

Q&A

VEXU 2020-2021: Change Up

Tagged: R23



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 Change Up 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 Change Up rules questions.

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

Index

[Optical Shaft Encoder Designation](#)

[Follow up to question 612](#)

[Follow up to question 611](#)

[Modifying V5 Smart Motor Cartridges](#)

[Inquiry on the Application of R23 Part \(a\) on COTS and Previously Anodized Parts](#)

[Inquiry on Broadness of R23 Application](#)

[Clarification on and regarding pneumatics with missing identification labels](#)

[Legality of painted screw heads and anodized aluminum standoffs](#)

[We would like to request clarification regarding the rules for non-threaded spacers.](#)

[R23c Wing Nut Clarification](#)

[Is plastic rivet a compliant material?](#)

[<R23> Connecting External Electronics to the Controller](#)

706: Optical Shaft Encoder Designation

6-Dec-2020

R22 R23

What is the legality of cutting a support hole off on a shaft encoder? Would this fall under R22 or R23? <R22> No modifications to electronic components are allowed. Motors (including the internal PTC or Smart Motor firmware), microcontrollers (including V5 Robot Brain firmware), extension cords, sensors, controllers, battery packs, reservoirs, solenoids, pneumatic cylinders, and any other electrical component or pneumatics component of the VEX platform may NOT be altered from their original state in ANY way.

<R23> Most modifications and repairs to non-electrical components are allowed. Physical modifications such as bending or cutting are permitted and may be done to legal VEX Robotics Competition metal structure or plastic components.

Answered by Game Design Committee

No, this would not be legal. A sensor is an electrical component, and cutting a hole in an electrical component would be a definitive violation of R22.

652: Follow up to question 612

17-Sep-2020

R23

In this QnA, [link](#), some questions are asked about what is legal in regards to motor cartridge modification in VexU. However, it is not directly asked if replacing the casing of the cartridge with a custom casing is legal. It is only asked if making custom internals and modifying the original case would be allowed. Would a cartridge that uses fully custom parts, including the casing, be legal as well?

Answered by Game Design Committee

Yes, this would be legal, as it is essentially just a specific application of the following two points from the linked Q&A:

C) Fabricating custom gears out of legal material and replacing the gears within the cartridge with them.

D) Removing the motor cartridge completely in addition to the cap so the smart motor may interface directly with a legally fabricated component.

650: Follow up to question 611

14-Sep-2020

R23

Hello, I wanted to make ask for clarification regarding this QnA: [Q611](#) Here, it is asked whether making a custom motor cap to reduce the profile of the motor is legal, as shown here: [image](#) The response says yes, this is legal, and includes this caveat: "The primary motor case, internal components, etc are still considered "electronics" under R23, and may not be modified." The main question I have here is this: does the other cap of the motor, opposite the one which was explicitly ruled legal to replace, included in this list of things which cannot be replaced? Or is replacing this cap also allowed in the same way that replacing the bottom one is. To ensure there is no confusion regarding this question, here is an example of

what I am asking about: [image](#) In summary, would this motor be legal in VexU?

Answered by Game Design Committee

No, this would not be legal.

The V5 Smart Motor was designed with removable / replaceable Smart Motor Caps and external gear cartridges in mind. Further modification to the primary motor case or internal components could cause unintended behavior, and would probably violate your VEX Robotics warranty (in addition to being a violation of rule R23).

612: Modifying V5 Smart Motor Cartridges

22-May-2020

R23

It was previously ruled during Tower Takeover that v5 motor cartridges could be used externally as hardware components. [See for reference](#). Under <R23> modifications of non-electrical hardware components is allowed. Therefore, when using a cartridge externally as hardware, would modification of the v5 motor cartridges be legal under <R23>? If so would the following scenarios be permitted:

- A) Opening the cartridge and removing its internal gears and using them externally.
- B) Drilling holes or slots in the cartridge to help mount it externally.
- C) Fabricating custom gears out of legal material and replacing the gears within the cartridge with them.

Furthermore, It was recently ruled that vexU could replace the motor cap portion of the motor. [see for reference](#) However the stipulation was that "The primary motor case, internal components, etc are still considered 'electronics' under R23, and may not be modified." Since the motor cartridge lies halfway between the motor cap and the internal side of the motor, is the cartridge considered an internal part of the motor or an external part like the cap?

