BECKER Robotic

Documentation:

Lean High Motion Solution Robot Portfolio

Customer: Fanuc Corporation, Japan

Date: 11-05-2026

Robot: Fanuc 2000 -180F/27E

System: Lean High Motion Solution (LHMS)

Kit / Part No.: K.FA.F340.L.0001

Dress Pack / Routing Scope: A3-A6, NW52

Application: Empty Dress pack

Project / Line: NA

Document Type: Final Technical Documentation

Revision: 00

Prepared By: Aniruddha Joshi

Scope

This documentation describes the **Lean High Motion System** supplied by Becker as a standardized, integrated energy supply solution for the specified industrial robot configuration.

The documentation covers

- System identification
- Safety precautions
- Installation and verification
- Maintenance and service concept
- Spare and wear parts

The Lean High Motion System is designed as an integrated part of the robot architecture and is intended for standardized global deployment.

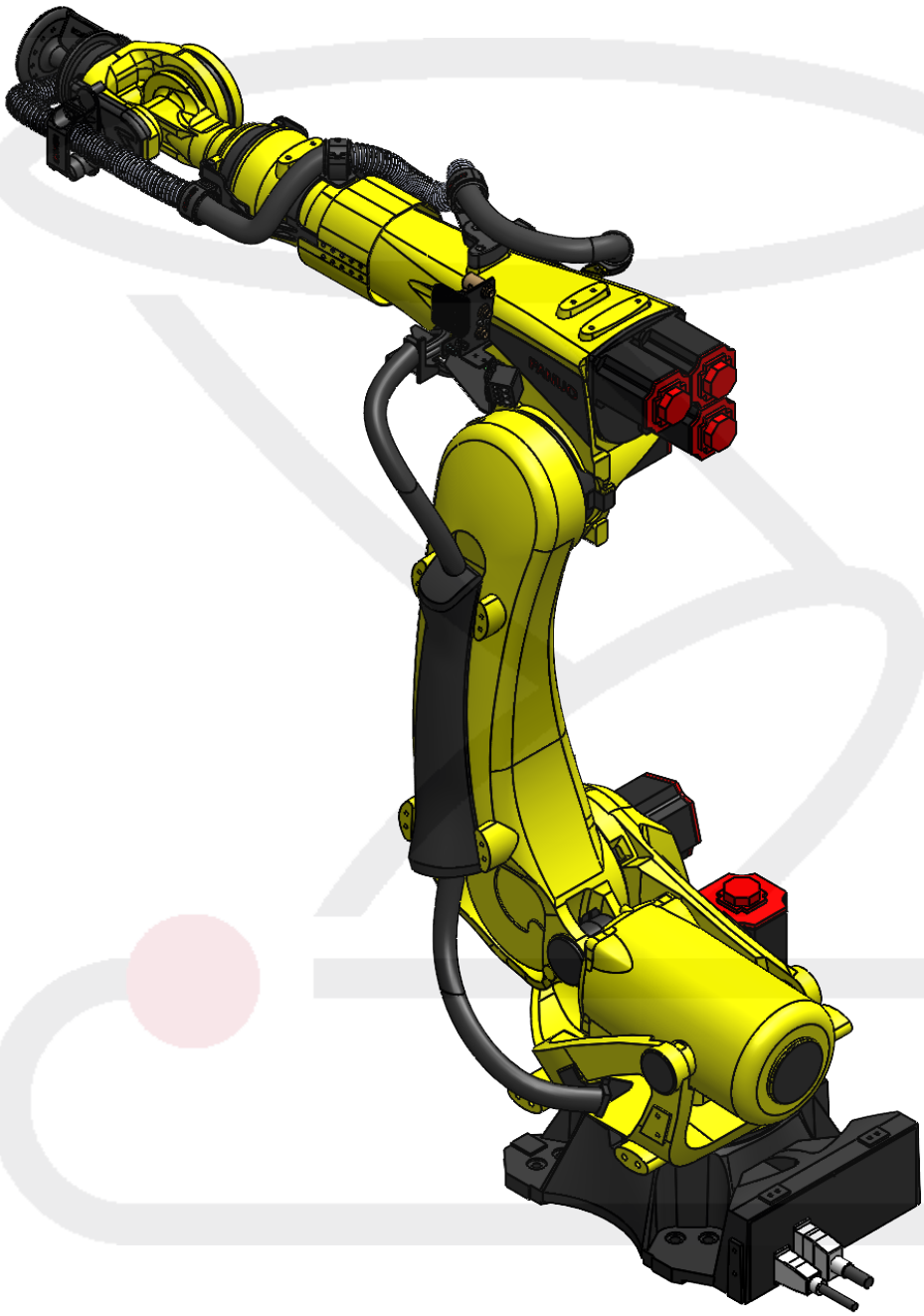
System Description

The Lean High Motion System is engineered as an extension of the robot and is designed to operate within defined motion and interference requirements.

The system is designed to provide predictable mechanical behavior, stable routing, and optimized serviceability for high-volume OEM production environments.

