manages the real-time synchronization of the servomotors, spindle, and I/O over the EtherCAT network.

Sigma-X servomotors and servopacks are purpose-built for CNC applications, combining high-resolution feedback with industry-leading quality and reliability.

GA800 variable frequency drives deliver the ideal combination of power, flexibility, and ease of use. supporting spindles of any size with outstanding performance.

SLIO modules offer a wide range of I/O options and can be connected either via the EtherCAT network or directly to the iC9200 for a more compact solution.

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G-CODES AND MACRO PROGRAMMING

STANDARD & CUSTOM G-CODES

Compass 2 supports the G-codes used on most CNC machines out of the box—and lets machine tool builders add custom functions and canned cycles as needed.

G-Code	Name
G00	Rapid Move
G01	Linear Move
G02, G03	Circular Move
G04	Dwell
G09	Non-Modal Exact Stop
G10	Set Work and Tool Offsets
G17, G18, G19	Plane Selection
G20, G21	Inches, Metric Mode
G28	Rapid Move to Home Position
G31	Skip Function
G40, G41, G42	Tool Radius Offset
G43, G44, G49	Tool Length Offset
G50, G51	Scaling Mode
G52	Local WCS Offset
G53	Non-Modal MCS Move
G54 - G59	Work Coordinate Systems
G61, G64	Exact Stop On, Off
G68, G69	Coordinate Rotation Mode On, Off
G90, G91	Absolute, Incremental Mode
G92	Set Axes Positions
G94	Units Per Minute Mode

EASY MACRO PROGRAMMING

Use the Compass 2 Macro Language to create canned cycles, custom G-codes, and subprograms. Logical operations within G-Code programs make part programming even more powerful—loop, branch, or bypass sections of code as needed.

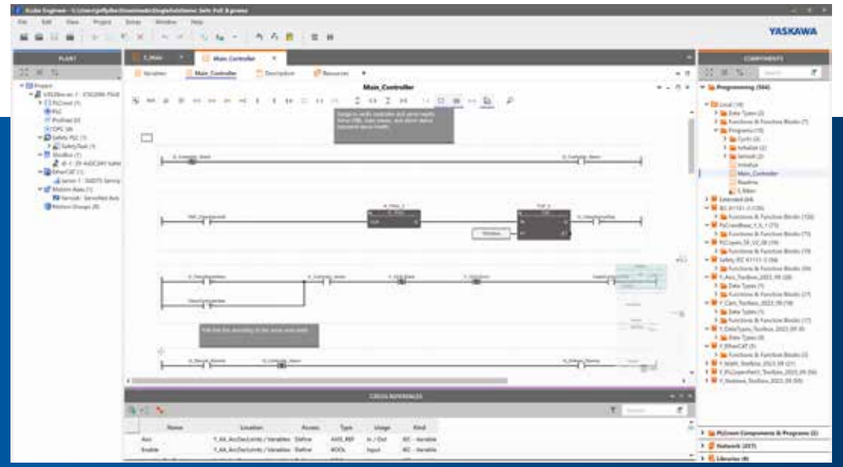
Control Operator	Name
IF, ELSE, END	Branching
WHILE, DO, END	While Loop
FOR, DO, END	For Loop

Operator	Name
=	Assignment
+	Add
-	Subtract
*	Multiply
/	Divide
**	Power
MOD	Modulus
[ ]	Expression Grouping
AND	AND
OR	OR
NOT	Complement
&	Bitwise AND
|	Bitwise OR
~	Bitwise NOT, 1's Complement
SIN	Sine
COS	Cosine
TAN	Tangent
ASIN	ArcSine
ACOS	ArcCosine
ATAN	ArcTangent
SQRT	Square Root
ABS	Absolute Value
BIN	BCD to Binary
BCD	Binary to BCD
ROUND	Round
FIX	Round Toward Zero
FUP	Round Away From Zero
LOG	Log Base 10
LN	Log Base e, Natural Log
EXP	Exponent Base e
<, LT	Less Than
<=, LE	Less Than Or Equal
>, GT	Greater Than
>=, GE	Greater Than Or Equal
==, EQ	Equal
!=, NE	Not Equal
//, ( ), ;	Single Line Comment

iCUBE ENGINEER

ENGINEERED FOR INNOVATION

Designed for collaborative working, iCube Engineer gives developers the freedom to innovate in the language of their choice.



