SEW EURODRIVE

For welding tongs used in the automotive industry:
Electric cylinder with patented bath lubrication

Unique – maintenance-free – patented

The task: Spot welding

There's no accounting for taste about the looks of a car body – but when it comes to its most important task, protecting the passengers from harm as effectively as possible, everyone will definitely agree.

In order to ensure the safety of the passengers, the body must above all be torsionally rigid and it must be able to support the other components. In the case of alternative drive and mobility concepts, it is also necessary to combine a mixture of different materials such as steel, aluminum, plastics, and composite materials.

This secure connection is created by thousands of welding spots on the vehicle body, the doors, the engine hood, etc. Each component contributes to the rigidity of the vehicle and so to protecting the passengers. In vehicle body manufacturing, these welding spot connections are applied fully automatically with consistent precision and quality.

For exactly this purpose, electric cylinders are used to evenly generate the force of the welding tongs. In order for a welding spot to meet all the quality requirements, the welding electrodes must be constantly pressed together and held with the correct amount of force during every welding procedure. Repeat accuracy, process reliability, and durability are just as important quality criteria for the deployed welding tong drive as accurately positioning the welding spots without damaging the surrounding surfaces. This means that welding spatter simply does not occur when a welding tong application works perfectly.

The technical solution

No matter what type of welding tongs you use – X-welding tongs for spots that are hard to access or C-welding tongs for simpler designs – the electric cylinders from SEW-EURODRIVE are perfectly suitable for both applications and will provide you with controlled welding power: SEW-EURODRIVE electric cylinders provide a peak drive force of up to 10 kN in C-welding tongs, and up to 24 kN in X-welding tongs.

The mechanical design of our electric cylinders is variable so they will fit exactly into your welding tong design, whether you are using X-tongs or C-tongs. The design of the electric cylinder depends on the following factors:

– Available installation space
– Required stroke
– Required welding power
– Required speed and
– Used control system

However, all of our electric servo cylinders have the following features in common:

- Maintenance-free for the entire service life due to the patented bath lubrication
- No regreasing required throughout the entire service life
- Very high efficiency (IE5)
- Easy to install
- Excellent power density/enhanced heat distribution thanks to bath lubrication
- Double the service life compared to the market standard
- Lower costs throughout the service life and higher OEE because the entire compressed air preparation and relubrication of the electric cylinder are omitted
- Easily integrated into control systems using flexible encoder systems and connector options
- Exact positioning thanks to ball screws using servo drive technology with high-precision encoders
- Perfect force and repeat accuracy throughout the entire service life, with no need for additional sensors
- Very low noise compared to pneumatically operated welding tongs

20 million welding spots facilitated by bath lubrication

Unique – maintenance-free – patented

The benefits of our electric cylinders with patented bath lubrication of the recirculating ball screw drive at a glance:

- Easy start from a starting position without slip-stick effect
- Smooth running, even in environments prone to dust and humidity
- Compact and lightweight design of the welding tongs, facilitated by the high power density of the electric cylinders and by a water cooling system
- Extremely low acquisition costs compared to other types of electric cylinder
- Increased overall equipment effectiveness (OEE) thanks to patented, maintenance-free bath lubrication
- High force precision for optimum welding quality without a force sensor
- Easy integration into automated car body manufacturing systems thanks to plug-and-play compatibility with market-leading robot controllers
- Up to 92% energy efficiency thanks to a recirculating ball screw solution with bath lubrication
- Extremely high welding quality thanks to high repeat accuracy and feed-in stability, regardless of the temperature and time
- Reduced total cost of ownership as maintenance is no longer required and fewer downtimes for refilling lubricants
- Maintenance-free operation for over 20 million reciprocations

