

Hydraulic Cleanliness

1. SCOPE

This standard establishes acceptable cleanliness levels and covers the contamination for fluid power components, systems, and assemblies. All requirements of this standard must be met in addition to all other requirements as stipulated on individual component drawings.

2. RELATED SPECIFICATIONS

2.1 REFERENCE STANDARDS

ANSI B93.44—Extracting Fluid Samples from a Reservoir of an Operating Hydraulic Fluid Power System
 ANSI B93.19M—Extracting Fluid Samples from the Lines of an Operating Hydraulic Fluid Power System (for Particulate Contamination Analysis)
 ANSI/SAE J1165—Reporting Cleanliness Levels of Hydraulic Fluids
 ASTM D95—Test Methods for Water in Petroleum Products and Bituminous Materials by Distillation
 NH Qualitas—Quality System Standard
 ISO 3733—Petroleum Products and Bituminous Materials—Determination of Water—Distillation Method
 ISO 4021—Hydraulic Fluid Power—Particulate Contamination Analysis—Extraction of Fluid Samples from Lines of an Operating System
 ISO 11171—Hydraulic Fluid Power—Calibration of Automatic Particle Counters for Liquids
 ISO 4405—Hydraulic Fluid Power—Fluid Contamination—Determination of Particulate Contaminants by the Gravimetric Method

ISO 4406—Hydraulic Fluid Power—Fluids—Methods for Coding Level of Contamination by Solid Particles

2.2 This standard replaces the following company standards:

Ford Tractor	
Specification	ES-7704875
New Holland	2.10.8
New Holland	FNH-3-A-100.00
Versatile	4-A-026

2.3 This standard is the same as Zedelgem standard ES 15.11. For European use and European design use ES 15.11, for North American use and North American design use 82001509 (FNHA-3-A-100.00). The reference charts for both standards were taken from ISO 4406.

3. MEASUREMENT

3.1 The International Organization for Standardization (ISO) Solid Contaminant Code per ISO 4406 (ANSI/SAE J1165) shall be used to identify cleanliness levels for fluid systems, test stand equipment, and base oils. Graphical representation shall be used to express the ISO Solid Contaminant Code—see Section 7. To obtain a valid particle count, the particle counting system must be calibrated per ISO 4402 or an equivalent ISO approved method.

3.2 The Gravimetric Method for the determination of particulate contaminants in fluids shall be used to identify cleanliness levels for hydraulic components and assemblies. Analysis by the Gravimetric Method shall be performed per ISO 4405. The contaminant sample shall be prepared

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ALL	E	TD	121458	30APR03	 NEW HOLLAND	ENGINEERING SPECIFICATION	
ALL	D	BJF	116564	19SEP01			
ALL	C	BJF	116097	07JUN01			
ALL	B	RLF	110229	JUL 97			
ALL	A	RE	107244	960111			
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	CHECKED					82001509	

by thoroughly washing the wetted area with a suitable volatile solvent such as isopropyl alcohol. This will normally require pressure application and several rinses to ensure that all contaminant is collected.

For extraction of fluid samples, reference ISO 4021 (ANSI B93.19M) and ANSI B93.44.

4. CLEANING FLUID

The cleaning fluid used to wash production components must be mineral spirits, filtered naphtha, chlorinated solvent, alkaline-base detergents or equivalent. The fluid shall be continuously filtered to maintain a cleanliness level equivalent to or better than an ISO Contamination Code of 12/9. Where particle count methods are not feasible, the cleaning fluid must have no more than 5mg/liter contamination when checked with a 0.8 micron filter pad.

5. ACCEPTABLE CONTAMINANT LEVELS

5.1 HYDRAULIC OIL

5.1.1 Contamination—All hydraulic oils used in hydraulic systems and production stands must have an initial ISO contamination code of 17/14 or better. In no circumstances shall the initial oil contamination level be greater than that specified for the specific system in which it is used.

5.1.2 Water Content—All hydraulic oils used in hydraulic systems and production test stands must not have a water content level over 0.10%. The test for water in liquid petroleum products per ISO 3733 (ASTM D95) distillation method shall be used.

5.2 HYDRAULIC SYSTEM CLEANLINESS

5.2.1 All hydraulic system shall have a production roll-off acceptable cleanliness level equivalent to or better than the specified ISO solid contaminant code.

5.2.2 Production roll-off is defined as a combination of hydraulic system running time plus a maximum allowable setting time before measure

ments are taken. After the product leaves the production line, a running time not less than 5 minutes, nor more than 15 minutes, followed by a setting time of not more than 5 minutes shall be allowed. Sample should be taken while system is running. All hydraulic system cleanliness level measurements stated in this standard shall be taken within these time limits.

5.2.3 Cleanliness Levels—The following are recommended cleanliness levels for generally classified hydraulic systems. Specific levels will depend upon contaminant ingress and generation levels and individual component requirements. For unique situations refer to manufacturer's specifications.

ISO Level	Hydraulic System
20/18	Steering Circuits Implement Hydraulic Systems
20/16	Tractor Dry Clutch Transmission Zedelgem Combine Systems
19/16	Closed Loop Hydrostatic Trans. Transmission Lubrication Circuit
18/15	Tractor Wet Clutch Transmission
17/14	Tractor Industrial Hydraulic

5.2.4 Drawings—All hydraulic system drawings (assembly or installations) shall reference this standard. A typical call out specifying a cleanliness level on a drawing would be: "MUST MEET SYSTEM ISO CLEANLINESS LEVEL XX/XX PER NEW HOLLAND STANDARD FNHA-3-A-100.00".

5.3 COMPONENT CLEANLINESS

5.3.1 All component parts used in hydraulic systems must meet a minimum cleanliness criteria which may be based upon size of particles, number of particles, or Gravimetric analysis over a known wetted surface area.

5.3.2 One method for determining component part cleanliness is by taking a contaminant sample and passing it through an absolute filter. The contamination level is then checked by using a microscope (to determine size and number of

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