Specifically, would the following situations be legal:

- D) Removing the motor cartridge completely in addition to the cap so the smart motor may interface directly with a legally fabricated component. This was previously allowed for the internal gears of 393 motors. [see for reference](#)
- E) If Situations A, B, and C are legal, insert a legally modified cartridge into a v5 smart motor.

Answered by Game Design Committee

These would all be legal, in VEX U only. These would not be legal in VRC.

3148: Inquiry on the Application of R23 Part (a) on COTS and Previously Anodized Parts

17-May-2026

R23

Our question relates to the application of <R23>; specifically, <R23> part (a), stating that "Anodizing, painting, dyeing or changing the color of any legal VEX part is prohibited."

(a) The VEX manual clearly states that some commercial off-the-shelf parts are legal, as has been standard for past seasons. Some of these parts come in color; for example, some companies sell nuts which come in color, and many teams choose to use screws with colored heads to aid in identification of screw lengths. These COTS colored parts can be considered to be outside the category of "legal VEX part", as they are not manufactured by VEX. Will these parts be legal? Broadly applied, does legal VEX part apply only to parts sold and distributed by VEX Robotics, Inc.?

(b) i. Many teams in the past have used anodized metal parts like C-channels or dyed parts like gears. Before the 2026-27 season, these parts were **already dyed or anodized**. The language of [<R23>](#) states that the action of anodization/painting/dyeing/coloring is not legal, but it does not state that the use of previously anodized/painted/dyed/colored parts is illegal. This part of the rule was not present before the 2026-27 season. Does [<R23>](#) forbid the action of anodizing, painting, dyeing, or changing the color of any legal VEX part from the 2026-27 season onwards, or is it meant to be applied in retrospect, overriding previous game manuals, thereby banning **all** parts that have been anodized, painted, dyed, or color-changed, including ones teams already owned, and that were previously legal?

(b) ii. This is a follow-up to (b) i. IF all anodized/dyed/painted/colored parts are banned. Does VEX have a plan to compensate or alleviate the financial burden on organizations which have a large amount of these parts? [<R23>](#) (a) was added to the rulebook without warning, and many teams operated under the expectation that these previously unambiguously legal parts would be continually reusable for future seasons, as is the intent with purchasing these parts; they are an investment towards students' education for the season the parts are bought in and many seasons following. How does VEX intend these teams to deal with the sudden financial burden of needing new parts?

Answered by Game Design Committee

Please see the following statement from VEX Robotics and the VEX Robotics Game Design Committee regarding R23a, alongside the June 4 Game Manual update.

<https://www.vexforum.com/t/a-message-from-vex-robotics-r23a-and-smc-pneumatics/146777>

If you still have any questions regarding rules clarifications, feel free to submit a follow-up question. For questions, suggestions, or concerns that go beyond rules clarifications/interpretations, please direct them to gdc@vex.com.

3147: Inquiry on Broadness of R23 Application

17-May-2026

R23

Our team's questions are as follows, with two specific examples which we would like clarified.

(a) Rule [<R23>](#) states that "Decorations that cover or obscure identifying features of electronics and/or pneumatics parts are not legal." Identifying features are defined following this, with "Identifying features include, but are not limited to, VEX logos, part numbers, and other distinctive colors or features of the part that allow an inspector to easily confirm it is a legal part." In some cases, modifications to VEX parts which remove material may remove the presence of VEX logos, listed as an identifying part. These modifications are not necessarily due to decorations, but they do remove the VEX logo, and may be for either functional or aesthetic reasons otherwise legal. Will such modifications be legal in general in the future?

Now, we would like to ask about specific applications of this rule.

(b) Teams have cut VEX gears for many seasons now in order to reduce drivetrain space and weight. Cutting or modifying these gears as has been standard for past seasons would potentially remove VEX logos, an identifying part. Will cutting of gears in ways that may remove the VEX logo be legal this season and in following seasons?

