

MAQUET

HEART-LUNG MACHINE MAQUET HL 20

CARDIOVASCULAR





WELL-PROVEN PERFUSION TECHNOLOGY MAQUET – THE GOLD STANDARD



Creating the best conditions for optimal medical care:

MAQUET is one of the world's leading manufacturers and distributors for heart-lung machines and disposables for heart surgery. Working closely together with the customers MAQUET combines its expertise with trends in cardiopulmonary surgery to develop new and innovative products. The MAQUET Cardiovascular portfolio offers state-of-the-art equipment and service for the optimal treatment of patients and the best work conditions for the medical staff.

A proven complete perfusion system: The MAQUET HL 20 perfusion system has been available for several years and has been established as "The Gold Standard".

With the new HL 20 VARIO FLEX, HL 20 VARIO SINGLE and HL 20 VARIO TWIN, MAQUET is making available safe and well proven heart-lung machines but with increased flexibility, convenience and a modern design whilst maintaining the safety and user-friendliness necessary to meet the demands of today and tomorrow.

MAQUET – The Gold Standard.

THE MAQUET HL 20 CONSISTENCY AND USER-FRIENDLINESS

The HL 20 perfusion system meets and exceeds the highest requirements for perfusion technology today: The MAQUET HL 20 heart-lung machine combines the complex technology needed for modern cardiopulmonary surgery with the clear and concise overview and handling necessary for safe and effective patient and operator management. Each pump function is indicated by name, not by location and the assigned function of each pump is displayed on its front panel. All alarms and errors are indicated both acoustically and visually. A single button on the system control panel SCP is used to mute all alarms. Furthermore a remote control for the MAQUET heater-cooler unit HCU 20 is incorporated in the SCP. Patient temperatures can be monitored and managed without diverting the operator's attention. The cardioplegia monitor unit CMU can be fitted to the SCP allowing essential cardioplegia data, including volume, ratio, times, temperature and pressure to be displayed and managed.

Safe and reliable: In the event of mains power failure an integrated and fully automatic battery backup system will cut in automatically and power the entire system to allow most surgical procedures to be completed. All pumps and modules operate on low 24 V for increased patient and operator safety. All electrical connections are inside the HL 20. There are no protruding or interfering cables to be broken, tangled or inadvertently unplugged. The short SCP cable gives positioning flexibility to the system control panel. The system performs an extensive self-test when powered up and continuously monitors all vital functions during operation.

Ultimate data acquisition system: MAQUET'S Data Management System JOCAP XL records all perfusion data which can be stored and then reviewed during and after operation. The configuration possibilities that are available with JOCAP XL are so extensive and flexible that most user requirements can be easily met. A new concept for connecting external devices directly to the JOCAP XL system has been successfully established. It allows users to automatically acquire data from a wide variety of operating room devices, such as blood-gas and anesthesia monitors, giving them the monitoring and data storage possibilities they have been requesting.

Flexible and adaptable to every operation: There are different configurations for the heart-lung machine HL 20. All controls and monitors are managed from a single panel, which can be mounted on the mast in a number of different positions using a special holder. Pump functions can be renamed or relocated instantly without reconnection of a single cable.

Technical Data	HL 20
Console	Automatic function test, periodic sampling, emergency power, electric supply 230 V/50 Hz, power consumption 230 V/1450 W
Roller pumps	RPM range 0–250 R/min [clockwise/anticlockwise] Flow rate 0–10 L/min, occlusion 0.03 mm
Pressure regulation	+/- 997 mmHg, activation 1 mmHg, optical & acoustic alarm release, digital readout
Temperature measurement	4 channels with sensors, measurement range 0–50°C, optical & acoustic alarm release, digital readout
Bubble detector	Detection >300 micrometer, pump stop > 0.065 qcm
Level detector	Stop limitation 10 mm

MAQUET HL 20 PERFUSION SYSTEM OVERVIEW

RELIABLE, FLEXIBLE AND ADAPTABLE

The OR-COMPUTER: Is specially designed for the rigorous environment found in an operating room. It is an ergonomic, rugged, water resistant unit with integrated battery backup for true data protection even in the event of power outage.

Flexible LED lamp: This new LED lamp is designed for the environment in an operating room. It is a flexible water resistant lamp with a very high illumination and a low power consumption of just 6 W.

