

Control Valve Actuators

EMV

For the BOA-Control PIC Type Series

Installation/Operating Manual



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Installation/Operating Manual EMV

Original operating manual

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1 General

1.1 Principles

This operating manual is valid for the type series and variants indicated on the front cover.

The operating manual describes the proper and safe use of this equipment in all phases of operation.

The name plate indicates the type series and size as well as the main operating data and the serial number. The serial number uniquely describes the product and is used as identification in all further business processes.

In the event of damage, immediately contact your nearest KSB service facility to maintain the right to claim under warranty.

1.2 Target group

This operating manual is aimed at the target group of trained and qualified specialist technical personnel.

1.3 Symbols

Table 1: Symbols used in this manual

Symbol	Description
✓	Conditions which need to be fulfilled before proceeding with the step-by-step instructions
▷	Safety instructions
⇒	Result of an action
⇨	Cross-references
1. 2.	Step-by-step instructions
	Note Recommendations and important information on how to handle the product

1.4 Key to safety symbols/markings

Table 2: Definition of safety symbols/markings

Symbol	Description
 DANGER	DANGER This signal word indicates a high-risk hazard which, if not avoided, will result in death or serious injury.
 WARNING	WARNING This signal word indicates a medium-risk hazard which, if not avoided, could result in death or serious injury.
 CAUTION	CAUTION This signal word indicates a hazard which, if not avoided, could result in damage to the machine and its functions.
	Explosion protection This symbol identifies information about avoiding explosions in potentially explosive atmospheres in accordance with EU Directive 2014/34/EU (ATEX).
	General hazard In conjunction with one of the signal words this symbol indicates a hazard which will or could result in death or serious injury.

Symbol	Description
	Electrical hazard In conjunction with one of the signal words this symbol indicates a hazard involving electrical voltage and identifies information about protection against electrical voltage.
	Machine damage In conjunction with the signal word CAUTION this symbol indicates a hazard for the machine and its functions.

**DANGER**

2 Safety

All the information contained in this section refers to hazardous situations.

In addition to the present general safety information the action-related safety information given in the other sections must be observed.

2.1 General

- This operating manual contains general installation, operating and maintenance instructions that must be observed to ensure safe operation of the system and prevent personal injury and damage to property.
- Comply with all the safety instructions given in the individual sections of this operating manual.
- The operating manual must be read and understood by the responsible specialist personnel/operators prior to installation and commissioning.
- The contents of this operating manual must be available to the specialist personnel at the site at all times.
- Information and markings attached directly to the product must always be complied with and kept in a perfectly legible condition at all times. This applies to, for example:
 - Markings for connections
 - Name plate
- The operator is responsible for ensuring compliance with all local regulations not taken into account.
- The actuator has been designed and constructed in accordance with the requirements of Directive 2014/35/EU ("Low-voltage Directive"). The actuator is intended for use in building services systems and industrial plants.
- If the motor is used in countries outside the European Community, adhere to the regulations applicable to the relevant country. Also observe any local and industry-specific regulations governing installation and safety.

2.2 Intended use

- Only operate actuators which are in perfect technical condition.
- Do not operate partially assembled actuators.
- Generally observe the operating limits given.
- Consult the manufacturer about any use or mode of operation not described in the data sheet or product literature.

2.2.1 Prevention of foreseeable misuse

- Never exceed the permissible application and operating limits specified in the data sheet or product literature regarding temperature, etc.
- Observe all safety information and instructions in this manual.

2.3 Personnel qualification and training

- All personnel involved must be fully qualified to install, operate, maintain and inspect the product this manual refers to.
- The responsibilities, competence and supervision of all personnel involved in transport, installation, operation, maintenance and inspection must be clearly defined by the operator.
- Deficits in knowledge must be rectified by means of training and instruction provided by sufficiently trained specialist personnel. If required, the operator can commission the manufacturer/supplier to train the personnel.
- Training on the product must always be supervised by specialist technical personnel.

2.4 Consequences and risks caused by non-compliance with this operating manual

- Non-compliance with this operating manual will lead to forfeiture of warranty cover and of any and all rights to claims for damages.
- Non-compliance can, for example, have the following consequences:
 - Hazards to persons due to electrical, thermal, mechanical and chemical effects and explosions
 - Failure of important product functions
 - Failure of prescribed maintenance and servicing practices

2.5 Safety awareness

In addition to the safety information contained in this operating manual and the intended use, the following safety regulations shall be complied with:

- Accident prevention, health regulations and safety regulations
- Explosion protection regulations
- Safety regulations for handling hazardous substances
- Applicable standards, directives and laws

2.6 Safety information for the user/operator

- Fit protective equipment (e.g. contact guards) supplied by the operator for hot, cold or moving parts, and check that the equipment functions properly.
- Do not remove any protective equipment (e.g. contact guards) during operation.
- Provide the personnel with protective equipment and make sure it is used.
- Eliminate all electrical hazards. (In this respect refer to the applicable national safety regulations and/or regulations issued by the local energy supply companies.)

2.7 Safety information for maintenance, inspection and installation

- Modifications or alterations of the actuator are only permitted with the manufacturer's prior consent.
- Use only original spare parts or parts/components authorised by the manufacturer. The use of other parts/components can invalidate any liability of the manufacturer for resulting damage.
- The operator ensures that maintenance, inspection and installation are performed by authorised, qualified specialist personnel who are thoroughly familiar with the manual.
- Any work on the product shall only be performed when it has been disconnected from the power supply (de-energised).
- Carry out work on the product during standstill only.
- As soon as the work has been completed, re-install and re-activate any safety-relevant devices and protective devices. Before returning the product to service, observe all instructions on commissioning. (⇒ Section 6.2, Page 30)

2.8 Unauthorised modes of operation

Never operate the product outside the limits stated in the data sheet and in this manual.

The warranty relating to the operating reliability and safety of the product supplied is only valid if the product is used in accordance with its intended use.

3 Transport/Storage/Disposal

3.1 Checking the condition upon delivery

1. On transfer of goods, check each packaging unit for damage.
2. In the event of in-transit damage, assess the exact damage, document it and notify KSB or the supplying dealer and the insurer about the damage in writing immediately.

3.2 Transport

Transport the actuator carefully and in its original packaging. Avoid damaging the coating.

3.3 Storage/preservation

If commissioning is to take place some time after delivery, we recommend that the following measures be taken:

EMV311/..., EMV312/...

Table 3: Ambient conditions for storage

Ambient condition	Value
Storage temperature	-20 °C to +65 °C
Humidity	5 % to 95 % rH

EMV311/PRO

Table 4: Ambient conditions for storage

Ambient condition	Value
Storage temperature	-25 °C to +60 °C
Humidity	5 % to 95 % rH

EMV211/...

Table 5: Ambient conditions for storage

Ambient condition	Value
Storage temperature	0 °C to +50 °C
Humidity	10 % to 90 % rH

EMV212/144, EMV212/145, EMV212/146, EMV212/147

Table 6: Ambient conditions for storage

Ambient condition	Value
Storage temperature	-25 °C to +65 °C
Humidity	5 % to 95 % rH

EMV212/148, EMV212/150

Table 7: Ambient conditions for storage

Ambient condition	Value
Storage temperature	-10 °C to +55 °C
Humidity	5 % to 95 % rH

EMV213/145, EMV213/147

Table 8: Ambient conditions for storage

Ambient condition	Value
Storage temperature	-20 °C to +55 °C
Humidity	5 % to 95 % rH

EMV213/148, EMV213/150

Table 9: Ambient conditions for storage

Ambient condition	Value
Storage temperature	-15 °C to +55 °C
Humidity	5 % to 95 % rH

- Well-ventilated
- Dry
- Dust-free
- Shock-free
- Vibration-free

3.4 Disposal

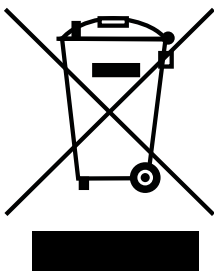
Electrical or electronic equipment marked with the adjacent symbol must not be disposed of in household waste at the end of its service life.

Contact your local waste disposal partner for returns.

If the used electrical or electronic equipment contains personal data, the operator is responsible for deleting it before the equipment is returned.

Due to some components, the product is classified as special waste.

1. Dismantle the product.
2. Separate and sort the materials, e.g. by:
 - Metals
 - Plastics
 - Electronic waste
 - Greases and other lubricants
3. Dispose of materials in accordance with local regulations or in another controlled manner. PCBs, power electronics, capacitors and electronic components are all hazardous waste.



4 Description

4.1 General description

- Electric actuator for the automation of a control valve

The electric actuators are used for actuating control valves in building services systems and industrial plants.

Continuous-action actuator

EMV 211/145, EMV212/148, EMV212/144:

The electric actuator provides continuously variable actuation for control valves. The input signal, the characteristic curve and the control value (voltage/current) can be set via DIP switches. Continuously variable actuation enables variable volume flow rate control or the control of different operating statuses, e.g. setback operation.

EMV213/145, EMV213/148:

The electric actuator provides continuously variable actuation for control valves. Variable actuating times can be set via DIP switches. Continuously variable actuation enables variable volume flow rate control or the control of different operating statuses, e.g. setback operation.

3-point actuator

EMV211/146, EMV211/147, EMV212/148, EMV212/150, EMV212/146, EMV212/147:

The electrothermal actuator enables the automatic opening and closing of control valves. For instance, the actuator can be controlled by a thermostat, so the room temperature can be controlled by opening and closing the heating circuits or air-conditioning circuits.

3-point part-turn actuator

EMV213/147, EMV213/150:

The electronic part-turn actuator enables the automatic opening and closing of control valves. Variable actuating times can be set via DIP switches. For instance, the actuators can be controlled by an ambient temperature thermostat, so the room temperature can be controlled by opening and closing the heating circuits or air-conditioning circuits.

Electrothermal actuator

EMV311:

The electrothermal actuator enables the automatic opening and closing of control valves. For instance, the actuator can be controlled by a thermostat, so the room temperature can be controlled by opening and closing the heating circuits or air-conditioning circuits.

Electrothermal continuous-action actuator

EMV311/PRO:

The electrothermal continuous-action actuator enables the automatic opening and closing of control valves as well as a continuously variable volume flow rate control or the control of different operating statuses, such as setback operation during the day or night.

