A740-MR-68

Flakt

EMERGENCY AND VENTILATION FANS

OPERATING AND MAINTENANCE INSTRUCTIONS

FOR

(SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT)

SUPPLIED TO:
LOS ANGELES TRANSIT

SUPPLIED BY:
FLAKT, INC., WINSTON-SALEM, NC

S.C.R.T.D. REFERENCE NO. A740

FLAKT, INC. REF. NO. C118.324.0773

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1.0 SAFETY INSTRUCTIONS (READ THIS SECTION FIRST)

1.1 For the protection of personnel, the data in this manual must be read and understood before proceeding with the handling, installation, operation or servicing of the equipment supplied under this contract.

1.2 All safety codes, standards and regulations must be observed during the handling, installation, operation or servicing of the equipment supplied under this contract.

1.3 The equipment supplied under this contract must be operated only with all safety devices in place and functioning. Safety devices include guards, screens, disconnect switches, etc.

1.4 All power to the fan must be disconnected and locked out while handling, installing or performing service maintenance or inspection whenever a safety device is removed or does not provide the intended protection.

1.5 The fan equipment must not be operated until it has been properly installed as described in the following sections, nor should it be operated except in strict accordance with the above safety precautions.

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2.0 FAN EQUIPMENT (For Drawings see Section No. 6)

2.1 General

The fans supplied on this contract are of the axial flow type, in which the direction of air flow is parallel to the axis of impeller (or rotor) rotation. The essential component of the axial flow fan is a propeller type impeller having a number of identical aerodynamically shaped blades which all operate at a certain identical pitch angle to achieve a given performance. To achieve different performance levels, some impellers are equipped with a central adjustment mechanism whereby the pitch angle of all the blades may be changed simultaneously. On the remaining fans, blades are adjusted individually by loosening the blade hold down bolts (4 per blade). The mounting of all impellers is directly to the motor shaft, and this assembly then installed in a cylindrical casing produces the basic axial flow fan. Certain fans are also classified as vaneaxial since they include vane sections at the end of the fan casing; the purpose of the vane section is to convert the rotating component of the airstream into axial flow and pressure. The direction of air flow through the emergency and subway ventilation fans is reversible with a change in motor rotation.

2.2 Nameplate Data

Each fan carries an equipment tag and a nameplate identifying its model by an alphanumeric product code, and a serial number, both of which must be supplied in any correspondence concerning the fan. The nameplate also bears specific information as to the maximum service conditions under which the fan is designed to operate.

Found with the fan manufacturer's nameplate is a motor manufacturer's nameplate (in addition to the one attached to the motor casing) containing specific information on the motor originally supplied with the fan. The motor serial number must be supplied in any correspondence concerning the motor.

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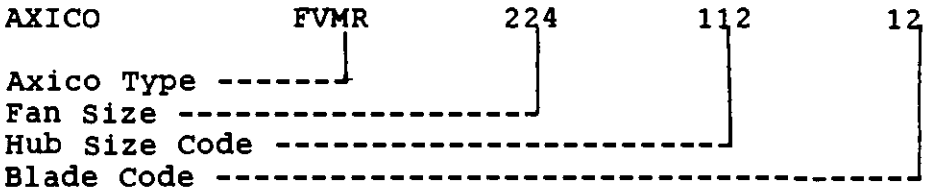
2.0 FAN EQUIPMENT (CONT'D)

2.2 Nameplate Data (Cont'd)

The product code for these fans is defined as follows:



3.0 RIGGING AND ERECTION

3.1 Fans are shipped as an assembled fan-motor unit. The internal heaters of the fan motors should be energized to keep the windings dry until the time of installation if the fans are to be stored for more than one month. The rotor assembly should be rotated manually once a month to avoid brinelling the shaft bearings and to circulate grease in the cavity of each motor bearing.

Only stable and secure lifting devices of adequate capacity should be used to move the items. The fan assembly is equipped with lifting eyes at the top of the casing near each flange. If the fan equipment is to be lifted from below, chains should not be used under the fan casing. Web slings may be used under the fan next to each flange, using a spreader bar if necessary. If there is any doubt as to the appropriate lifting method, use the safest way and one which does not damage the fan equipment. Note that the fan assembly weight is shown on the assembly drawings.

Some parts of the basic fan may extend beyond the casing and care must be taken to prevent damage to them during rigging. When the fan is in place on its foundation, it must be leveled accurately. Following this, the impeller is to be rotated slowly by hand to ensure that no blade tip is closer than 0.130 inches from the casing at any point of rotation.

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3.0 RIGGING AND ERECTION (CONT'D)

3.2 Transition Installation

The transition sections for all fans will arrive in either two or four sections, depending on size. For drawings see Section 6.

The transitions should be handled using slings and hooks (no chains), where convenience lifting bolts can be used in flange holes. Care should be taken not to damage the galvanic finish on the transitions.

After transition sections are located on concrete housekeeping pad, then the two halves or four quarters can be bolted together using the supplied stainless steel bolts and neoprene gaskets. Special care should be taken to ensure transitions are at correct elevation and alignment with fan casing is correct. On completion of this operation, anchor bolts can be installed using Helty two component fixing devices.

Special care should be taken when bolting the transition sections to the fan flanges to ensure that gasket is in correct location and no undue loads and stresses are transmitted to the flexible connections between fans and transitions.

The suggested sequence for installation of fans and associated equipment is as follows:

a) Install, align and level off fan.
b) Install, align and level off transitions.
c) Install flexible connections.
d) Install, align and level off silencers.
e) Install all screen guards.

Temporary bracing on transition sections should only be removed once the transitions are located in their final place.

Flexible connections will have threaded rods connected to them to prevent damage during transportation. These rods need to be removed prior to start-up of systems.

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3.0 RIGGING AND ERECTION (CONT'D)

3.3 Silencer Installation

The silencer casing and baffles will arrive on site on skids. Two silencer casings will be on one skid and baffles for one silencer will be on two skids. All equipment will be clearly marked with station identification number and equipment designation number. Extreme care should be taken when handling the silencer baffles which are made from light gauge sheet metal and packed with fiberglass absorptive material.

Each silencer casing consists of twelve or eight side panels. For details on individual silencers see Section 8.

FIRSTLY, the three casing sections for the base will be bolted together using correct bolts and caulking material. The bottom section will then have four feet welded to it and placed in position on the housekeeping pad. Anchor bolts can be installed. The side panels, again comprised of three sections each, can be bolted together and lifted into position onto the base section of the silencer. Again, silicone caulking should be used on the joints. NOTE: It may be necessary to use temporary bracing across the end flanges of the silencers to maintain correct position of the side walls.

The baffles can now be installed in the silencer casing, starting with the side wall baffles. For fixing all baffles in position with correct bolting pattern, see relevant drawing. In most instances two baffle sections are joined together to make one complete unit. Self-tapping screws and plate cleats are used to fasten the baffles in place to the bottom of the casing section. NOTE: One cleat at either end of the baffle. Special care should be taken when fitting one baffle section to the other baffle section to ensure that the front and rear section of the baffle slide into one another correctly and that no protruding edges are visible.

The top of the silencer casing can now be assembled and installed onto the lower portion of the casing using correct bolts and silicone sealer. Once the top is in place, the spacing of the baffles should be verified using a "made up" spacer, and the self-tapping screws installed through the top of the casing into the top of the baffle. The half

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3.0 RIGGING AND ERECTION (CONT'D)

3.3 Silencer Installation (Cont'd)

width side baffles can also be fastened using the self-tapping screws through the side casing.

Caulking should be applied between the end baffles (half baffle) and the side casing.

It may be found to be advantageous to preassemble the silencer complete with baffles adjacent to the housekeeping pad, and if lifting equipment is available, of the correct capacity, move the completely assembled unit into place. This procedure will need to be done on silencer assembly UA41B because it is supported from the roof. Vertical silencers may also require preassembly prior to final installation.

3.4 Screens

The screens can now be installed on sound attenuators or, where necessary, the dampers. No gasketing is required between the sound attenuator casings and the screen frame. Correct stainless steel bolts should be used for installation. For drawings see Section 6.

3.5 Dampers

For installation of the dampers see Section 7 in this manual.

4.0 FAN START-UP: INITIAL

4.1 Pre-start Check

4.1.1 All loose debris must be removed from the fan, connected equipment and ductwork.

4.1.2 Lubrication Check

See Lubrication in Section No. 6.3 of this section.

4.1.3 Power Check

Verify that the voltage available to the electrical equipment is nominally correct and is within acceptable NEMA limits. (Fan motors, blade actuator motors, damper, actuator motors and vibration and shock pad systems.)

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4.0 FAN START-UP: INITIAL (CONT'D)

4.1 Pre-start Check (Cont'd)

4.1.4 Rotation Check

With all personnel clear of fan and connected equipment, bump-start the fan to check rotation. Rotations are marked on casing sections for forward or reverse flow.

4.1.5 The direction of rotation may be safely checked during coast-down by viewing through the access door in the casing section.

4.1.6 Operational Start

All personnel must be clear of the fan and connected equipment and ductwork any time the fan is started. Failure to do so may result in serious injury. System dampers must be open. When the above checklist is satisfactorily completed, the fan may be started and vibration levels measured and recorded. See Vibration in Section 5.4 for pertinent data on vibration levels.

5.0 OPERATION OF AXIAL TYPE FANS

5.1 Normal

The axial fans supplied under this contract are designed and built to meet or exceed the required performance levels. Normal operation, assuming no system variations or deficiencies, consists of stable air flow and pressure.

5.2 Abnormal Operation

Abnormal operation refers to deviation from performance point, wide or cyclic variation in power draw, excessive vibration or noise, and similar mechanical/electrical problems. If there is ever any doubt as to whether operation is safe, the fan should be shut down and the problem investigated and resolved before restarting the fan.

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5.0 OPERATION OF AXIAL TYPE FANS (CONT'D)

5.3 Special Operation

Should the fans remain idle, once installed, for prolonged periods, the space heaters need to be energized and they should be run for a few minutes or the impellers rotated manually once a month to prevent brinelling of the motor bearings and to circulate the grease in the cavity of each motor bearing.

5.4 Vibration

The following vibration levels are recommended for operation:

FAN TYPE	RPM	NORMAL	ALARM	SHUTDOWN
OTE	900	1.6 mil	3.2 mil	6.4 mil
UP	900	1.6 mil	3.2 mil	6.4 mil
Emergency Fan	1200	1.2 mil	2.4 mil	4.8 mil
Subway Vent. Fan	1200	1.2 mil	2.4 mil	4.8 mil

5.4.1 Above figures are in mils peak-to-peak.

5.4.2 Axial measurements should not normally exceed one half of the above levels.

5.4.3. Measurement location can be on the fan casing or support frame for testing, the permanent monitors are located on the fan support legs.

5.4.4 Any balancing should be done only by an experienced balancing technician.

5.5 Changes in Performance

On site conditions may require an increase or a decrease in the pitch angle of the impeller blades to meet new performance requirements.

Overhead Trainway Exhaust Fan:

The pitch angle of the impeller blades is varied via two adjustment screws on either side of the fan center hub. The blade position is set by the two nuts on each side of the threaded rods. Motion parallel to the center line of the motor is transmitted through connecting linkage to the impeller blades, all of which are adjusted simultaneously.

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5.0 OPERATION OF AXIAL TYPE FANS (CONT'D)

5.5 Changes in Performance (Cont'd)

To adjust the pitch angle of the impeller blades, the two lock nuts, one either side of the cover, must be loosened to allow the adjustment nuts to be turned. Turning the nuts to travel towards the impeller decreases the pitch angle (reduces flow), turning the nuts to travel away from the impeller increases the pitch angle (increases flow). Pitch angle is shown by marks on the fan shroud and blade base. These will either be punched or cast into the relevant pieces of equipment. Fine adjustments to blade angle can be made by using a protractor between the blade base and the impeller fairing.

When the desired blade pitch is reached, the two lock nuts on the adjusting studs must be secured to maintain the pitch angle.

Emergency and Subway Ventilation Fans:

All blades on the SVF and EF fans are attached separately to the impeller fairing, by the use of a backing plate and four allen head cap screws. All blades have to be individually adjusted.

To adjust the pitch angle of the impeller blades, unlock all four retaining cap head screws and using the scale stamped on the hub rim, set the desired angle. On completion of this operation, tighten all cap head screws. Fine adjustments to blade angle can be made using a protractor between the blade base and the edge of the hub rim. Again, all blades must be individually adjusted.

On completion of any adjustments inside the fan casing, ensure that all tools and debris from fan interior are removed and all covers are replaced and bolted securely in position. The amperage draw by the motor should be checked immediately after restarting the fan to ensure that rated motor amps are not exceeded. NOTE: Motor information is shown on nameplate attached to both the motor and the fan casing.

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5.0 OPERATION OF AXIAL TYPE FANS (CONT'D)

5.5 Changes in Performance (Cont'd)

Underplatform Fan:

In the case of the underplatform fan, the blades are adjusted simultaneously as with the overhead train way exhaust fans, but because variable flow is required from these units, in-flight adjustment mechanisms have been added to these fans. When the fans are cycling correctly, the blades will move automatically from fully closed to their predetermined open position by use of an electrical actuator connected to the fan hub via a turnbuckle and operating arm. It should be noted that extent of blade movement can be altered by the actuator, and the turnbuckle mechanism, but also blade angle limit stops are installed on the fan hub. Should additional flow or pressure be required from the underplatform fans, then the blade angle limiting studs need to be adjusted, and the blade actuator needs adjustment as well. Blade actuator adjustment can be found under Section 5 in this manual.

6.0 MAINTENANCE

6.1 General

Axial and tube-axial fans are quality products which have been designed and built to provide reliable service with a minimum of maintenance. If properly maintained as described below, they can be expected to provide many years of trouble free service.

6.2 General Physical/Mechanical

6.2.1 Periodic Inspection

It is good practice to inspect a fan periodically, perhaps after every six months of service, for its general physical and mechanical condition. Such an inspection includes checking of castings, mechanical tightness of bolted connection, condition of paint and exposed metal surfaces, build-up of dirt on impeller blades, blade position and blade tip clearance.

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6.0 MAINTENANCE (CONT'D)

6.2 General Physical/Mechanical (Cont'd)

6.2.2 Vibration

All of the fans supplied on this contract are equipped with continuous vibration and bearing damage detection monitoring systems. Section 5 of this manual entitled "Vibration Monitoring and Bearing Damage Detection Systems", deals fully with the supplied apparatus.

6.2.3 Major Inspection and Service Lubrication of Fan Impellers

In the case of the emergency fans, the following procedure can be used.

Every three years, the fan impeller should receive a thorough inspection to determine the condition of the blades, the clearances between blade tips and fan casing, torque settings on blade bolts and torque setting on bolts used to hold impeller to motor shaft. At this time, the complete fan should be wiped clean of any contamination such as dust or grease which may have accumulated. There are no grease points on the emergency fans or station ventilation fans.

Procedures for the overhead train way exhaust fans are as follows:

Every three years the fan impeller should receive a service lubrication in addition to the periodic inspection of the entire fan. Prior to this lubrication, the impeller should be wiped clean of any grease or dirt build-up which may have accumulated.

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6.0 MAINTENANCE (CONT'D)

6.2.3 Major Inspection and Service Lubrication of Fan Impellers (Cont'd)

As part of the blade pitch angle adjustment, the cast spider slides axially along a finished OD on the impeller hub. The sliding surface between these parts requires lubrication at intervals more frequent than three years only if the blade angle is often adjusted. For this contract, the pitch angle is expected to remain at a given setting for long periods of time.

Thus, the three-year interval should be adequate. When required, Chevron SR2, or equal, grease should be added through a grease fitting on the side of the cast spider.

At the end of each spider leg a drag link connects the spider to each blade base. The drag link has a bronze bearing at each end. Without removing these drag links, wipe each bearing clean and lubricate with an aerosol silicone based lubricant such as CRC or WD40. The blade base is a casing which would normally house a bearing, but in this type of application no bearing is used and consequently no lubrication is required.

Underplatform Fans

In the case of the underplatform fans, the following procedure should be used. Once every four months, the fan impeller should receive a service lubrication in addition to the periodic inspection of the entire fan. Prior to this lubrication, the impeller should be wiped clean of any grease or grime which may have accumulated.

As part of the blade pitch angle adjustment, the cast spider slides axially along the finished OD of the impeller hub. The sliding surface between these parts requires lubrication at regular four-month intervals. A Chevron SR2 grease, or equivalent, should be used. The grease can be added through a grease fitting on the side of the cast spider assembly. NOTE: The fan needs to be stationary and locked out before this operation should be performed.

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6.0 MAINTENANCE (CONT'D)

6.2.3 Major Inspection and Service Lubrication of Fan Impellers (Cont'd)

At the end of each spider leg a drag link connects the spider to each blade base. The drag link has a bronze bearing at each end. Without removing these drag links, wipe each bearing clean and lubricate with an aerosol silicone-based lubricant such as CRC or WD40.

The base of each blade has a thrust or bearing race for smooth blade actuation. Each blade bearing housing has a grease nipple located on the inside of the fan hub which requires greasing every four months with a Chevron SR2 grease or equivalent. NOTE: The same amount of grease should be added to each blade bearing to ensure the fan stays in balance. Recommended quantity is two pumps from a cartridge type grease gun.

6.3 Motor Bearing Lubrication

The motor bearings are initially lubricated by the motor manufacturer and should not normally require any additional lubrication prior to start-up. The bearings should, however, be lubricated when the following conditions apply:

1) Fan in storage or idle for six months.
2) At every 2,000 hours of normal operation.
3) Once a year.

The above three options apply to all fans supplied on this contract.

6.3.1 Motor Bearing Lubrication Procedure

1) The lubrication fitting is located at the front and rear of the motor and is connected to a conveniently located bulk head fitting outside the fan casing.

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6.0 MAINTENANCE (CONT'D)

6.3.1 Motor Bearing Lubrication Procedure (Cont'd)

2) Each lubrication fitting will have a companion port for pressure relief and draining of old grease through a spring loaded purge valve.

3) Using a Chevron SR2 grease, or equal, add three strokes (hand cartridge gun) to each bearing.

   Adding grease does not imply that lubricant will come out of the relief ports. These ports are primarily intended to relieve pressure.

4) Wipe any excess grease from the lubrication fittings and ports and replace the plugs in the relief ports. **CAUTION: DO NOT OVER-LUBRICATE THE BEARINGS AS THIS CAN DAMAGE BEARING SEALS AND FORCE LUBRICANT INTO THE MOTOR HOUSING.**

5) Grease Listing and Quantity

HORSEPOWER	PERIOD	STROKES (See Note)
50-150	6 months	3

NOTE: Normal amount of grease delivered by a hand cartridge type grease gun.

Use only the following lubricants or their equal:

Chevron SR2	A.F. No. 2
Precision No. 2	Alvania No. 2
Starfak H, M and No. 2	Mobilux No. 2
	Mobil Grease NO. 77

The grease fittings must be clean to prevent contamination.

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6.0 MAINTENANCE (CONT'D)

6.4 Exposure to 300°F or More

In the event of an emergency fan operation at a temperature of 300°F, the impeller should receive a full inspection as outlined above, preferably by a Flakt Service Technician. If the impeller is in satisfactory condition, it can be relubricated as indicated above and returned to service.

The motor should be checked by a licensed service shop of Reliance Electric Company before being returned to service.

Restart after these inspections should be conducted according to the information given for initial start-up.

6.5 Impeller and Motor

6.5.1 Impeller and Motor Removal for Emergency, Underplatform, Overhead Train Way Exhaust, and Subway Ventilation Fans

It will be necessary to remove the impeller from the motor in order to remove the motor for major service or replacement. This may be accomplished as follows, with reference to the relevant drawings as listed in Section 6.

Disconnect and Lock Out of All Power to the Fan

The main conduit box will be opened and all power cables disconnected. Instrumentation wiring terminal box should also be opened and all connecting wiring disconnected. It will be noted from the drawing of the particular fan that the fan casing is split horizontally. This is to facilitate removal of complete upper section of the fan.

Bolts connecting upper and lower portion of the fan should be removed. Bolts connecting to fan to anti-stall of blade track section and connecting cones should also be removed. The upper portion of the fan casing can now be removed.

6.0 MAINTENANCE (CONT'D)

6.5.1 Impeller and Motor Removal for Emergency, Underplatform, Overhead Train Way Exhaust, and Subway Ventilation Fans (Cont'd)

The conduit piping for main motor terminal leads and instrumentation can now be disconnected from the motor and removed. When sliding conduit over wiring use extreme caution.

The impeller can be removed from the motor shaft by using a puller bar. The impeller should be supported by web slings during removal. NOTE: Do not use chains around the impeller. Do not remove the snap rings inside the hub and do not lose the socket head screw, shaft key or thrust washer, as these items are required for reassembly. To support the weight of the impeller during removal one blade can be removed and an adapter plate with an eye bolt secured in its place. Using a small hoist and an eye bolt attached to the inside of the anti-stall chamber or flange of blade track area, the weight of the impeller can be supported during removal of said impeller.

Once the impeller has been removed and secured in place the motor hold-down bolts and location dowels can be removed, the motor moved back on its base plate and then, if necessary, removed from the fan casing. NOTE: Ensure bearing lubrication lines and bearing vent lines are removed prior to moving motor.

6.5.2 Impeller Installation

On repair/replacement of motor, reassembly of motor and impeller will proceed as follows:

Motor will be lowered onto base plate, moved into correct position and shimmed to the correct height. Motor location dowels will be reinstalled and motor hold-down bolts tightened up.

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6.0 MAINTENANCE (CONT'D)

6.5.2 Impeller Installation (Cont'd)

The motor shaft should be cleaned with a solvent and a light film of anti-cease compound such as Mol-Kote GN or equivalent applied. Locate the key in the motor shaft keyway. The impeller should be supported by web slings (not chains) and lifted into position ahead of the motor shaft and key. Be sure the snap ring is in its correct place inside the hub. Slide the impeller onto the motor shaft using a puller bar to bring the impeller up to its correct location against the snap ring.

Clean the thrust washer retaining bolt and the tapped threads inside the motor shaft. Apply Locktite grade "T" primer to the threads. Allow Locktite to air dry for five minutes, then apply Locktite 242 to the threads. Install the thrust washer in the correct cavity, then insert the thrust washer hold-down bolt into the end of the shaft. Torque the screw to the settings stipulated on the relevant drawing. The web slings may now be removed from the impeller after it has been secured on the motor shaft. Remove adapter plate for lifting impeller and replace blade. For subway ventilation fans and emergency fans, ensure blade is in correct position relative to remaining blades.

The conduit piping for main motor leads and motor instrumentation can now be reconnected to motor. Again, care must be taken not to damage electrical cables.

Grease lubrication lines and ventilation lines can also be connected at this time.

When reassembling the fan casing, special attention should be paid to lowering the fan casing upper half into place on the lower half as flange gaskets will tend to get pinched. Once the upper casing is in the correct place, gaskets are in their correct positions, then all bolts securing the top half of the fan casing to the lower half and flanges either end of casing can be installed and tightened.

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6.0 MAINTENANCE (CONT'D)

6.5.2 Impeller Installation (Cont'd)

Follow the previously given service lubrication and start-up instructions to put the fan back in service.

7.0 SPARE PARTS

In general, it is not expected that these fans will require the stocking of any spare parts beyond those listed in the contract specifications. The fan casing and vane sections are of heavy construction and are not likely to require replacement except in cases of major catastrophe; on-site repair may be possible. Impeller part replacement may be done by the Owner or by a Flakt Service Technician. The motors are custom built and would best be serviced by a service facility licensed by the manufacturer. Spare motor bearings, if desired, are readily available from the motor manufacturer.

Any spare parts for the fan may be ordered through a local Flakt representative or directly from the factory. Prices will be quoted at the time of the order. Parts orders should specify:

1) Fan Model Number.
2) Fan Serial Number.
3) Part Description (and drawing number and item, if known).
4) Quality required.

Other than the Chevron SR2 or equal, the only materials which might be convenient to have on hand are:

Locktite Grade T Primer, P/N 100244-01 (6 oz. aerosol)

Locktite 242, P/N 100244-20 (50 cc. bottle).

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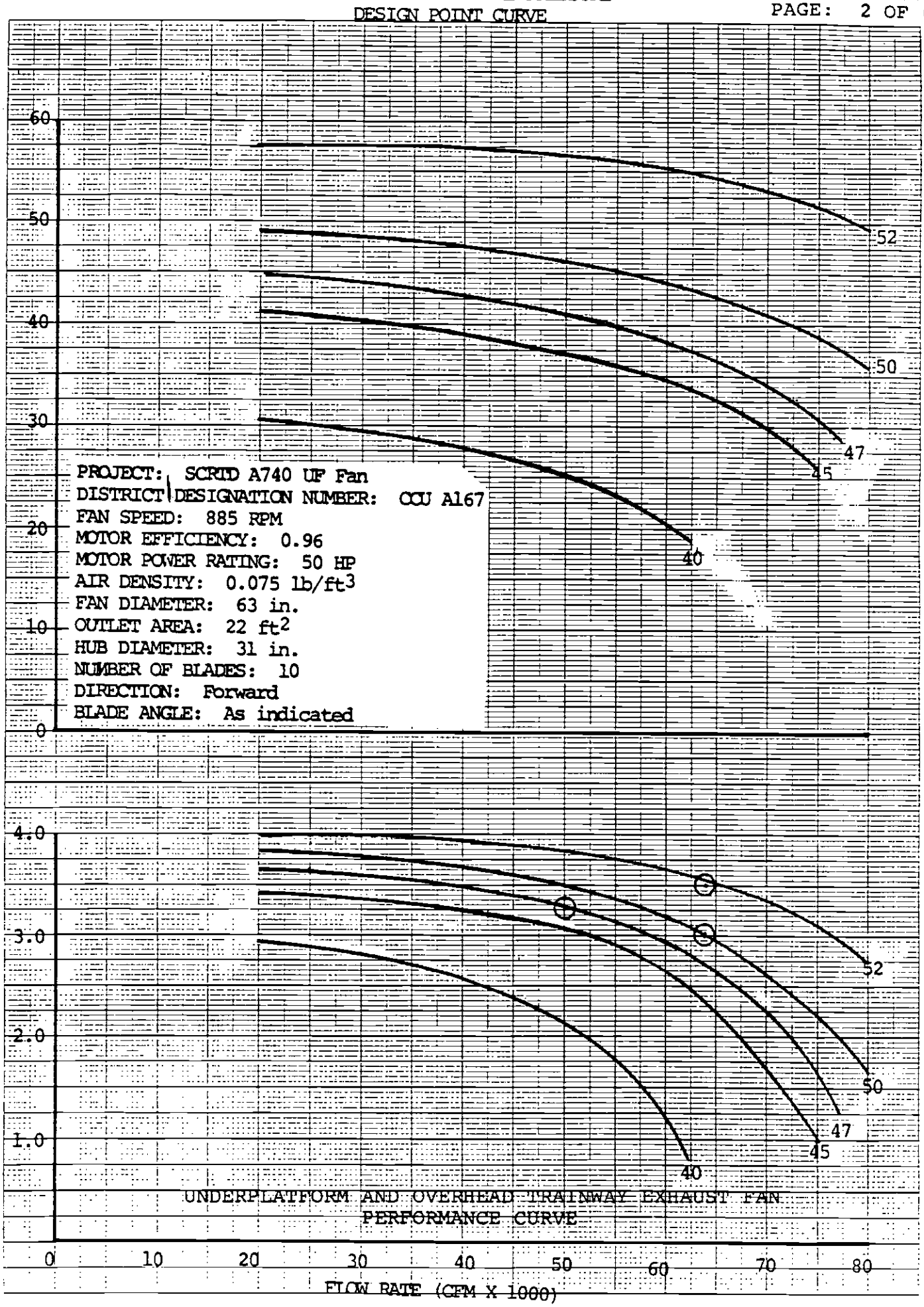
SECTION TWO

FAN PERFORMANCE CURVES

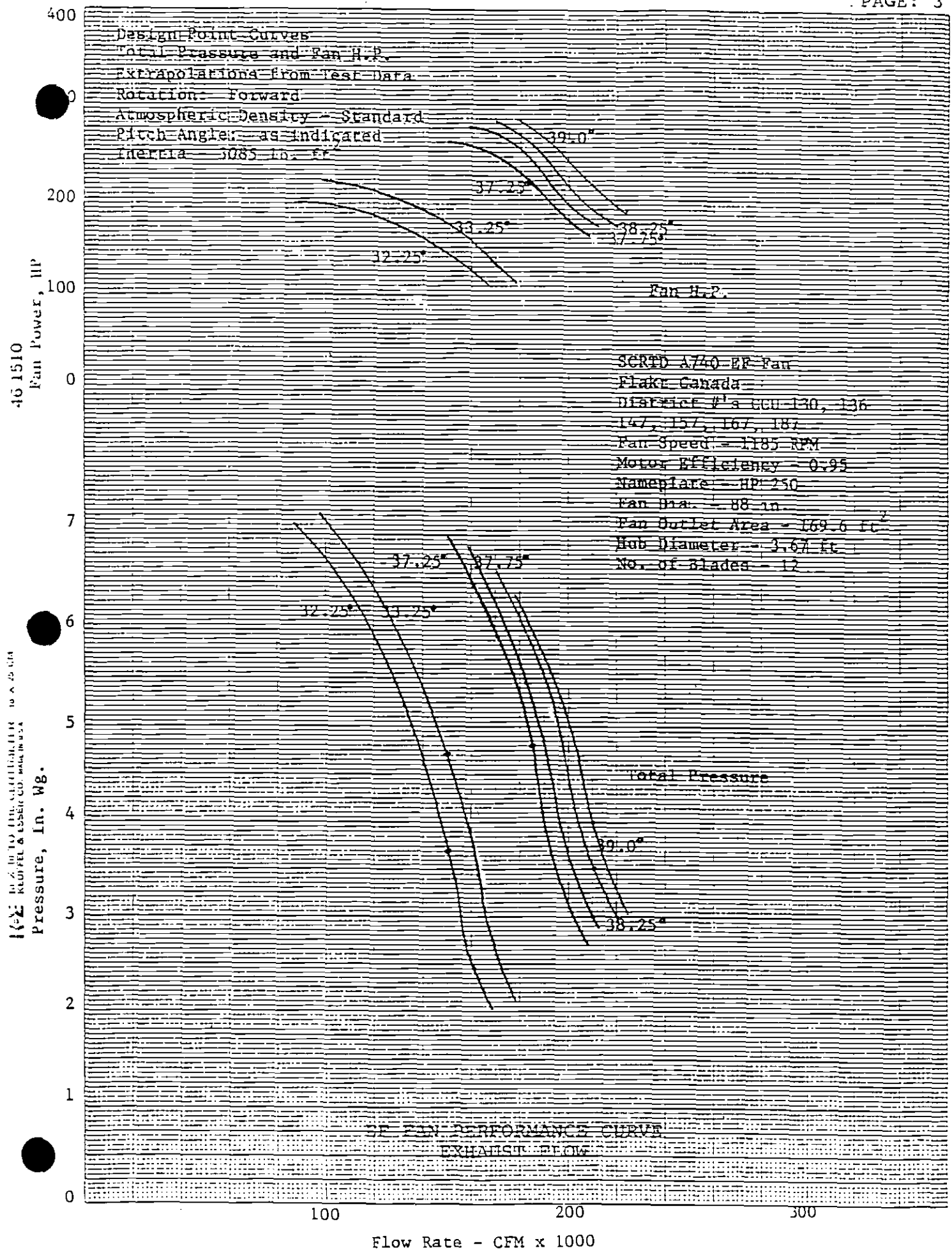
- UNDERPLATFORM AND OVERHEAD TRAINWAY EXHAUST FANS
- EMERGENCY FAN, EXHAUST FLOW
- EMERGENCY FAN, SUPPLY FLOW
- SUBWAY VENTILATION FAN, EXHAUST FLOW
- SUBWAY VENTILATION FAN, SUPPLY FLOW

FAN POWER AND TOTAL PRESSURE
DESIGN POINT CURVE



UNDERPLATFORM AND OVERHEAD TRAINWAY EXHAUST FAN
PERFORMANCE CURVE

461510



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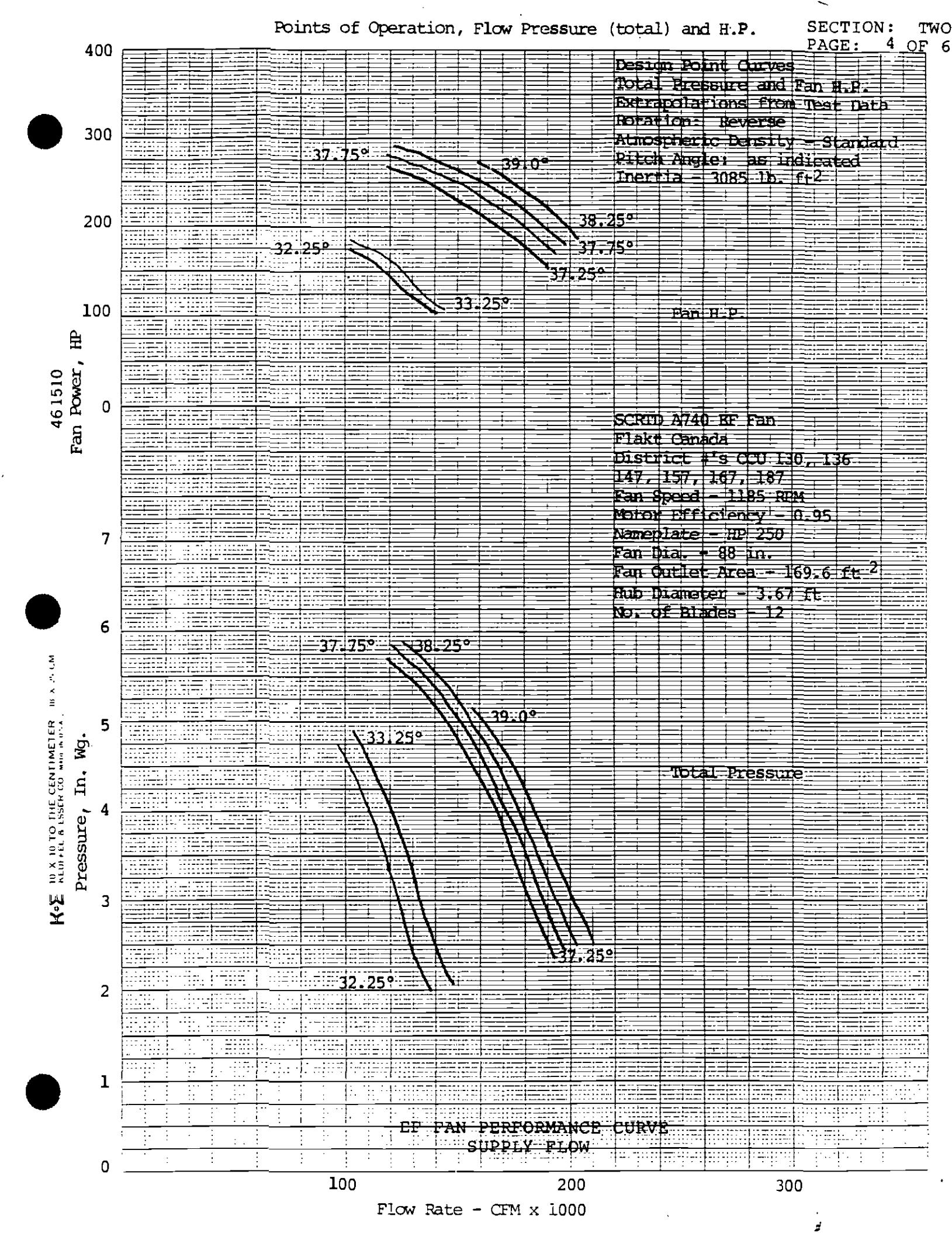
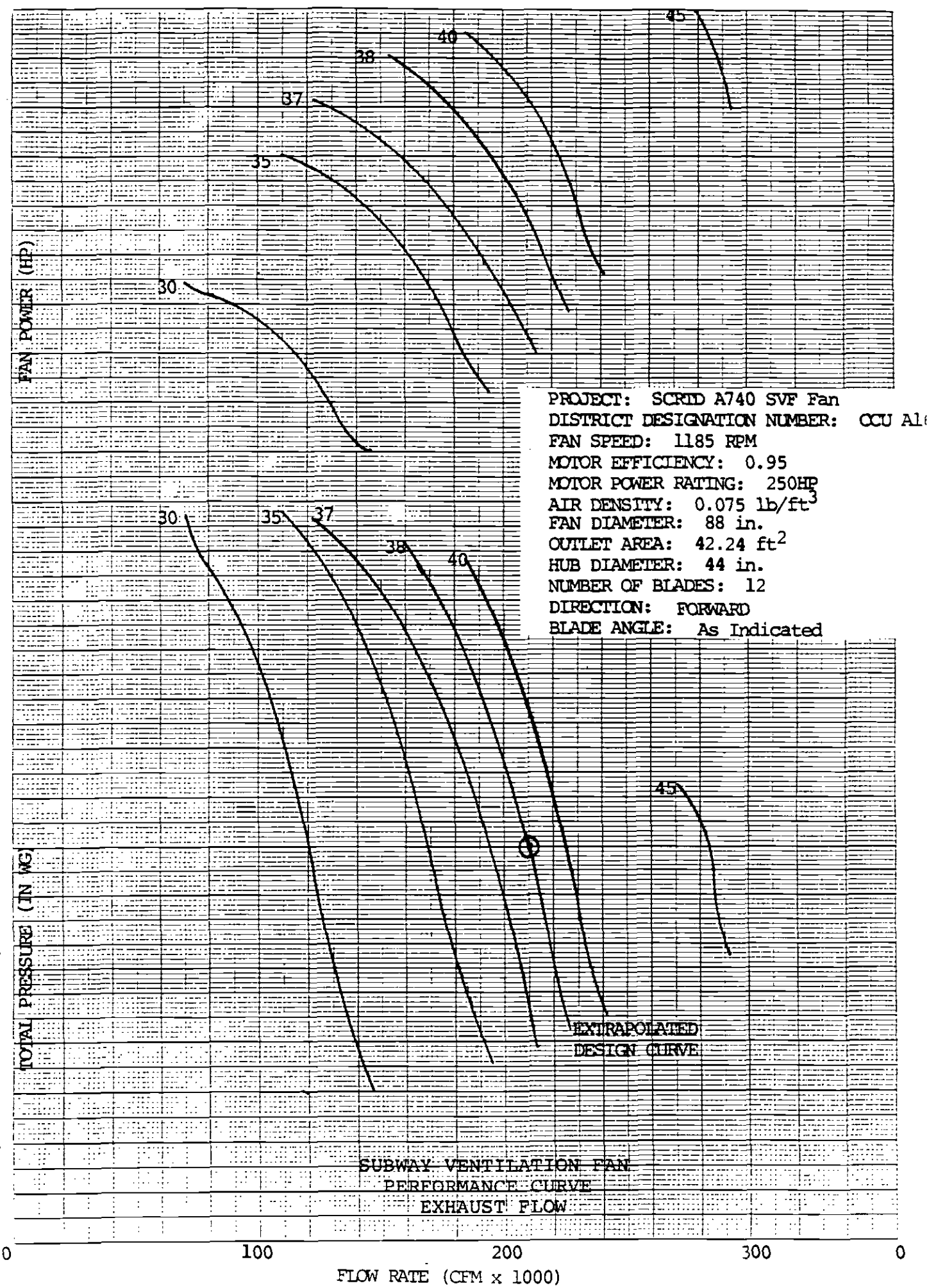
SF FAN PERFORMANCE CURVE
EXHAUST FLOW

Points of Operation, Flow Pressure (total) and H.P.



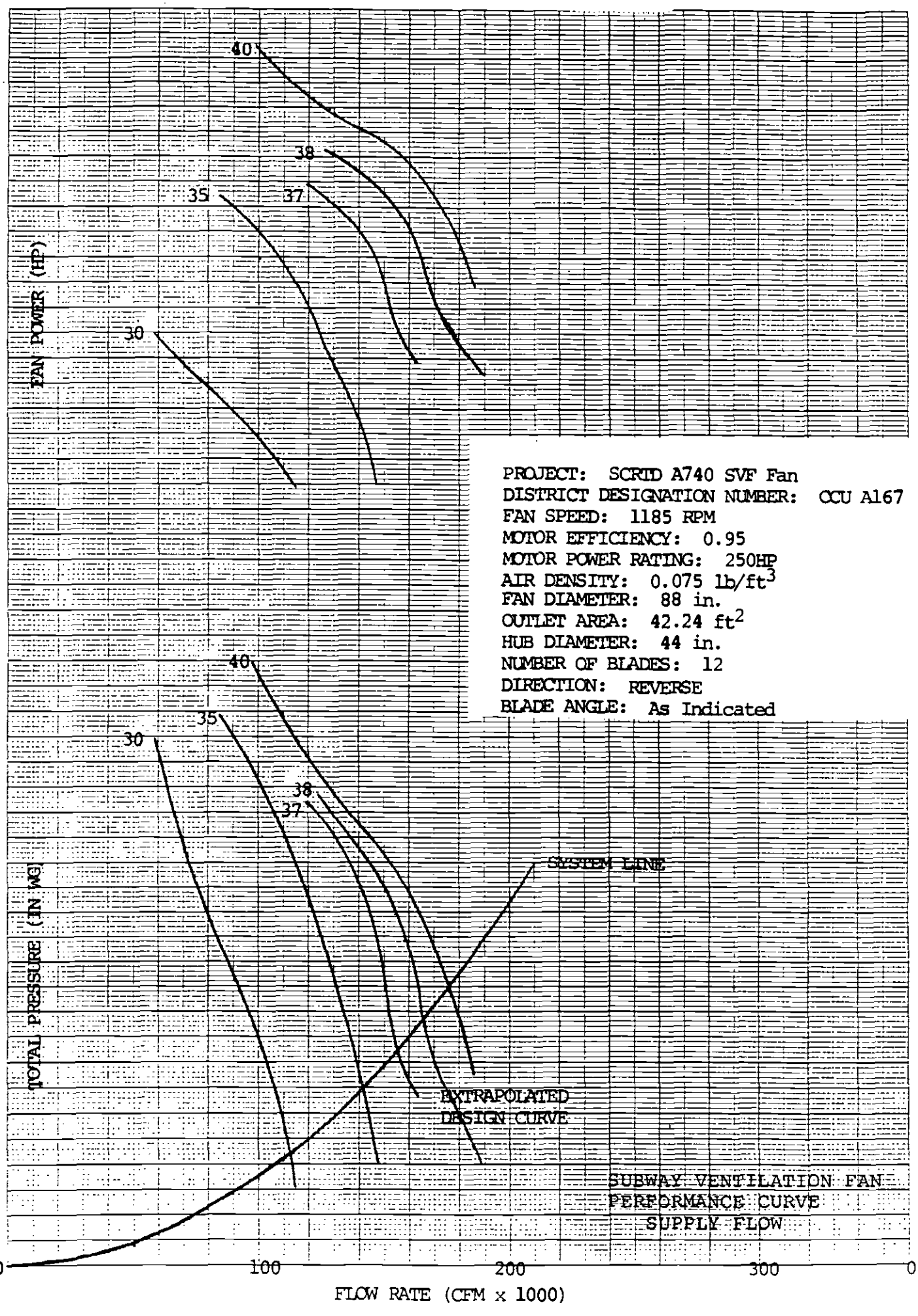
DESIGN POINT CURVE



PROJECT: SCRID A740 SVF Fan
DISTRICT DESIGNATION NUMBER: CCU Al
FAN SPEED: 1185 RPM
MOTOR EFFICIENCY: 0.95
MOTOR POWER RATING: 250HP
AIR DENSITY: 0.075 lb/ft^3
FAN DIAMETER: 88 in.
OUTLET AREA: 42.24 ft^2
HUB DIAMETER: 44 in.
NUMBER OF BLADES: 12
DIRECTION: FORWARD
BLADE ANGLE: As Indicated

461510

FAN POWER AND TOTAL PRESSURE - DESIGN POINT CURVE



461510

K&E 10 X 10 TO THE CENTIMETER

Flakt Inc.

EMERGENCY & VENTILATION FANS
OPERATION, MAINTENANCE AND INSTALLATION MANUAL

SECTION THREE

MOTOR DATA

- LUBRICATION SCHEDULE
- MOTOR PARTS LIST
- RELIANCE A-C MOTOR INSTRUCTION MANUAL
- TECHNICAL DATA FOR:
  1) FRAME 404T, 50 HP
  2) FRAME 445T, 150 HP
  3) FRAME 449T, 200 HP
  4) FRAME 449T, 250 HP

Flakt

EMERGENCY & VENTILATION FANS
OPERATION, MAINTENANCE AND INSTALLATION MANUAL

MOTOR LUBRICANT INFORMATION

The following lubricants apply to the motors, blade bearings and center hub blade adjusting devices.

Grease Listing and Quantity

HORSEPOWER	PERIOD	STROKES (See Note)
50-250	6 months	3

NOTE: Normal amount of grease delivered by a hand cartridge type grease gun.

Use only the following lubricants or their equal:

Chevron SR2	A.F. No. 2
Precision No. 2	Alvania No. 2
Starfak H, M and No. 2	Mobilux No. 2
	Mobil Grease No. 77

The grease fittings must be clean to prevent contamination.

RELIANCE ELECTRIC M O T O R P A R T S L I S T

CUST. PO. NO.	DATE	SALES ORDER NUMBER		
CP773004	10/11/88	2MAF38651	02	PAGE : 1

SOLD TO M. TURNER
FLAKT CANADA LTD.
1400 MERIVALE RD (K2C 3P9)
OTTAWA ONT CAN

SPECIAL MARKS: SCRDT/LA METRO RAIL

SHIP TO FAMCO-FORSYTH
216 JUNIA AVENUE
WINSTON-SALEM, NC 27107

RK

M O T O R I D E N T I F I C A T I O N

PROD LINE	FRAME SIZE	TYPE	INSL	DESIGN	SERV FCTR	PHASE	AMB.	DUTY	ENCL
E LINE AC	E00449T	P	H	B	1.15	3	040	CONT	TENV

HERTZ	HP	RPM	VOLTAGE	FL AMP	FT/MIN	CODE
60	200	1185	460		226.	G

BRG, DRIVE END 90BC03J30X26 BRG,OPP DRIVE END 90BC03J30X26

1 NAMEPLATE, 613-5C
1 NAMEPLATE,WARNING 692-F
1 NAMEPLATE,WARNING 692-F

P A R T S L I S T

QUANTITY	PART NUMBER	PART DESCRIPTION	DISC. SYM	LIST PRICE
1	89433-1A	FRAME		
1	604983-7R	SHAFT		
1	418143-76W	ROTOR		
1	416821-3G	B BRG,FE	S1	5.00
1	416821-3G	B BRG,BE	S1	5.00
1	603993-58D	CAP,FE INNER		
1	604978-22R	CAP,BE INNER		
1	89441-54B	BRKT,FE		
1	410700-4A	WAVY WSHR,FE BRKT	S1	32.00
1	415045-2C	SLINGER,FE		
1	412118-6A	DRAIN,FE BRKT		
1	418150-3A	CAPPLUG,FE GREASE		
1	35000-1A	ALEM FTG,FE		
1	48977-6J	RELIEF FITTING,FE		
1	89447-61B	BRKT,BE		
1	415045-2C	SLINGER,BE		
1	412118-6A	DRAIN,BE BRKT		
1	702623-1B	THERMAL BARR,BE		
1	418150-3A	CAPPLUG,BE GREASE		
1	35000-1A	ALEM FTG,BE		
1	76870-D	CONDUIT BOX	S1	484.00
1	76871-A	COVER,C/BOX	S1	330.00
2	75456-A	CONDUIT BOX,AUX	S1	42.00
2	75457-A	COVER,AUX C/BOX	S1	20.00
2	49843-19B	ADAPT,AUX C/BOX		
1	406056-7A	TERMINAL BOARD		

RELIANCE ELECTRIC M O T O R P A R T S L I S T

CUST. PO. NO.	DATE	SALES ORDER NUMBER		
CP773004	10/11/88	2MAF38651	02	PAGE : 2

QUANTITY	PART NUMBER	PART DESCRIPTION	DISC. SYM	LIST PRICE
1	67053-1A	GASK,CVR C/BOX		
2	65774-C	GASK,C/BASE AUX		
1	33510-4L	HHTTS,GROUND LUG		
2	604943-27S	ADAPT,SWITCH		
1	48897-10D	PLUG,FE BRKT		
1	34180-16H	KEY,FE		
1	34180-54K	KEY,BE		
2	33775-4E	DR SCR,N/PLT		

STICKERS & TAGS : 412031-1A

604989-193 DIMENSION SHEET

10 P/L TO SOLD TO
1 P/L TO 05244 (C.M. MCCARTHY-RNY)
1 P/L TO 84772 (S.P. WESTON-RLA)
12 COPIES

ELIANCE ELECTRIC M O T O R P A R T S L I S T

UST. PO. NO. DATE SALES ORDER NUMBER

P773004 10/24/88 3MAF38651 01 PAGE : 1

OLD TO M. TURNER SPECIAL MARKS: SCRDT/LA METRO RAIL
FLAKT CANADA LTD.
1400 MERIVALE RD (K2C 3P9)
OTTAWA ONT CAN

HIP TO FAMCO-FORSYTH
216 JUNIA AVENUE RK
WINSTON-SALEM NC 27107

----------M O T O R I D E N T I F I C A T I O N----------

ROD LINE	FRAME SIZE	TYPE	INSL	DESIGN	SERV FCTR	PHASE	AMB.	DUTY	ENCL
LINE AC	E0044ST	P	H	B	1.15	3	040	CONT	TENV

ERTZ	HP	RPM	VOLTAGE	FL AMP	FT/MIN	CODE
60	150	1185	460		174.	F

BRG, DRIVE END 90BC03J30X28 BRG,OPP DRIVE END 90BC03J30X28
TAMP N/P B/L '115 DEG C R

1 NAMEPLATE,WARNING 692-F 1 NAMEPLATE,WARNING 692-F

----------P A R T S L I S T----------

UANTITY	PART NUMBER	PART DESCRIPTION	DISC. SYM	LIST PRICE
1	89432-1A	FRAME		
1	604981-25R	SHAFT		
1	418143-76Y	ROTOR		
1	416821-15G	B BRG,FE		
1	416821-15G	B BRG,BE		
1	603993-58D	CAP,FE INNER		
1	604978-22R	CAP,BE INNER		
1	89441-54B	BRKT,FE		
1	410700-4A	WAVY WSHR,FE BRKT	S1	32.00
1	415045-2C	SLINGER,FE		
1	412118-6A	DRAIN,FE BRKT		
1	418150-3A	CAPPLUG,FE GREASE		
1	35000-1A	ALEM FTG,FE		
1	48977-6J	RELIEF FITTING,FE		
1	89447-61B	BRKT,BE		
1	415045-2C	SLINGER,BE		
1	412118-6A	DRAIN,BE BRKT		
1	702623-1B	THERMAL BARR,BE		
1	418150-3A	CAPPLUG,BE GREASE		
1	35000-1A	ALEM FTG,BE		
1	76870-B	CONDUIT BOX	S1	810.00
1	76871-A	COVER,C/BOX	S1	330.00
2	75456-A	CONDUIT BOX,AUX	S1	42.00
2	75457-A	COVER,AUX C/BOX	S1	20.00
2	49843-19B	ADAPT,AUX C/BOX		
1	67053-1A	GASK,CVR C/BOX		

:LIANCE ELECTRIC M O T O R P A R T S L I S T

ST. PO. NO.	DATE	SALES ORDER NUMBER		
773004	10/24/88	3MAF38651 01	PAGE :	2

ANTITY	PART NUMBER	PART DESCRIPTION	DISC. SYM	LIST PRICE
2	65530-D	GASK,CVR C/B AUX	S1	3.00
2	65774-C	GASK,C/BASE AUX		
1	33510-4L	HHTTS,GROUND LUG		
2	604943-27S	ADAPT,SWITCH		
1	48897-10D	PLUG,FE BRKT		
1	34180-16H	KEY,FE		
1	34180-22H	KEY,BE		
2	33775-4E	DR SCR,N/PLT		

ICKERS & TAGS : 412031-1A

604989-193 DIMENSION SHEET

P/L TO SOLD TO
P/L TO 05244 (C.M. MCCARTHY-RNY)
P/L TO 84772 (S.P. WESTON-RLA)
COPIES

Installation, Operation
and Care of

Reliance® Standard Integral Horsepower Induction Motors

- 180-449 FRAMES

Reliance
Electric

A-C MOTORS

We're keyed to your need.

Instruction Manual B-3620-17
February, 1987

TABLE OF CONTENTS

RECEIVING AND HANDLING

ACCEPTANCE

Thoroughly inspect the equipment before accepting shipment from the transportation company. If any of the goods called for in the bill of lading or express receipt are damaged or the quantity is short, do not accept them until the freight or express agent makes an appropriate notation on your freight bill or express receipt. If any concealed loss or damage is discovered later, notify your freight or express agent at once and request him to make an inspection. We will be very happy to assist you in collecting claims for loss or damage in shipment; however, this willingness on our part does not remove the transportation company's responsibility in reimbursing you for collection of claims or replacement of material. Claims for loss or damage in shipment must not be deducted from the Reliance Electric invoice, nor should payment of the Reliance Electric invoice be withheld awaiting adjustment of such claims, as the carrier guarantees safe delivery.

If considerable damage has been incurred and the situation is urgent, contact the nearest Reliance Electric District Office for assistance. Please keep a written record of all communications.

STORAGE – DUTY MASTER A-C MOTORS

Storage requirements for motors under negotiated extended warranty are listed below. When a negotiated extended warranty is in effect, these extended storage requirements must be followed to allow the submission of a valid warranty claim.

