AutomationWare™

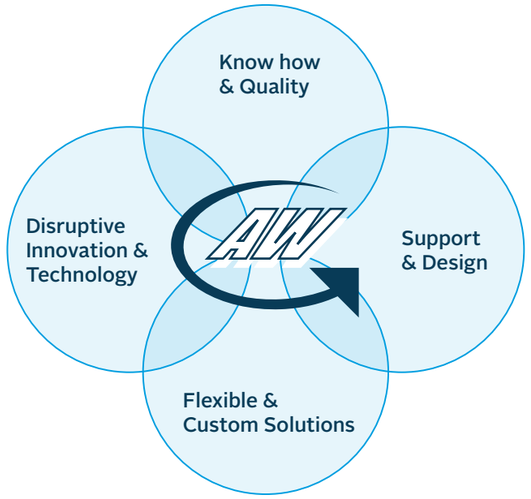
brought to you by IKO

EMBEDDING MECHATRONICS vs. COBOTICS LIFE

If you can dream it,
now with us you can do it!

Mission

Provide mechatronic and combined robotic. Solutions with the best technological fit and suitable for your applications, with great attention to quality and reliability to be used in a collaborative and safe perspective, minimizing the impact on energy consumption and always respecting the environment.



Key values

The industrial market requires **quality solutions, reliable, flexible, adaptable and customized.**

AutomationWare offers a range of products for tailor-made mechatronic and robotic solutions of customer.

ROS

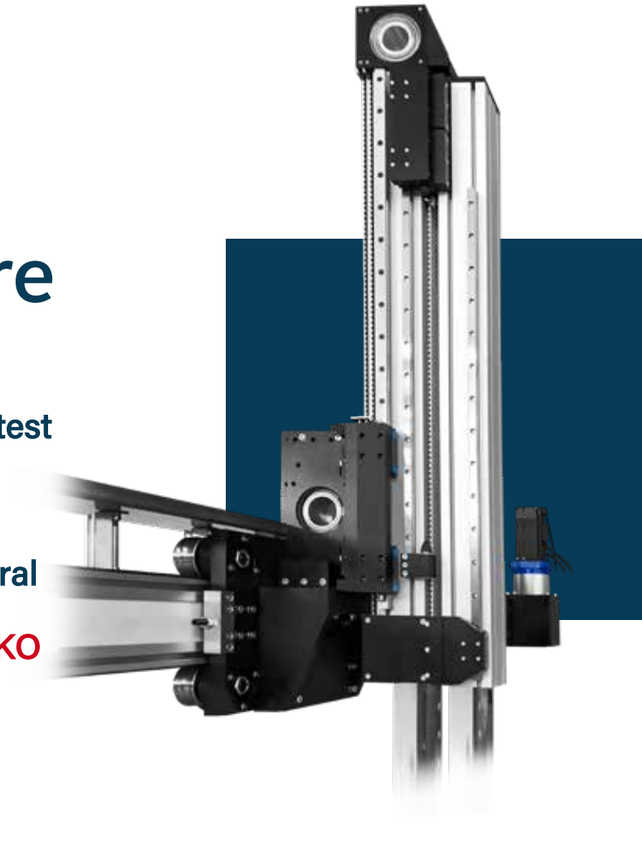
Attribution:
ROS is a trademark of Open Robotics.

Mechatronics combined with modular robotics

AutomationWare and IKO

Working together to bring you the latest in advanced automation products.

IKO technology can be found in several AutomationWare Mechatronics and Robotics components. Look for the IKO inside logo.



IKO is the master distributor in the US for **AutomationWare**. This collaboration introduces a new series of products, axes and actuators that use **IKO** Bearing and Linear Guides products. Look for the **IKO** inside logo.

About IKO

With over 50 years of experience operating in the United States, **IKO** products have become well know for their quality and technological innovations. Their numerous proprietary technologies and a wealth of experience enable them to develop these high-quality products. **IKO**'s main product lines include needle roller bearings, linear motion products and mechatronic products all engineered with the Innovation, Know-how and Originality that earned **IKO** the world-wide reputation for quality and innovation.

AutomationWare
One step ahead on the future

The new headquarter 5000 m^2 to innovate

Research & Development

AutomationWare invests heavily in R&D and collaborates with research organizations to lead on next gen development of new products.

It is thanks to an effective collaboration with the Advance Research Centre in EU, that we have evolved skills on the **ROS** *(Robot Operating System).*

We develop our robotic systems for industrial and research applications. Next generation robotics is now moving on open source platforms enabling powerful Kinematics in combination of 2-3D visual analysis.

We evolve SolidWorks CAD for fast and punctual design. But also, to evolve vs. URDF robotics files to adapt modularity to robotics and mechatronics. *(Unified Robotic Description Format).*

The possibility of carrying out virtual tests *(FEM analysis)* is a guarantee of constant improvement of the quality of the project.

Quality first

Testing systems to give the highest quality to our customers:

- Qualified and traceable components
- We always keep up to date on the latest technological innovations
- We strive for continuous improvement to offer quality to our customers
- We produce according to **Lean** manufacturing

We integrate robotic solutions with mechatronic. technology by obtaining robot-machine synchronization.

We use industrial field buses, such as **EtherCat**, for the control of robotic joints and actuators.

We calibrate our system to be precise and realisable on the applications.

AutomationWare
is headquartered in Venice

Our production plant

The new **Ind. 4.0** factory is a centre of excellence for mechatronic and robotics.

All production cycles are networked thanks to a last generation fiber optic connectivity.
State-of-the-art **Solidworks** technologies integrate the **CAD/CAM** technology in the process guaranteeing executive quality in the evolution of the project. Our **CNC** technology is based on last generation equipment to produce high quality and precision on semi-finished products.
*(machining centres **5-Axes Mazak**)*

Modern **automatic warehouses** ensure an efficient items storage and protection, in order to maintain the components integrity and accelerate delivery times; the last step in a production process so designed to drastically lower time to market *(**just in time system**)*.

A live demo area enables our customers to find the best solution for their production needs.

Plan to visit our factory, meet our designers to define your next Robotic solutions

AutomationWare
Mazak a 5 Assi
Icam Silo2 - opposite page

Several reasons to accelerate innovation from pneumatic or hydraulic technology to Ind 4.0 E-actuation

	E-Actuators	Pneumatic solutions	Hydraulic solutions
Thrust force	Good	Mediocre	Excellent
Accuracy	Excellent	Good	Good
Control	Excellent	Good	Good
Maintenance	Low	High	High
Repeatability	Excellent	Mediocre	Mediocre
Safety	Excellent	Good	Mediocre
Cleanliness	Excellent	Mediocre	Poor
Initial cost	High	Low	High
Operational cost	Low	High	High
Ind 4.0	Excellent	Good	Mediocre

The ideal solution for an efficient and safe production

- **High repeatability:**
  electrical actuators are accurate, reliable, do not pollute, reduce power consumption and are reprogrammable.
  Pneumatic systems need constant maintenance, have a low repeatability over time and require compressed air that could lead to pollution.

- **Initial cost or Return on Investment?:**
  Large Corporation are very careful in choosing future solutions for their production process. They normally opt for low environmental impact and limited power consumption systems.

  The answer is in electrical actuation: accurate and energy efficient *(up to 90% energy saving).*

  Production with hydraulic systems or polluted air *(banned in Pharma and Food & Beverage Industry)* will be a key issue in the coming years.

- **Low noise:**
  only electronically controlled electrical systems can ensure compliance with safety directives in the work place requiring less than 85dbA@1m noisiness.

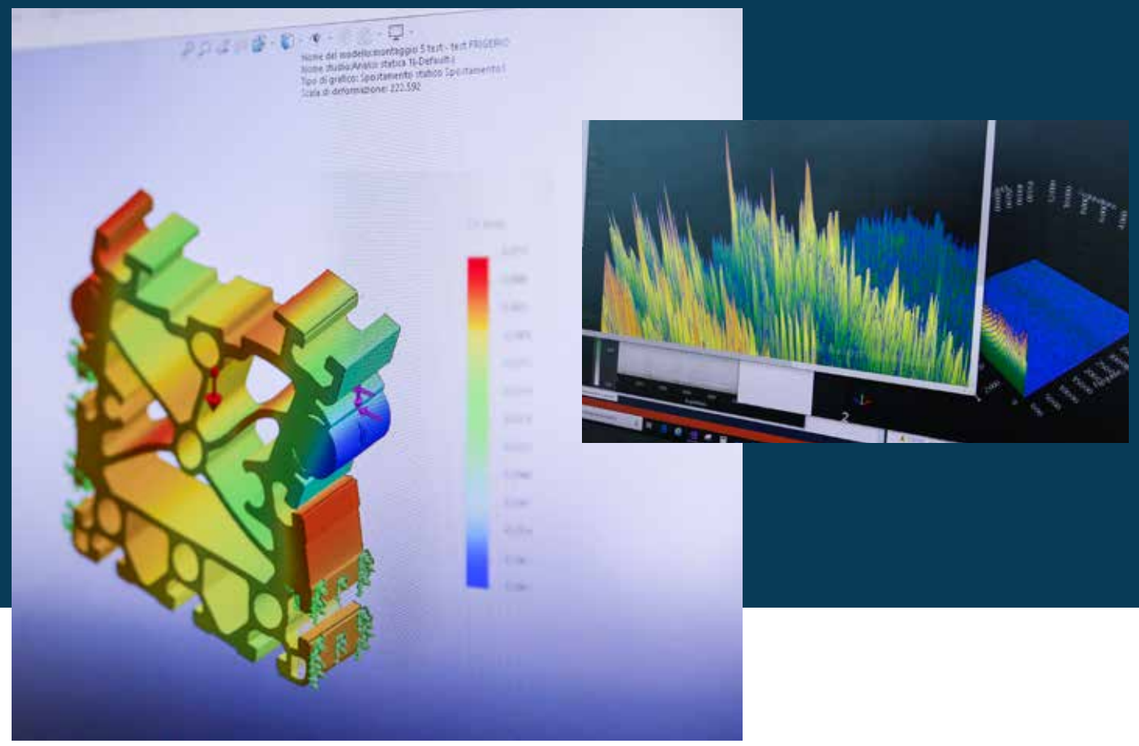
- **Productivity and Ind. 4.0 controllability:**
  all electrical actuators parameters can be measured and monitored in real time.
  AutomationWare offers Ind 4.0 solutions with vibration and temperature control system (***AwareVu***™), for predictive maintenance.

Many multinational companies of different industries such as Automotive, Food&Beverage, Pharma have moved to electric and require Ind 4.0 electrical actuators for their new projects.

