EPS

Electro-
Pneumatic-
Spindle drive

„FAST AND DYNAMIC“
TO THE PERFECT WELDING RESULT

DESIGN FEATURES

The main features of the **Electro-Pneumatic Spindle drive (EPS)** developed by **DALEX** are its servo-motorised linear unit with the tracking unit attached to it. The linear unit is designed as a spindle drive.

The tracking unit provides the device for pneumatic welding force generation. The principle of a pretensioned spring filled with compressed air is used to transfer the welding force to the welding spot. The masses to be accelerated during welding are very low, which ensures excellent repositioning behaviour.

Since the drive concept does not require sliding seals, static and sliding friction influences are almost completely eliminated. The high dynamics of the drive are additionally supported by very low-friction roller-bearing guides.

FUNCTION

By means of the servomotor linear unit, the welding electrodes can be adjusted to each other according to the required welding task and component geometry. The adjustment of the welding force to the welding task can be done simply by entering the welding force via the user interface.

After preselection of the welding force and thus the required force range of the tracking unit, the „spring pressure“ (welding pressure) is automatically determined on the basis of the sets of characteristic curves stored in the machine control and the required spring compression is determined.

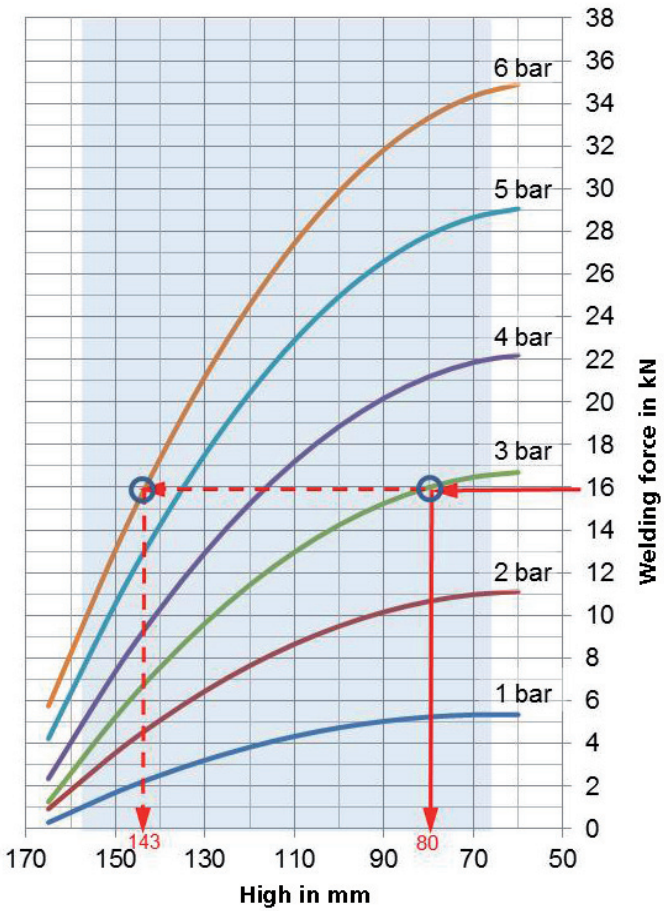
Depending on the component, the welding electrode is then fed to the welding point with the spindle-propulsion. The „pneumatic spring“ is loaded with a defined, adjustable fraction of the welding pressure. This ensures that the electrode is applied to the workpiece gently and without impact.

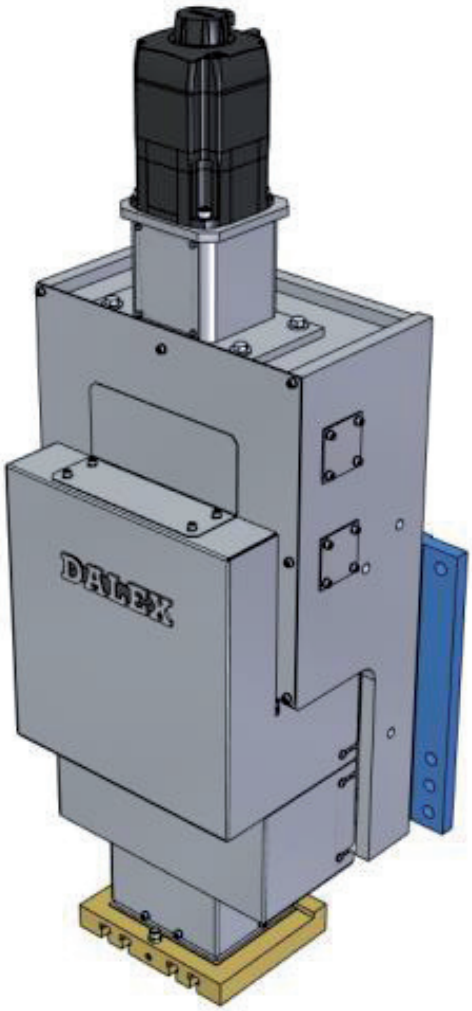
DALEX Schweißmaschinen GmbH & Co. KG - Koblenzer Str. 43 - D - 57537 Wissen
Tel. +49 2742 / 77-0 - Fax +49 2742 / 77-101 - info@dalex.de - **www.dalex.de**

A sensor in the tracking device detects the placement of the electrode and then gives the signal for further adjustment of the spring travel up to the specified spring compression. The welding force is applied and the welding process can be started immediately because the pressure has already been pre-controlled. The compressed air consumption required for this is extremely low and only occurs when the electrode force is adjusted.

