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English

Original instructions



## SERVICE MANUAL FOR TRAVELING INVERTER

Service Manual for **DMCS 007F**

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SUPDOC\_SM\_DMCS019-0.ORD 16.11.2010





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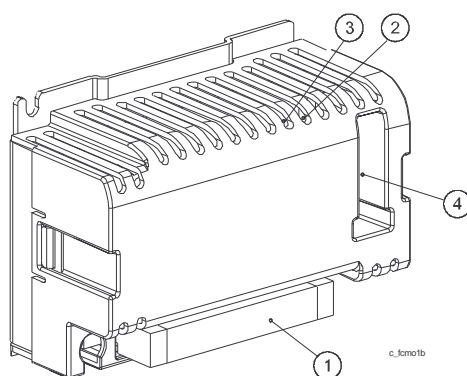
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## 1 DESCRIPTION OF THE INVERTER



There are high voltages inside the inverter (including the programming switches). Wait for at least three minutes after the supply voltage has been switched off before any service actions.

DMCS007



1. Terminal X1
2. Red led (fault)
3. Green led (ok)
4. Programming switches

### 1.1 Connections

All connections are made to terminal block X1 as follows:



Crane power supply conductor rail must have double collectors.

DMCS007		
Nbr	Name	Description
1	PE	Protective earth.
2	L1	Mains, phase 1. 380-480V 50/60Hz.
3	L2	Mains, phase 2. 380-480V 50/60Hz.
4	L3	Mains, phase 3. 380-480V 50/60Hz.
5	U	Motor, phase 1.
6	V	Motor, phase 2.
7	W	Motor, phase 3.
8	S1	Drive command. Direction 1. 48 or 115V 50/60Hz
9	S2	Drive command. Direction 2. 48 or 115V 50/60Hz
10	SP2/AP	Speed 2 / Acceleration command. 48 or 115V 50/60Hz
11	ON	Control voltage, neutral.



Standard duty resistor must be disconnected when heavy duty resistor DMHR01F90 is connected to terminals R+ and R-.

### 1.2 Technical characteristics

Technical data	DMCS007
Power range	0.75kW
Supply voltage	380 - 480 VAC -10%/+5%
Nominal supply frequency	48 – 62 Hz
Nominal current	2.4A
Digital control	S1, S2, DI3
Max output voltage	Equal to supply voltage
Control voltage range	48 VAC/115 +/- 10%. If control voltage is 230VAC, front resistors (15k,2W) have to be connected to digital inputs
Output	
Ambient temperature	-10°C to 50°C

Technical data	DMCS007
Humidity	95% N.C. (without dripping)
Degree of protection	Frequency converter + cover (IP20)
Dimensions (WxHxD)	133x92x60mm
Altitude	Output current must be reduced 1 % for every 100 m over 1000 m. For altitudes over 3000 m, manufacturer must be consulted.
Pollution degree	Pollution degree 2 according to NEMA ICS-1, IEC664 and UL840
Vibration	IEC68-2-6
Shock	IEC68-2-27

## 1.3 Normal operation

The inverter goes into the ready-to-run state within one second after the power supply is connected. During running the inverter follows the operator's speed reference according to the set acceleration/deceleration ramp. During direction change the brake is kept open all the time. When drive command is switched off the inverter decelerates to zero according to the set ramp and closes the mechanical brake.

## 1.4 Status indication leds (green and red)

The inverter indicates its operating state by two leds. Red led indicates "fault state" (driving is inhibited). Green led indicates "ok-state". Blinking of green led indicates that fault state has been active, but it has been recovered. Normal driving is however possible also when green led is blinking (in other words, blinking of green led does not indicate "warning-state").

## 1.5 Compact brake motors

This inverter is used with Compact brake motors, which have been especially designed for this use. The Compact brake motors have the following special features:

- Compact brake, which is opened by the magnetic force of the motor. When the magnetic force is removed (by cutting off the motor current) the brake is closed by spring force.
- High nominal frequency (80Hz...120Hz)

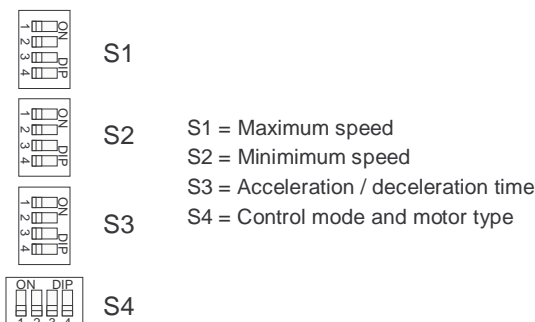
## 1.6 Programming switches



**WARNING!!! There are high voltages inside the inverter (including the programming switches). Wait for at least three minutes after the supply voltage has been switched off before any service actions.**

The programming of the inverter is performed by dip-switches. The state of each switch is either OFF (0) or ON (1). There are five parameters that are possible to set by the switches S1-S4.

DMSC007

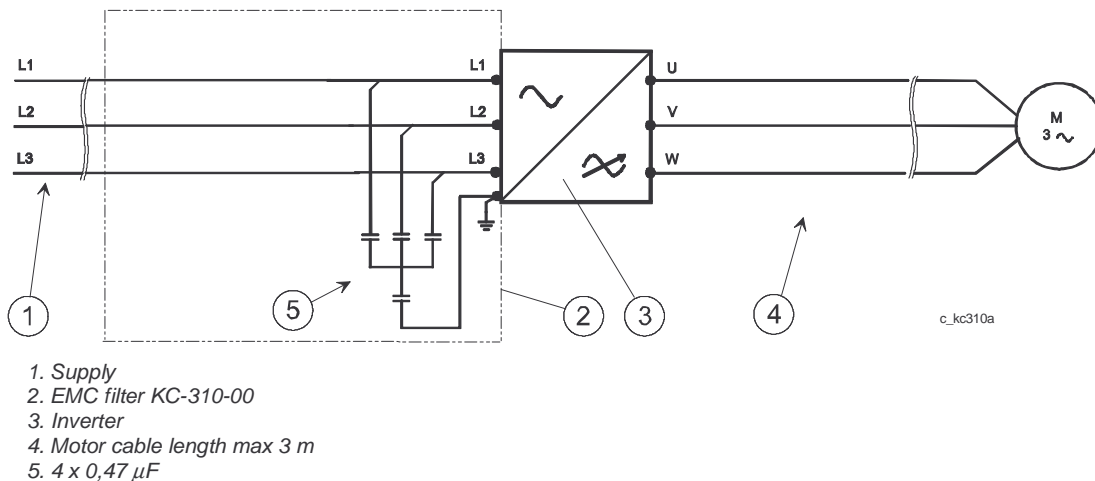


## 1.7 The EMC requirements

The device complies with the requirements of EN61800-3:2004 (IEC61800-3) for second environment, category C3, when a dedicated external EMC filter is applied.

