

MTW-9000
Welding control



Short information

General

In this brochure, you will find an overview of the many possible uses of the welding control MTW-9000 series.

The series MTW-9000 fulfils all of the requirements of the industry with regard to efficiency and quality assurance with automatic documentation in the branch of resistance welding technology.

In close cooperation with practice-oriented field service partners and based on all of the feedback data, experienced, specialized experts have designed the MTW -9000 as a welding control concept, which offers fully new and previously unknown possibilities with resistance welding including quality assurance.

Perfect welding, recognition of problems in due time, quality assurance including documentation in the quality of a welding laboratory are one side of the coin, which the other side includes efficient use, quick installation as well as simple and easy operation of this system.

- **Spot welding**
- **Projection welding**
- **Seam welding**

The MTW-9000 series offers a wide range of functions, with which almost every conceivable welding task in the branch of resistance welding technology can be performed.

The functions required for a specific welding task can be configured by a special function menu. With this, rarely used functions or functions not currently need are faded out and are ready for the case they are needed.

So that the operator of the MTW-9000 is not irritated by the complexity of the unit, operation of the respective welding system is adapted.

For the MTW-9000, it does not matter whether the 3-phase rectifier projection presses, portal multispot machines, simple spot tongs or the special welding devices still in planning are to be controlled.

This welding control is suitable for every welding system.

Operation

A 2x20-character, red-illuminating LED monitor shows the operator the current operating status. Highly integrated microprocessors ensure the dialogue between the operator and the control computer. All malfunctions are displayed in plain language in German or any other desired foreign language.

Welding

Along with the customary standard functions, the MTW-9000 offers several special features, which we would like to point out here:

Welding current

The welding current is digitally selectable from 1 to 99 percent in steps of 1 %. The setting corresponds to the welding current proportional to the effective value. With this, the repeatability of the desired welding energy is ensured after a change of parameters. A changed welding current setting between 10 and 12 % means the same procentual current change as between 97 and 99 %.

In this manner, the full 99 % of the range of the control unit can be used and is supplied to the welding transformer as energy. In the MTW-9000, the job is done at the welding spot, also above 70 % of the power setting!

Welding time

The welding time is adjustable between 0 and 99 periods, whereby short-time welding can be dosed in half-wave steps, e.g. the shortest welding time of 0.5 periods, 1 period, 1.5 periods etc. ... 10 periods. After that, it continues in 1 period steps up to 99 periods.

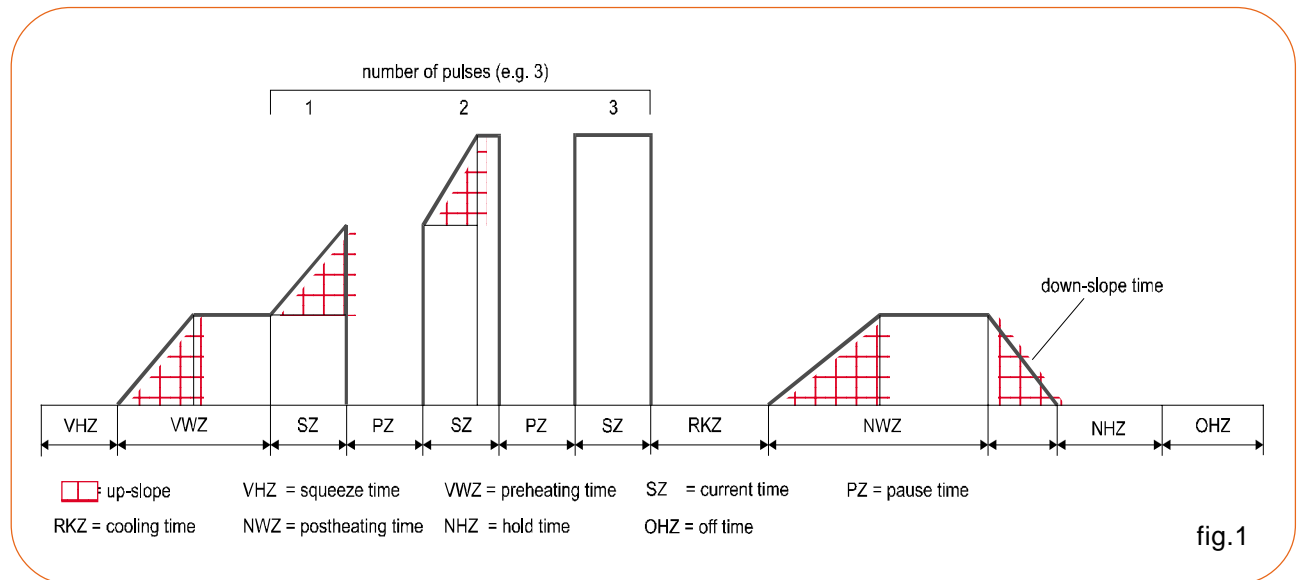
As an option, welding times of up to 3000 periods are possible.

