RE 95 023/04.00

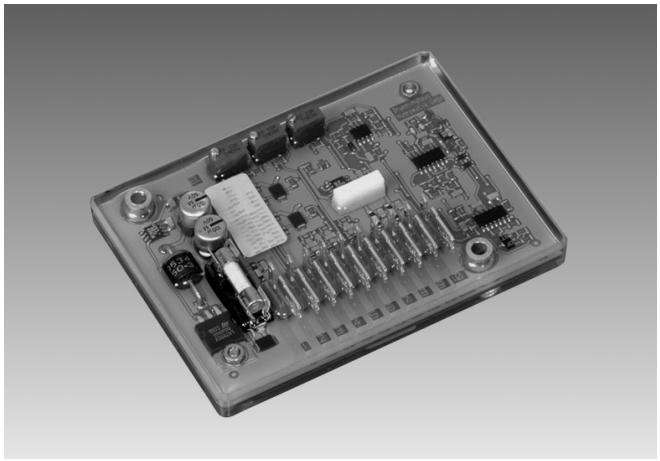
Replaces: 07.98

engineering mannesmann Rexroth

Proportional Amplifier PV

for the control of a proportional solenoid

Series 2



PV24FE/20

Features

The proportional amplifier PV is used for control of a variable displacement pump, a variable displacement motor or a valve with one proportional solenoid.

As input signal the amplifier PV is processing the control voltage adjustable by means of a potentiometer.

As output signal the amplifier is providing a closed loop electric current, e.g. for control a variable displacement pump A7VO (RE 92202) or a variable displacement motor A6VM (RE 91604).

Main components

- Voltage stabilisation
- PWM output stage (pulse width modulation)
- Time ramp function for demand value
- Multiple trimmer potentiometer for precise settings of the solenoid currents and time ramp
- LED display for functions
- Switching output fault display
- Circuit board poured in synthetic

Special characteristics

- Optionally version E with recognition of cable breaks and short circuits in the potentiometer cables
- Optional external control with a voltage signal, e.g. from a SPC (stored program control)
- Solenoid current pulse width modulated (PWM) for minimum hysteresis
- Solenoid current closed loop controlled, i.e. voltage and temperature independent, measurement resistance on the board located in the +line to the solenoids
- Solenoid output short circuit protected
- Pole and overvoltage protection

Ordering Code

PV		F		/	2	0

Type

Proportional amplifier	PV

Voltage supply

U= 12V	12
U= 24 V	24

Connections

Flat pin vehicle plug	F

Model

Standard	
Extended with fault recognition and fault display	E

Series

	2

Index

	0

Technical Data

Type	PV12F/20	PV24F/20	PV12FE/20	PV24FE/20
Nominal voltage	12 V	24 V	12 V	24
Voltage supply	10...17 V DC	18...33 V DC	10...17 V DC	18...33 V DC
Residual ripple (DIN 40839/1)	max. ± 2 V			
Reverse voltage protection (supply)	response of the fuse			
Current consumption, without load	approx. 30 mA			
Current consumption, maximum	< 1,6 A			< 2,5 A
Fuse on the circuit board	1,6 AT			2,5 AT
Resistance of the external potentiometer	500 Ω...2 kΩ		2 kΩ...5 kΩ ±20%	
Control voltage (input)	0...7,8 V		potentiometer 2 kΩ: approx. 0...5,3 V potentiometer 5 kΩ: approx. 0...6,7 V	
Ramp time, from I_{min} to I_{max}	0,2 s ... 30 s, adjustable			
Output current, max. (load depend. potentiometer 4,7 kΩ)	1500 mA	750 mA	1500 mA	750 mA
Start current, adjustable	0…900 mA	0...750 mA	0...900 mA	0...750 mA
Pulse frequency (PWM output stage)	100 Hz^{+20}_{0}			
Fault-switching output max. current			1000 mA	1000 mA
Electro-magnetic compatibility (EMC)	Immunity to interference: 50 V/m Impulse to DIN 40839, parts 1 and 3			
Short circuit protection	all in-/outputs			
Permissible short circuit current for internally connected connections, briefly (< 1 min)	10 A			
Ambient operating temperature	–25 °C ...+70 °C			
Ambient storage temperature	–40°C ...+80 °C			
Installation position	optional			
Weight	approx. 130 g			

Description

Function (PV...F/20 and PV...FE/20)

With the amplifier PV a proportional solenoid is charged with current depending on the input signal.

