VARIMETER
Motor Load Transmitter
BH 9098

Translation of the original instructions

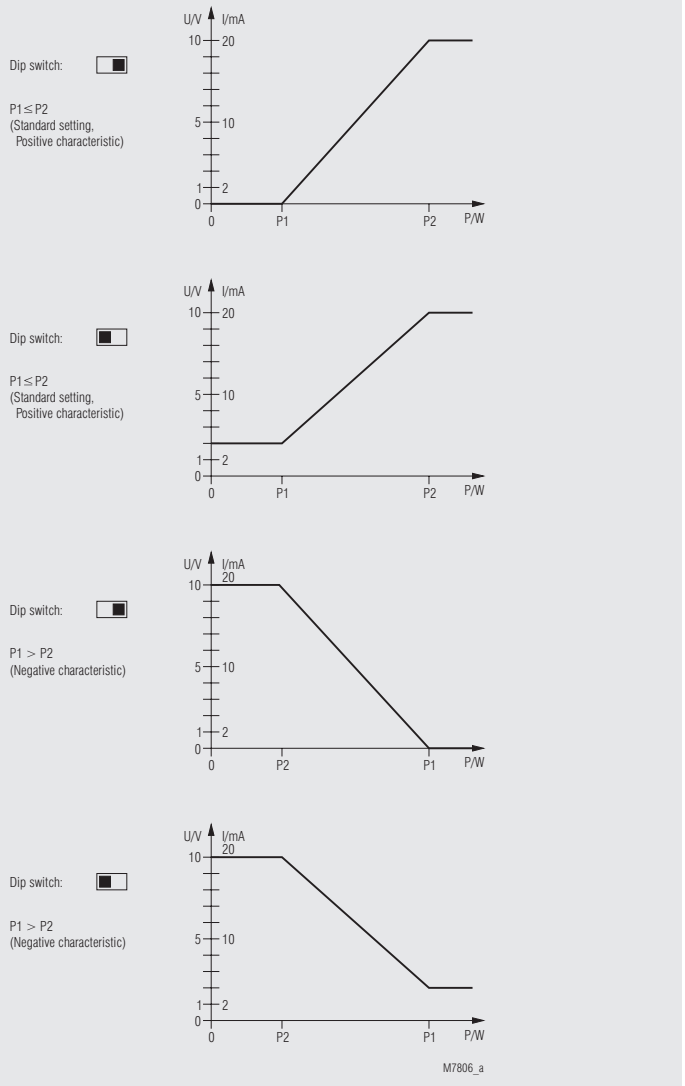
DOLD

Product Description

The BH 9098 load transformer measures the power consumption of electrical loads and converts them into standardised analogue voltage and current values.
Early detection of impending failures and preventive maintenance prevent costly damage and as a user you benefit from the operational safety and high availability of your system.

Load Characteristics

4 different types of load characteristics can be selected via P_1, P_2 and a DIP switch.



Your Advantages

- As load depending output signals are available
  - 0 ... 20 mA and 0 ... 10 V or
  - 4 ... 20 mA and 2 ... 10 V
- For motors up to 22 kW / 400 V or 37 kW / 690 V
- Early detection of irregularities
- Reduced wiring effort

Features

- According to IEC/EN 60255-1
- Measurement: Effective power
- Adjustment of P_1 and P_2 on absolute scale
- Adjustable start-up time delay t_a
- Up to 40 A without external current transformer
- As option for single phase loads
- LED indicators
- Width 45 mm

Approvals and Markings

CE

Applications

The motor load transmitter is suitable to monitor motors with variable load.

Function

Due to the 1-phase measuring principle, a **symmetrical load** of all 3 phases is assumed, as is usual with motor loads. The power consumption of the load is continuously monitored and converted into a standard dc current or voltage signal. Two pairs of rotary switches, P1 and P2 set the lower and upper end of the measured range in Watts. When the monitored load is **between** these set values a proportional output signal is produced. If the monitored load is out side the set range the output signal will remain at minimum or maximum.

