Data sheet

CI-tronic™ soft starters
for Danfoss commercial compressor applications
Type MCI 15/25 C

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CI-tronic™ soft starters type MCI 15/25 C

for Performer® scroll and Maneurop® reciprocating compressors

Introduction

The MCI compressor soft starters are designed for soft starting of 3 phase compressors. During start the MCI will gradually increase the voltage to the motor until it reaches full line voltage.

The soft start ramp-up time and initial start torque is preset to ensure a fast start and allow easy and quick installation.

MCI compressor soft starters are ideal for use on Danfoss Performer scroll and Maneurop Reciprocating compressors. The starting current can be reduced by up to 40% of the direct on line value.

Features

- Universal control voltage: 24 - 480 V ac/dc
- Automatic detection of missing phases
- LED Status indication.
- Automatic adaptation to 50/60 Hz
- Easy and quick installation
- Up to 12 start/stop operations per hour
- Built in varistor protection
- IP 20 Protection
- Compact modular design
- DIN rail mountable
- Ramp-time max. 0.4s (factory set-up)
- EN 60947-4-2

Product marking

	Side marking	Front marking
MCI 15 C		
MCI 25 C		

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for Performer® scroll and Maneurop® reciprocating compressors

**Soft starter
selection guide**

Performer® compressors

Motor voltage code 4, 400 V - 3 phase - 50 Hz / 460 V - 3 phase - 60 Hz

Compressor model	Soft starter type Ambient temp. max +40°C	Soft starter type Ambient temp. max +55°C
SM/SZ 084	MCI 15C	MCI 15C
SM/SZ 090	MCI 15C	MCI 15C
SM/SZ 100	MCI 15C	MCI 25C
SM/SZ 110	MCI 15C	MCI 25C
SM/SZ 115-125	MCI 25C	MCI 25C[1]
SM/SZ 120	MCI 25C	MCI 25C[1]
SM/SZ 160	MCI 25C	MCI 25C[1]
SM/SZ 161	MCI 25C	MCI 25C[1]
SM/SZ 175-185	MCI 25C	MCI 25C[1]

[1] The controller must be by-passed in steady state mode. See application example page 8.

Maneurop® compressors

Motor voltage code 4, 400 V - 3 phase - 50 Hz / 460 V - 3 phase - 60 Hz

Compressor model	Soft starter type Ambient temp. max +40°C	Soft starter type Ambient temp. max +55°C
MT/MTZ 18-22	MCI 15C	MCI 15C
MT/MTZ 28	MCI 15C	MCI 15C
MT/MTZ 32	MCI 15C	MCI 15C
MT/MTZ 36	MCI 15C	MCI 15C
MT/MTZ 40	MCI 15C	MCI 15C
MT/MTZ 44-50	MCI 15C	MCI 15C
MT/MTZ 45-51	MCI 15C	MCI 15C
MT/MTZ 56	MCI 15C	MCI 15C
MT/MTZ 57-65	MCI 15C	MCI 15C
MT/MTZ 64	MCI 15C	MCI 15C
MT/MTZ 72-73-80-81	MCI 15C	MCI 25C
MT/MTZ 100	MCI 25C	MCI 25C[1]
MT/MTZ 125	MCI 25C	MCI 25C[1]
MT/MTZ 144	MCI 25C	MCI 25C[1]
MT/MTZ 160	MCI 25C	MCI 25C[1]

[1] The controller must be by-passed in steady state mode. See application example page 8.

