Miller®

The Power of Blue®

# Welding Safety & Health Guide

**FUME EXTRACTION & RESPIRATORY | HEAD & FACE | HAND & BODY | HEAT STRESS**

**VOLUME II**

MillerWelds.com/Safety

# 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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# Fume Extraction & Respiratory Protection

Providing a safe, healthy and compliant work environment doesn't need to be complicated. Miller and ITW welding products are your single-source solution for weld 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.

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## **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 that a worker may be exposed to established by OSHA.

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

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

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

**Threshold Limit Value (TLV®):** Guidelines for exposure to chemical substances that may be present in the workplace, below which there should not be an unreasonable risk of disease or injury. Established and utilized by the ACGIH.

**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; regulates what manufacturers emit out of their shops.

## **Statistics & Trends:** Fume Extraction & Respiratory Protection

### #4-Respiratory Protection

**OSHA's 2017 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.
[2] James M. Antonini, "Health Effects of Welding." Critical Reviews in Toxicology. Vol. 33, No. 1 (2003), pp. 61-103.

# 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 another applicable government occupational exposure limit, 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 argon and carbon dioxide, 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.

| | | Exposure Limits | |
|---|---|---|---|
| **Substance** | **Prevalent In** | **OSHA - PEL (Enforceable)[1]** | **ACGIH® - TLV® (Recommended)** |
| Aluminum | Aluminum Alloys, Steel Additive, Electrode Coatings | 5.0 mg/m³ TWA | 1.0 mg/m³ TWA |
| Beryllium | Copper, Magnesium & Alluminum Alloys | 0.002 mg/m³ TWA, 0.025 mg/m³ Ceiling | 0.00005 mg/m³ TWA |
| Cadmium | Coatings of Electrodes | 0.005 mg/m³ TWA | 0.1 mg/m³ TWA |
| Copper | Copper Metals, Electrodes | 0.1 mg/m³ TWA | 0.2 mg/m³ TWA |
| Hexavalent Chromium | Stainless, High Alloy Steels, Some Non-Alloy Sheets | 0.005 mg/m³ TWA, 0.1 mg/m³ TWA | 0.05 mg/m³ TWA |
| Iron (Iron Oxide) | Most Welding Fumes | 5.0 mg/m³ TWA | 5.0 mg/m³ TWA |
| Lead | Solder, Brass & Bronze Alloys, Steel Coatings | 0.05 mg/m³ TWA | 0.05 mg/m³ TWA |
| Manganese | Most Welding Fumes: Electrodes & Steels | 0.2 mg/m³ Ceiling | 0.02 mg/m³ TWA |
| Nickel | Stainless, Nickel Alloys | 0.5 mg/m³ TWA | 0.2 mg/m³ TWA |
| Zinc (Zinc Oxide) | Galvanized Metal Coatings | 5.0 mg/m³ TWA | 2.0 mg/m³ TWA |

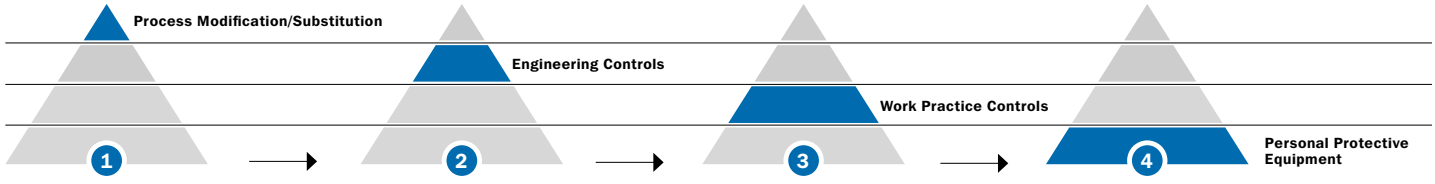
[1] More strict regulations may apply. Be sure to understand the relevant regulations in your area.

**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:**




### 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-manganese welding consumables, changing to a welding process with lower fume generation or integrating automated 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.

### 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.

### Work Practice Controls:

**Miller Recommends: Changes to Workplace, Training and Education, Miller LiveArc™ and AugmentedAc™**

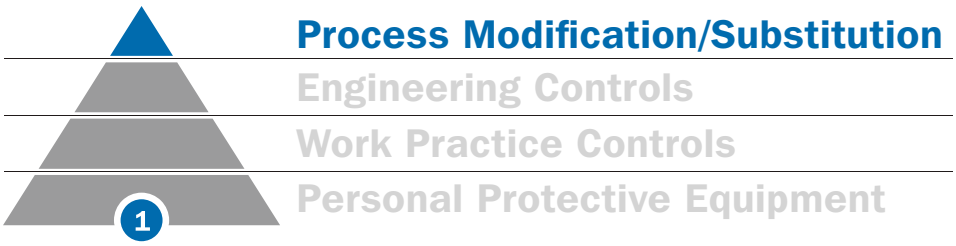
Work practice controls include changes to workplace procedures, policies and the way people work that limit and/or prevent exposure to the hazards. Training, job scheduling and hygiene are examples of work practice controls that can be used to minimize worker exposure to welding fume. Often these controls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

### 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 hazard 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

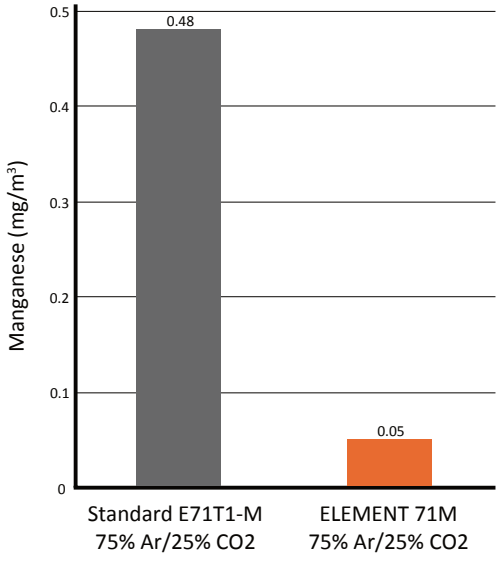
Element wire offers the most comprehensive line of filler metals in the industry that are designed to reduce manganese fume emissions in welding. Conversion to Element products may result in a 60-90% reduction in manganese levels when compared to current filler metal fume emissions.

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.

***Miller recommends*** HOBART FILLER METALS

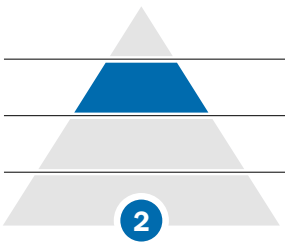
**Hobart Element Wire vs. Standard Wire**

(Values based off of controlled laboratory testing. Due to the vast number of variables involved, results may vary from application to application.)



## Available Diameters and Packaging

| Product | AWS Class | Diameter | Packaging | Part Number |
|---|---|---|---|---|
| FabCOR® Element™ 71T1C | E71T-1C H8, -9C H8, -12C H8 | .045 in | 33 lb Fiber Spool | S292112-029 |
| | | .052 in | 33 lb Fiber Spool | S292115-029 |
| | | 1/16 in | 33 lb Fiber Spool | S292119-029 |
| | | 1/16 in | 60 lb Coil | S292119-002 |
| FabCOR® Element™ 71T1M | E71T-1M H8, -9M H8, -12M H8 | .045 in | 33 lb Fiber Spool | S294112-029 |
| | | .052 in | 33 lb Fiber Spool | S294115-029 |
| | | 1/16 in | 33 lb Fiber Spool | S294119-029 |
| FabCOR® Element™ 71C | E71T1-GC H8 | .045 in | 33 lb Fiber Spool | S297912-029 |
| | | .052 in | 33 lb Fiber Spool | S297915-029 |
| | | 1/16 in | 33 lb Fiber Spool | S297919-029 |
| FabCOR® Element™ 71M | E71T1-GM H8 | .045 in | 33 lb Fiber Spool | S294712-029 |
| | | .052 in | 33 lb Fiber Spool | S294715-029 |
| | | 1/16 in | 33 lb Fiber Spool | S294719-029 |
| FabCOR® Element™ 81K2C | E81T1-GC H8 | .045 in | 33 lb Fiber Spool | S292412-029 |
| | | .052 in | 33 lb Fiber Spool | S292415-029 |
| | | 1/16 in | 33 lb Fiber Spool | S292419-029 |
| FabCOR® Element™ 81K2M | E81T1-GM H8 | .045 in | 33 lb Fiber Spool | S294412-029 |
| | | .052 in | 33 lb Fiber Spool | S294415-029 |
| | | 1/16 in | 33 lb Fiber Spool | S294419-029 |
| FabCOR® Element™ 70C6 | E70C-6M H4 | 0.0045 in | 33 lb Fiber Spool | S294612-029 |
| | | 0.052 in | 33 lb Fiber Stool | S294615-029 |
| | | 0.052 in | 60 lb Coil | S294615-002 |
| | | 1/16 in | 33 lb Fiber Stool | S294619-029 |
| | | 1/16 in | 33 lb Fiber Stool | S294619-002 |




Process Modification/Substitution

**Engineering Controls**

Work Practice Controls

Personal Protective Equipment

# Engineering Controls

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 systems provides total fume extraction solutions for any environment.

