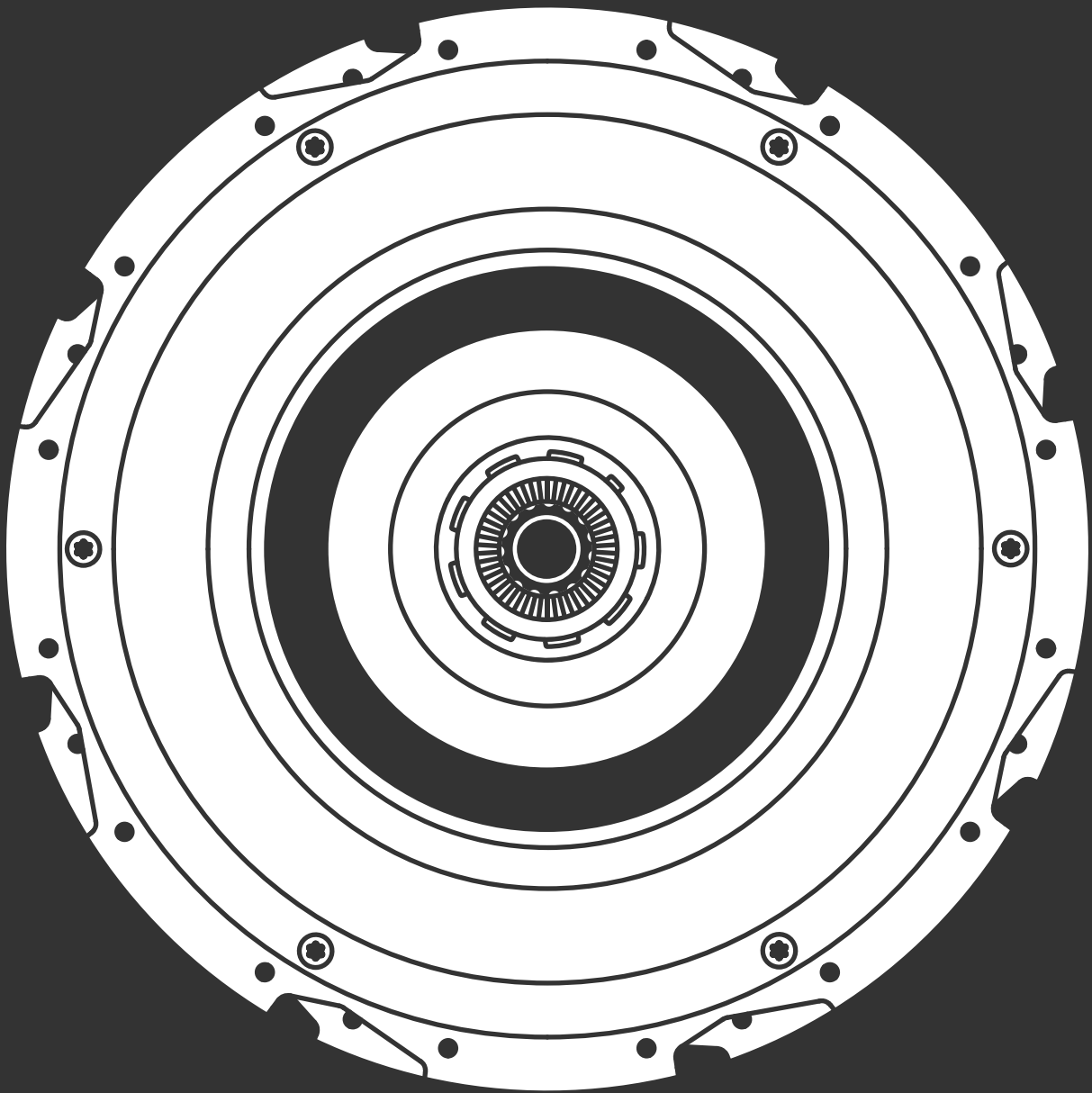


THE ALL IN ONE

HALOS

TECHNICAL
MANUAL



ZEXUS

The All In One Halos Technical Manual
Rev 1.4 - 03/2024

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This document contains detailed information about The All In One Halos (formerly Bike) model year 2021 (Gen 2.1) by Zehus.

1. Introduction

This manual contains detailed information about Zehus The All In One Halos, formerly Bike products, how to build a bike frame compatible with this product and how to install it on a bike.

1.1 Differences between 2.0 and 2.1

Zehus all in one Generation 2 are divided in:

- Generation 2.0: in these products, the mechanical design is inherited by Generation 1.0 motors.
- Generation 2.1: these products feature major design reviews on the mechanical side. Please double check if you purchased Generation 2.1 Zehus all in one.

1.2 How to check my product generation?

Please check Zehus P/N on the order confirmation. The 5th char is referring to your system's generation:

P/N: YB991XXX – Generation 1.2

P/N: YB991XXX – Generation 2.0

P/N: YB992XXX – Generation 2.1

Please check the S/N four initial characters indicating year of production:

9020XXXXXX - manufactured in 2020

9021XXXXXX - manufactured in 2021

9022XXXXXX - manufactured in 2022

2. Technical specifications

2.1 The All In One specifications

Motor

Rated power	250 W
Maximum torque	40 Nm

Battery

Cells	18650
Rated voltage	32,4 V
Rated capacity	6000 mAh
Rated energy	173 Wh

Hub

Weight	3,3 kg
Operating temperature*	-10 to +40 °C
Storage temperature	0 to +40 °C
Charging temperature	0 to +40 °C
Protection degree	IP X4

**Operating temperature is limited by software*

*** Optimal storage temperature is 23°C*

2.2 Charger specifications

Voltage input	100-240 V, 50/60 Hz
Voltage output	37,8 V
Charging current	2A
Charging time	3 h

3. Wheel dimensions

In the following table it is reported the wheel dimension related to The All In One hub size.

Please check the product that suits the intended application before ordering.

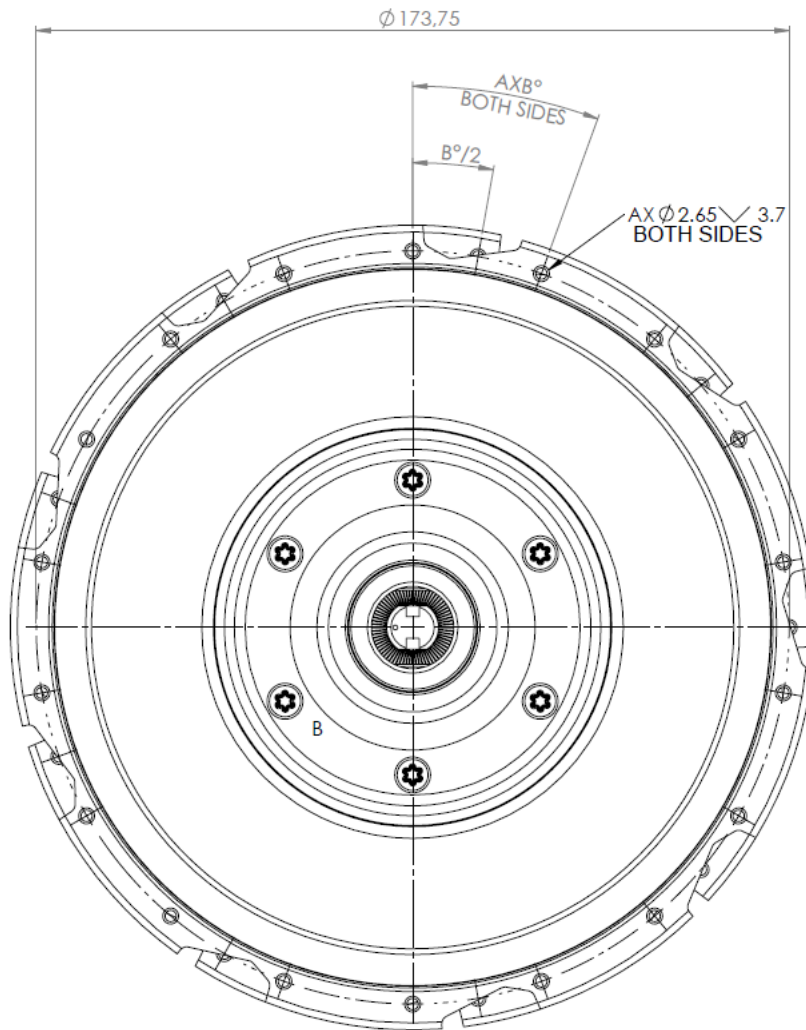
The All In One size	Wheel circumference (mm)	
	<i>Min</i>	<i>Max</i>
S	1265	1650
M	1900	2100
L	2100	2340

Attention: changes have been made since the previous The All In One model, check again the compatibility of your application to order the correct size.