MCI C Soft Starter selection

Operational voltage	Dimensions	Type	Code no.
400-480 V ac	45 mm module	MCI 15C	**037N0076**
	90 mm module	MCI 25C	**037N0077**

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for Performer® scroll and Maneurop® reciprocating compressors

Technical data

Output specifications

		MCI 15C	MCI 25C
Operational voltage	V a.c.	400 - 480	400 - 480
Operational current (AC-3, AC-53a, AC-53b) max.		15 A	25 A / 30 A
Ramp up time (preset)	max.	0.4 s	0.4 s
Leakage current	max.	5 mA	5 mA
Operational current	min.	50 mA	50 mA
Overload relay trip class		Class 10	Class 10
Semiconductor protection fusing:			
Type 1[1] co-ordination		50 A gL/gG	100 A gL/gG
Type 2[2] co-ordination	$I^2t(t=10\text{ ms})$	1800 A^2S	6300 A^2S
Rating index:			
AC-53a Asynchronous motors	[3]	15A: AC-53a: 8-3 : 100 - 3000	25A: AC-53a: 8-3 : 100 - 3000
AC-53b Asynchronous motors with bypass		-	30A: AC-53b: 6-3 : 30

[1] Type 1 coordination require that, under short-circuit conditions, the device shall cause no danger to persons or installation and may not be suitable for further use without repair and replacement of parts

[2] Type 2 coordination require that, under short-circuit conditions, the device shall cause no danger to persons or installation and shall be suitable for further use.

[3] 15A: AC-53a: 8-3:100-3000 means max. load 8x15A for 3 seconds. 100% ON-load factor or 3000 operations per hour.

Control circuit specifications

Control voltage range		24 - 480 V ac/dc
Pick-up voltage	max.	20.4 V ac/dc
Drop-out voltage	min.	5 V ac/dc
Control current for no operation	max.	1 mA
Control current / power	max.	15 mA / 2 VA
Response time	max.	70 ms
SCR by-pass contact, optional		
Voltage / current	max.	24 - 480 V a.c. / 0.5 A (AC-14, AC-15)
Fuse	max.	10 A gL/gG, I^2t max. 72 A^2s
EMC immunity		Meets requirements of EN 50082-1 and EN 500082-2

Insulation

Rated insulation voltage	U_i	660 V ac
Rated impulse withstand voltage	U_{imp}	4 kV
Installation category		III

Thermal specification

Cooling method		Natural convection
Mounting		Vertical +/- 30°
Storage temperature range		-20° C to +80° C
Enclosure degree / pollution degree		IP 20 / 3
Power dissipation, continuous duty	max.	2 W/A
Power dissipation, intermittent duty	max.	2 W/A x duty cycle

Materials

Housing self extinguishing	PPO UL94V1
Heatsink aluminium	Black anodized
Base	Electroplated steel

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Functional diagram

Mains voltage L1, L2, L3
Control voltage (A1, A2)
Motor voltage (T1, T2, T3)
LED 1
LED 2
SCR contact:
23-24 bypass (only MCI 25C)
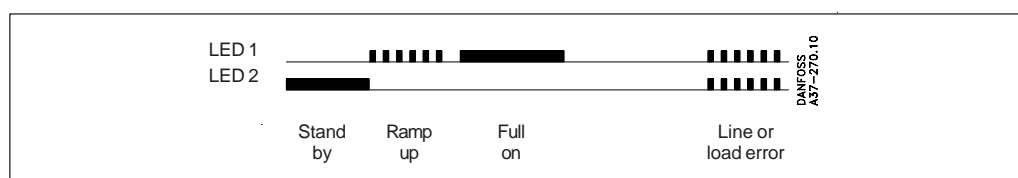
DANFOSS A37-271.10
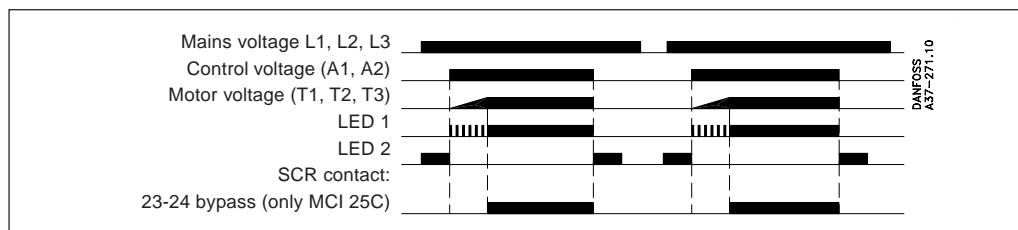
Functional description