## The Talk: Terms and definitions used in this section

**Accu-Rated™:** The true, accurate airflow at the inlet of the collection hood.

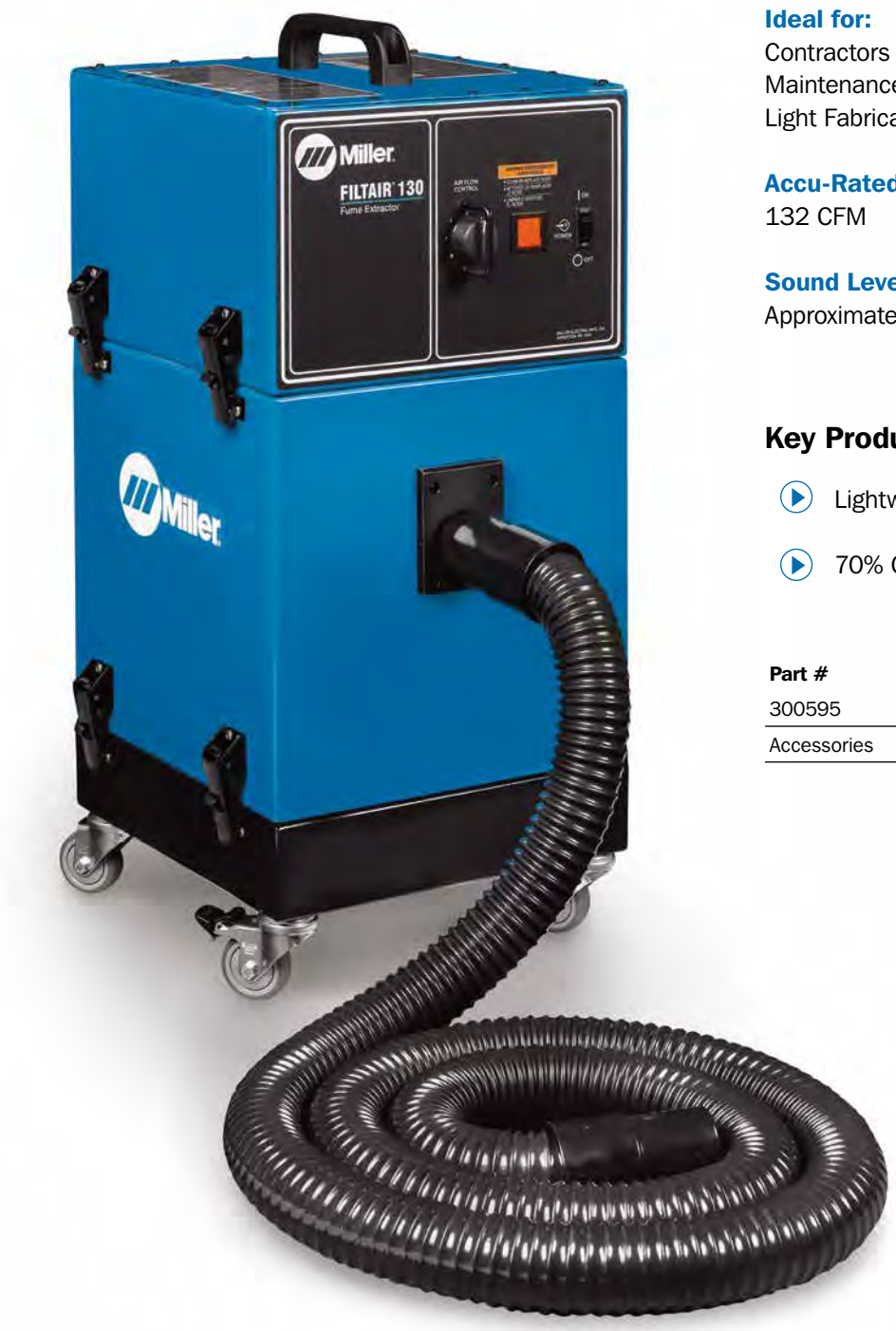
**ZoneFlow™:** Advanced Miller® technology that creates a negative pressure zone, allowing the weld particulate capture distance to be extended up to five feet deep and three feet wide.

**MERV (Minimum Efficiency Reporting Value):** A reliable standard to rate and compare filter media efficiency.

**High Vacuum Extraction Systems:** Draws air in at a high air transport velocity and high pressure, but a low air volume. Typically used to draw air through smaller, highly restrictive hoses or pipes, allowing the accessories to be mobile and reach restricted spaces more easily.

**Low Vacuum Extraction Systems:** Moves higher amounts of airflow (CFM) through larger ducts at a relatively low system pressure, providing a further source capture distance.

# Portable 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

| Part # | Description: |
|---|---|
| 300595 | Model 130 - Includes Filter, 8 ft Hose and 20 ft Power Cord |
| Accessories | See pg. 19 |

# 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.

# ZoneFlow™ Technology

Exclusive ZoneFlow™ Technology increases the capture zone by up to 70% compared to traditional equipment, minimizing operator interaction with the arm and helping to ensure proper use.

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.

# Mobile Extractors

## FILTAIR Capture 5

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

| Part # | Description: |
|---|---|
| 951639 | 208-230 V with 10 ft Pre-Assembled Extraction Arm |
| 951640 | 230 V with 12 ft Pre-Assembled Extraction Arm |
| 951574 | 460 V with 10 ft Pre-Assembled Extraction Arm |
| 951575 | 460 V with 12 ft Pre-Assembled Extraction Arm |

## FILTAIR® MWX

Mobile weld fume extractors designed to easily move with the welder and work. Features ZoneFlow™ Technology

### 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.

**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).

| Equipment and Options | Part # | Description: |
|---|---|---|
| **MWX-D Packages** (Includes mobile extractor, high-efficiency filter and arm) | 951507 | With 7 ft Extraction Arm and Disposable Filter |
| | 951508 | With 10 ft Extraction Arm and Disposable Filter |
| | 951509 | With 12 ft Extraction Arm and Disposable Filter |
| **MWX-S Packages** (Includes mobile extractor, high-efficiency filter and arm) | 951510 | With 7 ft Extraction Arm and Self-Cleaning Mechanism |
| | 951511 | With 10 ft Extraction Arm and Self-Cleaning Mechanism |
| | 951512 | With 12 ft Extraction Arm and Self-Cleaning Mechanism |

# 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. Features ZoneFlow™ Technology.

**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:

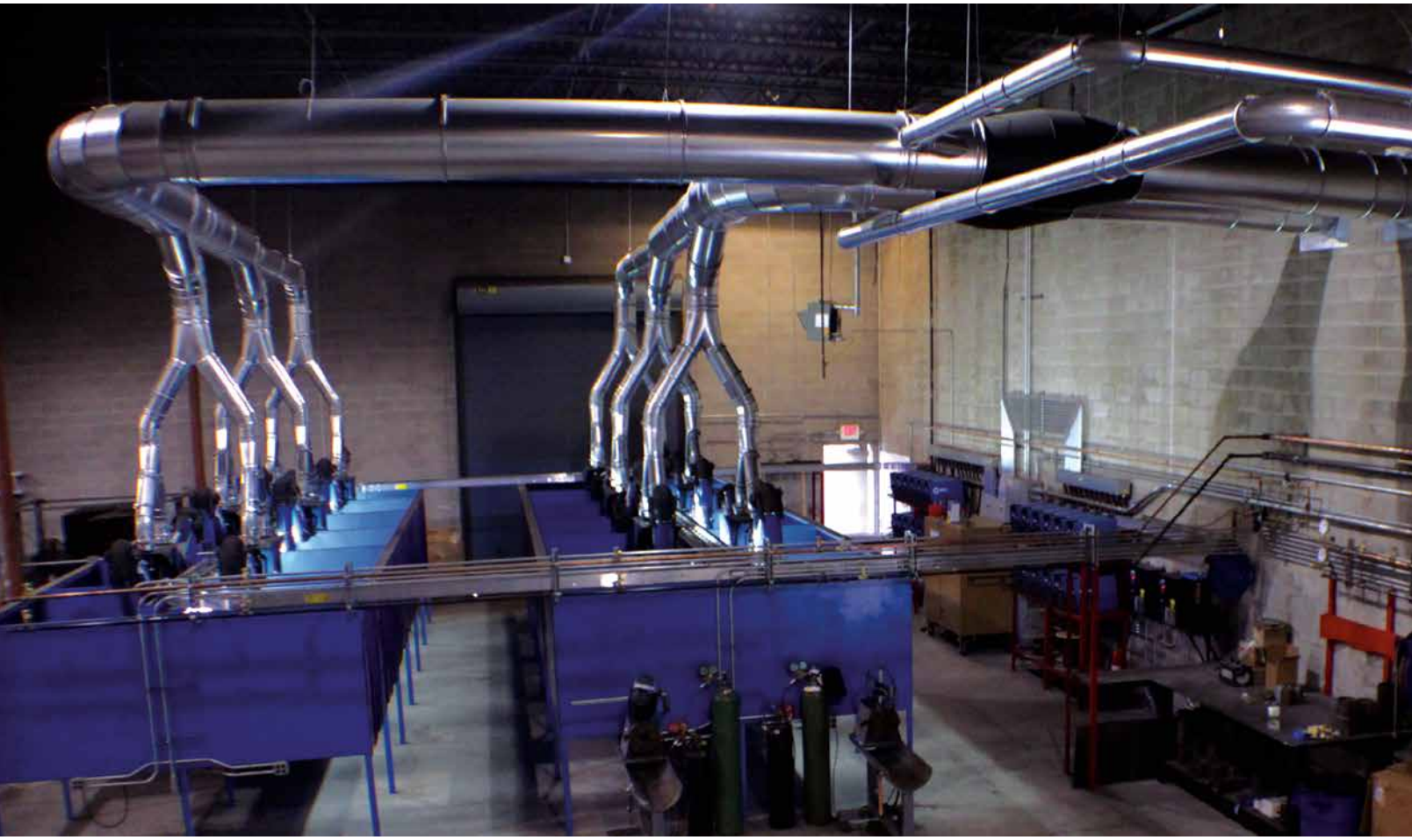
**Easy-to-operate, Pre-assembled Extraction Arms**
Designed to cover larger spaces. Available in 7-, 10-, and 12-foot lengths. External brackets and adjustments allow air to pass through with less resistance giving you stronger CFM (airflow).

