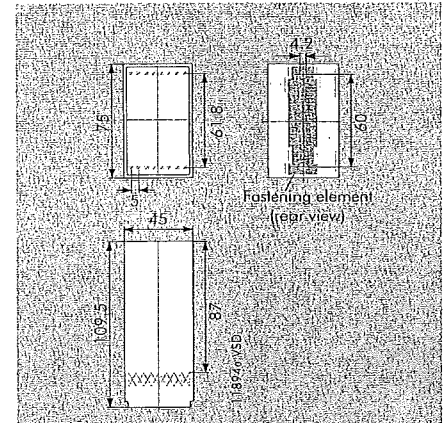
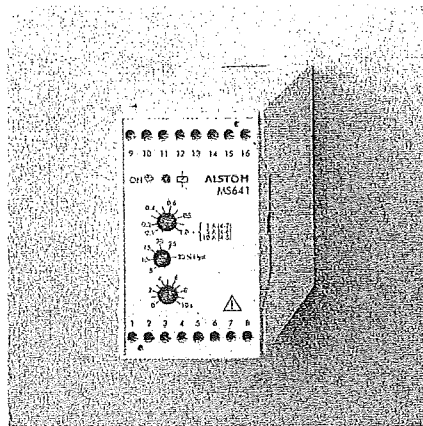


Current Monitoring Device MS 641

Principal Features

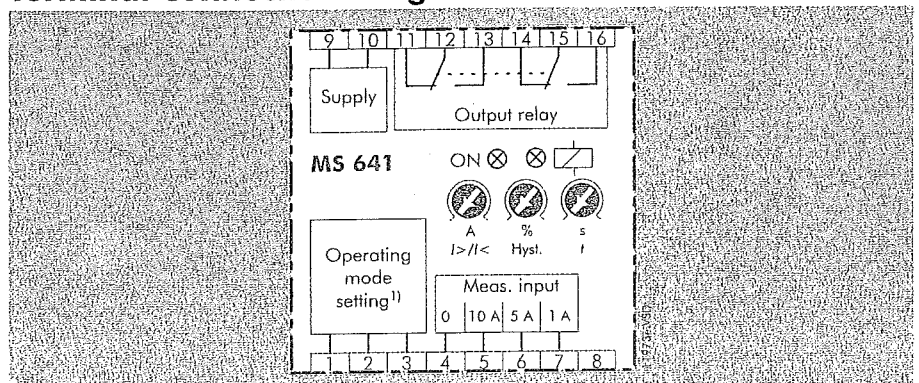
- ☐ Single-phase monitoring of DC and AC currents by r.m.s. value acquisition
- ☐ Selection of operating mode via jumper: overcurrent mode or undercurrent mode
- ☐ Overall measuring range of 0.1 A to 10 A divided into three partial measuring ranges
- ☐ Partial measuring range selection via connection terminals
- ☐ High overload rating
- ☐ Adjustable disengaging ratio
- ☐ Adjustable operate delay
- ☐ LED indicators for operation and signaling
- ☐ Output relay mode selection via jumper: energize-on-signal or normally-energized arrangement ('open-circuit' or 'closed-circuit' principle)



Technical Data

DC or AC current (40...400 Hz)	Operate val.	Overload rating
on terminals 4-7	0.1 to 1 A	Contin.: 5 A 1 s: 12 A
on terminals 4-6	0.5 to 5 A	Contin.: 10 A 1 s: 35 A
on terminals 4-5	1 to 10 A	Contin.: 15 A 1 s: 35 A
Nom. aux. voltage V_A (power supply)	see 'Ordering Information'	
Operate delay	0 to 10 s	
Disengaging ratio	5 to 30 %	
Contact type	2 change-over contacts	
Rated voltage	250 V DC / 250 V AC	
Continuous current	5 A	

