

# BOM Remotes

	# required	Type	Example Link	Contained in Kit	Comment
PCB Left Top	1	n/a		yes	
PCB Left Bottom	1	n/a		yes	
PCB Right Top	1	n/a		yes	
PCB Right Bottom	1	n/a		yes	
Enclosure Left Top	1			yes	
Enclosure Left Bottom	1			yes	
Enclosure Right Top	1			yes	
Enclosure Right Bottom	1			yes	
Lanyard	2			yes	
Display	1		<a href="https://de.rs-online.com/web/p/lcd-displays-farbig/1647079?srsId=AfmBOooPenmIOVHuUOmIRWCe4Hvb5smmsbZHTicLUNc">https://de.rs-online.com/web/p/lcd-displays-farbig/1647079?srsId=AfmBOooPenmIOVHuUOmIRWCe4Hvb5smmsbZHTicLUNc</a>	yes	
Ball Knob	2		PCBWAY	yes	1 extra should one get lost
Ball Know Screw	2			yes	
Joystick Lever	2			yes	
Joystick	2		<a href="https://a.aliexpress.com/_EGkkT9R">https://a.aliexpress.com/_EGkkT9R</a>	yes	Self solder
Potentiometer	2	3352T-102LF-ND	<a href="https://www.digikey.de/de/products/detail/bourns-inc/3352T-1-102LF/1088340">https://www.digikey.de/de/products/detail/bourns-inc/3352T-1-102LF/1088340</a>	yes	Self solder
Endless Pot	1	CJMCU-103	<a href="https://www.digikey.de/de/products/detail/bourns-inc/3382G-1-103G/1944267">https://www.digikey.de/de/products/detail/bourns-inc/3382G-1-103G/1944267</a>	yes	Populated
Side Buttons	10		<a href="https://de.aliexpress.com/item/1005004331522633.html?srcSns=sns_Copy&amp;sourceType=1&amp;spreadType=socialShare&amp;bizType=ProductDetail">https://de.aliexpress.com/item/1005004331522633.html?srcSns=sns_Copy&amp;sourceType=1&amp;spreadType=socialShare&amp;bizType=ProductDetail</a>	yes	Self solder
ESP32 Board	2		<a href="https://www.digikey.de/de/products/detail/seeed-technology-co-ltd/113991114/19285530?s=N4lgTCBcDallwFYCcB2AtHOBmJTNwBY0A5AERAF0BfIA">https://www.digikey.de/de/products/detail/seeed-technology-co-ltd/113991114/19285530?s=N4lgTCBcDallwFYCcB2AtHOBmJTNwBY0A5AERAF0BfIA</a>	yes	Populated
XBee Board	2		<a href="https://mou.sr/3zKN4ZJ">https://mou.sr/3zKN4ZJ</a>	yes	Populated
Antenna	2		<a href="https://www.amazon.de/gp/r.html?C=3KS82O7qFHPVW&amp;K=2C2JLIMDL17CAVA&amp;M=urn:rtm:msg:202">https://www.amazon.de/gp/r.html?C=3KS82O7qFHPVW&amp;K=2C2JLIMDL17CAVA&amp;M=urn:rtm:msg:202</a>	yes	Using ESP32 2.4Ghz antennas works well
On/Off Switch	2		<a href="https://a.aliexpress.com/_EJZx0Ff">https://a.aliexpress.com/_EJZx0Ff</a>	yes	Self solder
Battery	2		<a href="https://www.amazon.de/dp/B0CSSFQL94?ref=ppx_yo2ov_dt_b_fed_asin_title">https://www.amazon.de/dp/B0CSSFQL94?ref=ppx_yo2ov_dt_b_fed_asin_title</a>	no	Definitely not bigger than 45mm x 22mm x 6.9mm. Leads need to be reversed!!!
Inner screws M2x3	10		<a href="https://a.aliexpress.com/_EJgM4EH">https://a.aliexpress.com/_EJgM4EH</a>	yes	
Outer screws M2x12	10		<a href="https://a.aliexpress.com/_EwoJmZ">https://a.aliexpress.com/_EwoJmZ</a>	yes	
Hex key 1,3mm	1		<a href="https://a.aliexpress.com/_EJxqiKl">https://a.aliexpress.com/_EJxqiKl</a>	yes	
Hex key 1,5mm	1		<a href="https://a.aliexpress.com/_EJxqiKl">https://a.aliexpress.com/_EJxqiKl</a>	yes	
Connection Pins 12 long	1		<a href="https://de.aliexpress.com/item/1005005112381207.html?srcSns=sns_Copy&amp;spreadType=socialShare&amp;bizType=ProductDetail">https://de.aliexpress.com/item/1005005112381207.html?srcSns=sns_Copy&amp;spreadType=socialShare&amp;bizType=ProductDetail</a>	yes	
Connector Female 4 Pin	1		<a href="https://de.aliexpress.com/item/1005002534767823.html?src=google&amp;aff_fcid=88c2a0fb418a461f8ba91fb1a684fba1-17272">https://de.aliexpress.com/item/1005002534767823.html?src=google&amp;aff_fcid=88c2a0fb418a461f8ba91fb1a684fba1-17272</a>	yes	

