



## POINT MACHINES FOR TRAMWAYS & LIGHT RAIL



Elektroline

## INTRODUCTION



## Introduction

At Elektroline, three main principles guide us through all endeavors. No matter the size or circumstance of the projects, our philosophy of safety, reliability, and value has led to the growth and kept our customers satisfied. This holds true especially so with our point machines, which have been an industry innovator since their inception.

### SAFETY

Elektroline point machines meet SIL3 standards, are equipped with independent position sensors and internal locking mechanism.

### RELIABILITY

A completely watertight casing provides utmost protection against water. This in turn makes the point machine practically maintenance-free. Elektroline point machines are called “bullet-proof” by our customers.

### VALUE

Our competitive pricing coupled with the point machines' reliability and a unique customer-oriented after-sales care make our products industry leaders when it comes to value and the Total Costs of Ownership (TCO).

## POINT MACHINES OVERVIEW

TSH 100  
series



TSH 070 H  
series



TSH 109  
series



TSM 070  
series



TSM 060  
series



electro-hydraulic operation	●	●			
manual operation	●	●	●	●	●
watertight casing	●	●	●	●	
watertight separation of electrical part (extra water protection)	●	●	●		
equipped with checking rods	●		●		
equipped with locking mechanism	●		●		
equipped with position sensor (6 independent sensors)	●		●		
equipped with position sensor (2 independent sensors)		●		●	●
humidity sensors	●	●	●	●	
trailable	●	●	●	●	●
SIL 3 (AK 6) compliant for split points	●		●		
recommended for merge points				●	●
recommended for tram depots		●		●	●
suitable for self-reversing switches				●	●
height of the box (external)	200 mm	199 mm	200 mm	150 mm	180 mm
length of the box (external)	830 mm	830 mm	830 mm	501 mm	1290 mm
width of the box (external)	596 mm	590 mm	596 mm	590 mm	390 mm
operating voltage of hydraulic system	600-750 V DC, 230 V AC, 380 V AC, 110 V AC (60 Hz), 24 V DC, etc.			mechanical only	

● included in basic option      ● possible option

\* All models of point machine cases are made from stainless steel. Cases could be customized according to the client request .



## CHARACTERISTICS OF POINT MACHINES

### Electro-hydraulic Operation

- Compared to an electro-magnetic mechanism, the electro-hydraulic point machines provide a vast range of advantages, reduce material wear, extend life-span and save money.



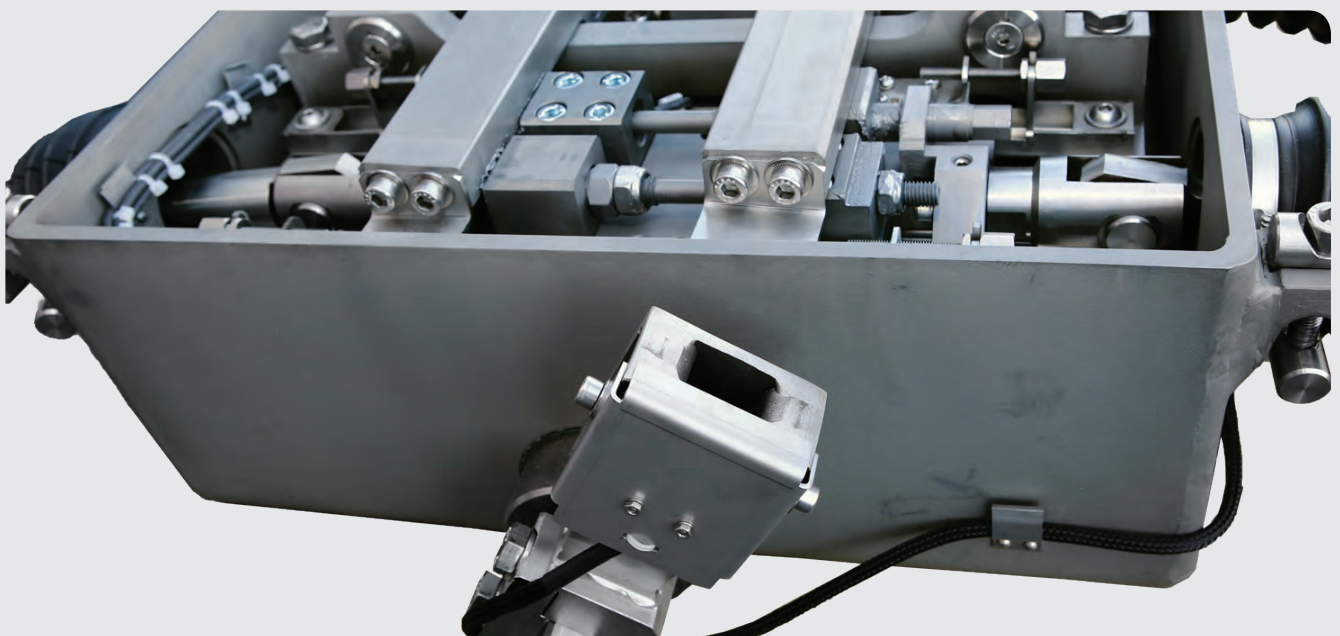
*Electro-hydraulic system of point machine*

### Highlights

- Smoother operation
- Noise reduction
- Material wear reduction
- Prolonged life-time
- Lower operation costs
- Lower risk of injury

### Manual Operation

All Elektroline point machines (powered as well as mechanical) come equipped with a throw-over lever socket to enable a manual operation in case of emergency. The sockets can be customized to fit customers' needs.



