Symmetrical motor cable SymFlex® EMV-DRIVE

The objective of EMC-compatible design of automation systems is to minimise the impact of potential sources of interference. When high-frequency consumers are being connected, it is observed that capacitive coupling leads to unwanted currents in the PE of the motor line. These currents, generally referred to as leakage currents, are being dissipated into the equipotential bonding system, and it is not uncommon that they will take the low-impedance path via the bus line shielding.

To compensate these undesirable currents right at their origin, use the special symmetrical motor cable **SymFlex® EMV-DRIVE**.

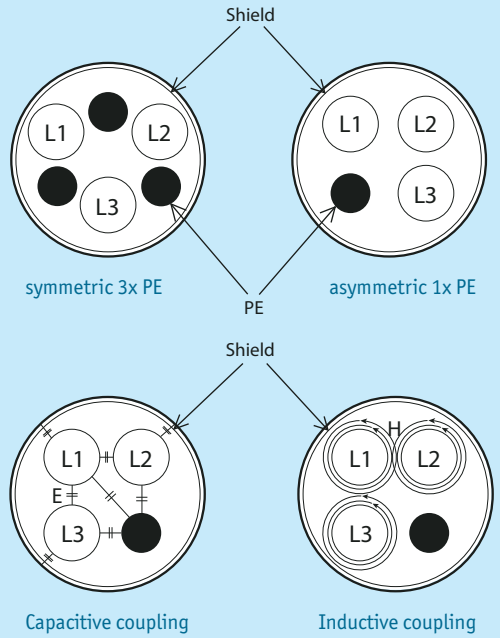

Fig. 17: Couplings, asymmetric motor cable

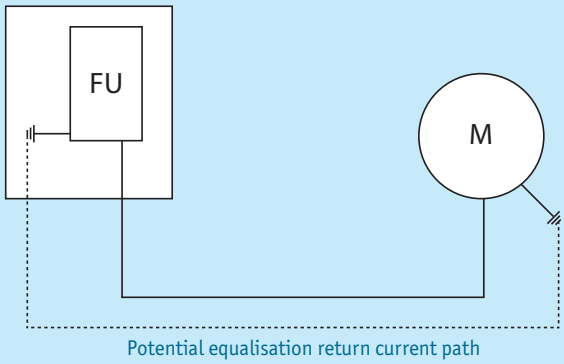

Fig. 18: Return current path, motor cable

Highlights

- Minimising unwanted currents
- Optimised for frequency-controlled drives
- Low working capacitance/inductance guaranteeing minimum electromagnetic emissions
- Symmetrical arrangement of cable cores
- Special CU braid and additional electrostatic shielding

Function

The motor cables of the **SymFlex®** series have been optimised for use in frequency-controlled drives. The low working capacitance/inductance of the cable, enclosed by a combination of braided and foil shield (100% covering) guarantee minimum electromagnetic emissions to neighbouring electronic equipment circuits.

To minimise the impact of electromagnetic fields to permissible levels, the cables are provided with a special CU braid and additional electrostatic shielding.

Application

Motor cables of type 2YSLCYK-3JB (labelling according to the standard) are suitable for fixed installation in dry, humid and wet rooms, for outdoor use, and for flexible use without additional mechanical stresses.

We specially recommend the symmetrical motor cable for high drive densities, long cable lengths (> 20 m), high pulse frequencies of frequency inverters or controllers, and for a wide range of sensitive electronic automation equipment in the environs of the drives.

SymFlex® EMV-DRIVE +FE

Minimising shield currents

The inductive currents and part of the capacitive currents coupled into the PE and shielding of motor cables find their way between inverter and motor through the bonding system. Under unfavourable circumstances (long cables, high frequency, poor cable symmetry) up to 10% of the motor phase current will be coupled into the PE. It is not uncommon that such higher-frequency compensating currents flow through shield connections of bus lines or through measurement lines running parallel to the PE or to the earth connection, with resulting malfunctions in the connected periphery.

