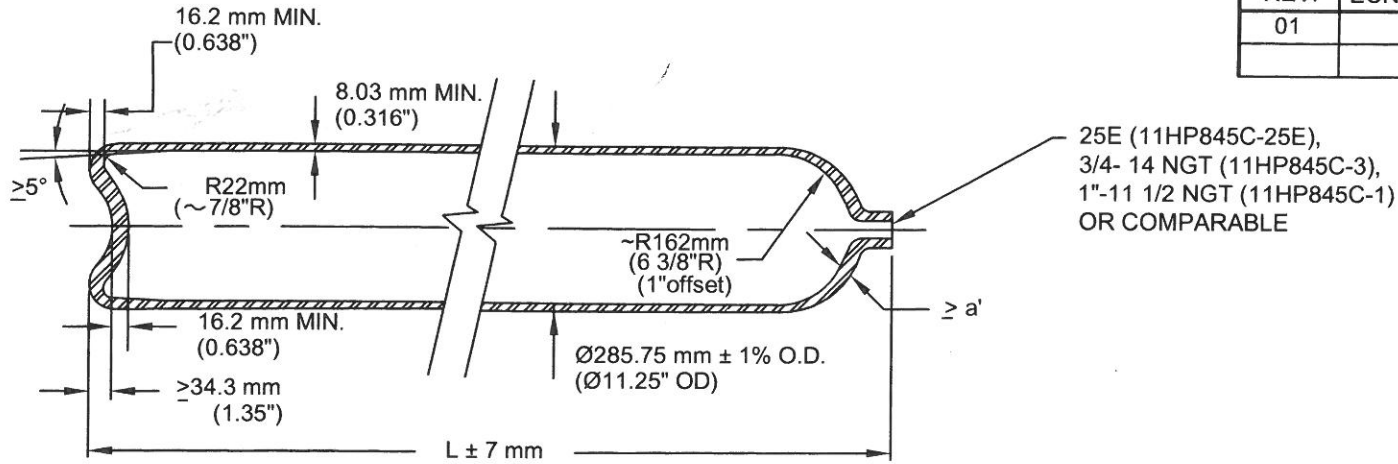


# CONTROL NO. D489-01

REV.	ECN - DESCRIPT.	DATE	DRWN.	CHKD.	APP.
01	3127	8/24/12	JJM	<i>Sam</i>	



**SPECIFICATION:** ISO 9809 - 2: 2000

**1. Service Conditions:**

- ISO rated working pressure: 300 bar (4350 psi)
- Hydraulic test pressure: 450 bar (6525 psi)

(1 bar = 14.5 psi)

**2. Material:**

Cr-Mo-Steel (4133M4) complying with the requirements of clause 6.2 of ISO 9809-2 and Norris' Specification for 4133M4 - EO-A6.

**3. Manufacture:**

Hot billet extrusion followed by hot drawing

**4. Heat Treatment: Quenched and Tempered**

- Austenitize:  $\sim 899^\circ \text{C}$  ( $1650^\circ \text{F}$ )
- Quenchant: Water based polymer: (temperature  $\leq 60^\circ \text{C}$  ( $140^\circ \text{F}$ ))
- Temper:  $\sim 574^\circ \text{C}$  ( $1065^\circ \text{F}$ ) (Min. 30 minutes at temp.)
- Tensile (Rg): 1100 - 1220 MPa (159.6 - 177 ksi)
- Yield (Re):  $\geq 935 \text{ MPa}$  (135.6 ksi)
- Elong (A):  $\geq 12\%$  (ON  $5.65\sqrt{S_0}$ )

**5. Mechanical Properties:** (continued)

- Out-of-roundness per ISO 9809-2: 8.5 -  $< 2\%$
- Straightness per ISO 9809-2: 8.7 - 3 mm per m
- Verticality per ISO 9809-2: 8.8 - 10 mm per m
- Hydraulic and volumetric expansion test per 11.2
- Hardness test: Each end of every cylinder
- Hardness range: 305 - 360 Brinell
- Flattening test: Flatten to  $10 \times t_m$  without cracks
- Charpy test ( $-50^\circ \text{C}$ , Trans):  $\geq 40 \text{ J/cm}^2$  (avg.)  $\geq 60 \text{ J/cm}^2$  (ind.)
- UT flaw detection: Each cyld. per ISO 9809-2
- Batch burst test:  $P_b \geq 720 \text{ bar}$  (10,440 psi)

**6(a). Thickness Calculations:** (ISO 9809-2: 2000)

$$a = 0.5xD \left( \frac{1 - (10FRe - \sqrt{3} Ph)}{(10FRe)} \right)$$

Where:

Ph= Test Pressure (bar) = 450 bar (6525 psi)  
 D = External diameter of container =  $\text{Ø}285.75 \text{ mm NOM}$   
 F = Lesser of  $0.65/(Re/Rg)$  or 0.77;  $Re/Rg \leq 0.9$   
 = Lesser of  $0.65/0.85$  or  $0.77 = 0.765$  (for  $Re/Rg = 0.85$ )

$$a = 0.5 \times 285.75 \left( 1 - \frac{\sqrt{(10 \times 0.765 \times 935 - \sqrt{3} \times 450)}}{(10 \times 0.765 \times 935)} \right) = 8.01 \text{ mm} \text{ (0.315")}$$

**NOTE:** a', the guaranteed min thickness = 8.03 mm (0.316") exceeds calculated min thickness, a.

MODEL	LENGTH 'L'		Min WATER CAPACITY		APPROX. WGT. W/O FITTINGS	
	MM	IN	LITERS	IN <sup>3</sup>	KG	LBS
11HP845C	1588	62.5	80.0	4893	111.2	245
*Vmin	815	32.1	36.3	2215	63.5	140
*Vmax	1651	65	83.0	5064	116.6	257

\*Note: Model 11HP845C is the design qualification test cylinder. Vmin and Vmax represent the range covered by the same design family.

**NORRIS CYLINDER COMPANY**  
4818 WEST LOOP 281 LONGVIEW, TEXAS 75603 USA

**REFILLABLE SEAMLESS STEEL CYLINDER**  
**11HP845C FOR PERMANENT GASES**  
**PER ISO 11114-1**

SCALE	NOT TO SCALE	DRAWING NO.	REV.
DWN. BY	JJM	7/14/11	
CHK'D BY		<b>901A-A-9866</b>	<b>01</b>
APP'D BY	<i>Sam</i>	7/14/11	

SHEET NO.1 OF 1 SHEETS