1. The motors, if not mounted, are to be stored in the original containers in a clean, dry, protected warehouse.
2. The storage area is to be free from any vibration and from extremes in temperature.
3. Bearings
   a. Ball & Roller (anti-friction regreasable type). The bearings are to be fully greased at the time of going into extended storage. Motor shafts are to be rotated manually every 6 months and additional grease added in the bearing cavity. Rotate shaft by hand before putting into service.
   b. Sleeve (oil lube) The bearings are tested using an oil containing a rust inhibitor. Prior to shipment the oil is drained. If motor is stored more than one month the oil reservoirs must be refilled to the indicated level with the specified lubricant. (See Instruction Manual) The shaft should be rotated by hand every month at least 10 to 15 revolutions to assure that an oil film is on the shaft and bearing surfaces.
   c. Ball (anti-friction non regreasable.) No additional bearing precautions are necessary.
4. **All drains to be fully operable while in storage, and/or the drain plugs removed. The motors must be stored so that the drain is at the lowest point. All breathers and automatic "T" drains must be operable to allow breathing at points other than through the bearing fits.**
5. All units equipped with heaters are to have the heaters connected if storage conditions in any way simulate or approach atmospheric conditions experienced in operation.
6. Windings to be megged at the time equipment is put in storage. At the time of removal from storage, the resistance reading must not have dropped more than 50% from the initial reading. Any drop below this point necessitates electrical or mechanical drying. Where a large quantity of motors is stored, an inspection or sampling should be made by removing the end brackets and visually inspecting for the presence of water in the grease or rust on the bearing. If present, replace the bearings and relubricate.
7. All external parts and motors subjected to corrosion should be protected by some corrosive resistant coating.
8. Where motors are not stored in the original containers, but are removed and mounted on other pieces of machinery, the mounting must be such that the drains and breathers are fully operable. In this respect, the drains must be kept at the lowest point in the motor and/or the drain plugs removed so that all condensation can automatically drain out.
9. All other storage conditions apply, including rotation of motor shafts. Where such conditions cannot be met, then the equipment must be treated the same as if it were mounted in its normal position, and all protective devices such as heaters, breathers, and drains fully operable.

UNPACKING

After unpacking and inspection to see that all parts are in good condition, turn the shaft by hand to be sure there are no obstructions to free rotation. Equipment which has been in storage for sometime should be tested and relubricated (regreasable type) prior to being put into service. Refer to "Test for General Condition" and "Lubrication" for procedure to be performed after extended storage.

Equipment with roller bearings is shipped with a shaft block at the opposite pulley end. In removing the shaft block, be sure to replace the bolts which are used to hold the shaft block in place during shipment.

INSTALLATION

INSPECTION

After the motor is unpacked, examine the nameplate data to see that it agrees with the power circuit to which it is to be connected. The motor will operate with frequency not more than 5% and voltage not more than 10% above or below the nameplate data, or combined variation of voltage and frequency of not more than 10% above or below nameplate data. Efficiency, power factor and current may vary from nameplate data. Performance within these voltage and frequency variations will not necessarily be in accordance with the standards established for operation at rated voltage and frequency.

GENERAL EFFECT OF VOLTAGE AND FREQUENCY VARIATION ON STANDARD EFFICIENT INDUCTION MOTOR CHARACTERISTICS

VARIATION	STARTING & MAX RUNNING TORQUE	SYNCHRONOUS SPEED	% SLIP	FULL-LOAD SPEED	EFFICIENCY			POWER FACTOR			FULL-LOAD CURRENT	STARTING CURRENT	TEMP RISE, FULL-LOAD	MAX OVERLOAD CAPACITY	MAGNETIC NOISE—NO LOAD IN PARTICULAR
					Full Load	3/4 Load	1/2 Load	Full Load	3/4 Load	1/2 Load					
Voltage variation: 120%	Increase 44%	No Change	Decrease 30%	Increase 1.5%	6-0% Decrease (1-75 HP) 0-.3% Increase (100-300 HP)	Decrease 1/2-2 points	Decrease 7-20 points	Decrease 5-15 points	Decrease 10-30 points	Decrease 15-40 points	Increase 12%	Increase 20%	Increase 5-6°C. (1-75 HP) Decrease 3-4° C (100-300 HP)	Increase 44%	Noticeable Increase
110% voltage	Increase 21%	No Change	Decrease 17%	Increase 1%	Slight Decrease	Practically no change	Decrease 1-2 points	Decrease 5-10 points	Decrease 5 points	Decrease 5-6 points	Increase 2-4%	Increase 10-12%	Increase 3-4° C.	Increase 21%	Increase Slightly
Functions of voltage	(Voltage)2	Constant	$\frac{1}{(\text{Voltage})^2}$	(Synchronous speed slip)								Voltage		(Voltage)2	
90% voltage	Decrease 19%	No Change	Increase 23%	Decrease 1-1/2%	Decrease 2 points	Practically no change	Increase 1-2 points	Increase 5 points	Increase 2-3 points	Increase 4-5 points	Increase 10-11%	Decrease 10-12%	Increase 6-7°C.	Decrease 19%	Decrease Slightly
Freq. variation: 105% freq.	Decrease 10%	Increase 5%	Practically no change	Increase 5%	Slight Increase	Slight Increase	Slight Increase	Slight Increase	Slight Increase	Slight Increase	Decrease Slightly	Decrease 5-6%	Decrease Slightly	Decrease Slightly	Decrease Slightly
Function of frequency	$\frac{1}{(\text{Frequency})^2}$	Frequency		(Synchronous speed slip)								$\frac{1}{\text{frequency}}$			
95% frequency	Increase 11%	Decrease 5%	Practically no change	Decrease 5%	Slight Decrease	Slight Decrease	Slight Decrease	Slight Decrease	Slight Decrease	Slight Decrease	Increase Slightly	Increase 5-6%	Increase Slightly	Increase Slightly	Increase Slightly
1% Unbalance	Slight Decrease	Slight Decrease		Slight Decrease	2% Decrease			5-6% Decrease			1-1/2% Increase	Slight Decrease	2% Increase		
2% Unbalance	Slight Decrease	Slight Decrease		Slight Decrease	8% Decrease			7% Decrease			3% Increase	Slight Decrease	8% Increase		

NOTE: This table shows general effects, which will vary somewhat for specific ratings.

LOCATION

The motor should be installed in a location compatible with the motor enclosure and specified ambient.

LIFTING MEANS

WARNING
WHEN A LIFTING MEANS IS PROVIDED FOR HANDLING THE MOTOR OR GENERATOR, IT SHOULD NOT BE USED TO LIFT THE MOTOR OR GENERATOR PLUS ADDITIONAL EQUIPMENT SUCH AS GEARS, PUMPS, COMPRESSORS, OR OTHER DRIVEN EQUIPMENT.

In the case of assemblies on a common base, any lifting means provided on the motor or generator should not be used to lift the assembly and base but, rather, the assembly should be lifted by a sling around the base or by other lifting means provided on the base. In all cases, care should be taken to assure lifting in the direction intended in the design of the lifting means. Likewise, precautions should be taken to prevent hazardous overloads due to deceleration, acceleration or shock forces.

DRIVE

The pulley, sprocket, or gear used in the drive should be located on the shaft as close to the shaft shoulder as possible. Heat to install. Driving a unit on the shaft will damage the bearings.

Belt Drive: Align the pulleys so that the belt will run true; tighten the belt just enough to prevent slippage, any tighter will cause premature bearing failure. If possible, the lower side of the belt should be the driving side.

Chain Drive: Mount the sprocket on the shaft as close to the bracket as possible. Align the sprockets so that the chain will run true. Avoid excessive chain tension.

Gear Drive and Direct Connection: Accurate alignment is very essential. Secure the motor and driven unit rigidly to the base.

INSTALLATION (Cont'd)

ROTATING PARTS

WARNING

ROTATING PARTS, SUCH AS COUPLINGS, PULLEYS, EXTERNAL FANS, AND UNUSED SHAFT EXTENSIONS, SHOULD BE PERMANENTLY GUARDED AGAINST ACCIDENTAL CONTACT WITH HANDS OR CLOTHING. THIS IS PARTICULARLY IMPORTANT WHERE THE PARTS HAVE SURFACE IRREGULARITIES SUCH AS KEYS, KEYWAYS OR SET SCREWS. SOME SATISFACTORY METHODS OF GUARDING ARE:

1. Covering the machine and associated rotating parts with structural or decorative parts of the driven or driving equipment.
2. Providing covers for the rotating parts. The openings in or at the edges of such covers should not be over 1/2 inch wide (3/4 inch if the rotating parts are more than 4 inches from the opening) in the direction, usually above and to the side, from which contact is to be expected. In other directions where other stationary parts, such as a sub-base provide partial guarding, somewhat wider openings may be used. Covers should be sufficiently rigid to maintain adequate guarding in normal service.

WIRING

WARNING

POWER SHOULD BE REMOVED BEFORE ATTEMPTING CONNECTION TO THE POWER SUPPLY.

Connect the motor to the power supply according to the diagram on the motor nameplate. For most 230 and 460 volt motors, nine leads are brought out from the stator windings so that the motor may be connected for either 230 or 460 volts.

GROUNDING

WARNING

THE FRAMES AND OTHER METAL EXTERIORS OF MOTORS AND GENERATORS (EXCEPT FOR INSULATED PEDESTAL BEARINGS) USUALLY SHOULD BE GROUNDED TO LIMIT THEIR POTENTIAL TO GROUND IN THE EVENT OF ACCIDENTAL CONNECTION OR CONTACT BETWEEN LIVE ELECTRICAL PARTS AND THE METAL EXTERIORS.

See the *National Electrical Code*, Article 430 for information on grounding of motors, Article 445 for grounding of generators, and Article 250 for general information on grounding. In making the ground connection, the installer should make certain that there is a solid and permanent metallic connection between the ground point, the motor or generator terminal housing, and the motor or generator frame. A common method of providing a ground is through a grounded metallic conduit system.

Motors with resilient cushion rings are usually supplied with a bonding conductor across the resilient member. Some motors are supplied with the bonding conductor on the concealed side of the cushion ring to protect the bond from damage. Motors with bonded cushion rings should usually be grounded at the time of installation in accordance with the above recommendations for making ground connections. When motors with bonded cushion rings are used in multimotor installations employing group fusing or group protection, the bonding of the cushion ring should be checked to determine that it is adequate for the rating of the branch circuit overcurrent protective device being used.

There are applications where grounding the exterior parts of a motor or generator may result in greater hazard by increasing the possibility of a person in the area simultaneously contacting ground and some other nearby live electrical part of other ungrounded electrical equipment. In portable equipment it is difficult to be sure that a positive ground connection is maintained as the equipment is moved, and providing a grounding conductor may lead to a false sense of security.

WARNING

WHEN CAREFUL CONSIDERATION OF THE HAZARDS INVOLVED IN A PARTICULAR APPLICATION INDICATE THE MACHINE FRAMES SHOULD NOT BE GROUNDED OR WHEN UNUSUAL OPERATING CONDITIONS DICTATE THAT A GROUNDED FRAME CANNOT BE USED, THE INSTALLER SHOULD MAKE SURE THE MACHINE IS PERMANENTLY AND EFFECTIVELY INSULATED FROM GROUND. IN THOSE INSTALLATIONS WHERE THE MACHINE FRAME IS INSULATED FROM GROUND, IT IS RECOMMENDED THAT APPROPRIATE WARNING LABELS OR SIGNS BE PLACED ON OR IN THE AREA OF THE EQUIPMENT BY THE INSTALLER.

STARTING

CAUTION: Check direction of motor rotation before coupling motor to load.

WARNING

BEFORE STARTING MOTOR, REMOVE ALL UNUSED SHAFT KEYS AND LOOSE ROTATING PARTS TO PREVENT THEM FROM FLYING OFF.

Before starting the motor, check the following items:

1. The rotor should turn freely when disconnected from the load.
2. Driven machine should be unloaded when first starting the motor.

The motor should run smoothly with little noise. If the motor should fail to start and produces a decided hum, it may be that the load is too great for the motor or that it has been connected improperly. Shut down immediately and investigate for trouble.

INSTALLATION (Cont'd)

DRAIN PLUGS

If motor is totally enclosed fan-cooled or non-ventilated it is recommended that condensation drain plugs be removed. These are located in the lower portion of the end-shields. Totally enclosed fan-cooled "XT" motors are equipped with automatic drains which should be left in place as received.

ROTATION

To reverse the direction of rotation, disconnect from power source and interchange any two of the three line leads for three phase motors.

TEST FOR GENERAL CONDITION

If the motor has been in storage for an extensive period or has been subjected to adverse moisture conditions, it is best to check the insulation resistance of the stator winding with a megohmeter.

CAUTION: Surface temperature of motor enclosure may reach temperatures which can cause discomfort or injury to personnel accidentally coming into contact with hot surfaces. (When installing, protection should be provided by user to protect against accidental contact with hot surface.

If the resistance is lower than one megohm the windings should be dried in one of the two following ways:

1. Bake in oven at temperatures not exceeding 90°C. until insulation resistance becomes constant.
2. With rotor locked, apply low voltage and gradually increase current through windings until temperature measured with thermometer reaches 194°F. Do not exceed this temperature.

INITIAL LUBRICATION

"Reliance motors are shipped from the factory with the bearings properly packed with grease and ready to operate. Where the unit has been subjected to extended storage (6 months or more) the bearings should be relubricated (regreasable type) prior to starting." When motors are equipped for oil mist lubrication refer to Instruction Manual B-3654.

MOUNTING

Mount the motor on a foundation sufficiently rigid to prevent excessive vibration. Roller bearing and ball-bearing motors may be mounted with the shaft horizontal, with the feet at any angle. Roller bearing motors are not suitable for coupled duty applications. After carefully aligning the motor with the driven unit, bolt securely in place.

When motors, which are normally mounted with the shaft in a horizontal position, are mounted vertically, it may be necessary to provide additional guards to prevent foreign objects from falling into the motor openings and striking rotating parts. Such guards may be obtained at the time of purchase or from a local service repair center.

OPERATION

Due to the inherent characteristics of insulating materials, abnormally high temperatures shorten the operating life of electrical apparatus. The total temperature, not the temperature rise, should be the measure of safe operation. The class of insulation determines the maximum safe operating temperature. Aging of insulation occurs at an accelerated rate at abnormally high temperatures. A general rule for gauging the effect of excessive heat is that for each 10°C. rise in temperature above the maximum limit for the insulation, the life of the insulation is halved.

Unbalanced voltage or single-phase operation of polyphase machines may cause excessive heating and ultimate failure. It requires only a slight unbalance of voltage applied to a polyphase motor to cause large unbalance currents and resultant overheating.

Periodic checks of phase voltage, frequency and power consumption of a motor while in operation are recommended; such checks assure the correctness of frequency and voltage applied to the motor and yield an indication of the load offered by the apparatus which the motor drives. Comparisons of this data with previous no-load and full-load power demands will give an indication of the performance of the complete machine. Any serious deviations should be investigated and corrected.

Stator troubles can usually be traced to one of the following causes:

Worn bearings	Operating single phase
Moisture	Poor insulation
Overloading	Oil and dirt

Dust and dirt are usually contributing factors. Some forms of dust are highly conductive and contribute materially to insulation breakdown. The effect of dust on the motor temperature through restriction of ventilation is a principal reason for keeping the windings clean.

Squirrel-cage rotors are rugged and, in general, give little trouble. The first symptom of a defective rotor is lack of torque. This may cause a slowing down in speed accompanied by a growling noise or perhaps failure to start the load.

This is caused by an open or high resistance joint in the rotor bar circuit. Such a condition can generally be detected by looking for evidence of localized heating.

WARNING
ROTATING PARTS, SUCH AS COUPLINGS, PULLEYS, INTERNAL—EXTERNAL FANS AND UNUSED SHAFT EXTENSIONS SHOULD BE PERMANENTLY GUARDED AGAINST ACCIDENTAL CONTACT WITH HANDS OR CLOTHING.

MAINTENANCE

The fundamental principle of electrical maintenance is KEEP THE APPARATUS CLEAN AND DRY. This requires periodic inspection of the motor, the frequency depending upon the type of motor and the service.

The following should be checked at regular intervals:

1. Windings should be dry and free of dust, grease, oil, and dirt. Windings may be cleaned by suction cleaners or by wiping. Nozzles on suction type cleaners should be non-metallic. Gummy deposits of dirt and grease may be removed by using a commercially available low volatile solvent.

WARNING
DO NOT USE GASOLINE OR OTHER FLAMMABLE SOLVENTS.

2. Terminal connections, assembly screws, bolts and nuts should be tight. They may loosen if motor is not securely bolted and tends to vibrate.
3. Insulation resistance of motors in service should be checked periodically at approximately the same temperature and humidity conditions to determine possible deterioration of the insulation. When such measurements at regular intervals indicate a wide variation, the cause should be determined. Motor should be reconditioned if the motor has been subjected to excessive moisture, or by re-winding or re-insulating if necessary. Enclosed motors require very little attention. Be sure that external air chamber of fan-cooled motors does not become clogged with foreign material which will restrict passage of air.

DISASSEMBLY

If it becomes necessary to disassemble the motor, care should be taken not to damage the stator windings as the insulation may be injured by improper or rough handling. Precautions to keep bearings clean should be exercised.

Before removing either end shield:

1. Disconnect motor from power source. Tag the leads to insure proper reconnection.
2. Remove motor from mounting base.
3. Mark end brackets relative to position on frame so they can be easily replaced.

REMOVING BRACKETS AND ROTOR

4. Remove bearing cartridge nuts or screws. (If used)
5. Remove front end bracket bolts.
6. Pull bracket.
7. Remove back end bracket in same manner.
8. Remove rotor.

REMOVING AND REPLACING BALL BEARINGS

BEARINGS SHOULD NOT BE REMOVED UNLESS THEY ARE TO BE REPLACED. WHEN REMOVAL IS NECESSARY, USE A BEARING PULLER. A BEARING PULLER MAY BE RIGGED BY USING A METAL PLATE, WITH HOLES DRILLED TO MATCH THE TAPPED HOLES IN THE INNER CAP. USE CARE TO KEEP THE PRESSURE EQUAL TO PREVENT BREAKING THE CAP.

TO INSTALL A BEARING, HEAT THE BEARING IN AN OVEN AT 250°F. THIS WILL EXPAND THE INNER RACE, ALLOWING IT TO SLIP OVER THE BEARING SEAT. ALL BEARINGS MUST BE REPLACED WITH THE IDENTICAL PART USED BY RELIANCE. IN MANY CASES SPECIAL BEARINGS ARE USED WHICH CANNOT BE IDENTIFIED BY MARKINGS ON BEARING. IN ALL CASES, WHEN REPLACING BEARINGS, USE MARKINGS ON BEARINGS AND MOTOR IDENTIFICATION NUMBER TO OBTAIN CORRECT REPLACEMENT BEARING.

THE MAJORITY OF BEARINGS USED NOW HAVE A C3 INTERNAL LOOSENESS.

REASSEMBLY

Follow reverse procedure as outlined for Disassembly. Having marked the brackets in the original position, replace as marked.

LUBRICATION OF ANTI-FRICTION BEARINGS
REGREASABLE TYPE BEARINGS ONLY

GREASE LUBRICATED MOTORS

This motor has been properly lubricated at the time of manufacture and it is not necessary to lubricate at time of installation. When the motor has been in storage for a period of six months or more, lubricate before starting.

Lubrication of anti-friction bearings should be done as a part of a planned maintenance schedule. The Recommended Lubrication Interval should be used as a guide to establish this schedule.

Cleanliness is important in lubrication. Any grease used to lubricate anti-friction bearings should be fresh and free from contamination. Similarily, care should be taken to properly clean the grease inlet area of the motor to prevent grease contamination.

RECOMMENDED LUBRICANT

For motors operating in ambient temperatures shown below, use the following lubricant or its equal:

OPERATING TEMP. —25°C (—15°F) to 50°C (120°F)

CHEVRON OIL	SRI NO. 2
EXXON	UNIREX #2
SHELL OIL CO.	DOLIUM R
TEXACO INC.	PREMIUM RB

MINIMUM STARTING TEMPERATURE —60°C (—76°F)

SHELL OIL CO.	AEROSHELL #7

LUBRICATION PROCEDURE

Reliance anti-friction bearings may be lubricated with the motor running or stationary. Stationary with the motor warm is preferred.

1. Locate the grease inlet, clean the area and replace the pipe plug with a grease fitting, if the motor is not equipped with grease fittings.
2. Add the Recommended Volume of the Recommended Lubricant using a hand operated grease gun.
3. Run the motor for two hours.
4. Replace the pipe plug in grease inlet.

LUBRICATION INSTRUCTIONS

1. Select Service Condition from Table 1.
2. Select Lubrication Frequency from Table 2.
3. Select Lubrication Volume from Table 3.
4. Lubricate the motor at the required frequency with the required lubricant volume in accordance with LUBRICATION PROCEDURE.

NOTE: Mixing lubricants is not recommended due to possible incompatability. If it is desired to change lubricant, follow instructions for lubrication and repeat lubrication a second time after 100 hours of service. Care must be taken to look for signs of lubricant incompatability, such as extreme soupiness visible from the grease relief area.

SERVICE CONDITIONS

TABLE 1

Standard Conditions:	Eight hours per day, normal or light loading, clean, @ 40°C (100°F) maximum ambient.
Severe Conditions:	Twenty-four hour per day operation or shock loading, vibration, or in dirt or dust @ 40-50°C (100-120°F) ambient
Extreme Conditions:	Heavy shock or vibration, or dust.

LUBRICATION FREQUENCY

TABLE 2

BALL BEARINGS

Speed	Frame	Standard Conditions	Severe Conditions	Extreme Conditions
1800 RPM And Slower	182 Thru 215	3 Years	1 Year	6 Months
	243 Thru 365	2 Years	6 to 12 Mos.	3 Months
	404 Thru 449 and 5000	1 Year	6 Months	1 to 3 Mos.
3600 RPM	ALL	6 Months	3 Months	1 Month

ROLLER BEARINGS

For Roller Bearings divide the time periods above by 2.

LUBRICATION VOLUME

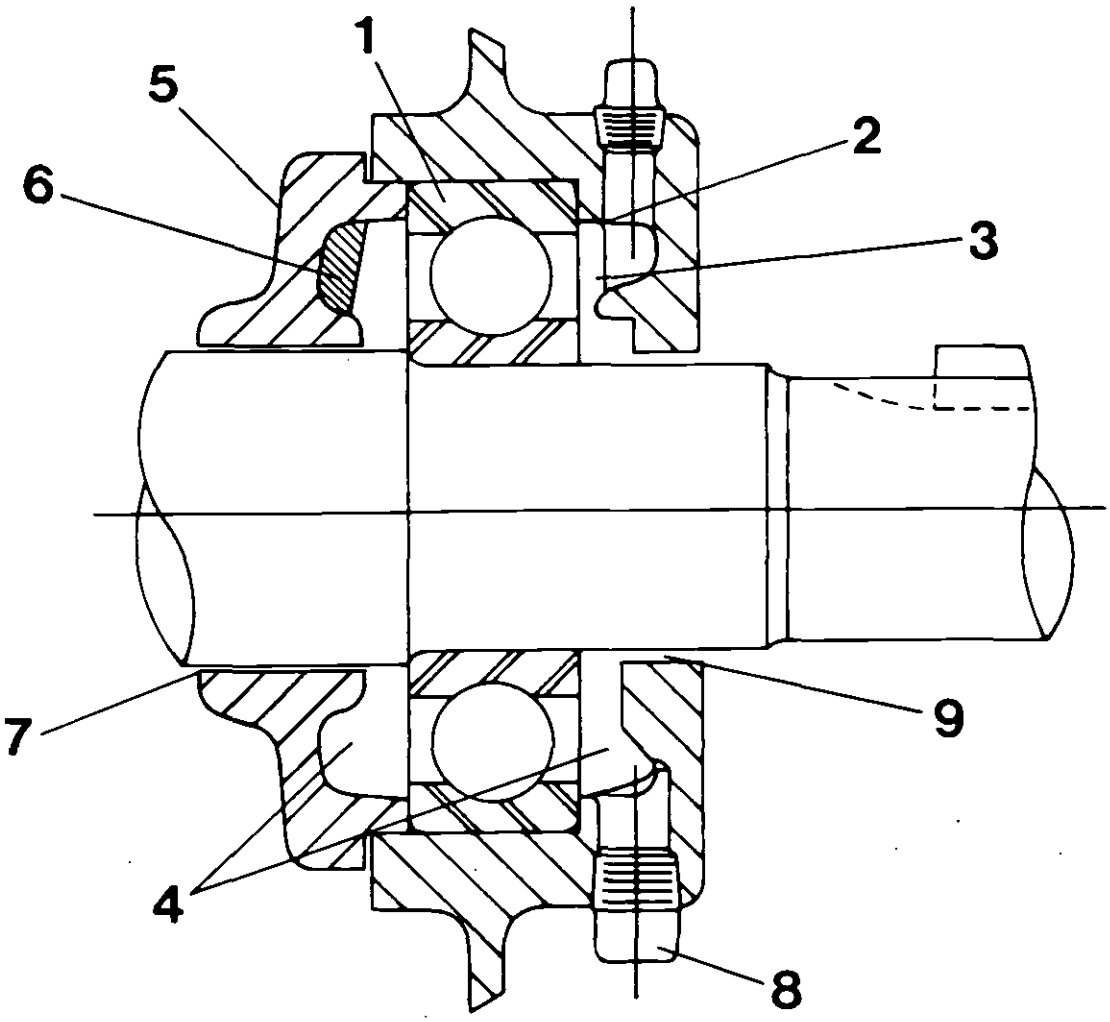
TABLE 3

FRAME SIZE	VOLUME IN CUBIC INCHES	
	1800 RPM And Slower	3600 RPM
182 Thru 215	0.5	0.5
254 Thru 286	1.0	1.0
324 Thru 365	1.5	1.5
404 Thru 449	2.5	1.0

OIL MIST LUBRICATION

Refer to Oil Mist Instruction Manual B-3654.

PLS® CONSTRUCTION STANDARD ON RELIANCE XT MOTORS PROVIDES LONG LIFE FOR BEARINGS AND MOTOR



Cooler Bearing Operating Temperatures — Open bearing (non-shielded) construction (1) minimizes friction, allowing cooler bearing operation.

Positive Lubrication/Relubrication in any Mounting Position — Exclusive grease channeling window (2), with minimum grease path entry (3), channels grease directly into bearing track and avoids premature relief out shaft bore or drain plug.

Minimizes Corrosion — Small clearance on either side of grease window uniformly distributes grease to both inboard and outboard reservoirs (4) to protect bearing surfaces during motor storage, long idle times and start-up. Bearing system is completely greased during motor assembly.

Restricts Inboard Contaminants — Inner bearing cap (5) (standard on motors with "XT" features) with anti-churning vanes (6) and close running shaft tolerance (7) minimizes contaminant entry into bearings, and grease migration into motor.

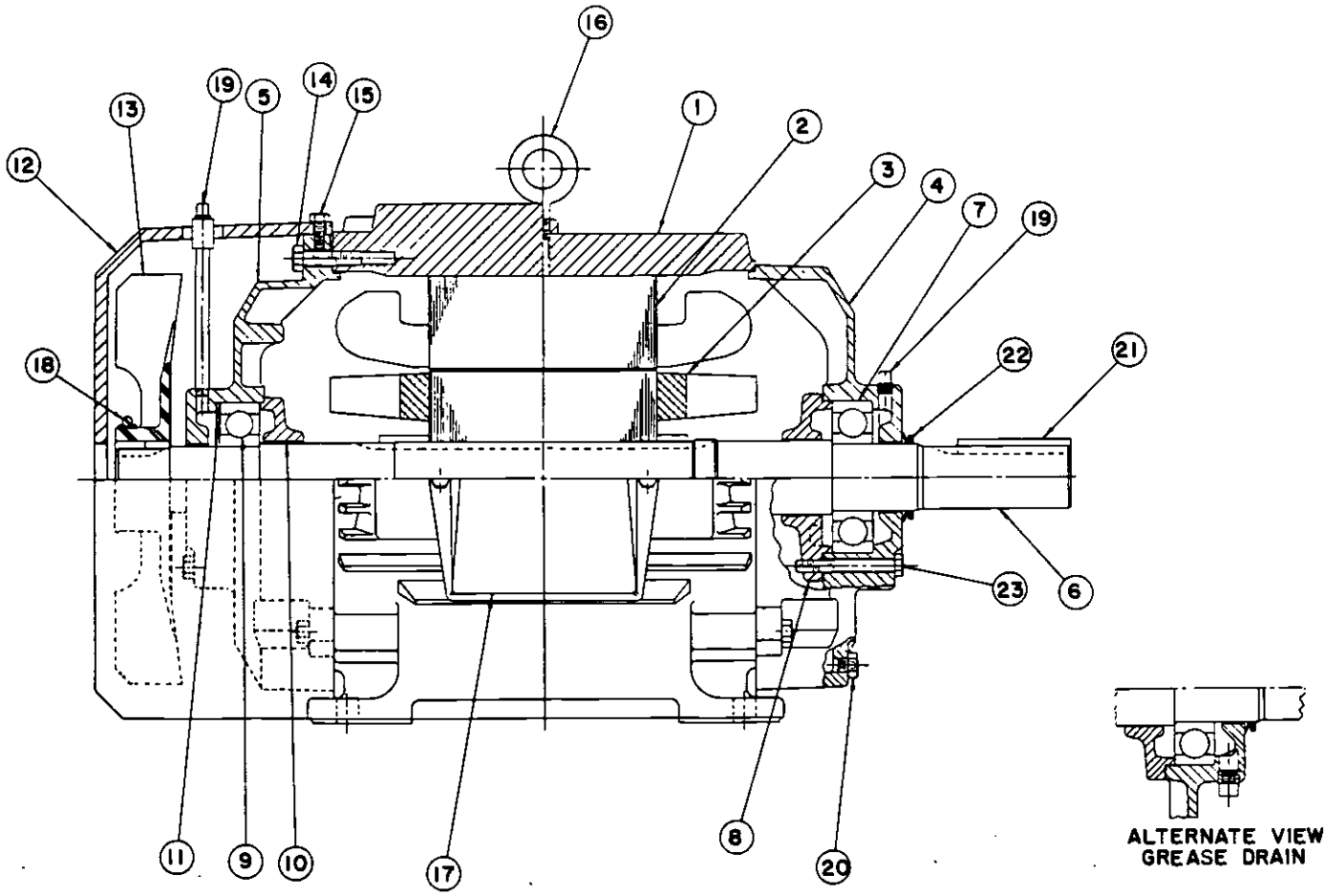
Prohibits Overgreasing During Lubrication/Relubrication — Grease relief port (8) accurately indicates completion of lubrication/relubrication. (If port is plugged during lubrication, PLS®, Positive Lubrication System design will relieve grease along the shaft (9).

REPLACEMENT BEARINGS

Your maintenance program will not be complete without including spare bearings. It must be remembered that the bearing is a wearable component and therefore must eventually be replaced. To insure that you are able to maintain original operation, we recommend the purchase of spares directly from Reliance Electric.

All bearings used in Reliance motors are subject to exact specifications and tests necessary to satisfy performance requirements. In this manner, it is possible to duplicate your present bearing. Markings on the bearing do not indicate complete specifications.

PARTS IDENTIFICATION DRAWING



FIND NO.	PART DESCRIPTION
1	FRAME
2	STATOR
3	ROTOR
4	BACKEND BRACKET
5	FRONTEND BRACKET
6	SHAFT
7	BACKEND BALL BEARING
8	BACKEND INNER CAP
9	FRONTEND BALL BEARING
10	FRONTEND INNER CAP
11	WAVE WASHER, FRONTEND
12	FAN COVER
13	OUTER FAN

FIND NO.	PART DESCRIPTION
14	FRONT END BRACKET BOLTS
15	FAN COVER BOLTS
16	EYEBOLT
17	CONDUIT BOX
18	FAN CLAMP
19	GREASE ENTRY
20	CONDENSATION DRAIN
21	KEY
22	SLINGER
23	BACKEND CAP BOLTS

NOTE: Bearings shown are regreasable type.

TOTAL SERVICE PROGRAMS

Reliance Electric can provide a wide range of maintenance programs to help you reduce downtime, improve productivity and increase profits. Capabilities include:

- Electrical and Mechanical Start-Up Service
- Electrical Preventive Maintenance
- Mechanical Preventive Maintenance
- Vibration Analysis
- Mobile Van Repair Service
- Balancing and Alignment Service
- Maintenance Schools
- 24-Hour Technical Support
- Modernization Service

For more information contact your local Reliance Electric Sales Office or write:

Reliance Electric
Industrial Services
24701 Euclid Avenue
Cleveland, Ohio 44117

RENEWAL PARTS

An adequate stock of factory-made renewal parts is an integral part of a sound maintenance program to protect against costly downtime.

Parts can be obtained from your nearest Reliance Electric parts distributor, or directly from the Reliance Electric factory. When ordering parts for which a part number is not available, give complete description of part and purchase order number, serial number, model number, etc., of the equipment on which the part is used.

A detailed parts list, which gives Reliance Electric recommendations for spare parts that should be stocked for your equipment, can be ordered from:

1. Nearest Reliance Electric Sales Office
2. Nearest Reliance Electric Keyparts Distributor
3. Reliance Electric Renewal Parts, Cleveland, Ohio

Be sure to include complete nameplate data — purchase order number, serial number, rating, etc. — for your equipment when ordering the spare parts list.

For the telephone number of your local Keyparts Stocking distributor call 1-800-321-2795 or in Ohio call 216-266-6732.

ADDITIONAL LITERATURE

Additional literature covering the maintenance of A-C motors can be obtained from the Reliance Electric Services Division. Requests should be submitted through your nearest Reliance Electric Sales Office.

Service Centers

ALABAMA
Birmingham Service Center
3100 Pinson Valley Parkway
Birmingham, Alabama 35217
205-841-8377

ARIZONA
Phoenix Service Center
3550 S. 16th Street
Phoenix, Arizona 85040
602-243-1791

CALIFORNIA
Anaheim Service Center
1025 North Sabina Street
Anaheim, California 92801
714-772-4773

San Jose Service Center
341 North Montgomery Street
San Jose, California 95110
408-287-4060

COLORADO
Tree Electric Service Center
1020 South Lipan Street
Denver, Colorado 80223
303-935-4615

ILLINOIS
Chicago Service Center
17001 South Vincennes Avenue
Thornton (Chicago), Illinois 60476
312-821-0050

LOUISIANA
Monroe Service Center
2304 Ruffin Drive
Monroe, Louisiana 71203
318-322-1474

Shreveport Service Center
1245 North Hearne
Shreveport, Louisiana 71107
318-222-9431

MASSACHUSETTS
Boston Service Center
31 Astor Avenue
Norwood (Boston), Massachusetts 02062
617-769-5900

OHIO
Cleveland Service Center
4950 East 49th Street
Cleveland, Ohio 44125
216-266-7274

Wente Service Center
223 North Fourth Street
Hamilton, Ohio 45011
513-863-8816

OREGON
Portland Service Center
2315 N.W. 21st Place
Portland, Oregon 97210
503-226-4951

PENNSYLVANIA
Philadelphia Service Center
3240 South 78th Street
Philadelphia, Pennsylvania 19153
215-365-1500

Washington Service Center (Pittsburgh)
320 Museum Road
Washington, Pennsylvania 15301
412-225-2900

TEXAS
Houston Service Center
1500 E. Main Street
LaPorte, Texas 77571
713-471-4611

WYOMING
Tree Electric Service Center
811 Edwards Road
Gillette, Wyoming 82716
307-682-0035

Tree Electric Service Center
839 Elk
Rock Springs, Wyoming 82901
307-362-6697

For a complete listing of all Reliance Authorized Service Centers, call 1 800 321-2795 or in Ohio call 1-216-266-2688.

Reliance Electric Company / 24701 Euclid Avenue / Cleveland, Ohio 44117

RELIANCE ELECTRIC

Printed in U.S.A. Instruction Manual B-3620-17 98550M

RELIANCE ELECTRIC

REVISED

DATA TRANSMITTAL AND CERTIFICATION

CUSTOMER ORDER NO.	DATE	REQ. NO.	S.O. NO.
CP773004	04/21/88		04MAF38651

REFER TO THIS NUMBER IN ALL CORRESPONDENCE

SOLD TO:
FLAKT CANADA LTD
1400 MERIVALE RD (K2C 3P9)
OTTAWA ONT CAN

SHIP TO:
SAME AS "SOLD TO" UNLESS SHOWN
FAMCO-FORSYTH
216 JUNIA AVENUE
WINSTON-SALEM NC 27107

DATA PROVIDED WITH THIS TRANSMITTAL AND CERTIFICATION IS:

- ☐ FOR CUSTOMER APPROVAL BY DATE: _____
  Return of approval prints by the above date is required to assure scheduled shipment, delay in return and/or revision of approval prints may require shipment reschedule. Return approved D/S to address below.
- ☒ FINAL, APPROVED FOR CONSTRUCTION OR INSTALLATION
- ☐ PRELIMINARY, ENGINEERING IS COMPLETED.
- ☒ REVISED, SUPERSEDES DATA PREVIOUSLY ISSUED.
- ☐ SEE REMARKS.

Flakt Canada Ltd.
JUN 8 1989
ANSWERED

DATA SOURCE

TRANSMITTAL AND CERTIFICATION ISSUED BY: COX DATE 5 19 '89 CK BY _____ DATE _____
RELIANCE ELECTRIC CO.
COLLINS IND. DRIVE
ATHENS, GA 30613

DATE PRINTED: 05/19/89

MOTOR OR GEN. DATA

ITEM	USED FOR	USERS PLANT	MOTOR OR GEN. D/S:
4 OF 4	SUBWAY FANS 320LB-FT2		604960-182

QTY.	FRAME		SERV. FA	TYPE	R.P.M.	C BOX D/S
5	404T	50 HP	1.15	PB	0900	

PH/HZ/VOLTS-WINDING	DUTY	ENCLOSURE	AMB./INSL.	PWR. CODE	MOTOR OR GEN. C/D:
3/60 /460.	CONT	TENV-AOX	40 /H /		1575-BA (25)

BEARINGS	MOUNTING & METHOD OF DRIVE	RAILS OR BASE	MODEL NUMBER	REDUCER OR AUX D/S:
BALL	F1 DRCT			

ROTAT FROM OPP. DR. END	D-C FIELD EXCITATION	DOUBLE SHAFT EXTEN.	BRAKE OR AUX D/S
REV			

RE DUCER DATA

REDUCER STYLE	CLASS	FRAME	RATIO	OUTPUT RPM	ASSEMBLY	BLOWER MOTOR PH/HZ/VOLTS/HP

BRAKE DATA

BRAKE TYPE	SIZE	RATING FT/LB	DUTY	P.O.

DATA FOR CONTROL

D-C MOTOR ARMATURE CURRENT: _____ AMPS
FIELD CHARACTERISTICS PER CURVE: _____
F_1—F_2 _____ MAX. AMPS _____ _____ RPM
F_{11}—F_{22} _____ MAX. AMPS _____ _____ RPM
F_3—F_4 _____ MAX. AMPS _____ _____ RPM

A-C MOTOR INFORMATION FOR SELECTION OF STARTER HEATERS:
CODE: F LOCKED AMPS: _____
F.L. CURRENT: 68.0 AMPS.

SPCL. INSTALLATION FEAT. AND MISC. DATA

ADDITIONAL MOTOR OR GEN DATA:
LD LOC - STD
FR CONST RGD

SPECIAL MARKS:
SCRDT/LA METRO RAIL

SPECIAL FEATURES:
TEAO-XT, 460/3/60; FAN APPLICATION, 1.15SF; REFLECTED LOAD INERTIA=320LB-FT2;CLASS H INSULATION; (150) DEG C,AMB (1) HOUR; CLASS F TEMPERATURE RISE; 75% VOLTAGE STARTING, 10 OHM COPPER WINDING RTD'S,2/PH PLUS AUX C/BOX; 120V SPACE HTRS PLUS SEP C/BOX;PROV FOR VIBRATION DETECTER QTY ONE 1/4-20 TAPPED HOLE AT EA BRG, HORIZONTAL PLANE;A/F GREASE LUBE-40,000 HR L-10, CAPABLE OF ACCEL FAN TO RATED SPD MAX 25 SEC CAP ACC SPD OPP DIRECTN MAX 45 SEC AFTER ENERG FOR REVR ROTA WITH 15 SEC DELAY BETWN PWR INTERR & RE-APPLCTN OF PWR FOR REV ROTATN, CAPBL OF OPERT 1 HR AT 300 DEG F (148 DEG C), 300 COMPL REV CYCLES WITH 10 SEC DELAY BETWN CYCLE(OVER LIFE TIME EXPECT);48" LEAD LGTH FOR ALL LEADS; CAST IRON C/BOX FOR SEP MOUNTING; GRND PROV IN C/BOX;2 IDENTL N/P 1 ON MTR,
CONTINUED ON PAGE 2

RELIANCE ELECTRIC

DATA TRANSMITTAL AND CERTIFICATION

CUSTOMER ORDER NO.	DATE	REQ. NO.	S.O. NO.
			04MAF38651

REFER TO THIS NUMBER IN ALL CORRESPONDENCE

SOLD TO:

SHIP TO: SAME AS "SOLD TO" UNLESS SHOWN

DATA PROVIDED WITH THIS TRANSMITTAL AND CERTIFICATION IS:

- ☐ FOR CUSTOMER APPROVAL BY DATE: _____
  Return of approval prints by the above date is required to assure scheduled shipment. delay in return and/or revision of approval prints may require shipment reschedule. Return approved D/S to data source.
- ☒ FINAL, APPROVED FOR CONSTRUCTION OR INSTALLATION.
- ☐ PRELIMINARY, ENGINEERING IS COMPLETED.
- ☒ REVISED, SUPERSEDES DATA PREVIOUSLY ISSUED.
- ☐ SEE REMARKS.

DATA SOURCE

TRANSMITTAL AND CERTIFICATION ISSUED BY: ACK DATE 5 1 9 '89 CK BY _____ DATE _____

MOTOR OR GEN. DATA

ITEM	USED FOR	USERS PLANT	MOTOR OR GEN. D/S:
QTY. / FRAME / SERV. FA / TYPE / R.P.M.			C BOX D/S
PH/HZ/VOLTS-WINDING / DUTY / ENCLOSURE / AMB./INSL. / PWR. CODE			MOTOR OR GEN. C/D:
BEARINGS / MOUNTING & METHOD OF DRIVE / RAILS OR BASE / MODEL NUMBER			REDUCER OR AUX D/S:
ROTAT FROM OPP. DR. END / D-C FIELD EXCITATION / DOUBLE SHAFT EXTEN.			BRAKE OR AUX. D/S

DRIVE DATA

REDUCER STYLE	CLASS	FRAME	RATIO	OUTPUT RPM	ASSEMBLY	BLOWER MOTOR PH/HZ/VOLTS/HP

BRAKE DATA

BRAKE TYPE	SIZE	RATING FT/LB	DUTY	P.O.

DATA FOR CONTROL

D-C MOTOR ARMATURE CURRENT: _____ AMPS

FIELD CHARACTERISTICS PER CURVE: _____

F_1—F_2, _____ MAX. AMPS _____ _____ RPM

F_{11}—F_{22}, _____ MAX. AMPS _____ _____ RPM

F_3—F_4, _____ MAX. AMPS _____ _____ RPM

A-C MOTOR INFORMATION FOR SELECTION OF STARTER HEATERS:

CODE: _____ LOCKED AMPS: _____

F.L. CURRENT: _____ AMPS.

SPCL. INSTALLATION FEAT. AND MISC. DATA

ONE FOR FAN HOUSING, 1 MTR TO RECV PRE-PRODTN TEST PER ATTCD SPEC PG 15865-40/41 ALL OTHER MTRS=ROUTINE TEST; WITH 1/2-13 TAPPED HOLE IN END OF SHAFT; WITH TWO ADAPTER PLATES; ONE ON FRAME, ONE ON C/BOX

CERTIFIED DRAWINGS AND DATA:
10 D/T D/S W/D I/M P/L PERF
CURVES THERMAL LIMIT AT 35 DEG
C & 148 DEG C, CERT OF COMPL
SOLD TO ATTN M. TURNER 1 EA TO
99801, 05244 & 84772

DUTY MASTER ALTERNATING CURRENT MOTORS

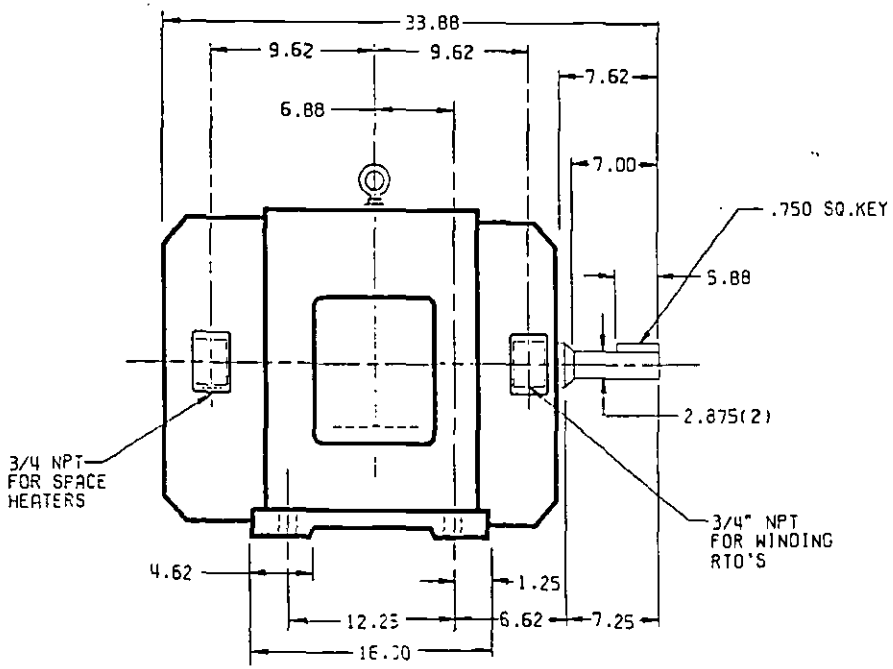
SQUIRREL-CAGE INDUCTION

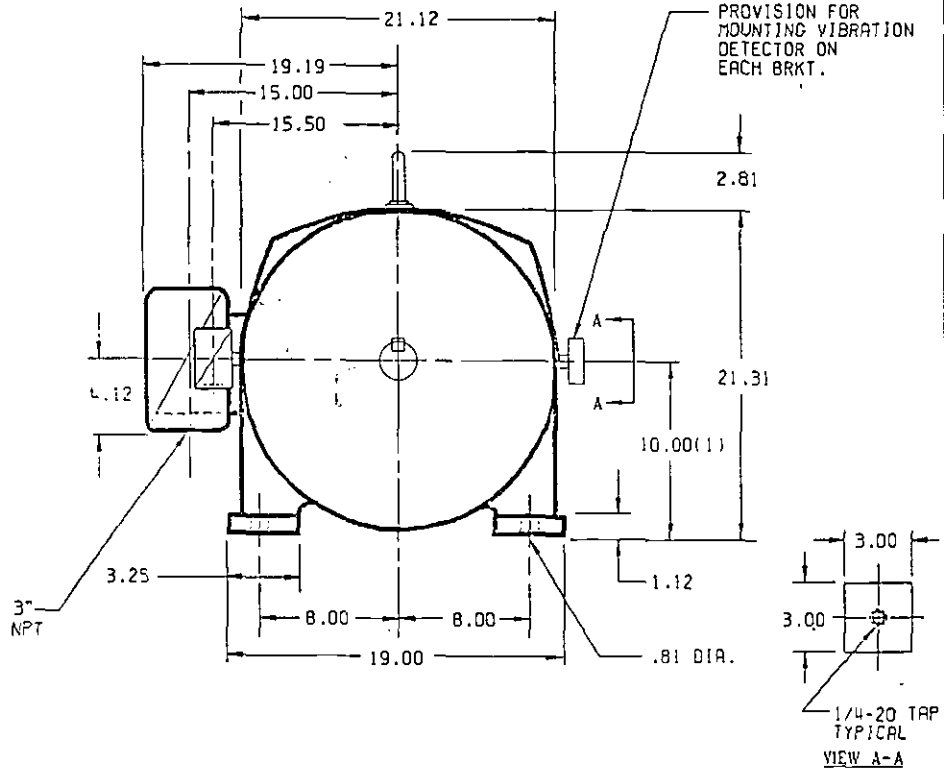
ENCLOSURE: TOTALLY ENCLOSED

COOLING: AIR OVER

MOUNTING: FOOT

FRAME 404T
AUXILIARY CONDUIT BOXES





VIEW A-A

NOTES:

(1) VARIES +.00, -.06.
(2) VARIES -.000, -.001.

IF MOUNTING CLEARANCE DETAILS ARE REQUIRED. CONSULT FACTORY.

MAXIMUM PERMISSIBLE SHAFT RUNOUT WHEN MEASURED AT END OF SHAFT EXTENSION IS .003 T.I.R.

WEIGHT: 1135 LBS.

FRAME- _____ TYPE- _____ TACH- _____ CERTIFIED FOR- _____

ORDER- _____ ITEM- _____ HP- _____ RPM- _____

RELIANCE SALES ORDER- _____ APPROVED BY- _____ DATE- _____

RELIANCE ELECTRIC
CLEVELAND, OHIO 44117 U.S.A.

DR. BY D.MATHEWS
CK. BY L.T.FOUNTIER
APP. BY J.H.PONTZER
DATE 10-20-88

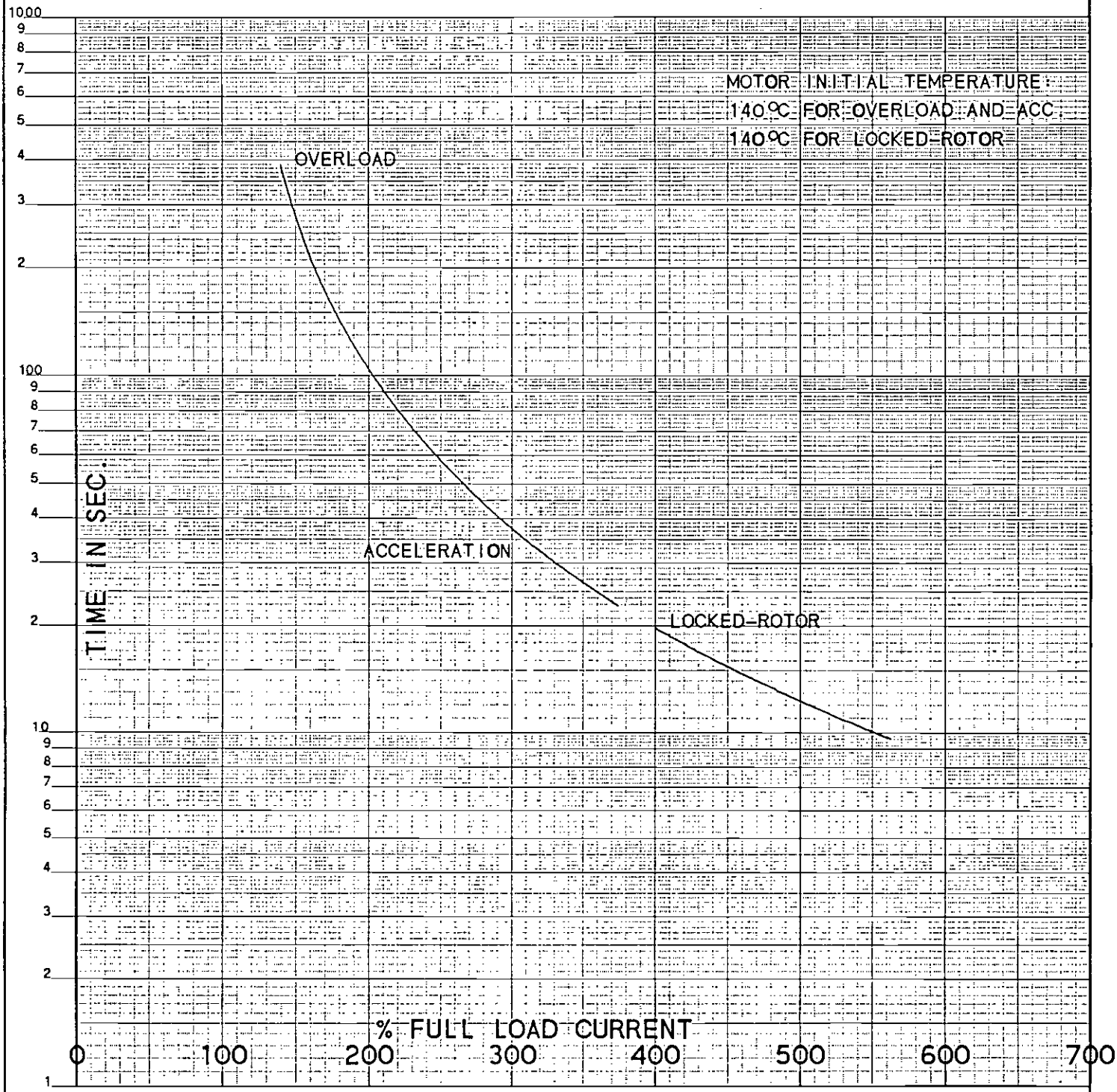
DIMENSION SHEET **604960-182**

ISSUE DATE: OCTOBER 20, 1988

C/R

10-541-03

REL. S.O. 4MAF38651	RPM 875	S.F. 1.15	ROTOR 414777-70-CE
FRAME 404T	VOLTS 460	NEMA DESIGN B	TEST S.O. TYPICAL DATA
HP 50	AMPS 68	CODE LETTER F	TEST DATE ---
TYPE P	DUTY CONT	ENCLOSURE TEAO	STATOR RES.@ 25°C .199
PHASE/HERTZ 3/60	AMB°C/INSUL 40/H	E/S 595341	OHMS (BETWEEN LINES)



THERMAL LIMIT CURVE

REMARKS:

AMPERES SHOWN FOR 460 VOLT CONNECTION, OF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE RATED VOLTAGE.

RELIANCE ELECTRIC
CLEVELAND, OHIO 44117 U.S.A.

