

YASKAWA – Company Introduction

Yaskawa Europe GmbH, YEU

January 2012



YASKAWA Electric Corporation

A global company



- World's largest producer of AC drives, Servo motion products and Robots.
- Yaskawa was first established in Japan in 1915 to produce electric motors.
- Employing 13,600 people worldwide.
- Achieving annual sales of 3 billion Euro. (End of Fiscal Year 2010)

1.800.000+



800.000+



20.000+



FY 2010/2011

17/01/2012

YASKAWA Electric Corporation Group Business



System Engineering Division



- Super-econo motor
- High-voltage inverter
- Electrical systems for steel plants
- Sewage treatment plant system



Motion Control Division



- AC/DC servo motor
- Servo controller
- Motion controller
- Programmable logic controller
- CNC controller



Drives Division



- Inverter
- ECOiPM
- PM Motors

Robotics Division



Industrial Robotics Business Div

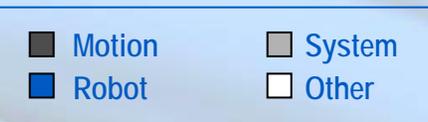
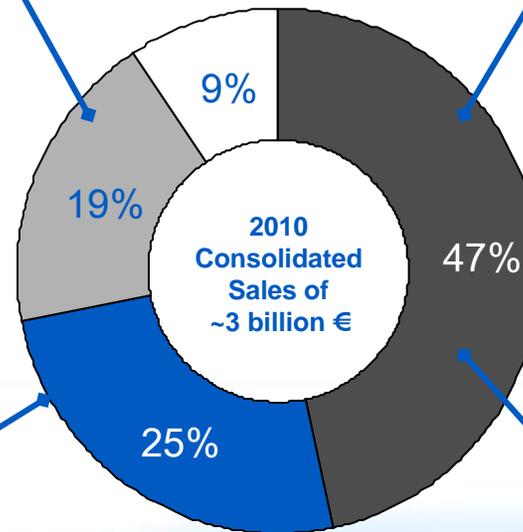
- Arc welding
- Painting
- Spot welding
- Handling

New Generation Robotics Business Div.

- New Generation Industrial Robot
- Medical and Welfare Support Robot

Clean Robotics Business Div.

- FPD Clean Robot
- Semiconductor Robot
- Semiconductor Related Equipment (Sorter/ EFEM)
- Vacuum Robot



YASKAWA Electric Corporation Worldwide



Yaskawa Europe GmbH



Yaskawa Electric Corporation



Yaskawa America Inc.



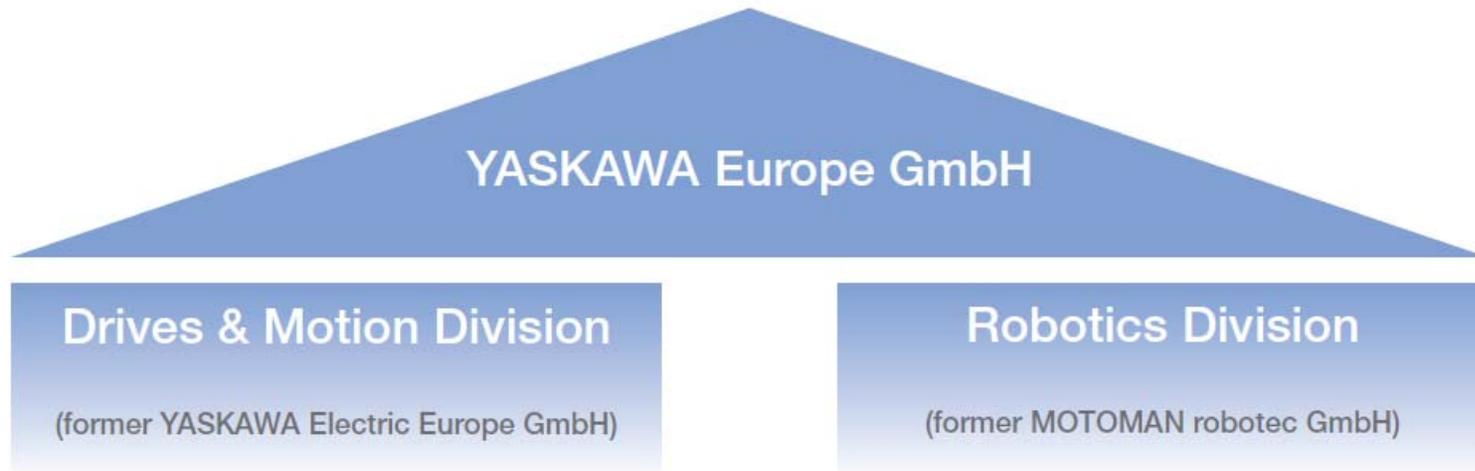
Yaskawa Electric (Singapore) Pte., Ltd.



Shanghai Yaskawa Drive Co., Ltd.



YASKAWA Europe GmbH a local partner in Europe



- Established in Europe since 1969
- About 1000 employees
- YASKAWA Electric Europe GmbH, Eschborn and MOTOMAN robotec GmbH, Allershausen merged to **YASKAWA Europe GmbH** with the two Divisions "Robotics" and "Drives & Motion".
- Combined **annual sales** of more than **340 million €** for Robot and Motion products

YASKAWA Europe GmbH a local partner in Europe



YASKAWA Europe GmbH
Robotics Division (Germany)



YASKAWA Europe GmbH
Headquarter
Drives & Motion Division
YASKAWA Academy



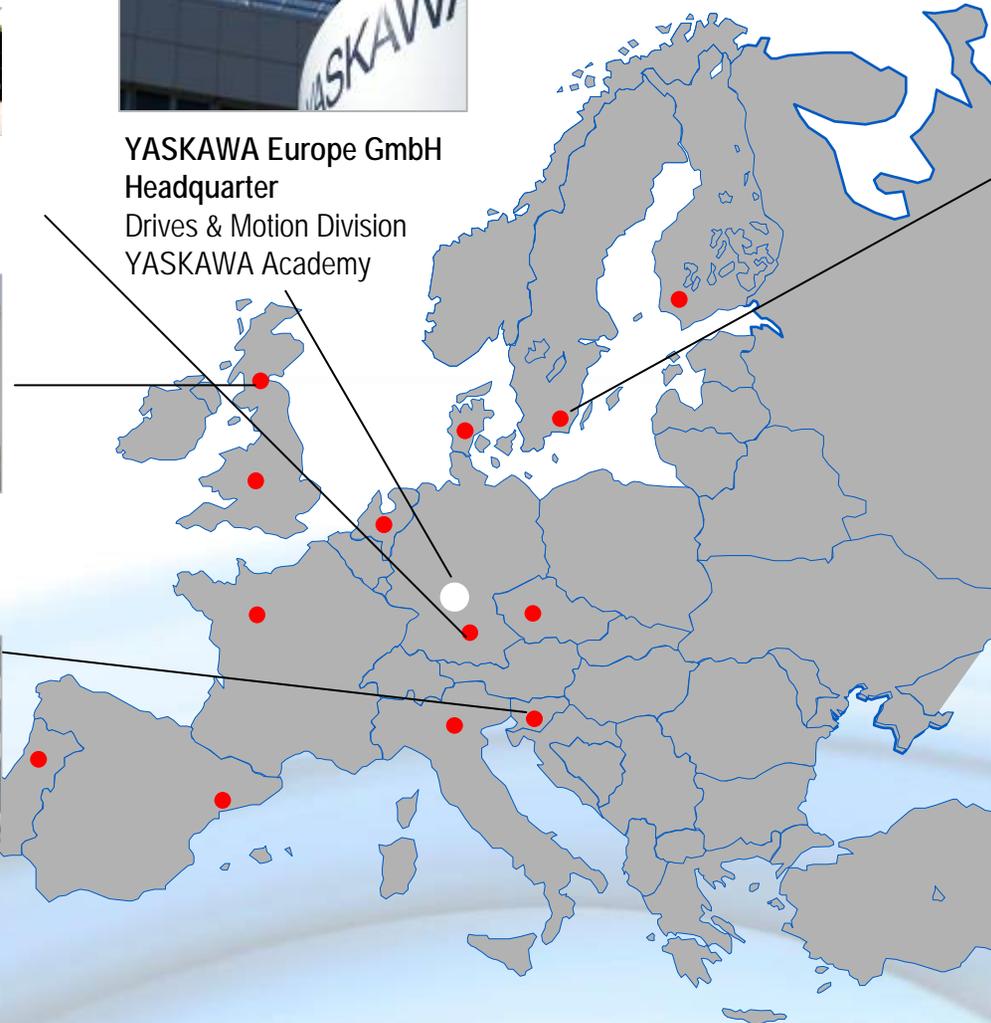
Production Robots
YASKAWA Nordic AB (Sweden)



