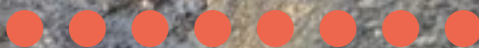


mandals
SINCE 1775

WORLD CLASS LAY-FLAT HOSES

THERMOPLASTIC POLYURETHANE HOSES • NITRILE RUBBER HOSES • TEXTILE HOSES
OIL & GAS • HYDRAULIC FRACTURING • MINING • WATER SUPPLY • PIPELINE REHABILITATION
CONSTRUCTION • AGRICULTURE • EMERGENCY RESPONSE





Bigger and stronger than ever

The Mandals AS factory in Mandal, Norway underwent a major expansion during 2013/2014 to meet future market demands.

Mandals is a leading manufacturer of lay-flat hoses suitable for high volume and high pressure, retrievable and permanent fluid discharge, whether for emergency response, cooling systems on- or off-shore, mine dewatering, fracturing or other applications. Used for decades in various sectors like firefighting, agriculture, construction and industry, the lay-flat hoses from Mandals offer a flexible, mobile, easy to handle alternative to rigid piping - providing a cost saving and environmentally friendly solution.

Mandals = quality hoses.

We produce hoses built to last for transferring most liquids, from drinking water to industrial or waste water, from slurry to concrete, in the volume and pressure needed. Reliability and extended lifetime outperform less durable hoses.

Mandals continues a long, proud history

Going back more than 240 years, Mandals started out manufacturing ropes for sailing vessels. We developed fire hoses and circular weaving looms in the 1930's and extruded through the weave with rubber from 1960. During the 1980's we led the way in developing industrial lay-flat thermoplastic polyurethane hoses. Since 2012 Mandals is part of the global acknowledged Fenner PLC group, a FTSE 250 company listed on the London Stock Exchange.

Quality and service driven

Customer service and adaptability remain the key factor at Mandals. Many loyal customers, including some of the most demanding companies in the world, have always required adherence to Norwegian Standards. To meet these requirements, Mandals is ISO 9001 certified.

World-wide distribution

Mandals hoses are distributed all over the world through a global network of partners. The hoses are often integrated into larger systems aimed for industrial markets. Businesses all over the world prefer and rely on our quality. They trust our hoses to provide the resistance to abrasion, pressure, pulling and roughness needed. We deliver according to our technical specifications and lead the way through Mandals' strict requirements for world class lay-flat hoses.

We look forward to working with you,



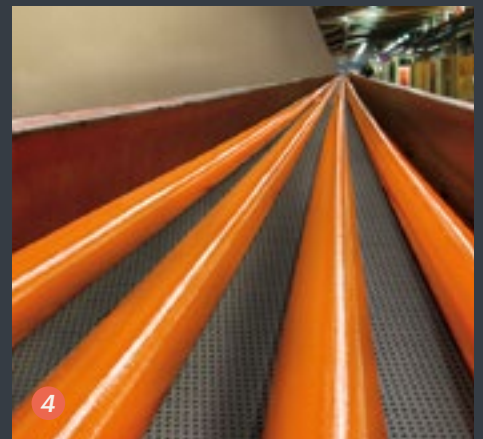
Øyvind Berntsen
Chairman of the Board, Mandals AS

mandals
SINCE 1775

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See www.mandals.com for updated technical product information.
See www.mandals.com/about-us/terms-and-conditions for Mandals AS General Terms & Conditions.



Production process

At Mandals we take pride in controlling each step of the process involved in the hose production.

Twisting of Yarn

This is the first key step. To ensure the desired strength of warp and weft in the weave we focus on always using the highest quality raw materials, calculating the right number of filaments and determining the correct twisting factor.

Weaving the jacket

“The strength of a hose is in the weave”
All jackets are woven on Mandals patented circular weaving looms, which are preferred globally by 9 out of 10 hose manufacturers. Our looms are constantly upgraded to meet demands in the hose market, and have over 80 years of uniform quality on key parameters. Mandals’ background gives us unique

know-how in both loom technology, yarns, twisting and weave construction. We focus especially on a 100% uniform weave with uniform tension on both weft and warp to prevent diameter variations.

Extrusion

We extrude simultaneously inside and outside of the weave, which ensures that the extruded material is strongly bonded through the textile. The material used is either nitrile rubber, which gives a very flexible hose, or thermoplastic polyurethane (TPU), which gives four times higher abrasion resistance compared to rubber.

Finalizing

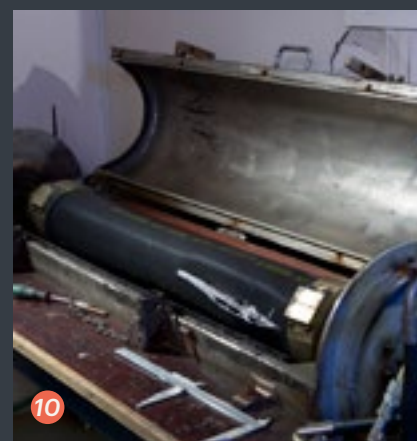
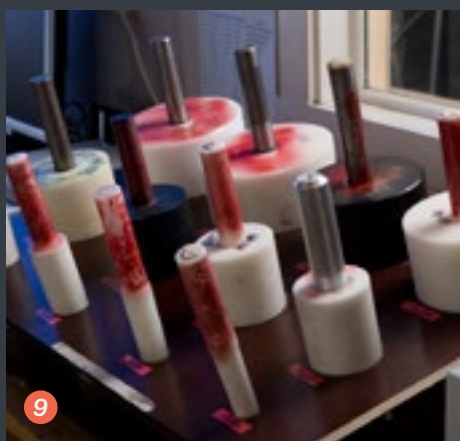
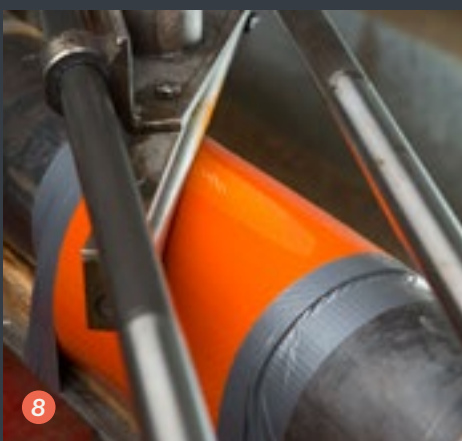
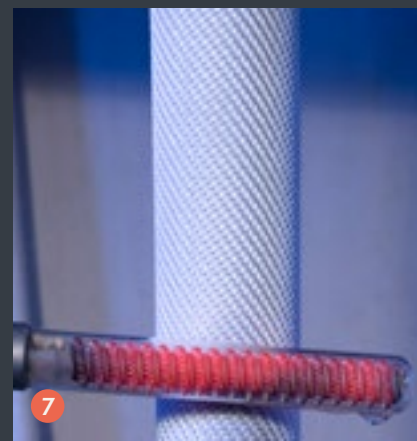
Our TPU hoses are processed in order to set the correct and permanent diameter, while our rubber hoses are vulcanized to complete the hardening process. The

final step for all hoses is the hydro testing and a full manual inspection.

A hose is not a hose!

“We minimize your risk and offer excellent life time cost.”

- Extraordinary weaving know-how
- High quality raw materials
- Even distribution of extruded material inside/outside
- High abrasion resistance
- Stable diameter – easy to recouple
- High puncture resistance
- Low elongation – no “snaking”
- Correct swell properties



Quality and control

Held to the highest of standards

Mandals is ISO 9001 certified and is aligned and integrated in the HSEQ Framework of Fenner PLC. Our dedicated employees monitor and improve our processes on a continuous basis, and our lab staff are an active part of our quality control process. Making a world class lay-flat hose takes time and dedication!

All raw materials are checked upon arrival according to a pre-set technical data sheet. I.e. tensile strength on yarn, melt-index for TPU and other parameters.

After twisting and weaving all weaves are visually inspected on both sides of the whole length in order to find and repair any defects. The flat width, thickness and length are also controlled.

During extrusion of the hose many aspects

are monitored in order to achieve an even quality. Especially temperature, speed and distribution of the TPU or nitrile rubber through the weave are constantly controlled to ensure a homogeneous product.

The internal diameter is permanently set to the exact size. Nitrile rubber hoses are vulcanized to enhance the properties. Finally, all hoses are hydro tested and manually inspected, to ensure no leaks.

Batch per batch all production lots are tested for various technical properties depending on the grade and intended end use.

We measure regularly:

Abrasion, thickness, adhesion of cover to weave, burst, elongation, puncture resistance, internal diameter setting before and after pressure, durability at low temperature (-35 °C), ozone, kink and bend test.

Pictures:

- 1 Twisting of yarn
- 2 Weaving
- 3 Extrusion through the weave
- 4 Diameter and leak control
- 5 Testing yarn strength
- 6 Testing adhesion between weave and cover
- 7 Testing heat resistance
- 8 Testing abrasion resistance
- 9 Diameter control equipment
- 10 Testing exact burst pressure and weave structure

Why lay-flat hoses?

Flexible lay-flat hoses offer many advantages over more rigid types of hoses or pipes, and areas of use have increased over the years. Lay-flat hoses are now the preferred solution in many fluid transfer applications in various segments. The experienced users are focused on the fact that, given the right quality, the hose can meet the requirements of the most demanding industrial users. Lay-flat hoses provide the flexibility and mobility to streamline efficient use and offer many positive HSE benefits.

Advantages of lay-flat hoses over conventional pipes

Fast Deployment and Retrieval

- Long continuous lengths.
- Less joints, no welding.
- Light weight.
- Fewer and lighter vehicles.
- Deployed or retrieved from moving vehicle.

- Terrain friendly – follows ground contours.

Economical Storage and Transport

- “Steel on Wheel” packed on compact reels.
- Long lengths with low coil volume.
- Light and compact.
- 40’ container holds up to 3600 m of 12” hose.
- Perfect for sites with limited space.
- Reduced transport costs.
- Standard pick-up trucks will do.
- Easy access in remote areas.

Low Operating Costs

- Excellent flow rates.
- Minimal pressure loss, low friction.
- Swelling allows full pumping efficiency.
- Long lengths and few joints – less manpower.
- Less leaking and risk of spills.

Long Service Life

- High resistance to abrasion and cutting.
- Continuous operation at high pressures.
- Durable even in the roughest environments.
- No corrosion or scale build-up.
- No delamination.
- Resistant to heat, UV-rays, ozone, many chemicals and weathering.
- Resistant to hydrolysis and microbiological attack.
- Withstands settings in the ground.

