Welding Health and Safety
Overview of Welding Helmets and ADFs

3M Occupational Health and Environmental Safety Division

Speedglas™

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Welding and Safety

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Presentation Overview

- Regulation & Standards Summary
- Welding Helmets Overview
  - Purpose
  - Variety of Welding Helmets
- Auto Darkening Filters (ADFs)
  - Construction
  - Safety Benefits of Auto-Darkening Filters
  - Differences in ADF Technology
- Summary

Welding Regulations for USA

Workplace Regulations:

- OSHA 1910 Subpart Q – Welding Cutting and Brazing
- OSHA 1926 Subpart J – Welding and Cutting
- OSHA 1915.51 – Occ. Safety & Health Standards for Shipyards
- MSHA 75.1106 – Welding, cutting, or soldering with arc or flame underground

Performance Standards:

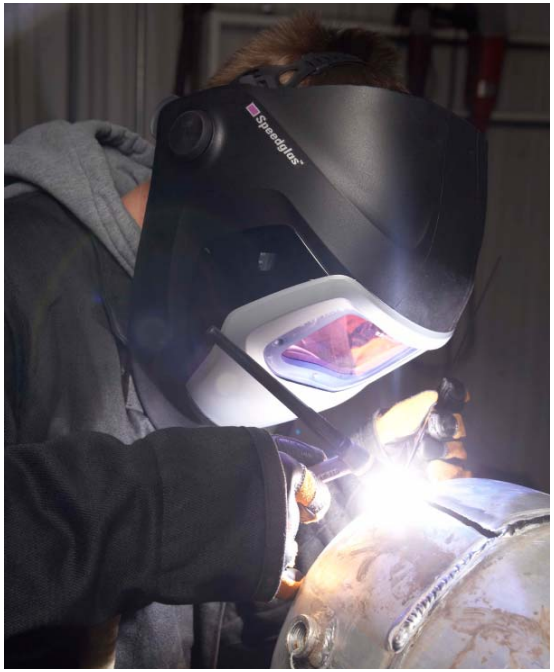
- ANSI Z87.1-2003 – Occupational & Educational Personal Eye & Face Protection Devices (welding shield compliance required by OSHA)
- ANSI Z49.1-2005 – Safety in Welding, Cutting and Allied Processes (available free at: www.aws.org)

Eye and Face Protection

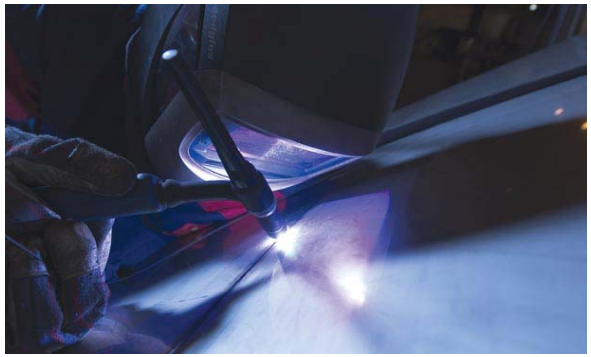
- Welding helmets are required to meet ANSI Z87.1-2003
  - Specifies testing requirements for welding shade filters and helmets
  - Requires use of safety spectacles in conjunction with all welding helmets
- ANSI approved welding helmets and filters required by OSHA (USA)

ANSI Z49.1 Shade Recommendations

Welding Process	Arc Current (Amperes)	Minimum Protective Shade	Suggested Protective Shade (Comfort)
Shielded Metal Arc Welding (SMAW)	Less than 60	7	-
	60 to 160	8	10
	160 to 250	10	12
	250 to 550	11	14
Gas Metal Arc Welding (GMAW)(MIG)	Less than 60	7	-
	60 to 160	10	11
	160 to 250	10	12
	250 to 550	10	14
Gas Tungsten Arc Welding (GTAW)(TIG)	Less than 50	8	10
	50 to 150	8	12
	150 to 500	10	14



- Dependent on welding process and amperage
- Varies according to individual and viewing distance



Welding Helmets Overview

Welding Helmets

- Definition provided by ANSI Z-87.1-2003 Standard:

  “Welding helmets and handshields are protective devices to provide protection for the eyes and face against optical radiation and spatter. Welding helmets shall be used only in conjunction with spectacles and/or goggles.”

