AutomationWare™

brought to you by IKO

One step ahead on the future

AW Modular Solutions
Handling Systems

Slides Modular
32 | 50 | 63 SM Series™

AW Solution System
Automationware

32 50 63

Innovative and modular solution for a modern handling or Pick & Place engineering.

It provides AwareVu™ Ind. 4.0 diagnostic.

Customer talk we listen ....

We always listen and anticipate customer needs, to solve definitely a wide variety of high-output application, to help advanced Mechatronic Systems designers find innovative solutions on the market.

The SM series enhances the **Automationware** product families *(axes, cylinders, electric rotary tables)* and integrates technologically giving a series of solutions on the market for highly efficient handling or pick and place.

Nowadays many customers use for such application mixed systems, electric and pneumatic, fitting them with electronic regulating and control devices to improve the movement and the control *(Ind. 4.0).*

Notwithstanding these efforts, manoeuvrability and accuracy are often limited.

In addition, the monitoring of the reproductive cycle doesn't have the **Ind. 4.0** feedback for the forecasting of eventual malfunctions.

The manoeuvrability or the regulation is extremely expensive, complex and inadequate for eventual, requested shape variations.

Some manufacturers have changed their pneumatic systems, providing them with linear motors, improving some of these technological limitations; but running into other contraindications, such as high costs or the impossibility of operating at extremely high loads or in environments with high concentrations of dust or processing residues.

Automationware, leader of Mechatronic-based components, designs a series of products for a definitive, reliable, precise and economic solution on the market; for the construction of high-performance Cartesian systems.

Furthermore many improvements have been made; the complete control possibility of the manufacturing process *(force, temperature and vibrations)* for high tech Real-Time Diagnostic. *(**AwareVu**™ Patent pending)*.

The SM series is composed of modular linear sliders, controlled by very high performance brushless motors.

The SM slides are available in 4 versions *(32-50-63)* for variable loads, stroke and speeds, also with high payloads.

The movement and the positioning are completely electronically controlled and ensure accuracies up to 0,01mm, with the complete control and modelling of the motion cycle.

The used first class mechanic technologies derive from the extensive experience of **AW** uniting mechanic and advanced electronic, to reach speed and high load movement, impossible for pneumatic systems and very critical for linear motor systems.

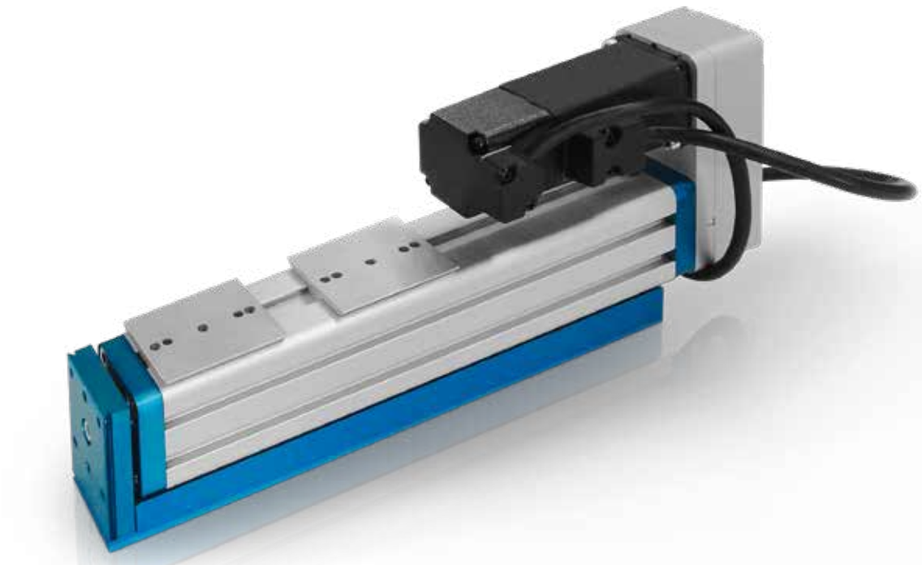
The system is completed by **Ind. 4.0** diagnostic, called **AwareVu** for the manufacturing cycle monitoring, highlighting real-time the anomalous vibrations of the manufacturing cycle, alerting the local monitoring and transmitting the functioning and frequency parametric trends to the control system *(Cloud)*.

Essential elements

- **3 formats, 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

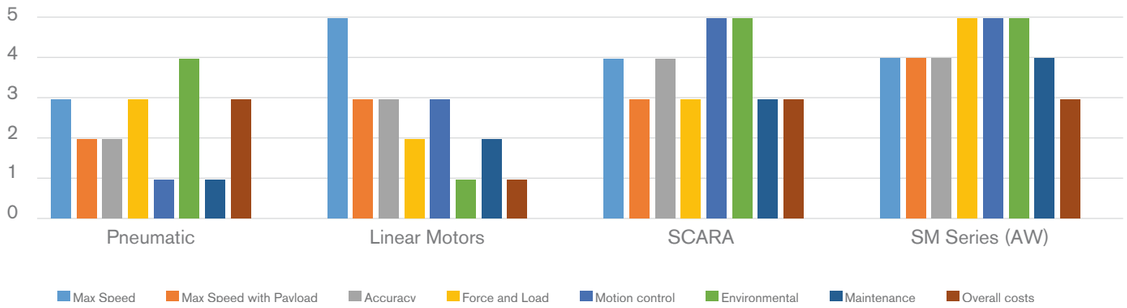


AW Solution System
Automationware

Criteria for Technological Choice

Pneumatic...
Linear Motor... SCARA...
or SM Automationware?

Comparison bewteen Fast Handling Systems



	Pneumatic	Linear Motors	SCARA	SM Series (AW)
Max Speed	3	5	4	4
Max Speed with Payload	2	3	3	4
Accuracy	2	3	4	4
Force and Load	3	2	3	5
Motion control	1	3	5	5
Environmental	4	1	5	5
Maintenance	1	2	4	4
Overall costs	3	1	3	3
Total Evaluation	19	20	31	34

5 Max Value - 1 Min Value

In the table above, we have indicated some essential characteristics for our customers *(Voice of Customers)*, to choose the right technology for their new **Handling** or **Pick&Place** projects.

For **AW** is the voice of customer essential for our internal engineering ideas, so we project to give a solution for customer questions.

In this table we meticulously compared the different available technologies, to better represent the differences between the different solutions.

(5 for the maximum performance and 1 for the minimum performance).

Maximum unladed speed: this parameter indicates the maximum speed capability.

As shown in the graph below, the linear motors allow superior speed and acceleration to each available system.

Maximum loaded speed: in case of operating cycle, the systems with linear motor decrease the general productivity depending on the payload.

The load inertia causes unwanted oscillations while positioning, with consequent impact on productivity.

The pneumatic systems rarely exceed 75 cycles per minute and are very vulnerable to compressor pressure variations.

The performance of **SCARA** is very good, but limited according to the applicable max. load *(small systems)*.

The SM series is not influenced by the load, the motorized mechanical movement allows, at maximum speed, thrust up to 3kN.

Accuracy: extreme vulnerability of the pneumatic systems, they need a considerable accessory planning to give precision and repeatability guarantees.

The systems with linear motors react to ringing positioning in case of operating loads, oscillating at the destination.

SCARA and **SM** offer an excellent position reliability in all conditions.

