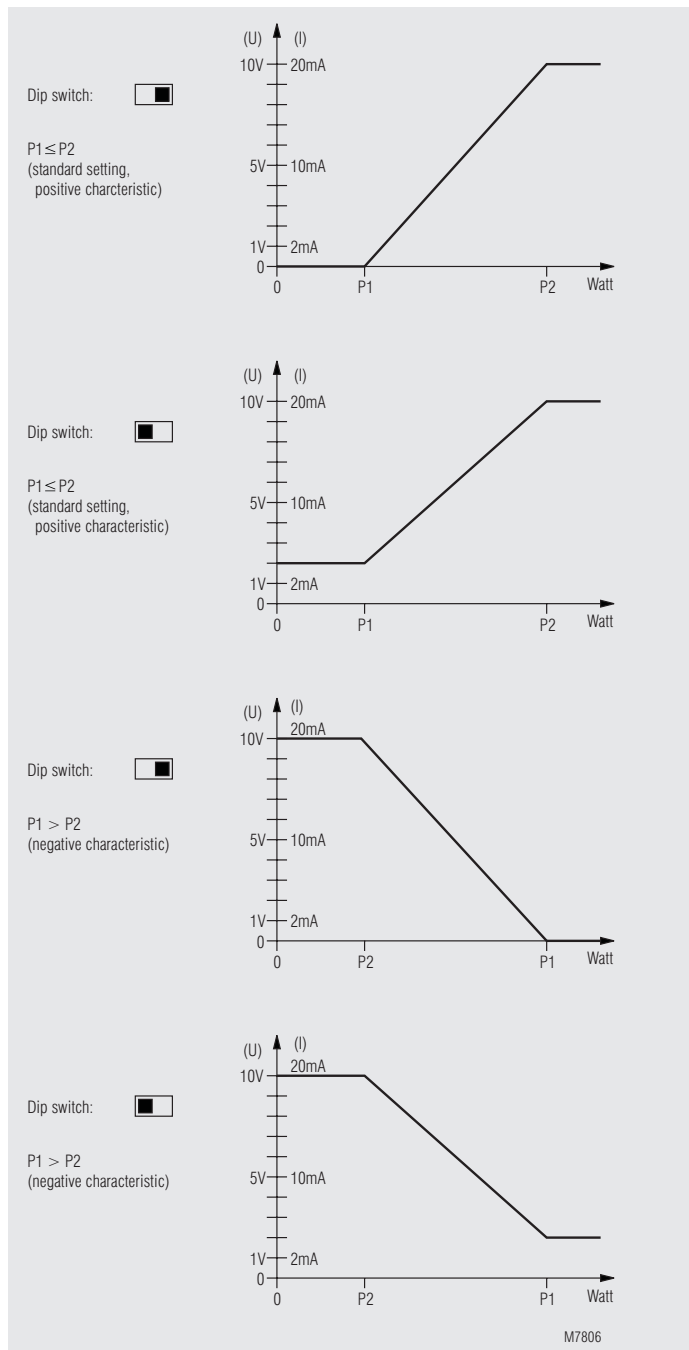




- According to IEC/EN 60 255, DIN VDE 0435-303
- As load depending output signals are available
  - 0 ... 20 mA and 0 ... 10 V or
  - 4 ... 20 mA and 2 ... 10 V
- Measures effective load
- Adjustment of  $P_1$  and  $P_2$  on absolute scale
- For motors up to 22 kW / 400 V bzw. 37 kW / 690 V
- Adjustable 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 Marking



### Application

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

### Function

The motor load transmitter BH9098 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

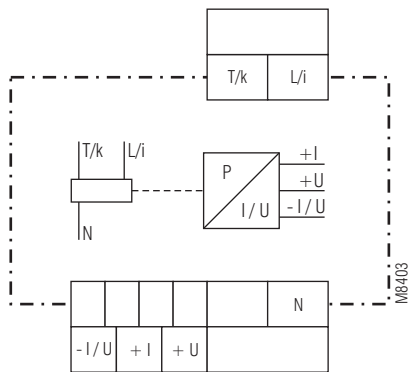
green LED,  $U_N$ : flashing: start up delay  $t_a$   
Continuous light: voltage connected