Production Drives and Servo
Cumbernauld, Scotland



Production Robots
Ribnica (Slovenia)



- YASKAWA Europe GmbH
- YASKAWA Nordic AB
- YASKAWA Finland Oy
- YASKAWA Benelux B.V.
- YASKAWA France SARL
- YASKAWA Italia S.r.l.
- YASKAWA Iberica S.L.
- YASKAWA UK Ltd.
- YASKAWA Slovenia d.o.o
- YASKAWA Czech s.r.o
- YASKAWA Electric UK Ltd.
- YASKAWA Ristro d.o.o
- YASKAWA Europe Technology Ltd
- YASKAWA Engineering Europe GmbH

YASKAWA Academy



- with a 1,700 sqm air-conditioned area one of the biggest of its kind in Europe
- training concept certified according to „AZWV“
- practical trainings
- the most modern training places and presentation technologies
- trainings in most different languages
- comprehensive training consultation
- individual training plans for every single participant



YASKAWA

Drives & Motion Division



European Operations

- European Sales
- Drive and Servo Manufacturing
- Local Product Development
- Application Engineering / Tech-Support
- After Sales Service / Field Service and Repair



Drives & Motion Division - Manufacturing

Manufacturing in Cumbernauld, Scotland:

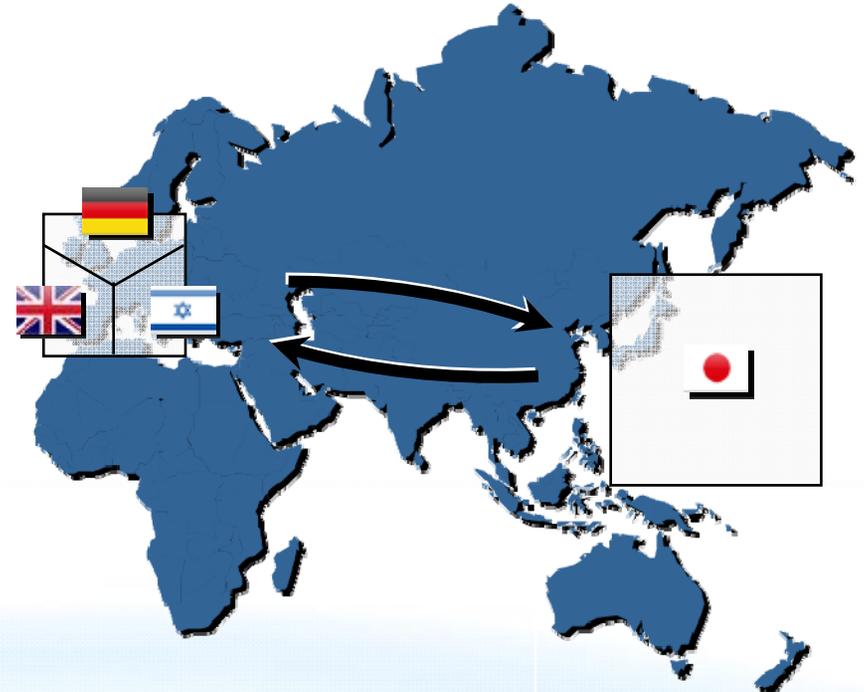
- Production facility for **AC inverters** and **Servo drive** products
- Capacity 30,000 units per month
- Automated and lean Manufacturing
- Flexible capacity adjustments to customer demands
- Customer specific assembly



Drives & Motion Division – local Development

Development Department (EuTC) :

- **Hardware-Design** engineers
- **Software** engineers
- **Mechanical design** engineers
 - i.e. housings for special applications
 - Linear Sliders
- **Integrated network** with R+D at HQ in Japan



Focus:

- **Customisation** for European OEMs
- Adaptations / Enhancements for **European Markets**
- **Localisation** of Products

Drives & Motion Division – Application Engineering

Dedicated experienced Engineering Teams

- Drives Product Line
- Servo + Controller Product Line

Focus:

- Product line specific **technical support**
- **Application specific support**
- Customer **trainings**
- Customer / Application specific **SW development**
- **Field Application support**



YASKAWA EEU

After Sales and Engineering Services



Yaskawa Engineering Europe - EEU:

- 50 Employees
- HQ in Germany
- Local Branches in Italy – UK - France

Focus:

- On site **Field Service**
- **Product Repair Service**
- Partner for predictive **Maintenance**
- **System Engineering Services**



YASKAWA YEU Product Portfolio

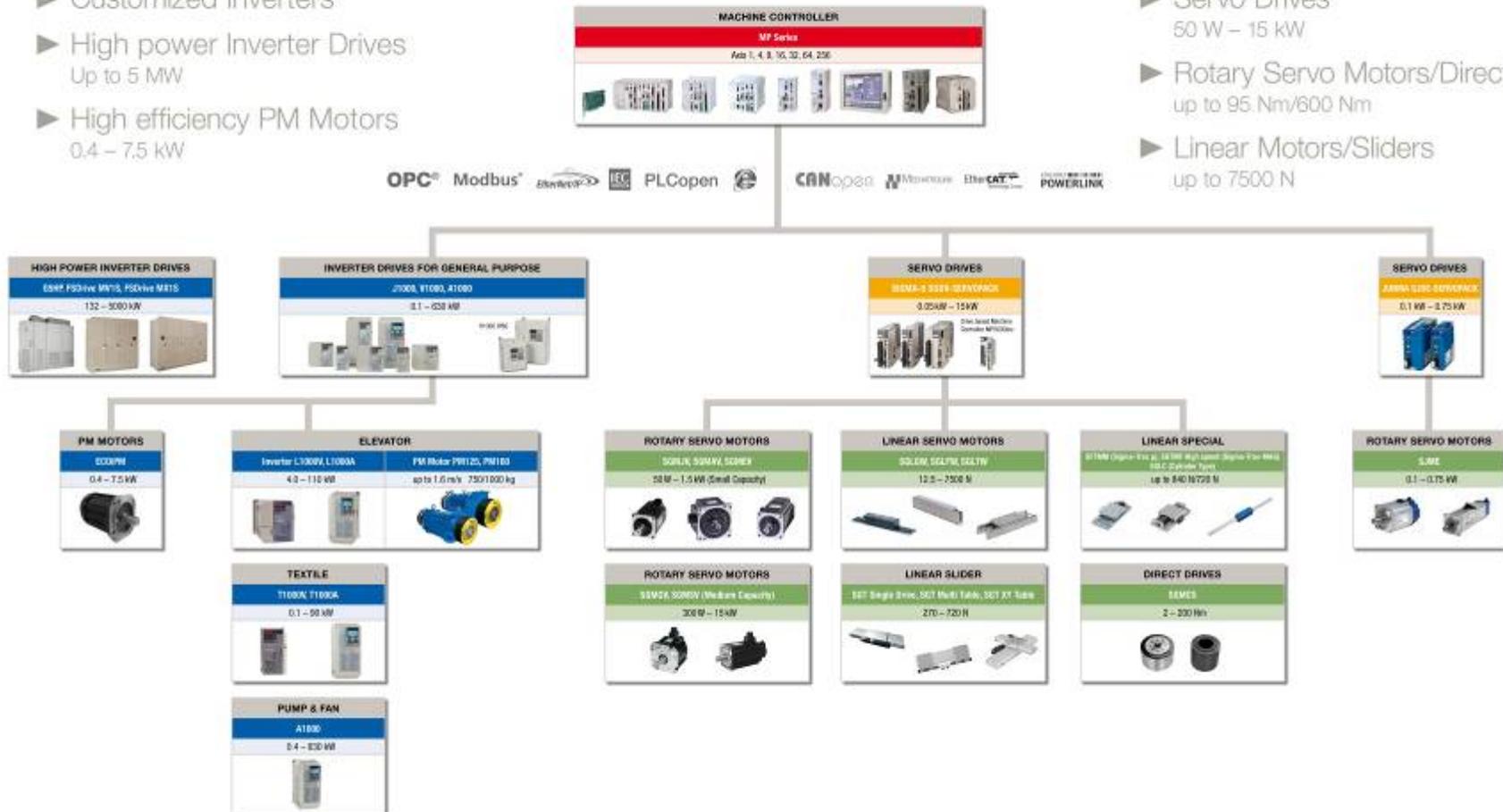


INVERTER DRIVES

- ▶ Inverters for standard applications
0.1 – 630 kW
- ▶ Customized Inverters
- ▶ High power Inverter Drives
Up to 5 MW
- ▶ High efficiency PM Motors
0.4 – 7.5 kW

