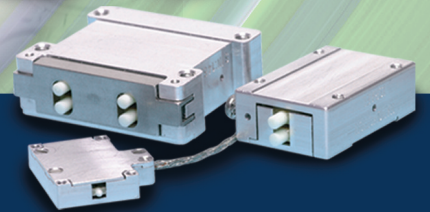
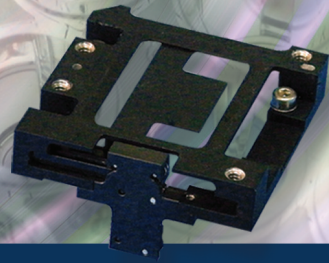
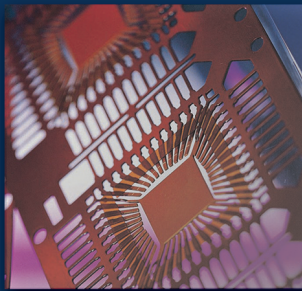
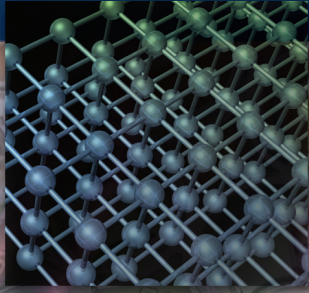


# **NM** NANOMOTION

A Johnson Electric Company



Nanomotion's HR Series motors range in size from a single element (providing 0.4kg of force) to an eight element motor (providing 3.2kg of force). The HR series is capable of driving both linear and rotary stages. The HR series motors have a wide dynamic range of speed, from several microns per second to 250mm/sec and can easily mount to traditional low friction stages or other devices. The unique operating characteristics of the HR Series motors provide inherent braking and the ability to eliminate servo dither when in a static position.

## Features

- Unlimited travel
- Wide dynamic velocity range— from 1 $\mu$ /sec to 250mm/sec
- Excellent move & settle
- Step resolutions to 10nm
- No intrinsic magnetic field
- No external magnetic field sensitivity (for non-magnetic version)
- Vacuum versions available



## Motor Performance Specifications

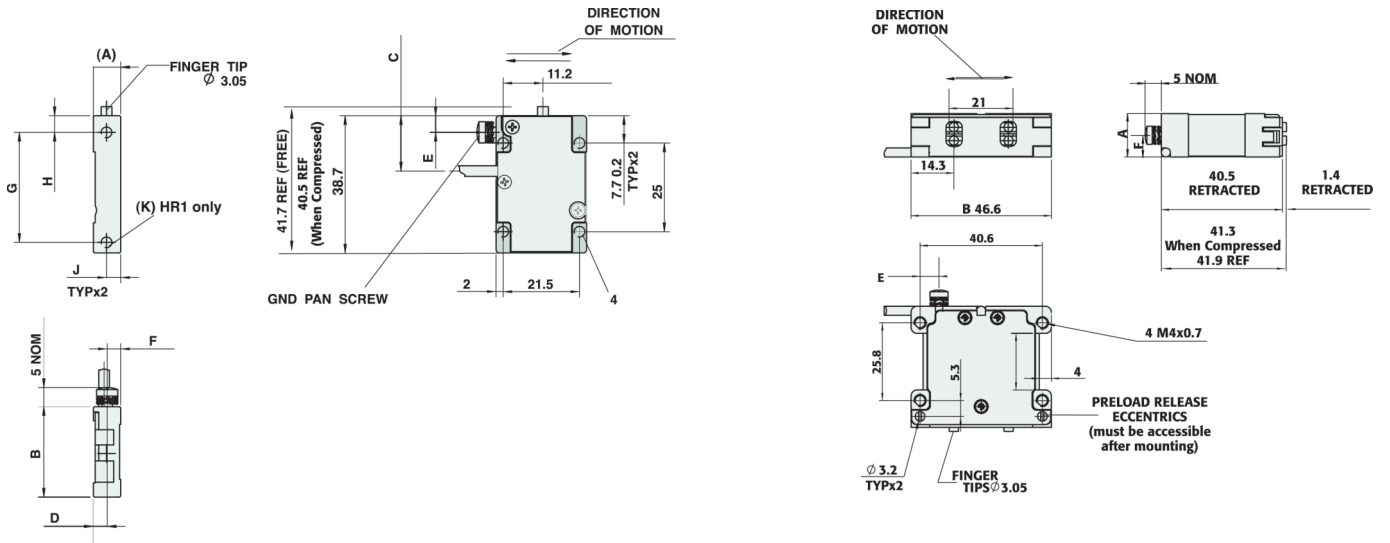
	max velocity (mm/sec)	dynamic stall force (N)	static hold force (N)	static stiffness (N/ $\mu$ )	preload on stage (N)	Kf force constant (N/volt commanded)
<b>HR1</b>	250	4	3.5	1	18	.75
<b>HR2</b>	250	8	7	1.8	36	1.5
<b>HR4</b>	250	16	14	2.8	72	3
<b>HR8</b>	250	32	28	3.5	144	6