### 1.7.1 EMC filter connection to inverter for trolley travelling.

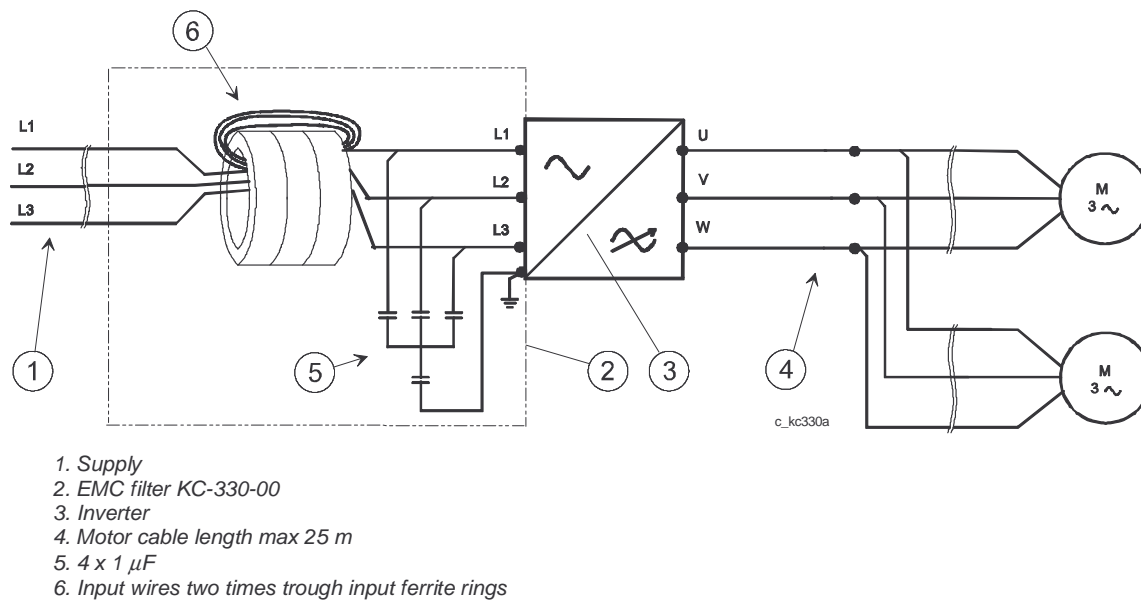
DMCS007



Capacitors have to be placed as near the inverter as possible.

### 1.7.2 EMC filter connection to inverter for bridge travelling.

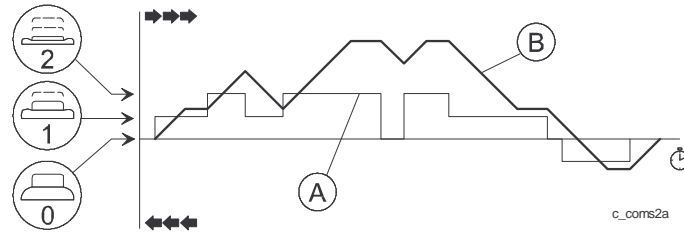
DMCS007



Capacitors have to be placed as near the inverter as possible.

## 2 DESCRIPTION OF CONTROL MODES

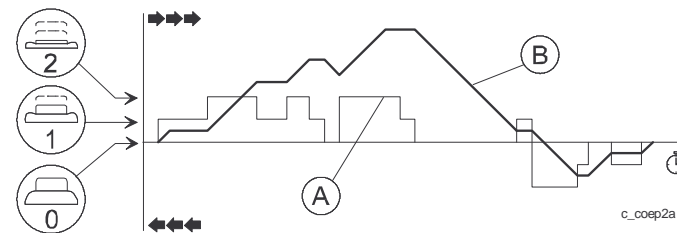
### 2.1 MS2-control (S4-1=OFF)



A. Push button position  
B. Speed

- S1 means "drive minimum speed forward"
- S2 means "drive minimum speed reverse"
- SP2 means "maximum speed"
- When S1 and S2 or are not active the inverter decelerates to zero

### 2.2 EP2-control (S4-1=ON)



A. Push button position  
B. Speed  
0. Decelerate  
1. Maintain speed  
2. Accelerate

- S1 means "drive forward"
- S2 means "drive reverse"
- AP means "acceleration"
- When starting S1 and S2 mean "accelerate to minimum speed"
- When S1 and S2 are not active the inverter decelerates to zero
- During running S1 and S2 mean "hold speed"
- At maximum speed AP means "hold speed"











### 3 FAULT CODES, TROUBLESHOOTING



**There are high voltages inside the inverter (including the programming switches). Wait for at least three minutes after the supply voltage has been switched off before any service actions.**

When the inverter detects a fault situation it stops running and starts signalling the fault code by blinking the indication leds (green and red). The blinking of the code is carried on until a new fault occurs or until power is switched off. The fault codes are explained in the table below.

Fault code, color		Fault. Possible cause. Checkings.
		<b>DMCS007</b>
GREEN		<b>Overvoltage.</b> Mains voltage is too high or ramp time is too short. Check the voltage of all supply phases at the terminal X1. If they are ok then set a longer ramp by switch S3.
		
GREEN		<b>Stall supervision / overcurrent.</b> Brake does not open properly or there is an obstacle on the track. Check also that the setting of switch S4 is made according to the supplied motor(s).
GREEN		<b>Deceleration ramp supervision.</b> Deceleration ramp has not been followed. If the fault occurs again set longer ramp time by switch S3. Check also the voltage of all supply phases at the terminal X1.
GREEN		<b>Inverter overtemperature.</b> Motor current is too high (bearing problem, obstacle on the track, brake does not open properly,...) or the ambient temperature is too high.
GREEN		<b>Undervoltage.</b> Check the voltage of all supply phases at the terminal X1.
RED		<b>Short circuit.</b> Switch the power off. Check the insulation of the motor cables and the motor windings.
RED		<b>Microprocessor fault.</b> Switch the power off for 10 seconds. Then power-up the inverter.



The latest active fault is removed from the memory always when power is switched off.



#### **If inverter is not in a fault state, but driving is not possible:**

- Motor will not start if dc-bus voltage too high (above 745V), this occurs if any of line-to-line voltages exceeds  $480V + 5\% = 508V$ 
  - *If line voltage cannot be reduced, install drop-down transformer*
- Check the supply voltage phases at terminal X1.
- Check the control signals at terminal X1.
- Check that the control voltage level is correct. Rating plate is located on the left side of the inverter.
- Check all parameters, especially the motor parameters (switch S4).
- Check that the motor(s) corresponds the selected motor parameters.
- Check that the microprocessor starts running. Both indication leds (green and red) blink once as the inverter is powered up. After the one second initialising-time only the green led should be light.
- Check that the brake opens and closes properly. Check the brake airgap if necessary.