MOTION CONTROL

- ▶ Machine Controller
up to 256 axes
- ▶ Servo Drives
50 W – 15 kW
- ▶ Rotary Servo Motors/Direct C
up to 95 Nm/600 Nm
- ▶ Linear Motors/Sliders
up to 7500 N



YASKAWA YEU Product Portfolio



YASKAWA

a leader in Inverter technology



- Most comprehensive range of AC inverter drive products available today.



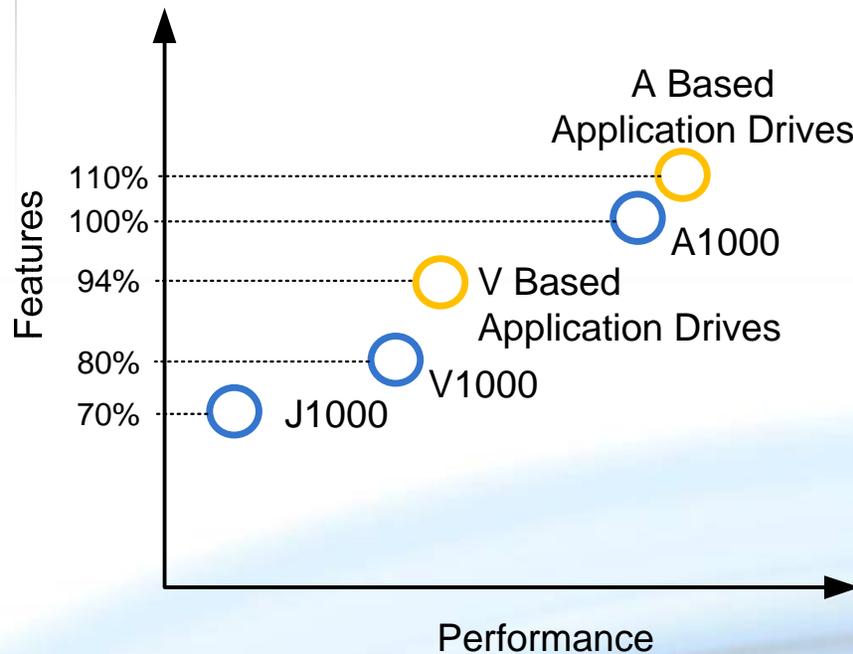
- Drives designed to run **induction and permanent magnet** motors.
- Simple setup and predefined **wizards**.
- Global standards Compliance **CE, UL, cUL**
- Compliant with EU's **RoHS** and **REACH** directive.
- **System connectivity** with MECHATROLINK, Devicenet, Profibus-DP, CC-Link, CANopen, Lonworks, MEMOBUS.
- **Mid Voltage** Inverters

YASKAWA Inverter Innovation Review

- 1971** First company to introduce a Transistor Inverter Drive
- 1974** First company with the Flux-Vector-Inverter Drive
- 1978** The first YASKAWA Inverter with Vector Control
- 1985** First to create a Sensor-less Flux Vector-Inverter
- 1989** First to use IGBTs for low noise inverters
- 2001** First to offer 3-Level Inverters
- 2003** First to produce Matrix Inverters
- 2008** YASKAWA produced its 10.000.000th Inverter

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Products Overview - Positioning



➤ Basic Drive Line Up

For standard applications with different demand levels

- J1000
- V1000
- A1000

➤ Application Drives

With ADDED VALUE for specific needs

- L1000V/A
- T1000V/A

➤ Customer Specific Drives

Totally customized

- K1000V
- K1000A

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Products Overview - Positioning



■ Basic / General Purpose Drives

J1000

- Easy to use – everyone can set up
- Offers basic performance for low demanding applications
- Cost efficient

V1000

- Still easy to use Allrounder (IM and PM)
- medium flexibility (lots of integrated functions, DWEZ, ...)
- medium performance
- IP66 version

A1000

- High performance (CL)
- Allrounder
- full power range, up to 630 KW
- highly flexible (IOs, Options, Software, DWEZ, ...)
- IP54 version



Products Overview - Positioning

- **Application Drives – ADDED VALUE for Specific Needs**

Drives that supply ADDED VALUE that saves effort on customer side!

L Drives – Specialists for Elevators

- Control sequence (Speed, Brake, MC, Rescue, IOs, Ride Profiles, ...)
- Motor Control (Current boost,...)
- Ride Comfort (slip comp for stopping precision, rollback prevention, ...)
- Adapted I/Os (Relay output, ...)
- Setup in „Elevator Language“ (Parameter naming, units, ...)
- High performance PM control, PM/Encoder stationary tuning, Endat, ... (L1000A)

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Products Overview - Positioning

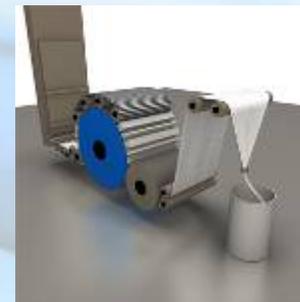
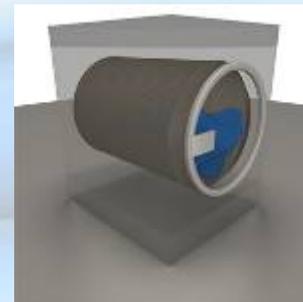


■ Application Drives – ADDED VALUE for Specific Needs

Drives that supply ADDED VALUE that saves effort on customer side!

T Drives – Inverter Drives for Textile Applications

- Cold Plate Drives to adapt to Heat Sinks suitable for Textile
- Speed Synchronisation as Standard
- Power Loss Ride Through Function
- Textile specific Drive Design
- 24h non-stop Operation
- PCB Coating



■ Application Drives – ADDED VALUE for Specific Needs

Drives that supply ADDED VALUE that saves effort on customer side!

T1000A – High Performance Inverter Drives for Textile Applications

- Heat sink and cold plate versions for water cooler mounting available (finless = fanless)
- PCB coating suitable for textile production – for highest reliability in typical textile applications
- Power loss ride-through function – safe operation status at all times, including
 - for synchronised drives with shared DC link
- Pulse Train Output and Pulse Train speed reference - easy and effective synchronised line speed
- Traverse function - for optimised yarn winding
- High precision open- and closed loop control of induction and permanent magnet motors
- Optional cards available for all major serial networks:
 - PROFIBUS-DP, DeviceNet, CC-Link, CANopen, MECHATROLINK, etc.

Rating:

- 3 ~ 200 V 240 V +10%/-15%, 0.55 kW – 110 kW
- 3 ~ 380 V 480 V +10%/-15%, 0.55 kW – 185 kW



■ Application Drives – ADDED VALUE for Specific Needs

Drives that supply ADDED VALUE that saves effort on customer side!

