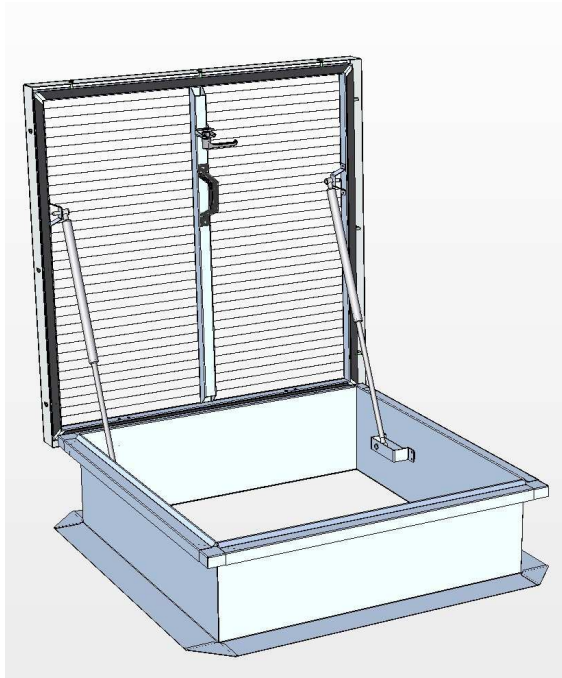


## OPERATIONS AND MAINTENANCE MANUAL

### C, E, NG, R type mcr-PROLIGHT Individual stand Skylights, Vents, and Roof Hatches



- type C
- type E
- type NG
- type R

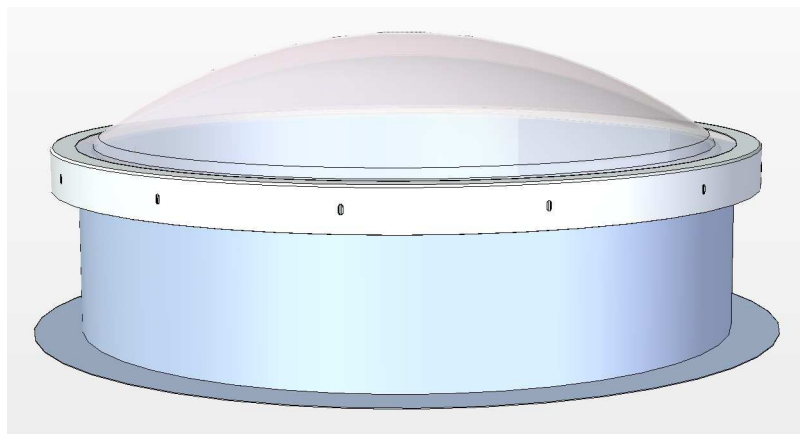


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## 1. INTRODUCTION.

The present Operations and Maintenance Manual describes the purpose, design, operating principles, correct assembling, and support of mcr-PROLIGHT non-ventilating and ventilating spot skylights. Furthermore, the documentation includes additional data on operations, maintenance, and warranty conditions.

The Manual applies to:

- C, E, NG, R type mcr-PROLIGHT skylights;
- C, E, NG, R type mcr-PROLIGHT vents (ventilating skylights), and
- C, E, NG type mcr-PROLIGHT roof hatches (ventilating skylights).

**Attention! According to PN-EN1873 Standard, vents and roof hatches are considered as ventilating skylights.**

Consistency with the recommendations contained in this Manual will ensure regular functioning of the systems designed for smoke exhausting and/or ventilation as well as safety to the users.

### **WARNING**

**All the works connected with assembling, operations, maintenance, and service support of vents and skylights should be conducted in compliance with occupational health and safety rules. Applicable personal protections should be used, including mostly protections from fall from a different level. High-rise works, works on electric systems, etc., should be conducted by competent personnel only.**

## 2. PURPOSE OF VENTS AND SKYLIGHTS.

mcr-PROLIGHT spot skylights are used as ventilation units, roof hatches, and additional roof lights.

**mcr-PROLIGHT skylights comply with the requirements of PN-EN1873 Standard.**

## 3. DESIGN AND OPERATING PRINCIPLES.

Depending on individual requirements, MERCOR offers the skylights with simple and diagonal bases and wide array of structural opening dimensions and base heights.

All the steel elements are protected by means of hot dip or electrolytic zinc coating.

Standard base models are delivered inclusive of 20 mm thick thermal insulation. Thickness and type of thermal insulation may be individually selected on request.

Available are active leaf filling types as follows:

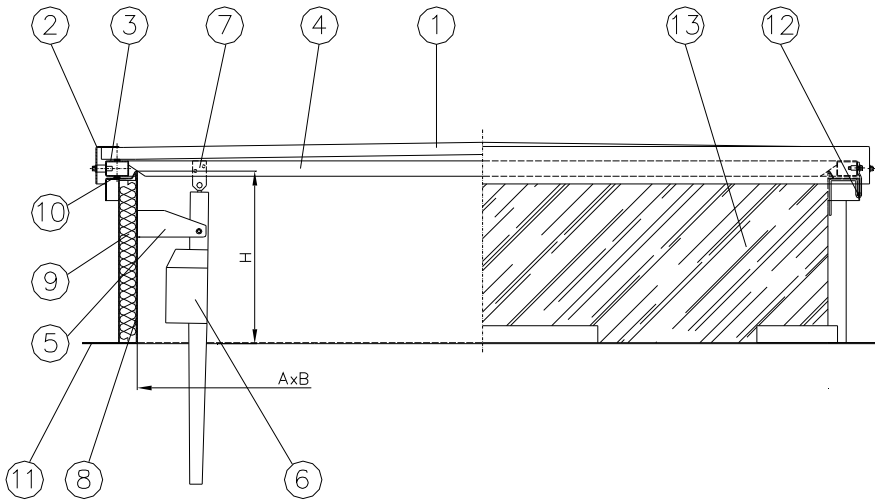
- Cellular polycarbonate, 10 mm through 25 mm thick, with various light transmittance values and heat transfer coefficients;
- Double and triple polycarbonate domes;
- Double and triple acrylic domes;
- 'ALU' composite panels (e.g. aluminium-thermal insulation-aluminium).
- Broof(t1) filling: cellular polycarbonate and polyester panel.

Vents may be equipped with electric or pneumatic control systems.

Roof hatches are equipped with gas springs which assist leaf opening; as an option, they may include control systems with electric actuators or pneumatic actuators.

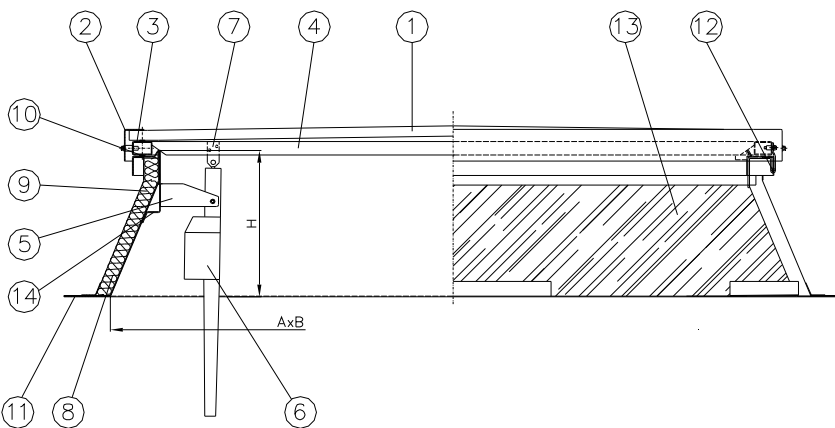
mcr-PROLIGHT ventilating spot skylights (vents and roof hatches) contain fixed part (base) and mobile part (leaves with filling).

(a) C, E type vent (electric control)



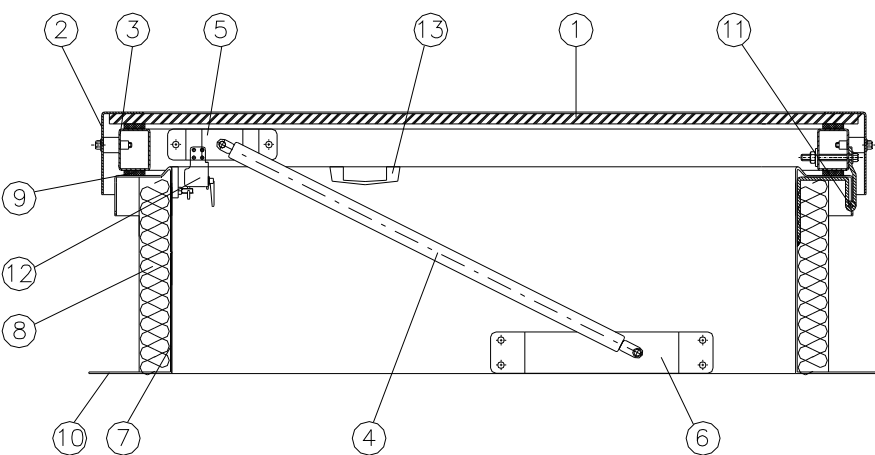
1. Filling
2. Clamp frame
3. Frame bearer
4. Leaf spreader boom
5. Leaf spreader boom actuator bracket
6. Ventilation actuator
7. Base actuator bracket
8. Base
9. Base thermal insulation
10. Leaf seal
11. Base flange
12. Hinge
13. External detailing: zinc-coated steel sheet

