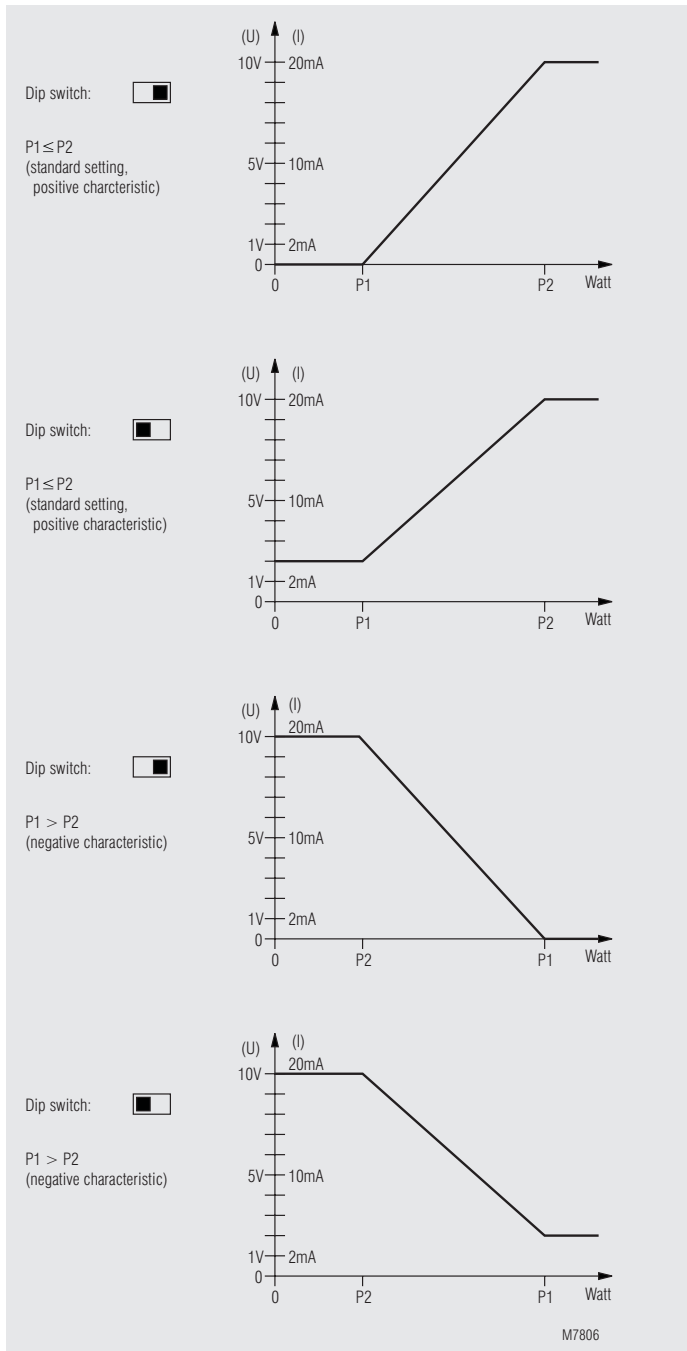




- According to IEC/EN 60255-1
- As load depending output signals are available
 - 0 ... 20 mA and 0 ... 10 V or
 - 4 ... 20 mA and 2 ... 10 V
- Measures effective load
- Adjustment of P_1 and P_2 on absolute scale
- For motors up to 22 kW / 400 V or 37 kW / 690 V
- Adjustable start up delay t_a
- Up to 40 A without external current transformer
- As option for single phase loads
- LED indicators
- Width 45 mm

Load Characteristics

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



Approvals and Markings



Applications

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

Function

The motor load transmitter BH 9098 monitors the effective load of motors and balanced three phase and single phase systems. Due to the single phase current measuring system, the unit assumes the load is balanced on all phases, as is the norm for motors. The power consumption of the load is continuously monitored and converted into a standard dc current or voltage signal. Two pairs of rotary switches, P_1 and P_2 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 outside the set range the output signal will remain at minimum or maximum.