### Failure Indication

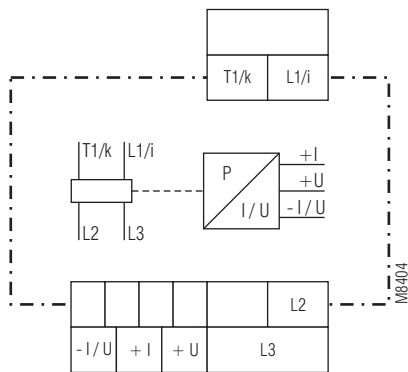
Two different failure states are displayed by LEDs.

- 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.

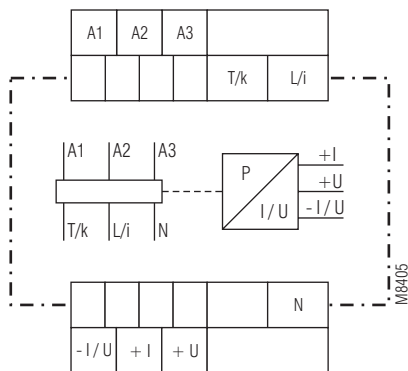
## Circuit Diagrams



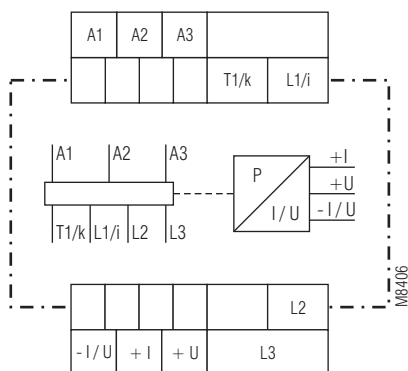
BH 9098.90



BH 9098.90/001

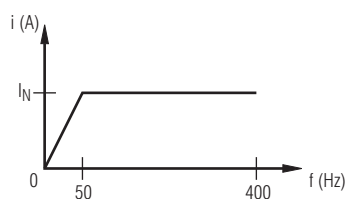


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BH 9098.90/011

## Characteristics



M7953

Max. input current curve in relation to input frequency

## 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 $\Omega$  ... 500 k $\Omega$

#### 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 [m $\Omega$ ]:	$\leq 1$	$\leq 1$	7	14	150	500

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

### Setting Ranges

#### P<sub>1</sub> and P<sub>2</sub> on absolute scale:

Upper Switch

load range

for P<sub>1</sub> and P<sub>2</sub>:

lower range



upper range



#### Measuring accuracy

(in % at nominal load):

$\pm 5 \%$

#### Harmonic distortion:

< 40 %

#### Start-up delay t<sub>a</sub>:

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  $\Omega$

### 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  $\Omega$

### Setting Ranges

Available variants	Measuring voltage U <sub>N</sub>	Measuring current I <sub>N</sub> [A]	selection of load range resistive
<b>1-phase</b>			
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
<b>3-phase</b>			
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:** - 20 ... + 55°C