INTEGRATED ENVIRONMENT

- M-Code logic, Auxiliary axis motion, and VFD control
- Fully integrated SIL 3 safety programming
- Network configuration, diagnostics and security

OPEN PROGRAMMING

- IEC61131 ladder, function block diagram, structured text, or sequential function chart (SFC)
- Create libraries with C#, C++ and other high-level languages

CONTROL SYSTEM SECURITY

- Device certificates and multi-user password protection

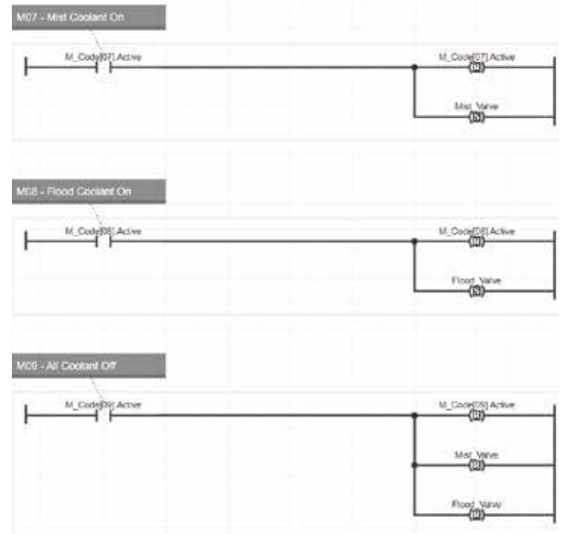
COLLABORATIVE

- Managed program access for multiple developers
- Online editing and version detection

EASY CUSTOM M-CODES

- Link M-Code logic to the G-Code program with a single bit
- M-Code call from the G-Code program turns on the Active bit
- G-Code program waits until the Active bit is reset

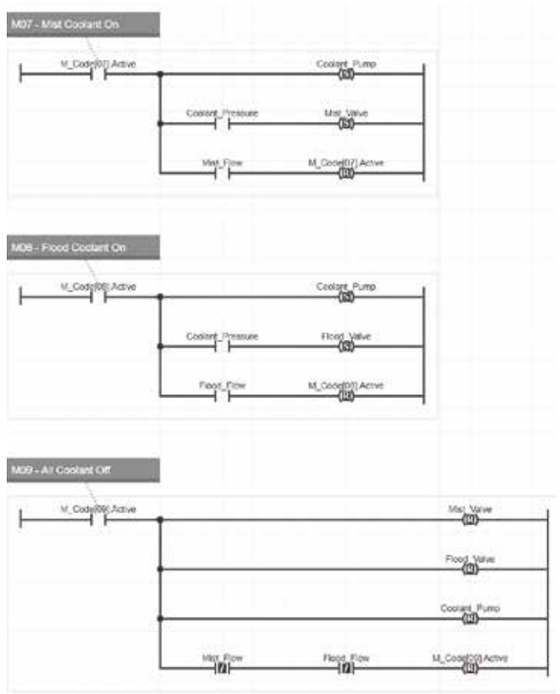
In this example, M07, M08, and M09 are implemented to turn on and off the Mist Coolant and Flood Coolant. No special function blocks are required, simplifying programming and troubleshooting.



LIMITED ONLY BY YOUR CREATIVITY

- Add closed-loop checks or more complex behaviors
- Implement machine options and proprietary functionality
- Use Ladder, Structured Text, Function Blocks, or SFC

In this example, M07, M08, and M09 are implemented as above, but with control of the coolant pump, and closed-loop checks of the coolant pressure, and flow. This logic can easily be expanded to support machines with VFD pump controls, redundant pumps, and filter pressure sensors, to name a few.



