

DC Injection-brake modules

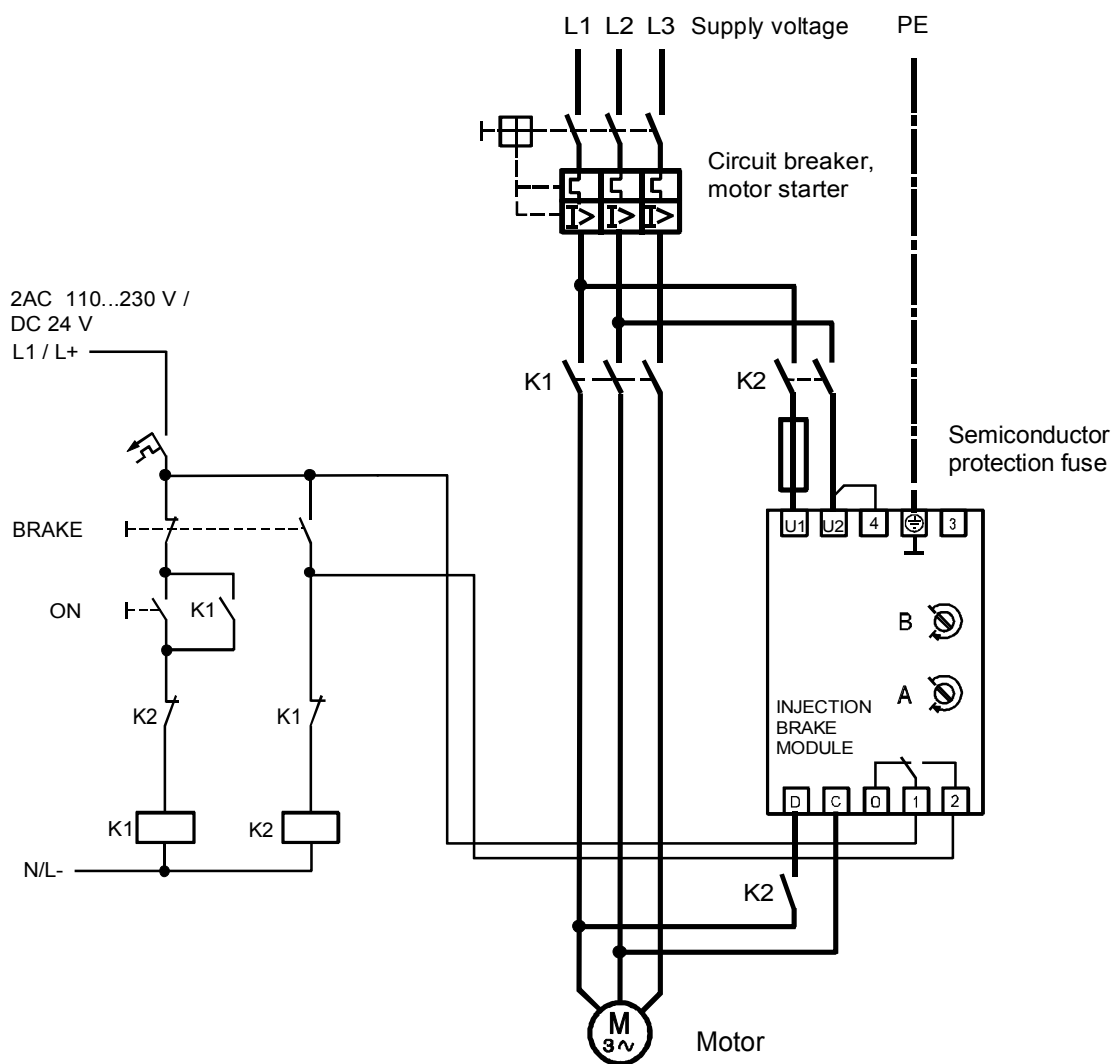


Instruction Leaflet

Size 0.25...2.2 kW
1.1...5.5 kW

RS stock no. 209-6384
209-6407

Figure 1 Recommended connection for use with induction motors with D/OL starting



General

RS DC Injection-Brake Modules provide a method of rapidly stopping production and machine tool processes smoothly. Designed to replace mechanical brakes these modules will brake 3 phase induction motors from 0.25 up to 5.5 kW in 2 module sizes. These compact DIN-rail mounted modules have the advantages of separate Braking Torque and Braking time-out adjustment; fast initiation of function, no maintenance requirements and simple connection.