Looking forward to expand your business?

Choose electric solutions.

Design and develop your products with us. Take advantage of our competence to evolve your product or process towards Ind 4.0



AutomationWare
Development J-Actuators

A platform for each application

PF Actuators	Description	Technology	Range Specs	Others
ML Series	Linear axis	Belt or Screw	up to 5 m/s	General Purpose
ML Roboline	Robotics or logistic axis	Roller	up to 5 m/s	High Speed
ML Telescopic	Telescopic & Palletizing	Belt / Roller	up to 5 m/s	High Speed
Mech Value	Electrical actuator	Ball Screw	up to 1,5 kN	General Purpose
Mech Line	Electrical actuator	Ball Screw	up to 15 kN	General Purpose
Mech Force	High force Electrical actuator	HP Ball Screw	up to 190 kN	High force
Mech Plus	H.Compact force Electrical actuator	CP Ball Screw	up to 210 kN	Compact and Force
Mech Extreme	Extreme forceElectrical actuator	NSK Ball Screw	up to 700 kN	Extreme Force
SM Sliders	Sliders	Ultra Fast Ball screw	up to 2 m/s and 30 m/s²	Fast handling
Rotac	Rotative mechanical actuator	Mechanical	up to 70 Nm	

PF Motion	Description	Technology	Range Specs	Others
AWDH Drivers	High Power Driver	EtherCat/Profinet/Modbus/Can	up to 120 kW	ROS Compatible
AWDL Drivers	Med Power Driver	EtherCat/Profinet/Modbus/Can	up to 2 kW	ROS Compatible
AW-Motors Brushless	Series of Brushless Drivers	Brushless	up to 400 Nm	All Actuators
AW-Encoders	Series of Encoders	Absolute /Incremental	up to 20 bit	All Motors
AW-Gearbox	High force Gearbox		up to 500 Nm	All Motors

PF Robotics	Description	Technology	Range Specs	Others
SM Pick and Place (4)	Scara Robot 3-4 axis	Ultra Fast Ball screw	20 cycles/min	Fast handling
SM Parallel Pick and P. T-Actuators	Parallel Robot 2-3 axis Torque Actuator	Ultra Fast Ball screw HF Torque	100 cycles/min up to 130 Nm	Fast handling
J-Actuators	Robotics Joint	Robotics	up to 800 Nm	
M-Actuators	Wheels actuators for AGVs	Robotics	3 mm	
AwareVu	ind.4.0 FFT diagnostic system	Electronics / FFT-Vibration	1kHz FFT	Board
RoboVu	ROS-EtherCat Driver	Software RT ROS	FSoE	Software
Aw-Tube	Modular Cobot a 5-7 axis	Robotics	up to 25 kg	Collaborative Robots
AW-Mobile	Robot Mobile AGV o AMR	Robotics	up to 400 kg	Collaborative AGV

Actuators

Motion

Robotics

AutomationWare™ brought to you by IKO

Attribution:
ROS is a trademark of Open Robotics.

A wider portfolio for each application

Evolving from Industry 4.0 to 5.0 and above

Actuators

Motion

Robotics

- The **AutomationWare** product range it is oriented to give a complete solution to your application.
  An extended range of Linear or rotary actuators to offer solutions mechatronics complete with power drivers *(new AW-Motion Series)* and **brushless motors o Torque actuators**.

- **Include our Axes to support the move of robots or for logistics applications**. Use our E-Actuators to lift payload on AMRs or AWGs. Robot mobility combined with Actuators to enhance functionality.

- **Modular robotics** on **EtherCat** fieldbus with safety management and application control.
  Mobile Robotics Mobile Robotics for the transport of objects or multi-axis robotic compositions.

- **Attention to anti-contamination issues**, full system integration templates up to certification of robotic devices or cells.

- **Assistance to Open Source robotics**, possibility of managing robotic systems in **ROS** mode and construction of software interfaces for the management of drives on platforms of last generation.

5.

AutomationWare Headquarter
2018 First AW-Tube Prototype

SOFTWARE AND DIAGNOSTIC

AwareVu™
SafeVu™
RoboVu™

AwareVu™

Ind 4.0 real time diagnostic system to detect vibration and temperature of each AW component installed in the system or in the production line.

Using an FFT algorithm, **AwareVu™** analyses the vibration profile in normal operation and warns the controller of possible deviations or malfunction due to internal *(Actuator)* and external events. *(Machines)*

The **AwareVu™** box can be connected via Wi-Fi or USB. Parametric data transfer, also in the cloud, enables to analyse trends over time.

A sophisticated yet easy to use analysis platform

essential to avoid production standstills

Actuators: 4.0 technology

for top performances

L-Actuators

Actuators or linear axes of different sizes and for different loads

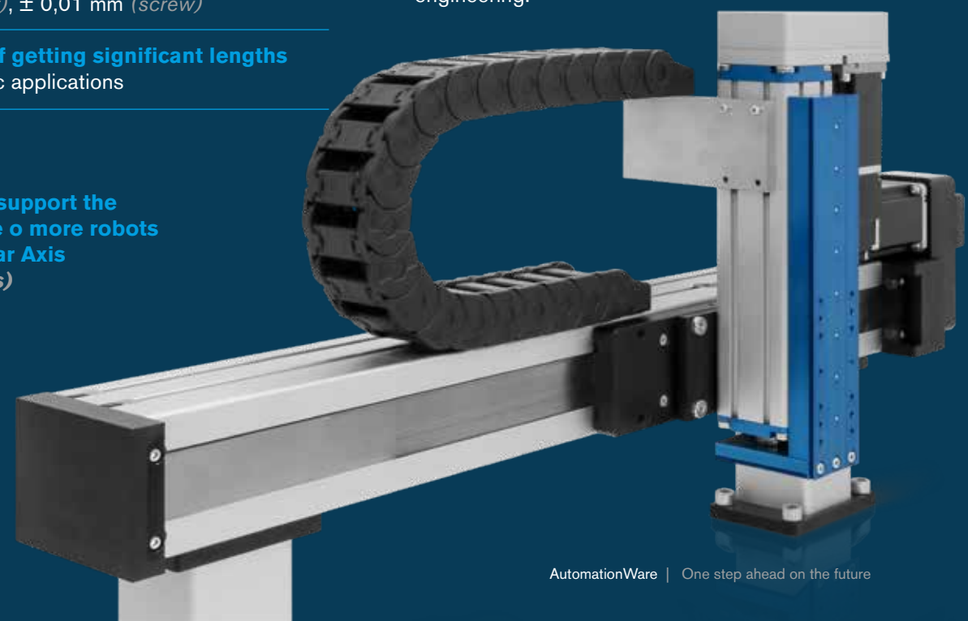
- **Sizes** from 45 mm up to 160 mm
- Translation: **screw** axes, with ball screws, caged for fast applications, performing maximum speed and acceleration. **Belt** axes with mobile or fixed belt used as a rack.
- **Linear guide rails or rollers** for high payloads
- **Speed**: 2mt/sec *(screw)*, 5m/s *(belt)*
- **Positioning accuracy**: ± 0,05mm *(belt)*, ± 0,01 mm *(screw)*
- **Opportunity of getting significant lengths axes** for logistic applications

The right solution?
Let's find it together!

It is possible to put more axes together or combine them with other **AutomationWare** products, such as SM Actuators. The maximum flexibility to give you several configuration options, from XYZ Cartesian systems, for light or high payloads to solutions, for a fast and accurate Pick&Place solution. ***(linear axes + SM-actuators)***.

A wide range of accessories enables the creation of single or multi axes solutions for a customized engineering.

L-Actuators, may support the integration of one o more robots on the same Linear Axis *(Robo-Line series)*



X-Actuators

Force and technology without compromises

New **Extreme** version for dynamic loads up to **700kN**.

The ideal answer to extreme applications, where high thrust and/or long term activities are required *(e.g. press type operations or plastic blowing).*

The thrust technology is made with in cage **NSK** recirculating ball screws, to withstand the toughest working conditions. *(www.nsk.com)*

E-Actuators

The best portfolio of fully electric cylinders

Sizes from 16 mm up to 200 mm and different load capacities for tailored solutions according to the application:

- **Mech Value**
  16,25 or 32 mm. Loads up to 1700 N
- **Mech Line**
  32, 50 or 63 mm. Loads up to 2900 N
- **Mech Force**
  50, 63, 80, 100, 125 or 150 mm. Loads up to 190 kN
- **Mech Plus**
  compact version for loads up to 213 kN
- All **E-Actuators** are **ISO 15552** compatible

AutomationWare™ brought to you by IKO

Series

01 . Mech value
02 . Mech Line
03 . Mech Force
04 . Mech Plus
05 . Mech Extreme

AutomationWare
Serie Mech

Actuators for compositions: From Flight simulation to Medical applications. The right portfolio of electrical actuator, different sizes and operating loads

GOUGH-STEWARD PLATFORM A
6 AXES (9 VIRTUAL)

ROS

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Mech Extreme solution for high loads

AutomationWare
Serie Mech Extreme

More and more companies decide to switch to one electric solution for advantages it offers compared to pneumatic or hydraulic technologies.

Not only less contamination and energy savings, but also less maintenance therefore lower costs of management. Electric actuators also have features more and more requests in Ind 4.0: precision, reliability, possibility of reprogramming and remote control.

Top product is **Mech Extreme**, a powerful cylinder, precise and fast able to withstand dynamic loads up to **750kN** with an operating speed of up to 1 m/s.

The thrust technology is made with recirculating screws of spheres combined with a very snail structure compact to guarantee the highest dynamic loads of the market and extreme thrust performance. The screws, specially made thanks to collaboration with NSK, are based on technology HTF *(High Tough Force)* for axial loads extremely high. Other than that, NSK screws are designed to achieve high travel speeds *(therefore short cycle times)* and high precision. Provided a graft for greasing the screw, in cases heavy duty activities where lubrication is required automatic

These features, combined with a reinforced structure steel profile, allow **operation even without stopping for over 4 years** at most axial force. **Positioning accuracy** is a lot high *(over 0.01mm)*.

AutomationWare also provides a system of control with motor drive to match to the actuator to obtain the best performance and the adequate torque control.

The **AwareVu** controller plugged into the base of the cylinder provides real-time feedback on vibrations, strength and temperature promptly warning of any anomalies, so as to avoid production blackouts e significantly lower maintenance costs.