Terminal Connection Diagram



Ordering Information

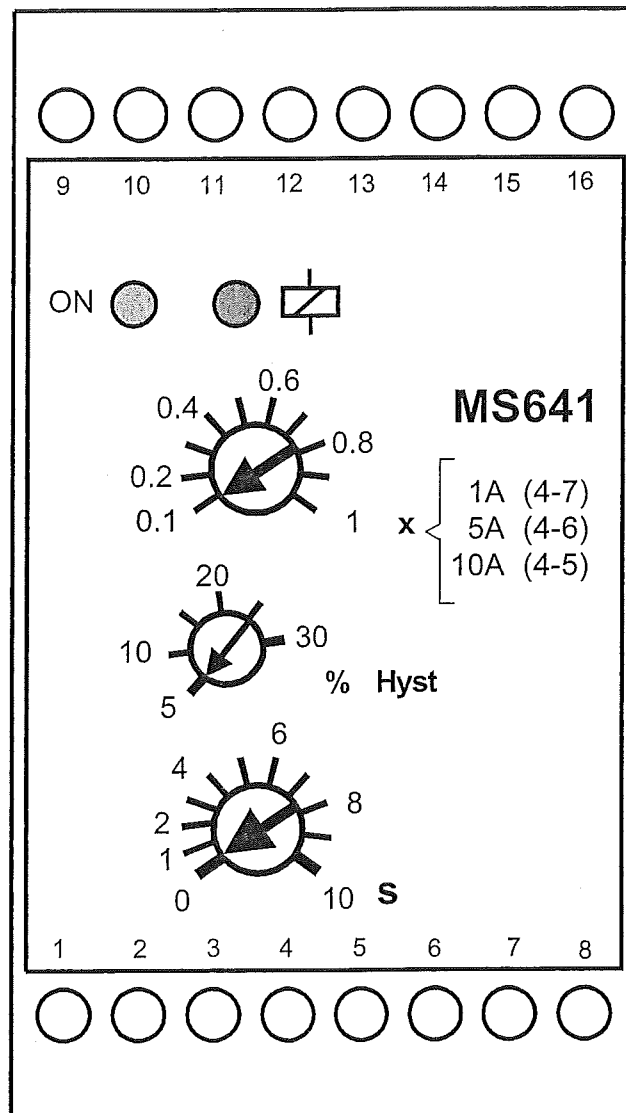
Description	Order No.
Current monitoring device MS 641	
Nom. aux. voltage 24 V AC, 50/60 Hz	89641-0-1143110
24 to 60 V DC	89641-0-1144110
100/110 V AC, 50/60 Hz	89641-0-1145110
100 to 220 V DC	89641-0-1146110
230 V AC, 50/60 Hz	89641-0-1147110

- 1) Terminals 1/3:
Without jumper: Overcurrent measurement $I >$
With jumper: Undercurrent measurement $I <$
- Terminals 2/3:
Without jumper:
Energize-on-signal arrangement
With jumper:
Normally-energized arrangement

Current Monitoring

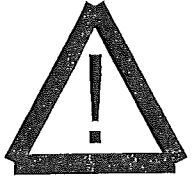
Device

Version - 300 - 401



Current monitoring device for DC and AC currents with a setting range of 0.1 A to 10 A

Safety Notice



Warning

When electrical equipment is in operation, dangerous voltage will be present in certain parts of the equipment. Failure to observe warning notices, incorrect use or improper use may endanger personnel and equipment and cause personal injury or physical damage.

Before working in the terminal strip area, the device must be isolated. Where stranded conductors are used as connecting leads, wire end ferrules must be employed.

Proper and safe operation of this device depends on appropriate shipping and handling, proper storage, installation and commissioning, and on careful operation, maintenance and servicing.

For this reason only qualified personnel may work on or operate this device.

Safety Notice

Qualified Personnel

are individuals who

- are familiar with the installation, commissioning and operation of the device and of the system to which it is being connected,
- are fully qualified electricians,
- are trained in the care and use of safety apparatus in accordance with safety engineering standards,
- are trained in emergency procedures (first aid).

Note

The operating manual for this device gives instructions for its installation, commissioning and operation. However, the manual cannot cover all conceivable circumstances or include detailed information on all topics. In the event of questions or specific problems, do not take any action without proper authorization. Contact the appropriate ALSTOM technical sales office and request the necessary information.

Notice

Any agreements, commitments, and legal relationships and any obligations on the part of ALSTOM, including settlement of warranties, result solely from the applicable purchase contract, which is not affected by the contents of the operating manual.

Modifications After Going to Press

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1 Application and Scope

The MS 641 is a single-pole current measuring relay. It monitors DC and AC currents. By virtue of its wide overall measuring range with settings for the partial measuring range, the disengaging ratio and the operate delay, the device is suitable for a wide range of applications. Due to the measurement principle based on true r.m.s. measurement, DC and AC currents can be measured directly without having to switch over and without any need for conversion. Thanks to the r.m.s. measurement, the MS 641 is also suitable for the monitoring of non-sinusoidal currents.

The MS 641 is distinguished by the following features:

- Single-pole monitoring of DC and AC currents

- True r.m.s. measurement

- Wide range of setting values (subdivided into three partial ranges) for the operate value within a single device version

 - 0.1 to 1 A;

 - 0.5 to 5 A;

 - 1 to 10 A

- Adjustable disengaging ratio of 5% to 30%.

- Adjustable operate delay of 0 s to 10 s.

- Overcurrent or undercurrent monitoring with mode selection via jumper

- Energize-on-signal arrangement or normally-energized arrangement with mode selection via jumper

1 Application and Scope

(continued)

LED indicators for operation and signaling

Output relay with 2 change-over contacts

Supply voltage: 24 V AC ; 110 V AC ; 230 V AC ;
24 to 60 VDC or 100 to 220 VDC

Straightforward installation

The case can be mounted onto a 35 mm width top-hat rail (per EN50022) by means of a snap-on foot or can be wall-mounted directly, without visible bolts.