Adjustment procedure

1. Set potentiometer A (Braking time-out) and potentiometer B (Braking torque), both fully counter clockwise.
2. Increase potentiometer B in a clockwise direction until the required braking performance is obtained by starting and stopping the motor.
3. Adjust potentiometer A until Braking Relay (MB) opens just after the motor has stopped (braking complete).

Note The above should be carried out for the maximum operational load that the motor is likely to experience with the motor at operating temperature.

Adjustment ranges

Designation, Meaning	Scaling	Explanation
B - Braking torque		Rated braking torque
A - Braking time-out		Electrical braking time

■ - Suggestion for initial setting (initial factory setting)
The above values are approximate values only

Control output

Signal	Terminals		Condition
	0-1	1-2	
MB- Momentary Signal "Braking"	open	closed	Braking
	closed	open	End of braking, no supply

Control input

Signal	Terminals		Condition
	U2 - 4		
BB -Command "Brake"	Inhibited	Enable	Caution, supply voltage

Isolated relay contact with rating AC 250 V, 2 A; 250 VA

Technical specifications

Electrical	RS Stock no. 209-6384	RS Stock no. 209-6407
Rated Voltage	2AC 400 V +10-15 %	
Rated Frequency	50/60 Hz ±2 %	
Rated Motor Power	2.2 kW	5.5 kW
Min. Motor Power	0.25 kW	1.1 kW
Max. braking current	11 A	30 A
Output voltage	DC 0...150 V	DC 0...150 V
Max braking duty* at max. braking current		
- side-by-side	10 %	3 %
- intermediate spacing 10 mm	15 %	5 %
EN 60947-4-2:		
- Utilization category	11 A: AC-53a: 1-10: 10-36	30 A: AC-53a: 1-10: 3-11
- Form designation	1 (any starting method with controlled braking)	1 (any starting method with controlled braking)
Overvoltage category to IEC 664-1 (1992)/ Rated insulation voltage to PE	III / AC 230 V only for use with TT/TN supplies with earthed neutral	
	II / AC 400 V	
Terminals	1.0...2.5 mm ² multistrand with end ferrules	
D style semiconductor protection fuse type gR, recommended RS Stock No. (for prospective short-circuit current up to 50 kA)	20 A 422-551	35 A 421-520

* Braking duty refers to the percentage of operating time the RS DC Injection-Brake Module is performing braking.

Environment	Permissible temperatures:	Operation: 0... +40 °C Storage: -25... +55 °C Transport -25... +70 °C
	Climatic conditions:	Class 3K3 to EN 60721-3-3 (5...85 % relative humidity). The cooling air must have little dust and be non corrosive and none flammable.
	Pollution:	Degree 2 to IEC 664-1 (1992): Dry non conducting dust or particles, infrequent light condensation when switched off permissible
	Altitude:	max. 2000 m NN above sea level, ≥ 1000 m: 1,5 % / 100 m power derating
Safety	Relevant standards:	EN 60947-4-2 (1996), prEN 50178 (1996)
	Protective class:	I to IEC 536 (1976) i.e. basic insulation with PE connection (protective earth). The user is responsible for the PE connection.
	IP Protection:	IP20 to EN 60529 (1991) Finger protection
	Signal and control terminals:	The control circuit is protected by basic insulation from the supply voltage. Any components connected to the control circuit (e.g. external push buttons) must be protected against direct contact by additional insulation.
Installation	Weight (approx.)	400 g
	Dimensions:	
	Height	75 mm
	Width	45 mm
	Depth	120 mm
General	Technical data subject to change without notice	

Planning the installation

Intended use:

RS DC Injection-Brake Modules are equipment to be mounted in a suitable enclosure (e.g. equipment cabinet) as part of a machine or electrical system.

