

<p>prEN 13155 – as of 08/2002 Crane – Safety – Loose load handling equipment</p>	<p>prEN 13035-1 Date 12/2001 Machines and plants for the production and processing of flat glass - Safety requirements – Part 1:Storage, handling and transportation equipment inside the factory</p>
<p>5.2.2.1 Vacuum lifters shall be dimensioned to hold at least a load corresponding to two times the working load limit at the end of the working range and the beginning of the danger range respectively at all intended angles of tilt. The maximum angles of tilt shall be increased in accordance with 5.1.1.2.</p> <p>Note: The pressure range within which it is possible to work is termed the working range. The danger range adjoins the working range. In some vacuum lifting systems, in particular self-priming vacuum lifters, the resultant pressure decrease depends upon the weight of the load.</p>	<p>Vacuum lifting systems must be dimensioned so that the suction force at the lower limit for its working range provides at least twice the effective maximum carrying capacity. In calculating the current load, the position of the glass must be taken into account. If the glass is not horizontal, the friction coefficient must be considered.</p> <p>Note: The pressure range within which it is possible to work is termed the working range. In some vacuum lifting systems, in particular self-priming vacuum suction cups, the resultant pressure decrease depends upon the mass of the load.</p>
<p>5.2.2.2 Non-self-priming vacuum lifters shall be equipped with a pressure measuring device clearly showing the working range and the danger range of the vacuum.</p>	<p>5.7.2 vacuum lifting devices must be equipped with a pressure measuring facility that clearly identifies the working and danger pressure range. The pressure and must be displayed and a leak warning must be implemented to allow operators to leave the danger area on time.</p> <p>Note: On the display device or the vacuum display the danger zone is adjacent to the working area and signals that the vacuum pressure in this range is insufficient.</p>
<p>5.2.2.4 The measuring device or the indicator respectively shall be fully visible for the slinger or, if there is no slinger, for the driver of the crane when in his normal working position.</p>	<p>5.7.3 The measuring device or the indicator shall be fully visible for the operator or the driver of the hoist in their normal working position, even when the load is suspended underneath the crane driver's cab.</p>

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<p>5.2.2.5 Means shall be provided to prevent the risks due to vacuum losses. This shall be:</p>	<p>5.7.4 Systems shall be provided to control and monitor vacuum losses comprising:</p> <p>5.7.4.1 Compensation devices to balance out vacuum losses are:</p> <p>Note: Vacuum losses can occur, for example, due to leaks or due to a power failure.</p>
<p>a) in the case of vacuum lifters with a vacuum pump: a reserve vacuum with non-return valve between the reserve vacuum and the pump, located as close as possible to the reserve vacuum.</p>	<p>a) In the case of vacuum lifters with a vacuum pump a reserve vacuum tank of minimum volume of at least twice the total evacuated volume of the system.</p> <p>In addition: 5.7.4.3 Vacuum hoisting devices with vacuum pump must be fitted with a non-return valve between vacuum accumulator and pump, as near as possible to the vacuum accumulator.</p>
<p>b) in the case of vacuum lifters with Venturi systems: a reserve pressure tank or a reserve vacuum tank with a non-return valve fitted in the venturi system as close as possible to the reserve vacuum.</p>	<p>b) In the case of vacuum lifters with injector venturi, each injector must be connected to a non-return valve.</p>
<p>5.2.2.6 There shall be a device to warn automatically when the danger range is reached, if vacuum losses can not be compensated. The indication shall be optical and/or acoustic, depending upon the circumstances of use for the vacuum lifter, and in accordance with EN 981, EN 842 and EN 457; The warning device shall work even if there is a power supply failure to the vacuum lifter.</p> <p>Note: The warning device is not the pressure measuring device of 5.2.2.2 or the indicator of 5.2.2.3.</p>	<p>5.7.4.2 a device to indicate the danger area when the compensation device can not balance the loss in vacuum must be fitted. This indication shall be automatic and clearly perceptible to the operator, to allow persons to leave the danger area below the load. The indication must be optical and/or acoustic, depending on the vacuum device's operating conditions, and in accordance with EN 981, EN 852 and EN 457;</p>

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<p>5.2.2.7 In case of power failure, the vacuum lifter shall be able to hold the load for 5 minutes. This is not necessary in no-go areas and this is not necessary for turbine vacuum lifters if all the following conditions are met:</p> <ul style="list-style-type: none"> • the operator maintains control of the load through steering handles which ensures that the operator is outside the danger zone in case of the load falling; • in addition to clause 5.2.2.6 a warning device shall be activated as soon as the power fails; • the manufacturer shall prohibit lifting of the geometric centre of the suction pads above 1.8 m by marking and instructions for use. 	<p>5.7.6.3 In the event of a power failure all movements must be stopped.</p>
<p>5.2.2.8 For vacuum lifters intended to be used in a building area a secondary positive holding device is required or there shall be two vacuum reserves each fitted with non-return valves. Each vacuum reserve shall be connected to a separate set of suction pads. Each set of suction pads shall fulfil the requirement of the clause 5.2.2.1.</p>	<p>5.7.1.1 The vacuum shall have redundancy so that if part of the systems fails then the remaining part of it shall be capable of supporting the actual load.</p> <p>The following parameters should be taken into account when laying out vacuum lifting devices:</p> <ol style="list-style-type: none"> a) the maximum mass, dimensions and thickness of the glass pane. b) the type of glass surface (e.g. smooth or textured, wet or dry, clean, dirty or powdered, etc.) c) the working procedure (e.g. only vertical, from vertical to horizontal, only horizontal) d) the temperature range

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<p>5.2.2.9 The releasing of the load shall be actuated by a two action control. This is not necessary if the release of the load is not possible until the load has been put down or in no-go areas.</p>	<p>5.7.6.2 c) The manual operating elements with which the load can be released must be secured against erroneous operation.</p>
<p>5.2.2.10 Controls for tilting or turning movements shall be hold-to-run type.</p>	<p>5.7.6.1 The control system's safety section must fulfil Category 1 of EN 954-1:1996. Any movement must be possible only with operating elements with automatic reset.</p>
<p>5.2.2.11 The shape of the suction pad shall be matched to that of the intended load(s). If more than one suction pad is used in conjunction with a lifting beam, the layout and working load limit of the suction pads shall be matched to that of the intended load(s). The share of the load which can foreseeable be imposed on each suction pad shall not exceed its working load limit taking account of the rigidity of both the load and the vacuum lifter.</p>	
	<p>5.7.5.1 For crude glass handles or a protective screen with handles must be fitted and arranged in such a way as to protect the operator from falling glass. No protective screen is required for small glass panes (dimensions less than 2 m edge length), provided that the distance of the suction cups to the glass edges is less than the distance of the handles to the glass.</p>
	<p>5.7.5.2 It must be possible to guide vacuum lifters using both hands, even if the operator has to simultaneously operate a hoist.</p> <p>Note: This can be achieved, for example, by positioning the control device for lifting immediately next to each guide handle.</p>