

# VSM23-X Datasheet

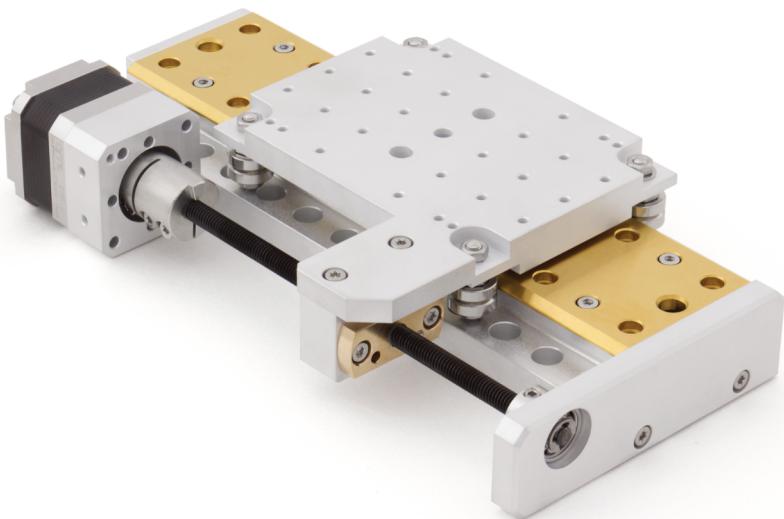
Modular UHV Linear Sample Transporter

**aml**  
ARUN MICROELECTRONICS LTD

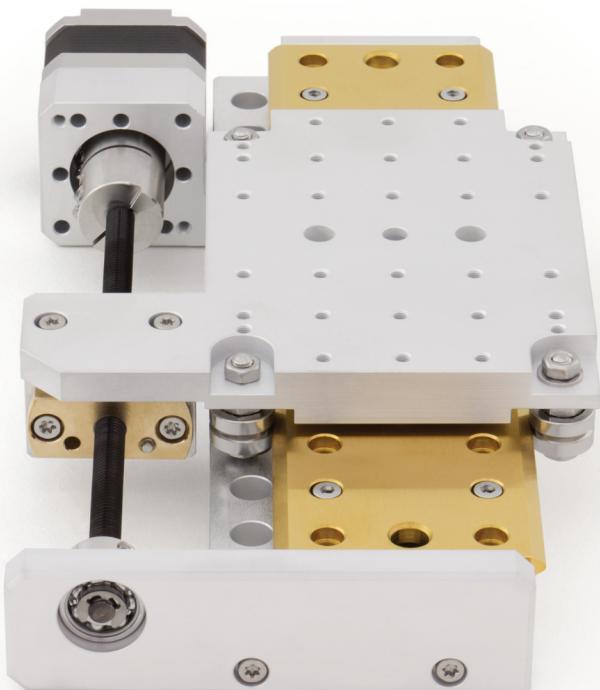
AML ultra high vacuum compatible modular linear translation stages provide long travel with minimum height for loads of up to 20 kilograms. They have widely spaced 'V' roller guides and are useful in simpler compound mechanisms where torsional loads are small.

Smooth motion is provided by a diamond corrected lead-screw and a matched nut to ensure good positional stability, and incorporate a preloaded leadscrew nut to eliminate backlash.

They can be used standalone or in combination with other VSM modular stages to create multi-axis mechanisms.



## FEATURES



- Standard travels from 100 to 450 mm
- 5  $\mu$ m resolution (1  $\mu$ m for option HR)
- Better than 1  $\mu$ m repeatability
- Maximum speed 25 mm/s (5 mm/s for option HR)
- Suitable for use to  $1 \times 10^{-10}$  mBar
- Load capacity to 20 kg
- UHV-prepared aluminium construction as standard
- Stainless steel construction available (option SS)
- Bakeable to 150°C (200°C for option SS)
- Features AML D35.1 stepper motor
- Limit switch and encoder options available
- High resolution, radiation resistant and dry lubricated versions available
- Compatible with all VSM modular stages
- May be customised for specific requirements

