



The Standard of Measurement

500 Series 3/8" Oval Gear



Installation, Operation & Maintenance Manual

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Warning Symbols



CAUTION

Follow the warning instructions within the following information to avoid equipment failure, personal injury or death.



TURN POWER OFF

Before performing any maintenance, be sure to turn system power off to avoid any potential electric spark



FLAMMABLE

Flammable liquids and their vapors may cause a fire or explosion if ignited.



EYE PROTECTION

Pressurized systems may cause hazardous leaks and spray that may be dangerous for your eyes. Always wear eye protection around pressurized systems and its hazardous liquids.



INJURY

Wear gloves for protection from hazardous liquids that may cause irritation or burns.



READ

Read and understand all related manuals thoroughly. The Engineering and OIM manuals will provide the knowledge for all systems, maintenance and operation procedures. If you have any questions, please consult the factory.

Receipt & Inspection

Upon receipt of meter shipment, be sure to inspect the packaging and the flow meter assembly for any damage before signing the receipt of the shipment. Notify the delivery company about possible damage and refuse receipt of the shipment.

Meters are individually boxed and are protected with packing material. Each package is identified with the flow meter assembly part number, description, direction of flow and serial number. Verify the meter model is the correct model, size, and configuration as ordered. Contact your distributor if there is any discrepancy or question.

Meter assemblies should be handled with appropriate methods for the awkwardness of size and weight involved. Appropriate clothing and shoes need to be utilized. Transport the meter package to the installation site with appropriate transportation methods, careful not to damage the flow meter.

Be careful of any loose or protruding staples from the packaging, as they can be very sharp and may potentially cause injury.

If foam has been used to protect meter, carefully remove top foam layer before attempting to remove meter assembly from box. Foam packaging maybe formed around the meter assembly making it difficult to remove. If meter is bolted to a wood pallet remove bolts while being careful not to let the meter tip over when the support has been removed. Do not lift the meter assembly by flex hoses, thermowells, wires, pulsers, or put objects through meter. Removing meter assembly from packaging without regard to these warnings may cause serious injury.

Every effort has been made to remove the test fluid before shipment. All TCS flow meters are plugged and enclosed in a plastic bag. The test fluid Material Safety Data Sheet (MSDS) can be reviewed on page 50. Appropriate precautions should be taken regarding any personal, environmental and material compatibility with the end use system.

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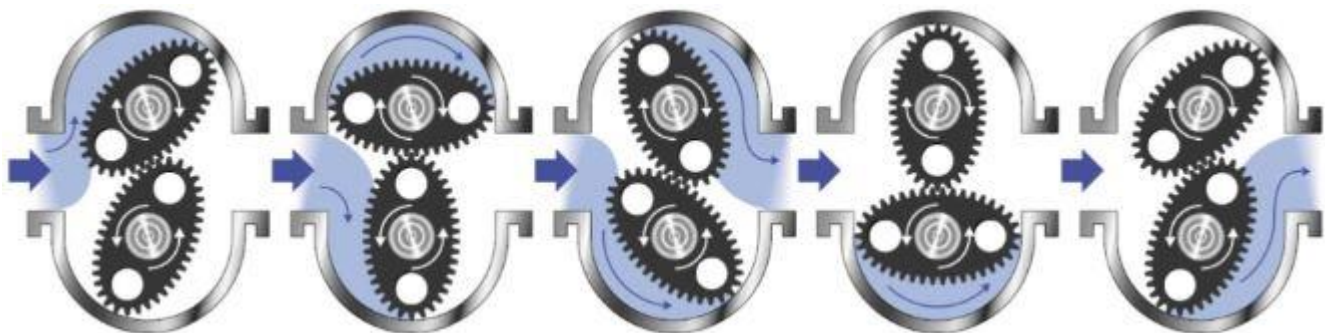
Meter Specifications

Principle Design:	Oval Gear
Connection:	3/8" NPT
Flow Rate:	4 to 180 GPH (15 to 681 LPH)
Linear Accuracy:	Capable of +/- 1%
Repeatability:	Capable of 0.03%
Maximum Pressure:	150 PSI (10.5 BAR)
Working Temperature:	-30 F to 176 F (-34 C to 80 C)
Hall Effect Output:	3 wire open collector, 5vdc at 20 mA max
Protection Class:	Built to IP66/67 (NEMA 4X)