	# required	Type	Example Link	Contained in Kit	Comment
Connector Female 6 Pin	1		<a href="https://de.aliexpress.com/item/1005002534767823.html?src=google&amp;aff_fcid=88c2a0fb418a461f8ba91fb1a684fba1-17272">https://de.aliexpress.com/item/1005002534767823.html?src=google&amp;aff_fcid=88c2a0fb418a461f8ba91fb1a684fba1-17272</a>	yes	

# BOM D-O Mainboard + Supply board

	# required	Type	Link	Contained in Kit	Comment
Main board	1			yes	
Power board	1			yes	
Female pin header Main board / Arduino	2	2.54mm 14pin		yes	Self solder
Female pin header Main board / DFPlayer	2	2.54mm 14pin		yes	Self solder
Female pin header Power board / Gyro	1	2.54mm 9pin		yes	Self solder
Female pin header Main board / Xbee	2	2mm 10pin	<a href="https://a.aliexpress.com/_Evzy9aN">https://a.aliexpress.com/_Evzy9aN</a>	yes	Self solder
Male pin header Main board / Amplifier	2	2.54mm 2pin	<a href="https://a.aliexpress.com/_ExxAZ2d">https://a.aliexpress.com/_ExxAZ2d</a>	yes	Self solder
Gyro standoffs	2	M2.5x12	<a href="https://a.aliexpress.com/_EG86KNx">https://a.aliexpress.com/_EG86KNx</a>	yes	
Gyro standoff screws	2	M2.5x5	<a href="https://de.aliexpress.com/item/32810852732.html?spm=a2g0o.productlist.main.7.35f2ea97efFr5N&amp;algo_pvid=5189f600-6001-4145-8-00">https://de.aliexpress.com/item/32810852732.html?spm=a2g0o.productlist.main.7.35f2ea97efFr5N&amp;algo_pvid=5189f600-6001-4145-8-00</a>	yes	
Power board mounting screws	2	M2x8	<a href="https://a.aliexpress.com/_EG068mN">https://a.aliexpress.com/_EG068mN</a>	yes	
Encoder cable with connector	2	KF2510 4 Pin 200mm	<a href="https://a.aliexpress.com/_EJB2txj">https://a.aliexpress.com/_EJB2txj</a>	yes	Self solder
Motor driver cable with connector	2	KF2510 3 Pin 200mm	<a href="https://a.aliexpress.com/_EJB2txj">https://a.aliexpress.com/_EJB2txj</a>	yes	Self solder
Amplifier Cable	1	JST PH 2mm	<a href="https://a.aliexpress.com/_Exf7Yh7">https://a.aliexpress.com/_Exf7Yh7</a>	yes	Self solder
Fan connector	2		JST XH 2pol	yes	Self solder
XT30 Male + Female Power Connector	10	XT30	<a href="https://www.amazon.de/HUAZIZ-Anschlüsse-Rundstecker-Gehäuse-fachblauh-Multi-Stecker/de/?pf_rd_p=800438/GU174/">https://www.amazon.de/HUAZIZ-Anschlüsse-Rundstecker-Gehäuse-fachblauh-Multi-Stecker/de/?pf_rd_p=800438/GU174/</a>	yes	Self solder
XT30 Boards for Battery Packs	2		<a href="https://de.aliexpress.com/item/1005006755414157.html?spm=a2g0o.detail.pcDetailTopMoreOtherSeller.1.30ccZniGZniGiH">https://de.aliexpress.com/item/1005006755414157.html?spm=a2g0o.detail.pcDetailTopMoreOtherSeller.1.30ccZniGZniGiH</a>	yes	Self solder
Fuse holder 17x7mm incl. 10A fuse	1		<a href="https://de.aliexpress.com/i/4000583874791.html">https://de.aliexpress.com/i/4000583874791.html</a>	yes	Self solder