Indicators

Green LED, U_N:	Flashing:	Start-up time delay t_a
	Continuous light:	Voltage connected

Failure Indication

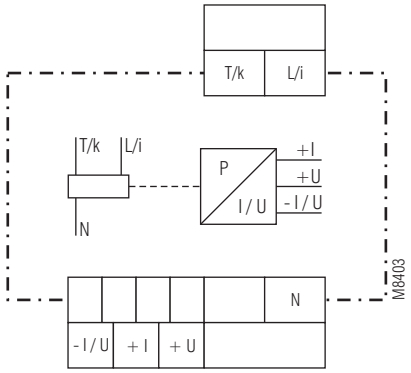
Two different failure states are displayed by LEDs.

1.) No measuring voltage:
If the measuring voltage is missing, measurement is not possible.
- The LED flashes fast in intervals.
- The output signals are on min. value.

2.) Reverse power:
The calculated power value is negative.
- The LED flashes fast.
- The output signals are on min. value.

Possible reason:
The unit detects reverse power or the current connections are inverted.

Circuit Diagrams



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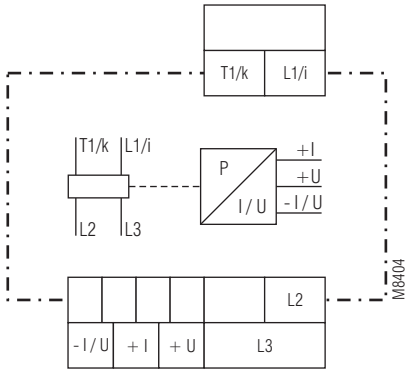

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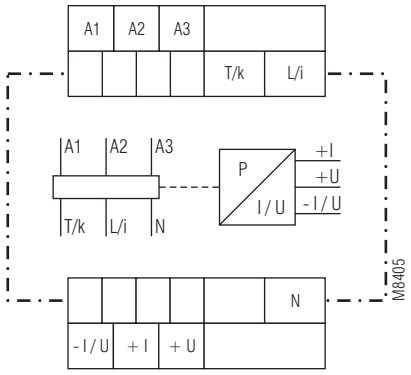

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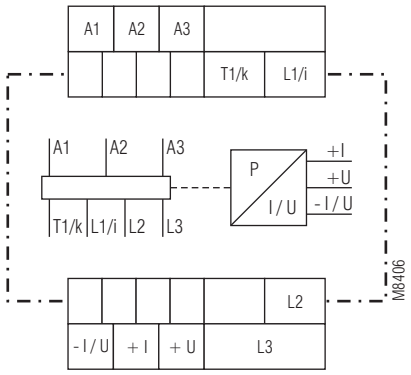

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Connection Terminals

Terminal designation	Signal description
A1, A2, A3	Auxiliary voltage
L1/i, L2, L3, N	Voltage measuring input AC
L1/i, T1/k	Current measuring circuit AC
U, I	Analogue output

Technical Data

Input

Measuring voltage
Voltage range: Without auxiliary voltage 0.8 ... 1.1 x U_N
with auxiliary voltage, see setting ranges
Input resistance: 300 kΩ ... 500 kΩ
Mesured current
Measuring range: See setting ranges

Rated current [A]	40	24	8	2.4	0.8	0.24
Permissible current range (overload) [A]						
continuously:	0 ... 40	0 ... 40	0 ... 16	0 ... 8	0 ... 4	0 ... 1
1 min. (10 min. break):	150	150	20	16	3	1.5
20 s (10 min. break):	200	200	25	20	4	2
Input resistance of current i-k [mΩ]:	≤ 1	≤ 1	7	14	150	500

Frequency range: 10 ... 400 Hz (see characteristics M7953)

Setting Ranges

P_1 und P_2 on absolute scale:
Upper Switch
load range
for P1 and P2: Lower range ■ Upper range ■

Measuring accuracy
(in % at nominal load): ± 5 %
Harmonic distortion: < 40 %
Start-up time delay t_a: 0 ... 30 s (infinetely variable)

