Rexroth
Bosch Group

VAC Valve Control System Application Software

RE 95 350/03.06 1/12

Technical Data Sheet

Electronic valve control system
for hydraulic valves, version 10

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Features

Hydraulic operating functions are controlled via valves whose positions are specified by target value generators, such as e.g. joysticks.

- The electronic valve control system is an easily adjusted software package for controlling hydraulic valves. It is used to match the valve behavior to the respective application.
- The valve control system is available in three variants:
  - Variant A for 1 axis (VACA)
  - Variant B for 2+1 axes (VACB)
  - Variant C for 3+1 axes (VACC)

  The valve control system is designed for Rexroth hydraulic valves.
- The valve control system can be easily adapted by the user to various joystick, valve and control block configurations by means of adjustment parameters.
- The valve control system is suitable for Rexroth CAN joysticks and CAN valves.
- Diagnostics and parameterization can be carried out using the BODEM PC software or the BB-3 control panel.

Ordering code

Type

Application software	**AS/**

Software

Electronic valve control system	**VAC**

Variant A

Valve control system of 1 axis (only in combination with RC2-2/20)	**A**

Variant B

Valve control system of up to 3 axes (only in combination with RC4-4/20)	**B**

Variant C

Valve control system of up to 4 axes (only in combination with RC6-9/20)	**C**

Version

	10

Ordering Information

The AS/VAC application software must only be operated with the RC2-2/20, RC4-4/20 or RC9-9/20 controllers and other add-on components (see page 5). When placing an order, the hardware and software ordering codes should be linked by a “+”.

Example: RC2-2/20+AS/VACA

Note

A description of variants A, B and C can be found beginning on page 6.

Method of operation

The electronic valve control system (Valve Control, VAC) is a flexible software and hardware package for controlling valves in a control block.

The hydraulic system consists of a fixed or variable displacement pump, a control block and the actuators in the form of hydraulic motors or hydraulic cylinders.

The control block controls the speed at which machine parts move in working hydraulics. In the control block, valves determine the speed and direction of the movement. Up to four valves in a control block can be controlled independently of each other. Each valve controls one movement axis and two movement directions.

The electronic valve control system is designed to actuate up to four valves in the open hydraulic circuit with electro-proportional control.

The following control blocks are supported:

- Directional valve SB 12 LS (see catalog 1 987 760 512)
- Directional valve SB 23 LS (see catalog 1 987 760 513)
- Mobile control block SP08 (see catalog RD 64 139)
- High-pressure LS-control blocks M4 in sizes
  - 12 (see catalog RE 64 278)
  - 15 (see catalog RE 64 282)
  - 22 (see catalog RE 64 279)

  each with proportional pressure reduction valve DRE02 (see catalog RE 58 032)
- High-pressure LUDV control blocks M6 in sizes
  - 15 (see catalog RE 64 284)
  - 20 (catalog on request)
  - 22 (see catalog RE 64 286)

  each with proportional pressure reduction valve DRE02 (see catalog RE 58 032)
- LUDV control block M7 in sizes
  - 20 (catalog on request)
  - 22 (see catalog RE 64 295)

  each with one proportional pressure reduction valve DRE04 (see catalog RE 58 038)

The analog valves are controlled via the proportional outputs of the controller.

The CAN valves (SB 12 LS and SB 23 LS) are controlled via the controller's CAN-bus interface.

Method of function

The VAC electronic valve control system allows the pressure in pressure reduction valves to be controlled via signals from a joystick in accordance with a parameterizable characteristic curve. In this way, the volume flow in hydraulic cylinders or hydraulic motors is controlled via directional valves.

The valves form part of a control block with which the movement speed of machine parts can be controlled. Each valve controls the speed of one movement axis, i.e. for two movement directions (A and B).

The electronic valve control system is designed for controlling directional valves in the open circuit.

Operating behavior

The following explains how a valve is controlled in a control block.

The position of the connected joystick is detected via the analog input or CAN connection.

The valve control behavior is controlled by various variables:

- The target value is defined with the joystick.
- The output value for the specified target value is specified in the parameterizable control characteristic.
- The time ramps on all inputs and outputs determine how quickly the output value is changed.

It is possible to automatically switch to counter operation depending on the joystick signals.

Control behavior

- The joystick is in the neutral position if it is positioned within a user-definable range around the zero position. This is called the deadband. It can be set in the parameters.

  When the joystick is in the neutral position, the outputs for controlling the valve are deactivated.

