Monitoring Technique

VARIMETER
Underload Monitor (cos φ Monitor)
IK 9065, SK 9065, SL 9065CT

**Translation
of the original instructions**

DOLD ®

IK 9065   SK 9065   SL 9065CT

- According to EN 60255-1
- Detection of underload (cos φ)
- Without auxiliary supply
- Current up to 8 A
  Motors up to 5 A nominal current can be connected directly
- Higher currents via current transformer
- SL 9065CT with integrated current transformer for currents up to 100 A
- Adjustable response value
- Automatic reset (Alarm auto reset)
- Adjustable operate delay up to 100 s
- De-energized on trip
- For single and 3-phase loads e.g. motors
- Independent of phase sequence
- 1 changeover contact
- LED indicator voltage supply and alarm
- DIN rail or screw mounting
- Devices available in 2 enclosure versions:
  IK 9065: Depth 58 mm, with terminals at the bottom for installation systems and industrial distribution systems according to DIN 43880
  SK 9065, SL 9065CT: Depth 98 mm, with terminals at the top for cabinets with mounting plate and cable duct
- IK 9065, SK 9065 width 17.5 mm
  SL 9065CT width 35 mm
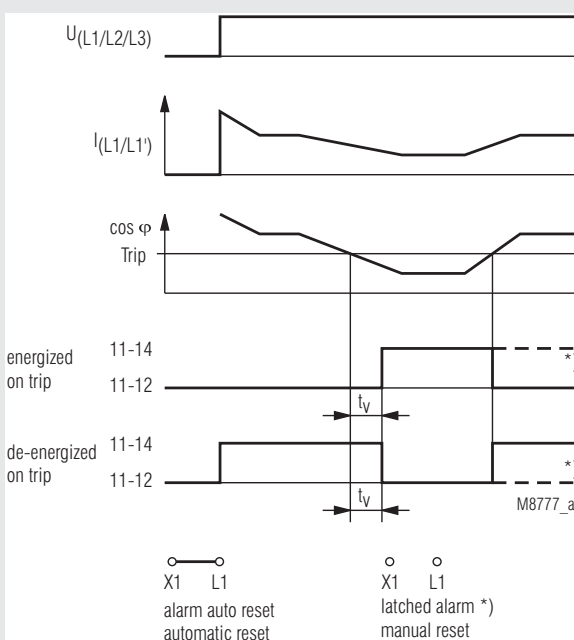
IK/SK 9065/100: as IK/SK 9065 but:
- Programmable for
  - Automatic reset or manual reset (latched alarm)
  - Energized or de-energized on trip
- With reset button
- Remote reset

Function Diagram

$U_{(L1/L2/L3)}$

$I_{(L1/L1')}$

cos φ
Trip

energized on trip   11-14   11-12 t_v

de-energized on trip   11-14   11-12 t_v M8777_a

X1   L1
alarm auto reset
automatic reset

X1   L1
latched alarm *)
manual reset

Approvals and Markings

CE

Applications

Monitors underload and no load on squirrel cage motors e.g.
- Fan monitoring (broken belt)
- Filter monitoring (blocked filter)
- Pump monitoring (blocked valve, dry running)
- General cos phi monitoring
- For industrial and railway applications

Circuit Diagrams

IK/SK 9065.11   IK/SK 9065.11/100   SL 9065.11CT/100
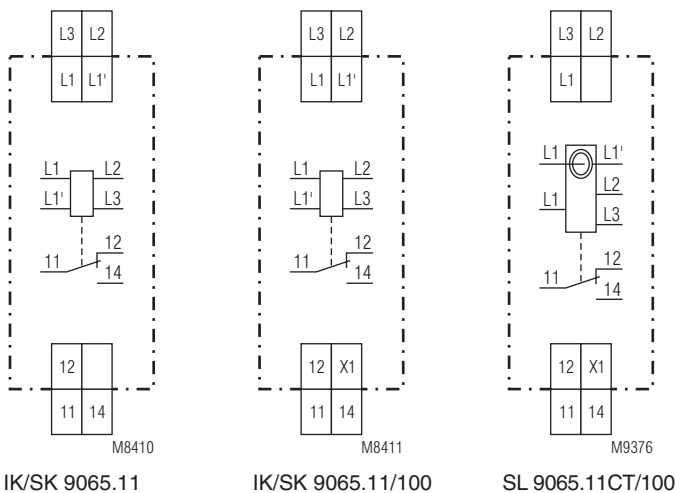
Function

The underload monitor IK/SK/SL 9065 measures the phase shift between voltage and current. The phase angle changes with changing load. This measuring method is suitable to monitor asynchronous motors on underload and no load independent of motor size. In some cases the cos φ does not change much with load change on the motor, e.g.:

- Small load change on oversized motor
- Single phase chaded-pole and collector motors

For these cases we recommend the use of our motor load monitor BH 9097.