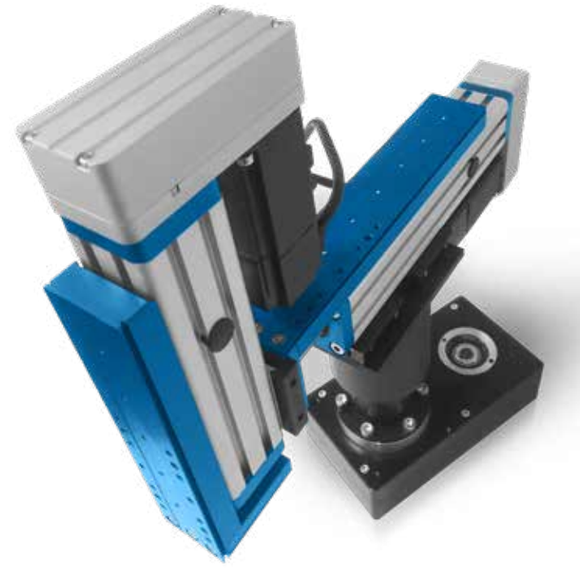
Loading force: the **SM** series derives from the consolidated experience of Automationware in designing and building high-performance actuators *(up to 190kN)*; so in the case of the sliders this technology is used to give the best performance on the market.

SCARA can handle relatively higher loads, but their cost increases significantly.

The pneumatic is inappropriate for high loads, the linear motors increase considerably their cost changing the operative payload.

Motion control: very difficult for pneumatic systems *(also for little modulations they need a very complicated planning)*, they are so not to choose for format changes.

The linear motors can have a very good motion control, but limited by modest loads. **SCARA** and SM allow an optimal manoeuvrability.



Working environment: pneumatic systems can be influenced by pressure variations, the initial factory calibration should be adjusted during the installation remote phase. The linear motors are vulnerable to weather changes, they can also begin to seize, if not protected from processing residues *(water, dust, metal powders)*. No problem for **SCARA** and **SM sliders.**

Maintenance: very important for pneumatic systems that often require frequent calibrations.

The maintenance cost-impact of pneumatic systems is frequently ignored by the manufacturers.

However the advent of **SCARA** and of the electronic controlled movements, such as the **SM series**, offer nowadays a valid alternative.

The **SM** series allows a better integration with axes and electric actuators that can be connected to the application, keeping the total cost of ownership low.

The **AwareVu** diagnostic system makes the installed configurations controllable in real time, thereby avoiding production blackouts.

Cost: the total cost of the chosen solution must also be considered with the installation and maintenance costs, that are on average 10 times higher than the configuration costs.

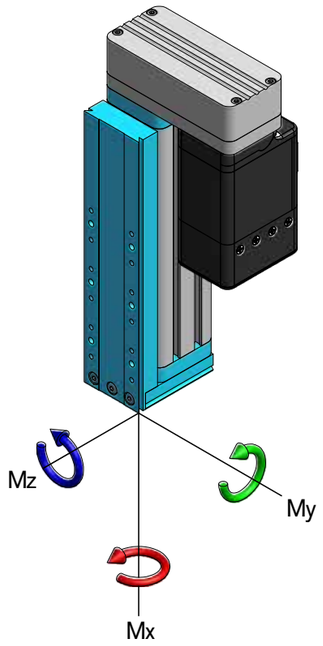
The planning of the **SM** series is designed for the best price/performance combination, without prejudice on productivity or applied load.

AW Solution System
Automationware

The SM series

Offers an ideal solution, particularly to give the right price at the best performance.

Optimal for P&P applications thanks to its exceptional speed and acceleration to reach up to 2 m/sec with productivity over 100 cycles/minute.



Models specification and correspondent Table for applicable loads

Table : Specifications of SM Sliders

Actuator	Screw		Stroke	Fx.max.	Fx Nom	Max Speed	Accelera-tion	Motors Specs	Encoder Res.	Accuracy	Mx	My	Mz	Cdyn
Size	Diam. (mm)	Lead (mm)	mm	N	N	mm/s²	m/s²	Nm - rpm	Pulse/ round	mm	Nm	Nm	Nm	Nm
SM32-BR1	12	5-10	60-120-180-240	250-125	200-100	375-750	7,5-25	BR1 0,32 Nm-4500rpm	10.000	+/- 0,01	9,5	23,4	23,4	2010
SM50-BR2	16	5-10-16	120-180-240-300	470-235-145	376-188-116	375-750-1200	7,5-15-25	BR2 0,64Nm-4500rpm	10.000	+/- 0,01	21	46	46	3290
SM63-BR3	20	5-10-20	120-180-240-300-420	1000-500-250	800-400-200	375-750-1500	7,5-15-30	BR3 1,27Nm-4500rpm	10.000	+/- 0,01	44,3	76,7	76,7	5480

Moments of Inertia Calculation

		SM32				SM50				SM63				
Stroke	[mm]	60	120	180	240	120	180	240	300	120	180	240	300	420
Slider Weight	[Kg]	1,2	1,6	1,94	2,28	2,8	3,35	3,9	4,45	4,1	4,74	5,42	6,11	7,46
In Motion Weight	[Kg]	0,59	0,75	0,9	1,06	1,54	1,8	2,06	2,33	2,32	2,66	3	3,34	4,02
M. Inertia Screw	[Kg mm²]	0,46	0,71	0,96	1,22	4,7	6,3	7,9	9,6	11,4	15,5	19,5	23,5	31,6

Lead	Moments of Inertia @ Payload Ø
[mm]	[kg mm² / kg]
5	J=0,63 x Payload(kg)
10	J=2,53 x Payload(kg)
16	J=6,47 x Payload(kg)
20	J=10,13 x Payload(kg)

Simulation models for operating cycles

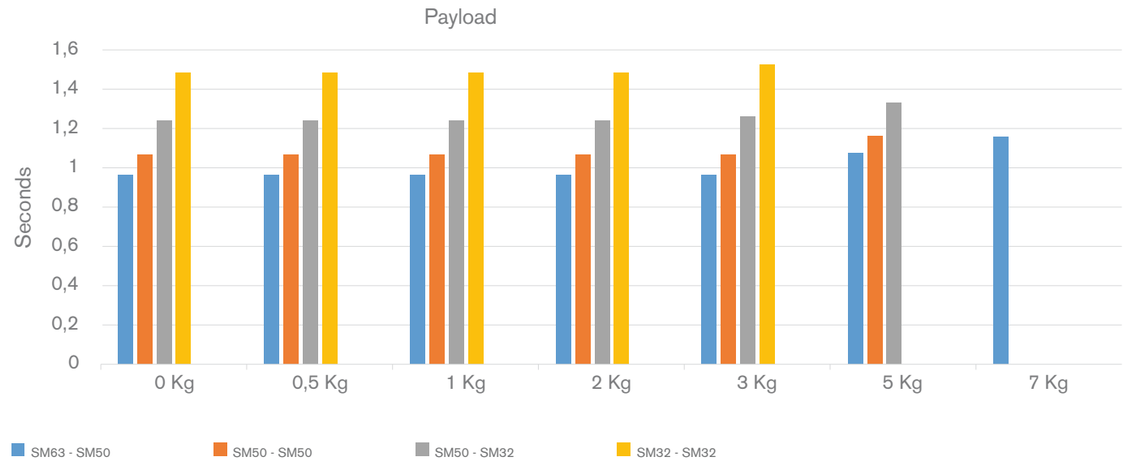
The graphs below show the cycle times for different P&P combinations.
*(Based on the 3 formats **32-50-63**)*

The productivity estimate in cycles/s are referable to different load examples.

