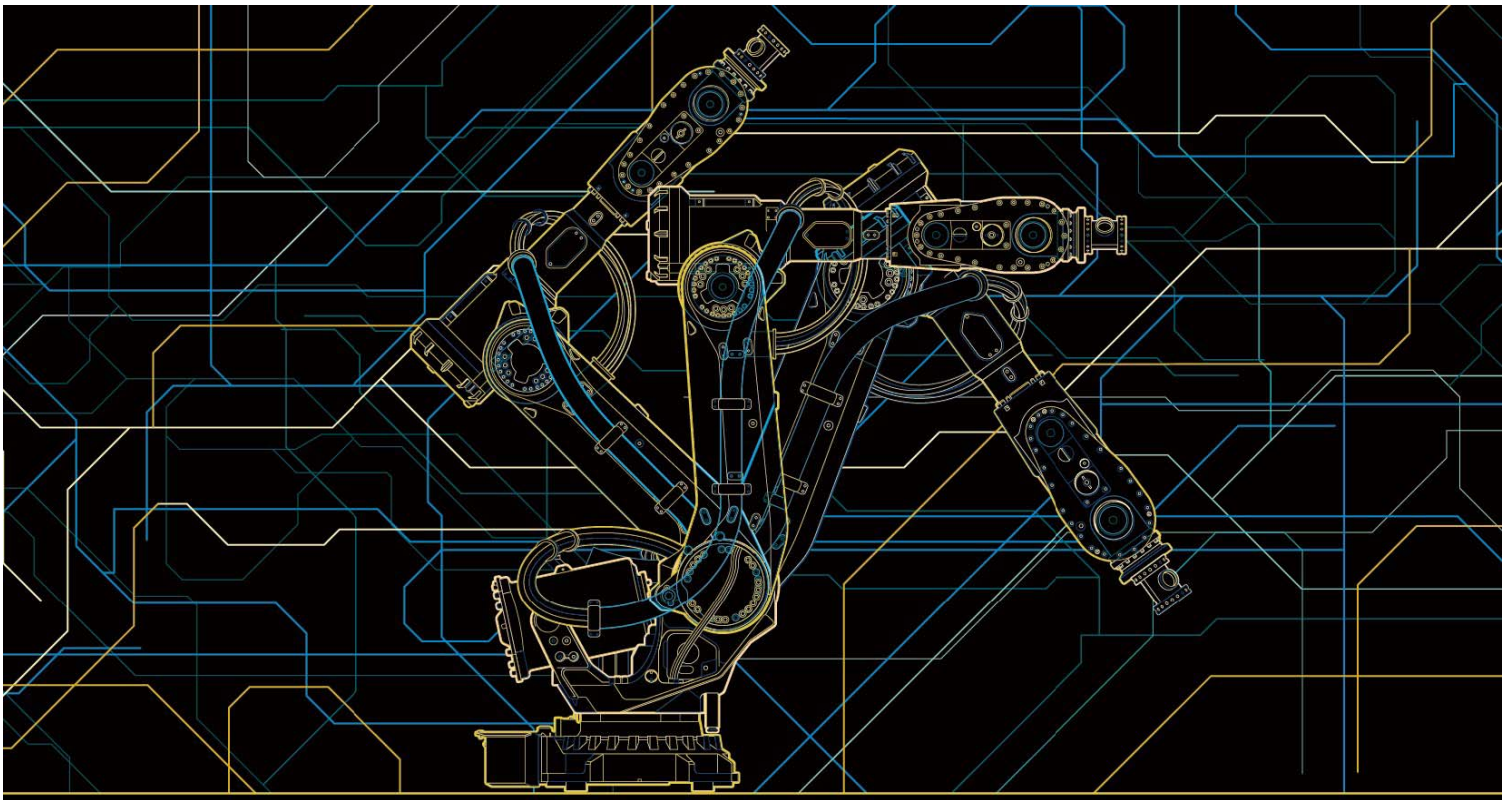

Product manual
Feather duster

Power and productivity
for a better world™

Product manual
Feather Duster

Document ID: 3HAW050027150
Revision: B

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0.0.1. Overview of this manual

About this manual

This manual contains instructions for:

- the characteristics of the Feather Duster
- mechanical and electrical installation instructions for the Feather Duster
- maintenance instructions for the Feather Duster
- spare parts

Usage

This manual should be used when working during:

- installation, from lifting the Feather Duster to its work site and securing it to the foundation, to making it ready for operation
- maintenance work
- repair work.

Who should read this manual?

This manual is intended for:

- installation personnel
- maintenance personnel
- repair personnel.

Prerequisites

A maintenance /repair/ installation craftsman working with an ABB Feather Duster must:

- be trained by ABB and have the required knowledge of mechanical and electrical installation/repair/maintenance work.

Organization of chapters

The manual is organized in the following chapters:

Chapter	Content
Safety	Safety information that must be read through before performing any installation or service work on the Feather Duster. Contains general safety aspects as well as more specific information about how to avoid personal injuries and damage to the product.
Description and technical details	Specifications and characteristics of the Feather Duster.
Installation	Information for installing the Feather Duster and connection to the control system.
Unpacking, acceptance and handling	Information relative to the steps following the reception of the Feather Duster, until its installation.
Maintenance	Step-by-step procedures that describe how to perform maintenance of the Feather Duster. Based on a maintenance schedule that may be used in the work of planning periodical maintenance.
Spare parts	List of the spare parts available for the Feather Duster.

References

Reference - ABB documentation	Document ID
Operating manual - General safety information	3HAC031045-001
Product manual - IRC5 Robot Controller with FlexPendant	3HAC021313-001
Service Information System - IRC5	3HAC025709-001
Operating manual - IRC5 with FlexPendant	3HAC16590
Getting started, IRC5 and RobotStudio	3HAC021564-001
Product manual - IRB6640	3HAC026876
Product manual - IRB6700	3HAC044266

Reference - SEW documentation	Document ID
System Manual – MOVIDRIVE® MDX60B/61B (09/2010) Download from: *http://www.seweurodrive.com/download/pdf/16838017_G01.pdf*	16838017 / EN
Operating Instructions – MOVIDRIVE® MDX60B/61B (01/2010) Download from: *http://download.sew-eurodrive.com/download/pdf/16837614.pdf*	16837614 / EN
Applications Manuals – MOVIDRIVE® MDX61B - DriveSync via Fieldbus Application (08/2010) Download from: *http://www.sew-eurodrive.com/download/pdf/17004411.pdf*	17004411 / EN

Revisions

Revision	Description
A	Updated - Spare parts list - Requirements for air flow - Wiring diagrams
B	Updated - Robot specification - RB6700 is added - Electrical diagrams added

0.0.2. Product documentation, M2004

Categories for manipulator documentation

The manipulator documentation is divided into a number of categories. This listing is based on the type of information in the documents, regardless of whether the products are standard or optional.

All documents listed can be ordered from ABB on a DVD. The documents listed are valid for M2004 manipulator systems.

Product manuals

All hardware, manipulators and controllers will be delivered with a **Product manual** that contains:

- Safety information.
- Installation and commissioning (descriptions of mechanical installation, electrical connections).
- Maintenance (descriptions of all required preventive maintenance procedures including intervals).
- Repair (descriptions of all recommended repair procedures including spare parts).
- Additional procedures, if any (calibration, decommissioning).
- Reference information (article numbers for documentation referred to in Product manual, procedures, lists of tools, safety standards).
- Parts list.
- Foldouts or exploded views.
- Circuit diagrams (or references to circuit diagrams).

Technical reference manuals

The technical reference manuals describe the manipulator software in general and contain relevant reference information.

- **RAPID Overview**: An overview of the RAPID programming language.
- **RAPID Instructions, Functions and Data types**: Description and syntax for all RAPID instructions, functions, and data types.
- **RAPID Kernel**: A formal description of the RAPID programming language.
- **System parameters**: Description of system parameters and configuration workflows.

Application manuals

Specific applications (for example software or hardware options) are described in **Application manuals**. An application manual can describe one or several applications.

An application manual generally contains information about:

- The purpose of the application (what it does and when it is useful).
- What is included (for example cables, I/O boards, RAPID instructions, system parameters, CD with PC software).
- How to use the application.
- Examples of how to use the application.

Operating manuals

The operating manuals describe hands-on handling of the products. The manuals are aimed at those having first-hand operational contact with the product, that is production cell operators, programmers, and trouble shooters.

The group of manuals includes:

- **Emergency safety information**
- **General safety information**
- **Getting started, IRC5 and RobotStudio**
- **IRC5 with FlexPendant**
- **RobotStudio**
- **Introduction to RAPID**
- **Trouble shooting**, for the controller and manipulator.

0.0.3. How to read the product manual

Reading the procedures

The procedures contain references to figures, tools, material etc. The references are read as described below.

References to figures

The procedures often include references to components or attachment points located on the robot/controller. The components or attachment points are marked with *italic text* in the procedures and completed with a reference to the figure where the current component or attachment point is shown.

The denomination in the procedure for the component or attachment point corresponds to the denomination in the referenced figure.

The table below shows an example of a reference to a figure from a step in a procedure.

	Action	Note/Illustration
8.	Remove the rear attachment screws, gearbox.	Shown in the figure *Location of gearbox on page xx*.

Reference to required equipment

The procedures often include references to equipment (spare parts, tools etc.) required for the different actions in the procedure. The equipment is marked with italic text in the procedures and completed with a reference to the section where the equipment is listed with further information, i.e. article number, dimension.

The denomination in the procedure for the component or attachment point corresponds to the denomination in the referenced list.

The table below shows an example of a reference to a list of required equipment, from a step in a procedure.

	Action	Note/Illustration
3.	Fit a new sealing, 2 to the gearbox.	Art. no. is specified in *Required equipment on page xx*.

Safety information

The manual includes a separate safety chapter that must be read through before proceeding with any service or installation procedures. All procedures also include specific safety information when dangerous steps are to be performed.

Read more in *Safety on page 11*.

1 Safety

1.1. Introduction

Overview

The safety information in this manual is divided in two categories:

- general safety aspects, important to attend to before performing any service work on the robot. These are applicable for all service work and are found in *General safety information on page 12*.
- specific safety information, pointed out in the procedure at the moment of the danger. How to avoid and eliminate the danger is either detailed directly in the procedure, or further detailed in separate instructions, found in *Safety related instructions on page 29*.

1.2 General safety information

1.2.1. Safety in the robot system

Validity and responsibility

The information does not cover how to design, install and operate a complete system, nor does it cover all peripheral equipment, which can influence the safety of the total system. To protect personnel, the complete system must be designed and installed in accordance with the safety requirements set forth in the standards and regulations of the country where the robot is installed.

The users of ABB industrial robots are responsible for ensuring that the applicable safety laws and regulations in the country concerned are observed and that the safety devices necessary to protect people working with the robot system are designed and installed correctly. Personnel working with robots must be familiar with the operation and handling of the industrial robot, described in the applicable documents, e.g. User's Guide and Product Manual.

Connection of external safety devices

Apart from the built-in safety functions, the robot is also supplied with an interface for the connection of external safety devices. Via this interface, an external safety function can interact with other machines and peripheral equipment. This means that control signals can act on safety signals received from the peripheral equipment as well as from the robot.

Limitation of liability

Any information given in this manual regarding safety, must not be construed as a warranty by ABB that the industrial robot will not cause injury or damage even if all safety instructions are complied with.

Related information

Type of information	Detailed in document	Section
Installation of safety devices	Product manual for the robot	Installation and commissioning
Changing robot modes	Operators manual (RobotWare 5.0)	Operating modes
Restricting the working space	Product manual for the robot	Installation and commissioning

1.3 Safety risks related to the robot

1.3.1. Safety risks during installation and service work on robot

Overview

This section includes information of general safety risks to be considered when performing installation and service work on the robot.

General risks during installation and service

- The instructions in the Product Manual - Installation and Commissioning must always be followed.
- Emergency stop buttons must be positioned in easily accessible places so that the robot can be stopped quickly.
- Those in charge of operations must make sure that safety instructions are available for the installation in question.
- Those who install the robot must have the appropriate training for the robot system in question and in any safety matters associated with it.

Nation/region specific regulations

To prevent injuries and damage during the installation of the robot system, the regulations applicable in the country concerned and the instructions of ABB Robotics must be complied with.

Non-voltage related risks

- Safety zones, which have to be crossed before admittance, must be set up in front of the robot's working space. Light beams or sensitive mats are suitable devices.
- Turntables or the like should be used to keep the operator out of the robot's working space.
- The axes are affected by the force of gravity when the brakes are released. In addition to the risk of being hit by moving robot parts, you run the risk of being crushed by the parallel arm.
- Energy, stored in the robot for the purpose of counterbalancing certain axes, may be released if the robot, or parts thereof, are dismantled.
- When dismantling/assembling mechanical units, watch out for falling objects.
- Be aware of stored heat energy in the controller.
- Never use the robot as a ladder, i.e. do not climb on the robot motors or other part during service work. There is a serious risk of slipping because of the high temperature of the motors or oil spills that can occur on the robot.

To be observed by the supplier of the complete system

- The supplier of the complete system must ensure that all circuits used in the safety function are interlocked in accordance with the applicable standards for that function.
- The supplier of the complete system must ensure that all circuits used in the emergency stop function are interlocked in a safe manner, in accordance with the applicable standards for the emergency stop function.

1.3.1. Safety risks during installation and service work on robot

Complete robot

Safety risk	Description
Hot components! Removed parts may result in collapse of robot!	 Caution signal **Caution!** Motors and gears are HOT after running the robot! Touching the motors and gears may result in burns!  Warning signal **Warning!** Take any necessary measures to ensure that the robot does not collapse as parts are removed, e.g. secure the lower arm with fixtures if removing motor, axis 2.

Cabling

Safety risk	Description
Cable packs are sensitive to mechanical damage!	 Caution signal **Caution!** The cable packs are sensitive to mechanical damage! They must be handled with care, especially the connectors, in order to avoid damaging them!

Gearboxes and motors

Safety risk	Description
Gears may be damaged if excessive force is used!	 Caution signal **Caution!** Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used!

1.3.2. Safety risks related to tools/workpieces

Safe handling

It must be possible to safely turn off tools, such as milling cutters, etc. Make sure that guards remain closed until the cutters stop rotating.

It should be possible to release parts by manual operation (valves).

Safe design

Grippers/end effectors must be designed so that they retain workpieces in the event of a power failure or a disturbance of the controller.

CAUTION!

Ensure that a gripper is prevented from dropping a workpiece, if such is used.

1.3.3. Safety risks related to pneumatic/hydraulic systems

General

Special safety regulations apply to pneumatic and hydraulic systems.

Residual energy

- Residual energy may be present in these systems. After shutdown, particular care must be taken.
- The pressure in pneumatic and hydraulic systems must be released before starting to repair them.

Safe design

- Gravity may cause any parts or objects held by these systems to drop.
- Dump valves should be used in case of emergency.
- Shot bolts should be used to prevent tools, etc., from falling due to gravity.

1.3.4. Safety risks during operational disturbances

General

- The industrial robot is a flexible tool which can be used in many different industrial applications.
- All work must be carried out professionally and in accordance with the applicable safety regulations.
- Care must be taken at all times.

Qualified personnel

- Corrective maintenance must only be carried out by qualified personnel who are familiar with the entire installation as well as the special risks associated with its different parts.

Extraordinary risks

If the working process is interrupted, extra care must be taken due to risks other than those associated with regular operation. Such an interruption may have to be rectified manually.

1.3.5. Risks associated with live electric parts

Voltage related risks, general

- Although troubleshooting may, on occasion, have to be carried out while the power supply is turned on, the robot must be turned off (by setting the mains switch to OFF) when repairing faults, disconnecting electric leads and disconnecting or connecting units.
- The mains supply to the robot must be connected in such a way that it can be turned off outside the robot's working space.

Voltage related risks, controller IRC5

A danger of high voltage is associated with the following parts:

- Be aware of stored electrical energy (DC link, Ultra Cap unit) in the controller.
- Units inside the controller, e.g. I/O modules, can be supplied with power from an external source.
- The mains supply/mains switch
- The transformers
- The power unit
- The control power supply (230 VAC)
- The rectifier unit (400-480 VAC and 700 VDC. Note: Capacitors!)
- The drive unit (700 VDC)
- The drive system power supply (230 VAC)
- The service outlets (115/230 VAC)
- The customer power supply (230 VAC)
- The power supply unit for tools, or special power supply units for the machining process.
- The external voltage connected to the control cabinet remains live even when the robot is disconnected from the mains.
- Additional connections.

Voltage related risks, robot

A danger of high voltage is associated with the robot in:

- The power supply for the motors (up to 800 VDC).
- The user connections for tools or other parts of the installation (max. 230 VAC, see chapter Installation and commissioning in the Product manual).

Voltage related risks, tools, material handling devices, etc.

Tools, material handling devices, etc., may be live even if the robot system is in the OFF position. Power supply cables which are in motion during the working process may be damaged.

1.4 Safety actions related to the robot

1.4.1. Safety fence dimensions

General

Install a safety cell around the robot to ensure safe robot installation and operation.

Dimensioning

Dimension the fence or enclosure to enable it to withstand the force created if the load being handled by the robot is dropped or released at maximum speed. Determine the maximum speed from the maximum velocities of the robot axes and from the position at which the robot is working in the work cell (see *Product Specification - Description, Robot Motion*).

Also consider the maximum possible impact caused by a breaking or malfunctioning rotating tool or other device fitted to the manipulator.

1.4.2. Fire extinguishing

NOTE!

Use a CARBON DIOXIDE (CO2) extinguisher in the event of a fire in the robot (manipulator or controller)!

1.4.3. Emergency release of the robots/manipulators axes

Description

In an emergency situation, any of the robot's/manipulators axes may be released manually by pushing the brake release buttons on the robot.

How to release the brakes is detailed in the robot product manual.

- The robot arm may be moved manually on smaller robot models, but larger models may require using an overhead crane or similar.

Increased injury

Before releasing the brakes, make sure that the weight of the arms does not increase the pressure on the trapped person, further increasing any injury!

1.4.4. Brake testing

When to test

During operation the holding brakes of each axis motor wear normally. A test may be performed to determine whether the brake can still perform its function.

How to test

The function of each axis' motor holding brakes may be checked as detailed below:

1. Run each manipulator axis to a position where the combined weight of the manipulator arm and any load is maximized (max. static load).
2. Switch the motor to the MOTORS OFF position with the Operating mode selector on the controller.
3. Check that the axis maintains its position.

If the manipulator does not change position as the motors are switched off, then the brake function is adequate.

1.4.5. Risk of disabling function "Reduced speed 250 mm/s"

NOTE!

Do not change *Transm. gear ratio* or other kinematic parameters from the Teach Pendant Unit or a PC. This will affect the safety function Reduced speed 250 mm/s.

1.4.6. Safe use of the Teach Pendant Unit

NOTE!

The enabling device is a push button located on the side of the Teach Pendant Unit (TPU) which, when pressed halfway in, takes the system to MOTORS ON. When the enabling device is released or pushed all the way in, the robot is taken to the MOTORS OFF state. To ensure safe use of the Teach Pendant Unit, the following must be implemented:

- The enabling device must never be rendered inoperative in any way.
- During programming and testing, the enabling device must be released as soon as there is no need for the robot to move.
- The programmer must always bring the Teach Pendant Unit with him/her, when entering the robot's working space. This is to prevent anyone else taking control of the robot without the programmer knowing.

1.4.7. Work inside the manipulator's working range

WARNING!

If work must be carried out within the robot's work envelope, the following points must be observed:

- The operating mode selector on the controller must be in the manual mode position to render the enabling device operative and to block operation from a computer link or remote control panel.
- The robot's speed is limited to max. 250 mm/s when the operating mode selector is in position < 250 mm/s. This should be the normal position when entering the working space. The position 100% "full speed" may only be used by trained personnel who are aware of the risks that this entails.
- Pay attention to the rotating axes of the manipulator! Keep a distance to the axes in order not to get entangled with hair or clothing. Also be aware of any danger that may be caused by rotating tools or other devices mounted on the manipulator or inside the cell.

1.4.8. Translate the information on safety and information labels

Labels on the product

Both the manipulator and the controller are marked with several safety and information labels, containing important information about the product. The information is useful for all personnel handling the robot system, e.g. during installation, service or operation.

Translation possibilities

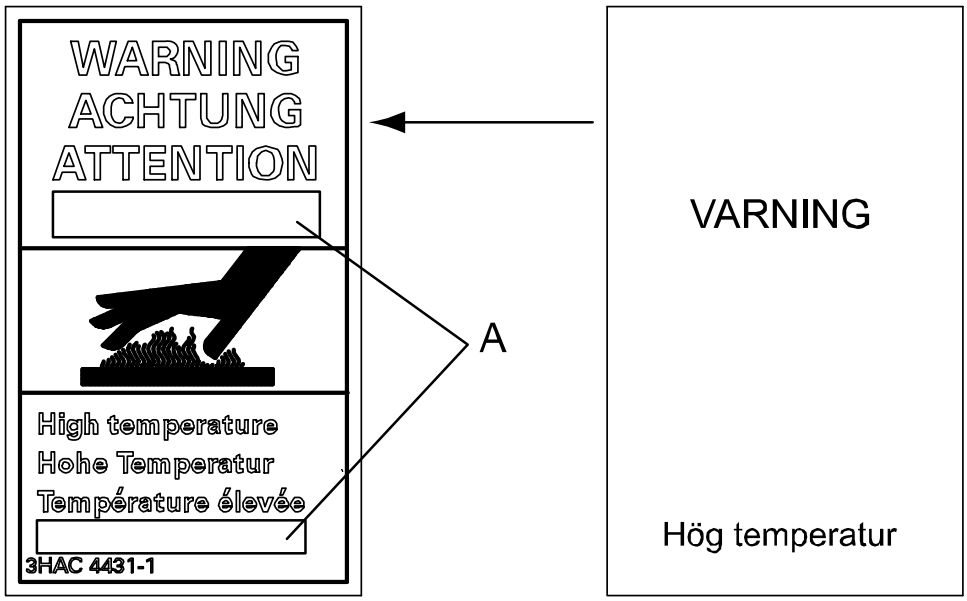
The labels fitted to the product contain space for adding a fourth language underneath the three standard languages (English, German and French).