**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 | Part # | Description: |
|---|---|---|
| **FILTAIR® SWX-D (Disposable Filter Model) Single-Arm Packages** (Includes SWX-D cabinet, disposable filter, blower, on/off control box, mounting bracket, duct, and 8 in arm. 115 VAC wiring NOT included.) | 951619 | With 3–4.5 ft Telescoping Extraction Arm |
| | 951513 | With 7 ft Standard Extraction Arm |
| | 951514 | With 10 ft Standard Extraction Arm |
| | 951515 | With 12 ft Standard Extraction Arm |
| **FILTAIR® SWX-S (Self-Cleaning Filter Model) Single-Arm Packages** (Includes SWX-S cabinet, self-cleaning control box and filter, blower, on/off control box, mouting bracket, duct, and 8 in arm. 115 VAC wiring NOT included.) | 951620 | With 3–4.5 ft Telescoping Extraction Arm |
| | 951516 | With 7 ft Standard Extraction Arm |
| | 951517 | With 10 ft Standard Extraction Arm |
| | 951518 | With 12 ft Standard Extraction Arm |
| **FILTAIR® SWX Dual-Arm Add-on Packages** (Includes blower, on/off control box, mounting bracket, duct, backdraft dampers, and 8 in arm. 115 VAC wiring NOT included.) | 951621 | With 3–4.5 ft Telescoping Extraction Arm |
| | 951519 | With 7 ft Standard Extraction Arm |
| | 951520 | With 10 ft Standard Extraction Arm |
| | 951521 | With 12 ft Standard Extraction Arm |



# Centralized Extraction Systems

## FILTAIR® 4000-12000

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

# 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®

**Extend and protect the life of your filters and system**

- 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

- Smaller footprint allows FILTAIR systems to fit where others cannot
- Maximize valuable floor space for more profitable work stations, increasing weld time

# FilTek® XL Filters

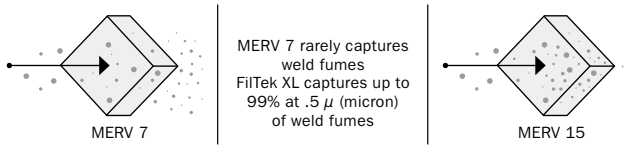
When it comes to selecting a fume extractor, nothing is more important than the filter.

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

Most weld fumes are less than one micron in diameter. Miller FilTek XL filters have the highest MERV ratings in the industry – a class-leading MERV 15 – capturing up to 99% at .5 $\mu$ (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** = Minimum **E** = Efficiency **R** = Reporting **V** = Value




### Filter Media Performance Summary

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

| MERV 15 per ASHRAE 52.2 | < 95% efficient |
|---|---|

| Filter Media Type | Weld Fume Capture Efficiency | Pressure Drop |
|---|---|---|
| Cellulose | Very Low | Low |
| Cellulose Blend | Low | Moderate |
| Spunbond Polyester | Moderate/High | High |
| Meltblown Composite | High | High |
| Miller FilTek XL | High | Low |

### 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**

| Part #: | Description: |
|---|---|
| 301242 | Telescoping Arm, 6 in Diameter |
| 300953 | Standard Arm, 6 in Diameter, 7 ft Arm |
| 300954 | Standard Arm, 6 in Diameter, 10 ft Arm |
| 300955 | Standard Arm, 6 in Diameter, 12 ft Arm |
| 300952 | Arm Mounting Bracket and Ducting Kit, 6 in Diameter |
| 301237 | Telescoping Arm, 8 in Diameter |
| 300980 | Standard Arm, 8 in Diameter, 7 ft Arm |
| 300981 | Standard Arm, 8 in Diameter, 10 ft Arm |
| 300982 | Standard Arm, 8 in Diameter, 12 ft Arm |
| 300771 | Arm Mounting Bracket and Ducting Kit, 8 in Diameter |

**SWX Dual-Arm Add-On Packages**
951621 With Telescoping Arm
951519 With 7 ft Standard Arm
951520 With 10 ft Standard Arm
951521 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**
301267 130 model
300925 400 model

**MWX & SWX Replacement Filters**
300540 Self-cleaning filter models
300539 Disposable filter models

**Capture 5 Replacement Filter**
301106

**Centralized FilTek® XL Replacement Filter**
300927

**Flexible Funnel Magnetic Nozzle**
300668

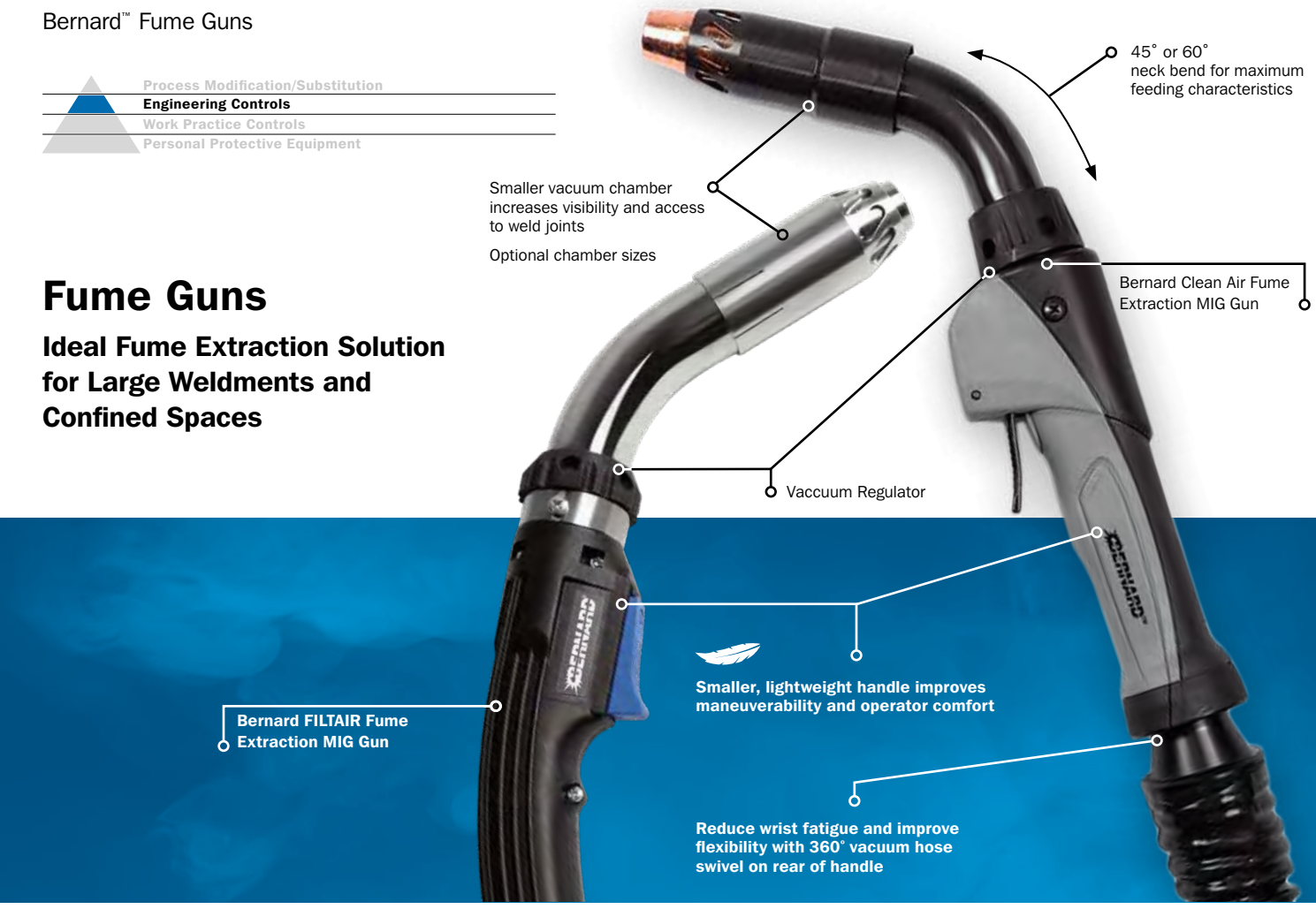
**Magnetic Nozzles**
300895 11.8 in (300 mm) width

**Collection Hose**
300896 17 ft (5.2 m)
300897 34 ft (10.4 m)

**Hood Light with Arc Sensor**
300689 MWX Series
300763 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. Designed 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:

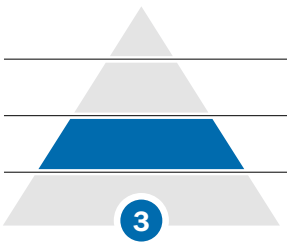
- Available in 300, 400, 500 and 600 amp models
- Lightweight, comfortable and durable design for industrial grade performance
- Nozzle shroud adjusts to one of four positions for optimized fume capture, gas flow and weld access
- Compatible with vacuum systems from most manufacturers
- Suitable for 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 with 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 vacuum systems from 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

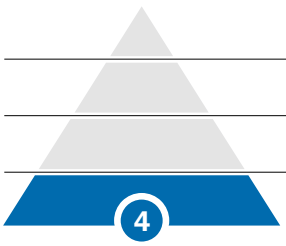
Remove paint or coatings before welding to minimize the release of contaminants

Accurately adjust weld settings to ensure the most stable arc and reduce fume

Properly set up weldcells and fixtures to minimize operator exposure to fume plumes

Correct body positioning so that airflow pulls or pushes fume away from the breathing zone

Improved lens quality lets welder allow more distance between them and the weld, and reduces overwelding




# 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 operators safe, comfortable and productive.

## **The Talk:** Terms and definitions used in this section

**29 CFR 1910.134:** OSHA standard that addresses respirator selection, use, implementation and creating a respiratory protection program.

**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 x OSHA PEL

**WRPP:** OSHA requires an employer to develop and implement a Written Respiratory Protection Program with required worksite-specific procedures and elements for both mandatory and voluntary respirator use. For employees voluntarily using respirators, employers must provide those users with a copy of Appendix D to OSHA 1910.134.

