2015 Welding Safety & Health Guide

HEAD & FACE | HAND & BODY | HEAT STRESS | RESPIRATORY | FUME EXTRACTION
Miller Welding Safety & Health

All of our products are designed and built to protect the welder behind the hood and the environment in which they perform their job duties everyday – because that’s what we know. By listening to welders and working with them side-by-side, we understand their pain points and have developed products that protect workers from the unique physical dangers and health risks prevalent within their work environments. The safety and health of your workers and your environment is critical to productivity, performance, and hiring and retaining the best employees.

Visit MillerWelds.com to learn more!

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Providing a safe, healthy and compliant work environment doesn’t need to be complicated. Miller is the only single-source solution for welding fume control products that fulfill each tier of OSHA’s hierarchy of controls, making it easier to keep your environment in compliance and your workers on the job.
The Talk: Terms and definitions used in this section

**OSHA**: Occupational Safety & Health Administration; federal agency responsible for setting and enforcing standards, providing training, outreach, education and assistance.

**Permissible Exposure Limit (PEL)**: Enforceable regulatory limits on the amount or concentration of a substance in the air, established by OSHA.

**Time Weighted Average (TWA)**: Average value of exposure on the basis of an 8h/day, 40h/week work schedule.

**Ceiling Limit (C)**: Absolute exposure limit that should not be exceeded at any time.

**ACGIH**: American Congress of Governmental Industrial Hygienists; a member-based organization that develops recommendations or guidelines to assist in the control of occupational health hazards.

**ACGIH Threshold Limit Value (TLV)**: Limits on the concentration of a substance in the air, typically for inhalation or skin exposure.

**NIOSH**: National Institute of Occupational Safety and Health; federal agency that conducts research and makes recommendations to prevent worker injury and illness as well as certifies respirators.

**Recommended Exposure Limits (REL)**: Occupational exposure limits recommended by NIOSH to OSHA for adoption.

**EPA**: Environmental Protection Agency; federal agency that focuses on protecting human health and the environment by writing and enforcing regulations based on laws passed by Congress.

**NESHAP**: National Emissions Standards for Hazardous Air Pollutants set by the EPA; controls what manufacturers emit out of their shops.

Statistics & Trends: Fume Extraction & Respiratory

**#4 - Respiratory Protection**

OSHA’s 2014 Top Ten Most Cited Violations
The section cited most often within this category is 1910.134(c)(1) - Establishing and implementing a written respiratory protection program.¹

**30-40%**

Long-term welders face a 30 to 40 percent increased risk of lung cancer due to exposure to fumes that may contain nickel, hexavalent chromium, and manganese, as well as welding or cutting surfaces covered in asbestos.²

¹ Report from OSHA and Safety+Health magazine.
Are Welding Fumes an Issue in Your Environment?

It’s critical to understand if exposure to airborne contaminants are putting your workers and facility at risk. If exposure levels reach OSHA PELs, or other applicable government occupational exposure limits, whichever is lower, there are methods to reduce potential hazards, protect workers’ health and ensure compliance.

Know Your Hazard

Dusts & Fibers: Solid particles that are formed or generated from solid materials through mechanical processes such as crushing, grinding, drilling, abrading or blasting. Examples are lead, silica, and asbestos.

Fumes: Solid particles that are formed when a metal or other solid vaporizes and the molecules condense (or solidify) in cool air. Examples are metal fumes from smelting or welding.

Mists: Tiny droplets of liquid suspended in the air. Examples are oil mists produced from lubricants used in metal cutting operations.

Gases: Materials that exist as individual molecules in the air at room temperature. Examples are welding gases, such as acetylene and nitrogen, and carbon monoxide produced from internal combustion engines.

Vapors: Gaseous form of substances that are formed by evaporation. They are normally in the solid or liquid state at room temperature and pressure. Most solvents produce vapors. Examples include toluene and methylene chloride.

Determine if Your Exposure Levels are Safe Using the Following 2-step Process

**STEP 1:**

Exposure Assessment

Have the air in your facility tested by a certified Industrial Hygienist to determine contaminant concentrations, ensuring exposure levels do not exceed limits as outlined in the chart below, or other applicable government occupational exposure limits, whichever is lower. To contact an Industrial Hygienist, visit www.aiha.org or call 703-849-8888.

<table>
<thead>
<tr>
<th>Substance</th>
<th>Prevalent In</th>
<th>Exposure Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>OSHA - PEL (Enforceable)iv</td>
</tr>
<tr>
<td>Hexavalent Chromium</td>
<td>Stainless, High Alloy Steels</td>
<td>5.0 ug/m³ TWA, 2.5 ug/m³ TWA</td>
</tr>
<tr>
<td>Zinc (Zinc Oxide)</td>
<td>Galvanized Metal Coatings</td>
<td>5.0 mg/m³ TWA</td>
</tr>
<tr>
<td>Manganese</td>
<td>Most Welding Fumes: Electrodes &amp; Steels</td>
<td>5 mg/m³ Ceiling</td>
</tr>
<tr>
<td>Aluminum</td>
<td>Steel Additive, Electrode Coatings</td>
<td>5.0 mg/m³ TWA</td>
</tr>
<tr>
<td>Nickel</td>
<td>Stainless, Nickel Alloys</td>
<td>1.0 mg/m³ TWA</td>
</tr>
<tr>
<td>Iron (Iron Oxide)</td>
<td>Most Welding Fumes</td>
<td>10.0 mg/m³ TWA</td>
</tr>
<tr>
<td>Copper</td>
<td>Copper Metals, Electrodes</td>
<td>0.1 mg/m³ TWA</td>
</tr>
<tr>
<td>Cadmium</td>
<td>Coatings of Electrodes</td>
<td>0.1 mg/m³ TWA, 0.3 mg/m³ Ceiling</td>
</tr>
<tr>
<td>Lead</td>
<td>Solder, Brass &amp; Bronze Alloys, Steel Coatings</td>
<td>0.05 mg/m³ TWA, 0.03 mg/m³ Action Level</td>
</tr>
<tr>
<td>Beryllium</td>
<td>Copper, Magnesium &amp; Aluminum Alloys</td>
<td>0.002 mg/m³ TWA, 0.005 mg/m³ Ceiling</td>
</tr>
</tbody>
</table>

iv More strict regulations may apply. Be sure to understand the relevant regulations in your area.
**STEP 2:**

**Determine an Action Plan**

Based on air sampling results, you may need to implement control measures to manage fume exposure within your facility. Following OSHA's Hierarchy of Controls will limit the risk of worker injury and illness, providing a safer and more productive work environment.

**Follow the step(s) below to reduce exposure levels and potential hazards:**

1. **Process Modification/Substitution:**
   - **Miller Recommends:** Hobart® Element™ Wire, Miller Advanced Welding Processes and Equipment, Miller Welding Automation
   - The first step in reducing exposure is to eliminate the hazard from the process, or modify the process to reduce airborne contaminants. Examples of this step include: eliminating welding operations, using low-fume welding consumables, changing to a welding process with lower fume generation or integrating automation welding, altering machine parameters and/or switching to a specialized shielding gas mix. If process modifications alone are not feasible or do not reduce exposure levels enough, continue to next step.

2. **Engineering Controls:**
   - **Miller Recommends:** FILTAIR® Fume Extraction Systems, Bernard® Fume Guns
   - Engineering controls are used to remove a hazard. Well-designed engineering controls can be highly effective in protecting workers and will sometimes be independent of worker interactions, depending on the solution chosen. Ventilation is an effective way to remove the fume at the source of generation before it reaches the welder’s breathing zone. Ventilation can take the form of natural dilution ventilation, mechanical dilution ventilation or local exhaust ventilation. If engineering controls are not feasible or do not reduce exposure levels enough, continue to next step.

3. **Work Practice Controls:**
   - **Miller Recommends:** Changes to Workplace, Training and Education
   - Work practice controls include changes to workplace procedures, policies and the way people work that limit and/or prevent exposure to the hazards. Training, job scheduling and hygiene are examples of work practice controls that can be used to minimize worker exposure to welding fume. Often these controls are used in conjunction with other control measures to promote a safe work environment.

4. **Personal Protective Equipment:**
   - **Miller Recommends:** Respirators
   - When engineering controls are not feasible, while they are being implemented, or when they are not able to reduce employee exposure below permissible levels, respiratory protection should be implemented. Disposable Respirators, Half Masks, Powered Air Purifying Respirators (PAPR) and Supplied Air Respirators (SAR) are common in welding applications.

This process requires repetitive exposure assessments. Any time there is a change to the worker, process or facility, retesting should be conducted to ensure exposure concentrations have not been affected.
Process Modification/Substitution

The first, and most effective level in the hierarchy of controls, removes the danger from the environment, or substitutes with something that does not produce a hazard. Hobart® Element™ filler metals address one of the leading health concerns in the industry – reducing the level of manganese in your welding environment – while maintaining the capabilities needed for industrial welding applications.
**Hobart® Element™ Wire**

Element wire offers the most comprehensive line of filler metals in the industry that are designed to reduce manganese fume emissions in welding. Conversion to Element products may result in a 60-80% reduction in manganese levels when compared to current filler metal fume emissions.

Designed for compliance and performance, Element wire can help you meet increasingly stringent environmental regulations for the manufacturing and fabrication industries – and ensure the best operability and productivity.

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**Miller recommends**

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**Available Diameters and Packaging**

<table>
<thead>
<tr>
<th>Product</th>
<th>AWS Class</th>
<th>Diameter</th>
<th>Packaging</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Element™ 71T1C</td>
<td>E71T-1C H8, -9C H8</td>
<td>.045 in</td>
<td>33 lb Fiber Spool</td>
<td>S292112-029</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.052 in</td>
<td>33 lb Fiber Spool</td>
<td>S292115-029</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1/16 in</td>
<td>33 lb Fiber Spool</td>
<td>S292119-029</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1/16 in</td>
<td>60 lb Coil</td>
<td>S292119-002</td>
</tr>
<tr>
<td>Element™ 71T1M</td>
<td>E71T-1M H8, -9M H8</td>
<td>.045 in</td>
<td>33 lb Fiber Spool</td>
<td>S294112-029</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.052 in</td>
<td>33 lb Fiber Spool</td>
<td>S294115-029</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1/16 in</td>
<td>33 lb Fiber Spool</td>
<td>S294119-029</td>
</tr>
<tr>
<td>Element™ 71M1C</td>
<td>E71T1-GC H8</td>
<td>.045 in</td>
<td>33 lb Fiber Spool</td>
<td>S292212-029</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.052 in</td>
<td>33 lb Fiber Spool</td>
<td>S292215-029</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1/16 in</td>
<td>33 lb Fiber Spool</td>
<td>S292219-029</td>
</tr>
<tr>
<td>Element™ 71M1M</td>
<td>E71T1-GM H8</td>
<td>.045 in</td>
<td>33 lb Fiber Spool</td>
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<td>33 lb Fiber Spool</td>
<td>S294215-029</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1/16 in</td>
<td>33 lb Fiber Spool</td>
<td>S294219-029</td>
</tr>
<tr>
<td>Element™ 81K2C</td>
<td>E81T1-GC H8</td>
<td>.045 in</td>
<td>33 lb Fiber Spool</td>
<td>S292412-029</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.052 in</td>
<td>33 lb Fiber Spool</td>
<td>S292415-029</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1/16 in</td>
<td>33 lb Fiber Spool</td>
<td>S292419-029</td>
</tr>
<tr>
<td>Element™ 81K2M</td>
<td>E81T1-GM H8</td>
<td>.045 in</td>
<td>33 lb Fiber Spool</td>
<td>S294412-029</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.052 in</td>
<td>33 lb Fiber Spool</td>
<td>S294415-029</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1/16 in</td>
<td>33 lb Fiber Spool</td>
<td>S294419-029</td>
</tr>
</tbody>
</table>
The second most effective level of control recommended by OSHA requires controlling the hazard through a physical change to the workplace or a change in the design of equipment, such as increased ventilation. Miller’s complete line of innovative extraction systems provides total weld fume solutions for any environment.
FILTAIR® Fume Extraction

The complete line of Miller® FILTAIR fume extractors are designed specifically for welding – drawing weld fumes away from the welder’s breathing zone and keeping your facility clean. We offer many types of Fume Extraction equipment to best fit your environment and fume control needs.

Mobile Extractors

FILTAIR Capture 5 – A Miller Exclusive!
Exclusive ZoneFlow™ technology creates the largest capture zone in the industry – up to five feet away, compared to the traditional 16 inch capture distance.