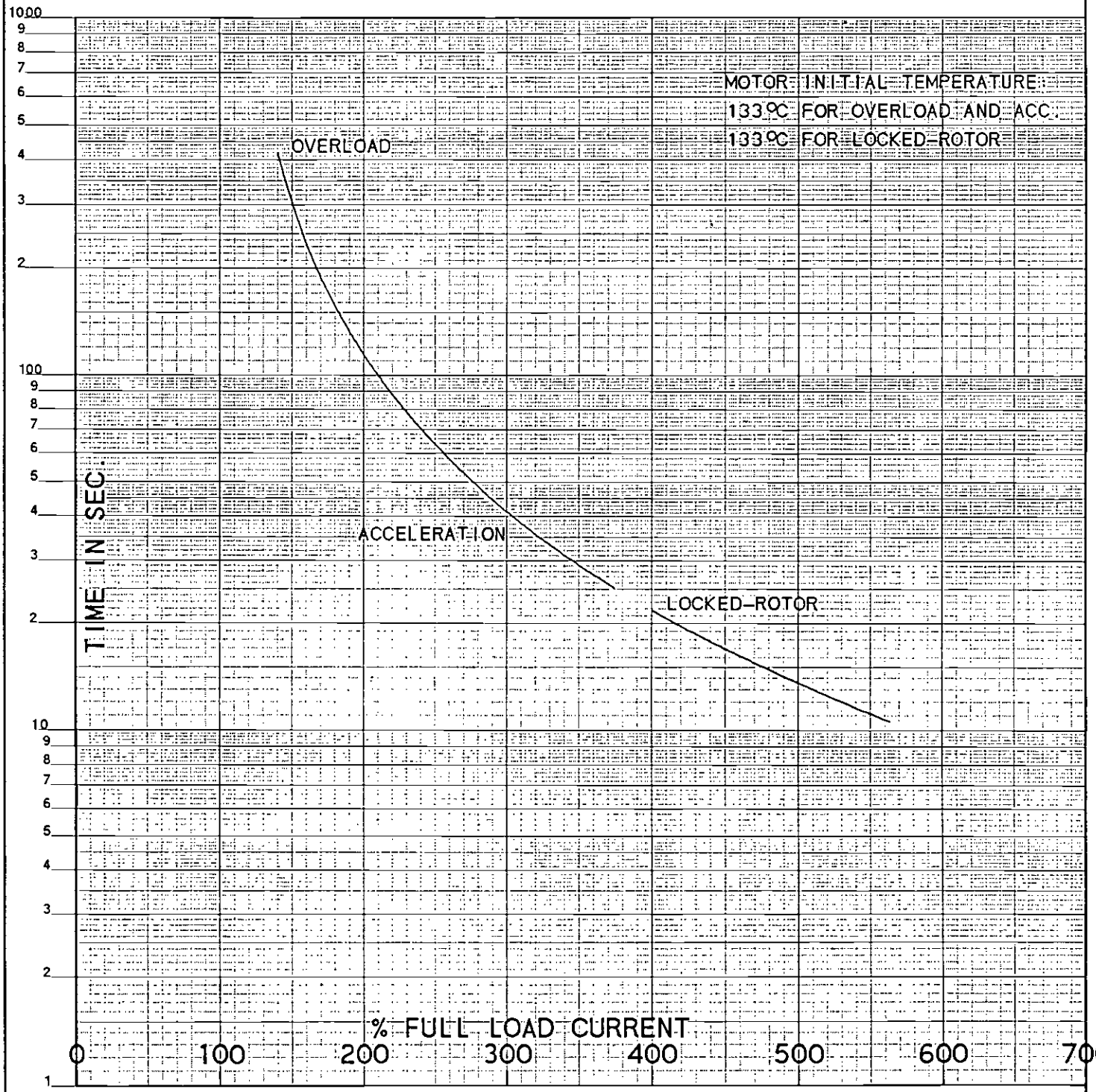
DR. BY D. M. BYRD
CK. BY D. H. MAY
APP. BY D. H. MAY
DATE 10/26/87

A-C MOTOR PERFORMANCE CURVES

E06009-A-B003
ISSUE DATE 10/26/87

File D79210

REL. S.O. 4MAF38651	RPM 875	S.F. 1.15	ROTOR 414777-70-CE
FRAME 404T	VOLTS 460	NEMA DESIGN B	TEST S.O. TYPICAL DATA
HP 50	AMPS 68	CODE LETTER F	TEST DATE ---
TYPE P	DUTY CONT	ENCLOSURE TEAO	STATOR RES.@ 25°C .199
PHASE/HERTZ 3/60	AMB°C/INSUL 40/H	E/S 595341	OHMS (BETWEEN LINES)



THERMAL LIMIT CURVE

REMARKS:

AMPERES SHOWN FOR 460 VOLT CONNECTION, OF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE RATED VOLTAGE.

RELIANCE ELECTRIC
CLEVELAND, OHIO 44117 U.S.A.

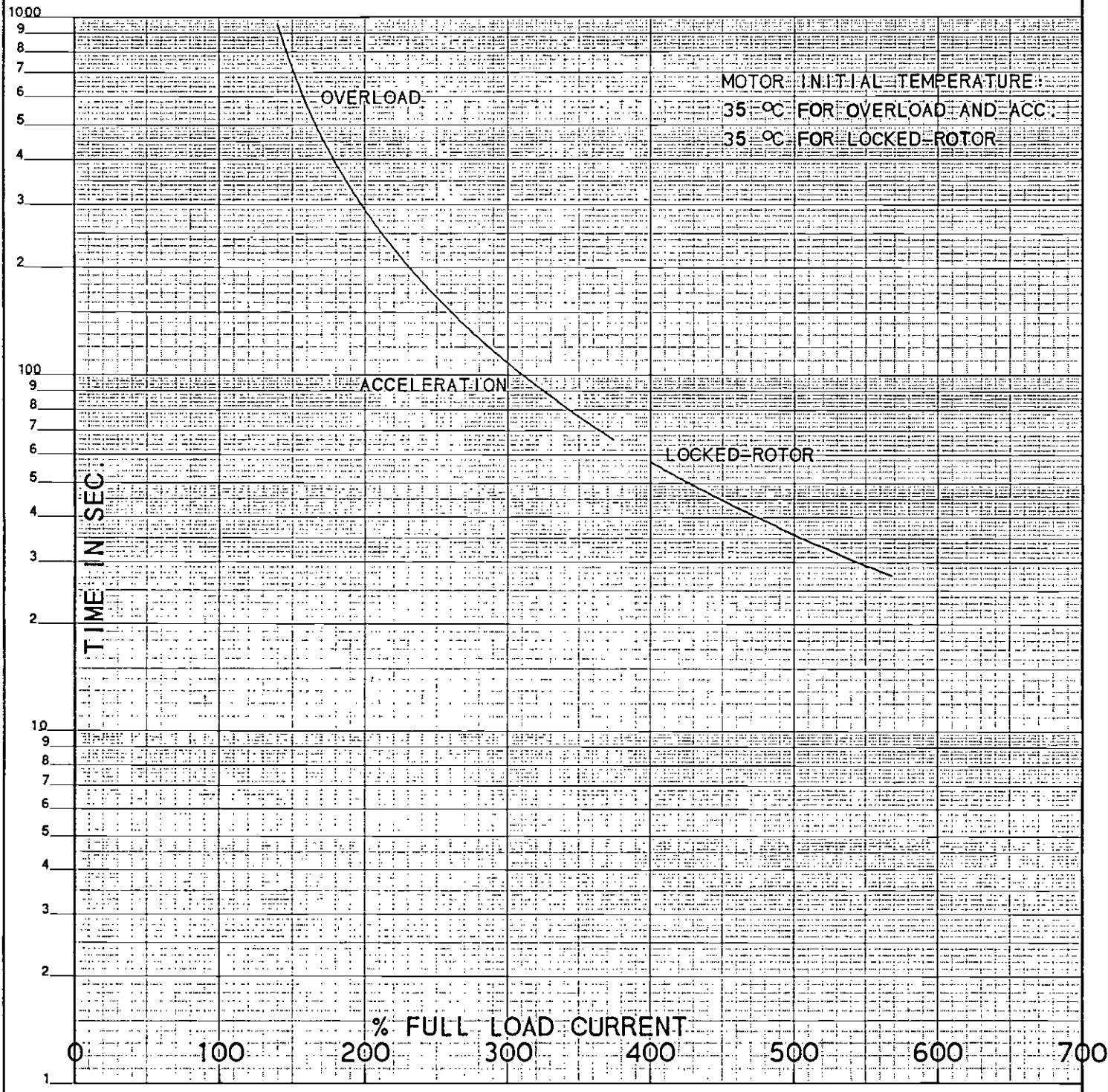
DR. BY D. M. BYRD
CK. BY D. H. MAY
APP. BY D. H. MAY
DATE 10/26/87

A-C MOTOR PERFORMANCE CURVES

E06009-A-B003
ISSUE DATE 10/26/87

File D79211

REL. S.O. 4MAF38651	RPM 875	S.F. 1.15	ROTOR 414777-70-CE
FRAME 404T	VOLTS 460	NEMA DESIGN B	TEST S.O. TYPICAL DATA
HP 50	AMPS 68	CODE LETTER F	TEST DATE ----
TYPE P	DUTY CONT	ENCLOSURE TEAO	STATOR RES.@ 25°C .199
PHASE/HERTZ 3/60	AMB°C/INSUL 40/H	E/S 595341	OHMS (BETWEEN LINES)



THERMAL LIMIT CURVE

REMARKS:

AMPERES SHOWN FOR 460 VOLT CONNECTION, OF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE RATED VOLTAGE.

RELIANCE ELECTRIC
CLEVELAND, OHIO 44117 U.S.A.

DR. BY	D. M. BYRD
CK. BY	D. H. MAY
APP. BY	D. H. MAY
DATE	10/26/87

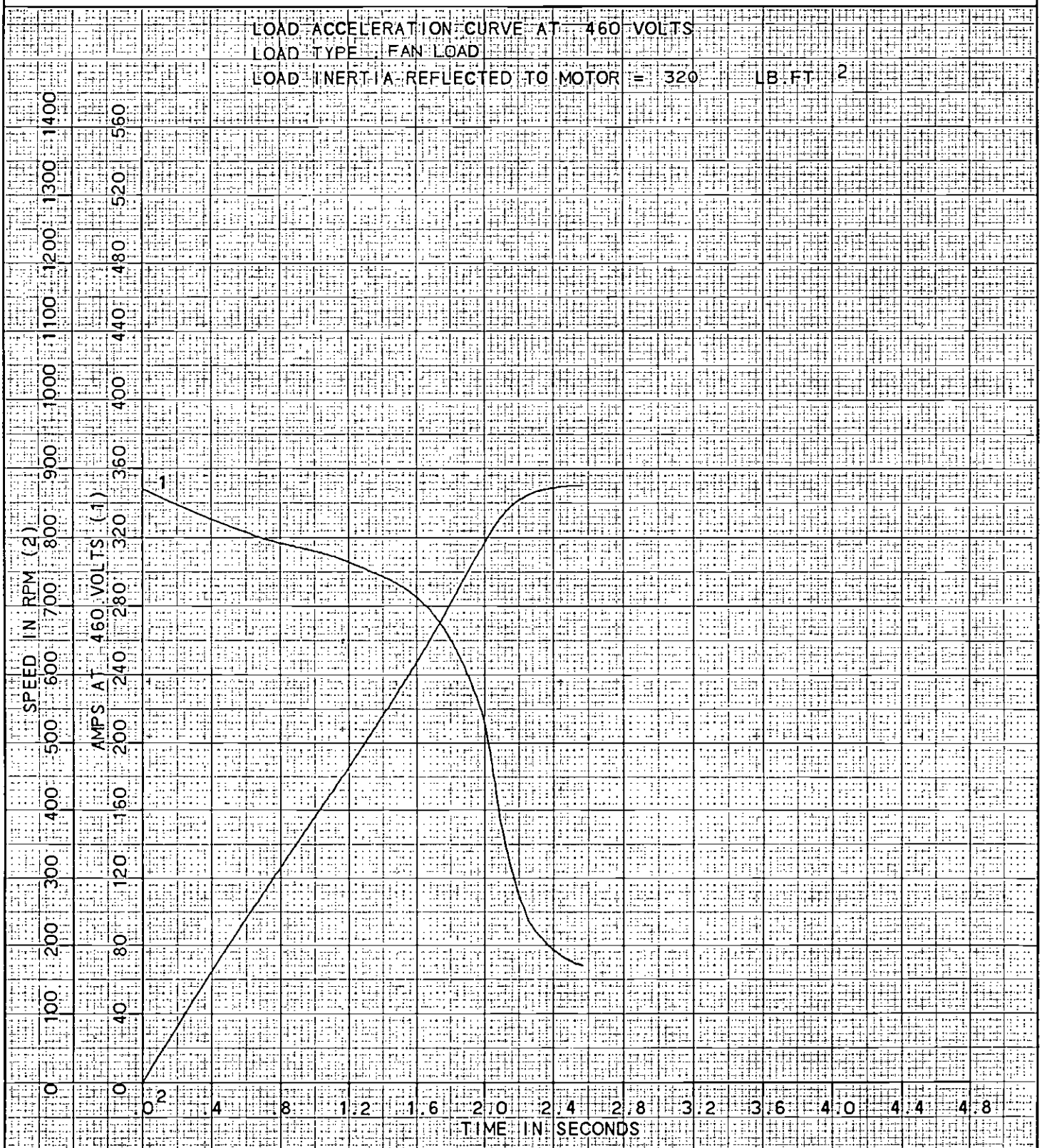
A-C MOTOR PERFORMANCE CURVES

E06009-A-B003

ISSUE DATE 10/26/87

File D79212

REL S.O. 4MAF38651	RPM 875	S.F. 1.0	ROTOR 414777-70-CE
FRAME 404T	VOLTS 460	NEMA DESIGN B	TEST S.O. TYPICAL DATA
HP 50	AMPS 68	CODE LETTER F	TEST DATE ---
TYPE P	DUTY CONT	ENCLOSURE TEFC	STATOR RES.@ 25°C .199
PHASE/HERTZ 3/60	AMB°C/INSUL 40/H	E/S 595341	OHMS (BETWEEN LINES)



AMPERES SHOWN FOR 460 VOLT CONNECTION, IF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE RATED VOLTAGE.

RELIANCE ELECTRIC
CLEVELAND, OHIO 44117 U.S.A.

DR. BY	D. M. BYRD
CK. BY	D. H. MAY
APP. BY	D. H. MAY
DATE	10/26/87

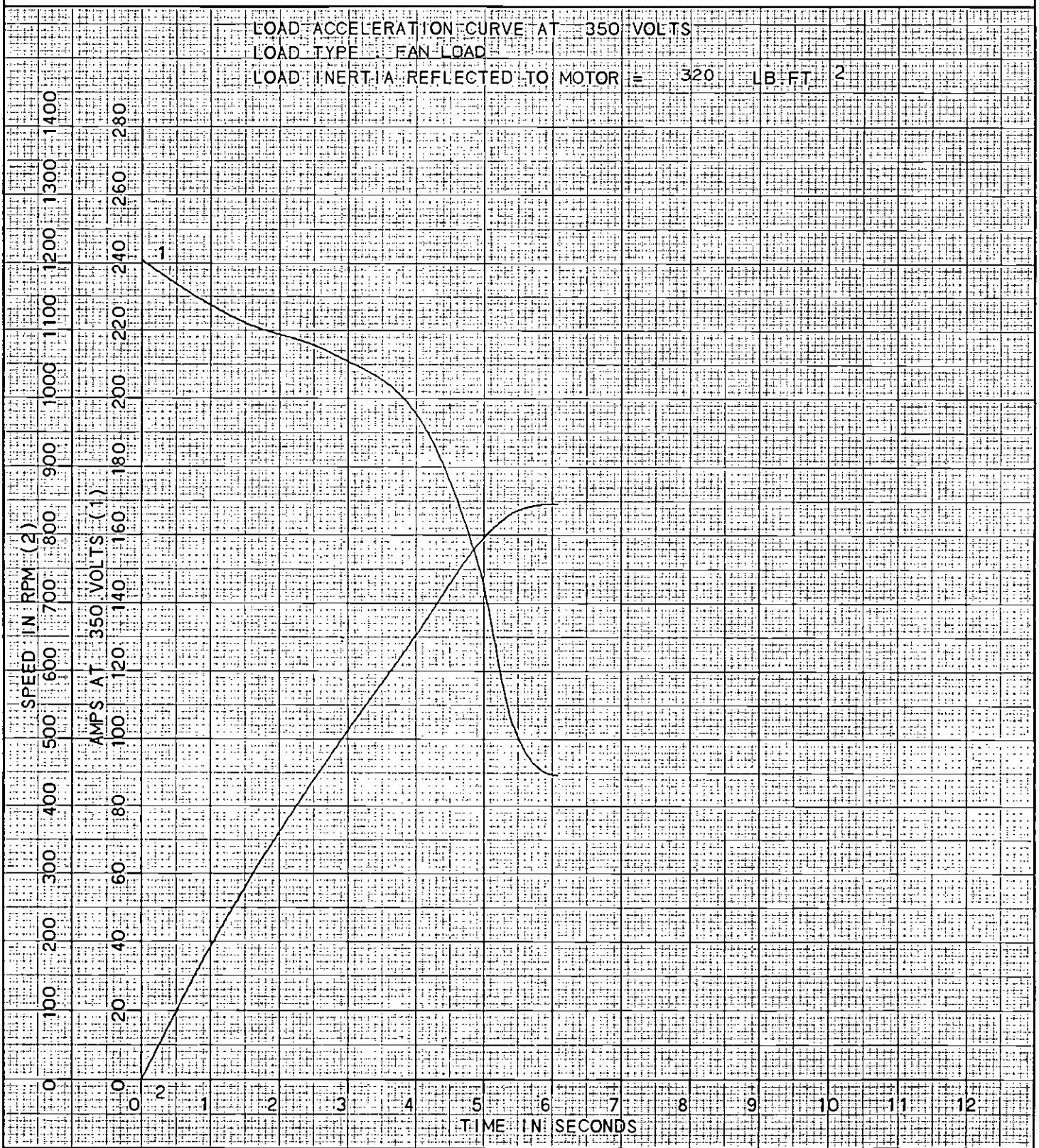
A-C MOTOR PERFORMANCE CURVES

E06009-A-B003

ISSUE DATE 10/26/87

File D79213

REL S.O. 4MAF38651	RPM 875	S.F. 1.0	ROTOR 414777-70-CE
FRAME 404T	VOLTS 460	NEMA DESIGN B	TEST S.O. TYPICAL DATA
HP 50	AMPS 68	CODE LETTER F	TEST DATE ---
TYPE P	DUTY CONT	ENCLOSURE TEFC	STATOR RES.@ 25°C .199
PHASE/HERTZ 3/60	AMB°C/INSUL 40/H	E/S 595341	OHMS (BETWEEN LINES)



AMPERES SHOWN FOR 460 VOLT CONNECTION, IF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE RATED VOLTAGE.

RELIANCE ELECTRIC
CLEVELAND, OHIO 44117 U.S.A.

DR. BY	D. M. BYRD
CK. BY	D. H. MAY
APP. BY	D. H. MAY
DATE	10/26/87

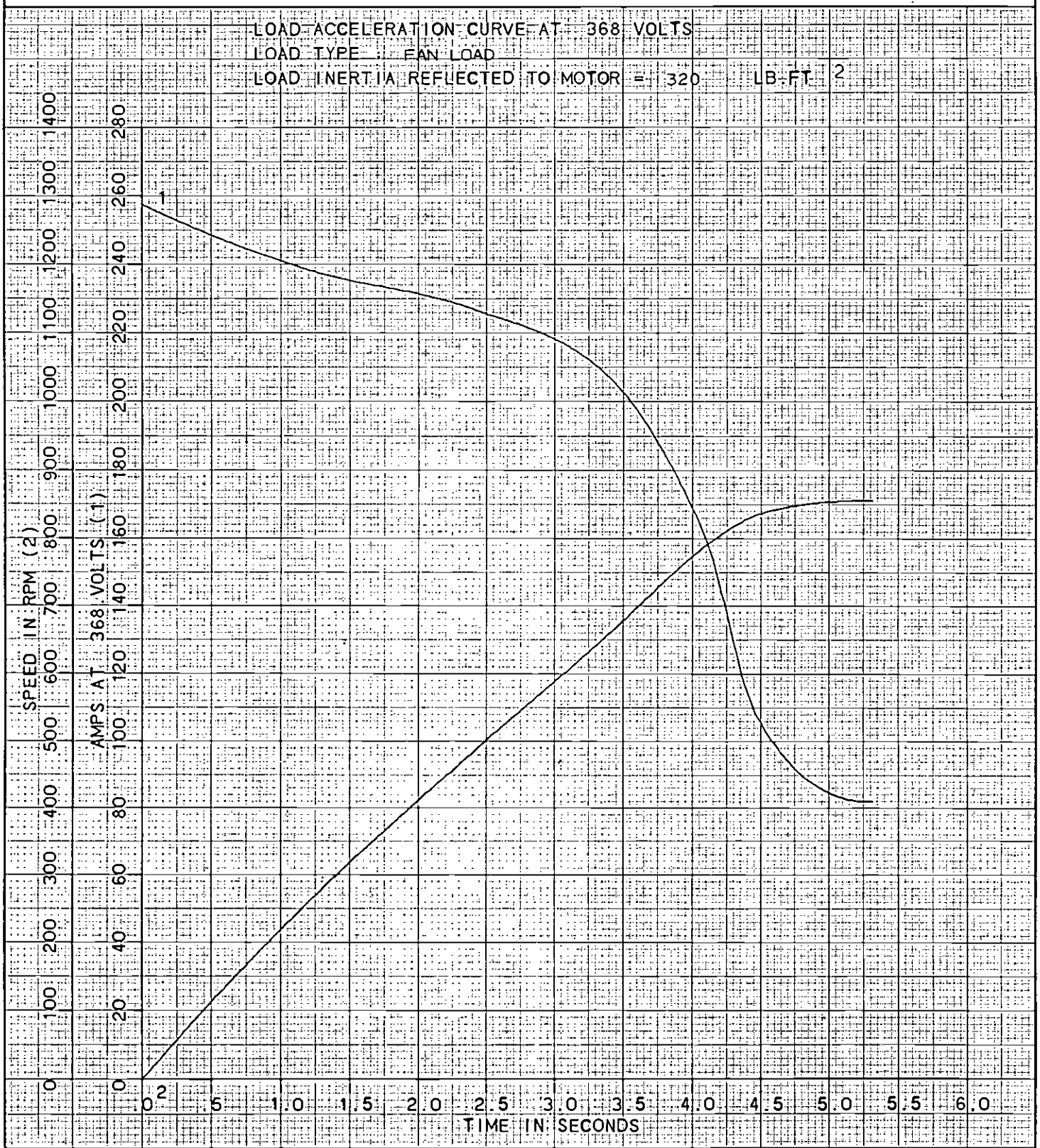
A-C MOTOR PERFORMANCE CURVES

E06009-A-B003

ISSUE DATE 10/26/87

File D79214

REL S.O. 4MAF38651	RPM 875	S.F. 1.0	ROTOR 414777-70-CE
FRAME 404T	VOLTS 460	NEMA DESIGN B	TEST S.O. TYPICAL DATA
HP 50	AMPS 68	CODE LETTER F	TEST DATE ---
TYPE P	DUTY CONT	ENCLOSURE TEFC	STATOR RES.@ 25°C .199
PHASE/HERTZ 3/60	AMB°C/INSUL 40/H	E/S 595341	OHMS (BETWEEN LINES)



AMPERES SHOWN FOR 460 VOLT CONNECTION, IF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE RATED VOLTAGE.

RELIANCE ELECTRIC
CLEVELAND, OHIO 44117 U.S.A.

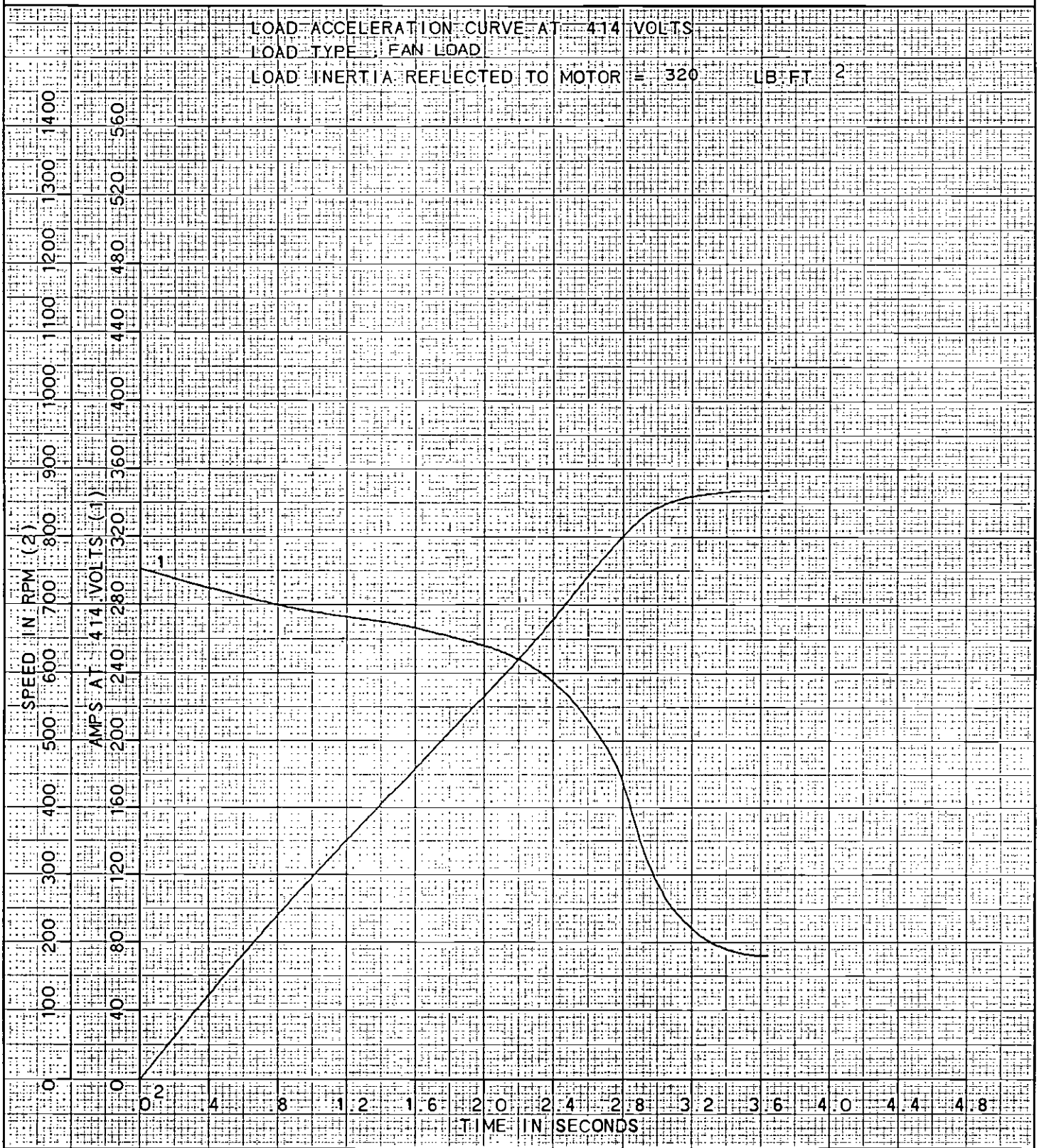
DR. BY	D. M. BYRD
CK. BY	D. H. MAY
APP. BY	D. H. MAY
DATE	10/26/87

A-C MOTOR PERFORMANCE CURVES

E06009-A-B003
ISSUE DATE 10/26/87

File D79215

REL S.O. 4MAF38651	RPM 875	S.F. 1.0	ROTOR 414777-70-CE
FRAME 404T	VOLTS 460	NEMA DESIGN B	TEST S.O. TYPICAL DATA
HP 50	AMPS 68	CODE LETTER F	TEST DATE ---
TYPE P	DUTY CONT	ENCLOSURE TEFC	STATOR RES.@ 25°C .199
PHASE/HERTZ 3/60	AMB°C/INSUL 40/H	E/S 595341	OHMS (BETWEEN LINES)



AMPERES SHOWN FOR 460 VOLT CONNECTION, IF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE RATED VOLTAGE.

RELIANCE ELECTRIC
CLEVELAND, OHIO 44117 U.S.A.

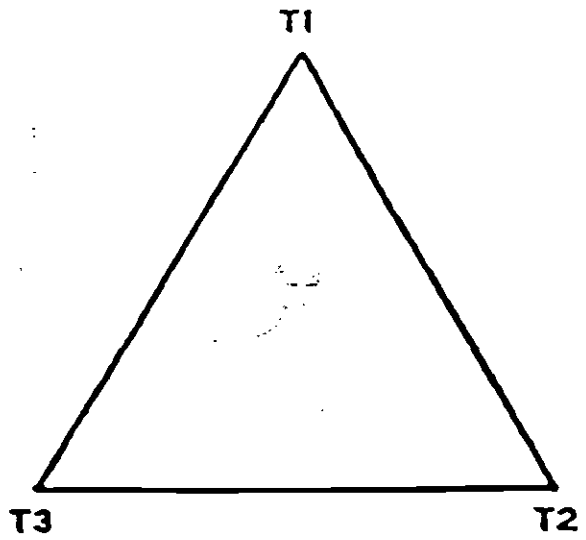
DR. BY D. M. BYRD
CK. BY D. H. MAY
APP. BY D. H. MAY
DATE 10/26/87

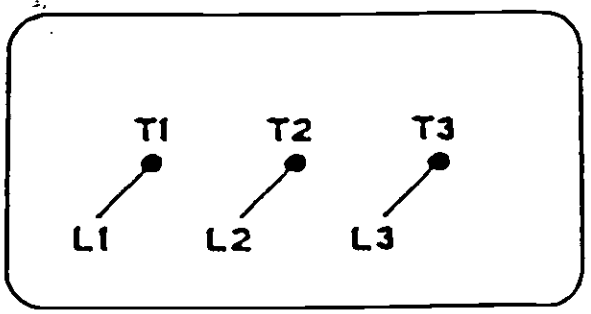
A-C MOTOR PERFORMANCE CURVES

E06009-A-B003
ISSUE DATE 10/26/87

File D79216

A-C MOTOR
CONNECTION DIAGRAM
STANDARD 3 LEAD DELTA-CONNECTED





(N.P 1575-BA)

CUSTOMER _____ CUSTOMER ORDER NO. _____ RELIANCE S.O. NO. _____

RELIANCE ELECTRIC
CLEVELAND, OHIO 44117

DR BY M.E.L.
CH BY R.S.
APP BY M.E.L.
DATE 10/31/78

CONNECTION DIAGRAM **416820-25**
ISSUE DATE OCT. 30, 1966

C/R 216(

RELIANCE ELECTRIC

REVISED

DATA TRANSMITTA AND CERTIFICATIOI

CUSTOMER ORDER NO.	DATE	REQ. NO.	S.O. NO.
CP773004	04/21/88		03MAF38651

REFER TO THIS NUMBER IN ALL CORRESPONDENC

SOLD TO:
FLAKT CANADA LTD
1400 MERIVALE RD (K2C 3P9)
OTTAWA ONT CAN

SHIP TO:
SAME AS "SOLD TO" UNLESS SHOWN
FAMCO-FORSYTH
216 JUNIA AVENUE
WINSTON-SALEM NC 27107

DATA PROVIDED WITH THIS TRANSMITTAL AND CERTIFICATION IS:

- ☐ FOR CUSTOMER APPROVAL BY DATE: _____
  Return of approval prints by the above date is required to assure scheduled shipment. delay in return and/or revision of approval prints may require shipment reschedule. Return approved D/S to data source.
- ☒ FINAL, APPROVED FOR CONSTRUCTION OR INSTALLATION.
- ☐ PRELIMINARY, ENGINEERING IS COMPLETED.
- ☒ REVISED, SUPERSEDES DATA PREVIOUSLY ISSUED.
- ☐ SEE REMARKS.

DATA SOURCE
TRANSMITTAL AND CERTIFICATION ISSUED BY: ACK DATE 7 0 '89 CK BY _____ DATE _____
RELIANCE ELECTRIC CO.
COLLINS IND. DRIVE
ATHENS, GA 30613

DATE PRINTED: 07/06/89

MOTOR OR GEN. DATA

ITEM	USED FOR	USERS PLANT	MOTOR OR GEN. D/S:
3 OF 4	SUBWAY FANS: 2371LB FT 2		604989-193

QTY.	FRAME		SERV. FA	TYPE	R.P.M.	C BOX D/S
3	445T	150 HP	1.15	PB	1200	

PH/HZ/VOLTS-WINDING	DUTY	ENCLOSURE	AMB./INSL.	PWR. CODE	MOTOR OR GEN. C/D:
3/60 /460	CONT	TENV-AOX	40 /H /		1575-BA (25)

BEARINGS	MOUNTING & METHOD OF DRIVE	RAILS OR BASE	MODEL NUMBER	REDUCER OR AUX D/S:
BALL	F2 DRCT			

ROTAT FROM OPP. DR. END	D-C FIELD EXCITATION	DOUBLE SHAFT EXTEN.	BRAKE OR AUX. D/S
REV			

REDUCER DATA

REDUCER STYLE	CLASS	FRAME	RATIO	OUTPUT RPM	ASSEMBLY	BLOWER MOTOR PH/HZ/VOLTS/HP

BRAKE DATA

BRAKE TYPE	SIZE	RATING FT/LB	DUTY	P.O.

DATA FOR CONTROL

D-C MOTOR ARMATURE CURRENT: _____ AMPS
FIELD CHARACTERISTICS PER CURVE: _____
F_1—F_2, _____ MAX. AMPS _____ _____ RPM
F_{11}—F_{22}, _____ MAX. AMPS _____ _____ RPM
F_3—F_4, _____ MAX. AMPS _____ _____ RPM

A-C MOTOR INFORMATION FOR SELECTION OF STARTER HEATERS:
CODE: F LOCKED AMPS: _____
F.L. CURRENT: 174. AMPS.

ADDITIONAL MOTOR OR GEN DATA:
FR CONST RGD

SPCL. INSTAL-LATION FEAT. AND MISC. DATA

SPECIAL MARKS:
SCRDT/LA METRO RAIL

SPECIAL FEATURES:
REFLECTED LOAD INERTIA= 2371 LB-FT 2; (150) DEG C AMB, ONE HOUR; CLASS F TEMPERATURE RISE; 75% VOLTAGE STARTING; QTY 6M 10 OHM WDG COPPER RTD'S WITH AUX C/BOX; 120V SPACE HEATER WITH SEPARATE C/BOX;PROVISION FOR VIBRATION DETECTER,QTY ONE 1/4-20 TAPPED HOLE AT EACH BRG, HORIZONTAL PLANE;A/F GREASE LUBS-40,000 HR L-10;CAPABLE OF ACCEL FAN TO RATED SPD MAX 25 SEC; CAPBL OF ACCEL TO RATED SPD IN OPP DIRCT IN MAX 45 SEC AFTER ENERGZ FOR REVR ROTATION;15 SECONDS DELAY BETWN POWER INTERR & RE-APPLCTN OF PWR FOR REV ROTATN;CAP OF OPER FOR 1 HR AT 300 DEG F (148 DEG C);CAPBL OF 300 COMPL REV CYCL WITH 10 SECOND DELAY BETWN CYCL (OVER LIFETIME EXPECT);48" LEAD LENGTH FOR ALL LEADS; CAST IRON C/B FOR SEP MOUNTING; GROUND PROV IN C/BOX; 2 IDENTICAL N/P(1 ON MTR, 1 FOR FAN HOUSING); 1 MTR TO RECV PRE-PRODTN TEST PER SPEC PG 15865-40/41, OTHER
CONTINUED ON PAGE 2

RELIANCE ELECTRIC

DATA TRANSMITTAL AND CERTIFICATION

CUSTOMER ORDER NO.	DATE	REQ. NO.	S.O. NO.
			03MAF38651

REFER TO THIS NUMBER IN ALL CORRESPONDENCE

SOLD TO:

SHIP TO: SAME AS "SOLD TO" UNLESS SHOWN

DATA PROVIDED WITH THIS TRANSMITTAL AND CERTIFICATION IS:

- ☐ FOR CUSTOMER APPROVAL BY DATE: _____
  Return of approval prints by the above date is required to assure scheduled shipment, delay in return and/or revision of approval prints may require shipment reschedule. Return approved D/S to data source.
- ☒ FINAL, APPROVED FOR CONSTRUCTION OR INSTALLATION.
- ☐ PRELIMINARY, ENGINEERING IS COMPLETED.
- ☒ REVISED, SUPERSEDES DATA PREVIOUSLY ISSUED.
- ☐ SEE REMARKS.

DATA SOURCE

TRANSMITTAL AND CERTIFICATION ISSUED BY: ACK DATE 7 0 7 '89 CK BY _____ DATE _____

MOTOR OR GEN. DATA

ITEM	USED FOR	USERS PLANT	MOTOR OR GEN. D/S:
QTY. / FRAME / SERV. FA / TYPE / R.P.M.			C BOX D/S
PH/HZ/VOLTS-WINDING / DUTY / ENCLOSURE / AMB./INSL. / PWR. CODE			MOTOR OR GEN. C/D:
BEARINGS / MOUNTING & METHOD OF DRIVE / RAILS OR BASE / MODEL NUMBER			REDUCER OR AUX D/S:
ROTAT FROM OPP. DR. END / D-C FIELD EXCITATION / DOUBLE SHAFT EXTEN.			BRAKE OR AUX. D/S

RE-DUCER DATA

REDUCER STYLE	CLASS	FRAME	RATIO	OUTPUT RPM	ASSEMBLY	BLOWER MOTOR PH/HZ/VOLTS/HP

BRAKE DATA

BRAKE TYPE	SIZE	RATING FT/LB	DUTY	P.O.

DATA FOR CONTROL

D-C MOTOR ARMATURE CURRENT: _____ AMPS

FIELD CHARACTERISTICS PER CURVE: _____

F_1—F_2, _____ MAX. AMPS _____ _____ RPM

F_{11}—F_{22}, _____ MAX. AMPS _____ _____ RPM

F_3—F_4, _____ MAX. AMPS _____ _____ RPM

A-C MOTOR INFORMATION FOR SELECTION OF STARTER HEATERS:

CODE: _____ LOCKED AMPS: _____

F.L. CURRENT: _____ AMPS.

SPCL. INSTALLATION FEAT. AND MISC. DATA

MOTORS RECEIVE ROUTINE TEST; WITH 1/2-13 TAPPED HOLE IN END OF SHAFT; WITH C/BASE ADAPTERS: ONE FOR FRAME, ONE FOR C/BOX

CERTIFIED DRAWINGS AND DATA:
10 D/T D/S W/D I/M P/L PERF CURVES THERMAL LIMIT AT 35 DEG C AND 149 DEG C CERT OF COMPL
TO SOLD TO ATTN M. TURNER 1 EA
TO 99801, 05244 & 84772

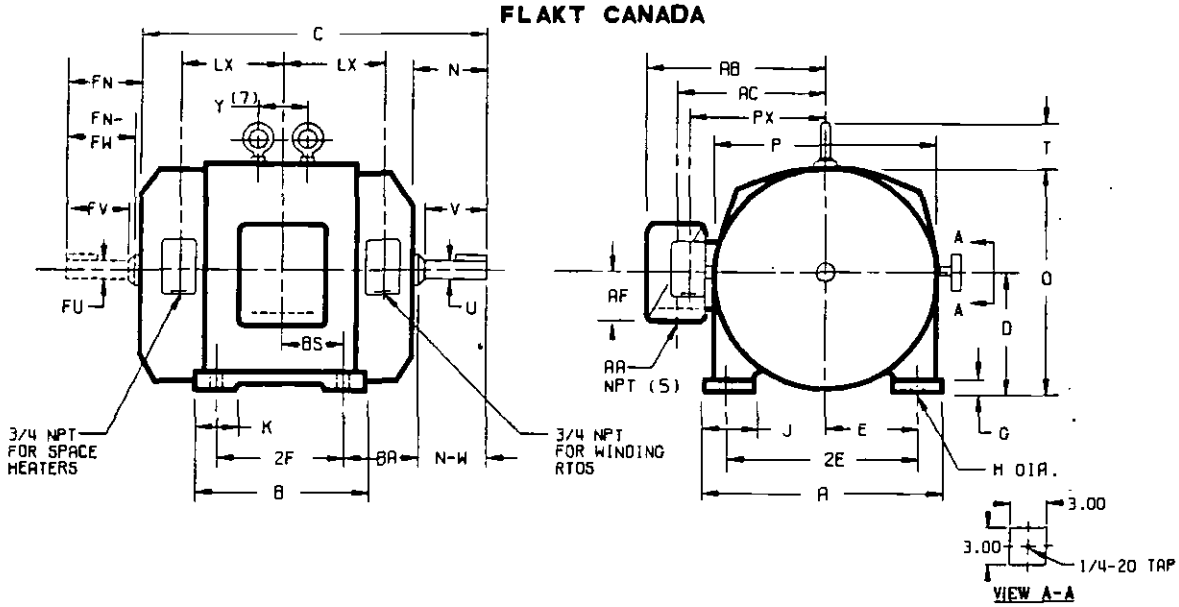
DUTY MASTER ALTERNATING CURRENT MOTORS

SQUIRREL-CAGE INDUCTION

ENCLOSURE: TOTALLY ENCLOSED **COOLING: NON-VENTILATED**

MOUNTING: FOOT

FRAMES 445T THRU 449T ABOVE NEMA RATINGS
AUXILIARY CONDUIT BOXES
PROVISIONS FOR VIBRATION DETECTORS
FLAKT CANADA



DIMENSIONS ARE IN INCHES

FRAME	A	O(2)	2E	G	H	J	K	O	P	T	Y (7)	BA	LX	PX
445T	21.00	11.00	18.00	1.12	.81	3.25	3.25	24.25	25.25	4.25	---	7.50	11.12	15.50
447T	21.00	11.00	18.00	1.12	.81	3.25	3.25	24.25	25.25	4.25	5.00	7.50	12.88	15.50
449T	21.00	11.00	18.00	1.12	.81	3.25	3.25	24.25	25.25	4.25	5.00	7.50	15.38	15.50
(1)														

				BACK END SHAFT AND KEY						SQ.	FRONT END SHAFT AND KEY					SQ.	WT.
FRAME	C	BS	B	2F	N	N-W	U(3)	Y	LGTH.	KEY	FN	FN-FW	FU(3)	FV	LGTH.	KEY	(LBS)
445T	39.56	8.25	19.00	16.50	8.94	8.50	3.375	8.25	6.88	.875	6.31	5.88	2.375	5.62	4.25	.625	1410
447T	43.06	10.00	22.50	20.00	8.94	8.50	3.375	8.25	6.88	.875	6.31	5.88	2.375	5.62	4.25	.625	1730
449T	48.06	12.50	27.50	25.00	8.94	8.50	3.375	8.25	6.88	.875	6.31	5.88	2.375	5.62	4.25	.625	2100
(1)																	

	CONDUIT BOX			
	AA	STANDARD		
FRAME	(4)(5)	AB(6)	AC(6)	AF
445T	REFER TO NOTE (4)(5)	22.75	17.50	7.00
445TS		22.75	17.50	7.00
447T		22.75	17.50	7.00
447TS		22.75	17.50	7.00
449T		22.75	17.50	7.00
449TS		22.75	17.50	7.00
(1)				

MAXIMUM FULL LOAD AMPERES	AA(5)	REF. ONLY CONDUIT BOX
201	4	76870-B
335	5	76870-D
600	6	76870-A

(1) SPECIAL DIMENSIONS ON THIS LINE
(2) "O" VARIES +.00, -.06
(3) "U" & "FU" VARY +.000, -.001
(4) WEATHERPROOF CONDUIT BOX SUPPLIED ONLY WHEN SPECIFIED
(5) "AA" VARIES WITH FULL LOAD AMPS PER TABLE ABOVE.
(6) DIMENSIONS SHOWN ARE FOR POTECTED MOTORS, FOR TENV MOTORS "AB"=23.37, "AC"=18.12
(7) 445 FRAME HAS ONE EYEBOLT C_L OF FRAME.

CONDUIT BOX LOCATED ON OPPOSITE SIDE WHEN F-2, W-1, W-4, W-5, W-7, OR C-1 MOUNTING IS SPECIFIED. STANDARD DOUBLE SHAFT SUPPLIED ONLY WHEN SPECIFIED. IF MOUNTING CLEARANCE DETAILS ARE REQUIRED CONSULT FACTORY. MAXIMUM PERMISSIBLE SHAFT RUNOUT WHEN MEASURED AT END OF STANDARD SHAFT EXTENSION IS .003 T.I.R.

FRAME- _____ TYPE- _____ CERTIFIED FOR- _____

ORDER- _____ ITEM- _____ HP- _____ RPM- _____ PH- _____ HZ- _____ VOLTS- _____

RELIANCE SALES ORDER- _____ APPROVED BY- _____ DATE _____

RELIANCE ELECTRIC
CLEVELAND, OHIO 44117 U.S.A.

DR. BY D.MATHEWS
CK. BY L.T.FOURNIER
APP. BY J.H.PONTZER
DATE 10-04-88

DIMENSION SHEET **604989-193**
ISSUE DATE: NOVEMBER 1, 1988

C/R 301177

REL. S.O:	FRAME	HP	TYPE	PHASE/ HERTZ	RPM	VOLTS
3MAF38651	445T	150	P	3/60	1185	460

AMPS	DUTY	AMB°C/ INSUL.	S.F.	NEMA DESIGN	CODE LETTER	ENCL.
174.	CONT	40/H	1.15	B	F	TENV-AOX

E/S	ROTOR	TEST S.O.	TEST DATE	STATOR RES.@25°C OHMS (BETWEEN LINES)
599545	418143-76-YE	3MAF38651G1	06-20-89	.03850

PERFORMANCE

LOAD	HP	AMPERES	RPM	% POWER FACTOR	% EFFICIENCY
NO LOAD	0	48.6	1200	4.53	0
1/4	37.8	64.7	1196	58.5	93.3
2/4	75.6	95.7	1191	77.5	95.2
3/4	112	131	1186	84.0	95.2
4/4	149	171	1182	86.1	94.7
5/4	186	214	1177	86.6	94.0
6/4	222	260	1170	85.8	93.0

SPEED TORQUE

	RPM	TORQUE % FULL LOAD	TORQUE LB.-FT.	AMPERES
LOCKED ROTOR	0	161	1066	1008
PULL UP	220	155	1032	990
BREAKDOWN	1119	249	1655	605
FULL LOAD	1182	100	664	171

AMPERES SHOWN FOR 460. VOLT CONNECTION. IF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE RATED VOLTAGE

REMARKS: TEST DATA INPUT: NL KW-1.76 LR KVA-830 FL KW-117.7
ROTOR INERTIA IS 69 LB. FT. SQ.

RELIANCE ELECTRIC
CLEVELAND, OHIO 44117 U.S.A.

DR. BY C.L.WILKES
CK. BY D.M.BYRD
APP. BY D.M.BYRD
DATE 06/29/89

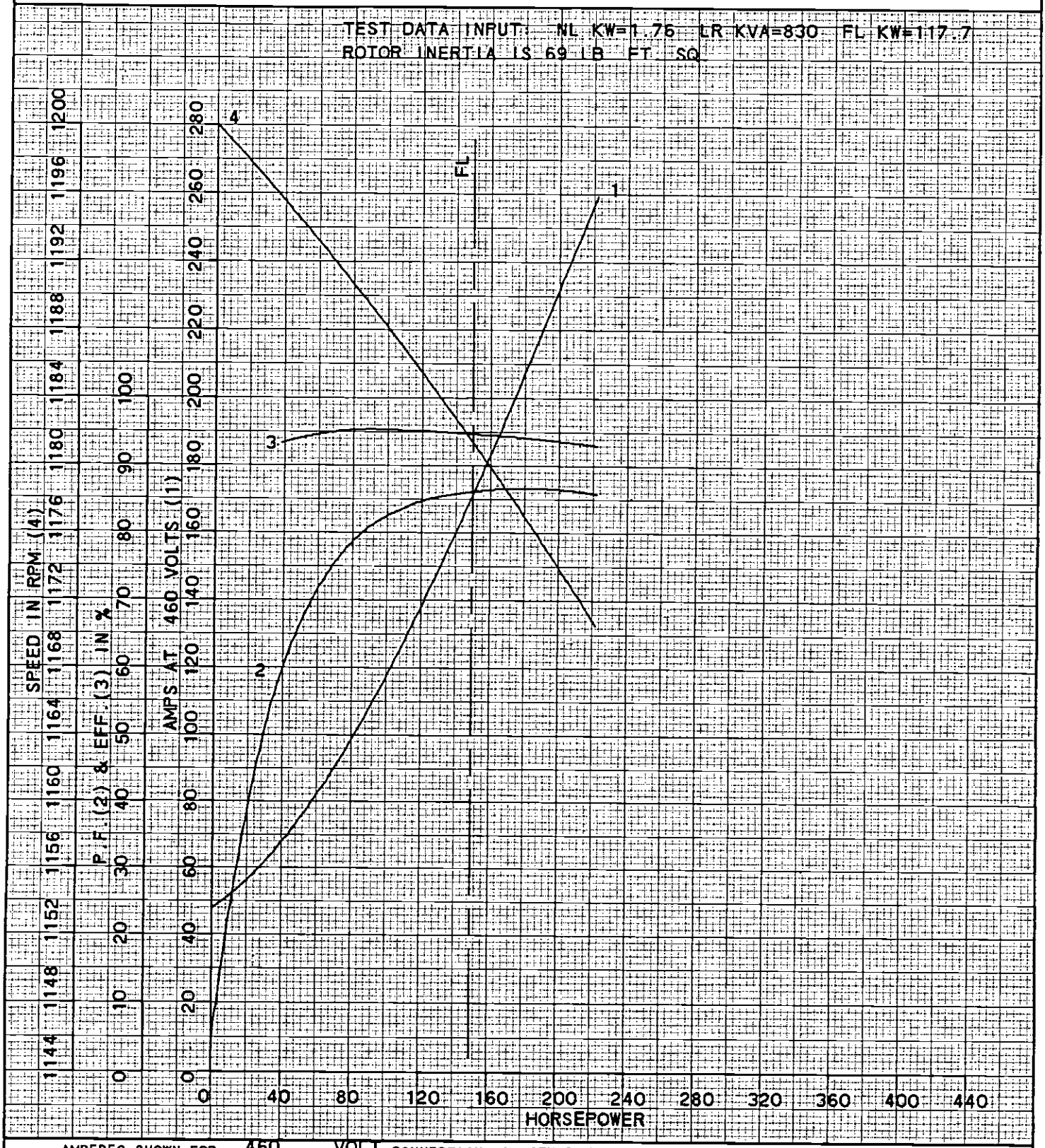
A-C MOTOR PERFORMANCE DATA

SK35397-3
ISSUE DATE 06/29/89

File #76328 S

REL S.O. 3MAF38651	RPM 1185	S.F. 1.15	ROTOR 418143-76-YE
FRAME 445T	VOLTS 460	NEMA DESIGN B	TEST S.O. 3MAF38651G1
HP 150	AMPS 174.	CODE LETTER F	TEST DATE 06-20-89
TYPE P	DUTY CONT	ENCLOSURE TENV-AOX	STATOR RES.@ 25°C .03850 OHMS (BETWEEN LINES)
PHASE/HERTZ 3/60	AMB°C/INSUL 40/H	E/S 599545	

TEST DATA INPUT: NL KW=1.76 LR KVA=830 FL KW=117.7
ROTOR INERTIA IS 69 LB FT SQ



AMPERES SHOWN FOR 460 VOLT CONNECTION, IF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE RATED VOLTAGE.

RELIANCE ELECTRIC
CLEVELAND, OHIO 44117 U.S.A.

DR. BY	C.L.WILKES
CK. BY	D.M.BYRD
APP. BY	D.M.BYRD
DATE	06/29/89

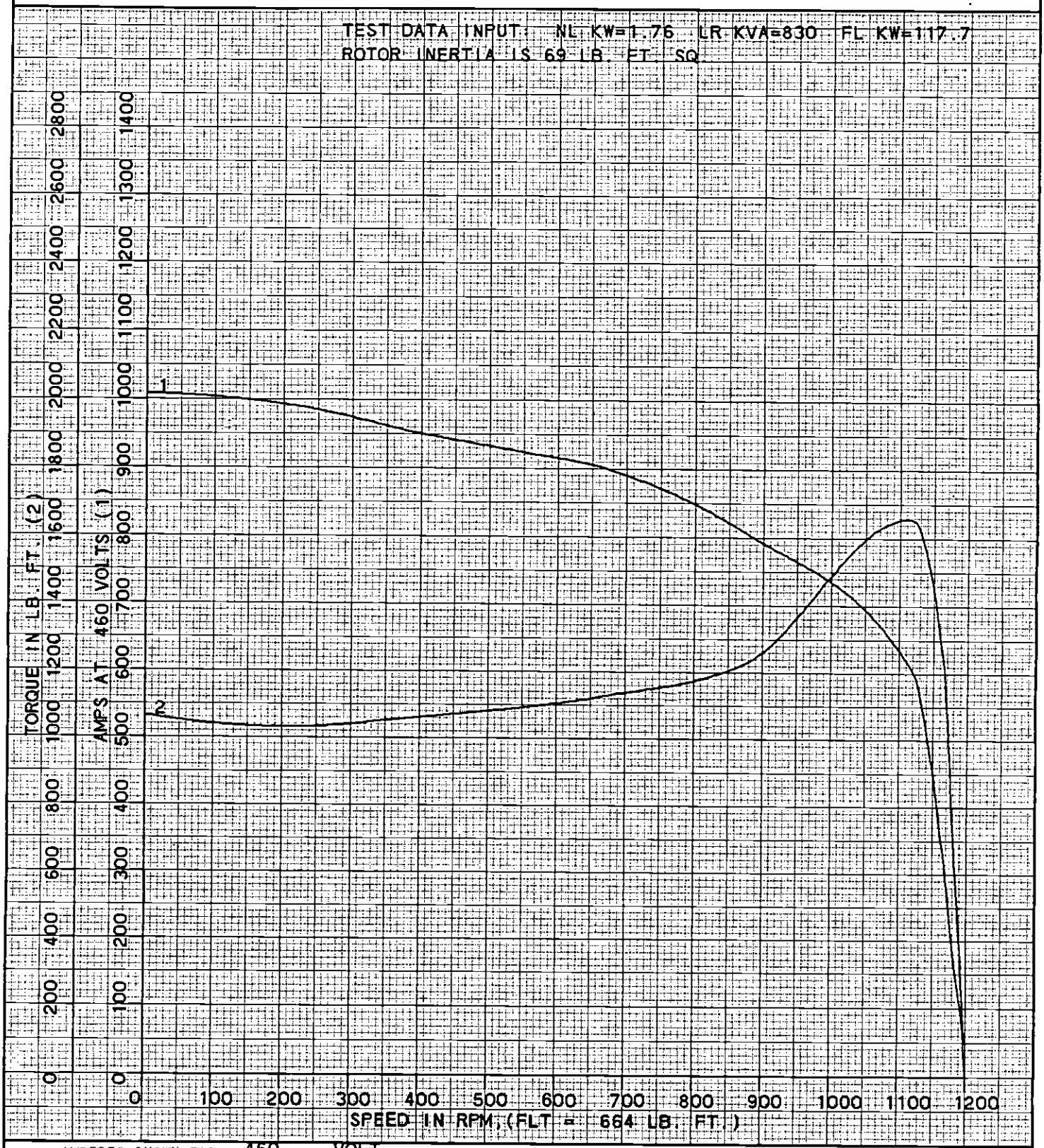
A-C MOTOR PERFORMANCE CURVES

SK35397-3
SH 2 OF 2
ISSUE DATE 06/29/89

File #76328 S

REL S.O. 3MAF38651	RPM 1185	S.F. 1.15	ROTOR 418143-76-YE
FRAME 445T	VOLTS 460	NEMA DESIGN B	TEST S.O. 3MAF38651G1
HP 150	AMPS 174.	CODE LETTER F	TEST DATE 06-20-89
TYPE P	DUTY CONT	ENCLOSURE TENV-AOX	TATOR RES.@ 25°C .03850
PHASE/HERTZ 3/60	AMB°C/INSUL 40/H	E/S 599545	OHMS (BETWEEN LINES)

TEST DATA INPUT: NL KW=1.76 LR KVA=830 FL KW=117.7
ROTOR INERTIA IS 69 LB. FT. SQ.