Fixed height shelf: A fixed height shelf is an integral part of the console.

The multi-positionable system control panel: This panel provides ergonomic integrated control for the entire heart-lung machine. The SCP can be positioned on any mast to meet the users requirements. A single knob adjusts all console settings, and a single button silences all acoustic alarms. Alternation of the vital functions demands a dual button safety setting procedure.

Side guard: To maneuver the console the height adjustable side guard can be separately ordered for each console type.

Twin pump: The twin pump module is suitable for applications where lower flow rates are required.

Mast system: Each type of console has four masts and two being with telescopic height adjustable infusion poles.

Roller pumps: The roller pumps are easily removed from and reinstalled onto the console simply by lifting or placing the module onto the guided position.

Heart-lung machine: The emergency battery provides a fully automatic uninterruptible power supply for the entire machine system. Charging and switching over from mains to battery operation, or vice versa, does not require any action from the operator. The whole heart-lung machine, including all pumps, continues its operation without any stops.

Drawer: To store accessories like tube inserts and hand cranks a special drawer can be ordered separately.

Chassis for electronic modules: The console is equipped with a rack for accommodation of the system electronic modules.

Transformer and power supply board: Mains power components are located inside the console, and in that way kept out of the operator's reach. Outside the console, only extra low (24 V) medical safety voltage connections are accessible.



CONFIGURATIONS

A WIDE RANGE OF CONFIGURATIONS TO MATCH EVERY NEED

The **MAQUET HL 20** console is constructed of stainless steel and easily maneuvered by means of a side guard and four stable wheels, two with total lock and two with direction lock. To explain the concept and variety of the HL 20 VARIO

FLEX, HL 20 VARIO SINGLE and HL 20 VARIO TWIN a 4-pump console is shown as an example. The 2-pump console is available as VARIO FLEX with a left or right oriented SCP. The 4 and 5-pump consoles are available in all three versions.



MAQUET HL 20 VARIO FLEX



MAQUET HL 20 VARIO SINGLE



MAQUET HL 20 VARIO TWIN

Flexible basic unit: The VARIO FLEX console is available as a basic unit to which optional components can be added.

- The basic unit includes:
 - four masts – two of them height adjustable
 - fixed top shelf
 - flexible mountable system control panel
 - mast attachment for control panel
 - can be equipped with the cardioplegia monitor unit
- Pumps and accessories are ordered individually
- 4 and 5-pump console available

Basic unit plus four single roller pumps: The VARIO SINGLE console is a complete system with a competitive price.

- In addition to the four single roller pump modules and all components from the VARIO FLEX, the VARIO SINGLE includes:
 - cardioplegia monitor unit mounted below the SCP
 - dual pressure module
 - temperature module
 - air emboli protection module
 - gas blender
- All other accessories can be ordered individually
- 4 and 5-pump versions are available. The fifth pump position on the 5-pump console can be utilized as the customer wishes

Basic unit plus three single roller pumps and one twin pump: The VARIO TWIN console is a complete system with a competitive price.

- In addition to the three single roller pumps and one twin pump and all components from the VARIO FLEX, the VARIO TWIN console includes:
 - cardioplegia monitor unit mounted below the SCP
 - dual pressure module
 - temperature module
 - air emboli protection module
 - gas blender
- All other accessories can be ordered individually
- 4 and 5-pump versions are available. The fifth pump position on the 5-pump console can be utilized as the customer wishes

THE PUMPS

SAFE AND VERSATILE PUMP SYSTEM



Single roller pump module



Twin pump module



The ROTAFLOW centrifugal pump system can also be used as a fully independent stand-alone unit.

Roller pump modules: The design of the MAQUET HL 20 peristaltic roller pumps offers precision, durability, versatility and convenience in handling. All pumps run quietly and smoothly on safe low-voltage power supplied by the console. There are no cables to connect. Due to their compact size and low weight, the pumps are easily removed from and reinstalled onto the console simply by lifting or placing the module onto the guided position.

