

# Schaeffler VELOMATIC

Automatic bike gearshift system

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## Features

The automatic gearshift system VELOMATIC is an automatic gearshift for bikes with a wide range of possible applications. It replaces the conventional manual gearshift and allows automatic shifting of gear hubs and chain gearshifts in pedelecs and e-bikes. The automatic gearshift system VELOMATIC is compatible with most commonly used hub and chain gears. It comprises a gearshift actuator and a coupled communication module.

The gearshift actuator carries out mechanical motion of the associated bike gearshift via a Bowden cable. The communication module functions as an information gateway. Various communication interfaces are available such as BLE (**B**luetooth **L**ow **E**nergy), ANT and CAN. With the associated intelligent communication, interaction with almost any commonly used electric drive system is possible. The power required for the actuator and communication module is supplied directly by the rechargeable battery of the electric bike or by the drive of the electric bike. Due to the compact dimensions of the components, it can be accommodated inconspicuously within the bike frame.

On the basis of travel speed and terrain gradient, VELOMATIC calculates the optimum gear for the user in each case. The gearshift program can be individually set by the rider with the aid of the app VELODAPTIC.

The functional software implemented detects the input values required for control of the gearshift actuator, which it then processes to create the necessary control parameters.

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Input values	<p>The input values required are:</p> <ul style="list-style-type: none"><li>■ speed, determined from the drive system by means of CAN bus</li><li>■ inclination of the bike, determined from the inclination sensor of VELOMATIC</li><li>■ cadence (for chain gears).</li></ul>
Components	<p>The automatic gearshift system VELOMATIC comprises the following:</p> <ul style="list-style-type: none"><li>■ gearshift actuator</li><li>■ communication module with optional voltage regulator</li><li>■ app VELODAPTIC (optional)</li><li>■ Bowden cable (optional)</li><li>■ cable for power supply (optional).</li></ul>
Compatible hub gears	<p>The following Shimano hub gears are compatible:</p> <ul style="list-style-type: none"><li>■ Nexus 7</li><li>■ Nexus 8</li><li>■ Alfine 8</li><li>■ Alfine 11.</li></ul>
Compatible chain gears	<p>The following chain gears are compatible:</p> <ul style="list-style-type: none"><li>■ Shimano HG62 HG-X 11-36T</li><li>■ Shimano Deore HG30H 11-32T</li><li>■ Sun M66 11-32T</li><li>■ Sun MFE60 13-32T.</li></ul> <p>It is possible to use gears of other types and from other manufacturers within the specification of the VELOMATIC.</p>

## Gearshift actuator

The gearshift actuator comprises a direct current motor coupled with a twin-stage planetary gearbox. This drives a spindle on which a spindle nut is mounted.

The spindle nut mounted on the gearshift actuator housing completes a linear motion that, since it is directly coupled by means of the Bowden cable, leads to shifting of the respective gears in the bike gearshift. The direct current motor is controlled by the electronics integrated in the gearshift actuator housing. This includes not only the motor control but also a measuring system for determining the gearshift position and a communication component for wireless connection to the communication module.

- ① Spindle
- ② Spindle nut
- ③ DC motor
- ④ Electronic system

*Figure 1*  
Structure  
of gearshift actuator



The gearshift actuator comprises the following:

- electronic assembly
- housing
- direct current motor
- planetary gearbox
- spindle
- nut for retaining the shift cable
- cable for gearshift operation
- end cap.

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The electronic assembly comprises a measuring system for determining the position of the spindle nut, a power pack, a processor and a communication unit for wireless communication.

The functional software implemented in the electronic assembly records the input values required, which it then processes to create the necessary control parameters.