AMPERES SHOWN FOR 460 VOLT CONNECTION, IF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE RATED VOLTAGE.

RELIANCE ELECTRIC
CLEVELAND, OHIO 44117 U.S.A.

DR. BY C.L.WILKES
CK. BY D.M.BYRD
APP. BY D.M.BYRD
DATE 06/29/89

A-C MOTOR PERFORMANCE CURVES

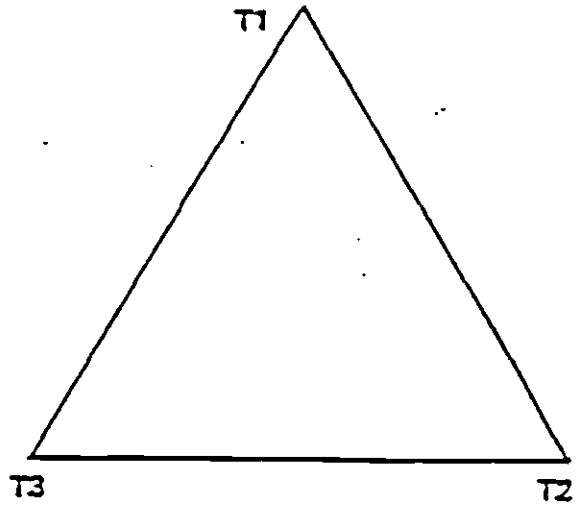
SK35397-3
SH 1 OF 2
ISSUE DATE 06/29/89

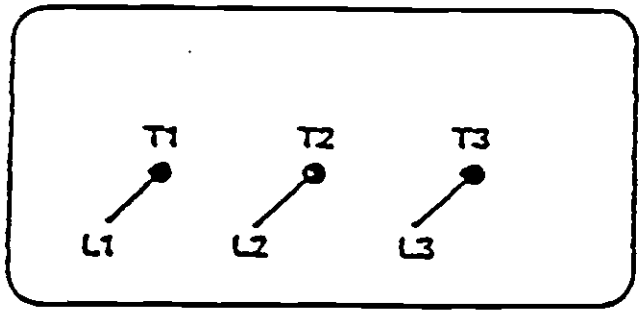
File #76328 S

A-C MOTOR

CONNECTION DIAGRAM

STANDARD 3 LEAD DELTA CONNECTED





(N.P. 1575-8A)

CUSTOMER _____ CUSTOMER ORDER NO. _____ RELIANCE S.O. NO. _____

RELIANCE ELECTRIC COMPANY CLEVELAND, OHIO 44117 U.S.A.	DR. BY ____ DES. BY ____ APP. BY ____ DATE ____	CONNECTION DIAGRAM 416820-25

RELIANCE ELECTRIC

REVISED

DATA TRANSMITTA AND CERTIFICATIOI

CUSTOMER ORDER NO.	DATE	REQ. NO.	S.O. NO.
CP773004	04/21/88		02MAF38651

REFER TO THIS NUMBER IN ALL CORRESPONDENC

SOLD TO:
FLAKT CANADA LTD
1400 MERIVALE RD (K2C 3P9)
OTTAWA ONT CAN

SHIP TO:
SAME AS "SOLD TO" UNLESS SHOWN
FAMCO-FORSYTH
216 JUNIA AVENUE
WINSTON-SALEM NC 27107

DATA PROVIDED WITH THIS TRANSMITTAL AND CERTIFICATION IS:
- ☐ FOR CUSTOMER APPROVAL BY DATE: _____
  Return of approval prints by the above date is required to assure scheduled shipment, delay in return and/or revision of approval prints may require shipment reschedule. Return approved D/S to data source.
- ☒ FINAL, APPROVED FOR CONSTRUCTION OR INSTALLATION.
- ☐ PRELIMINARY, ENGINEERING IS COMPLETED.
- ☒ REVISED, SUPERSEDES DATA PREVIOUSLY ISSUED.
- ☐ SEE REMARKS.

DATA SOURCE

TRANSMITTAL AND CERTIFICATION ISSUED BY: ACK DATE 7 0 5 89 CK BY _____ DATE _____
RELIANCE ELECTRIC CO.
COLLINS IND. DRIVE
ATHENS, GA 30613

DATE PRINTED: 06/30/89

MOTOR OR GEN. DATA

ITEM	USED FOR	USERS PLANT	MOTOR OR GEN. D/S:
2 OF 4	SUBWAY FANS: 2371LB FT2		604989-193

QTY.	FRAME		SERV. FA	TYPE	R.P.M.	C BOX D/S
5	449T	200 HP	1.15	PB	1200	

PH/HZ/VOLTS-WINDING	DUTY	ENCLOSURE	AMB./INSL.	PWR. CODE	MOTOR OR GEN. C/D:
3/60 /460	CONT	TENV-AOX	40 /H /		1575-BA (25)

BEARINGS	MOUNTING & METHOD OF DRIVE	RAILS OR BASE	MODEL NUMBER	REDUCER OR AUX D/S:
BALL	F1 DRCT			

ROTAT FROM OPP. DR. END	D-C FIELD EXCITATION	DOUBLE SHAFT EXTEN.	BRAKE OR AUX. D/S
REV			

REDUCER DATA

REDUCER STYLE	CLASS	FRAME	RATIO	OUTPUT RPM	ASSEMBLY	BLOWER MOTOR PH/HZ/VOLTS/HP

BRAKE DATA

BRAKE TYPE	SIZE	RATING FT/LB	DUTY	P.O.

DATA FOR CONTROL

D-C MOTOR ARMATURE CURRENT: _____ AMPS
FIELD CHARACTERISTICS PER CURVE: _____
F_1—F_2, _____ MAX. AMPS _____ _____ RPM
F_{11}—F_{22}, _____ MAX. AMPS _____ _____ RPM
F_3—F_4, _____ MAX. AMPS _____ _____ RPM

A-C MOTOR INFORMATION FOR SELECTION OF STARTER HEATERS:
CODE: G LOCKED AMPS: _____
F.L. CURRENT: 228. AMPS.

ADDITIONAL MOTOR OR GEN DATA:
LD LOC - STD
FR CONST RGD

SPCL. INSTAL-LA. TION FEAT. AND MISC. DATA

SPECIAL MARKS:
SCRDT/LA METRO RAIL

SPECIAL FEATURES:
TEAO-XT 460/3/60; FAN APPLTN 1.15SF; REFLECTED LOAD INERTIA= 2371LB-FT2;CLASS H INSUL; (150) DEG C AMB, 1 HOUR; CLASS F TEMP RISE 75% VOLT STRT; WINDING 10 OHM COPPER RTD'S 2/PH PLUS AUX C/BOX, SPC HTR 120V PLUS SEP C/BOX PROV FOR VIBRATN DETECTER QTY (1) 1/4-20 TAPPED HOLE AT EA BRG HORIZNTL PLANE A/F GREASE LUBE-40,000HR L10 CAPB OF ACC FAN TO RATED SPEED MAX 25 SEC CAPB OF ACCEL RATED SPD IN OPP DIRCTN IN MAX 45 SEC AFTER ENERG FOR REV RORATN-15 SEC DELAY BETWN PWR INTERR & RE-APPLCTN OW PWR FOR REV ROTATN CAPBL OF OPER FOR 1 HR AT 300 DEG F (148 DEG C), 300 COMPL REV CYCLES WITH 10 SEC DELAY BETWN CYCLES(OVER LIFTIME EXPECT) 48" LEAD LGNTH FOR ALL LEADS, CAST IRON C/BOX FOR SEP MOUNTING, GRND PROV IN C/B, 2 IDENT N/P 1 ON MTR, 1 FOR FAN HOUSING, 1 MTR TO RECV
CONTINUED ON PAGE 2

RE 1805ST2

RELIANCE ELECTRIC

DATA TRANSMITTAL AND CERTIFICATION

REFER TO THIS NUMBER IN ALL CORRESPONDENCE

CUSTOMER ORDER NO.	DATE	REQ. NO.	S.O. NO.
			02MAF38651

SOLD TO:

SHIP TO: SAME AS "SOLD TO" UNLESS SHOWN

DATA PROVIDED WITH THIS TRANSMITTAL AND CERTIFICATION IS:

- ☐ FOR CUSTOMER APPROVAL BY DATE: _____
  Return of approval prints by the above date is required to assure scheduled shipment. delay in return and/or revision of approval prints may require shipment reschedule. Return approved D/S to data source.
- ☒ FINAL, APPROVED FOR CONSTRUCTION OR INSTALLATION.
- ☐ PRELIMINARY, ENGINEERING IS COMPLETED.
- ☒ REVISED, SUPERSEDES DATA PREVIOUSLY ISSUED.
- ☐ SEE REMARKS.

DATA SOURCE

TRANSMITTAL AND CERTIFICATION ISSUED BY: ACK DATE 7.05.89 CK BY _____ DATE _____

MOTOR OR GEN. DATA

ITEM	USED FOR	USERS PLANT				MOTOR OR GEN. D/S:
QTY.	FRAME		SERV. FA	TYPE	R.P.M.	C BOX D/S
PH/HZ/VOLTS-WINDING	DUTY	ENCLOSURE	AMB./INSL.	PWR. CODE		MOTOR OR GEN. C/D:
BEARINGS	MOUNTING & METHOD OF DRIVE	RAILS OR BASE	MODEL NUMBER			REDUCER OR AUX D/S:
ROTAT FROM OPP. DR. END	D-C FIELD EXCITATION	DOUBLE SHAFT EXTEN.				BRAKE OR AUX. D/S

REDUCER DATA

REDUCER STYLE	CLASS	FRAME	RATIO	OUTPUT RPM	ASSEMBLY	BLOWER MOTOR PH/HZ/VOLTS/HP

BRAKE DATA

BRAKE TYPE	SIZE	RATING FT/LB	DUTY	P.O.

DATA FOR CONTROL

D-C MOTOR ARMATURE CURRENT: _____ AMPS

FIELD CHARACTERISTICS PER CURVE: _____

F_1—F_2, _____ MAX. AMPS _____ _____ RPM

F_{11}—F_{22}, _____ MAX. AMPS _____ _____ RPM

F_3—F_4, _____ MAX. AMPS _____ _____ RPM

A-C MOTOR INFORMATION FOR SELECTION OF STARTER HEATERS:

CODE: _____ LOCKED AMPS: _____

F.L. CURRENT: _____ AMPS.

SPCL. INSTALLATION FEAT. AND MISC. DATA

PRE-PRODCTN TEST PER ATTCD SPEC PG 15865-40/41 ALL OTHER MTR TO HAVE ROUTINE TEST; WITH 1/2-13 TAPPED HOLE IN END OF SHAFT; WITH TWO ADAPTER PLATES: ONE FOR FRAME, ONE FOR C/BOX

CERTIFIED DRAWINGS AND DATA:
10 D/T D/S W/D I/M P/L PERF
CURV THERMAL LIMIT AT 35 & 148
DEG C CERT OF COMPL TO SOLD TO
ATTN M. TURNER AND 99801,84772
& 05244

REL. S.O.	FRAME	HP	TYPE	PHASE/ HERTZ	RPM	VOLTS
2MAF38651	449T	200	P	3/60	1185	460

AMPS	DUTY	AMB°C/ INSUL.	S.F.	NEMA DESIGN	CODE LETTER	ENCL.
226.	CONT	40/H	1.15	B	G	TENV-AOX

E/S	ROTOR	TEST S.O.	TEST DATE	STATOR RES.@25°C OHMS (BETWEEN LINES)
401035	418143-76-WE	2MAF38651G1	06-20-89	.02860

PERFORMANCE

LOAD	HP	AMPERES	RPM	% POWER FACTOR	% EFFICIENCY
NO LOAD	0	61.2	1200	3.60	0
1/4	50.8	83.1	1197	60.4	94.7
2/4	102	125	1193	79.3	96.0
3/4	151	173	1190	84.9	95.8
4/4	200	226	1186	87.1	95.2
5/4	249	283	1181	87.3	94.4
6/4	298	343	1177	86.9	93.5

SPEED TORQUE

	RPM	TORQUE % FULL LOAD	TORQUE LB.-FT.	AMPERES
LOCKED ROTOR	0	142	1258	1431
PULL UP	196	124	1101	1328
BREAKDOWN	1137	259	2292	800
FULL LOAD	1186	100	886	226

AMPERES SHOWN FOR 460. VOLT CONNECTION. IF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE RATED VOLTAGE

REMARKS: TEST DATA INPUT: NL KW=1.78 LR KVA=1140 FL KW=156.7
ROTOR INERTIA= 78 LB. FT. SQ.

RELIANCE ELECTRIC
CLEVELAND, OHIO 44117 U.S.A.

DR. BY C.L.WILKES
CK. BY D.M.BYRD
APP. BY D.M.BYRD
DATE 06/28/89

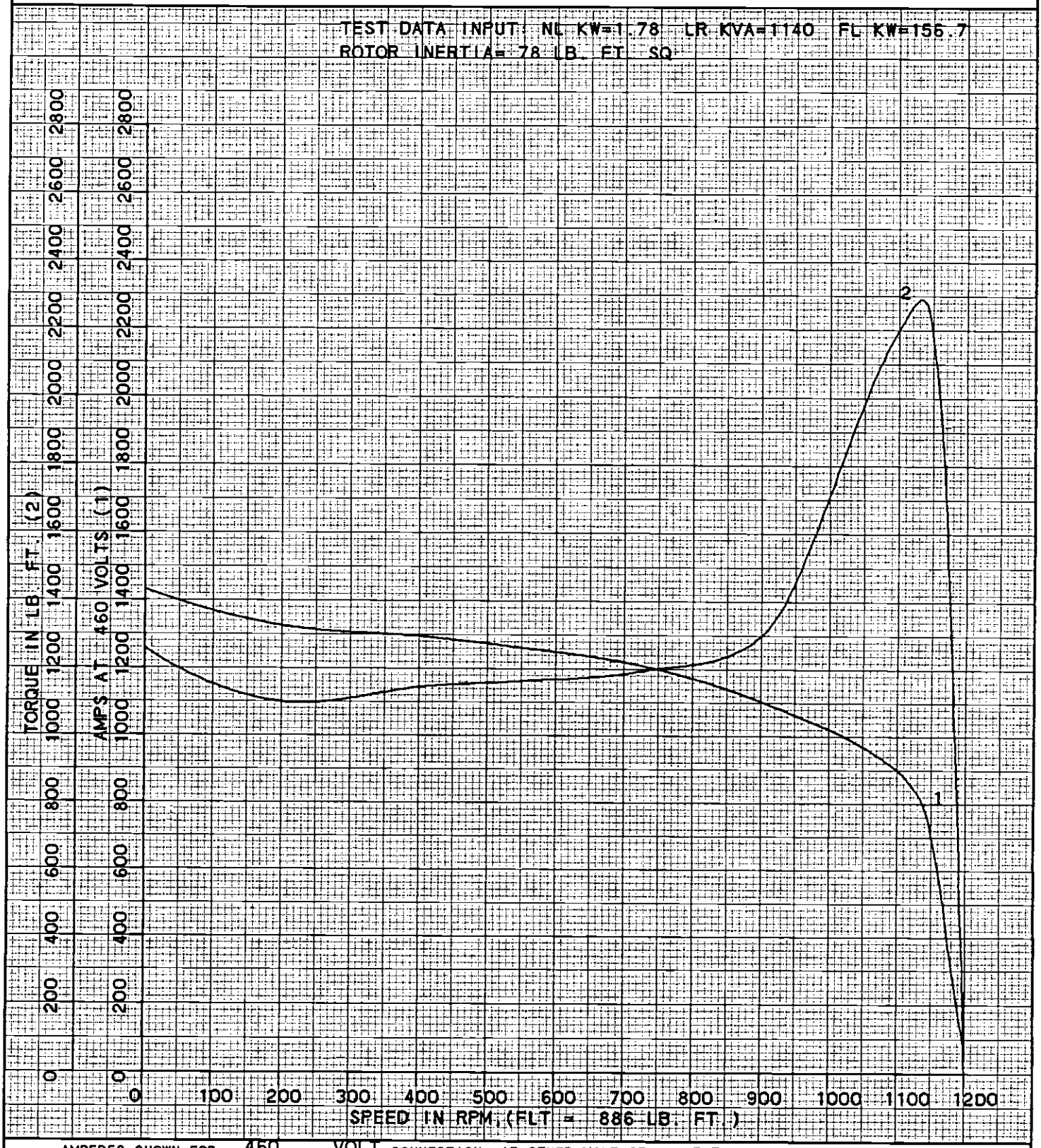
A-C MOTOR PERFORMANCE DATA

SK35397-4
ISSUE DATE 06/28/89

File #76326 S

REL S.O. 2MAF38651	RPM 1185	S.F. 1.15	ROTOR 418143-76-WE
FRAME 449T	VOLTS 460	NEMA DESIGN B	TEST S.O. 2MAF38651G1
HP 200	AMPS 226.	CODE LETTER G	TEST DATE 06-20-89
TYPE P	DUTY CONT	ENCLOSURE TENV-AOX	STATOR RES.@ 25°C .02860
PHASE/HERTZ 3/60	AMB°C/INSUL 40/H	E/S 401035	OHMS (BETWEEN LINES)

TEST DATA INPUT: NL KW=1.78 LR KVA=1140 FL KW=156.7
ROTOR INERTIA= 78 LB. FT. SQ.



AMPERES SHOWN FOR 460 VOLT CONNECTION, IF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE RATED VOLTAGE.

RELIANCE ELECTRIC
CLEVELAND, OHIO 44117 U.S.A.

DR. BY	C.L.WILKES
CK. BY	D.M.BYRD
APP. BY	D.M.BYRD
DATE	06/28/89

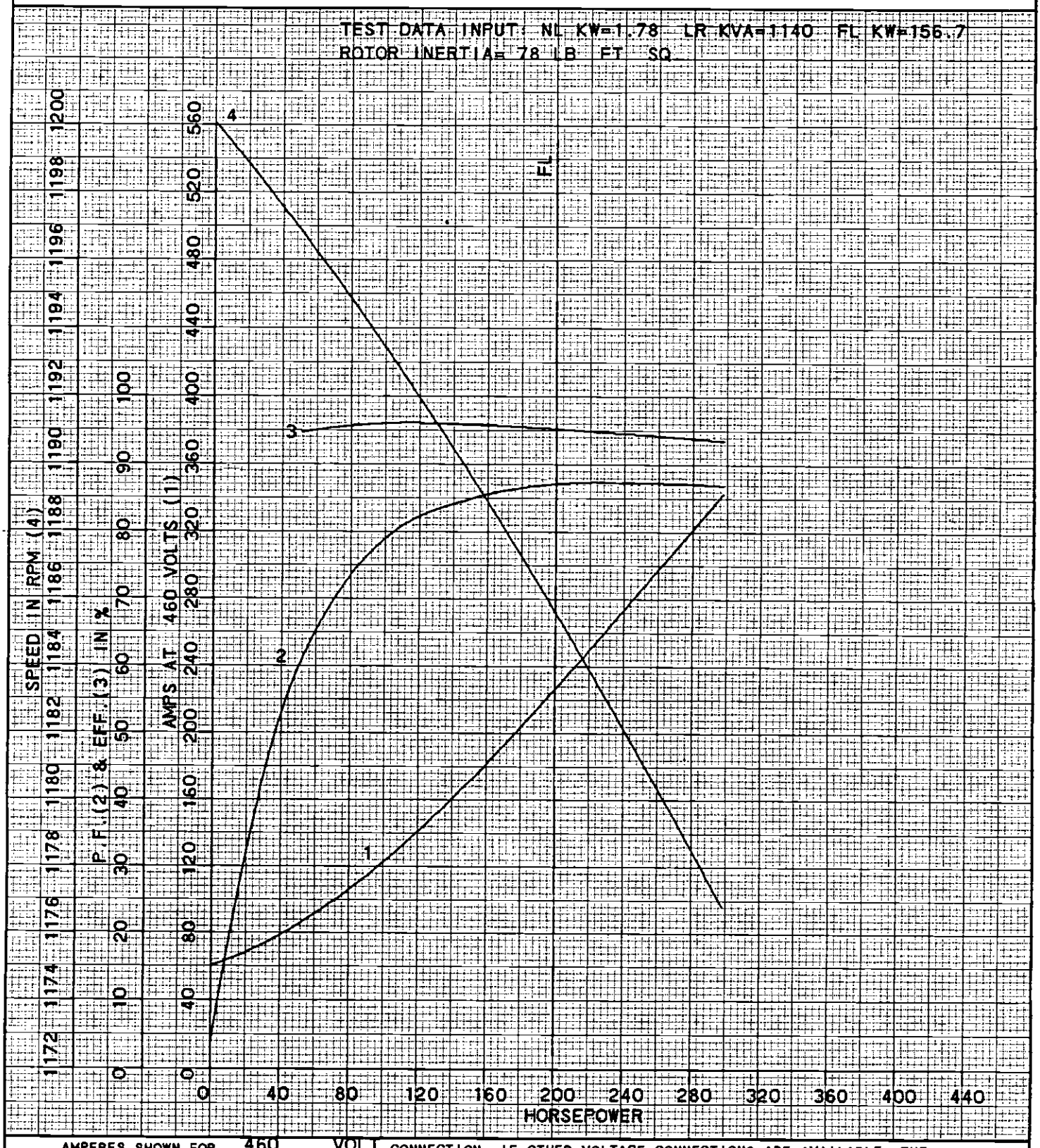
A-C MOTOR PERFORMANCE CURVES

SK35397-4
SH 1 OF 2
ISSUE DATE 06/28/89

File #76326 S

REL S.O. 2MAF38651	RPM 1185	S.F. 1.15	ROTOR 418143-76-WE
FRAME 449T	VOLTS 460	NEMA DESIGN B	TEST S.O. 2MAF38651G1
HP 200	AMPS 226.	CODE LETTER G	TEST DATE 06-20-89
TYPE P	DUTY CONT	ENCLOSURE TENV-AOX	TATOR RES.@ 25°C .02860
PHASE/HERTZ 3/60	AMB°C/INSUL 40/H	E/S 401035	OHMS (BETWEEN LINES)

TEST DATA INPUT: NL KW=1.78 LR KVA=1140 FL KW=156.7
ROTOR INERTIA= 78 LB FT SQ.



AMPERES SHOWN FOR 460 VOLT CONNECTION, IF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE RATED VOLTAGE.

RELIANCE ELECTRIC
CLEVELAND, OHIO 44117 U.S.A.

DR. BY	C.L.WILKES
CK. BY	D.M.BYRD
APP. BY	D.M.BYRD
DATE	06/28/89

A-C MOTOR PERFORMANCE CURVES

SK35397-4
SH 2 OF 2
ISSUE DATE 06/28/89

File #76326 S

E7630D N

RELIANCE ELECTRIC

24701 Euclid Avenue, Cleveland, Ohio 44117

Date of Test 6-20-1989

FLAKT CANADA LIMITED
1400 MERIVALE ROAD
OTTAWA ONTARIO CANADA
K2C 3P9

Manufacturer's Order No. 02MAF38651 Rel. 01

Purchaser's Order No. CP 773-004

REPORT OF ROUTINE TESTS
For Induction Motor

Nameplate Data

Rated HP	Service Factor	Rated Speed RPM	Phase	Frequency Hz	Volts	Amperes
200.0	1.15	1185	3	60	460	226.00

Type	Frame	(°C Temp Rise By (Resistance)	(°C Ambient Temp & (Insulation Class)	Time Rating	Design Letter	Code Letter For Locked kVA/hp
P	00449T	115	40/H	CONT	B	G

Test Characteristics

Serial No.	No Load					Locked Rotor					Wound Rotor Open-Circuit Voltage	High Potential Test Voltage	Stator Winding Resistance Between Terminals	
	Volts	Frequency Hz	Speed r/min	Amperes	Kilowatts*	Volts	Frequency Hz	Amperes	Kilowatts*				Ohms	Temperature °C
G- 1	462	60	1200	62.4		462	60	1438			----	2500	.0289	27.8
G- 2	460	60	1200	61.3		459	60	1335			----	2500	.0270	27.0

* If measured, optional:
Notes:

Data on test from THIS motor.
(This or Duplicate)

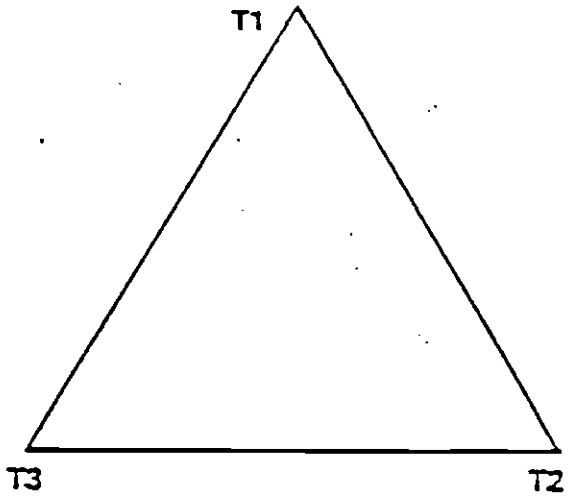
Approved by C. J. COBOSCO Date 6-20-89

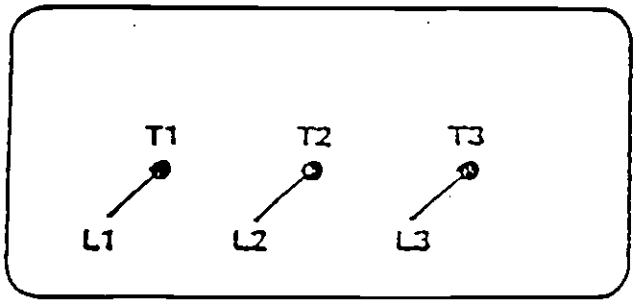
File C01074 96993 1 2

A-C MOTOR

CONNECTION DIAGRAM

STANDARD 3 LEAD DELTA CONNECTED





(N.P. 1575-8A)

CUSTOMER _____ CUSTOMER ORDER NO. _____ RELIANCE S.O. NO. _____

RELIANCE ELECTRIC COMPANY CLEVELAND, OHIO 44117 U.S.A.	DR. BY ___ CH. BY ___ APP. BY ___ DATE ___	CONNECTION DIAGRAM	416820-25 ISSUE DATE APRIL 7, 1977

RELIANCE ELECTRIC

REVISED

DATA TRANSMITTAL AND CERTIFICATION

CUSTOMER ORDER NO.	DATE	REQ. NO.	S.O. NO.
CP773004	04/21/89		01MAF32651

REFER TO THIS NUMBER IN ALL CORRESPONDENCE

SOLD TO:
FLAKT CANADA LTD
1400 MERIVALE RD (K2C 3P9)
OTTAWA ONT CAN

SHIP TO:
SAME AS "SOLD TO" UNLESS SHOWN
FAMCO-FORSYTH
216 JUNIA AVENUE
WINSTON-SALEM NC 27107

DATA PROVIDED WITH THIS TRANSMITTAL AND CERTIFICATION IS:

- ☐ FOR CUSTOMER APPROVAL BY DATE: _____
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- ☒ FINAL, APPROVED FOR CONSTRUCTION OR INSTALLATION.
- ☐ PRELIMINARY, ENGINEERING IS COMPLETED.
- ☒ REVISED, SUPERSEDES DATA PREVIOUSLY ISSUED.
- ☐ SEE REMARKS.

DATA SOURCE

TRANSMITTAL AND CERTIFICATION ISSUED BY: ACK DATE 5 19 '89 CK BY _____ DATE _____

RELIANCE ELECTRIC CO.
COLLINS IND. DRIVE
ATHENS, GA 30613

DATE PRINTED: 05/19/89

MOTOR OR GEN. DATA

ITEM	USED FOR	USERS PLANT	MOTOR OR GEN. D/S:
1 OF 4	SUBWAY FANS; 2371LB FT2		604989-206

QTY.	FRAME		SERV. FA	TYPE	R.P.M.	C BOX D/S
17	447T	250 HP	1.15	PB	1200	

PH/HZ/VOLTS-WINDING	DUTY	ENCLOSURE	AMB./INSL.	PWR. CODE	MOTOR OR GEN. C/D:
3/60 /460	CONT	TENV-AOX	40 /H /		1575-BA (25)

BEARINGS	MOUNTING & METHOD OF DRIVE	RAILS OR BASE	MODEL NUMBER	REDUCER OR AUX D/S:
BALL	F2 DRCT			

ROTAT FROM OPP. DR. END	D-C FIELD EXCITATION	DOUBLE SHAFT EXTEN.	BRAKE OR AUX. D/S
REV			

REDUCER DATA

REDUCER STYLE	CLASS	FRAME	RATIO	OUTPUT RPM	ASSEMBLY	BLOWER MOTOR PH/HZ/VOLTS/HP

BRAKE DATA

BRAKE TYPE	SIZE	RATING FT/LB	DUTY	P.O.

DATA FOR CONTROL

D-C MOTOR ARMATURE CURRENT: _____ AMPS
FIELD CHARACTERISTICS PER CURVE: _____
F_1—F_2, _____ MAX. AMPS _____ _____ RPM
F_{11}—F_{22}, _____ MAX. AMPS _____ _____ RPM
F_3—F_4, _____ MAX. AMPS _____ _____ RPM

A-C MOTOR INFORMATION FOR SELECTION OF STARTER HEATERS:
CODE: G LOCKED AMPS: _____
F.L. CURRENT: 284. AMPS.

ADDITIONAL MOTOR OR GEN DATA:
FR CONST RGD

SPCL. INSTALLATION FEAT. AND MISC. DATA

SPECIAL MARKS:
SCRDT/LA METRO RAIL

SPECIAL FEATURES:
REFLECTED LOAD INERTIA=2371LB-FT2; 150DEG C AMB,1 HR; CL F TEMP RISE; 75% VOLT STRT; WINDING 10 OHM COPPER RTDS 2/PH + AUX C/BOX; SPC HTR 120V PLUS SEP C/BOX; PROV FOR VIBR DETECT ONE 1/4-20 TAPPED HOLE AT EA BRG; HORIZ PLANE A/F GREASE LUBE-40,000 HR L10; CAPB OF ACC FAN RATED SPD MAX 25 SEC; CAPB ACC RATED SPD OPP DIRECTNMAX 45 SEC AFTER ENERG FOR REV ROTATN-15 SEC DELAY BETWN PWR INTERR & REAPPLCTN OF PWR FOR REV ROTATN; CAPBL OF OPER 1 HR AT 300 DEG F(148 DEG C); 300 COMPL REV CYCL WITH 10 SEC DELAY BETWN CYCLE (OVER LIFETIME EXPECT); 48" LEAD LGTH FOR ALL LEADS; CAST IRON C/B FOR SEP MOUNTING; GRND PROV IN C/B; 2 IDENT N/P 1 ON MTR 1 FOR FAN HOUSING; 1 MTR TO RECV PRE-PRODCTN TEST PER ATTCD SPEC PAGE 15865-40/41-ALL OTHER MTRS=ROUTINE TEST; THREADED C/BOX ADAP PLATES TO ALLOW THREADED PIPE TO BE USED TO CONNECT MAIN C/B
CONTINUED ON PAGE 2

RELIANCE ELECTRIC

DATA TRANSMITTAL AND CERTIFICATION

REFER TO THIS NUMBER IN ALL CORRESPONDENCE

CUSTOMER ORDER NO.	DATE	REQ. NO.	S.O. NO.
			01MAF38651

SOLD TO:

SHIP TO: SAME AS "SOLD TO" UNLESS SHOWN

DATA PROVIDED WITH THIS TRANSMITTAL AND CERTIFICATION IS:

- ☐ FOR CUSTOMER APPROVAL BY DATE: _____
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- ☐ PRELIMINARY, ENGINEERING IS COMPLETED.
- ☒ REVISED, SUPERSEDES DATA PREVIOUSLY ISSUED.
- ☐ SEE REMARKS.

DATA SOURCE

TRANSMITTAL AND CERTIFICATION ISSUED BY: ACK DATE 5 19 '89 CK BY _____ DATE _____

MOTOR OR GEN. DATA

ITEM	USED FOR	USERS PLANT	MOTOR OR GEN. D/S:

QTY.	FRAME		SERV. FA	TYPE	R.P.M.	C BOX D/S

PH/HZ/VOLTS-WINDING	DUTY	ENCLOSURE	AMB./INSL.	PWR. CODE	MOTOR OR GEN. C/D:

BEARINGS	MOUNTING & METHOD OF DRIVE	RAILS OR BASE	MODEL NUMBER	REDUCER OR AUX D/S:

ROTAT FROM OPP. DR. END	D-C FIELD EXCITATION	DOUBLE SHAFT EXTEN.	BRAKE OR AUX. D/S

RE[illegible] DATA

REDUCER STYLE	CLASS	FRAME	RATIO	OUTPUT RPM	ASSEMBLY	BLOWER MOTOR PH/HZ/VOLTS/HP

BRAKE DATA

BRAKE TYPE	SIZE	RATING FT/LB	DUTY	P.O.

DATA FOR CONTROL

D-C MOTOR ARMATURE CURRENT: _____ AMPS

FIELD CHARACTERISTICS PER CURVE: _____

F_1—F_2, _____ MAX. AMPS _____ _____ RPM

F_{11}—F_{22}, _____ MAX. AMPS _____ _____ RPM

F_3—F_4, _____ MAX. AMPS _____ _____ RPM

A-C MOTOR INFORMATION FOR SELECTION OF STARTER HEATERS:

CODE: _____ LOCKED AMPS: _____

F.L. CURRENT: _____ AMPS.

SPCL. INSTALLATION FEAT. AND MISC. DATA

TO FRAME; WITH 1/2-13 TAPPED HOLE IN END OF SHAFT

CERTIFIED DRAWINGS AND DATA:
10 D/T D/S W/D P/L I/M PERF
CURVES THERMAL LIMIT AT 35 &
148 DEG C, CERT OF COMPL SOLD
TO ATTN M. TURNER 1 EA 05244,
84772 & 99801

RE 1805ST2

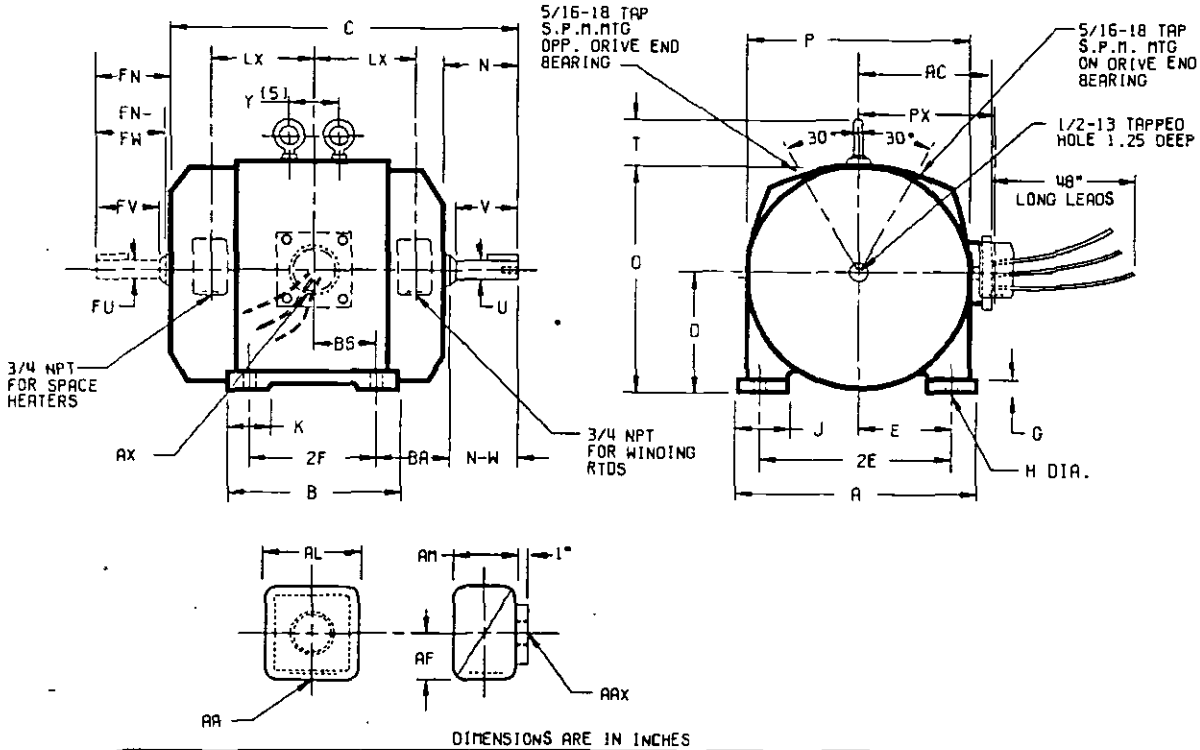
DUTY MASTER ALTERNATING CURRENT MOTORS

SQUIRREL-CAGE INDUCTION

ENCLOSURE: TOTALLY ENCLOSED **COOLING: NON-VENTILATED**

MOUNTING: FOOT

FRAMES 445T THRU 449T ABOVE NEMA RATINGS
AUXILIARY CONDUIT BOXES
PROVISIONS FOR VIBRATION DETECTORS
FLAKT CANADA



DIMENSIONS ARE IN INCHES

FRAME	A	D(2)	2E	G	H	J	K	O	P	T	Y (5)	BA	LX	PX
445T	21.00	11.00	18.00	1.12	.81	3.25	3.25	24.25	25.25	4.25	---	7.50	11.12	15.50
447T	21.00	11.00	18.00	1.12	.81	3.25	3.25	24.25	25.25	4.25	5.00	7.50	12.88	15.50
449T	21.00	11.00	18.00	1.12	.81	3.25	3.25	24.25	25.25	4.25	5.00	7.50	15.38	15.50
(1)														

FRAME	C	BS	B	BACK END SHAFT AND KEY 2F	N	N-W	U(3)	V	LGTH.	SQ. KEY	FRONT END SHAFT AND KEY FN	FN-FW	FU(3)	FV	LGTH.	SQ. KEY	WT. (LBS)
445T	39.56	8.25	19.00	16.50	8.94	8.50	3.375	8.25	6.88	.875	6.31	5.88	2.375	5.62	4.25	.625	1410
447T	43.06	10.00	22.50	20.00	8.94	8.50	3.375	8.25	6.88	.875	6.31	5.88	2.375	5.62	4.25	.625	1730
449T	48.06	12.50	27.50	25.00	8.94	8.50	3.375	8.25	6.88	.875	6.31	5.88	2.375	5.62	4.25	.625	2100
(1)																	

FRAME	AA(4)	AC	AF	AL	AM	AX	AAX
445T	4	14.38	7.00	15.00	10.00	2-1/2	2-1/2
445TS	4	14.38	7.00	15.00	10.00	2-1/2	2-1/2
447T	5	14.38	7.00	15.00	10.00	3	3
447TS	5	14.38	7.00	15.00	10.00	3	3
449T	5	14.38	7.00	15.00	10.00	3	3
449TS	5	14.38	7.00	15.00	10.00	3	3
(1)							

(1) SPECIAL DIMENSIONS ON THIS LINE
(2) "D" VARIES +.00, -.06
(3) "U" & "FU" VARY +.000, -.001
(4) WEATHERPROOF CONDUIT BOX SUPPLIED ONLY WHEN SPECIFIED
(5) 445 FRAME HAS ONE EYEBOLT C_L OF FRAME.

CONDUIT BOX LOCATED ON OPPOSITE SIDE WHEN F-2, W-1, W-4, W-5, W-7, OR C-1 MOUNTING IS SPECIFIED. STANDARD DOUBLE SHAFT SUPPLIED ONLY WHEN SPECIFIED. IF MOUNTING CLEARANCE DETAILS ARE REQUIRED CONSULT FACTORY. MAXIMUM PERMISSIBLE SHAFT RUNOUT WHEN MEASURED AT END OF STANDARD SHAFT EXTENSION IS .003 T.I.R.

FRAME- _____ TYPE- _____ CERTIFIED FOR- _____

ORDER- _____ ITEM- _____ HP- _____ RPM- _____ PH- _____ HZ- _____ VOLTS- _____

RELIANCE SALES ORDER- _____ APPROVED BY- _____ DATE _____

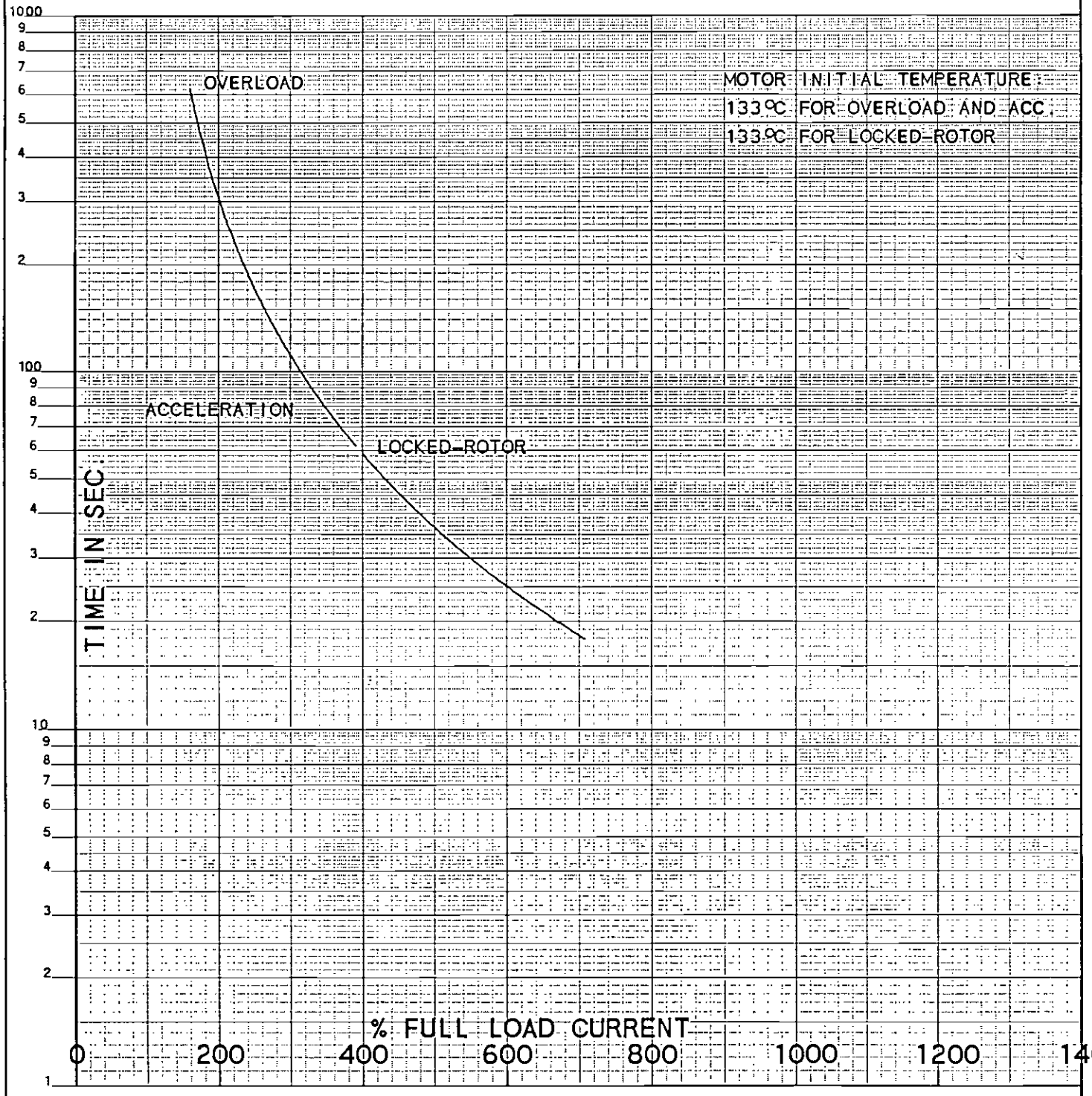
RELIANCE ELECTRIC
CLEVELAND, OHIO 44117 U.S.A.

DR. BY D.MATHEWS
CK. BY L.T.FOURNIER
APP. BY J.H.PONTZER
DATE 4-21-89

DIMENSION SHEET **604989-206**
ISSUE DATE: APRIL 21, 1989

C/R 306027

REL. S.O. 1MAF38651	RPM 1187	S.F. 1.15	ROTOR 418143-76ME
FRAME 449T	VOLTS 460	NEMA DESIGN B	TEST S.O. TYPICAL DATA
HP 250	AMPS 284	CODE LETTER G	TEST DATE ---
TYPE P	DUTY CONT	ENCLOSURE TEAO	STATOR RES.@ 25°C .0166
PHASE/HERTZ 3/60	AMB°C/INSUL 40/H	E/S 401088	OHMS (BETWEEN LINES)



THERMAL LIMIT CURVE

REMARKS: 114 LB. FT. SQ. IS ROTOR WR SQ.

AMPERES SHOWN FOR 460 VOLT CONNECTION. OF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE RATED VOLTAGE.

RELIANCE ELECTRIC
CLEVELAND, OHIO 44117 U.S.A.

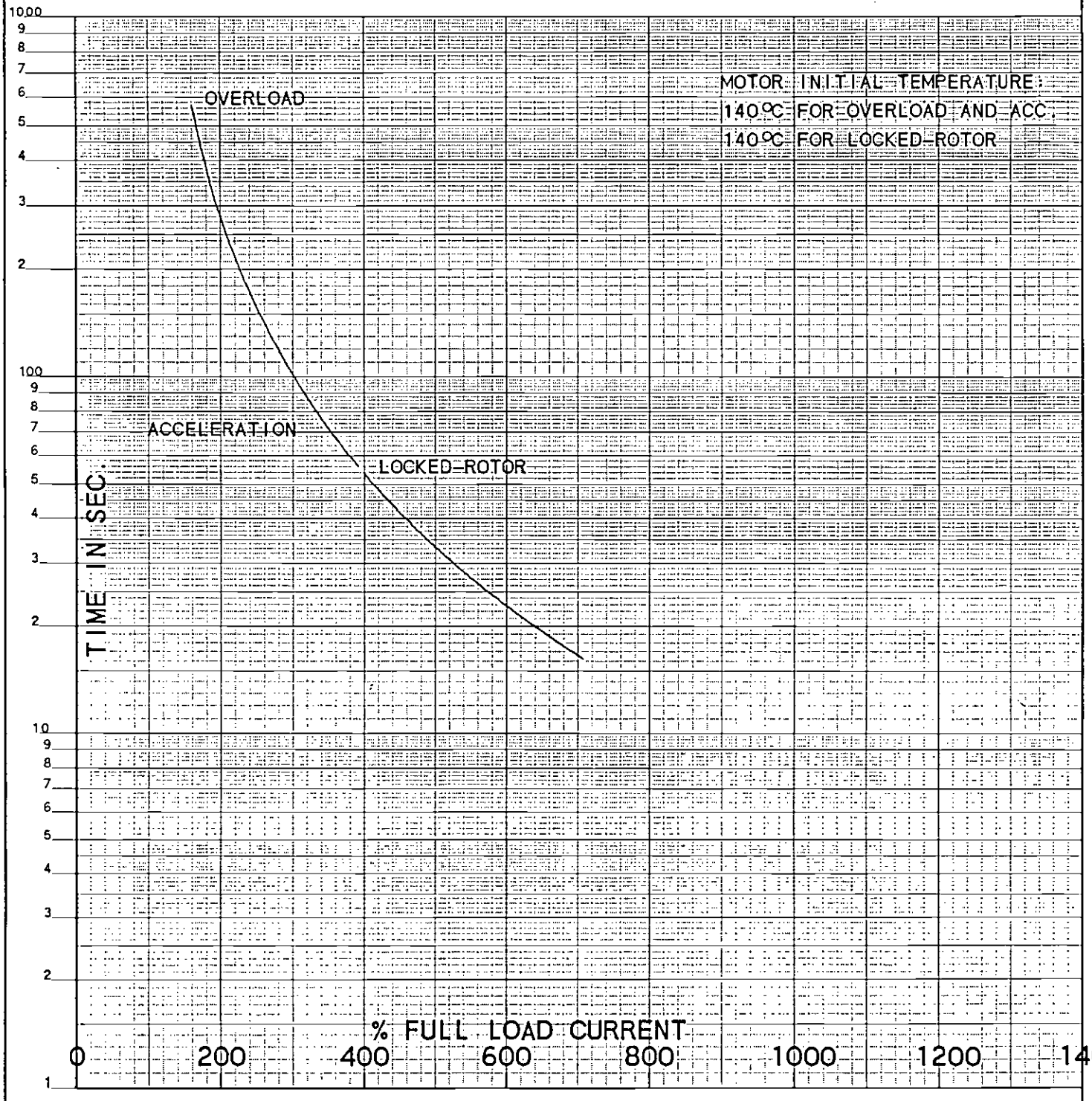
DR. BY D. M. BYRD
CK. BY J. P. TSAO
APP. BY J. P. TSAO
DATE 1/16/87

A-C MOTOR PERFORMANCE CURVES

E07709-A-B001
ISSUE DATE 1/14/87

File G79296

REL. S.O. 1MAF38651	RPM 1187	S.F. 1.15	ROTOR 418143-76ME
FRAME 449T	VOLTS 460	NEMA DESIGN B	TEST S.O. TYPICAL DATA
HP 250	AMPS 284	CODE LETTER G	TEST DATE ---
TYPE P	DUTY CONT	ENCLOSURE TEAO	STATOR RES.@ 25°C .0166
PHASE/HERTZ 3/60	AMB°C/INSUL 40/H	E/S 401088	OHMS (BETWEEN LINES)



THERMAL LIMIT CURVE

REMARKS: 114 LB. FT. SQ. IS ROTOR WR SQ.

AMPERES SHOWN FOR 460 VOLT CONNECTION, OF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE RATED VOLTAGE.

RELIANCE ELECTRIC
CLEVELAND, OHIO 44117 U.S.A.

DR. BY	D. M. BYRD
CK. BY	J. P. TSAO
APP. BY	J. P. TSAO
DATE	1/16/87

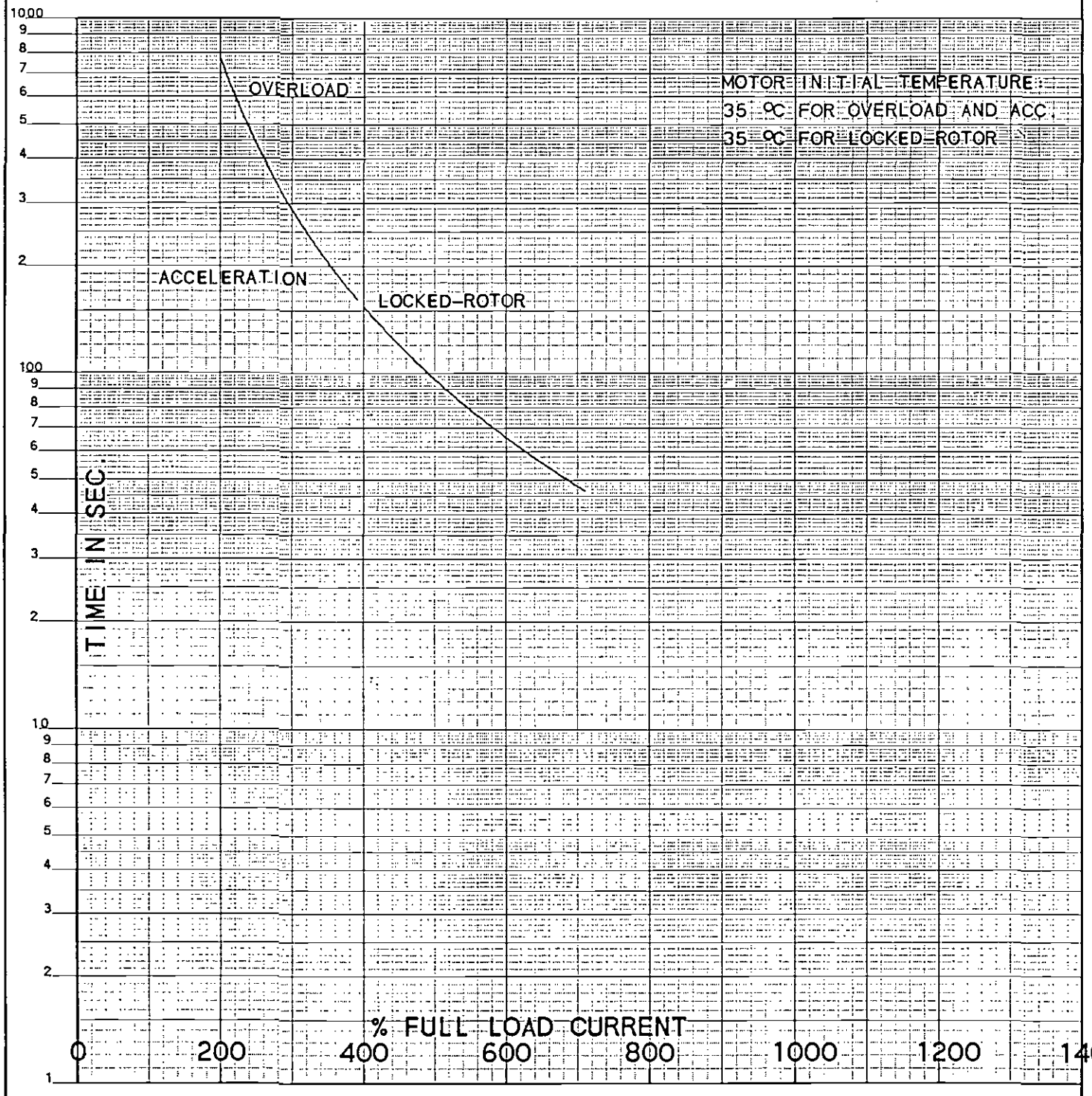
A-C MOTOR PERFORMANCE CURVES

E07709-A-B001

ISSUE DATE 1/14/87

File G79297

REL. S.O. 1MAF38651	RPM 1187	S.F. 1.15	ROTOR 418143-76ME
FRAME 449T	VOLTS 460	NEMA DESIGN B	TEST S.O. TYPICAL DATA
HP 250	AMPS 284	CODE LETTER G	TEST DATE ---
TYPE P	DUTY CONT	ENCLOSURE TEAO	STATOR RES.@ 25°C .0166
PHASE/HERTZ 3/60	AMB°C/INSUL 40/H	E/S 401088	OHMS (BETWEEN LINES)



THERMAL LIMIT CURVE

REMARKS: 114 LB. FT. SQ. IS ROTOR WR SQ.

