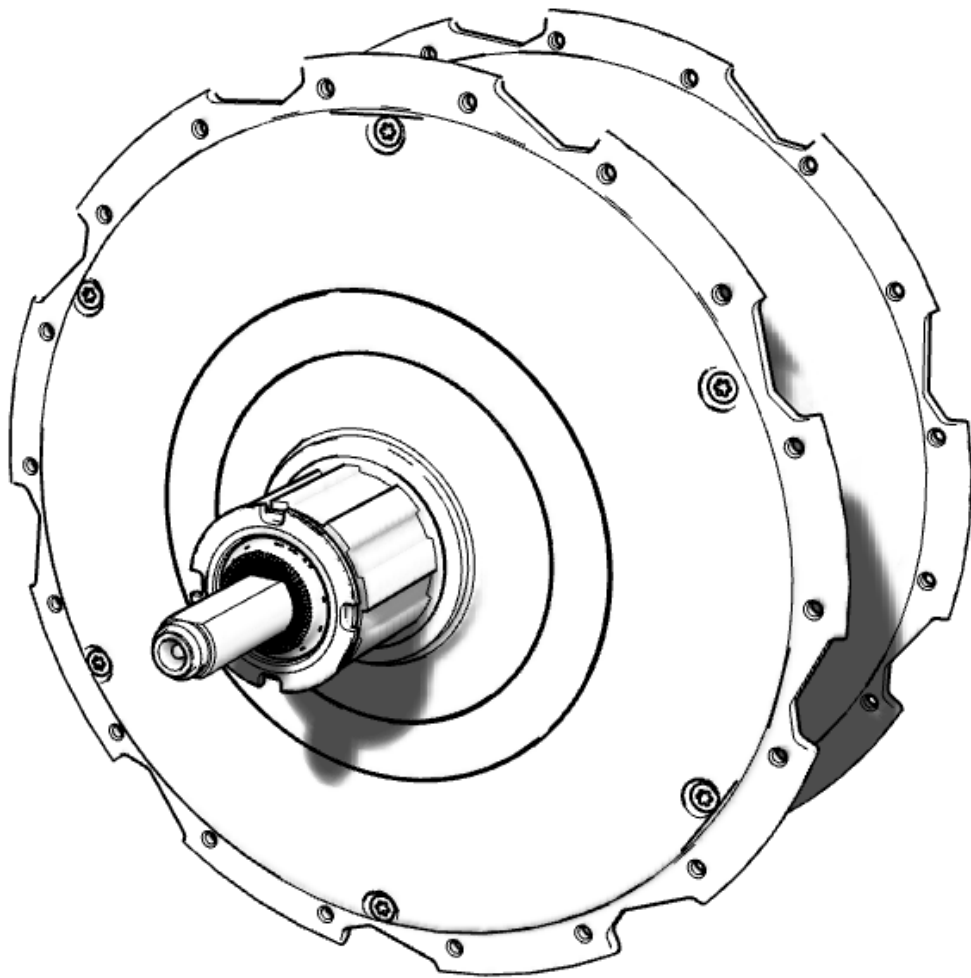


ZEHUS

BIKE all in one generation 2



OEM manual

Doc. Rev. 1.2

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1. Introduction

This manual contains detailed information about Zehus BIKE all in one products. This manual shows how to build a bike frame compatible with BIKE all in one. Furthermore, it provides information on how to install Zehus products on a bike.

1.1) Differences between generation 2.0 and generation 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.x motors.
- Generation 2.1: these products features changes on the mechanical side. Please double check if you purchased Generation 2.1 Zehus all in one.

1.1.1) How to check my all in one 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

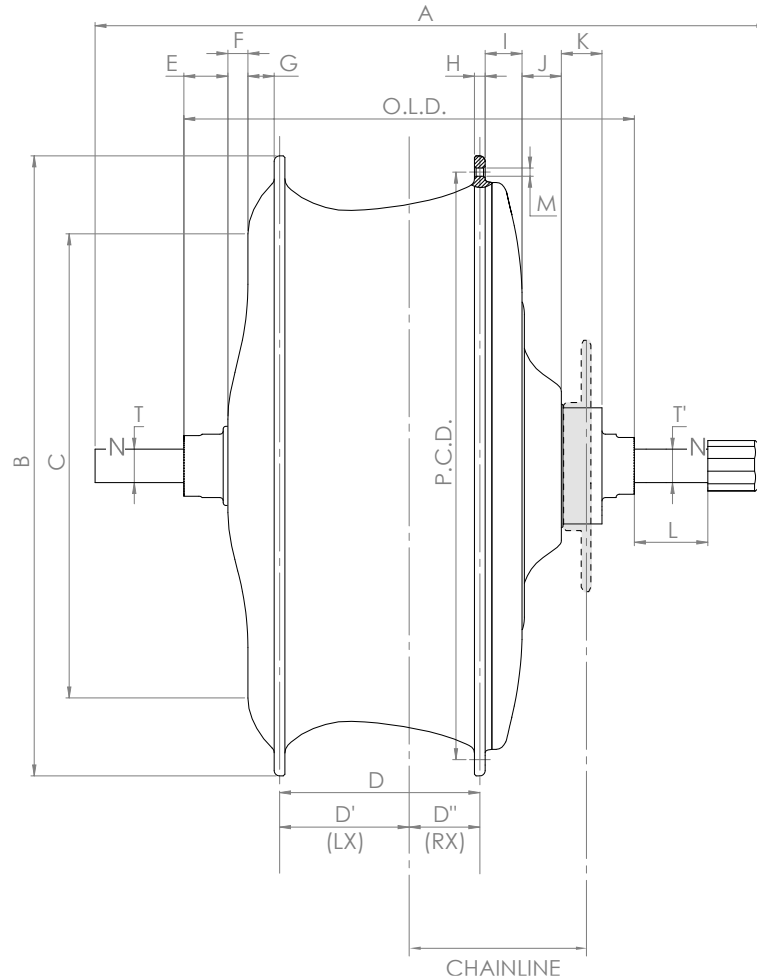
P/N: YB991XXX – Generation 2.0

P/N: YB992XXX – Generation 2.1

2. Detailed dimensions of ZEHUS BIKE all in one GENERATION 2.0

REMARK: Generation 2.0 shares mechanical design from previous generation all in one motor.