2 Technical Data

2.1 C o n f o r m i t y Statement

Applicable to the MS641,
Version 300-401

(Article 10 of EC Directive 73/23/EC)

The products designated as 'MS641 voltage monitoring device' has been developed and manufactured in conformity with the international standard EN 60255-6 and in accordance with the provisions of the EMC Directive and the Low Voltage Directive issued by the European Community.

2.2 G e n e r a l D a t a

Design

Suitable for rapid mounting on top-hat rail according to EN 50022[§] or direct wall-mounting without visible bolts

Installation position

Vertical $\pm 30^\circ$

Degree of device protection

According to DIN VDE 0470 and EN 60529 or IEC 529, resp.

Case: IP 40,
terminals: IP 20

Weight

Approx. 200 g

Dimensions and Connections

See dimensional drawing and terminal connection diagram

Connections

Threaded terminal ends M3, self-centering with wire protection for conductor cross-sections up to 4 mm² single-core or up to 2.5 mm² finely stranded

Creepage Distances and Clearances

Per EN 61010-1[§] or IEC 664-1

Pollution degree 2,
working voltage 250 V
overvoltage category III,
impulse test voltage 5 kV

2 Technical Data (continued)

2.3 Tests

2.3.1 Type Test

All tests per EN 60255-6^s and
DIN57 435 Part 303

EMC

Interference suppression

According to EN55022^s, level B

1MHz burst disturbance test

According to IEC 60255

Part 22-1^s, class III

Common mode test voltage: 2.5kV

Differential test voltage: 1.0kV

Test duration: >2s

Source impedance: 200

Immunity to electrostatic discharge

According to EN61000-4-2^s,
severity level 3

Air discharge:

Single discharges: >10

Holding time: >5s

Test voltage: 8kV

Test generator: 50 to 100M ,
150pF/330

Immunity to radiated electromagnetic energy

According to EN61000-4-3^s,
ENV50204^s, level 3

Antenna distance to tested device:
>1m on all sides

Test field strength, frequency band
80 to 1000MHz: 10V/m

Test using AM: 1kHz/80%

Single test at 900MHz:

AM 200Hz/100%

2 Technical Data (continued)

Electrical fast transient / burst requirements

According to EN61000-4-4^s,
test severity level 3

Rise time of one pulse: 5 ns

Impulse duration (50% value):
10 ns

Amplitude: 2 kV / 1 kV

Burst duration: 15 ms

Burst period: 300 ms

Source impedance: 50

Surge immunity test

According to EN61000-4-5^s,
test level 3

Testing of power supply circuits,
asymmetrically/symmetrically
operated lines

Open-circuit voltage front time /
/ time to half-value: 1.2 / 50 s

Short-circuit current front time /
/ time to half-value: 8 / 20 s

Amplitude, power supply: 1/4 kV

A m p l i t u d e ,
asymmetrically/symmetrically
operated lines: 2/2 kV

Pulse frequency: >5/min

Source impedance: 2 / 12 / 42

Immunity to conducted disturbances induced by radio frequency fields

According to EN61000-4-5^s,
test level 3

Disturbing test voltage: 10V

Power frequency magnetic field immunity

According to EN61000-4-8^s, level 4

Frequency: 50Hz

Test field strength: 30A/m

Insulation

Voltage test

According to IEC 255-5,
2kVAC, 60s

Impulse voltage withstand test

According to IEC 255-5

Front time: 1.2 μ s

Time to half-value: 50 μ s

Peak value: 5 kV

Source impedance: 500

2 Technical Data (continued)

Mechanical Robustness

Vibration test

According to IEC 255-21-1[§],
test severity class 1

Frequency range, in operation:
10 to 60 Hz, 0.035 mm,
60 to 150 Hz, 0.5 g

Frequency range, during transport:
10 to 150 Hz, 1 g

Shock response and withstand test, bump test

According to IEC 255-21-2[§],
test severity class 1

Acceleration: 5 g/15 g

Pulse duration: 11 ms

Seismic test

According to IEC 255-21-3[§],
test procedure A, class 1

5 to 8 Hz, 3.5/1.5 mm

8 to 35 Hz, 10/5 m/s²

3 x 1 cycle

2.3.2 Routine Test

All tests according to
EN60255-6[§] and DIN57435
Part303

2.4 Environmental Conditions

Allowable ambient temperatures

Operating temp.:

- 5 °C to + 50 °C

or 23 °F to + 122 °F

Storage temp.:

- 25 °C to + 55 °C

or -13 °F to + 131 °F

Shipping temp.:

- 25 °C to + 70 °C

or -13 °F to + 158 °F

Ambient humidity range

Relative humidity to preclude any
condensation;

45 to 75% (annual mean)

2 Technical Data

(continued)

2.5 Inputs and Outputs

Measuring Inputs

DC and AC voltages

Selection of measuring range via terminals 4 to 7

Connection to terminals	Setting range	Continuous load rating	1s load rating	Internal impedance
4 - 7	0.1 ... 1 A	5 A	12 A	0.10
4 - 6	0.5 ... 5 A	10 A	35 A	0.02
4 - 5	1 ... 10 A	15 A	35 A	0.01

Nominal frequency f_{nom} for AC voltage: 40 to 400Hz

Nominal voltage of the measuring circuit : up to 500 V

2 Technical Data (continued)

Output Relays

Fitted components:

1 output relay with two
change-over contacts.

