

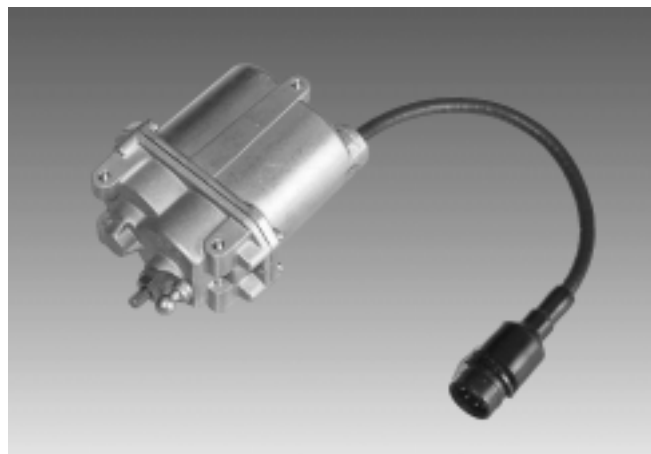
RE 95 120/04.99

Preliminary issue

**Actuator STM**

for control of a diesel engine injection pump

Series 1



STM.../10

Features

The electric actuator "STM" is designed to operate the injection pump lever of diesel engines in combination with an electronic control system for hydraulic drives supplied by Brueninghaus Hydromatik.

Due to its enclosure protection class, temperature resistance and vibration resistance, this servomotor is suitable for installation in the engine compartment close to the injection pump.

The STM permanent-magnet DC electric motor is activated by a pulse width modulated (PWM) voltage directly from a MC microcontroller (see RE 95050).

The STM actuator contains a 3-speed gear and a potentiometer that detects the angular position of the drive shaft. A built-in switch (safety contact) is opened at a predefined angle of rotation of the drive shaft.

Main components

- Permanent-magnet DC motor with spur-gear unit
- Plastic potentiometer for rotation angle sensing
- Safety contact
- Robust, sealed housing
- Connecting cable with plug-in connector

Special characteristics

- Suitable for installation in the engine compartment
- High torque and short setting times
- Direct control by MC microcontroller (RE 95050)

Ordering Code

	STM	/	1	0
Type	Actuator			
	STM			
Supply voltage	12 V		12	
	24 V		24	
Series			1	
Index				0

Note

The STM actuator may only be used with a MC microcontroller (RE 95050) and the software issued by Brueninghaus Hydromatik.

Technical Data (with MC Microcontroller where applicable)

Type	STM12...	STM24...
Nominal voltage	12 V	24 V
PWM frequency	300 Hz ± 30 Hz	
Rated current	2.4 A	1.2 A
Max. continuous current	2.7 A	1.3 A
Max. torque, momentary	600 Ncm	
Continuous holding torque	180 Ncm	
Adjusting time (for 90 % el. adj. angle)	≤ 500 ms	
Adjusting angle, mechanical	120°	
Adjusting angle, electrically usable	90° ± 3.7°	
Potentiometer:		
Series resistance	1 kΩ +90%/-25%	
Slider protective resistance	1,5 kΩ	
Switch:		
Max. switching current	500 mA, non-inductive	
Enclosure protection class to DIN 40050	IP 56	
Operating temperature, ambient	-40 °C ... +120 °C (...+140 °C max. 1h)	
Storage temperature	-40 °C ... +120 °C	
Weight	approx. 1000 g	
Fixing screws:		
Strength class	8.8	
Max. tightening torque	8 Nm + 4 Nm	
Depth of thread engagement	9 mm	
Max. tightening torque on the drive shaft	10 Nm	

Function Description

The MC microcontroller calculates a setpoint control signal for the injection pump on the basis of different input variables (e.g. position of the accelerator pedal or drive lever) and as a function of operating conditions (e.g. driving on public roads or in working use). The diesel injection pump is actuated by the output of the microcontroller via the STM actuator.