Current program

As is well known, there are always “materials that are difficult to weld” in practice (materials with high content of carbon, difficult to hold workpieces etc.), for which a special current program is needed under certain circumstances. The welding parameters PREHEATING and POSTHEATING as well as the currentless cool down time are a part of such a control with a current program.

These parameters, however, are frequently not enough. For this reason, a up-slope time between 0 and 15 periods for the preheating and postheating current can be set with the MTW-9000.

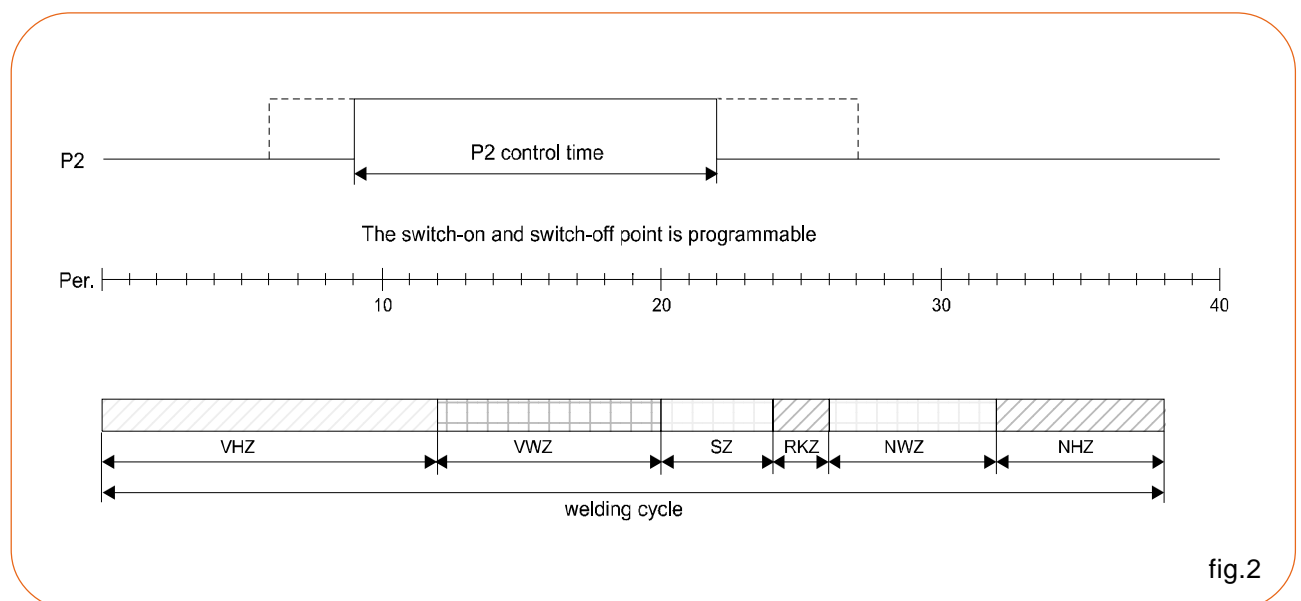
An adjustable down-slope time (0-15 periods) rounds off the MTW-9000 current program.



Pressure program

A voltage output specified for the pressure program can be set and reset at any time within a program routine. This possibility can be beneficially used with welding

machines, which require a pressure change over a defined period of time due to critical welding tasks. The solenoid valve additionally installed on the welding machine is then controlled via the P2 output.