## Technical data of gearshift actuator

Designation	Characteristic or value
Drive system	Linear drive with position control
Housing material	Aluminium and plastic
Control parameters	Terrain gradient, wheel speeds (must be provided by the customer)
Bowden cable fixture	For standard cable with barrel nipple
Voltage supply	DC 24 V to DC 42 V
Current consumption	Stand-by: approx. 20 mA Gearshift process: < 600 mA
Gearshift speed	15 mm/s
Shifting accuracy	0,2 mm
Tension force	max. 100 N
Connector	2-pin Nano MQS
Length	202,5 mm
Diameter	25 mm
Mass	approx. 150 g
Compatibility with hub gears	<ul style="list-style-type: none"> <li>■ Shimano (Nexus 7, Nexus 8, Alfine 8, Alfine 11)</li> <li>■ other types and manufacturers possible</li> </ul>
Compatibility with chain gears	<ul style="list-style-type: none"> <li>■ Shimano (HG62 HG-X 11-36T, Deore HG30H 11-32T, ...)</li> <li>■ Sun (M66 11-32T, MFE60 13-32T, ...)</li> <li>■ other types and manufacturers possible</li> </ul>
Protection class in mounted state	IP54
Mounting location (examples)	Down tube or seat tube

d = diameter  
l = length

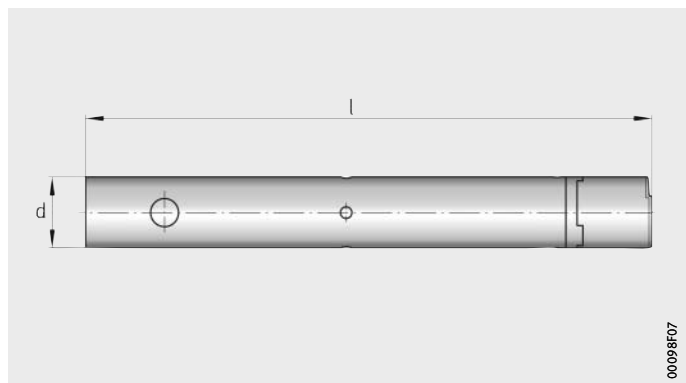


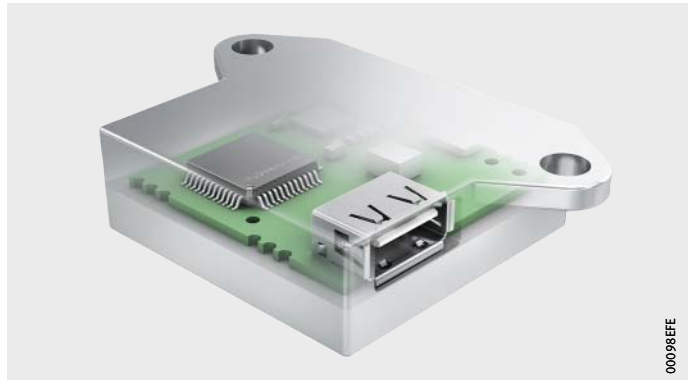
Figure 2  
Dimensions of gearshift actuator

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## Communication module

The communication module acts as a gateway for the distribution of information, *Figure 3*. It captures, processes and forwards information to the relevant recipients.

The communication module uses communication interfaces such as BLE (**B**luetooth **L**ow **E**nergy), ANT and CAN to link with various components of the electric bike. For example, the communication module can thus create a network between the gearshift actuator, the electric auxiliary drive of the electric bike and the smartphone of the rider. With this intelligent communication, interaction with almost any commonly used electric drive system is possible.

