

Nitrocellulose Drum Removal Work Plan

**Hercules Incorporated
Former Explo Site
Camp Minden, Louisiana**

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Table of Contents

1.0 Introduction	3
1.1 Purpose	3
1.2 Site Description.....	3
1.3 Site History	3
1.4 Scope of Work	4
2.0 Drum Handling and Preparation	5
2.1 Personnel	5
2.2 Equipment.....	6
2.3 Site Setup.....	7
2.4 Drum Removal from Storage.....	11
2.5 Drum Verification and Preparation.....	13
2.6 Damaged and Leaking Drum Handling.....	14
2.7 Nitrocellulose Repackaging.....	15
2.8 Drum Labeling and Staging.....	15
3.0 Drum Storage Areas	16
3.1 Area L2 – Storage igloo 2463.....	16
3.2 Area L2 – Storage igloo 2465.....	16
3.3 Area L2 – Storage igloo 2466.....	17
3.4 Area L3 – Storage igloo 2361.....	17
4.0 Operations Sequence	17
4.1 Site setup.....	18
4.2 Drum Inspection and Removal	19
4.3 Drum Verification and Hydration	19
4.4 Damaged/Leaking Drums.....	21
4.4 Demobilization.....	22
5.0 Transportation and Disposal.....	22
5.1 Waste Streams.....	22



5.2 Transportation..... 23

6.0 Project Schedule..... 24

7.0 Recordkeeping / Documentation 24

8.0 Health and Safety..... 26

9.0 Nitrocellulose Removal Cost..... 27

References

Appendices A - F



1.0 INTRODUCTION

1.1 PURPOSE

Clean Harbors has prepared this work plan on behalf of Hercules Incorporated (Hercules) for the removal and destruction of nitrocellulose associated with Hercules that is present at the former Explo Systems Inc. (Explo) Site located on Camp Minden, LA. This work is being performed per Item VIII of the Administrative Settlement Agreement and Order On Consent (AOC) between the United States Environmental Protection Agency (EPA) Region 6 and Hercules. The AOC was signed on April 11, 2014 and became effective on April 18, 2014. Per the AOC, EPA has identified approximately 661,000 lb of nitrocellulose, associated with Hercules, that must be removed from the former Explo Site. (USEPA, 2014)

Hercules has contracted Clean Harbors to have the nitrocellulose material removed from the jobsite and shipped off-site for destruction. Hercules evaluated the potential to reuse and/or recycle the nitrocellulose but due to the age and unknown quality of the material could not identify a viable alternative to destruction. Clean Harbors will be responsible for identifying the stored drums of nitrocellulose, evaluating the means of safe handling, ensuring the drums are within Department of Transportation (DOT) compliance, repacking material into new containers if necessary, and preparation for off-site shipment. The material will be destroyed at Clean Harbors' incineration facility in El Dorado, AR. Should it be needed, an alternate facility to receive this is the Clean Harbors Disposal Facility in Colfax, LA. The material will be shipped off-site by Clean Harbors Transportation.

1.2 SITE DESCRIPTION

The former Explo Site is located on a portion of Camp Minden, located near Doyline, LA. Camp Minden encompasses approximately 14,995 acres of land in Webster Parish, which is located in the northwestern corner of Louisiana. Camp Minden was previously known as the Louisiana Army Ammunition Plant, which functioned to produce, assemble, load, and pack ammunitions. In 2005 the United States Army transferred ownership of the property to State of Louisiana Military Department / National Guard (LNG) and renamed it Camp Minden. (USEPA, 2014)

1.3 SITE HISTORY

In 2006, the LNG entered into leasing agreements with Explo, which allowed Explo to use the Site property and approximately 100 magazines/igloos to perform activities required under demilitarization and disposal contracts they entered into with the United States Army. In 2002, Explo and the Aqualon Company (a subsidiary of Hercules) entered into a Chemical Product Sales Agreement pursuant to which Explo agreed to accept 55-gallon drums of nitrocellulose originating from New Jersey and Arkansas. The Agreement provided that Explo would convert the nitrocellulose into a commercial grade explosive for use in the mining industry. Explo failed to honor the agreement and a total of



approximately 661,000 pounds of nitrocellulose associated with Hercules remains at the Site. (USEPA, 2014)

On October 15, 2012, an explosion of a magazine and a box van trailer occurred at the Explo Site. The explosion was believed to be comprised of both black and smokeless powders, including the high energy M6 artillery propellant. The explosion completely destroyed the magazine and the trailer. As a result of the explosive storage violations observed during inspection of the explosion, the Louisiana State Police (LSP) served a search warrant on Explo Systems. The M6 propellant was stored in cardboard boxes, drums, and super sacks throughout Site igloos, hallways, and outside where it was exposed to the elements including heat which reduces the propellant stabilizers. Additional investigation of the Explo Site revealed the improper storage of other energetic materials. These energetic materials are known to be highly reactive and, in some cases, incompatible when stored in close proximity to one another. The energetic materials at the Site present a significant risk of fire or, if confined, explosion. Materials such as nitrocellulose may become less stable due to the degradation/aging process and become easier to ignite. (USEPA, 2014)

After court proceedings and revocation of the Explo Systems license, Explo filed for Chapter 11 bankruptcy protection in 2013. Bankruptcy court transferred title and ownership of the explosives stored at Camp Minden over to the LNG on September 30, 2013. (USEPA, 2014)

1.4 SCOPE OF WORK

As stipulated in the AOC, EPA has identified approximately 661,000 lb of nitrocellulose that originated from Hercules (or subsidiary Aqualon Company) to be removed from Camp Minden. In addition to the nitrocellulose, any other hazardous material as identified as originating from Hercules would be removed from the site. However, only the nitrocellulose is being evaluated in this work plan. That quantity is an estimate based on information the EPA extracted from Explo's files, and may vary depending on the actual number of drums encountered, and the condition of contents in the drum. The nitrocellulose drums are currently stored in four (4) separate storage igloos in the L2 and L3 areas of Camp Minden:

- Area L2 – Igloo #2463
- Area L2 – Igloo #2465
- Area L2 – Igloo #2466
- Area L3 – Igloo #2361

A site map of Camp Minden, including the locations of L2 and L3 areas, has been included in Appendix A.



2.0 DRUM HANDLING AND PREPARATION

Clean Harbors has developed this work plan to address the methodology and process of safely removing the drums of nitrocellulose associated with Hercules from the storage igloos, and shipping off-site in accordance with DOT Regulations per 49 Code of Federal Regulations (CFR) §172 and 49 CFR §173. The nitrocellulose drums will be prepared and/or repackaged and shipped off-site as Class 4.1 flammable solids in accordance with 49 CFR §172.101.

The following subsections detail the approach that will be taken to achieve the safe on-site preparation of the nitrocellulose drums for off-site shipment. The specific process for removal from each storage igloo will be discussed in Section 3.0.

2.1 PERSONNEL

Clean Harbors will mobilize a crew of six (6) people for on-site support at the project site. The crew will consist of a Project Manager, a Health and Safety Supervisor, two (2) equipment operators, and two (2) field technicians. The Project Manager will be responsible for all daily paperwork, tracking and scheduling of waste shipments, coordination with EPA and Camp Minden points of contact, and implementation of the work plan to the field crew. The Health and Safety Supervisor will carry out daily health and safety tailgate meetings with on-site personnel, and work directly with the site crew to ensure daily operations are performed in accordance with the site specific health and safety plan. The primary role of the equipment operators will be to relocate drums from the storage igloos to the loading docks, and then from the loading docks to the storage trailer to await transportation. Work will be primarily completed with forklifts and drum handling equipment in a manner that maximizes personnel safety. The field technicians are responsible for preparing the stored drums for safe movement, performing field verification measurements, and repackaging the drums, if necessary.

Since the nitrocellulose drums are considered to be characteristically hazardous per 40 CFR §261.21 (D001 waste code - Ignitability), all on-site personnel listed above will have current 40-hr Hazardous Waste Operations and Emergency Response (HAZWOPER) training. This training is a requirement for handling hazardous material per Occupational Safety and Health Administration (OSHA) regulations under 29 CFR 1910.120(e).

A Louisiana Explosives License will be obtained by on-site personnel directly handling any nitrocellulose. This license is a requirement for handling energetic or explosive material per the state explosive code in the Louisiana Revised Statutes (LRS) 40:1472.1. Each employee who obtains this license will need to meet the qualifications detailed in the Louisiana Administrative Code (LAC) 55:1472.3.c. (1). The nitrocellulose drums are considered to be a flammable solid, and would not apply under this Explosive Code. However, nitrocellulose drums containing less than 25% water (by weight) do not meet the flammable solid classification and the state explosive handler license would be a



requirement for any personnel handling drums that are found to be in this condition (i.e. field technicians and equipment operators).

Active railroad tracks are present in front of the loading docks of Igloos 2463, 2465, and 2466. The work described in Section 2.0 and 3.0 will include working around these tracks, and partially blocking/covering the tracks while accessing each igloo. All site personnel will have certification in the e-RAILSAFE System for Safety in working around Class 1 railroads associated with any storage igloos.

2.2 EQUIPMENT

Clean Harbors will utilize the following list of equipment to carry out the site work in a manner that maximizes personnel safety:

- Storage Trailer(s) for supplies and material – These will be setup in a lay down area as a central point for Personal Protective Equipment (PPE), tools, and other materials.
- Office trailer – Office space for Clean Harbors Project Manager to complete paperwork and perform moisture testing. Moisture testing will be performed in a separated room in the office trailer, as to not include any potential ignition sources or interfere with other field operations.
- Truck Trailer – A trailer will be staged on-site for loading of processed drums that are ready for off-site shipment.
- Filter box containment – This containment system (Figure 1) will be used as the processing area for drums in a water saturated environment (described in Section 2.3). This containment box has a pre-engineered stair system for proper access and egress that will eliminate the need for confined space entry.
- Diaphragm pumps and hosing – These will be used in conjunction with the filter box containment and used to recirculate filtered water within the filter box containment.
- Pressure washer with fan tip – This will be used to apply moisture to stored drums and remove fine nitrocellulose dust prior to handling. The maximum operating pressure will be 2,500 psi at a distance not less than 3 feet from the drums to minimize any potential damage to the drum during washing.
- Non-sparking hand tools – These tools will be used for opening and closing drum lids. The selected tools will be in accordance with Department of Defense (DOD) 4145.26.C.3.10.
- 4,000-6,000 lb capacity electric forklift – This forklift will be used for moving drums inside the storage igloos. A polycarbonate (1-1/4” thick) shield will be affixed to the front of this equipment. Forklift will have an “EE” rating per DOD 4145.26.C3.14.1-2.
- Long reach all-terrain forklift – This forklift will be used for moving drums outside the storage igloos, in the processing area, and into the transfer vehicle (Rack Truck). A polycarbonate (1-1/4” thick) shield will be affixed to the front of this equipment.



- Dual axle flat bed truck (Rack Truck) – This vehicle will be used to move drums that are compliant to DOT shipping requirements (49 CFR §172 and 49 CFR §173) containing nitrocellulose hydrated to at least 25% from the processing area to the staged truck trailer.
- 2,000 gallon water truck – The water truck will be used to transfer water from the water source(s) to the pressure washer and filter box containment.
- Company pickup trucks – vehicles for on-site personnel.
- Drum handler attachments – These will be affixed to the forks of both forklifts, and used for handling and moving the drums. Non-sparking elements, such as rubber grips, will be included in the drum handling attachment for the forklifts.
- Drum dolly – Dolly will be used to transfer verified drums from the rack truck into the receiving trailer. Dolly will have rubber components to pad the metal contact points against the drum.
- Road plates – The plates will be placed in areas for vehicle access to the igloo loading docks (i.e. railroad tracks, drainage ditch)
- Diesel powered generator – Used for electrical hookup to power the on-site trailer. This piece of equipment will be designated for the storage lay down area only.
- Remote drum opener – the pneumatic drum opener will be used to remotely puncture a leaking or non-DOT conforming drum in the filter box containment. The remote drum opener contains a brass tip for puncturing.
- Air compressor – The air compressor will be used to power pneumatic driven tools such as the air diaphragm pumps, and the remote drum opener.
- Model FLIR-E6-NIST Thermal Imaging Camera
- A&D Model MS-70 Moisture Analyzer with a 20” x 20” acrylic shielding stand.
- Temporary lighting system – Personnel entering the igloos will wear safety approved personal headlamps.
- Health and safety equipment – Safety shower/eyewash station

Specification sheets for the forklifts, filter box, thermal imaging camera, moisture analyzer, drum handler, and polycarbonate protective shielding attachments have been included in Appendix B.

2.3 SITE SETUP

When Clean Harbors mobilizes to the Site, all equipment and materials will be staged at the L2 lay down area. This L2 lay down area will be the main storage area for Clean Harbors where equipment and materials will be staged prior to setup at each drum location. The project team realizes that other organizations will likely be on-site at the same time and the area will be secured in a manner that other organizations may also utilize this area, if necessary.



The first phase of site setup at each storage igloo will consist of clearing and grubbing the overgrown vegetation in front of the loading dock. Hand tools will be used to cut and remove any excess vegetation that may interfere with operations outside of the storage igloo. All vegetation that is removed will be collected in the rack truck and hauled to a staging location designated by the LNG. After the vegetation has been cleared, metal road plates will be placed over the railroad tracks in front of the loading dock. (In area L3 – Igloo 2361, the road plates may be used over the drainage ditch). The Clean Harbors Project Manager will coordinate with the EPA, LNG, and the railroad regarding the temporary shutdown of the tracks. It is anticipated that with drum removal from one storage igloo at a time, approximately 100 linear feet of railroad track will be temporarily closed during operations in front of the igloo. If necessary, the road plates can be removed during off-hours to minimize disruption of the rail system. The 100 feet distance was determined by Clean Harbors as an estimated clearance necessary for accessing the igloo, moving appropriate equipment in the area, and consideration of worker protection in consultation of Federal Rail Administration (FRA) guidelines under 49 CFR §214 Subpart C.

The next stage of setup will be mobilizing the equipment to each storage igloo. The electric forklift will be transported with the dual axle rack truck, and offloaded directly on the loading dock. This will allow the electric forklift to work exclusively from the loading dock and inside the storage igloo. The long-reach forklift will work exclusively from the ground level during operations. Both forklifts will be outfitted with level 3, 1-1/4" thick laminated polycarbonate shields on the front of the cab. These shields are installed to protect against the possibility of a drum creating a fire/explosion hazard during handling operations. This shielding will be installed in accordance with DOD 4145.26.C.3.11. Equipment used at each storage igloo will need to be electrically grounded. The electric forklift will be furnished with a grounding tether while in operation in the storage igloo. The long reach forklift will be outfitted with non-sparking metal chains that will drag along the ground surface during operations. An alternative is to equip either or both forklifts with a static electricity grounding strap. Other equipment, such as the air compressor, pressure washer, and pumps, will be connected to existing grounding points inside or outside the igloo. The grounding capacity of such existing systems will be tested and verified prior to using this method for equipment grounding. If a grounding connection to the igloo cannot be achieved, a copper grounding rod will be installed into the ground, and grounding wires will be attached to this from the equipment.

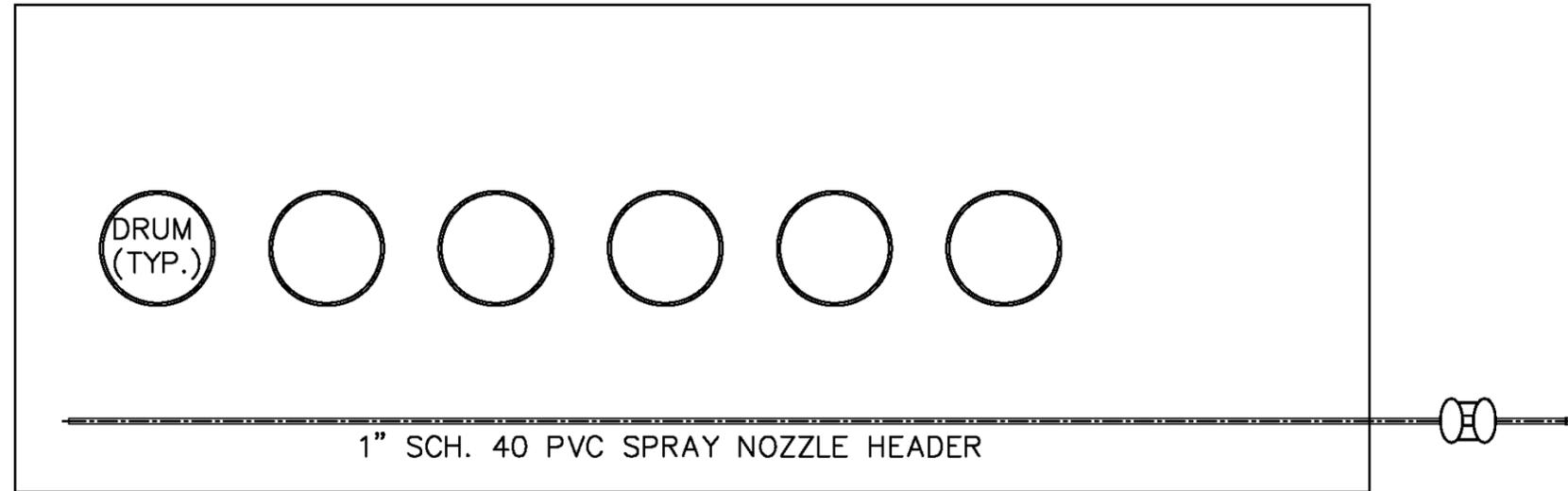
Clean Harbors will then begin installation of the filter box drum opening and rehydration area. The filter box will be a contained system that sprays filtered water over each drum prior to opening to maximize safety of field personnel. The filter box consists of a 25 yd³ water tight dewatering bin that is placed on top of a 50 feet x 10 feet poly liner. The edge of the poly liner will be equipped with a water tight 1-foot tall containment berm acting as a spill guard to minimize the potential for any nitrocellulose to enter the environment. The lowest portion of the dewatering bin will contain bar grating basket with wire cloth screen on the inside floor, which connects to two 4 inch blind flange drain lines. Disposable



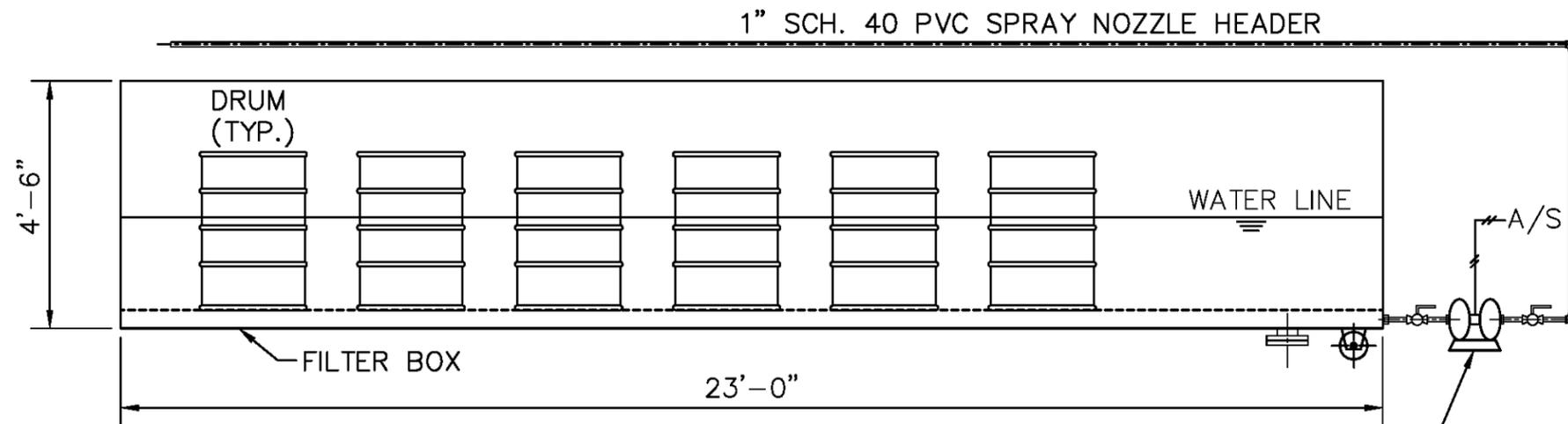
filtration pads will be placed over the interior screen to collect as much nitrocellulose as possible prior to recirculation. Disposable filtration pads will be placed into hydrated drums after removal from the filter box for incineration at the El Dorado facility. A suction line will be attached to the 4" drain line, which will be powered by an air actuated pneumatic diaphragm pump. The discharge from the diaphragm pump will, via flexible hose to the 2" perforated PVC pipe supported over the filter box, supply the spray water. The PVC piping will be supported by a stand adjacent to the filter box.

After the filtration box processing area is set up, the 2,000 gallon water truck will be filled from an on-site water source, and staged by the storage igloo. The water will be used for the filtration box, as well as the pressure sprayer inside of the storage igloo.

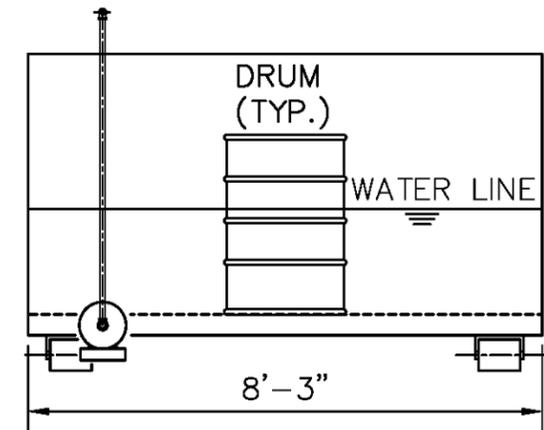
CAMP MINDEN NITROCELLULOSE HYDRATING BOX



PLAN



ELEVATION



END ELEVATION



2.4 DRUM REMOVAL FROM STORAGE

Clean Harbors will commence work with two explosive handlers (hence forth to be described as field technicians and equipment operators) entering the storage igloo and assessing the inventory and condition of the nitrocellulose drums. The field technicians will make note of any drums that are suspected of leaking (plastic sheeting over the top half of drum) or do not appear to conform to DOT compliance (damaged drums, severe rusting, etc.) per 49 CFR §173.3(c). These drums will need to be remotely opened with a pneumatic drum opener within the filter box. The process of handling and opening the non-conforming DOT drums is discussed in Section 2.6.

The initial task in the drum removal will be to use the pressure washer with fan tip to apply water to the top and side surface of the drums, as well as the floor that immediately surrounds the drums. Prior to initiating use of the pressure washer, the drains present within the interior of the igloo will be plugged and a water management system set-up to properly handle the drum cleaning water that may contain nitrocellulose residue. Field technicians will stand approximately 3 feet from the drums that are being sprayed. The field technicians will bring the spray nozzle and hose extensions inside the igloo while the pressure washer will be placed outside the storage igloo, no less than 10 feet from the entry way, and in a manner that will not allow exhaust fumes to enter the igloo. The water application is performed as a precautionary measure to ensure any potential nitrocellulose residue does not ignite due to friction during drum handling. Utilizing a water suppressant is designed to create a safer environment for moving and handling the drums. It is anticipated the spraying will not create any significant volume of water. However, Clean Harbors will collect any generated water that is captured in the floor drains located along the sides of the igloos. This captured water will be collected in closed head poly drums, and stored inside the igloos until final disposition is completed, pending laboratory analysis.

After the initial water application with the pressure washer, the entry team will use a thermal imaging camera (Model FLIR-E6-NIST or equivalent) to scan the accessible drum surfaces. The camera produces an infrared image depicting the temperature ranges of the area/material that is being scanned. Ambient temperatures will be measured first to establish a background reading. As the drums are being surveyed, any surface areas exhibiting temperatures 20°F or more above the recorded background temperature will be considered a “hot spot”, if any (This threshold was determined based on consultation within Clean Harbors High Hazard Safety department, as well as outside expertise in handling this material.) All hot spots will be noted as these would indicate that decomposition of the nitrocellulose may be on-going. A technical specification sheet for this device is included in Appendix B. The process of thermal imaging of the drums will be performed at a minimum each day. In some cases, thermal imaging may be performed more than once a day based on the location and accessibility of the drums. In either event, all drums will be thermally imaged prior to handling. All thermal imaging will be documented daily.



After a detailed inspection is completed, all drums considered hot spot or potentially breached will be prioritized and handled individually as stated above. Access to the identified drum will become a priority and will be handled individually within the filter box system. Any drum not meeting these criteria, but determined to be non DOT shippable due to damage will be further tested. Testing will be performed with the Expray Explosives Detection Kit (Expray). Expray is a test kit that consists of special collection paper for surface wipe samples, and three aerosol cans containing separate reagents that give distinct colorimetric results based on different types of explosives. The first spray can, labeled with an “E” on the front, contains an alkali solution that reacts with Nitroaromatics such as Trinitrotoluene (TNT), Dinitrotoluene (DNT), Tetryl, and Picric Acid. The second spray can, labeled with an “X” on the front, contains compounds that react with the compounds in the first spray can, and produces a dye based on the compounds that are detected. The second spray can is used to detect nitramines, such as research and development explosives (RDX) and high melting explosives (HMX), and nitrate esters, such as nitrocellulose. The “E” spray can must be used prior to the “X” spray in order to produce a colorimetric change for nitramines and nitrate esters. The third spray can will not be used in the testing these drums. The order of the spray applications must be in a specific sequence in order for the colorimetric results to occur. (Bjella, 2005. Included in Appendix C).

Once a wipe sample is collected from the surface of a suspected drum, the “E” spray will be applied to the wipe. The wipe will be observed for any potential Nitroaromatics, which may yield a dark brown (TNT), orange (Tetryl), or blue-green (DNT) color. It is not anticipated that these explosives will be present in storage igloos 2361, 2463, 2465, or 2466. After the first spray has been applied, the “X” spray will be applied to the wipe. If nitrocellulose is present on the surface wipe, a pink color will be produced from the chemical reaction. As per the protocol with drums producing high temperature scans, drums with the detection of nitrocellulose on surface beyond a trace amount that could have the potential to ignite during handling will be moved and handled as described in Section 2.6. For drums that exhibit residual surface nitrocellulose, the pressure washer will be used to apply a second wet spray on the top lids and sides of the drums to either remove the residual or render it safe for handling.

After the application of water to the drums, the electric forklift with drum handling attachment will be used to move the drums to the loading dock. After the drum is staged on the loading dock, the long-reach forklift will pick up the drum with the handling attachment, and place the drum into the filter box.

The drum handling attachments used for handling the drums are affixed and secured to the front forks. The handling arms are coated with rubber or other material to prevent sparking. The drum handling attachment used for the long reach forklift will be equipped with a rotating head that can be remotely controlled. The specification sheets for the drum handling attachments are included in Appendix B.



2.5 DRUM VERIFICATION AND PREPARATION

Once the drums are placed in the filter box, the diaphragm pump will be turned on and the water will begin spraying over the tops of the drums. The field technicians will enter the filter box through the installed stairway, and open the drum lids with non-sparking hand tools. The nitrocellulose is expected to be stored inside plastic bags within the drums. These plastic bags will be cut open using safety knives. After the plastic bags are opened, the drum contents will be evaluated and a sample taken for moisture content.

An A&D Model MS-70, or equivalent, moisture analyzer will be used on-site to test the samples. Samples will be taken from each drum using a one-time use plastic spoon or glass rod with wooden dowel push rod. Each drum will be marked with a drum number as well as the small glass sample jar that contains the sample taken from the drum. A sample of approximately 5 grams will be collected from each drum.

Analysis of the samples will be conducted in a separated room within the office trailer. This is done to perform testing away from the igloo area, and in controlled area without potential ignition sources and protection for other workers. The Project Manager will move the sample(s) to the moisture testing room in the office trailer in the L-2 area. The Project Manager will don a face shield, heat resistant apron with sleeves, and operate the moisture meter behind a 20 inch x 20 inch acrylic stand. Each sample is placed in the moisture meter's glass housing unit, which is heated to perform the moisture measurement (see Appendix B for the moisture meter's manual). The moisture meter can be programmed to adjust the heating temperature, given the desired accuracy of the measurement. Clean Harbors will operate the moisture meter accordingly to ensure the sample does not dry out too quickly and become a flammable risk. The goal of the analysis is to confirm that drums that are to be shipped have a minimum of 25% moisture, as water. If the moisture content is greater than 25% by weight the drum will be secured. Any drum with moisture content below 25% will be rehydrated and reanalyzed.

After each sample is analyzed, the dried sample will be deposited into a bucket of water and the glass jar can be re-used after removal of drum tracking number and washing and drying of both internal and external surfaces. The bucket containing dried samples and excess water will be emptied into an existing drum of properly hydrated nitrocellulose at the end of each day.

If a drum is determined to contain less than 25% moisture, water will be added into the drum from the overhead sprayer system or scooped manually from the standing water in the filter box. The amount of water placed in each drum will be dependent on the amount of existing nitrocellulose that is containerized, and will be assessed visually. In most cases, water will be added to approximately 4 inches above the top of the drum contents. The maximum amount of water added to each drum will be to a level that is at least 2 inches or more from the top of the drum. Any drum that has an excess amount



of water (water level < 2 inches from top or > 4 inches above the top of the nitrocellulose) will be decanted back into the filter box using a plastic scoop.

2.6 DAMAGED AND LEAKING DRUM HANDLING

Drums that have been identified to be leaking, damaged, or deteriorated, will be considered non-DOT conforming drums. These drums will be moved to the staging area on the loading dock carefully with the forklift. After each non-DOT conforming drum has been sprayed thoroughly with the pressure washer, the electric forklift will carefully attach the drum handler to the drum, and slowly move the drum to the loading dock. For drums that have significant rust, the forklift will slowly lift the drum to a height of no more than 4 inches off the floor surface. As the forklift is raising the drum, the field technicians will stand back a distance of 10 to 15 feet, behind the forklift, with the pressure washer. If there is a failure of the bottom or sides of the drum, and nitrocellulose material spills from the drum, the field technicians will immediately apply water with the pressure washer carefully to wet but not disperse any spilled nitrocellulose. The field technicians will then use plastic tools to collect the saturated nitrocellulose material and place it into 30-gallon poly containers. The containers will be sealed, and the forklift will move the drum to the loading dock. Any residual nitrocellulose remaining on the floor that cannot be collected with shovel/tools will be sprayed with the pressure washer into the collection drains. The collection drains will then be filtered and pumped into closed head poly drums for liquid disposal.

Once the non-DOT conforming drum is safely moved to the loading dock, the long reach forklift and drum handler will move the drum into the filter box. The blast doors on the igloo will be closed while each drum is remotely opened. A field technician will enter the filter box through the installed stairways, and attach the pneumatic drum opener to the top of the drum lid. The field technician will exit the filter box, and operate the device a distance of approximately 40 feet from the filter box. This is the typical length of hosing for the pneumatic device. The field technician(s) will operate the remote drum opener from the seat of one of the forklifts, as the blast shield will provide added protection to the worker. The primary blast protection during this operation is the filter box itself and the water that the drum is sitting in. Heat, pressure waves, and fragmentation that may occur will be deflected up and away from on site personnel. All other personnel will vacate the exclusion zone, a 300 foot perimeter outside the processed drum. This exclusion zone distance is based on the emergency withdrawal distance of Class 1.4 explosives in DOD 4145.26.C10.7.2.1 Table C10.T2 (Nitrocellulose is not classified as a Class 1.4 explosive, but Clean Harbors has implemented this exclusion zone distance as a conservative measure). The water sprayer will be turned on, and the field technician will operate the drum opener. The lid is punctured by a pneumatically driven piston with a brass tip spike that will self-retract after the lid has been punctured. When the drum opener device is operating the spraying water will hydrate any potentially dry nitrocellulose material inside. This process allows the safe preparation of material inside leaking or damaged drums while keeping the on-site crew from potential ignition hazards.



2.7 NITROCELLULOSE REPACKAGING

Clean Harbors anticipates a majority of the drums will be in a condition acceptable to DOT compliance (49 CFR §173). The drums that are identified as leaking, damaged, or otherwise unsuitable for shipment will need to be repackaged into new containers. The new containers will be 30-gallon open-head poly drums, UN1H2/Y125/S, that comply with the DOT packaging regulations under 49 CFR §173.3.

The existing drum will be picked up by the drum handling attachment on the long reach forklift, and lifted out of the water in the filter box. The field technician will bring a new container into the filter box, and place it on a stand that sits above the water line. The drum handling attachment will rotate the drum at an angle that will facilitate removal of nitrocellulose into the new 30 gallon container. The material will be removed with non-sparking shovels and other hand tools. Once the 30 gallon container is full, the lid will be placed on, and an additional container will be filled with the remaining drum contents. The damaged drums will be rinsed within the filter box and then removed from the filter box and placed in a staging area for drying. Any material that falls out of the existing drum into the filter box will be collected with hand tools by the field technician and placed in the new poly drum, to the extent practicable. Material that cannot be readily collected by hand tools will be captured on the disposal filters on the floor screening. These filters will be disposed of into a debris waste stream as discussed in Section 5.1.

2.8 DRUM LABELING AND STAGING

Before the drums are removed from the filter box, the lids and rings will be screwed on, and the long reach forklift will pick each drum out of the filter box and placed on the poly spill guard surrounding the filter box. In the spill guard area, the field technicians will wipe down the exterior of the drum with an absorbent pad, and place applicable markings and labels to the drum.

Each drum that is removed from the igloo will be given a unique identification number that will correspond to the entity associated with the drum, the storage igloo the drum was removed from, and a sequential number for that igloo. For example, “HERC-2463-0001” would be designated for the first drum removed from Igloo 2463. Drums that are not associated with Hercules will be given a different prefix in order to track separately. Nitrocellulose drums that are associated with a different entity, or an unknown entity, will need to be accounted for by Hercules for assignment of financial responsibility. A photo-log will be recorded for any drums that do not appear to be associated with previous Hercules operations. A record of the drums and identification number will be maintained on a daily tracking sheet. These identification numbers will be tracked with the waste manifest number that each drum is shipped out on. Section 7.0 details the recordkeeping and documentation that will be maintained during operations. The drums will be marked and labeled in accordance with Resource Conservation and Recovery Act (RCRA) and DOT requirements as discussed in Sections 5.1 and 5.2.



After the drum has been logged, labeled, and marked, the long-reach forklift will move the drum onto the back of the rack truck. If the rack truck is loaded with any drums during processing of other drums, it will be staged at least 100 feet from the operations area, or 300 feet if remote drum opening is being performed as stated in section 2.6. Once the rack truck is full, an equipment operator will transport the drums to the staging trailer in the L2 lay down area. The drums will be transferred from the rack truck into the trailer with a drum dolly.

3.0 DRUM STORAGE AREAS

Nitrocellulose drums have been identified in 4 separate igloos in the L-Area of Camp Minden. Clean Harbors will remove the nitrocellulose drums from the storage igloos in the following order:

1. Area L2 – Storage igloo 2463
2. Area L2 – Storage igloo 2465
3. Area L2 – Storage igloo 2466
4. Area L3 – Storage igloo 2361

The order is based on the accessibility of known Hercules associated drums in an effort to coordinate with other on-site contractor's performing removal work. This order may be adjusted based on feedback from the EPA, and the need to coordinate our removal efforts with other on-site contractors.

3.1 AREA L2 – STORAGE IGLOO 2463

Igloo 2463 is located in the L2 Area of Camp Minden. The storage igloo contains both nitrocellulose and other flammable solids related to a separate company. The two different waste streams are segregated by a temporary divider that runs down the middle of the interior floor. Since the nitrocellulose drums associated with Hercules are segregated to one side of the igloo, Clean Harbors does not anticipate the need to handle the other flammable solids in the igloo.

A railroad track is located in front of the loading dock of Igloo 2463. Prior to set up in the area, Clean Harbors will coordinate with Camp Minden personnel and EPA on contacting any railcar companies that may utilize this track, and have a 100 foot clearance where railcars will not block access to the igloo. Road plates will be used to provide equipment access over the railroad tracks during daily operations. The road plates will be removed from the track at the end of each work day, if necessary, to allow railcars access to the track during non-working hours.

3.2 AREA L2 – STORAGE IGLOO 2465

Igloo 2465 is located in the L2 Area of Camp Minden. The storage igloo is suspected to just contain drums of nitrocellulose. However, some of the drums may be associated with a different entity. Extra care and attention will be taken during initial assessment to ensure only the drums associated with Hercules are removed and processed.



A railroad track is located in front of the loading dock of igloo 2465. Prior to set up in the area, Clean Harbors will coordinate with Camp Minden personnel and EPA on contacting any railcar companies that may utilize this track, and have a 100 foot clearance where railcars will not block access to the igloo. Road plates will be used to provide equipment access over the railroad tracks during daily operations. The road plates will be removed from the track at the end of each work day, if necessary, to allow railcars access to the track during non-working hours.

3.3 AREA L2 – STORAGE IGLOO 2466

Igloo 2466 is located in the L2 Area of Camp Minden. Similar to Igloo 2465, the storage igloo is suspected to just contain drums of nitrocellulose, but some of the drums may be associated with a different entity. Extra care and attention will be taken during initial assessment to ensure only the drums associated with Hercules are removed and processed.

A railroad track is located in front of the loading dock of igloo 2466. Prior to set up in the area, Clean Harbors will coordinate with Camp Minden personnel and EPA on contacting any railcar companies that may utilize this track, and have a 100 foot clearance where railcars will not block access to the igloo. Road plates will be used to provide equipment access over the railroad tracks during daily operations. The road plates will be removed from the track at the end of each work day, if necessary, to allow railcars access to the track during non-working hours.

3.4 AREA L3 – STORAGE IGLOO 2361

Igloo 2361 is located in the L3 Area of Camp Minden. The storage igloo contains drums of nitrocellulose and pallets of M6 Propellant, which are associated with a different entity. The M6 propellant is staged at the front of the storage igloo, in front of the nitrocellulose drums. Clean Harbors will need to coordinate with EPA to determine if this material can be moved prior to the nitrocellulose removal. If the nitrocellulose is removed prior to the M6 propellant, then Clean Harbors will need to move some of the M-6 propellant outside of the storage igloo during operation hours and placed back into the igloo during non-operation hours. M6 Propellant will be handled and removed by personnel with Louisiana Explosive Handling Licenses.

Unlike the three previous storage igloos, there are no railroad tracks located in front of Igloo 2361. There is a drainage ditch that will need to be bridged in order to have access to the main road. The road plates will be used to place over the drainage ditch to allow access for equipment and personnel. These road plates will be left in place until the removal process is completed at this igloo.

4.0 OPERATIONS SEQUENCE

Clean Harbors has developed a sequential order for performing the daily operations for removing and preparing the nitrocellulose drums. The following is a detailed description of the activities that will be performed during operations at each Igloo.



4.1 SITE SETUP

The following steps will be performed for initial set up at Storage igloo 2463:

1. Equipment operators and field technicians will begin clearing and removing any overgrown vegetation in front of the storage igloo. The removed vegetation will be loaded into the dual-axle rack truck, and transported to a recycle area as designated by Camp Minden personnel.
2. After clearing, the electric forklift will be loaded onto the rack truck and transported from the L2 lay down area to the igloo. The forklift will then be offloaded onto the loading dock in front of the igloo.
3. The filter box will be offloaded at the igloo by Clean Harbors rental vendor.
4. All other equipment and supplies will be moved to the storage igloo with the rack truck, all terrain forklift, and pickup trucks.
5. The equipment operators will attach a non-sparking chain to the back of the long reach forklift, and the grounding tether to the back of the electric forklift. Static electric grounding straps may be used in place of the tether and/or chain.
6. The field technicians will attach grounding wires from the equipment (compressor, pumps, pressure washer) to grounding points at each igloo. If necessary, copper coated grounding rods will be installed into the ground as grounding points.
7. Road plates will be laid down over the railroad tracks or drainage ditch with the long reach forklift.
8. The spill guard will be laid down in the area where the filter box will be set up. The poly spill guard will be unrolled on the ground, and wrapped over standing wire mesh. This will create a 1 foot berm around the spill guard edges.
9. The drains on the sides of igloo will be plugged, and water will be collected with a diaphragm pump. The collected water will be transferred into drums for disposal.
10. The filter box will be moved inside the spill guard with the long reach forklift.
11. Clean Harbors will then set up the hosing and spray system for the filter box. Two stands will be constructed and placed at the two far ends of the filter box. These stands will be used to support the 2" PVC spray header. After the stands have been set up, the hosing and pumps will be fitted to the filter box connections, and the sprayer bar will be connected and placed on the support stands. Once the filters are in place over the interior mesh screen, the water truck will fill the filter box with 1 to 2 feet of standing water.
12. Safe distance zones will be marked or flagged on the ground prior to beginning work. This markings/flagging will denote exclusion areas to be observed while the remote drum opener is in operation. The exclusion zone perimeter is discussed in Section 2.6.



4.2 DRUM INSPECTION AND REMOVAL

After set up is complete, two field technicians will enter the storage igloo and begin their assessment and preparation. The field technicians will open the main vault door completely. Once inside, the two field technicians will be assessing the staged drums for potential nitrocellulose dust on the exterior for the drums. The following steps will be followed for the initial drum removal:

1. The field technicians will determine which drums are most accessible. Water will be applied to the surface of these drums with the pressure washer.
2. The technicians will use the thermal imaging camera as discussed in Section 2.4 of this work plan. If any drums have “hotspots” with temperature out of normal range (20°F or more above the recorded background temperature), the drum will be individually moved into the filter box.
3. The drums will then be visually inspected. Any drum that has evidence of potential leaking (visible damage, rusting, or plastic sheeting partially covering drum), will be individually moved into the filter box.
4. For any damaged or non-DOT compliant drums that do not appear to be leaking, the drum surface will be sampled with the Expray kit. The field technicians will perform the testing following the sequence for the test reagents as discussed in Section 2.4. If results indicate the presence of nitrocellulose, or any other explosive/flammable, beyond a trace amount that could pose an ignition hazard on the drum surface, then this drum will be re-sprayed prior to movement and handled individually in the filter box.
5. After the water application, an equipment operator will begin moving the wetted drums from the igloo to the top of the loading dock. The forklift will have a drum attachment with the grabber arms coated with rubber or some other material that will reduce potential of sparking with the drum. The field technician will act as a spotter for the forklift operator to ensure safe and careful handling of the drum.
6. Once the forklift has moved the drums from within the igloo onto the loading dock, the field technicians will exit the storage igloo, close the vault doors, and begin operations in the filter box.

4.3 DRUM VERIFICATION AND HYDRATION

After the first set of drums is staged outside of the storage igloo, the field technicians will discuss their observations of the drum conditions with the Project Manager. The Project Manager will also take note of any markings or labels on the drum and write them down on a tracking sheet. The documentation and data collection is discussed in Section 7.0.

After notes are collected, the field crew will begin the processing of the drums. The following steps will be followed for the hydration processing of the drums:



1. The equipment operator will pick up the drum from the loading dock using the all terrain forklift. The forklift will have the drum handling/tipping adaptor. A field technician will be on the loading dock to act as a spotter for the forklift.
2. The drum will be placed into the filter box with the forklift. The second field technician will act as a spotter outside of the filter box to ensure the drum is placed carefully inside the containment.
3. The recirculation pump will be turned on and water will begin spraying in the filter box.
4. The field technicians will don a rain jacket and chest waders and enter the filter box through the installed stair system. The technicians will use non-sparking tools to open the lids of the drums.
5. After the lids are removed the field technicians will inspect and collect samples of the drum contents for moisture analysis. The water will be turned off while samples are being collected. Sampling will be performed as discussed in Section 2.5 of this work plan. The Project Manager or designee will take the samples to the office trailer and analyze the samples with the on-site moisture meter.
6. If the moisture content is greater than or equal to 25%, the field technicians will place the lid(s) on the drum(s) inside the filter box. The long reach forklift will remove the drum from the filter box using the drum attachment.
7. Any drum's corresponding sample that does not have 25% moisture or greater will remain in the filter box with the lid off, and will have the recirculation pump spray additional water inside the drum until the moisture content is greater than 25%. Field technicians may also manually scoop the water in the filter box and pour into the drums.
8. After adequate hydration is confirmed, the drums in the filter box will be placed in the spill guard area on top of the absorbent pads.
9. The field technicians will wipe the excess water away from the surface of the drums, and affix the necessary labels and markings in accordance with DOT Hazard Classification 4.1 (49 CFR §172.101). Specific markings and labeling for the drums are discussed in Section 5.0 of this work plan. Debris generated from wiping down the drums will be classified and handled as discussed in Section 6.0 of this work plan.
10. After marking and labeling the drums, the long-reach forklift will lift the drums from the spill guard and place them into the back of the rack truck. One of the field technicians will act as a spotter for the forklift operator as the drums are loaded into the back of the rack truck.
11. The drums will be secured on the rack truck with large straps. The rack truck will then transport the drums to the truck trailer that will be staged in the L-2 lay down area.
12. The rack truck will back up to the end of the truck trailer, with a field technician acting as a spotter.
13. After the rack truck is stopped and turned off, the driver and field technician will move the drums into the truck trailer with a drum dolly.



At the end of each work day at each igloo, all drums that have not been hydrated and transported to the truck trailer will be staged safely inside the storage igloo, and the door will be closed and secured. A tarp will be placed over the filter box, and any generators or air compressors will be powered down for the evening. The road plates used to cover the railroad tracks will be removed to allow overnight access for railcars, if necessary. The electric forklift will be transported on the rack truck back to the L-2 area to be re-charged at the job trailer. If any rain water is collected in the spill guard during operations, or during non-working hours, it will be pumped into the filter box for re-use during operations.

At the beginning of each day, the technicians will re-inspect the drums within the igloo with the heat sensor to determine if new hot spots may be identified.

4.4 DAMAGED/LEAKING DRUMS

Drums that have been identified as leaking, damaged, or containing “hotspots” will be removed from the storage igloo and handled individually. The following steps will be followed once the drum has been removed from the igloo and the vault doors have been closed.

1. The hot spot, leaking, and/or damaged drum will be moved into the filter box with the long reach forklift and drum handler.
2. A field technician will don a rain jacket and chest waders and enter the filter box through the installed stair system.
3. The long reach forklift will place the remote drum opener inside the filter box. The field technician will help secure the drum opener to the top of the drum and connect the necessary hosing.
4. The water circulation pump will be started and the water will spray inside the filter box.
5. The field technician will exit the filter box through the stair system and move to a distance of approximately 40 feet from the edge of the filter box. The field technician will operate the remote drum opener inside the cab of a forklift, behind the polycarbonate shielding. All other personnel in the area will be at least 300 feet from the filter box, as indicated by ground markings/flagging.
6. The field technician will operate the remote drum opener and puncture the lid.
7. Once the water has sprayed inside the drum for 5 minutes, the field technician will enter the filter box and remove the remote drum opener. The field technician will remove the punctured lid from the top of the drum.
8. The long reach forklift will move the remote opener from the filter box.
9. The long reach forklift will then grab the damaged drum with the drum handler/tipping attachment.
10. The second field technician will enter the filter box with a new 30-gallon poly container.



11. The 30-gallon poly container will be placed on top of a stand inside the filter box. The top of the stand will be above the water line in the filter box.
12. The drum handler will rotate the existing drum to a tipping angle just above the new poly drum.
13. The field technicians will remove the nitrocellulose material from the old drum using non-sparking hand tools.
14. Once the old drum has had all contents removed, and sufficient water has been added, the field technicians will place the old lid on the drum, and the long-reach forklift will remove the empty drum and place in the drying area inside the spill guard.
15. A moisture sample will be collected from the re-packed drum, and the steps 5 through 13 in Section 4.3 will be followed for the re-packed drum.

4.4 DEMOBILIZATION

When all the nitrocellulose drums have been removed and processed from the four (4) igloo locations, Clean Harbors will begin the transfer/demobilization steps:

1. The floor space of the storage igloo will be washed clean with the pressure washer, and any collected rinsate will be transferred into waste drums for off-site shipment and disposal. (see Section 5.0)
2. The remaining process water will be pumped out of the filter box and into storage totes or a transport vehicle for re-use at the next igloo location. After the last igloo is cleared, the filter box water will be pumped into drums for disposal.
3. The disposable filters will be removed from the floor of the filter boxes, ensured to be wet, and placed in the drums for the debris waste stream.
4. The hosing, sprayer bar, support stands, and pumps will be dismantled from the filter box, and placed on the rack track for transport to the next igloo or the L-2 area for demobilization.
5. The pumps, pressure washer, air compressor, and road plates will be moved to the next igloo, or the L-2 area for demobilization.
6. The electric forklift will be loaded directly onto the rack track, and transported over to the loading dock of the next igloo or the L-2 area.
7. Clean Harbors rental vendor will be scheduled to move/pickup the filter box.

5.0 TRANSPORTATION AND DISPOSAL

5.1 WASTE STREAMS

The following waste streams have been identified based on the work described in Sections 2.0 and 3.0 of this work plan. Copies of the waste profiles have been included in Appendix D

- Nitrocellulose drums – Profile CH794615
- Wash and Rinsate Water – Profile CH800225



- Empty drums from re-packaging – Profile CH794671
- Debris contaminated with nitrocellulose – Profile CH794640

The nitrocellulose drums are included under Clean Harbors Profile #CH794615. These drums are characterized as a RCRA hazardous waste with a D001 code based on the characteristic for ignitability per 40 CFR §261.21.

The wash water waste stream will be generated from the process water used in the filter box. This water will be collected in 55-gallon poly drums. The generated water is included under Clean Harbors Profile #CH800225. This water is profiled as a non-DOT, non-RCRA Hazardous waste. Sampling may be required to confirm the water meets the characterization of this waste stream.

