



TRANSMISSION DATA

— 4000 PRODUCT FAMILY —

ALLISON ON-HIGHWAY TRANSMISSIONS

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List of Referenced Documents

Revision History

Unless otherwise noted, all documents referenced in this document may be found in the Extranet channel of the Allison Transmission website, www.allisontransmission.com. To locate the referenced documents, which are identified by *italic* font, look for Tech Data under the Engineering heading on the Extranet home page. Contact your Allison Transmission representative if you do not have access to the Allison Transmission Extranet.

1.0 MODELS AND RATINGS: 4000 PRODUCT FAMILY

The following is a listing of the base models which comprise the Allison 4000 Product Family. Each may be classified according to three different product types, based as the model's gear scheme. For gear ratios of the individual gear schemes, refer to Table 12.0, Gear Ratios of this document.

A comprehensive list of Input and Output Ratings for all models in the 4000 Product Family is available in a separate document entitled [*4000 Product Family Transmission Ratings*](#).

<u>BASE MODEL</u>	<u>GEAR SCHEME*</u>
4000	Close Ratio
4200	Close Ratio
4430	Wide Ratio
4440	Wide Ratio
4500	Wide Ratio
4600	Wide Ratio
4700	Deep Ratio, 7-Speed
4750	Deep Ratio, 7-Speed
4800	Deep Ratio, 7-Speed
B500	Close Ratio
T400 / T500	Close Ratio

2.0 POWER TAKE-OFF DRIVE GEAR RATINGS

TRANSMISSION CONFIGURATION	MAXIMUM VALUE	UNIT
Drive Gear Torque (Continuous Operation) With PTO on One Pad With PTO on Both Pads – Combined Total *	930 (685) Max. 1595 (1175) Max.	N•m (pound-foot) N•m (pound-foot)
Number of teeth on drive gear	97	—
* Refer to 4000 Product Family Transmission Ratings for minimum engine idle speed required if dual PTOs are used simultaneously.		

3.0 TRANSMISSION TEMPERATURES

PARAMETER	VALUE	UNIT
OPERATING TEMPERATURES		
Minimum Start-Up, TES-295 fluid	-35 (-31)	degrees C (degrees F)
Minimum Start-Up, DEXRON®-VI	-25 (-13)	degrees C (degrees F)
Minimum Start-Up, Schedule One TES389	-25 (-13)	degrees C (degrees F)
Sump, Minimum Continuous	40 (100)	degrees C (degrees F)
Sump, Typical Continuous	93 (200)	degrees C (degrees F)
Sump, Maximum Intermittent	121 (250)	degrees C (degrees F)
Converter-Out, Maximum Intermittent	149 (300)	degrees C (degrees F)
Retarder-Out, Maximum Intermittent (General, Truck)	165 (330)	degrees C (degrees F)
Retarder-Out, Maximum Intermittent (Bus & Coach)	149 (300)	degrees C (degrees F)
MAXIMUM TEMPERATURE PERMITTED		
At Transmission External Surfaces	121 (250)	degrees C (degrees F)

4.0 INSTALLED ANGLES OF TRANSMISSION IN CHASSIS

PARAMETER	MAXIMUM VALUE	UNIT
Pitch — Minimum, Tail-Down	0	degrees
Pitch — Maximum, Tail-Down	7	degrees
Roll	0	degrees

5.0 TRANSMISSION OPERATING ANGLES (INCLUDING INSTALLED ANGLES)

PARAMETER	MAXIMUM VALUE		UNIT
	DEEP OIL SUMP	SHALLOW OIL SUMP	
Pitch	38	24	degrees
Roll	45	28	degrees

NOTE: Values in U.S. units shown in parenthesis () are for reference only. Conversions between metric and U.S. units are not necessarily exactly equivalent.

6.0 TORQUE CONVERTER DATA

TORQUE CONVERTER	NOMINAL STALL TORQUE	NOMINAL K-FACTOR AT STALL	UNITS
TC-521	2.42	50.7 (59.0)	revs per minute / $\sqrt{N \cdot m}$ (revs per minute / $\sqrt{lb \cdot ft}$)
TC-531	2.34	44.8 (52.2)	revs per minute / $\sqrt{N \cdot m}$ (revs per minute / $\sqrt{lb \cdot ft}$)
TC-541	1.90	39.7 (46.2)	revs per minute / $\sqrt{N \cdot m}$ (revs per minute / $\sqrt{lb \cdot ft}$)
TC-551	1.79	38.2 (44.5)	revs per minute / $\sqrt{N \cdot m}$ (revs per minute / $\sqrt{lb \cdot ft}$)
TC-561	1.58	35.4 (41.2)	revs per minute / $\sqrt{N \cdot m}$ (revs per minute / $\sqrt{lb \cdot ft}$)

7.0 TRANSMISSION MAIN PRESSURE

Range	Main Pressure During Normal Operation			Units
	at 600 rpm		at 1800 rpm	
	PTO Request * On	PTO Request * Off	PTO Request * On or Off	
Reverse (R1 & R2)	1448–2055 (210–298)	1172–1586 (170–230)	1806–2055 (262–298)	kPa (psi)
Neutral	1517–2055 (220–298)	1172–1586 (170–230)	PTO Request On 1806–2055 (262–298) PTO Request Off 1310–1720 (190–250)	kPa (psi)
Forward Converter (All Gear Ranges)	1241–1793 (180–260)	869–1338 (126–194)	1551–1793 (225–260)	kPa (psi)
Forward Lockup				
All models except seven-speeds				
Ranges 1— 5	—	—	1082–1365 (157–198)	kPa (psi)
Range 6	—	—	1034–1234 (150–179)	kPa (psi)
Seven-speed models				
Ranges 1— 6	—	—	1082–1365 (157–198)	kPa (psi)
Range 7	—	—	1034–1234 (150–179)	kPa (psi)
* Allison 4th Generation Controls "PTO Request" input function				

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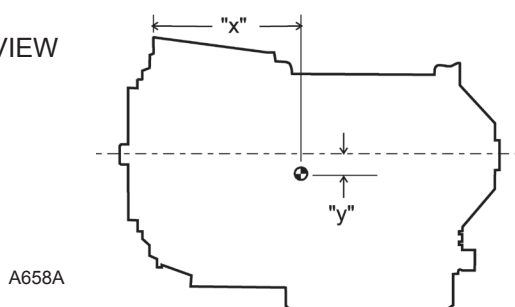
8.0 DRY WEIGHTS

HARDWARE	NOMINAL VALUE	UNIT
Transmission Assembly		
Close Ratio and Wide Ratio Models (No PTO / No Retarder)	377 (831)	kg (pounds)
Seven-Speed Models (No PTO / No Retarder configuration)	493 (1087)	kg (pounds)
Optional features / hardware have additional weight as follows:		
Power Take-Off Provision	28 (62)	kg (pounds)
Retarder Option	34 (75)	kg (pounds)
Direct-Mount Retarder / Sump Cooler	33 (72)	kg (pounds)
Remote Retarder / Sump Cooler	32 (70)	kg (pounds)
Direct-Mount Non-Retarder Standard-Capacity Cooler	16 (35)	kg (pounds)
Direct-Mount Non-Retarder High-Capacity Cooler	23 (50)	kg (pounds)
Retarder Accumulator	4.5 (10)	kg (pounds)
Retarder Accumulator Solenoid	0.5 (1.2)	kg (pounds)
Remote-Mount Provision	52 (114)	kg (pounds)
Rear Mount Bracket for Remote-Mount 6-Speed Transmissions	17 (37)	kg (pounds)
Output Flange or Yoke * Typical, varies by type. Refer to the following 4000 Product Family Installation Drawings : • AS67-441, Available Flanges • AS67-442, Available Yokes	5 – 12* (11 – 26)*	kg (pounds)

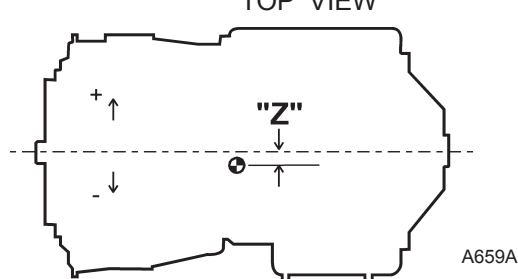
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9.0 CENTER OF GRAVITY

SIDE VIEW



TOP VIEW

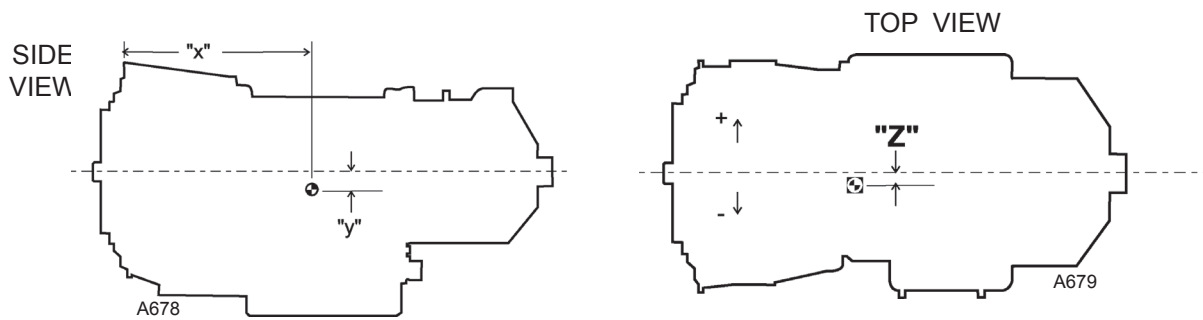


9.1 CENTER OF GRAVITY: Close Ratio and Wide Ratio Models

TRANSMISSION CONFIGURATION	NOMINAL VALUE			UNIT
<i>DIRECT-MOUNT TRANSMISSIONS</i>	X	Y	Z	
No Retarder, No PTO Provision				
With remote cooler provision	342.7 (13.49)	40.2 (1.58)	3.6 (0.14)	mm (in.)
With standard-capacity, direct-mount cooler	357.9 (14.09)	40.8 (1.89)	3.6 (0.14)	mm (in.)
With high-capacity, direct-mount cooler	367.5 (14.47)	51.3 ((2.02)	3.6 (0.14)	mm (in.)
No Retarder, With PTO Provision				
With remote cooler provision	387.7 (15.26)	36.3 (1.43)	0.6 (0.02)	mm (in.)
With standard-capacity, direct-mount cooler	402.8 (15.86)	43.7 (1.72)	0.6 (0.02)	mm (in.)
With high-capacity, direct-mount cooler	412.5 (16.24)	47.0 (1.85)	0.6 (0.02)	mm (in.)
With Retarder, No PTO Provision				
With remote cooler provision	367.5 (14.47)	45.7 (1.80)	7.1 (0.28)	mm (in.)
With direct-mount retarder/sump cooler	407.9 (16.06)	56.4 (2.22)	6.1 (0.24)	mm (in.)
With Retarder, With PTO Provision				
With remote cooler provision	404.6 (15.93)	37.6 (1.48)	5.3 (0.21)	mm (in.)
With direct-mount retarder/sump cooler	445.2 (17.53)	46.5 (1.83)	4.8 (0.19)	mm (in.)
<i>REMOTE-MOUNT TRANSMISSIONS</i>	X	Y	Z	UNIT
No Retarder, No PTO Provision				
With remote cooler provision	288.7 (11.37)	35.2 (1.38)	3.6 (0.14)	mm (in.)
With standard-capacity, direct-mount cooler	304.0 (11.97)	42.1 (1.66)	3.6 (0.14)	mm (in.)
With high-capacity, direct-mount cooler	313.7 (12.35)	45.2 (1.78)	3.6 (0.14)	mm (in.)
No Retarder, With PTO Provision				
With remote cooler provision	331.9 (13.11)	32.0 (1.26)	0.6 (0.02)	mm (in.)
With standard-capacity, direct-mount cooler	348.2 (13.71)	38.9 (1.53)	0.6 (0.02)	mm (in.)
With high-capacity, direct-mount cooler	357.6 (14.08)	41.7 (1.64)	0.6 (0.02)	mm (in.)
With Retarder, No PTO Provision				
With remote cooler provision	314.7 (12.39)	40.4 (1.59)	7.1 (0.28)	mm (in.)
With direct-mount retarder/sump cooler	354.0 (13.94)	50.4 (1.98)	6.1 (0.24)	mm (in.)
With Retarder, With PTO Provision				
With remote cooler provision	350.9 (13.84)	33.5 (1.32)	5.3 (0.21)	mm (in.)
With direct-mount retarder/sump cooler	391.8 (15.40)	41.8 (1.64)	4.8 (0.19)	mm (in.)