# N95 Disposable Mask Respirator

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

| | | |
|---|---|---|
| NIOSH 42 CFR 84 Certified | APF = 10 | OSHA Classification: Tight-Fitting[1] Respirator |

| **Part #:** | **Description:** |
|---|---|
| 267334-2 | N95 Respirator with Valve |
| 267334 | N95 Respirator with Valve, 10 Pack |
| 267335-2 | N95 Respirator with Valve and Nuisance Level OV Relief[2] |
| 267335 | N95 Respirator with Valve and Nuisance Level OV Relief[2], 10 Pack |

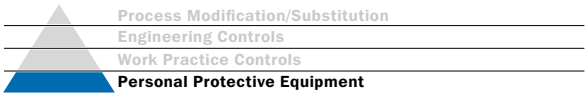
Front View

Back View

## 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 odors[2]
- Ergonomic design allows user to feel more comfortable and less constricted without compromising the efficiency and effectiveness of the mask

[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 Weld-Mask™ 2, maximizing the field of vision. The large, non-return exhaust valve eases breathing and reduces user fatigue.

| | | |
|---|---|---|
| NIOSH 42 CFR 84 Certified | APF = 10 | OSHA Classification: Tight-Fitting[1] Respirator |

| Part #: | Description: |
|---|---|
| ML00894 | LPR-100 Respirator with P100 Filters, Small/Medium |
| ML00895 | LPR-100 Respirator with P100 Filters, Medium/Large |
| ML00994 | LPR-100 Respirator with P100 Nuisance Level OV Relief Filters[2], Small/Medium |
| ML00995 | LPR-100 Respirator with P100 Nuisance Level Ov Relief Filters[2], Medium/Large |
| SA00818 | Replacement P100 Filters, Pair |
| SA00819 | Replacement Combination P100/Nuisance Level OV Relief Filters, Pair |
| 261086 | Quantitative Face-Fit Test Kit |

When use is mandatory, the Miller N95 and LPR-100 Half Mask Respirators need to be fit tested[1] 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

[1] Fit testing is necessary for mandatory use.
[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.
[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[2]
- 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

Front View

Back View

[1] 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 T94-R™, T94i-R™, and Hard Hat head assemblies.

| | | | | |
|---|---|---|---|---|
| NIOSH 42 CFR 84 Certified | APF = 25 | OSHA Classification: Loose-fitting powered air purifying respiration | Hard Hat Certification: ANSI Z89.2 2009 Certified, Type 1, Class C or G | Helmet Lens Certification: Meets ANSI Z87.1+ and CSA Z94.3 Standards |

Audible & vibrating alarms notify user of low battery or restricted airflow

Dual air speeds allow user to adjust volume of air to maximize comfort

Lightweight blower design provides all-day comfort for reduced fatigue

## 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
- Lightweight lithium ion battery provides up to 8 hours of life with no memory retention from frequent charging
- Two batteries included with each system

## T94 Key Product Features:

- Well-balanced design reduces torque on neck, increasing all-day wear
- Patent-pending Dualtec™ manifold system optimizes helmet balance and sound
- 6-point air distribution system maximizes cooling through targeted air placement
- Lightweight low-profile blower assembly with integrated shoulder straps reduces lower back strain and fatigue
- Low-profile breathing-tube attachment eases on/off, and flexible tube material eliminates breathing tube snags in work cell

Industry's largest integrated grind shield. Forty-four sq in of clear viewing area for increased helmet-on time and decreased eye injuries.

## PAPR Systems:

| Part #: | Description: |
|---|---|
| 259385 | PAPR with Hard Hat with Titanium 9400 |
| 261659 | PAPR with Hard Hat with Titanium 9400i with Integrated Grind Shield |
| 264573 | PAPR with T94-R |
| 264575 | PAPR with T94i-R |

## Replacement Parts:

| Part #: | Description: |
|---|---|
| 235673-2 | Filter, Particulate (HEPA) (2 pack) |
| 235673-6 | Filter, Particulate (HEPA) (6 pack) |
| 235673-36 | Filter, Particulate (HEPA) (36 pack) |
| 235674 | Filter, Prefilter (Foam) (6 pack) |
| 268841 | Prefilter, Nuisance Level OV Relief (6 pack) |
| 235676 | Spark Guard |
| 245818 | Grinding Shield (Titanium 9400i) |
| 258974 | Grinding Shield Tear-aways (T94) (5 pack) |

## Accessories:

| Part #: | Description: |
|---|---|
| 244151 | Belt Extension (adds 18 inches in length) |
| 264582 | Leather Belt |

T94i™ & T94™

# Supplied Air Respirator (SAR)

Industrial protection against weld fume and heat stress, our SAR system is available with the T94i-R™ helmet assembly.

| | | | |
|---|---|---|---|
| NIOSH 42 CFR 84 Certified | APF = 25 | Loose-fitting supplied air purifying respirator | Helmet Lens Certification: Meets ANSI Z87.1+ and CSA Z94.3 Standards |

## Key Product Features:

- C50 air regulator can be positioned vertically or horizontally to naturally align with body movements
- C50 air regulator can cool air entering the helmet up to 50 degrees Fahrenheit
- Well-balanced design reduces torque on neck, increasing all-day wear
- Patent-pending Dualtec™ manifold system optimizes helmet balance and sound
- 6-point air distribution system maximizes cooling through targeted air placement
- Lightweight low-profile blower assembly with integrated shoulder straps reduces lower back strain and fatigue
- Low-profile breathing-tube attachment eases on/off process while flexible tube material eliminates breathing tube snags in work cell

C50 Air Regulator

## T94i Key Product Features:

- ***Clear****Light*™ Lens Technology optimizes contrast and clarity in light and welding states
- Shade 5.0 side windows and integrated grind shield maximize downward and peripheral vision, improving sense of surroundings
- Half shade lens settings provide accurate adjustments for optimized comfort and vision

## SAR System:

| Part #: | Description: |
|---|---|
| 264271 | SAR with T94i-R™ |

## Accessories:

| Part #: | Description: |
|---|---|
| 270405 | Hose, straight, 25 ft with Industrial Interchange Quick Disconnect |
| 270407 | Hose, straight, 100 ft with Industrial Interchange Quick Disconnect |
| 270408 | Hose, coiled, 25 ft with Industrial Interchange Quick Disconnect |
| 270410 | Hose, coiled, 100 ft with Industrial Interchange Quick Disconnect |
| 270412 | C50 air regulator |
| 275983 | Two Person BreatheAir Portable Box (10Ppm CO Alarm) |
| 275984 | Two Person BreatheAir Portable Box (5Ppm CO Alarm) (Canada) |
| 275985 | Four Person BreatheAir Portable Box (10Ppm CO Alarm) |
| 275986 | Four Person BreatheAir Portable Box (5Ppm CO Alarm) (Canada) |

Four Person BreatheAir™ Portable Box

Straight Air Hose

Coiled Air Hose

# 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 injuries 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.


**30** Introduction

**34** Choosing the Right Lens

**36** Helmet Selection Chart

**38** Helmets
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- 39 Classic Series
- 42 Digital Performance™ Series
- 44 Digital Elite™ Series
- 46 Digital Infinity™ Series
- 48 T94™ Series

**50** Weld-Mask™

**51** Helmet Accessories

**54** Safety & Cutting Glasses

## 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 (ex. safety glasses), per OSHA.

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

## STATISTICS & TRENDS: Head & Face

### 61%

Sixty-one percent of on-the-job eye injuries happen in manufacturing, construction and trade.[3]

### $300 Million

Eye injuries alone cost more than $300 million per year in lost production time, medical expenses and worker compensation.[4]

[1] http://science.howstuffworks.com/dictionary/physics-terms/ultraviolet-radiation-info.htm
[2] http://science.howstuffworks.com/infraredradiation-info.htm
[3] US Bureau of Labor Statistics, 2012
[4] https://www.osha.gov/SLTC/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

| Lens | Passive (Shade 10) | Auto Darkening | |
|---|---|---|---|
| **Shade Type** | Fixed Shade | Fixed Shade | Variable Shade |
| **Inactive Shade Coverage** | #10 | #3 or #4 | #3 or #4 |
| **Active Shade Coverage** | #10 | Shade Dependent | #5 - #13 |

### 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 source, 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

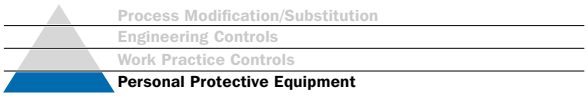
### Fixed Shade Lens vs. Variable Shade Lens

**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 traditional or bench welding applications.




# Eye Protection Against Radiant Energy

## Choosing the Right Lens

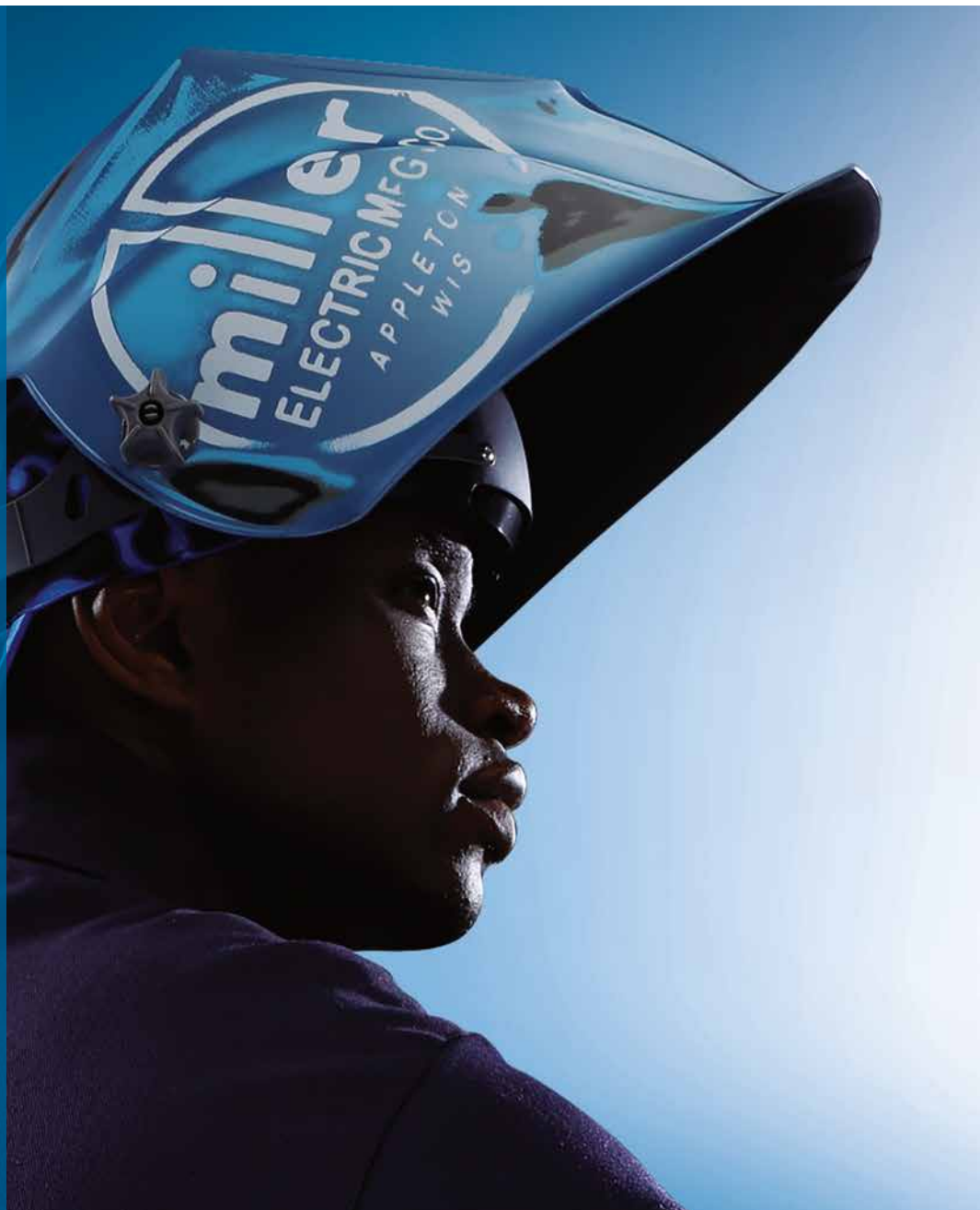
OSHA requires specific eye protection to ensure workers are safe. As a rule of thumb, start with a shade that is too dark to see the weld zone. Then, go to a lighter shade that gives a sufficient view of the weld zone without going below the minimum. During oxygen gas welding or cutting, where the torch 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 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.

