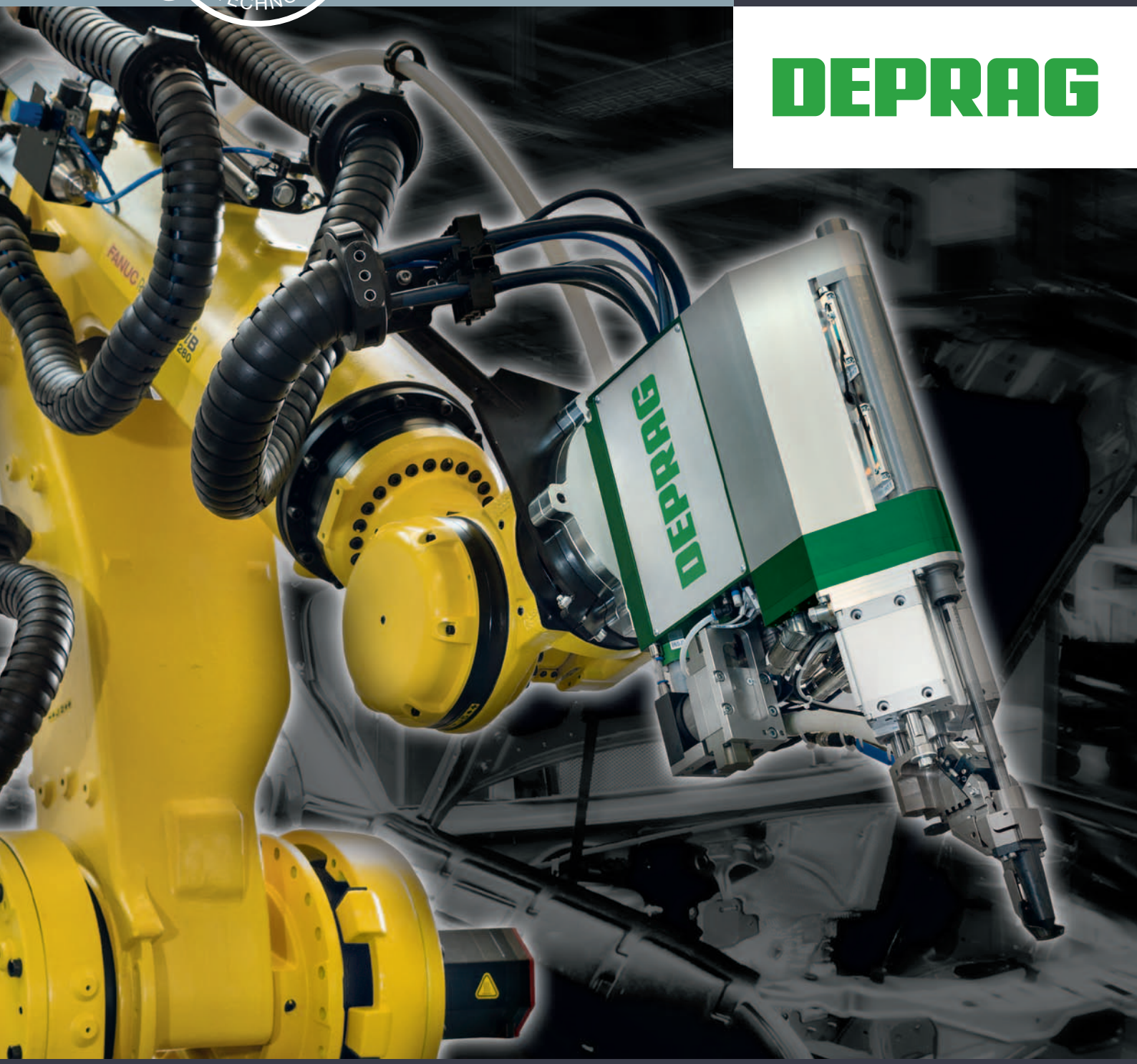
PATENTED TECHNOLOGY

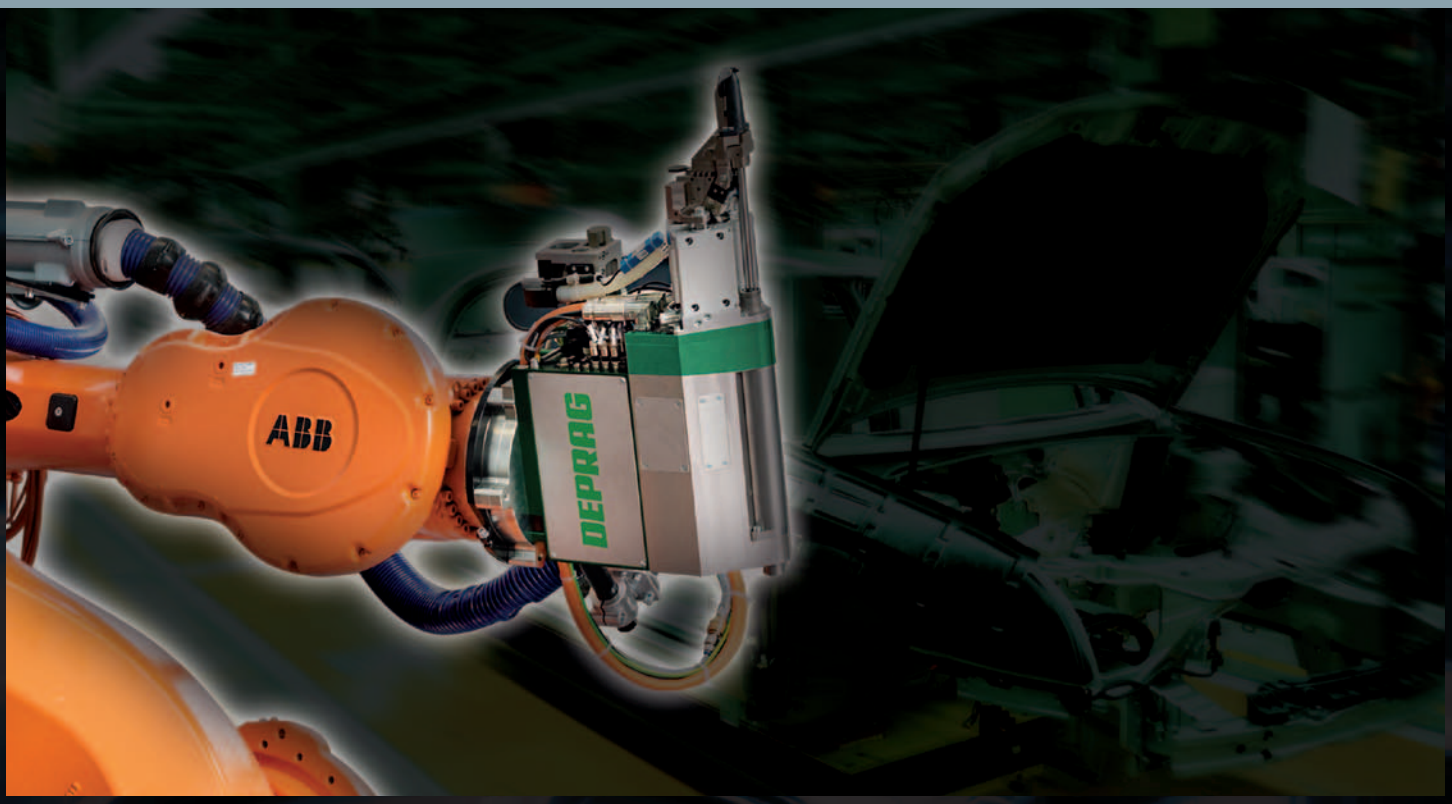
# ADAPTIVE DIRECT FASTENING

DEPRAG




# JOINING PROCESS VALIDATION

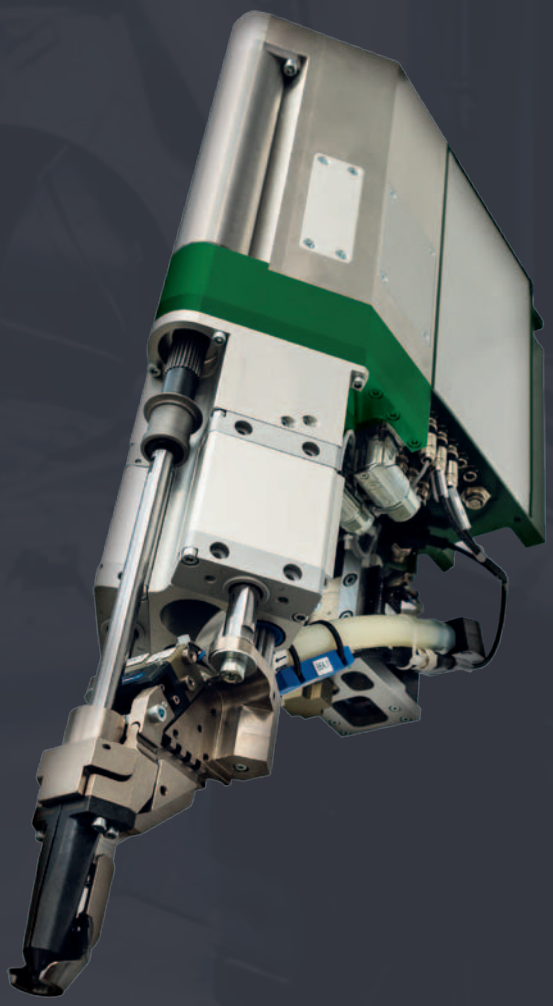
## ADAPTIVE DFS




# JOINING PROCESS VALIDATION

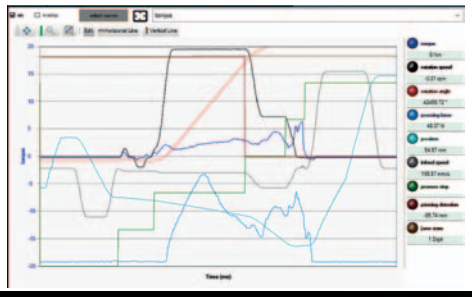
## for every assembly joint

- Feasibility analysis
- Accessibility check of the individual assembly points
- Process analysis
  Determine the process parameters
- Process validation
  Define the process parameters
- Process documentation
- Coupon tests