## 4 PROGRAMMING OF THE APPLICATION PARAMETERS

### 4.1 Minimum speed, maximum speed and ramp time

The adjustment ranges of maximum and minimum speed depend on the selected motor type (i.e. motor nominal frequency). The speeds in the speed table A are used for the 100/120Hz motors and the speeds in the speed table B for the 80Hz motors and in the speed table D for the 35Hz motors. The maximum speed and minimum speed and ramp time are set as follows:

Switch S1 / S2				SPEEDTABLE A (100/120Hz motors)		SPEEDTABLE B (80Hz motors)		SPEEDTABLE D (35Hz motors)	
-1	-2	-3	-4	Max speed (Hz)	Min speed (Hz)	Max speed (Hz)	Min speed (Hz)	Max speed (Hz)	Min speed (Hz)
0	0	0	1	50	14	42	14	19	9
0	0	1	1	54	10	40	10	20	4
0	1	0	1	58	12	44	12	21	5
0	0	1	0	62	23	50	18	22	13
0	1	1	0	66	16	46	16	23	6
0	1	1	1	70	18	48	20	25	7
1	0	0	1	75	20	53	24	26	10
0	1	0	0	80	32	62	30	28	15
1	0	1	0	85	26	56	26	30	11
1	0	1	1	90	35	59	28	32	12
1	1	0	0	95	38	65	32	33	14
0	0	0	0	100	29	77	22	35	8
1	1	0	1	105 <sup>1)</sup>	41	68	34	37	16
1	1	1	0	110 <sup>1)</sup>	44	71	36	39	17
1	0	0	0	115 <sup>1)</sup>	50	80	40	41	19
1	1	1	1	120 <sup>1)</sup>	47	74	38	42	18

1) Speeds above 100Hz are only available when the inverter is connected in 440-480V mains.

#### EXAMPLE OF PARAMETER SETTING:

80Hz motor is connected to the inverter and 62Hz maximum speed is desired. That speed is located on the 5<sup>th</sup> row in the speedtable B. The corresponding setting for S1 switches is in the same row in the leftmost columns of the table: 0-1-0-0 (off-on-off-off).



Max speed set to 62Hz.

#### 4.1.1 Acceleration and deceleration ramp

The acceleration and deceleration ramps are set by switch S3 as follows:

Switch S3				Acceleration/deceleration ramp time
-1	-2	-3	-4	
1	0	0	0	1.5 sec
0	1	0	0	2.0 sec
0	0	0	0	2.5 sec
0	0	1	0	3.0 sec
0	0	0	1	3.5 sec
1	0	0	1	4.0 sec
1	1	0	0	4.5 sec
0	0	1	1	5.0 sec
1	1	1	0	5.5 sec
1	1	0	1	6.0 sec
1	0	1	1	6.5 sec
1	0	1	0	7.0 sec
0	1	1	1	7.5 sec



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Switch S3				Acceleration/deceleration ramp time
-1	-2	-3	-4	
0	1	0	1	8.0 sec

## 4.2 Selection of the motor type

The motor type is selected by switches S4-2, S4-3 and S4-4. There are several motor dependant parameters which are set according to the selected motor (i.e. the operator selects a parameter set). The MF06-motors are selected as follows:

S4			Motor type	Nominal frequency	Nominal power
-2	-3	-4			
0	0	0	MF06MA200	100Hz (120Hz)	0.3kW (0.37kW)
1	0	0	MF06MA100	80Hz	0.65kW
0	1	0	MF06LA200	100Hz (120Hz)	0.45kW (0.55kW)
1	1	0	MF06LA100	80Hz	0.65kW
0	0	1	2*MF06MA200	100Hz (120Hz)	2*0.3kW (2*0.37kW)
1	0	1	MF06L-200	35 Hz	0.15kW

4060 12152 694 N

# SPARE PART INSTRUCTION

## EMC filter connections for DMCS inverters

023148

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## 1. EMC FILTER SELECTION TABLE

The EMC-filter is used to decrease the electro-magnetic disturbances to the power supply network caused by the DMCS-frequency converters. The filter is needed in every DMCS-frequency converter that has to fulfill IEC-standards.

See filter selection below.

Frequency converter type	Frequency converter location	End customer	EMC-filter
DMCS007	Trolley panel	IEC-standard (e.g. Europe and Asia)	KC-310-00 (ID: 52296674)
		CSA-standard (e.g. USA and Canada)	
	Bridge panel	IEC-standard (e.g. Europe and Asia)	KC-330-00 (ID: 52296673) + ferrite W74270096 (ID: 52299353)
		CSA-standard (e.g. USA and Canada)	KC-310-00 (ID: 52296674)
DMCS022	Trolley panel	IEC-standard (e.g. Europe and Asia)	KC-330-00 (ID: 52296673)
		CSA-standard (e.g. USA and Canada)	No filter, no ferrite
	Bridge panel	IEC-standard (e.g. Europe and Asia)	KC-330-00 + ferrite RH175285107 (ID: 52297604) in motor output
		CSA-standard (e.g. USA and Canada)	No filter, no ferrite



## 2. EMC FILTER CONNECTION TO DMCS007 FOR TROLLEY TRAVELLING

When mounting the EMC-filter to DMCS, make sure that the left side of the filter is right beside the left edge of DMCS007 (as in Figure 1) and the mounting claws of the filter are ABOVE the PCB (Printed Circuit Board). Do not tighten the terminal screws too much!