4.2 Designation

Example: EMV212/148

Table 10: Designation key

Code	Description
EMV	Type series
212/148	Actuator designation

4.3 Name plate

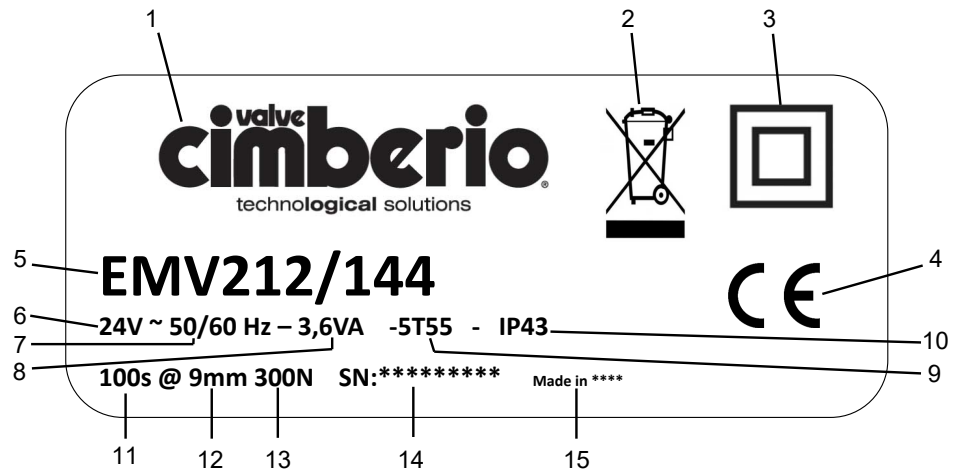


Fig. 1: Example of an EMV212/144

1	Manufacturer	2	Symbol for disposal/recycling in accordance with environmental guidelines
3	Appliance class	4	CE marking
5	Product name	6	Supply voltage
7	Frequency	8	Nominal power
9	Storage temperature	10	Enclosure
11	Actuating time	12	Nominal stroke
13	Actuating force	14	Serial number
15	Country of production		

4.4 Design details

Design

- Electrothermal actuator
- Electrothermal continuous-action actuator
- Continuous-action actuator
- 3-point actuator
- 3-point part-turn actuator

Operating modes

- Continuous duty S1

Actuating force

EMV211:

- 120 N

EMV212:

- 300 - 500 N

EMV213:

- 10 - 18 Nm

EMV311, EMV 312:

- 160 - 250 N

Actuating time

EMV311, EMV 312:

- 5 min and 3 min

EMV211:

- 13 s/mm

EMV212:

- 9.4 - 15 s/mm

EMV213:

- 60 s and 120 s

Design

Continuous-action actuators and 3-point actuators, 24 V AC/DC version (linear / part-turn function depending on the design variant)

- Positioning function
- Active feedback function
- Status message (depending on the type)
- Characteristic curve correction to equal-percentage (depending on the type)
- Selection of actuating speed (depending on the type)

3-point actuators and 2-point actuators, 230 V AC version (linear / part-turn function depending on the design variant)

- Status message (depending on the type)
- Selection of actuating speed (depending on the type)

Electrothermal 2-point actuators, 24 V AC version, in normally closed or normally open design

Electrothermal 2-point actuators, 230 V AC version, in normally closed or normally open design

- Mechanical position indicator
- The position indicator of the NO variant is black.
- The position indicator of the NC variant is red.

Electrothermal continuous-action actuators, 24 V AC version, in normally closed or normally open design

- Positioning function

4.5 Function

Electrothermal actuators

Function Electrothermal actuators contain a temperature-sensing material that expands when voltage is applied. Its expansion causes a linear movement of the actuator stem acting on the valve.

Electric linear actuators

Function Electric linear actuators are fitted with a gear unit that converts the rotary movement of the integrated electric motor into a linear movement.

Electric part-turn actuators

Function Electric part-turn actuators are fitted with a gear unit that converts the rotary movement of the integrated electric motor into a swivelling movement limited to 90°.

4.6 Noise characteristics

The sound pressure level depends on the local conditions and the operating point. It is ≤ 30 dB(A).

5 Installation

5.1 Safety regulations

	 DANGER Electrical connection work by unqualified personnel Risk of fatal injury due to electric shock! ▷ Always have any work on the connection to the power supply performed by a trained electrician.
	 WARNING Improper handling of an electric actuator Crushing of fingers! Damage to the actuator or the valve! ▷ When mounting the actuator onto the valve make sure that the power supply has not yet been connected or that the actuator is secured against unintentional start-up. ▷ Ensure that any objects and parts of the body are removed from the actuator coupling area prior to starting the actuator.
	 WARNING Incorrect connection to the mains Damage to the mains network, short circuit! ▷ Observe the technical specifications of the local energy supply companies. ▷ Inspect the power cable for visible damage. ▷ Never connect damaged power cables.
	CAUTION Painting of pipes Impairment of the valve's function and loss of information! ▷ Protect stem and plastic components prior to applying paint. ▷ Protect printed name plates prior to applying paint.

5.2 Checking prior to installation

Before beginning with the installation check the following:

- The actuator and valve are compatible.
- The valve has been prepared for the actuator to be mounted.
- The minimum wall clearance for removing the actuator has been ensured.

5.2.1 Dimensions and weights of actuators

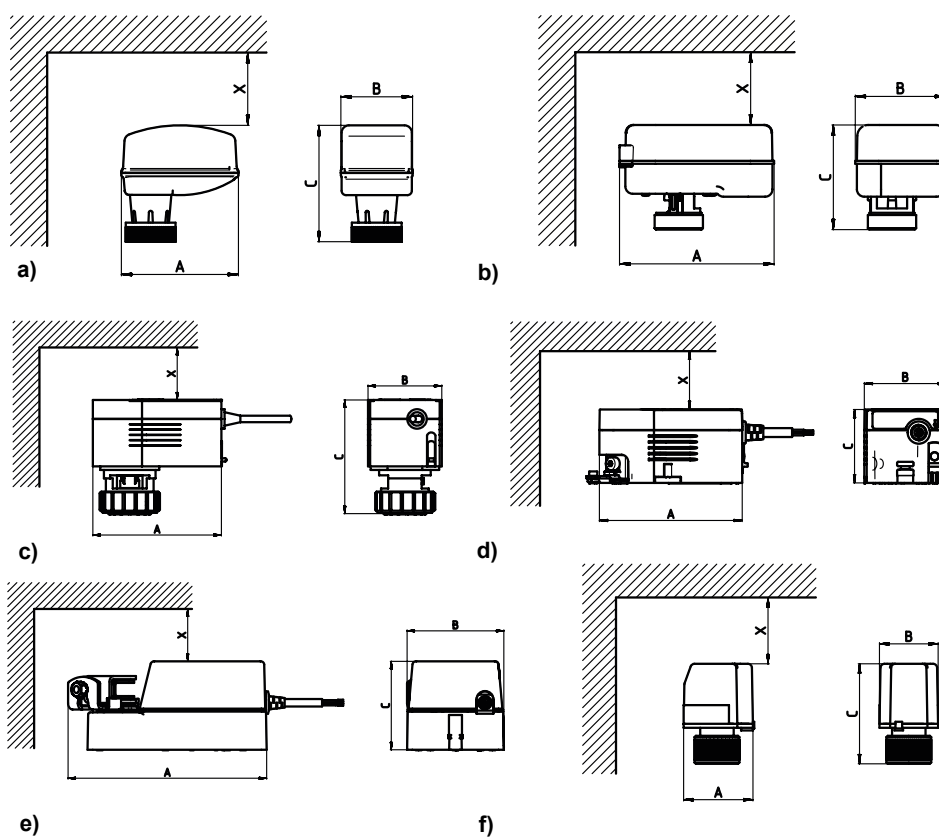


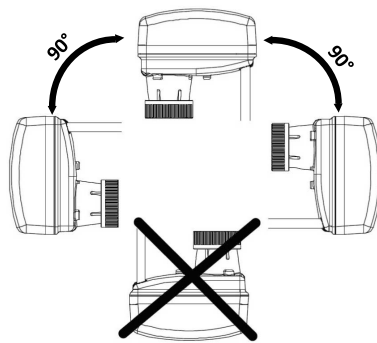
Fig. 2: Actuator dimensions a) EMV211/146 /147 b) EMV212/144 /145 /146 /147 c) EMV212/148 /150 d) EMV213/145 /147 e) EMV213/148 /150 f) EMV311/XXX EMV312/XXX

Table 11: Dimensions and weights of actuators

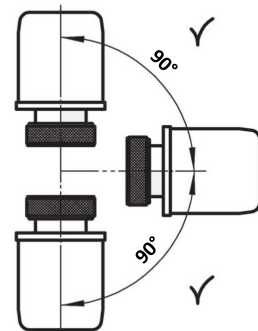
Actuator type	A	B	C	X	[kg]
	[mm]	[mm]	[mm]	[mm]	
EMV211/146	80	49	73,5	60	0,22
EMV211/147	80	49	73,5	60	0,25
EMV212/144	112	62	71,5	60	0,325
EMV212/145	112	62	71,5	60	0,325
EMV212/146	112	62	71,5	60	0,325
EMV212/147	112	62	71,5	60	0,29
EMV212/148	122	70	107	60	0,73
EMV212/150	122	70	107	60	0,73
EMV213/145	138	70	63	> 100	0,7
EMV213/147	138	70	63	> 100	0,7
EMV213/148	196	92	84	> 100	1,2
EMV213/150	196	92	84	> 100	1,2
EMV311/NC230	52	44	75	60	0,18
EMV311/NC24	52	44	75	60	0,18
EMV311/NO230	52	44	75	60	0,145
EMV311/NO24	52	44	75	60	0,145
EMV311/PRO	52	44	75	60	0,18
EMV312/NO230	52	44	75	60	0,18
EMV312/NO24	52	44	75	60	0,18

