

MULTIFREQUENCY CURRENT INJECTION

MCI P-01

DATASHEET



EN
ELA T206.4 (04/2026)
Firmware: 1.1.04

Multifrequency Current Injection

Multifrequency current injection module (MCI) is designed for automatic tuning of arc suppression coils (ASC) using a new multi-frequency method. The principle is based on injecting a multi-frequency current signal into the auxiliary power winding of an arc suppression coil and evaluating the voltage response.

MCI allows tuning in networks with very low neutral point voltage or in networks with unstable voltage, where conventional method does not work reliably.

Information about network characteristics as detuning of the arc suppression coil comparing to the actual earth capacitance of the network or network damping are always displayed during the injection process. MCI module enables a cooperation with a superior controller (REG-DP(A)).

Function

The main function of the current injection is provided by semiconductor converter which generates several current components of different amplitude, frequency and phase shift. The individual generated current components are merged into one multi-frequency signal.

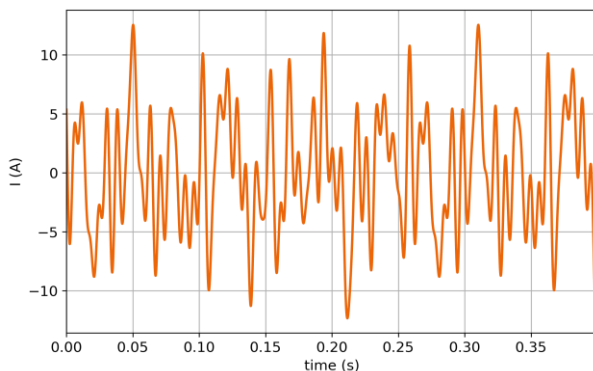


Figure 1: Current signal generated by MCI P-01

The resulting signal consists of up to 8 frequency components and it is injected into the power auxiliary winding (PAW) of the arc suppression coil. MCI measures voltage response of the network and it needs no additional voltage transformer. Using a mathematical model of arc suppression coil, parameters of a distribution network are calculated. The measured and calculated values provide information about the tuning status of the resonant circuit that is formed by the arc suppression coil and the network-earth capacitances.

MCI unit is primarily intended for cooperation with the superior REG-DP(A) controller via the serial interface RS-485 by MODBUS-RTU protocol. In case of communication loss, MCI can operate as an autonomous controller with limitations. Advantages of using REG-DP(A) controller together with MCI is well-arranged visualization of states, measured and calculated parameters of the distribution network and possibility of manual control and parameterization of MCI. MCI can be also connected to dispatching control system via REG-DP(A).

Inputs/outputs

MCI can be operated in two modes. In the first one, all the binary electrical commands for the adjustment of the arc suppression coil (Up and Down), limit switches and potentiometer states are directly connected to MCI. If the communication with REG-DP(A) is lost, MCI can maintain the arc suppression coil tuned thanks to implemented simple control algorithms. It is not a full replacement of the controller, because there is no direct communication with the control system, no human machine interface and no possibility to modify MCI parameters.

In the second mode, all the ASC commands and states are connected to the REG-DP(A) controller. If the communication of MCI with the controller is lost, MCI cannot operate, but the controller can use the resonance method for ASC tuning, which may not work reliably in all situations.

Measurement

All measurement circuits are implemented in the device, therefore MCI is not equipped with any measurement inputs for external measurements (converters, voltage and current transformers).

Communication

MCI is equipped with the RS-485 interface using a MODBUS-RTU protocol for communication with the superior system. MCI communicates in "SLAVE" mode. This connection is used for the transmission of control commands, states and measured values and parameterization.

