

DALEX

SCHWEISSTECHNIK

PMS

DALEX INDUSTRIAL WELDING MACHINES

CLASS PMS



DALEX Schweißmaschinen GmbH & Co. KG



ERFAHRUNG SCHWEISST ZUKUNFT
EXPERIENCE WELDS FUTURE

www.dalex.de



INDUSTRIAL MACHINES CLASS PMS

The industrial manufacturing requires highest when it concerns capability, quality and reliability of welding machines in use.

The **DALEX PMS LINE** enables a range of machines to the industry which consistently proves its capability in a wide range of industrial applications.















PERFORMANCE DATA

- **RATED POWER**
from 16 up to 630 kVA (alternating current),
from 60 up to 1200 kVA (three-phase direct current),
from 80 up to 1000 kVA (medium frequency);
- **ELECTRODE FORCE** 0,2-150 kN (20 up to 15000 daN)
- **MAXIMUM WELDING CURRENT** up to 300 kA

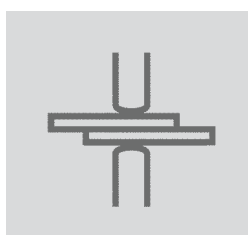
CHARACTERISTICS

- modular design, modular construction system
- modification possibilities for individual applications
- wide range of accessories
- modern, efficient and robust
- Optimum quality and durability
- Exclusive high-grade components of well-known brands manufactures
- High performance transformers self manufactured without thermal problems for shift operation

EXECUTION PMS-MACHINES

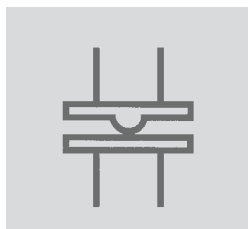
	A		SPOT-welding machine with spot welding fitting and foot switch for sport welding
	B		combined SPOT-PROJECTION-welding machine with changeable fittings and key-operated switch for preselection of operation mode. Operation optional by foot switch or 2-hands safety start desk for spot- and projection welding
	C		PROJECTION welding machine with projection fitting and 2-hands safety start desk for projection welding
	NL		LONGITUDINAL SEAM welding machine with longitudinal welding heads and foot switch
	NQ		TRANSVERSAL welding machine with transversal welding heads and foot switch
	NQ1 NQ2 NQ3		TRANSVERSAL welding machine with top drive gear TRANSVERSAL welding machine with bottom drive gear TRANSVERSAL welding machine with top and bottom drive gear

WELDING METHODS / TYPE OF CONNECTION



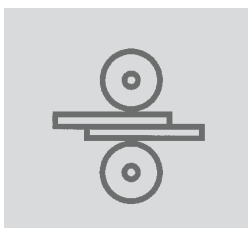
SPOT WELDING

When spot welding, the parts pressed up against each other after the joining component has been sufficiently heated are connected by means of spot welding electrodes via current flow. The joint is made by melting and hardening the material at the joint.



PROJECTION WELDING

When projection welding, the heating and current flow required for welding is generated by the projection form. In resistance projection welding the electrodes only serve to provide current and power



SEAM WELDING

In seam welding, the roll formed electrodes press the sheets together and transfer the welding current. The welding spots are set so densely by the rolls that a coherent thick seam is formed.

MODELS OF CYLINDERS

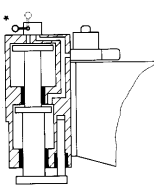
All electrode force cylinders are designed & built in accordance with the tandem principle using double air chambers and 2 working pistons. A relatively large electrode force is achieved despite smaller dimensioning through the arrangement of coupled working pistons.

Cylinders are fitted with precision guides, guaranteeing an optimum repositioning behaviour with the sealing elements available.

Safe anti-rotational protection is achieved through additionally positioned guide pins behind the piston rod.



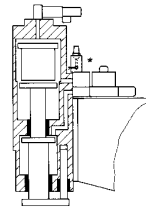
EH SINGLE STROKE-CYLINDER



Standard equipment for every machine is the single-stroke cylinder.

The range of electrode force as well as the stroke are corresponding with the type of machine and the electrical capability.

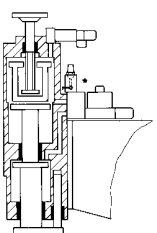
DH DOUBLE STROKE-CYLINDER



The piston for the work clearance stroke is floating positioned.

The operation mode long-stroke can be used on demand.

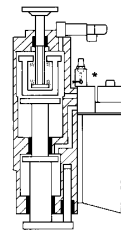
DHZ DOUBLE STROKE-CYLINDER WITH ADJUSTMENT STROKE



The piston for the work clearance stroke is floating positioned. The required work clearance stroke can be adjusted by spindle.

