



VEDQuality

Status – Ford



SensePlanAct

Autonomous Mobility and Safety | Vehicle Dynamics

Notification to Vehicle Manufacturers & Logistics

› Potentially suspect Parts sent to Customers

› BMW Spartanburg was notified on **February 3rd 2020**

Total qty. 18,406 suspect

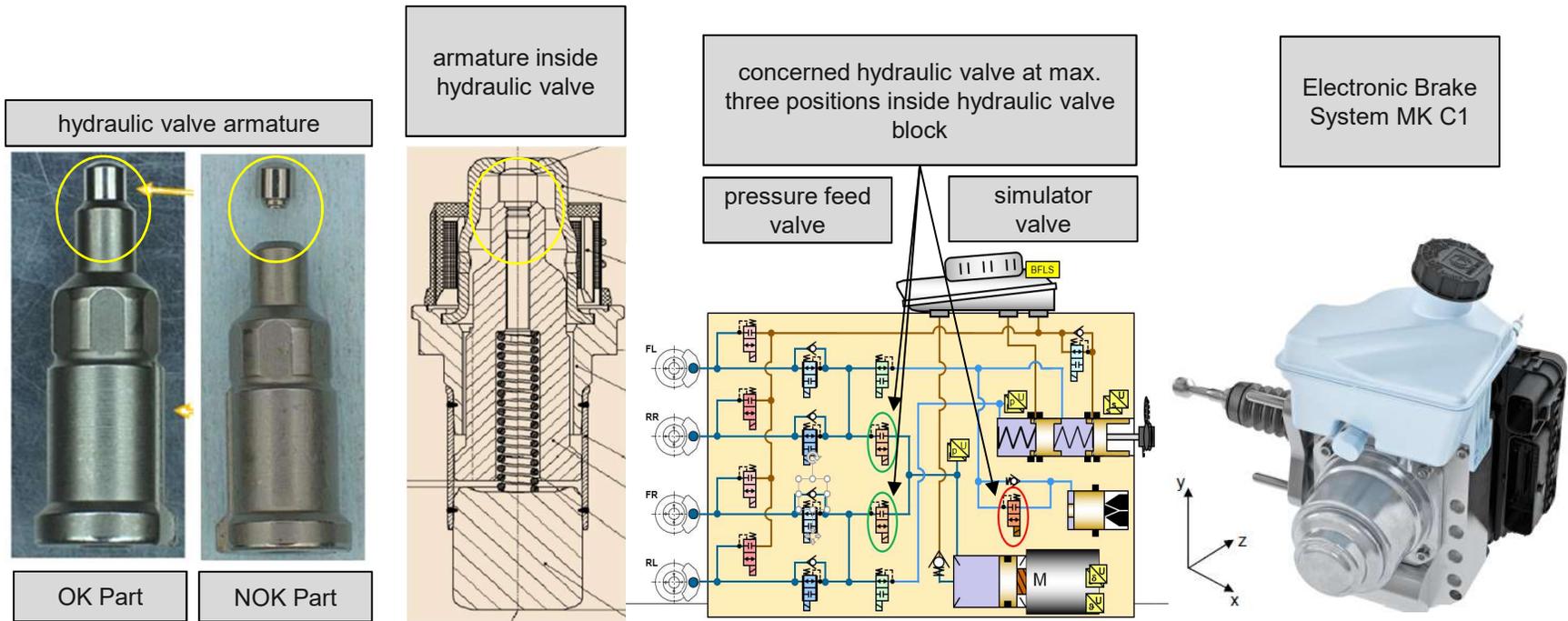
- › Spartanburg Part N° 5A0B13901; -18,942qty shipped (536 parts returned, 3,843 parts more targeted for return)

