Plug-in proportional amplifier

RE 30116/09.10 1/8
Replaces: 06.10

Type VT-SSPA1-1, VT-SSPA1-5, VT-SSPA1-50, VT-SSPA1-100, VT-SSPA1-150

HAD 7645
with M12 component connector

HAD 7072
with cable gland

Component series 1X

Table of contents

Features

- Used for controlling solenoid operated pressure control and directional valves without closed-loop position control
- Proportional command value / current characteristic curves for command values from 0 % to 100 %
- Regulated, adjustable maximum current for a command value greater than approx. 120 % (only with differential input)
- Differential input, optional current input
- Ramp generator, separate for up/down
- Zero potentiometer / biasing current
- Command value attenuator / maximum current
- Dither frequency potentiometer
- Operating voltage 24 V

Ordering code

VT−SSPA1− −1X/V0/ 0 −24/

for DBET / DRE	**= 1**
for KBPS...8	**= 5**
Universal, 2.5 A	**= 50**
for KKDSR	**= 100**
Universal, 0.8 A	**= 150**

No code = With cable gland
K24 = With M12 component connector

24 = 24 V operating voltage

0 = Voltage input

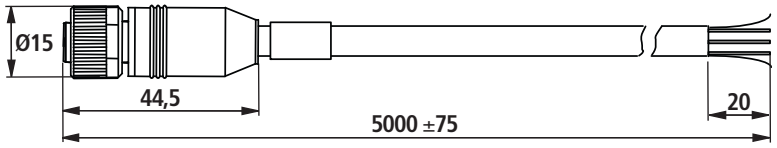
Overview of types

Type	Mat. no.	U_B	I_{nom}	f at I_{nom}	Command value	For valve	Solenoid	
VT-SSPA1-1-1X/V0/0-24	R900779643	24 V	1,6 A	340 Hz	0...10 V/24 V	DBET / DRE	5,5 Ω	1,6 A
VT-SSPA1-1-1X/V0/0-24/K24	R901238534	24 V	1,6 A	340 Hz	0...10 V/24 V	DBET / DRE	5,5 Ω	1,6 A
VT-SSPA1-5-1X/V0/0-24	R901024331	24 V	1,2 A	200 Hz	0...10 V/24 V	KBPS...8	4,77 Ω	1,2 A
VT-SSPA1-5-1X/V0/0-24/K24	R901238530	24 V	1,2 A	200 Hz	0...10 V/24 V	KBPS...8	4,77 Ω	1,2 A
VT-SSPA1-50-1X/V0/0-24	R901005414	24 V	2,5 A	305 Hz	0...10 V/24 V	universal	> 2 Ω	2,5 A
VT-SSPA1-50-1X/V0/0-24/K24	R901238532	24 V	2,5 A	305 Hz	0...10 V/24 V	universal	> 2 Ω	2,5 A
VT-SSPA1-100-1X/V0/0-24	R901030116	24 V	1,2 A	150 Hz	0...10 V/24 V	KKDSR1	7,2 Ω	1,2 A
VT-SSPA1-100-1X/V0/0-24/K24	R901238528	24 V	1,2 A	150 Hz	0...10 V/24 V	KKDSR1	7,2 Ω	1,2 A
VT-SSPA1-150-1X/V0/0-24	R901104644	24 V	0,8 A	150 Hz [1]	0...10 V	universal	19,5 Ω	0,8 A
VT-SSPA1-150-1X/V0/0-24/K24	R901263782	24 V	0,8 A	150 Hz [1]	0...10 V	universal	19,5 Ω	0,8 A

[1] With a solenoid resistance of R = 19.5 Ω and a solenoid current of I = 100 mA

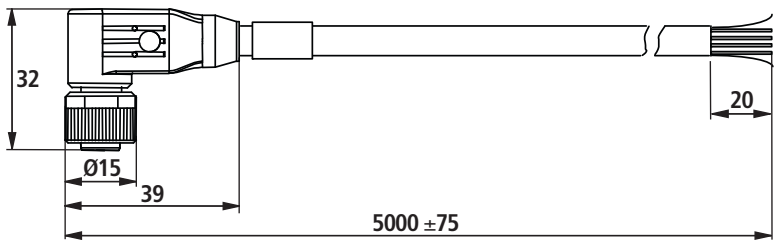
Accessories for type .../K24

Description	Designation	Mat. no.
Ready-to-connect cable with straight mating connector	KABELSATZ VT-SSPA1-1X/M12/1/V00	R901241656