If there is any modification of the control voltage at the input side, leading off from 0V (position of the potentiometer on "0"), the solenoid current is increasing linear from min. value I_{min} to the max. current I_{max}.

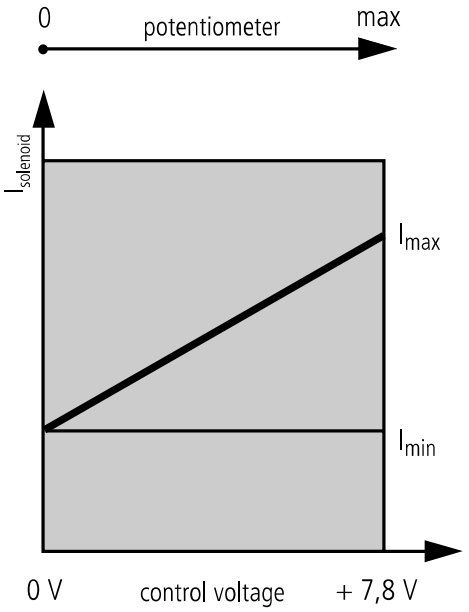
Start current I_{min} and max. current I_{max} are adjustable independent of each other.

At fast modification of the input signal the output current is "retarded" by means of a time ramp function. The time for the course from I_{min} untill I_{max} is adjustable between 0,2 s and 30 s.

The output stage is working almost free of losses by pulse width modulation (PWM) with a pulse repetition rate of 100 Hz. The current closed loop control is effected by modification of the duration of connection resp. disconnection. Temperature related resistance modifications in the proportional solenoid circuit and variations of the operating voltage are settled.

With over-loads at the proportional solenoid output the switched-on time of the output stage is reduced to 0,5 ms, so that it is not possible to damage the amplifier.

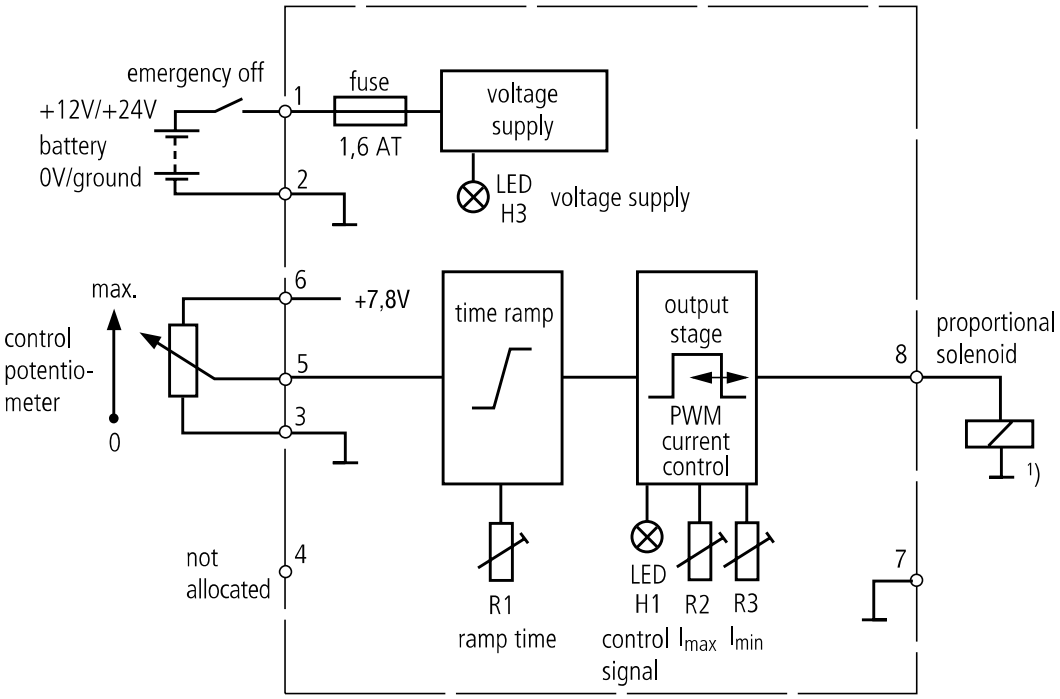
Characteristics



(for PV...FE/20 see technical data)

Block Circuit Diagram/Connection Diagrams (Potentiometer Control)

