General

- Confirm correct hydraulic oil (ISOVG46) is in the tank.
- Check and ensure oil level in the tank is adequate.
- Check and ensure the frame is bolted down and secured properly
- Ensure pipe fittings and pipe clamps are tight and correctly installed.
- Visually inspect all pipe connections to ensure the hydraulic circuit is correct and that all the pipes are connected to the correct port.
- Check and ensure the direction of rotation of all the 4 motors is correct. (2 main pump motors, 1 heat exchanger motor, 1 offline cooling and filtration motor)
- Check pre-charge pressure of gas in accumulators by reading Pressure Transducer display.
- Cleanliness requirement of hydraulic valves on the SB1-2 Brake system should be 17/15/12 according to ISO 4406.

First Flush Channel 1

- Close all isolating ball valves on all the calipers (1caliper = 2 brake elements) items 82.
- Close isolating ball valve item 2.46.
- Open isolating ball valve item 1.46.
- Open flushing ball valves item 1.75.1 and 1.75.2.
- Start flushing process by activating this process from the Brake Controller HMI screen. For more information refer to OEM manual of that particular brake system model.
- Continue flushing channel 1 for 2 minutes then stop the flushing process.
- Keep the brake system switched off for 5 mins to allow entrapped air in the oil to escape.
- Repeat process two or three times.
- Close flushing ball valves item 1.75.1 and 1.75.2.
- Open ball valve of the caliper which will be bleed and bleed air from test points of each brake element of that particular caliper. Use test hose and Bleed Bottle to safely capture oil from test points. Slowly allow air / oil to flow into bleed bottle. Close ball before carrying on with the next caliper.
- Repeat process two or three times.

First Flush Channel 2

- Close all isolating ball valves on all the calipers (1caliper = 2 brake elements) items 82.
- Close isolating ball valve item 1.46.
- Open isolating ball valve item 2.46.
- Open flushing ball valves item 2.75.1 and 2.75.2.
- Start flushing process by activating this process from the Brake Controller HMI screen. For more information refer to OEM manual of that particular brake system model.
- Continue flushing channel 1 for 2 minutes then stop the flushing process.
- Keep the brake system switched off for 5 mins to allow entrapped air in the oil to escape.
- Repeat process two or three times.
- Close flushing ball valves item 1.75.1 and 1.75.2.
- Open ball valve of the caliper which will be bleed and bleed air from test points of each brake element of that particular caliper. Use test hose and Bleed Bottle to safely capture oil from test points. Slowly allow air / oil to flow into bleed bottle. Close ball before carrying on with the next caliper.
- Repeat process two or three times.

Pressure test

- Close all isolating ball valves on all the calipers (1caliper = 2 brake elements) items 82.
- Energise Test Dump valves 60.1 and 60.2 so that oil path from the main pump to the brake calipers is open.
- Start main pump(s).
- Energise service valve 30 and quick drop solenoid valve 39.
- Limit Pressure on the safety valve item 34 to 25bar. Visually check all pipe connections for leaks.
- Increase pressure to 50bar. Visually check all pipe connections for leaks.
- Increase pressure to 75bar. Visually check all pipe connections for leaks.
- Increase pressure to 100bar. Visually check all pipe connections for leaks.
- Increase pressure to 125bar. Visually check all pipe connections for leaks.
- Increase pressure to 150bar. Visually check all pipe connections for leaks.
- Increase pressure to 175bar. Visually check all pipe connections for leaks.
- Increase pressure to 200bar. Visually check all pipe connections for leaks.
- Maintain pressure at 200bar for 1/2 an hour. Visually check all pipe connections for leaks.
- If any leaks are found; pressure is to be drained and joints are to be tightened or repaired as necessary.
- De-energise system and turn off main pump(s)

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Second flush

- Connect Oil Particle Monitor to Test Points M5 1.103.1 and 2.103.2 and Test Point on Return Filter 113.8
- Ensure heaters are on and that oil is as hot as possible but not more than 60 degrees.
- Close all isolating ball valves on all the calipers (1caliper = 2 brake elements) items 82.
- Close all flushing ball valves on all the calipers (1caliper = 2 brake elements) items 75.
- Start the Offline Cooling and Filtration pump and run continuously to filter the oil.
- Start main pump(s)
- Energise service valves 30 and quick drop solenoid valves 39.
- Limit Pressure on the safety valves item 34 to 25bar and energise the valves.
- Open each flushing item 75, located on each brake post for 30 minutes then close again.
- Continually monitor oil temperature and oil cleanliness. Repeat above opening and closing sequence until oil cleanliness is indicated as 17/15/12 or better.
- Stop the Offline Cooling and Filtration pump.
- Take oil sample from Test Points 1.103.1 and 2.103.1. Rinse sample bottle twice before filling. Send sample to laboratory for analysis.
- De-energise brake system.
- Turn off heaters, main pump(s) and Offline Cooling and Filtration pump.

Filter change

- Isolate 4 power pack motors.
- Ensure all oil pressure is released and that transducers are reading 3bar or less and analogue gauges read 0bar.
- Remove temporary flushing filter.
- Change all filters.
- De-isolate 4 power pack motors.
- Operate Offline Cooling and Filtration pump to check for leaks.
- Operate main pump(s) with pressure set to 25bar.
- Ensure all isolating ball valves on all the calipers (1caliper = 2 brake elements) items 82 are still closed.
- Open and close the Flushing Ball valves item 75 one at a time for two minutes each.
- Gradually increase pressure to 140bar and check for leaks from the pressure filters 17.1 and 17.2.
- Disconnect power supply leads to Test Dump valves, Trip valves and Driver's valve.
- Open all Caliper ball valves item 82.

