ecos 5 sunshade solution

Manual

7 010119 003 C

SAUTER

Creating Sustainable Environments.

ecos 5 sunshade solution

Manual

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2013-02	A	New document		
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2015-03	C	Weather stations: Order data updated	6.3	

1 Introduction

In its original form, sunshade for room automation prevents occupants from being disturbed and discomforted by direct solar radiation. To do this, sunshade equipment – such as roller blinds, awnings, roller shutters or various kinds of window blind – is brought into position either manually or automatically. Nowadays, sunshade equipment can also be utilised to assist heating or cooling in a building.

This means that sunshade equipment can serve different purposes:

- Glare protection
- Privacy provision
- Protection from overheating
- Protecting rooms from excessive cooling
- Assisting with heating
- Assisting with cooling
- Burglary protection
- Aesthetics: Uniform façade

Fig. 1: Sunshade reduces incoming heat by 80%

In state-of-the-art buildings, sunshades are activated according to demand, depending on sensor values for brightness, incoming heat and temperature. Complex sunshade even takes into account the position of the sun in the sky.

2 Explanation of basic terms

2.1 Awning

An awning consists of material stretched over a frame attached to the building, and is used, among other things, as a form of protection from sunlight, heat, glare and intrusion. Some kinds of awning can also be used as privacy screens or as protection from rain.

Structures similar to today's awnings have been used for sunshade equipment all the way back to ancient times. Awnings became very popular in the mid-18th century in France. The French word for them – *marquise* – originally referred to a noblewoman. It is said that, in army camps, the sunshade was always extended when the wife of an officer was present. In the centuries that followed, the simple sunshade developed into the awnings with which we are currently familiar. With an increasing number of technical innovations, awnings are now high-tech products.

Source: Wikipedia

Fig. 2: Awning (Source: Griesser brochure on awnings and patio covers)

2.2 Roller shutter

A roller shutter consists of a series of hinged slats on a roller to provide additional protection for a door or window.

It is generally mounted outside the door or window and, depending on the type, can carry out various functions, e.g. noise protection, preventing intrusion, protection from heat or privacy provision. In technical terms, it is similar to a roller door.

Source: Wikipedia

Fig. 3: Built-in roller shutter (Source: Griesser brochure on roller shutters)

2.3 Window blind

A window blind (known in many languages as a *jalousie*, from the French for “jealousy”) was originally a lattice screen on a window that allowed those inside to look out, but prevented those outside from looking in. The connection with jealousy is that they were based on those used in oriental harems, where the owner of the house jealously guarded the women’s chambers from being seen from outside. Like these oriental screens, the first window blinds used in Europe were also fixed in place. This remained the case until 14th April 1812, when Monsieur Cochot, a carpenter in Paris, patented his invention of a window blind with adjustable slats – the principle that is still used today.

In military tactics from the 18th and 19th century, a related use of the word ‘blind’ is a feinted attack on the enemy to conceal the main offensive.

Today, however, a window blind is an adjustable device to protect privacy and provide shade. Exterior window blinds (not to be confused with roller shutters) provide protection against sunlight and weather, while interior blinds provide only privacy and shade, similar to curtains, but hardly any protection from heat due to direct solar radiation – only

exterior blinds can do this. The leading manufacturers provide both outdoor and indoor blinds.

The slats of the blinds are made of rolled aluminium or wood, or – especially on cheap blinds – PVC. The upper head rail and the turning rod are usually made of metal. Non-rusting materials are also available for humid rooms.

The most common slat widths are 16 mm, 25 mm, 35 mm and 50 mm.

Source: Wikipedia

Fig. 4: Window blind (Source: Griesser brochure on window blinds)

2.4 Automatic solar control

Automatic solar control is a simple glare protection mechanism whereby the sunshade moves into position when the brightness outside exceeds a set level. When the brightness decreases, it returns to its original position. The outdoor brightness is measured by a light sensor on the façade.

