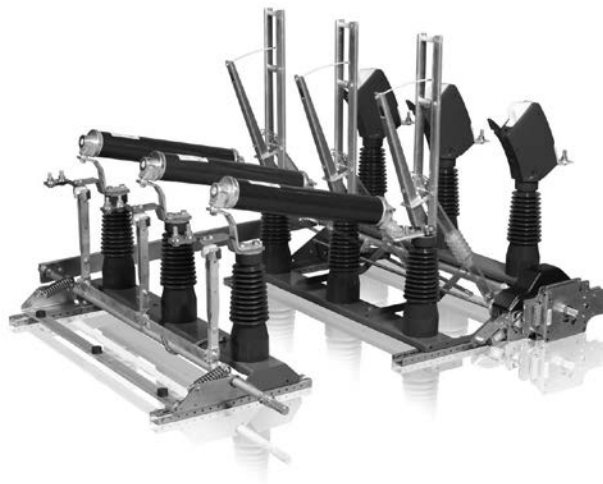


# Indoor switch-fuse combination NALFWind™ 36KV

The NALFWind indoor switch-fuse combination features compact modular design and a wide range of functions. Since the apparatus is equipped with a unique arc quenching system and high switching capacity, it may be applied as the key component of a transformer station. When combined with CEF fuse links, the NALFWind unit may ensure control over the full range of overload currents.

The main area of application of the NALFWind apparatus is protection of transformers in power distribution grids.



## Introduction

The NALFWind indoor switch-fuse combination is based on a modular design. The main part consists of the frame (base) with insulators and a current path.

An A-type double-spring operating mechanism based on the energy storage principle is mounted to the frame. The combination contains an EB-type earthing switch integrated with the fuse holder.

Accessories such as an electromagnetic trip unit, auxiliary switches, motor operating devices and various systems of manual operating mechanisms may easily be added to the combination.

## Key advantages

The indoor switch-fuse combination meets requirements of IEC 62271-105 concerning proper interoperation between the switch and fuse links. Due to its perfect combination, the apparatus guarantees protection against low (a function performed by the switch) and high currents (a function performed by the fuse link).

# Your safety first – at all times!

This is the reason why our manual begins with the following guidelines:

- Conform to the legally recognised standards (i.e. IEC, ANSI), conditions for the local connection to the power grid and safety rules included in the occupational health and safety regulations.

## WARNING!

- Particular attention should be paid to warning notes included in the instructions and marked with the following symbol.
- Make sure that the conditions under which the switch will be used meet the requirements defined in the technical features of the apparatus.
- Make sure all the persons responsible for the installation, operation and maintenance of the apparatus have access to these instructions.
- Operators of the apparatus should always perform the works in a fully responsible manner, in particular with regard to occupational safety and proper handling of the apparatus.,0



### CAUTION

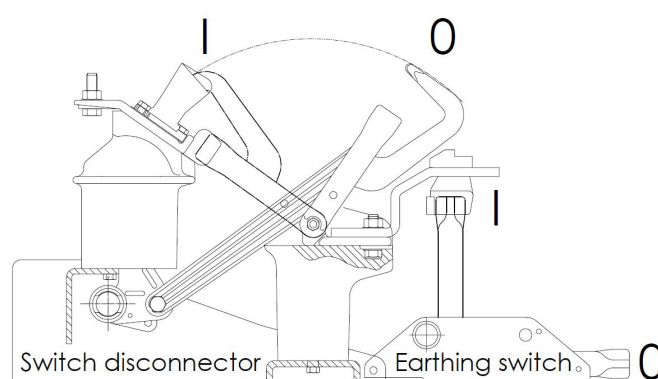
According to the good engineering practice, you always comply with the guidelines included in these instructions!

High voltage can cause electrical shocks and burns. Before commencing any works on the apparatus, disconnect the power supply and connect the apparatus to the earthing system.

Should you have any questions regarding these instructions, ABB will be pleased to provide any necessary information. Contact details are provided on the last page.

In case of any uncertainty or questions related to mounting and/or operation which are not described in the manual please contact ABB.

According to IEC 62271-1 p. 5.12 and IEC 62271-102 p. 5.104.3.1 position of the switch has to be clearly indicated. The NAL switch allows 100% certainty to determine the position of the main contacts which is a big advantage. ABB recommends to verify the position of the main knives before and after each operation. ABB recommends installing switch disconnectors in applications where it is possible to visually check main knives position e.g. through inspection window.



Please place attached sticker with drawing close to inspection window. Before any operation please check switch position.

# NALFWind indoor switch-fuse combination

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# NALFWind indoor switch-fuse combination

## 1.0 NALFWind indoor switch-fuse combination.

### Packing

The apparatus is supplied by the manufacturer as a completely assembled unit with the spring mechanism and auxiliary components. This makes its installation quick and easy (see point 2.0).

If the individual elements are to be installed separately, see points 4.0 and 5.0.

## 2.0 Installation

### 2.1 Preparation of the switch fuse for installation (Photo 1)

For installation purposes the current knives must be opened manually until the stop position is reached and connect the knife pull-rods with the apparatus shaft. Before test run of the switch, check that surfaces of the main contacts are covered with grease (recommended product: Isoflex Topas NCA 52).

### Rules for operating the switches

When operating the switches with the A-type spring mechanism (double-spring), the opening spring is first stretched and snapped by turning the operating unit shaft clockwise. When the shaft is turned counterclockwise, the closing spring is stretched and the switch closes. The switch opens when the operating unit shaft is turned clockwise.

### Note!

For the A-type mechanism, after closing or opening the apparatus (without charging the opening spring), do not continue turning the shaft in the closing direction. This may cause damage to the mechanism.

### Note

During operation of the switches keep safe distance from the contact knives. If the apparatus is to be installed on unsmooth surface, please use shims eliminating any unevenness. This helps to avoid appearance of stresses in the frame after its tightening, which might hinder adjustment of manual operating mechanisms. If the surface is very uneven, it is recommended to use a rigid support structure, e.g. by ABB.

### 2.2 Preparation of the support structure

The switches can be mounted only in the upright position. When selecting the installation location of the apparatus, one must take into account the geometrical dimensions and minimum clearance from the earthed and live parts of the apparatus. The support structure should be rigid enough to avoid deformation of the switch base. All the points of the surface on which the switch fuse is supported should be flush with one another. It is recommended that the support structure is made of steel profiles in the shape of a channel or angle section.

The switch fuse is mounted with the use of eight M12 bolts placed as shown in the dimension drawing.

## 2.3 Installation of the switch fuse combination

During installation of the switch, special attention must be paid to the method of transport. The hoist sling should be fixed to the points marked on the frame (Photo 2a). In order to reduce the risk of damaging the current knives, the apparatus should always be transported with the knives closed and the pull-rods not connected with the shaft. A method of transporting the units is presented in Photos 2b and 2c. Pay attention if the apparatuses are fastened in a stable way, otherwise the following problems may appear:

- improper operation of the operating unit shaft,
- maladjustment (non-simultaneity) of contacts closing, which under normal conditions should not exceed 3 mm,
- deterioration in the quality of the connection of contacts in the closed position,
- displacement of the symmetrical plane of moving contacts against the pole symmetrical plane, which results in improper interoperation of fixed and moving contacts (improper contact).

A gauge with the thickness of 0.05 mm should not go between fixed and moving contacts of the properly installed switch.



Photo 1 NALFWind indoor switch-fuse combination

To avoid this type of defects, if the support structure is not smooth enough, it is recommended to initially fasten the apparatus with three bolts. To avoid deformation, use additional washers when tightening the fourth fixing bolt.

Connect the pull-rods to the main shaft  
(see point 13 Repairs and maintenance – checking of current knives).

#### Note

The apparatus is designed for operation in the upright position (with post insulators on which the main knives are mounted). Other operation position to be agreed with manufacturer.  
If the apparatus is intended for operation under conditions which may cause accumulation or condensation of water on its elements or on the elements adjacent to it (busbars), it must be protected against water dropping or running on its insulation parts. This may result in deterioration of the insulation.

### 3.0 Operation of the manual HE operating mechanism

#### Switch fuse closing

Pull locking ring S (Fig. 7) of the manual HE operating unit body. Turn the operating mechanism counterclockwise using a lever, until the opening spring of the spring mechanism is pressed and snaps. Locking ring S should return to its proper position. After drawing locking ring S aside, turn the operating mechanism lever clockwise until the switch is closed.

Check proper operation of locking ring S.

#### Switch fuse opening

After drawing locking ring S aside, turn the manual lever counterclockwise. The switch will open after it is turned by 20°.

Photo 2a Mounting position of the mounting points hoist sling for the switch | Photo 2b Transport of the earthing switch | Photo 2c Transport of the switch



Photo 2b

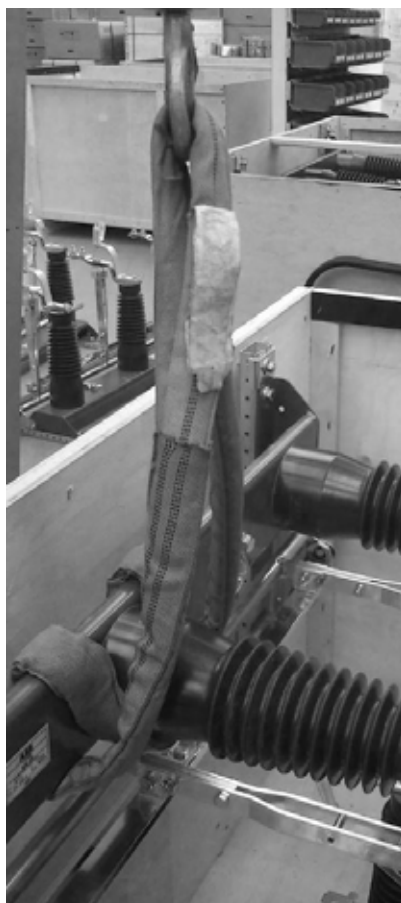
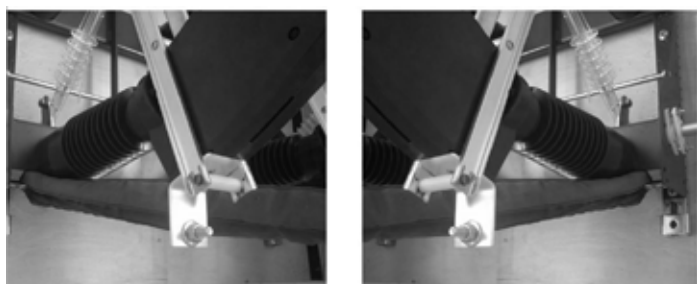


Photo 2c



#### 4.0 Installation of the mechanism on the switch (Photo 3)



##### WARNING

These operations must only be entrusted to personnel trained to operate this type of apparatus.

Spring mechanisms are mounted only on the right side of the switch frame and thus the switch is operated only on this side. If the switch is to be operated from the opposite side, it is necessary to use the shaft extension installed on the left (see Photo 3). The spring mechanism is coupled with the operating unit shaft of the switch and is mounted to the frame.

