BF Technical Guide 018 / 2014

Bundesverband
Flachglas

Instructions for control of integrated systems inside the cavity

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This Technical Guide is an integral part of a series of guides for planning, construction and use of integrated systems inside the cavity of multi-pane insulating glass (ISiM).

- "Processing guidelines for solar control systems inside the cavity" (2009)
- "Guideline for assessment of visual quality for systems in multi-pane insulating glass" (2010)
- "Installation recommendations for integrated systems in multi-pane insulating glass" (2010)
- "Planning aid: Integrated, movable systems inside multi-pane insulatingglass for architects, planners and users" (2012)

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1. Introduction

This Technical Guide deals with and describes the necessary basics of the control systems, installation directions and operating directions of the electrical control for ISiM.

The advantage of integrated systems in multi-pane insulating glass (ISiM) is their installation inside the cavity, with protection from damage and soiling. Their installation is possible inside frame structures as vertical and horizontal glazing.

With ISiM, it is possible to influence

- the solar radiation input (heat)
- thermal insulation
- light conditions / light control bright / dark, anti-glare protection
- privacy screening.

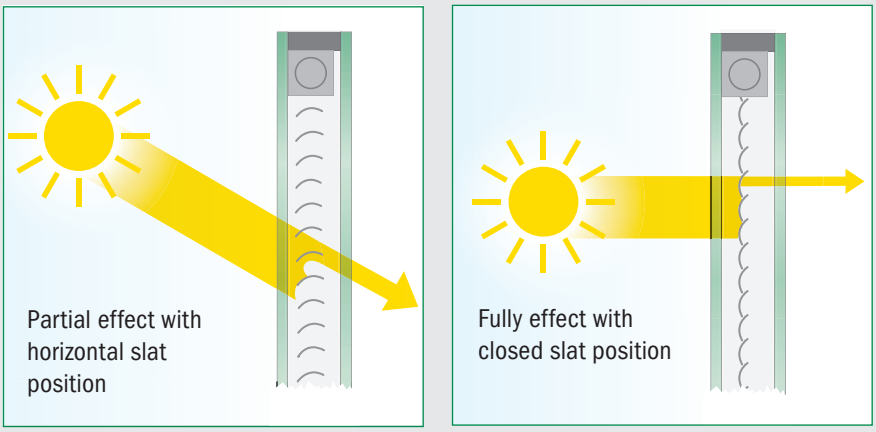
For planning and designing a control concept for ISiM, precise information on the use concept, operating options and variation possibilities are needed. This requires during the planning phase cooperation between the various trades involved in construction, in particular building physics and electrical planning experts.

Building physics requirements, design of details of the control and the interfaces must be stated in an invitation to tender.

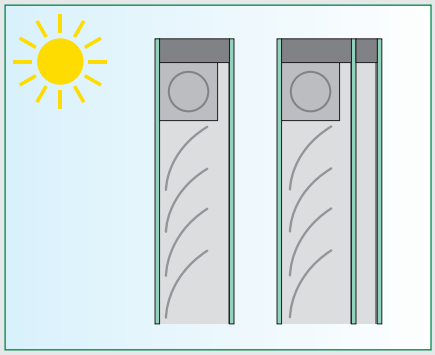
Effectiveness of variable ISiM

The major advantage of movable solar control systems is that the effectiveness changes depending on the situation and can also be used to verify summertime thermal insulation as per DIN 4108-2 (02-2013) or EnEV 2014.

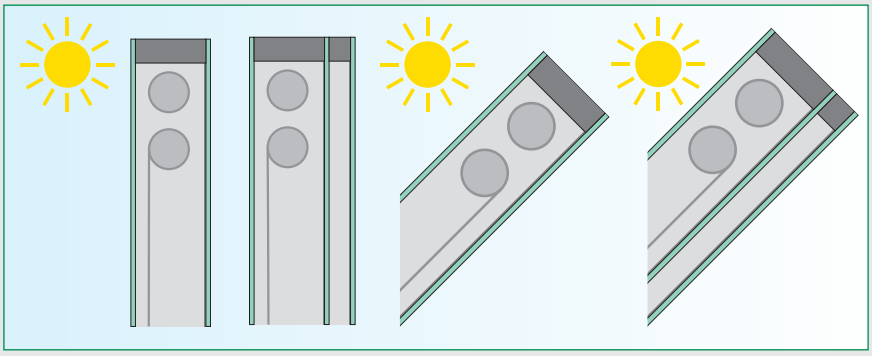
Slat position



(Fig. 1)



Example of ISiM with slats as double and triple multi-pane insulating glass



Example of ISiM with screen as double and triple multi-pane insulating glass

(Fig. 2)