Indicators

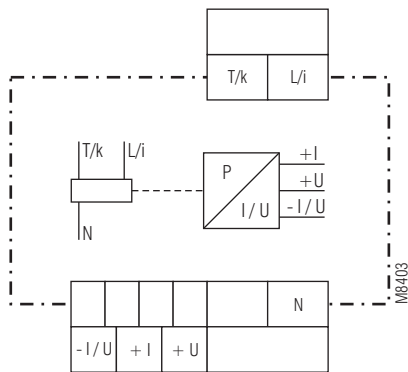
Green LED, U_N : Flashing: Start up delay t_a
Continuous light: Voltage connected

Failure Indication

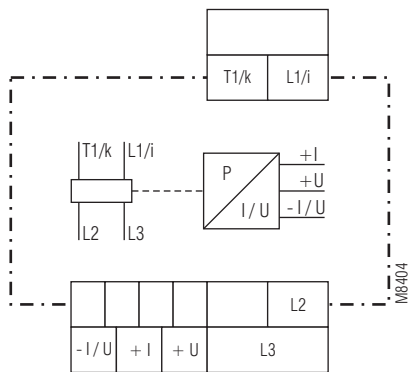
Two different failure states are displayed by LEDs.

- 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.

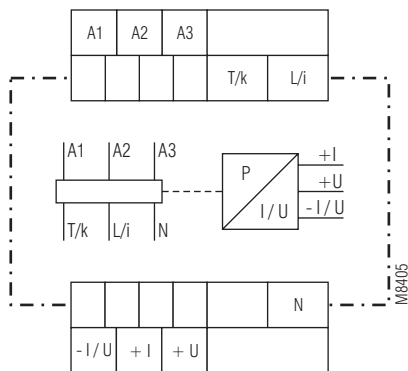
Circuit Diagrams



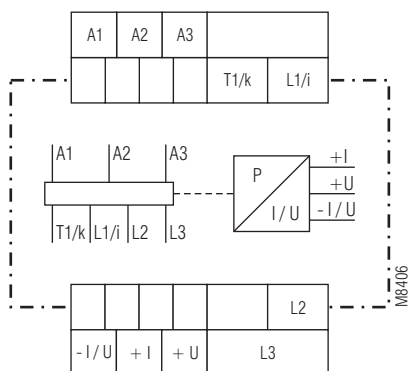
BH 9098.90



BH 9098.90/001



BH 9098.90/010



BH 9098.90/011

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 $0.8 \dots 1.1 \times U_N$
with auxiliary voltage, see setting ranges
300 k Ω ... 500 k Ω

Input resistance:

Measured 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 [$\text{m}\Omega$]:	≤ 1	≤ 1	7	14	150	500

Frequency range:

10 ... 400 Hz (see characteristics M7953)

Setting Ranges

P₁ and P₂ on absolute scale:

Upper Switch

load range

for P1 and P2:

Lower range



Upper range



Measuring accuracy

(in % at nominal load):

$\pm 5 \%$

Harmonic distortion:

< 40 %

Start-up delay t_a:

0 ... 30 s (infinitely 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 impedance (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 impedance (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

20 / 055 / 04 IEC/EN 60068-1

EN 50005

Climate resistance:

Terminal designation:

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

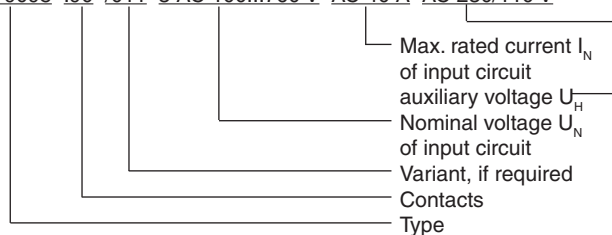
BH 9098.90/001 3 AC 400 V AC 40 A
Article number: 0055544
• 3-phase, without auxiliary voltage
• Output: Analogue
• Nominal voltage U_N : 3 AC 400 V
• Width: 45 mm

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

BH 9098 .90 /011 3 AC 100...760 V AC 40 A AC 230/110 V



Settings

Rotational switches P_1 and P_2 (2 digits) (calculation for resistive load) 48 kW

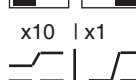
The switches are used to set the minimum and maximum load values P_1 and P_2 of the load characteristics. The scale shows the absolute value. On the 3-phase variant the max. possible power setting value is 52 kW (760 V x 40 A x 1.732). The setting resolution is 1 kW and the load range can be selected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

Potentiometer t_a

A start-up delay can be adjusted between 0 ... 30 s.

