

1 Purpose

This specification establishes the JpP plant specific requirements for equipment construction as a supplement to the **Bosch General Delivery Specifications**. Supplier quotation shall conform to these requirements unless the manufacturing engineer approves a written deviation.

2 Definitions

3 References

<u>Document</u>	<u>Description of Document</u>
ANSI	American National Standards Institute
MIOSHA	Michigan Occupational Safety and Health Act
MSDS	Material Safety Data Sheet
NFPA 70	National Electric Code
NFPA 79	Electrical Standards for Industrial Machinery
MSA	AIAG Measurement Systems Analysis Reference Manual
NMTBA	Noise Measurement Techniques, NMTBA
OSHA	Occupational Safety and Health Act
	<u>General Delivery Specifications for Machinery and Equipment</u>
<u>JpP 2-103s1</u>	Request for Quotation Form
<u>JpP 11-1</u>	Control of Inspection, Measuring, and Test Equipment
<u>JpP 11-102</u>	Test Equipment Specification

4 Procedure

4.1 General

4.1.1 Additional information regarding services available to assist in the preparation of quotations and the completion of the order is listed below.

- 4.1.1.1 **Electric** - 460 Volt, 3 phase, 60 cycle, +/- 15% volt, 1 Phase, 60 cycle. +/- 15%.
- 4.1.1.2 **Compressed Air** - Supplied at 80psi. Equipment design will allow for air pressures up to 125 psi for specific applications.
- 4.1.1.3 **Water** - Available at pressures to 50-psi equipment design will allow for pressures up 100 psi.
- 4.1.1.4 **Gas** - Available as a natural gas of calorific value of BTU.
- 4.1.1.5 **Per cubit foot** - Supply pressure is 10 psi.
- 4.1.1.6 **Process Heating** - Details will be supplied for specific applications.

4.2 Electrical Standards

- 4.2.1 Controls including limit switches to be Allen Bradley.
- 4.2.2 Relays - 700 P or 700N series.
- 4.2.3 Starters – 100 or 500 series.
- 4.2.4 Push buttons - 800 T series.
- 4.2.5 Limit switches - 802M series (seals to be compatible with synthetic coolant).

- 4.2.6 All connections to junction boxes shall be equipped with sealing O-rings.
- 4.2.7 Limit switches and solenoids shall be connected with STO 600 V Oil resistant cable and Hubbel CM 1208 connectors or equal.
- 4.2.8 **(Recommended):** Across the line starters should be used for electric motors with ratings up to and including 50 H.P. providing the motors are being started under no load conditions. For motors over 50 H.P., auto transformer starters shall be used. Where auto transformers are used, they shall be mounted in the control cabinet. Electric control equipment or wiring must not be mounted above the transformer.
- 4.2.9 All conduit, ducts and wiring are to be provided for interconnecting any separately mounted sections of equipment.
- 4.2.10 Where practical, ancillary equipment, is to be provided with plug in connections to facilitate quick changeover.
- 4.2.11 On all equipment where the control circuit is wholly contained within the control cabinet, the circuit is to be grounded. On all other equipment, the control circuit is to be ungrounded and ground detection lamps are to be installed in the control cabinet.
- 4.2.12 Indicating lamps are to be used to denote all major phases of the equipment cycle.
- 4.2.13 All indicating lamps to be push-to-test and used only for indicating, i.e. indicating light shall not be used as a push button.
- 4.2.14 All electrical equipment should be installed to minimize contact with coolant (where applicable). Lubrication units to be located in dry location.
- 4.2.15 All motors subject to coolant splash shall be totally enclosed with drain plugs on the bottom of the end bell.
- 4.2.16 All tapping and indexing operations to be equipped with dynamic braking.
- 4.2.17 **JpP Electrical Standards** nominates colors for wiring on machine tools and equipment the following color code:

- Line and Load Circuits AC Black
- AC Control Circuits Red
- DC Control Circuits and DC Power Blue
- Interlock Control Circuit Yellow
- Grounding Conductor Green
- Neutral White
- Alarm Circuits Brown

4.3 Programmable Controllers

- 4.3.1 All multiple function machines that would require over 5 relays for circuit logic, shall be equipped with a programmable controller as an option.
- 4.3.2 Allen Bradley SLC 500 series will be used for small systems.
- 4.3.3 Allen Bradley PLC5 series will be used for larger systems.
- 4.3.4 P.C. reserve memory to be stated in the quotation.
- 4.3.5 Each station to be wired so it can be bypassed and the rest of the machine will still function.
- 4.3.6 Wire each station so it can be operated manually.
- 4.3.7 All machine controls shall be designed so that machine automatically shuts off when not cycled for 20 minutes. This shut off applies to all motors, hydraulic pumps, coolant, etc.