Add a local language to the label by:

- using a transparent sticker over the standard label with text added in a fourth language. Drawings detailing the design (text, figure, dimensions) of the standard labels can be ordered from ABB. Notice that each label is identified according to the article number located in the lower corner of the label.

Example of transparent sticker

The figure below shows the location of the free space on one of the labels on the robot, where the fourth language can be added. The figure also shows a transparent sticker, containing the text in Swedish.



xx0500002517

A	Free space for adding a fourth language

1.5 Safety stops

1.5.1. What is an emergency stop?

Definition of emergency stop

An emergency stop is a state that overrides any other manipulator control, disconnects drive power from the manipulator motors, stops all moving parts, and disconnects power from any potentially dangerous functions controlled by the manipulator system.

An emergency stop state means that all power is disconnected from the manipulator except for the manual brake release circuits. You must perform a recovery procedure, i.e, resetting the emergency stop button and pressing the Motors On button, in order to return to normal operation.

The manipulator system can be configured so that the emergency stop results in either:

- An uncontrolled stop, immediately stopping the manipulator actions by disconnecting power from the motors.
- A controlled stop, stopping the manipulator actions with power available to the motors so that the manipulator path can be maintained. When completed, power is disconnected.

The default setting is uncontrolled stop. However, controlled stops are preferred since they minimize extra, unnecessary wear on the manipulator and the actions needed to return the manipulator system back to production. Please consult your plant or cell documentation to see how your manipulator system is configured.

NOTE!

The emergency stop function may only be used for the purpose and under the conditions for which it is intended.

NOTE!

The emergency stop function is intended for immediately stopping equipment in the event of an emergency.

NOTE!

Emergency stop should not be used for normal program stops as this causes extra, unnecessary wear on the manipulator.

Classification of stops

The safety standards that regulates automation and manipulator equipment defines categories in which each type of stop applies:

If the stop is...	then it is classified as...
uncontrolled	category 0 (zero)
controlled	category 1

1.5.1. What is an emergency stop?

Emergency stop devices

In a manipulator system there are several emergency stop devices that can be operated in order to achieve an emergency stop. There are emergency stop buttons available on the Flex-Pendant and on the controller cabinet (on the Control Module on a Dual Cabinet Controller).There can also be other types of emergency stops on your manipulator, consult your plant or cell documentation to see how your manipulator system is configured.

1.6 Safety related instructions

1.6.1. Safety signals in the manual

Introduction to safety signals

This section specifies all dangers that may arise from performing the work detailed in the manual. Each danger is detailed in its own section consisting of:

- A caption specifying the danger level (DANGER, WARNING or CAUTION) and the type of danger.
- A brief description of what will happen if the operator/service personnel do not eliminate the danger.
- An instruction of how to eliminate the danger to facilitate performing the activity at hand.

Danger levels

The table below defines the captions specifying the danger levels used throughout this manual.

Symbol	Designation	Signification
 danger	DANGER	Warns that an accident will occur if the instructions are not followed, resulting in a serious or fatal injury and/or severe damage to the product. It applies to warnings that apply to danger with, for example, contact with high voltage electrical units, explosion or fire risk, risk of poisonous gases, risk of crushing, impact, fall from height etc.
 warning	WARNING	Warns that an accident may occur if the instructions are not followed, that can lead to serious injury, possibly fatal, and/or great damage to the product. It applies to warnings that apply to danger with, for example, contact with high voltage electrical units, explosion or fire risk, risk of poisonous gases, risk of crushing, impact, fall from height etc.
 Electrical shock	ELECTRICAL SHOCK	The electrocution or electrical shock symbol indicates electrical hazards which could result in severe personal injury or death.
 caution	CAUTION	Warns that an accident may occur if the instructions are not followed, that can result in injury and/or damage to the product. It also applies to warnings of risks that include burns, eye injury, skin injury, hearing damage, crushing or slipping, tripping, impact, fall from height etc. Furthermore, it applies to warnings that include function requirements when fitting and removing equipment, where there is a risk of damaging the product or causing a breakdown.

1.6.1. Safety signals in the manual

Symbol	Designation	Signification
 Electrostatic discharge (ESD)	ELECTROSTATIC DISCHARGE (ESD)	The electrostatic discharge (ESD) symbol indicates electrostatic hazards which could result in severe damage to the product.
 Magnetic fields	MAGNETIC FIELDS	An intense and/or variable magnetic field can affect or damage certain electrical devices like cardiac pacemakers.
 Note	NOTE	Note symbols alert you to important facts and conditions.
 Tip	TIP	Tip symbols direct you to specific instructions, where to find additional information or how to perform a certain operation in an easier way.

2 System description

2.1 System overview

2.1.1. System basics

General

The Feather Duster Robot system is a pre-paint finishing equipment mounted on a 6 axis manipulator. It is used to remove dust and dirt particles from car bodies and from surfaces to be painted.

This system utilizes brushes manufactured from ostrich feathers to remove contaminants, which are then vacuumed from the brushes with an exhaust fan. It replaces the tack-off machine with more flexibility and high efficiency.

System overview

Besides robot and robot controller, a complete Feather Duster system consists mainly of an ostrich roller, a de-ionization unit, an exhaust system and a process cabinet.

For details, see *Components overview on page 33*

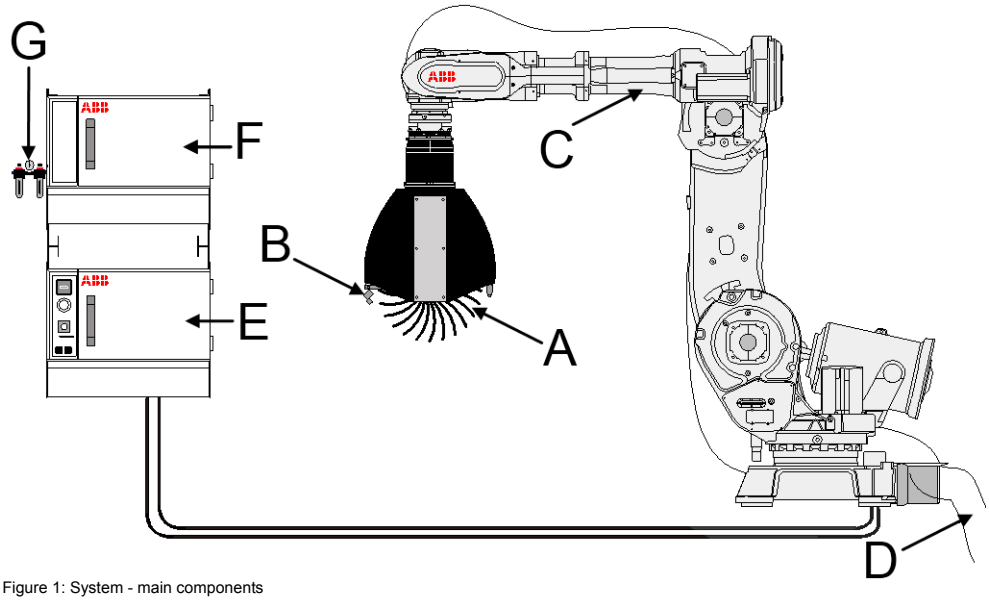


Figure 1: System - main components

Item	Description
A	Ostrich feather roller
B	Ionizing air knife
C	ABB IRB6640 or IRB6700
D	Exhaust hose
E	Control cabinet
F	Process cabinet
G	Compressed air supply

Function

The Feather Duster Robot system is designed to remove contaminants from surfaces to be painted. The surface is cleaned by the rotating ostrich feather brushes. The brushes come across the body shell with a depth of immersion of approximately 30~40 mm. Through this movement, the contaminants are absorbed by the feather brushes and then vacuumed from the brushes with an exhaust fan.

Two AC Ionization bars are mounted on the Feather Duster to deliver an ionized air stream, both to remove any static charge from the feather brushes just prior to the exhaust slot and to neutralize the body surface after cleaning. Removable outer carbon fiber covers allow easy access to the inner mechanical and electrical components, which are based on a modular design principle.

Benefits

As a pre-paint finishing equipment using ostrich feather integrated on a robot, the Feather Duster Robot system aims at providing a more flexible and easier way to increase production efficiency. Compared with a tack-off machine, it brings a lot of benefits:

- 6 axes robot for a perfect profile follow up, flexible movement for optimum cleaning, tracking of the car body for both horizontal and critical surface. The cleaning of critical zone is shown in the figure below.
- High reliability (MTBF>50,000h) and easy maintenance.
- Reduces possible contamination caused by dust collecting surfaces and mechanical parts in the roof.
- Modular design and convenient installation.
- Symmetrical removable carbon fiber covers allow easy access to mechanical and electrical parts.
- Low air consumption thanks to optimized air gaps and reduced amount of required rollers.
- Easy programming, high flexibility, large working area and accessibility.
- Common graphic user interface for both cleaning and painting robots.

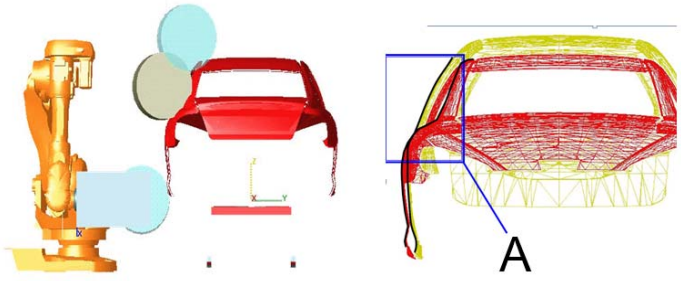


Figure 2: Critical zone cleaning

A	Critical zone

2.1.2. Components overview

Unit overview

The Feather Duster system consists mainly in the ostrich roller, ionization unit, exhaust system, process cabinet, compressed air system and control cabinet.

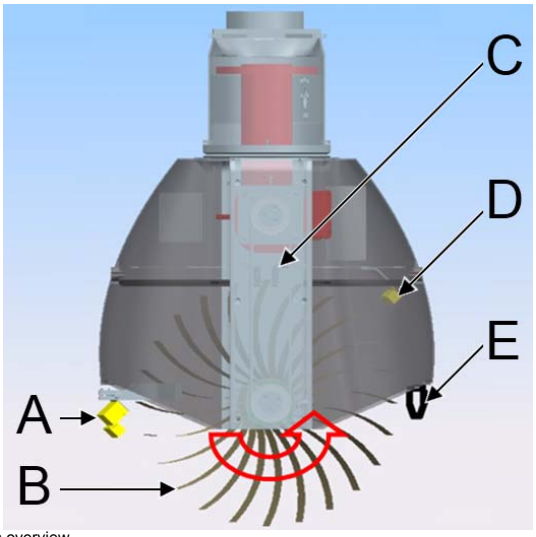


Figure 3: System - Components overview

Item	Description
A	Ionizing air knife
B	Ostrich roller
C	Suction slot with flexible lips
D	Ionizing bar
E	Anti-collision safe edge

Ostrich roller

The Feather Duster is equipped with an ostrich feather roller. The roller is made up of disks of feathers stacked on a stainless steel shaft. See *Feather roller on page 36*.

Ionization unit

The ionization system consists in an ionizing air knife bar mounted on the trailing edge and a ionization bar mounted in the mechanical unit. Its purpose is to eliminate static charge from the feathers and surface to be cleaned. See *Ionization on page 37*.

Exhaust system

An adjustable opening that spans the full length of the hood collects all of the dust and contaminants from the feathers. The air is routed from an exhaust fan to the hood through ductwork and flexible hose. See *Exhaust system on page 38*.

Compressed air system

The air knife is equipped with blowoff tubes which must be supplied in compressed air. See *Compressed air system on page 39*.

Process cabinet

The process cabinet is used to control the roller, the ionization bars and the compressed air valve. It is also an interface to automats (e.g. PLC cabinet), providing the signal from the main sensors (e.g. anti-collision switch).

Control cabinet

The control cabinet is a standard ABB IRC5 controller, used to control robot motion.

For more information, see *Product Manual, Control Cabinet IRC5*.

2.1.3. Process diagram

General

The figure below shows the general process diagram:

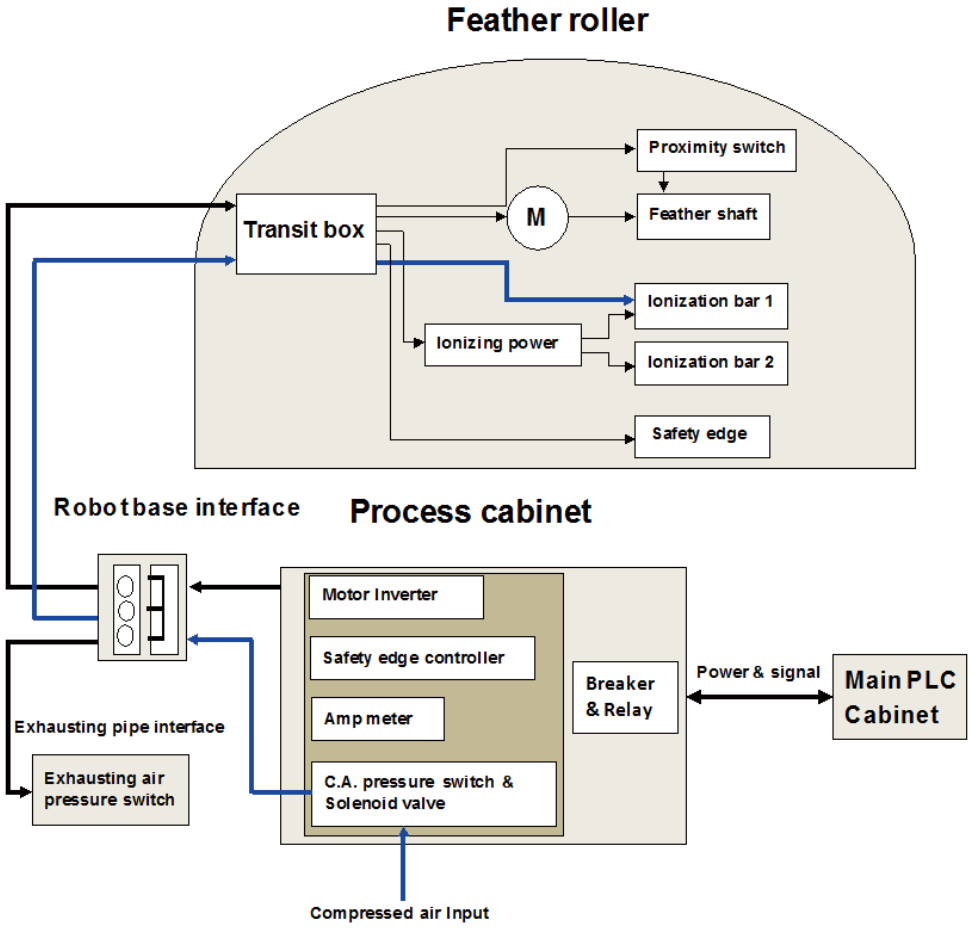


Figure 4: General process diagram

2.2. Feather roller

General

The Feather Duster is equipped with a roller which is an assembly of ostrich feathers disks stacked on a stainless steel shaft. The shaft is equipped with coupling hubs for quick change.

An approach switch monitors the speed on the drive shaft of the rollers. The rotating speed of the feather rollers can therefore be optimally controlled and adjusted to the body and the conveyor speed, achieving a uniform relative speed between feathers and body.

The feather roller is adapted to nearly all body profiles and can be replaced quickly and easily.

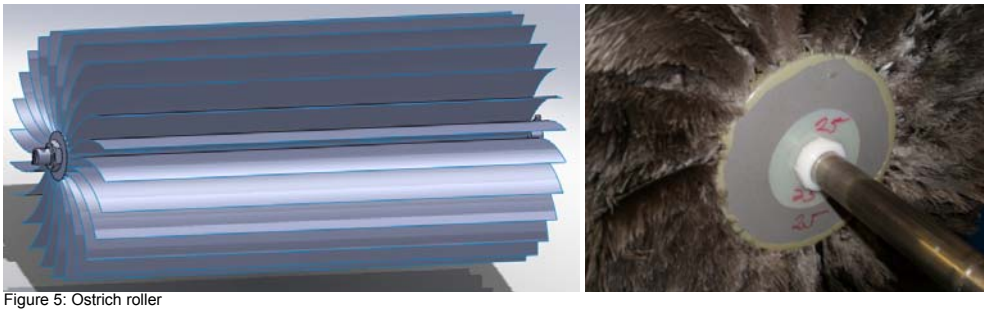


Figure 5: Ostrich roller

Function

The feathers of the rotating roller run across the surface of the body with low pressure. The contact effect and subsequent separation generates electrostatic positive and negative charging, on the body and on the feathers. For this reason the dust particles, charged positively and negatively as well, are consolidated by the respective opposite charge potential and absorbed by the feathers.

The rotating feather roller transfers the feathers that are full of dust particles into the area of the ionization air lock built within the roller covers. The ionization air lock neutralizes the electrostatic charges on the feathers. The suction device then sucks the dust particles off the neutralized feathers.

2.3. Ionization

General

The Feather Duster system is equipped with an ionization system which purpose is to reduce or eliminate static charge from the cleaned surface. The system includes a high voltage generator, an ionizing bars and an ionizing air knife.

High voltage generator

The AC high voltage generator produces both positive and negative ions at a rate of sixty times per second (60Hz line frequency). During the first half of the cycle, a discharge begins when the potential exceeds 2000V and positive ions are generated until the potential falls below the 2000V level. During the second half of the cycle, negative ions are generated.

When the potential is comprised between -2000V and 2000V, no ions are generated; this results in a gap between positive and negative ions.

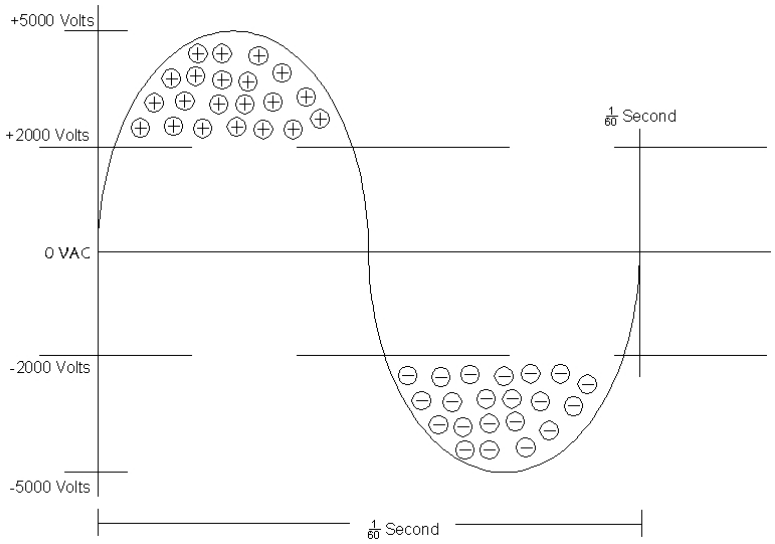


Figure 6: ions generation diagram

Ionization bar

Each system has two ionization bars, one mounted on the trailing edge, and another one mounted inside the hood. The outer unit is an ionizing air knife which blows the ions onto the feathers and vehicle. This creates a curtain of air that sweeps contaminants off the vehicle and neutralizes the body surface after cleaning. The inner bar mounted inside the hood neutralizes the dust particles in feathers.

Proper ion bar alignment is critical. The ion bar mounted on the trailing edge of the duster hood should be adjusted so that the air stream blows onto the vehicle.

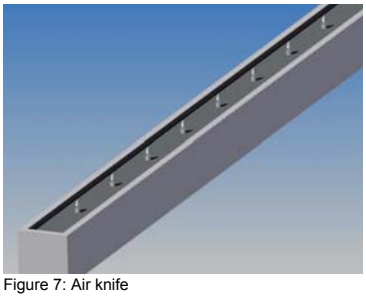


Figure 7: Air knife

2.4. Exhaust system

General

The Feather Duster system requires an exhaust fan to suck the dust and dirt from the feathers. An adjustable 1016 mm (40”) long exhaust slot spans the full length of the feather shaft, where all of the dust and contaminants are collected from the feathers. The exhaust air from the ductwork is routed through flexible hose.

The exhaust air volume will vary depending on the fan location, fan power and ductwork arrangement, but the Feather Duster system requires an air flow of at least 30 m^3/min at 1000 bar.

A pressure sensor connected to the ductwork ensures that the exhaust is running. If no exhaust air flows, a fault will be generated.

Figure 8: Exhaust system

2.5. Compressed air system

General

The compressed air system is required to supply air to the ionization air knife. The system is supplied with a solenoid controlled air valve, mounted on the process cabinet. If the air pressure is lower than the setting value, a fault will be created.

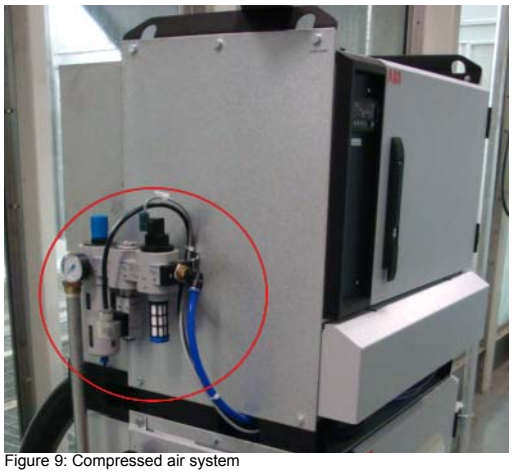


Figure 9: Compressed air system

Air supply requirement	Description
Pressure	3.5 bar min. - 6 bar max.
Filter accuracy	5 µm
Volume	3 m^3/min

3 Technical Specification

3.1. Feather Duster and robot specifications

Feather Duster specifications

Weight	140 kg
Cover Length	1200 mm
Cover Width	620 mm
Cover Depth	680 mm
Roller Widths	1000 mm
Motor Power	0.37 kw
Motoreducer Reduction Ration	23.15
Roller Speed	10-90 rpm variable (motor: 230 - 2085 rpm)
Exhaust Air Flow	30 m^3/min at 1000Pa dynamic, per roller
Compressed Air Supply	1.5 m^3/min at 3.5 bar, per robot
Downdraft Air Velocity	0.3m/s (±0.05)
Humidity and Temperature	Humidity: 60-70%; Temperature: 20-25°C
Conveyor System	Deviation ≤ 25mm

Robot specifications

Feather Duster is designed to be integrated with ABB IRB6640-185 or IRB6700-175.

