
Power operated Windows

Edition July 2017

Guidance Sheet KB.01

EuroWindowor AISBL

In cooperation with:

Institut für Fenstertechnik (ift)

The technical data and recommendations provided are based on the best available information on the date of publication and are not legally binding.

Published by:

EuroWindowor AISBL

40, rue Breydel, B-1040 Bruxelles

© EuroWindowor AISBL, Frankfurt 2017



Content

1	Introduction	3
2	Scope	3
3	Terminology	3
4	Fundamentals	4
	4.1 Legal bases	4
	4.2 Standards and codes	4
	4.3 Responsibilities	5
5	Liability	5
6	Documentation	6
7	Risk assessment	7
	7.1 General	7
	7.2 Hazard identification and risk estimation	8
	7.2.1 General	8
	7.2.2 General factors of installation (position, accessibility)	8
	7.2.3 Use of room	8
	7.2.4 Operation	8
	7.3 Risk evaluation and identification of protection class	9
8	Approaches to protective measures	9
	8.1 Allocation of protective measures	9
	8.2 Residual risk	10
	8.3 Falling/knocking off of casements	10
9	Maintenance / information for use	10

1 Introduction

Today's building technology relies more and more heavily on power-operated equipment such as power-operated windows.

Increasing window automation

Power operation allows

- windows to be integrated in complicated building control system processes (power efficiency, heating, ventilation,...) and to control them as needed;
- large and heavy casements to be opened and closed even if exposed to, e.g. heavy wind;
- a much higher ease of use;
- window use by persons in particular need of protection.

Power operation causes a higher risk of potential hazards which need to be eliminated by appropriate precautions. This Guidance Sheet provides a code of practice with approaches to technical solutions and information on how to use power-operated windows, aiming to help making window operation safe without major risks.

Objective: safe operation

2 Scope

This Guidance Sheet applies to the planning, construction, installation and use of power-operated windows in commercial, public and private applications. It includes retrofitting windows with power drives.

3 Terminology

- Component for closing and opening in a wall or roof intended for letting in light or for ventilation and sometimes to provide an occasional passage (e.g. door height window, lifting sliding sash,...). The casement (driven part) is moved by drives.
- The casement is moved by human effort alone.
- Device for moving power-operated windows by means of energy fed to them (e.g. electric, pneumatic or hydraulic energy) including the fittings needed to transfer the required force.

Power-operated window
(window is defined in EN 12519)

Manually operated Drives

- A product which is almost machinery but which cannot in itself perform a power-operated function. Examples of partly completed machinery include drive systems or windows with a drive but no control unit.
- A power-operated product able to function as installed or the product as an assembly ready to be installed and able to function as it stands only if mounted on a means of transport, or installed in a building. A window fitted with a drive and control unit qualifies as a part of completed machinery.
- Any natural or legal person who places the power-operated window on the market or who retrofits or makes major modifications to a product and places it on the market again (making the machinery or partly completed machinery available in der EU for the first time).
- Any natural or legal person who assembles and installs the power-operated window on-site (locally) such that it is ready for operation and who commissions it.
An installer is considered as manufacturer of the power-operated window, if he modifies the product or assembles several products to make a new one.
- A control system which needs to be operated continuously (such as a hold-to-run control device / pushbutton) in order to move the casement.

Partly completed machinery**(Completed) Machinery****Manufacturer of the power-operated window****Installer****Dead man's control**

4 Fundamentals

4.1 Legal bases

Planning, construction, installation and operating of power-operated windows are subject particularly to the following European regulations and the acts which adopt them into national law:

EU Regulation and Directives

- EU Construction Products Regulation (EU CPR) (2011/305/EU)
- EU Machinery Directive (2006/42/EC)
- EU Low-Voltage Directive (LVD) (2014/35/EU)
- EU EMC Directive (2014/30/EU)

These legal bases with the related national acts stipulate final and general requirements of the performance characteristics in a building, how to avoid and control mechanical hazards, how to control electrical hazards, and how to avoid electromagnetic disturbances.

4.2 Standards and codes

Substantiating the general requirements of the EU Regulations and Directives are usually defined by European Standards. Power-operated windows are covered by the scope of the product standard EN 14351-1. The safe operation of drives is subject to EN 60335-2-103 "Particular requirements for drives for gates, doors and windows".