Analogue Output for Current 0 / +I

Galvanically isolated
to measuring input and
auxiliary voltage: 4 kV eff.
Output current: DC 0 ... 20 mA
DC 4 ... 20 mA
(selectable via DIP switch)
Output impendance (Load): Max. 500 Ω

Analogue Output for Voltage 0 / +U

Galvanically isolated
to measuring input and
auxiliary voltage: 4 kV eff.
Output voltage: DC 0 ... 10 V
DC 2 ... 10 V
(selectable via DIP switch)
Output impendance (Load): Min. 5000 Ω

Setting Ranges

Available variants	Measuring voltage U_N	Measuring current I_N [A]	Selection of load range resistive
1-phase			
without auxiliary voltage			
BH 9098.90/000	AC 230 V	0.0024 ... 0.24	0.1 ... 60 W
	AC 230 V	0.024 ... 2.4	1 ... 600 W
	AC 230 V	0.24 ... 24	10 ... 6000 W
With auxiliary voltage			
BH 9098.90/010	AC 35 ... 250 V	0.0024 ... 0.24	0.1 ... 60 W
	AC 35 ... 250 V	0.024 ... 2.4	1 ... 600 W
	AC 35 ... 250 V	0.24 ... 24	10 ... 6000 W
3-phase			
without auxiliary voltage			
BH 9098.90/001	3 AC 400 V	0.008 ... 0,8	0.1 ... 60 W
	3 AC 400 V	0.08 ... 8	10 ... 6000 W
	3 AC 400 V	0.4 ... 40	0.1 ... 30 kW
With auxiliary voltage			
BH 9098.90/011	3 AC 60 ... 440 V	0.008 ... 0.8	1 ... 600 W
	3 AC 60 ... 440 V	0.08 ... 8	10 ... 6000 W
	3 AC 100 ... 760 V	0.4 ... 40	0.1 ... 52 kW

Technical Data

Auxiliary Circuit

Auxiliary voltage U_H
only for BH 9098.90/010 and
BH 9098.90/011: AC 110 V (terminals A 1 - A 2),
AC 230 V (terminals A 1 - A 3),
DC 24 V
Voltage range: 0.8 ... 1.1 U_H
Frequency range of U_H: 45 ... 400 Hz
Input current
AC 110 V: Approx. 30 mA
AC 230 V: Approx. 15 mA
DC 24 V: Approx. 50 mA

General Data

Operating mode: Continuous operation
Temperature range
Operation: - 20 ... + 55 °C
Storage: - 20 ... + 55 °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 ... 2.7 GHz: 10 V / m IEC/EN 61000-4-3
Fast transients: 2 kV IEC/EN 61000-4-4
Surge voltages between
wires for power supply: 1 kV IEC/EN 61000-4-5
Between wire and ground: 2 kV IEC/EN 61000-4-5
HF-wire guided: 10 V IEC/EN 61000-4-6
Interference suppression:
Units with AC auxiliary voltage: Limit value class B EN 55011
Units with DC auxiliary voltage: 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: Thermoplast 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: 20 / 055 / 04 IEC/EN 60068-1
Terminal designation: EN 50005
Wire connection
Load terminals: 1 x 10 mm² solid or
1 x 6 mm² stranded ferruled
Stripping length: 11 mm
Fixing torque: 1.2 Nm
Wire connection: Box terminals with self-lifting wire protection and plus-minus terminal screws M4
Control terminals: 1 x 4 mm² solid or
2 x 1.5 mm² stranded ferruled or
1 x 2.5 mm² stranded ferruled or
DIN 46228-1/-2/-3/-4
Stripping length: 11 mm
Fixing torque: 0.8 Nm
Wire connection: Box terminals with self-lifting wire protection and plus-minus terminal screws M3.5
Mounting: DIN rail IEC/EN 60715
Weight: 430 g