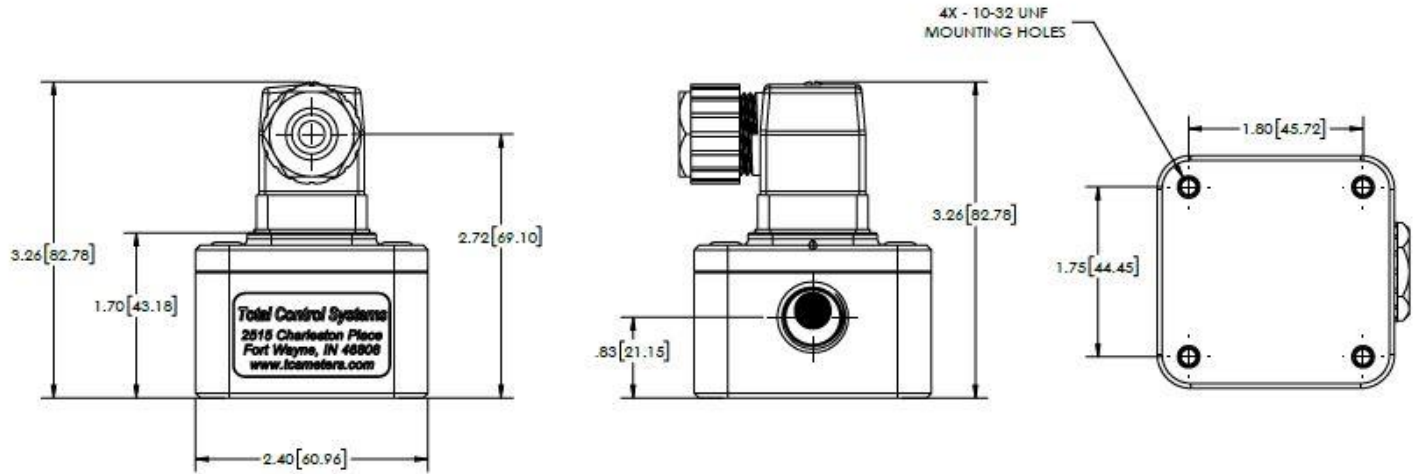
Material of Construction

Housing and Cap:	304 Stainless Steel
Gears:	316 Stainless Steel
Gear Bearing:	Carbon
O-ring Gasket:	FKM, PTFE or Neoprene

FLOW ILLUSTRATION



Dimensions



Installation Orientation

- The flowmeter **MUST** be mounted so that the rotor shafts are in a horizontal plane. The flow meter can operate with liquid flowing from Left-to-Right, Right-to-Left and Vertically up and down.
- It is recommended that a strainer be installed upstream of each flow meter, to prevent damage from foreign material.
- The meter should be installed in a manner, so that it remains full of liquid at all times.



INSTALLED CORRECTLY:
Face conduit entry downwards to avoid conduit moisture migration



INSTALLED CORRECTLY:
Face conduit entry downwards to avoid conduit moisture migration



INSTALLED INCORRECTLY: The weight of the rotors will wear on the base of the measuring chamber

System Recommendations



Control Valves

Safety and isolation valves should be used throughout the metering system. In any pumping system where there is one (1) pump and multiple flow meters, a digital or hydro-mechanical Rate-of-Flow control valve must be used at each flow meter to prevent over-speeding of the flow meters.

Best Plumbing Configuration

- 1) The flow meter must be securely mounted to a riser or foundation.
- 2) The inlet and outlet piping must be securely supported, in such a manner so as to avoid pipe stress on the flow meter.
- 3) The system should be designed to keep the flow meter full of liquid at all times.
- 4) The meter is by-directional. Install the meter in a horizontal position with the DIN connector facing out.
- 5) The pipe should be laid out as straight as possible to reduce pressure loss from flow restriction.
- 6) The meter and piping must be installed in such a way so as to avoid accidental draining of the meter. The inlet and outlet of the meter should be lower than the associated system plumbing. This is known as the sump position.
- 8) The metering system should include a means for calibration.