(b) NG type vent (electric control)



1. Filling
2. Clamp frame
3. Frame bearer
4. Leaf spreader boom
5. Leaf spreader boom actuator bracket
6. Ventilation actuator
7. Base actuator bracket
8. Base
9. Base thermal insulation
10. Leaf seal
11. Base flange
12. Hinge
13. External detailing: zinc-coated steel sheet
14. Lock bracket base

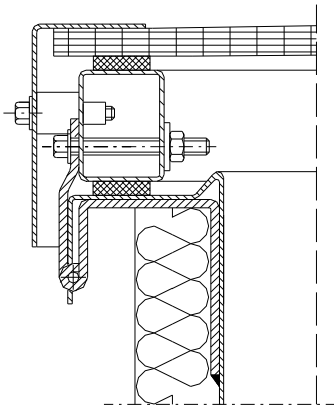
(c) C, E type roof hatch (mechanical control: gas springs)



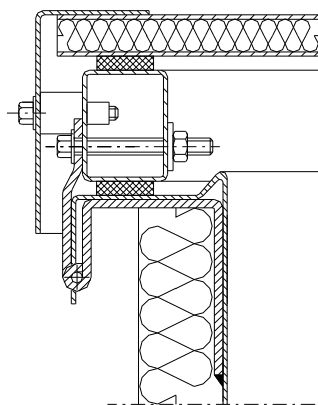
1. Filling
2. Clamp frame
3. Frame bearer
4. Gas spring
5. Leaf actuator bracket
6. Base actuator bracket
7. Base
8. Base thermal insulation
9. Leaf seal
10. Base flange
11. Hinge
12. Lock with handle
13. Grip

Fig. 1. mcr-PROLIGHT ventilating skylight cross-section.

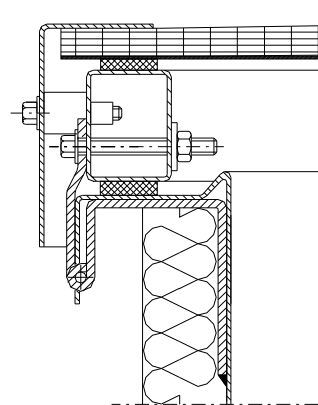
(a) polycarbonate panel



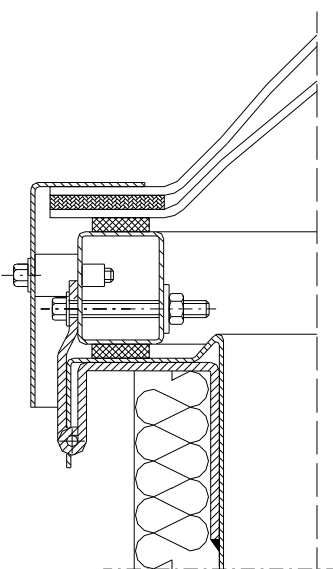
(b) ALU composite panel



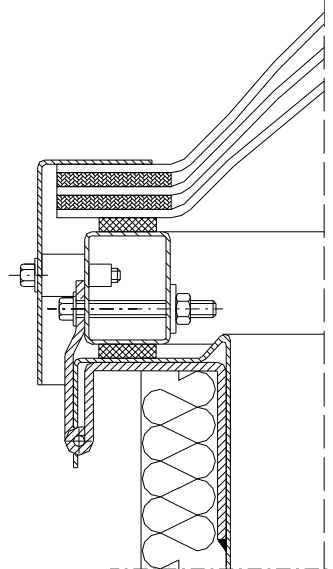
(c) polycarbonate and polyester panels [Broof(t1) class]



(d) double acrylic dome



(e) triple acrylic dome



**Fig. 2. Typical fillings of mcr-PROLIGHT skylights and roof hatches.**

## 4. TRANSPORT and DELIVERY.

mcr-PROLIGHT skylights are delivered as assembled units. In special circumstances, however (additional external treatment, low base, etc.), skylights may be supplied as detached subassemblies components because individual elements must be protected from damages during the transport in order to ensure road traffic safety. Unloading should be monitored by a person authorised by the manufacturer. For unloading, use commonly available appliances or unload by hand, in compliance with applicable occupational health and safety rules.

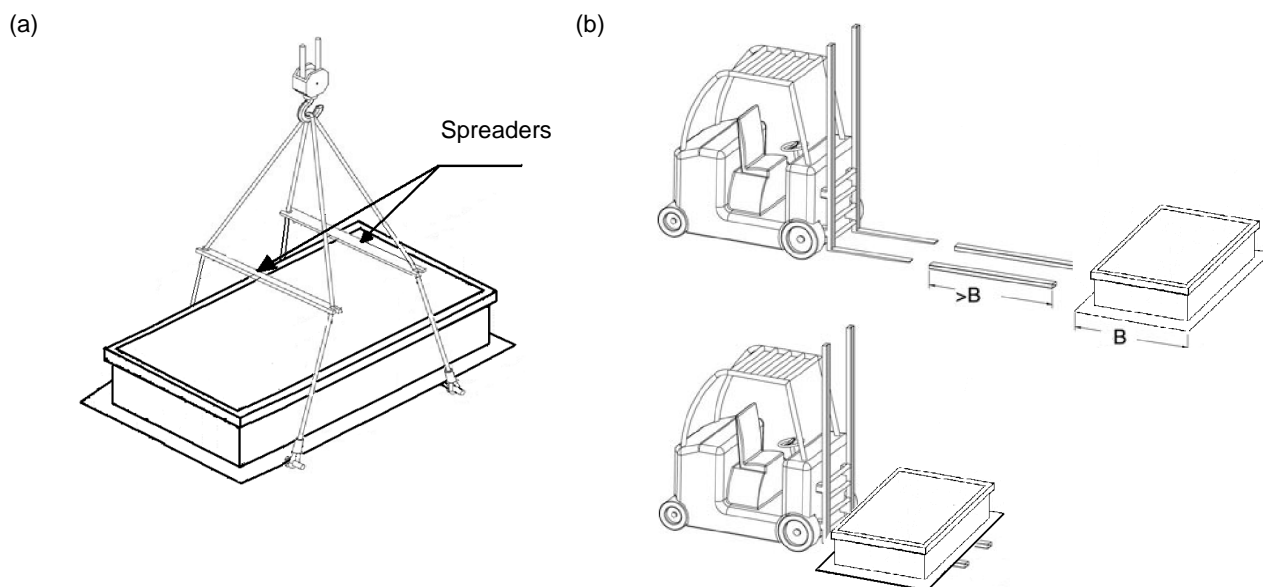


Fig. 3. Transport by means of crane (a) and fork lift truck (b).

## 5. INSTALLATION.

The equipment should be installed in compliance with any applicable occupational health and safety rules, specifically as regards high-rise works, using relevant personal protections.

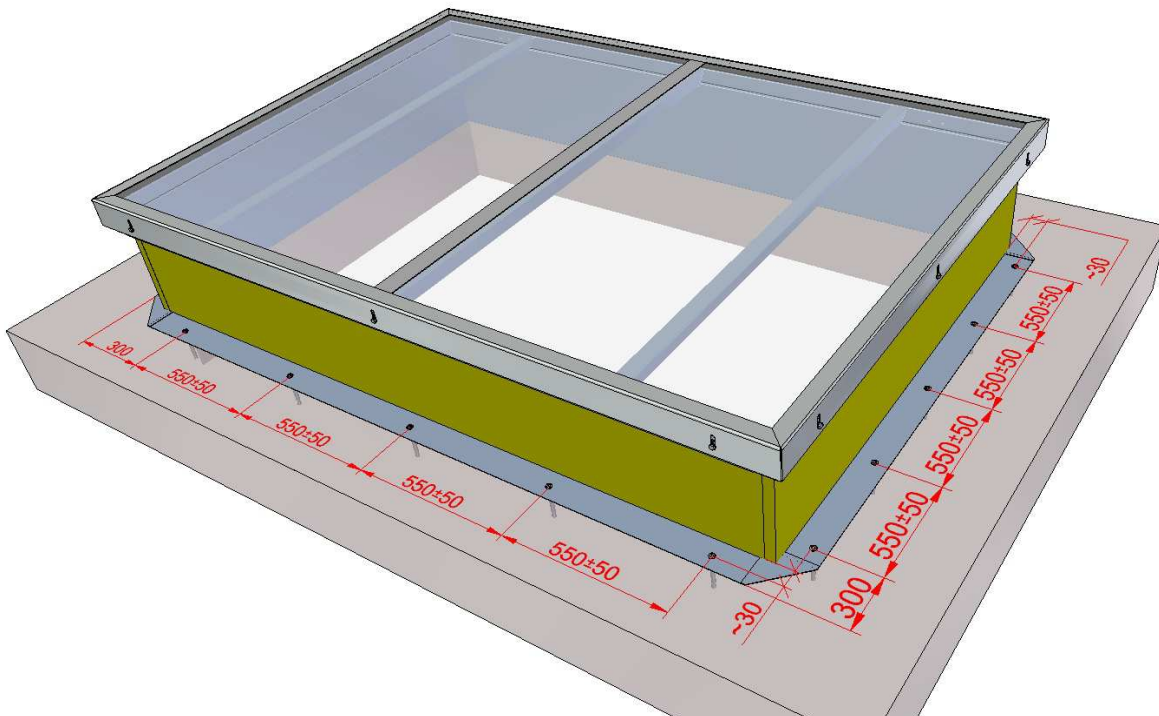
Skylights should be set on roof structural elements, such as e.g. purlins, trimmers, roof structural sheet, reinforced concrete curbs, etc. Any elements which may produce collisions with the skylight leaf (entire range) should be removed.

