Business case: throughput, budget and payback

Twin-line palletising cell · KUKA KR 210 R2700 extra · Palletising · 26 Nov 2026

THROUGHPUT AGAINST LINE RATE

~10.8 picks/min achievable

Robot at 100% speed, less 10% to be safe.

Cycle time, average	5.5 s per case
Cycle time, worst place	5.7 s
Where the time goes	PTP there and back 1.5 s, four LIN moves 2.9 s (down at 0.7 s each), gripper and settle 1.1 s. The 10% margin is in each figure
Achievable	10.8 picks/min, 650 cases/hour
Timed at	Robot at 100%: axes at the datasheet speed with rated payload, linear moves at 2 m/s. 10% is then taken off the rate to be safe (every time is divided by 0.9)
As generated	8.6 picks/min, 6.9 s per case. The program is generated at 50% axis speed and 0.5 m/s linear moves, the speeds to prove a new cell at. Raise them in the program once it is proven
Pallet	6 cases, built in 0.6 min
Pallets per hour	108.3 building non-stop, 108.3 with 60 s pallet changes (2 pallet positions: builds one while another is changed)
Line rate	Not given. Enter it under Stacking in the builder (cases/min).

BUDGET COST (GBP)

		Low	High
Robot	Robot KUKA KR 210 R2700 extra, controller and pendant Used, or new. New is £55,000 for most robots (£75,000 for the heavy KR FORTEC range).	**Used £25,000**	**New £55,000**
Robot accessories	Gripper, Robot pedestal	£7,500	£19,000
Cell equipment	Powered roller conveyor, Pallet station	£19,000	£21,000
Guarding	Mesh fencing, 2200 high	£3,000	£3,000
Safety	Safety devices	£2,000	£5,000
Controls	Electrical controls	£10,000	£20,000
Integration labour	Integration labour	£10,000	£20,000
Contingency 10%		£7,600	£14,300
Total		**£84,200**	**£157,300**

Budget range for planning, not a quote. The low end has a used robot, the high end a new one. Typical UK budget figures, 2026; replace with real quotes. Line by line in cycle_time_and_cost.xlsx.

SIMPLE PAYBACK

16 to 29 months

Labour saved	1 operator(s) x 2 shift(s) x £32,000 = £64,000 a year
Not included	Finance cost, maintenance, energy, downtime, and any gain in output.

ASSUMPTIONS

Calibration factor	1 (set to timed cycle / estimated cycle after timing one cycle)
Axis speeds, deg/s	A1 123, A2 115, A3 112, A4 179, A5 172, A6 219 (from datasheet, rated, KUKA data sheet KR 210 R2700 extra)
PTP speed	100% of the datasheet axis speed, plus 0.4 s to accelerate and brake
PTP timing	Slowest axis sets the time (synchronous PTP). Axis travel from the builder's IK, tool pointing down; direct move between the approach points
LIN down	250 mm at $VEL.CP = 2 m/s, $ACC.CP = 2.3 m/s2 (the controller's standard limits)
LIN up	250 mm at $VEL.CP = 2 m/s, $ACC.CP = 2.3 m/s2 (the controller's standard limits)
Approach heights	Pick approach 250 mm, place approach 250 mm
Via	None: direct PTP
Gripper	vacuum, 0.3 s to grip and 0.3 s to release
Settle	0.2 s at each exact stop before the gripper switches
Pallet change	60 s, manual (45 to 90 s typical). One pallet position: the robot waits during a change. Two or more: it builds the others meanwhile
Line rate	Cases per minute arriving at the cell, all infeeds together, shared equally between the pallet positions
Infeed queue	Cases end to end on the infeed conveyors with a 50 mm gap; assumes the conveyor can accumulate
Separator sheets	The program's own moves: search down the stack at 0.05 m/s, 0.5 s after each grip and release, through the via when there is one. Timed when the cell has a sheet stack or the sheet tile is stamped
Not included	Waiting for product, lifting higher than the approach points to clear the stack, override below 100%

Estimate. Calibrate with one timed cycle on the robot.