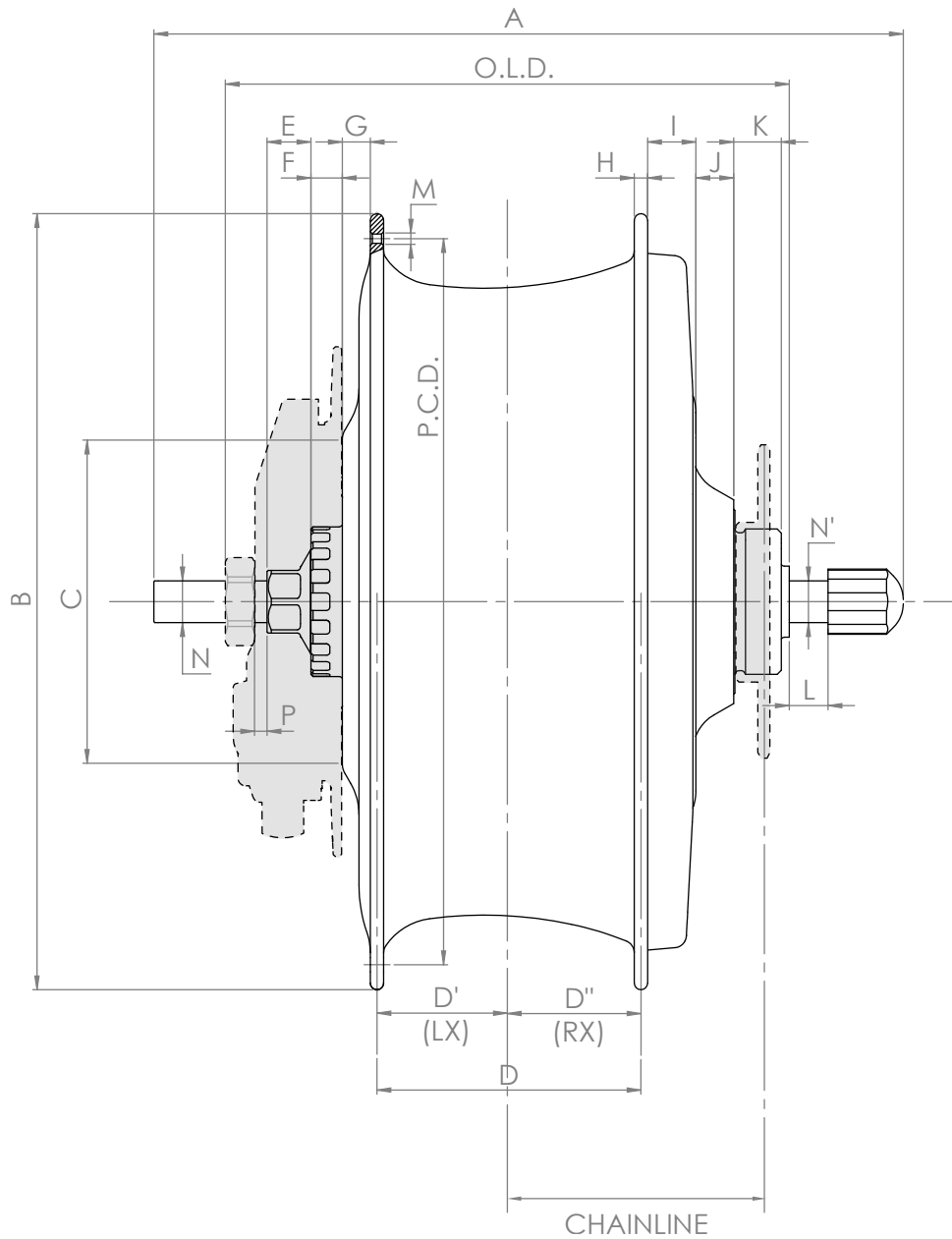
2.1) BIKE all in one for rim brakes



	O.L.D.	P.C.D.	A	B	C	D	D' (LX)
V120 mm	120	176	202,6	185,7	139	60	38,8
V135 mm	135	176	201,6	185,7	139	60	38,8
	D'' (RX)	E	F	G	H	I	J
V120 mm	21,2	5,7	6	7,9	3,2	11,05	11,75
V135 mm	21,2	13,2	6	7,9	3,2	11,05	11,75
	K	LMIN	LMAX	M	N (LX)	N' (RX)	P
V120 mm	12,2	22	24,7	2,45	10	10	N/A
V135 mm	12,2	22	24,7	2,45	10	10	N/A

CHAINLINE is 45,6 ÷ 57,8 mm for both versions. With a regular single speed sprocket (5 mm) CHAINLINE would be 50,6 mm.

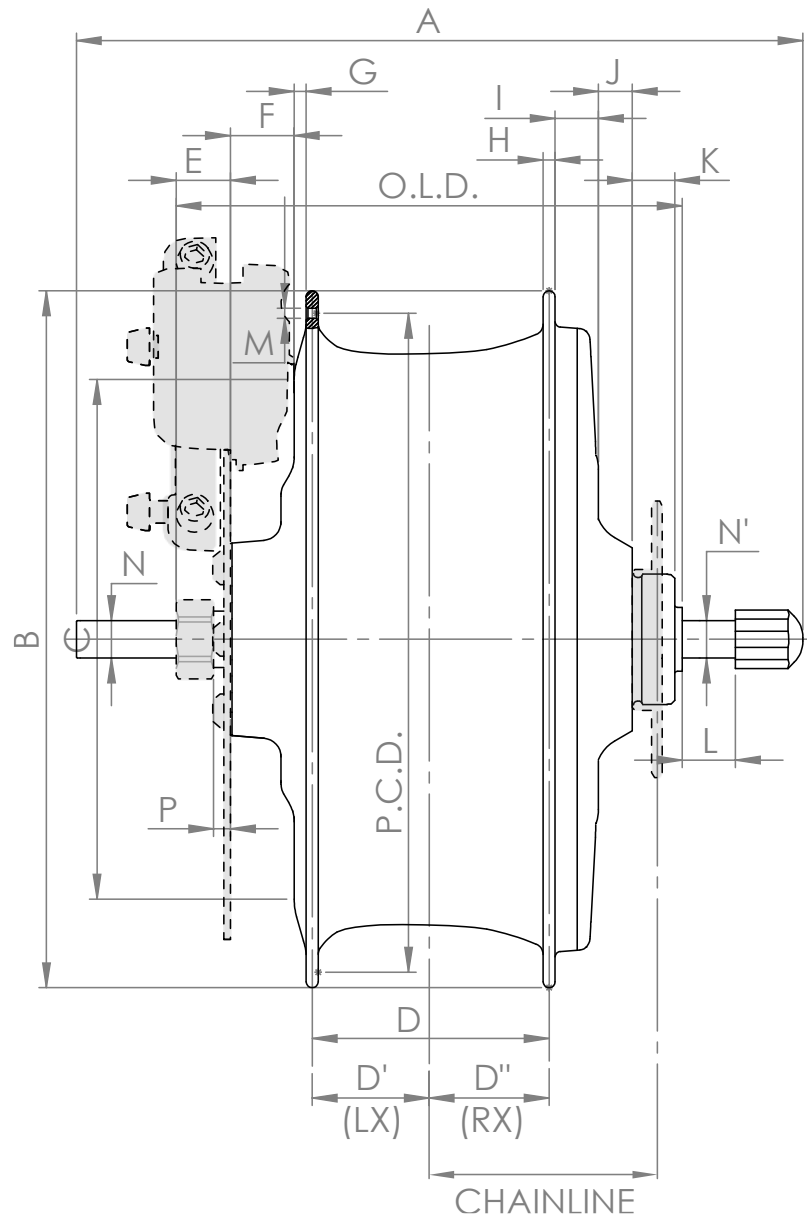
2.2) BIKE all in one for roller brake



	O.L.D.	P.C.D.	A	B	C	D	D' (LX)
RB	135	176	179,4	185,7	77,3	63,2	31,2
	D'' (RX)	E	F	G	H	I	J
RB	32	10,5	7,5	6,7	3,2	11,55	9,05
	K	LMIN	LMAX	M	N (LX)	N' (RX)	P
RB	11,4	9,3	11	2,7	10	10	3

CHAINLINE is 54,2 ÷ 65,6 mm for both versions. With a regular single speed sprocket (5 mm) CHAINLINE would be 59,2 mm.

2.3) BIKE all in one for disc brakes



	O.L.D.	P.C.D.	A	B	C	D	D' (LX)
DISC IS-PM	135	173,75	193,8	185,7	138,5	63,2	31,2
	D'' (RX)	E	F	G	H	I	J
DISC IS-PM	32	14,5	17	3,2	3,2	11,55	9,05
	K	LMIN	LMAX	M	N (LX)	N' (RX)	P
DISC IS-PM	11,3	14,2	16,9	2,7	10	10	4,5

CHAINLINE is 54,2 ÷ 65,6 mm for both versions. With a regular single speed sprocket (5 mm) CHAINLINE would be 59,2 mm.

2.4) Table of dimensions for GENERATION 2.0

In the following you can find a chart to compare the dimensions provided above:

	V120mm	V135mm	RB	DISC ZS	DISC IS-PM
O.L.D.	120	135	135	135	135
P.C.D.	176	176	176	176	173,75
A	202,6	201,6	179,4	202,6	193,8
B	185,7	185,7	185,7	185,7	185,7
C	139	139	77,3	139	138,5
D	60	60	63,2	60	63,2
D' (LX)	38,8	38,8	31,2	31,3	31,2
D" (RX)	21,2	21,2	32	28,7	32
E	5,7	13,2	10,5	8,3	14,5
F	6	6	7,5	18,4	17
G	7,9	7,9	6,7	7,9	3,2
H	3,2	3,2	3,2	3,2	3,2
I	11,05	11,05	11,55	11,05	11,55
J	11,75	11,75	9,05	11,75	9,05
K	12,2	12,2	11,4	12,2	11,3
LMIN	22	22	9,3	22	14,2
LMAX	24,7	24,7	11	24,7	16,9
M	2,45	2,45	2,7	2,45	2,7
N (LX)	10	10	10	10	10
N' (RX)	10	10	10	10	10
P			3		4,5
CHAINLINE	43,6÷55,8	43,6÷55,8	54,2÷65,6	53,1÷65,3	54,2÷65,6
CHAINLINE*	48,6	48,6	59,2	58,1	59,2

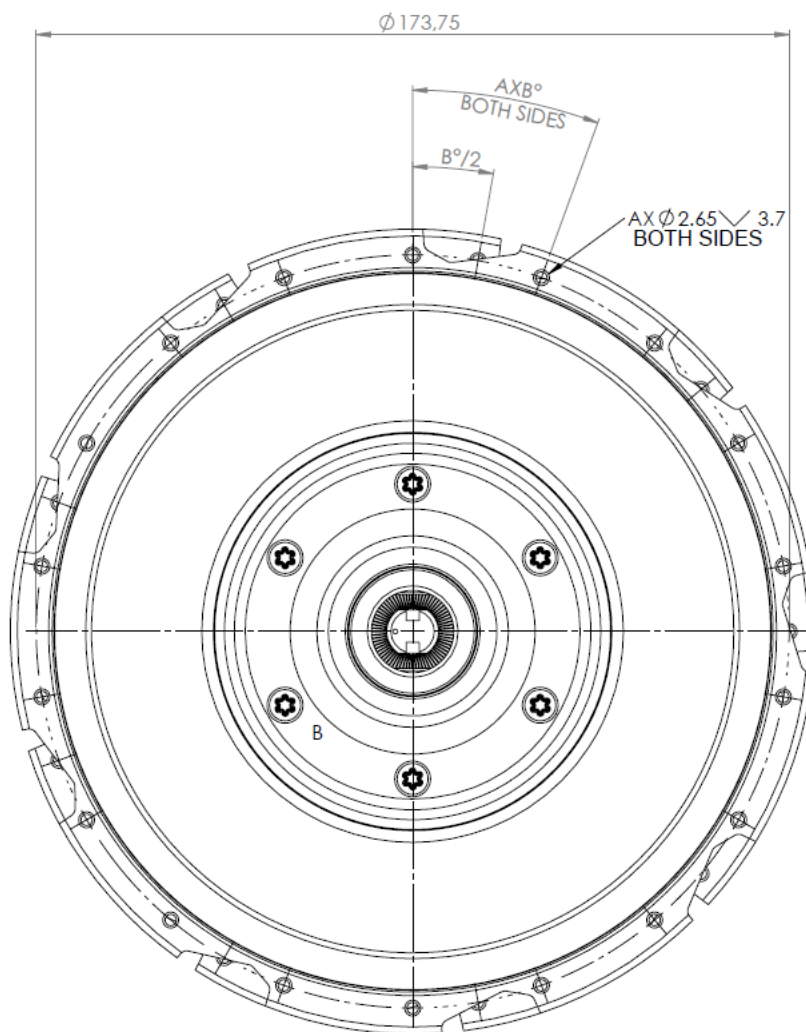
*with a standard single speed sprocket

3. Detailed dimensions of ZEHUS BIKE all in one GENERATION 2.1

REMARK: Generation 2.1 includes major design changes. Please check your frame with respect to the below mentioned charts if your part number is shares mechanical design from previous generation all in one motor.