Skylights may be installed on steel, concrete, or timber roof structures.

A recess (shelf) in the bottom part of the skylight base is designed for backing up and fixing the skylight to the supporting structure.

Selection of connectors depends on supporting structure materials in compliance with the table below. Connectors should be spaced every 50 to 60 cm (max.).

Type of supporting structure	Minimum diameter of connector
Steel	min. Ø 4.8 mm
Concrete	min. Ø 6 mm
Timber	min. Ø 6 mm



**Fig. 4. Method of setting mcr-PROLIGHT skylights and roof hatches on the roof: connector spacing.**

Skylight bases are adapted to roof works made of building felt, PVC membrane, or metal sheet.

The entire perimeter of the skylight base top part is equipped with a galvanised steel sheet belt for bolting roof works / cover. If the roof is covered with membrane, the belt will be made of PVC-coated sheet (option) in order to facilitate the installation.

**WARNING:**

1. If the building felt is welded to the above mentioned sheet belt, skylight leaf filling and spacing sleeves **SHOULD BE** protected from the impact of fire / hot air by means of safety screens.
2. Having installed the skylight remove the protective film from external aluminium parts of the skylight (clamp frames; clamp strip) and from the skylight filling (PCA; composite panels; acrylic domes), otherwise the film may discolour the elements and become difficult to remove.
3. If the skylight is delivered in assembled condition, pay special attention to the installation of polycarbonate panels. Any damage to polycarbonate panel edge protective strip will contribute to penetration of impurities into PCA cells and make the warranty null and void.

### 5.1. Methods of skylight and roof hatch setting.

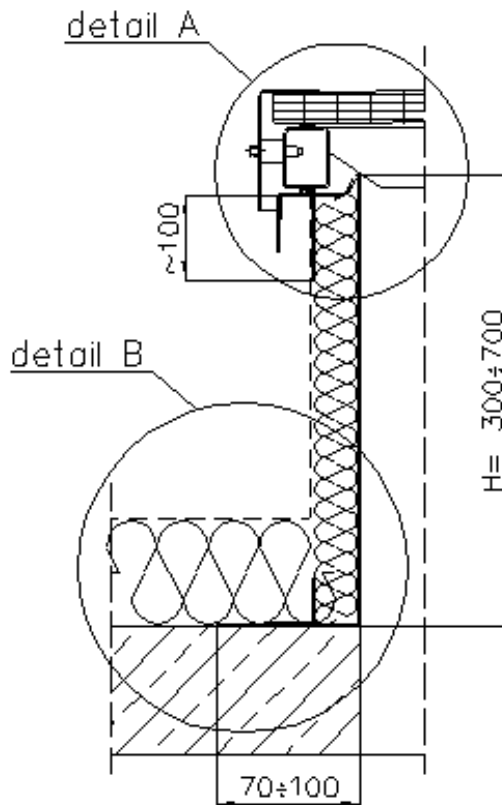


Fig. 5. Setting the steel base on the roof (DETAIL B) and method of sealing by means of roof membrane or building felt (DETAIL A).

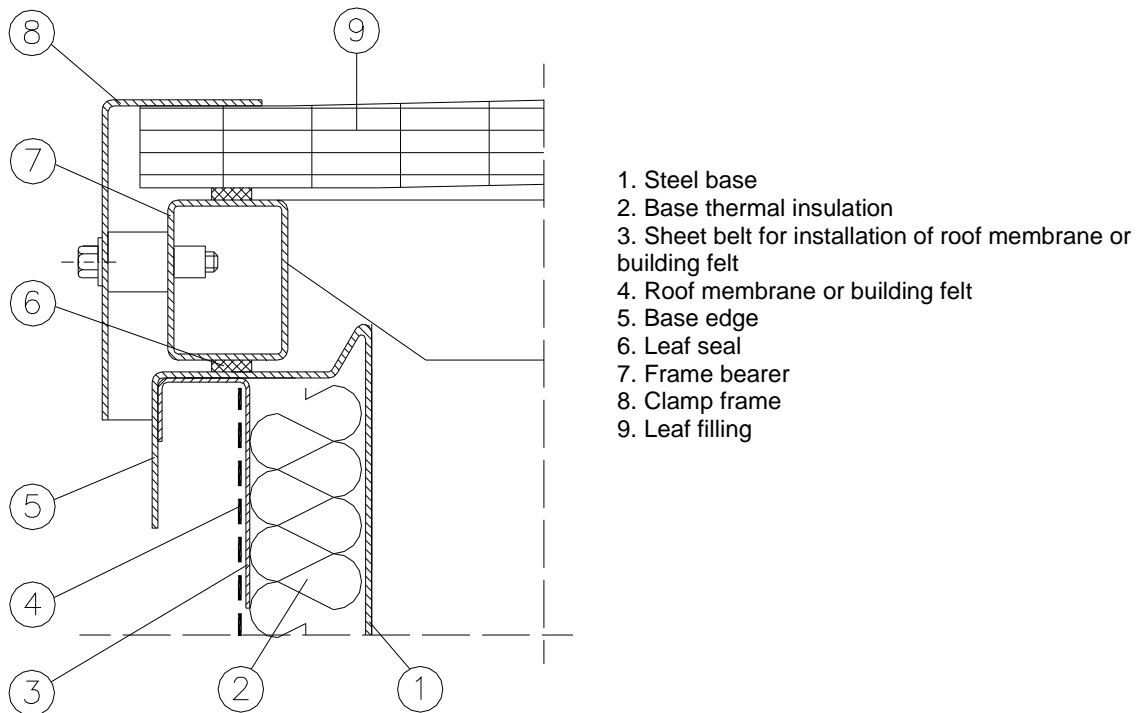


Fig. 6. Method of sealing with roof membrane or building felt (detail A).



Detail B

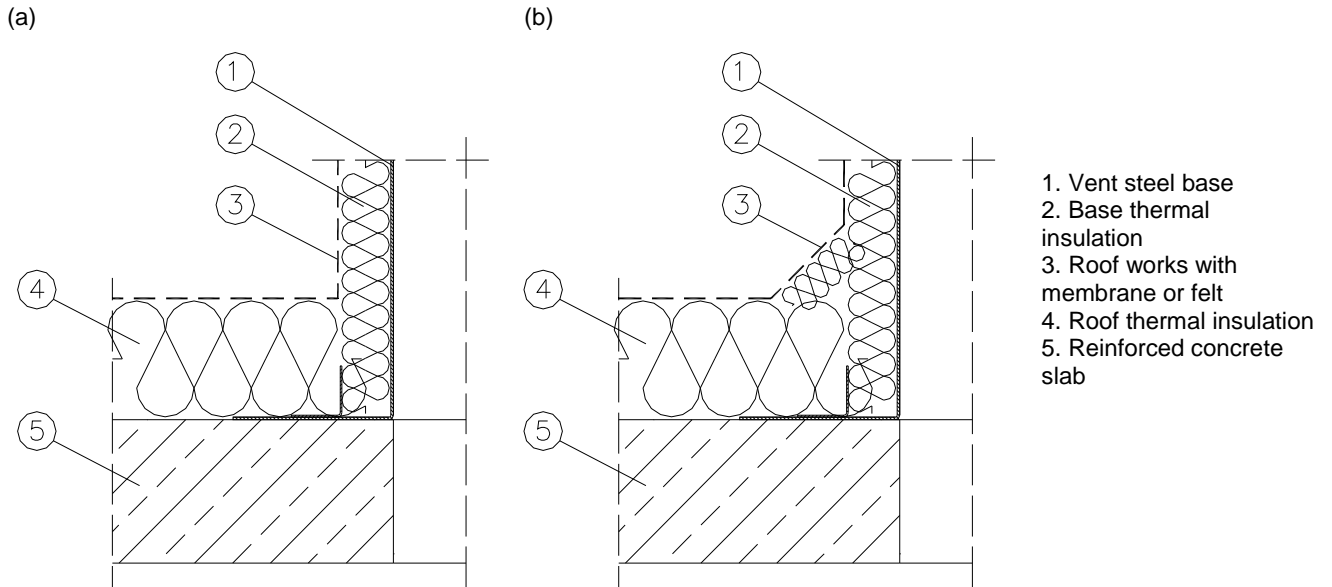


Fig. 7. Steel base on reinforced concrete slab: (a) membrane work; (b) felt work.