Unique – maintenance-free – patended: Bath lubrication of the electric cylinder

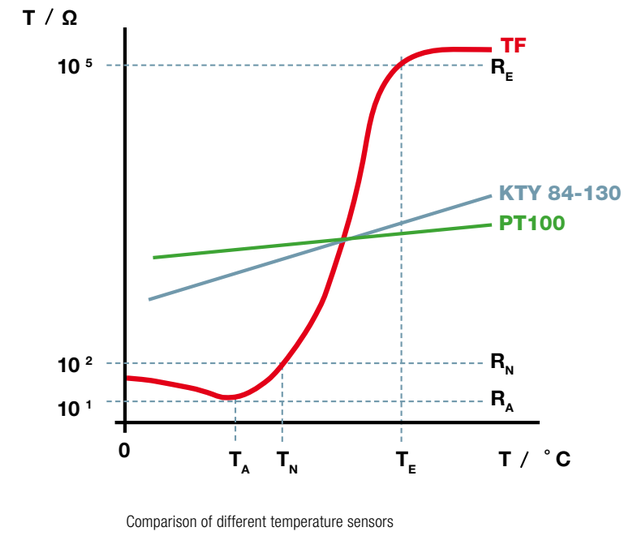
System integration via plug-and-play

Flexible options regarding motor feedback, connection assignment, and temperature sensors allow for plug-and-play operation with the market-leading control systems for welding robots.

There are two variants available for integrating electric cylinders:

1. As 7th axis in the robot controller:
With this variant, the motion of the robot (6 axes) and the opening/closing motion of the welding tongs (7th axis) are defined by the robot controller, e.g. KUKA, ABB, or Fanuc. A welding controller is also required and regulates the welding current.

2. Using the Bosch Rexroth welding control PRC7300 or PRC7400:
A robot controller controls the six axes, but the welding current and the control of the electric cylinder are coordinated and regulated by the PRC7300 or PRC7400.



Comparison of different temperature sensors

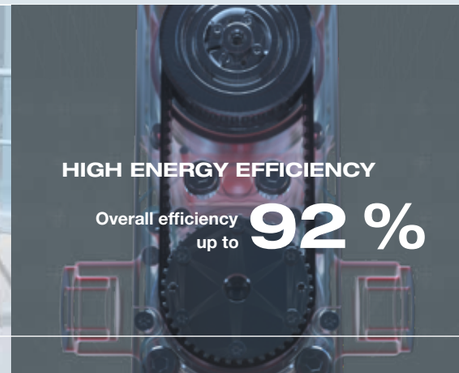
System comparison of welding tong drives

	Conventional	Market standard
Design/ selection criteria	**Pneumatic cylinder**	**Planetary roller screw drive with grease lubrication**
Service life	Depending on maintenance	Depending on relubrication
Speed	Up to 3 m/s	Up to 1.5 m/s
Space requirement and weight	Low	Medium
Noise level	High	Medium
Energy efficiency	7 – 10%[1]	60 – 80%[2]
Force precision	Low	Force sensor required
Positioning accuracy	Medium	High
Maintenance	Regular sealing maintenance every 1.2 million cycles	Regular relubrication every 2 million cycles
Monitoring capability in the process (speed, force, starting behavior)	No speed monitoring	Average monitoring capability, slip-stick effect at start of stroke
Environmental impact	Extremely low efficiency[1]	Higher grease requirement; low efficiency
Characteristic stability during temperature fluctuations, etc. throughout the service life	Risk of leakage in the compressed air system; speed depends on the compressed air	Excellent stability, regardless of the temperature
Additionally required devices	Compressed air supply, pressure reductions, sensors, pneumatic controller	Cables for motor feedback and power supply, servo controller, local relubrication tools
Welding spot quality	Repeat accuracy, positioning, and force control depending on air leakages; design provides less accurate control	High repeat accuracy, positioning, and force control
Reliability of the overall system	Approx. 11 million cycles with regular checks and sealing	15 million cycles with lubricant change after 7.5 million cycles

[1] Requires compressed air preparation; efficiency value incl. various compressions
[2] Depending on the temperature and the relubrication