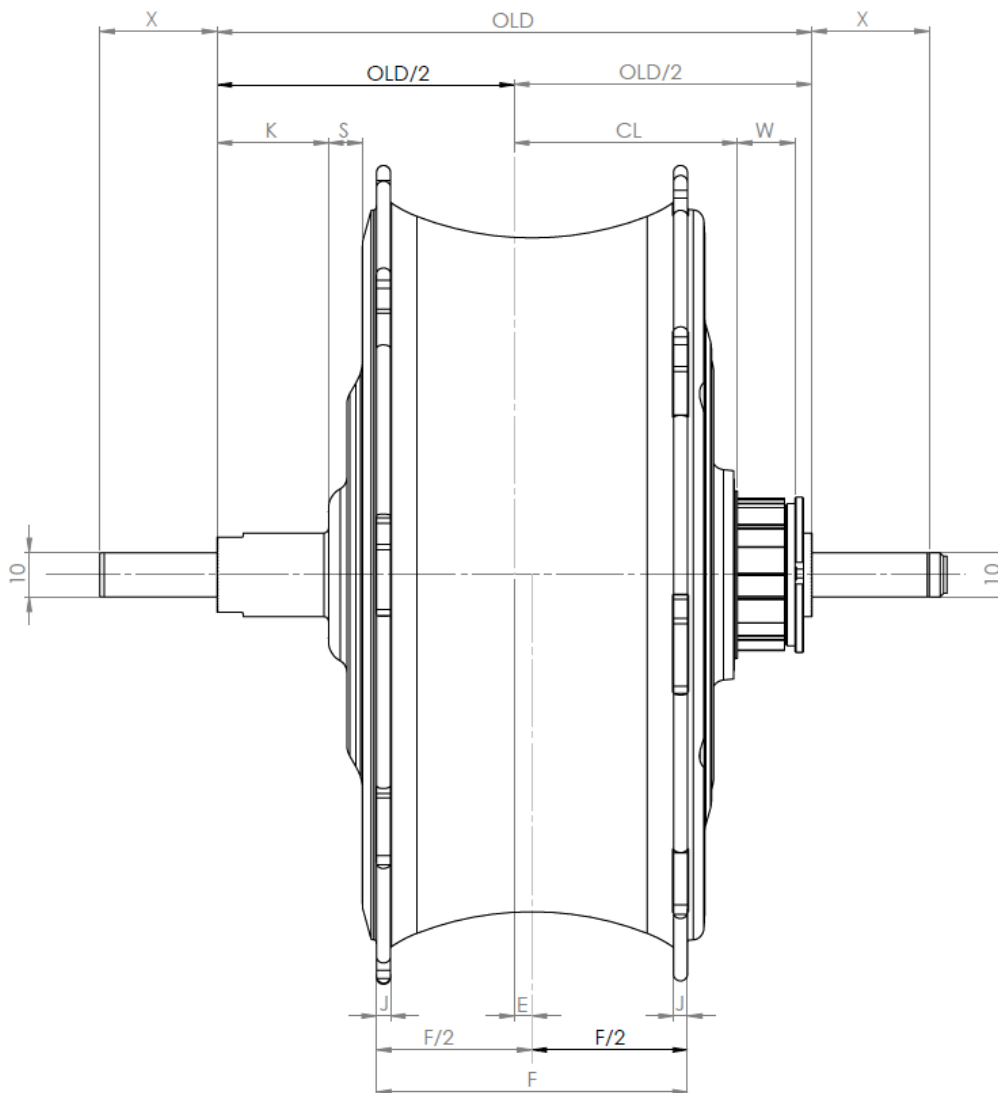
3.1) BIKE all in one for rim brake, up to 9 SPEED

3.1.1) Front view



	PCD	A	B
32H	173,75	16	22,5°
36H	173,75	18	20,0°

3.1.2) Side view



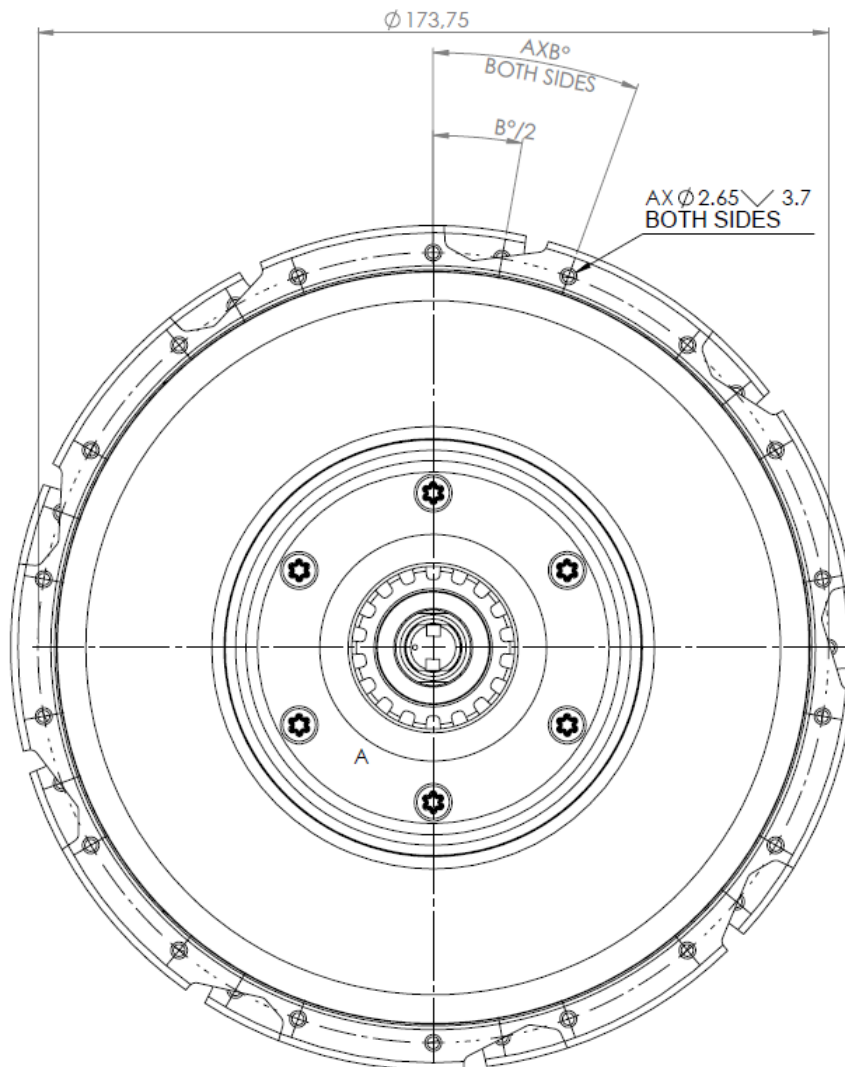
BRAKE	SPEEDS	OLD	CL	W	E	F	J	K	S	X
RIM	1-4	120	50,6	13,1	4,0	70,6	3,2	17,8	7,7	26,6
RIM	1-4	135	50,6	13,1	4,0	70,6	3,2	25,3	7,7	26,6
RIM	9	135	34,6	29,1	-14,8	70,6	3,2	6,6	7,7	26,6

FREEWHEEL is a Shimano 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.

Cassette for multi-speed are custom cassette designed for 11S spacing. For custom cassettes and components, please refer to chapter 5.4).