Communication with superior system is possible through REG-DP(A) via protocols supported by regulator (e.g. standard IEC 60870-5-101/103/104, IEC 61850 and more)

Technical parameters

Power supply

Power voltage	230 V AC, +25%,-30%
Network frequency	50 Hz
Power consumption:	<160 VA
Internal fuse type:	T1A / 250 V
Insulation level:	4 kV, galvanically isolated circuit

Power circuit

Nominal voltage	500 V AC
Max voltage during injection	165 V rms
Network frequency	50 Hz
Nominal current	5 A rms
Frequency range of generated current components	15–160 Hz (8 frequency components)
Operation time (Duty)	Continuous/short-term

Binary inputs

Number of channels	4
Voltage level	230 V AC, 50 Hz
Overload capacity	120 %
Internal consumption	1.5 mA
Insulation level	4 kV

Binary outputs

Number of channels	4
Relay contact NO (SPNO)	3 x single pole
Relay contact NO/NC (SPDT)	1 x single pole
Max. switching voltage	250 V AC
Switching current	8 A AC
Insulation level	4 kV

Potentiometer input

Potentiometer resistance	150 Ω – 3 k Ω
Measuring voltage	5 V DC
Insulation level	4 kV

LEDs

Number of LEDs	6
Type	4x G/R 2x Y

Communication

System communication	2x RS-485 – FULL Duplex
Service communication	USB 2.0 type B

Ambient conditions

Ambient temperature (operation)	-25...+65 °C
Ambient temperature (storage)	-45...+85 °C
Relative humidity	< 95 % non-condensing

Design

Case	anodized aluminum
Case dimensions (W x H x D)	210 x 310 x 130 mm
Total dimensions (W x H x D)	260 x 360 x 141 mm
Mounting hole spacing	170 x 330 mm or 230 x 270 mm
Weight	10 kg
Mounting	panel mounting
Connectors	detachable, fixed with screws
Cooling	passive

