Alpine Robot’s - Bill of Materials

[Consideration about winch motor]

1. **Data Simulated →** [**link\_excel**](https://drive.google.com/file/d/1vFgHuZqWaKZuP1oVTJFmfymfabHXZSEe/view)

In the simulation we simulated a robot with 10Kg with different initial posizition.

1. **Winch Motor (motore per vericelli)**

There are 2 possible motors used:

| [**6384 120kv**](https://www.amazon.it/Dingln-Outrunner-Compatibile-Bilanciamento-Skateboard/dp/B08GWZV7XX/ref=sr_1_1_sspa?dib=eyJ2IjoiMSJ9.zRnsXJbSDBNHhbCPWiuuWNG-NQSjtbGCmGKcV9o69jGowmzJW2oldmW9fZFgN4QMu4amM1Q3BVLgMcyQtX5bp4FNYtfAVmg9TBUJZ4VYJNvz9Rlx0jb1dcbLvrp14ymipZmlZ6vqzrf9ga-Zjcc1Sc6SsutgULlGO-eU8iPuxQ5eE_dInWJb-PvbmSONyze8dY7coI7S22nuK_hOvuQnYvZquxpVu8MnywCm7uq7Ka8gGcVxW1K8u5KOMWwsXy-a0wY_EFS2xvwOgAgNpywt9ztmK65jCcBKjOdfvTrA-uQ.cN9p7v9RetkG4vxiTPCnl10qLSAYbvmHxUXgAqb3t6A&dib_tag=se&keywords=6384+120KV+BLDC&qid=1742896479&sr=8-1-spons&sp_csd=d2lkZ2V0TmFtZT1zcF9hdGY&psc=1)**:** |  |
| --- | --- |
| [**48V 500W scooter motor**](https://www.amazon.it/Raguso-Elettrico-Manutenzione-Biciclette-elettriche/dp/B0CD44677Z/ref=sr_1_22?__mk_it_IT=%C3%85M%C3%85%C5%BD%C3%95%C3%91&crid=2VBRJF2GNU1C2&dib=eyJ2IjoiMSJ9.p5h5thVr2AvLYDmnqUm9P0FySwSaMOZaEdflMnRtXdlpo_ee4VuGT1f_-hdsrqfOXM03rpAW4pdkQmeuFpg2PjKzc_wxkjDrLHowP1wVn6LoK_XzMt6NjOmNsWAub9gjq2pPB1TViBvk56o2S9k9Fs8-L_zIenZsCG3j5vh7v3XilMum_YAZ0Z-0P932BEEA2R1xAoA9h5D8dDattLB9RxBD55P2CnXuXTKgHzEM34csUf8nwZzkbTAJWuHfX12qGYDEaQQ5ZPUjjJrdMRpWWKysyeBEjRzDzcKMff6F4Y7TaLHhrziRNAN-rVFYCY-xoEBa_zruzjNOtQMjq8deOT8TqwAe3pnbBkQuKUMSnUscbZ2rNZqA8kWwjW6LMRXOh6tO93XY0UM9VYdJXCCE_RfxmjeROHKekNAmxSwNq1GD3YQX_ISEAj39WIjvDdMU.SaZW8rN7JmBoA9ZL0AFLPWbBGbZxmgpUA6fRAorz60Q&dib_tag=se&keywords=brushless+motor+48v+500w&qid=1741865900&sprefix=brushless+motor+48v+500w%2Caps%2C98&sr=8-22)**:** |  |

1. **Transmission**

if we choice the first motor (6384 120V), This motor suggest a 1:1 gear ration, but for out lighter robot a 2:1 could stress less the motor.

We can use a timing belt to move the drum further from the motor shaft. A HTD 5M 15mm wide belt can support up to 920N but a 20mm belt maybe is better to prevent slippage, an idler has to be included in the design as well, also is good practice to have the pulley diameter grater that the width of the belt to prevent early wear. after all is all a gear ration game.

