ARO, worldwide leader in the area of resistance welding has designed this range of medium-power machines to cover the 4 families of resistance welding: projection, spot, seam and butt welding.

With the benefit of the experience gained with the M and MOS ranges, the P series integrates the latest technologies designed for resistance welding including Medium Frequency technology for the most demanding users.

Using a single machine frame, 8 "High Performance" transformers (AC or MF), 8 different programmable welding commands, a choice of 5 cylinders and 4 distinct pneumatic regulators, and through its know-how ARO optimizes the modularity of its offer with these 4 families thanks to a choice of standard and optional items of equipment.

Each "P" series machine is fitted with a very complete basic set of equipment, such as:
- 400 V/50 Hz power supply as standard,
- electric pedal on PA, PE or
- bimanual control desk on PB and PF,
- Filter, regulator pressure gauge and purge valve assembly for the air circuit,
- Solenoid valve for controlling the pneumatic cylinder,
- 740 daN cylinder with unlubricated air at 6 bar, or
- 1380 daN two-stage cylinder with unlubricated air at 6 bar,
- Safety pressure switch,
- Thyristor variator and welding control
- Program selector,
- With/without current selector,
- Mains power supply switch,
- 1/4 turn valves for the water supply.
A wide range of optional items of equipment is proposed to complete the basic system:

■ **For the frame:**
  - 150 mm riser,
  - Stay for machines with an effective length of more than 600 mm.

■ **For the resistance welding programmable control:**
  - 8 versions of sequences (AR 01, 5T2P, 7T8P, 10T16P, 10T32P, 10T32PEC, 10T16PMF, 10T16PMO).

■ **For the pneumatics:**
  - Opening/Closing position monitoring (by induction magnetic detector attached to the cylinder profile).

■ **For the force monitoring system***:
  - Manual pressure regulation program for Single-stroke or Double-stroke cylinders,
  - Electronic regulation pressure program for Single-stroke or Double-stroke cylinders,
  - Analog pressure sensor,
  - Welding pressure electronics regulation.
  * Options valid depending on the choice of certain CPSs, see table on page 12. Electronic regulation by proportional valve.

■ **For the electrical power supply***:
  - 230 V/50 Hz - 230 V/60 Hz - 400 V/60 Hz - 440 V/60 Hz - 480 V/60 Hz.
  * Options valid depending on machine power rating adopted

**WHAT IS THE MEDIUM FREQUENCY TECHNOLOGY?**

Unlike the conventional 50 Hz solution, medium frequency technology makes it possible to produce a DC current with the advantages specific to that solution. This DC current is delivered by a whole range of rectified 1000 Hz transformers powered by different types of converters operating in three-phase mode.

In order to optimize the performances of this technique, a current regulation and monitoring module is integrated in the system. Given the operating frequency of 1000 Hz, this regulation enables a very fast reaction with respect to any variation in the process and precise monitoring of the power used for welding.

**The advantages of Medium Frequency:**

■ **at the welding level:**
  - Production of a DC current which makes it possible to lower the weldability range by decreasing:
    - the value of the nominal current (hence fewer amperes required for the power supply),
    - and/or the length of the welding time (improved productivity),
    - longer electrode service life,
    - limited projections of matter at fusion.

■ **at the machine level:**
  - Relative independence of the machine's current performances with respect to the electrode-holder length and gap.

■ **at the network level:**
  - Better balancing of the network load thanks to the 3-phase power supply,
  - Smaller dimension of the cables and protection systems (contacts, circuit-breakers, etc.),
  - Low current/voltage phase shift enabling a lower reactive power consumption (improved Cos φ).

