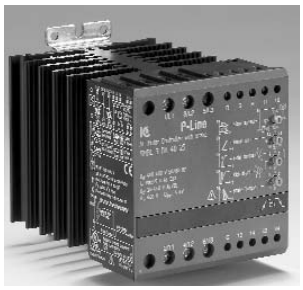
Soft Starter with Dynamic Brake (SMBC 3 two controlled phases)



- Rated operational voltage up to 480VAC 50/60Hz
- Rated operational current 1-25A
- Output signal for By-Pass and control of mechanical brake
- Ramp Up time and initial torque adjustable with kick start
- Adjustable Brake current
- Automatic stop detection
- Fast action brake mode with automatic motor field reduction
- Meets EN 60947-4-2 requirements

Item selection and technical specifications (see also motor table at page 11)

Load ratings AC-53a without by-pass AC-53b with by-pass	Item number by 208-240VAC 50/60Hz Line Voltage	Item number by 400-480VAC 50/60Hz Line Voltage		Ramp-Up / Brake-adjustment	Torque adjustment	Module-width
25A AC-53a	SMBC 3 DA 2325	SMBC 3 DA 4025		Ramp-up time 0.5 - 10 sec.	0- 85% adjustable of norminal torque with selectable kick start 200ms (break loose function)	90mm
30A AC-53b w. by-pass		SMBC 3 DA 4025		Brake current 0-50ADC.		90mm

Load specified with utilisation category AC-53a

SMBC 3 DA XX25 AC-53a: No by-pass contactors is nessesary during running

Load specified with utilisation category AC53b

SMBC 3 DA 4025 AC-53b: By-pass contactor shall be used for bypassing the soft starter during running of the motor by 30A/15kW 400V load

Output load specification

SMBC 3 DA XX25 (without by-pass contactor)	More info. page 37
Overload current profile AC-53a	X-Tx:8-3 : 100-3000
Overload relay trip class AC-53a	10 or 10A
Leakage current	5mA ACmax.

SMBC 3 DA XX25 (with by-pass contactor)	More info. page 37
Overload current profile AC-53b	X-Tx:6-5 : 100-120
Overload relay trip class AC-53b	10 or 10A
Min. operational current	1A

Control terminal specifications

Control voltage by line voltage 208-240VAC **A1-A2**	24 - 230 VAC/DC
Control voltage by line voltage 400-480VAC **A1-A2**	24 - 480 VAC/DC
Pick-up voltage max.	20.4 VAC/DC
Drop-out voltage min.	5 VAC/DC
Max. control current for no operation	1mA
Response time max.	100msec.
Control current / power max.	15mA / 2VA

AC Auxiliary contacts

Output specifications for SMBC 3 DA XXXX BP

Terminal: 13-14, AC SCR output for start/stop function,
Terminal: 23-24, AC SCR output for connection of by-pass contactor.

Output specifications: SCR: 0.5A AC-14, AC15 24-230/480V 50-60Hz
Fusing:gl/gG Max i^2t 72A^2Sr

Terminal: 11-12, have no connection with the internal circuit. Can be used in conjunction with a thermal overload protection or for other wiring purposes. See under general technical information.

Thermal specification

Power dissipation for continuous operation PDmax	2W/A without BP
Power dissipation with semiconductor by-passed	4 W Max.
Cooling method	Natural convection
Mounting	Vertical +/-30^o
Operating temperature range EN 60947-4-2	-5^{o}C to 40^{o}C
Max. operating temperature with current derating	60^{o}C
Storage temperature EN 60947-4-2	-20^{o}C to 80^{o}C

Operation in ambient temperatures exceeding 40^{o}C is possible if the power dissipation is limited either by reducing the steady-state current or by reducing the duty-cycle of the soft starter as shown in the table. Max.cycle time 15min.

