The machine controller BES/S4

Compact controller with a ColdFire CPU, with a base as big as a C5 envelope.

- The controller is limited to 4 stepping motor axes. (Four existing separate connectors with the signal outputs.) No operation possible with usual servo motors, however it is possible **to actuate motors with SERCOS III, so the possible number of axes increases to 8** Stepping and servo axes are mixable in the case of an operation with SERCOS III. E.g. a machine with SERCOS servo motors may dispose of a tool changer with a stepping motor.
- Apart from the essential ports for PC, keyboard, axes, reference switch, spindle and emergency stop, further available: **9 spared sensor inputs and 12 spared switch outputs** (for tool changer, edge sensor etc.). **(In case of an operation of motors via SERCOS III additional sensor inputs are available, which are at the SERCOS power driver.)**
- Maximum **output frequency: 350 kHz** (BES/C: 450 kHz).
  Thereby e.g. speeds up to 10 m/min are reachable with micro stepping of 10.000 pulsings per motor rotation and a spindle with 5mm pitch.
  The scale of the axes may differ here, too, divider head operation or rotary axis are possible.
  (Up to 900 kHz output frequency are available on request.)
- **Low wiring effort** in the machine. E.g. direct connection of the reference switch to the controller (one plug terminal per switch) without a separate terminal strip.
  The connectors to the PC and the keyboard are located at the front side. It is possible to mount the housing inside the machine in a way that the connectors are directly accessible from the outside.
- **Compact housing** 220mm x 165mm x 51mm.
- **Shared 24V-power adapter to power the controller and the machine components.**
  Included in the delivery: power adapter 24V, 2A for DIN rail assembling.
  The controller including the keyboard M24 requires ca. 500mA. So 1.5A are still on hand for machine components. (The controller needs a higher supply current during the usage of other keyboards, a lower supply current without a keyboard.)
- As an option an operation without a machine keyboard M24/M25 is possible (cost saving)
  Separate start- and stop-buttons are connectable to that end. But this leads to constricted operation options. The machine is then adapted via PC.
- During the **refitting/modernization** of existing machines, advantages of the BES/S4 occur as opposed to other controllers.
  - Cost-efficient but even so powerful.
  - An easy connecting of the components (e.g. one plug terminal per limit switch). An easy connecting and trying during the refitting of deprecated milling controllers etc.).
  - Flexible, multiple adjustment possibilities e.g. if different drive spindles are used in the axes (necessary e.g. during the refitting of Wissner machines).
  - Because the BES/S4 is equipped with four axes, it is not just suited for simple machines, but also for machines
    - which e.g. have a rotary axis,
    - or machines with two Z-axes.
- **It is even possible, that two Z-axes are used, that are making a depth detection separatly, and that enables in this way a double efficiency during the production by usage of an eletric depth detection.**

Features BES/S4

3.1

The features of the controller BES/S4 are:

- Compact housing: 220 mm x 165 mm x 51 mm.
- CPU with 32bit processor Coldfire® of the producer Motorola®/Freescale Semiconductor ®
- Signal outputs for 4 step motor axes (D-Sub 9 pol)
  Maximum output frequency: 350 kHz (on request up to 900 kHz)
- Connectors via pluggable terminals (necessary mating plugs are included in the delivery):
  - 4 inputs for the reference switch of the 4 axes
  - 3 inputs for sensors, scanners
  - 4 relay outputs, +24V switching
  - 3 transistor outputs, GND switching
  - connector for emergency stop circle-spindle
  - connector power supply 24V
- I/O-signal via expansion plug (D-Sub 25 pol):
  - 7 transistor output, GND switching
  - 6 inputs for sensors, scanning
  - connectors für emergency stop circle
- Spindle-connector (D-Sub 15 pol):
  - spindle analog output
  - spindle on/off
  - spindle sensor input

Included in the delivery:

- Power adapter 24V 2A, DIN rail assembling (Input 85..264V AC). To power the controller and the controlling elements of the machine
- Controller software (Firmware)

