

Product Information

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EMC-Filter FFR-CS/CSH/MSH-RF1/-LL for FR-D700 and E700SC inverter series

Herewith we would like to inform you about the footprint EMC-filter types for our Inverter series FR-D720S, FR-D740, FR-D720 and the new FR-E720S SC and FR-E740 SC types.

The inverter-filter combination is compliant to EN61800-3:2004 *Adjustable Speed Electrical Power Drives Systems- part 3: EMC requirements and specific test methods* and ensures class C1 with a motor cable length up to 25m and class C2 up to 100m (for details see Table 4: Test results).

The filters allow footprint and book type mounting. The input side is equipped with terminals; on the output side you can find dedicated cables with fork type cable shoes for time saving connection.

For footprint mounting the filter is placed between the inverter and the panel, for book type mounting the filter is placed beside the inverter. Due to this flexible design the user can save valuable space inside the wiring cabinet. All filters are designed and manufactured according to UL requirements and are CE marked.



Picture 1: FFR-CS/CSH/MSH/JS



Picture 2: FR-D700

■ Low leakage version (LL)

For FR-D720S, D740 and E720S SC there are additional low leakage filter available with a leakage current of less than 3,5mA. The FFR-CS/CSH/MSH-RF1-LL helps to ensure EMC compliance of machinery and installations using inverter drives on short motor cables (C1 up to 10m). That makes the filter a perfect solution for all portable devices with plug connection to the grid like mixer, farming and swimming pool applications. The dimensions of the LL-filters are the same like the standard types. That guarantees an easy replacement.

■ EMC-filter for the new FR-E700SC-EC inverter series

For the new inverter series FR-E700SC-EC you can use the same filter like for the old FR-E700-EC types. The Filters are compatible to both drive series. Both have exactly the same EMC-behaviour and the same footprint. For further information please see *FR-E700SC Product Information with communication options* on confidential homepage.



Picture 3: FR-E700SC

■ Change over from old inverter and filter series

In order to make the change over from old to new generation easier for our customer, there is a compliance document available; showing that the new inverter filter generation is equal or better from EMC-performance point of view than the former generation. Due to this, there is no re-testing necessary. The filters are compatible in mounting and dimensions to the older generation Filter, which have been used for the obsolete FR-S500 and E500 series.

Table 1: Allocation FR-D700 Inverter and filter

| Standard EMC-Filter FR-D700 | | | | | |
|------------------------------------|----------|---|----------------------------------|-----------------|----------|
| Type | SAP Code | Power [kW] 150% for 60s 200% for 3s | Filter Type | Leakage current | SAP Code |
| 1-phase, 200V | | | | | |
| FR-D720S-008-EC | 214189 | 0,1 | FFR-CS-050-14A-RF1 | <30mA | 216227 |
| FR-D720S-014-EC | 214190 | 0,2 | | | |
| FR-D720S-025-EC | 214191 | 0,4 | | | |
| FR-D720S-042-EC | 214192 | 0,75 | | | |
| FR-D720S-070-EC | 214193 | 1,5 | | | |
| FR-D720S-100-EC | 214194 | 2,2 | FFR-CS-110-26A-RF1 | | 216228 |
| | | | | | 216229 |
| 3-phase, 400V | | | | | |
| FR-D740-012-EC | 212414 | 0,4 | FFR-CSH-036-8A-RF1 | <30mA | 215007 |
| FR-D740-022-EC | 212415 | 0,75 | | | |
| FR-D740-036-EC | 212416 | 1,5 | | | |
| FR-D740-050-EC | 212417 | 2,2 | FFR-CSH-080-16A-RF1 | <30mA | 215008 |
| FR-D740-080-EC | 212418 | 3,7 | | | |
| FR-D740-120-EC | 212419 | 5,5 | FFR-MSH-170-30A-RF1 | <30mA | 215005 |
| FR-D740-160-EC | 212420 | 7,5 | | | |
| 3-phase, 200V ¹⁾ | | | | | |
| FR-D720-0.1K | 217399 | 0,1 | FFR-CSH-036-8A-RF1 | <30mA | 215007 |
| FR-D720-0.2K | 217400 | 0,2 | | | |
| FR-D720-0.4K | 217401 | 0,4 | | | |
| FR-D720-0.75K | 217402 | 0,75 | | | |
| FR-D720-1.5K | 217403 | 1,5 | FFR-CSH-080-16A-RF1 | <30mA | 215008 |
| FR-D720-2.2K | 217404 | 2,2 | | | |
| FR-D720-3.7K | 217415 | 3,7 | FFR-JS-7.5K-52A-RB1 | <30mA | 229804 |
| FR-D720-5.5K | 217416 | 5,5 | | | |
| FR-D720-7.5K | 217417 | 7,5 | | | |
| FR-D720-11K | 243781 | 11 | FFR-JS-15K-90A-RB1 ³⁾ | <30mA | 229805 |
| FR-D720-15K | 243782 | 15 | | | |