AMPERES SHOWN FOR 460 VOLT CONNECTION, OF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE RATED VOLTAGE.

RELIANCE ELECTRIC
CLEVELAND, OHIO 44117 U.S.A.

DR. BY D. M. BYRD
CK. BY J. P. TSAO
APP. BY J. P. TSAO
DATE 1/16/87

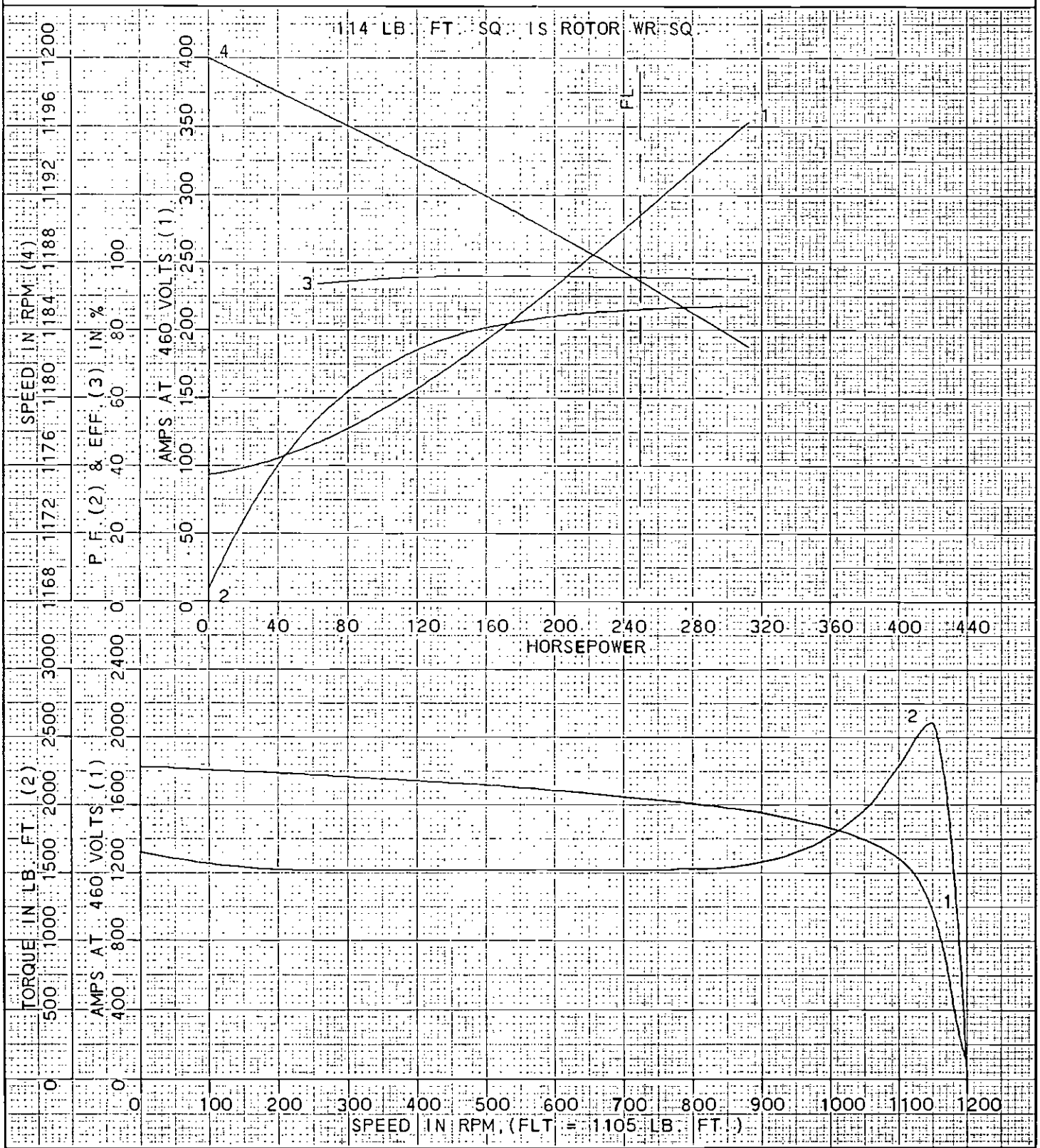
A-C MOTOR PERFORMANCE CURVES

E07709-A-B001

ISSUE DATE 1/14/87

File G79295

REL S.O. 1MAF38651	RPM 1187	S.F. 1.15	ROTOR 418143-76ME
FRAME 449T	VOLTS 460	NEMA DESIGN B	TEST S.O. TYPICAL DATA
HP 250	AMPS 284	CODE LETTER G	TEST DATE ---
TYPE P	DUTY CONT	ENCLOSURE TEAO	STATOR RES.@ 25°C .0166
PHASE/HERTZ 3/60	AMB°C/INSUL 40/H	E/S 401088	OHMS (BETWEEN LINES)



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DR. BY	D. M. BYRD
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APP. BY	J. P. TSAO
DATE	1/16/87

A-C MOTOR PERFORMANCE CURVES

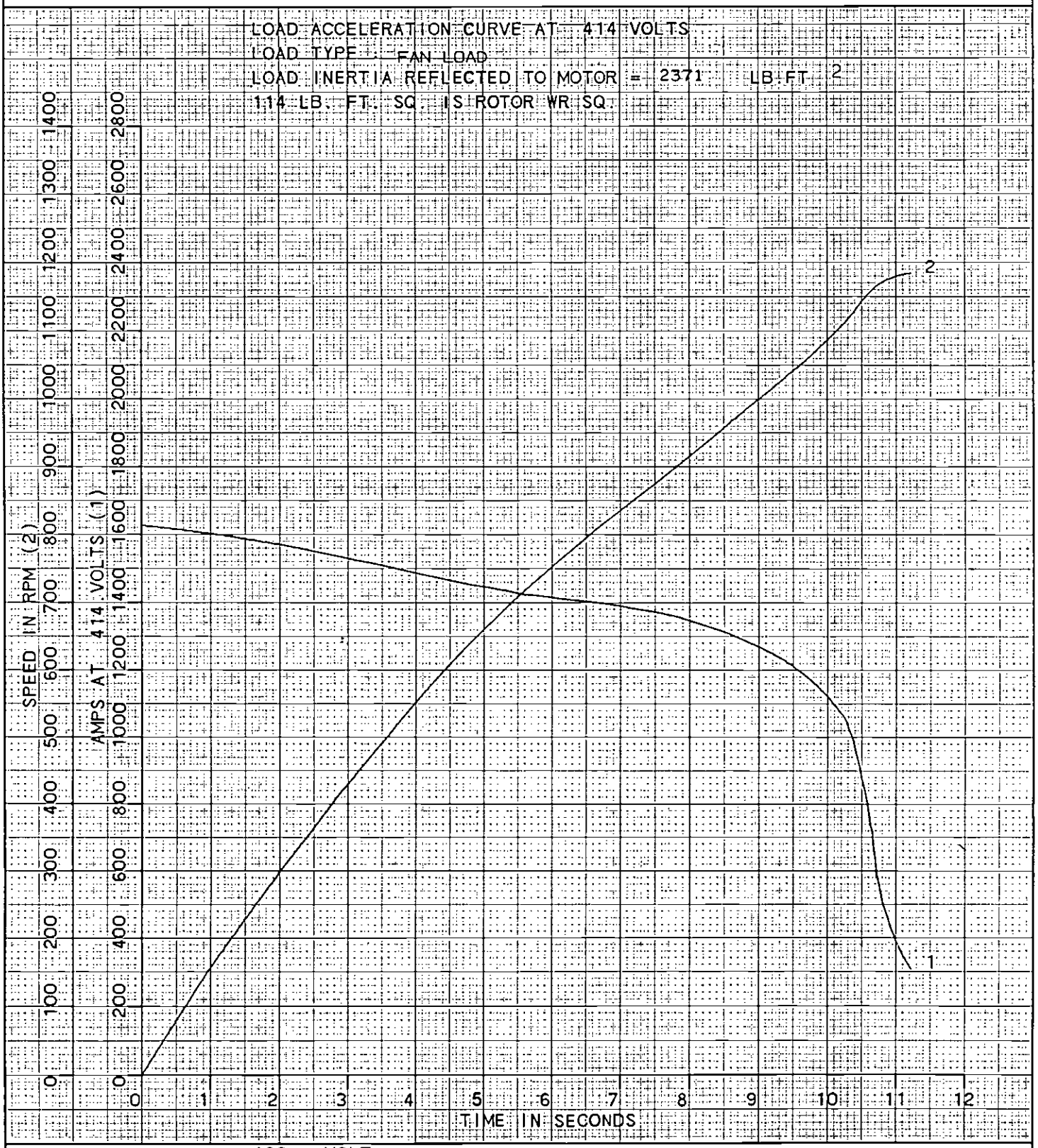
E07709-A-B001

ISSUE DATE 1/14/87

File G79290

REL S.O. 1MAF38651	RPM 1187	S.F. 1.15	ROTOR 418143-76ME
FRAME 449T	VOLTS 460	NEMA DESIGN B	TEST S.O. TYPICAL DATA
HP 250	AMPS 284	CODE LETTER G	TEST DATE ---
TYPE P	DUTY CONT	ENCLOSURE TEAO	STATOR RES.@ 25°C .0166
PHASE/HERTZ 3/60	AMB°C/INSUL 40/H	E/S 401088	OHMS (BETWEEN LINES)

LOAD ACCELERATION CURVE AT 414 VOLTS
LOAD TYPE : FAN LOAD
LOAD INERTIA REFLECTED TO MOTOR = 2371 LB-FT 2
114 LB. FT. SQ. IS ROTOR WR SQ.



AMPERES SHOWN FOR 460 VOLT CONNECTION, IF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE RATED VOLTAGE.

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DR. BY D. M. BYRD
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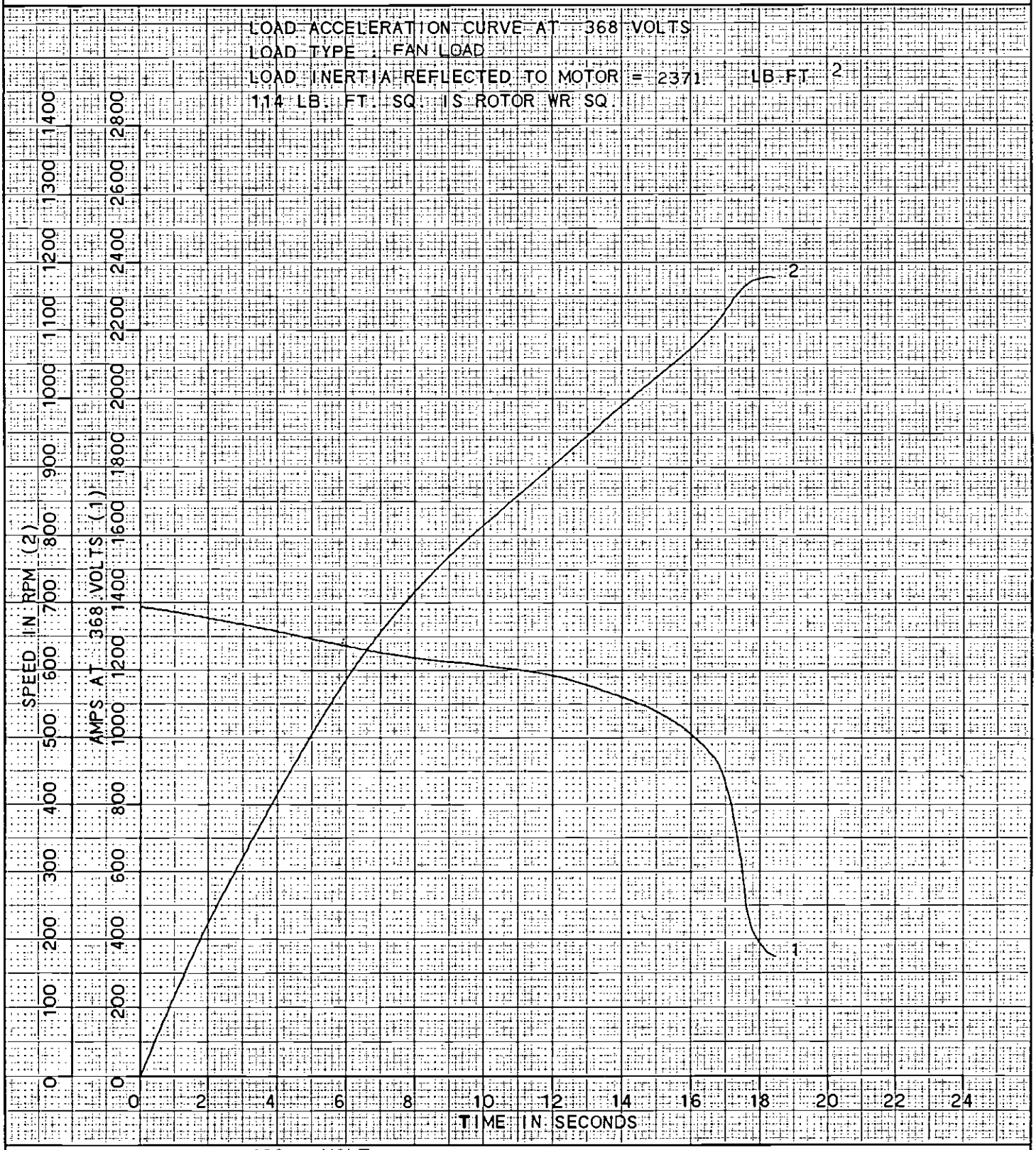
DATE 1/16/87

A-C MOTOR PERFORMANCE CURVES

E07709-A-B001
ISSUE DATE 1/14/87

File G79291

REL S.O. 1MAF38651	RPM 1187	S.F. 1.15	ROTOR 418143-76ME
FRAME 449T	VOLTS 460	NEMA DESIGN B	TEST S.O. TYPICAL DATA
HP 250	AMPS 284	CODE LETTER G	TEST DATE ---
TYPE P	DUTY CONT	ENCLOSURE TEAO	STATOR RES.@ 25°C .0166
PHASE/HERTZ 3/60	AMB°C/INSUL 40/H	E/S 401088	OHMS (BETWEEN LINES)



AMPERES SHOWN FOR 460 VOLT CONNECTION, IF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE RATED VOLTAGE.

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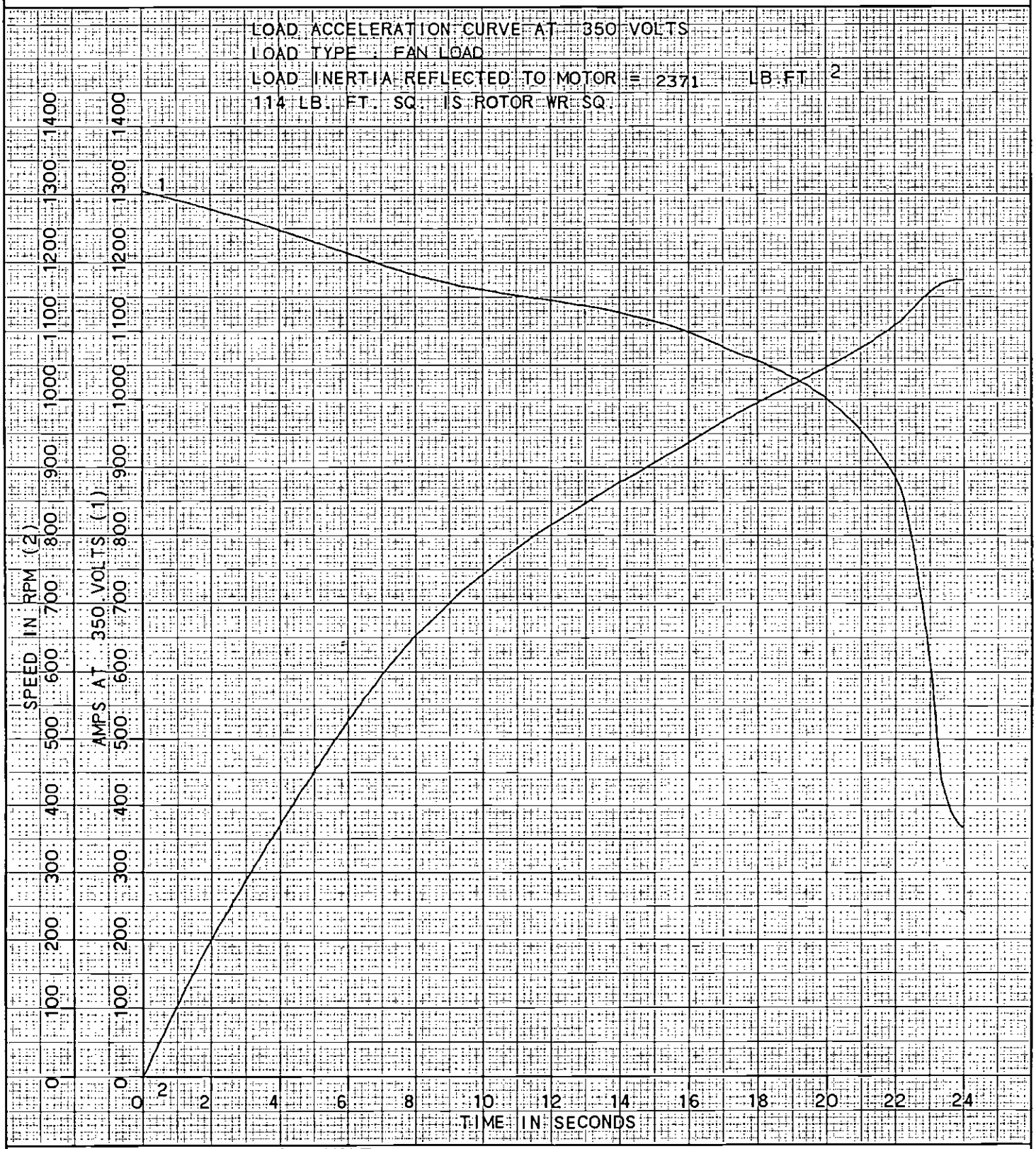
DATE 1/16/87

A-C MOTOR PERFORMANCE CURVES

E07709-A-B001
ISSUE DATE 1/14/87

File G79294

REL S.O. 1MAF38651	RPM 1187	S.F. 1.15	ROTOR 418143-76ME
FRAME 449T	VOLTS 460	NEMA DESIGN B	TEST S.O. TYPICAL DATA
HP 250	AMPS 284	CODE LETTER G	TEST DATE ---
TYPE P	DUTY CONT	ENCLOSURE TEAO	STATOR RES.@ 25°C .0166
PHASE/HERTZ 3/60	AMB°C/INSUL 40/H	E/S 401088	OHMS (BETWEEN LINES)



AMPERES SHOWN FOR 460 VOLT CONNECTION, IF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE RATED VOLTAGE.

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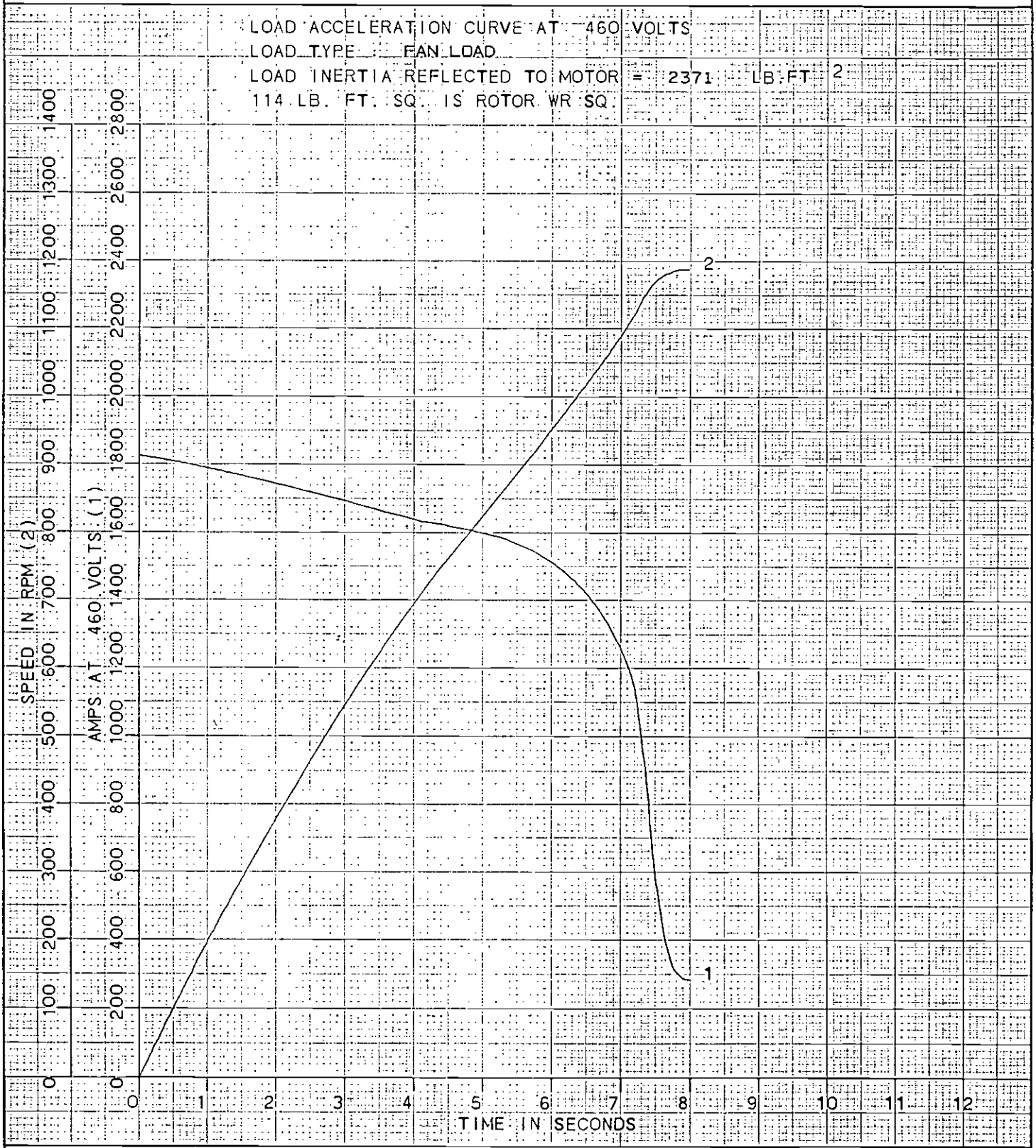
REL S.O. 1MAF38651	RPM 1187	S.F. 1.15	ROTOR 418143-76ME
FRAME 449T	VOLTS 460	NEMA DESIGN B	TEST S.O. TYPICAL DATA
HP 250	AMPS 284	CODE LETTER G	TEST DATE ---
TYPE P	DUTY CONT	ENCLOSURE TEAO	STATOR RES.@ 25°C .0166
PHASE/HERTZ 3/60	AMB°C/INSUL 40/H	E/S 401088	OHMS (BETWEEN LINES)



AMPERES SHOWN FOR 460 VOLT CONNECTION. IF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE RATED VOLTAGE.

RELIANCE ELECTRIC
CLEVELAND, OHIO 44117 U.S.A.

DR. BY D. M. BYRD
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DATE 1/16/87

A-C MOTOR PERFORMANCE CURVES

E07709-A-B001
ISSUE DATE 1/14/87

File G79290

REL. S.O.	FRAME	HP	TYPE	PHASE/ HERTZ	RPM	VOLTS
1MAF38651	449T	250	P	3/60	1187	460

AMPS	DUTY	AMB°C/ INSUL.	S.F.	NEMA DESIGN	CODE LETTER	ENCL.
284	CONT	40/H	1.15	B	G	TEAO

E/S	ROTOR	TEST S.O.	TEST DATE	STATOR RES.@25°C OHMS (BETWEEN LINES)
401088	418143-76ME	---	---	.0166

PERFORMANCE

LOAD	HP	AMPERES	RPM	% POWER FACTOR	% EFFICIENCY
NO LOAD	0	93.8	1200	3.85	0
1/4	62.6	116	1197	54.1	93.5
2/4	125	162	1194	75.3	95.6
3/4	187	220	1190	83.1	95.8
4/4	250	284	1187	86.1	95.5
5/4	312	354	1183	86.9	95.0

SPEED TORQUE

	RPM	TORQUE % FULL LOAD	TORQUE LB.-FT.	AMPERES
LOCKED ROTOR	0	150	1655	1825
PULL UP	250	138	1520	1780
BREAKDOWN	1148	236	2610	993
FULL LOAD	1187	100	1105	284

AMPERES SHOWN FOR 460. VOLT CONNECTION. IF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE RATED VOLTAGE

REMARKS: TYPICAL DATA
114 LB. FT. SQ. IS ROTOR WR SQ.

RELIANCE ELECTRIC
CLEVELAND, OHIO 44117 U.S.A.

DR. BY D. M. BYRD
CK. BY J. P. TSAO
APP. BY J. P. TSAO
DATE 1/16/87

A-C MOTOR PERFORMANCE DATA

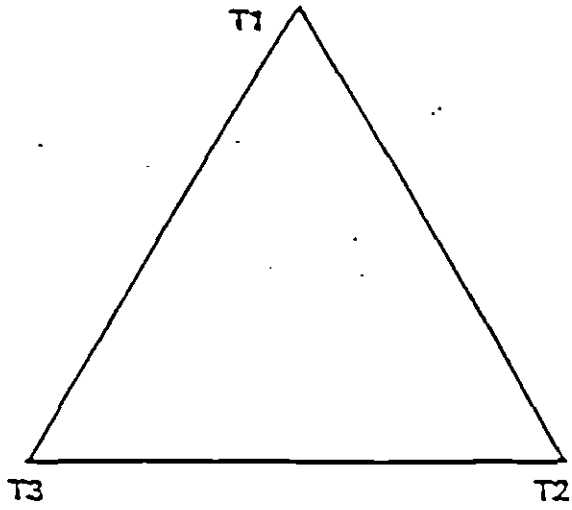
E07709-A-B001
ISSUE DATE 1/14/87

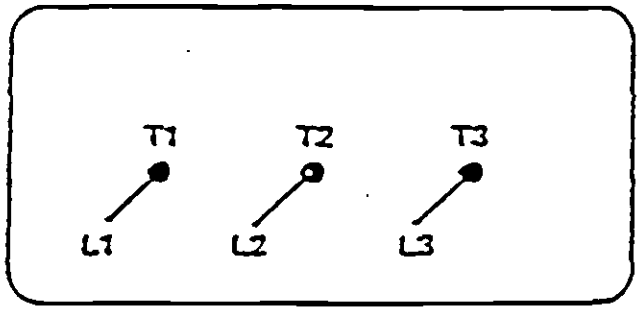
File G79290

A-C MOTOR

CONNECTION DIAGRAM

STANDARD 3 LEAD DELTA CONNECTED





(N.P. 1575-8A)

CUSTOMER _____ CUSTOMER ORDER NO. _____ RELIANCE S.O. NO. _____

RELIANCE ELECTRIC COMPANY	DR. BY ____ CK. BY ____ APP. BY ____	CONNECTION DIAGRAM	416820-25

Flakt Inc

EMERGENCY & VENTILATION FANS
OPERATION, MAINTENANCE AND INSTALLATION MANUAL

SECTION FOUR

UNDERPLATFORM FAN BLADE ACTUATORS

- HONEYWELL TECHNICAL DATA

Honeywell

Actionator Motors
Models M640, M740, M940

Specification

Function

The Actionator motors position dampers, butterfly valves, slip stem valves, or any device requiring rotary or linear motion.

Optional auxiliary equipment can be used to provide position feedback or supply power to other devices. Refer to Table 1.

The M640A, B, and D motors are used with either a two-position controller with maintained contacts, or a floating controller. Each motor has a crankarm with adjustable throw and position.

The M740A and B motors will accept a 4-20 mA signal from a proportional controller. These motors will position the final control device at any point between full open or full closed, as determined by the controller signal.

The M740 motor Hard Manual feature allows the customer to override the motor position to fully open or fully close the valve or damper when required.

The M940A and B Actionator Motors provide position proportional control of valves and other devices.

The M640B, 740B, 940B motors can be used to operate slip-stem valves of the direct acting, reverse acting or three-way types using suitable linkage.

The M640D motor provides unidirectional travel with adjustable stops, factory-set at 180°.

The M940 models may be used with the external electronic motor positioner model R7195. Refer to document number 81-99-25-02.

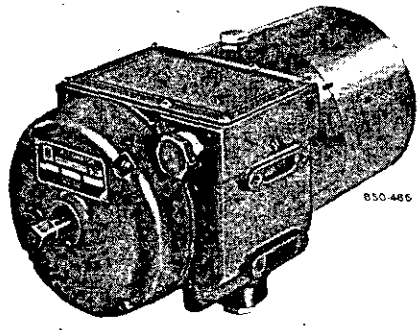


Figure 1—Model M640A and D, M940A Actionator Motors

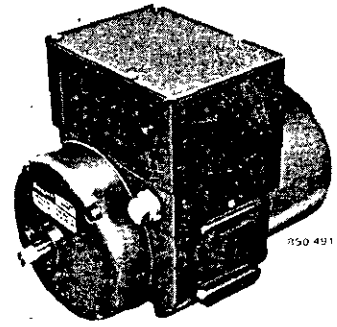


Figure 2—Model 740A Actionator Motor

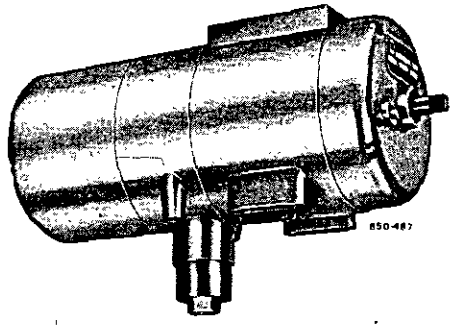


Figure 3—Model M640B, M940B Actionator Motors

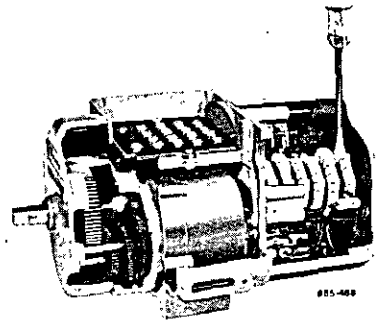


Figure 4—M640 Motor Cutaway View of Internal Parts

Description

Refer to Figures 1-4. A sealed, die-cast aluminum case provides excellent durability. The motor shaft is sealed with an "O" ring made of oil-resistant Buna-N. It is splash-proof and can be hosed down during a cleaning operation if the drain holes are plugged. These motors meet U.L. and C.S.A. type 4 enclosure ratings, when both drain holes are plugged.

Easily accessible switches and adjustments simplify installation and field adjustment. Cam position is easily changed by inserting a screwdriver into one of many slots on the cam and applying slight bias force. Figure 4 shows the simplicity of cam adjustment.

An internal disc brake stops and holds the load in any position. If power is removed from the motor, the brake will maintain the motor position until power is restored.

An adjustable crankarm is included with each motor for connecting the motor shaft to a ball joint and push rod.

The lifter assembly included on M640B, M740B and M940B motors has an adjustable eccentric and an internal strain relief spring to provide strain relief at both ends of the stroke.

The motors are available with timing and torque ratings shown in Table 1.

Options

Auxiliary Switches and Slidewires for M640 Actionator Motors

Auxiliary switches and slidewires provide additional switching functions for M640A motors that have a complete wire harness. Refer to Table 2 for models marked with an asterisk (*).

With the addition of an auxiliary slidewire, any M640A motor can be converted to an M940A. Auxiliary switches and slidewires cannot be added to other motors without changing the terminal board.

Auxiliary switches and slidewires can be combined to provide:

- from one to five auxiliary switches
- one balancing slidewire with up to four auxiliary switches
- one balancing slidewire with one retransmitting slidewire and up to three auxiliary switches

The following assembly numbers contain the auxiliary functions shown. Each assembly contains all the necessary hardware including cams, wipers, spacers, screws, and a wrench.

Assembly 7640MA — One auxiliary switch†

Assembly 7640MB — Two auxiliary switches*

Assembly 7640MC — One 135-ohm slidewire*

Assembly 7640MD — One 1000-ohm slidewire*

Assembly 7640ME — One 500-ohm slidewire*

110126A — Crankarm with adjustable throw and position

24400144-001 — Adaptor kit to mount R7195 to M940/M640

*Order special hub assembly (part number 132986C) with two wipers to mount two slidewires in the same motor.

†Order an extra spacer (part number 132985) and two 4-40 NC screws., 1-5/8 inches long (part number 80248BB), to mount five auxiliary switches in the same motor.

Accessories

Valves
Valve bodies and linkages must be ordered separately.

Dampers
Damper crank, push rod, and ball joint connected to the motor crankarm operate damper in combination with a slip-stem valve.

TABLE 1 — Timings and Torque Ratings Available

Motor Shaft Timing*		Motor Shaft Torque				Lifter Assembly Stem Force†			
In seconds for 180° rotation (in seconds for 150° rotation)		at 90% rated voltage		at 100% rated voltage		at 90% rated voltage		at 100% rated voltage	
60 Hz	50 Hz	lb-in	N•m‡	lb-in	N•m‡	lb	N•m	lb	N•m
7.5 (6.25)	9 (7.5)	45	5.08	70	7.85	100	444.8	140	622.7
15 (12.5)	18 (15)	90	10.2	140	15.8	200	889.6	280	1245.4
30 (25)	36 (30)	180	20.3	280	31.6	300	1334.4	300	1334.4
60 (50)	72 (60)	300	33.9	300	33.0	300	1334.4	300	1334.4
120 (100)	144 (120)	300	33.9	300	33.9	300	1334.4	300	1334.4

*Based on 180° rotation without a load at rated voltage, proportional style has 150°
†Stem force ratings determined with no load on motor shaft
‡Newton-Metre.

Specifications

Operating Conditions

Operating Temperature	−29 to +65°C (−20 to +150°F)
Power Consumption	*M640, M940:* 23 watts *M740:* 40 VA

Performance

Maximum Load Perpendicular to Motor Shaft	90.7 Kg (200 lb)
Motor Shaft Rotation	*M640A:* Adjustable from 10 to 350°, reversible *M740A, M940A:* Adjustable from 10 to 150°, reversible *M640B, M740B, M940B:* Adjustable stroke from 0.64 to 3.81 cm (0.25 to 1.5 inches), reversible *M640D:* Adjustable position, 180° stroke, unidirectional
Auxiliary Switch Rating	7.4 maximum resistive; 120 or 240 Vac (on each switch); 1/3 Hp at 120 or 240 Vac. 1/2 amp at 120 Vdc; 1/4 amp at 240 Vdc

Design

Input Range (M740A, B only)	4-20 mA (factory adjusted) (deadband adjusted to 1%) *Guaranteed fully closed:* 4.0 mA *Guaranteed start to open:* 4.3 mA *Guaranteed fully open:* 20.0 mA *Guaranteed start to close:* 19.7 mA
Input Impedance (M740A,B only)	75 ohms Floating
Adjustments (M740A, B only)	*Zero adjustment:* 0.8 mA to 16.8 mA *Span adjustment:* 2.0 mA to 20.0 mA *Deadband adjustment:* 1% to 5%
Repositions (M740A, B only)	**Deadband setting** — **Repositions** 1% — 100 5% — 20
Slidewire Resistance	135 or 1000 ohms
Motor Shaft Mounting Surface	12.7 mm long by 12.7 mm square (1/2 inch long by 1/2 inch square) Refer to Figures 5 and 6.
Dimensions	Refer to Figures 5 and 6.
Weight	M640A 11.95 lbs. (5.4 kg) M640B 19.0 lbs (8.6 kg) M740A 14.3 lbs. (6.5 kg) M740B 21.3 lbs. 9.7 kg) M940A 12.4 lbs. (5.6 kg) M940B 19.4 lbs. (8.8 kg)
Accessories (Standard)	1. Crank arm for mounting on square end of motor shaft with a starting angle adjustable in 22-1/2° steps and with a ball joint radius adjustable from 39.7 mm (1.6 inches) to 68.2 mm (2.7 inches) 2. Plug for unused conduit opening in the event that only one of the two opening is used.
Approval Bodies	*Underwriters Laboratories:* File E84572, Guide XAPX *Canadian Standards Association:* File Number LR 47125. All 120 and 240 volt models are U.L. and C.S.A. certified for type 4 enclosures. To comply, motors are supplied with both drain holes sealed with self-tapping screws. The lowest level drain screw may be removed, if venting or draining is desired; but U.L. and C.S.A. enclosure standards are not maintained when drain holes are left open.

TABLE 2 - M640, M740, M940 Actionator Motors

M640 Models/M740 Models

Model Number	Voltage	Timing (Seconds)	Auxiliary Equipment
M640A 1006 M640A 1121*	120V	7.5	—
M640A 1014	240V	7.5	—
M640A 1022 M640A 1139*	120V	15	—
M640A 1030 M640A 1196*	240V	15	—
M640A 1048 M640A 1204*	120V	15	2 SPDT 1 SPDT
M640A 1055 M640A 1147*	120V	30	—
M640A 1246	120V	30	2 SPDT
M640A 1063	120V	30	1 SPDT
M640A 1071 M640A 1170*	240V	30	—
M640A 1089 M640A 1154*	120V	60	—
M640A 1212*	120V	60	Stroke Set at 90°
M640A 1097 M640A 1188*	240V	60	—
M640A 1105 M640A 1162*	120V	120	—
M640A 1113	240V	120	—
M640A 1238*	120V	36	Fungus Treated
M640A 1253**	120V	15	2 SPDT
M640A 1261	120V	7.5	2 SPDT
M640A 1279	220V	60	—
M640B 1005	120V	15	—
M640B 1013 M640B 1054*	120V	30	—
M640B 1070*	240V	30	—
M640B 1021 M640B 1062*	120V	60	—
M640B 1039 M640B 1088*	240V	60	—
M640B 1047	120V	120	
M640D 1003	120V	15	
M640D 1011	120V	15	2 SPDT in Tandem
M640D 1029	120V	30	—
M740A 1004	120V	15	—
M740A 1012	120V	30	—
M740A 1038	120V	60	—
M740A 1053	120V	120	—
M740A 1020	120V	30	2 SPDT
M740A 1046	120V	60	2 SPDT
M740A 1061	120V	60	One 135Ω Retransmitting slidewire
M740A 1079	120V	15	2 SPDT
M740A 1087	120V	30	3 SPDT
M740A 1095	220V	60	2 SPDT
M740A 1103	120V	60	2 SPDT, One 1000 Ω Retransmitting Slidewire
M740A 1111	120V	60	One 1000Ω Retransmitting Slidewire
M740B 1003	120V	60	—
M740B 1011	120V	30	—
M740B 1029	120V	15	—
M740B 1037	120V	7.5	2 SPDT
M740B 1045	120V	15	2 SPDT
M740B 1052	120V	30	2 SPDT
M740B 1060	120V	60	2 SPDT
M740B 1078	120V	120	2 SPDT
M740B 1086	120V	30	One 1000Ω Retransmitting Slidewire

TABLE 2 - M640, M740, M940 Actionator Motors (continued)

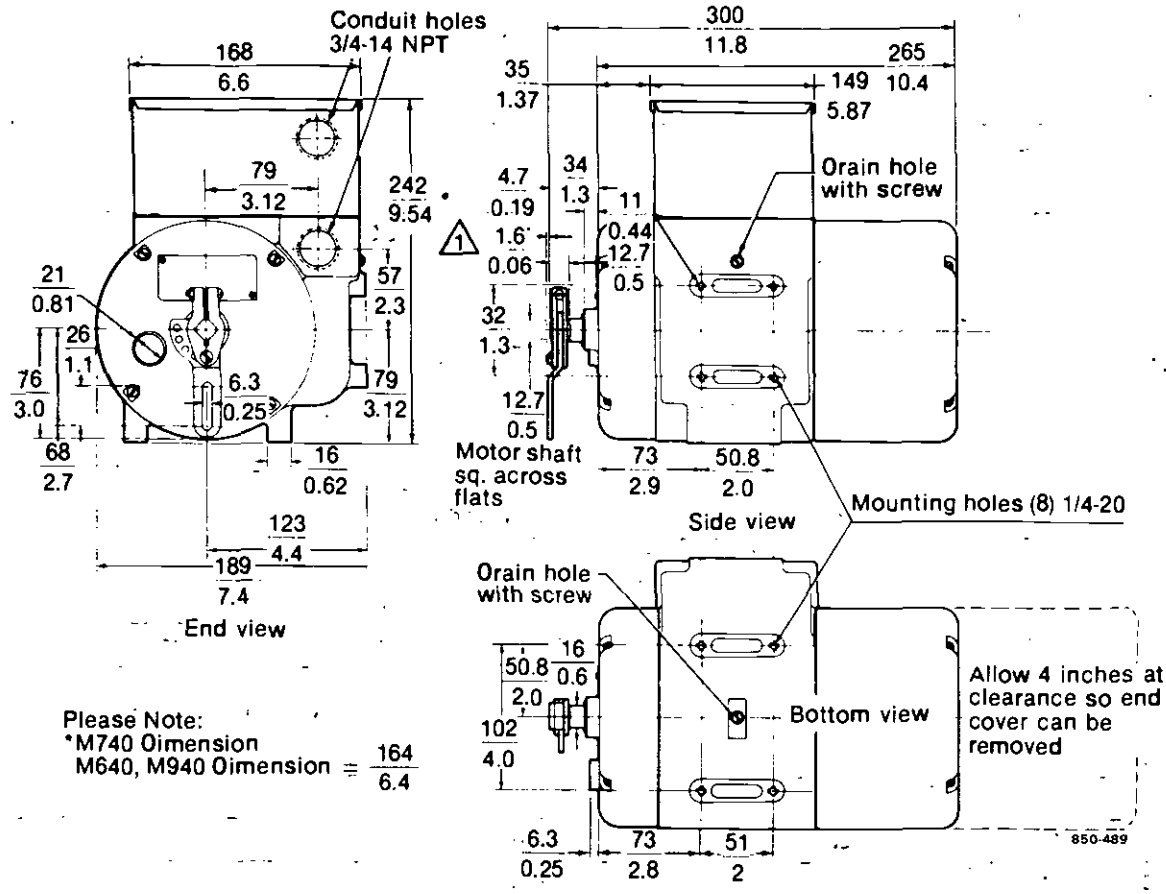
M940 Models

Model Number	Voltage	Timing (Seconds)	Auxiliary Equipment
M940A 1000	120V	15	——
M940A 1018	240V	15	——
M940A 1026	120V	30	——
M940A 1034	240V	30	——
M940A 1042	220V	30	
M940A 1059	120V	30	2 SPDT
M940A 1158	120V	30	1 SPDT
M940A 1067	120V	60	——
M940A 1075	240V	60	——
M940A 1083	220V	60	——
M940A 1091	120V	60	One 1000Ω Balance Slidewire
M940A 1109	120V	120	——
M940A 1117	220V	120	——
M940A 1125	120V	60	One 135Ω
M940A 1166	120V	120	Retransmitting Slidewire
M940A 1133	120V	60	1 SPDT
M940A 1182	120V	60	Stroke Set at 90°
M940A 1174	120V	120	One 135Ω Retransmitting
M940A 1190	120V	60	Slidewire and 1 SPDT
M940A 1141	120V	120	2 SPDT
M940A 1216	220V	60	2 SPDT One 1000Ω Retransmitting Slidewire
M940A 1208	220V	60	2 SPDT, One 135Ω Retransmitting Slidewire
M940A 1224*	120V	120	1 SPDT One 1000Ω Retransmitting Slidewire
M940A 1232	120V	30	3 SPDT
M940A 1240	120V	60	2 SPDT
M940A 1257	220V	60	2 SPDT
M940A 1265	120V	15	2 SPDT One 135Ω Retransmitting Slidewire
M940A 1273	120V	30	2 SPDT One 135Ω Retransmitting Slidewire
M940B 1009	120V	15	——
M940B 1058	120V	15	One 135Ω Retransmitting Slidewire and One 1000Ω Balance Slidewire
M940B 1066	120V	60	2 SPDT One 1000Ω Balance Slidewire
M940B 1074	120V	60	2 SPDT
M940B 1017	120V	30	——
M940B 1025	120V	60	——
M940B 1033	220V	60	——
M940B 1041	120V	60	One 135Ω Retransmitting Slidewire
M940B 1082	220V	60	One 135Ω Retransmitting Slidewire
M940B 1090	120	60	2 SPDT, One 1000Ω Retransmitting Slidewire

*Wired for field addition of auxiliary switches, balancing and retransmitting slidewire.

**Auxiliary switch cams are momentary make at the switch point rather than continuous make through the remaining motor stroke.

Dimensions: millimetres / inches

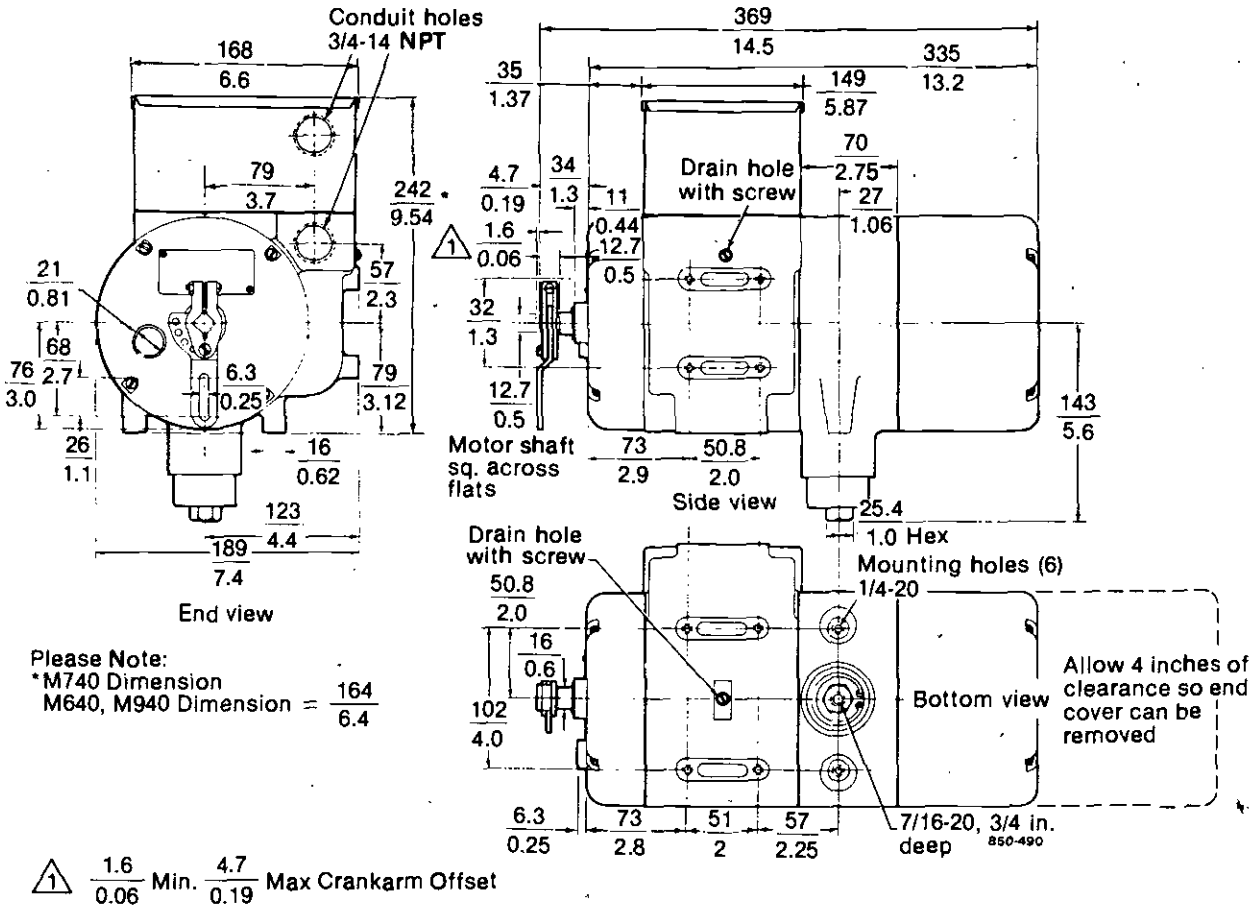


Please Note:
*M740 Oimension
M640, M940 Oimension = 164 / 6.4

⚠1 1.6 / 0.06 Min. 4.7 / 0.19 Max Crankarm Offset

Figure 5—Motor dimensions – M640A, M740A, M940A

Dimensions: millimetres / inches



Please Note:
*M740 Dimension
M640, M940 Dimension = 164 / 6.4

⚠1 1.6 / 0.06 Min. 4.7 / 0.19 Max Crankarm Offset

Figure 6—Motor dimensions – M640B, M740B, M940B

Ordering Information

When ordering, specify:
Complete Model Number (Refer to Table 1)
Options if desired:
a. Assembly number of auxiliary switches and slidewires for M640 motors. (Select from listing under "Options".)
b. Slidewire resistance for M940 motor.
c. Other option accessories.

Order from

Honeywell
1885 Douglas Drive North
Minneapolis, Minnesota 55422

(In Canada —
Honeywell Limited
155 Gordon Baker Road
Willowdale Ontario M2H 3N7)

For more information, contact the nearest Honeywell sales office or Honeywell, Process Control Division, 1100 Virginia Drive, Fort Washington, PA 19034.

Specifications are subject to change without notice

Flakt Inc

EMERGENCY & VENTILATION FANS
OPERATION, MAINTENANCE AND INSTALLATION MANUAL

SECTION FIVE

VIBRATION MONITORING
AND
BEARING DAMAGE DETECTION SYSTEMS

- PMC/BETA TECHNICAL DATA
- SPM TECHNICAL DATA

PMC/BETA
LIMITED PARTNERSHIP

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INSTALLATION AND OPERATING MANUAL

MODEL 440S-R/450S-R VIBRALOG

AW 000082
MARCH 1984
MODEL 440S-R/450S-R

INDEX

INSTRUCTION AND INSTALLATION

VIBRATION SWITCH

MODEL 440S-R/450S-R

1.0 General Description

1.1 Introduction

The Models 440S-R/450S-R contain one trip limit for alarm or shutdown. The trip is set in inches per second (velocity model) or mils (displacement model). In addition a 4-20 mA output proportional to vibration level is provided.

The 440 and 450 performance, wiring and specifications are identical except for the enclosure. The 440 meets NEMA 3, 4 and 12. The 450 meets these and in addition, certain explosion proof specifications.

1.2 Protection of Rotating and Reciprocating Machinery

a) A system is required which is responsive to faults which:

1) present themselves as low frequency vibrations vibrations such as imbalance, misalignment, sleeve bearings, broken tie down bolts, etc. and

2) faults which present themselves as higher frequency vibrations such as defective ball or roller bearings, gear mesh, blade pass frequencies, and in the case of reciprocating machinery, detonation and broken parts.

Velocity is the optimum parameter for both high and low frequencies, since it is equally sensitive to both. Acceleration (as with mechanical switches) is over sensitive to the high frequencies and very insensitive to the low frequencies.

On machines operating at very low RPM (100 - 200 RPM), displacement may also be suitable.

b) Time delay is absolutely essential in any usuable vibration monitor. Virtually all machines will exhibit high vibration for several seconds during startup. If time delay is not provided, the operator must turn up the trip point to get thru startup. The resultant setting will be too high to

provide protection during normal running. This is one reason there are so many cases where machines with mechanical type vibration switches have been seriously damaged and the mechanical switches have not tripped. Time delay is included in the Solid State Model 440.

1.3 Summary of Capabilities

A discussion of the 440/450 system and its control is as follows: (please refer to paragraph 1.4)

a) Trip is based on vibration severity (velocity). The sensor is built in (unless the separate 160 sensor option has been purchased) and is a piezoelectric crystal with built-in amplifier to reduce noise sensitivity. The output signal is electronically integrated to measure and trip on velocity. (Electronically converted to displacement on displacement models),

b) Calibrated set point controls permit adjusting set points to known values of vibration level. Shutdown set point range is in velocity. Alarm set point is calibrated 10% to 90% of shutdown set point.

c) 4-20 mA output provides continuous monitoring capability on a milliammeter or a programable controller for data logging or alarm. The 4 mA will be present even when there is no vibration, thus demonstrating the unit is functioning. The 4-20 mA output is normalized to the shutdown set point. Therefore, the output can be directly calibrated as a percent of set point.

d) One switch closure is provided. This is a triac and is a dry contact in the sense that it is isolated from the input power. The triac is settable for open on alarm or close on alarm.

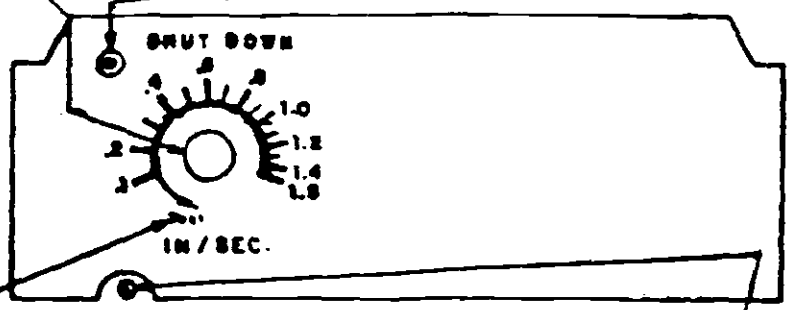
e) Built-in adjustable time delay is standard. This prevents false tripping on high startup vibrations and also from non-repetitive transient events. The standard range of adjustability is 2-15 seconds.

f) Self test and calibrate
A light adjacent to the set point control comes on the instant the measured vibration level exceeds the set point. The unit can be periodically calibrated on line, by turning the set point control down until the light comes on. This setting is then compared with the vibration measured with a portable vibration meter, thus providing a calibration check of the unit. If this setting is maintained, trip will occur after the duration of the time delay.

g) The 440 Series is designed with thick film hybrid circuits which are more rugged than the conventional IC and discrete circuitry. The resulting unit is also smaller in size.