Design objectives

- No requirement for individual robot-specific adjustments during installation
- Maximizing usable robot motion range
- Defined and predictable routing behavior under operating conditions
- Compliance with robot interference zones
- Reduced integration variability
- Support for standardized global deployment (service, documentation, spare parts)



General tolerance according to **DIN ISO 2768-fK** Edges of undefined shape according to **DIN ISO 13715** General tolerances for welded constructions according to **DIN EN ISO 13920-C** General tolerances for laser cutting according to **DIN EN ISO 9013-1**

Scale : 1:1

Weight: NA

Material :- NA

	Date	Name
Drawn	05-11-2026	SPM
Checked	05-11-2026	AJO
Unit (mm)		

Document type: Assembly Drawing

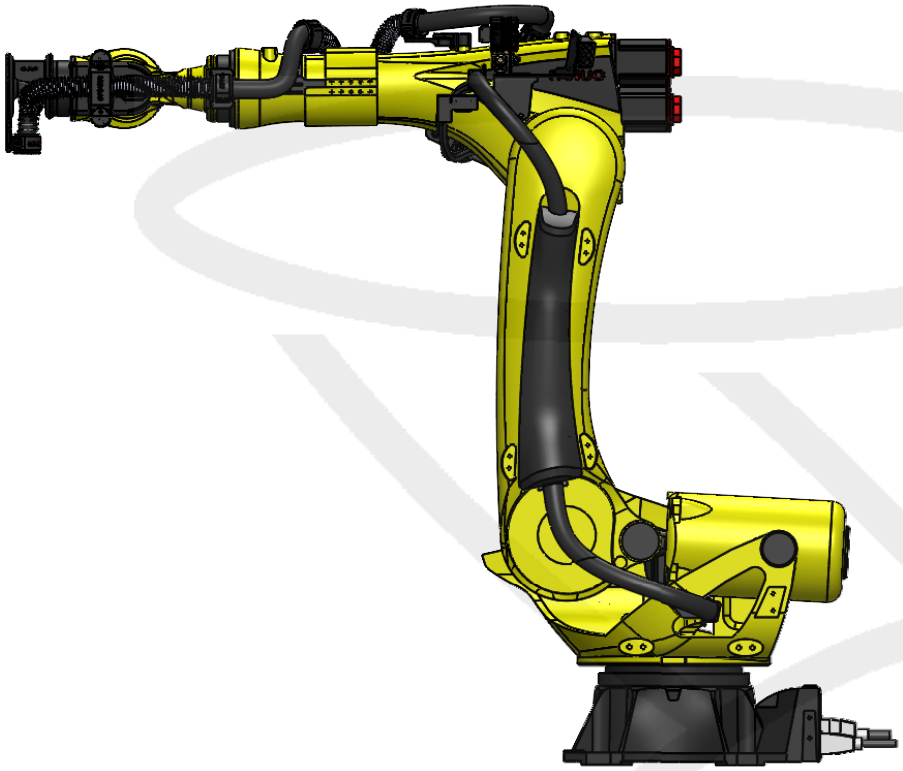
Title:
Fanuc Corporation Japan
Empty Dresspack-A3-A6
Fanuc R2000/180F-27E