**Z89.1-2014**
Upon request, accessory manufacturers (welding helmets) are required to prove that their components do not cause the hard hat to fail.



## Filter Lenses for Protection During Shielded Metal Arc Welding[1]

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

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

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

## Filter Lenses for Gas Welding and Oxygen Cutting Operations

| Operation | Electrode Size | Arc Current (Amperes) | OSHA Minimum Protective Shade Number |
|---|---|---|---|
| Gas Welding | Under 1/8 in (3.2 mm) | 4 | 5 |
| | 1/4 in to 1/2 in (3.2- 12.7 mm) | 5 | 6 |
| | Over 1/2 in (12.7 mm) | 6 | 8 |
| Oxygen Welding | Under 1 in (25 mm) | 3 | 4 |
| | 1 in to 6 in (25-150 mm) | 4 | 5 |
| | Over 6 in (150 mm) | 5 | 6 |

[1] https://www.osha.gov/Publications/OSHAfactsheet-eyeprotection-during-welding.pdf
* 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.

| | MP-10™ | Classic Series FS#10 Flip-Up | Classic Series Variable Shade | Classic Series VSi™ |
|---|---|---|---|---|
| **Viewing Area** | 16 sq in | 5.1 sq in | 5.2 sq in | 5.15 sq in |
| ***Clear**Light*™ Lens Technology** | No | No | No | No |
| **Shades** | Weld: 10 | Weld: 10 | Weld: 8-12 | 8-13 |
| **Modes** | Weld | Weld | Weld | Weld/X-Mode |
| **Integrated Grind Shield** | No | Yes | No | Yes |
| **Auto-on** | No | Yes | Yes | Yes |
| **Sensors** | - | 2 | 2 | 3 |
| **TIG Rating** | - | 20 amps | 20 amps | 5 amps/below |
| **Switching Speed** | - | 1/3,600 | 1/10,000 | 1/20,000 |
| **Digital Controls** | No | No | No | No |
| **Premium Headgear** | No | No | No | No |
| **InfoTrack™** | No | No | No | No |
| **Weight** | 18 oz (510 g) | 14 oz (396 g) | 16 oz (454 g) | 23 oz (652 g) |

| | Digital Performance™ | Digital Elite™ | Digital Infinity™ Largest in Industry! | T94™ |
|---|---|---|---|---|
| **Viewing Area** | 7.2 sq in | 9.2 sq in | 13.4 sq in | 9 sq in |
| ***Clear**Light*™ Lens Technology** | Yes | Yes | Yes | Yes |
| **Shades** | Grind: 3<br>Cut: 5-8<br>Weld: 8-13 | Grind: 3<br>Cut: 5-8<br>Weld: 8-13 | Grind: 3<br>Cut: 5-8<br>Weld: 8-13 | Grind: 3<br>Cut: 5-8<br>Weld: 8-13 |
| **Modes** | Weld/Cut/Grind | Weld/Cut/Grind/X-Mode | Weld/Cut/Grind/X-Mode | Weld/Cut/Grind/X-Mode |
| **Integrated Grind Shield** | No | No | No | No (T94)<br>Yes (T94i) |
| **Auto-on** | Yes | Yes | Yes | Yes |
| **Sensors** | 3 | 4 | 4 | 4 |
| **TIG Rating** | 5 amps | 5 amps/below | 5 amps/below | 3 amps/below |
| **Switching Speed** | 1/20,000 | 1/20,000 | 1/20,000 | 1/20,000 |
| **Digital Controls** | Yes | Yes | Yes | Yes |
| **Premium Headgear** | Yes | Yes | Yes | Yes |
| **InfoTrack™** | No | No | Yes - 1.0 | Yes - 2.0 |
| **Weight** | 17 oz<br>(482 g) | 18 oz<br>(510 g) | 22 oz<br>(624 g) | **T94** 21.1 oz (595 g)<br>**T94i** 26 oz (737 g) |

**X-Mode**™ electromagnetically senses the weld to eliminate sunlight interference and continuously detects the arc even when sensors are blocked.

**InfoTrack™ Data Monitoring Technology** tracks arc time and features a clock. Version 2.0 adds arc count.

# MP-10™ Series

Best-in-class traditional passive helmet.

| | |
|---|---|
| Meets ANSI Z87.1+ and CSA Z94.3 Standards | 90 Day Limited Warranty |

Large
Viewing Area

**Viewing Area:** 16 sq in

**Arc Sensors:** N/A

**Operating Modes:** N/A

**Weight:** 18 oz

| Part #: | Description: |
|---|---|
| 238497 | Black (Each) |
| 770246 | Replacement Ratchet Headgear |

Black

# Classic Series

Helmets for the value-minded welder.

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

Auto On/Off

X-Mode*
*VSi only

Black - Variable Shade

Black - FS#10 2x4 Flip-Up

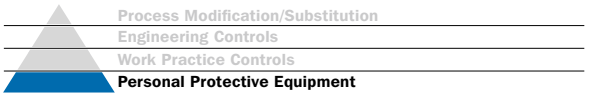
Black – VSi

Rise™

Metalworks™

Viewing area, operating modes and weight differ by model. See chart on page 36 for more information.

| Part #: | Description: |
|---|---|
| 251292 | Black – Variable Shade |
| 263038 | Black – FS#10 2x4 Flip-Up |
| 263038 | Black – VSi |
| 271346 | Metalworks™ |
| 271349 | Rise™ |
| 770246 | Replacement Headgear |




# *Clear*Light™ Lens Technology

## High-definition optics for precision arc recognition

## See what you've been missing.

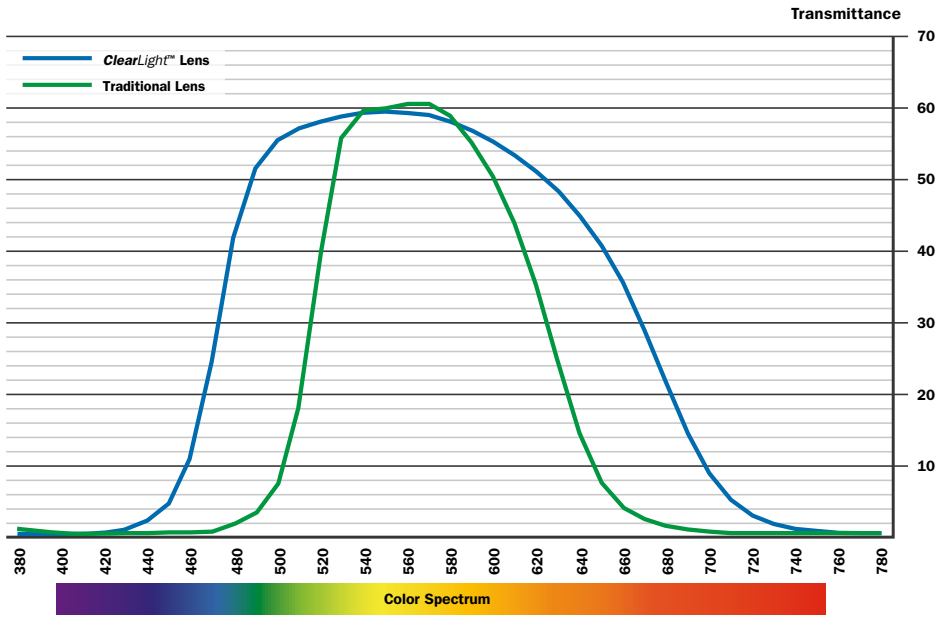
Designed by welders, for welders – ***Clear***Light™ Lens Technology is engineered to complement the colors emitted from the welding arc, enhancing clarity and natural color so that you can see more detail. Having confidence in what you see allows you to perform at a higher level, creating better welds with less rework.

**Now available in T94™, Digital Infinity™, Digital Elite™ and Digital Performance™ Series helmets.**

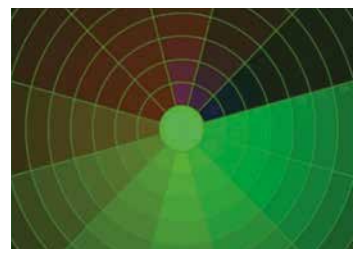
***Clear***Light™ Lens Technology

## LENS TINT MATTERS

- When developing ***Clear****Light*™ Lens Technology our goal was to be sure our lens tint fell within a specific parameter on the color bandwidth, allowing more colors of the spectrum to come through the lens for natural, accurate tones.
- Many other lenses have an artificial blue or yellow tint to them, which doesn't provide as much contrast and clarity, and can lead to increased eye fatigue.



***Clear****Light*™ Lens Technology



Traditional Lens Technology

## BRIGHTNESS COUNTS

- Auto-darkening welding lenses block light even when a welder isn't striking an arc. ***Clear****Light*™ Lens Technology is designed to minimize light blockage – giving welders a brighter light state to see their surroundings.
- Our 1/1/1/2 optical clarity rating provides a 3.0 light state that allows welders to keep the helmet down in between welds and for non-welding tasks, increasing productivity and helping to prevent eye injuries.