2.5 Automatic slat tracking and cut-off angle

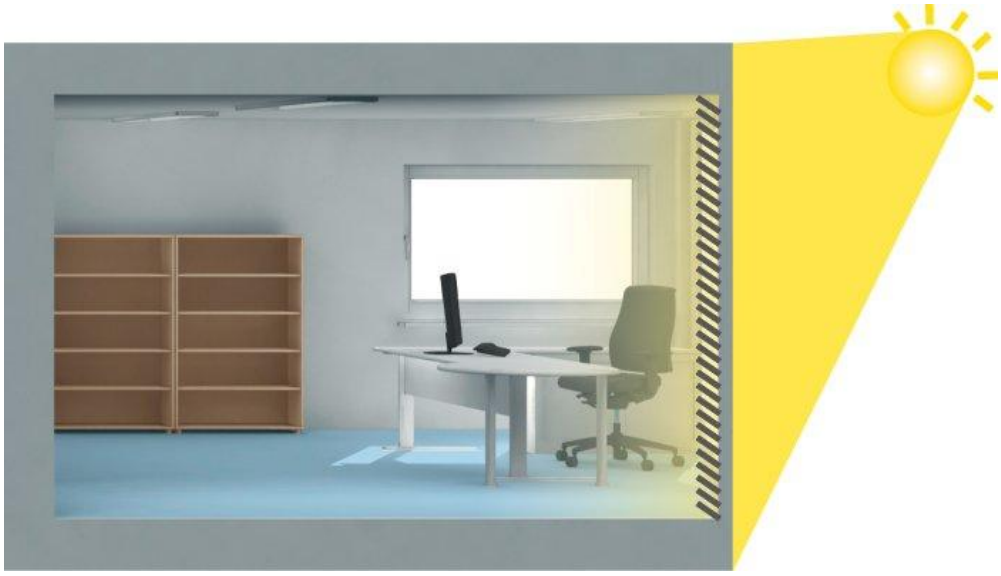

Fig. 5: Automatic slat tracking

The cut-off angle is the set slat angle that lets in the maximum amount of diffused light. If the slat opened any more, direct sunlight would be let in.

The slat angle is the inclination of the slat from the horizontal. In the picture above, it is approximately +45°.

The automatic slat tracking moves the slats to the cut-off angle when there is a risk of glare, as detected by an outdoor light sensor. The room automation station knows the position of the sun at every time of day.

2.6 Shadow edge

The shadow edge specifies how far the sun shines into the room, depending on the sunshade equipment.

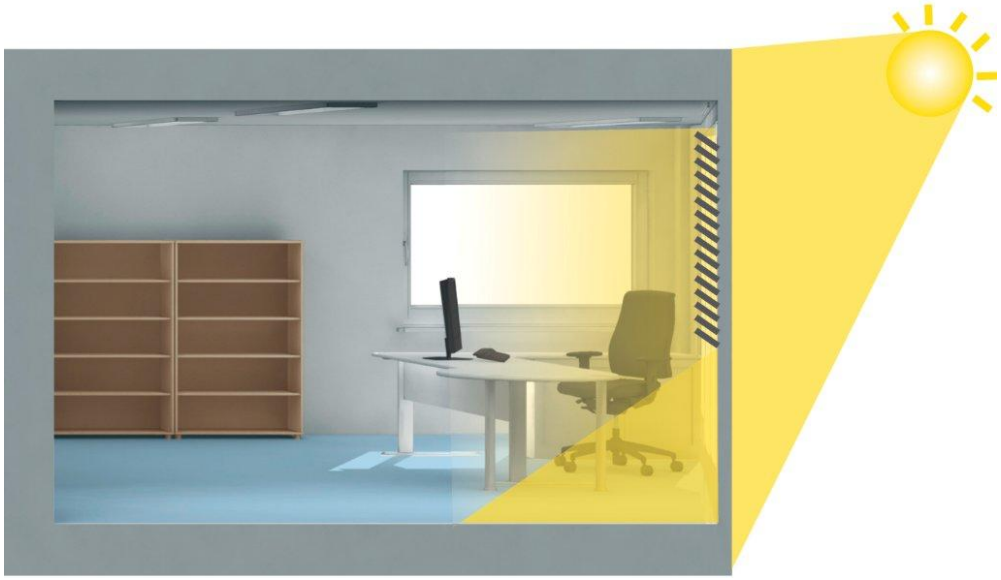

Fig. 6: Shadow edge

The length of the shadow edge can be actively affected by the height of the sunshade equipment.

