

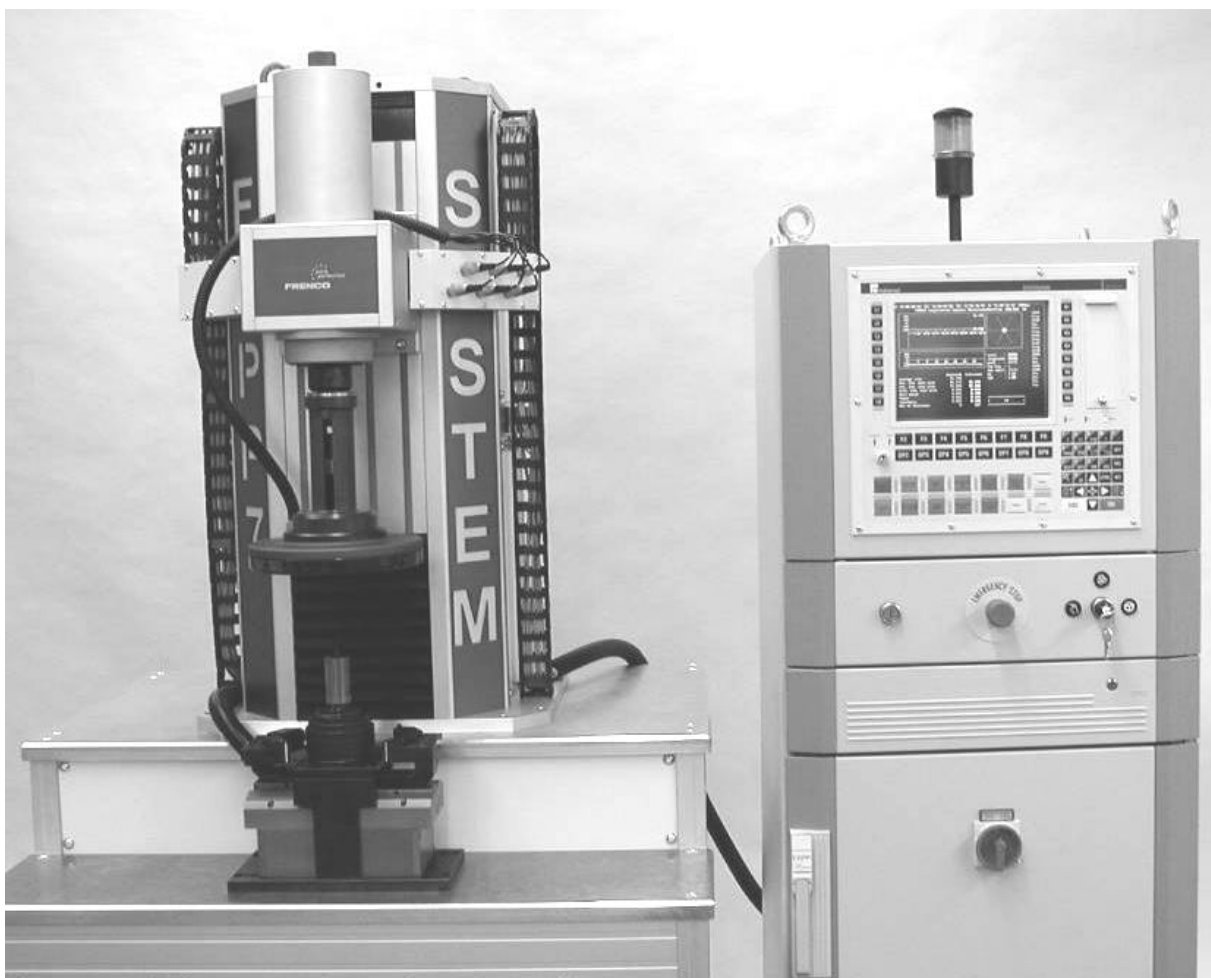


VMF

Version 03/01

FAPP System

The automated fitting of
male and female profiles



*pure
perfection*

FRENCO

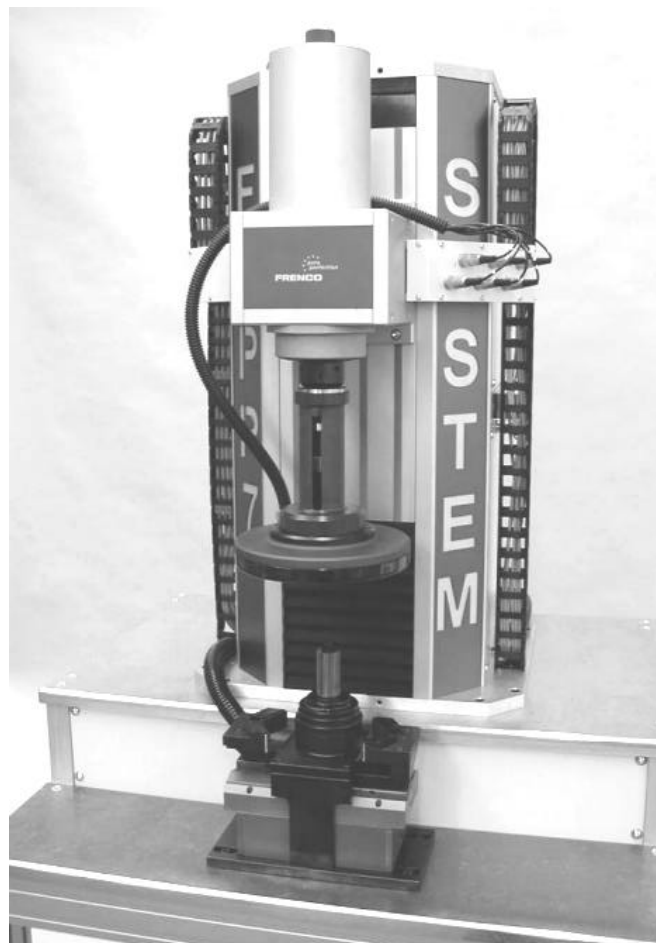
The system

The science of automatic internal and external profile assembly or inspection creates a very high technical demand on the machine performing this operation. There is a great amount of motion and flexibility required to carry out such an engagement. In addition the control of several conditions must be constantly monitored.

The answer to such a complex task is the FAPP 5 System. It possesses all the necessary characteristics to manage the complicated location rotation and insertion movements required to perform profile (spline etc.) assembly or inspection. All mechanical engagements are performed by the specially designed input holder with an integrated quick control system.

As a working example, one of the parts to be fitted is connected to the input holder through a quick action clutch and standard adapters. This can also be a measuring device or a gage for inspection purposes. During assembly, the part to be fitted is held by a chuck. For inspection, the mating part or component is clamped below or in front of the input holder depending on size considerations. A special concentric chuck is available as an accessory. The input holder then mates the two components through a series of motions much like a human hand would assemble an external and internal profile. Many variables such as engaging depth, force, non-connection, profile damages and measuring planes are supervised and control led beyond compare.

The end result is a fully inspected or assembled profile (spline) system with a very short cycle time.



Operation

The fitting of an internal and external profile is a complex task only possible by observance of a definite sequence of movements and their control:

1. Assuming that both profiles will never be clamped concentric to each other, the first operations to align both profile centers. This is made possible by a free floating movement of the input holder over a leading chamfer during the linear engaging feed.
2. Once aligning the centerline of the mating profiles, the second step is a rotational movement to create a tooth to space arrangement for both components. This is carried out in the following manner:
 - The down stroke feed movement is halted when the mating pieces (part to part or gage to part) are in contact and aligned according to step 1 above.
 - The input holder (holding the part or the gage) rotates with a clockwise motion while remaining slightly preloaded.
 - Once a tooth-to-space condition exists, the preloading and rotation ceases and the feed unit continues its stroke to complete successful part-to-part mating.