For the nitrocellulose drums that are re-packaged, the empty and rinsed drums will be characterized non-DOT, non-RCRA Hazardous waste. The empty drums have been included in Clean Harbors Profile #CH794671. The drums will be completely emptied, and all contents removed in order to meet the definition of a “RCRA Empty Container” as stipulated in 40 CFR §261.7.

Debris that is generated during the processing of the drums will be collected in 30-gallon poly drums. Clean Harbors will ensure the debris is wetted prior to placement in the drum. This debris is profiled as a RCRA hazardous waste with a D001 code based on the characteristic for ignitability per 40 CFR §261.21.

All four waste streams will be shipped to the Clean Harbors incineration unit in El Dorado, AR.

5.2 TRANSPORTATION

Clean Harbors will haul all waste streams from Camp Minden, LA to El Dorado, AR under US EPA Transporter ID MAD039322250. The drums for the 4 waste streams will be hauled off-site in a box trailer.

The nitrocellulose drums and debris waste streams will be shipped off-site as DOT Class 4.1 Flammable Solid Material per 49 CFR §172.101. The proper shipping name for all three waste streams will be *UN2555, Waste Nitrocellulose with Water, 4.1, PGII*. Each drum shipped in these waste streams will contain a unique drum identifier, a hazardous waste label, and a flammable solid label (49 CFR §172.420).

The empty drum waste stream is a non-DOT regulated material, and will be shipped off-site on a straight bill of lading. The proper shipping name for the empty drum waste stream will be *Non DOT Regulated Material, UN1263, Paint Related Material, 3, PG II*.

The wash/rinse water waste stream is a non-DOT regulated material, and will be shipped off-site on a straight bill of lading. The proper shipping name for the wash/rinse water waste stream is *Non Hazardous, Non DOT Regulated Material*.



In addition to DOT requirements, the waste transported offsite must comply with Section 121(d) (3) of CERCLA, 42 U.S.C. § 9621(d) (3), and 40 C.F.R. § 300.440. Compliance with CERCLA Section 121(d)(3) and 40 C.F.R. § 300.440 regarding a shipment will be deemed compliant if a prior determination from EPA is obtained indicating that the proposed receiving facility for such shipment is acceptable under the criteria of 40 C.F.R. § 300.440(b). (USEPA, 2014)

6.0 PROJECT SCHEDULE

Clean Harbors anticipates the project schedule to run 6 days per week, Monday through Saturday. On-site work hours will range from 10 – 12 hours each day.

A Project Schedule Gantt chart has been included in Appendix E.

7.0 RECORDKEEPING / DOCUMENTATION

Each work day will commence with a health and safety tailgate meeting. This meeting will include a tailgate form that is signed each day by all field personnel that are on-site. Clean Harbors will keep a record of these tailgate meetings.

As all the drums are being prepared in the filter box, Clean Harbors will keep a record of each drum that is removed, processed, re-packaged (if necessary) and staged for shipment. A tracking sheet will be used to log all drums that are handled each day, and the information will be transferred to a main electronic database. The tracking sheet will contain the following information:

- Unique drum identification
- Drum date
- Storage igloo where container was located
- Drum re-pack (Y/N)
- Original container (if repacked)
- Drum re-pack weight
- Drum contents (if other than Nitrocellulose)
- Moisture content

A sample copy of this tracking sheet is included in Appendix F.

The activities of each day will be kept in a hard-bound, weather-proof field notebook. The content of the field notes will include, but is not limited to: personnel working on-site, site conditions, storage igloo, and the number of drums processed and prepared for shipment, and any issues encountered. The field notes will be transferred to a daily report, and submitted to Hercules on a daily basis. A copy of the daily report form is included in Appendix F.



Shipping manifests will be maintained by Clean Harbors and submitted to Hercules daily. The nitrocellulose drums, contaminated water, and contaminated debris waste streams will be manifested on a uniform hazardous waste manifest (UHWM). The empty drum waste stream will be manifested on a straight bill of lading, or a non-hazardous waste manifest. An example of a UHWM and non-hazardous waste manifest is included in Appendix F.

Clean Harbors will provide documentation to Hercules, who will submit a progress report every 21st day after the date of receipt of EPA's approval of this Work Plan in accordance with the EPA AOC. This progress report will detail the work that has been performed up to that date, problems that have been encountered during that time frame, monitoring and analytical data received during that time frame, and the work and issues that are expected to come up during the next reporting period. An example copy of this progress report is included in Appendix F.

Within 30 days after completion of all field work at Camp Minden a Final Report will be prepared summarizing the actions completed to be in accordance with the Settlement Agreement (EPA 2014). The Final Report will be prepared in accordance with the requirements set forth in Section 300.165 of the NCP (OSC Reports) and EPA Guidance (i.e. Superfund Removal Procedures: Removal Response Reporting – POLREPS and OCS Reports – OSC Directive No 9360.3-03 [June 1, 1994]) The Final Report will include the following items:

- A good faith estimate of total costs incurred to comply with the Settlement Agreement;
- Type and quantities of all materials shipped off-site
- A discussion of material disposal
- Daily and monthly reports recorded during site operations
- Paperwork associate with off-site waste disposal (manifests, shipment tracking logs, certifications, weight tickets, etc.)
- Analytical results from on-site monitoring and testing (i.e. moisture tests)
- Drum tracking inventories (hard copy and electronic copy)
- Field notes
- Certification



8.0 HEALTH AND SAFETY

A site specific Health and Safety Plan (HASP) will be issued by Clean Harbors that details the hazards and mitigation measures at the project site. The health and safety plan will be reviewed by all personnel on-site, and sign the review page. The HASP will be on-site at all times and available to all on-site workers.

At the beginning of each work day, Clean Harbors will hold a safety tailgate meeting before work begins. This tailgate meeting will review the tasks and associated hazards that pertain to each work day, the required personal protective equipment (PPE) for carrying out the day's work, specific procedures or job hazard analysis to be followed, weather and environmental conditions, and issues/comments that need to be addressed. All on-site personnel will sign the safety tailgate meeting before work begins.

The PPE required will generally include level D PPE including the following: Steel-toe boots, hard hats, safety glasses, face shields, flame retardant coveralls, leather gloves (for drum handling and other tool work), neoprene gloves and chest waders (for entering the filter box), and safety vests.

One of the biggest hazards of concern in the igloo area is the potential for lightning to create an ignition source. All work in the igloo area will cease when a thunderstorm and/or threat of lightning is present at the base location. Clean Harbors will monitor the weather frequently before, during, and after each work day to determine if a thunderstorm is imminent in the area. On-site monitoring will be performed with a hand held lightning detector. This device will be able to track a lightning strike within a 25 to 40 mile range.



9.0 NITROCELLULOSE REMOVAL COST

The following is a schedule of values that Clean Harbors submitted to Hercules for the work associated with the removal of Nitrocellulose from Camp Minden. This schedule of values is inclusive of the scope of work performed by Clean Harbors, including pre-mobilization submittals, mobilization and set up, daily on-site support, transportation, disposal, and demobilization. The total cost may vary dependent on actual quantity of material managed during the project.

<u>Description</u>	<u>Quantity</u>	<u>Unit of Measure</u>	<u>Unit Rate</u>	<u>Price</u>
Pre-mobilization submittals	1	Lump Sum	\$32,950.00	\$32,950.00
Mobilization and Site Preparation	1	Lump Sum	\$75,136.00	\$75,136.00
On-site Support	90	Day	\$9,679.00	\$871,110.00
Waste Disposal – Clean Harbors El Dorado, AR Facility	661,000	Lb	\$3.25	\$2,148,250.00
Transportation to El Dorado, AR	24	Load	\$1,250.00	\$30,000.00
Demobilization	1	Lump Sum	\$26,802.00	\$26,802.00
TOTAL				\$3,184,248.00



References

1. Bjella, Kevin L., *Pre-Screening for Explosives Residues in Soil Prior to HPLC Analysis Utilizing Expray*, United States Army Engineer Research and Development Center, Environmental Laboratory, Arlington, Virginia, ERDC/CRREL TN-052-2, February 2005.
2. DoD 4145.26-M, *DOD Contractor's Safety Manual For Ammunitions and Explosives*, 13 March 2008.
3. United States Environmental Protection Agency (USEPA), *Administrative Settlement Agreement and Order on Consent for Removal Action*, U.S. EPA Region 6, CERCLA Docket Number 06-03-14, 11 April 2014



North American Remediation Organization
Hercules, Inc.
Nitrocellulose Removal
Camp Minden, LA

Appendix A: Site Map



North American Remediation Organization
Hercules, Inc.
Nitrocellulose Removal
Camp Minden, LA

Appendix B: Equipment Specifications



024721

PRODUCT DATA SHEET

January, 2007

DEWATERING BOX

(Baker Style)

GENERAL INFORMATION

This equipment is a 25 yd³ roll-off box with bottom-mounted filter packs. Sparging and vacuum capability is included beneath the filter packs.

WEIGHTS AND MEASURES

» Capacity:	.....	25 cu. yds.
» Height:	.....	5'-0"
» Width :	.....	8'-3"
» Length:	.....	23'-0"
» Weight:	.....	7,700 lbs. (approx.)

STRUCTURAL DESIGN

» Floor:	.....	Carbon steel plate
» Sides/Ends:	.....	Carbon steel plate
» Top:	.....	Roll tarp
» Filter Panel Support:	.....	Transverse 2" steel channel with longitudinal 3/8"x3-1/2" flat bar

FEATURES

» Door Gasket:	.....	Closed cell neoprene
» Suction Fittings:	.....	2-4", blind flanged, total drains
» Sparge Line Fittings:	.....	2-1" ball valves with female threads
» Filter Panels:	.....	12 total and hinged on wall side of box, 10 are approx. 40"x40", two panels farthest from door are smaller
» First Stage Filter:	.....	Fixed perforated steel plate, 1/4" diameter holes on 3/8" stagger, 42% open area
» Second Stage Filter:	.....	Removable stainless steel 50 mesh screen (0.0118 width opening) 30.3% open area sandwiched between two panels of expanded metal
» Sparge Line:	.....	(2) - 1" schedule 40 pipe with 1/8" dia. holes every 6" (approx. 40 holes per line)

SURFACE DETAILS

» Exterior Coating:	.....	High gloss polyurethane
» Interior Coating:	None

TESTS/CERTIFICATIONS

» Test Performed:	Scheduled QMS inspections
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To the best of our knowledge the technical data contained herein are true and accurate at the date of issuance and are subject to change without prior notice. No guarantee of accuracy is given or implied because variations can and do exist. NO WARRANTY OR GUARANTEE OF ANY KIND IS MADE BY BAKERCORP™, EITHER EXPRESS OR IMPLIED.

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5 Step Tilt And Roll Ladder - Perforated Step - 24"W Step



Availability: Usually ships in 3 to 6 days



Product Information

**Tilt & Roll Rolling Ladder
Perforated Step**

Heavy-duty 1-1/16" steel tubing makes this ladder ideal for warehouse use, stock picking or maintenance operations. This Perforated Step model has steel steps with slip-resistant openings for added traction. Tilt ladder forward on two 4" wheels to move from job to job. 4 large rubber end caps protect floor surfaces. 7" deep steps, 10" deep top platform and 30" handrails provide sure footing for safe, worry-free use. Overall height 80". Meets OSHA requirements. Powder coat finish. 450 lb. capacity.





4" Diameter Wheels

Non-Marring Rubber End Caps for Stationary Positioning



350 lb. Capacity



Handrails Provide User Safety



Meets the requirements of the Occupational Safety and Health Administration.

Product Specifications

WIDTH INCHES	31
DEPTH INCHES	42
DEPTH TOP STEP INCHES	10
HEIGHT INCHES TO TOP STEP	47
CAPACITY LBS	450
COLOR FINISH	Gray
ASSEMBLY	Unassembled
BRAND	Tri-Arc
CONSTRUCTION	Steel
MAUFACTURERS PART NUMBER	KDTF105246
QUANTITY STEPS	5
STEP TYPE	Perforated

STEP WIDTH INCHES	24
WEIGHT LBS	40

Photo Gallery



General Sales

For product information or to place an order, please contact us at sales@globalindustrial.com, or 1-888-978-7759.

Customer Support

For assistance regarding an order already placed or received, please contact us at 1-888-628-3466 or service@globalindustrial.com.

For information on an outstanding invoice, please email our Accounts Receivable Department at AR@globalindustrial.com.

Mail your remittances to:

Global Industrial
PO Box 905713
Charlotte, NC 28290-5713

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International Customers

Ordering is available to residents of the US, US territories and customers with APO/FPO addresses. For information or to place an order, please call 1-888-277-6995.

Mailing Addresses

You can contact us by mail at the following addresses:

Global Industrial
11 Harbor Park Drive
Port Washington, NY 11050

Global Industrial
2505 Mill Center Parkway
Suite 100
Buford, GA 30518-3700



Cat[®] TL943C

Telehandler

Specifications

Engine

Model	Cat [®] C3.4B Tier 4 Interim	
Gross Power (Basic)	83 kW	111.3 hp
Maximum Torque (Standard)	450 Nm at 1400 rpm	332 lb-ft
Bore	99 mm	3.9 in
Stroke	110 mm	4.3 in
Displacement	3.4 L	207.5 cu in

Weights

Operating Weight	12 032 kg	26,525 lb
------------------	-----------	-----------

Operating Specifications

Rated Load Capacity	4082 kg	9,000 lb
Maximum Lift Height	13.1 m	43 ft
Maximum Forward Reach	9.6 m	31.5 ft
Frame Leveling	10°	
Top Travel Speed	32.7 kph	20.3 mph
Capacity at Max Height	3175 kg	7,000 lb
Capacity at Max Reach	544 kg	1,200 lb
Turning Radius over Tires	3.7 m	12 ft
Drawbar Pull (Loaded)	115.7 kN	26,000 lb

Hydraulic System

Variable displacement load sensing axial piston pump		
System Operating Pressure	276 bar	4,000 psi
Auxiliary Hydraulic Pressure	207 bar	3,000 psi
Auxiliary Hydraulic Flow at Boom Head	38 L/min	10 gal/min

- Auxiliary Hydraulic Circuit used for all attachments equipped with cylinders or other hydraulic components. Consists of valves, controls and hydraulic lines.

Service Refill Capacities

Fuel Tank	144 L	38 gal
Hydraulic System	157 L	41.5 gal

Tires

Standard	370/75-28 Duraforce MT
Optional	370/75-28 Foam Filled 13.00 x 24 Foam Filled 13.00 x 24 12 PR

Transmission Speeds

Forward	4 speed
Reverse	3 speed

024731

Boom Performance

Boom Up	13.9 Seconds
Boom Down	10.2 Seconds
Tele In	16.8 Seconds
Tele Out	14.9 Seconds

Axles

- Trunnion mounted planetary 55 degree steer axles.
- Integral steer cylinder.
- High bias limited slip differential on front axle.

Brakes

- Service Brakes are inboard wet disc brakes on front and rear axles.
- Parking Brakes are spring-applied hydraulic release on front axle. Light on dash indicates when brake is on.

Work Tools

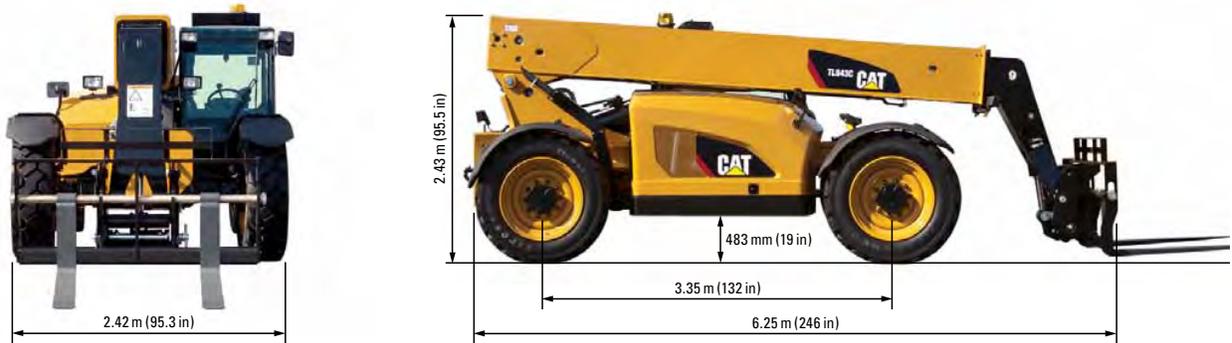
	Includes Auxiliary Electrics	Includes Auxiliary Electrics
Hydraulic IT Coupler	(2) 1525 mm, 60 mm x 150 mm	(2) 60 in, 2.36 in x 6 in
Pallet Forks	(2) 1220 mm, 60 mm x 100 mm (2) 1220 mm, 60 mm x 125 mm	(2) 48 in, 2.36 in x 4 in (2) 48 in, 2.36 in x 5 in
Lumber Forks	(2) 1525 mm, 45 mm x 180 mm (2) 1829 mm, 50 mm x 150 mm	(2) 60 in, 1.75 in x 7 in (2) 72 in, 2 in x 6 in
Cubing Forks	(2) 1220 mm, 50 mm x 50 mm	(2) 48 in, 2 in x 2 in
Carriages:		
Standard Tilt	1270 mm	50 in
Wide Tilt	1829 mm	72 in
Side Shift	1220 mm	48 in
Standard Rotate	1270 mm	50 in
Wide Rotate	1829 mm	72 in
Swing	100°, 1829 mm, 4028 kg Capacity, 2268 kg Swung	100°, 72 in, 9,000 lb Capacity, 5,000 lb Swung
Dual Fork Positioning	1270 mm	50 in



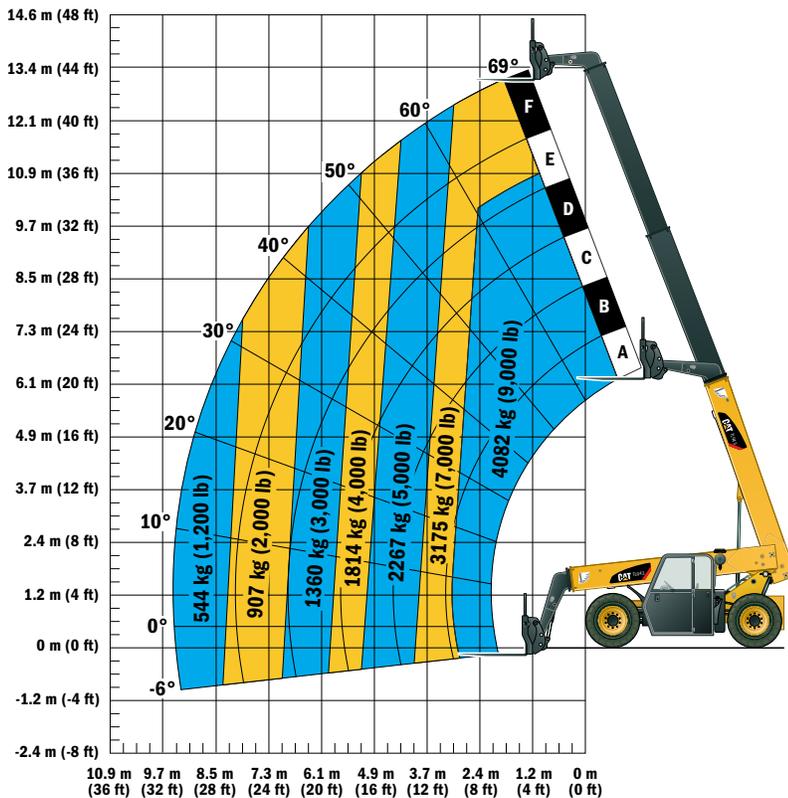
TL943C Telehandler

Dimensions

All dimensions are approximate.



Load Chart and Dimensions



IMPORTANT

Rated lift capacities shown are with machine equipped with carriage and pallet forks. The machine must be level on a firm surface with undamaged, properly inflated tires. Machine specifications and stability are based on rated lift capacities at specific boom angles and boom lengths. (If specifications are critical, the proposed application should be discussed with your dealer.)

DO NOT exceed rated lift capacity loads, as unstable and dangerous machine conditions will result.

DO NOT tip the machine forward to determine the allowable load.

Use only approved attachments with proper material handler model/attachment load capacity charts displayed in the operator's cab. OSHA requires all rough terrain forklift operators be trained according to OSHA 29 CFR 1910.178 (1).

Due to continuous product improvements, machine specifications and/or equipment changes may be made without prior notification. This machine meets or exceeds ANSI/ITSDF B56.6-2005 as originally manufactured for intended applications.

For more complete information on Cat products, dealer services, and industry solutions, visit us on the web at www.cat.com

AEHQ6747-00 (03-2012)

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Materials and specifications are subject to change without notice. Featured machines in photos may include additional equipment. See your Cat dealer for available options.

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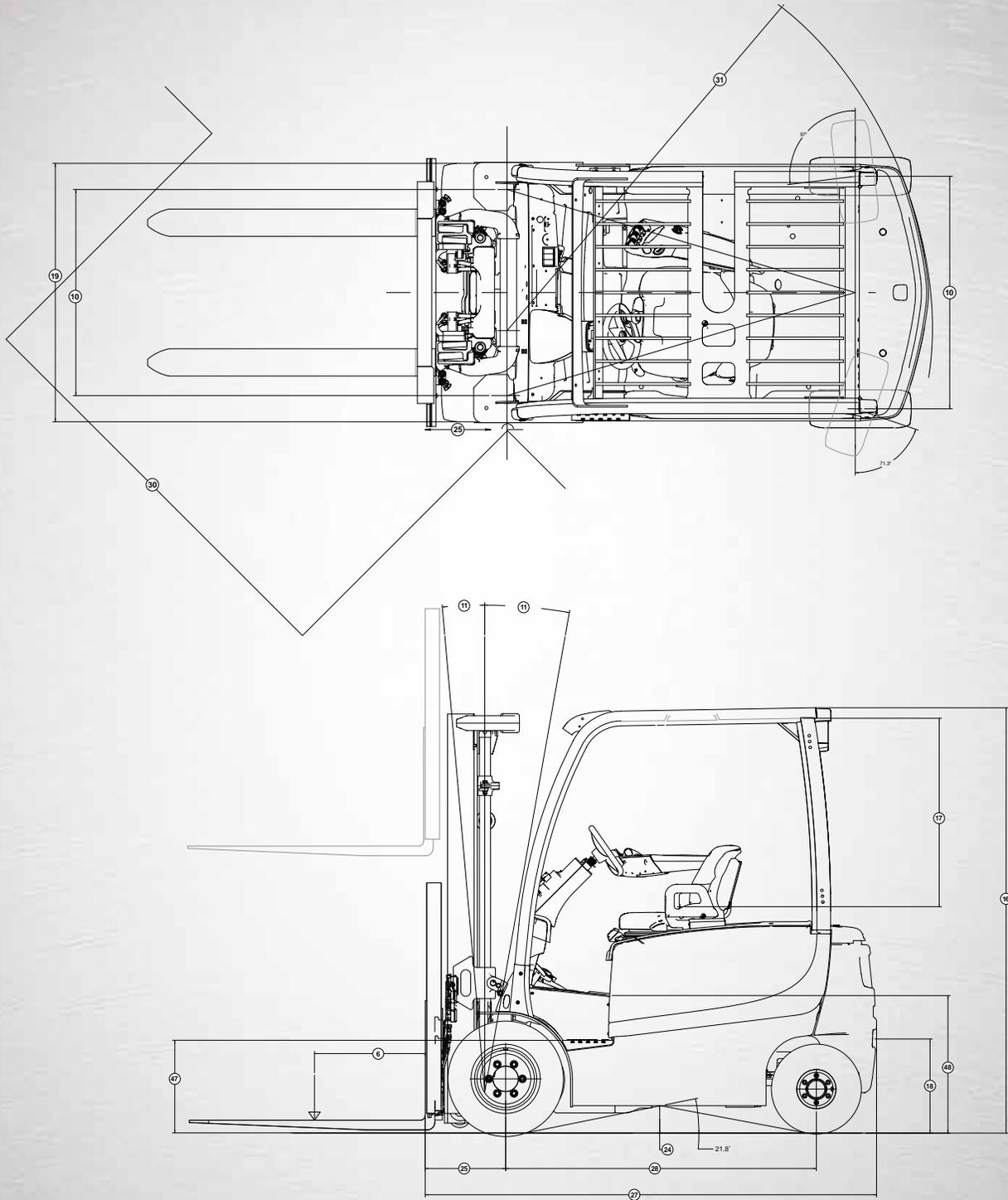
J45-70XN SERIES



**STRONG PARTNERS.
TOUGH TRUCKS.™**

TECHNICAL GUIDE
Counterbalanced Electric, Pneumatic Tire

J45-70XN DIMENSIONS



Circled dimensions correspond to the line numbers on the tabulated chart inside the Technical Guide. Dimensions are in inches (millimeters).

J45XN SPECIFICATIONS

GENERAL				Hyster Company	
1	Manufacturer			Hyster Company	
2	Model Designation			J45XN	
3	Power/Voltage			Electric / 80 Volts	
4	Operation			Sit	
5	Rated Capacity	lb. (kg)		4500 (2041)	
6	Load Center	in. (mm)		24 (610)	
7	Tire Type (Std/Opt)			Pneumatic / Pneumatic Shaped Solid	
8	Tire Size (Drive/Steer)	in.		23 x 10 - 12 / 18 x 7 - 8	
9	Wheels - Number X=Driven (Drive/Steer)	front/rear		2X / 2	
10	Tread	Ctr. of Tires	Std Dr/Wide Dr/Steer	in. (mm) 36.9 / 41.5 / 39.1 (938 / 1054 / 992)	
11	Mast Tilt	Std Opt Opt		degrees 5F / 5B 10F / 5B 5F / 6B	
12	Mast - Lowered Height	Std Mast		in. (mm) 87 (2192)	
13	Free Lift - Top of Fork	Std 2 Stg Limited Free Lift Mast		in. (mm) 5 (140)	
		Opt 2 Stg Full Free Lift Mast with/without LBR		in. (mm) 37 / 64 (962 / 1628)	
14	Lift Height - Top of Fork	Std 2 Stg Limited Free Lift Mast		in. (mm) 133 (3392)	
15	Mast - Extended Height	Std Mast with/without LBR		in. (mm) 182 / 156 (4622 / 3956)	
16	Overhead Guard Height	Without/With Battery Rollers		in. (mm) 86.3 / 90.4 (2193 / 2297)	
17	SIP to Bottom of OHG	Seat Depressed	Std/Susp/Swivel	in. (mm) 38.8 / 39.4 / 38.9 (986 / 1001 / 989)	
18	Tow Pin Height	Vertical Center of Pin		in. (mm) 10.3 (262)	
19	Overall Width	Pneumatic Tires	Std/Wide Tread	in. (mm) 46.9 / 51.5 (1192 / 1308)	
		PSS Tires	Std/Wide Tread	in. (mm) 46.2 / 50.7 (1173 / 1289)	
20	Forks	Thickness x Width x Length		in. (mm) 1.6 x 3.9 x 42 (40 x 100 x 1067)	
21	Standard Carriage Width			in. (mm) 42 (1067)	
22	Floor to Top of Battery Rollers			in. (mm) 9.8 (250)	
23	Ground Clearance	Lowest Point (NL/RL)		in. (mm) 3.9 / 3.3 (98 / 83)	
24	Ground Clearance	Center of Truck (NL/RL)		in. (mm) 5.4 / 5.3 (137 / 135)	
25	Load Distance	Center of Wheel to Face of Forks		in. (mm) 16.5 (419)	
26	Battery Compartment	Height	without/with Batt. Rollers	in. (mm) 31.2 / 31.2 (792 / 792)	
		Width		in. (mm) 40.7 (1034)	
			Nominal	SIZE 28"	
		Length	Actual	in. (mm) 28.2 (717)	
27	Length to Face of Forks	Chassis Length		in. (mm) 92.0 (2336)	
28	Wheelbase			in. (mm) 63.2 (1606)	
29	Right Angle Stack			in. (mm) 141.8 (3602)	
30	Equal Aisle	90° Intersecting Aisle		in. (mm) 78.2 (1986)	
31	Outside Turning Radius			in. (mm) 76 (1931)	
32	Truck Weight	Without Battery (NL)		lb. (kg) 6360 (2885)	
33	Axle Loading - Drive	Static with Max. Wt. Battery (NL/RL)		lb. (kg) 5266 / 12649 (2389 / 5737)	
34	Axle Loading - Steer	Static with Max. Wt. Battery (NL/RL)		lb. (kg) 5236 / 2352 (2375 / 1067)	
				Standard Performance	PowerPlus Performance
35	Travel Speed	(NL/RL)		mph (km/h) 11.2 / 11.2 (18 / 18)	
36	Lift Speed	Std 2 Stg LFL Mast (NL/RL)		ft/min (m/sec) 124 / 79 (0.63 / 0.40)	
		Opt 2 Stg FFL Mast (NL/RL)		ft/min (m/sec) 124 / 81 (0.63 / 0.41)	
		Opt 3 Stg FFL Mast (NL/RL)		ft/min (m/sec) 124 / 79 (0.63 / 0.40)	
37	Lower Speed	Std 2 Stg LFL Mast (NL/RL)		ft/min (m/sec) 100 / 112 (0.51 / 0.57)	
		Opt 2 Stg FFL Mast (NL/RL)		ft/min (m/sec) 91 / 102 (0.46 / 0.52)	
		Opt 3 Stg FFL Mast (NL/RL)		ft/min (m/sec) 93 / 106 (0.47 / 0.54)	
38	Gradability	5 Minute Rating (NL/RL)		% 39 / 26	
		60 Minute Rating (NL/RL)		% 13 / 9	
39	Drawbar Pull	5 Minute Rating (NL/RL)		lbf 4283 / 4057	
		60 Minute Rating (NL/RL)		lbf 1298 / 1229	
40	Brake	Method of Control (Service/Parking)		Hydraulic / Mechanical	
		Method of Operation (Service/Parking)		Foot / Automatic	
41	Battery	Type		Lead Acid	
42	Traction Motors (Dual)	60 Minute Rating (Each)		hp (kW) 13.4 (10)	
43	Pump Motor	15 Minute Rating		hp (kW) 21.5 (16)	
44	Traction Motors	Type/Control Method		Dual AC / Transistor	
45	Pump Motor	Type/Control Method		AC / Transistor	
46	Number of Speeds	Traction/Pump		Infinitely Variable / Infinitely Variable	
47	Step Height			in. (mm) 18.7 (475)	
48	Floor Height	Without/With Battery Rollers		in. (mm) 27.8 / 31.9 (706 / 810)	
49	Attachment Relief Pressure			psi (bar) 2250 (155)	
50	Auxiliary Oil Flow	3rd and 4th Function		gal/min (l/min) 11 (40)	
51	Sound Level	Measured per ANSI B56.11.5		dB (A) 63 65	

CERTIFICATION: These Hyster lift trucks meet design specifications of Part II ANSI B56.1-1969, as required by OSHA Section 1910.178(a)(2) and also comply with Part III ANSI B56.1-revision in effect at time of manufacture. Certification of compliance with the applicable ANSI standards appears on the lift truck.

NOTE: Performance specifications / ratings are for truck equipped as described under Standard Equipment in this Technical Guide. Performance specifications are affected by the condition of the vehicle and how it is equipped, as well as by the nature and condition of the operating area. Specifications are subject to change and the proposed application should be discussed with your authorized Hyster Company Dealer.

J50XN SPECIFICATIONS

GENERAL	1	Manufacturer		Hyster Company		
	2	Model Designation		J50XN		
	3	Power/Voltage		Electric / 80 Volts		
TIRES	4	Operation		Sit		
	5	Rated Capacity		5000 (2268)		
	6	Load Center		24 (610)		
	7	Tire Type (Std/Opt)		Pneumatic / Pneumatic Shaped Solid		
	8	Tire Size (Drive/Steer)		23 x 10 - 12 / 18 x 7 - 8		
	9	Wheels - Number X=Driven (Drive/Steer)		front/rear 2X / 2		
	10	Tread	Ctr. of Tires	Std Dr/Wide Dr/Steer	in. (mm) 36.9 / 41.5 / 39.1 (938 / 1054 / 992)	
	11	Mast Tilt	Std Opt Opt		degrees 5F / 5B 10F / 5B 5F / 6B	
	12	Mast - Lowered Height	Std Mast		in. (mm) 87 (2192)	
	DIMENSIONS	13	Free Lift - Top of Fork	Std 2 Stg Limited Free Lift Mast		in. (mm) 5 (140)
Opt 2 Stg Full Free Lift Mast with/without LBR				in. (mm) 37 / 64 (962 / 1628)		
14		Lift Height - Top of Fork	Std 2 Stg Limited Free Lift Mast		in. (mm) 133 (3392)	
15		Mast - Extended Height	Std Mast with/without LBR		in. (mm) 182 / 156 (4622 / 3956)	
16		Overhead Guard Height	Without/With Battery Rollers		in. (mm) 86.3 / 90.4 (2193 / 2297)	
17		SIP to Bottom of OHG	Seat Depressed	Std/Susp/Swivel	in. (mm) 38.8 / 39.4 / 38.9 (986 / 1001 / 989)	
18		Tow Pin Height	Vertical Center of Pin		in. (mm) 10.3 (262)	
19		Overall Width	Pneumatic Tires		Std/Wide Tread	
			PSS Tires		Std/Wide Tread	
20		Forks	Thickness x Width x Length		in. (mm) 1.6 x 3.9 x 42 (40 x 100 x 1067)	
21	Standard Carriage Width			in. (mm) 42 (1067)		
22	Floor to Top of Battery Rollers			in. (mm) 9.8 (250)		
23	Ground Clearance	Lowest Point (NL/RL)		in. (mm) 3.9 / 3.3 (98 / 83)		
24	Ground Clearance	Center of Truck (NL/RL)		in. (mm) 5.4 / 5.3 (137 / 134)		
25	Load Distance	Center of Wheel to Face of Forks		in. (mm) 16.5 (419)		
26	Battery Compartment	Height	without/with Batt. Rollers	in. (mm) 31.2 / 31.2 (792 / 792)		
		Width		in. (mm) 40.7 (1034)		
27	Length to Face of Forks	Nominal	SIZE	28" 34"		
		Length	Actual	in. (mm) 28.2 (717) 33.9 (861)		
28	Wheelbase	Chassis Length		in. (mm) 92.0 (2336) 97.6 (2480)		
29	Right Angle Stack			in. (mm) 63.2 (1606) 68.9 (1750)		
30	Equal Aisle	90° Intersecting Aisle		in. (mm) 141.8 (3602) 147.3 (3742)		
31	Outside Turning Radius			in. (mm) 78.2 (1986) 80.7 (2049)		
WT.	32	Truck Weight	Without Battery (NL)	lb. (kg) 6360 (2885) 6560 (2976)		
	33	Axle Loading - Drive	Static with Max. Wt. Battery (NL/RL)		lb. (kg) 5266 / 13470 (2389 / 6110) 5718 / 13659 (2594 / 6196)	
	34	Axle Loading - Steer	Static with Max. Wt. Battery (NL/RL)		lb. (kg) 5236 / 2032 (2375 / 922) 5762 / 2821 (2614 / 1280)	
PERFORMANCE	35	Travel Speed	(NL/RL)	mph (km/h) 11.2 / 11.2 (18 / 18) 13 / 13 (21 / 21)		
			Std 2 Stg LFL Mast (NL/RL)	ft/min (m/sec) 124 / 75 (0.63 / 0.38) 142 / 96 (0.72 / 0.49)		
	36	Lift Speed	Opt 2 Stg FFL Mast (NL/RL)	ft/min (m/sec) 124 / 77 (0.63 / 0.39) 130 / 93 (0.66 / 0.47)		
			Opt 3 Stg FFL Mast (NL/RL)	ft/min (m/sec) 124 / 77 (0.63 / 0.39) 134 / 94 (0.68 / 0.48)		
	37	Lower Speed	Std 2 Stg LFL Mast (NL/RL)	ft/min (m/sec) 100 / 112 (0.51 / 0.57)		
			Opt 2 Stg FFL Mast (NL/RL)	ft/min (m/sec) 91 / 106 (0.46 / 0.54)		
	38	Gradability	Opt 3 Stg FFL Mast (NL/RL)	ft/min (m/sec) 93 / 108 (0.47 / 0.55)		
			5 Minute Rating (NL/RL)	% 35 / 24 38 / 26		
	39	Drawbar Pull	60 Minute Rating (NL/RL)	% 12 / 8 13 / 9		
			5 Minute Rating (NL/RL)	lbf 4248 / 4148 4588 / 4480		
40	Brake	60 Minute Rating (NL/RL)	lbf 1287 / 1257 1390 / 1357			
		Method of Control (Service/Parking)	Hydraulic / Mechanical			
ELECTRIC	41	Battery	Method of Operation (Service/Parking)	Foot / Automatic		
			Type	Lead Acid		
	42	Traction Motors (Dual)	60 Minute Rating (Each)	hp (kW) 13.4 (10) 13.4 (10)		
	43	Pump Motor	15 Minute Rating	hp (kW) 21.5 (16) 32.2 (24)		
	44	Traction Motors	Type/Control Method	Dual AC / Transistor		
			Type/Control Method	AC / Transistor		
	45	Pump Motor	Type/Control Method	Infinitely Variable / Infinitely Variable		
			Number of Speeds	Traction/Pump		
	46	Step Height			in. (mm) 18.7 (475)	
	OTHER	47	Floor Height	Without/With Battery Rollers	in. (mm) 27.8 / 31.9 (706 / 810)	
48		Attachment Relief Pressure			psi (bar) 2250 (155)	
49		Auxiliary Oil Flow	3rd and 4th Function		gal/min (l/min) 11 (40)	
50	Sound Level	Measured per ANSI B56.11.5		dB (A) 63 65		

CERTIFICATION: These Hyster lift trucks meet design specifications of Part II ANSI B56.1-1969, as required by OSHA Section 1910.178(a)(2) and also comply with Part III ANSI B56.1-revision in effect at time of manufacture. Certification of compliance with the applicable ANSI standards appears on the lift truck.

† **NOTE:** Performance specifications / ratings are for truck equipped as described under Standard Equipment in this Technical Guide. Performance specifications are affected by the condition of the vehicle and how it is equipped, as well as by the nature and condition of the operating area. Specifications are subject to change and the proposed application should be discussed with your authorized Hyster Company Dealer.

J60XN SPECIFICATIONS

GENERAL	1	Manufacturer		Hyster Company		
	2	Model Designation		J60XN		
	3	Power/Voltage		Electric / 80 Volts		
TIRES	4	Operation		Sit		
	5	Rated Capacity		lb. (kg) 6000 (2722)		
	6	Load Center		in. (mm) 24 (610)		
	7	Tire Type (Std/Opt)		Pneumatic / Pneumatic Shaped Solid		
	8	Tire Size (Drive/Steer)		23 x 10 - 12 / 18 x 7 - 8		
	9	Wheels - Number X=Driven (Drive/Steer)		front/rear 2X / 2		
	10	Tread	Ctr. of Tires	Std Dr/Wide Dr/Steer	in. (mm) 36.9 / 41.5 / 39.1 (938 / 1054 / 992)	
	11	Mast Tilt	Std Opt Opt		degrees 5F / 5B 10F / 5B 5F / 6B	
	12	Mast - Lowered Height	Std Mast		in. (mm) 87 (2192)	
	DIMENSIONS	13	Free Lift - Top of Fork		Std 2 Stg Limited Free Lift Mast	in. (mm) 5 (140)
Opt 2 Stg Full Free Lift Mast with/without LBR			in. (mm) 37 / 60 (957 / 1540)			
14		Lift Height - Top of Fork		Std 2 Stg Limited Free Lift Mast	in. (mm) 126 (3209)	
15		Mast - Extended Height		Std Mast with/without LBR	in. (mm) 175 / 153 (4444 / 3861)	
16		Overhead Guard Height		Without/With Battery Rollers	in. (mm) 86.3 / 90.4 (2193 / 2297)	
17		SIP to Bottom of OHG	Seat Depressed	Std/Susp/Swivel	in. (mm) 38.8 / 39.4 / 38.9 (986 / 1001 / 989)	
18		Tow Pin Height		Vertical Center of Pin	in. (mm) 10.3 (262)	
19		Overall Width		Pneumatic Tires	Std/Wide Tread	in. (mm) 46.9 / 51.5 (1192 / 1308)
		PSS Tires		Std/Wide Tread	in. (mm) 46.2 / 50.7 (1173 / 1289)	
20		Forks		Thickness x Width x Length	in. (mm) 2 x 4.9 x 42 (50 x 125 x 1067)	
21		Standard Carriage Width			in. (mm) 42 (1067)	
22		Floor to Top of Battery Rollers			in. (mm) 9.8 (250)	
23		Ground Clearance	Lowest Point (NL/RL)		in. (mm) 3.9 / 3.3 (98 / 83)	
24		Ground Clearance	Center of Truck (NL/RL)		in. (mm) 5.4 / 5.3 (137 / 134)	
25		Load Distance	Center of Wheel to Face of Forks		in. (mm) 17.0 (431)	
26		Battery Compartment		Height	without/with Batt. Rollers	in. (mm) 31.2 / 31.2 (792 / 792)
				Width		in. (mm) 40.7 (1034)
				Nominal	SIZE 34"	
			Length	Actual	in. (mm) 33.9 (861)	
27		Length to Face of Forks	Chassis Length		in. (mm) 98.1 (2492)	
28	Wheelbase			in. (mm) 68.9 (1750)		
29	Right Angle Stack			in. (mm) 147.3 (3742)		
30	Equal Aisle	90° Intersecting Aisle		in. (mm) 80.7 (2049)		
31	Outside Turning Radius			in. (mm) 81.6 (2073)		
WT.	32	Truck Weight	Without Battery (NL)	lb. (kg) 6730 (3053)		
	33	Axle Loading - Drive	Static with Max. Wt. Battery (NL/RL)	lb. (kg) 5930 / 15499 (2690 / 7030)		
	34	Axle Loading - Steer	Static with Max. Wt. Battery (NL/RL)	lb. (kg) 5714 / 2145 (2592 / 973)		
PERFORMANCE	35	Travel Speed	(NL/RL)	mph (km/h) Standard Performance 11.2 / 10.6 (18 / 17) PowerPlus Performance 13 / 12.1 (21 / 19.5)		
	36	Lift Speed		Std 2 Stg LFL Mast (NL/RL)	ft/min (m/sec) 116 / 65 (0.59 / 0.33) 124 / 83 (0.63 / 0.42)	
		Opt 2 Stg FFL Mast (NL/RL)		ft/min (m/sec) 108 / 65 (0.55 / 0.33) 116 / 81 (0.59 / 0.41)		
		Opt 3 Stg FFL Mast (NL/RL)		ft/min (m/sec) 112 / 65 (0.57 / 0.33) 118 / 81 (0.60 / 0.41)		
	37	Lower Speed		Std 2 Stg LFL Mast (NL/RL)	ft/min (m/sec) 91 / 110 (0.46 / 0.56)	
		Opt 2 Stg FFL Mast (NL/RL)		ft/min (m/sec) 73 / 102 (0.37 / 0.52)		
		Opt 3 Stg FFL Mast (NL/RL)		ft/min (m/sec) 79 / 104 (0.4 / 0.53)		
	38	Gradability		5 Minute Rating (NL/RL)	% 34 / 22 37 / 24	
		60 Minute Rating (NL/RL)		% 11 / 7 12 / 8		
	39	Drawbar Pull		5 Minute Rating (NL/RL)	lbf 4146 / 4037 4477 / 4360	
60 Minute Rating (NL/RL)		lbf 1256 / 1223 1357 / 1321				
40	Brake		Method of Control (Service/Parking)	Hydraulic / Mechanical		
			Method of Operation (Service/Parking)	Foot / Automatic		
ELECTRIC	41	Battery		Lead Acid		
	42	Traction Motors (Dual)	60 Minute Rating (Each)	hp (kW) 13.4 (10) 13.4 (10)		
	43	Pump Motor		15 Minute Rating	hp (kW) 21.5 (16) 32.2 (24)	
	44	Traction Motors		Type/Control Method	Dual AC / Transistor	
	45	Pump Motor		Type/Control Method	AC / Transistor	
	46	Number of Speeds		Traction/Pump	Infinitely Variable / Infinitely Variable	
OTHER	47	Step Height		in. (mm) 18.7 (475)		
	48	Floor Height	Without/With Battery Rollers	in. (mm) 27.8 / 31.9 (706 / 810)		
	49	Attachment Relief Pressure		psi (bar) 2250 (155)		
	50	Auxiliary Oil Flow	3rd and 4th Function	gal/min (l/min) 11 (40)		
	51	Sound Level		Measured per ANSI B56.11.5	dB (A) 63 65	

J70XN SPECIFICATIONS

GENERAL	1	Manufacturer		Hyster Company			
	2	Model Designation		J70XN			
	3	Power/Voltage		Electric / 80 Volts			
TIRES	4	Operation		Sit			
	5	Rated Capacity		7000 (3175)			
	6	Load Center		24 (610)			
	7	Tire Type (Std/Opt)		Pneumatic / Pneumatic Shaped Solid			
	8	Tire Size (Drive/Steer)		23 x 10 - 12 / 18 x 7 - 8			
	9	Wheels - Number X=Driven (Drive/Steer)		front/rear 2X / 2			
	10	Tread	Ctr. of Tires	Std Dr/Wide Dr/Steer	in. (mm)	36.9 / 41.5 / 39.1 (938 / 1054 / 992)	
	11	Mast Tilt	Std Opt Opt		degrees	5F / 5B 10F / 5B 5F / 6B	
	12	Mast - Lowered Height	Std Mast		in. (mm)	87 (2192)	
	DIMENSIONS	13	Free Lift - Top of Fork	Std 2 Stg Limited Free Lift Mast		in. (mm)	5 (140)
			Opt 2 Stg Full Free Lift Mast with/without LBR		in. (mm)	37 / 60 (957 / 1540)	
14		Lift Height - Top of Fork	Std 2 Stg Limited Free Lift Mast		in. (mm)	126 (3209)	
15		Mast - Extended Height	Std Mast with/without LBR		in. (mm)	175 / 153 (4444 / 3861)	
16		Overhead Guard Height	Without/With Battery Rollers		in. (mm)	86.3 / 90.4 (2193 / 2297)	
17		SIP to Bottom of OHG	Seat Depressed	Std/Susp/Swivel	in. (mm)	38.8 / 39.4 / 38.9 (986 / 1001 / 989)	
18		Tow Pin Height	Vertical Center of Pin		in. (mm)	10.3 (262)	
19		Overall Width	Pneumatic Tires	Std/Wide Tread	in. (mm)	46.9 / 51.5 (1192 / 1308)	
			PSS Tires	Std/Wide Tread	in. (mm)	46.2 / 50.7 (1173 / 1289)	
20		Forks	Thickness x Width x Length		in. (mm)	2 x 4.9 x 42 (50 x 125 x 1067)	
21	Standard Carriage Width			in. (mm)	42 (1067)		
22	Floor to Top of Battery Rollers			in. (mm)	9.8 (250)		
23	Ground Clearance	Lowest Point (NL/RL)		in. (mm)	3.9 / 3.3 (98 / 83)		
24	Ground Clearance	Center of Truck (NL/RL)		in. (mm)	5.4 / 5.2 (137 / 132)		
25	Load Distance	Center of Wheel to Face of Forks		in. (mm)	17.0 (431)		
WT.	26	Battery Compartment	Height	without/with Batt. Rollers	in. (mm)	31.2 / 31.2 (792 / 792)	
			Width		in. (mm)	40.7 (1034)	
				Nominal	SIZE	34"	
			Length	Actual	in. (mm)	33.9 (861)	
	27	Length to Face of Forks	Chassis Length		in. (mm)	101.2 (2570)	
	28	Wheelbase			in. (mm)	68.9 (1750)	
	29	Right Angle Stack			in. (mm)	149.9 (3808)	
	30	Equal Aisle	90° Intersecting Aisle		in. (mm)	81.8 (2078)	
	31	Outside Turning Radius			in. (mm)	84.2 (2139)	
	32	Truck Weight	Without Battery (NL)		lb. (kg)	7420 (3366)	
33	Axle Loading - Drive	Static with Max. Wt. Battery (NL/RL)		lb. (kg)	5814 / 16979 (2637 / 7702)		
34	Axle Loading - Steer	Static with Max. Wt. Battery (NL/RL)		lb. (kg)	6525 / 2360 (2960 / 1070)		
PERFORMANCE	35	Travel Speed	(NL/RL)		mph (km/h)	Standard Performance 11.2 / 9.9 (18 / 16)	PowerPlus Performance 13 / 11.2 (21 / 18)
	36	Lift Speed	Std 2 Stg LFL Mast (NL/RL)		ft/min (m/sec)	116 / 61 (0.59 / 0.31)	124 / 73 (0.63 / 0.37)
			Opt 2 Stg FFL Mast (NL/RL)		ft/min (m/sec)	108 / 61 (0.55 / 0.31)	116 / 73 (0.59 / 0.37)
			Opt 3 Stg FFL Mast (NL/RL)		ft/min (m/sec)	112 / 61 (0.57 / 0.31)	118 / 73 (0.60 / 0.37)
	37	Lower Speed	Std 2 Stg LFL Mast (NL/RL)		ft/min (m/sec)	91 / 114 (0.46 / 0.58)	
			Opt 2 Stg FFL Mast (NL/RL)		ft/min (m/sec)	73 / 106 (0.37 / 0.54)	
			Opt 3 Stg FFL Mast (NL/RL)		ft/min (m/sec)	79 / 110 (0.40 / 0.56)	
	38	Gradability	5 Minute Rating (NL/RL)		%	32 / 20	35 / 22
			60 Minute Rating (NL/RL)		%	10 / 6	11 / 7
	39	Drawbar Pull	5 Minute Rating (NL/RL)		lbf	4243 / 4064	4583 / 4389
		60 Minute Rating (NL/RL)		lbf	1286 / 1232	1389 / 1330	
40	Brake	Method of Control (Service/Parking)			Hydraulic / Mechanical		
		Method of Operation (Service/Parking)			Foot / Automatic		
ELECTRIC	41	Battery	Type			Lead Acid	
	42	Traction Motors (Dual)	60 Minute Rating (Each)		hp (kW)	13.4 (10)	13.4 (10)
	43	Pump Motor	15 Minute Rating		hp (kW)	21.5 (16)	32.2 (24)
	44	Traction Motors	Type/Control Method			Dual AC / Transistor	
	45	Pump Motor	Type/Control Method			AC / Transistor	
	46	Number of Speeds	Traction/Pump			Infinitely Variable / Infinitely Variable	
OTHER	47	Step Height			in. (mm)	18.7 (475)	
	48	Floor Height	Without/With Battery Rollers		in. (mm)	27.8 / 31.9 (706 / 810)	
	49	Attachment Relief Pressure			psi (bar)	2250 (155)	
	50	Auxiliary Oil Flow	3rd and 4th Function		gal/min (l/min)	11 (40)	
	51	Sound Level	Measured per ANSI B56.11.5		dB (A)	63	65

CERTIFICATION: These Hyster lift trucks meet design specifications of Part II ANSI B56.1-1969, as required by OSHA Section 1910.178(a)(2) and also comply with Part III ANSI B56.1-revision in effect at time of manufacture. Certification of compliance with the applicable ANSI standards appears on the lift truck.