5.3 Installation position

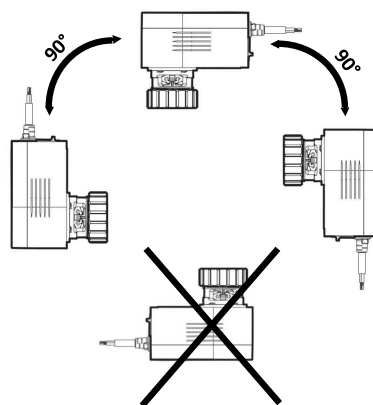
	CAUTION Incorrect installation position Valve function impaired! ► Always observe the valve's operating manual and the permissible installation position.
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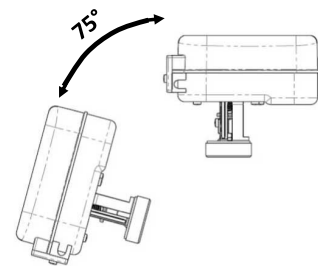
EMV 211/146 /147



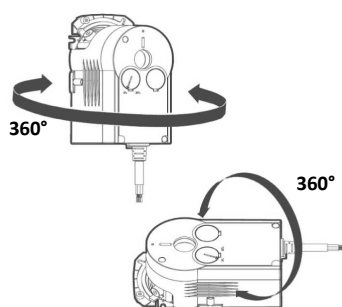
EMV 311/XXX, EMV312XXX



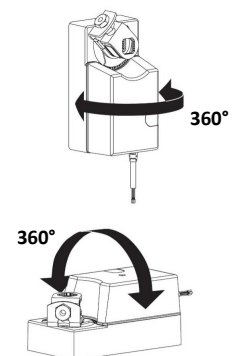
EMV 212/148 /150



EMV 212/144 /145 /146 /147



EMV213/145 /147



EMV213/148 /150

Fig. 3: Installation position by actuator type

Install the actuator with sufficient clearance for removal. (⇒ Section 5.2.1, Page 15) .

5.4 Manual override

A manual override is provided on versions EMV212/148 and EMV212/150 as well as EMV213/145 and EMV213/147 for operating the actuator in the event of a power failure or for making adjustments when mounting the actuator on the valve.

EMV212/148, EMV212/150

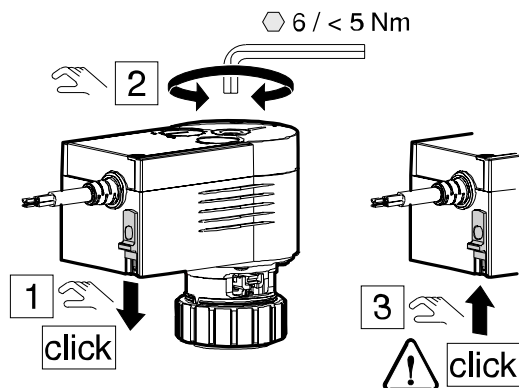


Fig. 4: Actuators EMV212/148, EMV212/150: Using the manual override of the actuator

1. Slide the safety device downwards.
⇒ The manual override has been enabled.
2. Use an Allen key (6 mm) to rotate the actuator until it has reached the required position.
3. Slide the safety device upwards.
⇒ The manual override has been disabled.

EMV212/144, EMV212/146, EMV212/147

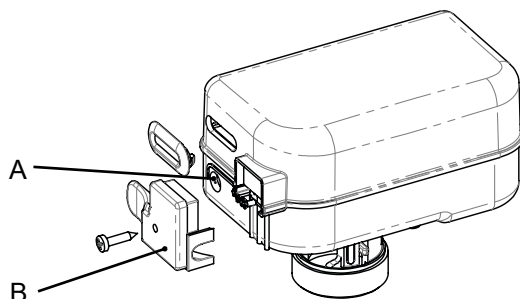


Fig. 5: Actuators EMV212/144, EMV212/146, EMV212/147: Using the manual override of the actuator

A	Hole
B	Strain relief device

1. Remove strain relief device B with a Phillips screwdriver.
2. Insert an Allen key (3 mm) into hole A.
3. Rotate the actuator until it has reached the required position.
4. Fit strain relief device B with a Phillips screwdriver.

EMV213/145, EMV213/147

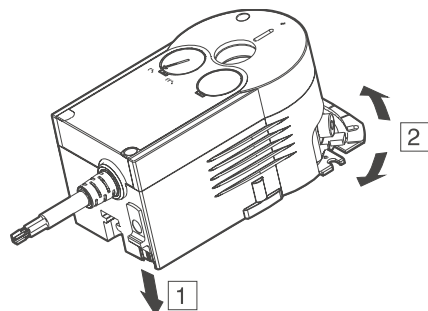


Fig. 6: Actuators EMV213/145, EMV213/147: Using the manual override of the actuator

1. Slide the safety device downwards.
⇒ The manual override has been enabled.
2. Rotate the actuator coupling until the actuator has reached the required position.
3. Slide the sliding switch upwards.
⇒ The manual override has been disabled.

5.5 Mounting the EMV211 actuator

5.5.1 Mounting the actuator

- ✓ The actuator has been de-energised.
- ✓ The actuator is in its upper limit position.

	CAUTION Incorrect installation/removal of the actuator with tools Damage to the actuator! ▷ Only tighten or loosen the threaded ring by hand. ▷ Do not use any tools for tightening or loosening the threaded ring.
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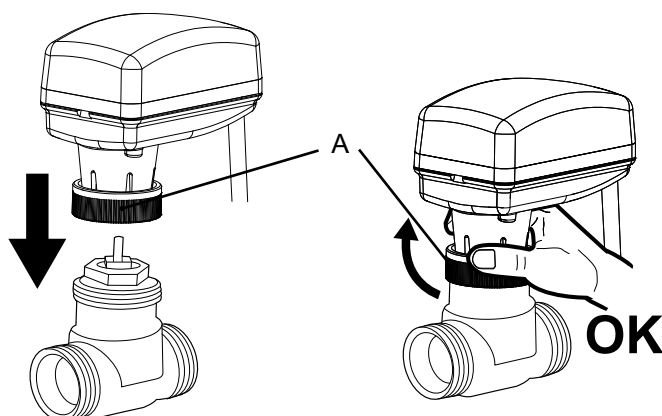


Fig. 7: Mounting the EMV211 actuator

A	Threaded ring
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1. Screw the threaded ring A onto the external thread of the valve.
2. Tighten the threaded ring A by hand.

5.5.2 Electrical connection

	⚠ DANGER Unintentional contact with live parts Danger of death from electric shock! ▷ De-energise the mains connection. ▷ Take steps to ensure that the mains connection cannot be re-energised unintentionally.
	CAUTION Improper electrical connections Damage to the device! ▷ Check the electrical connection. ▷ Observe the wiring diagrams.

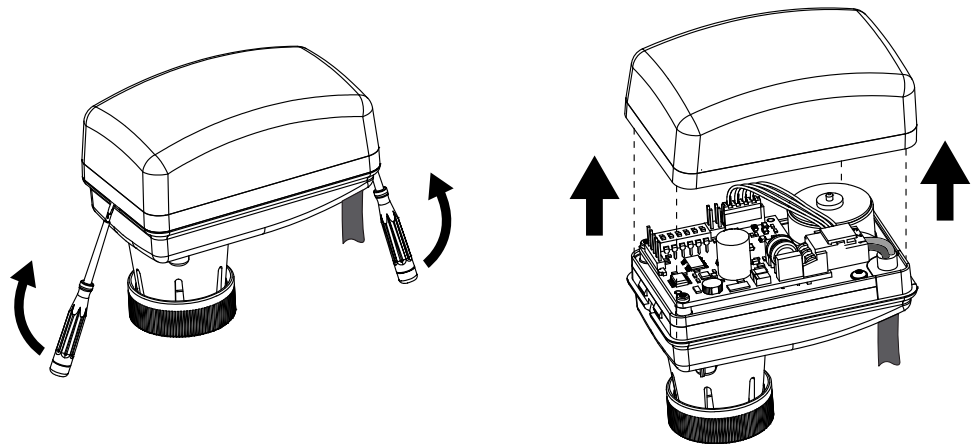


Fig. 8: Removing the actuator cover

1. For EMV211/147: Undo the fastening screw at the actuator cover.
2. Insert a flat-head screwdriver into the edges of the cover to lever off and remove the actuator cover.

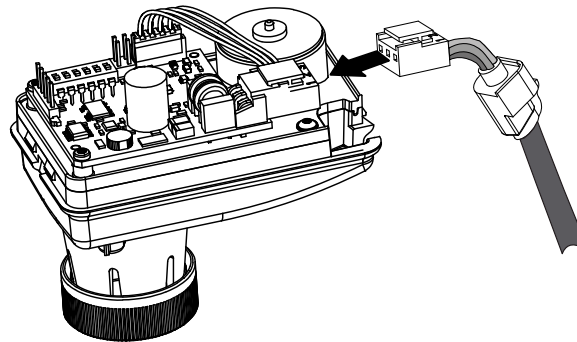


Fig. 9: Plugging the connector into the socket

3. Plug the connector into the socket.
- ⇒ The connector is engaged.

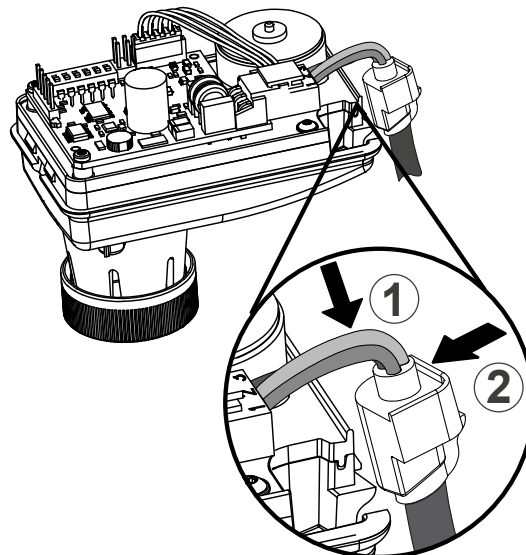


Fig. 10: Fitting the strain relief device in the corresponding recess

4. Fit the strain relief device in the corresponding recess.

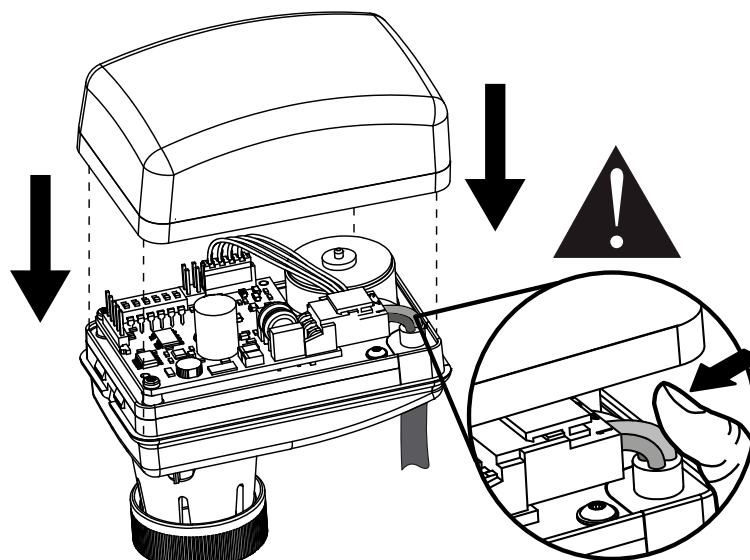


Fig. 11: Closing the actuator cover

5. Hold the strain relief device in place with a finger, and close the actuator cover.

6. For EMV211/147: Fasten the fastening screw at the actuator cover.

For the wiring refer to the "Wiring diagrams" section. (⇒ Section 9.1, Page 44) .