To minimise such currents right at their point of origin (source), symmetrically designed motor cables of the **SymFlex®-series** are used. The resulting lower working capacitance/inductance reduces the current coupled into the PE (interference current) by 60%. The system-wide use of motor cables of the type **SymFlex® EMV-DRIVE** will significantly improve electromagnetic compatibility of the entire system, including the factory hall, without higher costs of purchase and installation.

Prevent bearing currents!

For installation of frequency-controlled three-phase drives, renowned inverter manufacturers recommend using symmetrical multi-core motor cables exclusively. The clearly defined purpose is to prevent or minimise bearing currents, in order to prevent damage to bearing rings by spark erosion from high-frequency current pulses.

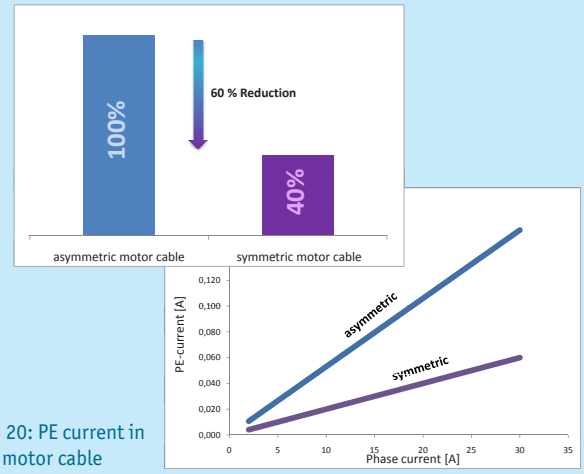

Fig. 20: PE current in the motor cable

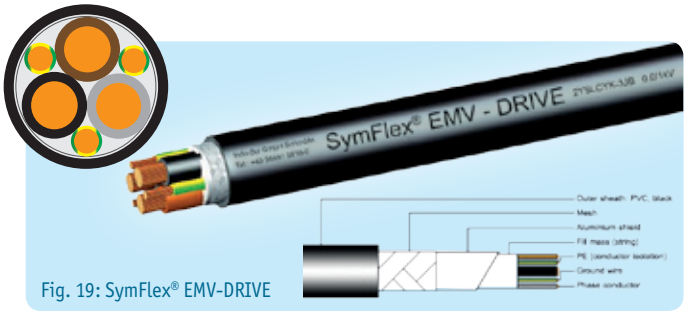

Fig. 19: SymFlex® EMV-DRIVE

Structure

Copper strand, bare, to VDE 0295, class 5, resp. IEC 60228 cl. 5, wire insulation 2 Y to VDE 0207, wires stranded in layers with filler, insulating foil, aluminium foil shielding, CU mesh, galvanised (approx. 80% coverage), PVC jacket insulation. Core colours: 3 x green/yellow, grey, brown, black.

Properties

- Cross-sections up to 240 mm²
- Halogen-free
- Fire propagation
- UL-compliant
- PUR jacket
- drag chain capable

Electrical

- Nominal voltage: 600/1000 V
- Testing voltage: 4000 V
- Insulation resistance: > 5 GOhm/km
- Coupling resistance: max. 250 Ohm/km
- Working capacitance, depending on cross-section:
  Core/core: 70 - 250 nF/km
  Core/shield: 110 - 410 nF/km
- Inductance
- depending on cross-section: 0,25 - 0,38 mH/km

Mechanical and thermal properties

- Bending radii:
  Moved occasionally: 10-20 x cable diameter
  Fixed installation: 5-10 x cable diameter
- Temperature range:
  Moved occasionally: +5 to +70 °C
  Fixed installation: -40 to +70 °C

RECOMMENDATION Labelling according to norm

2Y	Insulation/jacket of thermoplastic polyethylene (PE)
SL	Control cable
C	Shield of braided CU and aluminium shield foil
YK	Outer sheath of polyvinyl chloride (PVC), black
J	Cable with green and yellow core
B	Ethylene/propylene rubber