D.T.S. MAX

By: Mike Wood

D.T.S. may be a new manufacturer for this column, but it is far from being a new company. Based in northwestern Italy, not far from Rimini and the Adriatic, D.T.S. has been in business manufacturing lighting equipment since 1980. It produces architectural and industrial lighting products as well as those for the entertainment market. While the D.T.S. name may be less well-known in North America than in Europe, it manufactures a wide range of products that deserve consideration. (In the US, its products are distributed by Strong Entertainment Lighting.) In this issue, we are looking at the D.T.S. MAX, a compact luminaire designed to address the current desire for combination narrow-beam and spot units. As such, it enters a busy field with many competitors. The Max offers a few new features: How does it perform, and is this the unit for you? I'll try to help you by objectively reporting the results of tests on every aspect of the unit, starting with the lamp and working through the optical system to the output. My goal is not to make your mind up for you but to give you unbiased data to help in the decision-making process. In the end, the decision to use one light or another is often a subjective matter driven by many factors outside of the numbers. That is your decision to make, and, as always, if you like what you read here, I encourage you to take a test drive in your facility if possible.

Fig. 1: Fixture as tested.

D.T.S. shipped me a Max from Italy, through Strong, and the review is based solely on tests of that single unit. Ideally, it would be better to test multiple units and compare them, but I don't have the resources to do that. All tests were run on a nominal 115V 60Hz supply (actually 117V today); however, the D.T.S. Max is rated to run on voltages from 90 – 260V 50/60Hz (Fig. 1).

Lamp

Like other luminaires in its class, the D.T.S. Max uses one of the newer lamps from the Philips Platinum range, in this case, the Philips MSD Platinum 16R. This is an ultra-short arc lamp, which is supplied in an ellipsoidal reflector, accurately positioned and focused. The technology is essentially the same as that previously used in video projector lamps and has now made its way into lighting. Figure 2 shows the lamp after removal from the Max along with the hardware that was holding it in place. As I've seen in other competitive units, the lamp change is tricky and involves a number of small, non-captive parts. In my opinion, this is something that shouldn't be attempted in the rig, only on the bench; the small screws and parts involved would be very easy to drop. Figure 3 shows the view of the lamp once you've removed the two main outer plastic molded covers. This enclosure is designed to cool the lamp. These lamps have stringent cooling requirements, and an enclosed lamp house with a controlled environment is just about essential to do the job properly. Once the cover is lifted off, by removing four screws, the lamp is revealed (Fig. 4). Four more screws and it can be lifted out and replaced.

Fig. 2: Lamp after removal.

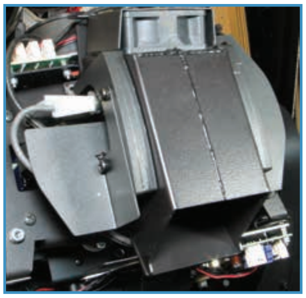

Fig. 3: Lamp house.

Fig. 4: Lamp in place.

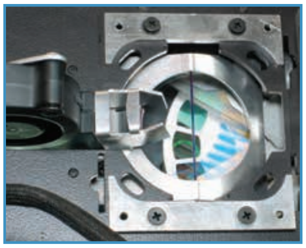

Fig. 5: View from lamp house.

D.T.S. is not alone in this complexity. The increasing use, by all manufacturers, of this lamp style has set back lamp changing a long way. We had a couple of years when things got easier with the "FastFit" style of lamp change, but, sadly, those days seem to be gone. Once again, you need screwdrivers, gloves, and patience to change a lamp. I completely understand why, but that doesn't stop me from complaining about it!

The accurate positioning and cooling of the lamp is critical to the performance of the Max's optical system, so it's worth spending the time to do this correctly.

Once the lamp is removed, you see what comes next in the optical train. As is shown in Figure 5, there is a split-angled hot mirror at the exit to the lamp house, immediately followed by the dimmer flags and color systems. You can also see the blower fan on the left of the photograph, which directs an air stream onto the top pinch of the lamp.