The new solution from SEW-EURODRIVE

	Future-proof
Design/ selection criteria	**Solution from SEW-EURODRIVE Ball screw with patented bath lubrication**
Service life	**Lifelong**
Speed	**Up to 0.75 m/s**
Space requirement and weight	**Medium**
Noise level	**Low**
Energy efficiency	**86% – 92%**
Force precision	**+/- 150 N**
Positioning accuracy	**High**
Maintenance	**Maintenance-free for entire service life**
Monitoring capability in the process (speed, force, starting behavior)	**Simple and precise controllability**
Environmental impact	**Used oil is collected only at the end of the service life; extremely high efficiency**
Characteristic stability during temperature fluctuations, etc. throughout the service life	**Excellent stability, regardless of the temperature**
Additionally required devices	**Cables for motor feedback and power supply; servo inverter**
Welding spot quality	**High repeat accuracy, positioning, and force control**
Reliability of the overall system	**20 million cycles**



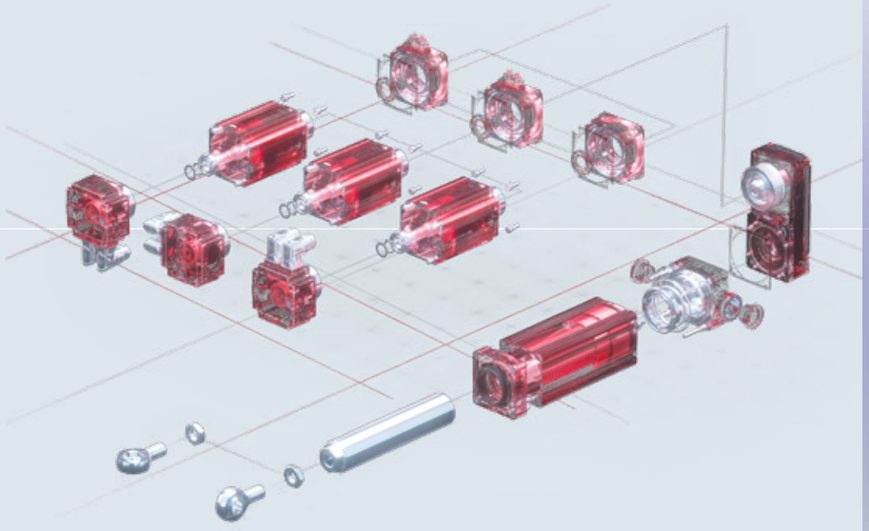
Electric cylinders made by SEW-EURODRIVE are

- **maintenance-fee**
- **reliable**
- **productive**
- **precise**
- **powerful**
- **constant**