**A technology that contributes to a “Total Quality” approach**

Today, the Medium Frequency technology is extremely advantageous for applications up to 50,000 A, since it enables the production of high-quality assembly spots for a very low cost (most applications can be found in multi-projection welding (PB machines) and spot welding (PA machines) in particular safety spots and appearance spots).
Spot welding

**General characteristics:**
- Tightening force on the electrodes: 740 daN at 6 bar,
- Single-stroke cylinder travel range: 100 mm,
  or double-stroke cylinder travel range: 80+20 mm,
- Air throttling,
- Parachute and anti-fall system (rapid purge),
- Machine equipped with standard shank-holders,
- Electrical power supply circuit-breaker,
- Electric pedal welding cycle command,
- Stay for 800 mm arm,
- Effective spacing between arm of 235 to 545 mm by continuous adjustment of the lower table
- "A" version of arm and electrode-holder installation as standard,
- electrode-holder upper assembly,
- Effective length of the lower arm: 400 600 800 mm at the cylinder center line,
- Program selector,
- Machine entirely water cooled (transformer, secondary junctions, electrode-holder and electrodes),
- Operates "blow by blow" or "on the fly",
- Welding current intensity setting by constant phase-shifting or adaptive regulation according to the choice of CPS.
PA type:
- 50 Hz AC single-phase technology
- 1000 Hz medium frequency technology

Specific options:
400 V/50 Hz AC transformers:
- Effective depths at the cylinder center line: 400/600 mm
- Effective depths at the electrode center line: 500/700 mm

400 V/50 Hz MF transformers:
- Effective depths at the cylinder center line:
- Effective depths at the electrode center line:

Arm and Electrode-holder installation:
"B" version optional:
- Upper arm assembly,
- Lower arm with electrode-holder assembly with an effective length of 500/700/900 mm.

"C" version optional:
- Upper arm assembly installed in the cylinder center line,
- Lower arm assembly with effective length of 400/600/800 mm.
- Stay for effective length shorter than 800 mm.

For the force monitoring:
- Pressure program with manual regulation for the Single-stroke or Double-stroke cylinders*,
- Pressure program with electronic regulation for the Single-stroke or Double-stroke cylinders*,
- Electronic regulation of the welding pressure*,
- Analog pressure sensor*,
- Double-function control pedal: Squeeze/Welding,
- Working Stroke Open/Gun Fully Open position monitor.

* Options valid according to choice of certain CPSs, see table page 12.
Arm and electrode-holder

OFFSET INSTALLATION

Installation offset with respect to cylinder center line

<table>
<thead>
<tr>
<th>Figure A</th>
<th>Eff. depth [mm]</th>
<th>P/N:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower arm assembly</td>
<td>500</td>
<td>00 290 606</td>
</tr>
<tr>
<td>Lower arm assembly</td>
<td>700</td>
<td>00 290 607</td>
</tr>
<tr>
<td>Lower arm assembly</td>
<td>900</td>
<td>00 290 608</td>
</tr>
<tr>
<td>Upper electrode-holder assembly</td>
<td></td>
<td>00 290 605</td>
</tr>
</tbody>
</table>

INSTALLATION IN THE CENTER LINE

Installation offset with respect to cylinder center line with axial lower electrode-holder

<table>
<thead>
<tr>
<th>Figure B</th>
<th>Eff. depth [mm]</th>
<th>P/N:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower arm assembly</td>
<td>500</td>
<td>00 290 716</td>
</tr>
<tr>
<td>Lower arm assembly</td>
<td>700</td>
<td>00 290 717</td>
</tr>
<tr>
<td>Lower arm assembly</td>
<td>900</td>
<td>00 290 718</td>
</tr>
<tr>
<td>Upper electrode-holder assembly</td>
<td></td>
<td>00 291 381</td>
</tr>
</tbody>
</table>

Installation in the cylinder center line

<table>
<thead>
<tr>
<th>Figure C</th>
<th>Eff. depth [mm]</th>
<th>P/N:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower arm assembly</td>
<td>400</td>
<td>00 290 713</td>
</tr>
<tr>
<td>Lower arm assembly</td>
<td>600</td>
<td>00 290 714</td>
</tr>
<tr>
<td>Lower arm assembly</td>
<td>800</td>
<td>00 290 715</td>
</tr>
<tr>
<td>Upper electrode-holder assembly</td>
<td></td>
<td>00 290 720</td>
</tr>
</tbody>
</table>
For PA Machines
Cone n°3, Ø 17.8 mm

