ISO 9001:2008 CERTIFIED
BROOKFIELD
AMETEK

DIN Adapter Accessory
Assembly & Operating Instructions

These instructions apply to both the Standard Coupling Nut and EZ-Lock Coupling for Spindle Connection.

The DIN Adapter Accessory components are as follows: the Standard Version, part number DAA, includes: DIN spindles 85, 86 and 87, sample chambers ULA-DIN-6Y and DAA-1, locating channel ULA-DIN-7Y, clamp assembly DAA-2Y, water jacket ULA-40Y and 6 tube end caps ULA-34. The EZ-Lock Version, part number DAAK, includes the same parts with the exception of DIN spindles 85K, 86K and 87K and locating channel ULA-DIN-7KY. All of these components are shown in Figure 1.

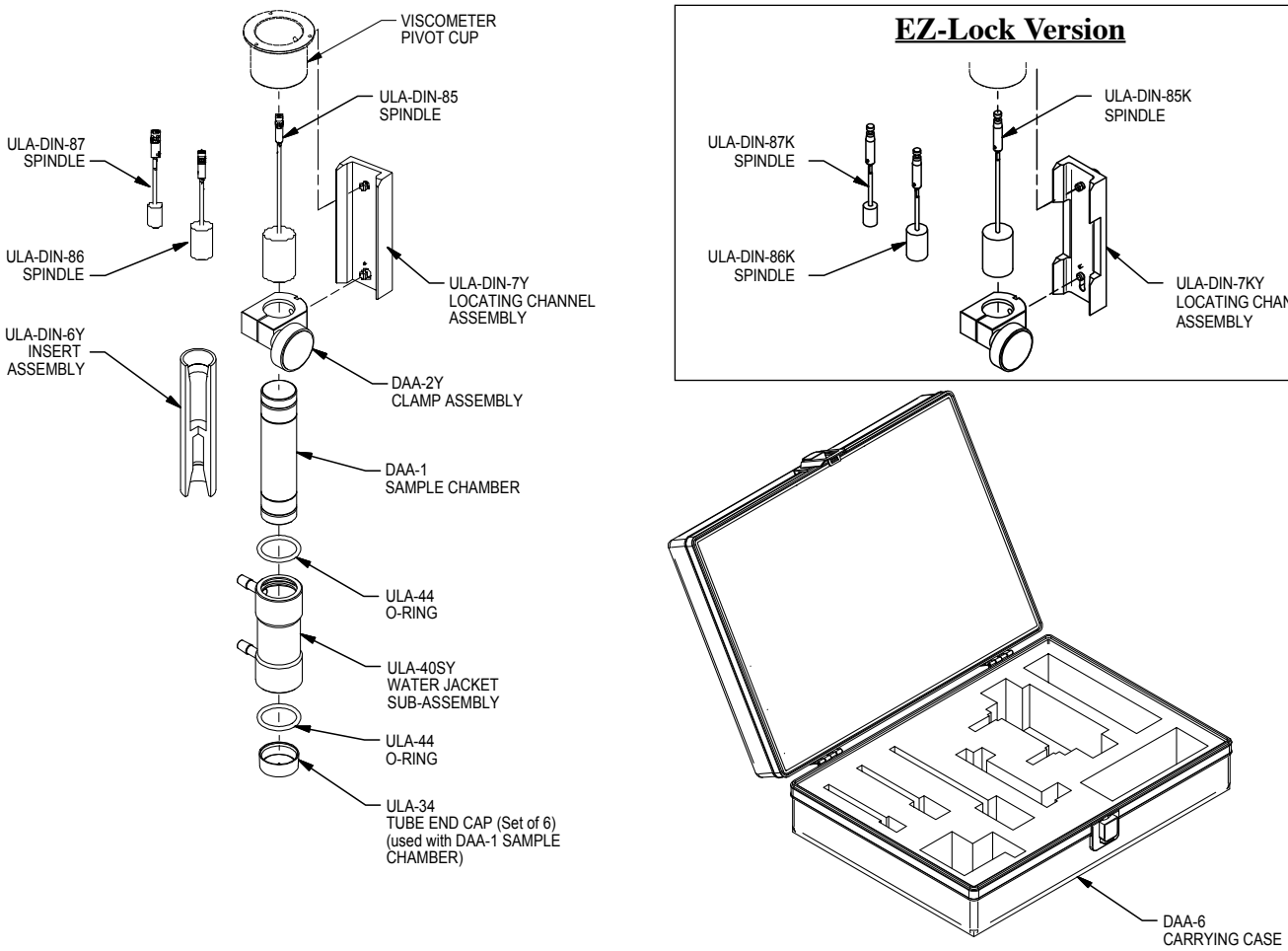


Figure 1: DIN Adapter Components

When an older dial reading viscometer is used, the viscometer pivot cup may need to be replaced with the current design as shown in Figure 2. If your viscometer has a Type I or Type II pivot cup, the cup should be replaced with a Type III cup. Contact AMETEK Brookfield or your local authorized dealer for information.