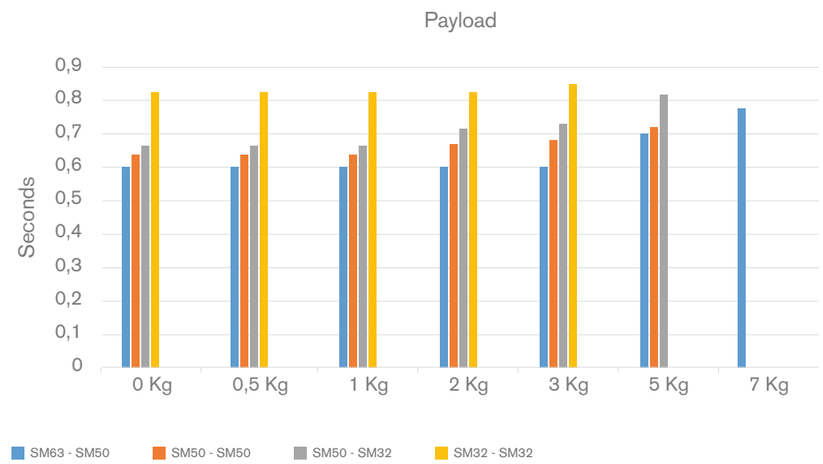
The evaluations are made with X=120 o 240mm and Z=60 o 120mm stroke, *(6 phases)*.

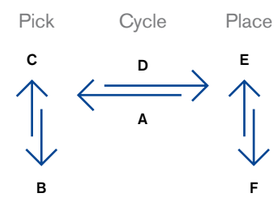
This analysis is recommended in the system planning phase, to define the best possible configuration and optimise productivity and construction costs.

Examples of P&P cycles based on SM sliders with X=240, Z=120 mm



Example of P&P cycle based on SM sliders X=120, Z=60 mm





Pick &Place Cycle	XZ (mm)	XZ (mm)
A	240	120
B	120	60
C	240	120
D	120	60
E	240	120
F	120	60

Applications

Electronic / Mechanical production
With Pick&Place for mounting mechanical or electronic components, also configurable with linear axes or Rotac Plus rotary actuators.
A wide range of grippers or vacuum accessories is also available for each need.

Quality control system
For liquid materials or products, with probes positioning for Quality Inspection.
High speed and accuracy in the positioning.

Manufacturing
(Food and Beverage)
Possibility to control, the acceleration and positioning
Very useful to prevent spillage of expensive liquids in high productivity situations *(Pharma)*.

Packaging and /or material movement
Optimal solution for packaging systems
Also combined with linear axes for high speed & long-distance movements.

Printing & Labelling
High speed solution with low construction costs.
Different accessories for height-adjustable positioning for different applications.
P&P combinable with the rotary actuator *(Miniscara configuration)*.

Factory automation
The definitive solution for production without the use of pneumatic.
Excellent productivity, low maintenance, integrated diagnostic system to avoid production-blackout.
Simplification of the design, helping the realization with low maintenance costs.

Medical & Pharmaceutical/ Laboratory Automation
Perfect for probing, to use with delicate applications such as biological tests, diagnostic tests, or pharmaceutical packaging.
The **AW** solution guarantees great reliability and precision,
greater process control with manufacturing-cycles storage, thanks to the **AwareVu** diagnostics. The hygienic integrity is ensured by the slide insulation, allowing the operating in controlled-contamination

AW Solution System
Automationware

AwareVu™ system, for Ind. 4.0 diagnostic

A very efficient system to detect anomalies during the production process.

AwareVu™

AW developed an innovative diagnostic system called **AwareVu ™** *(Patent Pending)*;
it allows the complete system monitoring with temperature and vibration control, to identify possible variations of the production cycle and / or possible malfunctions.

The system is able to determine the local alarm *(lighting alarm)*, and it is connected to the net via WIFI or via USB, to allow data recording and storing in the central computer or in cloud.

The system has also applications for Mobile Phones or Tablet, to alert the maintenance operators about eventual malfunctions.

The operator has the possibility to display on a single screen data, parameters and alarms.

The system acquires and processes signals from vibration and temperature sensors, it represents the frequency profile *(Fourier)*, determining established thresholds; the customer will be advised about unusual vibrations or high-temperature vibrations *(also for individual system components).*