If a cos phi value lower then the adjusted value is detected the output relay changes into alarm state after the adjusted time delay t_v and the red LED "Alarm" lights up. If the underload monitor is in auto reset mode it changes back to normal state without delay when the cos phi rises above the adjusted cos phi value.

Indicators

Green LED:	On, when supply connected to L1-L2
Red LED:	On, when underload detected (Alarm)

Terminal designation	Signal description
L1, L2, L3	Connection for 3-phase systems
L1', L1 [1]	Current measuring circuit, connection for external current transformer possible [1]
X1, L1 [2]	Control input (manual reset / auto-Reset) [2] X1/L1 not bridged: manual reset X1/L1 bridged: auto-reset
11, 12, 14	Changeover contact

[1] Only at IK/SK 9065
[2] Only at IK/SK/SL 9065.11/100

Setting

green LED, on, when supply connected to L1-L2

red LED on, when underload detected (Alarm)

position: energized on trip

position: de-energized on trip

response value

alarm delay

reset button to reset a stored alarm

M8778_a
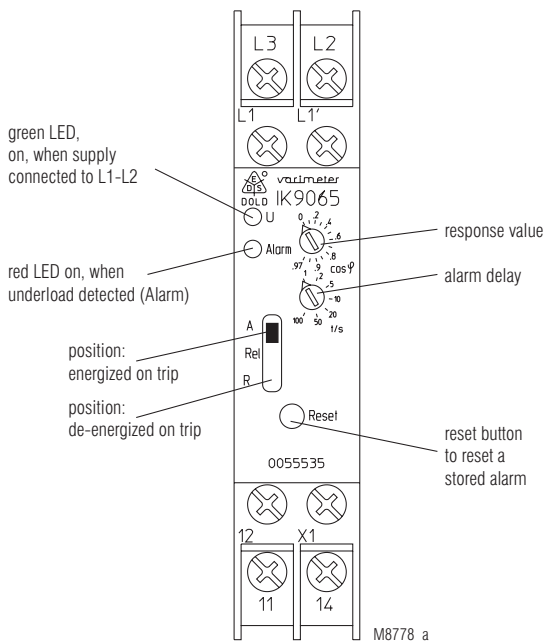
Notes

Monitoring of single phase load is also possible. The terminal L3 is not connected in this case (see connection diagram). The underload monitor must be ordered for the right voltage e.g. a unit for 3 AC 230 V for a single phase 230 V application.

When the underload monitor IK/SK 9065 is connected to the supply voltage L1-L2-L3 and no current is flowing in the current path L1-L1' the unit changes also in alarm state.

The current path L1-L1' allows to connect currents up to 8 A directly at IK/SK 9065. When connecting asynchronous motors not only the nominal current is important, but also the much higher starting current. The overload characteristic of the current input allows to connect motors with nominal current up to 4..5 A depending on the starting conditions. This is at 3 AC 400 V a motor load of 1.5 … 2.2 kW.

It is important that the motor is connected to L1' and **not** to L1. On wrong connection the phase angle will be measured in a wrong way and the underload monitor IK/SK 9065 will not work.

For higher currents over 8 A (nominal motor current over 5 A) external current transformers can be used (see Connection Examples). Also here the current transformers have to be connected with the right polarity. All standard current transformers of class 3 or better can be used (1 A or 5 A types). The integrated current transformer at SL 9065CT allows to connect currents up to 100 A directly.

