

Tilting  
Toolholder  
with Brakes

TA5 with Repositionable  
Nutrunner



# Torque Arms



TA10 with Complex Toolholder

**GIVENS**  
ENGINEERING INC

*London Ontario*

Manufactured in  
Canada and  
United States

**GIVENS**  
LIFTING SYSTEMS INC

*Toledo Ohio*

# Torque Arms for Any Application



▲ A TA2 torque arm mounted overhead. Toolholder mounts the nutrunner allowing a 360-degree spin.



Custom torque arm mounted on a vertical slide. Toolholder holds the nutrunner rigidly.



▲ TA5 torque arm with complex, braked toolholder. Nutrunner can rock left and right from vertical to access screws on a slant.

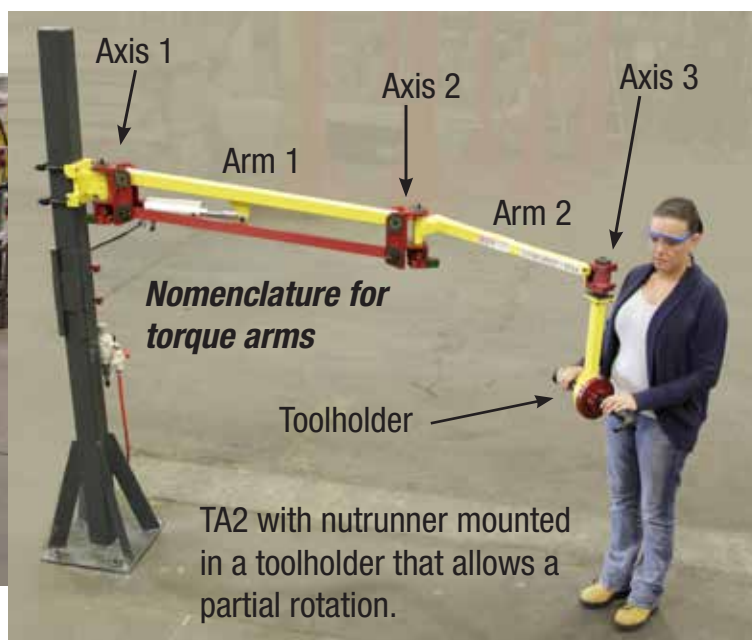
**Torque Arms** have 2 roles:

- 1) They absorb the torque that is generated during tightening
- 2) They provide lift for the nutrunner, so that the nutrunner floats at all times on the end of the arm and the arm follows, horizontally and vertically.

All of our torque arms float on air and are exceptionally easy to move about. In general, the arm itself is mass-produced and stocked. The toolholder though, is made custom for the nutrunner and the application at hand. The toolholder can be very simple, where the nutrunner is fixed, or it can be complex, with brakes and multiple nutrunner angles.



▲ TA2 mounted on a mobile base



# Torque Arms with Muscle!



Trombone close-up, incorporates rotation



TA10 with braked, tilting, rotating toolholder

**1000Nm (750 ft-lb) of torque! Applied to large fasteners in a military vehicle. When you need really serious torque, we can provide a serious arm.**



TA10 torque arm with "trombone" toolholder. Trombone converges on both nut and bolt to fasten simultaneously.

In the photos below and below left, **the nutrunner has been created by Givens Engineering**. The nutrunner consists of a servomotor and gear reducer, controlled by PLC and monitored thru an HMI.

