MONTECH®

Handling Components SERVOLINE

USER MANUAL

Option -AS-

Restart lock for personnel safety

BA-100044

Edition 02/06

Change index

Editions issued so far

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Contents

Safety instructions

- **Only properly qualified personnel are permitted to carry out activities such as transport, installation, commissioning and maintenance. Properly qualified persons are those who are familiar with transport, installation, assembly, commissioning and operation of the products, and who have the appropriate qualifications for their jobs. The qualified personnel must know and observe the following standards and directives:**
  IEC 364 and CENELEC HD 384 or DIN VDE 0100
  IEC Report 664 or DIN VDE 0110
  National accident prevention regulations or VBG 4

- **Read the available documentation before carrying out installation and commissioning. Incorrect handling of the servo amplifier or the –AS– option can lead to injury to persons or material damage. It is vital that you keep to the technical data and the information on connection requirements (nameplate and documentation).**

- **The servo amplifier contain electrostatically sensitive components which may be damaged by incorrect handling. Discharge you body before touching the servo amplifier. Avoid contact with highly insulating materials (artificial fabrics, plastic film etc.). Place the servo amplifier on a conducting surface.**

- **Do not open the units. Keep all covers and switchgear cabinet doors closed during operation. Otherwise there are deadly hazards, with the possibility of severe damage to the health or material.**

- **In operation, depending on the degree of enclosure protection, servo amplifiers can have bare components which are live, and hot surfaces. Control and power cables can carry a high voltage, even when the motor is not rotating.**

- **Never undo the electrical connections of the servo amplifier when it is live. There is a hazard of electric arcing, with danger to persons and contacts.**

- **After disconnecting the servo amplifier from the mains supply line, wait at least five minutes before touching live sections of the equipment (e.g. contacts) or undoing connections. Capacitors can have dangerous voltages present up to five minutes after switching off the supply voltages. To be safe, measure the voltage in the intermediate circuit (DC-link) and wait until it has fallen below 40V.**

1. General

1.1 About this manual

This manual describes the –AS– option (restart lock for personnel safety) for the digital servo amplifiers of Servoline®-products.

The function of the restart lock is described, with examples of applications and the necessary wiring and incorporation into the power and control circuits of the system.

This manual is intended for the use of qualified staff with the following knowledge:

Installation:	only by electrically trained personnel
Commissioning	only by personnel with extensive knowledge of electrical technology / drive technology

1.2 Prescribed use (Use as directed) of servo amplifiers with –AS–

Observe the user manual for the servo amplifier: „**Prescribed use**“.

The –AS– restart lock is **exclusively** intended to provide safety for personnel, by preventing the restart of a system. To achieve this personnel safety, the wiring of the safety circuits must meet the safety requirements of EN60204, EN292 and VDI 2853.

The –AS– restart lock must **only** be activated,

- when the motor is no longer rotating (setpoint = 0V, speed = 0rpm, enable = 0V). Drives with a suspended load must have an additional safe mechanical blocking (e.g. by a motor-holding brake).
- when the monitoring contacts (KSO1/2 and BTB/RTO) for all servo amplifiers are wired into the control signal loop (to recognize a cable break).

The –AS– restart lock may **only** be controlled by a CNC if the control of the internal safety relay is arranged for redundant monitoring.

The –AS– restart lock must **not** be used if the drive is to be made inactive for the following reasons:

1. - cleaning, maintenance and repair operations
   - long inoperative periods

   In such cases, the entire system should be disconnected from the supply by the personnel, and secured (main switch).

2. - emergency-stop situations

   In an emergency-stop situation, the main contactor is switched off (by the emergency-stop button or the BTB-contact in the safety circuit).

1.3 Description of the –AS– option

1.3.1 Advantages of the –AS– option

A frequently required application task is the protection of personnel against the restarting of drives. This can not be achieved by an electronic inhibit, but must be implemented with mechanical elements (positively driven relay contacts).