*Socket for manual operation*

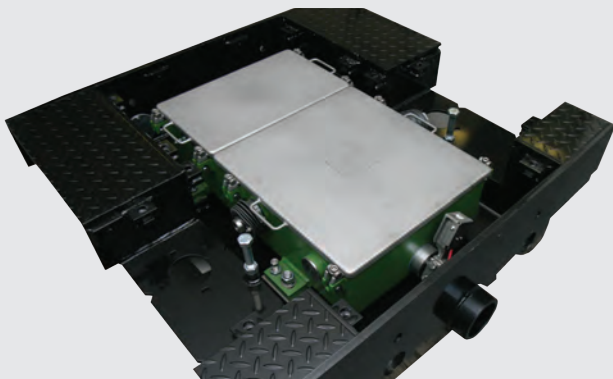
## CHARACTERISTICS OF POINT MACHINES

### Watertight Housing

The Elektroline point machines are designed to remain fully operational during the partial or even full submersion. This is guaranteed by the completely watertight housing and the separate compartments.

#### Highlights

- Maximum protection against water/impurities
- Internal components' corrosion prevented
- Excessive components' wear reduced
- Jamming prevented
- Easier & faster maintenance



*Watertight casing of Elektroline point machines*



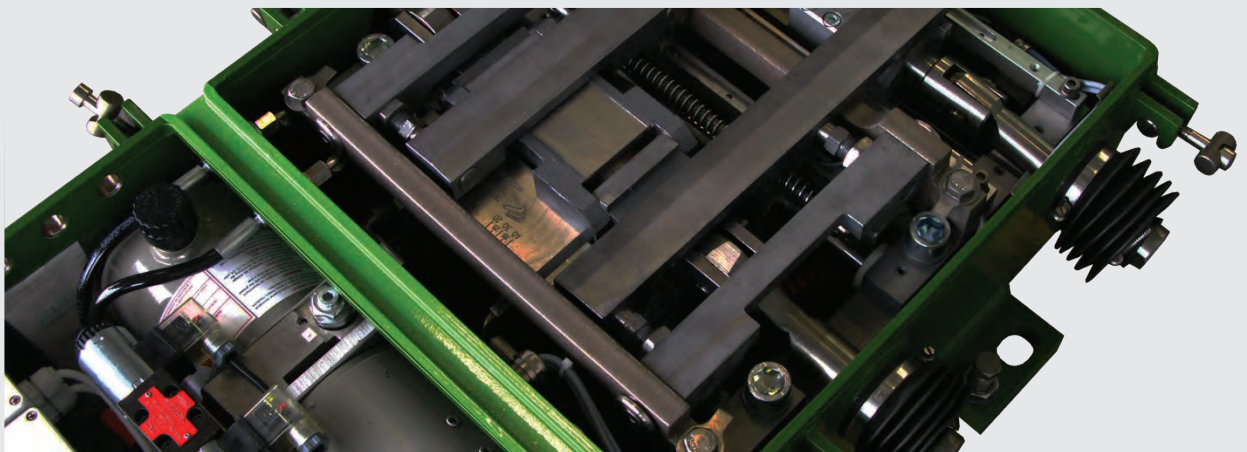
*Checking rods*

### Equipped with Checking Rods

The checking rods increase the operational safety by helping keep the flexible turnout blades at the desired position. The checking rods provide accurate information about the blades' position. When locked with the locking mechanism, the checking rods enable a further prevention of an accidental blade movement caused by the force of a passing tramway.

#### Highlights

- Help keep the blades in the desired position
- Improve information about the blades' position
- Improve the locking ability



*Watertight separation of electrical part*

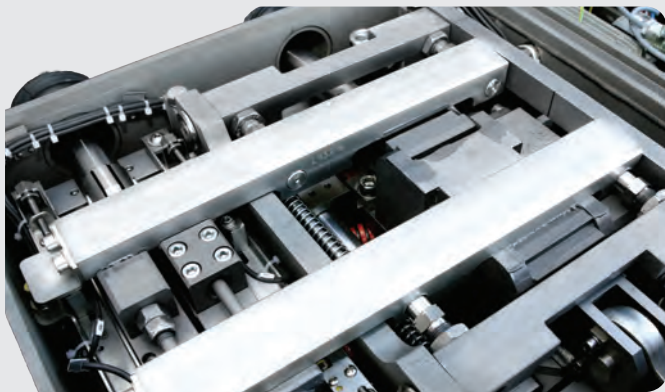




## CHARACTERISTICS OF POINT MACHINES

### Equipped with a Locking Mechanism

The locking mechanism is a crucial component for every switch machine installed in the mainline turnouts where the passenger-carrying trams travel in the so-called “facing” direction. The locking mechanism ensures that the adjacent blade will remain in its final position during the tram’s passage through the turnout.