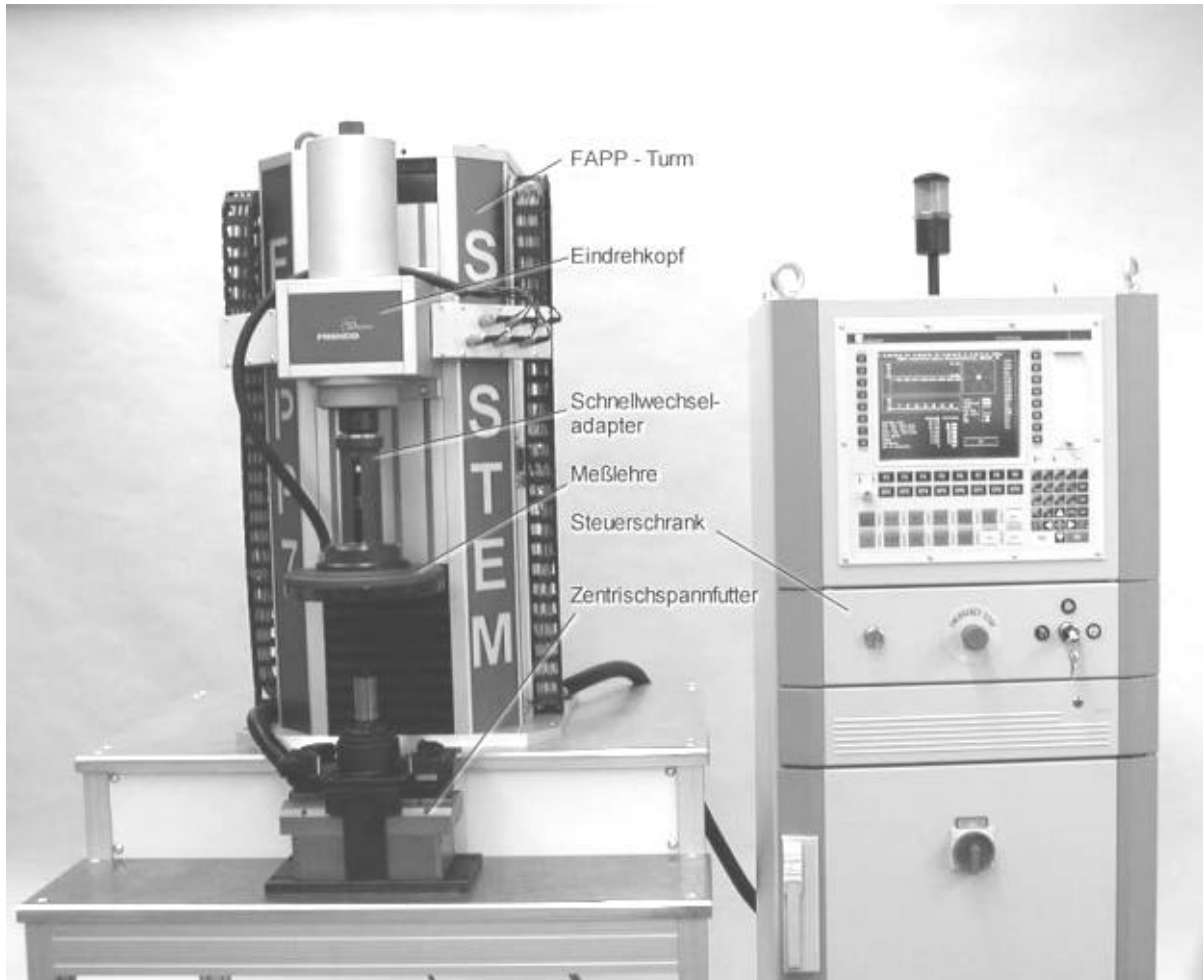
In the event that profile mating is not possible (different profiles, damage, part exceeding tolerance etc.), the feed unit retracts and resets, and a corresponding report is issued.