The operation mode long-stroke can be activated optionally by a switch selector.

DHZF DOUBLE STROKE-CYLINDER WITH ADJUSTMENT-STROKE AND SEQUENCE SWITCH



The piston for the work clearance stroke is floating positioned. The required work clearance stroke can be adjusted continuously by spindle. On this cylinder the reach of the desired position of the work clearance stroke is electrically detected and is used to switch automatically into the work stroke. Likewise a absolutely hit-free and bounce-free placing of the electrode can be achieved.

SERVO MOTOR DRIVEN EXECUTIONS

DALEX SERVOTRONIC® PRODUCT RANGE

Our developers have provided the DALEX „S-class“ with a new design featuring 3 power stages.



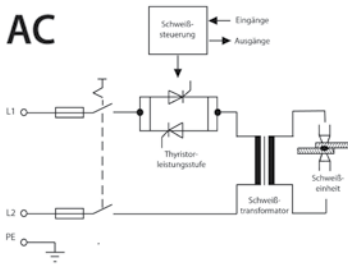
SII 1000
10 kN (1000 daN)

SII 2000
20 kN (2000 daN)

SII 4000
40 kN (4000 daN)

WELDING METHODS / TYPE OF CURRENT

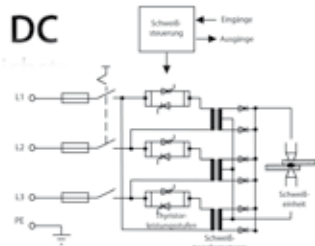
AC



ALTERNATING CURRENT

Alternating current welding (AC welding) means the mains supply voltage of 400 V 2-phase (e.g. L1-L2) is switched to a welding transformer per thyristor, where it is transformed over to ca. 5-9 V secondary voltage. Mains voltage / \ddot{U} = secondary voltage. Behaviour of the currents is exactly opposite, i.e. secondary current / \ddot{U} = primary current.

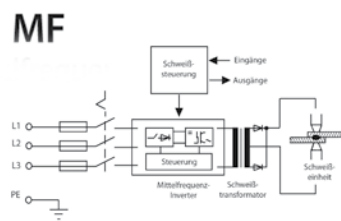
DC



3-PHASE DIRECT CURRENT

For welding with a 3-phase direct current machine, use is made of three precision-adapted transformers, whereby individual groups of rectifiers are installed on the secondary side of the transformers, which generate parallel switched direct current (6 pulse mid-point tapping). Current and voltage behaviour is in principle, similar to that of an alternating current machine.

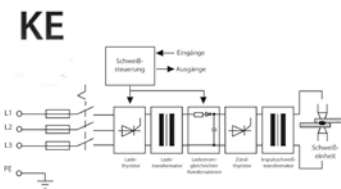
MF



MEDIUM FREQUENCY

With medium frequency welding (MF welding), the current is chopped from mains frequency up to 1000 Hz by means of an inverter and sent to the welding transformer. On the secondary side, the current is then rectified through water-cooled diodes, so that likewise direct current is formed.

KE



CAPACITOR DISCHARGE

In the case of capacitor discharge welding, the energy required for welding is discharged from a previously charged capacitor bank through a thyristor on a welding transformer. Due to the somewhat relatively high idling voltage of the transformer of up to 45V and the sudden discharge of the energy stored in the condenser, the current in the secondary circuit rises very quickly (direct current pulse).

COMPARISON OF CURRENT TYPES

The following example is based on 350 mm throat length:

execution	welding current	mains cross section	fuse protection
alternating current / AC	57 kA	150 mm ²	315 A
3-phase direct current / DC	57 kA	25 mm ²	100 A
medium frequency / MF	57 kA	25 mm ²	100 A
capacitor discharge / KE	57 kA	25 mm ²	32 A

TYPES AND EXECUTIONS

type PMS 10-6 T



TECHNICAL DATA

nominal power (50 % DC)	16 / 32 kVA
throat length	200 / 350 / 550 mm
electrode force (1 kN = 100 daN)	0,65 - 3,9 / 0,2 - 3,9 kN
stroke	max. 65 mm
possible executions*	A / B or C

type PMS 10-6



TECHNICAL DATA

nominal power (50 % DC)	80 kVA
throat length	250 / 350 / 550 / 750 mm
electrode force (1 kN = 100 daN)	0,65 - 3,9 / 0,2 - 3,9 / 1,15 - 6,9 kN
stroke	max. 65 mm
possible executions*	A / B or C

type PMS 14-6



TECHNICAL DATA

nominal power (50 % DC)	100 / 160 / 200 kVA
throat length	250 / 350 / 550 / 750 / 1050 mm
electrode force (1 kN = 100 daN)	2 - 12 / 0,8 - 12 / 3 - 18 kN
stroke	max. 100 mm
possible executions*	A / B / C or N