To get round this problem, up to now either the main contactor in the mains supply line was switched off, or another contactor was used to disconnect the motor from the servo amplifier.

The disadvantages of this method are:
- the DC-link has to be charged up again at restart
- wear on the contacts of the contactors, caused by switching under load
- extensive wiring required, with additional switching components

The –AS– option avoids these disadvantages. A safety relay in the servo amplifier is activated either by the PLC or manually. Positively driven contacts provide a safe disconnection of the servo amplifier, the setpoint input of the servo amplifier is inhibited, and a signal is sent to the safety circuit.

Advantages of the –AS– option:

- the DC-link remains charged up, since the mains supply line remains active
- only low voltages are switched, so there is no contact wear
- very little wiring is required
- the functionality and the personnel safety when using the circuit recommendations in this documentation have been approved by the trade liability association.

1.3.2 Functional description

An additional connector (X10) is mounted on the front panel of the servo amplifier. The coil connections and a make (n.o) contact of a safet relay are made available throug 4 terminals on this connector.

The 24V DC safety relay in the servo amplifier (TÜV approved) is controlled externally. All the relay contacts have positive action.

Two contacts switch off the driver supply of the output stage in the servo amplifier, and short the internal setpoint signal to AGND (0V).

The make (n.o.) contact used for monitoring is looped into the control circuit.

If the safety relay is not energized, then the monitoring contact is open and the servo amplifier is ready for operation.

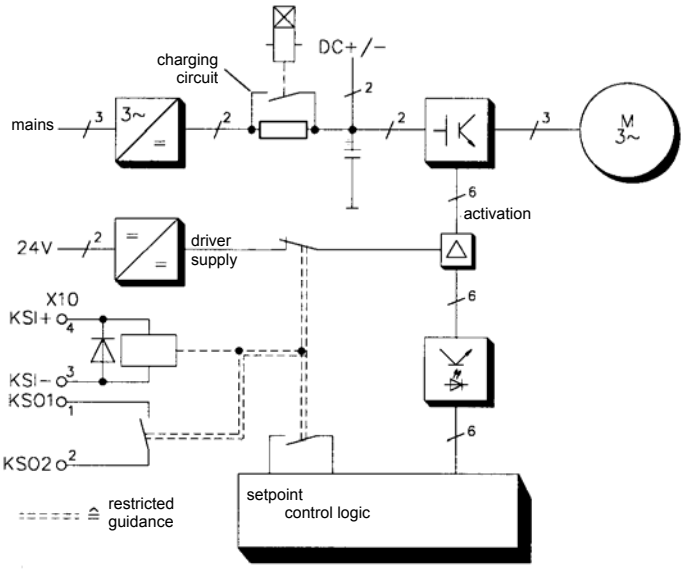
If the drive is electronically braked, the servo amplifier is disabled and the motor-holding brake is on, then the safety relay is energized (manually or by the controls).

The supply voltage for the driver circuit of the output stage is switched off in a safe manner, the internal setpoint is shorted to 0V, and the monitoring contact bridges the safety logic in the control circuit of the system (monitoring of protective doors etc.)