Table 2: Allocation FR-E700 SC Inverter and filter

| Standard EMC-Filter for FR-E700 SC ²⁾ | | | | | |
|---|----------|---|---------------------|-----------------|----------|
| Type | SAP Code | Power [kW] 150% for 60s 200% for 3s | Filter Type | Leakage current | SAP Code |
| 1-phase, 200V | | | | | |
| FR-E720S-008SC-EC | 234795 | 0,1 | FFR-CS-050-14A-RF1 | <30mA | 216227 |
| FR-E720S-015SC-EC | 234796 | 0,2 | | | |
| FR-E720S-030SC-EC | 234797 | 0,4 | | | |
| FR-E720S-050SC-EC | 234798 | 0,75 | | | |
| FR-E720S-080SC-EC | 234799 | 1,5 | | | |
| FR-E720S-110SC-EC | 234800 | 2,2 | FFR-CS-110-26A-RF1 | | 216228 |
| | | | | | 216229 |
| 3-phase, 400V | | | | | |
| FR-E740-016SC-EC | 234801 | 0,4 | FFR-MSH-040-8A-RF1 | <30mA | 214953 |
| FR-E740-026SC-EC | 234802 | 0,75 | | | |
| FR-E740-040SC-EC | 234803 | 1,5 | | | |
| FR-E740-060SC-EC | 234804 | 2,2 | FFR-MSH-095-16A-RF1 | <30mA | 215004 |
| FR-E740-095SC-EC | 234805 | 3,7 | | | |
| FR-E740-120SC-EC | 234806 | 5,5 | FFR-MSH-170-30A-RF1 | <30mA | 215005 |
| FR-E740-170SC-EC | 234807 | 7,5 | | | |
| FR-E740-230SC-EC | 234808 | 11 | FFR-MSH-300-50A-RF1 | <30mA | 215006 |
| FR-E740-300SC-EC | 234809 | 15 | | | |
| 3-phase, 200V ¹⁾ | | | | | |
| FR-E720-0.1KSC | 236465 | 0,1 | FFR-CSH-036-8A-RF1 | <30mA | 215007 |
| FR-E720-0.2KSC | 236466 | 0,2 | | | |
| FR-E720-0.4KSC | 236467 | 0,4 | | | |
| FR-E720-0.75KSC | 236468 | 0,75 | | | |
| FR-E720-1.5KSC | 236469 | 1,5 | FFR-CSH-080-16A-RF1 | <30mA | 215008 |
| FR-E720-2.2KSC | 236470 | 2,2 | | | |
| FR-E720-3.7KSC | 236471 | 3,7 | FFR-JS-7.5K-52A-RB1 | <30mA | 229804 |
| FR-E720-5.5KSC | 236472 | 5,5 | | | |
| FR-E720-7.5KSC | 236473 | 7,5 | | | |
| FR-E720-11KSC | 236474 | 11 | FFR-JS-15K-90A-RB1 | <30mA | 229805 |
| FR-E720-15KSC | 236475 | 15 | | | |