Contact load rating

Rated voltage: 250V DC, 250V AC

Continuous current: 5 A

Short-time current: 30 A for 0.5 s

Making capacity:

1000 W (VA) at $L/R = 40$ ms

Breaking capacity:

0.2 A at 220 V DC, $L/R = 40$ ms,

4 A at 220 V AC, $\cos \phi = 0.4$

2.6 Power Supply

AC voltage

Nominal voltage $V_{A,nom}$:

24 V AC, 110 V AC, 230 V AC

Operating range:

0.8 to 1.15 $V_{A,nom}$

Nominal frequency:

f_{nom} : 50 and 60 Hz

Operating range: 0.95 to 1.05 f_{nom}

Nominal consumption:

< 4 W (VA) at $V_{A,nom}$

DC voltage

Nominal voltage $V_{A,nom}$:

24 to 60 V DC, 100 to 220 V DC

Operating range:

0.8 to 1.2 $V_{A,nom}$

Nominal consumption:

< 1 W at $V_{A,nom}$

2.7 Settings

Operate value

Selection of setting values from the
following ranges:

0.1 to 1 A

0.5 to 5 A

1 to 10 A

see 'Measuring Inputs'

Disengaging ratio

5 to 30 % of the set operate value

Operate delay

0 to 10 s

2 technical Data (continued)

2.8 Deviations

Reference conditions:
Ambient temperature 20°C (or 68°F)
and nominal auxiliary voltage $V_{A,nom}$

Deviations under reference conditions:

Operate value: < 5%;

Operate delay: < 10%

Repeat accuracy: < 1%

Influence at 20°C 20 K: < 1%

2.9 Typical Characteristics

Overload rating of the measuring inputs:

see 'Measuring Inputs'

Internal impedance:

see 'Measuring Inputs'

Minimum operate and disengaging time:

< 100 ms

Key:

§ The DIN EN or DIN IEC editions, respectively, of the standards were used in these tests.

3 Operation

The current to be monitored is connected to terminal 4 and to one of the terminals 5 to 7 of the MS 641 (see Figure 2). Selection of terminal 5, 6, or 7 determines the measuring range. The current to be measured is fed through low-impedance shunt resistors in the MS 641 where it is converted into a voltage proportional to the current. This voltage is then amplified and passed on to the measuring circuit. In this circuit, the voltage is fed to an r.m.s. rectifier producing a DC voltage proportional to the r.m.s. value of the input current. Via a low-pass filter, this DC voltage is passed on to the settable limit value stage. Bridging of terminals 1 and 3 changes the limit value stage from the $I >$ function (operates when the setting value is exceeded) to the $I <$ function (operates when the monitored current falls below the setting value). Once the limit value stage has operated, the timer stage is enabled provided that the supply voltage is within the permissible range. Once the set operate delay has elapsed, the output relay takes on the operated condition as signaled via the red LED indicator. Bridging of terminals 2 and 3 changes the output relay mode from the energize-on-signal arrangement to the normally-energized arrangement.

The measuring circuit is connected to the potential of the input current. Input currents associated with potentials liable to pose a shock hazard are thus also present at terminals 1 to 3.

Consequently, jumpers for these terminals may not be handled unless the input voltage has been disconnected; the exposed jumper region must be insulated.

A transformer in the power supply unit provides electrical isolation between the measuring circuit and the supply.

4 Installation

The MS 641 is packaged in a carton and shipped inside outer packaging. Use special care when opening the cartons and unpacking the device, and do not use force. Please ensure that the manuals supplied with each individual device are removed from the inside carton.

After unpacking the device, inspect it visually to make sure it is in proper mechanical condition.

If the MS 641 is to be shipped, both inner and outer packaging must be used. If the original packaging is no longer available, make sure that packaging conforms to DIN ISO 2248 specifications for a drop height 0.8 m.

The MS 641 has been designed to conform to the EN 60255-6 standard. Accordingly, the installation site must be chosen to provide the operating conditions specified above under the heading 'Technical Data'.