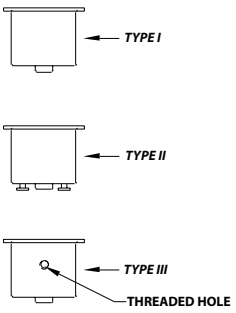


Figure 2: Pivot Cup Compatibility

Assembly

With the Viscometer/Rheometer set up on the lab stand and leveled, the DIN Adapter Accessory is assembled as follows:

1. Attach the locating channel to the Viscometer/Rheometer Pivot cup, shown in Figure 3, by screwing the upper mounting screw into the hole at the rear of the Pivot cup.

   Note: The pin is at the bottom of the locating channel.

Figure 3: Installing the Locating Channel

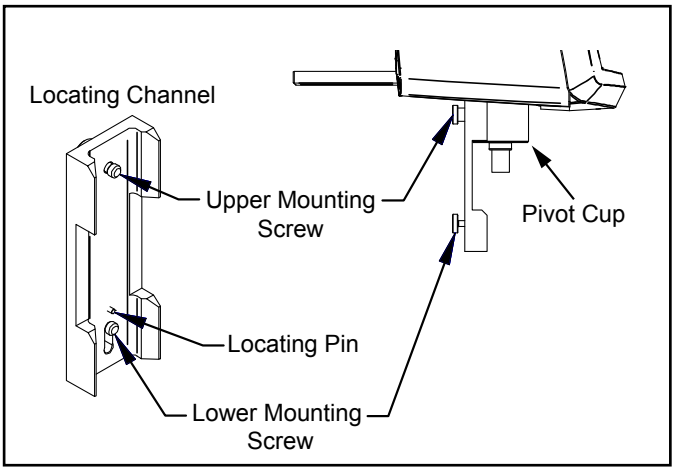
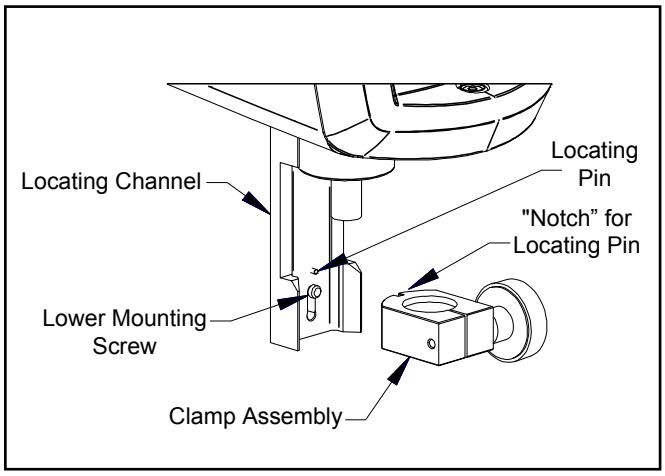


Figure 4: Installing the Clamp Assembly



2. Attach the clamp assembly to the locating channel, as shown in Figure 4, by screwing the lower mounting screw on the locating channel into the hole at the back of the clamp assembly.

   Note: The notch is placed against the locating pin.

3. Temperature of the sample may be controlled through the use of a water jacket. To control temperature, insert either sample chamber into the water jacket as shown in Figure 5. If the water jacket does not slide onto the Sample Chamber easily, the "O" rings may need to be lubricated with silicone oil.

   Note: If sample chamber DAA-1 is used, the end cap is also installed.

