Shafts

Shafts are rotating elements used to transmit torque through a robot’s mechanisms. In FRC, different shaft geometries are used depending on how securely components must transfer motion and how much load the system experiences.

Common Shaft Types

1/2" Hex Shaft

- Most common FRC shaft type
- Torque is transmitted through flat faces
- No slipping when used with matching hubs
- Easy to assemble and align

3/8" Hex Shaft

- Smaller, lighter hex shaft option
- Used in compact or low-load mechanisms
- Easier to package in tight designs
- Lower torque capacity than 1/2" hex

1/2" Round Shaft

- Smooth cylindrical shaft
- Requires keys, pins, or set screws for torque transfer
- Can slip if not properly constrained
- Used when free rotation or simple pivots are needed

Spline XL Shaft System

Spline XL is a high-torque shafting system used in FRC for demanding applications.

Key Features:

- Multiple splines (teeth) around the shaft
- Very high torque capacity

- Prevents slippage under heavy load
- Allows precise, repeatable component alignment

Why Teams Use It:

- Handles extreme drivetrain loads
- More robust than hex shafts in high-stress systems
- Reduces wear from repeated high-torque cycles
- Improves long-term reliability

How They Relate

- **Round shaft → simplest, lowest torque transfer (needs retention features)**
- **3/8" hex → compact, moderate torque, space-saving option**
- **1/2" hex → standard balance of strength and usability**
- **Spline XL → maximum torque capacity and reliability**

As load requirements increase, teams typically move from round → smaller hex → 1/2" hex → spline-based systems.

Common Applications

- Drivetrains (1/2" hex, Spline XL)
- Intakes and rollers (3/8" and 1/2" hex)
- Elevators and arms (1/2" hex, Spline XL)
- Light pivots and mechanisms (round shaft)

Key Idea

Shaft selection depends on torque, packaging, and reliability needs. 3/8" hex is a compact option, 1/2" hex is the standard, round shafts require additional retention, and Spline XL is used when maximum torque capacity and durability are required.

Revision #2
Created 26 June 2026 11:28:43 by eharis
Updated 26 June 2026 11:46:52 by eharis