AwareVu™

AutomationWare™
brought to you by IKO

E-Actuators

Models	Sizes	Force	Application	Key Features
Mech Value	16-25-32	up to 1,5 kN	Packaging / Food /Pharma	Small/precise
Mech Line	32-50*-63*	up to 15 kN	Packaging / Food /Pharma/Bending	ISO 15552
Mech Force	50-63-80-100-125**-150	up to 190 kN	Press Applications / Bending / Moulding /others	Force/Price
Mech Plus	50-63-80-100-125-160	up to 210 kN	Press Applications / Bending / Moulding /others	Force/Compact
Mech Extreme	100-125-160-200	up to 700 kN	Moulding / Press / Lift and heavy duty	Extreme applications
Mech Force-T	New 50-63-80-100	up-to 100kN	Press Application / Light Bending /Others	Compact /Torque

** (obsolete product, replaced by MechForce models) ** (obsolete product, replaced by MechPlus model)*

Key factors to define an E-Actuator	Value	Description
Max Force	kN	Peak force desired *(for limited time)*
Nominal Force *(usually 2000 Km duration)*	kN	Nominal average force required
Stroke	mm	Actuator effective length
Velocity	mm/sec	Speed of pistons
Motor Speed / Gearbox ration	rpm/Ration	Speed of motor and gearbox ration
Transmission	Direct/ Parallel	Type of connection *(Space)*
Lubrication	Manual/Auto	Maintenance type
connection system	Pins	Front / rear connection
Isolation	IPXX	Ambiental environments
Temperature ranges	T°	Operational temperature ranges
Application	MIL/Others	Type of applications
Mech Force-T	New 50-63-80-100	Up-to 100kN

Before choosing a new actuator, you need to have well identified the desired performance, better if defined with an **effective duty cycle** of the operating cycle.

Also essential are the definition of the **class of insulation** and **operating environmental conditions**.

Technical specifications

Features / Model	UM	Mech Value 16	Mech Value 25	Mech Value 32
Size Flange	mm	Flange 30 mm	Flange 32 mm	Flange 42 mm
Diameter / Lead Screw RS	mm	8/-2-8	10/-3-10	12/-5-10
Accuracy	mm	±0.02	±0.02	±0.02
Maximum axial force	N	325-50	833-105	1700-250
Maximum Motor Speed *(STP)*	rpm	3000	3000	3000
Maximum screw speed	rpm	3000	3000	3000
Maximum axial speed	mm/s	100-400	150-500	250-500
Useful Stroke* *(Not standard available under request)*	mm	50-300	50-400	50-500

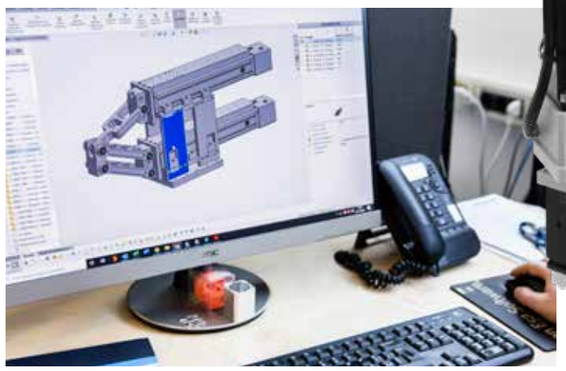
Features / Model	UM	Mech Line 25	Mech Line 32	Mech Line 50	Mech Line 63
Size Flange	mm	Flange 32mm	Flange 47 mm	Flange 65 mm	Flange 75 mm
Diameter / Lead Screw to RS	mm	10/3-10	12/5-10	16/5-10-16	20/5-10-20
Dynamic load	kN	2,8-2,5	5,14-3,90	10,49-11,81-8,33	14,6-11,0-13,4
Axial force 2000km	kN	0,32-0,43	0,69-0,67	1,42-2,02-1,67	1,98-1,88-2,89
Maximum screw speed	rpm	4500	4500	4500	4500
Maximum axial speed	mm/s	750	750	1200	1500
Useful Stroke* *(Not standard available under request)*	mm	50-300	50-400	50-500	50-500

Features / Model	UM	Mech Force 50	Mech Force 63	Mech Force 80	Mech Force 100	Mech Force 125	Mech Force 150
Size Flange	mm	Flange 65mm	Flange 75 mm	Flange 95 mm	Flange 115 mm	Flange 135 mm	Flange 165 mm
Diameter / Lead Screw to RS	mm	20/5-10-20	25/5-10-25	32/5-10-32	40/5-10-40	50/10	63/10-16-20
Dynamic load	kN	14,6-11-13,4	19,8-16-15,1	25,9-29,8-22,7	23,9-60,4-44,4	76,9	87,9-190-141,9
Axial force 2000km	kN	1,98-1,88-2,89	2,69-2,74-3,50	3,52-5,1-5,72	3,24-10,33-12,0	13,15	15-38-30,57
Maximum screw speed	rpm	4500	4500	4062	3250	2600	2063
Maximum axial speed	mm/s	1500	1875	2166	2167	433	688
Useful Stroke* *(Not standard available under request)*	mm	50-500	50-600	50-800	50-800	50-1000	50-500

Features / Model	UM	Mech Plus 50	Mech Plus 63	Mech Plus 80	Mech Plus 100	Mech Plus 125	Mech Plus 160	Mech Extreme
Size Flange	mm	65mm	75 mm	100mm	120mm	140mm	180mm	180mm
Diameter / Lead Screw to RS	mm	25P10	32P10	40P10	50P10	63P10	80P10 -20	50P40 ISO 5
Dynamic load	kN	19,9	33,8	78,6	97,8	109,7	121,9 - 213,7	414 - 752
Axial force 2000km	kN	3,4	5,78	13,44	16,72	18,76	20,84 - 46	92 - 184
Maximum screw speed	rpm	4500	4375	3500	2800	2222	1750	1500
Maximum axial speed	mm/s	750	729	583	467	370	292 - 583	1000
Useful Stroke* *(Not standard available under request)*	mm	50-600	50-800	50-900	50-1100	50-1300	50-1500	50-1000

SM

Slider Motion Actuators
Speed, precision and modularity to get Pharma e Food application under control



Sliders and rotary tables for fast **Pick&Place** applications, with a high operational reliability over time. Ideal for high intensity work cycles and for small works.

Choose the AW robotic solutions for minimum response times, lower programming need, more safety.

The right solution? Let's find it together!

- **SCARA** configuration for high positioning accuracy
- In combination with other **AW** products *(e.g. axes or rotary actuators)* for vertical and horizontal ***Pick&Place*** cartesian configurations *(see general catalogue for more info)*
- Availability of accessories such as cameras, grippers, …

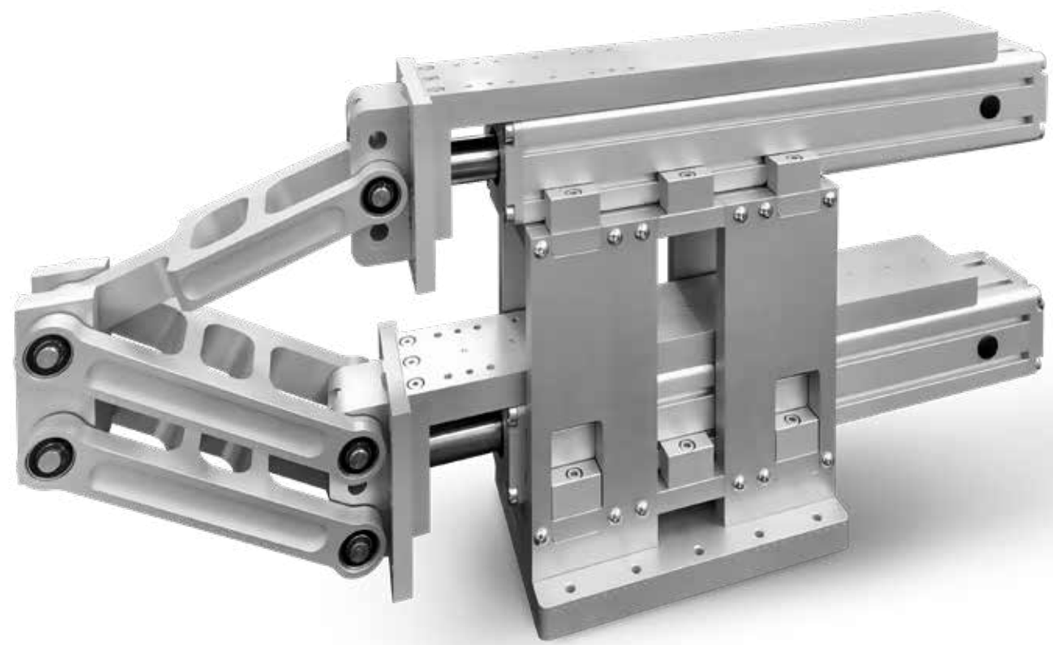
Essential elements

- **4 formats, 25-32-50-63**, completely motorized with high performance Brushless
- **Stroke up to 420 mm,** adaptable speed to the requested load
- **Speed up to 2 m/sec, acceleration up to 3g,** highest applicable force 3kN
- **Accuracy up to 0,01 mm,** positioning repeatability irrelevant to the load
- Movement mechanic *(slides, guides and screws)* studied for high acceleration *(3g)*
- Motion planning by software. **TRIO option** for complex trajectories
- Reduced maintenance, real-time diagnostic systems ***(AwareVu)***
- **Various configurations**, MiniScara solution, adaptability with AW screw-axes or belt axes
- **Grippers or vacuum accessories** to complete the application.

Benefits

- Valid alternative to pneumatic systems, **simplifying project cycles**
- Valid alternative to linear motor systems, **cost reduction and performance improvement**
- **Limited dependence on applied load, positioning accuracy and adaptability** in dusty environments with industrial manufacturing
- **Programmable motion curves** *(highly useful for liquids and/or delicate materials)*
- **Complete cycle control**, format change, reconfigurations
- **Minimal normal maintenance**, no calibration
- **High productivity**, more than 100 cycles in a minute

Design & Development
CAD/CAM SM-Actuators



Introducing
AW-Motion platform

AutomationWare™
brought to you by IKO

Servodrives AWDEVO

CE

New Evo Serie.
Power in an unthinkable amount of space.

