# XLS-1 series

## Compact and precise linear piezo stage

The XLS-1 series are precise linear stages driven by an ultrasonic piezo motor. These stages combine high-speed positioning with nanometre precision. Xeryon's ultrasonic piezo motor ensures you a long lifetime, noiseless and vibration-free operation. In addition, the self-locking piezo motor holds the position of the stage when powered off. The reduced heat dissipation leads to a very stable nano-positioning system. The XLS-1 is used in metrology applications, e.g. for part alignment or sample manipulation. The XLS-1 series is available in different lengths and are easily stacked into an XY-assembly. All stages can be equipped with a short cage to increase the stroke.

### Key features

| | |
|---|---|
| drive principle | patented Crossfixx™ ultrasonic piezo technology |
| bearings | precision crossed-roller |
| lifetime distance | > 1000 km / typ. 20 million cycles |
| control principle | closed-loop or open-loop position control |
| operating voltage | 20 to 48 V |

### Model code structure

| stage type | stage length (mm) | encoder resolution (nm) | optional | | |
|---|---|---|---|---|---|
| | | | vacuum compatibility ($10^{-6}$ mbar) | low- or non-magnetic bearings | short cage for increased stroke |
| XLS-1 | -30 | -OPEN | -HV | -LM / -NM | -SC |
| | | -1250 | | | |
| | | -312 | | | |
| | | -78 | | | |
| | | -5 | | | |
| | | -1 | | | |
| | -40 | same as for XLS-1-30 | | | |
| | -50 | | | | |
| | -60 | | | | |
| | -70 | | | | |
| | -80 | | | | |
| | -100 | | | | |
| | -120 | | | | |

### Environmental compatibility

| | |
|---|---|
| temperature range | -30°C to +70°C |
| humidity range | 20% to 90% RH (non-condensing) |
| heat dissipation (motor only) | < 1 W |
| mounting surface flatness | < flatness specification of stage |

## Motion performance

| | | | XLS-1 all lengths | | | | | | unit | tole-rance |
|---|---|---|---|---|---|---|---|---|---|---|
| | | resolution | -OPEN | -1250 | -312 | -78 | -5 | -1 | | |
| ENCODER | | type | NA[1] | optical, incrementals | | | | | | |
| | | grating period | NA[1] | 1280 | | 20 | | | µm | |
| | | resolution | NA[1] | 1250 | 312 | 78 | 5 | 1 | nm | |
| | | index | NA[1] | 1 per full stroke | | | | | | |
| | | accuracy | NA[1] | ± 10 | ± 5 | ± 1 | | | µm | typ. |
| STAGE | positioning | resolution = min. step size = min. incremental motion (MIM) | 50000[2] | 1250 | 350 | 80 | 25 | | nm | typ. |
| | | unidirectional repeatability | ± 50000[2] | ± 1250 | ± 350 | ± 80 | ± 25 | | nm | typ. |
| | | bidirectional repeatability | ± 50000[2] | ± 2500 | ± 700 | ± 160 | ± 50 | | nm | typ. |
| | speed | max. speed | 1000 | 200 | | | 150 | 25 | mm/s | typ. |
| | | min. speed | 5000[3] | 5 | | | 2 | 1 | µm/s | typ. |
| | | stability (at typical speed of 10 mm/s) | ± 10 | ± 1s | | | | | % | typ. |
| | | point-to-point positioning time for a 1 mm step[4] 0 g load<br>100 g load | NA | 300<br>500 | | | 500<br>800 | | msec<br>msec | typ. |

[1] a closed-loop control can be achieved by connecting an external position encoder to the controller

[2] when using stage in burst mode (50µm bursts)

[3] lower average speeds can be achieved when using burst mode

[4] settling within bidirectional repeatability range

Note: a detailed description of the technical terms used in this datasheet can be found on the Terminology page of our website.

## Mechanical properties

| | | XLS-1 -30 | XLS-1 -40 | XLS-1 -50 | XLS-1 -60 | XLS-1 -70 | XLS-1 -80 | XLS-1 -100 | XLS-1 -120 | unit | tole-rance |
|---|---|---|---|---|---|---|---|---|---|---|---|
| dimensions | length | 30 | 40 | 50 | 60 | 70 | 80 | 100 | 120 | mm | ± 0.1 |
| | width | 34 | | | | | | | | | |
| | height | 13 | | | | | | | | | |
| stroke/ travel range | standard cage | 10 | 25 | 30 | 40 | 45 | 50 | 75 | 100 | mm | ± 0.1 |
| | short cage (-SC) | 19 | 30 | 38 | 48 | 52 | 69 | 85 | 109 | | |
| mass (w/o connector) | | 40 | 50 | 63 | 76 | 88 | 105 | 126 | 151 | g | ± 5% |
| load capacity (payload limitation) | | 0.5 | | | | | | | | kg | max. |
| load capacity* (bearing force limitation) | vertical | 237 | 396 | 475 | 633 | 712 | 792 | 990 | 1188 | N | max. |
| | lateral | 237 | 396 | 475 | 633 | 712 | 792 | 990 | 1188 | | |
| | tilt around pitch axis | 1.13 | 1.50 | 1.88 | 2.25 | 2.63 | 3.00 | 3.75 | 4.50 | Nm | |
| | tilt around yaw axis | 1.13 | 1.50 | 1.88 | 2.s25 | 2.63 | 3.00 | 3.75 | 4.50 | | |
| | tilt around roll axis | 3.02 | 5.05 | 6.06 | 8.07 | 9.08 | 10.10 | 12.62 | 15.15 | | |
| driving force | | 1 | | | | | | | | N | min. |
| holding force | | 1 | | | | | | | | N | min. |
| passive holding stiffness | | 0.5 | | | | | | | | N/µm | typ. |
| stage material | slider/base | anodised aluminium | | | | | | | | | |
| | bearings | stainless steel | | | | | | | | | |
| cable length** | | 1.5 | | | | | | | | m | ± 0.1 |
| connector (stage to controller) | | 1x 15-pin D-sub HD male (standard)<br>1x 15-pin D-sub female (-HV) | | | | | | | | | |