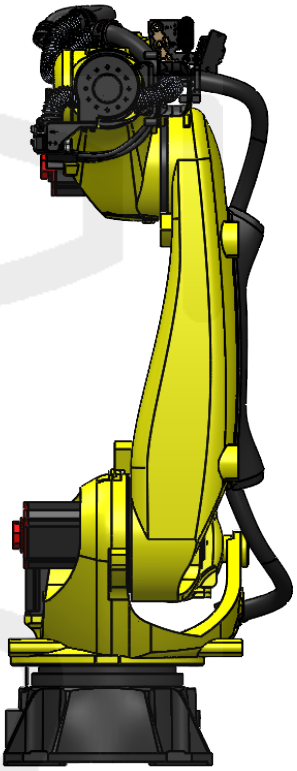
BECKER Robotic

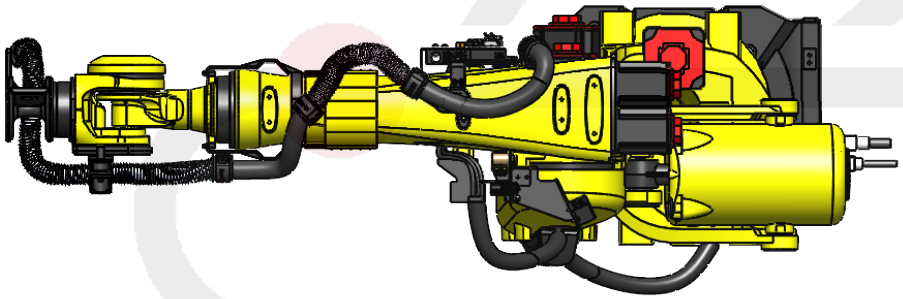
Drawing-no.:
K.FA.F340.L.0001

A4

4







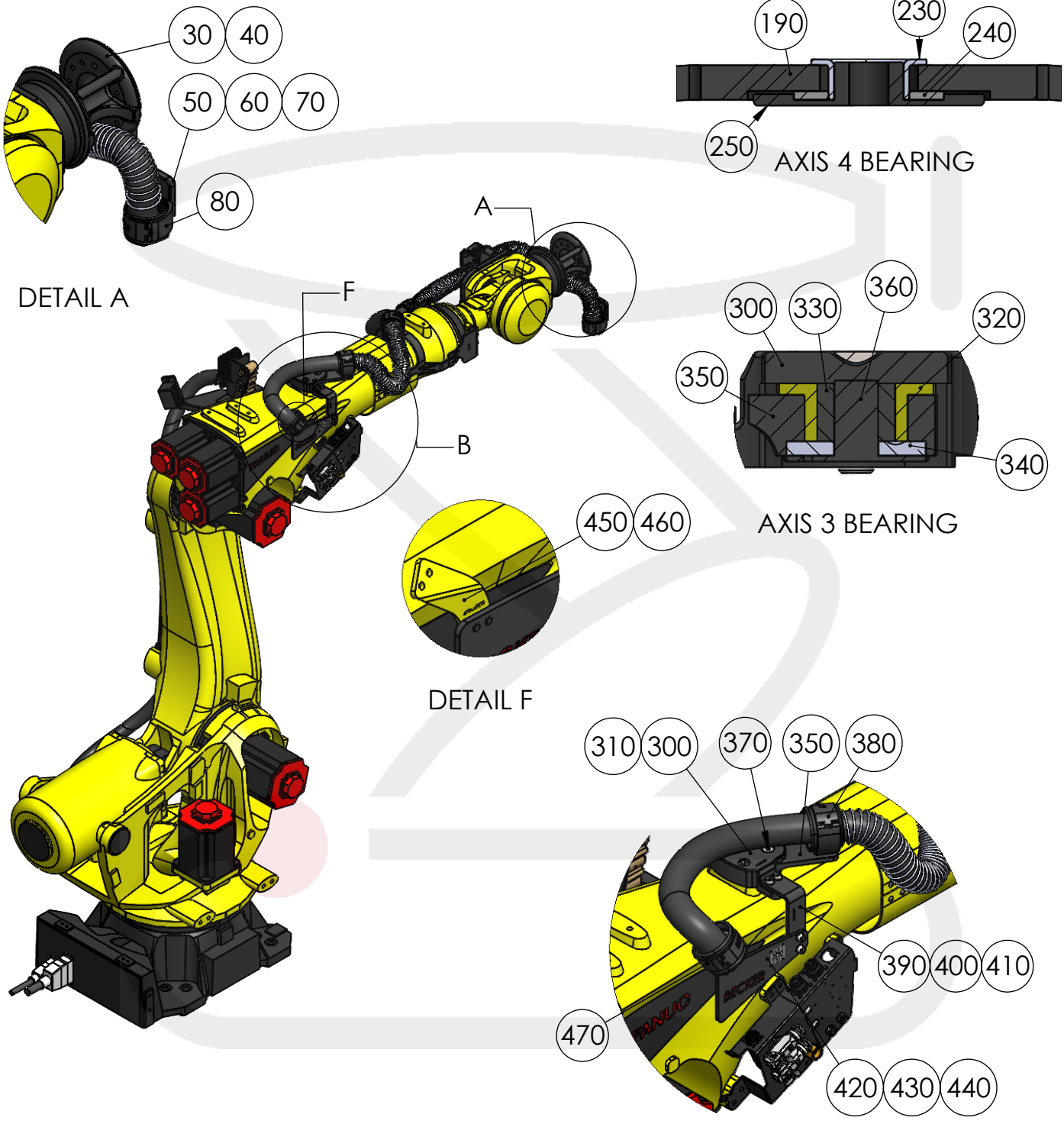
General tolerance according to **DIN ISO 2768-fK** Edges of undefined shape according to **DIN ISO 13715** General tolerances for welded constructions according to **DIN EN ISO 13920-C** General tolerances for laser cutting according to **DIN EN ISO 9013-1**			Scale : 1:1 / Material :- NA / Weight: NA
	Date	Name	Document type: Assembly Drawing
Drawn	05-11-2026	SPM	Title: Fanuc Corporation Japan Empty Dresspack-A3-A6 Fanuc R2000/180F-27E
Checked	05-11-2026	AJO	
Unit (mm)			