- If the joystick is moved to a position outside the deadband, the value at the respective output (for movement direction A or B) increases according to the position of the joystick and the set curve. The valve is controlled. In addition, the acceleration behavior can be selected via a parameterizable time ramp.

  In counter operation, the time ramp of a movement axis is changed temporary. Other ramp times are used.

Special function

Depending on the variant, different switched outputs can be controlled via switched inputs. For this purpose, unused inputs are used for endswitches.

Safety functions

Various options are available for monitoring the operating behavior:

- Start condition

  The start condition is used to prevent the valves from being opened unintentionally.

  After the controller is switched on (ignition switch switched on), all activated target value generators must be in the neutral position. In addition, the safety switch must be closed in order for the valves to be controlled.

  To acknowledge faults, all activated target value generators must be moved to the neutral position.

- Monitoring of inputs and outputs

  The lines for the target value inputs and proportional solenoid outputs are monitored for wire breaks and short circuits.

  In the event of an error or if the emergency stop switch is actuated, the valve control system is switched off immediately.

  In the event of an error, an error lamp is also controlled.

Important features

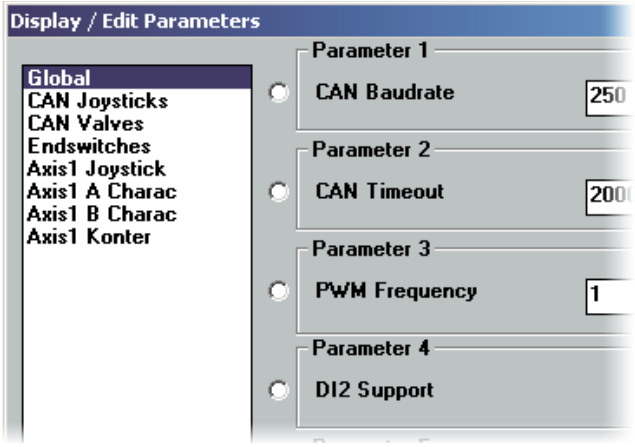
- Various joystick types are available for target value specification.
- The ramp times can be set for each movement direction and axis.
- There are various characteristic types (linear to progressive) which can be set for each movement direction and axis.
- The characteristics can be temporarily compressed for each axis to facilitate more precise operation.
- The target value generators can be monitored via direction switches.
- Valves are automatically closed at the end of motion by means of endswitches.
- The behavior of the valve control system is monitored by safety functions such as a start condition and safety switches.
- The inputs and outputs of the controller (e.g. target value generator) are monitored (cable break, short circuit). In the event of an error or if the emergency stop switch is actuated, the valve is set to neutral.
- Errors can be displayed via the connected error lamp.
- All errors that occur are stored in the controller and can also be read later in plain text with the aid of the BODEM or BB-3 diagnostics tools.

Important parameters

- Configuration of the analog or CAN joystick
- Adjustable ramps
- Selection of the characteristic
- Minimum and maximum magnetic current for each movement direction.
- Configuration of counter operation
- Configuration of the switched outputs

Parameterization and diagnostics

The parameters that need to be assigned for commissioning the VAC valve control system can be set easily using the BODEM PC software.



You can configure BODEM to display the most important process data and the error messages for diagnostics and troubleshooting purposes.

It is also possible to use the BB-3 control panel for parameterization and diagnostics instead of BODEM.

Required components

The following electronic components are required:

- VACA
  RC2-2/20 controller with AS/VACA application software with 52-pin mating connector (RE 95 200)
- VACB
  RC4-4/20 controller with AS/VACB application software with 52-pin mating connector (RE 95 200)
- VACC
  RC6-9/20 controller with AS/VACC application software with 52-pin mating connector and 28-pin mating connector (RE 95 200)

At least one of the following joysticks is required:

- THEC5 joystick
- CAL-JOY-2 with J1939 CAN protocol, Caldaro
- THES5 joystick
- MHVEJ joystick (on request)

The following items are required for commissioning and service:

- Diagnostics socket (RE 95 085)
- BODEM PC software with BODEM connecting cable (RE 95 085),
  or
- BB-3 control panel with BB-3 connecting cable (RE 29 798 and RE 95 080)

Depending on the machine design, an error lamp is needed in order to display errors conditions.