The case can be mounted onto a top-hat rail (per EN 50022) by means of a snap-on foot or can be wall-mounted directly, without visible bolts. For wall-mounting of the MS 641, the mounting bracket (see 'Dimensional Drawing') needs to be removed from the case by pushing the shipping brace upwards. The mounting bracket is bolted to the wall using two M4 bolts. Subsequently, the case is inserted into the mounting bracket.

4 Installation

(continued)

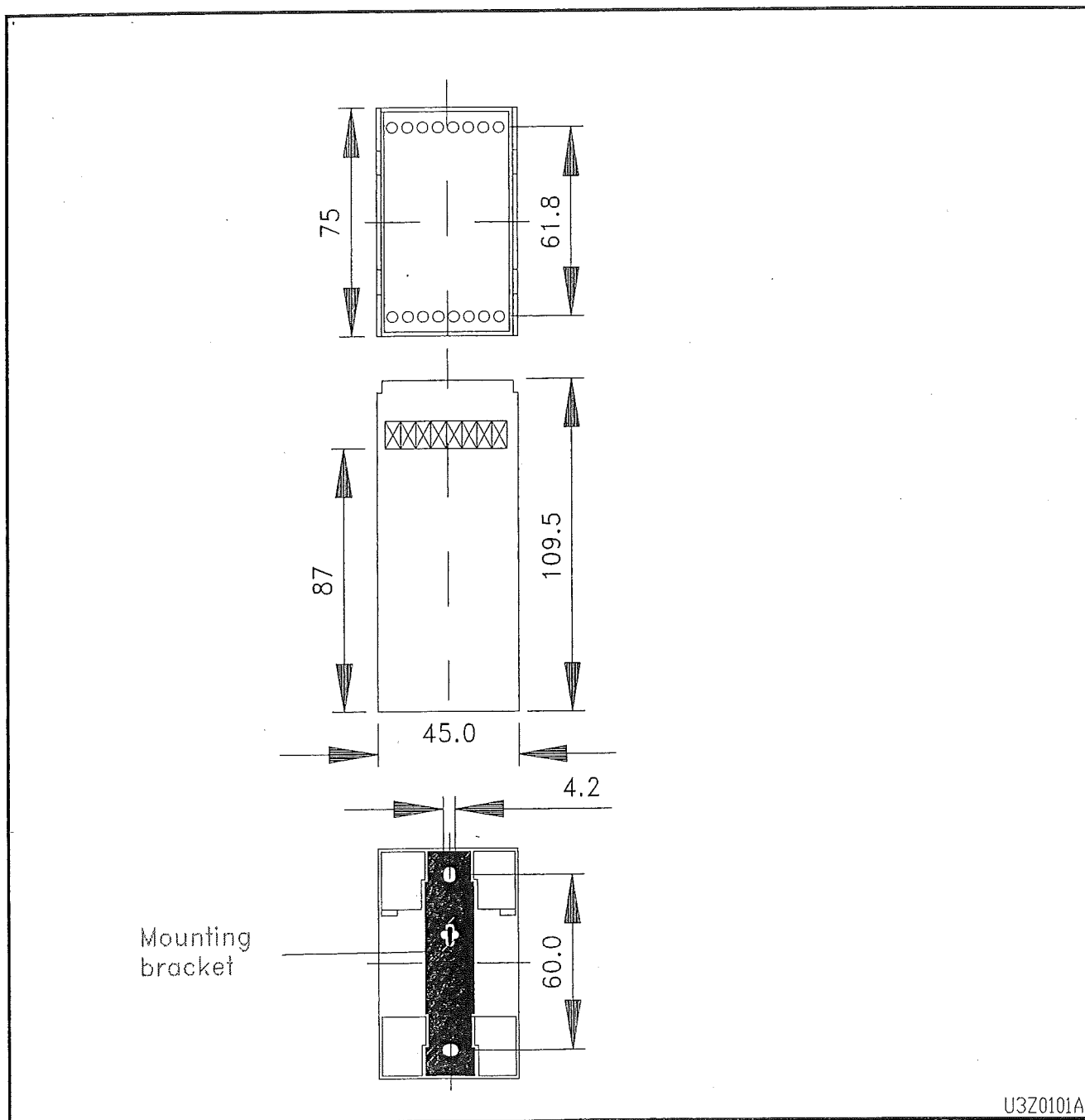


Figure 1 Dimensional drawing

5 Connection

The MS 641 current monitoring devices must be installed and connected by qualified electricians. The relevant safety regulations must be observed.

The MS 641 current monitoring device must be connected in accordance with the terminal connection diagram indicated on the type identification label. The supply voltage is also stated on this label.