- 4.3.8 For hydraulically actuated feed-out units, the control valve shall be energized in the retract state to prevent draw bar advance from hydraulic circuit by-pass leakage.
- 4.3.9 RF tag systems shall set all station bits to fail status. Individual stations shall send and verify accept status only when accept conditions are met.
- 4.3.10 Torque assembly stations failures shall verify the reject signal from the torque system in the accept logic.

4.4 Hydraulics

4.4.1 General

- 4.4.1.1 **(Recommended):** When possible, hydraulics systems will be grouped for operation from a single reservoir and with pumps and motors below for flooded suction.
- 4.4.1.2 Hydraulic filters shall be spin on type mounted external from the reservoir tank. AMBAC - Spin-A. filter.
- 4.4.1.3 Reservoir sight glasses are to be of standard design and replaceable without necessitating access to the interior of the reservoir or take excessive time due to location.
- 4.4.1.4 Hydraulic systems shall incorporate steel tubing supply and return lines in all cases **except** where the required degree of flexibility cannot be obtained without resorting to use of hydraulic hose.
- 4.4.1.5 Hydraulic reservoir layout shall locate reservoirs external from machine pads and grouped together in one area away from coolant splash, or protected from it.
- 4.4.1.6 Hydraulic reservoirs shall be mounted on a stand designed to retain leakage from reservoir or attached pump, valve, etc. Reservoir stacking is permissible if it is accessible.
- 4.4.1.7 Overheating indication with electric interlock shall be provided with all hydraulic system reservoirs.
- 4.4.1.8 Cooling devices to be approved by Bosch Associates.

4.4.2 Hydraulic Pumps

- 4.4.2.1 Hydraulic Pump Bosch - 1 gal. to 10 gal. Model SV-15 Pressure compensator, volume control, flange mount SAE side pored, Viton Seals, 1000 lb. pressure rating, R.H. rotation, key shaft.
- 4.4.2.2 Hydraulic Pump Bosch - 10 to 25 gal. sys. Model SV.20 Pressure compensator, volume control, flange mount SAE, side ported, Viton Seal 1000 lb. pressure rating, R.H. rotation, key shaft.
- 4.4.2.3 Hydraulic Pump Bosch - 25 to 40 gals. sys. Model SV-40 Pressure compensator, volume control, flange mount SAE side ported Viton seal 1000 lb. pressure rated, R.H. rotation, key shaft.
- 4.4.2.4 Hydraulic Pump Bosch - 40 to 100 gal sys. Model SV-80 Pressure compensating Volume Control, flange mount SAE side port Viton Seal 1000 lb. pressure rated, R.H. rotation key shaft.
- 4.4.2.5 Vickers - Pump (Must be shown as exception in quotation.) (All Foundry must be Vickers)

4.4.3 Valves and Controls

- 4.4.3.1 Directional Vickers, Model DG4S 1/8" valve, Viton seal, subplate mount, quick connect, sentinel light with AC/110, Volt coil, 3000 lb. pressure rated for small sys 0 to 6 gal. per min.
- 4.4.3.2 Directional Vickers, Model DG4S 1/4" valve Viton seal, subplate, quick connect, sentinel light with AC/110, volt coil, 3000 lb. pressure rated.
- 4.4.3.3 Directional Vickers, Model DG4S 3/4" valve Viton seal, subplate mound quick connect, sentinel light with AC/110, Volt coil 3000 lb. pressure rated.
- 4.4.3.4 Bosch/Racine (**Must be shown as exception in quotation.**)

4.4.4 Fittings

- 4.4.4.1 Fittings 37 degrees, straight or taper thread 37 degrees Parker Hannifin or 37 degrees Weatherhead.
- 4.4.4.2 (**Recommended**) SAE threads with o-ring seals.

4.4.5 Cylinders

- 4.4.5.1 Cylinders must be of interchangeable square head design. Parker Hannifin, Hydroline or Milwaukee or approved equal. All hydraulic cylinders used in Brake Components Assembly areas of the Plant must use EP seals to be compatible with the automotive brake fluids.