No particular option is required for the robot. See 3HAC028284-001, IRB6640 Product specification or 3HAC044265, IRB6700 Product specification.

For compatibility with other robot variants, please contact ABB.

axis	range of movement	Max axis speed
1st axis	+170 to -170	100/s
2nd axis	+85 to -85	90/s
3rd axis	+70 to -70	90/s
4th axis	+180 to -180	190/s
5th axis	+90 to -90	140/s
6th axis	+180 to -180	190/s

3.2. Feather Duster dimensions

Dimensions

The following figure shows the Feather Duster dimensions:

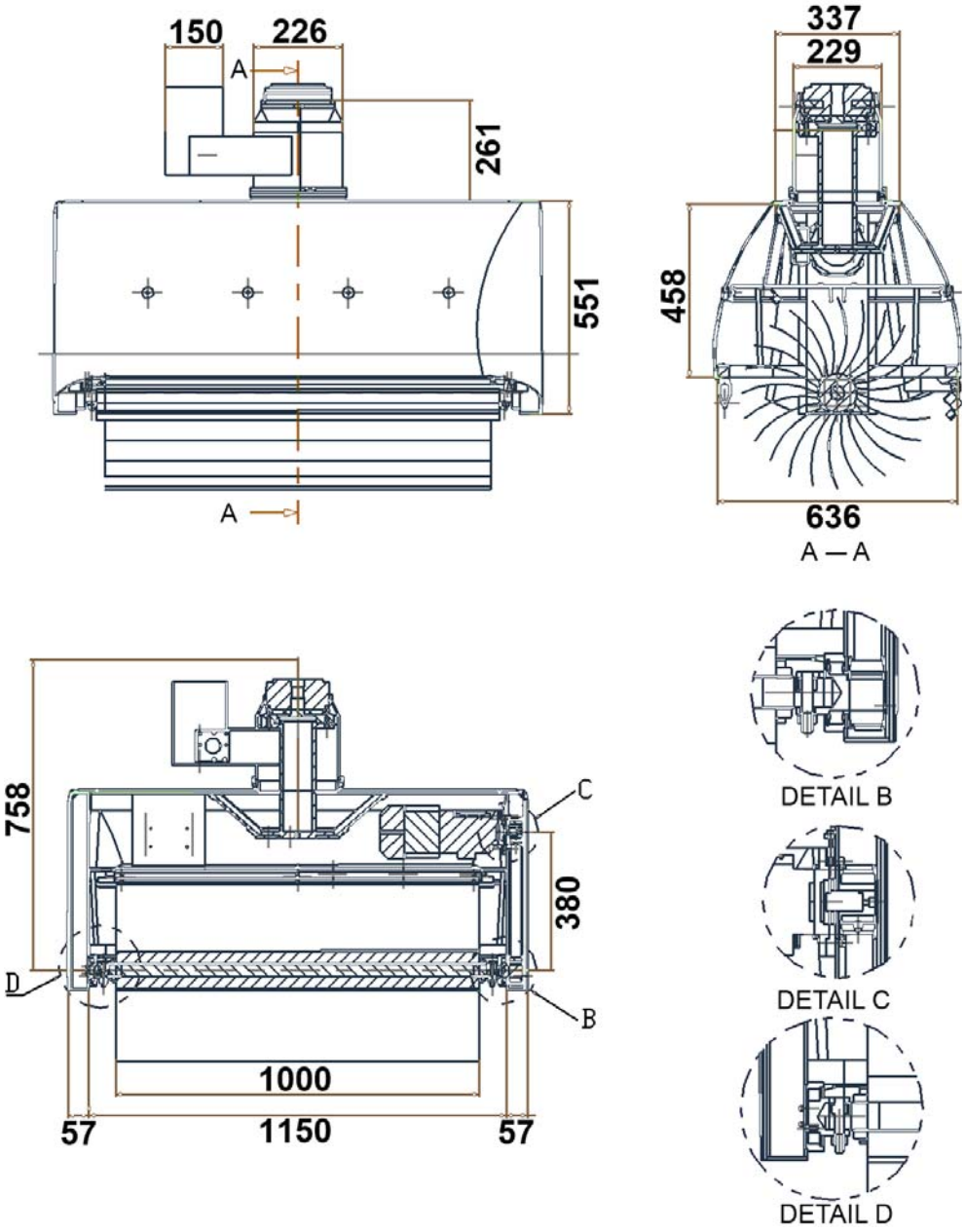


Figure 10: Dimensions

3.2. Feather Duster dimensions

4 Installation and commissioning

4.1. Introduction

Safety information

Before any service work is commenced, it is important that all safety information is observed! Read *Safety on page 11* before performing any service work.

Required equipment

Equipment	Note
Standard toolkit	Specified in *Standard toolkit on page 78*.
Other tools and procedures may be required. See references to these procedures in the step-by-step instructions below.	Specified in *Special tools on page 79*.

Bolts and screws and tightening torques

Specified in *Bolt, screws, tightening torques on page 77*.

4.2 Mechanical installation

4.2.1. Introduction

Safety information

Before any service work is commenced, it is extremely important that all safety information is observed! There are general safety aspects that must be read through, as well as more specific safety information that describe danger and safety risks when performing the procedures. Read *Safety on page 11* before performing any service work.

General

The Feather Duster mechanical installation consists mainly in the installation of the steel structure frame and the mounting of the exhaust air and compressed air supply hoses. Refer to *Assembly drawings on page 87* for details.

Robot position

The robot must be positioned as shown on the following picture:

The flange surface of axis 6 must be horizontal and both axis 4 and 6 must be at 0°.

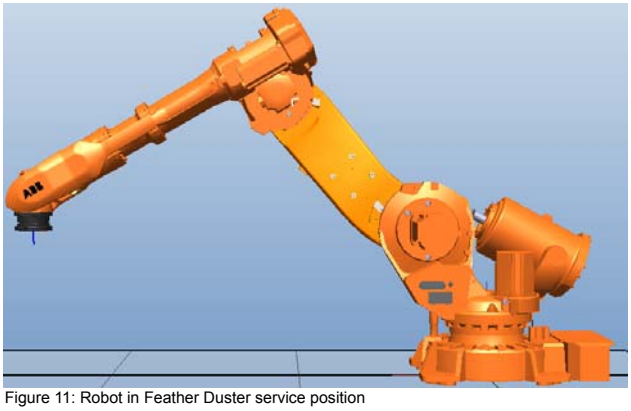


Figure 11: Robot in Feather Duster service position

Correct feather rotation

The figure below shows the correct orientation of the feathers rotation in relation to the travel of the vehicle. Note that the curve of the feathers follows the travel of the vehicle. As a result, the feathers are not bent backward while spinning.

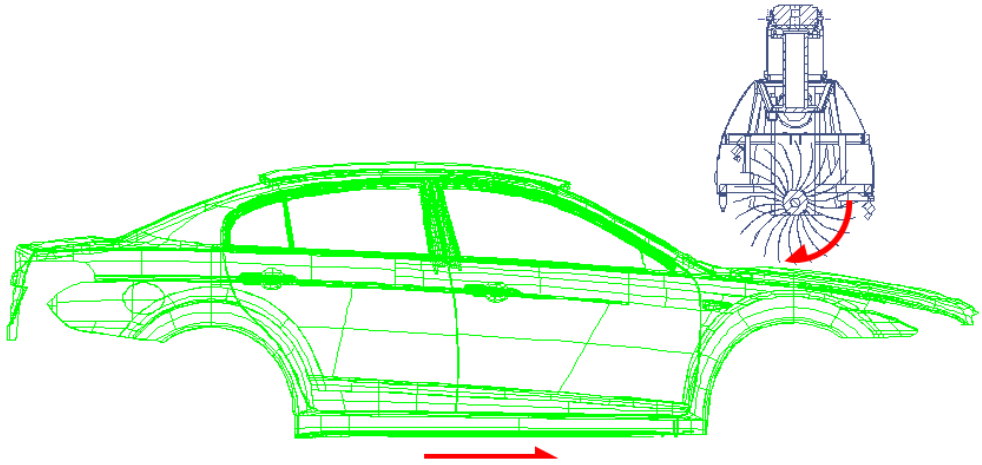


Figure 12: System - Feather rotation

4.2.2. Carbon fiber covers

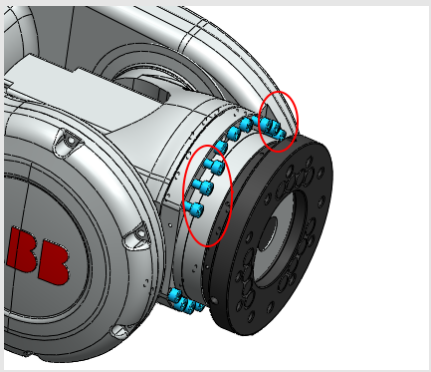
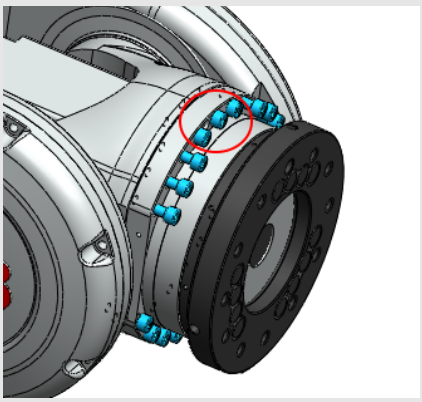
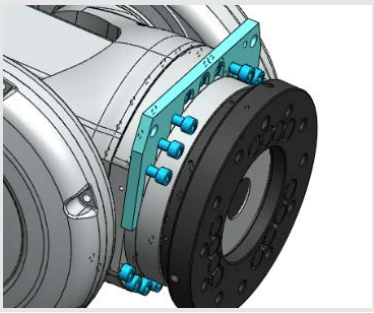
General

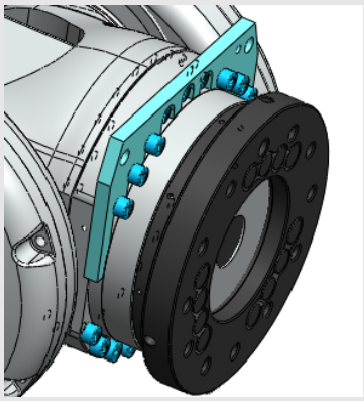
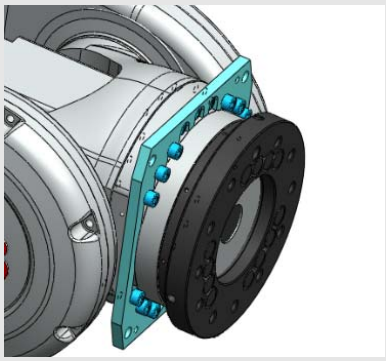
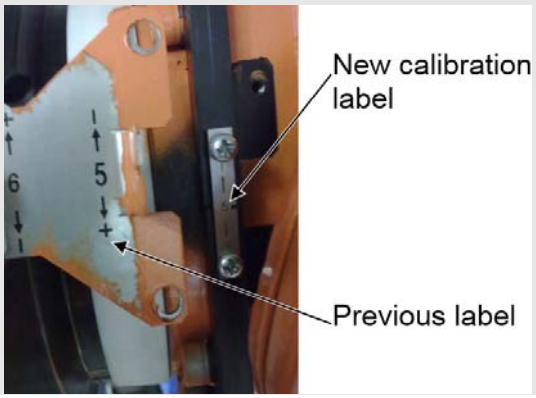
The covers are interchangeable carbon fiber panels, fastened on the frame with 4 M8 screw bolts.

Figure 13: Carbon fiber cover

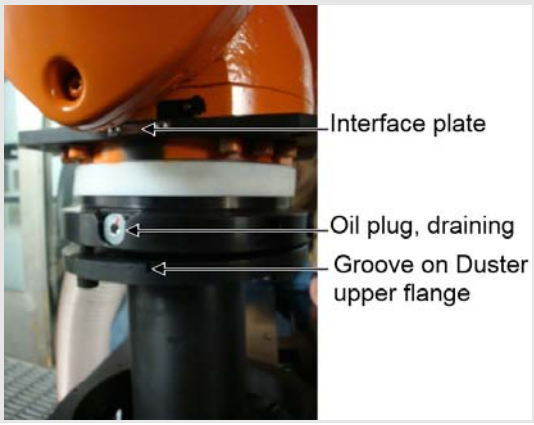
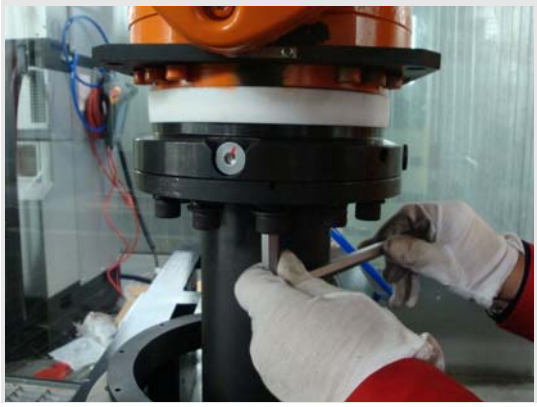
4.2.3. Instructions for the installation of the steel structure frame

Procedure

Steps	Action	Info/Illustration
1.	Ensure that the robot's axis 4 and 6 are set at 0°.	
2.	Remove the original 6th axis calibration label.	
3.	Loosen (but do not remove) the 6 M8 hexagon socket head cap screws at the upper end of 5th axis, keeping about 10mm of distance between the screw head and the 5th axis end surface. NOTE: This distance allows the assembly of the interface plate. keep the washers in contact with the screw heads, away from the 5th axis surface. **CAUTION!** Only loosen the upper 6 screws. If all screws are loosened simultaneously, the lubrication oil may leak out. Don't loose the three screws (A) highlighted in the picture.	 
4	Insert the upper half interface plate into the gap.	

Steps	Action	Info/Illustration
4.	Tighten the 6 screws. Tightening torque: 35Nm.	
5.	Once the upper interface plate is tight, install the lower interface plate the same way.	
6.	Install the new calibration label. Make sure that the label orientation (+ / -) is the same as the original.	
7.	Set the sealing guide and the sealing rubber ring on the steel plate.	

4.2.3. Instructions for the installation of the steel structure frame

Steps	Action	Info/Illustration
8.	Jog the robot vertically and bring its roleface down in contact with the steel structure frame. Pay attention to the direction of installation: the groove must be aligned with the 0°calibration mark of the 6th axis. Pre-tighten 2x M12 hexagon socket head cap screws. Insert the Ø12mm pin to locate the steel frame.	
9.	Tighten all 7 hexagon socket head cap M12 screws.	
10.	Assemble one half of the exhaust hose connector (the one with the connector) to the interface plate. The other half shouldn't me assembled until all mechanical installation is complete. Pay attention to the branch orientation, make sure that the calibration label is not hidden. Tighten only the 2x upper hexagon socket head M10 screws to the interface plate. The 5 screws used to tighten the cover to the sealing guide should be tightened later, upon the installation of the other cover.	 

4.2.4. Instructions for the connection of flexible hoses and cables

Pneumatic system overview

The pneumatic system is described in the diagram below:

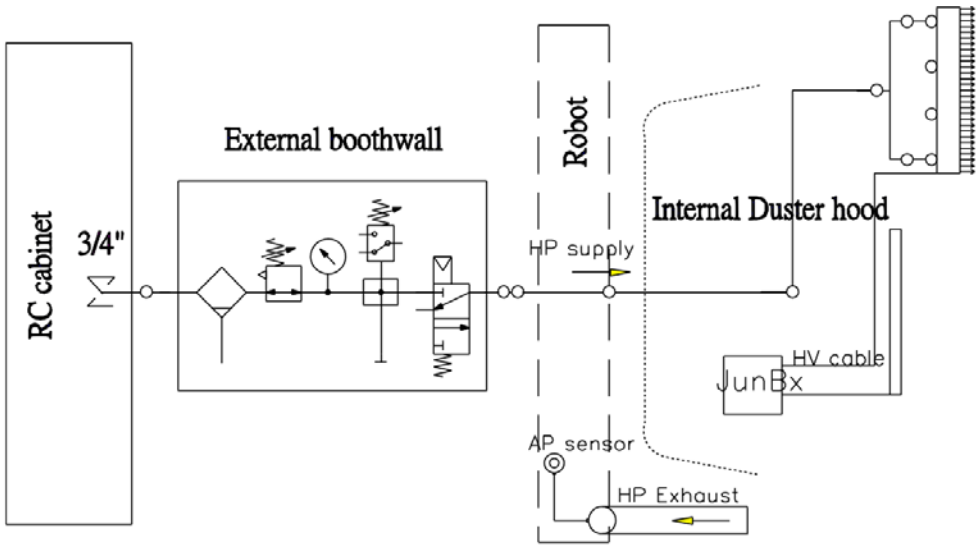


Figure 14: pneumatic diagram

External routing

The external routing of the exhaust hose, pneumatic tube and cables must be completed before the internal connection of the feather duster.
The electrical cables are combined with the air tube within a protection flexible conduit.
Exhaust hose and conduit are fixed at different locations on the robot to minimize wearing during operation.

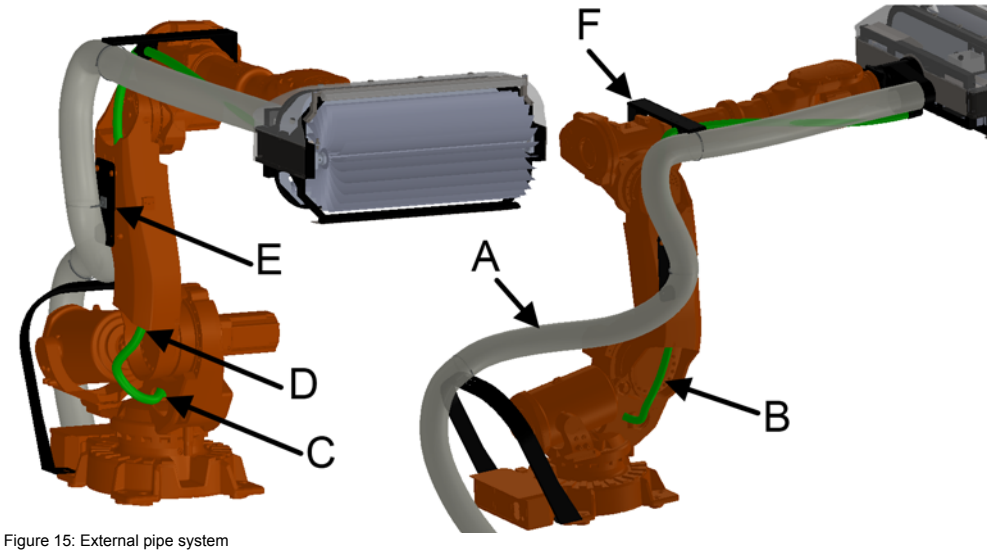
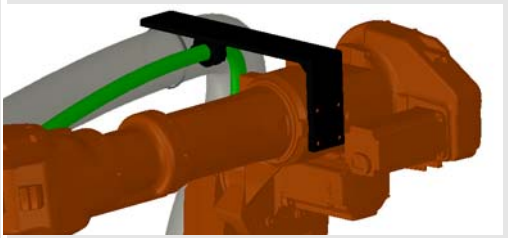


Figure 15: External pipe system

Item	Description	Info/Illustration
A	Exhaust hose	Ø150mm, L=10m
B	Air supply tube and electrical cables contained in the flexible protection conduit	Ø36mm, L=2.5m
C	Routing of the conduit at the robot base	
D	Routing of the conduit at the robot within the lower arm	
E	Fixture of the exhaust hose on the lower arm	
F	Fixture on the upper arm	

Internal routing

Once the exhaust hose and the flexible conduit (which contains the pneumatic tube and the harness) have been assembled onto the robot, connect them to the hose connector at the back of the Feather Duster. The electrical harness must be guided through the cover from the external connector to the internal connector.

A pneumatic elbow fitting must be set within the junction connectors to connect the inner and outer air tubes.

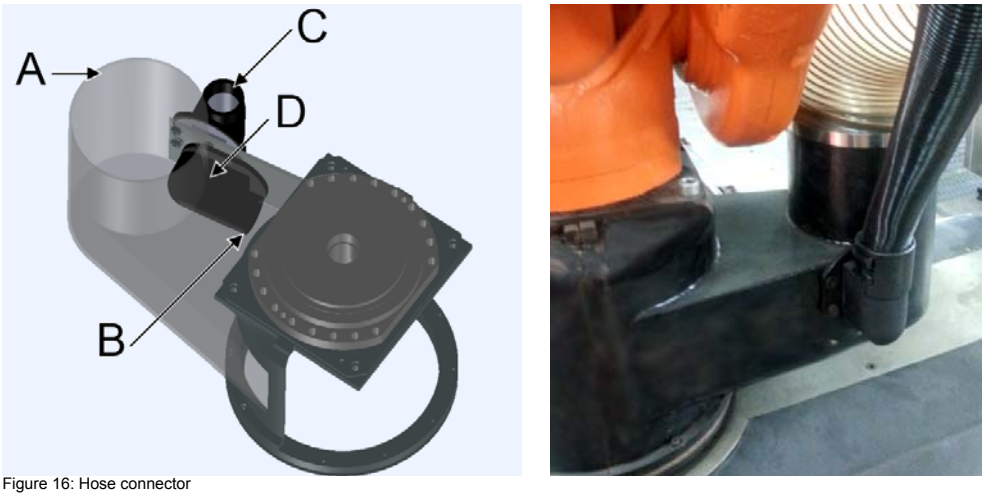


Figure 16: Hose connector

Item	Description	Item	Description
A	Exhaust hose connector	C	External flexible conduit connector
B	Internal flexible conduit connector	D	Pneumatic elbow fitting (inside)

The cables and air tube must be inserted in Ø29mm, 1.2m long internal flexible conduit, then routed in the Feather Duster as shown on the picture below.