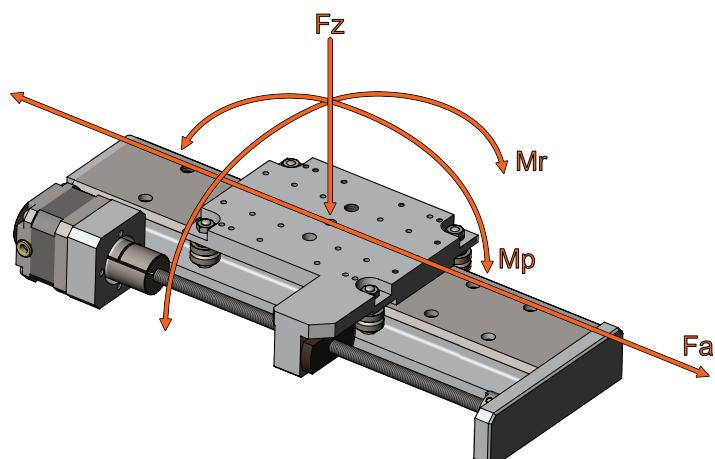
## SPECIFICATIONS

Specification	VSM23-X	Option HR
Travel (mm)	100 / 150 / 200 / 250 / 300 / 350 / 400 / 450	
Resolution	5 $\mu\text{m}$	1 $\mu\text{m}$
Maximum Speed	25 mm/s	5 mm/s
Repeatability	Better than 1 $\mu\text{m}$	
Centred Load Capacity (Normal) (Fz)	20 kg	
Maximum Load Moment (Mr, Mp)	10 Nm	
Axial Load Capacity @ 500 Hz/s 1000 Hz 1A	10 kg	
Phase Current (Fa)		
Backlash	$\pm 1 \mu\text{m}$	
Roll and Pitch	$\pm 40 \mu\text{rad}$	
Roll and Pitch Compliance	285 $\mu\text{rad}/\text{Nm}$	
Leadscrew Accuracy	0.055/100 mm	
Stepper Motor	AML D35.1	AML D35.1 + SG35-005
Vacuum Environment		$< 1 \times 10^{-10} \text{ mBar}$
Maximum Temperature	150°C (200°C for option SS) (reduces to 120°C when an optical encoder is fitted)	
MTBF (5 kg load and 30% duty cycle)	15,000 hrs	
Mass for 100 mm Travel	1.3 kg	1.6 kg
Mass Increase per 50 mm Travel	0.25 kg	0.25 kg

Encoder Specification	ER (Incremental Encoder)	EA (Absolute Encoder)
Readhead	T1630-15M	RL26BVE050D15V
Scale	RKLC20 20 $\mu\text{m}$ pitch	RELA30 30 $\mu\text{m}$ pitch
Interface Module	TI0040A10A 40x interpolation factor	None
Electrical Interface	Square wave differential line driver to EIA RS422A (except limits P and Q).	BiSS-C (unidirectional) 26 bit
Resolution	500 nm	50 nm

## NOTES

### LOAD DIAGRAM:



## NOTES CONT.

---

**MATERIALS:** The major components of standard stages are manufactured from 6061 T6 aluminium. The material surface is processed to obtain a thin, dense aluminium oxide coating which reduces diffusion and desorption at UHV. A 304L stainless steel version can be specified using option code "SS".

**BACKLASH:** Backlash in the gearbox of the high resolution (option code "HR") VSM23-X is controlled by special gearing and is negligible. Backlash between the nut and leadscrew is controlled by a pre-loaded nut and is much less than the resolution. If the transporter is used for motion with a significant vertical component ( $>45^\circ$ ), the load provided by the carriage weight is sufficient to eliminate backlash and the spring can be removed. In these cases, mount with the motor at the top. Since speeds are low, acceleration forces are negligible.

**CARRIAGE COMPLIANCE:** The carriage will deflect under load moments about the principal axes by  $285 \mu\text{rad}/\text{Nm}$ . In most applications the load deflection will be constant and can be compensated for in the sample mount. For stacked XY motions in a horizontal plane, the movement of the carriage and load on the upper transporter will produce a varying moment about the axis of the lower transporter. Minimise this by stacking the shorter transporter on the longer.

