

# See•All®

## MOISTURE & LIQUID INDICATOR

Most authorities agree on the **safe moisture levels** for CFC/HCFC refrigerants. The acceptable limit for Refrigerant 12 is 15 ppm, for Refrigerant 22 it is 60 ppm and for Refrigeration 502 it is 30 ppm. For further details consult the ASHRAE Handbook — Refrigeration System Practices.

The Sporlan See•All Moisture and Liquid Indicator **changes color in the acceptable range for all refrigerants** and combines the two functions of moisture and liquid indication into a single economical unit. It takes the guess work out of servicing refrigeration and air conditioning equipment.

It is no longer necessary to speculate on the moisture content in circulating refrigerant or whether the system is properly charged.

A very reliable scientific principle is utilized in the See•All to accurately determine the moisture content of any halocarbon type refrigerant in accordance with the liquid temperature.

The See•All is designed to replace the conventional accessory sight glass generally installed on commercial refrigeration and air conditioning systems.

## 8 OUTSTANDING BENEFITS

**ONE INDICATOR for all REFRIGERANTS** — provides a true moisture indication for Refrigerant 12, 134a, 22, 404A, 407C, 502 or 507.

**RELIABLE and ACCURATELY CALIBRATED COLOR CHANGE POINTS** — in parts per million of moisture for each refrigerant.

**REPLACEABLE INDICATOR ELEMENT** — the color indicator paper can be changed on fused glass models manufactured since 1984 without removing the See•All from the line.

**INDICATOR PROTECTED from DISCOLORATION and DIRT** — by a filter pad and screen. This prevents washing of the indicator by the refrigerant and protects it from system contamination and turbulence.

**COLOR CHANGES ARE EASILY DISTINGUISHED and REVERSIBLE** — indicator colors differ so widely between the wet and dry condition, there is no possibility of confusion. Colors reverse as often as moisture concentration in the system changes.

**LARGE FULL VIEW SIGHT GLASS** — extra large crystal clear sight glass for viewing the refrigerant. Bubbles indicate a shortage of refrigerant or a restriction in the liquid line.

**DISASSEMBLY FOR INSTALLATION IS UNNECESSARY** — with extended fittings on small size solder models. See•Alls are easy to braze.

**PLASTIC CAP** — is supplied with See•All to keep the glass free from dust, dirt and grease.

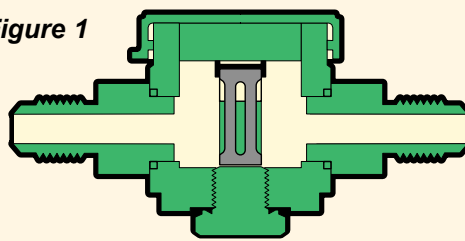
## HOW IT'S MADE

The steel plated fittings are copper brazed to the heavily copper plated steel body. A glass disc is inserted in the body and heated just to the melting point under carefully controlled conditions. This **fuses the glass to the body** in a permanent

leak-free joint. The unit is painted to protect it from corrosion. The indicator paper (retained in a small brass ferrule) is inserted from the back and held in place with a slotted cylinder. The slotted cylinder and indicator assembly is mounted on a post that screws into the bottom of the body, and seals with a knife-edge joint. This overall construction is highly effective in preventing refrigerant leakage.

Paper indicator elements are made in the Sporlan laboratory under the strictest quality control procedures. The indicator is tested for proper color change ability in the laboratory and twice more during assembly.

Figure 1



## HOW IT WORKS

The indicator is a porous filter paper impregnated with a chemical salt that is sensitive to moisture. The salt changes color according to the moisture content (relative saturation) in the refrigerant. A dark green color indicates the refrigerant is DRY and yellow indicates a WET condition. The indicator is formulated so that it changes color at the moisture levels generally accepted as the safe operating range.

The See•All calibration information in **Table 1** is based on detailed experimental data for Refrigerants 12, 22, 134a, 404A, 502 and 507. The calibration information on other refrigerants and solvents was obtained from a comparison of their properties with Refrigerants 12, 22, 134a, 404A, 502 and 507. **For Refrigerants 123, 401A, 402A and 30; Refrigerant 22 moisture calibration is suggested. A See•All is not suitable for Ammonia systems.**




**FOR AIR** — Tests on air show that the See•All changes color in the range of **0.5% to 2.0% R.H.** In ordinary air lines this means that the See•All will change color at dew points in the range of minus 40°F to minus 60°F.