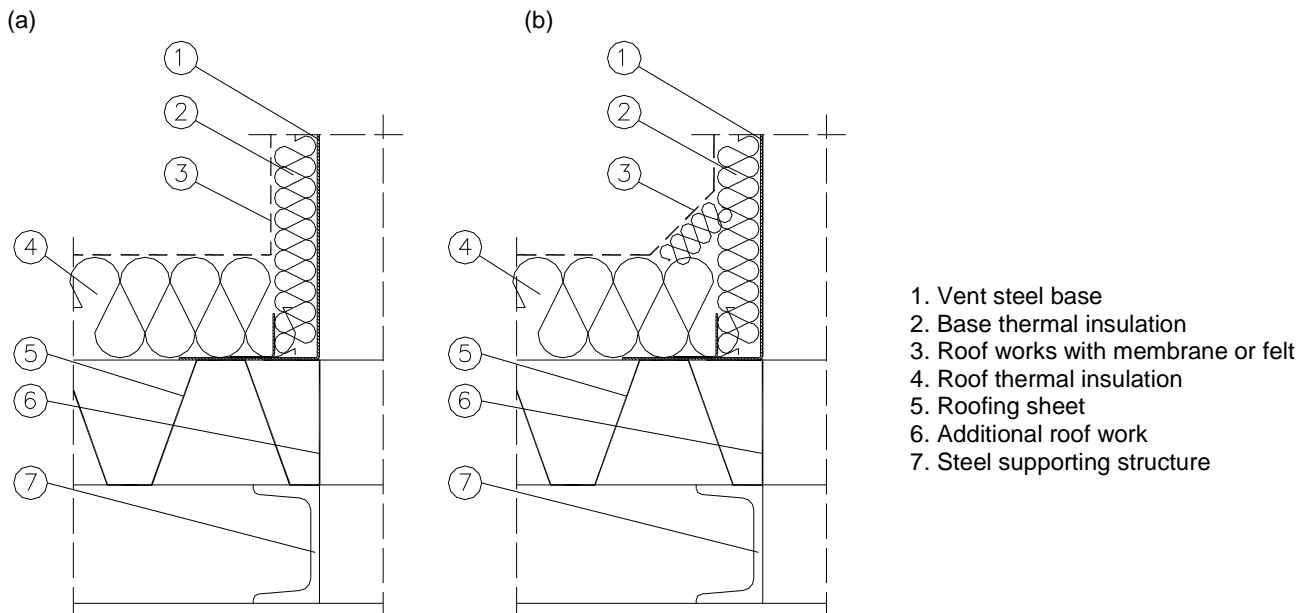


Fig. 8. Steel base on reinforced concrete slab: (a) membrane work; (b) felt work.

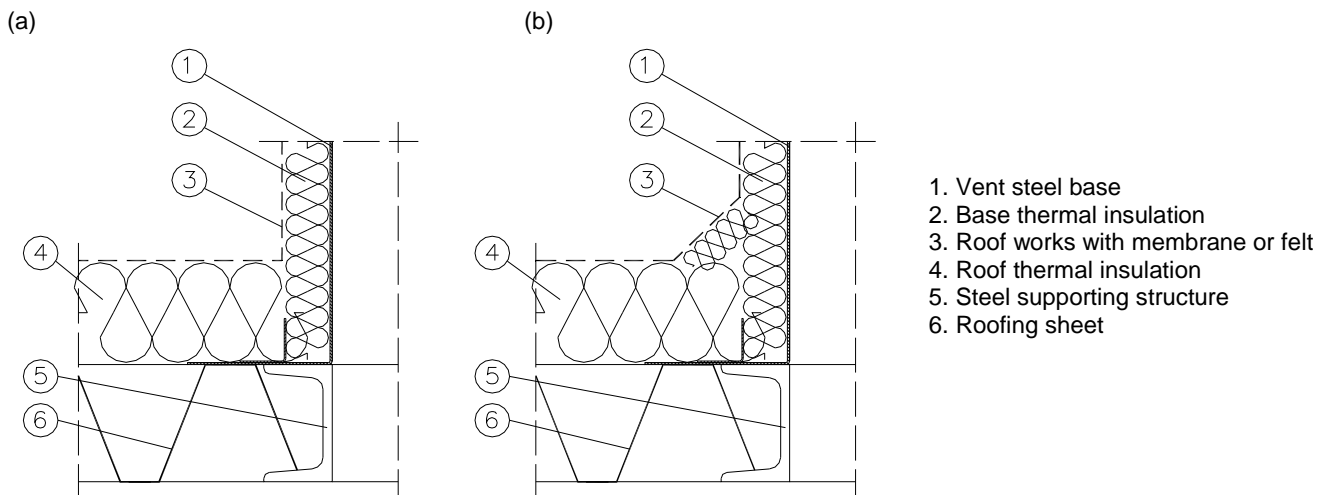


Fig. 9. Steel base on steel structure: (a) membrane work; (b) felt work.

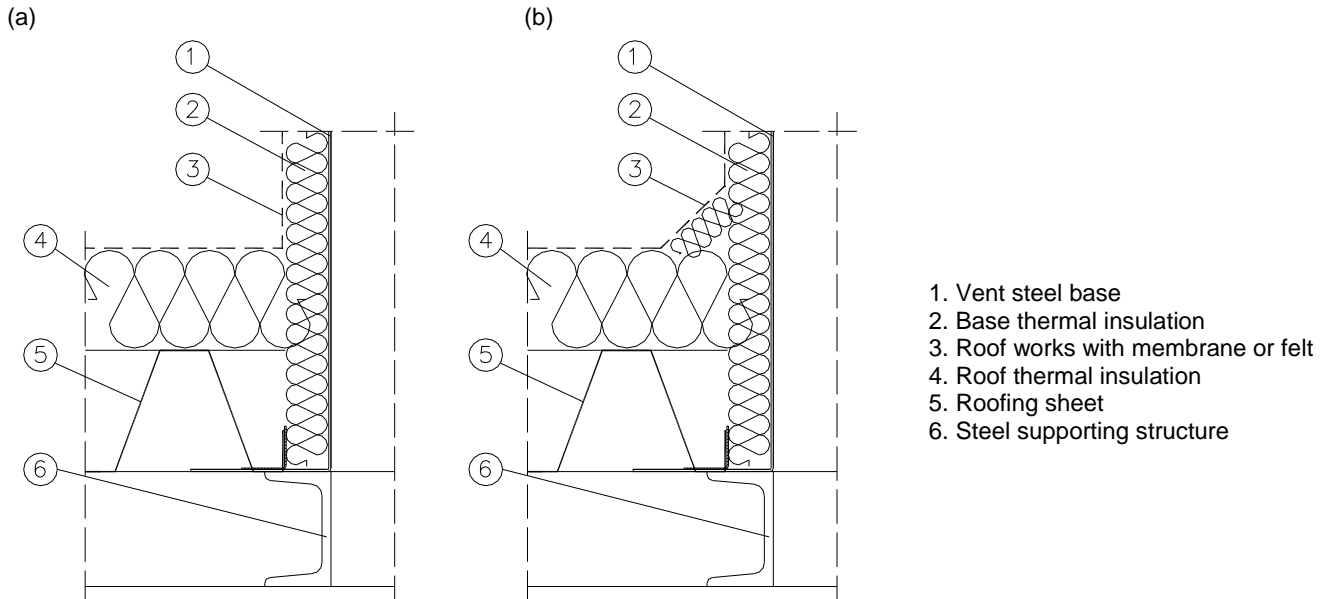


Fig. 10. Steel base on steel structure: (a) membrane work; (b) felt work.

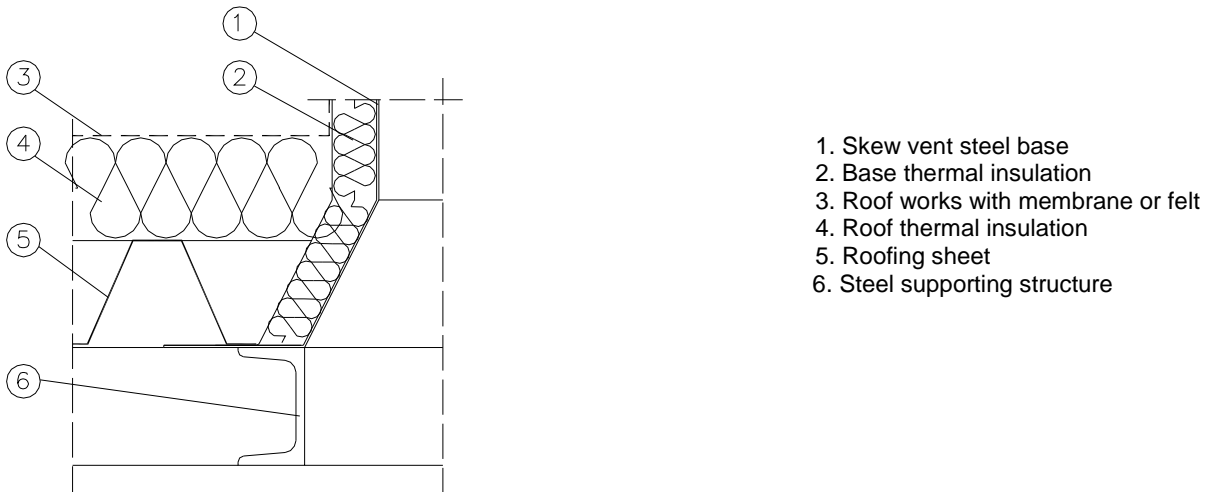


Fig. 11. Skew steel base on steel structure.