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9.0 CENTER OF GRAVITY



9.2 CENTER OF GRAVITY: Seven-Speed Models

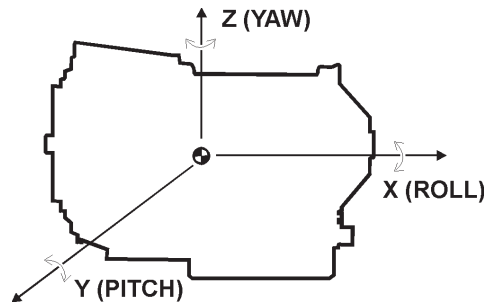
TRANSMISSION CONFIGURATION	NOMINAL VALUE			UNIT
<i>DIRECT-MOUNT TRANSMISSIONS</i>	X	Y	Z	
No Retarder, No PTO Provision	414.0 (16.30)	38.4 (1.51)	-1.5 (-0.06)	mm (in.)
No Retarder, With PTO Provision	489.5 (19.27)	33.8 (1.33)	0.1 (0.11)	mm (in.)
With Retarder, No PTO Provision	465.8 (18.34)	42.7 (1.68)	0.8 (0.03)	mm (in.)
With Retarder, With PTO Provision	525.5 (20.69)	39.9 (1.57)	5.6 (0.22)	mm (in.)
<i>REMOTE-MOUNT TRANSMISSIONS</i>	X	Y	Z	UNIT
No Retarder, No PTO Provision	364.7 (14.36)	34.6 (1.36)	-1.5 (-0.06)	mm (in.)
No Retarder, With PTO Provision	435.8 (17.16)	30.6 (1.21)	0.1 (0.11)	mm (in.)
With Retarder, No PTO Provision	414.8 (16.33)	38.7 (1.53)	0.8 (0.03)	mm (in.)
With Retarder, With PTO Provision	471.7 (18.57)	36.4 (1.43)	5.6 (0.22)	mm (in.)

10.0 TRANSMISSION STATIC BENDING MOMENT LIMIT

TRANSMISSION CONFIGURATION	MAXIMUM VALUE	UNIT
All Models	3500 (2580)	N•m (lb _F -ft)

NOTE: Values in U.S. units shown in parenthesis () are for reference only. Conversions between metric and U.S. units are not necessarily exactly equivalent.

11.0 MASS MOMENTS OF INERTIA



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11.1 MOMENTS OF INERTIA - Close Ratio and Wide Ratio Models

TRANSMISSION CONFIGURATION	NOMINAL VALUE*			UNIT
	X (ROLL)	Y (PITCH)	Z (YAW)	
No Retarder, No PTO Provision	11.93 (8.80)	28.35 (20.91)	26.44 (19.50)	kg-m ² (lb _f -ft-sec ²)
No Retarder, With PTO Provision	12.08 (8.91)	33.65 (24.82)	31.50 (23.23)	kg-m ² (lb _f -ft-sec ²)
With Retarder, No PTO Provision With Remote Cooler Provision With Direct-Mount Retarder/Sump Cooler	13.02 (9.60)	32.59 (24.04)	30.44 (22.45)	kg-m ² (lb _f -ft-sec ²)
	15.28 (11.27)	44.66 (32.94)	41.70 (30.76)	kg-m ² (lb _f -ft-sec ²)
With Retarder and PTO Provision With Remote Cooler Provision With Direct-Mount Retarder/Sump Cooler	14.18 (10.46)	41.01 (30.25)	37.87 (27.93)	kg-m ² (lb _f -ft-sec ²)
	15.55 (11.47)	54.06 (39.87)	49.84 (36.76)	kg-m ² (lb _f -ft-sec ²)

11.2 MOMENTS OF INERTIA - Seven-Speed Models

TRANSMISSION CONFIGURATION	NOMINAL VALUE*			UNIT
	X (ROLL)	Y (PITCH)	Z (YAW)	
No Retarder, No PTO Provision	15.34 (11.31)	53.10 (39.16)	48.82 (36.00)	kg-m ² (lb _f -ft-sec ²)
No Retarder, With PTO Provision	15.27 (11.26)	62.02 (45.74)	57.79 (42.62)	kg-m ² (lb _f -ft-sec ²)
With Retarder, No PTO Provision	15.34 (11.31)	59.16 (43.63)	54.13 (39.92)	kg-m ² (lb _f -ft-sec ²)
With Retarder and PTO Provision	16.43 (12.12)	68.15 (50.26)	64.91 (47.87)	kg-m ² (lb _f -ft-sec ²)

* Includes Output Flange

NOTE: Moment of inertia of those parts which always rotate with the engine can be found on [Installation Drawing AS67-420, Engine/Transmission Adaptation – General](#).

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12.0 GEAR RATIOS

GEAR RANGE	TRANSMISSION MODEL GEAR SCHEME *		
	CLOSE-RATIO (CR) MODELS	WIDE-RATIO (WR) MODELS	SEVEN-SPEED MODELS
FORWARD			
First	3.51	4.70	7.63
Second	1.91	2.21	3.51
Third	1.43	1.53	1.91
Fourth	1.00	1.00	1.43
Fifth	0.74	0.76	1.00
Sixth	0.64	0.67	0.74
Seventh	–	–	0.64
REVERSE			
R1	– 4.80	– 5.55	– 4.80
R2	–	–	– 17.12**
* To determine the gear scheme of a specific transmission model, refer to Table 1.0. ** For model availability refer to Technical Document (TD) 188, Application and Installation Requirements for 2nd Reverse.			

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13.0 OIL TYPES AND OIL FILL INFORMATION

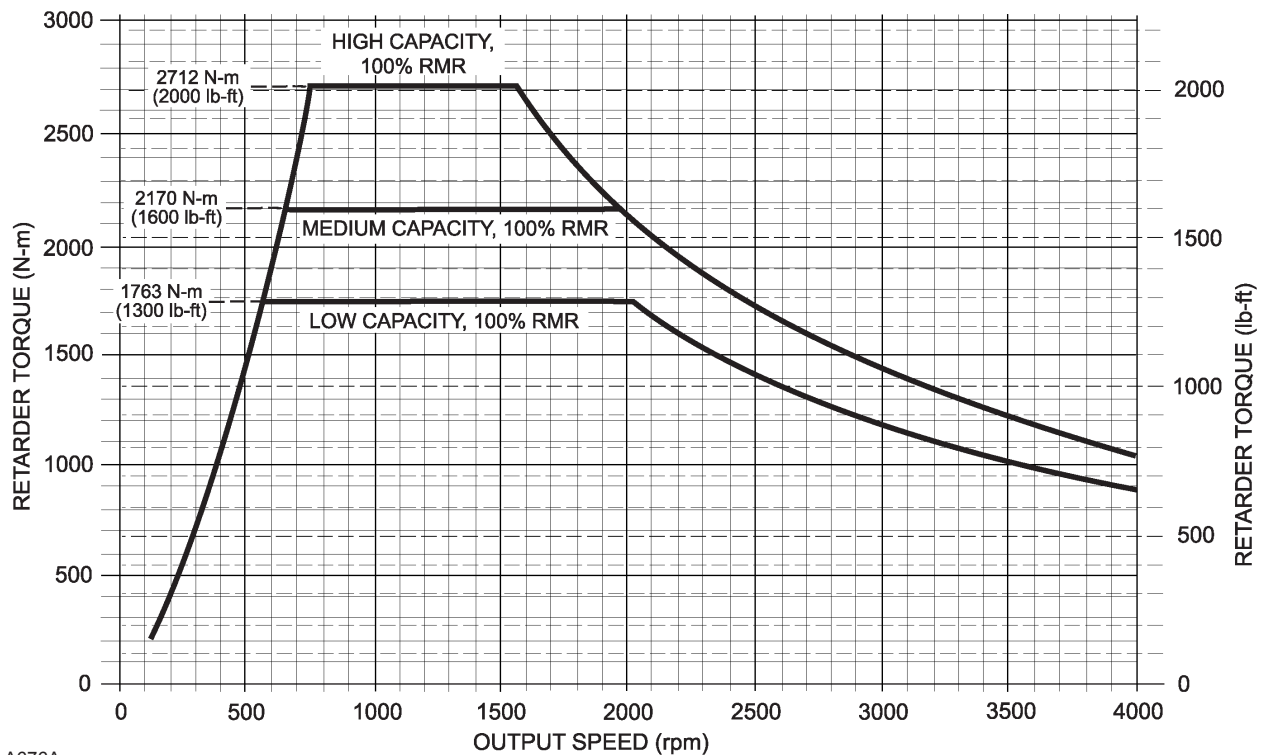
PARAMETER	VALUE	UNIT
INITIAL FILL VOLUME ¹		
Base Models – Transmission Only ²		
Deep Oil Sump, with PTO Provision	48 (51)	liters (quarts)
Deep Oil Sump, without PTO Provision	45 (48)	liters (quarts)
Shallow Oil Sump, with PTO Provision	41 (43)	liters (quarts)
Shallow Oil Sump, without PTO Provision	38 (40)	liters (quarts)
Seven-Speed Models - Transmission Only ²		
Deep Oil Sump, with PTO Provision	51 (54)	liters (quarts)
Deep Oil Sump, without PTO Provision	48 (51)	liters (quarts)
Additional Fill for Allison Coolers		
Direct-Mount, Non-Retarder, Standard-Capacity Cooler	1.0 (1.1)	liters (quarts)
Direct-Mount, Non-Retarder, High-Capacity Cooler	2.1 (2.2)	liters (quarts)
Direct-Mount, Retarder/Sump Cooler	2.5 (2.6)	liters (quarts)
Remote, Retarder with Sump Cooler	2.5 (2.6)	liters (quarts)
Additional Fill for Retarder Accumulator	0.6 (0.6)	liters (quarts)
ACCEPTABLE FLUIDS:		
For off-highway, articulated rear dump truck applications	TES-295 licensed fluid, or fully-synthetic Schedule One TES-389 licensed fluid	
For 4750 OFS applications	Refer to <i>TD183, Application Requirements for Oil Field Service (OFS) Transmissions</i>	
For all other applications:	TES-295 licensed fluid, or Schedule One TES-389 licensed fluid	
<i>Lists of the fluids</i> approved for use with Allison transmissions can be found on the Allison Transmission web site at: www.allisontransmission.com .		
¹ Transmission or listed components only (transmission at 0° installed angle). Does not include external circuits or additional volume which may be required if installed angle of the transmission greater than 0°.		
² Amount to fill dry transmission after disassembly and rebuild. The initial fill for a transmission as received from the Allison factory will be less. Residual fluid remains in the transmission after acceptance testing.		

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14.0 RETARDER PERFORMANCE

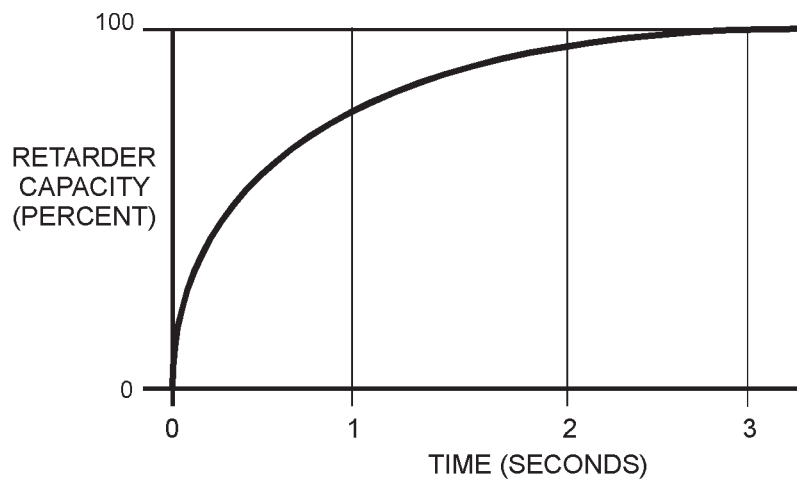
14.1 RETARDER CAPACITY*

* AT COMMAND FOR 100% APPLY



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14.2 RETARDER RESPONSE: INITIAL APPLY

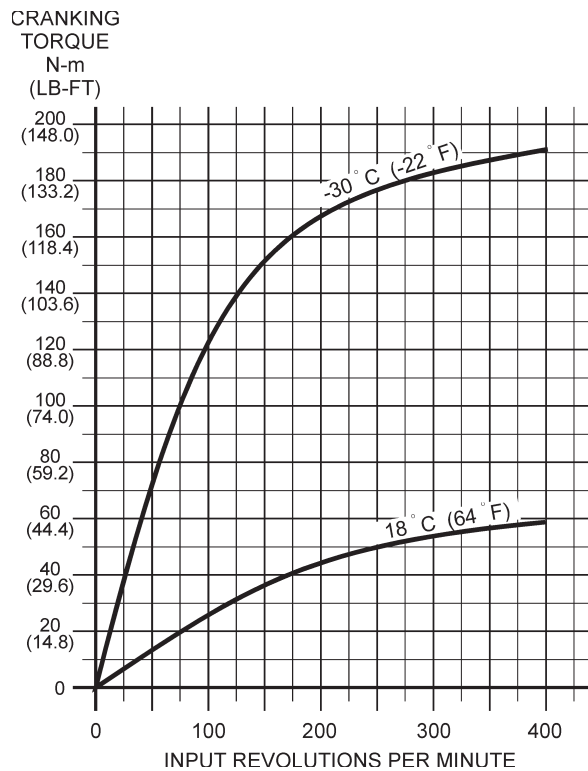


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15.0 TYPICAL CRANKING TORQUE CHARACTERISTICS

Typical Torque Required
to Rotate Transmission Parts
During Engine Cranking



A660a

NOTE: Values in U.S. units shown in parenthesis () are for reference only. Conversions between metric and U.S. units are not necessarily exactly equivalent.