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COMPASS DESIGNER

Custom HMI Without Code

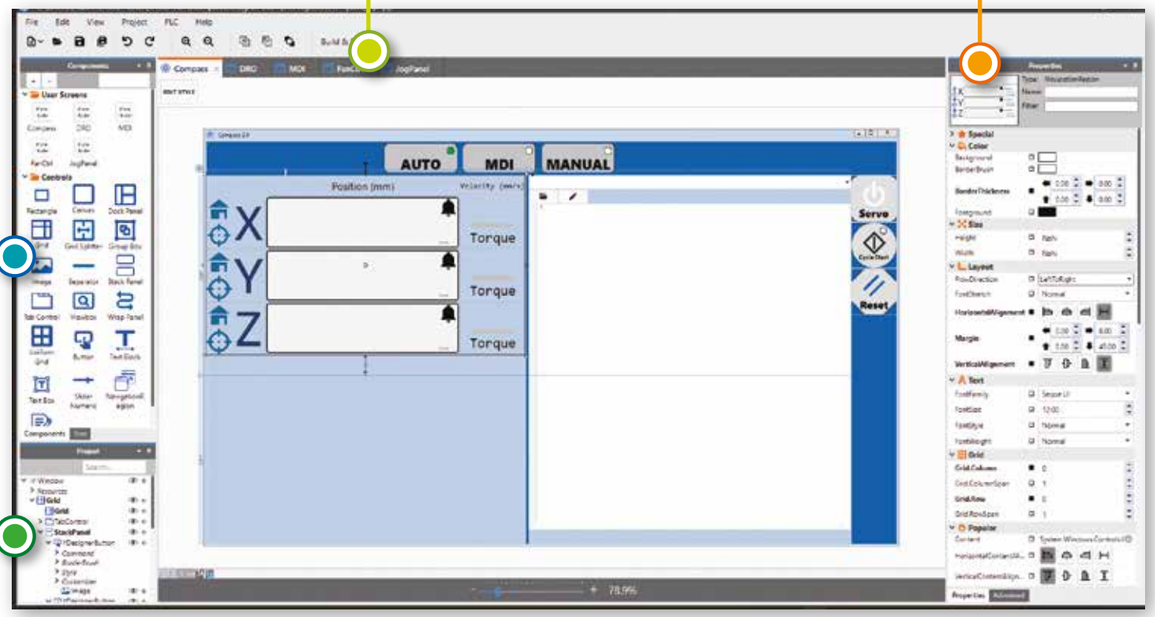
Compass Designer enables machine tool builders to create fully customized CNC HMIs as Windows WPF applications—without writing any C# code.

The result is a stand-alone executable that includes Compass NC and built-in communications with the iC9200 controller.

Drag-and-Drop controls such as stack panels, grid splitters, tabs, and images deliver modern app behavior with no code.

Create multiple screens to simplify editing and create more powerful designs.

Properties Grid gives complete control over the look of every UI element.



Project tree shows every control on the screen. Drag controls in the tree to change the order and nesting on the display.

Simply design your interface, build the project, and deploy the executable to your industrial PC.

SERVO PRODUCTS

SIGMA-X SERVO SERIES

Feature-Packed for your Machine

Sigma-X SERVOPACKS

With real-time data collection, speeds up to 7000 RPM, frequency response of 3.5 kHz, and multi-axis amplifiers with expanded functions to improve precision, Sigma-X takes servo response to a higher level to maximize your machine performance.

Sigma-X SERVOPACKS are EtherCAT-compatible to communicate seamlessly with our iCube Control platform.

Available 200 V models range from 50 W up to 15 kW.