5.6 Mounting the EMV212/144, EMV 212/146 and EMV212/147 actuators

5.6.1 Mounting the actuator

- ✓ The actuator has been de-energised.
- ✓ The actuator is in its upper limit position.

	CAUTION
	Incorrect installation/removal of the actuator with tools Damage to the actuator! ▷ Only tighten or loosen the threaded ring by hand. ▷ Do not use any tools for tightening or loosening the threaded ring.

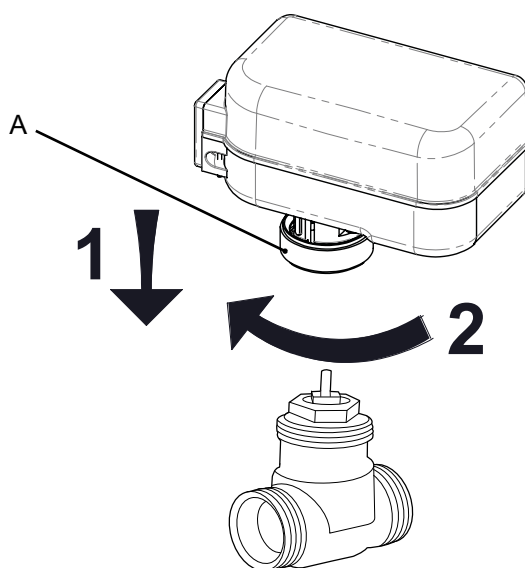


Fig. 12: Mounting the EMV 212/144, 212/146, 212/147 actuators

A	Threaded ring
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1. Fit the threaded ring A onto the external thread of the valve.
2. Tighten the threaded ring A by hand.

5.6.2 Electrical connection

	 DANGER
	Unintentional contact with live parts Danger of death from electric shock! ▷ De-energise the mains connection. ▷ Take steps to ensure that the mains connection cannot be re-energised unintentionally.

**CAUTION****Improper electrical connections**

Damage to the device!

- ▷ Check the electrical connection.
- ▷ Observe the wiring diagrams.

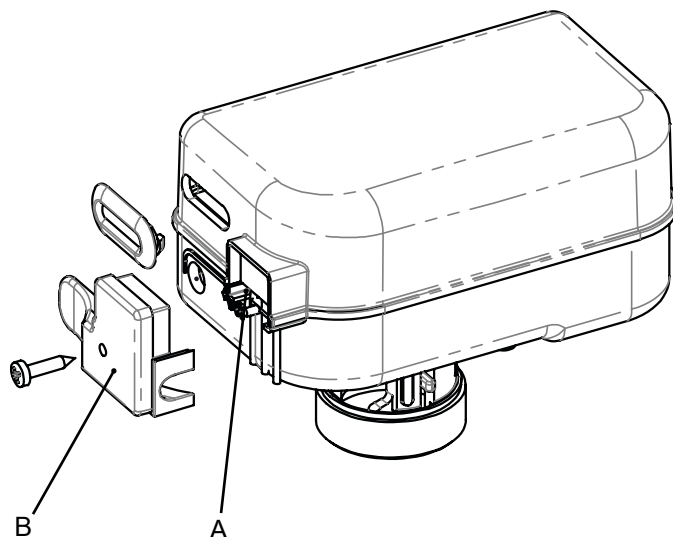


Fig. 13: Removing the strain relief device B

A	Hole
B	Strain relief device

1. Remove the cross recessed head screw with a screwdriver. Remove the strain relief device B.
2. Guide the power cable into the freely accessible opening.
3. Connect the cores in accordance with the wiring diagram (⇒ Section 9.1, Page 44) .
4. Fit the strain relief device B. Fit and tighten the cross recessed head screw with a screwdriver.

5.7 Mounting the EMV212/148 and EMV212/150 actuators

5.7.1 Mounting the actuator

- ✓ The actuator has been de-energised.
- ✓ The actuator is in its upper limit position.

	CAUTION Incorrect installation/removal of the actuator with tools Damage to the actuator! ▷ Only tighten or loosen the threaded ring by hand. ▷ Do not use any tools for tightening or loosening the threaded ring.
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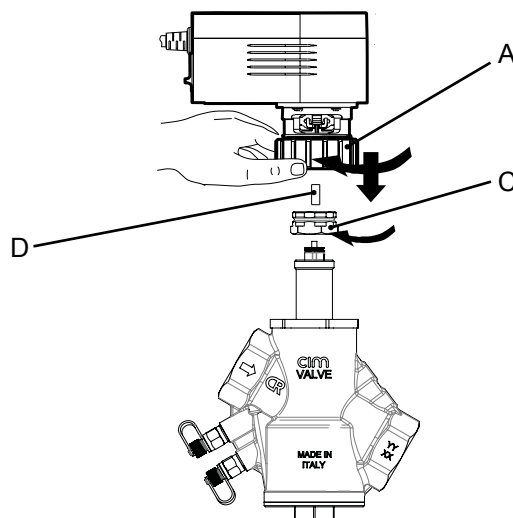


Fig. 14: Mounting the EMV 212/148 and 212/150 actuators

A	Threaded ring
C	Adapter
D	Stem extension

1. Screw adapter C onto the thread of the valve (tightening torque approx. 8 - 10 Nm).
2. Fit the stem extension D onto the valve stem.
3. Mount the actuator on the valve. Screw it on with the threaded ring A.

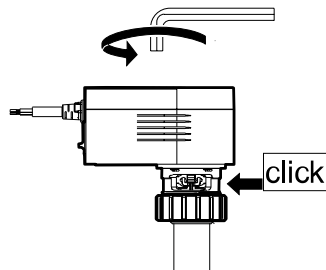


Fig. 15: Using the manual override to close actuators EMV 212/148 and 212/150

4. Use the manual override to close the actuator (⇒ Section 5.4, Page 17) until the stem extension D audibly engages into the actuator coupling.

5.7.2 Electrical connection

	 DANGER Unintentional contact with live parts Danger of death from electric shock! ▷ De-energise the mains connection. ▷ Take steps to ensure that the mains connection cannot be re-energised unintentionally.
	CAUTION Improper electrical connections Damage to the device! ▷ Check the electrical connection. ▷ Observe the wiring diagrams.

The power cable is included in the scope of supply. The power cable is connected to the actuator. For the wiring refer to the "Wiring diagrams" section.
 (⇒ Section 9.1, Page 44) .

5.8 Mounting the EMV213/145 and EMV213/147 actuators

5.8.1 Mounting the actuator

✓ The actuator has been de-energised.

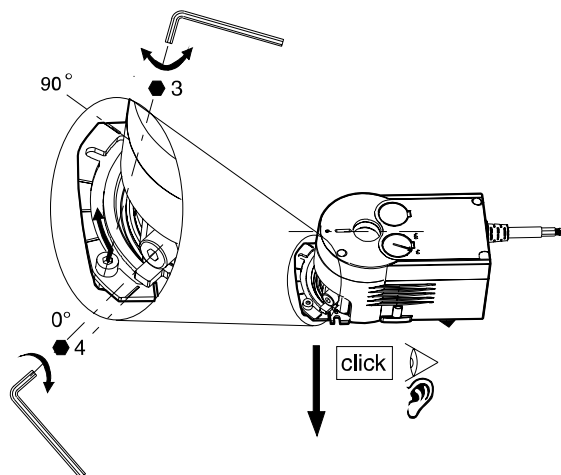


Fig. 16: Mounting the EMV213/145 and EMV213/147 actuators

1. Place the actuator on the fixing plate of the valve. Check that the valve stem slides into the opening of the actuator until you can hear its snap-fit connection engage.
2. Screw the actuator to the fixing plate with an Allen key (3 mm).
3. Screw the valve stem to the actuator with an Allen key (4 mm) (tightening torque approx. 7 - 9 Nm).

5.8.2 Electrical connection

	⚠ DANGER Unintentional contact with live parts Danger of death from electric shock! ▷ De-energise the mains connection. ▷ Take steps to ensure that the mains connection cannot be re-energised unintentionally.
	CAUTION Improper electrical connections Damage to the device! ▷ Check the electrical connection. ▷ Observe the wiring diagrams.

The power cable is included in the scope of supply. The power cable is connected to the actuator. For the wiring refer to the "Wiring diagrams" section. (⇒ Section 9.1, Page 44) .

5.9 Mounting the EMV213/148 and EMV213/150 actuators

5.9.1 Mounting the actuator

- ✓ The actuator has been de-energised.
- ✓ The control valve is in the middle position.