AwareVu™

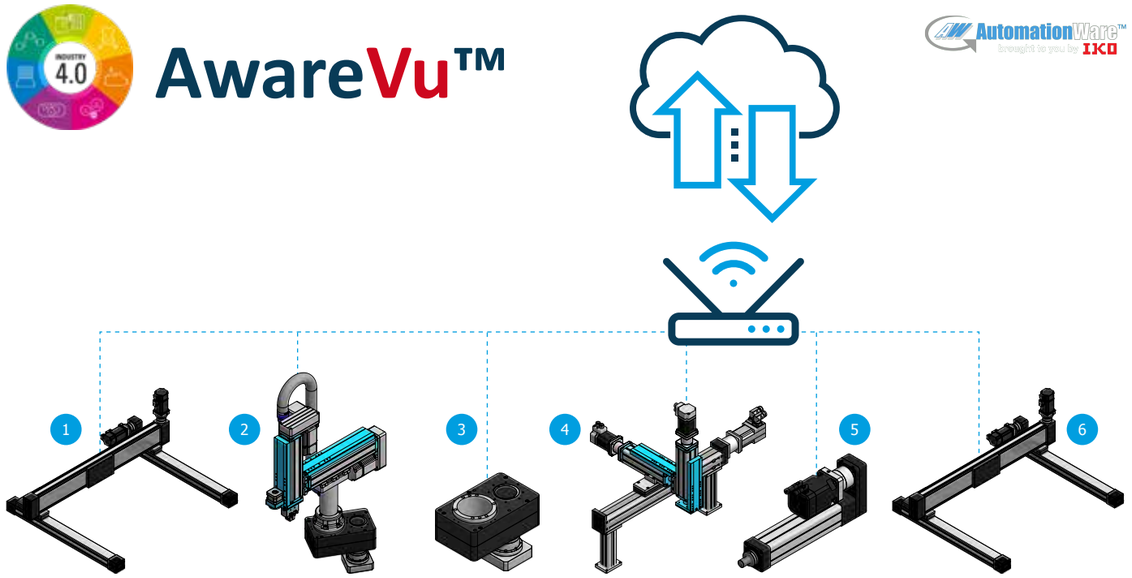


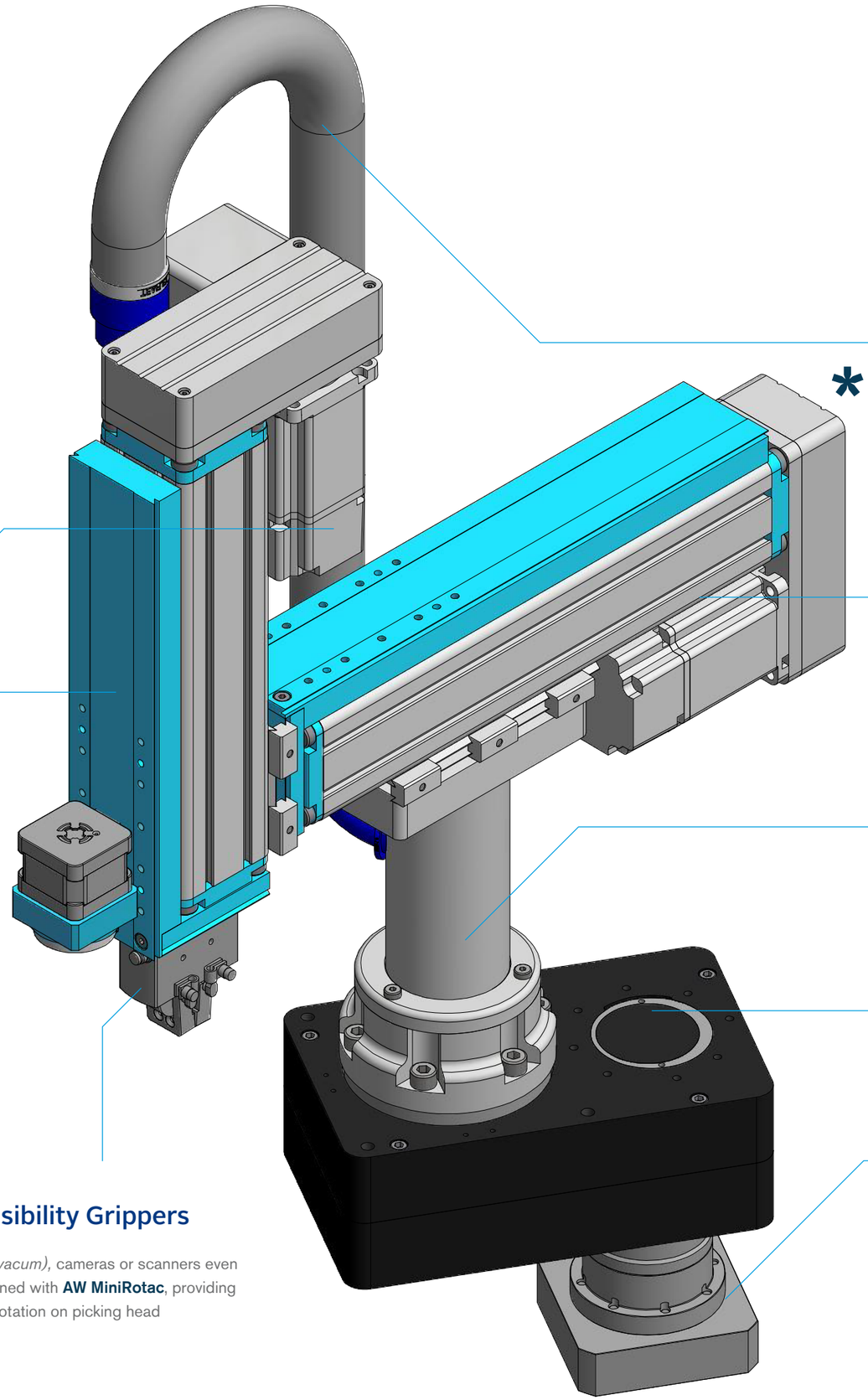
Table Configuration Sliders SM

Version : SM 32 | 50 | 63

	SM-	32-	10-	120-	BR1-	MP-	1
PRODUCT	SM						
SIZE	32-50-63						
LEAD mm	SM25 (5-10), SM32 (5-10), SM50 (5-10-16), SM63 (5-10-20)						
STROKE mm	SM25: 60-120-180, SM32: 60-120-180-240, SM50: 120-180-240-300, SM63: 120-180-240-300-420						
MOTOR TYPE	Brusheless Only (- BR0, BR1, BR2, BR3)						
DIRECT - PARALLEL	Without Motor (0) - Direct Drive (MD) - Parallel Drive (MP)						
HOME SENSOR	Type of Hall sensors 1 included - (1 end switch - 2 end switch Optional)						

SM Series™
Automationware

- Max speed up to **2 m/s**
- Accuracy **+/- 0,01 mm**
- Max Fx Force **3000 N**



* AwareVu™

Patent Pending AW monitoring system. This application prevents users of AW products to be exposed to unexpected problems *(Real time FFT)*

Best cable connectivity and protections

to avoid connectors stress.
Cables connectivity embedded on the system *(Inside of telescopic support)*

Proximity magnetic

Complementary proximity magnetic detector for additional protection *(Single included and Double optional)*

Brushless Motor

High Performance Brushless Motor with 17 bit resolution encoder, direct or parallel drive

Cylinder

based on high performance
ball screw system for extreme accelerations, long life and high loading capability

Sliders Motion and stability:
Tiny and light weight, block and rail are in special grade of stainless steel for anti-corrosion purpose.

Gothic arch contact design can sustain loads from all directions and offer high rigidity and high accuracy.

Possibility Grippers

(also vacum), cameras or scanners even combined with **AW MiniRotac**, providing a full rotation on picking head

Telescopic arm

for vertical adjustments

Combination

Combination with **Rotac Plus** for full rotation capability and high accuracy positioning up to 0,02°