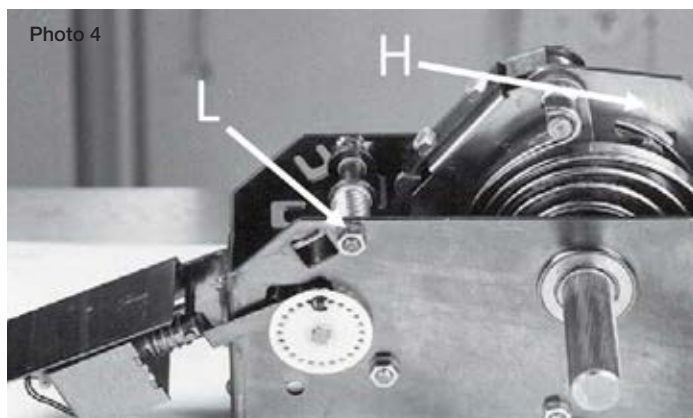
**Note:** During installation of the spring mechanism, the knives must be in open position, whereas the casing of the A-type mechanism must be removed upon untightening the “L” M8 nut (Photo 4).

As a standard, the switch provided in the NALFWind combination is fitted with the shaft extension. When fastening the mechanism to the frame, check that the “H” snap fastener is in proper position (see Photo 4). Once the mechanism is tightened, fix the casing of mechanism A and tighten the “L” M8 nut.

##### 4.1. Testing operation of the mechanism

Testing operation of the apparatus (see point 2.1).

Photo 3 Installation of the mechanism on the switch | Photo 4 Electromagnetic trip unit mounted on the A-type mechanism | Photo 5 View of the switch with the shaft extension fastened on the left side and mechanism casing on the right side



## 5.0 Installation of the manual HE mechanism

Gears are installed when the switch is in open position, as shown in Figure 6.

The angle of inclination of the connecting pull-rod cannot exceed  $40^\circ$  (see Photo 7). Position of openings in the pull-rod – see Fig. 8.

### 5.1 Installation and adjustment instructions for the NALFWind with manual HE operating mechanism

#### 1. Step by step.

Remove the switch fuse from the packaging. Mount the switch on the support structure as per guidelines of point 2.3.

Tilt the current knives to maximum open position. Connect the knife pull-rods to the main switch (during transport the knives are in closed position to facilitate the process of installation – see point 13). Repairs and maintenance – checking of current knives.

2. The opening spring of the mechanism cannot be charged – see Photo 10. Check the position through the “R” sight-glass (incorrect position shown in Photo 17).
3. Install the bevel gear box on the shaft of the switch and earthing switch. Make sure that the wheels are in a proper position (see Fig. 6).
4. Installation of the manual HE operating mechanism. Place the operating unit pull-rod between the Cardan fastener and the gear (tube  $\varnothing=26.9$  mm). Mark a position of the opening in the protective pin and drill the opening not bigger than  $\varnothing=10,1$  mm (see Fig. 8).
5. Remove the Seeger ring, spring and washer (see Photo 13).

Fig. 6 Switch-fuse combination with earthing switch | Fig. 7 Manual operating unit | Fig. 8 Connecting pull-rod | Photos 9-10 Installation of the manual HE mechanism

Fig. 6

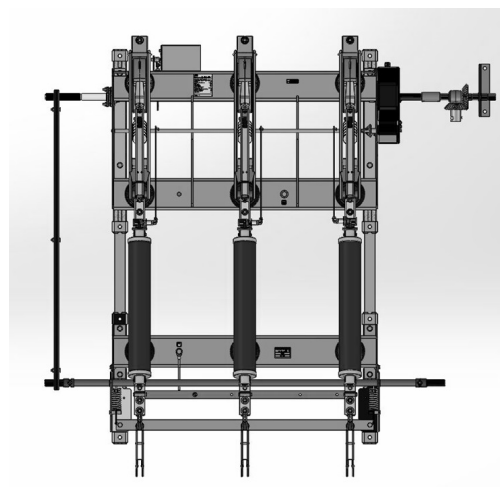


Fig. 7

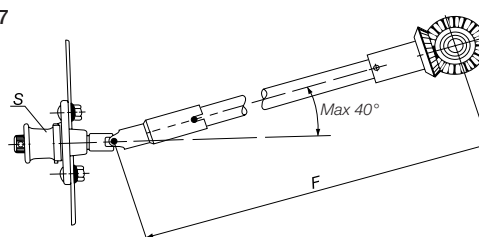


Fig. 8

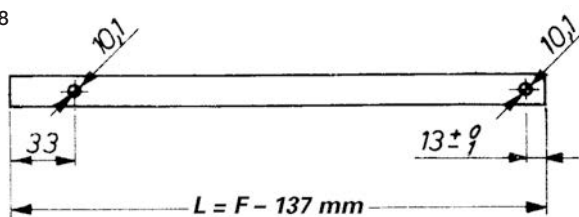


Photo 9

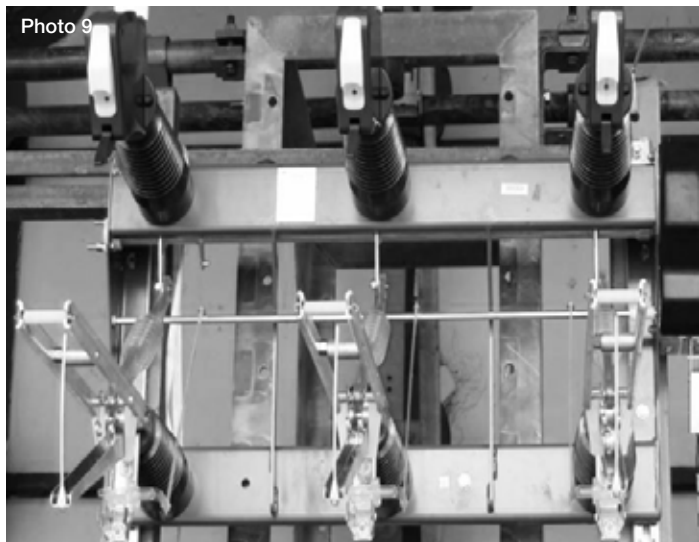
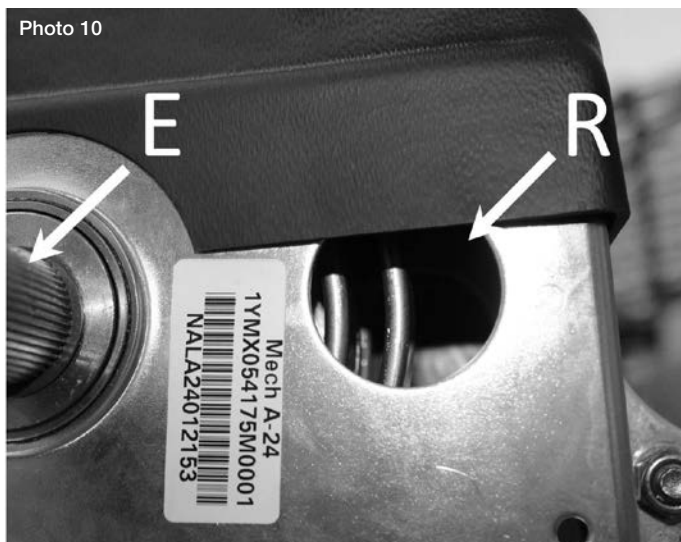


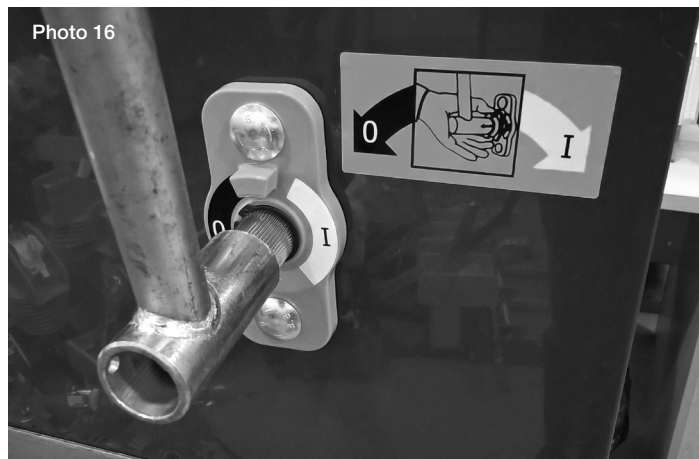
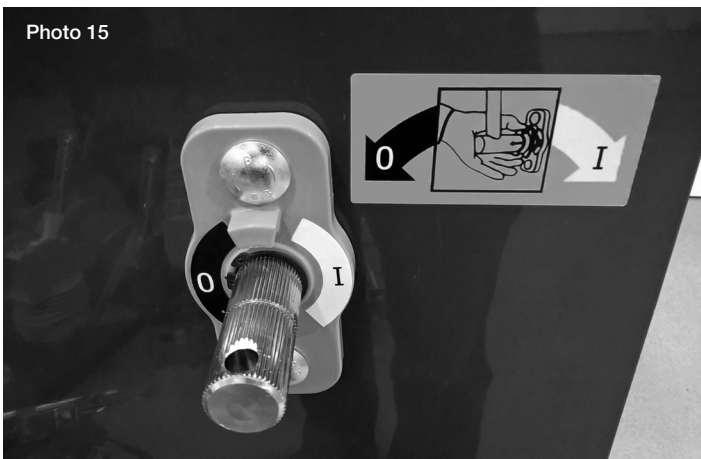
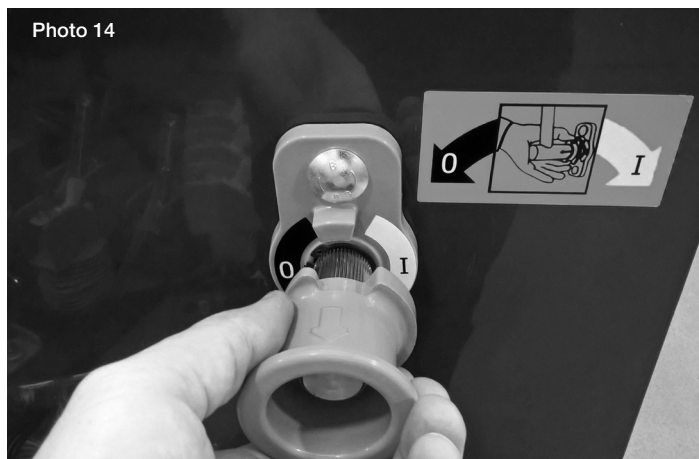
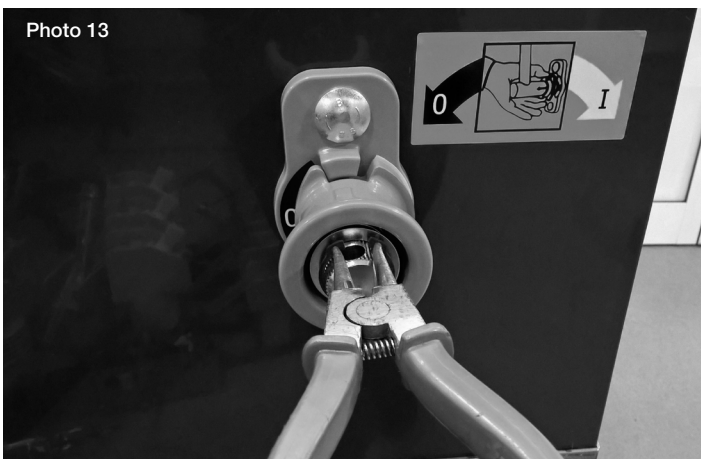
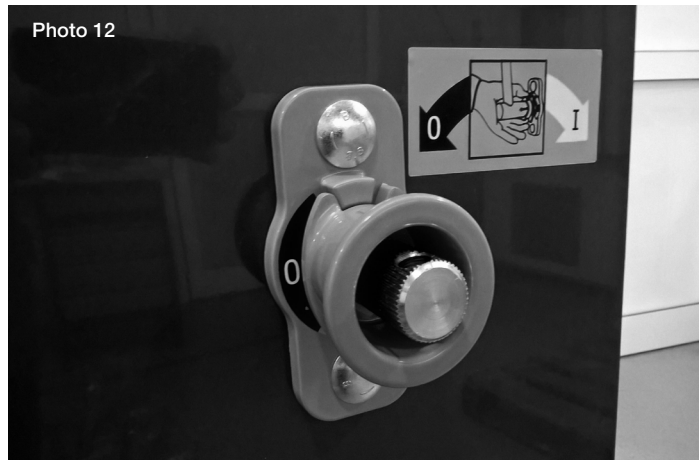
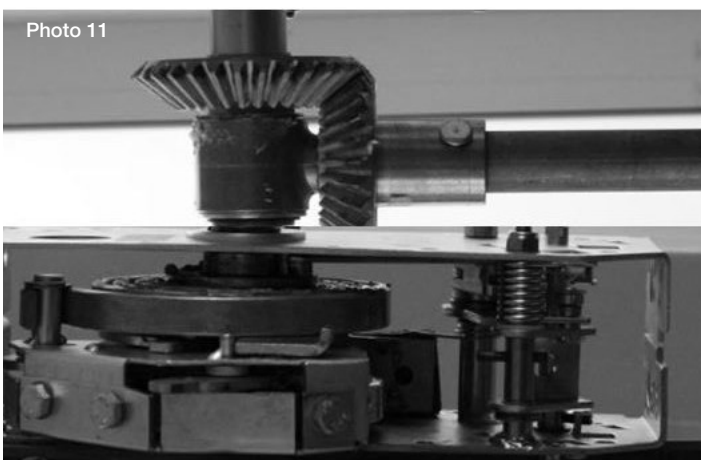
Photo 10