*Locking mechanism inside a point machine*

### Equipped with Position Sensors (6 Independent Sensors)

Position sensors provide safe and reliable information about the position of the switch blades and the status of the locking mechanisms. The information about the position of the blades is displayed to the tram driver on the Point Position Indicator (PPI). Locking of the switch mechanism together with the signalization of the position are the key aspects of the safety-related function.

The full configuration gives three independent forms of information for each direction (left/right) of the switch blades and the locking mechanism.

#### Highlights

- Position of the left blade
- Position of the right blade
- Split position indication
- Active function of the locking mechanism

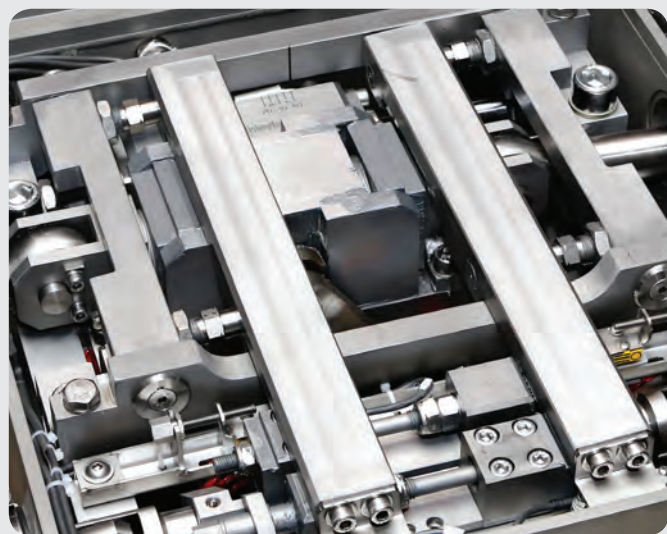


*Position sensors*

Information provided by the position sensors can be processed independently through Elektroline’s and/or a 3rd-party control system and analyzed independently.

### Equipped with Position Sensors (2 Independent Sensors)

Even the point machines without the locking mechanism and the control rods are equipped with the position sensors. In this case, the position sensors are attached to the setting rods detecting each position of the switch (left/right).



*Trailing mechanism is integrated within the lock body*





## CHARACTERISTICS OF POINT MACHINES

### Equipped with Secondary Sensors (optional)

The point machines can be optionally equipped with various additional sensors to detect humidity, open lid(s), oil pressure, throw force, etc. The sensors provide information to the Operational Control Center (OCC) in case of irregularities.

If combined with Elektroline Control System, SMS providing system information can be sent immediately to alert dispatchers.

### Trailable

All Elektroline point machines are trailable. The trailability is one of the main unique selling points (USP) of Elektroline point setting devices reflecting the tramway/LRT operational characteristics. Trailability saves money to the tram/LRT operators in case of an electro-hydraulic mechanism failure. Even the powered switch machines equipped with an internal locking mechanism withstand a temporary trailing without being damaged. These machines are not, however, designed for a regular trailing.

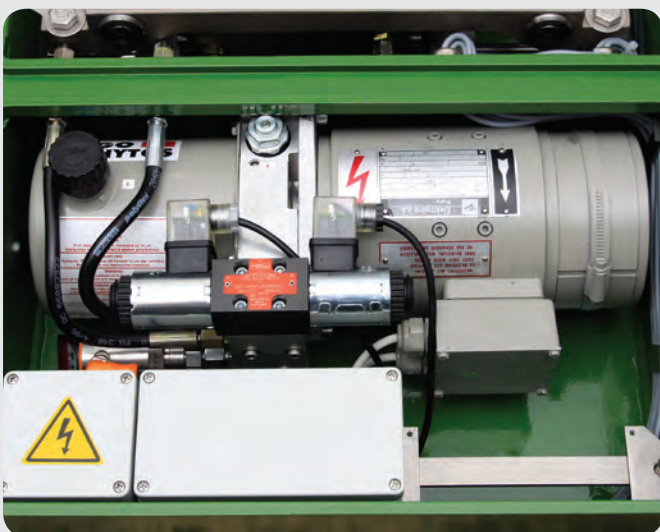
The point machines equipped with no internal locking can be, on the other hand, trailed regularly.

### Operating Voltage – Plug & Switch

Our point machines are able to function under various forms of power supply and can adapt to fit the customer needs. Point machines can work either with 600-750V DC (Continental Europe) or with 120V AC (USA/Canada), 230V AC, 3x380V AC or even 24V DC.

### SIL3 (AK 6) Compliant for Split Points

The point machines are SIL3 certified (where applicable). The SIL3 certificate confirms the highest safety and suitability for any tramway/LRT operation bringing the peace of mind to operators.