Stepper function

Electrode wear has an extremely negative influence on the operating costs of a spot welding machine, and the quality of the welded connection also seriously declines. Since the contact surface of the electrodes is enlarged with the continuing number of work strokes. As a consequence, the current density (A/sqmm) decreases until the welding connection is not usable.

The purpose of the stepper function is to extend the service life of the electrodes with a continuing uniform welded spot strength.

With customary control systems, a stepper function results in that, after a previously empirically determined number of spots, the welding current is increased drastically. The wear curve of the electrodes, however, is not at all linear and, furthermore, depends on a whole series of factors, e.g. pressure, electrode material, surface condition of the workpiece, welding time and welding current, initial diameter etc..

Experimentally obtained experience can thus not be transferred to other welding tasks, and time-consuming tests are the result. The stepper function of the MTW-9000 does not have this disadvantage. The graphics in figure 3 clearly emphasize the differences. Imagine a rubber band that is fastened at two points. Fastening point (A) = current for new electrodes
Fastening point (B) = current for old electrodes

The course of the band shows the course of the welding current as a function of electrode wear. Since the electrode wear is not linear, one or two bends are necessary to adapt to the non-linear wear curve. The computer does everything else.

Time-consuming experiments are no longer necessary and there are also no longer any drastic current changes between the confidence limit (minimum spot strength) and the splash limit (burning of the material).

The MTW -9000 stepper computer increases the current gently and automatically point by point. In this way, the electrode service life is extended and the welding current is automatically adapted to the respective contact surface of the electrodes.

It is naturally also possible with the MTW-9000 to specify by means of programming whether the stepper computer should take every electrode stroke into consideration or if it should only register electrode strokes, with which current flows. Furthermore, with multi-program controls, the stepper counter can also register the sum of the electrode wear or it can "calculate" each welding program separately, which is especially beneficial with robot applications with a change of tongs.