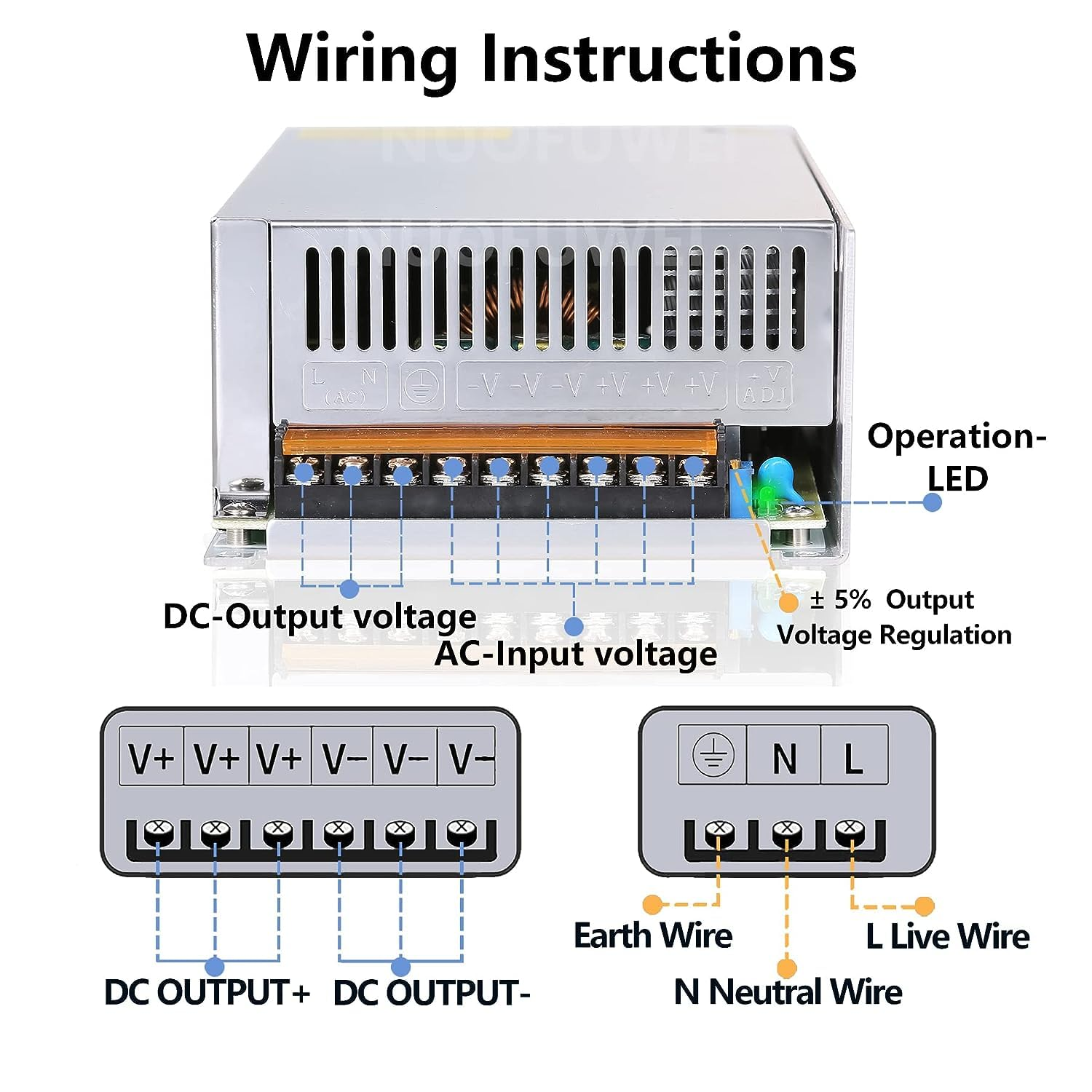
[datasheet](https://www.tyma.eu/pdf/elatech-htd-5m-timing-belts.pdf?srsltid=AfmBOoqvrD9hQ6XPvBO5HT7VPnTQQhwGAuddtTdY99Ezh_RLl6LqRd2y)

[amazon](https://www.amazon.it/dp/B0D66MPMLX/ref=sspa_dk_hqp_detail_aax_0?psc=1&sp_csd=d2lkZ2V0TmFtZT1zcF9ocXBfc2hhcmVk)