### TROLLEY TRAVELLING

EMC COMPONENTS	
EMC FILTER PACKAGE	KC-310-00

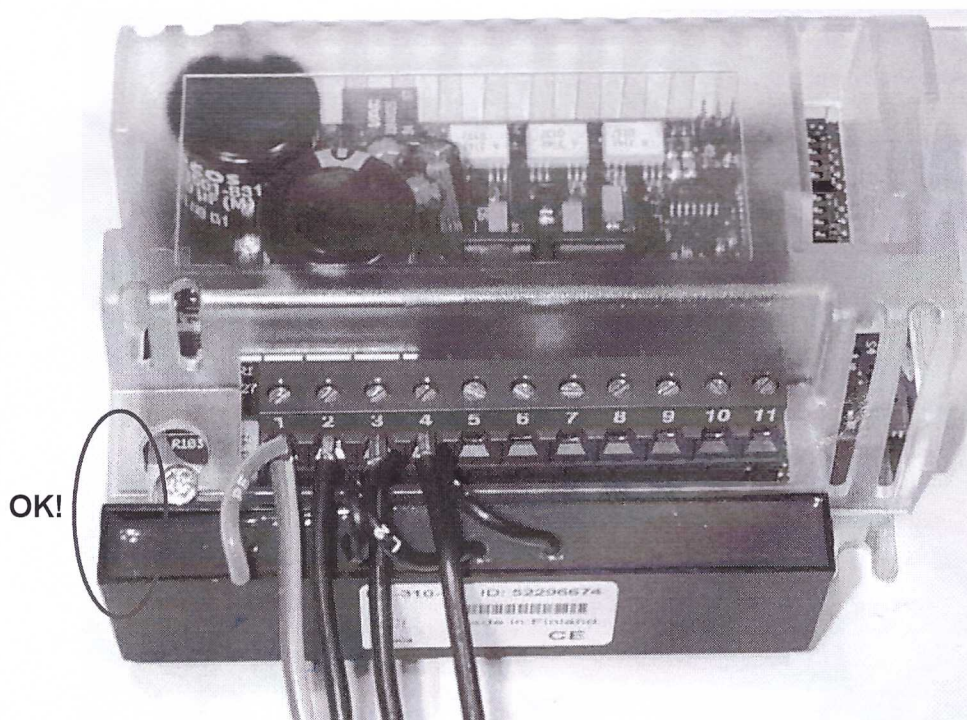
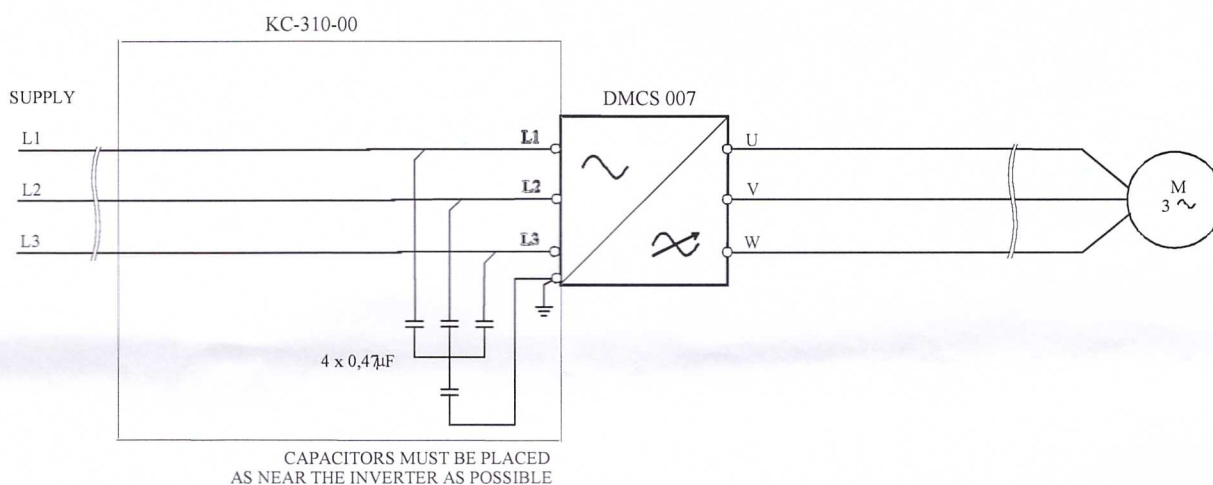
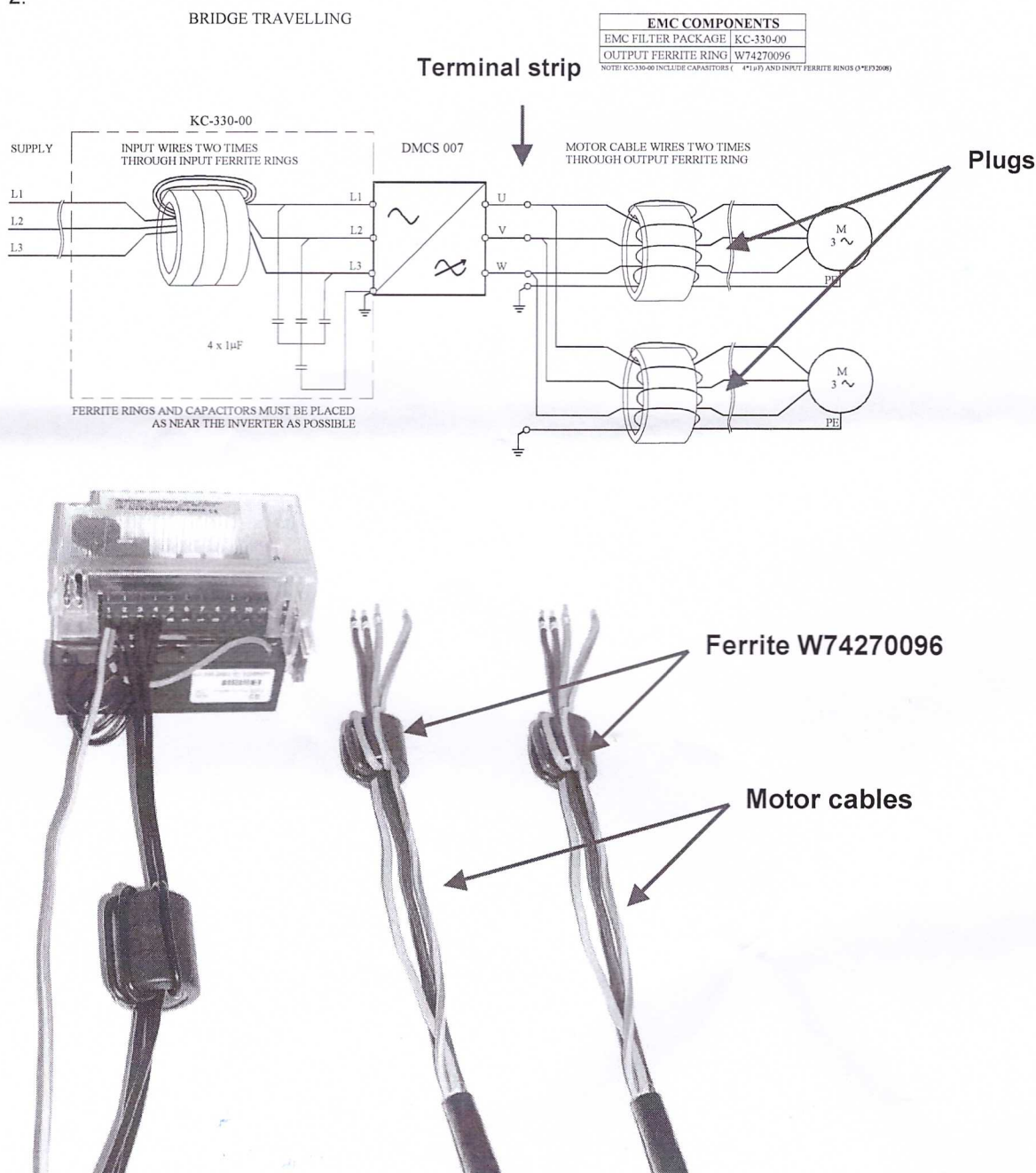


Figure 1 KC-310-filter connection when DMCS007 is used in trolley traveling.

