In the automotive industry, resistance robot welding guns are used to weld the parts of the car body. In this automated welding process, the welding current melts the car body parts on the contact surface so that they are permanently connected at the welding spot. The welding electrodes are supplied with replaceable electrode caps. They easily wear due to thermal and mechanical strain, which affects the quality of the welding spots. After a given number of welding spots, the electrodes are treated in a tip dresser unit. The original form of the caps is restored so that the welding spots comply with the requested quality with respect to size, form and stability. To dress the rotationally symmetrical electrode caps, the robot arm swings the weld gun towards the tipdresser. After a short period, the gun closes, and the caps are renewed by erosion of 0.1 – 0.15 mm in a dressing process of only 2 seconds.

A pneumatic system keeps the swarf that develops during this procedure from the operation spot and leads it into a collection unit (swarf collection unit). No cooling lubricants are used during the dressing process.

Tip dressers abe3600..., abe3610..., and the combined tip dresser and form system abe3610 can be used for the mechanical treatment of electrode caps. If fixed stationary weld guns are used, the above machines can be mounted onto the swing unit abe1000; abe1500; abe1600... or onto the docking device abe6000.... This enables the machines to be swung or transported accurately and repeatedly to the operation spot.

Different milling heads can be used in the tip dresser. Hence, it is possible to dress almost every rotationally symmetrical cap geometry. Detailed figures of the different variants are listed in Appendix „Table: Numbering system for milling heads“.

**Advantages for the operator:**

- Increased endurance for electrode caps
- Increased number of welding spots carried out by one pair of electrodes
- Optimisation of servicing intervals
- Increased quality of welding spots
- Diameter of the lens remains constant
- Reduction of machine stoppages when changing electrodes
- Reduction of production defects
- Increased safety during welding process
- Optimisation and stabilisation of technical parameter for welding control system
Tipdressers – general information

Standard values for dressing intervals:

The following parameters determine the possible quantity of welding spots:
- The material of the metals to be welded
- Sheet thickness
- Surface treatment of the used metal material (structure, cleanliness)

In comparison, see the following approximate values for dressing intervals: (not considering the metal sheet thickness)

<table>
<thead>
<tr>
<th>Material</th>
<th>Quantity of welding spots</th>
</tr>
</thead>
<tbody>
<tr>
<td>ungalvanised</td>
<td>200 - 800</td>
</tr>
<tr>
<td>double galvanised</td>
<td>75 - 200</td>
</tr>
<tr>
<td>aluminium</td>
<td>15 – 75</td>
</tr>
</tbody>
</table>

Drive:

Control box
A small control box is attached to the stand of the electrode tip dresser. It houses the engine protection plate, contractor, and relay for the actuators. All signals for the control including the monitoring devices, the limit switch, etc. are wired to a connector block. In this case, the INTERBUS Rugged Line DIO Module on the robot controls the signals.

Interbus module
Another control device is the starter module (IBS RL 400 MLR R DIO6/1 LK) from the product line INTERBUS Rugged Line by Phoenix Contact.

Advantages when using the Rugged Line starter module:
- The tip dresser can be easily integrated into an already existing Rugged Line Installation.
- The module is integrated in an IP67 zinc diecasting shell. The module is protected from spatter formation– hence, it can be installed next to weld guns.
- The module is clipped-on to the mounting plate and can be easily changed in case of a defect.
- Quick and effective connection of the power supply with IP67.
- Motor current parameters via process data

Optional additional components:

Optical sensor
The optical sensor (reflection light optical scanner) serves as quality assurance of the surface of the welding caps after dressing. Two reflection light optical scanners (adjustable in sensitivity) test the lens of the dressed electrode cap.

Force sensor
This sensor monitors whether the weld gun develops the requested pressure within a given time. The sensor measures the pressure on the electrodes.

Current sensor
This sensor monitors the welding current.
Electrode tip dressing system abe3600...

Application:
Stationary tip dressers are used for the mechanical dressing of spot welding electrodes. The tip dresser is attached to the stand of the robot weld gun on an infinitely height-adjustable stand. Different milling heads can be used with the machine, so every rotationally symmetrical cap form can be dressed.

Milling procedure:
The weld gun that is attached to the robot arm is moved to the tip dresser to restore the required cap form and geometry. After the electrodes are positioned near the milling head, the weld gun closes and the electrode caps are moved into the milling head and can be dressed.