#### Clearance and creepage distances

rated impuls voltage / pollution degree: 4 kV / 2 IEC 60 664-1

#### EMC

Electrostatic discharge: 8 kV (air) IEC/EN 61 000-4-2

HF-irradiation: 10 V / m IEC/EN 61 000-4-3

Fast transients: 2 kV IEC/EN 61 000-4-4

Surge voltages between

wires for power supply: 1 kV IEC/EN 61 000-4-5

between wire and ground: 2 kV IEC/EN 61 000-4-5

HF-wire guided: 10 V IEC/EN 61 000-4-6

Interference suppression: Limit value class B EN 55 011

#### Degree of protection

Housing: IP 40 IEC/EN 60 529

Terminals: IP 20 IEC/EN 60 529

#### Housing:

Thermoplast with V0-behaviour according to UL subject 94

#### Vibration resistance:

amplitude 0.35 mm frequency 10 ... 55 Hz, IEC/EN 60 068-2-6

20 / 055 / 04 IEC/EN 60 068-1

#### Climate resistance:

**Terminal designation:** EN 50 005

#### Wire connection

Load terminals: 1 x 10 mm<sup>2</sup> solid or 1 x 6 mm<sup>2</sup> stranded ferruled  
Control terminals: 1 x 4 mm<sup>2</sup> solid or 2 x 1.5 mm<sup>2</sup> stranded ferruled or 1 x 2.5 mm<sup>2</sup> stranded ferruled or DIN 46 228-1/-2/-3/-4

#### Wire connection:

Box terminals with self-lifting wire protection and plus-minus terminal screws M3.5

#### Mounting:

DIN rail IEC/EN 60 715

#### Weight:

430 g

## Dimensions

**Width x height x depth:** 45 x 84 x 121 mm

## Standard Type

BH 9098.90/001 3 AC 400 V AC 40 A

Article number:

• 3-phase, without auxiliary voltage

• Output: analogue

• Nominal voltage  $U_N$ : 3 AC 400 V

• Width: 45 mm

## Variants

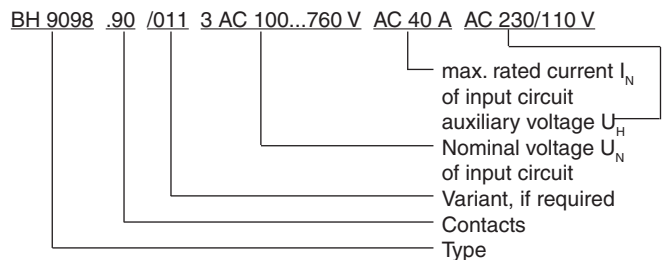
BH 9098.90/1\_ \_ : 3-phase without auxiliary voltage with galvanically separated current path. For applications with current transformers grounded on the secondary side, current range limited to 25 A

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

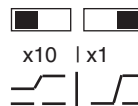
The switches are used to set the minimum and maximum load values  $P_1$  and  $P_2$  of the load characteristics. The scale shows the absolute value. On the 3-phase variant the max. possible power setting value is 52 kW (760 V x 40 A x 1.732). The setting resolution is 1 kW and the load range can be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



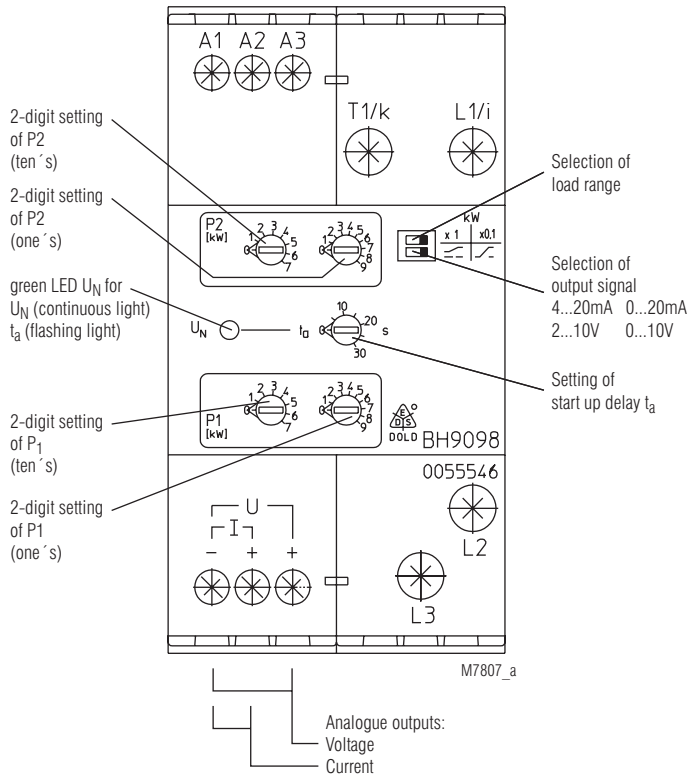
reduction of load range  $P_1$  and  $P_2$  by factor 10