The flexible conduit must be turned 1 times 1/2 (540°) around the steel column **when the manipulator's 6th axis is set at +360°:**

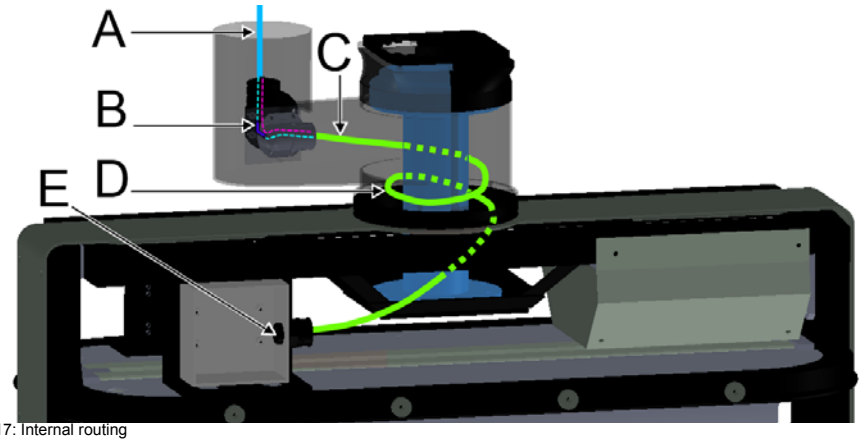
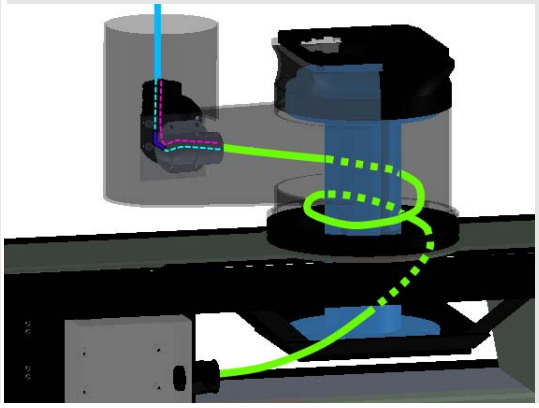
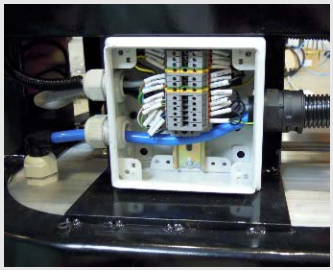


Figure 17: Internal routing

Item	Description	Item	Description
A	External flexible protection conduit	D	Loop
B	Cables running through connectors Air tubes linked through elbow fitting	E	Junction box
C	Internal flexible protection conduit		

4.2.4. Instructions for the connection of flexible hoses and cables

Steps	Action	Info/Illustration
1.	Before routing the internal cables and air pipe, use the Teach Pendant to jog the manipulator's 6th axis to +360°	
2.	Insert the pneumatic tube and the cable harness in the Ø29mm, 1.2m long internal flexible conduit. Route the conduit 1 and 1/2 turns (540°) around the steel column.	
3.	Connect the conduit to the junction box.	
4.	Let the air tube go through the fitting on the other side of the junction box. Connect the air tube to the quick connector on the side of the steels structure frame. **CAUTION!** Make sure the air is not supply is not blocked at any point.	
5.	Connect the cables to the junction box as described in Electrical installation on page 54 Close the junction box.	

Steps	Action	Info/Illustration
6.	Run the robot in manual to make sure that the assembly allows for all axis to run a complete stroke. If necessary, adjust the distance of the flexible conduit and the exhaust hose between clamps.	
7.	Fasten the other half of the exhaust hose connector cover to the interface plate with 2x hexagon socket head M10 screws.	
8.	If necessary, adjust the orientation of the sealing guide so that the calibration label on the exhaust hose connector cover is aligned with the slot on the sealing guide. Tighten the 10x hexagon socket head M4 screws to the steel structure frame.	

4.3. Electrical installation

Introduction

The electrical system of the feather duster consists mainly in the process cabinet, the deionization bars and the motor.
The feather duster is controlled by the PLC, so no connection needs to be made with the robot controller.

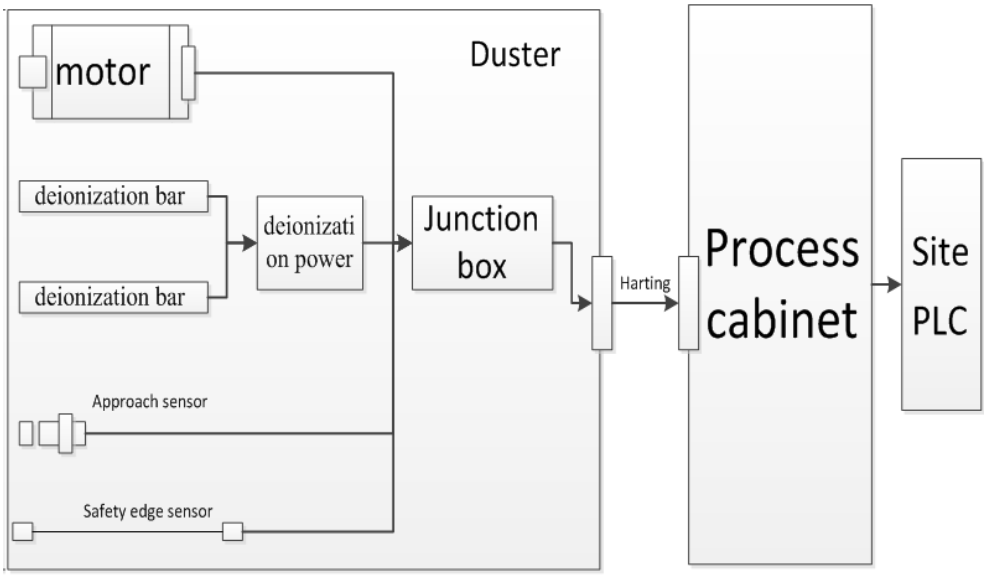


Figure 18: System scheme

Junction box

All the electrical devices connect to the process cabinet through the junction box.
The figure below shows the cable connection details in the junction box.

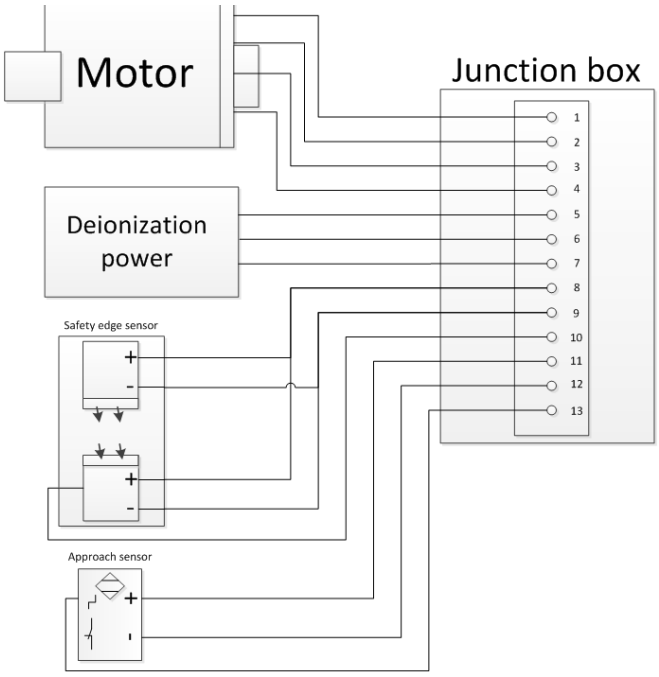


Figure 19: Cable connection in the junction box

A flexible cable connects the junction box to the robot base:

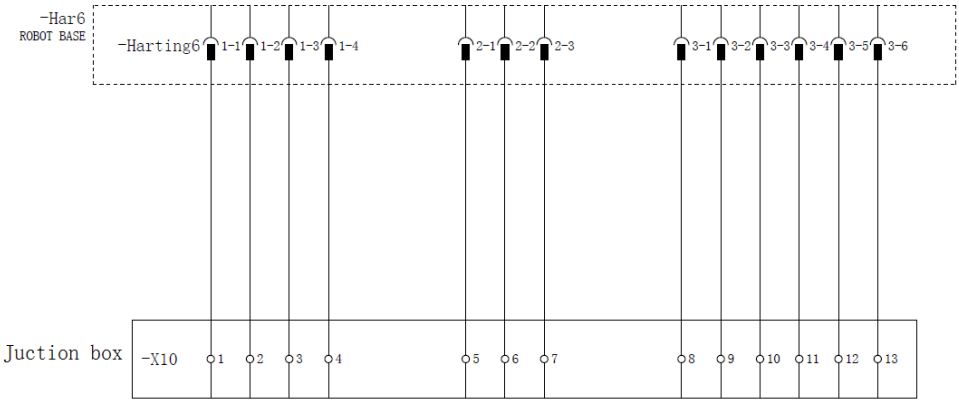


Figure 20: Cable connection between junction box and robot base harting connector

Process cabinet

There are five *Harting* connectors on the process cabinet:

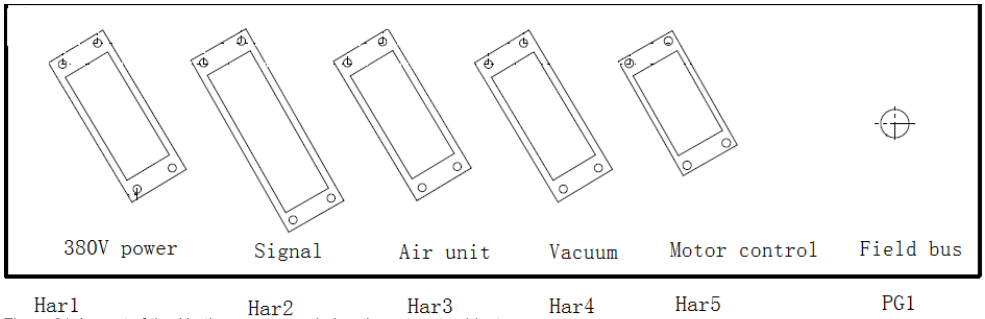


Figure 21: Layout of the *Harting* connectors below the process cabinet

	Pin number	Description
Har1	1-1	Power supply
	1-2	Power supply
	1-3	Power supply
	1-4	N
	1-5	PE
Har2	1-1	High current alarm
	1-2	High current alarm
	1-3	High current alarm
	1-4	High current alarm
	1-5	Safety edge crash signal
	1-6	Safety edge crash signal
	1-7	Safety edge crash signal
	1-8	Safety edge crash signal
	1-9	Rotation speed output
	1-10	Rotation speed output
	1-11	Air pressure alarm
	1-12	Air pressure alarm
	1-13	Alarm from fan
	1-14	Alarm from fan
	1-15	Ionization bar enable
	1-16	Ionization bar enable
	1-17	Compressed air valve opened
	1-18	Compressed air valve opened
Har3	1-1	Compressed air valve open (L)
	1-2	Compressed air valve open (N)
	1-3	Compressed air valve open (E)
	2-1	Pressure switch
	2-2	Pressure switch
	2-3	Pressure switch (PE)
Har4	1-1	VACUUM SWITCH
	1-2	VACUUM SWITCH
Har 5	1-1	Feather duster motor
	1-2	Feather duster motor
	1-3	Feather duster motor
	1-4	Feather duster motor
	2-1	Ionization bar
	2-2	Ionization bar
	2-3	Ionization bar
	3-1	Safety edge sensor
	3-2	Safety edge sensor
	3-3	Safety edge sensor
	3-4	Approach switch
	3-5	Approach switch
	3-6	Approach switch

Transducer for the roller motor

A SEW *Movidrive* MDX61B is used in the process cabinet to control the rotation speed of the roller. Other boards such as field bus, operation panel, are also installed. The field bus type is specific to the project's requirements. One can find installation, operation, and program detail in the SEW documentation. See *References on page 6*.

Power supply

	Power spec. 1	Power spec. 2
Voltage	380 V	480 V
Frequency	50 Hz	60 Hz
Current	16 A	16 A
Connection	*Harting* connector	*Harting* connector

NOTE!

As of today, the standard exhaust fan is only available for 380 V power supply. If another voltage is required, a transformer or a locally purchased exhaust fan will be needed.

Harting connections

	Content	Specification
Har1	Male core	HSB-006-M
	Female core	HSB-006-F
	Top cover	H16B-SE-4B-M25
	Bottom cover	H16B-BK-2L
Har2	Male core	HE-024-M
	Female core	HE-024-F
	Top cover	H24B-SE-4B-M25
	Bottom cover	H24B-BK-2L
Har3	12 core modules	HMD-012-MC
	12 core modules	HMD-012-FC
	Frame	HF6B-UA
	Frame	HF6B-LA
	Top cover	H6B-SE-2B-M20
	Bottom cover	H6B-BK-1L
	M20 conduit connector	WNAM20
Har4	Male core	HE006-M
	Female core	HE006-F
	Top cover	H6B-SE-2B-M20
	Bottom cover	H6B-BK-1L
	M20 conduit connector	WNAM20

4.4 System start-up

4.4.1. Introduction

Introduction

This chapter contains the instructions for setting up the Feather Duster system once the physical installation has been completed, and the robot and robot controller have been started up.

To start the robot system up, refer to the controller and robot documentation. See *References on page 6*.

Safety information

Follow the procedure below when performing the first test run after a service activity (repair, installation or maintenance):

Steps	Action
1.	Remove all service tools and foreign objects from the robot and its working area!
2.	Install all safety equipment properly!
3.	Make sure all personnel are standing at a safe distance from the robot, i.e. out of its reach behind safety fences, etc.!
4.	Pay special attention to the function of the part previously serviced!

Set the robot TCP

The Tool Center Point must be set as shown below:

Steps	Action
1.	Use the FTP software to connect the robot.
2.	Download \HOME\robdata\robdata.sys. Before any modification, back the current file up.
3.	Use the shopfloor editor or UE editor to open the file robdata.sys.
4.	Add one line as below to define the TCP for the feather duster: PERS tooldata Tool_Cleaner: =[TRUE,[[0,0,900],[1,0,0,0]],[125.1,[7.1,3.8,319.5],[1,0,0,0],26.302,12.415,18.623]]; Save the file.
5.	Download the modified file to the controller, replace the previous one.
6.	Warm start the robot.

4.4.2. Start up of the Feather Duster motor

Introduction

The content of this chapter is an adapted extract from the SEW Operating Instructions 16837614-*Movidrive* MDX61B (See *References on page 6*).

Movidrive key pad

The figure below shows the key pad main keys. More details can be found in the SEW documentation.

1	Move up to the next menu item	4	Move down to the next menu item
2	Confirm entry	4	Change the menu, display mode ↔ edit mode.
3	Activate the context menu	6	Cancel or abort startup

Set a language for the *Movidrive*

Set the language for the SEW *Movidrive* following these steps:

Steps	Action
1.	Press the key. A list of languages is displayed on the screen.
2.	Use the / keys to select the required language.
3.	Confirm your selection using the key. The basic display is now shown in your chosen language.

Startup procedure

The instruction below are an extract from the *Movidrive* 6837614-Operating Instructions *Movidrive* MDX61B (*References on page 6*).

Some settings depend on the local power supply type and the motor type (380VAC-50Hz or 480VAC-60 Hz). In case of doubt, refer to the nameplate on the motor or contact ABB.

Steps	Action	Parameters
1.	Activate the context menu by pressing the key	**BASIC VIEW** PARAMETER MODE VARIABLE MODE
2.	Press the key to scroll down to the “STARTUP” menu	MANUAL MODE **STARTUP** COPY TO DBG COPY TO MDX
3.	Press the key to begin the startup procedure. The first parameter appears. The flashing cursor under the parameter number indicates that the keypad is in display mode. • Press the key to change to edit mode. The flashing cursor disappears. • Press the key or key to select “PARAMETER SET 1". • Confirm the setting by pressing the key. • Press the key to return to display mode. The flashing cursor appears again. • Press he key to select the next parameter (C22*MOTORS).	STARTUP PREPARE FOR STARTUP C00*STARTUP **PARAMETER SET 1** PARAMETER SET 2
4.	Select “stand-alone motor”. Press the key to select the next parameter (C26*OPER. MODE 1).	C22*MOTORS **SINGLE MOTOR** IDENT. MOTORS
5.	Select “VFC”. Press the key to select the next parameter (C29*encoder).	C26*OPER. MODE 1 STANDARD V/F **VFC**
6.	Set that no encoder is to be evaluated. Press the key to select the next parameter (C36*OPER.MODE).	C29*encoder **NO** YES
7.	Select “SPEED CONTROL”. Press the key to select the next parameter (C02*MOTOR TYPE1).	C36*OPER.MODE **SPEED CONTROL** HOIST
8.	Select the “DT71D4” motor type. Press the key to select the next parameter (C03* V MOT. RATED VOLT 1).	C02*MOTOR TYPE1 DT71D2 **DT71D4** DT80K2
9.	Enter the rated motor voltage for the selected connection type according to the value specified on the motor nameplate. Press the key to select the next parameter (C04* Hz MOT.RATED FREQ1).	C03* V MOT. RATED VOLT1 400.000

Steps	Action	Parameters
10.	Enter the rated frequency specified on the motor nameplate. Press the ↑ key to select the next parameter.	C04* Hz MOT.RATED FREQ1 50.000
11.	Enter the rated power supply voltage.	C05* V RATED MAINS VLTG 400.000
12.	Set “NO RESPONSE”. Press the ↑ key to select the next parameter.	835* RESP. TF-SIG. **NO RESPONSE** DISPLAY ERROR
13.	Start the calculation for the startup data by choosing “YES”. The process lasts a few seconds.	C06*CALCULATION NO **YES**
14.	The calculation is performed. After calculation, the next menu item appears automatically.	C06*SAVE **NO** YES
15.	Set “SAVE” to “YES” The data (motor parameters) are copied to the non-volatile memory of *Movidrive*.	STARTUP DATA IS BEING COPIED
16.	The startup procedure is now complete. Press the DEL key to return to the context menu.	MANUAL MODE **STARTUP** COPY TO DBG COPY TO MDX
17.	Press the ↓ keys to scroll down to the “QUIT” menu item.	SIGNATURE **QUIT** BASIC VIEW
18.	Confirm the setting by pressing the OK key. The basic display appears.	0.00rpm 0.000Amp CONTROLLER INHIBIT

4.4.2. Start up of the Feather Duster motor

5 Maintenance

5.1. Introduction

General

This chapter details all maintenance activities recommended for the Feather Duster.

It is based on the maintenance schedule, located in the beginning of the chapter. The schedule contains information about required maintenance activities including intervals and refers to procedures for the activities. Each procedure contains all information required to perform the activity, e.g., required tools and materials. The procedures are gathered in different sections, divided according to the maintenance activity.

Safety information

Before any service work is commenced, it is extremely important that all safety information is observed! There are general safety aspects that must be read through, as well as more specific safety information that describe danger and safety risks when performing the procedures. Read *Safety on page 11* before performing any service work.

Precautions

The precautions below should be observed before proceeding with the maintenance of the Feather Duster:

CAUTION!

- Before any intervention on the mechanical and electrical components, all power supplies to the Feather Duster as well as to other machines within the danger zone must be turned off.
- If required, the main switch should be locked.
- Make sure that the pneumatic system is not pressurized.
- Use only original ABB spare parts. The use of unauthorized parts or others than original parts will void the warranty.

Required equipment

Equipment	Note
Standard toolkit	Specified in *Standard toolkit on page 78*.
Other tools and procedures may be required. See references to these procedures in the step-by-step instructions below.	Specified in *Special tools on page 79*.

Bolts and screws and tightening torques

Specified in *Bolt, screws, tightening torques on page 77*.

5.2. Expected components lifetime

General

The expected lifetime of the components can vary greatly depending on how intensively the feather duster is run.

Item	Maintenance
Cables	1,000,000 cycles
Belt	Over 16,000h
Roller	Over 6 month
Motor	Over 10 years

5.3. Maintenance planning

General

The feather duster must be maintained regularly to ensure proper function. The maintenance activities and intervals are specified in the table below.

Non-predictable situations may also give rise to inspections of the feather duster. Any damage must be attended immediately!

Time interval	Maintenance	More info.
Daily	Check for faults	
	Check for loose or damaged feathers	
	Check for machine damage	
Weekly	Clean the unit	*Weekly cleaning and inspection on page 66*
	Clean and adjust ion bars	
	Check ionizing bars correct operation	
	Check cables and flexible hoses for wear	
	Check that all pneumatic connections are secure	
Ever 2500h	Check the belt tension	
	Check the bearing guides and bearings	
Every 6 months	Replace the feather roller	*Feather roller care and replacement on page 67*
Annually	Verify that all fasteners, bolts and nuts are tight	
Every 16000h	Replace the timing belt	*Belt replacement on page 71*

5.4 Maintenance activities

5.4.1. Weekly cleaning and inspection

General

It is recommended to clean and inspect the Feather Duster every week.

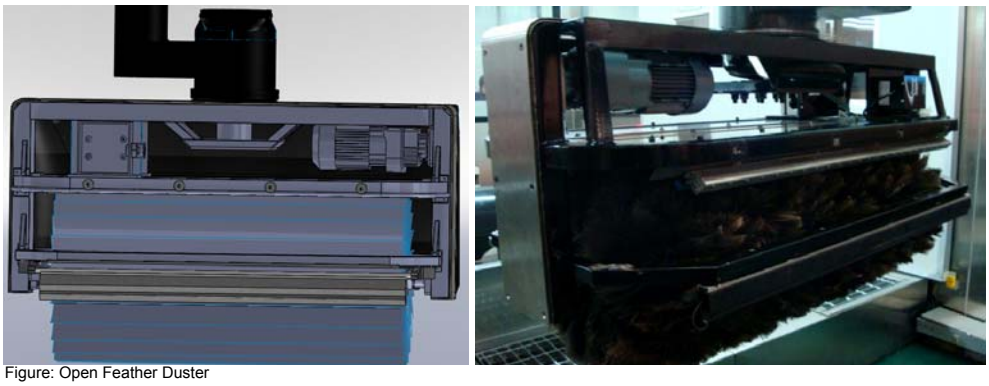


Figure: Open Feather Duster

Cleaning

Remove the 2 side carbon fiber covers and use a brush to clean the vacuum, the motor, the hood, the ionization bars and the support frame. Alcohol may be used but with care: Strong alcohol such as acetone, etc. should be avoided. A high pressure cleaning device may be used, but spraying directly on the Feather Duster robot should be avoided.
Ensure that the ionization bars are properly aligned.