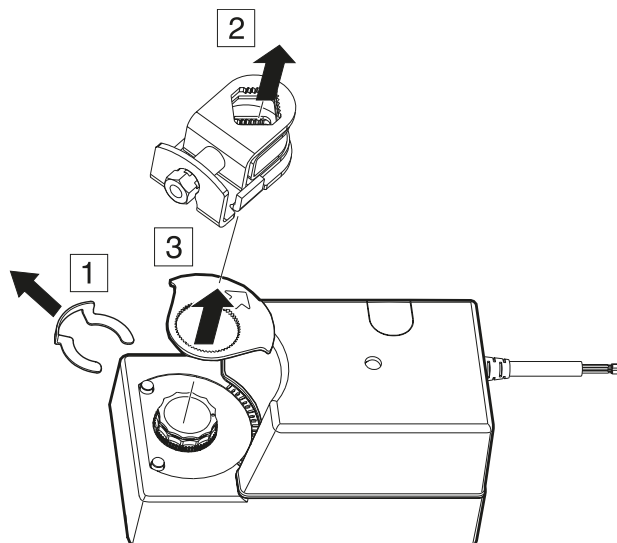


Fig. 17: Mounting the EMV213/148 and EMV213/150 actuators: Removing the circlip, fastening piece and metal sheet with directional arrow

1. Carefully remove the circlip with pliers.
2. Pull the fastening piece upwards and remove it.
3. Pull the metal sheet with directional arrow upwards and remove it.

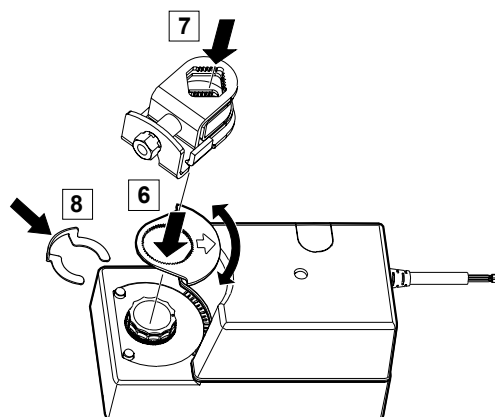


Fig. 18: Mounting the EMV213/148 and EMV213/150 actuators

4. Place the actuator on the fixing plate of the control valve. Make sure that the valve stem slides into the opening of the actuator.
5. Screw the actuator to the fixing plate.
6. Position the metal sheet with the directional arrow in middle position over the protruding valve stem.
7. Position the fastening piece over the protruding valve stem. Slide it on as far as it will go. Fasten it with an open-ended spanner.
8. Fit the circlip.

5.9.2 Electrical connection

	 DANGER Unintentional contact with live parts Danger of death from electric shock! ▷ De-energise the mains connection. ▷ Take steps to ensure that the mains connection cannot be re-energised unintentionally.
	CAUTION Improper electrical connections Damage to the device! ▷ Check the electrical connection. ▷ Observe the wiring diagrams.

The power cable is included in the scope of supply. The power cable is connected to the actuator. For the wiring refer to the "Wiring diagrams" section.
(⇒ Section 9.1, Page 44) .

5.10 Mounting the EMV311 and EMV312 actuators

5.10.1 Mounting the actuator

✓ The actuator has been de-energised.

	CAUTION Incorrect installation/removal of the actuator with tools Damage to the actuator! ▷ Only tighten or loosen the threaded ring by hand. ▷ Do not use any tools for tightening or loosening the threaded ring.
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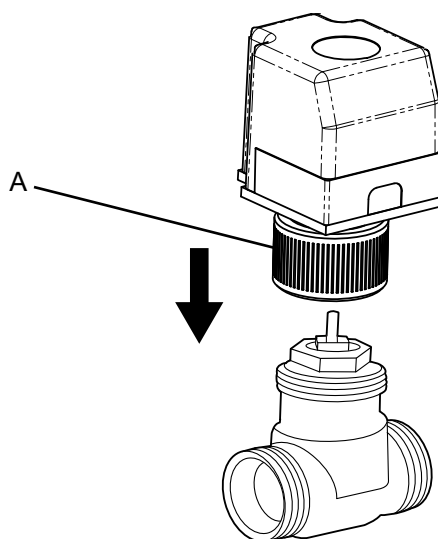


Fig. 19: Mounting the EMV311 and EMV312 actuators

A	Threaded ring
---	---------------

1. Screw the threaded ring A onto the external thread of the valve.
2. Tighten the threaded ring A by hand.

5.10.2 Electrical connection

	⚠ DANGER Unintentional contact with live parts Danger of death from electric shock! ▷ De-energise the mains connection. ▷ Take steps to ensure that the mains connection cannot be re-energised unintentionally.
	CAUTION Improper electrical connections Damage to the device! ▷ Check the electrical connection. ▷ Observe the wiring diagrams.

The power cable is included in the scope of supply. The power cable is connected to the actuator. For the wiring refer to the "Wiring diagrams" section.
(⇒ Section 9.1, Page 44) .

6 Commissioning/Start-up/Shutdown

6.1 Prerequisites for commissioning/start-up

	NOTE
	Never operate the actuator electrically or pneumatically before it has been mounted onto a valve.

Before commissioning/starting up the actuator, make sure the following conditions are met:

- The actuator has been properly mounted and positioned
- Make sure that the operating conditions correspond to the data specified and those provided on the name plate.
- All fastening bolts, connecting elements, and electrical connections have been properly tightened to the specified tightening torques.
- Implement all measures preventing accidental contact with moving and live parts.
- For the preconditions to be met prior to commissioning optional add-on parts refer to the operating manuals of the corresponding accessories.

6.2 Commissioning/Start-up

6.2.1 Commissioning / starting up the EMV211/146 and EMV211/147 actuators

The actuators do not require any further settings to be made. They can be controlled directly after they have been mounted and connected to the power supply.

6.2.2 Commissioning / starting up the EMV212/146 and EMV212/147 actuators

The actuators do not require any further settings to be made. They can be controlled directly after they have been mounted and connected to the power supply.

6.2.3 Commissioning / starting up the EMV212/144 and EMV212/145 actuators

	NOTE
	The actuator is pre-set to a control signal of 0 - 10 V (DIP switch 2 and DIP switch 5 set to "OFF"). When the control signal increases, the actuator stem retracts (DIP switch 1 to "OFF" = DIR action/stroke). DIP switches 3, 4 and 6 are pre-set to "OFF".

- ✓ The actuator has been de-energised.

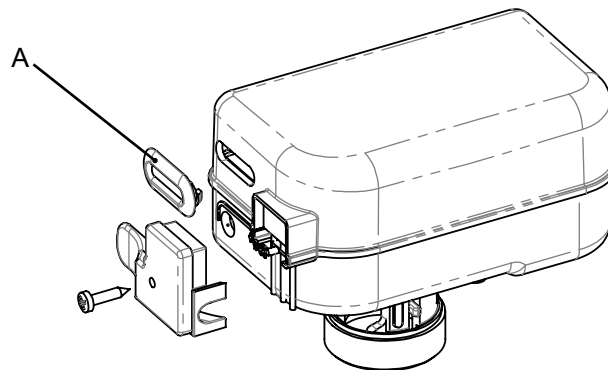


Fig. 20: Removing the cover for the DIP switches A

1. Removing the cover for the DIP switches A
2. Set the required actuator function via the DIP switches.

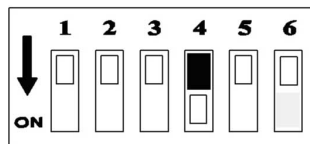


Fig. 21: Standard setting of the DIP switches for an EMV212/144 actuator mounted on a BOA-Control PIC DN 10-25 valve

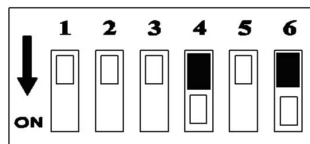


Fig. 22: Standard setting of the DIP switches for an EMV212/144 actuator mounted on a BOA-Control PIC DN 32-50 valve

Table 12: Possible settings of DIP switches 1 - 6

DIP switch	ON	OFF	Description
1	X	-	Inverted stroke
1	-	X	Direct stroke
2	X	-	2-10/6-10
2	-	X	0-10/0-5
3	X	-	Sequencing range
3	-	X	Specified range
4	X	-	Defined stroke
4	-	X	Auto stroke
5	X	-	4 - 20 mA
5	-	X	Voltage range
6	X	-	Stroke setting
6	-	X	Automatically calibrated stroke

Table 13: Setting the length of stroke via DIP switches 1 and 6

DIP switch	ON	OFF	Length of stroke
			[mm]
1	-	X	5
6	-	X	
1	-	X	5,5
6	X	-	
1	X	-	2,5
6	-	X	
1	X	-	3,5
6	X	-	

For the BOA-Control PIC valves (spring-return valves) DIP switch 4 is set to "ON" (defined stroke). This overrides the function of DIP switch 1 and DIP switch 6. When the control signal increases, the actuator stem retracts (DIR stroke).

The required valve travel (defined stroke) can be set via switches 1 and 6.

For valves with travel stop automatic commissioning can be carried out (DIP switch 4 "OFF" and DIP switch 6 "ON").

6.2.4 Commissioning / starting up the EMV212/148, EMV212/150, EMV213/145, EMV213/147, EMV213/148, EMV213/150 actuators

- ✓ The actuator has been de-energised.

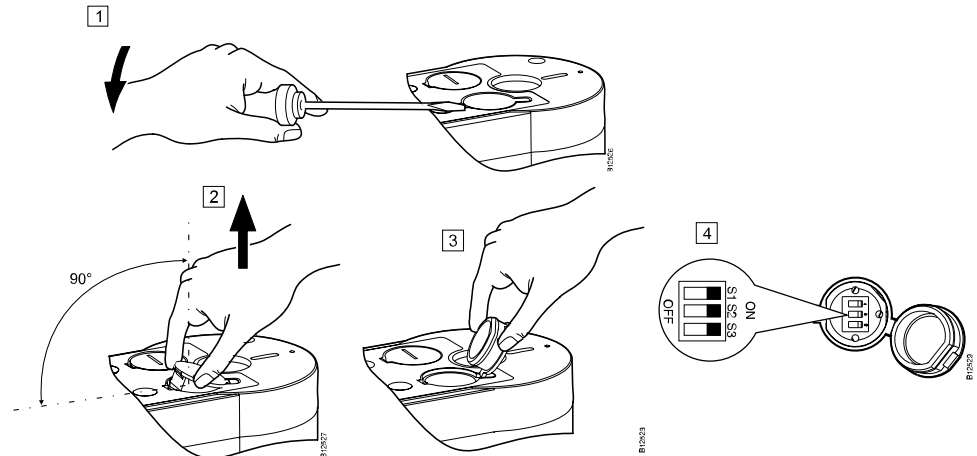


Fig. 23: Actuators EMV212/148, EMV212/150 and EMV213/145, EMV213/147: Removing the cover

1. For EMV212/148, EMV212/150, EMV213/145, EMV213/147: Lever off the rubber cover with a flat-head screwdriver and fingers.