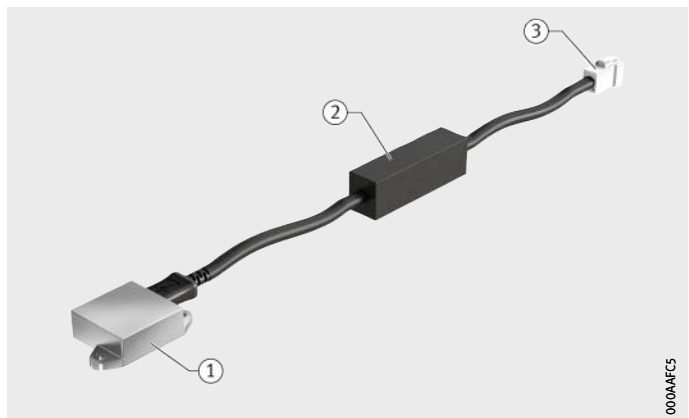


*Figure 3*  
Communication module

The communication module can optionally be connected to the voltage supply of the electric bike via the voltage converter, *Figure 4*.

- ① Communication module
- ② Voltage converter
- ③ Plug

*Figure 4*  
Structure  
of communication module  
with voltage converter



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## Technical data of communication module with voltage converter

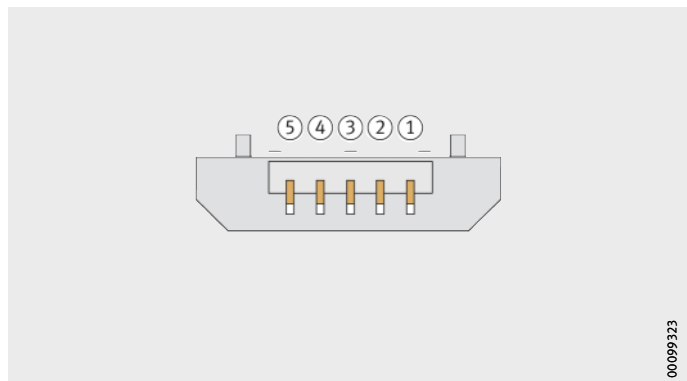
Designation	Characteristic
Voltage rating	DC 12 V to DC 48 V
Idle current	100 mA
Communication interfaces	BLE ( <b>B</b> luetooth <b>L</b> ow <b>E</b> nergy)
	ANT
	CAN
Sensor technology	Accelerometer to determine gradient
Protection class	IP54
Mass	34 g
Mounting location	Recommendation: mounting close to the actuator

## Connections of communication module

Designation	Characteristic
Fixing holes	Two $\varnothing$ 3,5 mm
Cable connection	Micro USB-B
PIN assignment of Micro USB-B	① +5 V
	② CAN LO
	③ CAN HI
	④ Not used
	⑤ Ground

- ① +5 V
- ② CAN LO
- ③ CAN HI
- ④ Not used
- ⑤ GND

*Figure 5*  
PIN assignment of Micro USB-B



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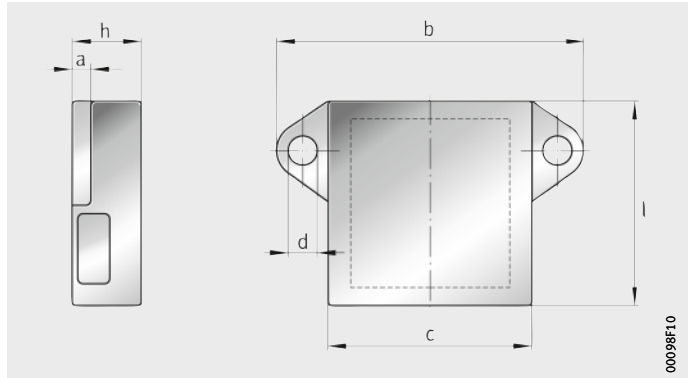
## Dimensions of communication module

Designation	Value
Housing height	h 10 mm $\pm$ 0,1 mm
Height of fixing tabs	a 3 mm $\pm$ 0,1 mm
Hole diameter	d 3,5 mm $\pm$ 0,1 mm
Total width	b 40 mm $\pm$ 0,3 mm
Housing width	c 25,2 mm $\pm$ 0,2 mm
Length	l 24,4 mm $\pm$ 0,2 mm



h = housing height  
 a = height of fixing tabs  
 d = bore diameter  
 b = total width  
 c = housing width  
 l = length