The measuring input of the MS 641 is connected in series with the current to be monitored. Before connecting the measuring circuit, first define the desired setting range by selecting the terminals according to the following table:

Connection to terminals	Setting range
4 - 7	0.1 ... 1 A
4 - 6	0.5 ... 5 A
4 - 5	1 ... 10 A

5 Connection

(continued)

In the as-delivered condition, the MS 641 operates with the $I >$ function (it operates if the setting value is exceeded). The output relay is set to the energize-on-signal mode. Bridging of terminals 1 and 3 selects the $I <$ function; bridging of terminals 2 and 3 selects the normally-energized mode. The following table summarizes the selection options using jumpers.

Jumper 1 - 3	Jumper 2 - 3	Function	Output relay mode
		$I >$	Energize- on-signal
	X	$I >$	Normally- energized
X		$I <$	Energize- on-signal
X	X	$I <$	Normally- energized

5 Connection

(continued)

Important: Please see the warning on the following page.



The measuring circuit is connected to the potential of the input current. Thus input currents associated with potentials liable to pose a shock hazard are also present at terminals 1 to 3.

Consequently, jumpers for these terminals may not be handled unless the input current has been disconnected. The exposed jumper regions must be insulated.

Before connecting the auxiliary supply voltage $V_{A,nom}$ check whether the nominal value of the supply voltage is in agreement with the nominal value of the auxiliary system voltage and whether a DC or AC voltage is required. The supply circuit must be safeguarded with a 2 A (or < 2A) fuse.



If the MS 641 is to be connected to a nominal voltage in excess of 400 V, compliance with the creepage distances and clearances must be ensured by keeping a distance of 5 mm between the side panels of the case and an adjacent metal wall.

The connection examples in Figures 3 and 4 illustrate the connection of the MS 641 to a DC and to an AC voltage supply.

5 Connection

(continued)