16.0 EXTERNAL HYDRAULIC CIRCUITS

16.1 GENERAL

Fluid Compatibility for Coolers and Hydraulic Lines

Must be compatible with acceptable fluids listed in Table 13.0, Oil Types and Oil Fill Information

Pressures for Coolers and Hydraulic Lines

Operating, Max:	896.4 kPa	(130 psi)
Spike, Max:	2068.5 kPa	(300 psi)
Gradient:	413.6 kPa within 1 sec.	(60 psi within 1 sec.)
Pulsation:	16 Hz at 413.6 +/- 103.4 kPa	(16 Hz at 60 +/- 15 psi)

Temperatures for Coolers and Hydraulic Lines

All components except retarder out (to cooler) line

Fluid temperature range:	38 to 121 °C	(100 to 250 °F)
With maximum intermittent excursions:	- 40 to 149 °C	(- 40 to 300 °F)

Retarder out (to cooler) line

Fluid temperature range:	38 to 121 °C	(100 to 250 °F)
With maximum intermittent excursions:	- 40 to 165 °C	(- 40 to 330 °F)

Gradient, initial:	28 °C per sec.	(50 °F per sec.)
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Hydraulic Line Size, Cooler Circuit

Circuit must meet pressure drop requirements (Refer to Tables 16.2 and 16.3)

Circuit must allow sufficient flow to meet cooling requirements

Recommended minimum inside diameter:

Non-retarder cooling circuit:	22.2 mm	(0.875 inch)
Retarder cooling circuit:	28.6 mm	(1.125 inch)
Retarder accumulator oil circuit:	28.6 mm	(1.125 inch)
Sump cooling circuit (retarder units):	15.9 mm	(0.625 inch)

Hydraulic Line Requirements, Cooler Circuit

Hydraulic lines must meet the above pressure and temperature requirements.

Hydraulic lines must be compatible with oils listed in Table 13.0.

In addition, Allison strongly recommends that hoses meet or exceed the tests described in Society of Automotive Engineers (SAE) J2545 and SAE J1405, Option IV – High Temperature Circulation Test.

Metal tubing is acceptable; requires flexible section (e.g. hose) between powerpack and chassis.

O-Ring Seal Requirements

Fluorocarbon elastomer, American Society of Testing and Materials (ASTM) D2000, material designation HK, recommended durometer hardness of 75. The material grade of the seal must be compatible with all acceptable fluids listed in Table 13.0.

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16.2 REMOTE-MOUNTED FILTERS

Fluid Compatibility for Filters and Hydraulic Lines

Refer to Acceptable Fluids in Table 13.0, Oil Types and Oil Fill Information

Pressures for Filters and Hydraulic Lines

Operating, Max:	2069 kPa	(300 psi)
Spike, Max:	6895 kPa	(1000 psi)

Temperatures for Filters and Hydraulic Lines

Fluid temperature range:		
Normal operating range	38 to 121 °C	(100 to 250 °F)
Maximum intermittent excursions	– 40 to 165 °C	(– 40 to 300 °F)

Hydraulic Line Size

Circuits must meet pressure drop requirements:

Main circuit filter	207 kPa max. at 114 liters/minute (30 psi at 30 gpm)
Lube circuit filter	104 kPa max. at 83 liters/minute (15 psi at 22 gpm)
Recommended minimum inside diameter:	22.2 mm (0.875 inch)

Hydraulic Line Requirements

Hydraulic lines must meet the above pressure and temperature requirements

Hydraulic lines must be compatible with oils listed under Fluid Compatibility

In addition, Allison strongly recommends that hoses meet or exceed the tests described in Society of Automotive Engineers (SAE) J2545 and SAE J1405, Option IV – High Temperature Circulation Test.

O-Ring Seal Requirements

Fluorocarbon elastomer, American Society of Testing and Materials (ASTM) D2000, material designation HK, recommended durometer hardness of 75. The material grade of the seal must be compatible with all acceptable fluids listed in Table 13.0.

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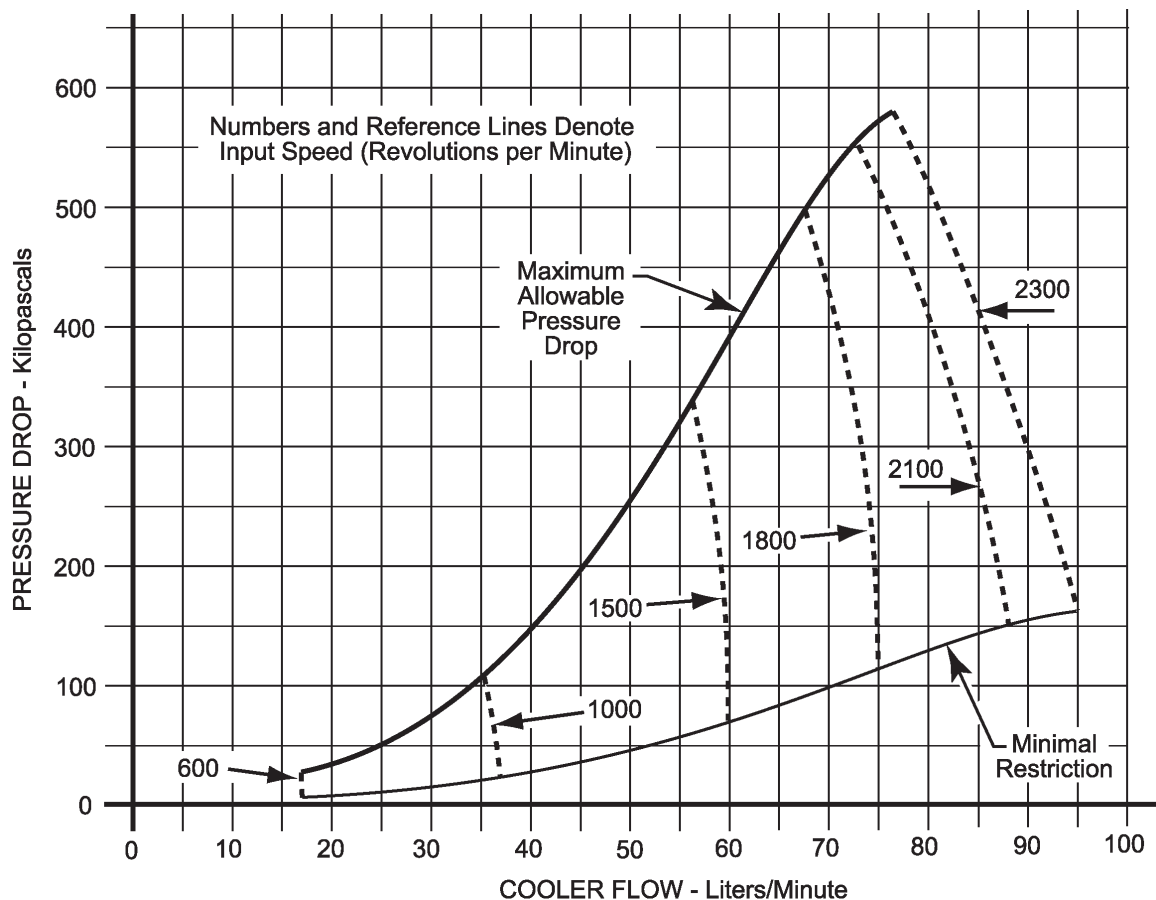
16.3 COOLER CIRCUIT FLOW AND RESTRICTION

NON-RETARDER – CONVERTER OPERATION* (METRIC UNITS)

COOLER FLOW VERSUS PRESSURE DROP

	AT MINIMAL PRESSURE DROP		AT MAXIMUM ALLOWABLE PRESSURE DROP	
INPUT SPEED Revolutions Per Minute (rpm)	FLOW Liters Per Minute (lpm)	PRESSURE DROP Kilopascals (kPa)	FLOW Liters Per Minute (lpm)	PRESSURE DROP Kilopascals (kPa)
600	17	4	17	32
1000	37	25	36	112
1500	60	73	57	346
1800	75	111	68	491
2100	88	151	73	552
2300	95	162	77	586

* 93°C SUMP TEMPERATURE



C315

NOTE: Values in U.S. units are for reference only. Conversions between metric and U.S. units are not necessarily exactly equivalent.

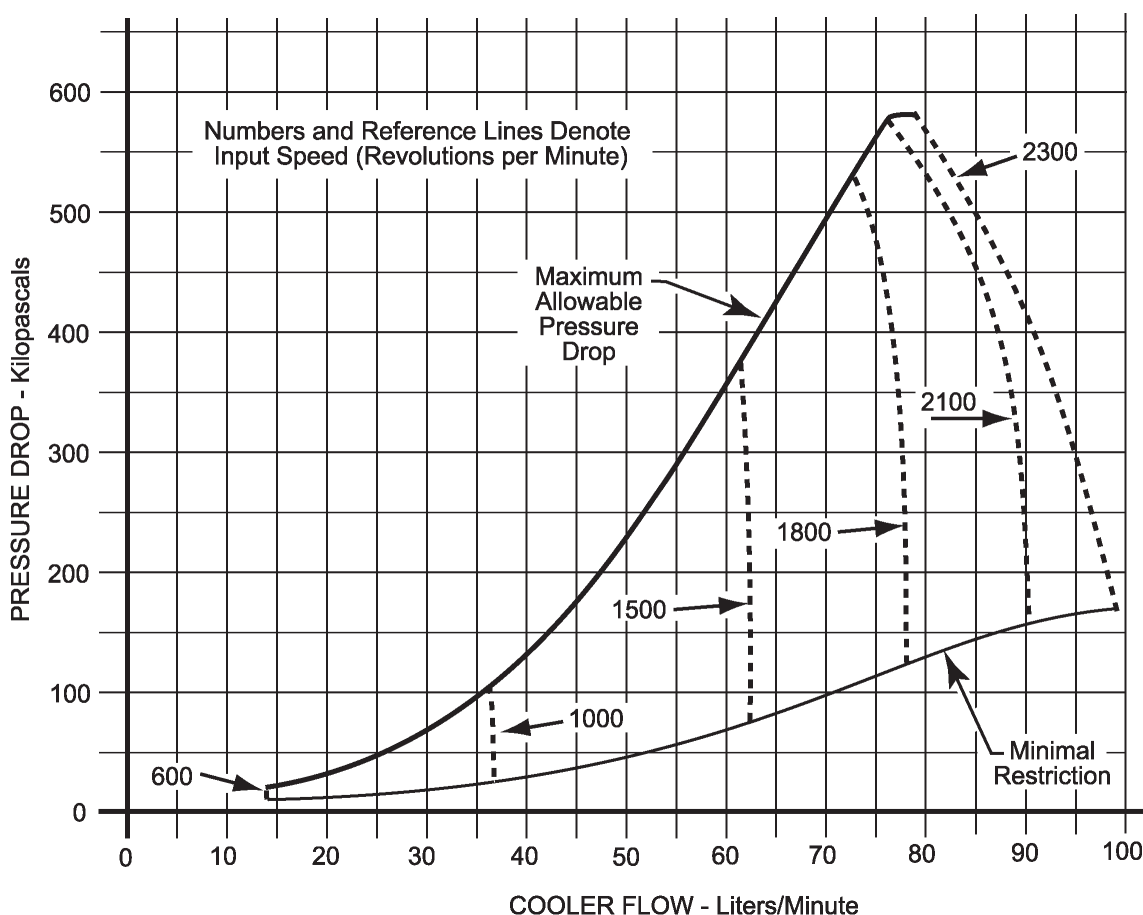
16.3 COOLER CIRCUIT FLOW AND RESTRICTION

NON-RETARDER – LOCKUP OPERATION* (METRIC UNITS)

COOLER FLOW VERSUS PRESSURE DROP

	AT MINIMAL PRESSURE DROP		AT MAXIMUM ALLOWABLE PRESSURE DROP	
INPUT SPEED Revolutions Per Minute (rpm)	FLOW Liters Per Minute (lpm)	PRESSURE DROP Kilopascals (kPa)	FLOW Liters Per Minute (lpm)	PRESSURE DROP Kilopascals (kPa)
600	14	5	14	20.5
1000	37	27	37	108
1500	62	77	62	368
1800	77	114	73	528
2100	91	154	76	574
2300	99	167	79	576

* 93°C SUMP TEMPERATURE



C316

NOTE: Values in U.S. units are for reference only. Conversions between metric and U.S. units are not necessarily exactly equivalent.