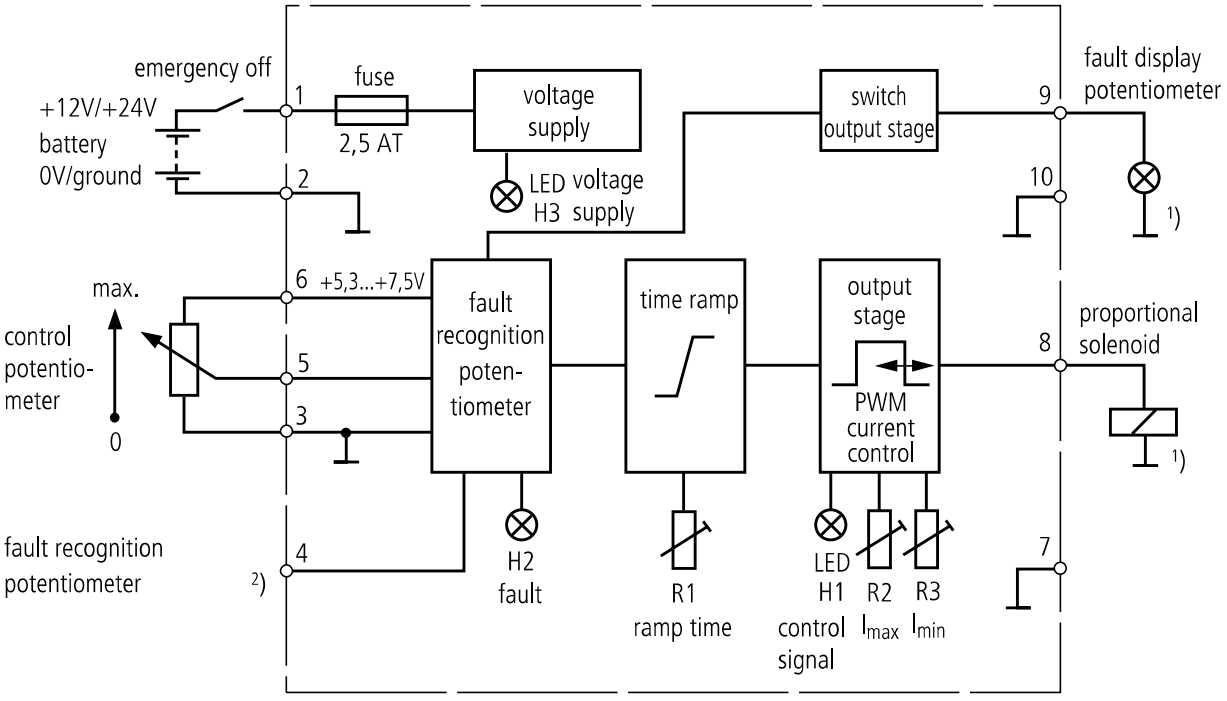
PV...F/20



1) A connection to connection 7, the chassis or to the battery ground is possible

With the version PV...F/20 faults at the potentiometer or in the potentiometer connection cables can lead to unforeseen output currents. For safety relevant projects a check should be carried out to see whether the application of the PV...FE/20 version offers advantages.

PV...FE/20



1) A connection to connections 7, 10, the chassis or to the battery ground is possible

2) If connection 4 is not allocated then the fault recognition is activated,
if connection 4 is connected with a ground then the fault recognition is **not** acitve.

Fault status PV...FE/20

Connection number	Meaning	Effect with connection open	Effect of a short circuit to the supply voltage	Effect of a short circuit to a ground
3	potentiometer: ground	output current I_{min} (via a time ramp), fault display LED H2 lights up, external fault display is active	internal short circuit without damage, no output current	no effect
5	potentiometer: wiper	output current I_{min} (via a time ramp)	output current I_{min} (via a time ramp), fault display LED H2 lights up, external fault display is active	output current I_{min} (via a time ramp)
6	potentiometer: supply	output current I_{min} (via a time ramp), fault display LED H2 lights up, external fault display is active	output current I_{min} (via a time ramp), fault display LED H2 lights up, external fault display is active	output current I_{min} (via a time ramp), fault display LED H2 lights up, external fault display is active
8	solenoid output	no output current	maximum solenoid current (DC voltage condition)	no output current, LED H1 does not light up

Fault recognition and fault display PV...FE/20

The PV...FE/20 version has a circuit which reduces the solenoid output to a minimum current value if there is a cable break or short circuit in the potentiometer cables. It is also possible, in the case of a fault, to control a lamp via an additional switched output for a fault display.