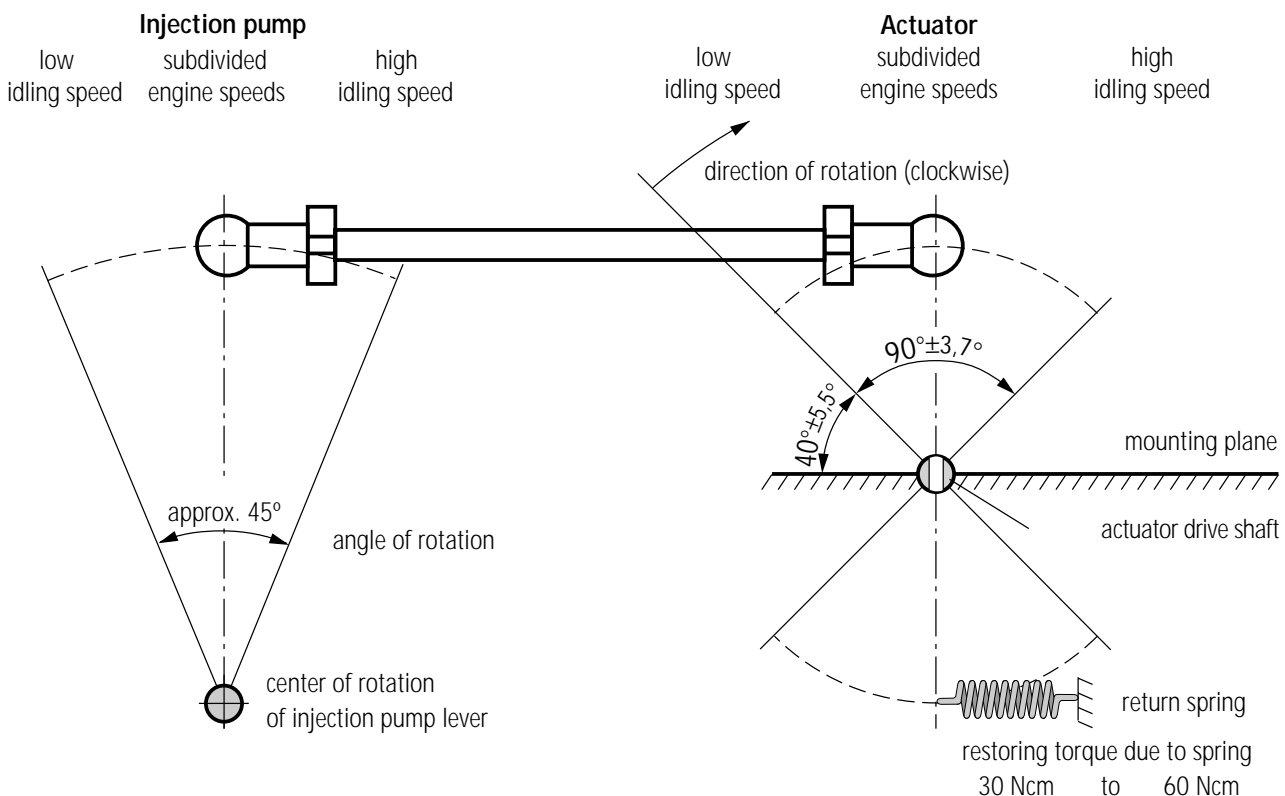
The actual position of the injection pump lever is recorded by the potentiometer signal in the STM actuator. If there is a difference between the setpoint and the actual value, the drive shaft of the servomotor is turned clockwise or counter-clockwise by the pulse-width-modulated output voltage of the microcontroller.

In the closed-loop control circuit, the new position is adjusted with high dynamic response (< 0.5 seconds).

The following functions, for example, can be implemented with the appropriate software in the MC microcontroller and with the STM actuator:

- fully automatic calibration of the function range between low and high idling speed after installation of the actuator
- automatic engine speed reduction when no working function is active (e.g. in excavator applications)
- automatic engine speed reduction in response to low power demand, to ensure optimal fuel consumption and low noise emission.