***Clear****Light*™ Lens Technology

Traditional Lens Technology

# Digital Performance™ Series

Lightweight helmet with superior headgear for ultimate comfort.

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

**Viewing Area:** 7.2 sq in

**Arc Sensors:** 3

**Operating Modes:** 3 – Weld, Cut, Grind

**Weight:** 17 oz

| Part #: | Description: |
|---|---|
| 282000 | Black |
| 282001 | Blue Rage™ |
| 282002 | '64 Custom™ |
| 256174 | Replacement Headgear |

Black

Blue Rage™

64 Custom™

***Clear**Light*™ Lens Technology

Enhanced Headgear

Digital Controls

Auto On/Off

Flexible, ergonomic design provides enhanced support and stability.

# Digital Elite™ Series

Industry-leading helmet provides high-performance versatility.

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

**Viewing Area:** 9.2 sq in

**Arc Sensors:** 4

**Operating Modes:** 4 – Weld, Cut, Grind & X-Mode™

**Weight:** 18 oz

| Part #: | Description: |
|---|---|
| 281000 | Black |
| 281001 | Lucky's Speed Shop™ |
| 281002 | Stars and Stripes™ III |
| 281003 | Inferno™ |
| 281004 | Vintage Roadster™ |
| 281006 | Cat® - 1st Edition |
| 281007 | Raptor™ |
| 256174 | Replacement Headgear |

Black

Lucky's Speed Shop™

Stars and Stripes™ III

Inferno™

Vintage Roadster™

Cat® - 1st Edition

Raptor™

Flexible, ergonomic design provides enhanced support and stability.

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***Clear**Light*™ Lens Technology – Provides a hi-definition, natural color view that leads to reduced eye strain, better welds and less rework.

Enhanced Headgear

Digital Controls

X-Mode™

Auto On/Off

# Digital Infinity™ Series

Industry's largest viewing area maximizes visibility.

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

**Viewing Area:** 13.4 sq in

**Arc Sensors:** 4

**Operating Modes:** 4 – Weld, Cut, Grind & X-Mode™

**Weight:** 22 oz

| Part #: | Description: |
|---|---|
| 280045 | Black |
| 280047 | Black Ops™ |
| 280048 | Departed™ |
| 280049 | Stars and Stripes™ |
| 282007 | Cat® - 2nd Edition |
| 271325 | Replacement Headgear with Comfort Cushion |

Black

Black Ops™

Departed™

Stars and Stripes™

Cat® - 2nd Edition

Oversized comfort cushion provides unsurpassed comfort and stability

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Black Ops™

## 13.4 square inches

The largest view helmet for demanding applications

**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.

***Clear**Light*™ Lens Technology

Enhanced Headgear

Digital Controls

X-Mode™

Auto On/Off

# T94™ Series

Maximized comfort, visibility and productivity for the professional welder.

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

T94™

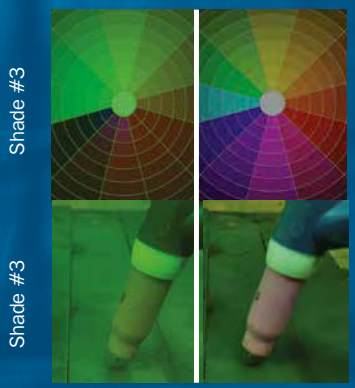
T94i™

| | |
|---|---|
| **Part #:** | 260482 |
| **Viewing Area:** | 9 sq in |
| **Arc Sensors:** | 4 |
| **Operating Modes:** | 4 – Weld, Cut, Grind & X-Mode™ |
| **Weight:** | 21.1 oz |
| **Integrated Grinding Shield:** | No |
| **External Grind Button:** | Yes |

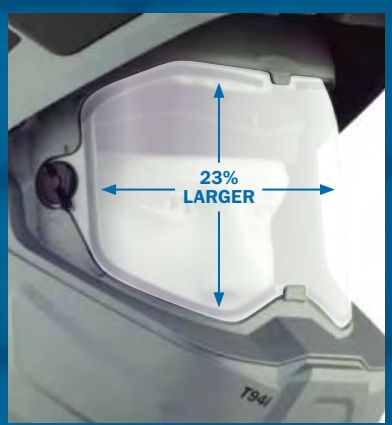
| | |
|---|---|
| **Part #:** | 260483 |
| **Viewing Area:** | 9 sq in (ADF); 44 sq in (Clear Grind Shield) |
| **Arc Sensors:** | 4 |
| **Operating Modes:** | 4 – Weld, Cut, Grind & X-Mode |
| **Weight:** | 26 oz |
| **Integrated Grinding Shield:** | Yes |
| **External Grind Button:** | No |

***Clear**Light*™ Lens Technology – High-definition optics for precision arc recognition.

Traditional Lens Technology **VS** ***Clear**Light*™ Lens Technology




**T94i™ Clear Grind Shield** – Maximizes downward and peripheral visibility




**T94™ External Grind Mode** – Switch to grind mode with the push of a button

# Weld-Mask™

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

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

| Part #: | Description: |
|---|---|
| 267370 | Weld-Mask™ |
| 280982 | Weld-Mask™ 2 |

## Overall Key Product Features:

- Compact auto-darkening lenses allow users to weld in spaces where access with traditional welding helmets is limited.
- Soft close-fitting eye covering provides total darkness for precision welding.
- Face shield and flame-resistant head cover provide coverage for UV/IR rays and applications with limited spatter.
- Ideal for use with hard hats. Both Weld-Mask models fit under a hard hat without the need of an adapter.

## Weld-Mask Additional Features:

- Ideal for auto restoration and other DIY environments. Narrow design provides protection without getting in the way.
- Shades 5, 7, 9, 11 and 13 for use with MIG, TIG, stick, and gas welding and cutting.
- Extremely lightweight (7.8 oz), virtually eliminates neck strain.

Weld-Mask™

## Weld-Mask 2 Additional Features:

- Ideal for industrial or construction environments. Can be worn with a Miller® Half Mask Respirator and Miller® Classic safety glasses.
- Shades 5-13 for use with MIG, TIG, stick, and gas welding and cutting.
- Wide singular lens provides unmatched auto-darkening range of visibility.
- X-Mode™ electromagnetically senses the weld to eliminate sunlight interference and continuously detects the arc even if sensors are blocked.

X-Mode™
(Weld-Mask 2 only)

Flashlight accessory* converts your Weld-Mask 2 into a headlamp, freeing both hands for welding

Miller LPR-100 Half Mask respirator* and Classic safety glasses* seamlessly fit under Weld-Mask 2 for added safety and compliance

*Items sold separately

Weld-Mask™ 2

External controls for quick and convenient access

Lightweight design virtually eliminates neck strain

# Accessories

**Weld-Mask**

| Part #: | Description: |
|---|---|
| 267420 | Front Cover Lens |
| 267421 | Weld-Mask™ FR Head Cover* |
| 270055 | CR2032 Replacement Battery |

**Weld-Mask 2**

| Part #: | Description: |
|---|---|
| 280985 | Front Cover Lens |
| 280983 | Weld-Mask 2 FR Head Cover* |
| 217043 | CR2450 Replacement Battery |

* For use with Weld-Mask auto-darkening goggles, or under a traditional welding helmet for added protection

# Helmet Consumables

**Cover Lenses**

| Part #: | Description: | Quantity: |
|---|---|---|
| 231411 | Front: Classic, Classic VS, Pro-Hobby | 5 pkg |
| 231410 | Inside: Classic, Classic VS, Classic VSi, Pro-Hobby | 5 pkg |
| 231921 | Front: Performance | 5 pkg |
| 770237 | Inside: Performance, Titanium 7300, 2x4 Flip-Up | 5 pkg |
| 216326 | Front: Elite, Titanium 1600, Titanium 1600i, Titanium 7300, Titanium9400, Titanium 9400i, MP-10 | 5 pkg |
| 216327 | Inside: Elite, Titanium 9400, Titanium 9400i | 5 pkg |
| 271320 | Front: Infinity | 5 pkg |
| 271319 | Inside: Infinity | 5 pkg |
| 235628 | Inside: Titanium 1600i, MP-10 Front: Classic VSi | 5 pkg |
| 261830 | Grind Shield: 2x4 Flip-Up | |
| 265304 | Front: T94, T94i | 5 pkg |
| 216327 | Inside: T94, T94i | 5 pkg |
| 258979 | Grind Shield: T94i | |
| 245818 | 9400i & VSi Replacement Grind Shield | |
| 260197 | Side Window Covers: T94, T94i | |

**Bulk Cover Lenses**

| Part #: | Description: | Quantity: |
|---|---|---|
| 216326B | Front: Elite, Titanium, MP-10 | 50 pkg |
| 216327B | Inside: Elite, Titanium, 9400i | 50 pkg |
| 231921B | Front: Performance | 50 pkg |
| 770237B | Inside: Performance | 50 pkg |
| 231411B | Front: Pro-Hobby, Classic | 50 pkg |
| 265304B | Front: T94, T94i | 50 pkg |
| 216327B | Inside: T94, T94i | 50 pkg |

**Magnifying Lenses**

| Part #: | Magnification: | Part #: | Magnification: |
|---|---|---|---|
| 212242 | 2.5 | 212237 | 1.25 |
| 212241 | 2.25 | 212236 | 1.00 |
| 212240 | 2.00 | 212235 | .75 |
| 212239 | 1.75 | | |
| 212238 | 1.5 | | |

# Head & Face Accessories

**Slotted Hard Hat Adapter**
259637

Compatible with most slotted hard hats.
(Helmet and hard hat not included)

**Halo Hard Hat Adapter**
213110 (XL and XLi Series)
222003 (Titanium, XLix, Elite, Performance, ProHobby, Classic and MP-10 Series)
265315 (T94 Series)

Compatible with Fibre Metal and MSA hard hats. Other brands may or may not fit. (Helmet and hard hat not included)

