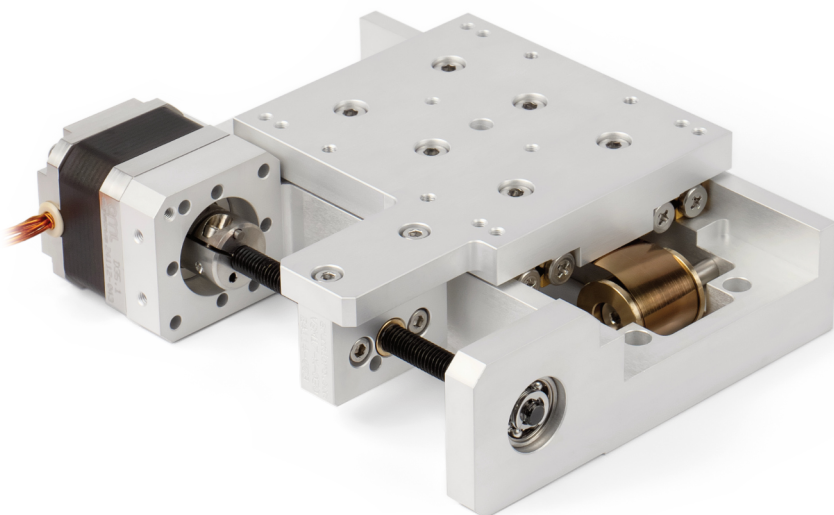


# VSM17-X Translation Stage

Modular UHV Linear Sample Transporter



AML ultra high vacuum compatible modular linear translation stages provide translation for loads of up to several tens of kilograms. They can be used standalone or as part of a complex motion system, as they are compatible with the range of VSM17 modular stage. They have very high rigidity, which is necessary where several transporters are stacked for compound motion or where offset loads are present. They are manufactured with UHV compatible material and construction methods and utilise AML UHV stepper motors.



## FEATURES

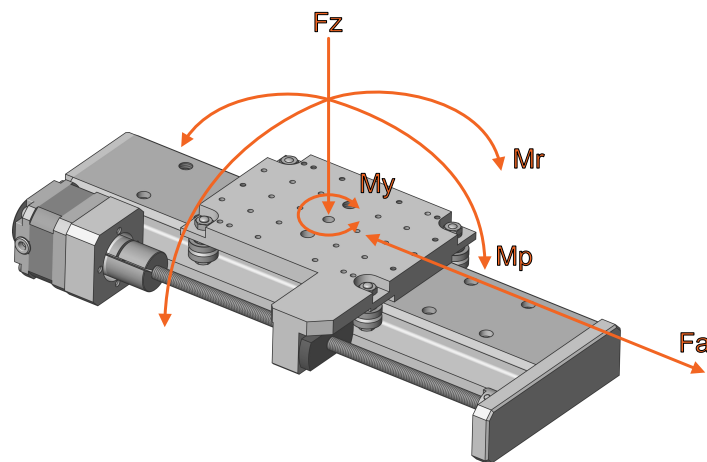


- Standard travels from 50 to 300 mm
- 5  $\mu\text{m}$  resolution (1  $\mu\text{m}$  for option HR)
- Better than 1  $\mu\text{m}$  repeatability
- Maximum speed 15 mm/s (3 mm/s for option HR)
- Suitable for use to  $1 \times 10^{-10}$  mBar
- UHV-prepared aluminium construction as standard
- Stainless steel construction available (option SS)
- Bakeable to 150°C (200°C for option SS)
- Features AML D35.1 stepper motor
- Can optionally be fitted with limit switches or an optical encoder
- High resolution, radiation resistant and dry lubricated versions available
- Directly stackable for XYZ orientations
- Compatible with all VSM17 modular stages
- May be customised for specific requirements

