

## Instruction Manual



## DORA Live Steam



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MUSEUM QUALITY BRASS MODELS





for the next run. Because DORA is a very small engine, the run time is limited. Ten minutes or so per run is average.

### Shutting down

At the end of the day's run, close the throttle snugly. When cool, the safety valve should be loosened to relieve the vacuum that will be created in the boiler. This vacuum could pull oil from the lubricator into the boiler if the throttle is not closed.

After a day's operation in the garden you may find that your engine has a coating of oil all over it. This is steam-cylinder oil that has been exhausted from the stack. A simple wipe-down with a dry cloth is all that's necessary to restore the engine to pristine condition. This is best done while the engine is still hot. Wipe any grit and excess oil from the wheels and running gear.

The boiler can be drained of water, or not, as you will. Leaving water in the boiler will not harm it. The lubricator can also be drained and refilled with steam oil in preparation for the next run.

### Notes on radio control

Although DORA was designed as a manually controlled locomotive, there is no reason why radio control (R/C) cannot be fitted with some ingenuity. A two-channel radio is all that's necessary—one for the throttle and one for the reversing valve. The gas valve should always be controlled manually. Small

servos can be mounted to the floor of the loco and linked to the control arms. You might be able to get away with one servo controlling only the reversing valve, but better control of the locomotive will be accomplished if the throttle is controlled, too.

The receiver and battery pack can be fitted to the ceiling of the cab or you could scratchbuild a bunker behind the cab to house them.

### A word to kitbashers

DORA was designed with kitbashers in mind. The cab and body can be easily removed by removing a few screws from beneath without affecting the running qualities of the engine in any way. Cosmetic changes can then be easily made.

### SPECIFICATIONS

**Scale:** 1:20.3 (15mm = 1'0")

**Gauge:** N° 1 (45mm)

**Wheel arrangement:** 0-4-0T

**Boiler:** Single flue, gas fired

**Boiler fittings:** Safety valve, throttle, filler plug, plug for add-on pressure gauge

**Fuel:** Butane gas

**Cylinder lubrication:** Displacement lubricator

**Cylinders:** Two, double-acting oscillating cylinders between the frames, exhausting through the smoke stack

**Reversing gear:** Rotary valve beneath rear of boiler

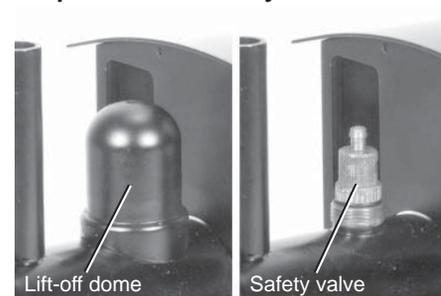
**Gear ratio:** 2:1



### Safety

For your safety, there are certain rules that should be observed, as follows:

1. The safety valve, under the slip-off dome, has been set at the factory. **Never tamper with the safety valve.**



2. The firing system has been designed to use butane gas only. Never use any other gas (including propane or butane/propane mix), as the storage pressures can reach unsafe levels.

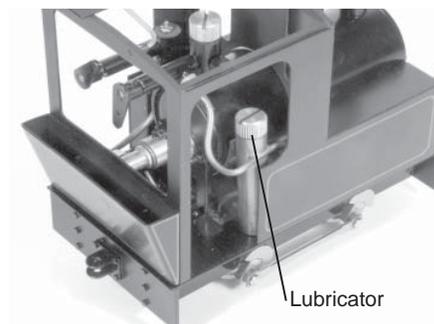
3. Always refuel the engine away from other working live-steam locomotives. The fuel-filling system allows a small amount of the gas to bleed off as the fuel tank is being filled. A passing engine can ignite this bleed-off gas, causing a potentially hazardous situation.

4. When lighting up, light your match first, then turn on the gas.

5. A steam engine gets hot. Be careful. Lift DORA by holding the body work when hot.

### Preparing the engine

A steam-locomotive engineer goes through a lighting-up ritual every time the engine is to be run. It is good to follow the same routine each time so that nothing is overlooked.



1. Oil all external moving parts with a high grade, lightweight machine oil like 3-in-1.

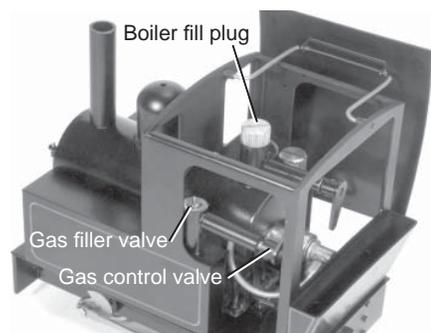
2. DORA's lubricator in the cab makes sure the cylinders are lubricated inside. As the steam passes through it, a small amount will condense into water. This water will sink to the bottom of the lubricator, forcing a similar quantity of oil into the steam line and thus to the cylinders.

