

Torque Plate Solutions

Torque Plate assembly solutions

Torque Plate

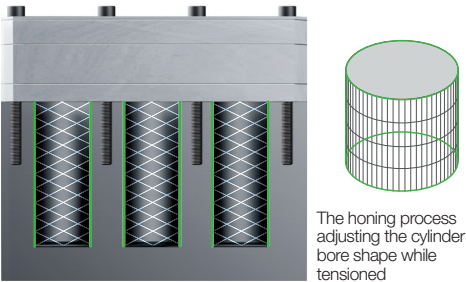
The torque plate is a device used to simulate the real conditions of use and operation of the engine and ensure precision in the machining process of e cylinder block. When an engine is assembled, the cylinder head bolts are tightened with a specific torque and sequence to ensure that all parts are correctly attached. The application of torque causes deformations in the cylinders bores, creating variations in their shape and diameter.

If the cylinder machining process does not account for these deformations, the cylinders may end up slightly out of specification once the engine is fully assembled. This distortion can result in:

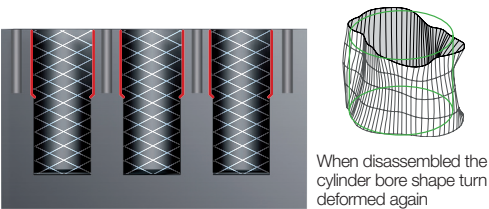
Compromised performance: It can lead to sealing issues between the cylinder and piston, causing compression loss. This reduces engine efficiency and overall performance, affecting both power and fuel consumption.

Accelerated wear: It can cause uneven wear on the cylinder walls and piston rings, shortening the engine's lifespan and increasing the risk of premature failure.

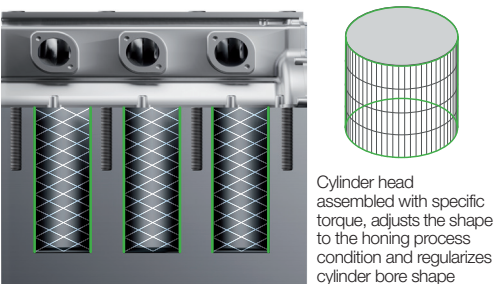
Vibrations and noise: It can increase engine vibrations and noise, negatively affecting vehicle comfort and performance.



CIRCULARITY AND CYLINDRICITY					DIAMETER						
Position (mm)	C1	C2	C3	C4	Heigh (mm)	Position	Tolerance (µm)	C1	C2	C3	C4
-5	0,64	0,87	0,82	0,65	-9	0	+15	12	12	11	11
-7	0,52	0,95	0,76	0,81	-9	90	+15	11	10	9	10
-9	0,71	1,12	0,91	0,84	-24	0	+15	13	12	12	10
-17	0,81	1,21	1,26	1,04	-24	90	+15	11	10	8	11
-24	1,11	1,24	1,37	1,60	-39	0	+15	14	13	14	11
-39	1,17	1,11	1,65	2,36	-39	90	+15	13	12	9	13
-70	1,67	1,43	2,03	3,25	-70	0	+15	14	13	15	10
-110	1,80	1,81	1,42	3,21	-70	90	+15	13	12	9	9
-125	1,91	1,19	1,02	2,78	-110	0	+15	11	10	12	8
					-110	90	+15	12	9	8	12
					-125	0	+15	13	12	15	10
					-125	90	+15	15	12	13	14
Cylindricity	5,40	5,40	4,38	5,83							