1. **Breking System**

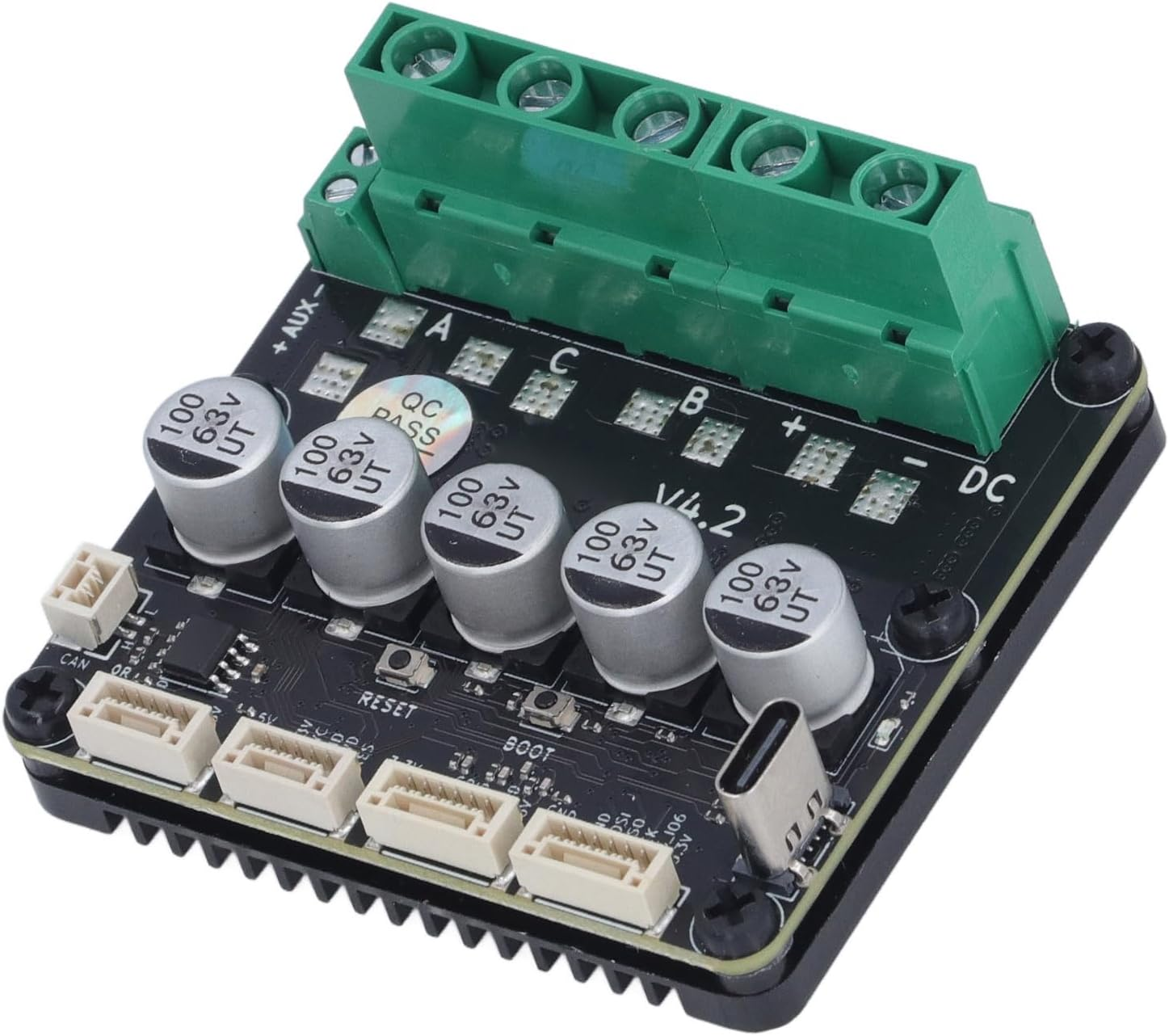
An important feature for this robot and for the motor longevity is the ability of the robot to stay stationary without consuming motor power so we discussed a braking system, a cheap but powerful brake kit should do the work just fine, they will be servo actuated and normally closed. [NC]