The technical data as well as information concerning the supply conditions are to be taken from rating plate and from this data sheet and must be strictly observed.

Required braking current:

The motor powers referred to in the Technical data are for normal applications with a load inertia up to around 4 x that of the motor and with braking times of several seconds.

Voltage supply system:

To meet the requirements of the LOW-VOLTAGE DIRECTIVE **RS DC Injection-Brake Modules** may only be used with earthed neutral TT/TN supply systems

Short-circuit protection of controller:

Fast semiconductor fuses are required for protection of the **RS DC Injection-Brake Modules** against short circuits on the output terminals of the controller (see Technical Data).

Wiring protection:

Short-circuit and overload protection of the wiring corresponding to the size of cable used (e.g. as in EN 60439-1, EN 60204-1 for machines) must be provided for. A circuit breaker, motor starter, or additional fuses are required.

Thermal considerations:

RS DC Injection-Brake Modules are designed for continuous operation with motors up to the indicated maximum braking currents / duty cycles indicated in the Technical Data (check spacing).

Important ! Braking duty = $\frac{\text{Braking time}}{\text{Cycle time}}$

EN 60947-4-2:

EN 60947-4-2 is a standard for **RS DC Injection-Brake Modules** when used with squirrel-cage induction motors. Information on the following data must be provided:

- Utilization category: 30 A: AC-53a: 1-10: 3-11;
 with 11 A: Rated braking current I_B
 AC-53a: Braking operation (without bridging relay)
 1-10: Max. braking current $1 \times I_B$ for 10 s
 10-36: 10 % braking duty, 36 braking cycles
 per hour at maximum braking load
- Form designation: 1 i.e. any starting method with
 controlled braking

Combination with soft-start modules:

All **RS DC Injection-Brake Modules** can be combined with RS Snatch-Free Soft-Start Modules RS (Stock number 209-6356 and 209-6362) or RS Soft-Start Modules (Stock No. 212-8683 and 212-8699). Suitable connection suggestions are shown in Fig. 2.

Interference suppression:

When opening contactor or relay coils, or electric brakes, high energy R.F. interference can occur. In extreme conditions this can result in a malfunction of the **RS DC Injection-Brake Modules**. For this reason the coils should be fitted with suitable interference suppressors:



- DC coils: Suppressor diodes
- AC coils: RC-suppressors

Obtaining maximum immunity:

Control inputs and outputs should be wired as short as possible and away from supply, motor or control cables which could carry significant interference. A direct connection to equipment external to the metal enclosure should not be made.

Safety:

RS DC Injection-Brake Modules are very reliable due to the relatively small number of electronic components used. However it is not permissible that the safety of persons, machines or other equipment depends on the correct function or adjustment of the controller. Additional means of providing the required safety must be provided for. (e.g. fail-safe brakes, overspeed grabs etc.).

 Warnings and safety information 
<p>In operation RS DC Injection-Brake Modules, depending on their degree of protection, may have live, uninsulated and hot surfaces.</p> <p>In case of improper use, incorrect installation or mal-operation, there is a danger of serious personal injury and damage to property.</p> <p>These RS DC Injection-Brake Modules can effect the movement of dangerous machinery or moving constructions. The following safety precautions must be taken before commissioning:</p> <ul style="list-style-type: none">● Provide adequate means of preventing persons from coming within the dangerous areas of machinery or moving constructions● Verify that all measures to comply with the EMC DIRECTIVE are complied with.● Verify if all requirements of the LOW-VOLTAGE DIRECTIVE are adhered to.● Verify that all requirements of the MACHINERY DIRECTIVE are adhered to and that safety-relevant equipment (e.g. EMERGENCY STOP) is functioning correctly. <p>The successful and safe operation of this equipment is dependent on proper transport, storage, planning and as installing well as commissioning. Hazardous voltages are present in this electrical equipment during operation.</p> <p>Equipment showing transport or other damage, or with insulating distances altered must not be used.</p> <p>Never operate with the cover removed. Non-observance of the warning or safety instructions can result in severe personal injury or property damage.</p> <p>Only <i>qualified trained persons</i> may work in an enclosure on or near these controllers. For the purpose of this documentation a "<i>qualified trained person</i>" is one who is familiar with the technical data, recommendations for planning and installing, commissioning instruction and recommended connections contained herein and the hazards involved. In addition, this person has the following qualifications:</p> <ul style="list-style-type: none">- Is trained in the requirements to comply with the EMC DIRECTIVE- Is trained in the requirements to comply with the LOW-VOLTAGE DIRECTIVE- Is trained in the requirement of the MACHINERY DIRECTIVE (e.g. EN 60204-1)- Is trained and authorized to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety practices- Is trained in the appropriate wiring and installation regulations including local regulations where applicable.- Is trained in the proper care and use of protective equipment in accordance with established safety practices- Is trained in rendering first aid <p>Suitable standards (IEC 364 or CENELEC 384 or DIN VDE 0100 and IEC-Report 664 or DIN 0110) are to be used to establish if a person is suitably qualified.</p>

