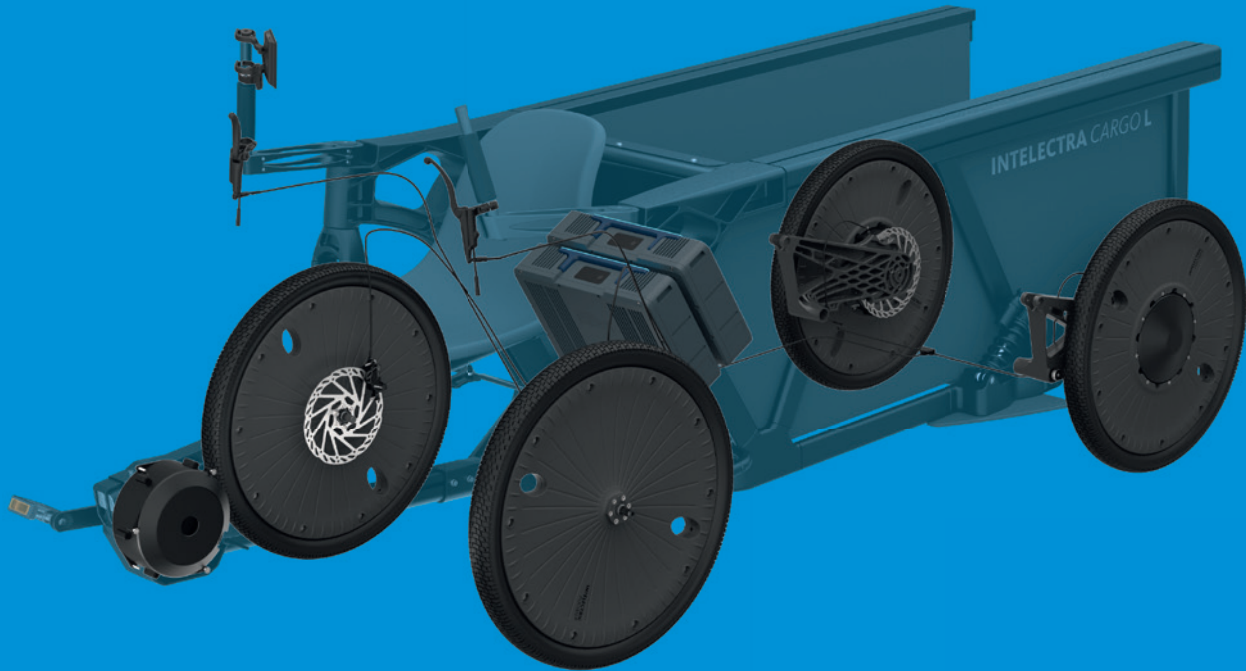


SERIAL HYBRID SYSTEM (iSHS)



CONTENT

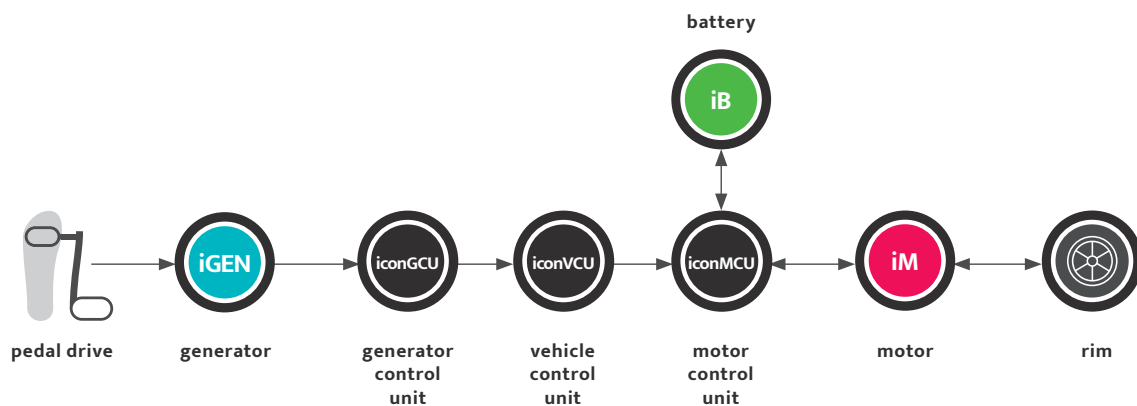
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SERIAL HYBRID SYSTEM (iSHS)

THE INTELECTRIC SERIAL HYBRID SYSTEM (OR ISHS) CONSIST OF SEVERAL COMPONENTS, WHICH WILL ADDRESS THE ADOPTION OF THE SYSTEM TO DIFFERENT REQUIREMENTS.