Get your Drive and Motor on the actuators:
for the new servosystems **AWDL EVO** and **AWDEVO** we took into consideration all the elements to create a family of servo drives that offer an easy way to connect your applications to different fieldbuses. Versatility and an easy way to get connected with an extensive software tool to profile the application. Of course we are offering also connectivity to ROS to provide real-time connection to the mechatronics

Firmware Functionalities

- Speed control with adjustable ramps with/ without jerk
- Torque control with cogging compensation
- Torque limit control
- Multipositioner up to 64 indexes
- Electronic Gear
- Electronic Cam
- Tubolar, linear and rotative motor control
- Digital filters
- Pressure control

Feedbacks

- Sensorless
- Hall Signals at 120°
- Incremental Encoders 5V LD
- Inc. Enc. with Hall Sensors
- Absolute Encoders SSI, BISS, EnDat *(32bit)*[2]
- 16 bit Resolver *(optional)*

Frame

- Designed around a high efficiency heatsink does not require forced ventilation up to 1.3kW. Dimensions reduced of the 67%. More space in the electrical panel
- Metal Cover as shield to minimize electronic noise.

Filtering Software

- Notch Filter
- Iq Filter
- Digital Input Filter
- Position Observer
- Measured Speed Filter

Motor Brake

- Electronic brake management

Control Mode

- Fieldbuses
- Pulses/Direction
- 12 Bit Analogue

Fieldbuses Options

- CanOpen CiA 40[2]
- ModBus RTU
- EtherCat COE
- ProfiNet RT and IRT

Feedback Output

- Encoder Repetition
- Emulated Encoder

Alert Status

- via LED's
- via Fieldbuses

Safety Integrated

- SafeTorque Off Input circuit *(STO only for TMC)*, according to IEC61800-5-2:2007[1]

Set Up Facile

- **ROBOTEST** is the software tool designed to make the calibration of your servo drive and motor a simple procedure. In addition to saving and loading data, Caliper includes a powerful oscilloscope professional tools for Autophasing, automatic reduction of cogging, Fieldbus Analyzer and many other features to help you to better adjust your applications. Communication is via Micro USB port 2.0 *(Windows OS only)*.

AW | T-Actuator

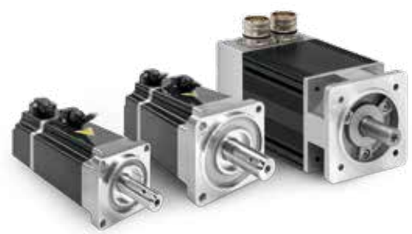
Linear Servomotors

Tubolar Linear motors

AC Asynchronous Motors

DC Servomotors

Brushless AC Synchronous motors



ROS

Attribution:
ROS is a trademark of Open Robotics.

RoboVu™ EtherCAT CANopen PROFINET Modbus

[1] Only available on AWDL EVO. [2] EnDat 2.1 and 2.2 available depending on the hardware version of the drive.

Servodrives AWD

CE

The spirit of motion control

Developed for modern automation needs, the **AWD** servodrive is designed around a new CPU that allows great performances and the real-time connectivity via fieldbus like EtherCat, ProfiNet, ProfiBus, CanOpen and Modbus. The **AWD** drives distinguish theselves thanks to the great flexibility in motor control, whether they are AC or DC, synchronous or asynchronous, rotary or linear.

The many features of these drives offer a solution for most applications, whether they are speed control, torque, but also positioning, electronic gear, electronic shaft and pressure control.

Keypad

- Keypad with 5 Digit display

Control Mode

- FieldBus
- Pulses/Direction
- 16 bit Analog reference

Encoder Output Line Drive 5V[1]

- Main Feedback Repetition.
- Pulses/Direction Repetition.
- Simulated encoder, up to 16384 ppr + Zero Index

Applicativi Software

- Speed control
- Sensorless speed control
- Torque control and torque limit
- Multi-positioner
- Electronic gear
- Electronic cam
- Pressure control

Software Filters

- Notch filter
- Iq filter
- Digital Input FIlter
- Observer
- Measured Speed Filter

Protection Circuits

- Motor short-circuit
- Over/undervoltage of power supply
- Drive Overtemperature
- Feedback fault
- Rated Current limit
- Motor temperature thermal image
- Other protections

Brake

- Electronic brake management

Digital I/O

- 8 PNP programmable optoinsulated inputs
- 3 PNP programmable non optoinsulated inputs
- 6 PNP programmable optoinsulated outputs
- 1 programmable clean contact relay
- 1 frequency input

Analog I/O

- 3 Inputs:
  - 1 x 16bit input
  - 2 x 12Bit inputs
- 2 programmable outputs

Controllable Motors

- AC brushless servomotor *(Synchronous)*:
  - rotary type
  - linear type
- Induction AC servomotor *(Asynchronous)*
  - V/Hz control
  - FOC control *(sensorless or with encoder)*
- DC permanent magnet motor

Auxiliary Encoder

- Incremental Encoder 5V LD

Optional Feedback

- Resolver
- Absolute Encoder SSI*(Bin)*, BiSS*(B-C)*, EnDat*(2.1-2.2)* + SinCos
- Absolute Encoder HyperFace + SinCos[2]

Main Feedback

- Sensorless
- Hall's sensors
- Incremental Encoder 5V LD
- Inc. Enc. with Hall's sensors
- Absolute Encoder SSI

Optional Fieldbuses

- EtherCat CoE
- ProfiNet RT and IRT
- ProfiBus DPV0
- CanOpen CiA 402
- ModBus RTU
- ModBus TCP[1]

Ethernet Port

- for Industry 4.0[2]
- for remote control via router[2]
- for diagnostic[1]

Communication Ports

- Micro USB 2.0
- RJ45 Ethernet port[2]
- RS485 for proprietary fieldbus[2]

Integrated safety STO

- Input for safety stop STO, SIL3, Cat.0, according to IEC61800-5-2:2007

ROS
Attribution:
ROS is a trademark of Open Robotics.

RoboVu™ EtherCAT CANopen PROFIBUS PROFINET Modbus

[1]24V opzionali [2]In fase di sviluppo

Servomotors AWD-B

General Features

Brushless or electronic switching servomotors are reliable high-performance machines that require only limited maintenance designed to provide the ideal solution for the drive of the latest manufacturing machines and satisfy ever-increasing needs in the field of industrial automation.

The new series **AWM-B** brushless servomotors features elevated dimension/torque and dimension/power ratios using permanent rare earth magnets and avant-garde technical solutions that guarantee:

- Remarkably low inertia;
- Elevated degree of protection with standard IP54/ IP65 protection rating;
- Sinusoidal C.E.M.F;
- Elevated overload capacity;
- Low torque undulation.

The new series **AWM-B** brushless servomotors are available in 6 sizes, from the smallest **AWM-B05** to the largest **AWM-B26** with torque values from 0.48 Nm to over 400 Nm.

Windings for power supplies of up to 220/240V are available for size **AWM-B05**, 220/400V power supply for all sizes up to **AWM-B14**, for larger sizes, the standard windings are all for 380/400V power supplies.

Standard Specifications

- **Type:** low-inertia permanent magnet servomotor
- **Rotor:** permanent magnet type
- **Insulation:** for Winding: Class H; for Motor: Class F
- **Thermal protection:** PTC built-in *(size 220/400V only)*
- **Bearings:** ball bearings with life-long lubrication double shield
- **Balancing:** degree “R”
- **Axis/flange concentricity and verticality:** grade “N” *(normal)* – in according to IEC 72 – DIN 0530
- **Shaft:** with key, with threaded coaxial hole
- **Cooling:** natural convection IC 0041; for sizes B20–B26 also available fan-cooled version IC 0641
- **Shape:** flanged B5 or B14, mountable into V1 or V3 without modifications
- **Protection:** IP54/IP65
- **Position sensor:** 2-pole resolver
- **Power/resolver connection:** by connector

Order Coding

PARKING AND/OR EMERGENCY BRAKE:

1 = motor without brake
3 = motor B05 with brake*
5 = motor B07 with brake*
6 = motor B10 with brake*
7 = motor B14 K/S/N/M with brake*
8 = motor B14 L/G with brake*
9 = motor B20(F) with brake*
12 = motor B26(F) S/M with brake*
13 = motor B26(F) L/G with brake*

DRIVE POWER SUPPLY VOLTAGE:

R = 400V
S = 230V
T = 100V
W = 60V
V = 48V

SHAFT:

C = with key
L = without key**

ANGUS OIL SEAL:

5 = without sealing ring
7 = with sealing ring

SIGNAL CONNECTION:

A = vertical connector
G = horizontal connector shaft side*
H = horizontal connector opposite side*
P = vertical cable output
M = terminal board
W = horizontal cable output shaft side*
Z = horizontal cable output opposite side*

RPM *(standard)*:

15 = 1500
30 = 3000
45 = 4500
60 = 6000

SERIES

SPECIAL WORKINGS

B	07	M	2	R	5	C	7	H	1	H	30	N	XXX

MOTOR TYPE:

05 - 07 - 10 - 14 - 20 - 26

MOTOR SIZE:

K - S - N - M - L - G - X

MECHANICAL CONFIGURATION:

1 = B5
2 = B14
3 = B3
4 = B5+B3*
5 = B14+B3*

POWER CONNECTION:

A = vertical connector
G = horizontal connector shaft side *
H = horizontal connector opposite side *
P = vertical cable output
M = terminal board, only for B20(F) and B26(F)
W = horiz. cable output shaft side*
Z = horiz. cable output opposite side*

TRANSDUCER UTILISED:

1 = 2 poles resolver
2 = incremental encoder + Hall effect phases*
280 = magnetic inc. enc. + Hall effect phases*
500 = multiturn enc. abs. SSI

COOLING:

N = not ventilated
F = fan cooled

*****option with surcharge*
***not available at the moment*

EXAMPLE: **B 07 M 1 S 01 C 5 H 1 H 30 N XXX**

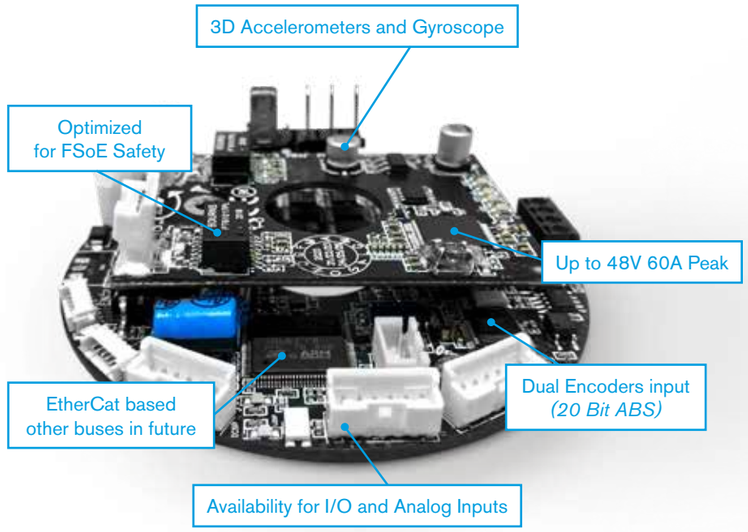
B07 series and type; **M** motor size 1,9Nm; **1** mech. configuration flange B5; **S** drive power supply 230V; **1** without parking brake; **C** shaft with key; **5** without sealing ring; **H** horizontal power connector on side opposite shaft; **1** 2 poles resolver; **H** horizontal signal connector on side opposite shaft; **30** 3000RPM speed; **N** not ventilated; **XXX** no special working.