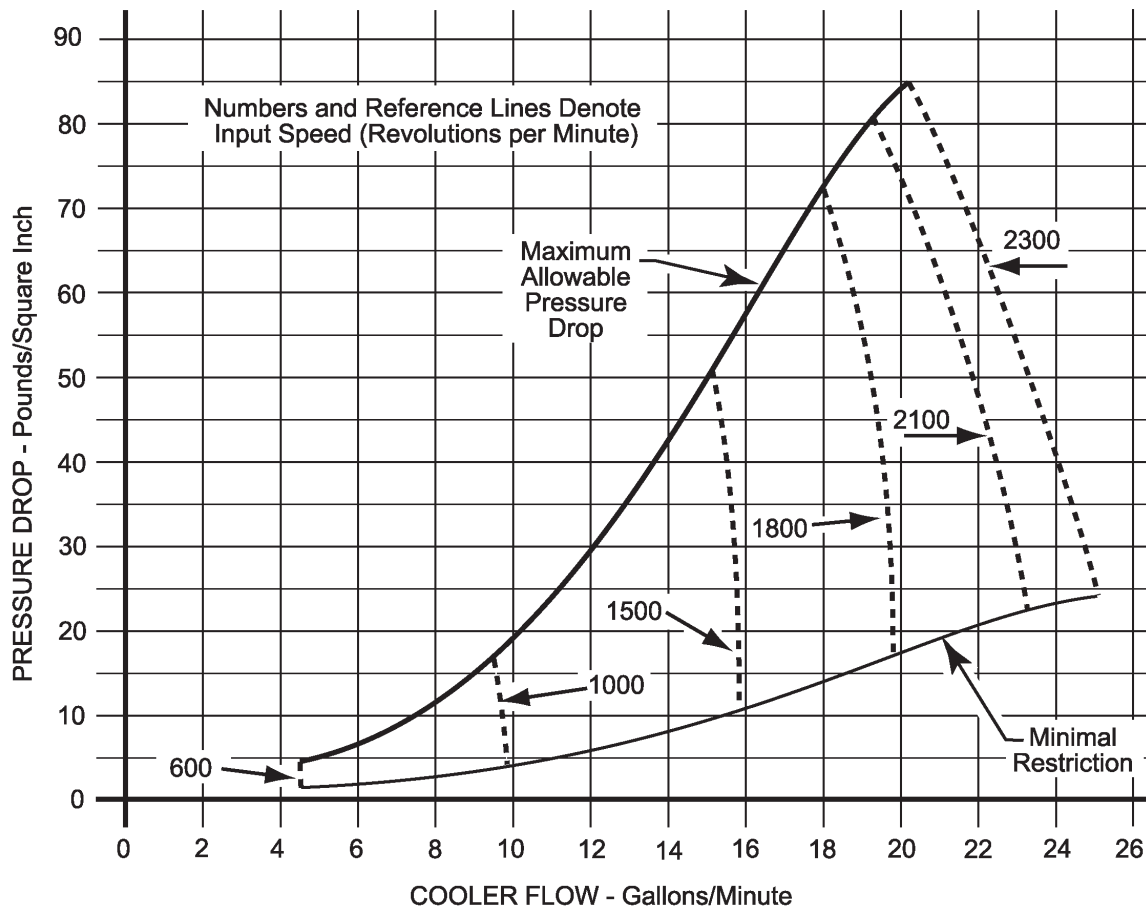
16.3 COOLER CIRCUIT FLOW AND RESTRICTION

NON-RETARDER – CONVERTER OPERATION* (U.S. UNITS)

COOLER FLOW VERSUS PRESSURE DROP

	AT MINIMAL PRESSURE DROP		AT MAXIMUM ALLOWABLE PRESSURE DROP	
INPUT SPEED Revolutions Per Minute (rpm)	FLOW Gallons Per Minute (gpm)	PRESSURE DROP Pounds Per Square Inch (psi)	FLOW Gallons Per Minute (gpm)	PRESSURE DROP Pounds Per Square Inch (psi)
600	4.5	0.6	4.5	4.6
1000	9.8	3.6	9.5	16.2
1500	15.8	10.5	15.0	50.2
1800	19.8	16.1	18.0	71.2
2100	23.2	21.9	19.2	80.0
2300	25.0	23.5	20.3	85.0

* 200°F SUMP TEMPERATURE



C313

NOTE: Values in U.S. units are for reference only. Conversions between metric and U.S. units are not necessarily exactly equivalent.

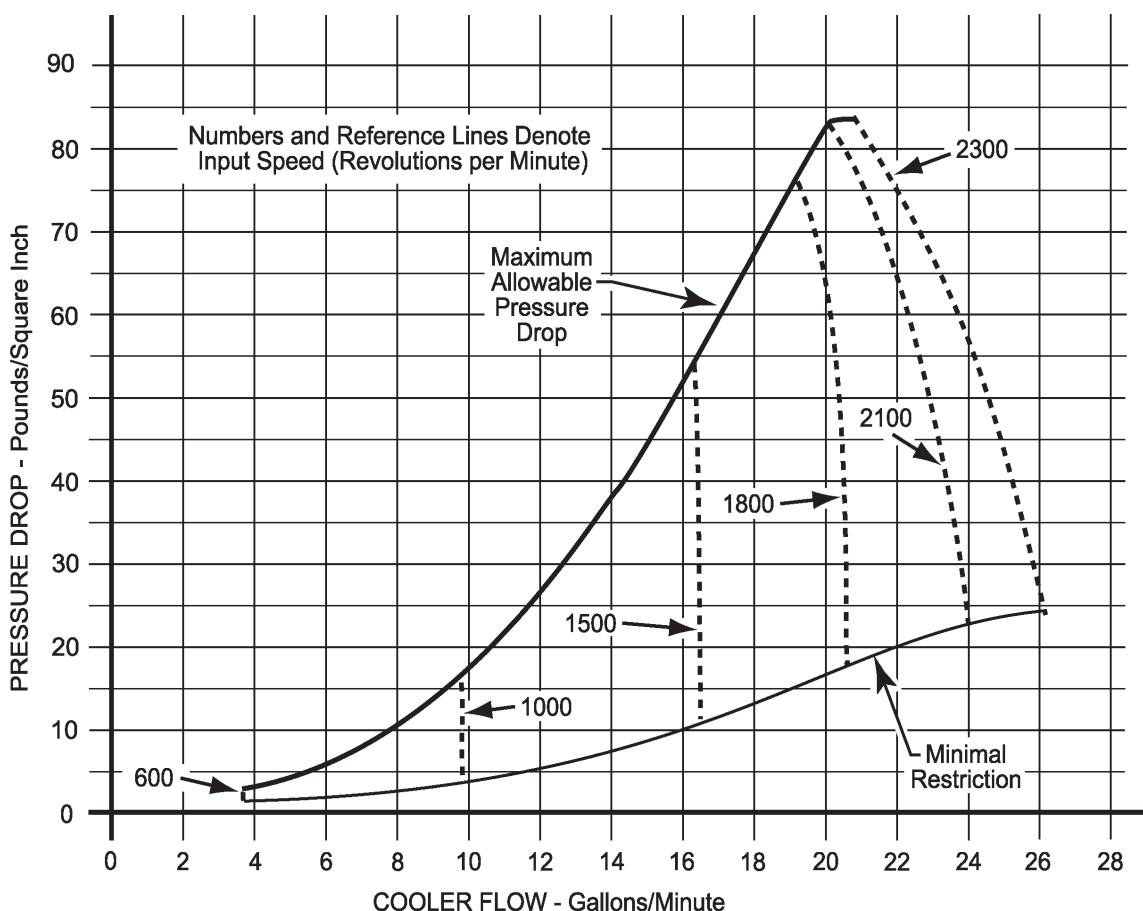
16.3 COOLER CIRCUIT FLOW AND RESTRICTION

NON-RETARDER – LOCKUP OPERATION* (U.S. UNITS)

COOLER FLOW VERSUS PRESSURE DROP

INPUT SPEED Revolutions Per Minute (rpm)	AT MINIMAL PRESSURE DROP		AT MAXIMUM ALLOWABLE PRESSURE DROP	
	FLOW Gallons Per Minute (gpm)	PRESSURE DROP Pounds Per Square Inch (psi)	FLOW Gallons Per Minute (gpm)	PRESSURE DROP Pounds Per Square Inch (psi)
600	3.7	0.7	3.7	3.0
1000	9.8	3.9	9.8	15.6
1500	16.4	11.2	16.4	53.4
1800	20.3	16.5	19.2	76.6
2100	24.0	22.3	20.1	83.2
2300	26.1	24.2	20.8	83.5

* 200°F SUMP TEMPERATURE



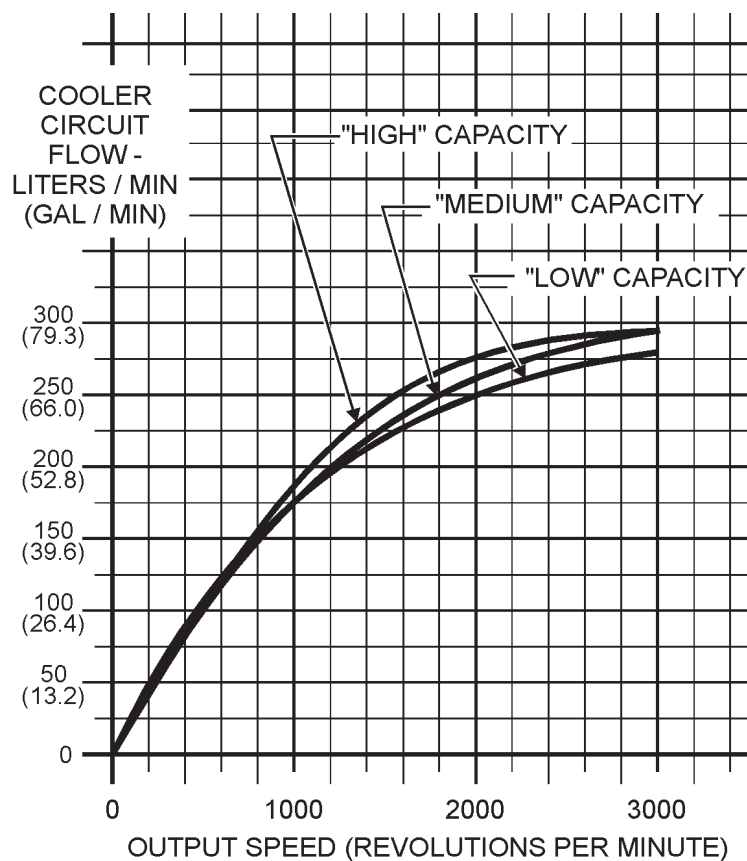
C314

NOTE: Values in U.S. units are for reference only. Conversions between metric and U.S. units are not necessarily exactly equivalent.

16.3 COOLER CIRCUIT FLOW AND RESTRICTION RETARDER OPERATION

Retarder circuit flow measured under the following test conditions:

- 88°C (190°F) fluid temperature
- circuit pressure drop (ΔP) set at 277 kPa (40 psi) for a flow of 215 liters/minute (57 gallons/minute)



A662

Note: Allison Transmission has specific pressure drop requirements for retarder installations that are integrated with Electronic Braking Systems (EBS). Refer to [Technical Document 182 \(TD-182\), Use of EBS with Allison Transmissions](#), for details.

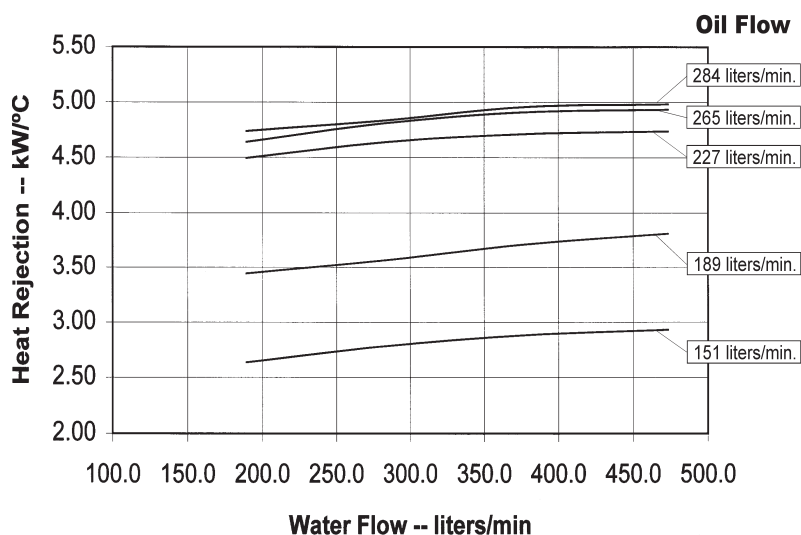
NOTE: Values in U.S. units shown in parenthesis () are for reference only. Conversions between metric and U.S. units are not necessarily exactly equivalent.