The Intelectric Serial Hybrid System (iSHS) consists of a chain of generator (iGEN), control units and a vehicle control unit (iVCU) which is responsible to calculate commands to drive the motor(s) (iM) via the Motor control units (iMCU). The battery (iB) acts as energy source and storage and powers the 48 V power layer, but also takes the energy while breaking (recuperation). The mechanical input of a rider is transferred to the wheel without a mechanical connection.

iSHS SCHEME



SINCE THERE IS NO MECHANICAL CONNECTION, THIS RESULTS IN SEVERAL ADVANTAGES:

- Complete freedom to design different arrangements.
- The motor may be divided into several motors, even with different commands calculated on vehicle physics (electronic differential, AWD drive as examples).
- For larger vehicles with complex drive trains the serial hybrid is evaluated as more robust and cost effective than a conventional drive train with chains or belts and several gears and chain rings.

OVERVIEW OF THE SERVERAL INTELECTRIC COMPONENTS



MOTOR



GENERATOR



BATTERY



iM1000



iM1500



iGEN



iB1000



iB1400/
AES SuperPack



BRAKE SYSTEM



CONTROL SYSTEMS



RIMS 20/24 INCH*

203 front brake disk

220 rear brake disk

4 piston brake

HALL sensor brake lever



icoFR20



icoFR24



icoMR1000.20



icoMR1000.24



icoMR1500.20



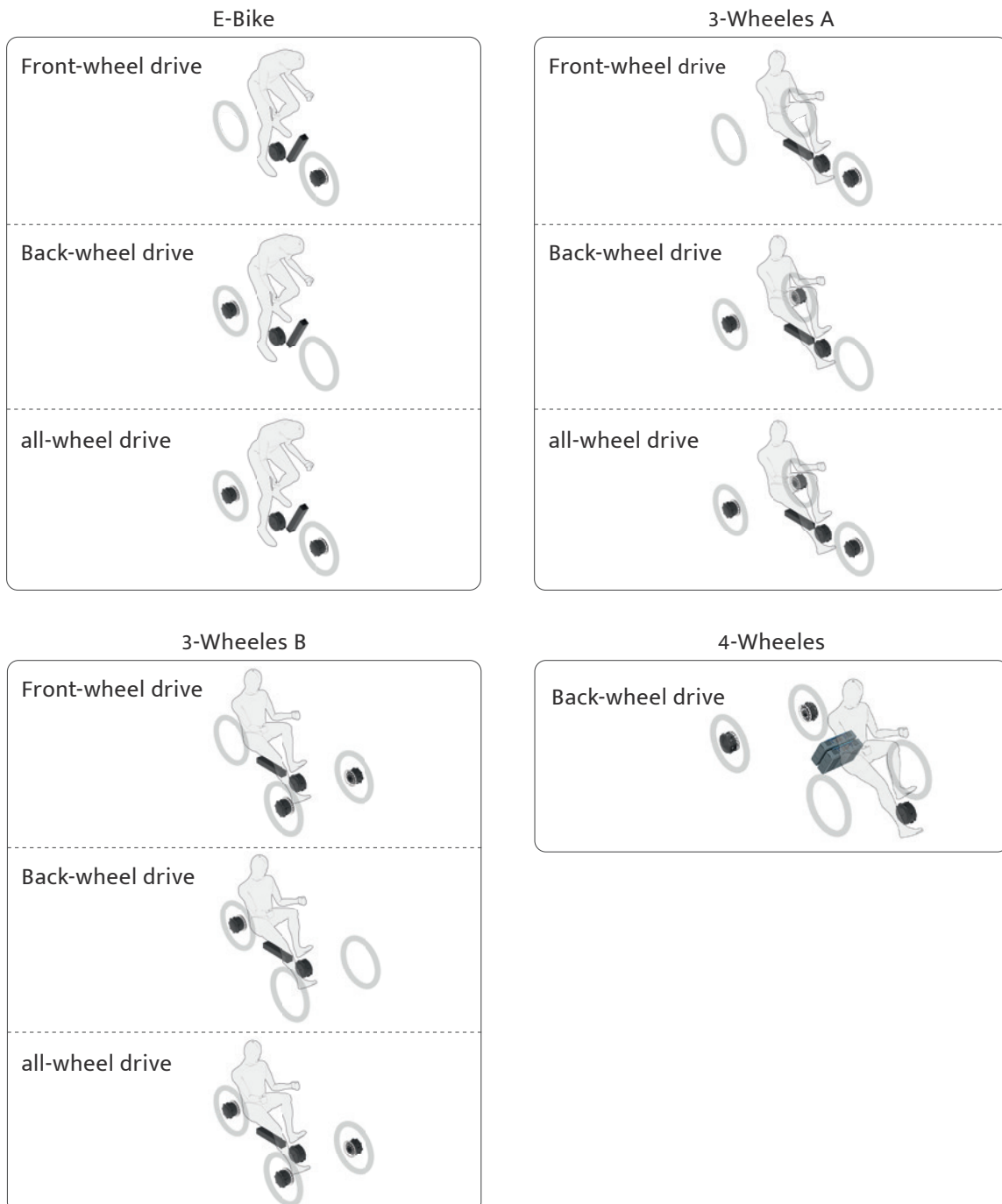
icoMR1500.24

* 28 inch wheel planned

Technische Änderungen und Irrtümer vorbehalten | Technical changes and errors excepted.

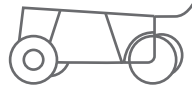
Stand der Information 20.12.2023 | current information of 20.12.2023

POSSIBLE ARRANGEMENTS OF THE COMPONENTS OF THE SYSTEM IN RELATION TO VEHICLES.



OVERVIEW OF THE SERVERAL INTELECTRIC COMPONENTS*

iSHS COMPONENTS



4 WHEELR



3 WHEELR



E-BIKE

MOTOR (iM)

iM1000 Ge1.700.000		• •	•
iM1500 Ge1.600.001	• •		

GENERATOR (iGEN)

iGEN Ge1.704.001	•	•	•
------------------	---	---	---

BATTERY (iB)

iB1000 Ge1.706.001		•	•
iB1400 (AES SuperPack) Ge1.706.101	• •		

BRAKE SYSTEM (iBRS)

iBRS Ge1.730.010	•	•	•
------------------	---	---	---

CONTROL SYSTEM (iCON)

iConVCU	•	•	•
iConMCU	•	•	•
iConGCU	•	•	•
iConPCB	•	•	•
iConHMI	•	•	•

RIM (24 INCH)

icoFR24 Ge1.703.001	• •	•	•
icoMR1500.24 Ge1.703.051	• •	• •	•

* The information refers to page 6-8. There are many other application combinations (page 4).

Technische Änderungen und Irrtümer vorbehalten | Technical changes and errors excepted.