Variants

VACA

- RC2-2/20 controller with AS/VACA application software with 52-pin mating connector
- 1 controllable valve
- 1 digital output signal
- Input signal from 1 joystick
- 2 solenoid outputs for current-controlled PWM currents

  A total of 2 outputs for proportional solenoids for 1 axis in two directions

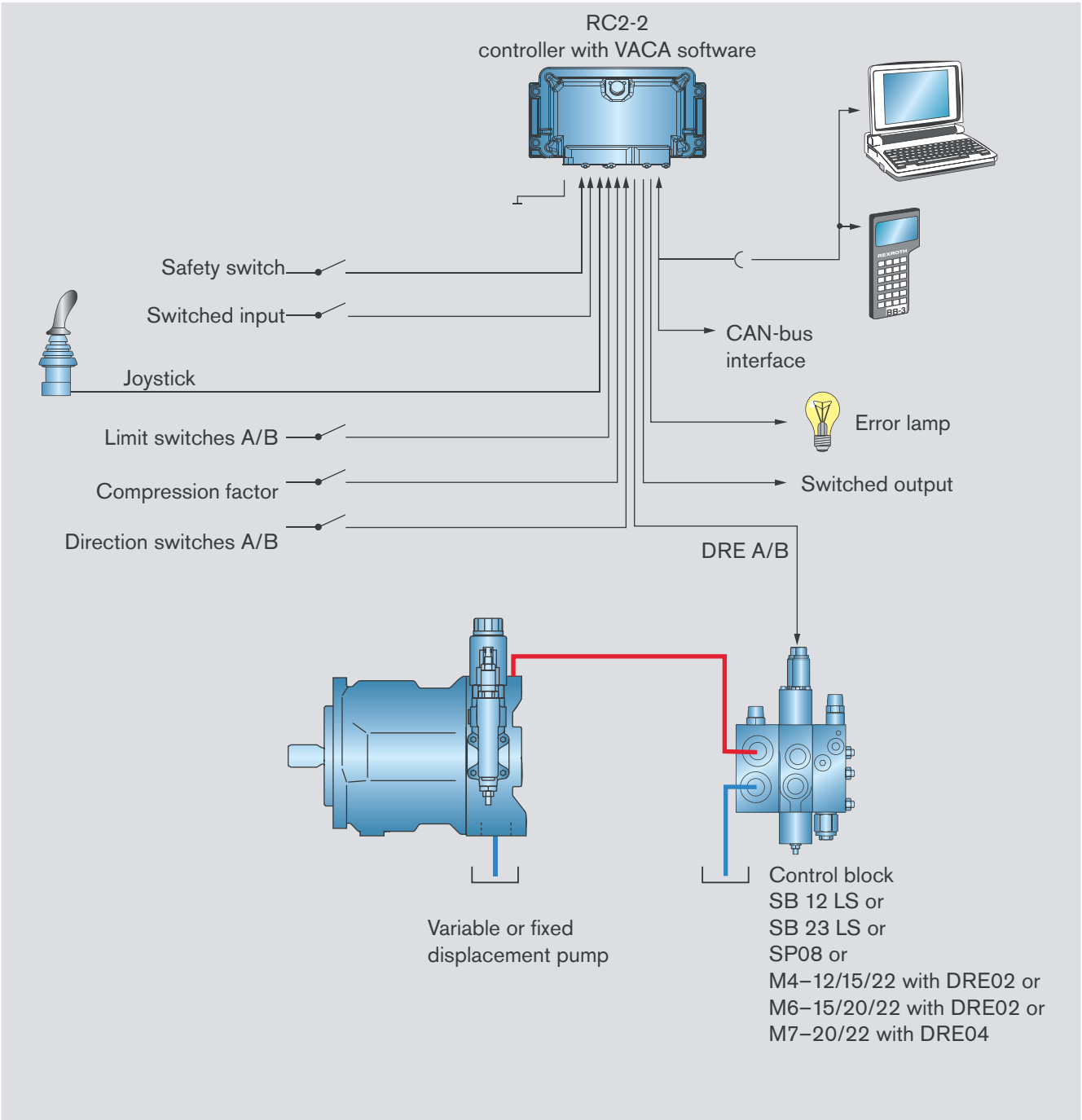
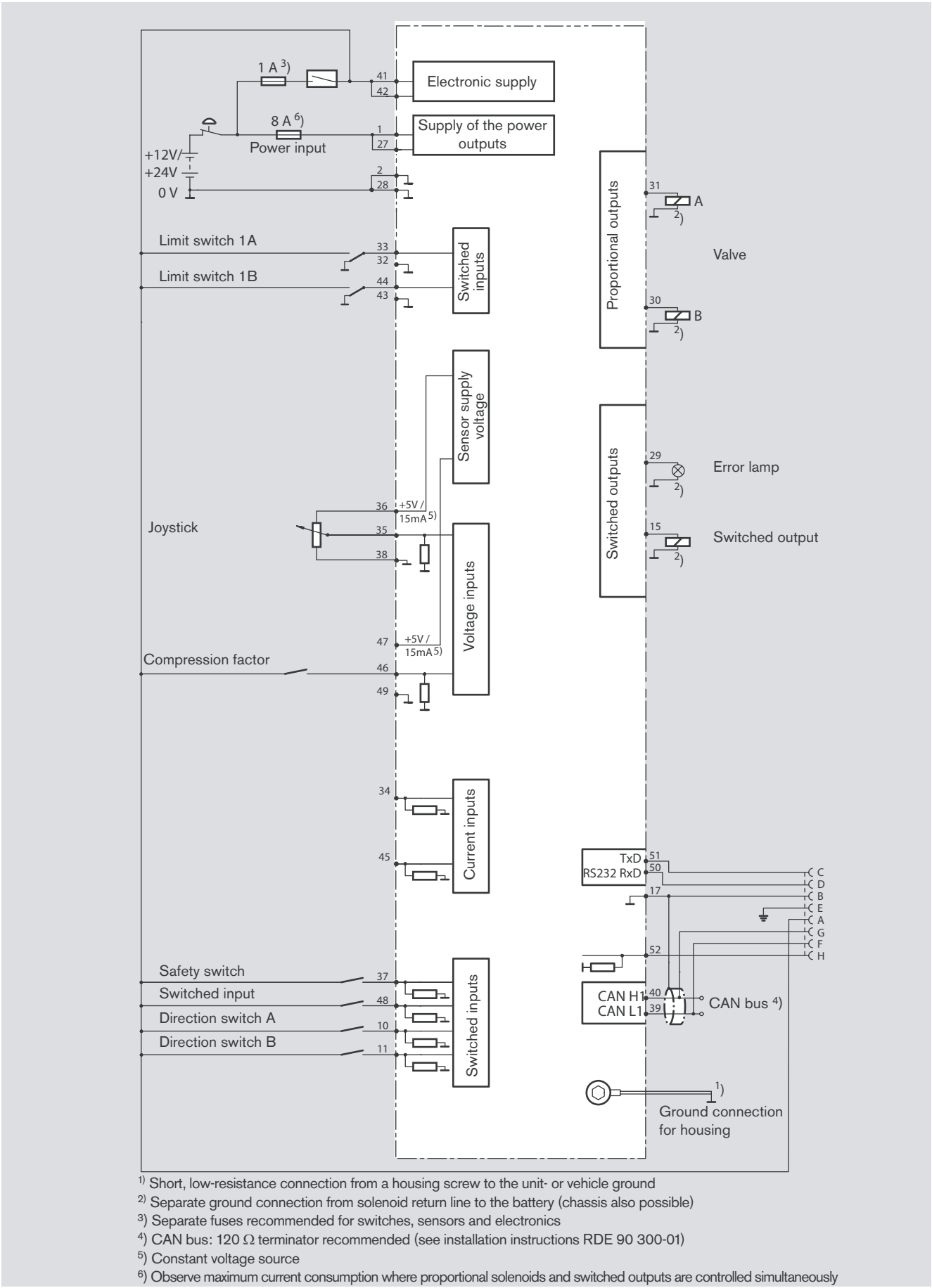