Calibrated set point controls enable operator to set specific velocity trip points

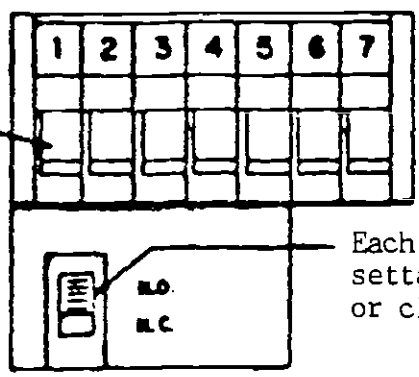
Light comes on immediately when vibration exceeds set point (alarm or shutdown will trip after 3 second time delay).



Adjustable time delay of 2-15 seconds. Factory set at 3 seconds.

Test position sets in minimum set point so that any vibration will cause trip condition. Light will come on immediately, and trip will occur after duration of the time delay, proving that the complete system is operational. If test position is maintained for less than the duration of the time delay, trip will not occur, thus permitting system test without shutdown.

VDE approved terminal strip accepts #12 wire. Screw adjustable clamping yoke rather than screw terminal permits assy, vibration proof connection. All hardware is captive.



Each triac is independently field settable to open on alarm (N.C.) or close on alarm (N.O.).

1.5 SPECIFICATIONS

Specifications for the appropriate models are given below.

Model No.	440S	440S-R	440D	440D-R
No of Trips	ONE: for alarm or shutdown. Set in in/sec (velocity model) or mils (displacement model).		TWO: One for alarm and one for shutdown. Shutdown set in in/sec (velocity model) or mils (displacement model). Alarm set as percent of shutdown.	
Analog Output for Remote Indication	N/A	± 10% accuracy over 4-20 mA DC range. 4 mA is 0 vibration; 14 mA is set point; 20 mA is 160% of set point. Termination load resistance, less than 450 ohms	N/A	± 10% accuracy over 4-20 mA DC range. 4 mA is 0 vibration; 14 mA is set point; 20 mA is 160% of set point. Termination load resistance, less than 450 ohms.
Velocity Set Point	0.1 to 1.5 in/sec or 0.2 to 3 in/sec peak. Metric ranges: 3 to 40 mm/sec or 6 to 80 mm/sec peak (Select one)			
Displacement Model	1 to 15 mils or 10 to 150 mils peak to peak. Metric ranges: 30μm to 400μm or 300μm to 4 mm peak to peak (Select one)			
Frequency Range	2 to 1000 Hz (120 to 60,000 RPM)			
Time Delay	Field adjustable 2-15 sec. Factory set for 3 sec unless specified otherwise			
Alarm or Shutdown Output(s)	Solid state relay (triac). One in 440S, 440S-R; Two in 440D, 440D-R. Insulated (dry) contact Each triac field settable for close on alarm (N.O.) or open on alarm (N.C.) 5 A continuous. 100A for 10 msec. Max. off-state leakage current: 1 mA Min holding current: 20 mA typical Max voltage across SS relay: 140VAC (280VAC on 230V input units)			
Remote Reset	Connection between terminals 5 and 6 latches triac output in alarm state after set point is exceeded. Opening the connection will reset the output to non-alarm state.			
Set Point Accuracy	± 10% of setting with repeatability of ± 2%. Circuitry utilizes RMS detector			
Vibration Sensitive Axis	Perpendicular to base. Unit can be mounted in any orientation without affecting setting			
Temp. Limits	−20°F to +140°F (−30°C to +60°C) including internal transducer. −65°F to +255°F (−55°C to +125°C) for optional external transducer			
Humidity	1% to 100% (non-condensing)			
Input Power	100-130 VAC 50/60 Hz standard. 200-260 VAC 50/60 Hz optional. DC input power optional. 440S, 3 Watt. 440D, 4 Watt			
Enclosure	Rugged, water-tight, dust-tight, cast aluminum. Meets NEMA 3, 4, and 12 standards. Optional explosion-proof enclosures available.			
Weight	3.5 lbs (1.6 Kg)			
Mounting	¼" hardware. 3 mounting bosses			
Terminals	All terminals will accept #12 AWG wire in clamping type yoke without need for termination hardware. ALL hardware is captive.			
Self Test	Test position on set point control and light emitting diode provide functional test of trip circuitry, time delay and triac closure. Also permits on-line calibration of switch.			
Circuitry	Proprietary hybrid circuitry throughout for minimum size and maximum reliability in vibration environment.			
Remote Transducer Option	The standard 440 includes a built-in transducer. When packaged in an optional separate housing, the transducer is designated Model 160. The 160 is 1.5 inch diameter by 3 inches high. If the remote transducer option is desired, it should be ordered at the time the 440 is ordered. To add a 160 transducer option at a later time, consult factory.			

2.0 Installation

2.1 Mechanical Installation

Please see outline drawings provided at the end of section 2.1

2.1.1 Orientation

The sensitive vibration "measuring" axis is perpendicular to the base of the unit (vibration switch or transducer). Always mount the unit such that the desired vibration of the equipment being monitored will occur along this axis.

2.1.2 Mounting Surface

Choose or fabricate a solid (rigid) surface (on the equipment being monitored) to mount the vibration switch or transducer to. This will ensure transferal of the desired vibration to the vibration transducer, while not introducing spurious vibrations.

In addition, the surface presented to the base of the unit should be flat. Fasten using sturdy hardware, at all places provided.

2.1.3 Temperature Considerations

The switch is designed to dissipate internal heat by conduction through its base. Hence it is quite important to keep the mounting surface below the switch max temperature limit of 140° (60°C). If the equipment being monitored is going to exceed this limit, consideration should be given to either using one of the remote 160 transducers, or thermally isolating the switch.

To insure accurate switch performance, a warm-up time of 5 minutes is recommended.

2.1.4 Cable/Wiring

The method chosen to electrically connect to the switch or transducer should be mechanically flexible, to eliminate the measurement of vibration of material not of interest (piping, etc.), and provide a moisture barrier as well.

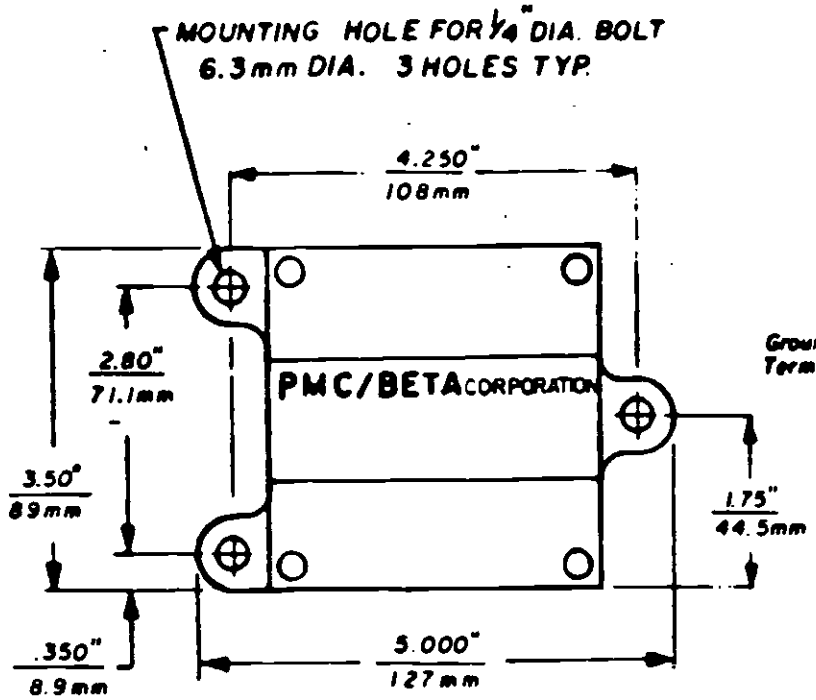
Although sealtight and other flexible conduit have been used successfully, in areas of extreme humidity or moisture it is recommended that an "SO" type cable together with a suitable raintight CGB fitting be used.

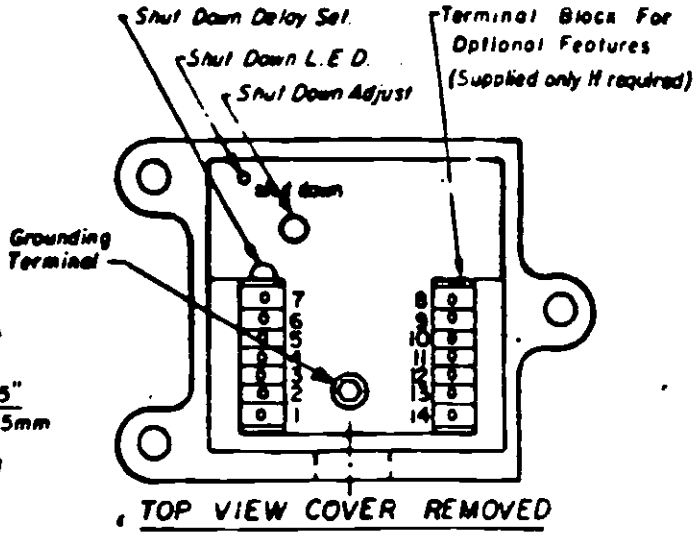
2.1.5 Sealing

In 440 installations where temperature and humidity conditions vary around the dew point, it is important that the cover plate be evenly and firmly fastened down with the four screws provided.

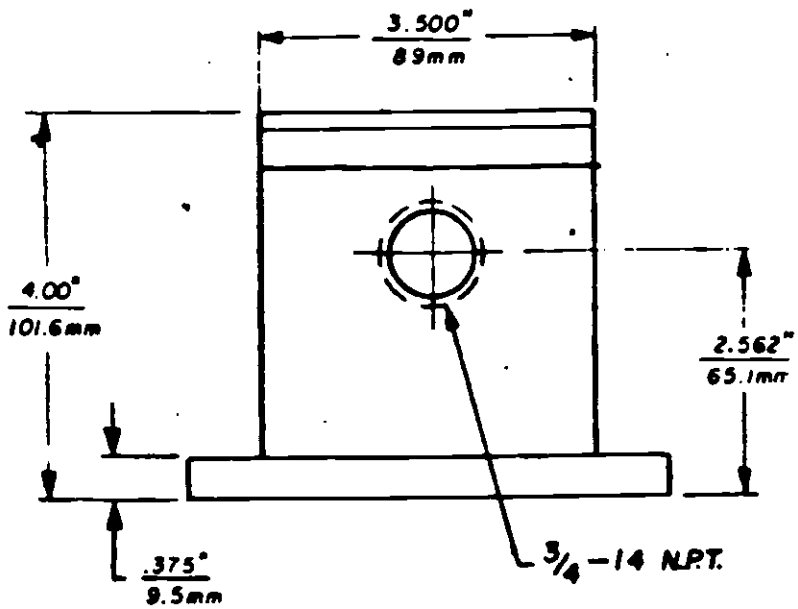
Although the switch enclosures meet NEMA standards for water tightness, it will do no good if proper sealing of both the cover and wiring entrances are not followed. Please remember that a hollow pipe through which wires may enter a switch may also conduct moisture as well.

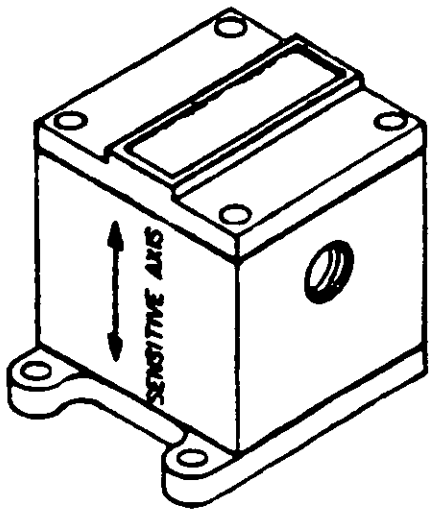
REV.	DESCRIPTION	DATE	APP'D
A	ADDED METRIC DIMENSIONS	3-23-84	WEC





TOP VIEW COVER REMOVED





Dimensions shown in inches and millimeters INCHES / MILLIMETERS

PMC/BETA CORPORATION

4 Tech Circle, Natick, Mass. 01760 U.S.A.

DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED

.X = ± .1 ∠'s = ± 1°

.XX = ± .01 X/XX = ±

.XXX = ±

MATERIAL	DRAWN BY A.ORDWAY
NEXT ASSEMBLY	DATE 10-9-83
USED ON	CHECKED BY
FOR	APPROVED BY,
TITLE OUTLINE DRAWING MODEL 440S/440S-R	SCALE 1/2

SHEET 1 OF 1

DRAWING NUMBER A23356A

3.0 Electrical Installation

3.1 Wiring to the Vibration Switch

The following paragraphs refer to the wiring diagrams at the end of section 3.1

3.1.1 AC Power (Terminals 1 & 2)

Connect a grounding wire to the grounding lug provided in the switch. This is important for safety as well as noise.

Power only with the AC voltage level indicated on the inner cover label. Orientation of AC power to terminals 1 and 2 is not important.

3.1.2 Shut-down Circuit (Terminals 3 & 4)

The internal single pole solid state switch, between terminals 3 and 4, is designed to be wired in series with the external shut-down circuit i.e.: motor starter, relay, contactor, etc. Maximum ratings are found in paragraph 3.2.1. Also see section 3.2.2.

3.1.3 Remote Reset (Terminals 5 & 6)

Shielded wiring is recommended. To avoid creating ground loops, the N.C. remote switch contacts should be isolated i.e.: not electrically connected to other circuits or grounds. See section 3.2.3 for further information.

3.1.4 Lockout (Optional) (Terminals 6 & &)

If this option has been purchased, terminal 7 will be labelled "Lockout". Shielded wiring is recommended. To avoid the possibility of ground loops, the remote N.O. lockout switch contacts should be electrically isolated from other external circuitry or grounds. See section 3.2.4 for further information.

3.1.5 4 - 20 mA Analog Output (Terminal 11 & 12)

To avoid the possibility of ground loops, the 4-20 mA remote meter terminals should be electrically isolated from external grounds. Shielded wire is recommended to protect against damage due to long wire runs and the possiblility of high induced voltage spikes from storms, etc. See section 3.2.5.

3.2 Functional Description and Installation Considerations

3.2.1 Alarm or Shutdown

Maximum ratings for the solid state relay used for alarm or shutdown are as follows:

Continuous current	5 amperes
Surge & overload (Duty cycle less than 1%)	
1 second	25 amperes
16 millisecond	50 amperes
1 millisecond	125 amperes
Maximum voltage	140 VAC (115V Model)
	280 VAC (230V Model)
Maximum off state leakage	1 mA
Isolation	2500 VAC min

As you can see from the above specs, these are medium power rated devices and are quite useful in controlling relays, contactors and most motor starters directly. Maximum noise immunity is obtained when used in the open on alarm (N.C.) mode.

3.2.2 Open/Close on Alarm

The alarm or shutdown triac is independently field settable for N.O. (close on alarm) or N.C. (open on alarm). The switch is accessible with a screwdriver thru holes in the side panel.

Open on alarm is recommended in installations where triac lines are likely to be noisy, i.e.: large transient voltage spikes due to unsuppressed relay, solenoid, or other inductive loads.

3.2.3 Remote Reset/Latch

The following paragraphs refer to the wiring diagrams and also paragraph 3.1.3.

3.2.3.1 Auto Reset Mode

In this mode, alarm and shutdown switches are automatically reset to the non-alarm condition when the vibration level falls below the set point.
(As shipped, no connection between terminals 5 and 6).

3.2.3.2 Latch Mode

In this mode, alarm and shutdown switches remain "latched" in alarm (shutdown) condition when the vibration level exceeds the set point for the duration of the time delay. The unit is in this condition when terminal 5 is connected to terminal 6.

3.2.3.3 Remote Reset Mode

When wired in this mode the alarm or shutdown switches latch in "trip" but can be reset to "non-alarm" mode by momentarily interrupting the connection from terminal 5 to 6. This can be accomplished with a normally closed momentary switch. The switch contacts should be isolated from other circuits, potentials, or grounds.

NOTE: If external DC power is used for the alarm or shutdown circuits, reset is accomplished in a different manner; see section 3.3.2 below.

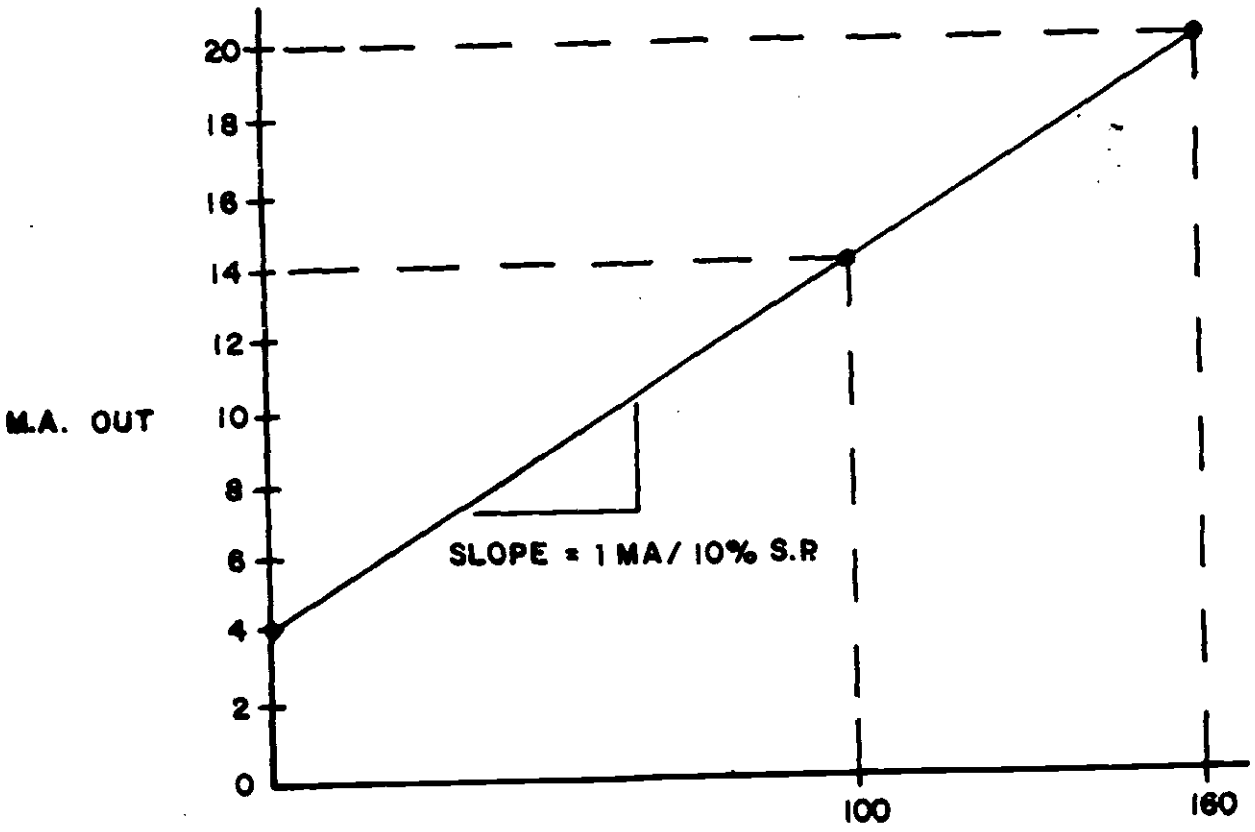
3.2.4 Lockout (Optional)

When this option has been purchased terminal 7 will be labeled "lockout". With this option, the shutdown and/or alarm triacs will not be permitted to actuate so long as terminal 7 is held to ground.

Please not that this option is not normally required in order to avoid nuisance trips on startup, since the built-in time delay will provide this protection. See paragraph 4.2. below.

3.2.5 4 - 20 mA Output

Terminal 12 is labelled "analog" with return (loop) to terminal 11. This loop provides a 4-20 mA output current proportional to vibration. 4 mA = 0 vibration, 14 mA occurs at whatever shutdown set point has been set, 20 mA at 160% of shutdown set point. This is shown on the following graph.



3.3 Special Considerations

3.3.1 Light Loads

The solid state relays used in the standard 440 series are a special high transient immunity, medium power type. Off state leakage is 1 mA max and should not create any problems, even when interfaced with a load as light as a programmable controller.

Minimum load required to keep the triac on however is a 20 mA typical and 50 mA max, due to "holding current" specifications. If the load is less than this, a resistor may have to be placed in parallel with the load. i.e.: for 115VAC light load (20 mA or less) a 2K-OHM 10 watt power resistor is recommended.

3.3.2 D.C. Loads

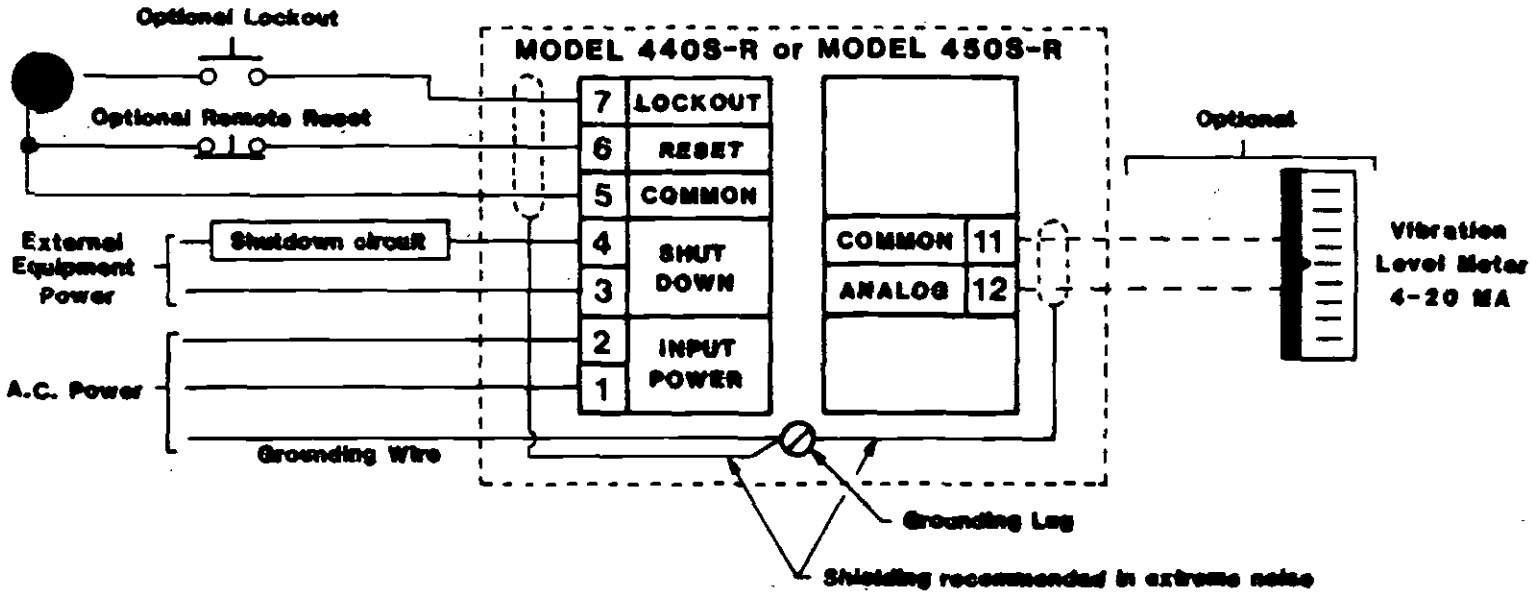
Although most applications use AC input power and AC on the S.S. relay outputs (alarm and shutdown) these triacs may be used in DC applications providing minimum loading requirements are met. See section 3.3.1 above.

When DC is used, a triac will automatically latch in "on" condition after trip, thus only "close onalarm" (N.O.) can be used. Also, to reset, an external N.C. reset switch must be wired in series with the load. In this case the usual reset terminals 5 & 6 referred to in paragraph 3.1.3 are not used.

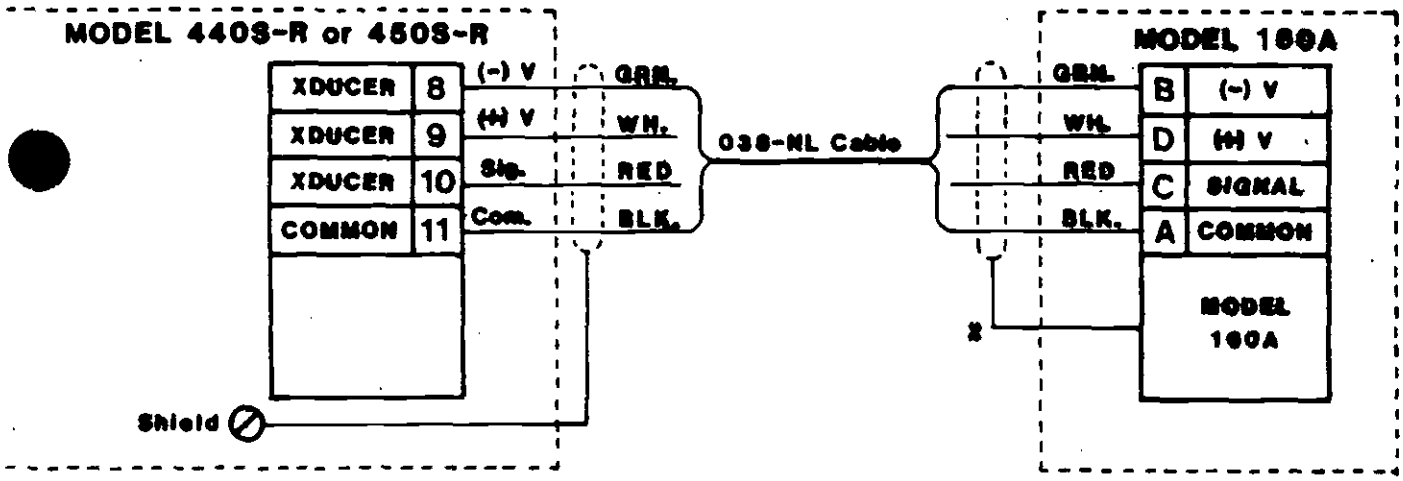
To avoid large voltage drops on DC operation, the triac should be connected as follows:

Term	
3	NEG
4	POS

WIRING DIAGRAMS

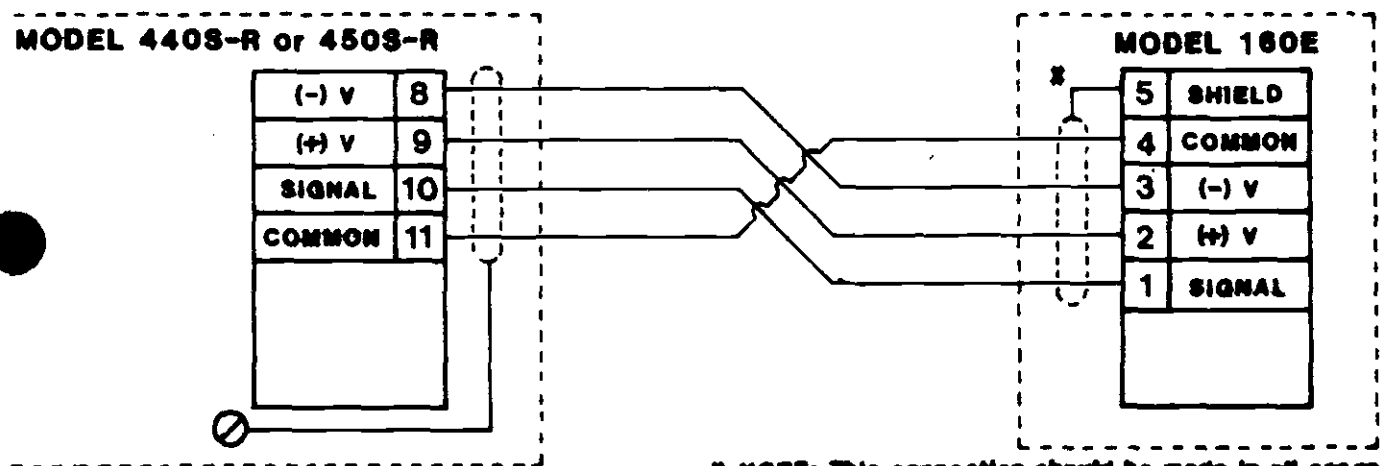


NOTE: Applies only if remote 160A transducer option is purchased.



* NOTE: This connection should not be made in typical motor driven machinery applications where magnetic fields and circulating currents are typical sources of noise pickup. Where large static charges such as from ignition systems are likely completing this connection is recommended.

NOTE: Applies only if remote 160E transducer option is purchased.



* NOTE: This connection should be made in all cases.

4.0 CONTROL SETTINGS

4.1 Setting Trip Points

The Models 440S-R and 450S-R provides one trip: one for alarm or for shutdown.

The alarm or shutdown is set directly in inches/seconds (velocity models) or mils (displacement models).

Since the set point control has a calibrated scale (unlike mechanical switches where you cannot tell what the trip point setting is), known trip points can be set in. The proper set point varies with the type machine. The following will assist you in determining the proper set point.

1. The Warning Level Guide shown below indicates recommended starting points for vibration warning levels - defined as levels at which abnormal wear is occuring. Vibration analysis is recommended at this level. Different warning levels are given for different types of machinery.

2. These ranges are typical. Each machine will have its won personality, depending on how much it is loaded, the particular installation, and the tolerances of the machine itself. Thus, you must make the final judgment for your equipment.

3. Trend information is frequently as meaningful as absolute levels. Thus, an alternate method is to determine the existing vibration level (this is easily accomplished using a vibration meter such as the PMC 101 or 201) and setting the trigger between 25% and 50% above this. The 440 itself can be used to determine the existing vibration level. See paragraph 4.4 below.

4. If the existing level is near or above the upper end of the range noted in the Warning Guide, vibration analysis with an instrument such as the PMC 208 should be performed as soon as possible and corrective action taken. (Write for Vibration Identification Guide contained in AN 803).

4.2 Setting of Time Delay

An important feature of PMC/BETA switches is the built-in time delay. This prevents triggering of the alarm or shutdown functions from transient increases in vibration levels. It also avoids shutdown due to transitory vibrations occuring during start-up.

Almost all machines experience a few seconds of high vibration during start-up before reaching operating speed. When no time delay function is included (as with mechanical switches), this start-up vibration causes a trip. Frequently, the operator turns the trip setting up until he can get through start-up. The resultant trip level is too high to afford protection at the machine's operating speed.

The time delay is adjustable. It will have been set at the factory for three (3) seconds unless your order specified otherwise.

The time a vibration must be above set-point before trip occurs is adjustable from 2 to 15 seconds.

To readjust the time delay, turn the shutdown set point (or alarm set point for alarm time delay) knob CCW until the LED illuminates. The time from this point to triac actuation is the time delay. Change the time delay via screwdriver adj., clockwise to increase time delay (one complete turn is approximately 0.5 seconds). Then recheck and readjust until the desired time delay is achieved.

4.3 Test Mode

The test position on the set point control is used to test the switch functions without the need for vibration. When the shutdown knob is turned to test, the shutdown LED should immediately illuminate, the 4-20 mA should exceed 20 mA, followed after the delay time by actuation of the shutdown triac.

If the set point knob is returned to a normal setting before the duration of the time delay has been exceeded, the LED will come on but the actuation of the triac can be avoided.

4.4 Alarm and Shutdown Light Emitting Diodes

Since the LED activate instantaneously (before time delay), it can be used to check the machine's actual vibration level, i.e.: slowly decrease shutdown set point by turning the set point knob counter-clockwise until the shutdown LED illuminates. Note this setting and return the knob to a higher setting (before time delay runs out). This is the actual vibration level present.

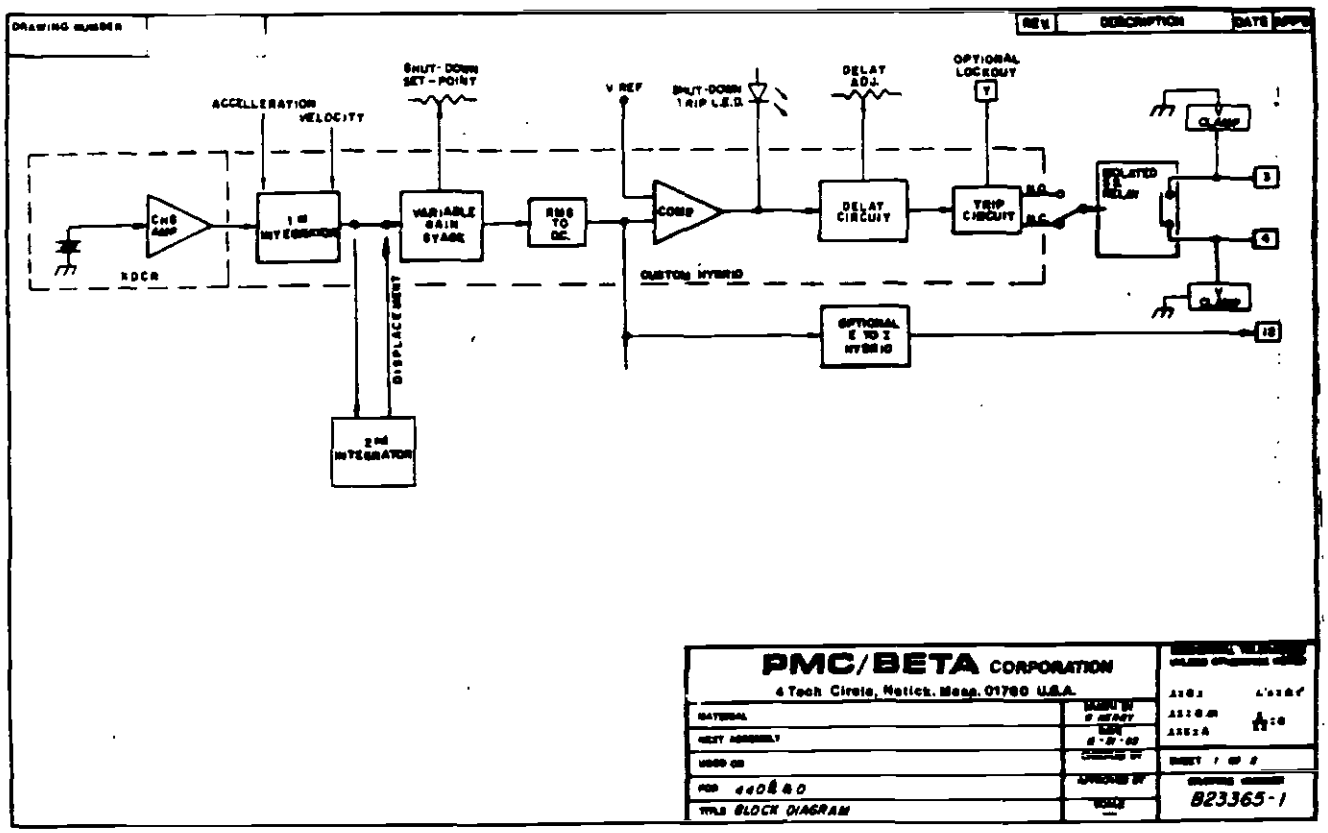
5.0 SYSTEM BLOCK DIAGRAM

Vibration is sensed by an internal transducer module consisting of a crystal assembly and integral charge amplifier. Thus, the electrical output of the transducer is a well buffered (low impedance) signal directly proportional to acceleration (G) of the switch.

This signal goes to a custom hybrid circuit, where, depending on the model, it may pass through one or more stages of signal conditioning to yield an A.C. signal now proportional to velocity (or displacement, in displacement models). This signal in turn is routed through an amplifier, the gain of which is controlled by the "shutdown set point".

Next, the signal is processed through a true RMS to DC stage and compared against a preset internal voltage reference. If the signal level is higher than reference, the shutdown LED is illuminated.

If the voltage level stays above the reference for the duration of the time delay and output trip occurs and the shutdown solid state relay will trip. (Change state).



PMC/BETA Corporation

Application Note 811

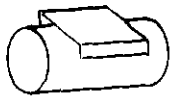
MOUNTING PMC/BETA ELECTRONIC VIBRATION SWITCHES

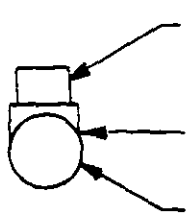
WHERE TO MOUNT THE SWITCH

It is desirable to mount the PMC electronic switch (or transducers for remote monitoring systems) on the bearing housing, since the forces on the rotating member (unbalance, misalignments, bearing wear, aerodynamics, etc.) reach the outside world through the bearings.

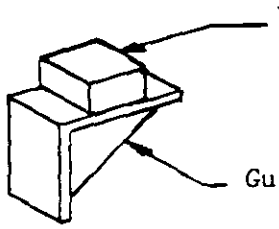
Most bearing housings are curved so it is necessary to attach a bracket with a flat surface for mounting the switch. If the machine has bolted end plates on the bearings or horizontally split bearing housings, these bolts can be used to attach the bracket.

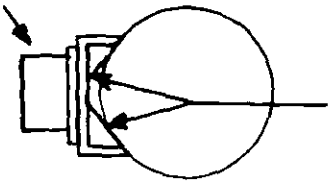
When bolt holes are not available or are not suitable, an alternative way is to weld an angle iron bracket similar to that in the sketch, but oriented so as to straddle the bearing housing similar to:





The best approach is to mount a gusseted bracket:

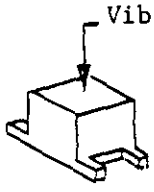


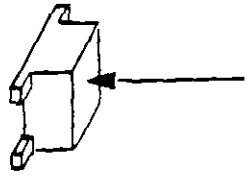


For most applications 3/8 inch material (preferably steel) will be suitable.

SENSITIVE AXIS

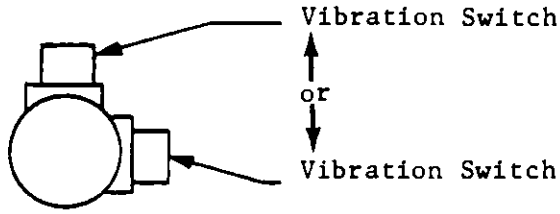
Please note that the electronic vibration switch can be mounted in any orientation without a change in sensitivity. It senses vibration in a direction perpendicular to its mounting surface.





CHOOSING MOUNTING DIRECTION

The vibration switch can be mounted in the vertical or horizontal direction (or anything in between).



The best way to choose the mounting direction is to measure the vibration level in both directions with a vibration meter (such as the PMC Model 101 or 201A) and choose the direction with the highest level. This will usually be horizontal, since the machine structure is usually less rigid horizontally than vertically.

HOW MANY MONITOR POINTS PER MACHINE

Anywhere from one to four switches are used per machine (depending on how critical the machine is to the process or how expensive it is), one on each end of the motor and one on each end of the compressor, fan, pump or whatever is being driven. If there is a gear box in between, one may be used here also.

It is quite common to use only one switch. In this case, it is best to mount on or near the driven bearing. For example, if you have a motor and large fan with a bearing on each end of the fan, the fan bearing on the motor side would be the driven bearing. It will usually see the highest forces and have the highest vibration level.

MOUNTING AT OTHER LOCATION

It is not always possible to mount on the bearing. The unit can then be mounted on the bearing pedestal or on a structural member nearby. Again, it is desirable to survey the machine with a vibration meter. If the level at the intended location is about the same (within 25 or 50%) it probably will be satisfactory. Of course, the trip setting would be reduced if the vibration level at the mounting location is smaller than at the bearing. (See Application Note 803 for information on recommended trigger levels).

PMC/BETA Corporation

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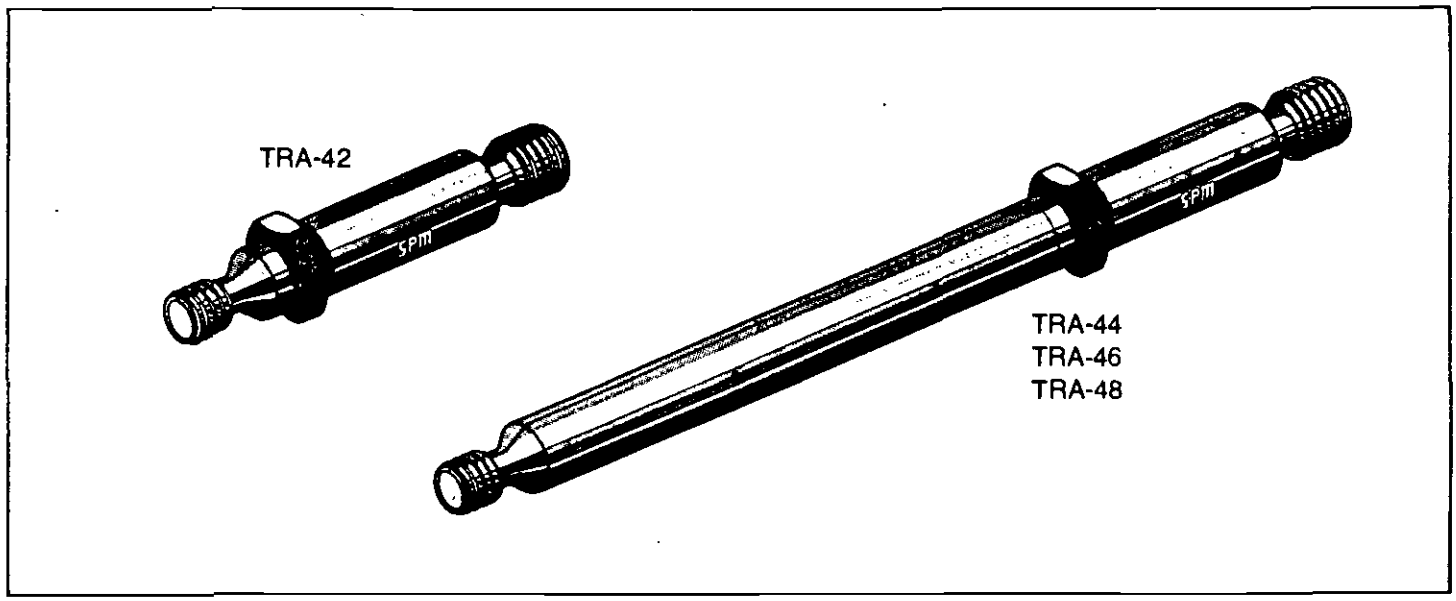
SPM®

Permanent Installation of TRA40 Series Transducers



TRA40 Series Transducers

The TRA40 Series permanently installed transducers are designed to be used where the measuring point is inaccessible for manual measurements or where automatic measurement such as on a continuous monitoring system is required. They are connected to measuring terminals by coaxial cable. Their sealed, stainless steel construction make them suitable for a wide range of environmental conditions.

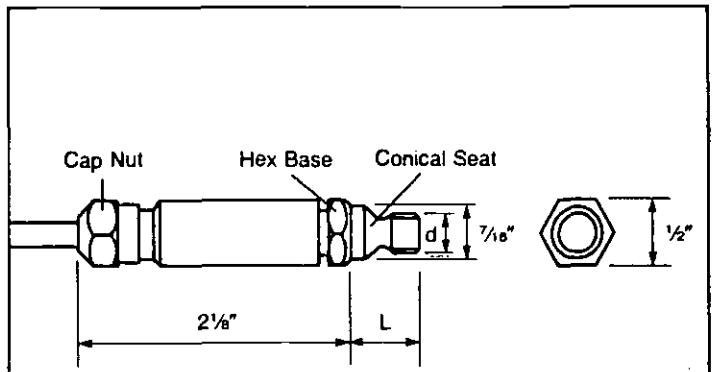


Figure 1

Specifications

Measuring Range: $-20dB_{SV}$ to $+100dB_{SV}$
Design: Sealed, corrosion resistant ASTM 303 stainless steel construction
External Pressure: 100 psig
Temperature Range: –20°F to 250°F
Tightening Torque: 8-11 foot-pounds
Connector: SPM designed sealed CON-02* for 90093-L for RAYOLIN cable.
NOTE: "L" = desired length in feet.

*Patent Pending

TRANSDUCER	THREAD SIZE (d)	LENGTH (L) UNDER HEX BASE
TRA-42	5/16"-18UNC	9/16 inch
TRA-44	5/16"-18UNC	4 1/16 inch
TRA-46	5/16"-18UNC	7 9/16 inch
TRA-48	5/16"-18UNC	11 1/16 inch

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P.O. Box 7220 Greensboro, NC 27407
(919) 292-6508

Mounting of Transducer

Mount the transducer and torque the ½ inch hexagonal base to between 8 and 11 foot-pounds. When installing TRA-44 through TRA-48 transducers, it is important that they have no metallic contact with their surroundings other than at the thread and seat surfaces. Transducer extensions must be sealed with rubber/silicone or similar dampening material where applicable. See Figure 4.

The transducer is connected to a measuring terminal by RAYOLIN (SPM No. 90093-L) coaxial cable. Special SPM design connector CON-02 for RAYOLIN cable must be used at the transducer. This connector provides internal sealing capability to 100 psig external pressure for a wide range of environments. Please refer to SPM Publication No. TRA-04 for instructions on how to mount these connectors. For cable lengths between 13 and a maximum length of 330 feet, a transducer matching unit (TMU) is required between the transducer and the measuring terminal. The TMU must be mounted no more than 13 feet from the transducer. Consult pertinent SPM product literature for various system suggestions.

NOTE: Minimum disturbance of the cable connection to TRA40 Series transducers ensures sealing integrity. It is recommended that the connector not be routinely disassembled.

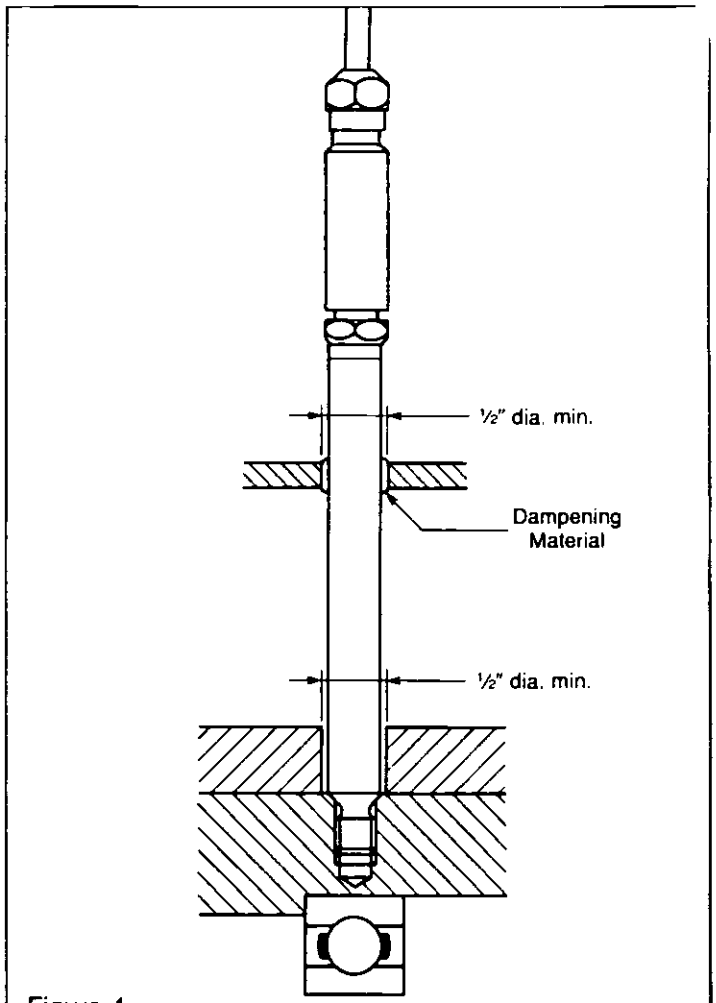

Figure 4

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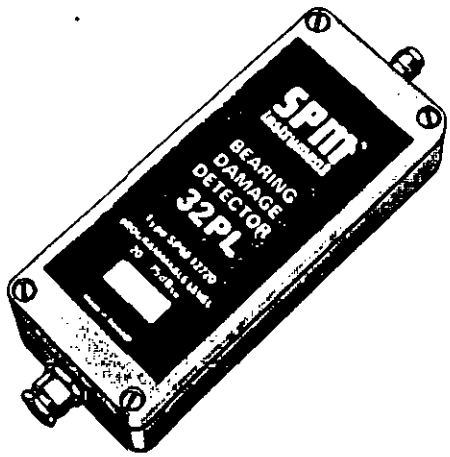
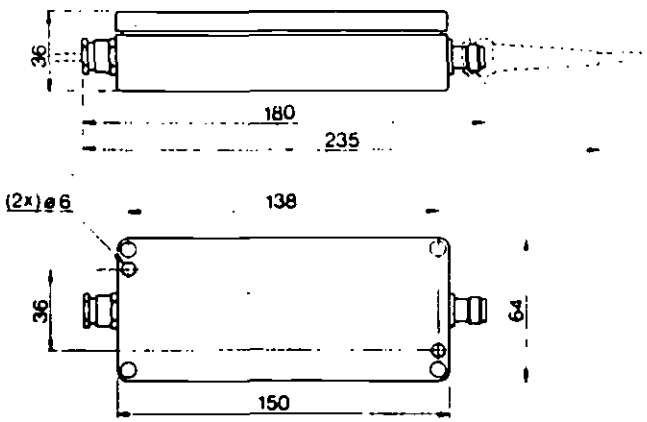
SPM®

System 32

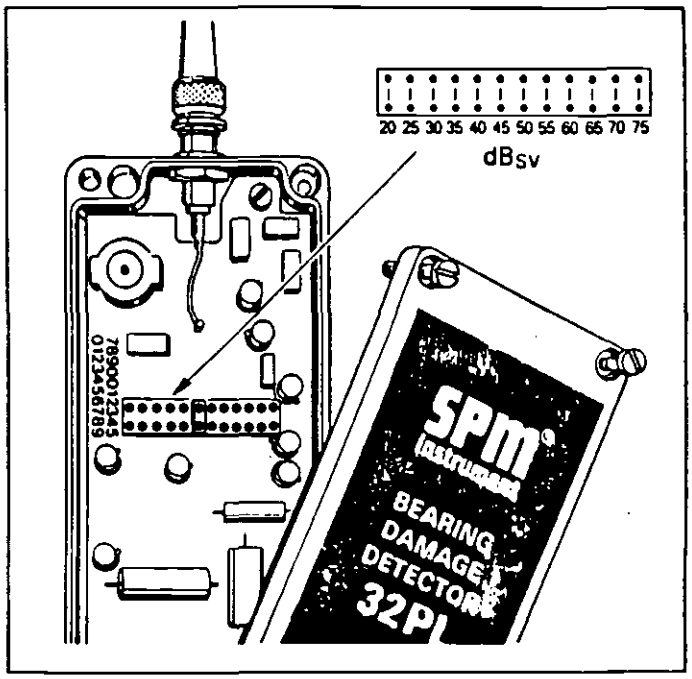
Bearing Damage Detector 32PL





The detector is a complete measuring unit with adjustable alarm level, to be used with System 32. The alarm is triggered when the signals from the shock pulse transducer exceed the alarm level at least once every 10 seconds. The alarm is reset by a short interruption of the current supply (performed in the alarm unit).

The alarm level is chosen with respect to the shaft diameter (d) and speed (n) of the monitored bearing. The diagram below comprises recommended alarm levels in dB_{SV}.

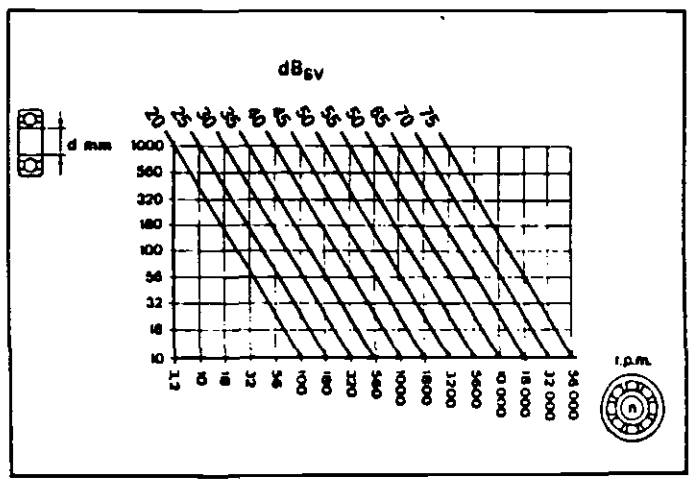


Adjusting alarm level

32 PL has a measuring range of 20 - 75 dB_{SV}. The alarm level is adjustable in 12 steps of 5 dB. The desired level is selected by moving the pin plug in the tag strip inside the box. By replacing the front cover the detector is sealed for use in industrial environment.

Technical data

Measuring range:	20 - 75 dB_{SV}
Housing:	Laquered aluminium, "IP" rating 65
Temperature range:	-20° to +100° C
Current supply:	24 V from alarm unit 32 CL
Length of transducer cable:	Max. 4 m
Supply cable:	Single conductor, max.50Ω



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71280 B 887654321

SPM®

Huvudkatalog General Catalogue Hauptkatalog

70554 ABC 9876 Printed in Sweden

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System 32

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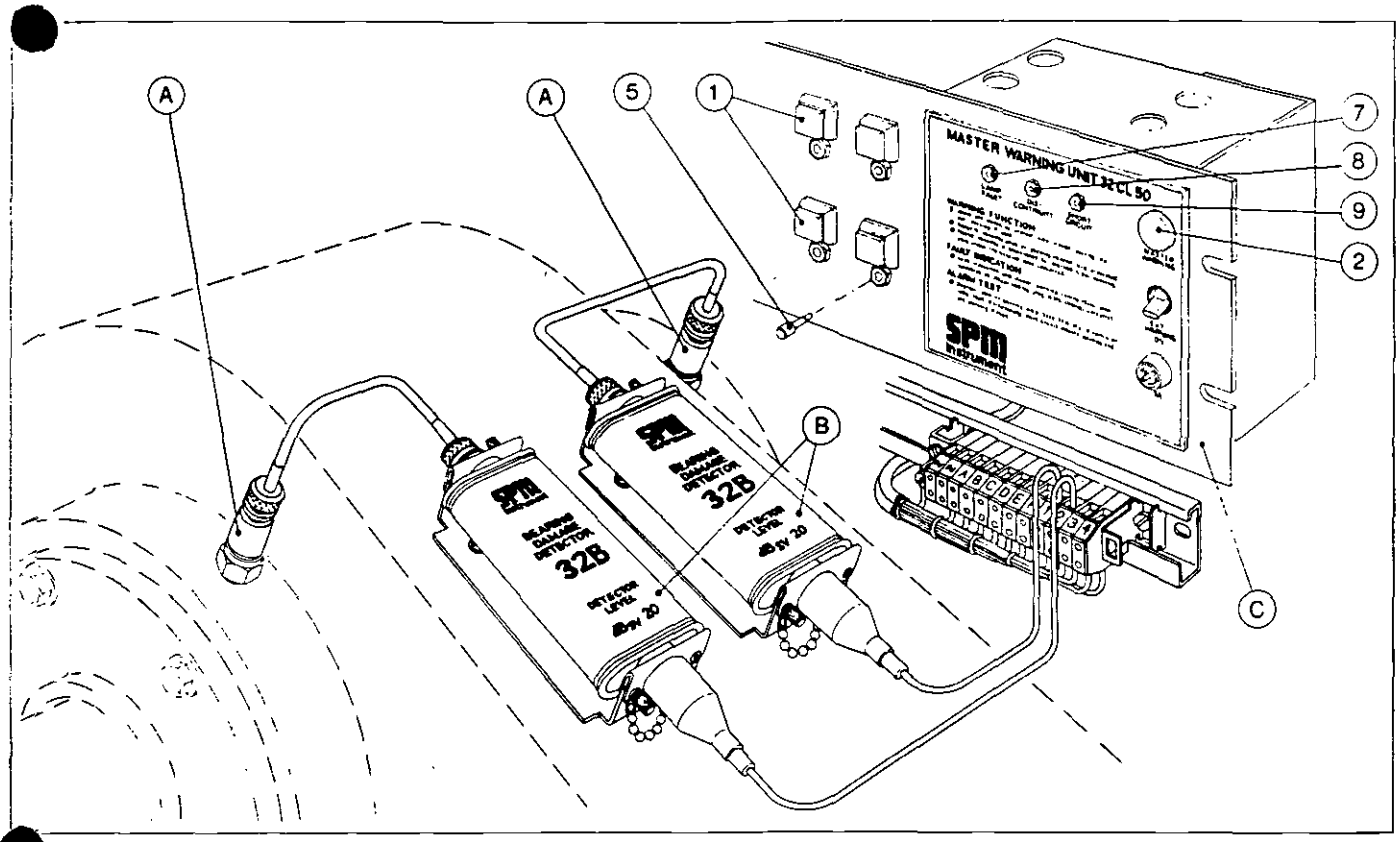
Fortlaufende Zustandsüberwachung von Wälzlagern



Vid kontinuerlig övervakning av rullningslager med SPM System 32 monteras en Stötpulsgivare (A) och en Lagerskadedetektor (B) för varje lager. Detektorerna ansluts till en gemensam Larmcentral (C).