Easy Maintenance and Repair

- Minimal maintenance even in harsh environments.
- Stable diameter after use allows easy recoupling.
- Quick on-site repair possible, no special tools.
- Lower labour and equipment costs.
- Reduced downtime.
- Damaged spots fixed temporarily by pulling over a sleeve.



Health, Safety and Environment

- Easy to handle – less heavy lifting.
- Reduced risk of pollution.
- Less heavy machinery on site.

Determining which hose to use

Mandals offers a wide range of hoses and together we can sort out the best hose for your application based on the needs for approvals, abrasion resistance, flexibility, flow, equipment involved, etc. Please contact us for advice.

Handling equipment for hoses in use

Through a worldwide network of equipment handlers, the Mandals hoses are available on mechanical equipment for deployment, retrieval, transport, storage and usage.

The partner network of Mandals seeks to offer a diversity of custom made equipment and couplings to meet any requirements needed.

Contact us for details and inquiries.



Small space – many meters

Large space – few meters

Agriculture

Mandals lay-flat hoses have been the preferred solution in the global agricultural sector for decades. The durability and wear resistance provide the longest lasting hoses for such demanding use. Quick deployment and retrieval, combined with excellent flow rates and long life time, reduce operating cost.

We offer hoses especially designed for use with umbilical **drag hose** systems. This ensures environmentally friendly and safe manure distribution, and also prevents hard-packing of the soil. Lighter hoses are used as **supply hoses** for irrigation and as **feeder hoses** for slurry systems. Our hoses are resistant to most industrial and agricultural

chemicals, ozone and UV-rays. They offer the very highest abrasion resistance and tensile strength. In areas where irrigation water comes from bore holes, our especially designed **well hoses** replace rigid piping for effective and stable delivery of well water to the surface.

Examples of Mandals hoses used in this segment:

THERMOPLASTIC POLYURETHANE HOSES (TPU)

MANDALS DRAGMAN

is especially designed to withstand the extreme tensile stress, pulling forces and abrasion from umbilical slurry systems. Some diameters are available in 300-400 meter lengths.

MANDALS SUPERMAN

is a hose intended for transfer of large volumes under high pressure, and is widely used as supply hoses for large agricultural systems.

MANDALS ULTRAMAN

is a multi purpose transfer hose, which is suitable as a feeder hose or even as a drag hose in smaller umbilical systems. Also suitable for irrigation. Longer lengths available for some diameters.

(TPU)

MANDALS WELLMAN

has a very high tensile strength and pressure rating which is required for use in wells and bore holes to source ground water, whether for irrigation or for potable water.

NITRILE RUBBER HOSES

MANDALS FLEXITEX STANDARD

is a general purpose hose for use in agricultural systems. Also suitable for irrigation.

MANDALS FLEXITEX EXTRA

is a more reinforced fluid transfer hose for agricultural systems, but it may also serve as a drag hose in umbilical systems, or for irrigation.



Oil & gas

CONVENTIONAL

Mandals hoses can be utilized in many processes in the conventional oil & gas sector, whether onshore or offshore. Conductive hoses are suitable as fire hoses in certain environments. They may also be used for transporting flammable liquids in case of oil spills, or simply for

transporting fuel. Lay-flat hoses help make exploration drilling in remote areas both lighter and easier, due to light weight, transportability and ease of deployment. Not to mention the fact that possible damages can be cut off in order to recouple the hose and continue the

operation with minimum downtime. Lay-flat hoses are even used as oil spill lenses and flotation devices. In the case of old and leaking pipelines a lay-flat lining may be the best solution to fix the pipe, instead of having to exchange the entire pipeline or build a completely new one.

Examples of Mandals hoses used in this segment:

THERMOPLASTIC POLYURETHANE HOSES (TPU)

MANDALS SUPERMAN

is designed for long life and maintenance-free service in the harshest environments. This market leading hose is tough and durable with exceptional resistance to abrasion and cutting. The best choice for high volume water transfer.

MANDALS INVERSION LINING

offers a no-dig solution to renovate leaking pipelines, whether underground or under the sea.

MANDALS PROMAN

is a sheath intended for the protection or bundling of f.ex. cables, ropes or chains.

MANDALS MANTEX HP

is a compressed air hose made to withstand higher than usual working pressures, while still offering a light weight solution with its ease of deployment, handling and storage.

NITRILE RUBBER HOSES

MANDALS ANTISTATICA

is an electrically conductive hose which may be used as a fire hose in static environments. It may also be used for transport of flammable liquids in case of oil spills, or simply for bunkering or transport of fuel.

MANDALS MANTEX

is a light weight and easy to transport compressed air hose, and thus perfect for use in remote regions. In case of damages caused by rough use or abrasive terrain the hose can be temporarily fixed in the field simply by pulling a sleeve over the damaged area.

FLEXITEX EXTRA/TROPICAL

is a general discharge hose proven to be a cost effective solution for drill water supply to e.g. rigs. It has little or no reaction to H₂S or saline content, and its flexibility easily brings the water around obstacles, bends and curves.



Hydraulic fracturing

UNCONVENTIONAL OIL & GAS

Mandals lay-flat hoses are "flexible pipelines" made from TPU (thermoplastic polyurethane), and are increasingly replacing rigid piping for optimal water supply. Provided the right quality hose is selected – both in terms of pressure rating, resistance and durability – this optimizes high volume water transfer without any concerns of corrosion or most chemicals (check details with us prior to use).

The rapid and flexible deployment reduces cost by reducing downtime. The adaptability to the terrain, reduction of heavy transport and a more efficient work process also favours lay-flat hoses. This in turn results in a safer work environment, a greatly reduced risk of accidents and a more environmentally friendly expansion.

Lay-flat hoses are easily transported by light vehicles in areas with limited

infrastructure. The longer hose lengths reduce the need for connections and manual labor. This reduces contaminating leakages and spills, as well as efficiency loss in the supply.

After use, the hose lengths may be easily cleaned, reeled up, and relocated to new sites, thus eliminating the costly dismantling and return transport of pipes.

We have been a major supplier to the American fracturing market for several years. To this date we still have zero claims. Think of quality, minimizing risk and lifetime cost. A hose is not a hose!



We assemble, test, certify and deliver our hoses – with your preferred couplings – from our warehouse in Houston, Texas, or from our factory in Mandal, Norway. Short lead times and high service are obvious!

TPU-HOSES

MANDALS SUPERMAN

is designed for long life and maintenance-free service in the harshest environments. This market leading hose is tough and durable with exceptional resistance to abrasion and cutting. The especially developed hose withstands the tough use and rough conditions while delivering water at high pressures. The best choice for high volume water transfer.



Mining industry

Mandals lay-flat hoses are an important part of an optimal water management system. Effective mine dewatering and slope depressurization systems are important components of many surface and underground mining operations.

In high flow and deep well dewatering systems for mines, lay-flat hoses are used to deliver or remove the many thousand gallons of water needed per minute. In

mines where pit slope depressurization is essential to maintain stable slopes, lay-flat hoses offer ease of handling, deployment and retrieval. And if the mining operation is to be taken to a deeper level, bore hoses are used to remove ground water.

Lay-flat hoses are ideal for rapid large volume dewatering due to less pressure drop over large distances. Not to forget

the rapid and flexible deployment compared to other types of rigid hoses or steel pipes.

Mine dewatering takes place in the harshest of environments. This requires extremely abrasion resistant hoses to withstand being deployed down steep, rocky mountain sides, lowered into deep wells and to carry the weight of a full set of submersible pumping equipment.

Examples of Mandals hoses used in this segment:

THERMOPLASTIC POLYURETHANE HOSES (TPU)

MANDALS SUPERMAN

is designed for horizontal and vertical high volume water transfer in rocky and rough environments. High puncture and abrasion resistance ensure a long and maintenance-free service life

MANDALS ULTRAMAN

is a durable lightweight hose for all-round use in the mining sector. Ease of handling and a long life time makes it very cost effective. This hose is also used in deep mines for relining the compressed air lines – available in up to 800 m lengths depending on diameter.

MANDALS WELLMAN

is used for extraction of ground water in deep mines or open pits. Very high pressure resistance and tensile strength to hold the weight of the submersible pump, cable and water column.

NITRILE RUBBER HOSES

MANDALS MANTEX

(See also HP version)

is a lightweight and mobile compressed air hose for exploration drilling in remote areas. Can be manually deployed in both deep mines and open pits.

MANDALS ANTISTATICA

is a conductive fire- and fuel transport hose for use in static environments.

MANDALS FLEXITEX EXTRA

is designed for all-round fluid transfer, and is ideal for use in the mining industry due to its light weight to transfer water to and from the mining area.



Water supply

POTABLE OR INDUSTRIAL SYSTEMS

Water transport in any form is one of the main applications for a lay-flat hose, typically in sectors like firefighting, agriculture and oil and gas.

Drinking water

Drinking water supply is becoming a challenge in many regions. Mandals lay-flat hoses provide an easy to handle and reliable solution to such challenges, whether for temporary or more permanent use. Mandals Aquaman and Mandals Wellman are two potable

water approved hoses for safe transfer of water for from the well or bore hole all the way to the household or the food processing plant. Potable water hoses from Mandals hold the most relevant certificates, including the KTW approval from Germany and the NSF 61 listing from the USA.

Water pipe rehabilitation

Leaking or corroded main lines present another challenge, even in areas where water may be abundant. The Mandals

Tube In and the Mandals Inversion Lining are products especially developed for the no-dig renovation of drinking water as well as waste water, sewer or gas lines.

Industrial water

For high volume transfer of produced or brackish water Mandals Superman offers a hardwearing, reliable and efficient solution. Rubber hoses such as Mandals Flexitex Extra is also used to return e.g. drill water back to the bore hole, or irrigation water out to the fields.

Examples of Mandals hoses used in this segment:

POTABLE WATER HOSES

MANDALS WELLMAN (TPU)

is a hose with exceptional tensile strength designed as a permanent alternative to traditional material in water wells where submersible pumps are used. No corrosion, no scale build up, low friction and improved flow rates make this a very cost effective solution.

MANDALS AQUAMAN (TPU)

can be used as an emergency bypass or even as a permanent alternative for supply of drinking water, whether for emergencies or planned projects. This hose is also used in the ship service sector, and even for festivals other temporary events.

PIPE REHABILITATION

is offered with different types of hoses for rehabilitation of drinking water pipelines, see page 18 for further details.

