

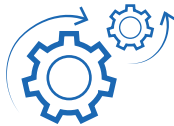
Precise Maneuverability

with AMR/AGV Wheel Drive Solutions

Increased automation to improve operational efficiencies within factories, warehouses and distribution centres has led to autonomous mobile robots (AMRs) and automated guided vehicles (AGVs) needing to adapt to different workflows and accommodate factory process changes more frequently. An industrial mobile robot's ability to navigate dynamically changing environments requires efficient and precise movement. Analog Devices' wheel drive solutions for brushless direct current (BLDC) and stepper motors enable precise motion control, ensuring efficient and safe AMR/AGV operation within industrial environments.



Precise
Motion Control



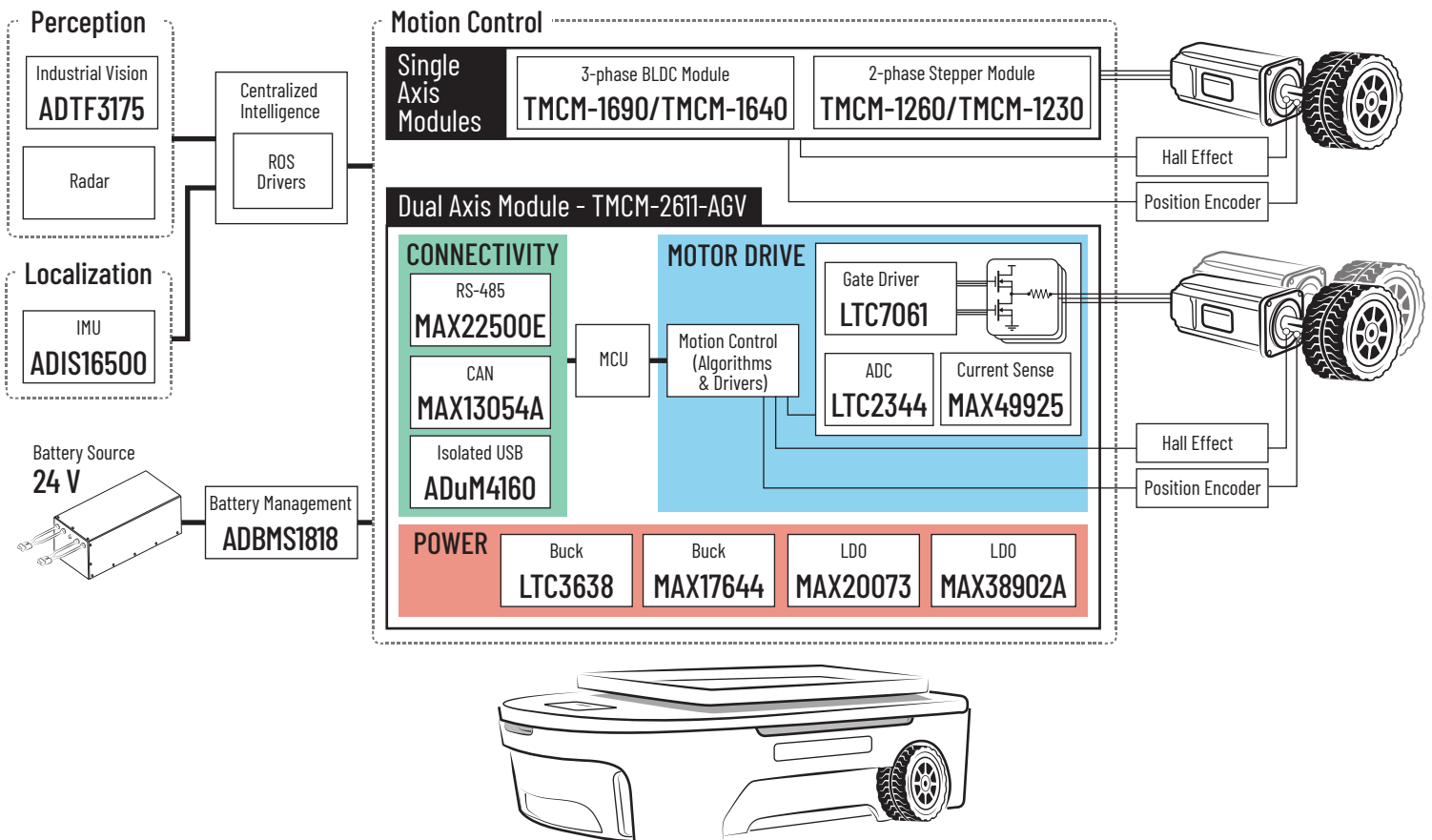
Increased
Automation



Efficient
Operation



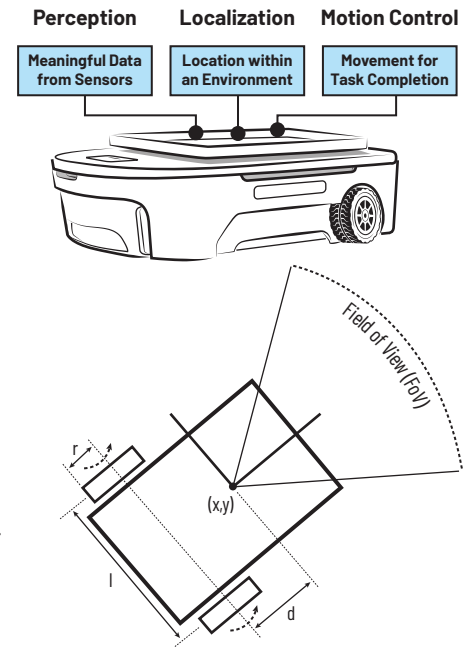
Flexible
Manufacturing



Fundamentals of Intelligent Motion

Autonomous mobile robots capable of intelligent motion rely on three main factors: perception, localization, and motion control. Perception provides the ability to interpret meaningful data from sensors, localization brings the ability to determine the robot's location within an environment and motion control enables ease of maneuvering to complete tasks.

Motion control is achieved with variable speed drive and position sensing technology. Intelligence within the system precisely interprets the movement needed based on perception data from vision systems like the [ADTF3175](#) industrial vision module and localization data using [ADIS16500](#) inertial measurement unit (IMU).



Accurate Movement

Size, weight, stability, wheel size and configuration all play a role in the physical design and operation of a mobile robot. Path planning and predicted trajectory in relation to wheel drive operations relies on the wheel movements being performed as commanded. To navigate, map and localize effectively, precise wheel movement and feedback is paramount. ADI's portfolio of motor drive modules significantly reduce the design challenges associated with motion in mobile robots.