The range of roller pumps consists of:

- Single roller pump module
- Twin pump module, which offers two small roller pumps, independent of each other, in a common standard size module housing. The twin pump module is suitable for applications where lower flow rates are required, such as pediatric perfusion, cardioplegia delivery, suction or venting

The pumps offer:

- Forward and reverse rotation
- Central occlusion knob, lockable and precise in setting
- Large four-digit alpha-numeric display for flow and speed
- Eight-digit alpha-numeric display for mode of operation, tube size and status messages
- Eight programmable modes of operation including slave and cardioplegia modes
- Continuous and pulsatile operation
- Calibration memory for up to four tubing sizes
- Full control by supervising units
- Full range of protection by monitoring of runaway, beltsliip, overload, direction, heat generation and communication

The ROTAFLOW system consists of:

- ROTAFLOW console, a control module with triple power supplies: mains, HL 20 or own batteries
- ROTAFLOW drive unit with incorporated flow and bubble measurement. A multiple led hydraulic holder allows optimal positioning of the drive unit
- ROTAFLOW emergency drive, a manual drive (hand crank) with speed indicator
- ROTAFLOW centrifugal pump, a disposable pump head with integrated flow probe connector

ROTAFLOW console pump: The ROTAFLOW centrifugal pump system, a natural part of HL 20, can also be used as a fully independent stand-alone unit. The unique flow and bubble measuring function is an integral part of the ROTAFLOW system.

The ROTAFLOW system offers:

- Completely independent stand-alone application for direct mains power supply, built-in battery back up, level and pressure measurements with external (optional) transducers
- Integrated flow and bubble sensors
- Separate flow and speed displays
- Constant flow mode of operation
- Suitability for pulsatile operation
- Technologically advanced disposable pump head

SUPERVISORY UNITS COMPREHENSIVE AND SAFE CONTROL



System control panel

Pressure monitoring system: The HL20 allows accurate measurement of up to four pressures. Standard medical grade pressure transducers serve as system sensors. The range and accuracy of measurements are decided by the technical data of the transducer itself.

Temperature monitoring system: The HL20 allows accurate measurement of up to four temperatures. The system works with insulated temperature probes, which are fully compatible with the Yellow Springs Instruments YSI 400 series interchangeable thermistor probes.

Air emboli protection system: The air emboli protection system offers two safety protection systems to prevent air entering the extracorporeal circuit: Capacitive level sensor and ultrasonic microbubble air detector.



Cardioplegia monitor unit

Cardioplegia monitor unit: With the cardioplegia monitor unit CMU essential cardioplegia data is easily displayed. It displays volumes, ratio, timers, temperature and pressure for full control of cardioplegia delivery.

The CMU is a principal component on the HL20 Vario Single and Vario Twin and is mounted under the system control panel. The CMU is an option on the HL20 Vario Flex 2, 4 and 5-pump consoles.

A COMPLETE RANGE OF ACCESSORIES HAS BEEN DEVELOPED FOR MAQUET HL 20

Some of the most commonly used accessories for the MAQUET HL20 heart-lung machine are:

Flexible LED lamp: This new LED lamp is designed for the environment in an operating room. It is a water resistant lamp with a smoothly and easy to clean surface. The LED itself is protected with a shatter-proof glass. The lamp needs no cooling fins because of the very low 6W power consumption. Due to the low heat emission – the cold light – the environment as well as tubing, circuit components and blood are not exposed to heat from the lamp source.

The LED can be mounted anywhere on the HL20. MAQUET offers two lengths of the LED goose neck arm – 200 mm and 400 mm. This flexible arm can be mounted anywhere on a mast and the lamp is plugged into the 24V socket of the HL20 console.

Cross mast: The cross masts for 4 and 5-pump consoles, respectively, consist of a round 25 mm bar with end mast holders. The cross masts are height adjustable along the console vertical masts without the use of any tools.

Vertical mast: The vertical mast is a round 25 mm bar; the length is 500 mm.

Ice box: The thermo insulated ice box can be used for example for the cooling of cardioplegia solution. The ice box fits into the space of a pump module on the HL20 console.

Venous clamp standard: The hard anodized aluminum venous clamp standard is designed to allow precise regulation of the venous return flow by variable occlusion of the venous line. There is no need for inserts, and the clamp is able to accommodate tubing up to 5/8" x 3/32" in size.