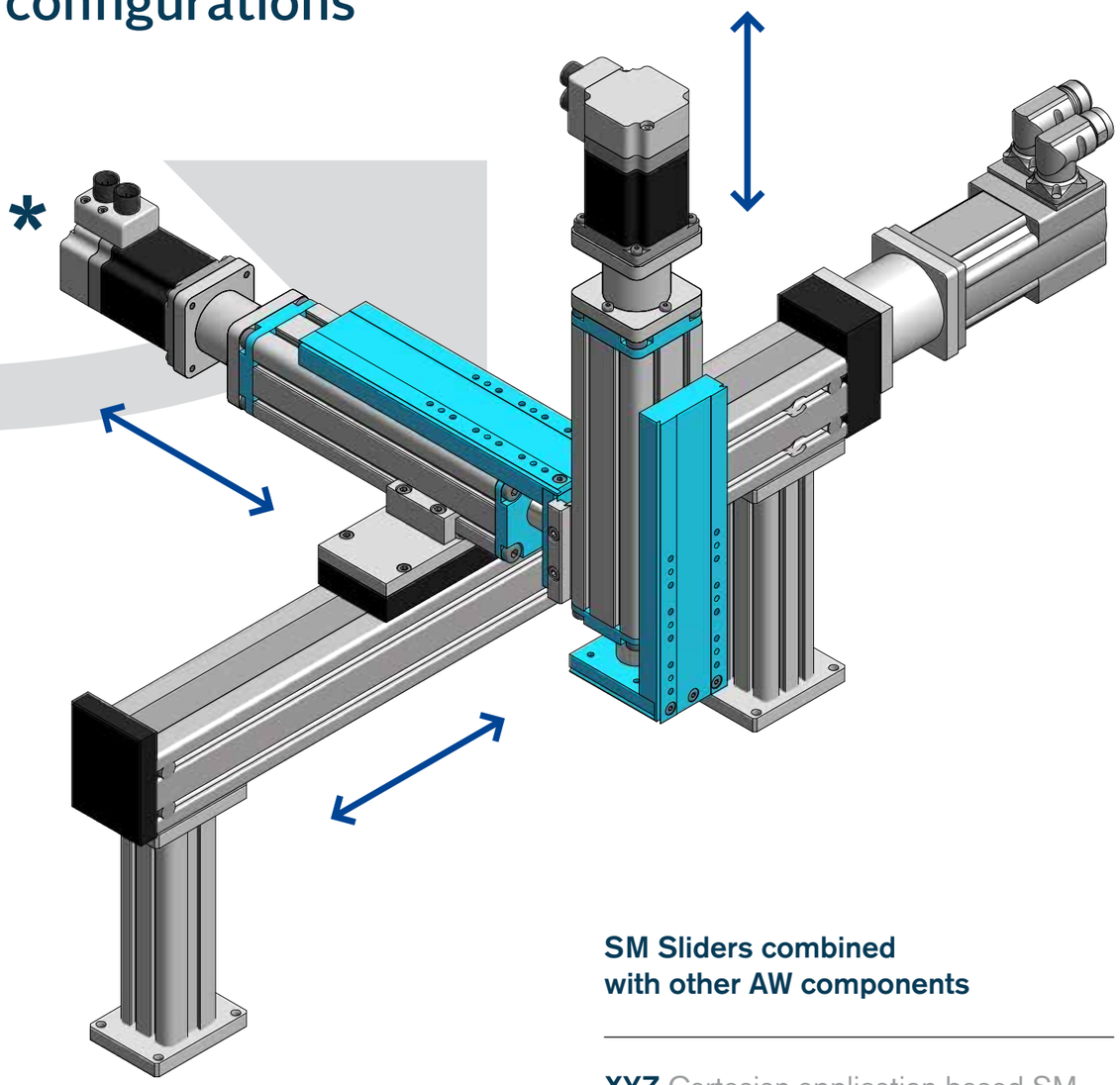
Possibility

of gearbox with very small backlash

AW AutomationWare™ brought to you by IKO

SM Series™
Automationware

Examples of configurations

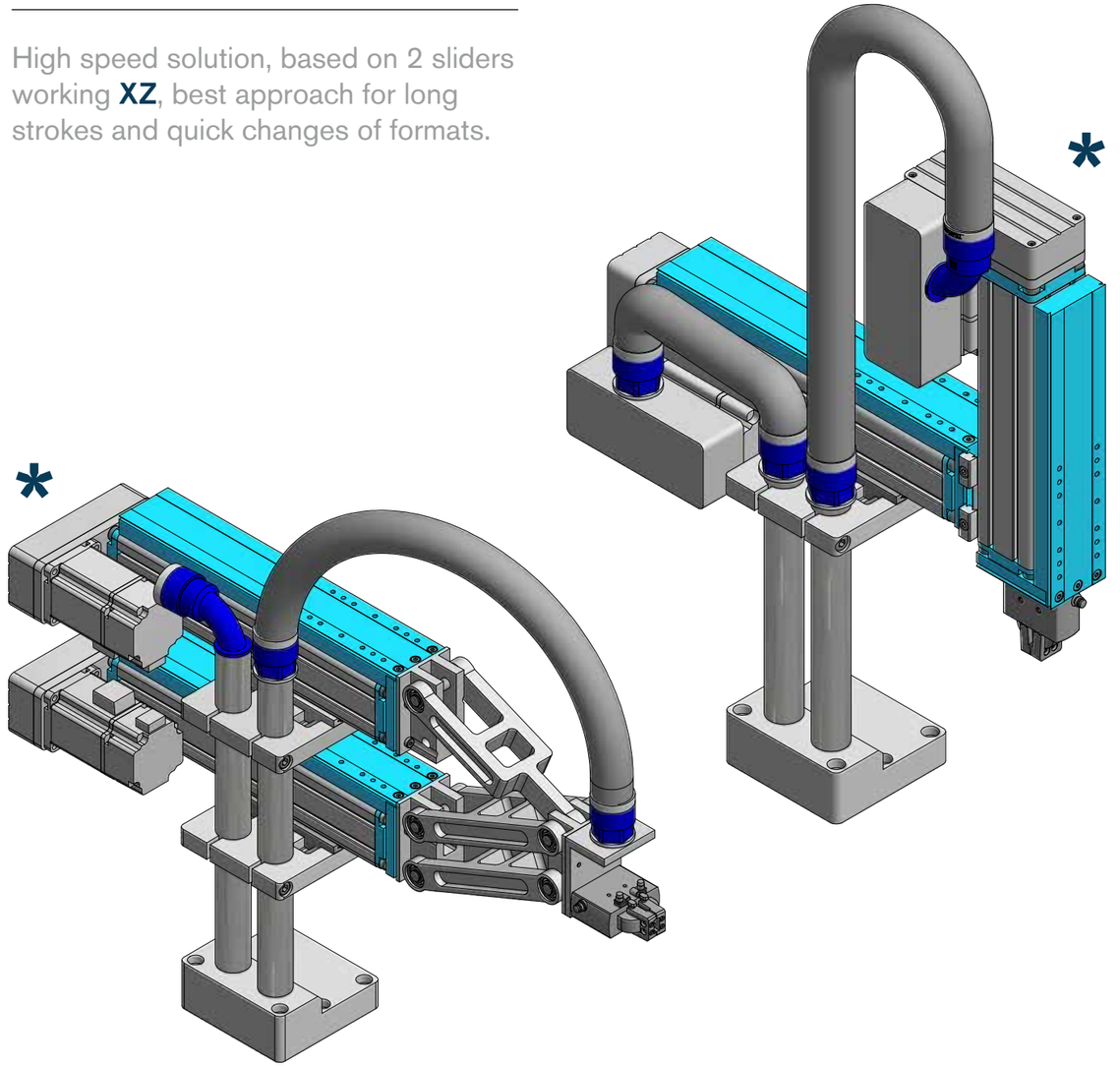


SM Sliders combined with other AW components

XYZ Cartesian application based SM series combined with Linear actuators ML series *(belt or screw).*

Vertical P&P configuration

High speed solution, based on 2 sliders working **XZ**, best approach for long strokes and quick changes of formats.



Horizontal P&P configuration

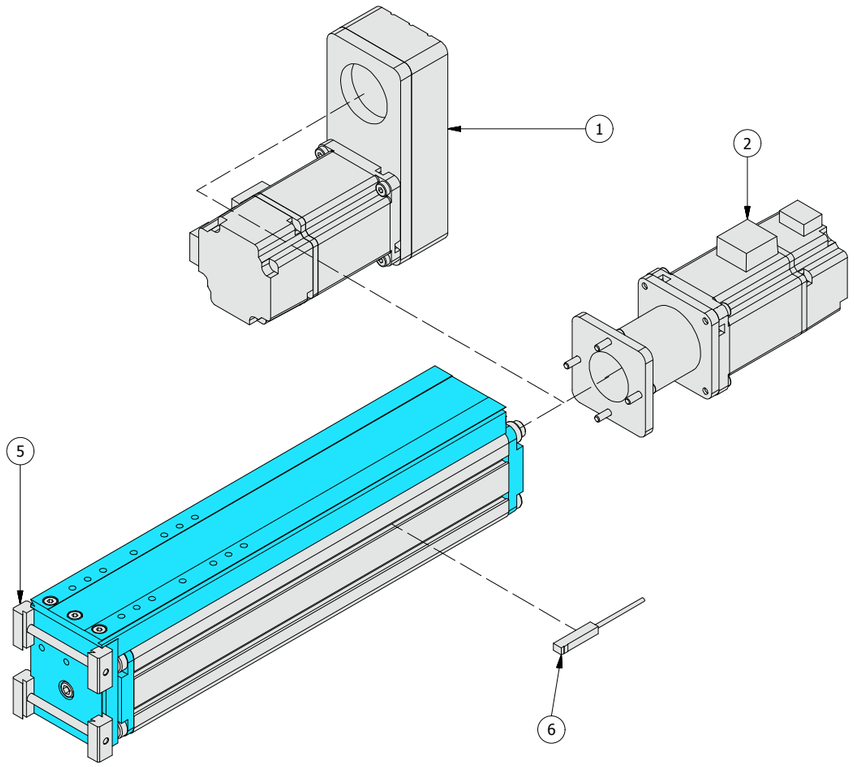
Very High speed solution, based on 2 sliders working in coordination horizontally, very useful for heavy loads applications and/or extreme cycling Requests.