Cable sheat: PVC, black
Cable diameter: 6.4 mm
Wire cross-section: 4 x 0.75 mm²
Cable and mating connector are shielded
Electrical connection, see page 6

Ready-to-connect cable with angled mating connector	KABELSATZ VT-SSPA1-1X/M12/2/V00	R901241651



Cable sheat: PVC, black
Cable diameter: 6.4 mm
Wire cross-section: 4 x 0.75 mm²
Cable and mating connector are shielded
Electrical connection, see page 6

Possible applications

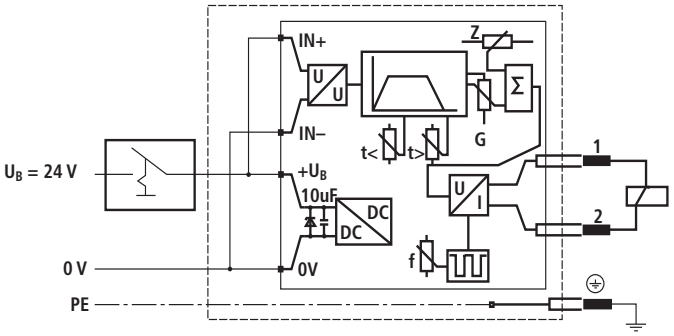
2-conductor technology (only with differential input)

– Switching applications with constant-current regulation

– Ramp function when switched on

The “IN+“ input is to be bridged with the supply voltage ($+U_B$) in the plug-in connector, the “IN–“ input is to be bridged with the supply voltage (0 V) in the plug-in connector.

The maximum current must usually be matched according to the solenoid data using potentiometer “G“. The ramp time “ramp up“ (t <) can be adjusted within the range of t_{min} ms to 5 s.



3-conductor technology (only with differential input)

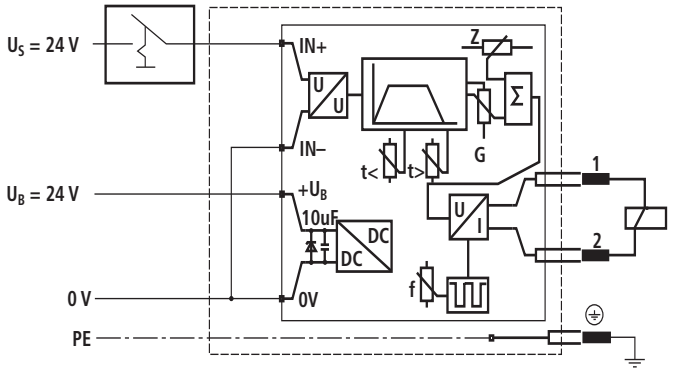
– Switching applications with constant-current regulation

– Switching with low control power

– Ramp function, when the control voltage is switched on or off, can be separately adjusted

The “IN+” input is to be connected to the control voltage (U_S = 24 V), the “IN–” input is to be bridged with the supply voltage (0 V) in the plug-in connector.

The maximum current must usually be matched according to the solenoid data using potentiometer “G“. In the de-energized condition (“IN+“ = 0 V or “IN+“ = open) a biasing current can be set on “Z“. This biasing current can be used to reduce the switch-on delay, especially in conjunction with a ramp. If required, a value of between approx. 20 mA and approx. 15 % of the nominal current can be set. The ramp times “ramp up“ (t <) and “ramp down“ – (t >) can be adjusted within the range of t_{min} to 5 s.



4-conductor technology

– The “IN+“ input is to be connected to the control signal (U_S = 0... 10 V/24 V), the “IN–“ input is to be connected to the reference potential of the control voltage.