Modular Robotic Solutions

5 robotic joints with integrated electronics to model collaborative robotic arms.

Connectable on the EtherCat bus with FSoE technology, they have redundancy in accordance with ISO standards for collaborative robotics.

Maximum expressible force 800 Nm



J-Actuators

Best Mechanical Technology
Ergal based chassis

Embedded Power drive
With double processor and several digital and analog inputs

EtherCat connection
From the Joint

Power off
System Block

14 bit ADC
Optional sensors plugs *(Atex - Others)*

Fully ROS compatible
With **AW ROS** interface ***(RoboVU)***

High Quality
Harmonic Drive gearbox reduction tatio may change on applications *(from 30 - 160)*

Torsional Stiffness
measurement embedded
(2 x 20 bit Encoders)

AwareVu™
Patent embedded to detect 3D accelerations and vibrations

High Speed Torque
(3000 - 2000 rpm) motor with current sensing technology

AutomationWare™ brought to you by IKO

AwareVu™

ROS
Attribution:
ROS is a trademark of Open Robotics.

EtherCAT®

Modular Robotic Solutions

Torque-based robotic actuators with absolute encoder up to 20 bits for maximum positioning accuracy, 600 rpm and torques up to 190 Nm.

Also controllable by ROS

T-Actuators

Superior Mechanical
On transmission system with Ergal based chassis and axis

EtherCat / Profinet
Driver based on EtherCat or Profinet connection

Top performance
On his category for Axial and radial payload perforomnce

Brake system
Optional: Eventual brake system

Several sizes
Possibility of customization *(over 10 units)*

Fully ROS compatible
With **AW ROS** interface ***(RoboVU)***

High Speed
And Acceleration reaching 300 RPM

High precision Positioning
Based on 20 Bit Absolute encoder

Optional AwareVu Patent
Technology to detect acceleration and vibrations

Torque sensor
Based on 14 Bit ADC conversion

AutomationWare™ brought to you by IKO · RoboVu™ · AwareVu™ · ROS · EtherCAT®

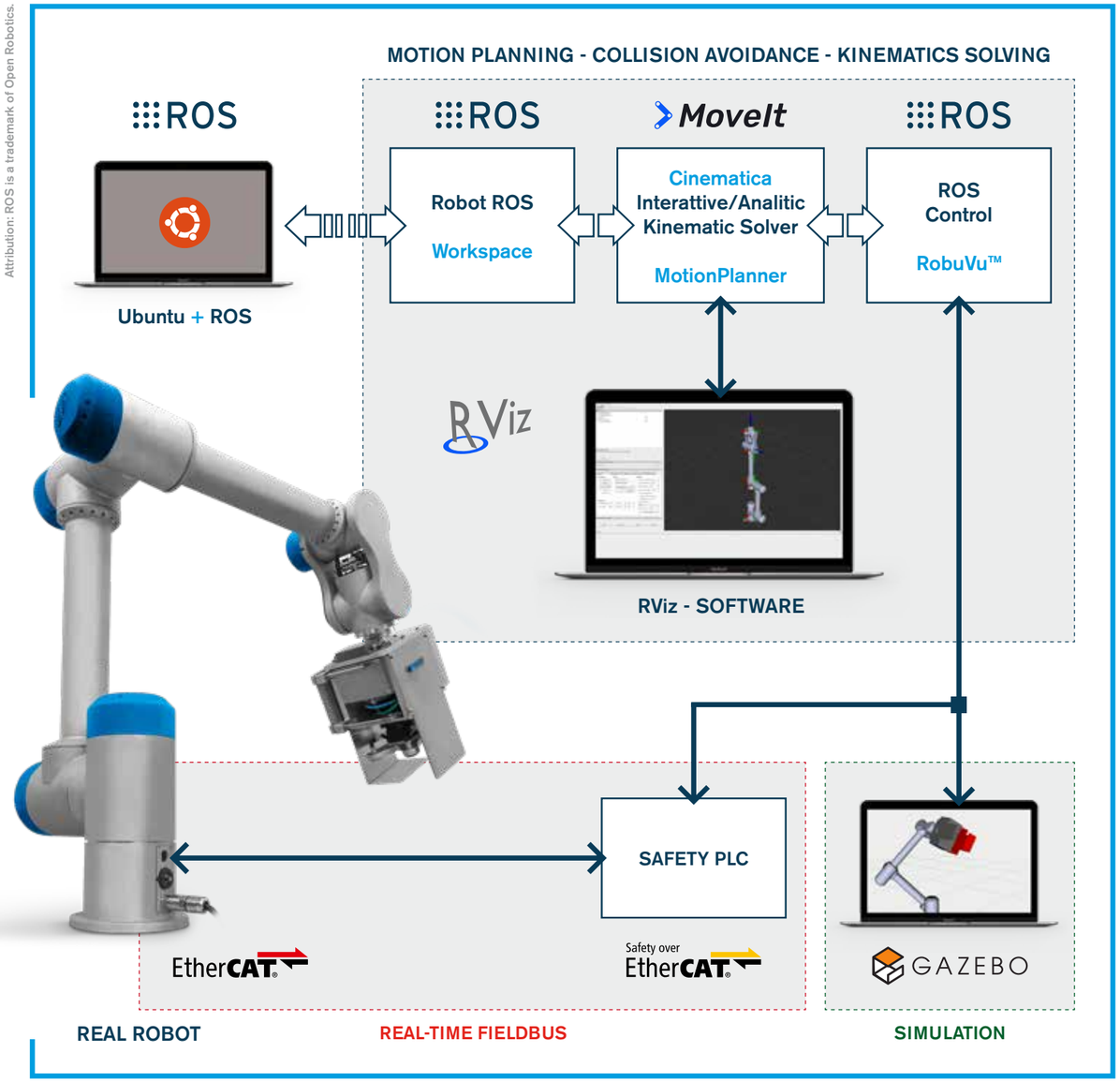
Evolve with cobotics and mechatronics

AutomationWare™ brought to you by IKO

	Cobotics Joints	Cobots Arms	Cartesian Cobots	Mobile Cobots	Customized Cobotics
Aerospace and Defense	Defense or Space complementary ARMS	Defense production - Contaminant or dangerous production	Eventual production with CNC machines	Critical Logistic *(Radioactivity or explosive applications)*	Manipulators for specifics Task
Automotive	Complementary to production lines	Arms for single or multiple assembly functions *(without cabinet)*	Production lines with long reach areas need of 7th axis or XY reach from top	Material handing for production of Logistic	Multiple coordinated arms for assembly
CNC and others Machines	Complementary to each machine	Single Arms for loading unloading parts	Production lines with long reach areas need of 7th axis or XY reach from top	Mobile Support for several CNC centers	Complex CNC or embedded solutions
Device production	4-5 Axis handling - Rotative actuators	Assembly station for semiconductors	Multiple assembly systems for electronics parallel production lines	Device handling from production to logistic	Multiple Arms and white chambers application
E-commerce Logisitc	Logistics Storage handing	Advance Logistic storage 6-7 axis	Embedded on Picking Storage system	Transportation of goods from A to B	Full logistic solution Mobile and Arms
Healthcare support	Precise diagnostic	Support on heavy or precise arms task	Storage robotics	Transportation of Pharma from A to B	Robotics anticontamination
Material Handling palletizing	Use as Rotative actuator	Fixed palletization	Multi line palletization	Long distance palletization	Complex palletizing system for critical environment *(Explosive-Radioactive)*
Material Logistic	Logistics Storage handing	Advance Logistic storage 6-7 axis	Embedded on Picking Storage system	Transportation of goods from A to B	Full logistic solution Mobile and Arms
Pharma and Food	Use on Machines	Fixed collaborative station	Embedded on Picking Storage system	Transportation of Pharma from A to B	Robotics anticontamination
Research and Robotics	Research robot constructions	ROS Arms development	NA	Advance robotics in ROS	Robot for Nuclear Research *(Fusion or accelerators)*

RoboVu ™

The Project

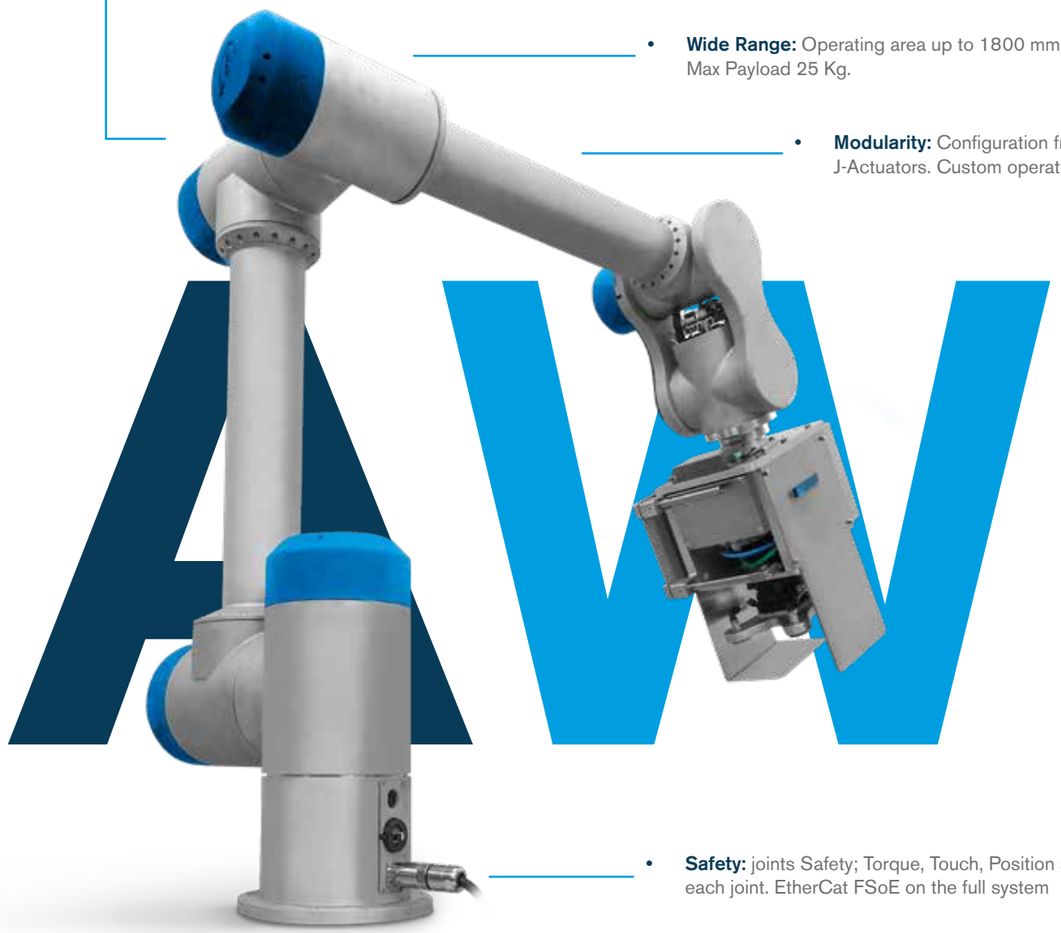


AW-Tube has been created to provide a scalable technological response while protecting the investment over time. This approach is creating a great impact for System integrators or machine builders who can apply the robotic arm without constraints of control cabinets or proprietary kinematics.