After mains voltage is connected the start-up 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:

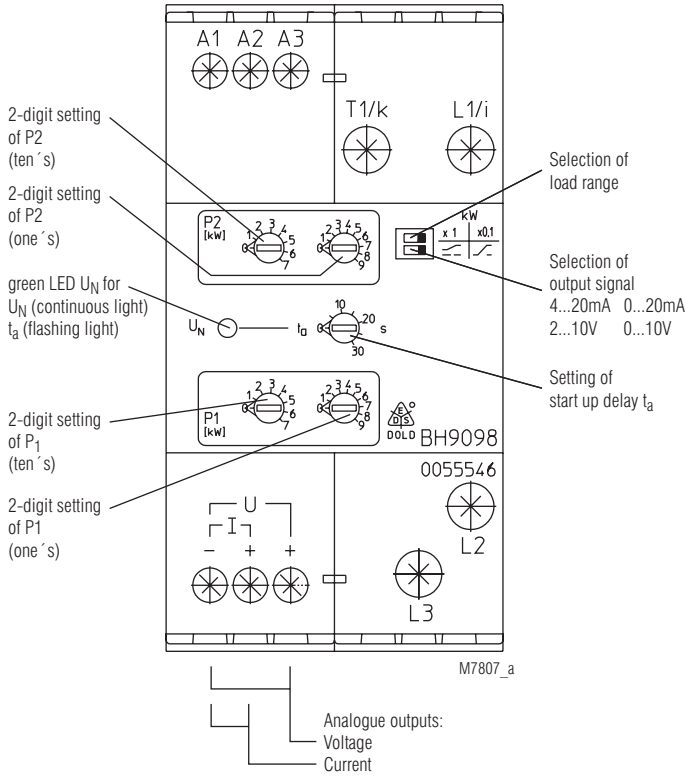
4 ... 20 mA to 0 ... 20 mA
2 ... 10 V to 0 ... 10 V

Connection

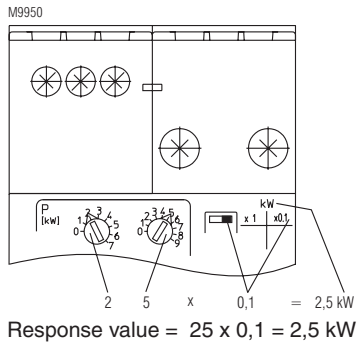
The connection has to be made according to the application drawings. The measuring current has to be connected to terminals L/i and T/k or L1/i and T1/k. The flow direction of the current must be correct. On reverse power the unit gives a failure indication. The maximum nominal motor current flowing 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

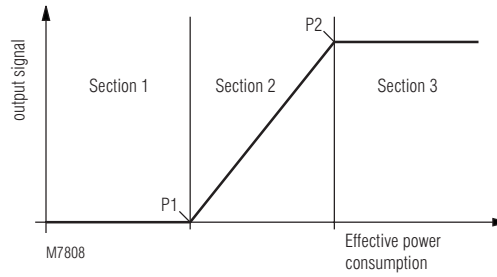
For proper operation, all phases and a correct phase sequence must be present.



Adjustment example: response value: 2,5 kW



The load characteristic 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 P_{max} the analogue output signal is on maximum value.

Example 2

$P_1 = 0$ and $P_2 = P_{max}$

- 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

$P_1 = P_2$

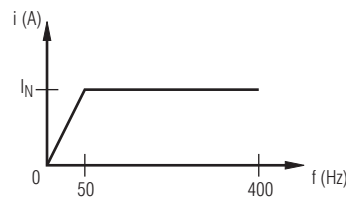
- If the **same** value is adjusted for P_1 and P_2 section 2 is missing, i.e. the output signal is either on minimum or maximum value. The unit works as limit switch.

Example 4

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

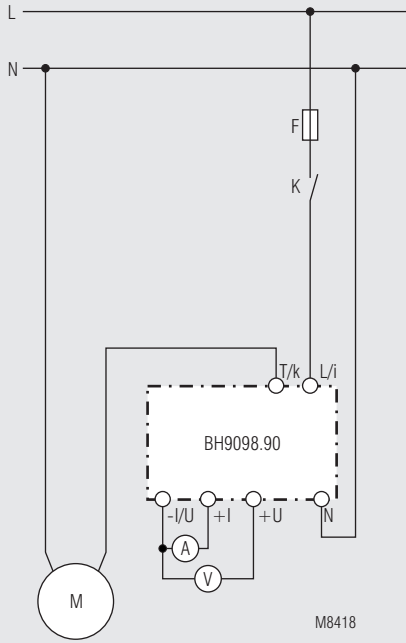
- Inverted output, negative characteristic