Protection From Debris

On new installations, care must be taken to protect the meter from damage during start-up. It is recommended that a strainer be installed in the system upstream from the meter. The meter could be subject to damage from the passage through of dirt, sand, welding slag or spatter, thread cuttings, rust, etc. A spool can be fabricated and installed in place of the meter until the system is flushed. A spool is a flanged length of pipe equal in length to the meter and any accessories attached to the meter such as an air eliminator or control valve. Another method is to temporarily bypass the plumbing containing the meter until the system is flushed. This will also protect the meter from debris. Once the system has run “clean” for a period of time the meter may be reinstalled or protective means removed.

Thermal Expansion

Most liquids will expand and contract with temperature. In any system where there is a chance for liquid to be captured between closed valves without relief, thermal expansion will likely occur. This can create dangerously high pressures within the system. When product is trapped within the system, the pressure will increase as temperature increases.

Care should be taken in designing the system in which thermal expansion may occur by implementing Pressure Relief Valves or Thermal Expansion Joints in the system design.

Thermal Shock

The metal parts within the flow meter will expand or contract with variations in the system operating temperature. For any systems where sudden or immediate temperature increases of 68 F (20 C) degrees or more are possible, the meter will require clearance rotors. The extra clearance will be necessary to eliminate the effects of immediate expansion of the rotors vs. the meter body, caused by thermal shock.

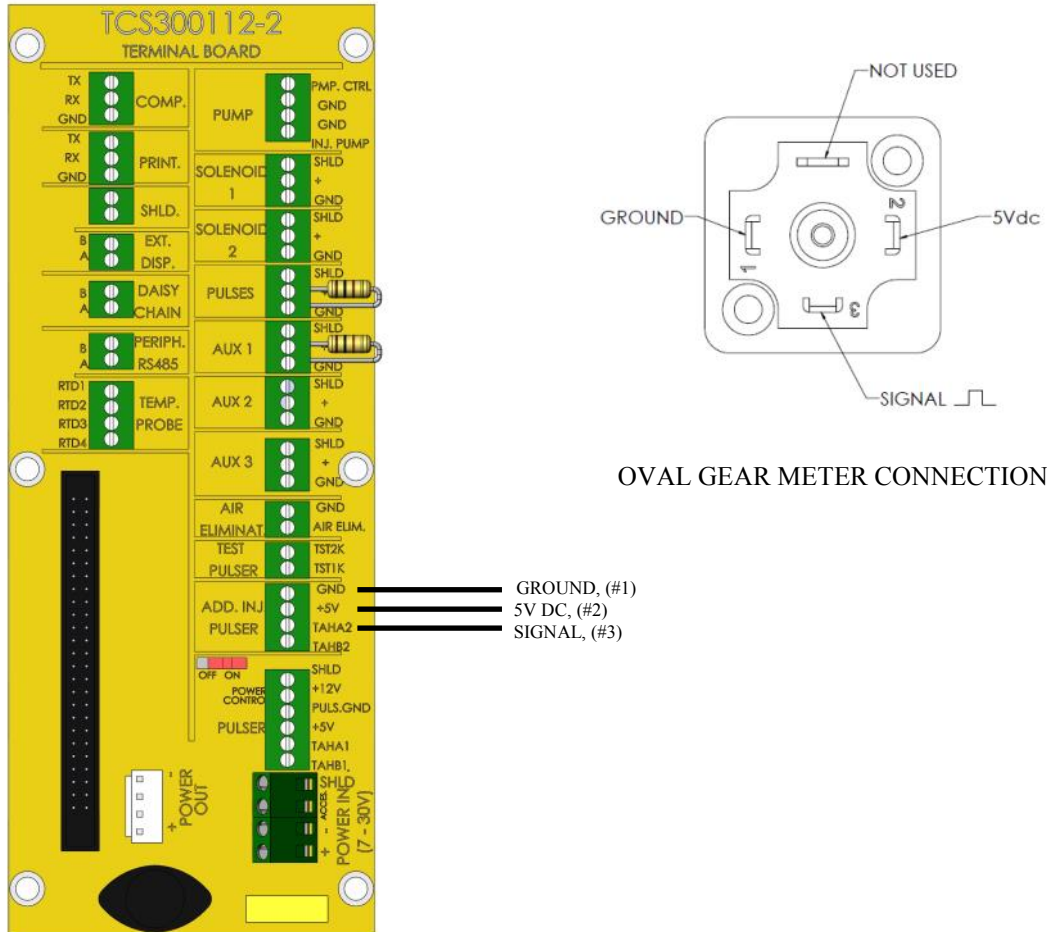
Hydraulic Shock (Water Hammer)