4.5 Pneumatics

4.5.1 Torque Guns

- 4.5.1.1 Torque control, all torque systems must be equipped with a digital readout system. Preference – is Bosch. **Any substitute must be approved** in writing by JpP.

4.5.2 Pneumatic Valves

Directional Valves and Accessories - ISO Size I

- 4.5.2.1 Ceram Valve 4 way Directional slide valve ISO size 1, 5/2 Single solenoid spring return 120VAC, Bosch Rexroth, GS10061-2440 or GT10061-2440, SC300 Catalog, Page 4
- 4.5.2.2 Ceram Valve 4 way Directional slide valve ISO size 1, 5/2 Double solenoid 120VAC, Bosch Rexroth, GS10062-2424 or GT10062-2424, SC300 Catalog, Page 6
- 4.5.2.3 Size 1 Single subbase with 1/4"NPT side ports, Bosch Rexroth, P-069191-00001, SC300 Catalog, Page 17
- 4.5.2.4 Size 1 Single subbase with 3/8"NPT side ports, Bosch Rexroth, P-068975-00001, SC300 Catalog, Page 17
- 4.5.2.5 Size 1 Manifold Station Segment 1/4" NPT ports, Bosch Rexroth, P-068424-00001, SC300 Catalog, Page 17
- 4.5.2.6 Size 1 Manifold End Plates 1/4" NPT, (includes both ends), Bosch Rexroth, P-068975-00001, SC300 Catalog, Page 17
- 4.5.2.7 Size 1, Port 1, Sandwich regulator kit (10-150 psi), Bosch Rexroth, P-029904-00000, Catalog SC-300, Page 21
- 4.5.2.8 Size 1, Port 1, Sandwich regulator kit (5-60 psi), Bosch Rexroth, P-029904-00001, Catalog SC-300, Page 21
- 4.5.2.9 Size 1, Port 1, Sandwich regulator kit (3-30 psi), Bosch Rexroth, P-029904-00002, Catalog SC-300, Page 21

- 4.5.2.10 Size 1 Port 2 & 4 Sandwich Regulator kit (10-120 psi), Bosch Rexroth, P-068999-00000, Catalog SC-300, Page 21
- 4.5.2.11 Size 1 Port 2 & 4 Sandwich Regulator kit (5-60 psi), Bosch Rexroth, P-068999-00001, Catalog SC-300, Page 21
- 4.5.2.12 Size 1 Port 2 & 4 Sandwich Regulator kit (3-30 psi), Bosch Rexroth, P-068999-00002, Catalog SC-300, Page 21

Directional Valves and Accessories – ISO Size II

- 4.5.2.13 Ceram Valve 4 way Directional slide valve, ISO size 2, 5/2 Single solenoid spring return 120 VAC, Bosch Rexroth, GS120061-2440, SC300 Catalog, Page 4
 - 4.5.2.14 Ceram Valve 4 way Directional slide valve ISO size 1, 5/2 Double solenoid 120 VAC, Bosch Rexroth , GS20062-2424, SC-300 Catalog, Page 4
 - 4.5.2.15 Size 2 Single aubbase with 3/8" NPT side ports, Bosch Rexroth, P68977-1, SC-300 Catalog, Page 23
 - 4.5.2.16 Size 2 Single subbase with 1/2 "NPT side ports, Bosch Rexroth, P-68418-1, SC-300 Catalog, Page 23
 - 4.5.2.17 Size 2 Manifold Station Segment 1/2" NPT Delivery ports, Bosch Rexroth, P-68430, SC300 Catalog, Page 23
 - 4.5.2.18 Size 2 Manifold End Plates 3/4 -14 NPT Supply & Exhaust Ports (includes both ends), Bosch Rexroth, P-68431, SC300 Catalog, Page 23
 - 4.5.2.19 Size 2, Port 1, Sandwich regulator kit (10-120 psi), Bosch Rexroth, P-029905-00000, Catalog SC-300, Page 25
 - 4.5.2.19 Size 2, Port 1, Sandwich regulator kit (5-60 psi), Bosch Rexroth, P-029905-00001, Catalog SC-300, Page 25
 - 4.5.2.20 Size 2, Port 1, Sandwich regulator kit (3-30 psi), Bosch Rexroth, P-029905-00002, Catalog SC-300, Page 25
 - 4.5.2.21 Size 2 Port 2 & 4 Sandwich Regulator kit (10-120 psi), Bosch Rexroth, P-068998-00000, Catalog SC-300, Page 25
 - 4.5.2.22 Size 1 Port 2 & 4 Sandwich Regulator kit (5-60 psi), Bosch Rexroth, P-068998-00001, Catalog SC-300, Page 25
 - 4.5.2.23 Size 1 Port 2 & 4 Sandwich Regulator kit (3-30 psi), Bosch Rexroth, P-068998-00002, Catalog SC-300, Page 25
- 4.5.3 Valves - Miscellaneous
- 4.5.3.1 Quick exhaust valve, Bosch Rexroth, **Inch Series** Catalog SC-400 Page 46, **Metric Series**, Know-how in Pneumatics Catalog
 - 4.5.3.2 Shuttle valve, Bosch Rexroth, **Inch Series** Catalog SC-400 Page 51, **Metric Series**, Know-how in Pneumatics Catalog