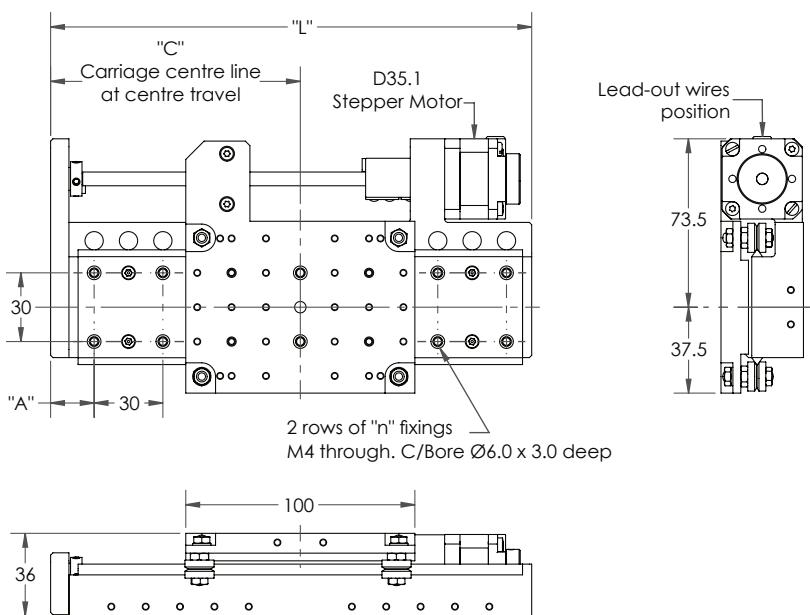
**LUBRICATION:** Running surfaces are dissimilar materials or dry lubricated with molybdenum disulfide. Leadscrews are lubricated with Nyetorr® 6300 UHV grease. Dry lubrication can be specified.

**VERNIER STOP:** These transporters may be driven to the vernier stops at the limits of their travel and stalled without damage.

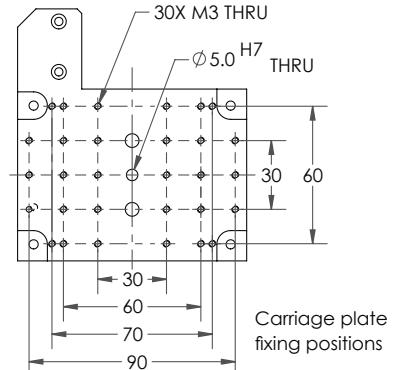
**STACKED MECHANISMS:** For multi-axis motion, mount the stage moving the load vertically on top of the others to avoid adding their weight to its load.

## DIMENSIONS

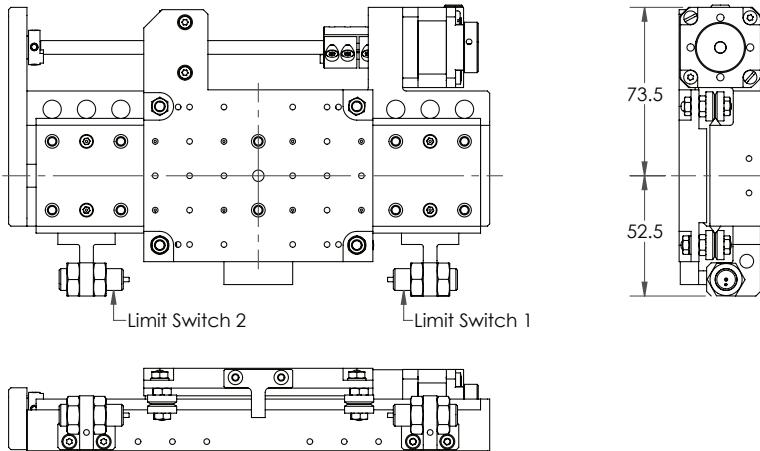
### VSM23-X



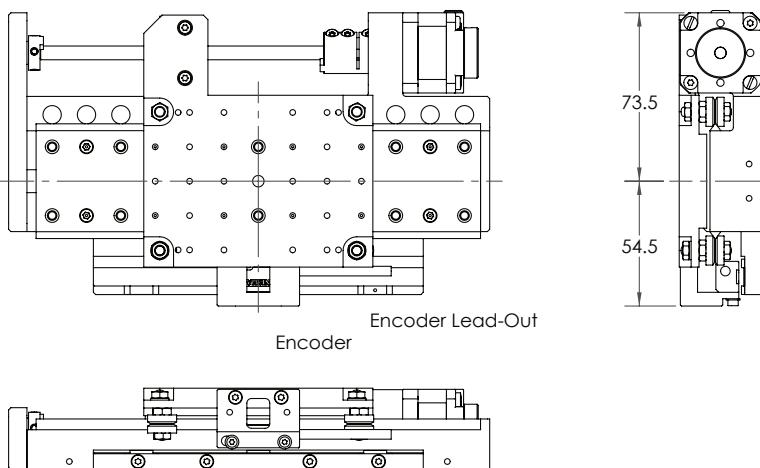
Travel mm	L	C	A	n
100	210	109	19	7
150	260	134	44	7
200	310	159	39	9
250	360	184	34	11
300	410	209	29	13
350	460	234	24	15
400	510	259	19	17
450	560	284	44	17