Start
During ramp-up the controller will gradually increase the voltage to the motor from the preset initial torque value until it reaches full line voltage. The actual ramp time is digitally calculated and will not be influenced by net frequency or load variations.
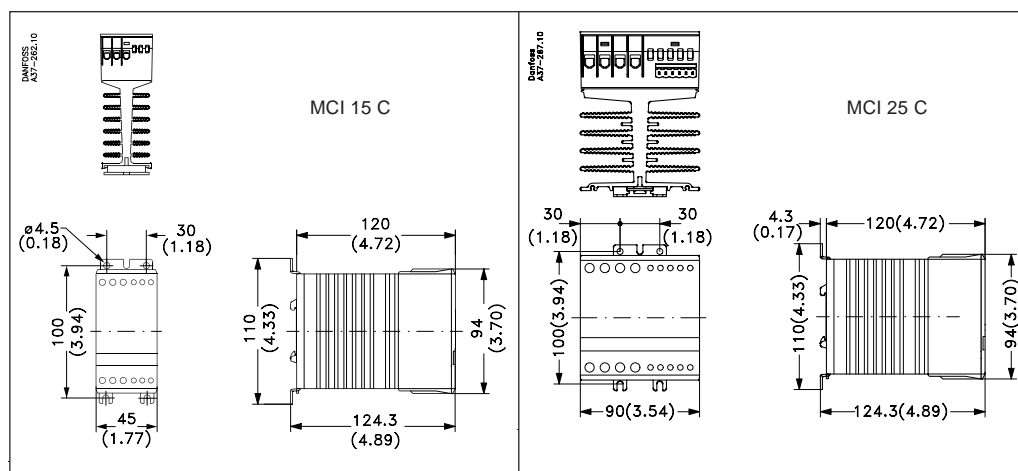
Bypass mode (contact 23 - 24, only MCI 25C)
The auxiliary contacts are made possible by means of SCR technology and will only switch correctly on a.c. current.
The contact is intended for operating an external by-pass contactor. The contact will close when the controller is in steady state operation, see application example page 8.
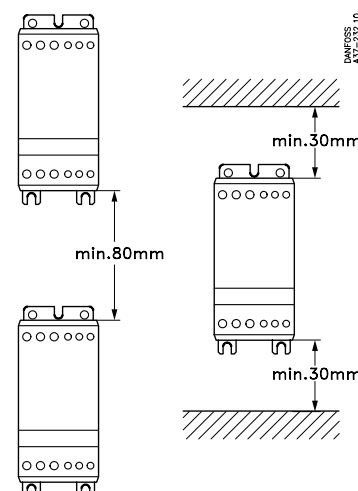
LED status indication

LED 1
LED 2

Stand by | Ramp up | Full on | Line or load error

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Dimensions

MCI 15 C

ø4.5 (0.18) 30 (1.18) 120 (4.72)
100 (3.94) 110 (4.33) 94 (3.70)
45 (1.77) 124.3 (4.89)

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MCI 25 C

30 (1.18) 30 (1.18) 4.3 (0.17) 120 (4.72)
100 (3.94) 110 (4.33) 94 (3.70)
90 (3.54) 124.3 (4.89)

Danfoss A37-287.10

Mounting instructions

The controller is designed for vertical mounting. If the controller is mounted horizontally the load current must be reduced by 50%.
The controller needs no side clearance. Clearance between two vertical mounted controller must be minimum 80 mm (3.15"). Clearance between controller and top and bottom walls must be minimum 30 mm (1.2").

min.30mm
min.80mm
min.30mm

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| **Overload and short circuit protection** | Overload and short circuit protection is easily achieved by installing a circuit breaker on the line side of the motor controller. Select the circuit breaker from the table below. | Be aware of the maximum prospective short circuit current breaking capacity. For further information please refer to the data sheet on the circuit breaker. |