Dimmer

There are two dimmer flags, each driven by its own stepper motor. Each flag consists of a metal blade with an edge of frosted glass to smooth the dimming. In operation, the two flags close like a pair of scissors, shutting down the exit aperture with first the frost glass and then the metal edge. This system (thanks to the homogenization system we'll come to later) performs very well, and dimming is smooth and artifact-free with very little vignetting across the entire dimming range. Figure 6 shows the resultant dimmer curve. It is S-shaped, giving you finer control at the very top and bottom in exchange for a faster transition in the middle of the range. This smooth dimming is a strong feature of the Max.

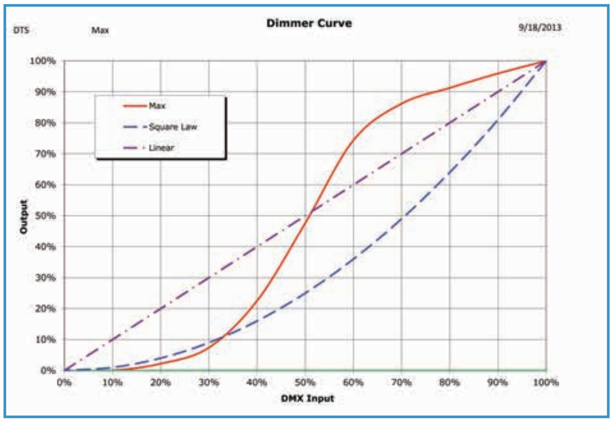

Fig. 6: Dimmer curve.

The dimmer serves dual duty as the strobe shutter. I measured strobe speeds from 0.86Hz – 9.6Hz. Both fade/ramp and snap strobes are available.

Color

The next system in the optical train is color control. The Max has both color mixing and a color wheel, which can be used separately or together. First in line are four quadrant-shaped dichroic glass flags: one each in cyan, magenta, yellow, and CTO, each etched with a finger pattern so as to provide a gradually increasing density of the corresponding color as the flag is rotated across the beam. Again, the homogenization system (I promise we'll get to that) really helps, and the single flags perform very well. You might expect the beam to be colored on one side as the color comes in, but that's not the case, and color mixing is even and flat.

I measured the output from the color-mixing system as follows. The colors are nicely saturated, and I was able to mix good ambers, aquas, and lavenders (always the hardest colors to mix).

COLOR MIXING

Color	Cyan	Magenta	Yellow	Red	Green	Blue	CTO
Transmission	28%	2.6%	83%	2.2%	13%	0.3%	71%

The fixed color wheel is right next to the color mixing flags. This is visible through the aperture in Figure 5 and contains 17 permanent dichroic colors plus an open hole.

The colors were again very smooth, and half-colors give an interesting effect, more like a gradient color from one to the next rather than any sharp transition. It's difficult to photograph, but Figure 7 gives an example of a half color. As the wheel rotates, you get a seamless crossfade from one color to the next, which I found pleasing. The color change is also very quick, giving good snap changes. Finally, as usual, the wheel can be rotated at varying speeds all the way down to a glacial 0.02 rpm, at which speed it takes 47 minutes to do a complete revolution! This rotation, as with all movements on the Max, was very smooth with no visible steps or jumps.

Fig. 7: Half color.

COLOR WHEEL

Color change speed – adjacent	< 0.1 sec
Color change speed – worst case	0.3 sec
Maximum wheel spin speed	0.82 sec/rev = 73 rpm
Minimum wheel spin speed	2850 sec/rev = 0.02 rpm

FIXED COLOR WHEEL

Color	Red	Yellow 1	Green	Pink	Full CTO	Full CTB	Orange	Lt Pink	Lt Red
Transmission	1.9%	72%	19%	10%	64%	54%	23%	47%	7.6%

Color	Purple	Yellow 2	Lt Blue	Lt Green	Magenta	Blue	Amber	Dark Green
Transmission	1.9%	88%	40%	48%	5.0%	17%	59%	20%

Homogenizing system

This is buried in the internal guts of the unit, so I was unable to get a good photograph of it. However, my guess, from some detective work, is that this is a long hexagonal cross-section reflective tube mounted immediately after the color systems. The light from the lamp goes through the dimmer and color systems into this tube, where it bounces back and forth between the internally mirrored surfaces, so that the exciting beam is evenly colored and clean. Inevitably, this will lose some light, but you get very nice color mixing because of it.