Table 3: Allocation FR-D700S, D740 and E720S SC Inverter and LL-filter

| Low leakage EMC-Filter for FR-D720S, D740 & E720S SC ²⁾ | | | | | | | |
|---|----------|---|------------------------|-----------------|----------|-----------------------|--------|
| Type | SAP Code | Power [kW] 150% for 60s 200% for 3s | Filter Type | Leakage current | SAP Code | | |
| 1-phase, 200V | | | | | | | |
| FR-D720S-008-EC | 214189 | 0,1 | FFR-CS-050-14A-RF1-LL | <3,5mA | 229801 | | |
| FR-D720S-014-EC | 214190 | 0,2 | | | | | |
| FR-D720S-025-EC | 214191 | 0,4 | | | | | |
| FR-D720S-042-EC | 214192 | 0,75 | | | | | |
| FR-D720S-070-EC | 214193 | 1,5 | | | | FFR-CS-080-20A-RF1-LL | 229802 |
| FR-D720S-100-EC | 214194 | 2,2 | FFR-CS-110-26A-RF1-LL | | 229803 | | |
| 3-phase, 400V | | | | | | | |
| FR-D740-012-EC | 212414 | 0,4 | FFR-CSH-036-8A-RF1-LL | <3,5mA | 226836 | | |
| FR-D740-022-EC | 212415 | 0,75 | | | | | |
| FR-D740-036-EC | 212416 | 1,5 | | | | | |
| FR-D740-050-EC | 212417 | 2,2 | FFR-CSH-080-16A-RF1-LL | <3,5mA | 226837 | | |
| FR-D740-080-EC | 212418 | 3,7 | | | | | |
| FR-D740-120-EC | 212419 | 5,5 | FFR-MSH-170-30A-RF1-LL | <3,5mA | 226838 | | |
| FR-D740-160-EC | 212420 | 7,5 | | | | | |
| 1-phase, 200V | | | | | | | |
| FR-E720S-008SC-EC | 234795 | 0,1 | FFR-CS-050-14A-RF1-LL | <3,5mA | 229801 | | |
| FR-E720S-015SC-EC | 234796 | 0,2 | | | | | |
| FR-E720S-030SC-EC | 234797 | 0,4 | | | | | |
| FR-E720S-050SC-EC | 234798 | 0,75 | | | | FFR-CS-080-20A-RF1-LL | 229802 |
| FR-E720S-080SC-EC | 234799 | 1,5 | | | | FFR-CS-110-26A-RF1-LL | 229803 |
| FR-E720S-110SC-EC | 234800 | 2,2 | | | | | |

Please note:

- 1) The filters for FR-D720 and E720 (3~200V) could be used for Japanese domestic types, as well as for North American (NA) types
- 2) The filters listed for FR-E700 SC are also valid for old FR-E700 types
- 3) EMC-behaviour of FR-D720-11/15K should be equal or better than FR-E720-11/15K, but it was never tested

