

Highlights of the PUMA Pouring Machine



The PUMA™ is the only fully automatic pouring system with independent NC control over all axis; with its patented virtual ladle spout turning point feature.

PUMA™ Fully Automatic Pouring Machine 15 / 25

Equipment Features

Description

General Overall Design:		Newly designed with full operating flexibility using the latest in servo-motor, numerical control and human machine interface combination technologies proven by Bosch Rexroth. Implementation of new weighing system.
Year of Design:	1997	Originally patented design.
	2006	Complete re-design and full implementation to Bosch Rexroth electrical controls system and servo-drive system.
Mechanical Design:		F. Lauper
Model Versions:	15 25	Capacity up to 1500 kg (3300 lbs) Capacity up to 2500 kg (5500 lbs)
Modularity:		Fully realized in the design layout and operation for placement and commissioning.
Space Requirement:		Compact requires very little floor space
Dimensions (mm):	PUMA 15 PUMA 25	4000 x 1500 x 3000* 4500 x 1800 x 3600* * denotes without ladle and inoculation system
Weight:	6,5 7,5	tonnes, ca for PUMA 15* tonnes, ca for PUMA 25* * denotes without ladle and inoculation system.
Operational Modes:		Manual, semi-automatic and automatic feedback.
Pouring Curve:		Virtual pouring position which is independently controlled electronically. Independently controlled movements in all axis with Bosch Rexroth NC components. Full freedom in programming ladle movements and the virtual pouring position (Patented). Spout up/down movement permits quick pre-pouring and clean at the end of pour. Permits height adjustment and pattern related adjustment of pouring height. Pour in far located pouring cups with optimal pouring quality and low pouring height. Smaller pouring cup to be used.
Pouring Height:		Readily adjustable with freedom in programming to allow low pouring heights.
Longitudinal Drive Movement:	0 – 1200	mm/second (Y-axis) The adaptation of a newly designed two (2) wheel drives system that is directly coupled to a gear drive. Easily transverse along the rail system on the floor. Mounting technique and the placement of the rails may be built and installed flushed with the floor with no disability for manual pouring. Design with very low maintenance requirements

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		Laser encoder absolute reference, absolute incremental encoder on the moulding line and absolute incremental encoder on the servo-drive.
Dynamic Accuracy:	±10	mm
Way Signal:		The adaptation of an absolute incremental encoder connected directly to servo drive controller.
Servo Drive Units:		A axis (tilting) Y axis (longitudinal) X axis (horizontal) Z axis (vertical) X₁ axis (horizontal – inoculation) D axis (ladle changer) E axis (ladle cover turn)
Ladle Cover Handling System:	Optional	
Synchronization:	0 - 630	mm/second (X-axis) (depending on flask dimensions)
	0 - 1070	mm/second (Z-axis) height movement (depending on flask dimensions)
Weighing System:		Newly developed system with load cells located in the tilting device. Better accuracy due to sufficiently less influences in the movement. Tara: ladle Pouring start by pre-pour sequence Pouring stopped by weight control Much shorter reaction time. Tolerance of new weight cell is: ± 150 grams Tolerance of new weight cells when pouring is: ± 1 kg
Temperature Measuring System:		By a two phase colour photo resistive optical sensor.
Ladle Design:	PUMA 15	Newly designed round ladles with capacity up to 1500 kg (3300 lbs)
	PUMA 25	Newly designed round ladles with capacity up to 2500 kg (5500 lbs) Round shaped ladles advantages are; low temperature drop and greater reduction in turbulence within the ladle during moving and pouring. Longer spout design for low pouring heights and distanced pouring positions on the flask.
Ladle Transportation:		The ladle design incorporates the lifting features for fork lift transportation. Excellent accessibility to the ladle on all three sides.
Ladle Changer:		Modular and separated from the pouring robot that allows for compact design of the robot. Stationary or movable Placement depends on the length of rails and the position of the ladle change system.
Metal Treatment:	Optional	KW-SLS Swisspour AG designed tundish cover New design with a thermal efficient – temperature loss 4° K a minute. Treatment of ductile iron can be done directly into the pouring ladle with no additional transfer of metal is required.
Pigging Function:	Optional	Reverse tilting
Ladle Cover Handling Module:	Optional	Separate and stationary
Inoculation:	Optional	Possible by KW-SLS Swisspour AG Inoculation System COBRA
	Yes	Inoculant flow control Filtered compressed air requirements: 14,4 m ³ /hour; 5 bar
Power Supply:	Standard	3φ, 400-V _{AC} + NE + PE, 50/60 Hz
Control Supply:	24-V _{DC}	Internal control power supply
Emergency Supply:	24-V _{DC}	Internal battery power supply with charging unit
Control System:	PLC	Bosch Rexroth with Profibus DP

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		Bosch Rexroth IPC MTX integrated PLC, HMI and NC hardware components.
Power Consumption:	56 63	kW for PUMA 15 kW for PUMA 25
Trailing Cable Harness Connections:	1x 1x 1x 2x 1x 1x	24-V _{DC} signal connections over trailing cable 3Φ, 400-V _{AC} + NE + PE Video Optical Profibus Air supply for inoculation system – if applicable
Indexing Configurations:	Yes Yes	Single inline Double inline for high speed moulding cycles
Designed for Usage:		Cycled or continuous driven moulding lines
Types of Pouring Modes:		Synchronous cycle pouring is when the pouring robot is pouring in synchronous with moulding line movement and automatically pours from one flask to the next. Asynchronous cycle pouring is when the pouring robot is not pouring within the moulding cycle and automatically pouring within the movement of the moulding line.
Types of Pouring Functions:		Weight, regulation (weight and time) and mass
Pouring Speed:	2 - 35	kg/s
Average Pouring Speed:	7,5	kg/s
Pouring Capacity:	230 221 212	moulds/hour – 36 kg iron per mould and pouring with movement of the line. moulds/hour – 56,5 kg per mould pouring while stopping of the moulding line. moulds/hour – 82 kg iron per mould only at stopping of moulding line. * Denotes indirectly is defined by pouring rate
Remote Monitoring and Control: Remote Control Room:	Yes Optional	Video camera
Quality Management Parameters:	Standard	Quality assurance parameters can be stored and managed for process automatic and repeatability for all the respective pouring parameters in relationship to each type of flask characteristics. Open for all the common data interfaces and database software.
SCADA:	Optional	Interfacing and connections applicable.
Pouring Strategies:		Date Pouring times and acceleration pouring ramps Pouring temperatures Pouring weights Pouring heights Inoculating quality Ladle change Ladle identification
Pouring Cup Positions Data:	Optional	Adaptable
Ladle Identification System:	Optional	Bit logic signals
Safety Features:		Fully built in compliance to current CE Equipment Safety and Securities Standards. Safety barriers around perimeter linked with interlocking safety switches (within the design). Automatic emergency back tilt feature during power failure. Emergency stop buttons on control console and control room. Bumper guard system on both the front and rear positions (longitudinal). 24-V _{DC} battery power supply and sensor control for loss of voltage.

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Factory Acceptance Test:	Yes	
Training:	Yes	
Pouring Sequence Timing Charts:	Yes	On request
Preliminary Layout Drawing:	Yes	On request
Reference List:	Yes	On request