The variant IK/SK/SL 9065.11/100 allows the following settings:
Bridge
X1-L1

●——●   Automatic restart (Alarm auto reset)

●   ●   Manual restart (Latched Alarm), reset with built in push button, external push button on X1-L1 or by disconnecting the supply voltage.
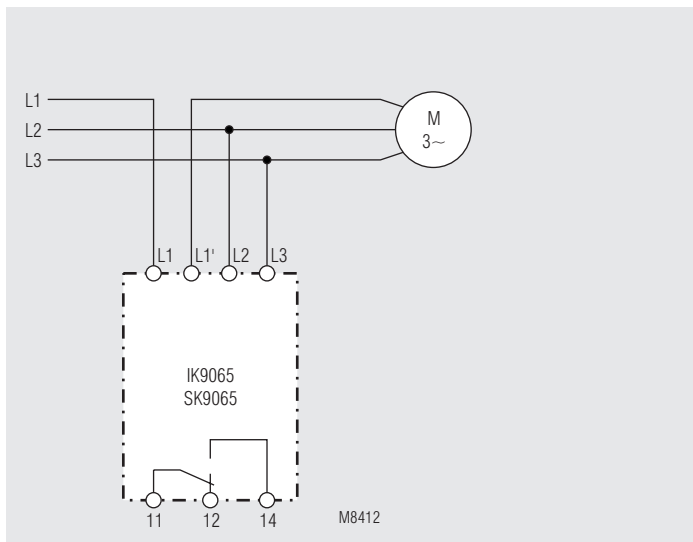
Switch "REL" on front side
• Position "A": Energized on trip (relay energizes on underload-alarm)
• Position "R": De-energized on trip (relay de-energizes on under load-alarm)

Technical Data

Input

Nominal voltage U_N: (= Motor voltage)
3 AC (or AC) 110, 230, 400 V
Voltage range: 0.8 ... 1.1 U_N
Nominal frequency of U_N: 45 ... 65 Hz
Nominal consumption
(L1-L2): Max. approx. 11 VA

Current Path

Current range
IK 9065, SK 9065: 0.1 ... 2 A   0.5 ... 8 A*
Internal resistance: Approx. 30 mΩ   Approx. 10 mΩ
Consumption: Max. 0.14 VA   Max. 0.7 VA
* (for higher currents use external current transformer see connection diagram)
Short time overload: 2.5 x I_{max} for 2 s,   5 x I_{max} for 0.5 s
Suitable current transformers: 1 A or 5 A types, class 3, with necessary load capacity
Current range SL 9065CT: 5 ... 100 A via integrated current transformer in the base
(max. wire-diameter: 10 mm)
Setting range cos φ: 0 ... 0.97 infinite variable
Operate delay t_v: 1 ... 100 s infinite variable

Output

Contacts: 1 changeover contact
Thermal current I_{th}: 4 A
Switching capacity
To AC 15
NO contact: 3 A / AC 230 V   IEC/EN 60947-5-1
NC contact: 1 A / AC 230 V   IEC/EN 60947-5-1
To DC 13 at 0.1 Hz: 1 A / DC 24 V   IEC/EN 60947-5-1
Electrical life
To AC 15 at 1 A, AC 230 V: 1.5×10^5 switching cycles
IEC/EC 60947-5-1
Short-circuit strength
max. fuse rating: 4 A gG / gL   IEC/EN 60947-5-1
Mechanical life: 30×10^6 switching cycles

General Data

Operating mode: Continuous operation
Temperature range
Operation - 25 ... + 60°C
Storage: - 25 ... + 60°C
Altitude: < 2000 m
Clearance and creepage distances
Rated impulse voltage / pollution degree: 4 kV / 2   IEC 60664-1
EMC
Electrostatic discharge: 8 kV (air)   IEC/EN 61000-4-2
HF-irradiation:
80 MHz ... 1 GHz: 20 V / m   IEC/EN 61000-4-3
1.4 GHz ... 2 GHz: 20 V / m   IEC/EN 61000-4-3
2 GHz ... 2.5 GHz: 10 V / m   IEC/EN 61000-4-3
Fast transients: 4 kV   IEC/EN 61000-4-4
Surge voltages
Between
wires for power supply: 2 kV   IEC/EN 61000-4-5
HF-wire guided: 10 V   IEC/EN 61000-4-6
Interference suppression: Limit value class A*)
*) The device is designed for the usage under industrial conditions (Class A, EN 55011).
When connected to a low voltage public system (Class B, EN 55011) radio interference can be generated. To avoid this, appropriate measures have to be taken.
Degree of protection
Housing: IP 40   IEC/EN 60529
Terminals: IP 20   IEC/EN 60529
Housing: Thermoplastic with V0 behaviour according to UL subject 94
Vibration resistance: Amplitude 0.35 mm frequency 10 ... 55 Hz   IEC/EN 60068-2-6
Climate resistance: 40 / 060 / 04   IEC/EN 60068-1
Terminal designation: EN 50005
Wire connection:
Cross section: 2 x 2.5 mm² solid or
1 x 1.5 mm² stranded wire with sleeve DIN 46228-1/-2/-3/-4
Stripping length: 10 mm