Battery holder	2	Keystone 1049	<a href="https://www.reichelt.de/batteriehalter-fuer-2x-18650-batterien-1049-040070.html?srsltid=AfmBOor1uf474VRO4F3swBHxR5lnk16Y9eaV17ocvaeaTx">https://www.reichelt.de/batteriehalter-fuer-2x-18650-batterien-1049-040070.html?srsltid=AfmBOor1uf474VRO4F3swBHxR5lnk16Y9eaV17ocvaeaTx</a>	yes	Self solder
Screw terminal socket + plug 3.81mm	1	2EDG 2 Pin 3.81mm	<a href="https://de.aliexpress.com/item/1005006431241111.html?spm=a2g0o.productlist.main.35.18e354565eNspE&amp;algo_pvid=52100-70-600-4100-700-401-00001-0100-11-50100-70">https://de.aliexpress.com/item/1005006431241111.html?spm=a2g0o.productlist.main.35.18e354565eNspE&amp;algo_pvid=52100-70-600-4100-700-401-00001-0100-11-50100-70</a>	yes	Self solder
Power switch	1		<a href="https://www.reichelt.de/kippschalter-10a-125vac-1x-ein-ein-ms-166-n13140.html?">https://www.reichelt.de/kippschalter-10a-125vac-1x-ein-ein-ms-166-n13140.html?</a>	yes	Self solder
Fan 12V XH2.54 Version	0		<a href="https://a.aliexpress.com/_EwbluWN">https://a.aliexpress.com/_EwbluWN</a>	no	Optional
Arduino Mkr Wifi 1010	1		<a href="https://store.arduino.cc/en-de/products/arduino-mkr-wifi-1010?srsltid=AfmBOor1uf474VRO4F3swBHxR5lnk16Y9eaV17ocvaeaTx">https://store.arduino.cc/en-de/products/arduino-mkr-wifi-1010?srsltid=AfmBOor1uf474VRO4F3swBHxR5lnk16Y9eaV17ocvaeaTx</a>	no	Not contained in kit
Arduino Mkr Dynamixel Shield	1		<a href="https://www.mybotshop.de/ROBOTIS-DYNAMIXEL-Arduino-MKR-Shield">https://www.mybotshop.de/ROBOTIS-DYNAMIXEL-Arduino-MKR-Shield</a>	no	Not contained in kit
Xbee board	1	XB24CAUIT	<a href="https://de.rs-online.com/web/p/entwicklungstools-1005006755414157.html?spm=a2g0o.productlist.main.35.18e354565eNspE&amp;algo_pvid=52100-70-600-4100-700-401-00001-0100-11-50100-70">https://de.rs-online.com/web/p/entwicklungstools-1005006755414157.html?spm=a2g0o.productlist.main.35.18e354565eNspE&amp;algo_pvid=52100-70-600-4100-700-401-00001-0100-11-50100-70</a>	no	Not contained in kit
Gyro board	1	ISM330DHCX	<a href="https://www.digikey.de/de/products/detail/adafruit-industries-llc/4502/11569134?utm_adgroup=Development%20Boards,%20Kits">https://www.digikey.de/de/products/detail/adafruit-industries-llc/4502/11569134?utm_adgroup=Development Boards, Kits,</a>	no	Not contained in kit
UBEC 12V3A	1		<a href="https://de.aliexpress.com/item/1005007037699334.html?spm=a2g0o.productlist.main.1.7932d20ctt8PtJ&amp;alao_pvid=9c1a4">https://de.aliexpress.com/item/1005007037699334.html?spm=a2g0o.productlist.main.1.7932d20ctt8PtJ&amp;alao_pvid=9c1a4</a>	no	Not contained in kit
UBEC 5V3A	1		<a href="https://de.aliexpress.com/item/1005007037699334.html?spm=a2g0o.productlist.main.1.7932d20ctt8PtJ&amp;alao_pvid=9c1a4">https://de.aliexpress.com/item/1005007037699334.html?spm=a2g0o.productlist.main.1.7932d20ctt8PtJ&amp;alao_pvid=9c1a4</a>	no	Not contained in kit

