OUTSTANDING FIRE RESISTANCE WITH SUPERIOR HYDRAULIC PERFORMANCE
Active safety systems are widely used in industrial environments to mitigate damage and counter the effects of accidents should they occur. Under normal operating conditions these systems are usually inactive but, more than any other system, they require guaranteed, continuous availability under the most arduous of environmental conditions.

Many of these systems require hydraulics to function, and as they are safety critical these systems must not fail!

The number of sectors where these emergency hydraulic systems are used is constantly increasing and includes:

- **Drilling** - Used in Blow-Out Preventer (BOP) systems.
- **Mining** - Used in general safety systems and areas at risk of fire.
- **Steel Mills** - Used in foundaries, forging shops and other areas with potentially explosive atmospheres.
- **Off-Shore and Refineries** - Used in critical plant control systems.
- **Marine** - Used in engine compartment hydraulics, tanker pump rooms and other high-temperature or fire-risk areas in naval applications.
- **Defence** - Used in strategic hydraulic services.

**API 16D TEST REQUIREMENTS**

This API 16D specification requires hose assemblies to withstand a particularly severe fire carried out under the following conditions:

- Test duration: 5 minutes
- Test temperature: 700°C
- Water pressurised inside at WP
- No fluid circulation
- Proof pressure after test up to WP

In contrast to other industry standard fire tests (e.g.: ISO 15540), the pressurised water inside the hose does not flow and therefore reaches a high temperature. This impacts heavily on the sealing performance of the fittings, and it is for this reason that additional heat protection is normally used in this area.
**THE SECRET**

A special blend of mineral fillers, refractory materials and flame retardant additives has been engineered to provide the outstanding insulation and self-extinguishing properties of the GoldenGuard cover compound.

This compound, dubbed BRICKOAT™, exceeds the requirements of API 16D whilst being free from asbestos and other fibrous materials which are known to be hazardous to human health.

This unique cover also guarantees the high standard of ozone and environmental resistance that you would naturally expect from a Manuli Hydraulics hose.

---

**GOLDENGUARD/3000**

A 3,000psi hose commonly used in the North American market. Designed to meet the most common pressure requirements for land rigs, and fitted with the new OPK (one-piece) fittings line. Both easy and cost effective to assemble, there is no need for an additional fire-sleeve in the fitting area and a partial skive is sufficient to guarantee a hose assembly that will meet the requirements of API 16D both in the lab and in the field.

**GOLDENGUARD/5000**

Suitable for even the most demanding of high-pressure applications, this 5,000psi hose is supplied with a choice of two fitting solutions, Interlock Plus™ and SpiralFit™.

**FITTING OPTIONS**

**INTERLOCK PLUS**

A reliable double-skive solution with an additional fire-sleeve underneath the ferrule to protect the crimped area from heat.

**SPIRALFIT**

Applied with a partial-skive in order to leave an insulating layer of rubber below the ferrule. This prevents the need for any additional heat protection in the crimped area.

*Note: For large and heavy-duty rigs the Interlock Plus solution is usually recommended.*
GOLDENARMOUR

Often preferred in tough environments, the GoldenArmour™ integrated hose assembly protects the rubber hose from both external mechanical damage and fire. Available in a unique 5,000psi rated line, GoldenArmour has been fully tested and approved to API 16D.

The GoldenArmour integrated hose assembly kit comprises of the following items:

- An appropriate RockMaster™ hydraulic hose
- Interlock™ stainless steel fittings (carbon steel available on request)
- A flexible stainless-steel armour guard - offers outstanding fire protection and resistance to both abrasion and mechanical stresses
- A stainless-steel ferrule - used to fix the armour guard over the hose ferrule according to the specifications of the relevant crimp chart
- An additional stainless-steel joint - used to connect different lengths of the armour guard to utilise short lengths or to make longer hose assemblies.
CUSTOMER ADDED VALUES

The Manuli Hydraulics GoldenGuard and GoldenArmour ranges offer the end user a reliable solution for all kind of applications with fire hazards, which is guaranteed to perform to the toughest industrial standards. The GoldenGuard and GoldenArmour ranges also offer a wide choice of:

- Mechanical construction
- Pressure ratings
- Sizes

Hose assemblers and distributors have easy access to a premium integrated product line for the Oil and Gas market. This product range, supported and guaranteed by Manuli Hydraulics, meets all likely performance requirements of the end user and offers a highly competitive solution.