[amazon](https://www.amazon.it/bicicletta-meccanico-anteriore-posteriore-equitazione/dp/B0BTPBTRWZ/ref=sr_1_12?__mk_it_IT=%C3%85M%C3%85%C5%BD%C3%95%C3%91&crid=2706CBRONK2E&dib=eyJ2IjoiMSJ9._NwUE0GvqpW6cEZMUF9KM7E1EXPV0poo_vuuPL_tCbBG7LuavIDuHrxs4l2EF6iApadSmooWXlmmEWcG09NyE1dBtL2uvTNSQKK1IlaG_X5vZ41Bllb0xEjfa9WajkIB7N68Kn3TGNL5k9TK0T2DvesMWeV5OJrQHfArRvE9Gb9EaTMkOKaU4HW_x0y2fWtpmHXvW3nQvf9ZrxRHPZGfWiUQwv-I6qhczNPh2o9hu-93owU8C0qO8Wa6iRWRkjImhByEh1Wkad5XwkpAOctGTTSHQSlS0LQJBBuoBhzbwO8frdZyz3yGaLpqgl3gbG0XfE2T4vWWq7QzHkQygEUOvRnpQDrz8UWIHzCFrFGU77ja5CVfhVR164gx0cx8ilzjCtfMeyNPL5j7uH0jWstPx12LB4ideaFsE041k9n1sd9JEKiePa-m31XEpvxYeQCL.lC4ffUXE8f7wsNoI8tANl5n0WzfJGSlOUb0LnNAVyXM&dib_tag=se&keywords=Kit+freni+a+disco+meccanici+per+bicicletta&qid=1742899341&sprefix=kit+freni+a+disco+meccanici+per+bicicletta%2Caps%2C92&sr=8-12)

1. **Power supply**

Ever for the first case motor (6384 120kV) maximum voltage of 36V that's what we are going to propose as main power supply for the winches, a separate one for the robot will be used. the biggest power supply i could find is 1200w at 36v. if under powered we can use 2, one for each winch.

[amazon](https://www.amazon.it/Alimentatore-Trasformatore-Telecamera-Sicurezza-Dispositivo/dp/B0C2R2HS62/ref=sr_1_9?__mk_it_IT=%C3%85M%C3%85%C5%BD%C3%95%C3%91&crid=CB6KVSTORKR9&dib=eyJ2IjoiMSJ9.UnhK0YfdsgMP0AHob2rT1YQlgSfvcFRO0C5_sAXeRgSOE7AkkzzzwTKjhSA1YXDkdFGew_mn3cyOWTn58230Wb6BARFvMxOqzjzm1Sk-JuDHCS-AA01awPhIDqenWKPUVnKCrtJ7GlP7uSE_bFMn0Roy5qQN3cfV626KYI86R2VcL4sUIOg3Bv_8G1C8GkKHT61MxoSPo7ZK91VoKrKBlm8i7FRUnj7ah9Xvf2I9MaLH2nPKPQ2HEdX8riZiEi7otaw4cPVFK9ZHb5btgULb0SwIMxwn_ai1c79JcCW8sfFEQM2Ahltc6DsUE5rtbVAaJE_ghk1I26NucNGE0TU1u44H8jvw7qh26EX8SlaM8Yj4kIz3dkg0gRMMwWljcU0r72Kao5n4-2TcCCqesvBBSZ39RuS1XedTILkcZfZ2ULLbamd_oZdnJL-mILO6X34_.wKlzBA_5EoQKGBRYn19Ph83O5VbS-oOICnk76EvvOJw&dib_tag=se&keywords=power+supply+2000w+36v&qid=1742901222&sprefix=power+supply+2000w+36v%2Caps%2C97&sr=8-9)

1. **Drive Motor Controller**

As the robot is torque controlled, we choose a FOC BLCD controller based on odesc V4.2, it has proven reliable and up to the standards, with up to 56V and 120A of peak current.

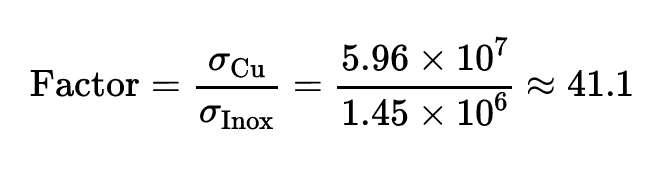
[amazon](https://www.amazon.it/gp/product/B0DYVLWJZS/ref=ewc_pr_img_2?smid=A38GRUO0066PF0&psc=1)

1. **Winch cable (**[**math info**](https://www.youmath.it/lezioni/fisica/elettricita/4912-conduttivita-elettrica.html)**)**

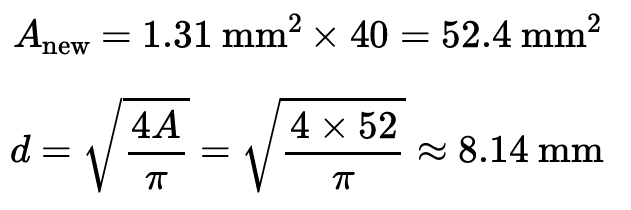
we proposed a zinc cable to be flexible, lightweight and conductive so to power the robot via the winch wires. So for a 10kg robot even with extreme acceleration will not eccede maximum tensile strength of a 1mm wire ( 1.770 N/mmq).