6. Pull the locking ring out of the shaft (see Photo 14).
7. After removal of the ring, the shaft should rotate freely (see Photo 15).
8. Put a lever onto a knurled end of the shaft. Turn the lever counter-clockwise to stretch the opening spring of the A-type mechanism (see Photo 16).

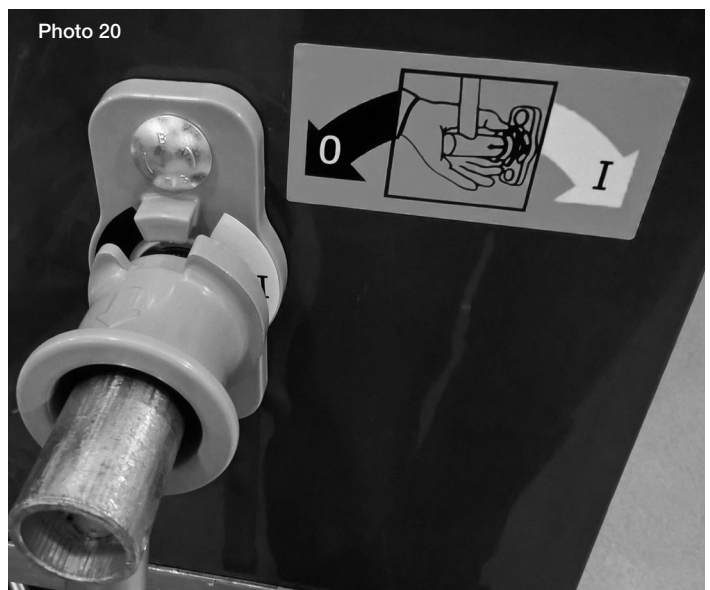
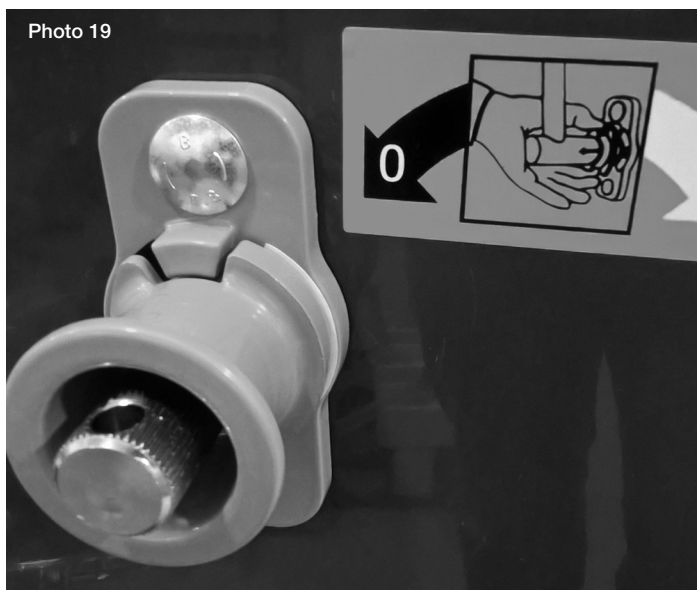
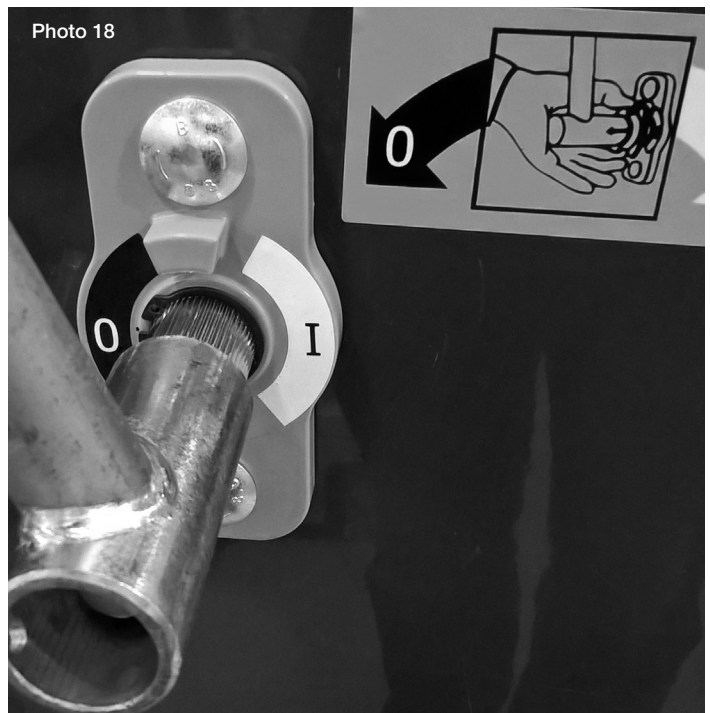
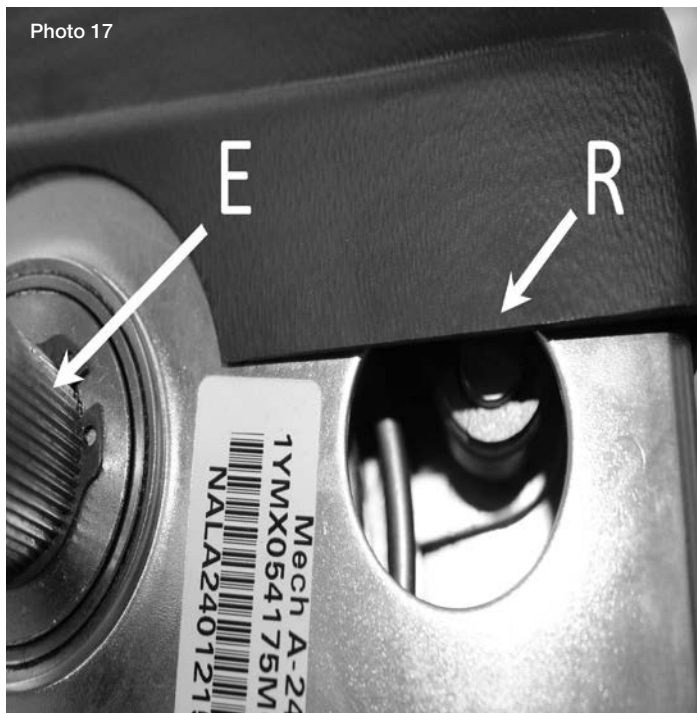
**Photos 11-16 Installation of the manual HE mechanism**



9. The spring opening mechanism A is stretched (see photo 17).
10. Turn vigorously the lever to the right and left in order to check operation of the switch (see Photo 18).

11. Replace the ring on the shaft (see Photo 19).
12. Pull out the locking ring until the shaft is locked and it is possible to turn it counterclockwise and close the switch (see Photo 20).

**Photos 18-21 Installation of the manual HE mechanism**

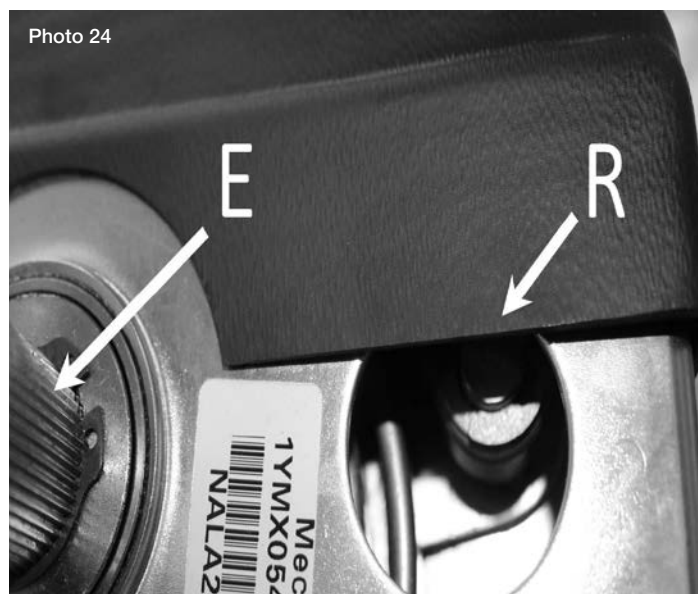
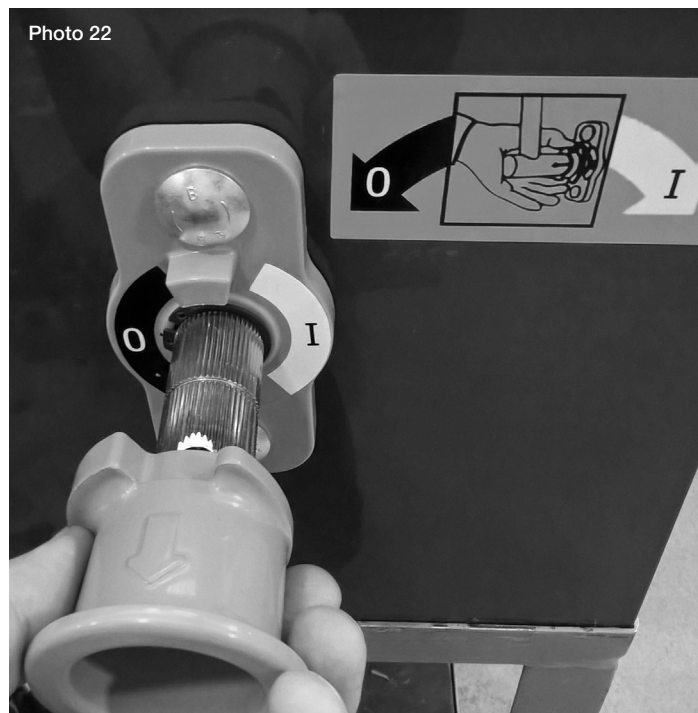




13. Check that the locking ring and the switch are in closed position (see Photo 21).
14. Otherwise (see Photo 12), remove the locking ring from the shaft and turn 2–3 teeth to the right (see Photo 22).

