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# henning

MADE IN GERMANY

## ELVI-System

### Elevator Inspection System 2.0



## Non destructive elevator testing

- elevator car safeties
- half-load balancing
- traction force
- machine brake
- rope brake
- rail brake

- oilhydraulic buffers
- safety components of hydraulic elevators



## Elevator inspection System ELVI 2.0:

The modern and quality-conscious non destructive testing of elevators requires specialized measuring tools and methods:

### The ELVI System permits the testing of

in case of rope elevators:

- elevator car safeties
- half-load balancing
- traction force
- machine brake
- rope brake
- rail brake
- oilhydraulic buffers

in case of hydraulically driven elevators:

- pressure-limiting switch
- safety valve
- hand pump
- lowering prevention
- line-brake valve
- throttle check valve
- pipe-break safety device
- pressure resistance



without the use of weights or a complicated intervention in the elevator mechanics and electronics.

This is based on the one hand on the unique Henning procedures for the testing of elevators and on the other hand the intelligent acceleration sensor, the hydraulic sensor HS1 and the unique Henning rope load sensors.

The ELVI System of Henning GmbH & Co. KG exhibits all features to fulfil these requirements by finding and realizing new ideas, patents and procedures which are widely accepted throughout the business.

## Hydraulic sensor HS1

Thanks to a quick-action coupling the hydraulic sensor HS1 can be connected to hydraulic power packs without having to depressurize them first.

The large measuring range of 0 to 250 bar ensures the application for all power packs. A pressure gauge function is integrated into the software interface. This function enables a quick and easy display and monitoring of the current pressure and its relation to the static pressure for the nominal load in the system.



## Tests of hydraulic elevators

With the help of the ELVI System the tests of hydraulic elevators can be carried out in a simple and comfortable way.

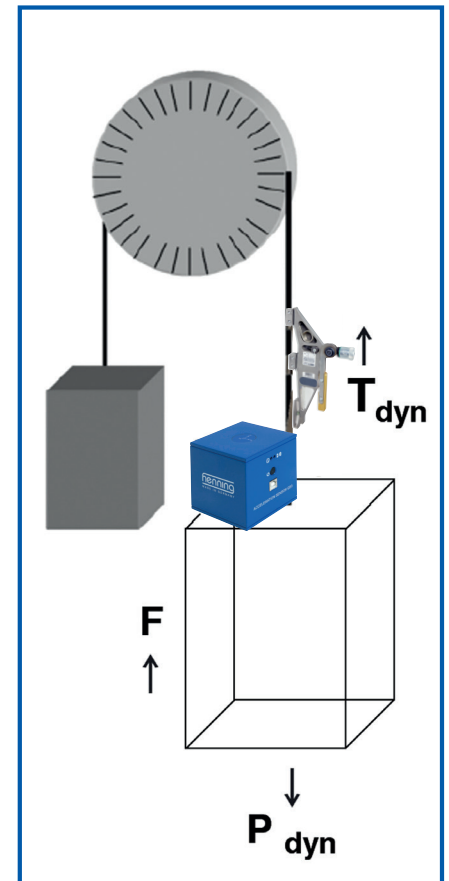
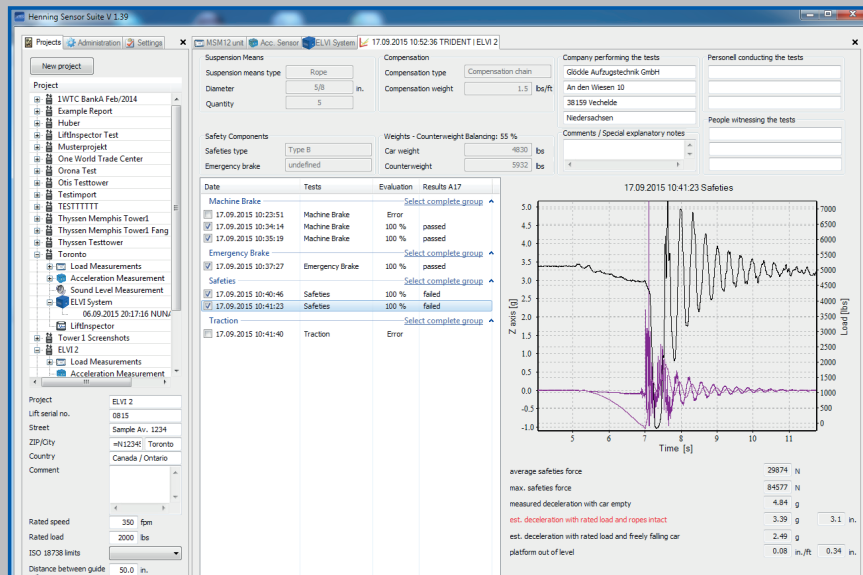
The hydraulic sensor HS1 is used for the following tests: Response limit of the pressure-limiting switch, response limit of the pressure-limiting valve, response limit of the pressure-limiting valve of the hand pump, function and effectiveness of the lowering prevention, function of the line break valve, function of the throttle check valve and the pressure resistance of the hydraulic sensor HS1.