17.0 ALLISON OIL-TO-WATER COOLER CHARACTERISTICS

17.1 COOLANT FILL VOLUME FOR ALLISON COOLERS

PARAMETER	VALUE	UNIT
Coolant Fill Volume for Allison Coolers		
Remote, Retarder/Sump Cooler	3.0 (3.2)	liters (quarts)
Direct-Mount, Retarder / Sump Cooler	3.0 (3.2)	liters (quarts)
Direct-Mount, Non-Retarder, Standard-Capacity Cooler	2.0 (2.1)	liters (quarts)
Direct-Mount, Non-Retarder, High-Capacity Cooler	3.5 (3.7)	liters (quarts)

17.2 REMOTE RETARDER/SUMP COOLER CHARACTERISTICS (METRIC UNITS)



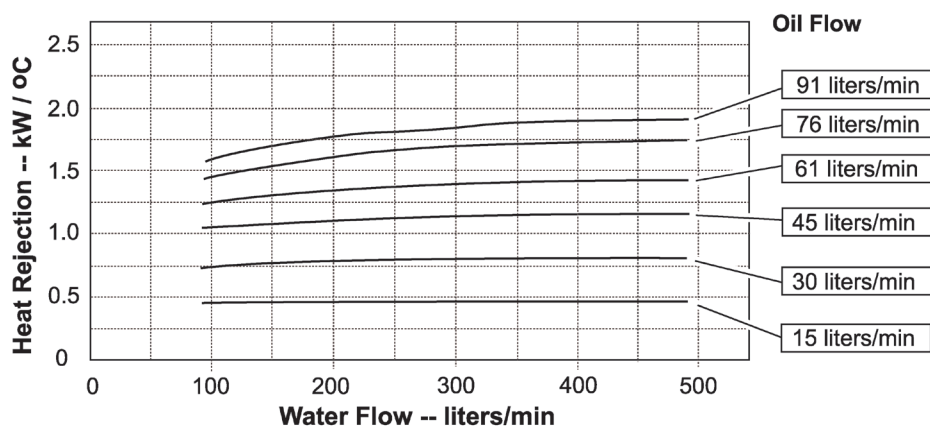
**RETARDER-SIDE
HEAT
REJECTION**

**RETARDER
MODE**

EM60-07

**RETARDER-SIDE
HEAT
REJECTION**

**CONVERTER
MODE**

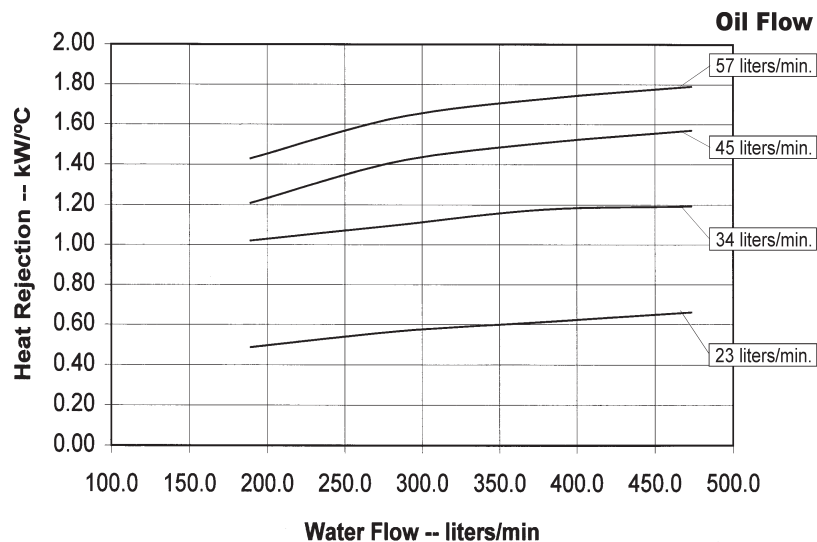


EM60-25

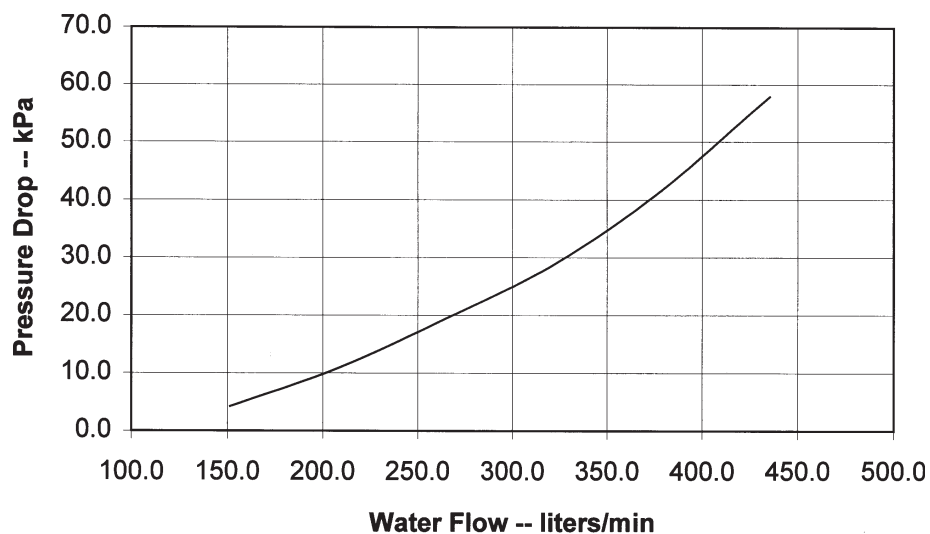
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17.2 REMOTE RETARDER/SUMP COOLER CHARACTERISTICS (METRIC UNITS – CONTINUED)

SUMP-SIDE HEAT REJECTION



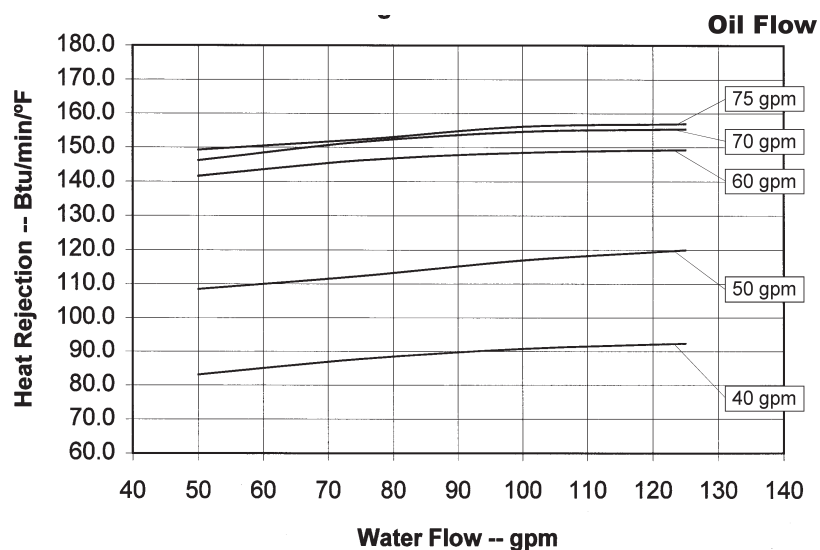
EM60-08



WATER-SIDE PRESSURE DROP

EM60-11

17.2 REMOTE RETARDER/SUMP COOLER CHARACTERISTICS (U.S. UNITS)



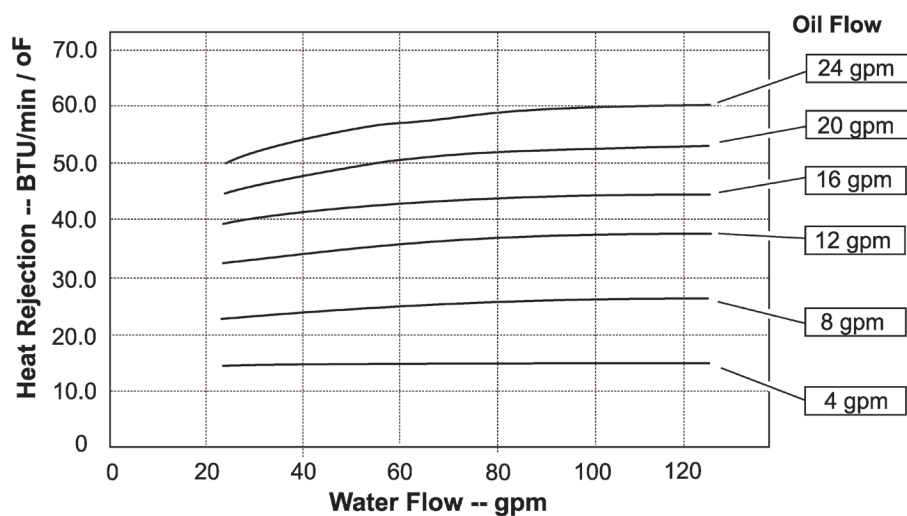
**RETARDER-SIDE
HEAT
REJECTION**

**RETARDER
MODE**

EM60-09

**RETARDER-SIDE
HEAT
REJECTION**

**CONVERTER
MODE**

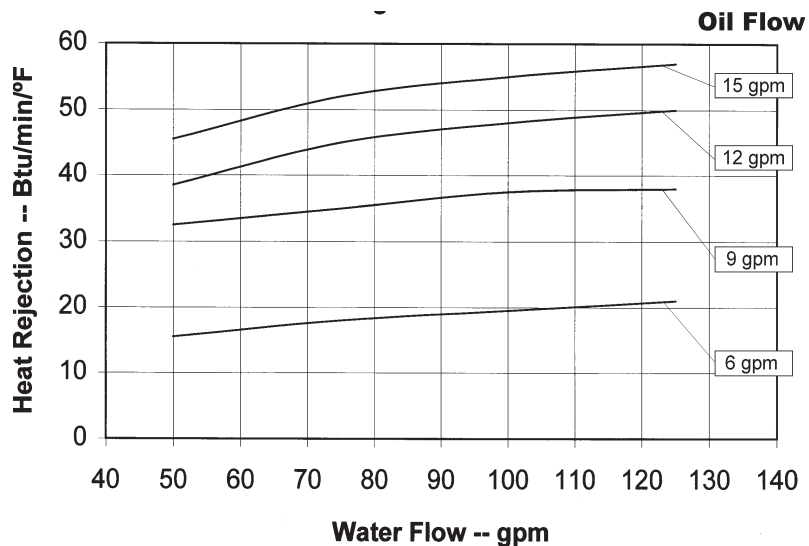


EM60-26

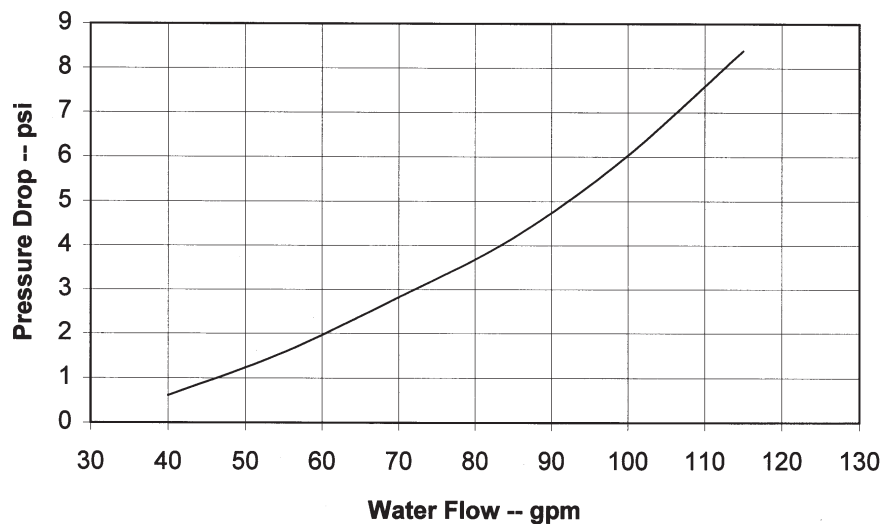
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17.2 REMOTE RETARDER/SUMP COOLER CHARACTERISTICS (U.S. UNITS – CONTINUED)