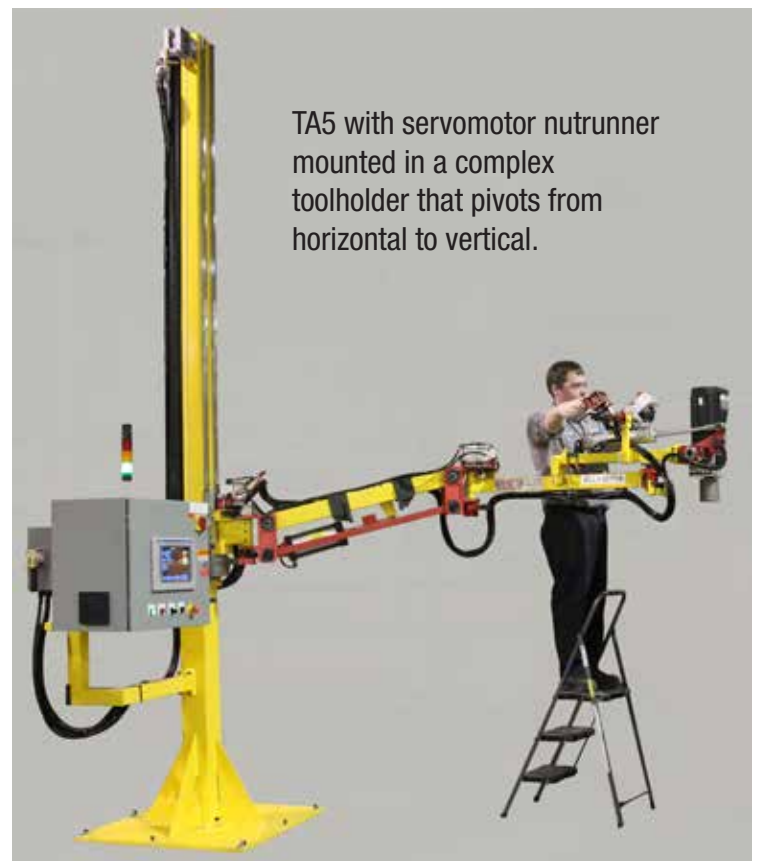
The torque arm rises to a height of 4m on a pneumatic slide and applies a torque of 160Nm (120 ft-lb). The number of rotations and the torque are continuously monitored and logged.



Servo controls



Servomotor Nutrunner



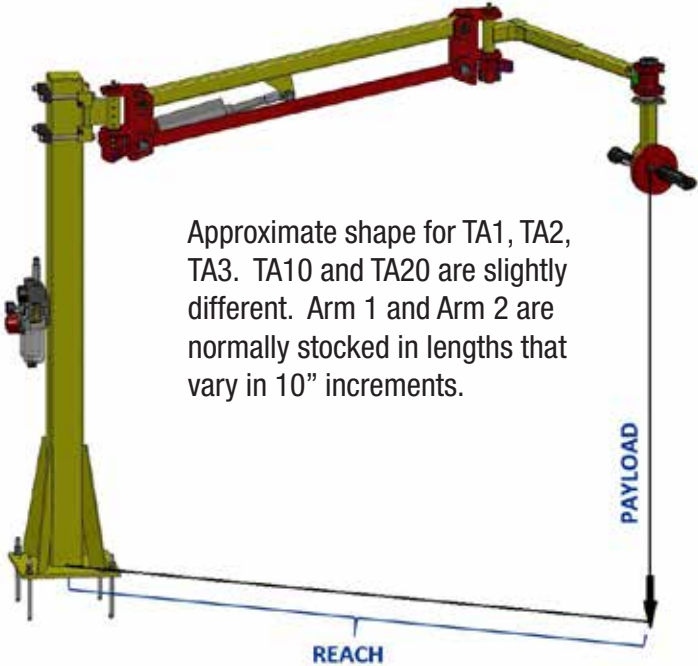
TA5 with servomotor nutrunner mounted in a complex toolholder that pivots from horizontal to vertical.

Torque Arm Model Selection					
Arm Size	TA1	TA2	TA5	TA10	TA20
Torque	75ft-lb 100N-m	150ft-lb 200N-m	370ft-lb 500N-m	750ft-lb 1000N-m	1500ft-lb 2000N-m
Approximate Pay Load*	10lb 5kg	30lb 15kg	50lb 25kg	100lb 45kg	150lb 70kg
Typical Reach	4ft 1.2m	5ft 1.5m	7ft 2.0m	8ft 2.5m	10ft 3.0m

\* Pay Load = weight of nut runner + weight of tool holder  
 Total capacity is always a combination of torque and payload; always consult a Professional Engineer before designing a torque arm.