This product range also offers a variety of crimping solutions, allowing distributors flexibility to meet unplanned demands and/or short delivery lead-times. As the product line is also a multi-purpose solution for any kind of emergency hydraulics application, it offers an opportunity to cover a wide range of applications with a minimal stock profile.

KEY FEATURES

GOLDENGUARD
- Easily identifiable red cover
- Outstanding resistance to fire hazards
- API 16D fire rating
- MSHA approval
- ISO 8030 Fire Test resistance compliance
- DNV-GL approval
- Free from Asbestos and other thermal insulating fibrous minerals impacting human health
- 3,000psi and 5,000psi pressure ratings
- Skive and no-skive fittings
- Integrated heat protection for the fitting area

GOLDENARMOUR
- Integrated kit of hose, connectors and accessories
- Standard Rockmaster/13 hose style
- Outstanding resistance to fire hazards
- API 16D fire rating
- MSHA approved
- ISO 8030 Fire Test resistance compliant
- DNV-GL approval
- Stainless steel armour guard
- Stainless steel armour joint
- Stainless steel Interlock Plus fittings (carbon steel fittings also available)

GoldenArmour hoses and MQS-BOP quick couplings in use in BOP application by customers in Italy (2014).
MQS-BOP QUICK COUPLING

Q.Safe™ is the Manuli Hydraulics solution for connecting and disconnecting two parts of a hydraulic system quickly, easily and safely, whilst also providing a seal against leakage in both situations.

The Manuli Hydraulics Q.Safe range has been developed to satisfy our customers’ needs by providing a reliable, high-performance, integrated quick couplings range.

Manuli Hydraulics have expanded this range to include a specially developed range of quick couplings dedicated to BOP applications. This range of couplings exceed fire test requirements of API 16D and are painted red for easy identification.

- **Working pressure**: 5,000psi with safety factor 4.1 (burst 20,000psi)
- **Working Temperature**: from -20°C to +200°C (FKM -Viton seals)
- **ISO 7241-1 B series interchangeable**
- **Sizes**: ½”, ¾”, 1”
- **Painted red for easy identification**
- **Safety lock system to avoid accidental disconnections**
- **Fire resistant according to API 16D**

*Note: the MQS-FS flat-face screw type quick couplings range is also suitable for BOP applications*
GoldenGuard and GoldenArmour hoses along with MQS-BOP quick couplings in use in BOP applications by customers in Poland and Italy (2014).
GOLDENGUARD/3000
EMERGENCY HYDRAULIC SYSTEMS & BOP

KEY FEATURES
- High robustness of the hose structures
- Thermal insulation of the hose with a special cover material
- Long lasting resistance of the cover layer
- Flame retardant properties of the cover
- High ozone and weather resistance

APPLICATIONS & FLUIDS
- Hydraulics: designed for use in areas where the continuous hydraulic function is required to drive the emergency systems (industrial, marine, off-shore and refineries, defense, mining)
- Flexible hose for hydraulic systems of Blow Out Preventer control lines on drilling rigs
- Mineral oils, glycols and polyglycols, mineral oils in aqueous emulsion

TECHNICAL DATA

<table>
<thead>
<tr>
<th>PART. REF.</th>
<th>HOSE SIZE</th>
<th>R.O.D.</th>
<th>O.D.</th>
<th>MAX W.P.</th>
<th>BURST</th>
<th>MIN.BEND</th>
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CONTINUOUS SERVICE TEMPERATURE RANGE
-40 °F / 250 °F
-40 °C / 121 °C