## Feasibility analysis

- Check the feedability of the fastener
- Determine the suitable feeding technology
- Evaluate the material pairing/material strength



## Accessibility check of the individual assembly points

- CAD-supported accessibility testing of every joint with rating, documentation and recommendation of needed modifications

## Process analysis

- Parameter presetting and initial selection of the assembly program, utilizing the extensive DEPRAG data base
- Production environmental-, robot-supported assembly to determine the process parameters, based on the autonomous penetration-detection with closed loop parameter adjustment

| | |
|---|---|
| Programm | |
| 0. General | |
| 1. Downholder force | 300 |
| 1. Pre Positioning | |
| 1. Feed motion | |
| 1. Downforce upper limit | 500 |
| 2. Feed rate | 125 |
| 3. Switchover offset pre positioning | 0.50 |
| 2.Screwdriver | |
| 3. General | |
| 1. Supervision time | 2000 |
| 2. Detection | |
| 1. Feed motion | |
| 1. Downforce upper limit | 500 |
| 2. Feed rate | 10 |
| 3. Recess depth | 75 |
| 2. Screwdriver | |
| 1. Torque upper limit | 2.00 |
| 2. Speed right | 700 |
| 3. Speed left | 700 |
| 4. Angle right | 45 |
| 5. Angle left | 45 |
| 3. General | |
| 1. Supervision time | 2000 |
| 3. Piercing | |
| 1. Feed motion | |
| 1. Downforce upper limit | 2500 |
| 2. Feed rate | 10 |
| 3. Start downforce | 500 |
| 4. Threshold downforce | 50 |
| 5. Switchover offset pierce detection | 0.00 |
| 2. Screwdriver | |
| 1. Torque upper limit | 10.00 |
| 2. Speed | 1800 |
| 3. General | |
| 1. Supervision time | 2000 |
| 4. Thread forming | |
| 1. Feed motion | |
| 1. Downforce upper limit | 500 |
| 3. Switchover offset seating point | 0.20 |
| 2. Screwdriver | |
| 1. Torque upper limit | 10.00 |
| 2. Speed | 1800 |
| 3. General | |
| 1. Supervision time | 2000 |
| 5. Final thightening | |
| 1. Feed motion | |
| 1. Downforce upper limit | 2000 |
| 3. Depth lower limit | -1.00 |
| 4. Depth upper limit | 1.00 |
| 2. Screwdriver | |
| 1. Shut-off torque | 9.00 |
| 10. Torque hold time | 0 |
| 2. Torque lower limit | 8.00 |
| 3. Torque | 10.00 |
| 4. Speed | 750 |
| 6. Angle supervision | False |
| 7. Threshold torque | 0.00 |
| 8. Angle lower limit | 0 |
| 9. Angle upper limit | 0 |
| 3. General | |
| 1. Supervision time | 2000 |

## Process validation

Define the following parameter for

- the controlled feed drive:
  - bit engagement
  - distance/time/force
  - spindle clamping force
- the controlled turn drive:
  - turn direction
  - speed
  - torque
  - angle
- the controlled downholder
  - down-hold load

## Process documentation

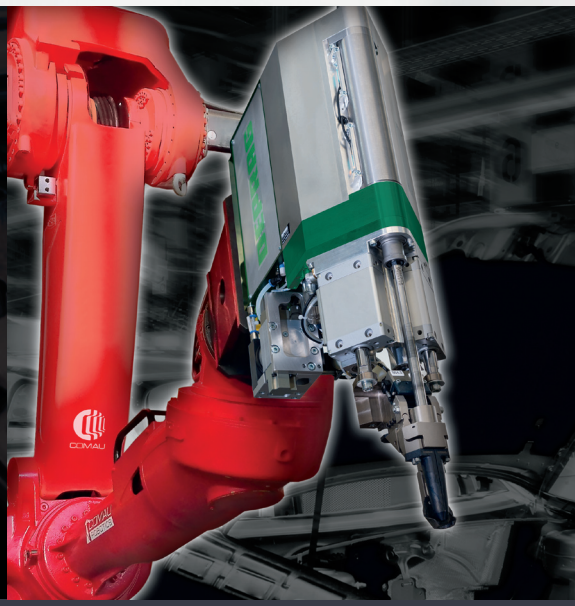
- Process documentation for traceability
- Set of parameters for upload into your ADAPTIVE DFS
- Filing the parameter set into the DEPRAG data base

## Coupon Tests

- ADAPTIVE DFS based coupon tests at laboratory conditions and based on the ascertained and set process parameters

# DEPRAG

## Your worldwide partner for screwdriving technology and automation



More information:
www.deprag.com

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