De tryckvågor (stötpulser), som alstras av skador i ett lager under drift, omvandlas i givaren till elektriska signaler. Dessa signaler leds till detektorn via en kort koaxialkabel. När signalerna från givaren överskrider detektorns larmnivå minst en gång var tionde sekund utlöses larmet.

Larmcentralen matar detektorerna med 24V ~ över enkelledare med strömåterföring genom maskingods och skyddsjord. Larmcentralen känner larmet som en ökning av detektorns strömförbrukning, därvid tänds motsvarande signallampa. Samtidigt sluts en reläkontakt för styrning av yttre larm, automatiskt maskinstopp etc.

For continuous monitoring of ball and roller bearings with SPM System 32 a Shock pulse transducer (A) and a Bearing damage detector (B) is mounted for each bearing. The detectors are connected to a common Alarm unit (C).

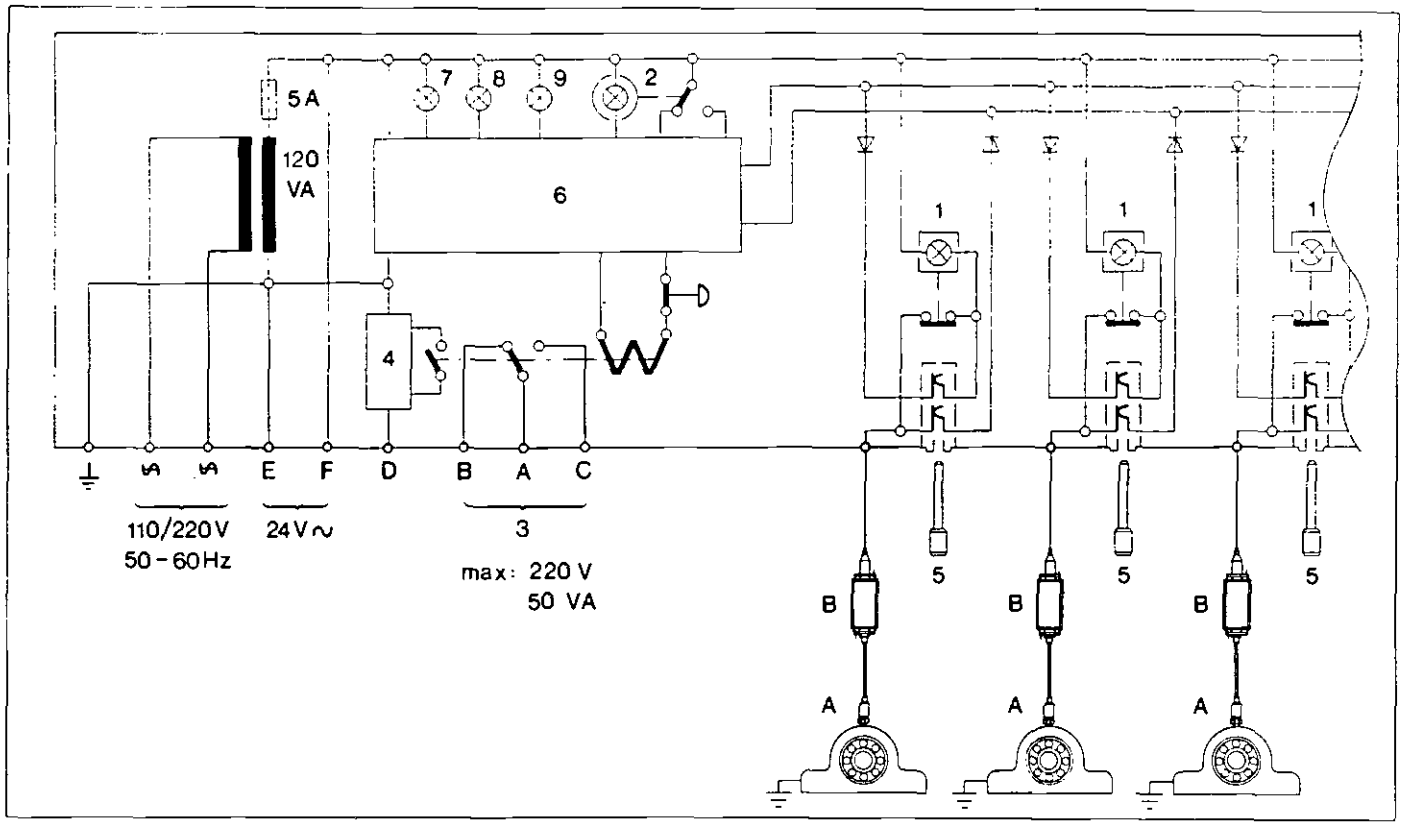
The pressure waves (shock pulses) generated by defects in a running bearing are transformed into electrical signals in the transducer. These signals are transmitted to the detector by a short coaxial cable. When the signals from the transducer exceed the alarm level of the detector at least once every 10 seconds the alarm is triggered.

The alarm unit supplies the detectors with 24V AC through single conductor cables with current return through machinery and ground. The alarm unit senses the alarm as an increase in the current consumption of the detector, thereby lighting the corresponding signal lamp. At the same time a relay is activated which can control remote warning, automatic machine stop, etc.

Für die fortlaufende Überwachung von Wälzlagern mit dem SPM System 32 wird ein Stossimpulsaufnehmer (A) und ein Lagerschadendetektor (B) für jedes Lager montiert. Die Detektoren werden an eine gemeinsame Alarmzentrale (C) angeschlossen.

Die Druckwellen (Stossimpulse), die durch Schäden in einem Lager während des Betriebes entstehen, werden im Aufnehmer in elektrische Signale umgewandelt. Diese Signale werden über ein kurzes Koaxialkabel zum Detektor geleitet. Wenn die Signale vom Aufnehmer die Alarmschwelle des Detektors mindestens jede zehnte Sekunde überschreiten, wird die Alarmfunktion ausgelöst.

Die Alarmzentrale speist die Detektoren mit 24V ~ über einadrige Kabel mit Stromrückführung durch Maschinenstativ und Schutzerde. Die Alarmzentrale erkennt den Alarm als eine Steigerung des Stromverbrauchs des Detektors und schaltet die entsprechende Signallampe ein. Gleichzeitig wird ein Relaiskontakt für die Steuerung des Alarms geschlossen, wodurch automatisches Abstellen der Maschine etc. gesteuert werden kann.



Larmfunktion
Signallampan (1) och centrallarmlampan (2) tänds. Samtidigt aktiveras reläutgången (3) och detektorsimulatorn (4). Detektorsimulatorn möjliggör sammankoppling av larmcentraler till större system. Larm återställs genom intryckning av signallampan (1). Larmande detektor kan kopplas bort från centrallarm med en brytpinne (5).

Alarm function
When alarm is triggered, signal lamp (1) and master alarm lamp (2) will light up. relay (3) will operate and detector simulator (4) will activate. The detector simulator enables connection of alarm units to larger systems. The alarm is reset by pushing the signal lamp (1). Detector giving alarm can be disconnected from master alarm by a disconnecting plug (5).

Alarmfunktion
Die Signallampe (1) und die Zentralalarmlampe (2) werden eingeschaltet. Gleichzeitig werden Relaisausgang (3) und Detektorsimulator (4) aktiviert. Der Detektorsimulator ermöglicht die Zusammenkopplung von Alarmzentralen zu einem grösseren System. Durch Eindrücken der Signallampe (1) wird der Alarm zurückgestellt. Der alarmierende Detektor kann mit einem Unterbrechungsstift (5) vom Zentralalarm abgeschaltet werden.

Felindikering
Elektronikenheten (6) övervakar den elektriska funktionen. Vid fel utlöses centrallarmet och felets art visas med lamporna: (7) Lampfel, (8) Avbrott och (9) Kortslutning. Felande kanal lokaliseras med en brytpinne (5). Genom insättning av brytpinnen i den felande kanalen avbryts larmet.

Fault indication
The electronic unit (6) monitors the electrical function. In case of fault the master alarm is triggered and type of fault is shown by the lamps: (7) Lamp fault, (8) Discontinuity and (9) Short circuit. Faulty channel is localized with a disconnecting plug (5). When the plug is inserted in the faulty channel the alarm ceases.

Fehleranzeige
Die Elektronikeinheit (6) überwacht die elektrischen Funktionen. Bei Fehler wird der Zentralalarm ausgelöst und die Fehlerursache mit den Lampen angezeigt: (7) Lampenfehler, (8) Unterbrechung und (9) Kurzschluss. Fehlender Kanal wird mit einem Unterbrechungsstift (5) lokalisiert. Durch Einstecken des Unterbrechungsstiftes in den fehlerhaften Kanal wird der Alarm abgeschaltet.

Funktionskontroll
Vid intryckning av centrallarmlampan (2) skall lamporna (2), (7), (8) och (9) tändas.

Functional test
Pushing master alarm lamp (2) should cause lamps (2), (7), (8) and (9) to light up.

Funktionskontrolle
Bei Eindrücken der Zentralalarmlampe (2) sollen die Lampen (2), (7), (8) und (9) aufleuchten.

System 32
Larmcentraler serie 32CL50

Centralerna kan utrustas med bl a svensk, engelsk eller tysk manöverinstruktion. Centralerna kan levereras i två olika versioner antingen för anslutning till 110 V, 50 – 60 Hz eller för anslutning till 220 V, 50 – 60 Hz.

Larmcentraler av serie 32CL50 kan beställas antingen färdig monterade och kopplade i olika skåp för väggmontage eller som kompletta larmpaneler för montering i befintliga skåp. I standardleveransen ingår signallampor, brytpinnar samt en eller två monteringsskenor med påsatta kopplingsplintar för nätkabel, reläväxling och larmkanaler. Plintarna är anslutna med kabelstam (fri längd 0,5 m) till centralens elektronikenhet och till signallamporna.

Larmcentraler med skåp levereras med genomföringar för inkommande kablar. Larmcentraler utan skåp kan levereras med 4 konsoler för vägg- eller skåpmontage.

Vid beställning av larmcentral anges **önskat antal kanaler (N)** som skall vara försedda med signallampor och anslutna till kopplingsplintarna. Exempel: larmcentral för 15 kanaler beställningsnummer XXXXX-15.

System 32
Alarm units series 32CL50

The alarm units are available with operating instructions in English, German or Swedish, among others. The alarm units are available in two different versions, either for connection to 110 V, 50 – 60 Hz or to 220 V, 50 – 60 Hz.

Alarm units series 32CL50 can be ordered with or without cabinets for wall mounting. In both cases the delivery includes signal lamps, disconnecting plugs, internal wiring, and one or two mounting rails with terminal blocks for power leads, alarm channels and connections to the main relay. The cable assembly connecting block terminals and alarm unit has a free length of 0.5 m.

Alarm units with cabinets will be delivered with bulkhead unions for incoming cables. Alarm units without cabinets can be ordered with 4 brackets for wall or cabinet mounting.

When ordering, please state the **desired** number of channels (N) which are to be equipped with signal lamps and connected to the terminals. Example: an alarm unit for 15 channels has ordering number XXXXX-15.

System 32
Alarmzentralen Serie 32CL50

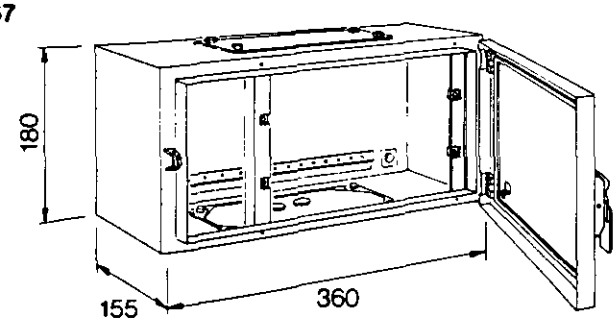
Die Alarmzentralen können mit Bedienungsanweisungen in u.a. deutscher, englischer oder schwedischer Sprache versehen werden. Die Alarmzentralen können in zwei verschiedenen Ausführungen geliefert werden: entweder für Anschluss an 110 V, 50 – 60 Hz oder für Anschluss an 220 V, 50 – 60 Hz.

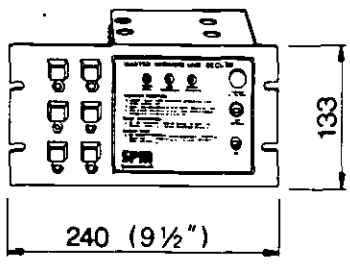
Die Alarmzentralen der Serie 32CL50 können mit oder ohne Gehäuse für Wandmontage geliefert werden. Die Lieferung umfasst in beiden Fällen die Signallampen, Unterbrechungsstifte, die interne Verdrahtung sowie eine oder zwei Montageschienen mit Anschlussklemmen für Netzanschluss, Relaisschaltung und Alarmkanäle. Der Kabelbaum zwischen Anschlussklemmen und Zentraleinheit bzw. Signallampen hat eine freie Länge von 0,5 m.

Alarmzentralen in Gehäusen werden mit Kabeldurchführungen für die Zuleitungen geliefert. Zentralen ohne Gehäuse können mit 4 Befestigungswinkeln für Schrank- und Wandmontage bestellt werden.

Bei Bestellung bitte Ausbaustufe (N) angeben, d.h. die gewünschte Anzahl verdrahteter und mit Lampen versehener Kanäle. Beispiel: eine Zentrale für 15 Kanäle hat die Bestellnummer XXXXX-15.

11567





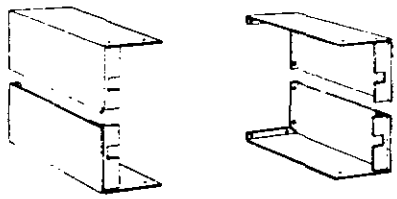
	Svensk	English	Deutsch
/	11090-N	11091-N	11092-N
220 V	10748-N	11087-N	11088-N

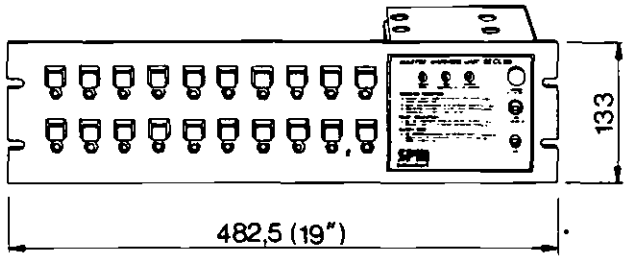
Larmcentral för max 6 kanaler
11567 Hölje

Alarm unit for max. 6 channels
11567 Cabinet

Alarmzentrale für max. 6 Kanäle
11567 Gehäuse

11558





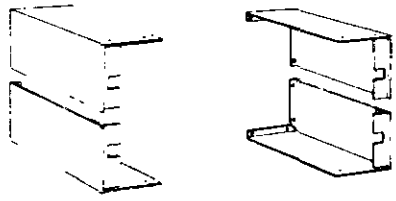
	Svensk	English	Deutsch
110 V	11097-N	11098-N	11099-N
220 V	10776-N	11094-N	11095-N

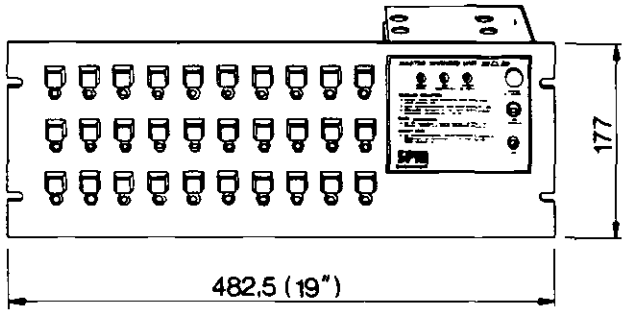
Larmcentral för max 20 kanaler
11558 Konsoler

Alarm unit for max. 20 channels
11558 Mounting brackets

Alarmzentrale für max. 20 Kanäle
11558 Befestigungswinkeln

11558





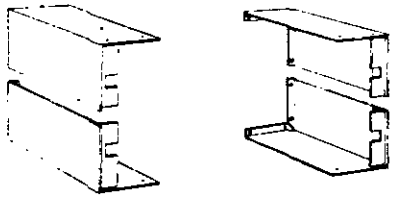
	Svensk	English	Deutsch
110 V	11104-N	11105-N	11106-N
220 V	10780-N	11101-N	11102-N

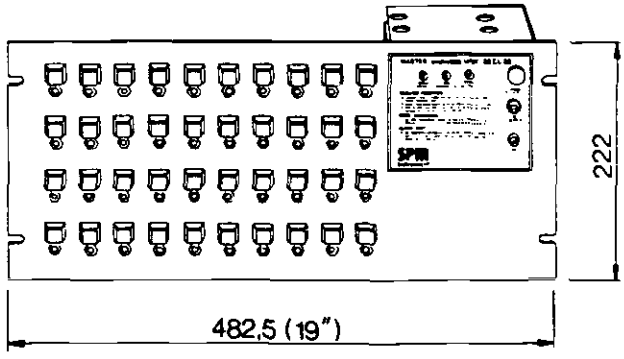
Larmcentral för max 30 kanaler
11558 Konsoler

Alarm unit for max. 30 channels
11558 Mounting brackets

Alarmzentrale für max. 30 Kanäle
11558 Befestigungswinkeln

11558





	Svensk	English	Deutsch
110 V	11111-N	11112-N	11113-N
220 V	10782-N	11108-N	11109-N

Larmcentral för max 40 kanaler
11558 Konsoler

Alarm unit for max. 40 channels
11558 Mounting brackets

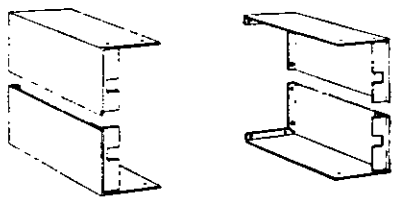
Alarmzentrale für max. 40 Kenäle
11558 Befestigungswinkeln

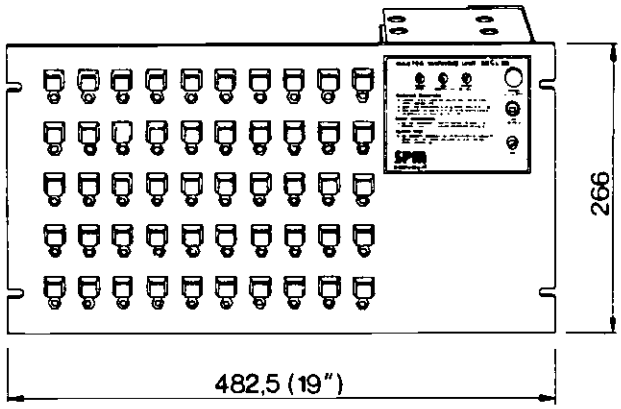
System 32
Larmcentraler serie 32CL50

System 32
Alarm units series 32CL50

System 32
Alarmzentralen Serie 32CL50

11558



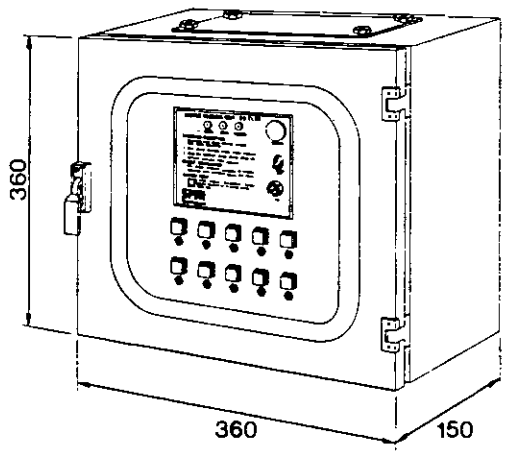


	Svensk	English	Deutsch
110 V	11118-N	11119-N	11120-N
220 V	10784-N	11115-N	11116-N

Larmcentral för max 50 kanaler
11558 Konsoler

Alarm unit for max. 50 channels
11558 Mounting brackets

Alarmzentrale für max. 50 Kanäle
11558 Befestigungswinkeln

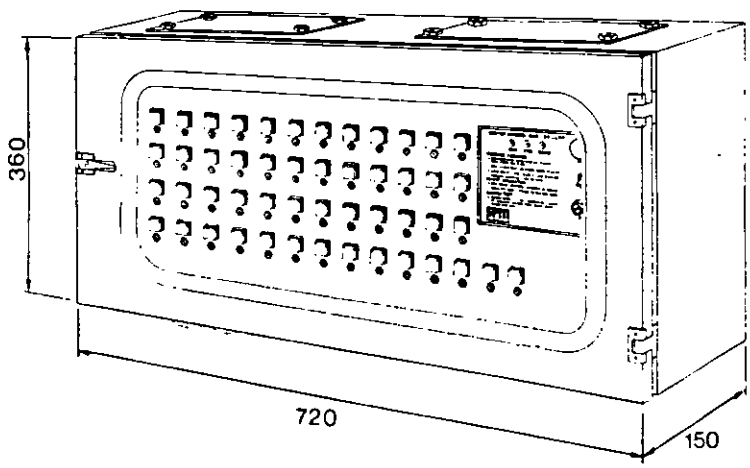


	Svensk	English	Deutsch
110 V	11166-N	11167-N	11168-N
220 V	10798-N	11164-N	11165-N

Larmcentral för max 10 kanaler, installerad i skåp med glasad frontlucka

Alarm unit for max. 10 channels, in cabinet with glassed front cover

Alarmzantrale für max. 10 Kanäle, installiert in Gehäuse mit eingeglaster Tür



	Svensk	English	Deutsch
110 V	11161-N	11162-N	11163-N
220 V	10796-N	11159-N	11160-N

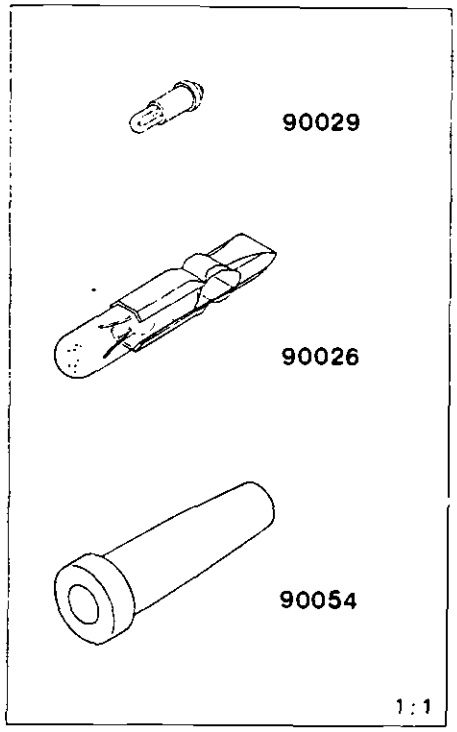
Larmcentral för max 50 kanaler, installerad i skåp med glasad frontlucka

Alarm unit for max. 50 channels, in cabinet with glassed front cover

Alarmzentrale für max. 50 Kanäle, installiert in Gehäuse mit eingeglaster Tür

System 32

Tillbehör för
Larmcentraler 32CL50



90026 Signallampa
Glödlampa för signallamphållare på larmcentraler serie 32CL50.

Utförande	:	Telefonlampa
Spänning	:	12 V
Strömförbrukning	:	50 mA

90029 Indikeringslampa
Glödlampa för felindikeringsfunktionen på larmcentraler serie 32CL50.

Utförande	:	Miniatyrlampa
Spänning	:	16 V
Strömförbrukning	:	30 mA

90054 Lampurdragare

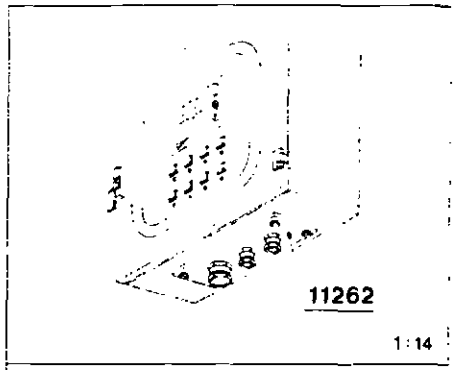
11262 Fläns med kabelgenomföringar
Flänsen är avsedd för inkommande kabelanslutningar till larmcentral i skåp för max 10 kanaler. Flänsen har tre kabelgenomföringar.

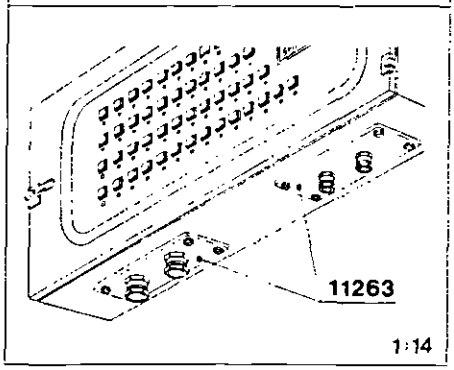
11263 Flänsar med kabelgenomföringar
Två flänsar med vardera två kabelgenomföringar avsedda för inkommande kabelanslutningar till larmcentral i skåp för max 50 kanaler.

11264 Fläns med yttre larmlampa
Larmlampan är avsedd för anslutning till centrallarm-utgången.

System 32

Accessories for
Alarm units 32CL50





90026 Signal lamp
Bulb for signal lamp socket on alarm units series 32CL50.

Design	:	Telephone lamp
Voltage	:	12 V
Current consumption	:	50 mA

90029 Indication lamp
Bulb for the fault monitoring function on alarm units series 32CL50.

Design	:	Miniature lamp
Voltage	:	16 V
Current consumption	:	30 mA

90054 Lamp remover

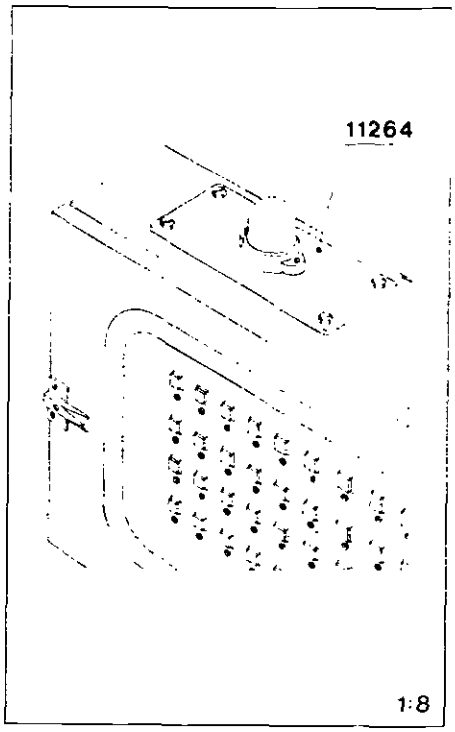
11262 Flange cover with bulkhead unions
The flange cover is designed for incoming cable connections to alarm unit in cabinet, max. 10 channels. The flange cover has three bulkhead unions.

11263 Flange covers with bulkhead unions
Two flange covers with two bulkhead unions each, designed for incoming cable connections to alarm unit in cabinet, max. 50 channels.

11264 Flange cover with external alarm lamp
The alarm lamp is designed for connection to the master alarm output.

System 32

Zubehör zu
Alarmzentralen 32CL50



90026 Signallampe
Glühbirne für Signallampenhalter an Alarmzentralen der Serie 32CL50.

Ausführung	:	Telefonlampe
Spannung	:	12 V
Stromverbrauch	:	50 mA

90029 Meldelampe
Glühbirne für die Fehlermeldefunktion an Alarmzentralen der Serie 32CL50.

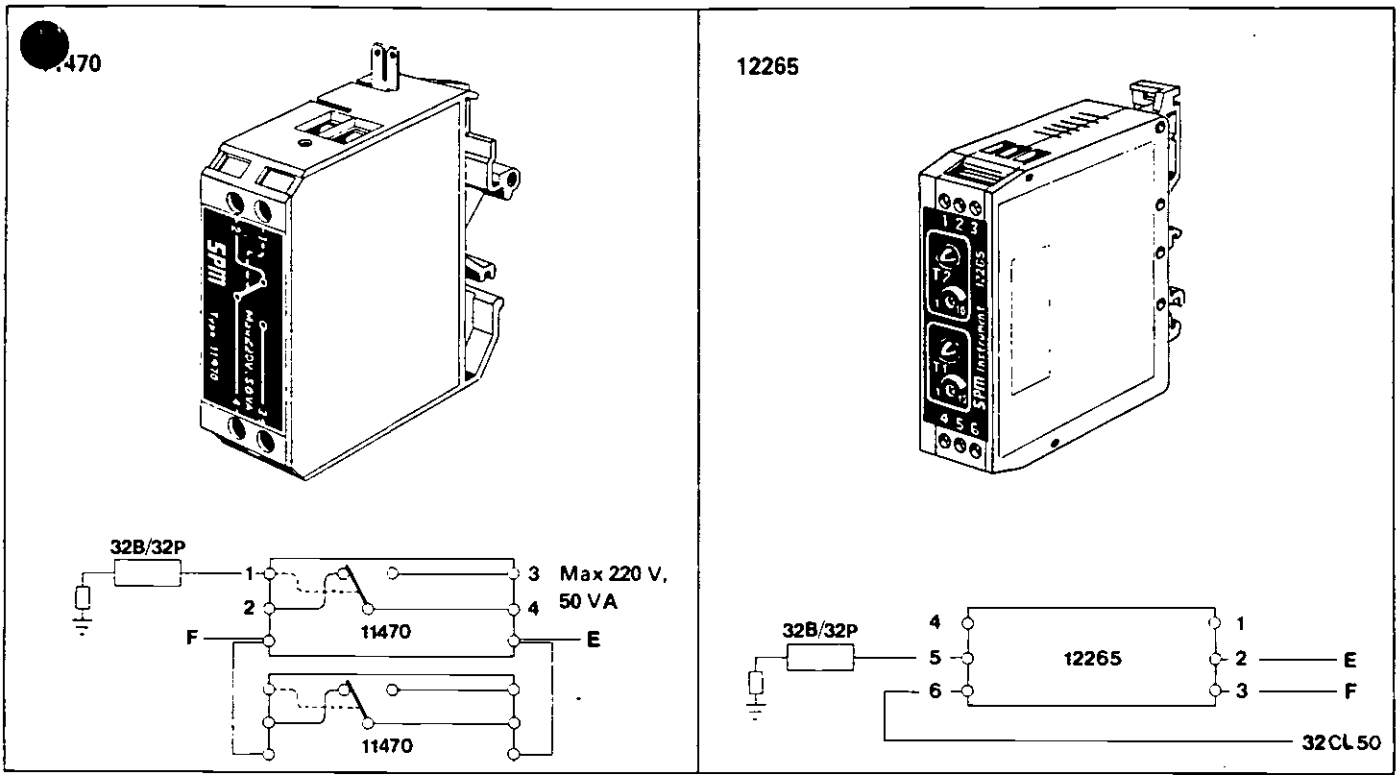
Ausführung	:	Miniaturlampe
Spannung	:	16 V
Stromverbrauch	:	30 mA

90054 Lampenzieher

11262 Flansch mit Kabeldurchführungen
Der Flansch ist für die Einführung der Kabelanschlüsse in die Alarmzentrale mit Gehäuse für max. 10 Kanäle vorgesehen. Der Flansch hat drei Kabeldurchführungen.

11263 Flansche mit Kabeldurchführungen
Zwei Flansche mit je zwei Kabeldurchführungen für die Einführung der Kabelanschlüsse in die Alarmzentrale mit Gehäuse, für max. 50 Kanäle.

11264 Flansch mit äusserer Alarmlampe
Die Alarmlampe ist für den Anschluss an den Relaisausgang vorgesehen.



11470 Larmavkodare

Larmavkodare ger individuell reläväxling för en a larmkanaler i centraler serie 32CL50. Detta möjliggör aktivering av separat yttre larm eller direkt maskinstopp för viktiga mätpunkter. Vidare kan flera larmavkodarutgångar serie och/eller parallellkopplas för prioritering av speciella larmkombinationer.

Larmavkodarens reläutgång aktiveras endast genom larm från detektorn. Eventuella fel i installationen kan inte orsaka reläväxling i larmavkodaren.

Larmavkodare fästs på monteringsskenan för kopplingsplintarna och matas med 24 V~ från centralen.

Vid beställning av central med inmonterade larmavkodare anges önskat antal och numren på kanalerna till vilka larmavkodare skall kopplas.

11470 Alarm decoder

Alarm decoders provide relay connections for individual alarm channels in alarm units series 32CL50. They can activate an external warning device or automatic machine stop for important measuring points. Several alarm decoders can be connected in series and/or parallell to give priority to certain alarm combinations.

The relay output of the decoder is activated only by an alarm from the detector. Possible electrical faults in the installation will not trigger the decoder.

The alarm decoders are clipped onto the mounting rail for the terminal blocks. They are supplied with 24 V AC from the alarm unit.

When ordering alarm units with installed alarm decoders, please state the numbers of the channels to which they are to be connected.

11470 Alarm-Dekoder

Der Alarm-Dekoder ermöglicht individuelle Relaisschaltung für einen einzelnen Alarmkanal. Für wichtige Messpunkte kann über den Alarm-Dekoder die Schnellabschaltung der Maschine oder eine äussere Warnvorrichtung ausgelöst werden. Weiterhin können mehrere Dekoder zu übergeordneten Alarmkreisen in UND/ODER-Funktionen miteinander verknüpft werden.

Der Relaisausgang des Dekoders wird nur durch Alarm vom Detektor aktiviert. Fehler in der Anlage können das Dekoder-Relais nicht zum Ansprechen bringen.

Der Dekoder wird auf die Montageschiene für die Anschlussklemmen aufgesteckt und von der Zentrale mit 24 V~ gespeist.

Bei Bestellung einer Zentrale mit eingebauten Alarm-Dekodern bitte gewünschte Anzahl angeben sowie die Nummern der Alarmkanäle, an welche die Dekoder angeschlossen werden sollen.

Larmfördröjare 12265

Lagerskadeövervakning med System 32 och detektorn 32 B eller 32 P kan, i vissa applikationer, vara störd av mekaniska stötar som ej är representativa för lagerkonditionen.

Larmfördröjarens funktion är att förhindra registreringen av sådana störande stötar som ett larm i larmcentralen.

Alarm delay unit 12265

Bearing Damage Supervision with System 32 and the detectors 32 B or 32 P can be disturbed, during certain operating routines, by mechanical shocks which are not representative of the bearing condition.

The purpose of A.D.U. 12265 is just to prevent such an occasional disturbance from being registrated as an alarm by the Alarm Unit.

Logische Störunterdrückung 12265

Die kontinuierliche Überwachung mit System 32 kann bei bestimmten Anwendungen durch nicht lagerbedingte Störpegel Fehlalarme auslösen.

Die logische Störunterdrückung 12265 vermeidet sporadisch auftretende Meldungen.

System 32
Larmcentral 32CL2

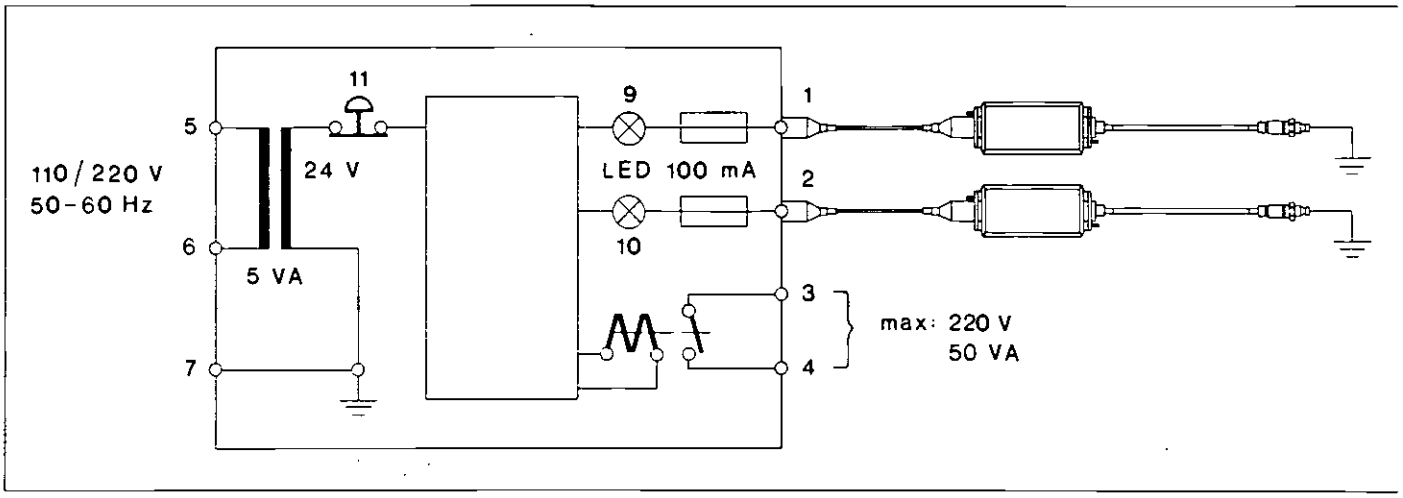
Larmcentral 32CL2 har anslutningsmöjlighet för max 2 detektorer. Centralen är kapslad i en tryckgjuten lättmetallkåpa och kan monteras direkt på maskinen. Larmcentralen kan utrustas med bl a svensk, engelsk eller tysk manöverinstruktion. Centralerna kan levereras i två olika versioner antingen för anslutning till 110 V, 50–60 Hz eller för anslutning till 220 V, 50–60 Hz.

System 32
Alarm unit 32CL2

Alarm unit 32CL2 is suitable for max. 2 detectors. The alarm unit is enclosed in a die cast light metal cabinet and can be mounted directly on the machine. The alarm unit can be supplied with operating instructions in English, German or Swedish, among others. The alarm units are available in two different versions, either for connection to 110 V, 50–60 Hz or to 220 V, 50–60 Hz.

System 32
Alarmzentrale 32CL2

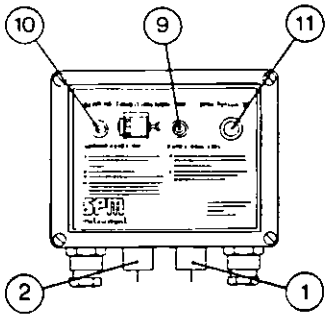
An die Alarmzentrale 32CL2 können max. 2 Detektoren angeschlossen werden. Die Zentrale ist in ein gegossenes Leichtmetallgehäuse eingekapselt und kann direkt an der Maschine befestigt werden. Die Alarmzentrale kann mit Bedienungsanweisung in u.a. deutscher, englischer oder schwedischer Sprache versehen werden. Die Alarmzentralen können in zwei verschiedenen Ausführungen geliefert werden: entweder für Anschluss an 110 V, 50–60 Hz oder für Anschluss an 220 V, 50–60 Hz.



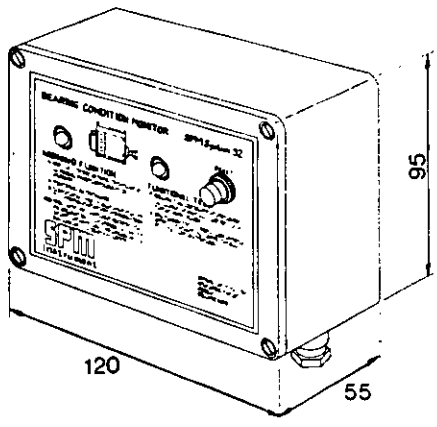
Larmfunktion
Ljusdioden (9–10) tänds och reläkontakten (3–4) sluts. Larm återställs genom kortvarig intryckning av återställningsknappen (11).

Alarm function
The light diode (9–10) lights up and the relay (3–4) closes. Alarm is reset by pressing the reset button (11).

Alarmfunktion
Die Leuchtdioden (9–10) leuchten auf und die Relaiskontakte (3–4) schliessen. Der Alarm wird durch kurzes Drücken auf den Rückstellknopf (11) abgestellt.



	Svensk	English	Deutsch
110 V		10998	
220 V	10991	10992	10993



1:3

Larmcentral 32CL2

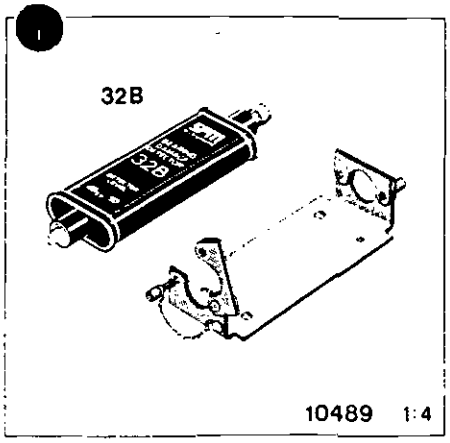
Alarm unit 32CL2

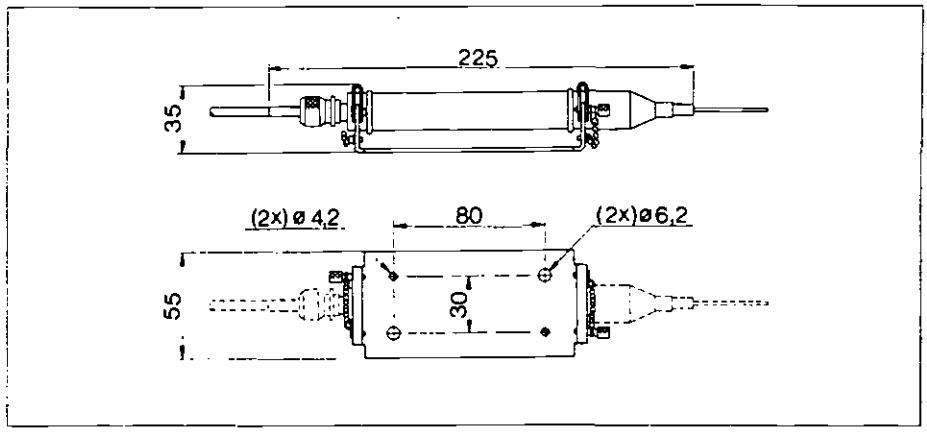
Alarmzentrale 32CL2

System 32
Lagerskadedetektor 32B

System 32
Bearing damage detector 32B

System 32
Lagerschadendetektor 32B





Lagerskadedetektor 32B
Detektorn är en komplett mätapparat med fast förprogrammerad larmnivå. Larm utlöses när signalerna från stötpulsgivaren överskrider larmnivån minst en gång var tionde sekund. Larmet återställs genom kortvarigt avbrott av strömförsörjningen (utföres i larmcentralen).

Utförande	:	Hermetiskt
Temperaturområde	:	−20° till +100°C
Strömförsörjning	:	24 V ~ från larmcentral
Givarkabelns längd	:	Max 4 m
[illegible]iskabel	:	Enkelledare

Larmnivån bestäms med ledning av det övervakade rullningslagrets axeldiameter (d) och varvtal (n). Diagrammet nedan omfattar samtliga standard-larmnivåer i dB_{SV} samt motsvarande beställningsnummer.

Bearing damage detector 32B
The detector is a complete measuring unit with fixed preprogrammed alarm level. Alarm is triggered when the signals from the shock pulse transducer exceed the alarm level at least once every 10 seconds. The alarm is reset by a short interruption of the current supply (performed in the alarm unit).

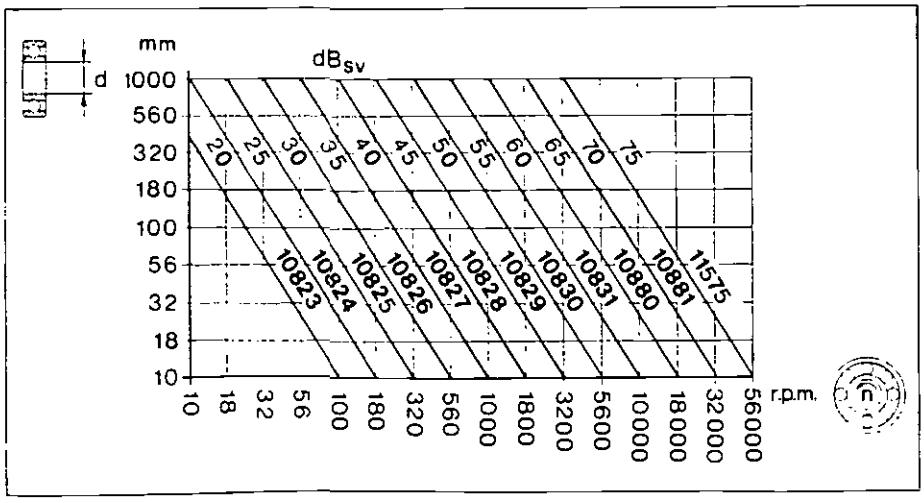
Design	:	Sealed
Temperature range	:	−20° to +100°C
Current supply	:	24 V AC from alarm unit
Length of transducer cable	:	Max. 4 m
Supply cable	:	Single conductor

The alarm level is chosen with respect to the shaft diameter (d) and speed (n) of the monitored bearing. The diagram below comprises all standard alarm levels in dB_{SV} and the corresponding ordering number.

Lagerschadendetektor 32B
Der Detektor ist ein komplettes Messgerät mit fest vorprogrammierter Alarmschwelle. Der Alarm wird ausgelöst, wenn die Signale vom Stossimpulsaufnehmer die Alarmschwelle mindestens jede zehnte Sekunde überschreiten. Der Alarm wird durch kurzzeitige Unterbrechung der Stromversorgung zurückgestellt (geschieht in der Alarmzentrale).

Ausführung	:	Hermetisch
Temperaturbereich	:	−20° bis +100°C
Stromversorgung	:	24 V ~ von Alarmzentrale
Aufnehmerkabel-Länge	:	Max. 4 m
Speisekabel	:	Einadriges Kabel

Die Alarmschwelle wird unter Berücksichtigung von Wellendurchmesser (d) und Drehzahl (n) des zu überwachenden Wälzlagers bestimmt. Das Diagramm umfasst sämtliche Standard-Alarmschwellen in dB_{SV} und deren entsprechende Bestellnummer.



10489 Hållare
Hållaren används för montering av Lagerskadedetektor 32B.

! Matningskabeln måste vara försedd med Tätningshylsa 10473.

10489 Bracket
The bracket is used for mounting of Bearing damage detector 32B.

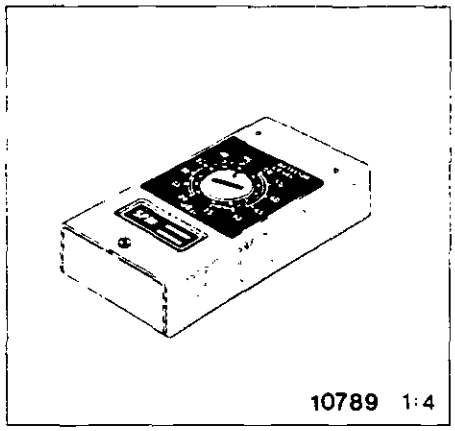
NB! The supply cable must be equipped with Sealing cover 10473.

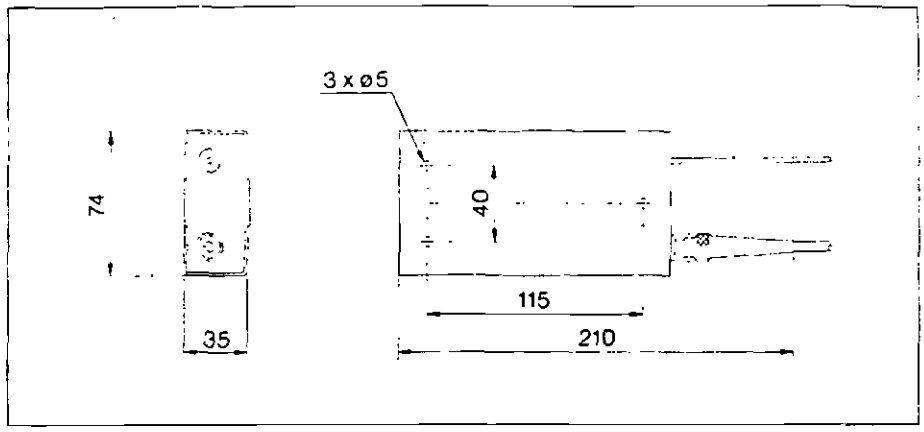
10489 Halter
Der Halter ist für die Befestigung des Lagerschadendetektors 32B vorgesehen.

Achtung! Das Speisekabel muss mit Dichtungshülse 10473 versieht sein.

System 32

Lagerskadedetektor 32P
Anpassningsenhet för stötpulsgivare





10789 Lagerskadedetektor 32P
Detektorn är utrustad med omkopplare för stegvis inställbar larmnivå, 12 steg om 5 dB. I övrigt har detektorn samma funktion som Lagerskadedetektor 32B.

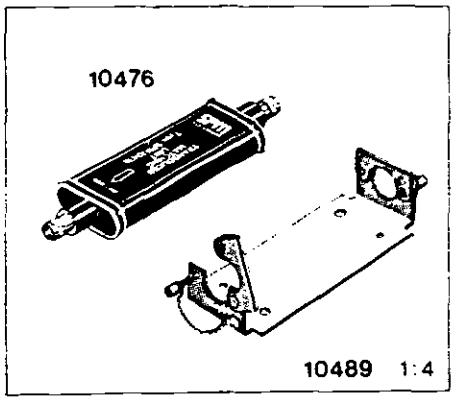
Mätområde	:	dB_{SV} = 20 till 75
Utförande	:	Kapslat
Temperaturområde:		−20° till + 70°C
Fuktighet	:	Max 75% rel
Strömförsörjning	:	24 V~ från larmcentral
Givarkabelns längd:		Max 4 m
Mätningskabel	:	Enkelledare

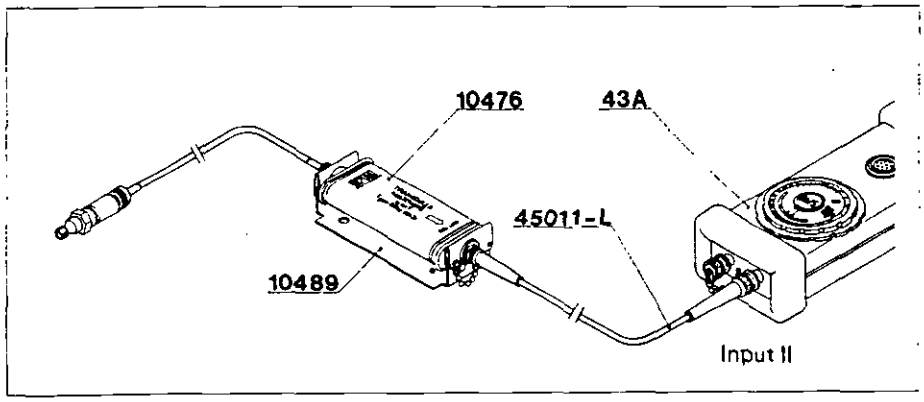
10789 Bearing damage detector 32P
The detector is equipped with a switch for step-by-step adjustable alarm level, 12 steps of 5 dB. Otherwise, the detector has the same function as Bearing damage detector 32B.

Measuring range	:	dB_{SV} = 20 to 75
Design	:	Encapsulated
Temperature range	:	−20° to + 70°C
Humidity	:	Max. 75% rel.
Current supply	:	24 V AC from alarm unit
Length of transducer cable:		Max. 4 m
Supply cable	:	Single conductor

10789 Lagerschadendetektor 32P
Der Detektor ist mit einem Umschalter für das stufenweise Einstellen der Alarmschwelle ausgerüstet, 12 Stufen von je 5 dB. Im übrigen hat der Detektor die gleiche Funktion wie der Lagerschadendetektor 32B.

Messbereich	:	dB_{SV} = 20 bis 75
Ausführung	:	Gekapselt
Temperaturbereich	:	−20° bis + 70°C
Feuchtigkeit	:	Max. 75% relativ
Stromversorgung	:	24 V~ von Alarmzentrale
Aufnehmerkabel-Länge:		Max. 4 m
Speisekabel	:	Einadriges Kabel





10476 Anpassningsenhet för stötpulsgivare
Anpassningsenheten är avsedd att ersätta Lagerskadedetektor 32B vid manuell mätning på installerade givare när stötpulsmätaren ej kan anslutas direkt till givarkabeln. Dimensioner, utförande och temperaturområde är lika som för 32B. Anpassningsenheten ansluts till stötpulsmätaren via separat mätkabel. Se fig.