Figure 5: Installing the Water Jacket

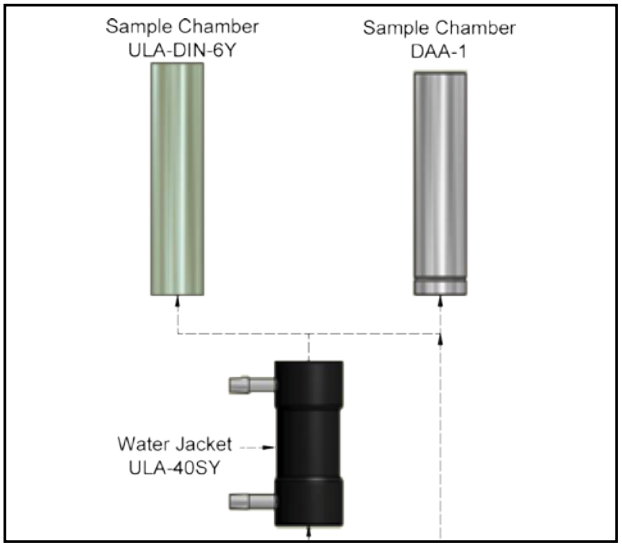
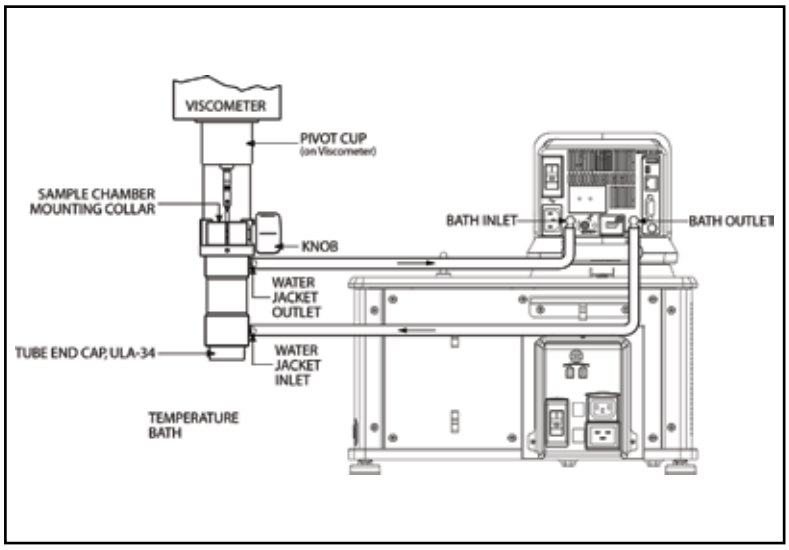


Figure 6: Installing the Water Bath

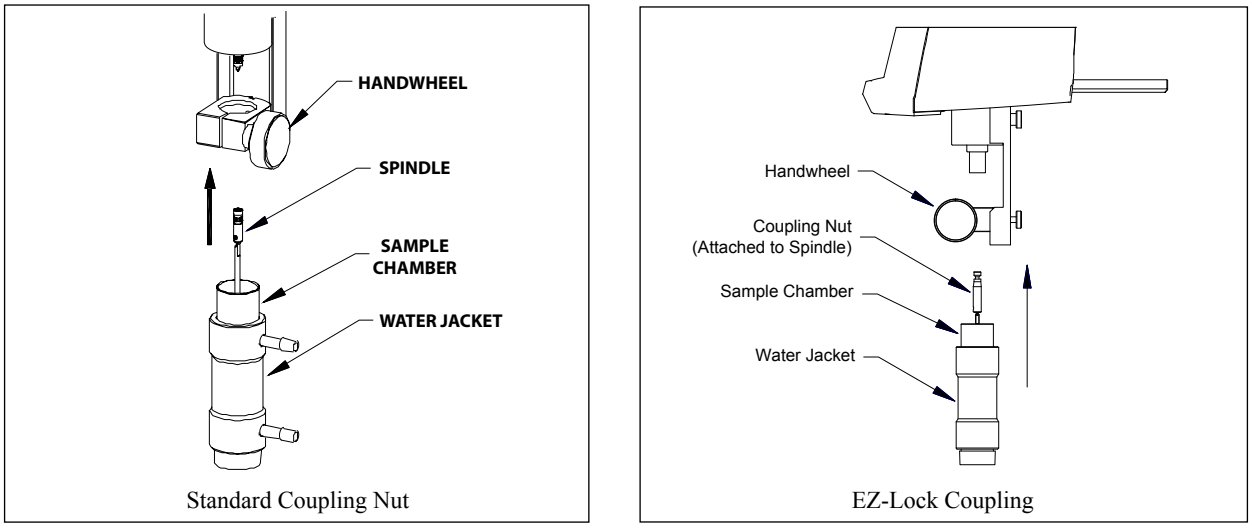


4. The water jacket is connected to a circulating water bath as shown in Figure 6. For temperatures from -15°C to 65°C, gum rubber tubing (Brookfield Part No. EX-TUBING) is used. For temperatures from 65°C to 100°C, Fluran® tubing (Brookfield Part No. ULA-45) should be used.

