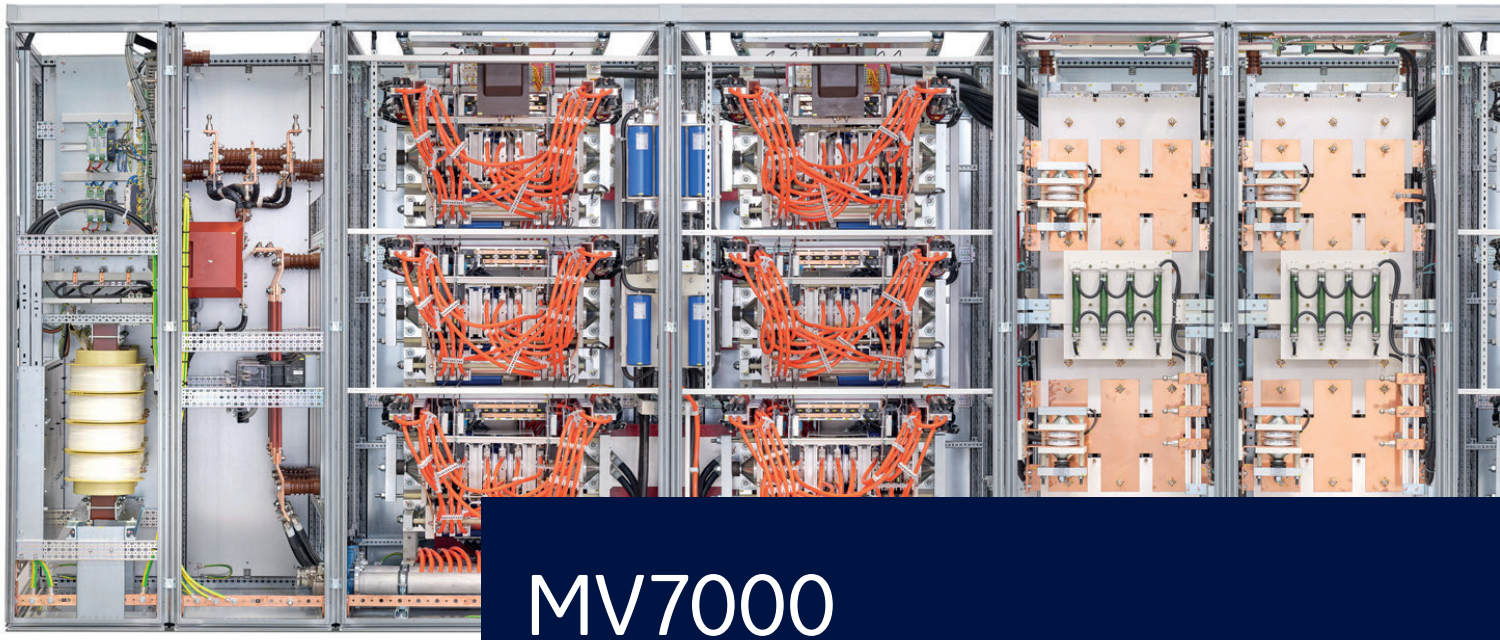

MV7000 example design

# MV7000
# Preventive maintenance

GE has developed, built and commissioned thousands of medium voltage drives. We continue to maintain many of them as part of the planned maintenance cycle - and in the event of an unplanned outage, we are there to help you to get back online as quickly as possible. As an original equipment manufacturer (OEM) with over 125 years of engineering expertise, we are your partner of choice to perform preventive maintenance services for medium voltage (MV) drives.

## Preventive maintenance programs

Systematic regular maintenance of drives helps to ensure efficient operation and reduces the risk of failures. GE offers structured inspections and planned maintenance programs tailored to the configuration of the drives. GE offers four types of preventive maintenance programs:

Preventive "performance" maintenance (annual): including visual inspection, performance checks, and basic maintenance tasks.

Preventive "extended performance" maintenance (every three years): including visual inspection, performance checks, and extended maintenance activities.

Preventive "major" maintenance (every five years): including advanced visual inspection, performance checks, and systematic replacement of parts.

Preventive "Lifecycle" Maintenance (every ten years): major maintenance extended by systematic replacement of parts and components from cooling and power cubicles.