3. With centerline orientation and tooth-to-space positioning accomplished, the feed movement is resumed. At this point, engaging force is closely monitored. If the engaging force exceeds a predetermined threshold, the infeed unit instantly reverses and returns to its initial position while simultaneously issuing a report.
4. When the programmed engagement depth is reached without incident, the system will alert peripheral devices. If the operation is part assembly, the assembled components will be transported to the next workstation. If the operation is inspection, the system will perform operations 5 - 7 below.
5. With the gage inserted full depth into the part, the SPC computer or intelligent amplifier is notified to accept a data stream. The FAPP 5 System can supply continuous data upon gage extraction or send data at various programmed points of location. The data will be supplied by standard LVDT Gage heads and may be messaged to give readings and SPC charts on characteristics such as true size at pitch diameter, taper and out of round conditions.
6. Once full gage extraction is accomplished, the input holder automatically resets and returns to its initial position.
7. If indicating gages with integrated setting master are used, an available calibration module may be desired. This allows a total recalibration of the gaging component after inspecting a pre selected number of parts with no increase in cycle time.

The complete fitting operation including communication with part handling devices and SPC calculators is accomplished within 6 seconds. Only the time of part change must be added for calculation of total cycle time. This allows the FAPP 5 System to be integrated into any manufacturing automation system.

Design

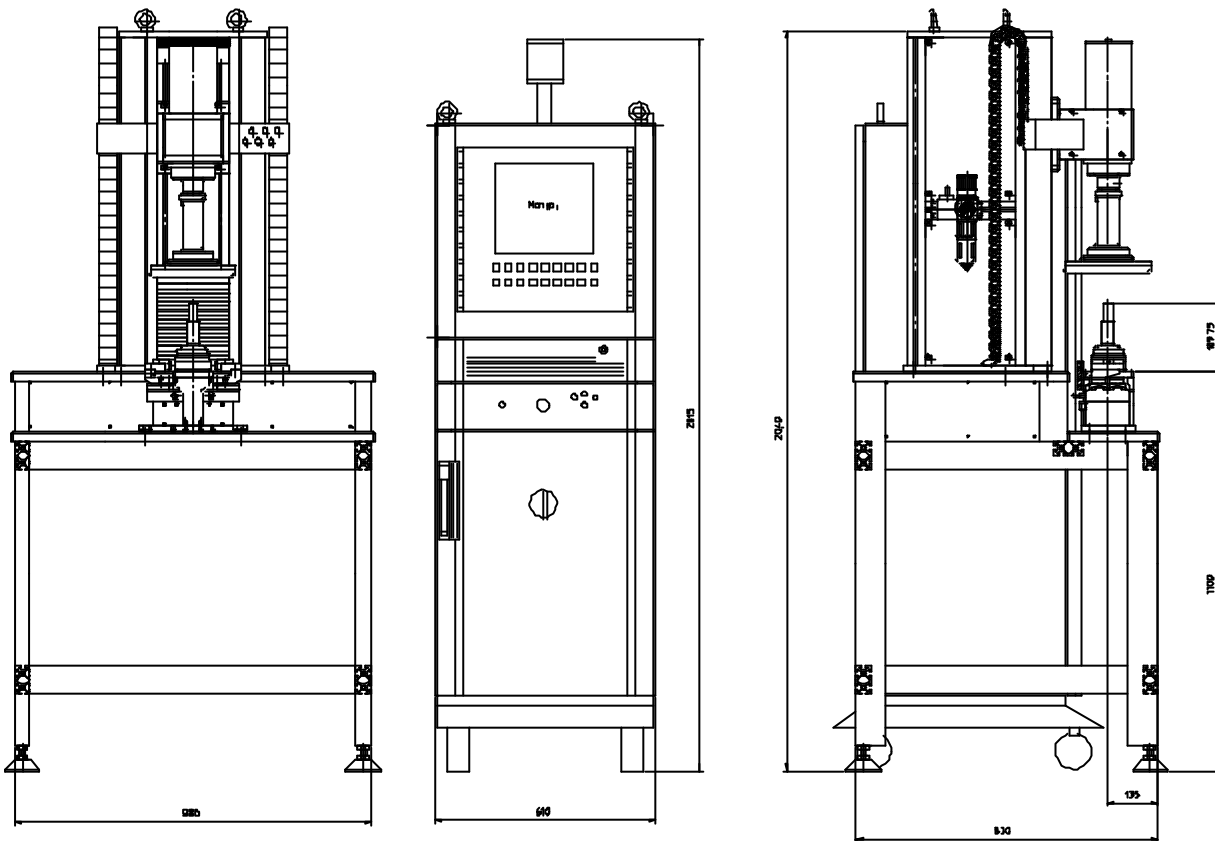
The FAPP System works as a self supporting unit. It possesses a pneumatic as well as an electronic control system for the movements of the input holder and the linear feed. Interfaces for communication with handling devices and SPC Processors are standard components. Further interfaces are available upon request.