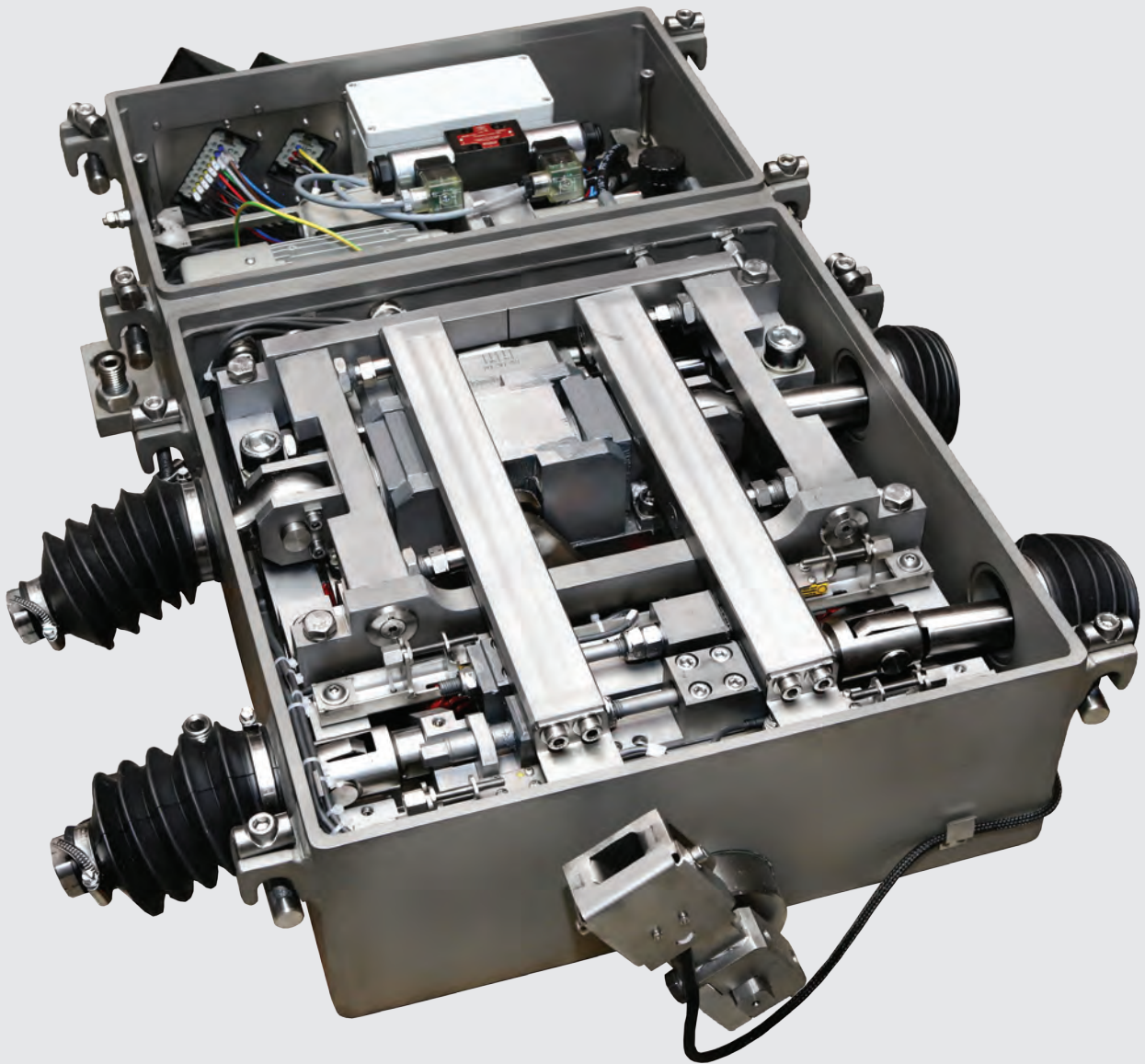


*Elektroline compact 600-750 V DC electromotor*





## TSH 100 SERIES (SIL3)



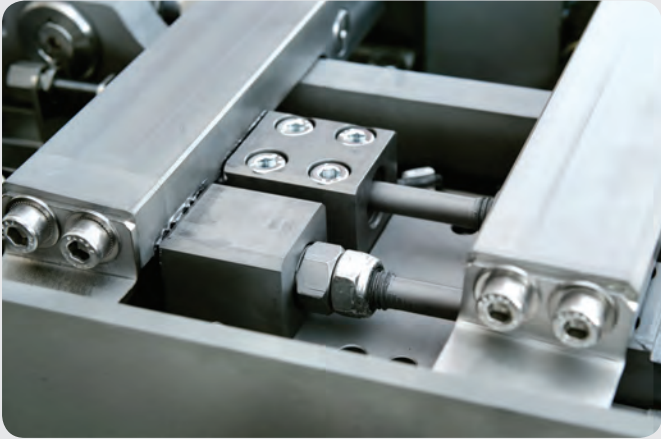
The TSH 100 series model is the most sophisticated point machine that Elektroline has in its portfolio. It is a modern state-of-the-art device for busy city centers as well as the express LRT lines. The point setting mechanism is installed inside a stainless steel watertight body. Using the stainless steel requires no additional coating and provides extraordinary protection from harsh conditions. If the rec-

ommended installation and guidelines are followed the device remains, de facto, maintenance-free during its entire life-cycle. This, in combination with its reliability and versatility, makes the TSH 100 a true market-leader when it comes to Total Costs of Ownership (TToO). The trailability, remote diagnostic tool and IP68 are just the cherries on the top.