4. Lacing specifications

4.1 Rim brake up to 9 speeds

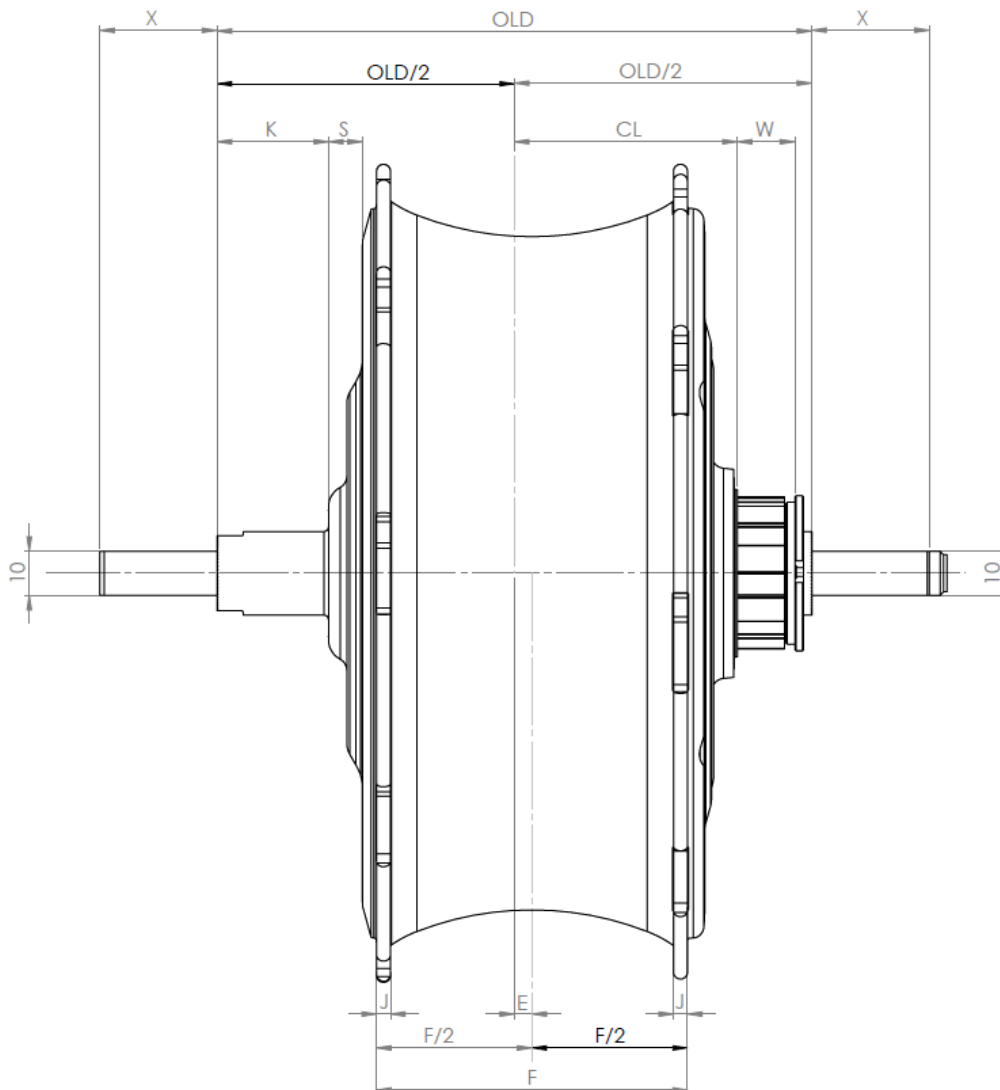
Front view



Holes	PCD (mm)	A	B
32	$\varnothing 173,75$	16	22,5°
36	$\varnothing 173,75$	18	20°

*dimensions are in mm

Side view



Speed	OLD	CL	W	E	F	J	K	S	X
1-4	120	50,6	13,1	4,0	70,6	3,2	17,8	7,7	26,6
1-4	135	50,6	13,1	4,0	70,6	3,2	25,3	7,7	26,6
9	135	34,6	29,1	-14,8	70,6	3,2	6,6	7,7	26,6

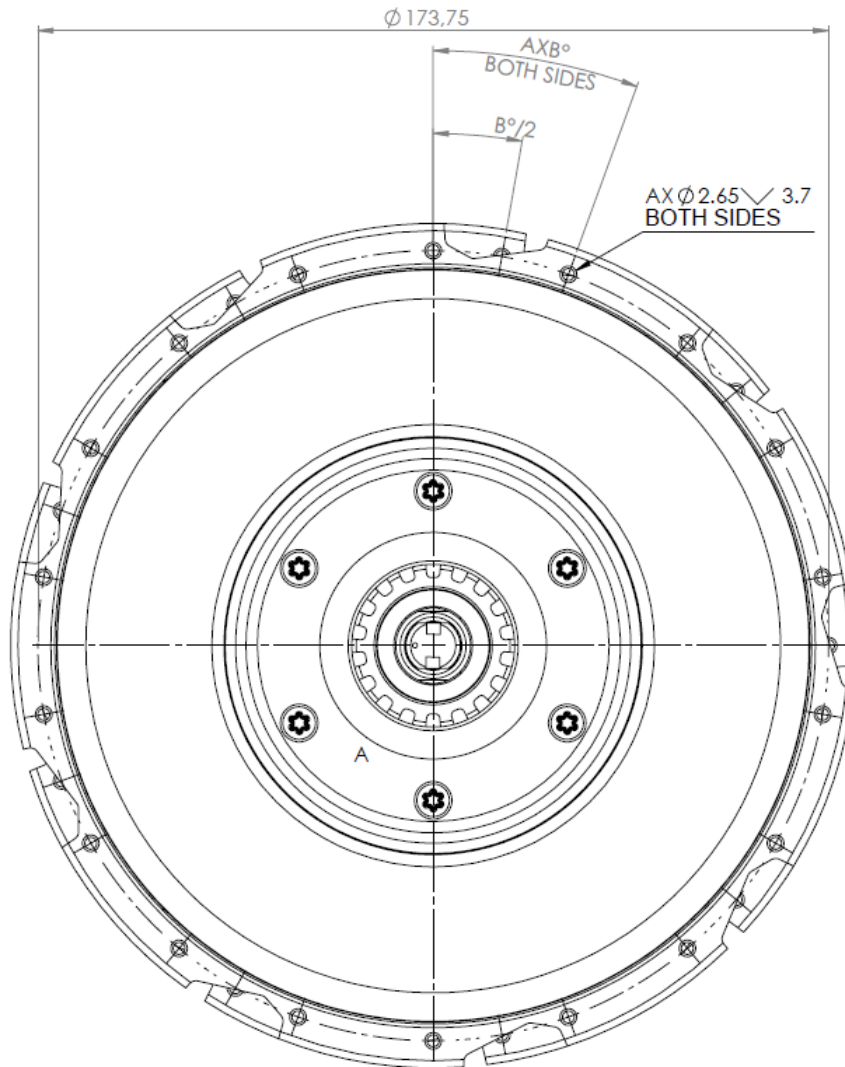
*dimensions are in mm

FREEWHEEL is a Shimano Splines freewheel with custom locking (provided by Zehus). For single speed applications, CHAINLINE can be adapted from "CL" mm for the length of the freewheel "W" using standard spacers.

Cassette for multi-speed are custom cassette designed for 11S spacing. For custom cassette (4-speed, 9-speed) and components, please refer to chapter below.