Passive Handshields and Welding Helmets

- Check for compliance to ANSI Z87.1 standards
- Relatively inexpensive ($20-50)
- Single shade glass or plastic lens
- Basic feature sets, limited comfort and productivity enhancement features
- Hand-held and headgear mounted available
- May be adapted for use with hardhats
- Flip-up models available for clear viewing for chipping, grinding and set-up

Auto Darkening Welding Helmets

- Check for compliance to ANSI Z87.1 standard
- Wide range in initial investment cost based on quality and features ($75-500)
- Improves quality and productivity, allows the user to keep the welding helmet down during electrode placement (up to 25-40% productivity increase)
- Improves comfort, reduces neck strain of continuous nodding, especially over time
- Potentially reduces eye injuries due to helmet often being “down” more frequently

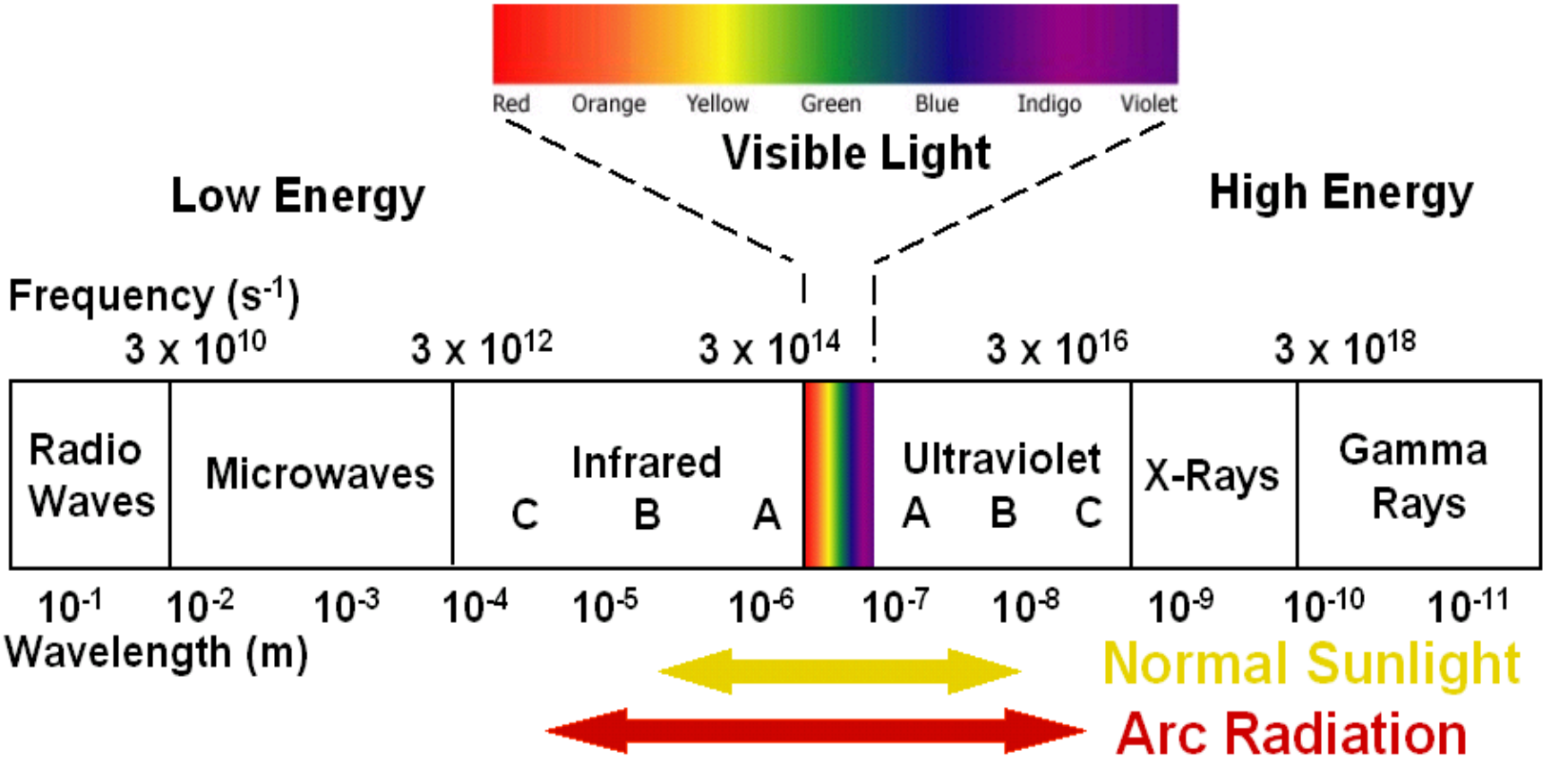
Auto Darkening Welding Helmets – Specialty Features