	# required	Type	Link	Contained in Kit	Comment
<b>DfPlayer Mini</b>	1		<a href="https://de.farnell.com/dfrobot/dfr0299/dfplayer-mini-mp3-player-arduino/dp/3517866?CMP=KNC-GDE-GEN-KWL-PMAX-Search-https://a.aliexpress.com/_Eli5efP">https://de.farnell.com/dfrobot/dfr0299/dfplayer-mini-mp3-player-arduino/dp/3517866?CMP=KNC-GDE-GEN-KWL-PMAX-Search-https://a.aliexpress.com/_Eli5efP</a>	no	Not contained in kit
<b>Amplifier</b>	1	TPA3110		no	Not contained in kit
<b>Speakers</b>	2	5W8Ω	<a href="https://www.cqrobot.com/index.php?route=product/product&amp;product_id=1106">https://www.cqrobot.com/index.php?route=product/product&amp;product_id=1106</a>	no	Not contained in kit

## BOM D-O Rest

Part		# required	Type	Link	Comment
<b>Body</b>	<b>Lead weight</b>	2kg	Lead shot ~1mm		
<b>Body</b>	<b>Countersunk screws top frame - bottom frame</b>	6	M3x8		
<b>Body</b>	<b>Motors</b>	2	Pololu 4863		
<b>Body</b>	<b>Screws motor - body</b>	4	M3x8 countersunk		
<b>Body</b>	<b>Motor drivers</b>	2	Adafruit DRV8871		
<b>Body</b>	<b>Neck - main axis connector male (in body)</b>	1	2.54mm 10 pin 2 row	<a href="https://www.digikey.de/short/pd8w3z7d">https://www.digikey.de/short/pd8w3z7d</a>	
<b>Body</b>	<b>Main axis i2c cable</b>	1	150mm+	<a href="https://www.amazon.de/elechawk-Kabel-Kit-Entwicklungsboards-Sensorboard-Breadboard/dp/B08HQ1VSVL/">https://www.amazon.de/elechawk-Kabel-Kit-Entwicklungsboards-Sensorboard-Breadboard/dp/B08HQ1VSVL/</a>	
<b>Body</b>	<b>Main axis Dynamixel cable</b>	1	100mm+		Comes with the servos
<b>Body</b>	<b>Main axis bearings</b>	2	6805-2RS OD 37mm ID 25mm Width 7mm		
<b>Body</b>	<b>Square nuts body</b>	16	M3		
<b>Body</b>	<b>Square nuts body</b>	4	M4		
<b>Body</b>	<b>Countersunk screws main axis holder left</b>	2	M4x10		Shorter, from inside the body
<b>Body</b>	<b>Countersunk screws main axis holder right</b>	2	M4x18		Longer, from outside the body
<b>Body</b>	<b>Main neck servo</b>	1	XL430-W250-T		
<b>Body</b>	<b>Screws servo holder - body</b>	3	M3x12 countersunk		
<b>Body</b>	<b>Screws servo holder - servo</b>	3	M2.5x12 socket		
<b>Body</b>	<b>Screws servo gear - servo</b>	4	M2x10mm socket		Included with servo
<b>Wheels</b>	<b>Delrin Balls</b>	120	10mm		
<b>Wheels</b>	<b>Countersunk screws wheels - body</b>	10	M3x8		
<b>Wheels</b>	<b>Countersunk screws wheels - outer bearings</b>	12	M3x8		
<b>Wheels</b>	<b>Countersunk screws drive edge - lazy susans</b>	12	M3x8		
<b>Wheels</b>	<b>Square nuts lazy susans</b>	12	M3		