## SPECIFICATIONS

| Specification                                                | VSM17-X-050                                                                      | VSM17-X-100                  | VSM17-X-150                  | VSM17-X-200                  | VSM17-X-250                  | VSM17-X-300                  |
|--------------------------------------------------------------|----------------------------------------------------------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| Travel                                                       | 50 mm                                                                            | 100 mm                       | 150 mm                       | 200 mm                       | 250 mm                       | 300 mm                       |
| Resolution                                                   | 5 $\mu\text{m}$ (1 $\mu\text{m}$ for option HR)                                  |                              |                              |                              |                              |                              |
| Maximum Speed                                                | 15 mm/s (3 mm/s for option HR)                                                   |                              |                              |                              |                              |                              |
| Repeatability                                                | Better than 1 $\mu\text{m}$                                                      |                              |                              |                              |                              |                              |
| Centred Load Capacity (Normal) ( $F_z$ )                     | 50 kg                                                                            |                              |                              |                              |                              |                              |
| Maximum Load Moment<br>( $M_r$ , $M_p$ , $M_y$ )             | 30 Nm                                                                            |                              |                              |                              |                              |                              |
| Axial Load Capacity<br>@ 1000 Hz 1 A Phase Current ( $F_a$ ) | 15 kg                                                                            |                              |                              |                              |                              |                              |
| Backlash                                                     | Less than resolution                                                             |                              |                              |                              |                              |                              |
| Roll, Pitch and Yaw (Unloaded)                               | $\pm 48 \mu\text{rad}$                                                           | $\pm 90 \mu\text{rad}$       | $\pm 80 \mu\text{rad}$       | $\pm 70 \mu\text{rad}$       | $\pm 70 \mu\text{rad}$       | $\pm 70 \mu\text{rad}$       |
| Roll, Pitch and Yaw Compliance                               | 16 $\mu\text{rad}/\text{Nm}$                                                     | 32 $\mu\text{rad}/\text{Nm}$ | 29 $\mu\text{rad}/\text{Nm}$ | 26 $\mu\text{rad}/\text{Nm}$ | 29 $\mu\text{rad}/\text{Nm}$ | 29 $\mu\text{rad}/\text{Nm}$ |
| Straightness of Travel                                       | 3 $\mu\text{m}/100 \text{ mm}$                                                   |                              |                              |                              |                              |                              |
| Leadscrew Accuracy                                           | 0.055/100 mm                                                                     |                              |                              |                              |                              |                              |
| Stepper Motor                                                | AML D35.1                                                                        |                              |                              |                              |                              |                              |
| 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 Including Motor                                         | 1 kg                                                                             | 1.6 kg                       | 2.1 kg                       | 2.7 kg                       | 3.2 kg                       | 4.9 kg                       |
| Mass Including Motor (option SS)                             | 2.2 kg                                                                           | 4.4 kg                       | 6 kg                         | 8 kg                         | TBC                          | TBC                          |

### LOAD DIAGRAM:



| Optional Encoder Specification | ER (Incremental Encoder)                           | EA (Absolute Encoder)             |
|--------------------------------|----------------------------------------------------|-----------------------------------|
| Readhead                       | Renishaw TONiC™ T1630-15M                          | Renishaw RESOLUTE™ RL26BUE050D15V |
| Scale                          | RKLC20<br>20 $\mu\text{m}$ pitch                   | RELA30<br>30 $\mu\text{m}$ pitch  |
| Interface Module               | T10040A10A<br>40x interpolation factor             | None                              |
| Electrical Interface           | Square wave differential line driver to EIA RS422A | BiSS-C (unidirectional)<br>26 bit |
| Resolution                     | 500 nm                                             | 50 nm                             |

## NOTES

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**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 VSM17-X is controlled by special gearing and is negligible. Backlash between the nut and leadscrew, and axial float in the bearings is controlled by a constant force spring and is much less than the resolution. If the transporter is used for motion with a significant vertical component ( $>30^\circ$ ), 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.

**ROLL COMPLIANCE:** Multiple-axis mechanisms can produce varying roll moments about the bottom transporter. The VSM17-X carriage will deflect about the roll axis at 5  $\mu$ radian per Nm. To achieve this performance the transporter must be fixed to an extremely rigid, flat baseplate, using all of the base fixings.