T1000V – Compact Inverter Drives for Textile Applications

- Heat sink and cold plate versions for water cooler mounting available
- PCB coating suitable for textile production – for highest reliability in typical textile applications
- Power loss ride-through function – safe operation status at all times, including
- for synchronized drives with shared DC link
- Traverse function – for optimized yarn winding
- Sensorless control of induction and PM motors

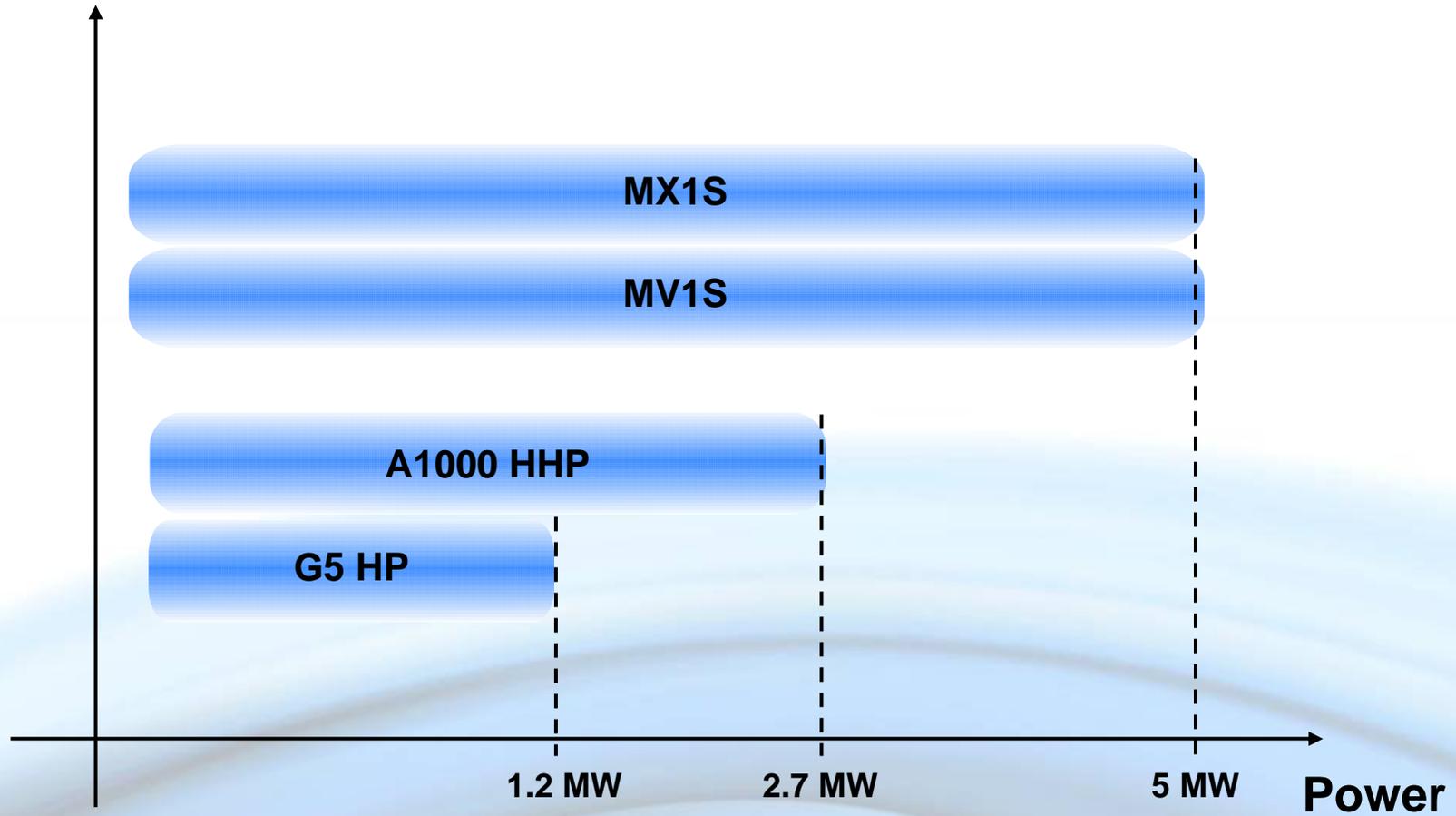
Rating:

- 1 ~ 200 V 240 V +10%/-15%, 0.1 kW – 3.0 kW
- 3 ~ 200 V 240 V +10%/-15%, 0.1 kW – 18.5 kW
- 3 ~ 380 V 480 V +10%/- 15%, 0.2 kW – 18.5 kW



High Power Products: Current and to Come

Performance



YASKAWA Inverter Applications in Europe



- Conveyors
- Pumps
- Textile
- Lift
- Cranes & Hoists
- Compressors
- Vacuum Pumps
- Winder
- Packaging / Food and Beverage

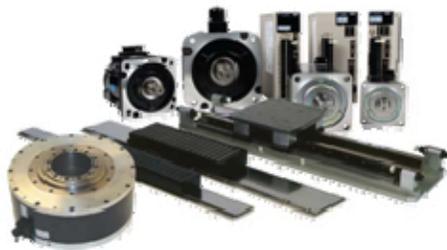


YASKAWA

a leader in Servo technology



- Exceptional dynamic performance in the most compact package available.
- Range of servo product covers rotary, linear and direct drive technology.
- System connectivity, MECHATROLINK, Profibus, Devicenet, EtherCAT, CANopen.
- Designed in ease of use with auto configuration and auto-tuning.



YASKAWA Motion Control Products



Machine Controllers



Servo Drives Sigma-5 Series



Servo Drives Junma Series



Sigma 5 - Product Line Up Amplifiers

4 Types of Amplifiers

- MECHATROLINK-2
- MECHATROLINK-3
- Analog & Pulse
- Command Option Attachable Type

Power Supply 1AC 230V

- 50W to 1,5kW

Power Supply 3AC 400V

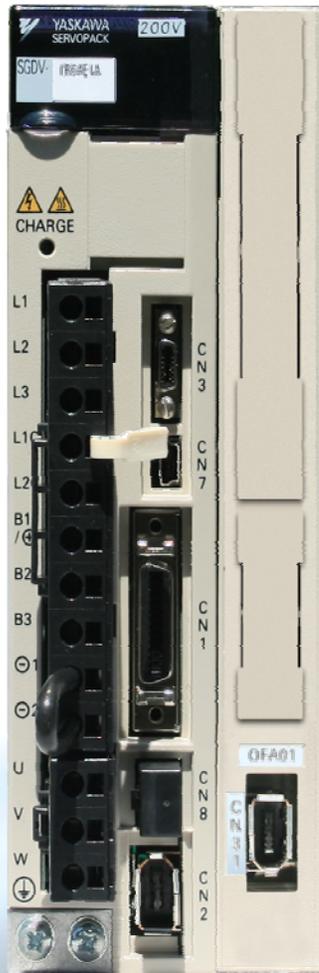
- 500W to 15kW

Integrated Safety

- Stop Category 0
- STO (Safe Torque Off)



Sigma 5 - General Options – suitable for all types of amplifiers



2nd Encoder Input

available

Safety Module

STO, SS1, SS2, SLS

available

3rd Party Encoder 1

EnDat 2.1, EnDat 2.2, Hiperface

Mass Production 06 / 2011

3rd Party Encoder 2

Resolver, Sin / Cos, A / B

Mass Production 09 / 2011

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Sigma 5 – Functional Safety



Integrated Safety

EN 954-1:

Safety Category 3

IEC 61508 :

SIL2

EN ISO 13849-1:

PL d

EN 60204-1 (VDE 0113):

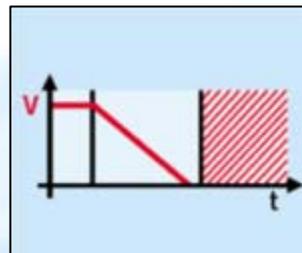
Stop Category 0

IEC 61800-5-2:

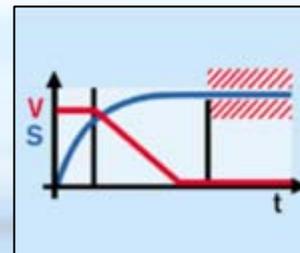
Safe Torque Off (STO)



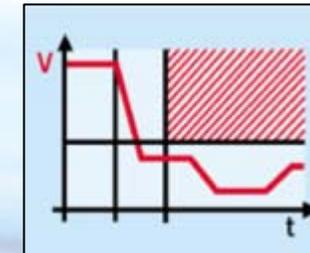
Optional Safety



IEC 61800-5-2:
Safe Stop 1 (SS1)