Assemble input coupling

- Isolate power supply to main motor after motor tuning has been completed.
- Remove Input Coupling Guard.
- Remove plastic covers from coupling halves.
- Clean mating faces and gasket.
- Rotate motor by hand to line up coupling halves.
- Bolt together coupling halves ensuring that the joint is centralised. Torque bolts according to the OEM specification with hand torque wrench.
- Install grease nipple in coupling half and remove plug from other half.
- Purge air from coupling using pneumatic grease gun.
- Remove grease nipple install plugs in both ports.
- Reinstall guard.
- De-isolate power supply to main motor.

Align Encoder couplings

- No rope on drum.
- With drum not rotating, remove cover of encoder assembly on the Drive End.
- Install laser alignment equipment vertically on gear box input coupling.
- Winder running at creep speed. Creep speed set to 0.2 m/s
- To obtain measurements: Drive winder through 75° then in the opposite direction 150°. Repeat as necessary.
- Adjust shims under gearbox and re-measure.
- Carry out shim adjustments and re-measure as necessary.
- Install laser alignment equipment vertically on gear box output coupling.
- Repeat above procedure.
- Re-install cover.
- With drum not rotating, remove cover of encoder assembly on the Non Drive End.
- Repeat above procedure.
- Re-install cover.

Measure Disc run-out

- No rope on winder drum.
- When drum is not rotating, install non-contact laser distance transducers mounted to magnetic base.
- Set laser measuring point 50mm from outside diameter of brake disk.
- Measure both sides of one disk at one time.
- Run winder at 1.0m/s
- Measure 10 drum revolutions.
- Measure one disk then the other.
- When drum is not rotating, remove measuring equipment.
- Rope on drum with conveyance in shaft.
- Repeat above set-up.
- Run winder at normal speed.
- Measure 1 complete hoisting cycle starting with the conveyance at the top of the shaft.

Bedding in Brakes

- No rope on drum.
- Ensure brake disks are free from contamination.
- Conduct static brake test for each brake disk to determine static holding torque.
- Drive winder for 10 minutes at creep speed 0.5m/s with brake pressure of both channels set to 90bar.
- Monitor brake disk temperature with non-contact infra-red thermometer. Temperature of disk not to exceed 80°C
- Monitor motor current.
- Conduct static brake test to determine increase in static brake torque.
- Repeat process two or three times.
- Confirm the air gaps in between the process.

Spring force TESTS / AIR gap SETTING / BRAKE element transducer calibration (SETTING OF THE AIR GAP FOR A – BE 100 and/or BE 125 BRAKE ELEMENT)

- Conduct Spring Force Tests after Bedding in the brake pads:
    - Checking of spring forces:
        - The objective of measuring the spring forces is to assess whether the spring force has changed and whether it can be expected that the minimum braking force of the disc brake system is ensured until the next overhaul.
        - The minimum braking force is attained when all the brake elements have reached an efficiency of 90%.

- The data for these graphs is collected using Linear Variable Distance Transducers and a Pressure Transducer. Signals from these devices are recorded and processed with BeanScape software. Brake elements are tested as a pair using a hand pump to release the brake elements. Two complete release and apply cycles are graphed simultaneously. During the tests all other brake elements ae isolated and in the applied position. Elements are failed using the following criteria:
    - Brake apply curve is less than minimum line
    - Slope of brake apply line is greater than 6 bar/mm (min line is 4 bar/mm)
    - Shape of curve is inconsistent.
    - Hysteresis is greater than 15 bar

- At same time re-set air gaps as necessary:
- Setting of air gap
    - The air gap between brake lining and brake disc must be precisely set to the value determined by brake calculation. In normal case, L0 is 2 mm; the exact value is indicated in the brake calculation.
    - Precise setting requires the use of following tools:
        - Set of hand pumps for lifting the brake elements (see A2.10, Item 1)
        - Hook spanner for turning the adjusting sleeve and the threaded ring (A2.10, Item 2.1)
        - Set of measuring tools for determining the lifting distance (A2.10, Item 3) (only required for operation monitors with micro switches (FWM)).
    - Setting procedure for brake units BE125 with linear displacement sensor (FWL):
        - Bolt hydraulic pump down to the manifold of the brake post.
        - Open the stop valve of the pressure line towards the brake element that is to be set; isolate the other brake elements.
        - Untighten threaded ring (10) using hook spanner and screw it out somewhat.
        - Undo the anti-rotation device (parts 21, 33, 34).
        - Read the lifting distance on the operator panel.
        - Lift brake unit completely up to the stop, using the hydraulic pump, and read again the lifting distance on the dial gauge. The reading must be "0".
        - Determine the differential value to the value preset in the brake calculation (normally 2 mm) and turn the adjusting sleeve either forwards or backwards (refer to table in sect. A2.6 a).
        - Relieve lifting pressure via the drain plug of the pump until the brake lining bears pressure-less against the brake disc. Read on the dial gauge the lifting distance to the brake disc. The lifting distance should coincide with that resulting from the brake calculation, with a tolerance of ±0.1 mm.
        - If necessary, repeat the setting operation.
        - After setting has been completed turn the threaded ring (10) up to the adjusting sleeve (9) and tighten it by using the hook spanner. Tighten firmly the anti-rotation lock (parts 21, 33, 34).
        - Then re-open all stop valves towards the other brake units and screw off the hydraulic pump.
- Check air gap readings on the HMI to determine if the calibration of the transducers is accurate.

Electrical checks

- Confirm all electrical connections to valves and monitoring devices on the power pack are tight.
- Confirm the operation of the valves is functioning properly.
- Confirm the monitoring and operation of the valves and ancillary devices is functioning properly.
- When power is ON, ensure all pressure transducers are powered. This is confirmed by the LCD screen on each transducer.