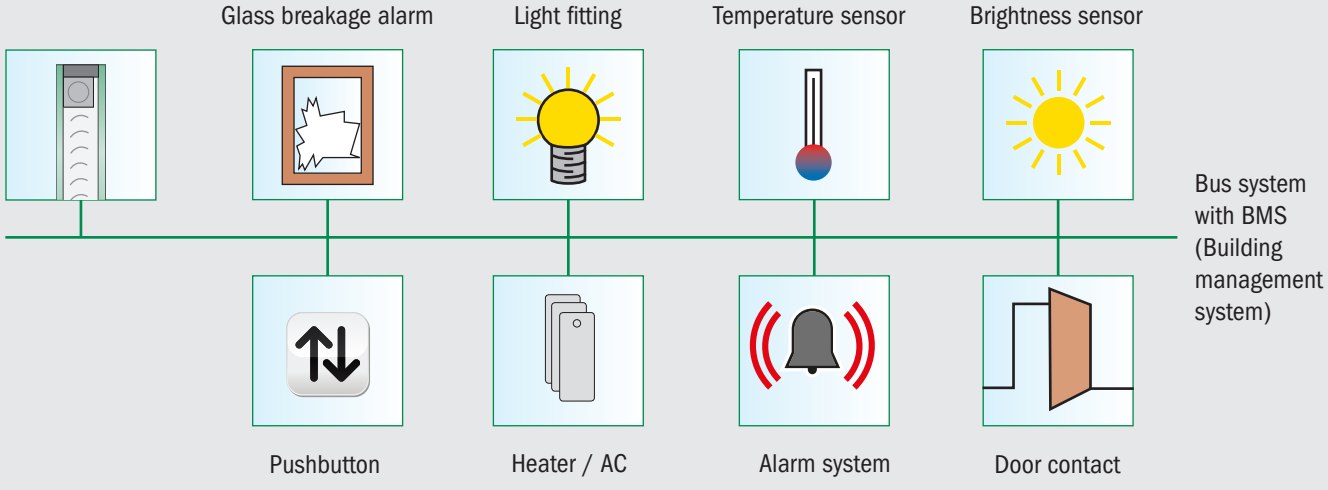
This is also a crucial advantage for daylight use. If solar control is performed such that enough light always enters the room to dispense with artificial lighting, this opens up additional potential for savings.

With suitable ISiM and settings, the requirements for anti-glare protection at monitor-using workstations are met.

Closed ISiM can improve the thermal insulation properties as an additional subdivision of the cavity.

Building automation has gained in importance thanks to complex control systems for climate, light, ventilation, weather protection and access checks. In practice, the different setting possibilities therefore result in a complex picture. The building physics requirements on the one hand and the requirements for user-friendly operation on the other have to be taken into account.

Example for building automation



(Fig. 3)

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2. General operating options and control concepts

The room user can exert a direct effect on the functioning of the system by simple operation, for example using pushbuttons. Additionally or alternatively, an automatic building system can adjust the functions of the fittings / film (ISiM).

Control concept

Depending on the planning concept, the ISiM control can consist of individual, grouped or central controls. Control options can be set manually for time, climate, sunshine, temperature, etc. using a BUS control EIB / KNX (drawing), LON, SMI.

Generally speaking a control concept consists of three components:

1. the power pack (transformer) with an output low voltage (as a rule 24 V DC)
2. the control unit, by the design of which the functions of the control are determined
3. and the ISiM.

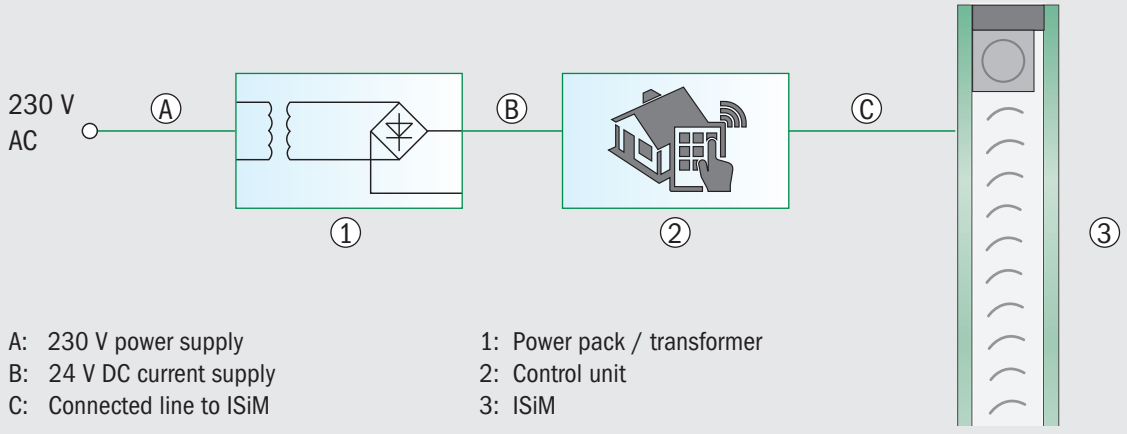
The system consists of power pack, operating element and ISiM