EC directives and regulations

'CE' marking

The 'CE' marking of the **RS** DC Injection-Brake Modules is at the date at which this Product Manual is issued valid for the EEC DIRECTIVES

- 89/336/EEC EMC DIRECTIVE
- 73/23/EWG LOW-VOLTAGE DIRECTIVE

Manufacturers of apparatus and machines sold as functional units are wholly responsible for issuing a Declaration of Conformity and applying the 'CE' mark.

EMC directive

RS DC Injection-Brake Modules are components with a function which is determined by the construction and layout of the complete installation. It is the responsibility of user to ensure that the EMC DIRECTIVE is adhered to. The following standards are particularly relevant:

- Product Standard for AC semiconductor motor starters (also valid for braking equipment): EN 60947-4-2 (1996)
- RF Interference: EN 55011
- Immunity: EN 61000-4-2/-3/-4/-5

Declaration of Conformity:

A Declaration of Conformity declaring conformance of these **RS** DC Injection-Brake Modules with the EMC DIRECTIVE based on the Product Standard EN60947-4-2 which references the above standards for RF Interference and Immunity is available on request. Particular reference should be made to the instructions for planning the installation concerning interference suppression and immunity.

During continuous operation Interference Limit B for use in residential, commercial and light industry supplied directly from public electricity supply (including public buildings, banks, hospitals etc.) is adhered to.

Other important information:

The user should be conversant with the following issues:

- EMC 'CE' Responsibility, and in particular the CEMEP recommendations for application of the EMC DIRECTIVE to electronic power drive equipment
- Limit values of permissible EMC interference when used in:
 - Residential areas (Class B)
 - Industrial areas with own transformer station (Class A)
- Responsibility of manufacturers of apparatus and machines sold as complete functional units

Low-voltage directive

It is the responsibility of the user to ensure that the complete installation adheres to the LOW-VOLTAGE DIRECTIVE. The following standards should be considered as is appropriate:

- Product Standard for AC semiconductor motor starters (also valid for braking equipment): EN 60947-4-2 (1996)
- Installation with power electronic equipment: prEN 50178 (1996)
- Installation regulations in electrical enclosures: EN 60439-1
- Electrical equipment of machines: EN 60204-1

Declaration of Conformity:

A Declaration of Conformity declaring conformance of these soft-start modules with the LOW-VOLTAGE DIRECTIVE based on the product standard EN 60947-4-2 (1996) and prEN 50178 (1996) is available on request. Particular reference should be made to the Technical Data and to the instructions for planning the installation.

Machinery directive

RS DC Injection-Brake Modules are components to be incorporated into machinery and may not be operated alone. A Manufacturer's Declaration is available on request. Pay particular reference to the following standard:

- Electrical equipment of machines EN 60204-1

Disposal

During transport, our products are protected by packaging as far as necessary. The packaging consists entirely of environmentally compatible material that should be taken for central disposal as valuable secondary raw materials.

Contact the relevant Local Authority department to find out about disposal, including disposal of old appliances.