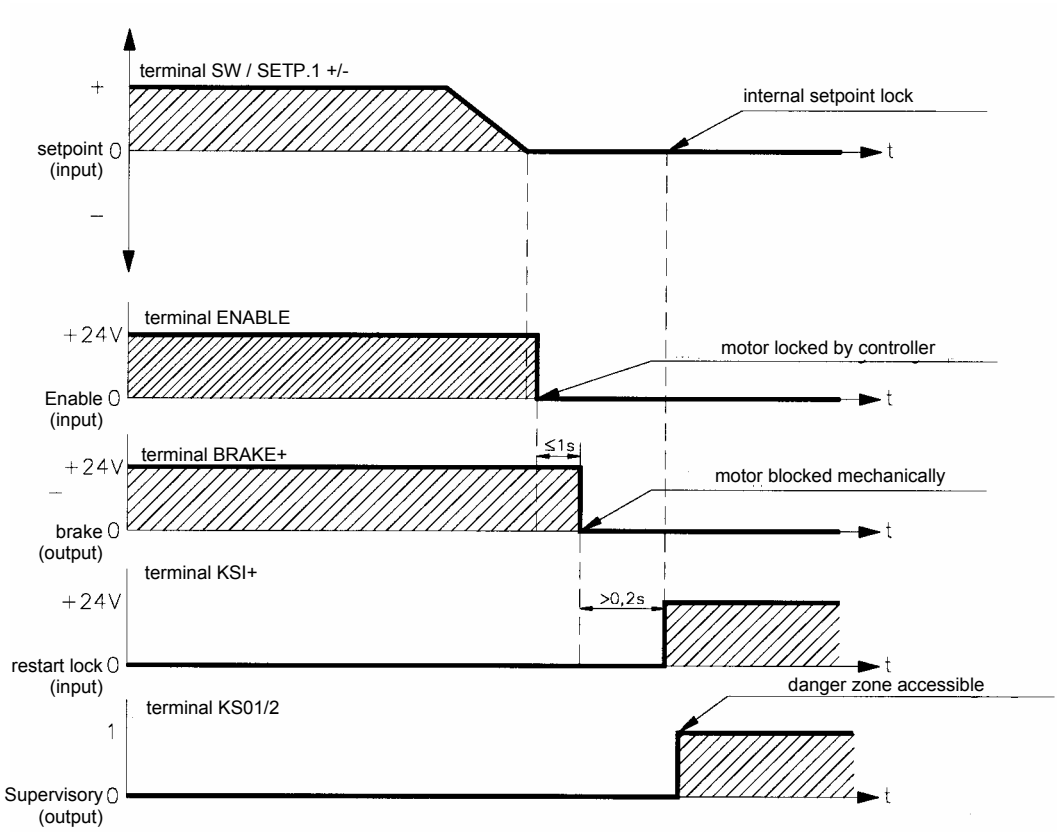
Even if the output stage or driver is destroyed, it is impossible to start the motor.

If the safety relay itself is faulty, then the monitoring contact cannot bridge the safety logic of the system. Opening the protective devices will then switch off the system.

1.3.3 Block diagram



1.3.4 Signal diagram (sequence)



2. Installation / Commissioning

2.1 Safety instructions

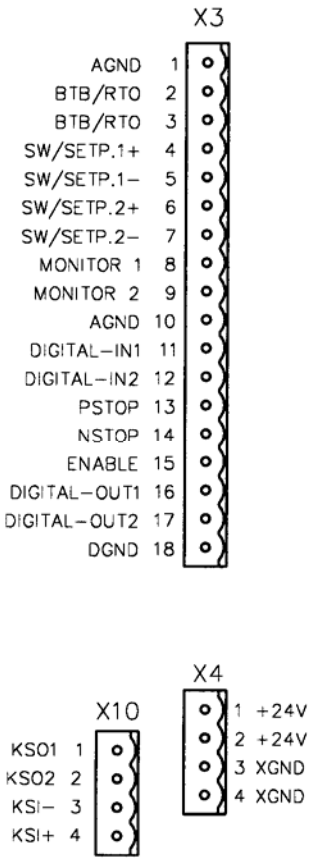
- **Use the –AS– option only to temporarily prevent a drive from restarting, to ensure personnel safety.**
- **The restart lock must not be used for immobilizing drives in emergency-stop situations, or for maintenance, repair and cleaning operations. In such cases, the entire system must be disconnected from the supply by using the mains switch or contactor.**
- **The monitoring contacts (KSO1/2) for each amplifier with an –AS– option must be looped into the control circuit. This is vital, so that a malfunction of the internal safety relay or a cable break can be recognized.**
- **If the –AS– option is automatically activated by a control system (KSI1/2), then make sure that the output of the control is monitored for possible malfunction. This can be used to prevent a faulty output from activating the –AS– option while the motor is running.**
- **It is vital to keep to the following functional sequence when the –AS– option is used:**
  1. **Brake the drive in a controlled manner (speed setpoint = 0V)**
  2. **When speed = 0 rpm, disable the servo amplifier (enable = 0V)**
  3. **If there is a suspended load, apply an additional mechanical block to the drive**
  4. **Activate the –AS– option**