- Sidewindow versions available for increased peripheral vision and safety
- Ventilated helmets to help decrease heat and humidity buildup and fogging of ADF
- Flip-up models available for clear viewing for chipping, grinding and weld prep
- Extended coverage options available for more coverage from UV, spark and spatter
- Some models available with powered and supplied air respiratory protection

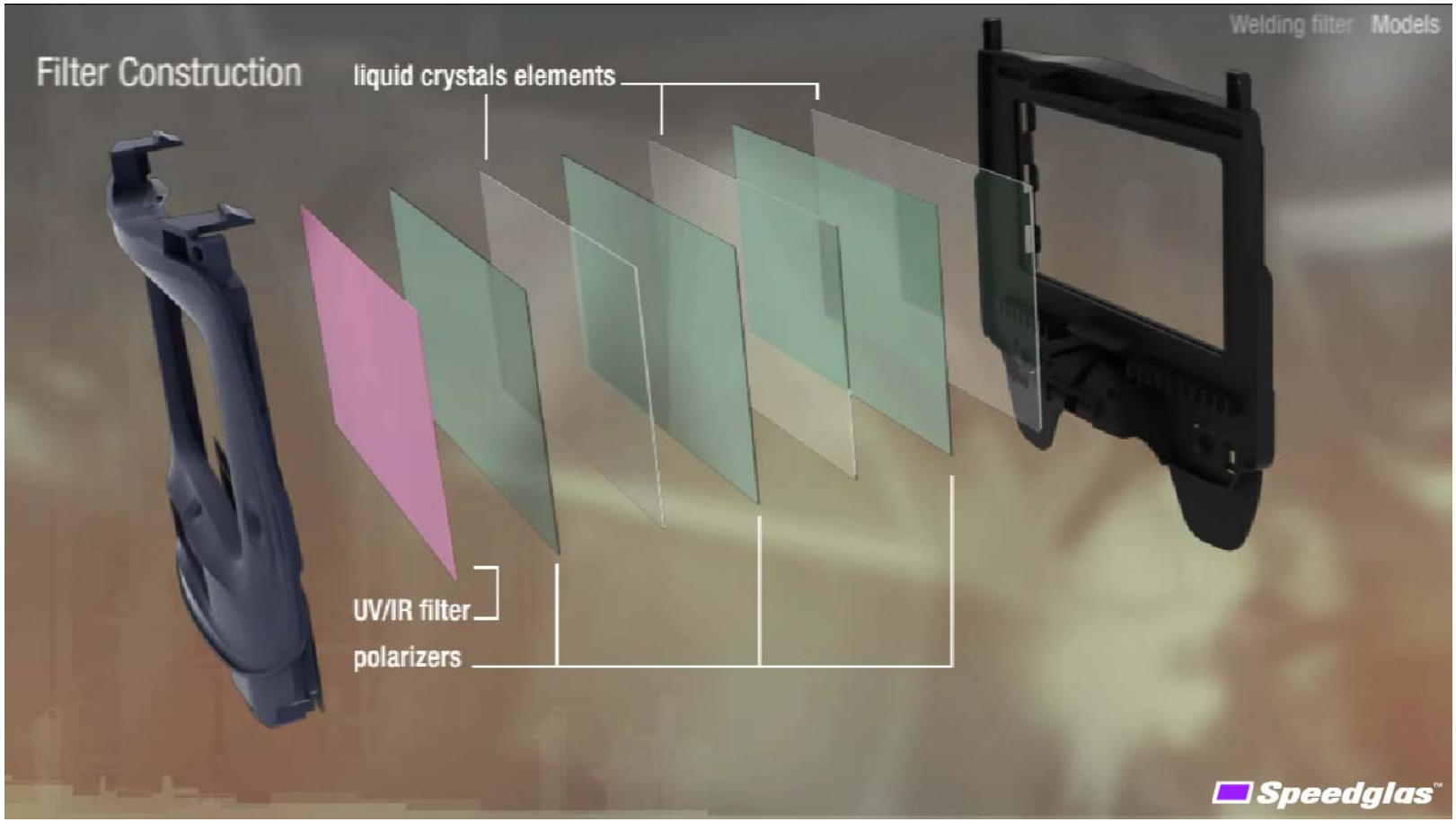
Auto Darkening Filters (ADF's)