For the verification of the effectiveness of the pipe-break safety device the acceleration sensor PS1 is used which can safely check the occurring decelerations for permissibility.



## Elevator car safeties

The test of the elevator car safeties is carried out according to a new patented procedure. In spite of the measurement with an empty car the test replicates the exact conditions of a loaded car. This determines exactly the influences of the counter weight and/or the motor, so that it is not required to make assumptions about their behaviour, which could distort the precision of the measured results.



## Elevator car safeties inspection

- Installation of acceleration sensor rope and loadsensors
- Select testing mode
- Start measurement
- Engage car safeties
- Stop measurement
- Print report

## Traction force

The comfortable and simple procedure for the determination of the maximum traction force is also only enabled by the patented rope sensors LSM1: Directly after the safety gear test the car is left in the safety braking condition and the motor is driven in a downward direction until either the ropes slide over the traction sheave or the maximum motor torque is reached.

From the continuous measurement of this process the software can immediately and automatically calculate the maximum traction force. The particular advantage of this procedure is that no mechanical intervention in the elevator or the shaft is necessary.

## Machine brake and rope / rail brake

The procedure for testing of machine, rope / rail brake is similar to the procedure for testing the car safeties: From the brake measurements of the empty car upward the minimum brake force of the machine brake is determined and the accelerations and the brake path lengths for the case of overload are calculated exactly.

Patented testing principle  
Measure forces at empty car:

$$F = P_{\text{dyn}} - T_{\text{dyn}}$$

Calculate forces at full car:

$$T = 0 \text{ (no rope, free fall)}$$

No fall, if

$$F > P = (m_p + m_Q) \cdot g$$

## TEST PROCEDURE ELVI

**A**

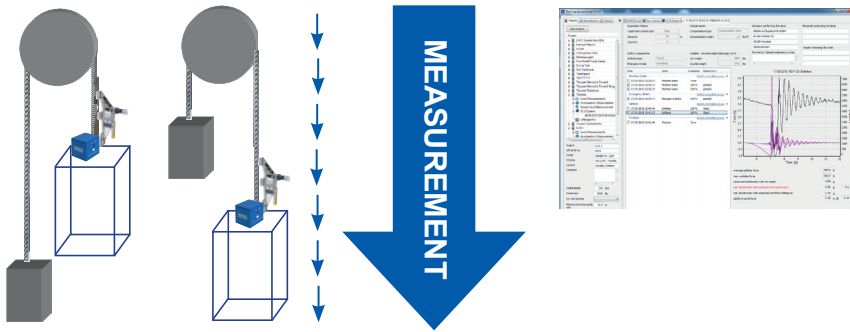
### WEIGHT MEASUREMENT

Measurement of Weight of CTW and Car (if not known exactly)