2.7 Shadow correction

In the case of automatic slat tracking and shadow edge, which depend on the position of the sun, shadow correction takes account of the objects casting shadows at each window. If a shadow is cast, the sunshade is opened to allow more light into the room.

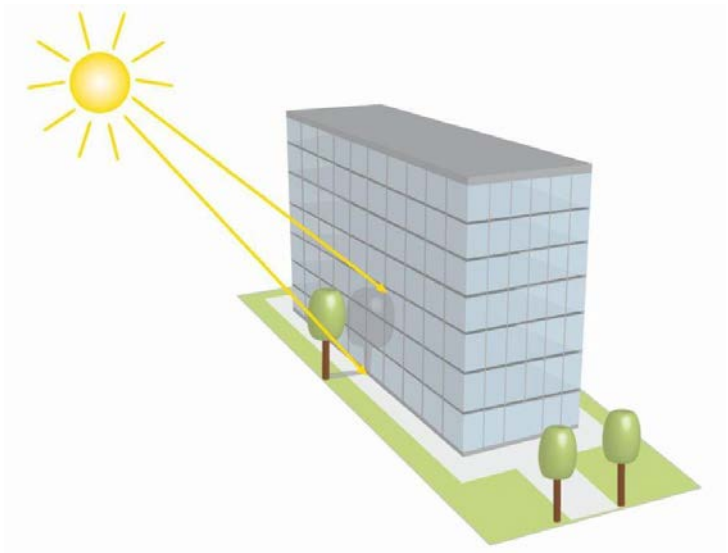

Fig. 7: Shadow correction

SAUTER does not offer shadow correction at present.

2.8 Weather protection control

Weather protection control prevents the sunshades from being damaged by rain, wind or ice. It uses data from a weather station to identify, for example, the risk of ice by evaluating the outside temperature in combination with precipitation.

2.9 Changeover between manual operation and automatic mode

With room occupancy, after manual operation the presence indication for this must be retracted so that the system can switch back to automatic mode. This can be controlled via the occupancy time profile, which must be created individually.

After the end of the occupancy period, the automatic mode is started. If a manual operation is then performed, after the parameterised delay time, the automatic mode is started again.

2.10 Automatic thermal control

Automatic thermal control assists with heating or cooling in unoccupied rooms. These functions can also be optionally used when the rooms are occupied. In winter, the sunshade equipment is automatically raised so that the sun can help to heat the rooms. The sunshade is automatically lowered in the summer to relieve the load on the air-conditioning system.

2.11 Automatic twilight control

The automatic twilight control lowers the sunshade in the evening after the outdoor brightness falls below a defined level. This prevents rooms from cooling down excessively in winter, and also provides privacy. An additional effect is that it prevents light emission to the outside, which is particularly important for large buildings. At daybreak, the automatic twilight control is deactivated, which means that other functions control the sunshade.

2.12 Safety functions

Safety functions always have the highest priority, because any failure poses serious or even fatal risks. For example, in the event of a fire alarm, the sunshade equipment must be raised so that the building can be evacuated. To enable cleaning, they adopt a cleaning position, and manual operation by room occupants is disabled.

2.13 Service functions

Service functions are required for moving the sunshade to a suitable position for cleaning, maintenance or repair. The automatic functions and manual control are disabled in order to prevent injury to service staff.

3 Customer benefits

In their simplest form, the sunshades are moved by hand or electrically, using ‘up’ and ‘down’ buttons in the room. However, this provides relatively little benefit to the customer.

For example, if a person does not enter the room until late afternoon in the summer, it may already be very hot because no-one has lowered the sunshade.

Automated sunshade saves energy and can prevent such inconveniences. The following section lists and explains the individual benefits to customers.

3.1 Glare protection and privacy provision

Two of the main and most useful functions of sunshade are to prevent glare from direct sunlight and to provide privacy from outside observers. When the sun sets, the automatic twilight control provides privacy by automatically lowering the sunshade.

3.2 Energy savings on lighting

If automatic slat tracking is installed, the maximum incidence of daylight is guaranteed without the risk of glare. Combined with lighting control, this can reduce the energy consumption for lighting to a minimum.