Dimensions

Width x height x depth: 45 x 84 x 118 mm

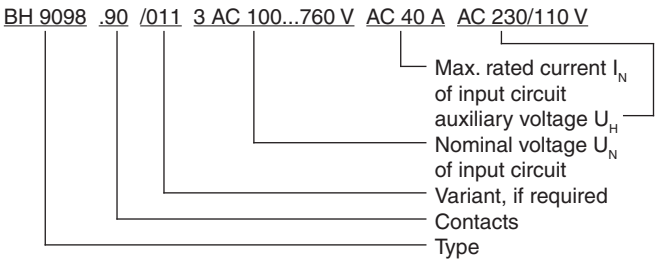
Standard Type

BH 9098.90/001 3 AC 400 V AC 40 A
Article number: 0055544
- 3-phase, without auxiliary voltage
- Output: Analogue
- Nominal voltage U_N: 3 AC 400 V
- Width: 45 mm

Variant

BH 9098.90/1_ _: 3-phase without auxiliary voltage with galvanically separated current path. For applications with current transformers grounded on the secondary side, current range limited to 25 A
BH 9098.90/011: 3-phase with auxiliary voltage
BH 9098.90/000: 1-phase without auxiliary voltage
BH 9098.90/010: 1-phase with auxiliary voltage

Ordering example for variants



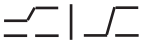
Settings

Rotational switches P_1 and P_2 (2 digits) (calculation for resistive load) 48 kW
The switches are used to set the minimum and maximum load values P_1 and P_2 of the load characteristics. The scale shows the absolute value. On the 3-phase variant the max. possible power setting value is 52 kW (760 V x 40 A x 1.732). The setting resolution is 1 kW and the load range can be selected by DIP-switches. If the load range is reduced by factor 10 the setting resolution is 100 W.

Potentiometer t_a
A start-up time delay can be adjusted between 0 ... 30 s.
After mains voltage is connected the start-up time delay begins. During this time the measurement is disabled and the LED flashes (see indicators). Independent of the settings the analogue output is on min. value.

DIP-switches:

Reduction of load range P_1 and P_2 by factor 10



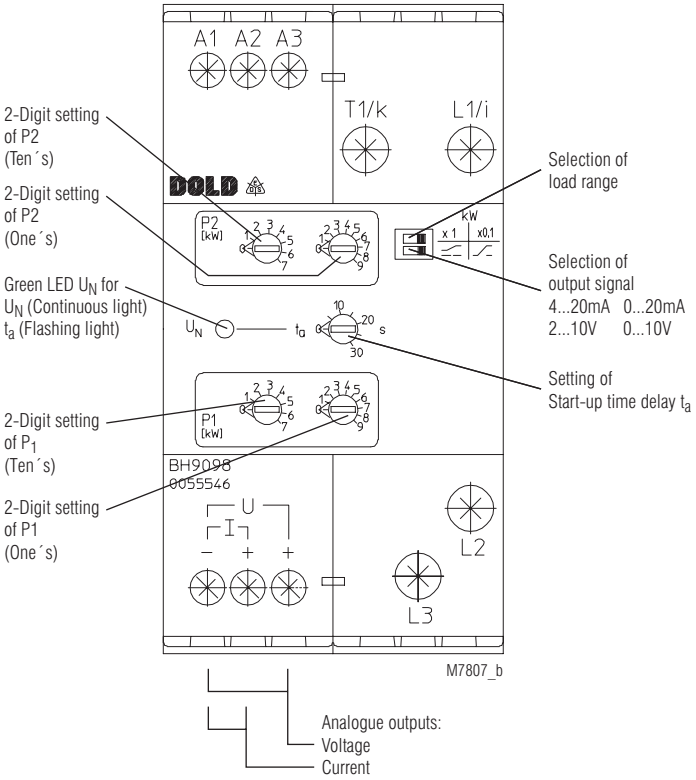
Selection of output signal:
4 ... 20 mA to 0 ... 20 mA
2 ... 10 V to 0 ... 10 V

Connection

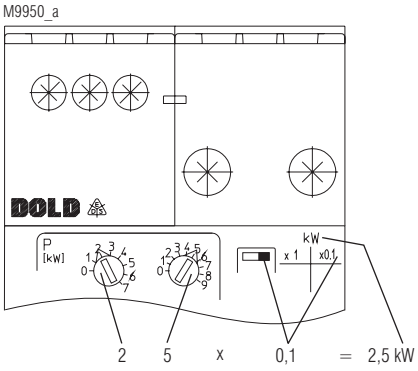
The connection has to be made according to the application drawings. The measuring current has to be connected to terminals L/i and T/k or L1/i and T1/k. The flow direction of the current must be correct. On reverse power the unit gives a failure indication. The maximum nominal motor current flowing directly through the load transmitter is 40 A. On higher current a current transformer with 2.5 VA burden capacity has to be used.

