

## Articulated Arm Ceiling Pendant Systems

### SPECIFICATION

#### **Pendant Systems**

The pendant system shall provide a safe, robust and ergonomic medical workplace solution. The pendants shall be designed to comply with HTM2022, HTM02-01, NFPA 99, BS EN 60601-1 and ISO 11197.

It shall be possible to replace all medical gas hoses without the need for on site crimping of ferrules. All medical gas hose shall be manufactured to BS EN ISO 5359, with NIST connectors manufactured to BS EN 15908. Non-colour coded hoses or hoses without permanently crimped connections are not acceptable.

#### **Bearings**

High quality bearings shall be used to provide smooth and free movement, minimising the force required to overcome static friction forces during repositioning. Bearings shall be permanently lubricated and sealed, with no maintenance or replacement necessary. The Heavy Duty pendant arm and bearing designed shall have been type tested to 40,000 revolutions under full load conditions at a safety factor of 4 to ensure the design is appropriate for the intended purpose.

#### **Pendant Arms**

Pendant arms other than the Standard Duty cantilever lift arm shall be manufactured from extruded aluminium sections and be available in various lengths. External surfaces of all arms shall be polyester powder coated in a RAL 9002 finish. Arm end caps shall be manufactured from moulded polyflam with a UL listed fire retardancy of UL94/VO. Tandem pendants for critical care areas shall be designed so that the consoles can readily swap sides within the bed bay to maximise the flexibility of the workspace.

Cantilever lift arms shall be driven by a single phase AC induction motor with power transmitted to the cantilever mechanism by a ball screw. Linear actuators shall not be used in the vertical lift mechanism for the pendant console. When tested to BS EN ISO 3744, the sound pressure level produced by the cantilever vertical lift mechanism shall not exceed 30db(A).

#### **Rotational Control**

The pendant shall be provided with active pneumatic brakes at each rotating arm joint (Heavy Duty Lateral and canti-lever arms) and electromagnetic brakes for Standard Duty Lateral type arm. Articulated pendants (double arms) shall have independently controlled brakes to enable individual control of arm movement.

The pendant console brake shall be operated from the same pneumatic control switch as the lower arm joint where articulated (double) arms are fitted. Pendants with cantilever vertical lift shall not be fitted with pneumatic brakes in the joint connecting to the console.

Visual indicators shall be included on the ceiling arm joint (green) and the intermediate arm joint (blue). A corresponding button mounted on the equipment shelf shall be included giving a clear indication as to which brake button controls which arm bearing, in order to give the user better control.

Non-return valves shall be fitted downstream of the connection to the medical/surgical air pipeline to prevent back-flow in the event of low distribution system pressure.

Heavy Duty arm joints shall be capable of 3300 of rotation, with consoles able to rotate up to 3400. The Standard Duty range of arms shall be capable of 3400 of rotation. Infinitely variable rotational stops shall enable precise of limits travel to be set to ensure maximum freedom of movement, whilst protecting walls and ancillary equipment. The rotational stops shall be dampened such that when limit of travel is reached, sensitive suspended equipment is not subjected to shock or vibration as the kinetic energy is absorbed.

#### **Consoles**

Consoles shall be manufactured from extruded hard-anodised aluminium sections, with polyester powder coated (RAL 9002) aluminium fascia plates. Consoles shall be configured using 200mm sectional compartments in order to provide efficient space usage and shall house auxiliary sockets and other electrical accessories.

Multi-function racks shall be stainless steel and shall be permanently fastened to the console. Racks shall be provided in varying lengths and configured along with the console suitable for the intended application and accessories included. Racks shall hold equipment such as shelves, drawers, infusion holding devices, monitor arms, keyboard trays, etc.

A docking facility shall be available to facilitate docking of ventilator trolleys or anaesthesia workstations. An electric lifting mechanism shall be available to enable lifting of anaesthesia workstations(1) off the floor, enabling easier cleaning in operating theatres and removing trailing cables and hoses from the floor. The lifting mechanism shall have a capacity of 280kg and lift up to 500mm from the floor level at a velocity of 9.5mm/s. When tested to BS EN ISO 3744, the sound pressure level produced by the lifting mechanism shall not exceed 30 db(A).