Milling parameters:

<table>
<thead>
<tr>
<th>Minimum electrode force:</th>
<th>1,0 kN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommended electrode force:</td>
<td>1,2 kN</td>
</tr>
<tr>
<td>Milling time (initially):</td>
<td>2 x 1,5 s</td>
</tr>
<tr>
<td>Milling time (normal):</td>
<td>0,8 – 1,5 s</td>
</tr>
</tbody>
</table>

Electrical data:

<table>
<thead>
<tr>
<th>Rated voltage (V):</th>
<th>3 ~ 400</th>
<th>3 ~ 415</th>
<th>3 ~ 460</th>
<th>3 ~ 480</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency (Hz):</td>
<td>50</td>
<td>50</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Rated current (A):</td>
<td>2,0</td>
<td>1,95</td>
<td>1,74</td>
<td>1,68</td>
</tr>
<tr>
<td>Output:</td>
<td>0,7kW – S3 – 5%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor speed n2 (RPM):</td>
<td>390</td>
<td>390</td>
<td>465</td>
<td>465</td>
</tr>
<tr>
<td>Tip dresser speed, unloaded (RPM):</td>
<td>301</td>
<td>301</td>
<td>362</td>
<td>362</td>
</tr>
<tr>
<td>cos phi:</td>
<td>0,82</td>
<td>0,82</td>
<td>0,82</td>
<td>0,82</td>
</tr>
<tr>
<td>Control voltage:</td>
<td>24 V DC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compressed air supply:</td>
<td>6 – 12 bar (oil-free)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Information on milling parameters:
The electrode forces and especially the milling times depend on the form (geometry) and material of the electrode caps or welding spot electrodes. Other influencing variables include the geometry of the cap to be milled (the slope of its flank and the forepart diameter), the time to build up pressure in the cylinder of the gun and the number of weldings between welding cycles (enlargement of forepart diameter, dirt accumulation and application of the caps). The above-mentioned milling parameters are standard values, the optimum values for the particular milling job have to be determined by optimising the machine
Aufbauvarianten bei stationären Kappenfräsern

Set-up variants – stationary tip dresser

Dieses Merkblatt ist allgemeingültig und dient nur zur schematischen Darstellung der Aufbauvarianten. This technical bulletin is generally accepted and serves as a schematic representation of the set-up variants only.

**Variante V1** (Vorzugsvariante/preferred)
Fräserlage vertikal 180°
Dresser vertical 180°

**Variante H**
Fräserlage horizontal
Dresser horizontal

**Variante V2**
Fräserlage vertikal 90°
Dresser vertical 90°

Für vertikale Aufbauvarianten ist ein Vertikalwinkel (Best.-Nr.: 89040000010012) notwendig. Vertical variants require an additional vertical angle (order number: 89040000010012)
TIP Dresser abe 3600.037.00A

Milling base unit:
- Gear with height equalization and drive without milling head
- Order-No.: 830471610600
- Type: abe 3600.K005.0001A
- Order-No.: 8160050001A

Swarf lead system:
- Type: NSB-3000-038.3
- Order-No.: 8653383
- Height 700 mm
- Engine start module:
- Order-No.: 86090000000700
- (400 V ; 2MB RAM)

Power DATA / Connected Loads:
- Operating voltage: 3 ~ 400 V 3 ~ 460 V 3 ~ 480 V
- Frequency: 50 Hz 60 Hz
- Rated Current: 2.0 A 1.95 A 1.74 A 1.68 A
- Output: 0.7 kW - 83 - 5%
- Tip Dresser revolutions (load free):
  - 301 rpm
  - 301 rpm
  - 362 rpm
  - 362 rpm
- Cos phi: 0.82
- Control voltage: 24 V DC
- Compressed air input: 4 - 6 bar (oil free)
- Air consumption during swarf blow-out: ca.: 400 l/min
- Energy consumption tip dresser:
  - ca.: 0.3 Wh (load=1.5 kN / milling duration t = 1.5 seconds)

Milling Parameter (guiding values) / LC-parameter:
- Min. Electrode power: 1.0 kN
- Recommended electrode power: 1.2 kN (max. 1.5 kN)
- 1.8 kN (max. 2 kN)
- Milling duration start dressing: 2 * 1.5 sec.
- 2.0 - 2.5 seconds
- Milling duration normal dressing:
  - 0.8 - 1.5 sec
  - 2 - 4 Seconds

Supplies Options / Besonderheiten / DRIVE VARIANTS:
- Special Color
- Special Valve
- Screw f. LC-UNI-Head
- Sensor unit
- Welding current sensor
- Optical sensor
- Welding-force sensor