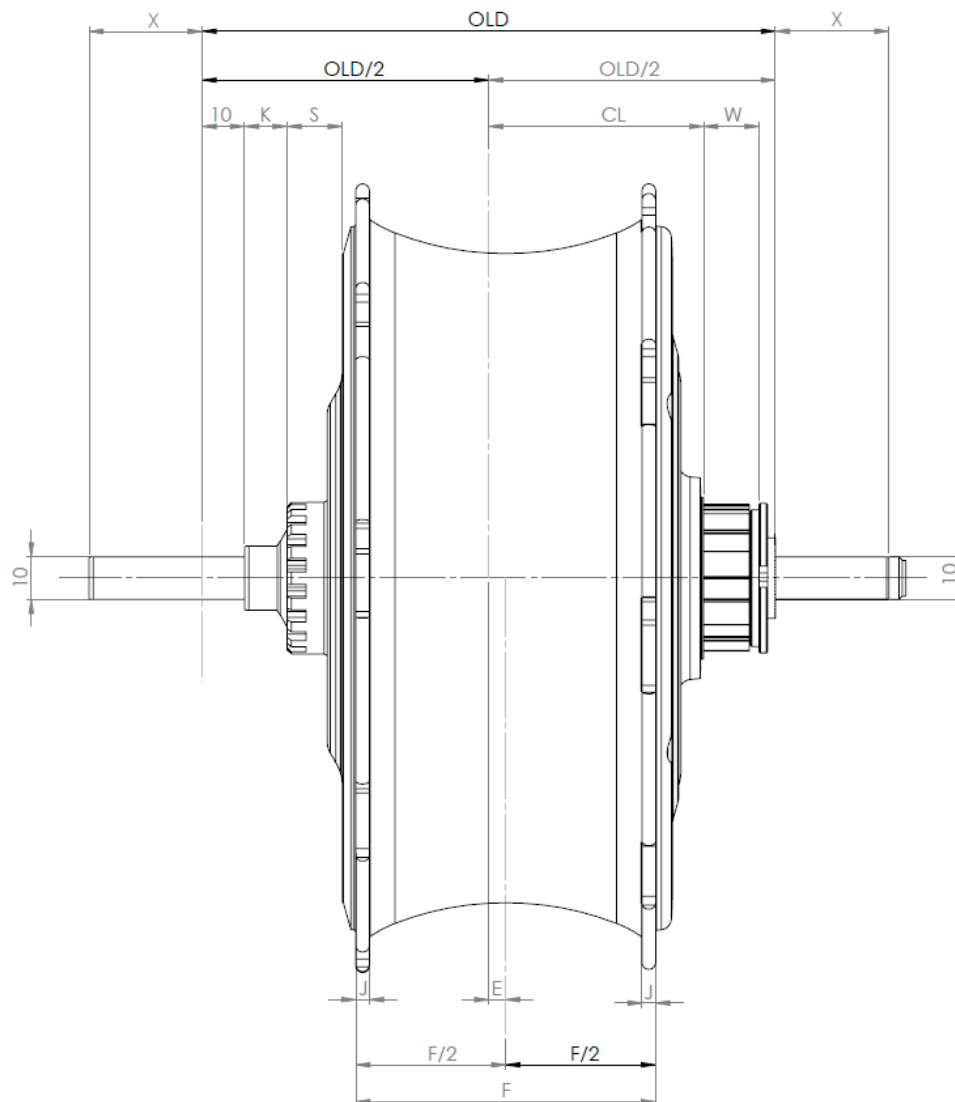
3.2) BIKE all in one for roller brake

3.2.1) Front view



	PCD	A	B
32H	173,75	16	22,5°
36H	173,75	18	20,0°

3.2.2) Side view



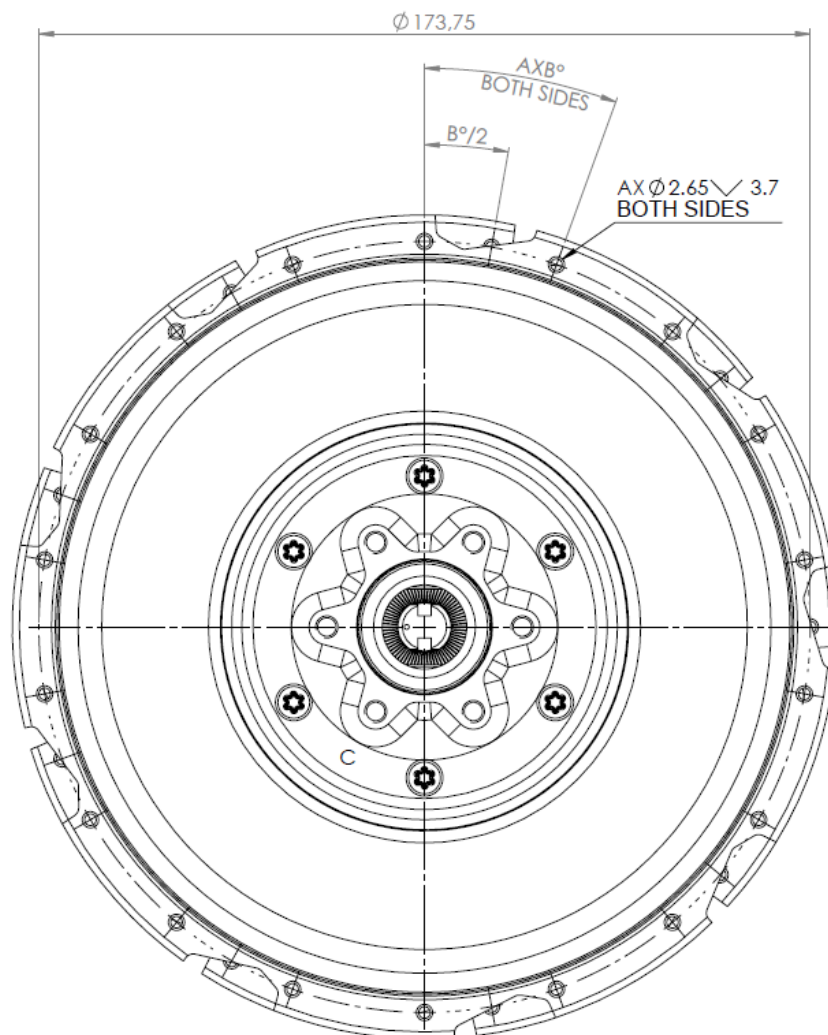
BRAKE	SPEEDS	OLD	CL	W	E	F	J	K	S	X
ROLLER	1-4	135	50,6	13,1	4,0	70,6	3,2	11,0	12,0	26,6

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. All dimensions are in mm.

Cassette for multi-speed are custom cassette designed for 11S spacing. For custom cassettes and components, please refer to chapter 5.4).

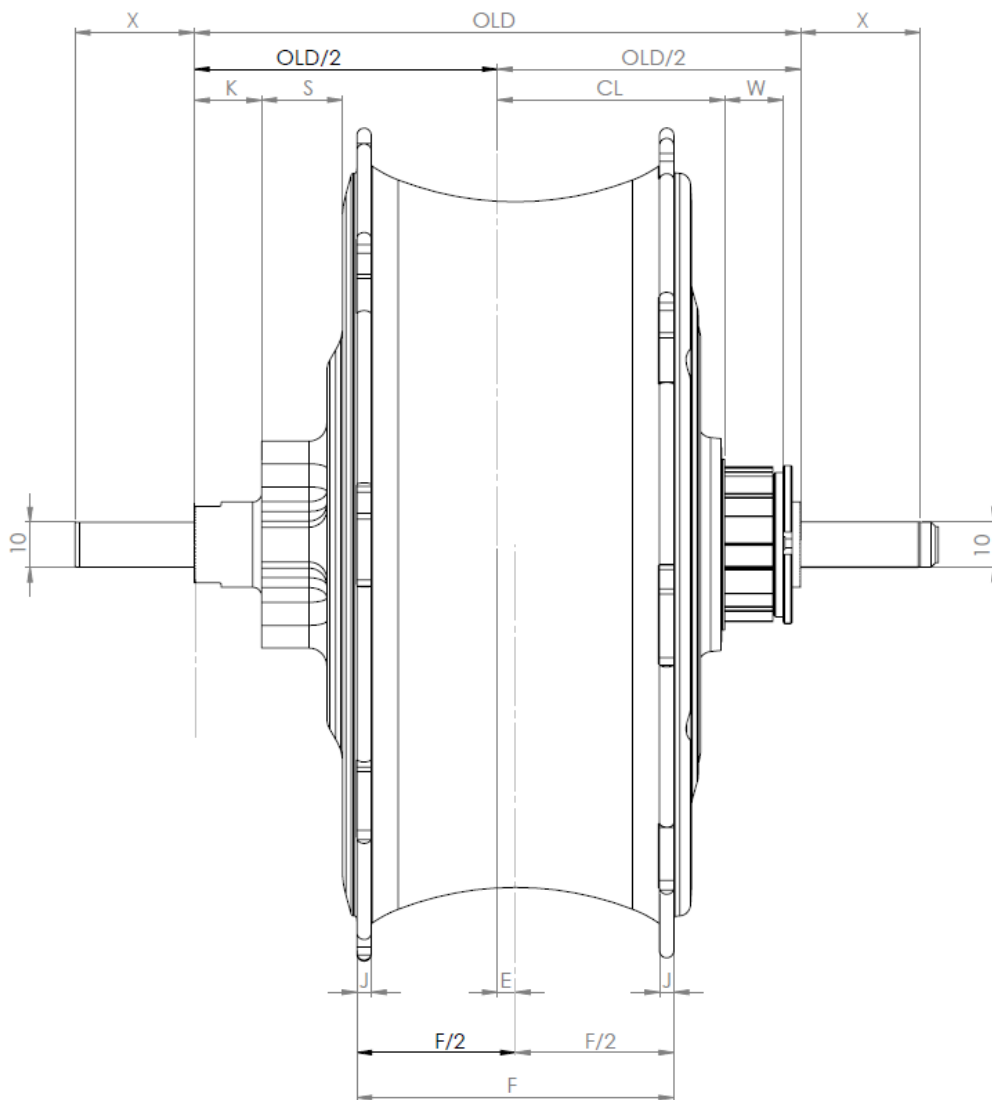
3.3) BIKE all in one for disc brake, up to 7 SPEED

3.3.1) Front view



	PCD	A	B
32H	173,75	16	22,5°
36H	173,75	18	20,0°

3.3.2) Side view



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

FREEWHEEL is a Shimano 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.