Table for fault finding

Fault	Possible cause	Cure
1. Not enough braking torque	<ul style="list-style-type: none"> • Adjustments not suitable • Motor not suitable for d.c. injection braking 	<ul style="list-style-type: none"> - Turn potentiometer B for braking cw - Check braking time-out A. Increase time by turning ccw if necessary. - Change motor, the next frame size may help
2. Frequent failures of brake module with damaged power semiconductors	<ul style="list-style-type: none"> • Short circuit due to connection fault 	<ul style="list-style-type: none"> - Verify correct function of interlocks for motor and braking contactors. Compare with recommended connections. Caution with software interlocks.
3. Controller suspected to be faulty (e.g. following a short circuit)	<ul style="list-style-type: none"> • Power semiconductors damaged. Check the terminals do not have a short circuit using a Ω-meter. 	<ul style="list-style-type: none"> - Return controller to supplier
4. Everything tried without success		<ul style="list-style-type: none"> - Send circuit diagram of application and potentiometer settings by fax to your supplier

Figure 2 **Alternative connection for use with induction motors with d.o.l. starting**

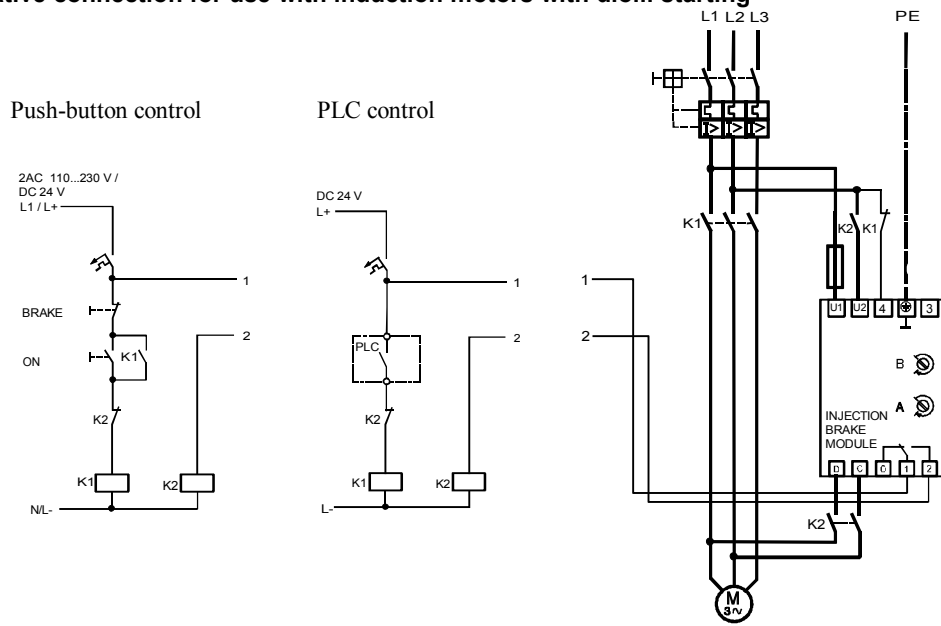


Figure 3 **Alternative connections without a braking contactor (only suitable for fractional-horsepower motors)**