BECKER Robotic

Drawing-no.: K.FA.F340.L.0001

A4

5



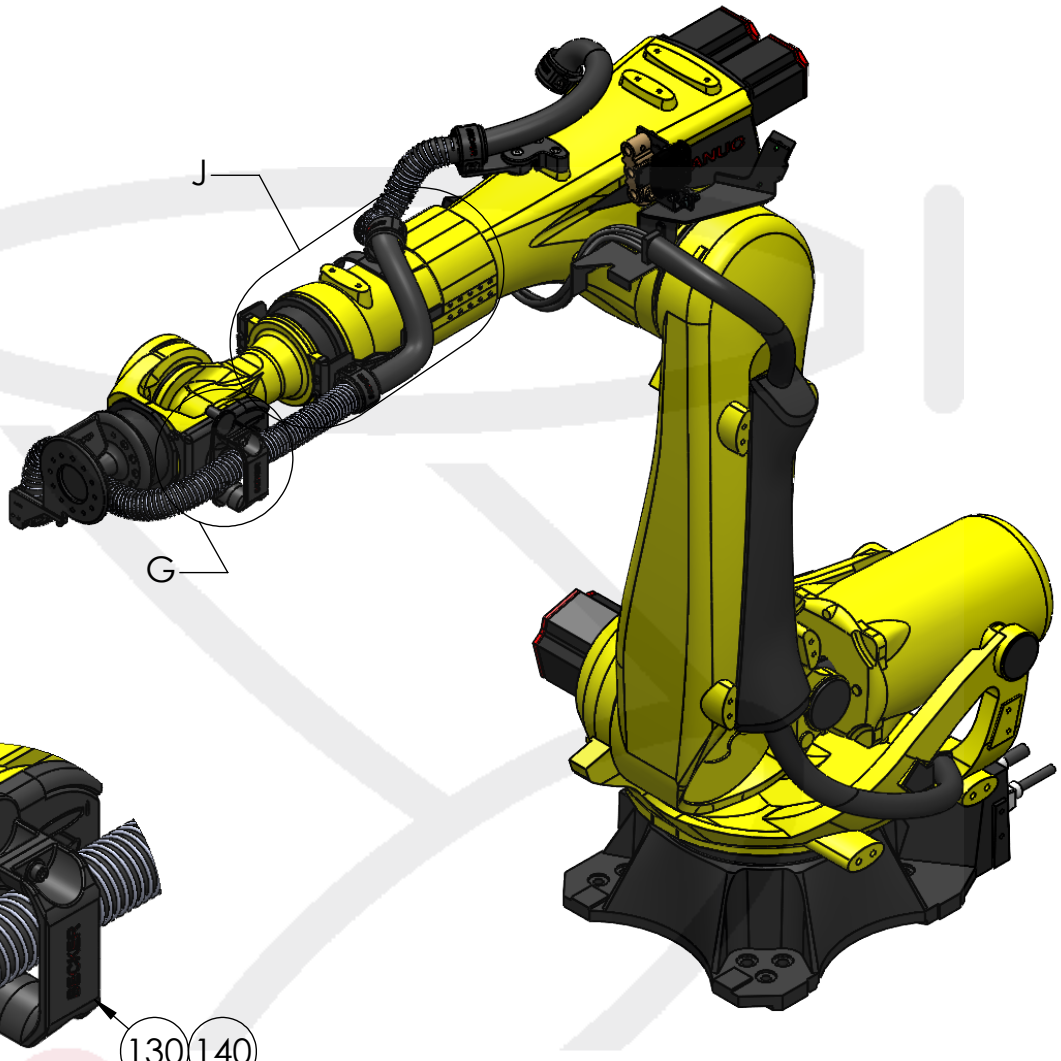
General tolerance according to **DIN ISO 2768-fK** Edges of undefined shape according to **DIN ISO 13715** General tolerances for welded constructions according to **DIN EN ISO 13920-C** General tolerances for laser cutting according to **DIN EN ISO 9013-1**			Scale : 1:1 / Material :- NA / Weight: NA
	Date	Name	Document type: Assembly Drawing
Drawn	05-11-2026	SPM	Title: Fanuc Corporation Japan Empty Dresspack-A3-A6 Fanuc R2000/180F-27E
Checked	05-11-2026	AJO	
Unit (mm)			

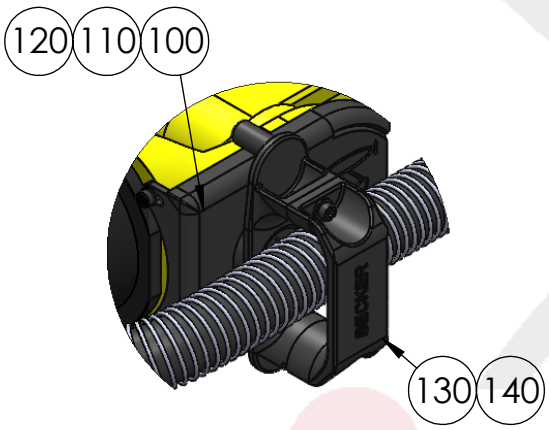
BECKER Robotic

Drawing-no.: K.FA.F340.L.0001

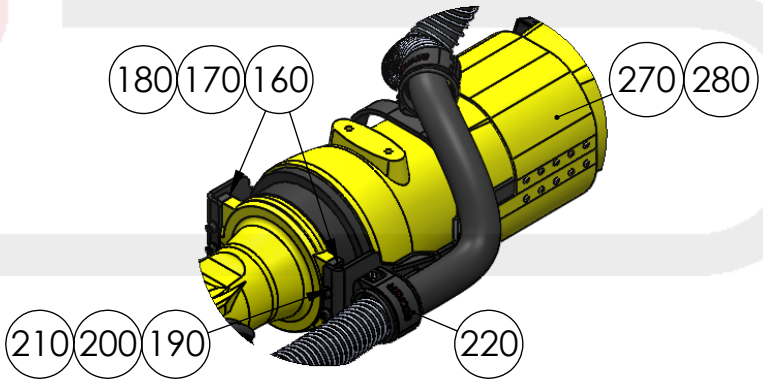
A4

6





DETAIL G



DETAIL J

General tolerance according to **DIN ISO 2768-fK** Edges of undefined shape according to **DIN ISO 13715** General tolerances for welded constructions according to **DIN EN ISO 13920-C** General tolerances for laser cutting according to **DIN EN ISO 9013-1**			Scale : 1:1 / Material :- NA / Weight: NA
	Date	Name	Document type: Assembly Drawing
Drawn	05-11-2026	SPM	Title: Fanuc Corporation Japan Empty Dresspack-A3-A6 Fanuc R2000/180F-27E
Checked	05-11-2026	AJO	
Unit (mm)			

