3.0.5 Measured values and function of solenoid valves

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Measurement Tools

PN 03501910

Multimeter set, Hako spare parts number 03501910.
For measuring voltage (V), current (A), resistance (Ω), diode test and temperature.

Pos.38, PN 03501740

Solenoid valve test set, Hako spare parts number 03501740, for testing the power supply, the current and the resistance of solenoid valves.
It is possible to determine very quickly and clearly with the aid of the solenoid valve test set whether there is an error in the electrical or hydraulic system.

Basics of troubleshooting on electrical system in vehicles

Check before starting all work:

- The fuses of the electrical system and whether the fuses are plugged in at the right place in the fuse box.
- Whether the fuses for these functions are in order. Use the multimeter for fuse testing.
- Whether the control units (electronics) have perfect voltage and ground connection.
- Check that the ground and plus terminals on the battery are firmly seated and whether there is damage to the pole terminals.
- Test the charge condition of the battery and the function of the generator, errors that are not relevant could be indicated by the control units when the voltage drops below 10.5 V in operation.
- In the case of sporadically occurring errors or flickering warning lamps / spotlights, it is necessary to check whether the ground leads from the minus pole of the battery to the vehicle frame and the cab are firmly seated and whether there is corrosion.

The function of the component to be tested must be safely recognised before starting the tests. Imperatively use the electrical circuit diagram, the training documents and the diagnostic system of the relevant vehicle!

Measurement and testing on the solenoid valves for the hydraulic functions

It is necessary to determine the measured values accurately to check the solenoid valves. The solenoid valve test set (PN 03501740) and a suitable multimeter (e.g. Multimeter Set PN03501910) are required for this.
Example: Solenoid valve Y17 raise dirt hopper:
A voltage of 12 V is required for safe operation of the solenoid valve Y17. The coil of Y17 as well as the cables of Y17 should have a resistance of approx. 6 Ω (ohms). A current of approx. 2 A (2000 mA) then flows.

Ohm's law applies here. Ohm's law describes the relationship between voltage, current and resistance.

U = voltage in V (volts)

R = resistance in Ω (ohms)

I = current in A (amperes)

1st example: I = U:R, I = 12 V:6 Ω , I= 2 A. A current of 2 A (2000 mA) flows.

If the resistance of the solenoid, of the plugs or connection points of the cables increases, then a lower current flows. In the example the resistance increases to 12 Ω. E.g. due to defects in the solenoid, the plugs or the connection points of the cables.

2nd example: I = U:R, I = 12 V:12 Ω, I = 1 A (1000 mA). A current of only 1 A (1000 mA) flows.

Measurement and testing solenoid valves for hydraulic functions

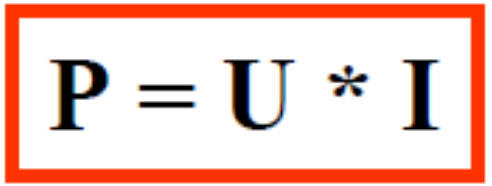
The electrical power is the product of voltage and current: P = U x I

Electrical voltage; symbol U; unit V (volts)

Electrical current; symbol I; unit A (amperes)

Electrical resistance; symbol R; unit Ω (ohms)

Electrical power; symbol P; unit W (watts)



In the 1st example the voltage is 12 V and the current 2 A. The electrical power is the product of voltage and current
P = U x I

P (watts) = U (volts) x I (amperes); P = 12 V x 2 A; P = 24 W; the electrical power is 24 W

In the 2nd example the voltage is 12 V and the current 1 A. The electrical power is the product of voltage and current
P = U x I

P (watts) = U (volts) x I (amperes); P = 12 V x 1 A; P = 12 W; the electrical power is 12 W

An electrical power of only 12 W no longer ensures that the solenoid valve Y17 is safely switched. For this reason we always state the setpoint current for the coil current.

Therefore if solenoid valves which switch hydraulic functions are not functioning correctly, it is absolutely necessary to determine the measured values accurately before working on the hydraulic system! A mere voltage measurement or only using solenoid valve testers is not sufficient!

Measured values and function of the solenoid valves in the hydraulic control block 2.11

	Desription **SV= soloniod valve**	**Voltage** **(V)**	**Current Flow (A)**	**Resistance Coil (Ω)**
	Function: Lower front tool carrier (FTC), floating position FTC, Y13			
Y13	SV lower front tool carrier (FTC), FTC floating position.	12V	1350 mA	9,0Ω (Ohm)
	Function: Raise front tool carrier, Y12 + Y14			
Y12	SV front tool carrier circulation, work hydraulic on	12V	2000mA	6,0Ω (Ohm)
Y14	SV valve raise front tool carrier (FTC up)	12V	2000mA	6,0Ω (Ohm)

Caution: A measuring tolerance of +/- 20% due to different measuring devices!