## 3. EMC FILTER CONNECTION TO DMCS007 FOR BRIDGE TRAVELLING

When mounting the EMC-filter to DMCS, make sure that the left side of the filter is right beside the left edge of DMCS007 (as in Figure 1) and the mounting claws of the filter are ABOVE the PCB (Printed Circuit Board). Do not tighten the terminal screws too much! In both motor cables ferrites W74270096 (ID: 52299353) are needed as close as the frequency converter as possible. In practice the ferrites have to be connected between the terminal strip and bridge panel plugs. Make sure that the conductors go through ferrites twice. Also the motors' grounding must go through the ferrite! See Figure 2.



**Figure 2** KC-330-filter and motor cable ferrite W74270096 connection when DMCS007 is used in bridge traveling.



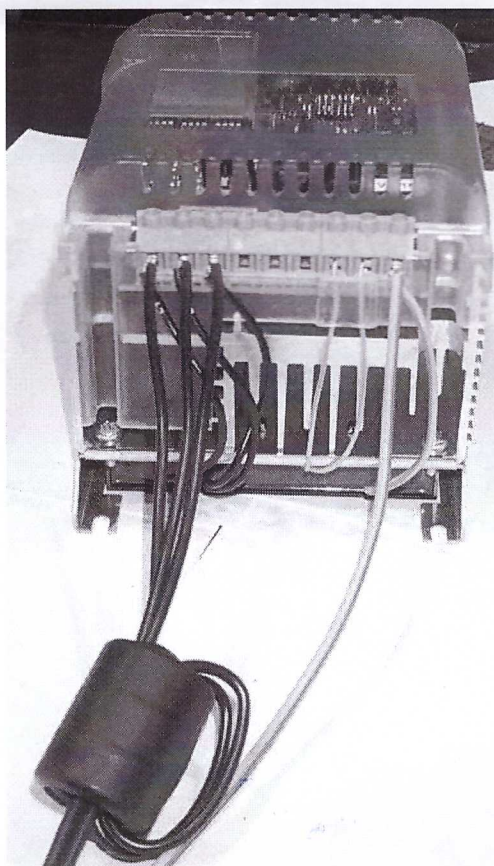
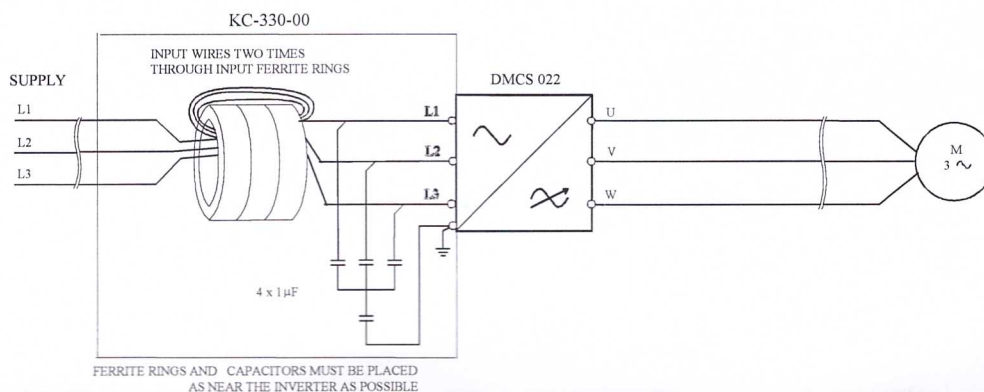
## 4. EMC FILTER CONNECTION TO DMCS022 FOR TROLLEY TRAVELLING

Notice the placing of the braking resistor wires in Figure 3. The wires must not get in any situation between the DMCS022 frame and the mounting plate because in this case the insulation of the cables will break and the conductors will get grounded resulting that the DMCS022 will be destroyed! Do not tighten the terminal screws too much!

TROLLEY TRAVELLING

EMC COMPONENTS	
EMC FILTER PACKAGE	KC-330-00

NOTE: KC-330-00 INCLUDE CAPACITORS (4x1µF) AND INPUT FERRITE RINGS (3 x EF 3200)



**Figure 3** KC-330-filter connection when DMCS022 is used in trolley traveling. Notice the braking resistor wires' place

## 5. EMC FILTER CONNECTION TO DMCS022 FOR BRIDGE TRAVELLING

Notice the placing of the braking resistor wires in Figure 3. The wires must not get in any situation between the DMCS022 frame and the mounting plate because in this case the insulation of the cables will break and the conductors will get grounded resulting that the DMCS022 will be destroyed! Do not tighten the terminal screws too much! The ferrite used in motor cable is RH175285107 (ID: 52297604) and it must be placed as near to the frequency converter as possible.

### BRIDGE TRAVELLING

EMC COMPONENTS	
EMC FILTER PACKAGE	KC-330-00
OUTPUT FERRITE RING	RH175285107

NOTE: KC-330-00 INCLUDE CAPACITORS (4x1µF) AND INPUT FERRITE RINGS (3 x EF 3200)