15. Proper position of the locking ring for the closed position (see Photo 23).
16. Check that the opening spring is stretched (in the “R” sight-glass of the mechanism, Photo 24). The photo above shows the stretched spring of the mechanism. After the adjustment the Seeger ring, spring and washer should be remounted on the HE shaft (see Photo 24).

**Photos 21–24 Installation of the manual HE mechanism**



## 6.0 Installation of the fuse holder

### WARNING

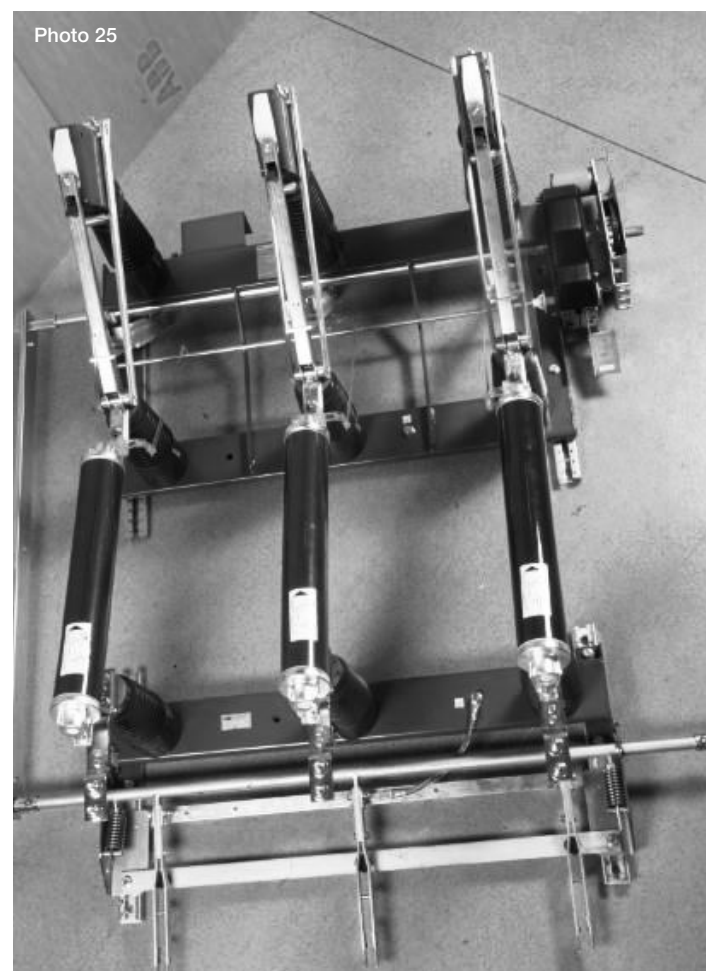


These operations must only be entrusted to personnel trained to operate this type of apparatus.

## 6.1 Installation of the fuse trip unit (Fig. 28)

1. Fasten the lower part of the bearing (8) to the connector (10) with a bolt (9).
2. Place the lever (13) with the fuse trip unit blade (15) in the lower bearing (8) and fix it there by means of the upper part of the bearing (14).
3. Fasten the trip unit pull-rod (11) in the lever (13).
4. Mount the disc ring (2) on the trip unit shaft (1) on the right side of the switch fuse.
5. Mount the bearing (5) and washer (6) on the trip unit shaft (1) on the left side of the switch and secure them using a locking ring (7).
6. Mount the disc (3) on the trip unit shaft (4).
7. Fix the trip unit pull-rod (11) on hooks (12) on the trip unit shaft (1).

**Photo 25 Indoor switch-fuse combination with earthing switch integrated with the fuse holder**



## 6.2 Adjustment of the fuse trip unit (Fig. 26)

The adjustment should be begun for the mechanism with non-charged power springs. Then the spring triggering the mechanism, which is referred to in the next item, must be charged in a controlled way (point 1, item 6.3).

1. Remove the ring (7) locking the trip unit shaft (1) together with the disc ring (2) which is pushed according to the direction of the arrow. Pull it out until the connection with the round disc (3) is released.
2. Fit the trip unit pull-rod (1) with the disc ring (2) into the openings in the disc (3), adjusting flaps of the fuse trip unit (15). Check its distance from the fuse striker (Fig. 26).



**Note:**

- the switch fuse must be opened (tripped) by individual tests on all the three poles,
- after activation of the fuse link, the spring mechanism is locked until the fuse link is replaced.

**Note:**

Taps of the trip unit shaft should be connected with tripping pull-rods as shown in Figures 27 and 28, when the switch is in open position with discharged power springs.

**6.3 Fuse trip unit. Check**

1. Turn the E-type operating unit shaft clockwise by max 60°, using the operating lever (see Photo 24) and return to the neutral position (casing of spring F cannot be locked – refer to Photo 29).
2. Fix a new fuse link or test fuse in one of the poles as per DIN 43625. In terms of dimensions, the fuse link should be the same as the CEF fuses by ABB.
3. If the distance between the fuse flange and the trip unit lever is greater than – max  $e \pm 8$  mm, it must be adjusted once more (point 6.3) and then the fuse link must be installed on the fuse holder.
4. Distance between the striker and flap of the fuse trip unit (15) must be within 3–6 mm. During the adjustment the fuse link may move downward, however the distance between the striker and flap of the fuse trip unit cannot be greater than 12 mm.
5. If after the adjustment the switch fuse does not open properly, the steps above must be repeated.

Fig. 26 Fuse trip unit | Fig. 27 Trip unit pull-rod | Fig. 28 Complete fuse trip unit | Photo 29 A-type operating mechanism

Fig. 26

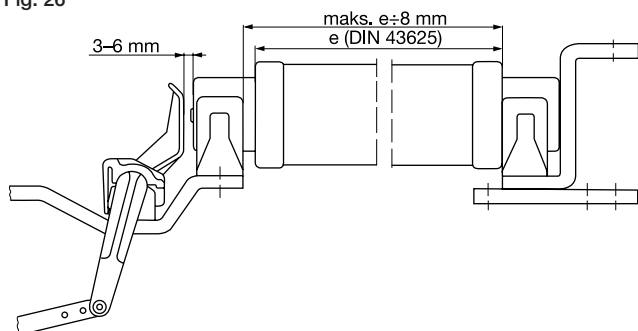


Fig. 27

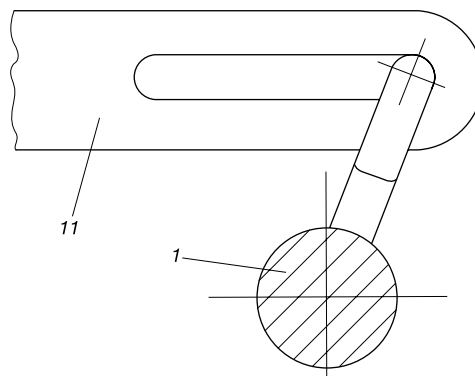


Fig. 28

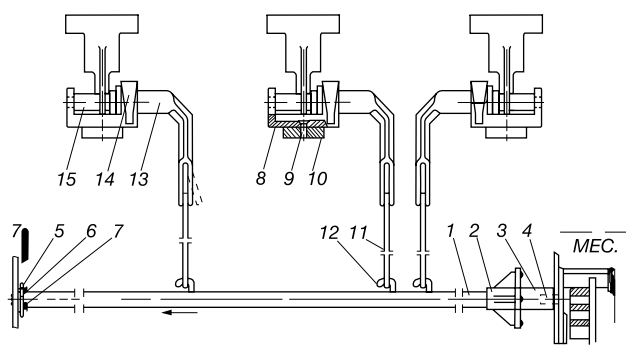
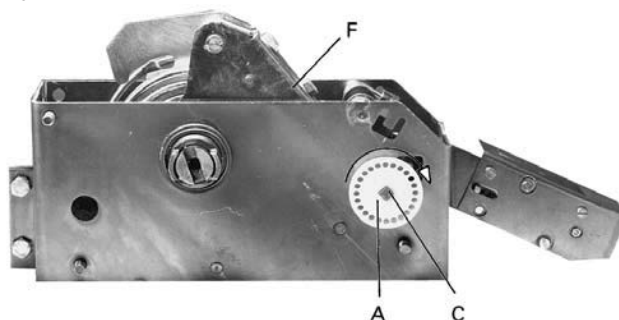


Fig. 29



## 7.0 Installation of the EB-type earthing switch integrated with the fuse holder (Photo 31)

As a standard, the earthing switch dedicated to the NALFWind apparatus is integrated with the fuse holder. Once the earthing switch is installed, proceed according to the guidelines regarding the installation of fuse holder 6.0.

Normally the earthing switch is adapted to manoeuvring of the lever on the right side and the mechanical interlock on the left side. The shaft extension on the side of the manual operating mechanism enables free rotation of the earthing switch shaft during its manoeuvring. The shaft extension on the mechanical interlock side is permanently fixed to the shaft with the use of the locking pin (see Photo 31).

## 8.0 Installation of the mechanical interlocking between the switch and earthing switch (Photos 30 and 32)

The switch and earthing switch must be in the open position. The spring of the operating mechanism must be stretched (see Photo 17) before commencing the installation of the NALFWind interlock.

The interlock must be installed on the side opposite to manual operating mechanisms.

Put half of the A interlock guide on operating unit shafts of the switch and earthing switch. Fasten the coupler of interlock B. Fix the rings of interlocks C and D on the shafts, so that the flat part of the ring is directed toward the coupler of interlock B (see Photo 32).

Photo 30 Overall view of the switch-fuse combination | Photo 31 Earthing switch with integrated EB fuse holder | Photo 32 Switch/earthing switch mechanical interlock

Photo 30

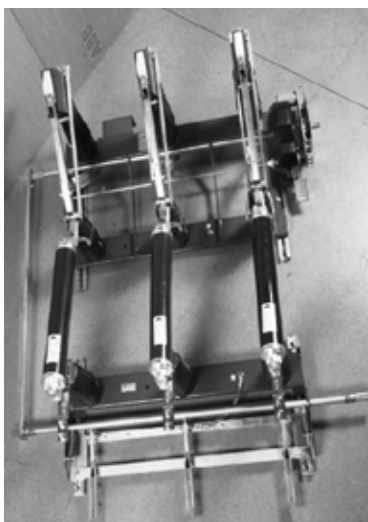
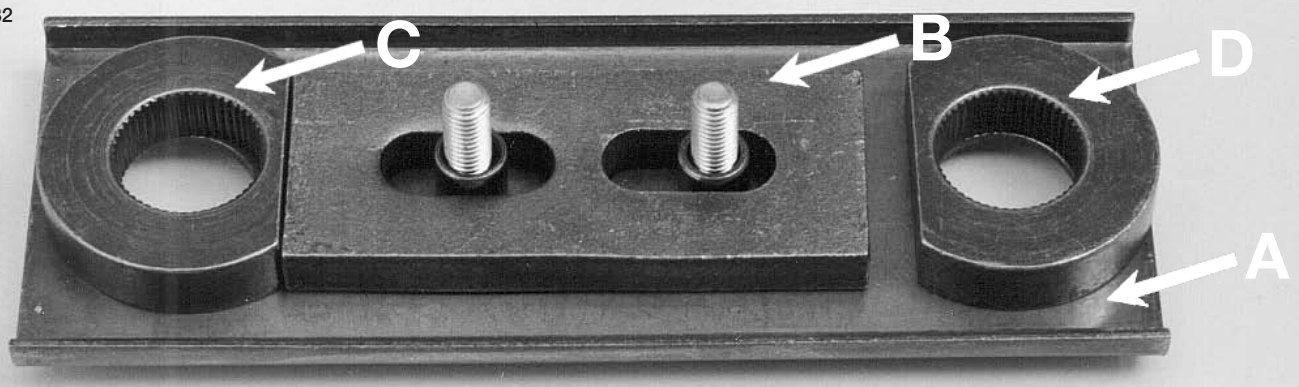


Photo 31



Photo 32



### Test of the switch disconnecter / earthing switch interlock

After closing the earthing switch, the operator should not be able to close the switch.