Remove any water from the displacement lubricator by sucking it out from the bottom with a syringe. Then fill the lubricator up to the level of the steam pipe with proper steam-cylinder oil.

3. Fill the boiler with water through the boiler-fill plug in the cab (make sure the throttle is closed). A properly filled boiler



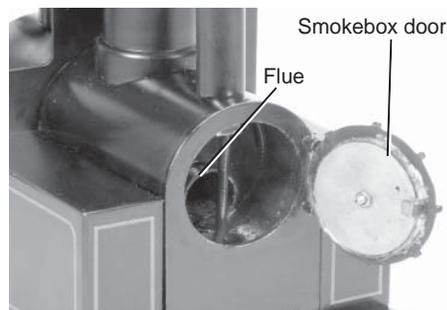
will have around 65ml of water in it. Do not fill the boiler full to the top. There must be room for the steam above the water level. If there is water in the boiler already, and you don't know how much, fill the boiler to the top, then remove 20ml. Use only distilled water in your engine's boiler. Tap water contains minerals that will leach out and ultimately affect the performance of the engine.



4. Finally, add fuel. Butane can be purchased in larger containers at camping-supply stores or in smaller containers at Asian groceries, but these cans will require special adaptors for filling. With the adaptor in place on the can, and the can inverted, simply press the adaptor's nozzle hard onto the engine's gas-filler valve. You will hear the gas transferring and may see a little gas bleeding out of the valve. When the tank is full, the gas will begin to splutter and much more gas will escape the valve. When the gas tank is full, you are ready to fire up the engine.

### Firing up

DORA's burner resides at the back of the flue inside the boiler. Open the hinged smokebox door at the front of the engine and you'll be able to see the flue. To light up, strike a match and hold it in the open smokebox door while simultaneously opening the gas valve in the cab very slowly until the gas ignites. You should hear the gas coming into the burner. Opening the valve too wide or too fast may blow out the flame or cause the fire to burn in the smokebox.



The fire should flash back into the back of the flue with a quiet "pop." If it tends to burn in the smokebox or in the forward part of the flue, slowly close the gas valve until it flashes back to the burner. Don't let the fire burn in the smokebox—your engine will not run as it should and may be damaged. The flame should be bright blue and should burn steadily. If it sputters, adjust the gas valve accordingly. **Note:** If you are running indoors or in subdued light, you may notice a pale blue flame coming out of the smokebox, even when the fire is burning properly in the burner. This is normal and not a cause for concern.



The object is to run the burner at the lowest setting possible to operate the engine, thereby increasing the efficiency of the engine and the duration of the run. You'll get the hang of this with practice.

If the flame looks yellow or green, or has difficulty staying lit, adjust the slider over the air holes at the end of the burner in the cab.

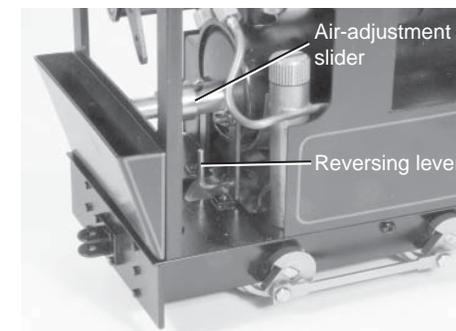
Keep an eye and ear on the fire while pressure is coming up, to make sure that the fire has not gone out. If it does go out, simply turn off the gas and repeat the lighting-up process.

When steam can be seen coming from the safety valve, you'll know that pressure is up to working level. This should take 5-8 minutes or so. The air temperature will have an effect on this. It will take longer on cold days and less on hot days. Butane gas turns to non-pressurized liquid at 32°F, so the engine may have difficulty on very cold days unless it is steamed up indoors.

### Running

With the engine on the track, and without a train, open the throttle. Make sure the reversing valve is in forward position (lever to the left side). Because the cylinders are cold, the hot steam entering them will condense into water and be exhausted through the stack. The engine will sputter and spit a little. To encourage it, a little gentle pushing may be in order.

When the cylinders have warmed a little, the engine should take off on its own, moving away smoothly. Once it is running smoothly, a train can be coupled on and the run can proceed. Since all of DORA's functions are controlled from the cab, it can be driven like a full-size engine, meaning that you'll have to stay with the engine through the run if you want to change its speed or direction. If you have a suitable track, the engine can be left to run on its own at a steady speed until the fuel runs out. As the gas tank in the cab heats up, you may find the engine picking up speed. Just turn the gas down a little and throttle the steam back. This is all part of learning how to get the best performance from your engine.



DORA was designed to run out of fuel before running out of water, thus preventing damage to the boiler. Care should be taken never to run the boiler dry. When the engine stops, the first thing to do is to close the gas valve. Then close the throttle. When the run is over and the locomotive has cooled somewhat, it can be lubricated, rewatered, and refueled