Gobo wheels

The exit aperture of the homogenizer tube forms the gate for the gobo system. There are two wheels in the Max: a rotating gobo wheel followed by a static gobo wheel.

The rotating gobo wheel contains nine replaceable patterns, and the static wheel has ten. All the gobos on both wheels are glass. Each wheel has its own, different cartridge system for holding gobos, which snap into place on their respective wheels. They are a little tricky to access, particularly the static wheel. D.T.S. claims that changing gobos doesn't require a tool, but unless you have tiny fingers, you'll find it much easier to use a pair of needle-nose pliers. These gobos are truly tiny; Figure 8 shows one of each of the gobo cartridges, rotating wheel at the top, fixed at the bottom, along with some small change for size comparison. (Previously, I used pennies and cents for these size comparisons. But inflation has struck, and I'm now using, in order from the top, a UK 5 pence coin, 10 euro cents, and a US dime). This gives you some idea of how small the image size is in the center of the gobo (Fig. 9).

Fig. 8: Gobos.

Fig. 9: Gobo change.

ROTATING GOBO SPEEDS

Gobo change speed – adjacent	0.4 sec
Gobo change speed – worst case	0.8 sec
Maximum gobo spin speed	0.2 sec/rev = 300rpm
Minimum gobo spin speed	2800 sec/rev = 0.021rpm
Maximum wheel spin speed	2.6 sec/rev = 23rpm
Minimum wheel spin speed	215 sec/rev = 0.3rpm

Positioning and rotation of both wheels was quick and smooth, with a good range of rotation speeds. The rotating wheel showed some bounce when changing direction, and I measured the accuracy as 0.4° of hysteresis error, which equates to 1.8" at a throw of 20' (76mm at 10m). All the wheels use a quick-path algorithm to minimize change times.

STATIC GOBO WHEEL SPEED

Gobo change speed – adjacent	0.1 sec
Gobo change speed – worst case	0.5 sec
Maximum wheel spin speed	3.12 sec/rev = 19 rpm
Minimum wheel spin speed	107 sec/rev = 0.6 rpm

Focus quality on all gobos was good, with very acceptable edge-to-center difference and color fringing. It is also possible to get a good gobo morph effect from one wheel to the other. Figure 10 shows an example of focus quality on a rotating gobo.

Fig. 10: Focus quality.

Iris

The iris is immediately after the fixed gobo wheel. I measured the opening/closing time at around 0.2 seconds. The fully closed iris reduces the aperture size to 54% of its full size, which gives equivalent field angles of 2° at minimum zoom and 16° at maximum zoom.

Animation wheel

The last item in the imaging section is the animation wheel. This is a large pattern wheel, which can be swung across the aperture and rotated. It adds background movement to either of the gobo wheels. Figure 11 shows the wheel in its parked position outside the beam. It can be moved across the beam in 0.2 seconds and then rotated at speeds from 0.62sec/rev = 97rpm down to 900sec/rev = 0.07rpm. Focus distance on the animation wheel is quite a long way from the rotating gobo wheel, which is likely the wheel you will use it with (Fig. 11).

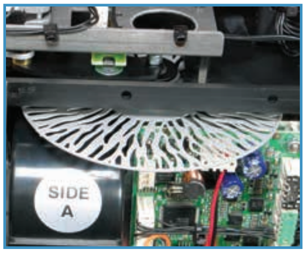

Fig. 11: Animation wheel.

Prism and frost systems

The D.T.S. Max has a single four-facet prism that can be inserted across the beam in around 0.2 seconds. Figure 12 shows the image separation when zoom is at full on the

Fig. 12: Prism image separation.

Fig. 13: Prism.