Operating Diagram (example)



Control Instructions

- The motor current must be limited by the electronic controls to ensure that the maximum continuous current is not exceeded for an average of 30 s.
- The internal mechanical end-stops of the STM actuator must not be reached.
- By appropriate electronic control, external end-stops may only be struck at low adjusting speed and with closed-loop position control.
- To compensate for gear backlash, an external torque must be applied to the output shaft during operation, e.g. by a return spring.

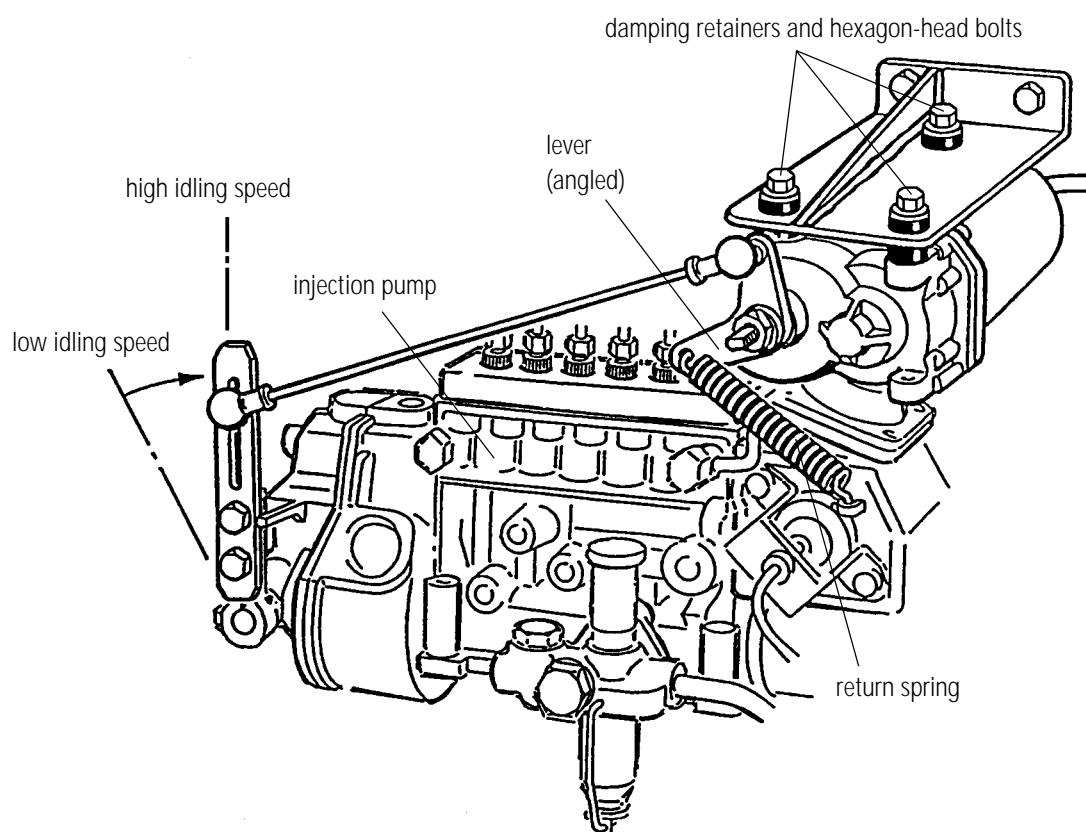
Note: All electronic control requirements are satisfied if the motor is operated in combination with an MC microcontroller (RE 95 050).