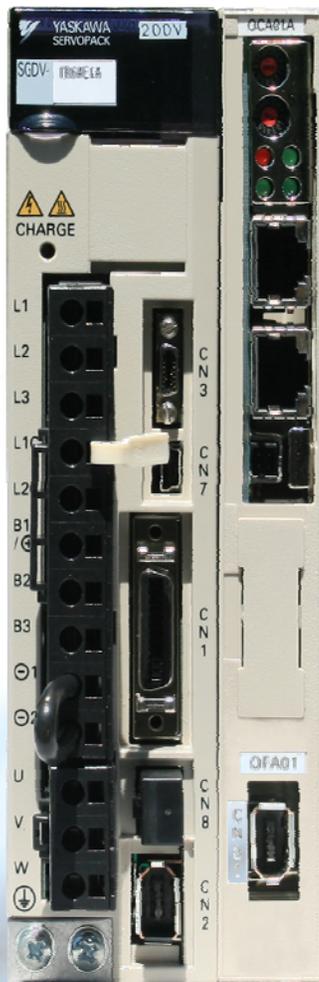
IEC 61800-5-2:
Safe Stop 2 (SS2)



IEC 61800-5-2:
Safely Limited Speed (SLS)

YASKAWA

Sigma 5 – Command Options



CANopen	available
EtherCAT / CoE	available
Indexer	available
Powerlink	available
MP2600iec	available
Profinet	Samples Q1 2012 Mass Production Q2 / 2012

Sigma 5 – Product Line Up Servomotors

5 Motor Families, 42 Models

SGMAV: 200VAC, Low Inertia

- 50W to 1kW (8 Models)

SGMJV: 200VAC, Medium Inertia

- 50W to 750W (5 Models)

SGMEV: 400VAC, Low / Medium Inertia

- 100W to 1,5kW (11 Models)

SGMGV: 400VAC, Medium Inertia

- 300W to 15kW (11 Models)

SGMSV: 400VAC, Low Inertia

- 1kW to 7kW (7 Models)



Sigma 5 – Product Line Up Direct Drive Motors

Direct-Drive-Motors

- SGMCS-Series
- Nominal Torque 2Nm to 200Nm (17 Models)
- Nominal Speed 150rpm, 200rpm
- Absolute Encoder 20bit



Sigma 5 – Product Line Up Direct Linear Motors

3 Motor Families, 39 Models

Ironless

- SGLGW: 200 VAC
- Peak Force 40N to 3000N (17 Models)

Ironcore

- SGLFW: 200 / 400VAC
- Peak Force 86N to 2400N (14 Models)

Ironcore, no magnetic attraction force

- SGLTW: 400 VAC
- Peak Force 600N to 7500N (8 Models)



Sigma 5 – Product Line Up Linear Sliders

SGT-F-35



Nominal Force: 80 - 160N

Peak Force: 220 - 440N

Stroke: 103 - 2183mm

SGT-F-50



Nominal Force: 280 - 560N

Peak Force: 600 - 1200N

Stroke: 144 - 2169mm

SGT-F-1Z



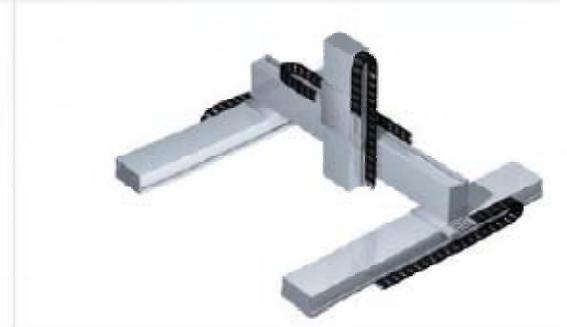
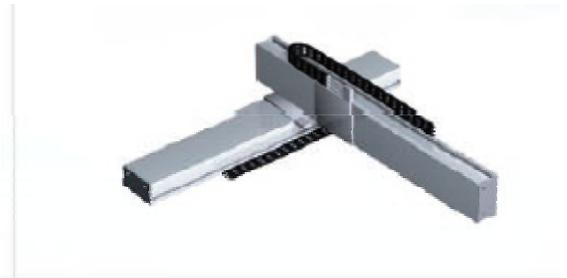
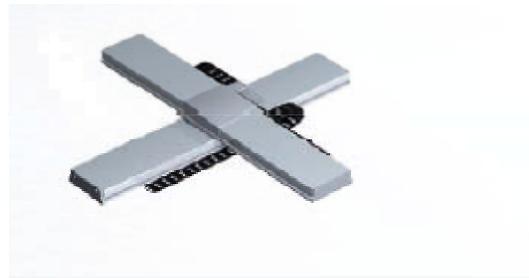
Nominal Force: 560 - 2250N

Peak Force: 1200 - 2400N

Stroke: 104 - 2129mm

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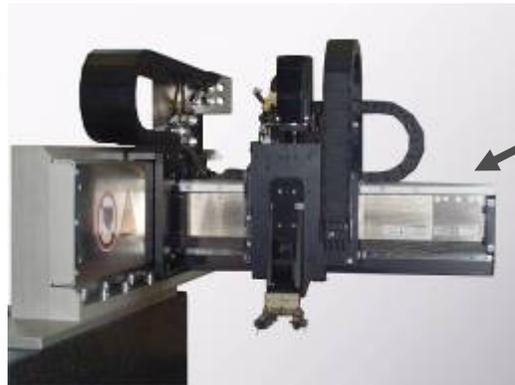
Sigma 5 – Linear Sliders – Build Variations



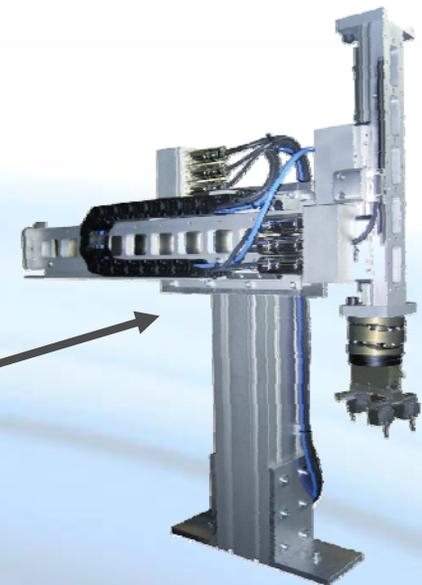
Sigma 5 – Linear Sliders – Customer Specific Solutions



Carbon Fiber Bridge
Less Weight
Highest Dynamic



X-Axis Carbon Fiber
Less Weight
Highest Dynamic



Pick & Place
High Speed
High Dynamic
Cycle Time < 0,9sec
Plug & Play

YASKAWA



Junma Series – Motors Series SJME

200VAC, Medium Inertia

4 Sizes, with / without Brake

Nominal Power: 100W
 200W
 400W
 750W

Nominal Speed: 3000rpm

Analog-Encoder, 10.000 Increments / Revolution



YASKAWA

Junma Series – Amplifier Series SJDE



1 AC 230V Amplifiers with Pulse Input

1 AC 230V Amplifiers with Mechatrolink-2 Motion Bus

4 Sizes

100W, 200W, 400W, 750W

Tuning Less Function

4 Status LEDs



YASKAWA

a technology leader with controls



- Stand-alone control or PC based control for servo motion.
- Single axis control up to 256 multi axis without performance compromise.
- Extensive functionality master slave, circular & linear interpolation, electronic-cam and multi axis synchronisation.
- IEC61131-3 programming.