SGDXS Single-Axis

SGDXW Dual-Axis

SGDXT Three-Axis

INTEGRATED DATA COLLECTION AND VISUALIZATION

- Servo motor acts as a sensor to collect data used for preventive maintenance
- Operation optimization monitor ensures efficient equipment operation
- Detects equipment errors by comparing data stored in servo amplifier with operational data

EXPANDED FUNCTIONS TO IMPROVE PRECISION & QUALITY

- Speed ripple compensation
- Output torque compensation
- High resolution 26-bit absolute encoder feedback

IMPROVE PERFORMANCE

- Maximum motor speed increased to 7000 RPM
- Speed frequency response increased to 3.5 kHz.

FASTER SERVO TUNING

- Tuning-less function to 100 times the load
- Advanced auto-tuning with vibration suppression and moment of inertia estimation algorithms
- One parameter tuning with load fluctuation compensation control

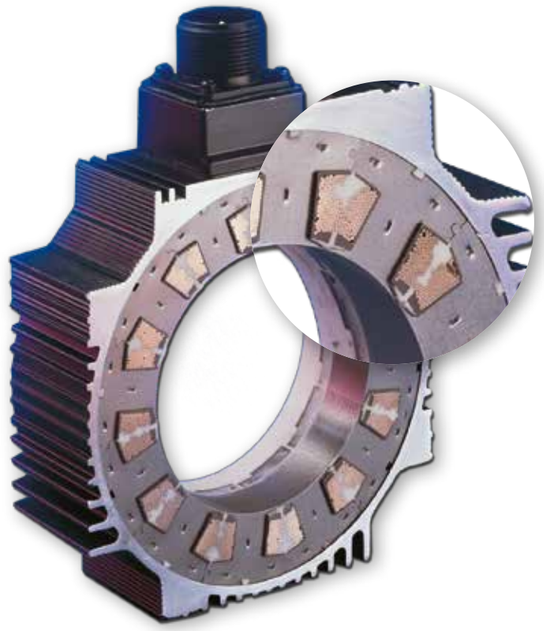
MULTI-AXIS SERVO AMPLIFIERS

- Reduces control panel size
- Reduces wiring time
- Two- and three-axis servo amplifiers available

ELIMINATE EFFECTS THAT STEAL AWAY PERFORMANCE

Unwanted mechanical effects rob a servo system of the quick, smooth, and precise movement you need. Yaskawa SERVOPACKs are equipped with suppression features that automatically eliminate harmful artifacts

Sigma-X Servo Motors



MORE TORQUE IN LESS SPACE

- Yaskawa's segmented stator core design and automated winding techniques pack nearly twice the copper into the stator gap, for much more torque output from every square millimeter of space
- Encapsulated windings prevent shorts between windings, improving heat dissipation
- Precise machining is used to minimize the air gap between rotor magnets and stator windings, for higher running torque and reduced cogging torque
- By reducing the space taken up by the end turns of the winding, overall motor length is significantly reduced
- Neodymium-Iron-Boron rotor magnets optimize flux density in the motor

26-BIT BATTERYLESS ABSOLUTE ENCODER

- Simplifies wiring in control panels
- No concerns about losing rotational data if battery runs out.
- No need to stock batteries

SGMXG **SGMXA** **SGMXP** **SGMXJ**

VARIABLE FREQUENCY DRIVES

GA800 AC DRIVE

Easy, Powerful, and Reliable

GA800 is the one drive you need for all types of motors from 1 to 1000 HP.

FLEXIBLE MOTOR CONTROL

- Control induction, IPM, SPM, and synchronous reluctance motors
- Easy and accurate autotuning optimizes performance
- Supports open loop vector control and closed loop vector control up to 590Hz
- 110% Normal Duty (ND) overload
- 150% Heavy Duty (HD) overload

DeviceNet EtherNet/IP EtherCAT ETHERNET POWERLINK CC-Link CANopen Modbus MECHATROLINK PROFIBUS PROFINET