4 WHEELER CARGOBIKE

INTELECTRIC SHS



Motor iM1500

1.500 W
190 Nm (peak)



Battery iB1400

1.440 Wh
AES SuperPack



Generator iGEN

250 W
ISIS



Brake system iBRS

203 front brake disk
220 rear brake disk
4 piston brake
HALL sensor brake lever



Control systems iCON

iconVCU
iconGCU
iconMCU
iconPCB
iconIOT
iconHMI

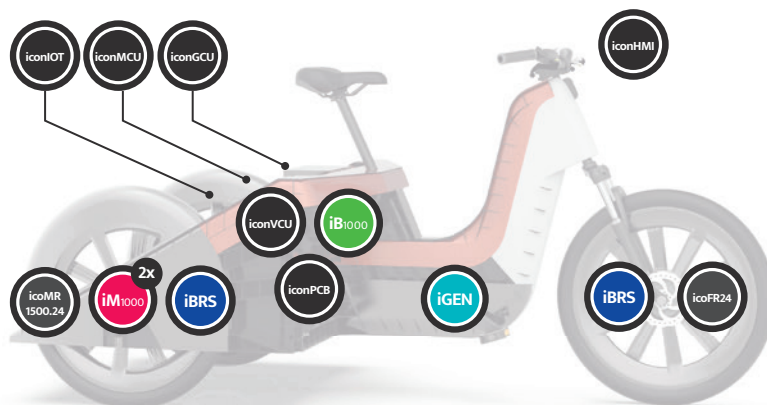


Rims 24 inch

icoFR24
icoMR1500.24

3 WHEELER

INTELECTRIC SHS



Motor iM1000

1.000 W
90 Nm (peak)



Battery* iB1000

1.000 Wh



Generator iGEN

250 W
ISIS



Brake system iBRS

203 front brake disk
220 rear brake disk
4 piston brake
HALL sensor brake lever



Control systems iCON

iconVCU
iconGCU
iconMCU
iconPCB
iconIOT
iconHMI



Rims 24 inch

icoFR24
icoMR1500.24

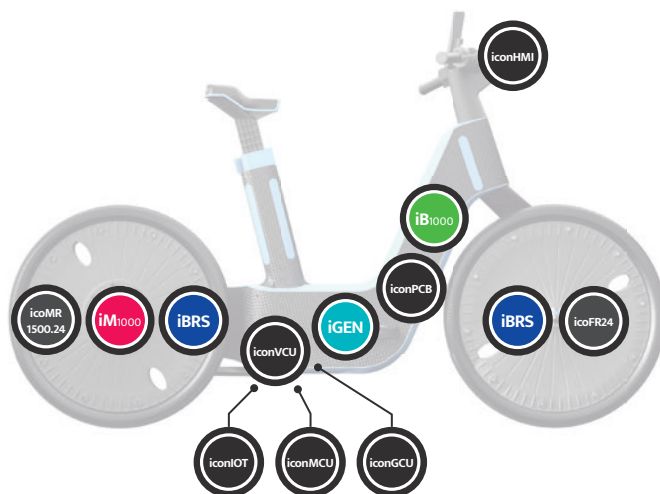
* iB1400/ AES SuperPack is also compatible with the 3 Wheeler.

Technische Änderungen und Irrtümer vorbehalten | Technical changes and errors excepted.

Stand der Information 20.12.2023 | current information of 20.12.2023

2 WHEELER

INTELECTRIC SHS



Motor iM1000

1.000 W
90 Nm (peak)



Battery iB1000

1.000 Wh



Generator iGEN

250 W
ISIS



Braking system iBRS

203 front brake disk
220 rear brake disk
4 piston brake
HALL sensor brake lever



Control systems iCON

iconVCU
iconGCU
iconMCU
iconPCB
iconIOT
iconHMI



Rims 24 inch

icoFR24
icoMR1000.24



iM1000

component of intelectric SHS





iM1000
Ge1.700.000



CORE DATA

Geared motor with recuperation

Diameter	Ø 183 mm
Width	143 mm
Wheel diameter	20/ 24/ 28 inch
Color	black
Weight	less than 6,4 kg

MECHANICAL

Nominal power(mechanical!)	1.000 W
Max. Torque	90 Nm (20% climb and friction)
Max. Support speed	25 km/h (EU) 32 km/h (USA)
Wheel rpm	215/275 (25 km/h / 32 km/h)

ELECRTICAL

Nominal voltage (nominal)	48 V (performance must be validated at 46 V)
Sensors	3 Hall-Sensors, temperature sensor at most critical position

ENVIRONMENTAL CONDITIONS

IP	IP69 (appreciated, IP68 mandatory)
Operating temperature	- 20 – 45°C

MOUNTING PARAMETERS

Cabling Route	Shaft Side, Right
Cable Length	customized



iM1500

component of intelectric SHS





iM1500
Ge1.600.001



CORE DATA

Geared motor with recuperation

Diameter	Ø 222,5 mm
Width	147 mm
Wheel diameter	20/ 24/ 28 inch
Color	black
Weight	11,1 kg

MECHANICAL

Nominal power(mechanical!)	1.500 W
Max. Torque	190 Nm (20% climb and friction)
Max. Support speed	32 km/h
wheel rpm	Ø 222,5 mm

ELECRTICAL

Nominal voltage (nominal)	48 V
Nominal power(electrical!)	1.500/1.300 W
Sensors	3 Hall-Sensors

ENVIRONMENTAL CONDITIONS

IP	IP69 (appreciated, IP68 mandatory)
Operating temperature	-20–45°C

MOUNTING PARAMETERS

Cabling Route	Side axle outlet
Cable Length	According to requirements



iGEN

component of intelectric SHS





CORE DATA

Geared generator with crank shaft

Diameter	Ø 218 mm
Width	140 mm
Interface crankset	ISIS
Color	black
Weight	less than 5,5 kg
crank length	170 mm
Axle length	152 mm

MECHANICAL

Nominal cadence	63 rpm
Maximum cadence	110 rpm
Nominal power	250 W
Max. Power	400 W
Rated Torque	38 Nm