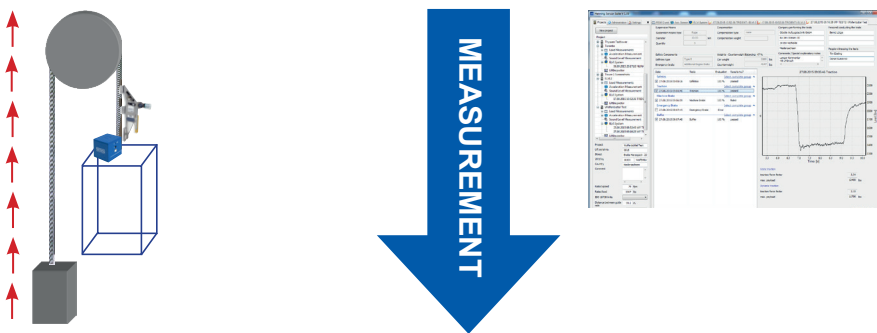
**B**

### ELEVATOR CAR SAFETIES



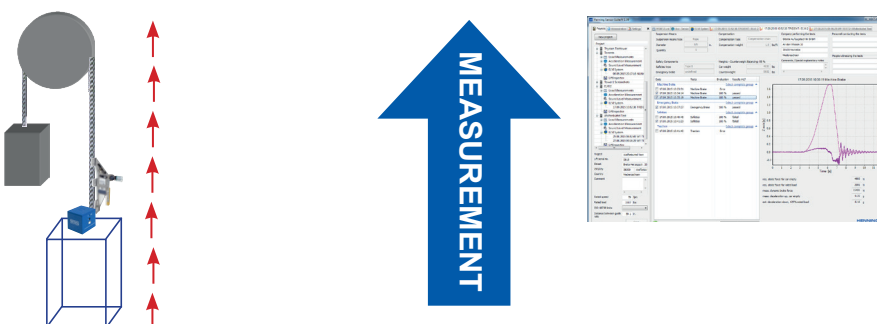
**C**

### TRACTION



**D**

### MACHINE BRAKE (ROPE/RAIL BRAKE)



ELVI TESTING MODE

# Tests results

The test results are available immediately after the tests and measurements have been carried out. The results will be stored in a data base and, if desired, can be issued as a report and / or synchronised with superior systems and data bases using appropriate connections (via Intranet, Internet, GPRS, UMTS etc.).

Date	Tests	Evaluation	Results A17
17.09.2015 10:23:51	Machine Brake	Error	Select complete group
17.09.2015 10:34:14	Machine Brake	100 %	passed
17.09.2015 10:35:19	Machine Brake	100 %	passed
17.09.2015 10:37:27	Emergency Brake	100 %	passed
17.09.2015 10:40:46	Safeties	100 %	failed
17.09.2015 10:41:23	Safeties	100 %	failed
17.09.2015 10:41:40	Traction	Error	Select complete group

Example Screenshot of the software interface showing the results of a safety gear test. The expert can immediately take from the results under which load conditions the car can be safely braked from a free fall or whether the brake force of the safety gear is sufficient.

### Elevator Testing Report

Elevator installation: ELV12  
 Lift serial no.: 0815  
 Site: Saugka Al. 1234  
 ZIP/City: N1245 Toronto  
 Country: Canada / Ontario  
 Rated speed: 350 fpm  
 Rated load: 2000 lbs

Measurement-ID: TRIDENT  
 Trigger time: 17.09.2015  
 Version: 1.39  
 Code: A17.1/B44

Company performing the tests		Comments / Special explanatory notes	
John Doe Elevators An den Wiesen 19 38159 Vechelde Germany / Niedersachsen			
Personnel conducting the tests		People witnessing the tests	

Suspension Means		Weights (Measured)	
Suspension means type	1:1	Car weight	4830 lbs
Diameter	Rope	Counterweight	5932 lbs
Quantity	5/8 in.	Counterweight Balancing	55 %

Safety Components		Compensation	
Safeties type	Type B	Compensation type	Compensation chain
Emergency brake	undefined	Compensation weight	1.5 lbs/ft
Distance between guide rails	50.0 in.		

Evaluation Components			
Model	Serial no.	Version	Last calibration
PS2	01530001	2.29	24.08.2015
MSM12 V3	01202101	3.29	31.07.2015
LSM-XL	00500425		19.11.2014
LSM-XL	00500429		19.11.2014
LSM-XL	00500450		19.11.2014
LSM-XL	00500427		19.11.2014
LSM-XL	00500428		19.11.2014
UCD	00000001	1.21	23.07.2015

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### Machine Brake

17.09.2015 10:34:14 **passed**

req. static force for car empty	4903 N
req. static force for rated load	3993 N
meas. dynamic brake force	8974 N
meas. deceleration up, car empty	0.09 g
est. deceleration down, 125% rated load	0.05 g

### Machine Brake

17.09.2015 10:35:19 **passed**

req. static force for car empty	4903 N
req. static force for rated load	3993 N
meas. dynamic brake force	15431 N
meas. deceleration up, car empty	0.22 g
est. deceleration down, 125% rated load	0.16 g

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### Emergency Brake

17.09.2015 10:37:27 **passed**

req. static force for car empty	4903 N
req. static force for rated load	3993 N
meas. dynamic brake force	8238 N
meas. deceleration up, car empty	0.07 g
est. deceleration down, 125% rated load	0.03 g

### Safeties

17.09.2015 10:41:23 **failed**

average safeties force	29874 N	
max. safeties force	84577 N	
measured deceleration with car empty	4.84 g	3.1 in.
est. deceleration with rated load and ropes intact	3.39 g	2.49 g
est. deceleration with rated load and freely falling car platform out of level	0.08 in./ft	0.34 in.