Ideal for:
Heavy Equipment Manufacturing
Fabrication
Maintenance and Repair Operations

Accu-Rated™ Airflow: 900 CFM
Sound Level: Approximately 77 dBA at 5 ft

Increase Compliance and Productivity

- Up to three times larger capture zone than traditional extractors improves welder usage, increasing compliance
- Larger capture zone decreases arm movement for larger weldments, improving productivity

How it Works:
The weld fume capture distance is extended by a negative pressure zone that is designed to take air into the extraction arm at a standard rate of 900 cubic feet per minute (CFM) and release filtered air at approximately a 90 degree angle. The negative pressure zone created by this airflow moves the weld fume toward the center of the arm, resulting in maximum weld fume capture.

<table>
<thead>
<tr>
<th>Part #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>#951 639</td>
<td>230 V with 10 ft Pre-Assembled Extraction Arm</td>
</tr>
<tr>
<td>#951 640</td>
<td>230 V with 12 ft Pre-Assembled Extraction Arm</td>
</tr>
<tr>
<td>#951 574</td>
<td>460 V with 10 ft Pre-Assembled Extraction Arm</td>
</tr>
<tr>
<td>#951 575</td>
<td>460 V with 12 ft Pre-Assembled Extraction Arm</td>
</tr>
<tr>
<td>#951 594</td>
<td>575 V with 10 ft Pre-Assembled Extraction Arm</td>
</tr>
<tr>
<td>#951 595</td>
<td>575 V with 12 ft Pre-Assembled Extraction Arm</td>
</tr>
</tbody>
</table>

Now available in 230-volt, single-phase model, making it suitable for use in small shops or rural areas without access to industrial three-phase power.
Mobile Extractors

FILTAIR® MWX
Mobile weld fume extractors designed to easily move with the welder and work.

Ideal for:
Manufacturing & Fabrication
Maintenance & Repair Operations
School & Training Facilities

Accu-Rated™ Airflow: 875 CFM
Sound Level: Approximately 70 dBA at 5 ft

Key Product Features:

- **Large Hood**
  The largest hood in the industry provides 360 degree rotation to obtain the best position over the weld – limiting the amount of weld fume entering the breathing zone. Position up to 18 inches from the arc.

- **Easy-to-Operate Extraction Arm**
  External adjustments allow air to pass through with less airflow resistance giving you stronger CFM (airflow). Reliable and accurate positioning across the full range of motion of the arm increases proper use and compliance. Easy maintenance ensures long-lasting operation and increased ROI. Extraction arms are pre-assembled in 7-, 10- and 12-foot lengths.

- **Filter Pressure Gauge**
  Front panel Filter Pressure Gauge is easy to read with color-coded graphics, indicating when pressure drop increases and the filter needs to be replaced (MWX-D) or cleaned (MWX-S).

<table>
<thead>
<tr>
<th>Equipment and Options</th>
<th>Part #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MWX-D Packages</td>
<td>#951 507</td>
<td>With 7 ft Extraction Arm and Disposable Filter</td>
</tr>
<tr>
<td>MWX-D Packages</td>
<td>#951 508</td>
<td>With 10 ft Extraction Arm and Disposable Filter</td>
</tr>
<tr>
<td>MWX-D Packages</td>
<td>#951 509</td>
<td>With 12 ft Extraction Arm and Disposable Filter</td>
</tr>
<tr>
<td>MWX-S Packages</td>
<td>#951 510</td>
<td>With 7 ft Extraction Arm and Self-Cleaning Mechanism</td>
</tr>
<tr>
<td>MWX-S Packages</td>
<td>#951 516</td>
<td>With 10 ft Extraction Arm and Self-Cleaning Mechanism</td>
</tr>
<tr>
<td>MWX-S Packages</td>
<td>#951 517</td>
<td>With 12 ft Extraction Arm and Self-Cleaning Mechanism</td>
</tr>
</tbody>
</table>
Stationary Extractors

**FILTAIR® 130**
Extremely lightweight and portable high vacuum weld fume extractor ideal for moving with the welder and work. Only 46 pounds!

**Ideal for:**
Contractors  
Maintenance & Repair Operations  
Light Fabrication

**Accu-Rated Airflow:** 132 CFM  
**Sound Level:** Approximately 68.5 dBA at 5 ft

**Key Product Features:**
- Lightweight – 46 lbs
- 70% Quieter for a safer work environment

<table>
<thead>
<tr>
<th>Part #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>#300 595</td>
<td>Includes Filter, 8 ft Hose and 20 ft Power Cord</td>
</tr>
</tbody>
</table>

**FILTAIR® 400**
High vacuum system that can be moved to different welding cells, with longer, more flexible hoses that maximize the portability of attachments. Extracts fume at the source with the use of funnel attachments, nozzles and fume guns.

**Ideal for:**
Manufacturing & Fabrication

**Accu-Rated Airflow:** 400 CFM  
**Sound Level:** Approximately 74 dBA at 5 ft

**Key Product Features:**
- Attach up to 6 fume guns
- 60 ft reach

<table>
<thead>
<tr>
<th>Part #</th>
<th>Description</th>
</tr>
</thead>
</table>
| #300 894 | Includes Industrial High-Vacuum System.  
(Collection hoses ordered separately) |

MillerWelds.com | 13
Stationary Extractors

FILTAIR® SWX
Wall or column mounted weld fume extractors designed for environments with weld areas that need filtration but do not have extensive floor space.

Ideal for:
Schools & Training Facilities
Manufacturing & Fabrication
Fixed Welding Cells/Stations

Accu-Rated™ Airflow: 875 CFM
Sound Level: Approximately 75 dBA at 5 ft

Key Product Features:

► Easy-to-operate, Pre-assembled Extraction Arms
Designed to cover larger spaces. Available in 7-, 10-, and 12-foot lengths. External brackets and adjustments allow air to pass through with less resistance giving you stronger CFM (airflow).

► Telescoping Arms
Designed to fit small booth spaces used in training centers and educational booths. Telescopes from 3 to 4.5 feet with a wide range of motion to cover all positions.

► Filter Pressure Gauge
Easy-to-read front panel Filter Pressure Gauge indicates when pressure drop increases and the filter needs to be replaced (SWX-D) or cleaned (SWX-S). Note: On self-cleaning model, the filter gauge and cleaning control are mounted on a remote control box for easy access.

Equipment and Options

<table>
<thead>
<tr>
<th>FILTAIR® SWX-D (Disposable Filter Model) Single-Arm Packages</th>
<th>Part #</th>
<th>Description:</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Includes SWX-D cabinet, disposable filter, blower, on/off control box, mounting bracket, duct, and 8 in arm. 115 VAC wiring NOT included.)</td>
<td>#951 619</td>
<td>With 3–4.5 ft Telescoping Extraction Arm</td>
</tr>
<tr>
<td>#951 513</td>
<td>With 7 ft Standard Extraction Arm</td>
<td></td>
</tr>
<tr>
<td>#951 514</td>
<td>With 10 ft Standard Extraction Arm</td>
<td></td>
</tr>
<tr>
<td>#951 515</td>
<td>With 12 ft Standard Extraction Arm</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FILTAIR® SWX-S (Self-Cleaning Filter Model) Single-Arm Packages</th>
<th>Part #</th>
<th>Description:</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Includes SWX-S cabinet, self-cleaning control box and filter, blower, on/off control box, mounting bracket, duct, and 8 in arm. 115 VAC wiring NOT included.)</td>
<td>#951 620</td>
<td>With 3–4.5 ft Telescoping Extraction Arm</td>
</tr>
<tr>
<td>#951 516</td>
<td>With 7 ft Standard Extraction Arm</td>
<td></td>
</tr>
<tr>
<td>#951 517</td>
<td>With 10 ft Standard Extraction Arm</td>
<td></td>
</tr>
<tr>
<td>#951 518</td>
<td>With 12 ft Standard Extraction Arm</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FILTAIR® SWX Dual-Arm Add-on Packages</th>
<th>Part #</th>
<th>Description:</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Includes blower, on/off control box, mounting bracket, duct, backdraft dampers, and 8 in arm. 115 VAC wiring NOT included.)</td>
<td>#951 621</td>
<td>With 3–4.5 ft Telescoping Extraction Arm</td>
</tr>
<tr>
<td>#951 519</td>
<td>With 7 ft Standard Extraction Arm</td>
<td></td>
</tr>
<tr>
<td>#951 520</td>
<td>With 10 ft Standard Extraction Arm</td>
<td></td>
</tr>
<tr>
<td>#951 521</td>
<td>With 12 ft Standard Extraction Arm</td>
<td></td>
</tr>
</tbody>
</table>
Centralized Extraction Systems

**FILTAIR® 2000-12000**
Custom engineered industrial centralized solutions designed for multiple capture sources that require ducting and accessories to complete the system.

**Ideal for:**
- Manufacturing Facilities
- Automated Welding Cells
- Schools and Training Facilities

**Key Product Features:**
- 65% Smaller footprint than traditional systems
- 75% Quieter
- Ductwork can easily be reconfigured/reutilized
- Less expensive installation with completely packaged, fully assembled and pre-wired systems

FUME EXTRACTION & RESPIRATORY PROTECTION
Centralized Extraction Systems
FILTAIR® Centralized Extraction Systems Overview

Modular, Expandable Ductwork
• Clamp-together ducting easily integrates with existing ductwork and adapts to future facility needs – reducing the cost of ongoing plant changes

Spark Cooler®
• Cool and suppress sparks before they reach the filter material
• Help prevent dust collector fires
• Minimal pressure drop, no maintenance, simple installation

Sprinkler Inlet
Increase safety and limit damage
• All FILTAIR Industrial Centralized Systems feature a sprinkler inlet ready for sprinkler head installation

Low-Profile Automation Hoods
• Exclusive technology - capture velocity zone is maximized and distributed over the work area
• Clear, UV-protected polycarbonate ceiling panels allow maximum light into cell
• Modular design for easy size and height change

Arms with External Supports
• Combined with our custom engineered systems, FILTAIR extraction arms with external supports maintain stronger suction capture velocity to ensure adequate ventilation to pull fume from the breathing zone

16
**FilTek™ XL Filters**

When it comes to selecting a fume extractor, nothing is more important than the filter.

FilTek XL is an innovative, surface-loading filter that captures particles on the surface of the media (versus depth loading), making maintenance easier and extending the filter life.

Most weld fumes are less than one micron in diameter. The Miller FilTek XL filters have the highest MERV ratings in the industry – a class-leading MERV 15-16 – capturing up to 99% at .5 µ (micron) of weld fume particulate, including hexavalent chrome. The smaller the particles in the air, the higher the MERV rating required to capture them.

**MERV Rating**

\[ M = \text{Minimum} \quad E = \text{Efficiency} \quad R = \text{Reporting} \quad V = \text{Value} \]

- MERV 7 rarely captures weld fumes where FilTek XL captures up to 99% at .5 µ (micron) of weld fumes

**Filter Media Performance Summary**

FilTek XL filters have the highest efficiencies and lowest pressure drops to capture better, last longer and lower operating costs.

<table>
<thead>
<tr>
<th>Filter Media Type</th>
<th>Weld Fume Capture Efficiency</th>
<th>Pressure Drop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cellulose</td>
<td>Very Low</td>
<td>Low</td>
</tr>
<tr>
<td>Cellulose Blend</td>
<td>Low</td>
<td>Moderate</td>
</tr>
<tr>
<td>Spunbond Polyester</td>
<td>Moderate/High</td>
<td>High</td>
</tr>
<tr>
<td>Meltblown Composite</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Miller FilTek XL</td>
<td>High</td>
<td>Low</td>
</tr>
</tbody>
</table>

**Disposable vs. Self-cleaning Model Filters**

**XL Filters** provide excellent surface loading qualities with very low resistance that makes them perfect for weld fume.

**Disposable Model Filters:** "D" model extractors have disposable filters with lower initial expenditures, but the need to replace the filter is more frequent.