4.2 Roller brake

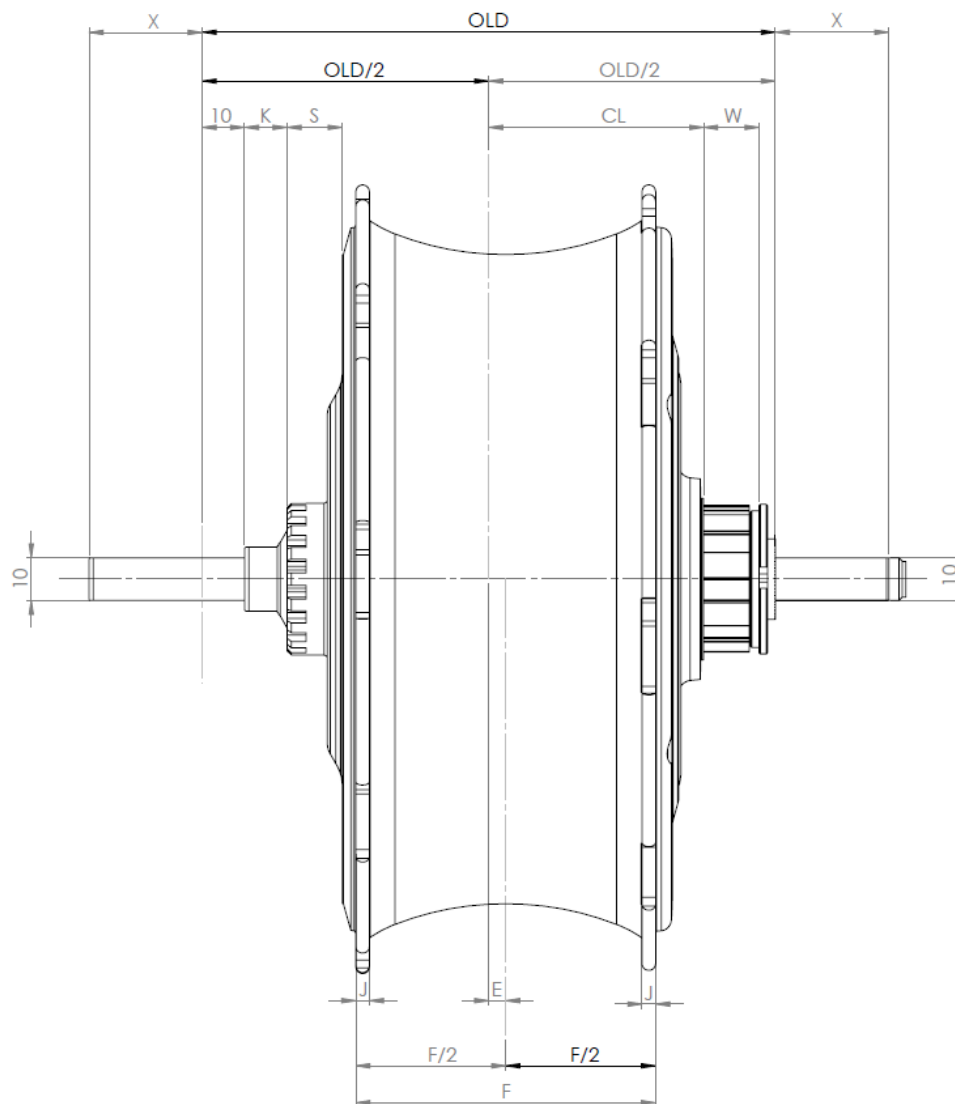
Front view



Holes	PCD (mm)	A	B
32	ø173,75	16	22,5°
36	ø173,75	18	20°

*dimensions are in mm

Side view



Speed	OLD	CL	W	E	F	J	K	S	X
1-4	135	50,6	13,1	4,0	70,6	3,2	11,0	12,0	26,6

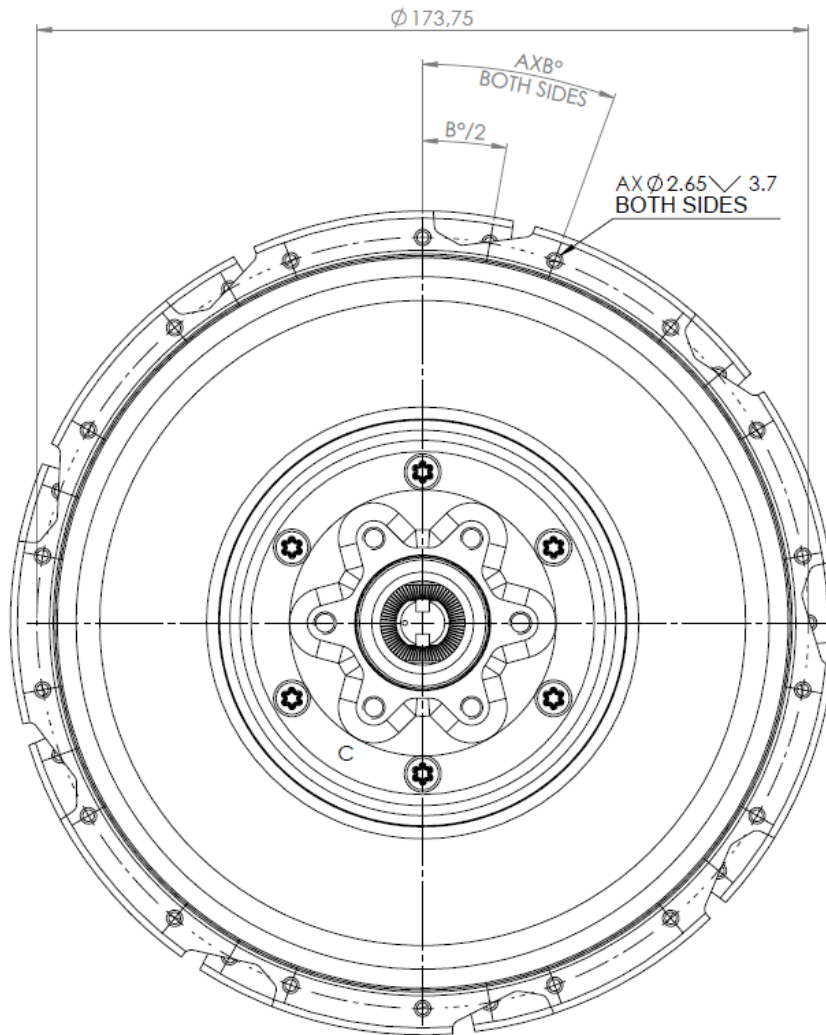
*dimensions are in mm

FREEWHEEL is a HG Splines freewheel with custom lockring (provided by Zehus). For single speed applications, CHAINLINE can be adapted from "CL" mm for the length of the freewheel "W" using standard spacers.

Cassette for multi-speed are custom cassette designed for 11S spacing. For custom cassette (4-speed) and components, please refer to chapter below.

4.3 Disc brake up to 7 speed

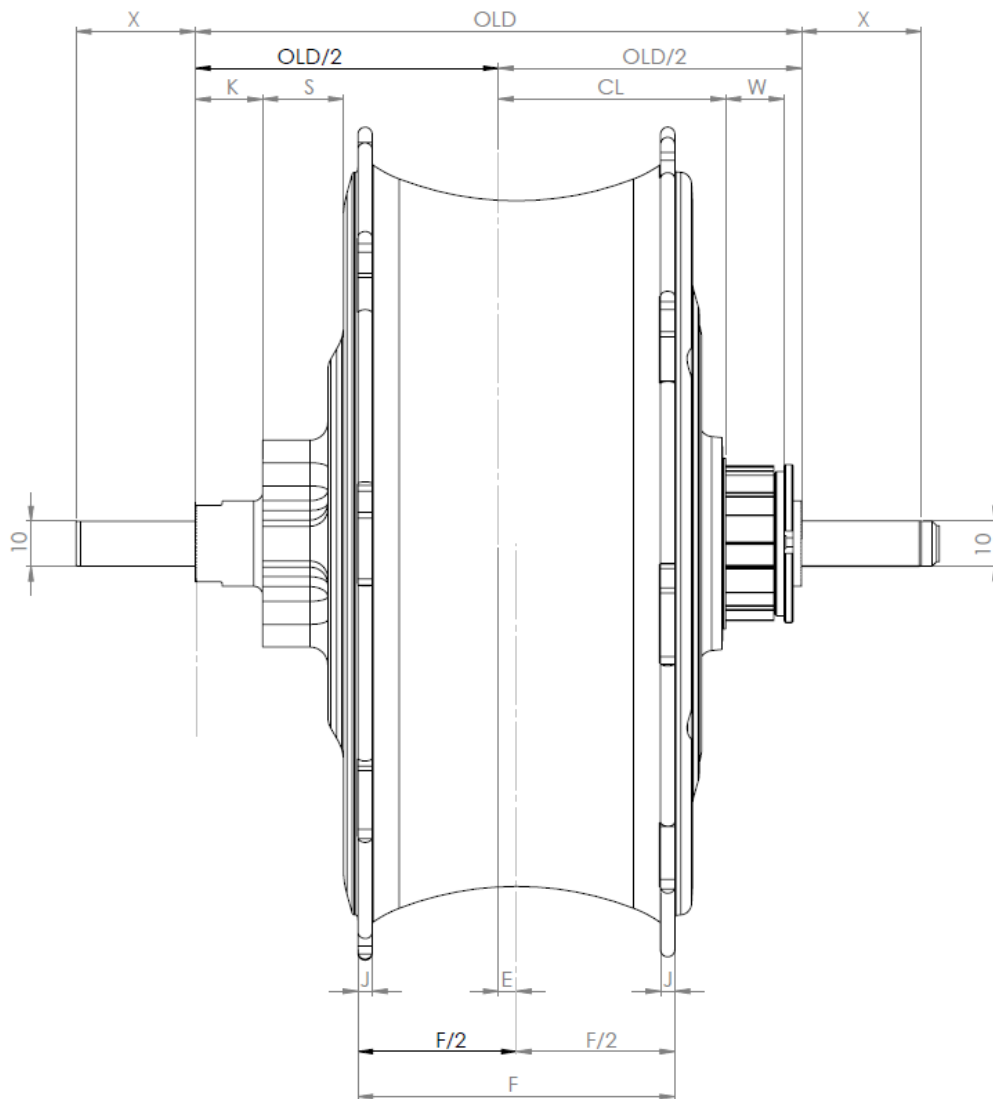
Front view



Holes	PCD (mm)	A	B
32	$\phi 173,75$	16	22,5°
36	$\phi 173,75$	18	20°

*dimensions are in mm

Side view



Speed	OLD	CL	W	E	F	J	K	S	X
1-4	135	50,6	13,1	4,0	70,6	3,2	15,0	18,0	26,6
7	147	44,6	24,3	-2,0	70,6	3,2	15,0	18,0	26,6