3.3 Energy savings on heating

Automatic thermal control can assist heating by raising the sunshade in unoccupied rooms. This minimises energy consumption for heating.

3.4 Energy savings on cooling

Automatic thermal control can actively assist cooling by lowering the sunshade. It normally takes into account whether the room is occupied. Automatic thermal control and automatic slat tracking guarantee that the rooms are protected from overheating.

3.5 Protecting rooms from excessive cooling

In winter, the automatic twilight control helps to prevent the rooms from becoming too cold when it gets dark. The sunshade is lowered and acts as insulation.

3.6 Burglary protection

High-quality sunshades provide additional protection from intruders with a mechanism to stop them from raising the blinds. Because they move automatically, the building appears to be occupied. This also reduces the risk of intrusion.

3.7 Uniform façade

For representative and prestigious buildings, aesthetics are also important. Collective control ensures that the façade presents a harmonious appearance.

3.8 The added value of buildings: energy efficiency A, LEED

Energy savings and sustainability are constant factors in building and room automation, and will become increasingly important in the future. For a building to achieve energy efficiency class A according to EN15232, it needs an integrated, intelligent room automation system with concepts for room climate control, lighting control and sunshade. As mentioned above, it is important that the sunshade assists other room automation functions such as climate control. Complex sunshade scores more than 10 points in the LEED certification scheme. This increases the value of the building for investors.

3.9 Summary of energy savings

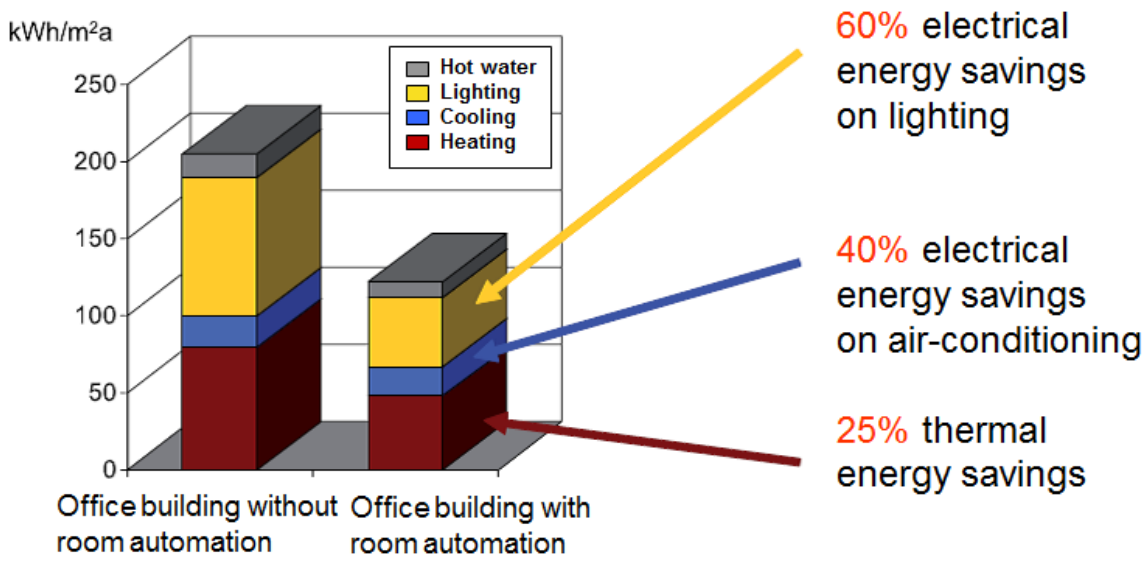

Fig. 8: Annual energy requirements of an office building with and without room automation (Data source: Reference building of the LONMARK study with energy-optimised room automation)

Savings compared to a reference building as per DIN V 18599 and EN 15232:

Automatic solar control can save up to 8% on lighting and automatic slat tracking can save up to 13 %. The automatic thermal control of the sunshade can save up to 5% of energy for heating.