### Limit Switch Option (LS)



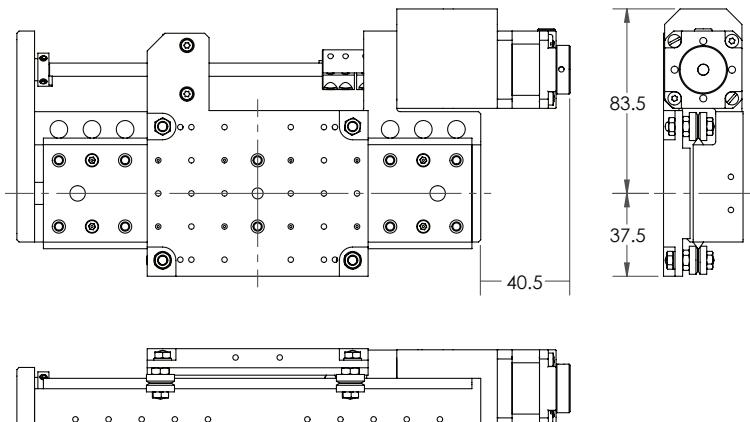
### Encoder Option (ER/EA)



## DIMENSIONS

---

### High Resolution Option (HR)



## OPTIONS

---

**SS** Option SS is for the material of the VSM23-X to be 304L stainless steel. This increases the maximum temperature of the stage to 200°C from its standard 150°C.

**HR** Adds a SG35-005 UHV inline spur gearhead. This increases the full step resolution of the stage to 1 µm. Maximum speed is reduced to 5 mm/s.

**LS** Adds 2x limit switches to the stage.

**ER** Adds a Renishaw TONiC™ UHV incremental encoder.  
Renishaw readhead part number: T1630-15M.

**EA** Adds a Renishaw RESOLUTE™ UHV absolute encoder.  
Renishaw readhead part number: RL26BVE050D15V.

**R** Adapts the stage so that it is radiation hardened, making it compatible with a total dose of 1E6 Gy of gamma radiation.

## RELATED PRODUCTS

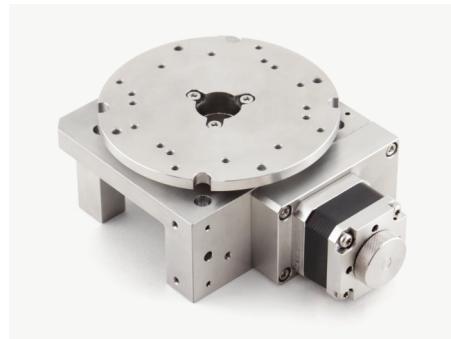


### VSA MOUNTING BRACKETS AND TABLE

VSAB01

Mounting Brackets and Table For UHV Compatible Stages.

AML UHV compatible mounting brackets for use with VSM stages. Used to reorient stages and create complex multi-axis mechanisms with standard products. Constructed with lightweight uhv-prepared aluminium to reduce mass whilst maintaining stability.



### VSM17-R

High Performance, Modular UHV Rotation Stage.

Rotation stage suitable for use in UHV. Can support loads of up to 100 kilograms. Resolutions from 0.1° to 0.005° with 360° of continuous rotation.



### SMD4

Single-axis Bipolar Stepper Motor Drive.

Engineered to operate vacuum-compatible stepper motors with maximum performance while minimising temperature rise. It is optimised for use with AML UHV-compatible motors.

## ORDERING INFORMATION

Order Codes	
VSM23-X-xxx	Linear stage (xxx=travel in mm)
VSM23-X-xxx-SS	Linear stage, stainless steel
VSM23-X-xxx-HR	Linear stage, 1 µm resolution
VSM23-X-xxx-LS	Linear stage with 2 x limit switches
VSM23-X-xxx-ER	Linear stage with encoder (incremental)
VSM23-X-xxx-EA	Linear stage with encoder (absolute)
VSM23-X-xxx-R	Linear stage, radiation resistant

Example Order Code	
VSM23-X-400-HR-ER	Linear stage, 400 mm travel, 1 µm resolution, incremental encoder.



Arun Microelectronics Ltd.  
Unit 2, Bury Mill Farm  
Bury Gate  
PULBOROUGH  
RH20 1NN  
United Kingdom

Tel: +44 (0)1903 884141

Email: sales@arunmicro.com

AML pursues a policy of continuous improvement and reserves the right to make detail changes to specifications without consultation. E and OE.