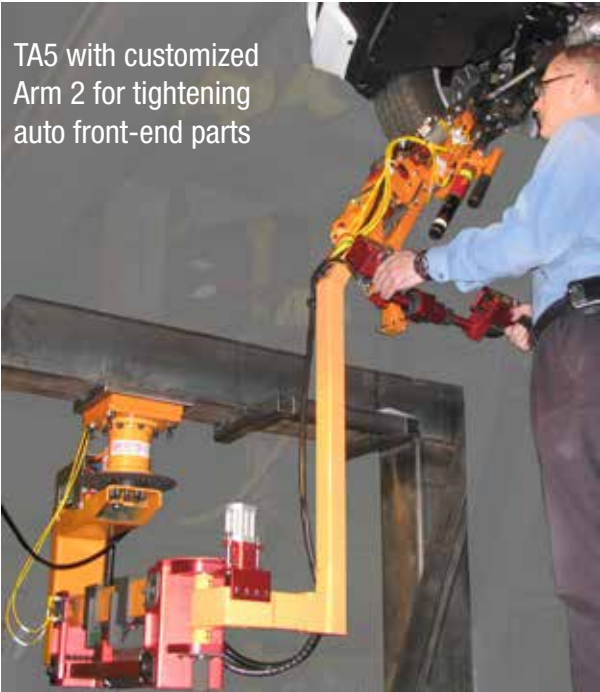
TA2 with pivoting 3rd axis



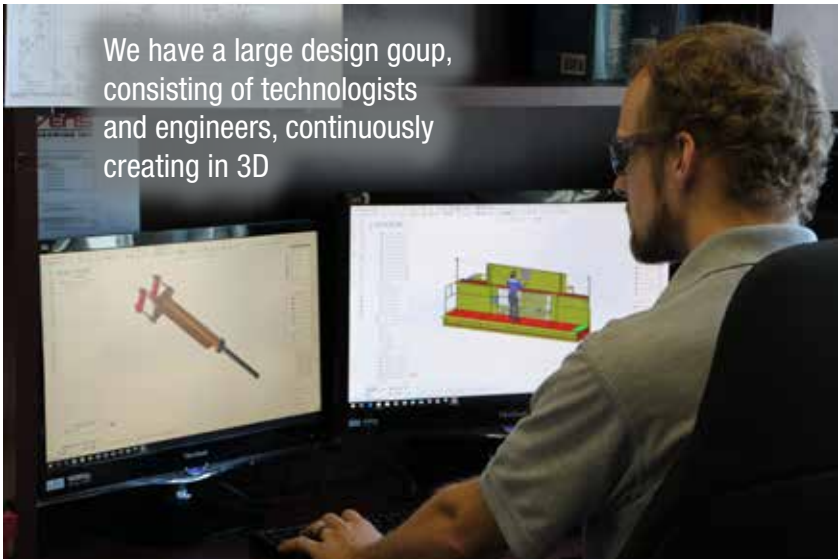
Approximate shape for TA1, TA2, TA3. TA10 and TA20 are slightly different. Arm 1 and Arm 2 are normally stocked in lengths that vary in 10" increments.



TA2 mounted on a mobile base with extra linkages for holding 3rd Axis attitude



TA5 with customized Arm 2 for tightening auto front-end parts



We have a large design group, consisting of technologists and engineers, continuously creating in 3D

# Position Brakes vs Torque Brakes

Any torque arm can be equipped with several **positioning brakes** or with **one torque brake**.

**Positioning Brakes** or 'drag brakes' are typically mounted on the 1st and 2nd Axes of the arm and act to hold the arm in one position so that it will not drift away. These brakes are usually very light and can be overcome by pushing with some force against the nutrunner or the end of the arm. Many torque arms are not equipped with positioning brakes at all, and are expected to drift away when the operator releases the nutrunner.

*Positioning brakes are not meant to hold against a torque; they merely prevent arm drift.*

**Torque Brakes**, on the other hand, are meant to withstand the torque exerted by the nutrunner. While it is theoretically possible to mount them on the 2nd Axis, typically they are mounted on the 3rd.

In the photo below right, the nutrunner is equipped with a disk and 2 heavy caliper brakes. These brakes are normally off until the time the nutrunner begins to spin. Torque brakes will have a safety factor against slippage of about 2:1.