4 Activation of window-blind motors

4.1 General philosophy for controlling sunshade equipment

With automatic sunshading functions, the sunshade should not be raised and lowered more often than is necessary. “Less is more” is the key. If it is constantly moving, it disturbs the occupants of the room. In addition, it puts unnecessary strain on the shutter mechanisms and motors.

With automatic slat tracking, four movements per day are totally sufficient for the glare protection on each façade. These movements can be adapted to room utilisation, e.g. so that some slat movements take place when the room is empty and only two or three take place when it is occupied.

4.2 Motor selection

Suitable motors must be chosen for the purchased sunshade solution. For the complex sunshade package, it is advisable to use motors with position feedback, such as SMI. Purely time-controlled positioning is not recommended for automatic slat tracking with a shadow edge according to the position of the sun, for the following reasons:

- Mechanical ageing cannot be taken into account
- Irregularities such as the slackening of the guide cables after full lowering cannot be taken adequately into account

For basic sunshade where only one glare protection position is required, accurate activation via relays is sufficient, e.g. directly via an ecos 5 or ecoLink module. It is important that the glare protection position is always attained from the same direction, for example downwards. This ensures that the slat angle is always accurately adjusted.

4.3 Motor control via relay

The most common types of motor for sunshade equipment are 230 V AC (induction) motors, because they are reliable and cheap. They can be controlled using two sets of normally-open relay contacts, where both sets of contacts should never activated at the same time.

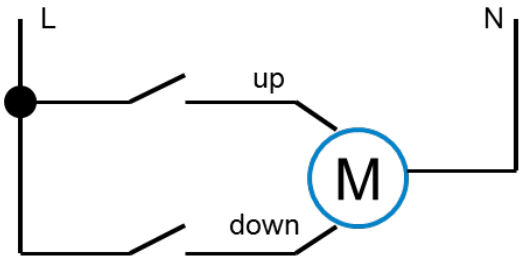

Fig. 9: Motor control via relay

Additionally, there must be a pause between movement commands, otherwise the remaining inductive energy in the motor circuit may jam or irreparably damage the relay contacts. Depending on the motor, this pause is 0.5 to 2 seconds, and is stated on the motor's data sheet. The CASE Engine BLIND_O module includes a locking facility, and the pause time can be parameterised. The BLIND_O module should always be used for motor control via relay. The module also includes an estimator that can set the position and angle over the running time.

Many invitations to tender now include a hardware-based locking facility for the 'up' and 'down' control elements. If the BLIND_O CASE Engine module is used for activating the ecos 5, the following statement applies:

"The outputs for raising/lowering the blinds are locked against each other using a fixed microprogramme."

4.4 Motor control via SMI

SMI stands for Standard Motor Interface and consists of a two-wire bus for controlling the motor.

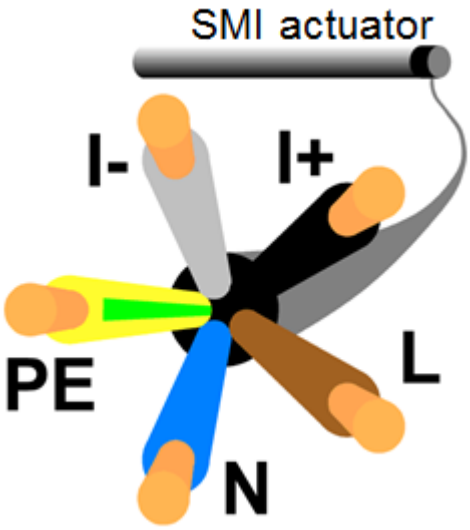

Fig. 10: SMI actuator connection

SMI has the following features:

- Power supply and data transfer on the same 5-core cable
- Telegram transfer at 2400 bits per second
- Telegram lines are protected against reversed polarity and excess voltage
- Cable length up to 350 m
- Up to 16 actuators per SMI line
- Built-in incremental encoder for accurate positioning and feedback
- Troubleshooting possible

The advantages of a two-wire bus solution in the form of continuous wiring are obvious. A standard electrical installation cable can be used for this. Because the motor is

activated by an internal electronic control circuit, there is no risk of electrical feedback from the motor circuit to the room controller when the actuators are switched off.

SMI motors are ideal for sunshade where very accurate positioning is required, e.g. sunshade with automatic slat tracking. SAUTER currently connects SMI motors with a BACnet-SMI gateway.

