Precision Linear Stage

High Cycle Number, Inexpensive

M-404

- Inexpensive, cost-optimized design for precise positioning
- Travel ranges from 25 to 200 mm
- Resolution to 0.012 µm
- Minimum incremental motion to 0.1 µm
- Recirculating ball screw provides high velocity and long life-time
- Heavier loads with M-413 and M-414

Application fields
Measuring technology. Adjustment.

Motion	Unit	Toleran-ce	M-404.1PD	M-404.2PD	M-404.4PD	M-404.6PD	M-404.8PD	M-404.1DG	M-404.2DG	M-404.4DG
Active axes			X	X	X	X	X	X	X	X
Travel range in X	mm		25	50	100	150	200	25	50	100
Maximum velocity in X, unloaded	mm/s		50	50	50	50	50	1.5	1.5	1.5
Pitch (Rotational crosstalk in θY with motion in X)	µrad	Typ.	± 200	± 200	± 200	± 200	± 200	± 200	± 200	± 200
Yaw (Rotational crosstalk in θZ with motion in X)	µrad	Typ.	± 200	± 200	± 200	± 200	± 200	± 200	± 200	± 200

Positioning	Unit	Toleran-ce	M-404.1PD	M-404.2PD	M-404.4PD	M-404.6PD	M-404.8PD	M-404.1DG	M-404.2DG	M-404.4DG
System resolution in X	nm		250	250	250	250	250	11.6494	11.6494	11.6494
Unidirectional repeatabili-ty in X	µm	Typ.	0.5	0.5	0.5	0.5	0.5	1	1	1
Bidirectional repeatability in X	µm	Typ.								
Minimum incremental motion in X	µm	Typ.	0.25	0.25	0.25	0.25	0.25	0.1	0.1	0.1
Backlash in X	µm	Typ.	0.5	0.5	0.5	0.5	0.5	2	2	2
Integrated sensor			Incremental rotary en-coder	Incremental rotary en-coder	Incremental rotary en-coder	Incremental rotary en-coder	Incremental rotary en-coder	Incremental rotary en-coder	Incremental rotary en-coder	Incremental rotary en-coder
Sensor signal			A/B quadra-ture, RS-422	A/B quadra-ture, RS-422	A/B quadra-ture, RS-422	A/B quadra-ture, RS-422	A/B quadra-ture, RS-422	A/B quadra-ture, RS-422	A/B quadra-ture, RS-422	A/B quadra-ture, RS-422
Sensor resolution	Cts./rev.		4000	4000	4000	4000	4000	2000	2000	2000
Reference switch			Hall effect	Hall effect	Hall effect	Hall effect	Hall effect	Hall effect	Hall effect	Hall effect
Reference switch repeata-bility	µm		1	1	1	1	1	1	1	1
Limit switches			Hall effect	Hall effect	Hall effect	Hall effect	Hall effect	Hall effect	Hall effect	Hall effect

Drive Properties	Unit	Toleran-ce	M-404.1PD	M-404.2PD	M-404.4PD	M-404.6PD	M-404.8PD	M-404.1DG	M-404.2DG	M-404.4DG
Drive type			Electric mo-tor/Rota-ting electric motor/DC motor with ActiveDrive	Electric mo-tor/Rota-ting electric motor/DC motor with ActiveDrive	Electric mo-tor/Rota-ting electric motor/DC motor with ActiveDrive	Electric mo-tor/Rota-ting electric motor/DC motor with ActiveDrive	Electric mo-tor/Rota-ting electric motor/DC motor with ActiveDrive	Electric mo-tor/Rota-ting electric motor/DC motor	Electric mo-tor/Rota-ting electric motor/DC motor	Electric mo-tor/Rota-ting electric motor/DC motor
Motor resolution	Full steps/ rev.									
Nominal voltage	V		24	24	24	24	24	12	12	12
Nominal current, RMS	A	Typ.						0.43	0.43	0.43
Drive force in negative di-rection of motion in X	N	Typ.	50	50	50	50	50	50	50	50
Drive force in positive di-rection of motion in X	N	Typ.	50	50	50	50	50	50	50	50
Resistance phase-phase	Ω	Typ.						9.6	9.6	9.6
Inductance phase-phase	mH							0.44	0.44	0.44