**Self-cleaning Model Filters:** "S" model extractors have a self-cleaning mechanism that releases a strong reverse pulse of air to remove the collected fume off the outside of the filter. The self-cleaning models have higher initial expenditures, but require less maintenance and a much longer filter life.
FILTAIR® Accessories

**Extraction Arms**

<table>
<thead>
<tr>
<th>Part #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>#301 242</td>
<td>Telescoping Arm, 6 in Diameter</td>
</tr>
<tr>
<td>#300 953</td>
<td>Standard Arm, 6 in Diameter, 7 ft Arm</td>
</tr>
<tr>
<td>#300 954</td>
<td>Standard Arm, 6 in Diameter, 10 ft Arm</td>
</tr>
<tr>
<td>#300 955</td>
<td>Standard Arm, 6 in Diameter, 12 ft Arm</td>
</tr>
<tr>
<td>#300 952</td>
<td>Arm Mounting Bracket and Ducting Kit, 6 in Diameter</td>
</tr>
<tr>
<td>#301 237</td>
<td>Telescoping Arm, 8 in Diameter</td>
</tr>
<tr>
<td>#300 980</td>
<td>Standard Arm, 8 in Diameter, 7 ft Arm</td>
</tr>
<tr>
<td>#300 981</td>
<td>Standard Arm, 8 in Diameter, 10 ft Arm</td>
</tr>
<tr>
<td>#300 982</td>
<td>Standard Arm, 8 in Diameter, 12 ft Arm</td>
</tr>
<tr>
<td>#300 771</td>
<td>Arm Mounting Bracket and Ducting Kit, 8 in Diameter</td>
</tr>
</tbody>
</table>

**SWX Dual-Arm Add-On Packages**

- #951 621 With Telescoping Arm
- #951 519 With 7 ft Standard Arm
- #951 520 With 10 ft Standard Arm
- #951 521 With 12 ft Standard Arm

- Includes 8 inch diameter arm, blower, control box, mounting bracket, duct and back draft dampers to turn single-arm weld fume extractor into dual-arm extractor.

**Spark Cooler®**

- Available in a variety of sizes
- See representative for part numbers

**FILTAIR Low Profile Modular Hoods**

- Available in one foot increments from 4 x 4 feet up to 16 x 16 feet
- Corner lift hooks are convenient for installing or hanging over a work area. The hood can also be placed on an existing cell enclosure or supported with 9-, 10-, 12- or 14-foot post assemblies
- See representative for part numbers
FILTAIR® Accessories

130 and 400 Replacement Filters
- #301 267 For 130 model (cleanable)
- #300 925 For 400 model

MWX & SWX Replacement Filters
- #300 540 Self-cleaning filter models
- #300 539 Disposable filter models

Capture 5 Replacement Filter
- #301 106

Centralized FilTek™ XL Replacement Filter
- #300 927

Flexible Funnel Magnetic Nozzle
- #300 668

Magnetic Nozzles
- #300 669 11.8 in (300 mm) width
- #300 670 23.6 in (600 mm) width (400 model only)

Dual Hose Inlet to Duct Adapter
- #301 070 (400 model only)
  - Y-shaped adapter connects duct to one or two hose attachments

Collection Hose
- #300 672 17 ft (5.2 m)
- #300 673 34 ft (10.4 m)

Hood Light with Arc Sensor
- #300 689 MWX Series
- #300 763 SWX Series
  - Illuminates the welding zone and enables the fume extractor to start automatically when welding begins
Fume Guns
Ideal Fume Extraction Solution for Large Weldments and Confined Spaces

Bernard™ Clean Air™ Fume Extraction MIG Gun
Reduce smoke at the source to provide a cleaner, compliant work environment. Completely redesigned to closely match the weight, handle size, durability and industrial grade performance of regular Bernard MIG Guns, this welding gun was built with welder comfort and productivity in mind.

Key Product Features:
- Available in 400, 500 and 600 amp models
- Lightweight, comfortable and durable design for industrial grade performance
- Nozzle shroud adjusts to one of four positions for optimized fume capture, gas flow and weld access
- Compatible with vacuum systems from most manufacturers
- Suitable for use with solid and flux core wires
- Durable crush and snag resistant vacuum hose eliminates the need for a bulky vacuum hose cover for most applications

Bernard™ FILTAIR® Fume Extraction MIG Gun
Get to the source and capture weld fume at the front of the gun via the chrome-plated vacuum chamber. Weld fume is suctioned through the gun handle, and into the hose to a port on the vacuum system to keep work environments clean and compliant.

Key Product Features:
- Available in 300 and 400 amp models
- Protect against porosity with vacuum regulator that balances suction with shielding gas flow
- Compatible with the FILTAIR 400 High Vacuum System and most major manufacturers
- Suitable for use with solid and flux core wires
Work Practice Controls

The third level of the OSHA Hierarchy is work practice controls, which does not remove the hazards, but includes general workplace and operation-specific rules that limit or prevent exposure to the hazards. Safe work practices involve adjustments to how a task is performed, along with regular maintenance and supervision of engineering controls. It is also important that everyone using any type of personal protective equipment knows how to use and maintain their PPE for optimal performance.

Examples of Work Practice Controls within a Welding Environment

- Remove paint or coatings before welding to minimize the release of contaminants
- Accurately adjust weld settings to ensure the most stable arc and reduce fume
- Properly set up weld cells and fixtures to minimize operator exposure to fume plumes
- Correct body positioning so that airflow pulls or pushes fume away from the breathing zone
Personal Protective Equipment

When engineering controls are not feasible, while they are being implemented or when they do not reduce exposure levels enough, respiratory protection should be implemented. Miller respirators are specifically designed to offer protection from welding fumes – keeping welders safe, comfortable and productive.

The Talk: Terms and definitions used in this section


Assigned Protection Factor (APF): Level of protection that a respirator is intended to provide, when used in conjunction with a written respiratory protection program.

Maximum Use Concentration (MUC): Calculation indicating the maximum atmospheric concentration of a hazardous substance that an employee can be expected to be protected when wearing a respirator.

\[
MUC = APF \times OSHA\ PEL
\]
N95 Disposable Mask Respirator

Features a flame retardant outer layer that offers necessary protection for welding applications.

Specifications:

- **NIOSH 42 CFR 84 Certified**
- **APF = 10**
- **OSHA Classification: Tight-Fitting¹ Respirator**

Part #: Description:

<table>
<thead>
<tr>
<th>Part #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>#267 334</td>
<td>N95 Respirator with Valve, 10 Pack</td>
</tr>
<tr>
<td>#267 335</td>
<td>N95 Respirator with Valve and Nuisance Level OV Relief², 10 Pack</td>
</tr>
</tbody>
</table>

Key Product Features:

- N95 Filter Media provides 95% filtration of airborne particles, including those in the fume regulation chart.
- Optional N95 nuisance level Organic Vapor respirators feature an added layer of carbon that helps remove nuisance level organic vapor odors².
- Ergonomic design allows user to feel more comfortable and less constricted without compromising the efficiency and effectiveness of the mask.
- Large non-return exhaust valve reduces heat build-up and user fatigue.

¹ Fit testing is necessary for mandatory use. See page 24 for fit testing details.
² Nuisance level OV relief respirators are designed for use with organic vapor concentrations not exceeding OSHA’s PELs or other applicable government occupational exposure limits, whichever is lower.
LPR-100™ Half Mask Respirator

Low-profile design fits comfortably under welding helmets and maximizes field of vision. The large, non-return exhaust valve eases breathing and reduces user fatigue.

NIO SH 42 CFR 84 Certified APF = 10 OSHA Classification: Tight-Fitting³ Respirator

<table>
<thead>
<tr>
<th>Part #:</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ML00894</td>
<td>LPR-100 Respirator with P100 Filters, Small/Medium</td>
</tr>
<tr>
<td>ML00895</td>
<td>LPR-100 Respirator with P100 Filters, Medium/Large</td>
</tr>
<tr>
<td>ML00994</td>
<td>LPR-100 Respirator with P100 Nuisance Level OV Relief Filters², Small/Medium</td>
</tr>
<tr>
<td>ML00995</td>
<td>LPR-100 Respirator with P100 Nuisance Level Ov Relief Filters², Medium/Large</td>
</tr>
<tr>
<td>SA00818</td>
<td>Replacement P100 Filters, Pair</td>
</tr>
<tr>
<td>SA00819</td>
<td>Replacement Combination P100/Nuisance Level OV Relief Filters, Pair</td>
</tr>
<tr>
<td>#261 086</td>
<td>Quantitative Face-Fit Test Kit</td>
</tr>
</tbody>
</table>

When use is mandatory, the Miller LPR-100 Half Mask Respirator needs to be fit tested prior to use and then annually or sooner if a change to the workplace or user occurs. Fit testing can be done either qualitatively or quantitatively to determine whether the mask provides an acceptable fit to the wearer.³

Quantitative:
Uses measuring instruments to measure facial seal leakage

Qualitative:
Relies on a subjective sensation (taste, irritation, smell) of the wearer to a particular test agent

³ OSHA-accepted fit test protocols and procedures are contained in 29 CFR 1910.134 Appendix A
Key Product Features:

- P100 Filters provide 99.97% filtration of airborne particles and oil aerosols, including those in the fume regulation chart.
- Optional Combination P100/Nuisance level Organic Vapor respirators feature an added layer of carbon that helps remove nuisance level organic vapor odors.
- Four-point head strap adjustments with integrated comfort cushion provide a customized and comfortable fit.
- Odor-free, non-allergenic, latex and silicone free, made from medical grade materials.

1 Fit testing is necessary for mandatory use. See page 24 for fit testing details.
2 Nuisance level OV relief respirators are designed for use with organic vapor concentrations not exceeding OSHA’s PELs or other applicable government occupational exposure limits, whichever is lower.
Powered Air Purifying Respirators (PAPRs)

Industrial protection for the most extreme welding applications, our PAPR systems are available with the Titanium 9400, 9400i and Hard Hat head assemblies.

| NIOSH 42 CFR 84 Certified | APF = 25 | OSHA Classification: Loose-fitting powered air purifying respiration | Hard Hat Certification: ANSI Z89.1 2009 Certified, Type 1, Class C or G | Helmet Lens Certification: Meets ANSI Z87.1+ and CSA Z94.3 Standards |

Key Product Features:

- **HEPA filter** is at least 99.97% efficient in removing monodisperse particles of 0.3 micrometers, including those on the fume regulations chart.
- **Load-bearing shoulder straps** evenly distribute weight.
- **Quick-release belt** for easy, one-handed on/off.
- **Low-profile design** allows for unrestricted movement and reduces interference.
- **Lightweight lithium ion battery** provides up to 8 hours of life with no memory retention from frequent charging.
  - 4-6 hr/high air speed
  - 6-8 hr/low air speed
  - 500 charges
- **Two batteries included with each system**.

Lightweight blower design provides all-day comfort for reduced fatigue. Audible & vibrating alarms notify user of low battery or restricted airflow. Dual air speeds allow user to adjust volume of air to maximize comfort.
# Powered Air Purifying Respirators

## Process Modification/Substitution

## Engineering Controls

## Work Practice Controls

## Personal Protective Equipment

<table>
<thead>
<tr>
<th>Part #:</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>#235 673-2</td>
<td>Filter, Particulate (HEPA) (2 pack)</td>
</tr>
<tr>
<td>#235 673-6</td>
<td>Filter, Particulate (HEPA) (6 pack)</td>
</tr>
<tr>
<td>#235 673-36</td>
<td>Filter, Particulate (HEPA) (36 pack)</td>
</tr>
<tr>
<td>#235 674</td>
<td>Filter, Prefilter (Foam) (6 pack)</td>
</tr>
<tr>
<td>#244 841</td>
<td>Prefilter, Nuisance Level OV Relief (6 pack)</td>
</tr>
<tr>
<td>#235 676</td>
<td>Spark Guard</td>
</tr>
<tr>
<td>#245 818</td>
<td>Grinding Shield (Titanium 9400i)</td>
</tr>
<tr>
<td>#254 278</td>
<td>Grinding Shield Tear-aways (Titanium 9400i) (5 pack)</td>
</tr>
</tbody>
</table>

## Replacement Parts:

<table>
<thead>
<tr>
<th>Part #:</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>#244 151</td>
<td>Belt Extension adds 18 inches in length</td>
</tr>
</tbody>
</table>

## Accessories:

<table>
<thead>
<tr>
<th>Part #:</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>#244 151</td>
<td>Belt Extension adds 18 inches in length</td>
</tr>
</tbody>
</table>
Head and Face Protection

Ultraviolet (UV) and infrared (IR) radiation can be a significant threat to a welder’s eyes and face, and even minimal exposure can cause burns. Helmets, protective glasses and goggles help prevent eye injury and skin burns. Different applications require different PPE, and it is critical to choose the right equipment for the job. Miller’s complete line of head and face PPE provides welders with the best equipment – designed to protect and perform in demanding welding, cutting and grinding applications.
**THE TALK:** Terms and definitions used in this section

**Ultraviolet Radiation (UV):** A form of electromagnetic radiation with shorter wavelengths that emit bright light.¹

**Infrared Radiation (IR):** A form of electromagnetic radiation with longer wavelengths that produce heat.²

**Welder’s Flash or Arc Flash:** A painful inflammation of the cornea caused by exposure to high-intensity ultraviolet light, resulting in pain, sensitivity and visual impairment.