Electrical safety

Degree of pollution:	2
Safety class:	I
Over-voltage category:	II
IP code	IP2X

Typical connection of REG-DP(A) and MCI

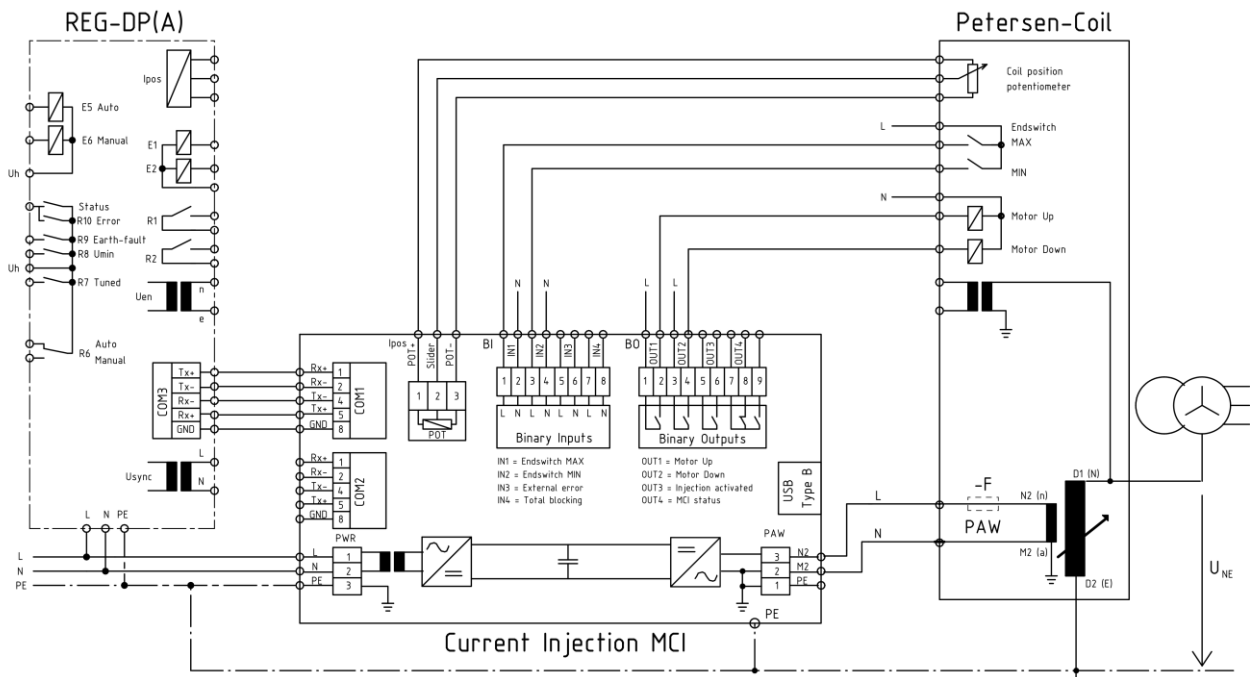


Figure 2: Typical connection for mode 1

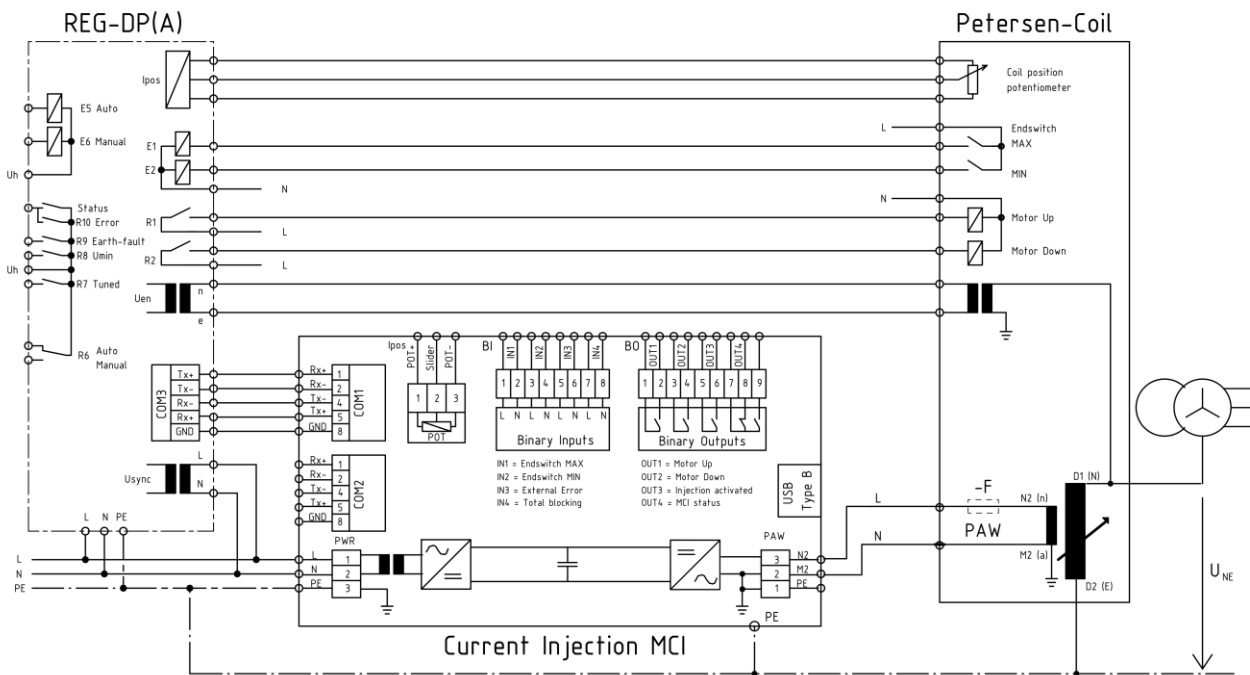


Figure 2: Typical connection for mode 1

It is recommended to use following cross-section of wires depending on length for connection of PAW connector to power auxiliary winding of ASC:

Wire length	< 10 m	< 20 m	< 50 m	< 100 m	< 200 m
Minimum cross-section	1.5 mm ²	2.5 mm ²	4 mm ²	6 mm ²	10 mm ²

It is not recommended to use wires longer than 200 m. Wires 1.5 mm² and 2.5 mm² are recommended only for installation inside of control box of ASC. Fuse according to the cable dimensioning.