† **NOTE:** Performance specifications / ratings are for truck equipped as described under Standard Equipment in this Technical Guide. Performance specifications are affected by the condition of the vehicle and how it is equipped, as well as by the nature and condition of the operating area. Specifications are subject to change and the proposed application should be discussed with your authorized Hyster Company Dealer.

MAST DIMENSIONS

J45-50XN MAST DIMENSIONS

Maximum Fork Height (TOF)	Overall Lowered Ht.	Overall Extended Height w/Load Backrest	Overall Extended Height w/o Load Backrest	Free-Lift (TOF) w/Load Backrest	Free-Lift (TOF) w/o Load Backrest	Truck Weight	
						in. (mm)	in. (mm)	J45XN	J50XN
2-STAGE LIMITED FREE-LIFT (LFL) VISTA® MAST							
133 (3392)	87 (2192)	182 (4622)	156 (3956)	5 (140)	5 (140)	6305	6305
141 (3592)	91 (2292)	190 (4822)	164 (4156)	5 (140)	5 (140)	6335	6335
2-STAGE FULL FREE-LIFT (FFL) VISTA® MAST							
133 (3402)	87 (2192)	183 (4632)	157 (3966)	37 (962)	64 (1628)	6350	6350
141 (3602)	91 (2292)	191 (4832)	164 (4166)	41 (1062)	68 (1728)	6380	6380
3-STAGE FULL FREE-LIFT (FFL) VISTA® MAST							
183 (4650)	81 (2042)	232 (5880)	205 (5196)	32 (812)	58 (1496)	6645	6645
189 (4800)	83 (2092)	238 (6030)	211 (5346)	33 (862)	60 (1546)	6665	6665
194 (4950)	85 (2142)	244 (6180)	217 (5496)	35 (912)	62 (1596)	6690	6690
200 (5100)	89 (2242)	250 (6330)	223 (5646)	39 (1012)	66 (1696)	6735	6735
206 (5250)	91 (2292)	256 (6480)	229 (5796)	41 (1062)	68 (1746)	6765	6765
212 (5400)	93 (2342)	261 (6630)	235 (5946)	43 (1112)	70 (1796)	6790	6790

J60-70XN MAST DIMENSIONS

Maximum Fork Height (TOF)	Overall Lowered Ht.	Overall Extended Height w/Load Backrest	Overall Extended Height w/o Load Backrest	Free-Lift (TOF) w/Load Backrest	Free-Lift (TOF) w/o Load Backrest	Truck Weight	
						in. (mm)	in. (mm)	J60XN	J70XN
2-STAGE LIMITED FREE-LIFT (LFL) VISTA® MAST							
126 (3209)	87 (2192)	175 (4444)	152 (3861)	5 (150)	5 (150)	6655	7345
134 (3409)	91 (2292)	183 (4644)	160 (4061)	5 (150)	5 (150)	6690	7380
2-STAGE FULL FREE-LIFT (FFL) VISTA® MAST							
126 (3210)	87 (2192)	175 (4445)	152 (3862)	37 (957)	60 (1540)	6700	7390
134 (3410)	91 (2292)	183 (4645)	160 (4062)	41 (1057)	64 (1640)	6730	7420
3-STAGE FULL FREE-LIFT (FFL) VISTA® MAST							
181 (4618)	85 (2142)	231 (5853)	207 (5252)	35 (907)	59 (1508)	7030	7720
187 (4768)	89 (2242)	237 (6003)	213 (5402)	39 (1007)	63 (1608)	7085	7775
193 (4918)	91 (2292)	243 (6153)	219 (5552)	41 (1057)	65 (1658)	7105	7795
205 (5218)	95 (2392)	255 (6453)	231 (5852)	45 (1157)	69 (1758)	7160	7850
217 (5518)	101 (2542)	266 (6753)	243 (6152)	51 (1307)	75 (1908)	7340	8030

BATTERY AND COMPARTMENT SPECIFICATIONS

Model	Compartment Size			Battery Specifications								
				Electrical				Size			Weight	
	W in (mm)	L in (mm)	H in (mm)	Volts	No. of cells	Plates per cell	Max Amp Hr (kWh)	"X" Max in (mm)	"Y" Max in (mm)	"Z" Max in (mm)	Min lbs (kg)	Max lbs (kg)
J45-50XN 28" Compartment	40.7 (1034)	28.2 (717)	31.2 (792)	80	40	9	1000 (77.6)	40.5 (1028)	28 (711)	30.9 (784)	3700 (1686)	4100 (1878)
J60-70XN 34" Compartment	40.7 (1034)	33.9 (861)	31.2 (792)	80	40	11	1000 (77.6)	40.5 (1028)	33.7 (855)	30.9 (784)	4500 (2021)	4900 (2233)

Battery Type: "EO" (Without Cover)

Battery amp hr (kwh) capacity is max allowable per UL

Commercially available lead acid batteries may not necessarily reach these max limits

Battery Compartment Length is measured front to rear. Battery Compartment Width is measured across the truck

Battery Notes - Conventional Charging (Opt G26201)

Battery Connector: 80 volt - Black (Anderson Power Products® SBE®320 P/N 6363G1 or REMA® SRE 320 P/N 78350-05)

Battery Lead: Length 30" (762 mm), Position "A", 2/0 AWG

Battery Notes - Rapid / Fast Charging (Opt G26202)

Battery Connector: Requires Positive / Negative Cabling terminating in (1) Female EBC-320 DIN Connector

(Anderson Power Products® P/N E32503-00X9 or REMA® 95625-X1)

DIN connector to include 1 Red Conductor to (+) and 1 black conductor to (-)

Battery Lead: Length 36" (915 mm), Position "A", Minimum Cable Size 3/0 AWG

Battery Notes - Premium, Fully Integrated "Quick Connect" Rapid / Fast Charging

Battery Connector: Requires Positive / Negative Cabling terminating in (1) Female EBC-320 DIN Connector

(Anderson Power Products® P/N E32503-00X9 or REMA® 95625-X1)

DIN connector to include 1 Red Conductor to (+) and 1 black conductor to (-)

Battery Lead: Length 36" (915 mm), Position "A", Minimum Cable Size 3/0 AWG

Lift, Transport and Pour Drums with Your Forklift

- Add drum handling to your fork truck to raise and control pouring
- Attach to forklift quickly with no tools or truck modification
- No electric or hydraulic connections
- Eliminate backbreaking labor and dangerous, makeshift methods
- Fully invert a drum in less than 15 seconds

MADE
IN
USA

MORCINCH™ Drum Handling System

Automatically adjusts for 22" to 23.5" (56 to 59.7 cm) diameter drum. Includes a flexible cinch chain cover to help protect the sidewall of your drum. Incorporates alloy cinch chain and durable stress relief weld joints.



MORcinch™ Options to Handle Almost Any Drum



Top Rim Clamp

The **Top Rim Clamp** grips the upper rim of your drum to prevent it from slipping through the drum holder. Use to handle a 55-gallon (208 liter) rimmed plastic or fiber drum. To handle a 55-gallon plastic drum with top rim, you must install either the Bracket Assembly or the Top Rim Clamp. Part # 4560-P Rim Clamp Assembly.



Bracket Assembly

The **Bracket Assembly** provides a brace at top and bottom of your drum to prevent it from slipping lengthways through the drum holder. It adjusts for 31" to 39" (79 to 99 cm) tall drum. The Bracket Assembly is required to handle a rimless plastic drum. It also recommended to more securely handle a fiber drum. Part # 4556-P Bracket Assembly.



Diameter Adaptors

For a smaller diameter drum, Diameter Adaptors install easily without tools and are quickly removed. Quickly insert the correct size Diameter Adaptor into the drum holder. Simply remove it to return to handling a 55-gallon drum.

Diameter Adaptors for 17.5" (44.5 cm) diameter or smaller have brackets at top and bottom of the drum. They adjust for a drum up to 38" (95.5 cm) tall. Spark resistant and stainless steel Diameter Adaptors are also available.



Web Strap and Ratchet



MORCinch™ Drum Holder with Option # 5115i-P Web Strap and Ratchet installed (not for use on spark resistant models)

DIAMETER ADAPTORS		
DIAMETER ADAPTORS	FITS DIAMETER	SHIP WEIGHT
55/30-20.5	20" to 20.5" (50.8 to 52.1 cm)	20 Lb. (9 kg)
55/30-19	18.5" to 19" (47 to 48.3 cm)	24 Lb. (11 kg)
55/30-17.5	17" to 17.5" (43.2 to 44.5 cm)	35 Lb. (16 kg)
55/30-16	15.5" to 16" (39.4 to 40.6 cm)	35 Lb. (16 kg)
55/30-14.5	14" to 14.5" (35.6 to 36.8 cm)	36 Lb. (16 kg)

* Half-full rating is an indication of capacity for tilting an unbalanced, bottom-heavy drum. A partially full drum with unbalanced and shifting load is harder to tilt than a full drum.

>> [Click to Watch Video](#) <<

Model 285A-BP



Also see model 285XBP on page 2

Battery Powered Drum Tilt Control

Model 285A-BP provides 12V battery-powered drum tilt with controls on a 10' cord, so you can control drum pouring with pushbutton ease while in your truck. Fully invert your drum to completely empty the contents. Drum tilt may be started, stopped or reversed at any point in the 180° range.

Model 285A-BP Forklift-Karrier has its own battery. No power connection or truck modification is required. A separate charger is included.

Capacity: 1,500 Lb. (681 kg) full-drum, 800 Lb. (364 kg) Half-full* drum. Ship dimensions: L39"W41"H28" (99x104x71 cm). Ship weight: 395Lb. (180kg).

Option: Wireless Drum Tilt Control

Safe, simple and reliable wireless machine control. Approximately 300 foot (91 m) operating range featuring 900MHz frequency hopping technology for eliminating interference from other RF sources. Easily switch between direct wire pendant control and wireless remote control. Quick DC power disconnect for locking out the equipment.

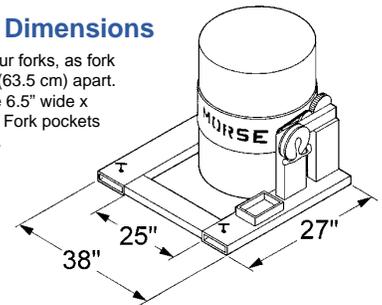


Option # 4804i-P - Wireless Control factory installed on new model 285A-BP Forklift-Karrier. It may also be installed on Forklift Mounted Drum Rackers models 289C and 289F.

Kit # 4804-P - Kit to field install Wireless Control on your model 285A-BP.

Forklift-Karrier Dimensions

Requires 25" between your forks, as fork pocket openings are 25" (63.5 cm) apart. Fork pocket openings are 6.5" wide x 2.5" high (16.5 x 6.4 cm). Fork pockets are 26.5" (67.3 cm) deep.



Shipped assembled in durable carton.

Custom versions can be made for non-standard forks.

Model 285XBP

**Forklift-Karrier with 2500 Lb. (1134 kg)
Capacity and Battery Power Tilt**

Use model 285XBP to lift and pour a drum weighing up to 2500 Lb. (1134 kg) with the convenience of battery powered tilt control. This model has an extra heavy-duty 3-piece drum holder with toggle clamp closure to secure the drum.

It can also be ordered with the wireless tilt control option installed - Option # 48048i-P.



MADE
IN
USA

WESCO® DRUM GRABS

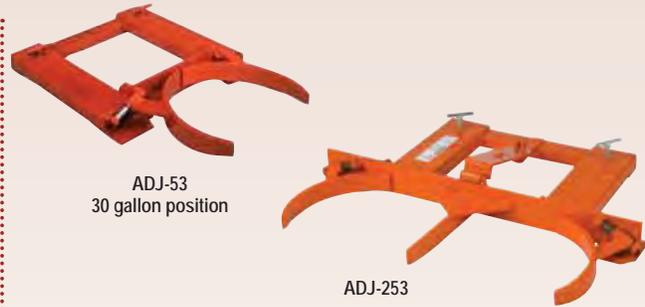


The Best Drum Grabs Are Made In The USA



DJ-55
55 gallon position

DJ-255



ADJ-53
30 gallon position

ADJ-253

Drum Grabs for 55 Gallon Steel Drums

- All welded steel construction for durability.
- Cost effective way to move 55 gallon steel drums.

OVERALL DIMENSIONS

w:	28"	28"	46"
h:	4.75"	4.75"	7.25"
d:	42.75"	42.75"	43.25"

Adjustable Drum Grabs for 55 or 30 Gallon Steel Drums

- ADJ models feature all welded steel construction for durability.
- Handles 55 or 30 gallon steel drums.

OVERALL DIMENSIONS

w:	28"	28"	51"
h:	5.5"	5.5"	7.25"
d:	41.75"	41.75"	42.75"

Part #	240048	270051	240049	240047	270084	240066
Model #	DJ-55	DJL-55	DJ-255	ADJ-53	ADJL-53	ADJ-253
Capacity	1,500 lbs/drum	1,500 lbs/drum	1,500 lbs/drum	1,500 lbs/drum	1,500 lbs/drum	1,500 lbs/drum
Handles	one 55-gallon	one 55-gallon	two 55-gallon	one 55 or one 30 gallon	one 55 or one 30 gallon	two 55 or two 30 gallon
ID Fork Pocket	5.5" x 2"	7" x 2.25"	7" x 2.25"	5.5" x 2"	7" x 2.25"	7" x 2.25"
Weight	145 lbs	150 lbs	205 lbs	135 lbs	140 lbs	215 lbs



SVG-55



DVG-255



SAVG-53



DAVG-253

Value Drum Grabs

- Economically priced lower capacity grabs.
- VG models: jaws not adjustable.
- AVG models: adjustable jaws.

OVERALL DIMENSIONS

w:	28"	46"	28"	51"
h:	4.5"	7.25"	5.5"	7.25"
d:	42.5"	43.25"	41.75"	42.75"

Part #	272400	272401	272408	272409
Model #	SVG-55	DVG-255	SAVG-53	DAVG-253
Capacity	1,000 lbs/drum	1,000 lbs/drum	1,000 lbs/drum	1,000 lbs/drum
Handles	one 55-gallon	two 55-gallon	one 55 or one 30 gallon	two 55 or two 30 gallon
ID Fork Pocket	5.5" x 2"	7" x 2.25"	5.5" x 2"	7" x 2.25"
Weight	125 lbs	233 lbs	128 lbs	194 lbs

Note: OSHA requires contacting the manufacturer of your fork truck for written approval for the use of any fork truck attachments.



SINCE 1948

024742

WESCO® FORK TRUCK DRUM LIFTERS & TILTERS



240039

Fork Truck Drum Lifter & Tilter DGF-55

- Fork truck driver does not have to leave truck to dispense.
- Geared design allows controlled dumping and dispensing.
- Does not require any modifications to the fork truck.
- Ships assembled and boxed.
- Has 800 lbs capacity for a full drum, 500 lbs for a half full drum.
- Not for use with poly drums.
- Fork pocket dimensions (ID) 6.625"W x 2.625"H.
- Fork pocket dimensions center to center 31".
- Length of Chain 144".

OVERALL DIMENSIONS

w: 38"
h: 20.5"
d: 32.5"



Model PJ for most 30 and 55 gallon drums

240148

Wesco Polyjaws

- Fork truck adjustable attachment for handling most 55 and 30 gallon poly drums.
- Fork truck driver does not have to leave cab to engage or disengage drum.
- Works on poly drums that have at least a 3/16" top lip (chime).
- Substantially lower priced than any other poly drum lifter on the market.
- Ships knocked down/boxed via UPS.
- Fork pocket dimensions (ID) 5.375"W x 1.5"H.

OVERALL DIMENSIONS

w: 25.5" -29.375"
h: 6.28"
d: 21.38"

Part # Model #	240039 DGF-55 55 GAL. DRUM UNIT	270240 DGF-30A 30 GAL. DRUM ADAPTER	270402 FBA FIBER DRUM ADAPTER	240148 PJ
Capacity	Half Drum - 500 lbs Full Drum - 800 lbs	Half Drum - 500 lbs Full Drum - 800 lbs	Half Drum - 500 lbs Full Drum - 800 lbs	1,000 lbs
Weight	159 lbs	24 lbs	3 lbs	44 lbs

Value Fork Truck Drum Lifter & Tilter

- Economically priced lower capacity model.
- Two models, 700 & 1,400 lb capacities.
- Operator does not have to leave seat to tilt drum.
- Fork pocket dimensions (ID) 7" W x 2.5"H.
- Fork pocket dimensions center to center 24.4".
- Length of Chain 120".

OVERALL DIMENSIONS

w: 39"
h: 19"
d: 26.75"

OVERALL DIMENSIONS

w: 39"
h: 19"
d: 30.38"



VFDLT-1400

Part # Model #	272402 VFDLT-700	272403 VFDLT-1400
Capacity	Half Drum - 440 lbs Full Drum - 700 lbs	Half Drum - 750 lbs Full Drum - 1,400 lbs
Weight	166 lbs	214 lbs

Note: OSHA requires contacting the manufacturer of your fork truck for written approval for the use of any fork truck attachments.

DRUM HANDLING EQUIPMENT

LP 1250 | GLAZING MATERIAL

FEATURES

- ▶ U.L. Listed Level 3
- ▶ Ease of fabrication
- ▶ Optical clarity
- ▶ Numerous sizes available

PRODUCT DESCRIPTION

The abrasion resistant coating is standard. The LP 1250 is composed of an acrylic interlayer with polycarbonate cap sheets.

TECHNICAL DATA

Protection	44 magnum
Light Transmission	>90%
Haze	>1.0%
Yellowness Index	<0.7
Thickness	1.25
Weight	7.7 lbs. per sq. ft.
Burn Rate	1.2 in./min
Abrasion Resistant Coating	Standard

SPECIFICATIONS

A. USES

LP 1250 sheets are to be used in applications where optical quality, cleanability and longterm retention of properties are important.

B. LIMITATIONS

To be used as a Level 3 bullet resisting glazing material. Impact of projectiles from other higher level weapons may cause system failure. End user to determine specific protection requirements.

HANDLING INFORMATION

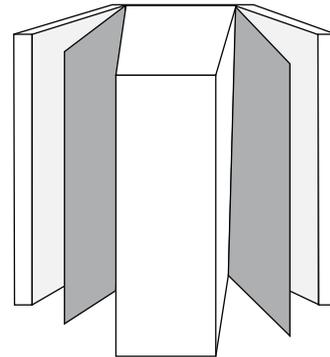
You must clean the glazing unit during and after the construction period to maintain optimum performance and aesthetic properties. To clean, use a soft, clean cloth and a mild soap, detergent, or slightly acidic cleaning solution (such as vinegar). Wipe with a clean, lint-free cloth.

TECHNICAL SUPPORT

TSS maintains a full staff of professional and experienced sales representatives, project estimators, engineers, draftsmen, craftsmen and installers ready to assist in all phases of the bullet resistant project from initial design through installation. Consult our sales department or your local representative for assistance with all your bullet-resistant needs at 1.517.223.7807.

LIMITED WARRANTY

TSS offers a twelve month limited warranty. This warranty does not cover damage caused by neglect, abuse, vandalism, improper maintenance, accident or any other cause beyond the suppliers control not arising out of defects in material or workmanship. The warranties stated replace and exclude all other warranties. The warranty is limited to replacing products that fail to meet specification, or are defective in quality or workmanship at the time of delivery. TSS will not be responsible for (re)installation expenses or any direct or indirect loss(es) which may result from a defective product. TSS reserves the right to field inspect any product alleged to be defective. The buyer is responsible for any consequences resulting from product use.





FLIR E4, E5, E6, E8 with MSX® Enhancement

FLIR E4, E5, E6, E8 with MSX® Enhancement

- Display: 3" color LCD
- On-board 640 x 480 Digital Camera
- Easy-to-use, weighs only 1.2lbs
- 2% accuracy
- File format: Radiometric jpg
- Swappable Li-ion Battery with 4 hour life
- Spot Measurement mode
- Simultaneous storage of IR/Visual/MSX images
- Picture in Picture image (E5, E6 and E8)
- Area Box Measurement mode (E5, E6 and E8)

Each includes power supply/charger with four plugs, rechargeable battery, FLIR Tools software, USB cable, and hard transport case. E8 also includes extra battery and external battery charger.

FLIR E4

- 4800 pixels (80 x 60)

FLIR E5

- 10,800 pixels (120 x 90)

FLIR E6

- 19,200 pixels (160 x 120)

FLIR E8

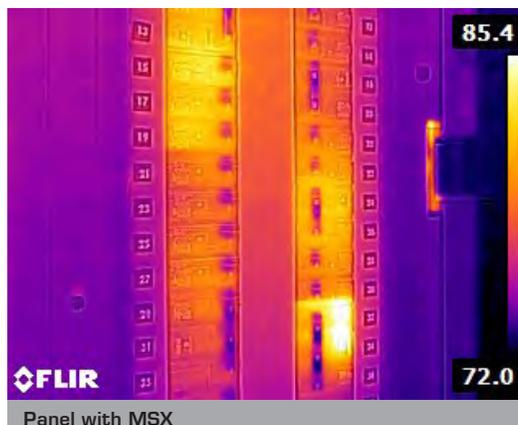
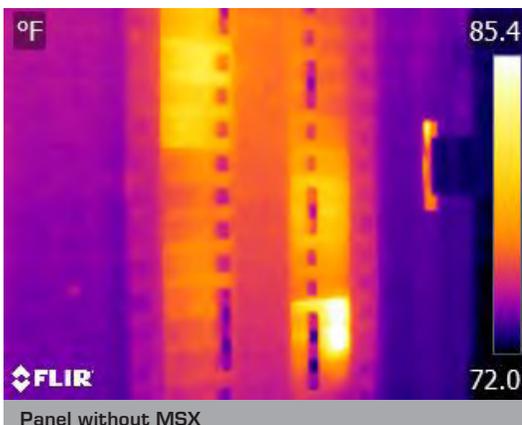
- 76,800 pixels (320 x 240)



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What is MSX?

Multi-Spectral Dynamic Imaging (MSX) for easier interpretation of an image - adds visible spectrum definition to IR images by detecting the edges of objects and including that detail in the thermal image. Text becomes clearly visible so that you can read a label or identifier within the IR image. This exclusive function provides extraordinary thermal detail that instantly highlights and orients problem locations and eliminates the need to refer back to a visual image for detail.



Imaging Specifications

FEATURES	FLIR E4	FLIR E5	FLIR E6	FLIR E8
IR Pixel Resolution	4,800 (80 x 60)	10,800 (120 x 90)	19,200 (160 x 120)	76,800 (320 x 240)
Thermal Sensitivity	<0.15°C	<0.10°C	<0.06°C	<0.06°C
Temperature Range	-4 to 482°F (-20 to 250°C)			
Measurement modes	Centerspot	Centerspot, Area Box, Auto Hot/Cold detection	Centerspot, Area Box, Auto Hot/Cold detection	Centerspot, Area Box, Auto Hot/Cold detection
Frame Rate	9Hz			
Field of View	45° x 34°			
Focus	Focus free			
Auto Hot/Cold Detection	No	Auto min/max markers within area	Auto min/max markers within area	Auto min/max markers within area

Ordering Information

63901-0101 FLIR E4 Compact Thermal Imaging Infrared Camera with MSX® Enhancement (80x60)
 63901-0101-NIST FLIR E4 with Certificate Traceable to NIST
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 63903-0303 FLIR E8 Compact Thermal Imaging Infrared Camera with MSX® Enhancement (320x240)
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ACCESSORIES

T198529 Pouch
 T198530 Replacement battery
 T198531 External battery charger
 T198532 Car Charger
 T198534 Power supply/charger with EU, UK, US and AU plugs
 T198533 USB cable
 T198528 Hard Transport Case



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www.flir.com
 NASDAQ: FLIR

024746

Moisture Analyzer

INSTRUCTION MANUAL

MS-70

MX-50

MF-50

ML-50

AND

A&D Company, Limited

1WMPD4000477F

This manual and Marks

All safety messages are identified by the following, "WARNING" or "CAUTION", of ANSI Z535.4 (American National Standard Institute: Product Safety Signs and Labels). The meanings are as follows:

 WARNING	A potentially hazardous situation which, if not avoided, could result in death or serious injury.
 CAUTION	A potentially hazardous situation which, if not avoided, may result in minor or moderate injury.



This is a hazard alert mark.



This mark is the IEC417 mark for "Caution. Hot surface".
Do not touch parts affixed with this mark without adequate protection.



This mark informs you about the operation of the product.

- This manual is subject to change without notice at any time to improve the product.
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- Windows is a registered trademark of the Microsoft Corporation.



Contents

1.	Safety and Compliance	3
2.	Precautions.....	6
2.1.	Installing the Analyzer.....	6
2.2.	During Use	7
2.3.	After Use and Maintaining the Analyzer	8
3.	Outline and Features.....	9
4.	Packing List and Names of each part.....	11
4.1.	Display and Keys	13
5.	Preparations	15
5.1.	Installing the Analyzer.....	15
5.2.	Setting the Clock and Calendar	16
5.2.1.	Operation	16
5.3.	Proper Operation for Precision Measurement	17
5.3.1.	Operation of the sample.....	17
5.3.2.	Operation of the analyzer	17
5.3.3.	The Glass Fiber Sheets.....	18
6.	Measurement Procedure	19
6.1.	Standard Mode Operation.....	19
6.1.1.	ACCURACY.....	19
6.1.2.	Operation	19
6.2.	Quick Mode Operation.....	22
6.2.1.	ACCURACY.....	22
6.2.2.	Operation	22
6.3.	Program Number	25
6.3.1.	Storing a Measurement Program to a Program Number.....	25
6.3.2.	Recalling a Measurement Program with a Program Number	25
7.	Measurement Programs	26
7.1.	List of Measurement Programs	26
7.1.1.	ACCURACY of the Standard Mode and Quick Mode	27
7.1.2.	Analyzing mode of the Automatic Mode	28
7.1.3.	Analyzing mode of the Timer Mode.....	28
7.1.4.	Drying Program (Heating Pattern and Drying Temperature).....	28
7.1.5.	Measurement Unit	29
7.2.	Procedures to Store a Measurement Program.....	30
7.2.1.	Standard Drying	30
7.2.2.	Ramp Drying.....	33
7.2.3.	Step Drying.....	37

8.	Check Function.....	42
8.1.	Self-Check Function	42
8.1.1.	Operation	42
8.2.	Test Sample (Sodium Tartrate Dihydrate)	43
9.	Connecting to a Printer	44
9.1.	Print samples.....	45
9.1.1.	Example To Print The Whole Data At One Time.....	45
9.1.2.	Example To Print Selected Items.....	46
9.1.3.	Explanation for Print Item	48
10.	Connecting to a Computer.....	50
10.1.	RS-232C Serial Interface.....	51
10.2.	Output Format	52
10.3.	Command	53
11.	Data Memory Function	54
11.1.1.	Preparation	54
11.1.2.	Output All Data at One Time	55
11.1.3.	Delete All Data at One Time	55
12.	Calibration.....	56
12.1.	Identification Number (ID No.).....	56
12.1.1.	Setting the ID Number.....	56
12.2.	Calibration of the Weighting Sensor.....	57
12.2.1.	Operation	57
12.3.	Calibration of Drying Temperature (for MS-70 and MX-50).....	59
12.3.1.	Operation	59
13.	Function Table	61
13.1.1.	Operation	62
14.	Maintenance	63
14.1.	Cleaning the Heater Unit	63
14.2.	Replacement of the Halogen Lamp	64
14.3.	Factory Settings.....	65
14.3.1.	Operation	65
14.4.	Troubleshooting.....	66
14.5.	Error Message	67
15.	Specifications.....	68
15.1.	Dimensions	69
15.2.	Accessories and Peripheral Equipment.....	70
16.	Index	71



1. Safety and Compliance

WARNING

- ❑ Do not use a sample that could make a dangerous chemical reaction and cause an explosion or poisonous gas, when the sample is dried.
- ❑ Keep flammables away from the analyzer.
Parts of the analyzer become very hot. Materials placed near it might catch fire.
- ❑ Do not use the analyzer in ambient ignitable gas. It may cause explosion and fire.
- ❑ Use a power source (voltage, frequency, outlet type) adapted to the specification of the analyzer. If excessive voltage is used, the analyzer may overheat and be damaged or cause a fire.
- ❑ Turn off the power switch and remove the power cord from the power outlet, when replacing the halogen lamp. Touching an electrode of the halogen lamp connector carelessly, it may cause to receive an electric shock.
- ❑ Do not disassemble the analyzer. It may cause an error, damage, receiving an electric shock or fire. If the analyzer needs service or repair, contact the local A&D dealer.
- ❑ Avoid getting the analyzer wet. It is not a water-resistant structure. If there is leakage of liquid into the analyzer, it may cause damage to the analyzer or receiving electric shock.
- ❑ Do not look at the active halogen lamp to protect your eyes from damage.
- ❑ Do not drop, hit or crack the glassware including the halogen lamp, to avoid an injury.
- ❑ When the halogen lamp is used beyond 5000 hours, we recommend replacing the lamp with a new one to avoid trouble.
- ❑ When discarding a halogen lamp, do not break it to avoid scattering glass and injury.

CAUTION

- ❑ Do not touch the heater cover, the halogen lamp, glass-housing, pan handle, sample pan and sample without adequate protection, it could cause a burn or scald. Parts of the analyzer are very hot when a measurement finishes. For operation, use the specified grips of the heater cover and pan handle. Use the standard accessory tools.
- ❑ Do not touch parts affixed with the  mark, because they may get very hot and dangerous.
- ❑ When the analyzer is used in a room where hot air does not diffuse, it may unexpectedly overheat. In this case, adjust the drying temperature or move the analyzer to a place with adequate ventilation.
- ❑ Avoid leaving the analyzer in direct sunlight, as that could cause discoloration of the case or a malfunction.

Compliance with FCC Rules

Please note that this device generates, uses and can radiate radio frequency energy. This device has been tested and has been found to comply with the limits of a Class A computing device pursuant to Subpart J of Part 15 of FCC rules. These rules are designed to provide reasonable protection against interference when this device is operated in a commercial environment. If this unit is operated in a residential area, it may cause some interference and under these circumstances the user would be required to take, at his own expense, whatever measures are necessary to eliminate the interference.

(FCC = Federal Communications Commission in the U.S.A.)

Compliance with Council Directives

CE This device features radio interference suppression and safety regulation in compliance with the following Council Directives

Council directive 89/336/EEC	EN61326	EMC directive
Council directive 73/23/EEC	EN61010-1	Low voltage directive

EN61326 Emission and Immunity.



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A & D Instruments Ltd. hereby declare that the following weighing product conforms to the requirements of the council directives on ...

Electromagnetic Compatibility (EMC) 89/336/EEC

Low voltage equipment (LVD) 73/23/EEC amended by 93/68/EEC

provided that they bear the CE mark of conformity as shown above.

MF, ML, MX and MS Series Moisture Analyser

Standards applicable :

BS EN 61326 Electrical equipment for measurement, control and laboratory use - EMC requirements

BS EN 61010 Safety requirements for electrical equipment for measurement, control and laboratory use.

CE Mark First Applied May 2002

Signed for A&D Instruments in Oxford England April 2005

Takeo Goto
Managing Director

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2. Precautions



2.1. Installing the Analyzer

---Caution for Measurement Safety ---

- ❑ Do not install the analyzer in a dangerous place.
- ❑ Maintain the following ambient condition to operate the analyzer.
5°C to 40°C (41°F to 104°F), 85%RH or less (no condensation)
- ❑ Keep flammables away from the analyzer.
- ❑ Do not put anything on the heater cover.
- ❑ Do not install the analyzer in a small airtight room. If the analyzer is used in an airtight room, hot air does not diffuse, the sample may unexpectedly overheat. In this case, the safety circuit of the halogen lamp activates. Move the analyzer to a place with adequate ventilation or adjust the drying temperature.
- ❑ There is the voltage label on the back panel of the analyzer.
Confirm that voltage, frequency and outlet type is correct for your local voltage.
- ❑ Confirm that the rated voltage of the halogen lamp is correct for your power supply voltage. (Refer to 14.4.Troubleshooting)

Voltage Label	Power Supply Voltage	The Rated Voltage of Halogen Lamp
100 - 120 V	AC 100 V to AC 120 V	AC 120 V
200 - 240 V	AC 200V to AC 240 V	AC 240 V

- ❑ Ground the analyzer using the ground terminal of the power cord.
- ❑ Do not change the setting of the I/II switch on the rear of the analyzer. If the incorrect setting is used, it may damage the analyzer or cause a fire.

---Caution for Precision Measurement---

Confirm the following condition, because the weighing sensor (S.H.S.) is very sensitive.

- ❑ The weighing surface should be solid and free from vibration, drafts and as level as possible.
- ❑ Install the analyzer in a stable place avoiding vibration and shock.
- ❑ Install the analyzer where it not affected by heaters or air conditioners.
- ❑ Ensure a stable power source.
- ❑ Keep the analyzer away from equipment that generates magnetic fields.
- ❑ Discharge static electricity.

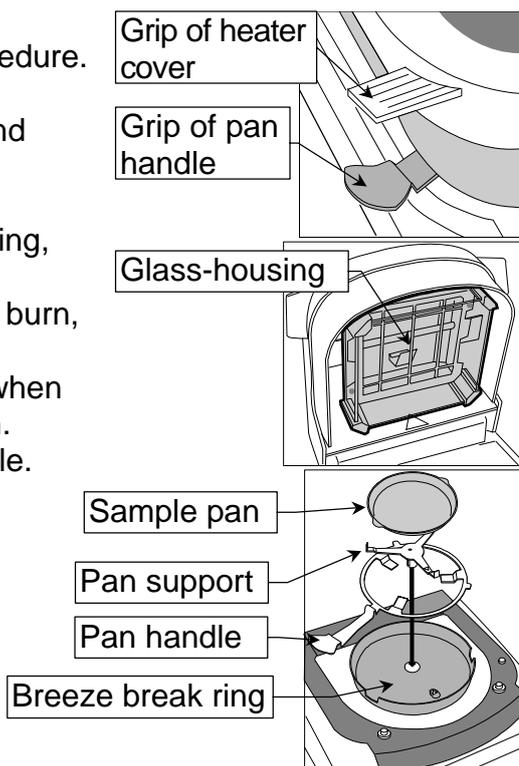
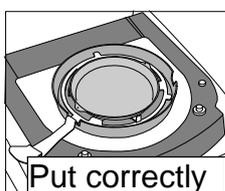


2.2. During Use

---Caution for Measurement Safety ---

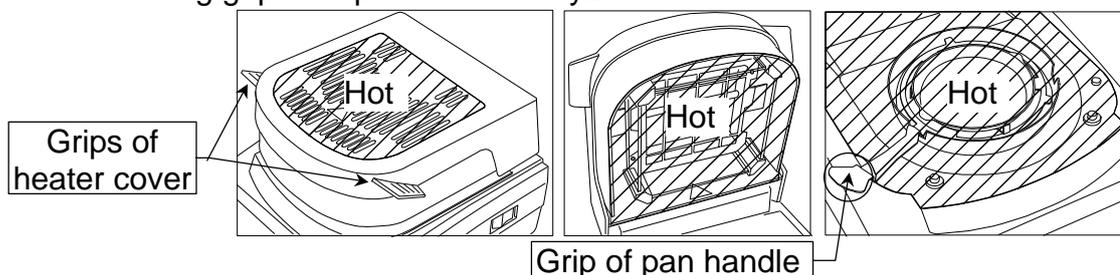
Operate the analyzer using the following procedure.

- ❑ Put the sample pan in the correct position.
- ❑ Handle the grip of the heater cover to open and close it.
- ❑ Use the pan handle to move the sample pan.
- ❑ Do not touch hot parts around the glass-housing, when the cover is opened.
- ❑ The glass-housing is very hot. It may cause a burn, if touched.
- ❑ The sample pan and pan handle is very hot, when finishing measurement. Allow them cool down.
- ❑ Use the tweezers or spoon to move the sample.



Grips and Hot Parts.

- ❑ Hot parts are as follows:
Use the following grips to operate the analyzer.



Do Not Measure a Dangerous Sample.

- ❑ Do not use an explosive, flammable or noxious substance as a sample.
Do not use a sample that makes a dangerous substance by drying it.
Do not use unknown substances.
- ❑ When a sample surface becomes dry first and the inner pressure increases, the sample may explode. Do not use such a sample.
- ❑ Turn off the power switch if a sample catches fire.
- ❑ The case of the analyzer is made of a flame-retardant substance (UL94V0).

Do Not Put any Flammable Matter Around the Analyzer.

- ❑ During and after measurement, parts of the analyzer become very hot. Do not put flammable matter near the analyzer.
- ❑ Do not put any thing on the heater cover.

Caution for Heating (Drying).

- When the drying temperature is set to 200°C and measurement is started, the thermostat of the halogen lamp may work after 30 minutes. When the halogen lamp has cooled down, the next measurement can be started. If necessary, change the drying time and temperature.
- When a measurement is started and the time passes one hour, the maximum temperature is automatically regulated to 160°C for safety.

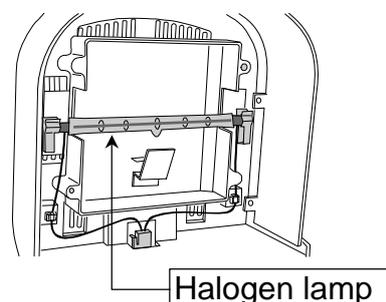
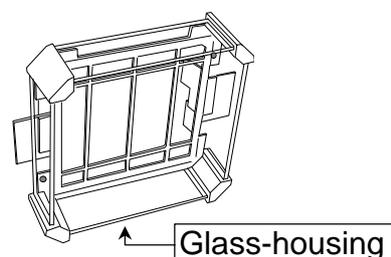
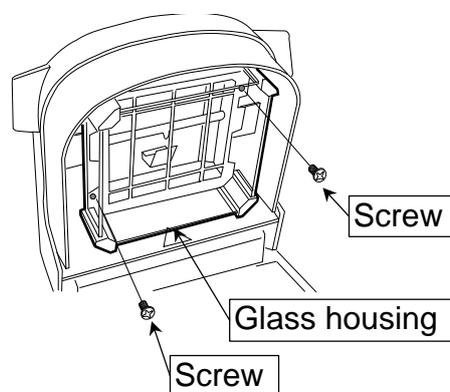
Operation to Stop Measurement

- During measurement, the **STOP** key is always effective. If there is an error or danger, press the **STOP** key.



2.3. After Use and Maintaining the Analyzer

- Put dust cover on the analyzer after it is cool.
- Clean the glass-housing carefully.
- Clean fingerprints from the halogen lamp to keep its life. Refer to "14.2.Replacement of the Halogen Lamp".
- Avoid mechanical shock to the analyzer.
- Do not disassemble the analyzer.
- Protect the analyzer from excessive dust.
- Use the packing box (special container) to move the analyzer.
- Clean the analyzer with a lint free cloth that is moistened with warm water and a mild detergent.
- Do not use organic solvents to clean the analyzer.
- Do not disassemble or remodel the analyzer.





3. Outline and Features

- The moisture analyzer was designed using a **super hybrid sensor (S.H.S.)** adopted in an analytical balance. Therefore, the results are more precise and get greater repeatability.
- An analyzer using the S.H.S. has high sensitivity, needs only a sample quantity of a few grams, and the analysis time becomes shorter.
- A 400W halogen lamp is used as the heating source and the temperature on the sample pan can reach 200°C within two minutes.
- There are five analysis modes.
 - Standard mode** The moisture content can be obtained with settings of the drying temperature and accuracy.
 - Quick mode** Sample is heated up for approximately three minutes at 200°C so that analysis time becomes shorter. The moisture content can be obtained with settings of the drying temperature and accuracy.
 - Automatic mode**..... When the change of moisture content per minute is less than the preset termination value, the measurement is automatically stopped and the result is obtained.
 - Timer mode**..... The sample is dried for a preset time and the result is obtained.
 - Manual mode** This mode can stop the measurement by key operation and the result is decided.
- The heating patterns can be used for analysis mode without using the quick mode. (For ML-50, standard drying and quick drying can be used only)
 - Standard drying**..... Maintains a constant drying temperature.
 - Ramp drying** Increases the drying temperature gently.
 - Step drying**..... Uses multiple steps of the drying temperature.
 - Quick drying** Heats up to 200°C for few minutes and uses a constant drying temperature.
- The analyzer can store and recall proper individual settings for each sample using a program number (PROG No.).

Maximum program number	MS-70 / MX-50	MF-50	ML-50
	20 sets	10 sets	5 sets

- The data memory function can store the results and output all of them at one time.

Maximum number of storable results	MS-70 / MX-50	MF-50	ML-50
	100	50	30

- The software, "WinCT-Moisture", a standard accessory for the MS-70 and MX-50, has a function that can make a graph of the change of moisture content in realtime and has an optimum temperature search program that judges heating at an appropriate temperature setting.
- The software, " WinCT", a standard accessory for the MF-50, is communication software for transmitting data to a computer using Microsoft Windows.

- The analyzer is equipped with a serial interface as standard. It can be connected to a printer or computer.
- The analyzer can calibrate the weighing sensor (Use special mass.) and drying temperature (Use temperature calibrator for MS-70 and MX-50 except MF-50 and ML-50). The analyzer can output the data required at GLP, GMP and ISO at the end of the calibration.
- The analyzer has a self check function that can detect function errors.
- The analyzer displays the current change of moisture content per minute [%/ min] in real-time. It can be used for the reference to find the analyzing mode.
- The sample pans can be used repeatedly.
The sample pans and the disposable aluminum foil pans are included in the standard accessories.
- There is a test sample that is used to check the moisture accuracy. (The test sample is a part of the standard accessories except for the ML-50)
- The glass fiber sheets can be used for quick and precise measurement of a liquid sample. (The glass fiber sheets are a part of the standard accessories except for the ML-50)
- A reference card is built into the bottom of the analyzer.

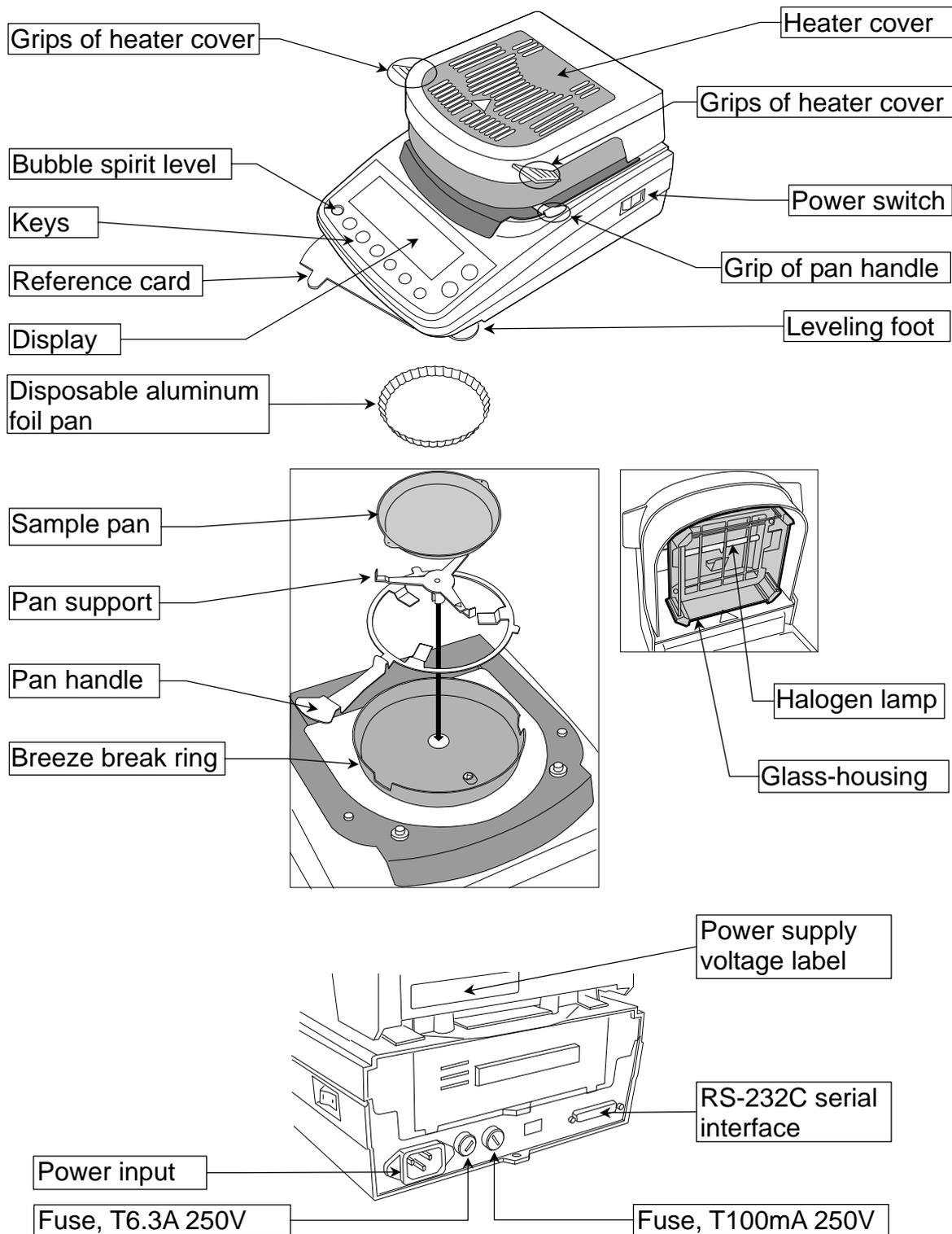
Principle and Use

- The moisture analyzer, based on the principle of thermogravimetric analysis, dries a sample using a halogen lamp and obtains the moisture content in % and other results by the difference between the wet weight and dry weight.



4. Packing List and Names of each part

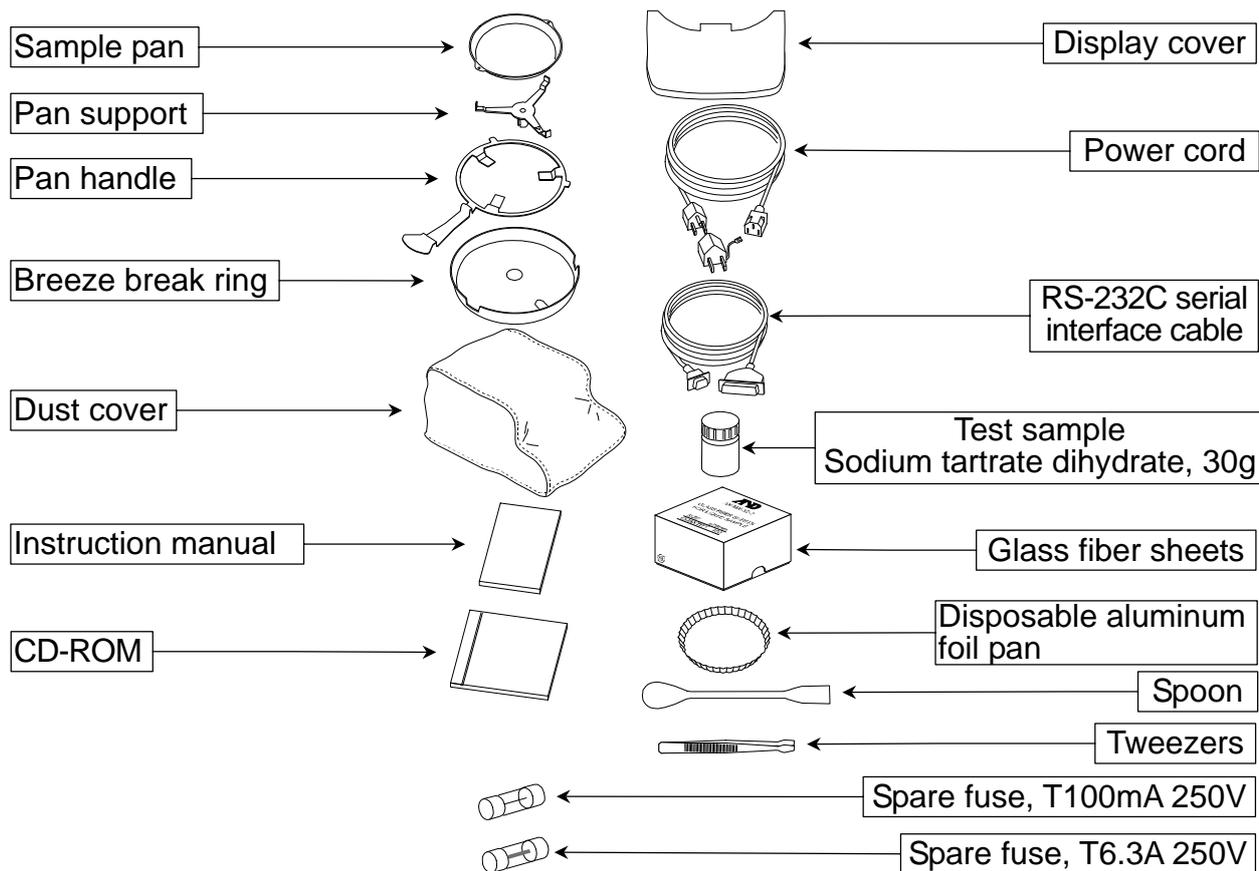
- Keep the packing box to move the analyzer.
- Packing list as follows:



Caution

Please confirm that the analyzer is correct for your local voltage, receptacle type and the power cord.