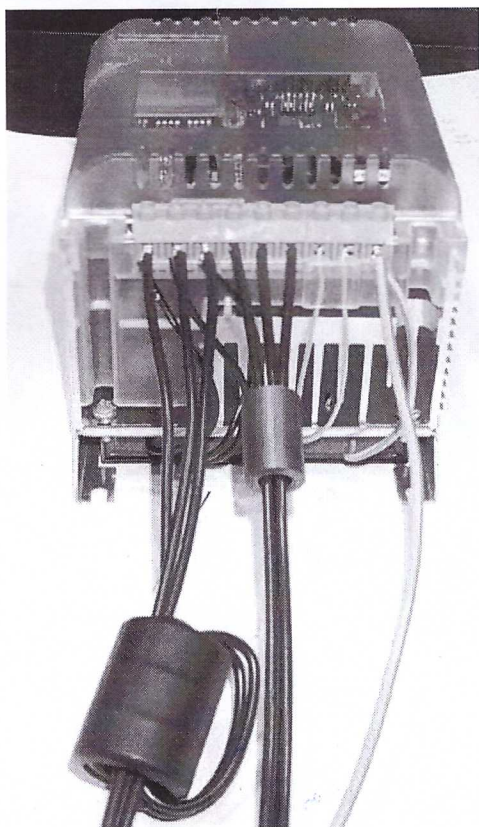
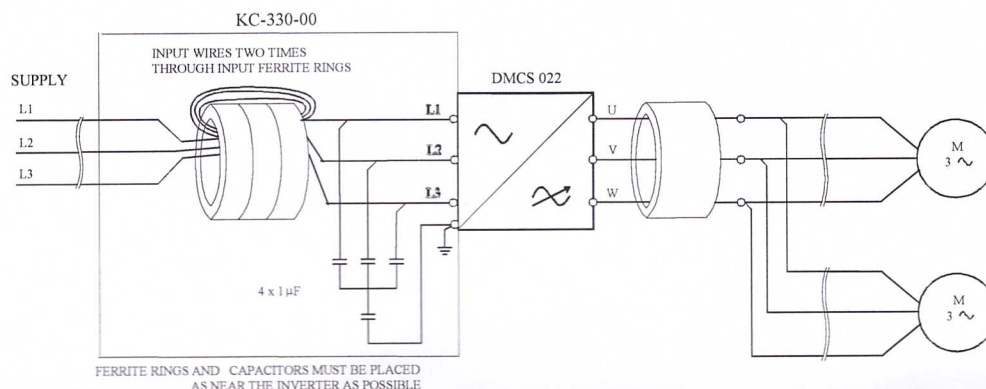


Figure 4 KC-330-filter connection when DMCS022 is used in bridge traveling. Notice the braking resistor wires' place.

## 6. EMC SUODATTIMEN VALINTA

Taajuusmuuttajan syöttöverkkoon kytkettävää EMC-suodatinta käytetään vähentämään DMCS-taajuusmuuttajien ympäristölleen aiheuttamia häiriöitä. Se tarvitaan kaikkiin DMCS:in, joiden tulee täyttää IEC-standardit.

**Taulukko 1** DMCS:t ja EMC-suodattimet

Taajuusmuuttajatyyppe	Loppuasiakas	Suodatin
DMCS007 vaununsiirossa	IEC-standardi (esim. Eurooppa ja Aasia)	KC-310-00 (ID: 52296674)
	CSA-standardi (esim. USA & Kanada)	KC-310-00 (ID: 52296674)
DMCS007 sillansiirossa	IEC-standardi (esim. Eurooppa ja Aasia)	KC-330-00 (ID: 52296673) + ferriitti W74270096 (ID: 52299353)
	CSA-standardi (esim. USA & Kanada)	KC-310-00 (ID: 52296674)
DMCS022 vaununsiirossa	IEC-standardi (esim. Eurooppa ja Aasia)	pääjännite ≤ <b>415V</b> KC-330-00 pääjännite > <b>415V</b> , Ei suodatinta
	CSA-standardi (esim. USA & Kanada)	Ei suodatinta
DMCS022 sillansiirossa	IEC-standardi (esim. Eurooppa ja Aasia)	Pääjännite ≤ <b>415V</b> , KC-330-00 + ferriitti RH175285107 (ID: 52297604) moottorilähtöön pääjännite > <b>415V</b> , Ei suodatinta
	CSA-standardi (esim. USA & Kanada)	Ei suodatinta

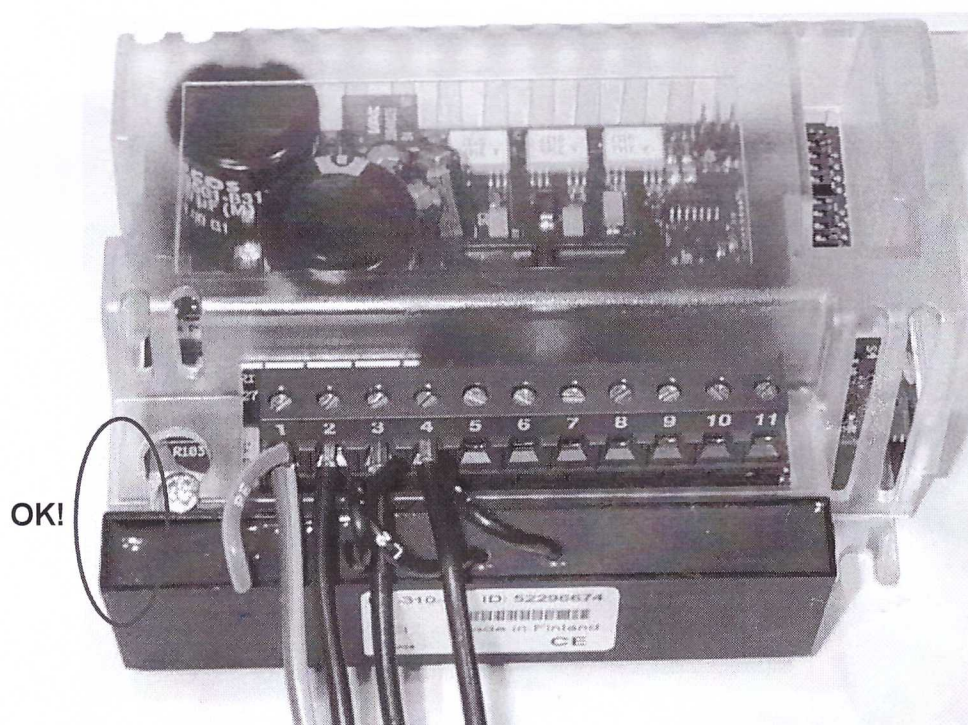
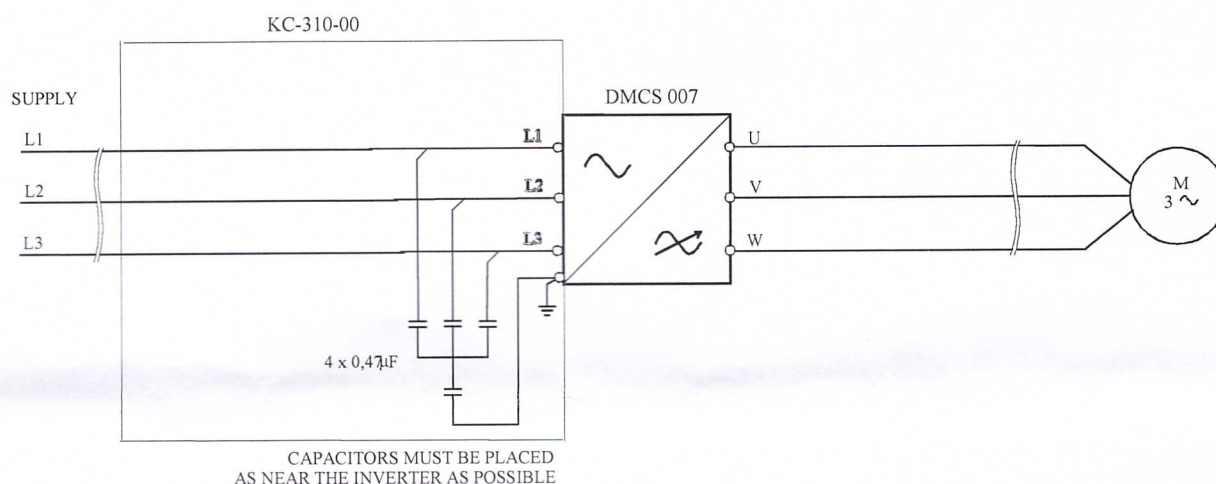