Assembly Instructions

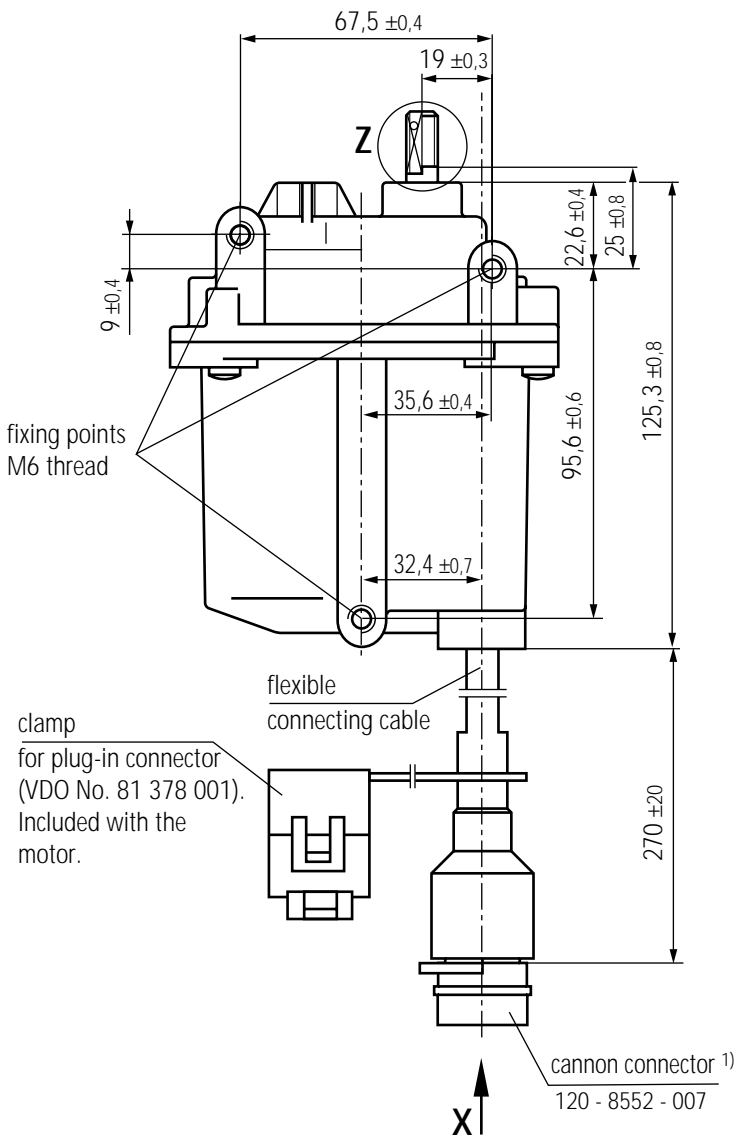
- The actuator must be mounted on a mounting plate and must be insulated from the vibrations of the diesel engine, taking into account the local conditions.
- To reduce operating forces and force/travel hysteresis, the motor must be installed as close as possible to the injection pump.
- The mounting plate must be made of sheet metal at least 4 mm thick with stiffening ribs. The diameter of the three holes for the damping retainers is 20 mm.
- To ensure quasi-linear kinematic response, the injection pump lever and the actuator lever must be as parallel as possible to each other in every operating position and must form a right angle with the rod at the mid-point of the adjusting range (see function diagram).
- Due to the positioning travel adjustment, only metal ball cups may be used between the actuator and the injection pump lever.
- When designing the control system, consider that the maximum permissible adjusting torque at the actuator is 180 Ncm (Note: the return spring must be taken into account in the design configuration).
To prevent consequential damage to the actuator, the adjusting torque must be set at the injection pump lever with each installation.
- An external spring must be used to reset the actuator to the off-load state.
The restoring torque of the spring must be 30 Ncm to 60 Ncm.
- The adjustment ranges of the injection pump adjusting lever and the actuator must be harmonized and set in accordance with the setting specifications.

Further installation instructions are available on request from Brueninghaus Hydromatik.