AW-Tube is based on EtherCat fieldbus perfect for quick configuration and Kinematics control. The EtherCat protocol include safety management based on FSoE in each Robotic joint.

This allows the PLCs network safety to synchronize, without latencies, any robot alarms with the rest of the mechatronics cell. Collaborative function is included in each robotic joint, based on sophisticated sensors to avoid any risk of collision in compliance with the directives of **ISO 10218-1** *(Certification in progress)*

- **Programmable joints:** Several I/O and Analog inputs to control grippers, sensors or device
- **Wide Range:** Operating area up to 1800 mm Max Payload 25 Kg.
- **Modularity:** Configuration from 47 J-Actuators. Custom operating area



- **Safety:** joints Safety; Torque, Touch, Position sensor in each joint. EtherCat FSoE on the full system
- **Collaborative mode** with Gravity compensation and easy remote programming system *(RoboVu)*
- **EtherCat:** All joints connected on Industrial standard Direct control in HTML 5.x and ROS Support. Direct motion control vs. EtherCat Motion Controller

Control of AW-Tube

The control of **AW-Tube** has various declinations.

Since the robotic arm is made up of a series of actuators with integrated diagnostics, the user can control each robotic joint with an EtherCat filedbus.

There are various 5-6-7 + robot programming systems in the market that can be used as robotic arm controllers. The collaboration functions of the arm are integrated in the joints thanks to impact detection systems that are able to detect alarms to be transmitted to the safety PLC *(each joint has controllable torque and impact sensors)*. Furthermore, the programming can be managed directly by the machine manufacturer, who can use the EtherCat bus to control the robotic arm without having to program with an external cabinet.

The robotic arm has Safety OTT *(FSoE).*

Control by ROS without barriers

Several collaborative robots today may be controlled by **Robot Operating System** *(ROS)* environment.

This framework is booming thanks to very powerful tools applications, that allow the management of the full robotic cell.

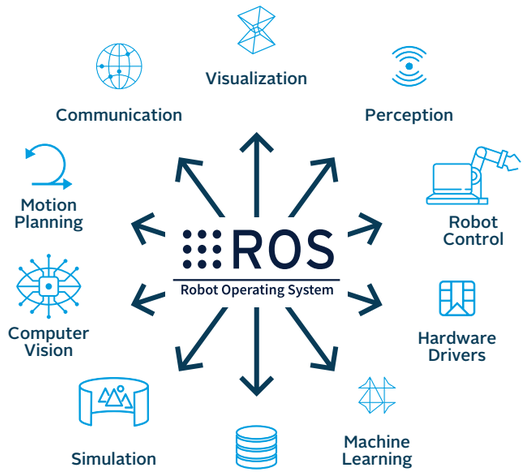
The limitation of several robots is based on the proprietary cabinet implication, that build a real barrier on direct robot control. **AW** is setting a new way of controlling robots thanks to a middleware virtual connector to **ROS** or others Industrial Kinematics system.

The virtual connector **RoboVu™** it allows a direct and real-time connection to the robotics Joints via EtherCat, by passing traditional cabinet approach, with a real simplification on the full system management *(Mobile Robots or 7th axis approach).*

This open new scenarios for providers of industrial EtherCat robots control system.

RoboVu™ provide also gravity compensation technology, that allows the robot to be manually controlled for simple movement and gripping operations.

Software platform AW-Tube



- URDF File describing geometry and dinamics of the mechanical system
- User Interface — ROS
- Motion Planning — MoveIt
- Virtualization and Simulation of project — GAZEBO
- Link to real virtual hardware — ROS CONTROL

ROS *(Robot Operating System) is* an open source development environment composed of a set of software libraries, tools and algorithms for the development and programming of robotic and advanced automation systems. It is a constantly evolving modular system, which grows thanks to the contribution of its developer community.

ROS allows you to program complex kinematics for a wide variety of applications and to synchronize robots on industrial buses such as EtherCat or Profinet, making them synchronous with all other devices on the network.

System integrators may combine application based on HTML 5 panels with **ROS** background, having connection with Codesys platform to integrate other devices on the robotic cell. *(Fig x figura con I pannelli di SYSdesign)*

In alternative **AW-Tube** could be also controlled by EtherCat Robotics industrial control system, helping customer to adapt Robotics on their actual controls of EtherCat devices.

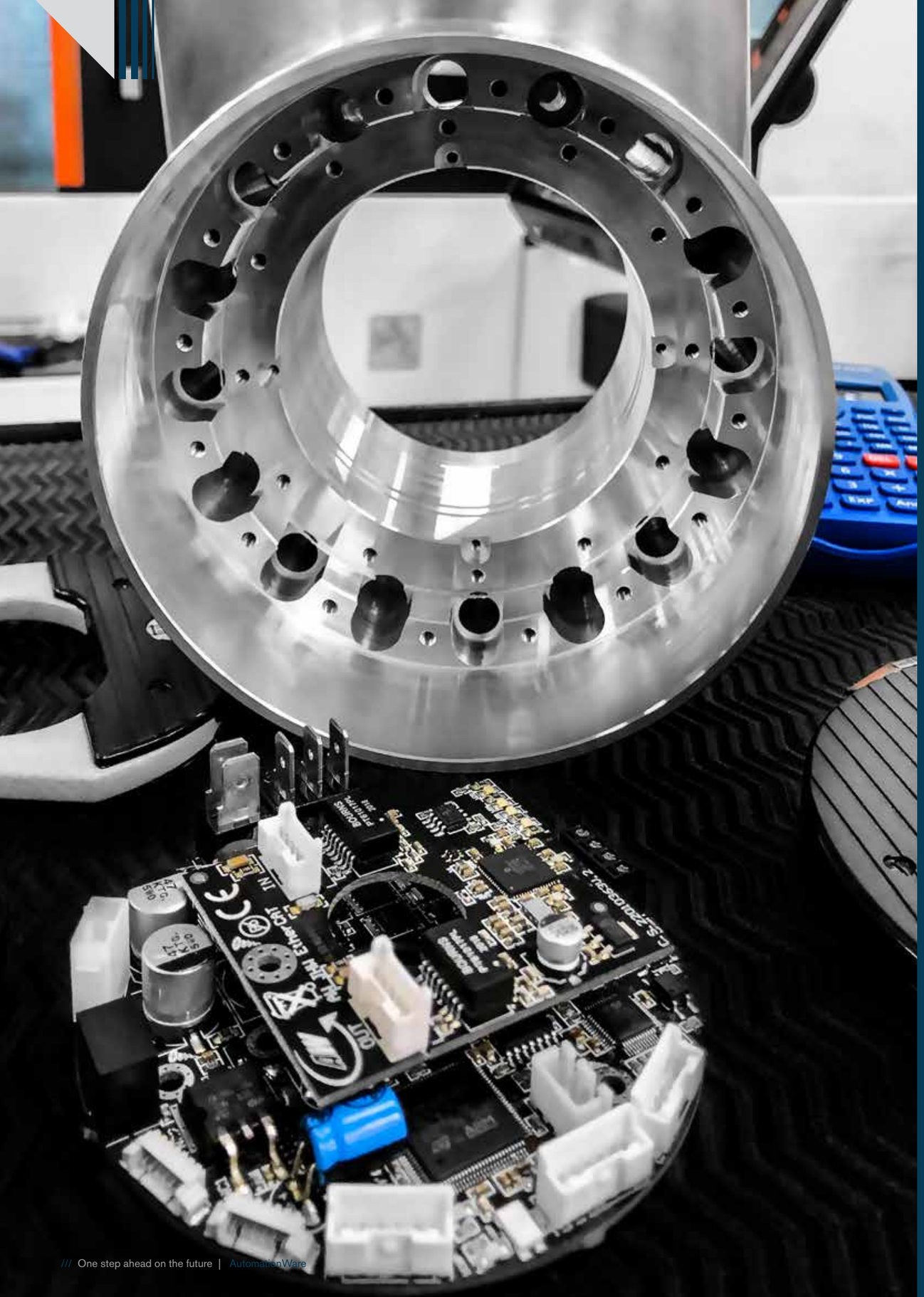
All our collaborative robots are supplied with the installation of a basic **ROS** package that includes all the drivers and a 3D model of the cobot, but also tools for locating and using maps and simulators for planning movements.

Do you want to start planning the tailor-made solution for your application or design and test individual software modules offline?

We provide simulation software with 3D robot models, test environments and a pre-configured and easily adaptable navigation package.

You can simulate all the sensor data, create maps and make the cobot move in the virtual environment.

An opportunity to see the driving behavior of our collaborative robots, try how they react to different conditions and obstacles and test your changes.



AW RM

Modularity and Mobility without ballast

The mobile robots of the **AW-Mobile** series are a safe and flexible solution to optimize production processes and internal logistics. In research application they serve as test platforms for next generation robots.

Our **AGV**s or **AMR**s are designed to meet the **TÜV** safety requirements thanks to advanced sensor technology and intelligent algorithms, they can move freely in all environment, avoid people and obstacles dynamically and reach their destination independently.

The Wi-Fi industrial connection *(TUV certified)* allows the remote maintenance and the simultaneous control and management of robot and of every other device connected to the network.

With **ROS** *(Robot Operating Systems)* you can configure and easily adjust navigation setups, as well as test your mobile robot.

Coordination of multiple robots is also available.