Characteristic

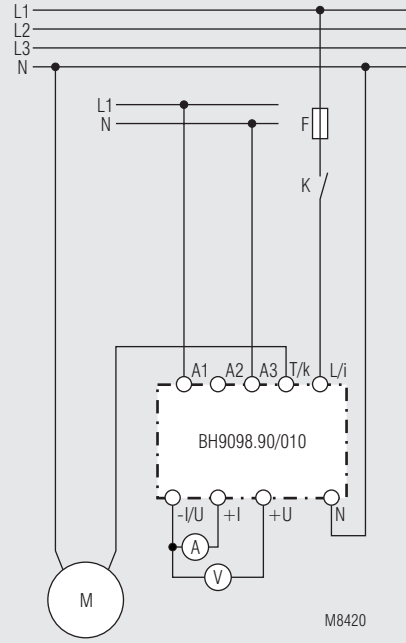


Max. input current curve in relation to input frequency

1-phase

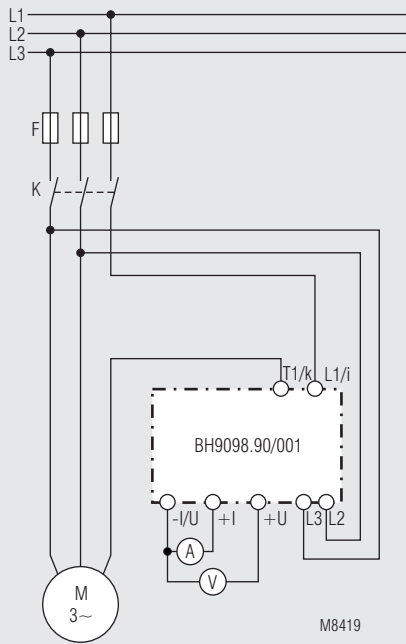


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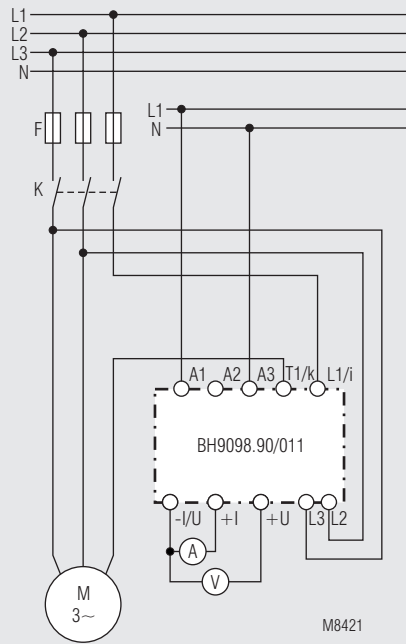