Valve - Check

- 4.5.3.3 Right Angle Check Valve, Bosch Rexroth, **Inch series** Catalog SC-400 Page 50, **Metric Series** Knowhow in Pneumatics Catalog
- 4.5.3.4 Inline check valve, Bosch Rexroth, **Inch series** Catalog SC-400 Page 49, **Metric series**, Know-how in Pneumatics Catalog

Valve - Flow

- 4.5.3.5 Right angle flow control valve , Bosch Rexroth, **Metric series**, Catalog SC-400 page 39, **Inch series** Catalog SC-400 Page 37
- 4.5.3.6 Inline flow control valve, Bosch Rexroth, **Metric series**, Catalog SC-400 page 43, **Inch series** Catalog SC-400, Page 41

4.5.4 Pneumatic Actuator

- 4.5.4.1 NFPA Cylinders (Square Head Design), Powermaster PP series, Steel Head, Tube and Tie Rod, Bosch Rexroth, Catalog SC-200
- 4.5.4.2 Taskmaster Cylinder, Aluminum Construction NFPA Dimensions, Bosch Rexroth, Catalog SC-200
- 4.5.4.3 Rodless cylinder, Bosch Rexroth, Series 277 RexMover Catalog SC200.10
- 4.5.4.4 ISO VDMA Series Cylinders, Bosch Rexroth, Series TRP Tie Rod, PRB Profile Knowhow In Pneumatics Catalog 2003 version Section 1
- 4.5.4.5 Compact Cylinders, Bosch Rexroth, KPZ series, Knowhow In Pneumatics Catalog 2003 edition Section 1
- 4.5.4.6 Short Stroke Cylinders, Bosch Rexroth, KHZ series, Knowhow In Pneumatics Catalog 2003 Edition Section 1

4.5.5 Filters

- 4.5.5.1 Modular Ci Series Filters, C4i Port sizes 1/8, 1/4 & 3/8, BSP or NPT, C15i Port sizes 1/4, 3/8 & 1/2 BSP or NPT, C25i Port sizes 3/8, 1/2, 3/4 & 1" BSP or NPT, Bosch Rexroth, **535**, FRL Catalog, Know-how in Pneumatics Catalog
- 4.5.5.2 Modular Ci Series Combination Pre-Filter and Coalescing Filter, C4i Port sizes 1/8, 1/4 & 3/8, BSP or NPT, C15i Port sizes 1/4, 3/8 & 1/2 BSP or NPT, C25i Port sizes 3/8, 1/2, 3/4 & 1" BSP or NPT, Bosch Rexroth, **535 series**, FRL Catalog, Know-how in Pneumatics Catalog
- 4.5.5.3 Modular Ci Series Filter Regulator, C4i Port sizes 1/8, 1/4 & 3/8, BSP or NPT, C15i Port sizes 1/4, 3/8 & 1/2 BSP or NPT, C25i Port sizes 3/8, 1/2, 3/4 & 1" BSP or NPT, Bosch Rexroth, **535 series**, FRL Catalog, Know-how in Pneumatics Catalog

Lubricators

Modular Ci Series Lubricator, C4i Port sizes 1/8, 1/4 & 3/8, BSP or NPT C15i Port sizes 1/4, 3/8 & 1/2 BSP or NPT C25i Port sizes 3/8, 1/2, 3/4 & 1" BSP or NPT, Bosch Rexroth, **535 series**, FRL Catalog, Know-how in Pneumatics Catalog