ELECTRONICAL

Nominal voltage	48 V
-----------------	------

ENVIRONMENTAL CONDITIONS

IP	IP69 (appreciated, IP68 mandatory)
Operating Temperature	- 20 – 45°C

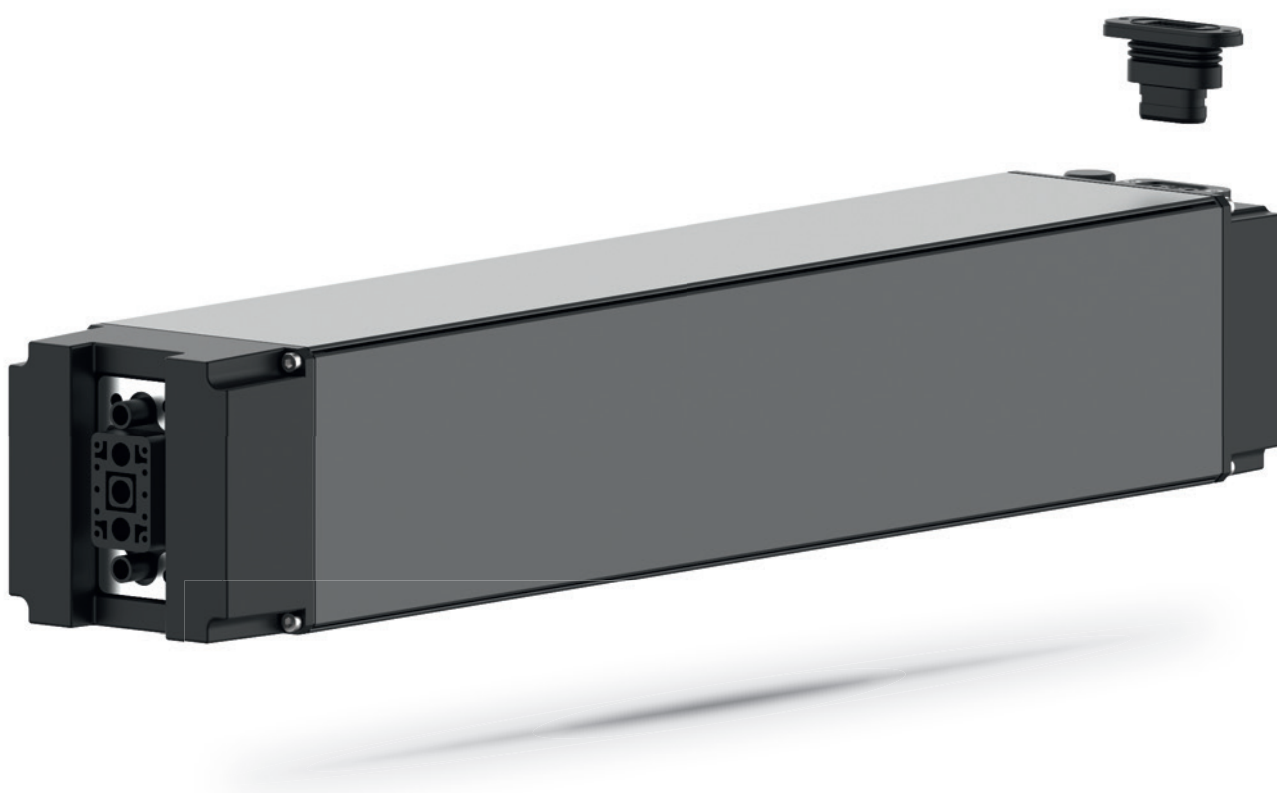
MOUNTING PARAMETERS

Cabling Route	Shaft Side, Right
Cable Length	customized



iB1000

component of intelectric SHS





iB1000

Ge1.706.001



BASIC PARAMETERS

Max. Dimension (L*W*H)	560.5 x 84.5 x 84.5mm
Weight	less than 6 kg
Nominal Voltage	48 V
Nominal Current (100% duty cycle)	30 A
Capacity	approx. 1.000 Wh
Operating temperature for discharging and charging (recuperation)	-20 – 45° C
Lifetime	300 time cycles = 80%
BUS-Communication in vehicle	CANopen, CiA profile 454
OTA Update	OTA update of SW via CAN

TESTS & CERTIFICATIONS

IP class	IP65
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iB1400 / AES SUPERPACK

component of intelectric SHS



Note:

The AES Superpack be integrated as a rental or purchase module
The rental and maintenance is carried out by Swobbee GmbH |
www.swobbee.de

Our INTELECTRA cargo bikes require two AES SuperPack batteries
for control and commissioning.



iB1400
Ge1.706.101



Detail of connection port

BASIC PARAMETERS

Technical details for one battery

Max. Dimension (L*W*H)	400 x 268 x 89 mm
Weight	12 kg
Nominal Voltage	48 V DC
Nominal Current	60 A
Capacity	30 Ah
Energy	1.440 Wh
Type of cell	LiFePO4

KEY FEATURES

Can be used for large electric cargo vehicles with motors that have a nominal output of 3kW.

Robust and safe

Extremely reliable and short charging time possible

easy to repair: cells are individually



iBRS

component of intelectric SHS





iBRS
Ge1.730.010



Assembly configuration (front):
icoFR24/iBRS



Assembly configuration (rear):
icoMR1500.24/iBRS/iSA

CORE DATA

Hydraulic disc brake system for 2-4 wheel vehicles

Brake caliper	twin 4-piston caliper
Brake lever	Hall sensor for recuperation controll 3 forged/4 forged ball-end/2.5 finger blade

DISC BRAKE - FRONT

Size	Ø 203 mm
Thickness	(1.8mm/ 2.3mm / 3mm)
Mounted on	DDG Wheel (icoFR24)

DISC BRAKE - REAR

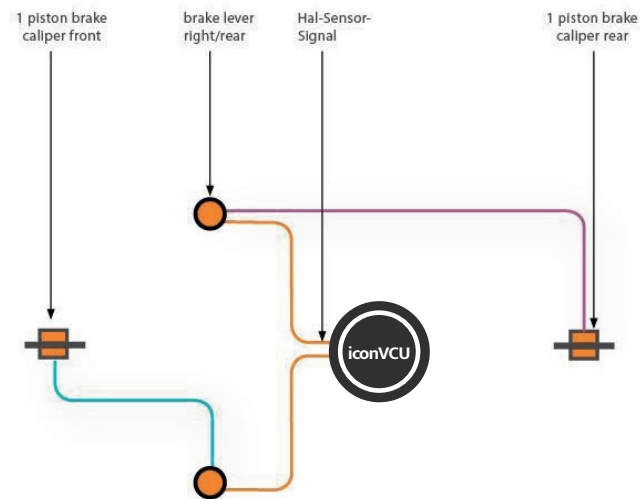
Size	Ø 220 mm
Mounted on	iM1000 / iM1500



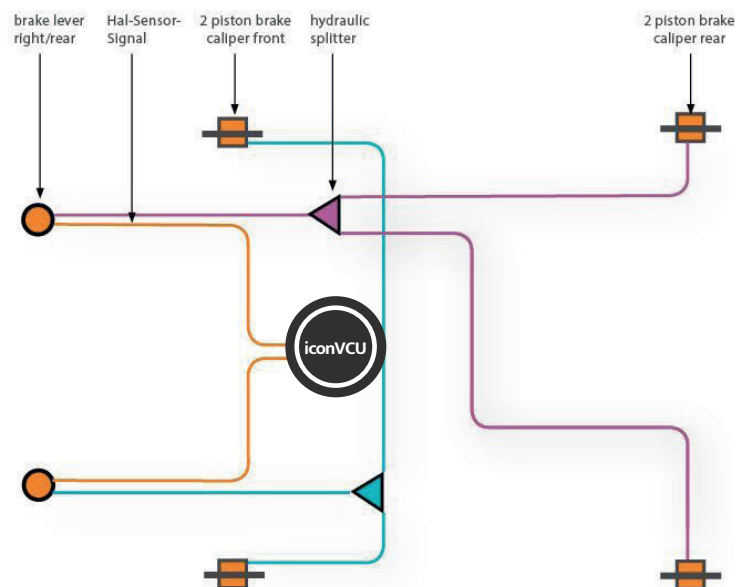
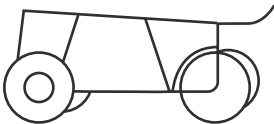
iBRS