(c) Many teams have removed the vinyl wrapping on their air tanks and air cylinders. This does not affect the functionality of the air cylinder or air tank, and is usually made for aesthetic reasons or after damage to the vinyl wrapping. Removing the vinyl wrapping will remove VEX logos. Will air cylinders and air tanks with the vinyl wrapping removed be legal this season and in upcoming seasons? If not, how does VEX robotics plan to allow old pneumatics sets with these vinyl wrappings removed to be legal, if at all?

(d) Hypothetically, if a team was to remove the VEX logo from parts for little to no gain, like shaving off the VEX logo off new aluminum C-channels or sandblasting the surface of a VEX gear or sprocket, how would this be ruled?

(e) In the past, teams have been known to use rubber bands or zipties to connect the VEX V5 Smart Motor cap and body, in order to improve maintainability and serviceability in the middle of a competition. This is commonly referred to as allowing a motor to be "hotswapped". However, in some cases, these zipties or rubber bands can cover the VEX logo on these motors, which are electronic parts. Will such hotswapping setups be allowed in this season and onwards? If not, [<R23>](#) also states that the appropriate way to address this is to "remove the decoration if possible". Would this removal

be only for inspection, or would it be for the duration of the competition? Broadly applied, since the intent of this rule is to aid in inspection, do restrictions on decorations potentially obscuring VEX identifying features apply only during inspection, or through the full duration of the competition?

(f) Finally, what are some general guidelines our team can apply to decide the legality of modifications which remove identifying features in the future? We ask this on an understanding that not every edge case can be covered here, but the manual is vague on these guidelines as well.

Answered by Game Design Committee

- a. Please note that [<R23>](#) clause F applies to decorations that cover or obscure identifying features of *electronics and/or pneumatic parts*, and [<R28>](#) prohibits modifications to electronic or pneumatic components.
- b. Gears are not considered electronic or pneumatic parts and are therefore not subject to [<R23>](#) clause F.
- c. Teams should not intentionally remove or cover the labels/logos on their pneumatic cylinders or tanks. Regarding damaged or missing labels/logos, please see our response to [Q&A 3136](#).
- d. Gears, sprockets, and C-channels are not considered electronic or pneumatic parts and are therefore not subject to [<R23>](#) clause F.
- e. Rubber bands and/or zip ties used to secure V5 Smart Motor Caps would be considered functional parts. [<R23>](#) clause F specifically restricts non-functional decorations.

If you have any remaining questions that you believe we have not adequately addressed with the answers above, please feel free to submit a follow-up question.

3136: Clarification on and regarding pneumatics with missing identification labels

14-May-2026

R23

[<R23>](#)

Decorations that cover or obscure identifying features of electronics and/or pneumatics parts are not legal. i. Teams will be asked to either replace the electronics and/or pneumatics part entirely, or remove the decoration if possible. ii. Identifying features include, but are not limited to, VEX logos, part numbers, and other distinctive colors or features of the part that allow an inspector to easily confirm it is a legal part.

Question: Over the course of normal use, the plastic protective wrapping/labeling on V5RC pneumatic reservoirs and cylinders can become frayed, damaged, or fall off entirely, removing the VEX logo and part number. If a pneumatic part is otherwise identical in form and function to an official VEX part but is missing its factory label/logo due to wear and tear, is it still considered legal for competition use and furthermore, what secondary identifying features should a team point to during inspection to "easily confirm" the part is legal if the primary logo is missing?

Answered by Game Design Committee

Normal wear and tear that damages factory-applied labels does not inherently make an otherwise legal pneumatic component immediately illegal.

Inspectors may use other identifiable characteristics of the part, such as its dimensions, construction, fittings, color, shape, or other distinctive features, to determine whether it is a legal VEX component. Comparing the part to a known-legal component with intact factory labels may help facilitate this process.

The easiest way to ensure inspection of these parts proceeds smoothly is to ensure that factory labels remain clearly visible to Robot inspectors whenever possible.

Teams should expect additional scrutiny if a part cannot be readily identified during inspection, and should understand that inspectors may deem a part illegal if they cannot reasonably verify that it is a legal VEX component.

3133: Legality of painted screw heads and anodized aluminum standoffs

14-May-2026

R23

[<R23>](#) reads:

Anodizing, painting, dyeing or changing the color of any legal VEX part is prohibited.

Our team has many RoboSource "Color Coded Star Drive Screws" where the screw heads have been painted by the vendor.