Please note:

- **The data transfer from PC to the BES/S4 works via network (Ethernet RJ45 plug-on-connector). If the usage of a serial connection via RS422 is favoured, the needed RS422-card 1.4.1 (PCI(e)-plug-in-card for the PC) or a USB-adapter box has to be ordered separatly.**

M25   **Keyboard M25**
Membrane keyboard with LCD-display, 3m connection cable and emergency stop switch
(emergency stop by key is NOT available)

2.1.1   **Keyboard M24**
Membrane keyboard, 3m connection cable and emergency stop switch with a key
(emergency stop is just unlockable by key)
If no keyboard is needed, separate keys for STOP and START need to be mounted.
NEW: It is also possible to realise the keyboard functions directly on the PC.

1.4.1   **RS422-card**
PC-plug-in-card (for PCI(e)-slot) with two interfaces (connection of two machines possible) incl.: one 5m RS422 cable
Is needed, if the connection between PC and controller should not work via network

2.2.1   **Kuhlmann-keyboard adapter**
Is needed, if a Kuhlmann-keyboard (instead of the M24) should operate at the BES/S4-controller
(additional voltage-generation).
Is also available for DIN rail assembling

Further function details of the BES/S4

•Lookahead
Up to 200 lines are calculated beforehand to reach a high speed. Curved lines, that are composed of straight lines, are driven faster than 90° corners. The speed is determined by the transition angle. Transitions, that are nearly tangential, are driveable with a high speed. Corners may just be driven slowly. The machine slows down in time in case of it is converging to a corner. The "brake path length" may reach up to 200 small path sections.
Related to the software BESgrav it is also possible to change curved lines out of straight lines into spline curves automatically prior to the drive off. These may be driven even faster but still result in an improvement of the smooth operation and the quality of the milling (from controller software 3.22/BESgrav 3.35).

•Activation of portal axes
It is possible to activate two parallel running axes (e.g. portal axes) with our controllers BES/S4 and BES/C. Additionally it is possible to activate two Z-axes via this function, that can do a depth scanning severally during the manufacturing of two similar workpieces.

•Activation of rotary axes (rotary index table, dividing head, dividing attachments, rotary engraving device, rotary engraving, cylindric engraving, roller engraving, compression roll production, cutting roller production)

   •Activation of automatic:
   •tool changers
   •length sensing to adjust the tool length
   •surface sensing for adaption to the material surface
   •edge sensor to determine the lie of the workpiece (position and angle)
   (For SERCOS III-motors an input at the power unit of the motors is used)

•Sensing of simple 3D-surfaces for further data processing in the PC. Just one radial sensing line is needed for a profile sensing (e.g. of a wheel rim)

•Sensing to capture material irregularities for a compensational calculation. Thereby it is possible to generate exact engravings on uneven surfaces (e.g. for processing of cheap raw material)

•Own machine keyboards M25 and **M24** (handheld units).
Or usage of a **KUHLMANN-keyboard**, the controllers **CX268, CS268 or CG268.** Such a keyboard is connectable by way of a specific adapter.

•Manual feedrate adjustment: changing feed and spindle speed directly immediately effective during the processing.

•Repeat of already processed program parts (e.g. in case of mill breakage) without an intervention on the PC. The repeat is also usable to change the engraving depth.

•The processing is interruptible: Machine is then driveable by hand. After pushing Start, the controller drives back to the previous position and proceeds the processing.

•Activation via network (Ethernet RJ45 plug-in-connector) or optional with a fast and interference-free RS422-interface from the PC (free PCI(e)-plug-in position or USB-interface for specific interfaces on the PC needed; both solutions can be sourced directly from us).

•Activation of the spindle for speed specification by way of an analog output.
Further switch outputs and sensor inputs available. Also usable for monitoring functions (spindle OK/stop-input of access door).

•From our own development and production, so as a result special requests and special applications are fastly realisable.