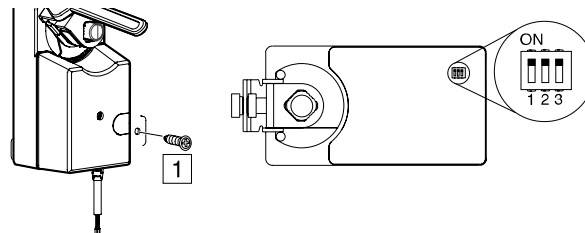


Fig. 24: Actuators EMV213/148, EMV213/150: Removing the cover

2. For EMV213/148 and EMV213/150: Undo the fastening screw with a Phillips screwdriver. Remove the cover.
⇒ DIP switches S1 - S3 are accessible.

Switch setting	Actuating time at 8 mm stroke / 90° angle of rotation
1 2 3 On Off	60 s ± 2
1 2 3 On Off 	120 s ± 4

Fig. 25: Setting the actuating time

3. Set the actuating time via DIP switch S1.

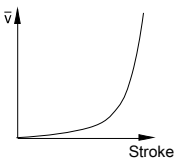
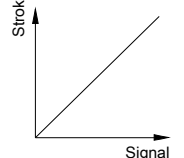
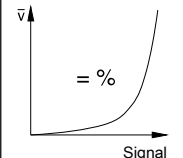
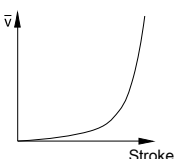
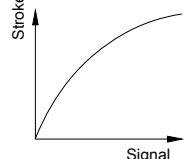
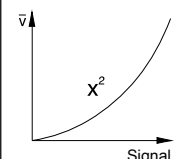
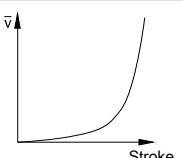
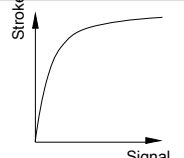
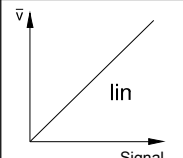
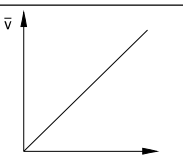
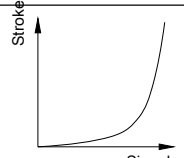
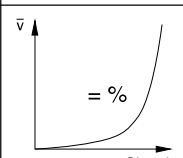
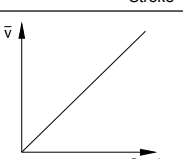
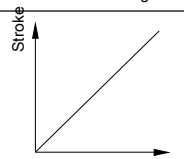
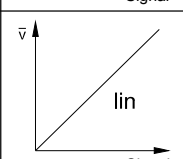
			
1 2 3 On Off 			
1 2 3 On Off			
1 2 3 On Off			
1 2 3 On Off			
1 2 3 On Off			

Fig. 26: Setting the characteristic curves behaviour

4. Set the characteristic curves behaviour via DIP switches S2 and S3.

6.2.5 Commissioning / starting up the EMV311 and EMV312 actuators

The actuators do not require any further settings to be made. They can be controlled directly after they have been mounted and connected to the power supply.

6.3 Operating limits

6.3.1 Ambient temperature

Observe the following parameters and values during operation:

Table 14: Permissible ambient temperatures

Ambient condition	Value
Ambient temperature EMV211	0 °C to +50 °C
Ambient temperature EMV212	0 °C to +50 °C
Ambient temperature EMV213	0 °C to +50 °C
Ambient temperature EMV311	-5 °C to +50 °C
Ambient temperature EMV312	-5 °C to +50 °C
Humidity	5 % to 95 % rH

6.4 Shutdown

6.4.1 Measures to be taken for shutdown

1. Disconnect the equipment from the power supply.
2. Secure against unauthorised start-up.

6.5 Returning to service

For returning the equipment to service, observe the sections on commissioning/start-up (⇒ Section 6.2, Page 30) and the operating limits (⇒ Section 6.3, Page 34) .

In addition, carry out all servicing/maintenance operations before returning the actuator to service. (⇒ Section 7, Page 35)

7 Servicing/Maintenance

7.1 Safety regulations

The operator ensures that maintenance, inspection and installation are performed by authorised, qualified specialist personnel who are thoroughly familiar with the manual.

	 WARNING Unintentional starting of the actuator Risk of injury by moving components and shock currents! ▷ Always make sure the electrical connections are de-energised before carrying out work on the actuator. Ensure that the main circuits as well as the supplementary and auxiliary circuits are de-energised. ▷ Mind the capacitor discharge time. After switching off the frequency inverter, wait 10 minutes until dangerous voltages have discharged. ▷ Ensure that the actuator cannot be switched on unintentionally.
	 WARNING Insufficient stability Risk of crushing hands and feet! ▷ Secure the actuator against tilting or tipping over during installation/dismantling.
	NOTE All maintenance work, service work and installation work can be carried out by KSB Service or authorised workshops.

Never use force when dismantling and reassembling the actuator.

7.2 Removing the actuator

7.2.1 Removing the EMV211 actuator

- ✓ The actuator has been de-energised.

	CAUTION Incorrect installation/removal of the actuator with tools Damage to the actuator! ▷ Only tighten or loosen the threaded ring by hand. ▷ Do not use any tools for tightening or loosening the threaded ring.
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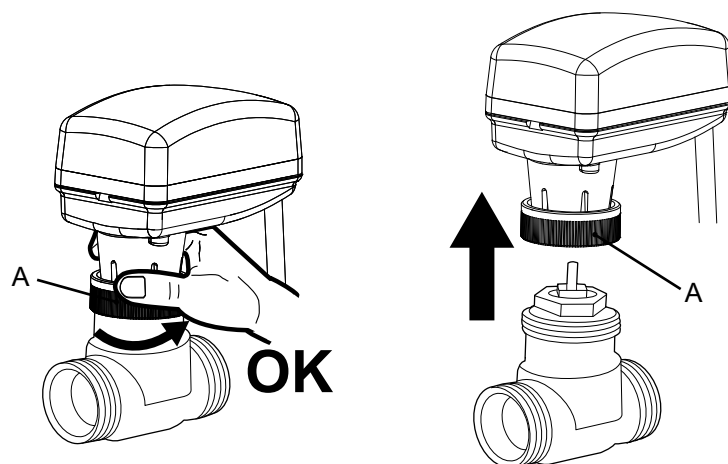


Fig. 27: Removing the EMV211 actuator

A	Threaded ring
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1. Unscrew the threaded ring A from the external thread of the valve by hand.
2. Remove the actuator from the valve.

7.2.2 Removing the EMV212/144, EMV 212/146 and EMV212/147 actuators

✓ The actuator has been de-energised.

	CAUTION Incorrect installation/removal of the actuator with tools Damage to the actuator! ▷ Only tighten or loosen the threaded ring by hand. ▷ Do not use any tools for tightening or loosening the threaded ring.
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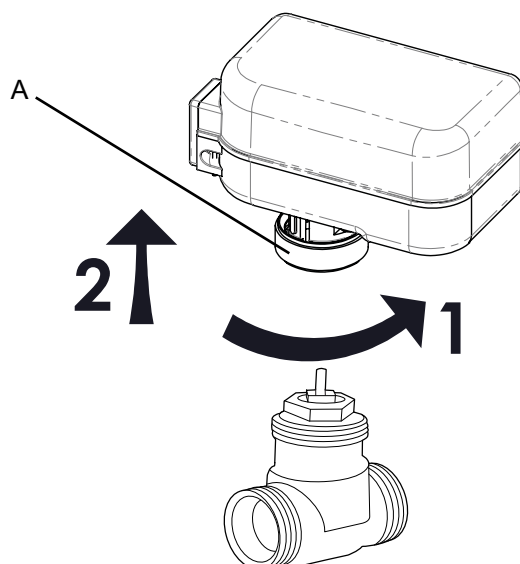


Fig. 28: Removing the EMV212/144, EMV212/146, EMV212/147 actuators

1. Unscrew the threaded ring A from the external thread of the valve by hand.
2. Remove the actuator from the valve.

7.2.3 Removing the EMV212/148 and EMV212/150 actuators

✓ The actuator has been de-energised.

	CAUTION Incorrect installation/removal of the actuator with tools Damage to the actuator! ▷ Only tighten or loosen the threaded ring by hand. ▷ Do not use any tools for tightening or loosening the threaded ring.
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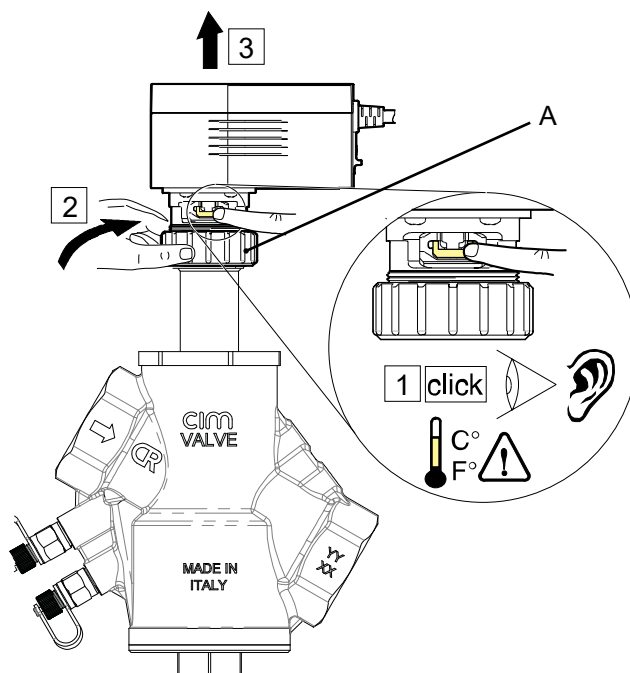


Fig. 29: Removing the EMV212/148 and EMV212/150 actuators

1. Press the safety catch upwards and hold it in this position.
2. Unscrew the threaded ring A counter-clockwise.
3. Remove the actuator from the valve.

7.2.4 Removing the EMV213/145 and EMV213/147 actuators

✓ The actuator has been de-energised.