**Primary Protection:** A device that may be worn alone or in conjunction with a secondary protector (i.e. safety glasses), per OSHA.

**Secondary Protection:** A device that may be worn only in conjunction with a primary protector (i.e. welding helmet, grind shield), per OSHA.

---

**STATISTICS & TRENDS: Head & Face**

**90%**

Eye injuries account for approximately 25% of all injury claims by welders.³ **90% of eye injuries can be prevented** through the use of proper protective eyewear.⁴

**$300 Million**

Eye injuries alone cost more than $300 million per year in lost production time, medical expenses and worker compensation.⁵

---

² [http://science.howstuffworks.com/infraredradiation-info.htm](http://science.howstuffworks.com/infraredradiation-info.htm)
³ [http://injuryprevention.bmj.com/content/11/3/174.long](http://injuryprevention.bmj.com/content/11/3/174.long)
⁴ [https://ehs.okstate.edu/training/oshaeye.htm](https://ehs.okstate.edu/training/oshaeye.htm)
⁵ [https://www.osha.gov/SFLC/eyefaceprotection/](https://www.osha.gov/SFLC/eyefaceprotection/)
OSHA Standard 1910.133
Primary eye protection (ex. safety glasses) should always be used with secondary eye/face protection (ex. welding helmet or grind shield).
Choosing The Right Helmet

The most important criteria when choosing a welding helmet are safety, compliance and comfort, but other valuable features to consider include: lens type, viewing size, filter shade, number of sensors, ease of use, weight and useful technology. Choosing the right helmet for your application(s) and overall comfort can increase your weld quality, productivity, safety and long-term health.

### Lens Types and Shade Coverage

<table>
<thead>
<tr>
<th>Lens Type</th>
<th>Passive Lens</th>
<th>Auto-Darkening Lens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shade Type</td>
<td>Fixed Shade</td>
<td>Variable Shade</td>
</tr>
<tr>
<td>Inactive Shade Coverage</td>
<td>Shade Dependent</td>
<td>#14</td>
</tr>
<tr>
<td>Active Shade Coverage</td>
<td>Shade Dependent</td>
<td>#5-#13</td>
</tr>
</tbody>
</table>

**Passive Lens vs. Auto-Darkening Lens**

**Passive Lens:** Utilizes a UV and IR coated dark-tinted glass, typically with a #10 fixed shade. A passive helmet is worn in the up position until the electrode, gun or torch is positioned. The welder then flips the helmet down with a quick nod of the head, just before the arc is struck.

**Auto-Darkening Lens:** Typically starts with a #3 or #4 shade in its inactive state. Depending on the light state, when an arc or cutting torch is started the lens darkens to shade #5-#13. The helmet stays in position, without the need for head nods – improving weld quality and reducing neck fatigue.

**Auto-Darkening Helmet Options**

**Fixed Shade Lens vs. Variable Shade Lens**

**Fixed Shade Lens:** Senses an arc and darkens to a fixed shade. Ideal when using the same material, thickness and process every time you weld. Fixed shade lenses are available in different shades.

**Variable Shade Lens:** Adjusts the shade depending on the brightness of the arc. Ideal when using different materials and processes that vary the amperage.

**Number of Arc Sensors**

More arc sensors on a helmet allow it to easily identify a change in lighting, increasing the sensitivity and accuracy of the auto-darkening function. Four sensors are best for fabrication or out-of-position welding, while two may be adequate for a hobbyist.
Eye Protection Against Radiant Energy

Choosing the Right Lens

OSHA requires specific eye protection to ensure workers are safe. As a rule of thumb, start with a shade that is too dark to see the weld zone. Then, go to a lighter shade that gives a sufficient view of the weld zone without going below the minimum. During oxygen gas welding or cutting, where the torch produces a high yellow light, it is recommended to use a filter lens that absorbs the yellow or sodium line in the visible light (spectrum) of the operation.

What are ANSI Z87.1 Standards?

ANSI Z87.1 ensures that helmets and lenses have passed independent testing to show they can survive high velocity impact from flying objects, provide 100% ultraviolet and infrared filtering regardless of shade setting, and meet advertised switching speeds and darkness shades in temperatures as low as 23° F and high as 131° F.

An ANSI Z87.1+ marking indicates a high-impact rating for cutting and grinding.

All Miller welding helmets and glasses meet the ANSI Z87.1+ standards.
### Filter Lenses for Protection During Shielded Metal Arc Welding

<table>
<thead>
<tr>
<th>Operation</th>
<th>Electrode Size</th>
<th>Arc Current (Amperes)</th>
<th>OSHA Minimum Protective Shade Number</th>
<th>ANSI &amp; AWS Shade Number Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shielded Metal Arc Welding (SMAW)</td>
<td>Less than 3/32 in (2.4 mm)</td>
<td>Fewer than 60</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>3/32-5/32 in (2.4-4.0 mm)</td>
<td>60-160</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>More than 5/32-1/4 in (4.0-6.4 mm)</td>
<td>More than 160-250</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>More than 1/4 in (6.4 mm)</td>
<td>More than 250-550</td>
<td>11</td>
<td>14</td>
</tr>
</tbody>
</table>

### Filter Lenses for Protection During Other Welding and Cutting Operations

<table>
<thead>
<tr>
<th>Operation</th>
<th>Arc Current (Amperes)</th>
<th>OSHA Minimum Protective Shade Number</th>
<th>ANSI &amp; AWS Shade Number Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas Metal Arc Welding (GMAW) and Flux Cored Arc Welding (FCAW)</td>
<td>Fewer than 60</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>60-160</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>More than 160-250</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>More than 250-500</td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td>Gas Tungsten Arc Welding (GTAW)</td>
<td>Fewer than 50</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>50-150</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>More than 150-500</td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td>Air Carbon Arc Cutting (CAC-A) (Light)</td>
<td>Fewer than 500</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Air Carbon Arc Cutting (CAC-A) (Heavy)</td>
<td>500-1000</td>
<td>11</td>
<td>14</td>
</tr>
<tr>
<td>Plasma Arc Welding (PAW)</td>
<td>Fewer than 20</td>
<td>6</td>
<td>6-8</td>
</tr>
<tr>
<td></td>
<td>20-100</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>More than 100-400</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>More than 400-800</td>
<td>11</td>
<td>14</td>
</tr>
<tr>
<td>Plasma Arc Cutting (PAC) (Light)*</td>
<td>Fewer than 300</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Plasma Arc Cutting (PAC) (Medium)*</td>
<td>300-400</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>Plasma Arc Cutting (PAC) (Heavy)*</td>
<td>More than 400-800</td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td>Torch Brazing (TB)</td>
<td>3</td>
<td>3 or 4</td>
<td></td>
</tr>
<tr>
<td>Torch Soldering (TS)</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Carbon Arc Welding (CAW)</td>
<td>14</td>
<td>14</td>
<td></td>
</tr>
</tbody>
</table>

### Filter Lenses for Gas Welding and Oxygen Cutting Operations

<table>
<thead>
<tr>
<th>Operation</th>
<th>Electrode Size</th>
<th>Arc Current (Amperes)</th>
<th>OSHA Minimum Protective Shade Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas Welding</td>
<td>Under 1/8 in (3.2 mm)</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>1/4 in to 1/2 in (3.2-12.7 mm)</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Over 1/2 in (12.7 mm)</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Oxygen Welding</td>
<td>Under 1 in (25 mm)</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>1 in to 6 in (25-150 mm)</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Over 6 in (150 mm)</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

2. *Values apply where the actual arc is clearly seen. Lighter filters may be used when the arc is hidden by the workpiece.
## Helmet Selection Chart

Choosing a helmet that is best suited for specific application(s) can increase productivity, weld quality, safety and comfort.

<table>
<thead>
<tr>
<th></th>
<th>Classic Series FS#10</th>
<th>Classic Series FS#10 Flip-Up</th>
<th>Classic Series Variable Shade</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Viewing Area</strong></td>
<td>5.15 sq in</td>
<td>5.07 sq in</td>
<td>5.15 sq in</td>
</tr>
<tr>
<td><strong>Shades</strong></td>
<td>Weld: 10</td>
<td>Weld: 10</td>
<td>Weld: 8-12</td>
</tr>
<tr>
<td><strong>Modes</strong></td>
<td>Weld</td>
<td>Weld</td>
<td>Weld</td>
</tr>
<tr>
<td><strong>Integrated Grind Shield</strong></td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td><strong>Auto-on</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Sensors</strong></td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><strong>TIG Rating</strong></td>
<td>20 amps</td>
<td>20 amps</td>
<td>20 amps</td>
</tr>
<tr>
<td><strong>Switching Speed</strong></td>
<td>1/3,600</td>
<td>1/3,600</td>
<td>1/10,000</td>
</tr>
<tr>
<td><strong>Digital Controls</strong></td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>Premium Headgear</strong></td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>InfoTrack™</strong></td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>16 oz (454 g)</td>
<td>14 oz (396 g)</td>
<td>16 oz (454 g)</td>
</tr>
<tr>
<td>Classic Series</td>
<td>Digital Performance™</td>
<td>Digital Elite™</td>
<td>Digital Infinity™</td>
</tr>
<tr>
<td>----------------</td>
<td>----------------------</td>
<td>---------------</td>
<td>-------------------</td>
</tr>
<tr>
<td></td>
<td>5.15 sq in</td>
<td>7.22 sq in</td>
<td>9.22 sq in</td>
</tr>
<tr>
<td></td>
<td>Yes No No No No Yes No No Yes Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3 4 4 N/A N/A 3 4 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 amps/below</td>
<td>5 amps 5 amps/below 5 amps/below</td>
<td>N/A N/A 5 amps/below 5 amps/below 5 amps/below</td>
<td></td>
</tr>
<tr>
<td>1/20,000</td>
<td>1/20,000 1/20,000 1/20,000 N/A N/A 1/20,000 1/20,000 1/20,000</td>
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<td></td>
</tr>
<tr>
<td>No</td>
<td>Yes Yes Yes No No Yes Yes Yes Yes</td>
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</tr>
<tr>
<td>No</td>
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<td></td>
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<tr>
<td>No</td>
<td>No No No No Yes Yes Yes Yes Yes</td>
<td></td>
<td></td>
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<tr>
<td>23 oz (652 g)</td>
<td>17 oz (482 g) 18 oz (510 g) 22 oz (624 g) 17 oz (482 g) 22.5 oz (638 g) 19 oz (539 g) 20 oz (567 g) 24 oz (680 g)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Titanium™ Series

Designed to perform in the most demanding industrial environments.

Meets ANSI Z87.1+ and CSA Z94.3 Standards 3-Year Warranty*

Titanium™ Series Welding Helmets

Process Modification/Substitution
Engineering Controls
Work Practice Controls
Personal Protective Equipment

9400i™

Part #: #256 177
Viewing Area: 9.22 sq in
Arc Sensors: 4
Operating Modes: 4 – Weld, Cut, Grind & X-Mode
Weight: 24 oz
Integrated Grinding Shield: Yes

9400™

Part #: #256 176
Viewing Area: 9.22 sq in
Arc Sensors: 4
Operating Modes: 4 – Weld, Cut, Grind & X-Mode
Weight: 20 oz
Integrated Grinding Shield: No

7300™

Part #: #256 175
Viewing Area: 7.22 sq in
Arc Sensors: 3
Operating Modes: 4 – Weld, Cut, Grind & X-Mode
Weight: 19 oz
Integrated Grinding Shield: No

1600i™

Part #: #255 519
Viewing Area: 16 sq in
Arc Sensors: -
Operating Modes: -
Passive Shade: #10
Weight: 22.5 oz
Integrated Grinding Shield: Yes

90 Day Limited Warranty
**HEAD & FACE PROTECTION**

<table>
<thead>
<tr>
<th>Part #:</th>
<th>#245 799</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viewing Area:</td>
<td>16 sq in</td>
</tr>
<tr>
<td>Arc Sensors:</td>
<td>-</td>
</tr>
<tr>
<td>Operating Modes:</td>
<td>-</td>
</tr>
<tr>
<td>Passive Shade:</td>
<td>#10</td>
</tr>
<tr>
<td>Weight:</td>
<td>17 oz</td>
</tr>
<tr>
<td>Integrated Grinding Shield:</td>
<td>No</td>
</tr>
</tbody>
</table>

- **90 Day Limited Warranty**

**INFO**

- **External Grind Mode** – Switch to grind mode with the push of a button (available on the 7300 and 9400).

- **Aluminum Heat Shield** – Keeps lens protected in high heat/amp applications.