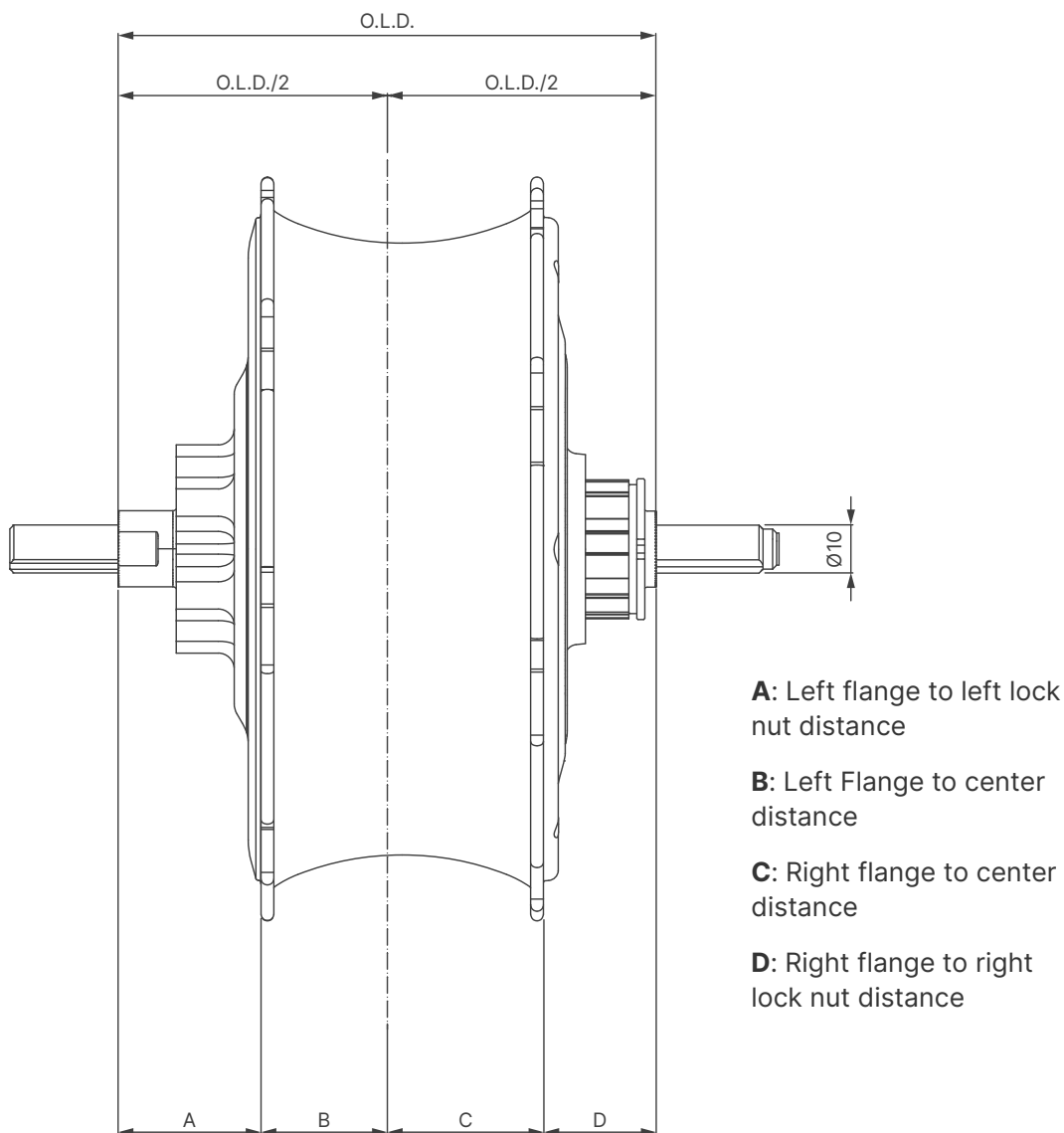
*dimensions are in mm

FREEWHEEL is a HG Splines freewheel with custom lockring (provided by Zehus). For single speed applications, CHAINLINE can be adapted from "CL" mm for the length of the freewheel "W" using standard spacers. All dimensions are in mm.

Cassettes for multi-speed are custom cassette designed for 11S spacing. For custom cassette (4-speed, 7-speed) and components, please refer to chapter below.

4.4 Spoke length calculation

To calculate the correct spokes length through the online calculation tools it is necessary to consider these dimensions according to the hub version of interest.



The All In One version	O.L.D.	B	C	A	D
Rim brake 1-4 speed	120	31,3	39,3	28,7	20,7
Roller brake 1-4 speed	135	31,3	39,3	36,2	28,2
Disc brake 1-4 speed	135	31,3	39,3	36,2	28,2
Disc brake 7 speed	147	39,3	31,3	36,2	42,2
Rim brake 9 speed	135	50,1	20,5	17,4	47

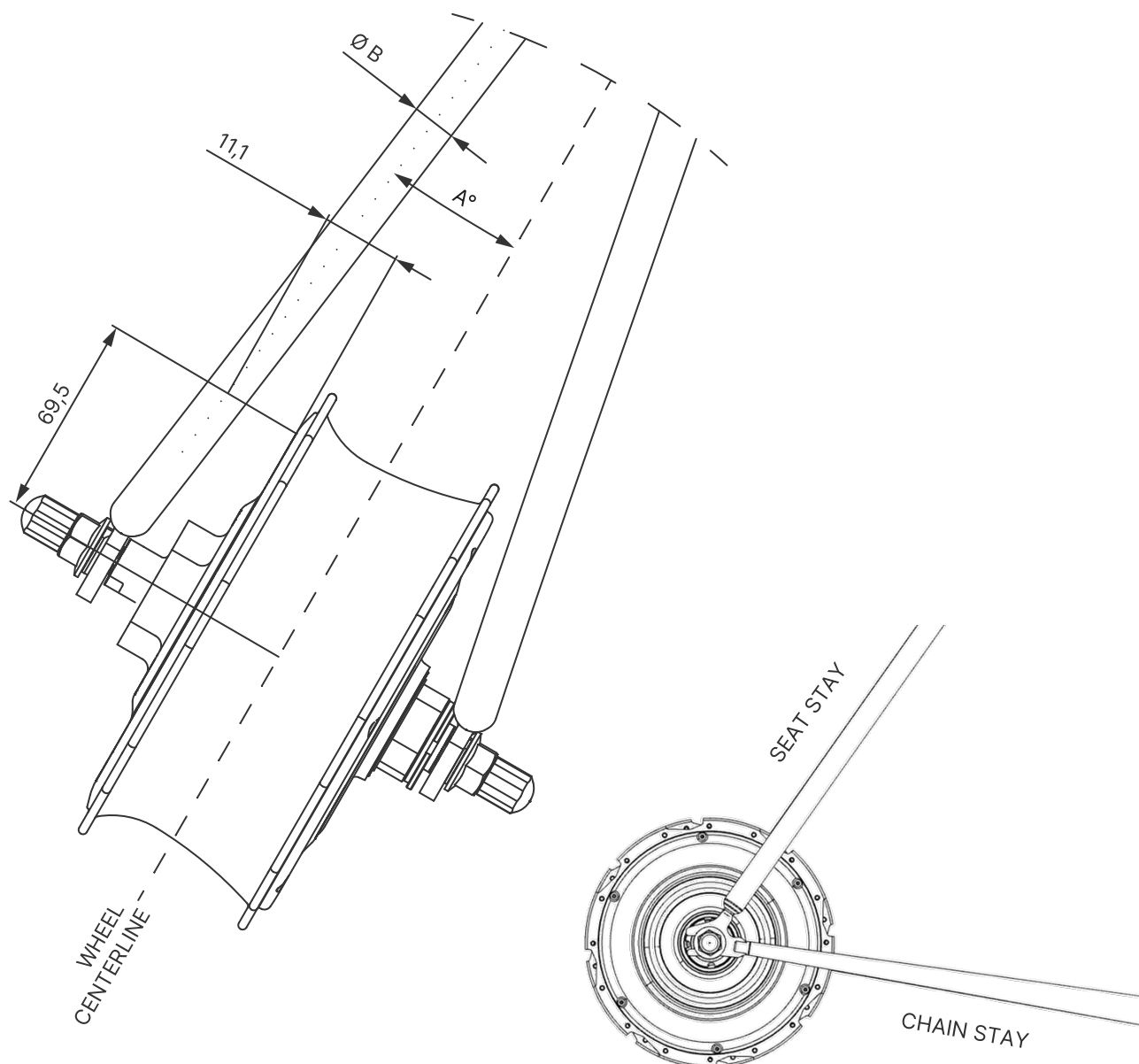
*dimensions are in mm

5. Frame building guidelines

This part of the techdocs helps in frame design starting from measures above. Customers 3D models are available on request.

