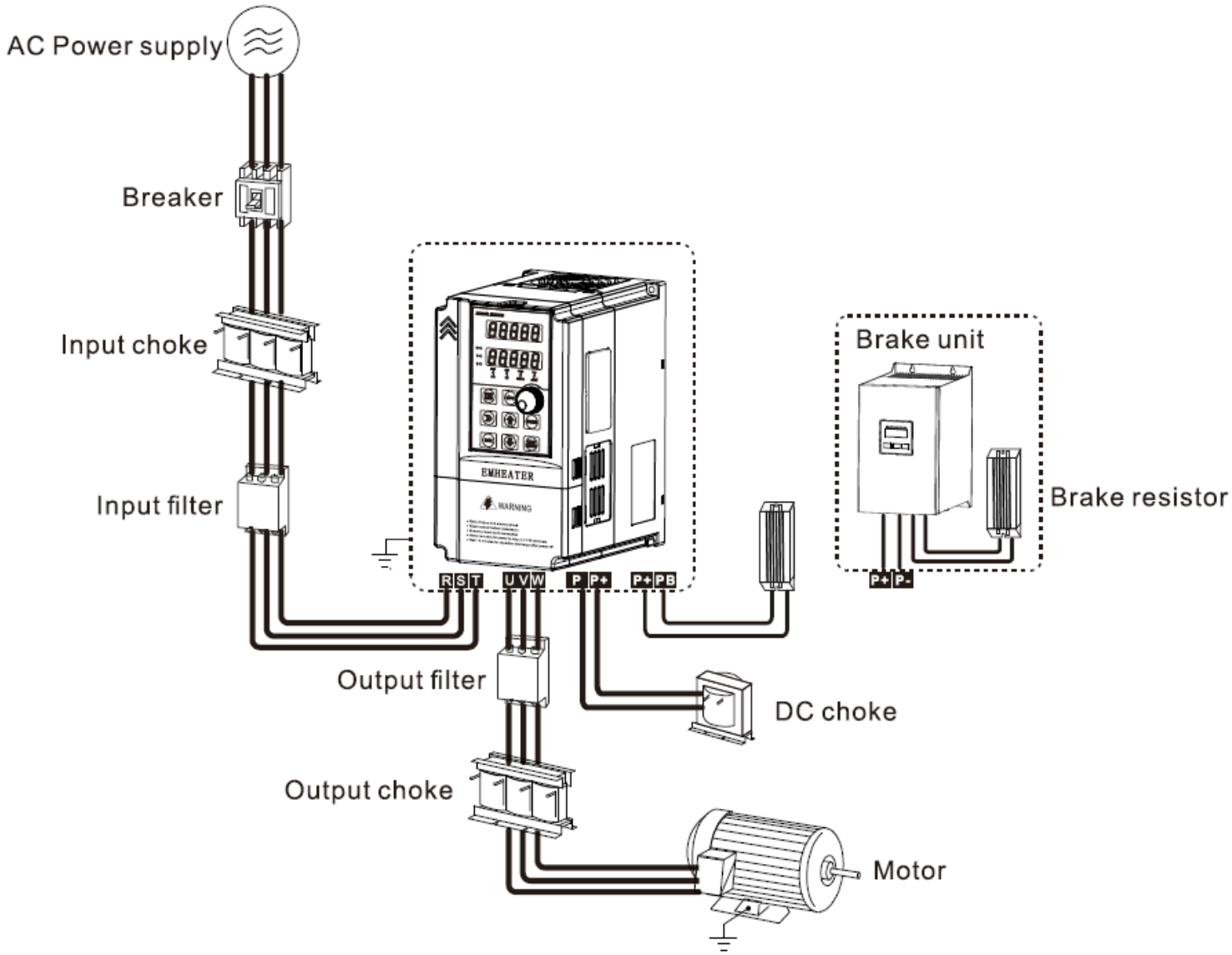
EMHEATER®

Peripherals (VSD and Solar Drives)

VSD/Solar Drive installations might require or benefit from the use of some additional peripherals depending on the application (e.g., heavy industrial use, large motors, motor types etc.) and environment (quality of power source, interference of/with other applications, distance between **VSD/Solar Drive** and motor etc.) of the installation. These **Peripherals**, typically include items such as the following:

- **DC Bus/Link Chokes/Reactors** - Reactors for Power Factor Improvement
- **AC Chokes/Reactors** (Input and Output) - Reactors for Harmonic Filtration
- **AC EMC/EMI Filters** (Input and Output) - Filters for Noise Disturbance
- **Sine Wave Filters**
- **Dynamic Braking Systems** with:
  - Porcelain Braking Resistors/Windings; or
  - Aluminium Housed Braking Resistors