BECKER Robotic

Drawing-no.: K.FA.F340.L.0001

A4

7

Pos. No.	Description	Art. No	Qty.	Wear part = V Spare parts =E
10	Empty Dress pack, A3-A6, NW52	4.000.00XX	1.00	E
20			0.00	
30	AXIS 6 C MODULE R-2000IE SERIES	4.FA6.0004	1.00	
40	SOCKET HEAD SCREW M10 X 30 DIN 912	3.010.030	8.00	
50	AXIS 06 CLAMP MOUNTING BRACKET	4.FA6.0006	1.00	
60	INBUS SCREW M8 X 25 ACCORDING TO DIN 912	3.008.025	2.00	
70	WASHER DIN 125 FORM A	3.108.000	2.00	
80	NW52 METAL CLAMP WITH ADAPTER	4.BI.PP.01112-3	1.00	
90			0.00	
100	AXIS 05 BEARING BRACKET BASE PART ASM	4.FA5.0001	1.00	
110	SOCKET HEAD SCREW M8 X 16 DIN 912	3.008.016	2.00	
120	WASHER DIN 125 FORM A	3.108.000	2.00	
130	AXIS 05 BEARING STOPPER ASSEMBLY	4.FA5.0002	1.00	
140	Pan head screw M10 x 20 according to DIN 7380-1	3.010.020-ISO7380-BK	1.00	
150			0.00	
160	AXIS 4 PART	4.BI.PP.01042-1	2.00	
170	ALLEN SCREW M8 X 20 DIN 6912	3.508.020	4.00	
180	WASHER DIN 125 FORM A	3.108.000	4.00	
190	AXIS 4 BRACKET	4.BI.PP.00931-20	1.00	
200	INBUS SCREW M8 X 25 ACCORDING TO DIN 912	3.008.025	4.00	
210	WASHER DIN 125 FORM A	3.108.000	4.00	
220	NW52 METAL CLAMP WITH DOWEL	4.BI.PP.01128-2	1.00	
230	FLANGED LINEAR PLAIN BEARINGS	4.BI.PP.01201	1.00	
240	THRUST WASHERS(MISUMI)	4.BI.PP.01084	1.00	
250	SUPPORT BRACKET FOR BEARING	4.FA4.0003	1.00	
260			0.00	
270	CAGE ASSEMBLY	4.FA4.0018	1.00	
280	Pan head screw M6 x 10 according to DIN 7380-1	3.006.010-ISO7380-BK	20.00	
290			0.00	
300	AXIS 3 BEARING MOUNTING PART	4.FA3.0015	1.00	
310	ALLEN SCREW M12 X 40 DIN 912	3.012.040	2.00	
320	THRUST BUSHING (SPFG)	4.FA3.0030	1.00	
330	AXIS 03 SPACE PART	4.FA3.0034	1.00	
340	THRUST WASHER	4.FA3.0033	1.00	
350	AXIS 3 BEARING PART	4.BI.PP.01074-1	1.00	
360	METAL INSERT	4.BI.PP.01066-2-T5	1.00	
370	COUNTERSUNK SCREW M10 X 25 ACCORDING TO	3.110.025	1.00	
380	NW52 METAL CLAMP WITH ADAPTER	4.BI.PP.01112-3	1.00	
390	INTERFACE MOUNTING SUPPORT PLATE	4.FA3.0018	1.00	
400	INBUSSCHRAUBE M8 X 20 NACH DIN 6912	3.508.025	2.00	
410	WASHER DIN 125 FORM A	3.108.000	2.00	
420	BC MOUNTING BRACKET SUPPORT PLATE	4.FA3.0019	1.00	
430	SOCKET HEAD SCREW SCREW M8 X 14 DIN 912	3.008.014	2.00	
440	WASHER DIN 125 FORM A	3.108.000	2.00	
450	AXIS 3 BC MOUNTING BRACKET	4.FA3.0020	1.00	
460	Pan head screw M8 x 12 according to DIN 7380-1	3.008.012-ISO7380-BK	2.00	

General tolerance according to **DIN ISO 2768-fK** Edges of undefined shape according to **DIN ISO 13715** General tolerances for welded constructions according to **DIN EN ISO 13920-C** General tolerances for laser cutting according to **DIN EN ISO 9013-1**

Scale : 1:1

Weight: kg

Material :-

	Date	Name
Drawn	05-11-2026	SPM
Checked	05-11-2026	AJO
Unit (mm)		

Document type: Assembly Drawing

Title:
Fanuc Corporation Japan
Empty Dresspack-A3-A6
Fanuc R2000/180F-27E

BECKER Robotic

Drawing-no.:
K.FA.F340.L.0001

A4

8

pos. No.	Description	Art. No	Qty.	Wear part = V Spare parts =E
470	NW52 METAL CLAMP WITH ADAPTER	4.BI.PP.01112	1.00	