When the switch is closed, it should be impossible to close the earthing switch.

### 9.0 Installation of the trip unit (Photo 36)

Turn the mechanism shaft clockwise by the angle of max 60° (Photo 36). Spring cover (element F shown in Photo 29) should not be sagged. Check that the position is proper through the “R” sight-glass (Fig. 17).  
Connect pull-rod B to the disc with holes (see Photo 36). Return the shaft to the neutral position and then open the switch fuse.

### 10.0 Installation of the auxiliary switch (Photos 33 and 37)

The auxiliary switch is fixed to the frame and connected to the lever on the main shaft. The electrical diagram of the auxiliary switch is presented in Fig. 34.

If an electromagnetic trip unit is installed, it is necessary to connect it with the auxiliary switch in the manner shown in Figure 35.

Photo 33 Auxiliary switch installed on the switch | Fig. 34 Electrical diagram of the auxiliary switch | Fig. 35 Electrical diagram of the tripping coil | Photo 36 Elements of the trip unit A-type mechanism | Photo 37 Switch pull-rod connected with the switch shaft

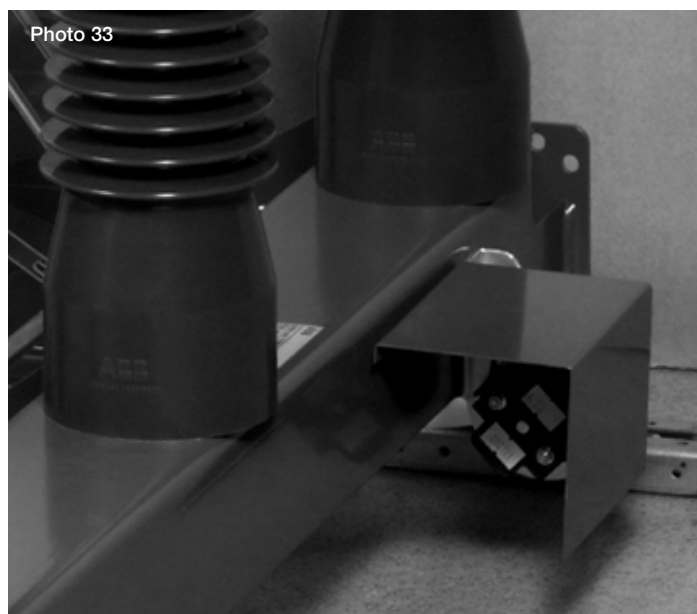


Fig. 34

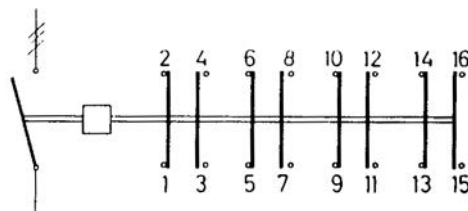
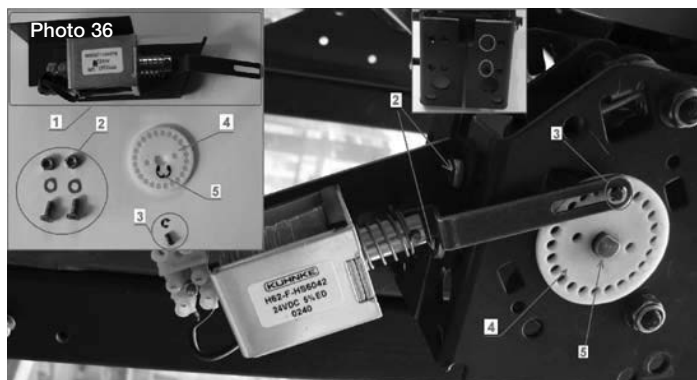
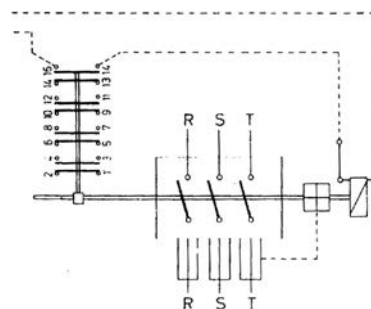


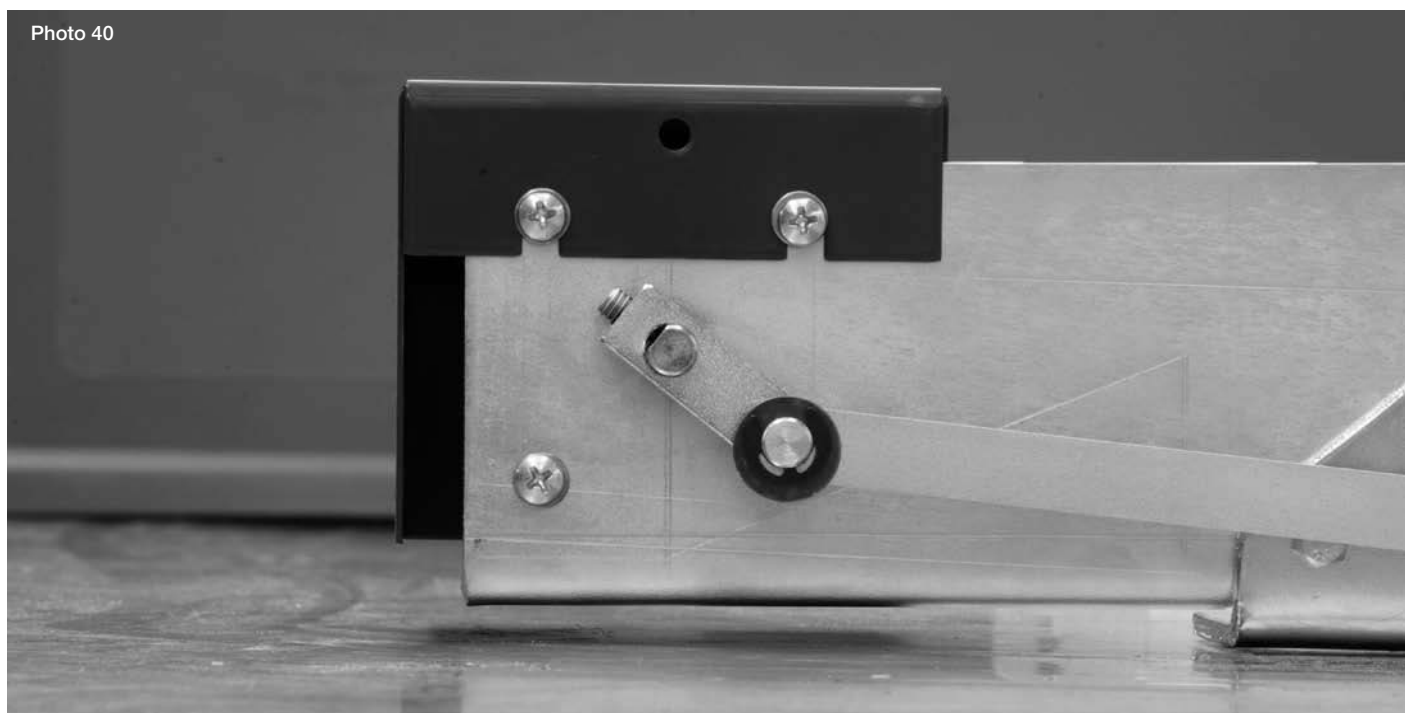
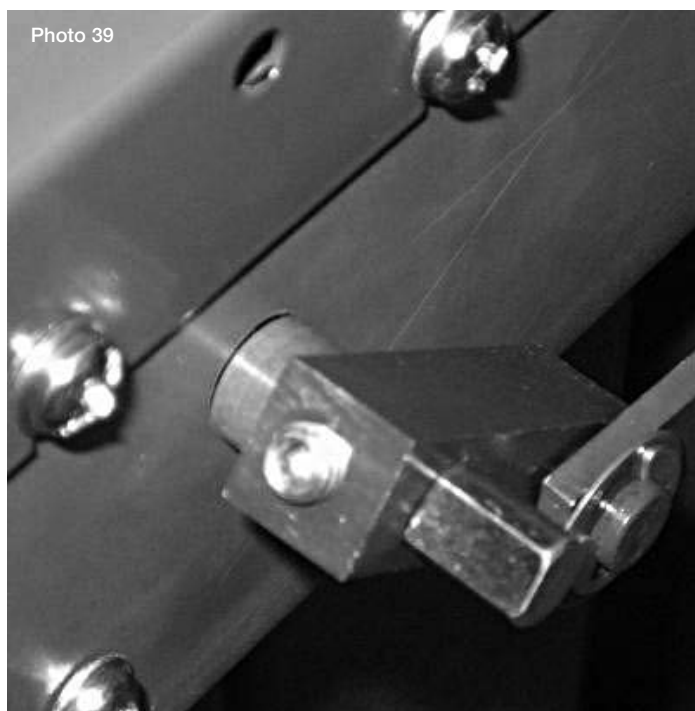
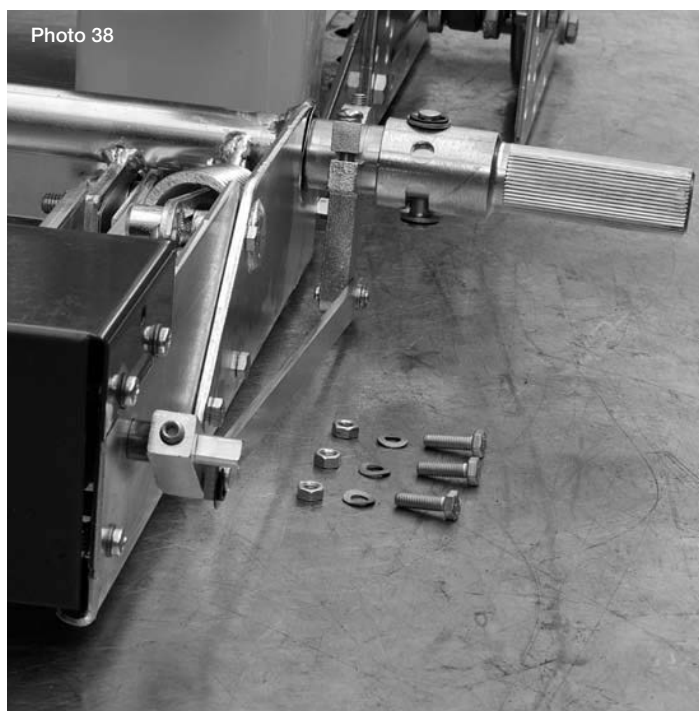
Fig. 35



#### 11.0 Installation of the auxiliary switch for EB earthing switch (Photos 38–47).

1. The installation should be started when the earthing switch is in the open position (see Photo 38).
2. The arm of the auxiliary switch should be at the angle of 45–50 degrees towards the earthing switch (see Photo 39).
3. Fixing bolts must be tightened from the outer side of the auxiliary switches of the earthing switch shaft (see Photo 40).