Venous clamp quick: This clamp offers both precise and quick venous return adjustment by means of two separate knobs. An extension arm and ball and socket joint facilitate optimal positioning of the clamp. The clamp accommodates tubing up to 1/2" x 3/32" in size.

Drawer: The drawer can be fixed under the console rack. It can be used for hand cranks and other accessories. The drawer can be opened from the rear or front of the 4 and 5-pump consoles but only from the front of the 2-pump console.

Sechrist gas blenders: The sechrist air-oxygen mixer is a precision pressure regulation and proportioning device, which is designed to accurately mix medical air and oxygen (O₂) to any selected FIO₂ between 0.21 and 1.0, for delivery to a variety of respiratory care devices.

Side guard: The flexible side guard is used to maneuver the console. The height adjustable side guard can be fixed on the right or left side of the console. The side guard can be separately ordered for each console type.



Flexible LED lamp

Technical Data	LED lamp
Power consumption	6 W
Operating voltage range	22–28 VDC/19 VAC
Operating temperature	–20° C up to +40° C
Measurements	Length: 200 mm or 400 mm arm Diameter head: 59 mm Length head: 73 mm
Dim regulation steps	3
Light color	Natural white
Angle of reflected beam	30° C
Operating mode	Qualified for continuous operation
Material of the housing	Aluminum (anodized) borosilicate glass

ORDER INFORMATION

PUMP CONSOLES

HL 20 VARIO FLEX	Code No.
2-pump console left oriented control panel	70 36 93
2-pump console right oriented control panel	70 36 95
4-pump console	70 61 87
5-pump console	70 61 89

Console base and components:

- Console base with connections for 2, 4 or 5-pumps
- Drawer under the 2-pump console base
- Four wheels (lockable)
- Four masts – two with height adjustable infusion poles
- Mast-mounted console rack with shelf
- Multi-positional system control panel on the 4 and 5-pump console
- SCP mast attachment for 4 and 5-pump consoles, 200 mm arm
- Adjustment screwdriver, 4 pcs.
- Hand crank for single pump, 2 pcs.
- Ultrasonic gel dispenser
- Can be equipped with cardioplegia monitor unit under the system control panel

HL 20 VARIO SINGLE	Code No.
4-pump console	70 61 93
5-pump console	70 61 99

Console base and components:

- Four wheels (two with total lock, two with direction lock)
- Four masts – two with height adjustable infusion poles
- Fixed top shelf
- Multi-positional system control panel
- Cardioplegia monitor unit mounted below the SCP
- SCP mast attachment, 200 mm arm
- 4 single roller pump modules (rear connections, anticlockwise), including 4 sets of inserts for 3 sizes of tubing
- Hand crank for single pump, 2 pcs.
- Dual pressure module, channels 1 + 2
- Medex transducer kit including:
 - transducer cable 2 m, for pressure module connection
 - transducer plate
 - one medex pressure dome
- Medex transducer holder
- Quad temperature module
- Temperature probe box, 4 probe connections including connection cable 1.3 m

- Air emboli protection system including:
 - air protection module (to be placed in the console rack)
 - bubble sensor complete with cable 2.1 m including one pair of inserts for 3/8" x 3/32" tubing
 - capacitive level sensor
 - level sensor pads, 100 pcs.
 - ultrasonic gel dispenser
- Sechrist gas blender, 2 tubes, without gas hoses

HL 20 VARIO TWIN	Code No.
4-pump console	70 61 95
5-pump console	70 61 97

Console base and components:

- Four wheels (two with total lock, two with direction lock)
- Four masts – two with height adjustable infusion poles
- Fixed top shelf
- Multi-positional system control panel
- Cardioplegia monitor unit mounted below the SCP
- SCP mast attachment, 200 mm arm
- 4 single roller pump modules (rear connections, anticlockwise), including 4 sets of inserts for 3 sizes of tubing
- Hand crank for single pump, 2 pcs.
- 1 twin pump module (anticlockwise), including:
 - inserts for 1/4 tubing, 2 pcs.
 - hand crank for twin pump
- Dual pressure module, channels 1 + 2
- Medex transducer kit including:
 - transducer cable 2 m, for pressure module connection
 - transducer plate
 - one medex pressure dome
- Medex transducer holder
- Quad temperature module
- Temperature probe box, 4 probe connections including connection cable 1.3 m
- Air emboli protection system including:
 - air protection module (to be placed in the console rack)
 - bubble sensor complete with cable 2.1 m including one pair of inserts for 3/8" x 3/32" tubing
 - capacitive level sensor
 - level sensor pads, 100 pcs.
 - ultrasonic gel dispenser
- Sechrist gas blender, 2 tubes, without gas hoses