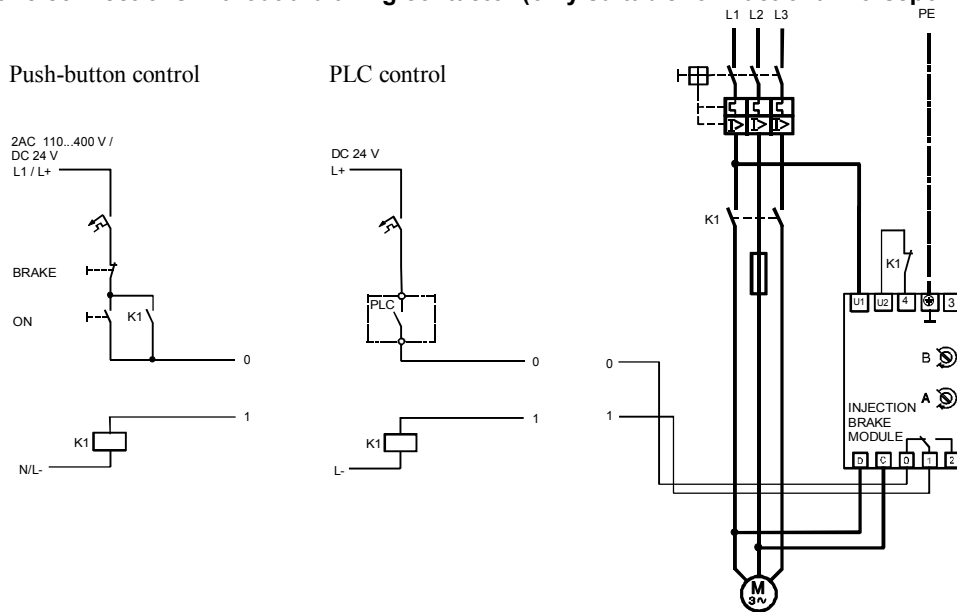


Figure 4 **Recommended connection combined with star-delta starting**

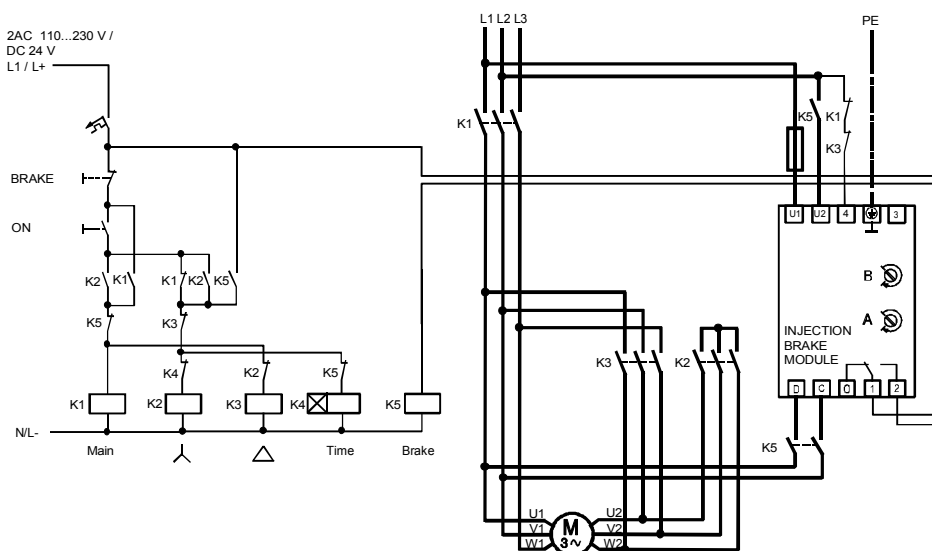


Figure 5 Recommended connection as combined soft-start and injection brake using RS Soft-Start Modules 212-8683 and 212-8699