- **Silver Shell** – Reflects heat to keep helmet and user cool.

- **InfoTrack** – Exclusive arc tracking technology allows the lens to track arc time for productivity tracking, and includes a digital clock display with the ability to set an alarm or timer.
**HEAD & FACE PROTECTION**

**Digital Infinity™ Series Welding Helmets**

**NEW!**

**Digital Infinity™ Series**

The largest view helmet for demanding applications.

Meets ANSI Z87.1+ and CSA Z94.3 Standards 3-Year Warranty

<table>
<thead>
<tr>
<th>Viewing Area:</th>
<th>Arc Sensors:</th>
<th>Operating Modes:</th>
<th>Weight:</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.4 sq in</td>
<td>4</td>
<td>4 – Weld, Cut, Grind &amp; X-Mode</td>
<td>22 oz</td>
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</table>

<table>
<thead>
<tr>
<th>Part #:</th>
<th>Description:</th>
</tr>
</thead>
<tbody>
<tr>
<td>#271 329</td>
<td>Black</td>
</tr>
<tr>
<td>#271 330</td>
<td>Stars and Stripes™</td>
</tr>
<tr>
<td>#271 331</td>
<td>Camouflage</td>
</tr>
<tr>
<td>#271 332</td>
<td>Departed™</td>
</tr>
<tr>
<td>#271 325</td>
<td>Replacement Headgear with Comfort Cushion</td>
</tr>
</tbody>
</table>
HEAD & FACE PROTECTION

Digital Infinity™ Series Welding Helmets

InfoTrack™ – Exclusive arc tracking technology allows the lens to track arc time for productivity tracking, and includes a digital clock display with the ability to set an alarm or timer.

Enhanced Headgear

Digital Controls

X-Mode

Auto On/Off

13.4 square inches

The largest view helmet for demanding applications

Oversized comfort cushion provides unsurpassed comfort and stability.
Digital Elite™ Series

The ultimate welding helmet PLUS four modes of digital versatility for intense applications.

<table>
<thead>
<tr>
<th>Viewing Area:</th>
<th>Arc Sensors:</th>
<th>Operating Modes:</th>
<th>Weight:</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.22 sq in</td>
<td>4</td>
<td>4 – Weld, Cut, Grind &amp; X-Mode</td>
<td>18 oz</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Part #:</th>
<th>Description:</th>
<th>Part #:</th>
<th>Description:</th>
</tr>
</thead>
<tbody>
<tr>
<td>#257 213</td>
<td>Black</td>
<td>#257 214</td>
<td>Lucky’s Speed Shop™</td>
</tr>
<tr>
<td>#269 946</td>
<td>Hot Rod Garage™</td>
<td>#257 217</td>
<td>Inferno™</td>
</tr>
<tr>
<td>#269 273</td>
<td>Blue Flame</td>
<td>#256 158</td>
<td>Fury™</td>
</tr>
<tr>
<td>#264 852</td>
<td>Stars and Stripes™ III</td>
<td>#256 173</td>
<td>Camouflage</td>
</tr>
<tr>
<td>#259 485</td>
<td>Vintage Roadster™</td>
<td>#268 618</td>
<td>Cat® - 1st Edition</td>
</tr>
<tr>
<td>#260 127</td>
<td>Not Forgotten™</td>
<td>#256 174</td>
<td>Replacement Headgear</td>
</tr>
</tbody>
</table>

Meets ANSI Z87.1+ and CSA Z94.3 Standards

3-Year Warranty
**X-Mode** – Eliminates interference from sunlight and out-of-position welding angles, like those found in pipe welding or in obstructed or hidden cavity welds.

**Digital Controls** – Adjust mode and settings with the push of a button.
Digital Performance™ Series

Mid-range welding helmet designed for all welding applications.

Meets ANSI Z87.1+ and CSA Z94.3 Standards  3-Year Warranty

<table>
<thead>
<tr>
<th>Viewing Area:</th>
<th>Arc Sensors:</th>
<th>Operating Modes:</th>
<th>Weight:</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.22 sq in</td>
<td>3</td>
<td>3 – Weld, Cut &amp; Grind</td>
<td>17 oz</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Part #:</th>
<th>Description:</th>
<th>Part #:</th>
<th>Description:</th>
</tr>
</thead>
<tbody>
<tr>
<td>#256 159</td>
<td>Black</td>
<td>#256 160</td>
<td>'64 Custom™</td>
</tr>
<tr>
<td>#264 851</td>
<td>America’s Eagle™ II</td>
<td>#256 165</td>
<td>Illusion™</td>
</tr>
<tr>
<td>#256 163</td>
<td>Camouflage</td>
<td>#268 739</td>
<td>Cat® - 1st Edition</td>
</tr>
<tr>
<td>#256 164</td>
<td>Blue Rage™</td>
<td>#256 174</td>
<td>Replacement Headgear</td>
</tr>
</tbody>
</table>
Classic Series

Designed for farm, home and hobby.

<table>
<thead>
<tr>
<th>Viewing Area:</th>
<th>Arc Sensors:</th>
<th>Operating Modes:</th>
<th>Weight:</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.15 sq in</td>
<td>2</td>
<td>1 – Weld</td>
<td>16 oz</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Part #:</th>
<th>Description:</th>
<th>Part #:</th>
<th>Description:</th>
</tr>
</thead>
<tbody>
<tr>
<td>#231 703</td>
<td>Black – Fixed Shade</td>
<td>#271 345</td>
<td>Stars and Stripes™</td>
</tr>
<tr>
<td>#251 292</td>
<td>Black – Variable Shade</td>
<td>#271 346</td>
<td>Metalworks™</td>
</tr>
<tr>
<td>#263 038</td>
<td>Black – FS#10 2x4 Flip-Up</td>
<td>#271 347</td>
<td>Red Flame</td>
</tr>
<tr>
<td>#260 938</td>
<td>Black – VSi</td>
<td>#271 348</td>
<td>Camouflage</td>
</tr>
<tr>
<td>#256 174</td>
<td>Replacement Headgear</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Meets ANSI Z87.1+ and CSA Z94.3 Standards  2-Year Warranty

Auto On/Off  X-Mode*

*VSi only
MP-10™ Series

Passive helmet with a shade #10 filter.

Meet ANSI Z87.1+ and CSA Z94.3 Standards  90 Day Limited Warranty

Viewing Area: Arc Sensors: Operating Modes: Weight:
16 sq in 4  4 – Weld, Cut, Grind & X-Mode  18 oz

Part #: Description: 
#238 497 Black (Each) 
#235 626 Black (6 Pack) 
#238 496 Inferno 
#770 246 Replacement Ratchet Headgear
Weld-Mask™ Auto-Darkening Goggles

Ideal for welding in tight spaces, mobile welding and welding inspection.

Meets CE/ANSI/CSA/AS NZ standards. 2-Year Warranty

Part #: Description:
#267 370 Weld-Mask™ Auto-Darkening Goggles

Key Product Features:

- Compact design allows users to weld in spaces where access with traditional welding helmets is limited
- Use for: gas welding & cutting, MIG, TIG and stick
- Ideal for use with hard hats
- Eye covering fits tightly to the face to block out light for precision welding in bright surroundings
- Face shield and head cover provide coverage for UV/IR rays and applications with limited spatter
- Goggles feature shades 5, 7, 9, 11, and 13 (light state shade 3)
HEAD & FACE PROTECTION
Weld-Mask™ Auto-Darkening Goggles

Process Modification/Substitution
Engineering Controls
Work Practice Controls
Personal Protective Equipment

Accessories

Weld-Mask Cover Lens (Package of 5)
#267 420

Weld-Mask FR Head Cover
#267 421
• For use with Weld-Mask auto-darkening goggles, or under a traditional welding helmet for added protection

CR2032 Replacement Battery
#270 055

Lightweight design virtually eliminates neck strain

External controls for quick and convenient access
Head Threads

Key Product Features:

- Bandanas feature sewn-in sweatband
- Caps are reversible with low, soft bill

Head Thread Size Chart

<table>
<thead>
<tr>
<th>Caps</th>
<th>Size 7</th>
<th>Size 7-1/8</th>
<th>Size 7-1/4</th>
<th>Size 7-3/8</th>
<th>Size 7-1/2</th>
<th>Size 7-3/4</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Pride</td>
<td>#230 553</td>
<td>#230 554</td>
<td>#230 555</td>
<td>#230 556</td>
<td>#230 557</td>
<td>#230 558</td>
</tr>
<tr>
<td>Blue Flame</td>
<td>#230 535</td>
<td>#230 536</td>
<td>#230 537</td>
<td>#230 538</td>
<td>#230 539</td>
<td>#230 540</td>
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<tr>
<td>Dragon</td>
<td>#230 547</td>
<td>#230 548</td>
<td>#230 549</td>
<td>#230 550</td>
<td>#230 551</td>
<td>#230 552</td>
</tr>
<tr>
<td>Ghost Skulls</td>
<td>#230 541</td>
<td>#230 542</td>
<td>#230 543</td>
<td>#230 544</td>
<td>#230 545</td>
<td>#230 546</td>
</tr>
<tr>
<td>Bandanas (One Size Only)</td>
<td>Black #250 904</td>
<td>Dragon #230 560</td>
<td>Maple Leaf #250 905</td>
<td>Skull &amp; Barbed Wire #230 559</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Head & Face Accessories

NEW!

Slotted Hard Hat Adapter
#259 637
Compatible with most slotted hard hats.
(Helmet and hard hat not included)

Hard Hat Adapter
#213 110 (XL and XLI Series)
#222 003 (Titanium, XLI, Elite, Performance, ProHobby, Classic and MP-10 Series)
Compatible with Fibre Metal and MSA hard hats. Other brands may or may not fit. (Helmet and hard hat not included)

Helmet Hook
#251 018
- Holds your helmet or grinding shield
- Silicone strap secures helmet in place
**HEAD & FACE PROTECTION**

Head Threads and Accessories

**Fabric Headband**

#770 249

**2x4 Auto-Darkening Lenses**

#770 660 (Shade 8) • #770 659 (Shade 9) • #770 226 (Shade 10) • #770 961 (Shade 11)

- Auto-On/Auto-Off
- Light state shade #3

Fits all 2x4 inch windows, 2-year warranty

**Helmet Bib**

#253 882

- WeldX™ helmet bib provides added protection
- Velcro® attachment

**Job-Site Tool Bag**

#228 028

- Unzipped bag opening: 12 x 18-1/2 in
- Comfortable, padded shoulder strap
- Over 20 separate pockets

**Helmet Bag with Miller® Logo**

#770 250

- Drawstring closure
- Ultra-soft inside liner
- Exterior storage pouch

**9400i & VSi Replacement Grind Shield**

#245 818

**Grind Shield Lens Tear-Off**

#254 278 (5 Pack)

**Lithium Battery**

#217 043

**Cover Lenses**

<table>
<thead>
<tr>
<th>Part #:</th>
<th>Description:</th>
<th>Quantity:</th>
</tr>
</thead>
<tbody>
<tr>
<td>#231 411</td>
<td>Front: Classic, Classic VS, Classic VSi</td>
<td>5 pkg.</td>
</tr>
<tr>
<td>#231 410</td>
<td>Inside: Classic, Classic VS, Classic VSi, 2x4 Flip-up</td>
<td>5 pkg.</td>
</tr>
<tr>
<td>#231 921</td>
<td>Front: Performance</td>
<td>5 pkg.</td>
</tr>
<tr>
<td>#770 327</td>
<td>Inside: Performance, Titanium 7300</td>
<td>5 pkg.</td>
</tr>
<tr>
<td>#216 326</td>
<td>Front: Elite, Titanium 1600, Titanium 1600i, Titanium 7300, Titanium9400, Titanium 9400i,</td>
<td>5 pkg.</td>
</tr>
<tr>
<td>#216 327</td>
<td>Inside: Elite, Titanium 9400, Titanium 9400i</td>
<td>5 pkg.</td>
</tr>
<tr>
<td>#271 319</td>
<td>Front: Infinity</td>
<td>5 pkg.</td>
</tr>
<tr>
<td>#271 320</td>
<td>Inside: Infinity</td>
<td>5 pkg.</td>
</tr>
<tr>
<td>#235 628</td>
<td>Inside: Titanium 1600i</td>
<td>5 pkg.</td>
</tr>
</tbody>
</table>