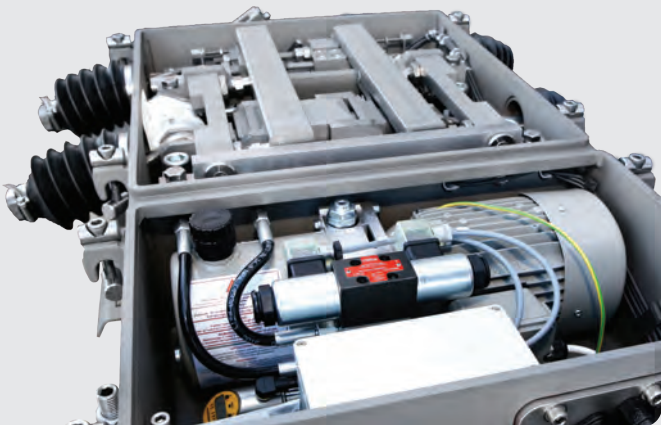


## TSH 100 SERIES (SIL3)



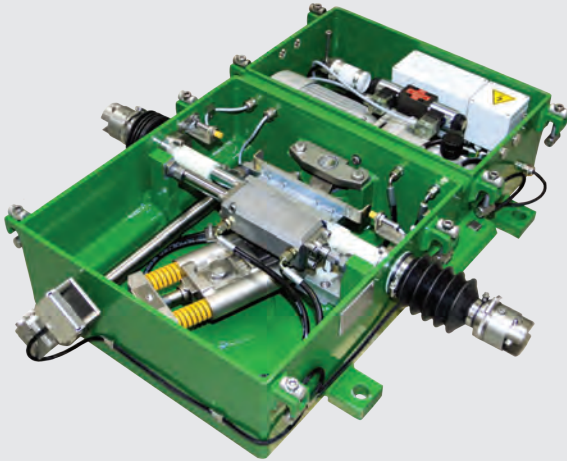
### Highlights

- Stainless-steel Housing
- Watertight
- Separate Compartments
- Power Supply Versatility
- Trailable
- Maintenance-free
- Total Costs of Ownership
- 6 Position Sensors
- SIL3
- IP68
- Predictive Maintenance & Monitoring Tool





## TSH 070 H SERIES

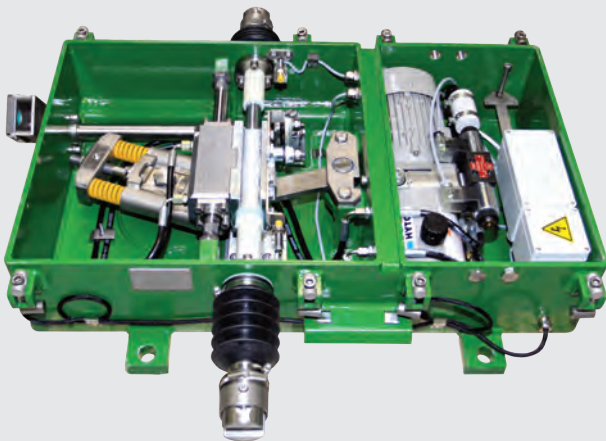


*Point machine TSH 070 H*

The TSH 070 point machine is an electro-hydraulic device used in the depot zones and/or at the mainline locations with no passenger-carrying trams. The dimensions are equal to the TSH 100 series. The TSH 070 is not, unlike its TSH 100 counterpart, equipped with the checking rods. It is, however, equipped with two position sensors providing information about the setting rods' position. To keep it simple, the TSH 070 is a light-weight version of its bigger brother TSH 100.

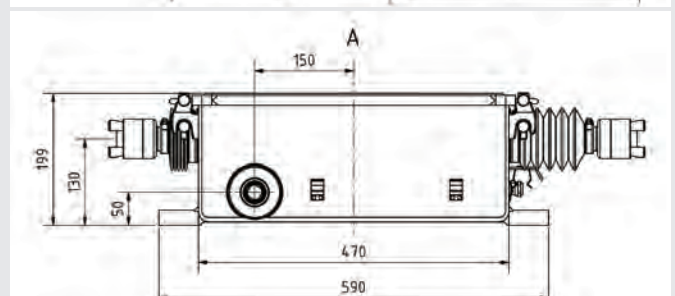
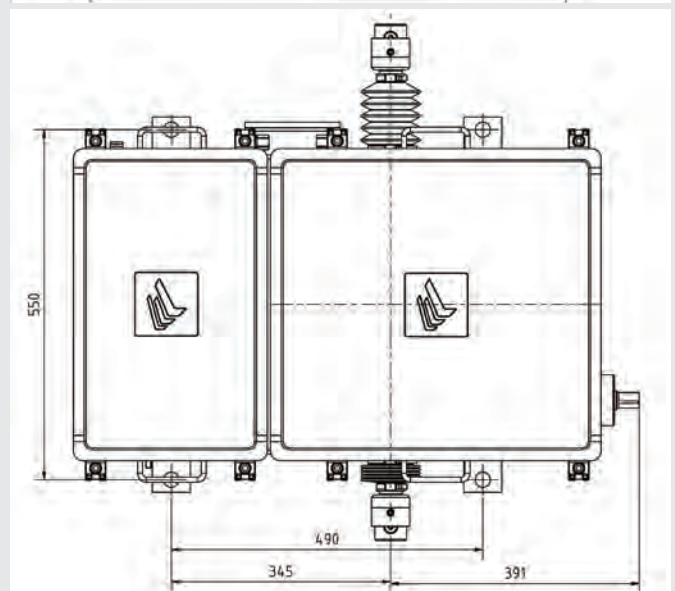
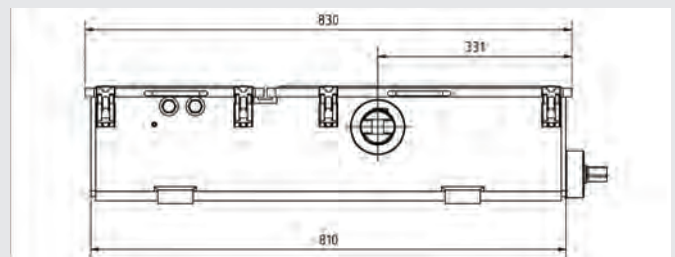
### Highlights:

- Stainless-steel Housing
- Watertight



*TSH 070 H does not have any checking rods*

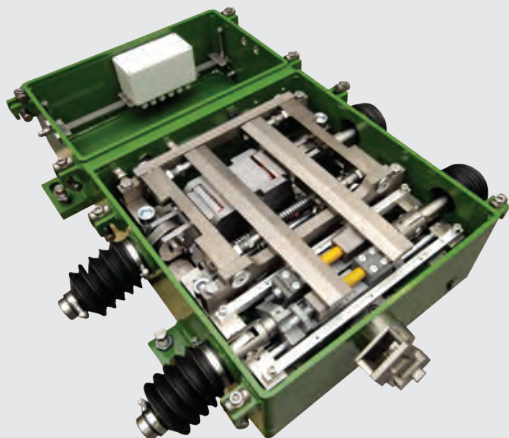
- Separate Compartments
- Power Supply Versatility
- Trailable
- Maintenance-free
- Total Costs of Ownership
- IP68
- Predictive Maintenance & Monitoring Tool (Optional)







## TSH 109 SERIES



*Point machine TSH 109 LC (SIL 3)*

Despite the letter “H” in its name, usually referring to “hydraulic”, the TSH 109 is a fully-equipped mechanical point machine. It is based on the TSH 100’s design and keeps all the goodies. The only difference is it lacks the powered mechanism. The TSH 109 is used at locations where the passenger-carrying trams travel in the facing direction and, at the same, the direction of travel rarely changes. Because a powered device would be too expensive for such cases, a fully-equipped machine that guarantees the highest operational safety is the preferred choice.

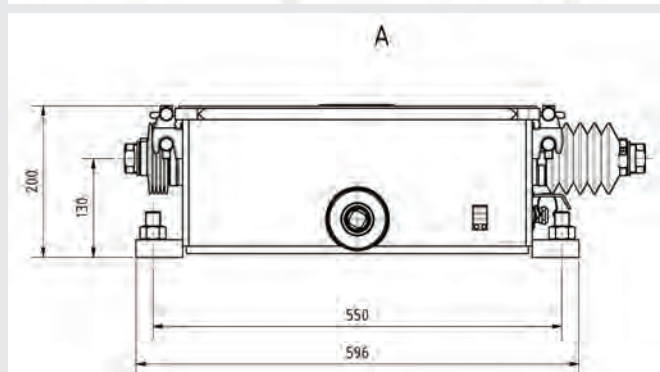
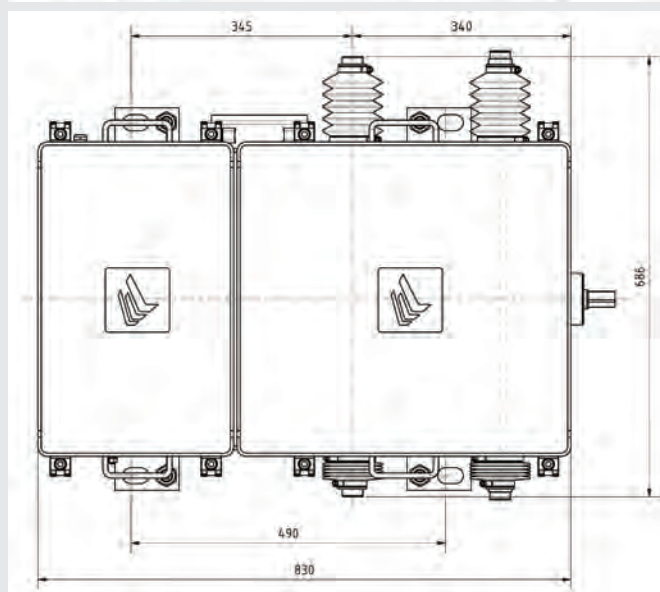
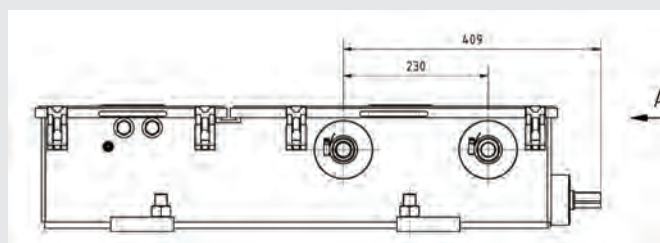
### Highlights