The biasing current and the maximum current have to be adjusted by means of potentiometers “Z“ and “G“ before commissioning. The current can then be adjusted proportionally between the set biasing current and the set maximum current according to the control voltage. The biasing current can be adjusted within the range of approx. 0 mA to approx. 15 % of the nominal current, the maximum current within the range of 0 to I_{max} (see technical data on page 5).

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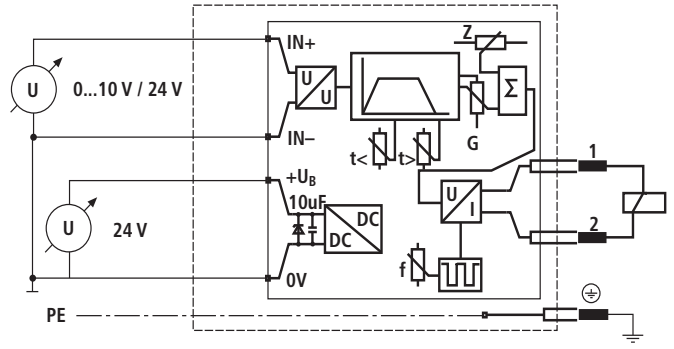
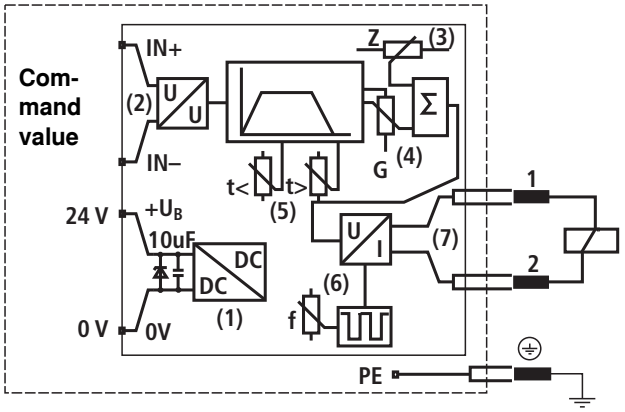
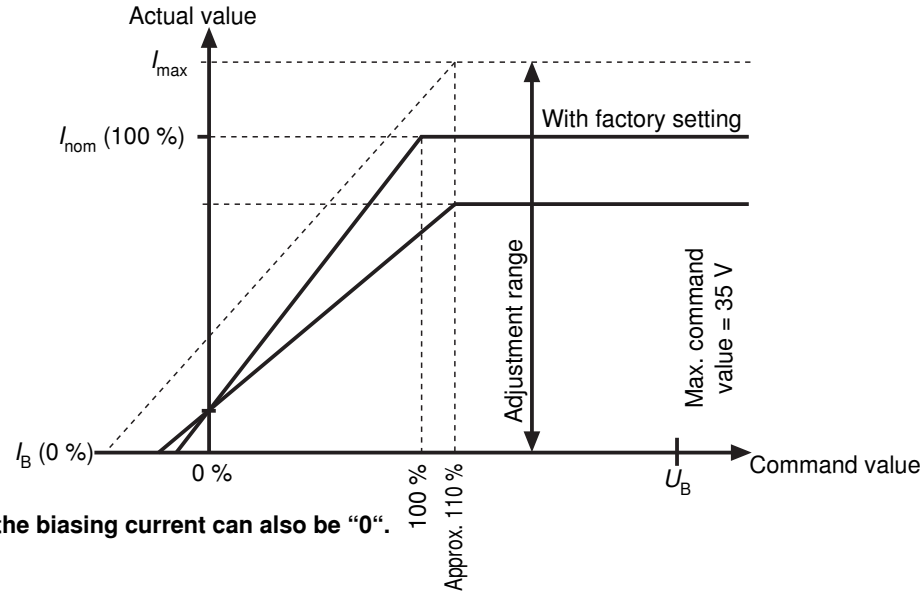


Block circuit diagram

(1): Internal voltage adjustment
(2): Command value input
(3): Zero point potentiometer "Z" / biasing current *I* (IN = 0%)
(4): Command value attenuator "G" / maximum current *I* (IN = 100%)
(5): Ramp time potentiometers "*t* <" and "*t* >"
(6): Frequency range correction "*f*"
(7): Current output stage



Characteristic curve



Note:

Depending on the type, the biasing current can also be "0".