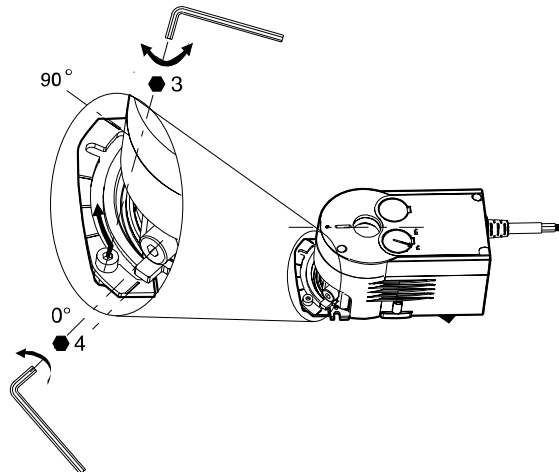


Fig. 30: Removing the EMV213/145 and EMV213/147 actuators

1. Use an Allen key (4 mm) to remove the valve stem from the actuator.
2. Use an Allen key (3 mm) to undo the fastening element between the actuator and the fixing plate of the control valve.
3. Remove the actuator from the fixing plate of the valve.

7.2.5 Removing the EMV213/148 and EMV213/150 actuators

✓ The actuator has been de-energised.

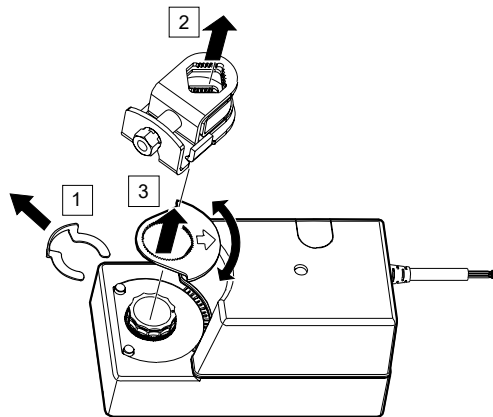


Fig. 31: Removing the EMV213/148 and EMV213/150 actuators

1. Remove the circlip.
2. Undo and remove the fastening piece with an open-ended spanner.
3. Remove the metal sheet with directional arrow from the protruding valve stem.
4. Undo the actuator from the fixing plate.
5. Remove the actuator from the valve.

7.2.6 Removing the EMV311 and EMV312 actuator

✓ The actuator has been de-energised.

	CAUTION Incorrect installation/removal of the actuator with tools Damage to the actuator! ▷ Only tighten or loosen the threaded ring by hand. ▷ Do not use any tools for tightening or loosening the threaded ring.
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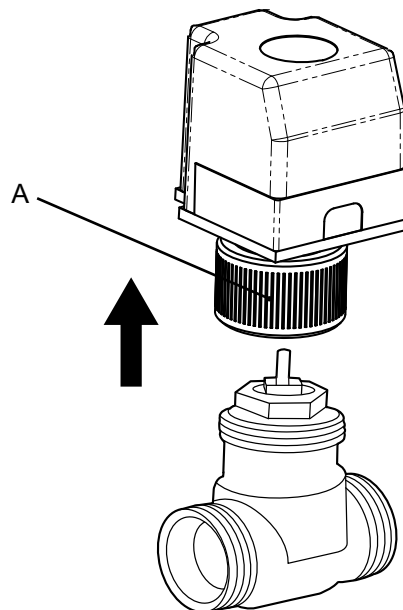


Fig. 32: Removing the EMV311 and EMV312 actuators

1. Unscrew the threaded ring A from the external thread of the valve by hand.
2. Remove the actuator from the valve.

7.3 Maintenance/inspection

The actuators are maintenance-free.

7.4 Lubrication

The gear unit is lubricated for life and does not need to be re-lubricated.

7.5 Cleaning

	CAUTION Improper cleaning of actuators Damage to the actuator covers! ▷ Clean the actuators in dry condition only. ▷ Do not use solvents. ▷ Use a soft cloth. ▷ Do not use abrasive substances.
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7.6 Mounting the actuator

After maintenance / inspection, the actuator must be mounted back on the valve.

EMV211/...: (⇒ Section 5.5.1, Page 19)

EMV212/144, EMV 212/146 and EMV212/147: (⇒ Section 5.6.1, Page 22)

EMV212/148 and EMV212/150: (⇒ Section 5.7.1, Page 24)

EMV213/145 and EMV213/147: (⇒ Section 5.8.1, Page 26)

EMV213/148 and EMV213/150: (⇒ Section 5.9.1, Page 27)

EMV311/..., EMV312/... : (⇒ Section 5.10.1, Page 29)

Connect the power cable and the control cable. Mechanically secure them in front of the terminals to prevent loosening.

EMV211/...: (⇒ Section 5.5.2, Page 19)

EMV212/144, EMV 212/146 and EMV212/147: (⇒ Section 5.6.2, Page 22)

EMV212/148 and EMV212/150: (⇒ Section 5.7.2, Page 25)

EMV213/145 and EMV213/147: (⇒ Section 5.8.2, Page 26)

EMV213/148 and EMV213/150: (⇒ Section 5.9.2, Page 28)

EMV311/..., EMV312/... : (⇒ Section 5.10.2, Page 29)

For returning the actuator to service after maintenance and mounting, see (⇒ Section 6.5, Page 34) .

7.7 Spare parts stock

In the case of damage and malfunction, a full replacement is recommended.

8 Trouble-shooting

	 WARNING
	Improper work to remedy faults Risk of injury! ► For any work performed to remedy faults, observe the relevant information given in this operating manual and/or in the product literature provided by the accessories manufacturer.

If problems occur that are not described in the following table, consultation with the KSB service is required.

8.1 Display of EMV211/145

- A** Green LED lit continuously
- B** Green LED flashing
- C** Green LED OFF
- D** Red LED lit continuously
- E** Red LED flashing
- F** Red LED OFF

Table 15: Trouble-shooting for statuses

A	B	C	D	E	F	Status	Possible cause	Remedy
-	X	-	-	-	-	Actuator moving into limit position	-	-
X	-	-	-	-	-	Actuator in limit position	-	-
-	-	-	-	X	-	Actuator in calibration phase	-	-
-	-	-	X	-	-	No input signal	Signal cable damaged	Check electrical connection and power cable for any damage.
-	-	-	-	-	-		Signal cable not connected	
-	-	-	-	-	-		Electronic components defective	
-	-	X	-	-	X	Actuator not responding	Signal cable damaged	Check electrical connection and power cable for any damage.
-	-	-	-	-	-		Signal cable not connected	
-	-	-	-	-	-	Actuator not moving	Actuator stem broken	Actuator has to be replaced.

8.2 Display of EMV211/146 and EMV211/147

- A** Green LED lit continuously
B Green LED flashing
C Green LED OFF

Table 16: Trouble-shooting for statuses

A	B	C	Status	Possible cause	Remedy
-	X	-	Actuator moving into limit position	-	-
X	-	-	Actuator in limit position	-	-
-	-	-	Actuator in calibration phase	-	-
-	-	X	Actuator not responding	Signal cable damaged	Check electrical connection and power cable for any damage.
				Signal cable not connected	
				Electronic components defective	Actuator has to be replaced.
-	-	-	Actuator not moving	Actuator stem broken	Actuator has to be replaced.

8.3 Display of EMV212/144, EMV212/145, EMV212/146 and EMV212/147

- A** Yellow LED lit continuously
- B** Yellow LED flashing slowly
- C** Yellow LED OFF
- D** Red and green LEDs flashing in alternation (fast)
- E** Red and green LEDs flashing in alternation (slowly)
- F** Red LED OFF
- G** Red LED flashing slowly
- H** Red LED lit continuously
- I** Green LED flashing slowly
- J** Green LED lit continuously
- K** Green LED OFF
- L** Green and red LEDs flashing simultaneously (fast)

Table 17: Trouble-shooting for statuses

A	B	C	D	E	F	G	H	I	J	K	L	Status	Possible cause	Remedy
X	-	-	-	-	X	-	-	-	-	X	-	Actuator stopped	-	-
X	-	-	-	-	-	-	-	-	-	-	X	Actuator stopped unexpectedly	Signal cable damaged Signal cable not connected	Check electrical connection and power cable for any damage.
-	X	-	-	-	X	-	-	-	-	X	-	Low supply voltage	Power cable overloaded	Check supply capacity.
-	-	-	-	-	X	-	-	-	-	X	-	Actuator OFF or reset (low supply voltage).	Power cable overloaded Power cable damaged Power cable not connected	Check supply capacity. Check electrical connection and power cable for any damage.
-	-	-	-	-	-	-	-	-	-	-	-	Actuator not moving	Electronic components defective	Actuator has to be replaced.

9 Related Documents

9.1 Wiring diagrams

EMV211/146, EMV211/147

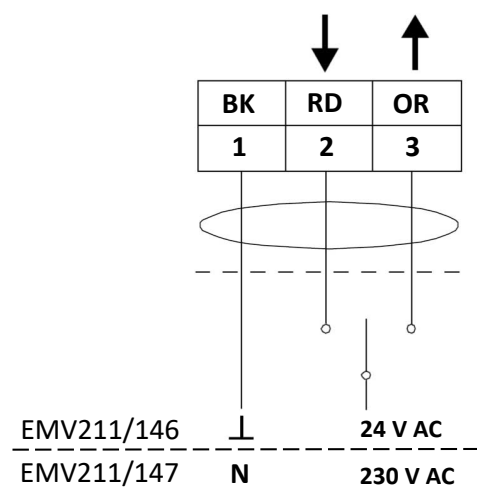


Fig. 33: Wiring diagram EMV211/146 and EMV211/147 (3-point)

BK	Blue	OR	Orange
RD	Red		

EMV212/144, EMV212/145, EMV212/146, EMV212/147

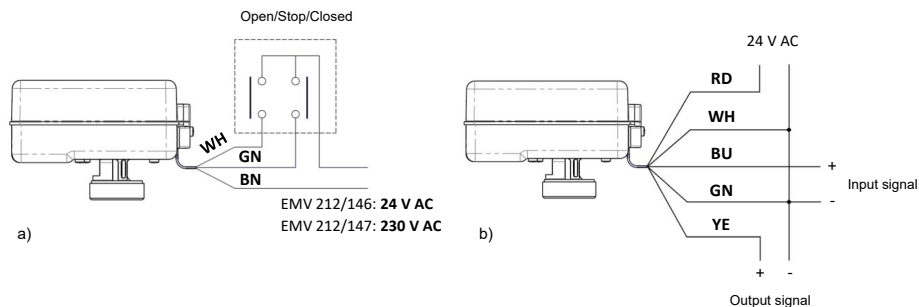


Fig. 34: Wiring diagrams a) EMV212/146 and EMV212/147 (3-point) b) EMV212/144 and EMV212/145 (continuous-action)