Related to this, we also have many RoboSource "Color-Coded Standoffs" which are anodized aluminum.

Technically, none of us painted or anodized the part ourselves - it came brand new painted and/or anodized from a well-known reputable vendor.

Are either or both of these two types of products legal?

Thank you!

Answered by Game Design Committee

R23a is intended to apply to parts made by VEX Robotics. It does not apply to commercially available hardware.

Provided the screws and standoffs meet the stated criteria in R22, these parts are legal for use in the VEX V5 Robotics Competition.

2970: We would like to request clarification regarding the rules for non-threaded spacers.

6-Dec-2025

R23

[<R23>](#) Hello REC Foundation, we hope you are doing well. We would like to request clarification regarding the rules for non-threaded spacers.

According to the rule that allows commercially available nuts, washers, standoffs, and non-threaded spacers up to 2.5" in length, we understand that the length is restricted but the outer diameter is not mentioned.

Is there any outer diameter (OD) limit for plastic spacers? For example, can a plastic spacer have a diameter larger than 2.5", as long as its length is within 2.5" and it fits legal screw sizes?

If a plastic spacer is cut, drilled, or modified (e.g., adding a hole or reshaping it), does it still count as a "spacer" or does it become a "plastic sheet" under the separate plastic-sheet rule (12 uses)?

We would like to confirm whether modified spacers remain classified as spacers, or if any cutting/drilling reclassifies them as plastic sheets.

Thank you!

Answered by Game Design Committee

There is no specified outer diameter for spacers, but we encourage Teams, referees, and inspectors to rely on [<G3>](#) when determining what does and does not qualify as a spacer.

Non-VEX spacers are meant to be used as spacers--that is, to create a specified "standoff" distance between structural parts on a Robot assembly.

Spacers that are slightly larger (or smaller) in diameter than standard VEX spacers are intended to be legal. To ensure easy accessibility to hardware solutions across the entire international landscape of the competition, we don't specify the range of legal dimensions. This flexibility is not intended to create an opportunity for Teams to exploit and utilize spacers that can not be reasonably replaced with VEX parts.

For example, a spacer with an abnormally large outer diameter that is used as a roller/drum/intake roller/etc. is not being used as a spacer, but instead circumvents the custom parts allowances and limitations. A non-VEX spacer used for purposes other than spacing should not be considered a legal Robot part.

Commercially-available spacers can be cut, drilled, tapped, and modified just as their VEX spacer counterparts can, provided they are used as spacers.

2934: R23c Wing Nut Clarification

21-Nov-2025

R23

[<R23>](#)

R23c State "Any commercially available nut, washer, standoff, and/or non-threaded spacer up to 2.5" long which fits these screws."

Does this include wing nuts?

Can a team use a wing nut to secure a licence plate for quick switch over between matches?

Answered by Game Design Committee

Yes, this would be considered legal.

2815: Is plastic rivet a compliant material?

24-Sep-2025

R23

Could you please tell me if this commercially available plastic rivet shown in the picture can be used as a compliant construction material for robots in the junior and senior high school categories?[<R23>](#)



Answered by Game Design Committee

Thanks for your question!

Per rule [<R17>](#), Robots must be built from the V5 System. [<R20>](#) lists all of the exceptions to this rule; commercially available plastic rivets are not included in that list, and are not legal for use in the VEX V5 Robotics Competition.

14-Nov-2023

R23

Concerning vexu's ability to use custom sensors and electronics, as well as rule <R23> as follows

[<R23>](#) One or two Controllers per Robot. No more than two (2) VEX V5 Controllers may control a single Robot. No physical or electrical modification of these Controllers are allowed under any circumstances. Attachments which assist the Drive Team Member in holding or manipulating buttons/joysticks on the V5 Controller are permitted, provided that they do not involve direct physical or electrical modification of the Controller itself. No other methods of controlling the Robot (light, sound, etc.) are permissible. Using sensor feedback to augment driver control (such as motor encoders or the Vision Sensor) is permitted.

As we are allowed to make custom sensors, could we connect them to a controller and act as a secondary controller.

For example, could we plug a big red button into an arduino, which mimics a controller and plugs into the primary controller?

Answered by Game Design Committee

No. This would not be legal.