

Official report

Safety in shuttle warehouses

During the last two years a safety discussion regarding shuttle warehouse systems has been taken place between the manufacturers and independent organizations in Europe. The independent organizations are the Berufsgenossenschaft Handel und Warendistribution (BGHW) and the Regierungspräsidium Kassel. Both independent organizations are located in Germany. The outcomes of the discussions are recommended actions for existing shuttle warehouses and safety features that should be considered for new shuttle warehouses.

SSI Schaefer has developed the Schaefer Orbiter System in accordance to all new requirements, standards and norms and can present a state of the art shuttle warehouse system. One of the new concepts the Schaefer Orbiter System has been equipped with, is a self powered Docking station. The Docking Station creates a physical barrier to prevent anyone to enter the system. The Docking Station creates a light barrier between itself and the Orbiter and as soon as anything breaks the barrier all movement will stop. Furthermore, the Docking Station is also equipped with warning lights that indicates that the Orbiter is moving and Emergency Stop which is easy to access at the front of the channel.

To prevent uncontrolled movement or an unexpected situation within the shuttle warehouse the components within the Schaefer Orbiter are redundant, i.e. the components are doubled. All from sensors, breaks, control units and drive servos are redundant. The result is, if one of these components are malfunctioning the second unit will do the job and prevent the dangerous situation.

Combining new concepts and safety features SSI Schaefer has developed a state of the art system and has raised the bar within safety in shuttle warehouses.

SSI Schaefer has noticed that some of the manufactures of shuttle warehouse systems has **neglected** the rising issue of safety. Therefore SSI Schaefer feel obligated to highlight several important sections from the latest standards and norms that are valid within the European Union.

For further information, please contact your local SSI Schaefer office or SSI Schäfer AG in Neunkirch, Switzerland.

Kind Regards
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Machine Directive, 2006/42/EC

Please see important sections from the Machine Directive that applies on shuttle warehouses below. One or several sections are first highlighted and thereafter it is commented to show how the Schaefer Orbiter System has been adapted to it.

§ Annex 1, section 1

“The manufacturer of machinery or his authorised representative must ensure that a risk assessment is carried out in order to determine the health and safety requirements which apply to the machinery. The machinery must then be designed and constructed taking into account the results of the risk assessment.”

§ Annex 1, section 1.1.2 Principles of safety integration a)

“Machinery must be designed and constructed so that it is fitted for its function, and can be operated, adjusted and maintained without putting persons at risk when these operations are carried out under the conditions foreseen but also taking into account any reasonably foreseeable misuse thereof.”

§ Annex 1, section 1.1.2 Principles of safety integration b)

“In selecting the most appropriate methods, the manufacturer or his authorised representative must apply the following principles, in the order given:

- eliminate or reduce risks as far as possible (inherently safe machinery design and construction),*
- take the necessary protective measures in relation to risks that cannot be eliminated,*
- inform users of the residual risks due to any shortcomings of the protective measures adopted, indicate whether any particular training is required and specify any need to provide personal protective equipment.”*

In the risk analysis made by SSI Schaefer, a risk regarding entering the racking of a shuttle warehouse was noted. The Schaefer Orbiter System is therefore equipped with a Docking Station, warning lights and light barrier to reduce the risk to an absolute minimum.

SSI Schaefer also noted that uncontrolled movement due to misuse of the system can be a risk and therefore all components are designed to be redundant.

Several of the manufacturers of shuttle warehouses has been aware of these risks a long time and neglected them. Their risk analysis should also show a potential risk for the user and therefore they should also provide safety features to minimize them.

§ Annex 1, section 1.2.1 Safety and reliability of control systems

“Control systems must be designed and constructed in such a way as to prevent hazardous situations from arising. Above all, they must be designed and constructed in such a way that:

- they can withstand the intended operating stresses and external influences,*
- a fault in the hardware or the software of the control system does not lead to hazardous situations,*
- errors in the control system logic do not lead to hazardous situations,*
- reasonably foreseeable human error during operation does not lead to hazardous situations.*

Particular attention must be given to the following points:

- the machinery must not start unexpectedly,*
- the machinery must not be prevented from stopping if the stop command has already been given”*

§ Annex 2, section 1.3.9. Risks of uncontrolled movements

“When a part of the machinery has been stopped, any drift away from the stopping position, for whatever reason other than action on the control devices, must be prevented or must be such that it does not present a hazard.”

SSI Schaefer has noted the risk of a malfunctioning control system and therefore designed all parts to be redundant. I.e. if the master micro processor breaks down the slave micro process will do the job. Or, if a sensor is damaged or malfunctions another will take over its function. Some of the manufactures of shuttle warehouses are using a normal PLC with no back up or safety control. Furthermore, some sensors that control critical functions are not redundant.

§ Annex 1, section 1.2.2 Control devices

“Control devices must be:

- located outside the danger zones, except where necessary for certain control devices such as an emergency stop or a teach pendant,*
- positioned in such a way that their operation cannot cause additional risk”*

§ Annex 1, section 1.2.4.3. Emergency stop

“Machinery must be fitted with one or more emergency stop devices to enable actual or impending danger to be averted.

The device must:

- stop the hazardous process as quickly as possible, without creating additional risks”*

Thanks to the new concept of a Docking Station, SSI Schaefer has been able to place an emergency stop outside of the danger zone. In this way the user do not have to enter the danger zone if a danger occurs. This feature is unique for the Schaefer Orbiter System. In normal shuttle warehouses you need to enter the danger zone to reach the emergency stop and in this way expose yourself to further danger.

§ Annex 1, section 1.1.2 Principles of safety integration c)

“The machinery must be designed and constructed in such a way as to prevent abnormal use if such use would engender a risk. “

§ Annex 1, section 1.2.3. Starting

“Where machinery has several starting control devices and the operators can therefore put each other in danger, additional devices must be fitted to rule out such risks.”

The radio remote controls in normal shuttle warehouse can control several shuttles by changing channels. It means that users can accidently control a shuttle that was not intended. With the Schaefer Orbiter System one radio has been assigned to one shuttle and therefore the risk of misuse has been minimized.

§ Annex 1, section 1.7.1.2. Warning devices

“Where the health and safety of persons may be endangered by a fault in the operation of unsupervised machinery, the machinery must be equipped in such a way as to give an appropriate acoustic or light signal as a warning.”

The Docking station is provided with a warning light that indicates that the Schaefer Orbiter System is in operation. The concept of a Docking Station is unique for the Schaefer Orbiter System. Other manufacturers of shuttle warehouses do not provide any warnings, what so ever, that a shuttle is in operation. It is in fact very hard to see that a shuttle is in operation in other shuttle warehouses.

Conclusion

SSI Schaefer has with the Schaefer Orbiter System raised the bar of safety within shuttle warehouses. A very high level of safety, efficiency and ease of use is achieved and a new state of the art is hereby set.

We strongly suggest that these points are discussed with other manufacturers before considering offers of a non safe shuttle warehouse.

We hope that other manufacturers shortly start to consider the importance of safety for warehouse equipment at the same level as we do at SSI Schaefer. And as seen below, we hope that our new state of the art shuttle system shows the right way to go and that safety no longer can be neglected.

§ Annex 1, Section 3; Machine Directive, 2006/42/EC

“The essential health and safety requirements laid down in this Annex are mandatory; However, taking into account the state of the art, it may not be possible to meet the objectives set by them. In that event, the machinery must, as far as possible, be designed and constructed with the purpose of approaching these objectives.”