Besides the abovementioned, even though **VSDs/Solar Drives** include built-in **Voltage Dependent Resistors** (**VDR**) for suppressing surge voltage, the use of **SPDs** (**Surge Protection Devices**) are strongly recommended for all installations to protect the **VSDs/Solar Drives** from frequent surges, large Eskom power surges as well as lightning (although **SPDs** only provide protection to some degree). This is typically important for warranty and insurance claims that might arise from damages caused by lightning or power surges. Further to this, although **VSDs/Solar Drives** include a motor overload protection function, in circumstances where a single **VSD/Solar Drive** is used to drive two or more motors, **Thermal Motor Protection Relays** (**Thermal Overload Relays** - **LRDs**) are also recommended to prevent motor over-heating (installed between the **VSD/Solar Drive** and each motor). Also, if the rated capacity of the motor does not match that of the **VSD/Solar Drive** (especially when the **VSD's /Solar Drive's** rated power is greater than the motor's), it is advisable to adjust the moto protection parameters on the **VSD/Solar Drive**, or to install a thermal relay in the motor circuit for protection.

DC Chokes (Reactors for Power Factor Improvement)

Installation of **DC Bus/Link Chokes/Reactors** are highly recommended for applications from 250kW and larger (possibly from 90kW depending on circumstances). These units are connected after the input diode in the **VSD/Solar Drive** circuit (rectifier circuits) and are used to smooth the rectified current (improves the input current wave form distortion caused by the capacitor). This then:

- reduces the rectifier damage
- prevents capacitor overheating
- increases the power factor
- suppresses sudden changes in grid voltage (power supply)

TCGC offers the following **DC Bus/Link Chokes/Reactors:**

- **EM-RAD3** (3-Phase ~380V) – From 0.4 kW up to 560 kW
- **EM-RAD4** (3-Phase ~480V) – From 0.4 kW up to 560 kW
- **EM-RAD5** (3-Phase ~525V) – From 0.4 kW up to 560 kW

**Manufactured with Amp ratings according to specific requirement (Custom Voltage options also available on request).*

**For installations where a DC Choke is required the VSD/Solar Drive wiring needs to be reconfigured by the manufacturer.*

AC Chokes (Reactors for Harmonic Filtration)

The use of **Line Reactors** and **Load Reactors** increases the reliability, performance and efficiency of **VSD/Solar Drive** systems and extends the life of both the **VSD/Solar Drive** and motor.

Input Chokes (Line Reactors)

Connected in series with the incoming power supply line and is recommended when the power supply is unbalanced or when power factor is poor in order to:

- protect the **VSD/Solar Drive** from transient overvoltage conditions typically caused by utility capacitor switching;
- reduce the harmonic distortion and imbalance of the power supply current;
- reduce over-voltage trips caused by transient voltage spikes and power line surges;
- protect input rectifiers from in-rush current caused by sudden power supply surges and sags;
- extend the life of the DC bus capacitor bank by reducing the internal heating caused by ripple currents.

Output Chokes (Load Reactors)

Used for operating 'non-**VSD** duty' motors or when the length of wiring between the **VSD/Solar Drive** and motor exceeds 50 metres (can consider from 25 metres). This is to:

- protect the motor insulation against **VSD/Solar Drive** short circuits and IGBT reflective wave damage;
- allow the motor to run cooler by 'smoothing' the motor current waveform;
- reduce the effects of high motor wiring capacitance and 'soften' the dv/dt (high rates of change of voltage) applied to the motor windings;
- suppress the capacitive charging current of the cable between the **VSD/Solar Drive** and motor;

- protect motor windings.

TCGC offers the following **AC Chokes/Reactors:**

- **Input Chokes (Line Reactors)** – From 0.75 kW up to 600 kW
  - **EM-RAI3** (3-Phase ~380V)
  - **EM-RAI4** (3-Phase ~480V)
  - **EM-RAI5** (3-Phase ~525V)
- **Output Chokes (Load Reactors)** – From 0.75 kW up to 600 kW
  - **EM-RAO3** (3-Phase ~380V)
  - **EM-RAO4** (3-Phase ~480V)
  - **EM-RAO5** (3-Phase ~525V)

**Manufactured with Amp ratings according to specific requirement (Custom Voltage options available on request).*

AC EMC/EMI Filters (For Noise Disturbance)

Some frequency-dependant electronic components can produce electric, magnetic or electromagnetic fields, which, if strong enough, can interfere with other appliances (cause undesired effects). **Electromagnetic Compatibility** (**EMC**) is the ability of electrical equipment to operate without being affected by or causing **Electromagnetic Interference** (**EMI**).

Input Filters

Prevents **EMI** and radio interference which comes from the power supply cable to the **VSD/Solar Drive**. To be installed when other appliances cause interference on the **VSD/Solar Drive** supply line (power supply line).