› Ford Chicago and Louisville were notified on **February 4th 2020**

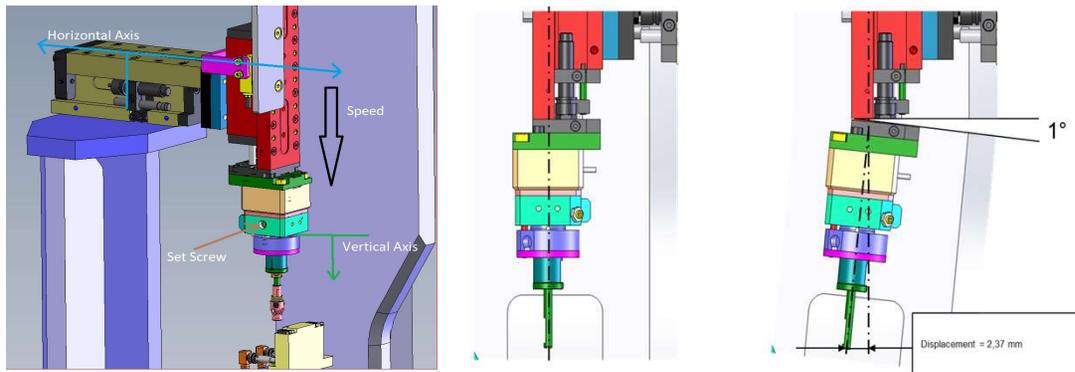
Total qty. 32,814 suspect

- › Chicago Part N° L1MC-2D335-CB -18,635qty shipped, Chicago trading; 550qty shipped
- › Louisville Part N° LX6C-2D335-KA -13,455qty shipped
- › Hermosillo Part N° LX6C-2D335-KA -53qty shipped (53 parts are targeted for return)
- › Cuautitlan Part N° LJ9C-2D335-AB -121qty shipped (121 parts are targeted for return)

Defect Description



Root Cause at Valve Assembly Continental Plant Morganton



- › Due to crash at the armature assembly station the assembly axis became misaligned
- › Machine stopped and Technician adjusted the alignment w/o recognizing a permanent deformation – after adjustment line was re-started
- › Due to the self centering capability of the assembly head, the machine started to create sporicidal failures – with detection of cracked plunger inside a customer return part, assembly line was stopped at 6th of February
- › Clean date of further completed MK C1 units deliveries with containment valves from sister plant Mechelen in Belgium – 7th of February

Defect Occurrence Probability

- › 8 x 0-mileage Complaints from Customer
 - › 6 x from BMW
 - › 2 x from Ford
 - › Defect at simulator valve – Customer Complaint = *“hard brake pedal”*
 - › Defect at pressure feed valve – Customer Complaint = *“pressure feed valve unwanted open” – DTC0x4808D1, Red & Yellow warning light ON*
- › Suspected time frame from **7th to 30th of January 2020** based on production dates of valves investigated and found with cracked plunger
- › Tear down and analysis of valves from suspect time frame (Morganton stock)
 - › 6 out of 315 plungers found cracked = 1,93% NOK
(with 90% confidence level NOK rate is within 0,83%-3,72%)
 - › Depending on MK-C1 variant, either 2 or 3 valves are used inside 1 hydraulic valve block
 - › HECU variant with 3 valves, expected NOK rate = 2,47 to 10,8%
 - › HECU variant with 2 valves, expected NOK rate = 1,65 to 7,30%

Defect Severity

› Simulator Valve Failure

- › Pressure build up OK - $>6.43\text{m/s}^2$ @500N confirmed
- › Hard pedal possible (down to 4mm rod travel → approx. 16mm pedal travel)
- › Sporadically behavior based on plunger tip position
- › Controllable for the driver (noticeable changed pedal feel), no vehicle instability, no yawing
- › Control functions remain active (ABS / AYC) and ensure vehicle stability
- › Regulatory Affairs Frankfurt: No violation of ECE13h nor FMVSS norms

› Pressure Feed Valve Failure

- › Pressure build up OK but - sporadically delayed pressure decrease in one circuit after releasing the brake pedal
 - › Approx. 30bar delta pressure for 200ms (reduced volume flow through Pressure Feed Valve)
 - › Max. 80bar pressure remaining for 0.8...1.0s inside one circuit
- › Controllable for the driver, no vehicle instability, no yawing
- › Control functions remain active (ABS / AYC) and ensure vehicle stability
- › Regulatory Affairs Frankfurt: No violation of ECE13h nor FMVSS norms

Thank you
for your attention!