5 Sunshade packages: Solutions from SAUTER

5.1 Basic sunshade package

The SAUTER package for “basic” sunshade comprises automatic solar control, automatic twilight control, automatic thermal control, weather protection control, safety function, service, time programme, manual control, priority control and the actuator.

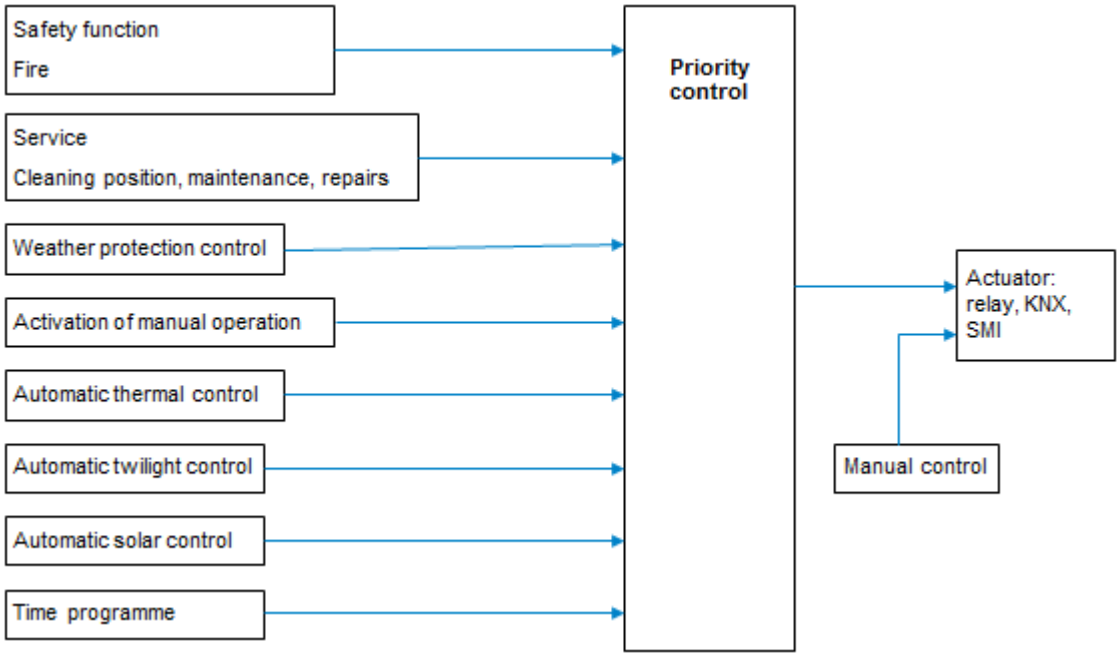

Fig. 11: Basic sunshade package

With this package, the sunshade is not adjusted according to the position of the sun.

When people are in the room and there is a risk of glare (when the outdoor brightness exceeds a set value), the sunshade automatically moves to a set glare protection position.

The automatic twilight control lowers the sunshade when it gets dark in order to block the view into the room and to help to reduce cooling in winter.

Automatic thermal control assists heating and cooling in unoccupied rooms.

Weather protection control prevents external sunshade equipment from icing up or being damaged by ice or strong winds. In the event of a fire alarm, all the sunshade equipment is raised so that the building can be evacuated without obstruction. If a person in the room uses manual control, the automatic functions are disabled for a set period of time.

The time programme can be used to cover time requirements for building use. For example, the sunshade can be raised from Monday to Friday when work begins, provided no higher-priority automatic functions are active.

5.2 Complex sunshade package

The SAUTER package for complex sunshade comprises sun position, automatic slat tracking with shadow edge, automatic twilight control, automatic thermal control, weather protection control, safety function, service, time programme, manual control, priority control and the actuator.