Variant C
- 386/301 rpm

Variant F
- 720/563 rpm

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URL: www.schweisstechnik-sb.de
Stand: 11.10.2006
**TIP Dresser abe 3600.037.15A**

**Milling base unit**
- Gear with height equalization and drive without milling head

**Electric switch box with connection cable for drive and proximity switch cable for tip dresser**

**Stand**

**Vertical angle**
- for vertical set-up variant V2

**Power Data / Connected Loads**

<table>
<thead>
<tr>
<th>Operating Voltage</th>
<th>3 ~ 400 V</th>
<th>3 ~ 415 V</th>
<th>3 ~ 460 V</th>
<th>3 ~ 480 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>50 Hz</td>
<td>50 Hz</td>
<td>60 Hz</td>
<td>60 Hz</td>
</tr>
<tr>
<td>Rated Current</td>
<td>2.0 A</td>
<td>1.95 A</td>
<td>1.74 A</td>
<td>1.68 A</td>
</tr>
<tr>
<td>Output</td>
<td>0.7 kW - 5%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tip Dresser revolutions (load free)</td>
<td>301 rpm</td>
<td>301 rpm</td>
<td>362 rpm</td>
<td>362 rpm</td>
</tr>
<tr>
<td>cos phi</td>
<td>0.82</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control voltage</td>
<td>24 V DC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compressed air input</td>
<td>4 - 6 bar (oil free)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air consumption during swarf blow-out</td>
<td>ca.: 400 l/min</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy consumption tip dresser</td>
<td>ca.: 0.3 Wh (load=1.5 kN / milling duration t = 1.5 seconds)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Milling Parameter (guiding values)**

| Min. Electrode power | 1.0 kN | 1.8 kN |
| recommended electrode power | 1.2 kN (max. 1.5 kN) | 1.8 kN (max. 2 kN) |
| Milling duration start dressing | 2 * 1.5 sec. | 2 x 1.5 Seconds |
| Milling duration normal dressing | 0.8 - 1.5 sec | 2-4 Seconds |

**Supplies Options**

<table>
<thead>
<tr>
<th>Besonderheiten</th>
<th>DRIVE VARIANTS</th>
<th>Revolutions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Variant A</td>
<td>386/301 rpm</td>
</tr>
<tr>
<td></td>
<td>Variant C</td>
<td>386/301 rpm</td>
</tr>
</tbody>
</table>

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Stand: 01.11.2006
Double head tip dresser system abe3610...

Application:
Stationary tip dressers are used for the mechanical dressing of spot welding electrodes. The tip dresser is attached to the stand of the robot weld gun on an infinitely height-adjustable stand. Different milling heads can be used with the machine, so every rotationally symmetrical cap form can be dressed.

Milling procedure:
The weld gun that is attached to the robot arm is moved to the tip dresser to restore the required cap form and geometry. After the electrodes are positioned near the milling head, the weld gun closes and the electrode caps are moved into the milling head and can be dressed. Afterwards, the second milling head can be used to mill a cap pair of another gun.

Milling parameter:

<table>
<thead>
<tr>
<th>Minimum electrode force:</th>
<th>1.0 kN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommended electrode force</td>
<td>1.2 kN</td>
</tr>
<tr>
<td>Milling time (initially):</td>
<td>2 x 1.5 s</td>
</tr>
<tr>
<td>Milling time (normal):</td>
<td>0.8 – 1.5 s</td>
</tr>
</tbody>
</table>

Electrical data:

<table>
<thead>
<tr>
<th>Rated voltage (V):</th>
<th>3 ~ 400</th>
<th>3 ~ 415</th>
<th>3 ~ 460</th>
<th>3 ~ 480</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency (Hz):</td>
<td>50</td>
<td>50</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Rated current (A):</td>
<td>1.92</td>
<td>2.0</td>
<td>1.75</td>
<td>1.85</td>
</tr>
<tr>
<td>Output:</td>
<td>0.7 kW – S3 – 5%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>390</td>
<td>390</td>
<td>465</td>
<td>465</td>
</tr>
<tr>
<td>Tip dresser speed, unloaded (RPM):</td>
<td>301</td>
<td>301</td>
<td>362</td>
<td>362</td>
</tr>
<tr>
<td>cos phi:</td>
<td>0.82</td>
<td>0.82</td>
<td>0.82</td>
<td>0.82</td>
</tr>
<tr>
<td>Motor speed n2 (RPM):</td>
<td>24 V DC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control voltage:</td>
<td>24 V DC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compressed air supply:</td>
<td>6 – 12 bar (oil-free)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Information on milling parameters:
The electrode forces and especially the milling times depend on the form (geometry) and material of the electrode caps or welding spot electrodes. Other influencing variables include the geometry of the cap to be milled (the slope of its flank and the forepart diameter), the time to build up pressure in the cylinder of the gun and the number of weldings between welding cycles (enlargement of forepart diameter, dirt accumulation and application of the caps). The above-mentioned milling parameters are standard values, the optimum values for the particular milling job have to be determined by optimising the machine.
TIP Dresser abe 3610.037.00A