CIRCULARITY AND CYLINDRICITY					DIAMETER						
Position (mm)	C1	C2	C3	C4	Heigh (mm)	Position	Tolerance (µm)	C1	C2	C3	C4
-5	9,53	6,37	14,87	9,61	-9	0	+15	6	7	11	3
-7	9,18	6,74	14,85	10,10	-9	90	+15	-6	-4	-11	-6
-9	9,09	7,21	15,02	9,93	-24	0	+15	3	6	9	0
-17	7,67	7,40	14,94	9,08	-24	90	+15	-6	-5	-13	-6
-24	6,19	6,51	14,37	7,58	-39	0	+15	4	6	10	2
-39	6,97	6,42	12,64	7,64	-39	90	+15	0	1	-8	0
-70	4,70	4,07	6,01	5,67	-70	0	+15	0	5	8	-1
-110	5,43	2,51	2,46	6,55	-70	90	+15	1	0	-2	-2
-125	5,52	3,24	2,40	7,15	-110	0	+15	-10	0	3	-1
					-110	90	+15	4	1	-1	6
					-125	0	+15	1	0	3	0
					-125	90	+15	6	4	2	7
Cylindricity	12,74	10,09	17,43	13,11							



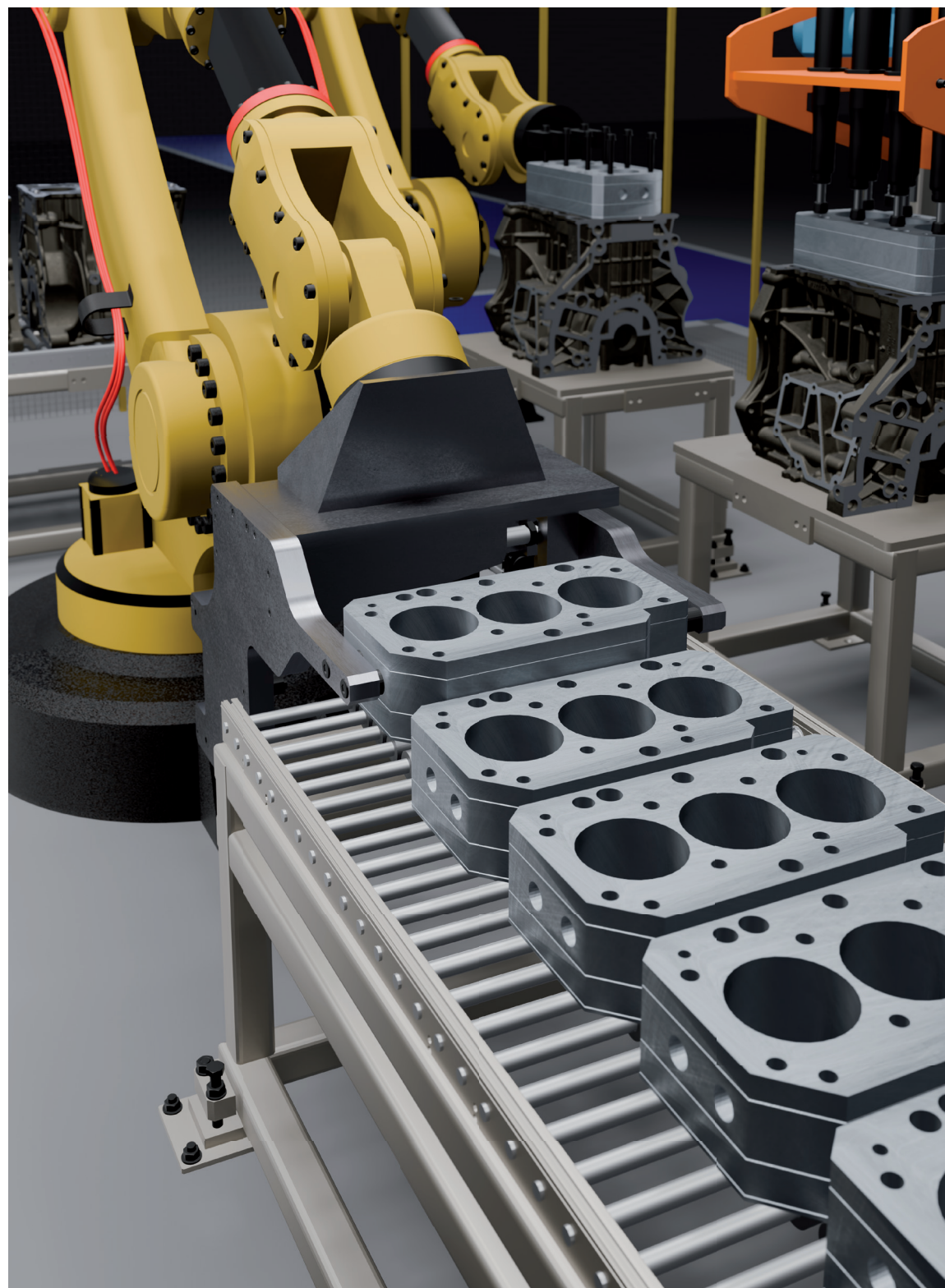
CIRCULARITY AND CYLINDRICITY					DIAMETER						
Position (mm)	C1	C2	C3	C4	Heigh (mm)	Position	Tolerance (µm)	C1	C2	C3	C4
-5	3,65	2,63	6,29	3,78	-9	0	+15	5	7	9	7
-7	3,39	2,51	5,81	3,32	-9	90	+15	9	6	0	1
-9	3,33	2,74	5,56	3,12	-24	0	+15	6	7	9	5
-17	2,98	2,79	5,45	2,38	-24	90	+15	7	4	-1	2
-24	3,03	2,72	5,94	1,77	-39	0	+15	8	8	10	5
-39	3,26	2,51	6,77	1,39	-39	90	+15	6	4	0	5
-70	3,06	3,37	4,61	4,91	-70	0	+15	9	8	11	4
-110	2,51	3,07	3,69	8,74	-70	90	+15	4	4	2	2
-125	2,88	2,30	4,00	8,86	-110	0	+15	5	5	8	-1
					-110	90	+15	6	4	0	4
					-125	0	+15	8	7	12	0
					-125	90	+15	10	10	9	15
Cylindricity	7,33	6,31	8,69	8,97							