General standards and codes

With regard to the safe operation of power-operated windows, the Machine Directive generally suggests an auxiliary reference to other codes and standards including but not limited to:

EN ISO 12100 Safety of machinery - Basic concepts, general principles for design - Part 1: Basic terminology, methodology, and Part 2: Technical principles

National Technical Rules may apply also, e.g. in Germany for Workplaces ASR A 1.6 for windows substantiate the requirements of the German Workplace Ordinance which fully apply to workplaces.

Barrier-free construction may have to meet further requirements.

This Guidance Sheet KB.01 fills gaps in the standards and describes measures to be taken in order to assure the safe use of power-operated windows.

4.3 Responsibilities

The construction planner/architect and/or the procuring entity must define distinct requirements of power-operated windows with particular regard to the necessary protective measures.

Construction planner/architect

This process should be completed in close coordination with the client, the competent authorities (such as the building authority) and, in the case of commercial and public utilisation, the responsible accident insurer.

The planner must clearly describe the interfaces between the trades involved. Unmistakeable details of transfer points and the requirements of the components are particularly important.

The contractor installing the power-operated window is also responsible for meeting the requirements of the request for proposal and for applying good engineering practices.

Contractor/installer

The client/operator/user must ensure that power-operated windows are operated and serviced in conformity with the user information for use/instruction handbook.

Client/operator/user

5 Liability

Everybody involved in the construction work must always provide the contractual services, which is to say that all (construction) services must be of the agreed performance and all generally recognized rules of technology must be applied, as appropriate.

Comply with regulations and generally recognized rules of technology

In order to avoid personal injury or material damage and the ensuing claims, it is essential to know the applicable regulations and good engineering practices and to comply with them when providing such agreed performance.

6 Documentation

Apart from various legal documentation requirements, the parties responsible for successful workmanship should generally keep records appropriately detailed to document their involvement in the work process (see Figure 1)

Responsible		Documents
Owner		<ul style="list-style-type: none"> • Usage specifications • Building permit • Authority constraints
Planner		<ul style="list-style-type: none"> • Usage concept • Risk assessment • Tender specifications of technical / structural requirements
Window manufacturer	without drive (not a machinery)	<ul style="list-style-type: none"> • Technical documentation to EU CPR (internal) • Window user information • Declaration of performance for windows to CPR and EN 14351-1 Annex ZA • CE marking of window (CPR)
	with drive (partly completed machinery)	<ul style="list-style-type: none"> • Technical documentation to EU CPR and Machinery Directive (internal) • Window user information • Declaration of performance for windows to CPR and EN 14351-1 Annex ZA • CE marking of window (CPR) • Declaration of incorporation of partly completed machinery, assembly instructions
	with drive and control unit (completed machinery)	<ul style="list-style-type: none"> • Technical documentation to EU CPR and Machinery Directive (internal) • Risk assessment for the intended use (internal) • Window user information and operating manual • Declaration of performance of power-operated windows to CPR and EN 14351-1 Annex ZA, ZB, ZC and ZD as well as to EN 12101-2, if the window classify as "natural smoke and heat exhaust ventilators" (NSHEV) covered by that standard. • CE marking of window to EU CPR and Machinery, EMC and LVD Directives
Drive manufacturer and control system manufacturer		<ul style="list-style-type: none"> • Product user information • Safety instructions • Declaration of incorporation of partly completed machinery, assembly instructions with reference to EN 60335-2-103 • Declaration of conformity and CE marking of the product (EMC and LVD)
Installer	Completion of window to make up a fully functional power-operated window; putting into service	<ul style="list-style-type: none"> • Electrical wiring diagram • Handover certificate • User information / operating manual • CE marking and declaration of conformity to Machinery Directive • Risk assessment for verifying compliance with the specifications (e.g. checklist)
	Putting power-operated window into service (completed machinery)	<ul style="list-style-type: none"> • Electrical wiring diagram • Handover certificate • Handover of manufacturer's documents (declaration of performance, CE marking of power-operated window, user information,...) • Risk assessment for verifying compliance with the specifications (e.g. checklist)
Operator		<ul style="list-style-type: none"> • Maintenance documentation

Figure 1: Plan of power-operated window documentation

7 Risk assessment

7.1 General

It is necessary to carry out a risk assessment at the planning stage in order to identify both the hazards potentially caused by a power-operated window and the protective measures eligible to eliminate these hazards.

Safety assessment at the planning stage

A risk assessment is a sequence of logical steps taken to investigate the hazards caused by the window.

Figure 2 illustrates the flow of risk assessment steps.