Arc Radiation Hazards

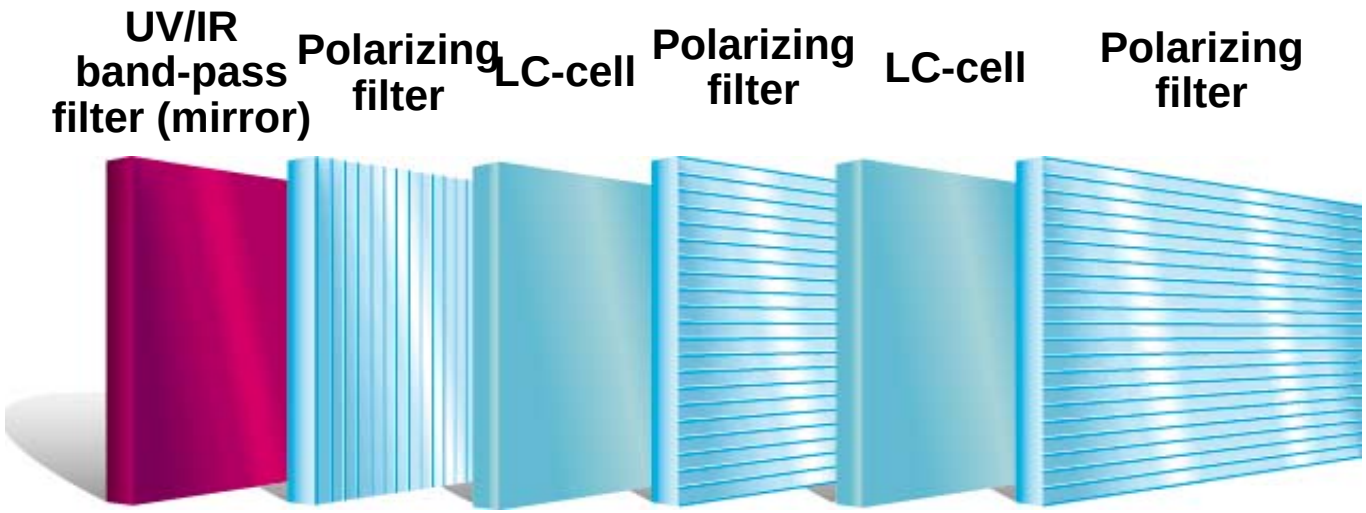
- Arc radiation covers a wider frequency range than sunlight



Auto Darkening Filter (ADF) Construction



ADF Construction



Band-Pass Filter

- Protects from IR and UV light
- Allows only visible light to pass through
- Always working – not part of electrical circuitry or switching part of filter

Liquid Crystal / Polarizing Filter

- Work together as an electronic “shutter”
- Only acting on visible light passing through the band-pass filter
- Failure of this filter element to turn dark does not result in eye injury such as arc-eye (see band-pass filter)

Potential Safety Benefits of Auto-Darkening Welding Filters

- Uninterrupted view of work, during and between welds helmet is down more consistently
  - Reduced probability of impact injuries
  - Reduced arc-eye burns
  - Reduced neck strain from “nodding”
- Secondary benefits include:
  - Increased welder productivity
  - More accurate welds
  - Less time to train welders
  - Less scrap and rework

How to Choose an ADF's - They Are Not All the Same!

- **Welding helmets with auto darkening filters (ADF) are an essential tool for all welders.**
  - ADF's are an investment similar to any other tool or equipment purchased by a welder to help them do their job more efficiently and increased quality.

- **Before investing in an ADF understand what you are getting for your money.**
  - That means understanding the quality, performance, and durability of the different ADF's that are on the market and choosing the one best for you.