Functional Note

For proper operation, all phases and a correct phase sequence must be present.

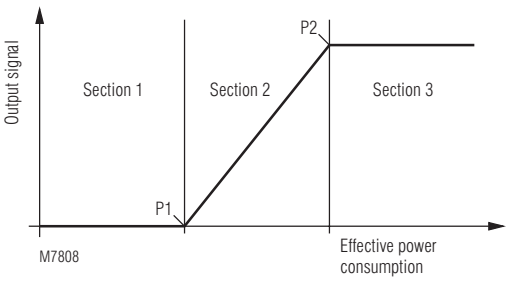


Adjustemt example: response value: 2.5 kW



Response value = 25 x 0.1 = 2.5 kW

The load charasteristic shows 3 sections:



Example 1

The smaller value is adjusted on P_1
The higher value is adjusted on P_2
Standard setting: Positive characteristic

- If the effective power consumption of the load is in section 1 between 0 W and P_1 setting the analogue output signal is on minimum value.
- If the effective power consumption of the load is in section 2 between P_1 and P_2 setting the analogue output signal is proportional to the effective load following a **positive characteristic**.
- If the effective power consumption of the load is in section 3 between P_2 setting and Pmax the analogue output signal is on maximum value.

Example 2

$P_1 = 0$ and $P_2 = Pmax$

- Selection of the maximum possible load range span.
  The whole load range of the unit is converted into a proportional output signal. Section 1 and 3 are missing.

Example 3

$P_1 = P_2$

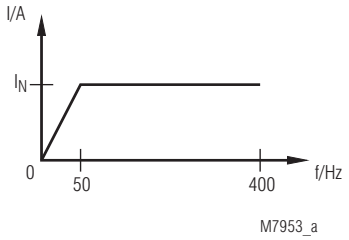
- If the **same** value is adjusted for P_1 and P_2 section 2 is missing, i.e. the output signal is either on minimum or maximum value. The unit works as limit switch.

Example 4

On P_1 the higher value is adjusted.
On P_2 the lower value is adjusted.

- Inverted output, negative characteristic

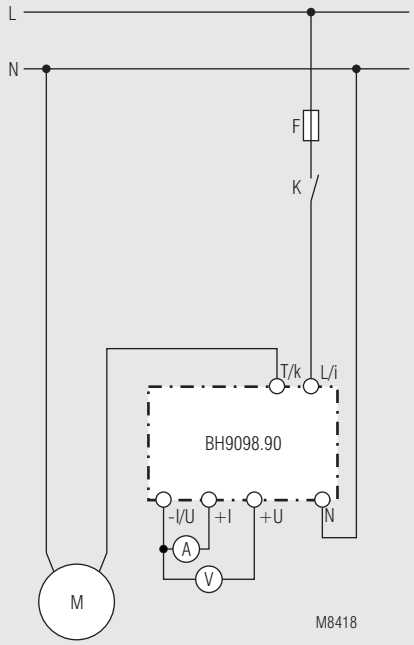
Characteristic



Max. input current curve in relation to input frequency

Connection Examples

1-phase



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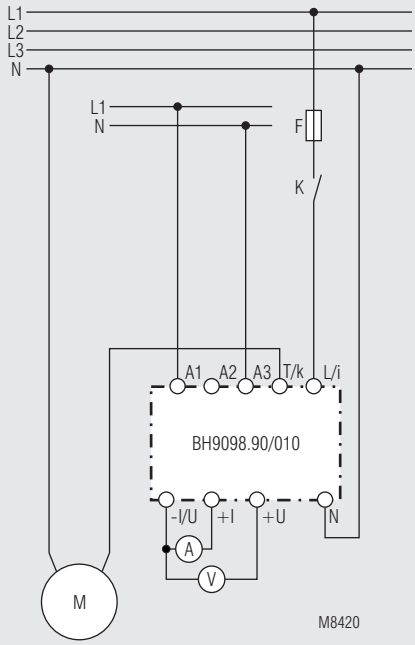