Mechanical Properties	Unit	Toleran-ce	M-404.1PD	M-404.2PD	M-404.4PD	M-404.6PD	M-404.8PD	M-404.1DG	M-404.2DG	M-404.4DG
Guide										
Drive screw type			Ball screw	Ball screw	Ball screw	Ball screw	Ball screw	Ball screw	Ball screw	Ball screw
Drive screw pitch	mm		1	1	1	1	1	1	1	1
Gear ratio i								42.921	42.921	42.921
Stiffness in X	N/µm		3	3	3	3	3	3	3	3
Moved mass in X, unloa-ded	g									
Permissible push force in Y	N	Max.	100	100	100	100	100	100	100	100
Permissible push force in Z	N	Max.	200	200	200	200	200	200	200	200
Overall mass	g		1800	1900	2200	2300	2600	1800	1900	2200
Material			Aluminum, anodized	Aluminum, anodized	Aluminum, anodized	Aluminum, anodized	Aluminum, anodized	Aluminum, anodized	Aluminum, anodized	Aluminum, anodized

Miscellaneous	Unit		M-404.1PD	M-404.2PD	M-404.4PD	M-404.6PD	M-404.8PD	M-404.1DG	M-404.2DG	M-404.4DG
Connector			D-sub 15-pin (m)	D-sub 15-pin (m)	D-sub 15-pin (m)	D-sub 15-pin (m)	D-sub 15-pin (m)	D-sub 15-pin (m)	D-sub 15-pin (m)	D-sub 15-pin (m)
Connector: Supply voltage			M8 4-pin (m)	M8 4-pin (m)	M8 4-pin (m)	M8 4-pin (m)	M8 4-pin (m)			
Recommended controllers / drivers			C-863 (sin-gle axis) C-884 (up to 6 axes)	C-863 (sin-gle axis) C-884 (up to 6 axes)	C-863 (sin-gle axis) C-884 (up to 6 axes)	C-863 (sin-gle axis) C-884 (up to 6 axes)	C-863 (sin-gle axis) C-884 (up to 6 axes)	C-863 (sin-gle axis) C-884 (up to 6 axes)	C-863 (sin-gle axis) C-884 (up to 6 axes)	C-863 (sin-gle axis) C-884 (up to 6 axes)
Cable length	m		3	3	3	3	3	3	3	3
Operating temperature range	°C		-20 to 65	-20 to 65	-20 to 65	-20 to 65	-20 to 65	-20 to 65	-20 to 65	-20 to 65

Motion	Unit	Toleran-ce	M-404.6DG	M-404.8DG	M-404.12S	M-404.22S	M-404.42S	M-404.62S	M-404.82S
Active axes			X	X	X	X	X	X	X
Travel range in X	mm		150	200	25	50	100	150	200
Maximum velocity in X, unloaded	mm/s		1.5	1.5	3	3	3	3	3
Pitch (Rotational crosstalk in θY with motion in X)	µrad	Typ.	± 200	± 200	± 200	± 200	± 200	± 200	± 200
Yaw (Rotational crosstalk in θZ with motion in X)	µrad	Typ.	± 200	± 200	± 200	± 200	± 200	± 200	± 200