Fig. 14: Frost flag.

rotating gobo wheel. The prism mechanism is mounted on the rear surface of the focus lens group and travels back and forth with that lens (Fig. 13). Similarly, the frost flag is mounted to the front face of the zoom lens group and travels with that lens. It's a full frost that is either in or out, not variable, to produce a wash light effect, so it cannot be used to frost out gobos. Figure 14 shows this flag.

Lenses and output

The optical system of the Max is quite complex: The ellipsoidal reflector around the lamp directs the light into the homogenizing system (which may contain lenses; I couldn't tell without complete disassembly) and then through three lens groups. The focus and zoom groups can both move, while the final group is static and forms the output lens. This system has a wide zoom range of about 10:1. The system also has two differently sized apertures on the rotating gobo wheel, which change the native field angle of the unit. Figures 15 and 16 show the wide angle output with these two apertures. Figure 15 is the standard aperture, which gives a zoom range from 4° – 30° (or 2° with iris included). I measured the output in wide angle of 30° at just over 4,000 lumens in this mode. Output with the larger aperture is higher, as expected, at 4,560 lumens. The maximum field angle in this mode is 45°. Of course, adding in the frost filter increases these angles further. The field is very smooth and flat, as can be seen in Figure 15, with just over 2:1 ratio from center to edge. There's also a third mode, which D.T.S. is calling studio mode; this also uses the larger aperture, focused on a different gate. In this mode, the beam is extremely flat; however, you cannot use gobos. Overall, I'd say that the light output is on the low side for this class of unit, but that's the penalty you pay for such a large zoom range. That zoom is useful. In narrow angle, the beam makes an excellent aerial effect. In the middle, it's good for gobos, and it's useful as a wash or fill in the wide-angle range. The Max also offers, through a menu selection, the possibility of entering an auto-focus mode. In it, the user

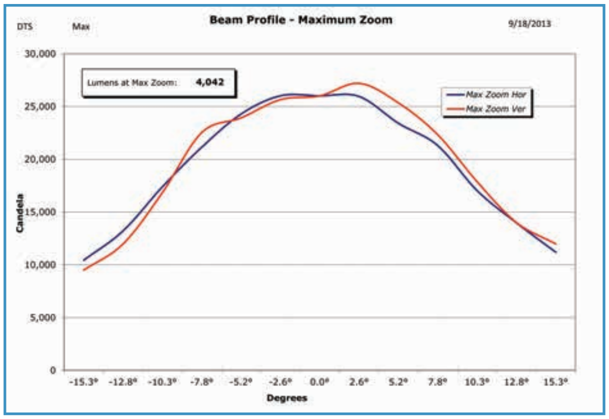

Fig. 15: Spot mode output.

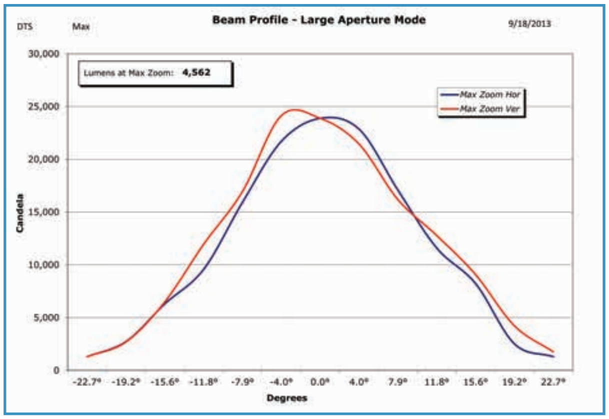

Fig. 16: Large aperture mode output.

sets gobo focus manually at both ends of the zoom, and the unit will track focus at intermediate positions. I found this worked well in my setup in the workshop, and I'd like to try it at longer throws.

Pan and tilt

The Max has an unusual feature in its pan-and-tilt system: The pan axis can rotate continuously. D.T.S. handles this well in the fixture profiles, and you can emulate a fixed angle unit with many different rotation angles—the standard being 540°—or allow it to fully spin in either direction. The mode I liked was the 360° smart path, where the unit will always take the quickest route to get to the destination, no head flips or awkward blind moves necessary. D.T.S. calls this its Free Pan Rotation, or FPR, system.