type PMS 16-6



TECHNICAL DATA

nominal power (50 % DC)	200 / 250 kVA
throat length	350 / 550 / 750 / 1050 mm
electrode force (1 kN = 100 daN)	3,4 - 20,4 / 1,4 - 20,4 / 5 - 30 kN
stroke	max. 120 mm
possible executions*	A / B / C or N

type PMS 11-6

TECHNICAL DATA

nominal power (50 % DC)	80 / 100 kVA
throat length	250 / 350 / 550 / 750 / 1050 mm
electrode force (1 kN = 100 daN)	1 - 6 / 0,2 - 6 / 1,9 - 11,4 kN
stroke	max. 90 mm
possible executions*	A / B / C / N

type PMS 12-6

TECHNICAL DATA

nominal power (50 % DC)	100 / 160 / 200 kVA
throat length	350 / 550 / 750 / 1050 mm
electrode force (1 kN = 100 daN)	1,2 - 7,2 / 1,65 - 9,9 / 2,15 - 12,9 / 3 - 18 kN
stroke	max. 100 mm
possible executions*	A

type PMS 32-6

TECHNICAL DATA

nominal power (50 % DC)	100 / 160 / 200 kVA
throat length	250 / 350 / 550 mm
electrode force (1 kN = 100 daN)	1,2 - 7,2 / 1,65 - 9,9 / 2,15 - 12,9 / 3 - 18 / 1,35 - 18 kN
stroke	max. 100 mm
possible executions*	C

type PMS 36-6

TECHNICAL DATA

nominal power (50 % DC)	160 / 200 / 250 kVA
throat length	175 / 250 mm
electrode force (1 kN = 100 daN)	3,6 - 21,6 / 1,6 - 21,6 / 5 - 30 / 2,3 - 30 / 1,35 - 18 kN
stroke	max. 120 mm
possible executions*	C

OPTIONAL FEATURES



4-RANGE SELECTOR SWITCH for coarse adjustment of the welding performance



MAIN SWITCH according to VDE installed in attached cabinet.



EMERGENCY-OFF-BUTTON mounted on the cylinder



FLOW CONTROL INSTRUMENT (water control switch) installed in water feed



ADJUSTMENT DEVICE with ratchet for height adjustment of bottom fitting



LOWER ARM SUPPORT



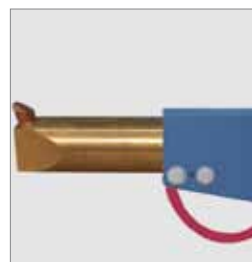
CLAMPING PIECE for lower arm support



CLAMPING PIECE with ratchet



TUBE ARM for bottom spot fitting



TUBE ARM FITTING with special wide working length of the spot fitting



AIR PRESSURE REGULATOR



WATER FLOW CONTROL 4-fourfold



SAFETY VALVE 2-channel version



WATER SEPARATOR for pressure air



DOUBLE FILTER AND DIFFERENTIAL PRESSURE CONTACT DISPLAY for cooling water



PRESS PLATE for mounting of the lower clamping plate



CLAMPING PLATE at the top



CLAMPING PLATE at the bottom



LAMINTATED POWER-STRIP



POWER BRIDGE

Further accessories are contained in our DALEX Components Catalogue



**PROJECTED
ELECTRODE HOLDER**



WISE ELECTRODE
for conductive clamping
and manual operation,
air-operated available



BAR ELECTRODE
with current partition for
mounting on top and
bottom platen



**PRESSURE COMPENSA-
TOR** for projection wel-
ding tools to be mounted
of the upper platen



**FLANGE ELECTRODE
HOLDER** for use of a pro-
jection welding machine
as spot welding machine



**HYDRAULIC
WELDING UNIT**
(compensating element)



**SPRING ELECTRODE
HOLDER**
(for quick electrode
follow up characteristic)



**BAR ELECTROCE
HOLDER**



**PENDULUM
ELECTRODE HOLDER**



**SEAM ROLL
ELECTRODES**



**PRESSURELESS LOWE-
RING** of upper welding
attachement via manual
valve at the cylinder



**ELECTRODE FORCE-
SWITCH**
electronically



**RETURN STROKE
MONITORING**
electrical operated



**PROGRAM SELECTOR
SWITCH** for preselection
of the welding program



POSITION ENCODER
electronically



FOOT PEDAL SWITCH
- single foot pedal switch
- double foot pedal switch
- threefold foot pedal switch



**TWO HAND SAFETY
START CONSOLE**



**RAPID REETOOLING
SYSTEM**
for quick changing of
the welding tools



QUICK COUPLING
water connection for
welding tools



PROPORTIONAL VALVE
incl. safety sinking device
and electrode force moni-
toring

RANGE OF 3-PHASE DIRECT CURRENT

The DALEX DC current range embodies a machine concept whereby, in addition to special economic productivity and dependable continuous operation, each machine is easy to maintain and reliability of all components is a true reality. Every diode can be tested individually and exchanged if by chance the need arises. Further advantages include close-coupling and minimised losses.