* valid for stages with standard cage

** extension cables available or shorter cable on request

## Error motion

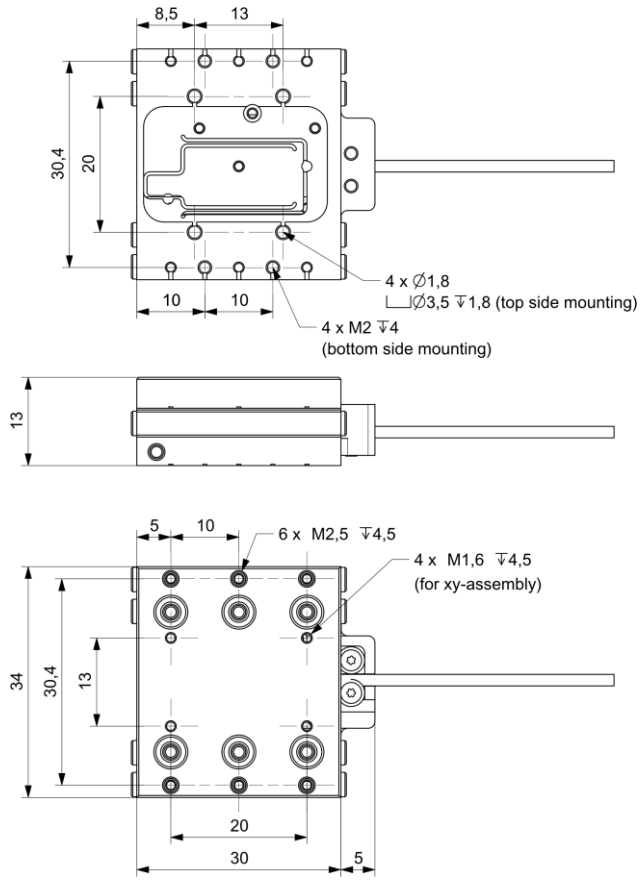
| | | XLS-1 length 30 to 70 | | XLS-1 length 80 to 120 | | unit | tolerance |
|---|---|---|---|---|---|---|---|
| resolution | | -open<br>-1250<br>-312 | -78<br>-5<br>-1 | -open<br>-1250<br>-312 | -78<br>-5<br>-1 | | |
| error motion | straightness | ± 5 | ± 1 | ± 10 | ± 2 | µm | max. |
| | flatness | ± 5 | ± 1 | ± 10 | ± 2 | µm | max. |
| | pitch | 120<br>25 | 24<br>5 | 120<br>25 | 24<br>5 | µrad<br>arcsec | max. |
| | roll | 120<br>25 | 24<br>5 | 120<br>25 | 24<br>5 | µrad<br>arcsec | max. |
| | yaw | 60<br>12.5 | 12<br>2.5 | 60<br>12.5 | 12<br>2.5 | µrad<br>arcsec | max. |

## Controller/software

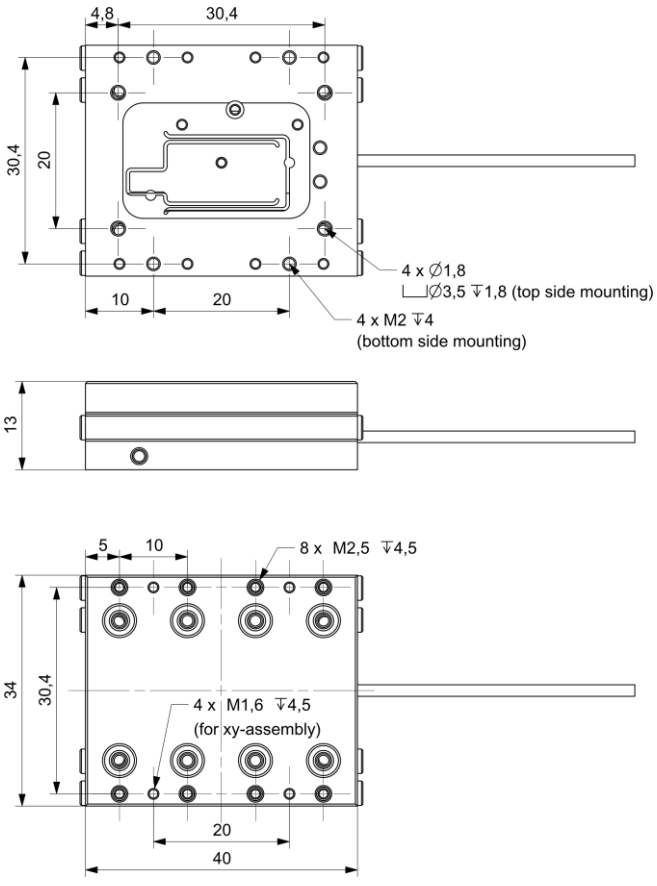
The XLS-1 series linear stages are compatible with all Xeryon controllers. Controlling of the stage is done with:

- easy-to-use Windows interface
- LabVIEW interface program (compiled program or source)
- MATLAB interface script
- C++ and Python libraries

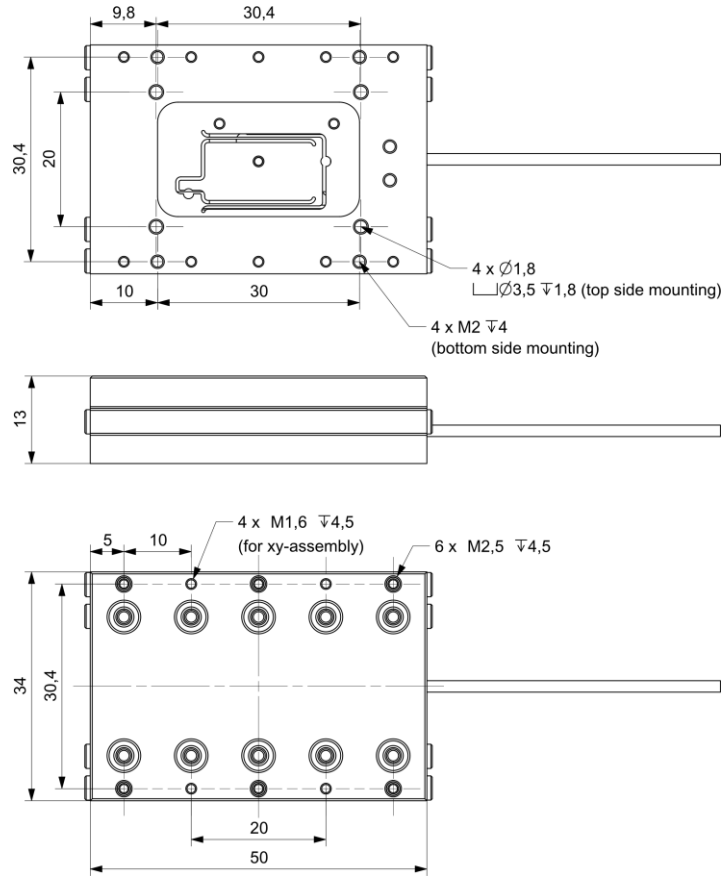
## Drawings (STEP-files are available on our website)