During the melting off of the welding projections the tracking device adjusts under expansion of the spring. Due to the selected spring characteristics, the welding force acts almost constantly by means of the tracking device over the tracking path..

Fig. 2 (right): Pressure-dependent characteristic curves of the Electrical Pneumatic Spindle drive (schematic).





TECHNICAL VALUES

Infeed speed
of the spindle adjustable: 0 - 200 mm/s

Force ranges of the
tracking unit[1]: 50 daN – 430 daN
150 daN – 1500 daN
310 daN – 3400 daN

[1] plus tool weight

Fig. 3: DALEX-Electro-Pneumatic Spindle Drive (EPS)

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„DYNAMIC“ OF THE WELDING PROCESS

The dynamic properties of the **DALEX Electro-Pneumatic Spindle drive (EPS)** can be seen on the best in comparison to other, conventional welding drives. In the following example the welding of a ring projection on a capacitor discharge machine (KE) with **EPS** and for comparison with a linear drive and additional pressure compensation with elastomer springs is compared.

If the current curve in Figure 4 is viewed, it can be seen that the welding force collapses as soon as the annular projection begins to melt.

It can be clearly seen that the original force level is only reached again relatively late. At this point, however, the welding current of the capacitor discharge has already decayed to approx. 20% of the maximum welding current.

This means that the entire welding process takes place at a significantly lower effective welding force than that preselected. The welding process is practically completed electrically before the welding force has reached its preset level again.

Figure 5 shows the same welding task, but carried out with the **DALEX Electro-Pneumatic Spindle drive (EPS)**. Here, too, the welding force collapses when the weld projection begins to melt. In contrast to Figure 4, however, it can be seen that the welding force returned to its initial value much more quickly. In this case, the welding current has just exceeded its maximum value and is still at about 80% of the maximum value. The welding force is thus at the preselected level for almost the entire „current time“.

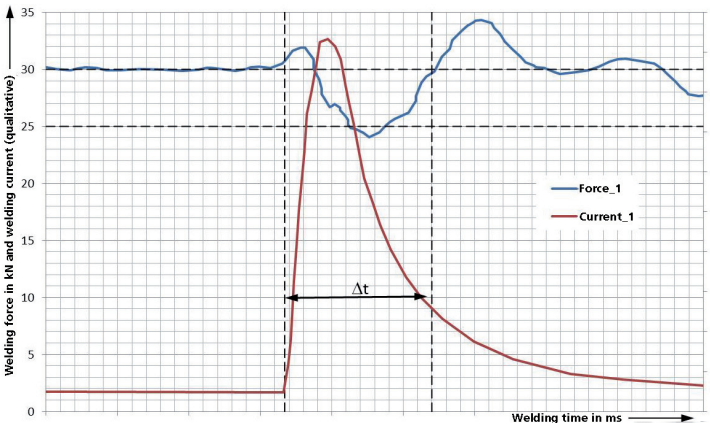

Fig. 4:
Schematic representation of KE welds with linear drive and additional elastomer pressure compensation

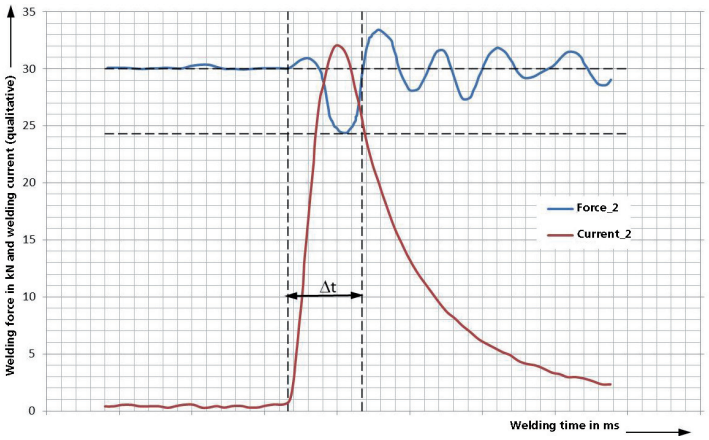

Fig. 5:
Schematic diagram of DALEX Electro-Pneumatic Spindle Drive without additional pressure compensation

„ADVANTAGES“ FOR THE USER

▪ Freely selectable working stroke	The servomotor drive allows fast, stepless adjustment of the feed movements to the welding tasks.
▪ Short cycle times	Short cycle times can easily be achieved by the servo motorized infeed.
▪ Impact-free touchdown	The servo-motorized adjustment makes it possible to move the tracking unit towards the workpiece without impact.
▪ Low moving mass	The mass to be moved during the welding process is greatly reduced due to the pneumatic spring.
▪ High dynamic repositioning	This is achieved by the fact that during the actual welding process only the components directly connected to the tracking unit need to be accelerated.
▪ Low friction and wear	Friction and wear are significantly reduced by the roller bearing guides.
▪ Minimum compressed air consumption	Only when the electrode force is adjusted, a very small amount of compressed air is required to adjust the pressure of the pneumatic spring.
▪ Low noise	Since the outflowing air volume is low, noise is also greatly reduced.
▪ User-friendly operation	The welding drive can be easily parameterized by preselecting the force on the machine control.