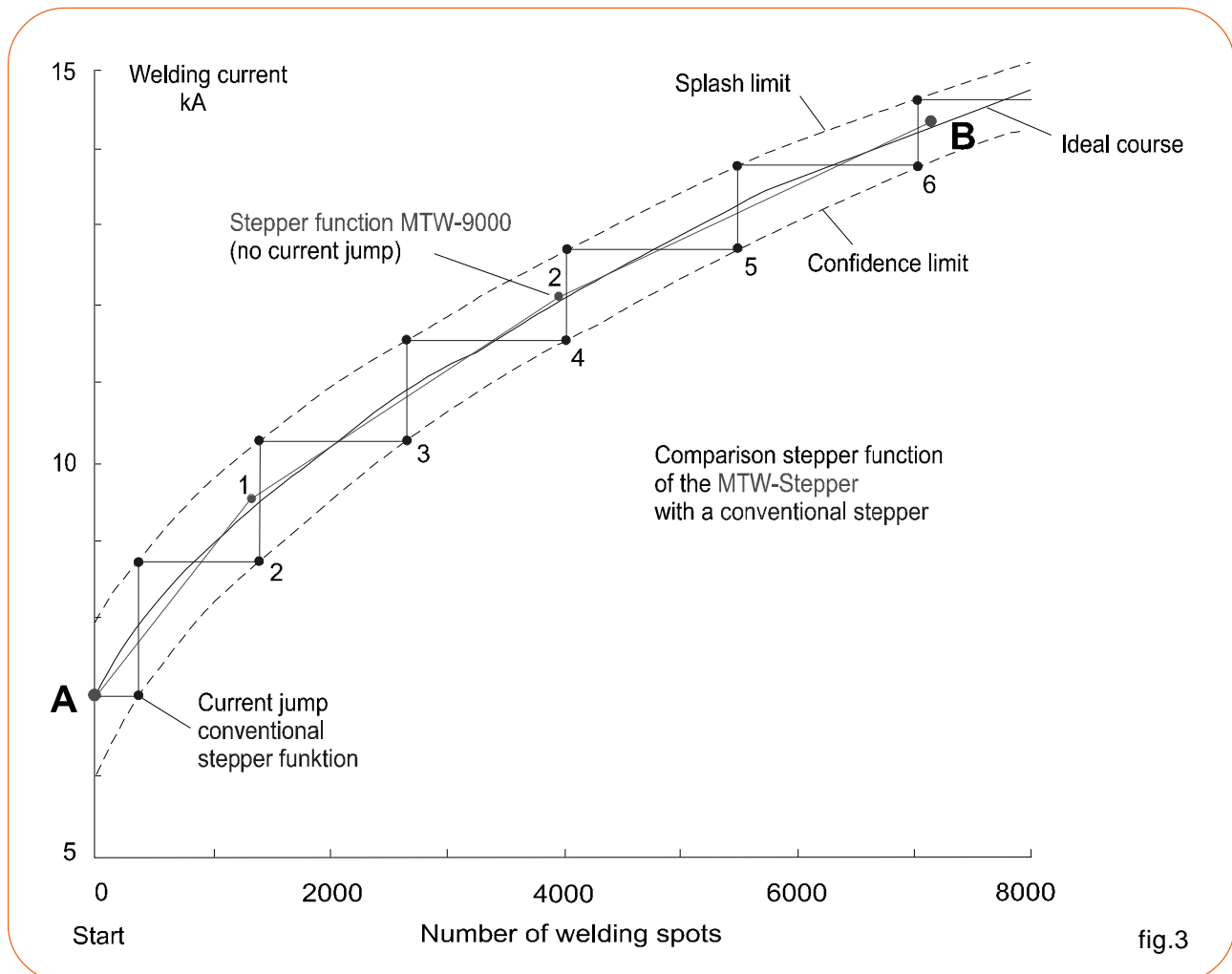


fig.3

Interface RS-232/RS-422

A printer and a PC can be connected to this interface. Via an output menu in the MTW-9000, the type of desired documentation can be selected, e.g. it is possible to document each welding process or only the welding processes that are faulty. The informative content of the printed out documents can also be freely selected and ranges from a simple good/bad statement to parameter evaluation, in which each single half-wave is put down in writing with current and voltage values. The operator can thus freely design his own documentation.

It is also possible via the interface to have one or more MTW-9000 units communicate with one PC. The PC then specifies the parameters or reads the parameters from the MTW unit and records operating data from the connected welding systems.

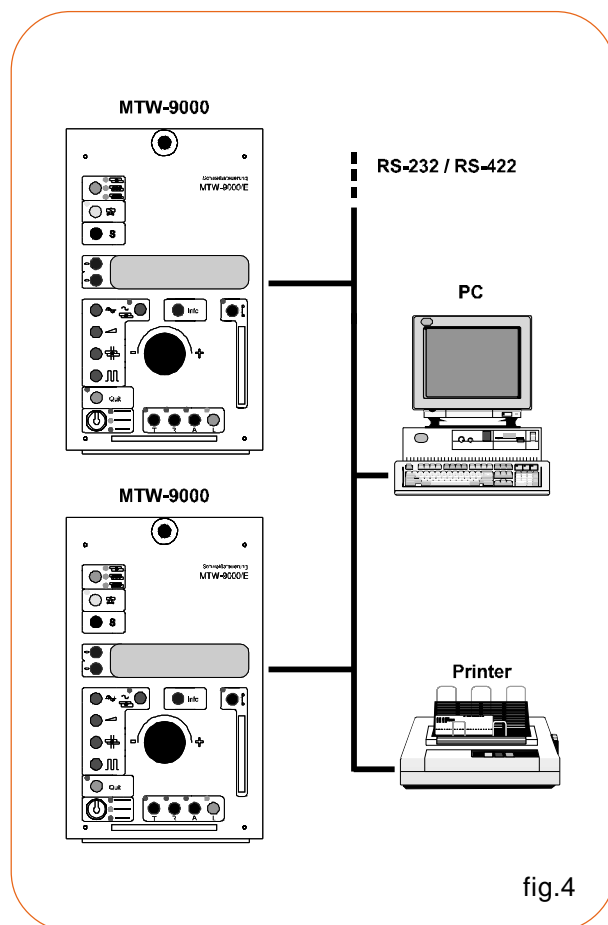


fig.4

The data card

The MTW-9000 offers another variation to the interface RS-232/RS-422, the data card.