Transformers are cast in a vacuum and fitted with a temperature sensor to avoid the dangers of overloading. Diodes are thermally monitored to ensure reliable duty cycles. If a certain threshold temperature is exceeded, then the machine will be switched off automatically.

All machine frames are designed & built with distortion-resistant, generously dimensioned sectional frame welded construction, and yet still enabling free access to all components.



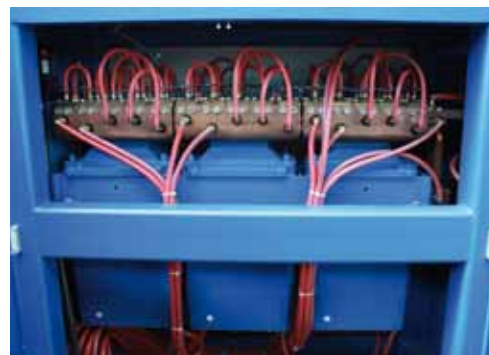
DALEX-3-phase-direct current-
projection welding machine type PMS 38-6 G3

PERFORMANCE DATA

- **NOMINAL POWER**
Rectifier sets from 60 up to 1200 kVA
- **ELECTRODE FORCE**
from 0,2 up to 150 kN (20 - 1500 daN)
- **MAXIMUM WELDING CURRENT**
up to 300 kA

ADVANTAGES

- low trend-to-alloy of the electrodes
- short welding duration with reduced heat affected zone
- good conditions for mains connection
- uniform current partition in electrodes and work piece
- big power factor - small losses
- low energy consumption
- high welding current with lower secondary voltage



position of transformer and rectifier set

MEDIUM FREQUENCY TRANSFORMATOR

type MF 80/90



TECHNICAL DATA	
nominal power at 20 % DC	80 - 90 kVA
no-load direct voltage	6.3 - 8.3 V
weight	17 kg
number of diods	2 pieces

type MF 160/180



TECHNICAL DATA	
nominal power at 20 % DC	130 - 180 kVA
no-load direct voltage	7.0 - 10.2 V
weight	26,4 kg
number of diods	4 / 6 pieces

type MF 250/300



TECHNICAL DATA	
nominal power at 20 % DC	250 - 300 kVA
no-load direct voltage	10-2 - 16.0 V
weight	33 kg
number of diods	4 / 6 pieces

type MF 500



TECHNICAL DATA	
nominal power at 20 % DC	500 kVA
no-load direct voltage	11.8 V
weight	54,5 kg
number of diods	6 pieces

type MF 700/1000



TECHNICAL DATA	
nominal power at 20 % DC	700 - 1000 kVA
no-load direct voltage	8.4 - 15.9 V
weight	167 kg
number of diods	10 pieces

Transformators in special execution, eg. 2 step-transformer. on request / Further information are contained in our Catalogue „DALEX MF-Trafos“

CHARACTERISTICS

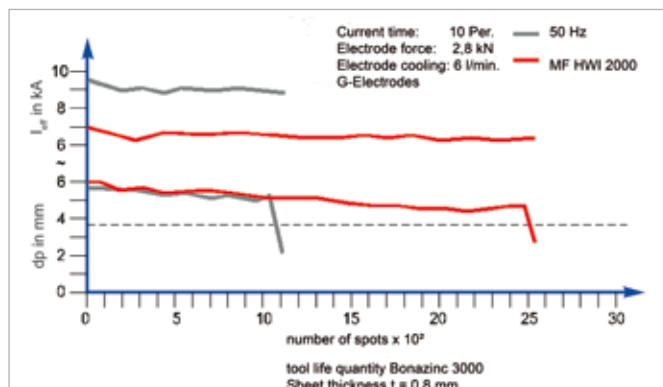
- low self-impedance
- series connection of all cooling circuits
- sec. voltage suppressor wiring beginning with MF 180
- diodes are tightened max. as a pair
- high capability with small size

METHOD

In an special inverter the three-phase power supply is rectified and converted to alternating two phase current of 1000 Hz. A compact, close coupled transformer is primary fed with this current, which is rectified again on secondary side. The result is a welding current which can be regulated fast and precise because of the 1000 Hz.

