

Safety on the existing Hydraulic Elevators

Procedures and checking for regular periodic inspections of the lift

all remarks/changes are marked in this colour



ELCA WG HYDRO
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Developed by the manufacturer of hydraulic elevators and components

Recommendations for periodic checking to ensure the safety of existing hydraulic lifting equipment (according to Lift Directive 95/16/EC+2014/33/EU and Machinery Directive 2006/42/EC) with special attention on the increasing number of always older elevators (>20 years), the protection of existing lifts but also to operate and use a lift respecting the state of the art and the actual safety requirements (Self-assessment)

- Target:**
 1. Document as a template to define the checks during recurring audits, to integrate into the legend / check list of the notified body or in local standards/forms
 2. The approved inspection bodies should attend to this checks during the recurring audits (each or every two years) or verify that the checks had been properly carried out by the maintenance company

some remarks to the comments (column) will be cancelled in the later public version

Description of the checking Necessary time for all the checks (10-20 min)	Measurement and control for periodical inspection on hydraulic lifts			Risk analyses		Test Instruction	Protective Measures (Risk Reduction Measure)		
	European Community	Spain	Germany	Estimation of					
	Required by EN 81-2 (2010) for new lifts	Checked in periodical inspection (UNE 192008)	Requirement of TRBS 1201-4	Already in NBS check list	Comment			S	F
Prevention of Car Freefall									
Check Rupture Valve Working	YES	YES A.5.15	YES	YES	Already controlled by NB	I	D	Free fall of the car with speed higher than nominal +30%	Replace the rupture valve
Presence of an UCM device (e.g. Double Safety valve) (According Machine Directive DM 2006/42 par. 6.4.1)	YES	NO	NO	NO	We suggest for control	I	D	Unintended car movement or Free fall of the car in case of dirty or mechanical wear one valve is not enough	Replace the main valve block with an redundant valve block system with double safety included or another equivalent UCM device
Check UCM device Working	YES	NO	NO	YES	Already controlled by NB	I	D	Unintended car movement with opened doors	According Manufacturer's Instruction manual and A3 requirements Replace the UCM device
Emergency Operations									
Operability of the emergency downward valve (manually operated)	YES	YES A.8.07	NO	YES	Already controlled by NB	II	D	It is not possible to move the car downward; people could be remain trapped inside the car	Adjust, clean, substitute the valve or replace/revision of the main valve block; evtl. clean/change the oil
Operability of the hand pump	YES	YES A.8.07	YES	YES	Already controlled by NB	II	D	It is not possible to move the car upward; people could be remain trapped inside the car	Adjust, clean, substitute the hand pump or replace/revision of the main valve block; evtl. clean/change the oil
Hydraulic Controls and Pressure Controls									
Pressure relief valve Working (1,4 times the nominal pressure)	YES	YES A.8.10	YES	YES	Already controlled by NB	II	D	The car doesn't move in upward or move with sharp starting because of overload or blocked carrier	To pump against the close shut off valve; check the pressure on the manometer when the pressure relief valves opens
Pressure relief valve of Hand Pump working (2,3 times the full load pressure)	YES	YES	YES	YES	Already controlled by NB	I	D	Breakage of tubes and fittings	To pump against the close shut off valve; check the pressure on the manometer when the pressure relief valves opens
Visual Control of complete system (Main valve and fittings...)	NO	NO	NO	NO	We suggest for control	II	C	Leakage of tubes, valves, fittings; ecological impact; sudden movements of the car or freefall of the car	Revision of the main valve block; clean the main valve block or change the sealing
Control the leakage of the System (Main valve, hoses, cylinders)	YES	YES A.8.09	NO	YES	Already controlled by NB	I	C	Depending on the mass of leakage the cabin slides downwards with open doors; in best case relieving occurs (until the maximum number of relieving is reached); in worst case depending on construction particulars of the valve block and its leakage the cabin drops down quickly without relieving	Revision of the main valve block; cleaning the main valve and/or change the sealing
Leakage from the Cylinder Head, control the amount of oil in the tank (recovery (compared to the marking of the last visual check))	YES	YES A.8.09	NO	YES	Already controlled by NB	I	D	The cabin relieves too much; downward sliding of the cabin with open doors risk of falling in/out of cabin; environmental risk	Replace sealing of the cylinder; replacement of the damaged rod; replace aggressive bio oil; replace the complete piston
Piping and Fittings damaged or with leakage; flexible hoses with wrong bending radius (indicated by the hose manufacturer)	YES	YES A.8.09	NO	YES	Already controlled by NB	II	D	Freefall of the car; environmental problem	Replace the hose and/or fittings
Control Leakage on shut-off valve	NO	NO	NO	NO	We suggest for control	I	D	Safety problem during maintenance procedure; environmental problems	Close shut off valve and push the emergency button; the car must stand still and the pressure inside the main valve must decrease
Leakage or Malfunction of Down direction valve or its commanding valve	NO	NO	NO	NO	We suggest for control	I	D	Depending on the mass of leakage (dirt, mechanical blocked) of the down direction valve or its commanding valve the cabin slides downwards with open doors; in best case relieving occurs (until the maximum number of relieving is reached); in worst case depending on construction particulars of the valve block and its leakage the cabin drops down quickly without relieving	Close shut off valve and increase the pressure 2 times the nominal pressure with hand pump; check the pressure doesn't decrease more than 5 bars in 5 min
Functionality and presence overpressure switch (maximum pressure switch)	YES	YES A.4.13	NO	YES	Already controlled by NB	II	D	very sharp starting of the car in upward	increase the pressure with hand pump and check when the pressure switch gives the signal to the control panel
Slack rope (or chain) safety device for indirect acting lifts	YES	NO	YES	YES	Already controlled by NB	II	A	ropes get caught with elements in the shaft when the cabin get moved in upward direction	install a device preventing slack ropes; do hold minimum pressure 5 bar
Functionality and presence minimum pressure switch	YES	NO	NO	YES	Already controlled by NB	II	D	Oils comes outside the tank, environmental	Close the shut off valve, decrease the pressure until the pressure switch gives the signal to the control panel
Normal stopping of the car at landings									
Stopping accuracy shall be +/- 10mm	YES	NO	NO	YES	Already controlled by NB	II	C	People can fall when come inside the car or going outside because of big step	Revision of the main valve block or complete replacement of the main valve block
Influence to the safe functionality and the safety in use									
It is not possible to do adjustment on acceleration/deceleration and starting and stopping phase; the comfort of the elevator is not acceptable	NO	NO	NO	NO	We suggest for control	II	D	People can fall when come inside the car or going outside because of big step; excessive acceleration/deceleration (more than 1 g)	Check the stopping accuracy and confort travel
Stopping not accuracy or variable	NO	NO	NO	NO	We suggest for control	II	D	People can fall when come inside the car or going outside because of big step; excessive acceleration/deceleration (more than 1 g)	Check the stopping accuracy and confort travel
It is not possible to reach the nominal down speed	NO	NO	NO	NO	We suggest for control	III	D	Danger of being trapped (travel time control); excessive acceleration/deceleration; indication for faults (e.g. broken springs, seals, dirt, leakage)	The speed must not be different than 10% of nominal speed on empty cabin (e.g. ~20 bar) and normal temperature of the oil (30°)
check of too much air, water or dirt contained in the oil	NO	NO	NO	NO	We suggest for control	II	D	Short circuit of the motor, the lift will be out of service	Measure of the motor insulation between phase and earth; resistance must be higher than 1000 Ohm/V at 500 V and must be equal between phases and earth
Oil level not sufficient	NO	NO	NO	NO	We suggest for control	II	D	It is not possible to reach top floor	When the car is at the top of the oil inside the tank must cover the motor (no submerged motors only); check oil level indicator
Absorption of the motor current too high referred to the nominal current (measured and protocolled during the initial test (putting into service test))	NO	NO	NO	NO	We suggest for control	II	D	Short circuit of the motor, the lift will be out of service	Check that under the same conditions as for the initial test the nominal current doesn't deviate more than 10 % (attention on condition of oil temperature and pressure/load); the resistance between the single phases must be equal
Filter inside main valve dirty	NO	NO	NO	NO	We suggest for control	II	D	Safety problem for preventing the functionality of safety device (down valve, double security, max relief valve, etc.); elevator comfort is not acceptable	Check the filter inside the main valve and shut off valve
Functionality and presence of the manometer	YES	NO	NO	YES	Already controlled by NB	II	D	It is not possible to check the pressure of the lift; safety problem during maintenance operation	Replace the manometer, clean the valve or replace/revision of the main valve block
Periodical Revision of the main valve block (Black box)*	NO	NO	NO	NO	We suggest for control	I	D	Dirt, mechanical wear, broken springs, consumed rubber or metal seals could influence in different extent the car movement also cause dangerous movements or unintended car movement	Periodical inspection according Manufacturer instruction
Limitation of the ram stroke	NO	NO	YES	NO	We suggest for control	II	D	The design of the cushioned stop shall be such that the average retardation of the car does not exceed 1g	Bring the cylinder to the top limit
Telescopic Cylinder Synchronization	NO	NO	NO	NO	We suggest for control	II	C	It is not possible to reach the lowest floor or the top floor; stopping accuracy more than +/- 10mm	According manufacturer's instruction manual
Pawl Device Presence	YES	NO	YES	YES	Already controlled by NB	I	D	The car is moving with doors opened; stopping accuracy more than +/- 10mm; problem of fall when entering or going outside the car	According manufacturer's instruction manual