Cassette for multi-speed are custom cassette designed for 11S spacing. For custom cassette and components, please refer to chapter 5.4).

3.4) Table of dimensions for GENERATION 2.1

See below dimensions for all versions of Zehus BIKE all in one generation 2.1:

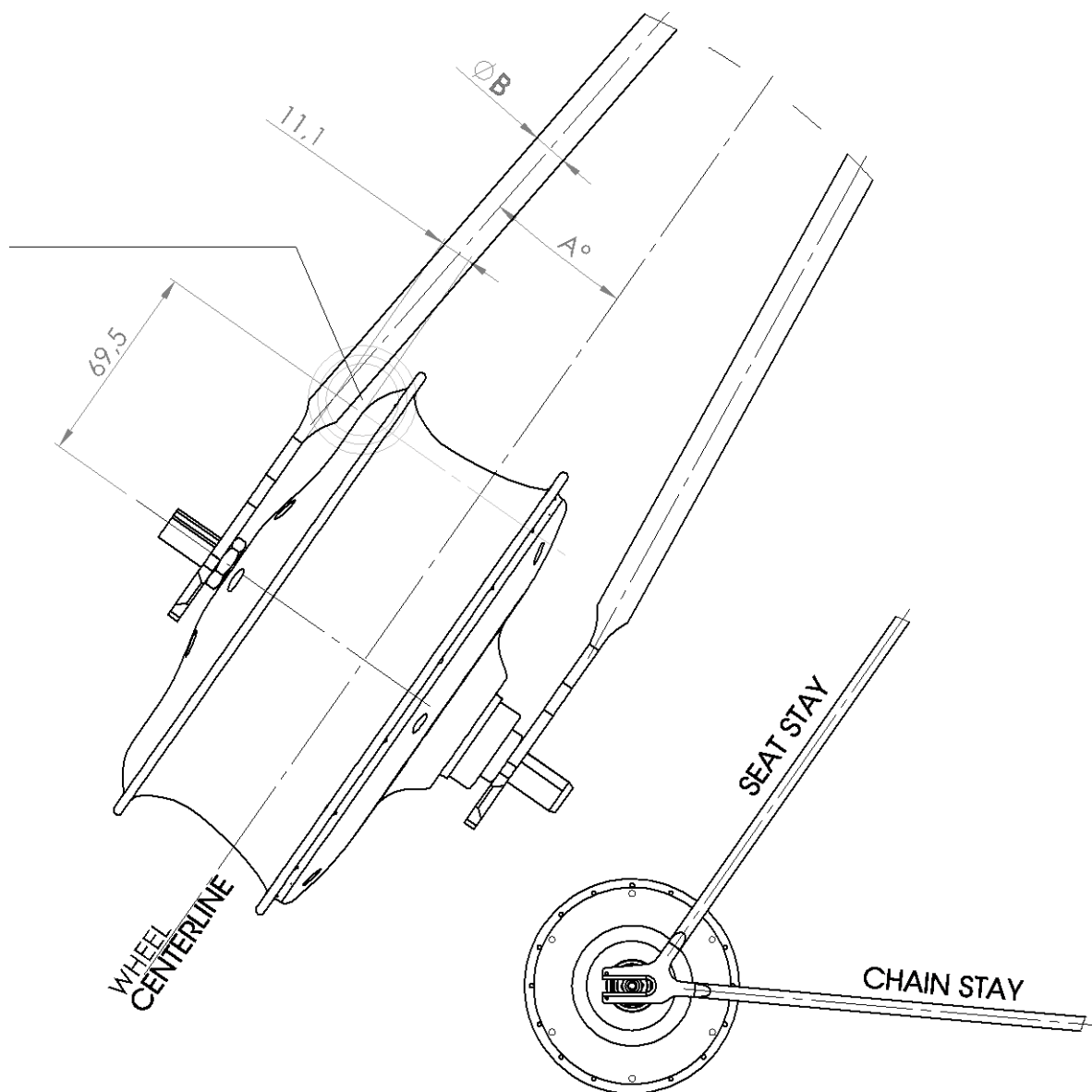
BRAKE	SPEEDS	OLD	CL	W	E	F	J	K	S	X
RIM	1-4	120	50,6	13,1	4,0	70,6	3,2	17,8	7,7	26,6
RIM	1-4	135	50,6	13,1	4,0	70,6	3,2	25,3	7,7	26,6
RIM	9	135	34,6	29,1	-14,8	70,6	3,2	6,6	7,7	26,6
ROLLER	1-4	135	50,6	13,1	4,0	70,6	3,2	20,0	13,0	26,6
DISC	1-4	135	50,6	13,1	4,0	70,6	3,2	15,0	18,0	26,6
DISC	7	147	44,6	24,3	-2,0	70,6	3,2	15,0	18,0	26,6

4. Frame building guidelines

This part of the manual is intended to be a guide for building a frame that suites Zehus BIKE all in one. Please read this manual **carefully**. Applies to all item codes.

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 BIKE all in one.



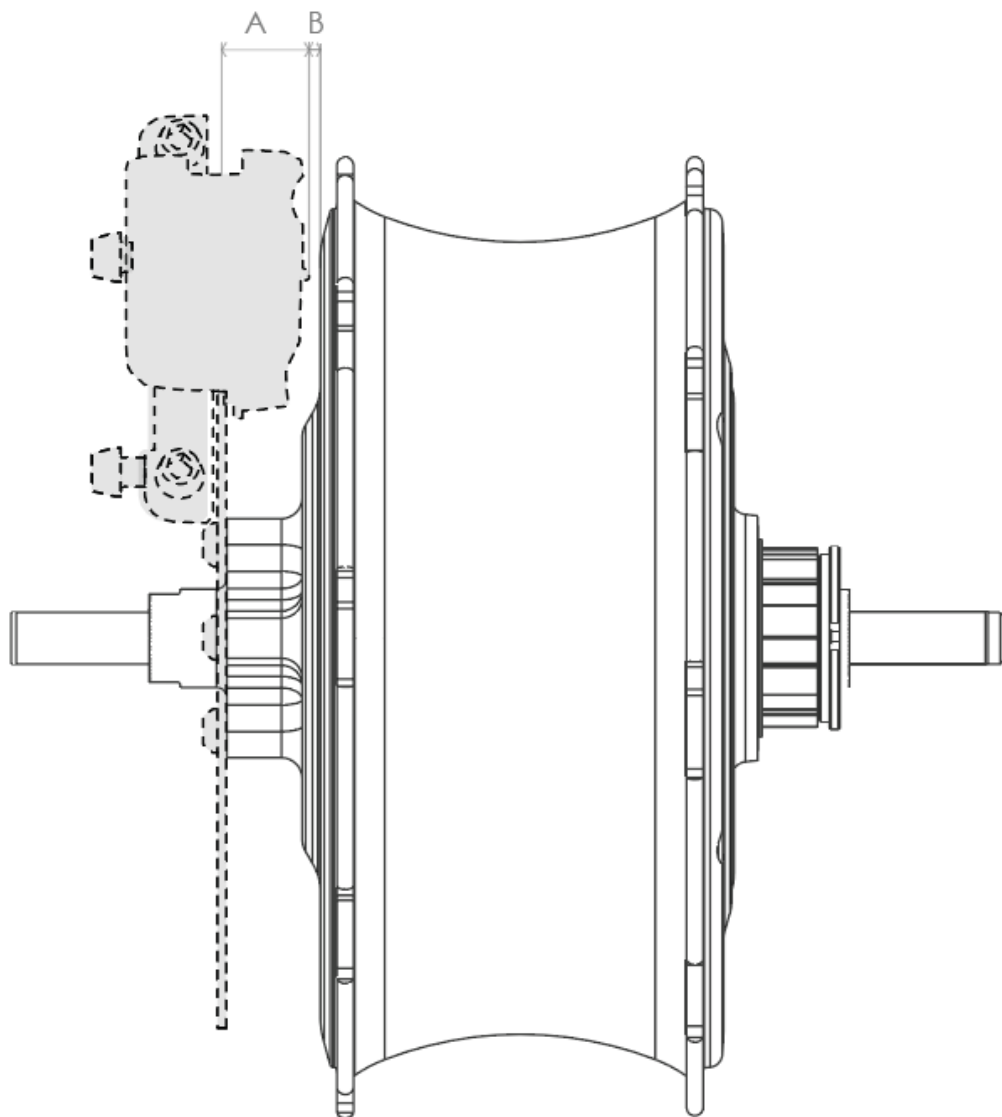
The gap between Zehus BIKE all in one and both chain and seat stays depends on many factors, such as the angle A° , the frame pipe diameter B and the dropout shape. The advice is to use pipes with a diameter $B < 12\text{mm}$ and angle $A^\circ < 6^\circ$, using a standard track dropout. Please be careful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

4.1) DISC BRAKE – CALIPER compatibility

4.1.1) COMPATIBLE CALIPER

Please check CALIPER "A" dimension with the brake manufacturer. Suggested distance "B" is 2 mm. Minimum distance "B" is 1.5 mm.