Output Filters

Prevents **EMI** or radio interference which comes from the **VSD/Solar Drive** cable to the motor. To be installed when there is interference on the **VSD/Solar Drive** output line to the Motor (motor supply line).

TCGC offers the following **AC EMC/EMI Filters** for **Noise Disturbance**:

- **Input Filters** – From 0.75 kW up to 560 kW
  - **EM-FIT3** (3-Phase ~380V)
  - **EM-FIT4** (3-Phase ~480V)
  - **EM-FIT5** (3-Phase ~525V)
- **Output Filters** – From 0.75 kW up to 560 kW
  - **EM-FOT3** (3-Phase ~380V)
  - **EM-FOT4** (3-Phase ~480V)
  - **EM-FOT5** (3-Phase ~525V)

**Manufactured with Amp ratings according to specific requirement (Custom Voltage options available on request).*

Sine Wave Filters

AC motors operate at their peak efficiency when they run on clean sinusoidal power. **VSDs/Solar Drives** produce square waves that are modulated so that the pulse width of the square waves can be varied continuously (known as **pulse width modulation** - **PWM**). **VSDs/Solar Drives** maintain fine control over the width and amplitude of the square waves so that they take on the appearance (as viewed on an oscilloscope) of good approximations of a sine wave. Yet, even the most sophisticated **VSDs/Solar Drives** fail to match the purity a true sine wave. Installing a sine wave filter between the **VSD/Solar Drive** and the motor itself 'smooths' the **VSD's/Solar Drive's PWM** signal and converts it into a nearly perfect sinusoidal power wave form. This then:

- reduces motor insulation stress and eliminates switching acoustic noise from the motor;
- prevents disturbing pulses from being transmitted to the motor;
- minimises eddy current losses in the motor, resulting in a cooler motor and thus extended motor lifetime;
- reduces capacitances in screened motor supply cables which cause high oscillating circuit currents through motor bearings, vaporising lubricant, and causing damage to the bearings (especially in motors above 50 kW);
- provides protection for the **VSD/Solar Drive** (due to the lower pulse load being reflected in lower semiconductor losses).

To be installed for applications using older motors, applications in 'aggressive' environments, applications requiring frequent braking, 690V applications with general purpose motors and applications where cable lengths between the **VSD/Solar Drive** and motor is 150 to 500 metres (can reach 3000 metres).

TCGC offers the following **Sine Wave Filters**:

- **EM-SWF3** (3-Phase ~380V) – From 0.75 kW up to 630 kW
- **EM-SWF4** (3-Phase ~480V) – From 0.75 kW up to 630 kW
- **EM-SWF5** (3-Phase ~525V) – From 0.75 kW up to 630 kW

**Manufactured with Amp ratings according to specific requirement (Custom Voltage options available on request).*

Dynamic Braking Systems

Generally used for industrial applications where quick stopping is required which could cause the DC bus voltage to rise (over voltage). It is thus required where the regenerated energ needs to be dissipated quickly to manage the DC bus voltage to prevent the **VSD/Solar Drive** from tripping.

These products are used to dissipate energy (cheap and simple method) by converting regenerative energy into thermal energy (burn off energy). Smaller **VSDs/Solar Drives** include built-in switch to divert extra power to a resistor, but for larger units without a built-in braking switch, external braking units are required.

- These systems can release the energy regenerated during motor speed regulation (via brake resistance) to produce enough braking torque to ensure normal operation of the transducer and other devices.
- These systems are popular for use in cable/wire drawing machines, cranes, elevators, production machinery, mine hoists, centrifugal and oil pumps in oil field, etc.

TCGC offers the following **Dynamic Braking Systems** (listed according to **VSD/Solar Drive** kW Range):

- **0.75kW up to 22kW**: No Break Unit Required (only require resistors - ranging from 100W/500Ω to 3KW/30Ω)
- **30kW up to 45kW**: EM-B U2 (using resistors ranging from 5KW/20Ω to 10KW/8Ω)
- **55kW up to 110kW**: EM-B U3 (using resistors ranging from 10KW/8Ω to 12KW/6.8Ω)
- **132kW up to 160kW**: EM-B U3H (using resistors of 12KW/6.8Ω)
- **185kW up to 220kW**: EM-B U4H (using resistors ranging from 12KW/6.8Ω to 30KW/4Ω)
- **250kW up to 315kW**: EM-B U5H (using resistors ranging from 40KW/3Ω to 40KW/3Ω)
- **355kW up to 500kW**: EM-B U4H (using resistors ranging from 50KW/2.5Ω to 70KW/2Ω)

TCGC offers **Aluminium Housed Braking Resistors** and **Porcelain Windings** (brake resistors)

**Custom Watt/Ohm resistor options available on request.*

EMHEATER South Africa

Clean Imports (part of **TCGC**) has Sole Distribution rights in southern Africa for all **EMHEATER** products.

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