* AwareVu™

Patent pending monitoring system from **AW.**

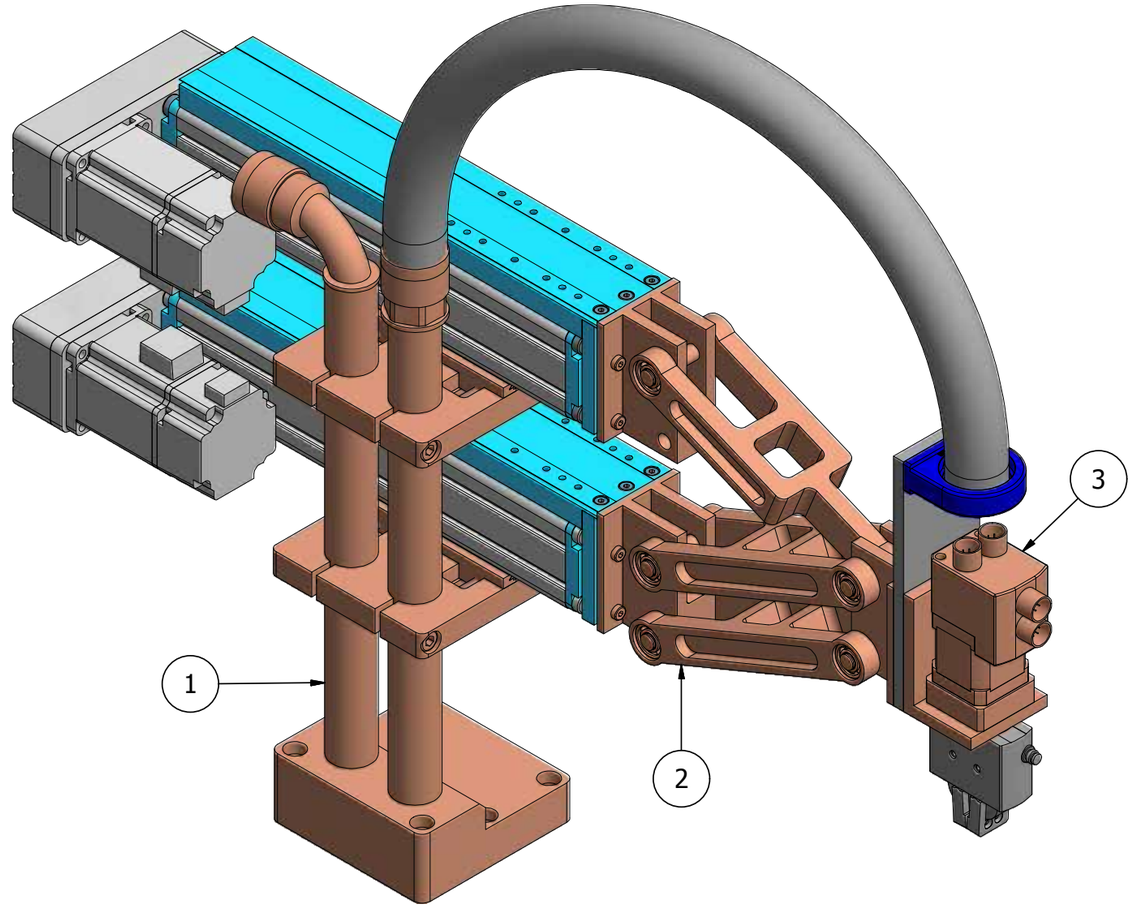
Application to store cycle vibrations and alert for any overshoot or instability *(FFT).*

Accessories



AVAILABLE OPTIONS SLIDES SM

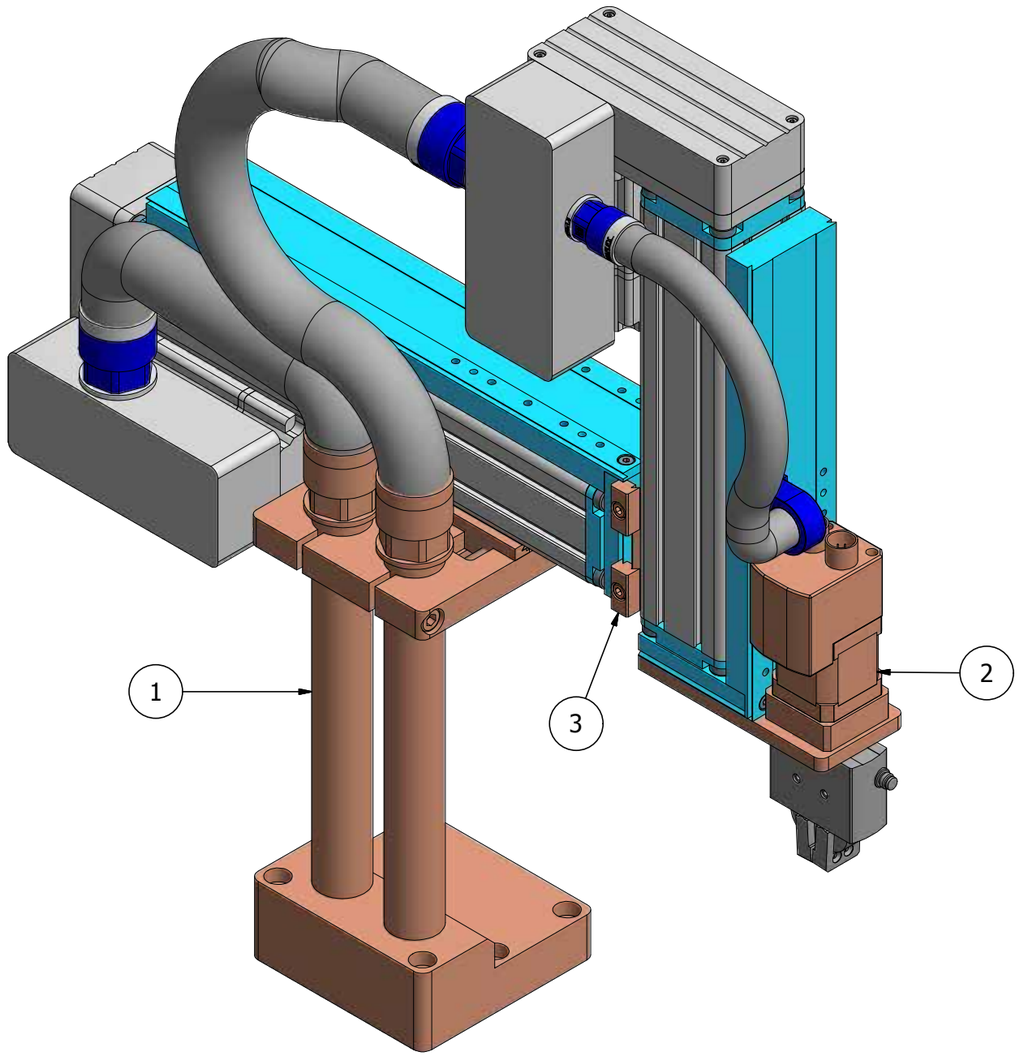
POSITION	DESCRIPTIONS
1	Parallel Drive Mounting Kit
2	Direct Drive Mounting Kit
5	Holding Kit
6	Hall sensor