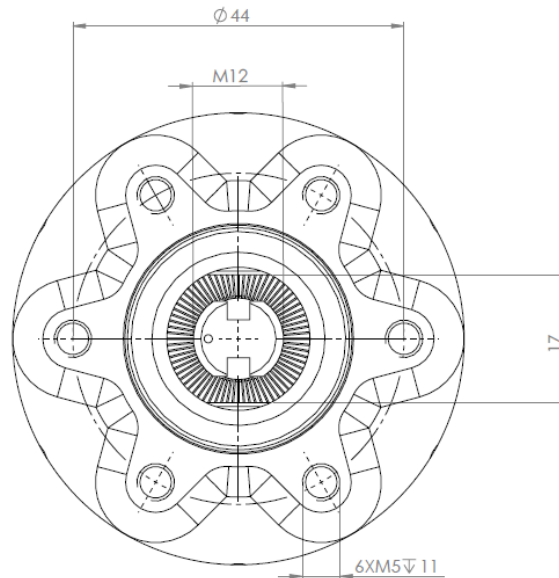
THE MINIMUM CLEARANCE BETWEEN THE CALIPER AND THE HUB SHALL BE RESPECTED.



Please ALWAYS check dimensions of brake caliper and adapters with your brake manufacturer!

4.1.2) DISK ROTOR COMPATIBILITY

Zehus disc brake All in One hub is compatible with all six-bolt IS disk rotor. DISK ROTOR DIAMETER MUST BE AT LEAST 160 mm.



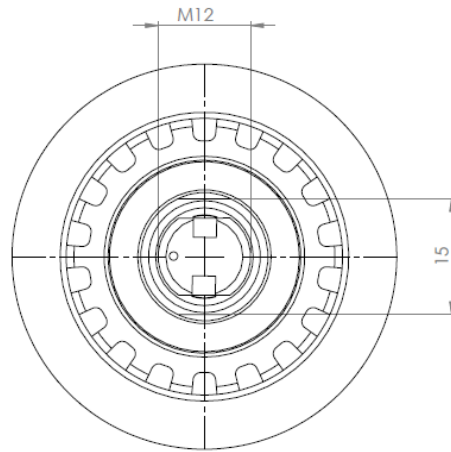
4.1.3) DISK BRAKE MOUNT DIMENSIONS

Please refer to INTERNATIONAL STANDARD / POST MOUNT / FLAT MOUNT manuals to design or purchase the correct adaptor for your Zehus all in one system.

Please always check hub dimensions to determine the final disc position.

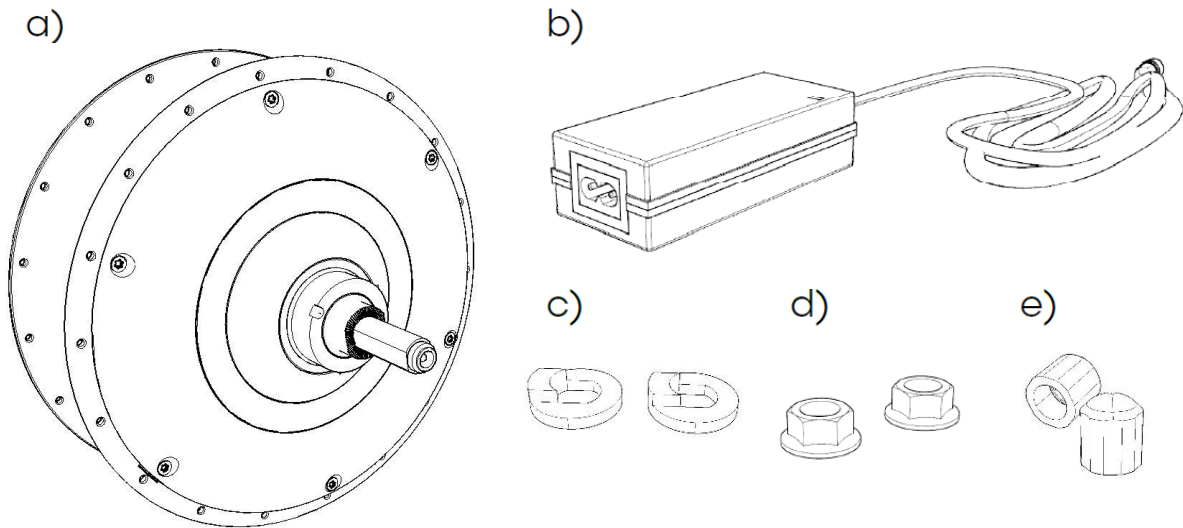
4.2) ROLLERBRAKE® COMPATIBILITY

Roller brake version for BIKE all in one is compatible with Shimano Rollerbrake® drum brakes.



5. Assembly instructions for BIKE all in one

5.1) In the Zehus Box*



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

5.2) Wheel building (lacing)

BIKE all in one 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.

5.2.1) Evaluating the correct spoke length

In order 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).

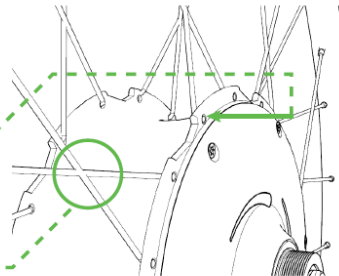
5.2.2) EN15194 Configuration

This motorized wheel building configuration has been successfully tested under the EN15194 conditions:

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

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”).

5.2.3) Important information



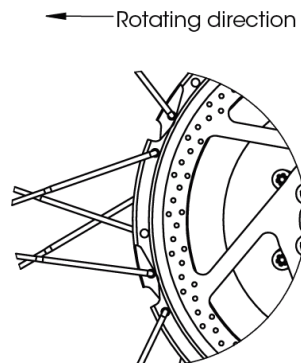
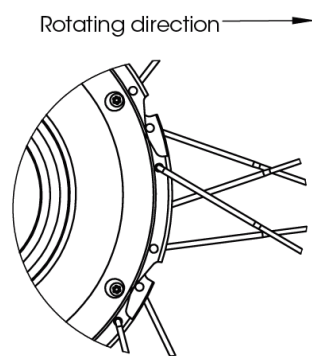
! Zehus strongly recommends to insert the spokes from **OUTSIDE** to **INSIDE** the spoke hole

! Zehus strongly recommends building **1-cross** wheels with exception of 20 inches wheels (**0-cross**)

! For **DISC BRAKE APPLICATIONS**, we recommend **1-cross** wheels. **Radial spoking (0-cross)** should not be used.

RIGHT SIDE (SPROCKET SIDE)

LEFT SIDE (DISC SIDE)



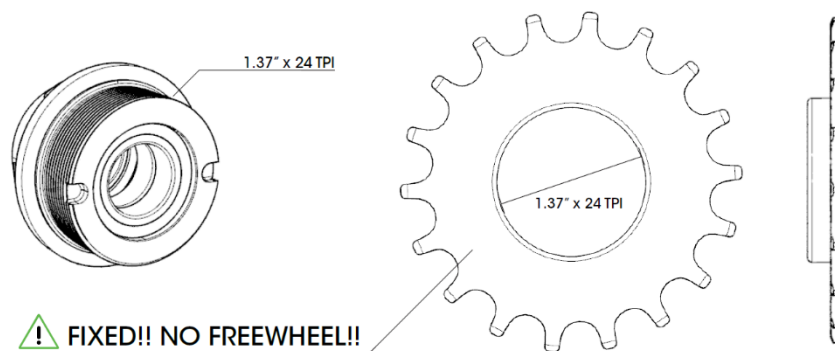
5.3) Notes on sprocket and gearbox compatibility

5.3.1) GENERATION 2.0

Chain drive systems

Since BIKE all in one embeds sensors in its Freewheel, **ONLY FIXED SPROCKET are compatible with Zehus All in One**. Embedded freewheel must be able to sense both the onward and the backward rotation of the pedals. As a matter of fact, the latter is enabling the Regenerative braking (KERS) and it is necessary to activate the assistance on the bike itself.

The freewheel is built for standard thread-on sprocket* (British standard). The freewheel is threaded with 1.37" x 24 TPI left Thread on the sprocket – not included - to the freewheel body. Please be careful in using a chain compatible with the sprocket you chose.



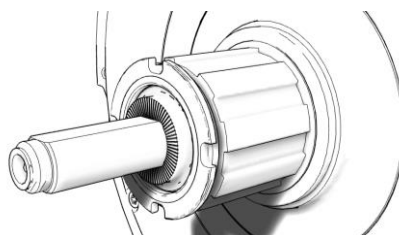
BELT DRIVE systems

BIKE all in one is compatible with standard belt drive systems. Please make sure that your belt sprocket is not a Freewheel sprocket; otherwise sensors integrated in Zehus freewheel will not detect the backwards pedalling.