Selection of output signal:

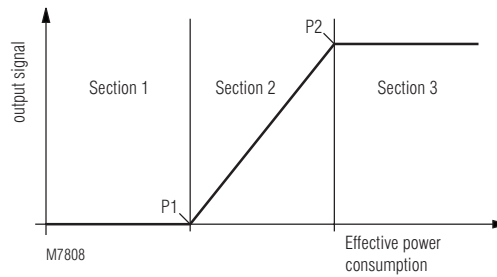
4 ... 20 mA	to	0 ... 20 mA
2 ... 10 V	to	0 ... 10 V

## 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.



The load characteristic shows 3 sections:



**Example 1**

The smaller value is adjusted on P<sub>1</sub>  
The higher value is adjusted on P<sub>2</sub>  
Standard setting: positive characteristic

- If the effective power consumption of the load is in section 1 between 0 W and P<sub>1</sub> setting the analogue output signal is on minimum value.
- If the effective power consumption of the load is in section 2 between P<sub>1</sub> and P<sub>2</sub> 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<sub>2</sub> setting and P<sub>max</sub> the analogue output signal is on maximum value.

**Example 2**

P<sub>1</sub> = 0 and P<sub>2</sub> = P<sub>max</sub>

- 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<sub>1</sub> = P<sub>2</sub>

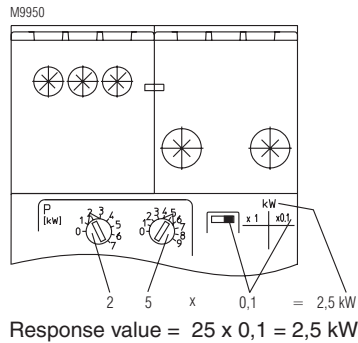
- If the **same** value is adjusted for P<sub>1</sub> and P<sub>2</sub> section 2 is missing, i.e. the output signal is either on minimum or maximum value. The unit works as limit switch.

**Example 4**

On P<sub>1</sub> the higher value is adjusted.  
On P<sub>2</sub> the lower value is adjusted.

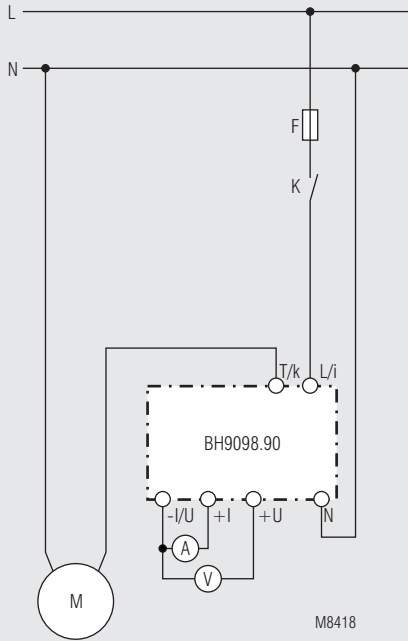
- Inverted output, negative characteristic

