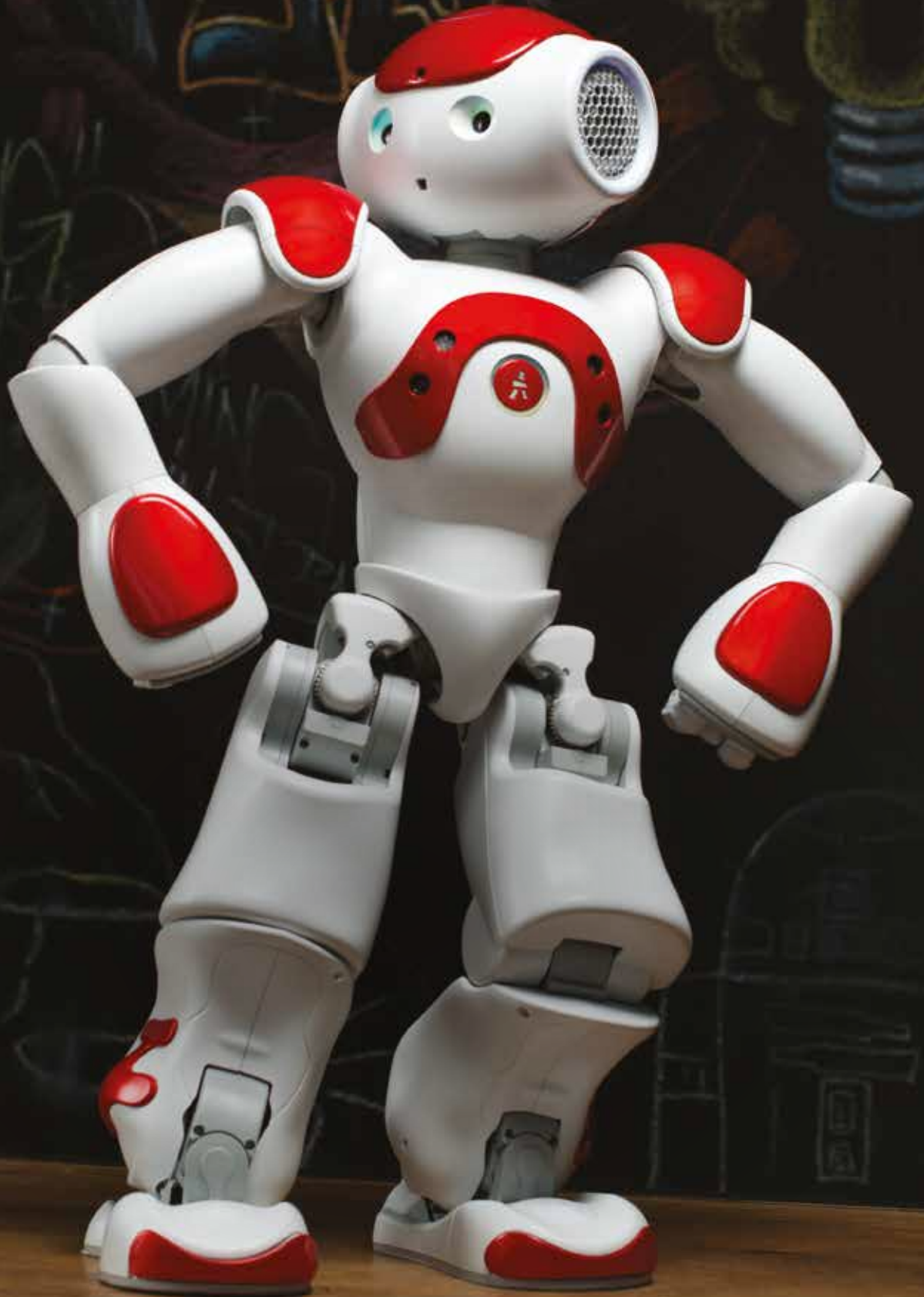


六 NAO





## ELECTRICAL

Input	100 to 240 Vac – 50/60Hz – Max 1.2A	
Output	Max 1.2A 25.2 Vdc – 2A	
Battery	Type	Lithium-Ion
	Nominal voltage/capacity	21.6V / 2.25
	Max charge voltage	25.2V
	Recommended charge current	1.8A
	Max charge / discharge current	2.3A / 2.0A
	Energy	48.6Wh
	Charging duration	3h
	Autonomy	60min (Active use) 90 min (Normal use)

