Validation aid for the use of ROBA®-guidestop safety brakes as a safety-related part in accordance with DIN EN ISO 13849-2

This document provides machine manufacturers with important information with respect to validating the installed ROBA®-guidestop safety brakes in accordance with DIN EN ISO 13849-2.

Validity

This validation aid applies exclusively to the named types in standard design, as well as approved special designs. Special designs deviate from the standard and can be identified by the suffix "S" in the type name.

Use the 7-digit *mayr*® article number to ask *mayr*® power transmission whether this validation aid is approved for your special design.

The validation aid applies to the following types:

ROBA®-guidestop pneumatic	
Construction size	Types
All	3854._ _ _ _ _
	3855._ _ _ _ _

ROBA®-guidestop hydraulic	
Construction size	Types
All	3840._ _ _ _ _
	3841._ _ _ _ _

Safety Parameters

The following safety parameters are required for calculating the performance level:

- ❑ $B10_d$ - Medium number of cycles until 10 % of the components have failed dangerously

ROBA®-guidestop pneumatic	
Construction size	$B10_d$ switching cycles
SBP25	2,000,000
SBP30	2,000,000
SBP35	2000000
SBP45	2000000
SBP55	2000000
SBP65	2000000

ROBA®-guidestop hydraulic	
Construction size	$B10_d$ switching cycles
SBH35	1,000,000
SBH45	1000000
SBH55	1000000
SBH65	1000000

The **$B10_d$** value states the medium number of cycles until 10% of the brakes have failed dangerously. The $B10_d$ value for the ROBA®-guidestop refers to the mechanical switching procedure, i.e. the movement of the pistions and the brake shoes, a well as the application of the spring force.
Attention: It does not include the braking force or the wear on the brake shoe.

The $B10_d$ value is a statistical value that does not indicate any guaranteed lifetime or failure-free period. The brake provides no single error reliability. One error, and the resulting loss of braking force, is possible.

- ❑ T_M – service life – period covering the equipment's prescribed useful life

  T_M = 20 years

  To ensure that the brake is functioning correctly over its period of application, regular inspections or maintenance tasks are necessary. These activities concern the brake shoe, the brake mounting and the guide rail. Refer to the original operating instructions for specific information on inspections, maintenance tasks and wear tests.

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Category according to DIN EN ISO 13849-1

Determining the required category according to DIN EN ISO 13849-1 depends on the specific application and is therefore the responsibility of the user.

The ROBA®-guidestop safety brake has been designed in such a way that it meets the requirements of category 1 according to DIN EN ISO 13849-1. Dimensioning and use of the brake in accordance with the original operating instructions must be ensured here.
The relevant fundamental and established safety principles, according to DIN EN ISO 13849-2, are applicable to the ROBA®-guidestop safety brakes
Tried and tested springs and screw connections are also used.

mayr® power transmission has plenty of experience dealing with numerous types of brakes that have been designed and manufactured according to the same principles and used successfully in a wide range of applications over many years. Different and more challenging conditions (additional requirements) require an agreement with the manufacturer in accordance with VDE 0580.

Dimensioning

To ensure safe and reliable holding and braking and correct operation of ROBA®-guidestop safety brakes, the following is required: adequate dimensioning in accordance with the original operating instructions, intended use, compliance with application limits and technical fringe parameters as outlined in the original operating instructions.

For this, the static holding force, the dynamic braking force, the path feed speed, the friction work per braking action, the switching frequency and the braking time are to be determined so that the required load torque can be held reliably, and the required braking distance can be reliably maintained.

Refer to the original operating instructions for specific information on brake dimensioning.
mayr® power transmission, your reliable partner, is happy to assist you in selecting the correct brake dimensioning.

Test / Diagnostic

The efficacy and function of the brake is to be inspected due to the overall risk assessment to be carried out and the resulting measures for risk minimisation depending on the application case through suitable tests at appropriate time intervals.

The brake safety is generated through the braking force. Some errors, e.g. braking force too low due to friction-reducing substances on the guide rail, can only be detected by performing a cyclical brake test. Errors relating to the braking force cannot be detected by the switching condition monitoring signal.

Refer to the original operating instructions for recommendations on how to perform a brake test.

The switching condition monitoring signal is a feedback signal of the actuator (output unit, output) ROBA®-guidestop brake as a test and monitoring measure, related to the brake component as part of the safety channel, and is used to estimate the diagnostic coverage DC in accordance with Annex E DIN EN ISO 13849-1 of the brake.

This helps detect any brake faults affecting the release of the brake shoe and/or the actuation (pressurization) of the brake. We recommend a DC value of 60% for the actuator by way of release monitoring including an additional plausibility check – e.g. with the safe brake control ROBA®-SBCplus or a similar safe control unit. For higher DC values, we recommend taking further measures, e.g. a cyclical brake test. The DC values specified by the control unit manufacturers can then be applied. MTTF values are available for applications in category 2 according to DIN EN ISO 13849-1.