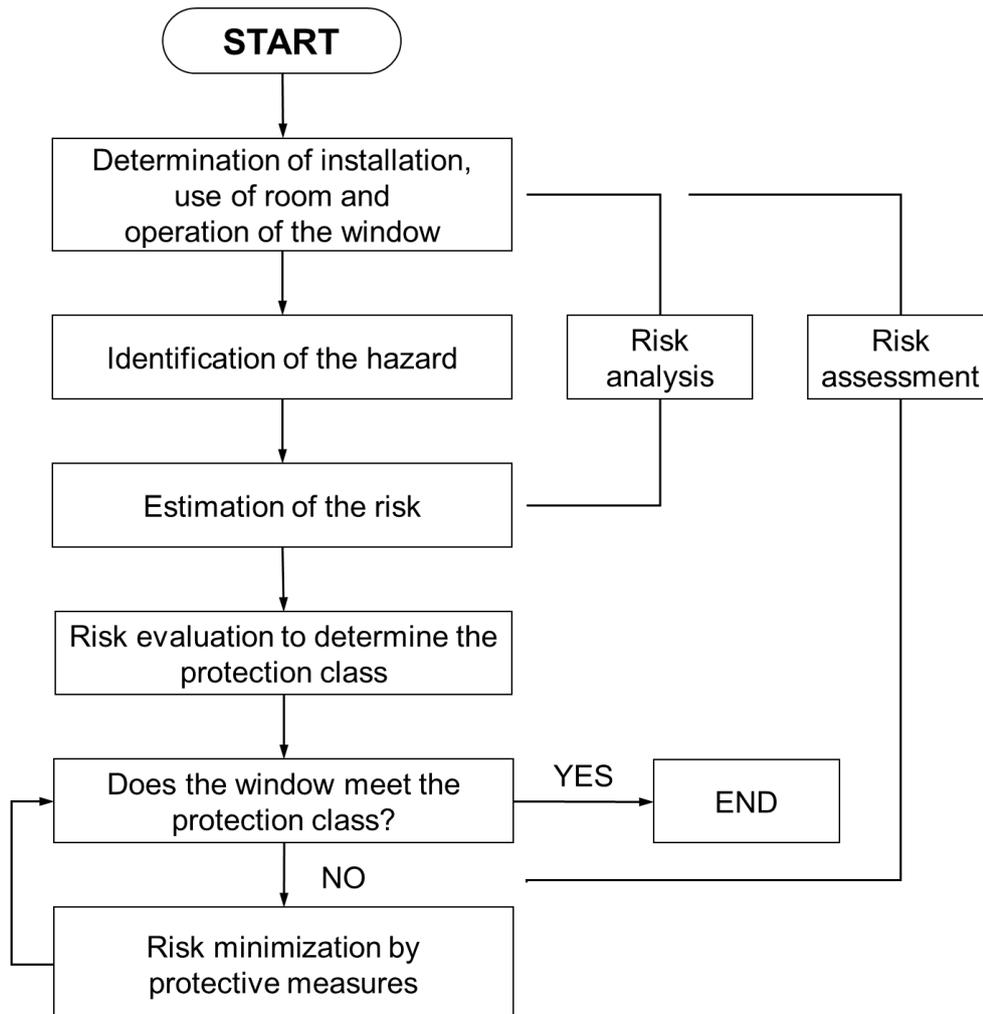


Figure 2: Risk assessment flow chart

The **risk analysis** provides the information required to evaluate the risk(s) and, in the next step, to take the risk analysis results to decide on the safety of the window.

The **risk assessment** is based on **balanced and calculated** decisions. It should be carried out so that both the path of the procedure and its results are comprehensible.

7.2 Hazard identification and risk estimation

7.2.1 General

The process should identify all hazards, hazardous situations and hazard events foreseeable due to the general factors of installation, the use and the actuation of the power-operated window.

A risk assessment is also required if drives to EN 60335-2-103 are used.

The following procedure has been tried and tested and shown to provide reliable risk assessments.

7.2.2 General factors of installation (position, accessibility)

The assessment must take account of where in the envelope of the building the window is installed. It must verify whether it takes any utilities to access the window. Risk caused by situation of installation

The findings enable a risk evaluation as outlined in Table 1:

Table 1: Risk evaluation example with reference to the situation of installation

Situations of installation (examples)	Risk classification	Risk parameter
a) Bottom edge of casement installed at least 2.5 m above the floor or a firm access level b) Fixed installations in front of the window which prevent free access to the window c) Window sills or reveals preventing free user access to the window d) Window classified as "natural smoke and heat exhaust ventilator" (NSHEV) according to EN 12101-2 not used for ventilation	Low risk	E1
Unrestricted access to casement whose bottom edge is installed less than 2.5 m above the floor or a firm access level	Higher risk	E2

7.2.3 Use of room

The risk estimation must take account of what the room is used for. It should look at whether potential users can handle the product at any time. Factors to be assessed include Risk caused by type of use

- whether this user is always the same user and familiar with the equipment
- whether the user is not familiar with the equipment
- which group of persons does the user belong to (e.g. persons in need of protection)
- every reasonably foreseeable misuse

A risk classification may be based on Table 2.