**STRAIGHT CENTERED ELECTRODES**

- WL 305145: Standard 23 mm
- WL 305156: Long 34 mm
- WL 375145: Made of electrolytic copper for light alloys (24 mm)
- WL 367156: Long made of electrolytic copper for light alloys (35 mm)

**STRAIGHT OFFSET ELECTRODES**

- WL 341145: Standard 23 mm
- WL 342156: Long 34 mm
- WL 358156: With molybdenum tip
- WL 375155: With cutene tip
- WL 355145: Made of electrolytic copper for light alloys (24 mm)

**OFFSET INCLINED ELECTRODES**

- WL 385145: Standard 23 mm
- WL 342157: Long 34 mm
- WL 367156: Long made of electrolytic copper for light alloys (35 mm)

**FLAT ELECTRODES**

- WL 345146: Standard 23 mm
- WL 345165: Long 43 mm
- WL 364152: With molybdenum tip
- WL 376145: With cutene tip

**SPECIAL ELECTRODES**

- WL 308363: With welding swirl joint without mark
- WL 310104: with molybdenum tip
- WL 313950: V-shaped
- WL 313942: With plate width 90 mm
- WL 313949: With imprint for tubes
- WL 378148: Ø 16 mm graphite end for brazing
- WL 378345: Ø 24 mm graphite end for brazing
General characteristics:
- Single-stage cylinder 740 daN or 1380 daN in double-stage cylinder at 6 bar,
- Single-stroke cylinder travel range: 100 mm,
- Air throttling,
- Platen dimensions 200 mm x 200 mm,
- 3 grooves, center distance 63 mm,
- Effective spacing between platens: 205 to 515 mm by continuous adjustment of the lower platen,
- Effective depth at the cylinder center line: 250 mm,
- Program selector,
- Machine entirely water-cooled (transformer, secondary junctions, connections for tools),
- Welding current intensity adjustment by constant phase-shift or by adaptive regulation according to the choice of CPS,
- Bimanual control desk
PB type:
- 50 Hz AC single-phase technology
- 1000 Hz medium frequency technology

Specific options:
- 400 V/50 Hz AC transformers: 90 kVA AC 125 kVA AC 160 kVA AC
- 400 V/50 Hz MF transformers: 90 kVA MF 180 kVA MF

Options:
- PO-GO position monitor,
- Pressure program with manual regulation for Single-Stroke or Double-Stroke cylinders*,
- Pressure program with electronic regulation for Single-Stroke or Double-Stroke cylinders*,
- Analog pressure sensor*,
- Electronic regulation of the welding pressure*,
- 250 mm x 250 mm platen, 4 grooves, center distance 63 mm.

* Options valid according to choice of certain CPSs, see table page 12.

Technical dimensions for PB machines
Seam welding machines:
Given the wide range of applications involving seal or 'Roll spot' welding, it is difficult to define a range of seam welding machines. However, our Design Office, working in close cooperation with the users, can design and define tools that are the best suited to characteristics of the application.
We can nevertheless define a standard machine profile with the following characteristics:

**General characteristics:**
- High thermal power and low magnetic saturation
  63 kVA transformer,
- Duty cycle that can vary between 40 and 100%,
- Clamping force at seam wheels: 480 daN at 6 bar,
- Single-stage, single-stroke cylinder travel range: 100 mm,
- Air throttling,
- Parachute and anti-fall system (rapid purge),
- Electrical power supply circuit-breaker,
- Electric pedal welding cycle command,
- Seam wheel gap by continuous adjustment of the lower table,
- Machine entirely water cooled (transformer, junction of the secondaries, seam wheel units and seam wheels),
- Functions for seal and 'Roll spot' welding,
- Welding current intensity adjustment by constant phase shift or by adaptive regulation according to the choice of CPS,
- Specific command sequence for ARO 10T16P Mo seam welding, also controlling welding speed management.