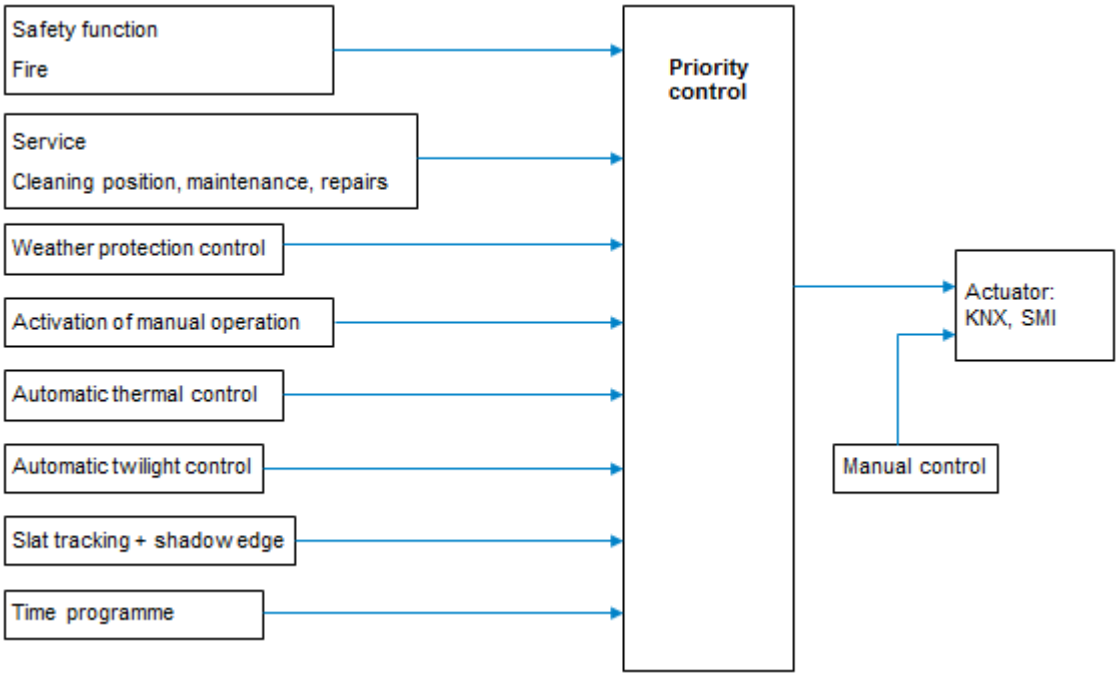

Fig. 12: Complex sunshade package

Compared to the basic package, it offers optimised glare protection, with automatic solar control replaced by automatic slat tracking plus shadow edge. Automatic slat tracking according to the position of the sun sets the ideal angle to let as much daylight as possible into the room, without occupants being dazzled by direct sunlight. A variable shadow edge – i.e. how far the sun can shine into the room – can also be defined. It also provides a better view outside. The rest of the functions are the same.

5.3 Priority control

Priority control plays a major part in both sunshade packages. It determines which command takes precedence. The safety functions always have top priority, but, apart from that, the order of priority can be defined by the user by editing the default settings. The default order of priority is:

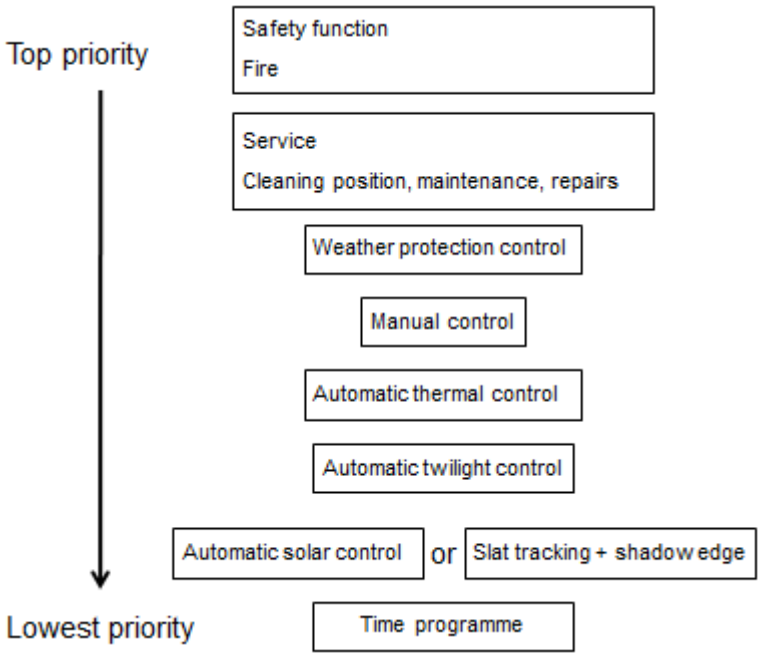

Fig. 13: Priority control

Apart from position and angle signals, the priority controller receives status messages from the various function blocks, i.e. information on whether the sunshading function is active. For example, glare protection functions such as automatic solar control or automatic slat tracking are not activated until a certain outside light level has been attained. The priority controller ignores inactive functions.

The occupancy modes are switched either by pressing the occupancy key on the room operating unit or by the occupancy detector.

When switching from occupied to unoccupied, the active automatic function with the highest priority is started: automatic thermal control when there is sufficient heat coming in; automatic twilight control at night; automatic solar control or automatic slat tracking with shadow edge when it is bright enough outside. If no automatic function is active, the time programme takes over.

Automatic thermal control is switched off when the room is occupied.

In unoccupied mode in rooms without automatic occupancy detection, the automatic functions are blocked for a set period after manual operation.

When the room is occupied and manual operation is carried out, all automatic functions are blocked.

The safety function, weather protection control and service function are unaffected by occupancy and always take precedence over the automatic functions and manual operation.

6 Recommendation of weather stations for projects in building automation

In collaboration with SCU Freiburg, SAUTER Basel has tested various types and models of weather stations. Ultimately, modularly-structured weather stations were not decided on. These stations can be set up according to the modular principle. However, this necessitates quite a lot of fitting work and special knowledge with regard to the correct connection of the sensors.

It was decided to recommend two compact weather stations manufactured by Thies. In compact weather stations, all the important sensors are already integrated, and they are easy to fit and inexpensive.

6.1 Recommended: “Clima Sensor US NHTFB” compact weather station from THIES

This weather station provides information about wind, rain, brightness, temperature and humidity, and has an integrated GPS receiver. The global radiation sensor must be provided externally.

Fig. 14: Thies “Clima Sensor US NHTFB” weather station with external pyranometer

Aside from the weather data, the date, time and sun position can be transferred via Modbus.

This weather station strikes a compromise between a high-end weather station and an inexpensive compact weather station. As the weather data is provided in the form of analogue signals, it is not absolutely necessary to have a Modbus here.

6.2 Recommendation: “WSC 11” compact weather station from THIES

This weather station also provides information about wind, rain, brightness, temperature and humidity, and has an integrated GPS receiver. The global radiation sensor is also integrated.

Fig. 15: “WSC 11” compact weather station from THIES

Aside from the weather data, the date, time and sun position can be transferred via Modbus.

This weather station is compact, inexpensive and very easy to fit. However, in contrast to the Thies Medium, it does not have signal outputs and therefore has to be connected via a Modbus.

6.3 Order data

The Thies weather stations can be ordered from the following address:

Adolf Thies GmbH&Co KG
Hauptstr. 76
D-37083 Göttingen
Tel.: +49(0) 551 790 01-0
Fax: +49(0) 551 790 01-65
E-mail: info@thiesclima.com
Internet: www.thiesclima.com

Designation	Art. No.
CLIMA SENSOR US NHTFB (analogue + Modbus)	4.9200.00.000
POWER CABLE, COMPL. 10 METRE, 19 P	509311
PYRANOMETER SMP3-A	7.14.15.03.441
ADAPTOR - COMPACT	506345
TRAVERSE SHORT, COMPACT	4.3171.40.000
DEVICE HOLDER FOR WALL MOUNTING WITH TILT JOINT	4.318713.060

Tab. 1: Order data for Thies “Medium” and accessories

Designation	Art. No.
COMPACT WEATHER STATION WSC11, Modbus RTU	4.9056.10.001
POWER CABLE	509279
WSC 11, 5m	
FIXING BRACKET FOR COMPACT WEATHER STATION	509276

Tab. 2: Order data for Thies “COMPACT” and accessories

The latest information on the weather stations and accessories can be found on the manufacturer’s website.

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