Positioning	Unit	Tolerance	M-404.6DG	M-404.8DG	M-404.12S	M-404.22S	M-404.42S	M-404.62S	M-404.82S
System resolution in X	nm		11.6494	11.6494	156.25	156.25	156.25	156.25	156.25
Unidirectional repeatability in X	µm	Typ.	1	1	1	1	1	1	1
Bidirectional repeatability in X	µm	Typ.							
Minimum incremental motion in X	µm	Typ.	0.1	0.1	0.2	0.2	0.2	0.2	0.2
Backlash in X	µm	Typ.	2	2	2	2	2	2	2
Integrated sensor			Incremental rotary encoder	Incremental rotary encoder					
Sensor signal			A/B quadrature, RS-422	A/B quadrature, RS-422					
Sensor resolution	Cts./rev.		2000	2000					
Reference switch			Hall effect	Hall effect	Hall effect	Hall effect	Hall effect	Hall effect	Hall effect
Reference switch repeatability	µm		1	1	1	1	1	1	1
Limit switches			Hall effect	Hall effect	Hall effect	Hall effect	Hall effect	Hall effect	Hall effect

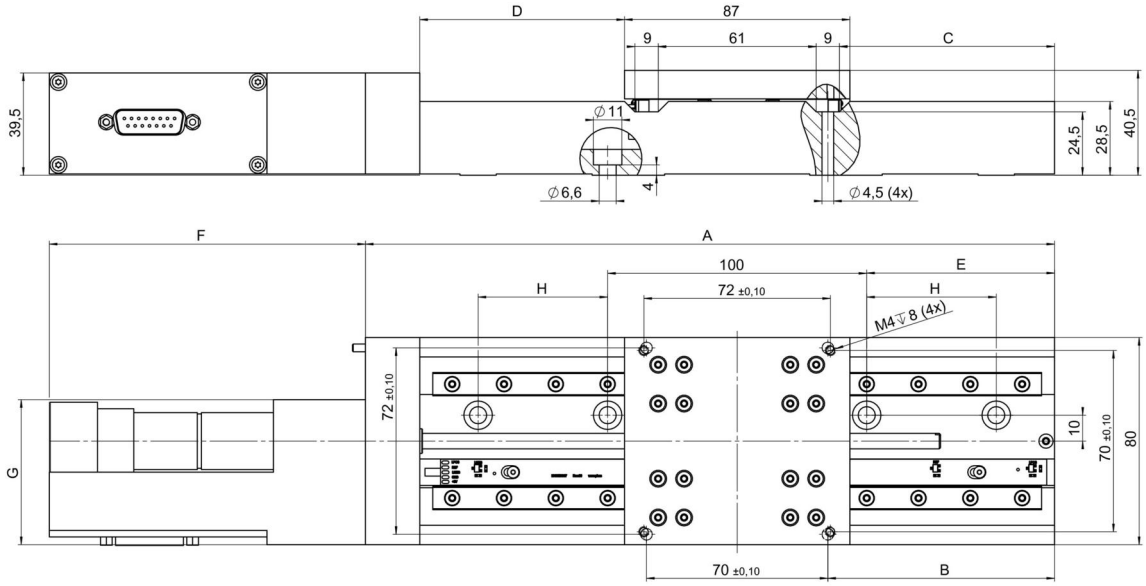
Drive Properties	Unit	Tolerance	M-404.6DG	M-404.8DG	M-404.12S	M-404.22S	M-404.42S	M-404.62S	M-404.82S
Drive type			Electric motor/Rotating electric motor/DC motor	Electric motor/Rotating electric motor/DC motor	Electric motor/Rotating electric motor/2-phase stepper motor	Electric motor/Rotating electric motor/2-phase stepper motor	Electric motor/Rotating electric motor/2-phase stepper motor	Electric motor/Rotating electric motor/2-phase stepper motor	Electric motor/Rotating electric motor/2-phase stepper motor
Motor resolution	Full steps/rev.				400	400	400	400	400
Nominal voltage	V		12	12	24	24	24	24	24
Nominal current, RMS	A	Typ.	0.43	0.43	1.2	1.2	1.2	1.2	1.2
Drive force in negative direction of motion in X	N	Typ.	50	50	50	50	50	50	50
Drive force in positive direction of motion in X	N	Typ.	50	50	50	50	50	50	50
Resistance phase-phase	Ω	Typ.	9.6	9.6	2.6	2.6	2.6	2.6	2.6
Inductance phase-phase	mH		0.44	0.44	1.9	1.9	1.9	1.9	1.9