5.1 Chain stays and seat stays design

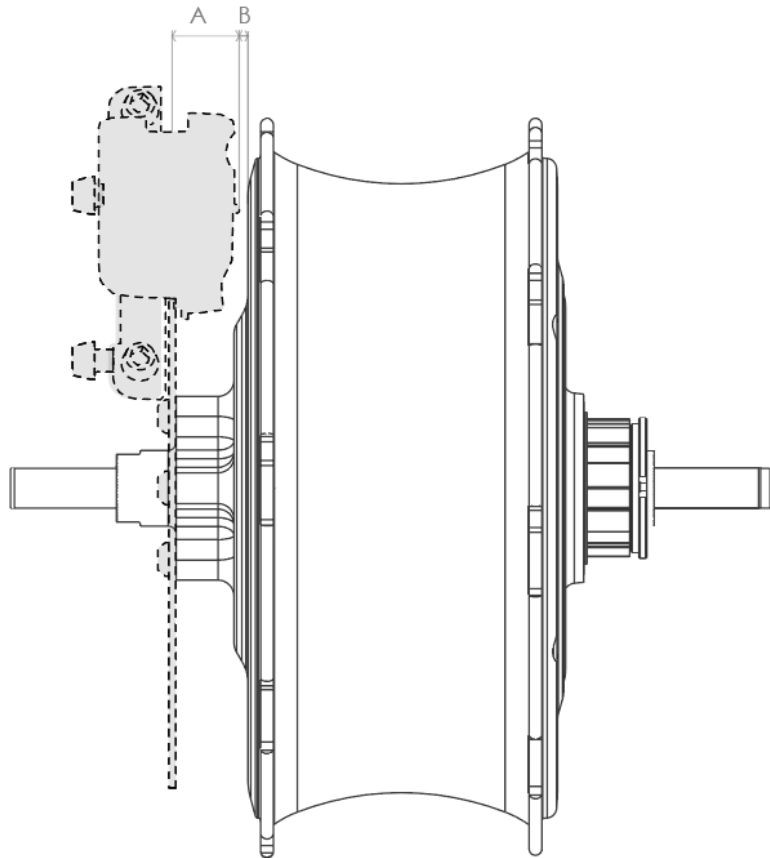
Frame builders must pay attention to the angle between the wheel centerline and both seat and chain stays, especially on the left side of The All In One.



The gap between The All In One and both chain and seat stays depends on many factors, such as the angle A° , the frame pipe diameter B and the dropout shape. The advice is to use pipes with a diameter $B < 12\text{mm}$ and angle $A^\circ < 6^\circ$, using a standard track dropout. Please be careful when designing the frame.

5.2 Disc brake caliper compatibility

Please check the caliper dimensions with the brake manufacturer in order to fit correctly in the suggested distance of 2 mm between The All In One hub and the brake caliper.

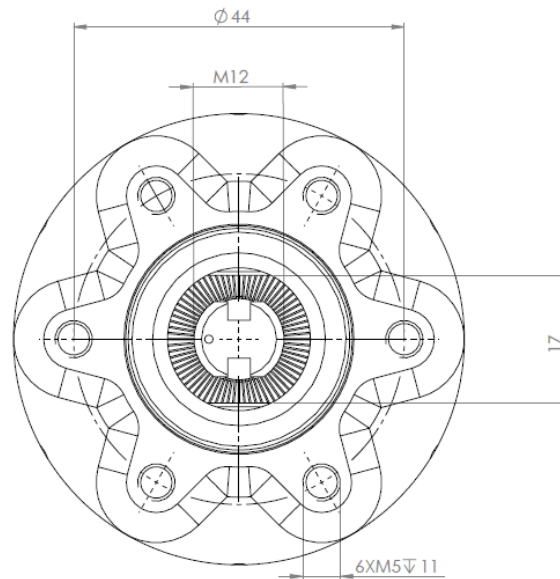


Note: please respect the clearance between the caliper and The All In One hub.

Note: please always check the dimensions of the brake calipers with the brake and adapters manufacturers.

5.3 Disc rotor compatibility

The All In One model year 2021 (Gen 2.1) is compatible with all 6-bolts IS disc rotors. The diameter of the rotor must be 160 mm or superior.



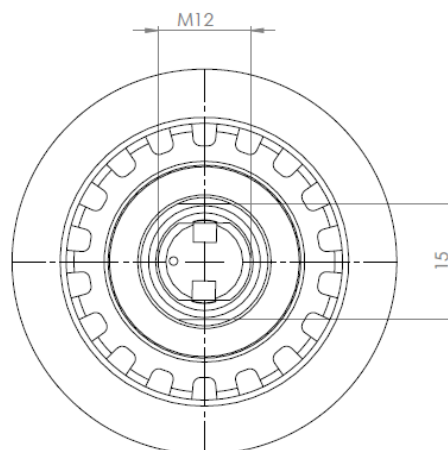
5.4 Disc brake mount dimensions

Please refer to the INTERNATIONAL STANDARD / POST MOUNT / FLAT MOUNT manuals to design or purchase the correct adaptor for The Zehus All In One system.

Attention: please always check The All In One hub dimensions to determine the final disc and caliper position.

5.5 Rollerbrake® compatibility

The Roller brake version of The All In One is compatible with Rollerbrake® drum brakes.

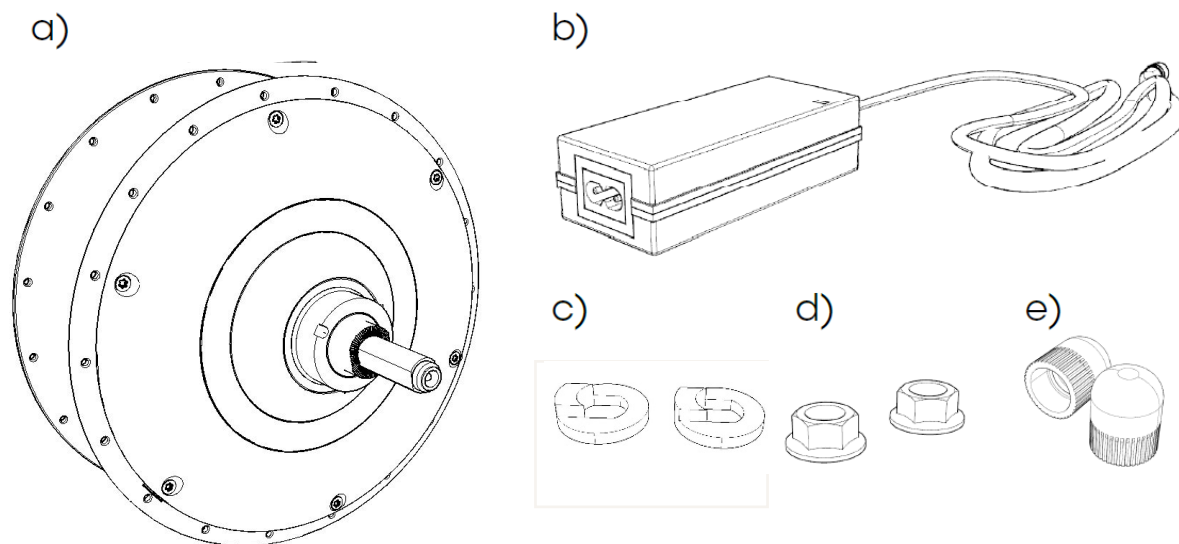


Zehus provides a HEX nut $M12 \times 1.25 - H19 \times 7$ according to ISO DIN936.

Thickness for this nut is 7 mm. Please ensure that your frame is compatible with this spacing.

6. Assembly instructions

6.1 Content of the box



*check the content of the box. If anything is missing, please contact us (support@zehus.it)

6.2 Wheel building (lacing)

The All In One Halos is compatible with rims from 20 inches on. For 16 inches wheels, custom motor and custom lacing should be produced; please contact directly your Zehus sales contact. For further information please contact us at Support@zehus.it.

Evaluating the correct spoke length

To evaluate the spoke length to lace the wheel please refer to the measurements of your model. Please double check the item code to match with the chart provided above. You can then use a standard manual or an online calculator (e.g. SAPIM spoke calculator).

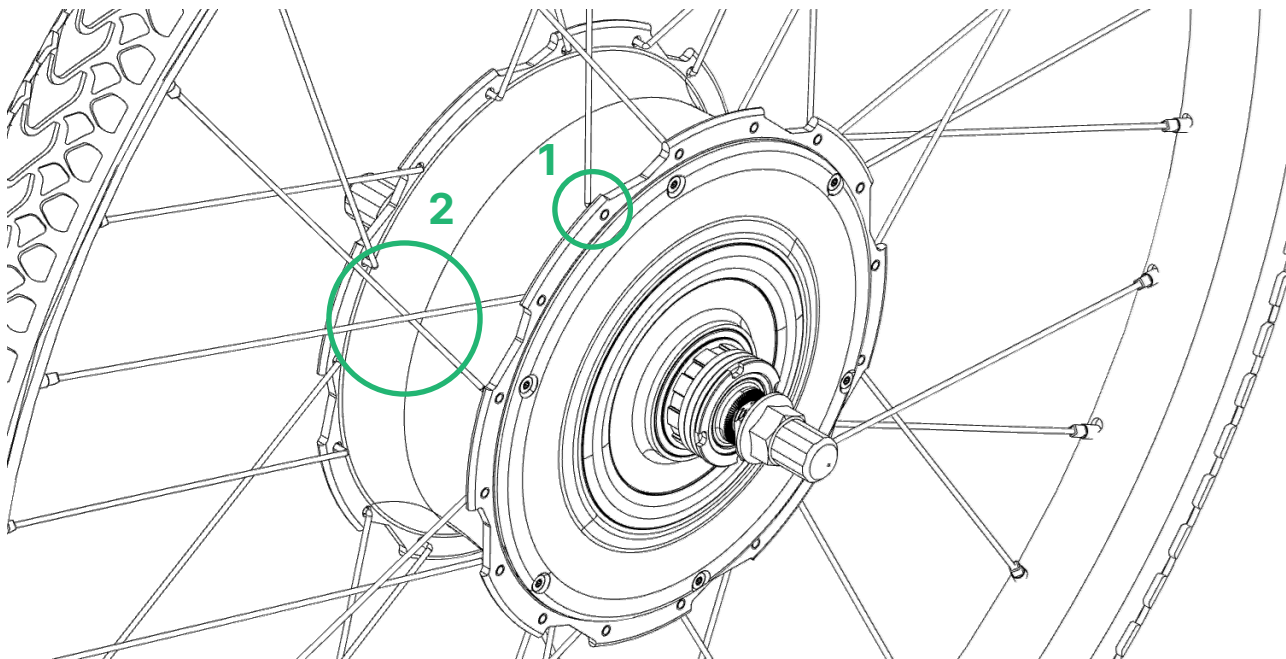
EN15194 Configuration

the following configuration has been successfully tested under the EN15194 conditions:

Rim	Tire	Tube	Spokes
Ambrosio Keba 28"	Schwalbe	Butyl 700x28c	Steel 2.3 mm
	Marathon Plus		tapered 2 mm
	700x28c		

Zehus, formerly Zehus, is not responsible for the assembly of any wheel with different configuration than the one shown above. If your wheel configuration includes different components or different sizes or qualities from the ones listed above, it will be necessary to perform a preventive validation carried out by an expert wheel builder (that includes EN15194 test) before selling the vehicle to any end consumer").

Important information

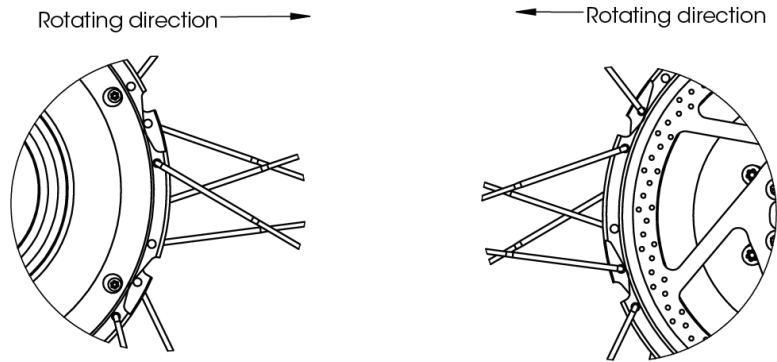


Attention: Zehus strongly recommends inserting the spokes from OUTSIDE to INSIDE the spoke hole (1).

Attention: Zehus strongly recommends building 1-cross wheels for 24"-29" wheels (2), instead 16"-20" wheels should be laced with radial spoking (0-cross).

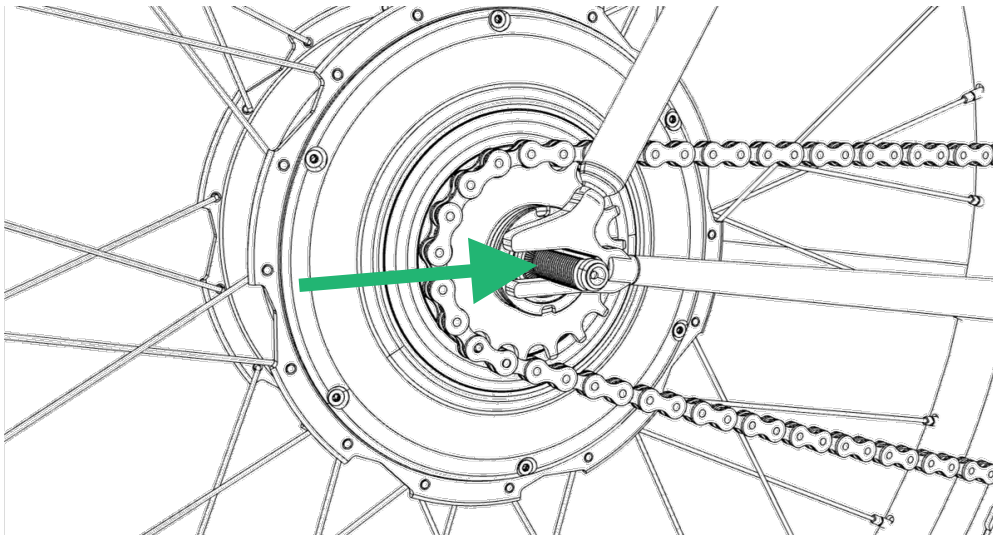
RIGHT SIDE (SPROCKET SIDE)

LEFT SIDE (DISC SIDE)

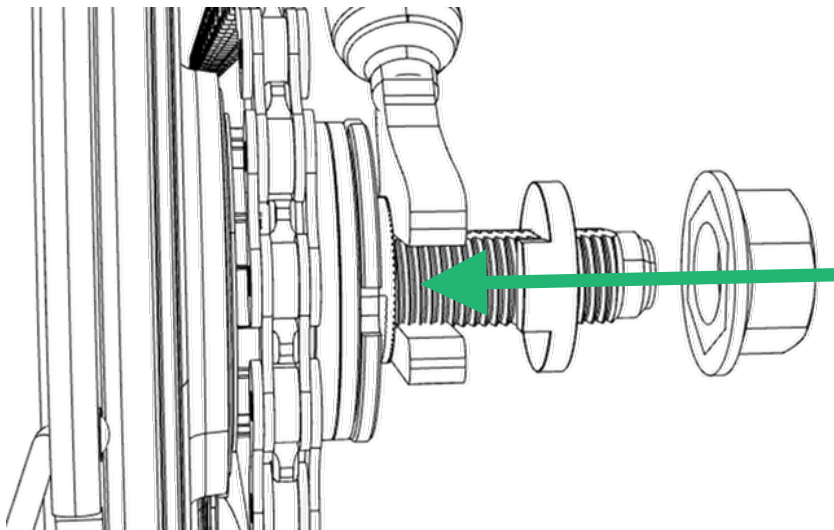


6.3 Wheel assembly on frame

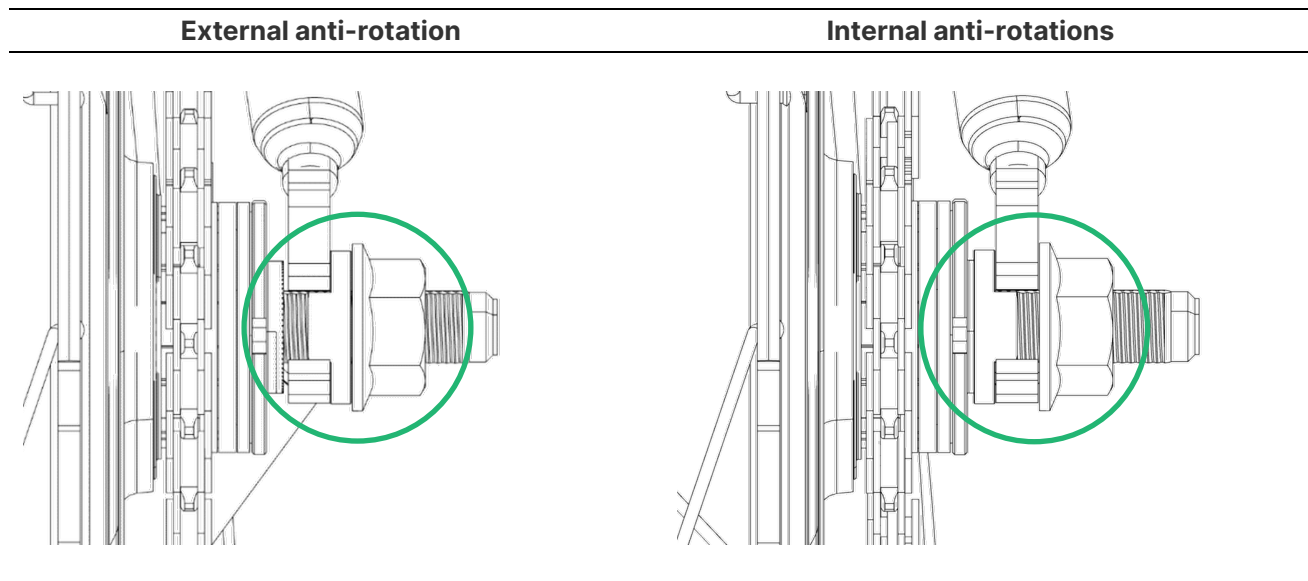
→ Mount The All In One on the frame dropouts.



→ Insert anti-rotation washers and hex-nuts on each side.