**Note:** All motor performance data is based on using Nanomotion ceramic motors and amplifiers. All dimensions in mm

## Environmental

Operating Temperature:	0 to 50°C
Storage:	-20°C to +70°C
Humidity:	0 to 80%, non condensing
-V Vacuum Motors:	to 10 <sup>-7</sup> torr after bake out
-U Ultra-high Vacuum Motors:	to 10 <sup>-10</sup> torr after bake out
Max Bake Out Temperature:	120°C for -V motors, 140°C for -U motors

## Dimensions (European View)

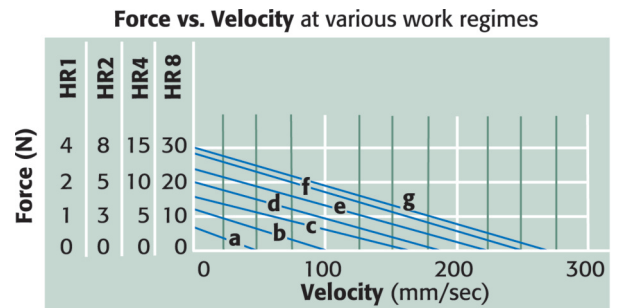


	A motor height	B motor width	C cable exit	D	E gnd screw	F gnd screw	G side mtg	H side mtg	J side mtg	K screw type	motor weight (grams)
<b>HR1-1-S</b>	8	25.7	15.6	4.7	4.7	3.8	31	4.7	4	M3x0.5	30
<b>HR1-1-V</b>	8	25.7	15.6	4.7	4.7	3.8	31	4.7	4	M3x0.5	20
<b>HR1-1-U</b>	7.7	25.5	NA	NA	4	4	NA	NA	NA	NA	20
<b>HR2-1-S</b>	12.7	25.7	15.6	9.7	4.7	6	NA	NA	NA	NA	60
<b>HR2-1-V</b>	12.7	25.7	15.6	9.7	4.7	6	NA	NA	NA	NA	40
<b>HR2-1-U</b>	12.7	25.5	NA	NA	4	6	NA	NA	NA	NA	40
Terminal Mtg for U motors											
<b>HR4-1-S</b>	14.4	46.6	Bottom Back	9.3	7.2	NA	NA	NA	NA	73	
<b>HR4-1-V</b>	14.4	46.6	Left or Right	9.3	7.2	NA	NA	NA	NA	73	
<b>HR4-1-U</b>	14.9	46.6	NA	NA	NA	NA	NA	NA	6	NA	73
<b>HR8-1-S</b>	23.3	46.6	Bottom Back	9	12	NA	NA	NA	NA	170	
<b>HR8-1-V</b>	23.3	46.6	Left or Right	9	12	NA	NA	NA	NA	120	
<b>HR8-1-U</b>	23.8	46.6	NA	NA	NA	NA	NA	NA	12	NA	120

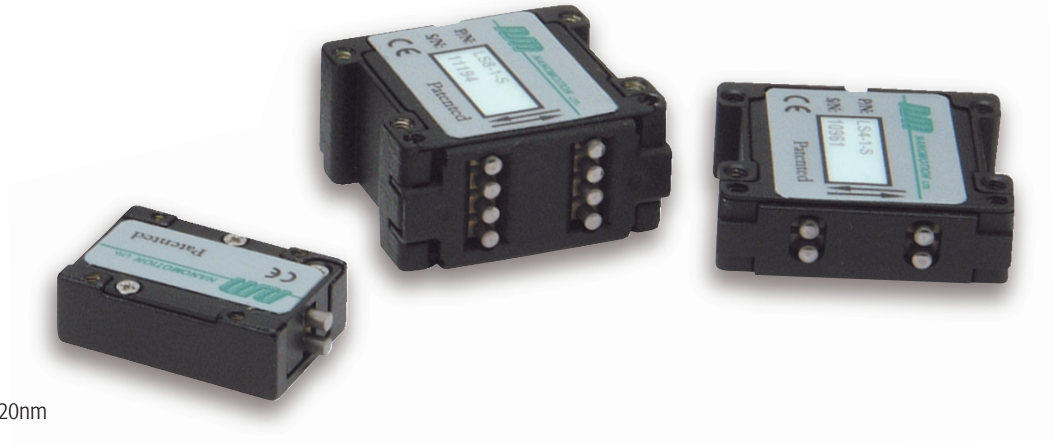
**Note:** All dimensions in mm  
 -S motors are Standard  
 -V motors are Vacuum Rated to 10-7 Torr (use VN for Vacuum & Non-Magnetic)  
 -U motors are Vacuum Rated to 10-10 Torr and are Non-Magnetic  
 -N motors are Non-Magnetic, for MRI environments