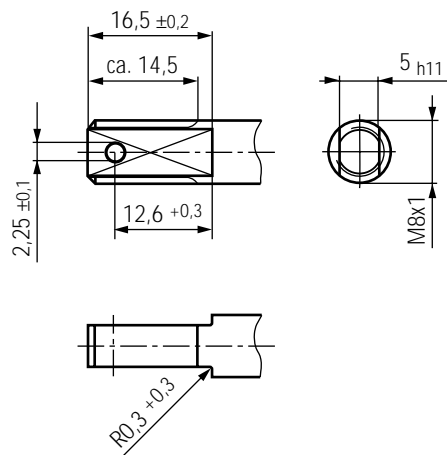
Example Assembly



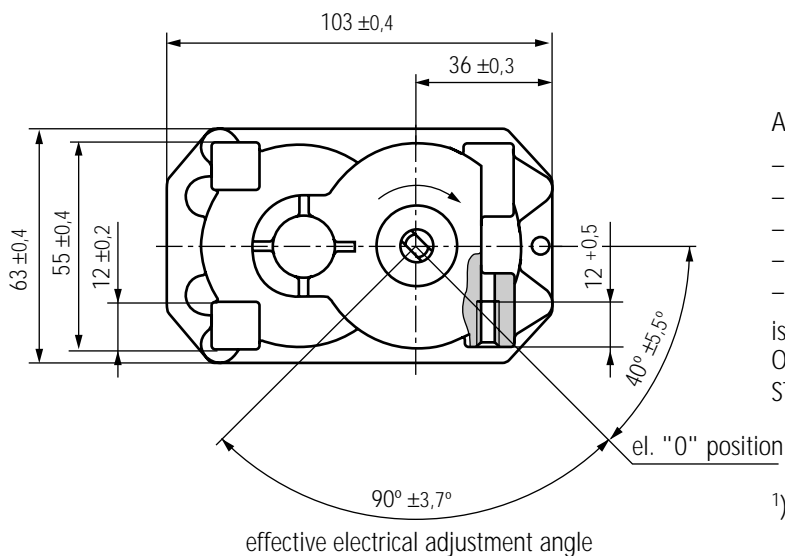
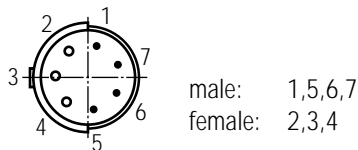
Unit Dimensions



View Z (enlarged)



View X (cannon connector)



A complete set of installation accessories, comprising:

- 1 lever (angled) VDO No. 993 620 079 1143
- 1 lever (straight) VDO No. 993 620 082 1143
- 1 return spring VDO No. X11 397 112 006
- 1 set of damping retainers.. VDO No. 240 110 001 001
- 3 hexagon-head bolts VDO No. X11 397 109 056

is available on request from Brueninghaus Hydromatik. Order designation: "Installation accessories for actuator STM".