TIP dresser complete unit
Stand and E-box, without Milling Head
Type: abe 3610.037.00A
order-Nr.: F-3610.037.00A

Milling base unit
gear with height equalization and drive without milling head
Type: abe 3610.K005.0000A
order-Nr.: 81610050000A

Swarf lead system
Type: SAS-3610-13
order-Nr.: 850.3610.13

Milling head with cutter
AIR-LESS-Milling System single-cutter system
Type: 4716.106.00
order-Nr.: 830471610600

Electric switch box with connection cable for drive and proximity switch cable for tip dresser
Type: (Standart; RAL 9002)
order-Nr.: 8653383

Pneumatic Valve for swarf blow-out (with connection cable)
Type: 2/2 Valve Bräuer
order-Nr.: 89040000010012

Stand
Type: 1416.106.00
order-Nr.: 830141610600

Vertical angle for vertical set-up variant V2
Type: 3610.106.00
order-Nr.: 835361610600

Power DATA / Connected Loads
Operating voltage
3 ~ 400 V
3 ~ 415 V
3 ~ 460 V
3 ~ 480 V
Frequency
50 Hz
50 Hz
60 Hz
60 Hz
Rated Current
2.0 A
1.95 A
1.74 A
1.68 A
Output
0.7 kW - 53 - 5%
Tip Dresser revolutions (load free)
301 rpm
301 rpm
362 rpm
362 rpm
cos phi
0.82
Control voltage
24 V DC
Compressed air input
4 ~ 6 bar (oil free)
Air consumption during swarf blow-out
ca.: 400 l/min
Energy consumption tip dresser
ca.: 0.3 Wh (load=1.5 kN / milling duration t = 1.5 seconds)

Milling Parameter (guiding values)
Min. Electrode power
1.0 kN
1.8 kN
Recommended electrode power
1.2 kN (max. 1.5 kN)
1.8 kN (max. 2 kN)
Milling duration start dressing
2 ~ 1.5 sec.
2 x 1.5 Seconds
Milling duration normal dressing
0.8 ~ 1.5 sec
2-4 Seconds

Supplies Options
specially Color
O.-Nr.
specially Valve
O.-Nr.
screw f. LC-UNI-Head
O.-Nr.: 3100000030085
Sensor-unit kpl.
O.-Nr.: 8605106
welding current sensor
O.-Nr.: 8605500
optical sensor
O.-Nr.: 8053600001006
welding -force sensor
O.-Nr.: 8605501

DRIVE VARIANTS

Revolutions

Variant A
366/301 rpm

Variant C
386/301 rpm

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Stand: 01.11.2006
Hand-operated electrode cap milling system 
abe2400... with pneumatic drive

Application/use:
The hand-operated electrode cap milling cutter was developed especially for the mechanical finishing of electrode caps in hand-held transformer welding guns and cable welding guns.
An interchangeable milling head allows you to process rotationally symmetrical electrode caps with different diameters and geometries simultaneously and on both sides.

Requirements:
• disconnect welding current on welding gun before milling
• welding gun power has to be reducible (see milling parameters)
• recommended number of persons for milling procedure: 2 (1 person for welding gun / 1 person for tip dresser)

Milling process:
For the milling process, the tip dresser will be adjusted manually to the locked electrode cap. Subsequently, the tip dresser will be started manually (by actuating the hand lever valve) and the welding gun will be closed. The welding current has to be stopped prior to milling. After processing, the welding gun will be opened and the dresser switched off.