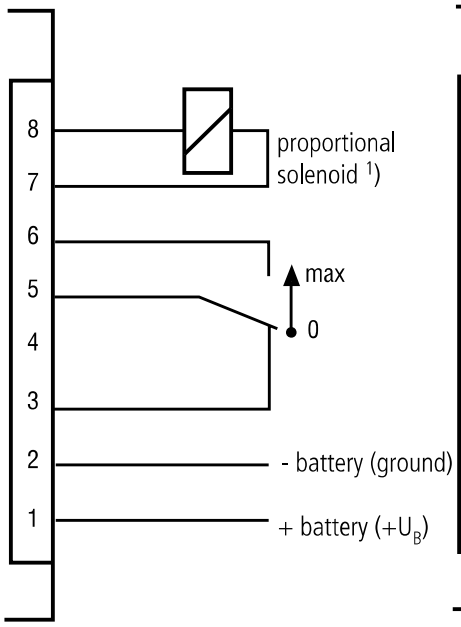
When projecting amplifier controlled hydraulic systems it has to be ensured that with a minimum output current a safe condition can be achieved, (e.g. the vehicle stops)!

If a control voltage is used as an input signal instead of a potentiometer, the fault monitoring must be deactivated by a special input circuit at connection 4.

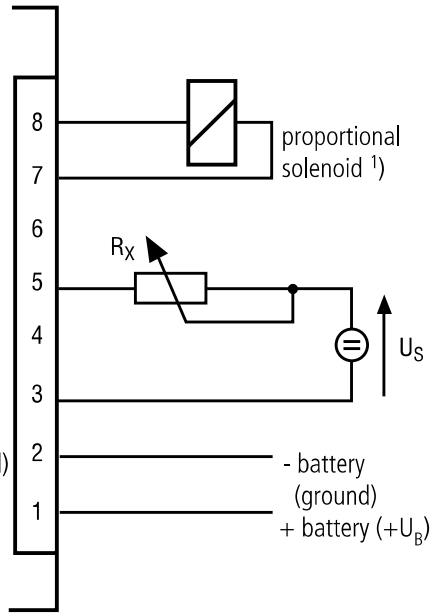
Connection Diagrams (alternative)