**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.

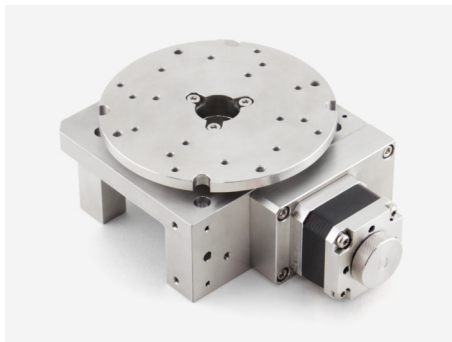
**STACKED MECHANISMS:** For multi-axis motion, mount the stage moving the load vertically on top of the others to avoid adding their weight to its load.

## OPTIONS

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- SS** Option SS is for the material of the VSM17-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  $\mu$ m. Maximum speed is reduced to 3 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.
- DL** Adapts the stage to be dry lubricated. This is achieved by using dry-lubricated hybrid bearings and removing the PTFE content of our standard motors. The leadcrew is also dry lubricated with Tungsten disulphide coating. Please note that dry lubricated motors may, depending on the application, have significantly shorter life expectancy than motors using the standard NyeTorr® 6300 UHV grease.
- R** Adapts the stage so that it is radiation hardened, making it compatible with a total dose of 1E6 Gy of gamma radiation.

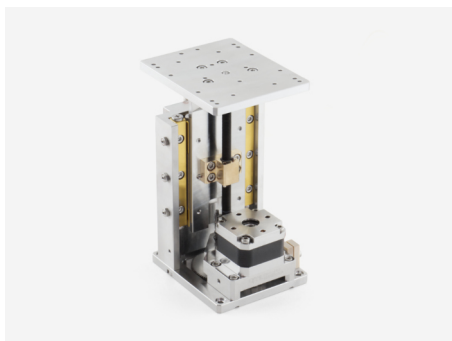
## RELATED PRODUCTS



VSM17-R

High Performance, Modular UHV Rotation Stage.

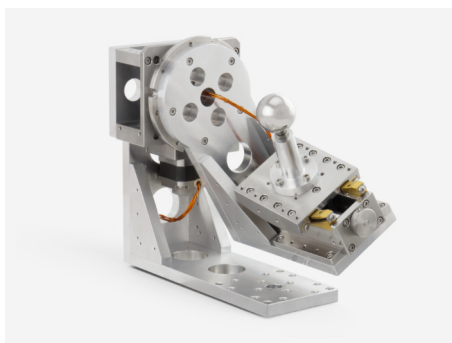
Rotation stage suitable for use in UHV. Can support loads of up to 100 kilograms. Resolutions from 0.1° to 0.005° with 360° of continuous rotation.



VSM17-Z

High Performance, Modular UHV Stage for Z-Axis Translation.

Linear vertical translation stage suitable for use in UHV. Can support loads of up to several kilograms and travel from 50 mm. Designed specifically for Z-axis translation with its high load capacity.



VSM17-G

High Performance, Modular UHV Goniometer Stage.

Goniometer stage suitable for use in UHV. It is possible to build a Euler goniometer with a common centre of rotation.

## ORDERING INFORMATION

| Order Code         |                                                               |
|--------------------|---------------------------------------------------------------|
| VSM17-X-xxx        | Linear stage (xxx=travel in mm)                               |
| VSM17-X-xxx-SS     | Linear stage, stainless steel                                 |
| VSM17-X-xxx-HR     | Linear stage, 1 µm resolution                                 |
| VSM17-X-xxx-LS     | Linear stage with 2 x limit switches                          |
| VSM17-X-xxx-ER     | Linear stage with encoder (incremental)                       |
| VSM17-X-xxx-EA     | Linear stage with encoder (absolute)                          |
| VSM17-X-xxx-R      | Linear stage, radiation resistant                             |
| Example Order Code |                                                               |
| VSM17-X-100-HR-LS  | Linear stage, 100 mm travel, 1 µm resolution, limit switches. |



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