Inspection

- Check for oil leaks.
- Check for excessive play in gears.
- Check that cables and hoses between control cabinet, robot and feather duster are not damaged.

5.4.2. Feather roller care and replacement

General

The feather roller wears normally. It is necessary to replace it every six month.

Location

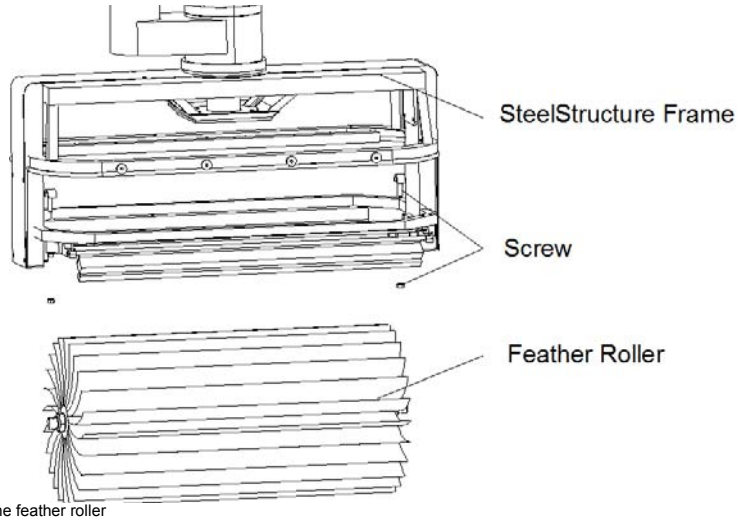


Figure: Location of the feather roller

Feather Roller Care

Ostrich feathers contain millions of tiny hairs on each of their threads. These hairs are what grabs on to the dirt and removes it from the surface. The feather hairs can be lost through wear, sharp edges and aging. The roller is no longer effective and should be replaced when no more hairs can be seen at the feathers tips.

Feather in good condition	Worn feather - replace soon	Destroyed feather - replace

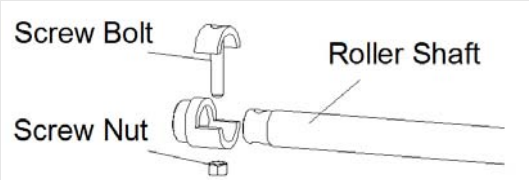
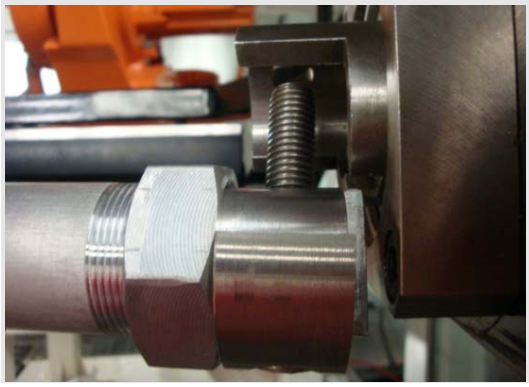
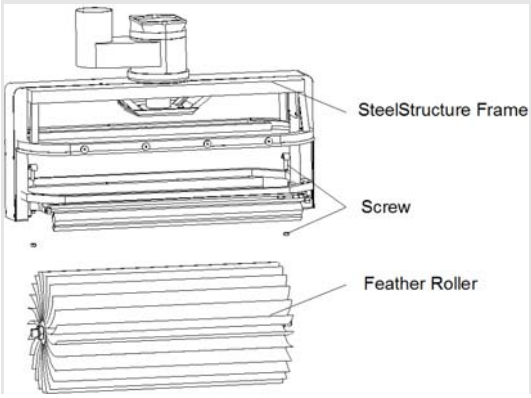
CAUTION!

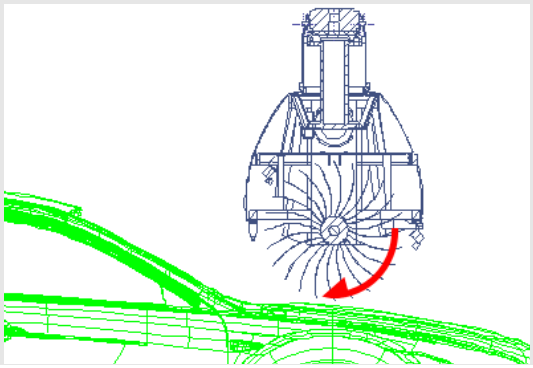
When replacing feather roller, care must be taken to ensure that the feathers are not damaged or contaminated.

- Wash hands before installing feathers. Keep all grease and oil away from feathers
- Keep the feather roller in its package until it is ready to be installed on the machine
- Reseal packages if they have been opened for inspection
- Do not allow feathers to rest on the floor. If possible, use the ABB feather roller support 3HAW050024260 (See *Special tools on page 79*)

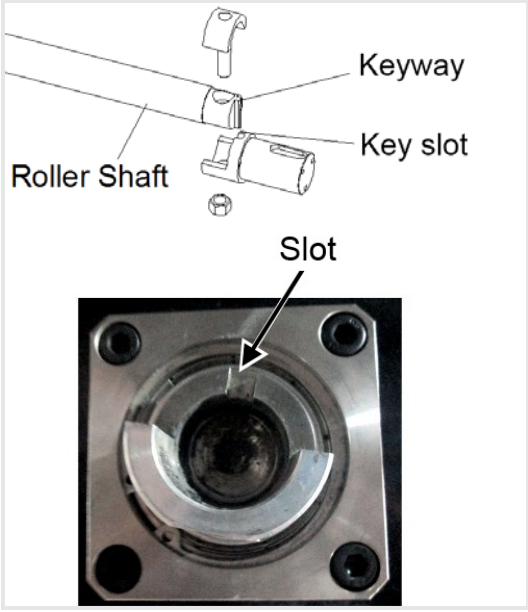
5.4.2. Feather roller care and replacement

Replacement procedure

Steps	Action	Info/Illustration
1.	Loosen the nuts on both ends of the roller shaft.	
2.	Extract the screw bolts. Proceed on both sides simultaneously.	
3.	Remove the roller shaft from the mechanical unit. If available, place it on the ABB feather roller support 3HAW050024260 (See *Special tools on page 79*).	
4.	Remove one locknut at the shaft's end and remove the feather disks.	

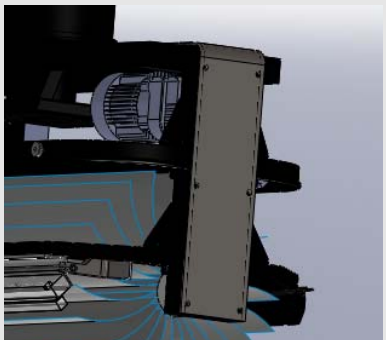
Steps	Action	Info/Illustration
5.	Stack 20 feather disks on the shaft. Pay attention to the orientation of the disks (See *Correct feather rotation* in *Introduction on page 44*).	  
6.	Tighten the locknut previously removed at the shaft's end	

5.4.2. Feather roller care and replacement

Steps	Action	Info/Illustration
7.	Fasten the shaft back into the frame. Pay attention the shaft orientation: the end with a keyway must but put in the matching slotted hub.	

5.4.3. Belt replacement

Procedure

Steps	Action	Info/Illustration
1.	Remove the two carbon fiber covers.	
2.	Remove the tunnel cover on the motor side.	
3.	Loosen the 4 nuts of the motor fixing flange to release the belt tension. Remove the belt.	
4.	Install the new belt, and adjust the tension by moving the motor up or down. The distance between the belt when you pinch it should be around 50-55mm. When the tension is satisfying, tighten the 4 nuts.	
5.	Re-assemble the tunnel cover and the carbon fiber covers.	

5.4.4. Motor replacement

Location

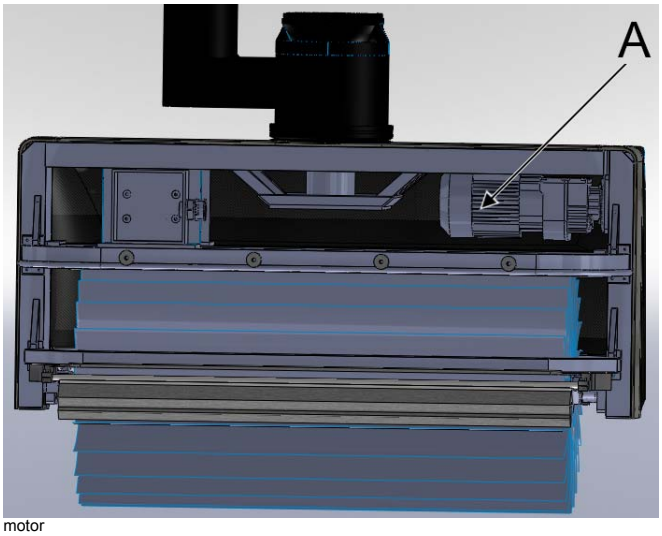
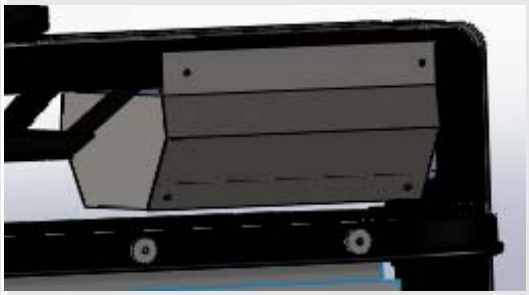
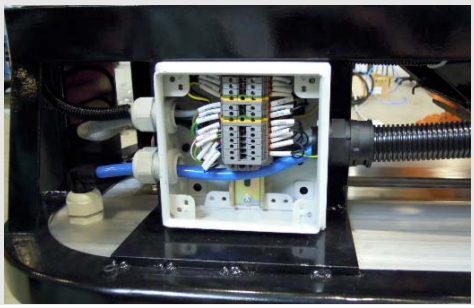
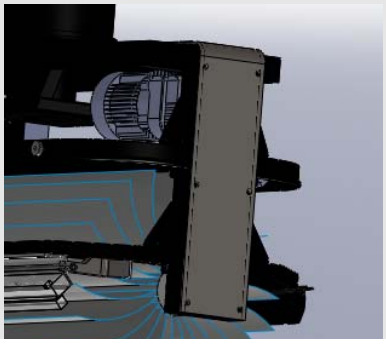
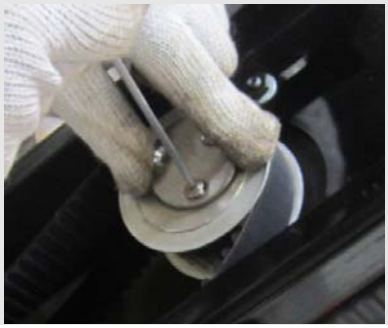


Figure: Location of the motor

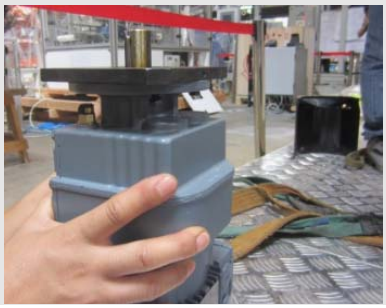
A	Motor

Procedure

Steps	Action	Info/Illustration
1.	Remove the two carbon fiber covers.	
2.	Remove the motor cover.	

Steps	Action	Info/Illustration
3.	Open the junction box and disconnect the cables. See *Electrical installation on page 54*.	
4.	Remove the tunnel cover on the motor side.	
5.	Loosen the 4 nuts of the motor fixing flange to release the belt tension. Remove the belt, the shaft end cover, and the pulley.	
6.	Remove the key on the motor shaft and remove the shaft spacer.	
7.	Remove the 4 nuts on the motor fixture flange, and remove the motor.	

5.4.4. Motor replacement

Steps	Action	Info/Illustration
8.	Remove the motor flange.	
9.	Install the flange on the new motor, and fasten the 4 screws. Mount the top shaft spacer on the motor axis.	
10.	Install the motor on the support frame, and pre-tighten the 4 screws. Install the shaft spacer, the pulley and the shaft end cover.	
11.	Install the belt and adjust the belt tension (See *Belt replacement on page 71*). Connect the cable in the junction box (See *Electrical installation on page 54*).	
12.	Re-assemble the tunnel cover, the motor cover and the carbon fiber covers.	

6 Reference information

6.1. Introduction

General

This chapter includes general information, complementing the more specific information in the different procedures in the manual.

6.2. Unit conversion

Converter table

Use the following table to convert units used in this manual.

Quantity	Unit		
Length	1 m	3.28 ft	39.37 in
Weight	1 kg	2.21 lb	
Pressure	1 bar	100 kPa	14.5 psi
Force	1 N	0.738 lbf	
Moment	1 N.m	0.738 lbf-tn	
Volume	1 L	0.264 US gal	

6.3. Bolt, screws, tightening torques

Bolt and screws

Before tightening any screw, observe the following:

- Determine whether a **standard** tightening torque or **special** torque is to be applied. The **standard torques** are specified in the following tables. Any **special torques** are specified in the repair, maintenance or installation procedure descriptions. **Any special torque specified overrides the standard torque!**
- Use the *correct tightening torque* for each type of screw joint.
- Only use *correctly calibrated* torque keys.
- Always *tighten the joint by hand*, and never use pneumatic tools.
- Use the *correct tightening technique*, tighten the screw in a slow, flowing motion.
- Maximum allowed total deviation from the specified value is **10%**!

NOTE!

Unless indicated otherwise, the bolts used on (or provided with) the Feather Duster are of class 8.8.

NOTE!

Unless indicated otherwise, all bolts must be clean of oil or grease and tightened with a mild thread-locker such as Loctite 243.

Standard tightening torques

The following table specifies the recommended standard tightening torques for *hex screws* and *socket head hex screws*:

Screw thread size	M5	M6	M8	M10	M12
Tightening torque CLASS 8.8	5.5 N.m	9.5 N.m	23 N.m	46 N.m	79 N.m
Tightening torque CLASS 10.9	8.1 N.m	14 N.m	34 N.m	67 N.m	116 N.m
Tightening torque CLASS 12.9	9.5 N.m	16.4 N.m	40 N.m	79 N.m	136 N.m

The following table specifies the recommended standard tightening torque for *water and air connectors* when one or both connectors are made of brass:

Dimension	Tightening torque Nm - Nominal	Tightening torque Nm - Minimal	Tightening torque Nm - Maximum
1/8	12 N.m	8 N.m	15 N.m
1/4	15 N.m	10 N.m	20 N.m
3/8	20 N.m	15 N.m	25 N.m
1/2	40 N.m	30 N.m	50 N.m
3/4	70 N.m	55 N.m	90 N.m

6.4. Standard toolkit

General

All service (repairs, maintenance and installation) procedures contain lists of tools required to perform the specified activity.

All special tools required are listed directly in the procedures while all the tools that are considered standard are gathered in the standard toolkit and defined in the table below.

This way, the tools required are the sum of the standard toolkit and any tools listed in the instruction.

Contents, standard toolkit

Qty	Tool
1	Set of spanners or ring-open-end spanner 8-22 mm
1	Hex keys (*Allen* key) 3, 4, 5, and 6 mm
1	Torque wrench
1	Ratchet head for torque wrench 1/4”
1	Socket head cap 3mm, 4mm, 5mm, 6mm, 8mm and 10mm socket 1/4” bit L 20 MM (for socket head cap screws - ISO 4762)
1	Mild thread-locker (Recommended: Loctite 243)
1	Small flat tip screwdriver
1	Small cross tip screwdriver
1	Plastic mallet
1	Ladder 2.5m
1	Ruler
1	Brush

6.5. Special tools

General

All service instructions contain lists of tools required to perform the specified activity. The required tools are a sum of standard tools, defined in the section *Standard toolkit on page 78*, and of special tools, listed directly in the instructions and also gathered in this section.

Special tools

The following table specifies the special tools required during several of the service procedures. The tools are also specified directly in concerned instructions in the Product manual.

For operations on pneumatic connectors:		
Qty	**Tool**	**Product**
1	Thread sealant for conical fittings	Loctite 577
For operations on electrical parts:		
Qty	**Tool**	**Product**
1	Multimeter	
1	Wire strippers	
1	Cable cutters	

Special tools available from ABB

The following table specifies the special tools required during several of the service procedures. The tools may be ordered separately and are also specified directly in concerned instructions in the Product manual.

Qty	Tool	ABB Article no.
1	Feather roller support	3HAW050024260

Figure: Feather roller support

6.5. Special tools

7 Spare parts

7.1. Introduction

General

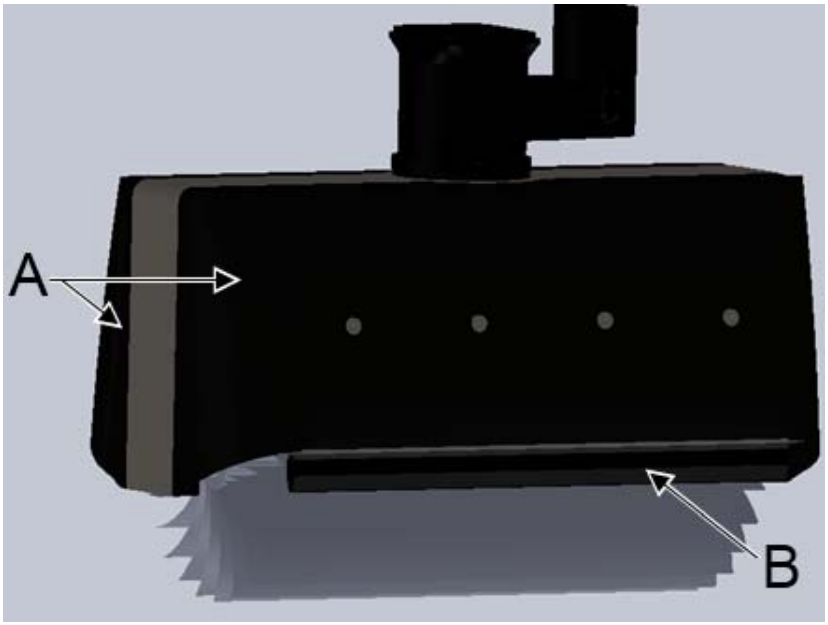
This chapter specifies all spare parts and replacement articles of the Feather Duster. It is divided in 2 sections:

- Mechanical spare parts
- Electrical parts and cables

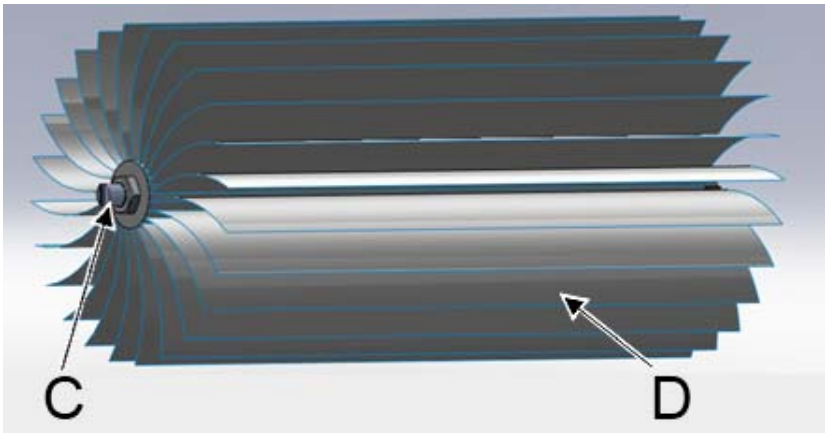
Some parts are available in several types, depending on the Feather Duster configuration. If you do not know what type of material is required for your Feather Duster, contact ABB.