By 40^{o}C	By 50^{o}C	By 60^{o}C
100% load Duty-cycle 100%	80% load Duty-cycle max. 0.8	70% load Duty-cycle max. 0.65

Insulation specifications

Rated insulation voltage	Ui 660 Volt
Rated impulse withstand voltage	Uimp. 4 kVolt
Installation catagory	III

Approval

cUL Std No. 508 / CAN/CSA-C22.2

UL:Use thermal overload protection as required by the National Electric Code. When protected by a non-time delay K5 or H Class fuse, rated 266% of motor FLA, this device is rated for use on a circuit capable of delivering not more than 5,000 rms. symmetrical amperes, 600 V maximum. Maximum surrounding temperature 40°C.

Environment

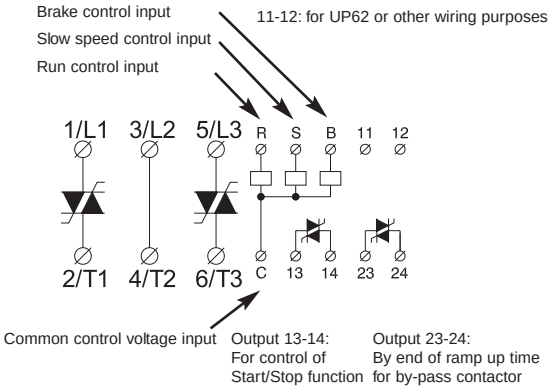
Degree of protection	IP 20	Pollution degree	3

EMC

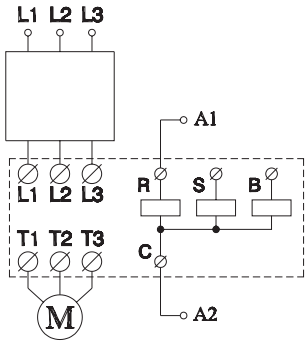
This component meets the requirements of the product standard EN60947-4-2 and is CE marked according to this standard.
This products has been designed for class A equipment. Use of the product in domestic environments may cause radio interference, in which case the user may be required to employ additional mitigation methods.

Soft Starter with Dynamic Brake (SMBC 3 two controlled phases)

Wiring diagram

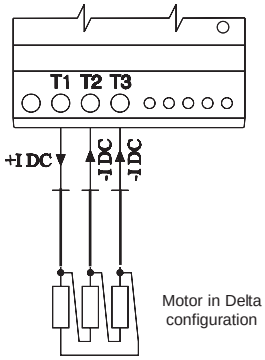


Wiring example: automatic brake to stop function



Set Ramp-Up and Initial Torque adjustments for best start-up function. Adjust brake torque to reach a complete stop after each working cycle

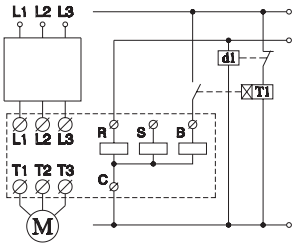
Wiring example: DC brake current configuration



To achieve maximum brake torque the DC current is applied on all 3 motor windings.
Direction of current is from T1 to T2 and T3.

Do not open any switches in the DC current path during the braking cycle as this might cause severe burning of the contacts.

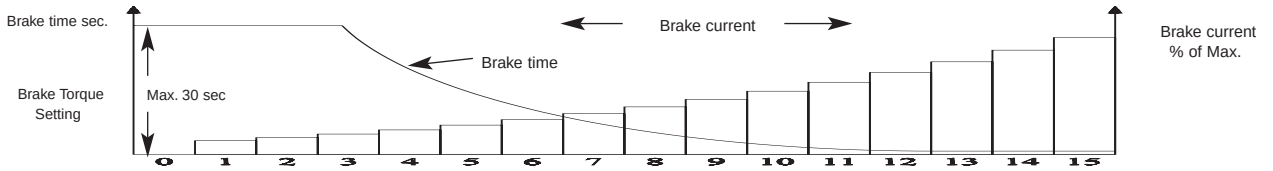
Wiring example: Timer controlled brake cycle



If the application only can accept a low braking torque below the sensing range of the stop detection it is possible to connect an external "delay on" operate timer to the Brake control input.