1. The power pack regulates the voltage from the building network (230 Volt AC) to the required direct voltage of 24 Volt DC. The precise design in terms of capacity and size of the power packs depends on the performance and size of the ISiM used.

2. a) Very simple operation by pushbutton
   b) Operation by higher-level automatic control
   c) Incorporation into a building management system in conjunction with light, air-conditioning, ventilation or connection to "smart home" systems.

3. Depending on system, e.g. roller blind, venetian blind, screen (see BF Technical Guide 011/2012)

Schematic representation of basic connection



A: 230 V power supply
B: 24 V DC current supply
C: Connected line to ISiM

1: Power pack / transformer
2: Control unit
3: ISiM

(Fig. 4)

3. Information on connection points and cable laying

Cable laying in frame system

Cables are preferably laid in the non-visible area of glass rebates and routed via the support structures (mullion-transom) to the electrical installations inside the building. Holes and apertures in the frame systems and passages through sealing levels must not impair the properties of the window/facade system, and may only be decided in consultation with the window/facade manufacturer.

All through-holes, cutouts, edges, corners etc. through or over which cables are laid must be designed such that damage to the cables during fitting and use is ruled out. Suitable cable leadthroughs must be used. Care must be taken that no tensile loads are imposed on the cables. The cables are correctly connected up using extension leads and with a plug-in or crimped connection. The connection must be protected from moisture.

The compatibility of the components used (plugs, cables, control elements, drives etc.) must be checked and if necessary confirmed by the system provider.

Cable transitions, contacts, energy chains for power transmission (installation position)

The arrangement of the window contacts and transitions must be performed, for example in side-hung or tilt and turn elements, preferably on the hinge side. The ISiM should be controlled such that during opening and closing operations and in the tilted state the movement of the fittings is not hindered.

Accessible interfaces

The transitions (interfaces) for connection to the house's control system must be stipulated to match project-related requirements. Planning of the transfer points must be stipulated in a specification. The interfaces should be preferably on the room side, easy to fit, readily accessible and arranged for example in the following areas:

- Balustrade duct
- Suspended ceiling
- Cavity floor
- Flush/surface-mounted sockets

For a function test with visual check, an interface in the immediate vicinity of the glazing element is required.

4. Acceptance and function check

The functioning must be checked during the various processing steps and recorded.

Function check (acceptance record or the like)

1. The ISiM is fitted into the frame structure at the factory.
2. By others
   a) After glass fitting when cabling in the frame structure is exposed
   b) After final completion of frame fitting, at the transfer point from the interface to the electric system.

The individual function checks must be documented. The provisions of the German building authorities regarding acceptance (e.g. VOB, BGB) must be complied with.

5. General notes

Service life aspects

In addition to the general service life requirements for multi-pane insulating glass, the study of ISiM puts the functioning of the moving components at the forefront.

The basis for an evaluation can be the ift guideline VE.07, which describes the requirements for a duration of use of around twenty years.

The operating cycles may be increased by an incorrectly programmed automatic solar unit, unnecessary reference movements, excessive use and incorrect operation. All mechanical components are subject to wear, and reduction of the operating cycles can prolong the service life.

Depending on the design, additional stress factors exist for the service life in comparison with MIG without systems installed in the cavity, and they can be assessed using the ift guideline.

These elements must be properly protected during storage, transport and installation.
As a general principle, the system-specific requirements of the manufacturers must be additionally taken into consideration for all detailed designs and acceptance inspections.

This Technical Guide was authored by: Working group on "Systems inside cavity" at Bundesverband Flachglas e.V. · Mülheimer Strasse 1 · D-53840 Troisdorf

Further BF Technical Guides on the subject of Integrated Systems in Cavity (ISiM)

- Processing guidelines for solar control systems inside cavity (005/2009)
- Guideline for assessment of visual quality for systems in multi-pane insulating glass (007/2010)
- Installation recommendations for integrated systems in multi-pane insulating glass (008/2010)
- Planning aid: Integrated, movable systems in multi-pane insulating glass for architects, planners and users (011/2012)

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