Operation

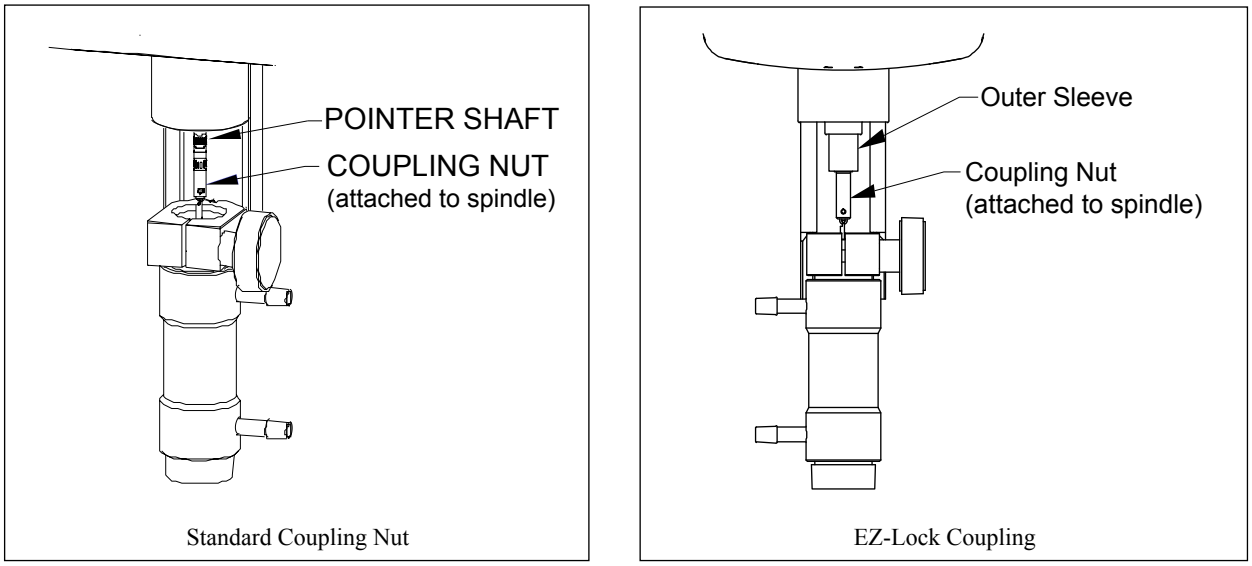
1. Pour the sample into the Sample Chamber.
2. Insert the Spindle into the Sample Chamber.
3. Install the Sample Chamber onto the clamp assembly, see Figure 7. Slide the Sample Chamber/Water Jacket up into the clamp and tighten the Handwheel.

Figure 7: Installing the Sample Chamber/Water Jacket



4. Install the Spindle onto the viscometer/rheometer pointer shaft, see Figure 8. For the Standard Coupling Nut, lift the coupling when attaching the spindle to avoid damage to the instrument. (Note: spindles have a left-handed thread for installation.) For the EZ-Lock Coupling, attach the spindle coupling to the viscometer by raising the spring-loaded sleeve at the base of the viscometer pivot cup and inserting the spindle so that the bottom of the coupling is flush with the bottom of the sleeve. Then lower the sleeve.

Figure 8: Installing the Spindle



5. If the viscometer is a model DV-I+, DV-II+, DV2T, DV-III or DV3T, enter the proper spindle entry code (85, 86 or 87) following the procedure in the viscometer/rheometer operating manual.

   If a model Dial Reading, DV-I or DV-II is used, the spindle factors are found on page 4 of this manual.
6. The viscometer/rheometer speed may now be set and readings can be taken as described in the viscometer/rheometer operating manual.

