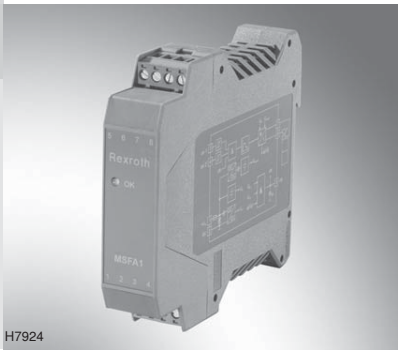
Booster amplifier

RE 30260/04.12 1/6
Replaces: 08.11

Type VT-MSFA1

Component series 1X



H7924

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Features

- Control of hydraulic on/off valves which are to be switched fast
- Freely clocking output stage
- Protection against reversed polarity and short circuit of the load circuit (output stage) as well as protection against reversed polarity for the operating voltage
- 24 V status output "Ready for operation" (for analysis e.g. in a PLC)
- LED status displays "Ready for operation"
- Removable plug-in screw connectors
- Two equivalent switching inputs (with "AND" link)

Ordering code

VT–MSFA1– –1X/V0/ *

Analog amplifier in modular design for controlling an on/off valve

For KSDER valve with coil 2.3 Ohm at 1.76 A **= 50**
For 4SEC6...SO843 valve **= 100**
For 4WE6...SO893 valve **= 150**

1X = Component series 10 to 19
(10 to 19: Unchanged technical data and pinout)

Further details in the plain text

Functional description

General

The VT-MSFA1 booster amplifier is used to control hydraulic on/off valves which are to be switched fast. The module is snapped onto a top hat rail. The electrical connection is established via screw terminals. The module is operated with 24 V direct voltage.

By means of the internally generated boost voltage of approx. 48 V which is connected to the valve solenoid during the boost phase and the resulting higher solenoid current (>> $I_{Nominal}$) considerably reduced switching times of the valve can be achieved. In holding operation, the solenoid current is reduced. This reduces the actuator operating temperature which again favors a longer service life of the actuator.

Power supply unit [1]

The internal power supply unit provides all internally required supply voltages.

Switching inputs [2]

If there is a "low signal" at one of the two switching inputs "IN1" or "IN2" [2], the output stage is block irrespective of the current phase (boost, tightening or holding phase) and the current actual current value. Then, there is a fast shut-down of the valve.

When applying a "high signal" to both switching inputs "IN1" and "IN2" [2], the output stage is activated and the valve is switched on.

Voltage and current profile generator [3]

Generates the control signals for the output stage [4].

Power output stage [4]

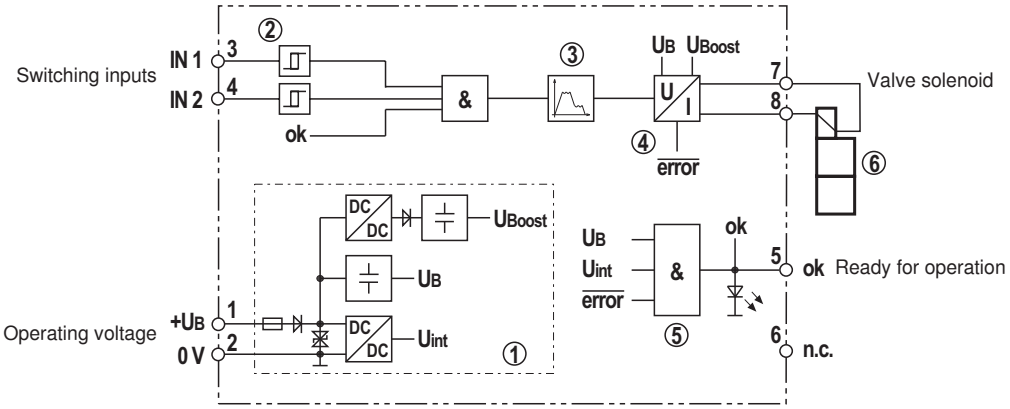
The power output stage creates the clocked solenoid current for the on/off valve. The output stage output is short-circuit-proof.

Fault detection [5]

If the valve is connected, the green LED will light up if there is no error. The LED flashes in case of short circuit or if the solenoid resistance is too high. In case of cable break or internal errors, the LED will go out. The "Ready for operation" output will be taken back with all errors detected. After troubleshooting, there is an automatic restart.