**Specific options:**
- Min/max diameter of the seam wheels (lower/upper) to be defined as a function of the work program to be carried out,
- Double-function control pedal Squeeze/Weld.
PE type machines:
- 50 Hz AC single-phase technology

Technical dimensions for PE machines

Seam welding
PE type stationary machine
General characteristics:
- Machine with 3 cylinders:
  2 single-stroke, double-stage cylinders for clamping 900 daN at 6 bar,
  1 single-stroke, single-stage cylinder for thrusting 300 daN at 6 bar,
- Standard jaw for round 4 to 20 mm diameter,
- Bimanual control desk,
- Machine entirely water cooled (transformer, junction of the secondaries, jaw-holder),
- Adjustment of the welding current intensity by constant phase-shift or by adaptive regulation according to the choice of CPS.

Specific options:
- Command for 10T16P, 10T16PEC or 10T32P type welding,
- Analog force sensor (only with machines equipped with the 10T16PEC sequence),
- 400 V/50 Hz AC transformers: 36 kVA AC, 60 kVA AC.
PF type machines:
- 50 Hz AC single-phase technology

Cooled copper jaws and clamping and upsetting cylinders

PF type 36 kVA stationary machine, seen from the upsetting cylinder

Technical dimensions for PF machines

PF type 60 kVA stationary machine with 2X16 III type CPS
<table>
<thead>
<tr>
<th>AR.01 AND 2X16III FUNCTIONS</th>
<th>INDUSTRIAL VERSIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Software version</strong></td>
<td><strong>AR.01</strong></td>
</tr>
<tr>
<td><strong>Number of programs</strong></td>
<td>2</td>
</tr>
<tr>
<td>1° squeeze</td>
<td>-</td>
</tr>
<tr>
<td>Squeeze</td>
<td>0 to 200 periods</td>
</tr>
<tr>
<td>Welding</td>
<td>0 to 200 periods</td>
</tr>
<tr>
<td>Hold</td>
<td>0 to 200 periods</td>
</tr>
<tr>
<td>Interval</td>
<td>0 to 200 periods</td>
</tr>
<tr>
<td>Upslope</td>
<td>0 to 20 periods</td>
</tr>
<tr>
<td>Downslope</td>
<td>0 to 20 periods</td>
</tr>
<tr>
<td>Pulse</td>
<td>0 to 20 periods</td>
</tr>
<tr>
<td>Pulse interval</td>
<td>0 to 20 periods</td>
</tr>
<tr>
<td>Pre-heating</td>
<td>0 to 200 periods</td>
</tr>
<tr>
<td>Cooling</td>
<td>0 to 200 periods</td>
</tr>
<tr>
<td>Annealing</td>
<td>0 to 200 periods</td>
</tr>
<tr>
<td>Current control in % without intensity monitoring</td>
<td></td>
</tr>
<tr>
<td>Current regulation in kA with intensity monitoring</td>
<td></td>
</tr>
<tr>
<td>Current control in % with mains voltage compensation</td>
<td></td>
</tr>
<tr>
<td>Duty cycle monitoring</td>
<td></td>
</tr>
<tr>
<td>Weld spot counter with reset</td>
<td></td>
</tr>
<tr>
<td>Electrode worn alarm</td>
<td></td>
</tr>
<tr>
<td>Wear compensation in steps or segments</td>
<td></td>
</tr>
<tr>
<td>Link between electrodes and programs</td>
<td></td>
</tr>
<tr>
<td>Electrode dressing management (alarm and end-of-life)</td>
<td></td>
</tr>
<tr>
<td>Spot-by-spot welding</td>
<td>1</td>
</tr>
<tr>
<td>On-the-fly welding</td>
<td>1</td>
</tr>
<tr>
<td>Servovalve monitoring</td>
<td></td>
</tr>
<tr>
<td>Programmable outputs</td>
<td></td>
</tr>
<tr>
<td>Pressure program</td>
<td></td>
</tr>
<tr>
<td>Proportional valve control</td>
<td></td>
</tr>
<tr>
<td>Clamping without welding (SSS)</td>
<td></td>
</tr>
<tr>
<td>With/without welding current (CSC)</td>
<td></td>
</tr>
<tr>
<td>16 programs with management of 6 cascade steps with 6 “on-off” outputs</td>
<td></td>
</tr>
<tr>
<td>0 to 10 volt force monitoring</td>
<td></td>
</tr>
<tr>
<td>Off-line programming/loading/saving on PC</td>
<td></td>
</tr>
<tr>
<td>ARONET network</td>
<td></td>
</tr>
<tr>
<td>Servovalve power supply</td>
<td>standard</td>
</tr>
<tr>
<td>Servovalve internal power supply</td>
<td>as standard</td>
</tr>
<tr>
<td>CPS power supply on power network</td>
<td>as standard (1)</td>
</tr>
<tr>
<td>Languages (2) number of languages</td>
<td>7</td>
</tr>
<tr>
<td>Measuring coil rating (10 to 2600 mV/kA)</td>
<td></td>
</tr>
<tr>
<td>Parity bit/Choice of program</td>
<td></td>
</tr>
<tr>
<td>Link - START - SV control</td>
<td></td>
</tr>
<tr>
<td>Electrode wear compensation configuration</td>
<td></td>
</tr>
<tr>
<td>Date/Time</td>
<td></td>
</tr>
</tbody>
</table>