INDUSTRIAL WATER HOSES

MANDALS SUPERMAN (TPU)

is a hose intended for high volume fluid transfer, whether water needs to be removed or supplied quickly and safely under high pressures.

MANDALS ULTRAMAN (TPU)

is a general purpose fluid transfer hose which adapts well to the terrain and can be stored easily. Well suited for e.g. industrial water, process water, sewage and dewatering.

MANDALS FLEXITEX EXTRA (Nitrile rubber)

is a flexible and light weight rubber hose for general fluid transfer whether in flood handling, agriculture or industry.



Pipe rehabilitation

TRENCHLESS, NO-DIG, CIPP SOLUTIONS FOR WATER, SEWAGE AND GAS PIPES

Pipeline rehabilitation is a hot political topic worldwide as rust, leakages, earth quakes and pure age wear out old pipes. Renovation of deteriorated pipe lines is critical in some of the most heavily populated areas globally, where there is usually limited access to the underground pipelines. The negative effects range from loss of valuable drinking water to risk of ground pollution or even the danger of gas explosions in city centres. Mandals **pipe rehabilitation hoses** can be used for all kinds of leaking transfer

pipes, whether for drinking water, methane gas, sewage or industrial chemicals. The installation is either by inversion or pulling. This provides a permanent solution and extends the life time of the existing pipe. Prior to installation all that is needed is a regular cleaning procedure of the host pipe by Polly Pig or other method.

The main advantages of using the Mandals pipe renovation hoses are the reduced down period and the cost

savings. There is no need to invest in new pipes, or disrupt traffic with endless excavation works. Leaks and corrosions are stopped and water quality is improved. The liner is flexible in terms of the diameter variations of the original pipe, and it easily passes sharp bends even in longer lengths.

During the pipe rehabilitation work lay-flat hoses can also be used as **temporary by-pass systems** for water or waste water, see page 16 for more details.

BY PULLING

Mandals Tube In is made with polyethylene (PE) or drinking water approved TPU for renovation of leaking drinking water mains, and holds the DVGW approval. The hose is covered inside and outside by PE using the "extrusion through the weave" production method. Mandals Tube In comes in a "U-shape" which in combination with high flexibility allows easy installation into the

host pipe by pulling, also through sharp bends. By recoupling and just setting the installed hose under normal water pressure, it opens up and expands towards the inner host pipe wall. No steaming is needed to inflate the hose afterwards. Special end couplings are available on request.

Mandals Tube In is a semi-structural,

stand-alone hose which reinforces the existing pipe and will ensure continual service even if the host pipe should break. The easy installation and short down period of the water supply make Mandals Tube In a unique renovation system for drinking water mains. Tube In can also be made with industrial grade PU for sewage or waste water pipes.

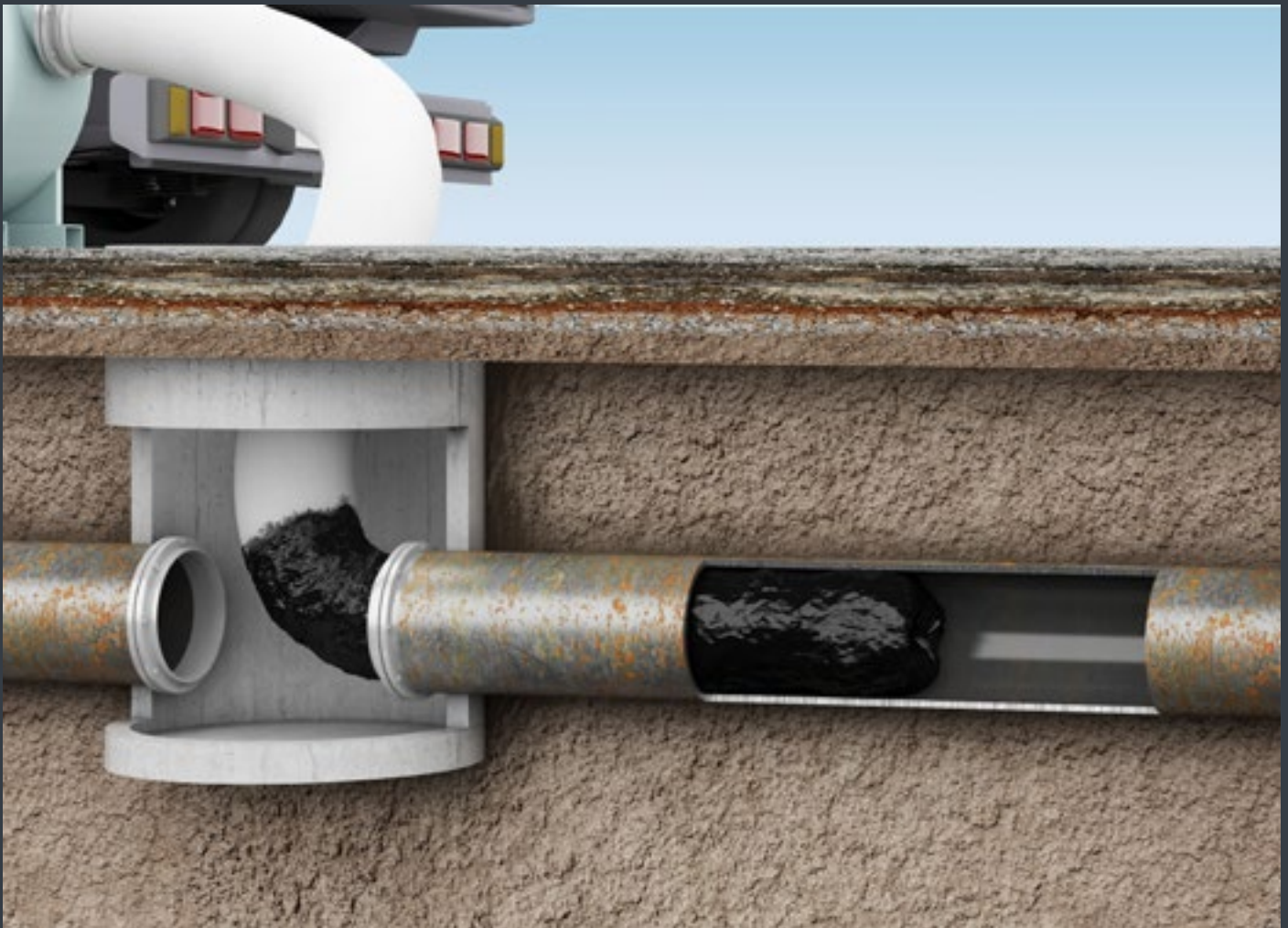
BY INVERSION

Mandals Inversion Lining is an extremely flexible polyethylene or hytrel coated hose, designed for relining and renovation of leaking transfer pipes whether for drinking water, methane gas, sewer or industrial chemicals. The weave provides the longitudinal and circumferential strength, whilst the polymer layer, which becomes the final inside barrier after the inversion, ensures impermeability and chemical resistance

to the conveyed fluid or gas.

Prior to the installation, the lining is coated inside by a liquid epoxy resin, which attaches permanently to the inner pipe wall when cured by steaming. The lining is then inverted into the host pipe with special equipment using either compressed air or water as the pressure medium. After inversion the lining can be opened from the inside by a remote

controlled robot drilling to connect service lines, and is totally maintenance free. The smooth lining helps increase flow, and reduction of pipe cross section is minimal. The lining is also resistant to vibrations and settings underground, and is resistant to leaks even at high internal pressure. And of course - long lengths can be installed with minimal obstruction of traffic above ground.



Step by step



① **Prior to rehabilitation**
Pipe before inspection and cleaning

② **During rehabilitation**
Epoxy-impregnated hose inverted into pipe

③ **After rehabilitation**
PU lining has become a new, smooth pipe wall

Construction and drilling

LIGHTWEIGHT HOSES INCREASE SAFETY, EFFICIENCY AND OPERATIONAL EXCELLENCE

The construction sector is in need of efficient and modern techniques and equipment for increased safety and reduced cost. Mandals offers hoses especially developed to cover specific needs in the construction segment.

Light weight and flexibility are the main advantages for the revolutionary **concrete boom end hose**. It is operator friendly and offers ease of pour in tight areas, especially suited for ICF forms, tall walls and columns where space is

minimal. The lay-flat design allows better flow control and lower placement rates, while it meets strict safety regulations.

Our market leading **compressed air hoses** combine light weight and flexibility with the highest pressure ratings and safety. The long lengths mean it can easily be deployed and moved around in otherwise inaccessible areas. The compressor may be left behind, while only the drill hammer is brought up the mountain sides, or into the jungle, by

manual labour if needed. The flexible hose adapts to the terrain. Low pressure loss ensures efficiency, and in case of smaller damages it is easily repaired temporarily on site to keep operations uninterrupted. In case of burst, for safety reasons the hose will always split longitudinal.

And should the construction projects require **temporary bypass pipelines** for drinking water, sewage or other fluids, check more details on page 16.

Examples of Mandals hoses used in this segment:

THERMOPLASTIC POLYURETHANE HOSES

MANDALS MORTAR

is a polyaramid based easy to maneuver hose for deploying concrete with accuracy. Lightweight and semi rigid eases the manual handling and every day use.

MANDALS ULTRAMAN

is a reinforced multi purpose hose with high wear and tear properties.

MANDALS MANTEX HP

is a compressed air hose for the highest need of pressure. Easy to carry, deploy and/or transport. Ideal in tight construction areas.

MANDALS AQUAMAN

is ideal for setting up as temporary bypass hose, while construction work set the pipes out of order. Is approved for potable water.

NITRILE RUBBER

MANDALS MANTEX

is a lightweight compressed air hose. Easy to carry, deploy and/or transport air thorough long hose lengths up high buildings without the need of heavy machinery. Ideal in tight construction areas.

MANDALS FLEXITEX


is a lightweight general purpose hose ideal f. ex. as a wash down or transfer hose.



Emergency response

FIRE FIGHTING, FLOOD CONTROL & NUCLEAR COOLING SYSTEMS

Mandals lay-flat hoses are used in large mobile stand-by emergency firefighting systems around the world. Stored securely and centrally to reduce the response time for a city, a factory, or a large refinery where the consequences of a fire is often dramatic. Fire hoses are also used in case of flooding, for quick and safe dewatering of large or small areas.

With roots in the maritime industry dating back to 1775, Mandals delivers fire hoses also to the international maritime industry and our fire hoses have been standardized for offshore oil rigs in the North Sea, a proof of quality in the most demanding of markets. Most of our fire hoses have obtained the MED maritime certification (the  mark).