1. Housing of welded construction, basic assembly plate, separate pneumatic and electronic control unit, linear feed, fastening elements for input holder, control panel, cam gib, numeric travel control and female plugs for communication.
2. Calibration module with pneumatic feed of the setting master.
3. Input holder inserted in two guiding gibs. All control cables are provided with plug connection.
4. Quick change chuck for holding adapters. The clamping is done by one screw only, designed to prevent self loosening.
5. Cam gib for final stroke limitation and adjustment of measuring levels if a numeric travel control is not purchased.
6. Control panel for the manual operation of all functions, change over switch for manual or automatic operation and alphanumeric display of reports.

Technical data

The FAPP System can be integrated in any automation system for inspection or assembling. It works free of all other control units like handling or pick ups and their electronic control. A simple and easy interfacing is necessary between them.



Weight :	FAPP: about 150 Kg Control unit: ca.: 150 Kg
Electric power supply:	FAPP: 24V D/C coming from control unit Control unit: 105 – 130 Volt A/C or 180 – 250 Volt A/C by IEC- plug
Pressure air :	filtered pressure air of 5-7 bar
Pressure air consumption :	max. 30 l/min
Cycle time :	min. 6 sec. Without part interchange
Assembling force :	40 to 400 N + adapted instrument
Travel of vertical axis:	0-200 mm
Accuracy of vertical travel:	± 0,2 mm
Max. assembling travel :	200 mm - adapted instruments
Possible numbers of teeth :	6-60
Min. torque of clamping :	10 Nm
Electronic control of vertical travel:	done by Frenco control unit

Examples



Manual loaded machine for inspection of 2 involute splines at both ends of shaft at one time

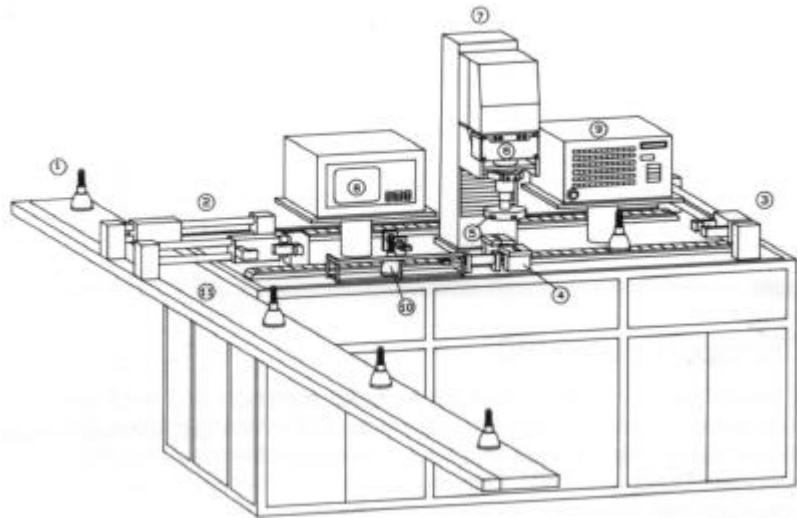


Fully automated inspection machine for the inspection of splined shafts with sort out of tolerance