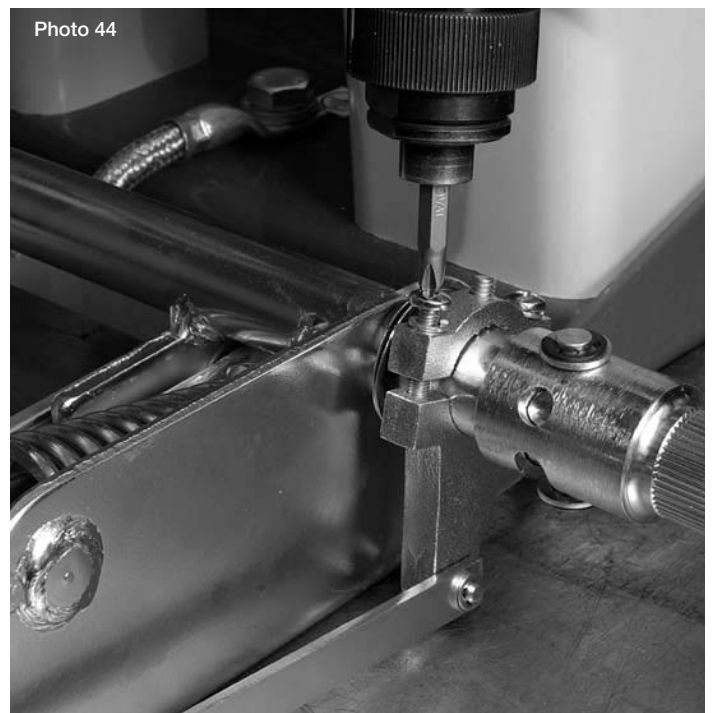
Photos 38-40 Installation of the auxiliary switches for EB earthing switch





4. Fasten the yoke (part with the opening) on the earthing switch shaft extension, so that the arm of the auxiliary switch with the yoke is slightly under tension (see Photo 41).
- 5-7. Tighten the bolts (M5) so that the yoke is fixed to the earthing switch shaft extension (see Photos 42–44).

Photos 41–44 Installation of the auxiliary switch for EB earthing switch



- 8-9. Tighten the bolt used to fix the clamp (see Photos 45–46).  
Check proper operation of the auxiliary switch.
10. Earthing switch in open position (see Photo 47).

Photos 45-47 Installation of the auxiliary switches for EB earthing switch



## 12.0 Installation of the NM motor operating device

1. Check that the motor operating mechanism works properly, according to Photos 48-49.

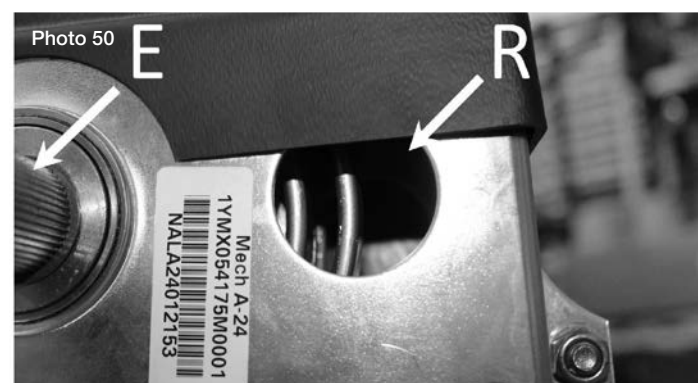
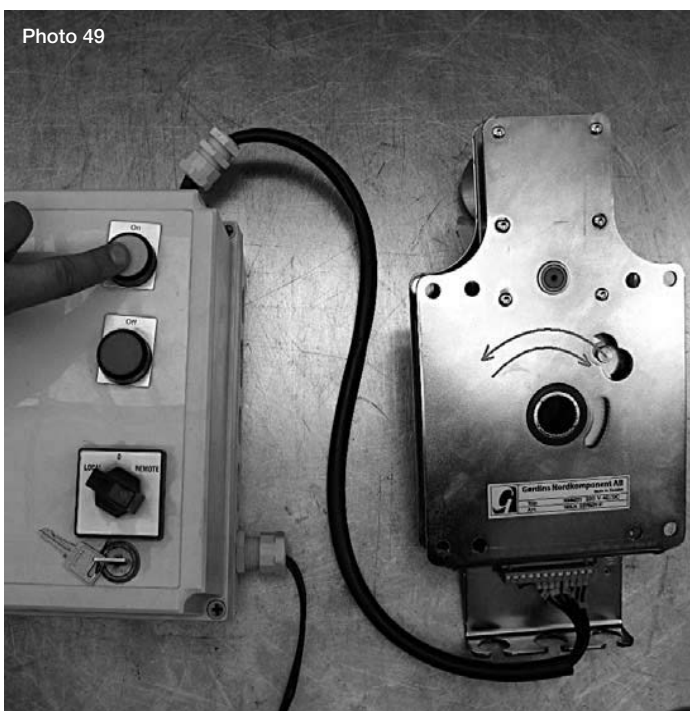
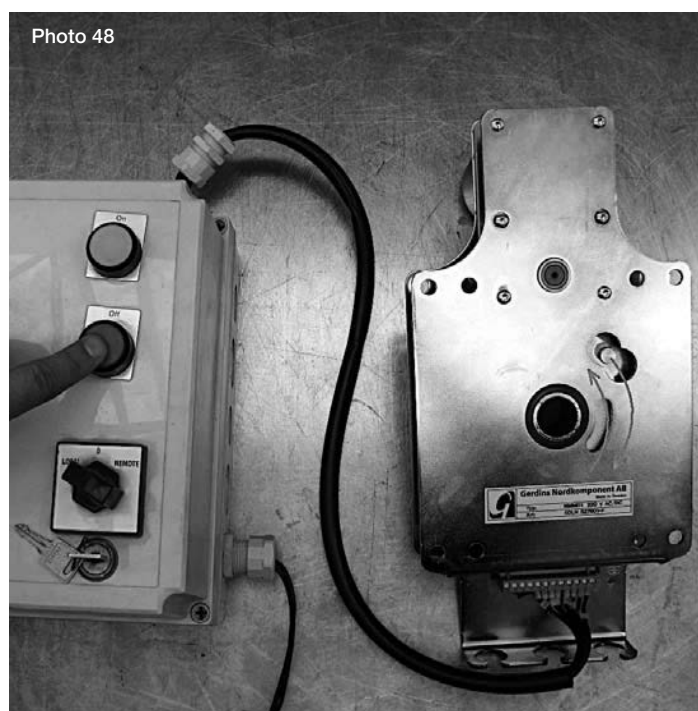
### Note

In case of any installation/maintenance works connected with the NAFWind apparatus fitted with the NM electric operating unit, it is necessary to disconnect power supply from the control panel.

## Settings of the motor operating device for the A-type double-spring mechanism

2. The switch must be in open position and springs of the A-type mechanism must be discharged. Check proper position of the mechanism through the "R" sight-glass (Photo 50). Find fixing holes of the holder for the NM operating unit on mechanism A (see Photo 51). Tighten the fixing bolts securely.

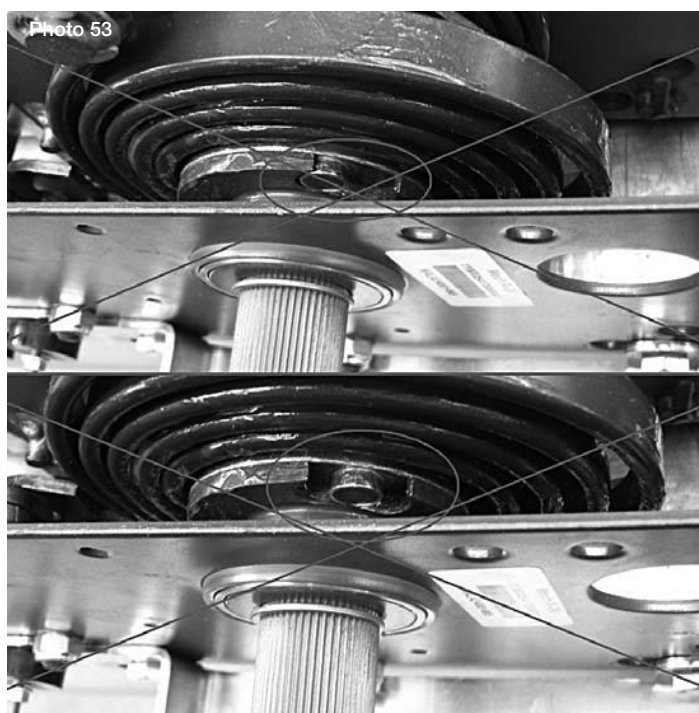
Photos 48–51 Installation of the NM motor operating device on the double-spring A-type mechanism





3. To reduce the clearance, turn the mechanism shaft to the left – it is necessary to properly install the NM/MU operating unit (see Photos 52–53).
4. Before commencing the installation, set the distance to ~ 4 -8 mm by rotating the NM/MU operating unit shaft (see Photo 54).

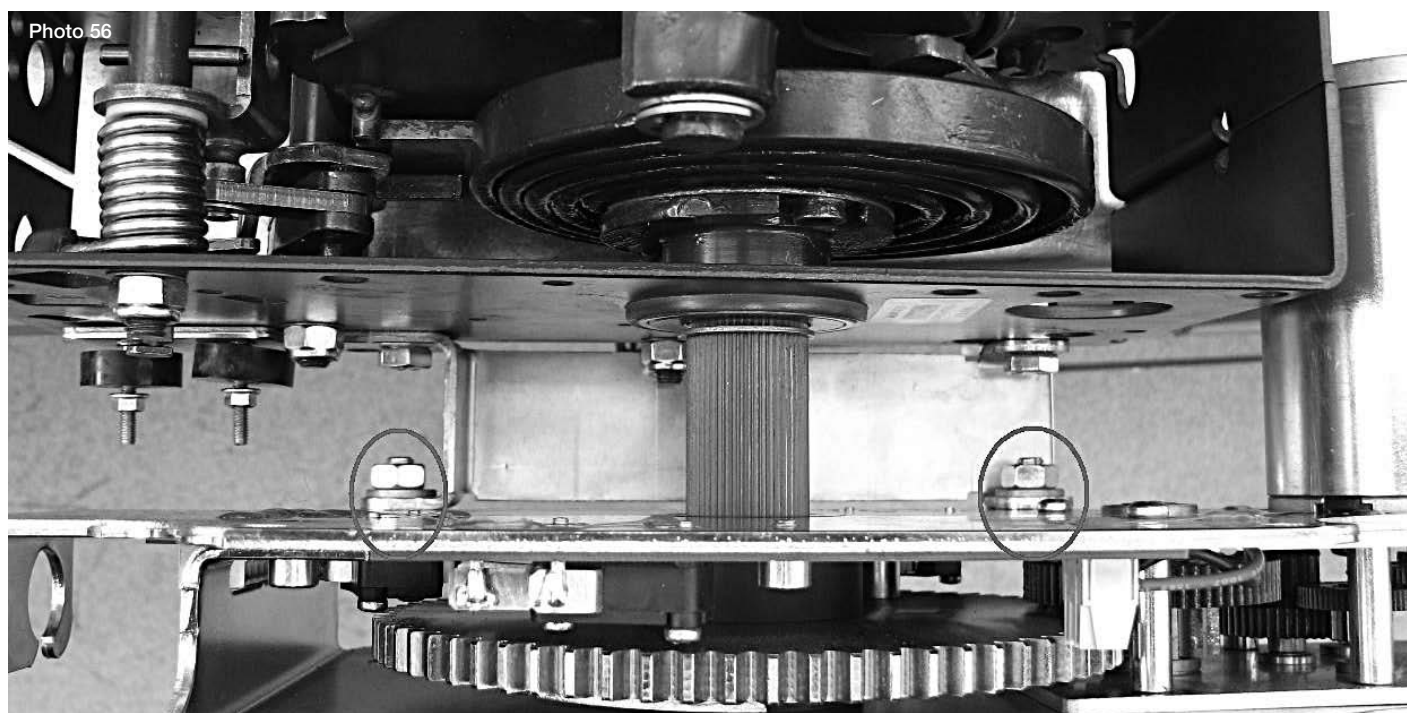
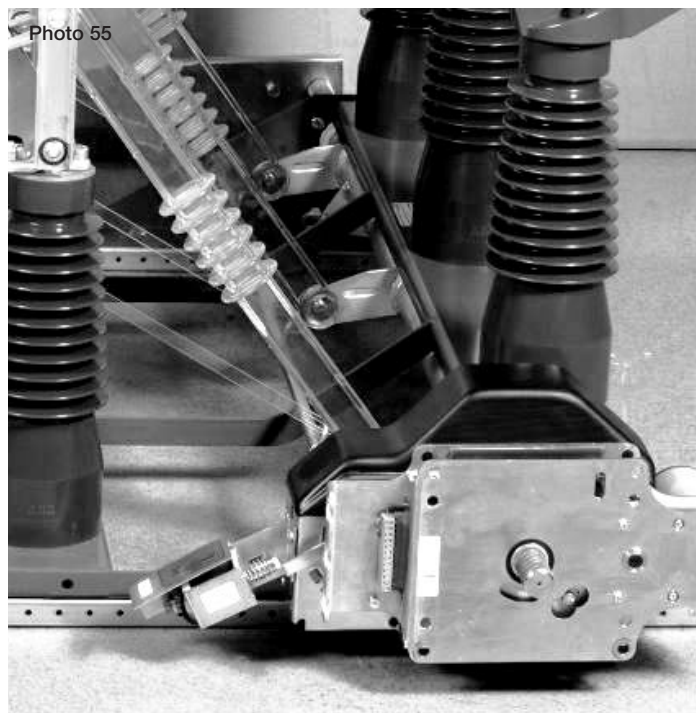
Photos 52–54 Installation of the NM/MU motor operating device on the double-spring A-type mechanism