Note:

(1) Not all anaesthesia workstations are suitable for lifting. Please contact our design support department to discuss your particular application.



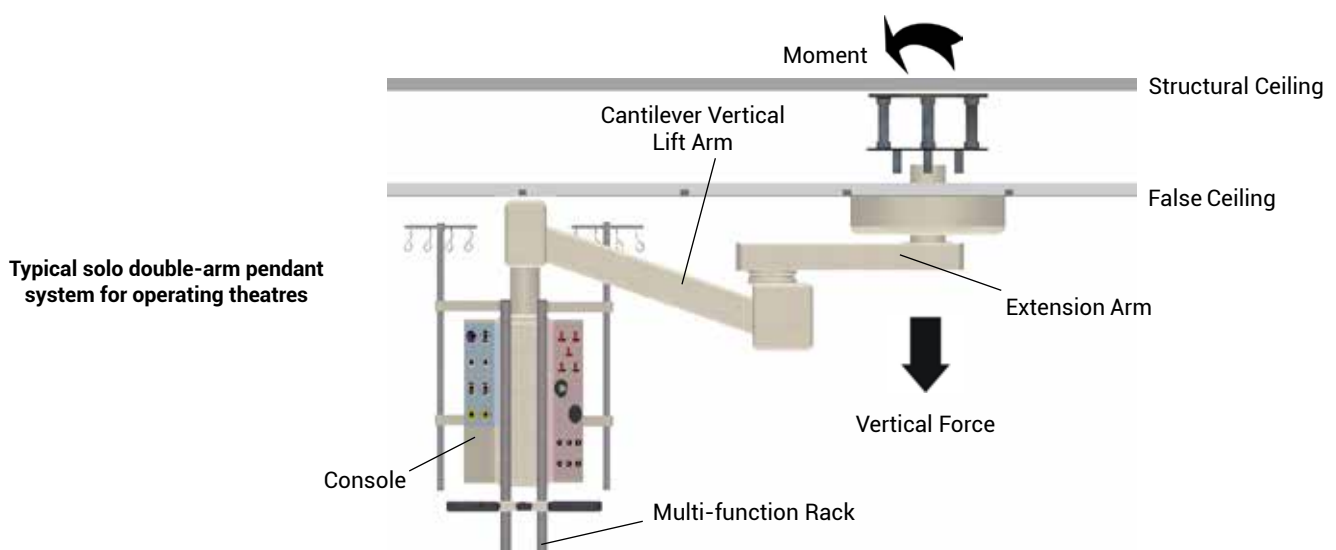
**Pendant Payloads, Moments and Forces**
**Standard Duty – Lateral Movement Only**

Arm Lengths		Safety Factor of 4 (towards yield)		
Extension Arm (mm)	Console Arm (mm)	Payload (kg)	Moment (Nm)	Vertical Force (N)
-	600	640	2470	5130
-	800	470	2520	4170
-	1000	370	2470	3520
-	1200	300	2520	3160
600	600	300	2475	3235
600	800	260	2475	2850
600	1000	220	2475	2710
800	800	220	2475	2710
800	1000	190	2475	2595
1000	1000	170	2475	2430
1200	1000	150	2475	2370

**Standard Duty – Lateral & Cantilever Movement**

Arm Lengths		Safety Factor of 4 (towards yield)		
Extension Arm (mm)	Console Arm (mm)	Payload (kg)	Moment (Nm)	Vertical Force (N)
-	1000	90	1051	2369
600	1000	90	2562	2492
800	1000	90	2562	2526
1000	1000	75	2562	2560
1200	1000	65	2562	2447

- Notes:
1. For tandem pendants the moment acting on each side of the pendant system should be added to give the worst case
  2. For tandem pendants the vertical force acting on each side should be added
  3. Net payload will be reduced by the weight of the console and associated fixed equipment and fixtures
  4. The current edition of BS EN 60601-1 stipulates a safety factor of 4 should be applied to suspended masses
  5. A factor of safety of 4 will ensure a deflection of no more than 10 between fully loaded and unloaded. Lower safety factors will lead to a larger deflection under the payloads shown.