Figure 1: Typical configuration of the VACA valve control system

VACA connection diagram



1) Short, low-resistance connection from a housing screw to the unit- or vehicle ground
2) Separate ground connection from solenoid return line to the battery (chassis also possible)
3) Separate fuses recommended for switches, sensors and electronics
4) CAN bus: 120 Ω terminator recommended (see installation instructions RDE 90 300-01)
5) Constant voltage source
6) Observe maximum current consumption where proportional solenoids and switched outputs are controlled simultaneously

Figure 2: Inputs and outputs on the controller for the valve control system (VACA)

VACB

- RC4-4/20 controller with AS/VACB application software with 52-pin mating connector
- Maximum 3 controllable valves
- 1 digital output signal
- Input signals from maximum 3 joysticks
- 4 solenoid outputs for current-controlled PWM currents
- 2 solenoid outputs for open-loop controlled PWM currents

  A total of 6 outputs for proportional solenoids for 3 axes in two directions each

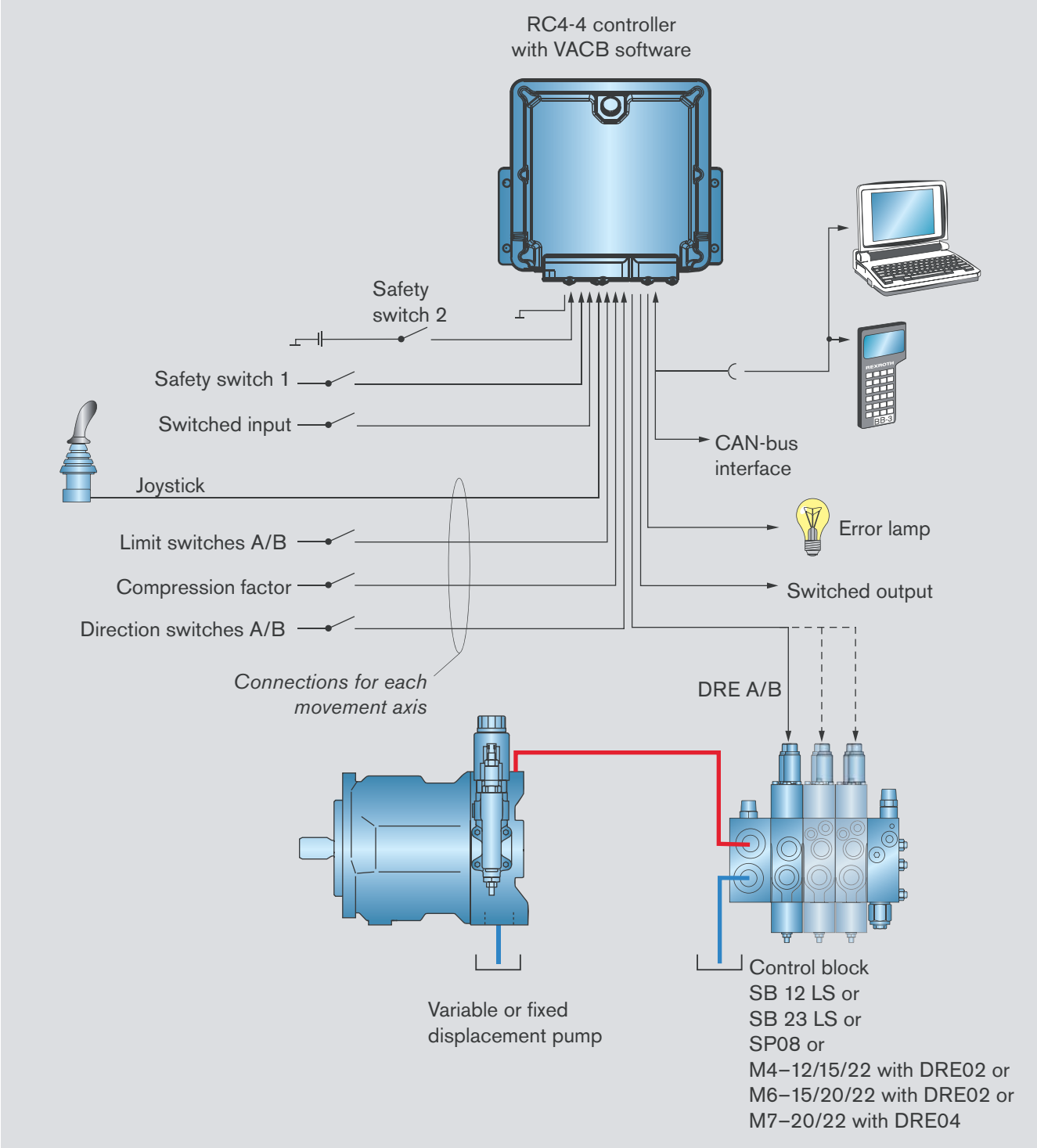
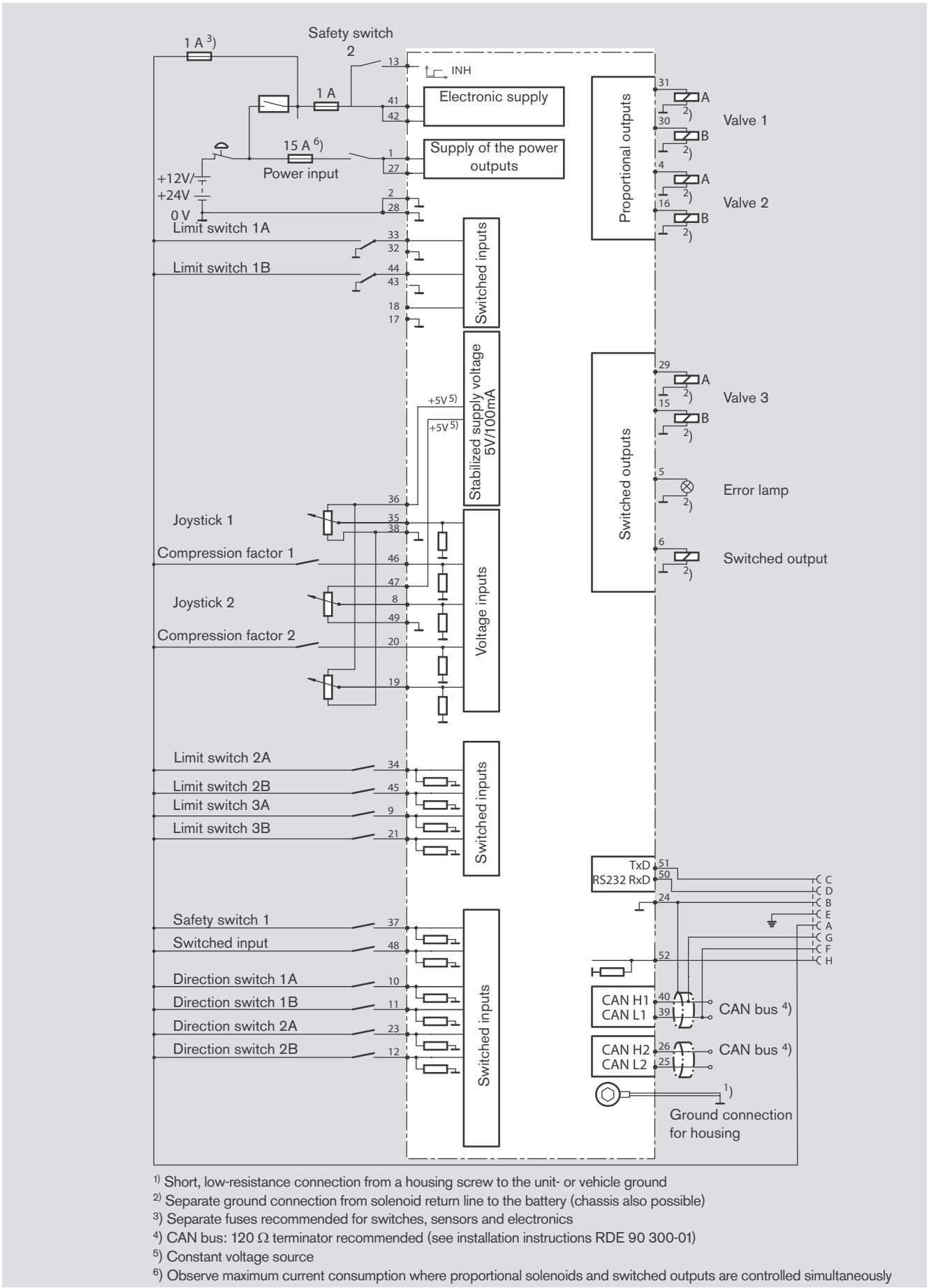