Torque brakes are generally air-operated and are much more powerful than positioning brakes. **If a torque brake is not present when it should be, the arm will begin to turn unexpectedly when torque is applied, possibly resulting in injury.**



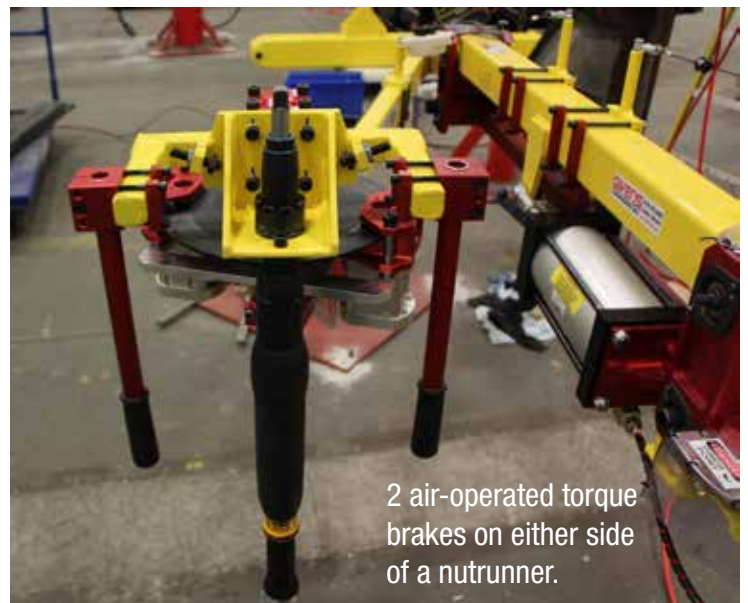
## When do I need a torque brake?

Usually, torque brakes are only needed when the fasteners to be tightened are vertical (or semi-vertical) and the nutrunner must be repositioned at the 3rd Axis.

Example 1: All fasteners are horizontal: typically, **no torque brake is required** because the arm geometry withstands the torque.

Example 2: All fasteners are vertical and the nutrunner has an in-line shape. There is no reason to spin or reposition the nutrunner at the end of the arm and **no torque brake is required**. The nutrunner can be fixed at the end of the arm and the arm geometry withstands the torque.

Example 3: Several fasteners are significantly off vertical (but are not horizontal) and are arranged in a long row. In this case, the nutrunner has to be twisted slightly with respect to the arm as each fastener is engaged and **a torque brake at the 3rd Axis is required**.

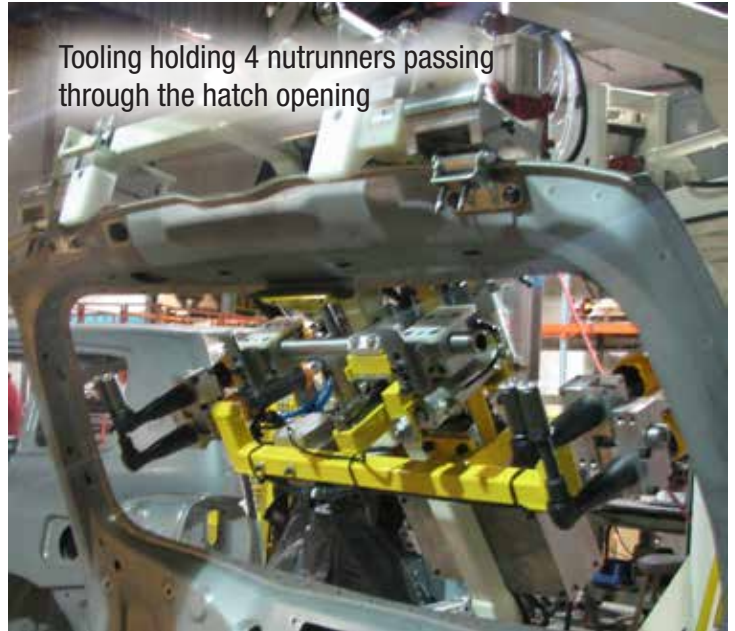


Example 4: All fasteners are vertical and arranged around the perimeter of a hub. The nutrunner has a right-angle shape. The operator must reposition the nutrunner at the 3rd Axis with each fastener to avoid interfering with the hub, and **a torque brake is required**.

# Automated Nutrunner Positioning



Givens manipulator carrying a rear hatch and 4 nutrunners to automatically attach and tighten



Tooling holding 4 nutrunners passing through the hatch opening



4 nutrunners mounted on slides to automatically spread and tighten, PLC-controlled, hung from a crane



PLC and nutrunner controllers



Groups of nutrunners can be automatically moved into position and activated. In these photos, groups of nutrunners are carried by manipulators or cranes.

**We design, wire and program!** Nutrunners, grippers and movements are all programmed and PLC-controlled. Readouts of nutrunner positions and torques can be monitored on a display.