This check card-sized data memory allows for the storage of all entered welding parameters. The data card is to be inserted into the mount that is installed on the front side of the master oscillator. After that, you need to select whether data from the unit should be stored on the card or vice-versa. With this, it is possible to transfer parameters to other welding machines.

The programs

Up to 127 programs are available in the MTW-9000. 1 to 6 solenoid valve outputs are also available.

The allocation of the solenoid valve outputs to the programs can be programmed such that a solenoid valve output (1-6) is activated as a function of the selected program No.

The output solenoid valve voltage can be selected in the power stage TW between 24, 42 and 220 V. Each program (1-127) can be given and called up with its own individual parameters.

The analogue output

With resistance welding, along with the welding parameters, the electrode pressure is also one of the most important prerequisites to obtain certain welding results. Especially with robot applications, numerous programs with various welding parameters are frequently required. In this case, the electrode force of the tongs is controlled by a proportional valve. This valve ensures that the right amount of pressure is available at the right time for each program.

A proportional output installed in the MTW-9000 supplies the necessary analogue voltage for the valve. The voltage can be specified separately for each program between 0 V and 9.9 V in 0.1 V steps. With this, the entered voltage is proportional to the electrode pressure applied. The analogue voltage can be changed over to a second value and reset once again at any optional point of time during the welding process. In this way, the pressure can still be specifically changed during the welding process.

If the data of the welding cylinder is known, then these can be programmed into the MTW-9000. Entry of the pressure is then carried out directly in daN.

Controlling (QSP)

The MTW-9000 has numerous control possibilities with the option "QSP":

If the welding time is only 3 periods long, or if a roll seam is being welded.

If the problems involve projection welding, or if welding problems arise due to edge welding, shunt circuits etc. Using the control possibilities of the MTW-9000/QSP, you can find a way to ensure welding quality.

The MTW-control "QSP" is different from customary controls with regulation in at least 4 decisive points:

1. Due to the flexibility of the adjustable of the adjustable regulation modes.

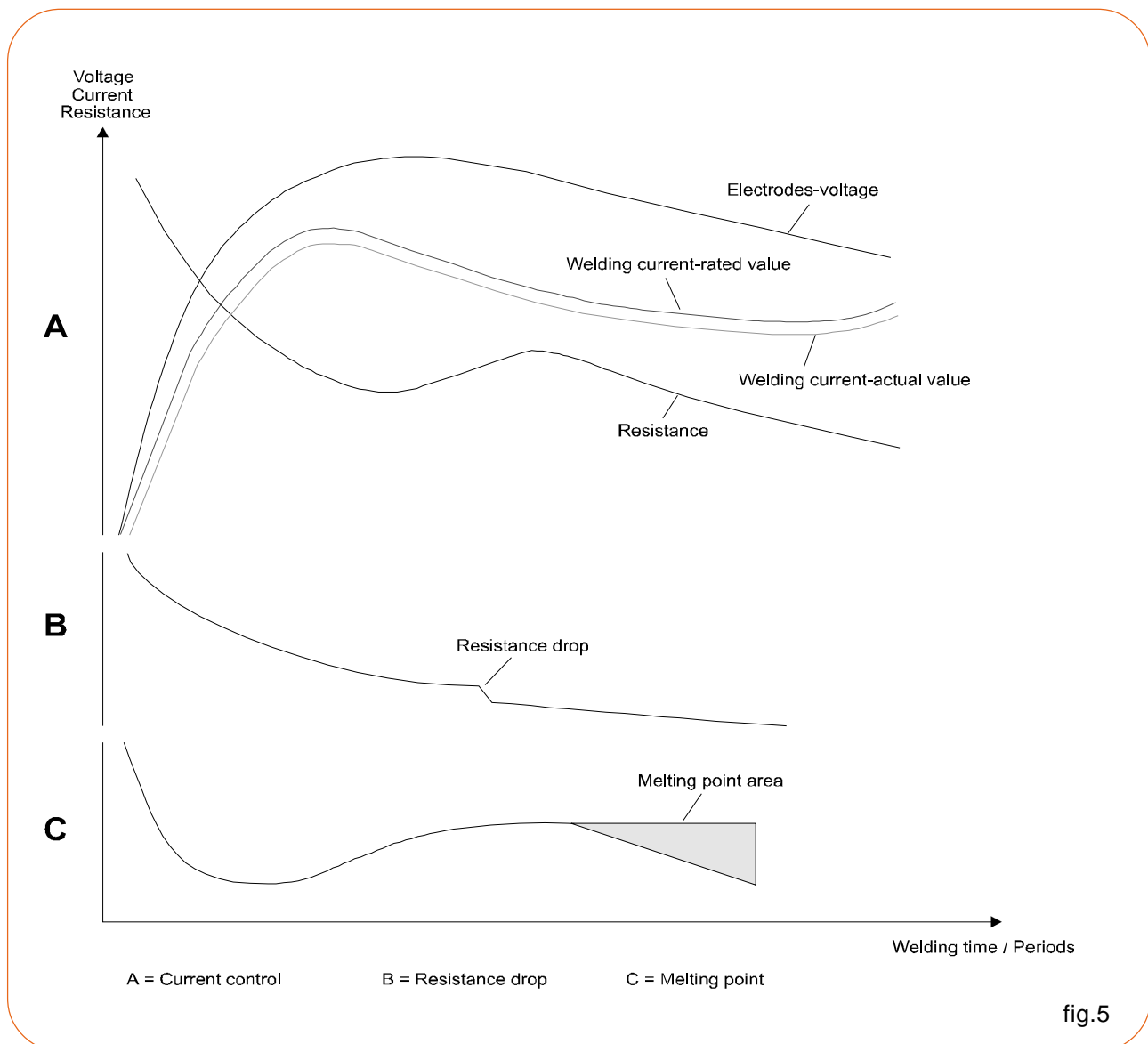
Customary quality assurance units only have one regulation mode, usually so-called "constant current control". With this, however, only a few welding problems can be solved and, in many cases, a constant current control even worsens the welding results, since the current course of proper spot welding is never constant.

This fact is based on numerous "disturbance factors" that arise in practice (non-uniform contact surfaces at the beginning of the welding time, heating up of the material and penetration of the electrodes are only three factors, which dynamically influence the secondary circuit and thus also the welding current).

In order to face these physical laws effectively, a constant current control should not be used, but the controlling characteristics of the quality assurance unit must dynamically follow the natural welding current course.

The MTW-9000/QSP is equipped with a highly complex control algorithm, which accomplishes this task.

2. Due to the ingenious hardware/software, the MTW has an especially high regulating speed, which follows the selected value with a half period delay (10 ms!).



With this, short-time welding (starting with 3 periods) with control is also possible. A set current increase time is naturally also registered by the MTW-9000/QSP and taken into consideration with the regulation process. Customary quality assurance units, to the contrary, simply filter out the time of the current increase, whereby an extremely important monitoring and control time period is not correctly registered or is lost.

3. Operation and installation criteria:

The option QSP together with the MTW-9000/QSP forms an integrated unit that is easy to operate and easy to install. The current channel is selected by means of a menu, whereby it does not matter if a primary current transformer, a Rogowski belt or the current coil built into the welding transformer is to be used. The right measuring range is automatically set. The measured values are displayed separately in A / kA as selected for each half-wave.

The welding current control MTW-9000/QSP is even transformed with this into a welding current meter with excellent accuracy.

The electrode voltage measuring lines do not pose a problem with the MTW-9000/QSP and may be laid parallel to the electrode arm. Interference is filtered out with mathematical precision.

What is behind all of this? A magnetic field that arises with every welding machine induces an interference voltage in the voltage measuring line, which falsifies the electrode voltage to be measured such that it is unusable. Physically seen, it does not matter if the lines are shielded or not!

