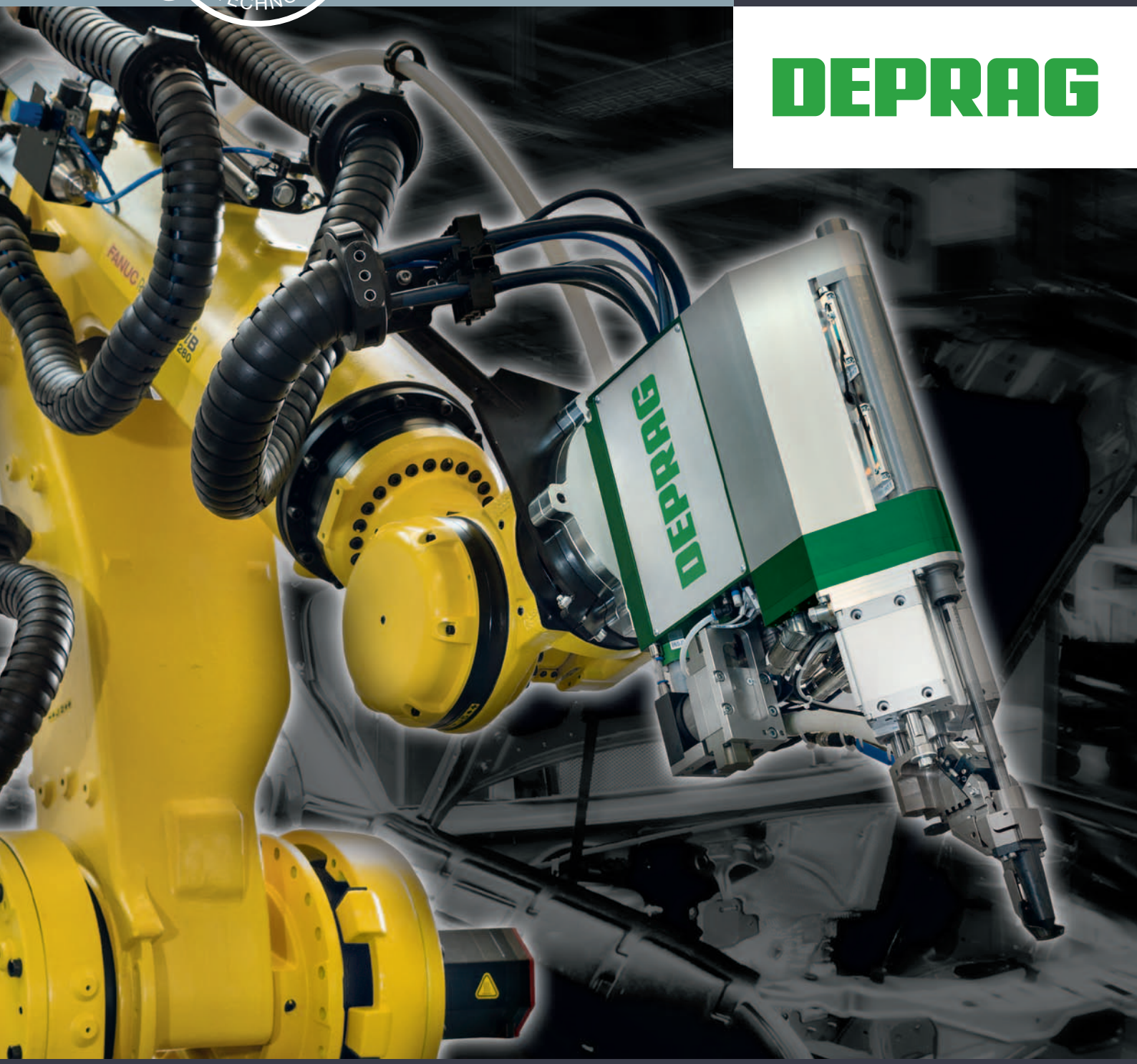
PATENTED TECHNOLOGY

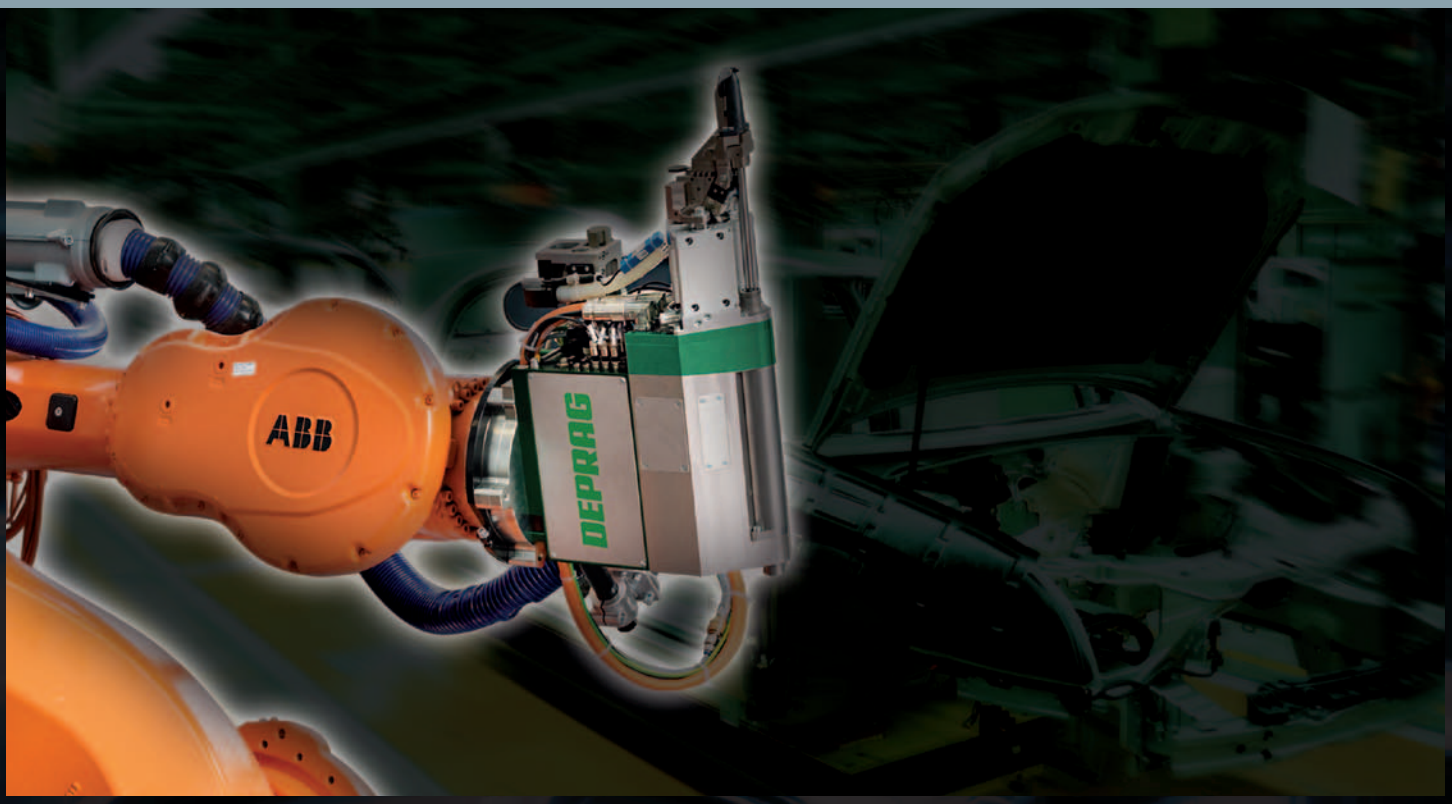
ADAPTIVE DIRECT FASTENING

DEPRAG



JOINING PROCESS VALIDATION

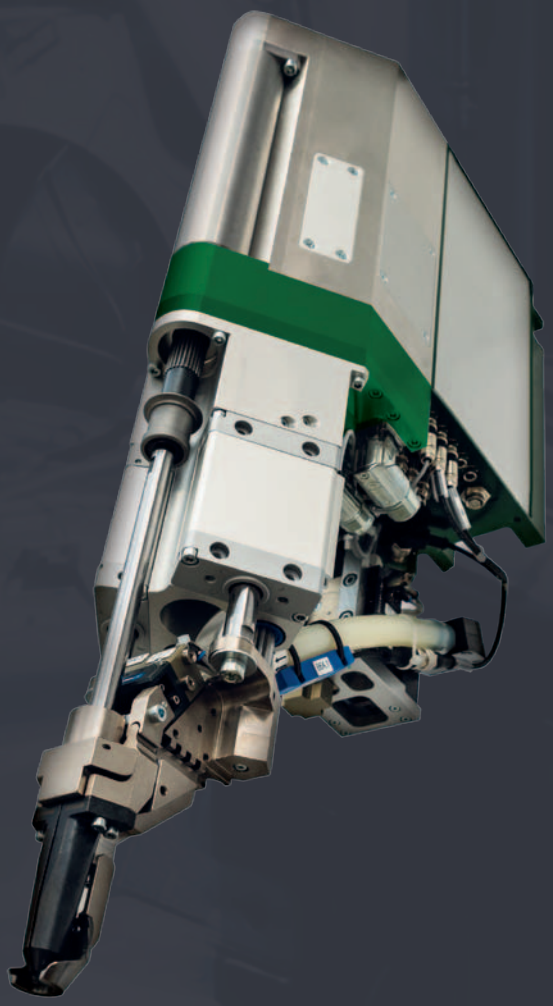
ADAPTIVE DFS



JOINING PROCESS VALIDATION

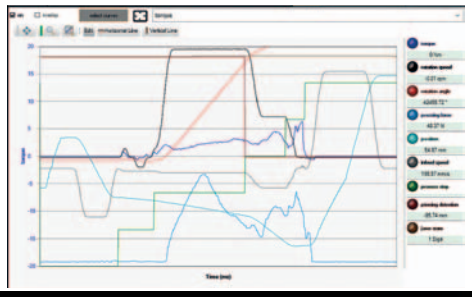
for every assembly joint