**Bulk Cover Lenses**

<table>
<thead>
<tr>
<th>Part #:</th>
<th>Description:</th>
<th>Quantity:</th>
</tr>
</thead>
<tbody>
<tr>
<td>#216 326B</td>
<td>Front: Elite, Titanium, MP-10</td>
<td>50 pkg.</td>
</tr>
<tr>
<td>#216 327B</td>
<td>Inside: Elite, Titanium 9400i</td>
<td>50 pkg.</td>
</tr>
<tr>
<td>#231 921B</td>
<td>Front: Performance</td>
<td>50 pkg.</td>
</tr>
<tr>
<td>#770 237B</td>
<td>Inside: Performance</td>
<td>50 pkg.</td>
</tr>
<tr>
<td>#231 411B</td>
<td>Front: Pro-Hobby, Classic</td>
<td>50 pkg.</td>
</tr>
</tbody>
</table>

**Magnifying Lenses**

<table>
<thead>
<tr>
<th>Part #:</th>
<th>Magnification:</th>
<th>Part #:</th>
<th>Magnification:</th>
</tr>
</thead>
<tbody>
<tr>
<td>#212 242</td>
<td>2.5</td>
<td>#212 237</td>
<td>1.25</td>
</tr>
<tr>
<td>#212 241</td>
<td>2.25</td>
<td>#212 236</td>
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<tr>
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<td>2.00</td>
<td>#212 235</td>
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</tr>
<tr>
<td>#212 239</td>
<td>1.75</td>
<td>#212 238</td>
<td>1.5</td>
</tr>
</tbody>
</table>
NEW! Coming Soon

Safety and Cutting Glasses

Meets ANSI Z287.1+ Standards

Key Product Features:

- Anti-Fog
- Form-fitting orbital eye coverage enhances protection
- Shatterproof polycarbonate lenses
- Rubber ear pads on select models for additional comfort
- Wrap around designs meet ANSI side shield requirements

<table>
<thead>
<tr>
<th>Frame Style/Color</th>
<th>Lens</th>
<th>Part #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classic</td>
<td>Clear</td>
<td>#272 187</td>
</tr>
<tr>
<td>Classic with Strap</td>
<td>Clear</td>
<td>#272 188</td>
</tr>
<tr>
<td>Spark™</td>
<td>Clear</td>
<td>#272 190</td>
</tr>
<tr>
<td>Spatter™ - Black</td>
<td>Clear</td>
<td>#272 191</td>
</tr>
<tr>
<td></td>
<td>Smoke</td>
<td>#272 195</td>
</tr>
<tr>
<td>Spatter™ - White</td>
<td>Clear</td>
<td>#272 198</td>
</tr>
<tr>
<td></td>
<td>Smoke</td>
<td>#272 199</td>
</tr>
<tr>
<td>Slag™ - Black</td>
<td>Clear</td>
<td>#272 201</td>
</tr>
<tr>
<td></td>
<td>I/O</td>
<td>#272 202</td>
</tr>
<tr>
<td></td>
<td>Smoke</td>
<td>#272 203</td>
</tr>
<tr>
<td></td>
<td>#3</td>
<td>#272 204</td>
</tr>
<tr>
<td></td>
<td>#5</td>
<td>#272 205</td>
</tr>
<tr>
<td>Slag™ - White</td>
<td>Clear</td>
<td>#272 206</td>
</tr>
<tr>
<td></td>
<td>I/O</td>
<td>#272 207</td>
</tr>
<tr>
<td></td>
<td>Smoke</td>
<td>#272 208</td>
</tr>
<tr>
<td></td>
<td>#3</td>
<td>#272 196</td>
</tr>
<tr>
<td></td>
<td>#5</td>
<td>#272 209</td>
</tr>
</tbody>
</table>

Classic

- Angle adjustable temples for personalized fit
- Lightweight for all-day comfort
- Frameless design provides unobstructed view

Classic with Strap

- Elastic strap holds glasses tight to face for improved protection
- Foam padding blocks debris
- Lightweight for all-day comfort

Spark™

- Wrap-around design enhances vision
- Flexible over-molded temples conform to user’s head
- Rubber nose piece provides comfort and prevents slipping
Spatter™
- Rubber temples and nose piece provide extreme comfort and security
- Enhanced comfort and styling promote compliance
- Half-frame increases view

Slag™
- Rubber temples and nose piece provide extreme comfort and security
- Enhanced comfort and styling promote compliance
- Full-frame design optimizes protection

Lens Options
Select from a wide range of lens options for any application
- All lenses feature anti-fog coating and high quality optics
- I/O (Indoor/Outdoor) lenses feature light shading with a mirrored finish to reduce glare in indoor and outdoor applications
- Smoke lenses provide shade protection in outdoor applications
- Shade #3 and #5 green IR lenses offer protection for cutting, brazing, or soldering applications
Hand and Body Protection

Jackets, gloves and apparel can be found in every welding facility, but not all products are created equal. Making sure your operators are wearing the best protection for the application is critical in not only reducing injuries and downtime, but also ensuring optimal performance. If the protection is comfortable, has a good fit and provides the necessary protection your welders will keep it on – increasing productivity and compliance.
The Talk: Terms and definitions used in this section

**NFPA** – National Fire Protection Association, the world’s leading advocate of fire prevention. The NFPA develops, publishes and distributes codes and standards intended to minimize the possibility and effects of fire and other risks.

**ANSI** – American National Standard Institute, a nonprofit organization that defines and oversees common standards and assessment systems.

**Kevlar® Thread** – Almost 2½ times stronger than nylon or polyester, with a heat decomposition (turns to ash) of 800° F. Does not melt.

**Flame Retardant** – Materials that have been chemically treated to self-extinguish. Surface finishes and coatings are applied that inhibit, suppress or delay the production of flames.

**Flame Resistance** – Materials that are inherently self-extinguishing and resistant to catching fire. They will not melt or drip when exposed directly to extreme heat, and protection is built into the fiber itself and can never be worn away or washed out.

The Statistics: Hand & Body

- **70%**
  - 70% of employees with hand injuries reported not wearing gloves at the time of the injury. The injuries of the remaining 30% were caused by inadequate, damaged or inappropriate gloves.¹

- **25%**
  - More than 25% of all workplace accidents involve hand and finger injuries.²

- **25%**
  - Work-related burns account for 20-25% of all serious burns requiring hospital attention.

---

¹ Bureau of Labor Statistics Work Injury Reports - eye, face, head & hand injuries
Are You Covered?

Protecting worker’s hands and bodies is not only essential to safeguarding their most critical instruments on the job, but is also a regulated requirement. OSHA requires personal protective clothing for workers who weld, cut or braze.

Selecting the right hand and body protection can affect more than safety – apparel and gloves made specifically for the demands of welding contribute to increased comfort, productivity and performance.

OSHA Standard 1910.132
- Employees exposed to the hazards created by welding, cutting, or brazing operations must be protected by PPE in accordance with the requirements of the general personal protective equipment standard. Appropriate protective clothing required for any welding will vary with the size, nature and location of the work to be performed.

ANSI Z49.1
- Requires all welders to wear protective flame-resistant gloves that provide the heat resistance and general hand protection needed for welding.
- Must be in good repair, dry and capable of providing protection from electric shock by the welding equipment.
- Insulating linings should be used to protect areas exposed to high radiant energy.
- Clothing and apparel must provide sufficient coverage and be made of suitable materials to minimize skin burns, ideally leather or flame-resistant materials.

NFPA 51B, 5.1 Personal Protective Clothing
- Clothing shall be selected to minimize the potential for ignition, burning, trapping hot sparks and electric shock.

Welding Gloves

Hand injuries are a common workplace injury, and extremely preventable. The number one reason workers remove hand protection is due to discomfort. Miller gloves are designed using a three-dimensional pattern providing an excellent fit, resulting in unprecedented comfort and dexterity – keeping gloves on your operators and alleviating injuries.

Glove 101

- Select gloves made of materials that will perform best according to the specific application.
- Make sure the glove fits for added safety, comfort and dexterity. A glove that is too big or small can decrease performance and increase the risk of injury.
- Engage workers in the selection process – they’ll be more likely to wear them if they choose them.
- Conduct regular inspections to make sure the gloves are in good condition before wearing. Replace any gloves that are worn or torn.

How to Get the Proper Fit

Measure Around Your Dominant Hand

<table>
<thead>
<tr>
<th>Size</th>
<th>Inch:</th>
</tr>
</thead>
<tbody>
<tr>
<td>XS</td>
<td>6 - 7</td>
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<tr>
<td>S</td>
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<tr>
<td>M</td>
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<td>L</td>
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<td>XL</td>
<td>10 - 11</td>
</tr>
<tr>
<td>XXL</td>
<td>11 - 12</td>
</tr>
</tbody>
</table>

Glove Features

<table>
<thead>
<tr>
<th>Component Exterior</th>
<th>Material</th>
<th>Cowhide</th>
<th>Deerskin</th>
<th>Pigskin</th>
<th>Goatskin</th>
<th>Sheepskin</th>
<th>Silicone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feature</td>
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</tr>
</tbody>
</table>
- Most versatile
- Various grades and grains available, which affects pliability and strength
- Ideal for Stick and MIG welding and handling
- Most versatile
- Extremely soft
- Snug fit provides maximum dexterity
- Ideal for TIG welding and lighter-duty handling
- Soft and durable
- Naturally resistant to moisture
- Extremely breathable
- Ideal for Stick and MIG welding and handling
- Greatest tensile strength for weight
- Resistant to scraping and rubbing
- Ideal for TIG and MIG welding and handling
- High dexterity rating
- Smooth surface for wire handling
- Ideal for TIG welding
- Strong and durable
- Resists temperature extremes, oxidation and ultraviolet radiation
- Withstands up to 660°F
- Repels moisture

<table>
<thead>
<tr>
<th>Component Thread Lining</th>
<th>Material</th>
<th>Kevlar®</th>
<th>Wool</th>
<th>Cotton/Foam</th>
<th>Cotton</th>
<th>Aluminized</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feature</td>
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</tbody>
</table>
- High heat resistance, does not melt
- 2 ½ times stronger than nylon or polyester thread
- Has little to no stretch for a tight seam
- Best heat protection
- Thicker, with somewhat limited dexterity
- Designed for higher heat and cold weather applications
- Wicks Moisture
- Good for medium - to heavy-stick welding applications
- Cotton absorbs moisture
- Foam protects against heat
- Maximum dexterity
- Maximum moisture absorption
- Reflects radiant heat for high heat handling

Welding Gloves

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**Component Exterior**

- **Material**
  - Cowhide
  - Deerskin
  - Pigskin
  - Goatskin
  - Sheepskin
  - Silicone

- **Feature**
  - Most versatile
  - Various grades and grains available, which affects pliability and strength
  - Ideal for Stick and MIG welding and handling
  - Extremely soft
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  - Ideal for TIG welding
  - Strong and durable
  - Resists temperature extremes, oxidation and ultraviolet radiation
  - Withstands up to 660˚ F
  - Repels moisture

**Component Thread Lining**

- **Material**
  - Kevlar®
  - Wool
  - Cotton/Foam
  - Aluminized

- **Feature**
  - High heat resistance, does not melt
  - 2 ½ times stronger than nylon or polyester thread
  - Has little to no stretch for a tight seam
  - Best heat protection
  - Thicker, with somewhat limited dexterity
  - Designed for higher heat and cold weather applications
  - Wicks moisture
  - Good for medium- to heavy-stick welding applications
  - Cotton absorbs moisture
  - Foam protects against heat
  - Maximum dexterity
  - Maximum moisture absorption
  - Reflects radiant heat for high heat handling

---


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Sewn with 100% flame-resistant Kevlar® thread for maximum seam strength

Dual-padded, pig grain palm for added comfort

Strategically placed silicone patches on back for heat and spatter protection

Extra Heavy Duty MIG/ Stick glove shown

Each glove is made from multiple pieces of material, creating a three-dimensional pattern that comfortably wraps and supports the hand for increased comfort and dexterity
Performance Gloves

Unprecedented comfort and performance with exceptional dexterity and flexibility.