Customary quality assurance units without interference filters can not be used to state whether the measured voltage is the desired measuring voltage, or if the measured voltage is a current-dependent induced falsified voltage. Most of the customary quality assurance units are therefore only suitable for the parameter processing "electrode voltage" to a limited extent. A quality assurance unit frequently becomes a quality worsening unit.

4. Electrode distance measurements

With this function, component-related faults are compensated for. The position and movement of the electrodes are monitored during the individual welding phases. In this way, it is possible to carry out a component inspection before welding, and to monitor and/or to regulate the sinking depth during the welding process.

Monitoring

With welding systems with automatic material feed, with projection welding as well as with the welding of difficult sheet metal forms, it is possible that parts have been improperly laid, indents have been punched in different heights or are completely missing.

There are also parts to be welded, which have very high production tolerances and can therefore not be welded. These non-conformance components should be automatically sorted out.

The MTW-9000/QSP offers the possibility to specify fixed welding parameters and components sizes and to monitor if this is maintained.

If the tolerances are outside of the specified values, a signal is given off and/or the machine is automatically blocked. By means of this "self-control", it is almost impossible for faulty components to be welded and to be delivered accidentally.

Text generator

Using the generator, six texts can be freely written without an additional keyboard. These texts will then be respectively shown as messages independently from each other as a function of the number of spots, the date or the contacts.

Such a function offers the possibility of pointing out the need for important maintenance work, e.g. tool changes, safety inspections of pressure lines etc. and - to the extent necessary - to block the machine.

Counter

The MTW-9000 is equipped with an adjustable welding spot counter. This offers the possibility to separately count the welding spots of each individual program and to additionally count the sum of all program sequences. The spot counter is to be programmed such that it only registers start sequences with current. In addition, a pre-adjustable counter number can be selected in order to block the system.

Technical specifications

Current parameters:

| | |
|---------------|------------------------------|
| Up-slope | 0 - 15 per. |
| Power setting | 1 - 99 % |
| Welding time | 0 - 99 per. (up to 3000*) |
| Pulses | 1 - 15 |
| Pause time | 0 - 99 per. |
| Down-slope | 0 - 99 per. |

Additional times:

| | |
|---------------------------|-------------|
| Squeeze time | 0 - 99 per. |
| Hold time | 0 - 99 per. |
| Off time | 0 - 99 per. |
| 1st extended squeeze time | 0 - 99 per. |

Current program *):

| | |
|---------------------|-------------|
| Preheat up-slope | 0 - 15 per. |
| Postheat up-slope | 0 - 15 per. |
| Preheating current | 1 - 99 % |
| Postheating current | 1 - 99 % |
| Preheating time | 0 - 99 per. |
| Postheating time | 0 - 99 per. |
| Cooling time | 0 - 99 per. |

Pressure program P-2:

1 output

Pressure program P-3 *):

1 output

Proportional valve *):

2 outputs

Modes of operation:

Single spot welding
Series spot welding
Seam welding (seam without intervals = continuous current)
3-phase seam welding

Regulating functions *):

Current
Voltage
Resistance
Automatic (AQS)

Quality assurance *):

Parameter monitoring
Protocol output / documentation

Program selection *):

Up to 127 programs

Solenoid valve outputs:

Programmable 1 - 6 outputs (24 V, 42 V and 220 V adjustable in the power stages)

Stepping contact:

Switch-on point is programmable

Interlocking contact:

Switch-on point is programmable

Mains power fluctuation compensation (NK):

+15/-20 % to 1.5 % (with $\cos \varphi 35^\circ$)

Selection of the start interlocking (SV):

With beginning of the squeeze time, or
With beginning of the current time

Selection of the pressure switch function (DK):

squeeze time begin after start, or after closing of the pressure switch

Operating data registration:

Date / time
Welding spot counter

Text generator:

6 texts of 50 characters each

With / without current switch:

Internal and external

Key-operated switch:

Parameter protection

Interfaces *):

RS-232, RS-422

Additional special functions:

- Pre-stroke valve output
- 1st extended squeeze time (0-99 periods)
- Plain language messages with lack of function conditions
- 3-phase operation etc.

These are only a small excerpt of the wide range of functions of the MTW-9000.

*) Special equipment

Subject to change and errors excepted.



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