# **SPATZ+** M400/M600/M900 Medium Frequency Inverter Power Source

The 1,000 Hz Medium Frequency Inverter Power Source **SPATZ+** is specially designed for applications in the automotive industry. This weld timer provides extended data recording, online monitoring possibilities and an USB interface. Extension cards with different field buses (e.g. Profibus-DP, DEVICENET, PROFINET or ETHERNET IP with RJ45 connector) are available for connections to a robot controller or a line PLC. The controller has a modular setup and can be configured for different purposes. It can be upgraded with e.g. servodrive extension cards for operations of servo-electric welding guns. All changes in the new generation are related to the circuit board only. The established power section and the successful adaptive **MASTER** control remain unchanged.

In combination with an external MFDC transformer the **SPATZ+** is a powerful supply for a welding current range of 3 kA to 18 kA (*M400*). The weld timer and middle frequency inverter is housed in a compact IP20-protected housing for switch cabinet mounting. Each welding operation is feedback controlled during the weld procedure. The control process has short reaction time, which is based on the 1 kHz inverter frequency. Actual values are compared with target values every 0.5 ms. The output power is adapted during the welding process if targets are not being met. The adaptive **MASTER** control process , constant current control (CCC), constant power control (CPC), constant voltage control (CVC) and constant trigger angle Control (CTC) can all be used.

Using the **MASTER** control mode there is only one reference weld schedule for each sheet combination necessary. In total up to 1,024 reference weldschedules can be stored. If the spot number related weld schedule selection is activated and the timer is running in **MASTER** control mode then for each individual weld spot number a fine adjustment can be done. Reference curves from standard guns can be transferred to arbitray welding guns. As a standard the **SPATZ+** includes signal inputs for welding current and electrode voltage and one proportional valve output. The internal welding data recorder keeps details of the last 100,000 welding passes. For each of weld it records details of the welding parameters, such as welding current, electrode voltage, energy and current time. Each data set gets a time stamp with time and date. In addition it also stores weld expulsions, counter reset, changing of target values, changing of the control parameters, details of fault status and instances where limits were exceeded.

| Technical Data | |
|---|---|
| Welding spot selection | 32 Bit |
| No. of programs | 1024 |
| Welding impulses / program | 16 |
| Control modes | **MASTER**, CCC, CPC, CVC |
| Weld parameter monitoring | yes |
| Stepper function | for CCC, CPC, CVC |
| Force schedule | yes |
| Slope up / slope down | yes |
| Signal inputs | current, voltage |
| Sensor monitoring | yes |
| 1 x Output for proportional valve | 0 - 10 V DC or 4 - 20 mA |
| Mains voltage $U_1$ | 3~400 V - 480 V, 50/60 Hz |
| Nominal power $S_N$ | 140 -150 kVA with 20 % duty cycle, 400 V<br>90 kVA with 50 % duty cycle, 400 V |
| Output voltage $U_{2N}$ | 500 V / 1000 Hz, 400 V |
| Output current $I_{2max}$ | 450 A / 650 A / 950 A |
| Interfaces | USB, PROFIBUS-DP, DEVICENET, PROFINET, ETHERNET |
| Digital inputs / outputs | 16 / 11 |
| Cooling system | Water-cooled or air-cooled (ambient air temperature max. 50 °C / 122 °F) |
| Type of protection | IP20 |
| Dimensions (H x W x D) | 390 x 200 x 345 mm<br>15.4 x 7.9 x 13.6 in |
| Weight | 20 kg / 21 kg / 22 kg<br>44.1 lb / 46.3 lb / 48.5 lb |
| Included in delivery | connecting kit |

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The whole tip dresser management (initial tip dressing, following tip dressing) and tip dresser supervision (duty cycle supervision, tip dress result supervision, ELK test and **NUGGET***Index*) can be done with the **SPATZ+**. In addition 16 digital inputs and 10 outputs as a standard ensure a reliable data exchange with 24 V DC signals via standard protocols. A 24 V DC fan output is available.

For communications between the **SPATZ+** and a line PC, an ETHERNET connection has been implemented, using the **SPATZ***StudioNET* software. Communication with a local PC is possible via the USB interface, using the **SPATZ***Studio* software.

The features of the **SPATZ+** *M400 / M600 / M900* weld controller are:

- Adaptive **MASTER** control
- Generation of **MASTER** reference curves from standard guns and data transfer to arbitray welding guns in different plants via **MASTER** database
- 32 Bit (max. 4,294,967,296 spots) weld spot number selectable via field bus
- 1,024 **MASTER** reference weld schedules, can be related to the individual spot numbers
- 128 service schedules (scale force, scale current, change cap, start dressing, dressing, tip polishing, sensor test ...) complete the **MASTER** reference weld schedules
- Different weld schedules easy to configure, e.g. several squeeze and hold times, several current times - different in length and amplitude -, slope up and down, several pause times, force schedules
- Constant trigger angle Control, Constant Current Control CCC, Constant Power Control CPC, Constant Voltage Control CVC
- Signal inputs for current and voltage, optionally 2 further signal inputs for force and penetration
- 0 - 10 V or 4 - 20 mA analog output, e.g. for proportional valve
- Weld parameter limit checking for all weld parameters like weld current, electrode voltage, current time, total energy, final resistance, trigger angle...
- Extended QA data (e.g.: $R_{Min}$, $R_{Max}$, $I_{Min}$, $I_{Max}$, $F_{Start}$, $F_{End}$ …)
- Extended QA documentation
- Internal welding data recorder for the last 100,000 welding and the last 1000 curves for quality assurance
- Error memory for the last 100 error messages including waveforms (weld current, electrode voltage, control value) for error analysis
- Schedules and check of minimum and maximum force before current time start
- Sensor fault detection for electrode voltage and weld current sensor
- Input for weld stop within 0.5 ms
- 8 independent counters for tip life, dresser, dresser blade and gun life
- Tip dresser management and control
- Tip dresser supervision via ELK test and **NUGGET***Index*
- Interface for weld gun identification system **MASDAT** via extension board for manual guns
- Battery buffered real time clock and counter values
- Parallel I/O interface, 16 digital inputs, 10 digital outputs, 24 V DC
- Fan output, 24 V DC
- External 24 V DC power supply for digital outputs and peripherals e.g. via robot
- Field bus slot, field bus freely selectable
- Slots for quasi parallel operation of two manual guns at a single weld controller with extension for I/O, proportional valve and gun identification system
- Two slots for servodrive extension cards to drive servo-electric welding guns (e.g. electrode stroke and equalizer)
- USB interface for local PC
- Firmware update via PC / Internet
- Water-cooled or Air-cooled

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