

**N O T E S**

**for the usage within the railway  
system**



While the measured results for relay position “stop polarity” (type Siemens) resp. “condition right setting” (type WSSB) can be adopted with leaving out the negative sign, this does not apply to the relay position “approach polarity” (type Siemens) resp. “condition left setting” (type WSSB) due to reasons of consistency regarding former entries in test sheets and the compatibility to former measuring devices. In this case it is necessary to convert the displayed phase angle result as the displayed phase angle value is subtracted from 180°. A displayed negative sign is not considered.

Example of three-position track relay in stop polarity (Siemens) / condition right setting (WSSB):

*SICO 2074 displays:*       $-110^\circ$       *leave out negative sign*       $\rightarrow$        $= 110^\circ$

Example of three-position track relay in approach polarity (Siemens) / condition left setting (WSSB):

*SICO 2074 displays:*       $70^\circ$       *conversion*       $\rightarrow$        $180^\circ - 70^\circ = 110^\circ$

4 Special Notes ...

... on measuring the phase angle on low frequency track circuits and on signalling plants with three position vane relay

4.1 Low Frequency Track Circuits ...

- with
- Valve Track Circuit Relay
- respectively
- Two-position Track Relay

Attention!

The displayed sign of the phase angle is of no relevance for measurements on track circuit systems.

The Phase Multimeter SICO 2074 is able to display the phase angle in two versions,

- the full circle presentation from 0..360° and
- the half circle presentation from -180°..180°.

For reasons of convention one has to select the half-circle presentation for phase measurements in track circuit systems. For example, a phase angle of -90° corresponds in a full circle presentation to 270°, which would cause a faulty entry in the test protocol. After switching on the Phase Multimeter SICO 2074 it displays the half circle presentation, unless this factory setting was not changed.

This standard setting is arranged as followed:  
By pressing the right key for a longer time, it opens the menu *settings*. Now you can select **180** as initial value in **angle mode**.

Connect the Phase Multimeter SICO 2074 with the port of the track circuit by using the proper adapter. The phase angle, all voltages and the operating frequency of the track circuit are displayed immediately and simultaneously in the SICO 2074.

The circuits in the adapters are connected in the way that the SICO 2074 displays the same phase angle as it is the case with using the three voltage method or with older phase angle meters.

4.2 Three-position Track Relay

For both types of vane relay, Siemens and WSSB, exist three-position track relays. It means that in addition to idle state and active state of the corresponding two-position relay version there is the turn of the relay in opposite direction. The control of this additional position originates from a phase inverse voltage by the system. The relay positions of that type have special names.

Dear customer,

Thank you for choosing the Phase Multimeter SICO 2074. You have purchased a precise and easy-to-use tester with two independent isolated inputs. The SICO 2074 combines a frequency meter, a phase meter, and two AC voltage meters in a firm and lightweight housing. Focus was set on the high level of protection against electrical shock. We hope that your expectations in this versatile and convenient tester are met.

Please read these notes carefully to care for your own safety, to receive best measuring results and to avoid damages on the tester and its accessories.

This product was designed, manufactured and tested with highest care and in compliance with European standards. Please contact us if the Phase Multimeter SICO 2074 or its accessories do not work properly in accordance with the conditions described in this manual:

Signal Concept GmbH  
Suedring 11  
04416 MARKKLEEBERG  
GERMANY

Phone: +49 (0) 34297 14390  
Fax: +49 (0) 34297 143913  
E-mail: [info@signalconcept.de](mailto:info@signalconcept.de)



Signal Concept GmbH confirms the conformity of the device according to the directives given by the European Parliament and Council 2014/30/EU (EMC-Directive), 2006/42/EC (Machinery Directive), 2014/35/EU (Low Voltage Directive), 85/374 EEC (Product Liability Directive), 2011/65/EU (RoHS Directive) and 2012/19/EU (WEEE Directive).



Signal Concept GmbH holds a Quality Management (DIN EN ISO 9001:2015), which is checked annually by TÜV Rheinland as accredited organization.

These notes will give you an overview of the adapters belonging to the Phase Multimeter SICO 2074 and further specific features. Please study them completely. Furthermore, it enables you to use all functions properly. Please follow all directions and hints to avoid accidents with persons and damages of the device.

The notes are part of the device. The user is responsible for keeping it until the disposal of the device. When handing the device to other users, the notes are required to be enclosed.

Document no.:	2074 B1	Copyright © 2025, Signal Concept GmbH
Version:	1.1	All rights reserved. All data, properties and descriptions given in this operating manual may be changed at any time without giving notice.
Date:	11.07.2025	For the latest version please visit <a href="http://www.signalconcept.com">www.signalconcept.com</a>

Content

Content ..... 4

1 Safety Instructions ..... 5

2 Electric Measurements on Phase Selective Track Circuits ..... 6

2.1 Functional Principle and Meaning of the Phase Angle ..... 6

2.2 Relevant Types of Track Circuits..... 6

3 Optional Accessory for Phase Multimeter SICO 2074 ..... 8

3.1 Adapter..... 8

3.2 Available Adapters ..... 8

3.3 Technical Data of the Adapters ..... 9

4 Special Notes ... ..... 10

4.1 Low Frequency Track Circuits ... ..... 10

4.2 Three-position Track Relay ..... 10

Attention!