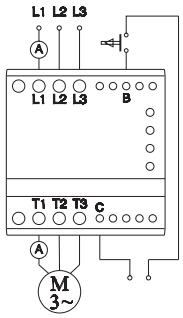
Functional description:
When control relay d1 and Run input is switched off timer T1 will activate the Brake input for the adjusted time.

Adjusting the brake current (connexion between brake torque, setting, brakecurrent and braketime)



When the Brake current is set it is actually a DC voltage that is adjusted. The current is therefore depending on the ohmic resistance of the windings and the actual connection of the motor (Delta).
For small motors a high DC voltage is necessary and for bigger motors a low voltage can produce sufficient brake current. Therefore the brake current must be adjusted for the actual application.
Before start-up of an unknown application set the Brake Torque adjustment to 1. Increase until the desired stop time is achieved.
If it is impossible to reach a time long enough for the application an external timer must be connected. See also application information next page.

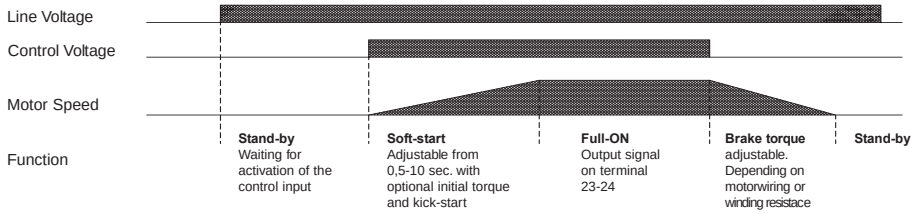
Automatic stop detection



The motor speed is detected by sensing the DC brake current. As this controller can operate a wide range of motors with different wiring configurations, the ohmic resistance of the actual motor has a wide range, it is therefore necessary to adjust the "Brake Torque" (DC Brake current) to achieve correct function in the actual application.
If the current is set to a low value the brake will be switched off before the motor has come to a complete stop. If the current is set too high, it will be out of the detection range and cannot be switched off before end of the build-in maximum time (30 sec.).
The LED's will flash to indicate failure condition. The mains must be switched off and reapplied to reset this condition

CAUTION ! For bigger motors the current can be adjusted to a value that will destroy the controller or open the circuit breaker or fuse.
Before start-up of an unknown application set the Brake Torque adjustment to 1. To measure the Brake current activate the Brake Control input.
The DC brake current can be measured on the out put of T1 only. The AC value of the Brake current can be measured in L1 or L2. The DC current is approx. 1,5 times the AC current.

Functional diagram



Basic application.

When the control voltage is applied the motor will soft-start. When the control voltage is switched off the automatic Brake cycle will operate. The application shall be overload- and shortcircuit protected by fuses or circuit breaker.

Continues on the next pages

Application, adjustment hints and general specifications for SMBC 3

Short-circuit protection by circuit breaker or fuses

Two type of short-circuit protection can be used:
a) Short-circuit protection by circuit breaker.
b) Short-circuit protection by fuses.

Short-circuit protection is divided into 2 levels **Type 1 or Type 2**

Co-ordination Type 1: Short-circuit protects the installation

Co-ordination Type 2: Short-circuit protects the installation and the semiconductors inside the motor controller

a) Short-circuit protection
Co-ordination type 1 will be obtained when using magnetic circuit breakers or standard gl/Gl fuses.
Co-ordination type 2 will be obtained when using semiconductor fuses.
When using semiconductor fuses the SCR will not be damaged due to transients and short circuits. The table indicates suitable fuses for co-ordination type 2 protection.