BH 9098.90/010

3-phase

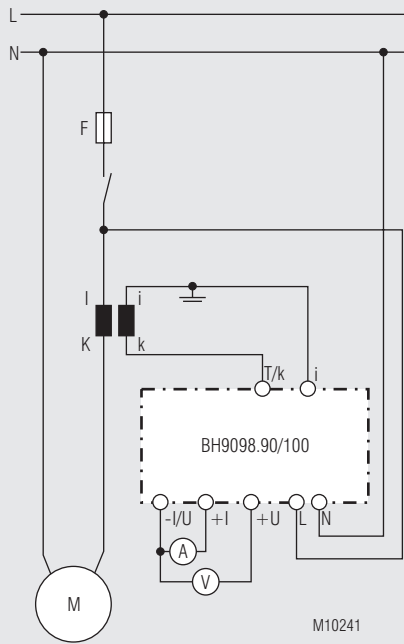


BH 9098.90/001



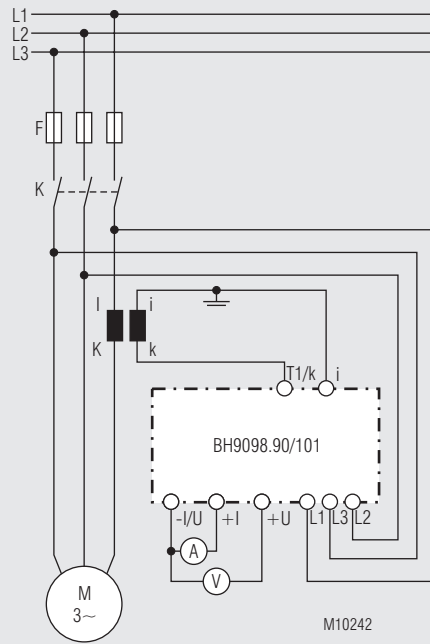
BH 9098.90/011

Connection Examples with external current transformer



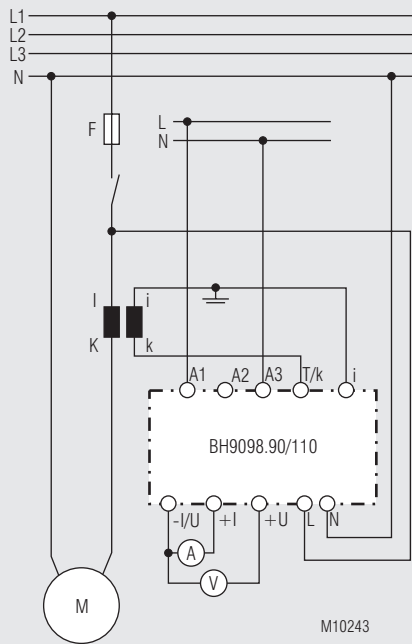
BH 9098.90/100

M10241



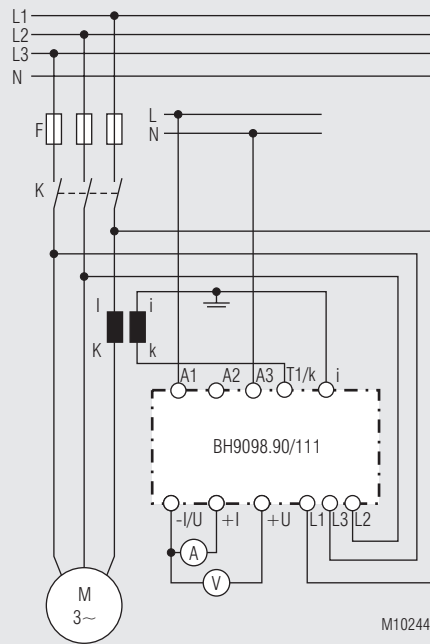
BH 9098.90/101

M10242



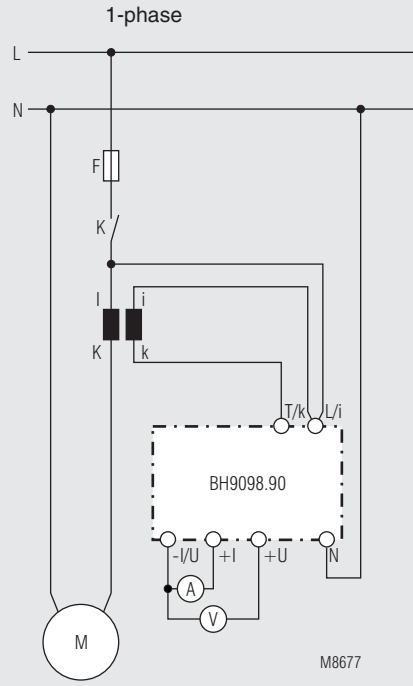
BH 9098.90/110

M10243

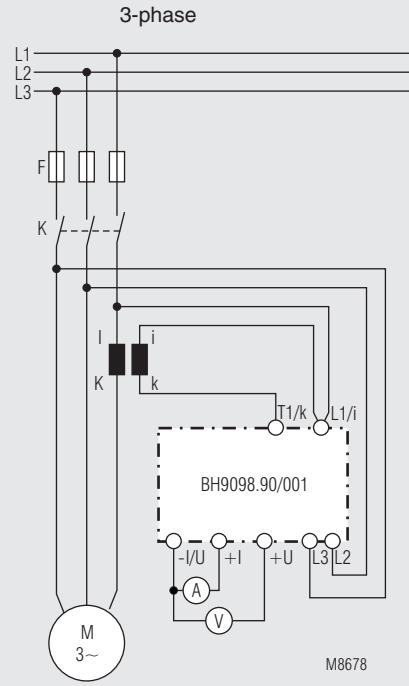


BH 9098.90/111

M10244



BH 9098.90



BH 9098.90/001

Note: When using external CTs the adjusted value has to be multiplied with the transmission ratio (\ddot{u}) of the CT.

Example: Switching value = Setting value (P1/P2) \times \ddot{u} e.g. for 100/5A C/T $\ddot{u}=20$ (100 divided by 5)