**Adjustment example: response value: 2,5 kW**

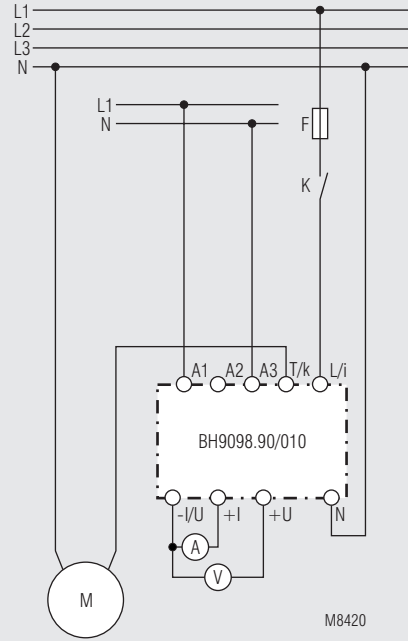


Connection Example

1-phase

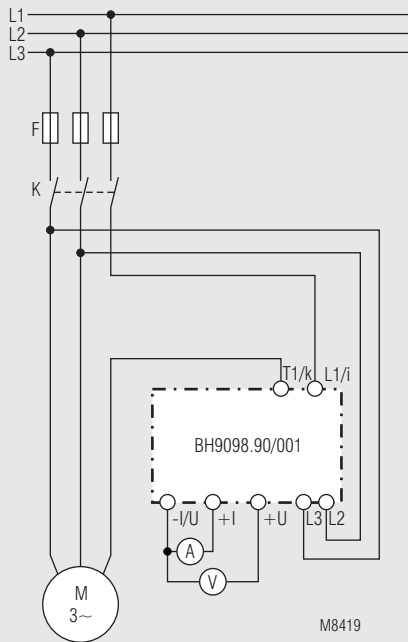


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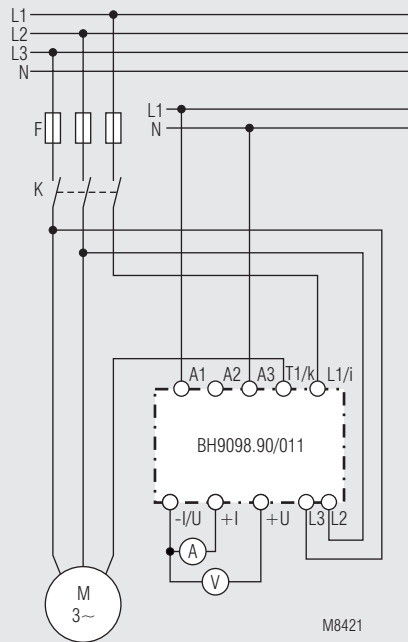