Regulators

Modular Ci Series Regulators, C4i Port sizes 1/8, 1/4 & 3/8, BSP or NPT C15i Port sizes 1/4, 3/8 & 1/2 BSP or NPT C25i Port sizes 3/8, 1/2, 3/4 & 1" BSP or NPT, Bosch Rexroth, **535 Series**, FRL Catalog, Know-how in Pneumatics Catalog, Modular Ci Series Manifolded Regulators, C4i Common supply 1/4 and 3/8 BSP or NPT C25i Common supply 3/8, 1/2, 3/4 & 1" BSP or NPT, Bosch Rexroth, **535**

series, FRL Catalog, Know-how in Pneumatics Catalog, Modular Ci Series Progressive Start-up units, Bosch Rexroth, **535 series**, FRL Catalog, Know-how in Pneumatics Catalog

Miscellaneous Items

Push in Fittings, Bosch Rexroth, Inch series catalog SC-400, Page 3, Metric series catalog SC-400, Page 11, Stainless Steel Fittings, Bosch Rexroth, Inch series catalog SC-400, Page 22, Metric series catalog SC-400, Page 26, Plastic Tubing, Bosch Rexroth, Inch series catalog SC-400, Page 29, Metric series catalog SC-400, Page 30, Silencers, *Bosch Rexroth*, NPT series catalog SC-400, Page 33, Metric series catalog SC-400, Page 34

4.6 Mechanical

4.6.1 Mechanical Feed Units

4.6.1.1 They are to be considered first, then hydraulic (prevent coolant contamination).

4.6.2 Mechanical Feed Units Suppliers

4.6.2.1 Force Control Industries

4.6.2.2 Michigan Mechanical Feed (Giddings & Lewis)

4.6.3 Belts

4.6.3.1 Timing belt should be Gates Poly. Chain first if available.

4.6.3.2 Choice is Gates Kevlor Belts or equivalent.

4.6.4 Couplings

4.6.4.1 Falk Spring Flex

4.6.4.2 Par-a-Flex for Foundry

4.6.5 Spacers

4.6.5.1 Whenever spacers are used to align motors or spindles, bolt them securely the sub-plate.

4.6.6 Seals and Bearings

4.6.6.1 Double lip oil seals will be used for oil sealing applications when the seal will be exposed to water soluble coolants unless such usage would require special seals not normally available for replacement purposes. Seal Type:

- Garlock Seal
- National Seal

4.6.6.2 Design must include devices specifically intended to eliminate or reduce seal exposure to coolant.

4.6.6.3 Rotating members in contact with oil seals are to be ceramic coated.

4.6.6.4 All anti-friction bearings or seals to be standard catalog items.

4.6.6.5 Spindle adjustment must be possible without major disassembly of machine.

4.6.6.6 Air seals to be incorporated where excessive contamination of coolant and chips exists.

4.6.7 Linear Motion Products

4.6.7.1 Linear Bearings to be Bosch Rexroth standard catalog items available from the “24 Hour Greenlight” program where possible.

- Greenlight Flyer
 - www.boschrexroth-us.com
 - Click on Linear Motion and Assembly Technologies
 - Click on Documentation and Software or Catalogs
 - The Greenlight brochure is in the middle of the page
- RA 82 202 – Ball Rail
- RA 82 210 – Mini Ball Rail
- RA 82 301 – Roller Rail
- RA 99 100 – Metric Linear Bushing
- RA 99 110 – Inch Linear Bushing

4.6.7.2 Ball Screws to be Bosch Rexroth standard catalog items.

- Catalog RE 83 301 – Ball Screws

4.6.7.3 Linear Motion Systems to be Bosch Rexroth chosen from the following catalogs depending on the application parameters.

- RA 83 001 – Linear Motion Slide
- RA 99 012 – Belt Driven LMS/SGR
- RA 99 007 – Mini Compact Slide
- RA 82 402 – Linear Module
- RA 82 414 – PSK Precision Module
- RA 82 601 – CKK Compact Module
- RE 82 615 – CKR Compact Module
- RA 82 501 – Ball Rail Tables

4.6.8 Assembly Conveyors, Workstations & Guarding

4.6.8.1 Assembly Conveyors to be Bosch Rexroth selected from one of the following catalogs depending on the application parameters.