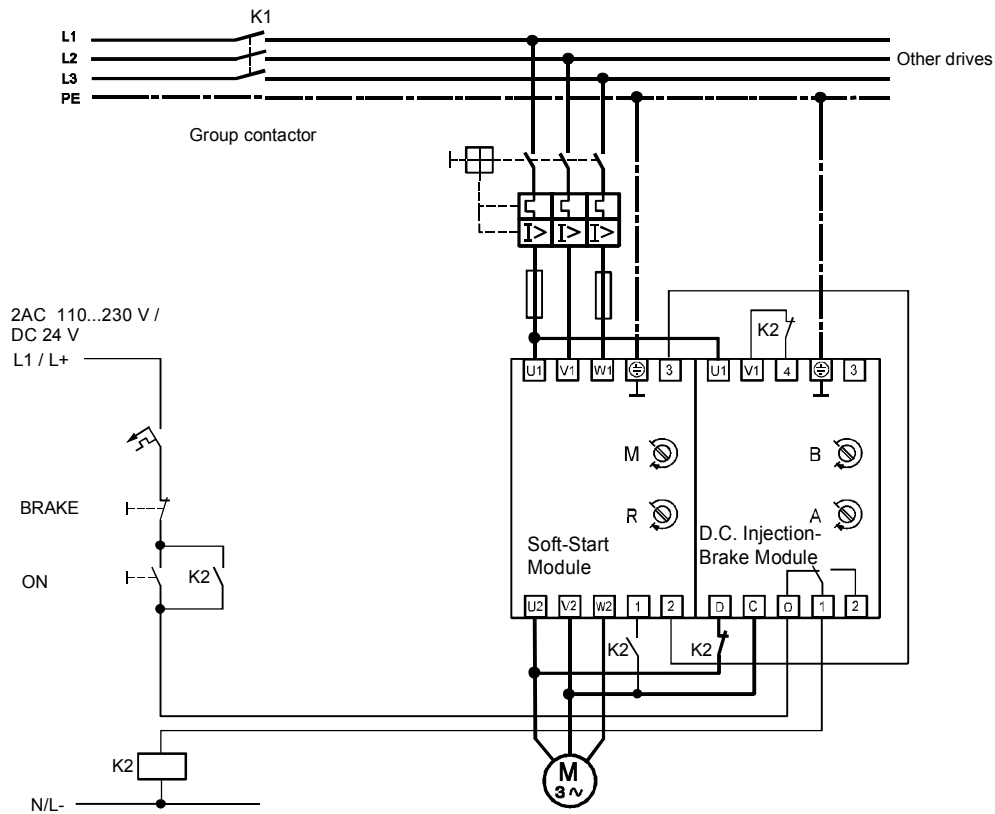
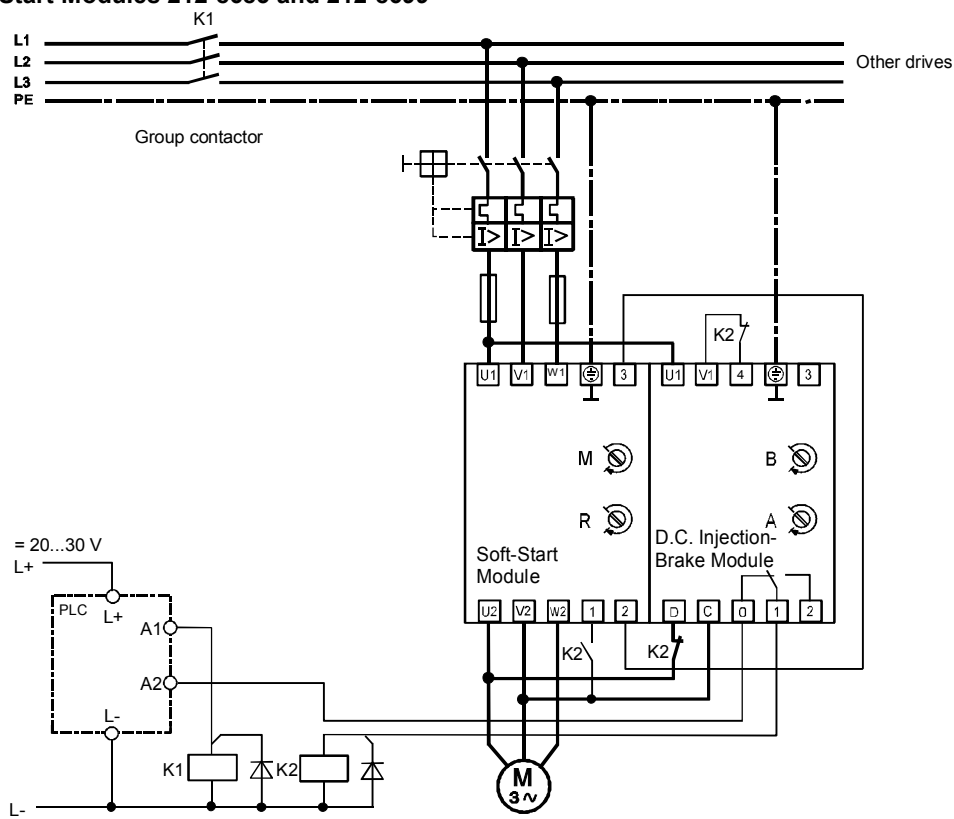


Figure 6 Alternative connection with PLC-control as combined soft-start and injection brake using RS Soft-Start Modules 212-8683 and 212-8699



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