General tolerance according to **DIN ISO 2768-fK** Edges of undefined shape according to **DIN ISO 13715** General tolerances for welded constructions according to **DIN EN ISO 13920-C** General tolerances for laser cutting according to **DIN EN ISO 9013-1**

Scale : 1:1

Weight: kg

Material :-

	Date	Name
Drawn	05-11-2026	SPM
Checked	05-11-2026	AJO
Unit (mm)		

Document type: Assembly Drawing

Title:
Fanuc Corporation Japan
Empty Dresspack-A3-A6
Fanuc R2000/180F-27E

BECKER Robotic

Drawing-no.:
K.FA.F340.L.0001

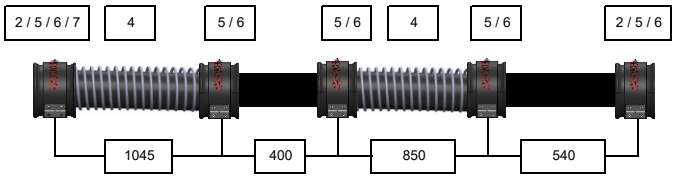
A4

9

axis 6

corrugated tube ID52 = 4.702.524-F-BK
2740

axis 3



pos.	description	art no.
2	clamping ring for ID52	4.BI.PP.01077
4	spring for ID52, Ø70 x Ø3.0 x 745mm (for protection)	4.BI.PP.01076
5	Support (included in the kit)	4.BI.PP.01055
6	Adapter for ID52 (included in the kit)	4.BI.PP.01053
7	Kevlar protection, approx. 0.5m	4.DPP.KV.001

+/- x addition for pre-cut (not relevant for the total length)

tolerance range -0/+1%

Dress pack Spot Welding

Fanuc R-2000 180F-27E, 225F-27E

BECKER Robotic

date	12.03.2026
created	Paetz
checked	22.04.2026 / NJA
revision no.	REV 01
drawing no.	4.000.00XX

Customer: Fanuc
Project: Fanuc Corporation Japan Open House 2026

Refer to protection notice DIN ISO 16016

General Notes & Applicable Standards

- General tolerances according to DIN ISO 2768-fK
- Edges of undefined shape according to DIN ISO 13715
- Welded constructions (if applicable) according to DIN EN ISO 13920-C
- Laser cutting (if applicable) according to DIN EN ISO 9013-1
- Units: mm
- Protection notices according to DIN ISO 16016

Safety Precautions

Please read and follow the precautions stated below carefully.
When working on the robot, always refer to the robot manufacturer's manual.

General

- The Becker system is intended exclusively for **industrial applications**.
- The system may only be installed, operated, and serviced by **authorized and trained personnel**.
- Before installation or service, ensure all electrical power is disconnected and all media lines are depressurized.
- Entry into the robot operating space is prohibited while power or pressure is applied.
- Always wear appropriate personal protective equipment (PPE) according to site regulations.

Lubrication / Cable Grease (if applicable)

For technical reasons, supply lines inside protected routing may be lubricated with cable grease.

- Avoid skin and eye contact; do not inhale vapors; do not ingest.
- Spilled grease may cause slip hazards and must be removed immediately.
- Prevent discharge into drains, sewers, or open waters.
- For repeated or prolonged contact, wear oil-resistant protective gloves.

Pinch Points

Due to design characteristics, pinch hazards may occur during installation or service.

- Always wear robust safety gloves.
- Installation and service only by authorized and qualified personnel.

Handling: Length and Weight

Depending on the system size and configuration, there is a risk of injury during transport and installation.

- If possible, handling and installation should be performed by two authorized service technicians.
- Secure the system during lifting and positioning to prevent uncontrolled movement.

Installation & Verification

The Lean High Motion System is delivered as a validated, standardized configuration.

Installation is performed at defined mechanical interfaces.
No robot-specific adjustments to the routing geometry are required or intended.

Pre-Installation Checks

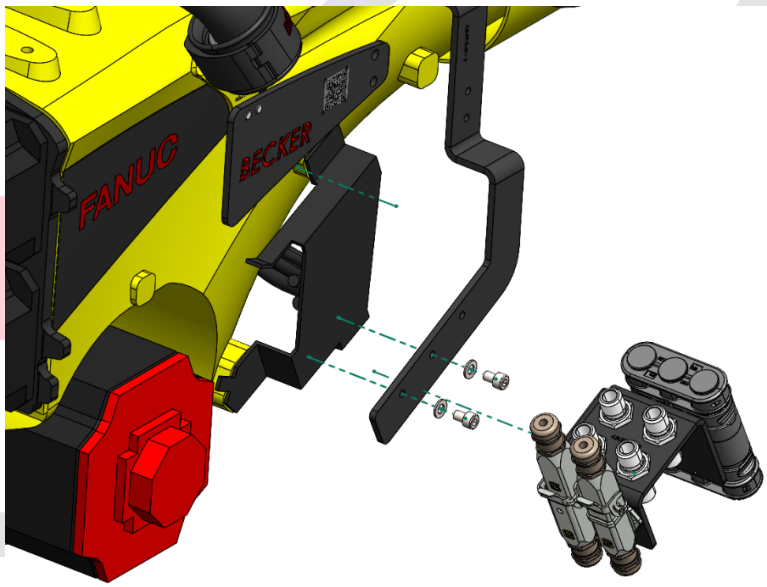
- Verify that the robot model and application match the delivered kit documentation.
- Verify that all delivered assemblies are complete and undamaged.
- Confirm that the intended routing remains within the defined interference envelope.