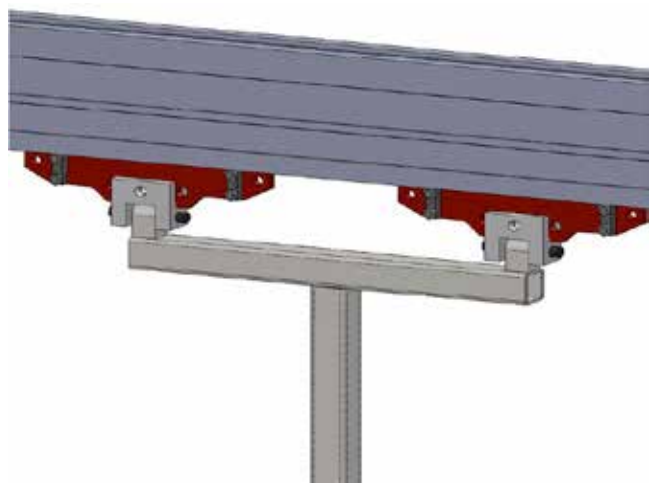
**The manipulators, cranes and automated machinery that support the nutrunners are designed and manufactured by Givens....every part of the project integrated together by one company.**



Givens manipulator with hatch and nutrunners

# Torque Tubes-- Hanging from Cranes

Sometimes it's necessary to hang a nutrunner from a crane *in order to achieve large travel distances*. In this situation, a **torque tube** is used instead of a torque arm. A vertical slide floats the nutrunner, suspended from a balancer or an air cylinder.



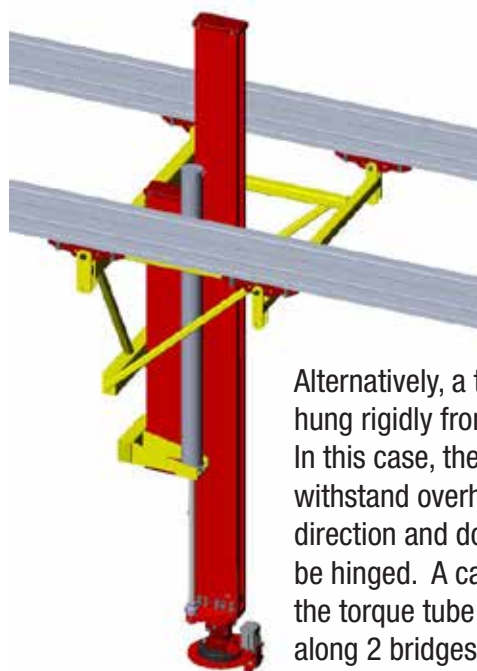
Usually a torque tube hangs from 2 trolleys on a bridge or monorail. In this situation, hinge pivots have to be provided to avoid applying a moment to the trolleys.



Torque tube floating on a spring balancer



A torque tube supporting 2 nutrunners. Note that the right-angle nutrunner drives against a fork that prevents a nut from turning, at the bottom.



Alternatively, a torque tube can be hung rigidly from 4 crane trolleys. In this case, the torque tube can withstand overhung loads in any direction and does not have to be hinged. A carriage supports the torque tube and usually runs along 2 bridges, which in turn are supported by 2 runways.

# Nutrunner Toolholders



**We create a wide variety of custom toolholders!** If you need your nutrunner to pivot, spin or lock in several positions, we can make it happen. **Our large engineering staff and fully-equipped machine shop turn out a huge volume of tooling and machinery of all types on a continuous basis.**



**Givens Engineering**, established in 1993, provides torque arms, manipulators, cranes and custom machinery to a wide range of customers in the United States, Canada and beyond.

**Almost everything** we manufacture is customized and engineered to some extent.

**We employ mechanical engineers**, electrical engineers, designers, machinists, millwrights, welders, electricians and controls specialists to manufacture torque arms, cranes, manipulators and machinery entirely in-house.

**Installation**, startup support, maintenance and annual inspections are services that we routinely provide.

**We have supplied equipment** to these large organizations:

Toyota, Honda, GM, Chrysler, Magna, International Truck, Hino Truck, GE, Bombardier, Volvo, NASA, TRW, Dana, GKN, Siemens, Kaiser, Bosch and many others.



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