Figure 3: Typical configuration of the VACB valve control system

VACB connection diagram



1) Short, low-resistance connection from a housing screw to the unit- or vehicle ground
2) Separate ground connection from solenoid return line to the battery (chassis also possible)
3) Separate fuses recommended for switches, sensors and electronics
4) CAN bus: 120 Ω terminator recommended (see installation instructions RDE 90 300-01)
5) Constant voltage source
6) Observe maximum current consumption where proportional solenoids and switched outputs are controlled simultaneously

Figure 4: Inputs and outputs on the controller for the valve control system (VACB)

VACC

- RC6-9/20 controller with AS/VACC application software with 52-pin mating connector and 28-pin mating connector
- Maximum 4 controllable valves
- Maximum 6 digital output signals
- Input signals from maximum 4 joysticks
- 6 solenoid outputs for current-controlled PWM currents
- 2 solenoid outputs for open-loop controlled PWM currents

  A total of 8 outputs for proportional solenoids for 4 axes in two directions each

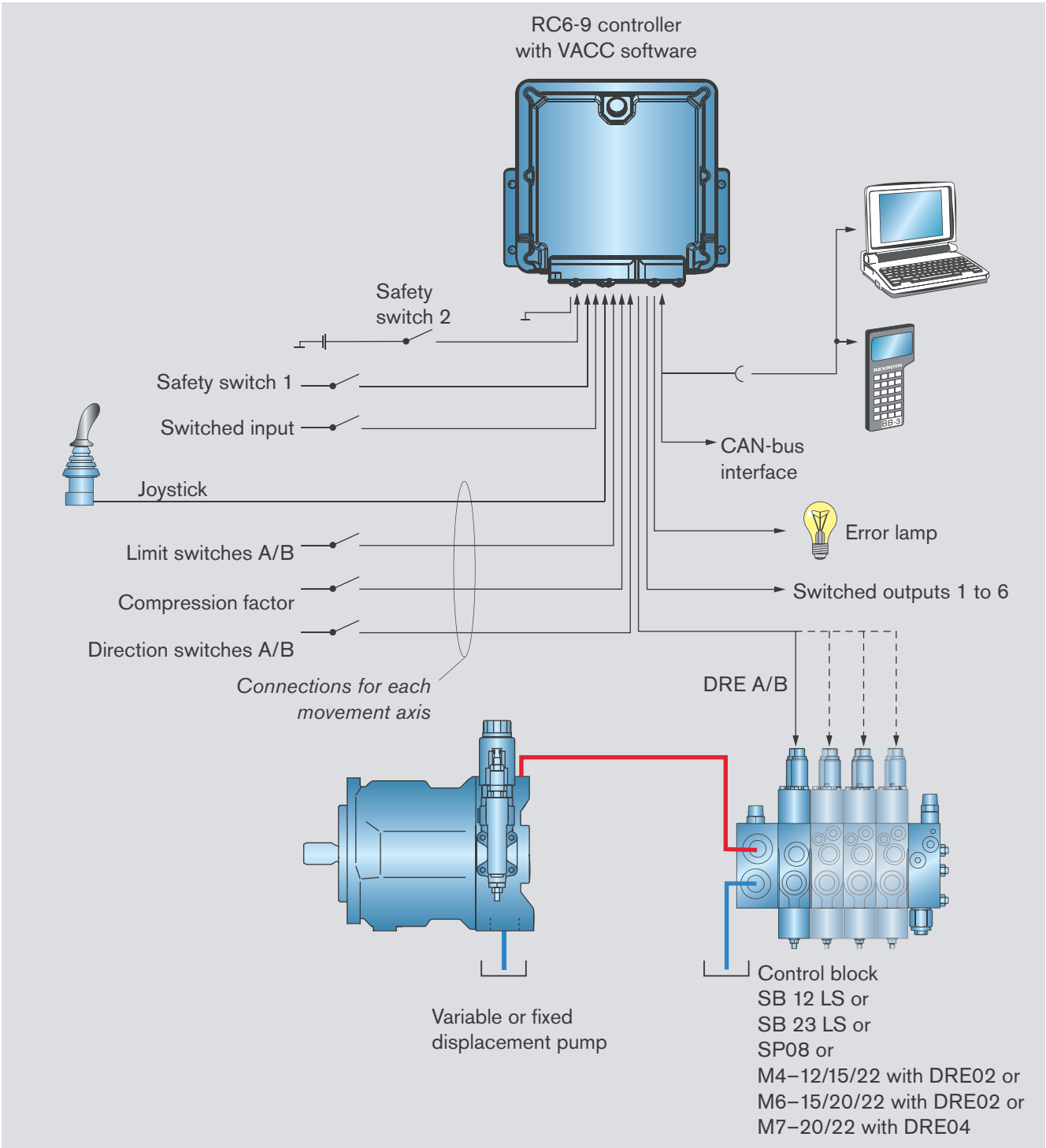
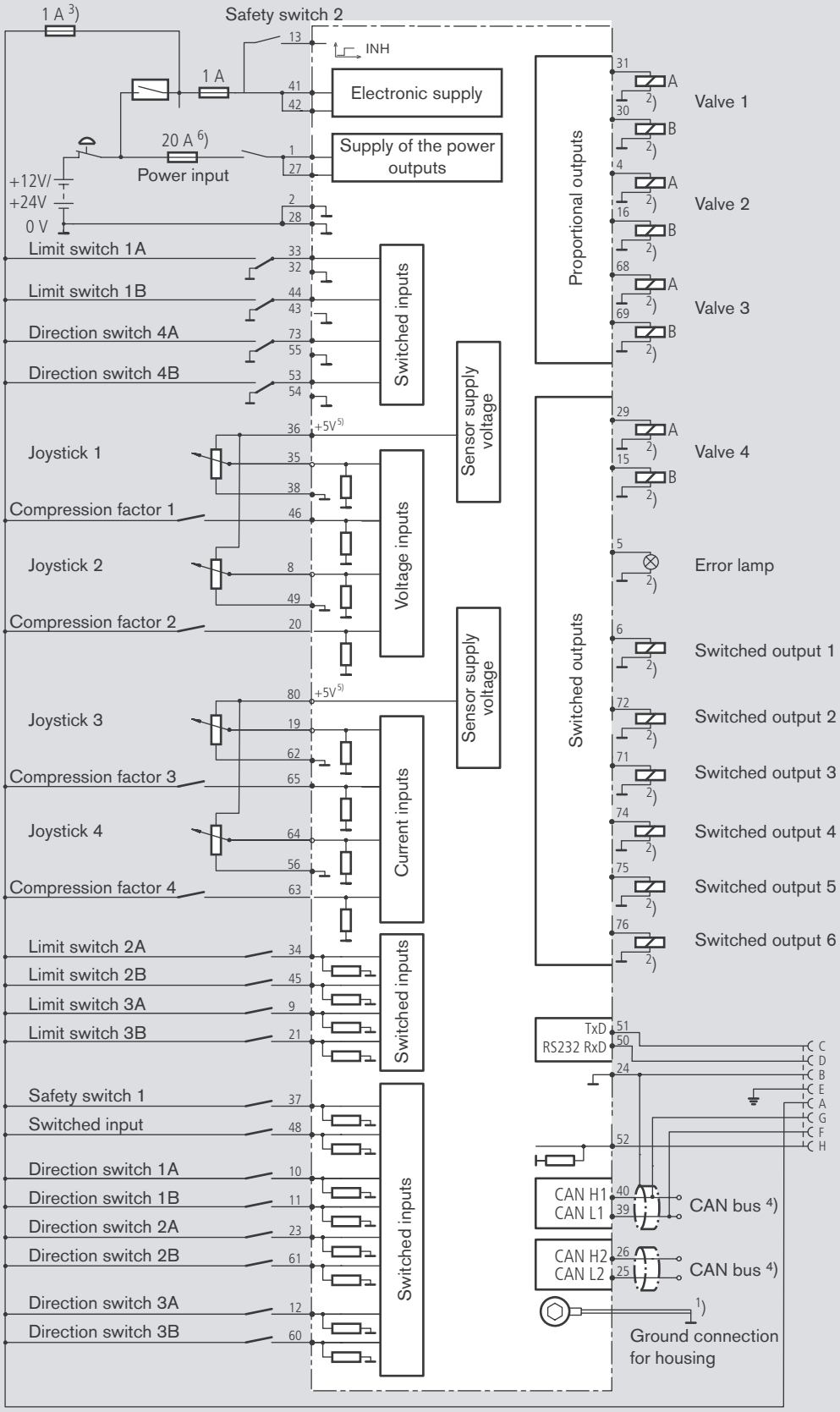