7.2. Mechanical spare parts

List of spare parts

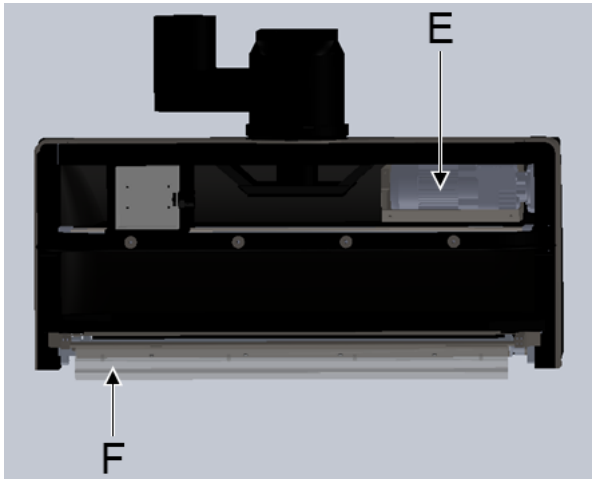


Item	Qty	ABB part no.	Description	Note
A	2	3HAW050024263	Carbon fiber covers	Symetrical part - 2 covers per Feather Duster
B	1	3HAW050024318	Safe edge sensor	

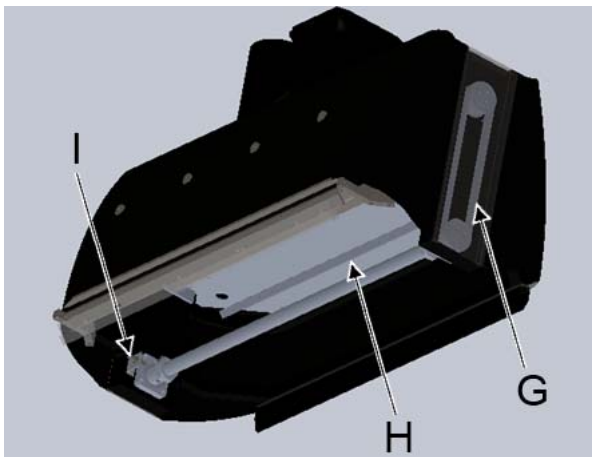


Item	Qty	ABB part no.	Description	Note
C	1	3HAW050024255	Shaft assembly	The shaft assembly includes the roller shaft 3HAW050024258, the pulley 3HAW050024229, the bearing 3HAW050024218, and other accessories.
-	1	3HAW050024258	Roller shaft	

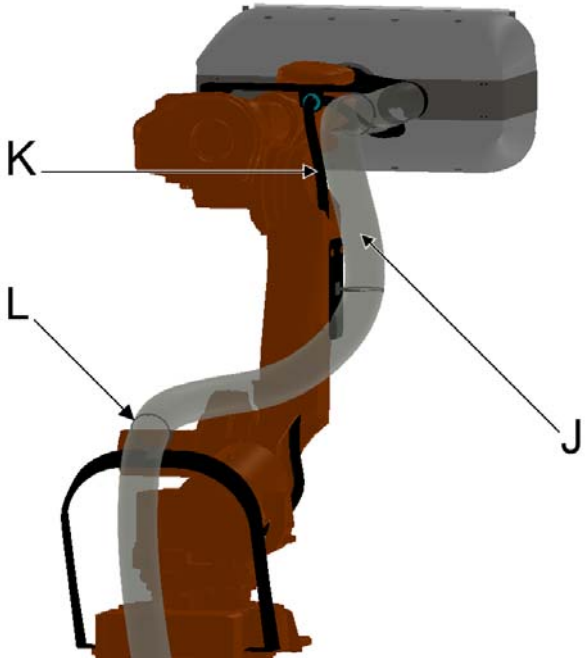
Item	Qty	ABB part no.	Description	Note
D	20	3HAW050024273	Feather Brush	To form a complete brush, 20 pieces are stacked on the shaft
-	2	3HAW050024230	Shaft bearing with housing	



Item	Qty	ABB part no.	Description	Note
E	1	3HAW050024220	Motor and gear (380VAC-50Hz)	The motor 3HAW050024221 is to be used only if the mains power supply type is 480VAC-60Hz and if the process cabinet is not equipped with a transfomer 3HAC037015-001. If the mains power supply type is 380VAC-50Hz or if the process cabinet is equipped with a transformer 3HAC037015-001, the motor 3HAW050024220 is to be used.
		3HAW050024221	Motor and gear (480VAC-60Hz)	
F	1	3HAW050024243	Air knife	



Item	Qty	ABB part no.	Description	Note
G	1	3HAW050024222	Timing belt	
-	2	3HAW050024229	Pulley	
H	1	3HAW050024233	Ionizing bar	
I	1	3HAW050024314	Approach switch	



Item	Qty	ABB part no.	Description	Note
J	1	3HAW050024238-010	Exhaust hose 10m	
K	1	3HAW050024207-004	Outer protection flexible conduit Ø 36mm	Used from robot base to wrist (Feather Duster Dresspack)
-	1	3HAW050024240-001	Inner protection flexible conduit Ø 29mm	Used from the robot wrist to the electrical junction box in the Feather Duster.
L	3	3HAW050024236	Exhaust pipe support	

7.3. Electrical spare parts

List of spare parts

Item	Quantity	ABB part reference no.	Note
-	1	3HAW050024312	Safety edge sensor relay
-	1	3HAW050024313	General relay
-	1	3HAW050024317	Safe edge controller
-	1	3HAW050024325	Brake resistor
-	1	3HAW050024294-010	Control cable (from process cabinet to robot base) - 10m
-	1	3HAW050024294-015	Control cable (from process cabinet to robot base) - 15m
-	1	3HAW050024279	Flexible control harness (from robot base to junction box)

8 Appendix

8.1. Assembly drawings

List

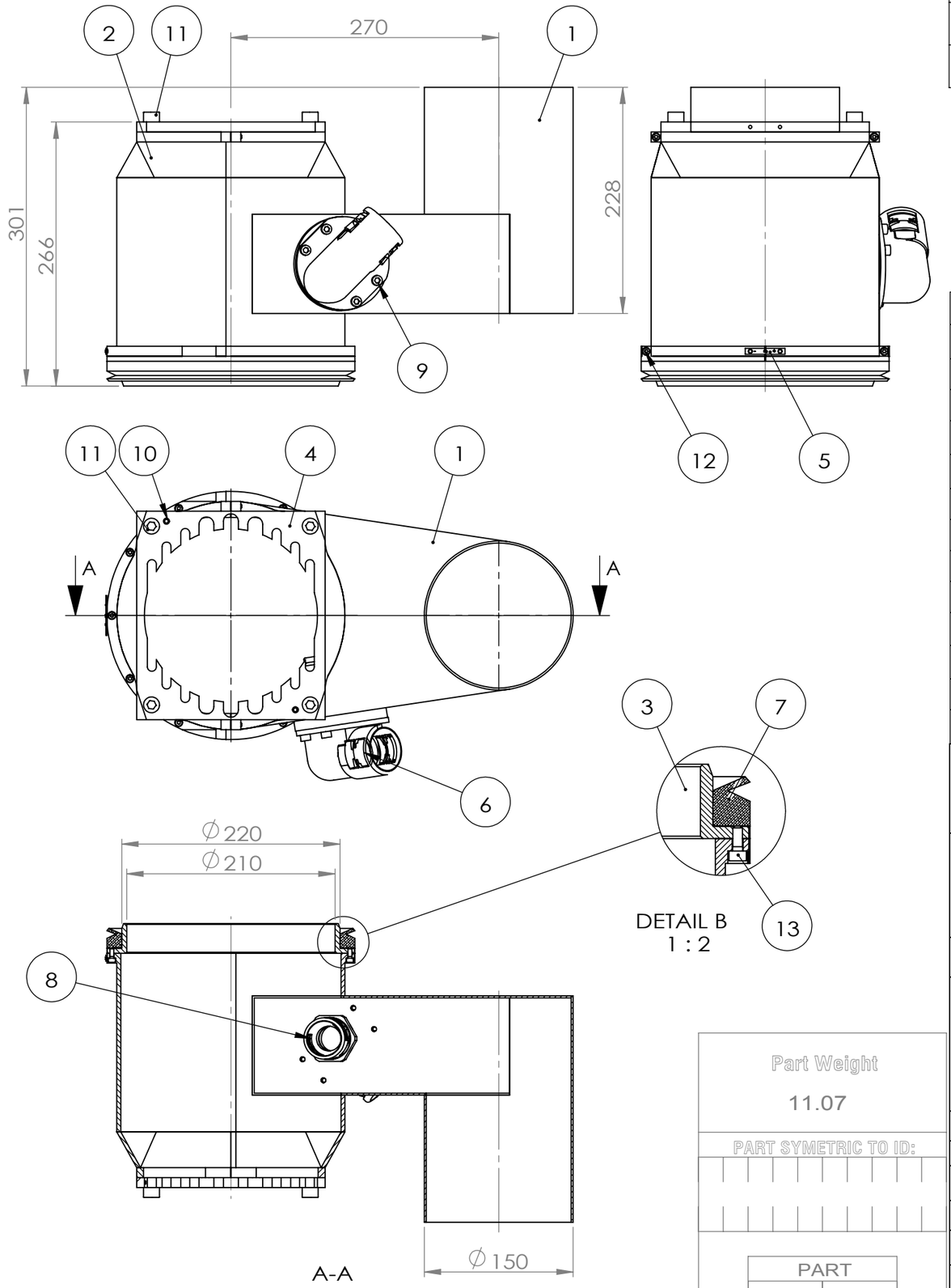
This section contains following drawings:

- Exhaust manifold assembly
- Shaft assembly
- Tack off
- IRB 6640 Feather duster dresspack - left
- IRB 6640 Feather duster dresspack - right
- IRB 6700 Feather duster dresspack - left

8.2. Wiring diagrams

List

- 3HAW050024286: EMU process cabinet
- 3HAW050024294: Ground control cable
- 3HAW050024279: Flexible control harness



Date	Name	Modifications/ Revisions	Repere Item NO.	Indice Update
2014/1/21	Jin Yonglong	Cable connector changed; exhaust manifold divided into two parts.	a	A
05-26-2015	King Jin	Sub-parts revised.	b	B

Item	PartNo	Description	Mat.	Qty.	Remarks
13		Socket cap screw M4x10, EN 4762		10	
12		Socket cap screw M4x16, EN 4762		4	
11		Socket cap screw M10x12, DIN 912		4	
10		PIN 6x20, DIN7979		2	
9		Socket cap screw M6x12, DIN 912		4	
8	3HAW050024357	Straight Connector, PMGOB-29M32Z		1	
7	3HAW050024389	Sealing rubber, VA-220		1	
6	3HAW050024388	90 Degree Elbow Flange PAFOB-36		1	
5	3HAW050024390	Lable	304	1	
4	3HAW050024386	Joint plate 185	Q235A	1	
3	3HAW050024385	Sealing guide	Q235A	1	
2	3HAW050024384	Exhaust Manifold	Q235A	1	
1	3HAW050024356	Exhaust Manifold	Q235A	1	

Part Weight
11.07

PART SYMETRIC TO ID:

PART	
FIXED	MOBILE

Scale: 1:5 (1 cm)

Designation: Part, sub-assembly or Assembly

FEATHER DUSTER

Exhaust manifold assembly

Material:

Threatment:

Brut:

Date: 5/26/2015 | Par: F LEGELEUX | Plant: CNAUS | Dpt: R & D | VISA:

Engineering by:

Jin Yonglong

ABB Engineering Ltd

ABB
Engineering Ltd
No5, Lane 369
Chuangye Rd, Kangqiao
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Shanghai, PRC
tel: +86 2161298980
fax: +86 2161056905

Conception	Copie	Archivage	Format
Manuelle CAO-DAO	Scanner MicroFilm		A3

B

Other ID: W

Vehicle:

Pour Usine:

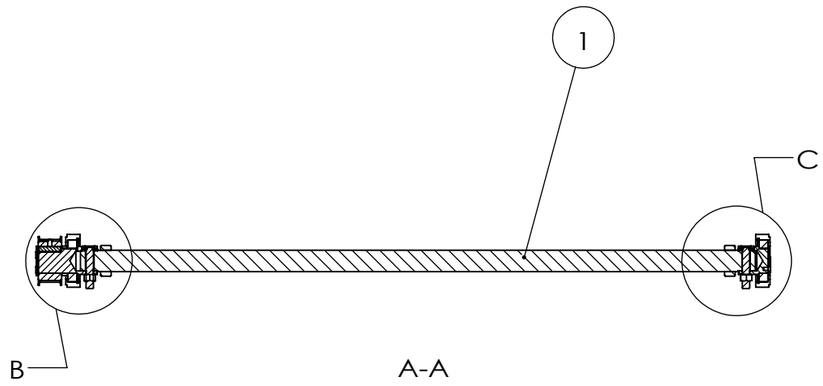
Inventaires	Matricules

Classement Archives:

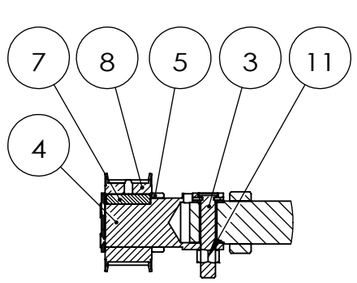
Drawing ID: 3HAW050024252

Sheet: 1/1

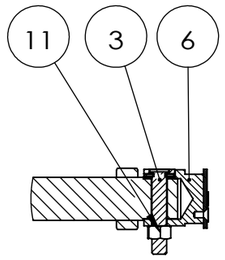
Date	Name	Modifications/ Revisions	Repere Item NO.	Indice Update
08/05/2014	Yonglong Jin	Exploded view added on sheet 2.		A
08/14/2014	Yonglong Jin	3HAW050024273 - Feather Brush removed.		B
01/05/2015	King Jin	Sub-parts revised.		C
05-26-2015	King Jin	Sub-part revised.		D



A-A



DETAIL B
1 : 5



DETAIL C
1 : 5

11		Hex nut M12, DIN 934		2	
10		Socket flat screw M5x12, DIN7991		6	
9	3HAW050024230	Bearing housing		2	
8	3HAW050024229	High Torque Timing Pulley		1	
7	3HAW050024227	Key	304	1	
6	3HAW050024228	Fix connected axi	304	1	
5	3HAW050024226	Located ring	304	1	
4	3HAW050024224	Connected shaft	304	1	
3	3HAW050024219	Pipe frame_1ST axi	304	2	
2	3HAW050024218	Bearing bottom	304	2	
1	3HAW050024258	Roller shaft	2A16	1	
Item	PartNo	Description	Mat.	Qty.	Remarks

Part Weight
5.23

PART SYMETRIC TO ID:

PART	
FIXED	MOBILE

Scale: 1:10 (1 cm)

Designation: Part, sub-assembly or Assembly

Feather Duster Shaft assembly

-

Material:

Threatment:

Brut:

Date: 5/27/2015 | Par: F LEGELEUX | Plant: CNAUS | Dpt: R & D | VISA:

Engineering by:

Jin Yonglong

ABB Engineering Ltd

ABB
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No5, Lane 369
Chuangye Rd, Kangqiao
201319 Nanhui District
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tel: +86 2161298980
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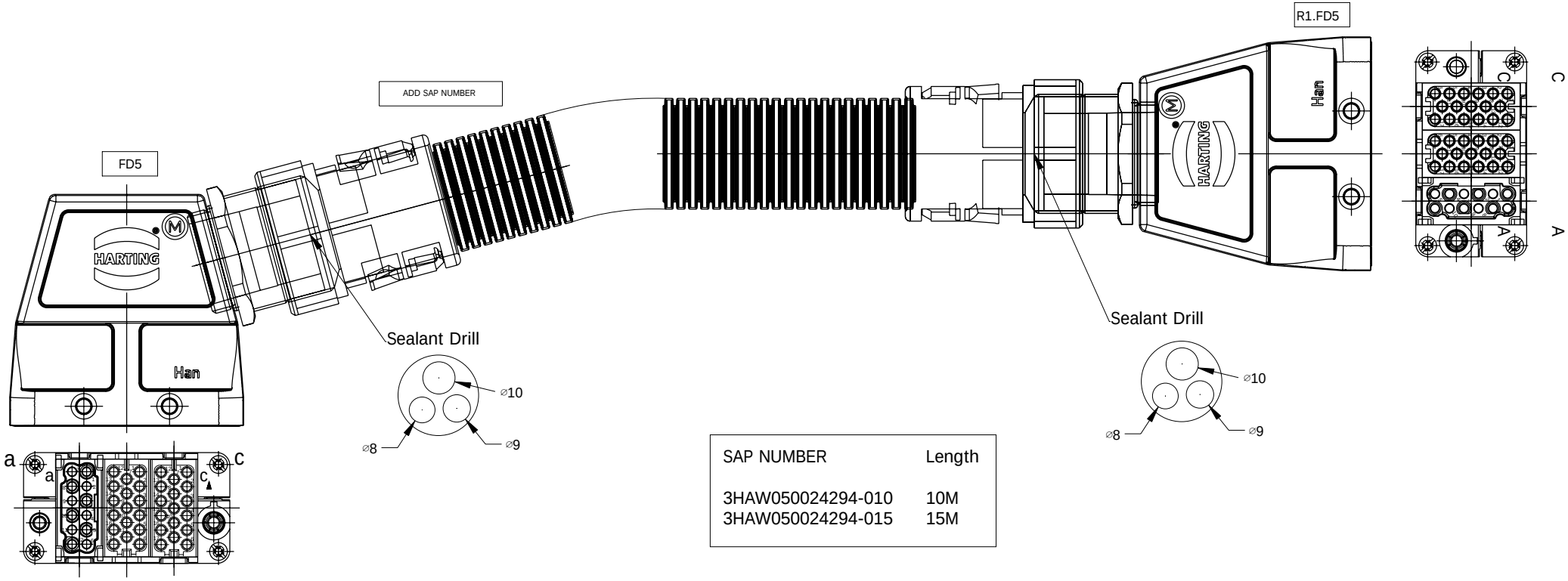
C				Other ID	W	Vehicle:
Conception	Copie	Archivage	Format			
Manuelle CAO-DAO	Scanner MicroFilm		A3			
Pour Usine:				Classement Archives		Sheet: 1/2
Inventaires		Matricules				
				Drawing ID	3HAW050024255	

Project Discription	Feather Duster FD5 Harness Cabinet to Robot Base
Document Number	3HAW050024294-XXX
Revision	004

Number of pages 10

		Feather Duster FD5 Harness Cabinet to Robot Base		Title page / cover sheet	Status: Approved 2012/6/1	=	
Respsonsible Department: RS / BIW						+	
Prepare by, Date N,Cao 2014/4/24	Approve by,Date 2012/6/1	Replacement of	Replaced by		Document no. 3HAW050024294-XXX	Rev.Ind 004	Page 0 / Total Page 10

Supplementary Document	Doc Type	Document	Description
Technical Provisions	TP	3HAB8053-1	Barcodes

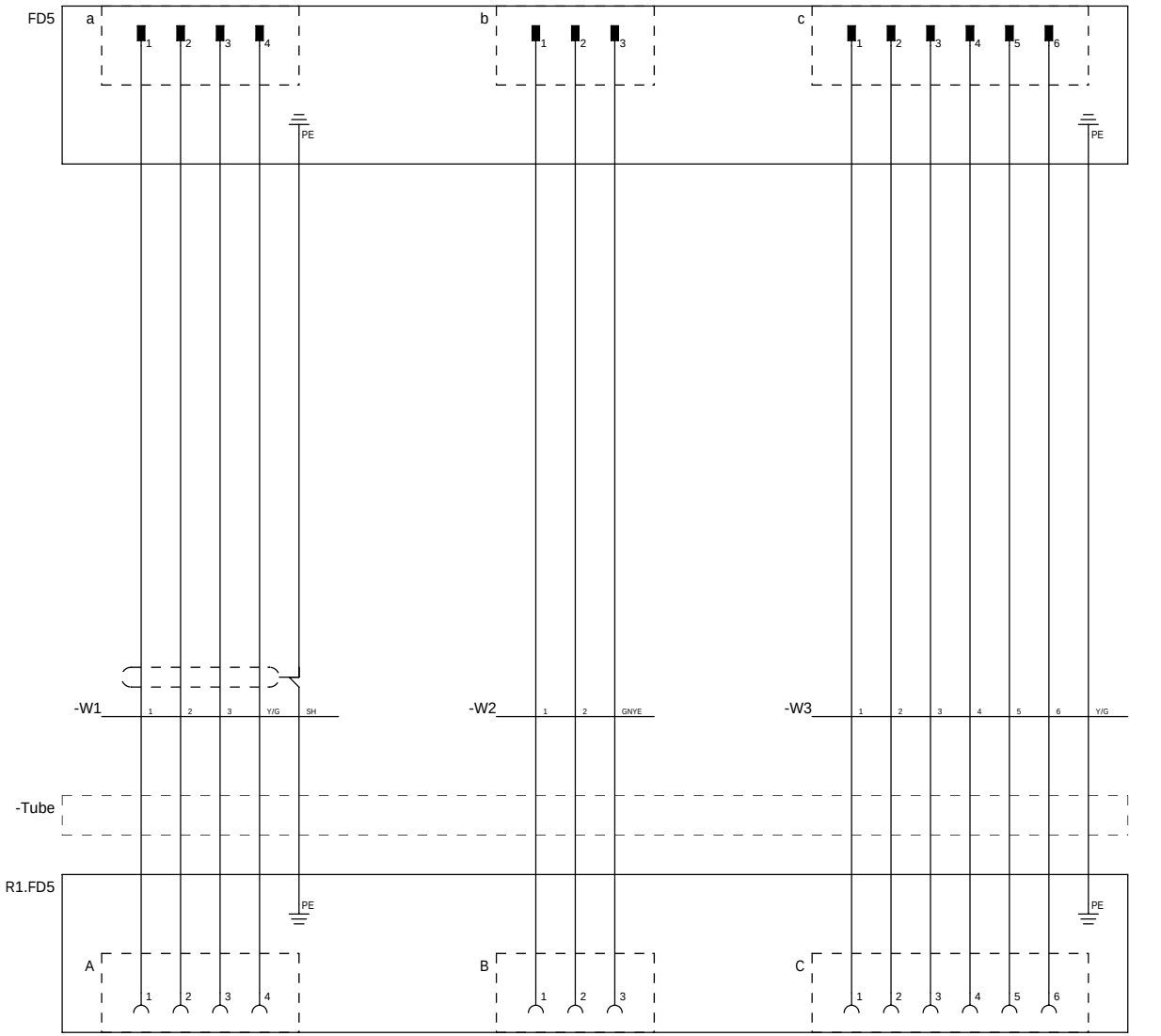


SAP NUMBER	Length
3HAW050024294-010	10M
3HAW050024294-015	15M

1 3

	Feather Duster FD5 Harness Cabinet to Robot Base		Layout	Status: Approved 2012/6/1	= +
Respsonsible Department: RS / BIW				Document no. 3HAW050024294-XXX	Rev.Ind 004
Prepare by, Date N,Cao 2014/4/24	Approve by,Date 2012/6/1	Replacement of	Replaced by		Page 2 / Total Page 10

Cabinet Connector



Feature Motor

Ionization bar

Anti-collision

Rotation speed switch

Robot Base

		Feather Duster FD5 Harness Cabinet to Robot Base		Connection	Status: Approved 2012/6/1
Respsonsible Department: RS / BIW					Document no. 3HAW050024294-XXX
Prepare by, Date N,Cao 2014/4/24	Approve by,Date 2012/6/1	Replacement of	Replaced by		Rev.Ind 004