Accessory Name



Accessory List

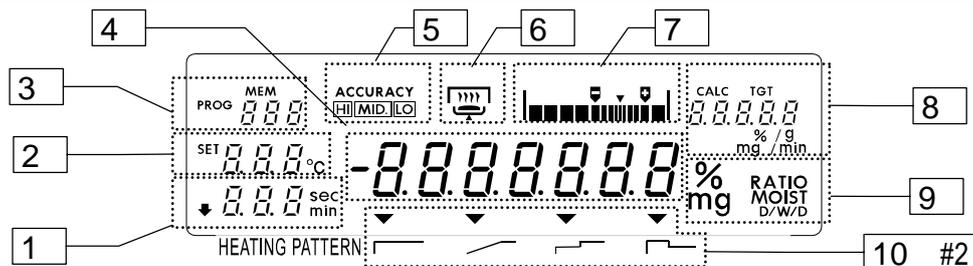
O : Standard accessory, — : Accessory by your order.

	MS-70	MX-50	MF-50	ML-50
Pan support	O	O	O	O
Breeze break ring	O	O	O	O
Display cover	O	O	O	O
Power cord	O	O	O	O
Spare fuse T100mA 250V	O	O	O	O
Spare fuse T6.3A 250V	O	O	O	O
Instruction manual	O	O	O	O
Dust cover	O	O	O	—
Test sample	O	O	O	—
Glass fiber sheets	O	O	O	—
Spoon	O	O	O	—
Tweezers	O	O	O	—
RS-232C serial interface cable	O	O	—	—
Sample pan	20	20	20	10
Pan handle	2	2	2	1
Disposable aluminum foil pan	100	100	100	100
CD-ROM *1	WinCT-Moisture	WinCT-Moisture	WinCT	—

*1: Application software for Windows.



4.1. Display and Keys



Name		State and Meaning	
1	Time	At gram display	Preset time is displayed at timer mode
		At measurement	Analysis time
2	Temperature of sample pan	At gram display	Set temperature of sample pan
		At measurement	Current temperature of sample pan
3	PROG: Program No.	At gram display	Program number of measurement program
	MEM: Data No.	Storing data	Data number of data memory function
	Analysis mode	At setting	Symbols: <i>Std, Quic, U-R, U-t, U-n</i>
4	Value	At gram display	Sample quantity [g]
		At measurement	Current moisture content [%]
5	Accuracy	Accuracy indicator of measurement	
6		Indicator of heater cover, sample and drying process Sample needs at least 0.1 g or more to start measurement.	
		Lights when heater cover is closed	
		Blinks during measurement. Disappears when not measuring	
7	Level indicator		Proper sample quantity range
			Reference of sample quantity for standard mode and quick mode.
8	Target quantity	At gram display	Standard mode Quick mode Automatic mode
		Target quantity of sample [g]	
		Preset termination value [%/min.]	
	Drying rate	At measurement	Current drying rate [%/min.]
9	Measurement unit		
	% MOIST /W	Moisture content is based on W	$\frac{W - D}{W} \times 100$
	% MOIST /D	Moisture content (Atro) is based on D	$\frac{W - D}{D} \times 100$
	% MOIST D/W	Dry content	$\frac{D}{W} \times 100$
	% MOIST W/D	Ratio	$\frac{W}{D} \times 100$
		W: Wet sample mass D: Dried sample mass	
10	Heating pattern #1		
	Standard drying	Maintains a constant drying temperature.	
	Ramp drying	Increases the drying temperature gently.	
	Step drying	Uses multiple steps of the drying temperature.	
	Quick drying	Quick mode	

- #1 ML-50 can select "standard drying " and "quick drying" only.
- #2 ML-50 does not display "heating pattern".

Display Samples for Analysis Mode

Analysis mode	Symbols (during settings)	Gram display (after settings and before measurement)
Standard mode	<i>Std</i>	 Target quantity
Quick mode	<i>Quc</i>	 Target quantity
Automatic mode	<i>U-R</i>	 Preset termination value of analyzing mode
Timer mode	<i>U-t</i>	 Preset time
Manual mode	<i>U-n</i>	

Key Operation and Key Functions

Keys	Function and action
 PROGRAM	Stores or recalls measurement program with the program number during the gram display. Selects a heating pattern while the drying temperature is selected.
 SELECT	Selects item in the measurement program.
 ↓ , ↑	Changes value of item in the measurement program.
 ENTER	Stores current condition in the measurement program number. Output data at measurement.
 START	Start prepared measurement Sample needs at least 0.1 g or more to start measurement.
 STOP	Stop current measurement
 RESET	Sets the display to zero in the unit of gram. Cancel key.



5. Preparations



5.1. Installing the Analyzer

1. Select the place to install the analyzer.
Refer to "2.1.Installing the Analyzer".
2. Level the analyzer by adjusting the leveling feet and confirm it using the bubble spirit level.
3. Read the power supply voltage label on the back of the heater cover.

Confirm that voltage, frequency and outlet type is correct for your local voltage.

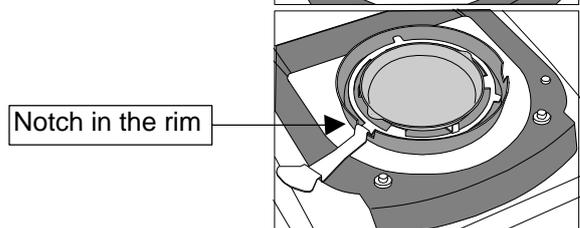
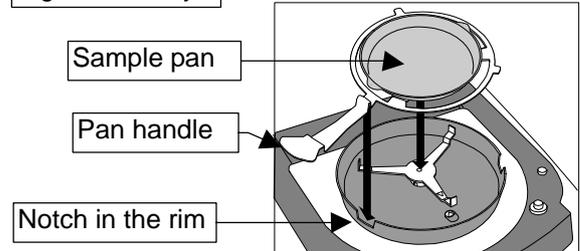
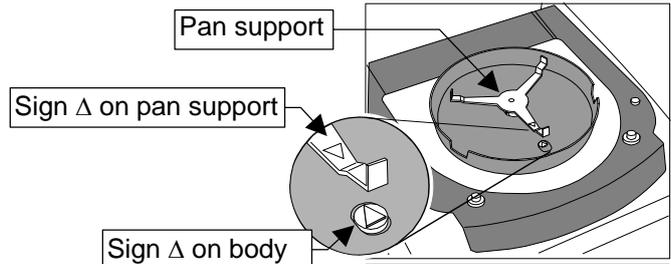
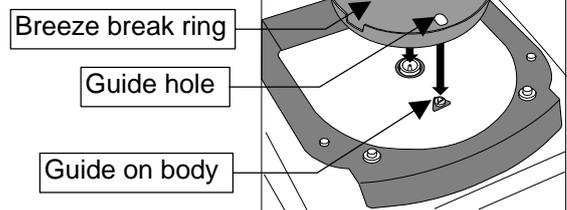
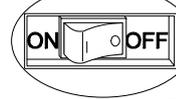
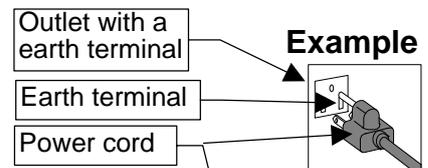
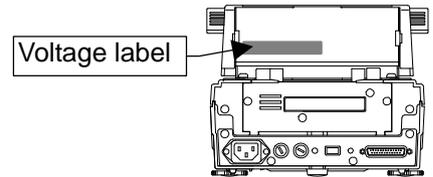
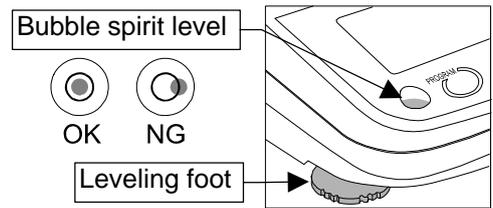
Confirm that the rated voltage of the halogen lamp is correct to your power supply voltage.

Voltage Label	Power Supply Voltage	The Rated Voltage of the Halogen Lamp
100 - 120 V	AC 100 V to AC 120 V	AC 120 V
200 - 240 V	AC 200V to AC 240 V	AC 240 V

4. Confirm that the power switch is set to the "OFF" position.
5. Connect the power cord. Ground the analyzer with the earth terminal on the power cord.
6. Align the guide hole of the breeze break ring to the guide on the body.
7. Install the pan support.
Align together the Δ signs on the pan support and body.
8. Put the sample pan on the pan handle.
And hook the pan handle on the notch in the rim of the breeze break ring.

Caution

For the disposable aluminum foil pan, place it on the sample pan.





5.2. Setting the Clock and Calendar

Adjust the built-in clock and calendar before use.

5.2.1. Operation

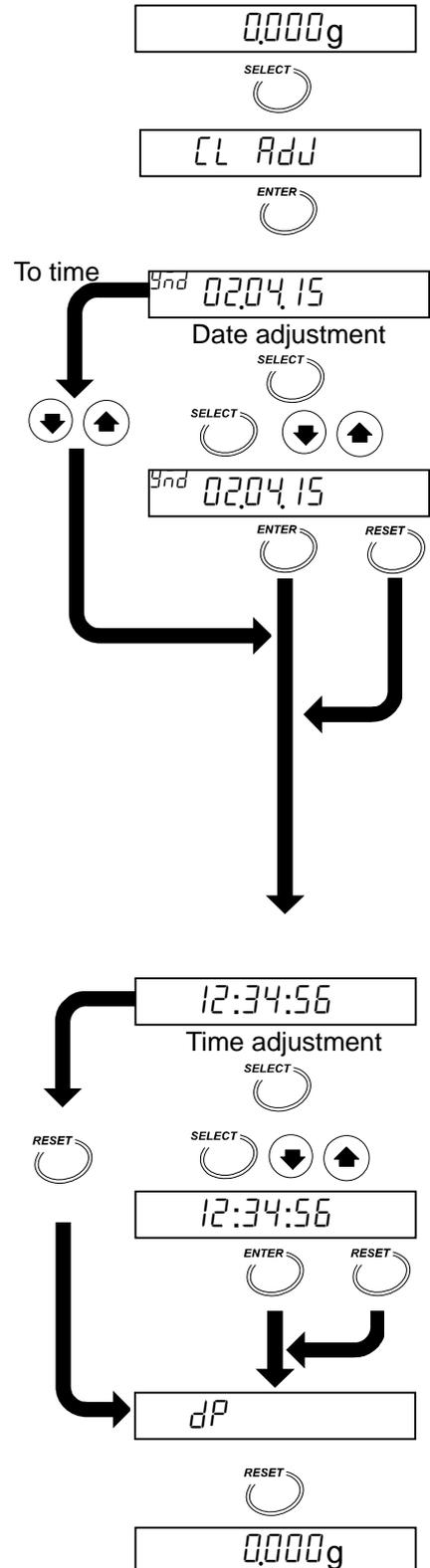
- Turn on the analyzer.
The gram unit (of weighing mode) is displayed.
- Press and hold the **SELECT** key to display **CL Adj**.
- Press the **ENTER** key to display the calendar.
Example: 15th April, 2002
- To skip the calendar settings.
Press the **↓** or **↑** key to proceed step 5.
To adjust the calendar settings.
Press **SELECT** key. Adjust the calendar using the following keys.
 - SELECT** key.....Selects a figure.
 - ↓, ↑** keySelects a value for the figure.
 - ENTER** keyStores the current date and proceeds to step 5.
 - RESET** keyCancels the adjustment and proceeds to step 5.

Symbols and arrangement of the calendar

yndYear, month, day
ndyMonth, day, year
dnyDay, month, year

The arrangement of the calendar is used for the report of GLP, GMP and ISO.

- Time is displayed.
- To finish the adjustment.
Press the **RESET** key to proceed step 7.
To adjust the clock.
Press the **SELECT** key. Adjust the clock using the following keys.
 - SELECT** key.....Selects a figure.
 - ↓, ↑** keySelects a value for the figure.
 - ENTER** keyStores time and proceeds to step 7.
 - RESET** keyCancels the adjustment and proceeds to step 7.
- When finishing the adjustment, **dP** is displayed.
Press the **RESET** key to return to the weighing mode.





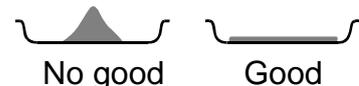
5.3. Proper Operation for Precision Measurement

5.3.1. Operation of the sample

- Use a proper sample quantity. If the quantity is small, precise results may not be possible.
- If the moisture content of the sample (example: plastic) can be estimated that is less than 1%, the mass of moisture is not enough for the measurement, when measuring light sample, the result may not be accurate. Consider the following sample mass for the measurement.

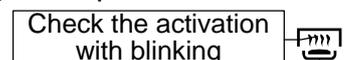
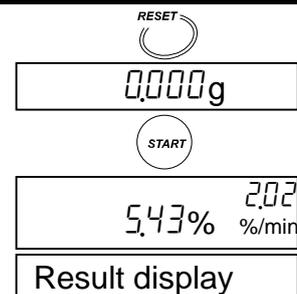
An estimate of moisture content	1%	0.5%	0.1%
Necessary mass for measurement	2 g at least	5 g at least	20 g at least

- If the measurement is repeated, maintain the same sample quantity.
- Crush grain samples to a small, uniform powder for a quick drying process.
- Spread the sample as evenly as possible.
- The analyzer is designed to measure the moisture content of the sample by its weight change. If the sample includes volatile matter, it may vaporize during drying causing a measurement error.
- When measuring a liquid or liquid state sample that may make a film on the surface, we recommend you use a glass fiber sheet (AX-MX-32-2).



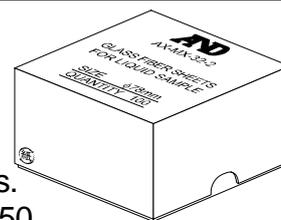
5.3.2. Operation of the analyzer

- Press the **RESET** key to display the zero value before each measurement.
- Check that the displayed sample weight is stable before measurement. Press the **START** key to start a measurement.
- Select the proper Analysis Mode to finish a measurement. Use the change of moisture content per one minute [%/min] that is displayed during measurement as a reference value.
- The analyzer needs a pre-heating process before measurement. When measuring samples repeatedly or continuously, the first result is always different from the others.
- The pre-heating process is as follows: Put a sample pan, instead of a sample, on the pan. Press the **START** key to heat it. The analyzer temperature becomes equilibrium.
- Use a sample on the sample pan that has cooled to room temperature. When a sample is put on a hot sample pan, the moisture content is diffused before measurement, and precise results are not possible. We recommend you use multiple sample pans.
- Do not pile up sample pans during a measurement.
- Avoid drift and vibration of air conditioners. It may cause "measurement error" and "unstable value". In particular, because MS-70 is sensitive instrument, it is necessary to consider these influences.
- When the difference between ambient temperature and sample temperature is small, it may cause temperature control error.
Example: If the heating temperature is crossed to the range of 30°C and 50°C, it is affected by a room temperature.
- Check the activation of the halogen lamp with the operation indicator.
Example: If low heating temperature is set, the brightness of halogen lamp becomes dark.



5.3.3. The Glass Fiber Sheets

- ❑ Use the glass fiber sheet to measure the moisture content that is included in the following samples. When this sheet is used, vaporization of moisture is speeded up and moisture measurement result becomes quick and precise.
- ❑ This accessory (AX-MX-32-1) is a package of 100 glass fiber sheets.
- ❑ This accessory is included in the packing for MS-70, MX-50 and MF-50.
- ❑ Purchase this accessory by your order for ML-50.
- ❑ Use the glass fiber sheet (AX-MX32-1) for high surface tension liquid sample.



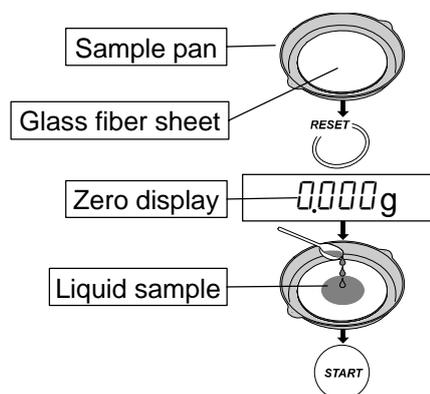
Example 1 : "Liquid Sample" Or "Meltable Sample"

When the glass fiber sheet is used for these measurements, moisture is more apt to vaporize because of expanding the surface area and space. And the glass fiber sheet has the effect of preventing a surface film from forming at drying process.

- ❑ A sample including a lot of moisture
: Milk, yogurt, soybean milk, condensed milk, ketchup, resin, liquid paste, hand soap, etc.
- ❑ A sample that melts and adheres to the sample pan.
Example: Chewing gums, caramel, honey, etc.

Procedure (Preparation before heating)

- 1 Put the glass fiber sheet on the sample pan.
- 2 Press the **RESET** key to display zero.
- 3 Soak the sample into the glass fiber sheet or put the sample on the glass fiber sheet.
- 4 Press the **START** key to start the measurement.



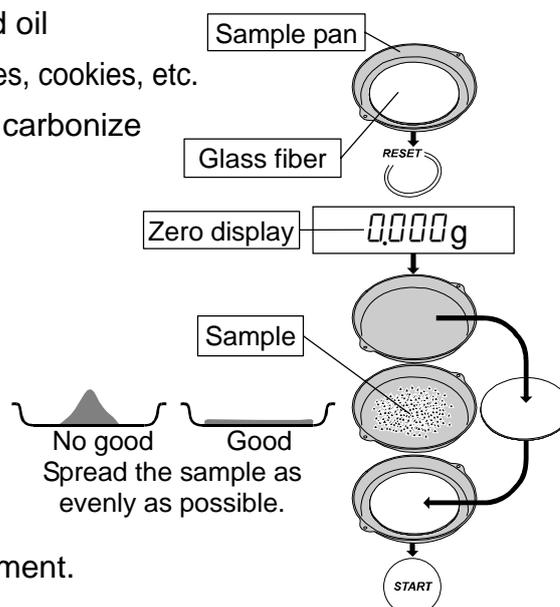
Example 2 : "If The Sample's Surface Is Apt To Carbonize"

When the sample is covered with a glass fiber sheet, carbonization of the sample surface decreases. Therefore the measurement result becomes repeatable and precise.

- ❑ A sample including a lot of sugar, protein and oil
Example: Honey, soybean powder, green tea leaves, cookies, etc.
- ❑ A sample that has dark surface and is apt to carbonize
Example: Coffee, peanuts, etc.

Procedure (Preparation before heating)

- 1 Put a glass fiber sheet on the sample pan.
- 2 Press the **RESET** key to display zero.
- 3 Remove the glass fiber sheet.
- 4 Put the sample on the pan.
Cover the sample with the glass fiber sheet.
- 5 Press the **START** key to start the measurement.





6. Measurement Procedure



6.1. Standard Mode Operation

The standard mode can obtain the moisture content with settings of ACCURACY and drying program (heating pattern, drying temperature).

6.1.1. ACCURACY

ACCURACY of measurement can be set either **[HI]**, **[MID.]** or **[LO]**.

The sample quantity is automatically selected by ACCURACY.

The termination value of the analyzing mode is automatically selected by ACCURACY and minimum scale value of % display.

The analysis mode is the program to finish the measurement when a change of moisture content per one minute becomes smaller than a preset termination value.

The settings are as follows: Specify an ACCURACY.

			ACCURACY		
	Model	Minimum scale	HI	MID.	LO
Preset Termination value	MS-70	0.001 %	0.01 %/min	0.02 %/min	0.05 %/min
		0.01 %	0.02 %/min	0.05 %/min	0.10 %/min
		0.1 %	0.10 %/min	0.20 %/min	0.50 %/min
	MX-50	0.01 %	0.02 %/min	0.05 %/min	0.10 %/min
		0.1 %	0.10 %/min	0.20 %/min	0.50 %/min
	MF-50	0.05 %	0.05 %/min	0.10 %/min	
		0.1 %	0.10 %/min	0.20 %/min	
		1 %			
	ML-50	0.1 %	0.10 %/min	0.20 %/min	
		1 %			
Sample quantity			10 g	5 g	1 g
Use			Precise result	↔	Quick measurement

6.1.2. Operation

This operation explanation uses the following example of the MX-50:

Refer to "7.Selection of Measurement Method" for detail.

Input Parameters

Analysis mode Standard mode
Drying temperature..... 130 °C
ACCURACY **[LO]**
Sample quantity..... Approximately 1 g (Automatic selection)
Analysis mode 0.10 %/min (Automatic selection)

Stored Parameters (Factory Settings for the MX-50)

Heating pattern Standard drying ()
Measurement unit..... Moisture content is based on a wet sample
Minimum scale value of % display..... 0.01 %
Minimum scale value of gram display... 0.001 g
Data memory function Not used

% MOIST /W

1. Turn on the analyzer.
The gram unit (of weighing mode) is displayed.

Enter the Standard Mode

2. Press the **SELECT** key to display an analysis mode and press the **↓** or **↑** key to select **Std**.

Select ACCURACY

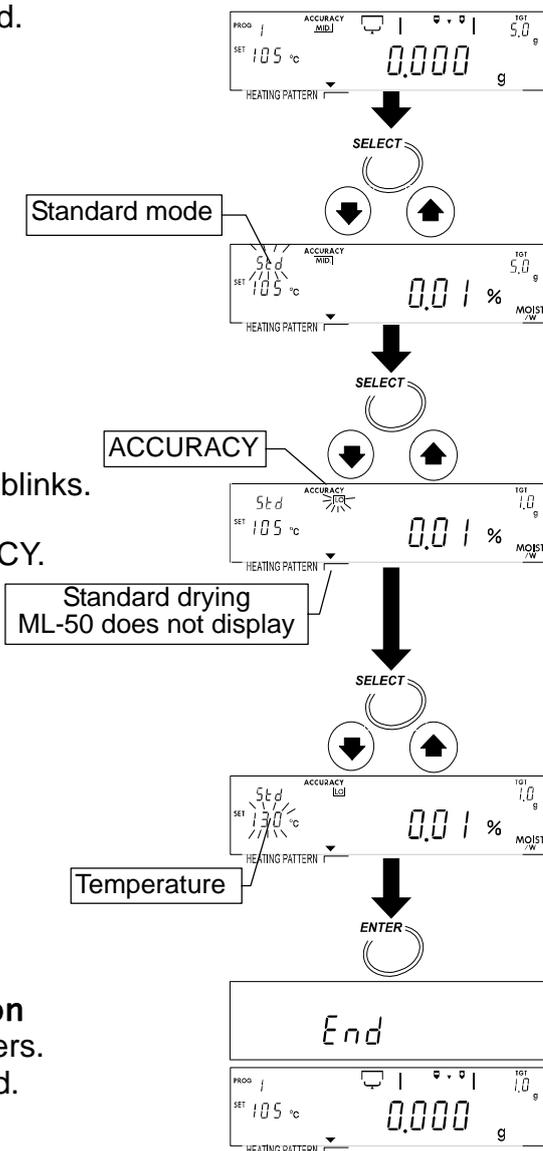
3. Press the **SELECT** key to select ACCURACY.
When ACCURACY is selected, **HI**, **MID**, or **LO** blinks.
4. Press the **↓** or **↑** key to select **LO** of ACCURACY.

Set Drying Temperature at the Sample Pan

5. Press the **SELECT** key to select the drying temperature.
6. Press the **↓** or **↑** key to set 130 °C.

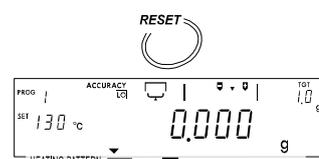
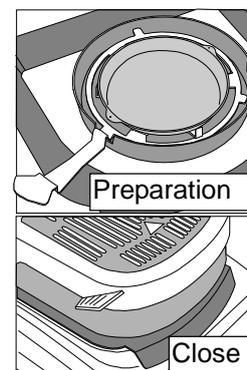
Store the Parameters and Finish the Operation

7. Press the **ENTER** key to store the parameters.
The weighing mode is automatically displayed.



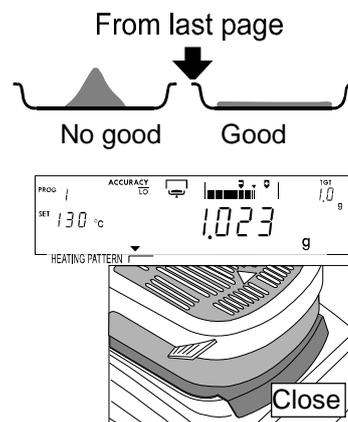
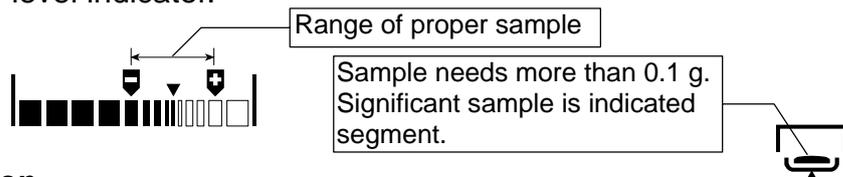
Put a Sample on the Pan

8. Put the breeze break ring, pan support, pan handle and sample pan in order. (With no sample.)
9. Close the heater cover.
10. When displaying a stable value, Press the **RESET** key. Avoid mechanical vibration, breeze and environmental noise during measurement. If it deviates from zero display, press the **RESET** key.



To next page

- Open the heater cover. Put in a sample using the level indicator.



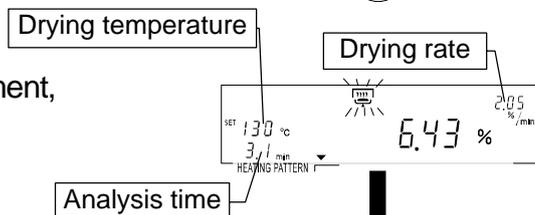
Caution

The sample needs to be more than 0.1 g. Spread the sample evenly.

- If the key is pressed during gram display, analysis mode, measurement unit and minimum scale value are displayed. If the **ENTER** key is pressed, the sample mass is output.

Start the Measurement

- Close the heater cover. Press the **START** key after a stable value is displayed.
- If the **SELECT** key is pressed during measurement, other units can be displayed temporarily and its measurement values can be output.

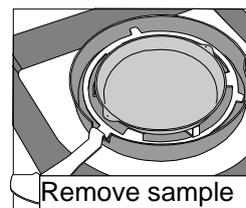
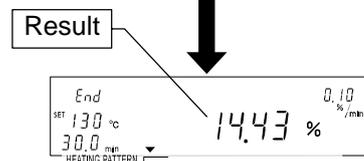


Caution

Do not press the **SELECT** key while sampling data.

Finish the Measurement

- When the change of moisture content per one minute (drying rate) reaches the preset termination value, the measurement is completed and the buzzer beeps.
- Open the heater cover and remove the sample using the pan handle.
- Press the following key to return to gram display.
 - ENTER** key.....Outputs (Prints) result.
 - SELECT** keyReturns to the weighing mode.
 - RESET** key.....Returns to the weighing mode and displays zero.



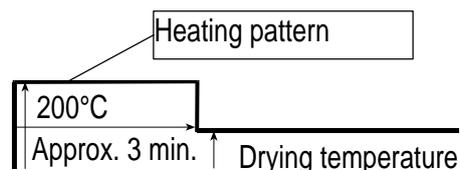
- If the same condition is used, proceed to step 8. If changing the condition, proceed to step 2.

The sample pans can be washed and reused.
There is the Reference card on the bottom of the analyzer.



6.2. Quick Mode Operation

The quick mode can obtain the moisture content with settings of ACCURACY and drying temperature. Sample is heated up at 200°C for approximately three minutes so that moisture content is measured quickly.



6.2.1. ACCURACY

ACCURACY of measurement can be set either **HI**, **MID.** or **LO**.

The sample quantity is automatically selected by ACCURACY.

The termination value of the analysis mode is automatically selected by ACCURACY and minimum scale value of % display.

Analysis mode is the program to finish the measurement when a change of moisture content per one minute becomes smaller than a preset termination value.

The settings are as follows: Specify an ACCURACY.

			ACCURACY		
	Model	Minimum scale	HI	MID.	LO
Preset Termination value	MS-70	0.001 %	0.02 %/min	0.05 %/min	0.05 %/min
		0.01 %	0.05 %/min	0.10 %/min	0.20 %/min
		0.1 %	0.10 %/min	0.20 %/min	0.50 %/min
	MX-50	0.01 %	0.05 %/min	0.10 %/min	0.20 %/min
		0.1 %	0.10 %/min	0.20 %/min	0.50 %/min
	MF-50	0.05 %	0.10 %/min	0.20 %/min	0.50 %/min
		0.1 %			
		1 %			
	ML-50	0.1 %	0.20 %/min	0.50 %/min	1.00 %/min
		1 %			
Sample quantity			5 g	2 g	1 g
Use			Precise result	↔	Quick measurement

6.2.2. Operation

This operation explanation uses the following example of the MX-50 : Refer to "7.Selection of Measurement Method" for detail.

Input Parameters

Analysis mode Quick mode
 Heating pattern Quick drying (☐, Automatic selection)
 Drying temperature 130 °C
 ACCURACY **LO**
 Sample quantity Approximately 1 g (Automatic selection)
 Analyzing mode 0.20 %/min (Automatic selection)

Stored Parameters (Factory Settings for the MX-50)

Measurement unit Moisture content is based on a wet sample % MOIST /W
 Minimum scale value of % display 0.01 %
 Minimum scale value of gram display ... 0.001 g
 Data memory function Not used

1. Turn on the analyzer.
The gram unit (of weighing mode) is displayed.

Enter the Quick Mode

2. Press the **SELECT** key to display an analysis mode and press the **↓** or **↑** key to select **QUC**.

Select ACCURACY

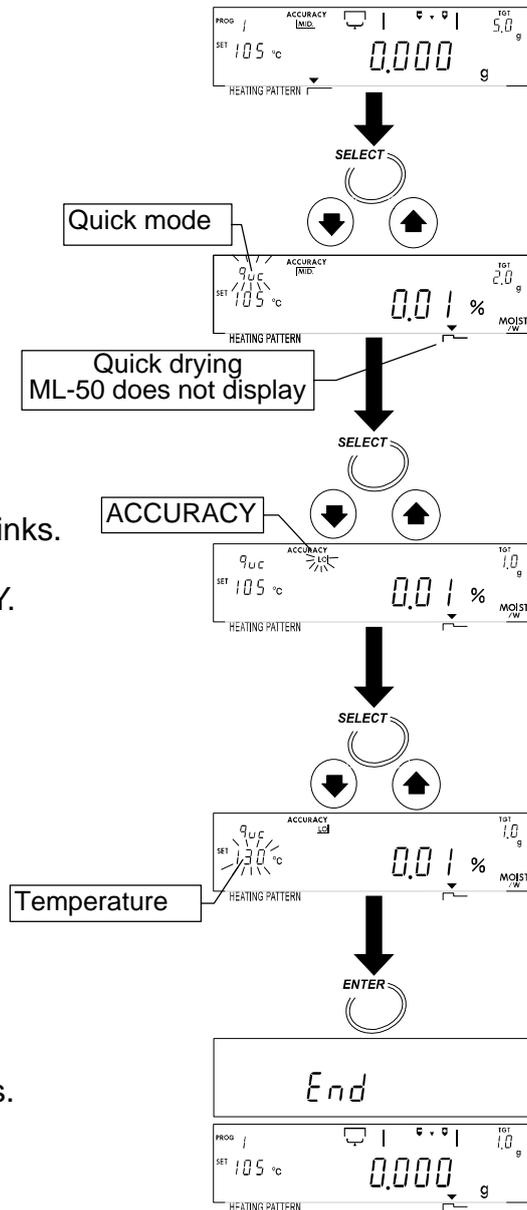
3. Press the **SELECT** key to select ACCURACY.
When ACCURACY is selected, **HI**, **MID**, or **LO** blinks.
4. Press the **↓** or **↑** key to select **LO** of ACCURACY.

Set Drying Temperature at the Sample Pan

5. Press the **SELECT** key to select the drying temperature.
6. Press the **↓** or **↑** key to set 130 °C.

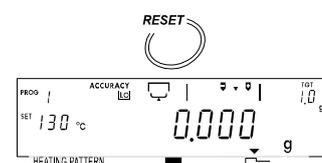
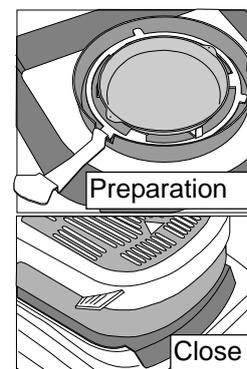
Store Parameters and Finish the Operation

7. Press the **ENTER** key to store the parameters.
The weighing mode is automatically displayed.



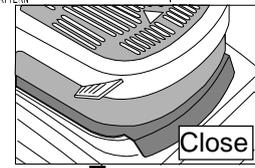
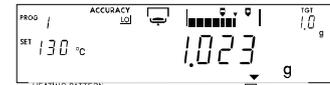
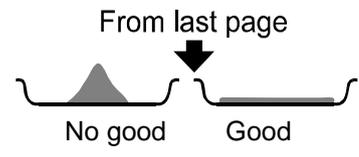
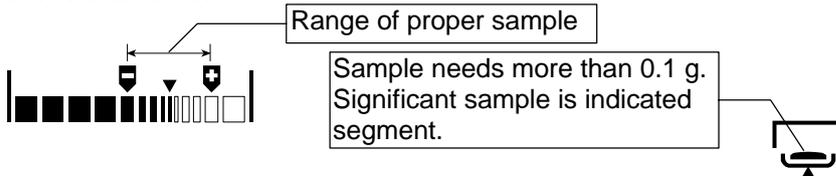
Put a Sample on the Pan

8. Put the breeze break ring, pan support, pan handle and sample pan in order. (With no sample.)
9. Close the heater cover.
10. When displaying a stable value, Press the **RESET** key.
Avoid mechanical vibration, breeze and environmental noise during measurement. If it deviates from zero display, press the **RESET** key.



To next page

- Open the heater cover. Put in a sample using the level indicator.



Caution

The sample needs to be more than 0.1 g. Spread the sample evenly.

- If the key is pressed during gram display, analysis mode, measurement unit and minimum scale value are displayed. If the key is pressed, sample mass is output.

Start the Measurement

- Close the heater cover. Press the key after a stable value is displayed.
- If the key is pressed during measurement, other units can be displayed temporarily and its measurement values can be output.



Drying temperature

Drying rate



Analysis time

Caution

Do not press the key while sampling data.

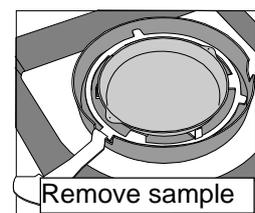
Finish the Measurement

- When the change of moisture content per one minute (drying rate) reaches the preset termination value, the measurement is completed and the buzzer beeps.

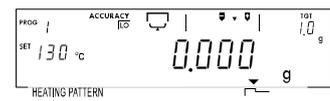
Result



- Open the heater cover and remove the sample using the pan handle.



- Press the following key to return to gram display.
 - key.....Outputs (Prints) result.
 - keyReturns to the weighing mode.
 - key.....Returns to the weighing mode and displays zero.



- If the same condition is used, proceed to step 8. If changing the condition, proceed to step 2.

The sample pans can be washed and reused.
There is the Reference card on the bottom of the analyzer.

6.3. Program Number

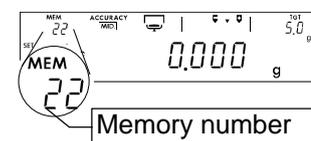
The measurement conditions of all program numbers are set to the standard mode at the factory. The analyzer can store and recall proper individual settings for each sample with the program number (PROG No.).

MS-70 / MX-50	20 sets	PROG 1 to 20
MF-50	10 sets	PROG 1 to 10
ML-50	5 sets	PROG 1 to 5



The same measurement program is stored in all program numbers with factory settings.

Analysis mode.....	Standard mode
Heating pattern	Standard drying

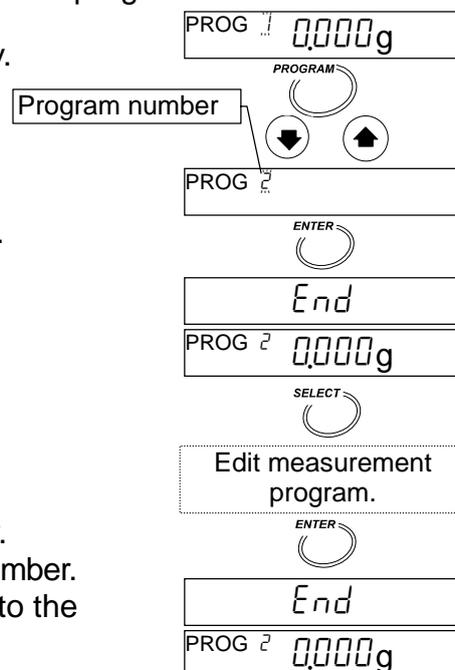


Caution If the data memory function is active, the data memory number (MEM) is displayed, in place of the program number (PROG).

6.3.1. Storing a Measurement Program to a Program Number

Displaying or recalling a PROG number, a measurement program can be renewed.

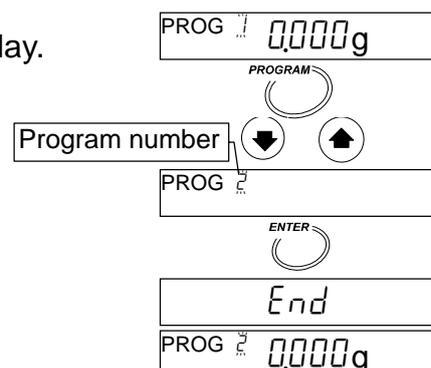
1. Press and hold the **PROGRAM** key in gram display.
2. Press the **↓** or **↑** key to select a program number
3. Press the **ENTER** key to use the selected number.
4. Press the **SELECT** key to edit the parameters.
5. Edit parameters of a measurement program.
Refer to "7.Selection of Measurement Method"
6. Press the following key to return to the gram display.
ENTER key.....Stores parameters to the selected number.
RESET key.....Cancels the operation and returns to the weighing mode.



6.3.2. Recalling a Measurement Program with a Program Number

Stored measurement programs can be recalled with a program number.

1. Press and hold the **PROGRAM** key in the gram display.
2. Press the **↓** or **↑** key to select a program number
3. Press the **ENTER** key to use the selected number.





7. Measurement Programs



7.1. List of Measurement Programs

There are five analysis modes.

	Measurement Programs				
	Analyzing mode to Finish Measurement	Drying Program			
		Heating pattern		Drying Temperature	
		MS-70, MX-50, MF-50	ML-50	MS-70	MX-50 MF-50 ML-50
Standard Mode <i>Std</i>	Measurement condition is automatically selected by ACCURACY and minimum value of % display. When drying rate is less than preset termination value, measurement is completed automatically.	Standard drying Ramp drying Step drying	Standard drying	30°C to 200°C	50°C to 200°C
Quick Mode <i>Quc</i>		Quick drying			
Automatic Mode <i>U-R</i>	When drying rate is less than preset termination value, measurement is completed automatically.	Standard drying Ramp drying Step drying	Standard drying		
Timer Mode <i>U-t</i>	Sample is dried for a preset time. 1min. to 480min.				
Manual Mode <i>U-n</i>	Measurement is completed by the <input type="button" value="STOP"/> key. Max. 480 min.				

Drying rate: Change of moisture content per one minute [%/min]

7.1.1. ACCURACY of the Standard Mode and Quick Mode

ACCURACY of measurement can be set either **[HI]**, **[MID.]** or **[LO]**.

The sample quantity is automatically selected by ACCURACY.

The termination value of the analyzing mode is automatically selected by ACCURACY and minimum scale value of % display.

The analyzing mode is the program to finish the measurement when a change of moisture content per one minute becomes smaller than a preset termination value.

The settings are as follows: Specify an ACCURACY.

Drying rate: Change of moisture content per one minute [%/min]

Standard Mode

			ACCURACY		
	Model	Minimum scale	HI	MID.	LO
Preset Termination value	MS-70	0.001 %	0.01 %/min	0.02 %/min	0.05 %/min
		0.01 %	0.02 %/min	0.05 %/min	0.10 %/min
		0.1 %	0.10 %/min	0.20 %/min	0.50 %/min
	MX-50	0.01 %	0.02 %/min	0.05 %/min	0.10 %/min
		0.1 %	0.10 %/min	0.20 %/min	0.50 %/min
	MF-50	0.05 %	0.05 %/min	0.10 %/min	
		0.1 %	0.10 %/min	0.20 %/min	
		1 %			
	ML-50	0.1 %			
			1 %		
Sample quantity			10 g	5 g	1 g
Use			Precise result	↔	Quick measurement

Quick Mode

			ACCURACY		
	Model	Minimum scale	HI	MID.	LO
Preset Termination value	MS-70	0.001 %	0.02 %/min	0.05 %/min	0.05 %/min
		0.01 %	0.05 %/min	0.10 %/min	0.20 %/min
		0.1 %	0.10 %/min	0.20 %/min	0.50 %/min
	MX-50	0.01 %	0.05 %/min	0.10 %/min	0.20 %/min
		0.1 %	0.10 %/min	0.20 %/min	0.50 %/min
	MF-50	0.05 %	0.10 %/min	0.20 %/min	0.50 %/min
		0.1 %			
		1 %			
	ML-50	0.1 %	0.20 %/min	0.50 %/min	1.00 %/min
		1 %			
Sample quantity			5 g	2 g	1 g
Use			Precise result	↔	Quick measurement

7.1.2. Analyzing mode of the Automatic Mode

When the change of moisture content per one minute is less than the preset value, the measurement is automatically completed.

Preset Termination value to complete measurement	Range			
	MS-70	MX-50	MF-50	ML-50
2.00 %/min	↑	↑	↑	↑
1.00 %/min				
0.50 %/min			Available range	Available range
0.20 %/min		Available range	(Factory setting)	(Factory setting)
0.10 %/min	Available range	(Factory setting)		
0.05 %/min	(Factory setting)			
0.02 %/min				
0.01 %/min				
0.005 %/min				
0.002 %/min				
0.001 %/min			Unavailable item	

7.1.3. Analyzing mode of the Timer Mode

Sample is dried for a preset analysis time.

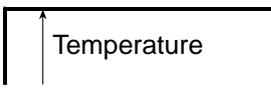
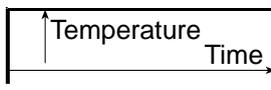
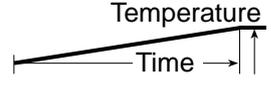
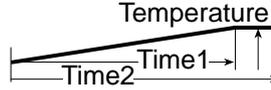
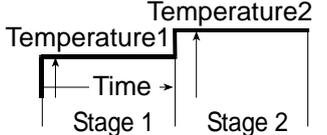
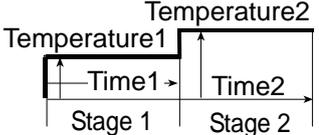
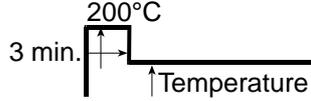
Drying Time 1 minute to 480 minutes.

Setting interval : 1 minute during 1 minute to 60 minutes.
5 minutes during 60 minutes to 480 minutes.

Factory setting: 10 minutes.

7.1.4. Drying Program (Heating Pattern and Drying Temperature)

Heating pattern

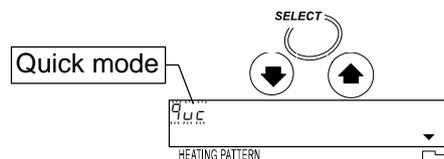
	Standard Mode, Automatic Mode, Manual Mode	Timer Mode	Quick Mode
Standard drying 			—
Ramp drying 			—
Step drying 			—
Quick drying 	—	—	

"Temperature 1" can be set higher than "temperature 2" in step drying.

ML-50, can select standard drying and quick drying only, does not display heating pattern.

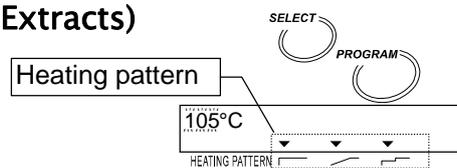
How to Select quick mode (Extracts)

Press the **SELECT** key during the gram display.
 Display **QUC** using the **↓** or **↑** key.
 ML-50 is does not display heating pattern.

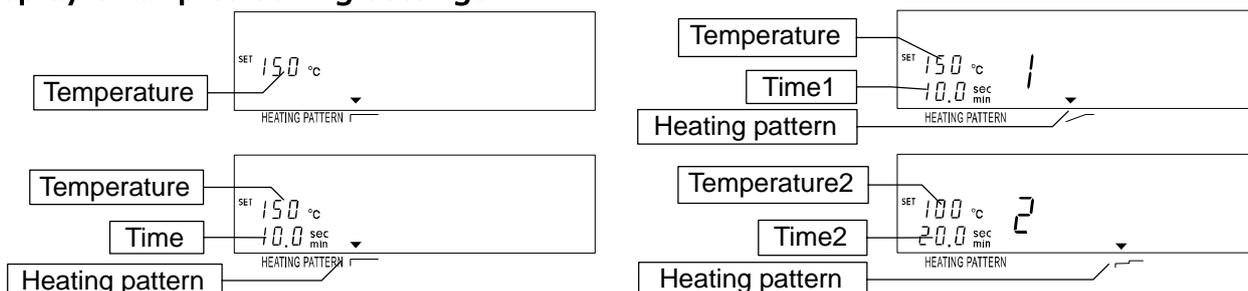


How to Select a Heating pattern without quick mode (Extracts)

Press the **SELECT** key to select temperature during the gram display.
 Press the **PROGRAM** key to select a symbol of heating pattern are displayed in order.
 ML-50 can select standard drying and quick drying only.



Display examples during settings



Drying Temperature at the Sample Pan

Drying temperature range for MS-70 30°C to 200°C, 1°C interval.
 Drying temperature range for MX-50, MF-50 and ML-50 50°C to 200°C, 1°C interval.
 When a measurement is started and one hour passes, the maximum temperature is automatically regulated to 160°C for safety.

7.1.5. Measurement Unit

Unit	Formula	Display
Moisture content is based on wet sample mass *1	$\frac{W - D}{W} \times 100$	% MOIST /W
Moisture content (Atro) is based on dried sample mass	$\frac{W - D}{D} \times 100$	% MOIST /D
Dry content	$\frac{D}{W} \times 100$	% RATIO D/W
Ratio *2	$\frac{W}{D} \times 100$	% RATIO W/D
Gram value	—	g

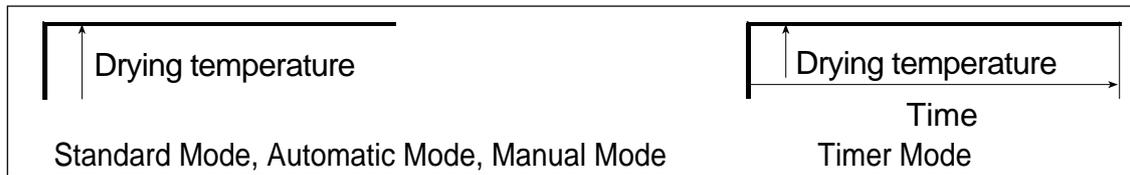
W: Wet sample mass D: Dried sample mass
 *1: Factory settings
 *2: When result reaches to 999%, measurement is stopped.



7.2. Procedures to Store a Measurement Program

7.2.1. Standard Drying

This explanation uses the following parameters and sample displays of MX-50.



Common Items

Program number	2 (PROG 2)	
Drying program Heating pattern.....	Standard drying ()	
Drying temperature	160°C	
Measurement unit	Moisture content	
Minimum scale value during measurement ..	0.01 %	
Minimum scale value of gram display.....	0.001 g	
Sample quantity.....	Approximately 5 g	
Data memory function	Not used	

Items for Standard Mode

Analysis mode	Standard mode (Symbol:)
ACCURACY	
Analyzing mode to finish a measurement.....	Automatic setting by ACCURACY

Items for Automatic Mode

Analysis mode	Automatic mode (Symbol:)
Analyzing mode to finish measurement.....	0.05 %/min

Items for Timer Mode

Analysis mode	Timer mode (Symbol:)
Analyzing mode to finish measurement.....	10 minutes

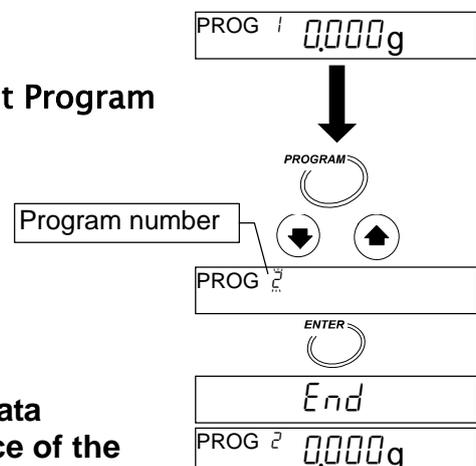
Items for Manual Mode

Analysis mode	Manual mode (Symbol:)
---------------------	-------------------------

1. Display the gram unit (of the weighing mode).

Select a Program Number to Edit the Measurement Program

2. Press the key and press the or key to select a program number.
3. Press the key to use the number.
4. The analyzer displays and returns to the weighing mode.