Table 2: Risk classification with reference to how a room is used

Use of room	Risk classification	Risk parameter
a) Commercial use by users briefed on technological issues (e.g. offices, industrial use)	Low risk	N1
b) Private use by users brief on technological issues c) Rooms , whose users/visitors are able to assess the hazards or are under supervision	Medium risk	N2
d) Rooms intended for regular use by persons who cannot be briefed on safe utilisation (e.g. shops, assembly points,...)	High risk	N3
e) Rooms intended for regular use by persons in need of protection (e.g. nursery schools, schools, hospitals,...)	Very high risk	N4

7.2.4 Operation

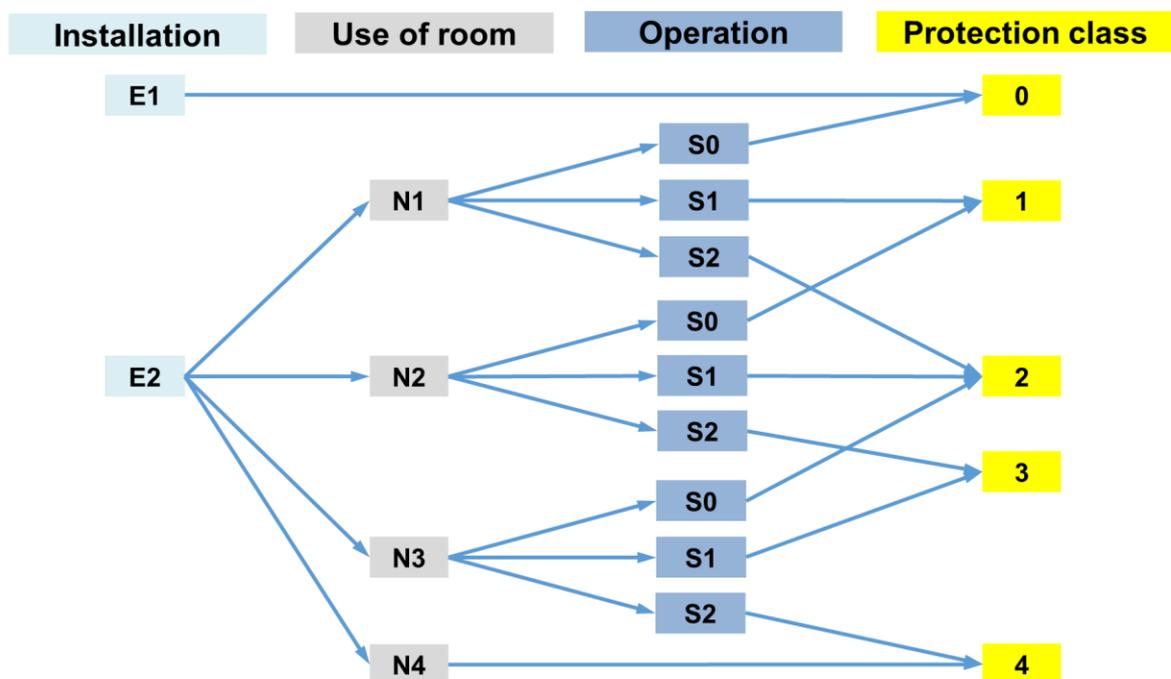
The risk estimation varies with the method of opening and closing the window. Table 3 summarises and grades the following risks: Risk caused by operation

Table 3: Risk classification with reference to the method of operation

Operation	Risk classification	Risk parameter
Manual operation without self-retaining mode and with visual control of all windows (Dead man's control, e.g. by using a key-operated hold-to-run control device or pushbutton)	Very low risk	S0
Manual operation with self-retaining mode and with visual control of all windows (e.g. by using a switch)	Low risk	S1
Automatic operation (e.g. wind/rain control, building control system) or manual operation without visual control (e.g. central switch, remote control) of all windows	Higher risk	S2

7.3 Risk evaluation and identification of protection class

The risks itemised and described in section 7.2 are linked to the risk parameters to derive a protection class of the total risk identified for the planned construction project.