and allow for 20 million welding spots over their entire service life

Technical data

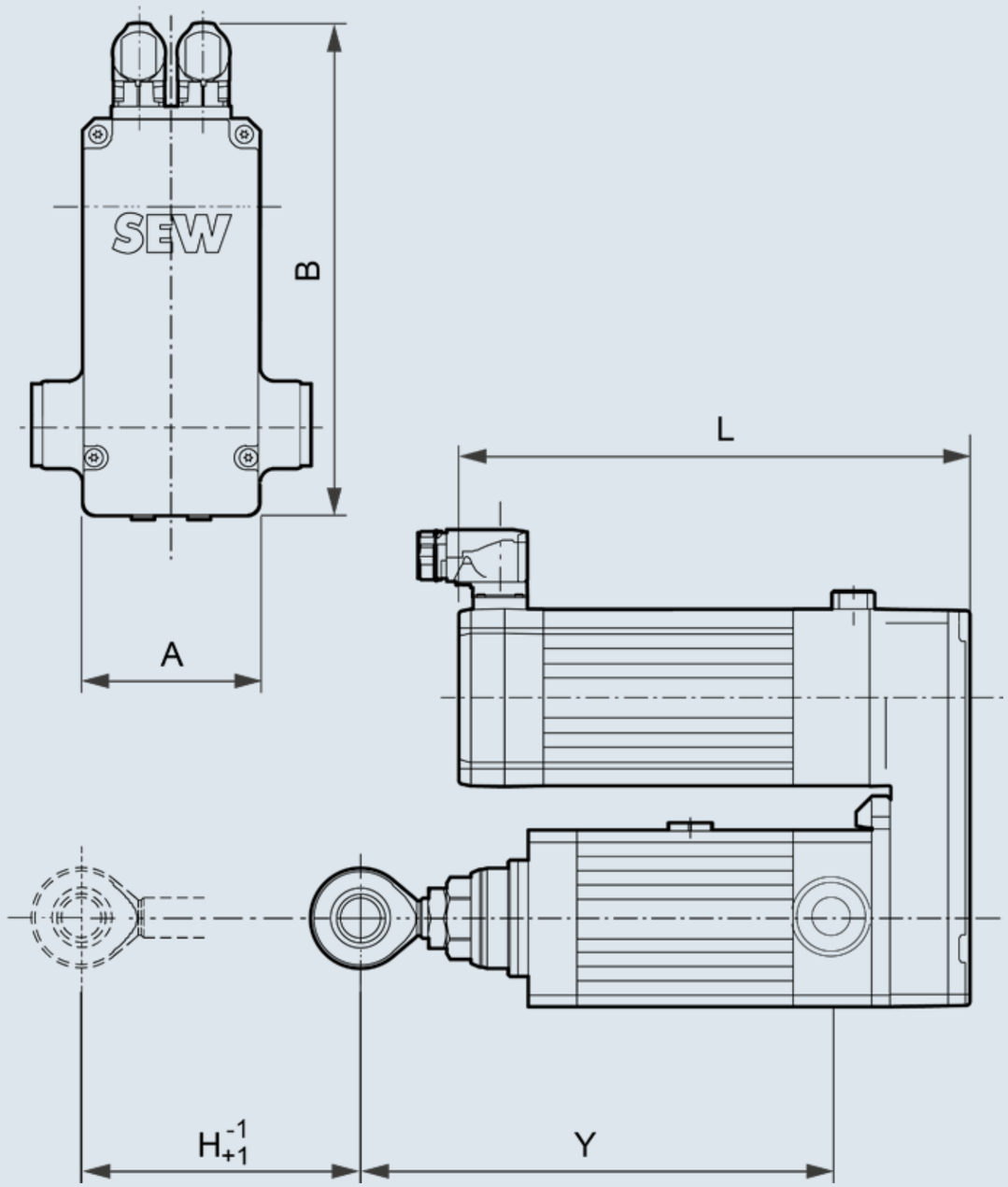
Electric cylinder	Stroke mm	Maximum feed speed m/s	Peak feed force kN	Permanent feed force kN	Weight (stroke lenght 160 mm) kg
Size 50	70 – 600	0.75	2.65 – 8	0.6 – 3.2	5.8 – 13.6
Size 63	60 – 600	0.45	10	2.4 – 5.2	8.8 – 18.6
Size 71	100 – 1200	0.45	18 – 24	6.2 – 12	21.6 – 48.7



Design with parallel axes

Electric cylinder	A	B	H	Y	L
50 **Lengths** **S/M/L**	73	217	70 100 150 200 300 400 600	221.5 251.5 301.5 351.5 451.5 581.5 781.5	Length S: 174.5 Length M: 223.5 Length L: 262.5
63 **Lengths** **S/M/L**	88	245.5	60 100 160 180 200 400 600	235.5 275.5 335.5 355.5 375.5 607.5 807.5	Length S: 252.8 Length M: 302.8 Length L: 352.8
71 **Lengths** **S/M/L**	115	295	100 160 200 400 600 800 1000 1200	326 386 426 686 886 1146 1346 1546	Length S: 229 Length M: 254 Length L: 304