AVAILABLE OPTIONS HORIZONTAL P&P

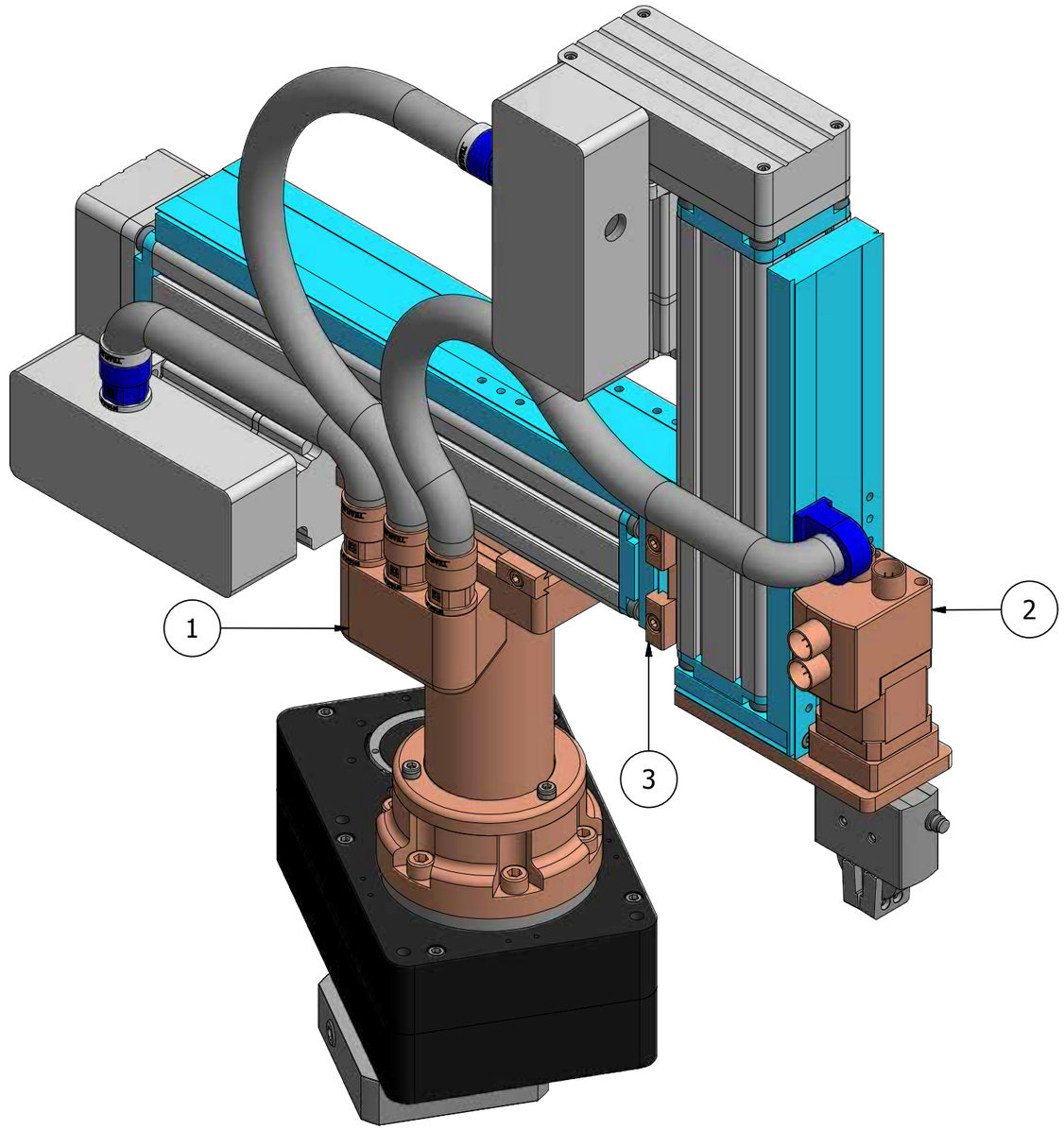
POSITION	DESCRIPTIONS
1	Support Kit
2	Front trapeze kit
3	Rotary spindle kit

Accessories



AVAILABLE OPTIONS VERTICAL P&P

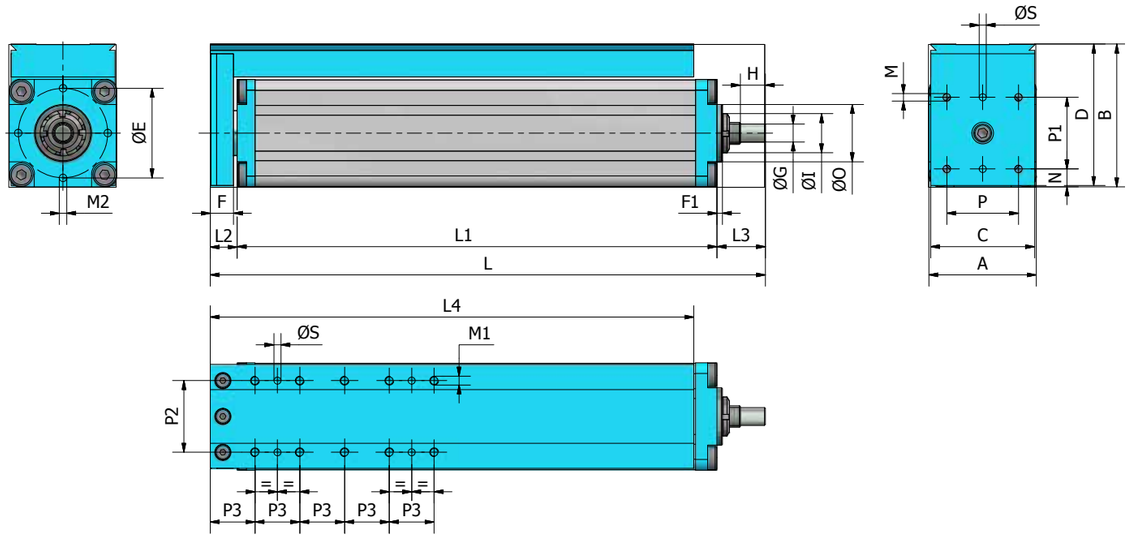
POSITION	DESCRIPTIONS
1	Support Kit
2	Rotary spindle kit
3	SM vertical interface kit



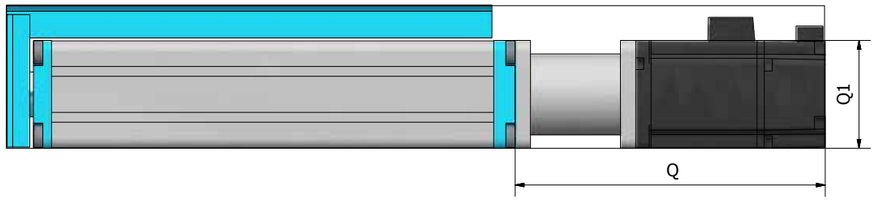
AVAILABLE OPTIONS MINI SCARA

POSITION	DESCRIPTIONS
1	Telescopic support kit
2	Rotary spindle kit
3	SM vertical interface kit