PLANNED USE

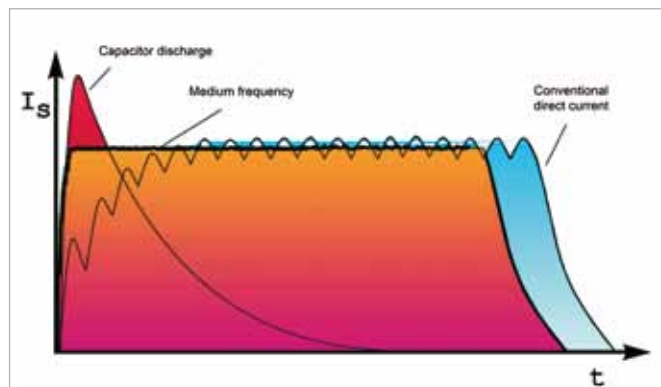
- short-time welding (f. e. annular projections), partially as replacement of capacitor discharge welding machines
- welding of galvanized sheets
- joining of different materials as well as nonferrous metals
- welding of coated materials



LIFE OF ELECTRODES - MF DIRECT CURRENT / ALTERNATING CURRENT

ADVANTAGES

- direct current in high quality
- minimal inductive loss
- energy saving
- regulation and time adjusting in ms
- fast upslope
- long life of electrodes
- compact and lightweight transformer
- high quality of welding spot
- wide range welding application
- symmetrical load of supply network
- low trend of spatter formation



COMPARISON OF WELDING CURRENT CURVES

THE POWER OF DISCHARGE

PLANNED USE

- High welding currents
 - large ring projections
 - multiple projection welds
 - high-alloyed steels
- Heat-sensitive components
- Sealing areas
- Electronic components
- Distortion-free components
- Hard-to-weld parts
 - hardened components
 - mixed compounds
 - sinter metals
 - steel & grey-cast castings

CHARACTERISTICS

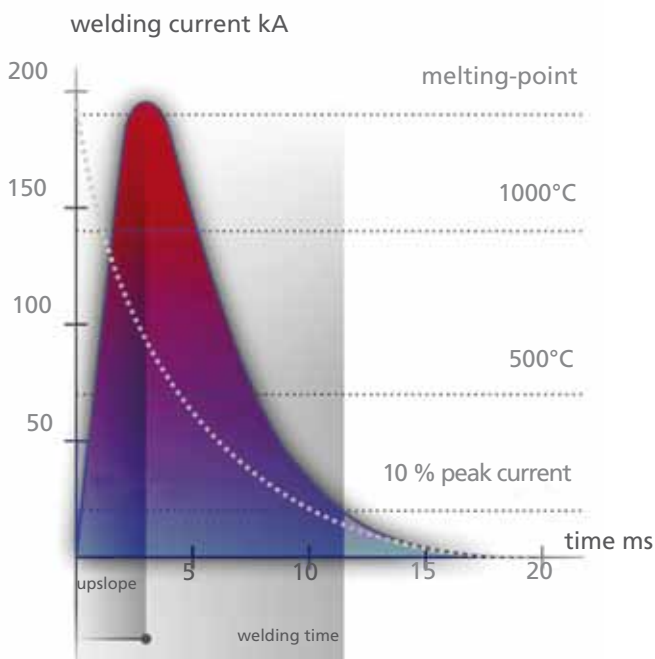
- rapid upslope
- short welding time
- high welding current
- rapid heat conduction in the seam zone allows welds without appreciable heating of surrounding material



DALEX-machine with CD-Technology
type PMS 37-6 KE

ADVANTAGES

- low demands on your mains supply
- savings on energy needs
- no water cooling needed
- more efficient tool life



TECHNICAL DATA

max. welding power	18.000 - 36.000 Ws
electrode force	7 - 42 kN (700 - 4200 daN)
No. weld sequences @ 10 mm stroke	60 / min
pre-stroke	150 mm
working stroke	0 - 150 mm
standard throat depth	350 mm
load time	0,5 - 2,5 s
welding time	3 - 10 ms
efficiency	> 90 %

Energy and electrode force are variable.
Welding time is a machine constant.

DALEX-SERVOTRONIC®



SII 1000 - 10 kN

SII 2000 - 20 kN

SII 4000 - 40 kN

CHARACTERISTICS

- dynamically readjusts the welding parameters by virtue of an intelligent control technology
- ensures optimal lens formation in resistance welding to a high degree.
- welds an enormous variety of material pairings
- Avoidance of spatters inside the thread when nut welding is solvable

METHOD

What this means for spot, projection or seam welding is illustrated by the second generation of DALEX servomotor welding machines.