## During the preventive maintenance service, GE will ...

**Conduct and document preventive actions** according to a pre-defined schedule of tests of the drives. Typical preventive actions include, but not limited to:

- Drive inspection and health checks
- Air-/water-cooling system maintenance
- Process cabinets & controller equipment maintenance (e.g., drive controller, DFE rectifier, AFE inverter, DC Bus, output filters, etc.)

**Identify operational and safety critical issues:**
Operational and safety critical issues identified will be brought to your attention and resolution will be proposed based on Customer Technical Communications (CTC's) that are relevant to your specific installation.

## Maintenance schedule

| Operation description | 1Y | 3Y | 5Y | 10Y | Material required |
|---|---|---|---|---|---|
| **General maintenance activities** | | | | | |
| Record/document drive data with revision status and serial numbers | X | | | | |
| Event, error logs & history retrieval | X | | | | |
| Complete data storage | X | | | | |
| Retained values storage | X | | | | |
| Replacing controller filters if Power Electronics Controller | X | | | | X |
| Renew controller buffer battery | X | | | | |
| Option: BEFORE stopping equipment: recording perturbed reference point | X | | | | |
| Visual check (leak, heating, wiring, ...) | X | | | | |
| Electronics cubicle cleaning | X | | | | |
| Fan functional check: Current measurement, isolation, noise | X | | | | |
| Check the correct operation of the keys for locking the power cabinet doors | X | | | | |
| Check pressure flaps | X | | | | |
| Check PEC rack power supply (24V - 230V - 400V) | X | | | | |
| Check power supplies for correct voltage output (230VAC/24VDC) | X | | | | |
| Visual check of earthing system | X | | | | |
| Visual inspection of optical fibers | X | | | | |
| Replace door filters | X | | | | X |
| Check the load of the CPU, record and compare to previous maintenance value | X | | | | |
| Record the signature of a start/stop request, compare to previous recorded signature | X | | | | |
| Record Pertu and check load currents, voltages, earth fault signal - PY comparison | X | | | | |
| Restarting recordings (Pertus) - check that permanent pertus are running | X | | | | |
| Validation of default actions Ctrl emergency stop with opening MVSG | X | | | | |
| Test of safety protection against unexpected restart | X | | | | |
| Prepare recommended spare parts list | X | | | | |
| AFTER maintenance, return system into „ready to operation“ mode | X | | | | |
| Check Pre-charge characteristics | X | | | | |
| Check discharge characteristics | X | | | | |
| Check spare parts agains RSPL, create a deficency list | X | | | | |
| Check controller PIB components (power up, sw startup, HPCi running, FPGA SW load/check) | X | | | | |
| Check thermostat setting in LVDC cubicle | | | X | | |
| Replace the power supply of the PEC rack (VME) | | | X | | X |
| **Cooling unit** | | | | | |
| Pumps functional check: current measurement, isolation, no noise | X | | | | |
| Measurement sanity check (T°, pressure, Q-flow, resistivity) | X | | | | |
| Maintainance of pumps | X | | | | X |
| Check the operation of the 3-way valve | X | | | | |
| Expansion tank pressure control | X | | | | |
| Clean filter in clean water system | X | | | | |
| Check/exchange deionization cartridge | X | | | | X |
| Renew cooling pipes and minor parts | | | | X | X |
| Test of the pressurized water circuit | | | | X | |
| Replace Pumps | | | | X | X |
| Renew the solenoid valve/ 3-way valve | | | | X | X |