PV...F/20

Two point control

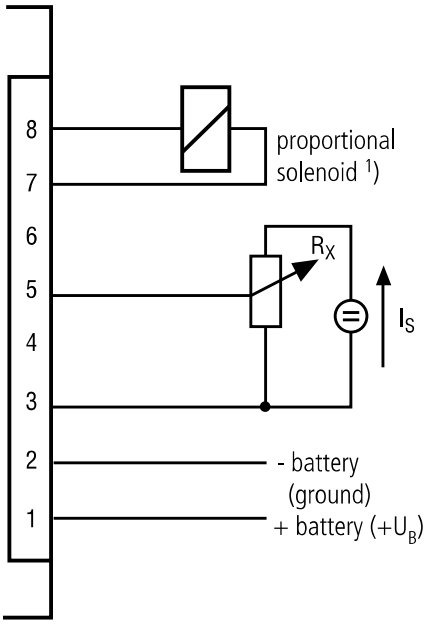


Voltage control



R_I = 12,7 kΩ input resistance
R_X = 3,3 kΩ for U_S = 10 V

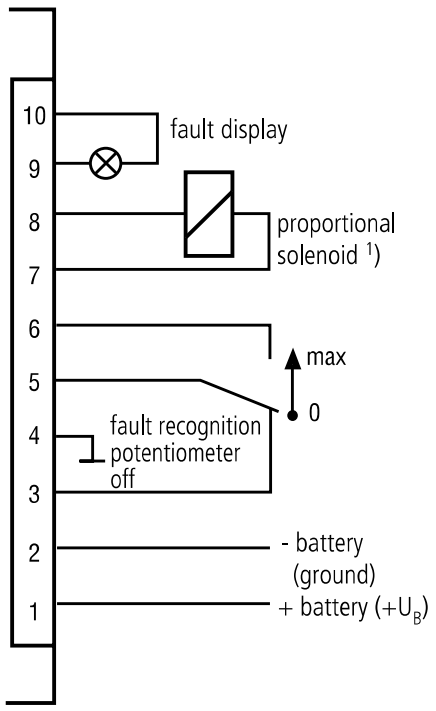
Current control



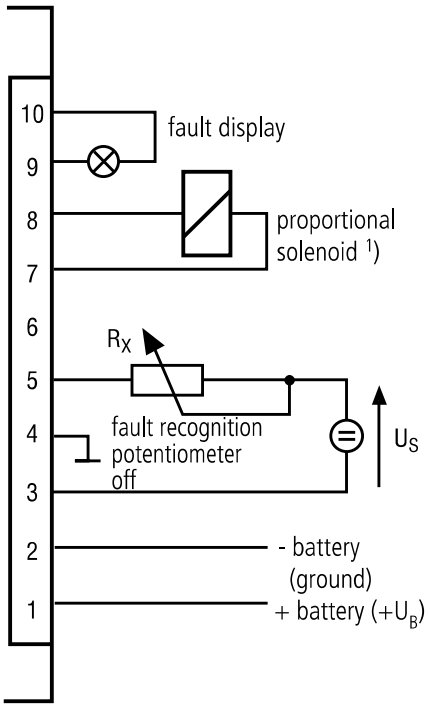
R_X = 390 Ω for $I_{S\,max}$ = 20 mA
(current source)

PV...FE/20

Two point control

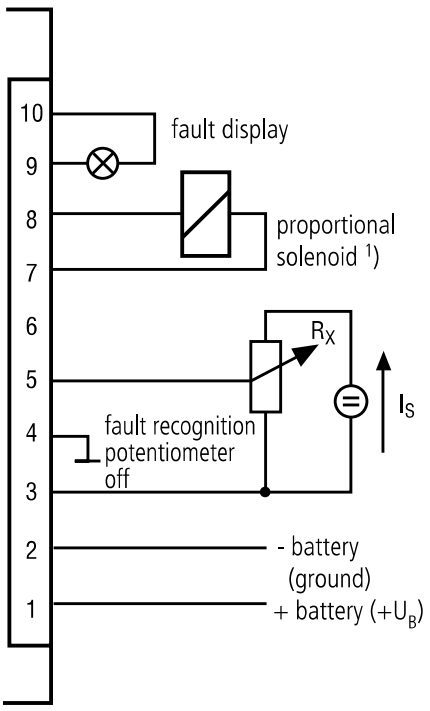


Voltage control



R_I = 110 kΩ input resistance
R_X = 27 kΩ for U_S = 10 V

Current control



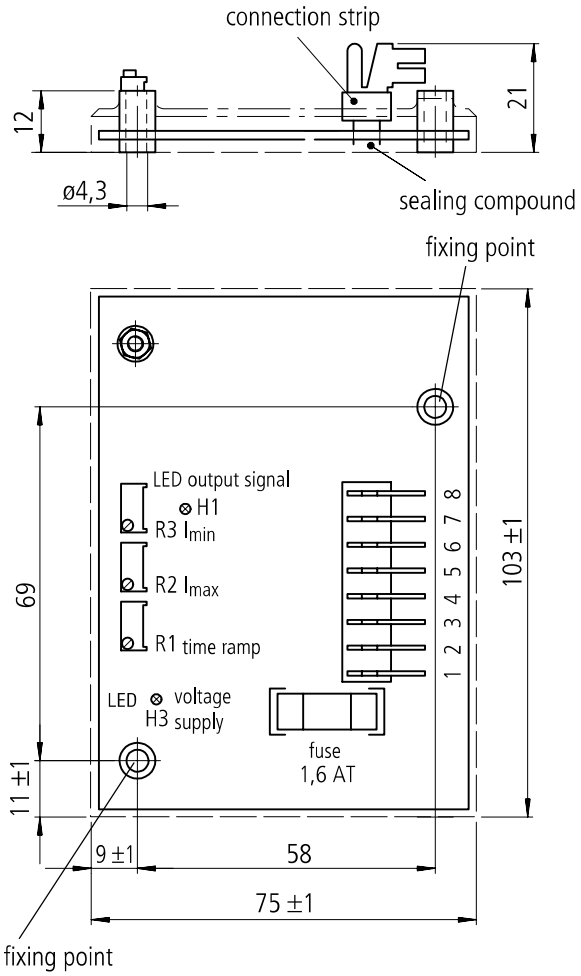
R_X = 390 Ω for $I_{S\,max}$ = 20 mA
(current source)

[1]) A connection to connections 7, 10, the chassis or to the battery ground is possible