After the Fukushima accident the requirements for stand by emergency cooling systems have become stricter also for nuclear power plants, and lay-flat hoses have proven to have the right properties in terms of pressure rating, flow rate and mobility for such critical systems.

Examples of Mandals hoses used in this segment:


TPU-HOSES

MANDALS SUPERMAN

has a very high pressure rating, and is suitable for larger emergency systems where speed of deployment and the maximum volume is required.

NITRILE RUBBER HOSES

MANDALS GUARDMAN


has a proven track record from applications in the coldest and harshest regions in Northern Norway to the deserts of Australia. This hose carries the  mark.

MANDALS ANTISTATICA

is a fire hose intended for use in static environments. Also suitable for oil spill clean up.

UNCOVERED TEXTILE HOSES

MANDALS MERTEX

is an uncovered fire hose used widely in the maritime industry, and carries the  mark.

MANDALS GETEX

is an uncovered and lightweight fire hose very well suited for use in fire hose cabinets.

COUPLINGS

NORLOCK AND STORZ

We stock NorLock and Storz fire hose couplings in brass or aluminum for assembly with Mandals hoses. For other types of accessories please contact us.



Special applications

Lay-flat hoses from Mandals have been and will continue to be used in various applications, some of which we as the manufacturer never even considered possible.

We have seen lay-flat hoses being used as flotation devices both for silt curtains, for bunkering hoses, for oil lenses and for equipment at fish farms.

The fact that the hoses can be inflated and deflated also leads to certain uses, e.g. tent poles in inflatable tents for emergency relief camps (see picture below). In some applications the hoses are even used both as a pressing device, and as a sealing element.

Due to the very abrasion resistant surface and the reinforcing textile, some hoses

are cut lengthwise and used as protective sheaths over boat rims or other exposed areas. And even the inner textile jacket by itself is sometimes used, either for protection or to hold together a bundle of, for example, cables, ropes or other tubes.

So should you have a challenge that you haven't found the right solution to, feel free to contact us!





The silt curtain is used below water to hold the polluted water separate from the clear water, and is held up by the white flotation devices made from Mandals hoses that are filled with air.

Couplings and fittings

Standard couplings

We have standardized on some of the most commonly used couplings for our fire hoses – such as Storz and NorLock. For our compressed air hoses we offer the typical claw couplings and also a specialized high pressure coupling for use with the 2" Mantex HP hose. And for our agricultural hoses we stock the most widely used Storz couplings.

For more specialized applications we can give our recommendations and also refer to local or international suppliers, or source specific couplings for your project as needed.

Especially designed couplings

For the Mandals Wellman hose we have designed our own range of couplings that meet the pull strength, pressure rating and drinking water approvals for this hose.

For the Mandals Mortar we have also designed a customized coupling with Victaulic end, to be used safely with our thin walled and light weight concrete boom end hose.

Large dimension couplings

As a leading lay-flat hose manufacturer with a great focus on large dimension world class hoses, we have close relationships with several international premium couplings suppliers. We will be happy to recommend solutions based on our experience in different areas of use, to ensure the best total performance of the complete system. Feel free to contact us for advice.

Services offered

We can wire whip, assemble or externally crimp standard couplings as well as our

own specialty couplings from stock.

We also have facilities to pressure test assembled hoses on request. We can carry out special requests such as adding burst sleeves, or source and assemble Bauer couplings, Cam-lock, Instantaneous or other types of fittings for your project. All couplings are sourced through leading manufacturers or maybe even made in-house.

Safety

Always make sure the couplings used have a higher pressure rating than the hose! For safety reasons all our hoses are designed so that they will burst longitudinal long before our recommended couplings break.

MORTAR COUPLING



WELLMAN COUPLING





Product information

- OIL & GAS
- MINING
- PIPE REHABILITATION
- AGRICULTURE
- HYDRAULIC FRACTURING
- WATER SUPPLY
- CONSTRUCTION
- EMERGENCY RESPONSE

TPU hoses by mandals

Mandals TPU hoses are among the most innovative world class hoses, made from extruded thermoplastic polyether based polyurethane (TPU) with excellent wear and tear properties. The TPU is extruded through the reinforcement made from circular woven high tenacity filament polyester yarn. This method gives a very strong bonding between cover and lining as well as firmly encapsulating the woven polyester. The abrasion resistance of the Mandals TPU hoses is among the highest available, and our TPU hoses also have excellent resistance against the most commonly used chemicals, UV radiation, hydrolysis and fungus degradation.

The textile reinforcement ensures very high tensile strength combined with maximum 2% extension in length at recommended working pressures. This prevents “snaking” of the hose when pressurized. Similarly, the interlocking weave gives exceptionally high pressure ratings. Mandals TPU hoses can operate in a temperature range from -50°C to +75°C (-58°F to +167°F), intermittent use up to +80°C (176°F). Standard lengths are available up to 200 meters, while longer lengths are possible on request for many diameters.

SUPERMAN - HVT



- FRACTURING / MINING / WATER / AGRICULTURE / EMERGENCY

This hose is intended for “High Volume Transfer” of fluids at higher than normal working pressures, yet is light weight and easy to deploy. The excellent abrasion resistance prevents the hose from being damaged when deployed in rugged terrain where other types of outer cover would be worn off quickly due to the pulsations of the flow combined with the weight of the filled hose. The heavily reinforced weave ensures minimum extension in length and minimum “snaking” of the deployed hose. Available up to 200 meters in dimensions 8”, 10” and 12”.

ULTRAMAN



- MINING / WATER / AGRICULTURE

This is a more lightweight hose ideal for f. ex. dewatering, fluid transfer, as a supply hose or as a temporary bypass line for sewage or slurry. A high quality multi purpose industrial hose with a long service life. Ultraman is available from 1” to 12” in 200 meter lengths or longer.

DRAGMAN



● SLURRY, WASTE WATER & MINE DEWATERING

This hose is intended for use with umbilical drag systems and is especially designed, with substantially increased abrasion resistance and tensile strength, to withstand the continuous severe stress from the pulling and abrasion.

Dragman is available in three different versions for normal, demanding and extreme use – ask us for details. Note - never tow one part of the hose across another. The tensile strength and abrasion resistance also makes it an alternative for transport of abrasive substances in the construction industry. Available up to 8", some dimensions in longer than 200 m lengths.

MORTAR



● CONSTRUCTION

This is a revolutionary light weight concrete boom end hose, operator friendly and easy to handle, designed to satisfy strict safety regulations such as the North American ASME B30.27 2009. Mandals Mortar is a unique specialty tool – getting the job done quickly, easily and with precision. Improved flow control at lower placement rates. Ideal when space is minimal. The bright colour offers visibility. Lengths are available from 1 – 200 meters, and we also offer especially designed and tested Victaulic steel couplings.

The exceptional pressure rating of 172 bar/2 500 psi may offer advantages also in other applications, ask us for details.

WELLMAN



● WATER / MINING / EMERGENCY / AGRICULTURE

A flexible bore hose for use in ground water abstraction – for drinking water, irrigation or in mine dewatering. Easier to handle and install than conventional rigid piping of metal or plastic, with greatly improved flow rates and efficiency due to no scale build up or corrosion, and up to 15% swell during operation. Maximum length extension is 2%, with minimal torque. Integrated loops for attaching the electrical cable.

Especially designed couplings and the exceptional tensile strength carry the weight of the pump, the electrical cable, the column of water and the couplings for problem free use over time. Lengths up to 400 meters in 2" to 6", for use in max 250 m deep wells. The very high pressure rating also makes this hose preferred for emergency systems with needs for high volume water transfer.

Potable water certifications for Wellman are:

WRAS approved to BS 6920UK.

KTW-DVGW approval, Germany.

W270 approval, Germany.

NSF 61 listing, USA.

AQUAMAN



● WATER / CONSTRUCTION

Aquaman is used for potable water bypass systems both after disasters as well as for planned construction projects or for bunkering drinking water in the ship industry. Excellent abrasion resistance enables a very thin and lightweight hose so that large diameters can be quickly deployed and retrieved.

Dimensions from 1" to 12" are available in 200 meter or longer lengths. Fewer couplings mean fewer problems. The hose is resistant to ozone, most chemicals, hydrocarbons, mildew, rotting and more, and is very kink resistant even in tight bends.

Aquaman has the following potable water certifications:

WRAS approved to BS 6920, UK.

KTW-DVGW approval, Germany.

W270 approval, Germany.

NSF 61 listing, USA.

TPU hoses by mandals

MANTEX HP



● CONSTRUCTION / MINING / OIL & GAS

This is a lightweight yet sturdy double jacket hose developed for more demanding use of compressed air tools. Both the inner and outer cover is extruded with oil resistant thermoplastic polyurethane, which gives excellent abrasion and puncture resistance combined with a very high burst pressure.

The hose can be supplied with different kinds of couplings or screw connections, assembled at Mandals. For safety the hose will always tear longitudinal in case of burst. Available in 2" in maximum 40 meter lengths. Operating temperature range is -50°C to +100°C (-58°F to +212°F).

PROMAN



● OIL & GAS

Proman is the first choice in tubular protective sheathing due to low internal friction combined with high flexibility and long durability. The hose is pulled over cables, ropes, chains or bundles of such for protection or safety. The textile reinforcement is extruded only on the outside with a 1 mm layer of TPU providing excellent abrasion resistance and minimal risk of delamination. And the textile inside provides low internal friction against the cables or ropes.

Mandals Proman is resistant to most chemicals, oil and UV rays. The hose can be delivered in continuous lengths, and either tubular or split (for use as a flat sheet). Contact us if you have other needs for protective tubular or flat sheaths, whether in rubber, TPU or pure textile.

Nitrile rubber hoses by mandals

Our rubber hoses are made from a blend of nitrile rubber and PVC, with an added UV barrier. The rubber is fully extruded through the circular woven polyester jacket, ensuring exceptionally good bonding between cover and lining to prevent delamination. Thanks to the interlocking circular weave of the jacket (instead of just being braided), the hoses do not stretch when pulled, and also have a very high pressure rating to wall thickness ratio. The hoses have high resistance to the most commonly used chemicals. They can operate from -30°C to +75°C (-22°F to +167°F), intermittent use up to +80°C (+176°F). Lengths are available up to max 200 meters, in dimensions from ¼" to 6".