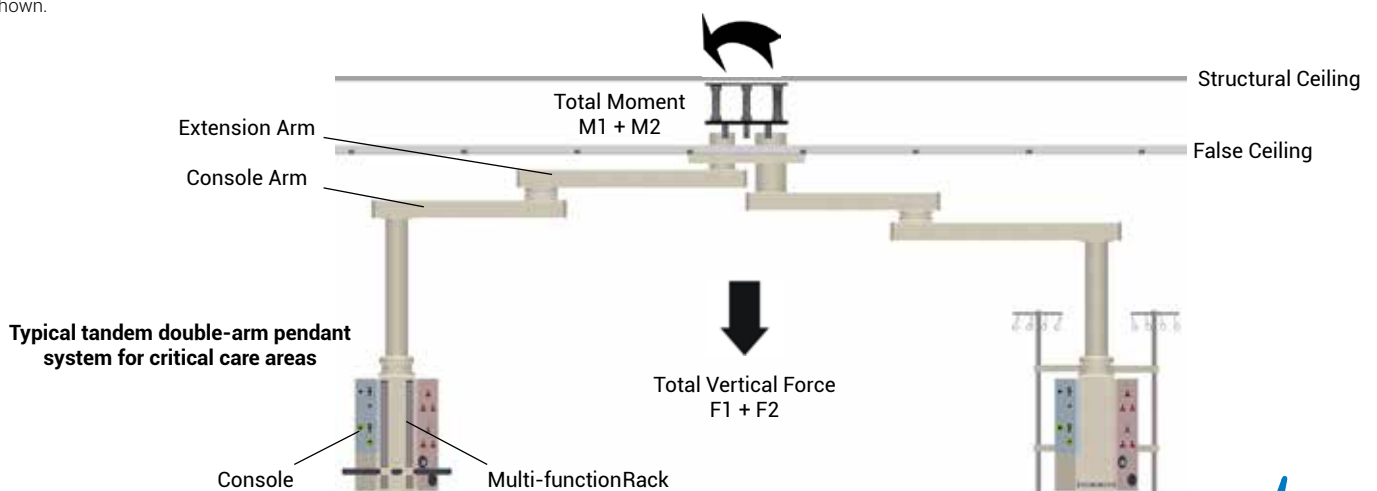
### Heavy Duty – Lateral Movement Only

Arm Lengths		Safety Factor of 4 (towards yield)		
Extension Arm (mm)	Console Arm (mm)	Payload (kg)	Moment (Nm)	Vertical Force (N)
-	600	650	4000	8500
-	800	460	4000	6640
-	1000	360	4000	5680
-	1200	285	4000	4980
600	600	280	4000	5230
600	800	230	4000	4775
600	1000	190	4000	4425
800	800	190	4000	4425
800	1000	160	4000	4170
800	1200	140	4000	4020
1000	1000	140	4000	4020
1200	1000	110	4000	3770

### Heavy Duty – Lateral & Cantilever Movement

Arm Lengths		Safety Factor of 4 (towards yield)		
Extension Arm (mm)	Console Arm (mm)	Payload (kg)	Moment (Nm)	Vertical Force (N)
-	750	200	1500	4150
-	1000	150	1500	3670
600	750	200	3100	4700
600	1000	150	2800	4300
800	750	200	3600	4750
800	1000	150	3200	4350
1000	750	145	3400	4400
1000	1000	137	3400	4400

- Notes:
1. For tandem pendants the moment acting on each side of the pendant system should be added to give the worst case
  2. For tandem pendants the vertical force acting on each side should be added
  3. Net payload will be reduced by the weight of the console and associated fixed equipment and fixtures
  4. The current edition of BS EN 60601-1 stipulates a safety factor of 4 should be applied to suspended masses
  5. A factor of safety of 4 will ensure a deflection of no more than 10 between fully loaded and unloaded. Lower safety factors will lead to a larger deflection under the payloads shown.



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