Measured values and function of the solenoid valves in the hydraulic control block 2.11

	Desription **SV= soloniod valve**	**Voltage (V)**	**Current Flow (A)**	**Resistance Coil Ω**
	Function: SV broom R- H wide (broom out), Y12 + Y15			
Y12	SV front tool carrier circulation, work hydraulic on	12V	2000mA	6,0Ω (Ohm)
Y15	SV broom R- H wide (broom out)	12V	2000mA	6,0Ω (Ohm)
	Function: Broom R- H narrow (broom in); Y12 + Y16			
Y12	SV front tool carrier circulation, workhydraulic on	12V	2000mA	6,0Ω (Ohm)
Y16	SV broom R- H narrow (broom in)	12V	2000mA	6,0Ω (Ohm)
Caution: A measuring tolerance of +/- 20% due to different measuring devices!				

Measured values and function of the solenoid valves in the hydraulic control block 2.11

	Desription **SV= soloniod valve**	**Voltage** **(V)**	**Current Flow (A)**	**Resistance Coil Ω**
	Function: SV broom R- H wide (broom out), Y12 + Y15			
Y12	SV front tool carrier circulation, work hydraulic on	12V	2000mA	6,0Ω (Ohm)
Y19	SV broom L- H wide (broom out)	12V	2000mA	6,0Ω (Ohm)
	Function: Broom L- H narrow (broom in); Y12 + Y20			
Y12	SV front tool carrier circulation, work hydraulic on	12V	2000mA	6,0Ω (Ohm)
Y20	MV Tellerbesen links einschwenken SV broom L- H narrow (broom in)	12V	2000mA	6,0Ω (Ohm)

Achtung: Eine Messtoleranz von +/- 20% durch unterschiedliche Meßgeräte ist möglich!

Measured values and function of the solenoid valves in the hydraulic control block 2.xx

	Desription **SV= soloniod valve**	**Voltage** **(V)**	**Stromstärke (A)**	**Resistance Coil Ω**
Y55	Function: Oil supply 2- Broom - System Proportional- solonoid valve broom speed 14 + 3 L/min bei 2000 1/min	4,4 - 5,8V	790 - 1040mA	5,6Ω (Ohm)
Y55	Function: Oil supply front mower 1.50m Proportional- solonoid valve 54 + 2/ -1 L/min bei 2000 1/min	0 - 7,6V	0- 1360mA	5,6Ω (Ohm)
Y55	Function: Oil supply front mower 2.75m, snow blower Proportional- Solonoid valve 74 +2/ -1L/min bei 2400 1/min	0 - 8,3V	0- 1480mA	5,6Ω (Ohm)
Y29	SV Stop Function Front attachment	12V	2000mA ?	6,0Ω (Ohm) ?

Caution: A measuring tolerance of +/- 20% due to different measuring devices!

3.0.5 Measured values and function of solenoid valves

Measured values and function of the solenoid valves in the hydraulic control block 2.12

	Desription **SV= soloniod valve**	**Voltage** **(V)**	**Current Flow (A)**	**Resistance Coil Ω**
	Function: Suction fan/ spreader on, Y10			
Y10	Prop.- Solenoid valve suction fan/ spreader on	0- 6.0V	0- 2000mA	3.0Ω (Ohm)
	Function: Raise hopper, Y12 + Y17			
Y12	SV front tool carrier circulation, work hydraulic on	12V	2000mA	6,0Ω (Ohm)
Y17	Solenoid valve raise hopper (hopper up)	12V	2000mA	6,0Ω (Ohm)
	Function: Lower hopper Y12 + Y18			
Y12	SV front tool carrier circulation, work hydraulic on	12V	2000mA	6,0Ω (Ohm)
Y18	Solenoid valve lower hopper	12V	2000mA	6,0Ω (Ohm)
Caution: A measuring tolerance of +/- 20% due to different measuring devices!				

3.0.5 Measured values and function of solenoid valves

Measured values and function of the solenoid valves in the hydraulic control block 2.23

	Desription SV= soloniod valve	Voltage (V)	Current Flow (A)	Resistance Coil Ω
	Function: Lower- floating position FTC, Y13			
Y13	SV lower front tool carrier (FTC), FTC floating position.	12V	1350 mA	9,0Ω (Ohm)
	Function: Raise FTC, Y12, Y14, Y35			
Y12	SV front tool carrier circulation, work hydraulic on	12V	2000mA	6,0Ω (Ohm)
Y14	SV valve raise front tool carrier (FTC up)	12V	2000mA	6,0Ω (Ohm)
Y35	SV pressure changeover to 200 bar	12V	2000mA	6,0Ω (Ohm)
Caution: A measuring tolerance of +/- 20% due to different measuring devices!				