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Annex

Basic safety principles of mechanical systems

Basic safety principle	Explanations
Application of suitable materials and appropriate manufacturing methods	Use of tried and tested materials and manufacturing methods
proper dimensioning and design	Design and dimensioning according to established internal specifications
suitable selection, combination, arrangement, assembly and installation of components / system	Use of tried and tested components and design
Application of energy-separation principle	The reliable condition is achieved through separation of the energy source, and thus accords with the required safety aspects, for example during power failure or EMERGENCY STOP. When de-pressurised condition, the springs press against the clamping element of the brake. This presses the brake shoes together and clamps or brakes the guide rail. When the operating pressure is applied, the clamping element is pressed against the spring force on the housing. The brake shoes become free and the brake is released. The guide rail can rotate freely.
suitable mounting	Dimensioning of screw connection according to established internal specifications
Limiting production and/or transmission of force and similar parameters	For holding force tolerance and dimensioning of other machine elements, see original operating instructions
Limiting range of environmental parameters	Ambient conditions are defined in the original operating instructions.
Limitation of speed and similar parameters	Technical data according to original operating instructions • Maximal permitted sliding speed • Nominal holding force F_N and tolerance • Permitted friction work $Q_{r\ zul.}$ [J] per braking • Permitted total friction work $Q_{r\ ges.}$ up to wear end
suitable reaction time	Switching time according to the original operating instructions, • Switching time of the brake t_{50} • Separation time (release) t_2
Protected against unexpected start-up	An unexpected start-up, i.e. brake is opened, is only possible by pressurizing the brake. Machine manufacturers/operators must take measures to reliably prevent this from occurring. Disassembling the brake results in a loss of holding force.
Simplification	Generation of the holding force according to simple principle
Separation	Use of brake only for safety-related functions under the responsibility of the machine manufacturer / machine operator
Suitable lubrication	Lubrication not required Compressed air quality, see original operating instructions
suitable protection against penetration of liquids and dust	Protection of brakes, see original operating instructions

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Tried and tested safety principles of mechanical systems

Tried and tested safety principle	Explanations
Application of carefully selected materials and manufacturing methods	Use of tried and tested materials and manufacturing methods
Use of oriented failure mode components	The most common failure behavior of brakes is described in the “Malfunctions” section of the original operating instructions.
Overdimensioning/safety factor	Dimensioning according to established internal specifications Dimensioning appropriate for the application is important!
Secured position	Movement of the mechanism by springs
increased OFF force	Not relevant. Energy-separation principle, fail-safe principle
Careful selection, combination, arrangement, assembly and installation of components/systems for respective application	Use of tried and tested components and design The specifications contained in the “Installation” and “Initial operation” section of the original operating instructions apply to the installation of brakes by the machine manufacturer.
Careful selection of the mounting method for the respective application	Dimensioning of screw connection according to established internal specifications Installation according to original operating instructions, see above.
positive mechanically created effect	Functional principle safety brake
Proliferation of parts	If several springs are used to generate force, breakage of one spring does not lead to complete loss of holding force.
Application of tried and tested springs	Use of tried and tested springs, design and dimensioning in accordance with internal specifications The dimensioning of the springs in the dynamic strength range avoids a loss of spring force over the brake’s service lifetime of 2 million load cycles.
reduced range of force and similar parameters	Holding force tolerance, see original operating instructions
reduced range of speed and similar parameters	Technical data according to original operating instructions • Maximal permitted sliding speed • Nominal holding force F_N and tolerance • Permitted friction work $Q_{r\ zul.}$ [J] per braking • Permitted total friction work $Q_{r\ ges.}$ up to wear end
reduced range of environmental parameters	Ambient conditions are defined in the original operating instructions.
reduced range of response time, hysteresis limitation	Information in original operating instructions, cyclical brake test Certain conditions can result in a loss of braking force during operation, e.g. • aging of friction lining • wear • friction value-reducing materials in the brake • Mounting to machine That is why regular maintenance work / inspections must be carried out in accordance with the specifications in the original operating instructions. The brake must be checked for effectiveness and function. This must be carried out on the basis of the overall risk assessment to be conducted and the resulting measures for risk minimization, depending on the application case, through suitable tests at appropriate time intervals (brake test, safe brake management, safe brake and holding system, etc.).

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Basic safety principles of pneumatic systems

Basic safety principle	Explanations
Application of suitable materials and manufacturing methods	Use of tried and tested materials and manufacturing methods
Correct dimensioning and design	Design and dimensioning according to established internal specifications
Suitable selection, combination, arrangement, assembly and installation of components / system	Use of tried and tested components and design The specifications contained in the “Installation” and “Initial operation” section of the original operating instructions apply to the installation of brakes by the machine manufacturer.
Application of energy-separation principle	Fail-safe principle of ROBA®- guidestop brakes via safe separation of energy supply
Suitable mounting	Dimensioning of screw connection according to established internal specifications
Pressure limitation	Specification of the maximum operating pressure in the original operational instructions. The machine manufacturer and operator are responsible for the use of suitable pressure limiters.
Limitation/reduction of speed	Throttles or hose length and diameter influence the switching time of the brake. Specifications according to original operating instructions
Sufficient measures to prevent the fluid from becoming contaminated	Specifications according to original operating instructions
Suitable switching time range	Specification of the switching times in the original operational instructions
Resistance to ambient conditions	Use of tried and tested components and design Ambient conditions as specified in the original operational instructions.
Protected against unexpected start-up	An unexpected start-up, i.e. brake is opened, is only possible by pressurizing the brake. Machine manufacturers/operators must take measures to reliably prevent this from occurring.
Simplification	Generation of the holding force according to simple principle
suitable temperature range	As specified in the original operational instructions
Separation	Use of brake only for safety-related functions under the responsibility of the machine manufacturer / machine operator