Cable diagram

F09_002_ABB

Cable name =+-W1			cable type Igus:CF140.15.04.UL					
function text			no. of conductors 4G			cross-section 1.5		Length
function text	Page / column	Target designation from	Connection point	conductor	Target designation to	Connection point	Page / column	function text
	/3.1	-FD5-a	1	1	-R1.FD5-A	1	/3.1	
	/3.1	-FD5-a	2	2	-R1.FD5-A	2	/3.1	
	/3.1	-FD5-a	3	3	-R1.FD5-A	3	/3.1	
	/3.2	-FD5	PE	SH	-R1.FD5	PE	/3.2	
	/3.2	-FD5-a	4	Y/G	-R1.FD5-A	4	/3.2	

Cable diagram

F09_002_ABB

Cable name =+-W2			cable type Igus:CF130.15.04.UL					
function text			no. of conductors 4G			cross-section 1.5		Length
function text	Page / column	Target designation from	Connection point	conductor	Target designation to	Connection point	Page / column	function text
	/3.3	-FD5-b	1	1	-R1.FD5-B	1	/3.3	
	/3.3	-FD5-b	2	2	-R1.FD5-B	2	/3.3	
	/3.3	-FD5-b	3	GNYE	-R1.FD5-B	3	/3.3	

Cable diagram

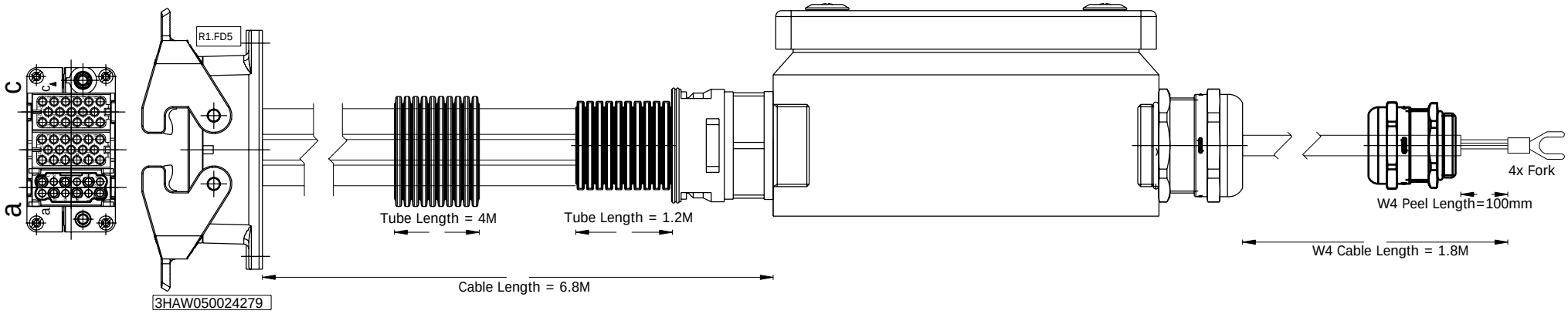
F09_002_ABB

Cable name =+-W3			cable type Igus:CF130.07.07.UL					
function text			no. of conductors 7G			cross-section 0.75		Length
function text	Page / column	Target designation from	Connection point	conductor	Target designation to	Connection point	Page / column	function text
	/3.4	-FD5-c	1	1	-R1.FD5-C	1	/3.4	
	/3.5	-FD5-c	2	2	-R1.FD5-C	2	/3.5	
	/3.5	-FD5-c	3	3	-R1.FD5-C	3	/3.5	
	/3.5	-FD5-c	4	4	-R1.FD5-C	4	/3.5	
	/3.5	-FD5-c	5	5	-R1.FD5-C	5	/3.5	
	/3.5	-FD5-c	6	6	-R1.FD5-C	6	/3.5	
	/3.6	-FD5	PE	Y/G	-R1.FD5	PE	/3.6	

Project Discription	Feather Duster FD5 Harness Robot Base to Arm
Document Number	3HAW050024279
Revision	006

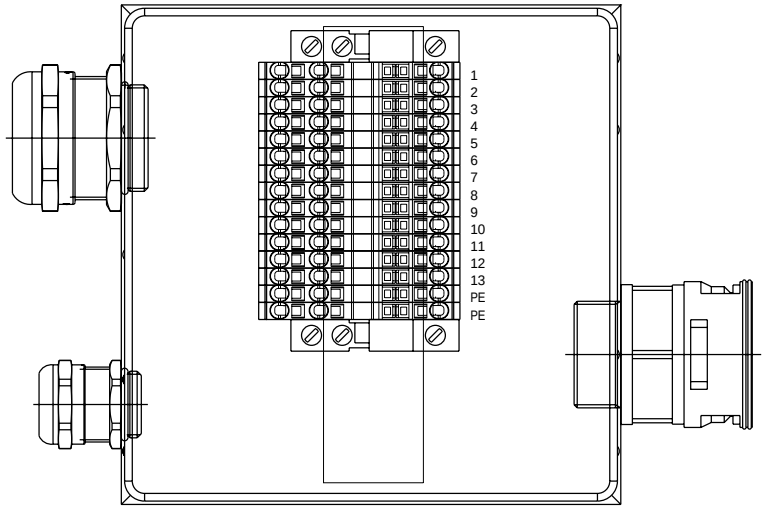
Number of pages 14

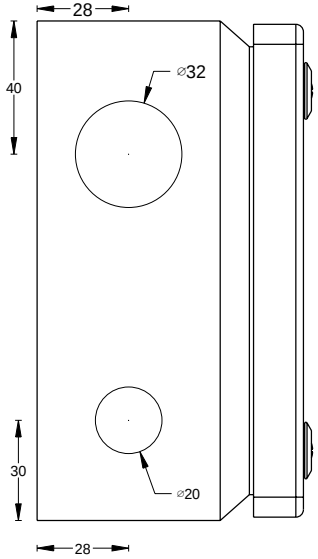
Supplementary Document	Doc Type	Document	Description
Technical Provisions	TP	3HAB8053-1	Barcodes

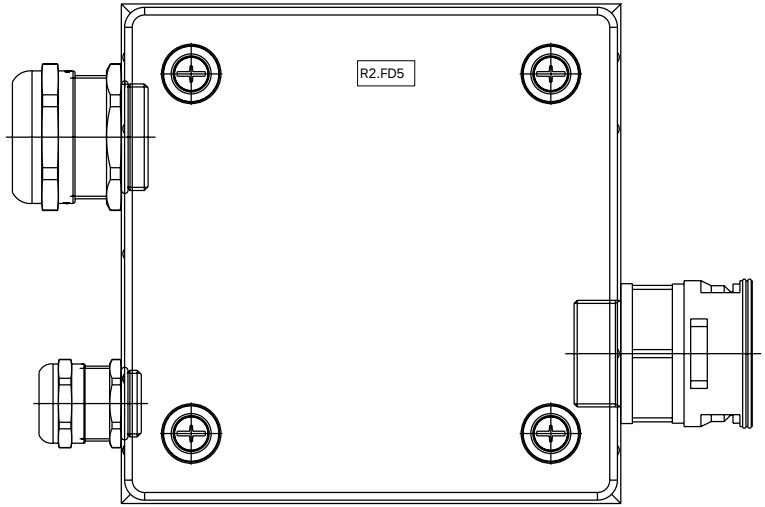


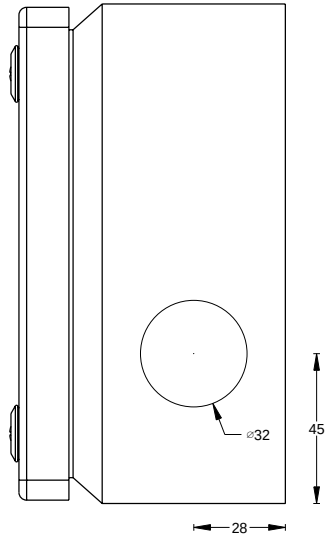
	Feather Duster FD5 Harness Robot Base to Arm		Layout Harness	Status: Approved	=
Respsonsible Department: RS / BIW				Document no. 3HAW050024279	Rev.Ind 006
Prepare by, Date N,Cao 2014/6/16	Approve by,Date	Replacement of	Replaced by		Page 2.a / Total Page 14

Supplementary Document	Doc Type	Document	Description
Technical Provisions	TP	3HAB8053-1	Barcodes

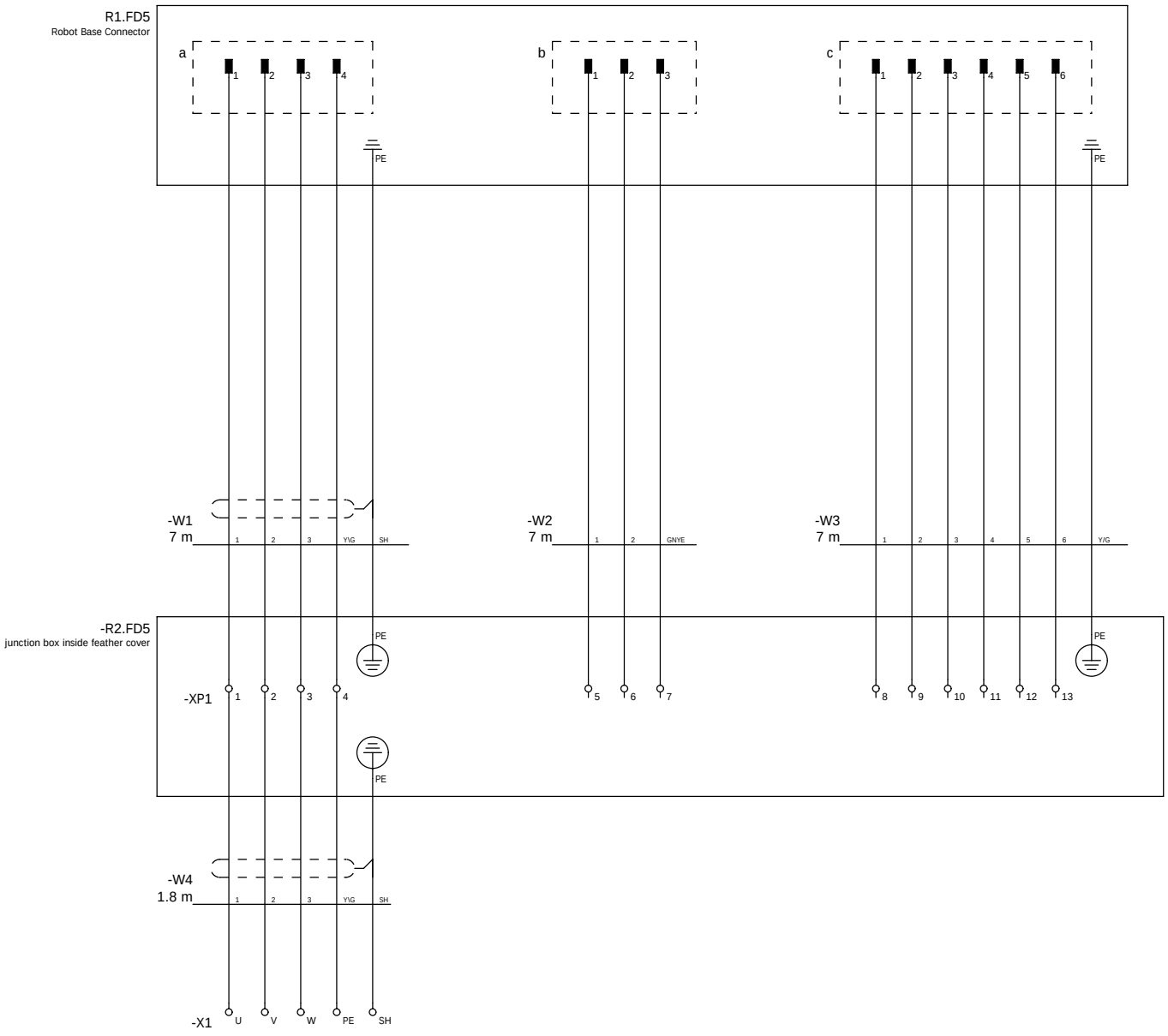








Respsonsible Department: RS / BIW	Feather Duster FD5 Harness Robot Base to Arm	Layout Box	Status: Approved
Prepare by, Date N,Cao 2014/6/16	Approve by,Date	Replacement of	Replaced by
Document no. 3HAW050024279	Rev.Ind 006	Page 2.b	Total Page 14



Feature Duster Motor

Ionization bar

Anticollision Sensor

Rotation speed Sensor

2.b

4

	Feather Duster FD5 Harness Robot Base to Arm		Connection	Status: Approved	=
Respsonsible Department: RS / BIW				Document no. 3HAW050024279	Rev.Ind 006
Prepare by, Date N,Cao 2014/6/16	Approve by,Date	Replacement of	Replaced by		Page 3 / Total Page 14

Cable diagram

F09_002_ABB

Cable name =+-W1			cable type Igus:CF140.15.04.UL					
function text			no. of conductors 4G			cross-section 1.5		Length 7
function text	Page / column	Target designation from	Connection point	conductor	Target designation to	Connection point	Page / column	function text
	/3.1	-R1.FD5-a	1	1	-R2.FD5-XP1	1	/3.1	
	/3.1	-R1.FD5-a	2	2	-R2.FD5-XP1	2	/3.1	
	/3.1	-R1.FD5-a	3	3	-R2.FD5-XP1	3	/3.1	
	/3.2	-R1.FD5	PE	SH		SH	/3.2	
	/3.2		SH	SH	-R2.FD5	PE	/3.2	
	/3.2	-R1.FD5	PE	SH	-R2.FD5	PE	/3.2	
	/3.1	-R1.FD5-a	4	Y\G	-R2.FD5-XP1	4	/3.1	

Cable diagram

F09_002_ABB

Cable name =+-W2			cable type Igus:CF130.15.04.UL					
function text			no. of conductors 4G			cross-section 1.5		Length 7
function text	Page / column	Target designation from	Connection point	conductor	Target designation to	Connection point	Page / column	function text
	/3.3	-R1.FD5-b	1	1	-R2.FD5-XP1	5	/3.3	IonzB +
	/3.3	-R1.FD5-b	2	2	-R2.FD5-XP1	6	/3.3	IonzB -
	/3.3	-R1.FD5-b	3	GNYE	-R2.FD5-XP1	7	/3.3	IonzB PE

Cable diagram

F09_002_ABB

Cable name =+-W3			cable type Igus:CF130.07.07.UL					
function text			no. of conductors 7G			cross-section 0.75		Length 7
function text	Page / column	Target designation from	Connection point	conductor	Target designation to	Connection point	Page / column	function text
	/3.4	-R1.FD5-c	1	1	-R2.FD5-XP1	8	/3.4	AntCls Br
	/3.4	-R1.FD5-c	2	2	-R2.FD5-XP1	9	/3.4	AntCls Wh
	/3.5	-R1.FD5-c	3	3	-R2.FD5-XP1	10	/3.5	AntCls Gn
	/3.5	-R1.FD5-c	4	4	-R2.FD5-XP1	11	/3.5	RotSw+
	/3.5	-R1.FD5-c	5	5	-R2.FD5-XP1	12	/3.5	RotSw-
	/3.5	-R1.FD5-c	6	6	-R2.FD5-XP1	13	/3.5	RotSwSg
	/3.5	-R1.FD5	PE	Y/G	-R2.FD5	PE	/3.5	

Cable diagram

F09_002_ABB

Cable name =+-W4			cable type Igus:CF140.15.04.UL					
function text			no. of conductors 4G			cross-section 1.5		Length 1.8
function text	Page / column	Target designation from	Connection point	conductor	Target designation to	Connection point	Page / column	function text
	/3.1	-R2.FD5-XP1	1	1	-X1	U	/3.1	
	/3.1	-R2.FD5-XP1	2	2	-X1	V	/3.1	
	/3.1	-R2.FD5-XP1	3	3	-X1	W	/3.1	
	/3.2	-R2.FD5	PE	SH	-X1	SH	/3.2	
	/3.1	-R2.FD5-XP1	4	Y\G	-X1	PE	/3.1	

SOUDURE WELDING		
Discontinue: / Discontinuous:	Longueur cordon: / Lenght of weld:	.
	Longueur espace: / Space beetwen welds:	.
Continu / Continuous	Classe = / Category =	NNN(3)

Classe 3 si aucune autre indication / Category 3 unless otherwise indicated

CLASSE / CATEGORY

1	Controle ressuage 100 % + certificat / Sweating inspection 100 % + certificate
2	Controle ressuage des zones critiques / Sweating inspection of critical areas
3	Controle visuel (voir procedure) / Visual inspection (see procedure)

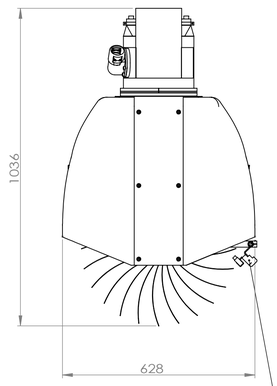
Qualite des mecanosoudures: / Weldment quality: S6_F024

Ep.tole / Plate thick.	5 ≤ a ≤ 9	10	10 ≤ a ≤ 15	15 ≤ a ≤ 20	20 ≤ a ≤ 25	25 ≤ a ≤ 30
L	11	14	17	17	17	17

TOLERANCES GENERALES
GENERALS TOLERANCES
Sauf indication contraire
Unless otherwise indicated

	BRUT STOCK MATERIAL	R25	R12.5	R6.3
0 – 150	± 1	± 0.25	± 0.20	± 0.15
150 – 400	± 1.25	± 0.35	± 0.30	± 0.20
> 400	± 1.50	± 0.50	± 0.40	± 0.30

	⊥	//	▱
USINE MACHINED	0.2/1000	0.2/1000	0.3/1000
BRUT STOCK MATERIAL	2/1000	2/1000	2.5/1000



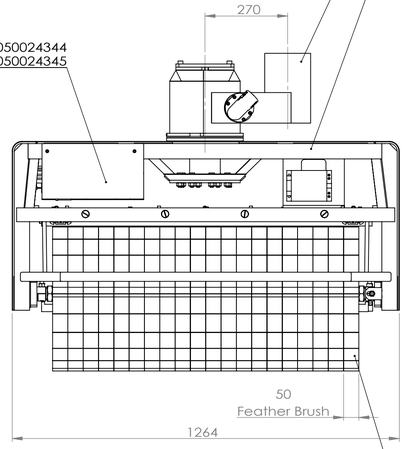
(x1) Ionized bar plate 3HAW050024231 (b)
(x1) Ionized bar 3HAW050024256 (f)
(x10) Screw bolt M4x10 GB/T 70.1-2000

(x1) Motor cover_1 3HAW050024344
(x1) Motor cover_2 3HAW050024345

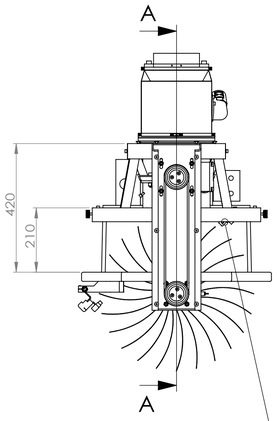
(f)

(x1) Exhaust manifold 3HAW050024252

(x1) Support frame 3HAW050024253
(x8) Screw bolt M8x25 GB/T 70.1-2000
(x8) Nut M8 GB/T 41-2000
(x4) Screw bolt M6x10 GB/T 70.1-2000
(x4) Screw bolt M6x15 GB/T 70.1-2000
(x8) Nut M6 GB/T 41-2000
(x9) Screw bolt M4x15 GB/T 70.1-2000

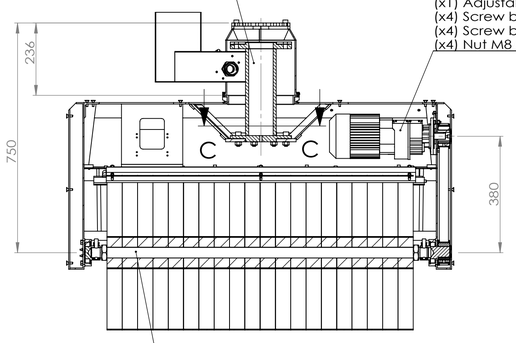


(x20) Feather Brush 3HAW050024273



(x1) Connection pipe 3HAW050024215
(x1) Pad 3HAW050024257
(x8) Screw bolt M12x35 GB/T 70.1-2000
(x1) Pin ∅10x15 GB/T 120.2-2000

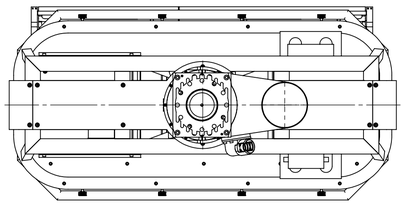
(x1) Adjustable asm 3HAW050024254
(x4) Screw bolt M8x15 GB/T 70.1-2000
(x4) Screw bolt M5x15 GB/T 70.1-2000
(x4) Nut M8 GB/T 41-2000

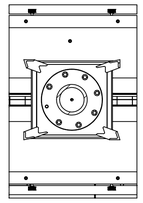


A-A

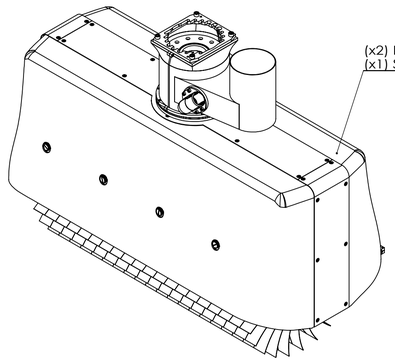
(x1) Feather Duster Shaft asm 3HAW050024255 (f)
(x4) Screw bolt M6x40 GB/T 70.1-2000

D 1 : 1





C-C



(x2) Roller cover 3HAW050024263
(x1) Sealing rubber

Part Weight
134.90
PART SYMETRIC TO ID:
PART FIXED / MOBILE

Date	Name	Modifications/ Revisions	Repere Item NO.	Indice Update
06/09/2015	King Jin	Few sub-assemblies & parts revised.	f	F
01/22/2015	King Jin	Sub-assembly 3HAW050024231 - Ionized bar plate revised.	b	B
08/15/2014	King Jin	3HAW050024273 - Feather Brush added in BOM.	a	A

Scale: 1:10 (1 cm)