- Standard function in the corresponding version.
- Optional function in the corresponding version.

Consult us for the other panels. (1) On request, power supply delivered by separate network that can be backed up in case of power cut-out.
(2) F: French, E: English, S: Spanish, I: Italian, Swedish, Finnish, Dutch/German
The language is selected by programming. Other languages: consult us.
Options and details

P type machines

**Glycerin bath precision pressure gauge:**
this option makes it possible to monitor very precisely the initial pressure when generating the welding pressure.

**Analog pressure sensor:**
This piece of equipment makes it possible to trigger the welding cycle as soon as the required force has been reached.

**Single-Stroke, Double-Stage cylinder 1380 daN:**
Thanks to the addition of a second housing on the upper part of the cylinder, this option makes it possible to increase the clamping force. The travel height can be adjusted by adding bushes inside the cylinder.

**Stay assembly for 400/600/800 mm machine:**
This option ensures the required stiffness for the assembly and makes it possible to carry out precision welding. Equipment strongly recommended for welding operations carried out in accordance with a Quality Charter.

**Electronic pressure regulation by means of a proportional valve:**
This option makes it possible to store in memory the force during the welding cycle from the CPS, whatever the program used.

**Electronic pressure regulation by means of a proportional valve:**
This option makes it possible to store in memory the force during the welding cycle from the CPS, whatever the program used.

**500 daN elastomer head:**
Double-spot welding head mounted on an elastomer assembly making it possible to balance the pressure force on each weld spot.

**Glycerin bath precision pressure gauge:**
this option makes it possible to monitor very precisely the initial pressure when generating the welding pressure.
**Technical characteristics**