Motor Drive Solutions

	Motor Type	# of Axis	Phase Current, RMS	Supply Voltage	RS-485	CAN	USB
TMCM-2611-AGV	3-phase BLDC	2	14 A	48 V	●	●	●
TMCM-1690	3-phase BLDC	1	10 A	10 V - 60 V	●	●	○
TMCM-1640	3-phase BLDC	1	5 A	12 V - 28.5 V	●	○	●
TMCM-3351	2-phase Stepper	3	3 A	11 V - 28 V	●	●	●
TMCM-1260	2-phase Stepper	1	6 A	12 V - 48 V	●	●	●
TMCM-1230	2-phase Stepper	1	5 A	10 V - 30 V	●	●	○

While stepper motors offer superior position accuracy over BLDC motors, stepper motors lack the ability to quickly accelerate and produce more noise than BLDC motors. The position accuracy of BLDC motors is directly proportional to the accuracy of the angle sensor.

For discrete motor drive implementations utilize ADI's complete signal chain solutions incorporating high performance current and voltage sensing, robust isolation, high density power management and seamless connectivity technology.

Variable Speed Drive

LTC7061	Half Bridge Driver
LTC2344	SAR ADC
MAX49925	Current-Sense Amplifier

Power & Isolation

Mobile robots rely on efficient power management to operate longer on a single charge. Utilize [ADBMS1818/ADBMS6948](#) battery monitoring solutions, along with ADI's extensive range of step-down regulators ([LTC3638](#)), DC-DC converters ([MAX17644/MAX20073](#)), and LDOs ([MAX38902A](#)) to address your AMR/AGV power needs.

For new developments in mobile robotics, the trend is moving towards 48 V operation. Robot designs operating at 24 V/48 V are considered safe for humans, requiring no strict need for isolation. However, integrated isolation within AMR/AGV designs offers increased signal integrity and noise robustness when operating in harsh industrial environments.

Isolation

ADM2867E	Isolated RS-485
ADM3055E	Isolated CAN
ADuM3165 / ADuM4160	Isolated USB
ADuM7223	Isolated Gate Drivers

Power

LTC3638	Step-Down Regulator
MAX17644 / MAX20073	Step-Down DC-DC Converter
MAX38902A	LDO Linear Regulator