Designation: Part, sub-assembly or Assembly

FEATHER DUSTER

Take off

Material:

Threatment: --

Brut:

Date: 6/9/2015 | Par: F LEGELEUX | Plant: CNAUS | Dpt: R & D | VISA:

Engineering by: King Jin

ABB Engineering Ltd

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No5, Lane 369
Chuangye Rd. Kangqiao
201319 Nanhui District
Shanghai, PRC
tel: +86 2161298980
fax: +86 21 61056905

F				Other ID	W	Vehicle:
Conception	Copie	Archivage	Format			
Manuelle CAO-DAO	Scanner Microfilm		A1			
Pour Usine:				Classement Archives		Sheet: 1/1
Inventaires		Matricules				
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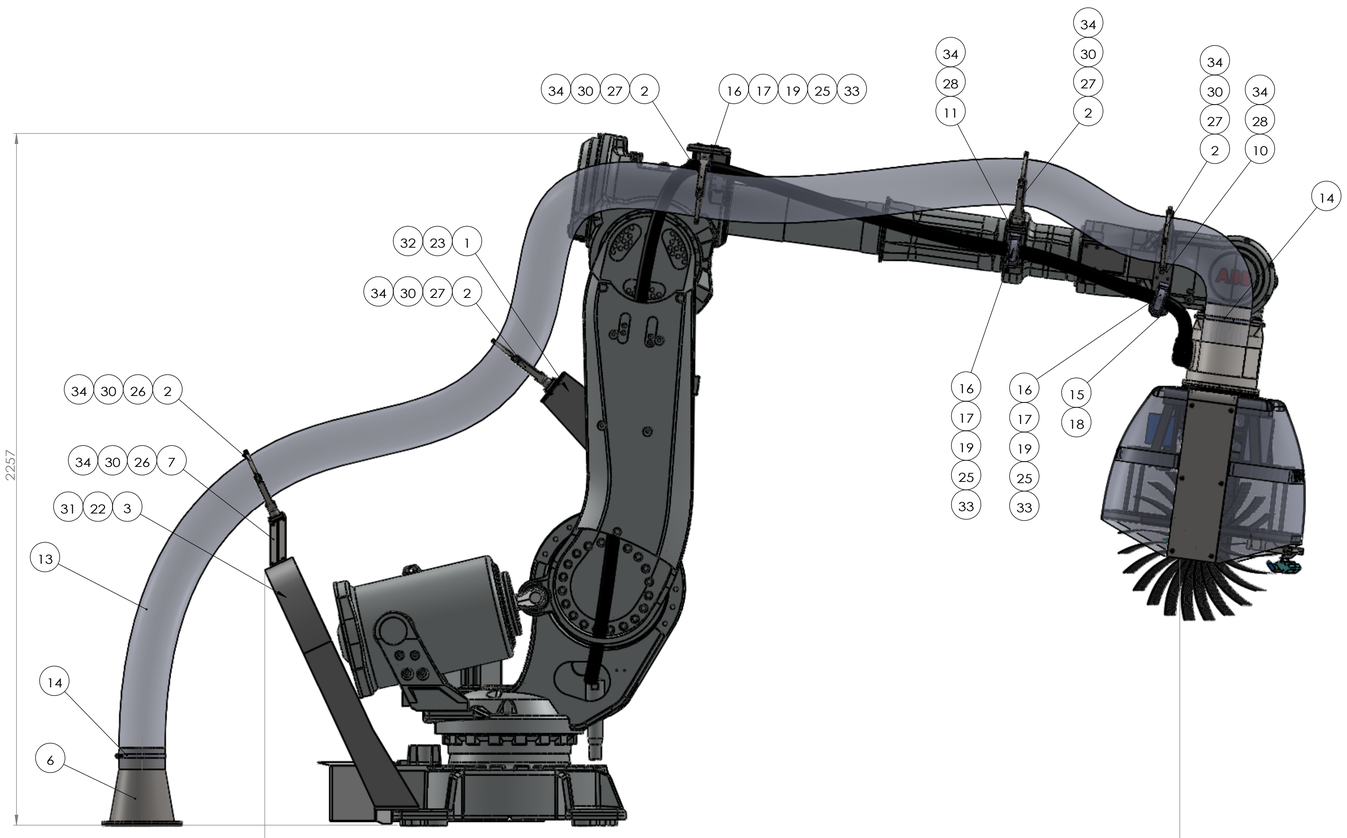

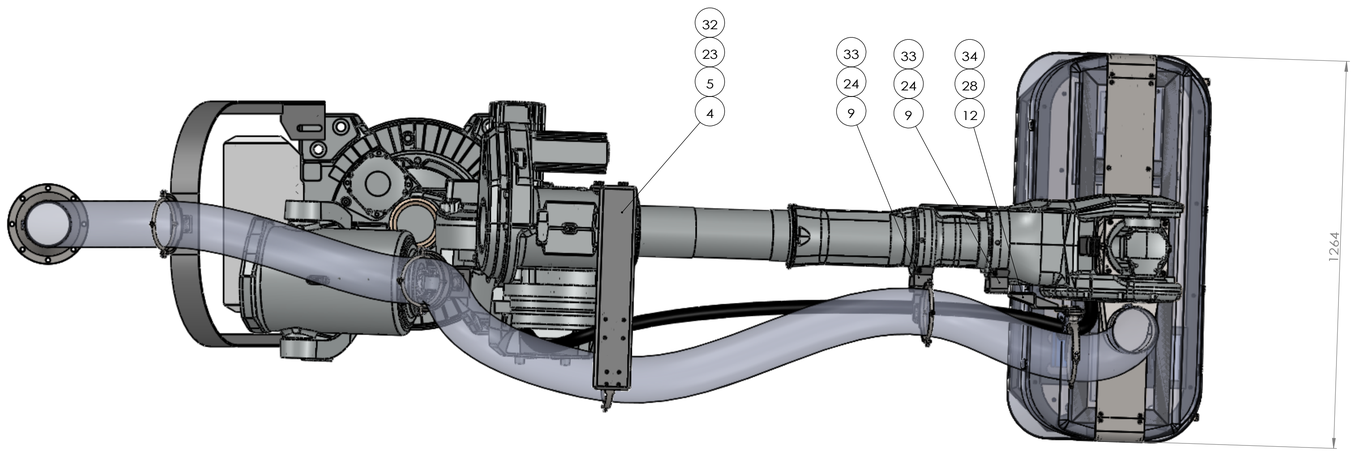

SOUDURE / WELDING

Classe 3 ou autre autre indication / Category 3 unless otherwise indicated

Longueur cordon: / lenght of weld: .
Longueur espace: / Space beetwen welds: .
Classe = / Category = NNI(3)

Discontinue: / Discontinuous:
Continu / Continuous

CLASSE / CATEGORY

1 Controle ressuage 100 % + certificat / Sweating inspection 100 % + certificate
2 Controle ressuage des zones critiques / Sweating inspection of critical areas
3 Controle visuel (voir procedure) / Visual inspection (see procedure)

Qualite des mecanosoudures: / Weldment quality: S6_F024

Ep.tole / Plate thick.	à 5	5 à 10	10 à 15	15 à 20	20 à 25	25 à 30
L	11	14	17	17	17	17

TOLERANCES GENERALES / GENERALS TOLERANCES

Sauf indication contraire / Unless otherwise indicated

	BRUT / STOCK MATERIAL	R25	R12.5	R6.3
0 – 150	± 1	± 0.25	± 0.20	± 0.15
150 – 400	± 1.25	± 0.35	± 0.30	± 0.20
> 400	± 1.50	± 0.50	± 0.40	± 0.30

	⊥	//	▱
USINE / MACHINED	0.2/1000	0.2/1000	0.3/1000
BRUT / STOCK MATERIAL	2/1000	2/1000	2.5/1000

Item	PartNo	Description	Mat.	Qty.	Remarks
34		Washer M6, DIN 9250		40	
33		Washer M8, DIN 9250		10	
32		Washer M12, DIN 9250		8	
31		Washer M18, DIN 9250		2	
30		NUT M6, DIN 934		16	
29		Screw M6x10, DIN 912 class 8.8		4	
28		Screw M6x16, DIN 912 class 8.8		12	
27		Screw M6x20, DIN 912 class 8.8		16	
26		Screw M6x25, DIN 912 class 8.8		8	
25		Screw M8x12, DIN 912 class 8.8		6	
24		Screw M8x25, DIN 912 class 8.8		4	
23		Screw M12x20, DIN 912 class 8.8		8	
22		Screw M18x30, DIN 912 class 8.8		2	
21	3HAW050024375	90 Degree Joint		1	Legris
20	3HAW050024374	Protection Shell		0.05 m	Misumi
19	3HAW050024276	Standard Protector 36mm, PAPRB-36F		3	REIKU
18	3HAW050024272	Tubing		15 m	Legris
17	3HAW050024247	Cable Ball joint clamp 36mm, PAKGB_36		3	REIKU
16	3HAW050024277	Gripping Clamp Hose 52mm, PASSB-52M		3	REIKU
15	3HAWL001001	Tubing Cable Protection, PURRB-36F		1	REIKU
14	3HAW050024239	Clamp		2	友动
13	3HAWL001003	Exhaust hose, VM152		10 m	友动
12	3HAW050024368	Fixing plate 3	Q235A	1	
11	3HAW050024367	Fixing plate 2	Q235A	1	
10	3HAW050024366	Fixing plate 1	Q235A	1	
9	3HAW050024365	New Bracket Support	Q235A	2	
8	3HAW050027152	IRB6640 Robot Cover Plate Feather Duster	6061	1	
7	3HAW050027151	SPACER	Q235A	1	
6	3HAW050024261	Exhaust Flange	304	1	
5	3HAW050024242	Joint plate	Q235A	1	
4	3HAW050024241	3ND aix Hangor	Q235-A	1	
3	3HAW050024237	Support frame Axis 1	Q235-A	1	
2	3HAW050024379	Exhaust pipe support		5	
1	3HAW050024235	Pipe frame_2ND axi	Q235A	1	

Scale: 1:10 (1 cm)

Designation: Part, sub-assembly or Assembly

FEATHER DUSTER

Feather Duster Dresspack - LEFT

Material:

Threatment: --

Brut:

Date: 5/26/2015 | Par: F LEGELEUX | Plant: CNAUS | Dpt: R & D | VISA:

Engineering by: King Jin

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B

Conception	Copie	Archivage	Format
Manuelle CAO-DAO	Scanner MicroFilm		A1

Other ID: W

Vehicle:

Pour Usine:

Inventaires	Matricules

Classement Archives:

Drawing ID: 3HAW050024259

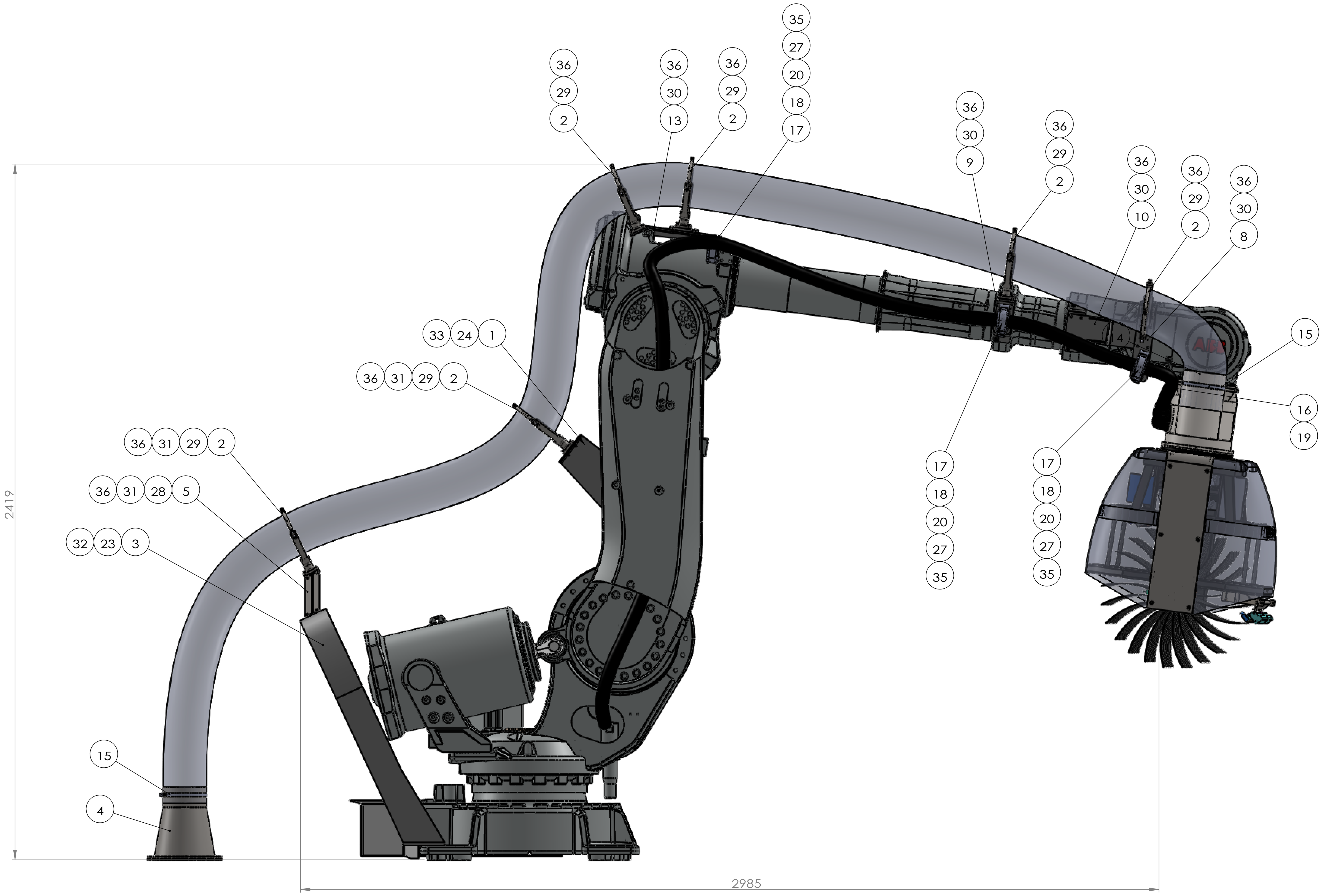
Sheet: 1/2

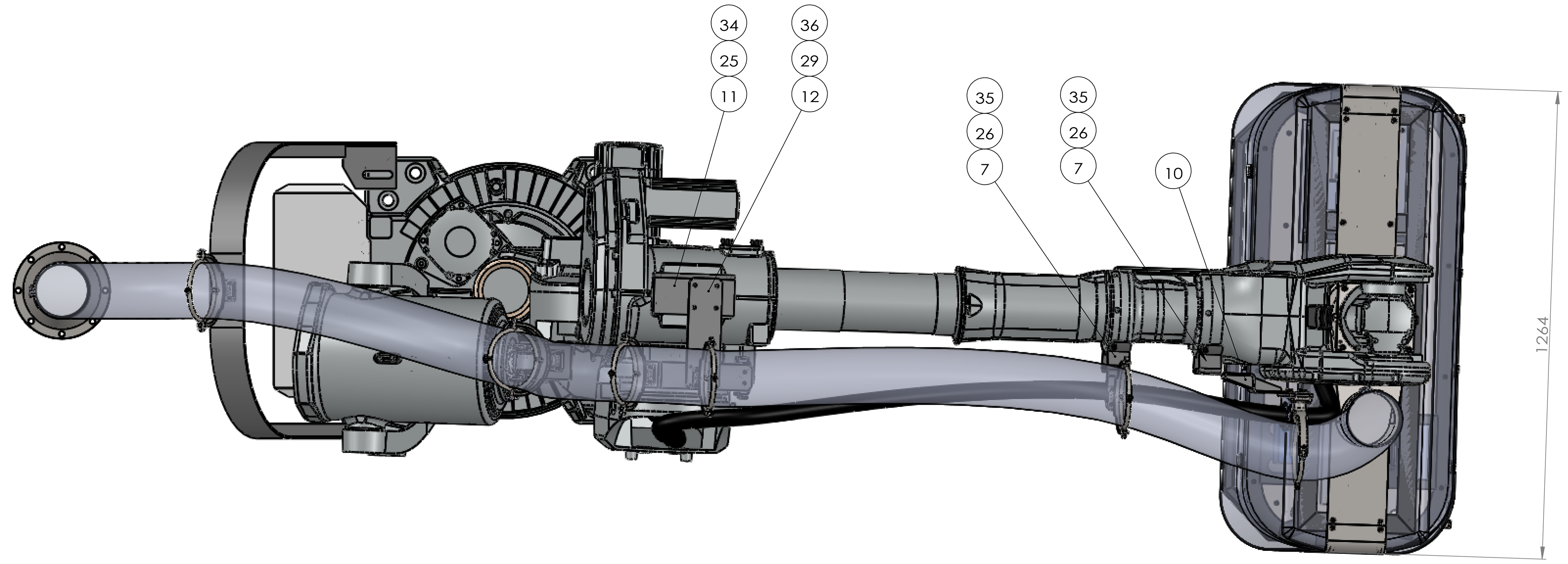
Date	Name	Modifications/ Revisions	Repere Item NO.	Indice Update
05-26-2015	King Jin	Sub-parts revised.	b	B
2014-8-4	Jin Yonglong	Revised for better performance.	a	A

Part Weight: 526.64 kg

PART SYMETRIC TO ID:

PART: FIXED | MOBILE





SOUDURE / WELDING		Classe 3 si aucune autre indication / Category 3 unless otherwise indicated
Discontinue: / Discontinuous:	Longueur cordon: / Lenght of weld: . / Longueur espace: / Space beetwen welds: .	
Continu / Continuous	Classe = / Category =	(1)(2)(3)
CLASSE / CATEGORY	1	Controle ressuage 100 % + certificat / Sweating inspection 100 % + certificate
	2	Controle ressuage des zones critiques / Sweating inspection of critical areas
	3	Controle visuel (voir procedure) / Visual inspection (see procedure)
Qualite des mecanosoudures: / Weldment quality:	S6_F024	

Ep.tole / Plate thick.	a 5–9	10	a 10–15	a 15–20	a 20–25	a 25–30
L	11	14	17	17	17	17

TOLERANCES GENERALES / GENERALS TOLERANCES

Sauf indication contraire / Unless otherwise indicated

	BRUT STOCK MATERIAL	R25	R12.5	R6.3
0 – 150	± 1	± 0.25	± 0.20	± 0.15
150 – 400	± 1.25	± 0.35	± 0.30	± 0.20
> 400	± 1.50	± 0.50	± 0.40	± 0.30

	⊥	//	▱
USINE MACHINED	0.2/1000	0.2/1000	0.3/1000
BRUT STOCK MATERIAL	2/1000	2/1000	2.5/1000

Item	PartNo	Description	Mat.	QTY.	Remarks
36		Washer M6, DIN 9250		44	
35		Washer M8, DIN 9250		14	
34		Washer M10, DIN 9250		2	
33		Washer M12, DIN 9250		4	
32		Washer M18, DIN 9250		2	
31		NUT M6, DIN 934		12	
30		Screw M6x16, DIN 912 class 8.8		16	
29		Screw M6x20, DIN 912 class 8.8		24	
28		Screw M6x25, DIN 912 class 8.8		4	
27		Screw M8x20, DIN 912 class 8.8		10	
26		Screw M8x25, DIN 912 class 8.8		4	
25		Screw M10x30, DIN 912 class 8.8		2	
24		Screw M12x20, DIN 912 class 8.8		4	
23		Screw M18x30, DIN 912 class 8.8		2	
22	3HAW050024375	90 Degree Joint		1	Legris
21	3HAW050024374	Protection Shell		0.05 m	Misumi
20	3HAW050024276	Standard Protector 36mm, PAPRB-36F		3	REIKU
19	3HAW050024272	Tubing		15 m	Legris
18	3HAW050024247	Cable Ball joint clamp 36mm, PAKGB_36		3	REIKU
17	3HAW050024277	Gripping Clamp Hose 52mm, PASSB-52M		3	REIKU
16	3HAWL001001	Tubing Cable Protection, PURRB-36F		1	REIKU
15	3HAW050024239	Clamp		2	友动
14	3HAWL001003	Exhaust hose, VM152		1	友动
13	3HAW050024371	Extend support plate	Q235A	1	
12	3HAW050024370	New Axis 3 support_RIGHT	Q235A	1	
11	3HAW050024369	New Axis 3 fixing plate_RIGHT	Q235A	1	
10	3HAW050024368	Fixing plate 3	Q235A	1	
9	3HAW050024367	Fixing plate 2	Q235A	1	
8	3HAW050024366	Fixing plate 1	Q235A	1	
7	3HAW050024365	New Bracket Support	Q235A	2	
6	3HAW050027152	IRB6640 Robot Cover Plate Feather Duster	6061	1	
5	3HAW050027151	SPACER	Q235A	1	
4	3HAW050024261	Exhaust Flange	304	1	
3	3HAW050024237	Support frame Axis 1	Q235-A	1	
2	3HAW050024379	Exhaust pipe support		6	
1	3HAW050024235	Pipe frame_2ND axi	Q235A	1	

Scale: 1:10 (1 cm)	Designation: Part, sub-assembly or Assembly	Material:
	FEATHER DUSTER	Threatment: --
	Feather Duster Dresspack - RIGHT	Brut:

Date: 5/26/2015	Par: F LEGELEUX	Plant: CNAUS	Dpt: R & D	VISA:

Engineering by: King Jin

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B				Other ID	W	Vehicle:
Conception	Copie	Archivage	Format			
Manuelle CAO-DAO	Scanner MicroFilm		A1			
Pour Usine:				Classement Archives		Sheet:
Inventaires	Matricules			Drawing ID	3HAW050024373	2/2

Date	Name	Modifications/ Revisions	Repere Item NO.	Indice Update
05-26-2015	King Jin	Sub-parts revised.	b	B
2014-8-4	Jin Yonglong	Revised for better performance.	a	A

Part Weight
526.64 kg

PART SYMETRIC TO ID:

PART
FIXED MOBILE

Contact us

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