Hydraulic shock is a rise in pressure, which happens when an operating system undergoes an immediate change in flow direction. This is most often the result of a rapid valve closure while the system is operating at a high flow rate. Hydraulic shock can damage any system component. Particularly susceptible are internal components of the meter, valves, and pump. System design and improper operating procedures will contribute to the seriousness of this problem. In order to eliminate hydraulic shock, the valve closure rate must be slowed. The use of 2-stage preset control valves or surge suppressing bladders or risers will help reduce or eliminate this problem.

Products that Dry/Congel/Crystallize

There are many liquids that crystallize, harden and/or solidify on contact with air or with an increase in temperature. A proper system design and a good understanding of the product being measured will help to avoid the possibility of air entering into the system and the product and effective operation of the meter being affected.

500-380 Meter Installation

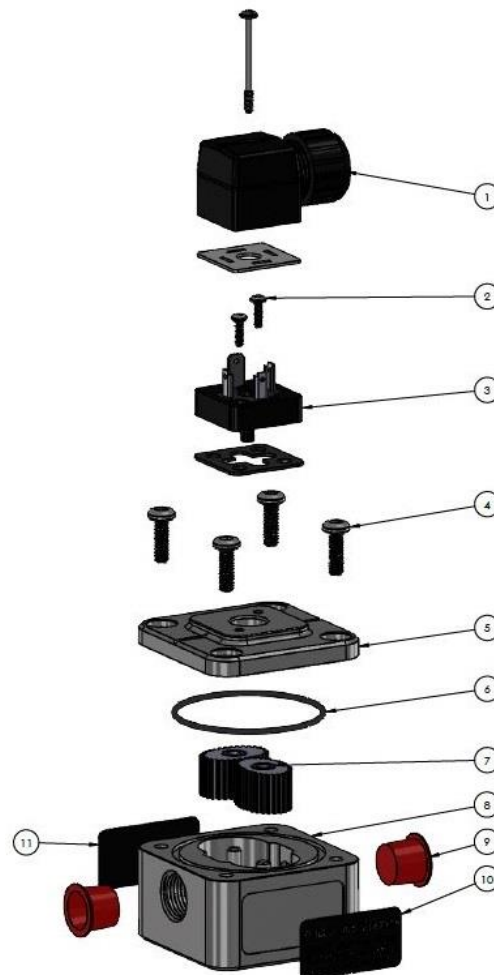


TCS 3000 REGISTER TERMINAL BOARD

TCS 500-380 GEAR METER WIRED TO A TCS 3000 REGISTER

- Connect the GROUND (PIN #1) terminal on the meter to the GND terminal for the ADD. INJ. PULSER.
- Connect the 5Vdc (PIN #2) terminal on the meter to the +5V terminal.
- Connect the SIGNAL (PIN #3) terminal on the meter to the TAHA2 terminal.

500-380, 3/8" Oval Gear Meter Assembly



Item	Description	Quantity	Part Number
1	DIN CONNECTOR	1	740102
2	SCREW, 4-40 X 3/8 PAN	2	538425
3	CIRCUIT BOARD	1	500500
4	SCREW, 10-32 X 5/8 TORX	4	538420
5	CAP 3/8 OVAL GEAR	1	538150
6	ORING GASKET, FKM	1	538415
6A	ORING GASKET, PTFE	1	538417
6B	ORING GASKET, NEOPRENE	1	538418
7	GEAR SET	1	538360
8	HOUSING ASSEMBLY	1	538110
9	CAP PLUG	2	300719
10	NAMEPLATE-TCS INFO	1	538077
11	NAMEPLATE	1	538017