- 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

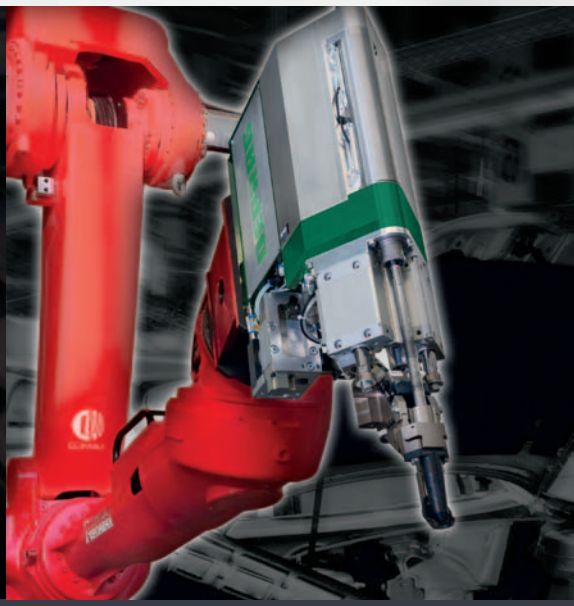
- Process documentation for traceability
- Set of parameters for upload into your ADAPTIVE DFS
- Filing the parameter set into the DEPRAG data base

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



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