| Operation description | 1Y | 3Y | 5Y | 10Y | Material required |
|---|---|---|---|---|---|
| **Power electronics / bus bar sections** | | | | | |
| All connections of cooling water pipes Inspection | X | | | | |
| Visual check of DC Bus capacitors | X | | | | |
| Check diode bridge characteristics | X | | | | |
| All connections of cooling water pipes Inspection (visual) | X | | | | |
| Check the surface condition and cleaning of the earthing switch | X | | | | |
| Check the power supply of voltage measurement cards (PIB 701 - PIB 701A - LEM ...) | X | | | | |
| Visual check of gate drive crads | X | | | | |
| LED status check IGBT gate drivers | X | | | | |
| Check temperature measurement (sanity check) | X | | | | |
| Initiate test pulses for GDUs (software function) | X | | | | |
| Measurement of earthing system (PE, loop resistance)* | | X | | | |
| Annual measurement of Snubber Capacitors/ Resistors** | | X | | | |
| Renew Snubber Capacitor/Resistor Assembly** | | X | | | X |
| Fan renewal after end of lifetime (40.000hrs) | | | X | | X |
| Check/measurement of DFE RC damping components*** | | | X | | |
| Renewal of DFE RC Damping assembly | | | X | | X |
| DC voltage injection on voltage sensors | | | X | | |
| Check values of the earth fault resistors | | | X | | |
| Renew power supplies (230VAC/24VDC) | | | X | | X |
| Check/measurement of DC RC damping component**** | | | X | | |
| Renewal of DC RC damping assembly**** | | | X | | X |
| Annual measurement of clamp capacitors**** | | | | X | |
| Renew clamp capacitors**** | | | | X | X |
| Renew power supplies (DC/DC converters) | | | | X | |
| **dV/dt filters** | | | | | |
| Visual inspection filter capacitors | X | | | | |
| Visual inspection Resistors | X | | | | |
| Check the contact status of HV relays (if applicable) | X | | | | |
| Resistances measurement of the dV/dt - Sinus filter | | | X | | |
| Measurement of the capacitors of the dV/dt - Sinus filter | | | X | | |
| Tightening checks | | | X | | |
| Renew Resistors/Capacitors assembly of the dV/dt - Sinus filter | | | | X | X |
| **pre charge cabinet** | | | | | |
| Visual inspection: Pre-magnetization transformer, resistors | X | | | | |
| check setting of the precharge relays | X | | | | |
| 400V Transformer primary Insulation Measurement | | | X | | |

* as per DGU V3
** as per CTC-PC-2019-007
*** refer to CTC-PC-2019-034
**** as per CTC-PC-2019-006

## Inspection & health check

Our preventive maintenance programme helps you asses the condition of your drives.

As part of our health check and inspections,
GE experts will:

- Assess the present condition of your installation through
  - > Visual inspection: leakages, heating, wiring
  - > Cleaning: cabinets cleaning, filter replacement
  - > Measurement/checks: power supply, temperature, pressure, flow and resistivity
  - > Functional checks: fans, pumps, insulation, and restart record
  - > Safety and protection functionality check
- Retrieve event logs, alarms and controller historical recordings
- Record inventory of and compare to prepared recommended spare parts list

## Troubleshooting

GE provides different tiers of field service support to undertake inspections, troubleshooting and repairs or offering long term service agreements.
In case, customer advises of specific issues for service attention, GE field service engineers can perform repair or collect additional information for detailed investigations.

After the preventive maintenance service, we will issue a maintenance report and recommend:
**Critical spare parts** that you should consider holding.
**Replacement parts for the obsolete parts**, which you may wish to plan to replace.
**Upgrade packages** appropriate to your drives and circumstances.

We are also always happy to discuss and recommend possibilities of a long term service agreement and related offerings.

## Contact us:

**services.powerconversion@ge.com**

## Services from GE —a focus on availability

We understand the vital importance of process availability – and our focus on service keeps us actively engaged, both when things are going right, and when they are going wrong.

Our world-class Global Customer Service and Support Center is available 24/7, 365 days a year. Our strategic distribution centers and authorized distributors carry an extensive inventory of GE's drives, allowing us to quickly fulfill your genuine replacement part needs, no matter where you are located.

With a comprehensive global network of service engineers and technicians, GE is uniquely positioned to provide the knowledge, experience, and skills for your full range of industrial service requirements. From system design to maintenance and outage support, we have the resources and capabilities to advance your equipment 's performance and reliability.

We also provide managed system upgrade paths for our legacy systems and have significant experience in replacing systems from other manufacturers with low disruption to the existing infrastructure.

Some key benefits of GE's support contracts are:

- Single point of contact
- Reduced call-out rates
- 24/7 availability
- Rapid mobilization of engineers
- Routine maintenance visits
- Training
- System health checks
- Spares management
- Obsolescence management

Building a world that works