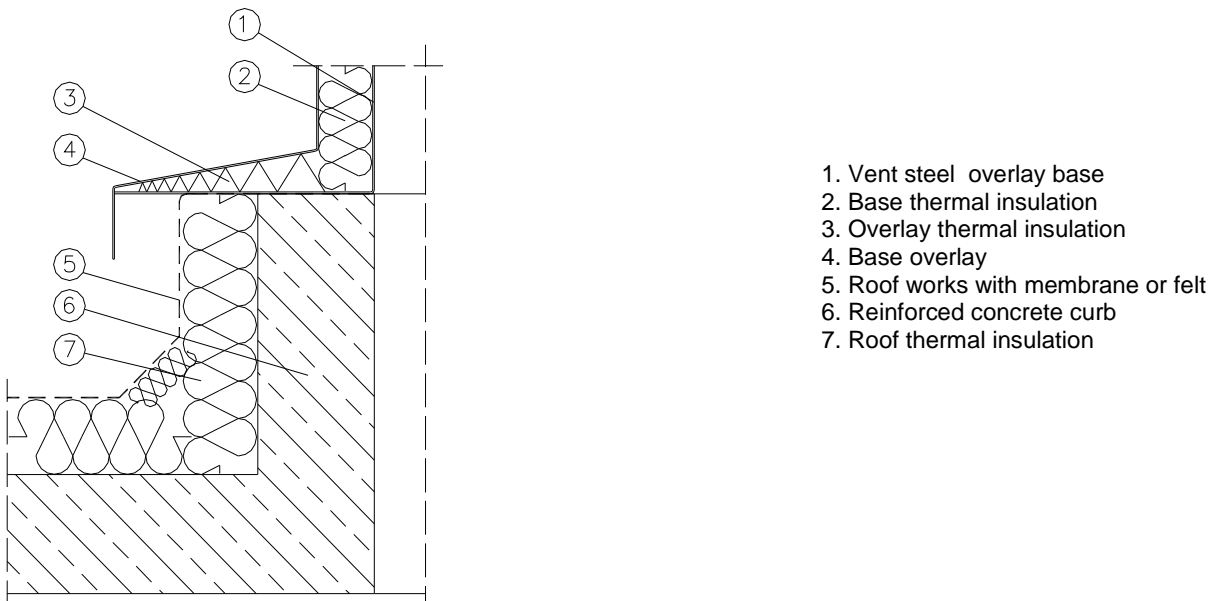


Fig. 12. Steel base on steel, timber, or reinforced concrete curb.

## 6. CONTROL.

Spot skylights make use of opening and closing mechanisms which compose the ventilation control systems. Depending on the components, control systems may be:

- Pneumatic,
- Electric, or
- Mechanical (gas springs).

The user must immediately notify the service support (see section 10) of any such failure of control system which prevents the skylight leaf from closing.

In case of emergency the user can immediately close the leaf without waiting for the service team by switching the defective actuator off (e.g.: disconnect the eye bolt from the bracket in the vent base or undo the eye bolt from the actuator or undo the eye bolt from the actuator), shut the leaf and lock it in closed position.

### 6.1. Electric control.

Typically, ventilation electric actuator is not factory installed for transport safety reasons. It should be installed inside the base bracket by means of ST12-1/8 screws (Exxx-230 actuator) or screw bolts (JMB actuators) supplied together with the actuator. The actuator has an eye bolt by which it is connected with the leaf spreader boom bracket. ST 12 screws should be protected from undoing by means of Loctite 243 or similar sealant.

We recommend using a weather automatic control unit, such as e.g. mcrP054, in the ventilation control system. With this unit, the system will close open skylights in case of strong wind or rainfall and hence, protect user's property and skylight structures from damages.



Fig. 13. Ventilation control actuator (Exxx-230 type).

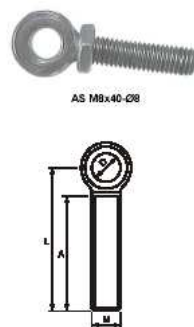


Fig. 14. Eye screw.

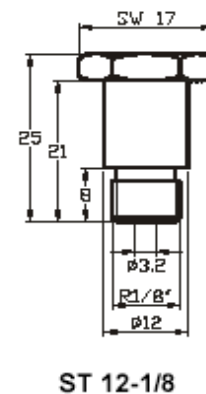


Fig. 15. ST12-1/8 screw.

(a) Exxx - 230 V type actuator has two circuits:

- operating: movement sense control (black / brown / blue wires);
- signalling (2 x white wires; actuator opening signalling: neutral contact).

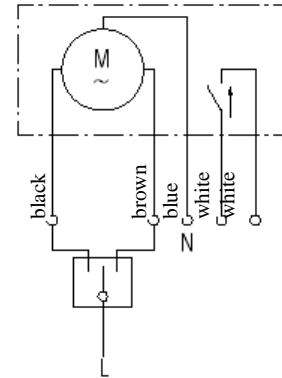


Fig. 14. Exx-230 type actuator

(b) JMBB-500-300-LA type actuator has two circuits:

- operating: movement sense control (wires: brown / black 1 - blue),
- signalling (wires: black 2 / black 3; actuator opening signalling: neutral contact).

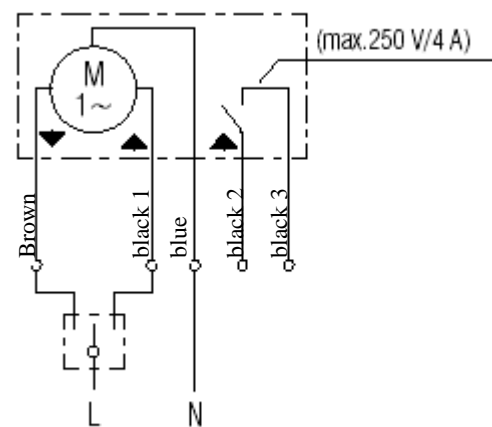


Fig. 15. JMBB-500-300-LA type actuator.

## 6.2. Pneumatic control.

Pneumatic control system includes one or two pneumatic actuators with standard cylinder diameter of 32 mm and pitch of 300 mm. Depending on the customer, available are also other cylinder diameter and actuator pitch values. Once the skylight is installed, connect the actuator by means of flexible or rigid tubes (recommended  $\varnothing 6 / \varnothing 4$  mm) running from the ventilation box with the integrated pneumatic valve. We recommend the actuator operating pressure of 0.4...0.8 MPa.

Pneumatic actuators are adjusted by means of tightening the eye bolt inside the actuator piston rod.

We recommend using a weather automatic control unit, such as e.g. mcrP054, in the ventilation control system. With this unit, the system will close open vents in case of strong wind or rainfall and hence, protect user's property and vent structures from damages.

Threaded connections of the union with valves, actuators, etc., should be sealed with suitable chemical preparations, such as e.g. Loctite 243 (recommended) or Teflon® tape to be winded onto the thread. Loctite 243 should be coated drop by drop (2-3) onto the thread. Once the threaded connection is tightened, Loctite 243 will set and seal the connection thus protecting it from uncontrolled loosening (which is important in the case of actuator connections). To undo such unions, the user is required to employ manual tools.

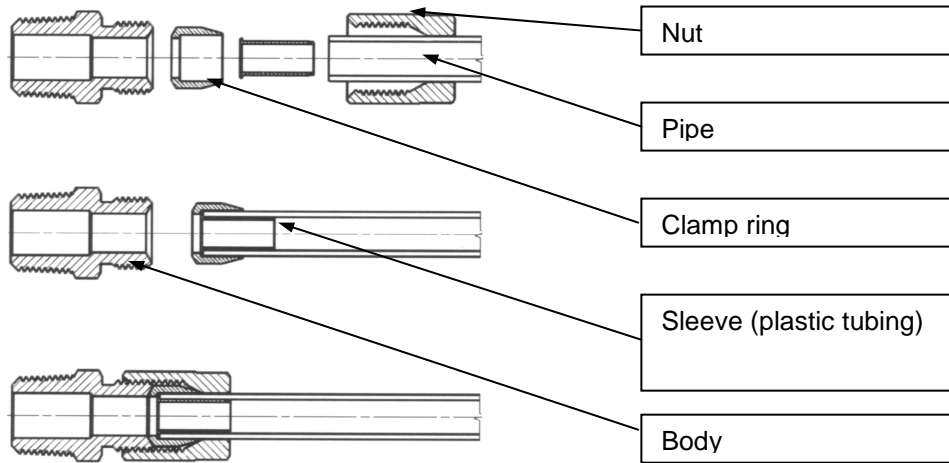


Fig. 16. Pneumatic system flexible tubing: assembling method.

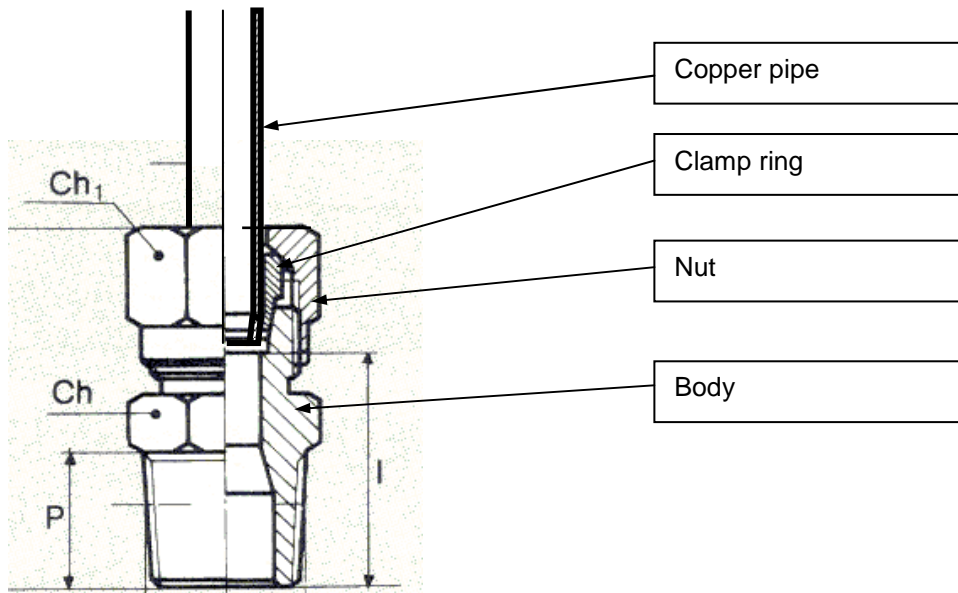


Fig. 17. Connection of union with copper / steel pipe.