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# Manufacturers-Calibration

Manufacturers Calibration of ELVI-System can be handled in North America through our local distributor. No shipment to Europe necessary.

## Validation

All procedures, sensors and devices described here have been validated as: **ELVI System** by an independent organisation.

**Centre for Materials Handling and Elevator Technology**  
**Ressourcen gemeinnützige (non-profit) GmbH**  
Institut für Materialhandling und Elevator-Technologie (IME)

**Summary of the validation report on the Henning Diagnostic System for hydraulic elevators**

**Object of validation:** Diagnostic system for hydraulic elevators of Henning, Testing Systems GmbH consisting of:  
 • Pressure sensor H51  
 • Evaluation software Elvi 4.13

**Name and address of manufacturer:** Henning, Testing Systems GmbH  
 FF 323  
 44173 Schwanau

**Test site:** Testing laboratory of ZFA Ressourcen GmbH

**Date of testing:** 18.09.07, 24.09.07, 25.09.07

**Testing institute:** Centre for Materials Handling and Elevator Technology  
 Ressourcen GmbH  
 Testing laboratory 0123456789101 of 28.09.2007

**Test result:** On account of the examinations a suitability of the pressure sensor H51 and a credibility of the results of the Henning Diagnostic System for the required testing of hydraulic elevator installations according to TNA 102 und EN 81-2 can be certified.

**Partial results:**

1. Verification of the pressure sensor H51  
 The procedure of the pressure sensor H51 together with its evaluation unit can be assessed to be sufficiently exact with an extended measuring uncertainty of 2.5%.
2. Lowering device  
 The measuring calculation method has been evaluated.  
 Both the measurements using the pressure sensor H51 and the procedure can be certified to be plausible.
3. Effectiveness of the lowering prevention circuit
4. Function of the hoist-brake valve
5. Effectiveness of the pipe-break safety device
6. Operation margin of the pressure-limiting valve and switch
7. Operation margin of the pressure-limiting valve of the hand pump

To be established in the partial results 3 to 7:  
 Both the measurements using the pressure sensor H51 and the procedure can be certified to be plausible.

8. Pressure assistance of the system  
 The result of the test during commissioning can be manually recorded. This procedure is assessed to be plausible.

Ressourcen, 16.11.2007

Centre for Materials Handling and Elevator Technology  
 Ressourcen gemeinnützige (non-profit) GmbH

M. Giese (Chairman) T. Meyer (President) A. Meyer (Managing Director)

Henning, Testing Systems GmbH  
 FF 323  
 44173 Schwanau

ZFA Ressourcen GmbH  
 Testing laboratory 0123456789101 of 28.09.2007

**Centre for Materials Handling and Elevator Technology Ressourcen**

**Test Report** 1/17

**Diagnostic system for hydraulic elevators** 0123456789101

**Subject:** Test and validation of a diagnostic system for hydraulic elevators

**Customer:** Henning, Testing Systems GmbH

**Examiners:** Mrs. A. Meyer, Mr. K.-H. Hornack (ZFA Ressourcen)

**Test site:** Testing laboratory of ZFA Ressourcen

**Date of testing:** 18.09.07, 24.09.07, 25.09.07

**Test item:** Diagnostic system of Henning, Testing Systems GmbH consisting of:  
 • Pressure sensor H51  
 • Evaluation software Elvi 4.13

**Test basis:** Requirements on testing systems according to Annex C, subchapter 3 of the "Guidelines for the requirements on the accreditation of authorized monitoring organizations" of 18.09.2006

**Devices used:** Pressure sensor H51 / 100 bar Inventory no. 01-4-10000  
 Acceleration sensor 8102000 Inventory no. 01-4-10007  
 Distance sensor W510K1-0000-PP20V-L1 Inventory no. 01-1-10000  
 M52-200 Inventory no. 01-0-10000

**Execution:**  
 The test of the diagnostic system was supported by carried out under real conditions in the future field of application, i.e. on a hydraulic elevator installation.  
 For these examinations we have chosen a simple elevator of the test laboratory. This elevator is a "technical" elevator with a speed of 0.7 / 1.0 m/s. (Objective: to control by a real installation the elevator has its car, no shaft at all and no shaft head. A transport of people is not permitted. The moving components have no influence on the examinations. The following figure shows the test setup.)