### PA type machines

#### TECHNICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Type of transformer</th>
<th>kVA</th>
<th>90</th>
<th>125</th>
<th>160</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective depth at the electrode center line (type A)/seam wheel</td>
<td>mm</td>
<td>500</td>
<td>700</td>
<td>500</td>
</tr>
<tr>
<td>Conventional power at 50%</td>
<td>kVA</td>
<td>90</td>
<td>127</td>
<td>159</td>
</tr>
<tr>
<td>Permanent power 100%</td>
<td>kVA</td>
<td>64</td>
<td>90</td>
<td>112</td>
</tr>
<tr>
<td>Max. short-circuit power</td>
<td>kVA</td>
<td>195</td>
<td>164</td>
<td>395</td>
</tr>
<tr>
<td>Max. welding power</td>
<td>kVA</td>
<td>156</td>
<td>131</td>
<td>316</td>
</tr>
<tr>
<td>Nominal primary voltage (three-phase*)</td>
<td>kVA</td>
<td>230/400</td>
<td>400</td>
<td></td>
</tr>
<tr>
<td>Network frequency</td>
<td>Hz</td>
<td>50</td>
<td>-----</td>
<td></td>
</tr>
<tr>
<td>Consumed power</td>
<td>kVA</td>
<td>117</td>
<td>98</td>
<td>237</td>
</tr>
<tr>
<td>Fuses (1)</td>
<td>230 V</td>
<td>A</td>
<td>320</td>
<td>250</td>
</tr>
<tr>
<td></td>
<td>400 V</td>
<td>A</td>
<td>160</td>
<td>125</td>
</tr>
<tr>
<td>Copper cable cross-section (for 20m)</td>
<td>230 V</td>
<td>mm²</td>
<td>70</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>400 V</td>
<td>mm²</td>
<td>35</td>
<td>50</td>
</tr>
<tr>
<td>No load secondary voltage</td>
<td>V</td>
<td>7.1</td>
<td>10</td>
<td>12.5</td>
</tr>
<tr>
<td>Permanent current</td>
<td>kA</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Max. short-circuit current (2)</td>
<td>kA</td>
<td>27.5</td>
<td>23.1</td>
<td>39.5</td>
</tr>
<tr>
<td>Max. welding current (2)</td>
<td>kA</td>
<td>22</td>
<td>18.5</td>
<td>31.6</td>
</tr>
<tr>
<td>...for a duty cycle of</td>
<td>%</td>
<td>16.7</td>
<td>23.6</td>
<td>8.1</td>
</tr>
<tr>
<td>Sheet steel welding capacity</td>
<td>mm</td>
<td>5+5</td>
<td>4+4</td>
<td>6+6</td>
</tr>
<tr>
<td>Force on the electrodes/seam wheels (6 bar max, 1 bar min)</td>
<td>daN</td>
<td>740/120</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effective spacing</td>
<td>min</td>
<td>235</td>
<td></td>
<td></td>
</tr>
<tr>
<td>max</td>
<td>mm</td>
<td>545</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diameter of the arm/seam wheels* - Platen dimensions</td>
<td>mm</td>
<td>90</td>
<td>-----</td>
<td></td>
</tr>
<tr>
<td>Reinforcement stay on the lower arm</td>
<td>Read: 800 mm standard/600 mm option</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arm lower setting (extended-retracted)</td>
<td>mm</td>
<td>+/- 50 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diameter of the electrode-holder</td>
<td>mm</td>
<td>30 mm copper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrodes/seam wheels max travel</td>
<td>mm</td>
<td>100</td>
<td>-----</td>
<td></td>
</tr>
<tr>
<td>Fluid connection (air and water)</td>
<td>1/2&quot; L int. Ø 13 mm hose</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air service pressure</td>
<td>bar</td>
<td>3.5 to 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air consumption for 1000 blows at 6 bar</td>
<td>Nm³</td>
<td>3.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td>bar</td>
<td>2 to 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water consumption (average) ΔP 2 bar</td>
<td>l/h</td>
<td>800</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td>Width W</td>
<td>mm</td>
<td>560</td>
<td></td>
</tr>
<tr>
<td>Depth D</td>
<td>mm</td>
<td>1040</td>
<td>1240</td>
<td>905</td>
</tr>
<tr>
<td>Height H</td>
<td>mm</td>
<td>1820</td>
<td>-----</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>kg</td>
<td>545</td>
<td>565</td>
<td>545</td>
</tr>
</tbody>
</table>