TUBE
High grade NBR oil resistant rubber

REINFORCEMENT
Four high tensile steel wire spirals

COVER
Red insulant and flame retardant synthetic rubber

APPLICABLE SPECS
API 16D Fire Test (pr. 10.1.2), ISO 18752 type C

TYPE APPROVALS
DNV-GL; CU-TR; MSHA; API 16D fire test (DNV), LR

Remarks:
Refer to GoldenGuard assembling instructions and crimp chart for correct assembling (partial skive required).
EMERGENCY HYDRAULIC SYSTEMS & BOP

GOLDENGUARD/5000

KEY FEATURES

- High robustness of the hose structures
- Thermal insulation of the hose with a special cover material
- Long lasting resistance of the cover layer
- Flame retardant properties of the cover
- High ozone and weather resistance

APPLICATIONS & FLUIDS

- Hydraulics: designed for use in areas where the continuous hydraulic function is required to drive the emergency systems (industrial, marine, offshore and refineries, defense, mining)
- Flexible hose for hydraulic systems of Blow Out Preventer control lines on drilling rigs
- Mineral oils, glycols and polyglycols, mineral oils in aqueous emulsion

TECHNICAL DATA

<table>
<thead>
<tr>
<th>PART. REF.</th>
<th>HOSE SIZE</th>
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<td>mm inch</td>
<td>mm inch</td>
<td>bar psi</td>
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CONTINUOUS SERVICE TEMPERATURE RANGE

-40 °F / 250 °F
-40 °C / 121 °C

TUBE
High grade NBR oil resistant rubber

REINFORCEMENT
Multiple plies of high tensile steel wire spirals (DN 16 to 51), 2 wire braids (DN 10 & 12)

COVER
Red insulant and flame retardant synthetic rubber

APPLICABLE SPECS
API 16D Fire Test (pr. 10.1.2), DN 10-12: ISO 18752-A; DN 16-51: ISO 18752-C (STD2 fitting) and type C "Plus" (STD1 fitting), ISO 3862 and SAE J517-100R13 performance

TYPE APPROVALS
DNV-GL; CU-TR; MSHA; API 16D fire test (DNV), LR

Remarks:
Refer to GoldenGuard assembling instructions and crimp chart for the use of accessories when required:
- STD1 fitting solution: Fire Sleeve & Metal Sleeve over the fitting area are required
- STD2 fitting solution: No accessories required
The STD1 fitting solution has to be selected for the most demanding applications.
DN 10 & 12: Max. continuous temperature 100°C for these wire braided references.
## GOLDENARMOUR

### EMERGENCY HYDRAULIC SYSTEMS & BOP

#### KEY FEATURES
- High robustness of the hose structures
- Thermal insulation of the hose with a stainless armour
- Long lasting resistance of the cover layer
- Flame retardant properties
- High ozone and weather resistance

#### APPLICATIONS & FLUIDS
- Hydraulics: designed for use in areas where the continuous hydraulic function is required to drive the emergency systems (industrial, marine, off-shore and refineries, defense, mining);
- Flexible hose for hydraulic systems of Blow Out Preventer control lines on drilling rigs;
- Mineral oils, glycols and polyglycols, mineral oils in aqueous emulsion;

#### HOSE SIZE

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<td>345 5000</td>
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#### CONTINUOUS SERVICE TEMPERATURE RANGE:
- TUBE: High grade NBR oil resistant rubber
- REINFORCEMENT: Multiple plies of high tensile steel wire spirals (DN 16 to 51): 2 wire braids (DN 10, 12)
- COVER: High abrasion and ozone resistant rubber
- FITTINGS: MF2000 Interlock Plus crimped fittings (DN 10, 12), Multi fit fittings, stainless steel and carbon steel
- EXTERNAL PROTECTION: Stainless steel flexible armour