- 3 Industrial Wi-Fi connection for Kinematics—Safety—Programming
- High Payload Manipulation with direct Control of Robotic Arms AW-Tube others Cobotics system
- Omnidirectional Wheels for accurate Positioning and fast driving *(max 400 Kg)*
- Full TUV certified 2D Lidar System to detect the full operating area 3D oprional CAmera for AI applications

AW Mobile	AWRM-P-400	AWRM-P-500	AWRM-PO 500	AWRM-P-700	AWRM-PO 700
Max Payload	150 Kg	80 Kg	150 Kg	300 Kg	400 Kg
Dimension (LxWxH)	590 x 559 x 411 mm	814 x 592 x 361 mm	986 x 662 x 409 mm	786 x 717 x 411 mm	741 x 509 x 348 mm
Speed	<1,5 m / s.	<1,5 m / s.	<0,8 m / s.	<1,0 m / s.	<0,9 m / s.
Control	ROS	ROS	ROS	ROS	ROS
Safety	Sick Lidar 2D	Sick Lidar 2D	Sick Lidar 2D	Sick Lidar 2D	Sick Lidar 2D

AW-Tube is usefully used Vs. applications where mobility is required

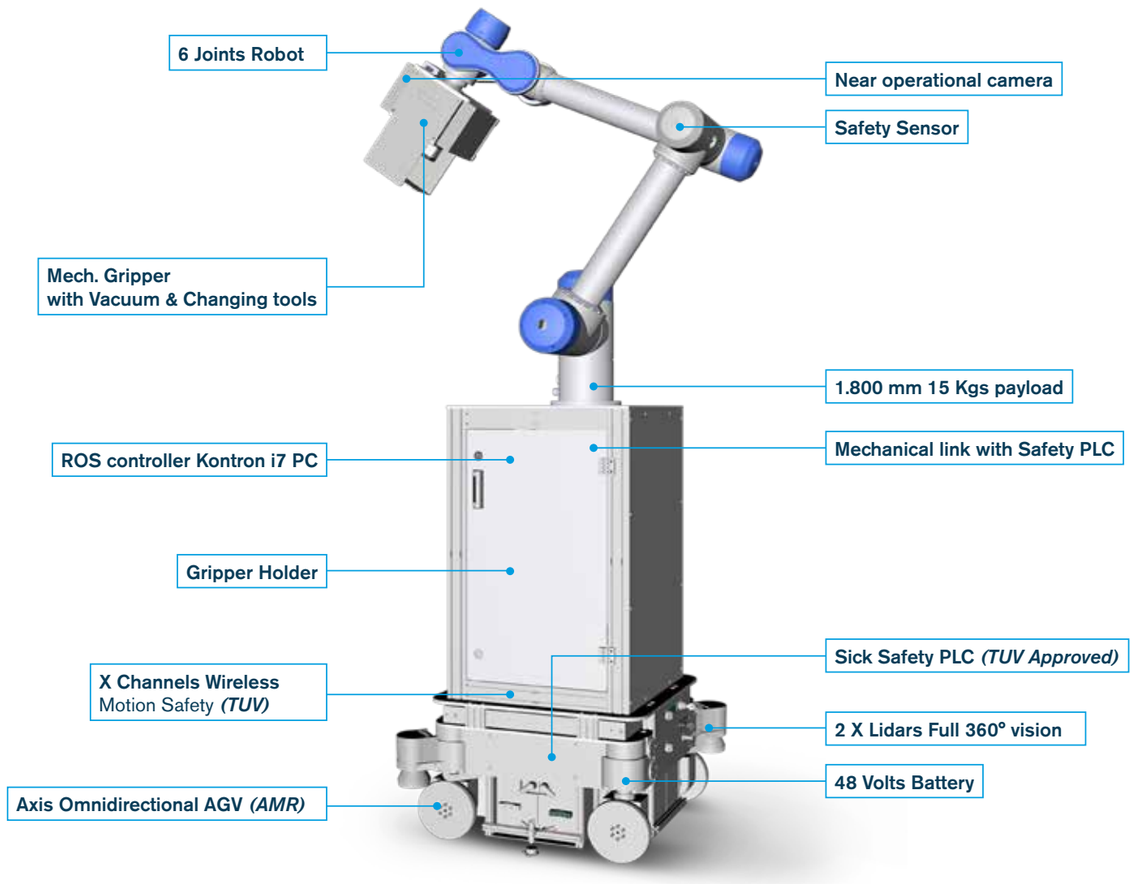
AutomationWare offers a series of solutions to give consistency to the issues of mobile assistance in the warehouse or systems with machine tools, use of the robot on the seventh axis for applications with short paths for palletizing or CNC interlocking.

On Pharma, Food and logistics sectors, is required the use of robots able to operate avoiding the risk of contamination.

Future electrical cars productions and consequent logistic will also impact on collaborative robots deployments.

AW products to support mobility

- Robotics wheels and electronics
- Mobile Robots *(AWMR-XX series)*
- Robotic system with Cartesian 7th or 8th a axis *(ML 90-135-180 see Aw Linear Axis)*
- Custom robotic system for special applications



Specifications

AW-Tube Specs	AW-Tube 5	AW-Tube 8	AW-Tube 12	AW-Tube 15	AW-Tube 18	AW-Tube 20
Payload	5 kg	8 kg	13 Kg	15 Kg	18 Kg	20 Kg
Min Reach	500 mm	600 mm	800 mm	600 mm	900 mm	900 mm
Max Reach	900 mm	1000 mm	1300 mm	1000 mm	1700 mm	1500 mm
Power, Consumption	300 W	300 W	450 W	450 W	750 W	750 W
Registration	CE	CE	CE	CE	CE	CE
J-Actuators	2xJ17 2xJ20 2xJ25	2xJ17 2xJ20 2xJ25	1x J17 2xJ20 1xJ25 2xJ32	1x J17 2xJ20 1xJ25 2xJ32	1xJ20 2xJ25 1xJ32 2xJ40	1xJ20 2xJ25 1xJ32 2xJ40
Certification (2022)	cartesian force	cartesian force	cartesian force	cartesian force	cartesian force	cartesian force
Force Sensitivty	less than 1 Nm	less than 1 Nm	less than 1 Nm	less than 1 Nm	less than 1 Nm	less than 1 Nm
Encoder ADC sensitivty	20 bits absolute x 2	20 bits absolute x 2	20 bits absolute x 2	20 bits absolute x 2	20 bits absolute x 2	20 bits absolute x 2
Joint accuracy Acccuracy	0,01°	0,01°	0,01°	0,01°	0,01°	0,01°
	ISO 13849 ISO 10218-1 *(2022 Tuv)*					
Repetability	± 0,03	± 0,04	± 0,05	± 0,05	± 0,06	± 0,07
Maximun Speed	Maximun Speed	Maximun Speed	Maximun Speed	Maximun Speed	Maximun Speed	Maximun Speed
Base J1	± 155°/s	± 130°/s	± 90°/s	± 90°/s	± 90°/s	± 90°/s
J2	± 155°/s	± 130°/s	± 90°/s	± 90°/s	± 70°/s	± 70°/s
J3	± 250°/s	± 200°/s	± 155°/s	± 155°/s	± 90°/s	± 90°/s
J4	± 250°/s	± 200°/s	± 250°/s	± 250°/s	± 180°/s	± 180°/s
J5	± 250°/s	± 200°/s	± 250°/s	± 250°/s	± 180°/s	± 180°/s
J6	± 250°/s	± 250°/s	± 250°/s	± 250°/s	± 250°/s	± 250°/s
Axis Movements	working range	working range	working range	working range	working range	working range
Base J1	± 360°	± 360°	± 360°	± 360°	± 360°	± 360°
J2	± 360°	± 360°	± 360°	± 360°	± 360°	± 360°
J3	± 360°	± 360°	± 360°	± 360°	± 360°	± 360°
J4	± 360°	± 360°	± 360°	± 360°	± 360°	± 360°
J5	± 360°	± 360°	± 360°	± 360°	± 360°	± 360°
J6	Infinite	Infinite	Infinite	Infinite	Infinite	Infinite
IP Classification	IP44	IP44	IP44	IP44	IP44	IP44
ISO 5	optional 2022	optional 2022	optional 2022	optional 2022	optional 2022	optional 2022
Connectivty	EtherCat FSoE 1Khz	EtherCat FSoE 1Khz	EtherCat FSoE 1Khz	EtherCat FSoE 1Khz	EtherCat FSoE 1Khz	EtherCat FSoE 1Khz
Middleware	RoboVu™	RoboVu™	RoboVu™	RoboVu™	RoboVu™	RoboVu™
Safety PLC	–	–	–	–	–	–
Wifi connection	–	–	–	–	–	–
Kinematics	ROS	ROS	ROS	ROS	ROS	ROS
Power Supply			DC 48 V	AC Power 117-240 Frequency 50-60 Hz		
Weight	–	–	–	–	–	–

AW Mobile	AWRM-P-400	AWRM-P-500	AWRM-PO 500	AWRM-P-700	AWRM-PO 700
Max Payload	150 kg	80 kg	150 kg	300 kg	400 kg
Dimension (LxWxH)	590 x 559 x 411 mm	814 x 592 x 361 mm	986 x 662 x 409 mm	786 x 717 x 411 mm	741 x 509 x 348 mm
Speed	<1,5 m / s.	<1,5 m / s.	<0,8 m / s.	<1,0 m / s.	<0,9 m / s.
Control	ROS	ROS	ROS	ROS	ROS
Safety	Sick Lidar 2D	Sick Lidar 2D	Sick Lidar 2D	Sick Lidar 2D	Sick Lidar 2D

Specifications may be subject to change

Industrial or Machines Application

The modular platform of **AW-Tube**, open new scenarios of applications in different handing application from Pharma & Food, Logistic, or machines handing for example in supporting CNC situation. *(Fig. 1)*

AW-Tube may be combined with existing Mechatronics configurations and been applied quickly thanks to the modular approach and fast connectivity.

Here in (*Fig. 2)* and example of **AW-Tube** applied on a CNC Table well integrated with others devices and grippers fully controlled on proprietary EtherCat CNC eventually connected also with MES application.