3.0.5 Measured values and function of solenoid valves

Measured values of the solenoid valves at the hydraulic control block 2.23

	Desription **SV= soloniod valve**	**Voltage** **(V)**	**Current Flow (A)**	**Resistance Coil Ω**
	Function: Unload FTC (0- 50 bar), Y12,Y33, Y36			
Y12	SV front tool carrier circulation, work hydraulic on	12V	2000mA	6,0Ω (Ohm)
Y33	Prop.- SV Unload Front Tool Carrier,	0- 4,25V	0- 700mA	6,0Ω (Ohm)
Y36	SV floating position	12V	1350mA	9,0Ω (Ohm)
AchtCaution: A measuring tolerance of +/- 20% due to different measuring devices!				

3.0.5 Measured values and function of solenoid valves

Measured values of the solenoid valves for the radiator control

	Desription SV= soloniod valve	Voltage (V)	Current Flow (A)	Resistance Coil Ω
	Function, Radiator control			
Y31	Prop.- Solenoid valve radiator	7,8 – 3,8V	1300 - 630mA	6,0Ω (Ohm)
Y32	SV Reversible fan	12V	2000mA ?	6,0Ω (Ohm)
Caution: A measuring tolerance of +/- 20% due to different measuring devices!				

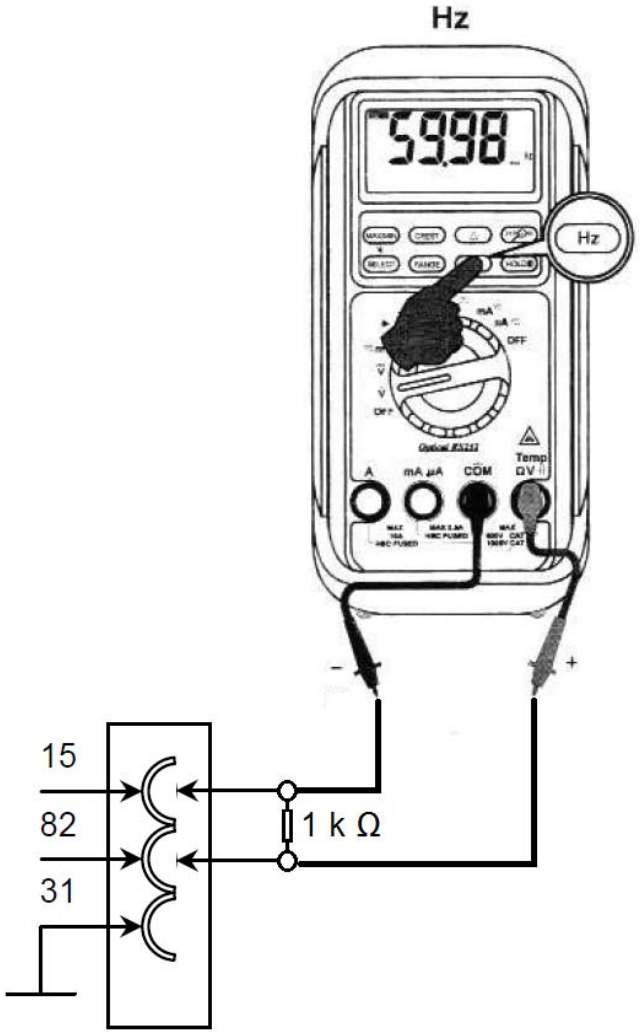
Speed signal- C3 signal for sand and salt spreader, connector X61:82

Mass built-up:

The signal can be measured X61: 82 to X61: 15/30.
Between these 2 points a resistance of 1kOhm,
or a test lamp is necessary.

- Multimeter, e.g. “Beha 340“ tension measurement, AC or DC
- Function activated „Frequency measurement“ (Hz)
- Black measuring line to X61: 15/30
- Red measuring line to X61: 82

A display of the frequency appears above 2 km/h (ca. 10 Hz)



Speed signal- C3 signal for sand and salt spreader, connector X61:82

Speed in Km/h	Frequence in Hz
0	0
5	26
10	53
15	79
20	105
25	132
30	158
35	184
40	211
45	237
50	263