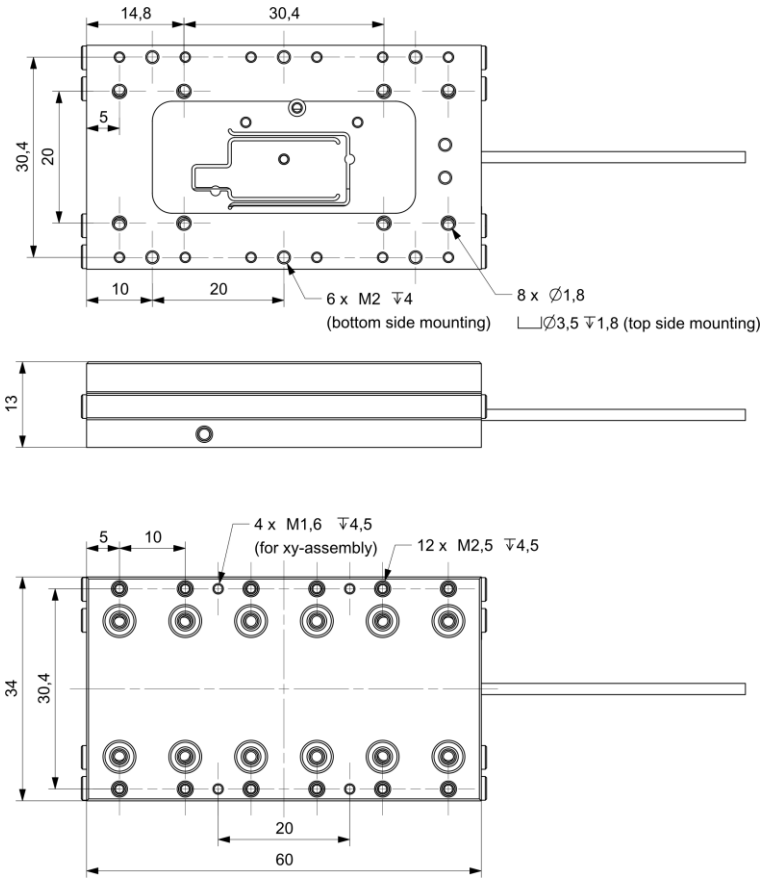

XLS-1-30



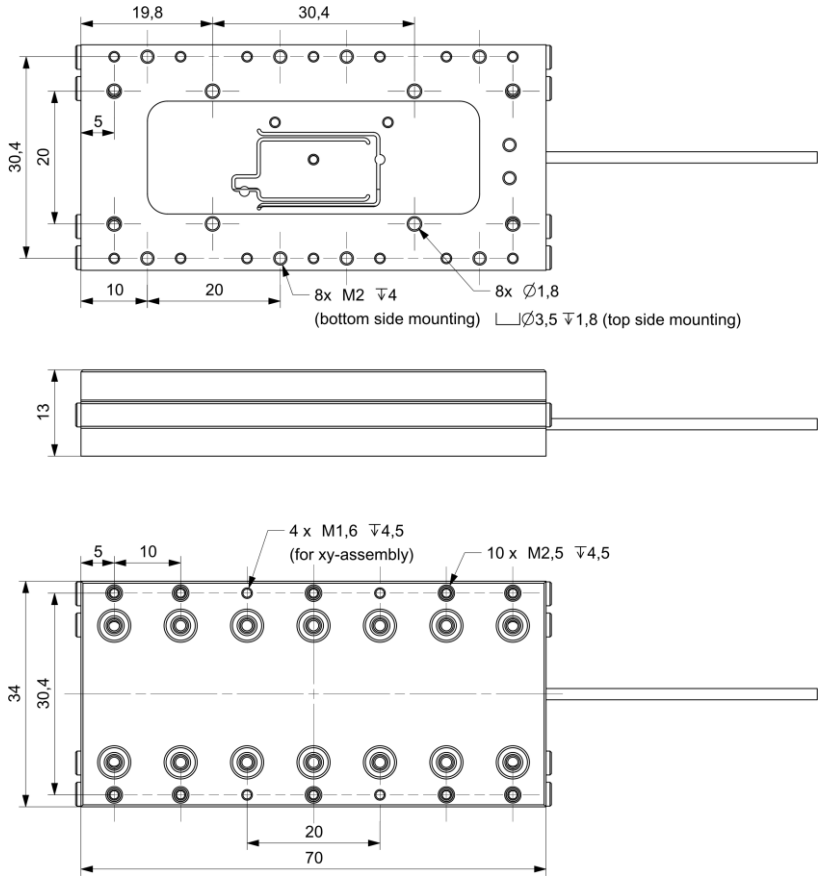

XLS-1-40



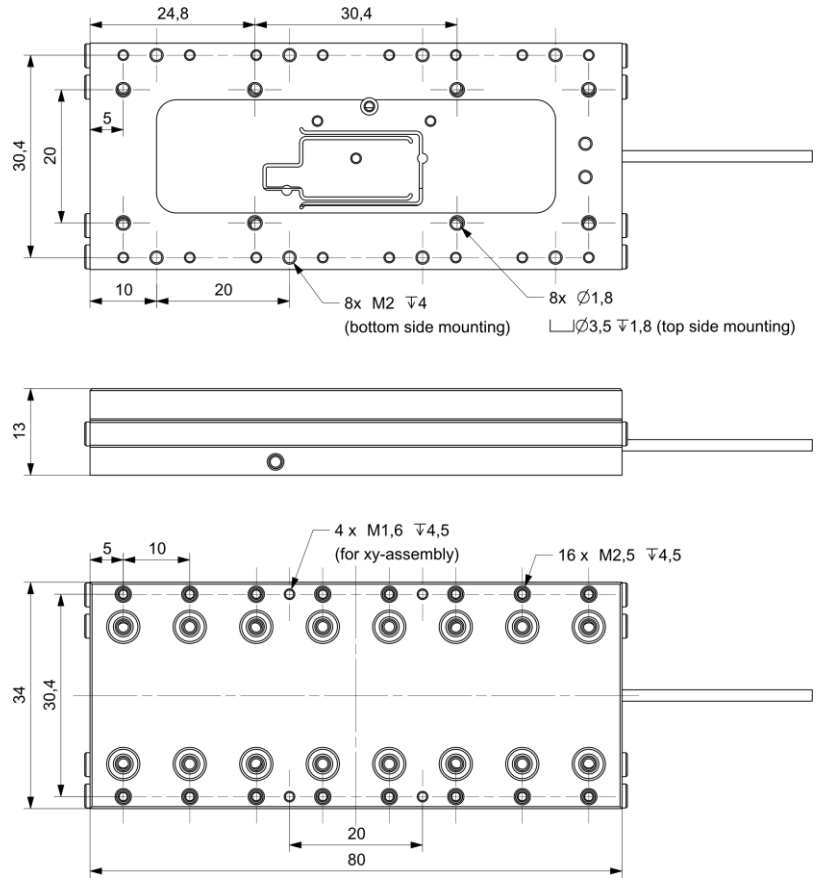

**XLS-1-50**



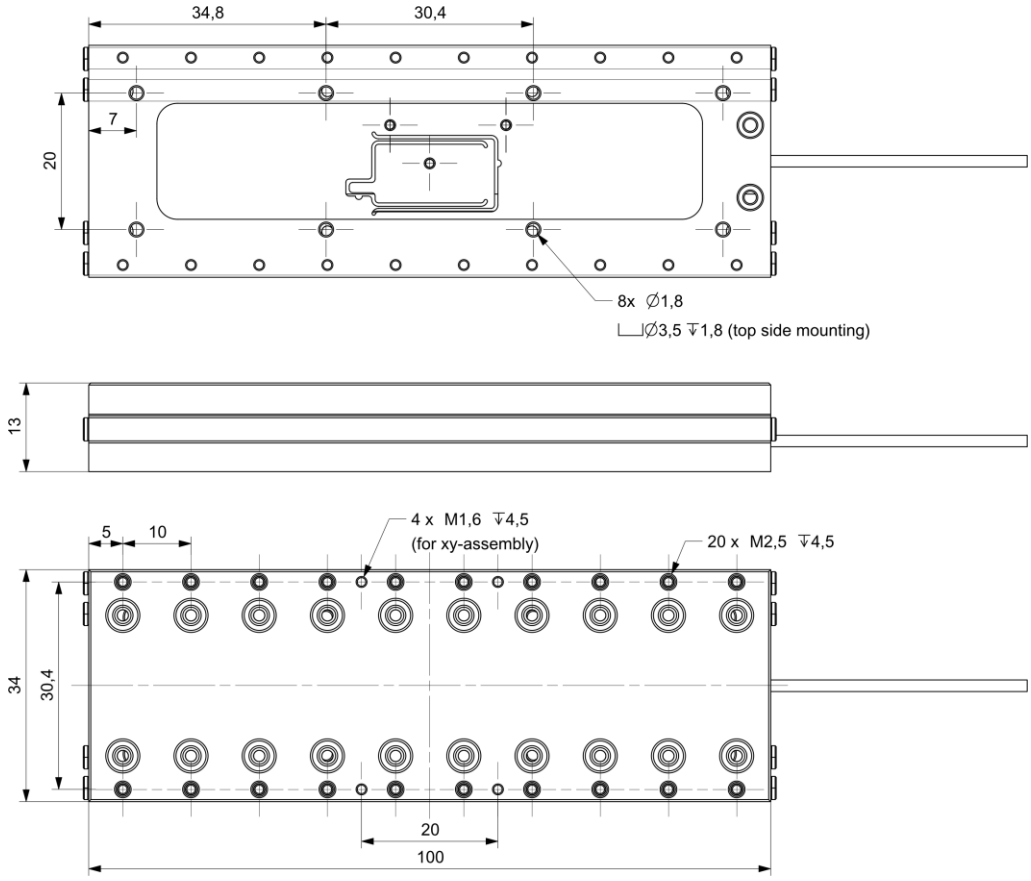