Performer® scroll compressors

Motor voltage code 4 / 400V - 3ph - 50Hz / 460V - 3ph - 60Hz			
Compressor type	Compressor max. current [A]	Danfoss CTI	
		Type	Code no.
SM / SZ 084	17	CTI 25 MB	**047B3157**
SM / SZ 090	17	CTI 25 MB	**047B3157**
SM / SZ 100	19	CTI 25 MB	**047B3158**
SM / SZ 110	20	CTI 25 MB	**047B3158**
SM / SZ 115	25	CTI 25 MB	**047B3159**
SM / SZ 120	29	CTI 25 MB	**047B3159**
SM / SZ 125	25	CTI 25 MB	**047B3159**
SM / SZ 161	32	CTI 45 MB	**047B3164**
SM / SZ 160	29	CTI 25 MB	**047B3159**
SM / SZ 175	35	CTI 45 MB	**047B3164**
SM / SZ 185	35	CTI 45 MB	**047B3164**

Maneurop® reciprocating compressors

Motor voltage code 4 / 400V - 3ph - 50Hz / 460V - 3ph - 60Hz			
Compressor type	Compressor max. current [A]	Danfoss CTI	
		Type	Code no.
MT/MTZ 18	5	CTI 25 M	**047B3147**
MT/MTZ 22	6	CTI 25 M	**047B3148**
MT/MTZ 28	7.5	CTI 25 M	**047B3148**
MT/MTZ 32	8	CTI 25 M	**047B3149**
MT/MTZ 36	9	CTI 25 M	**047B3149**
MT/MTZ 40	10	CTI 25 M	**047B3149**
MT/MTZ 44	9.5	CTI 25 M	**047B3149**
MT/MTZ 45	9.5	CTI 25 M	**047B3149**
MT/MTZ 50	12	CTI 25 MB	**047B3157**
MT/MTZ 51	11.5	CTI 25 M	**047B3149**
MT/MTZ 56	12	CTI 25 MB	**047B3157**
MT/MTZ 57	12	CTI 25 MB	**047B3157**
MT/MTZ 64	15	CTI 25 MB	**047B3157**
MT/MTZ 65	14	CTI 25 MB	**047B3157**
MT/MTZ 72	15.5	CTI 25 MB	**047B3157**
MT/MTZ 73	17	CTI 25 MB	**047B3157**
MT/MTZ 80	18	CTI 25 MB	**047B3158**
MT/MTZ 81	19	CTI 25 MB	**047B3158**
MT/MTZ 100	22	CTI 25 MB	**047B3158**
MT/MTZ 125	27	CTI 25 MB	**047B3159**
MT/MTZ 144	30	CTI 45 MB	**047B3164**
MT/MTZ 160	36	CTI 45 MB	**047B3164**

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for Performer® scroll and Maneurop® reciprocating compressors

Overheat protection

If required, the controller can be protected against overheating by inserting a thermostat in the slot on the right-hand side of the controller.
Order: UP 62 thermostat, code no. **037N0050**

For wiring connections see application examples below.
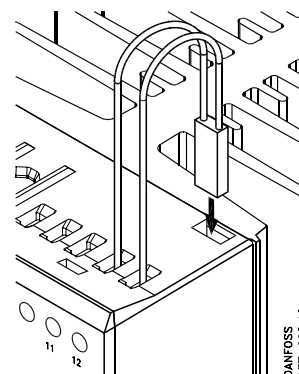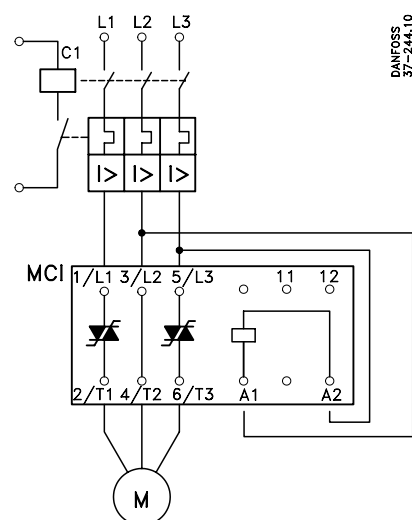
Application examples