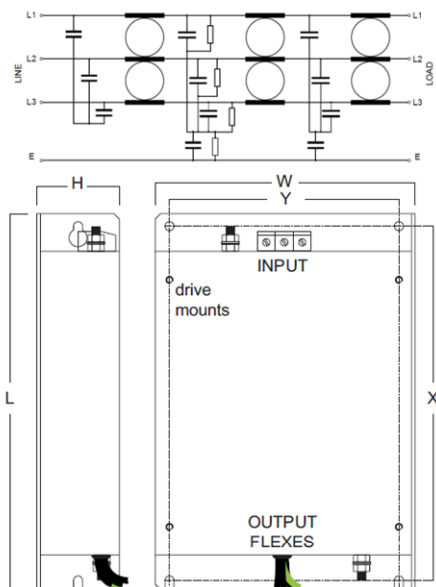
■ Passed EMC tests

Table 4: Test results

| Inverter | | Filter | | | | Motor cable length and carrier frequency | | | | | | | |
|----------|--------------------------|-------------------------|-------------------------|------------|-------|--|------|-----|-----|-----|-----|------|--|
| Series | Type | Type | Mounting | Protection | class | 2m | 5m | 10m | 20m | 25m | 50m | 100m | |
| D720S | all types | Standard | Footprint/ Book size | IP20 | C1 | 15kHz | | | | | | | |
| | | | | | | 15kHz | | | | | | | |
| D740 | all types | | Footprint/ Book size | IP20 | C1 | 15kHz | | | | | | | |
| | | | | | | 15kHz | | | | | | | |
| D720 | FR-D720-0.1K to 7.5K | | Book size | IP20 | C2 | 15kHz | | | | | | | |
| | FR-D720-0.1K to 2.2K | | | | | 15kHz | | | | | | | |
| | FR-D720-3.7K | | | | | 15kHz | | | | | | | |
| | FR-D720-5.5K to 7.5K | | | | | 12kHz | | | | | | | |
| | FR-D720-11K/15K | | | | | 15kHz | | | | | | | |
| E720S SC | all types | | Footprint/ Book size | IP20 | C1 | 15kHz | | | | | | | |
| | FR-E720S-008 to 080SC-EC | | | | | 15kHz | | | | | | | |
| | FR-E720S-110-EC | | | | | 8kHz | | | | | | | |
| E740 SC | all types | Footprint/ Book size | IP20 | C2 | 15kHz | | | | | | | | |
| | | | | | 15kHz | | | | | | | | |
| E720 | all types | Book size | IP20 | C1 | 15kHz | | | | | | | | |
| | FR-E720-008 to 110-NA | | | | 15kHz | | | | | | | | |
| | FR-E720-175-NA | | | | 15kHz | | | | | | | | |
| | FR-E720-240 to 330-NA | | | | 12kHz | | | | | | | | |
| | FR-E720-470 to 600-NA | | | | 15kHz | | | | | | | | |
| | not tested ³⁾ | | | | | | | | | | | | |
| D720S | FR-D720S-008 to 042-EC | Footprint/ Book size | IP20 | C1 | 15kHz | | | | | | | | |
| | FR-D720S-070-EC | | | | 15kHz | 10kHz | | | | | | | |
| | FR-D720S-100-EC | | | | 15kHz | 10kHz | 2kHz | | | | | | |
| D740 | FR-D740-012 to 80-EC | Footprint/ Book size | IP20 | C1 | 15kHz | | | | | | | | |
| | FR-D740-120/160-EC | | | | 15kHz | | | | | | | | |
| E720S SC | FR-E720S-008 to 030SC | Footprint/ Book size | IP20 | C1 | 15kHz | | | | | | | | |
| | FR-E720S-050/080SC | | | | 5kHz | | | | | | | | |
| | FR-E720S-110SC | | | | 15kHz | 10kHz | 5kHz | | | | | | |

■ Dimensions:

Table 5: Dimensions



| Dimensions | | | |
|------------------------|--------------------------------|------------------------------|-----------------|
| Filter Type | External Dimensions LxWxH [mm] | Mounting Dimensions XxY [mm] | Inverter Fixing |
| FFR-CS-050-14A-RF1 | 186x72x38 | 158x56 | 3xM4 |
| FFR-CS-050-14A-RF1-LL | | | |
| FFR-CS-080-20A-RF1 | 168x113x38 | 158x96 | 4xM4 |
| FFR-CS-080-20A-RF1-LL | | | |
| FFR-CS-110-26A-RF1 | 214x145x46 | 200x104 | 4xM4 |
| FFR-CS-110-26A-RF1-LL | | | |
| FFR-CSH-036-8A-RF1 | 168x114x45 | 158x96 | 4xM4 |
| FFR-CSH-036-8A-RF1-LL | | | |
| FFR-CSH-080-16A-RF1 | 168x114x45 | 158x96 | 4xM4 |
| FFR-CSH-080-16A-RF1-LL | | | |
| FFR-MSH-170-30A-RF1 | 210x225x55 | 198x208 | 4xM4 |
| FFR-MSH-170-30A-RF1-LL | | | |
| FFR-MSH-300-50A-RF1 | 318x216x56 | 302x195 | 4xM5 |
| FFR-JS-7.5K-52A-RB1 | 302x55x180 | 266x35 | book |
| FFR-JS-15K-90A-RB1 | 362x70x190 | 346x40 | book |