YASKAWA

Machine Controllers MP Series



MP2100, MP2200, MP2300, MP2400

- Compact or modular, universal Machine Controllers
- Up to 256 axes
- Execution of large programs in short time
- Precise and fast positioning
- High performance multi axis synchronization

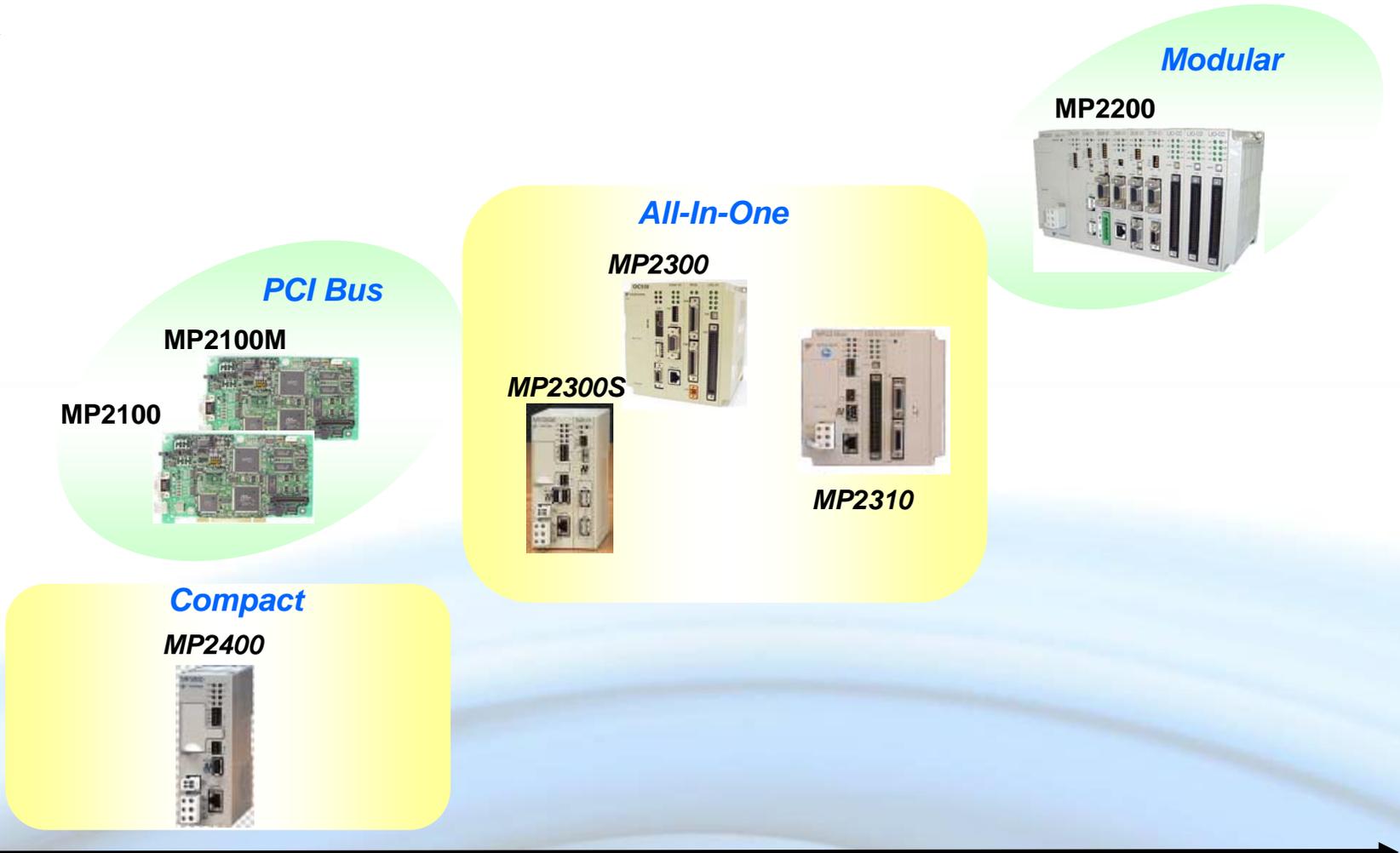
MP720 (Programming Tool)

- Easy to use, Windows based programming
- Ladder Programming
- Motion Language
- Re-use of application software

YASKAWA Machine Controllers MP 2000 Series

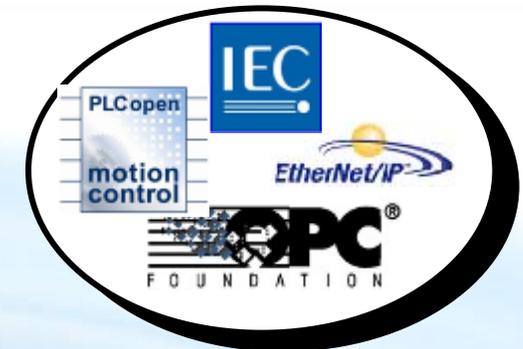
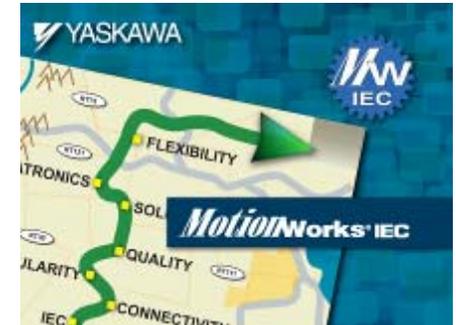


Functionality ↑



MP2300Siec, MP2310iec

- Compact, flexible Machine Controllers
- Up to 16 Axes
- Point-to-Point
- Pick & Place
- Flying Saw
- Register Control
- Indexer
- Electronic CAM



MotionWorks iec (Programming Tool)

- IEC61131-3 Development Environment
- PLCopen Functions-Blocks for Motion Control

YASKAWA

Motion & Control Applications



Yaskawa's Motion Control Products are suitable for very demanding Motion Applications with highest Dynamic, absolute Precision, fastest Positioning and perfect Multi-Axis-Synchronisation

Multi-Axis Synchronisation	<ul style="list-style-type: none">• Wood & Metal• Printing• Glass• Converting 
Fast Positioning	<ul style="list-style-type: none">• Electronic Components• Packaging• Pick & Place• Semiconductor 

Why do you need reliable products?

- to reduce maintenance cost to a minimum.
- to reduce cost for spare parts and logistics.
- to reduce loss of production caused by device fault.

Therefore YASKAWA pays special attention to the design and parts evaluation!

YASKAWA Robotics Division



- More than 700 employees in Europe
- Turnover about 180 Mio. Euro
- Industrial robots, turnkey systems, Total Customer Support
- Covering important industrial sectors: Automotive, Food/Packaging, Logistics



YASKAWA Robotics Division Applications



- arc + spot welding
- cutting
- milling
- trimming
- polishing
- bonding
- painting
- assembling
- handling
- picking, packing, palletizing
- measuring



YASKAWA Robotics Division

Product portfolio



- MOTOMAN industrial robots 3kg to 800 kg payload
- robot controller DX100
- positioner
- plant construction
- safety engineering
- handling systems
- equipment
- portals and tracks
- software
- TCS - Total Customer Support:
 - maintenance
 - spare parts
 - training
 - repair
 - used robots / retooling



...tomorrow's robotics today!

MOTOMAN DX100 control unit



- Patented Multi-Robot-control for **up to 8 robots**
- Patented Multi-Robot-control for **up to 72 axes**
- Multi-window display
- User-friendly **function setting without parameter list**
- **Programming** of I/O signals and variables **with direct names**
- Extended programming language
- Improved welding quality
- **Reduced programming time**
- **Up to 25 % energy savings**