Instead of simply „flattening“ the projections before the actual welding process, as would be the case with conventional pneumatic systems, the geometry of the projections is kept completely intact with a DALEX SERVOTRONIC®.

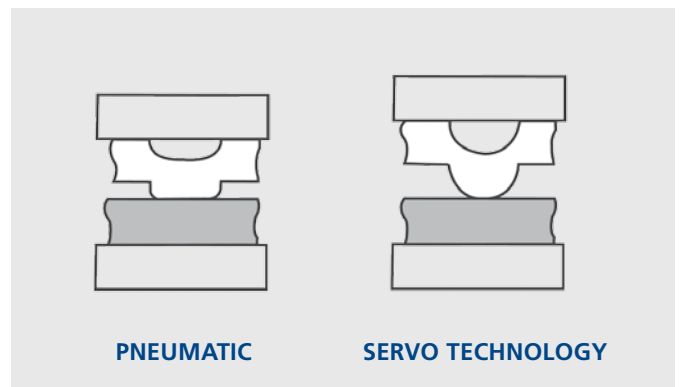


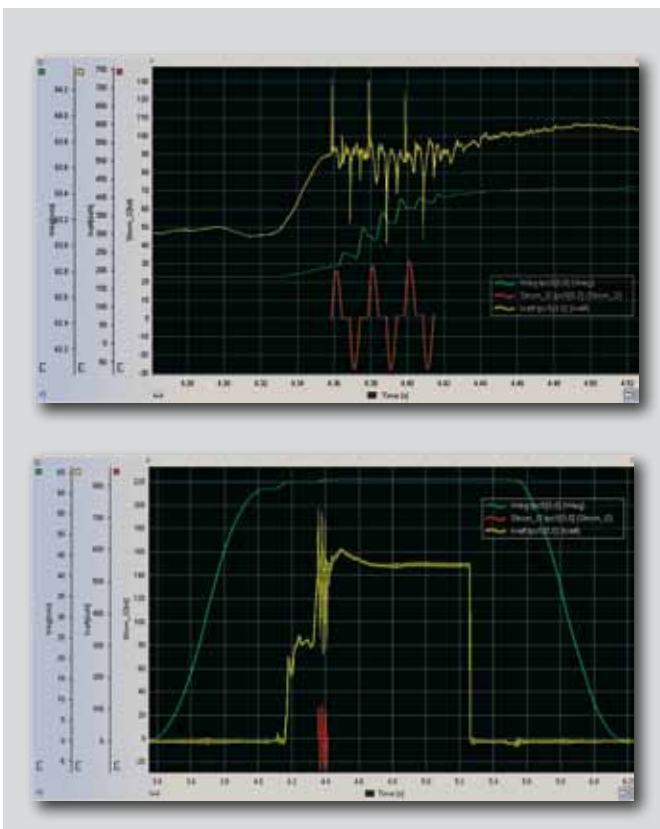
DIAGRAM: PRE-WELDING PROJECTION GEOMETRY

ADVANTAGES

Process safety and welding quality are drastically increased.

The success factors:

- Die-to-die blow-free welding electrode touch-down on the component
- Constantly adjusted preliminary force for defined press-on of components to be welded (projection geometry remains intact)
- Welding current build-up synchronized with welding force build-up with an also constantly adjusted end force
- Optimal process operation reproducibility with typical welding cycles of 20 to 150 ms



SCHEMATIC: DYNAMIC CHARACTERISTICS OF A SERVO-MOTOR DALEX-PROJECTION WELDING MACHINE WITH SERVOTRONIC®



CUSTOM-MADE SOLUTIONS FOR INDUSTRIAL DEMANDS

The DALEX concept of modifications of high-capable standard machines in response to individual demands is a well proved and secured base for industrial welding with high productivity and economic efficiency.

The machines are used in the various branches such as automotive manufacturing, utility and agricultural manufacturing, aircraft construction, wire grating manufacturing, luminous advertising, household appliances, electrical engineering, furniture manufacturers as well as window and door manufacturers.



For complex welding applications the series of DALEX machines type PMS can be fast and cost efficient modified thanks to their modular design. For reproducible welding results they can be completed by special tools designed for the intended application.