**XLS-1-60**



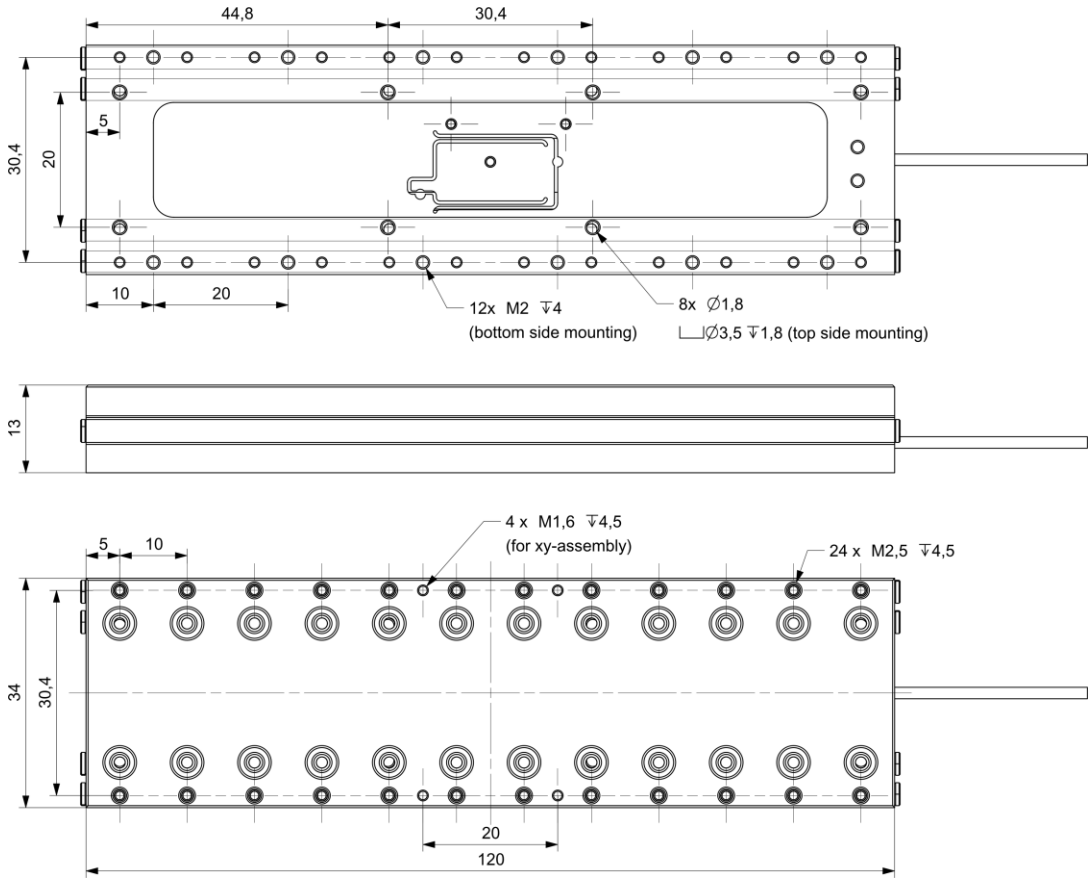

**XLS-1-70**




**XLS-1-80**




**XLS-1-100**




**XLS-1-120**

Last updated: 30/06/2023ss. All specifications are subject to change without prior notice.