## BRAZING

See•Alls with 1/4" thru 1-1/8" ODF Solder connections are constructed with long steel fittings that are copper plated. The heavily copper plated connections are suitable for soldering or brazing using any of the common alloys, such as silver solder, soft solder, Sta-Brite, or **Sil-Fos or PhosCopper (which do not require flux)**. These size See•Alls **do not require disassembly** in the field for brazing. These copper plated steel fittings can be brazed as easily, and with the same technique, as used with copper connections. The copper plated steel fittings actually heat up faster and braze quicker than copper. The advantage of the copper plated steel fittings is that they hold their round shape more readily than copper, eliminating the need for frequent re-sizing.

The copper plated steel connections on the See•All are bright and clean when shipped. **Polishing the inside of the fittings before brazing is unnecessary, and could be harmful if an excessive amount of the copper plating is removed.**

Table 1

| MOISTURE CONTENT PPM                                                                                 |                         |          |          |          |           |           |           |           |           |               |          |           |           |           |
|------------------------------------------------------------------------------------------------------|-------------------------|----------|----------|----------|-----------|-----------|-----------|-----------|-----------|---------------|----------|-----------|-----------|-----------|
| SEE•ALL<br>SHOWS                                                                                     | REFRIGERANTS            |          |          |          |           |           |           |           |           |               |          |           |           |           |
|                                                                                                      | 11, 12                  |          |          | 22       |           |           | 134a      |           |           | 502, 113, 114 |          |           | 404A, 507 |           |
|                                                                                                      | LIQUID LINE TEMPERATURE |          |          |          |           |           |           |           |           |               |          |           |           |           |
|                                                                                                      | 75°                     | 100°     | 125°     | 75°      | 100°      | 125°      | 75°       | 100°      | 125°      | 75°           | 100°     | 125°      | 75°       | 100°      |
|  Green — DRY        | Below 5                 | Below 10 | Below 20 | Below 30 | Below 45  | Below 60  | Below 50  | Below 80  | Below 110 | Below 10      | Below 20 | Below 30  | Below 15  | Below 30  |
|  Chartreuse CAUTION | 5-15                    | 10-30    | 20-50    | 30-90    | 45-130    | 60-180    | 50-200    | 80-225    | 110-310   | 10-45         | 20-65    | 30-110    | 15-90     | 30-140    |
|  Yellow — WET       | Above 15                | Above 30 | Above 50 | Above 90 | Above 130 | Above 180 | Above 200 | Above 225 | Above 310 | Above 45      | Above 65 | Above 110 | Above 90  | Above 140 |

**BOLD** figures are for the **average design conditions** of refrigerant liquid lines operating at 100°F. Since the actual temperature is not critical, a satisfactory estimate can be made by comparing it to body temperature. If it feels cool to the touch, use 75°F., whereas if it feels warm, use 125°F. column figures.

The larger See•Alls with 1-3/8", 1-5/8", and 2-1/8" ODF Solder connections utilize copper connections and require removal of the cartridge from the brass saddle adaptor before brazing. The cartridge is shipped hand tight for easy removal.

## APPLICATION

The See•All may be installed anywhere in the the liquid line, but preferably after the Catch•All Filter-Drier and ahead of the expansion device.

The indicator element of the See•All, prior to installation, will be yellow, indicating a wet condition. This is a normal situation since the air in contact with the element is above 0.5% Relative Humidity. This does not affect the operation or calibration of the See•All. As soon as it is installed on a system, the indicator element will begin to change according to the moisture content of the refrigerant. Some change may take place rapidly at the start-up of a new system or after replacement of a drier on existing installations. In some cases the See•All will change in as short a time as 15 minutes. However, it is **recommended that the equipment operate for about 12 hours** to allow the moisture in the system and the See•All color to come to complete equilibrium. The action of the indicator element is completely **reversible** and will change color as often as the moisture content of the system varies.

The drying of the system should be continued until the indicating element changes from chartreuse to green. The actual moisture content of the refrigerant will be in accordance with the above table.