Please connect first the coloured single plugs of the adapter with the Phase Multimeter SICO 2074 and then the adapter's test plug with the test port of the track circuit. After the measurement disconnect first the adapter from the track circuit and then from the SICO 2074.

3.3 Technical Data of the Adapters

	SICO 2074 Z1	SICO 2074 Z2	SICO 2074 Z3	SICO 2074 Z4
Max. operating voltage (V)	300 V	300 V	300 V	300 V
Dimension relay plug (mm)	60 x 60 x 22	66 x 60 x 15	61 x Ø18	43 x Ø23
Weight (g)	approx. 250	approx. 200	approx. 100	approx. 200
Protection class	II	II	II	II
IP code	IP 40	IP 40	IP 40	IP 40
Operating temperature range (°C)	-40 ...+70	-40 ...+70	-40 ...+70	-40 ...+70
Storage temperature range (°C)	-40 ...+70	-40 ...+70	-40 ...+70	-40 ...+70

### 3 Optional Accessory for Phase Multimeter SICO 2074

#### 3.1 Adapter

A phase meter with isolated inputs like the Phase Multimeter SICO 2074 has four sockets. It is possible to mismatch the single measuring lines, which leads to deviant measuring results. Mismatching of single lines per input leads to a 180° phase shifting; the mismatching of both inputs leads to a reversal of signs.

The available adapters provide a convenient plug-in for unambiguous assignment and to compatible phase angle results compared to former measuring procedures.

#### 3.2 Available Adapters



Fig. 3.1 Adapter SICO 2074 Z1 for vane relay type Siemens  
Order number: 100635



Fig. 3.2 Adapter SICO 2074 Z2 for vane relay type WSSB  
Order number: 100636



Fig. 3.3 Adapter SICO 2074 Z3 for valve track circuit relay type SEL  
Order number: 100637



Fig. 3.4 SICO 2074 Z4 Adapter to connect SICO 2074 to interlocking type STW SP Dr L 30  
Order number: 100643

The connection between Phase Multimeter SICO 2074 and adapter is defined by the same colours of sockets and plugs.

### 1 Safety Instructions

The Phase Multimeter SICO 2074 is to be used exclusively according to the description in this manual. Otherwise, the protection given by the measuring device can be limited.

To avoid the damage of persons or products, mind the following guidelines!



Follow the valid guidelines for working on railway facilities.

When using the measuring device in or near the track, make sure your working area is kept clear of running trains.

Repairs may only be carried out by the manufacturer or a company authorized by the manufacturer.

Only use accessories approved to be used with the device.

Do not use the measuring device in environments with explosive gases, steam or dust.

Do not drop or shock the Phase Multimeter SICO 2074 and its accessories.



Check the device and accessories (leads, plugs) for visible damages or insulation faults. Those parts must not be used! In case of doubts, please contact the manufacturer.

Plugs shall be fully inserted into the sockets.

First disconnect leads or probes from the inspected system followed by unplugging them from the Phase Multimeter.

To avoid any electrical hazard do not connect leads to the measuring device while it is opened. Disconnect all leads before you open the battery cover.

#### Disposal

Electric and electronic devices must not be given to the general rubbish, since they mostly contain noxious elements. Instead, dispose them at the collecting points for special waste.



## 2 Electric Measurements on Phase Selective Track Circuits

Low frequency track circuits are still important plants for track occupation. The voltages and currents fed into the track can be distinguished by these three parameters:

- Amplitude,
- Frequency and
- Zero phase.

While the frequency is typically kept constant, the amplitude serves to analyse the report; and the phasing in relation to a reference as a reliable classification criterion as well as a section distinguishing feature. For the safe functioning of a track circuit system it is important to properly select and monitor the phase parameters. The Phase Multimeter SICO 2074 fulfills these requirements. The accessory for SICO 2074 prevents mistakes when connecting the SICO 2074 to relays of different types; and it gives the same phase display compared to former measuring methods.

### 2.1 Functional Principle and Meaning of the Phase Angle

A low frequency, phase selective track circuit system requires the adjustment of a certain phase relation between the local voltage and the voltage coming from the track for which reason the evaluating element – the track relay – has a phase selective feature. Especially, the outdoor installation of track circuits is fragile to interference signals. The track relay not only needs to act according to the dependence of value and phase relation of both voltages, but it also needs a high immunity against interference signals. With regard to a reliable evaluation of the correct track relay supply these requirements apply for the used measuring device as well. The Phase Multimeter SICO 2074 behaves like a typical track relay and in combination with the corresponding adapter for the track circuit it provides the reliable and simultaneous determination of all values in question. In addition of the phase angle there are always displayed both voltages and the frequency.

### 2.2 Relevant Types of Track Circuits

Nowadays in operation are low frequency track circuits made by the three manufacturers Siemens, WSSB and the former Lorenz AG, which now is represented by Thales Group. There are two different vane relay types of WSSB and Siemens, which each have two embodiments: one with two defined relay positions and one with three defined positions (elements). The low frequency track circuit system Thales comes with two connection variants.

For those four track circuit types which each has its plant's own pin Signal Concept has developed fitting adapters to connect the Phase Multimeter SICO 2074 to the track circuit:



Fig. 2.1 Additional accessory of SICO 2074 for error-free testing