Overview of the brake line and sensor cable

APPLICATION 2 WHEELER



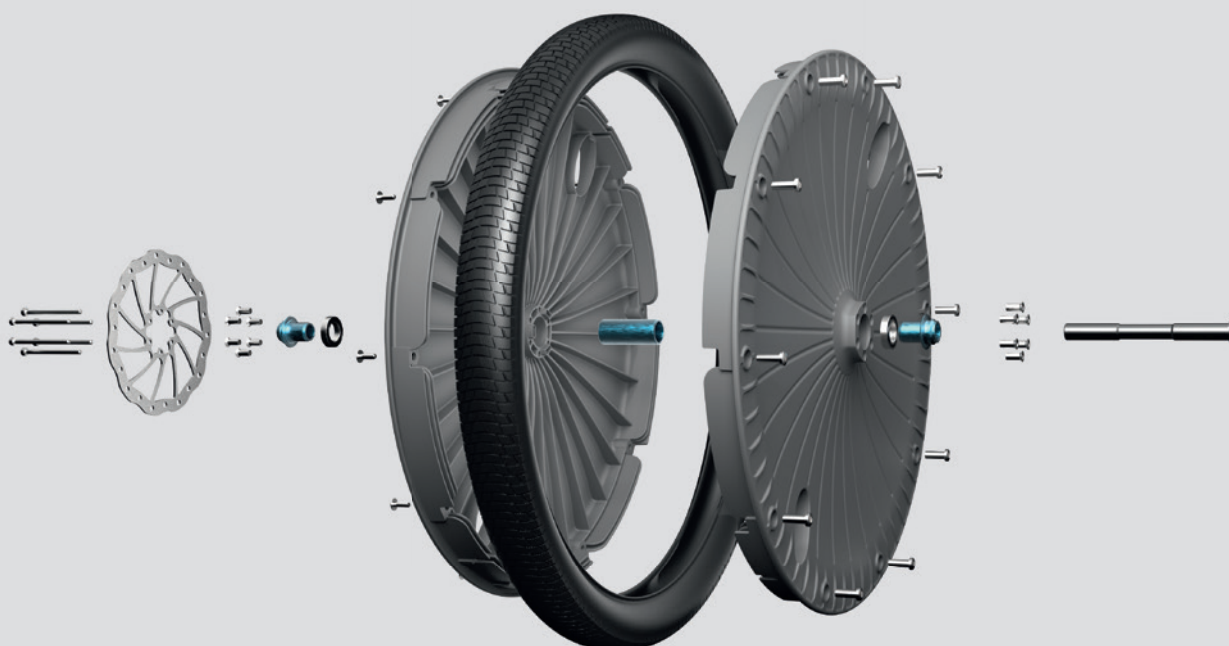
APPLICATION 4 WHEELER





icoFR24

component of intelectric SHS





icoFR24

Ge1.703.001



SPECS

Material	PA66-GF35
Surface finish	VDI-Richtlinie 3400 36
Roughness	VDI-Richtlinie 3400 36
Diameter	608 mm
Width	60 mm
Color	black
Weight	3,5 kg

COMPATIBLE COMPONENTS

Tire (size)	ETRTO 60-507 /24 x 2.35 inch
True-Axle	M15 x 1,5, leght = 148 mm
Brake Disk	200 - 220 mm



icoMR1000.24

component of intelectric SHS





icoMR1000.24



SPECS

Material	PA66-GF35
Surface finish	VDI-Richtlinie 3400 36
Roughness	VDI-Richtlinie 3400 36
Diameter	608 mm
Width	60 mm
Color	black
Weight	3,1 kg

COMPATIBLE COMPONENTS

Tire (size)	ETRO 60-507 / 24 x 2.35 inch
Motor	iM1000
Brake Disk	mounted on Motor



