GENERAL GUIDELINES:

- MATERIAL, DIMENSIONS AND DESIGN OF INDIVIDUAL PARTS SUCH AS PISTON, CAN AND CARTRIDGE SHALL BE TO MANUFACTURER'S CHOICE, UNLESS OTHERWISE SPECIFIED IN THE GUIDELINES ON THE FOLLOWING PAGES.
- GAS SPRINGS ARE TO BE DESIGNED, MANUFACTURED AND TESTED IN ACCORDANCE WITH PRESSURE VESSEL REGULATIONS WITHIN THE COUNTRY THE GAS SPRING IS SOLD TO.
- THE MANUFACTURER'S CHOICE OF MATERIALS, DIMENSIONS AND DESIGN SHALL ENSURE A SAFE WORKING PRODUCT.
- WHEN REBUILDING NITROGEN GAS SPRINGS USE ONLY SEAL KITS OR PARTS MADE BY THE SAME GAS SPRING MANUFACTURER. DO NOT INTERCHANGE PARTS FROM DIFFERENT MANUFACTURERS.

PISTON ROD:

- EACH PISTON ROD IS TO BE PERMANENTLY MARKED WITH MANUFACTURER'S NAME AND LOT NUMBER FOR IDENTIFICATION AND TRACKING PURPOSES.
- THE PISTON ROD MUST BE MANUFACTURED WITH A SECONDARY SAFETY RING/SECURITY FEATURE THAT WILL INTRODUCE A GAS LEAKAGE AND RETAIN THE PISTON ROD IN THE EVENT OF PISTON ROD BREAKAGE.

CAN:

- CAN IS TO BE A ONE PIECE OR WELDED CONSTRUCTION.
- EACH CAN IS TO BE PERMANENTLY MARKED WITH THE FOLLOWING INFORMATION:
  - INDIVIDUAL SERIAL NUMBER FOR TRACKING PURPOSES, FORD PART NUMBER, MANUFACTURER'S NAME OR LOGO, REPAIR KIT NUMBER AND MAXIMUM CHARGING PRESSURE.

CARTRIDGE:

- CARTRIDGE DESIGN AND MATERIAL SPECIFICATIONS ARE TO MANUFACTURER'S CHOICE ALONG WITH THE FOLLOWING REQUIREMENTS:
  - THE CARTRIDGE MUST BE DESIGNED IN SUCH A WAY THAT WHEN ASSEMBLED UPSIDE DOWN IN THE CAN AND PRESSURIZED, THE NITROGEN WILL THEN BE EXHAUSTED RAPIDLY FROM THE CYLINDER.
  - THE CARTRIDGE BOTTOM MUST HAVE A GROOVE OR CHAMFER FEATURE TO LOCK THE RETAINING RING IN PLACE IF THE CARTRIDGE IS INSTALLED UPSIDE DOWN.
  - FOR ADDITIONAL INFORMATION REQUIRED ON THE CARTRIDGE AND IN THE REPAIR KIT SEE WDX35-42M PAGE 3.

CARTRIDGE RETAINER RING:

- THE RETAINER RING IS TO BE A ONE-PIECE CONSTRUCTION.
- THE RETAINER RING MUST BE DESIGNED IN SUCH A WAY THAT IT PRESSES OUTWARD WHEN INSTALLED IN THE GROOVE.

CHARGING PORT:

- THE CHARGING PORT IS G 1/8" BSPP (REF. DIN ISO 228). SPRING MUST BE ABLE TO BE CONVERTED FROM A SELF CONTAINED SYSTEM TO A PIPE SYSTEM.
- SELF CONTAINED GAS SPRING IS TO BE SHIPPED WITH A HIGH PRESSURE VALVE AND PORT PLUG.
GUIDELINES FOR NITROGEN GAS SPRINGS SUPPLIED TO FORD

MOUNTING ACCESSORIES:

- ALL MOUNTING ACCESSORIES ARE TO BE TO FORD SPECIFICATIONS, SEE WDX35-72M PAGES 1-7.

INSPECTION & TESTING PROCEDURES:

- ALL CYLINDERS TO BE ASSEMBLED, INSPECTED AND TESTED BEFORE SHIPPING.
- EACH CYLINDER IS ALSO TO BE LOAD-CELL TESTED INDIVIDUALLY TO ENSURE PROPER CHARGING PRESSURE.

LABELS:

- IDENTIFICATION LABEL IS TO HAVE MANUFACTURER'S NAME OR LOGO, ADDRESS, TELEPHONE NUMBER AND FORD PART NUMBER.
- CAUTION / WARNING LABEL IS TO BE PLACED DIRECTLY ABOVE THE CHARGING PORT. THIS LABEL HAS TO CONTAIN GRAPHICS AND / OR INSTRUCTIONS ON PROPER HANDLING PROCEDURES INCLUDING A SPECIFIC WARNING NOT TO ATTEMPT ANY MAINTENANCE ON THE CYLINDER UNTIL ALL THE NITROGEN PRESSURE HAS BEEN DISCHARGED. THE MAXIMUM PRESSURE OF 15 MPa (150 BAR) SHOULD ALSO BE ON THE LABEL. BACKGROUND OF LABEL IS TO BE BRIGHT YELLOW WITH BLACK LETTERING.
NITROGEN GAS SPRING CARTRIDGE AND REPAIR KIT PROCEDURES

- ALL NITROGEN GAS SPRING REPAIR KITS REQUIRE TO CONTAIN A SET OF INSTRUCTIONS DETAILING THE PROPER REPAIR PROCEDURE. THE INSTRUCTIONS HAVE TO HAVE ILLUSTRATIONS ALONG WITH SCHEMATICS AND WRITTEN STEP-BY-STEP REPAIR PROCEDURES.