Mechanical Properties	Unit	Tolerance	M-404.6DG	M-404.8DG	M-404.12S	M-404.22S	M-404.42S	M-404.62S	M-404.82S
Guide									
Drive screw type			Ball screw	Ball screw	Ball screw	Ball screw	Ball screw	Ball screw	Ball screw
Drive screw pitch	mm		1	1	1	1	1	1	1
Gear ratio i			42.921	42.921					
Stiffness in X	N/µm		3	3	3	3	3	3	3
Moved mass in X, unloaded	g								
Permissible push force in Y	N	Max.	100	100	100	100	100	100	100
Permissible push force in Z	N	Max.	200	200	200	200	200	200	200
Overall mass	g		2300	2600	1800	1900	2200	2300	2600
Material			Aluminum, anodized	Aluminum, anodized	Aluminum, anodized	Aluminum, anodized	Aluminum, anodized	Aluminum, anodized	Aluminum, anodized

Miscellaneous	Unit		M-404.6DG	M-404.8DG	M-404.12S	M-404.22S	M-404.42S	M-404.62S	M-404.82S
Connector			D-sub 15-pin (m)	D-sub 15-pin (m)	D-sub 15-pin (m)	D-sub 15-pin (m)	D-sub 15-pin (m)	D-sub 15-pin (m)	D-sub 15-pin (m)
Connector: Supply voltage									
Recommended controllers / drivers			C-863 (single axis) C-884 (up to 6 axes)	C-863 (single axis) C-884 (up to 6 axes)	C-663 (single axis)	C-663 (single axis)	C-663 (single axis)	C-663 (single axis)	C-663 (single axis)
Cable length	m		3	3	3	3	3	3	3
Operating temperature range	°C		-20 to 65	-20 to 65	-20 to 65	-20 to 65	-20 to 65	-20 to 65	-20 to 65

Note on the sensor resolution: Quadruple evaluated
Note on the permissible push force in Z: Maximum possible normal load capacity, centered, vertical load (linear stage installed horizontally)
Note on the motor resolution and drive type for M-404.x2S: Maximum 0.85 A/phase; 400 full steps/rev., motor resolution with C-663 stepper motor controller

Drawings / Images



M-40x, dimensions in mm

Order Information

M-404.1PD
Precision linear stage, ball screw, 80 mm width, 25 mm travel range, ActiveDrive

M-404.2PD
Precision linear stage, ball screw, 80 mm width, 50 mm travel range, ActiveDrive

M-404.4PD
Precision linear stage, ball screw, 80 mm width, 100 mm travel range, ActiveDrive

Order Information

M-404.6PD
Precision linear stage, ball screw, 80 mm width, 150 mm travel range, ActiveDrive

M-404.8PD
Precision linear stage, ball screw, 80 mm width, 200 mm travel range, ActiveDrive

M-404.1DG
Precision linear stage, ball screw, 80 mm width, 25 mm travel range, DC gear motor,

M-404.2DG
Precision linear stage, ball screw, 80 mm width, 50 mm travel range, DC gear motor,

M-404.4DG
Precision linear stage, ball screw, 80 mm width, 100 mm travel range, DC gear motor,

M-404.6DG
Precision linear stage, ball screw, 80 mm width, 150 mm travel range, DC gear motor,

M-404.8DG
Precision linear stage, ball screw, 80 mm width, 200 mm travel range, DC gear motor,

M-404.12S
Precision linear stage, ball screw, 80 mm width, 25 mm travel range, stepper motor

M-404.22S
Precision linear stage, ball screw, 80 mm width, 50 mm travel range, stepper motor

M-404.42S
Precision linear stage, ball screw, 80 mm width, 100 mm travel range, stepper motor

M-404.62S
Precision linear stage, ball screw, 80 mm width, 150 mm travel range, stepper motor

M-404.82S
Precision linear stage, ball screw, 80 mm width, 200 mm travel range, stepper motor