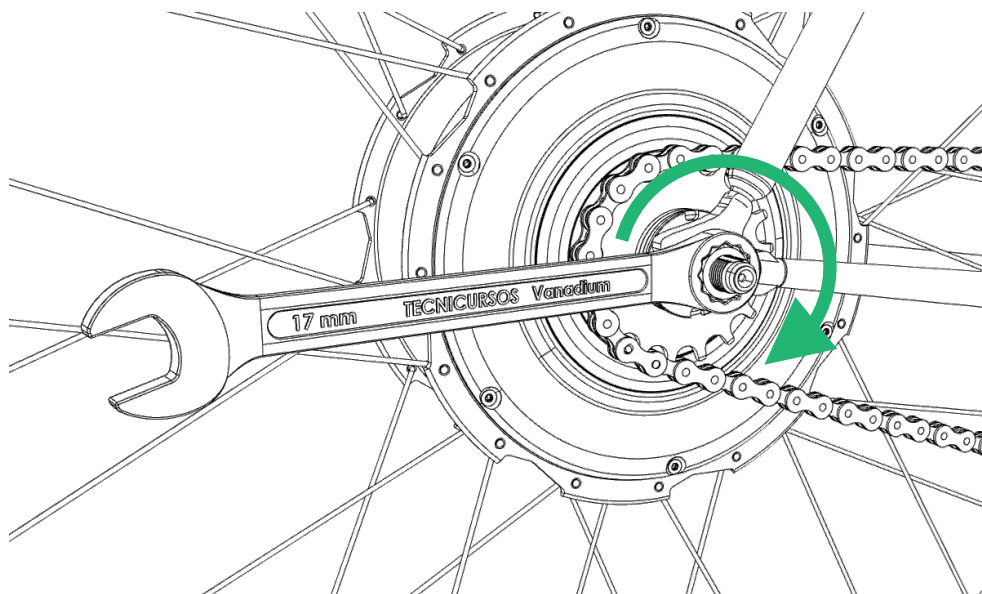


Anti-rotation washers can be installed both externally or internally as shown below:



Attention: Zehus strongly recommends mounting the anti-rotation washers in the external position not to damage the frame paint with hex nuts knurling. If there is necessity to install them internally, consider adding standard washers between frame and hex nuts to protect the paint.

→ Tighten the hub nuts up to **30 Nm**.



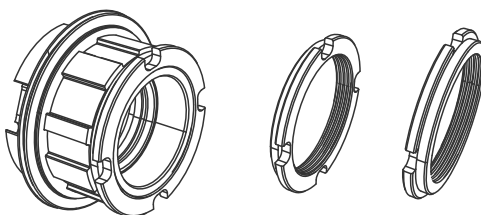
→ Finally, install the protective closed nuts on each side to prevent shaft, and charging port, damages.

7. Sprockets and gearbox compatibility

The All In One model year 2021 (Gen 2.1) freewheel system is compatible with Shimano HG-Splines sprockets, the Zehus lockring is provided, it may be necessary the use of spacers to adjust the sprocket for the correct chainline.

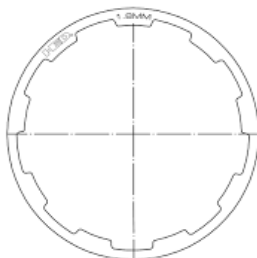
7.1 Lockring and lockring tools

In case of multi speed applications, the provided lockring is the following:



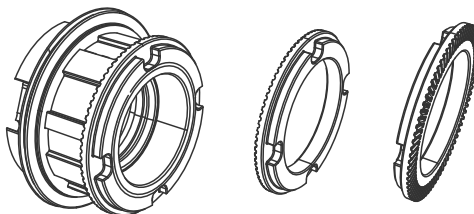
Then, first cassette sprocket should be an 11T.

In case of single speed applications, the provided lockring is the following, last sprocket spacer should be a 9 splined spacer like the following:

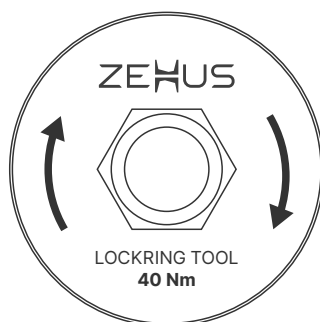


Tightening torque for any freewheel Lockring is 40 Nm. Please make sure that your lockring is correctly tightened to guarantee the correct functioning of the system.

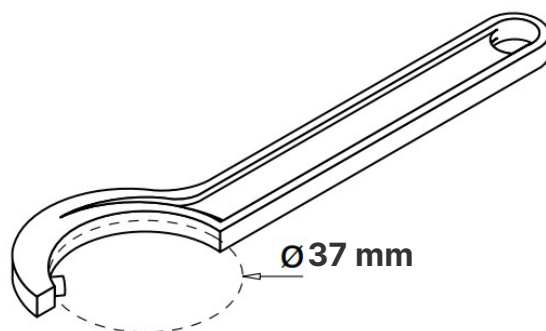
It is possible to request the lockring M0781300 specifically designed for single speed applications. This lockring is compatible with standard cassette spacers.



Zehus developed a tool to tighten this type of lockring with a H17 wrench. Please inquire with Sales for Price, Availability and Lead time.



For Single Speed versions, Zehus lockring can be tightened using a Hook Spanner. This tool is specific for certain diameters. Please make sure your Hook Spanner is compatible with a 37 mm diameter.



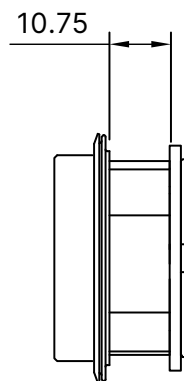
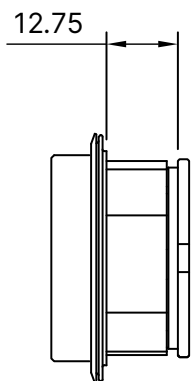
7.2 Zehus cassette system

Freewheel body technical data

Max Speeds	Interface type	Sprocket width	Spacer width	Body width	Lockring	Notes
1	Shimano HG Splines	-	-	13,1	Zehus	Single speed sprocket kit with spacers
4	Shimano HG Splines	1,6 mm	2,3 mm	13,1 mm	Zehus	4 speed achieved on 11 speed Standard spacing
7	Shimano HG Splines	1,6 mm	2,3 mm	24,3 mm	Zehus	7 speed achieved on 11 speed Standard spacing
9	Shimano HG Splines	1,6 mm	2,3 mm	29,1 mm	Zehus	9 speed achieved on 11 speed Standard spacing

4-7-9 speed Lockring

Single Speed Lockring



Derailleur technical data

Speeds	MAX sprocket size	Cage size	Notes
4	18	Short	Always check max Sprocket allowed by derailleur. Use short cage derailleurs
7	28	Short	Always check max Sprocket allowed by derailleur. Use short cage derailleurs
9	36	Medium - Long	Always check max Sprocket allowed by derailleur

Shifter technical data

Speeds	INDEX	PITCH	TRIGGERS	POSITION
4	11-Speed	3,9 mm	4	Right
7	11-Speed	3,9 mm	7	Right
9	11-Speed	3,9 mm	9	Right

7.3 Cassette compatibility

4 speed cassette and 9 speed cassette

Please contact your cassette supplier to have an 11 speed cassette customized to a 4, 7 or 9 speed cassette.

7 speed cassette

Any 7-speed cassette with 11S spacing, as adopted by some downhill groupsets, could be compatible with Zehus 7-speed cassette body.

BRAND	SERIES	COD	SPROCKETS
Sunrace	MDH	CSD11X 7AP	11 - 24 T
Sunrace	MDH	CSD110 7AP	11 - 24 T
SRAM	X01-DH	CS-PG-720-A1	11 - 25 T
HOPE	DH cassette	N/A	10 - 24 T
BOX Components	TWO DH	BX-CS161124T-BK	11 - 24 T

Note: SRAM XG-795 MINI BLOCK™ CASSETTE is a full body cassette. It has integrated spacer to work on 11S body. Even this is under Sram DH standard, it is NOT compatible with Zehus freewheel body.

Please double check with the manufacturer for further information. Zehus declines any responsibility for non-compatible components use

As in the above case of the 4 and 9 speed cassettes, it is possible to source from SRSA a custom cassette that they provide for The All In One Halos 7 Speed models.

Possible custom cassette data

The following table shows a possible configuration of custom cassettes for Zehus all in one.

4-speed: 11 – 13 – 15 – 18 – overall ratio **163,6%**

7-speed: 11 – 13 – 15 – 18 – 21 – 24 – 28 – overall ratio **254,5%**

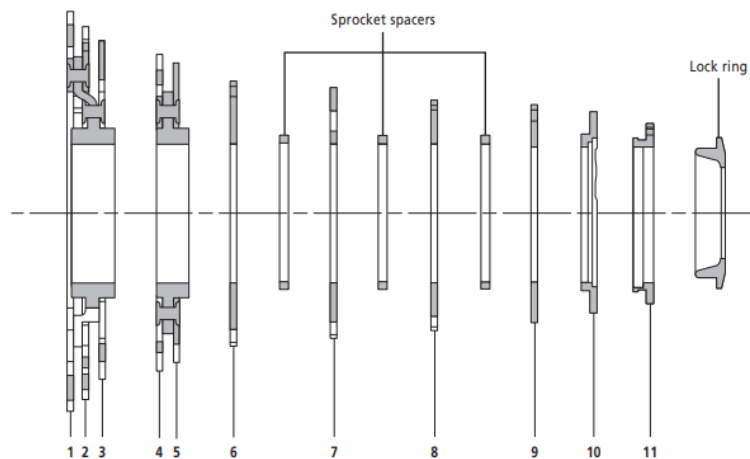
9-speed: 11 – 13 – 15 – 18 – 21 – 24 – 28 – 32 – 36 – overall ratio **327,3%**

Adjusting existing 11-speed cassette

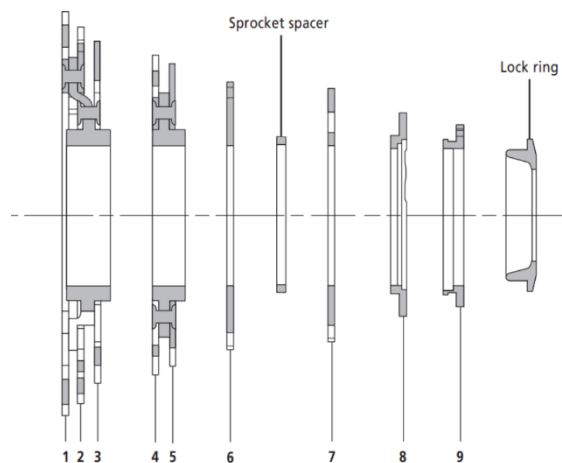
You could alternatively use a part of a 11-speed cassette. Important is to keep the 1st and 2nd position sprockets as the originals.