Caution If the data memory function is active, the data memory number (MEM) is displayed in place of the program number (PROG).

Select an Analysis Mode

- Press the **SELECT** key to select a symbol, it will blink. Select an analysis mode using the **↓** or **↑** key.
 If standard mode is used, select **Std.**
 If automatic mode is used, select **U-R**.
 If timer mode is used, select **U-E**.
 If manual mode is used, select **U-n**.

Set ACCURACY for the Standard Mode

- Select **ACCURACY** with the **SELECT** key.
 Select **MID.** with the **↓** or **↑** key.
 When **ACCURACY** is selected, **HI**, **MID.** or **LO** blinks.

Set the Heating Pattern

- Select drying temperature with the **SELECT** key.
 Select standard drying **r** of the heating pattern with the **PROGRAM** key.

Set the Drying Temperature

- Set 160°C with the **↓** or **↑** key.

Set the Preset Termination Value for Automatic Mode

- Select the preset termination value with the **SELECT** key.
 Select 0.05 [%/min] with the **↓** or **↑** key.

Set the Analysis Time for the Timer Mode

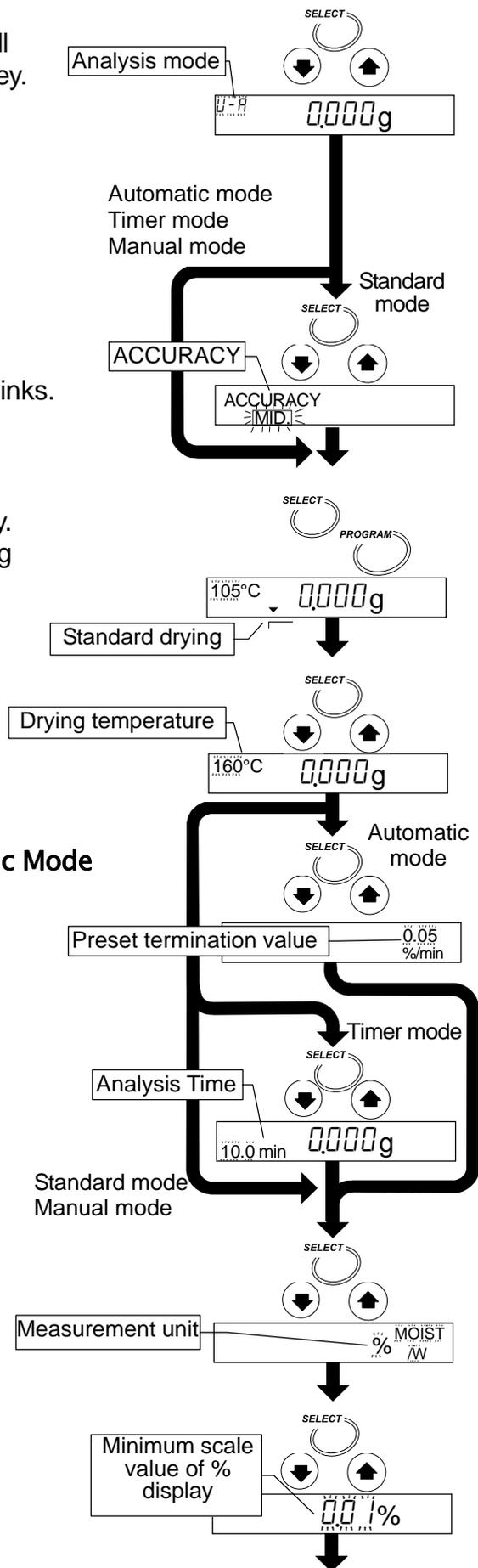
- Select time with the **SELECT** key.
 Select 10.0 [min] with the **↓** or **↑** key.

Set the Measurement Unit

- Select a measurement unit with the **SELECT** key. Select a moisture content (based on a wet sample) with the **↓** or **↑** key.

Set the Minimum Scale Value of the % Display

- Select % display with the **SELECT** key.
 Select 0.01 [%] with the **↓** or **↑** key.



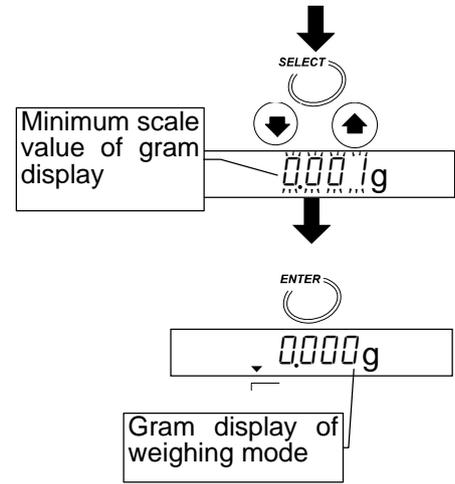
Set the Minimum Scale Value of the Gram Display

13. Select gram display with the **SELECT** key.
Select 0.001 [g] with the **↓** or **↑** key.

Store the Parameters and Finish the Operation

14. Press the **ENTER** key to store the new parameters for the measurement program to program number 2. Pressing the key, the weighing mode is automatically displayed. When PROG 2 is recalled, the settings can be used.

To cancel the new parameters and return to the weighing mode, press the **RESET** key.

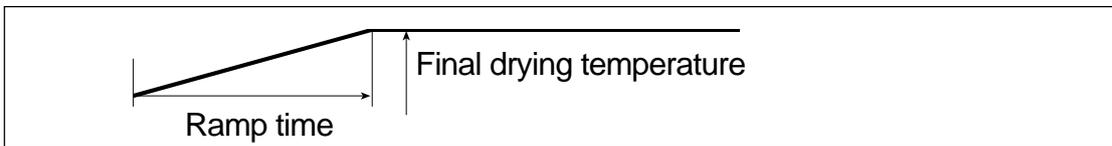


7.2.2. Ramp Drying (ML-50 can not select ramp drying)

Standard Mode, Automatic Mode or Manual Mode

Refer to page 35 for Timer Mode

This explanation uses the following parameters and sample displays of MX-50.



Common Items

Program number	3 (PROG 3)	
Drying program Heating pattern.....	Ramp drying ()	
	Final drying temperature.....	160°C
	Ramp time.....	5.0 minutes
Measurement Unit.....	Moisture content	<div style="border: 1px solid black; padding: 2px; display: inline-block;">% MOIST /W</div>
Minimum scale value during measurement ..	0.01 %	
Minimum scale value of gram display.....	0.001 g	
Sample quantity.....	Approximately 5 g	
Data memory function	Not used	

Items for Standard Mode

Analysis mode	Standard mode (Symbol: <div style="border: 1px solid black; padding: 2px;">Std</div>)
ACCURACY	<div style="border: 1px solid black; padding: 2px;">MID</div>
Analyzing mode to finish measurement.....	Automatic setting by ACCURACY

Items for Automatic Mode

Analysis mode	Automatic mode (Symbol: <div style="border: 1px solid black; padding: 2px;">U-R</div>)
Analyzing mode to finish measurement.....	0.05 %/min

Items for Manual Mode

Analysis mode	Manual mode (Symbol: <div style="border: 1px solid black; padding: 2px;">U-n</div>)
---------------------	--

1. Display gram unit (of the weighing mode).

Select a Program Number to Edit the Measurement Program

2. Press the

PROGRAM

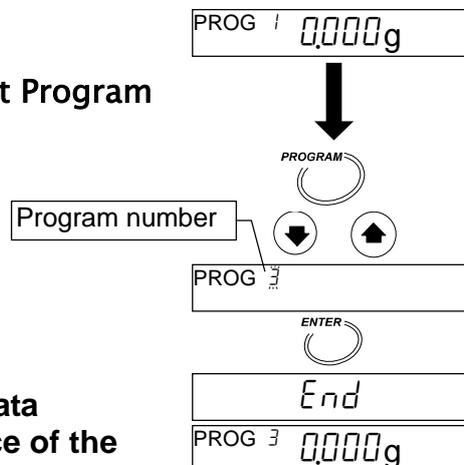
 key and press the or key to select a program number.
3. Press the

ENTER

 key to use the number.
4. The analyzer displays

End

 and returns to the weighing mode.



Caution If the data memory function is active, the data memory number (MEM) is displayed in place of the program number (PROG).

Select an Analysis Mode

5. Press the **SELECT** key to select a symbol, it will blink. Select an analysis mode using the \downarrow or \uparrow key.

If standard mode is used, select **Std.**

If automatic mode is used, select **U-R**.

If manual mode is used, select **U-n**.

Set ACCURACY for Standard Mode

6. Select **ACCURACY** with the **SELECT** key.

Select **MID.** with the \downarrow or \uparrow key.

When **ACCURACY** is selected, **HI**, **MID.** or **LO** blinks.

Set the Heating Pattern

7. Select drying temperature with the **SELECT** key.
Select ramp drying \nearrow of heating pattern with the **PROGRAM** key.

Set the Final Drying Temperature

8. Set 160°C with the \downarrow or \uparrow key.

Set the Ramp Time

9. Set 5.0 minutes with the \downarrow or \uparrow key.

Set the Preset Termination Value for Automatic Mode

10. Select preset termination value with the **SELECT** key. Select 0.05 [%/min] with the \downarrow or \uparrow key.

Set the Measurement Unit

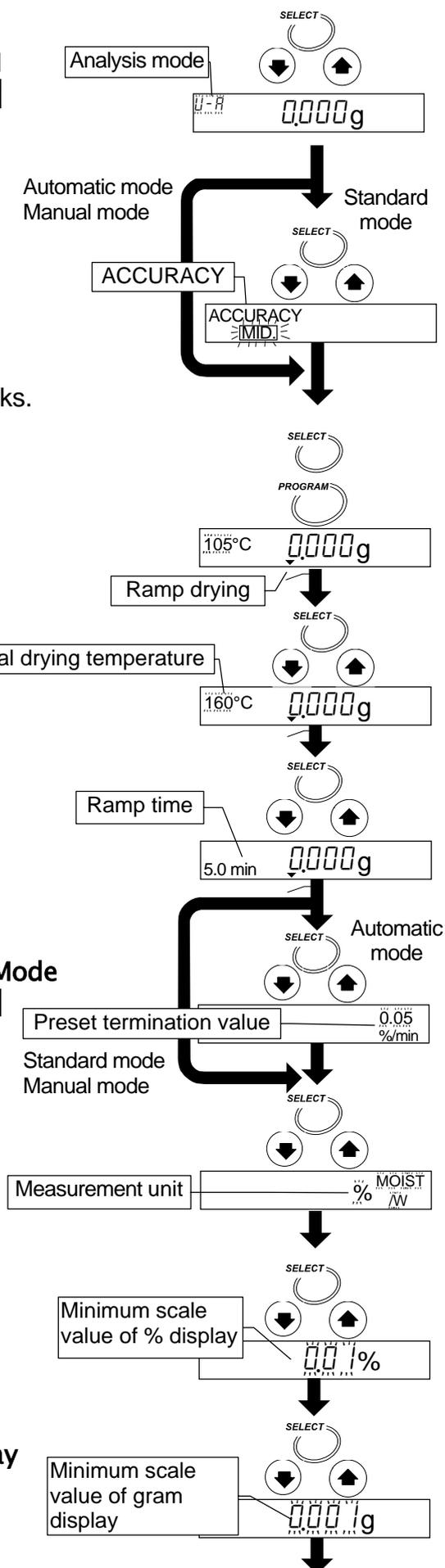
11. Select measurement unit with the **SELECT** key.
Select a moisture content (based on a wet sample) with the \downarrow or \uparrow key.

Set the Minimum Scale Value of the % Display

12. Select % display with the **SELECT** key.
Select 0.01 [%] with the \downarrow or \uparrow key.

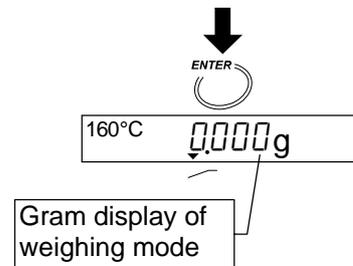
Set the Minimum Scale Value of the Gram Display

13. Select gram display with the **SELECT** key.
Select 0.001 [g] with the \downarrow or \uparrow key.



Store Parameters and Finish the Operation

- Press the **ENTER** key to store the new parameters of the measurement program to program number 3. Pressing the key, the weighing mode is automatically displayed. When PROG 3 is recalled, the settings can be used.

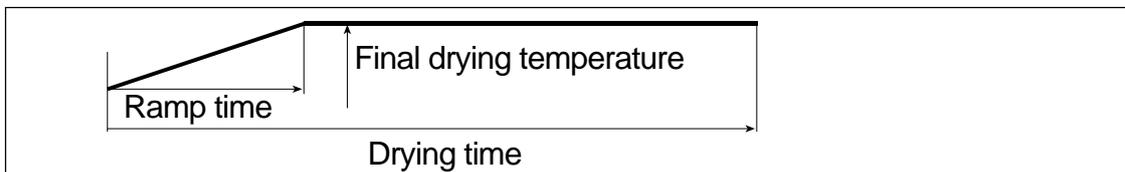


To cancel the new parameters and return to the weighing mode, press the **RESET** key.

Timer Mode

Refer to page 33 for Standard Mode, Automatic Mode or Manual Mode

This explanation uses the following parameters and sample displays of MX-50.



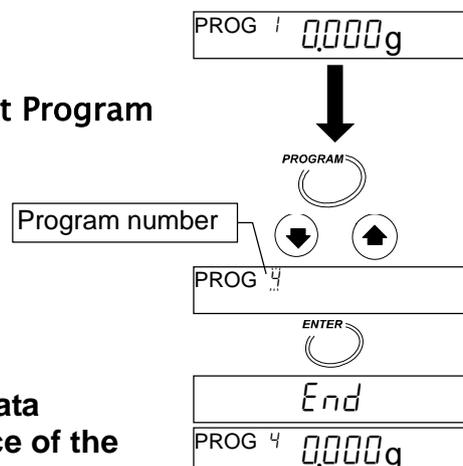
Common Items

Program number	4 (PROG 4)
Analysis mode	Timer mode (Symbol: U-t)
Drying program Heating pattern.....	Ramp drying ()
Final drying temperature.....	160°C
Ramp time	5.0 minutes
Drying time	10.0 minutes
Measurement unit	Moisture content % MOIST /W
Minimum scale value during measurement ..	0.01 %
Minimum scale value of gram display.....	0.001 g
Sample quantity.....	Approximately 5 g
Data memory function	Not used

- Display gram unit (of the weighing mode).

Select a Program Number to Edit the Measurement Program

- Press the **PROGRAM** key and press the **↓** or **↑** key to select a program number.
- Press the **ENTER** key to use the number.
- The analyzer displays **End** and returns to the weighing mode.



Caution If the data memory function is active, the data memory number (MEM) is displayed in place of the program number (PROG).

Select an Analysis Mode

- Press the **SELECT** key to select a symbol, it will blink. Select **U-E** of the timer mode with the **↓** or **↑** key. (Press these keys to select it)

Set the Heating Pattern

- Select drying temperature with the **SELECT** key. Select ramp drying  of the heating pattern with the **PROGRAM** key.

Set the Final Drying Temperature

- Set 160°C with the **↓** or **↑** key.

Set the Ramp Time

- Set 5.0 minutes with the **↓** or **↑** key.

Set the Analysis Time

- Set 10.0 minutes with the **↓** or **↑** key.

Set a Measurement Unit

- Select a measurement unit with the **SELECT** key. Select moisture content (based on a wet sample) with the **↓** or **↑** key.

Set the Minimum Scale Value of the % Display

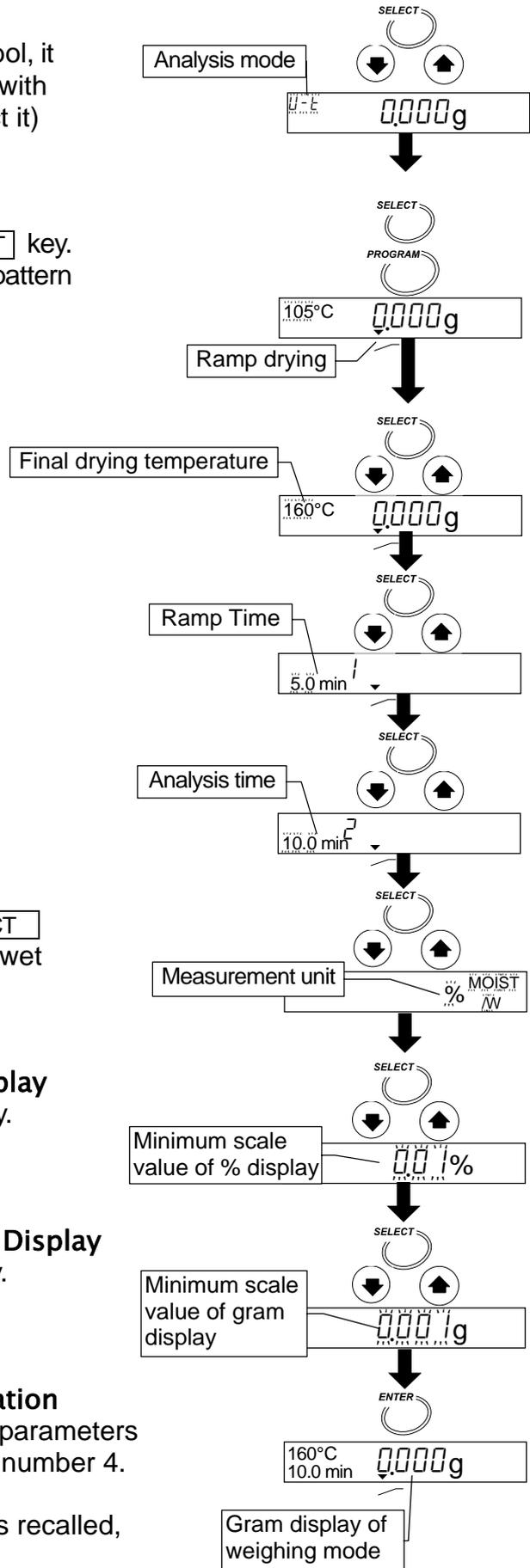
- Select the % display with the **SELECT** key. Select 0.01 [%] with the **↓** or **↑** key.

Set the Minimum Scale Value of the Gram Display

- Select gram display with the **SELECT** key. Select 0.001 [g] with the **↓** or **↑** key.

Store the Parameters and Finish the Operation

- Press the **ENTER** key to store the new parameters of the measurement program to program number 4. Pressing the key, the weighing mode is automatically displayed. When PROG 4 is recalled, the settings can be used. To cancel the new parameters and return to the weighing mode, press the **RESET** key.

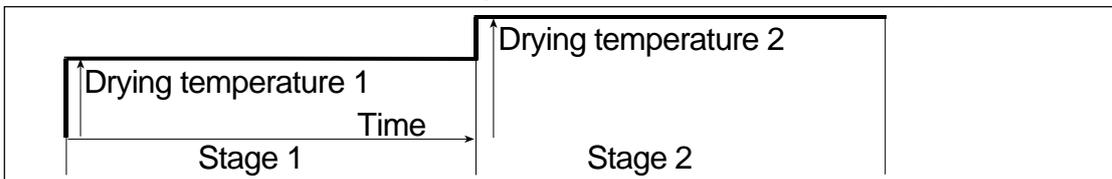


7.2.3. Step Drying (ML-50 can not select step drying)

Standard Mode, Automatic Mode or Manual Mode

Refer to page 39 for Timer Mode

This explanation uses the following parameters and sample displays of MX-50.



"Temperature 1" can be set higher than "temperature 2" in step drying.

Common Items

Program number	5 (PROG 5)	
Drying program Heating pattern.....	Step drying ()	
Drying temperature 1	120°C	
Drying temperature 2	160°C	
Time.....	5.0 minutes	
Measurement Unit.....	Moisture content	
Minimum scale value during measurement ..	0.01 %	
Minimum scale value of gram display.....	0.001 g	
Sample quantity.....	Approximately 5 g	
Data memory function	Not used	

Items for Standard Mode

Analysis mode	Standard mode (Symbol: )
ACCURACY	
Analyzing mode to finish measurement.....	Automatic setting by ACCURACY

Items for Automatic Mode

Analysis mode	Automatic mode (Symbol: )
Analyzing mode to finish measurement.....	0.05 %/min

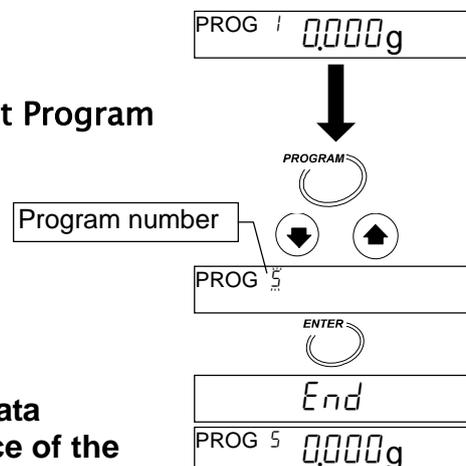
Items for Manual Mode

Analysis mode	Manual mode (Symbol: )
---------------------	--

1. Display gram unit (of the weighing mode).

Select a Program Number to Edit the Measurement Program

2. Press the  key and press the  or  key to select a program number.
3. Press the  key to use the number.
4. The analyzer displays  and returns to the weighing mode.



Caution If the data memory function is active, the data memory number (MEM) is displayed in place of the program number (PROG).

Select an Analysis Mode

- Press the **SELECT** key to blink a symbol, it will blink. Select an analysis mode using the \downarrow or \uparrow key.
If standard mode is used, select **Std.**
If automatic mode is used, select **U-R**.
If manual mode is used, select **U-n**.

Set ACCURACY for the Standard Mode

- Select ACCURACY with the **SELECT** key.
Select **MID.** with the \downarrow or \uparrow key.
When ACCURACY is selected, **HI**, **MID.** or **LO** blinks.

Set the Heating Pattern

- Select drying temperature 1 with the **SELECT** key. Select step drying —|— of the heating pattern with the **PROGRAM** key.

Set Drying Temperature 1

- Set 120°C to drying temperature 1 with the \downarrow or \uparrow key.

Set the Time

- Select time with the **SELECT** key.
Set 5.0 minutes with the \downarrow or \uparrow key.

Set Drying Temperature 2

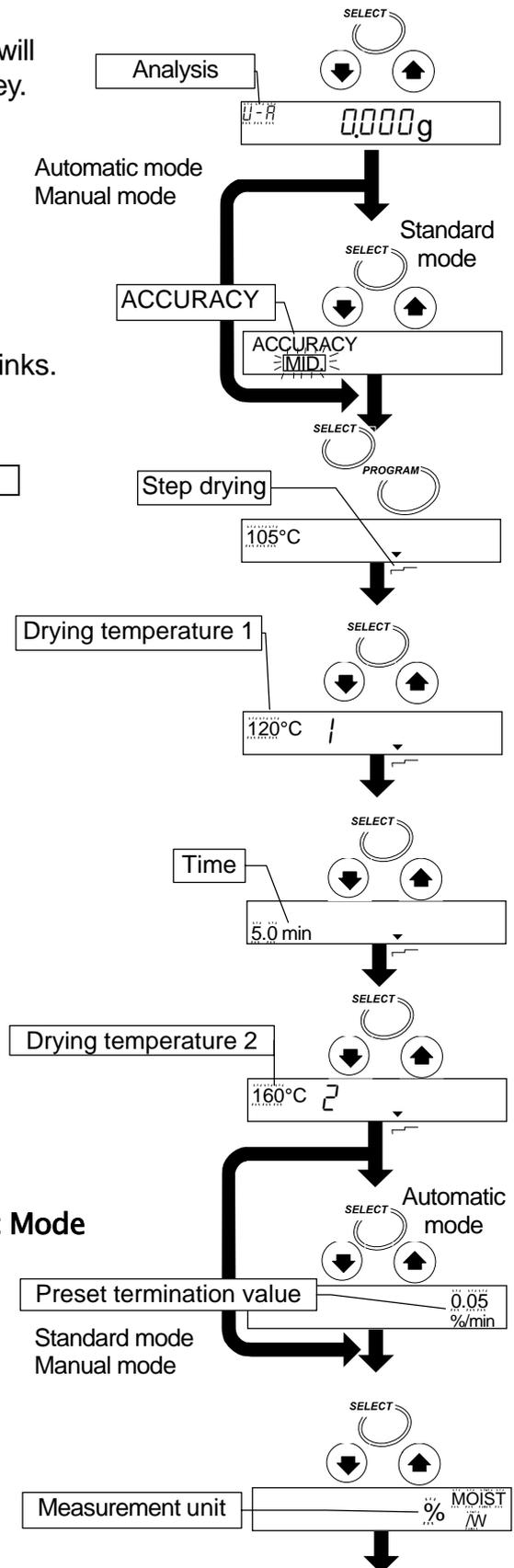
- Select drying Temperature 2 with the **SELECT** key.
Set 160°C with the \downarrow or \uparrow key.

Set the Preset Termination Value for Automatic Mode

- Select a preset termination value with the **SELECT** key. Select 0.05 [%/min] with the \downarrow or \uparrow key.

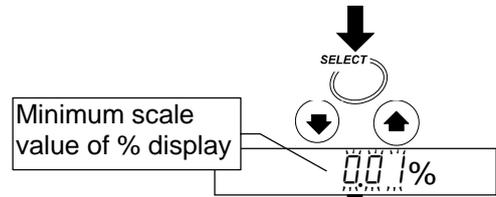
Set Measurement Unit

- Select measurement unit with the **SELECT** key.
Select moisture content (based on a wet sample) with the \downarrow or \uparrow key.



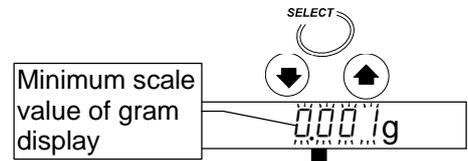
Set the Minimum Scale Value of the % Display

13. Select the % display with the **SELECT** key.
 Select 0.01 [%] with the **↓** or **↑** key.



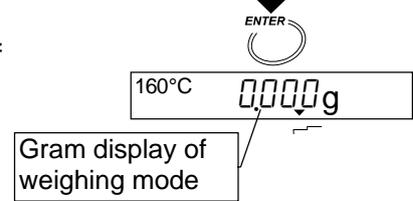
Set the Minimum Scale Value of the Gram Display

14. Select the gram display with the **SELECT** key.
 Select 0.001 [g] with the **↓** or **↑** key.



Store the Parameters and Finish the Operation

15. Press the **ENTER** key to store the new parameters of the measurement program to program number 3. Pressing the key, the weighing mode is automatically displayed. When PROG 3 is recalled, the settings can be used.

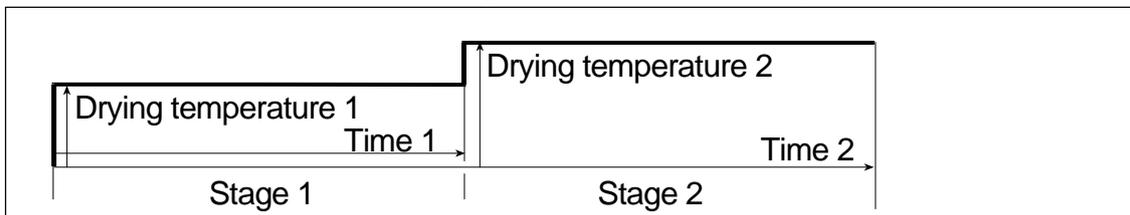


To cancel new parameters and return to weighing mode, press the **RESET** key.

Timer Mode

Refer to page 37 for Standard Mode, Automatic Mode or Manual Mode

This explanation uses the following parameters and sample displays of MX-50.



"Temperature 1" can be set higher than "temperature 2" in step drying.

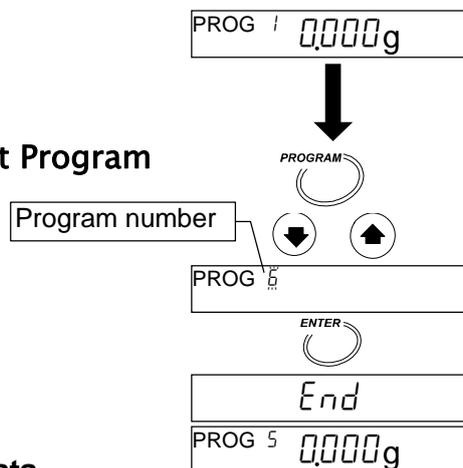
Common Items

Program number	6 (PROG 6)	
Analysis mode	Timer mode (Symbol: U-t)	
Drying program	Heating pattern.....	Step drying (—)
	Drying temperature 1	160°C
	Drying temperature 2	120°C
	Time 1	5.0 minutes
	Time 2	10.0 minutes
Measurement unit	Moisture content	% MOIST /W
Minimum scale value during measurement ..	0.01 %	
Minimum scale value of the gram display	0.001 g	
Sample quantity	Approximately 5 g	
Data memory function	Not used	

1. Display gram unit (of the weighing mode).

Select a Program Number to Edit the Measurement Program

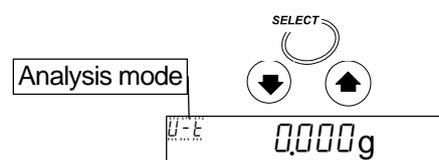
2. Press the **PROGRAM** key and press the \downarrow or \uparrow key to select a program number.
3. Press the **ENTER** key to use the number.
4. The analyzer displays **End** and returns to the weighing mode.



Caution If the data memory function is active, the data memory number (MEM) is displayed in place of the program number (PROG).

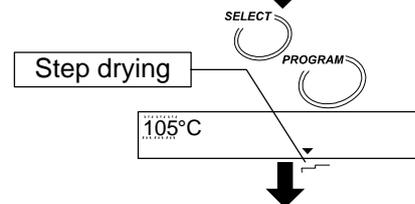
Select an Analysis Mode

5. Press the **SELECT** key to select a symbol, it will blink. Select **U-t** of the timer mode with the \downarrow or \uparrow key. (Press these keys to select it)



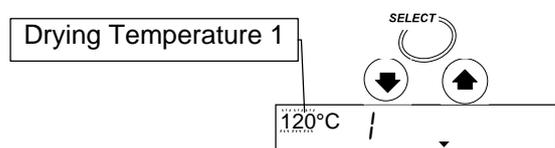
Set the Heating Pattern

6. Select drying temperature with the **SELECT** key. Select step drying  of the heating pattern with the **PROGRAM** key.



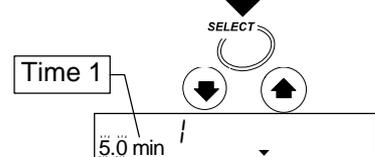
Set Drying Temperature 1

7. Set 120°C with the \downarrow or \uparrow key.



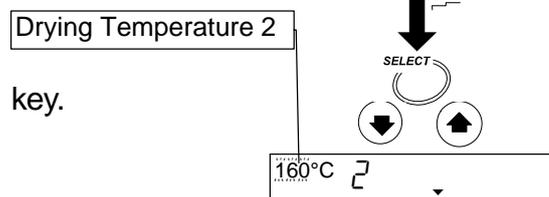
Set Time 1

8. Select time 1 with the **SELECT** key. Set 5.0 minutes with the \downarrow or \uparrow key.



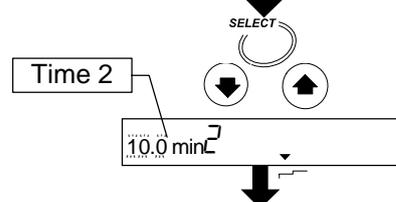
Set Drying Temperature 2

9. Select Drying Temperature 2 with the **SELECT** key. Set 160°C with the \downarrow or \uparrow key.



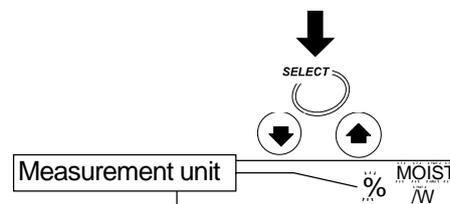
Set Time 2

10. Select time 2 with the **SELECT** key. Set 10.0 minutes with the \downarrow or \uparrow key.



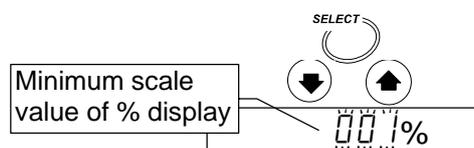
Set the Measurement Unit

11. Select measurement unit with the **SELECT** key.
Select the moisture content (based on wet sample) with the \downarrow or \uparrow key.



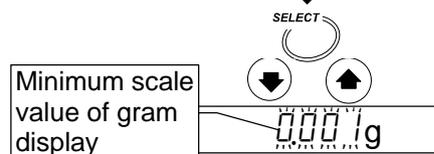
Set the Minimum Scale Value of the % Display

12. Select the % display with the **SELECT** key.
Select 0.01 [%] with the \downarrow or \uparrow key.



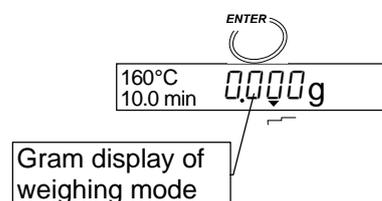
Set the Minimum Scale Value of the Gram Display

13. Select the gram display with the **SELECT** key.
Select 0.001 [g] with the \downarrow or \uparrow key.



Store the Parameters and Finish the Operation

14. Press the **ENTER** key to store the new parameters of the measurement program to program number 6.
Pressing the key, the weighing mode is automatically displayed.
When PROG 6 is recalled, the settings can be used.



To cancel the new parameters and return to the weighing mode, press the **RESET** key.



8. Check Function



8.1. Self-Check Function

Use the self-check function to check whether there is an error or inaccurate result. During the check, the heater is turned on and the temperature sensor is checked.

Caution

Do not put flammable matter near the analyzer.
Do not put anything on the heater cover.

8.1.1. Operation

1. Display the gram unit (of the weighing mode).

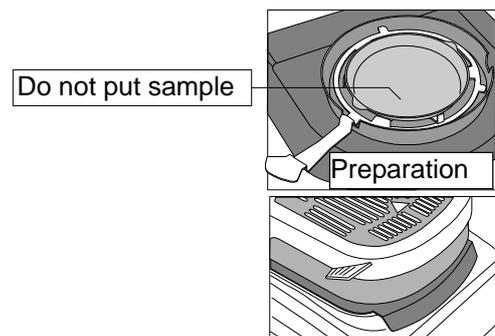
0.000g

2. Press and hold the **PROGRAM** key to display **CH**.

Press and hold 

CH

3. Put the breeze break ring, pan support, pan handle and sample pan in order. (Do not put a sample on the pan.)
Close the heater cover.
Press the **ENTER** to start the check.



If **CLoSE** is displayed, the heater cover is not closed. When it is closed, the self-check function is started.

4. The check function needs approximately one minute.

Checking 
CH 

Good result... Displays **CH PASS**, sounds buzzer and returns to weighing mode automatically.

Good result
CH PASS

Error The buzzer sounds and an error code is displayed.
Refer to 14.5. Error Message for details.

Weighing mode
0.000g

Example: **CH no**
Error 0
Ht Err



9. Connecting to a Printer

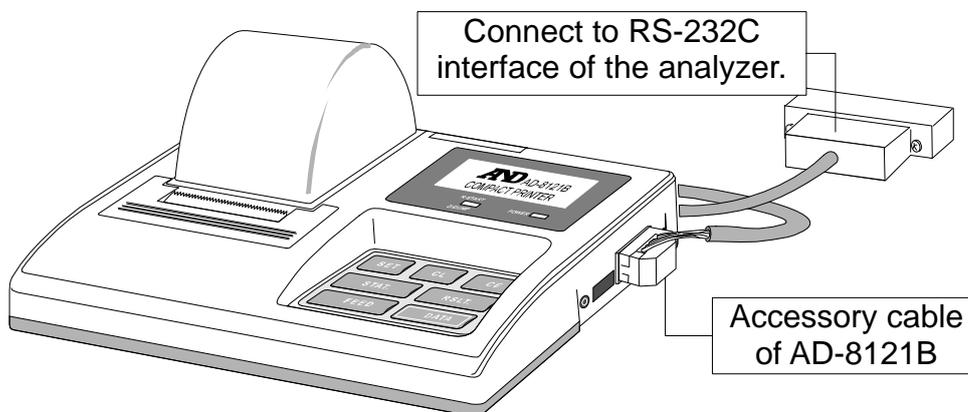
- The analyzer can be connected to a compact dot-matrix printer (AD-8121B) using the RS-232C interface. The results and record adapted to GLP, GMP and ISO can be printed.
 - GLP: Good Laboratory Practice,
 - GMP: Good Manufacture Practice,
 - ISO: International Organization for Standardization
- The statistical calculation data of the result and the graph data of the change of moisture content per one minute can be printed using the function of the AD-8121B.
- Use the AD-8121B accessory cable to connect them.

Setting List

Use	Analyzer settings				AD-8121B settings	Dip switch
	<i>Prt</i>	<i>S-d</i>	<i>PUSE</i>	<i>inFo</i>		
Result and easurement program(Excluding statistics calculation)	0,1	0	1	1,2	MODE 3 Dump printing	
Result with statistical calculation	0,1	0	0,1	0	MODE 1	
Trace of change of moisture content per one minute	2	0	0,1	0	MODE 2 Interval printing	
Data for GLP, GMP and ISO	0,1,2	0	0	1,2	MODE 3 Dump printing	

Refer to "13. Function Table" to detail of settings.

Read the instruction manual of the printer.



Compact dot-matrix printer (AD-8121B)



9.1. Print samples

9.1.1. Example To Print The Whole Data At One Time

This example is printed items of "analyzer information", "measurement program", "measurement data" and "signature space" at one time.

Preparation of Parameters

Device	Parameter	Description
Analyzer	<i>Pr t 0</i> *1	When pressing the <input type="button" value="ENTER"/> key, the result is outputted.
	<i>Pr t 1</i>	Data is outputted after measurement automatically.
	<i>S-d 0</i> *1	Result is outputted only.
	<i>PUSE 1</i> *1	Approx. two seconds interval in each line.
	<i>inFo 1</i>	To print items at one time.
AD-8121B	MODE 3	Dump print (Received data is printed as it is)

*1: Factory settings

How To Print

Select a parameter to print "Measurement data". Refer to "13. Function Table"

<i>Pr t 0</i>	When pressing the <input type="button" value="ENTER"/> key, the result is outputted.
<i>Pr t 1</i>	Data is outputted after measurement automatically.

Print Example

<pre> A & D MODEL MX-50 S/N P1234567 ID LAB-123 PROGRAM No. 1 MODE STANDARD MID. DRYING STANDARD 160 C UNIT MOIST/ W - - - - - INITIAL WEIGHT 5.678 g FINAL WEIGHT 4.567 g RESULT MOIST/ W 19.57 % ANALYSIS TIME 6.7min DATE 2004/09/30 TIME 12:34:56 REMARKS - - - - - SIGNATURE - - - - - </pre>	<pre> Factory Product Serial number ID number. *2 PROG No. } Analysis mode. Refer to 9.1.3 } Drying program. Refer to 9.1.3 Measurement Unit } Wet weight } Dried weight } Measurement Result } Analysis time } Date. Refer to 9.1.3 } Remarks. Refer to 9.1.3 } Signature. Refer to 9.1.3 </pre>	<pre> } Analyzer information } Measurement program } Measurement data } Signature space </pre>
--	---	--

*2: ID number can be changed. Refer to "12.1. Identification Number (ID No.)"

9.1.2. Example To Print Selected Items

This print example is printed multiple measurement data and a suit of items specified from "analyzer information", "measurement program" or "signature space". When the title data is the same, it is economical use.

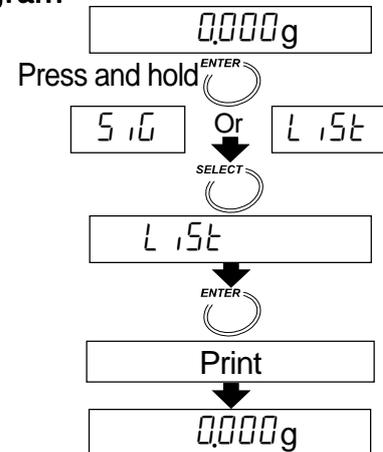
Preparation of Parameters

Device	Parameter	Description
Analyzer	<i>Prt 0</i> *1	When pressing the ENTER key, the result is outputted.
	<i>Prt 1</i>	Data is outputted after measurement automatically.
	<i>S-d 0</i> *1	Result is outputted only.
	<i>PUSE 1</i> *1	Approx. two seconds interval in each line.
	<i>info 2</i>	To print specified item.
AD-8121B	MODE 3	Dump print (Received data is printed as it is)

*1: Factory settings

How To Print "Analyzer Information" and "Measurement Program"

1. Display the gram unit (of the weighing mode).
2. Press and hold the **ENTER** key.
3. Press the **SELECT** key to select **L 15t**.
4. Press the **ENTER** key to print them.
5. Display the gram unit (of the weighing mode).



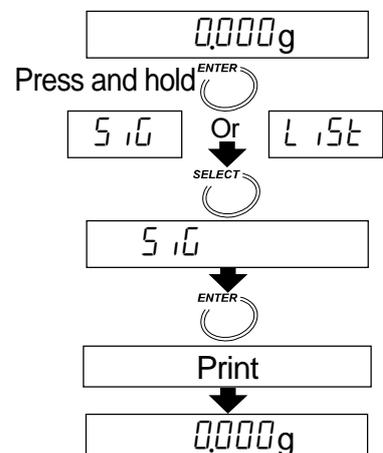
How To Print "Measurement Data"

Select a parameter to print "Measurement data". Refer to "13. Function Table"

<i>Prt 0</i>	When pressing the ENTER key, the result is outputted.
<i>Prt 1</i>	Data is outputted after measurement automatically.

How To Print "Signature Space"

1. Display the gram unit (of the weighing mode).
2. Press and hold the **ENTER** key.
3. Press the **SELECT** key to select **5.10**.
4. Press the **ENTER** key to print "signature space".
5. Display the gram unit (of the weighing mode).



Print Example

```

MODEL      A & D
           MX-50
S/N        P1234567
ID         LAB-123
PROGRAM    No. 1
MODE       STANDARD
           MID.
DRYING     STANDARD
           160 C
UNIT       MOIST/ U
- - - - -
INITIAL WEIGHT
           5.678 g
FINAL WEIGHT
           4.567 g
RESULT     MOIST/ U
           19.57 %
ANALYSIS TIME
           6.7min
DATE       2004/09/30
TIME       12:34:56
REMARKS

- - - - -
INITIAL WEIGHT
           5.791 g
FINAL WEIGHT
           4.680 g
RESULT     MOIST/ U
           19.19 %
ANALYSIS TIME
           7.8min
DATE       2004/09/30
TIME       12:57:12
REMARKS

- - - - -
INITIAL WEIGHT
           5.432 g
FINAL WEIGHT
           4.321 g
RESULT     MOIST/ U
           20.45 %
ANALYSIS TIME
           5.4min
DATE       2004/09/30
TIME       13:24:57
REMARKS

- - - - -
SIGNATURE

```

```

Factory
Product
Serial number
ID number. *1
PROG No.
}
Analysis mode. Refer to 9.1.3
}
Drying program. Refer to 9.1.3
Measurement Unit
}
Wet weight
}
Dried weight
}
Measurement Result
}
Analysis time
Date. Refer to 9.1.3
}
Remarks. Refer to 9.1.3
}
Wet weight
}
Dried weight
}
Measurement Result
}
Analysis time
Date. Refer to 9.1.3
}
Remarks. Refer to 9.1.3
}
Wet weight
}
Dried weight
}
Measurement Result
}
Analysis time
Date. Refer to 9.1.3
}
Remarks. Refer to 9.1.3
}
Signature. Refer to 9.1.3

```

Analyzer information

Measurement program

Measurement data

Measurement data

Measurement data

Signature space

*1: ID number can be changed. Refer to "12.1. Identification Number (ID No.)"

9.1.3. Explanation for Print Item

"Analyzer information" and "Measurement program"

Analysis Mode	A Part of Print and Description	
Standard mode <i>Std</i>		Standard mode ACCURACY HI, MID, or LO
Quick mode <i>QuC</i>		Quick mode ACCURACY HI, MID, or LO
Automatic mode <i>U-A</i>		Automatic mode Analyzing mode to finish measurement
Timer mode <i>U-t</i>		Timer mode Analysis time
Manual mode <i>U-n</i>		Manual mode

"Heating pattern"

Heating pattern	A Part of Print and Description	
Standard drying 		Standard drying Drying temperature
Ramp drying 		Ramp drying Final drying temperature Ramp time
Step drying 		Step drying Drying temperature of stage 1 Drying temperature of stage 2 Time of stage 1
Quick drying 		Quick drying Drying temperature

ML-50 can select standard drying and quick drying only.

"Measurement Unit"

Unit	A Part of Print	Formula	Display
Moisture content is based on wet sample mass *1	UNIT MOIST/ W	$\frac{W - D}{W} \times 100$	% MOIST /W
Moisture content (A _{tro}) is based on dried sample mass	UNIT MOIST/ D	$\frac{W - D}{D} \times 100$	% MOIST /D
Dry content	UNIT RATIO D/W	$\frac{D}{W} \times 100$	% RATIO D/W
Ratio *2	UNIT RATIO W/D	$\frac{W}{D} \times 100$	% RATIO W/D
Gram value	UNIT g	—	g

W: Wet sample mass

D: Dried sample mass

*1: Factory settings

*2: When result reaches to 999%, measurement is stopped.

"Date"

It is printed date and time of the built-in clock in the analyzer.

Arrangement of the calendar is the same setting of the built-in clock.

Refer to ".5.2 Setting the Clock and Calendar "

If you need to adjust the clock, refer to ".5.2 Setting the Clock and Calendar "

```

DATE  2003/08/01
TIME  13:24:57
    
```

"Remarks Space"

For instance: This space can use for a comment about samples.

```

REMARKS
-----
    
```

"Signature Space"

```

SIGNATURE
-----
    
```



10. Connecting to a Computer

- The analyzer can be connected to personal computer using the RS-232C interface.
- The analyzer is the Data Communication Equipment type (DCE).

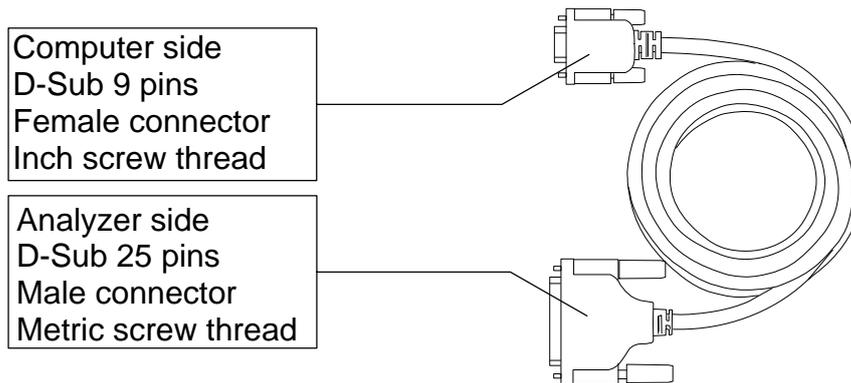
Use a straight-through type cable.

The MS-70 and MX-50 have the following standard accessory cable for RS-232C.

If it is necessary to connect a cable to the MF-50 and ML-50, purchase the cable of accessory AX-MX-40. If purchasing the RS-232C cable on the market, check the interface connections and type.

RS-232C Cable Included As A Standard Accessory Of The MS-70 and MX-50

Length 2m, straight-through type for modem



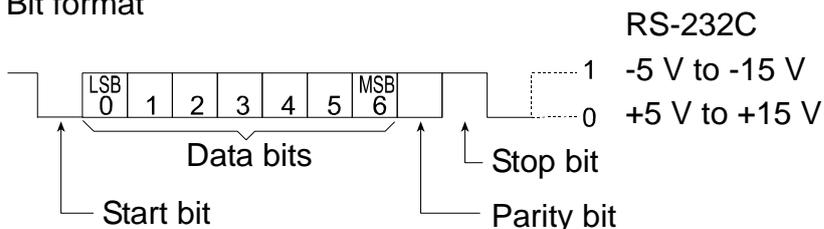
- The MS-70 and MX-50 have the standard accessory software "WinCT-Moisture" for Windows. It has the function to make graphs of the change of moisture content in realtime and has an optimum temperature search program that judges heating at an appropriate temperature setting. Refer to "English\Readme.txt" on the CD-ROM for the details.
- The MF-50 has the standard accessory software " WinCT" for Windows. It can transmit data to a computer and can be used to monitor data and to check the measurement condition.
- There is the accessory AX-MX-42 of the software " WinCT" for Windows.