5. Fasten the NM/MU motor operating device on the shaft and tighten the fixing bolts (see Photos 55–56).

Photos 55–56 Installation of the NM/MU motor operating device on the double-spring A-type mechanism



### 13.0 Repairs and maintenance



#### WARNING

It is forbidden to use any alcohol-based cleaning agents. This may result in deterioration of mechanical features of pull-rods and their damage (breaking).

#### Cleaning

After completion of the maintenance operations the switch must be cleaned before hand-over for operation. For this purpose use water and soap only. Do not use spirit-based solvents or liquids. After cleaning, the surfaces of the main contacts must be covered with grease (recommended product: Isoflex Topas NCA 52). If the switch is used in a very wet or polluted environment causing reduction of the surface resistance, it is recommended to polish the insulators with silicone agent of HS4 type.

#### Use of switches

Frequency of maintenance operations depends on the operating conditions, the environment and the number of On/Off operations.

The switch must be inspected on average once a year. The inspection should involve a series of operations checking all of its functions. Frequency of maintenance operations depends on the operating conditions and the environment.

- Apply the grease Isoflex Topas NCA 52 on moving and fixed contacts.
- Under normal operating conditions the mechanisms do not require lubrication.

#### Note!

Arcing knives must not be lubricated.

#### Mechanical inspection

After potential short-circuit, the switch must be subject to overall mechanical and electrical inspections. A decision on the replacement of a part or a complete replacement of the apparatus should be taken based on the inspection of the switch status.

Pay special attention to the condition of the main contacts.

The silver coatings of the main contacts should be continuous in the contact area. Otherwise, any damaged or defective elements must be replaced with new ones. If one of the fuse links is damaged, it is recommended to replace all three links.

In order to properly match fuses with the switch fuse, it is necessary to select fuses from the fuse reference list (see point 17) as specified in the ABB instructions.

For the currently manufactured NAL switches, the inspection intervals may be extended even to 15 years, provided that the following conditions are met:

- 1) The apparatus must be transported and stored in the original packaging.
- 2) Operation of the switch fuse – installation:
  - a) it must be possible to use the apparatus under indoor conditions according to IEC 62271-1:2007, section 2.1,
  - b) the apparatus must be installed by qualified personnel as per manufacturer's requirements,
  - c) maximum values of making and breaking currents and the number of 1000 mechanical operations cannot be exceeded,
  - d) it is necessary to keep all the distances between live and earthed elements,
  - e) if in the location of the apparatus installation there was a short-circuit or if the apparatus was overloaded, it is necessary to perform its inspection,
  - f) the apparatus is not installed in the upright position so that the insulator fitted with quenching chambers are below the post insulators, if operating conditions of the apparatus enable penetration of water to the apparatus breaking chamber.

The mechanical inspection of the switch should be performed after max. 1000 operations or 15 years of operation (preferably by maintenance services of ABB).

#### Electrical inspection

Frequency of the inspections depends on the number of operations and the value of breaking current.

After 10 operations at the rated current it is necessary to perform the inspection and possibly replacement of the main and arcing contacts, and the insert of the gassing chamber.

The replacement is necessary if any of the following cases occurs:

- Ends of arcing knives are reduced by approx. 2 mm (for minor damage, it is sufficient polish the end).
- Fixed arcing contacts got burnt or they do not make contact possible.
- Local width of the slot in the gassing chamber is greater than 3 mm (1.5 mm per one side)

If copper is found on any of the active contact surfaces, the whole element must be replaced with a new one.

### Checking of current knives of the NALFWind switches (Fig. 57–59)

1. The switch is supplied with disconnected pull-rods (1) of the knife (2) (see Fig. 57).
  - b Check with the hand, supporting the bottom of the main knife (2), if the arcing knife (3) moves freely in the chamber channel (4) (moves in a springy way after being released by the pawl (5)).
  - c) Open the current knife (2) (supporting its bottom) in the open position. Fasten the knife pull-rods (1) on the main shaft (6) using the eccentric bolt (7), place the washer (8) and secure it with a retaining ring (9).
4. Before starting the apparatus again, check that the main knife (2) contact areas are covered with grease for contacts. If any deficiencies are found, use Isoflex Topas NCA 52.
5. Close the switch and start the operating mechanism. Pull the main knife (2) upward until the clearances are selected.  
The two contact points of each current knife must come into contact with the fixed contacts. Overlapping depth of the fixed and moving contacts must be adjusted by means of the eccentric bolt (7) (see Fig. 58). The maximum clearances between the contacts are shown in Fig. 59.

Fig. 57 Checking current knives and NALFWind switches after the installation | Fig. 58 Adjustment of the eccentric | Fig. 59 Adjustment of current knives

Fig. 57

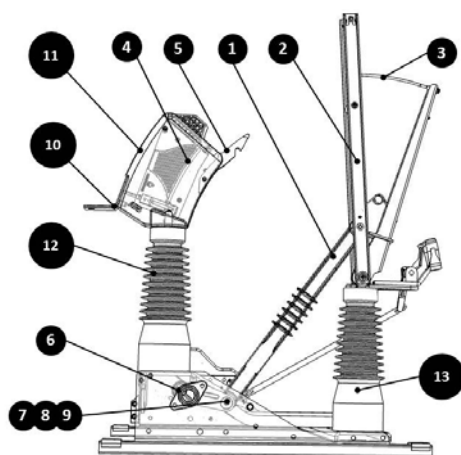


Fig. 58

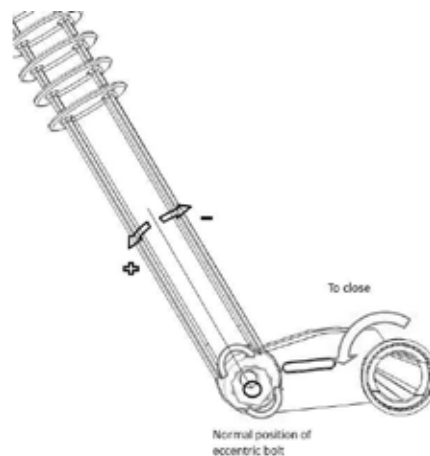
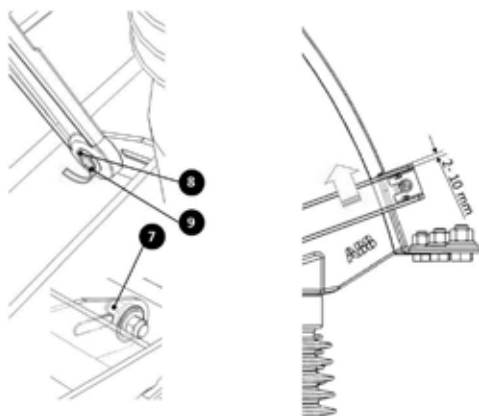


Fig. 59



## 14.0 Replacement of parts



### WARNING

These operations must only be entrusted to personnel trained to operate this type of apparatus.

After adjustment, check the requirements according to p. 15.0.

### 14.1 Replacement of the current knife with the knife pull-rod (Fig. 60–62).

The switch should be in the open position, and its power springs should not be stretched.

- Remove the retaining rings (9) fixing the knife pull-rod on the main shaft. Do not loosen the eccentric bolt.
- Remove the trip unit pull-rod (21) from the trip unit shaft (27), and then loosen the nut (24).
- Untighten the bolts fixing the fixed contact on the insulator. Remove the fixed contact together with the current knife and the knife pull-rod.

- Fasten a new fixed contact with a current knife and pull-rod on the insulator.
- Apply the grease Isoflex Topas NCA 52 on the current knife and check if the arcing knife (3) goes smoothly into the chamber channel (4). If necessary, move the insulator (13) (Fig. 62). The current knife must rotate in the point of rotation smoothly without stoppage.
- Set the clearance of 2 mm between the main knife roller (2) and casing of the chamber, adjusting the eccentric (27). Tighten the screws (28) (Fig. 61).
- Fasten the knife pull-rod on the main shaft using the eccentric bolt (7) and secure it with a washer and retaining rings (8 and 9).
- Overlapping depth of the fixed and moving contact may be adjusted by means of the eccentric bolt (7) (see Fig. 59). Proper tightening torques are provided in Fig. 66.