Overheat protection

The thermostat is connected in series with the control circuit of the main contactor. When the temp. of the heat sink exceeds 100°C the main contactor will be switched OFF.
This circuit requires manual reset to restart the motor.
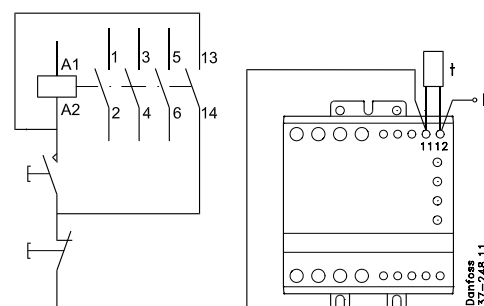
Line Controlled Soft start

When the contactor C1 is switched to the ON-State, the soft starter will start the motor, according to the settings of the ramp-up time and Initial torque adjustments. When the contactor C1 is switched to the OFF-State the motor will be switched off instantaneously. In this application the contactor will have no load during making operation. The contactor will carry and break the nominal motor current.

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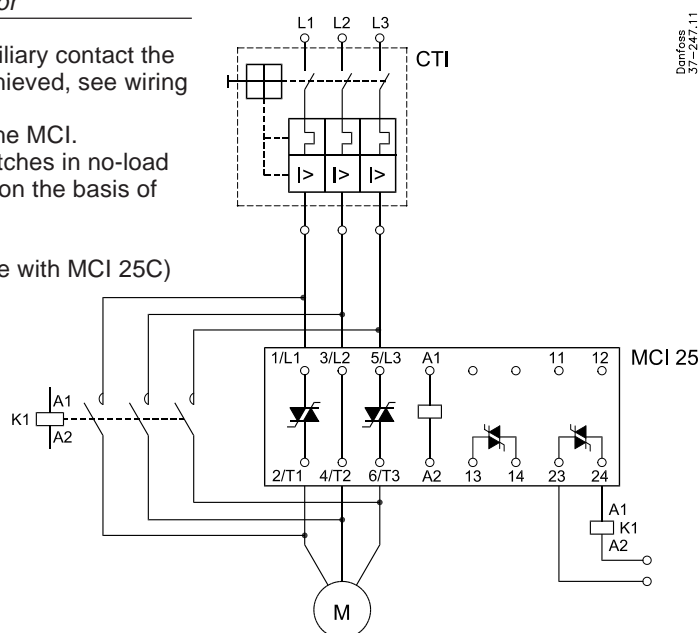
Application examples (continued)

MCI 25 with bypass contactor

By means of the built-in auxiliary contact the bypass function is easily achieved, see wiring diagram below.
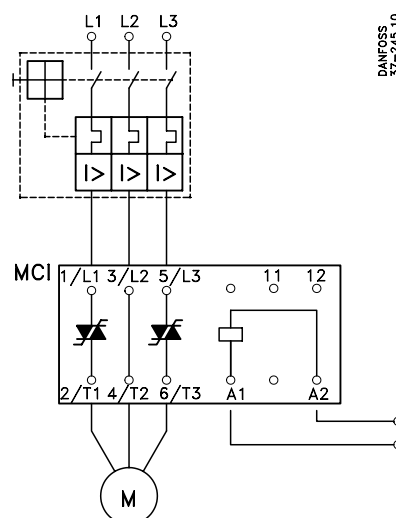No heat is generated from the MCI.
As the contactor always switches in no-load condition it can be selected on the basis of the thermal current (AC-1).

(13-14 contact not applicable with MCI 25C)

Input controlled soft start

When the control voltage is applied to A1 - A2, the MCI soft starter will start the motor, according to the settings of the Ramp-up time and Initial torque adjustments. When the control voltage is switched OFF, the motor will switch off instantaneously.

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