# XLS-3 series

## Precise linear piezo stage with high force output

The XLS-3 series are precise linear stages driven by an ultrasonic piezo motor. These stages combine high-speed positioning with nanometre precision and generate a high force output within a small volume. Xeryon's ultrasonic piezo motor ensures you a long lifetime, noiseless and vibration-free operation. In addition, the self-locking piezo motor holds the position of the stage when powered off. The reduced heat dissipation leads to a very stable nano-positioning system. The XLS-3 is used in metrology applications, e.g. for part alignment or sample manipulation. The XLS-3 series is available in different lengths and are easily stacked into an XY- or XYZ-assembly.

### Key features

| | |
|---|---|
| drive principle | patented Crossfixx™ ultrasonic piezo technology |
| bearings | precision crossed-roller |
| lifetime distance | > 1000 km / typ. 20 million cycles |
| control principle | closed-loop or open-loop position control |
| operating voltage | 20 to 48 V |

### Model code structure

| stage type | stage length (mm) | encoder resolution (nm) | optional | | |
|---|---|---|---|---|---|
| | | | vacuum compatibility ($10^{-6}$ mbar) | low- or non-magnetic bearings | short cage for increased stroke |
| XLS-3 | -40 | -OPEN | -HV | -LM / -NM | -SC |
| | | -1250 | | | |
| | | -312 | | | |
| | | -78 | | | |
| | | -5 | | | |
| | | -1 | | | |
| | -50 | same as for XLS-3-40 | | | |
| | -60 | | | | |
| | -70 | | | | |
| | -80 | | | | |
| | -100 | | | | |
| | -120 | | | | |

### Environmental compatibility

| | |
|---|---|
| temperature range | -30°C to +70°C |
| humidity range | 20% to 90% RH (non-condensing) |
| heat dissipation (motor only) | < 5 W |
| mounting surface flatness | < flatness specification of stage |

## Motion performance

| | | | XLS-3 all lengths | | | | | | unit | tole-rance |
|---|---|---|---|---|---|---|---|---|---|---|
| | | resolution | -OPEN | -1250 | -312 | -78 | -5 | -1 | | |
| ENCODER | | type | NA[1] | optical, incremental | | | | | | |
| | | grating period | NA[1] | 1280 | | 20 | | | µm | |
| | | resolution | NA[1] | 1250 | 312 | 78 | 5 | 1 | nm | |
| | | index | NA[1] | 1 per full stroke | | | | | | |
| | | accuracy | NA[1] | ± 10 | ± 5 | ± 1 | | | µm | typ. |
| STAGE | positioning | resolution = min. step size = min. incremental motion (MIM) | 50000[2] | 1250 | 350 | 80 | 25 | | nm | typ. |
| | | unidirectional repeatability | ± 50000[2] | ± 1250 | ± 350 | ± 80 | ± 25 | | nm | typ. |
| | | bidirectional repeatability | ± 50000[2] | ± 2500 | ± 700 | ± 160 | ± 50 | | nm | typ. |
| | speed | max. speed | 1000 | 200 | | | 150 | 25 | mm/s | typ. |
| | | min. speed | 5000[3] | 5 | | | 2 | 1 | µm/s | typ. |
| | | stability (at typical speed of 10 mm/s) | ± 10 | ± 1 | | | | | % | typ. |
| | | point-to-point positioning time for a 1 mm step[4] 0 g load<br>100 g load | NA | 300<br>500 | | | 500<br>800 | | msec<br>msec | typ. |

[1] a closed-loop control can be achieved by connecting an external position encoder to the controller

[2] when using stage in burst mode (50µm bursts)

[3] lower average speeds can be achieved when using burst mode

[4] settling within bidirectional repeatability range

Note: a detailed description of the technical terms used in this datasheet can be found on the Terminology page of our website.

## Mechanical properties

| | | XLS-3 -40 | XLS-3 -50 | XLS-3 -60 | XLS-3 -70 | XLS-3 -80 | XLS-3 -100 | XLS-3 -120 | unit | tolerance |
|---|---|---|---|---|---|---|---|---|---|---|
| dimensions | length | 40 | 50 | 60 | 70 | 80 | 100 | 120 | mm | ± 0.1 |
| | width | 47.6 | | | | | | | | |
| | height | 16.8 | | | | | | | | |
| stroke/ travel range | standard cage | 25 | 30 | 40 | 45 | 50 | 75 | 100 | mm | ± 0.1 |
| | short cage (-SC) | 30 | 38 | 48 | 52 | 69 | 85 | 109 | | |
| mass (w/o connector) | | 81 | 101 | 120 | 141 | 161 | 201 | 241 | g | ± 5% |
| load capacity (payload limitation) | | 1.5 | | | | | | | kg | max. |
| load capacity* (bearing force limitation) | vertical | 396 | 475 | 633 | 712 | 792 | 990 | 1188 | N | max. |
| | lateral | 396 | 475 | 633 | 712 | 792 | 990 | 1188 | | |
| | tilt around pitch axis | 1.50 | 1.88 | 2.25 | 2.63 | 3.00 | 3.75 | 4.50 | Nm | |
| | tilt around yaw axis | 1.50 | 1.88 | 2.25 | 2.63 | 3.00 | 3.75 | 4.50 | | |
| | tilt around roll axis | 7.74 | 9.29 | 12.38 | 13.92 | 15.48 | 19.35 | 23.23 | | |
| driving force | | 3 | | | | | | | N | min. |
| holding force | | 3 | | | | | | | N | min. |
| passive holding stiffness | | 1 | | | | | | | N/µm | typ. |
| stage material | slider/base | anodised aluminium | | | | | | | | |
| | bearings | stainless steel | | | | | | | | |
| cable length** | | 1.5 | | | | | | | m | ± 0.1 |
| connector (stage to controller) | | 1x 15-pin D-sub HD male (standard)<br>1x 15-pin D-sub female (-HV) | | | | | | | | |