Mechanical Installation

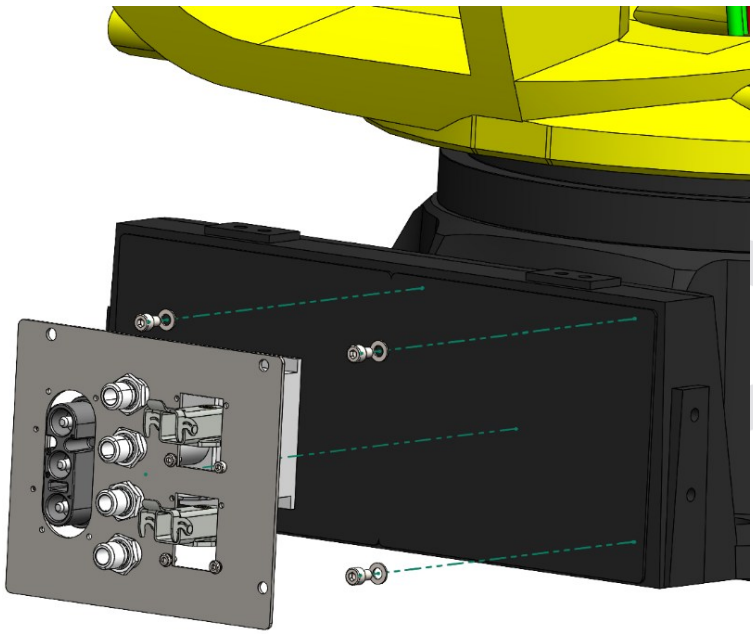
Document the installation steps and torque values applicable to the delivered kit:

- Mount interface plates and brackets at the specified robot axes

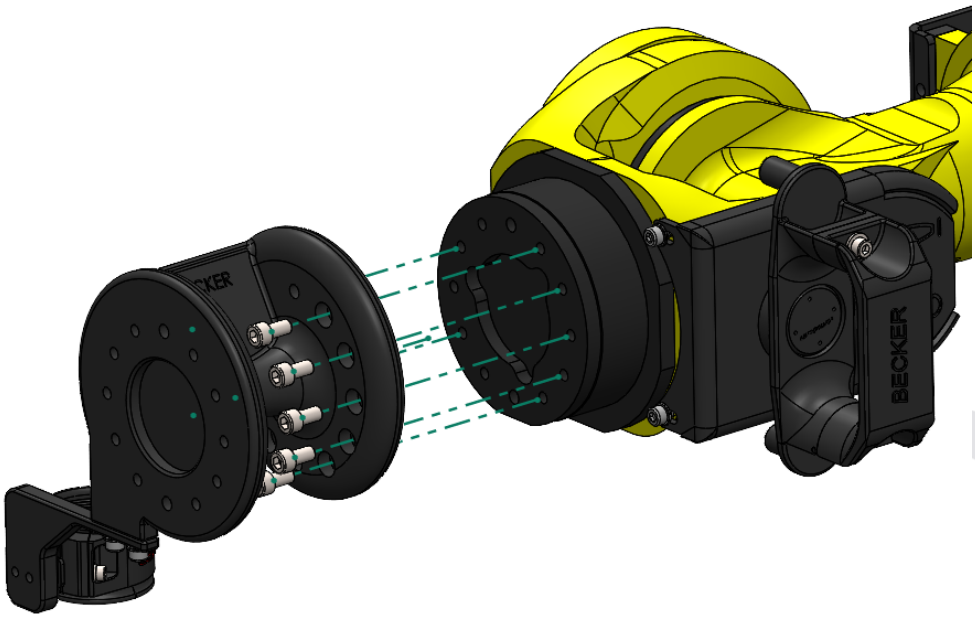
  Interface plate on Axis 03:



Interface plate on Axis 01:

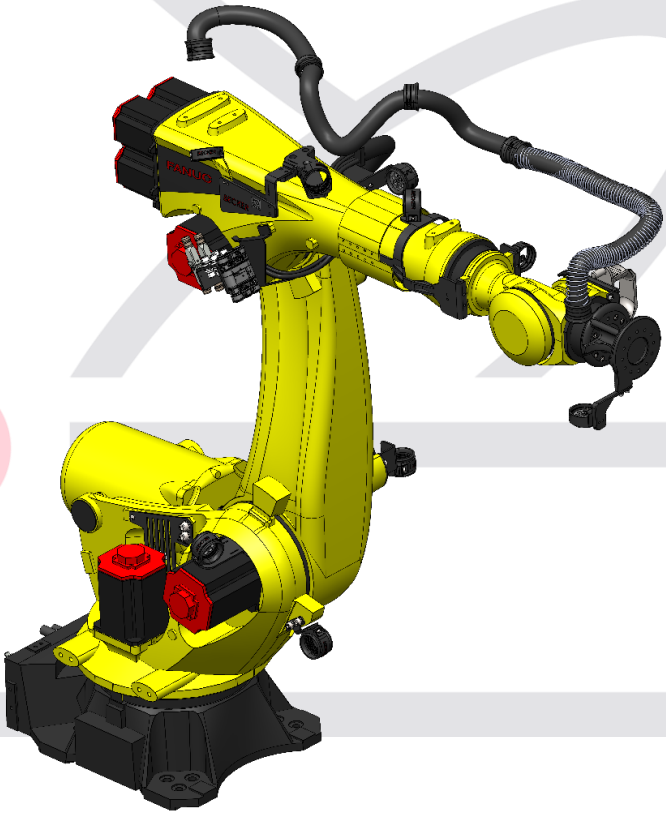


- Install protected routing components according to drawings.



