Specifications of WAM Arm

Shoulder Yaw: **Shoulder Pitch:** **Shoulder Roll:** **Elbow Joint:** **Wrist Yaw:** **Wrist Pitch:** **Wrist Roll:**	**4-dof** 300° 225° 315° 230° – – –	**7-dof** 300° 225° 315° 230° 350° 180° 344°
Mechanisms	Mechanical transmissions based on advanced, patented high-speed cable transmissions and patented zero-backlash, low-friction, cabled differentials.	
Mechanical Stiffness	1.5E6 N/m	1.5E6 N/m
Payload	4 kg	3 kg
Reach (w/ hand or gripper tool)	1000 mm	1000 mm
Work Volume	3.5 m^3	3.5 m^3
Agility Index* (avg. joint mobility in radians raised to the # of dofs)	466	44,000
Peak Velocity	3 m/s	3 m/s
Peak Accel. (at endtip with 1-kg load)	30 m/s^2	20 m/s^2
Repeatability	1000 µm 100 µm**	2000 µm 200 µm**
Weight		
Entire Assembly	25 kg	27 kg
Arm beyond shoulder	3.3 kg	5.8 kg
Size		
Footprint	0.1 m^2	
Base Height	160 mm	
Motors	Neodymium-iron, brushless motors with Pucks providing high-performance space-vector-commutated current amplifier/control	

High-Level Interface	High-speed network cable (Ethernet and CANbus) and (Ethernet) wireless	
High-Level Cartesian Control (Trajectory and/or Force)	500 Hz	500 Hz
Low-Level Joint-Torque Resolution	14-bits	14-bits
Lower-Level Position Feedback		
Type	12-bit digital motor position feedback 18-20-bit** joint position feedback	
Minimum Joint Resolution	0.005° 0.001**	0.008° N/A**
Power Requirement (AC Operation)	100-240 vac 1Φ 50-60 Hz @ 60 watts minimum	
Mobile (DCN Operation)	24-80 vdc @ 50 watts minimum	
Amplifier Cabinet + Controller PC* **		
Weight	0 kg	0 kg
Depth	0 mm	0 mm
Height	0 mm	0 mm
Arm Cabinet	0 mm	0 mm
Tether Length	0 m	0 m

*The agility index presumes adherence to optimal kinematics, defined as

- 3 axes intersecting at right angles at the shoulder;
- 3 axes intersecting at right angles at the wrist **as close as possible to the grasp center**; and
- 1 elbow axis at the midpoint between the shoulder and grasp center.

**For high-precision operation, a special, custom version of the WAM may be ordered with precision (metrology-level) joint encoders integrated into all 4 joints of the 4-dof WAM.

***The zero values dramatize the point that Puck electronics eliminate the need for any external amplifier cabinet. In addition, a PC is incorporated into the base of the WAM, complete with its own video monitor and USB-keyboard jacks. DC power (24-80 vdc native) operation for mobile applications requires no external power supply. A simple laptop-sized power supply is included with every WAM for AC operation in any country. In addition to the embedded-PC jacks, users can control the PC remotely via either standard wired or wireless Ethernet. Users may also circumvent the internal PC and use their own realtime PC with opto-isolated CANbus card to communicate via CANbus with the motor Pucks™ in the WAM. Barrett will support users in setting up their own PC if the system is still under warranty or extended warranty. Alternatively, for a modest fee Barrett will supply a properly configured and tested realtime external PC with opto-isolated CANbus card. The advantage is that the user can add PCI cards (e.g. for machine vision) so that all realtime actions are handled under a single PC.