When operating in the default 540° pan mode, I measured pan speed over the full travel at three seconds and 1.6

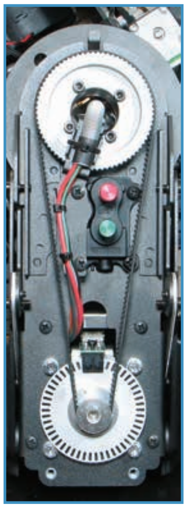

Fig. 17: Yoke.

seconds for 180°. In tilt, the figures were two seconds for the full 270° and 1.5 seconds for 180°. Movement on both axes was very smooth, with minimal hysteresis and little-to-no overshoot or bounce. In particular, pan exhibited almost no hysteresis at all, only 0.04°, which is 0.2" at a throw of 20' (7.6mm at 10m). Tilt was slightly more but still very good at 0.09°, 0.4" at 20' (15mm at 10m). Figure 17 shows the tilt motor system and encoder wheel in one yoke arm.

Noise

As with other luminaires using this lamp type, the need for constant forced air cooling of the lamp produced the most noise from the Max. The noisiest motor was pan, which uses a very large motor for the full rotation system.

SOUND LEVELS

Ambient	<35dBA at 1m
Stationary	47.7dBA at 1m
Homing/Initialization	51.2dBA at 1m
Pan	52.2dBA at 1m
Tilt	50.7dBA at 1m
Color	47.8dBA at 1m
Zoom	48.8dBA at 1m
Focus	48.5dBA at 1m
Frost	47.8dBA at 1m
Gobo	49.0dBA at 1m
Gobo Rotate	49.0dBA at 1m
Strobe	47.8dBA at 1m

Homing/initialization time

The D.T.S. Max took a measured 51 seconds to complete a full initialization from either power up or from a DMX reset command. The reset is well-behaved in that the lamp is dimmed out before reset starts and doesn't fade up again until after final positioning.

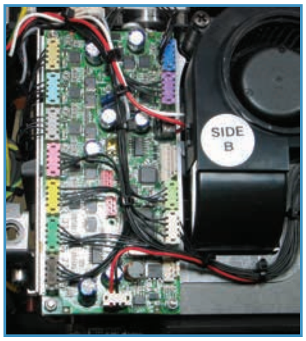

Fig. 18: Motor drive board.

Power, electronics, and control

Running as I did with a 117V 60Hz supply, the Max consumed 3.64A when running and warmed up. This equates to 424W and a power factor of 0.99. With all motors running, the power peaked below 450W.

Because of the necessity for slip rings through the rotating pan joint, and thus a need to keep the number of conductors to a minimum, the drive electronics are mostly in the head, with a single data feed from the base. Figure 18 shows one of the two driver boards in the head; the other is identical on the other side. Figure 19 shows a more general view of the head layout and the final optics. The color and gobo unit lifts out as a module to give access for cleaning and service.


Fig. 19: Head.

Power supplies for both electronics and lamp are in the top box (Fig. 20) along with the large diameter pan system. As is becoming increasingly common with moving lights, there is also a battery system in the Max top box, which allows setting fixture address before the unit is powered up.


Fig. 20: Top box.

Finally, Figures 21 and 22 show the LCD display and menu system and the set of connectors. The D.T.S. Max uses Powercon connectors for power in and out and provides both three-pin and five-pin XLR connectors for DMX512 data. Additionally, there is an Ethercon for Art-Net support, and the unit has optional integrated Wireless DMX (Figs. 21 and 22).

Fig. 21: Connectors.

Fig. 22: Display.

Conclusion

That just about wraps things up for the D.T.S. Max. It's a full-featured unit in a small package. How does it compare with the other units on the market? The endless pan range is interesting, as is the large zoom range from narrow angle beam to wide wash, but output suffers slightly correspondingly. Is this the unit for you? I'll end, as I always do, by side-stepping the question and reminding you that, although I've given you some facts and figures, it's your decision as to whether or not the Max will work for you.

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