SUMP-SIDE HEAT REJECTION



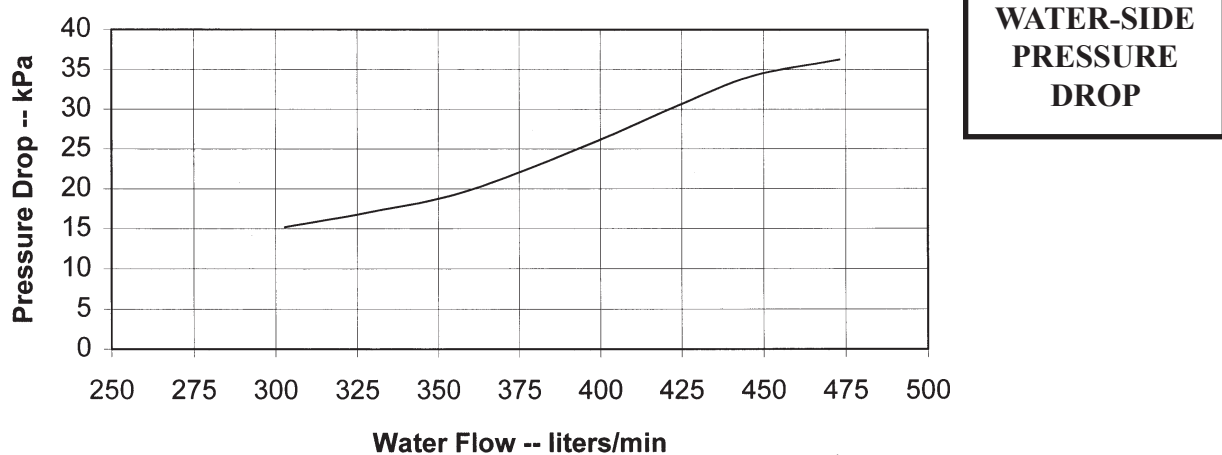
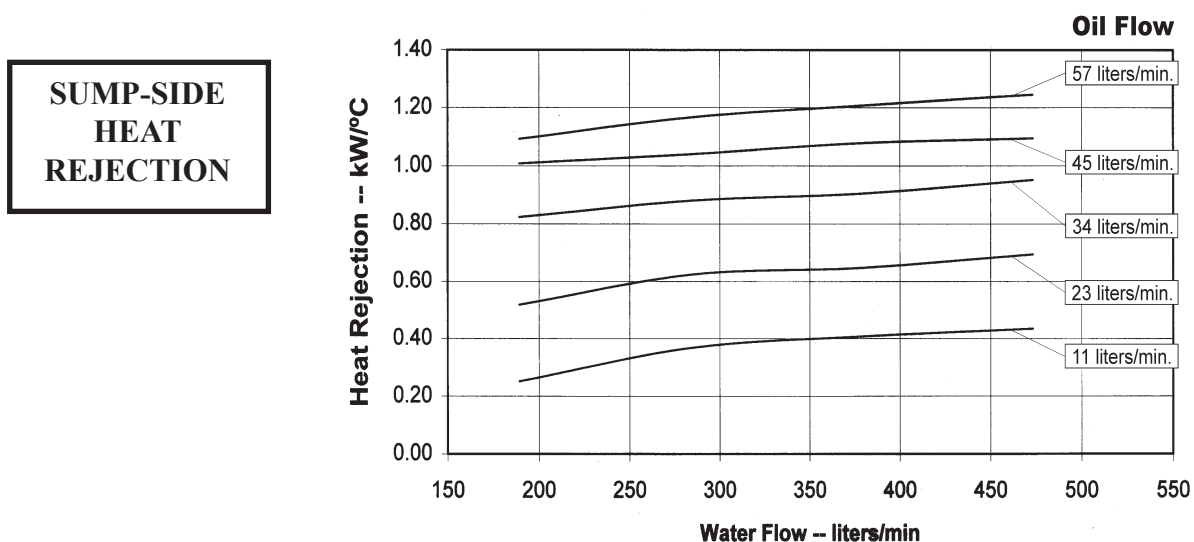
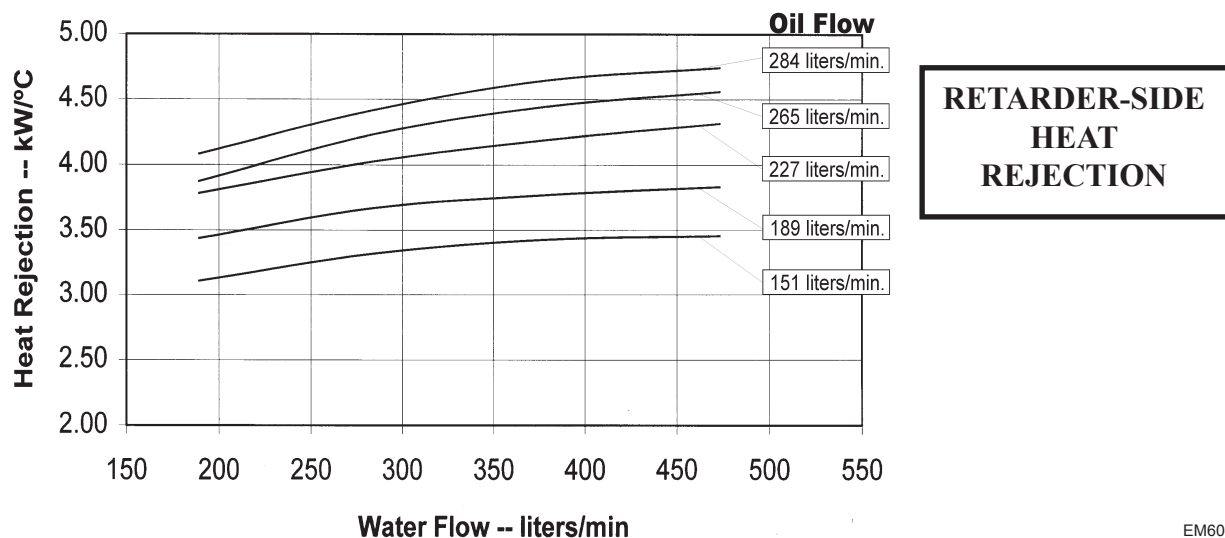
EM60-10



