



# TECHNICAL SPECIFICATIONS

Free simulation and tutorials at [wiki.ros.org/Robots/ARI](http://wiki.ros.org/Robots/ARI)

## GENERAL FEATURES

**Height**  
165 cm

**Width**  
53 cm

**Depth**  
75 cm

## DEGREES OF FREEDOM (DoF)

**Head**  
2

**Mobile Base**  
2

**Arm (2X)**  
5





# HARDWARE SPECIFICATIONS

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## COMPUTER POWER

<b>CPU</b>	Intel i5 / i7 / i9.
<b>SSD</b>	265 GB / 512 GB / up to 1TB.
<b>RAM</b>	8 GB / 16 GB / 32 GB.
<b>GPU</b>	Nvidia Xavier NX, CUDA compatible. <i>(optional)</i> Nvidia Orin, CUDA compatible. <i>(optional)</i>

## DISPLAYS

<b>Touchscreen</b>	Touch screen 10.1" 1200x800 capacitive.
<b>Eyes</b>	2X LCD screen with custom animations.
<b>LEDs</b>	Ears (2x 16 RGB LED Ring), back (40 RGB LED Ring).

## CONNECTIVITY

<b>Wireless</b>	WiFi 802.11ax Dual Band 5 GHz and 2.4 GHz.
<b>Wired</b>	Ethernet 1000 BaseT.

## VISION\*

<b>Head Camera</b>	Head Camera 8 MP RGB. <i>(Optional upgrade to RGB-D)</i>
<b>Torso Camera</b>	Front RGB-D (RealSense D435i).
<b>LIDAR</b>	YDLIDAR TG15. <i>(optional)</i>
<b>Touchscreen</b>	Cameras - RGB, RGB-D, Thermal <i>(Optional upgrades)</i>

## AUDIO

<b>Speakers</b>	2 x 30 W Hi-Fi Full-range speaker.
<b>Microphones</b>	4x high performance digital microphone array.

## BATTERY

<b>Battery</b>	24V / 40VAh <i>(Optional 60Ah)</i> 8-12 hours autonomy.
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\* or equivalent hardware based on component availability



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## CORE SOFTWARE

### Operating system

Ubuntu LTS 64-bit.  
RT Preempt Linux kernel.

### Middleware

Robot Operating System (ROS) Noetic.  
Orocos compatibility.

## HUMAN PERCEPTION

### Face processing

Face detection & tracking.  
Facial feature extraction.  
Face recognition.  
3D gaze estimation based on head-pose.

### Skeleton tracking

Realtime 2D and 3D skeleton tracking.  
Compatible with monocular RGB head camera.  
*(increased accuracy with optional RGB-D camera)*

### Automatic engagement detection

Based on gaze, proxemics and voice activity.

### Probabilistic human model fusion

Transparently fuse face, body and voices detection for a complete realtime, multi-modal people detection.

### Full ROS support and custom visualisation tools

Full integration with the ROS4HRI standard.  
2D and 3D tools to visualise in realtime humans surrounding the robot.  
Compatible with rqt and ROS rviz.

## SPEECH AND DIALOGUE PROCESSING

### Always-on, on-board speech recognition

Automatic voice activity detection.  
ASR based on vosk, includes support for 20+ languages and dialects.\*  
*(optional Google speech integration)*

### Speech synthesis

Based on acapella, comes with support for 6 languages.  
*(additional languages can be purchased separately)*

### 3D sound source localisation

Compatible with ROS tf.

### Customisable dialogue manager

Based on rasa, include machine-learning based intent detection comes off-the-shelf with casual chat capability. *(extendable by the user)*  
*(optional Google Dialog Flow integration)*

## REASONING

### Knowledge base

OWL/RDF compliant knowledge base.  
Fast first-order-logic reasoner.  
Fully integrated with ROS.

\* *speech recognition results may vary depending on the language, and are sensitive to background noise*



## MOTIONS AND BEHAVIOURS

### Full compatibility with standard ROS interfaces

Includes ros\_controllers support to control the robot's joints.  
Standard differential drive API.  
Support for standard ROS interfaces to sensors (camera, depth cameras, LIDARs).  
Full compatibility with MoveIt! for motion planning.

### Whole-body Cartesian control

Whole-body Cartesian control of the robot arm, based on our state-of-art technology for humanoid bipeds.

### Custom tools to record and play animations

Easy-to-use and access (no install) via the integrated web-based GUI.

### Navigation

Support for ROS-based 2D navigation.  
Purchase of the Autonomous Navigation pack, that includes a LIDAR, is recommended for navigation in complex environments.

### Expressive behaviours

Fully controllable expressive eyes with 20+ off-the-shelf expressions. *(possibility to use custom eye designs)*  
SSML support in the text-to-speech engine to control speech prosody.

## USER PRIVACY AND DATA MANAGEMENT

### GDPR-compliant\*

All data processed on-board (edge computing).  
Connection to cloud servers opt-in only, and not required for regular use.  
Privacy-sensitive data (eg face database) easy to delete.

## USER INTERFACES

### Web GUI interface

Build new motions.  
Build new Presentations that coordinate robot speech, motions, LEDs and touchscreen.  
Create buttons that trigger motions, speech or presentations.  
Create new touch screen content.  
See camera outputs - Robot's camera live streaming.  
Information Panel.  
Graphical Joystick for teleoperation of the base.

### Web Commander diagnostics

Diagnosis of software, actuators and sensors.  
Text-to-speech triggering.  
Execution of pre-recorded motions.  
Execution of demonstrations.

### Custom touchscreen-based interfaces

Load custom HTML/javascript onto the touchscreen to create your own interactive display, includes ROS-Javascript bridge to interact with the robot hardware from the tablet.

\* if you opt-in for Google-based ASR & dialogue management, instead of the default on-board speech processing pipeline, your robot might not be GDPR compliant anymore



## PREMIUM UPGRADES

### Upgraded Sensors

Head RGB-D camera instead of RGB, additional Thermal Camera

### Voice Processing

Add extra languages and voices

### Autonomous Navigation Pack

Includes LIDAR - YDLIDAR TG15

Vision and laser based self-localization and mapping (SLAM)

Navigation to a point of a map

Obstacle avoidance using laser sensors and front RGB-D camera

Available RViZ Plugin and web plugin to navigation to a point in a map

### Autonomous Docking Pack

Includes back stereo fisheye camera, dock station, Autonomous Docking Software

### Additional Dock Station

### ARI Premium Transportation crate

### Spare ARI charger