Function

The plug-in amplifier is suitable for mounting onto a valve connection base according to EN 175301-803. By turning the plug insert and the electronics in the housing, the plug-in amplifier can be mounted on the solenoid in 90° increments.

Command value feedforward

The command value range is between 0 and U_B. In the command value range 0...10 V the solenoid current is proportional to the command value. From a command value of approx. 12 V up to U_B the solenoid current is almost constant according to the I_{max} setting (switching application).

Ramp generator

Ramp generator (5) limits the gradient of the control variable. The ramp times can be adjusted separately for up and down ramps. In switching applications, the ramps can be used to dampen the switch-on and switch-off impulse (in the case of switching off, with 3-conductor connection only, i.e. switching signal and supply are connected separately). This characteristic also depends on the valve and solenoid type. The downstream command value attenuator (4) has no influence on the ramp time.

Characteristic curve

Up to a command value of approx. 110 % the transfer characteristic curve rises linearly. The zero point can be corrected by means of potentiometer "Z", the maximum value using potentiometer "G".

Current output stage

Output stage (7) is self-clocking. The clock frequency depends on the current intensity, the operating voltage and the impedance of the controlled solenoid. The clock frequency can be re-adjusted by means of potentiometer "f". The current output stage generates a regulated current signal according to the control variable provided by summator (3). Too high a clock frequency results in an increase in the valve hysteresis. Too low a clock frequency increases the noise level of the hydraulic system.

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

Type		VT-SSPA1-1	VT-SSPA1-5	VT-SSPA1-50	VT-SSPA1-100	VT-SSPA1-150
Operating voltage 24 V	U_B	24 VDC				
	$u(t)_{max}$	35 V				
	$u(t)_{min}$	18 V				
Maximum cable inductance [1]	L_{max}	100 μH				
Current / power consumption (depending on solenoid data)	I [A]	< 1.7	< 1.7	< 2.6	< 1.7	< 1.2
	P_{max} [VA]	< 40	< 40	< 60	< 40	< 30
Recommended back-up fuse	I [A]	2; slow-blow	2; slow-blow	3,15; slow-blow	2; slow-blow	1.5; slow-blow
Minimum coil inductance	L_{min} [mH]	15	15	10	15	15
Biasing current (adjustment range)	I_B [mA]	0...300	0...300	0...350	0...250	0...200
Biasing current (factory setting)	I_B [mA]	100	0	100	0	100
Nominal current (factory setting)	I [A]	1.6	1.2	2.5	1.2	0.8
Maximum current (adjustment range)	I_{max} [A]	I_B...1,7	I_B...1.8	I_B...2.6	I_B...1.7	I_B...0.8
Clock frequency at I_{max}	f [Hz]	340	200	305	150	150 [2]
Command value input (voltage)						
Proportional range	U	0...10 V				
Switching range	U	12 V... U_B				
Resistance	R	20 kΩ				
Ramp time (adjustment range)	t	100 ms...5 s	60 ms...5 s			
Type of connection (cable gland)		4 screw terminals				
Cable diameter		4,5 … 11 mm				
Type of connection (M12 component connector)		Component connector, 4-pin, M12x1				
Type of connection (solenoid)		Base to EN 175301-803				
Number of pins (solenoid)		2 + PE				
Dimensions		see page 7				
Type of mounting		M3 x 40 mm				
Permissible operating temperature range (amplifier with cable gland)	ϑ [°C]	–25 … +70	–25 … +70	–25 … +60	–25 … +70	–25 … +70
Permissible operating temperature range (amplifier with M12 component connector)	ϑ [°C]	–25 … +70	–25 … +70	–25 … +50	–25 … +70	–25 … +70
Storage temperature range	ϑ	–25 … +85 °C				
Type of protection		IP65 to EN 60529 with cable mounted/mating connector mounted				
Weight	m	0.125 kg				

[1] Usually corresponds to a cable length of less than 100 m

[2] With a solenoid resistance of R = 19.5 Ω and a solenoid current of I = 100 mA