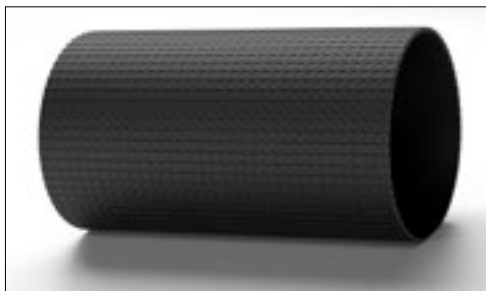
MANTEX



● CONSTRUCTION / MINING / OIL & GAS

A lightweight and mobile, yet rugged and hardwearing hose, mainly used for compressed air, but also for waste water or even for snow production. The low weight combined with a high pressure rating makes the hose popular and easy to use. For safety the hose will always tear longitudinal in case of burst. Small damages may be fixed temporarily on site by simply pulling a sleeve over the damaged spot to continue operations. Lengths up to 200 meters are available in dimensions from ¼" to 3".

FLEXITEX EXTRA



● OIL & GAS / AGRICULTURE / WATER / MINING

Mandals Flexitex Extra is intended for more demanding fluid transfer, f. ex. for drill water supply to onshore rigs, as a feeder hose for larger irrigation and slurry units in the agricultural sector or as a general transfer hose for non-flammable liquids in construction, mining and industry. It is easy to store and deploy/retrieve, adapts well to the terrain and can be routed around obstacles. The design ensures minimum stretching and a very high pressure rating to wall thickness ratio. The rubber blend has excellent chemical resistance and little or no reaction to H₂S or saline content. Lengths up to 200 meters means less couplings and less pressure drop.

FLEXITEX STANDARD



● AGRICULTURE / CONSTRUCTION / WATER

This lightweight general purpose hose can be used f. ex. as a feeder hose for smaller irrigation and slurry units in the agricultural sector, or as a light weight wash down or transfer hose for water based and non-polar liquids in construction and general industry. Lengths up to 200 meters means less couplings and less pressure drop.


GUARDMAN



● EMERGENCY

Our original red fire hose has been chosen by the most demanding of customers for decades. Offshore oil rigs in the Norwegian North Sea and also international shipping have standardized on this fire hose.

To reduce friction loss Guardman absorbs pressure increase by swelling, not stretching. It tolerates most low aromatic oil products and commonly used chemicals. The special rubber blend renders the hose light and pliable with no adverse effects on operability in the full temperature range.

Guardman has obtained the maritime  mark as well as a large number of national approvals, and is also tested in accordance with the following standards:

NS 4016 – 4018, SS 2840, DIN 14811, NEN 2242, BS 6391 type 3.

Is also available upon request in 42 mm with BP 55 bar/798 psi.

ANTISTATICA



● EMERGENCY / OIL & GAS / MINING

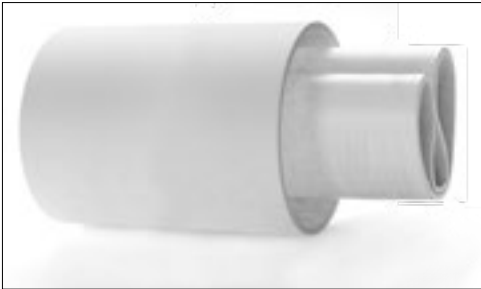
Intended for transfer of fuels and other flammable liquids, but can also be used in the construction and general industry as well as for fire-fighting in conductive environments, or for removal of oil spills. The hose itself is made electrically conductive through an additive in the rubber blend, to remove the risk of breaking conductive wires commonly used in rubber hoses for this purpose. The volume resistivity is max. 10⁶ Ohm/m.

Pipe Rehabilitation hoses by mandals

Pipe rehabilitation hoses from Mandals can be used for trenchless renovation of all kinds of leaking transfer pipes, whether drinking water, methane gas, sewer or industrial chemicals. The installation is done either by inversion or by pulling. Prior to installation all that is needed is a regular cleaning procedure of the host pipe by pipe line pigging, high pressure cleaning or other cleaning method. National certification is obtained in Norway and several other European countries.

MANDALS TUBE IN

● PIPE REHABILITATION / CONSTRUCTION / WATER



Mandals Tube In is developed for renovation of leaking drinking water or sewage pipes, and is made from a textile reinforcement fully extruded with a flexible polyethylene material (PE) or TPU. The weave is made from high tenacity filament polyester yarn. This is covered with the thermoplastic polymer inside and outside by the "extrusion through the weave" production method, giving an outstanding adhesion level. The hose is packed in a "U-shape" for easy installation by pulling and recoupling with special end couplings. Mandals Tube In is a semi-structural, stand-alone hose. Standard length is 200 meters, but longer lengths can be made on request. The nominal inner diameter of the pipe ranges from DN80 to DN300.

MANDALS INVERSION LINING – PE

● PIPE REHABILITATION / CONSTRUCTION / WATER



Made from flexible polyethylene (LLDPE) and suitable for renovation of drinking water pipes, sewer lines and other fluid transfer pipes. The outer PE layer of 1.2 mm is extruded on the circular polyester weave. Mandals Inversion Lining covers a nominal internal pipe diameter range from DN150 up to DN300. Section lengths are available up to 1000 meters per bobbin. Longer lengths or special projects are possible on request. The standard burst pressure of min. 10 bar can be increased to 20-30 bar if requested, resulting in a reinforcement able to cope also with larger holes in the host pipe.

MANDALS INVERSION LINING – HY

● PIPE REHABILITATION / CONSTRUCTION / OIL & GAS



Made from hytel (HY) and suitable for renovation of gas pipes (natural gas) at low or medium pressure. The outer HY layer of 1.2 mm is extruded on the circular polyester weave. Mandals Inversion Lining covers a nominal internal pipe diameter range from DN150 up to DN300. Section lengths are available up to 1000 meters per bobbin. Longer lengths or special projects are possible on request. The standard burst pressure of min. 10 bar can be increased to 20-30 bar if requested, resulting in a reinforcement able to cope also with larger holes in the host pipe.


Textile hoses by mandals

Textile covered hoses are extremely lightweight and flexible. They are well suited for use in smaller fire hose systems both in private homes and the maritime, industrial or public sector. Available in continuous lengths from ¾" to 4".

MERTEX




● EMERGENCY

Mandals Mertex is a circular woven hose with an extruded inner lining of thermoplastic polyurethane (TPU). The hose is very lightweight yet rugged with good mechanical properties. Mandals Mertex performs excellent under all climatic conditions from -50°C to +75°C. Intermittent use up to +80°C. Mandals Mertex is manufactured in accordance with BS 6391 Type 1. The hose has obtained the  mark and (MED) certificate. The hose can be delivered in continuous lengths.

MARTEX



● EMERGENCY

Mandals Martex is an uncovered fully synthetic firehose made from circular woven polyester with an inner lining made from EPDM rubber. The circular woven polyester is robust and does not rot when wet for extended periods. The hose is very lightweight and ideal for use where hoses have to be handled over longer distances. Mandals Martex is excellent under all climatic conditions and can be used in a temperature range from -40°C to +90°C. Mandals Martex is produced to and tested in accordance with NS 4016 - 4018 and BS 6391 type 1. The hose has been approved by a number of national authorities and has obtained the  mark and (MED) certificate. The hose can be delivered in continuous lengths.

GETEX



● EMERGENCY

Mandals Getex is an uncovered fully synthetic firehose made from circular woven polyester with an inner lining made from EPDM rubber. The hose has good chemical resistance against common chemicals. Mandals Getex remains flexible and easy to handle under most climatic & temperature conditions. It can be safely used from -40°C to +90°C. The hose can be delivered in continuous lengths.

FORMTEX



● EMERGENCY

Mandals Formtex is a semi rigid fire hose which meets the demand for extra light and easy-to-handle hoses used in hose reel cabinets. The weight is only 1/3 of conventional rigid rubber/pvc hoses used for this application. The polyester outer cover ensures that friction to floor or other surfaces is kept at a minimum. The circular woven design combines high pressure rating and strength with very easy handling. The lining is made from EPDM rubber with good chemical and ozone resistance. The range of Formtex hoses can be delivered in continuous lengths up to 600 meter. Mandals Formtex is approved according to EN 694.

| BURST PRESSURE – BARS | | | | | | | | | | | | | | | | | | | |
|-----------------------------------|----------------|---------|---------|---------|---------|---------|---------|-----------------------|---------|---------|----------|----------|----------|----------|------------------------|----------|----------|----------|----|
| mandrels | Type | Ø | 20,0 mm | 25,4 mm | 38,0 mm | 45,0 mm | 51,0 mm | 65,0 mm ¹⁾ | 76,0 mm | 90,0 mm | 102,0 mm | 114,0 mm | 127,0 mm | 140,0 mm | 152,0 mm ²⁾ | 203,0 mm | 254,0 mm | 305,0 mm | |
| | TPU | Aquaman | | | 50 | 45 | | 45 | 42 | 42 | | 36 | | 30 | | 32 | 26 | 21 | 15 |
| Dragman | | | | | | | | | | 40 | 38 | 35 | 32 | 28 | 28 | 28 | | | |
| Dragman Extra | | | | | | | | | | | 35 | 35 | 28 | 28 | 28 | | | | |
| Inversion Lining ^{3) 4)} | | | | | | | | | | | 12 | | | | 10 | 10 | 10 | 10 | |
| Mantex HP | | | | | | | 175 | | | | | | | | | | | | |
| Mineman | | | | | | | | | | | | | | | 32 | 42 | | | |
| Mortar ³⁾ | | | | | | | | | | | | 172 | | | | | | | |
| Proman | | | | | | | | | | | | | | | | | | | |
| Superman | | | | | | | | | | | | | | | | | 42 | 36 | 30 |
| Tube In ³⁾ | | | | | | | | | | 48 | 38 | | 32 | | 32 | | 32 | 32 | 30 |
| Ultraman | | | | | | | | 70 | 50 | 48 | 40 | 36 | 34 | 32 | | 32 | 26 | 21 | 15 |
| Wellman | | | | | | | | 60 | | 60 | | 60 | | 60 | | 60 | | | |
| Rubber | Antistatica | | 100 | 100 | 60 | | 45 | 45 | 50 | | 40 | | 30 | | 42 | | | | |
| | Flexitex Extra | | | | | | | | 50 | 40 | 40 | 35 | 30 | | 42 & 55 | | | | |
| | Flexitex Std | | | | 60 | | 45 | 45 | 45 | 40 | 35 | | | | 36 | | | | |
| | Guardman | | | 100 | 55 | 50 | 45 | 45 | 45 | 40 | 36 | | | | 36 | | | | |
| | Mantex | | 100 | 100 | 85 | | 60 | 50 | 50 | | | | | | | | | | |
| Textile | Formtex Ultra | | 160 | 130 | | | | | | | | | | | | | | | |
| | Getex | | | 70 | 60 | | 50 | 45 | 45 | | 35 | | | | | | | | |
| | Martex | | | | 70 | 65 | 50 | 50 | 50 | | | | | | | | | | |
| | Mertex | | | | 60 | | 55 | 50 | | | | | | | | | | | |