## Envelope of Performance

curve	duty cycle	25°C		50°C		Vacuum	
		max. continuous operation time	duty cycle	max. continuous operation time	duty cycle	max. continuous operation time	duty cycle
a	100%	-	100%	-	100%	-	
b	100%	-	100%	-	44%	184	
c	100%	-	92%	137	26%	107	
d	100%	-	62%	93	17%	72	
e	78%	67 seconds	47%	70	13%	55	
f	56%	67 seconds	33%	50	9%	39	
g	50%	67 seconds	30%	45	8%	35	



Nanomotion's family of LS Series motors are available in configurations with 2, 4 and 8 elements. The LS series provides unmatched resolution for repetitive step and settle applications with zero servo dither when in position. The LS series is capable of reaching step sizes in the few nanometers range with maximum speeds of up to 20mm/sec.



## Features

- Unlimited travel
- Step resolution better than 20nm
- No intrinsic magnetic field
- No external magnetic field sensitivity
- Vacuum versions available



## Motor Performance Specifications

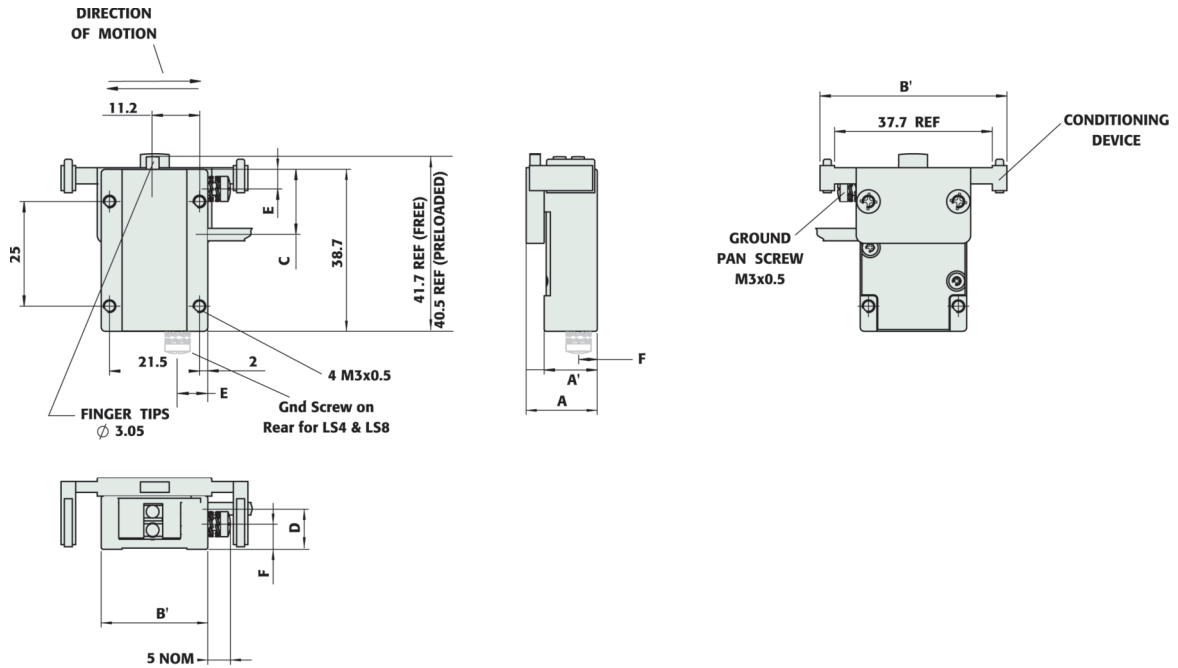
	max velocity (mm/sec)	dynamic stall force (N)	static hold force (N)	static stiffness (N/μ)	preload on stage (N)	Kf force constant (N/volt commanded)
<b>LS2</b>	50	2	2	1.6	18	.1
<b>LS4</b>	50	4	4	2.5	36	1.5
<b>LS8</b>	50	8	8	3.5	72	4