Part		# required	Type	Link	Comment
Wheels	Outer bearings wheels	12	683-ZZ OD 7mm ID 3mm Width 3mm		May need to experiment with 8mm OD bearings such as 619/3-ZZ if you're using the Prusa Cut outer tire
Neck	Countersunk screws neck - body	3	M3x40		
Neck	Neck - body connector female (in neck)	2	Dupont 2.54mm 5 pin	<a href="https://www.amazon.de/Crimpzange-Dupont-Stecker-Steckverbinder-Crimpkontakten/dp/B07QX51F3B">https://www.amazon.de/Crimpzange-Dupont-Stecker-Steckverbinder-Crimpkontakten/dp/B07QX51F3B</a>	
Neck	Neck carbon tube	0	OD15mm, ID13mm, length >170mm	<a href="https://www.amazon.de/dp/B07RLF822F/ref=pe_27091401_487027711_TE_SCE_3p_dp_i1?th=1">https://www.amazon.de/dp/B07RLF822F/ref=pe_27091401_487027711_TE_SCE_3p_dp_i1?th=1</a>	Optional, can use printed part
Neck	Neck i2c cable	1	STEMMA/Qt, length 250mm+	<a href="https://www.amazon.de/elechawk-Kabel-Kit-Entwicklungsboards-Sensorboard-Breadboard/dp/B08HQ1VSVL/">https://www.amazon.de/elechawk-Kabel-Kit-Entwicklungsboards-Sensorboard-Breadboard/dp/B08HQ1VSVL/</a>	
Neck	Neck Dynamixel cable	1	length 250mm+		Comes with the servos, maybe has to be extended with a regular generic 3-strand cable, like a servo extension cable or ...
Neck	Neck square nut	1	M3		
Neck	Neck safety screw	1	M3x5		
Head Box	Head pitch servo	1	Dynamixel XL330-M288		
Head Box	Square nut servo connector	1	M3		
Head Box	Screws servo connector - servo	3	2mm self- tapping socket		Included with servo
Head Box	Screw servo connector - neck	1	M3x12 countersunk		
Head Box	Screws head frame - pitch servo	4	M2.5x12 socket		
Head Box	Square nut head frame	1	M3		
Yaw Assy	Screw neck bottom - head frame	1	M3x8 countersunk		
Yaw Assy	Screws neck bottom - servo	4	M2.5x12 socket		
Yaw Assy	Head yaw servo	1	Dynamixel XL330-M288		
Yaw Assy	Screws neck bottom - neck top	2	M3x40 countersunk		
Yaw Assy	Screws tilt mount - yaw servo	4	2mm self- tapping socket		Included with servo
Yaw Assy	Screws tilt mount - roll servo	4	M2.5x12 socket		
Head	Head roll servo	1	Dynamixel XL330-M288		
Head	Head roll servo rear mount grommet	1	FPX330-H101		
Head	Screws head plate - roll servo	8	2mm self- tapping socket		Included with servo

Part		# required	Type	Link	Comment

Tabelle 1

Ausgaben			
Name	Was	Summe	
Felix	Aliexpress	75,31 €	
Felix	Aliexpress	13,00 €	
Felix	Aliexpress	9,08 €	
Felix	Aliexpress	14,91 €	
Björn	JLC Komponenteneten	900,00 €	
Felix	Aliexpress	50,95 €	