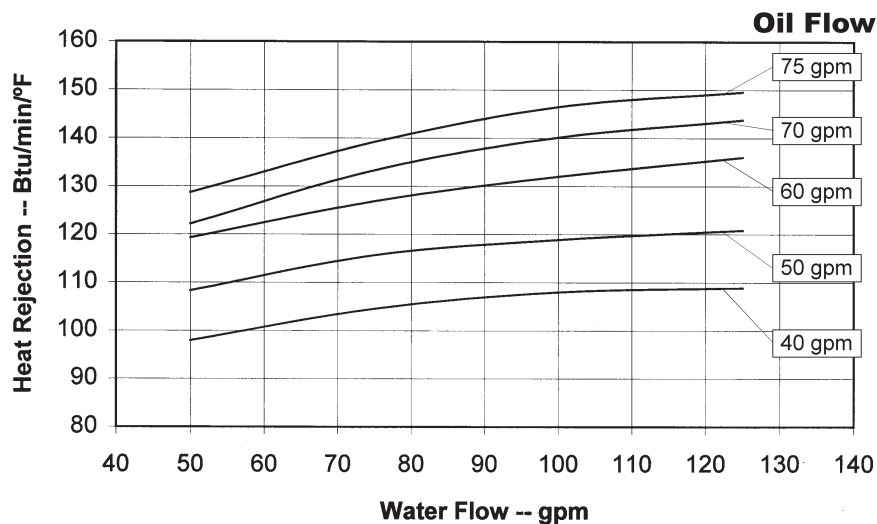
WATER-SIDE PRESSURE DROP

EM60-12

17.3 DIRECT-MOUNT RETARDER/SUMP COOLER CHARACTERISTICS (METRIC UNITS)

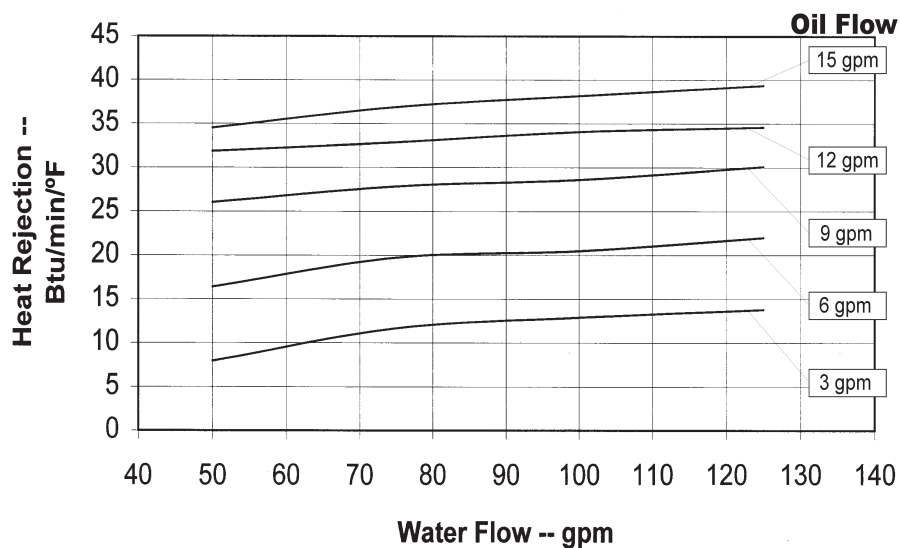


17.3 DIRECT-MOUNT RETARDER/SUMP COOLER CHARACTERISTICS (U.S. UNITS)

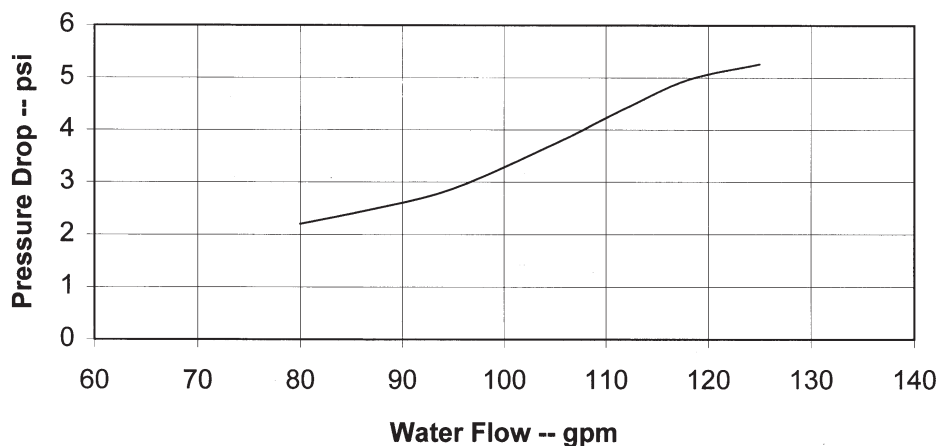


EM60-22

SUMP-SIDE HEAT REJECTION



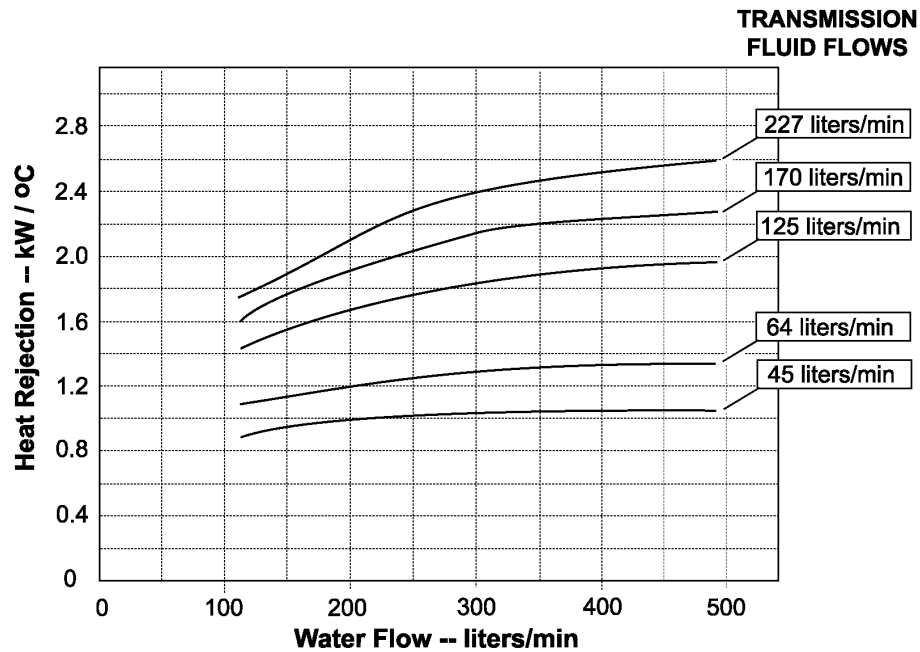
EM60-21



WATER-SIDE PRESSURE DROP

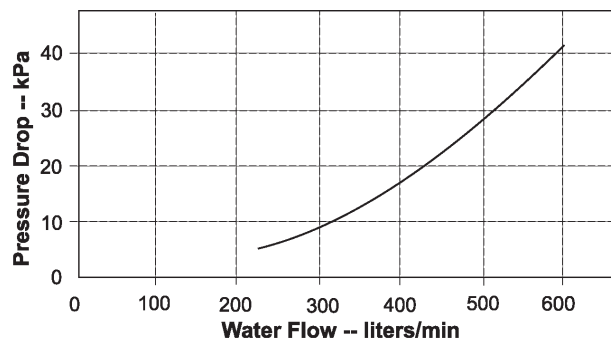
EM60-18

17.4 DIRECT-MOUNT NON-RETARDER STANDARD-CAPACITY COOLER CHARACTERISTICS (METRIC UNITS)



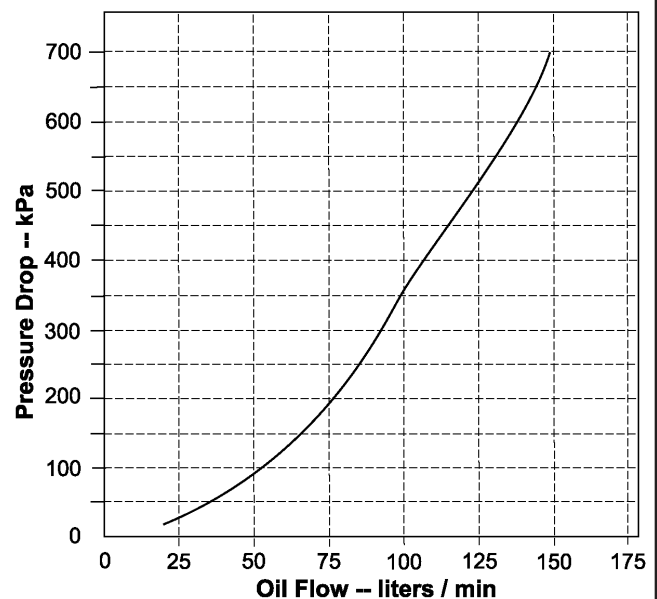
D003MET

WATER-SIDE PRESSURE DROP



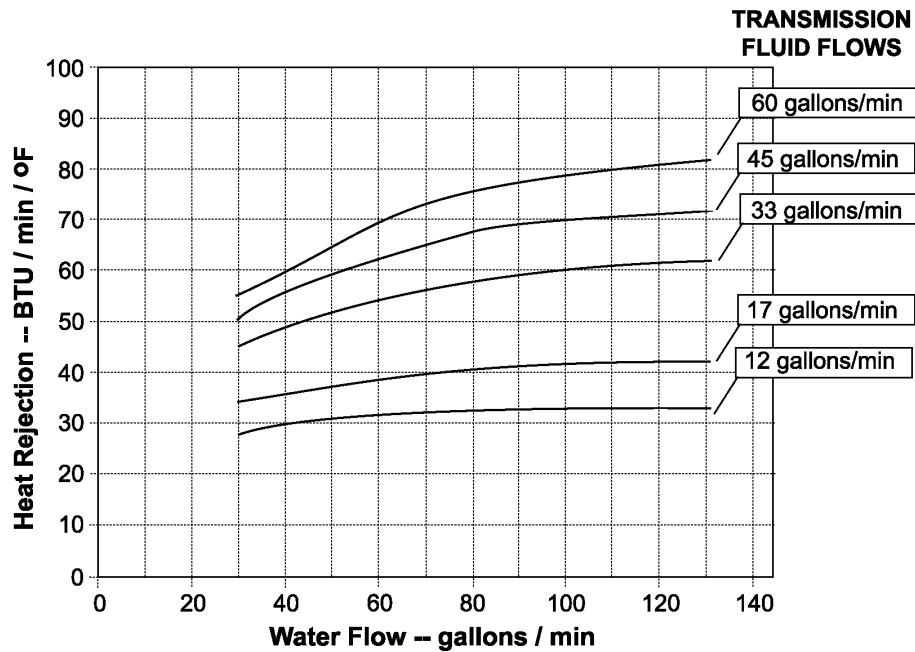
D002MET

OIL-SIDE PRESSURE DROP



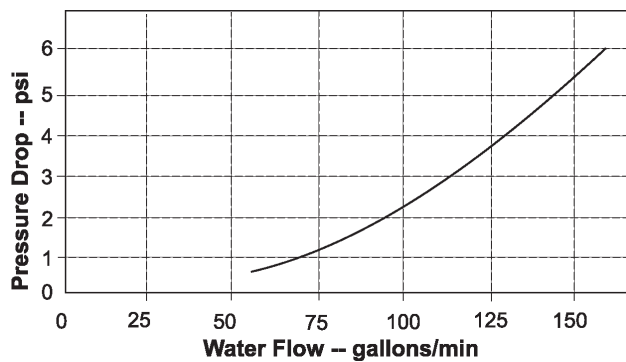
D004MET

17.4 DIRECT-MOUNT NON-RETARDER STANDARD-CAPACITY COOLER CHARACTERISTICS (U.S. UNITS)



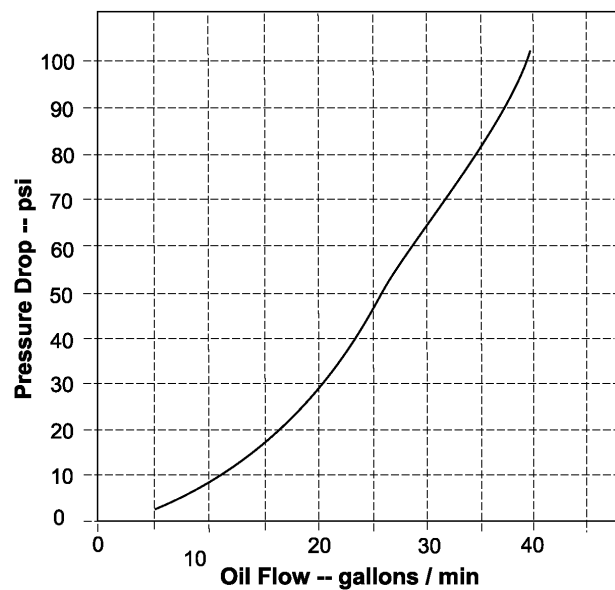
D003US

WATER-SIDE PRESSURE DROP



D002US

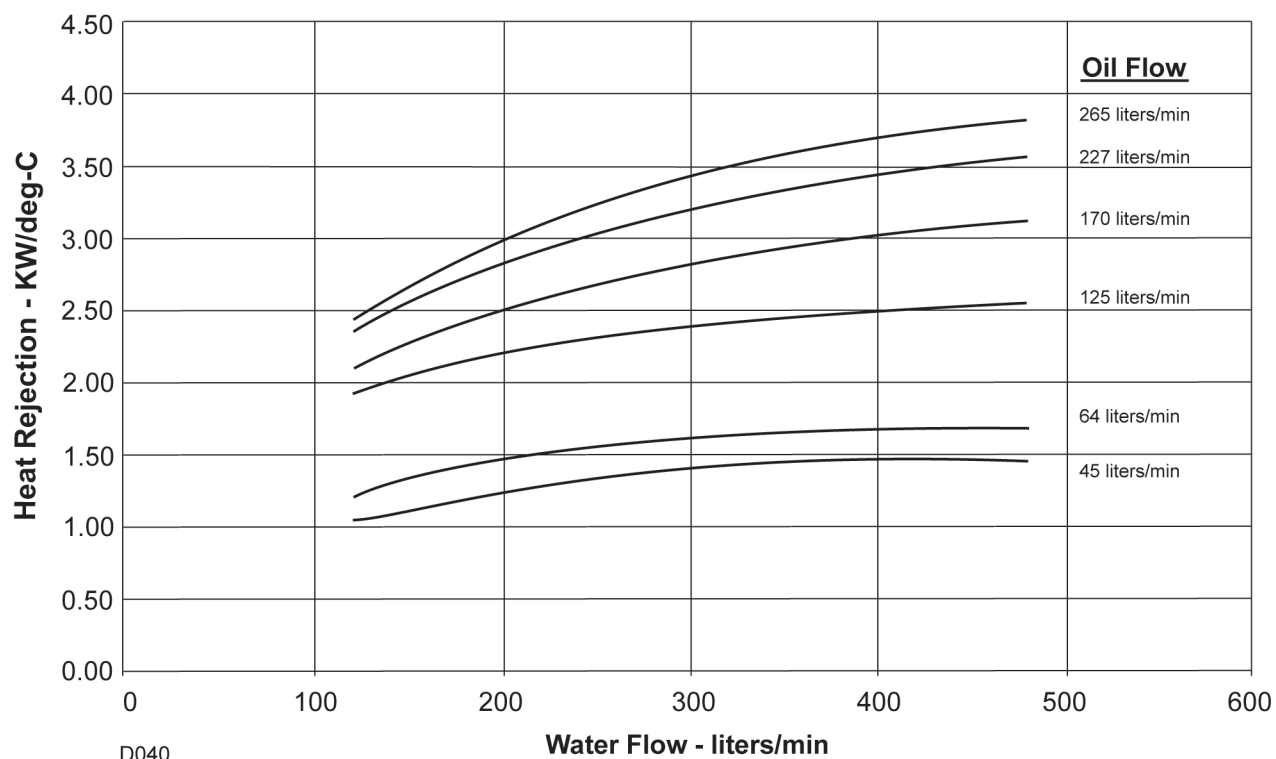
OIL-SIDE PRESSURE DROP



D004US

17.5 DIRECT-MOUNT NON-RETARDER HIGH-CAPACITY COOLER CHARACTERISTICS (METRIC UNITS)

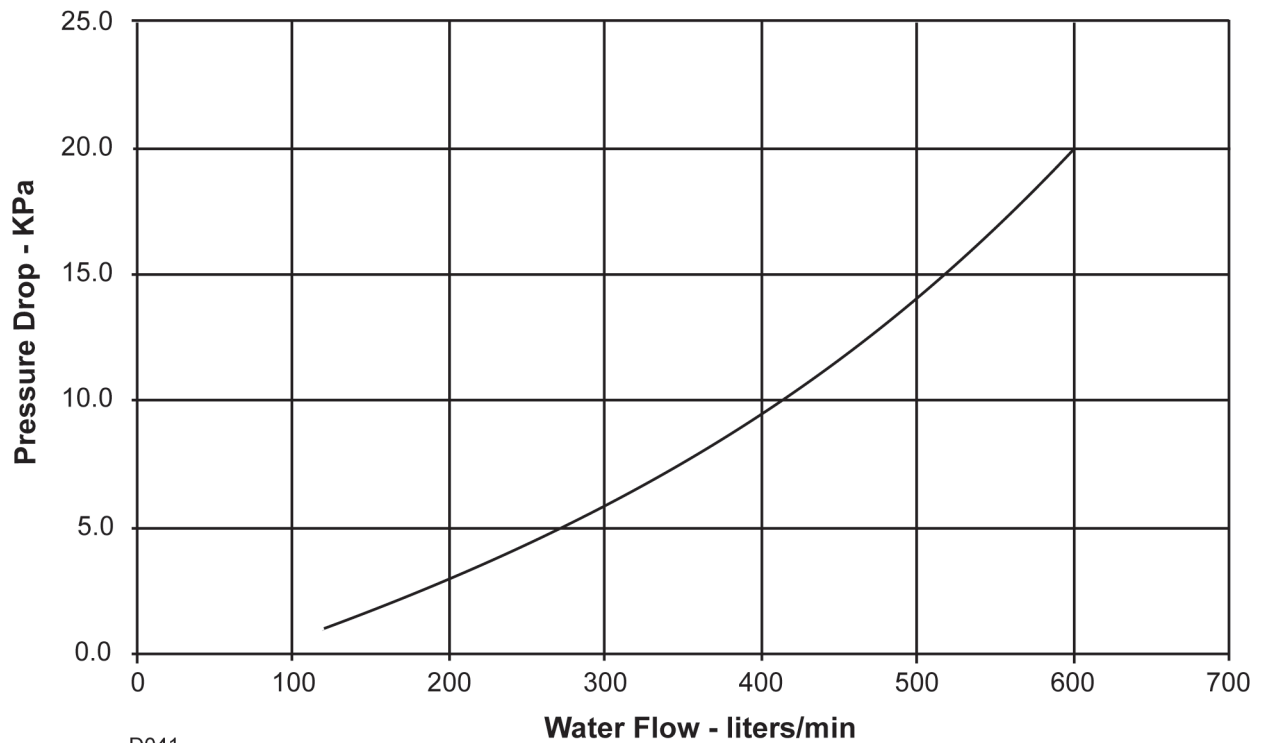
HEAT REJECTION



— Continued —

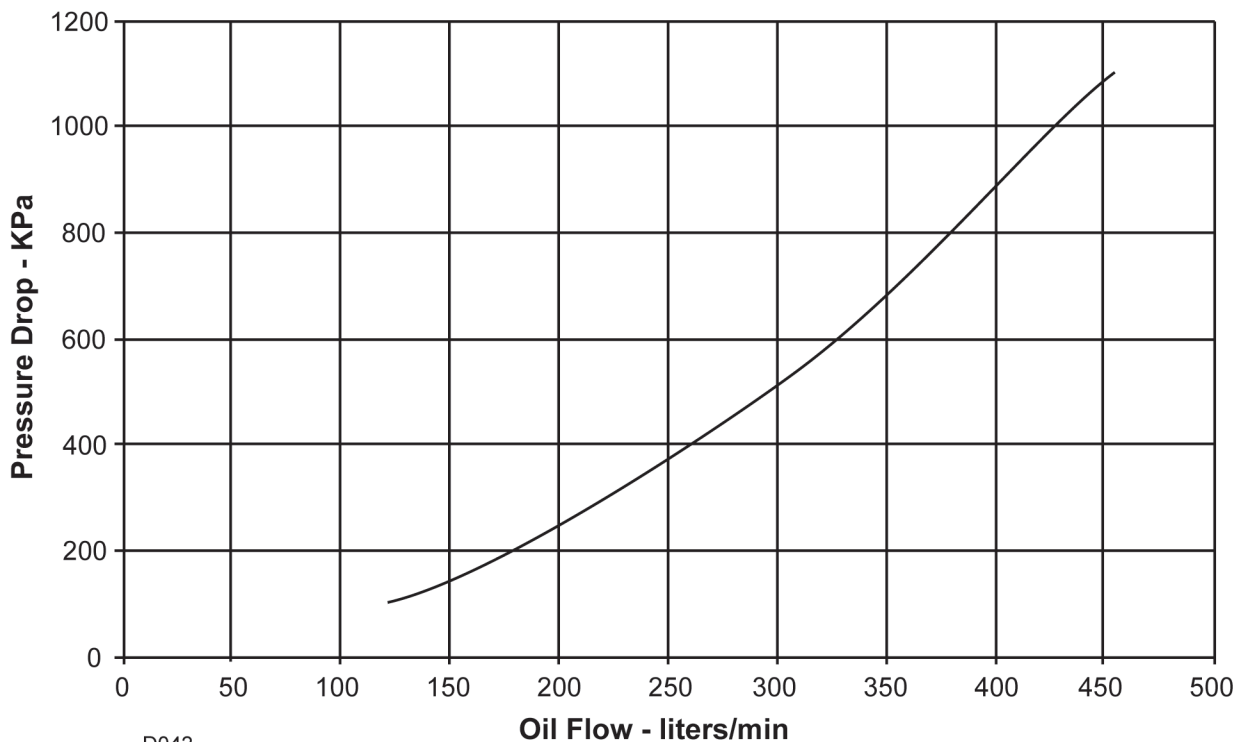
17.5 DIRECT-MOUNT NON-RETARDER HIGH-CAPACITY COOLER CHARACTERISTICS (METRIC UNITS – CONTINUED)