FLEXIBLE MOTOR CONTROL

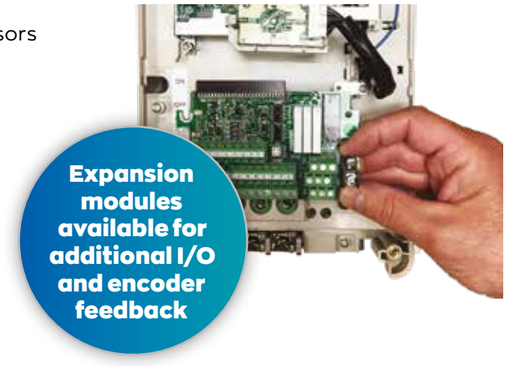
- Optional multi-protocol Ethernet network module supports all major industrial Ethernet networks
- Maintain control power with main power removed by supplying 24VDC to the GA800's auxiliary input

STANDARD INPUTS

- RS-485 Modbus RTU
- 8 digital, 3 analog, 1 pulse
- Safe Torque Off (STO)
- 24 VDC auxiliary power

STANDARD OUTPUTS

- 4 digital, 2 analog, 1 pulse
- 24 VDC supply for external sensors



SAFE TORQUE OFF

- Certified by TUV
  - SIL3 according to IEC 62061
  - Ple according to ISO 1.849-1
- Programmable EDM monitor output for status

The GA800 standard interface provides you with a crisp, large display that is intuitive and loaded with capability.

Copy Function

Multiple parameter sets can be stored and easily transferred to additional drives

High-Resolution Display

Large multi-language screen with contrast and backlight control

Automatic Back-up

Periodically copies parameters to keypad memory for safe keeping

Advanced Keypad

Fast scrolling, function keys, and shortcuts reduce your setup time

Micro SD Storage

Expandable memory (up to 32GB) for data logging storage

Real-Time Clock

Stamp events with dates and times.

Optional Bluetooth LCD Keypad

Wireless communication with your mobile device

Setup Wizard

Reduce configuration time using the setup wizard without any drive parameter knowledge

Ideal for dust collection, chip conveying, and pumping, the GA800 Configured Package provides a GA800 in a UL Type 1, 12, or 3R enclosure.

WIDE RANGE OF OPTIONS

- 240 or 480 VAC
- UL Type 1, UL Type 12, and UL Type 3R enclosures
- Input fuse or circuit breaker, including 65kA and 100kA options
- Network interfaces, analog, and digital I/O
- Hand/Off/Auto switch
- Speed potentiometer
- Keypad window

COMPASS 2

INDUSTRIAL PC

Scalable and Reliable Performance

Compass 2 uses an Industrial PC for the HMI and NC for faster-than-realtime tasks such as parsing, look-ahead, and path planning. Choosing the right PC is critical to ensuring optimal performance of your CNC system.

RECOMMENDED RUNTIME PC SPECIFICATIONS

- Windows 11 IoT Enterprise 2024 LTSC
- 16GB RAM
- CPU with 3400+ PassMark*1 Single Thread Rating or higher (e.g. Intel Core i3-1220PE)
- CPU with 16,000+ PassMark Multi-Thread Rating or higher (e.g. Intel Core i3-1220PE)
- 256GB solid state storage
- 2 Ethernet ports (one for network connection, one for dedicated controller communications)
- 3 USB 2.0 ports (one USB Type A port required for the License Key)
- Fanless
- UPS with automatic PC shutdown

ENHANCED PERFORMANCE UPGRADE RECOMMENDATIONS

- 32GB RAM or more for part programs exceeding 200MB or running additional applications
- Additional storage for additional applications or part programs
- Increased CPU performance, especially PassMark Single Thread Rating

CUSTOM SOLUTIONS

Yaskawa Engineered System Group

Let our experts create custom enclosures, cables, and operator stations to complete your Compass 2 solution. We can assist with design, component selection, panel layout, and wiring, combining top quality Yaskawa and 3rd party components.

iCUBECONTROL.COM

Yaskawa is the leading global manufacturer of low and medium voltage variable frequency drives, servo systems, machine controllers and industrial robots. Our standard products, as well as tailor-made solutions, are well known and have a high reputation for outstanding quality and reliability.

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