#### ACCESSORIES
- MAX W.P.
- ARMOUR GUARD METAL SLEEVE

#### TYPE APPROVALS
- API 16D Fire Test (pr. 10.1.2).
- MSHA, DNV-GL

#### REMARK
- Refer to GOLDENARMOUR assembling instructions and crimp chart for the correct assembling of the hose.

#### Hose assembly branding:
- The GOLDENARMOUR must report at least the following information in the hose brand:
  - Hose size - WP 5000 psi (on the metal sleeve)
  - Assembling date - Assembler identification (additional tag or on the metal sleeve)
BOP QUICK COUPLINGS

ISO B FOR DRILLING BOP UNITS

<table>
<thead>
<tr>
<th>SIZE</th>
<th>WORKING PRESSURE (Dynamic)</th>
<th>RATED FLOW at 0.2 MPa of pressure drop</th>
<th>CONNECTION EFFORT</th>
<th>OIL SPILLAGE Connection/Disconnection</th>
<th>MINIMUM BURST PRESSURE</th>
<th>CONNECTION/DISCONNECTION UNDER PRESSURE</th>
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<td>inch</td>
<td>MPa</td>
<td>PSI</td>
<td>l/min</td>
<td>US GPM</td>
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<tr>
<td>12.5</td>
<td>½</td>
<td>08</td>
<td>42</td>
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<tr>
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<td>¾</td>
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<td>5075</td>
<td>170</td>
<td>44.9</td>
</tr>
</tbody>
</table>

**Product description:**

- MQS-B BOP VERSION is designed for BOP (Blowout preventer) service in Oil & Gas Industry
- Simple connection & disconnection by pulling back the sleeve
- Safety system on the female part to avoid accidental disconnection
- Positive quick connection of the male into the female by latching ball system
- Poppet valve sealing system that guarantee high sealing performance at low & high pressure
- ECOAT zinc plating with improved corrosion protection and environmentally friendly process
- Female & Male Coupling with red identification for an easy visual verification
- ISO 7241-1 series B interchangeable
- API 16D approval.

**Material:**
- Female & male couplings in high grade carbon steel with hardened areas in correspondence to the mist stressed points. Seal in Viton with back-up in PTFE.

**Working Temperature:**
- -25°C to +200°C

**Safety Factor:**
- 4.1 in CONNECTED & DISCONNECTED conditions

**Impulse Pressures:**
- Withstands 100,000 cycles of impulse pressure at 133% of the rated one (freq. 1Hz)

**Test Specifications:**
- ISO 7241-2, Flame resistance test to API 16D
# BOP Quick Couplings

**Screw coupling with quick connection system**  
**Working pressure 35MPa**  
**Triple valve system that guarantees connection under pressure safely**  
**Interchangeable according to Manuli Q.Safe specifications**  
**Sealing system with flat valve**  
**Polyurethane seals**  
**Compact design**  
**Wide range of termination ends**

---

## Pressure Drop

**Flow Rate [l/min]**

**Flow Rate [US gallons/min]**

---

**Material**  
Couplings in steel with some stressed area hardened, carbonitrided valve, springs in C98 steel, seals in polyurethane and NBR, back-up ring PTFE

**Working Temperature**  
-22°F up to +230°F (-30°C up to +110°C)

**Safety Factor**  
4:1 for dynamic pressures

**Impulse Pressures**  
100,000 cycles at 133% of the rated one (freq. 1Hz) in disconnected conditions.

1,000,000 cycles at 133% of the rated one (freq. 1Hz) in connected conditions

**Test Specifications**  
ISO 7241-2 and ISO 16028:1997aMD.1.2006 (E)

---

## Table

<table>
<thead>
<tr>
<th>Size</th>
<th>Working Pressure Connected (Dynamic)</th>
<th>Working Pressure Disconnected (Dynamic)</th>
<th>Rated Flow at 0.2 MPa of pressure drop</th>
<th>Tightening Torque</th>
<th>Oil Spillage Connection/Disconnection</th>
<th>Minimum Burst Pressure</th>
<th>Connection/Disconnection Under Pressure</th>
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<td>35 5075</td>
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### ACCESSORIES

#### METAL SLEEVE (STAINLESS STEEL)

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<th>SIZE</th>
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