Spindle Factors, LVF, LVT, LVTDV-I/DV-II Series Viscometers

Speed, RPM	Spindle 85	Spindle 86	Spindle 87	Shear Rate, Sec-1
0.3	38.12	N/A	378.00	0.39
0.6	19.06	N/A	189.00	0.77
1.5	7.62	22.81	75.60	1.94
3	3.81	11.40	37.80	3.87
6	1.91	5.70	18.90	7.74
12	0.95	2.85	9.45	15.48
30	0.38	1.14	3.78	38.70
60	0.19	0.57	1.89	77.40

Spindle Factors, Spindle 85 with RV, HA, HB Dial Reading and DV-I/DV-II Series Viscometers

Speed, RPM	RV	HA	HB	Shear Rate, Sec-1
0.5	N/A	N/A	N/A	0.65
1.0	N/A	N/A	N/A	1.29
2.0	N/A	N/A	N/A	2.58
2.5	48.80	N/A	N/A	3.23
4	30.50	N/A	N/A	5.16
5	24.40	48.80	N/A	6.45
10	12.20	24.40	N/A	12.90
20	6.10	12.20	48.80	25.80
50	2.44	4.88	19.52	64.50
100	1.22	2.44	9.76	129.00

Spindle Factors, Spindle 86 with RV, HA, HB Dial Reading and DV-I/DV-II Series Viscometers

Speed, RPM	RV	HA	HB	Shear Rate, Sec-1
0.5	N/A	N/A	N/A	0.65
1.0	N/A	N/A	N/A	1.29
2.0	N/A	N/A	N/A	2.58
2.5	N/A	N/A	N/A	3.23
4	91.25	N/A	N/A	5.16
5	73.00	N/A	N/A	6.45
10	36.50	73.00	N/A	12.90
20	18.25	36.50	N/A	25.80
50	7.30	14.60	58.40	64.50
100	3.65	7.30	29.20	129.00

Spindle Factors, Spindle 87 with RV, HA, HB Dial Reading and DV-I/DV-II Series Viscometers

Speed, RPM	RV	HA	HB	Shear Rate, Sec-1
0.5	N/A	N/A	N/A	0.65
1.0	N/A	N/A	N/A	1.29
2.0	N/A	N/A	N/A	2.58
2.5	485.20	N/A	N/A	3.23
4	303.25	N/A	N/A	5.16
5	242.6	485.20	N/A	6.45
10	121.3	242.60	N/A	12.90
20	60.65	121.30	485.20	25.80
50	24.26	48.52	194.08	64.50
100	12.13	24.26	97.04	129.00

Table 1: Viscometer Factors

DIAL READING AND DV-I OR DV-II VISCOMETERS

The viscometer reading is multiplied by the factor from the table above to produce the viscosity in cP (mPa•s).

DV-II VISCOMETERS

The DV-II series viscometers will display viscosity (in cP) and shear stress when the proper SMC (Spindle Multiplier Constant) and SRC (Shear Rate Constant) values (see Table 2) are entered using "spindle 99" entry procedure. Refer to the DV-II operating manual for instructions.

DV-I+ OR DV-II +VISCOMETERS

Instruments, with firmware version 3.0 or higher, will calculate viscosity (and shear rate/shear stress if the viscometer is a DV-II+) when the spindle number (i.e. 85, 86 or 87) is entered. When using viscometers with firmware versions 1.x and 2.x, the % torque value is multiplied by the appropriate factor (see Table 1) to calculate the cP or mPa•s value. Shear rate (Sec^{-1}) is calculated by multiplying the SRC (see Table 2) by the rotational speed in RPM. Viscometers with firmware versions 1.x and 2.x may be upgraded to version 3.x, allowing automatic calculation of viscosity, shear rate and shear stress. Contact AMETEK Brookfield or your local authorized dealer for pricing information.

DV-III RHEOMETERS

Instruments with firmware version 3.0 or higher will calculate viscosity, shear rate and shear stress when the spindle number (85, 86 or 87) is entered.

When using rheometers with firmware versions 1.x or 2.x, the rheometer will calculate viscosity, shear rate and shear stress if the SMC and SRC (see Table 2) constants are entered using "spindle 99". Refer to the rheometer operating manual for instructions. Rheometers with firmware versions 1.x and 2.x may be upgraded to version 3.x, allowing calculation of viscosity. Contact AMETEK Brookfield or your local authorized dealer for pricing information.

Spindle	SMC	SRC	Volume (mL)
85	1.22	1.29	17
86	3.65	1.29	6.5
87	12.13	1.29	2.0

Table 2: SMC and SRC Constants