5.3.2) GENERATION 2.1

Generation 2.1 freewheeling system is compatible with Shimano 9-SPLINES sprockets. A custom lockring is provided by Zehus. You may need spacers to adopt the sprocket to your preferred chainline.



5.3.3) NOTES on front gearbox systems

BIKE all in one embeds:

- Safety turn on button: this button is available on the smartphone app. 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 pedalling 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*

Zehus Cassette System

5.4) NOTES on cassette compatibility

5.4.1) Technical data on freewheel body

Speeds	Interface type	Sprocket width	Spacer width	Body width	Lockring	Notes
4	Shimano 9 Splines	1,6 mm	2,3 mm	13,1 mm	Zehus	11 speed Standard spacing
7	Shimano 9 Splines	1,6 mm	2,3 mm	24,3 mm	Zehus	11 speed Standard spacing
9	Shimano 9 Splines	1,6 mm	2,3 mm	29,1 mm	Zehus	11 speed Standard spacing

5.4.2) Technical data on derailleur

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

5.4.3) Technical data on shifter

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

5.4.4) Cassette compatibility

4 speed cassette and 9 speed cassette

At the moment, custom cassettes produced by SRSA are available on demand to fit Zehus 4, 7 or 9 speed BIKE all in one.

SRSA custom cassettes data

The following table shows sprockets in SRSA custom cassettes built for Zehus BIKE 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%**

Notes on 7 speed cassette

Any 7-speed cassette with 11S spacing, 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.

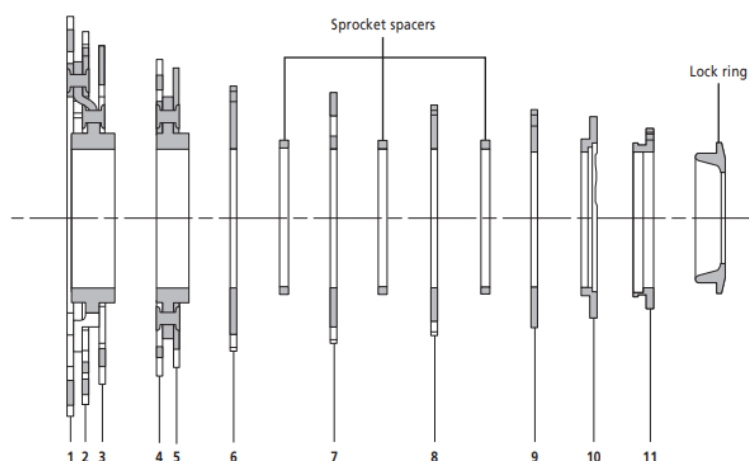
Please double check with the manufacturer for further information. Zehus declines any responsibility for non-compatible components use

As in the above case of the 4 and 9 speed cassette, it is possible to source from SRSA a custom cassette that they provide for Zehus BIKE all in one 7 Speed models.

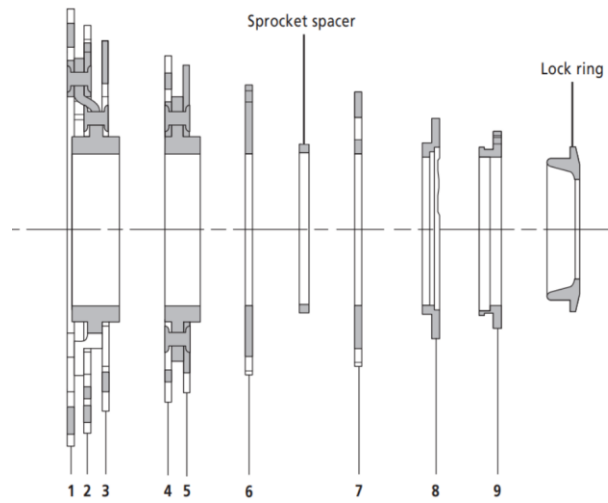
Adjusting existing 11-speed cassette

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

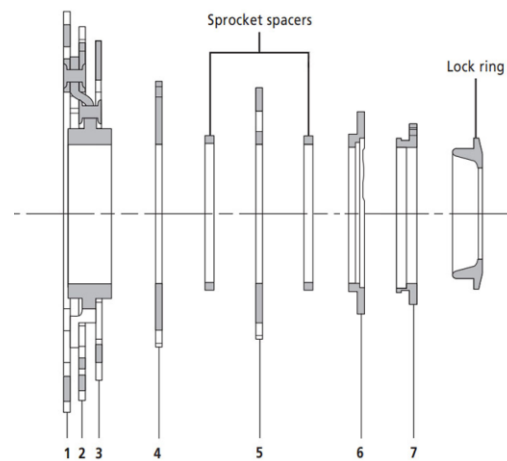
Please check that dimensions of the cassette are compatible with Zehus cassette body. Zehus declines any responsibility for non-compatible components use.



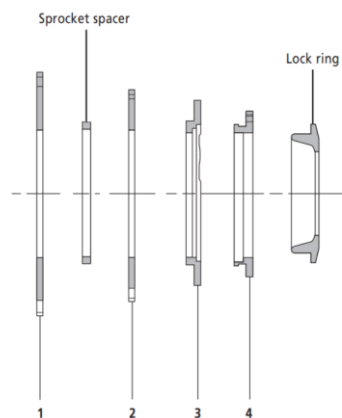
Example #1: 9-speed cassette from the above 11-speed cassette:



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



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



5.4.5) 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.

5.4.6) Shifter compatibility

SRSA can provide a thumb shifter with 11S indexing limited to 4, 7 or 9 speeds according to BIKE all in one specification.

11 S Thumb shifter customized for Zehus is the following:



DLEX33N RE

- Single Shift
- Without Gear Display
- 251g / pair

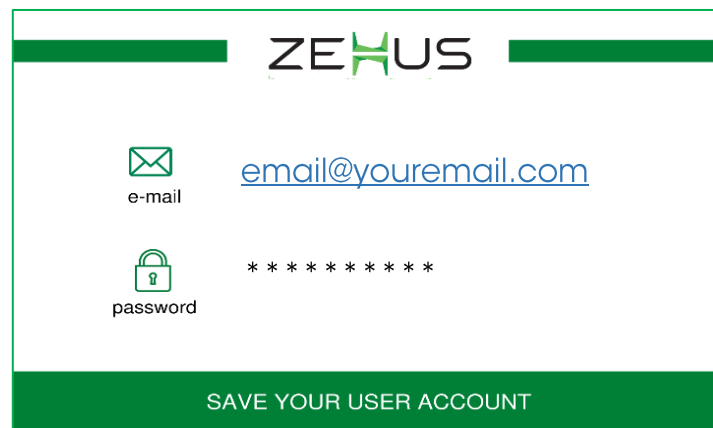
7 speed shifters

As per 7 speed cassettes, shifter adopted by some downhill groupsets could be compatible with Zehus BIKE all in one 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

6. Zehus Manufacturer Portal tool



The image shows a login form for the Zehus Manufacturer Portal. At the top, the ZEHUS logo is displayed in a green bar. Below the logo, there are two input fields. The first field is for the email address, with a green envelope icon to its left and the text "e-mail" below it. The email address "email@youremail.com" is entered in blue text. The second field is for the password, with a green padlock icon to its left and the text "password" below it. The password is masked with ten asterisks. At the bottom of the form, there is a green bar with the text "SAVE YOUR USER ACCOUNT" in white.

Welcome to the new Zehus Manufacturer Portal.

This portal will guide you during The End of Line procedure that is mandatory to allow your bike to work properly.

You will have the full access to the data related to your vehicles, for this reason is so important that all motors are proper associated to specific vehicle brand and model.

Bitride® Connect App will read from this portal all bike data (Brand, Model, Vehicle) and will modify and customize itself automatically if your Brand has implemented a customized version of the Bitride® Connect App.

Moreover, with this portal you can store vehicles information and track where hubs are installed.

6.1) Minimum Requirements

An Internet browser shall be used to access Zehus Manufacturer Portal, suggested compatible browser is Google Chrome.