For best results with the plated steel flare fittings that are used on See•Alls, **lubricate the flare surface** and the back of the flare nut with refrigerant grade oil during assembly. This is particularly necessary to avoid leaks if the See•All is being assembled to another steel flare fitting, such as the Catch-All Filter-Drier.

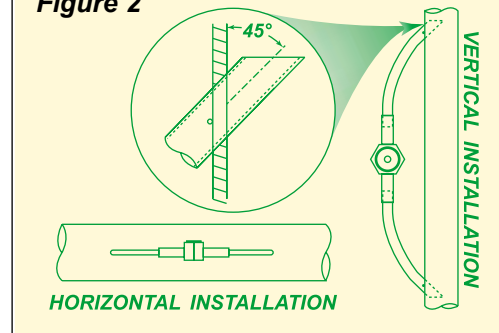
## BYPASS INSTALLATION

On systems having liquid lines larger than 2-1/8" O.D., the See•All should be installed in a bypass line. During the operating cycle this will provide sufficient flow to obtain a **satisfactory reading for both moisture and liquid indication**.

Best results will be obtained if the bypass line is parallel to the main liquid line and the take off and return tubes **project into the main liquid** line at a 45° angle.

While satisfactory liquid and moisture indication will generally be obtained in any position, the preferred methods of installation are shown in Figure 2.

Figure 2



**Kits of preformed 1/4" or 3/8" tubing** are available as a separate item at a nominal cost; application instructions and a detailed template are included. The kits can be used with either SAE Flare or ODF Solder type See•Alls.

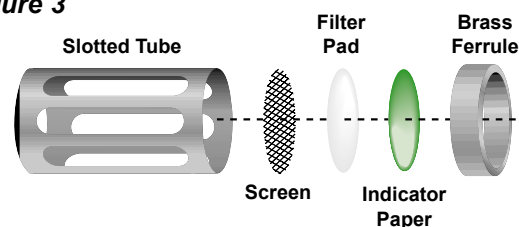
Table 2

| Tube Size ODF | Kit No. | SAE Flare | ODF SOLDER |
|---------------|---------|-----------|------------|
| 1/4"          | AC-2    | SA-12     | SA-12S     |
| 3/8"          | AC-3    | SA-13     | SA-13S     |

## SERVICE POINTERS

**REPLACEMENT INDICATOR PAPER** — Sporlan kit K-SA-4 consisting of a new slotted cylinder and indicator paper assembly is available for replacing the indicator in the fused glass style Sporlan See•Alls (1/4" thru 1-1/8" sizes) manufactured since 1984 (illustrated below). Replacement is through the bottom (see Figure 1). If the indicator becomes damaged, it is generally recommended that the entire See•All be replaced. However, the parts kit can be used in situations where it is difficult to remove the See•All.

Figure 3



**LIQUID WATER** — On occasion it is possible for large quantities of water to enter a refrigeration system. An example would be a broken tube in a water cooled condenser. If this happens and **free water** comes in contact with the indicator element, the element will be damaged.

All moisture indicating elements use a chemical salt (see "How it Works"). These salts must be soluble in water in order to change color. **If excessive water is present then the salts will dissolve causing permanent damage to the indicator. The indicator paper may remain yellow or turn white.**

**HERMETIC MOTOR BURNOUTS** — After a hermetic motor burnout, install a **Catch-All Filter-Drier** to remove the acid and sludge contamination. When the system has operated for 48 hours, replace the Catch-All Filter-Drier and install a See•All.

Since the **acid formed by the burnout** may damage the indicator element of the See•All, it is preferable to install it after most of the contaminants have been removed.

**EXCESS OIL** — When a system is circulating an excessive amount of oil, the See•All indicator paper may become saturated. This causes the **indicator to appear brown** or translucent and lose its ability to change color, but does not permanently damage the See•All. **Let the See•All remain in the system.** The circulating refrigerant will remove the excess oil, and the indicator element will return to its proper color.

**LEAK DETECTORS** — Certain dye type liquid leak detectors may interfere with the color change of the indicator paper. If desired, many of these leak detectors can be removed by installing a Sporlan **Catch-All** in the liquid line. The See•All can then be installed on the system without risk of damaging the indicator paper.

**ALCOHOL** — Do **NOT** install a See•All on a system that contains methyl alcohol or similar liquid dehydrating agents. Remove the alcohol by using a Catch-All Filter-Drier, and then install the See•All. Otherwise the alcohol will damage the See•All color indicator.