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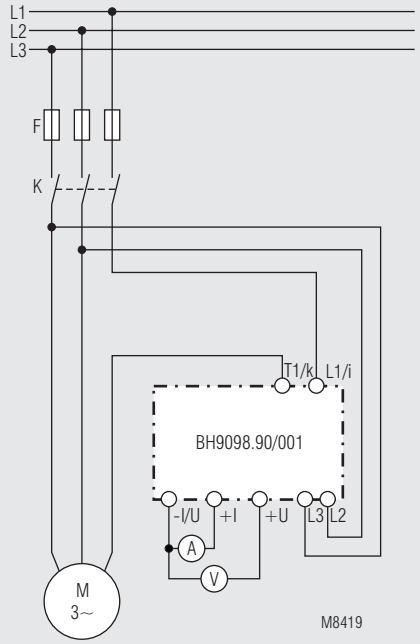
3-phase



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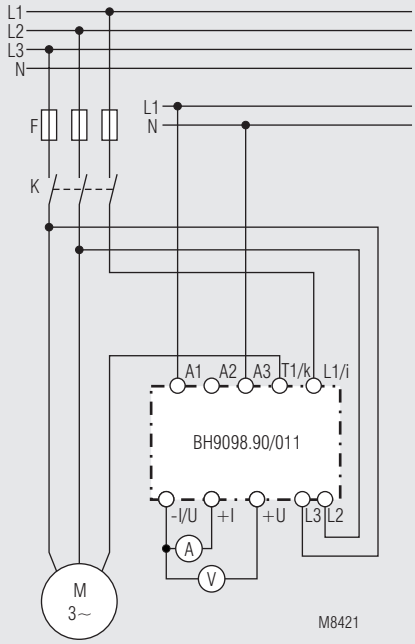

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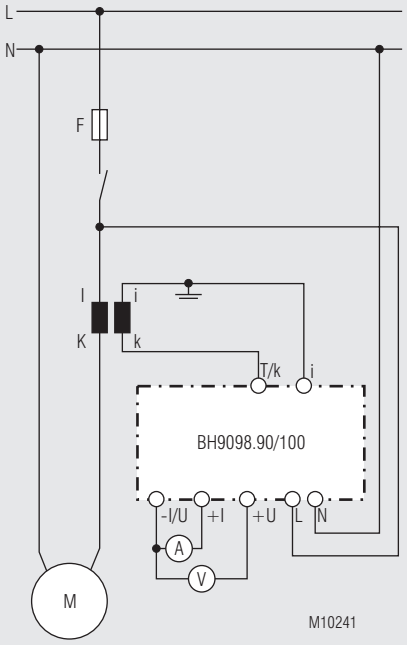
Connection Examples with external current transformer



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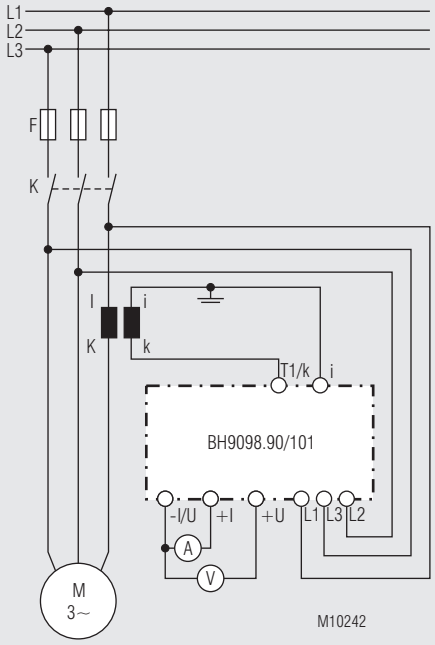