6.2) Access

Once you received your credential (username and password) from Zehus you can access to the portal at this link: <https://zehusvehiclemanufacturer-prod.azurewebsites.net>

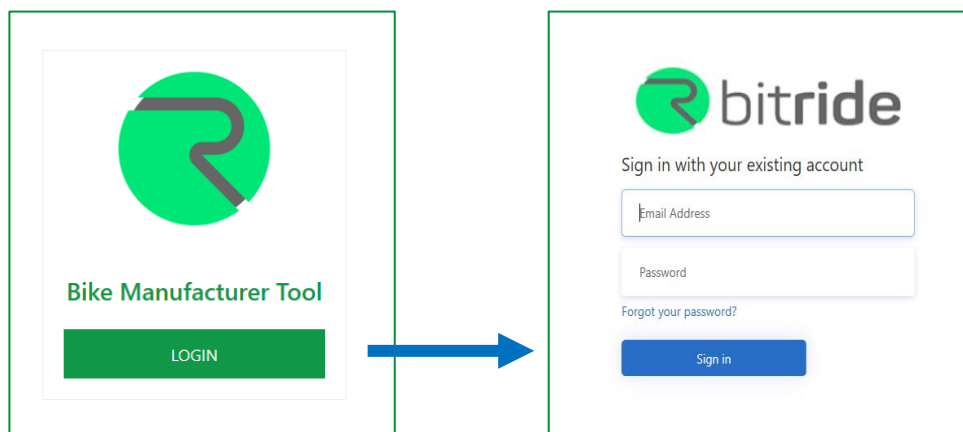
You cannot register new credentials by yourself. You need to ask new credentials following the link: https://www.zehus.it/manuf_registration/

For any doubt please contact Zehus at: support@zehus.it

6.3) Login

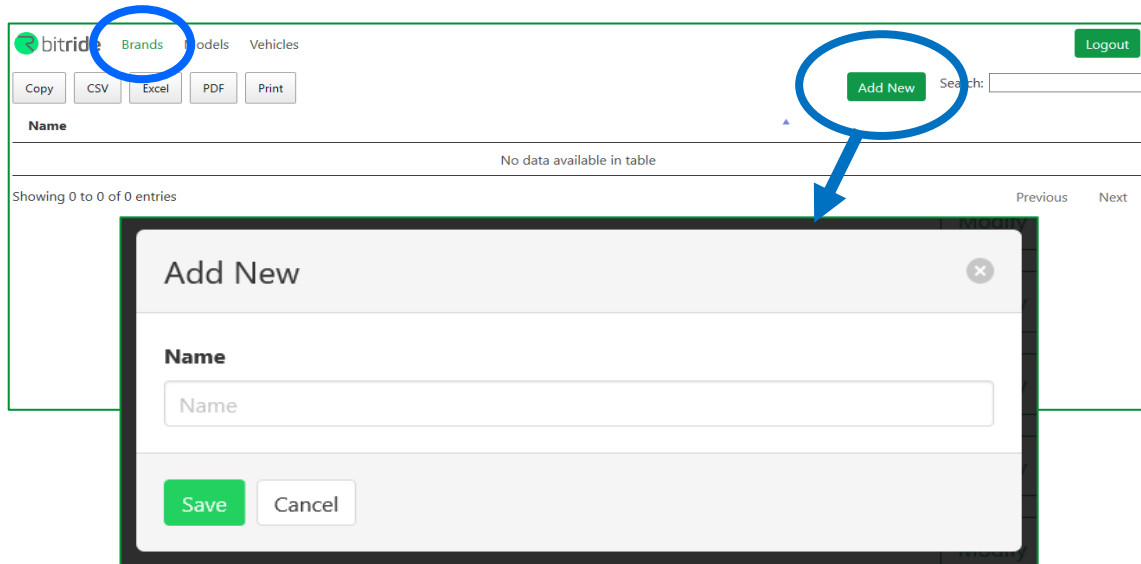
To login type username and password that Zehus provided to you.

Once logged into the Manufacturer Portal you will be able to maintain your portal profile automatically updated.



6.4) BRAND CREATION

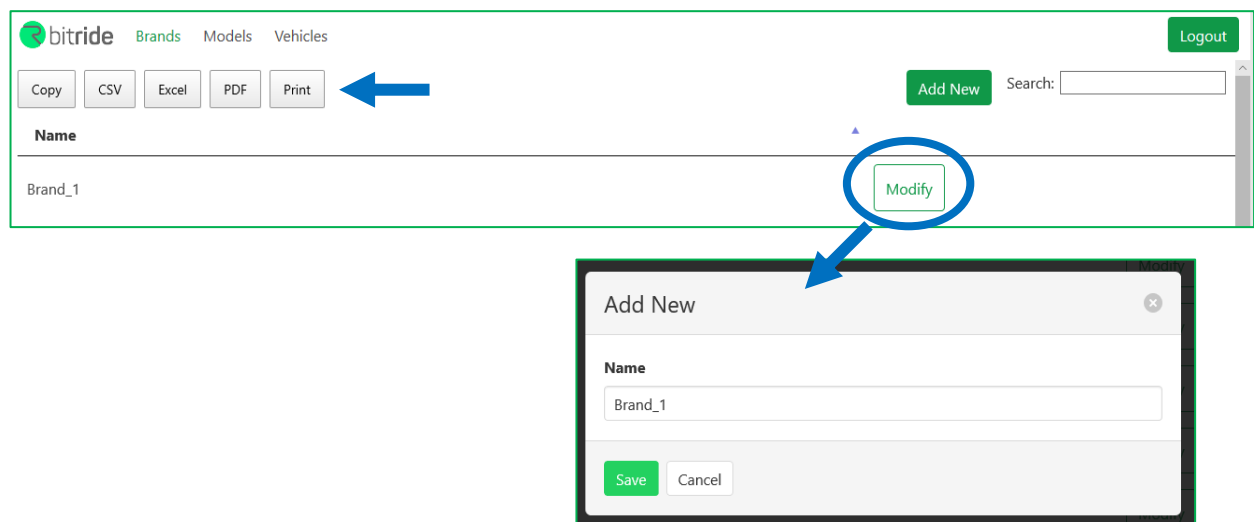
In the first page you can add vehicle's Brand name. To add a new Brand Vehicle use the button *Add New*, then insert the name of the brand and save the data.



To modify the Brand's name please click on the button *Modify*.

If you want to export the data you can:

- copy them and then past using the button *Copy*,
- export a CSV file using the button *CSV*,
- export an Excel file using the button *Excel*,
- export a PDF file using the button *PDF*,
- Print them using the button *Print*.



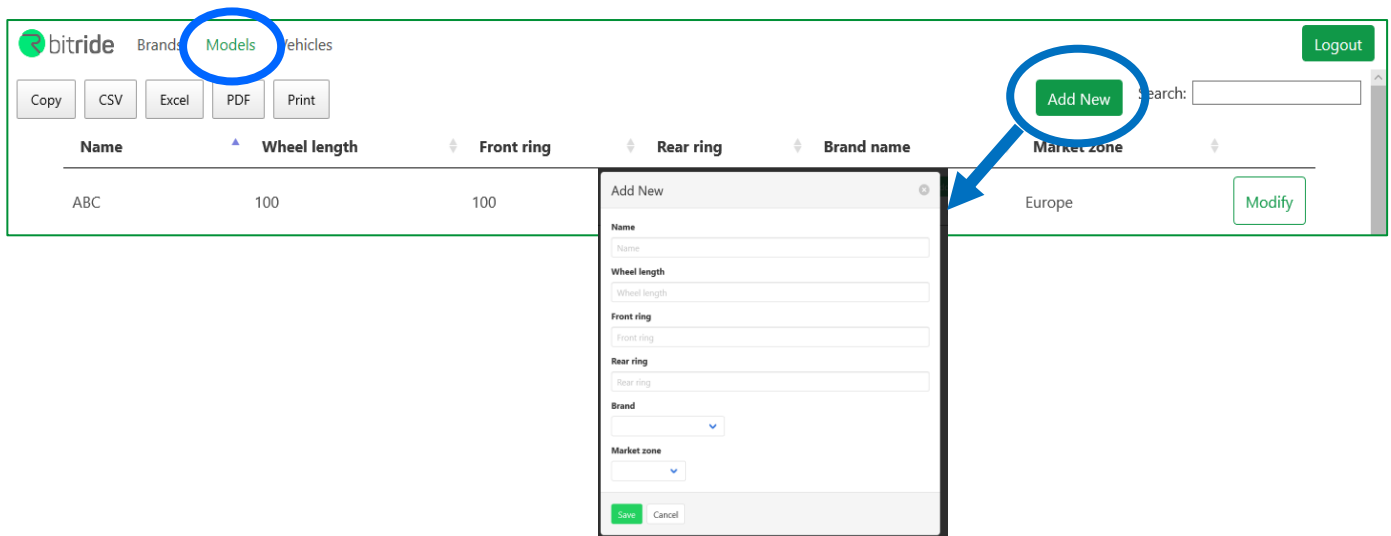
6.5) MODELS CREATION

Once created Brand you can add Models clicking on the Models page.

To add a new Model use the button *Add New*, then insert bike model data:

- Name
- Wheel length
- Front Ring
- Rear Ring
- Brand
- Market zone

To modify a Model please click on the button *Modify*.



6.6) VEHICLES CREATION

Once created and Models you can configure Vehicles clicking on the Vehicles page.

1.1 To add a new Vehicle please click on the button *Add New*, then insert vehicle details:

- Serial Number
- Frame Number
- Model

To modify a Vehicle please click on the button *Modify*.

The screenshot displays the 'bitride' web application interface. At the top, navigation tabs include 'Brands', 'Models', and 'Vehicles', with 'Vehicles' highlighted. A 'Logout' button is in the top right corner. Below the navigation, there are 'Table' and 'Map' view options, and a set of action buttons: 'Copy', 'CSV', 'Excel', 'PDF', and 'Print'. A table lists vehicle records with columns: 'Frame number', 'Serial number', 'Model', 'Wheel length', 'Front ring', 'Rear ring', 'VehicleBrand', and 'Manufacturer'. A row shows values: '00000', '9020139517', 'Model_1', '1213', '46', '18', 'Brand', and 'Zehus'. An 'Add New' button is circled in blue, and a blue arrow points from it to a modal form titled 'Add New'. The modal form contains input fields for 'Serial number', 'Frame number', and a dropdown menu for 'Model', with 'Save' and 'Cancel' buttons at the bottom.