* valid for stages with standard cage

** extension cables available or shorter cable on request

## Error motion

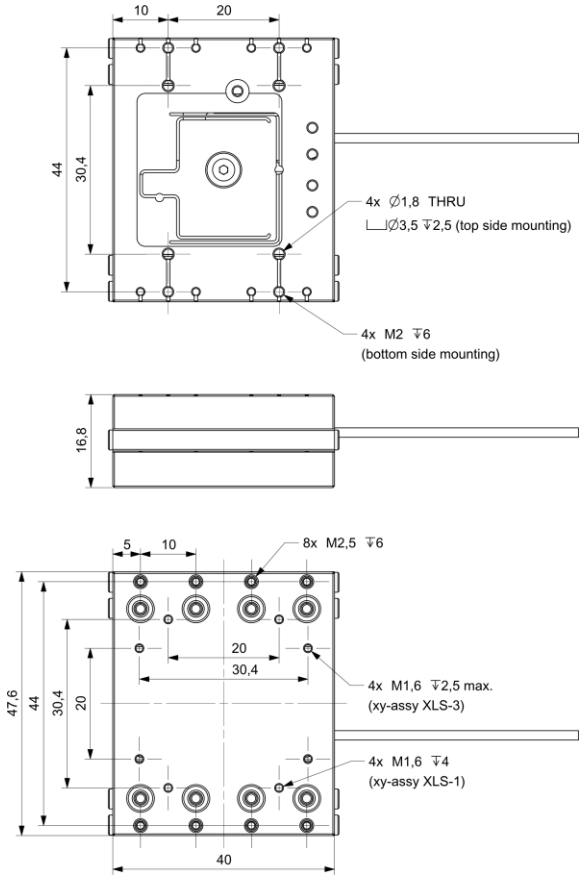
| | | XLS-3 length 40 to 70 | | XLS-3 length 80 to 120 | | unit | tolerance |
|---|---|---|---|---|---|---|---|
| resolution | | -1250 -312 | -78 -5 -1 | -1250 -312 | -78 -5 -1 | | |
| error motion | straightness | ± 5 | ± 1 | ± 10 | ± 2 | µm | max. |
| | flatness | ± 5 | ± 1 | ± 10 | ± 2 | µm | max. |
| | pitch | 120<br>25 | 24<br>5 | 120<br>25 | 24<br>5 | µrad<br>arcsec | max. |
| | roll | 120<br>25 | 24<br>5 | 120<br>25 | 24<br>5 | µrad<br>arcsec | max. |
| | yaw | 60<br>12.5 | 12<br>2.5 | 60<br>12.5 | 12<br>2.5 | µrad<br>arcsec | max. |

## Controller/software

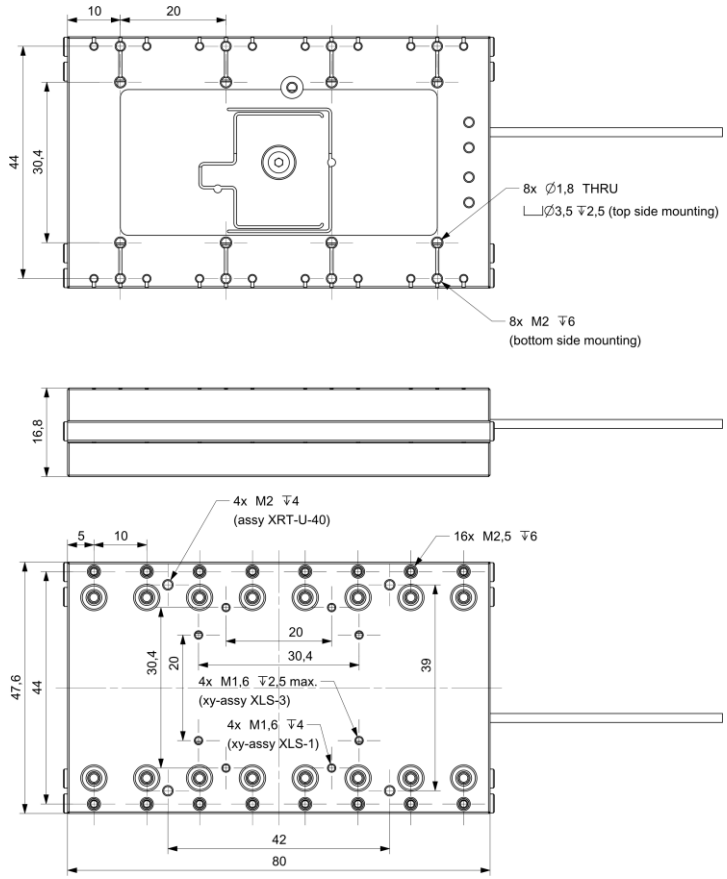
The XLS-3 series linear stages are compatible with all Xeryon controllers. Controlling of the stage is done with:

- easy-to-use Windows interface
- LabVIEW interface program (compiled program or source)
- MATLAB interface script
- C++ and Python libraries

## Drawings (STEP-files are available on our website)



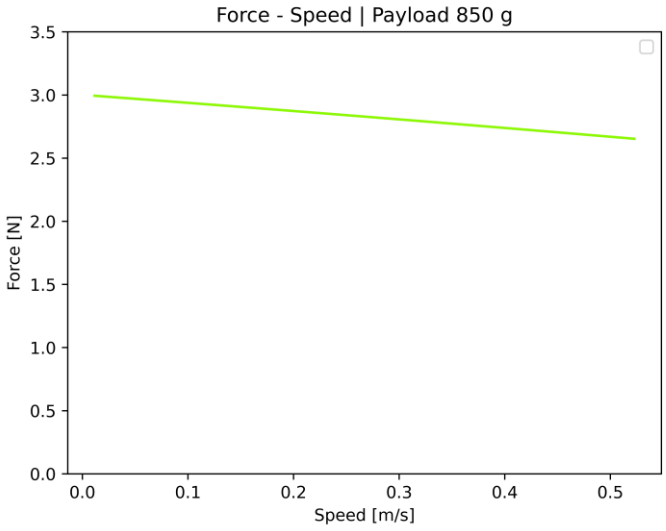

**XLS-3-40**




**XLS-3-80**

Note: stages XLS-3-50, XLS-3-60, XLS-3-70, XLS-3-100 and XLS-3-120 have similar mounting holes as shown in the drawings above.