2.2 Functional test

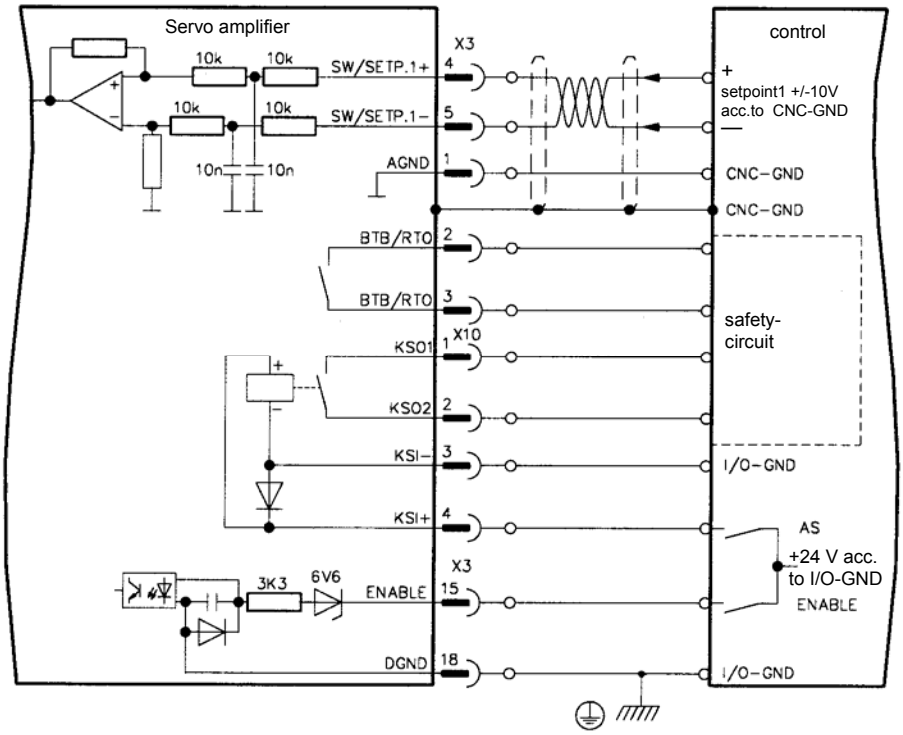
The functioning of the restart lock must be tested during commissioning, after every alteration in the wiring of the system, or after exchanging one or more components of the system.

1. Stop all drives, with setpoint 0V, disable drives, mechanically block any suspended loads
2. Activate the –AS– option
3. Open protective screens (but do not enter hazardous area)
4. Pull off the X10 connector from an amplifier: the mains contactor must drop out
5. Reconnect X10. Switch on mains contactor again.
6. Repeat steps 4 and 5 for each individual servo amplifier.