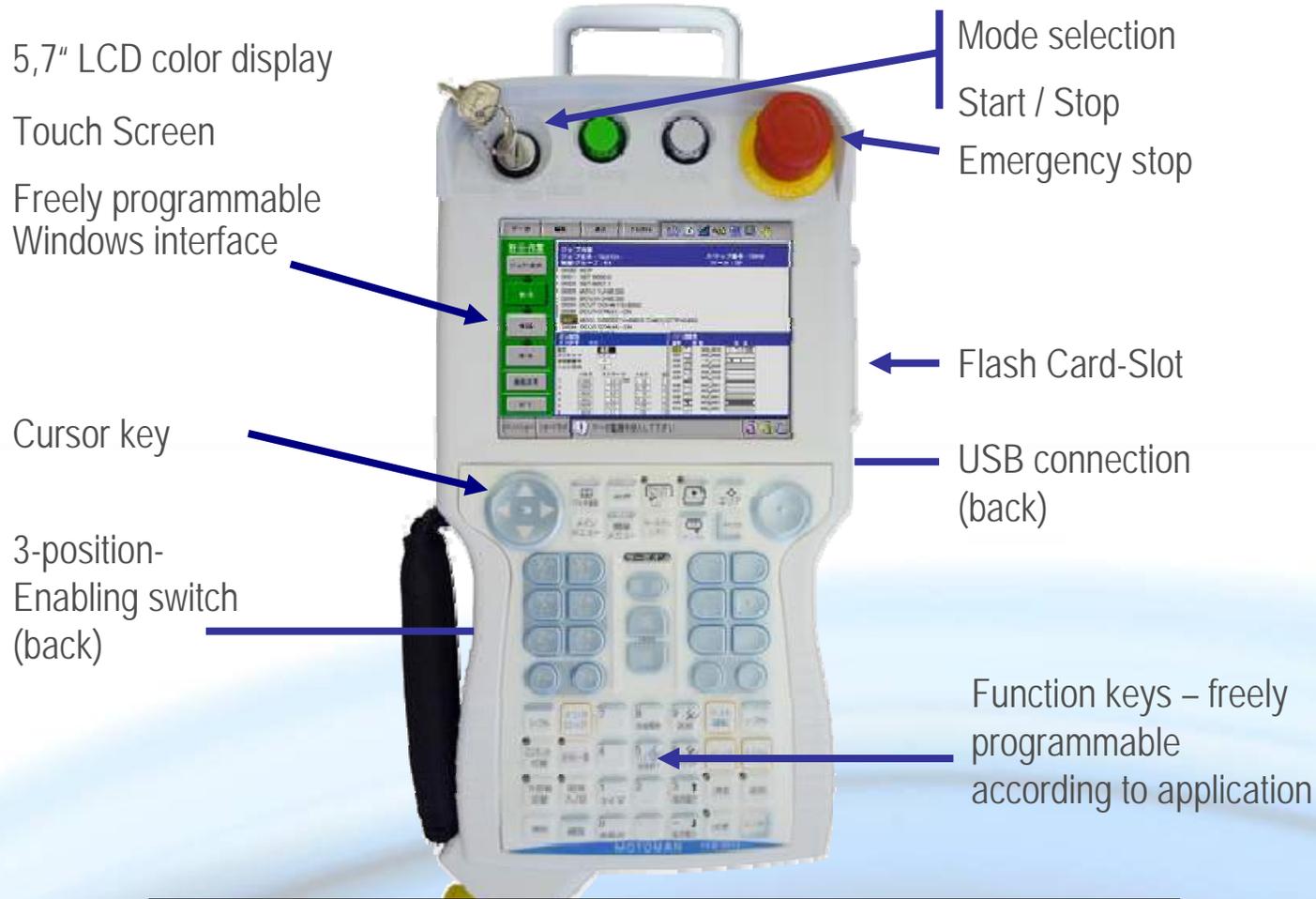


Advantages over NX100:

- **more power!**
- **more functions!**
- **more user friendly!**
- **less energy consumption!**

...tomorrow's robotics today!

MOTOMAN DX100 – teach panel ergonomic, lightweight and clearly laid out

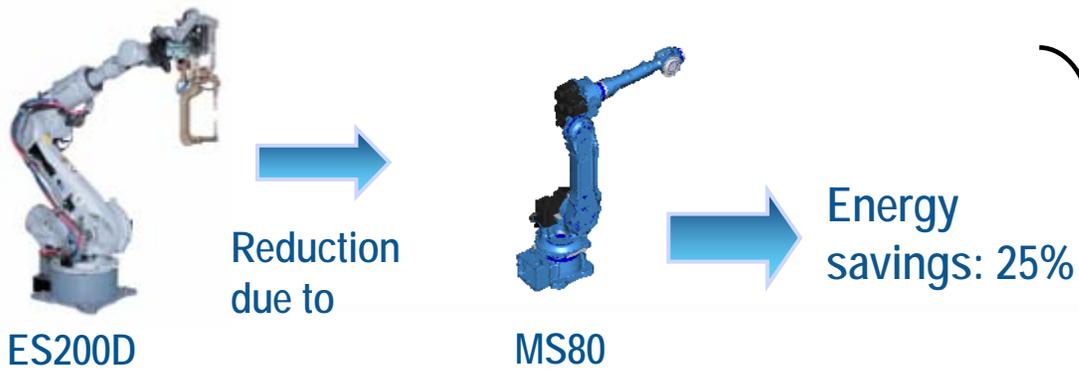


The teach pendant (PHG) – only 0.99 kg!

...tomorrow's robotics today!

Reduction of ongoing costs

1. Energy savings with smaller manipulators



2. Energy savings due to energy saving mode

Servo drives are being turned off in case of longer wait times.

Conditions

- run time: 16 hours/day
- wait time: 8 hours/day in case of 24h operation

→ Energy savings: 25%

Total energy savings: 50%

...tomorrow's robotics today!

PC Software "MOTOSOFT"



MOTOSOFT represents the brand for software products in the environment of YASKAWA's Motoman robots:

Apart from application specific software packages like MotoPick, MotoBend, MotoPal etc. there is a number of basic software packages to support the robot operator & user in their daily business.

- Offline programming / Simulation:

MotoSimEG/VRC (Offline-Programming and Simulation)

JobEditor32 (Job Editing)

LadderEditor32 (Programming of internal PLC)

MotoCalv32 (Robot and Tool Calibration)

- Backup & File exchange:

FDDWIN32 (Data Backup Software)

JobExchanger32 (Remote Data Backup Software)

MotoDCI32 (PC based Memory Expansion Software)

- SDKs (for building customized applications):

MotoCom32 (Development Package for PC-Software)

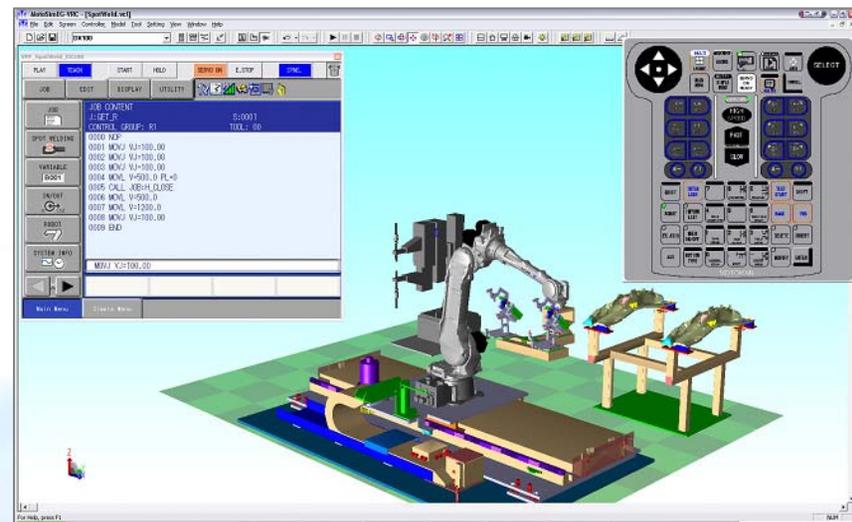
MotoPlusSDK (SDK for VxWorks Development)

PP-CustomizationSDK (SDK/Framework for PP Development)

- Remote access

MotoAdmin (Remote Access Tool)

MotoOPCServer (OPC-Server-Software)



MotoSimEG-VRC

...tomorrow's robotics today!

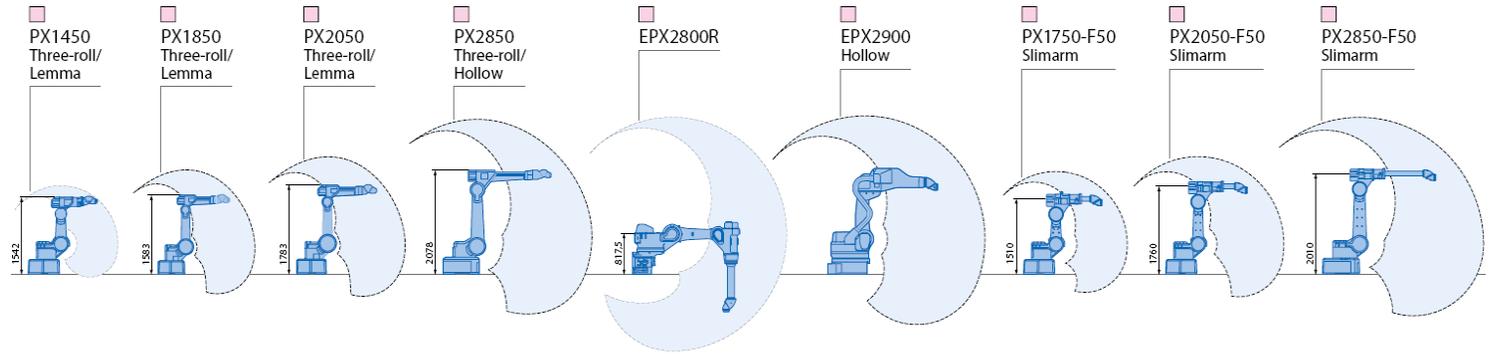
MOTOMAN palletizing robots (4 and 5 axis)



	MPL80	MPL100	MPL160	MPL300	MPL500	MPL800
Number of axes	5	4	4	4	4	4
Max. payload (kg)	80	100	160	300	500	800
Repeatability (\pm mm)	0,07	0,5	0,5	0,5	0,5	0,5
Working envelope (mm)	2,046	3,159	3,159	3,159	3,159	3,159

...tomorrow's robotics today!