Application

Nagel's torque plate assembly cells are ideal for automotive manufacturers and engine producers that demand High precision and reliability. These cells are specifically designed for the assembly and disassembly of torque plates, which are essential for simulating the real stress experienced during the machining of cylinder bores and crankshaft bores. This helps to reduce engine friction, fuel and oil consumption, lower emissions, and increase engine durability.

This solution is particularly suited to environments that require consistent quality and repeatability in the production of High-performance engines. By maintaining precise torque settings during assembly and seamlessly integrating with processes such as honing, Nagel's cells ensure superior performance, durability, and efficiency in the final engine components.



Automation and Integration

Nagel's torque plate assembly cells offer advanced automation and seamless integration, designed to maximize efficiency at every stage of production.

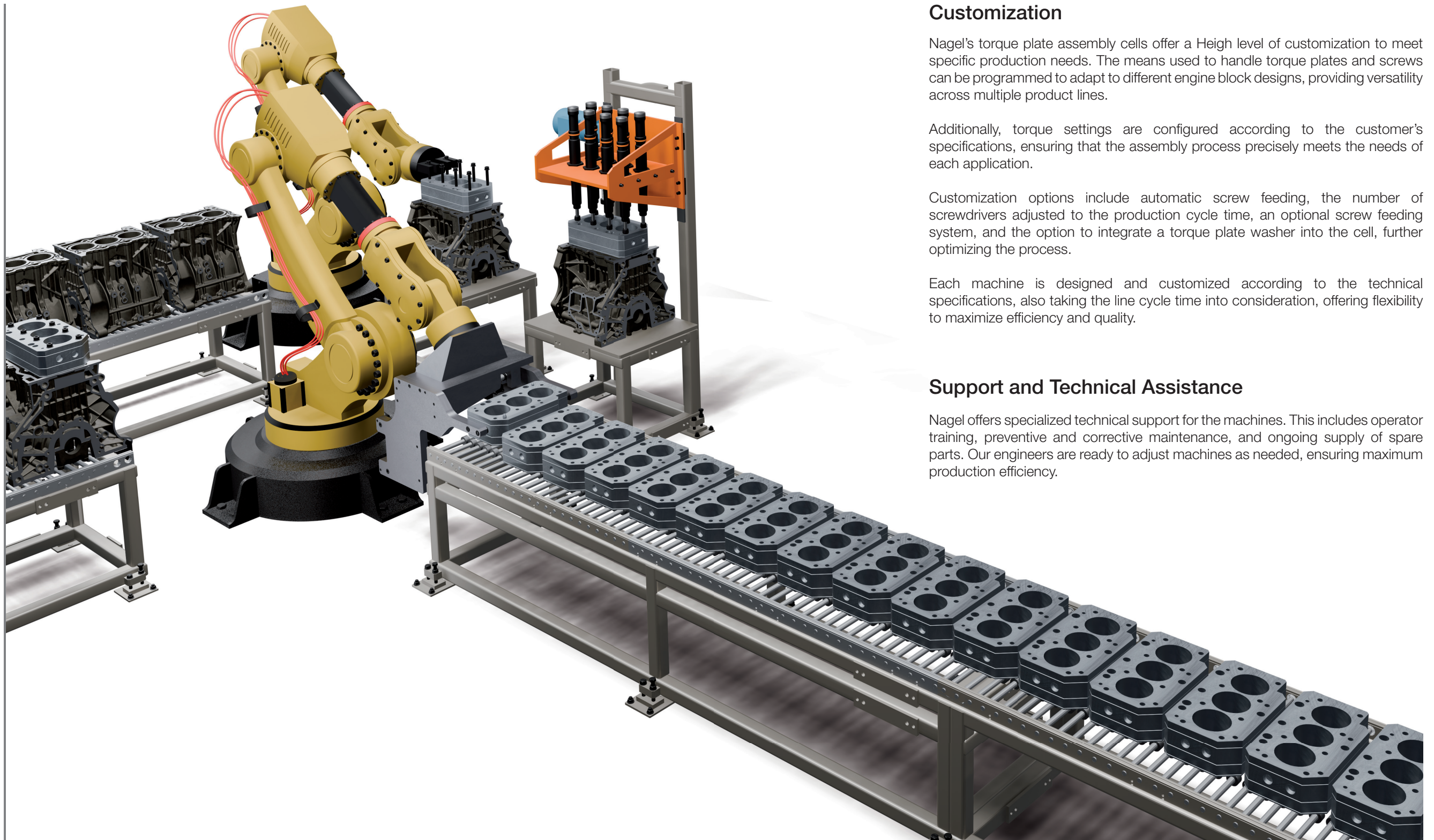
These systems manage each phase — from loading screw, torque at torque plate honing, disassembly, bolt unloading, and even an optional washing station before the parts are cycled back to the beginning — using robots to ensure precise, consistent operations, reducing manual intervention and minimizing errors.

With flexible transport options, such as roller conveyors or belt systems, the cells can easily adapt to different production setups.

These solutions can be integrated into existing lines or operate independently, making them versatile for several industrial environments.

Integrated with machining processes like honing, the cells reduce cycle time and ensure continuous production flow, improving both productivity and product quality.

Integration with PLC systems allows for real-time monitoring and control through an HMI (Human-Machine Interface), providing full visibility into the process and enhancing operational efficiency.



Customization

Nagel's torque plate assembly cells offer a high level of customization to meet specific production needs. The means used to handle torque plates and screws can be programmed to adapt to different engine block designs, providing versatility across multiple product lines.

Additionally, torque settings are configured according to the customer's specifications, ensuring that the assembly process precisely meets the needs of each application.

Customization options include automatic screw feeding, the number of screwdrivers adjusted to the production cycle time, an optional screw feeding system, and the option to integrate a torque plate washer into the cell, further optimizing the process.

Each machine is designed and customized according to the technical specifications, also taking the line cycle time into consideration, offering flexibility to maximize efficiency and quality.

Support and Technical Assistance

Nagel offers specialized technical support for the machines. This includes operator training, preventive and corrective maintenance, and ongoing supply of spare parts. Our engineers are ready to adjust machines as needed, ensuring maximum production efficiency.



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