- Install individual strain relief components per supply line

- Connect media and electrical cables according to wiring and hoses specifications



Equipment

The following equipment is required for assembly and fastening operations:

Fastener and torque range details

Designation	**Specification / Size**
Set of Allen keys	1.5; 2; 2.5; 3; 4; 5; 6; 8; 10 mm
Torque wrench	Torque range: **5 Nm to 50 Nm**
Socket wrench set	Standard metric set
Set of combination wrenches	6; 7; 8; 9; 10; 11; 12; 13; 14; 15; 17; 19 mm

Fastener Standards

DIN 912 / ISO 4762 – Hexagon socket head cap screws

DIN 7991 / ISO 10642 – Countersunk (flat-head) screws

Property class: 12.9

Thread type: Metric coarse

Condition: Dry, clean threads

Torque basis: Recommended seating torque per DIN / ISO, including assembly tolerance

Torque ranges correspond to ±15% of the nominal DIN seating torque, which is standard industrial practice for torque-controlled assembly and tool tolerance.

Axis 1 – Base / Pedestal

Bolt Size (DIN)	Typical Length Range (mm)	Torque Range (Nm)
M16	20 – 40	300 – 400 Nm
M12	20 – 40	120 – 165 Nm
M10	20 – 40	70 – 95 Nm

Axis 2 – Lower Arm Joint

Bolt Size (DIN)	Typical Length Range (mm)	Torque Range (Nm)
M12	20 – 40	120 – 165 Nm
M10	20 – 35	70 – 95 Nm
M8	12 – 30	35 – 48 Nm

Axis 3 – Upper Arm

Bolt Size (DIN)	Typical Length Range (mm)	Torque Range (Nm)
M10	20 – 35	70 – 95 Nm
M8	12 – 25	35 – 48 Nm
M6	10 – 20	14 – 20 Nm

Axis 4 – Wrist Roll

Bolt Size (DIN)	Typical Length Range (mm)	Torque Range (Nm)
M8	10 – 25	35 – 48 Nm
M6	10 – 20	14 – 20 Nm

Axis 5 – Wrist Pitch

Bolt Size (DIN)	Typical Length Range (mm)	Torque Range (Nm)
M8	10 – 20	35 – 48 Nm
M6	10 – 20	14 – 20 Nm
M5	8 – 12	**8 – 12 Nm**

Axis 6 – Tool Flange / EOAT Interface

Bolt Size (DIN)	Typical Length Range (mm)	Torque Range (Nm)
M8	10 – 20	35 – 48 Nm
M6	10 – 16	14 – 20 Nm
M5	8 – 12	8 – 12 Nm
M4	6 – 12	4 – 6 Nm
M3	6 – 10	1.8 – 2.6 Nm
M2	4 – 6	0.5 – 0.7 Nm

Note

Torque ranges are based on recommended seating torques for DIN 912 / ISO 4762 fasteners, property class 12.9, with dry threads.

Actual tightening torque depends on joint design, surface condition, and assembly method. If lubrication, coating, or thread-locking compound is used, the torque shall be reduced accordingly.

Functional Verification

Run the robot at manual speed and verify:

- No contact with robot components or OEM cabling over the full motion range
- No uncontrolled movement, oscillation, or migration of the routing package
- Minimum bend radius is maintained under worst-case combined motion
- No friction points causing abrasion or heat build-up

Maintenance Instructions

The Lean High Motion System is designed for serviceability and predictable lifecycle performance.

Maintenance intervals depend on the duty cycle and application.
As a baseline, periodic visual inspections and functional checks are recommended.

Warranty Condition

Warranty coverage is valid only if the following requirements are met:

- Periodic visual inspection and functional check (e.g. weekly for multi-shift operation)
- Replacement of protection elements if worn or damaged
- Inspection of protection enclosure / corrugated tubing for damage
- Inspection of supports and strain relief points for secure seating
- Immediate investigation of abnormal routing behavior (catching, squashing, excessive movement)

Maintenance & Repair Principles

Dress pack systems are considered wear items.
The type and degree of wear depend on the robot application and duty cycle.

The following components must be checked regularly and replaced as required:

- Protection elements / connectors
- Protection enclosure / corrugated tubing
- Supports and brackets
- Individual cables and hoses
- Strain relief components

Service & Repair Concept

Serviceability is a key design objective of the Lean High Motion System.

Where applicable, the system supports the following target mean time to repair (MTTR):

- ≤ 7 minutes for Material Handling
- ≤ 15 minutes for Carried Spot Welding

Service principle:

Replacement of standardized components or modules is preferred over tuning or adjustment of routing geometry.

Document Control & IP Notice