**Figure 3: Identification of protection class**

8 Approaches to protective measures

Protective measures are all measures taken to reduce the risks identified. Protective measures for reducing the risks will thus vary with the actual risk.

Functional and economically feasible solutions will always require an object-related risk analysis of the use of power-operated windows in buildings.

8.1 Allocation of protective measures

Protective measures can be allocated to the protection classes of Table 4 below:

Table 4: Allocation of protective measures to the protection classes (examples)

Class	Examples of protective measures
Protection class 0	No protective measures required
Protection class 1	<ul style="list-style-type: none"> • Hazard warnings
Protection class 2	<ul style="list-style-type: none"> • Access restrictions by structural measures, or • rounded, padded edges, closing forces between 80 N and 150 N, no shearing, or • acoustic warning signals, or • hazard warning lights, or • EMERGENCY STOP switch at the window, or • moveable installations in front of the window which prevent free access to the window
Protection class 3	<ul style="list-style-type: none"> • Dead man's control without a higher-level central control system, or • casement moves slowly at max. 5 mm/s, or • main closing edge opens by ≤ 200 mm and closing speed is ≤ 15 mm/s, or • access gap is less than 8 mm wide, or • rounded, padded edges, low closing forces below 80 N, no shearing
Protection class 4	<ul style="list-style-type: none"> • Control by contact-enabled safeguards such as pressure sensitive edges, contact sensors, or • Control by non-contact-enabled safeguards such as photocells, light grids, or • dead man's control with authorised operation per window without a higher-level central control system (e.g. key-operated hold-to-run control device), or • access gap is less than 4 mm wide, or • access prevented by construction measures

The specified protection class is obtained by one of the above protective measures designed to be suitable for the actual case of use. Several measures may be combined. Measures of a higher protection class cover all lower classes.

Better precautions do no harm.

8.2 Residual risk

It is impossible to ensure safety in a way that excludes all risks in every situation. The residual risk is the risk that remains after taking safety protections. The planning of protective measures should aim to minimise the residual risk.

Minimise the residual risk

8.3 Falling/knocking off of casements

Attachment, guiding or other means design features such as double suspension, safety shear, catcher etc. should prevent casements from falling off, being knocked off or moving in an uncontrolled manner even if one of the suspension elements fails.

9 Maintenance / information for use

After site acceptance and subject to contract obligations, the contractor will grant a warranty for the products. The power-operated windows require professional maintenance/care and inspection, in order to assure their fitness for use and sustainable quality and also to avoid personal injury and material damage. This should be documented. Not conforming to the above may void the warranty.

A warranty demands maintenance.

Maintaining the safe operation and fitness for use of objects equipped with adjustment fixtures and/or designed for the replacement of wearing parts requires periodic maintenance and inspection, corrective maintenance and repair, as necessary. This particularly applies to power-operated windows because their hazard potential is normally greater than that of manually operated windows and because they require more maintenance due to the additional drive system components. Note that it is normally required to repeat the risk assessment when drives are being replaced.

Extensive product warranty and liability assumes not only proper maintenance but also the so-called "intended use" of the products. The contractor should ensure this and should provide the client with user information / operating manual including documents with information on the intended use, the required maintenance and procedures of operation and other means of information. In order to account for the higher risk potential of power-operated windows, the user information / operating manual should include at least the following points:

- Instructions for use including plain and understandable safety signs and hazard warnings making product users aware of the consequences of improper operation or misuse
- Product-related maintenance instructions listing the safety-related inspection and maintenance actions, e.g. by way of a checklist of required activities
- Recommended inspection intervals with reference to the use of the room and frequency of window operation, as appropriate
- Additional cleaning and care instructions regarding the drive components

The client is responsible for taking the maintenance and quality assurance actions regarding the products and services it has been supplied with. Non-compliance will void all warranty and product liability claims. The contractor must appropriately fulfil its associated duty to inform the client about the terms of warranty and product liability.

An interesting option for clients is to transfer their maintenance obligations to the manufacturer of a window or facade by entering into a service contract. This will also ensure that all quality assuring actions will be taken professionally and that unqualified attempts at repairs by third parties are avoided in the first place.

Maintenance is based on the user information / operating manual

Duty to inform and maintain quality at the time of partial acceptance

Service contract

EuroWindoor AISBL
Schuman Business Center
40, Rue Breydel
1040 Bruxelles / Belgium
Phone: +32 (2) 502 3396
gs@eurowindoor.eu
www.eurowindoor.eu