[ ] = Assignment to the block diagram

Block diagram / pinout

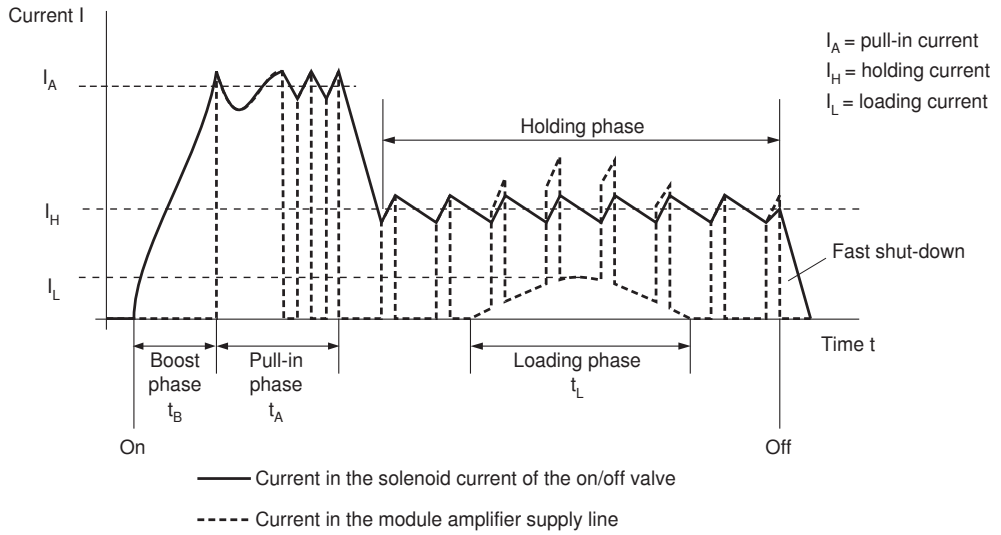


1 Power supply
2 Switching inputs
3 Voltage and current profile generator
4 Output stage
5 Fault recognition
6 On/off valve

Terminal assignment

Operating voltage	$+U_B$	1	5	ok	Ready for operation
	0 V	2	6	n.c	
Switching inputs	IN1	3	7		Valve solenoid
	IN2	4	8		

Current profile



Technical data (For applications outside these parameters, please consult us!)

electric

Internal power supply unit			
Operating voltage		U_B	24 VDC
Operating range	Upper limit value	$u_B(t)_{max}$	35 V
	Lower limit value	$u_B(t)_{max}$	18 V
Current consumption			
during the boost and pull-in phase (t_{B+A} = 16 ms ± 1 ms)		$I(t)_{max}$	< 6 A
during the holding and loading phase (t_L = ≤ 20 ms)		$I(t)_{max}$	< 5 A
during the holding phase		$I(t)_{max}$	< 2 A
with switched-off output stage		I_{max}	< 100 mA
Power consumption (depending on the switching frequency *fs* and duty cycle t_p)			
fs_{max} = 50 Hz; t_p = 6 ms		P_S	< 55 W
fs_{max} = 20 Hz; t_p = 15 ms		P_S	< 45 W
fs_{max} = 10 Hz; t_p = 80 ms		P_S	< 35 W
with switched-off output stage		P_S	< 1.5 W
Fuse			
Safety fuse			5 A (time-lag)
Output stage			
Output voltage		$u(t)_{max}$	< 50 V
Output current			
Boost current		$I(t)_{max}$	< 6 A
Pull-in current [1)]		$I(t)_{max}$	< 6 A
Holding current [1)]		I_{max}	< 2 A
Internal clock frequency		*f*	Freely clocking

[1)] For the KSDER valve, no pull-in current is required. After the boost phase, the module amplifier switches directly to the holding current.

Technical data (For applications outside these parameters, please consult us!)