icoMR1500.24

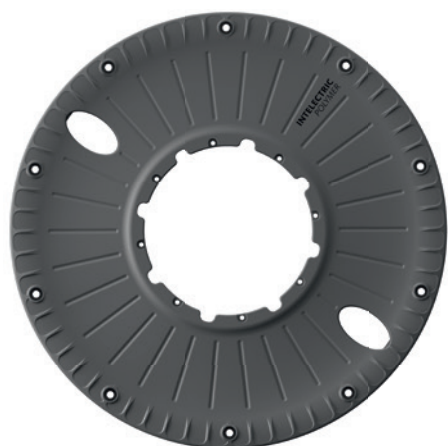
component of intelectric SHS





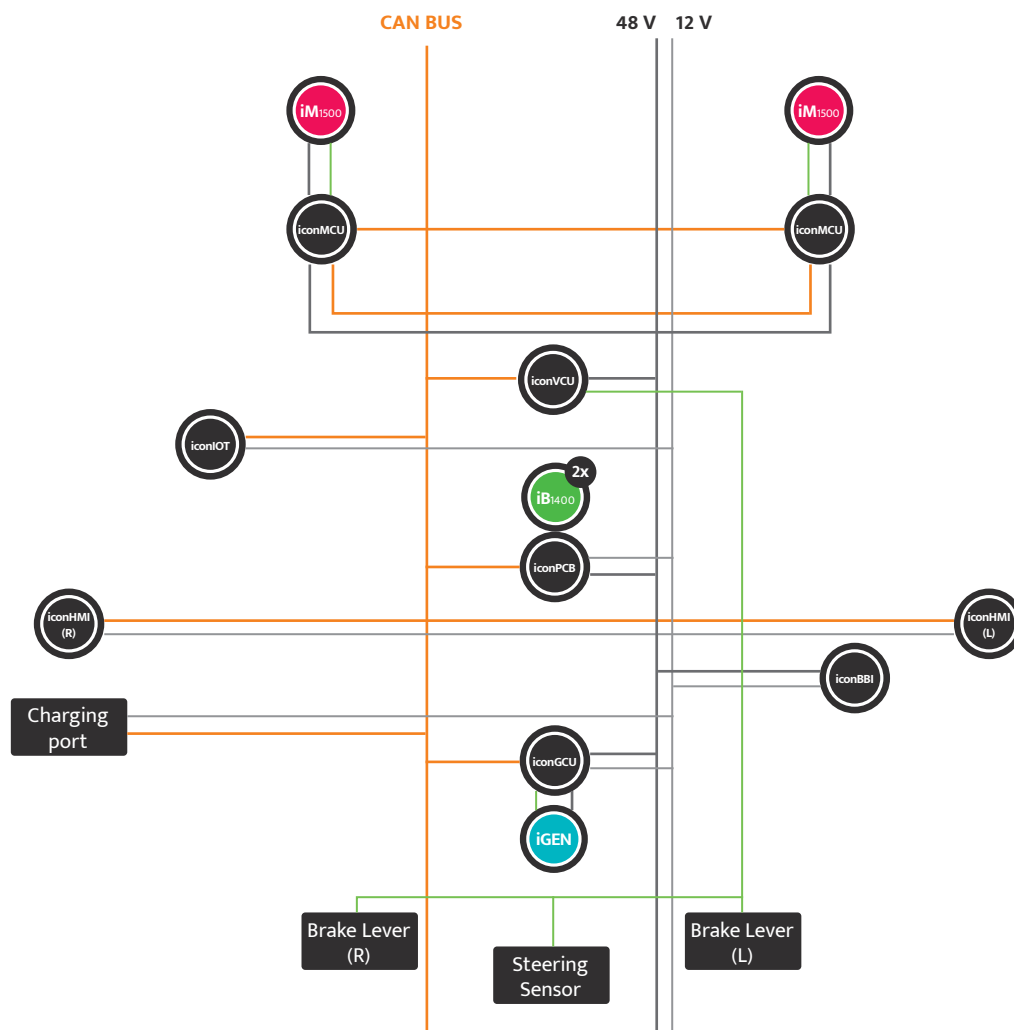
icoMR1500.24

Ge1.703.051



SPECS	
Material	PA66-GF35
Surface finish	VDI-Richtlinie 3400 36
Roughness	VDI-Richtlinie 3400 36
Diameter	608 mm
Width	60 mm
Color	black
Weight	3,1 kg
COMPATIBLE COMPONENTS	
Tire (size)	ETRO 60-507 / 24 x 2.35 inch
Motor	iM1500
Brake Disk	mounted on Motor

OVERVIEW ABOUT THE ARCHITECTURE FOR A 4-WHEELER ARRANGEMENT WITH ONE POWERED AXIS WITH TWO DRIVES. THE POWER AND COMMUNICATION NETWORK CONSISTS OF 4 DIFFERENT LAYERS.



— 48 V Power line	iM INTELECTRIC Motor	icoGCU Generator Controller Unit
— 12 V Power line	iB INTELECTRIC Battery	icoHMI Humaninterface (L=left, R=right)
— Signal line	iGEN INTELECTRIC Generator	icoPCB Power Distribution Box and Battery interface
— CAN open	iconMCU Motor Controller Unit	iconBBI Customer applications bodybuilder interface



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