Tried and tested safety principles of pneumatic systems

Tried and tested safety principles	Explanations
Overdimensioning/safety factor	Dimensioning according to established internal specifications Dimensioning appropriate for the application is important!
secured position	Movement of the mechanism by springs
increased OFF force	Not relevant. Energy-separation principle, fail-safe principle
Valve closing due to the load pressure	Selection of valves by machine manufacturer / machine operator

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mechanically created effect	Energy-separation principle, fail-safe principle
Proliferation of parts	If several springs are used to generate force, breakage of one spring does not lead to complete loss of holding force.
Application of tried and tested springs	Use of tried and tested springs, design and dimensioning in accordance with internal specifications The dimensioning of the springs in the dynamic strength range avoids a loss of spring force over the brake's service lifetime of 2 million load cycles.
Limitation/reduction of the speed using resistance to achieve a defined volume flow rate	Not desired. Switching times should be as low as possible. Wiring according to the original operating instructions, check the braking distance by the machine operator
Limitation/reduction of force	Holding force tolerance, see original operating instructions
Suitable range for the operating conditions	Operating conditions according to the original operational instructions
Suitable prevention of contamination of the fluid	Compressed air quality according to original operating instructions
Sufficiently large positive overlap in gate valves	Not relevant
Hysteresis limitation	Use of tried and tested construction and dimensioning according to internal specifications. Hysteresis due to friction, spring force is known and taken into account.

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Basic safety principles of hydraulic systems

Basic safety principles	Explanations
Application of suitable materials and manufacturing methods	Use of tried and tested materials and manufacturing methods
correct dimensioning and design	Design and dimensioning according to established internal specifications
suitable selection, combination, arrangement, assembly and installation of components / system	Use of tried and tested components and design The specifications contained in the “Installation” and “Initial operation” section of the original operating instructions apply to the installation of brakes by the machine manufacturer.
Application of energy-separation principle	Fail-safe principle of ROBA®- guidestop brakes via safe separation of energy supply
suitable mounting	Dimensioning of screw connection according to established internal specifications
Pressure limitation	Specification of the maximum operating pressure in the original operational instructions. The machine manufacturer and operator are responsible for the use of suitable pressure limiters.
Limitation/reduction of speed	Technical data according to original operating instructions • Maximal permitted sliding speed • Nominal holding force F_N and tolerance • Permitted friction work $Q_{r\ zul.}$ [J] per braking • Permitted total friction work $Q_{r\ ges.}$ up to wear end
Sufficient measures to prevent the fluid from becoming contaminated	Specifications according to original operating instructions
Suitable switching time range	Specification of the switching times in the original operational instructions
Resistance to ambient conditions	Use of tried and tested components and design Ambient conditions as specified in the original operational instructions.
Simplification	Generation of the holding force according to simple principle
suitable temperature range	Specifications according to original operating instructions
Separation	Use of brake only for safety-related functions under the responsibility of the machine manufacturer / machine operator

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Tried and tested safety principles of hydraulic systems

Tried and tested safety principles	Explanations
Overdimensioning/safety factor	Dimensioning according to established internal specifications Dimensioning appropriate for the application is important!
secured position	Movement of the mechanism by springs
increased OFF force	Not relevant. Energy-separation principle, fail-safe principle
Valve closing due to the load pressure	Selection of valves by machine manufacturer / machine operator
mechanically created effect	Energy-separation principle, fail-safe principle
Proliferation of parts	If several springs are used to generate force, breakage of one spring does not lead to complete loss of holding force.
Application of tried and tested springs	Use of tried and tested springs, design and dimensioning in accordance with internal specifications The dimensioning of the springs in the dynamic strength range avoids a loss of spring force over the brake's service lifetime of 2 million load cycles.
Limitation/reduction of the speed using resistance against a fixed volume flow	Not desired Switching times should be as low as possible. Wiring according to the original operating instructions, check the braking distance by the machine operator
Limitation/reduction of force	Holding force tolerance, see original operating instructions
Suitable range for the operating conditions	Operating conditions according to the original operational instructions
Monitoring of the fluid condition	Hydraulic oil according to original operating instructions
Sufficiently large positive overlap in piston spool valves	Not relevant
Hysteresis limitation	Use of tried and tested construction and dimensioning according to internal specifications. Hysteresis due to friction, spring force is known and taken into account

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