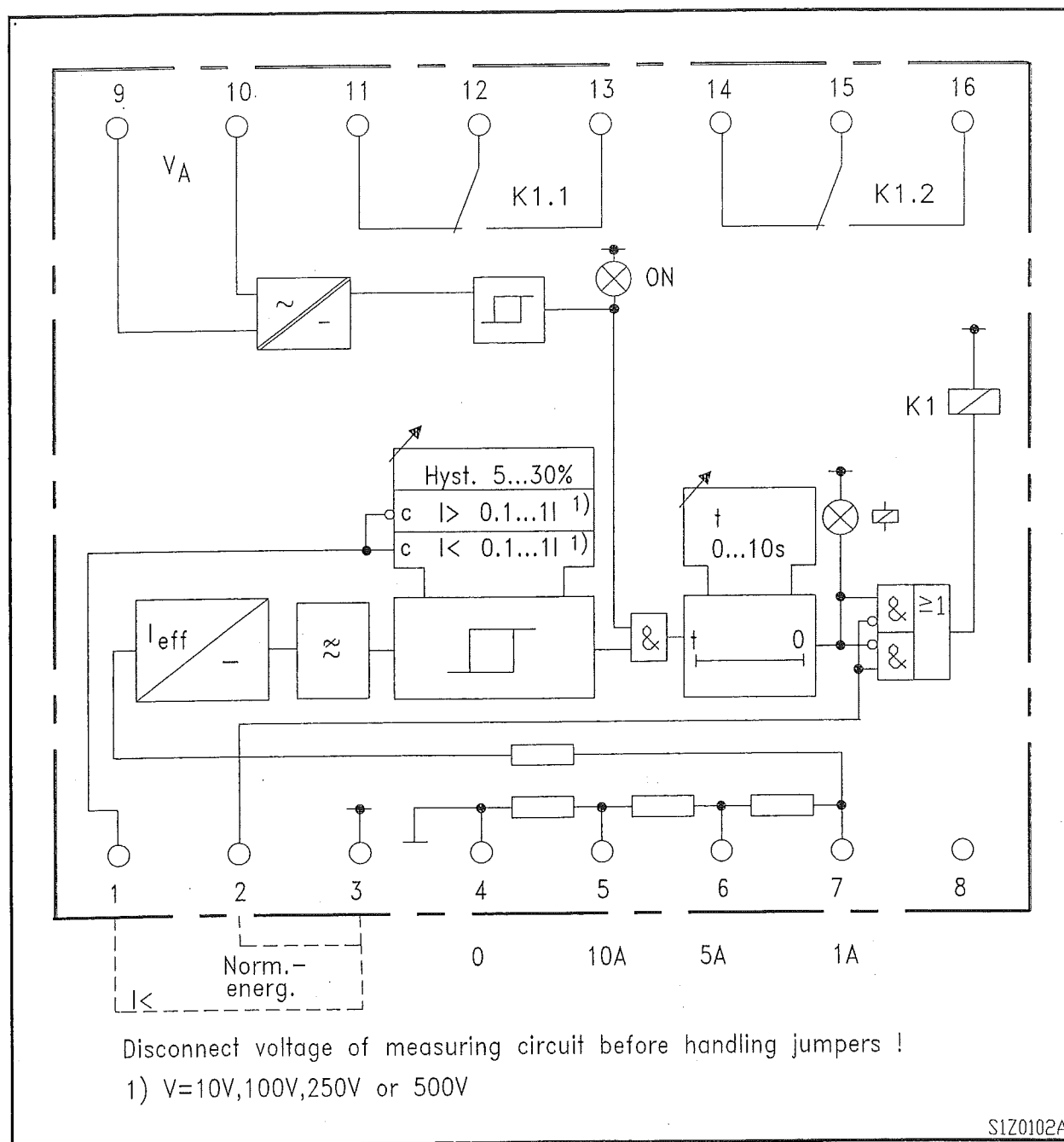


Figure 2 Terminal connection diagram for MS 641, diagram 89641.401
(Terminals 2 and 3 bridged: normally-energized arrangement)

5 Connection

(continued)

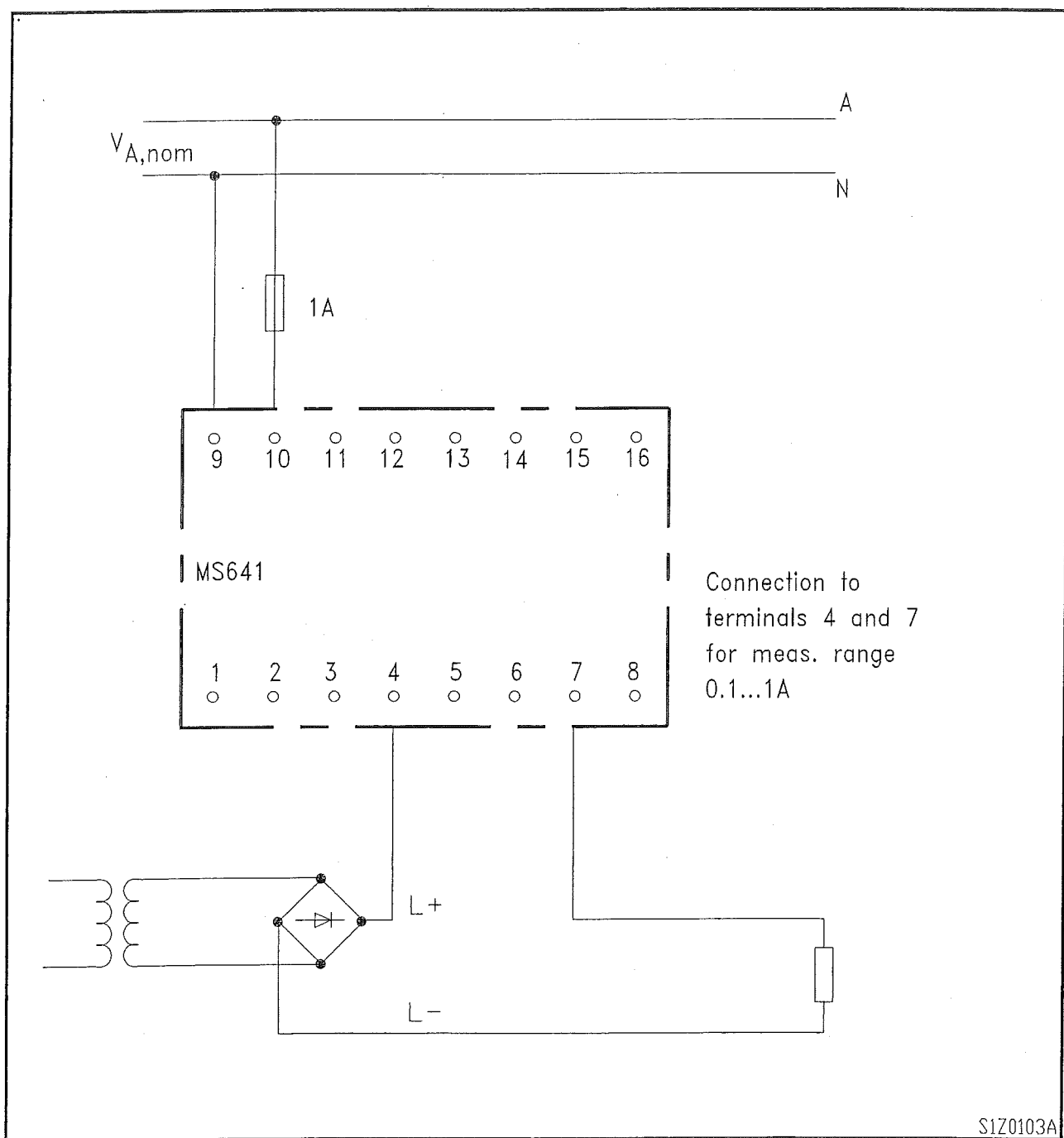


Figure 3 Connection of the MS 641 to a supply voltage $V_{A,nom}$ of 230 V AC and with DC measurement