## Measurement data




**Typical force-speed diagram of an XLS-3 stage with a payload of 850g.**

Last updated: 4/08/2023. All specifications are subject to change without prior notice.

# XLS-5 series

## Precise linear piezo stage with high force output

The XLS-5 series are precise linear stages driven by an ultrasonic piezo motor. These stages combine high-speed positioning with nanometre precision and generate a high force output within a small volume. Xeryon's ultrasonic piezo motor ensures you a long lifetime, noiseless and vibration-free operation. In addition, the self-locking piezo motor holds the position of the stage when powered off. The reduced heat dissipation leads to a very stable nano-positioning system. The XLS-5 is used in metrology applications, e.g. for part alignment or sample manipulation. The XLS-5 series is available in different lengths and are easily stacked into an XY- or XYZ-assembly.

### Key features

| | |
|---|---|
| drive principle | patented Crossfixx™ ultrasonic piezo technology |
| bearings | precision crossed-roller |
| lifetime distance | > 1000 km / typ. 20 million cycles |
| control principle | closed-loop or open-loop position control |
| operating voltage | 20 to 48 V |

### Model code structure

| stage type | stage length (mm) | encoder resolution (nm) | optional | | |
|---|---|---|---|---|---|
| | | | vacuum compatibility ($10^{-6}$ mbar) | low- or non-magnetic bearings | short cage for increased stroke |
| XLS-5 | -40 | -OPEN | -HV | -LM / -NM | -SC |
| | | -1250 | | | |
| | | -312 | | | |
| | | -78 | | | |
| | | -5 | | | |
| | | -1 | | | |
| | -50 | same as for XLS-5-40 | | | |
| | -60 | | | | |
| | -70 | | | | |
| | -80 | | | | |
| | -100 | | | | |
| | -120 | | | | |

### Environmental compatibility

| | |
|---|---|
| temperature range | -30°C to +70°C |
| humidity range | 20% to 90% RH (non-condensing) |
| heat dissipation (motor only) | < 5 W |
| mounting surface flatness | < flatness specification of stage |

## Motion performance

| | | | XLS-5 all lengths | | | | | | unit | tole-rance |
|---|---|---|---|---|---|---|---|---|---|---|
| | | resolution | -OPEN | -1250 | -312 | -78 | -5 | -1 | | |
| ENCODER | | type | NA[1] | optical, incremental | | | | | | |
| | | grating period | NA[1] | 1280 | | 20 | | | µm | |
| | | resolution | NA[1] | 1250 | 312 | 78 | 5 | 1 | nm | |
| | | index | NA[1] | 1 per full stroke | | | | | | |
| | | accuracy | NA[1] | ± 10 | ± 5 | ± 1 | | | µm | typ. |
| STAGE | positioning | resolution = min. step size = min. incremental motion (MIM) | 50000[2] | 1250 | 350 | 80 | 25 | | nm | typ. |
| | | unidirectional repeatability | ± 50000[2] | ± 1250 | ± 350 | ± 80 | ± 25 | | nm | typ. |
| | | bidirectional repeatability | ± 50000[2] | ± 2500 | ± 700 | ± 160 | ± 50 | | nm | typ. |
| | speed | max. speed | 1000 | 200 | | | 150 | 25 | mm/s | typ. |
| | | min. speed | 5000[3] | 5 | | | 2 | 1 | µm/s | typ. |
| | | stability (at typical speed of 10 mm/s) | ± 10 | ± 1 | | | | | % | typ. |
| | | point-to-point positioning time for a 1 mm step[4] 0 g load<br>100 g load | NA | 300<br>500 | | | 500<br>800 | | msec<br>msec | typ. |

[1] a closed-loop control can be achieved by connecting an external position encoder to the controller

[2] when using stage in burst mode (50µm bursts)

[3] lower average speeds can be achieved when using burst mode

[4] settling within bidirectional repeatability range

Note: a detailed description of the technical terms used in this datasheet can be found on the Terminology page of our website.

## Mechanical properties

| | | XLS-5 -40 | XLS-5 -50 | XLS-5 -60 | XLS-5 -70 | XLS-5 -80 | XLS-5 -100 | XLS-5 -120 | unit | tolerance |
|---|---|---|---|---|---|---|---|---|---|---|
| dimensions | length | 40 | 50 | 60 | 70 | 80 | 100 | 120 | mm | ± 0.1 |
| | width | 47.6 | | | | | | | | |
| | height | 16.8 | | | | | | | | |
| stroke/ travel range | standard cage | 25 | 30 | 40 | 45 | 50 | 75 | 100 | mm | ± 0.1 |
| | short cage (-SC) | 30 | 38 | 48 | 52 | 69 | 85 | 109 | | |
| mass (w/o connector) | | 81 | 101 | 120 | 141 | 161 | 201 | 241 | g | ± 5% |
| load capacity (payload limitation) | | 2 | | | | | | | kg | max. |
| load capacity* (bearing force limitation) | vertical | 396 | 475 | 633 | 712 | 792 | 990 | 1188 | N | max. |
| | lateral | 396 | 475 | 633 | 712 | 792 | 990 | 1188 | | |
| | tilt around pitch axis | 1.50 | 1.88 | 2.25 | 2.63 | 3.00 | 3.75 | 4.50 | Nm | |
| | tilt around yaw axis | 1.50 | 1.88 | 2.25 | 2.63 | 3.00 | 3.75 | 4.50 | | |
| | tilt around roll axis | 7.74 | 9.29 | 12.38 | 13.92 | 15.48 | 19.35 | 23.23 | | |
| driving force | | 5 | | | | | | | N | min. |
| holding force | | 5 | | | | | | | N | min. |
| passive holding stiffness | | 1 | | | | | | | N/µm | typ. |
| stage material | slider/base | anodised aluminium | | | | | | | | |
| | bearings | stainless steel | | | | | | | | |
| cable length** | | 1.5 | | | | | | | m | ± 0.1 |
| connector (stage to controller) | | 1x 15-pin D-sub HD male (standard)<br>1x 15-pin D-sub female (-HV) | | | | | | | | |