Pneumatic actuators have an internal lock which prevents from closing a completely open skylight leaf. In case of emergency closure of the skylight leaf release the **actuator locks (1)**: lift them towards the actuator operating movement (follow the arrow shown on Fig. 25).

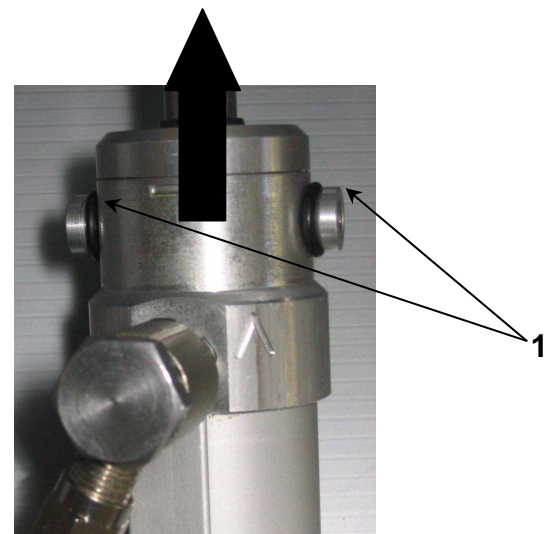


Fig.18. PUAV pneumatic actuator: direction of releasing the lock.

### 6.3. Mechanical control.

Mechanical control of C, E, NG type mcr-PROLIGHT roof hatches employs gas springs (oleopneumatic actuators).

Hatch opening support gas springs are installed on the brackets placed on lateral walls of the hatch base.

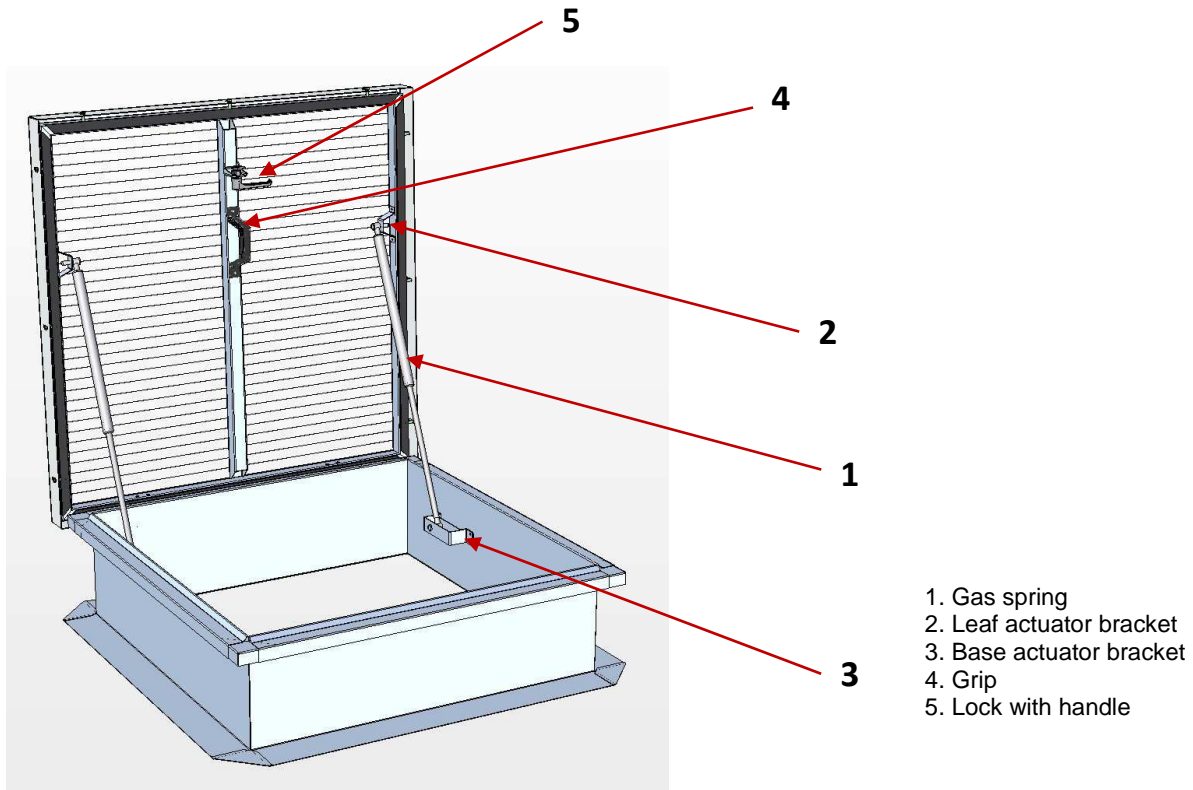


Fig. 19. C, E type mcr-PROLIGHT roof hatch with gas springs.

## 7. LEAF FILLING.

For transport reasons, filling domes are supplied as separate components. Domes should be fixed to the skylight leaf on site once the skylight is installed. Proceed as follows:

1. Remove the press frame (undo M6x30 bolts and remove spacing sleeves);
2. Check the condition of PES seal on the frame bearer (remove the dust);
3. Place multiple-layer dome elements: watch the sequence from the lowest to the highest; separate particular domes with supplied seal; stick the seal to the previous dome; maintain a 1-cm space on the corners along the perimeter (see the figure below);
4. Place the clamp frame;
5. Place the spacing sleeves;
6. Tighten M6x30 bolts and press down the frame from the top.

Polycarbonate filling is delivered as a factory integrated element. To replace, follow the instructions 1, 2, 4, 5, and 6 specified above.

If the frame bearer is loosened, slightly loosen M6x30 bolts and next screw them in pressing down the frame from the top.

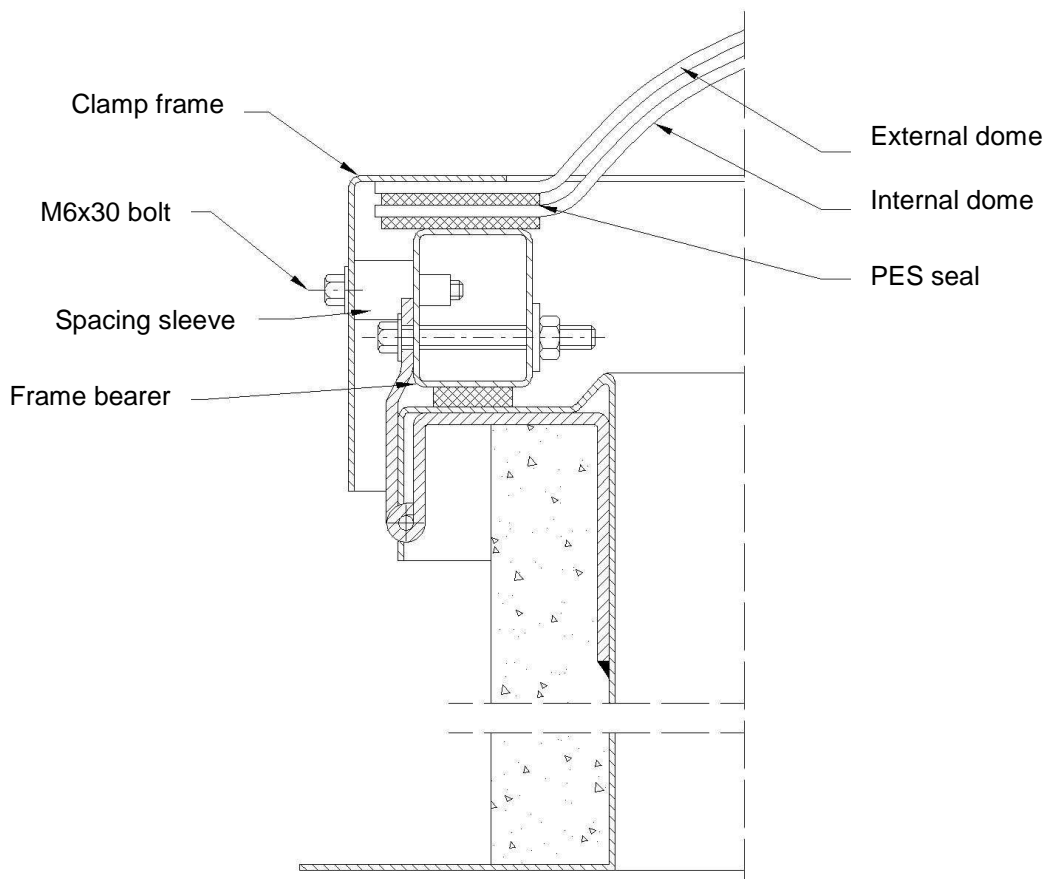


Fig. 20. View of finished dome.