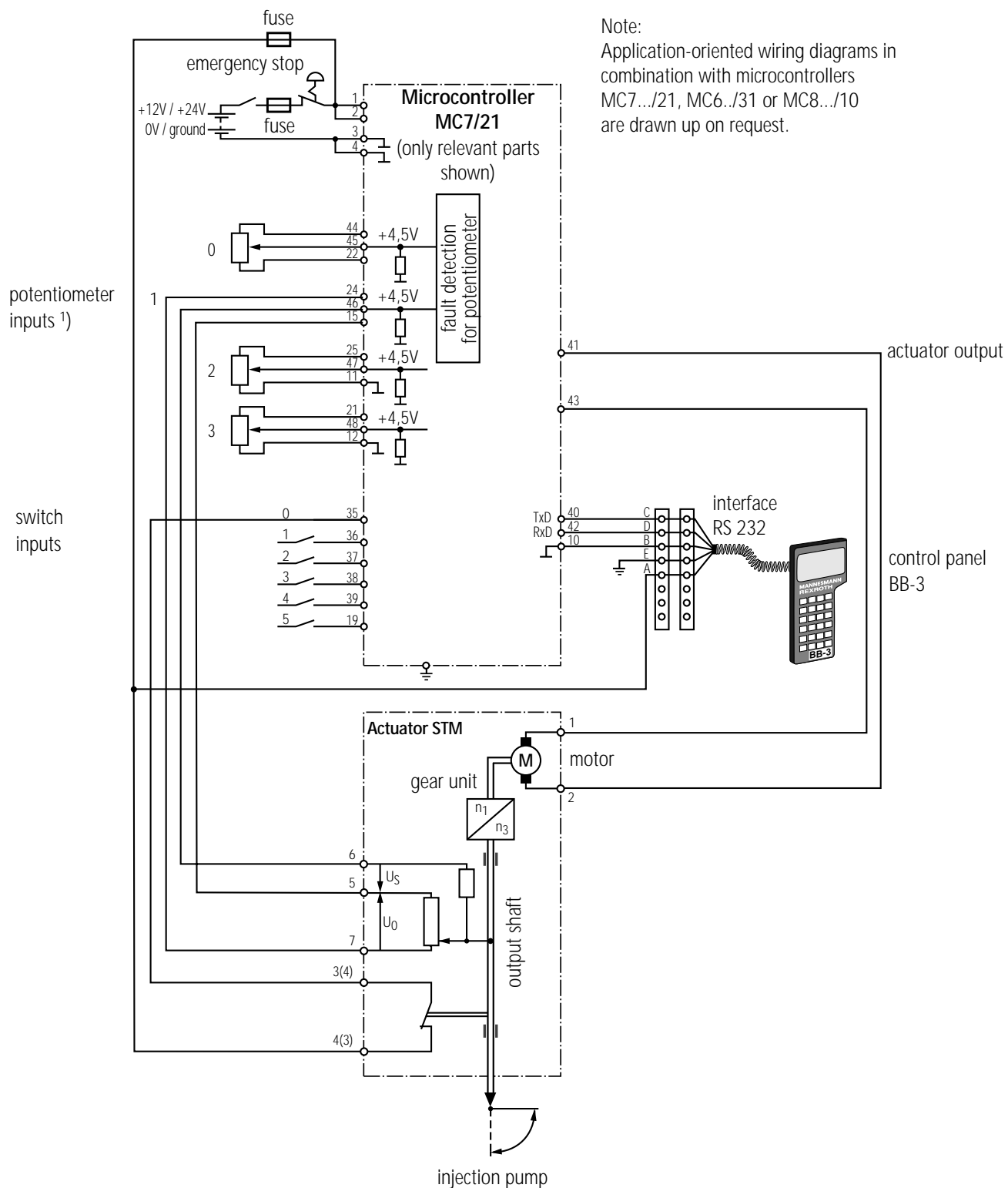
¹⁾ The CANNON "Sure Seal" mating connector, comprising:

- 1 connector body VDO No. 88 400 137
- 1 rubber grommet VDO No. 89 563 058
- 4 female contacts VDO No. 45 031 033 1351
- 3 male contacts VDO No. 21 813 156 1351

is not supplied with the device.

Available on request from Brueninghaus Hydromatik. Order designation: "Mating connector for actuator STM".

Wiring Diagram (in combination with a MC microcontroller RE 95 050)



STM connector layout

1 (male)	Motor –
2 (female)	Motor +
3 (female)	Safety contact
4 (female)	Safety contact
5 (male)	Potentiometer IP –
6 (male)	Potentiometer IPS
7 (male)	Potentiometer IP +

1) When using microcontroller MC7/21, the potentiometer in the STM actuator should preferably be connected to potentiometer inputs 1 or 2.

- Please note:**
- Cables between the STM actuator and the electronic controls (MC) must not be routed close to other energy conducting lines in the device.
 - The cut-off system in emergency situations must disconnect the power supply.
 - During electric welding operations on the device, the electronic controls must be disconnected from the operating voltage.
 - The circuit configurations suggested by Brueninghaus Hydromatik do not imply any technical liability for the overall system.
 - The safety instructions laid down in RDE 90301-01 must be observed.

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The specified data is for product description purposes only and may not be deemed to be guaranteed unless expressly confirmed in the contract.

Notes

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