

# Q&A

## VRC 2023-2024: Over Under

Tagged: R20

Welcome to the official VEX Robotics Competition Question & Answer system, where all registered teams have the opportunity to ask for official rules interpretations and clarifications. This Q&A system is the only source for official VRC Over Under rules clarifications, and the clarifications made here from the Game Design Committee (GDC) are considered as official and binding as the written [Game Manual](#) itself.

**Please review the [Q&A Usage Guidelines](#) before posting.** This system is only intended for specific VRC Over Under rules questions.

- For event, registration, or other competition support questions, please contact your [REC Foundation Manager](#).
  - For VEX technical support, contact [support@vex.com](mailto:support@vex.com) or [sales@vex.com](mailto:sales@vex.com).
- For game questions, suggestions, or concerns outside of specific and official rules questions, contact [GDC@vex.com](mailto:GDC@vex.com).

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## <VUR6> Clarification

7-Dec-2020

R6 R7 R8 R10 R12 R20 R22 VUR2 VUR3 VUR5 VUR6 VUR8

In this previous ruling, it was determined that <VUR5> takes priority over <VUR6>:

<https://www.robotevents.com/VEXU/2020-2021/QA/674>

However, this is contradictory to every other instance of past rulings regarding <VUR6> and the wording of <VUR6> in the game manual.

?

For example, consider a typical custom sensor such as the pixy camera:

<https://www.robotshop.com/en/charmed-labs-pixy-2-cmucam5-image-sensor.html>

This sensor violates <R6>, <R7>, <R8>, <R10>, <R12>, <R20>, <R22>, as well as <VUR3> and <VUR8>.

VUR3 restricts the materials allowed, but this sensor violates the allowed materials.

VUR8 restricts the screw sizes allowed, but this sensor may have smaller screws than the allowed limit.

As another example, consider a vex IQ sensor: <https://www.vexrobotics.com/228-3014.html>

This sensor would violate <R6>, <R7>, <R8>, <R10>, <R12>, <R20>, <R22>, as well as <VUR3> and <VUR2b>.

<VUR2b> restricts teams from using any vex IQ electronics, which would include this sensor.

?

Because <VUR6> specifically states "There is no restriction on sensors and other additional electronics that Robots may use for sensing and processing" it has been understood by most VexU teams that <VUR6> takes priority over all the other rules in the game manual. Logically this would also mean <VUR6> would take priority over <VUR5>.

?

Several other Q/As over the years have verified this as correct as the wording on <VUR6> has not significantly changed since these rulings:

<https://www.vexforum.com/t/answered-vexu-speakers-as-part-of-custom-sensor/42312>

<https://www.vexforum.com/t/answered-vex-u-old-college-q-a-updates/23810>

<https://www.vexforum.com/t/answered-custom-sensor-housing/19582/2>

These three Q/As verify that <VUR6> would take priority over <VUR3> and <VUR8> as well as all the regular game manual rules mentioned above.

Furthermore, the following Q/A shows that <VUR6> would also take priority over <VUR5>:

<https://www.vexforum.com/t/answered-vex-u-non-vex-servo-motors-for-a-custom-sensor/35538>

This allowed external non vex motors used solely for manipulating custom sensors.

If this were the case, it would agree with the wording of <VUR6>. There are numerous sensors and processing boards that rely on motors to operate.

For example, many full field lidar systems such as:

<https://www.robotshop.com/en/rplidar-a1m8-360-degree-laser-scanner-development-kit.html>

rely on an integrated motor to spin the lidar enabling it to map the field. VexU teams have legally used similar lidar systems in the past and may plan to do so again this season.

Another example would be the Nvidia Jetson Xavier NX listed below:

<https://www.nvidia.com/en-us/autonomous-machines/embedded-systems/jetson-xavier-nx/>

This processing board has a built-in fan on its heatsink that is critical to its function as a processing unit.

A third example is the pixy tilt and pan kit: <https://pixycam.com/pixy2-pan-tilt-kit/> (ruled legal in the above Q/A linked).

Without these integrated motors, none of these sensors or processing units could function as intended.

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Therefore, which rules, if any, restrict the "no restriction" clause of <VUR6>?

Furthermore, if <VUR5> does not apply to <VUR6>, then was the previous ruling in QA#674 an error?