MOTOMAN painting robot (6 axis)



	PX1450	PX1850	PX2050	PX2850	EPX2800R	EPX2900	PX1750F-50	PX2050F-50	PX2850F-50
Max. payload (kg)	10	10	10	10	15	20	15	15	15
Repeatability (± mm)	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Working envelope (mm)	1,457	1,835	2,035	2,829	2,825	2,900	1,757	2,054	2,833
Weight (kg)	345/360	360	370	570	820	980	410	420	640
Installation type Floor, Wall, Ceiling	F, W, C	F, W, C	F, W, C	F	W	F	F, W, C	F, W, C	F



...tomorrow's robotics today!

MOTOMAN Industrial robots (6 axis)



Advantages:

- compact
- „Slim Arm“ format
- extremely fast
- energy saving
- cost saving



	MA1900 series	ES280D series	MH50 series	HP20D series	UP350D series
Max. payload (kg)	3	280	50	20	350
Repeatability (± mm)	0.08	0.2	0.07	0.06	0.50
Working envelope (mm)	1,904	2,446	2,061	1,717	2,542
	Further models: - MA1800	Further models : - ES200D - ES200RD - ES280D-230	Further models : - MH50-20 - MH50-35	Further models : - HP20D-6	Further models : - UP350D-350 - UP350D-600

...tomorrow's robotics today!

MOTOMAN SIA50D (7 axis): The only 7 axis robot among the global players!



Strong advantages:

- extremely powerful
- improved product version
- 7 controlled axes for an extreme freedom of movement
- max. payload: 50 kg
- repeatability +/- 0.1 mm
- working range: R = 1,630 mm
- highest flexibility in the working range
- due to its slim body, the SIA20D enables a system installation in confined spaces
- ultra light servo drives
- floor, wall or ceiling installation



...tomorrow's robotics today!

MOTOMAN SDA10D and SDA20D (15 axis!): worldwide unique!



Strong advantages

- 15 controlled axis
- (each arm 7 axis + 1 rotation axis)
- max. payload per arm 10 resp. 20 kg
- repeatability +/- 0.1 mm
- working area per arm:
R = 720 mm, resp. R = 910 mm
- ultra light servo drives
- newest most flexible arm system
- co-ordinated movements of the arms in
different kinds of interpolations
- installation: floor, wall, ceiling



...tomorrow's robotics today!

MOTOMAN MPP3 (Delta robot): The fastest on the market!



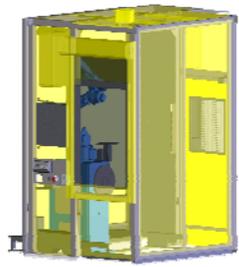
Strong advantages

- payloads with unprecedented speed:
 - 140 cycles per minute with 3 kg payload
 - 230 cycles per minute with 1 kg payload
- total stroke of 500 mm with a working range of 1,300 mm
- high-precision high-speed conveyor tracking
- maximum machine accuracy
- space saving installation directly above the conveyor
- protection classification IP65 (IP67 optional)

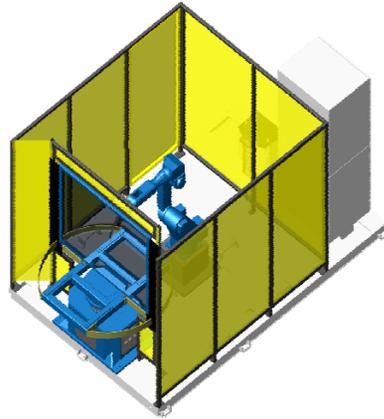


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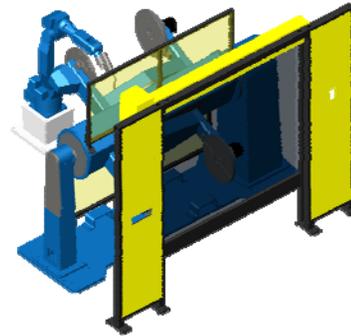
Robot cells



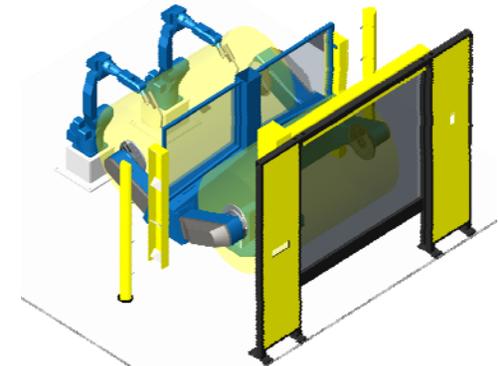
Compact cell
„Small Cell“



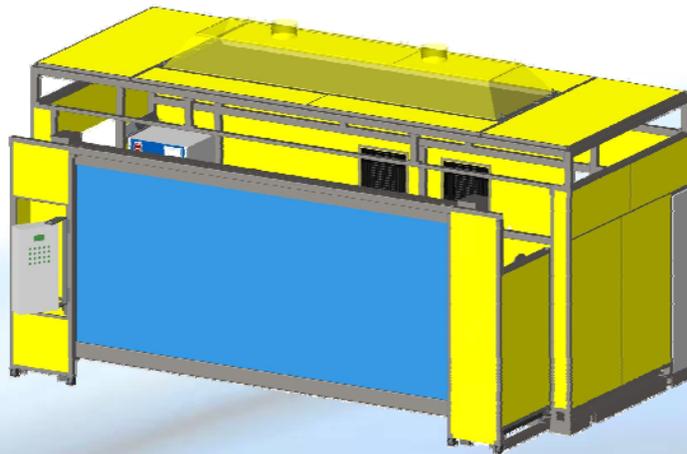
Compact cell RVE



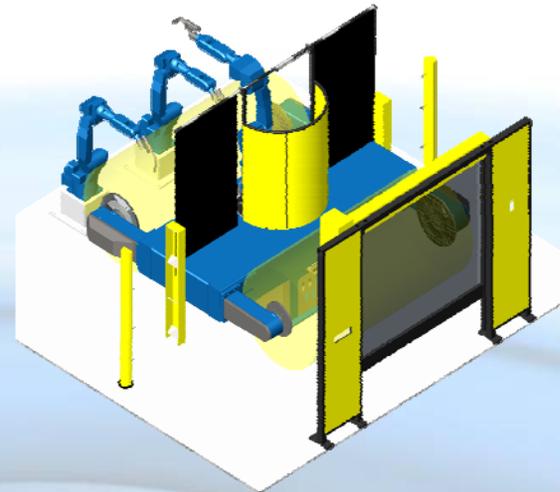
Robot cell with positioner and
MOTOMAN-UP20



Robot cell with positioner
and 2 x MOTOMAN-UP20



Robot cell with flexible roll door



Robot cell
with positioner and
3 x MOTOMAN-UP6

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System integration and robot systems: Our turnkey systems for YOU!



Result of our long years of experience in systems engineering are the numerous and successful solutions for our customers.

Individual system concepts are our core competence.

To realize our projects we place on the comprehensive expertise of our engineers



device construction



standard compact cell



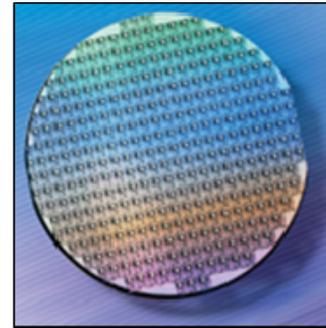
interlinked welding lines



25 t positioner

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YASKAWA in the Automation business:



 **YASKAWA**
a global company –
a technology leader –
a local partner.