5 Connection

(continued)

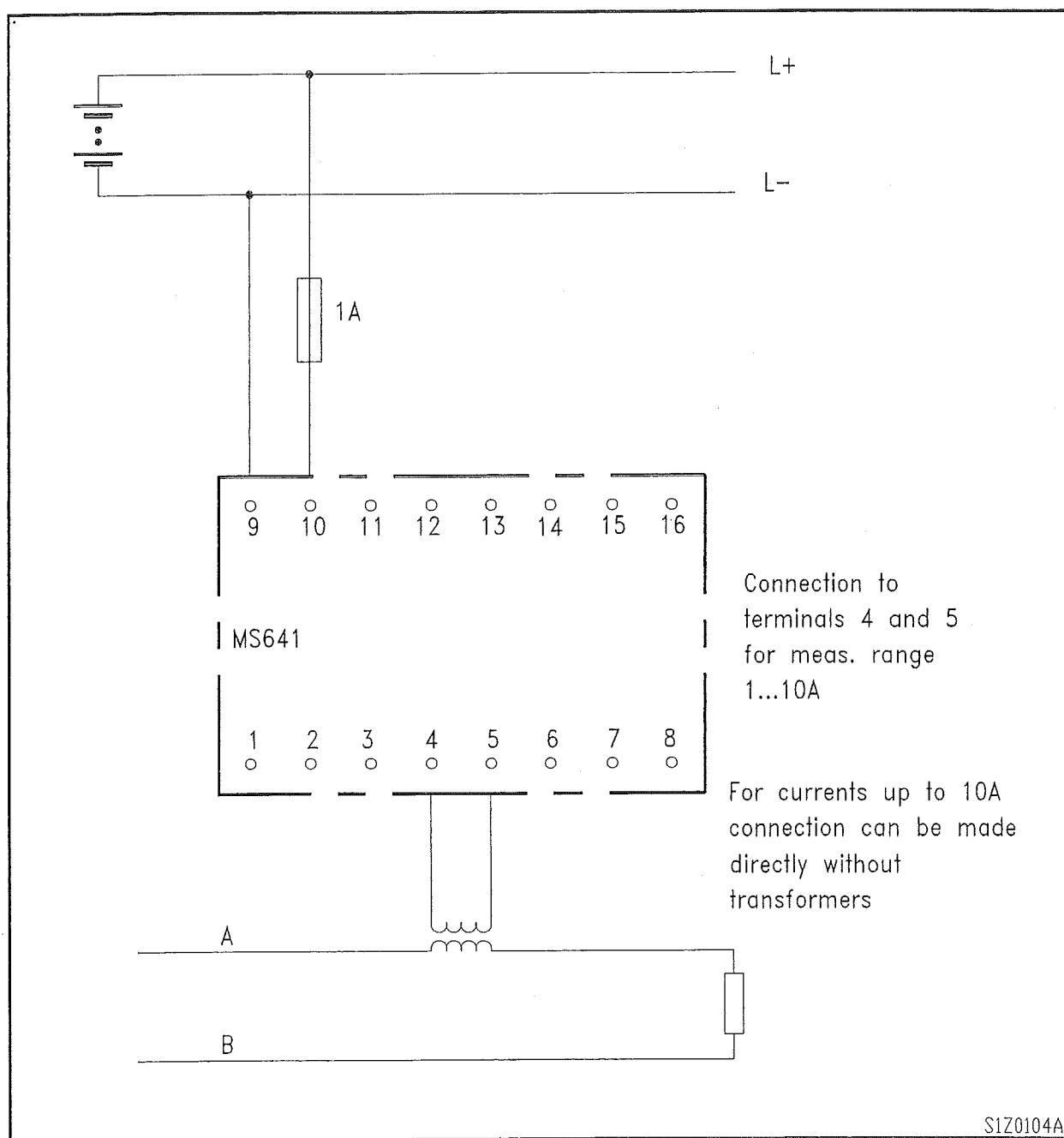


Figure 4 Connection of the MS 641 to a supply voltage $V_{A,nom}$ of 24 V DC

6 Order Information

Design Versions

Order No.

MS 641

Current Monitoring

Überwachungsrelais

89641-0- 1 1 4 1 1 0 -300 -401

Standard case

45 mm width,

1-pole

Measuring range

0.1 to 10A

f_{nom} = 40 to 400 Hz /

Timer stage 0 to 10 s

Variants

Supply voltage

V_{A,nom}

24 V AC, 50/60 Hz 3

24 V to 60 V DC 4

100/110 V AC, 50/60 5

100 V to 220 V DC 6

230 V AC, 50/60 Hz 7

Inspection Certificate B <1>

-599

per

EN 10204 - 3.1B

<1> Can only be ordered prior to manufacture of the device. This order extension number is not printed out on the type identification label on the device or packaging.