Material Safety Data Sheet

24 HOUR EMERGENCY ASSISTANCE
(260) 833-3173

GENERAL MSDS ASSISTANCE
(260) 484-0301

CODE: RPS

HAZARD RATING> LEAST-0 SLIGHT-1 MODERATE-2 HIGH-3 EXTREME-4

DR LUBRICANTS, INC.
4611 NEWAYGO ROAD, SUITE D
FORT WAYNE, IN 46808

DATE: 01/21/06

TELEPHONE NUMBER: (260 484-0301

SECTION I - PRODUCT IDENTIFICATION

PRODUCT: **RP 1060**

SECTION II - COMPOSITION AND HAZARDOUS INFORMATION*

CHEMICAL NAME	CAS NUMBER	WT. PERCENT IS LESS THAN	OCCUPATIONAL EXPOSURE LIMITS (TLV-TWA) (TLV-STEL)
PETROLEUM HYDROCARBON	64741-65-7	45.0	100MG/M3
PETROLEUM HYDROCARBON	64742-53-6	65.0	5MG/M3

*ITEMS NOT SHOWN ARE NOT LISTED IN THE OSHA - T.S.C.A. HAZARDOUS CHEMICALS LISTING.

SECTION III - PHYSICAL DATA

BOILING RANGE:	NA	VAPOR DENSITY:	NA
ODOR:	PETROLEUM ODOR	EVAPORATION RATE:	NA
APPEARANCE	AMBER LIQUID	SOLUBILITY:	INSOLUBLE
VOLATILE BY WEIGHT:	NA	PRODUCT DENSITY:	0.829
VOLATILE BY VOLUME:	NA		

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLAMMABILITY CLASSIFICATION: COMBUSTIBLE FLASH POINT: 170 F LEL: NA
(CLEVELAND OPEN CUP) UEL: NA

DOT: COMBUSTIBLE LIQUID

EXTINGUISHING MEDIA: CARBON DIOXIDE, DRY CHEMICAL, FOAM

Material Safety Data Sheet (Continued)

PRODUCT: RP 1060

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SECTION IV - FIRE AND EXPLOSION HAZARD DATA

UNUSUAL FIRE AND EXPLOSION HAZARDS : DO NOT DIRECT A SOLID STREAM OF WATER ONTO BURNING PRODUCT. THIS MAY CAUSE SPREADING AND INCREASE THE FIRES INTENSITY. COMBUSTION MAY PRODUCE: OXIDES OF CARBON, AND INCOMPLETELY BURNED HYDROCARBONS IN THE FORM OF FUMES AND SMOKE.

SPECIAL FIREFIGHTING PROCEDURES: WEAR A SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE.

SECTION V - HEALTH HAZARD DATA

EFFECTS OF OVER EXPOSURE: MAY CAUSE MILD EYE IRRITATION AND REDNESS. PROLONGED OR REPEATED EXPOSURE TO THE SKIN MAY RESULT IN LOSS OF NATURAL OILS ACCOMPANIED BY DRYNESS, CRACKING AND DERMATITIS. INGESTION MAY RESULT IN NAUSEA, DIARRHEA AND GASTRO INTESTINAL IRRITATION. OVEREXPOSURE TO MIST MAY CAUSE UPPER RESPIRATORY TRACT IRRITATION AND DIFFICULTY BREATHING.

MEDICAL CONDITIONS PRONE TO AGGRAVATION BY EXPOSURE: NONE KNOWN.

PRIMARY ROUTE(S) OF ENTRY: DERMAL INHALATION INGESTION.

EMERGENCY AND FIRST AID PROCEDURES: IN CASE OF EYE CONTACT, IMMEDIATELY FLUSH EYES WITH CLEAN WATER FOR AT LEAST 15 MINUTES. IF EYE IRRITATION PERSISTS, CONTACT A PHYSICIAN. IN CASE OF SKIN CONTACT, REMOVE ANY CONTAMINATED CLOTHING AND RINSE SKIN THOROUGHLY WITH WATER FOR AT LEAST 15 MINUTES. IF SKIN IRRITATION PERSISTS, CONTACT A PHYSICIAN. IN CASE OF OVEREXPOSURE TO MIST, REMOVE VICTIM TO FRESH AIR: IF BREATHING IS DIFFICULT ADMINISTER OXYGEN: AND CONTACT A PHYSICIAN IMMEDIATELY. IF PRODUCT IS INGESTED DO NOT INDUCE VOMITING: CONTACT A PHYSICIAN.