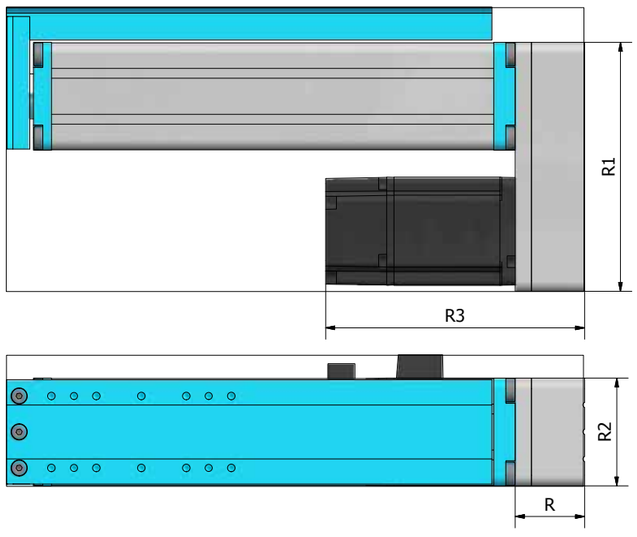
Components



Direct Motorization

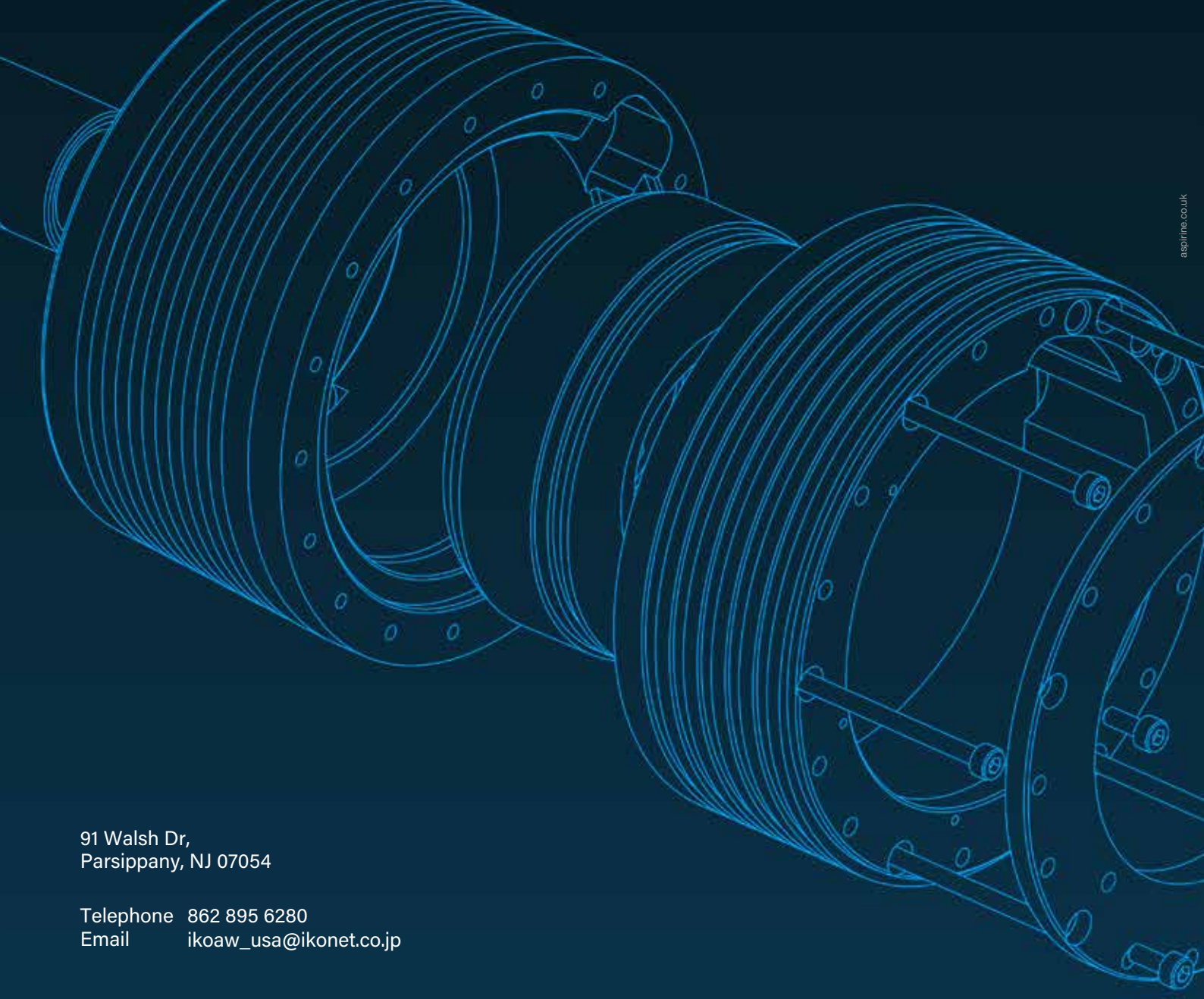


Motorized Returned



DIMENSIONS: Base Version, Direct Drive, Parallel Drive

Size Slider	UDM	SM 32				SM 50				SM 63				
Lead screw	mm	P 5/10				P 5/10/16				P 5/10/20				
Stroke	mm	60	120	180	240	120	180	240	300	120	180	240	300	240
A	mm	42				60,6				70				
B	mm	60				80				94				
C	mm	40				58				68				
D	mm	59				79				93				
ØE	mm	39				50				60				
F	mm	11				13				14				
F1	mm	2				3				3				
ØG h7	mm	8				10				12				
H	mm	14				14				16				
ØI	mm	18				21				25				
L	mm	220,5	280,5	340,5	400,5	310	370	430	490	324	384	444	504	624
L1	mm	183,5	243,5	303,5	363,5	268	328	388	448	278,5	338,5	398,5	458,5	578,5
L2	mm	12				15				16				
L3	mm	25				27				29,5				
L4	mm	192	252	312	372	270	330	390	450	280	340	400	460	580
M	mm	N°4 M4X10				N°4 M5x12				N°4 M6x12				
M1	mm	N°4 M4x8				N°10 M5x10				N°10 M6x12				
M2	mm	N°4 M3x10				N°4 M4x10				N°4 M5x10				
N	mm	6,3				10,3				10				
ØO	mm	26				32				35				
P	mm	20				40				50				
P1	mm	30				40				50				
P2	mm	23				40				50				
P3	mm	30				25				30				
Q	mm	55				172,5				200,7				
Q1	mm	45x45				60x60				70x70				
R	mm	27,5				38,5				38				
R1	mm	107				138				144				
R2	mm	45				60				70				
R3	mm	130,1				144				169,7				
ØS H7	mm	4x4				4x5				5x5				



91 Walsh Dr,
Parsippany, NJ 07054

Telephone 862 895 6280
Email ikoaw_usa@ikonet.co.jp

AutomationWare™
brought to you by IKO