GN	Green	BN	Brown
RD	Red	BU	Blue
WH	White	YE	Yellow

EMV212/148, EMV212/150

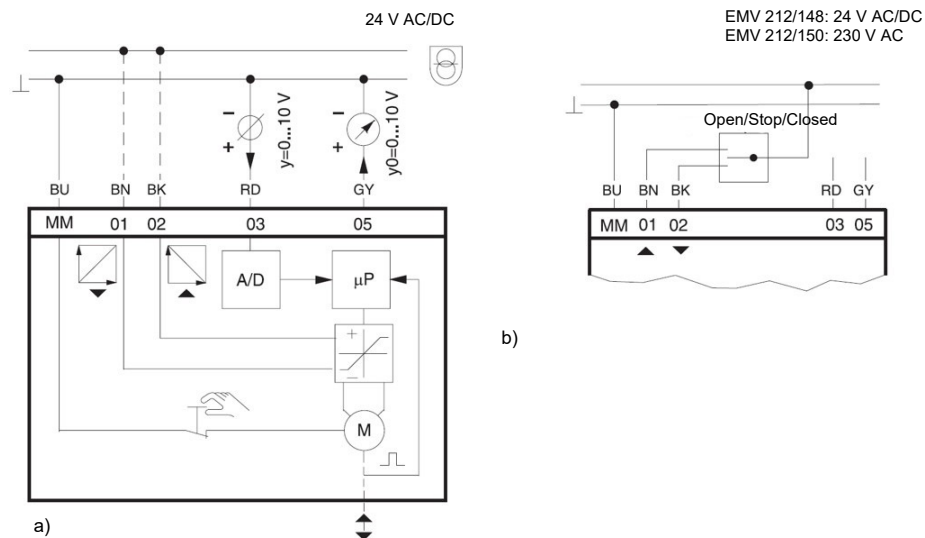


Fig. 35: Wiring diagrams a) EMV212/148 (continuous-action) b) EMV212/148 and EMV212/150 (3-point)

BK	Blue	BN	Brown
RD	Red	BU	Blue
GY	Grey		

EMV213/147, EMV213/150

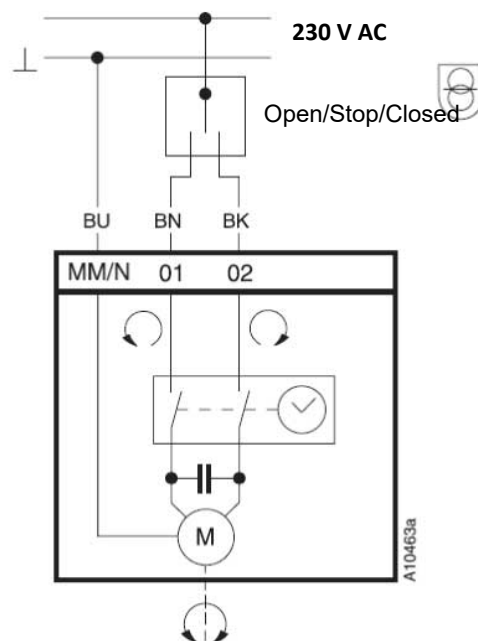


Fig. 36: Wiring diagram EMV213/147 and EMV213/150

BK	Blue	BN	Brown
BU	Blue		

EMV213/145, EMV213/148

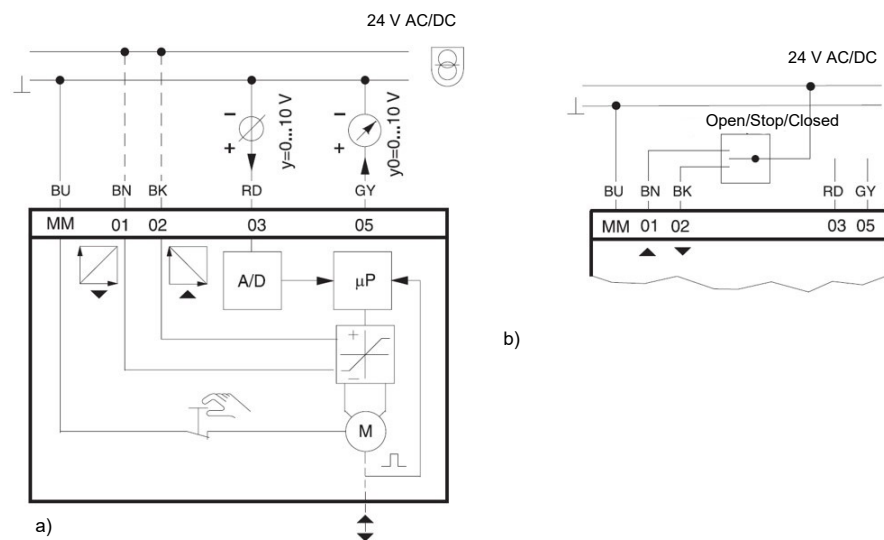


Fig. 37: Wiring diagrams a) EMV213/145 and EMV213/148 (continuous-action) b) EMV213/145 and EMV213/148 (3-point)

BK	Blue	BN	Brown
RD	Red	BU	Blue
GY	Grey		

EMV311/NC24, EMV311/NO24, EMV311/NC230, EMV311/NO230, EMV312/NO24, EMV312/NO230

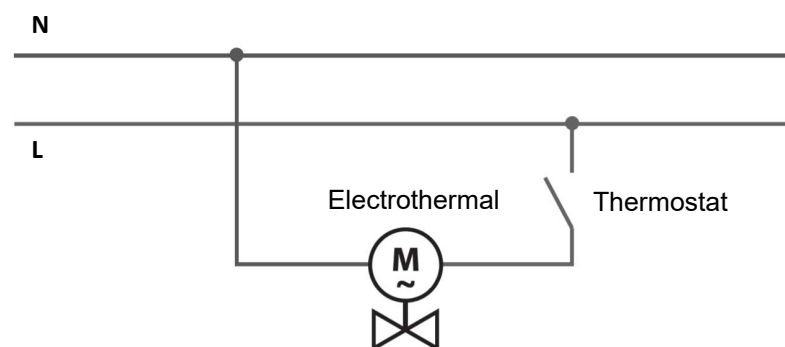


Fig. 38: Wiring diagram EMV311/NC24, EMV311/NO24, EMV311/NC230, EMV311/NO230, EMV312/NO24, EMV312/NO230

N	Blue	L	Brown
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EMV311/PRO

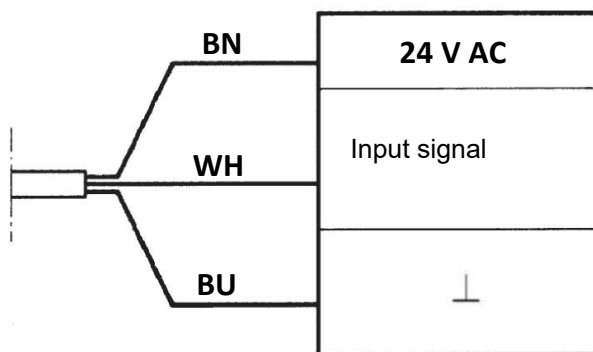


Fig. 39: Wiring diagram EMV311/Pro

BN	Brown	BU	Blue
WH	White		

10 EU Declaration of Conformity

Manufacturer:

KSB SE & Co. KGaA
Johann-Klein-Straße 9
67227 Frankenthal (Germany)

The manufacturer herewith declares that the product:

EMV311

- is in conformity with the provisions of the following directives / regulations as amended from time to time:
 - 2011/65/EU: Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS)
 - 2014/35/EU: Electrical Equipment Designed for Use within Specific Voltage Limits (Low Voltage)

The EU Declaration of Conformity was issued in/on:

Frankenthal, 12 July 2021



Dieter Hanewald
Product Management and Product Development II Frankenthal
KSB SE & Co. KGaA
Johann-Klein-Straße 9
67227 Frankenthal

11 EU Declaration of Conformity

Manufacturer:

KSB SE & Co. KGaA
Johann-Klein-Straße 9
67227 Frankenthal (Germany)

The manufacturer herewith declares that the product:

**EMV212/144, EMV212/145, EMV212/146, EMV212/147,
EMV212/150, EMV212/148, EMV213/147, EMV213/145**

- is in conformity with the provisions of the following directives / regulations as amended from time to time:
 - 2014/30/EU: Electromagnetic Compatibility (EMC)
 - 2014/35/EU: Electrical Equipment Designed for Use within Specific Voltage Limits (Low Voltage)

The EU Declaration of Conformity was issued in/on:

Frankenthal, 12 July 2021



Dieter Hanewald
Product Management and Product Development II Frankenthal
KSB SE & Co. KGaA
Johann-Klein-Straße 9
67227 Frankenthal

12 EU Declaration of Conformity

Manufacturer:

KSB SE & Co. KGaA
Johann-Klein-Straße 9
67227 Frankenthal (Germany)

The manufacturer herewith declares that the product:

EMV211/145, EMV211/146, EMV211/147, EMV213/150, EMV213/148

- is in conformity with the provisions of the following directives / regulations as amended from time to time:
 - 2011/65/EU: Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS)
 - 2014/30/EU: Electromagnetic Compatibility (EMC)
 - 2014/35/EU: Electrical Equipment Designed for Use within Specific Voltage Limits (Low Voltage)

The EU Declaration of Conformity was issued in/on:

Frankenthal, 12 July 2021



Dieter Hanewald
Product Management and Product Development II Frankenthal
KSB SE & Co. KGaA
Johann-Klein-Straße 9
67227 Frankenthal

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KSB SE & Co. KGaA

Johann-Klein-Straße 9 • 67227 Frankenthal (Germany)

Tel. +49 6233 86-0

www.ksb.com