- MANUFACTURER HAS TO PERMANENTLY MARK THE WORD "TOP" OR "THIS END UP" ON THE FACE OF THE CARTRIDGE.

- THE 0750 TON AND SMALLER CARTRIDGE CAN HAVE THE WORD "TOP" OR "THIS END UP" PERMANENTLY MARKED ON THE SIDE WITH AN ARROW POINTING UP.

- TOP FACE OF THE CARTRIDGE HAS TO BE PERMANENTLY MARKED WITH THE WORD "TOP" OR "THIS END UP" INTO THE FACE AND REFER TO THIS IN THE INSTRUCTIONS AND ILLUSTRATIONS. EXCEPTION: THE 0750 TON CARTRIDGE AND SMALLER CAN HAVE THE WORDS MARKED ON THE SIDE WITH AN ARROW POINTING UP. THE CARTRIDGE BOTTOM MUST HAVE A MACHINED GROOVE/CHAMFER TO LOCK THE RETAINING RING IN PLACE IF THE CARTRIDGE IS INSTALLED UPSIDE DOWN.

- MANUFACTURER'S NAME HAS TO BE PERMANENTLY MARKED ON THE SIDE OF THE CARTRIDGE.

- DOWN AND PRESSURIZED THE NITROGEN WILL BE EXHAUSTED RAPIDLY FROM THE CYLINDER. THE CARTRIDGE MUST HAVE A FAIL-SAFE BUILT INTO IT THAT WHEN ASSEMBLED UPSIDE DOWN AND PRESSURIZED THE NITROGEN WILL BE EXHAUSTED RAPIDLY FROM THE CYLINDER.

REPAIR KIT SHOULD INCLUDE BUT ARE NOT LIMITED TO:
- (1) FULLY ASSEMBLED CARTRIDGE.
- (1) BOTTLE ASSEMBLY OIL.
- (1) DUSTCOVER/WIPER.
- (1) CAUTION-HIGH PRESSURE LABEL.
- (1) REPAIR PROCEDURES (INSTRUCTIONS).
CHARGING PRESSURE AND FORCE INCREASE FACTOR

0750 CYLINDERS

1500 CYLINDERS

3000 CYLINDERS
CHARGING PRESSURE AND FORCE INCREASE FACTOR

5000 CYLINDERS

FORCE F1 (kN) vs. PRESSURE (BAR)

FORCE INCREASE FACTOR K \( \frac{F_2}{F_1} \) vs. TRAVEL (mm)

7500 CYLINDERS

FORCE F1 (kN) vs. PRESSURE (BAR)

FORCE INCREASE FACTOR K \( \frac{F_2}{F_1} \) vs. TRAVEL (mm)
DROP-IN NITROGEN GAS SPRING APPLICATION
BASIC MOUNT GAS SPRING IN LOWER SHOE OF DRAW DIE

<table>
<thead>
<tr>
<th>GAS SPRING SIZE (N)</th>
<th>X</th>
<th>ØB</th>
<th>ØD</th>
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<tbody>
<tr>
<td>7.500</td>
<td>50</td>
<td>50</td>
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<tr>
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<tr>
<td>75.000</td>
<td>90</td>
<td>150</td>
<td>152.5</td>
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</table>

MAKE GAS SPRING CLEARANCE HOLE 0.5mm TO 1mm LARGER THAN THE CYLINDER BODY TO PREVENT GAS SPRING FROM FLOPPING AROUND IN THE HOLE.

10% MIN. UNUSED STROKE LEFT IN GAS SPRING.

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MAY 2006
AIR CYLINDERS, GAS SPRINGS & EQUIPMENT
W-DX35-42M
PAGE: 6
1. DIE OPEN

**EXAMPLE:**

POWER UNIT WITH DRIVING CYLINDER STROKE = 60mm AND CAM UNIT WITH STROKE = 50mm.

2. CAM FINISHED WORKING 10mm BEFORE THE DIE CLOSED

**EACH CAM OR CYLINDER IS BUILD WITH AN INTEGRATED STOP.
DON'T USE OLD CAMS OR CYLINDERS WITHOUT INTEGRATED STOP.**

3. DIE CLOSED

**THE DRIVING CYLINDER OF THE POWER UNIT HAS GOT 10mm MORE STROKE THAN THE CAM FOR LEAKAGE AND SAFETY. IT IS FEED INTO THE ACCUMULATOR OF THE POWER STATION.**