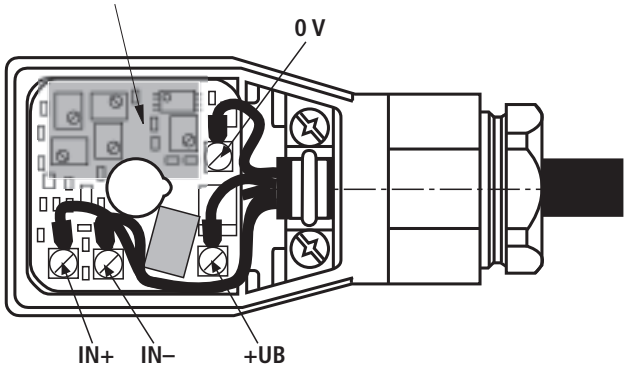
Electrical connection

Terminal / Pin		Terminal / Pin	
+UB / 1	Operating voltage U_B 24 V	IN+ / 2	command value input 24 V; 0...10 V
0 V / 3	0 V ground	IN– / 4	Reference potential wfor command value

Terminal connection

Risk of malfunction in the case of
EMC/ESD interference on the connection cable

Do not route command value connection cables through this section!



The protective earth conductor connection is accessible after the electronic printed-circuit board was removed.

Connection cross-section:

4 x 0.75 mm² shielded or
5 x 0.5 mm² shielded (connect shield in control cabinet)

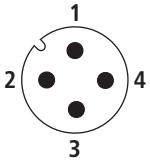
For VT-SSPA1-50:

4 x 1.5 mm² shielded (connect shield in control cabinet)