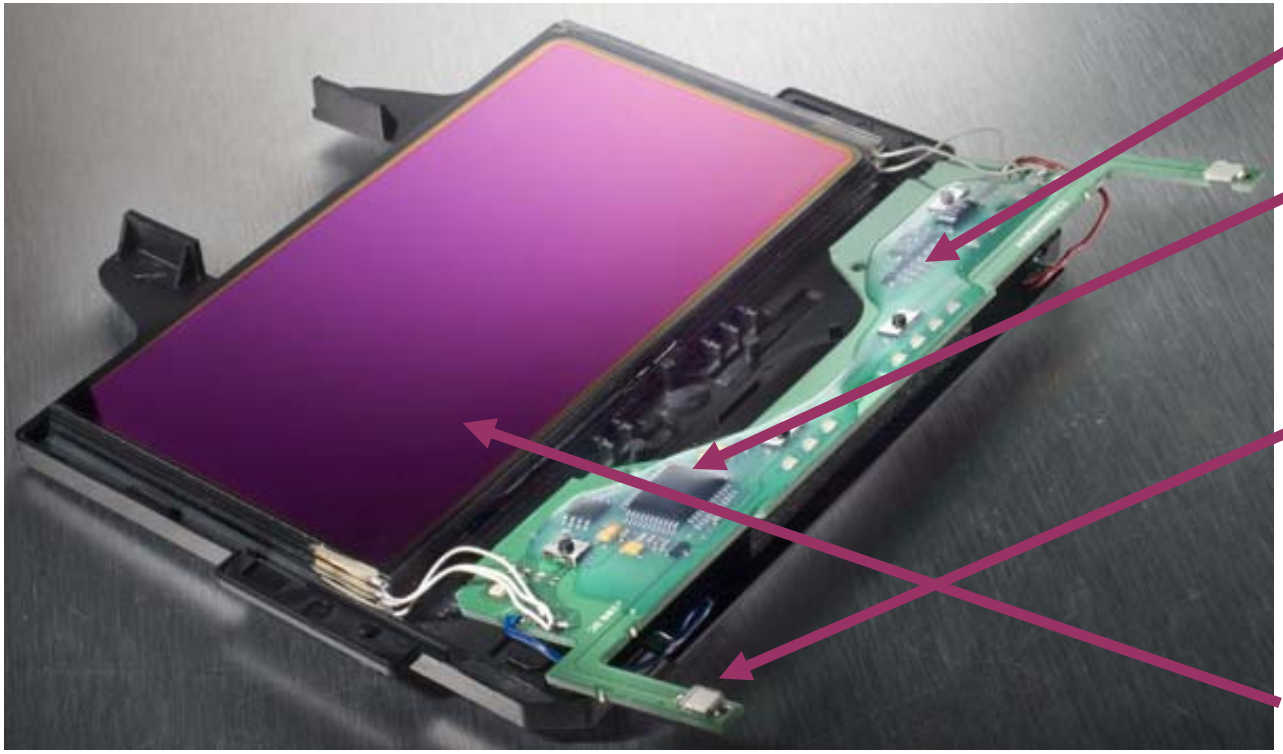
How to Choose an ADF's - They Are Not All the Same!

- **Quality differences affect the performance and life of ADF's**
  - All helmets and ADF's must meet basic minimum ANSI standards
  - Quality differences exist between manufacturers and models of ADFs
    - These include optics, fit and finish of components, overall functionality.
  - Quality differences can affect the durability and performance of ADF's.

- **How to find a quality ADF**
  - Review the manufacturers product literature and features marked on the box
  - Ask questions to find out the quality differences you can't see
  - As with any tool remember the saying "You get what you pay for."

- **Educate yourself by asking questions before you buy**
  - The next few slides illustrate some of the differences in ADF's that are more difficult to see from the outside.
  - Use this information to help drive a discussion prior to investing in a welding helmet with an ADF.