HOUSEHOLD TECHNOLOGY



MACHINE DESCRIPTION

DALEX-transversal seam welding machine
type **PMS 16-6**

WELDING TASK

seam welding of lye drums

HOUSEHOLD TECHNOLOGY



MACHINE DESCRIPTION

DALEX-spot welding machine
type **PMS 11-6** with special fittings

WELDING TASK

tab-spot welding of sinking basin

HOUSEHOLD TECHNOLOGY



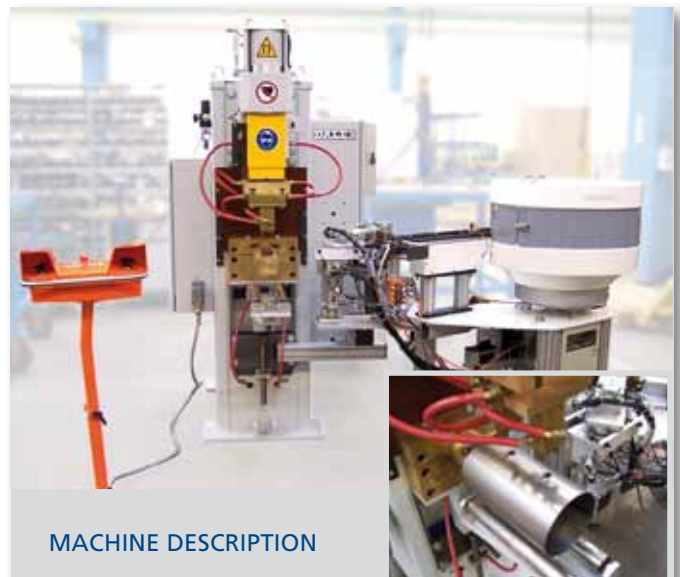
MACHINE DESCRIPTION

DALEX-transversal seam welding machine
type **PMS 14-6** with special fittings

WELDING TASK

seam welding of chimney pipe

HOUSEHOLD TECHNOLOGY



MACHINE DESCRIPTION

DALEX-projection welding machine
type **PMS 36-6** with special tools and feeding device

MACHINE DESCRIPTION

projection welding of fire-extinguisher case

AUTOMOTIVE INDUSTRY



MACHINE DESCRIPTION

DALEX-medium frequency projection welding machine type **PMS 32-6 MF** with special welding tool

WELDING TASK

projection welding of fuel distributor

AUTOMOTIVE INDUSTRY



MACHINE DESCRIPTION

DALEX-medium frequency projection welding machine-type **PMS 36-6 MF** with special fittings

WELDING TASK

projection welding of adapter on flue gas part

AUTOMOTIVE INDUSTRY



MACHINE DESCRIPTION

DALEX-double head projection welding machine type **PMS 32-6** with special tools

WELDING TASK

projection welding of hinge reinforcement

AUTOMOTIVE INDUSTRY



MACHINE DESCRIPTION

DALEX-foil seam welding machine type **PMS 14-6** with special foil seam welding device

WELDING TASK

foil seam welding of heat exchanger for passenger cars and commercial vehicles

AUTOMOTIVE INDUSTRY



MACHINE DESCRIPTION

DALEX-medium frequency 3-cylinder projection welding machine type **PMS 37-6 MF** with special tools

WELDING TASK

projection welding of parts for automotive manufacturing

AUTOMOTIVE INDUSTRY



MACHINE DESCRIPTION

DALEX-projection welding machine type **PMS 32-6** with automatic nut feeding device and special tools

WELDING TASK

projection welding of nuts on sheet metal parts

WINDOWS & DOORS



MACHINE DESCRIPTION

DALEX-double head projection welding machine type **PMS 36-6** with special fittings

WELDING TASK

projection welding of case of a lock on lock plate



MACHINE DESCRIPTION

DALEX-projection welding machine type **PMS 36-6** with special welding tool

WELDING TASK

projection welding of lock case on door frame

AUTOMOTIVE TECHNOLOGY



MACHINE DESCRIPTION

DALEX-medium frequency projection welding machine type **PMS 36-6 MF** with special welding tool

WELDING TASK

projection welding of cylindrical tubes



AUTOMOTIVE TECHNOLOGY



MACHINE DESCRIPTION

DALEX-3-phase direct current projection welding machine type **PMS 38-6 G3** with special welding tool

WELDING TASK

projection welding of diffuser on compressor housing



ELECTRO TECHNOLOGY



MACHINE DESCRIPTION

DALEX-3-phase direct current projection welding machine type **PMS 37-6 G3** with wide-speed clamping plate