- 8981 500 282 – TS1
- 8981 500 269 – *Tsplus*
- 8981 500 252 – *TS4plus*
- 8981 500 202 – VarioFlow

4.6.8.2 Work Stations to be Bosch Rexroth selected from the following catalog.

- 8981 500 125 – Ergonomic Workstations

4.6.8.3 Aluminum guarding to be chosen from the standard catalog

offering.

- 8981 500 201 – Aluminum Framing Catalog

4.7 Coolant System and Chip Removal

4.7.1 Chip Removal

4.7.1.1 Machine design must incorporate flush systems to provide for continuous removal of chips from machine. Three chip chutes to be available on dial type machines, only (1) will be used.

4.7.1.2 Special attention is to be given to chip coolant sumps. Effective means shall be provided at floor elevation for the cleaning of washing machines and machinery with coolant sumps, such as an easy access door/s for clean out. Minimum size doors to be 16" x 16."

4.7.2 Coolant Systems or Washers

4.7.2.1 Filter Tanks = Hilco

4.7.2.2 Filtering material (Bags, canister cartridges) = Parker Hannifin.

- All equipment to be compatible with existing JpP coolants / washer solutions.

4.8 Lubrication

Note: All fill points for lubrication must be easily accessible.

4.8.1 **Preferred:** Trabon system is preferred.

All points of lubrication requiring attention within a 200-hour operating period will be included in a central system. All lubricant reservoirs shall have a 200-hour operating capacity before refilling is required.

4.8.2 All gear boxes to have flow through (continuous flow) lubricating systems.

4.8.3 All lubrication systems MUST be effectively sealed from possible contamination by coolants and mounted away from splash area.

4.8.4 When automatic lubrication systems are used, or when manual lubrication systems having multi-point lubricant application from a single Zerk fitting are used, the system must include plugged line and broken line indication. For automatic lubrication systems, broken or plugged line indication must result in a machine shut down at the end of the cycle in process. Flow of lubrication to all "Feeders" blocks is to occur during each lubrication cycle and the lube fault and limit switch is to be placed on the last feeder block in the series rather than on the master block. Systems to be protected from coolant spray.

4.8.5 **Preferred:** Where automatic lubrication is not practical, all Zerk fittings installed on equipment must be on the 'ALEMITE' type. (Relief type of protect overflow preferred).

4.8.6 Whenever lube line tubing is run around the base of a machine, exposed to coolant and chips, it must be stainless steel to prevent the tubing from rusting out.

4.8.7 Machines designed for machining cast iron parts must have effective wipers and/or covers on all sides.

4.8.8. All lubricating systems to be used in ASSEMBLY AREAS MUST be designed to operate with BRAKE fluid compatible fluids.

4.8.9 Brake fluid applications use UCON LB 1145-Y-27 coating fluid, source Union Carbide Corporation.

4.8.10 MINERAL OIL applications use A.T.F. Imperial 6148.

4.8.11 Lubrication fill fittings to be Parker H4 631.

4.8.12 Lubrication for Linear Motion Products

4.8.12.1 Bosch Rexroth Linear Motion Products as designated in Section 4.6.7 require the use of Lithium Based Grease.

- Specification = DIN 51825
 - K2K for normal loads
 - KP2K for high loads
- Consistency class NLGI-2 = DIN 51818

4.9 Equipment Color Coding

(Numbers shown are PPG numbers)

a) Bosch Beige:
Equipment In General
Part "A" Formula:

Or Gray/White

Or For Foundry Equipment: Medium Blue

Epoxy
#97-51 'A' Paint
#97-98 'B'
Activator
C2Y=14D1/2L20
per gallon
RAL 9002
#6-284

b) Yellow:
Control Switches, Guards, Rails On Screens To Designate
Caution

#97-13 'A'
#97-98 'B'

c) Orange:
Moving Parts That Pinch, Crush, And Shock. Emphasizes
Hazard Areas.

#97-12 'A'
#97-98 'B'

d) Red:
Emergency Stop Buttons, Stop Bars On Electrical Switches.

#97-10 'A'
#97-98 'B'

e) Primers:
To Be Used With Epoxy.

Gray #97-46 'A'
Brown #97-47 'A'
Red #97-48 'A'
Clear #97-98 'B'

Assembly areas where brake fluid is used - NO paint at all. Stainless or aluminum is required. Indicate type in quotation.