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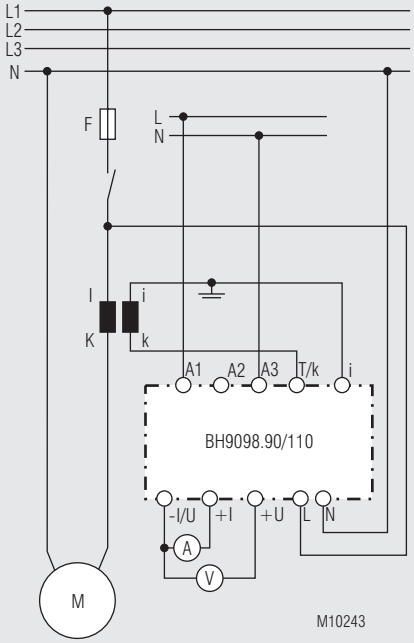

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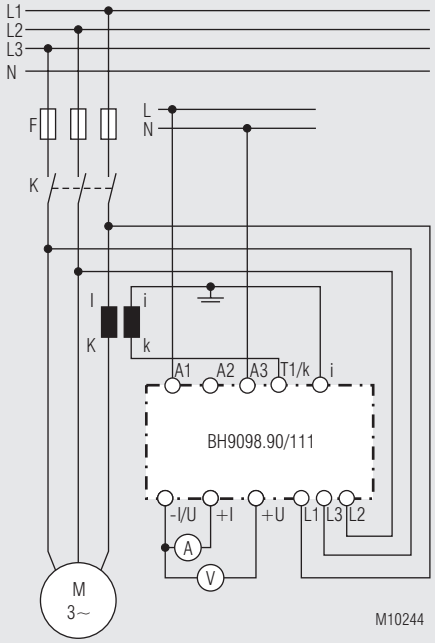

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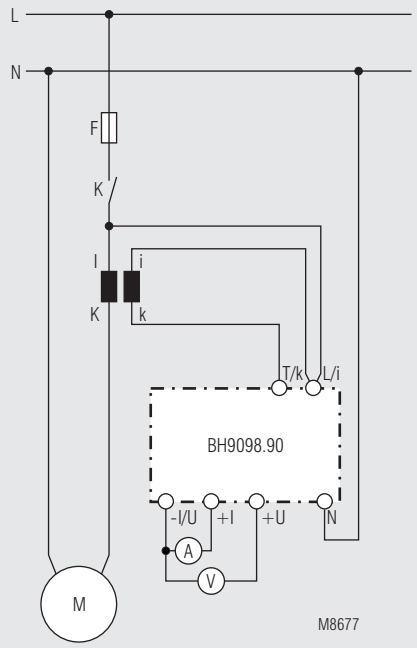
Connection Examples with external current transformer

1-phase



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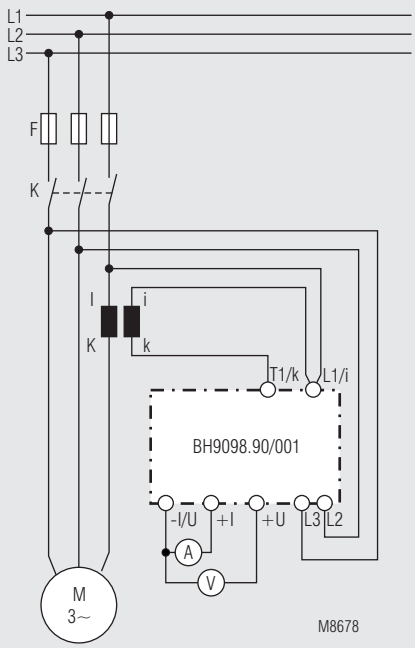
3-phase



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Note: When using external CTs the adjusted value has to be multiplied with the transmission ratio (ü) of the CT.

Example: Switching value = Setting value (P1/P2) x ü e.g. for 100/5A C/T u=20 (100 divided by 5)