**Figure 6**  
 Dimensions  
 of communication module



### Mounting positions

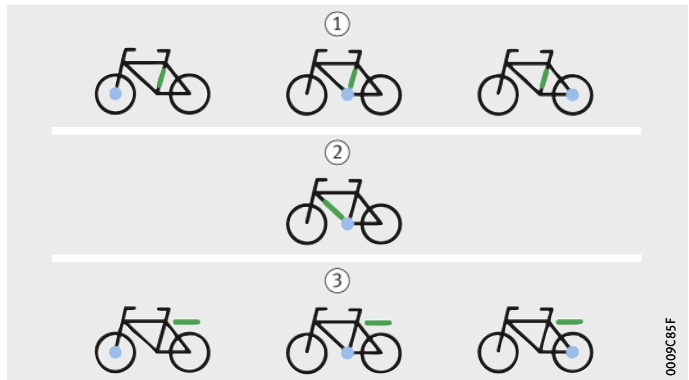
Possible mounting positions for the gearshift actuator are:

- in or on the seat tube
- in or on the down tube
- in or on the seat stays
- in or on the rear stays
- on the luggage rack.

Green = gearshift actuator  
 Blue = auxiliary drive

- ① Mounting in or on seat tube
- ② Mounting in or on down tube
- ③ Mounting on luggage rack

**Figure 7**  
 Mounting positions  
 of gearshift actuator



### Alternative applications

In mounting outside the bike frame, attention must be paid to the following:

- An additional means of locating the gearshift actuator is required.
- Protection class IP54 must be observed.  
If the requirements extend beyond this protection class, suitable measures must be taken.
- Suitable protection against external mechanical effects must be provided.

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## App VELODAPTIC

The app VELODAPTIC, which can be used as an option, is capable of creating customised gearshift programs for personal riding style. Due to the versatile functions of the app, a smartphone can be used as a bike computer. For this purpose, it must be connected to the communication module via the communication interface BLE.

### Functional scope

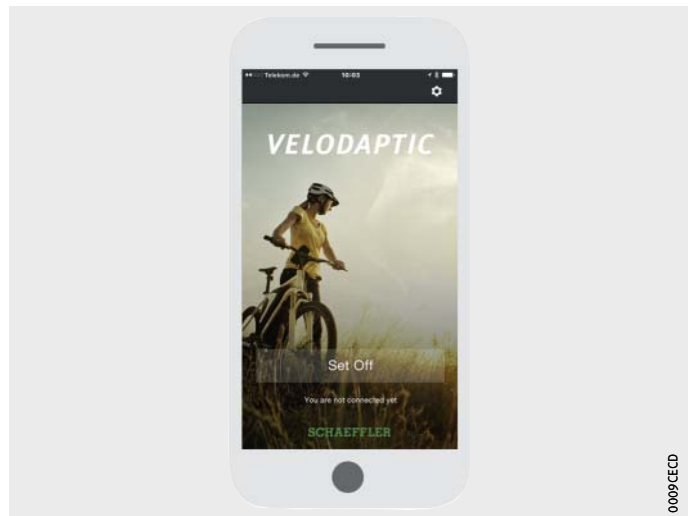
The app VELODAPTIC includes the following functions:

- three selectable basic gearshift programs
- configuration of individual gearshift programs
- display of selected gear and wheel speed
- compass function
- manual upshift and downshift
- adjustment of Bowden cable in relation to gearshift setting
- replacement of Bowden cable
- selection of the gearshift type used in the bike
- software updates for the gearshift actuator and communication module.

The app VELODAPTIC is divided into two sections:

- operating section
- configuration section.

To use the app with the bike, a connection must first be established with the gearshift actuator via Bluetooth.



*Figure 8*  
Start screen  
of bike app VELODAPTIC

Information on the structure and operation can be found in the user manual for the bike app VELODAPTIC.



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