**Note:** All motor performance data is based on using Nanomotion ceramic, with motors and amplifiers

## Environmental

Operating Temperature:	0 to 50°C
Storage:	-20°C to +70°C
Humidity:	0 to 80%, non condensing
-V Vacuum Motors:	to 10-7 Torr after bake out
Max Bake Out Temperature	120°C for -V motors

## Dimensions (European View)

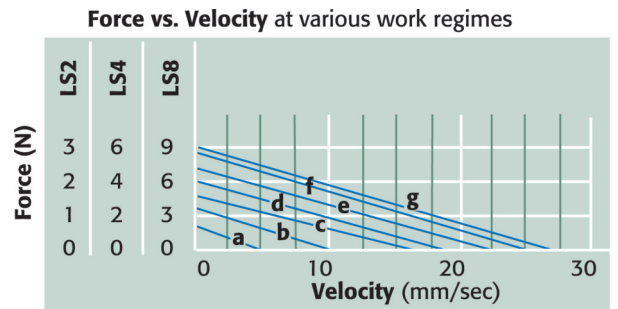


	A motor height	A' height w/o conditioning	B motor width	B' width w/o conditioning	C cable exit	D cable exit	E gnd screw	F gnd screw	Motor weight (grams)
LS2-1-S	17	12.7	44.7	25.7	15.6	9.7	4.7	6	65
LS4-1-S	18.9	14.4	60	46.6	Bottom Back		9.3	7.2	89
LS8-1-S	27.8	23.3	60	46.6	Bottom Back		9.3	11.8	175

**Note:** All dimensions in mm  
 -S motors are Standard  
 -V motors are Vacuum Rated to 10<sup>-7</sup> Torr (use VN for Vacuum & Non-Magnetic)

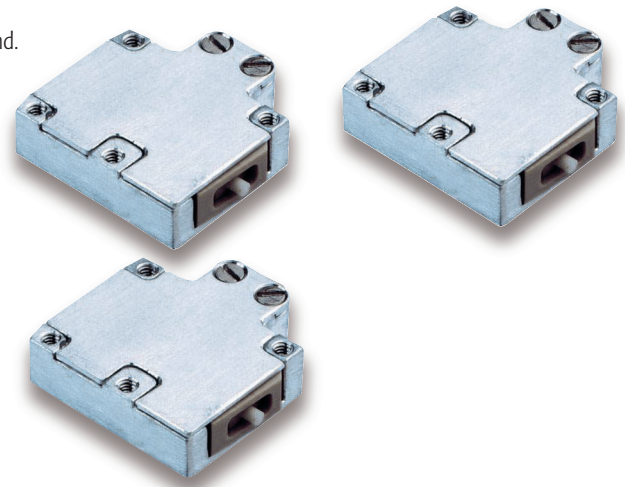
## Envelope of Performance

curve	25°C		50°C	
	duty cycle	max. continuous operation time	duty cycle	max. continuous operation time
a	100%	—	100%	—
b	100%	—	100%	—
c	100%	—	92%	137
d	100%	—	62%	93
e	78%	67 seconds	47%	70
f	56%	62 seconds	33%	50
g	50%	56 seconds	30%	45





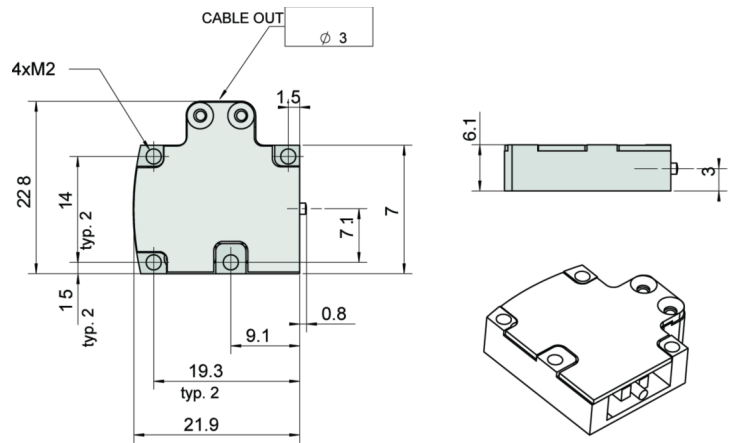
The ST Series Piezoelectric Motor is the smallest motor of its kind. The ST provides high resolution motion control for linear or rotary devices in a fraction of the space of traditional mechanisms. The ST is ideal for small stepping as well as continuous travel, with the ability to make step increments in the tens of nanometers and the ability to operate at speeds up to 250mm/sec.