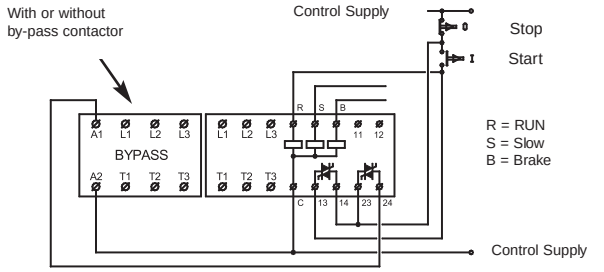
a1) Short-circuit protection by circuit breaker (continued)
It is recommended to overload protect the soft starter by a manual motor starter which is insensitive to the unbalanced operation condition during braking operation. The motor is thus protected also during the brake cycle. The manual motor starter will also short-circuit protect the Controller if prospective short-circuit limits are observed (Co-ordination 2.)
NOTE: Due to the integral brake function the motor is overload protected during the brake cycle. The phase unbalance in this mode might trip an overload relay with high sensitivity to phase unbalance.
Danfoss CTI 25 is not sensitive to unbalanced loads.

b) Short-circuit protection by fuses

Type 1: SMBC 3 DA XX25 — Protection max. 80 A gL/gG 63A T
Type 2: SMBC 3 DA XX25 — Protection max. I2t of the fuse 1800 A2S

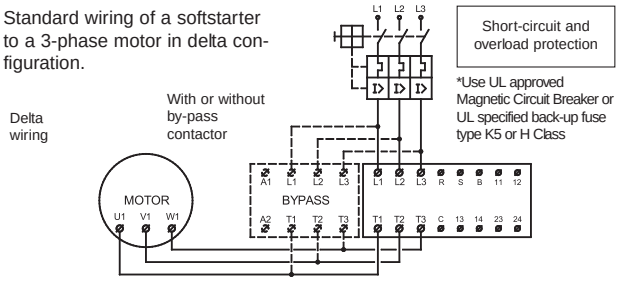
Fuses from e.g. Ferraz, Siba, Bussmann can be used as short-circuit protection Type 2
More information concerning Co-ordination Type 2 see page 37

Wiring example (Start/Stop with or without By-pass contactor)

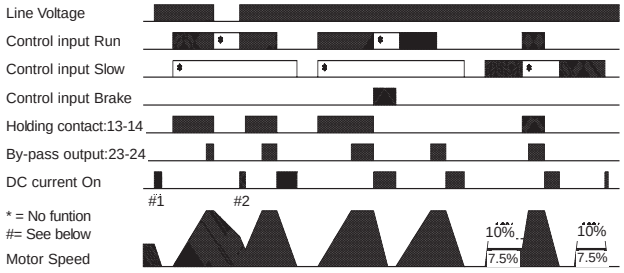


Motor wiring with or without by-pass

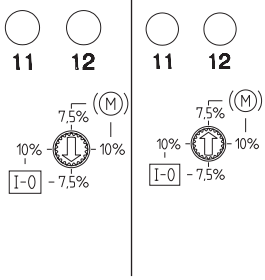
Standard wiring of a softstarter to a 3-phase motor in delta configuration.



Functional diagram of start-stop/control/by-pass contator



Setting of the operation mode selector

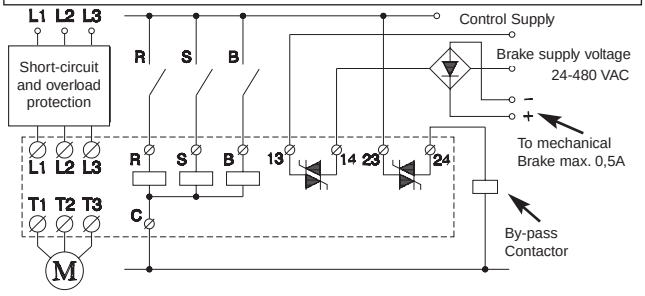


NOTE:

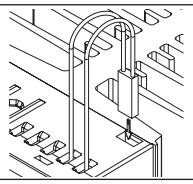
When terminal 13-14 is used as Start/Stop function:
Set the selector in position I-0
(7.5% or 10% if slow speed is used)

When terminal 13-14 & 23-24 is used as brake control:
Set the selector in position M
(7.5% or 10% if slow speed is used)

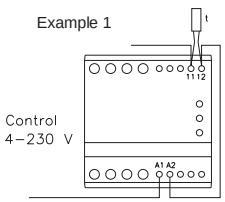
Control of mechanical brake and by-pass contactor



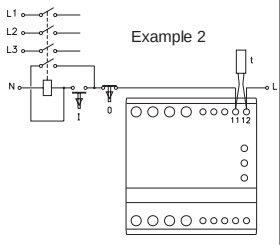
Thermal overload protection (see also page 36)



Optional thermal overload protection is possible by inserting a thermostat in a slot on the right hand side of the soft starter. Type number UP62

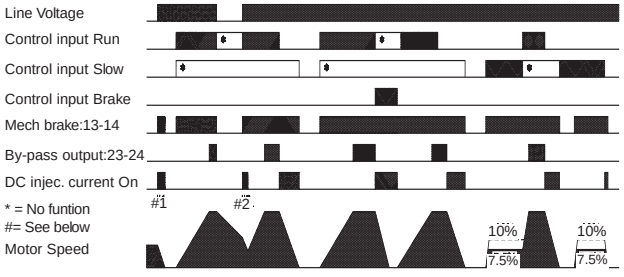


The thermostat can be connected in series with the control circuit of the soft starter.
When the temperature of the heatsink exceeds 90°C the soft starter will switch Off.
Note:
When the temperature has dropped approx. 30°C the soft starter will automatically be switched on again.



The thermostat is connected in series with the control circuit of the main contactor.
When the temperature of the heatsink exceeds 90°C the main contactor will switch Off.
Note: A manual reset is necessary to restart this circuit.

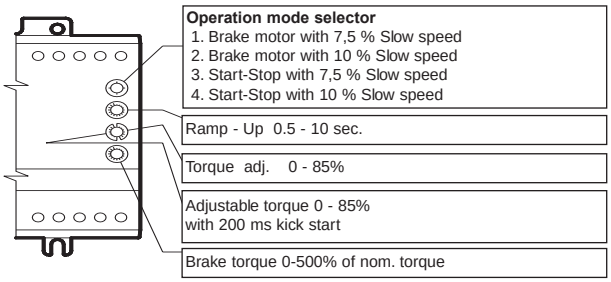
Functional diagram of mechanical brake/by-pass contact.

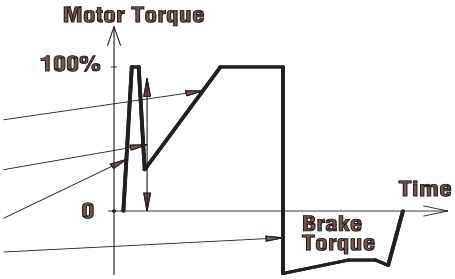


Note: #1. If the motor is running when the soft starter is switched On, the Auto Brake mode will stop the rotation.
Note: #2. With "RUN" signal present on Power-Up the soft starter will start the motor.

Application, adjustment hints and general specifications for SMBC 3

How to adjust ramp time, initial torque and brake torque





A. Standard load with automatic brake cycle

A1) Set the *Ramp-Up* switch to maximum.

A2) Set the *Brake Torque* switch to 1

A3) Set the *Initial Torque* switch to minimum.

A4) Apply control signal for a few seconds.
If the load does not rotate immediately increment the *Initial Torque* and try again. Repeat until the load starts to rotate immediately on start-up.

A5) Adjust *Ramp-Up* time to the desired starting time (scale is in seconds) is obtained.