**Helmet Hook**
251018

- Holds your helmet or grinding shield
- Silicone strap secures helmet in place

***Miller recommends*** MSA The Safety Company

**Fabric Headband**
770249

**Lithium Battery - CR2450**
217043

**T94 Helmet Bib**
279078

- Flame-resistant material provides additional neck coverage

**T94™ Helmet Cape**
279080

- Flame-resistant material provides additional back-of-neck coverage

**Helmet Bib**
253882

- WeldX™ helmet bib provides added protection
- Velcro® attachment
  Fits all series except T94

**Job-Site Tool Bag**
228028

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

**Helmet Bag with Miller® Logo**
770250

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

**2x4 Auto-Darkening Lenses**
770660 (Shade 8)
770659 (Shade 9)
770226 (Shade 10)
770961 (Shade 11)

- Auto-On/Auto-Off
- Light state shade #3
  Fits all 2x4 inch windows. 2-year warranty

**Headgear - Gen 1**
770246

**Headgear - Gen 2**
256174

**Headgear - Gen 3**
271325

**Headgear - Gen 4**
260486

# Safety and Cutting Glasses

Meets ANSI Z87.1+ 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

| Frame Style/Color | Lens | Part # |
|---|---|---|
| **Classic** | Clear | 272187 |
| **Classic with Strap** | Clear | 272188 |
| **Spark™** | Clear | 272190 |
| **Spatter™ - Black** | Clear | 272191 |
| | Smoke | 272195 |
| **Spatter™ - White** | Clear | 272198 |
| | Smoke | 272199 |
| **Slag™ - Black** | Clear | 272201 |
| | I/O | 272202 |
| | Smoke | 272203 |
| | #3 | 272204 |
| | #5 | 272205 |
| **Slag™ - White** | I/O | 272207 |
| | Smoke | 272208 |
| | #3 | 272196 |
| | #5 | 272209 |

### 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

Clear

I/O

Smoke

#3

#5

# 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.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- 63 Classic

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- 66 Classic FR Cotton
- 68 INDURA® FR Cotton
- 69 Combo
- 70 WeldX™
- 72 Leather

## 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 800º 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.

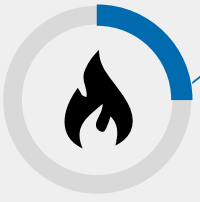
## The Statistics: Hand & Body

**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
[2] http://www.ansellpro.com/main/pressRoom_whitePapers_details.asp?rId=35

# 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[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.

[1] http://www.aws.org/technical/facts/FACT-33.pdf

The Power of Blue®

# Welding Gloves

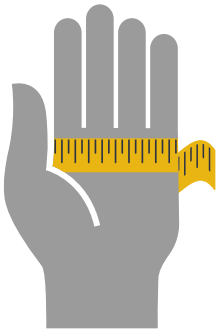
Although extremely preventable, hand injuries are a common workplace injury. The number one reason workers remove hand protection is due to discomfort[1]. Miller gloves are designed using a three-dimensional pattern to provide an excellent fit, resulting in unprecedented comfort and dexterity – keeping 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



| Size: | Inch: |
|---|---|
| XS | 6 - 7 |
| S | 7 - 8 |
| M | 8 - 9 |
| L | 9 - 10 |
| XL | 10 - 11 |
| XXL | 11 - 12 |

### Glove Features

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

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



[1] http://www.ishn.com/articles/print/98084-taking-off-the-gloves-theres-no-reason-for-noncompliance

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

Double-layered insulated pig skin palm provides extreme durability and protection

Strategically placed patches on palm and back for extended glove life

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.

## 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

## 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

## TIG

- Completely unlined for heightened feel and dexterity
- Triple 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

## 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

## 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

## TIG/Multitask

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

## 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



See page 63 for sizing and part number information

# Classic Gloves

Traditional design for the value-minded welder.

## Heavy-Duty MIG/Stick

- Reflective insulation on back reduces heat impact
- Moisture-wicking fleece and foam insulation
- Pig grain palm, pig split back and cuff

## MIG

- Reinforcement patches enhance durability
- Moisture-wicking fleece and foam insulation
- Pig split leather palm, back and cuff

## MIG

- Reinforcement patches enhance durability
- Moisture-wicking fleece and foam insulation
- Goat split palm, pig split back and cuff

## TIG

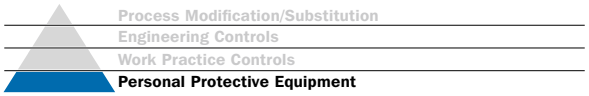
- Thin internal padding for added comfort
- Unlined palm for precise dexterity
- Sheep grain palm, goat split back, pig split cuff

### Classic Gloves

| | M | L | XL | 2XL |
|---|---|---|---|---|
| **Extra Heavy Duty MIG/Stick** | – | 271877 | 271887 | – |
| **MIG** | – | 271888 | 271889 | – |
| **MIG** | – | 271890 | 271891 | 269615 |
| **TIG** | 271892 | 271893 | 271894 | 269616 |

### Performance Gloves

| | XS | S | M | L | XL | 2XL |
|---|---|---|---|---|---|---|
| **Heavy Duty MIG Stick (Long Cuff)** | – | – | – | – | 263342 | – |
| **Heavy Duty MIG Stick** | – | – | – | 263339 | 263340 | 269615 |
| **MIG/Stick** | – | – | – | 263343 | 263344 | 269616 |
| **MIG (Lined)** | – | – | 263332 | 263333 | 263334 | 269618 |
| **TIG** | 263345 | 263346 | 263347 | 263348 | 263349 | – |
| **TIG/Multitask** | – | 263352 | 263353 | 263354 | 263355 | – |
| **Work** | – | – | 266041 | 266042 | 266043 | – |
| **Metalworker** | – | – | 251066 | 251067 | 251068 | – |




# 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

| Fabric | Description | Cost | Durability | Protection Level |
|---|---|---|---|---|
| **Classic FR Cotton** | Ideal for everyday use. Nine ounce, flame-resistant, pre-shrunk fabric features quality material without compromising your bottom line. | $ | • | Light-Duty |
| **INDURA® FR Cotton** | 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. | $$ | •• | Light-Duty |
| **Combo** | Perfect mix of top-grain leather and Indura FR cotton, providing additional protection in high-exposure areas. | $$$ | ••• | Medium-Duty |
| **WeldX™** | 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. | $$$$ | •••• | Medium-Duty |
| **Leather** | Top-grain pigskin leather withstands sparks and spatter for long-term industrial use. | $$$$ | ••••• | Heavy-Duty |

Miller
Miller

# 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

| | S | M | L | XL | 2XL | 3XL | 4XL | 5XL |
|---|---|---|---|---|---|---|---|---|
| **Part #** | 244749 | 244750 | 244751 | 244752 | 244754 | 244755 | 244756 | 244758 |
| **Chest Width** | 42 in | 46 in | 50 in | 54 in | 58 in | 62 in | 66 in | 70 in |
| **Sleeve Length** | 31 in | 32 in | 33 in | 34 in | 35 in | 36 in | 37 in | 38 in |
| **Shoulder Width** | 15.5 in | 17 in | 18.5 in | 20 in | 21.5 in | 23 in | 24.5 in | 26 in |

**All Classic FR cotton** apparel features finished hems and reinforced stitching for enhanced durability.

**Classic FR Cotton**

## Classic FR Cotton Apron

247149

- 35 inch length
- Convenient adjustable drawstring ensures a superior fit around the neck and waist
- Accessible front pocket

## Classic FR Cotton Sleeves

247148

- 18 inch length
- Innovative one-handed cinch closure for easy adjustability
- "Fold-in" sleeve snaps for a better fit around the wrist

# 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

Men's Jacket

Women's Jacket

## 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
- 30 inch torso length

## INDURA® FR Cotton
### 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

| | M | L | XL | 2XL |
|---|---|---|---|---|
| **Part Number** | 258097 | 258098 | 258099 | 258100 |
| **Chest Width** | 48 in | 52 in | 56 in | 60 in |
| **Sleeve Length** | 33 in | 34 in | 35 in | 36 in |
| **Shoulder Width** | 19 in | 20 in | 21 in | 22 in |

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

| | M | L | XL | 2XL |
|---|---|---|---|---|
| **Part Number** | 264380 | 264381 | 264382 | 264383 |
| **Shoulder Width** | 16 in | 18 in | 19 in | 20 in |
| **Chest Width** | 21 in | 23 in | 25 in | 26 in |
| **Sleeve Length** | 33 in | 34 in | 36 in | 38 in |
| **Torso Length** | 25 in | 26 in | 27 in | 27 in |

# 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
- 30 inch torso length

## Combo Sleeves

231096

- 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

231125

- Provides added protection where you need it for extended jacket life
- Patented hidden snap design

## Combo Jacket Sizing

| | S | M | L | XL | 2XL | 3XL | 4XL | 5XL |
|---|---|---|---|---|---|---|---|---|
| **Part Number** | 231080 | 231081 | 231082 | 231083 | 231084 | 231085 | 231086 | 231087 |
| **Chest Width** | 44 in | 46 in | 50 in | 52 in | 58 in | 62 in | 65 in | 69 in |
| **Sleeve Length** | 32 in | 33 in | 34.5 in | 35 in | 37 in | 37.5 in | 39.5 in | 40 in |
| **Shoulder Width** | 17.5 in | 18 in | 19 in | 20 in | 22 in | 23 in | 24 in | 25 in |

# WeldX™

## A Miller® exclusive

MEDIUM DUTY

## 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

| | S | M | L | XL | 2XL | 3XL | 4XL | 5XL |
|---|---|---|---|---|---|---|---|---|
| **Part #** | 244749 | 244750 | 244751 | 244752 | 244754 | 244755 | 244756 | 244758 |
| **Chest Width** | 42 in | 46 in | 50 in | 54 in | 58 in | 62 in | 66 in | 70 in |
| **Sleeve Length** | 31 in | 32 in | 33 in | 34 in | 35 in | 36 in | 37 in | 38 in |
| **Shoulder Width** | 15.5 in | 17 in | 18.5 in | 20 in | 21.5 in | 23 in | 24.5 in | 26 in |

## WeldX™ Cape Sleeves

- 7 oz WeldX front and sleeves combined with 9 oz Flame-resistant Navy cotton back provide optimal protection
- Miller bib accessory can be attached along the chest
- Barracuda style stand-up collar for extra neck protection
- Pre-shrunk fabric
- "Fold-in" sleeve snaps for a better fit around the wrist]