For footnotes and important details re. diameter and product range, see page 38.

| LONGITUDINAL TENSILE STRENGTH – TONS | | | | | | | | | | | | | | | | | | |
|--------------------------------------|----------------|---------|---------|---------|---------|---------|---------|-----------------------|---------|---------|----------|----------|----------|----------|------------------------|----------|----------|----------|
| mandrels | Type | Ø | 20,0 mm | 25,4 mm | 38,0 mm | 45,0 mm | 51,0 mm | 65,0 mm ¹⁾ | 76,0 mm | 90,0 mm | 102,0 mm | 114,0 mm | 127,0 mm | 140,0 mm | 152,0 mm ²⁾ | 203,0 mm | 254,0 mm | 305,0 mm |
| | TPU | Aquaman | | | 1,5 | 2,6 | | 3,4 | 4,1 | 4,8 | | 10,4 | | 12,1 | | 15,0 | 19,7 | 29,6 |
| Dragman | | | | | | | | | | 12,0 | 13,1 | 15,9 | 17,7 | 20,7 | 24,8 | 46,1 | | |
| Dragman Extra | | | | | | | | | | | 15,9 | 17,7 | 20,7 | 24,8 | 27,1 | | | |
| Inversion Lining ³⁾ | | | | | | | | | | | 11,4 | | | | 19,9 | 24,0 | 30,6 | 42,5 |
| Mantex HP | | | | | | | 14,3 | | | | | | | | | | | |
| Mineman | | | | | | | | | | | | | | | 14,9 | 37,0 | | |
| Mortar ³⁾ | | | | | | | | | | | | 80 | | | | | | |
| Proman | | | | | | | 6,8 | 8,6 | 9,0 | 11,3 | 12,3 | 13,7 | 15,0 | | 19,2 | | | |
| Superman | | | | | | | | | | | | | | | | 37,0 | 47,2 | 56,0 |
| Tube In ³⁾ | | | | | | | | | 6,3 | 8,1 | | 9,6 | | 11,9 | | 29,6 | 36,8 | 44,8 |
| Ultraman | | | | | | | 5,4 | 6,5 | 7,9 | 9,1 | 10,1 | 10,8 | 12,0 | | 14,9 | 18,9 | 23,7 | 38,2 |
| Wellman ⁵⁾ | | | | | | | 6,0 | | 11,0 | | | 18,0 | | 22,0 | 28,0 | | | |
| Max. End Load ⁵⁾ | | | | | | 2,0 | | 3,6 | | | 6,0 | | 7,2 | 9,3 | | | | |
| Rubber | Antistatica | | 1,9 | 2,3 | 2,9 | | 3,8 | 4,2 | 8,1 | | 10,2 | | 12,2 | | 16,6 | | | |
| | Flexitex Extra | | | | | | | | 8,1 | 9,1 | 10,2 | 11,2 | 12,2 | | 16,6 & 24,6 | | | |
| | Flexitex Std | | | | 2,9 | | 3,8 | 4,2 | 5,2 | 8,0 | 8,8 | | | | 16,1 | | | |
| | Guardman | | | 2,3 | 3,1 | 3,4 | 3,9 | 5,0 | 7,0 | | 9,2 | | | | 16,1 | | | |
| | Mantex | | 1,9 | 2,3 | 3,5 | | 4,7 | 6,7 | 8,1 | | | | | | | | | |
| Textile | Formtex Ultra | | | | | | | | | | | | | | | | | |
| | Getex | | | | 4,8 | | 6,3 | 6,9 | 8,1 | | 11,5 | | | | | | | |
| | Martex | | | | 5,9 | | 7,3 | 9,1 | 10,8 | | | | | | | | | |
| | Mertex | | | | 5,7 | | 7,2 | 8,7 | | | | | | | | | | |

For footnotes and important details re. diameter and product range, see page 38.

| mandolats | | WALL THICKNESS – MM | | | | | | | | | | | | | | | | | | |
|-----------|--------------------------------|---------------------|-----|---------|---------|---------|---------|---------|-----------------------|---------|---------|----------|----------|----------|-----------|------------------------|----------|----------|----------|-----|
| | | Type | Ø | 20,0 mm | 25,4 mm | 38,0 mm | 45,0 mm | 51,0 mm | 65,0 mm ¹⁾ | 76,0 mm | 90,0 mm | 102,0 mm | 114,0 mm | 127,0 mm | 140,0 mm | 152,0 mm ²⁾ | 203,0 mm | 254,0 mm | 305,0 mm | |
| TPU | Aquaman | | | 1,6 | 2,0 | | | 2,2 | 2,3 | 2,4 | | | 3,0 | | 3,0 | | 3,0 | 3,2 | 3,3 | 3,4 |
| | Dragman | | | | | | | | | | | | 3,5 | 3,5 | 3,6 | 3,6 | 3,7 | 3,7 | 4,4 | |
| | Dragman Extra | | | | | | | | | | | | 4,2 | 4,2 | 4,0 | 4,0 | 4,0 | | | |
| | Inversion Lining ³⁾ | | | | | | | | | | | | 1,7 | | | 1,9 | 1,9 | 2,0 | 2,2 | |
| | Mantex HP | | | | | | | 4,4 | | | | | | | | | | | | |
| | Mineman | | | | | | | | | | | | | | | 3,9 | 4,2 | | | |
| | Mortar ³⁾ | | | | | | | | | | | | 4,2 | | | | | | | |
| | Proman | | | | | | | 1,6 | 1,6 | 1,6 | 1,6 | 1,7 | 1,7 | 1,7 | | 1,7 | | | | |
| | Superman | | | | | | | | | | | | | | | | | 4,2 | 4,3 | 4,5 |
| | Tube In ³⁾ | | | | | | | | | 3,0 | 3,2 | | 3,3 | | 3,3 | | | 3,8 | 4,0 | 4,3 |
| | Ultraman | | | | | | | 2,6 | 2,6 | 2,8 | 2,9 | 3,0 | 3,0 | 3,0 | | 3,0 | 3,2 | 3,3 | 3,4 | |
| | Wellman | | | | | | | 3,0 | | 3,2 | | 3,6 | | 4,0 | | 4,0 | | | | |
| Rubber | Antistatica | | 2,3 | 2,5 | 2,2 | | 2,2 | 2,2 | 3,1 | | | 3,3 | | 3,3 | | 3,8 | | | | |
| | Flexitex Extra | | | | | | | | 3,1 | 3,2 | 3,2 | 3,2 | 3,3 | | 3,8 & 4,0 | | | | | |
| | Flexitex Std | | | | 2,2 | | 2,2 | 2,2 | 2,5 | 2,7 | 2,7 | | | | 3,2 | | | | | |
| | Guardman | | | 2,5 | 2,2 | 2,2 | 2,2 | 2,2 | 2,6 | 2,6 | 2,7 | | | | 3,0 | | | | | |
| | Mantex | | 2,3 | 2,5 | 2,5 | | 2,5 | 2,9 | 3,1 | | | | | | | | | | | |
| Textile | Formtex Ultra | | 2,5 | 2,5 | | | | | | | | | | | | | | | | |
| | Getex | | | 1,7 | 1,7 | | 1,8 | 2,1 | 2,3 | | 2,3 | | | | | | | | | |
| | Martex | | | | 2,0 | | 2,1 | 2,3 | 2,5 | | | | | | | | | | | |
| | Mertex | | | | 1,6 | | 1,8 | 1,8 | | | | | | | | | | | | |

For footnotes and important details re. diameter and product range, see page 38.

| mandolats | | WEIGHT – KG/METER | | | | | | | | | | | | | | | | | | |
|-----------|--------------------------------|-------------------|------|---------|---------|---------|---------|---------|-----------------------|---------|---------|----------|----------|----------|----------|------------------------|----------|----------|----------|------|
| | | Type | Ø | 20,0 mm | 25,4 mm | 38,0 mm | 45,0 mm | 51,0 mm | 65,0 mm ¹⁾ | 76,0 mm | 90,0 mm | 102,0 mm | 114,0 mm | 127,0 mm | 140,0 mm | 152,0 mm ²⁾ | 203,0 mm | 254,0 mm | 305,0 mm | |
| TPU | Aquaman | | | 0,17 | 0,30 | | | 0,44 | 0,54 | 0,70 | | | 1,07 | | 1,48 | | 1,72 | 2,30 | 3,08 | 3,80 |
| | Dragman | | | | | | | | | | | | 1,10 | 1,35 | 1,50 | 1,67 | 1,82 | 2,04 | 3,30 | |
| | Dragman Extra | | | | | | | | | | | | | 1,60 | 1,73 | 1,85 | 2,03 | 2,25 | | |
| | Inversion Lining ³⁾ | | | | | | | | | | | | | 0,48 | | | 0,81 | 1,20 | 1,52 | 1,95 |
| | Mantex HP | | | | | | | 0,82 | | | | | | | | | | | | |
| | Mineman | | | | | | | | | | | | | | | 2,10 | 3,10 | | | |
| | Mortar ³⁾ | | | | | | | | | | | | | 1,73 | | | | | | |
| | Proman | | | | | | | 0,30 | 0,32 | 0,37 | 0,43 | 0,50 | 0,60 | 0,70 | | 0,90 | | | | |
| | Superman | | | | | | | | | | | | | | | | | 3,10 | 4,10 | 5,15 |
| | Tube In ³⁾ | | | | | | | | | 0,75 | 1,11 | | 1,48 | | 1,65 | | | 2,75 | 3,90 | 4,75 |
| | Ultraman | | | | | | | 0,52 | 0,64 | 0,78 | 0,95 | 1,16 | 1,30 | 1,48 | | 1,72 | 2,30 | 3,08 | 3,80 | |
| | Wellman | | | | | | | 0,59 | | 0,93 | | 1,40 | | 1,94 | | 2,40 | | | | |
| Rubber | Antistatica | | 0,21 | 0,28 | 0,32 | | 0,41 | 0,54 | 0,97 | | | 1,35 | | 1,70 | | 2,25 | | | | |
| | Flexitex Extra | | | | | | | | 0,95 | 1,12 | 1,32 | 1,43 | 1,68 | | 2,25 | | | | | |
| | Flexitex Std | | | | 0,31 | | 0,41 | 0,54 | 0,73 | 1,00 | 1,10 | | | | 1,78 | | | | | |
| | Guardman | | | 0,27 | 0,31 | 0,35 | 0,41 | 0,54 | 0,73 | 1,00 | 1,10 | | | | 1,78 | | | | | |
| | Mantex | | 0,21 | 0,27 | 0,38 | | 0,53 | 0,68 | 0,95 | | | | | | | | | | | |
| Textile | Formtex Ultra | | 0,14 | 0,16 | | | | | | | | | | | | | | | | |
| | Getex | | | 0,12 | 0,18 | | 0,27 | 0,32 | 0,40 | | 0,65 | | | | | | | | | |
| | Martex | | | | 0,21 | 0,25 | 0,29 | 0,38 | 0,48 | | | | | | | | | | | |
| | Mertex | | | | 0,20 | | 0,28 | 0,36 | | | | | | | | | | | | |