2.3 Pin assignments



2.4 Connection diagram



2.5 Application examples

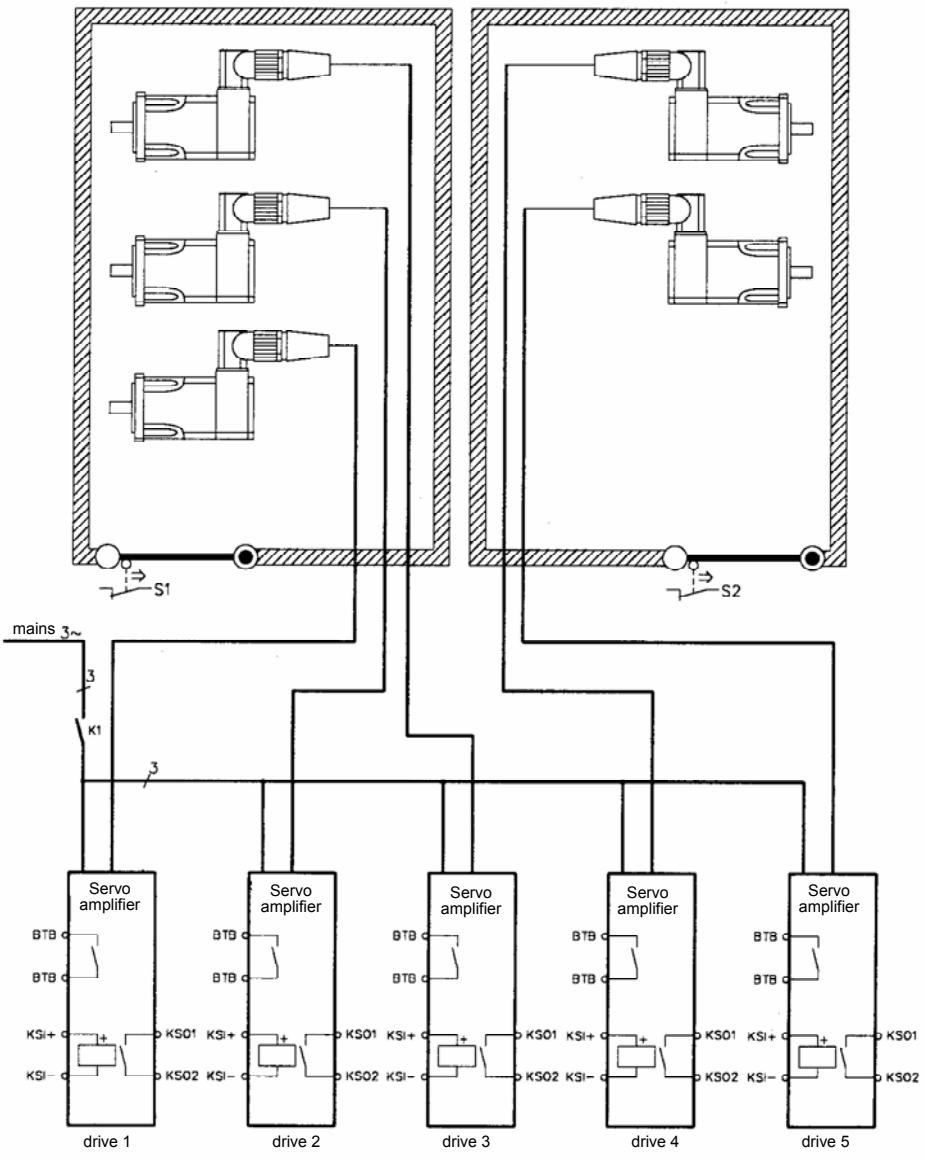
2.5.1 Moving single axes or axis-groups in setting-up operation

In setting-up operation, people will frequently be within the danger zone of the machinery. Axes will normally be moved under the control of permission switches. An additional switch-off of the unused axes, by means of the restart lock, increases the safety margin and avoids the repeated switching of main contactors or motor contactors.