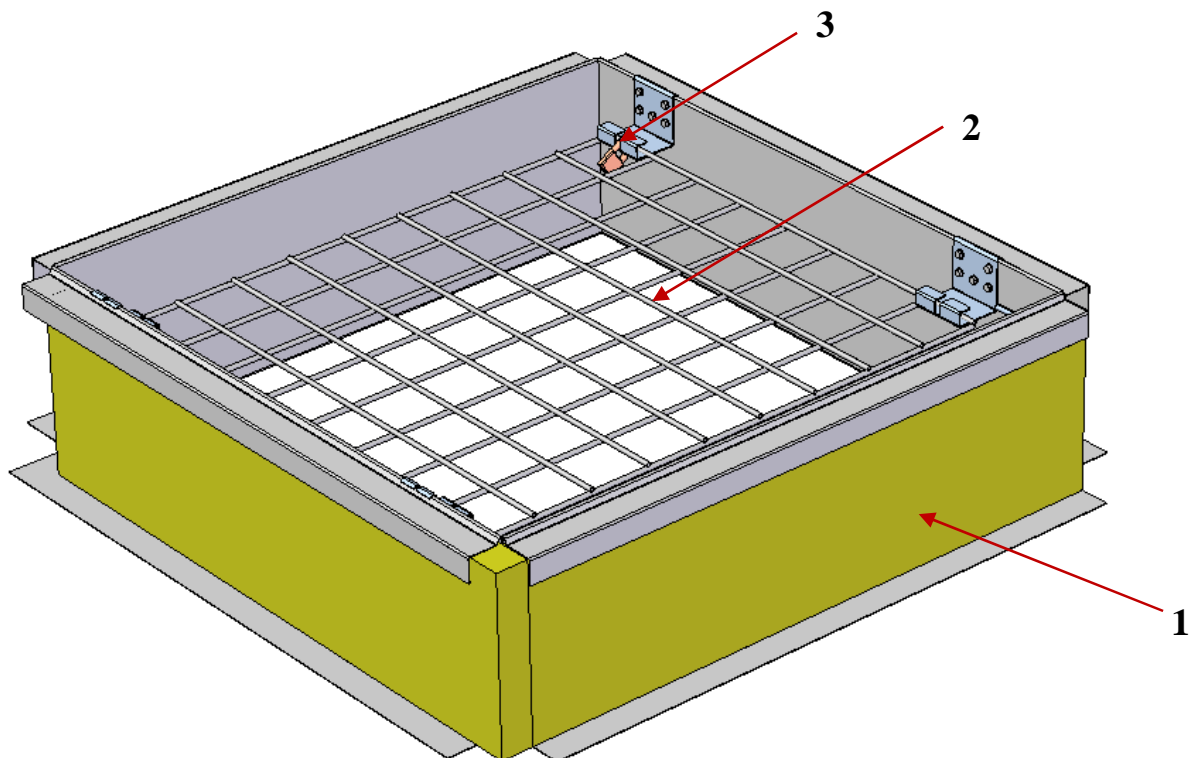
## 8. SKYLIGHTS WITH SECURITY BARS or NETS.

Skylights may be equipped with anti-burglar bars or security nets.

Security nets are delivered as elements already integrated with the skylight; they are resistant to the impact of a large soft solid < 1,200 J.

Anti-burglar bars are delivered as either finished products or sets of elements to be installed on site. They are resistant to the impact of a large soft solid < 1,200 J.

mcr-PROLIGHT roof hatches may be equipped with side-hung security nets. Security nets are delivered as elements already integrated with the skylight. Side-hung net structure is equipped with brackets which ensure net locking by means of e.g. cylinder padlock.



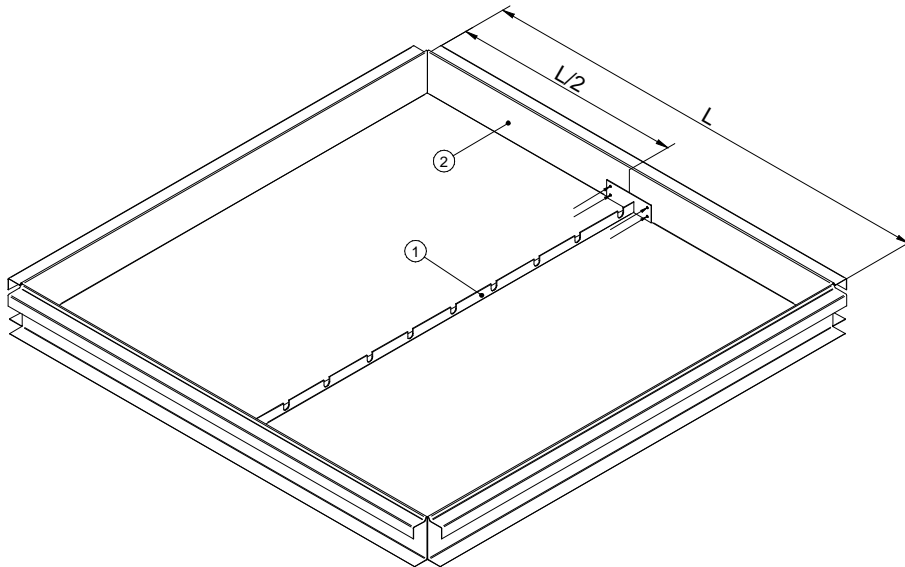
1. Skylight base with mineral wool filling
2. Side-hung security net
3. Bracket with padlock (option)

**Fig. 21. View of C-type mcr-PROLIGHT ventilating skylight base with side-hung security net (without control system and skylight leaf).**



If the anti-burglar bars are delivered as separate elements, they should be installed following the instructions below:

### I. Installation of the bracing on the skylight base.

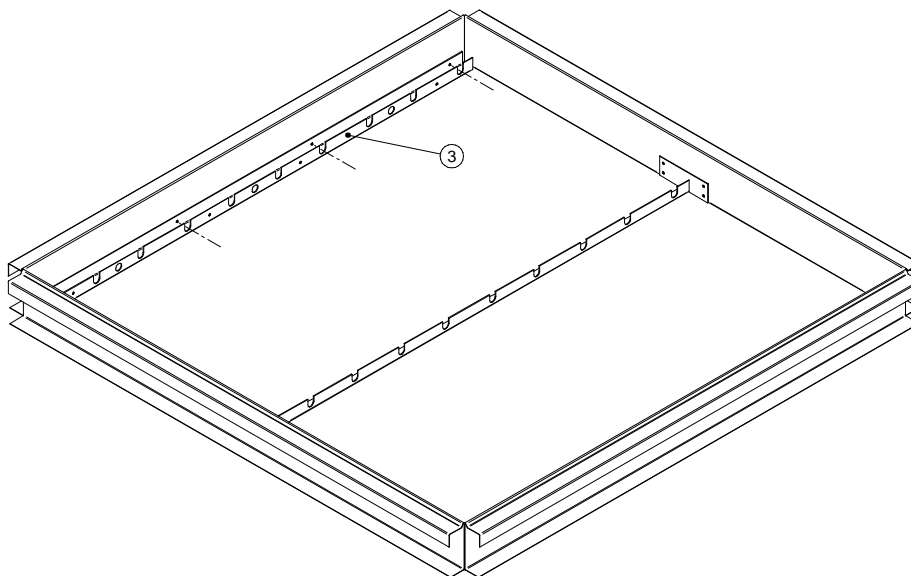


- 1. Bar bracing with catch sheets;
- 2. Skylight base;
- L: skylight length.

Arrows show the points of bolting.

- Place the catch sheet along with welded bracing at the half length of the skylight at a distance of 20 mm from the top of the base;
- Fix the bracing by means of four self-tapping bolts  $\varnothing$  6.3 to the skylight base through the holes in the catch plate.

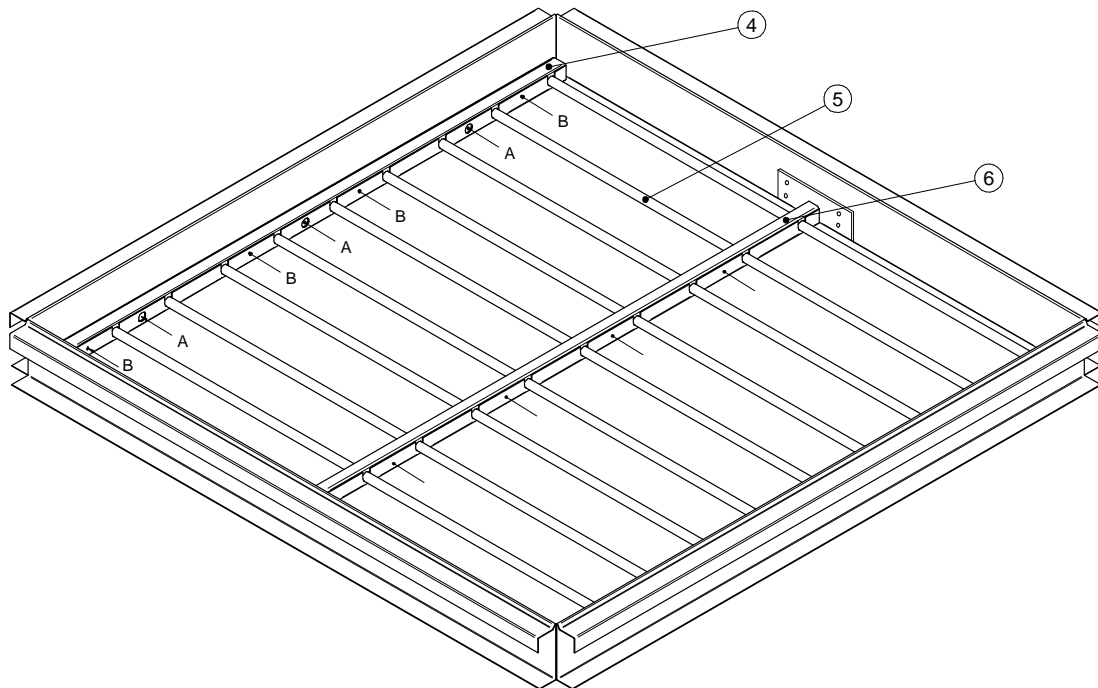
### II. Installation of bar supporting profiles.