**Extra Heavy Duty MIG/Stick**
- An industry first! Strategically placed silicone patches on back for heat and spatter protection
- Multi-layered insulated palm and back
- Dual-padded, pig grain palm for added comfort

**Heavy Duty MIG Stick (Long Cuff)**
- Padded forearm for additional protection and comfort
- Triple layered insulated back
- Strategically placed patches of pig grain and cow split back for extended glove life

**Heavy Duty MIG Stick**
- Strategically placed patches on palm and back for extended glove life
- Double layered insulated palm and back
- Premium pig grain leather provides extreme durability and protection

**MIG/Stick**
- Strategically placed patches on palm and back for extended glove life
- Double layered insulated palm and back
- Cow split leather provides extreme durability and protection
MIG (Lined)
- Dual padded palm for added comfort
- Fleece insulated palm, foam insulated back
- Cow grain palm, pig split back and goat grain inner fingers provide exceptional dexterity and comfort

MIG (Unlined)
- Unlined palm for heightened feel and dexterity
- Double layer insulated back and dual padded palm for added comfort
- Cow grain palm, cow split back and goat grain inner fingers provide exceptional dexterity and comfort

TIG
- Completely unlined for heightened feel and dexterity
- Triple padded palm for added comfort
- Premium goat grain leather offers superior flexibility and dexterity

TIG/Multitask
- Wool back provides ultimate insulation
- Dual padded palm for added comfort
- Premium goat grain leather offers superior flexibility and dexterity

Work
- Dual-padded palm for added comfort
- Fleece back provides ultimate insulation
- Cow grain leather offers superior durability and abrasion resistance

Metalworker
- Durable top grain leather and spandex back for enhanced durability and dexterity
- Neoprene wrist with Velcro® closure increases fit and support
- Padded, reinforced palm and thumb saddle for extended wear
- Not intended for welding

<table>
<thead>
<tr>
<th>Performance Gloves</th>
<th>XS</th>
<th>S</th>
<th>M</th>
<th>L</th>
<th>XL</th>
<th>2XL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extra Heavy Duty MIG/Stick</td>
<td></td>
<td></td>
<td></td>
<td>#263 350</td>
<td>#263 351</td>
<td></td>
</tr>
<tr>
<td>Heavy Duty MIG Stick (Long Cuff)</td>
<td></td>
<td></td>
<td></td>
<td>#263 339</td>
<td>#263 340</td>
<td>#269 615</td>
</tr>
<tr>
<td>Heavy Duty MIG Stick</td>
<td></td>
<td></td>
<td></td>
<td>#263 343</td>
<td>#263 344</td>
<td>#269 616</td>
</tr>
<tr>
<td>MIG/Stick</td>
<td></td>
<td></td>
<td></td>
<td>#263 330</td>
<td>#263 331</td>
<td>#263 332</td>
</tr>
<tr>
<td>MIG (Lined)</td>
<td>#263 330</td>
<td>#263 331</td>
<td>#263 332</td>
<td>#263 333</td>
<td>#263 334</td>
<td>#269 618</td>
</tr>
<tr>
<td>MIG (Unlined)</td>
<td></td>
<td></td>
<td></td>
<td>#263 335</td>
<td>#263 336</td>
<td>#263 337</td>
</tr>
<tr>
<td>TIG</td>
<td></td>
<td></td>
<td></td>
<td>#263 345</td>
<td>#263 346</td>
<td>#263 347</td>
</tr>
<tr>
<td>TIG/Multitask</td>
<td></td>
<td></td>
<td></td>
<td>#263 352</td>
<td>#263 353</td>
<td>#263 354</td>
</tr>
<tr>
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<td></td>
<td>#266 041</td>
<td>#266 042</td>
<td>#266 043</td>
</tr>
<tr>
<td>Metalworker</td>
<td></td>
<td></td>
<td></td>
<td>#251 066</td>
<td>#251 067</td>
<td>#251 068</td>
</tr>
</tbody>
</table>
Welding Apparel

Protective welding apparel that performs in your specific environment is crucial to keeping welders safe and on the job. Not all apparel is created equal – construction and quality materials combine for an ideal fit that encourages welders to keep their PPE on, increasing compliance and performance.

4 Steps to Creating an FR Program

1 Identify Your Hazards
   What exposures do your welders face?

2 Perform a Hazard Assessment
   Identify industry standards and regulations.

3 Select Your Fabric
   Based on specific applications, what is the best fabric for your welders?

4 Educate/Train Your Team
   Make your team aware of the importance, maintenance and proper usage of protective apparel.

Select Your Fabric

<table>
<thead>
<tr>
<th>Fabric</th>
<th>Description</th>
<th>Cost</th>
<th>Durability</th>
<th>Protection Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classic FR Cotton</td>
<td>Ideal for everyday use. Nine ounce, flame-resistant, pre-shrunk fabric features quality material without compromising your bottom line.</td>
<td>$</td>
<td>•</td>
<td>Light-Duty</td>
</tr>
<tr>
<td>INDURA® FR Cotton</td>
<td>The Indura brand name is derived from “Industrial Durability.” Indura is a 100% cotton, flame-resistant fabric, guaranteed for the life of the garment. Indura will self-extinguish and will not ignite, but it can burn.</td>
<td>$$</td>
<td>••</td>
<td>Light-Duty</td>
</tr>
<tr>
<td>Combo</td>
<td>Perfect mix of top-grain leather and Indura FR cotton, providing additional protection in high-exposure areas.</td>
<td>$$$</td>
<td>•••</td>
<td>Medium-Duty</td>
</tr>
<tr>
<td>WeldX™</td>
<td>Extreme flame-resistant properties won’t burn, melt, ignite or shrink - repelling sparks, spatter and other molten metals. Chromium free for easy disposal. Machine washable, retains FR properties. A Miller exclusive.</td>
<td>$$$$</td>
<td>••••</td>
<td>Medium-Duty</td>
</tr>
<tr>
<td>Leather</td>
<td>Top-grain pigskin leather withstands sparks and spatter for long-term industrial use.</td>
<td>$$$$</td>
<td>•••••</td>
<td>Heavy-Duty</td>
</tr>
</tbody>
</table>
Classic FR Cotton

Protect your operators without compromising your bottom line.

Key Product Features:

- Ideal for everyday use
- Nine ounce, flame-resistant, navy cotton
- Pre-shrunk fabric
- All Classic FR cotton apparel features finished hems and reinforced stitching for enhanced durability

Classic FR Cotton Jacket

- Barracuda style stand-up collar for extra neck protection
- Accessible inside pocket
- Five button snaps provide added protection
- "Fold-in" sleeve snaps for a better fit around the wrist
- 30 inch torso length

Classic FR Cotton Jacket Sizing & Part Numbers

<table>
<thead>
<tr>
<th>Part #</th>
<th>S</th>
<th>M</th>
<th>L</th>
<th>XL</th>
<th>2XL</th>
<th>3XL</th>
<th>4XL</th>
<th>5XL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chest Width</td>
<td>42 in</td>
<td>46 in</td>
<td>50 in</td>
<td>54 in</td>
<td>58 in</td>
<td>62 in</td>
<td>66 in</td>
<td>70 in</td>
</tr>
<tr>
<td>Sleeve Length</td>
<td>31 in</td>
<td>32 in</td>
<td>33 in</td>
<td>34 in</td>
<td>35 in</td>
<td>36 in</td>
<td>37 in</td>
<td>38 in</td>
</tr>
<tr>
<td>Shoulder Width</td>
<td>15.5 in</td>
<td>17 in</td>
<td>18.5 in</td>
<td>20 in</td>
<td>21.5 in</td>
<td>23 in</td>
<td>24.5 in</td>
<td>26 in</td>
</tr>
</tbody>
</table>
Classic FR Cotton Cape Sleeves
• Allows for the attachment of our Bib accessory along the chest
• Barracuda style stand-up collar for extra neck protection
• "Fold-in" sleeve snaps for a better fit around the wrist

Classic FR Cotton Bib
#247 147
• 19 inch length
• Adjustable belt closure provides a quick easy-on/easy-off option

Classic FR Cotton Sleeves
#247 148
• 18 inch length
• Innovative one-handed cinch closure for easy adjustability
• "Fold-in" sleeve snaps for a better fit around the wrist

Classic FR Cotton Lab Coat
• Barracuda style stand-up collar for extra neck protection
• 40 inch length
• "Fold-in" sleeve snaps for a better fit around the wrist

Classic FR Cotton Apron
#247 149
• 35 inch length
• Convenient adjustable drawstring ensures a superior fit around the neck and waist
• Accessible front pocket

Classic FR Cape Sleeves & Lab Coat Part Numbers

<table>
<thead>
<tr>
<th></th>
<th>S</th>
<th>M</th>
<th>L</th>
<th>XL</th>
<th>2XL</th>
<th>3XL</th>
<th>4XL</th>
<th>5XL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab Coat</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>#252 000</td>
<td>#252 001</td>
<td>#252 002</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Cape Sleeves</td>
<td>#247 138</td>
<td>#247 139</td>
<td>#247 140</td>
<td>#247 142</td>
<td>#247 143</td>
<td>#247 144</td>
<td>#247 145</td>
<td>#247 146</td>
</tr>
</tbody>
</table>
**INDURA® FR Cotton**

### Key Product Features:

- Derived from “Industrial Durability”
  - 100% cotton, flame-resistant fabric

- Flame-resistance guaranteed for the life of the garment

- Pre-shrunk fabric

### INDURA® FR Cotton

**Men's Jacket**

- Barracuda style stand-up collar for extra neck protection
- Easy-access slash front pockets
- "Fold-in" sleeve snaps for a better fit around the wrist
- Reinforced snaps to prevent ripping of the jacket
- 30 inch torso length

**Women’s Jacket**

- Tailored, fitted design provides less restriction and better movement
- Barracuda style stand-up collar for added neck protection
- Functional and stylish - finished hems and contrast stitching

### INDURA® FR Cotton Men's Jacket Sizing & Part Numbers

<table>
<thead>
<tr>
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<th>2XL</th>
<th>3XL</th>
<th>4XL</th>
<th>5XL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part Number</td>
<td>#258 095</td>
<td>#258 097</td>
<td>#258 098</td>
<td>#258 099</td>
<td>#258 100</td>
<td>#258 101</td>
<td>#258 102</td>
</tr>
<tr>
<td>Chest Width</td>
<td>44 in</td>
<td>48 in</td>
<td>52 in</td>
<td>56 in</td>
<td>60 in</td>
<td>64 in</td>
<td>68 in</td>
</tr>
<tr>
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<td>34 in</td>
<td>35 in</td>
<td>36 in</td>
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<td>38 in</td>
</tr>
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<td>#264 380</td>
<td>#264 381</td>
<td>#264 382</td>
</tr>
<tr>
<td>Shoulder Width</td>
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<td>16 in</td>
<td>18 in</td>
<td>19 in</td>
</tr>
<tr>
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<td>21 in</td>
<td>23 in</td>
<td>25 in</td>
</tr>
<tr>
<td>Sleeve Length</td>
<td>32 in</td>
<td>33 in</td>
<td>34 in</td>
<td>36 in</td>
</tr>
<tr>
<td>Torso Length</td>
<td>22 in</td>
<td>25 in</td>
<td>26 in</td>
<td>27 in</td>
</tr>
</tbody>
</table>
Combo

Key Product Features:

• Perfect mix of top-grain leather and INDURA® FR cotton, providing additional protection in high-exposure areas

• Flame-resistant INDURA® 100% cotton is guaranteed for the life of the garment

• Pre-shrunk fabric

Combo Jacket

• Top-grain leather placed on sleeves and shoulders to increase overall protection

• Allows for the attachment of Miller’s patented Bib/Apron accessory along the chest as a bib or at the bottom as an apron

• Barracuda style stand-up collar for extra neck protection

• Easy-access slash front pockets

• "Fold-in" sleeve snaps for a better fit around the wrist

• Reinforced snaps with leather to prevent ripping of the jacket

• 30 inch torso length

Combo Sleeves

#231 096

• Top-grain leather is lightweight and can be positioned for more protection where needed

• Wide elastic band at top of sleeve securing fit

• Flame-resistant cuff for extra comfort and protection

• 21 inch length

Leather® Bib/Apron

#231 125

• Provides added protection where you need it for extended jacket life

• Patented hidden snap design

Combo Jacket Sizing

<table>
<thead>
<tr>
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<th>L</th>
<th>XL</th>
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<th>3XL</th>
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<td>#231 084</td>
<td>#231 085</td>
<td>#231 086</td>
<td>#231 087</td>
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<tr>
<td>44 in</td>
<td>46 in</td>
<td>50 in</td>
<td>52 in</td>
<td>58 in</td>
<td>62 in</td>
<td>65 in</td>
<td>69 in</td>
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<tr>
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<tr>
<td>17.5 in</td>
<td>18 in</td>
<td>19 in</td>
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<td>22 in</td>
<td>23 in</td>
<td>24 in</td>
<td>25 in</td>
<td></td>
</tr>
</tbody>
</table>
WeldX™
A Miller® exclusive

Key Product Features:

- 7 oz WeldX fabric – A lighter weight alternative to leather
- Extreme flame-resistant properties won’t burn, melt, ignite or shrink – repelling sparks, spatter and other molten metals
- Chromium free for easy disposal
- Machine washable, retains FR properties
- All WeldX products have finished hems and reinforced stitching for enhanced durability