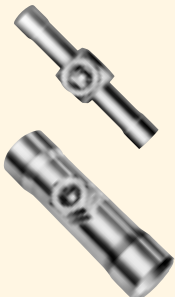
## REMOVABLE CARTRIDGE

Types SA-211, 213 and 217 have copper connections and feature a removable cartridge containing the moisture indicating element. The cartridge has a **knife edge joint** and is available as a separate unit for field replacement purposes if necessary. It is designated as AC-20 and fits all three sizes.



AC-20

Table 3

| SPECIFICATIONS               |          |                            |                                                                                       |
|------------------------------|----------|----------------------------|---------------------------------------------------------------------------------------|
| Connection Sizes<br>(Inches) | Type No. | Overall Length<br>(Inches) | See•All                                                                               |
| Male Flare                   |          |                            |    |
| 1/4                          | SA-12    | 2.87                       |                                                                                       |
| 3/8                          | SA-13    | 3.37                       |                                                                                       |
| 1/2                          | SA-14    | 3.81                       |                                                                                       |
| 5/8                          | SA-15    | 4.13                       |                                                                                       |
| Female X Male Flare          |          |                            |    |
| 1/4                          | SA-12FM  | 2.56                       |                                                                                       |
| 3/8                          | SA-13FM  | 2.97                       |                                                                                       |
| 1/2                          | SA-14FM  | 3.44                       |                                                                                       |
| Male Flare X Swivel Nut      |          |                            |    |
| 3/8                          | SA-13U   | 3.64                       |                                                                                       |
| 1/2                          | SA-14U   | 4.13                       |                                                                                       |
| 5/8                          | SA-15U   | 4.44                       |                                                                                       |
| Swivel Nut X Swivel Nut      |          |                            |    |
| 3/8                          | SA-13UU  | 3.95                       |                                                                                       |
| 1/2                          | SA-14UU  | 4.50                       |                                                                                       |
| 5/8                          | SA-15UU  | 4.75                       |                                                                                       |
| Female Flare X Swivel Nut    |          |                            |    |
| 3/8                          | SA-13FU  | 3.19                       |                                                                                       |
| 1/2                          | SA-14FU  | 3.75                       |                                                                                       |
| Swivel Nut X ODF Solder      |          |                            |  |
| 3/8                          | SA-13SU  | 4.19                       |                                                                                       |
| 1/2                          | SA-14SU  | 4.62                       |                                                                                       |
| 5/8                          | SA-15SU  | 4.89                       |                                                                                       |
| ODF Solder                   |          |                            |  |
| 1/4                          | SA-12S   | 4.62                       |                                                                                       |
| 3/8                          | SA-13S   |                            |                                                                                       |
| 1/2                          | SA-14S   |                            |                                                                                       |
| 5/8                          | SA-15S   | 4.87                       |                                                                                       |
| 7/8                          | SA-17S   |                            |                                                                                       |
| 1-1/8                        | SA19S    |                            |                                                                                       |
| 1-3/8                        | SA-211   | 8.00                       |                                                                                       |
| 1-5/8                        | SA-213   |                            |                                                                                       |
| 2-1/8                        | SA-217   |                            |                                                                                       |

Most solder connections can be used as male fittings as well as female fittings. The 1/4" ODF is 3/8" ODM, the 3/8" ODF is 1/2" ODM, the 1/2" ODF is 5/8" ODM and the 5/8" ODF is 3/4" ODM. Models with female flare and/or swivel nut connections are supplied with a copper gasket in the fitting.

Overall width is: 1.31" for 1/4" and 3/8" sizes, 1.58" for 1/2" and 5/8" sizes, and 1.38" for 7/8" and 1-1/8" sizes. Shipping weight is: 7 oz. for 1/4" and 3/8" sizes, 10 oz for 1/2" and 5/8" sizes, 15 oz for 7/8" and 1-1/8" sizes and 1.5 lbs. for the SA-200 series.

UL and UL<sub>C</sub> Listed - Guide - SEYW - File No. SA-3182. Safe working pressure — SA-12 through SA-19S - 500 psi; SA-211 - 460 psi; SA-213 and SA-217 - 430 psi.

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