For footnotes and important details re. diameter and product range, see page 38.

| mandrels | | BURST PRESSURE - PSI | | | | | | | | | | | | | | | | |
|----------|----------------------------------|----------------------|------|------|-----|------|-------------------|-----|-----|------|-----|-----|-----|------------------|-----|-----|-----|-----|
| Type | Ø | ¾" | 1" | 1½" | 1¾" | 2" | 2½" ¹⁾ | 3" | 3½" | 4" | 4½" | 5" | 5½" | 6" ²⁾ | 8" | 10" | 12" | |
| TPU | Aquaman | | 725 | 655 | | 655 | 610 | 610 | | 520 | | 435 | | 465 | 380 | 305 | 220 | |
| | Dragman | | | | | | | | 580 | 550 | 510 | 465 | 405 | 405 | 405 | | | |
| | Dragman Extra | | | | | | | | | 510 | 510 | 405 | 405 | 405 | | | | |
| | Inversion Lining ³⁾⁴⁾ | | | | | | | | | 175 | | | | 145 | 145 | 145 | 145 | |
| | Mantex HP | | | | | 2535 | | | | | | | | | | | | |
| | Mineman | | | | | | | | | | | | | 465 | 610 | | | |
| | Mortar ³⁾ | | | | | | | | | 2500 | | | | | | | | |
| | Proman | | | | | | | | | | | | | | | | | |
| | Superman | | | | | | | | | | | | | | | 610 | 520 | 435 |
| | Tube In ³⁾ | | | | | | | | 700 | 550 | | 465 | | 465 | | 465 | 465 | 435 |
| | Ultraman | | | | | | 1015 | 725 | 700 | 580 | 520 | 495 | 465 | | 465 | 380 | 305 | 220 |
| | Wellman | | | | | | 870 | | 870 | | 870 | | 870 | | 870 | | | |
| Rubber | Antistatica | 1450 | 1450 | 870 | | 655 | 655 | 725 | | 580 | | 435 | | 610 | | | | |
| | Flexitex Extra | | | | | | | 725 | 580 | 580 | 510 | 435 | | 610 & 800 | | | | |
| | Flexitex Std | | | | | 655 | 655 | 655 | 580 | 510 | | | | 520 | | | | |
| | Guardman | | 1450 | 800 | 725 | 655 | 655 | 655 | 580 | 520 | | | | 520 | | | | |
| | Mantex | 1450 | 1450 | 1235 | | 870 | 725 | 725 | | | | | | | | | | |
| Textile | Formtex Ultra | 2320 | 1885 | | | | | | | | | | | | | | | |
| | Getex | | 1015 | 870 | | 725 | 655 | 655 | | 510 | | | | | | | | |
| | Martex | | | 1015 | 945 | 725 | 725 | 725 | | | | | | | | | | |
| | Mertex | | | 870 | | 800 | 725 | | | | | | | | | | | |

For footnotes and important details re. diameter and product range, see page 38.

| mandrels | | LONGITUDINAL TENSILE STRENGTH - X 1000 LBS | | | | | | | | | | | | | | | | |
|-----------------------------|--------------------------------|--------------------------------------------|-----|------|-----|------|-------------------|------|------|------|------|------|------|------------------|-------|------|-------|-------|
| Type | Ø | ¾" | 1" | 1½" | 1¾" | 2" | 2½" ¹⁾ | 3" | 3½" | 4" | 4½" | 5" | 5½" | 6" ²⁾ | 8" | 10" | 12" | |
| TPU | Aquaman | | 3,3 | 5,8 | | 7,6 | 9,1 | 10,7 | | 23,1 | | 26,9 | | 33,3 | 43,8 | 65,8 | 83,1 | |
| | Dragman | | | | | | | | 26,5 | 28,9 | 35,0 | 39,0 | 45,6 | 54,7 | 101,6 | | | |
| | Dragman Extra | | | | | | | | | 35,0 | 39,0 | 45,6 | 54,7 | 60,2 | | | | |
| | Inversion Lining ³⁾ | | | | | | | | | 25,3 | | | | 44,2 | 53,3 | 68 | 94,4 | |
| | Mantex HP | | | | | 31,7 | | | | | | | | | | | | |
| | Mineman | | | | | | | | | | | | | 32,8 | 81,5 | | | |
| | Mortar ³⁾ | | | | | | | | | 178 | | | | | | | | |
| | Proman | | | | | | 15,1 | 19,1 | 20,0 | 25,1 | 27,3 | 30,4 | 33,3 | | 42,7 | | | |
| | Superman | | | | | | | | | | | | | | | 81,5 | 104,0 | 123,4 |
| | Tube In ³⁾ | | | | | | | | 14,0 | 18,0 | | 21,3 | | 26,4 | | 65,8 | 81,8 | 99,5 |
| | Ultraman | | | | | | 11,9 | 14,3 | 17,4 | 20,0 | 22,2 | 23,8 | 26,4 | | 32,8 | 41,7 | 52,3 | 84,2 |
| | Wellman ⁵⁾ | | | | | | 13,3 | | 24,4 | | 40,0 | | 48,9 | | 62,2 | | | |
| Max. End Load ⁵⁾ | | | | | | 4,4 | | 8,0 | | 13,3 | | 16,0 | | 20,7 | | | | |
| Rubber | Antistatica | 4,2 | 5,1 | 6,4 | | 8,4 | 9,3 | 17,9 | | 22,5 | | 26,9 | | 36,6 | | | | |
| | Flexitex Extra | | | | | | | 17,9 | 20,0 | 22,5 | 24,7 | 26,9 | | 36,6 & 54,2 | | | | |
| | Flexitex Std | | | 6,4 | | 8,4 | 9,3 | 11,5 | 17,6 | 19,4 | | | | 35,5 | | | | |
| | Guardman | | 5,1 | 6,9 | 7,6 | 8,7 | 11,1 | 15,6 | | 20,4 | | | | 35,8 | | | | |
| | Mantex | 4,2 | 5,1 | 7,7 | | 10,4 | 14,8 | 17,9 | | | | | | | | | | |
| Textile | Formtex Ultra | | | | | | | | | | | | | | | | | |
| | Getex | | | 10,6 | | 13,9 | 15,2 | 17,9 | | 25,3 | | | | | | | | |
| | Martex | | | 13,0 | | 16,1 | 20,0 | 23,8 | | | | | | | | | | |
| | Mertex | | | 12,7 | | 16,0 | 19,3 | | | | | | | | | | | |

For footnotes and important details re. diameter and product range, see page 38.

| models | | WALL THICKNESS - INCHES | | | | | | | | | | | | | | | | |
|---------|--------------------------------|-------------------------|------|------|------|------|-------------------|------|------|------|------|------|------|------------------|------|------|------|------|
| Type | Ø | ¾" | 1" | 1½" | 1¾" | 2" | 2½" ¹⁾ | 3" | 3½" | 4" | 4½" | 5" | 5½" | 6" ²⁾ | 8" | 10" | 12" | |
| TPU | Aquaman | | 0,06 | 0,08 | | 0,09 | 0,09 | 0,09 | | 0,12 | | 0,12 | | 0,12 | 0,13 | 0,13 | 0,13 | |
| | Dragman | | | | | | | | 0,14 | 0,14 | 0,14 | 0,14 | 0,15 | 0,15 | 0,17 | | | |
| | Dragman Extra | | | | | | | | | 0,17 | 0,17 | 0,16 | 0,16 | 0,16 | | | | |
| | Inversion Lining ³⁾ | | | | | | | | | 0,07 | | | | 0,07 | 0,07 | 0,08 | 0,09 | |
| | Mantex HP | | | | | 0,17 | | | | | | | | | | | | |
| | Mineman | | | | | | | | | | | | | 0,15 | 0,17 | | | |
| | Mortar ³⁾ | | | | | | | | | 0,17 | | | | | | | | |
| | Proman | | | | | | 0,06 | 0,06 | 0,06 | 0,06 | 0,07 | 0,07 | 0,07 | | 0,07 | | | |
| | Superman | | | | | | | | | | | | | | | 0,17 | 0,17 | 0,18 |
| | Tube In ³⁾ | | | | | | | | 0,12 | 0,13 | | 0,13 | | 0,13 | | 0,15 | 0,16 | 0,17 |
| | Ultraman | | | | | | 0,10 | 0,10 | 0,11 | 0,11 | 0,12 | 0,12 | 0,12 | | 0,12 | 0,13 | 0,13 | 0,13 |
| Wellman | | | | | | 0,12 | | 0,13 | | 0,14 | | 0,16 | | 0,16 | | | | |
| Rubber | Antistatica | 0,09 | 0,10 | 0,09 | | 0,09 | 0,09 | 0,12 | | 0,13 | | 0,13 | | 0,15 | | | | |
| | Flexitex Extra | | | | | | | 0,12 | 0,13 | 0,13 | 0,13 | 0,13 | | 0,15 & 0,16 | | | | |
| | Flexitex Std | | | 0,09 | | 0,09 | 0,09 | 0,10 | 0,11 | 0,11 | | | | 0,13 | | | | |
| | Guardman | | 0,10 | 0,09 | 0,09 | 0,09 | 0,09 | 0,10 | 0,10 | 0,11 | | | | 0,12 | | | | |
| | Mantex | 0,09 | 0,10 | 0,10 | | 0,10 | 0,11 | 0,12 | | | | | | | | | | |
| Textile | Formtex Ultra | 0,10 | 0,10 | | | | | | | | | | | | | | | |
| | Getex | | 0,07 | 0,07 | | 0,07 | 0,08 | 0,09 | | 0,09 | | | | | | | | |
| | Martex | | | 0,08 | | 0,08 | 0,09 | 0,10 | | | | | | | | | | |
| | Mertex | | | 0,06 | | 0,07 | 0,07 | | | | | | | | | | | |