## Features

- The smallest standard Piezo-Electric package
- Unlimited travel
- Wide dynamic velocity range— from 1 $\mu$ m/sec to 250mm/sec
- Excellent move & settle
- Standard and low speed version for high resolution
- No intrinsic magnetic field
- No external magnetic field sensitivity

## Dimensions (European View)



## Motor Performance Specifications

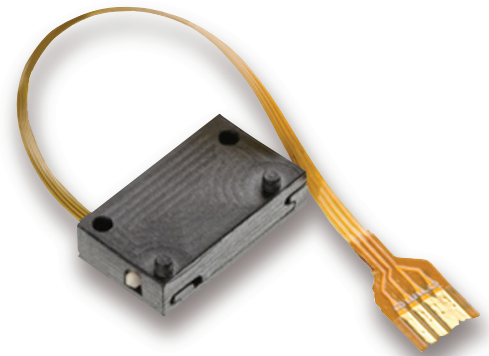
	max velocity (mm/sec)	dynamic stall force (N)	static hold force (N)	static stiffness (N/ $\mu$ )	preload on stage (N)	Kf force constant (N/Volt Commanded)
<b>ST-1-S</b>	250	1.2	1	.15	8	.1
<b>ST-1-V</b>	250	1.2	1	.15	8	.1

**Note:** All Dimensions are in mm.

## Environmental

Operating temperature: 0 to 50°C  
 Storage: -40°C to +70°C  
 Humidity: 0 to 80%, non condensing

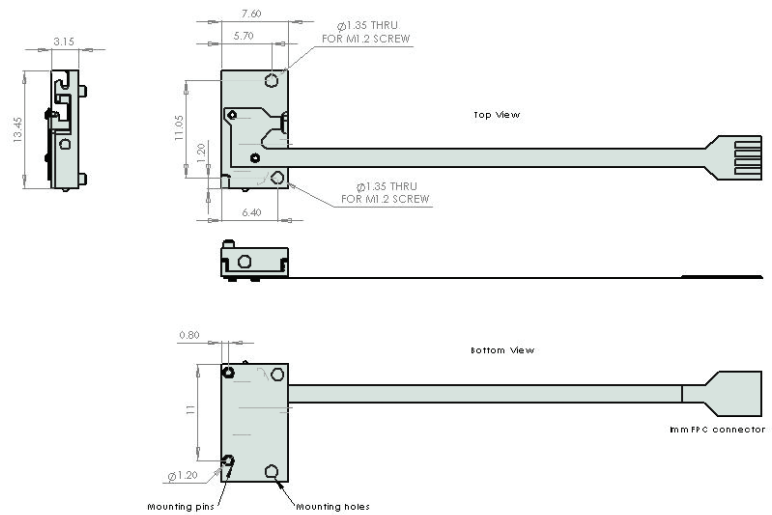
Nanomotion's Edge motor is the smallest industrial motor of its kind available in the marketplace today. Providing unlimited linear or rotary motion, the Edge motor offers extensive opportunities in applications that suit a wide range of industries. The Edge motor works with a uniquely designed, compact ASIC-based driver, and can be operated with any servo controller.



## Features

The Edge can be easily integrated into most bearing structures, and is ideal for mass production opportunities.

- Extremely small dimensions
- Low power consumption
- ASIC drive and control
- Wide dynamic velocity range
- Motor weight of 0.55g
- Excellent move and settle characteristics
- Inherent brake at power off



## Motor Performance Specifications

	max velocity (mm/sec)	dynamic stall force (mN)	static hold force (mN)	static stiffness (N/μ)	preload on stage (N)	Kf force constant (mn/volt commanded)	kv force (N • sec/m)
<b>EM1-S-0</b>	120	300	310	.075	1.8	30.5	1.6
<b>EM1-V-0</b>	120	300	310	.075	1.8	30.5	1.6

**Note:** All motor performance data is based on using Nanomotion ceramic motors and amplifiers

## Environmental

Maximum Velocity: 120 [mm/sec]  
 Dynamic Stall Force: 300 [mN]  
 Static Holding Force: 300 to 320 [mN] (reference value)  
 Non-energized Stiffness: 0.06 to 0.09 [N/μ]  
 Nominal Preload on Stage: 1.65 to 2.0 [N]  
 Kf: 30.5 mN/VoH command with AB5 driver (+/-15% tolerance)  
 40.6 mN/VoH command with AB1 driver (+/-15% tolerance)

Kfv: -1.6307 Nsec/m  
 Offset: 2-3 [V] (driver dependent)  
 Attainable Resolution: better than 100 nm  
 Nominal Lifetime: 20,000 hours under nominal operating conditions



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