Max. switching frequency		fs_{max}	50 Hz
Maximum duty factor [1]	Switching frequency and duty factor are to be selected so that the rated current of the coil is not permanently exceeded.		
with KSDER valve [2]			
at 20 Hz ≤ *fs* ≤ 50 Hz		Duty factor	20 %
at 10 Hz ≤ *fs* < 20 Hz		Duty factor	50 %
at 5 Hz ≤ *fs* < 10 Hz		Duty factor	80 %
at 0 Hz ≤ *fs* < 5 Hz		Duty factor	Without limitation
with 4SEC6 valve [3]			
at 10 Hz ≤ *fs* ≤ 50 Hz		Duty factor	30 %
at 5 Hz ≤ *fs* < 10 Hz		Duty factor	90 %
at 0 Hz ≤ *fs* < 5 Hz		Duty factor	Without limitation
with 4WE6 valve [4]			
at 10 Hz ≤ *fs* ≤ 50 Hz		Duty factor	30 %
at 5 Hz ≤ *fs* < 10 Hz		Duty factor	90 %
at 0 Hz ≤ *fs* < 5 Hz		Duty factor	Without limitation
Inputs			
IN1 and IN2			
Switching thresholds	On	*U*	+8.5 V to U_B
	Off	*U*	–3 V to 5 V
Current consumption		*I*	< 5 mA
Outputs			
Ready for operation			
Switching thresholds	On	*U*	> 16 V
	Off	*U*	< 3 V
Current carrying capacity		I_{max}	< 100 mA
Operating conditions			
Type of connection			Screw terminals (max. 2.5 mm²)
Mounting type			Top hat rail TH 35/7.5 according to EN 60715
Protection class			IP 20 according to EN 60529
Dimensions (W x H x D)			22.5 x 99 x 114.5
Admissible operating temperature range		ϑ	–20 to +55 °C
Storage temperature range		ϑ	–25 to +70 °C
Weight		m	0.15 kg

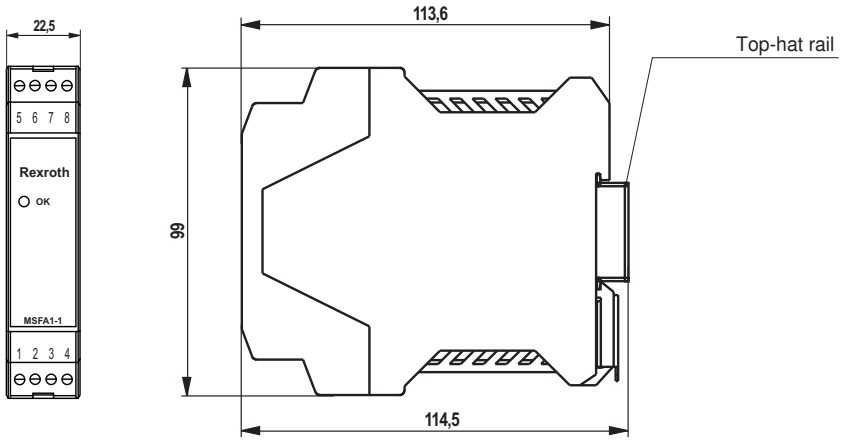
[1] Duty factor = t_p / T · 100 %
t_p: Switch-on duration, T: Cycle duration)

[2] The specified duty factor for different switching frequency applies only to on/off valves of type KSDER with coil 2.3 Ohm / 1.76 A / material no. R901002932

[3] The specified duty factor for different switching frequency applies only to on/off valves of type 4SEC6...SO843

[4] The specified duty factor for different switching frequency applies only to on/off valves of type 4WE6...SO893

Unit dimensions (dimensions in mm)



Project planning / maintenance instructions / additional information

- The amplifier module may only be wired when de-energized.
- The distance to aerial lines, radios and radar systems must be sufficient (>> 1 m).
- Ensure a maintenance-friendly installation, i.e. simple access to the connection lines (cable ends with sufficient length so that removal of the module is also possible in the wired condition).
- Do not lay solenoid and signal lines near power cables.
- With a strongly fluctuating operating voltage, it may in the individual case be necessary to use an external smoothing capacitor with a capacity of at least 2200 μF.
  Recommendation: Capacitor module VT 11110-1X (see data sheet 30750); sufficient for up to two modules
- For supply, signal and solenoid lines, shielded cables must be used. The cable shield must be connected to the control cabinet extensively and as short as possible. To the connection of the valve solenoid, the following applies: Up to a length of 10 m, the wire cross-section must be 2 x 1.5 mm^2, from a length of 10 m to 25 m 2 x 2.5 mm^2. With greater lengths, please contact us.
- The distance between two booster amplifiers must at least be 25 mm. The clearance area between booster amplifier and cable channel must at least be 50 mm.
- The booster amplifier may only be operated with the valve/coil combinations released in the ordering codes.
- The solenoid and the mating connector must not be connected to free-wheeling diodes or other protective circuits.