Estimation of Risk Elements
 S = Level of Severity of Harm: I. High, II. Medium, III. Low, IV. Negligible
 F = Level of Probability of Occurrence of Harm: A. High-Probable, B. Probable, C. Occasional, D. Remote, E. Improbable, F. Highly Improbable

*Revision of the main valve block means: the revision of the valve block (gaskets, pistons, coils, springs, single valves, etc.) according to the manufacturer's specifications by the manufacturer or an authorized reseller protocol (the contents according to the manufacturer's) Non recurring & documented inspection check can be made by an NB after 15 years in order to extend the periodical revision to 20 years

Cancelled: (no leakage with pressure up to 2,3 times the full load pressure; no small leakage of oil like drops)

depending on construction particulars of the valve block one open downward valve can cause a different level of downward speed

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already required in EN81-2; (more there is the overpressure valve, shall we show or cancel this point? Comments required)

to fall into/out of the cabin is one of the frequent reasons of accidents on lifts; means to guarantee a better / reliable prevention as possible/available; a check on that by a neutral authority should be done

we think, also mechanical valves in typical conditions comparable (e.g. 30°C) should, when not failed, guarantee a speed value not different from 10% from nominal; evtl. comments are required

partial is required to change or cancel this point, because when the current is higher than indicated on the motor label (because of the higher pressure, higher movement resistance in the shaft...), for this reason we do now reference to the initially measured current control and not to the current on the motor label; it is also proposed to increase the value to 20%; comments are required

some WG Hydro member propose to cancel this point because of when something does not work properly, some strange consequences in the movement (not reliable stopping accuracy e.g.) occurs and customer and maintainer will recognize this and fix it; on the other hand it's seen as necessary to check old valves as it's done on brakes, traction sheaves and so on to avoid e.g. that decelerations fails and cabin runs on buffers or in top end switch / please give comments on this important point