Milling parameters (guidelines):
<table>
<thead>
<tr>
<th>Maximum electrode force:</th>
<th>1.1 – 1.4 kN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milling time - initial milling:</td>
<td>3 x 5 s</td>
</tr>
<tr>
<td>Milling time – normal milling:</td>
<td>1.5-3 s</td>
</tr>
</tbody>
</table>

Performance data/connection values:
| Torque measurement (Nm): | 60 / 90 |
| Speed (RPM): | 2120 / 170 |
| Operating pressure (bar): | 5.5 – 6.3 |
| Compressed air consumption (l/min): | 150 / 190 |
| Weight (kg): | 2.3 |
| Air connection: | Plug nipple ¼“ |

Notes about milling parameters:
The electrode forces and the milling times in particular are heavily dependent on the shape (geometry) and the material of the electrode caps or spot welding electrodes. Other influencing variables include the geometry to be milled on the cap (steepness of the side and face-to-surface diameter), the pressure build-up time in the gripper cylinder, and of course the number of welds between milling cycles (expansion of face-to-surface diameter, dirt and alloys on the caps). Therefore, the above milling parameters are guidelines; the best values for each milling task can be determined and adjusted by optimising the system.
## HAND-OPERATED TIP DRESSER  abe 2400.000.10

### Tip Dresser
- **without Milling Head**
- **Type:** abe 2400.000.10
- **Order-Nr.:** F-2400.000.10

### Stand: height adjustable
- **615 - 1000 mm**
- **Typ:** (Standart; RAL 9002)
- **Order-Nr.:** 890405/9000000100

### Milling Head with Cutterblade
- **single-cutter system**
- **Type:** 8616.106.20
- **Order-Nr.:** 830861610620

### Pneumatic Drive
- **Type:** abe 2400.000.10
- **Order-Nr.:** 87024000001005

### Milling Base Unit
- **Type:** abe 2400.000.10
- **Order-Nr.:** 83024000001009

### Supplies / Options
- **specially Color**
- **specially valve**
- **screw for Milling Head**

### Milling Parameter (Guiding values)
- **Min. Electrode force:** 1,0 kN
- **recommended electrode force:** 1,2 kN
- **Cutt Time:** 5-10 sec.

### Power Data / Connected Loads
- **weight:** 2.5 kg
- **torque:** 90 Nm
- **air pressure:** 5.5 - 6.3 bar (1/4”)
- **air consumption:** ca. 400 l/min
- **noise emission value:** 73 dB (A)

### Drive Variants
- **Variante A:** 170 rpm

---

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**Stand:** 23.10.2006
Übersicht: Nummerierungssystem Fräsköpfe

Chart: numbering system for milling heads

Beispiel: Fräskopf 2616.106.00
Example: milling head 2616.106.00

Stand: 09.10.2006
### Datenblatt zur Fräskopfauswahl
**DATA SHEET for Milling Head Selection**

- **Informationen zur Schweißzange und zu den Originalkappen**
- **Information about weld gun and original caps**

#### Diagram:
- **C-Zange/ C-type gun**
- **X-Zange/ X-type gun**

#### Table:
<table>
<thead>
<tr>
<th>Nr.: /No.:</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>fester Arm / fixed arm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>beweglicher Arm / movable arm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>oberer Arm / upper arm (*)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>unterer Arm / lower arm (*)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(*) Oberer/unterer Elektrodenarm nicht wie auf Zeichnung, sondern in Bezug auf Kappenfräser.
Hinweis: Es ist immer vorteilhaft, wenn der bewegliche Arm von oben in den Fräser einfährt und den Fräser beim Schließen der Zange auf den unteren Arm drückt.

Please note: It is always advantageous if the movable arm drives into the tip dresser from above, so the tip dresser is being pushed onto the lower arm when the gun closes.

<table>
<thead>
<tr>
<th>Maß / Measure</th>
<th>h1</th>
<th>h2</th>
<th>l2</th>
<th>Winkel / Angle ;1</th>
<th>Winkel / Angle ;2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kappe / Cap 1 (**)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kappe / Cap 2 (**)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(**) Angaben zur DIN /ISO-Form / Größe, nach Werksnorm, oder nach Zeichnung usw.

(**) Details about DIN / ISO shape/size according to customer specification, or drawing, etc.

Minimale Zangenöffnung (Arbeitshub)
Minimum gun opening (working stroke)

#### Information zum gewünschten Fräsbild
**Information about the requested dressing quality**

- **obere Kappe / upper cap**
  - LinsenØ / Lens diameter d1
  - Radius des LinsenØ / Radius of lens diameter R1
  - Flankenwinkel / Flank angle w1

- **untere Kappe / lower cap**
  - LinsenØ / Lens diameter d2
  - Radius des LinsenØ / Radius of lens diameter R2
  - Flankenwinkel / Flank angle w2

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