## MOTHER BOARD

CPU	CPU processor	ATOM Z530
	Cache memory	512KB
	Clock speed	1.6GHz
	FSB speed	533MHz
RAM	1GB	
Flash memory	2GB	
Micro SDHC	8GB	

## CONNECTION

Ethernet	1×RJ45 - 10/100/1000 BASE T
WIFI	IEEE 802.11a/b/g/n

## AUDIO

Loud Speakers	×2 lateral	
	Diameter	36mm
	Impedance	8ohms
	Sp level	87dB/w +/- 3dB
	Freq range	up to ~20kHz
	Input	2W
Microphones	×4 on the head	
	Sensitivity	20mV/Pa +/-3dB at 1KHz
	Frequency range	150Hz-12kHz

## CONSTRUCTION

Dimension (HxDxW)	574x275x311mm / 22.6x10.8x12.2 inch
Weight	5.4kg / 11.9 lb
Construction material	ABS-PC/PA-66/XCF-30

## LANGUAGES

Text to speech & Automatic speech Recognition	Czech, Danish, Dutch, English, Finnish, French, German, Italian, Japanese, Korean, Polish, Portuguese, Spanish, Swedish, Russian, Turkish, Arabic, Brazilian, Chinese
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## VISION

Cameras	×2 on front			
Sensor model	MT9M114			
Sensor type	SOC Image Sensor			
Imaging array	Resolution	1.22MP		
	Optical format	1/6inch		
	Active Pixels (H×V)	1288×968		
Sensitivity	Pixel size	1.9µm		
	Dynamic range	70dB		
	Signal/Noise ratio (max)	37dB		
	Responsivity	2.24 V/lux-sec (960p) 8.96 V/lux-sec (VGA)		
Output	Camera output	1280×960 @30fps		
	Data Format	YUV422		
	Shutter type	ERS (Electronic Rolling Shutter)		
View	Field of view	72.6°DFOV (60.9°HFOV, 47.6VFOV)		
	Focus range	30cm ~ infinity		
	Focus type	Fixed focus		
Framerate				
Resolution	Embedded	Gigabit Ethernet	100Mb Ethernet	Wifi g
160×120px	30fps	30fps	30fps	30fps
320×240px	30fps	30fps	30fps	11fps
640×480px	30fps	30fps	12fps	2.5fps
1280×960px	29fps	10fps	3fps	0.5fps

Note: using the video stream in remote highly depends on the network and the video resolution chosen. All frame rates depend on the CPU usage. Values are calculated with a CPU fully dedicated to images gathering.

## IR

Number	x2 on front
Wavelength	940nm
Emission Angle	+/-60°
Power	8mW/sr

## FSR (FORCE SENSITIVE RESISTORS)

Range	0 to 110N
	x4 per feet

## POSITION SENSORS

MRE (Magnetic Rotary Encoder)	x36
	Using hall effect sensor technology
	Precision: 12bits / 0.1°

## SOFTWARE

Open Nao	Embedded GNU/Linux
	Distribution based on Gentoo
Architecture	x86
Programming	Embedded: C++ / Python
	Remote: C++ / Python / .NET / Java / MatLab

## CONTACT SENSOR

Chest Button	✓
Foot Bumper	✓
Tactile Head	✓
Tactile Hand	✓

## SONAR

Emitters	x2 on front
Receivers	x2 on front
Frequency	40kHz
Resolution	1cm
Detection Range	0.05m to 3m
Effective Cone	60°

## INERTIAL UNIT

Gyrometer	x1
Axis	3
Precision	5%
Angular speed	-500°/s
Accelerometer	x1
Axis	3
Precision	1%
Acceleration	-2g

## LEDS

Placement	Quantity	Description
Tactile Head	x12	16 Blue levels
Eyes	2x8	RGB FullColor
Ears	2x10	16 Blue levels
Chest button	x1	RGB FullColor
Feet	2x1	RGB FullColor