## 7. EMC-SUODATTIMEN KYTKEMINEN DMCS007:N VAUNUNSIIRROSSA

Kun kiinnität EMC-suodatinta laitteen kylkeen, varmista, että suodattimen vasen kylki tulee DMCS007:n vasempaan reunaan (kuten kuvassa) ja että suodattimen kiinnityskynnet tulevat piirilevyn YLÄPUOLELLE. Älä kiristä liittimen ruuveja liian tiukalle!

TROLLEY TRAVELLING

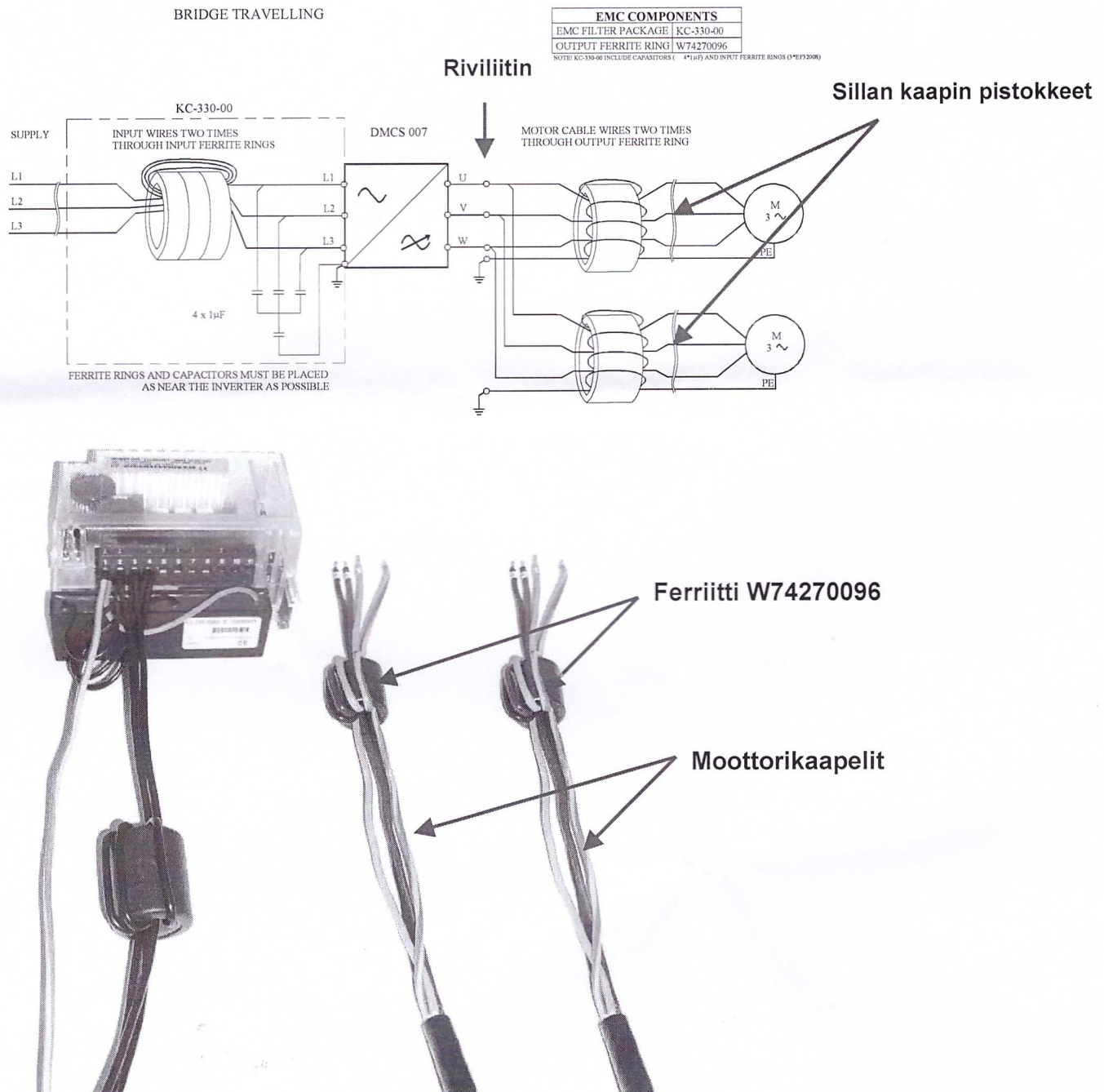
EMC COMPONENTS	
EMC FILTER PACKAGE	KC-310-00



**Kuva 1** KC-310-suodattimen kytkentä, kun DMCS007:a käytetään vaununsiirrossa.

## 8. EMC-SUODATTIMEN KYTKEMINEN DMCS007:N SILLANSIIRROSSA

Kun kiinnität EMC-suodatinta laitteen kylkeen, varmista, että suodattimen vasen kylki tulee DMCS007:n vasempaan reunaan (kuten kuvassa) ja että suodattimen kiinnityskynnet tulevat piirilevyn YLÄPUOLELLE. Älä kiristä liittimen ruuveja liian tiukalle! Kumpaankin moottorikaapeliin kytketään ferriitti W74270096 (ID: 52299353) mahdollisimman lähelle taajuusmuuttajaa. Käytännössä ferriitti on kytkettävä riviliittimen ja sillankaapin pistokkeiden väliin. Varmista, että johtimet kulkevat ferriitin läpi kahdesti. Myös moottorin suojamaa menee ferriitin läpi! Katso kuva 2.



Kuva 2 KC-330-suodattimen ja moottorilähdön ferriitin W74270096 kytkentä.