3: Bar supporting profile (sheet #2 mm)

- Fasten two bar supporting profiles at a distance of 20 mm from the top of the skylight base by means of self-tapping bolts  $\varnothing$  6.3. The profile should be placed so as to make the recesses for tubes align with the recesses in the bracing.

### III. Installation of bar tubes and masking profiles.



- 4: Masking profile (sheet #1.25 mm);
- 5: Steel tube;
- 6: Bar bracing with holes.

- Place the anti-burglar bar tubes in supporting profiles and bracing.
- Place the masking profiles and fix to the base through the supporting profile at the points indicated by the holes (A) and with supporting profile (B) by means of self-tapping bolts  $\varnothing$  6.3.;
- Place the bar bracing and fix it by means of self-tapping bolts  $\varnothing$  6.3.

**WARNING:** Number of tubes and fastening bolts depends on the skylight size. This manual refers to C160 skylight.

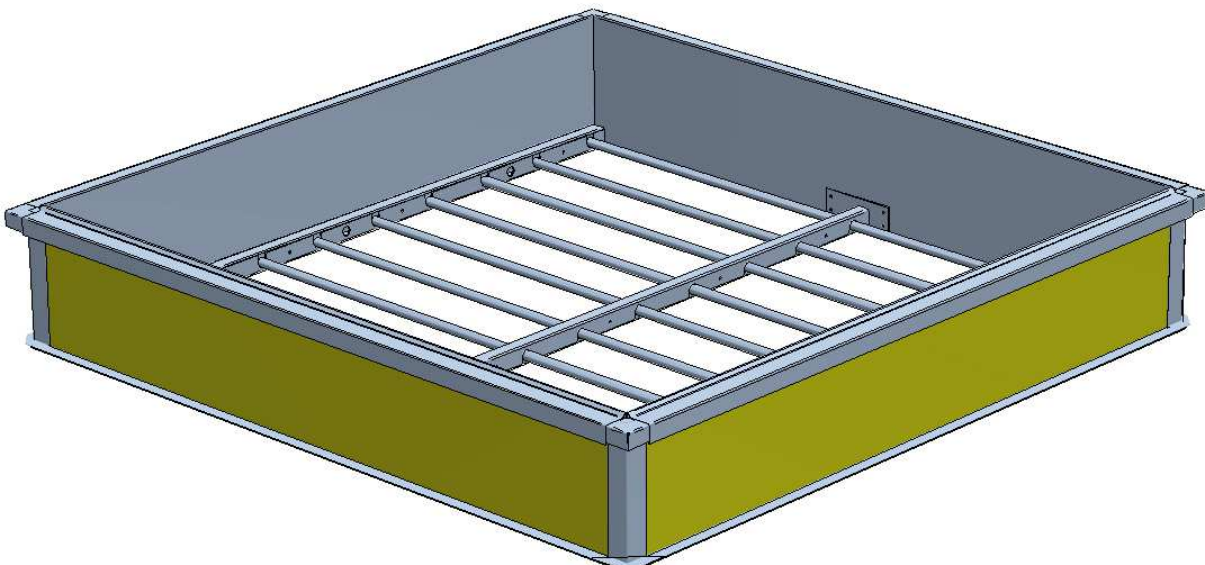


Fig. 22. C-type mcr-PROLIGHT non-ventilating skylight base with anti-burglar bars (without skylight filling).

## 9. MAINTENANCE.

The equipment should be maintained in compliance with any applicable occupational health and safety regulations, specifically as regards high-rise works, and using suitable personal protections.

During the operations, ensure regular maintenance and service reviews of the equipment. Service support and maintenance works are conducted by a team authorised by MERCOR SA. The time between the service reviews is 6 months. Between individual reviews, we recommend the works specified below:

1. Inspection of electric wiring condition, specifically with regard to mechanical damages.
2. Inspection of pneumatic connection condition, specifically with regard to mechanical damages.
3. Inspection of actuator bracket condition (should be firmly fixed).
4. Inspection of leaf filling clamp frame which should be firmly fastened; if loosened, follow the instructions set out in section 7.
5. Regular cleaning of polycarbonate dome / panel surface:  
Use a sponge or soft fabric as well as lukewarm water with common household mild cleansers. Do not scrub the panels with brushes or sharp things. Do not use abrasive materials, strong alkaline substances, solvents, etc. If doubtful, try a cleanser on a sample or small area.
6. Due to natural environmental processes, water vapours may condensate inside the polycarbonate panel cells. Condensation appears mostly as a mist or even visible drops in case of high moistness. After a certain time, moisture content inside the cells will equal the one in the outdoor air provided that suitable air change is ensured by way of diffusion between the cells and the outdoor space, and the symptoms will disappear.

**Water vapour condensation has no impact on material service life or product quality.**

### **WARNING**

**Do not use salt for snow removal from the roofs with mcr-PROLIGHT spot skylights. Salt may decolour and damage aluminium profiles, polycarbonate panels, or acrylic domes. Such damages will make the warranty null and void.**

## 10. TERMS AND CONDITIONS OF WARRANTY AND SERVICE SUPPORT.

1. MERCOR SA provides a 12-month warranty on the quality of the unit, beginning from the date of its purchase, unless the contract provides otherwise.
2. If during the warranty period any physical defects of the units shall be revealed, MERCOR SA agrees to remove them no later than 21 days from the date of receipt of written notification, subject to par. 5.
3. In the case of defects caused by improper operation of the unit, or for other reasons specified in par. 6, the Buyer / Holder of the warranty will be charged for their removal.
4. Liability covered by the warranty only applies to those defects that arise from causes inherent in the devices sold.
5. MERCOR SA reserves the right to extend the time to repair in case of complex repairs or those requiring the purchase of any custom subassemblies [components] or spare parts.
6. The warranty does not cover:
  - equipment damages or failures caused by improper operation, tampering, lack of maintenance or lack of periodic inspections;
  - damages to the units arising from causes other than those attributable to MERCOR SA, and in particular, acts of God, in the form of: torrential rain, flooding, hurricane, inundation, lightning, power surges in the electrical grid, explosion, hail, collapse of an air vehicle, fire, avalanches, landslides, and any consequential damages resulting from the above-mentioned reasons. The torrential rain means a rain with a performance ratio of at least 4, as set by IMGW (Institute of Meteorology and Water Management). If the ratio referred to in the preceding sentence cannot be determined, the factual status and the extent of damages in their place of origin, which will provide for the operation of torrential rain will be taken into consideration. The hurricane means a wind speed of not less than 17.5 m/s (a damage shall be considered as caused by hurricane, if it was found in the immediate vicinity of the hurricane activity);
  - damages caused by failing the obligation to immediately report defects revealed;
  - coating deterioration caused by the natural process of aging (fading, oxidation);
  - defects caused by use of abrasive or harsh cleaning agents;
  - parts subject to normal wear and tear (e.g. seals), unless caused by a manufacturing defect;
  - damages caused by the action of external aggressive agents, and in particular chemical and biological, or whose origin is connected with production processes and activities carried out in the facility or the immediate vicinity, where the devices have been installed
  - contamination of chambers of structured polycarbonate plate with dust or bits or particles which effective diameter is smaller than 50 µm
  - condensation of steam inside chambers of structured polycarbonate, during exploitation.
7. Any defect covered by the warranty should be reported immediately to MERCOR SA or local Mercor's representative, that is, within 7 days from the date of its disclosure.
8. The Buyer/Holder of the warranty is required for proper operation, maintenance and conducting periodic (at least 2 times a year) service reviews.
9. The warranty expires with immediate effect in the event of:
  - when the Buyer/Holder of the warranty introduces any design changes on their own, without the prior agreement of the fact with MERCOR SA
  - the maintenance or periodic maintenance inspections were not performed on time or were executed by unauthorized persons or a service centre not authorized by MERCOR SA, or if the unit was improperly operated
  - any intervention of unauthorized personnel - outside activities which fall within the normal operation of the unit
10. In addition, in the cases referred to in par. 9, responsibility of MERCOR SA for the warranty is excluded.

In matters not covered by these warranty terms and conditions, the relevant provisions of the Civil Code shall be applicable.

### Servicing

1. The devices should undergo maintenance inspections every 6 months during their entire life
2. Maintenance inspections should be carried out by companies with appropriate authorization of MERCOR SA
3. For servicing, please contact local Mercor's representative.