Dimensions of MCI and mounting holes

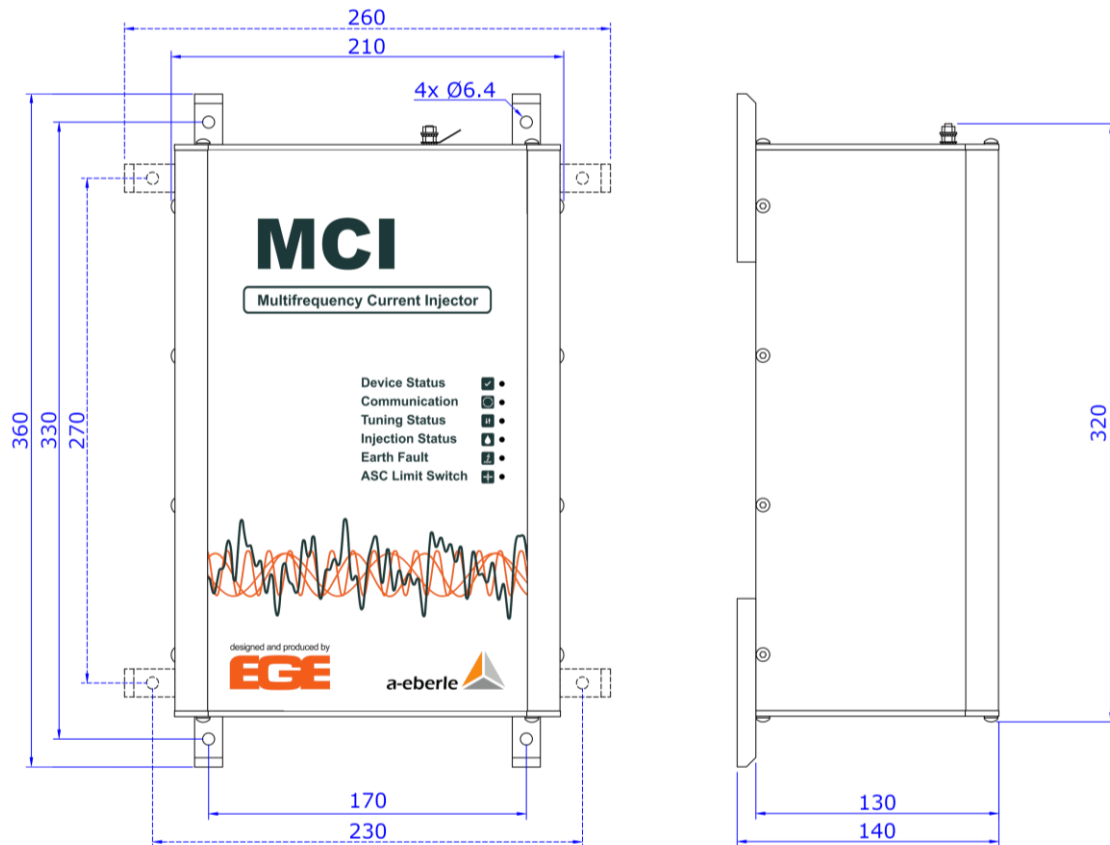


Figure 3: Basic MCI dimensions and layout of mounting holes

Connectors

Protective earth

The M4 earthing pin (screw) on the top of the case is provided for protective grounding of MCI. FASTON connector 6.3 mm is also possible to use.

Power supply – PWR

External fuse: ≥ 2 A, galvanically isolated circuit, RCD can be used.

Connector: conductor cross section min/max 0.7/2.5 mm²

Pin	Marking	Function/Polarity	Description
1	L	Phase conductor	
2	N	Neutral conductor	
3	PE	Protective conductor	

Power circuit output – PAW

External fuse: ≥ 10 A

Connector: conductor cross section min/max 1.5/2.5 mm²

Pin	Marking	Function/Polarity	Description
1	PE	Protective conductor	Internally connected to M2
2	M2	Neutral conductor	Internally connected to PE
3	N2	Phase conductor	

Binary inputs – BI

Connector: conductor cross section min/max 0.7/2.5 mm²

Pin	Marking	Function/Polarity	Description (Default)
1	IN1 - 1	L	Programmable (End switch – max)
2	IN1 - 2	N	
3	IN2 - 1	L	Programmable (End switch – min)
4	IN2 - 2	N	
5	IN3 - 1	L	Programmable (External error)
6	IN3 - 2	N	
7	IN4 - 1	L	Programmable (Total blocking)
8	IN4 - 2	N	