Basic application of machine tending with **AW-Tube** cobot and **CobotCUBE** with component drawer for a ready to use automation of numerical controlled turning and milling machines. *(Fig. 3)*

The solutions high modularity allows the early integration of different components as linear axis for adapting the automation the different requirements as the vertical palletization on the machining centre for maximising the non attending operation time

figura 1

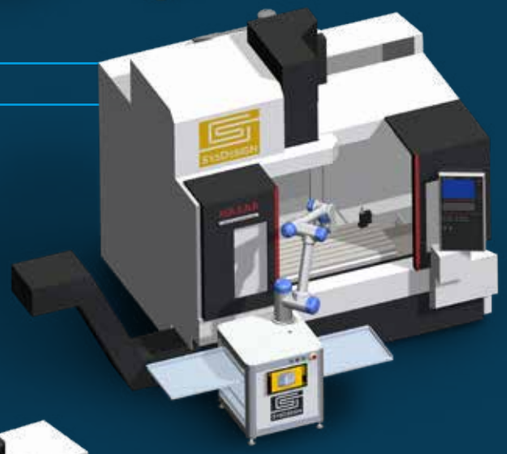


figura 2

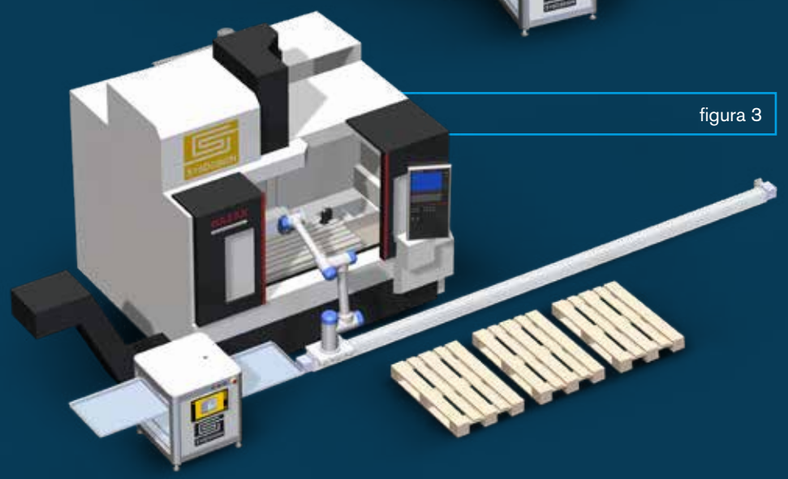


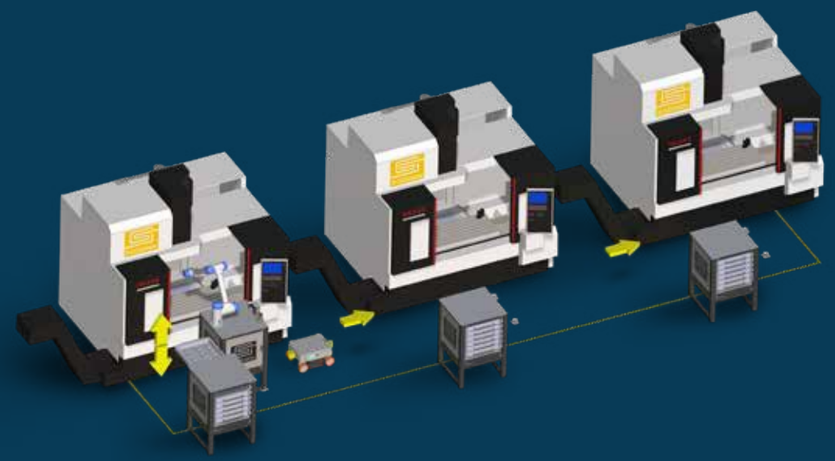
figura 3

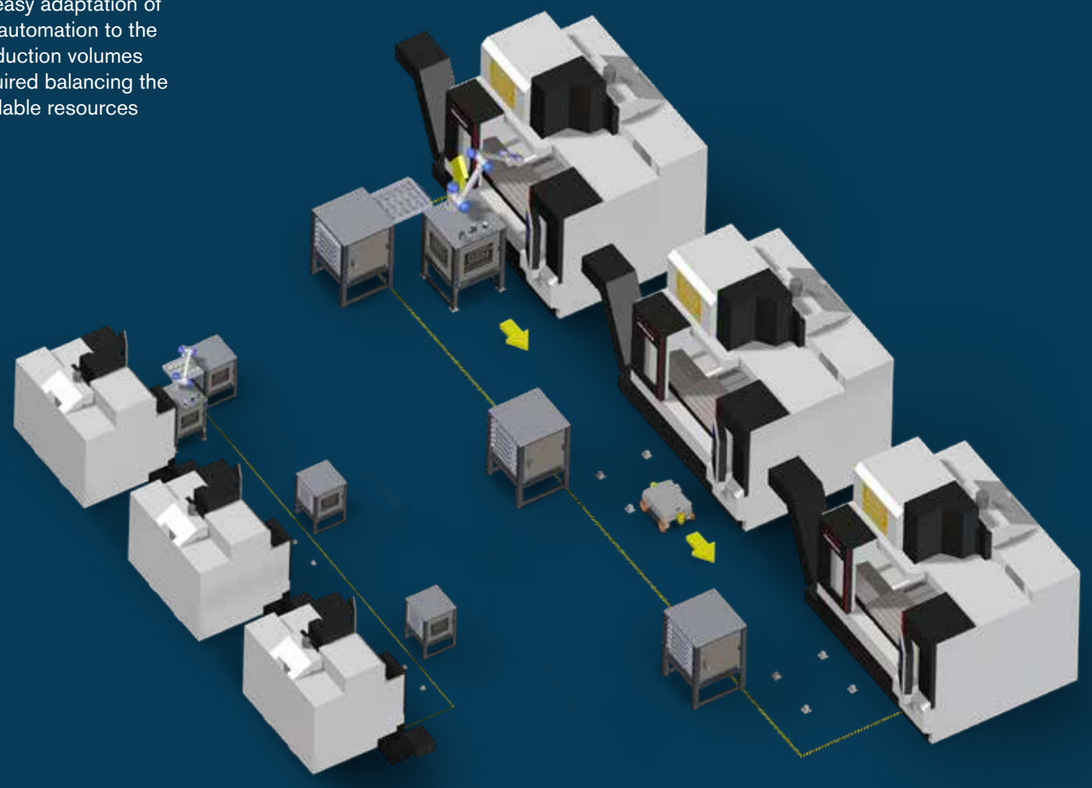
Robot manipulators [AW-Tube and AW-Mobile]

Multi machine tending automation with a single handling system shared between several machining centres on a production floor.

The integrated **AMR** *(Autonomous Mobile Robot)* moves the productive assets as well as the semifinished goods scheming the maximum operative flexibility.

The shared production asset enables scalability for easy adaptation of the automation to the production volumes required balancing the available resources





Pharma and Food Robotics

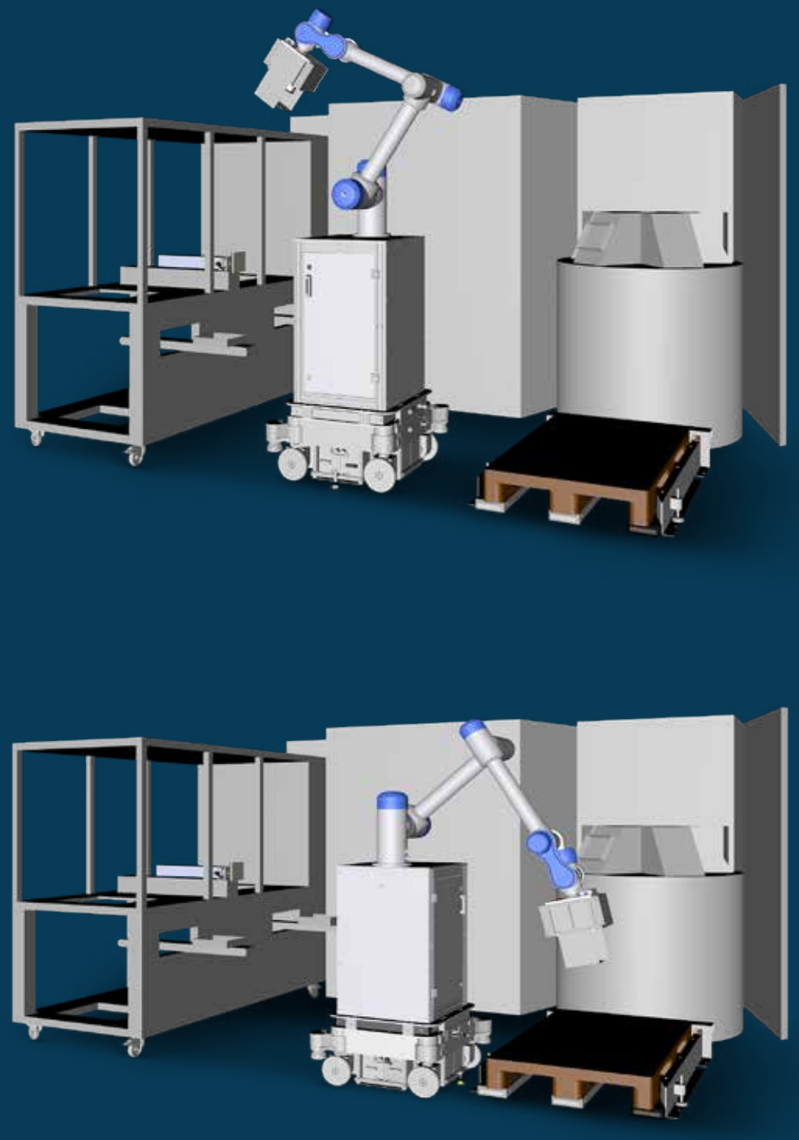
These sectors will be involved in a extreme transformation in the coming years.

In the pharma sector the manipulation in the production of syringes or complementary products, today largely made with semi-manual productions, will have to be transformed to raise the integrity process and define hygienic procedures with maximum reliability of the production rate.

Furthermore, the demand for robots also with a mobility function in clean rooms requires a transformation of current processes. In the food sector, the issues are very similar even if some attention is required to the cost of the robotic solution which must still be efficient but with **ROI** within a very short time.

AutomationWare offers a comprehensive and modular solution in both applications.

Our mobile cobot also in clean room configuration is one of the most advanced mobile robotics systems in the world.



Robotics vs Logistic application

Logistics will undergo an epochal transformation in the coming years.

The evolution of e-commerce and material management from warehouse to shipment will involve a total transformation thanks to the use of **AGV** and **AMR** able to move in different areas of the company with fleet management and connection to company management.

However, the role of cobot also in the function of manipulator will be decisive.

Access to automatic warehouses and palletisation or preparation of orders will be enslaved by collaborative robotic solutions that do not provide for the isolation of the area to people, but to manage any collisions through Lidar or 3D cameras.

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