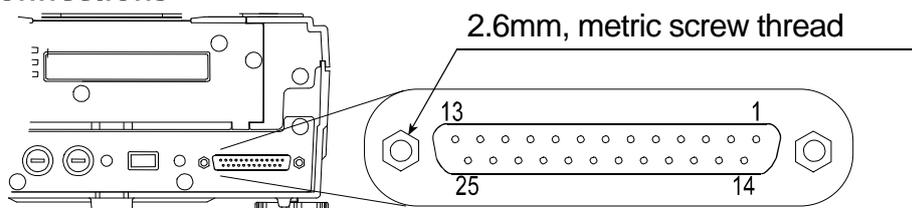
10.1. RS-232C Serial Interface

RS-232C Serial Interface

- Transmission system EIA RS-232C
- Transmission form Asynchronous, bi-directional, half duplex
- Data format Baud rate 2400bps
- Data bits 7bits
- Parity EVEN
- Stop bit 1bit
- Code ASCII
- Terminator CR LF (CR: 0Dh, LF: 0Ah)
- Bit format



Pin Connections



Pin No.	MX-50 and MF-50 (DCE)		Direction	Computer (DTE)
	Signal Name *2	Description		Signal Name
1	FG	Frame ground	-	FG
2	RXD	Receive data	←	TXD
3	TXD	Transmit data	→	RXD
4	RTS	Ready to send *3	←	RTS
5	CTS	Clear to send *3	→	CTS
6	DSR	Data set ready	→	DSR
7	SG	Signal ground	-	SG
16, 18, 19, 21, 23	Internal use		Do not connect *1	
Other	Not used			

*1: Normal DOS/V cables do not use these terminals.

*2: Signal names of the analyzer side are the same as the DTE side with TXD and RXD reversed.

*3: RTS and CTS control are not used. CTS output is HI always.



10.2. Output Format

In Case of Format omitted Temperature Data (Function Table 5-d 0)

- The format consists of fifteen characters except the terminator.
- A polarity sign is placed before the data with the leading zeros. If the data is zero, the plus sign is used.
- The unit is g or %.
- The position of decimal point and minimum display are changed by models.
- Sign of ASCII code

C _R	0Dh	Carriage return
L _F	0Ah	Line feed
	20h	Space

Sample Mass Format (Gram Display)

S	T	,	+	0	0	0	1	.	2	3	4			g	C _R	L _F
Header			Mass data								Unit		Terminator			

Positive Overload Format (Too heavy weighing, display)

O	L	,	+	9	9	9	9	9	9	9	9	E	+	1	9	C _R	L _F
Header			Polarity	Overload								Terminator					

Negative Overload Format (Too light weighing, display)

O	L	,	-	9	9	9	9	9	9	9	9	E	+	1	9	C _R	L _F
Header			Polarity	Overload								Terminator					

Moisture Content (during weighing or after weighing)

In case of the MS-70

S	T	,	+	0	0	1	2	.	3	4	5			%	C _R	L _F
Header			Moisture content									Unit		Terminator		

In case of the MX-50 or MF-50

S	T	,	+	0	0	0	2	3	.	4	5			%	C _R	L _F
Header			Moisture content									Unit		Terminator		

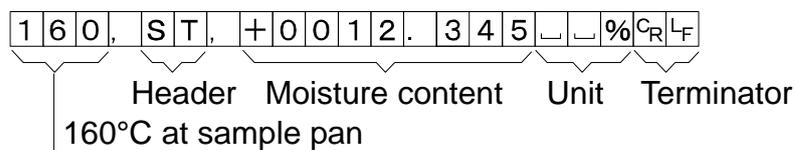
In case of the ML-50

S	T	,	+	0	0	0	1	2	3	.	4			%	C _R	L _F
Header			Moisture content									Unit		Terminator		

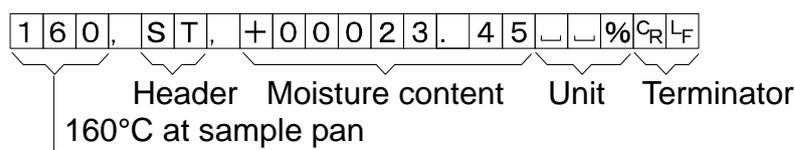
In Case of Format included Temperature Data (Function Table 5-d 1)

- The first 3 figures are the temperature data.
The format consists of nineteen characters except the terminator.

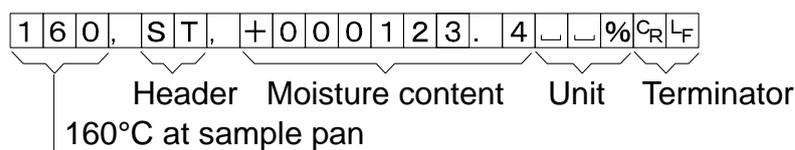
In case of the MS-70



In case of the MX-50 or MF-50



In case of the ML-50



10.3. Command

- The analyzer can be controlled by the following commands from the computer.
Add a terminator C_RL_F (0Dh, 0Ah) to each command.

Command	Description
Q	Outputs the current data.
SIR	Outputs data continuously
C	Stops data output by SIR command.
QM	Outputs the data during measurement. (In other mode, QM can not use.)
START	Same as the START key
STOP	Same as the STOP key
RESET	Same as the RESET key
ENTER	Same as the ENTER key
SELECT	Same as the SELECT key
DOWN	Same as the ↓ key
UP	Same as the ↑ key
PROGRAM	Same as the PROGRAM key



11. Data Memory Function

- The data memory function automatically stores each result when finishing a measurement.

	MS-70 / MX-50	MF-50	ML-50
Maximum number	100 data	50 data	30 data

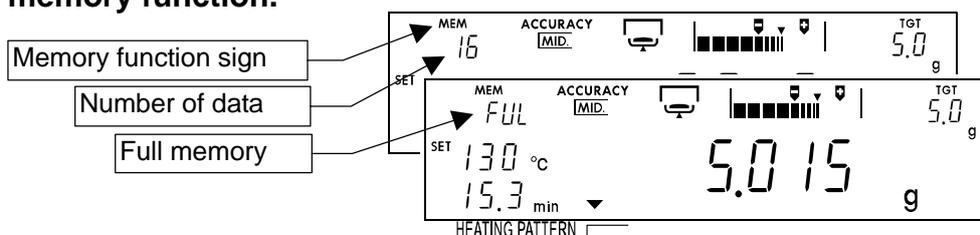
- The stored data can be output to a printer at one time and can be output to a computer using RsCom and Rskey that are Windows applications stored in the CD-ROM of WinCT-Moisture or WinCT at one time.
- The stored data can be deleted at one time.
- The function can select either storing each result or not at *data* of the function table.

Data is stored at each measurement..... data 1
 Data is not stored data 0

- When using the data memory function, MEM is displayed.
- When displaying FULL, the function can not store the next data. The function can store new data after deleting the stored data.

Caution

- When pressing the STOP key during a measurement except manual mode, the result is not stored.
- Set *data 1* before measurement, if it is necessary to store each result with data memory function.



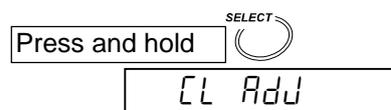
11.1.1. Preparation

This example selects "store result" at *data* of the function table.

1. Display the gram unit (of the weighing mode).



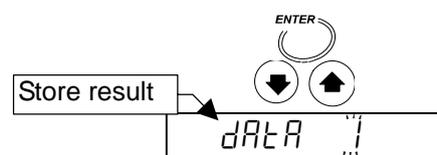
2. Press and hold the SELECT key to enter the function table.



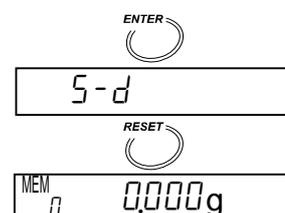
3. Press the SELECT key to display data.



3. Press the SELECT key several times and press the ↓ or ↑ key to display data 1.

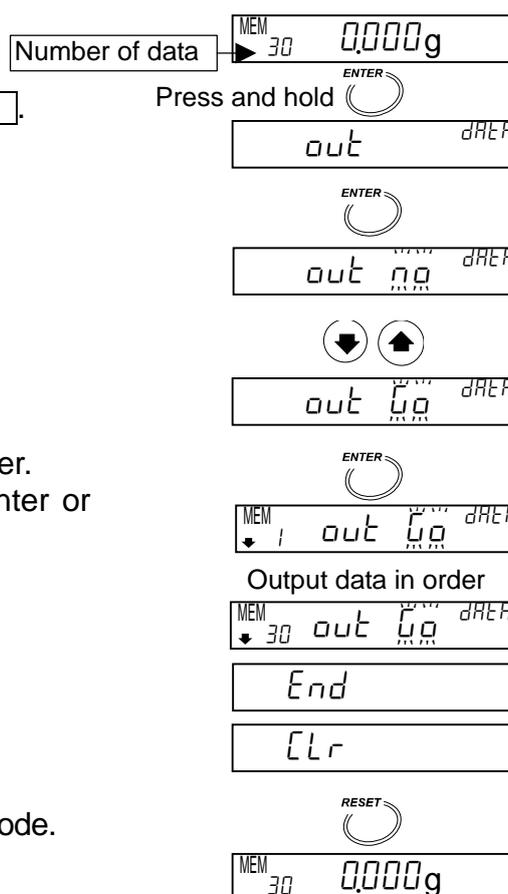


5. Press the ENTER key to store the new settings. Press the RESET key to return to the weighing mode. MEM is displayed when the memory function is effective.



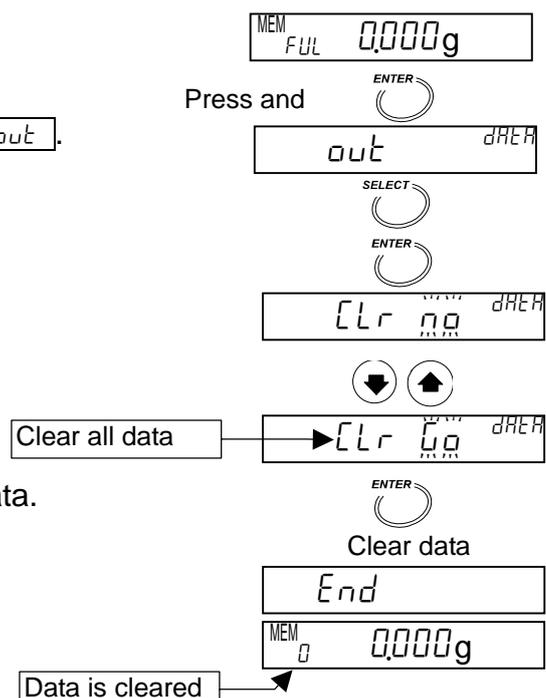
11.1.2. Output All Data at One Time

1. Display the gram unit (of the weighing mode).
2. Press and hold the **ENTER** key to display **out**.
3. Press the **ENTER** key to display **out no**.
4. Press the **↓** or **↑** key to display **out 00**.
5. Press the **ENTER** key to output the data in order.
Data is output to the peripheral equipment (printer or computer) connected to the RS-232C interface.
6. When output is finished, **End** is displayed.
7. Press the **RESET** key to return to the weighing mode.



11.1.3. Delete All Data at One Time

1. Display the gram unit (of the weighing mode).
2. Press and hold the **ENTER** key to display **out**.
3. Press the **SELECT** key to display **Clr**.
Press the **ENTER** key to enter the mode.
4. Press the **↓** or **↑** key to display **Clr 00**.
5. Press the **ENTER** key to delete all stored data.
6. When deleting is finished, **End** is displayed.





12. Calibration

- The moisture content is calculated with a ratio of wet weight and dried weight. Therefore, the absolute value of weighing does not influence the calculation of the moisture content, but it is necessary to get precise weighing for GLP, GMP and ISO. Use a 20g mass or a 50g mass to calibrate the weighing sensor.
- When calibrating the weighing sensor, you can output the calibration report adapted to GLP, GMP and ISO.
- There is a certified temperature calibrator (accessory AX-MX-43, only for MS-70 and MX-50) to calibrate the pan temperature for precise temperature control.
- When calibrating the temperature, you can output the calibration report adapted to GLP, GMP and ISO.
- The analyzer can store an ID number to be used in the calibration report. The number can be used for management and maintenance of the analyzer.



12.1. Identification Number (ID No.)

- The ID number consists of the following seven characters.

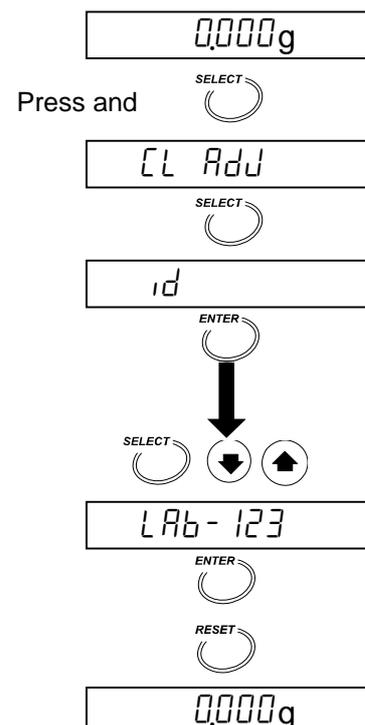
Characters	0	1	2	3	4	5	6	7	8	9	Space	-(hyphen)
Display	0	1	2	3	4	5	6	7	8	9		-

Characters	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
Display	A	b	c	d	E	F	G	H	I	J	K	L	M	N	O	P	Q

Characters	R	S	T	U	V	W	X	Y	Z
Display	r	S	t	U	v	w	X	Y	Z

12.1.1. Setting the ID Number

1. Turn on the analyzer.
The gram unit (of weighing mode) is displayed.
2. Press and hold the **SELECT** key to enter the function table. Then **CL Adj** is displayed.
3. Press the **SELECT** key to display **id**.
4. Press the **ENTER** key.
5. Set the ID number using the following keys.
Example: *LAb-123*
SELECT keySelects a figure.
↓, ↑ key.....Selects a value for the figure.
ENTER key.....Stores the ID No. and proceeds to step 6.
6. Press the **RESET** key to return to the weighing mode.





12.2. Calibration of the Weighing Sensor

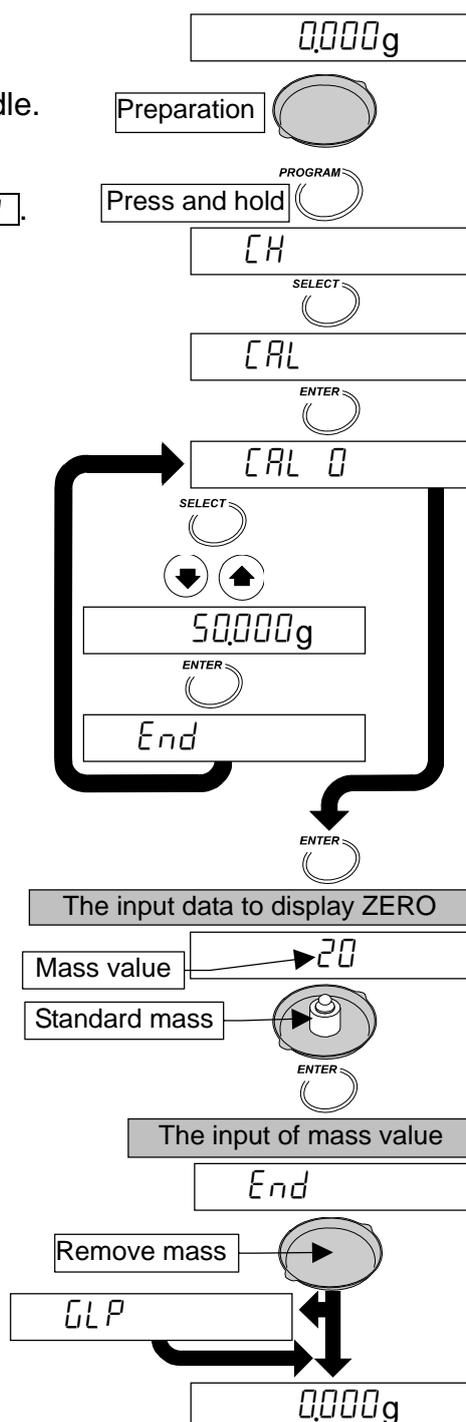
- A standard mass of 20g or 50g can be used for the calibration
- A 20g standard mass (AX-MX-41) is recommend.

Caution

- **Avoid vibration and drafts that affect the calibration. If affected, the analyzer may be unable to calibrate the weighing sensor.**
- **Use a 20g mass for the calibration, because the height between the weighing pan and glass-housing is 26 mm. If a tall mass is used, open the glass-housing and avoid external influence.**

12.2.1. Operation

1. Display the gram unit (of the weighing mode).
2. Install the weighing pan, pan support and pan handle.
Close the heater cover.
3. Press and hold the **PROGRAM** key to display **[CH]**.
4. Press the **SELECT** key to display **[CAL]**.
5. Press the **ENTER** key to display **[CAL 0]**.
6. If 20g mass is used, Press the **ENTER** key.
Proceed to step 8.
If 50g mass is used, Press the **SELECT** key.
Proceed to step 7.
7. Press the **↓** or **↑** key to select 50.000g.
Press the **ENTER** key to store it.
[End], **[CAL 0]** are displayed in order.
8. When displaying **[CAL 0]**, press the **ENTER** key to input "Data to display ZERO". The standard mass value is displayed (Example: 20g).
9. Open the heater cover and put the standard mass on the center of the pan and press the **ENTER** key to input "mass value". **[End]** is displayed.
10. Remove the mass to return to the weighing mode
If the report for GLP, GMP and ISO is to be output (Refer to page 61), **[GLP]** is displayed.
The output condition for the report is selected in the function table.



Calibration Report Example for the Weighing Sensor Adapted to GLP, GMP and ISO

Preset the following parameters to print data to AD-8121B

Device	Parameter	Description
Analyzer	Interval	<i>PUSE 1</i> *1
	Output format adapted to GLP, GMP and ISO	<i>info 1</i> or <i>info 2</i>
AD-8121B	MODE 3	Dump print (Received data is printed as it is)

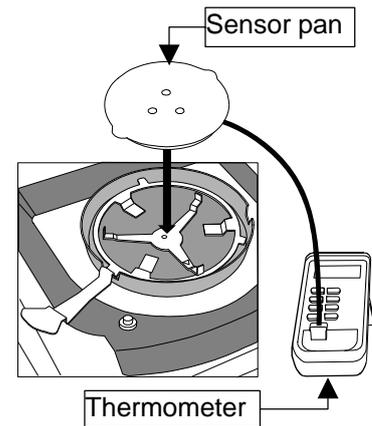
*1: Factory settings

A & D	.....	Manufacture
MODEL MX-50	.....	Model
S/N K1234567	.....	Serial number
ID LAB-123	.....	ID number
DATE 2004/09/30	.....	Date
TIME 13:57:24	.....	Time
CALIBRATED	}	Calibration type
WEIGHT		
CAL.WEIGHT	}	Calibration mass
20.000 g		
SIGNATURE	.....	Signature
- - - - -		



12.3. Calibration of Drying Temperature (for MS-70 and MX-50)

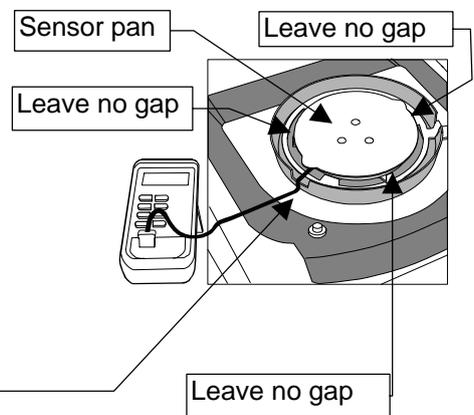
- The temperature calibrator (accessory AX-MX-43) adjusts the drying temperature on the pan. Put the sensor on the pan and input measurement data at 100°C and 160°C.
- Each adjustment needs fifteen minutes. The buzzer sounds at the end.
- **t-UP** is displayed after no adjustment for five minutes during the operation and calibration is stopped. Press any key to return to weighing mode.
- Refer to the instruction manual of the certified temperature calibrator (accessory AX-MX-43).



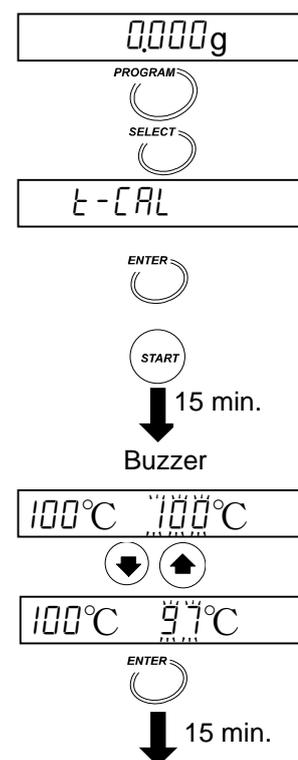
12.3.1. Operation

1. Replace the weighing pan with the sensor pan of the temperature calibrator.
2. Curve the sensor wire so it does not touch the heater cover and glass-housing when closing heater cover.
Level the sensor pan.
Do not leave a gap between the pan support and the sensor.

Level the sensor pan.
Curve the sensor wire so as not to touch heater cover.

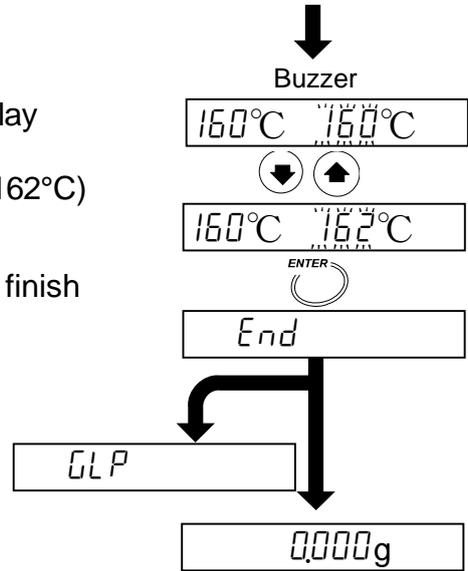


3. Turn on the analyzer.
Display the gram unit (of the weighing mode)
4. Press and hold the **PROGRAM** key
5. Press the **SELECT** key to display **t-CAL**.
6. Press the **ENTER** key.
7. Press the **START** key to start the 100°C measurement.
8. After fifteen minutes, the buzzer sounds and blinks **100°C**. Adjust the blinking value to the thermometer value using the **↓** or **↑** key. (Example: 97°C)
9. Press the **ENTER** key to store the new data and to start the 160°C measurement.

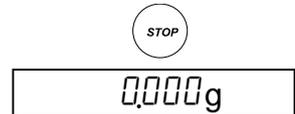


10. After fifteen minutes, the buzzer sounds and the display blinks 160°C. Adjust the blinking value to the thermometer value using the ↓ or ↑ key. (Example: 162°C)
11. Press the ENTER key to store the new data, to finish the adjustment and to return to the weighing mode.

If the report for GLP, GMP and ISO is output, GLP is displayed. Output condition is selected in the function table.



When the heater cover is opened during measurement or the STOP key is pressed, calibration is stopped and the analyzer displays the weighing mode.



Calibration Report Example for Temperature Sensor Adapted to GLP, GMP and ISO

Preset the following parameters to print data to AD-8121B

Device	Parameter	Description
Analyzer	Interval	<i>PUSE 1 *1</i> Approx. two seconds interval in each line.
	Output format adapted to GLP, GMP and ISO	<i>inFa 1</i> or <i>inFa 2</i> Calibration report is printed at "Calibration of the Weighting Sensor" and "Calibration of Drying Temperature".
AD-8121B	MODE 3	Dump print (Received data is printed as it is)

*1: Factory settings

A & D	.....	Manufacture	
MODEL	MX-50	.....	Model
S/N	K1234567	.....	Serial number
ID	LAB-123	.....	ID number
DATE	2004/09/30	.....	Date
TIME	12:34:56	.....	Time
CALIBRATED		} Calibration type	
TEMPERATURE			
TARGET	ACTUAL		
100 C	97 C	.....	100°C target value measurement value
160 C	162 C	.....	160°C target value measurement value
SIGNATURE		.....	Signature
— — — — —			



13. Function Table

The function table can store the following parameters to control the analyzer.

Details of the Function Table

Item and Display Symbol	Parameter	Description	
Clock	<i>CL ADJ</i>	Set date and time for the built-in clock. Refer to "5.2. Setting the clock and calendar"	
Decimal point	<i>dP</i>	0 *1	Dot " . "
		1	Comma " , "
Data output mode	<i>Prnt</i>	0 *1	Key mode
		1	Auto print mode
		2	Stream mode
Data memory function	<i>dMEm</i>	0 *1	Not used.
		1	Data is stored at each measurement
Form selection	<i>S-d</i>	0 *1	Moisture content is output.
		1	Moisture content and temperature are output.*2
Interval	<i>PUSE</i>	0	Continuous output
		1 *1	Output with approx. two seconds interval in each line.
Output format adapted to GLP, GMP and ISO	<i>inFo</i>	0 *1	Not used
		1	To output (print) items with "analyzer information", "measurement program", "measurement data" and ""signature space" at one time. *3
		2	To output (print) items specified from "analyzer information", "measurement program" and "signature space". *4
ID number	<i>id</i>	Set ID number. Used for the calibration report.	
Factory settings	<i>CLr</i>	Resets the analyzer to the factory settings.	

*1: Factory settings

*2: Use a computer because the AD-8121B printer can not print this correctly.
RsTemp and RsFig contained in the software "WinCT-Moisture" that is the standard accessory of the MS-70 and MX-50 can not output this correctly.

*3: Refer to "9.1.1. Example To Print The Whole Data At One Time".

*4: Refer to "9.1.2. Example To Print Selected Items".

*5: Calibration report is outputted in "Calibration of the Weighting Sensor" and "Calibration of Drying Temperature".

13.1.1. Operation

1. Display the gram unit (of the weighing mode).
2. Press and hold the **SELECT** key to enter the function table.

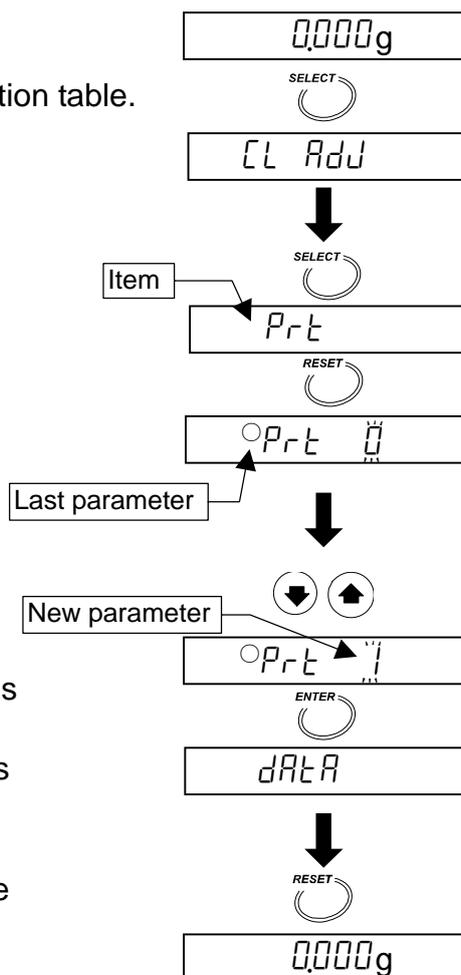
Select an Item

3. Select an item using the following keys.
 Example: Data output mode *Prt* is selected.
SELECT keySelects a figure.
ENTER key.....Enters to the selected item.
RESET key.....Cancels the operation and returns to the weighing mode.

Select a Parameter

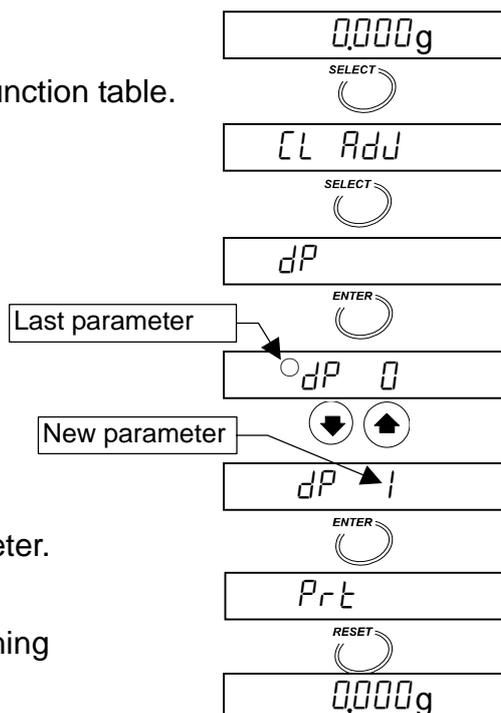
4. Select a parameter using the following keys.
 Example: Auto print mode *Prt 1* is selected.
 \downarrow , \uparrow keySelects a parameter.
ENTER key.....Stores the parameter and proceeds to the next item.
RESET key.....Cancels the operation and returns to the weighing mode.

5. If you want to finish the operation, press the **RESET** key to return to the weighing mode.



Example, Use Comma for Decimal Point

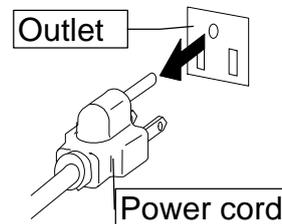
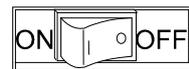
1. Press and hold the **SELECT** key to enter the function table.
2. Press the **SELECT** key to display *dP*.
3. Press the **ENTER** key to enter the item.
4. Press the \downarrow or \uparrow key to display *dP 1*.
5. Press the **ENTER** key to store the new parameter.
6. Press the **RESET** key to return to the weighing mode.





14. Maintenance

- ❑ Turn off the power switch and remove power cord during maintenance.
- ❑ Cool down all parts of the analyzer before maintenance.
- ❑ Pan support, sample pan and breeze break ring can be removed.
- ❑ Clean the analyzer with a lint free cloth that is moistened with warm water and a mild detergent.
- ❑ Do not use organic solvents to clean the analyzer.
- ❑ Dry the parts and reassemble them. Refer to "2. Precautions" and "5.1. Installing the Analyzer"
- ❑ Use the original packing material and box for transportation.

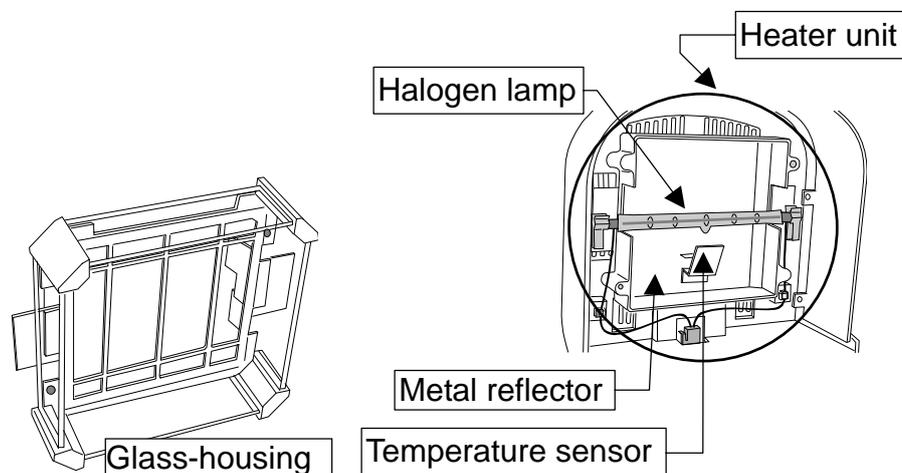
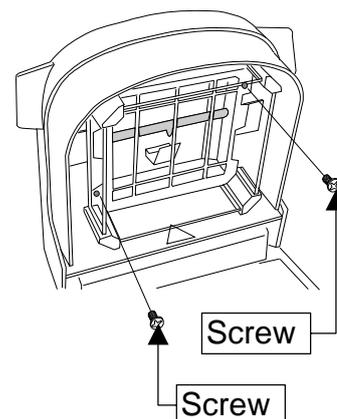


Example



14.1. Cleaning the Heater Unit

- ❑ Clean the glass-housing when it is stained (not clear) to maintain the drying performance.
- ❑ The glass-housing can be removed by removing two screws.
- ❑ Remove fingerprints from the halogen lamp to keep its life.
- ❑ Do not touch to reflective surface of the metal reflector. If the surface is touched, it may be the cause of a drying temperature error.
- ❑ Do not touch the temperature sensor that is at the side of halogen lamp. If the surface is touched, it may be the cause of a drying temperature error.





14.2. Replacement of the Halogen Lamp

- Replace the halogen lamp, when the drying time is excessive or the lamp is defective. Use the halogen lamp of accessory AX-MX-34-120V or AX-MX-34-240V that is adapted to your local voltage. The life of the halogen lamp is approximately 5000 hours.

Caution

- **Remove power cord before replacement. If the power cord is not removed during lamp replacement, it may cause receiving an electric shock.**
- **Read the power supply voltage label on the back of the heater cover and confirm that the rated voltage of the halogen lamp is correct for your power supply voltage.**

Voltage Label	The Rated Voltage of the Halogen Lamp	Accessory number
100 - 120 V	AC 120 V	AX-MX-34-120V
200 - 240 V	AC 240 V	AX-MX-34-240V

- **Do not drop, throw or crack the halogen lamp. Broken glass may cause an injury.**
- **Clean the surface of the halogen lamp. If there is a stain or fingerprint, it may shorten life of the halogen lamp. Do not touch the lamp directly.**
- **Dispose of a used halogen lamp that keeps its shape. If it is broken, glass may spread and cause injury.**
- **We recommend that you replace the halogen lamp, when it exceeds the rated life.**
- **Affix the lamp wire to the hook so that the lamp wire does not touch the glass-housing and heater cover.**

1. Turn off the power switch and remove power cord.

2. Check rated voltage of the halogen lamp that is printed around the holder.

3. Check that the lamp is cool.

4. Remove the two screws holding the glass-housing.

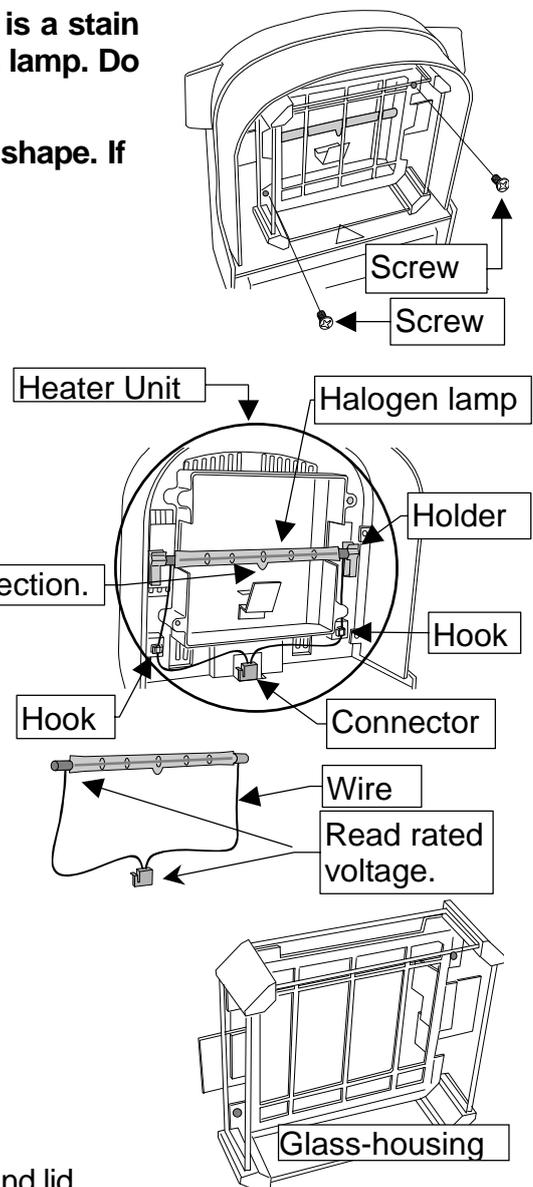
5. Remove halogen lamp.

6. Install the new halogen lamp so that there is downward projection of the heat and light.

7. Affix the lamp wire to the hook.

8. Affix the glass-housing with the two screws. Do not pinch the wire between the glass housing and lid.

There is downward projection.





14.3. Factory Settings

This function can set the following parameters to factory settings.

- All measurement programs
- All results stored in memory function.
- All parameters of the function table
- ID number is reset to 0000000.
- Order of calendar and date.

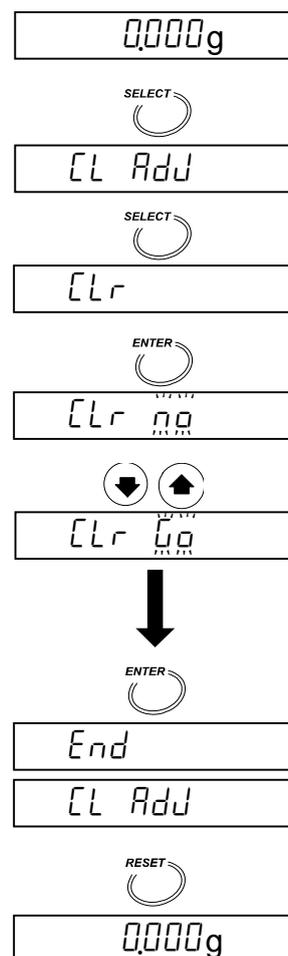
14.3.1. Operation

1. Turn on the analyzer. The gram unit (of the weighing mode) is displayed.
2. Press and hold the **SELECT** key to enter the function table.
3. Press the **SELECT** key to display **[CLr]**.
4. Press the **ENTER** key to enter the item.
5. Press the **↓** or **↑** key to display **[CLr 00]**.

Caution

If pressing the **ENTER** key with **[CLr 00]** and pressing the **RESET** key, operation is canceled.

6. Press the **ENTER** key to reset. And **[End]** is displayed.
7. Press the **RESET** key to return to the weighing mode.

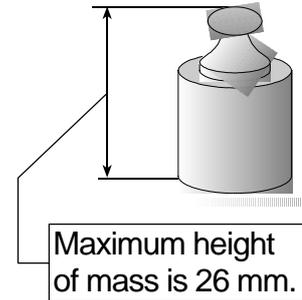




14.4. Troubleshooting

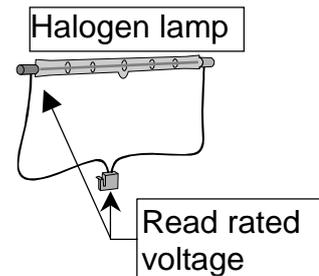
1. In the Case that Proper Results are not be Obtained.

- Use the self-check function. Refer to 8.1.Self-Check Function .
- Check repeatability. (Weigh the same mass several times in the weighing mode.) A taller mass may touch the glass-housing. Use a short mass if possible. If a tall 50g mass is used, open the heater cover and avoid external influence.
- The height from sample pan to glass-housing is 26 mm.
- Check whether the test sample can be measured correctly.
- Avoid the breeze from an air conditioner and vibration.
- Check sample condition. Refer to 5.3.Proper Operation for Precision Measurement
- Check measurement procedure and pre-heating process. Refer to 5.3.Proper Operation for Precision Measurement



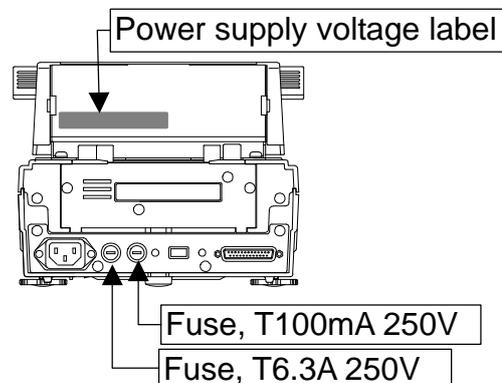
2. In Case that the Lamp does not Light or it takes Too Long to Reach the Drying Temperature.

- It requires six seconds to light the halogen lamp using the **START** key.
- When the heater cover is opened, power is not supplied to the halogen lamp.
- When an overheat has occurred, power is not supplied to the halogen lamp until the halogen lamp becomes cool.
- Check the rated voltage of the halogen lamp that is printed around the holder.
- Read the power supply voltage label on the back of the heater cover and confirm that the rated voltage of the halogen lamp is correct for your power supply voltage.



Voltage Label	Power Supply Voltage	The Rated Voltage of the Halogen Lamp	Accessory number
100 - 120 V	AC 100 V to AC 120 V	AC 120 V	AX-MX-34-120V
200V - 240 V	AC 200V to AC 240 V	AC 240 V	AX-MX-34-240V

- Is a fuse blown? Check the fuses after removing the power cord. Check the rated value and put new fuses into the correct holders.
- Do you measure a lower drying temperature after a high drying temperature? If the lamp is hotter than the drying temperature, the measurement can not be started.
- Check that the sample pan is cool.
- Other cases, the halogen lamp may be defective. Replace with a new halogen lamp. Refer to "14.2. Replacement of the Halogen Lamp".





14.5. Error Message

[H no]

Internal Error

An internal error indicated by the result of the self-check function. If repair is needed, contact the local A&D dealer.

[L PF]

Clock Battery Error

Press any key and input the date and time. Refer to "5.2. Setting the Clock and Calendar".

[L Err]

Clock Error

Contact the local A&D dealer to repair the analyzer.

[LoSE]

Heater Cover Error

The heater cover is opened when starting self-check function. If it is closed, the self-check function is started.

[Error0]

Internal Error

Turn the power switch off and then on. Check the frequency of the power supply. Contact the local A&D dealer to repair the analyzer, if the error is not cleared.

[Error3]

IC Error

[Error8]

Contact the local A&D dealer to repair the analyzer.

[Error9]

[Ht Err]

Temperature Control Error

Contact the local A&D dealer to repair the analyzer, if an error is not cleared when turning the power switch off for more than a half hour and rechecking it.

[t-UP]

Time Error at Temperature Calibration

There is no key operation for five minutes during temperature calibration. If pressing any key, the weighing mode is displayed.

[E]

Positive Overload, Overweight

The sample has exceeded the weighing capacity. If the weighing sample pan is empty and this error is displayed, contact the local A&D dealer to repair the analyzer.

[-E]

Negative Overload, Sample Pan Error

The weight value is too light. Check the pan, pan support and press the **[RESET]** key. Calibrate the weighing sensor. If an error can be not cleared, contact the local A&D dealer to repair the analyzer.

[CAL E]

Unsuitable Calibration mass (Positive Error)

The calibration mass is too heavy. Confirm that anything does not touch to the pan, the calibration mass does not touch to the glass-housing of the heater cover and the calibration mass value is correct. When pressing any key or waiting for 15 seconds, the weighing mode is automatically displayed.

[-CAL E]

Unsuitable Calibration mass (Negative Error)

The calibration mass is too light. Confirm that anything does not touch to the pan and the calibration mass value is correct. When pressing any key or waiting for 15 seconds, the weighing mode is automatically displayed.

MEM

FUL

Full Memory

The number of results stored in memory has reached the upper limit. Clear the data to store the new results. Refer to "11. Data Memory Function".



15. Specifications

	MS-70	MX-50	MF-50	ML-50	
Measurement method	400 W halogen lamp, thermogravimetric analysis				
Drying temperature range at sample pan (Increments)	30°C to 200°C (1°C)	50°C to 200°C (1°C)			
Heating pattern	Standard drying, Ramp drying, Step drying, Quick drying			Standard drying, Quick drying	
Temperature calibration	By Accessory AX-MX-43		—		
Sample weight range	0.1 g to 71 g	0.1 g to 51 g			
Accuracy: Repeatability of measurement, (Standard deviation)					
Moisture content *1					
	over 5 g sample	0.01 %	0.02 %	0.05 %	0.1 %
	over 1 g sample	0.05 %	0.1 %	0.2 %	0.5 %
Weighing mode	0.0005 g	0.001 g	0.002 g	0.005 g	
Minimum reading					
Moisture content	0.001 %, 0.01 %, 0.1 %	0.01 %, 0.1 %	0.05%, 0.1 %, 1 %	0.1%, 1 %	
Weighing mode	0.0001 g	0.001g	0.002g	0.002g	
Measurement programs					
Analysis mode	Standard mode	Sample weight and termination value is automatically set with ACCURACY and % display. When drying rate reaches the termination value, measurement is automatically completed. (*2)			
		Standard drying, Ramp drying, Step drying	Standard drying		
	Quick mode	Sample weight and termination value is automatically set with ACCURACY and % display. When drying rate reaches the termination value, measurement is automatically completed. (*2)			
		Quick drying			
	Automatic mode	When drying rate is less than preset termination value, measurement is automatically completed. (*2)			
		Standard drying, Ramp drying, Step drying	Standard drying		
Timer mode	After heating for the preset drying time, measurement is automatically stopped. (1 min. to 480 min.)				
	Standard drying, Ramp drying, Step drying	Standard drying			
Manual mode	When pressing the key at any time, measurement is stopped and the result is decided.				
	Standard drying, Ramp drying, Step drying	Standard drying			
Measurement unit	Moisture content (Wet-base)				
	Moisture content (Dry-base, AtrO)				
	Dry content				
	Ratio				
	Weight (g)				
Number of memory	20 sets		10 sets	5 sets	
Data memory function	100 results		50 results	30 results	
Communication function	RS-232C serial interface				
Operation environment	5°C to 40°C (41°F to 104°F), 85%RH or less (no condensation)				
Sample pan	φ85 mm				

*1: After preheating the analyzer, the data can be obtained with approximately 5 g test sample (Sodium tartrate dihydrate) in standard mode (MID.), standard drying, 160 °C

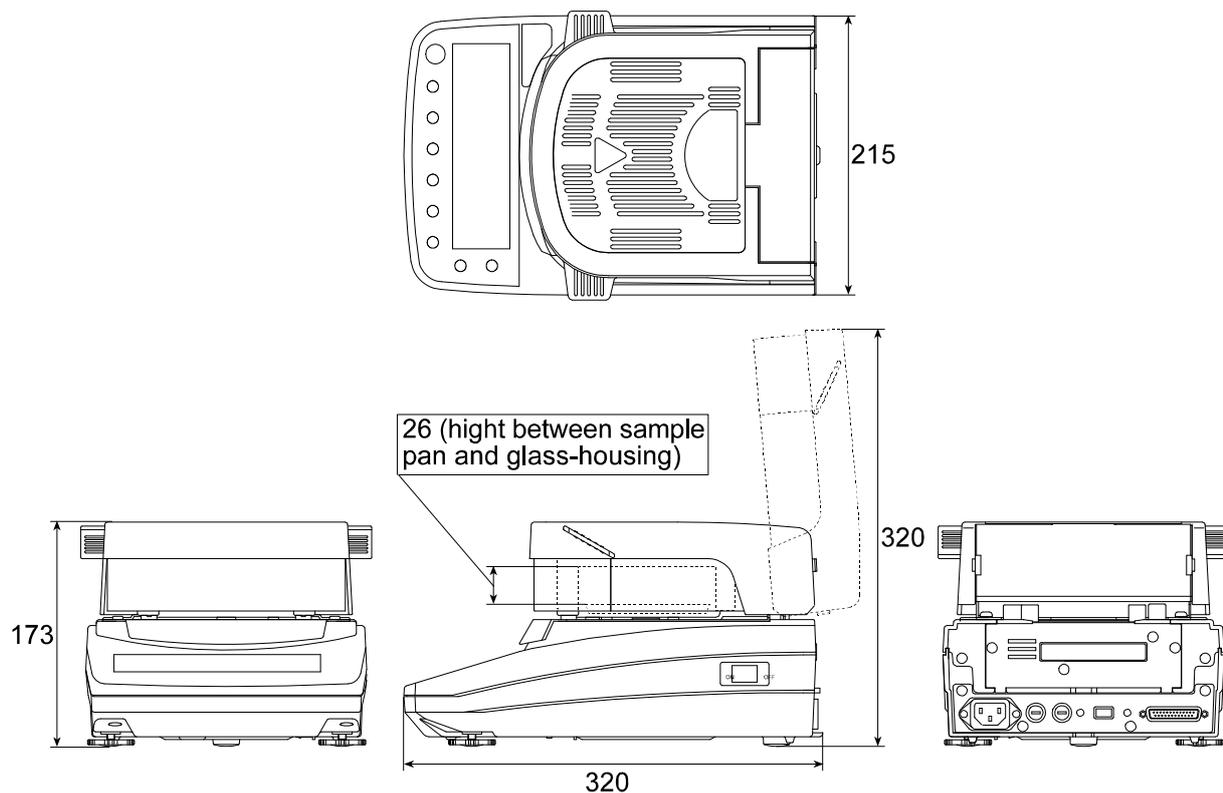
*2: When change of moisture content per one minute reaches the preset termination value, the measurement is completed.

	MS-70	MX-50	MF-50	ML-50
Power source, Maximum current (r.m.s), Maximum consumption	AC100V to 120V 3A or AC200V to 240V 1.5A, 50Hz or 60Hz, Approximately 400W *3			
External dimensions	215(W) x 320(D) x 173(H)mm, 8.46(W) x 12.60(D) x 6.81(H)in.			
Mass (Net weight)	Approximately 6kg (without accessories)			
Accessories	O : Standard accessory, — : Accessory by your order.			
Pan support	O	O	O	O
Breeze break ring	O	O	O	O
Display cover	O	O	O	O
Power cord *3	O	O	O	O
Spare fuse T100mA 250V	O	O	O	O
Spare fuse T6.3A 250V	O	O	O	O
Instruction manual	O	O	O	O
Dust cover	O	O	O	—
Test sample	O	O	O	—
Glass fiber sheets	O	O	O	—
Spoon	O	O	O	—
Tweezers	O	O	O	—
RS-232C serial interface cable	O	O	—	—
Sample pan	20	20	20	10
Pan handle	2	2	2	1
Disposable aluminum foil pan	100	100	100	100
CD-ROM *4	WinCT-Moisture	WinCT-Moisture	WinCT	—

*3: Please confirm that this analyzer is correct for your local voltage and receptacle type and the power cord.