* valid for stages with standard cage

** extension cables available or shorter cable on request

## Error motion

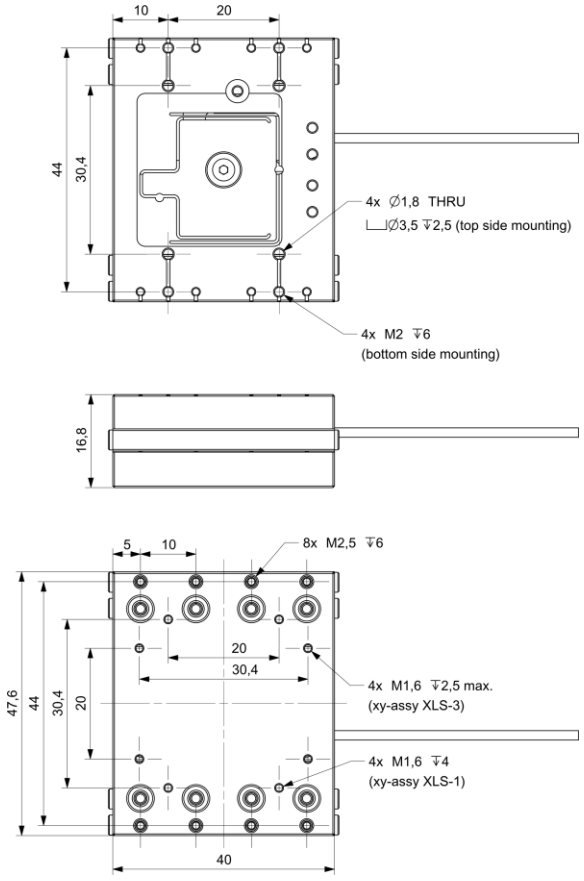
| | | XLS-5 length 40 to 70 | | XLS-5 length 80 to 120 | | unit | tolerance |
|---|---|---|---|---|---|---|---|
| resolution | | -1250 -312 | -78 -5 -1 | -1250 -312 | -78 -5 -1 | | |
| error motion | straightness | ± 5 | ± 1 | ± 10 | ± 2 | µm | max. |
| | flatness | ± 5 | ± 1 | ± 10 | ± 2 | µm | max. |
| | pitch | 120<br>25 | 24<br>5 | 120<br>25 | 24<br>5 | µrad<br>arcsec | max. |
| | roll | 120<br>25 | 24<br>5 | 120<br>25 | 24<br>5 | µrad<br>arcsec | max. |
| | yaw | 60<br>12.5 | 12<br>2.5 | 60<br>12.5 | 12<br>2.5 | µrad<br>arcsec | max. |

## Controller/software

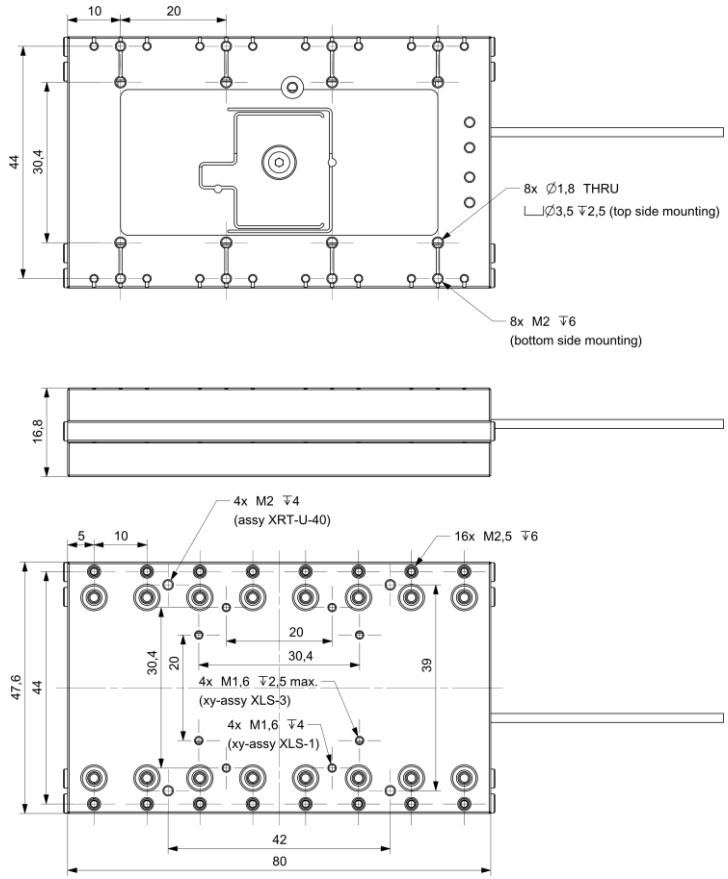
The XLS-5 series linear stages are compatible with all Xeryon controllers. Controlling of the stage is done with:

- Easy-to-use Windows interface
- LabVIEW interface program (compiled program or source)
- MATLAB interface script
- C++ and Python libraries

## Drawings (STEP-files are available on our website)



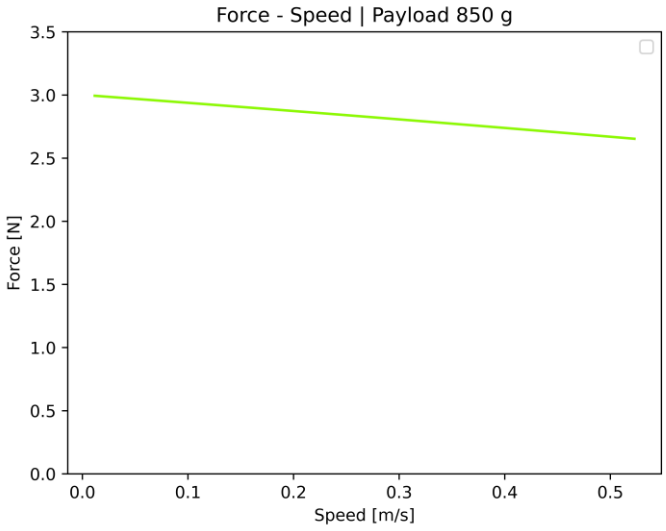

**XLS-5-40**




**XLS-5-80**

Note: stages XLS-5-50, XLS-5-60, XLS-5-70, XLS-5-100 and XLS-5-120 have similar mounting holes as shown in the drawings above.

## Measurement data




**Typical force-speed diagram of an XLS-5 stage with a payload of 850g.**

Last updated:23/01/2024. All specifications are subject to change without prior notice.