If <VUR5> is applicable, are 360-degree Lidar sensors and the Nvidia Jetson processing boards also illegal? If all VexU appendix rules also apply to <VUR6>, then does that mean that there are no legal VexU custom sensors?

### Answered by committee

If all VexU appendix rules also apply to <VUR6>, then does that mean that there are no legal VexU custom sensors?

Please see rule G3:

<G3> Use common sense. When reading and applying the various rules in this document, please remember that common sense always applies in the VEX Robotics Competition.

The intent of the answer in the linked Q&A was to prohibit using VUR6 as a loophole to install cooling fans on a Robot.

Sensors containing an internal motor which is integral to their operation, such as a LIDAR or pan-tilt Pixy, would be permissible. It would not be feasible for an inspector to take apart a LIDAR module to see if there is a motor inside of it. It is, however, feasible for an inspector to check if a fan is being used to cool a V5 Smart Motor.

To prevent confusion, we would advise Teams with external processors that require thermal protection to utilize a [passive heat sink](#) instead of an active cooling fan.

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## Regarding R20

23-Jan-2024

R20

[<R20>](#)

R20 says certain commercial screw can be used which doesn't prohibit nylon screw. So my question is whether the nylon screw from robosource can be legal or not? Thanks. Ref: <https://www.robosource.net/robot-parts/screws-hardware/nylon-screws-nuts/139-nylon-screw-0500>

### Answered by committee

Rule [<R20>](#) permits the use of specific sizes of commercially-available hardware, but does not specify or restrict their material beyond the statement in the rule's red box regarding additional functionality. There is no rule that prohibits nylon screws that fall within the other constraints of rule [<R20>](#), therefore they are legal.

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## R20 and use of threadlockers

23-Sep-2023

R20

<R20>

is the use of commercially available threadlocker (i.e. loctite blue) legal for use in securing nuts and bolts?

### Answered by committee

Commercially-available threadlocker, including Loctite blue, is made legal for limited uses by clause F of rule <R15>:

Mechanical fasteners may be secured using Loctite or a similar thread-locking product. This may ONLY be used for securing hardware, such as screws and nuts.

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## <R20> Certain non-VEX fasteners are allowed. (Clarification of heed types).

20-Jun-2023

R20

<R20> Current content of first item (a): #4, #6, #8, M3, M3.5, or M4 screws up to 2.5" (63.5mm) long. Add/clarify that all types are permissible. Thought this seems obvious, flat heads are likely very important in the plastics, and should be called out: ADD: Head styles permitted include: Hex, pan, flat, round, oval, truss, socket and button. Drive types permitted include: Phillips, slotted, Ferson, Pozidriv, hex (aka, allen), square and star (aka, Torx). Washers permitted include: SAE, USS and Fender washers. Materials permitted include: Zinc-plated steel, Stainless steel, Chrome and nickel plated steel, brass, bronze and alloy steel.

Great reference: <https://www.boltdepot.com/fastener-information/Printable-Tools/Fastener-Basics.pdf>

### Answered by committee

Please be sure to review the [Q&A Usage Guidelines](#) before posting, specifically note 1, "The Q&A system is for rules clarifications only." As noted, the Q&A platform is intended to be a communication channel for questions such as "Is this interpretation of a rule legal?", not a discussion forum to post questions such as "I disagree with this rule, can it be changed?" For those comments, please use the official [VEX Forum](#) or email [GDC@vex.com](mailto:GDC@vex.com).

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## <R20>(b) shoulder screw constraints

19-Jun-2023

R20

<R20> There were some very specific constraints put on shoulder screws that don't make sense. Current text says: Shoulder screws cannot have a shoulder length over 0.20" or a diameter over 0.176". What was the logic in constraining shoulder screws?? The winch pulley system (part 276-1546) should be using a #6 with shoulder screws having shoulder dimensions slightly exceeding 0.160 by 0.325. Commercially available as "303 Stainless Steel, Star Head Shoulder Screw, 5/32 in. Dia. x 3/8 in. Long" would suffice (e.g., <https://www.ondrivesus.com/ST3-1537>) If constraining anything, limit the constraint to #6, #8, M3.5 or M4 threads, with maximum thread length, and recommend "star" or "Torex" sockets, for consistency.