ACCESSORIES AND ADDITIONS

Accessories	Code No.
Flexible holder for SCP micro arm, 6 mm	70 60 25
short arm, 100 mm	70 60 27
long arm, 300 mm	70 60 31
Cross mast for 2-pump console	96 24 31
Cross mast for 4-pump console	96 21 41
Cross mast for 5-pump console	96 21 51
Drawer for 4 and 5-pump console	92 29 61
Vertical mast	96 82 51
Venous clamp quick	90 47 21
Venous clamp standard	90 03 71
Y-cable for more external devices	70 59 55
Ice box	93 96 71
Side guard	70 59 53
Extended mast system	70 60 65
LED lamp	Code No.
200 mm arm	70 60 69
400 mm arm	70 60 71
Cardioplegia monitor unit	Code No.
English	70 61 91
French	70 61 65
German	70 61 63
Pressure monitoring system	Code No.
Dual pressure module, channels 1+2	92 58 71
Dual pressure module, channels 3+4	90 23 21
Pressure transducer	Code No.
Medex transducer kit	93 30 91
Medex LogiCal transducer kit	96 32 01
Medes transducer holder	15 10 10
Medex logical transducer holder	96 31 91
Medex pressure dome	15 10 11
Medex LogiCal pressure dome	15 10 19
Air emboli protection	Code No.
Level detector	70 37 49
Bubble detector	70 37 51
Level and bubble detector	92 43 21
Extra sensor pads	15 10 04

Cable adapter for pressure transducer	Code No.
Abbott transpac baxter truewave	96 73 81
BD DTX PLUS/Ohmeda TC-XX	96 73 31
BD/Spectramed/Statham P23 XL	92 58 11
Braun CombiTrans	96 73 61
Maxxim CDXpress	96 81 91
Medex MX-960 LogiCal	96 31 81
Medex TranStar 950	96 73 41
TranStar 950 PvB DPT6000	96 73 51
Medex MX860 Medex	93 04 41
PvB type 4-327-1	96 73 71

Temperature monitoring system	Code No.
Quad temperature module	90 93 11
Temperature probe box, 4 probe connections	92 73 11
Temperature box holder	92 71 11
Temperature probe, pediatric	70 03 45
Temperature probe, flat surface	70 03 41
Temperature probe, adult	70 03 39
Temperature probe, oxygenator compatible	70 00 17

Alternative bubble sensor inserts available	Code No.
For 3/16" x 1/16" tubing	70 38 71
For 1/4" x 1/16" tubing	70 38 73
For 1/4" x 3/32" tubing	70 38 75
For 3/8" x 1/16" tubing	70 38 77
For 3/8" x 3/32" tubing	70 38 79
For 1/2" x 1/16" tubing	70 39 81
For 1/2" x 3/32" tubing	70 38 81
Ultrasonic gel dispenser	45 00 06
Alternative tube inserts	

Additional medical devices	Code No.
VAVD CONTROLLER	JH 103 59 05
Sechrist gas blender*	51 01 19
Data management system JOCAP XL	
Heater-cooler unit HCU 20	
Heater-cooler unit HCU 30	

For detailed information please ask your local dealer.

* Not released for all countries

PUMP MODULES

Single roller pump module	Code No.
Anticlockwise, rear connections	70 33 09
Anticlockwise, left side connection	70 61 43
Anticlockwise, right side connections	70 61 45
Clockwise, rear connections	70 61 47
Clockwise, left side connections	70 61 49
Clockwise, right side connections	70 61 51

Specific country kits available. Please ask your local dealer.

Twin pump module	Code No.
Anticlockwise	70 33 23
Clockwise	70 61 59

ROTAFLOW pump module	Code No.
ROTAFLOW console	
ROTAFLOW drive unit	95 22 91
ROTAFLOW emergency drive unit	95 23 01





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