Technical Data

Wire fixing: Flat terminals with self-lifting clamping piece   IEC/EN 60999-1
Fixing torque: 0,8 Nm
Mounting: DIN rail mounting (IEC/EN 60715) or screw mounting M4, 90 mm hole pattern, with additional clip available as accessory
Weight:
IK 9065: Approx 65 g
SK 9065: Approx 84 g
SL 9065CT: Approx. 195 g

Dimensions

Width x height x depth:

IK 9065: 17.5 x 90 x 58 mm
SK 9065: 17.5 x 90 x 98 mm
SL 9065CT: 35 x 90 x 98 mm

Classification to DIN EN 50155 for IK 9065 and SK 9065

Vibration and
shock resistance: Category 1, Class B   IEC/EN 61373
Ambient temperature: T1, T2 compliant
T3 and TX with operational limitations
Protective coating of the PCB: No

Standard Types

IK 9065.11 3 AC 400 V 0.4 ... 8 A 1 ... 100 s
Article number: 0055534
- Output: 1 changeover contact
- De-energized on trip:
- Nominal voltage U_N: 3 AC 400 V
- Current range: 0.4 ... 8 A
- Operate delay: 1 ... 100 s
- Width: 17.5 mm

SK 9065.11 3 AC 400 V 0.4 ... 8 A 1 ... 100 s
Article number: 0055816
- Output: 1 changeover contact
- De-energized on trip
- Nominal voltage U_N: 3 AC 400 V
- Current range: 0.4 ... 8 A
- Operate delay: 1 ... 100 s
- Width: 17.5 mm

SL 9065.11CT/100   3 AC 400 V   5 ... 100 A   1 ... 100 s
Article number: 0059410
- Output: 1 changeover contact
- Nominal voltage U_N: 3 AC 400 V
- Current range: 5 ... 100 A
- Operate delay: 1 ... 100 s
- Programmable for: Manual reset with built in or external push button, energized or de-energized on trip, selection via switch on the front
- Width: 35 mm

Variants

IK 9065.11/100,
SK 9065.11/100: Programmable for: manual reset with built in or external push button, energized or de-energized on trip, selection via switch on the front

Ordering example for variants

IK 9065 .11 / _ _ 3 AC 400 V 0.4 ... 8 A 1 ... 100 s
└── Operate delay
└── Current range
└── Nominal voltage
└── Variant, if required
└── Contacts
└── Type