## DEGREES OF FREEDOM

Head	x2 dof
Arm (in each)	x5 dof
Pelvis	x1 dof
Leg (in each)	x5 dof
Hand (in each)	x1 dof



## MOTOR SPECIFICATIONS

Motor type Brush DC Coreless

## POSITION OF MOTORS

		Motor	Reduction Ratio
Head joints	HeadYaw	Type 3	Type A
	HeadPitch	Type 3	Type B
Arm joints	ShoulderPitch	Type 3	Type A
	ShoulderRoll	Type 3	Type B
	ElbowYaw	Type 3	Type A
	ElbowRoll	Type 3	Type B
	WristYaw	Type 2	Type C
	Hand	Type 2	Type D
Leg joints	HipYawPitch	Type 1	Type A
	HipRoll	Type 1	Type A
	HipPitch	Type 1	Type B
	KneePitch	Type 1	Type B
	AnklePitch	Type 1	Type B
	AnkleRoll	Type 1	Type A

## DESCRIPTION OF THE MOTORS

	Motor type 1	Motor type 2	Motor type 3
Model	22NT82213P	17N88208E	16GT83210E
No load speed	8300rpm $\pm 10\%$	8400rpm $\pm 12\%$	10700rpm $\pm 10\%$
Stall torque	68mNm $\pm 8\%$	9.4mNm $\pm 8\%$	14.3mNm $\pm 8\%$
Continuous torque	16.1mNm max	4.9mNm max	6.2mNm max

## Speed Reduction Ratio **TYPE A**

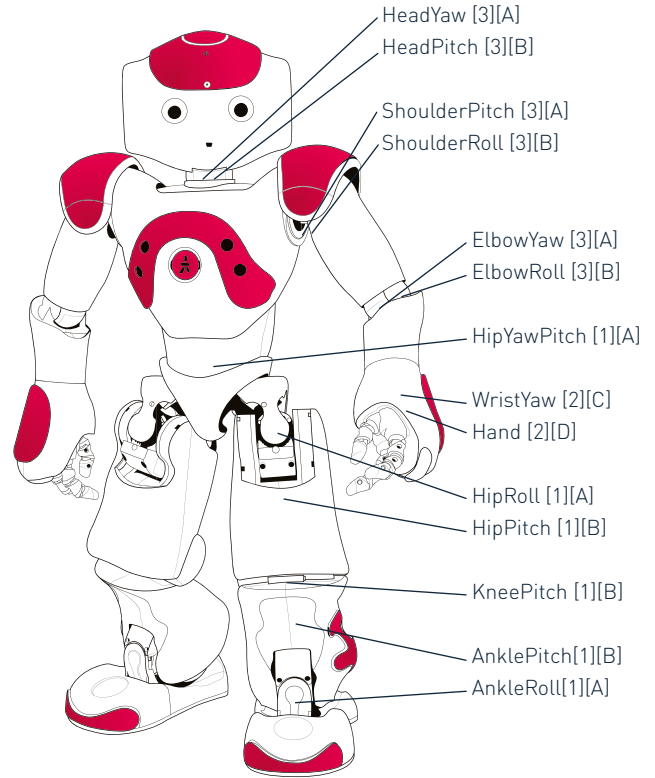
	Motor type 1	Motor type 3
Reduction ratio	201.3	150.27

## Speed Reduction Ratio **TYPE C**

	Motor type 2
Reduction ratio	50.61

## CERTIFICATIONS & APPROVALS

Region	Classification	Electromagnetic compatibility	EN 301-1 / EN 301 489-17 / EN 300 328 EN 62311 : 2008 / FCC PART15, Class B
Europe	CE (Attestation of conformity)	Safety	IEC 60950-1 : 2005 (2nd edition)
USA	FCC		



Legend:  
Joint Name[Motor Type][Reductor Type]

## Speed Reduction Ratio **TYPE B**

	Motor type 1	Motor type 3
Reduction ratio	130.85	173.22

## Speed Reduction Ratio **TYPE D**

	Motor type 2
Reduction ratio	36.24