### Answered by committee

Please be sure to review the [Q&A Usage Guidelines](#) before posting, specifically note 1, "The Q&A system is for rules clarifications only." As noted, the Q&A platform is intended to be a communication channel for questions such as "Is this interpretation of a rule legal?", not a discussion forum to post questions such as "I disagree with this rule, can it be changed?" For those comments, please use the official [VEX Forum](#) or email [GDC@vex.com](mailto:GDC@vex.com).

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## Wiring

23-Jan-2023

R20 R21 VUR10

Does there need to be a single continuous wire between a brain and a motor? As a VEXU team would it be legal to have two wires connected to each other as long as the wires are not connected using non legal parts?

### Answered by committee

This system is only intended for specific VRC Spin Up rules questions. Because your question only pertains to VEX U and has no effect on VRC robots or rules, you will need to resubmit it in the [Official VEXU 2022-2023: Spin Up Q&A](#) for us to consider it. Thank you.

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## String Question

12-Jan-2023

R7 R20

1. Can we use Vex electrical cable as the string/rope for the endgame?
2. If not, because it's too small, could we wrap it in string to make it size compliant?

Thank you for your help.

### Answered by committee

V5 Smart Cables may only be used for connecting legal electronic devices to the V5 Robot Brain. This change was reflected in the scheduled game manual update on January 31, 2023.

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## Pneumatic Alterations Clarification

9-Nov-2022

R4 R20

[<R20>](#) No modifications to electronic or pneumatic components are allowed. Motors (including the internal PTC or V5 Smart Motor firmware), microcontrollers (including V5 Robot Brain firmware), cables, sensors, controllers, battery packs, reservoirs, solenoids, pneumatic cylinders, and any other electrical or pneumatics component of the VEX platform may NOT be altered from their original state in ANY way.

[In this VEX Knowledge base article](#), it states the nut can be removed from the cylinder to reduce weight.

R20 states pneumatic cylinders, reservoirs, solenoids, etc. may not be altered from their original state in any way.

1. Is the removal of the nut on the bottom of the pneumatic **cylinder** (NCJ2D10-200S or NCJ2D10-200) considered to be an alteration from the original state?
2. Is the removal of the nut on the bottom of the pneumatic **reservoir** (US14227-S0400 or NCMZ5-U12001-320) considered to be an alteration from the original state?
3. Can either of these nuts by themselves be used in an end-game launcher's design if the head referee considers the mechanism to be safe per <R4d>
4. If the nut from the reservoir is used outside of the reservoir, is the nut considered to be only the "pneumatic reservoir nut" or is it considered to be an "an entire pneumatic reservoir that has been altered such that only the nut remains"?

### Answered by committee

Thank you for your questions.

1. Is the removal of the nut on the bottom of the pneumatic **cylinder** (NCJ2D10-200S or NCJ2D10-200) considered to be an alteration from the original state?
2. Is the removal of the nut on the bottom of the pneumatic **reservoir** (US14227-S0400 or NCMZ5-U12001-320) considered to be an alteration from the original state?

These are both considered normal uses of the parts, and are not modifications of the pneumatic device.

3. Can either of these nuts by themselves be used in an end-game launcher's design if the head referee considers the mechanism to be safe per R4d
4. If the nut from the reservoir is used outside of the reservoir, is the nut considered to be only the "pneumatic reservoir nut" or is it considered to be an "an entire pneumatic reservoir that has been altered such that only the nut remains"?

Using either of these nuts as part of an Endgame expansion mechanism is allowed, provided no other rules are broken in the process. If used in this manner, the nut is considered to be a pneumatic reservoir nut and not a modified pneumatic device.

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## Non-electric Motor Components

9-Nov-2022

R20





Are we allowed

to make non-electrical modifications to the motor, such as what is shown above? When the cap is modified, "cart-less" motors will have less friction, as they wobble due to a lack of preciseness. Many motors on flywheels are also very likely to overheat, so the removal of the shell would reduce overheating. Can the posts of the cap also be shaven down in order to reduce motor stack height?

**Answered by committee**

Rule [<R20c>](#) provides an inclusive list of competition-legal modifications to the V5 Smart Motor, and [Q&A 1189](#) clarifies that shafts may be connected to internal components of the motor with legal parts other than standard cartridges.



| The modifications described and pictured in your question are **not permitted** in the Spin Up competition.