Copies of PPG Technical Data available upon request. TD 36 and TD 38.

4.10 Sample Parts

4.10.1 ALL SAMPLE PARTS are to be returned to BOSCH CHASSIS DIVISION, 3737 Red Arrow Highway, St. Joseph, Michigan 49085, to the attention of manufacturing engineer in charge of project - (ME). Parts must be identified on all four sides of the containers as:

“SAMPLE PARTS FROM EQUIPMENT TRIALS. DO NOT USE.”

4.11 Facilities

4.11.1 Supplier to provide quotations for required support equipment covering non-productive facilities equipment supplied as a complete package, i.e.

- Air make-up units
- Dust collectors
- Exhaust units
- Disposal units, etc.

4.11.2 Suppliers will provide quotations in compliance with the applicable sections of this specification.

(Quotations will state compliance or the extent of non-compliance with regulatory requirements.)

4.12 CAD Drawings

4.12.1 Electronic drawings to be AUTO CAD Drawing Format.

4.13 Fixtures and Tooling

4.13.1 Equipment with fixtures must provide detection for misload.

4.14 Request for Quotation (RFQ Form)

4.14.1 The RFQ is used for Capital Equipment RFQ # is assigned by the year, month, and date. (Example: 990122 would be used as the RFQ # for a RFQ submitted on January 22, 1999)

Appendix A

4.15 Safety Distance For Two Hand Controls

The location of machine activation controls relative to the point of operation must be sufficient to prevent hand injuries. Safety Distance is defined as the minimum separation distance between machine activation controls (e.g., two hand palm buttons and the point of operation in order to make it physically impossible for the operator to place hand(s) into the point of operation after activation. Safety distance is calculated as follows:

$$D = 1.6.m/sec \times T (sec)^*$$

or

$$D = 63 in/sec \times T (sec)^*$$

Safety Distance (D) = minimum safe distance between the point of operation and palm button, The 1.6.m/sec (63 in/sec) value is a hand speed constant that represents the fastest speed at which workers can perform a hand movement toward the point of operation.

Hazard Time (T) = the time required to eliminate the point of operation hazard on the press

On presses with part-revolution clutches, the hazard time is defined as the stopping time of the press ram. This can be obtained by using a stop-time meter.

On presses with full revolution clutches, the hazard time is defined as the maximum possible time required for the ram to complete one down stroke.

The safety distance should be checked periodically and at each new set up to ensure that operators are adequately protected. Your local Safety Coordinator can provide assistance.

*The National Institute for Occupational Safety and Health (NIOSH) has recently concluded that certain workers have hand speeds faster than the hand speed constant of 63 inches/second, as adopted by OSHA. In their study, 28% of all test subjects, 40% of males and 12% of females exceeded the hand injury speed constant. As a group, males 20 to 30 years of age showed the fastest hand speed of 84 inches/second or 33% faster than the OSHA Standard. Therefore, the Standard may not provide adequate protection for all workers.

NIOSH has recommended that further study be initiated. Also, while the existing hand speed constant of 63 inches/second can still be used, further emphasis must be placed on evaluating safety distance for particular operations recognizing that hand speed may be function of age and gender.

Appendix B

4.16 Data Collection Standard for Shop Floor Equipment

STANDARD OVERVIEW

Because of the diversity in the types and amount of data to be collected from the shop floor equipment and the various options available regarding the long vs. short term storage of data, this standard is created to establish a common approach to the data collection process while maintaining flexibility to accommodate various needs. It is intended that this standard be used by OEMs so that the data to be collected is set up and managed properly in the PLC when the equipment is delivered. The standard provides an easy way for the Bosch purchasing engineer to specify the types of data to be collected from new equipment.

SYSTEM OVERVIEW

A typical data collection system consists of the machine controller (PLC), a computer to maintain a data collection database, and interface hardware and software. The interface to the PLC is the Allen Bradley data highway plus network. The Software is to be Rockwell Software RSVIEW machine interface software and RSSQL database software that will interface directly with Microsoft SQL databases. A data collection management program authored by Bosch will reside in the PLC memory, and will collect data that is used by other Bosch systems. The data collection management program is used to (1) collect and store the data in preparation for the upload process, (2) reset data where necessary after it has been successfully uploaded, and (3) process data from the host that is downloaded to the PLC. A broader description of the data management program is contained in the PLC data collection standard.