*4: Application software for Windows.

15.1. Dimensions





15.2. Accessories and Peripheral Equipment

Accessories

Name	Order number
Disposable aluminum foil pan (ϕ 83 mm, 100 pcs)	AX-MX-30
Sample pan (ϕ 85 mm, 100 pcs)	AX-MX-31
Glass fiber sheet, ϕ 70 mm, (Filter paper, 100 sheets) Use for high surface tension liquid sample.	AX-MX-32-1
Glass fiber sheet, ϕ 78 mm, (Glass paper, 100 sheets) The same sheet as accessory. Use liquid sample.	AX-MX-32-2
Test sample (Sodium tartrate dihydrate, 30gx12 pcs)	AX-MX-33
Halogen lamp for AC 100V to 120 V	AX-MX-34-120V
Halogen lamp for AC 200V to 240 V	AX-MX-34-240V
Pan handle (2 pcs)	AX-MX-35
Tweezers (2 pcs)	AX-MX-36
Spoon (2 pcs)	AX-MX-37
Display cover (5 pcs)	AX-MX-38
Dust cover	AX-MX-39
RS-232C cable (2m, 25 pins - 9 pins)	AX-MX-40
Calibration mass (20g, equivalent to OIML class F1)	AX-MX-41
WinCT-Moisture (CD-ROM: Application software for Windows)	AX-MX-42
Certified Temperature calibrator (only for MS-70 and MX-50)	AX-MX-43

Peripheral equipment

AD-8121B Dot matrix compact printer

Function: Statistical function, interval printing, chart printing,

Character: 5x7 dot, height 2.5mm/01.in., 16 characters/line

Power source: AC adapter or alkaline batteries





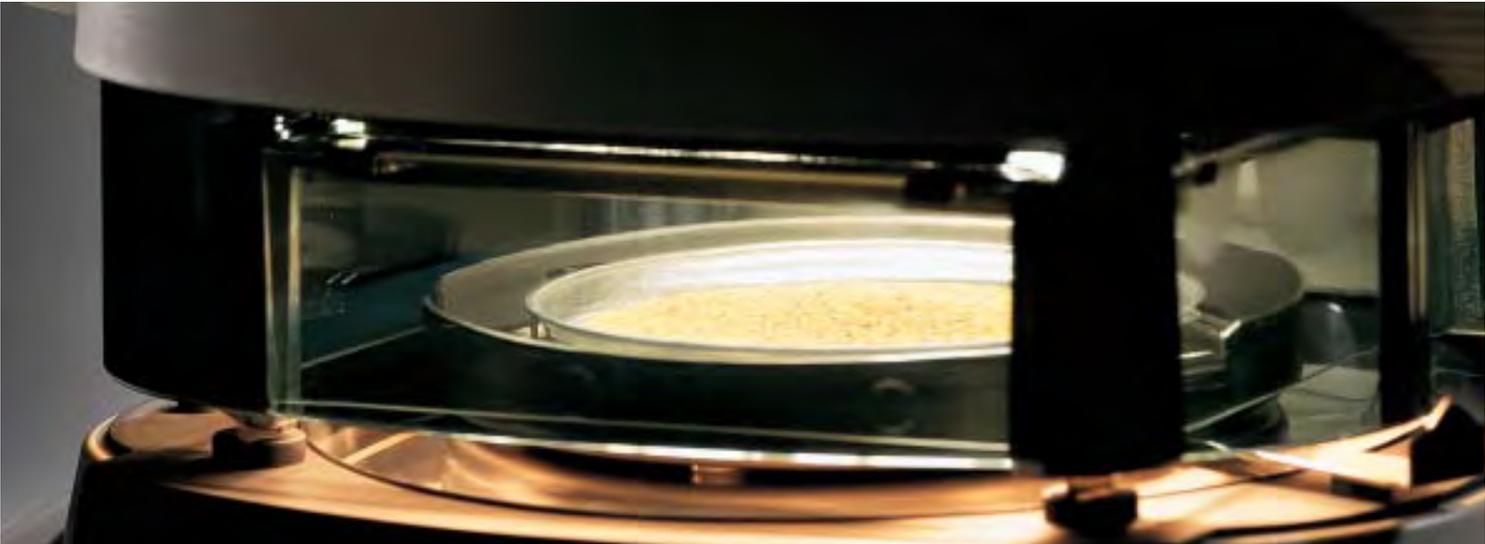
16. Index

%/min	19, 22, 27, 28
, ENTER key	14
, PROGRAM key	14
, RESET key	14
, SELECT key	14
, START key	14
, STOP key	14
and key	14
, Standard drying	13, 30, 43
, Ramp drying	13, 33, 35
, Step drying	13, 37, 39
, Quick drying	13
Sign Δ	15
, Operation state indicator	13
, Level indicator	13

ACCURACY	19, 22, 26, 27
AD-8121B	44, 70
Ambient condition	6
Analysis mode	9, 26
Analyzing mode	26, 28
Auto print mode	61
Automatic mode	9, 26, 28, 37, 39
Baud rate	51
Breeze break ring	7, 11, 12, 15
Bubble spirit level	11, 15
[AL E	67
-[AL E	67
Calendar	16
Calibration	56
Calibration report	58, 60
Cancel key	14
[H	42
[H no	67
[H PASS	42
Character	56
[L PF	67
[L Add	61
[L Err	67
[L oSE	42, 67
Clock	16, 61
[Lr	55, 61
[Lr Go	65

Comma	61
Command	53
Continuous measurement	17
CR	52
CTS	51
dAtA	54, 61
Data bits	51
Data memory	54
Data memory function	61
Data output mode	61
Decimal point	61
Display	13
Display cover	12
Disposable aluminum foil pan	10, 11, 12, 15, 69, 70
dñY	16
Dot	61
dP	61
Dried sample mass	29
Dry content	29
Drying program	9, 13, 28
Drying rate	26
Drying temperature	26, 29, 34, 36, 59
DSR	51
Dust cover	12
E	67
-E	67
Earth terminal	15
ENTER key	14
Error0	67
Error3	67
Error8	67
Error9	67
Factory settings	61
FG	51
FULL	54, 67
Fuse	11, 12
Glass fiber sheet	12, 18
Glass-housing	7, 11, 12, 64
[LP	57, 60
GLP	44, 57, 60, 61
GMP	44, 57, 60, 61
Gram value	29
Grip	7, 11
Halogen lamp	6, 9, 11, 12, 15, 64, 66
Header	52
Heater cover	11
HI	19, 22, 27
Ht Err	67

I/II-----	6	Report-----	58, 60
<i>i d</i> -----	61	RESET key-----	14
ID number-----	56, 61	RS-232C-----	11, 50, 51
Indicators-----	13	RTS-----	51
<i>i n F o</i> -----	61	RXD-----	51
ISO-----	44, 57, 60, 61	Sample mass-----	26
Key mode-----	61	Sample pan-----	7, 11, 12
Keys-----	13	<i>S - d</i> -----	52, 53, 61
Leveling foot-----	11, 15	SELECT key-----	14
LF-----	52	SG-----	51
<i>L i s t</i> -----	46	<i>S i d</i> -----	46
LO-----	19, 22, 27	Sodium tartrate dihydrate-----	43
Manual mode-----	9, 26, 28, 37, 39	Spoon-----	12
Mass-----	57, 66	Standard accessories-----	11, 12
<i>m a s s</i> -----	16	Standard drying-----	9, 28, 30, 37, 39, 43
Measurement program-----	26	Standard mode-----	9, 26, 28, 37, 39
MEM-----	25, 54, 67	START key-----	14
MID-----	19, 22, 27	<i>S t d</i> -----	14, 26
MOIST /D-----	29	Step drying-----	9, 28, 37, 39
MOIST /W-----	29	Stop bit-----	51
Moisture content-----	29, 56, 61	STOP key-----	14
<i>m o i s t</i> -----	55	Stream mode-----	61
Output format-----	52, 61	<i>t - C A L</i> -----	59
Pan handle-----	11, 12, 15	Temperature-----	6
Pan support-----	11, 12, 15	Temperature sensor-----	59
Parity-----	51	Terminator-----	51, 52
Polarity-----	52	Test sample-----	11, 43
Power cord-----	11, 12	Thermogravimetric analysis-----	10
Power input-----	11	Thermometer-----	59
Power supply voltage label-----	6, 15, 66	Timer mode-----	9, 26, 28, 37, 39
Power switch-----	11, 15	Test sample-----	12
Pre-heating process-----	17	<i>t - U P</i> -----	67
Printer-----	44, 70	Tweezers-----	12
PROG-----	25	TXD-----	51
PROGRAM key-----	14	<i>U - A</i> -----	14, 26
<i>P r t</i> -----	61	<i>U - n</i> -----	14, 26
<i>q u c</i> -----	26	Unit-----	29, 52
Quick drying-----	28, 37, 39	<i>U - t</i> -----	14, 26
Quick mode-----	9, 26, 28, 37, 39	Weighing sensor-----	56, 57
Ramp drying-----	9, 28, 33, 35, 37, 39	Wet sample mass-----	29
Ratio-----	29	WinCT-----	9, 50
RATIO D/W-----	29	WinCT-Moisture-----	9, 50
RATIO W/D-----	29	<i>Y n d</i> -----	16
Reference card-----	11	Zero display-----	14
Repeatability-----	17		



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MF-50/MIL-50



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Straight halogen lamp and uniquely designed SRA (Secondary Radiation Assist) filter gives shorter measurement time, thanks to fast and uniform heating

High repeatability

With SHS (Super Hybrid Sensor) featured as the weight sensor, ultra accurate moisture content determination is possible based on high precision weighing of even a small sample

High moisture content measurement

MS-70 measures the moisture content at 0.001% resolution suitable for low moisture content samples as well as Karl Fischer method, yet requires no special knowledge or training and produces no harmful waste

Standard WinCT-Moisture (for MS&MX) for real-time graph displaying

WinCT-Moisture is an original software application designed to display a graph of moisture content rate change while measuring with a connected PC

Sodium Tartrate Dihydrate comes as standard for accuracy checking

Sodium Tartrate Dihydrate is a chemical material that has stable moisture content of $15.66\%^{+0.3}_{-0.1}$, and thus is best to use for accuracy check to maintain the reference value of the analyzer

Calibration of the heater temperature (for MS&MX)

With the temperature calibrator (optional), calibration result can be output in the format that conforms to GLP, GMP, ISO

Memory function

According to sample up to 20 suitable measurement conditions can be stored and recalled, which saves time and prevents the user from making a mistake when setting (10 for MF & 5 for ML)

For measurement result, up to 100 data can be stored and output at once (50 for MF & 30 for ML)

Five measurement programs

Five choices of measurement programs, Standard, Automatic, Quick, Timer, and Manual Mode are provided

Standard Mode : Just measurement accuracy, HI, MID or LO needs to be set

Automatic Mode : Ends measurement when moisture content changes at a rate less than the set rate

Quick Mode : Begins heating samples at 200°C for 3 minutes, then is the same as Automatic Mode

Timer Mode : Continues measurement for a set duration of time (1~60mins.: by 1min, 60~480mins.: by 5mins.)

Manual Mode : STOP button should be pressed to end measurement (Max. heating time: 480mins.)

Selectable Heating Mode

Choose the heating mode from standard, quick, step and ramp heating modes for the most suitable measurement (ML has Standard and Quick heating modes only)

Clear and easy-to-see, large VFD display

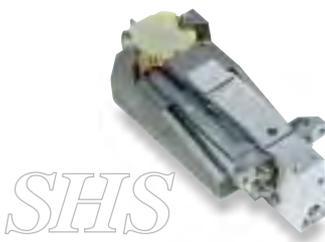
Measurement, setting value, change in moisture content, action status, data number and other important information are clearly displayed

Easy handling of the unit

Ergonomically designed pan handle eliminates mishaps such as burns when moving a hot sample pan into or out of the unit from either side. Wing handle for easy opening and closing of the heater cover

Low maintenance cost assured

The halogen lamp is user replaceable without unit downtime with protective chamber for easy cleaning (Lamp life 5000 hours)



Best moisture analyzer Verification-Test with The Best

MS/MF-50/ML-50



MS



MX



MF



ML

Progress window for heating check

Heating process can be checked through translucent window

Self Check function

Defect check function is available along with temperature control

Quick Reference Card

A convenient operating guide is installed at the bottom of the analyzer

Standard RS-232C

Bi-directional communication with a PC or connects directly to a printer

Conformity to GLP, GMP, GCP and ISO with date/time, ID, calibration data and check record outputs

Data output for daily record management

024823



SRA
Secondary Radiation Assist

Straight Halogen Lamp

SHS
Super Hybrid Sensor

WinCT
MOISTURE

888
VFD Display

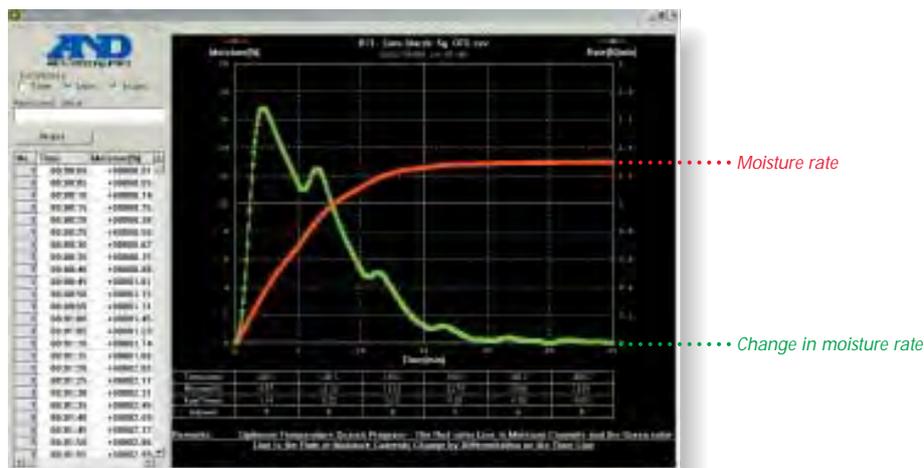
RS-232C

GLP

WinCT-Moisture

With our WinCT-Moisture software, data measured by the Moisture Analyzers can be easily displayed on your computer.

Effective for determining measurement conditions such as heating temperature, and useful in reducing the time needed for measurement and improving accuracy.



Displays moisture rate changes over time in a graph (RsFig)

Displays changes in moisture rate in real time

Measures moisture rate in a minimum time with excellent accuracy

Heats at the highest temperature without changing the physical properties of the sample and provides measurements with good repeatability

Automatically determines the most suitable heating conditions in a short time (RsTemp)

Automatically changes the heat applied by the set increments and interval time within a range of 30°C-200°C. From the moisture rate change over that time can determine the most suitable heating temperature in one time measurement (*Patent pending)

Shows sample data summary

Provides a data summary for the sample with the results of moisture rate change for the representative material's measurement

Calculates measurement data statistics

Saves the recorded data as a CSV file

Determines other changes to the sample material in addition to moisture rate

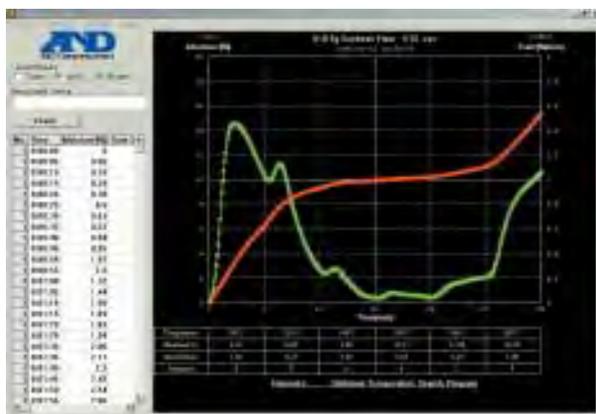
Continuously measures changes to the mass in response to heating temperature and detects other material changes besides the moisture rate

WinCT-Moisture Measurement example

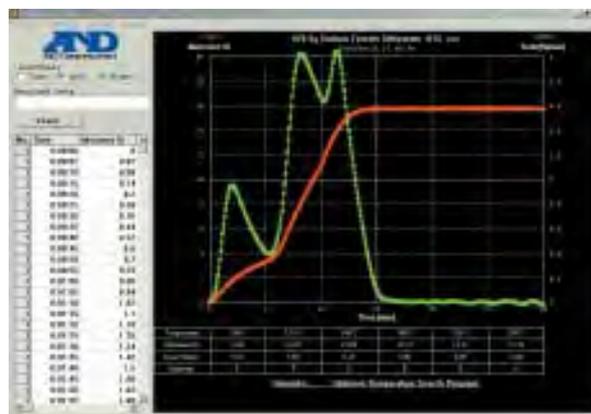
WinCT-Moisture consists of RsTemp software to determine the heating temperature and RsFig software for graphics.

1. Example of measurement using RsTemp software to determine the heating temperature

Automatically changes the heating temperature (by your setting increments and interval time) within a range of 30°C - 200°C. From the rate of change in moisture over time, in one time measurement it can determine the optimum heating temperature for the sample.



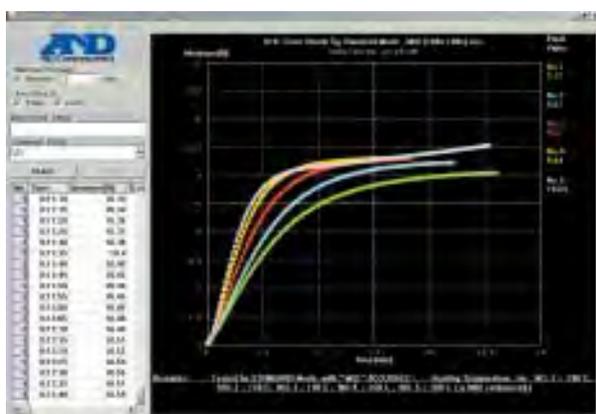
Soybean flour



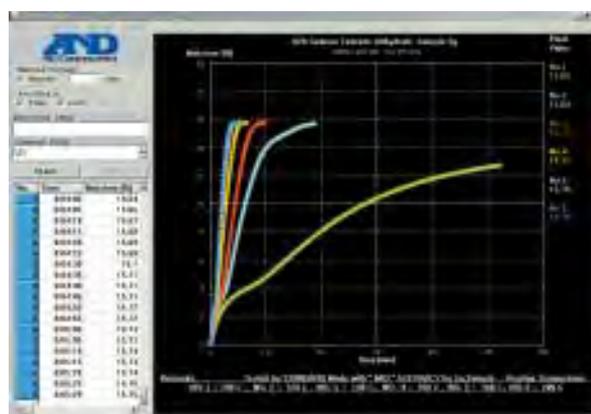
Sodium tartrate dihydrate

2. Example of measurement using RsFig graphic software

Can show moisture rate against time when the heating temperature is changed as well as showing the results of repeated measurements at a certain temperature. From the graph, the highest possible heating range for the sample and the quickest measuring time can be determined.



Corn starch



Sodium tartrate dihydrate

Comparison between MS-70 and the KF (Karl Fischer) method

Example of PET plastic pellet measurement

	Moisture rate		Average measurement time	Measurement conditions
	Average value	Repeatability (standard deviation)		
MS-70	0.298%	0.0045%	6.8 mins	Heating temperature 180°C Test sample 10g Measurements 5 times
KF method	0.307%	0.0065%	19.1 mins	Heating temperature 180°C Test sample 0.3g Measurements 5 times

KF method: a way of measuring moisture content through chemical determination.

With PET plastic and other materials, the MS-70 can measure a drop of moisture content of less than 1%. Specialist knowledge is not necessary to operate the MS-70, and since measurement occurs quickly no harmful waste is produced.

Specifications	MS-70	MX-50	MF-50	ML-50
Measurement Method	400W straight halogen lamp heating system with SRA filter and SHS weighing technology			
Max Sample Weight Capacity	71g	51g		
Weight Resolution	0.0001g	0.001g	0.002g	0.005g
Moisture Content Display	0.001% / 0.01% / 0.1%	0.01% / 0.1%	0.05% / 0.1% / 1%	0.1% / 1%
Moisture Content Accuracy over 1g (Standard Deviation)	0.05%	0.10%	0.20%	0.5%
Moisture Content Accuracy over 5g	0.01%	0.02%	0.05%	0.1%
Heating Technology	Halogen lamp (Straight type, 400 Watt max, 5000 hours)			
Drying Temperature (1°C increment)	30-200°C	50-200°C		
Memory of Measurement Programs	20 sets		10 sets	5 sets
Measurement Programs	Standard Mode/Automatic Mode/Quick Mode/Timer Mode/Manual Mode			
Measurement Mode	Moisture content (Wet or Dry base) / Dry content / Ratio / Weight			
Heating Mode	Standard / Quick / Step / Ramp			Standard / Quick
Display Type	Large VFD			
Interface	RS-232C standard			
Data Memory Function	100		50	30
Operating Temperature	5-40°C (41-104°F) less than 85%RH			
GLP/GMP/ISO	Available			
Self Check Function	Standard			
Communication Software	WinCT-Moisture standard		WinCT standard	—
Sample Pan Size	Ø85mm			
Power	AC 100V to 120V (3A) or AC 200V to 240V (1.5A), 50/60 Hz, Approx. 400W			
Physical Dimension/Weight	215(W) x 320(D) x 173(H) / Approx. 6kg			
Standard Accessories	Sample Pans (20 for MS/MX/MF 10 for ML), Pan Handles (2 for MS/MX/MF, 1 for ML), Tweezers (for MS/MX/MF), Spoon (for MS/MX/MF), Test Sample (30g of Sodium Tartrate Dihydrate for MS/MX/MF), CD-ROM (WinCT-Moisture for MS/MX, WinCT for MF), Glass Fiber Sheet (for MS/MX/MF), RS-232C Cable (for MS/MX), Display Cover, Dust Cover (for MS/MX/MF), Instruction Manual, Quick Reference Card, Power Cable, Fuse			

Specifications are subject to change for improvement without notice.

Accessories

AD-8121B	Dot Matrix Compact Printer
AX-MX-31	Sample Pan (Ø85mm x 100pcs)
AX-MX-32-1	Glass Fiber sheet (Ø70mm x 100 sheets)
AX-MX-32-2	Glass Fiber sheet (Ø78mm x 100 sheets)
AX-MX-33	Test Sample (Sodium Tartrate Dihydrate, 30g x 12pcs)
AX-MX-34-120V	Halogen Lamp for AC100V to 120V
AX-MX-34-240V	Halogen Lamp for AC200V to 240V
AX-MX-35	Pan Handle (2pcs)
AX-MX-36	Tweezers (2pcs)
AX-MX-37	Spoon (2pcs)
AX-MX-38	Display Cover (5pcs)
AX-MX-39	Dust Cover
AX-MX-40	RS-232C Cable (2m, 25-9pins)
AX-MX-41	Calibration Mass (20g, equivalent to OIML class F1)
AX-MX-42	WinCT-Moisture (CD-ROM, Application Software for Windows)
AX-MX-43	Certified Temperature Calibrator (only for MS/MX)



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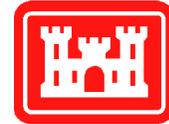
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Appendix C: Expray Procedure



Pre-Screening for Explosives Residues in Soil Prior to HPLC Analysis Utilizing Expray

Kevin L. Bjella

February 2005

Pre-Screening for Explosives Residues in Soil Prior to HPLC Analysis Utilizing Expray

Kevin L. Bjella

Approved for public release; distribution is unlimited.

Prepared for STRATEGIC ENVIRONMENTAL RESEARCH AND DEVELOPMENT PROGRAM
(SERDP)
ARLINGTON, VIRGINIA 22203

ABSTRACT

The characterization of Department of Defense (DoD) training lands for explosives residues involves sampling and analyzing soil samples collected at firing points and impact areas. Laboratory instruments used for this analysis are susceptible to accumulating high concentrations of these compounds, thus possibly requiring reanalyzing. By using the Expray Explosives Detection Kit to determine the approximate concentration of explosives compounds prior to analysis, soil extracts can be diluted to a concentration that will not interfere with analysis results. This report describes the method used to develop the visual index for concentration determination of explosives in soil extracts, and also the use of the Expray Kit.

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CONTENTS

Preface	iv
1 Introduction	1
2 Background	2
3 Method and Materials.....	4
Equipment	4
Method	5
4 Results	8
5 Conclusions	12
References.....	13

ILLUSTRATIONS

Figure 1. Expray Explosives Detection Kit.....	3
Figure 2. Blotting the test paper	6
Figure 3. Application results	9

TABLES

Table 1. Detectability results.....	10
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PREFACE

This report was prepared by Kevin L. Bjella, Physical Science Technician, Environmental Sciences Branch (ESB), Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory (ERDC-CRREL), Hanover, New Hampshire. The author gratefully acknowledges Dr. Thomas F. Jenkins and Nathan D. Mulherin for their review of this manuscript. The author also gratefully acknowledges the technical assistance provided by Alan D. Hewitt and Marianne E. Walsh, ESB.

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The Commander and Executive Director of the Engineer Research and Development Center is Colonel James R. Rowan, EN. The Director is Dr. James R. Houston.

Pre-Screening for Explosives Residues in Soil Prior to HPLC Analysis Utilizing Expray

KEVIN L. BJELLA

1 INTRODUCTION

Characterization of the presence and amount of energetic residues on military training ranges involves the sampling and analyzing of the surface and near-surface soils. The concentration of energetic residues in samples collected at firing points and impact locations can range from below instrumental detection limits in parts per billion (ppb) to percent levels. Reverse-Phase High-Performance Liquid Chromatography (RP-HPLC) is typically used for analysis of these energetic residues. Extract concentrations of 10 parts per million (ppm) TNT and 20 ppm RDX/HMX/NG are considered safe upper limits for RP-HPLC. Higher analyte concentrations may carry over to subsequent samples, elevating responses and yielding false positives. This requires reanalysis of the samples possibly affected, and may require that corrective measures be taken to address instrumental performance. To avoid interruptions to the analytical runs, a simple screening technique was developed using a commercially available colorimetric explosives detection kit.

Pre-screening utilizing the Expray Explosives Detection Kit prior to analysis has proven to be useful for coarse determination of concentration values within a factor of 10. Dilution can then be carried out to bring the sample concentration down to an analytically acceptable level, and/or the placement within the analyzing sequence can be designed to minimize the effects of the carryover. This report describes the testing of the Expray Explosives Detection Kit for this screening process.

2 BACKGROUND

Explosives are classified as “primary” or “secondary” based on their susceptibility to initiation. Primary explosives, which include lead azide, lead styphnate, and mercury fulminate, are highly susceptible to ignition and are often used to ignite secondary explosives. Secondary explosives are much more prevalent on military sites than primary explosives. They include trinitrotoluene (TNT), 1,3,5-hexahydro-1,3,5-trinitrotriazine (RDX), and octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX). These are used as the main destructive explosive in ammunition (Thiboutot et al. 2002). TNT is the most commonly used, either independently or in varying compositions where Composition B contains TNT and RDX, and octol contains TNT and HMX. HMX is also found as a manufacturing by-product of RDX.

The most commonly used organic chemicals for rocket, artillery, and mortar propellants are nitroglycerin (NG) and nitrocellulose (NC). The residues most often detected at the firing points are NG and dinitrotoluene (DNT) (Jenkins et al. 2003). These compounds also can be found downrange in rocket impact areas because there often is unburned propellant remaining when the rockets detonate.

Characterization of impact areas and firing points consists of collecting surface soil samples from a location of interest and placing these into a container, either a bag or jar (Pennington et al. 2002). These samples may be either discrete (one sample unit for the given area) or composite (multiple sample units from a given area), and can range in weight from 50 to 5000 grams. Discrete samples are generally small (50–100g) and can be directly extracted with solvent without pre-processing. Composite samples are generally much larger and require extensive processing (i.e., sieving and grinding) to more evenly distribute the explosives residue particle(s) throughout the sample. The composites are then subsampled to obtain a representative fraction that can be extracted with solvent prior to instrumental analysis.

During sampling there are few indicators that an area may have high concentrations of explosives residues. Munition fragments, non-detonated munitions, discolored soil, discolored ponded water, or unburned propellant lying in the vicinity of an impact area or firing point may indicate relative concentrations. Yet with these indicators it is impossible to determine whether dilution of extracts will be necessary prior to analysis. To quickly determine the approximate concentration of either a nitramine or nitroaromatic residue in a soil or water sample, we have employed the use of an Expray Explosives Detection Kit (Fig. 1). The cost of the full kit is approximately \$U.S. 270 and it takes approxi-

3 METHOD AND MATERIALS

Equipment

The Expray kit is composed of three aerosol cans, each of which contains reagents that will react with explosives residues and give an easily discernable color change. The first can is designed for the colorimetric detection of polynitroaromatics (TNT, tetryl, trinitrobenzene). The second can is for nitramines and nitrate esters (RDX, HMX, NG, and NC). The third can is for the detection of nitrate-based explosives, ammonium-nitrate and fuel oil (ANFO), and black powder. The complete kit comes with a special collector test paper that has an impervious backing and raised coarse areas that aid in sample retention and swiping. It also contains test strips to determine whether the reagents are still reactive, and a reference card for quick identification of possible indicators. The manufacturer states that a single can will perform a maximum of 110 tests, using the included test paper. Our tests have indicated that approximately 20 batches of samples with up to 50 samples on an 8.5- × 11.0-inch sheet of paper can be screened from one can. The determination of the type of explosive and relative concentration is dependant on the sequence of the application. Expray 1 must be applied first, followed by Expray 2, followed by Expray 3.

Expray 1 contains an alkali that reacts with polynitroaromatics and forms Meisenheimer complexes, which are highly colored compounds. The alkali is tetrabutylammonium hydroxide, and the colors range from dark brown for TNT to orange for tetryl. A blue-green color indicates the presence of DNT (Plexus Scientific, Silver Spring, Maryland).

Expray 2 contains compounds that produce a Griess reaction with the nitrate ions from the reaction with Expray 1, and this yields an azo dye, giving a color change. For nitramines (RDX, HMX), sulfanilamide and N-ethylenediamine are used to produce the dye. For nitrate esters (NG, NC, PETN), sulfanilic acid is used to produce diazonium ions, which are complexed with an aromatic nucleophile to produce the dye. Dimethyl sulfoxide is also added as a solvent to accelerate the reaction for nitramines. The color produced is pink for any nitramine and nitrate ester.

Expray 3 is used for the detection of inorganic nitrates (ANFO, gun powder, black powder). Zinc dust is used to reduce the nitrates to nitrite ions, which then react with the Griess reagent. This will also yield a pink color with the presence of nitrates. There is no way to distinguish between innocent fertilizers and nitrate-based explosives.

Expray claims this product can detect a minimum of 20 nanograms of RDX and 5 nanograms of TNT. In our tests, application of 1 μL of 20 ppm RDX (20 ng) and 1 μL of 5 ppm TNT (5 ng) onto the test paper failed to yield a visually detectable color change. A granular sample tested at these masses may very well produce a color change; however, we did not perform those tests.

Method

TNT, RDX, HMX, and NG are the analytes most commonly found in soils at DoD training ranges and therefore these four were selected for this study. The TNT, RDX, and HMX standards were made from Standard Analytical Reference Material (SARM) obtained from the U.S. Army Environmental Center and were prepared in acetonitrile (ACN) at 1 g/L, and NG is obtained in solution form. Dilutions were prepared from these standards with ACN and concentrations were confirmed by HPLC analysis using a system consisting of a Spectra System P1000 pump, AS3000 autosampler, and UV 2000 dual wavelength detector. Eluent consisted of 85:15 MilliQ filtered water:2-propanol. The column was a Waters NovaPak C8, 150 mm \times 3.9 mm at 28°C.

Eight types of paper were chosen for this study to determine whether screening results were dependent on the type of paper used. The eight are

1. Expray sample paper. Unknown composition, appears to be a more robust form of glass fiber with an impervious backing and raised fluffed areas.
2. Boise Aspen. White/20 lb/10.0 M copy paper, 30% post-consumer fiber.
3. Whatman's Filter Paper #1. Qualitative cellulose filters.
4. Whatman's Filter Paper #2. Qualitative cellulose filters.
5. Fisher Filter Paper #09-803-5, P2. Unknown composition, most likely cellulose.
6. Baroid Filter Paper #988. Unknown composition, most likely cellulose.
7. Reeve Angel Filter Paper #934 AH. 100% borosilicate glass fiber, chemically inert.
8. VWR Scientific Filter Paper Grade 417. Qualitative cellulose filter.

The test paper was prepared by placing a Pasteur pipette into the standard, drawing approximately 8–10 μL of liquid into it, and then touching the tip briefly to the test paper, which drew the liquid out. Because it was found that some of the paper drew differing amounts of solution, all tests were performed by placing the total volume (8–10 μL) drawn into the pipette onto each type of paper and therefore holding the testing volume constant (see Fig. 2).



Figure 2. Blotting the test paper.

The area was allowed to dry thoroughly before applying the Expray solutions. Drying time during this study was short (one minute) due to the use of the high-vapor-pressure solvent ACN. The cans were shaken for 10 seconds, held approximately 15 cm from the paper, and swept across the blotted area at an approximate velocity of 8 cm/s while in a fume hood (respiratory precautions were taken due to the solvents in this product). Expray 2 was then applied in the same manner after Expray 1 was allowed to dry (approximately 30 seconds). Expray 3 was not used in this experiment as it was not applicable to the nitroaromatic, nitramine, and nitrate esters in question.

Three phases of testing were conducted to study the four analytes. The first phase was designed to establish an approximate operating range for the Expray kit using 25, 50, 75, 100, 125, 150, 200, and 250 ppm of each of the four standards. Using the eight different types of paper, five sequences were performed to test repeatability.

The second phase was designed to establish detection limits to ± 10 ppm. Ten standards were made for each of the four analytes, ranging from 10 ppm to 100 ppm in 10-ppm increments. Having established the general repeatability of the

testing, only three sequences were performed during this phase. The eight different types of paper were used, and the same technique was conducted as before.

The third phase was designed to identify three distinct color intensities that could be quantitatively matched to “order-of-magnitude” dilutions of tenfold, hundredfold, and thousandfold. Standards of 20, 30, 40, 50, 100, 250, 500, 750, and 1000 ppm were made to cover the realistic concentrations found at training ranges and also the dynamic range of the color intensities. Having eliminated most of the differing types of paper (see results), two sequences were tested using only the Whatman’s #1 filter paper. The same technique was conducted as before.

4 RESULTS

Expray 1: The presence of nitroaromatics (TNT) immediately exhibited a dark brown color and was discernable by a distinct boundary that was coincident with the wetted perimeter immediately after blotting.

Expray 2: The application of the second spray is slower to indicate than Expray 1. In the presence of a nitramine (RDX or HMX) or nitrate-ester (NG), the color change resolved in 5 to 10 seconds where time was dependent on concentration. The color change was pink and varied in intensity according to the concentration. In both cases there was a distinct boundary coincident with blotting.

TNT is detectable down to 20 ppm and very intense at 750 ppm. The color gradation from 20 ppm to 100 ppm is not dramatic, and there is a distinct jump in intensity with the 500-ppm concentration. The color gradation between 500 ppm and 1000 ppm is not dramatic as well. The faint color intensity, 20 to 100 ppm, would suggest a tenfold dilution. The medium intensity from 100 to 500 ppm would suggest a hundredfold dilution. Finally, the brightest color intensity, from 500 to 1000 ppm, would suggest a thousandfold dilution (Fig. 3a, Table 1).

RDX was discernable down to 30 ppm and very intense at 500 ppm. The color gradation from 30 to 100 ppm was not dramatic and would suggest a tenfold dilution. The medium intensity color occurred at 250 ppm so 100 ppm to 500 ppm would require a hundredfold dilution. The color intensity from 500 to 1000 ppm was dramatic; however, the gradation was not very discernable. This would require a thousandfold dilution (Fig. 3b, Table 1).

HMX was discernable down to 100 ppm with only a slight gradation to 1000 ppm. Great care would need to be taken if it were known that the samples were to contain only HMX. The first indication would immediately require a hundredfold dilution with the brightest intensity requiring a thousandfold dilution. The brightest intensity was very faint in comparison with RDX (Fig. 3b, Table 1).

NG was discernable down to 40 to 50 ppm with only a slight gradation up to 100 ppm. A tenfold dilution would be required for this intensity range. From 100 to 1000 ppm is the medium color intensity with little gradation, where a hundredfold dilution would be required. The color intensity was greatest at 1000 ppm; however, not as intense as RDX, but greater than HMX, and this would require a thousandfold dilution (Fig. 3b, Table 1).



a. Can # 1.



b. Can #2.

Figure 3. Application results.

Explosive	Faint color Tenfold dilution	Medium color Hundredfold dilution	Brightest color Thousandfold dilution
TNT	20 to 100 ppm	100 to 500 ppm	500 to 1000 ppm
RDX	30 to 100 ppm	100 to 500 ppm	500 to 1000 ppm
HMX	—	100 to 500 ppm	500 to 1000 ppm
NG	50 to 100 ppm	100 to 750 ppm	750 to 1000 ppm

The results indicate that there is a dramatic difference in the detectability between the differing types of paper. The copy paper provided the worst detectability and it is believed that chemicals introduced in the manufacturing process may be adversely affecting the reaction. This paper is relatively smooth and glossy in comparison to the filter papers and therefore may have an effect on the absorption of the sample, yielding poor results. Experience has shown that on a few occasions false negatives were reported from field samples blotted on copy paper, when in fact the concentration of RDX and/or TNT was significantly high enough that it should have yielded some color indication. Retesting with either Expray test paper, cellulose, or glass fiber paper produced an indication consistent with the concentration. Copy paper was thus eliminated from the study.

The glass fiber paper had the best detectability, giving a more intense indication relative to the other papers. This enhanced detectability may be due to the paper being very absorptive, not allowing the aliquot of standard to spread laterally, thereby concentrating the sample in a smaller area. However, this paper is very easily torn, and so does not allow for writing upon in order to identify the sample. This was a significant drawback and hence this paper was eliminated from the study. The Expray test paper at the time of study was available only in the testing coupons (size 6 × 4.4 cm), and because of this extremely small size it was eliminated from the study. However, 8.5- × 11-inch sheets, which are desirable for large-scale blotting, are now available.

The remaining cellulose fiber papers all performed similarly. The cellulose papers do have some ash content, and the Whatman's has resin with an unknown quantity of nitrogen. It is felt these additives were not a detriment to the study and the cellulose filter papers performed as well as the Expray test paper. Whatman's #1 is familiar and easily obtainable, therefore all further testing was completed using this paper.

As mentioned earlier, false negatives have been observed, and this we attribute to the testing paper used in the procedure. However, we cannot discount the possibility of other interferences resulting in poor results, such as the soil matrix and/or organics masking the colorimetric results. Some false positives have been

observed when analyzing samples from anti-tank firing points where high concentrations of propellant are present. It is hypothesized that these samples contained high concentrations of nitrocellulose, which is not detectable with the methods used for HPLC or GC analysis. These samples did contain concentrations of NG and 2,4 DNT, but less than the level of concentration suggested by the Expray indication, thus causing redilution and reanalyzing of the samples.

5 CONCLUSIONS

The Expray Explosives Detection Kit can be used to not only give a qualitative measurement, but will also provide a semi-quantitative measurement prior to HPLC or GC analysis. TNT and RDX gave the best color intensities and gradation, yielding a much clearer definition for performing orders-of-magnitude dilutions. HMX was discernable at a concentration much higher than the other three and with little color gradation through the range of concentrations. NG showed little color gradation through its dynamic range. Throughout the testing it was noted that the results were variable (± 20 ppm) at concentrations lower than 500 ppm with all analytes.

These experiments have shown that after the analyte in question reached the upper limit of color intensity (brightest color), it was impossible to determine the relative sample concentration. Therefore it is recommended to dilute and repeat spraying when these high concentration extracts are encountered to ensure safe analyzing.

Experience indicates that care should be taken when evaluating the soil extracts, as some field samples may not react fully with the Expray solution, yielding false negatives. Also, false positives may be encountered when analyzing firing point samples due to the presence of nitrocellulose, which also reacts to form a pink color with Expray 2. The location in which the sample was taken should be scrutinized along with the results of the spraying to determine whether an error possibly occurred. The sequence of samples should be scrutinized to minimize the effects of carryover, i.e., they should be analyzed in order of increasing concentration. The recent availability of the Expray test paper in 8.5- × 11-inch sheets allows it to be used for large-scale pre-screening and is recommended; however, other cellulose filter papers can be used.

REFERENCES

Jenkins, T.F., C. Bartolini, and T.A. Ranney (2003) Stability of CL-20, TNAZ, HMX, RDX, NG, and PETN in moist, unsaturated soil. U.S. Army Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, Technical Report ERDC/CRREL TR-03-7.

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REPORT DOCUMENTATION PAGE

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				5b. GRANT NUMBER		
				5c. PROGRAM ELEMENT NUMBER		
6. AUTHOR(S) Kevin L. Bjella				5d. PROJECT NUMBER		
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13. SUPPLEMENTARY NOTES						
14. ABSTRACT The characterization of Department of Defense (DoD) training lands for explosives residues involves sampling and analyzing soil samples collected at firing points and impact areas. Laboratory instruments used for this analysis are susceptible to accumulating high concentrations of these compounds, thus possibly requiring reanalyzing. By using the Expray Explosives Detection Kit to determine the approximate concentration of explosives compounds prior to analysis, soil extracts can be diluted to a concentration that will not interfere with analysis results. This report describes the method used to develop the visual index for concentration determination of explosives in soil extracts, and also the use of the Expray Kit.						
15. SUBJECT TERMS						
Explosives residues		HMX		RDX		
Expray		HPLC		Soil sampling		
High-performance liquid chromatography		NG		TNT		
16. SECURITY CLASSIFICATION OF:				17. LIMITATION OF OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE	19b. TELEPHONE NUMBER (include area code)			
U	U	U	U	19		



North American Remediation Organization
Hercules, Inc.
Nitrocellulose Removal
Camp Minden, LA

Appendix D: Waste Profiles



WASTE MATERIAL PROFILE SHEET

Clean Harbors Profile No. CH794615

A. GENERAL INFORMATION

GENERATOR EPA ID #/REGISTRATION #
 GENERATOR CODE (Assigned by Clean Harbors)
 ADDRESS **1600 Jjava Road**

NONEREQUIRED
AS15559

GENERATOR NAME:
 CITY **Minden**

Ashland
 STATE/PROVINCE **LA** ZIP/POSTAL CODE **71055**

CUSTOMER CODE (Assigned by Clean Harbors)
 ADDRESS **1600 Jjava Road**

AS15559

CUSTOMER NAME:
 CITY **Minden**

PHONE: **(302) 995-3433**
 STATE/PROVINCE **LA** ZIP/POSTAL CODE **71055**

B. WASTE DESCRIPTION

WASTE DESCRIPTION: **Nitrocellulose**

PROCESS GENERATING WASTE: **Site Cleanup**

IS THIS WASTE CONTAINED IN SMALL PACKAGING CONTAINED WITHIN A LARGER SHIPPING CONTAINER ? **No**

C. PHYSICAL PROPERTIES (at 25C or 77F)

PHYSICAL STATE <input checked="" type="checkbox"/> SOLID WITHOUT FREE LIQUID POWDER MONOLITHIC SOLID LIQUID WITH NO SOLIDS LIQUID/SOLID MIXTURE % FREE LIQUID % SETTLED SOLID % TOTAL SUSPENDED SOLID SLUDGE GAS/AEROSOL	NUMBER OF PHASES/LAYERS 1 2 3 TOP 0.00 % BY VOLUME (Approx.) MIDDLE 0.00 BOTTOM 0.00				VISCOSITY (if liquid present) 1 - 100 (e.g. Water) 101 - 500 (e.g. Motor Oil) 501 - 10,000 (e.g. Molasses) > 10,000		COLOR White
	ODOR <input checked="" type="checkbox"/> NONE MILD STRONG Describe:		BOILING POINT °F (°C) <= 95 (<=35) 95 - 100 (35-38) 101 - 129 (38-54) >= 130 (>54)		MELTING POINT °F (°C) < 140 (<60) 140-200 (60-93) <input checked="" type="checkbox"/> > 200 (>93)		TOTAL ORGANIC CARBON <= 1% 1-9% <input checked="" type="checkbox"/> >= 10%
FLASH POINT °F (°C) < 73 (<23) 73 - 100 (23-38) 101 -140 (38-60) 141 -200 (60-93) > 200 (>93)	pH <= 2 2.1 - 6.9 <input checked="" type="checkbox"/> 7 (Neutral) 7.1 - 12.4 >= 12.5	SPECIFIC GRAVITY < 0.8 (e.g. Gasoline) 0.8-1.0 (e.g. Ethanol) 1.0 (e.g. Water) <input checked="" type="checkbox"/> 1.0-1.2 (e.g. Antifreeze) > 1.2 (e.g. Methylene Chloride)	ASH < 0.1 0.1 - 1.0 1.1 - 5.0 5.1 - 20.0		BTU/LB (MJ/kg) < 2,000 (<4.6) <input checked="" type="checkbox"/> 2,000-5,000 (4.6-11.6) 5,000-10,000 (11.6-23.2) > 10,000 (>23.2) Actual:		

D. COMPOSITION (List the complete composition of the waste, include any inert components and/or debris. Ranges for individual components are acceptable. If a trade name is used, please supply an MSDS. Please do not use abbreviations.)

CHEMICAL	MIN	MAX	UOM
NITROCELLULOSE	70.0000000	75.0000000	%
WATER	25.0000000	30.0000000	%

DOES THIS WASTE CONTAIN ANY HEAVY GAUGE METAL DEBRIS OR OTHER LARGE OBJECTS (EX., METAL PLATE OR PIPING >1/4" THICK OR >12" LONG, METAL REINFORCED HOSE >12" LONG, METAL WIRE >12" LONG, METAL VALVES, PIPE FITTINGS, CONCRETE REINFORCING BAR OR PIECES OF CONCRETE >3")? YES NO

If yes, describe, including dimensions:

DOES THIS WASTE CONTAIN ANY METALS IN POWDERED OR OTHER FINELY DIVIDED FORM? YES NO

DOES THIS WASTE CONTAIN OR HAS IT CONTACTED ANY OF THE FOLLOWING; ANIMAL WASTES, HUMAN BLOOD, BLOOD PRODUCTS, BODY FLUIDS, MICROBIOLOGICAL WASTE, PATHOLOGICAL WASTE, HUMAN OR ANIMAL DERIVED SERUMS OR PROTEINS OR ANY OTHER POTENTIALLY INFECTIOUS MATERIAL? YES NO

I acknowledge that this waste material is neither infectious nor does it contain any organism known to be a threat to human health. This certification is based on my knowledge of the material. Select the answer below that applies:

The waste was never exposed to potentially infectious material. YES NO

Chemical disinfection or some other form of sterilization has been applied to the waste. YES NO

I ACKNOWLEDGE THAT THIS PROFILE MEETS THE CLEAN HARBORS BATTERY PACKAGING REQUIREMENTS. YES NO

I ACKNOWLEDGE THAT MY FRIABLE ASBESTOS WASTE IS DOUBLE BAGGED AND WETTED. YES NO

SPECIFY THE SOURCE CODE ASSOCIATED WITH THE WASTE. **G39**

SPECIFY THE FORM CODE ASSOCIATED WITH THE WASTE. **W409**



E. CONSTITUENTS

Are these values based on testing or knowledge? Knowledge Testing

If constituent concentrations are based on analytical testing, analysis must be provided. Please attach document(s) using the link on the Submit tab.

Please indicate which constituents below apply. Concentrations must be entered when applicable to assist in accurate review and expedited approval of your waste profile. Please note that the total regulated metals and other constituents sections require answers.

Table with columns: RCRA, REGULATED METALS, REGULATORY LEVEL (mg/l), TCLP mg/l, TOTAL, UOM, NOT APPLICABLE. Includes sections for VOLATILE COMPOUNDS, SEMI-VOLATILE COMPOUNDS, PESTICIDES AND HERBICIDES, and OTHER CONSTITUENTS.

ADDITIONAL HAZARDS

DOES THIS WASTE HAVE ANY UNDISCLOSED HAZARDS OR PRIOR INCIDENTS ASSOCIATED WITH IT, WHICH COULD AFFECT THE WAY IT SHOULD BE HANDLED?