Figure 1: Test setup

# Extension modules

The ELVI-System can be expanded with further modules. The LiftPC mobile Diagnosis module of Henning GmbH & Co. KG is a modern diagnostic system which makes it possible to measure and analyse elevator quality and ride comfort according to ISO 18738 and GB/T10058/1997 during travel of elevator. The mobile system permits the highest possible flexibility and it is used both in construction and service and also for the performance record for consultants and inspectors. The module LiftPC mobile diagnosis can be used both for rope and hydraulic elevators and is suitable for all elevator types – independent of make and age. For the analysis of escalators and other dynamic systems further software modules are available.

# Single rope adjustment module

Only a uniformly distributed load in the ropset provides for uniform wear and long life of the ropes. During installation and in running operation non-uniform loads may occur due to manufacturing tolerances of the rope diameter. With the single rope adjustment module it becomes possible to carry out a computer-aided rope adjustment within a few minutes and to output it as a protocol.

**weight watcher**

**Rope Load Report**

**Time stamp of measurement:** MSM12 Calibration date:

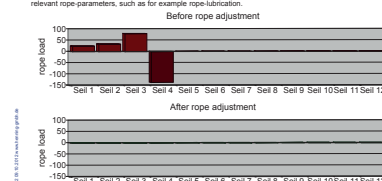
**Elevator installation:** Frankfurt Südbahnhof

Serial number: 283006144 User-ID: Gegengewicht Suspension:

Street: City: City:

Single rope loads	Deviations																																							
<table border="1"> <thead> <tr> <th>Rope</th> <th>Before</th> <th>After</th> </tr> </thead> <tbody> <tr><td>Seil 1 (lbs)</td><td>569</td><td>485</td></tr> <tr><td>Seil 2 (lbs)</td><td>518</td><td>485</td></tr> <tr><td>Seil 3 (lbs)</td><td>504</td><td>485</td></tr> <tr><td>Seil 4 (lbs)</td><td>345</td><td>485</td></tr> <tr><td>Seil 5 (lbs)</td><td>0</td><td>0</td></tr> <tr><td>Seil 6 (lbs)</td><td>0</td><td>0</td></tr> <tr><td>Seil 7 (lbs)</td><td>0</td><td>0</td></tr> <tr><td>Seil 8 (lbs)</td><td>0</td><td>0</td></tr> <tr><td>Seil 9 (lbs)</td><td>0</td><td>0</td></tr> <tr><td>Seil 10 (lbs)</td><td>0</td><td>0</td></tr> <tr><td>Seil 11 (lbs)</td><td>0</td><td>0</td></tr> <tr><td>Seil 12 (lbs)</td><td>0</td><td>0</td></tr> </tbody> </table>	Rope	Before	After	Seil 1 (lbs)	569	485	Seil 2 (lbs)	518	485	Seil 3 (lbs)	504	485	Seil 4 (lbs)	345	485	Seil 5 (lbs)	0	0	Seil 6 (lbs)	0	0	Seil 7 (lbs)	0	0	Seil 8 (lbs)	0	0	Seil 9 (lbs)	0	0	Seil 10 (lbs)	0	0	Seil 11 (lbs)	0	0	Seil 12 (lbs)	0	0	Before adjustment ( ) Average deviation: 14,1% [68 lbs] Max. deviation: 28,2% [137 lbs]  After adjustment ( ) Standard deviation: 0,0% [0 lbs] Max. deviation: 0,0% [0 lbs]  <b>Total weight: 1940 lbs</b>
Rope	Before	After																																						
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Seil 12 (lbs)	0	0																																						

**Adjustment of the rope will increase its service life by 63,8%**  
 Service life is calculated by the equation of Prof. Feyer. Rope bending value can be raised in the above-mentioned value thanks to rope adjustment. This improvement is possible while retaining all other relevant rope-parameters, such as for example rope-lubrication.



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# ELVI-System

## Elevator Inspection System 2.0



**henning**

MADE IN GERMANY

**Henning GmbH & Co. KG**  
Loher Straße 4  
58332 Schwelm (Germany)  
Tel.: +49 2336 9298-0  
Fax: +49 2336 9298-100  
info@henning-gmbh.de  
www.henning-gmbh.de