Accessories

ET 4086-0-2: Additional clip for screw mounting
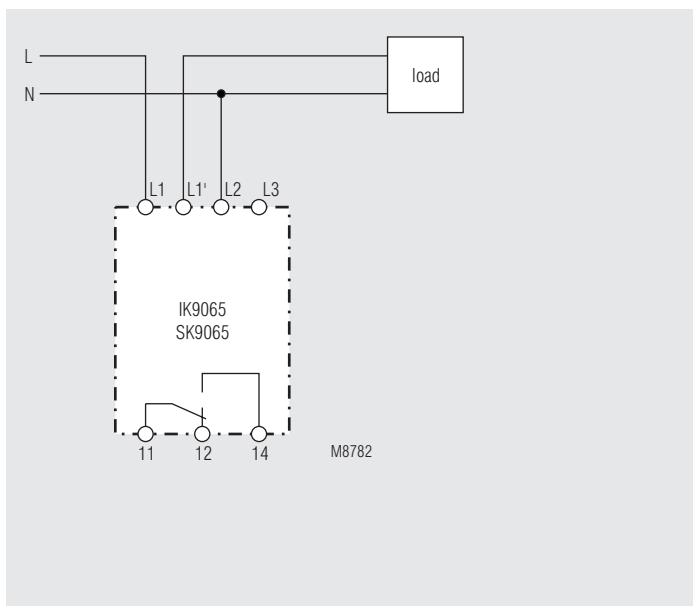Article number: 0046578
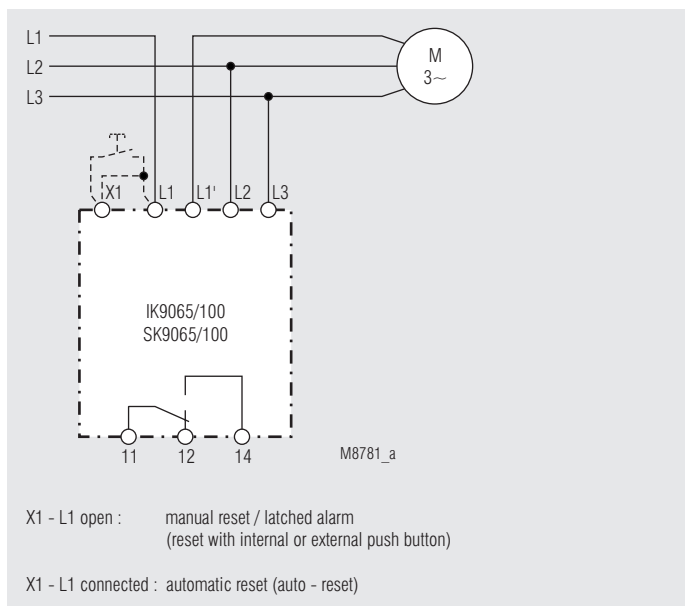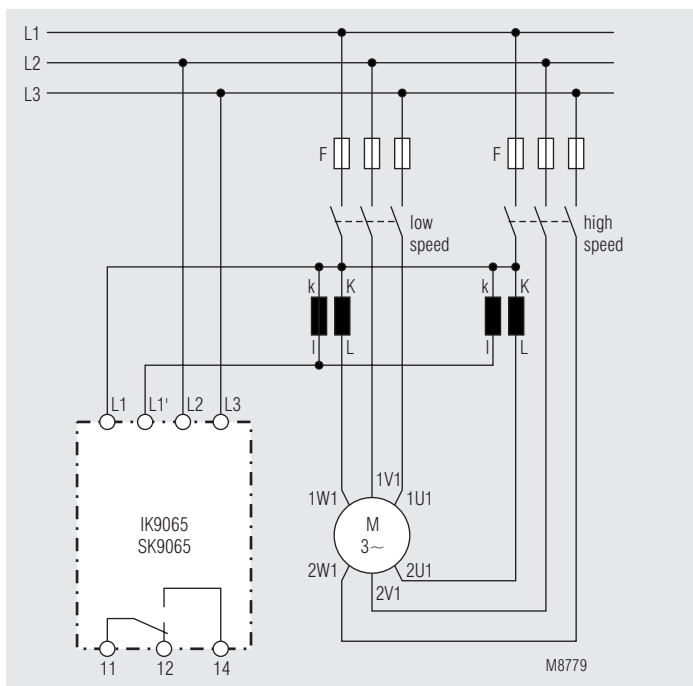
Connection Examples

IK 9065.11 with 3-phase load

Please connect the CT in the right sense of winding !
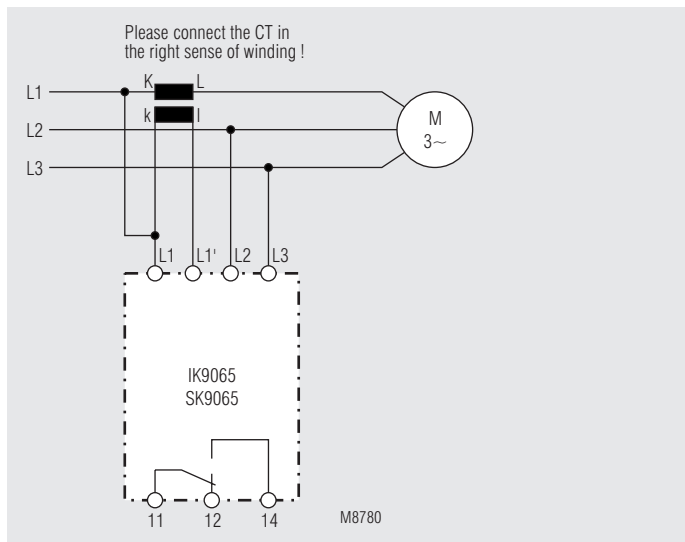
IK/SK 9065.11 with 3-phase load and external current transformer

IK 9065.11 with single-phase load

X1 - L1 open :   manual reset / latched alarm
                    (reset with internal or external push button)

X1 - L1 connected : automatic reset (auto - reset)

IK/SK 9065.11/100 with 3-phase load

IK/SK 9065.11 for motors with separate windings

X1 - L1 open :   manual reset / latched alarm
                    (reset with internal or external push button)

X1 - L1 connected : automatic reset (auto - reset)

SL 9065.11CT/100

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