## WeldX™ Bib

247133

- 19 inch length
- Adjustable belt closure provides a quick easy-on/easy-off option

## WeldX™ Cape Sleeves Part Numbers

| | S | M | L | XL | 2XL | 3XL | 4XL | 5XL |
|---|---|---|---|---|---|---|---|---|
| **Cape Sleeves** | 247122 | 247123 | 247124 | 247126 | 247127 | 247128 | 247130 | 247131 |

# 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

### Grain 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
- 30 inch torso length

### Grain Leather Jacket Sizing & Part Numbers

| | L | XL | 2XL |
|---|---|---|---|
| **Part Number** | 231090 | 231091 | 231092 |
| **Chest Width** | 52 in | 56 in | 60 in |
| **Sleeve Length** | 34 in | 35 in | 36 in |
| **Shoulder Width** | 20 in | 21 in | 22 in |

## Key Product Features:

- Premium pig split leather
- Sewn entirely with Kevlar® thread for added durability at each seam

### Split Leather Jacket

- Extended rear tail for additional protection
- “Expandable” leather strategically placed for optimal mobility
- Mesh lining for comfort and breathability
- Sewn entirely with Kevlar® thread, adding structural durability at each seam

### Split Leather Jacket Sizing & Part Numbers

| | S | M | L | XL | 2XL | 3XL | 4XL | 5XL |
|---|---|---|---|---|---|---|---|---|
| **Part Number** | 273212 | 273213 | 273214 | 231091 | 273216 | 273217 | 273218 | 273219 |
| **Chest Width** | 44 in | 48 in | 52 in | 56 in | 60 in | 64 in | 68 in | 72 in |
| **Sleeve Length** | 32 in | 33 in | 34 in | 35 in | 36 in | 37 in | 38 in | 39 in |
| **Shoulder Width** | 18 in | 19 in | 20 in | 21 in | 22 in | 24 in | 25 in | 27 in |

## General Fabric Care

**Classic FR, INDURA®, WeldX™**
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, 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.

74 Introduction

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## **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.

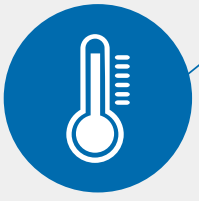
**Body Heat Balance:** Steady state equilibrium between body heat production and heat loss to the environment.

**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.

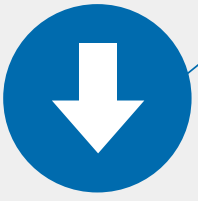
**Threshold Limit Values (TLV):** Guidelines designed for use by industrial hygienists in making decisions regarding safe levels of exposure to various chemical substances and physical agents found in the workplace.

## **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

# 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.

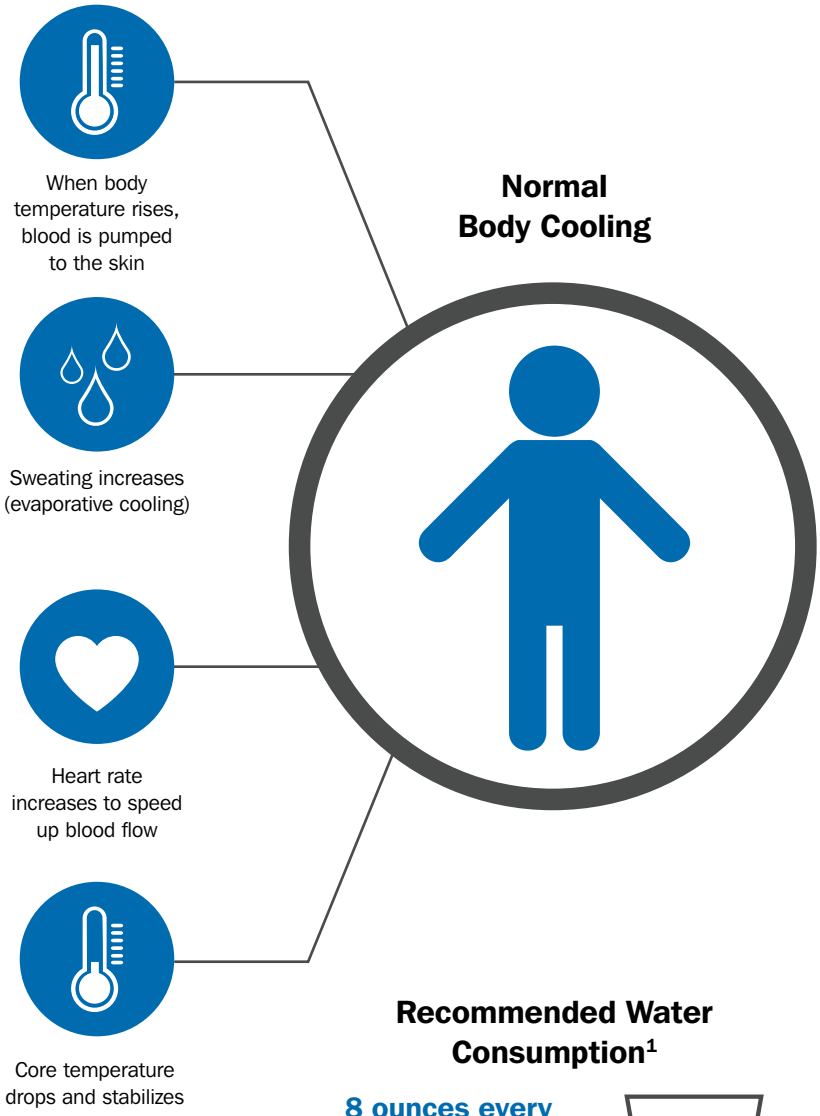
## Know the symptoms

- 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

If someone is experiencing heat stroke, do not have them drink water, as they could aspirate and have further complications




### Recommended Water Consumption[1]

**8 ounces every 15 to 20 minutes**

During moderate activity in moderately hot conditions

# Types of Heat Stress[1]

**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)

| Heat Index | Risk Level | Protective Measures[2] |
|---|---|---|
| Less than 91° | Lower (Caution) | Basic heat safety and planning |
| 91°F to 103°F | Moderate | Implement precautions and heighten awareness |
| 103°F to 115°F | High | Additional precautions to protect workers |
| Greater than 115°F | Very High to Extreme | Triggers even more aggressive protective measures |

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.

[1] http://www.cdc.gov/niosh/topics/heatstress
[2] https://www.osha.gov/SLTC/heatillness/heat_index/index.html

# 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.

## 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.

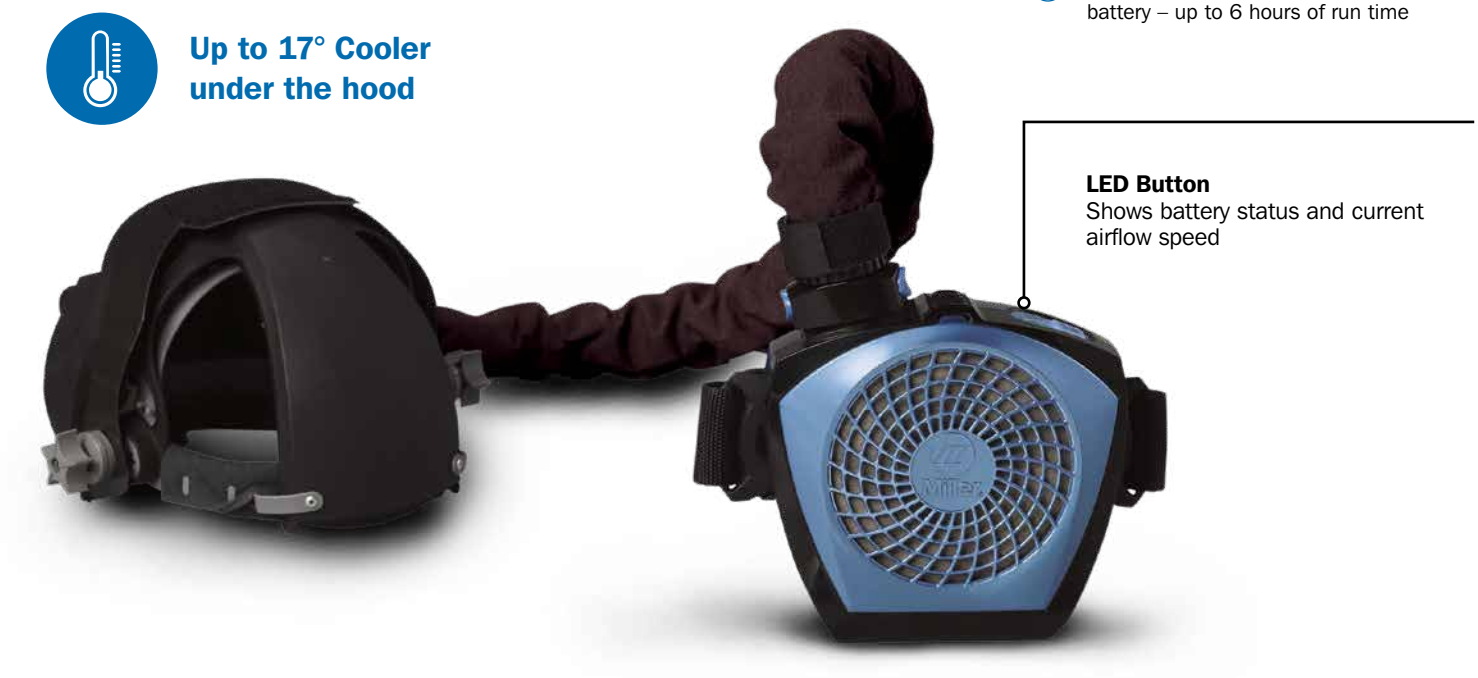
| Part #: | Description: |
|---|---|
| 245230 | CoolBelt |

** 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**




**LED Button**
Shows battery status and current airflow speed

**By cooling a worker 15 degrees, they will make approximately 90% fewer errors**[1]

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

(Number of heat-related errors at 95 degrees)
x (cost of fixing errors)
x .90

= Total Potential Savings of Reducing Heat Related Errors

[1] British Journal of Industrial Medicine, 3, 143-158

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# 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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