A6) Adjust *Brake Torque* until the desired stop time is obtained
Note. If the current is set too high, the zero speed detect will not function.
If the current is set too low, the zero speed detect will not function.
To achieve a longer braking time an external timer must be installed as shown in application example page 15

B. High inertia loads with stiction

If it is not possible to reach a smoth start for an application it might be it may be necessary to kick-start / Break loose function.

B1) Set the *Ramp-Up* switch to maximum.

B2) Set the *Brake-Torque* switch to 1.

B3) Set the *Initial Torque* switch to minimum in the *Kick-start* mode.

B4) Apply control signal for a few sec. If the motor stops right after the 200 ms "kick" increment the *initial torque* and try again. Repeat until the load continues to rotate after the "kick".

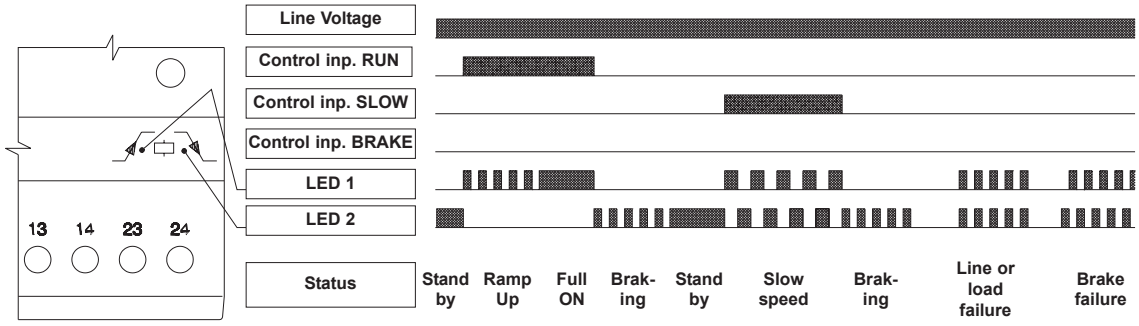
B5) Adjust *Ramp-Up* time to the desired start time (the scale is in seconds) and start the motor.

B6) Adjust *Brake Torque* until the desired stop time is obtained

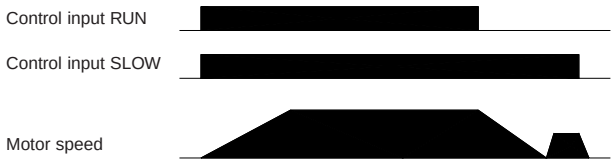
LED information:
Note: When both LED's are flashing, no connection to the motor

Please note:
a) The Soft Starter will read time and torque settings in stand by mode i.e. after the Brake cycle. Repeated starts may trip the motor protection relay.
b) Make sure NOT to set the rotary switches in between positions as this corrupts the time and torque adjustment. Use screwdriver 2 mm x 0.5 mm
c) Caution: Set the Brake Torque switch to 1, before switching the controller ON
CAUTION!
For bigger motors the Brake Torque can be adjusted to a value that will destroy the controller or open the circuit breaker or fuse. Only increase Brake Torque in single steps for an unknown application.

LED status indication



Slow speed-operation (funtional diagram)



The Slow speed option is intended for short time operation in applications where an exact positioning is needed, for example cranes. The motor operates at full speed until the application reaches the early limit switch, where the motor is braked until stop is detected, then it will continue until final position and brake down to stop in the exact position. There is 2 selectable speeds 7,5 % and 10 % of nominal speed. **NB.Torque levels are lower than nominal torque.** In slow speed 7,5 % mode the operational current in L2 is approx. 2.5 times the nominal current. In slow speed 10 % mode the operational current in L2 is approx. 2 times the nominal current but with lower torque.
Note: RUN input signal has priority over SLOW input signal. If Brake Torque is adjusted to "0" Slow speed will be ignored.

Mounting and cable wiring information

Mounting information see page 36 / Cable wiring see page 37

Dimensions (se also page 36)

Type	H	D	W
90 mm module	94 mm	128.1 mm	90 mm