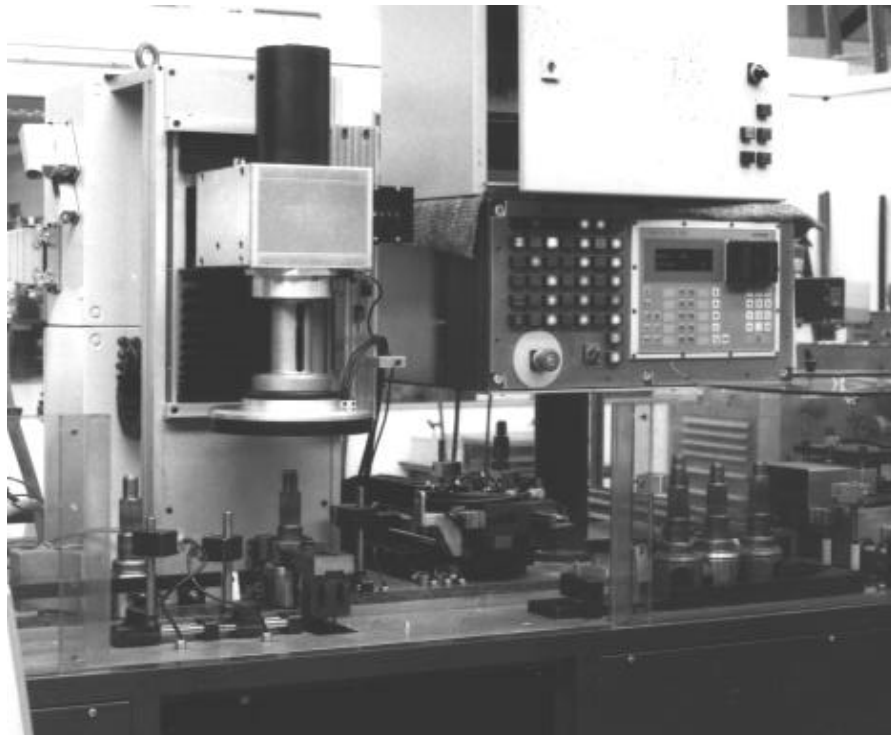
Examples

Fully automatic system
connected to a conveyor
part transport

1. Parts coming from machine tool
2. Transport into inspection system
3. Transport to inspection station
4. Concentric clamping unit
5. Indicating spline gauge
6. Assembling head FAPP
7. Vertical travel unit
8. Measuring PC
9. Sorting out of parts out of tolerance
10. Parts are lifted back to conveyor system



Fully automatic system



FRENCO Product Lines



Gear and spline high precision

Spline Gages
Master Gears and master wheels
Setting masters
Punches, dies and electrodes
Gear and spline clamping systems
Gear and spline manufacturing



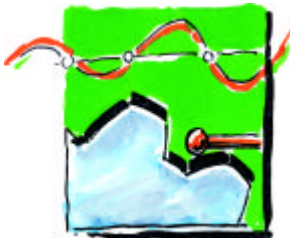
Instruments for size inspection Series V

VK Measuring ball inserts and pins
VA Instruments for rocking
VP Instruments with face stop
VM Indicating Gages with guiding profile
VS Customized solutions
VD Variable 3-Disc Gages



Universal Rotation Measuring Systems URM

URM - K with balls and pins
URM - R with master wheels
URM - WE for single flank gear rolling
URM - WZ for double flank gear rolling
URM - WS Gear Rollscan



Gear and spline inspection

DKD Calibrations of artefacts
Inspection of parts
Analysis of deviations
Wear inspection of gages and masters



Know-how Transfer

Software
Training, seminars and workshops
Consulting and calculations
Literature and documents
National and international standards work

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