SECTION VI - REACTIVITY DATA

STABILITY: THIS PRODUCT IS STABLE UNDER NORMAL STORAGE CONDITIONS.

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR UNDER NORMAL CONDITIONS.

HAZARDOUS DECOMPOSITION PRODUCTS: THERMAL DECOMPOSITION MAY RESULT IN THE FORMATION OF: OXIDES OF CARBON, AND INCOMPLETELY BURNED HYDROCARBONS IN THE FORM OF FUMES AND SMOKE.

CONDITIONS TO AVOID: AVOID CONTACT WITH OPEN FLAME, STORE IN ROOM TEMPERATURE AREA.

INCOMPATIBILITY: AVOID CONTACT WITH STRONG OXIDIZING AND REDUCING AGENTS AND STRONG ALKLI.

Material Safety Data Sheet (Continued)

PRODUCT: RP 1060

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SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: FOR SMALL SPILLS: SOAK UP SPILL WITH ABSORBENT MATERIAL. FOR LARGE SPILLS: DIKE SPILL AND PUMP INTO DRUMS FOR PROPER DISPOSAL.

WASTE DISPOSAL METHOD: DISPOSE OF IN ACCORDANCE WITH ALL LOCAL STATE AND FEDERAL REGULATIONS.

SECTION VIII - SAFE HANDLING AND USE INFORMATION

RESPIRATORY PROTECTION: NORMALLY NOT REQUIRED, HOWEVER, WHEN THE TLV IS EXCEEDED WEAR THE APPROPRIATE MSHA/NIOSH APPROVED RESPIRATOR.

VENTILATION: PROVIDE ADEQUATE VENTILATION (SUCH AS MECHANICAL OR LOCAL) TO ASSURE TLV IS NOT EXCEEDED.

PROTECTIVE GLOVES: NORMALLY NOT REQUIRED, HOWEVER, IF HANDS ARE FREQUENTLY IN FLUID WEAR OIL AND CHEMICAL IMPERVIOUS GLOVES.

EYE PROTECTION: SAFETY GLASSES REQUIRED FOR NORMAL USAGE, WEAR CHEMICAL GOGGLES WHEN EXCESSIVE SPLASHING MAY OCCUR.

OTHER PROTECTIVE EQUIPMENT: NORMALLY NOT REQUIRED, HOWEVER, WHERE REPEATED CONTACT OCCURS, WEAR IMPERVIOUS CLOTHING AND BOOTS.

HYGIENIC PRACTICES: FOLLOW STANDARD INDUSTRIAL HYGIENE PRACTICES. LAUNDER ANY CONTAMINATED CLOTHING BEFORE RE-USE.

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: DO NOT STORE IN THE PRESENCE OF HEAT, SPARKS, FLAME OR ANY OTHER SOURCES OF IGNITION. STORE AWAY FROM STRONG OXIDIZING AGENTS. EMPTY DRUMS MAY CONTAIN PRODUCT RESIDUES. ALL SAFETY PRECAUTIONS TAKEN WHEN HANDLING THIS PRODUCT SHOULD ALSO BE TAKEN WHEN HANDLING EMPTY DRUMS AND CONTAINERS.

OTHER PRECAUTIONS: NONE

Material Safety Data Sheet (Continued)

PRODUCT: RP 1060
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SECTION X - HMIS/NFPA RATINGS

HMIS:HEALTH:1 FLAMMABILITY:2 REACTIVITY:0 PERSONAL PROTECTION:C
NFPA:HEALTH:1 FLAMMABILITY:2 REACTIVITY:0 SPECIFIC HAZARD:

SECTION XI - OTHER REGULATORY INFORMATION

LAND (TDG)

PROPER SHIPPING NAME: PETROLEUM DISTILLATES, N.O.S.
HAZARD CLASS & DIVISION: 3
UN NUMBER: 1268
PACKING GROUP: III

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Notes



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