WeldX™ Jacket

- 7 oz WeldX front and sleeves combined with 9 oz Flame-resistant Navy cotton back provides optimal protection
- Lined sleeves for added protection
- Zipper closure with Velcro® storm flap
- Extended rear tail
- Vented back for improved air flow
- Barracuda style stand-up collar for extra neck protection
- Accessible inside pocket
- "Fold-in" sleeve snaps for a better fit around the wrist
- 32 inch torso length

WeldX™ Jacket Sizing & Part Numbers

<table>
<thead>
<tr>
<th></th>
<th>S</th>
<th>M</th>
<th>L</th>
<th>XL</th>
<th>2XL</th>
<th>3XL</th>
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<tr>
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<td>#247 115</td>
<td>#247 116</td>
<td>#247 117</td>
<td>#247 118</td>
<td>#247 119</td>
<td>#247 120</td>
<td>#247 121</td>
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<td>Chest Width</td>
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<td>46 in</td>
<td>50 in</td>
<td>54 in</td>
<td>58 in</td>
<td>62 in</td>
<td>66 in</td>
<td>70 in</td>
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<tr>
<td>Sleeve Length</td>
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<td>33 in</td>
<td>34 in</td>
<td>35 in</td>
<td>36 in</td>
<td>37 in</td>
<td>38 in</td>
<td>39 in</td>
</tr>
<tr>
<td>Shoulder Width</td>
<td>19 in</td>
<td>20 in</td>
<td>21 in</td>
<td>22 in</td>
<td>23 in</td>
<td>24 in</td>
<td>25 in</td>
<td>26 in</td>
</tr>
</tbody>
</table>
**WeldX™ Cape Sleeves**
- 7 oz WeldX front and sleeves combined with 9 oz Flame-resistant Navy cotton back provide optimal protection
- Allows for the attachment of our Bib accessory along the chest
- Barracuda style stand-up collar for extra neck protection
- Pre-shrunk fabric eliminates shrinkage
- "Fold-in" sleeve snaps for a better fit around the wrist

**WeldX™ Bib**
- #247 133
- 19 inch length
- Adjustable belt closure provides a quick easy-on/easy-off option

**WeldX™ Sleeves**
- #247 137
- 18 inch length
- Innovative one-handed cinch closure for easy adjustability
- "Fold-in" sleeve snaps for a better fit around the wrist

**WeldX™ Apron**
- #247 134
- 35 inch length
- Convenient adjustable drawstring ensures a superior fit around the neck and waist
- Accessible front pocket

**WeldX™ Cape Sleeves Part Numbers**

<table>
<thead>
<tr>
<th></th>
<th>S</th>
<th>M</th>
<th>L</th>
<th>XL</th>
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<td>#247 124</td>
<td>#247 126</td>
<td>#247 127</td>
<td>#247 128</td>
<td>#247 130</td>
<td>#247 131</td>
</tr>
</tbody>
</table>
Leather

Key Product Features:

- Top-grain pigskin leather withstands sparks and spatter for extreme, long-term industrial use
- Sewn entirely with Kevlar® thread for added durability at each seam

Leather Jacket

- Barracuda style stand-up collar for extra neck protection
- Expandable leather strategically placed for enhanced mobility
- Satin lining for added comfort
- Reinforced snaps to prevent ripping of the jacket
- 30 inch torso length

Leather Jacket Sizing & Part Numbers

<table>
<thead>
<tr>
<th>Part Number</th>
<th>S</th>
<th>M</th>
<th>L</th>
<th>XL</th>
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<tr>
<td>Chest Width</td>
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<td>48 in</td>
<td>52 in</td>
<td>56 in</td>
<td>60 in</td>
<td>64 in</td>
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<tr>
<td>Sleeve Length</td>
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<td>33 in</td>
<td>34 in</td>
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<td>24 in</td>
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<td>27 in</td>
</tr>
</tbody>
</table>
General Fabric Care

Classic FR, INDURA®
The best results in cleaning and utilization of detergent supplies are obtained when using softened water. Classic and INDURA® fabrics can be washed at temperatures up to 165°F (75°C). Softeners, starches, bleach, hydrogen peroxide bleach and soap are not recommended.

Combo, WeldX™, Leather
Dry clean only.

The thermal protective properties of any flame resistant fabric can be compromised by the presence of contaminants on the fabric. Even though the original fabric is fully flame resistant as measured by standard test protocols, flammable contaminants on garments can ignite and burn until consumed, thereby increasing heat transfer to the wearer and leading to flame resistance failure. Garments must be laundered thoroughly to remove contaminants. It is recommended to wash garments prior to wearing. Load size 65% – 80% of capacity.

It is recommended that garments be washed and dried inside out. This will minimize surface abrasion and aid in maintaining the surface appearance of garments constructed of UltraSoft®, UltraSoft AC® and INDURA® fabrics.

The flame resistant polymer contained in UltraSoft®, UltraSoft AC® and INDURA® fabrics is highly resistant to most acids, bases and solvents. Exposure to strong acids, such as hydrochloric or sulfuric, however, may degrade the strength of the cotton fiber and even cause holes in the fabric. Additionally, these fabrics should not be exposed to strong oxidizers, such as bleach (over 6% sodium hypochlorite) and hydrogen peroxide, and strong reducers, such as sodium hydrosulfite. Strong oxidizing and reducing agents can cause an adverse reaction with the flame resistant polymer.
Heat Stress Protection

Heat stress is not only a serious condition for workers, but it can greatly reduce productivity and increase operator errors. The heat of the welding arc and added warmth of protective clothing can make already hot conditions even more intense for welders. Miller cooling products help lower body temperatures and can be an effective solution to help improve the welder's well being and performance on the job.
HEAT STRESS PROTECTION

Statistics & Trends: Heat Stress

688 Heat related deaths per year. 65% reported exposure to excessive heat as the underlying cause of death.¹

2% The amount workers output decreases for each degree above 77°.

40% Of all heat-related illness cases cause victims to miss two or more days of work.

¹ http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5529a2.htm

The Talk: Terms and definitions used in this section

**Acclimatization**: The time needed for physiological adaptation to extreme temperature changes. An average individual takes about 1 to 2 weeks to adapt to extreme hot temperatures.

**Body Heat Balance**: Steady state equilibrium between body heat production and heat loss to the environment.

**Wet Bulb Globe Temperature (WBGT)**: Composite temperature used to estimate the effect of temperature, humidity, wind speed, and radiation (usually sunlight) on humans. Used by industrial hygienists to determine appropriate exposure levels to high temperatures. It can also be adjusted and measured for indoor indexes.

**Wet Bulb (WB)**: The temperature at which water evaporates into the air. It is significant when compared to skin temperature because of the affect it has on how much of a worker’s sweat evaporates.

**Threshold Limit Values (TLV)**: Guidelines designed for use by industrial hygienists in making decisions regarding safe levels of exposure to various chemical substances and physical agents found in the workplace.
Understand and Prevent Heat Stress

Welders can be exposed to very hot environments all year, especially when temperatures rise during summer months. Understanding the different types of heat stress, symptoms and first aid treatments will help keep your team safe.

Know the symptoms
- Hot, dry skin or profuse sweating
- Hallucinations
- Chills
- Throbbing headache
- High body temperature
- Confusion/dizziness
- Slurred speech

First Aid
- Call 911
- Move worker to a cooler area
- Loosen or remove clothing
- Spray the worker with room temperature water
- Apply cold packs to the groin, neck and armpits
- Do not fully immerse in water

Normal Body Cooling
- When body temperature rises, blood is pumped to the skin
- Sweating increases (evaporative cooling)
- Heart rate increases to speed up blood flow
- Core temperature drops and stabilizes

Recommended Water Consumption
- 8 ounces every 15 to 20 minutes
- During moderate activity in moderately hot conditions
Types of Heat Stress

**Heat Stroke**: Critical condition – Call 911! Occurs when the body can no longer control its own temperature due to failure of the sweating mechanism, causing body temperature to rapidly rise. Heat Stroke can cause permanent disability or death.

**Heat Cramps**: Sweating depletes the body’s salt and moisture levels, causing painful cramps.

**Heat Collapse (Syncope)**: Dehydration and lack of acclimatization can contribute to fainting or dizziness. This condition can be very serious if workers are operating machinery.

**Heat Rash**: Skin irritation (typically a cluster of small red blisters) caused by excessive sweating during hot, humid conditions that gives a prickling sensation.

**Heat Fatigue**: Typically occurs due to lack of acclimatization, leaving the worker tired and with impaired performance.

There are many different ways to measure and determine if an environment is too hot for workers. Two of the more common means are the Heat Index and Permissible Heat Exposure TLV, providing information on when caution needs to be taken and recommended work/rest regimens.

### Permissible Heat Exposure Threshold Limit Value (TLV)

<table>
<thead>
<tr>
<th>Heat Index</th>
<th>Risk Level</th>
<th>Protective Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 91°F</td>
<td>Lower (Caution)</td>
<td>Basic heat safety and planning</td>
</tr>
<tr>
<td>91°F to 103°F</td>
<td>Moderate</td>
<td>Implement precautions and heighten awareness</td>
</tr>
<tr>
<td>103°F to 115°F</td>
<td>High</td>
<td>Additional precautions to protect workers</td>
</tr>
<tr>
<td>Greater than 115°F</td>
<td>Very High to Extreme</td>
<td>Triggers even more aggressive protective measures</td>
</tr>
</tbody>
</table>

These TLV levels are based on the assumption that nearly all acclimatized, fully clothed workers with adequate water and salt intake should be able to function effectively under the given working conditions without exceeding a deep body temperature of 100.4°F. They apply to physically fit and acclimatized individuals wearing light summer clothing.
HEAT STRESS PROTECTION
CoolBand™ II

Helmet Cooling

Excessive heat exposure can lead to very serious health risks and be a detriment to performance. When engineering controls or work practice controls are not sufficient to reduce heat exposures, innovative cooling products can reduce worksite injuries by lowering the temperature under the hood through evaporative cooling – keeping welders cool, safe and productive.

CoolBand™ II

Constant airflow over the welder’s head and face can decrease temperatures up to 8 degrees under the hood. The CoolBand II fits seamlessly with most Miller helmets*, providing a slim, balanced fit for all-day comfort.

<table>
<thead>
<tr>
<th>Part #:</th>
<th>Description:</th>
</tr>
</thead>
<tbody>
<tr>
<td>#261 970</td>
<td>CoolBand™ II</td>
</tr>
</tbody>
</table>

* Not compatible with XL Series, Classic VSi, Titanium 1600i or 9400i helmets

Key Product Features:

- Upward air vents cool entire head
- Downward air vents cool face and temples
- Reduces lens fogging
- Removable air deflector provides airflow direction adjustability
- Oversized power button for easy on/off
- Lightweight lithium polymer rechargeable battery – up to 6 hours of run time

Evaporative Cooling

A physical occurrence in which evaporation of a liquid (perspiration) into surrounding air cools an object (welder). As the perspiration evaporates it absorbs heat. Increased airflow leads to an increased evaporation rate, cooling the welder more quickly.
**CoolBelt™**

Designed for industrial use, this lightweight, belt-mounted cooling system delivers maximum airflow, keeping the welder’s head and face cool, removing stagnant air and decreasing lens fog. With temperatures up to 17 degrees cooler under the hood, the operator experiences improved comfort and lower incidence of heat fatigue and illness.

**Part #: Description:**

| #245 230 | CoolBelt |

* Not compatible with XL Series™ Helmets

**Key Product Features:**

- Dual air speeds provide airflow adjustability
- Constant airflow removes hot, stagnant air and reduces lens fog
- Swivel hose connection for maximum maneuverability
- Lightweight lithium ion rechargeable battery – up to 6 hours of run time

**Up to 17° Cooler under the hood**

**By cooling a worker 15 degrees, they will make approximately 90% fewer errors**

Determine your potential savings by lowering welders’ temperatures 15 degrees:

\[
\text{(Number of heat-related errors at 95 degrees)} \times \text{(cost of fixing errors)} \times .90 = \text{Total Potential Savings of Reducing Heat Related Errors}
\]

*British Journal of Industrial Medicine, 3, 143-158*
Miller® Welding Safety & Health
For Health. For Safety. For Life.

Miller Safety & Health personal protective equipment and fume management solutions are designed specifically for the risks prevalent within welding environments - with products and services that fulfill OSHA’s Hierarchy of Controls at all levels.

Get Connected

Safety eNewsletter
Stay on top of the latest regulations and learn how other occupational health and safety specialists have improved the safety and health of their workplace with Miller’s quarterly safety eNewsletter.

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