



Tactical and First Response Water Purification Systems

MPRO[®] 60HDX[™]

**GENERAL INFORMATION, EQUIPMENT DESCRIPTION AND THEORY
OF OPERATION**



EQUIPMENT DESCRIPTION AND DATA

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

The MPRO® 60 HDX™ was designed for utilization by military forces as well as first responders and disaster relief personnel. The MPRO® 60 HDX™ is a Reverse Osmosis (RO) modular unit that is optimally equipped to provide water purification in any field condition.

The MPRO® 60 HDX™ is a Reverse Osmosis (RO) unit that is optimally equipped to achieve small-scale, absolute water purification in any field condition. It was developed for use by highly mobile teams in remote areas or emergency or temporary sites. Its versatile footprint provides for self-contained, potable water support without committing larger water production assets from a support structure. Thus, the MPRO® 60 HDX™ is able to provide sustainable pure water support in expeditionary environments.

The MPRO® 60 HDX™ is designed to fit into any military vehicle that has a 24v NATO receptacle.

The MPRO® 60 HDX™ has an easy-access, open-frame design and all connections are quick-release for easy maintenance and quick element or parts replacement. It is configured in an ultra-lightweight, modular design to ensure portability and adaptive layout.

The MPRO® 60 HDX™ consists of 2 components that are connected by various hoses, cables and fittings. The major components include:

Purification Module

The MPRO® 60 HDX™ is designed to be charged/operated by any military or civilian vehicle (with optional 12 volt dc to 120 volt ac power inverter) 650 watts DC or from 24-28 VDC power source. The purification module consists of the following:

Raw Water Pump: The raw water pump is used to pump water from seas, lakes, rivers, or other natural sources. The raw water pump can pull water from a distance of 50 foot from the source, and a vertical lift of 25 foot, pump output capacity is 1.4 Gallons Per Minute (GPM) and includes a pressure gauge to monitor pump outlet pressure during operation. The raw water pump has a detachable 5 micron bag for pre-filtration that can be easily cleaned or replaced. A float is provided to keep pump upright.

High-Pressure Pump: The high-pressure pump is powered by a .75 horsepower (hp) motor, 24VDC. The high-pressure pump is self-priming, direct drive diaphragm pump that increases feed flow pressure to RO vessel and includes a pressure gauge to monitor pump outlet pressure during operation. The high-pressure pump is rated at .96 GPM. An hourmeter is included for monitoring service intervals.

RO Vessel: The RO vessel contains one RO membrane. The RO membrane allows filtered water to pass through while rejecting the impurities, both suspended and dissolved. The Water Production Valve controls the RO pressure within the vessel, which in turn controls product water production. The vessel with membrane is easily replaced.

Power Module

The power module supplies independent power to the purification module by use of two 24 volt lithium ion batteries. AC/DC power source charges the batteries while supplying power to the purification module. The power module includes a voltage gauge to monitor battery life during operation.

EQUIPMENT DATA

Purification Module

Module Dimensions

Length.....32 inch

Width.....22 inch

Height.....13 inch

Weight.....138 pound

Case Dimensions

Length.....37 inch

Width.....27 inch

Height.....18.5 inch

Weight.....46 pound

Total Weight.....184 pound

Power Module

Module Dimensions

Length.....32 inch

Width.....22 inch

Height.....13 inch

Weight.....97 pound

Case Dimensions

Length.....37 inch

Width.....27 inch

Height.....18.5 inch

Weight.....46 pound

Total Weight.....143 pound

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THEORY OF OPERATION

INTRODUCTION

The U.S. Military requires the ability to produce a safe, reliable supply of potable water to support early entry, highly mobile forces across a spectrum of missions, entailing everything from humanitarian aid to limited conflicts or total war. The Military Portable Reverse Osmosis Heavy Duty Extreme (MPRO® 60 HDX™) provides quality water support to detachments or fire teams where distribution of bulk water is not feasible, necessary, or practical. The MPRO® 60 HDX™ provides water support without committing larger water production assets from logistics support structure. It tailors water production flow rates to the demands of independent Special Operations Forces (SOF), detachments, and units typically engaged in remote site missions.

The MPRO® 60 HDX™ is designed to be setup/operated by two personnel and can be emplaced without material handling equipment and with a minimum of site preparation, set-up time, and manpower.

The MPRO® 60 HDX™ is capable of purifying and dispensing water, meeting Military Field Water Standards (MFWS) for short-term consumption.

Table 1. MPRO® 60 HDX™ Production Rate.

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| MPRO® 60 HDX™ Production Rate: |
| Produces ≤ 60 GPH of product water from a fresh water source |
| Produces ≤ 30 GPH of product water from a salt water source (up to 40,000 TDS) |

WATER FLOW PROCESS

Raw water is drawn from the water source through the submersible raw water pump.

Water will enter the high-pressure pump which is a direct-drive diaphragm pump. Water exits the high-pressure pump through a high-pressure hose to the Reverse Osmosis (RO) vessel.

RO (or hyper-filtration) is a separation process in which filtered water is pumped against a semi-permeable membrane under great pressure. The membrane allows filtered water to pass through while rejecting the impurities, both suspended and dissolved. Extremely high pressures are essential to get a useful volume of water to pass through a unit area of membrane. While RO may appear to be similar to a filtration process, there are distinct differences. In filtration, the entire liquid stream flows through the porous filter medium, and there are no changes in chemical potential between the feed and the filtrate. In RO, the feed flows parallel to the semi-permeable membrane with a fraction of it passing through a given membrane area. Dissolved ionic and organic solutes are largely rejected by the membrane. RO removes selenium, copper, iron, manganese, chloride, lindane, radiation, and most color and odor-causing compounds. The Water Production Valve is connected to the reject port of the RO vessel and used to create pressure within the RO vessel by reducing the flow of reject water from the RO vessel, and thereby increasing pressure within the system. Pressure within the RO Membrane forces the water to pass through the membrane, which removes a significant amount of the impurities before exiting through the product water hose.