

**GENERAL**

The primary function of corrosion coupons is to determine weight loss over time at a particular location. This measurement can be related to the rate of corrosion, either in mils per year (mpy) or micrometers per annum ( $\mu\text{mpa}$ ). Coupons are also used to give a visual example of the corrosion mechanism occurring within the system at that location.

Caproco also offers a range of coupon configurations that are designed to be used for special monitoring applications:

- Applied Stress - For environments where stress corrosion cracking is suspected
- Residual Stress - For environments where an embrittling environment is suspected
- Scale Coupons - For environments where scaling is a possible problem

**COUPONS WITH APPLIED STRESS**

This type of coupon is similar in shape to that of a strip coupon, with a mounting hole drilled in each end. The coupon is supplied pre-clamped onto the holder at a precise applied stress level, and does not require any adjustment before installation in the pipeline or vessel. Information necessary to place an order for an applied stress coupon/holder is:

- physical dimensions and properties of the pipeline or vessel at the monitoring location
- intended orientation of the access fitting assembly (e.g. top of line, bottom of line)
- working pressure and details of the medium flowing in the line

The purpose of the applied stress coupon is to simulate the effects of the stress due to line pressure combined with the possibly corrosive medium in the line on the pipe or vessel wall. In this way the coupon can offer a means of monitoring stress corrosion cracking.

After exposure, the coupon is then laboratory tested to determine the significance of stress corrosion. Coupons in an environment that is highly susceptible to stress corrosion cracking are likely to fracture in a short time.

Stress corrosion is usually accompanied by an intergranular fracture in which the material shows no ductility even though the tensile test results may indicate a high plastic elongation capacity for the material.

**SCALE COUPONS**

Scale coupons are rectangular in shape and are mounted on a coupon holder the same way as strip coupons. The coupon has a series of holes in a range of sizes machined in it.

Scale is most likely to form in cavities, and therefore forms most readily in the smallest size hole. If a pipeline medium has a tendency to form scale, the strength of this tendency can be determined by the largest hole that has accumulated scale. The greater the concentration of scaling compounds, the larger the hole size that is likely to accumulate scale.

Before ordering, the catalog sheet on strip coupon holders should be reviewed to determine the correct length of coupon holder. Coupons are supplied separately and the mounting procedure is the same for strip coupons.

**Scale Coupon**

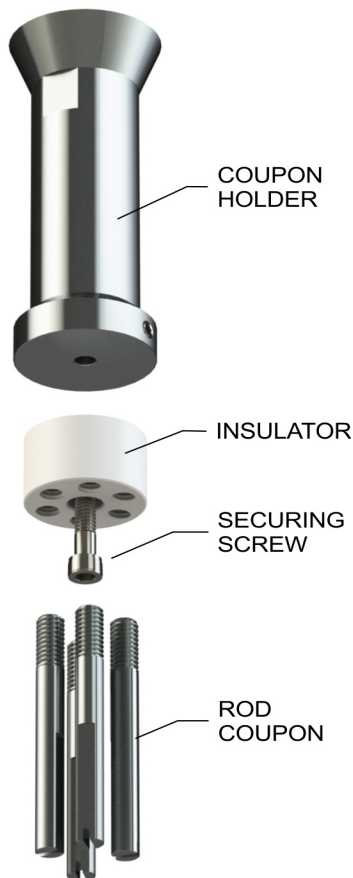
## COUPONS WITH RESIDUAL STRESS

This coupon is rectangular in shape and is mounted on a strip coupon holder. Similar to applied stress coupons, the coupons do not require any special adjustment before installation.

The coupon is purposely deformed during manufacturing to produce residual stress. The cold working of the coupon is designed to simulate any residual stress created in the equipment at the manufacturing stage (e.g. cold rolling of tubes). An area of high residual stress will be anodic to the portion of the material that has not been worked. Therefore only a fraction of the coupon is cold worked.

This type of coupon will simulate any corrosion effect, due to the residual stress present in the wall combined with an embrittling environment, which makes the part susceptible to catastrophic failure.

The exposed coupon is laboratory tested to determine the significance of the embrittling environment. The catalog sheet on strip coupon holders should be reviewed to determine the length of coupon holder required (note: coupons and holders supplied separately).



**Rod Coupon Holder Assembly**

## ROD COUPONS

Rod coupons are used to measure weight loss in the same manner as standard strip coupons. The advantage to the rod coupon design is that several coupons may be mounted together in one location while still offering a large surface area to the product flowing in the line. This allows the operator to withdraw a pair of coupons at the same intervals that strip coupons are withdrawn, while leaving the remaining coupons to continue their exposure. In this way longer exposure periods may be monitored with the same shorter time interval between withdrawals as strip coupons. It is therefore possible to produce results from longer exposure tests without having to wait the full length of an individual exposure period (typically six months).

A further advantage of rod coupons is that they do not require orientation in the flow, as their cylindrical shape does not render them liable to edge effects.

## SPECIALTY LAB-TESTING COUPONS

Caproco supplies a variety of coupons used in laboratory testing of corrosive environments. Wheel test coupons and rotating cylinder electrodes are two types of coupons used in laboratory analyses to test the effectiveness of inhibitors.

Casing coupons are manufactured from drill pipe casing and are used to in lab tests to evaluate the effects that different gases or drilling muds can have on drill pipe.



**Applied Stress  
Coupon Holder  
Assembly**

**SPECIAL PURPOSE COUPONS & COUPON HOLDER ASSEMBLIES**

**SCALE COUPONS**

**STRIP**

1018 MILD STEEL			
COUPON SIZE	PART NUMBER	COUPON SIZE	PART NUMBER
3" X 3/4" X 1/8"	11723	2 1/2" X 3/4" X 1/8"	36016
2 7/8" X 7/8" X 1/8"	36001	2 1/2" X 1/2" X 1/16"	36052
3" X 1/2" X 1/8"	36051	2" X 3/4" X 1/8"	36014
3" X 1/2" X 1/16"	36003	2" X 1/2" X 1/8"	36037
3" X 1" X 1/16"	36053	2" X 1" X 1/16"	36020
		2" X 1/2" X 1/16"	36049
316 SS			
3" X 3/4" X 1/8"	36015	2" X 3/4" X 1/8"	36018

**ROD**

1018 MILD STEEL	
COUPON SIZE	PART NUMBER
4"Ø X 1/4"	11686
3"Ø X 1/4"	36012
2"Ø X 1/4"	12848

**FLUSH DISC**

COUPON SIZE	MATERIAL	PART NUMBER
1 1/4"Ø X 1/8"	1018 Mild Steel	11537
1 1/4"Ø X 1/8"	A106 Gr B	36035

**Note: Coupons available in alternative materials and dimensions**