YES NO (If yes, explain) Wastes associated with this material may be considered RCRA Hazardous Wastes (40 CFR Part 261) for the characteristic of

CHOOSE ALL THAT APPLY

- DEA REGULATED SUBSTANCE EXPLOSIVE FUMING OSHA REGULATED CARCINOGENS
POLYMERIZABLE RADIOACTIVE REACTIVE MATERIAL NONE OF THE ABOVE



F. REGULATORY STATUS

USEPA HAZARDOUS WASTE? D001
DO ANY STATE WASTE CODES APPLY?
DO ANY CANADIAN PROVINCIAL WASTE CODES APPLY?
IS THIS WASTE PROHIBITED FROM LAND DISPOSAL WITHOUT FURTHER TREATMENT PER 40 CFR PART 268?
LDR CATEGORY: This is subject to LDR.
IS THIS A UNIVERSAL WASTE?
IS THE GENERATOR OF THE WASTE CLASSIFIED AS CONDITIONALLY EXEMPT SMALL QUANTITY GENERATOR (CESQG)?
IS THIS MATERIAL GOING TO BE MANAGED AS A RCRA EXEMPT COMMERCIAL PRODUCT, WHICH IS FUEL (40 CFR 261.2 (C)(2)(II))?
DOES TREATMENT OF THIS WASTE GENERATE A F006 OR F019 SLUDGE?
IS THIS WASTE STREAM SUBJECT TO THE INORGANIC METAL BEARING WASTE PROHIBITION FOUND AT 40 CFR 268.3(C)?
DOES THIS WASTE CONTAIN VOC'S IN CONCENTRATIONS >=500 PPM?
DOES THE WASTE CONTAIN GREATER THAN 20% OF ORGANIC CONSTITUENTS WITH A VAPOR PRESSURE >= .3KPA (.044 PSIA)?
DOES THIS WASTE CONTAIN AN ORGANIC CONSTITUENT WHICH IN ITS PURE FORM HAS A VAPOR PRESSURE > 77 KPA (11.2 PSIA)?
IS THIS CERCLA REGULATED (SUPERFUND) WASTE ?
IS THE WASTE SUBJECT TO ONE OF THE FOLLOWING NESHAP RULES?
Hazardous Organic NESHAP (HON) rule (subpart G) Pharmaceuticals production (subpart GGG)
IF THIS IS A US EPA HAZARDOUS WASTE, DOES THIS WASTE STREAM CONTAIN BENZENE?
Does the waste stream come from a facility with one of the SIC codes listed under benzene NESHAP or is this waste regulated under the benzene NESHAP rules because the original source of the waste is from a chemical manufacturing, coke by-product recovery, or petroleum refinery process?
Is the generating source of this waste stream a facility with Total Annual Benzene (TAB) >10 Mg/year?
What is the TAB quantity for your facility? Megagram/year (1 Mg = 2,200 lbs)
The basis for this determination is: Knowledge of the Waste Or Test Data Knowledge Testing
Describe the knowledge :

G. DOT/TDG INFORMATION

DOT/TDG PROPER SHIPPING NAME: UN2555, WASTE NITROCELLULOSE WITH WATER, 4.1, PG II

H. TRANSPORTATION REQUIREMENTS

ESTIMATED SHIPMENT FREQUENCY ONE TIME WEEKLY MONTHLY QUARTERLY YEARLY OTHER Multiple shipments
CONTAINERIZED BULK LIQUID BULK SOLID
80-88 CONTAINERS/SHIPMENT GALLONS/SHIPMENT: 0 Min -0 Max GAL. SHIPMENT UOM: TON YARD
STORAGE CAPACITY: 500
CONTAINER TYPE:
CUBIC YARD BOX PALLET
TOTE TANK DRUM
OTHER: DRUM SIZE: 55
TONS/YARDS/SHIPMENT: 0 Min - 0 Max

I. SPECIAL REQUEST

COMMENTS OR REQUESTS: Approve to EL, DE and AG.

GENERATOR'S CERTIFICATION

I certify that I am authorized to execute this document as an authorized agent. I hereby certify that all information submitted in this and attached documents is correct to the best of my knowledge. I also certify that any samples submitted are representative of the actual waste. If Clean Harbors discovers a discrepancy during the approval process, Generator grants Clean Harbors the authority to amend the profile, as Clean Harbors deems necessary, to reflect the discrepancy.

AUTHORIZED SIGNATURE NAME (PRINT) TITLE DATE



WASTE MATERIAL PROFILE SHEET

Clean Harbors Profile No. CH794640

A. GENERAL INFORMATION

GENERATOR EPA ID #/REGISTRATION #
 GENERATOR CODE (Assigned by Clean Harbors)
 ADDRESS **1600 Jjava Road**

NONEREQUIRED
AS15559

GENERATOR NAME:
 CITY **Minden**

Ashland
 STATE/PROVINCE **LA** ZIP/POSTAL CODE **71055**

CUSTOMER CODE (Assigned by Clean Harbors)
 ADDRESS **1600 Jjava Road**

AS15559

CUSTOMER NAME:
 CITY **Minden**

PHONE: **(302) 995-3433**
 STATE/PROVINCE **LA** ZIP/POSTAL CODE **71055**

B. WASTE DESCRIPTION

WASTE DESCRIPTION: **Debris Contaminated with Nitrocellulose**

PROCESS GENERATING WASTE: **Site Cleanup**

IS THIS WASTE CONTAINED IN SMALL PACKAGING CONTAINED WITHIN A LARGER SHIPPING CONTAINER ? **No**

C. PHYSICAL PROPERTIES (at 25C or 77F)

PHYSICAL STATE <input checked="" type="checkbox"/> SOLID WITHOUT FREE LIQUID POWDER MONOLITHIC SOLID LIQUID WITH NO SOLIDS LIQUID/SOLID MIXTURE % FREE LIQUID % SETTLED SOLID % TOTAL SUSPENDED SOLID SLUDGE GAS/AEROSOL	NUMBER OF PHASES/LAYERS 1 2 3 TOP 0.00 % BY VOLUME (Approx.) MIDDLE 0.00 BOTTOM 0.00				VISCOSITY (if liquid present) 1 - 100 (e.g. Water) 101 - 500 (e.g. Motor Oil) 501 - 10,000 (e.g. Molasses) > 10,000		COLOR White
	ODOR <input checked="" type="checkbox"/> NONE MILD STRONG Describe:	BOILING POINT °F (°C) <= 95 (<=35) 95 - 100 (35-38) 101 - 129 (38-54) >= 130 (>54)		MELTING POINT °F (°C) < 140 (<60) 140-200 (60-93) <input checked="" type="checkbox"/> > 200 (>93)		TOTAL ORGANIC CARBON <= 1% 1-9% <input checked="" type="checkbox"/> >= 10%	
FLASH POINT °F (°C) < 73 (<23) 73 - 100 (23-38) 101 -140 (38-60) 141 -200 (60-93) > 200 (>93)	pH <= 2 2.1 - 6.9 <input checked="" type="checkbox"/> 7 (Neutral) 7.1 - 12.4 >= 12.5	SPECIFIC GRAVITY < 0.8 (e.g. Gasoline) 0.8-1.0 (e.g. Ethanol) 1.0 (e.g. Water) <input checked="" type="checkbox"/> 1.0-1.2 (e.g. Antifreeze) > 1.2 (e.g. Methylene Chloride)	ASH < 0.1 0.1 - 1.0 1.1 - 5.0 5.1 - 20.0 <input checked="" type="checkbox"/> > 20 <input checked="" type="checkbox"/> Unknown		BTU/LB (MJ/kg) < 2,000 (<4.6) <input checked="" type="checkbox"/> 2,000-5,000 (4.6-11.6) 5,000-10,000 (11.6-23.2) > 10,000 (>23.2) Actual:		

D. COMPOSITION (List the complete composition of the waste, include any inert components and/or debris. Ranges for individual components are acceptable. If a trade name is used, please supply an MSDS. Please do not use abbreviations.)

CHEMICAL	MIN	--	MAX	UOM
DEBRIS (PPE, GLOVES, PAPER, SPILL PADS)	95.0000000	--	100.0000000	%
NITROCELLULOSE	0.0000000	--	5.0000000	%
WATER	25.0000000	--	30.0000000	%

DOES THIS WASTE CONTAIN ANY HEAVY GAUGE METAL DEBRIS OR OTHER LARGE OBJECTS (EX., METAL PLATE OR PIPING >1/4" THICK OR >12" LONG, METAL REINFORCED HOSE >12" LONG, METAL WIRE >12" LONG, METAL VALVES, PIPE FITTINGS, CONCRETE REINFORCING BAR OR PIECES OF CONCRETE >3")? YES NO

If yes, describe, including dimensions:

DOES THIS WASTE CONTAIN ANY METALS IN POWDERED OR OTHER FINELY DIVIDED FORM? YES NO

DOES THIS WASTE CONTAIN OR HAS IT CONTACTED ANY OF THE FOLLOWING; ANIMAL WASTES, HUMAN BLOOD, BLOOD PRODUCTS, BODY FLUIDS, MICROBIOLOGICAL WASTE, PATHOLOGICAL WASTE, HUMAN OR ANIMAL DERIVED SERUMS OR PROTEINS OR ANY OTHER POTENTIALLY INFECTIOUS MATERIAL? YES NO

I acknowledge that this waste material is neither infectious nor does it contain any organism known to be a threat to human health. This certification is based on my knowledge of the material. Select the answer below that applies:

The waste was never exposed to potentially infectious material. YES NO

Chemical disinfection or some other form of sterilization has been applied to the waste. YES NO

I ACKNOWLEDGE THAT THIS PROFILE MEETS THE CLEAN HARBORS BATTERY PACKAGING REQUIREMENTS. YES NO

I ACKNOWLEDGE THAT MY FRIABLE ASBESTOS WASTE IS DOUBLE BAGGED AND WETTED. YES NO

SPECIFY THE SOURCE CODE ASSOCIATED WITH THE WASTE. **G39**

SPECIFY THE FORM CODE ASSOCIATED WITH THE WASTE. **W409**



E. CONSTITUENTS

Are these values based on testing or knowledge? Knowledge Testing

If constituent concentrations are based on analytical testing, analysis must be provided. Please attach document(s) using the link on the Submit tab.

Please indicate which constituents below apply. Concentrations must be entered when applicable to assist in accurate review and expedited approval of your waste profile. Please note that the total regulated metals and other constituents sections require answers.

Table with columns: RCRA, REGULATED METALS, REGULATORY LEVEL (mg/l), TCLP mg/l, TOTAL, UOM, NOT APPLICABLE. Rows include ARSENIC, BARIUM, CADMIUM, CHROMIUM, LEAD, MERCURY, SELENIUM, SILVER, VOLATILE COMPOUNDS (BENZENE, CARBON TETRACHLORIDE, etc.), SEMI-VOLATILE COMPOUNDS (o-CRESOL, m-CRESOL, etc.), and PESTICIDES AND HERBICIDES (ENDRIN, LINDANE, etc.).

ADDITIONAL HAZARDS

DOES THIS WASTE HAVE ANY UNDISCLOSED HAZARDS OR PRIOR INCIDENTS ASSOCIATED WITH IT, WHICH COULD AFFECT THE WAY IT SHOULD BE HANDLED?

YES NO (If yes, explain) Extremely flammable when dry. Accidental explosion is likely to cause severe injury or death. Electrostatic charges an

CHOOSE ALL THAT APPLY

- DEA REGULATED SUBSTANCE EXPLOSIVE FUMING OSHA REGULATED CARCINOGENS
POLYMERIZABLE RADIOACTIVE REACTIVE MATERIAL NONE OF THE ABOVE



F. REGULATORY STATUS

YES NO USEPA HAZARDOUS WASTE?

YES NO DO ANY STATE WASTE CODES APPLY?

Texas Waste Code

YES NO DO ANY CANADIAN PROVINCIAL WASTE CODES APPLY?

YES NO IS THIS WASTE PROHIBITED FROM LAND DISPOSAL WITHOUT FURTHER TREATMENT PER 40 CFR PART 268?
LDR CATEGORY:
VARIANCE INFO:

YES NO IS THIS A UNIVERSAL WASTE?

YES NO IS THE GENERATOR OF THE WASTE CLASSIFIED AS CONDITIONALLY EXEMPT SMALL QUANTITY GENERATOR (CESQG)?

YES NO IS THIS MATERIAL GOING TO BE MANAGED AS A RCRA EXEMPT COMMERCIAL PRODUCT, WHICH IS FUEL (40 CFR 261.2 (C)(2)(II))?

YES NO DOES TREATMENT OF THIS WASTE GENERATE A F006 OR F019 SLUDGE?

YES NO IS THIS WASTE STREAM SUBJECT TO THE INORGANIC METAL BEARING WASTE PROHIBITION FOUND AT 40 CFR 268.3(C)?

YES NO DOES THIS WASTE CONTAIN VOC'S IN CONCENTRATIONS >=500 PPM?

YES NO DOES THE WASTE CONTAIN GREATER THAN 20% OF ORGANIC CONSTITUENTS WITH A VAPOR PRESSURE >= .3KPA (.044 PSIA)?

YES NO DOES THIS WASTE CONTAIN AN ORGANIC CONSTITUENT WHICH IN ITS PURE FORM HAS A VAPOR PRESSURE > 77 KPA (11.2 PSIA)?

YES NO IS THIS CERCLA REGULATED (SUPERFUND) WASTE ?

YES NO IS THE WASTE SUBJECT TO ONE OF THE FOLLOWING NESHAP RULES?
Hazardous Organic NESHAP (HON) rule (subpart G) Pharmaceuticals production (subpart GGG)

YES NO IF THIS IS A US EPA HAZARDOUS WASTE, DOES THIS WASTE STREAM CONTAIN BENZENE?
YES NO Does the waste stream come from a facility with one of the SIC codes listed under benzene NESHAP or is this waste regulated under the benzene NESHAP rules because the original source of the waste is from a chemical manufacturing, coke by-product recovery, or petroleum refinery process?
YES NO Is the generating source of this waste stream a facility with Total Annual Benzene (TAB) >10 Mg/year?
What is the TAB quantity for your facility? Megagram/year (1 Mg = 2,200 lbs)
The basis for this determination is: Knowledge of the Waste Or Test Data Knowledge Testing
Describe the knowledge :

G. DOT/TDG INFORMATION

DOT/TDG PROPER SHIPPING NAME:
UN2555, WASTE NITROCELLULOSE WITH WATER, 4.1, PG II

H. TRANSPORTATION REQUIREMENTS

ESTIMATED SHIPMENT FREQUENCY ONE TIME WEEKLY MONTHLY QUARTERLY YEARLY OTHER **Multiple shipments**

<input checked="" type="checkbox"/> CONTAINERIZED		BULK LIQUID		BULK SOLID	
80-88 CONTAINERS/SHIPMENT		GALLONS/SHIPMENT: 0 Min -0 Max	GAL.	SHIPMENT UOM:	TON YARD
STORAGE CAPACITY: 500				TONS/YARDS/SHIPMENT: 0 Min - 0 Max	
CONTAINER TYPE:					
<input checked="" type="checkbox"/> CUBIC YARD BOX	PALLET				
TOTE TANK	DRUM				
OTHER:	DRUM SIZE: 55				

I. SPECIAL REQUEST

COMMENTS OR REQUESTS:
Approve to EL, DE and AG.

GENERATOR'S CERTIFICATION

I certify that I am authorized to execute this document as an authorized agent. I hereby certify that all information submitted in this and attached documents is correct to the best of my knowledge. I also certify that any samples submitted are representative of the actual waste. If Clean Harbors discovers a discrepancy during the approval process, Generator grants Clean Harbors the authority to amend the profile, as Clean Harbors deems necessary, to reflect the discrepancy.

AUTHORIZED SIGNATURE	NAME (PRINT)	TITLE	DATE
_____	_____	_____	_____



WASTE MATERIAL PROFILE SHEET

Clean Harbors Profile No. CH794671

A. GENERAL INFORMATION

GENERATOR EPA ID #/REGISTRATION #
 GENERATOR CODE (Assigned by Clean Harbors)
 ADDRESS **1600 Jjava Road**

NONEREQUIRED
AS15559

GENERATOR NAME:
 CITY **Minden**

Ashland
 STATE/PROVINCE **LA** ZIP/POSTAL CODE **71055**

CUSTOMER CODE (Assigned by Clean Harbors)
 ADDRESS **1600 Jjava Road**

AS15559

CUSTOMER NAME:
 CITY **Minden**

PHONE: **(302) 995-3433**
 STATE/PROVINCE **LA** ZIP/POSTAL CODE **71055**

B. WASTE DESCRIPTION

WASTE DESCRIPTION: **EMPTY DRUMS**

PROCESS GENERATING WASTE: **Site cleanup. Last contained Nitrocellulose.**

IS THIS WASTE CONTAINED IN SMALL PACKAGING CONTAINED WITHIN A LARGER SHIPPING CONTAINER ? **No**

C. PHYSICAL PROPERTIES (at 25C or 77F)

PHYSICAL STATE <input checked="" type="checkbox"/> SOLID WITHOUT FREE LIQUID POWDER MONOLITHIC SOLID LIQUID WITH NO SOLIDS LIQUID/SOLID MIXTURE % FREE LIQUID % SETTLED SOLID % TOTAL SUSPENDED SOLID SLUDGE GAS/AEROSOL	NUMBER OF PHASES/LAYERS 1 2 3 TOP 0.00 % BY VOLUME (Approx.) MIDDLE 0.00 BOTTOM 0.00				VISCOSITY (if liquid present) 1 - 100 (e.g. Water) 101 - 500 (e.g. Motor Oil) 501 - 10,000 (e.g. Molasses) > 10,000		COLOR VARIOUS
	ODOR <input checked="" type="checkbox"/> NONE MILD STRONG Describe:		BOILING POINT °F (°C) <= 95 (<=35) 95 - 100 (35-38) 101 - 129 (38-54) >= 130 (>54)		MELTING POINT °F (°C) < 140 (<60) 140-200 (60-93) <input checked="" type="checkbox"/> > 200 (>93)		TOTAL ORGANIC CARBON <= 1% <input checked="" type="checkbox"/> 1-9% >= 10%
FLASH POINT °F (°C) < 73 (<23) 73 - 100 (23-38) 101 -140 (38-60) 141 -200 (60-93) > 200 (>93)	pH <= 2 2.1 - 6.9 <input checked="" type="checkbox"/> 7 (Neutral) 7.1 - 12.4 >= 12.5	SPECIFIC GRAVITY < 0.8 (e.g. Gasoline) 0.8-1.0 (e.g. Ethanol) 1.0 (e.g. Water) <input checked="" type="checkbox"/> 1.0-1.2 (e.g. Antifreeze) > 1.2 (e.g. Methylene Chloride)	ASH < 0.1 <input checked="" type="checkbox"/> > 20 0.1 - 1.0 Unknown 1.1 - 5.0 5.1 - 20.0		BTU/LB (MJ/kg) < 2,000 (<4.6) <input checked="" type="checkbox"/> 2,000-5,000 (4.6-11.6) 5,000-10,000 (11.6-23.2) > 10,000 (>23.2) Actual:		

D. COMPOSITION (List the complete composition of the waste, include any inert components and/or debris. Ranges for individual components are acceptable. If a trade name is used, please supply an MSDS. Please do not use abbreviations.)

CHEMICAL	MIN	--	MAX	UOM
RCRA EMPTY DRUMS	100.0000000	--	100.0000000	%

DOES THIS WASTE CONTAIN ANY HEAVY GAUGE METAL DEBRIS OR OTHER LARGE OBJECTS (EX., METAL PLATE OR PIPING >1/4" THICK OR >12" LONG, METAL REINFORCED HOSE >12" LONG, METAL WIRE >12" LONG, METAL VALVES, PIPE FITTINGS, CONCRETE REINFORCING BAR OR PIECES OF CONCRETE >3")? YES NO

If yes, describe, including dimensions:

DOES THIS WASTE CONTAIN ANY METALS IN POWDERED OR OTHER FINELY DIVIDED FORM? YES NO

DOES THIS WASTE CONTAIN OR HAS IT CONTACTED ANY OF THE FOLLOWING; ANIMAL WASTES, HUMAN BLOOD, BLOOD PRODUCTS, BODY FLUIDS, MICROBIOLOGICAL WASTE, PATHOLOGICAL WASTE, HUMAN OR ANIMAL DERIVED SERUMS OR PROTEINS OR ANY OTHER POTENTIALLY INFECTIOUS MATERIAL? YES NO

I acknowledge that this waste material is neither infectious nor does it contain any organism known to be a threat to human health. This certification is based on my knowledge of the material. Select the answer below that applies:

The waste was never exposed to potentially infectious material. YES NO

Chemical disinfection or some other form of sterilization has been applied to the waste. YES NO

I ACKNOWLEDGE THAT THIS PROFILE MEETS THE CLEAN HARBORS BATTERY PACKAGING REQUIREMENTS. YES NO

I ACKNOWLEDGE THAT MY FRIABLE ASBESTOS WASTE IS DOUBLE BAGGED AND WETTED. YES NO

SPECIFY THE SOURCE CODE ASSOCIATED WITH THE WASTE. **G09**

SPECIFY THE FORM CODE ASSOCIATED WITH THE WASTE. **W307**



E. CONSTITUENTS

Are these values based on testing or knowledge? Knowledge Testing

If constituent concentrations are based on analytical testing, analysis must be provided. Please attach document(s) using the link on the Submit tab.

Please indicate which constituents below apply. Concentrations must be entered when applicable to assist in accurate review and expedited approval of your waste profile. Please note that the total regulated metals and other constituents sections require answers.

Table with columns: RCRA, REGULATED METALS, REGULATORY LEVEL (mg/l), TCLP mg/l, TOTAL, UOM, NOT APPLICABLE. Includes sections for VOLATILE COMPOUNDS, SEMI-VOLATILE COMPOUNDS, and PESTICIDES AND HERBICIDES.

ADDITIONAL HAZARDS

DOES THIS WASTE HAVE ANY UNDISCLOSED HAZARDS OR PRIOR INCIDENTS ASSOCIATED WITH IT, WHICH COULD AFFECT THE WAY IT SHOULD BE HANDLED?

YES [checked] NO (If yes, explain)

CHOOSE ALL THAT APPLY

- DEA REGULATED SUBSTANCE, EXPLOSIVE, FUMING, OSHA REGULATED CARCINOGENS, POLYMERIZABLE, RADIOACTIVE, REACTIVE MATERIAL, [checked] NONE OF THE ABOVE



F. REGULATORY STATUS

YES NO USEPA HAZARDOUS WASTE?

YES NO DO ANY STATE WASTE CODES APPLY?
513 MA99
 Texas Waste Code

YES NO DO ANY CANADIAN PROVINCIAL WASTE CODES APPLY?

YES NO IS THIS WASTE PROHIBITED FROM LAND DISPOSAL WITHOUT FURTHER TREATMENT PER 40 CFR PART 268?
 LDR CATEGORY: **Not subject to LDR**
 VARIANCE INFO:

YES NO IS THIS A UNIVERSAL WASTE?

YES NO IS THE GENERATOR OF THE WASTE CLASSIFIED AS CONDITIONALLY EXEMPT SMALL QUANTITY GENERATOR (CESQG)?

YES NO IS THIS MATERIAL GOING TO BE MANAGED AS A RCRA EXEMPT COMMERCIAL PRODUCT, WHICH IS FUEL (40 CFR 261.2 (C)(2)(II))?

YES NO DOES TREATMENT OF THIS WASTE GENERATE A F006 OR F019 SLUDGE?

YES NO IS THIS WASTE STREAM SUBJECT TO THE INORGANIC METAL BEARING WASTE PROHIBITION FOUND AT 40 CFR 268.3(C)?

YES NO DOES THIS WASTE CONTAIN VOC'S IN CONCENTRATIONS >=500 PPM?

YES NO DOES THE WASTE CONTAIN GREATER THAN 20% OF ORGANIC CONSTITUENTS WITH A VAPOR PRESSURE >= .3KPA (.044 PSIA)?

YES NO DOES THIS WASTE CONTAIN AN ORGANIC CONSTITUENT WHICH IN ITS PURE FORM HAS A VAPOR PRESSURE > 77 KPA (11.2 PSIA)?

YES NO IS THIS CERCLA REGULATED (SUPERFUND) WASTE ?

YES NO IS THE WASTE SUBJECT TO ONE OF THE FOLLOWING NESHAP RULES?
 Hazardous Organic NESHAP (HON) rule (subpart G) Pharmaceuticals production (subpart GGG)

YES NO IF THIS IS A US EPA HAZARDOUS WASTE, DOES THIS WASTE STREAM CONTAIN BENZENE?
 YES NO Does the waste stream come from a facility with one of the SIC codes listed under benzene NESHAP or is this waste regulated under the benzene NESHAP rules because the original source of the waste is from a chemical manufacturing, coke by-product recovery, or petroleum refinery process?
 YES NO Is the generating source of this waste stream a facility with Total Annual Benzene (TAB) >10 Mg/year?
 What is the TAB quantity for your facility? Megagram/year (1 Mg = 2,200 lbs)
 The basis for this determination is: Knowledge of the Waste Or Test Data Knowledge Testing
 Describe the knowledge :

G. DOT/TDG INFORMATION

DOT/TDG PROPER SHIPPING NAME:

NON DOT REGULATED MATERIAL

RESIDUE LAST CONTAINED UN1263, PAINT RELATED MATERIAL, 3, PG II

H. TRANSPORTATION REQUIREMENTS

ESTIMATED SHIPMENT FREQUENCY: ONE TIME WEEKLY MONTHLY QUARTERLY YEARLY OTHER Other

<input checked="" type="checkbox"/> CONTAINERIZED		BULK LIQUID		BULK SOLID	
80-88	CONTAINERS/SHIPMENT	GALLONS/SHIPMENT:	0 Min -0 Max	GAL.	SHIPMENT UOM: TON YARD
STORAGE CAPACITY:	500				TONS/YARDS/SHIPMENT: 0 Min - 0 Max
CONTAINER TYPE:					
CUBIC YARD BOX	PALLET				
TOTE TANK	<input checked="" type="checkbox"/> DRUM				
OTHER:	DRUM SIZE: 55				

I. SPECIAL REQUEST

COMMENTS OR REQUESTS:

GENERATOR'S CERTIFICATION

I certify that I am authorized to execute this document as an authorized agent. I hereby certify that all information submitted in this and attached documents is correct to the best of my knowledge. I also certify that any samples submitted are representative of the actual waste. If Clean Harbors discovers a discrepancy during the approval process, Generator grants Clean Harbors the authority to amend the profile, as Clean Harbors deems necessary, to reflect the discrepancy.

AUTHORIZED SIGNATURE	NAME (PRINT)	TITLE	DATE
_____	_____	_____	_____



Addendum

G. DOT/TDG INFORMATION

DOT/TDG PROPER SHIPPING NAME:

RESIDUE LAST CONTAINED: UN1263, PAINT, 3, PG II

RESIDUE: LAST CONTAINED UN1268, PETROLEUM DISTILLATES, N.O.S., (.), 3, PG III

RESIDUE LAST CONTAINED UN1479, OXIDIZING SOLID, N.O.S., (.), 5.1, PG II

RESIDUE LAST CONTAINED: UN1993, FLAMMABLE LIQUIDS, N.O.S., (.), 3, PG II

RESIDUE LAST CONTAINED UN2810, TOXIC LIQUIDS, ORGANIC, N.O.S, (.), 6.1, PG III



WASTE MATERIAL PROFILE SHEET

Clean Harbors Profile No. CH800225

A. GENERAL INFORMATION

GENERATOR EPA ID #/REGISTRATION #
 GENERATOR CODE (Assigned by Clean Harbors)
 ADDRESS **1600 Java Road**

NONREQUIRED
AS15559

GENERATOR NAME:
 CITY **Minden**

Ashland
 STATE/PROVINCE **LA** ZIP/POSTAL CODE **71055**

CUSTOMER CODE (Assigned by Clean Harbors)
 ADDRESS **1600 Java Road**

AS15559

CUSTOMER NAME:
 CITY **Minden**

PHONE: **(302) 995-3433**
 STATE/PROVINCE **LA** ZIP/POSTAL CODE **71055**

B. WASTE DESCRIPTION

WASTE DESCRIPTION: **Water**

PROCESS GENERATING WASTE: **Water from waste project dealing with nitrocellulose**

IS THIS WASTE CONTAINED IN SMALL PACKAGING CONTAINED WITHIN A LARGER SHIPPING CONTAINER? **No**

C. PHYSICAL PROPERTIES (at 25C or 77F)

PHYSICAL STATE SOLID WITHOUT FREE LIQUID POWDER MONOLITHIC SOLID <input checked="" type="checkbox"/> LIQUID WITH NO SOLIDS LIQUID/SOLID MIXTURE % FREE LIQUID % SETTLED SOLID % TOTAL SUSPENDED SOLID SLUDGE GAS/AEROSOL	NUMBER OF PHASES/LAYERS <input checked="" type="checkbox"/> 1 2 3 TOP 0.00 % BY VOLUME (Approx.) MIDDLE 0.00 BOTTOM 0.00			VISCOSITY (If liquid present) <input checked="" type="checkbox"/> 1 - 100 (e.g. Water) 101 - 500 (e.g. Motor Oil) 501 - 10,000 (e.g. Molasses) > 10,000	COLOR <u>clear</u>
	ODOR <input checked="" type="checkbox"/> NONE MILD STRONG Describe:	BOILING POINT °F (°C) <= 95 (<=35) 95 - 100 (35-38) 101 - 129 (38-54) <input checked="" type="checkbox"/> >= 130 (>54)		MELTING POINT °F (°C) < 140 (<60) 140-200 (60-93) > 200 (>93)	TOTAL ORGANIC CARBON <input checked="" type="checkbox"/> <= 1% 1-9% >= 10%
FLASH POINT °F (°C) < 73 (<23) 73 - 100 (23-38) 101 -140 (38-60) 141 -200 (60-93) <input checked="" type="checkbox"/> > 200 (>93)	pH <= 2 2.1 - 6.9 <input checked="" type="checkbox"/> 7 (Neutral) 7.1 - 12.4 >= 12.5	SPECIFIC GRAVITY < 0.8 (e.g. Gasoline) 0.8-1.0 (e.g. Ethanol) <input checked="" type="checkbox"/> 1.0 (e.g. Water) 1.0-1.2 (e.g. Antifreeze) > 1.2 (e.g. Methylene Chloride)	ASH < 0.1 > 20 0.1 - 1.0 <input checked="" type="checkbox"/> Unknown 1.1 - 5.0 5.1 - 20.0	BTU/LB (MJ/kg) <input checked="" type="checkbox"/> < 2,000 (<4.6) 2,000-5,000 (4.6-11.6) 5,000-10,000 (11.6-23.2) > 10,000 (>23.2) Actual:	

D. COMPOSITION (List the complete composition of the waste, include any inert components and/or debris. Ranges for individual components are acceptable. If a trade name is used, please supply an MSDS. Please do not use abbreviations.)

CHEMICAL	MIN	--	MAX	UOM
WATER	100.0000000	--	100.0000000	%

DOES THIS WASTE CONTAIN ANY HEAVY GAUGE METAL DEBRIS OR OTHER LARGE OBJECTS (EX., METAL PLATE OR PIPING >1/4" THICK OR >12" LONG, METAL REINFORCED HOSE >12" LONG, METAL WIRE >12" LONG, METAL VALVES, PIPE FITTINGS, CONCRETE REINFORCING BAR OR PIECES OF CONCRETE >3")? YES NO

If yes, describe, including dimensions:

DOES THIS WASTE CONTAIN ANY METALS IN POWDERED OR OTHER FINELY DIVIDED FORM? YES NO

DOES THIS WASTE CONTAIN OR HAS IT CONTACTED ANY OF THE FOLLOWING; ANIMAL WASTES, HUMAN BLOOD, BLOOD PRODUCTS, BODY FLUIDS, MICROBIOLOGICAL WASTE, PATHOLOGICAL WASTE, HUMAN OR ANIMAL DERIVED SERUMS OR PROTEINS OR ANY OTHER POTENTIALLY INFECTIOUS MATERIAL? YES NO

I acknowledge that this waste material is neither infectious nor does it contain any organism known to be a threat to human health. This certification is based on my knowledge of the material. Select the answer below that applies:

The waste was never exposed to potentially infectious material. YES NO

Chemical disinfection or some other form of sterilization has been applied to the waste. YES NO

I ACKNOWLEDGE THAT THIS PROFILE MEETS THE CLEAN HARBORS BATTERY PACKAGING REQUIREMENTS. YES NO

I ACKNOWLEDGE THAT MY FRIABLE ASBESTOS WASTE IS DOUBLE BAGGED AND WETTED. YES NO

SPECIFY THE SOURCE CODE ASSOCIATED WITH THE WASTE. **G19**

SPECIFY THE FORM CODE ASSOCIATED WITH THE WASTE. **W113**



E. CONSTITUENTS

Are these values based on testing or knowledge? Knowledge Testing

If based on knowledge, please describe in detail, the rationale applied to identify and characterize the waste material. Please include reference to Material Safety Data Sheets (MSDS) when applicable. Include the chemical or trade-name represented by the MSDS, and or detailed process or operating procedures which generate the waste.

Generator knowledge

Please indicate which constituents below apply. Concentrations must be entered when applicable to assist in accurate review and expedited approval of your waste profile. Please note that the total regulated metals and other constituents sections require answers.

Table with columns: RCRA, REGULATED METALS, REGULATORY LEVEL (mg/l), TCLP mg/l, TOTAL, UOM, NOT APPLICABLE. Rows include ARSENIC, BARIUM, CADMIUM, CHROMIUM, LEAD, MERCURY, SELENIUM, SILVER, VOLATILE COMPOUNDS (BENZENE, CARBON TETRACHLORIDE, etc.), SEMI-VOLATILE COMPOUNDS (o-CRESOL, m-CRESOL, etc.), PESTICIDES AND HERBICIDES (ENDRIN, LINDANE, etc.).

HOCs: NONE < 1000 PPM, >= 1000 PPM. PCBs: NONE < 50 PPM, >=50 PPM. IF PCBs ARE PRESENT, IS THE WASTE REGULATED BY TSCA 40 CFR 761? YES NO

ADDITIONAL HAZARDS

DOES THIS WASTE HAVE ANY UNDISCLOSED HAZARDS OR PRIOR INCIDENTS ASSOCIATED WITH IT, WHICH COULD AFFECT THE WAY IT SHOULD BE HANDLED?

YES NO (If yes, explain)

CHOOSE ALL THAT APPLY

- DEA REGULATED SUBSTANCES, EXPLOSIVE, FUMING, OSHA REGULATED CARCINOGENS, POLYMERIZABLE, RADIOACTIVE, REACTIVE MATERIAL, NONE OF THE ABOVE



F. REGULATORY STATUS

YES NO USEPA HAZARDOUS WASTE? _____

YES NO DO ANY STATE WASTE CODES APPLY?

 Texas Waste Code _____

YES NO DO ANY CANADIAN PROVINCIAL WASTE CODES APPLY?

YES NO IS THIS WASTE PROHIBITED FROM LAND DISPOSAL WITHOUT FURTHER TREATMENT PER 40 CFR PART 268?
 LDR CATEGORY: **Not subject to LDR**
 VARIANCE INFO: _____

YES NO IS THIS A UNIVERSAL WASTE?

YES NO IS THE GENERATOR OF THE WASTE CLASSIFIED AS CONDITIONALLY EXEMPT SMALL QUANTITY GENERATOR (CESQG)?

YES NO IS THIS MATERIAL GOING TO BE MANAGED AS A RCRA EXEMPT COMMERCIAL PRODUCT, WHICH IS FUEL (40 CFR 261.2 (C)(2)(III))?

YES NO DOES TREATMENT OF THIS WASTE GENERATE A F006 OR F019 SLUDGE?

YES NO IS THIS WASTE STREAM SUBJECT TO THE INORGANIC METAL BEARING WASTE PROHIBITION FOUND AT 40 CFR 268.3(C)?

YES NO DOES THIS WASTE CONTAIN VOC'S IN CONCENTRATIONS >=500 PPM?

YES NO DOES THE WASTE CONTAIN GREATER THAN 20% OF ORGANIC CONSTITUENTS WITH A VAPOR PRESSURE >= .3KPA (.044 PSIA)?

YES NO DOES THIS WASTE CONTAIN AN ORGANIC CONSTITUENT WHICH IN ITS PURE FORM HAS A VAPOR PRESSURE > 77 KPA (11.2 PSIA)?

YES NO IS THIS CERCLA REGULATED (SUPERFUND) WASTE ?

YES NO IS THE WASTE SUBJECT TO ONE OF THE FOLLOWING NESHAP RULES?
 Hazardous Organic NESHAP (HON) rule (subpart G) Pharmaceuticals production (subpart GGG)

YES NO IF THIS IS A US EPA HAZARDOUS WASTE, DOES THIS WASTE STREAM CONTAIN BENZENE?
 YES NO Does the waste stream come from a facility with one of the SIC codes listed under benzene NESHAP or is this waste regulated under the benzene NESHAP rules because the original source of the waste is from a chemical manufacturing, coke by-product recovery, or petroleum refinery process?
 YES NO Is the generating source of this waste stream a facility with Total Annual Benzene (TAB) >10 Mg/year?
 What is the TAB quantity for your facility? _____ Megagram/year (1 Mg = 2,200 lbs)
 The basis for this determination is: Knowledge of the Waste Or Test Data Knowledge Testing
 Describe the knowledge : _____

G. DOT/TDG INFORMATION

DOT/TDG PROPER SHIPPING NAME:
NON HAZARDOUS, NON D.O.T. REGULATED

H. TRANSPORTATION REQUIREMENTS

ESTIMATED SHIPMENT FREQUENCY ONE TIME WEEKLY MONTHLY QUARTERLY YEARLY OTHER

<input checked="" type="checkbox"/> CONTAINERIZED 10-50 CONTAINERS/SHIPMENT STORAGE CAPACITY: 50 CONTAINER TYPE: CUBIC YARD BOX PALLET <input checked="" type="checkbox"/> TOTE TANK DRUM OTHER: DRUM SIZE: 275	BULK LIQUID GALLONS/SHIPMENT: 0 Min -0 Max GAL.	BULK SOLID SHIPMENT UOM: TON YARD TONS/YARDS/SHIPMENT: 0 Min - 0 Max
--	--	--

I. SPECIAL REQUEST

COMMENTS OR REQUESTS:

GENERATOR'S CERTIFICATION

I certify that I am authorized to execute this document as an authorized agent. I hereby certify that all information submitted in this and attached documents is correct to the best of my knowledge. I also certify that any samples submitted are representative of the actual waste. If Clean Harbors discovers a discrepancy during the approval process, Generator grants Clean Harbors the authority to amend the profile, as Clean Harbors deems necessary, to reflect the discrepancy.

AUTHORIZED SIGNATURE	NAME (PRINT)	TITLE	DATE
_____	_____	_____	_____



North American Remediation Organization
Hercules, Inc.
Nitrocellulose Removal
Camp Minden, LA

Appendix E: Project Schedule



North American Remediation Organization
Hercules, Inc.
Nitrocellulose Removal
Camp Minden, LA

Appendix F: Field Documents



Clean Harbors
42 Longwater Drive
Norwell, MA 02061
781.792.5000
www.cleanharbors.com

Via UPS and electronic mail

Ms. Paige Delgado
On-Scene Coordinator
United States Environmental Protection Agency – Region VI
1445 Ross Avenue; Suite 1200
Dallas, Texas 75202

RE: Progress Report – June 1, 2014 through June 21, 2014
CERCLA Administrative Order on Consent (AOC)
Docket No. CERCLA-06-03-14
Hercules Incorporated, Camp Minden, LA

Dear Ms. Delgado:

On behalf of Hercules Incorporated (Hercules), Clean Harbors Environmental Services, Inc. (Clean Harbors) is pleased to submit this Progress Report to the United States Environmental Protection Agency (USEPA) in accordance with CERCLA Docket No. 06-03-14 Administrative Order on Consent (AOC). The CERCLA Docket No. 06-03-14 AOC (Order) went into effect on April 18, 2010 between the USEPA and Hercules for the former Explo Site located at Camp Minden near Doyline, Louisiana (Site). This Progress Report documents activities conducted from June 1, 2014 through June 21, 2014.

The following sections address the requirements of the Explo Systems Inc. Removal Scope of Work guidance, Section 8 - Reporting.

1. Scope of Work performed during reporting period:

- Nitrocellulose drums were removed from Igloo XX....
- Based on the current progress of the removal actions completed to date, it is anticipated that the nitrocellulose removal is approximately XX% complete.

2. Analytical Data received during reporting period:

- The summary of moisture testing has been provided in the attachment XX.....
- The following analytical results were received from off-site laboratory....

3. Issues/problems encountered during reporting period:

“People and Technology Creating a Better Environment”



Ms. Paige Delgado

6/1/14

Page 2 of 2

- No issues or problems were encountered during this reporting period.

4. Activities for the next reporting period:

- The following developments are anticipated for the next reporting period.....

5. Schedule of activities for the next reporting period:

- The following schedule is anticipated for the next reporting period.....

6. Anticipated problems/issues for the next reporting period:

- No problems or potential problems related to the Scope of Work are anticipated during the next reporting period.

7. Resolutions for past or anticipated problems/issues:

- No action required.

Should you have any questions regarding the information included in this Progress Report, please contact the undersigned at (775) 781-9705

Respectfully submitted,

Lawrence Izzo
Project Manager
Clean Harbors

cc:

Mr. Ed Meeks, Ashland, Inc.



HAZARDOUS WORK PERMIT

HAZARDOUS WORK HOT WORK LINE/EQUIP OPENING LOCKOUT/TAGOUT (Check all that apply)

Permit authorization and permit termination for each type of permit must be completed on the last page of this permit

Start Time/Date: / /		Expires: / /		Completion Time:	
Client:		Client Contact:		Client Phone #:	
CHES Job #:		CHES Location:		CHES Phone #:	
Job Location:		Task 4:		Dig Safe #:	
Scope of Work - Task 1:		Task 5:		H&S Rep:	
Task 2:		Task 6:			
Task 3:					
Special Conditions:					
EMERGENCY TELEPHONE NUMBERS - Fire:		Police:		Ambulance/Rescue:	
Emergency Assembly Area: primary secondary					
Hospital Name & Location:					

HAZARD IDENTIFICATION

(circle task number)	(List specific substances in air monitoring section)				
CHEMICAL/BIOLOGICAL	^{1,2,3} / _{4,5,6} Toxic:	^{1,2,3} / _{4,5,6} Corrosive:	^{1,2,3} / _{4,5,6} Flammable:	^{1,2,3} / _{4,5,6} Combustible:	^{1,2,3} / _{4,5,6} Reactive:
^{1,2,3} / _{4,5,6} Shock Sensitive	^{1,2,3} / _{4,5,6} Path Waste	^{1,2,3} / _{4,5,6} Oxygen Deficiency			
PHYSICAL					
^{1,2,3} / _{4,5,6} Abrasive Blasting	^{1,2,3} / _{4,5,6} Extreme Cold/Heat	^{1,2,3} / _{4,5,6} Lighting	^{1,2,3} / _{4,5,6} Sharp Objects	^{1,2,3} / _{4,5,6} Underground Utilities	
^{1,2,3} / _{4,5,6} Drum Sumps	^{1,2,3} / _{4,5,6} Floor Holes	^{1,2,3} / _{4,5,6} Live Electrical Circuits	^{1,2,3} / _{4,5,6} Slips/Trips/Falls	^{1,2,3} / _{4,5,6} Vector/Cusco	
^{1,2,3} / _{4,5,6} Drilling In Soil	^{1,2,3} / _{4,5,6} Hot Work	^{1,2,3} / _{4,5,6} Manlifts/Highlifts	^{1,2,3} / _{4,5,6} Soil Excavation	^{1,2,3} / _{4,5,6} Vehicle Traffic	
^{1,2,3} / _{4,5,6} Drum Handling	^{1,2,3} / _{4,5,6} Hotsy	^{1,2,3} / _{4,5,6} Noise	^{1,2,3} / _{4,5,6} Tank Excavation	^{1,2,3} / _{4,5,6} Waterblaster	
^{1,2,3} / _{4,5,6} Elevated Work Area	^{1,2,3} / _{4,5,6} Ladders	^{1,2,3} / _{4,5,6} Overhead Utilities	^{1,2,3} / _{4,5,6} Trenching	^{1,2,3} / _{4,5,6} Work On/Near Water	
^{1,2,3} / _{4,5,6} Excavation/Trench	^{1,2,3} / _{4,5,6} Lifting	^{1,2,3} / _{4,5,6} Pneumatic Tools	^{1,2,3} / _{4,5,6} Uncontrolled Work Area		

PERSONAL PROTECTIVE/SAFETY EQUIPMENT

(Review requirements with H&S)(Line opening; minimum level C)

<input type="checkbox"/> SCBA	<input type="checkbox"/> Supplied Air Resp.	<input type="checkbox"/> SAR w/Egress Bottle	<input type="checkbox"/> Air Purifying Respirator/Cartridge: _____
<input type="checkbox"/> Protective Coverall	<input type="checkbox"/> Outer Gloves	<input type="checkbox"/> Inner Gloves	<input type="checkbox"/> Fully Encapsulating Suit Cartridge
Type: _____	Type: _____	Type: _____	Type: _____ Use Time: _____
<input type="checkbox"/> Barrier Cream	<input type="checkbox"/> Evacuation Plans	<input type="checkbox"/> GFCI Required	<input type="checkbox"/> Nomex Coveralls <input type="checkbox"/> Safety Shower
<input type="checkbox"/> Bonding/Grounding	<input type="checkbox"/> Explosion Proof Equip	<input type="checkbox"/> Hardhats	<input type="checkbox"/> Non-Sparking Tools <input type="checkbox"/> Ventilation
<input type="checkbox"/> Chemical Goggles	<input type="checkbox"/> Eye Wash	<input type="checkbox"/> Harness/Lanyard	<input type="checkbox"/> Over Boots Type: _____
<input type="checkbox"/> Communications	<input type="checkbox"/> Face Shield	<input type="checkbox"/> Hearing Protection	<input type="checkbox"/> PFD's <input type="checkbox"/> Welding/Cutting
<input type="checkbox"/> Cylinders Secured	<input type="checkbox"/> Flashback Prev. Device	<input type="checkbox"/> Hearing Prot.; Double	<input type="checkbox"/> Reflective Vests <input type="checkbox"/> Shaded Lenses
<input type="checkbox"/> Eliminate Ignit. Source	<input type="checkbox"/> Flash Suit	<input type="checkbox"/> MSDS's Reviewed	<input type="checkbox"/> Safety Glasses

EQUIPMENT INSPECTIONS - Foreman must initial to verify equipment has been inspected and is safe to use/operate.

_____ D/D Pump (pressure relief valve)	_____ Hoses/Hose Connections	_____ Shower/Eyewash
_____ Fall Protection (harness, lanyard)	_____ Ladder(s)	_____ Vector Butterfly
_____ Anchor points support > 5000 lbs)	_____ Retrieval Device	_____ Wire Rope/Sling
_____ Fire Extinguisher(s)	_____ SAR/SCBA OTHER _____	
_____ Forklift	_____ Scaffold	

UNIFORM HAZARDOUS WASTE MANIFEST		1. Generator ID Number	2. Page 1 of	3. Emergency Response Phone		4. Manifest Tracking Number						
		5. Generator's Name and Mailing Address					Generator's Site Address (if different than mailing address)					
Generator's Phone:												
6. Transporter 1 Company Name						U.S. EPA ID Number						
7. Transporter 2 Company Name						U.S. EPA ID Number						
8. Designated Facility Name and Site Address						U.S. EPA ID Number						
Facility's Phone:												
GENERATOR	9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))			10. Containers		11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes			
			No.	Type								
	1.											
	2.											
	3.											
4.												
14. Special Handling Instructions and Additional Information												
<p>15. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent.</p> <p>I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.</p>												
Generator's/Offeror's Printed/Typed Name						Signature			Month	Day	Year	
16. International Shipments <input type="checkbox"/> Import to U.S. <input type="checkbox"/> Export from U.S. Port of entry/exit: _____												
Transporter signature (for exports only): _____ Date leaving U.S.: _____												
TRANSPORTER	17. Transporter Acknowledgment of Receipt of Materials											
	Transporter 1 Printed/Typed Name					Signature			Month	Day	Year	
	Transporter 2 Printed/Typed Name					Signature			Month	Day	Year	
DESIGNATED FACILITY	18. Discrepancy											
	18a. Discrepancy Indication Space <input type="checkbox"/> Quantity <input type="checkbox"/> Type <input type="checkbox"/> Residue <input type="checkbox"/> Partial Rejection <input type="checkbox"/> Full Rejection											
	Manifest Reference Number: _____											
	18b. Alternate Facility (or Generator)						U.S. EPA ID Number					
	Facility's Phone: _____											
18c. Signature of Alternate Facility (or Generator)									Month	Day	Year	
19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)												
1.			2.			3.			4.			
20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a												
Printed/Typed Name						Signature			Month	Day	Year	

NON-HAZARDOUS WASTE MANIFEST		1. Generator's US EPA ID No.	Manifest Doc No.	2. Page 1 of 1	
3. Generator's Name and Mailing Address					
4. Generator's Phone (including area code)					
5. Transporter 1 Company Name	6. US EPA ID Number	A. Transporter's Phone			
7. Transporter 2 Company Name	8. US EPA ID Number	B. Transporter's Phone			
9. Designated Facility Name and Site Address	10. US EPA ID Number	C. Facility's Phone			
11. Waste Shipping Name and Description		12. Containers		13. Total Quantity	14. Unit Wt/Vol
		No.	Type		
a.					
b.					
c.					
d.					
D. Additional Descriptions for Materials Listed Above		E. Handling Codes for Wastes Listed Above			
15. Special Handling Instructions and Additional Information					
16. GENERATOR'S CERTIFICATION: I certify the materials described above on this manifest are not subject to federal regulations for reporting proper disposal of Hazardous Waste.					
Printed/Typed Name		Signature		Month	Day Year
T R A N S P O R T E R	17. Transporter 1 Acknowledgement of Receipt of Materials				
	Printed/Typed Name	Signature	Month	Day	Year
F A C I L I T Y	18. Transporter 2 Acknowledgement of Receipt of Materials				
	Printed/Typed Name	Signature	Month	Day	Year
19. Discrepancy Indication Space					
20. Facility Owner or Operator: Certification of receipt of waste materials covered by this manifest except as noted in Item 19.					
Printed/Typed Name		Signature		Month	Day Year

ORIGINAL - RETURN TO GENERATOR