WATER-SIDE PRESSURE DROP



D041

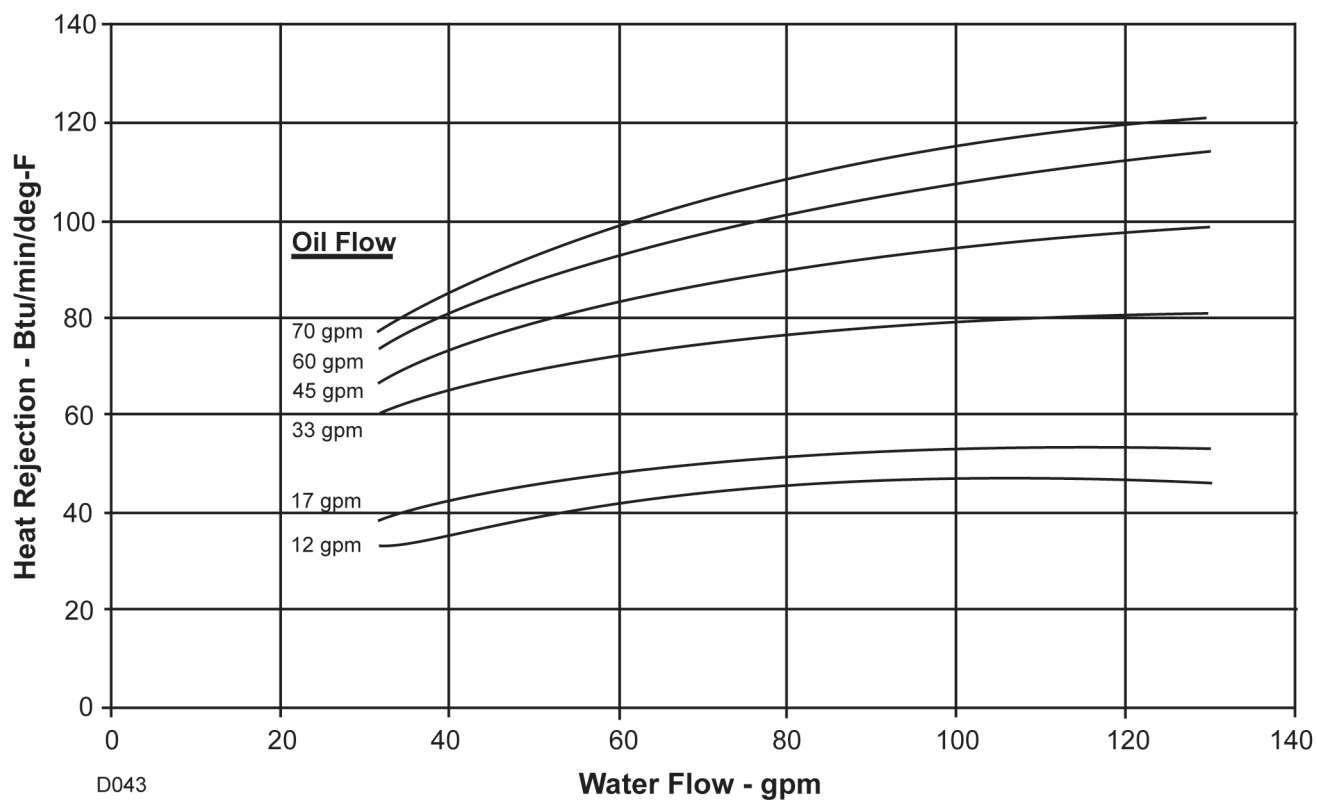
OIL-SIDE PRESSURE DROP



D042

17.5 DIRECT-MOUNT NON-RETARDER HIGH-CAPACITY COOLER CHARACTERISTICS (U.S. UNITS)

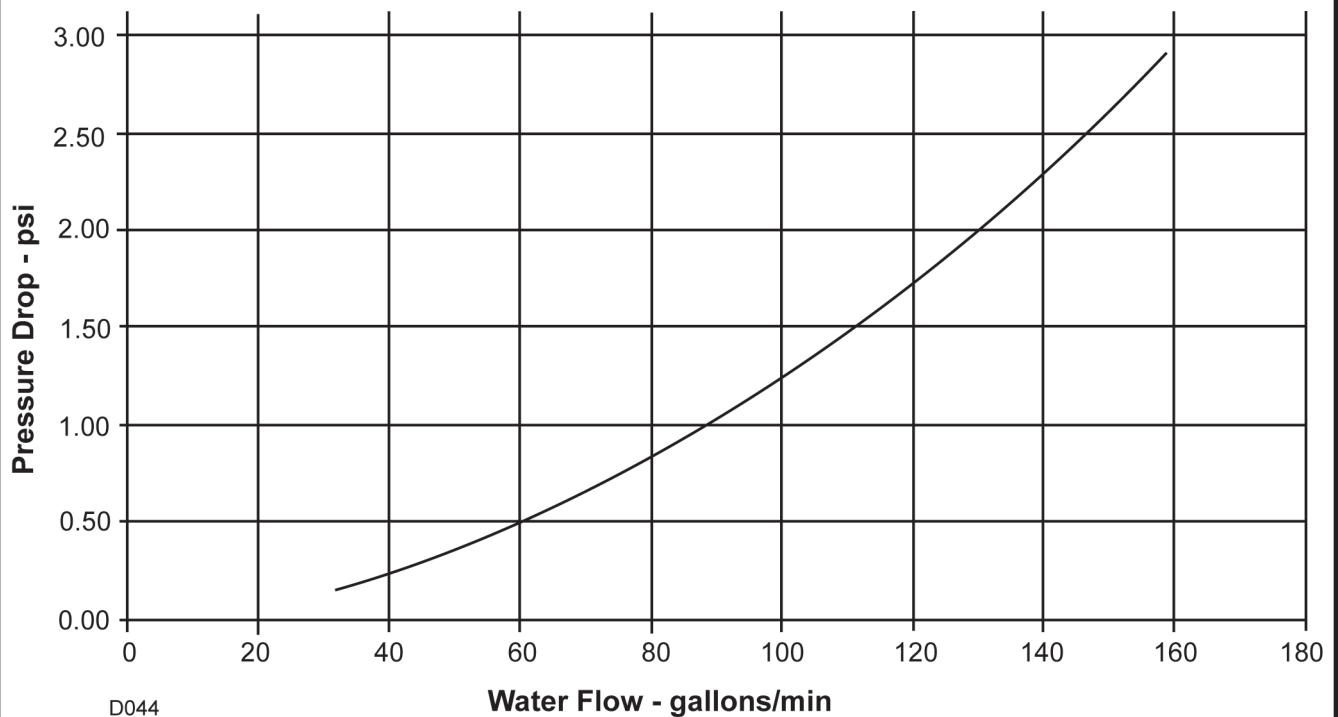
HEAT REJECTION



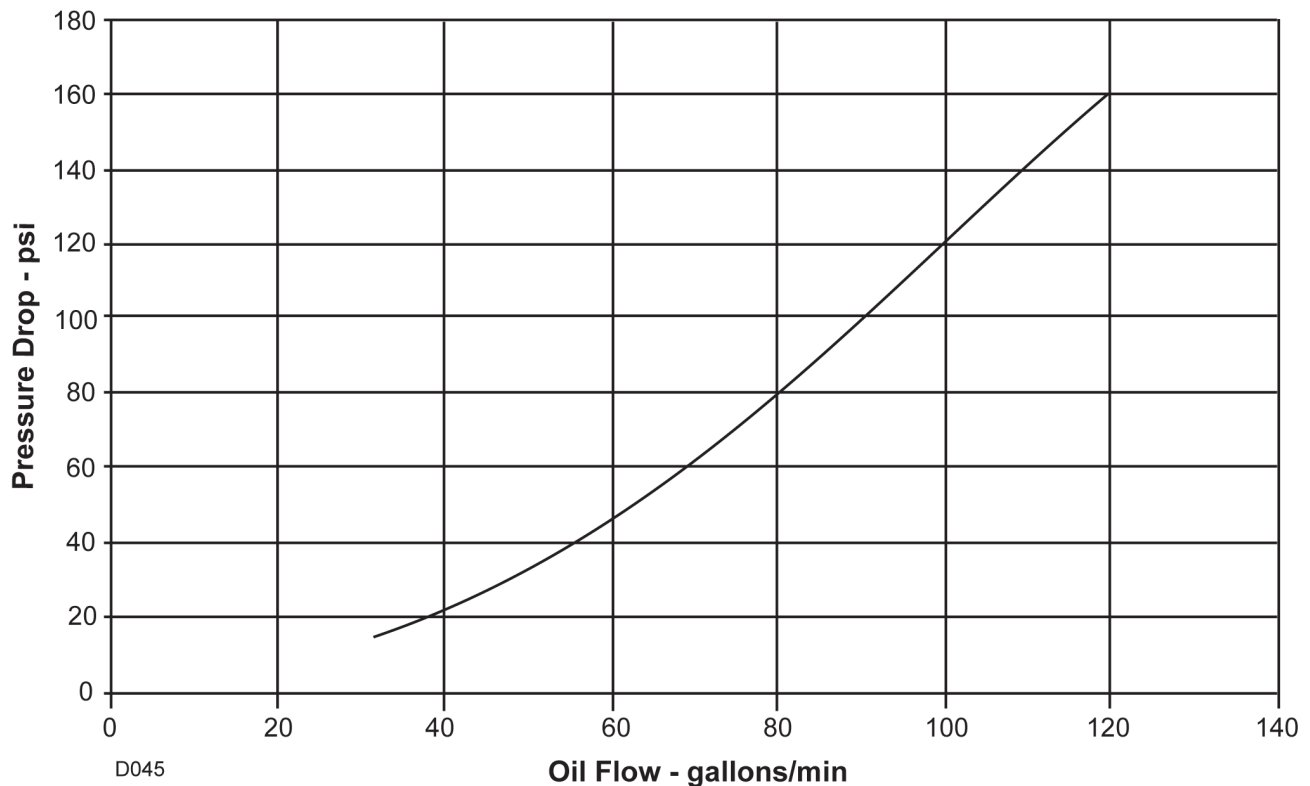
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17.5 DIRECT-MOUNT NON-RETARDER HIGH-CAPACITY COOLER CHARACTERISTICS (U.S. UNITS – CONTINUED)

WATER-SIDE PRESSURE DROP



OIL-SIDE PRESSURE DROP



LIST OF REFERENCED DOCUMENTS

- [4000 Product Family Transmission Ratings](#)
- [Fluids at \[www.allisontransmission.com\]\(http://www.allisontransmission.com\)](#)

[4000 Product Family Installation Drawings](#)

- [AS67-420, Engine/Transmission Adaptation – General](#)
- [AS67-441, Output Flange Information](#)
- [AS67-442, Output Yoke Information](#)

Technical Documents (TD's)

- [TD-182, Use of Electronic Braking Systems \(EBS\) with Allison Transmissions](#)
- [TD-183, Application Requirements for the Oil Field Service \(OFS\) Transmissions](#)
- [TD-188, Application and Installation Requirements for the 2nd Reverse Feature](#)

REVISION HISTORY

March 11, 2011

- Table 1.0, replaced the list of individual models with a list of base models.
- Table 13.0, under acceptable fluids, added 4750 OFS and reference to TD183.

August 26, 2010

- Table 12.0 and Table 7.0, added 2nd Reverse
- Table 16.2, corrected flow units: 114 liters/minute was 114 liters/sec and 83 liters/minute was 83 liters/sec

October 13, 2009

- Table 13.0, removed DEXRON® VI as an acceptable fluid.

April 20, 2009

- Added new model, 4430 SP, to Table 1.0.
- Updated Table 13.0 with serial numbers for DEXRON®-VI acceptability
- Added coolant volume for Allison coolers to Table 17.0.

October 7, 2008

- Updated Table 2, PTO Drive Gear Ratings, to add number of teeth on PTO drive gear.

August 27, 2008

- Updated Table 16.3, Cooler Circuit Flow and Restriction, Non-Retarder, Converter Operation.
- Added Cooler Circuit Flow and Restriction, Non-Retarder, Lockup Operation, to Table 16.3.

July 17, 2008

- Prepared for Extranet publication with updated cover page

May 28, 2008

- Table 1.0, added new models 4430 ORS, 4430 and 4440
- Added list of referenced documents

May 7, 2008

Rename document: was "Transmission Specifications". Revise several section titles.

March 28, 2008

- Tables 16.1 and 16.2, revised O-ring seal specification to remove SAE J200, and to add recommended durometer hardness of 75.
- Tables 16.1 and 16.2, replaced SAE J1019 and J517 hose specifications with SAE J2545 and SAE J1405, Option IV.

January 4, 2008

- Table 11.1: added moment of inertia values for 6-speed transmissions with retarder.

November 7, 2007

- Table 13.0: replaced "TranSynd® or TES-295 fluid" with the phrase "TES-295 licensed fluid".
- Table 14.1: added torque values to high, medium, and low retarder capacity lines.