Fig. 60 Disassembly of the current knife | Fig. 61 Adjustment of the current knife | Fig. 62 Adjustment of the post insulator

Fig. 60

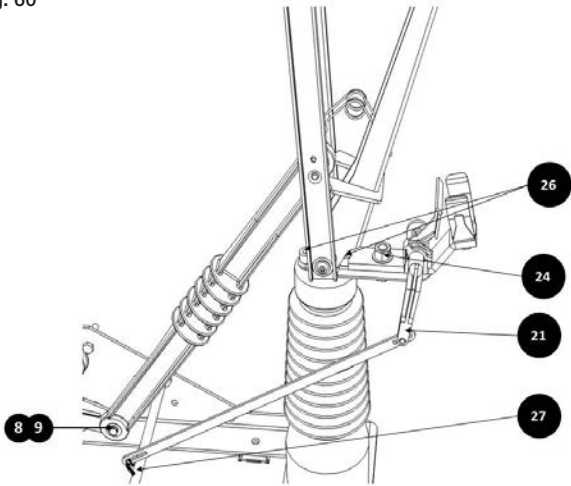


Fig. 61

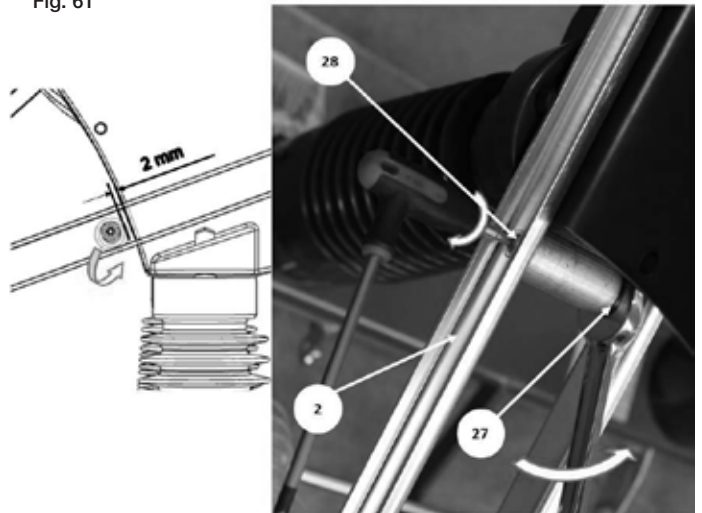
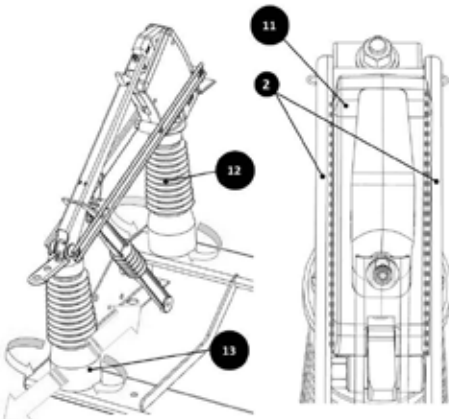


Fig. 62



#### 14.2 Replacement of the fixed contact (Fig. 64)

The switch should be in the open position.

- Untighten the bolts (17 and 18). Remove the main contact (10).
- Any defective parts must be replaced.
- Put the bolt (17) through the opening of the main contact (10) and place a sealing (19) on it, and then fix the contact to the chamber (11) using bolts (17 and 18). Pay attention to vertical position of the contact (10). Proper tightening torques are provided in Fig. 66.
- Apply the grease Isoflex Topas NCA 52 on the contact area.

#### 14.3 Replacement of the gassing chamber (Fig. 64)

The switch should be in the open position.

- Remove the pin (16).
- Untighten the bolt (17).
- Remove the chamber (4).
- Put a sealing (20) onto the new chamber.
- Place chamber 4 in the casing (11).
- Tighten the bolt (17).
- Push the pin (16) into the opening in the chamber casing (11). The pin cannot protrude beyond the outline of the chamber casing. Proper tightening torques are provided in Fig. 66.



#### WARNING

These operations must only be entrusted to personnel trained to operate this type of apparatus.

#### 14.4 Upper post insulators (Fig. 64)

- Proceed as specified in point 14.3 a, b, c.
- Untighten the bolts (14 and 18).
- Fasten a new insulator, tightening it to the frame (bolt 18). Remember to put washers (16 and 17) under the bolts.
- Refasten the chamber casing (11), tightening it with a bolt (14). Remember to put a new washer (15).
- Re-fasten the chamber (4) according to point 14 d, e, f, g.
- Disconnect the pull-rod of the main knife (2) from the main shaft (6) according to point 14.1.
- Place the insulator in such a position so that the arcing knife moves freely in the chamber channel (4), and the slot between the main knife (2) and the chamber casing (11) is equal on both sides (see Fig. 62).
- Connect the pull-rod of the main knife (2) with the main shaft (6) according to point 14.1.

Proper tightening torques are provided in Fig. 66.

#### 14.5 Lower post insulators (Fig. 63)

- Proceed as specified in point 14.1 a, b, c.
- Untighten the bolt (18).
- Fasten a new insulator (13), tightening it to the frame with a bolt (18). Remember to put washers (16 and 17) under the bolts.
- Refasten the main knife unit as per point 14.1 d, e, f, g, h.

Proper tightening torques are provided in Fig. 66.

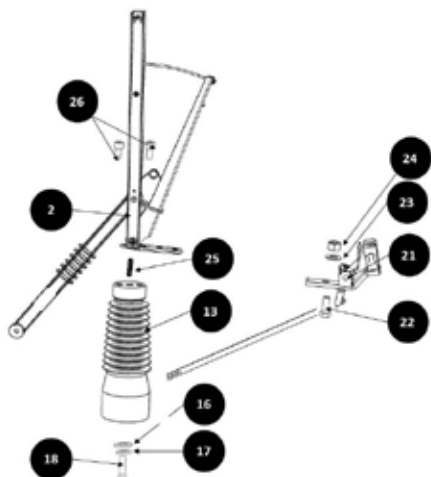


Fig. 63 Post insulator with current knife

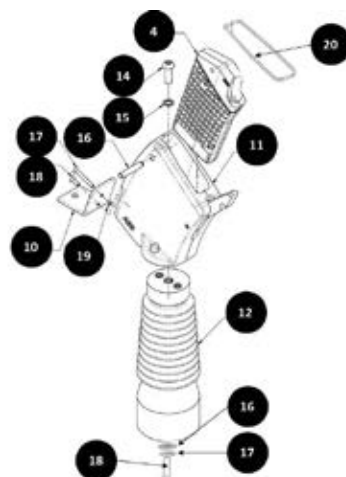


Fig. 64 Post insulator with chamber



#### 14.6 Replacement of the fuse holder insulator and earthing switch of EB type (Fig. 65)

1. Loosen the bolts (26) and separate the upper fuse contacts and the contact block.
2. Loosen the bolt (18) in the insulator base and remove the insulator.
3. Fasten a new insulator on the base using a bolt (18). Remember to put washers (16 and 17) under the bolts.
4. Fasten the fuse contacts and the contact block with bolts (26) at the top of the insulator.

Proper tightening torques are provided in Fig. 66.



Fig. 65 Post insulator

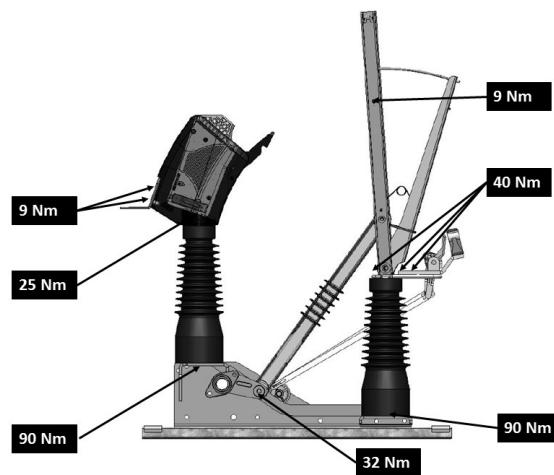
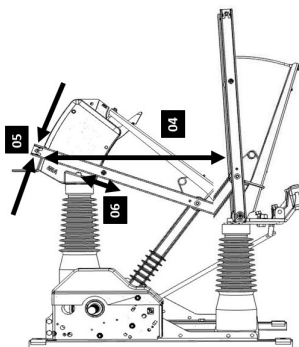


Fig. 66 Tightening torques

## 15.0 Mechanical requirements for NALFWind 36 kV switch-fuse combinations

Position	Function	Structure designed for specific voltages		Unit	Assessment method
				36 kV	
01	Current knife closing rate	m/s		4.3–6.0	Verified by the manufacturer
02	Current knife opening rate	m/s		5.8–7.0	
03	Maximum driving torque of the spring mechanism	Type A	Closing [Nm]	120	Verified by the manufacturer
			Opening [Nm]	5	
04	Minimum clearance between the fixed contact and the current knife of the switch in open position			475	Verified by the manufacturer
05	Penetration of the current knife			The both contact points on both sides of the current knife must have a contact	100% visual inspection
06	Penetration of the current knife				
See items 05–06			Tolerance for positions of contacts: 2–10 mm (see Fig. 59)		100% visual inspection
			Alignment is checked by: The current knife must be aligned with the fixed contact.		100% visual inspection
			The arcing knife must be positioned straight and move freely in the spout, enabling full coupling with the fixed arcing contact.		It must fit well.

#### **16.0 Liability**

Liability of ABB with respect to any and all claims resulting from the performance or failure to perform the obligations associated with the 36kV NALFWind cannot exceed the aggregate price for the equipment delivered and in no event will include damages for loss of profit, loss of revenues, loss of use, loss of production, costs of capital, costs of replacement equipment, conveniences or services, downtime costs, delays, as well as claims of the purchaser's customers or costs related to downtimes, loss of anticipated savings and any other indirect or consequential damage or loss.

The provisions regarding the limitation of the liability referred to above prevail over any conflicting or inconsistent provisions included in any of the documents related to the 36kV NALFWind, excluding the case when such conflicting or inconsistent provisions limit the supplier's liability in a stricter manner.



### 17.0 Fuse reference list

The fuse links are suitable for the 36 kV NALFWind switch as per IEC 62271-105.



#### WARNING

For replacement of the fuse link the switch must be opened.

Switch	Type of fuse link	Rated current [A]	Fuse link length [mm]	Diameter [mm]
NALFWind 36 kV	CEF-S	6.3	537	65
	CEF-S	10	537	65
	CEF-S	16	537	65
	CEF-S	20	537	65
	CEF-S	25	537	65
	CEF-S	31.5	537	65
	CEF-S	40	537	65
	CEF-S	50	537	65
	CEF-S	63	537	65
	CEF-S-TCU	6.3	537	65
	CEF-S-TCU	10	537	65
	CEF-S-TCU	16	537	65
	CEF-S-TCU	20	537	65
	CEF-S-TCU	25	537	65
	CEF-S-TCU	31.5	537	65
	CEF-S-TCU	40	537	87
	CEF-S-TCU	50	537	87
	CEF-S-TCU	63	537	87
	CEF	6	537	65
	CEF	10	537	65
	CEF	16	537	65
	CEF	25	537	87
	CEF	40	537	87
	CEF-TCU	6	537	65
	CEF-TCU	10	537	65
	CEF-TCU	16	537	65
	CEF-TCU	25	537	87
	CEF-TCU	40	537	87

## 18.0 Environmental declaration

### Environmental certification

#### Expected lifetime

The product is developed as per IEC 62271-200. According to the design, the lifetime of the product under indoor conditions will exceed 25 years (IEC 62271-200).

#### Recycling

Weight: 130 kg

Raw material	% of total weight (weight)	Recycling	Environmental hazards /method of disposal
Steel	61.75%	yes	Separate and regenerate for re-use
Copper	12.14%	yes	Separate and regenerate for re-use
Zinc	0.025%	yes	Subject to electrolysis/regenerate for re-use
Silver	0.012%	yes	Subject to electrolysis/regenerate for re-use
Aluminum	0.56%	yes	Separate and regenerate for re-use
Thermoplastic material	1.97%	yes	Make granulate, re-use or use as a source of energy in waste incineration plants; a part of the material may be re-used in the manufacturing process.
Total recycling	76.46%		
Not listed	1.34%		Powder coatings / grease etc.
Total	100%		Complete apparatus without packaging
Wooden pallets / packaging	42 kg	yes	Re-use it or dispose of it to a waste incineration plant and use as a source of energy.
Epoxy resin*	22.2%	no	Store in the places which are designed for this purpose.

\* Packaging depends on individual requirements of the client, legal regulations and the method of transport.

### Warning

The apparatus cannot be used with or come into contact with chemicals that are harmful for the aforementioned materials.

### End of product lifecycle

ABB undertakes to protect the environment and observe the ISO 14001 standard. We feel obliged to facilitate recycling of our products.



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