Cable diameter: 4.5 … 11 mm

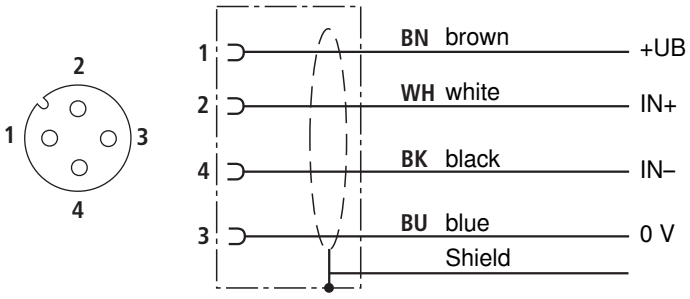
M12 plug-in connector connection

Component connector **on amplifier**



Mating connector and wire color of ready-to-connect cable kit

Please order cable kit separately, see page 2

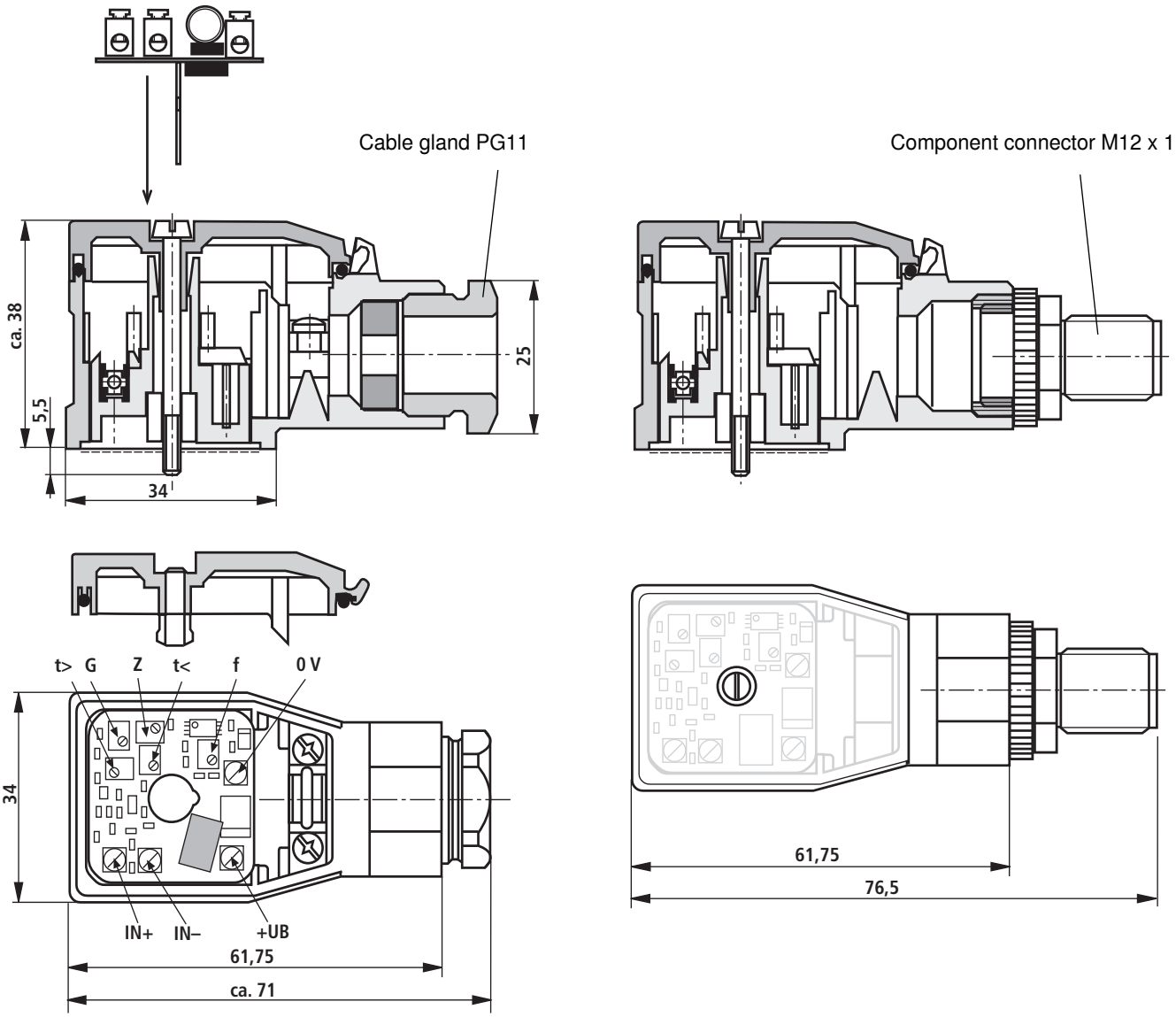


A protective earthing conductor connection is not provided

Connection cross-section:

4 x 0.75 mm² shielded
(connect shield in control cabinet)

Control elements / **dimensions** (dimensions in mm)



Top view on open housing:

G: Command value attenuator / maximum current

Z: Zero point potentiometer / biasing current

t <: Ramp time “up“

t >: Ramp time “down“

f: Frequency range

Engineering / maintenance notes / supplementary information

- The plug-in amplifier may only be wired when disconnected from the power supply.
- Do not lay cables near power cables!
- The distance to aerial lines, radio sources and radar equipment must be at least 1m.
- Use a measuring adapter for adjusting the potentiometers and for checking the current values, and measure currents electrically isolated.
- The specified maximum solenoid currents must not be exceeded.
- Do not use solenoids with integrated free-wheeling diodes.
- The supply voltage must be protected by means of a fuse - see technical data.

Note:

The solenoids are controlled with a clocked voltage. The intensity of the solenoid voltage impulse corresponds to the applied operating voltage ($+U_B$).

Solenoids with integrated EMC suppressor circuit may only be used, if the permissible solenoid voltage - both, for positive and negative voltage - is greater than the actual operating voltage.

Please observe the manufacturer's information.

Note:

- In the case of strongly fluctuating operating voltage, it may be required to provide an external smoothing capacitor having a capacitance of approx. 470 μF to 2200 μF.
- The cable length should not exceed 50 m. For longer lines, a capacitor with C ≥ 100 μF has to be connected between U_B and 0 V. The line between capacitor and plug-in amplifier must not be longer than 50 m.

Recommendation: Capacitor module VT 11110 (see RE 30750) sufficient for up to 5 plug-in amplifiers

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