- Stainless-steel Housing
- Watertight

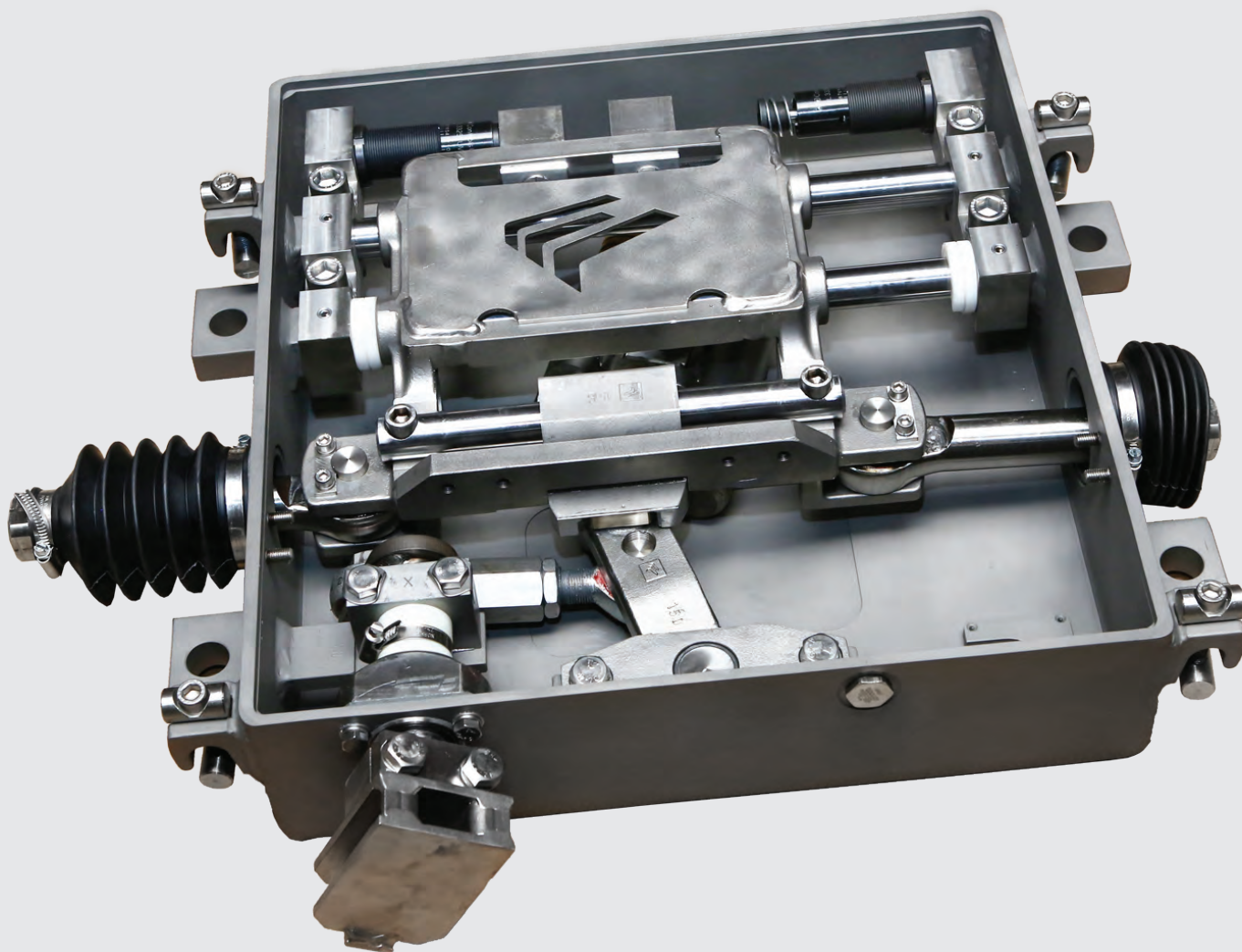


*The electro-hydraulic part is missing in TSH 109 LC (SIL 3)*

- Trailable
- Maintenance-free
- Total Costs of Ownership
- 6 Position Sensors
- SIL3
- IP68



## TSM 070 SERIES



The TSM 070 represents the mechanical point machine family. It's suitable for mainline and/or depot turnouts where trams travel in the trailing direction.

The TSM 070 keeps all characteristics of its powered counter-parts such as stainless-steel body, weathertight-

ness (IP68) and versatility. Although it is a mechanical device, it can be equipped with a pair of position sensors (powered from the controller) signaling the points position to a driver of (not only) the passenger-carrying trams. Such combination further increases the operational safety and brings a peace of mind.



## TSM 070 SERIES

### Damping

In order to reduce vibrations and noise, a pair of dampers is installed in each TSM 070 point machine. In order to achieve the best performance, these dampers should be adjusted independently for each direction. Because of this attention to detail, operation of the point machine is therefore smooth and quiet, even during trailing in the self-reversal mode.

### Replacement for the Powered Machine

By using a special installation adaptor, the TSM 070 point machine can replace an electro-hydraulic device in case it needs to be uninstalled.