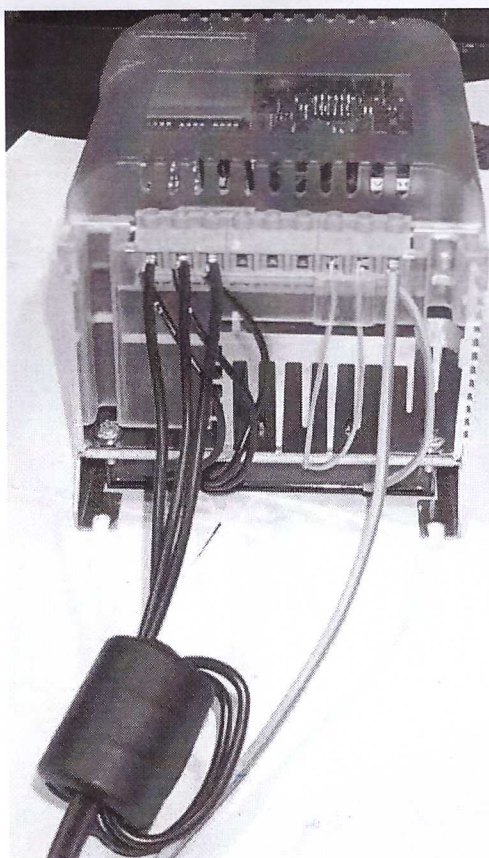
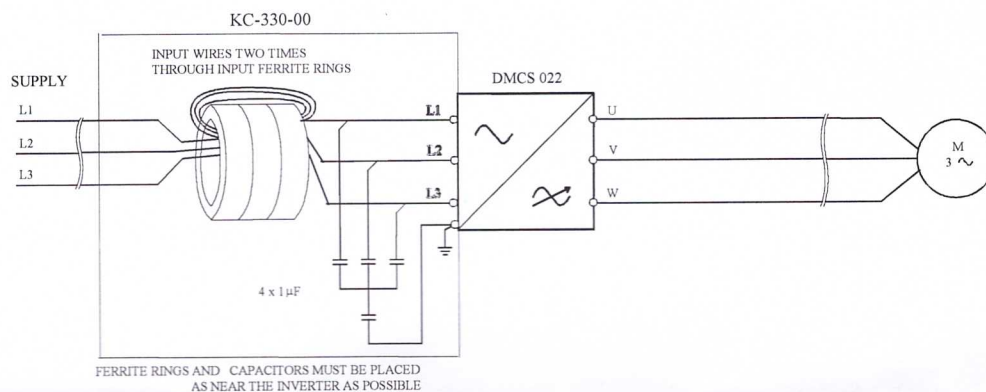
## 9. EMC-SUODATTIMEN KYTKEMINEN DMCS022:N VAUNUNSIIRROSSA

Huomaa jarruvastusjohtojen paikka kuvassa 3: ne ovat laitteen rungon ja EMC-suodattimen välissä. Johdot eivät saa joutua laitteen rungon ja pohjalevyn väliin, koska tällöin johdinten eristeet rikkoutuvat ja johtimet maadoittuvat ja laite tuhoutuu! Älä kiristä liittimien ruuveja liian tiukalle!

TROLLEY TRAVELLING

EMC COMPONENTS	
EMC FILTER PACKAGE	KC-330-00

NOTE: KC-330-00 INCLUDE CAPACITORS (4x1µF) AND INPUT FERRITE RINGS (3 x EF 3100)



**Kuva 3** KC-330-suodattimen kytkentä, kun DMCS022:sta käytetään vaununsiirrossa. Huomaa jarruvastusjohtojen paikka.

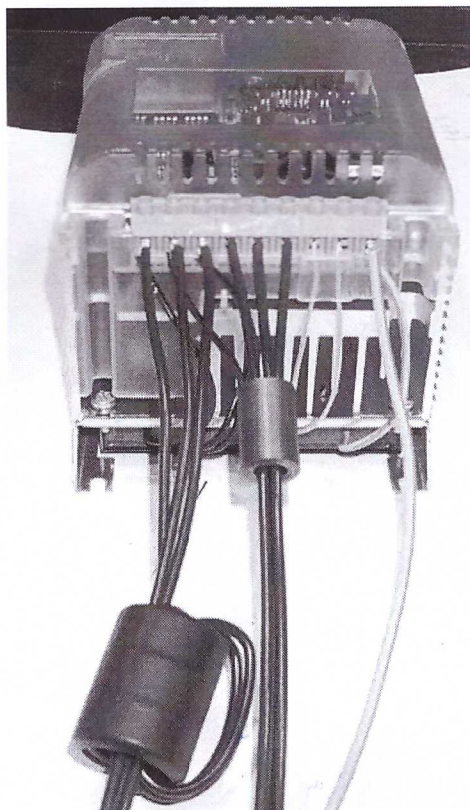
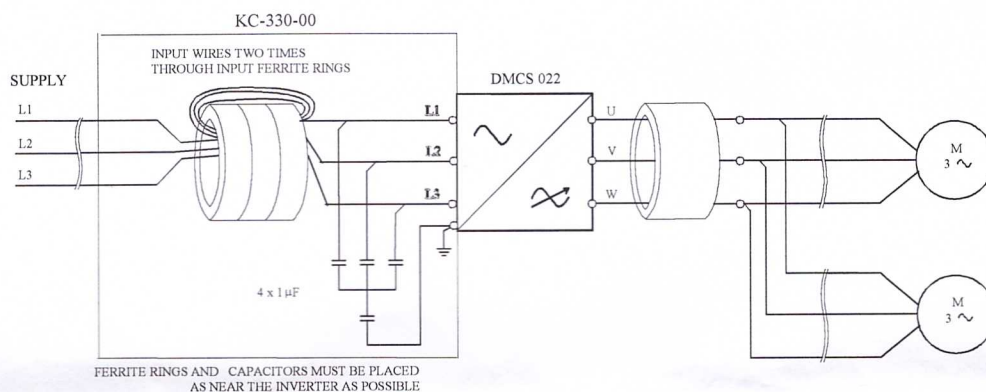
## 10. EMC-SUODATTIMEN KYTKEMINEN DMCS022:N SILLANSIIRROSSA

Huomaa jarruvastusjohtojen paikka kuvassa 3: ne ovat laitteen rungon ja EMC-suodattimen välissä. Johdot eivät saa joutua laitteen rungon ja pohjalevyn väliin, koska tällöin johdinten eristeet rikkoutuvat ja johtimet maadoittuvat ja laite tuhoutuu! Älä kiristä liittimien ruuveja liian tiukalle! Moottorilähdössä käytettävä ferriitti on RH175285107 (ID:52297604). Se pitää laittaa mahdollisimman lähelle taajuusmuuttajaa.

BRIDGE TRAVELLING

EMC COMPONENTS	
EMC FILTER PACKAGE	KC-330-00
OUTPUT FERRITE RING	RH175285107

NOTE: KC-330-00 INCLUDE CAPACITORS (4x1µF) AND INPUT FERRITE RINGS (3x RF 3200)



**Kuva 4** KC-330-suodattimen kytkentä, kun DMCS022:sta käytetään sillansiirrossa. Huomaa jarruvastusjohtojen paikka.