Unit Dimensions

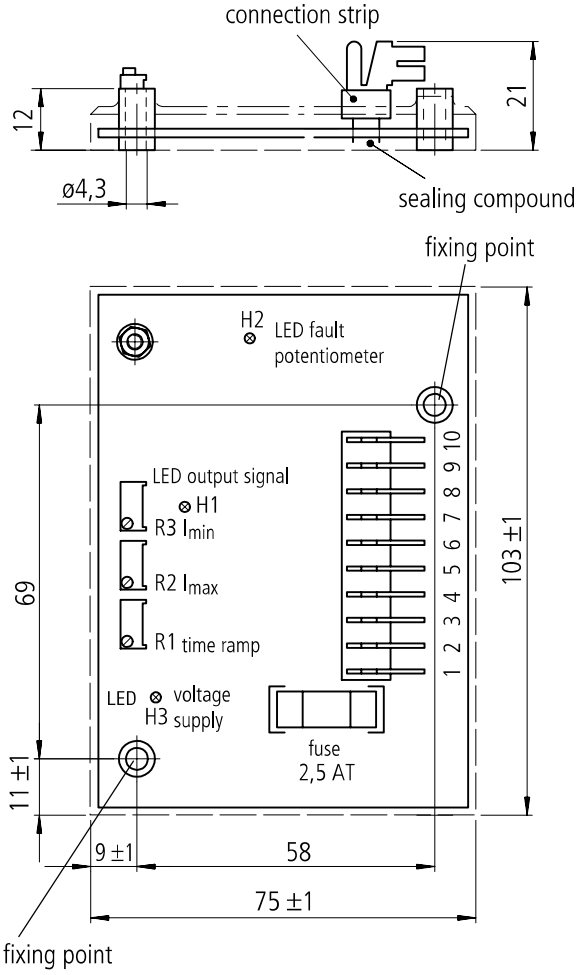
PV...F/20

View drawn without fuse



PV...FE/20

View drawn without fuse



The counterplug connectors consist of individual pin connectors *AMP-Faston size 6,3* are not included.
Use only connectors with insulation (avoidance of short circuits)!

Presetting for Delivery

(for variable displacement pumps and motors)

Amplifier	PV12.../20	PV24.../20
Nominal voltage	12 V	24 V
Solenoid current	I_{min} = 400 mA I_{max} = 1200 mA	I_{min} = 200 mA I_{max} = 600 mA
Ramp time	approx. 5 s	approx. 5 s

The presetting relate to a control potentiometer with a resistance of 4,7 kΩ. For the PV...FE/20 version with fault recognition, other resistance values may result in changes to the current settings.

Compatibility to PV.../10

With regard to the dimensions and the connections 1 to 8 the PV...F/20 and PV...FE/20 amplifiers are compatible with the earlier PV.../10 version.

With regard to the functions the PV...F/20 version is directly interchangeable with the earlier PV.../10 version.

The version PV...FE/20 with fault recognition, other current values may result at the output which are in relation to the resistance value of the control potentiometer.

For the PV.../20 version the measuring resistance for the current control of the solenoid output is switched in the +line of the solenoids; in the PV.../10 version the measurement resistance is in the -line against ground.

Setting Instruction PV.../20

(change of presetting)

1. Set control potentiometer to "0" (control voltage 0V at port 3). Adjust start current I_{min} with R3.
   (current increase by rotating in clockwise direction)
2. Set control potentiometer to maximum. Adjust maximum current I_{max} with R2.
   (current increase by rotating in clockwise direction)
3. Adjust duration of time ramp with R1.
   (ramp time increase by rotating in clockwise direction)

Please note:

- Brueninghaus Hydromatik cannot accept any responsibility for technical problems occurring within the system arising from using a circuit diagram based on the recommendation.
- *The Safety Regulations for Hydrostatic Transmissions with Electronic Controls* (RDE 90301-01) are to be observed.
- An emergency switch must be fitted to cut off the power supply to the electronics in the event of an emergency. This switch must be easily accessible to the operator.
  Safe and effective braking must be guaranteed on operating the emergency switch.
- Lines to the electronics may not be laid in the vicinity of other power lines in the equipment.
- There must be sufficient distance between any radio equipment.
- During welding operations all electrical connectors to the electronics must be unplugged.
- Only test the electronics when proportional solenoids are connected.
- The proportional solenoid may not be fitted with free wheeling diodes.
- Switching solenoids at outputs of the electronics and other inductive actuators within the system must be fitted with free wheeling diodes.
- External switching contacts in the solenoid lines are not permitted.