Binary inputs – BO

External fuse: ≤ 6 A AC

Connector: conductor cross section min/max 0.7/2.5 mm²

Pin	Marking	Function/Polarity	Description (Default)
1	OUT1 - COM		Programmable (Motor Up)
2	OUT1 - NO		
3	OUT2 - COM		Programmable (Motor Down)
4	OUT2 - NO		
5	OUT3 - COM		Programmable (Injection activated)
6	OUT3 - NO		
7	OUT4 - COM		Programmable (Status)
8	OUT4 - NC		
9	OUT4 - NO		

Potentiometer input – POT

Connector: conductor cross section min/max: 0.7/2.5 mm²

Pin	Marking	Function/Polarity	Default
1	POT+	Potentiometer +	
2	SLIDER	Potentiometer value	
3	POT-	Potentiometer -	

Service communication connector – USB

USB type B.

Pin	Marking	Function	Description
1	+5V	Supply	
2	D-	Data	
3	D+	Data	
4	GND	Reference potential	Internally connected to PE
5	Shield		Internally connected to PE
6	Shield		Internally connected to PE

Communication connectors – COM1, COM2

Connector: conductor cross section min/max 0.2/1.5 mm², MCI produced up to 2026: RJ45

Pin	Marking	Function
1	Rx+ (A)	Data IN
2	Rx- (B)	Data IN
4	Tx- (Z)	Data OUT
5	Tx+ (Y)	Data OUT
8	GND	Reference potential

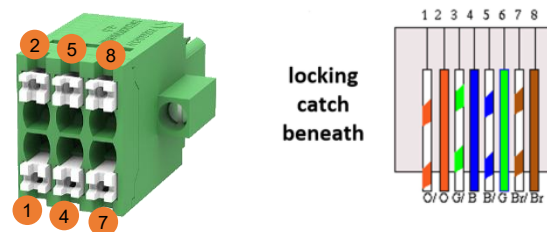


Figure 4: Communication connector for HW version >1.1 – left; RJ45 for HW version 1.0 (up to 2026) – right

Standard and laws

Ambient conditions

Cold	IEC/EN 60068-2-1 - 40 °C / 16 h
Dry heat	IEC/EN 60068-2-2 65 °C / 16 h
Damp heat, cyclic	IEC/EN 60068-2-30 55 °C / 6 cycles / 95 % rel. humidity, non-cond.
Composite cyclic test	IEC/EN 60068-2-38 10 cycles
Altitude	<= 2000 m
IP code	IEC/EN 60529 IP20

Vibration and seismic test

Vibration	IEC/EN 60255-21-1
Shock and bump	IEC/EN 60255-21-2
Seismic test	IEC/EN 60255-21-3

EMC

1MHz – burst disturbance	IEC/EN 60255-22-1 IEC/EN 61000-4-18 2,5kV asym., 1kV sym.
Electrostatic discharge	IEC/EN 60255-22-2 IEC/EN 61000-4-2 8kV contact, 15kV air
Radio frequency interference	IEC/EN 60255-22-3 IEC/EN 61000-4-3 80MHz - 1GHz / 10V/m 1,4GHz - 2,7GHz / 10V/m

Fast transient disturbance	IEC/EN 60255-22-4 IEC/EN 61000-4-4 4kV, 5kHz or 100kHz, 2kV (communication)
Surge immunity	IEC/EN 60255-22-5 IEC/EN 61000-4-5 4kV L-PE, 2kV L-L
Radio frequency interference	IEC/EN 60255-22-6 IEC/EN 61000-4-6 150kHz - 80MHz, 10V
Power frequency immunity	IEC/EN 60255-22-7 150 V common mode, 300 V differential mode
Voltage dips	IEC/EN 60255-11 IEC/EN 61000-4-11 IEC/EN 61000-4-29 IEC/EN 61000-4-17 1 cycle/ 20 ms
Power frequency magnetic field immunity	IEC/EN 61000-4-8 30 A/m continually, 300 A/m 3s
Ring wave immunity	IEC/EN 61000-4-12 4kV L-PE, 2kV L – L
Emissions	IEC/EN 60255-25

Safety

Safety requirements	IEC/EN 60255-27
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Figure 5: Installation example of MCI P-01 inside of the ASC control box.



Figure 6: Example of MCI P-01 in a separate box for additional instalation to ASC.