WELDING TASK

welding of clip-on electric contacts



ELECTRO TECHNOLOGY

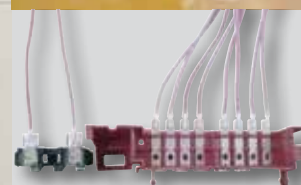


MACHINE DESCRIPTION

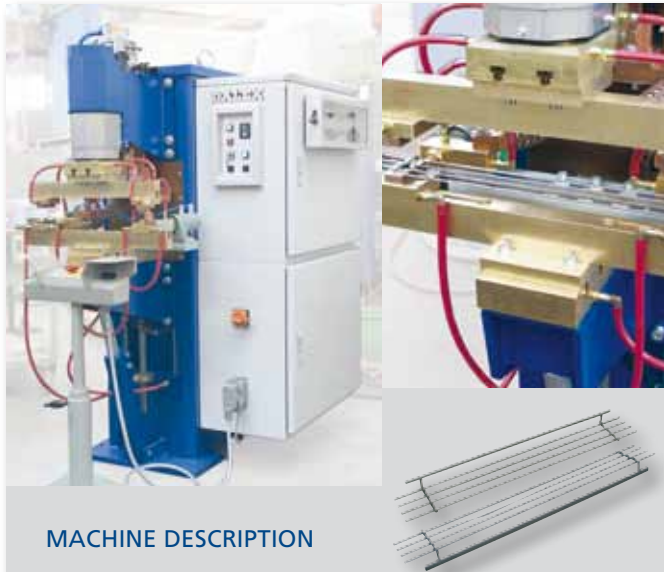
DALEX-bench type spot welding machine type **PMS 10-6 T** with special fittings

WELDING TASK

spot welding of copper stranded wire on mains terminal



WIRE INDUSTRY

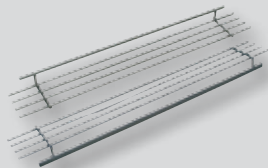


MACHINE DESCRIPTION

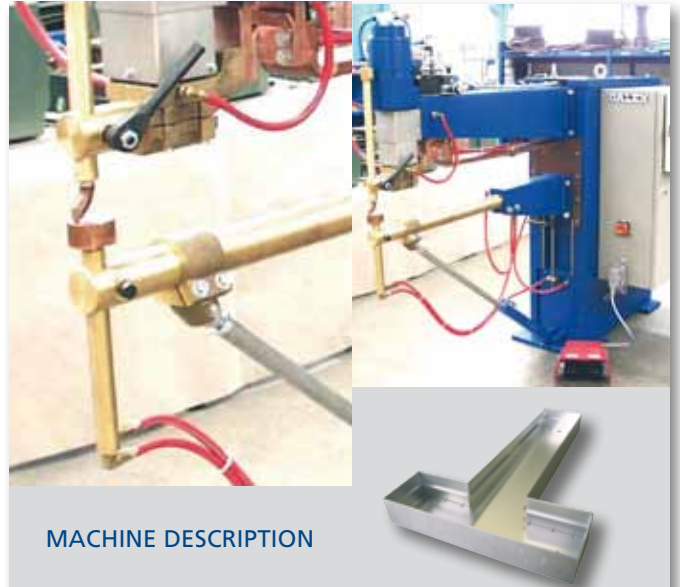
DALEX-medium frequency projection welding machine type **PMS 14-6 MF** with special welding tool

WELDING TASK

projection welding of wire console



ADVERTISING TECHNOLOGY

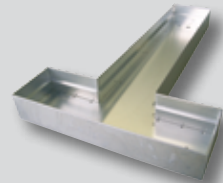


MACHINE DESCRIPTION

DALEX-3-phases direct current welding machine type **PMS 11-6 G3** with special fittings

WELDING TASK

spot welding of luminous aluminium letters



FILTER- AND SIEVE TECHNOLOGY



MACHINE DESCRIPTION

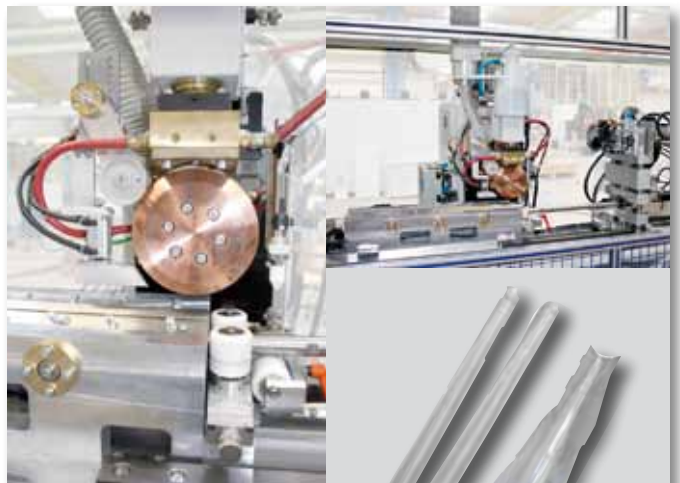
DALEX-transversal seam welding machine type **PMS 11-6** with special fittings

WELDING TASK

seam welding of filter sieve



FILTER- AND SIEVE TECHNOLOGY



MACHINE DESCRIPTION

DALEX-seam welding machine type **PMS 10-6 T** with special welding tool

WELDING TASK

seam welding of filtering bag fabrics





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