*(1) Calculations performed per NFA 82.002 standard (2) with PE Config A std  
* three-phase power
<table>
<thead>
<tr>
<th>PA spot welding (cont’d)</th>
<th>PB Projection</th>
<th>PE Seam</th>
<th>PF Butt</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000 Hz medium frequency</td>
<td>50Hz AC single-phase</td>
<td>1000 Hz med. freq.</td>
<td>50 Hz AC single-phase</td>
</tr>
<tr>
<td>91</td>
<td>180</td>
<td>90</td>
<td>125</td>
</tr>
<tr>
<td>700</td>
<td>900</td>
<td>700</td>
<td>900</td>
</tr>
<tr>
<td>90</td>
<td>180</td>
<td>90</td>
<td>127</td>
</tr>
<tr>
<td>63</td>
<td>126</td>
<td>64</td>
<td>90</td>
</tr>
<tr>
<td>360</td>
<td>570</td>
<td>337</td>
<td>635</td>
</tr>
<tr>
<td>288</td>
<td>456</td>
<td>270</td>
<td>508</td>
</tr>
<tr>
<td>400*</td>
<td>230/400</td>
<td>400</td>
<td>400*</td>
</tr>
<tr>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>150</td>
<td>300</td>
<td>202</td>
<td>381</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>400</td>
<td>800</td>
</tr>
<tr>
<td>160</td>
<td>250</td>
<td>250</td>
<td>400</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>95</td>
<td>185</td>
</tr>
<tr>
<td>3x25 + PE 25</td>
<td>3x50 + PE 35</td>
<td>35</td>
<td>70</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>7.1</td>
<td>10</td>
</tr>
<tr>
<td>6.3</td>
<td>12.6</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>36</td>
<td>57</td>
<td>47.5</td>
<td>63.5</td>
</tr>
<tr>
<td>28.8</td>
<td>45.6</td>
<td>38</td>
<td>50.8</td>
</tr>
<tr>
<td>see diode graph (MF Transfo. doc)</td>
<td>5.6</td>
<td>3.1</td>
<td>2.1</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>740/120</td>
<td>480/80</td>
<td>effective depth 80 mm</td>
<td></td>
</tr>
<tr>
<td>740/120 single-stage cylinder - 1360/225 with double-stage cylinder</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>279</td>
<td>205</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>589</td>
<td>515</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>200x200 3 grooves - 250x250 4 grooves (options)</td>
<td>120*</td>
<td></td>
</tr>
<tr>
<td>Read: 800 mm standard/600 mm option</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+/- 50 mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 mm copper</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>1/2 L int. Ø 13 mm hose</td>
<td>1/2 L int. Ø 13 mm hose</td>
<td>1/2 L int. Ø 13 mm hose</td>
<td>1/2 L int. Ø 13 mm hose</td>
</tr>
<tr>
<td>3.5 to 6</td>
<td>3.5 to 6</td>
<td>3.5 to 6</td>
<td>3.5 to 6</td>
</tr>
<tr>
<td>3.4</td>
<td>3.4 (6.6 with double-stage cylinder)</td>
<td>1/2.5</td>
<td>1/2.5</td>
</tr>
<tr>
<td>2 to 6</td>
<td>2 to 6</td>
<td>2 to 6</td>
<td>2 to 6</td>
</tr>
<tr>
<td>800</td>
<td>800</td>
<td>800</td>
<td>800</td>
</tr>
<tr>
<td>620</td>
<td>560</td>
<td>620</td>
<td>560</td>
</tr>
<tr>
<td>1430</td>
<td>1630</td>
<td>1430</td>
<td>1630</td>
</tr>
<tr>
<td>1820</td>
<td>1820 (1985 with double-stage cylinder)</td>
<td>2030/1820</td>
<td>1740</td>
</tr>
<tr>
<td>1820</td>
<td>1820 (1985 with double-stage cylinder)</td>
<td>2030/1820</td>
<td>1740</td>
</tr>
<tr>
<td>580</td>
<td>600</td>
<td>620</td>
<td>640</td>
</tr>
<tr>
<td>580</td>
<td>600</td>
<td>620</td>
<td>640</td>
</tr>
</tbody>
</table>
### General characteristics and special options