Please check that dimensions of the cassette are compatible with Zehus cassette body. Zehus declines any responsibility for non-compatible components use.

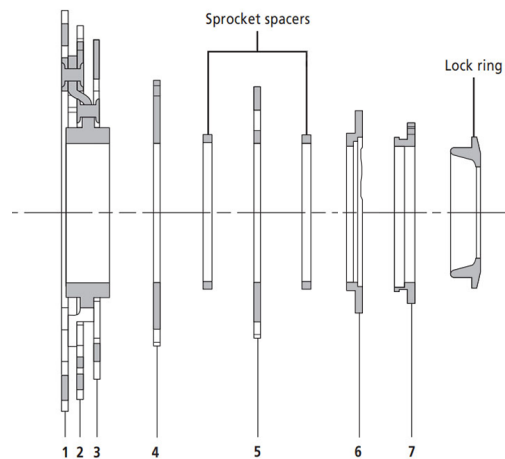
11-Speed cassette



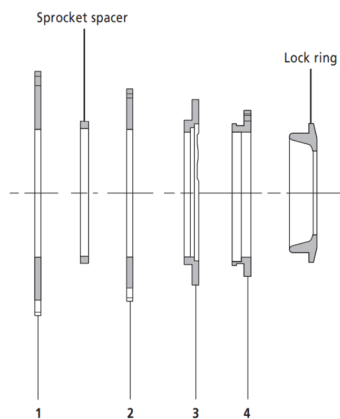
Example 1: 9-speed cassette from the above 11-speed cassette:



Example 2: 7-speed cassette from the above 11-speed cassette:



Example 3: 4-speed cassette from the above 11-speed cassette:



7.4 Derailleur and shifters compatibility

Derailleur compatibility

There are no restrictions on Derailleurs, manufacturers should check derailleur spec such that:

- 4-SPEED: Derailleur should be able to shift on a 18T sprocket
- 7-SPEED: Derailleur should be able to shift on a 28T sprocket
- 9-SPEED: Derailleur should be able to shift on a 36T sprocket and reach 30 mm width

There are many derailleurs from many brands that fit above specs. Please refer to Derailleur manufacturer manual to match the specs to Zehus ones.

Shifter compatibility

Please contact your cassette supplier to have a 11-speed indexed shifter customized to a 4, 7 or 9 triggers.

As per 7 speed cassettes, shifter adopted by some downhill groupsets could be compatible with Zehus The All In One Halos 7-speed:

BRAND	SERIES	COD	TYPE
SRAM	X01-DH	SL-X0-DH-A2	thumb
SRAM	X01-DH	SL-X0-DH-A1	thumb
BOX Components	TWO DH	BX-SH2-07ATL-BK	thumb
BOX Components	TWO DH	BX-SH1-07ATL-BK	thumb

Please double check with the manufacturer for further information. Zehus declines any responsibility for non-compatible components use.

7.5 Gearbox systems

The All In One Halos embeds:

- Safety turn on button: this button is available on the smartphone app and on the Remote Controller. If the customer does not want to use the app, procedure to activate the bike requires to pedal backwards per 3 revolutions at a speed faster than 10 Km/h.
- KERS – regenerative braking capabilities. KERS is activated by pedaling backwards or via Remote control.

All the system that inserts a freewheeling between the chain and Zehus hub are not compatible with the 2 functions mentioned above. Please notice that all Pinion gearbox systems feature a freewheeling system!

Here below you can find a list of front gearboxes without internal freewheeling system and their main features*

Product	Gears	Weight (kg)	Ratio	Website
Efneo	3	1,200	1,79:1,43:1	http://www.efneo.com/gearbox/
Habelstock Schlumpf	2	0,900	1,65:1 or 2,5:1	http://www.haberstock-mobility.com/index.php/products.html

**Products specs can change without notice. Please check on the producer's website*

8. Battery care

It is important to take care of the battery embedded in The All In One to maximize its durability and capacity.

8.1 Charging

Always charge the battery of your All In One to avoid full discharge that could damage its power. Please follow the instruction contained on the label of the battery charger. It is recommended to charge the battery in a safe environment, clean and protected by water. It is recommended not to charge the battery at night.

8.2 Storage conditions

The All In One has to be stored at the right temperature. The battery pack life can be maximized by following the rules for correct storage and handling. In case of malfunctioning your battery pack will have to be replaced. Please refer to a Zehus retailer to have your battery pack replaced.

Note: when not using the bike for long periods it is recommended to charge the battery pack to 60% and to check the battery condition at least every 6 months. Before using the bike after a long period it is recommended to fully charge the battery.

Store All In One in a well-ventilated location, dry if possible. Protect the hub from moisture and water. The optimal storage temperature is +23°C and the bike must be stored between 0°C and +40°C. It is preferred not to leave the bike under the direct sunlight during hot summer days.

8.3 Transport

Items with internal battery packs are subject to Dangerous Goods Legislation requirements. Private users can transport such undamaged items by road without further requirements.

When being transported by commercial users or third parties (e.g. air transport or FWD agencies), special requirements on packaging and labeling must be observed (e.g. ADR regulations). If necessary, an expert for hazardous materials can be consulted when preparing the item for shipping.

Dispatch The All In One only when the housing is undamaged. Protect the charger connector with the provided closed nut in such a manner that the connector itself cannot be damaged or broken. Inform your parcel service that the package contains dangerous goods. Please also observe the possibility of more detailed national regulations. In case of questions concerning transport of The All In One, please refer to an authorized Zehus dealer. Bicycle dealers can also provide suitable transport packaging.

8.4 Disposal

The All In One and all its components should be sorted for environmental-friendly recycling.

Only for EC countries

According to European Guideline 2012/19/EU, electrical devices tools that are no longer usable, and according to European Guideline 2006/66/EC, defective or used battery packs/batteries. The All In One must be collected separately and disposed of in an environmentally correct manner.

Warning

Handling of Li-Ion battery cells - risks and precautions

The user must have appropriate understanding of lithium-ion batteries before purchase.

Use caution when working with and using lithium-ion batteries as they are very sensitive to charging characteristics and may explode, burn, or cause a fire if misused or mishandled.

Always charge in or on a fire-proof surface. Never leave batteries charging unattended.

The batteries are sold for the use of system integrations with proper protection circuitry or battery packs with a battery management system or PCB (circuit board/module).

Buyer is responsible for any damage or injury caused by misuse or mishandling lithium-ion batteries and chargers.

Charge only with appropriate charger designed by ZEHUS for this specific type of lithium-ion battery pack.

- MISUSING OR MISHANDLING LITHIUM-ION BATTERIES CAN POSE A SERIOUS RISK OF PERSONAL INJURY, PROPERTY DAMAGE, OR DEATH
- BATTERIES MAY EXPLODE, BURN, OR CAUSE A FIRE IF MISUSED OR MISHANDLED
- ONLY USE WITH PROPER CIRCUITRY IN A PROTECTED BATTERY PACK
- ONLY USE WITHIN MANUFACTURER LISTED SPECIFICATIONS

- DO NOT STORE LOOSE BATTERY IN A SIMPLY CARTOON BOX - ALWAYS USE A PROTECTIVE CASE OR BOX
- KEEP AWAY from metal objects to prevent short circuiting
- DO NOT short circuit
- DO NOT use if wrapper or insulator is damaged or torn
- DO NOT use if damaged in any way
- DO NOT overcharge or over-discharge
- DO NOT modify, disassemble, puncture, cut, crush, or incinerate
- DO NOT expose to liquids or high temperatures
- DO NOT solder, spot weld only
- User must be familiar with handling lithium-ion batteries before purchase
- Usage of batteries is AT YOUR OWN RISK
- ALWAYS charge in or on a fire-proof surface and never leave charging batteries unattended
- RESELLERS MUST FORWARD ALL WARNINGS TO ALL CUSTOMERS FOR THEIR REFERENCE AND SAFETY

Local regulations and laws pertaining to the recycling and disposal of lithium ion batteries vary so please consult your local jurisdiction regarding appropriate disposal.

HUMAN PLUS