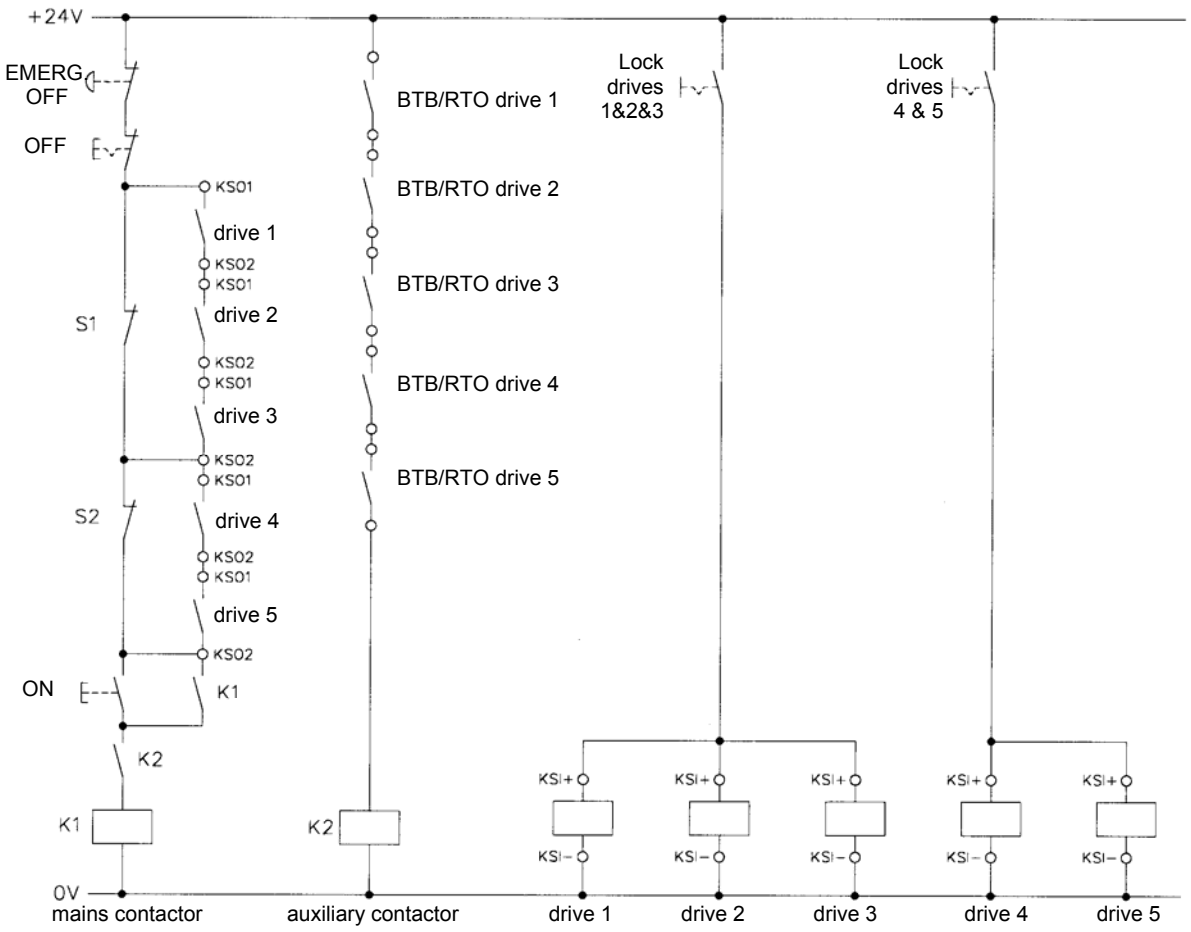
2.5.2 Switching off grouped axes with separate working areas

Even when several amplifiers are operating off a common mains supply and DC-link, it is possible to set up groups for separate working areas. These groups can then be switched off separately for personnel safety. For this purpose, we have provided you with a suggested circuit (mains supply circuit and control circuit for 2 separate groups, interconnected DC-links and a common mains supply voltage).

2.5.2.1 Mains supply circuit



2.5.2.2 Control circuit



3. Appendix

3.1 Abbreviations and acronyms

The table below shows abbreviations and acronyms used in this manual

Abbreviation / acronym	Explanation
AGND	Analogue ground
AS	Start inhibit
BTB/RTO	Ready for operation
DGND	Digital ground
DIN	German technical standards organisation (Deutsches Institut für Normung)
ISO	International Standardisation Organisation
V AC	Alternating voltage
V DC	Direct voltage
VDE	Association of German electrical engineers
XGND	Ground of the 24 V supply voltage

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