BH 9098.90/010

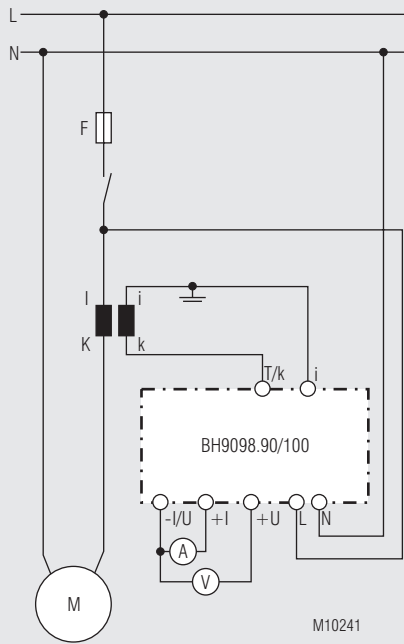
3-phase



BH 9098.90/001

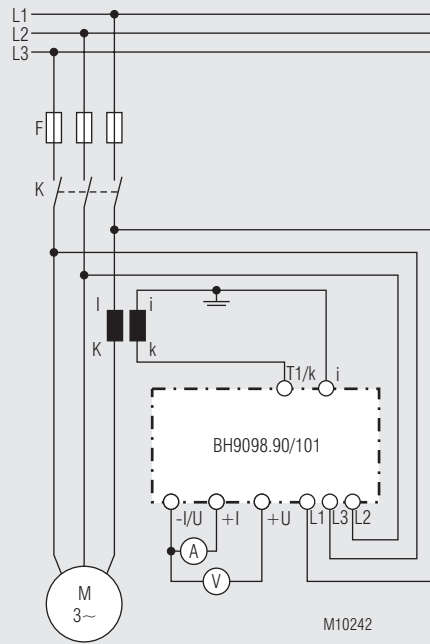


BH 9098.90/011



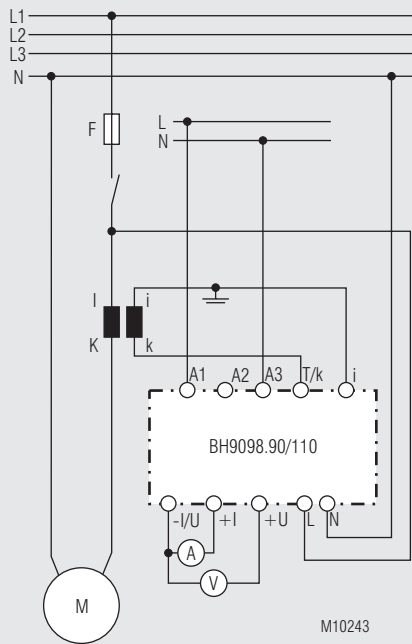
BH 9098.90/100

M10241



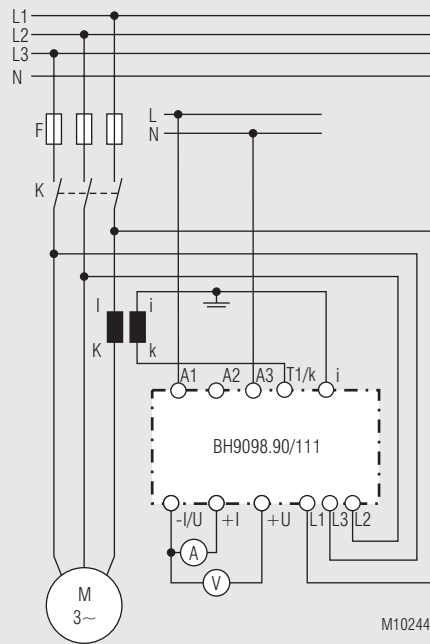
BH 9098.90/101

M10242



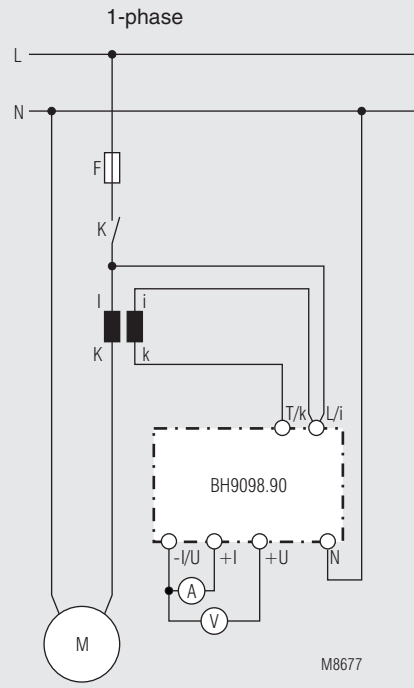
BH 9098.90/110

M10243

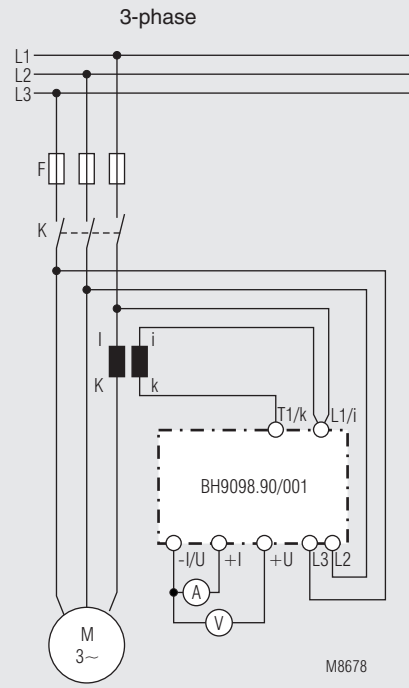


BH 9098.90/111

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)