#### Check list

**MACHINE:**
- PA
- PB
- PE
- PF

**SPECIAL FEATURES:**

**EFFECTIVE DEPTH** at the cylinder center line

+ 100 mm at the center line of the "A" version electrodes:
- 400 mm + 100 mm PA
- 600 mm + 100 mm PB
- 800 mm + 100 mm PE
- 250 mm PF
- 390 mm as standard for PE

Other depth to be defined according to tool required

Electrode-holder kit for machines

**PNEUMATIC:**
- Cylinders (PA, PB): 100 mm 740 daN
- Sgl Stroke/Sgl Stage: 163 mm 740 daN (PA, PB)
- Dbl Stroke/Dbl Stage: 80+20 mm 740 daN (PA)
- Sgl Stroke/Dbl Stage: 163 mm 1380 daN (PB)

Analog pressure sensor*

Adjustable single-stroke cylinder

Without pressure program:

Sgl Stroke/Dbl Stroke electronic regulation*

With pressure program:

Manual pressure regulation*

Electronic pressure regulation*

* Options valid according to choice of certain CPSs or to the type of machine, see table page 12

**ELECTRICITY:**

**AC transformer:**
- 36 kVA PA, PB
- 60 kVA PA
- 63 kVA PE
- 90 kVA PA
- 125 kVA PF
- 160 kVA PF

**MF transformer:**
- 90 kVA PA, PB
- 180 kVA PA, PB

**Voltage/Frequency**:  
- 230 V/50 Hz
- 400 V/60 Hz
- 400 V/50 Hz
- 440 V/60 Hz
- 480 V/60 Hz

* Options valid according to choice of power rating

---

**Programmable Welding Control**

for PA, PB, PF:

AR. 01
7T2P
778P
10T16P
10T32P
10T32PEC
10T32PEMF

**OPTION(S)**:

Installation offset with respect to cylinder center line
- "B" version electrode holder
- Installation in the cylinder center line
- "C" version electrode holder
- Protection window
- 150 mm riser
- 250 x 250 mm platen
- Support stay
- A/S double-stroke pedal
- PO/GO position monitor
* Options valid according to the type of machine

**The Essentials**:

Standard electrodes
- Special electrodes
- Electrode removal wrench
- Force monitor (dynamometer)
- Welding monitor

**Machine definition**:  

- Standard electrodes
- Special electrodes
- Electrode removal wrench
- Force monitor (dynamometer)
- Welding monitor

---

* Specifics:  

- Standard electrodes
- Special electrodes
- Electrode removal wrench
- Force monitor (dynamometer)
- Welding monitor

---

* Options valid according to choice of power rating
Some specific developments

Machine with upper and lower cylinders

Machine P with multi-spot heads

Inverted machine with pressure head protection

Machine P per customer expression of requirements (adapted for the automobile industry)

Warning:

The various P machines presented in this catalogue meet most standard requirements for the greatest satisfaction of our customers. However, for specific applications, we can place the expertise of our teams at your disposal. Our sales staff and technicians will be able to help you define your requirements, and validate them by means of laboratory tests. This approach enables us to design and develop the product that is best suited to your needs.

Glossary:

CPS: Programmable Welding Control
PE: Electrode-holder
SC: Single-Stroke cylinder
DC: Double-Stroke cylinder

Manual regulation: the adjustment is made by means of a pressure regulator which determines the compressed air supply to be delivered to the cylinder with a view to obtaining the best force when clamping.

Electronic regulation: the cylinder’s welding force is adjusted by a proportional valve.

Pressure program: this system makes it possible, for example, to vary the pressure when applying the force, lower it when welding and raise it again for the holding phase.
The information and illustrations contained in this brochure are based on the technical characteristics that apply at the time this document was printed. In the framework of a constant improvement policy with respect to its products, ARO reserves the right to modify the technical specifications of its products at any moment. This brochure provides information of a general nature and is not a contractually binding document. The content of this brochure may not be reproduced without the express authorization of ARO SA.