Figure 5: Typical configuration of the VACC valve control system

VACC connection diagram



1) Short, low-resistance connection from a housing screw to the unit- or vehicle ground
2) Separate ground connection from solenoid return line to the battery (chassis also possible)
3) Separate fuses recommended for switches, sensors and electronics
4) CAN bus: 120 Ω terminator recommended (see installation instructions RDE 90 300-01)
5) Constant voltage source
6) Observe maximum current consumption where proportional solenoids and switched outputs are controlled simultaneously

Figure 6: Inputs and outputs on the controller for the valve control system (VACC)

Safety instructions

- The suggested circuits do not imply any technical liability for the system on the part of Rexroth.
- To switch off the system in emergencies, the power supply to the electronics must be disconnected by an emergency stop switch. The emergency stop switch must be installed in a location which is easily accessible to the operator. Safe braking must be ensured when the emergency stop function is activated.
- Lines to the electronics must not be routed close to other power-conducting lines in the machine or vehicle.
- Radio equipment and mobile telephones must not be used inside the driver's cab without a suitable outside antenna and nowhere near the control electronics. A sufficiently large distance to radio systems must be maintained.
- All connectors must be unplugged from the electronics during electrical welding operations.
- The electronics may only be tested with the proportional solenoids connected.
- The proportional solenoids must not be connected to spark suppression diodes.
  Switching solenoids at the outputs of the RC electronics need not be connected to spark suppression diodes.
  Other inductive loads that are in the system but not connected to the RC must be connected to spark suppression diodes.
- In order to preserve the warranty, any installation or replacement of the RC software (flash EPROM) must be performed by personnel from Rexroth.
- Cables/wires must be sealed individually to prevent water from entering the unit.
- Dangerous malfunctions may result if the control electronics are opened or modified or the wiring repaired without authorization.
- Please observe operating instructions RE 95 350-B.

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