All dimensions in mm

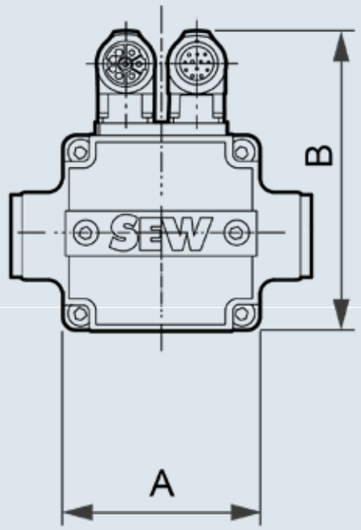


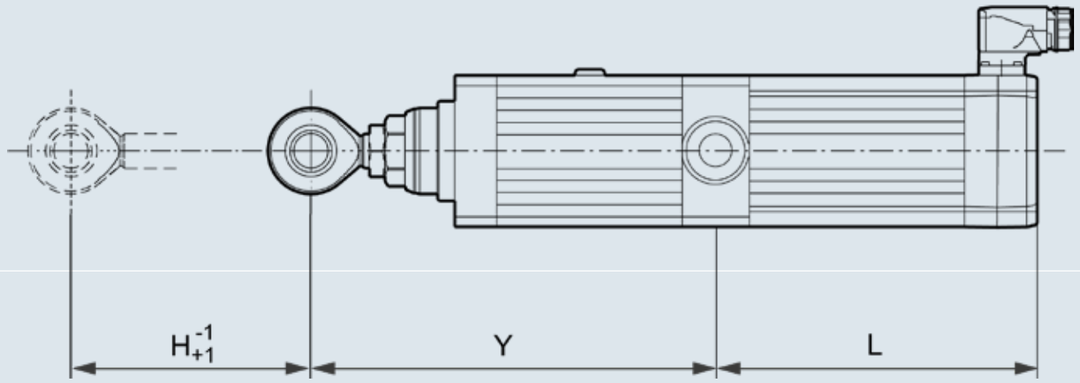
In the case of stationary tongs, please observe our notes in the technical documentation about the oil level, depending on the mounting position of the electric cylinders!

Design with serial axes

Electric cylinder	A	B	H	Y	L
50 **Lengths** **S/M/L**	73	120.7	70 100 150 200 300 400 600	221.5 251.5 301.5 351.5 451.5 581.5 781.5	Length S: 156.4 Length M: 195.4 Length L: 234.4
63 **Lengths** **S/M/L**	88	245.5	60 100 160 180 200 400 600	235.5 275.5 335.5 355.5 375.5 607.5 807.5	Length S: 163.7 Length M: 214.2
71 **Lengths** **S/M/L**	115	295	100 160 200 400 600 800 1000 1200	326 386 426 686 886 1146 1346 1546	Length S: 211 Length M: 236 Length L: 286

All dimensions in mm





In the case of stationary tongs, please observe our notes in the technical documentation about the oil level, depending on the mounting position of the electric cylinders!

Our modularity – your project success

WE AUTOMATE
welding tongs – in your production too

To produce safe vehicles efficiently and economically, automotive manufacturers place two essential requirements in body construction on the welding tongs and their drive components:

1. Consistently high quality in the welding process and

2. Guaranteed system availability

Ultimately, the quality of the welding is indicated by the so-called “welding spot”. The smaller the diameter, the better – and that is why the tongs have to be tracked, naturally with constant pressure on the sheet metal. In this “tracking”, we refer to tolerances in the range of +/- 150 N – regardless of how heavy the welding tongs are or which design principle they have. C-tongs with simple designs are used for this, whereas X-tongs are the perfect choice when you need to apply welding spots in awkwardly accessible locations.

How long and how well the welding tongs work and ultimately how high the level of system availability is essentially depend on the tongs drive being used. For this purpose, we at SEW-EURODRIVE, as a manufacturer of drive technology for almost 90 years of experience, rely on our proven “recipe for success”: **Quality and innovation in the drive components and their modularity for flexible applications.**

Our electric cylinders have a service life of 20 million welding spots. Of course, they provide a constant power transmission over the entire life cycle of the welding tongs. Thanks to the patented bath lubrication, they are entirely wear-free for this entire period – and so no maintenance of the tongs drive is necessary. In addition, they have a modular structure and can be used in both C- and Z-welding tongs.

The electric cylinders made by SEW-EURODRIVE have been performing their task as the tongs drive in welding tongs for several years: Always hidden behind the scenes, but always efficient and with precisely the right force and – above all – always reliable. Worldwide.

Try us and our electric cylinders for welding tongs out – we shall be delighted to work on your projects: **www.sew-eurodrive.de.**

The electric cylinders are used successfully in many spot-welding applications with controllers from the following suppliers of robot and welding controllers:

Volkswagen, Audi, SEAT, MAN, Skoda

Düring, SERRA, HELU Schweißtechnik, NIMAK Die perfekte Verbindung

FANUC, rexroth A Bosch Company, ABB, KUKA

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