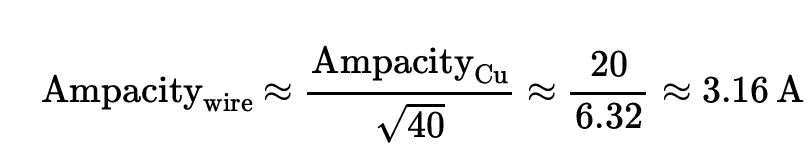
our real limiting factor is the max amp capacity of the wire to power the robot. To properly size the wire diameter the following characteristic have to be taken into account.

1. The zinc layer is few microns high so it doesn't really play big on the conductivity side.
2. Copper has conductivity 5.96 \* 10^7 3.
3. inox has conductivity: 1.45 \* 10^6

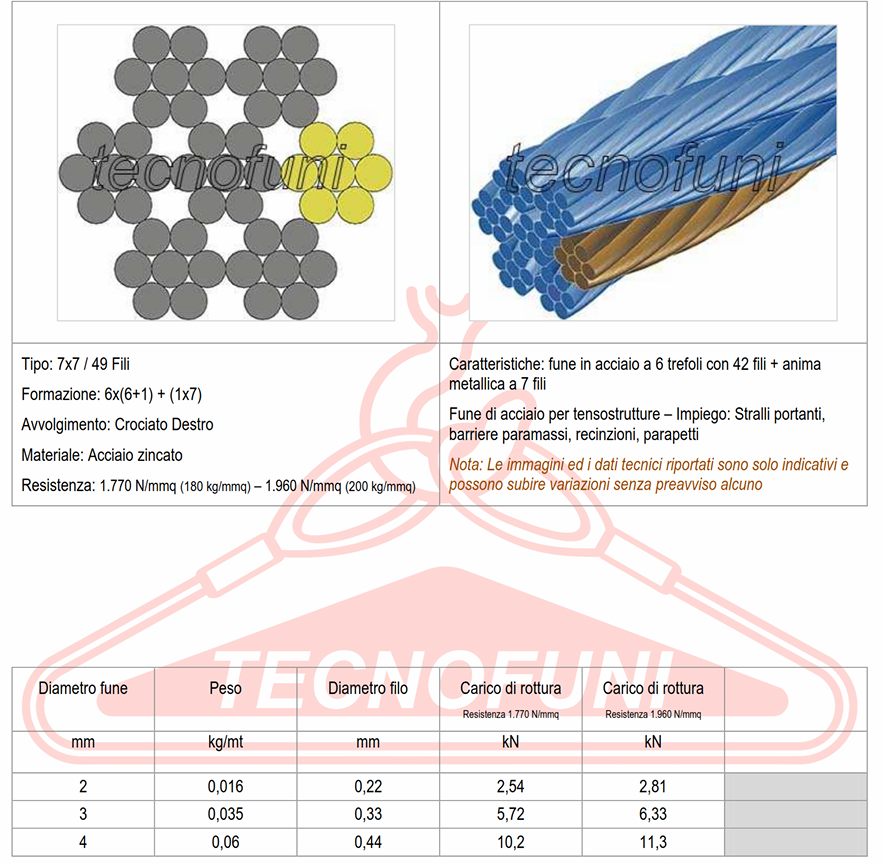


So we need 41 times bigger wire to carry the same amps. relative to a standard copper wire. Suppose a 600W robot powered by 48v (we could use higher voltages for transmission but 48 transformer is easy to find) we have around 12.5 amp, so the cable rating for it is 16-gauge that has area of 1.31 mm².



if we fix 2 mm wire and compare it to a copper, if a 2mm copper wire can carry 20 amp. our inox wire will carry:

Not much for out propellers on the robot. 150w at most with 48v. Needed discussion to change material/technique, proposing a Steel Wire Armored (SWA) Cables or Aerial Bundled Cables (ABC) that are both conductive and suitable for bearing load.

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