DATA TO BE COLLECTED

Different machines may have various data types available. The following is a list of standard items for a machine to collect:

- Machine Downtime
- Machine or Station Fault Conditions with Date/Time/Model or Part Number being Run
- Master Date/Time/Number of Master Run
- Master Failing Test. Date/Time/model or Part Number Being Run/Specific Fault Condition
- Machine Vision failed images
- First Pass Yield
- Good / Scrap Counts
- Tool Change Counts
- Total Machine Counts
- Test Stand Traces of Analog Data
- Test Stand Data
- In-process Attribute Data from Equipment
- Gage Outputs
- Cycle Time of the Machine
- Cycle Times of Individual Stations

The machine program should provide this information for the data collection management program to collect and maintain in a database for review.

PLC DATA LAYOUT

This standard defines the layout and management of data within the PLC to be collected from shop floor manufacturing equipment. It includes a layout definition that specifies the memory location of the data to be collected.

Data organization in the PLC

Machine information will be stored in a contiguous block of data within the machine controller. The "Data Collection Block" definition contains the type of data being collected from the equipment and where the data is to be located. These data blocks are specific to the Allen Bradley controllers used at JpP. PLC "data files" N40:0 through N75:0 are to be defined when the machine program is written, but shall be reserved for Bosch data collection use per the PLC data collection standard and shall not be used in the machine operating program; PLC "data file" B10 shall be used for MMI communication; program "Ladder File 3" is reserved for the data management program and shall not be used for machine programs.

PLC DATA COLLECTION PROCESS

The data collection will occur as defined by the JpP data collection team and the CIT department. The data collection program will be controlled by the CIT department. Special data collection requests will be reviewed by the JpP data collection team.

Designed in Error Detecting/Error Proofing

1. All designed detection shall have a defect master that is used to verify detector function. Automatic running of defect master at a specified frequency is preferred without human intervention. Typically frequency is every 4 hours or 10 minutes after change-over.
2. In the event of a master failure, the MMI screen shall show the reason for fault and allow the supervisor to clear fault or rerun the master after fault correction.

Machine Vision Systems

1. **Preferred:** DVT system.

5 Change History

Edition No.	Date of Implementation	Written by	Changes
2 nd Edition	01-Jun-01	J. Styf	Format changes to meet new AC 5-1 requirements. Added Appendix B. SUPERSEDES: K1-Jp 2-103 1 st Edition
3rd Edition		Date of implementation: 01-Oct-02	
Written by: T. Fuller			
Changes:			
<ol style="list-style-type: none"> 1. Add section 4.3.8, 4.3.9, 4.3.10. 2. Misc. Clarifications and spelling corrections SUPERSEDES: K1-Jp 2-103 2 nd Edition			
4th Edition		Date of implementation: 8-Apr-04	
Written by: T. Fuller			
Changes:			
<ol style="list-style-type: none"> 1. Add "NFPA 70" & "NFPA 79" to references 2. Sec. 4.2.2.1, .2, .3, & .4 replaced "Racine" to "Bosch" 3. Sec. 4.5.1.1 replaced "Chicago Pneumatic..." to "Bosch" 4. Sec. 4.5.2.1 replaced "WABCO" to "Bosch" 5. Add 4.3.8- 4.3.10 6. Add 4.4.4.2 to sec. 4.4.4 7. Replaced "Texaco 1833" to "Imperial 6148" 8. Updated many minor references, 4.2.3, 4.2.8, 4.4.3.2, 4.8.5, 4.10 App B System Overview, 9. Updated link for "General Delivery Specifications" in the reference section., deleted reference to AC 6-56 10. Updated acronyms and formatted to current AC 5-1 11. Owner from Guthrie to Styf 			
5th Edition		Date of implementation: 2-July-04	
Written by: T. Fuller			
Changes:			
<ol style="list-style-type: none"> 1. Revised Sec. 4.5.2, 4.5.3, 4.5.4, 4.5.5 and 4.16. 2. Added Sec. 4.6.7, 4.6.8 and 4.8.12.1 			

6 Review and Approval

Process owner signature:

JpP/TEF3 Styf

Signature on File

Date: __6/25/04____

Quality management system representative signature:

JpP/QAM6-Davidson

Signature on File

Date: __6/25/04____

Process champion signature:

JpP/ATF Fuller

Signature on File

Date: __6/25/04____