Speedglas™ – An Inside Look

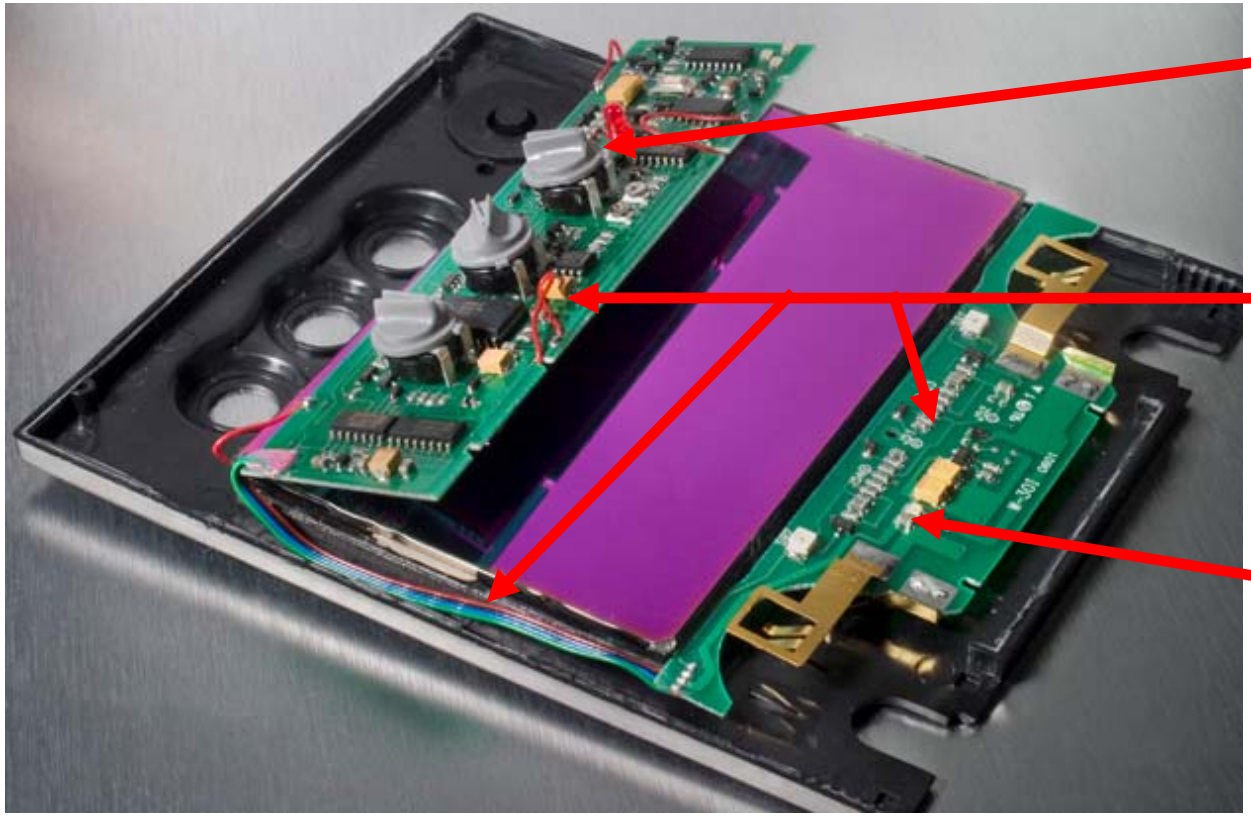


- Silicon coating protects critical components from moisture
- Custom – multi function programmed logic chip minimizes components and increase reliability
- Sensors mounted on circuit board minimize electromagnetic noise interference from LC, increasing low amp arc detection capability
- Filter elements are bonded with optical adhesive for minimum distortion and maximum strength

Other:

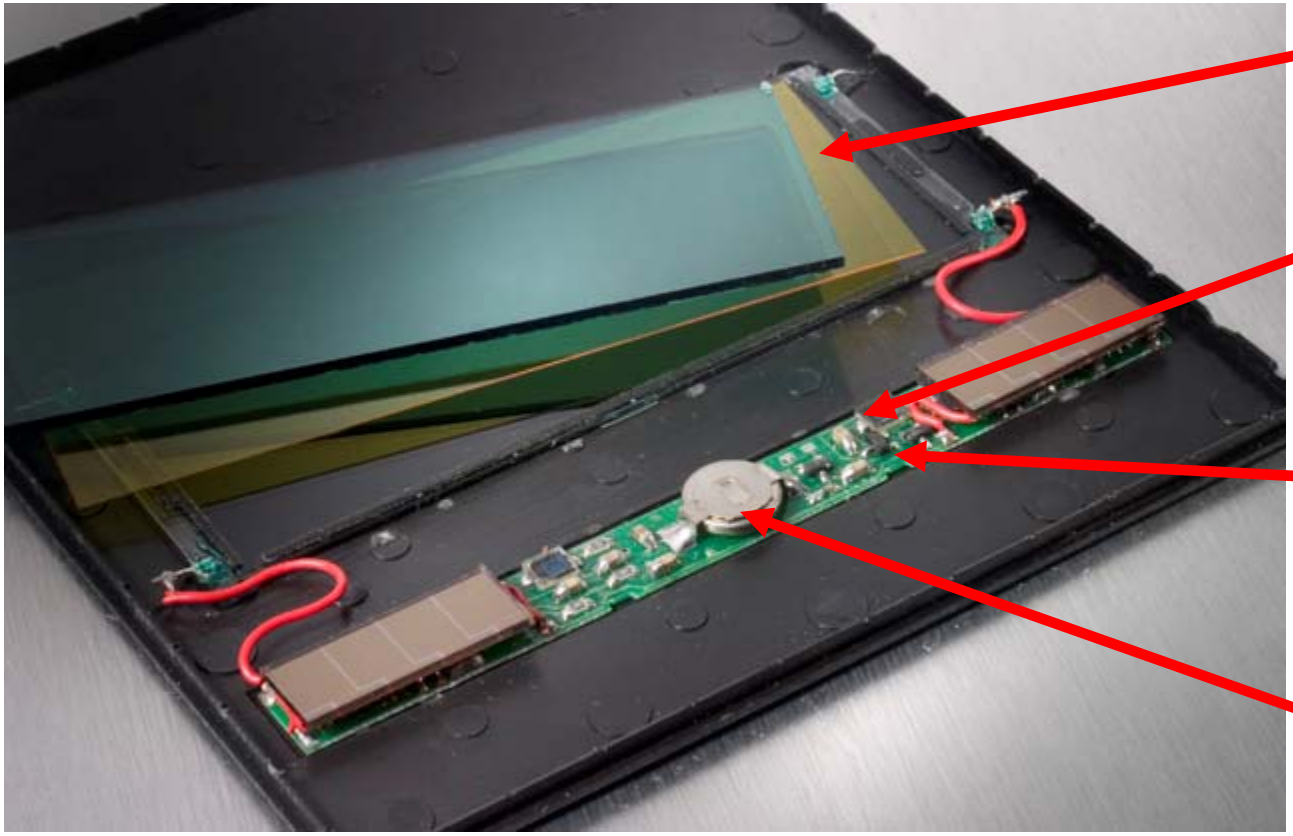
- Sealed button membrane to help protect digital controls and reduces sweat and liquid infiltration
- Replaceable batteries

Brand A - An Inside Look



- Analog controls are fragile and prone to moisture and particle infiltration
- Excessive wiring and circuitry components increase the potential for signal interference and connection failure.
- Spray coated or unprotected circuit board components are vulnerable to contamination

Brand B - An Inside Look



- Un-bonded filter elements reduce optical clarity and are less durable
- Basic electronics may have difficulty detecting certain arc welding processes
- Spray coated or unprotected circuit board components are vulnerable to contamination
- Non-replaceable batteries eventually go dead and the lens becomes non-functional

ADF Features for Consideration

- **Shade range**
  - Selected based on welding processes
- **Arc detection**
  - Electronic's ability to detect arc based on welding process and lighting conditions (outdoors or specialty lighting)
- **Switching speed**
  - Recommend switching speed <0.3ms to reduce intermittent flash
- **Sensors**
  - Sensor placement and arc detection electronics are most important, not necessarily the number of sensors

ADF Features for Consideration - Continued

- **Replaceable batteries**
  - "Solar only" still have batteries on the circuit board, replaceable batteries will ultimately lead to longer lasting ADF
- **Optical clarity**
  - Important for puddle control and specialty welding applications
- **Modes**
  - Welding, grinding, brazing and cutting, tack welding
- **Delay**
  - Time needed to allow "hot" welds to cool before returning to light state
- **Light State**
  - The shade when the ADF is on and not activated by the welding process

Summary and Learnings

- Standards and Regulations applicable to welding applications
- Definition of a welding helmet
- Differences between passive and ADF welding helmets
- Specialty features for consideration in welding helmets
- ADF construction and basic working premise
- Safety and productivity benefits of a ADF welding helmet
- Differences in quality of ADFs
- Features to consider when selecting a ADF

Thank you!

Welding Health and Safety Topics

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