For footnotes and important details re. diameter and product range, see page 38.

| models | | WEIGHT - LBS/FT | | | | | | | | | | | | | | | | |
|---------|--------------------------------|-----------------|------|------|------|------|-------------------|------|------|------|------|------|------|------------------|------|------|------|------|
| Type | Ø | ¾" | 1" | 1½" | 1¾" | 2" | 2½" ¹⁾ | 3" | 3½" | 4" | 4½" | 5" | 5½" | 6" ²⁾ | 8" | 10" | 12" | |
| TPU | Aquaman | | 0,11 | 0,20 | | 0,29 | 0,36 | 0,47 | | 0,72 | | 0,99 | | 1,15 | 1,53 | 2,05 | 2,53 | |
| | Dragman | | | | | | | | 0,73 | 0,90 | 1,00 | 1,11 | 1,21 | 1,36 | 2,20 | | | |
| | Dragman Extra | | | | | | | | | 1,07 | 1,15 | 1,24 | 1,35 | 1,51 | | | | |
| | Inversion Lining ³⁾ | | | | | | | | | 0,32 | | | | 0,54 | 0,80 | 1,01 | 1,30 | |
| | Mantex HP | | | | | 0,55 | | | | | | | | | | | | |
| | Mineman | | | | | | | | | | | | | 1,40 | 2,07 | | | |
| | Mortar ³⁾ | | | | | | | | | 1,16 | | | | | | | | |
| | Proman | | | | | 0,20 | 0,21 | 0,25 | 0,29 | 0,33 | 0,40 | 0,47 | | | 0,60 | | | |
| | Superman | | | | | | | | | | | | | | | 2,07 | 2,73 | 3,43 |
| | Tube In ³⁾ | | | | | | | | 0,50 | 0,74 | | 0,99 | | 1,10 | | 1,83 | 2,60 | 3,17 |
| | Ultraman | | | | | | 0,35 | 0,43 | 0,52 | 0,63 | 0,77 | 0,87 | 0,99 | | 1,15 | 1,53 | 2,05 | 2,53 |
| Wellman | | | | | | 0,39 | | 0,62 | | 0,94 | | 1,30 | | 1,61 | | | | |
| Rubber | Antistatica | 0,14 | 0,19 | 0,21 | | 0,27 | 0,36 | 0,65 | | 0,90 | | 1,13 | | 0,15 | | | | |
| | Flexitex Extra | | | | | | | 0,63 | 0,75 | 0,88 | 0,96 | 1,13 | | 1,51 | | | | |
| | Flexitex Std | | | 0,21 | | 0,27 | 0,36 | 0,49 | 0,67 | 0,74 | | | | 1,19 | | | | |
| | Guardman | | 0,18 | 0,21 | 0,23 | 0,27 | 0,36 | 0,49 | 0,67 | 0,74 | | | | 1,19 | | | | |
| | Mantex | 0,14 | 0,18 | 0,25 | | 0,35 | 0,45 | 0,63 | | | | | | | | | | |
| Textile | Formtex Ultra | 0,09 | 0,11 | | | | | | | | | | | | | | | |
| | Getex | | 0,08 | 0,12 | | 0,18 | 0,21 | 0,27 | | 0,43 | | | | | | | | |
| | Martex | | | 0,14 | 0,17 | 0,19 | 0,25 | 0,32 | | | | | | | | | | |
| | Mertex | | | 0,13 | | 0,19 | 0,24 | | | | | | | | | | | |

For footnotes and important details re. diameter and product range, see page 38.

DIAMETER TOLERANCES - MM AND INCHES

(Except Proman: see details below)

| [MM] | 20,0 mm | 25,4 mm | 38,0 mm | 45,0 mm | 51,0 mm | 65,0 mm ¹⁾ | 76,0 mm | 90,0 mm | 102,0 mm | 114,0 mm | 127,0 mm | 140,0 mm | 152,0 mm ²⁾ | 203,0 mm | 254,0 mm | 305,0 mm | |
|-----------------------|-----------------------------------|---------|---------|---------|------------------------------------------------------|-----------------------|---------|---------------------------------------------------------------------------------------------------------------|----------|----------|----------|---------------------------------------------|------------------------|----------|------------------------------------|------------------------------------|--|
| [INCHES] | ¾" | 1" | 1½" | 1¾" | 2" | 2½" ¹⁾ | 3" | 3½" | 4" | 4½" | 5" | 5½" | 6" ²⁾ | 8" | 10" | 12" | |
| 20-45 mm Except: | +1,6 mm 25 mm Aquaman: +1,3 mm | | | | | | | | | | | | | | | | |
| ¾"-1¾" Except: | +0,06" 1" Aquaman: +0,05" | | | | | | | | | | | | | | | | |
| 51-90 mm Except: | | | | | +2,0 mm 90 mm Flexitex Extra and Tube In: +2,5 mm | | | | | | | | | | | | |
| 2"-3½" Except: | | | | | +0,08" 3½" Flexitex Extra and Tube In: +0,10" | | | | | | | | | | | | |
| 102-127 mm Except: | | | | | | | | +2,5 mm 102 mm Getex: +2,0 mm. 114 mm Flex.Ex. & Tube In plus 127 mm Flex.Ex. & Antistatica: +3,0 mm | | | | | | | | | |
| 4"-5" Except: | | | | | | | | +0,1" 4" Getex: +0,08". 4½" Flex. Ex. & Tube In plus 5" Flex.Ex. & Antistatica: +0,12" | | | | | | | | | |
| 140-203 mm Except: | | | | | | | | | | | | +3,0 mm 152 mm Inversion Lining: +2,0 mm | | | | | |
| 5½"-8" Except: | | | | | | | | | | | | +0,12" 6" Inversion Lining: 0,08" | | | | | |
| 254 mm Except: | | | | | | | | | | | | | | | +4,0 mm Inv. Lining: +3,0 mm | | |
| 10" Except: | | | | | | | | | | | | | | | +0,16" Inv. Lining: +0,12" | | |
| 305 mm Except: | | | | | | | | | | | | | | | | +5,0 mm Inv. Lining: +3,0 mm | |
| 12" Except: | | | | | | | | | | | | | | | | +0,2" Inv. Lining: +0,12" | |

Proman: tolerance is +4,0 mm / +0,16" for all diameters.

General information and footnotes to technical tables:

Our product range is under constant development and this list is therefore not extensive. Please ask us for details on other product types or dimensions incl. info on minimum volumes and lead times.

Maximum advised Working Pressure (WP) is 50% of the listed values for water transferring hoses.

1) Mertex 2,5" has ID 64,5 mm.

2) The 6" Flexitex Standard and Guardman are 150,0 mm while 6" Flexitex Extra and Antistatica are 154,0 mm.

3) Actual inner diameters for some products deviate from listed nominal IDs. See www.mandals.com for details.

4) For Inversion Lining, max. advised WP is 40%.

5) Maximum Well Depth is 250 m. "Maximum Total End Load" is including weight of water, pump, power cable, couplings, attachments.

Check the individual product sheets on www.mandals.com for updated details.



Mandals AS – part of Fenner PLC

Since 2012 Mandals is part of the globally acknowledged Fenner PLC group, a FTSE 250 company listed on the London Stock Exchange.



Sales office and warehouse, Houston.



Sales office and factory, Mandal.



KEY

Fenner PLC Head Office

○ Head Office UK

Engineered Conveyor Solutions (ECS)

○ Manufacturing Units

○ Sales & Service Branches

Advanced Engineered Products (AEP)

○ Manufacturing Units

○ Sales & Service Branches

We wish to thank the following for photos: Balzer, Hytrans, Advanced, Listech, Fluid Control, Flexiflo, Technipozo, Luf, Rofi, Mørenot.

HISTORY – SINCE 1775

18th and 19th Century – Production of ropes

Mandals was established in 1775 under the name Mandals Reberbane. In those days Norway was ruled by Denmark, thus it was the Danish king who approved the establishment of the company. Norway broke free from Denmark in 1814, only to end up in a union with Sweden until 1905. All the while business at Mandals was uninterrupted.

Back in the 18th century the city of Mandal, located at the southern tip of Norway, was a busy international port. All the sailing vessels needed lots of ropes, and this was the platform for the foundation of the company. Ropes remained the sole product for almost one hundred and fifty years.

20th Century – Hoses and weaving looms

Not until 1922 did fire hoses become a supplementary product to the ropes. After several changes in ownership over time, the two Christiansen brothers took over the company in 1927. Weaving looms were needed in the hose production, resulting in the development of the first Mandals Circular Weaving Loom.

In 1970 Hans Christiansen took over the ownership from his father and uncle, while the remaining rope production was sold. The focus since then has been various types of hoses and also circular weaving looms. The company became known worldwide as Mandals Reberbane Christiansen & Co. AS

Mandals continued the product development also of hoses, and became innovators of the lay-flat hose. The “extrusion

through the weave” technology was implemented at an early stage, and is still vital to the company.

The “extrusion through the weave” technology was at first only applying nitrile rubber, but in the 1980’s Mandals also developed hoses extruded with thermoplastic polyurethane (TPU). These are much more complicated products, but Mandals has successfully developed this business over time, and has high ambitions in this field.

21st Century – Ownership changes and expansion

In 2004, Hans Christiansen – a “grown up” man at 75 years – sold the company to three local investors: The Mosvold family, Rune Iversen and Øyvind Berntsen. The old company name “Mandals Reberbane Christiansen & Co. AS” was thus replaced with the internationally known brand name of the company “Mandals”, and today’s company logo was developed.

Development of the weaving loom has continuously been ongoing, since 2008 through our sister company Mandals Technology AS (see www.mandals-t.com).

Since 2012 Mandals is part of the globally acknowledged Fenner PLC group, a FTSE 250 company listed on the London Stock Exchange.

Mandals is now through the first 240 years, and with great respect for the history we are very motivated to go on for another 240.



www.mandals.com

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 Org.no.: NO 914 157 900 MVA

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mandals
 SINCE 1775