### Installation Height

The installation height is only 136 mm enabling the machine to be installed directly on sleepers without requiring major alterations and/or civil works. Even when installed in a ground box, the requirements for installation depth are low saving money on track bed adjustments and maintenance.

### Position Sensors

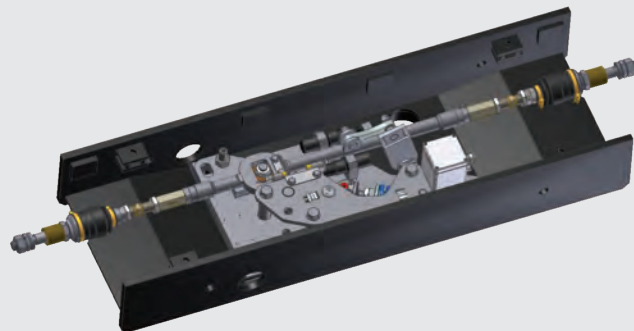
If required, the TSM 070 can be equipped with two independent position sensors monitoring the position of the setting rods.

### Highlights

- Stainless-steel Housing
- Watertight
- Regular or self-reversal mode
- Position Sensors (optional)
- Maintenance-free
- Total Costs of Ownership

## TSM 060 SERIES

### TSM 060



Point machines **TSM 060** series are ideal solution for switch point operation. These mechanical switch points are designed for locations, where no motorized operation of a switch point is required – especially for depot (yards) and other place where no passenger-carrying-trams travel in the facing direction.

### Highlights

- trailing/hand-operated point machine
- maintenance-free mechanism
- used both as hand-operated or self-reversing point machine
- very flat design
- suitable for installation directly on sleepers
- dampening mechanism included
- (including set of custom-made connecting rods, socket for manual operation, and ground box)



## CHOSEN REFERENCES



Brussels, Belgium, 2007-16

- **point machines (electro-hydraulic and mechanical)**
- over 130 pcs. of electro-hydraulic point machines
- over 170 pcs. of mechanical point machines



Blackpool, United Kingdom, 2009-11



- **point machines (electro-hydraulic and mechanical), over 40 pcs**
- switch point control system (SIL 3)
- VETRA tram-to-wayside communication system
- depot signaling system (Vetra communication)



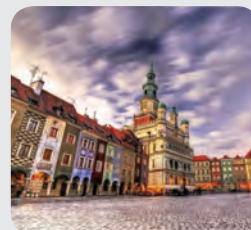
- **point machines (electro-hydraulic)**



Portland, USA, 2014



- **point machines (electro-hydraulic and mechanical)**
- terminal station automatic signaling system
- over 290 pcs. of electro-hydraulic point machines
- over 150 pcs. of mechanical PM



Poland: Poznan, Łódź, Olzstyn, Katowice, Gdańsk, Czestochowa, Bydgoszcz





## CHOSEN REFERENCES



China: Wuhan, Suzhou, Shenyang,  
Qingdao, Beijing, Donghu

- **point machines (electro-hydraulic)**
- over 220 pcs. of electro-hydraulic point machines



Pilsen, Czech Republic, 1992–2016



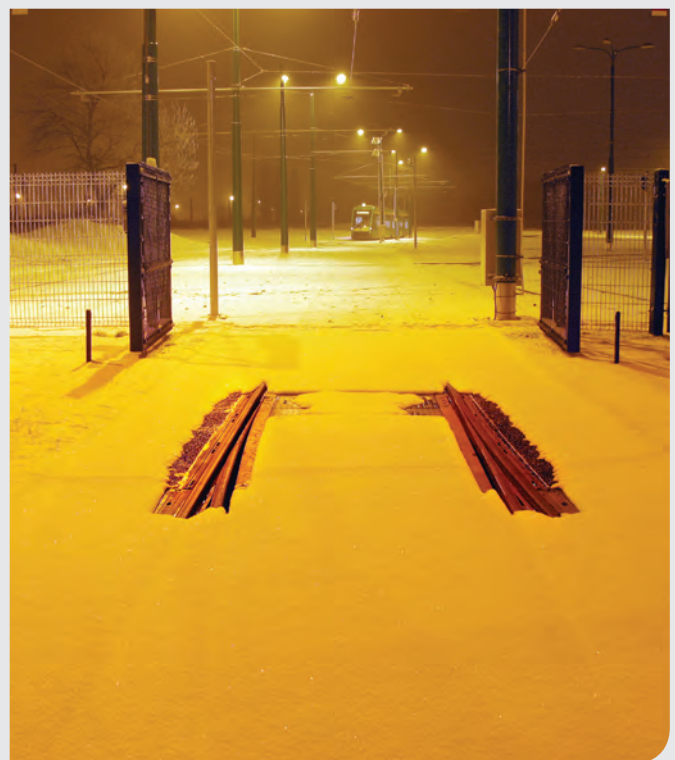
- **point machines (electro-hydraulic), over 50 pcs.**
- switch point control system (SIL 3)
- VETRA tram-to-wayside communication system
- automatic switch point heating
- depot signaling system (VETRA)



- **point machines (electro-hydraulic and mechanical), over 50 pcs.**
- semi-automatic depot control system
- VETRA tram-to-wayside communication system
- tram priority system



Gaziantep, Turkey, 2010–14







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