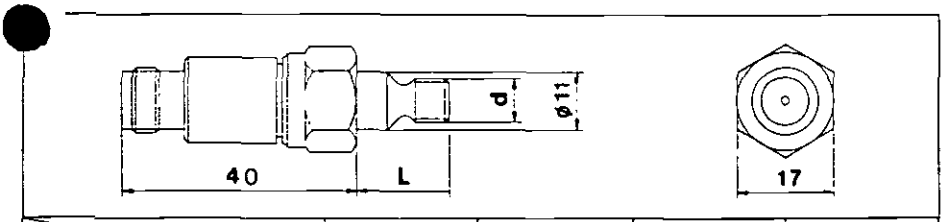
10476 Matching unit for shock pulse transducer
The matching unit is intended to replace Bearing damage detector 32B when manual measurements on installed transducers are to be performed and the shock pulse meter cannot be connected directly to the transducer cable. Dimensions, design and temperature range are the same as for 32B. The matching unit is connected to the shock pulse meter by a separate measuring cable. See fig.

10476 Anpassungseinheit für Stossimpulsaufnehmer
Die Anpassungseinheit soll den Lagerschadendetektor 32B bei der manuellen Messung an installierten Aufnehmern ersetzen, wenn das Stossimpuls-Messgerät nicht direkt an das Messkabel zum Aufnehmer angeschlossen werden kann. Abmessungen, Ausführung und Temperaturbereich wie für 32B. Die Anpassungseinheit wird mit einem separaten Messkabel an das Stossimpuls-Messgerät angeschlossen. Siehe Abb.

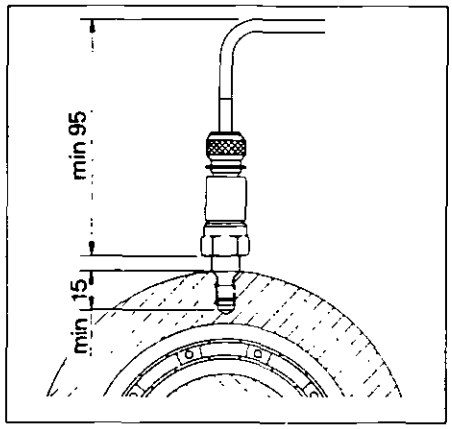
System 32
Stötpulsgivare

System 32
Shock pulse transducers

System 32
Stossimpulsaufnehmer



L \ d	M 8	UNC 5/16"	M 10	UNC 3/8"
17 mm	40000	40100		
106 mm	40006	40106	40206	40306
195 mm	40007	40107	40207	40307
284 mm	40008	40108	40208	40308



Stötpulsgivare i
standardutförande

Givarna installeras på lagerhusen och ansluts till lagerskadedetektorerna via korta koaxialkablar (max 4 meter).

Matområde	: Max 100 dB_{SV}
Utförande	: Evakuerat, hermetiskt
Yttre övertryck	: Max 1 MPa (10 bar)
Temperaturområde	: −30° till +150°C
Åtdragningsmoment	: 10 - 15 Nm
Anslutning	: TNC

Verktyg för korrekt försänkning av monteringshål visas på sidan 38.

Standard shock pulse
transducers

The transducers are installed into the bearing housings and are connected to the bearing damage detectors by short coaxial cables (max. 4 meters).

Measuring range	: Max. 100 dB_{SV}
Design	: Evacuated, sealed
External overpressure	: Max. 1 MPa (10 bar)
Temperature range	: −30° to +150°C
Torque limit	: 10 - 15 Nm
Connector	: TNC

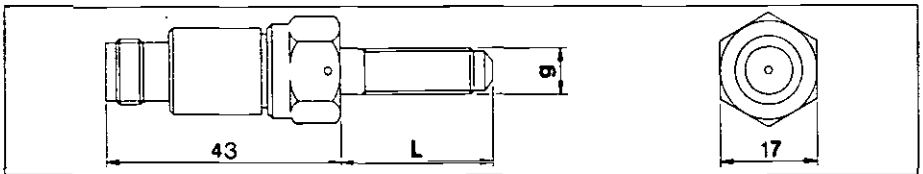
Tools for correct countersinking of mounting holes are described on page 38.

Stossimpulsaufnehmer in
Standardausführung

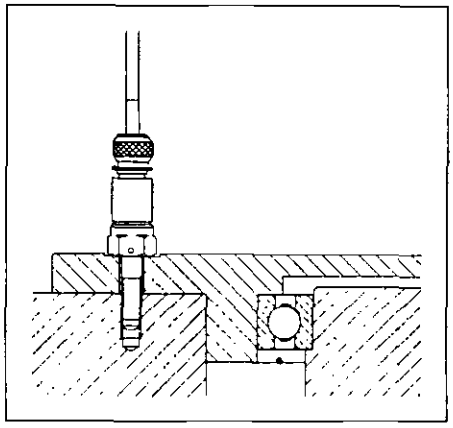
Die Aufnehmer werden am Lagergehäuse installiert und über kurze Koaxialkabel (max. 4 m) an die Lagerschadendetektoren angeschlossen.

Messbereich	: Max. 100 dB_{SV}
Ausführung	: Evakuiert, hermetisch
Äusserer Überdruck	: Max. 1 MPa (10 bar)
Temperaturbereich	: −30° bis +150°C
Max. Anzugsmoment	: 10 - 15 Nm
Kabelstecker	: TNC

Werkzeug für fachgerechte Versenkung der Montagebohrungen wird auf Seite 38 beschrieben.



L \ d	M 8	UNC 5/16"	M 10	UNC 3/8"	M 12	UNC 1/2"
20 mm	41011	41111	41221	41321	41431	41531
30 mm	41012	41112	41222	41322	41432	41532
40 mm	41013	41113	41223	41323	41433	41533
50 mm	41014	41114	41224	41324	41434	41534
60 mm	41015	41115	41225	41325	41435	41535



Stötpulsgivare i
bultutförande

Givarna är avsedda att ersätta befintlig fästbult för lagerhus och skall monteras mot planbearbetad och obehandlad yta. Underlagsbrickor får ej användas. Givarna ansluts till lagerskadedetektorerna via korta koaxialkablar (max 4 meter).

Matområde	: Max 100 dB_{SV}
Utförande	: Evakuerat, hermetiskt
Yttre övertryck	: Max 1 MPa (10 bar)
Temperaturområde	: −30° till +150°C
Åtdragningsmoment	: 10 - 15 Nm (M8)
Låstrådshål	: ø 1,5 mm
Anslutning	: TNC

Kablar och kontakter, se sid 40 och 41.

Shock pulse transducers in
bolt design

The transducers are intended to replace existing mounting bolts for bearing housings and should be mounted against a flat face milled and untreated surface. Washers must not be used. The transducers are connected to the bearing damage detectors by short coaxial cables (max. 4 meters).

Measuring range	: Max. 100 dB_{SV}
Design	: Evacuated, sealed
External overpressure	: Max. 1 MPa (10 bar)
Temperature range	: −30° to +150°C
Torque limit	: 10 - 15 Nm (M8)
Hole for locking wire	: 1.5 mm dia.
Connector	: TNC

Cables and connectors, see page 40 and 41.

Stossimpulsaufnehmer in
Bolzenausführung

Die Aufnehmer sollen befindliche Befestigungsbolzen an Lagergehäusen ersetzen und sollen gegen ebenflächig bearbeitete und metallisch reine Oberflächen montiert werden. Unterlagscheiben dürfen nicht verwendet werden. Die Aufnehmer werden mit kurzen Koaxialkabeln (max. 4 m) an die Lagerschadendetektoren angeschlossen.

Messbereich	: Max. 100 dB_{SV}
Ausführung	: Evakuiert, hermetisch
Äusserer Überdruck	: Max. 1 MPa (10 bar)
Temperaturbereich	: −30° bis +150°C
Max. Anzugsmoment	: 10 - 15 Nm (M8)
Bohrung für Sicherungsdraht	: ø 1,5 mm
Kabelstecker	: TNC

Kabeln und Steckern, siehe Seite 40 und 41.

System 32

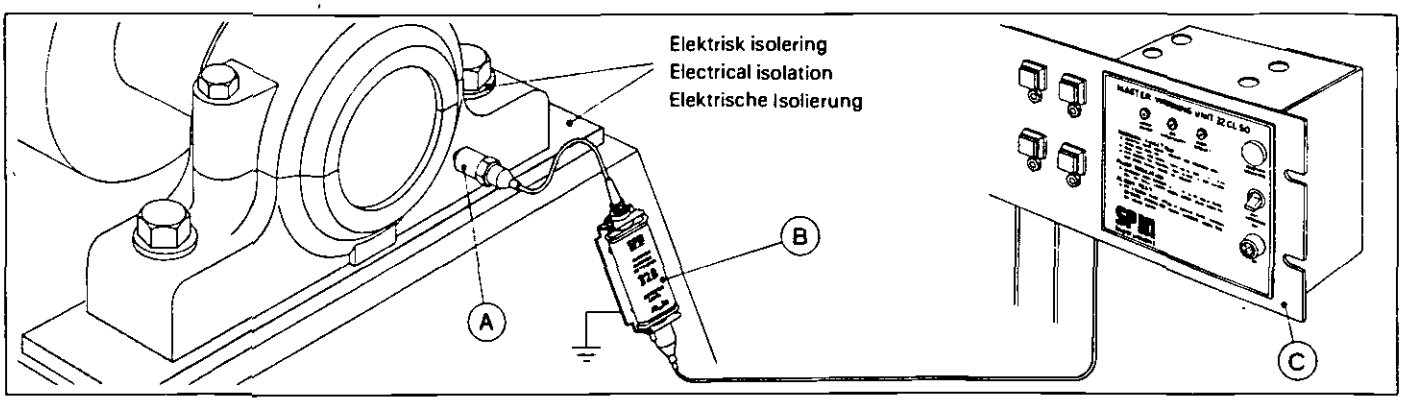
Kontinuerlig övervakning av rullningslagers driftskondition i isolerade lagerhus

System 32

Continuous condition monitoring of ball and roller bearings in electrically isolated bearing housings

System 32

Fortlaufende Zustandsüberwachung von Wälzlagern in isolierten Lagergehäusen



I vissa maskiner t ex elektriska motorer föreligger det risk att elektrisk ström leds genom rullningslagren och förorsakar skador. Denna risk förebyggs genom isolering av lagerhusen.

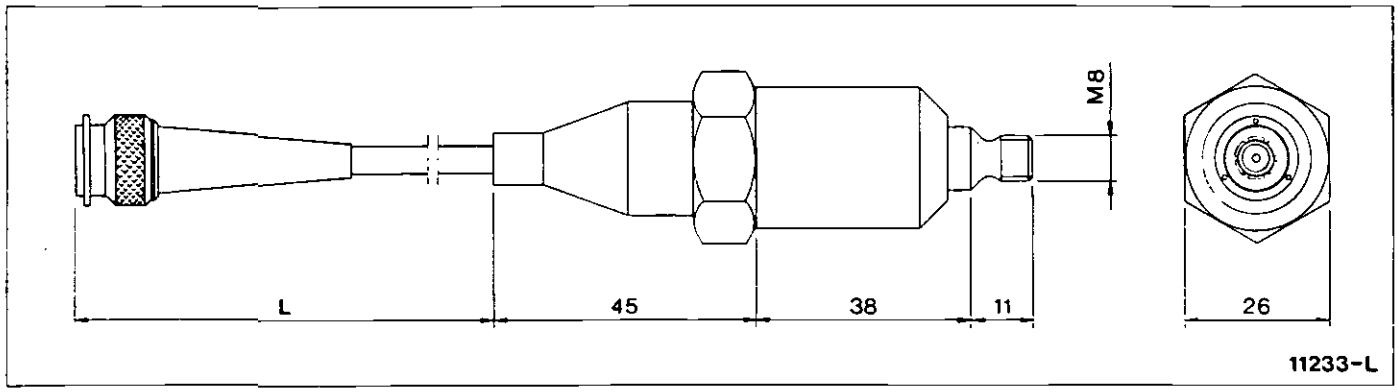
För att inte bryta denna isolering monteras en isolerad Stötpulsgivare (A) och en Lagerskadedetektor med jordanslutning (B) för varje isolerat lager. Detektorerna ansluts till en gemensam Larmcentral (C).

In certain applications, for example electrical motors, there is a risk that defects in ball and roller bearings can be caused by current flow through the bearing. This is prevented by electrically isolating the bearing housing.

In order to maintain this isolation, an isolated Shock pulse transducer (A) and a Bearing damage detector with ground connection (B) are installed for each isolated bearing. The detectors are connected to a common Alarm unit (C).

Bei einigen Maschinen, z.B. Elektromotoren, besteht die Gefahr, dass elektrischer Strom durch die Wälzlager fliesst und dadurch Schäden verursacht. Dieser Gefahr wird durch Isolierung der Lagergehäuse vorgebeugt.

Um diese Isolierung aufrechtzuerhalten, wird ein isolierter Stossimpulsaufnehmer (A) und ein Lagerschadendetektor mit Erdungsanschluss (B) für jedes isolierte Lager montiert. Die Detektoren werden an eine gemeinsame Alarmzentrale (C) angeschlossen.



11233-L Isolerad stötpulsgivare för fast installation

Givaren har en fast ansluten mätkabel av PVC-typ. Vid beställning anges önskad kabellängd (L) i meter (max 4 meter).

Mätområde	:	Max 100 dB_{SV}
Utförande	:	Evakuerat, hermetiskt samt isolerat från huset.
Yttre övertryck	:	Max 1 MPa (10 bar)
Temperaturområde	:	−30° till +80°C
Isolationsresistans	:	Min 1 MΩ vid max 1 kV
Åtdragningsmoment:		20 Nm
Anslutning	:	TNC med tätningshylsa

Verktyg för korrekt försänkning av monteringshål visas på sidan 38.

11233-L Isolated shock pulse transducer for permanent installation

This transducer has a permanently connected measuring cable of PVC-type. When ordering, please specify desired cable length (L) in meters (max. 4 meters).

Measuring range	:	Max. 100 dB_{SV}
Design	:	Evacuated, sealed and isolated from housing.
External overpressure:		Max. 1 MPa (10 bar)
Temperature range	:	−30° to +80°C
Insulation resistance	:	Min. 1 MΩ at max. 1 kV
Torque limit	:	20 Nm
Connector	:	TNC with sealing cover

Tools for correct countersinking of mounting holes are listed on page 38.

11233-L Isolierter Stossimpulsaufnehmer für feste Installation

Der Aufnehmer hat ein fest angeschlossenes Messkabel vom Typ PVC. Bei Bestellung bitte gewünschte Kabellänge (L) in Metern (max. 4 m) angeben.

Messbereich	:	Max. 100 dB_{SV}
Ausführung	:	Evakuiert, hermetisch und vom Gehäuse isoliert.
Äusserer Überdruck	:	Max. 1 MPa (10 bar)
Temperaturbereich	:	−30° bis +80°C
Isolationswiderstand	:	Min. 1 MΩ bei max. 1 kV
Max. Anzugsmoment:		20 Nm
Kabelstecker	:	TNC mit Dichtungshülse

Werkzeug für fachgerechte Einsenkung der Montagebohrungen wird auf Seite 38 beschrieben.

System 32

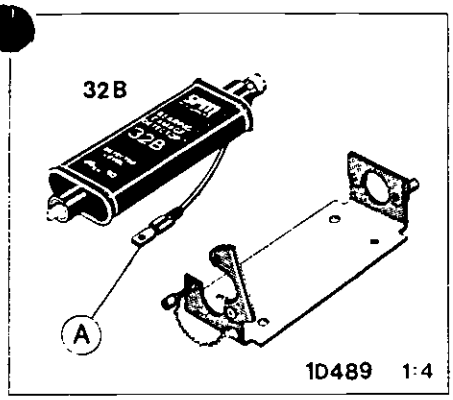
Lagerskadedetektor 32B med jordanslutning

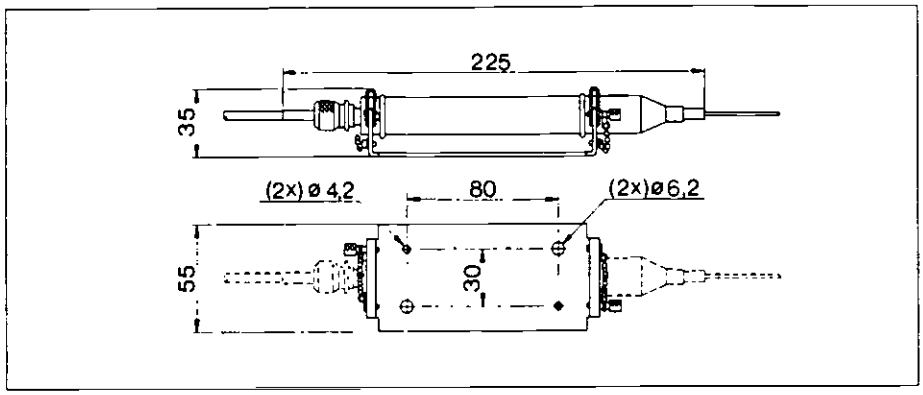
System 32

Bearing damage detector 32B with ground connection

System 32

Lagerschadendetektor 32B mit Erdungsanschluss





Lagerskadedetektor 32B med jordanslutning

Lagerskadedetektorns jordanslutning (A) ansluts till detektorhållaren med en fästskruv. Detektorn används vid kontinuerlig övervakning av rullningslager i isolerade lagerhus. Detektorn är en komplett mätapparat med fast förprogrammerad larmnivå. Larm utlöses när signalerna från stötpulsgivaren överskrider larmnivån minst en gång var tionde sekund. Larmet återställs genom kortvarigt avbrott av strömförsörjningen (utföres i larmcentralen).

Bearing damage detector 32B with ground connection

The bearing damage detector's ground connection (A) is connected to the bracket with a mounting screw. The detector is used for continuous monitoring of ball and roller bearings in isolated bearing housings. The detector is a complete measuring unit with fixed preprogrammed alarm level. Alarm is triggered when the signal from the shock pulse transducer exceeds the alarm level at least once every 10 seconds. The alarm is reset by a short interruption of the current supply (performed in the alarm unit).

Lagerschadendetektor 32B mit Erdungsanschluss

Der Erdungsanschluss (A) des Lagerschadendetektors wird an dem Detektorhalter mit einer Befestigungsschraube angeschlossen. Der Detektor wird bei der fortlaufenden Überwachung von Wälzlagern in isolierten Lagergehäusen verwendet. Der Detektor ist ein komplettes Messgerät mit fest vorprogrammierter Alarmschwelle. Der Alarm wird ausgelöst, wenn die Signale vom Stossimpulsaufnehmer die Alarmschwelle mindestens jede zehnte Sekunde überschreiten. Der Alarm wird durch kurzzeitige Unterbrechung der Stromversorgung zurückgestellt (geschieht in der Alarmzentrale).

:ende	:	Hermetiskt
Temperaturområde:		−20° till +100°C
Strömförsörjning	:	24 V ~ från larmcentral
Givarkabelns längd:		Max 4 m
Matningskabel	:	Enkelledare

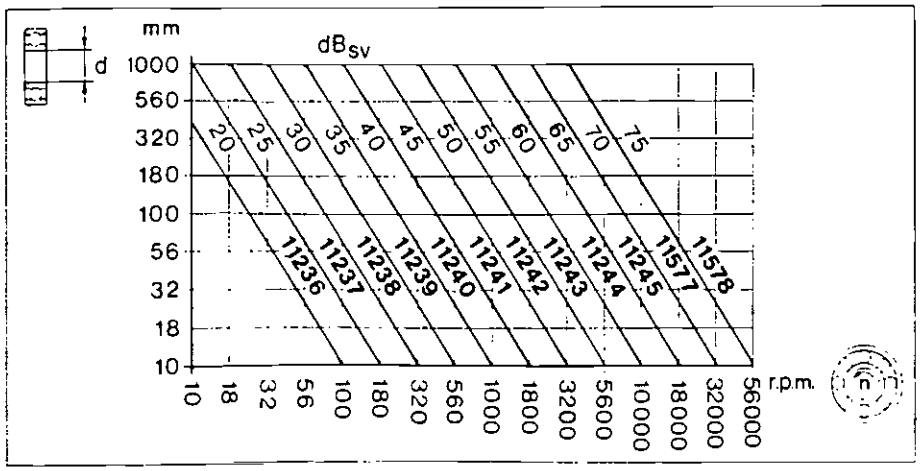
Larmnivån bestäms med ledning av det övervakade rullningslagrets axeldiameter (d) och varvtal (n). Diagrammet nedan omfattar samtliga standard-larmnivåer i dB_{SV} samt motsvarande beställningsnummer.

Design	:	Sealed
Temperature range	:	−20° to +100°C
Current supply	:	24 V AC from alarm unit
Length of transducer cable:		Max. 4 m
Supply cable	:	Single conductor

The alarm level is chosen with respect to the shaft diameter (d) and speed (n) of the monitored bearing. The diagram below comprises all standard alarm levels in dB_{SV} and the corresponding ordering numbers.

Ausführung	:	Hermetisch
Temperaturbereich	:	−20° bis +100°C
Stromversorgung	:	24 V~ von Alarmzentrale
Aufnehmerkabel-Länge:		Max. 4 m
Speisekabel	:	Einadriges Kabel

Die Alarmschwelle wird unter Berücksichtigung von Wellendurchmesser (d) und Drehzahl (n) des zu überwachenden Wälzlagers bestimmt. Das Diagramm umfasst sämtliche Standard-Alarmschwellen in dB_{SV} und die entsprechenden Bestellnummern.



89 Hållare

Hållaren används för montering av Lagerskadedetektor 32B med jordanslutning.

OBS! Matningskabeln måste vara försedd med Tätningshylsa 10473.

10489 Bracket

The bracket is used for mounting of Bearing damage detector 32B with ground connection.

NB! The supply cable must be equipped with Sealing cover 10473.

10489 Halter

Der Halter ist für die Befestigung des Lagerschadendetektors 32B mit Erdungsanschluss vorgesehen.

Achtung! Das Speisekabel muss mit Dichtungshülse 10473 versieht sein.

System 32

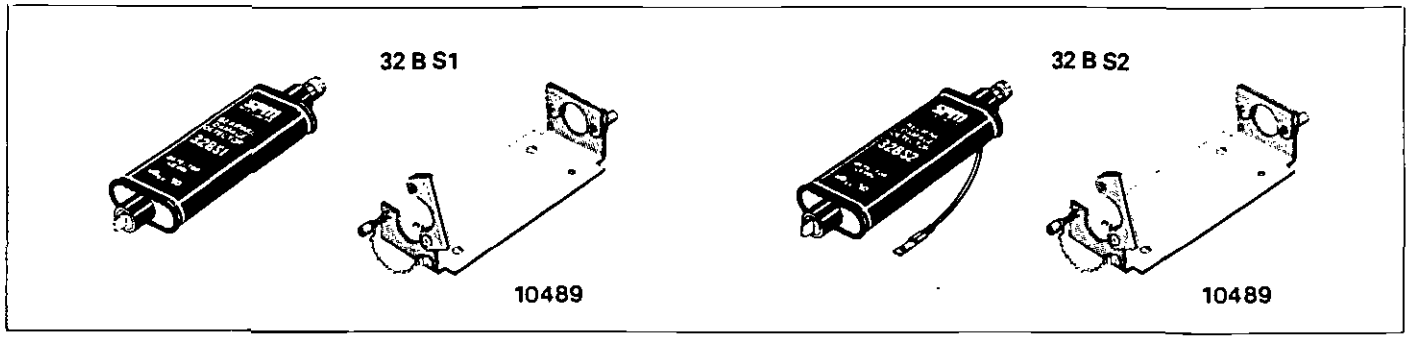
Lagerskadedetektor
32 B S1 och 32 B S2

System 32

Bearing damage detector
32 B S1 and 32 B S2

System 32

Lagerschadendetektor
32 B S1 und 32 B S2



Lagerskadedetektor 32 BS1

Denna detektor används när längden på koaxialkabeln mellan stötpulsgivare och detektor är mer än 4 m. Genom att installera en anpassningsenhet (TMU-10) kan kabellängden uppgå till max 100 m. Detektorn monteras med hållare 10489 och ansluts med koaxialkabel till anpassningsenheten. Utförande, funktion och temperaturområde för denna lagerskadedetektor är som för detektor 32 B utom att 32BS1 saknar ingångsfilter.

Diagrammet nedan omfattar samtliga standard-larmnivåer i dB_{SV} samt motsvarande beställningsnummer.

Lagerskadedetektor 32 BS2

Denna detektor är avsedd för mätningar på lager i isolerade lagerhus och används när kabellängden mellan den isolerade stötpulsgivaren 11233-L och lagerskadedetektorn är mer än 4 m. Genom att installera en anpassningsenhet (TMU-10) kan kabellängden uppgå till max 100 m. Detektorns jordanslutning kopplas till detektorhållare 10489 med en fästskruv. Detektorn ansluts med koaxialkabel till anpassningsenheten. Utförande, funktion och temperaturområde för denna detektor är som för lagerskadedetektor 32 B med jordanslutning. 32 BS2 saknar ingångsfilter.

Diagrammet nedan omfattar samtliga standard-larmnivåer i dB_{SV} samt motsvarande beställningsnummer.

Bearing Damage Detector 32 BS1

This detector is used when the length of the cable between shock pulse transducer and detector exceeds 4 m. By installing a Transducer Matching Unit (TMU-10) the cable length can be extended to max. 100 m. The detector is mounted with bracket 10489 and connected by coaxial cable to the transducer matching unit. Design, function and temperature range are the same as for detector 32 B, exept that the 32 BS1 has no input filter.

The diagram below comprises all standard alarm levels in dB_{SV} and the corresponding ordering numbers.

Bearing Damage Detector 32 BS2

This detector is used for monitoring bearings in isolated bearing housings when the connecting cable between the isolated transducer 11233-L is longer than 4 m. By installation of Transducer Matching Unit (TMU-10) the cable length can be extended to max. 100 m. The detector's ground connection is fastened to bracket 10489 with a mounting screw and the detector is connected to the transducer matching unit by a coaxial cable. Design, function and temperature range are the same as for detector 32 B with ground connection, except that the 32 BS2 has no input filter.

The diagram below comprises all standard alarm levels in dB_{SV} and the corresponding ordering numbers.

Lagerschadendetektor 32 BS1

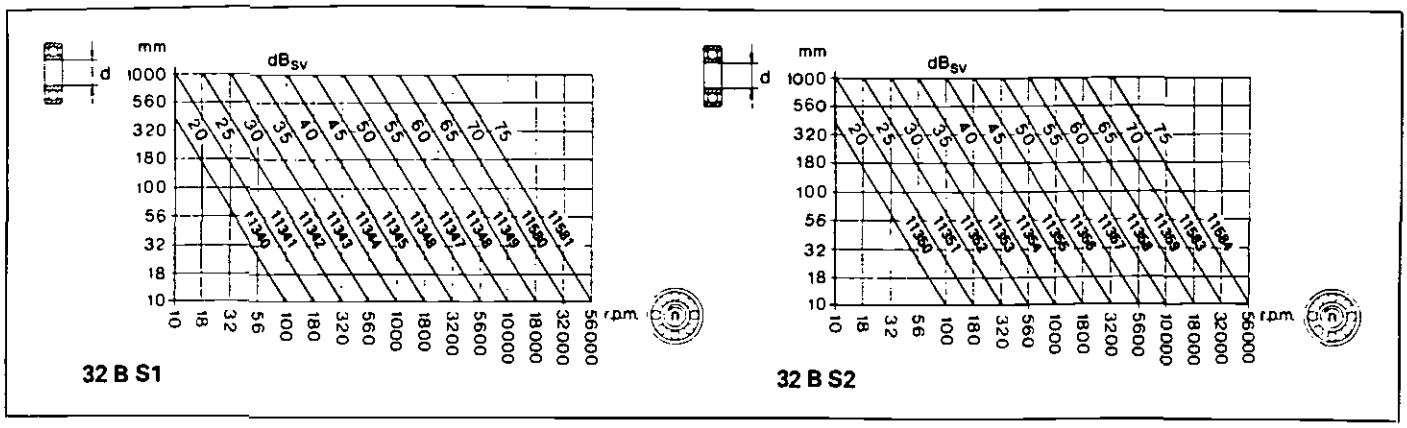
Dieser Detektor wird benötigt, wenn das Koaxialkabel zwischen Stoßimpulsaufnehmer und Detektor länger als 4 m sein muss. Durch den Einbau einer Anpassungseinheit (TMU-10) kann das Kabel bis auf max. 100 m verlängert werden. Der Detektor wird an Detektorhalter 10489 befestigt und mit einem Koaxialkabel an die Anpassungseinheit angeschlossen. Ausführung, Abmessungen und Temperaturbereich wie für 32 B. 32 BS1 hat kein Eingangs filter.

Das Diagramm umfaßt sämtliche Standard-Alarmschwellen in dB_{SV} und die entsprechenden Bestellnummern.

Lagerschadendetektor 32 BS2

Dieser Detektor wird für Messungen an Lagern in isolierten Lagergehäusen benötigt. wenn das Koaxialkabel zwischen dem isolierten Stoßimpulsaufnehmer und Detektor länger als 4 m sein muss. Durch den Einbau einer Anpassungseinheit (TMU-10) kann das Kabel bis auf max. 100 m verlängert werden. Der Erdungsanschluß des Detektors wird an Detektorhalter 10489 mit einer Befestigungsschraube angeschlossen. Detektor und Anpassungseinheit werden mit einem Koaxialkabel verbunden. Ausführung, Abmessungen und Temperaturbereich wie für Detektor 32 B mit Erdungsanschluß. 32BS2 hat kein Eingangsfilter.

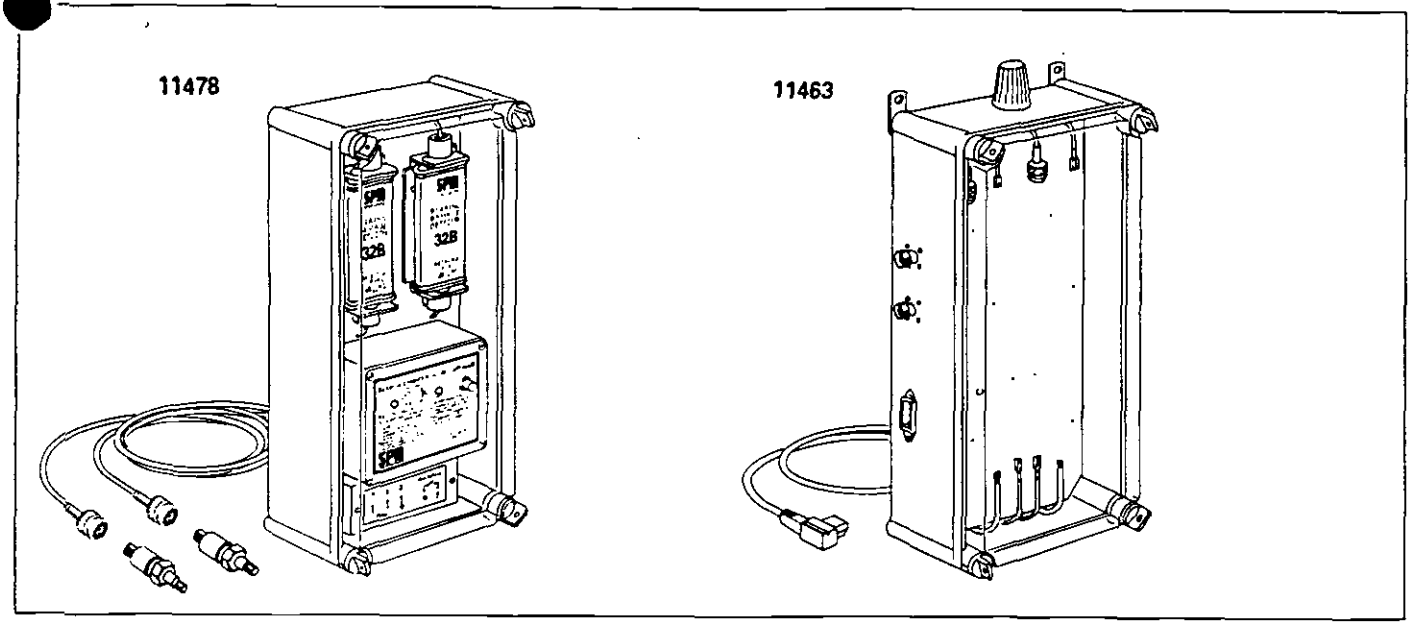
Das Diagramm unfaßt sämtliche Standard-Alarmschwellen in dB_{SV} und die entsprechenden Bestellnummern.



System 32
Larmbox

System 32
Alarmbox

System 32
Alarmbox



11478 Larmbox
Larmboxen är ett komplett övervakningssystem för två rullningslager. Mätutrustningen är uppbyggd av standardkomponenter från SPM System 32. Larmcentralen 32CL2 och detektorerna 32 B är fabriks-*monterade i en gemensam apparatlåda.* Larmboxen utrustas individuellt för varje maskintyp. Den kan snabbt och enkelt anslutas till nät och till de på lagerhusen monterade givarna.

För att larmboxen skall kunna utrustas korrekt anges vid beställning alltid maskinfabrikat och typbeteckning.

11463 Portabel Larmbox
Den portabla larmboxen är ett övervakningssystem för två rullningslager, speciellt avsett för maskiner som kräver särskild kontroll under kortare tid. Mätutrustningen består av standardkomponenter från SPM System 32, dvs larmcentral 32CL2 för två kanaler samt två lagerskadedetektorer, *färdigt monterade* och kopplade i en stänktät apparatlåda.

Beställningsnummer 11463 betecknar apparatlåda med nätkabel, kontakter, larmlampa och interna kablar. Vid beställning av komplett larmbox anges dessutom beställningsnumren för följande utrustning:

Larmcentral 32CL2, se sid 25.
Detektorer, se sid 26 och 27.
Givare, se sid 28.
Mätkablar, se sid 10.

Vibrationsövervakning
Larmboxen kan även användas för vibrationsövervakning. Se vidare sid 34.

11478 Alarmbox
The Alarmbox is a fixed monitoring system for two ball or roller bearings. The equipment consists of standard parts from SPM System 32, which are selected by us for your individual machine. Alarm Unit 32CL2 *and detectors* 32 B *are fitted in a common* protective casing. Simply connect the alarmbox to the electricity supply and to the transducers on the bearing housing.

When ordering the alarmbox, machine specifications such as make and type code should be stated in order to adjust the equipment to the special use.

11463 Portable Alarmbox
The portable Alarmbox is a monitoring system for two rolling bearings.
It can be set up quickly wherever there is a need for constant machine surveillance. The measuring equipment consists of standard parts from SPM System 32, i.e. Alarm Unit 32CL2 for two channels and *two bearing damage detectors, mounted* and connected in a splash-proof casing.

The ordering number 11463 is for the alarmbox casing with warning lamp, power cord and plug, and the internal wiring. To order complete alarmbox, please select required parts from the following equipments:

Alarm Unit 32CL2, see page 25.
Detectors, see page 26 and 27.
Transducers, see page 28.
Measuring cables, see page 10.

Vibration monitoring
Equipped with vibration transducers and detectors the alarmbox can also be used for vibration monitoring. Se page 34.

11478 Alarmbox
Die Alarmbox ist eine feste Überwachungsanlage für zwei Wälzlager. Die Anlage besteht aus bewährten Komponenten des System 32. Lagerschadendetektoren 32 B und Alarmzentrale 32CL2 sind werkseitig *in ein gemeinsames Gehäuse eingebaut* worden. Die Alarmbox wird für jeden beliebigen Maschinentyp individuell bestückt und kann mit wenigen Griffen an Netz und die im Lagergehäuse angebrachten Aufnehmer angeschlossen werden.

Damit eine korrekte Bestückung erfolgen kann, bitte bei Bestellung Typenbezeichung und Hersteller der jeweiligen Maschine angeben.

11463 Tragbare Alarmbox
Die tragbare Alarmbox ist ein Überwachungssystem für zwei Wälzlager, das überall in einer Maschinenanlage eingesetzt werden kann. Die Box enthält bewährte Komponenten des System 32, d.h. eine Alarmzentrale 32CL2 für zwei Kanäle und zwei Lagerschadendetektoren in einem spritzwasserdichten Gehäuse, *werkseitig eingebaut und* verdrahtet.

Die Bestellnummer 11463 bezeichnet das Alarmbox-Gehäuse mit Warnlampe, Netzstecker und internen Kabeln. Für eine komplette Alarmbox müssen außerdem die Bestellnummern folgender Ausrüstung angegeben werden:

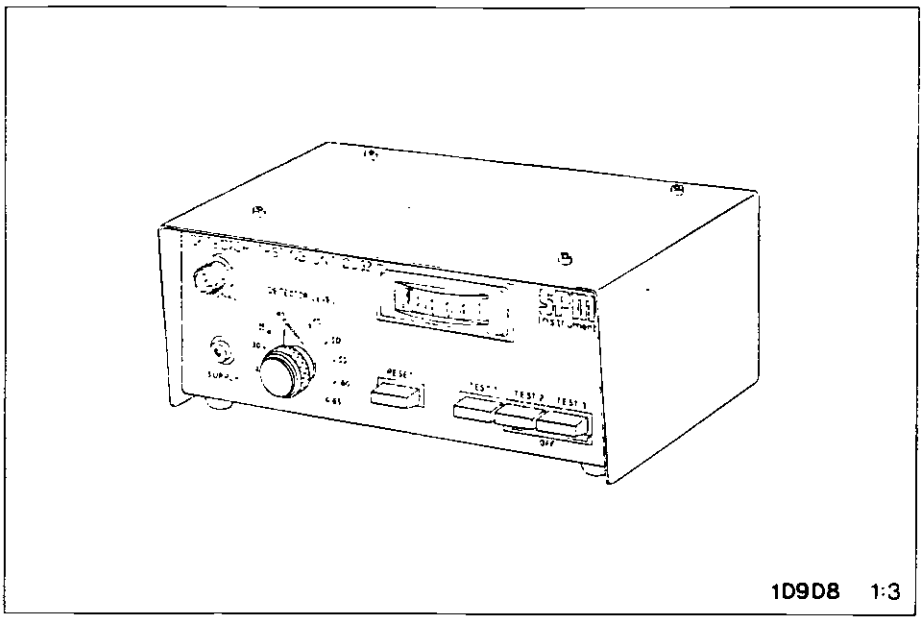
Alarmcentrale 32CL2, siehe Seite 25.
Detektoren, siehe Seite 26 und 27.
Aufnehmer, siehe Seite 28.
Messkabeln, siehe Seite 10.

Schwingungsüberwachung
Die Alarmbox kann auch für Schwingungsüberwachung verwendet werden. Siehe weiter Seite 34.

System 32
Servicehjälpmedel

System 32
Service aids

System 32
Service - Hilfsmittel



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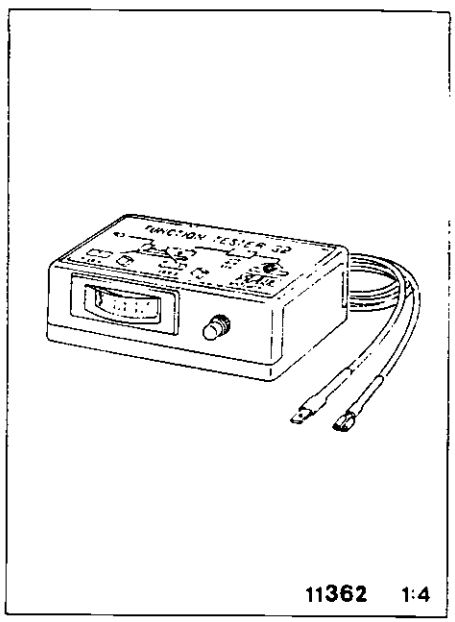


11362 1:4

10908 Testgenerator CU32
Testgeneratorn är avsedd att användas vid kontroll av lagerskadedetektor 32B. Generatorn är programmerbar för samtliga standard-larmnivåer. Testgeneratorn levereras komplett med erforderliga kablar och instruktioner.

Dimensioner	:	200 x 130 x 90 mm
Temperaturområde:		0° till +55°C
Fuktighet	:	Max 75% rel
Strömförsörjning	:	220 V, 50–60 Hz

11362 Funktionsprovare 32
Funktionsprovaren inkopplas i serie med matningskabeln till detektor i System 32. Provaren indikerar detektorns strömförbrukning vid tomgång, larm samt ev triggning. Funktionsprovaren är utrustad med återställningsknapp för lagerskadedetektor.

10908 Test generator CU32
The test generator is designed to check the function of Bearing damage detector 32B. The generator can be programmed for all standard alarm levels. It is supplied with necessary cables and instructions.

Dimensions	:	200 x 130 x 90 mm
Temperature range:		0° to +55°C
Humidity	:	Max. 75% rel.
Current supply	:	220 V, 50–60 Hz

11362 Function tester 32
The function tester is connected in series with the supply cable to detector in System 32. The tester indicates the current consumption of the detector under no load, alarm and trigger pulses if any. The function tester has a button for reset of bearing damage detector.

10908 Testgenerator CU32
Der Testgenerator ist für die Kontrolle von Lagerschadendetektor 32B vorgesehen und kann für sämtliche Standard-Alarmschwellen programmiert werden. Der Generator wird komplett mit den erforderlichen Kabeln und Instruktionen geliefert.

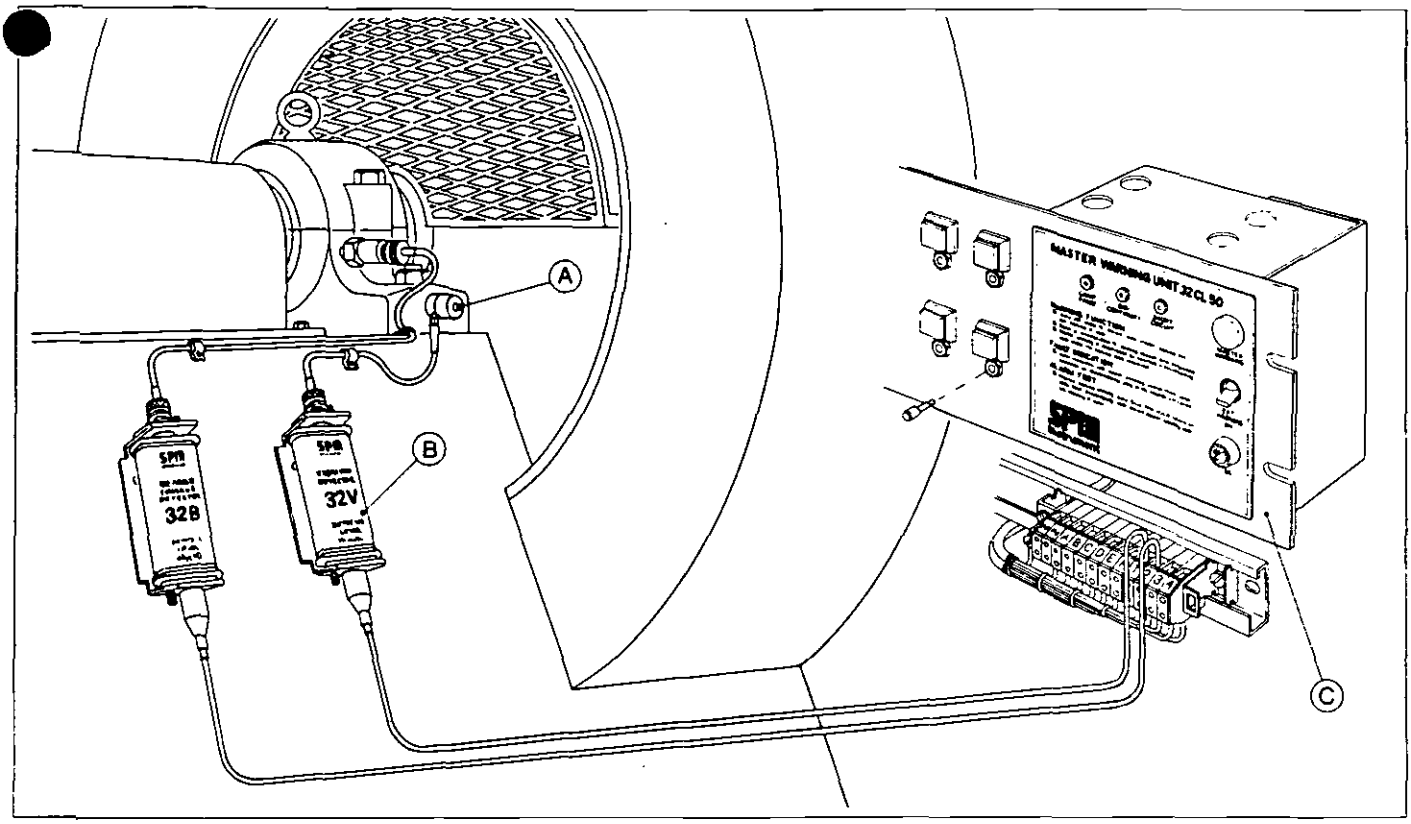
Abmessungen	:	200 x 130 x 90 mm
Temperaturbereich:		0° bis +55°C
Feuchtigkeit	:	Max. 75% relativ
Stromversorgung	:	220 V, 50–60 Hz

11362 Funktionstester 32
Der Funktionstester wird in der Stromversorgungsleitung mit einem Detektor des System 32 in Reihe geschaltet. Der Funktionstester zeigt den Stromverbrauch des Detektors bei normalem Betrieb, Alarm und bei event. Triggerimpulsen an. Der Funktionstester hat eine Rückstelltaste für Lagerschadendetektoren.

System 32
Kontinuerlig vibrationsövervakning

System 32
Continuous vibration monitoring

System 32
Kontinuierliche Schwingungsüberwachung



vibrationsövervakning med SPM System 32 monteras en Vibrationsgivare (A) och en Vibrationsdetektor (B) för varje mätpunkt. Detektorerna ansluts till en gemensam Larmcentral (C).

Vibrationsdetektorerna behandlar signalerna från givarna enligt ISO rekommendation 2954 för mätning av maskinernas vibrationstal (vibrationstal = vibrationshastighetens effektivvärde inom området 10 till 1000 Hz).

Vibrationsdetektorerna har förprogrammerad larmnivå motsvarande ISO rekommendationerna 2372 och 2373 för klassificering av maskiner och val av larmnivå (vibrationstal).

When monitoring vibration with SPM System 32 a Vibration transducer (A) and a Vibration detector (B) are mounted for each measuring point. The detectors are connected to a common Alarm unit (C).

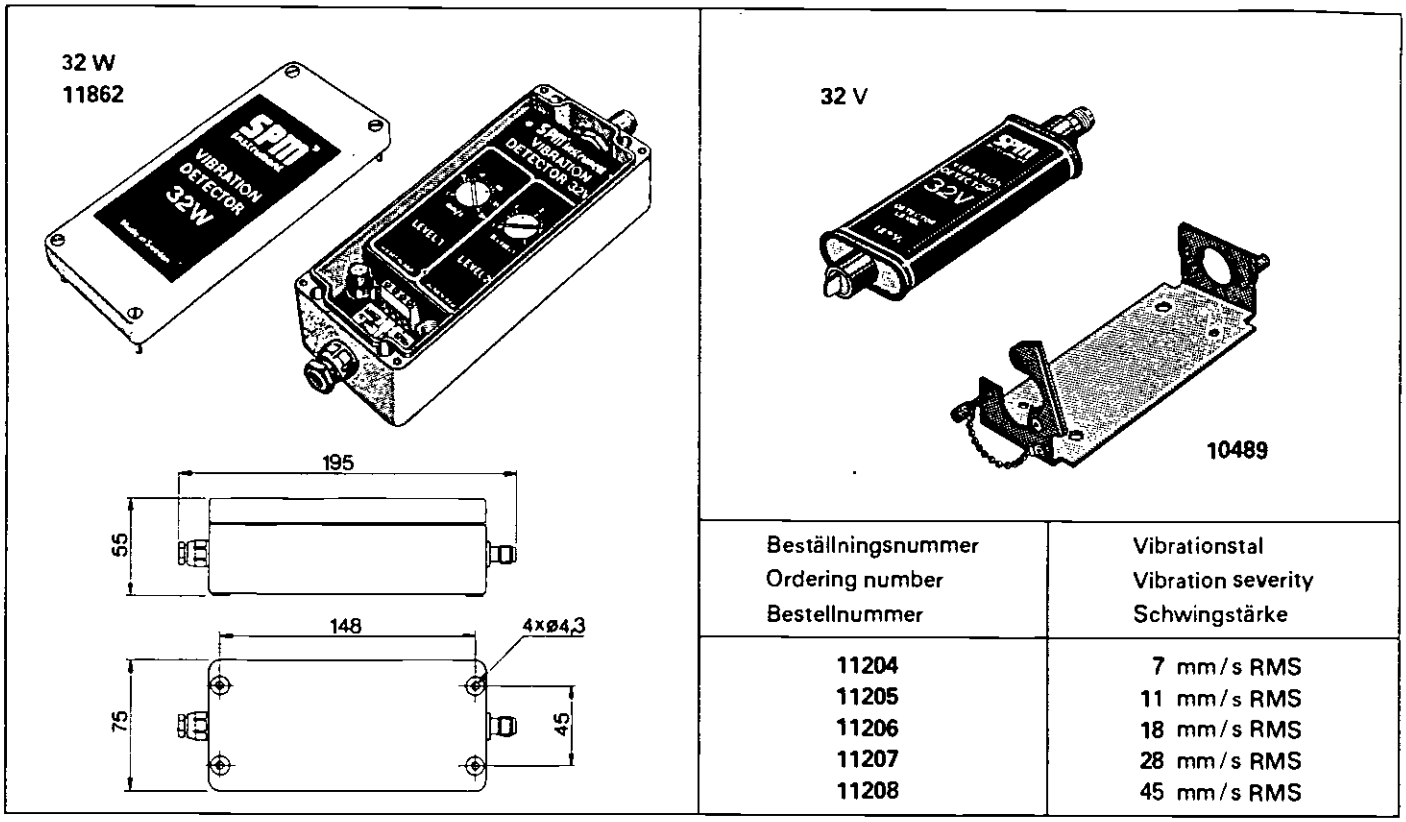
The vibration detectors process the transducer signals according to the ISO recommendation 2954, measurement of vibration severity (vibration severity = rms-value of vibration velocity in the frequency range 10 to 1000 Hz).

The vibration detectors have preprogrammed alarm level corresponding to ISO recommendations 2372 and 2373, classification of machines and selection of alarm level (vibration severity).

Bei der Schwingungsüberwachung mit dem SPM System 32 wird für jede Messtelle ein Schwingungsaufnehmer (A) und ein Schwingungsdetektor (B) montiert. Die Detektoren werden an eine gemeinsame Alarmzentrale (C) angeschlossen.

Die Schwingungsdetektoren behandeln die Signale von den Aufnehmern gemäss ISO Empfehlung 2954 für die Messung der Schwingstärke an Maschinen (Schwingstärke = Effektivwert der Schwinggeschwindigkeit im Frequenzbereich 10 bis 1000 Hz).

Die Schwingungsdetektoren haben vorprogrammierte Alarmschwellen entsprechend der ISO Empfehlungen 2372 und 2373 für Klassifikation von Maschinen und Wahl von Alarmschwelle (Schwingstärke).



Beställningsnummer Ordering number Bestellnummer	Vibrationstal Vibration severity Schwingstärke
11204	7 mm/s RMS
11205	11 mm/s RMS
11206	18 mm/s RMS
11207	28 mm/s RMS
11208	45 mm/s RMS

11862 Vibrationsdetektor 32 W

32 W har två separata larmnivåer och ansluts till två av larmcentralens kanaler. Level 1 kan t ex ge larm när maskinen kräver underhåll. Level 2 kan användas för larm vid farliga vibrationer och styrning av automatisk avstängning.

Hölje	: Polyester, IP 65
Temperaturområde	: 0° till + 55° C
Strömförsörjning	: från larmcentral
Mätområde	: Level 1: 5 – 30 mm/s
	: Level 2: 5 – 90 mm/s

Vibrationsdetektor 32 V

Detektorn är en komplett mätapparat med fast förprogrammerad larmnivå. Signalerna behandlas enligt ISO 2954. Larm utlöses när maskinens vibrationstal överskrider larmnivån. Larmet återställs automatiskt när vibrationstalet underskrider larmnivån.

Utförande	: Hermetiskt
Temperaturområde	: 0° till - 55° C
Strömförsörjning	: från larmcentral
Givarkabelns längd	: Max 1,5 m
Matningskabel	: Enkelledare

10489 Hållare

Hållaren används för montering av Vibrationsdetektor 32 V.

OBS! Matningskabeln måste vara försedd med Tätningshylsa 10473.

11862 Vibration Detector 32 W

32 W is a detector with two trigger levels, each connected to its own channel in the alarm unit. Level 1 can be adjusted to give an alarm when maintenance is needed. Level 2 can be used to indicate danger conditions and trip a shutdown circuit.

Casing	: Polyester IP 65
Temperature range	: 0° to + 55° C
Power supply	: from the alarm unit
Measuring range	: Level 1: 5 – 30 mm/s
	: Level 2: 5 – 90 mm/s

Vibration detector 32 V

The detector is a complete measuring unit with fixed preprogrammed alarm level. The signals are processed according to ISO 2954. Alarm is triggered when the vibration severity of the machine exceeds the alarm level. The alarm is automatically reset when the vibration severity falls below the alarm level.

Design	: Sealed
Temperature range	: 0° to + 55° C
Power supply	: from alarm unit
Length of transducer cable	: Max. 1.5 m
Supply cable	: Single conductor

10489 Bracket

The bracket is used for mounting of Vibration detector 32 V.

NB! The supply cable must be equipped with Sealing cover 10473.

11862 Schwingungsdetektor 32 W

32 W hat zwei Stufen mit einstellbaren Alarmschwellen. Jede Stufe wird an einen eigenen Kanal in der Zentrale angeschlossen. Stufe 1 kann auf "Vorwarnung" eingestellt werden. Stufe 2 dient zur Absicherung gegen plötzlichen, gefährlichen Anstieg des Schwingungspegels und steuert die automatische Abschaltung.

Gehäuse	: Polyester IP 65
Temperaturbereich	: 0° bis + 55° C
Stromversorgung	: von der Zentrale
Meßbereich	: Stufe 1: 5 – 30 mm/s
	: Stufe 2: 5 – 90 mm/s

Schwingungsdetektor 32 V

Der Detektor ist ein kompletter Messapparat mit fest vorprogrammierter Alarmschwelle. Die Signale werden gemäss ISO 2954 behandelt. Der Alarm wird ausgelöst, wenn die Schwingstärke der Maschine die Alarmschwelle überschreitet und wird automatisch zurückgestellt, wenn die Schwingstärke die Alarmstufe wieder unterschreitet.

Ausführung	: Hermetisch
Temperaturbereich	: 0° bis + 55° C
Stromversorgung	: von Alarmzentrale
Aufnehmerkabellänge	: Max 1,5
Speisekabel	: Einzelleiter

10489 Halter

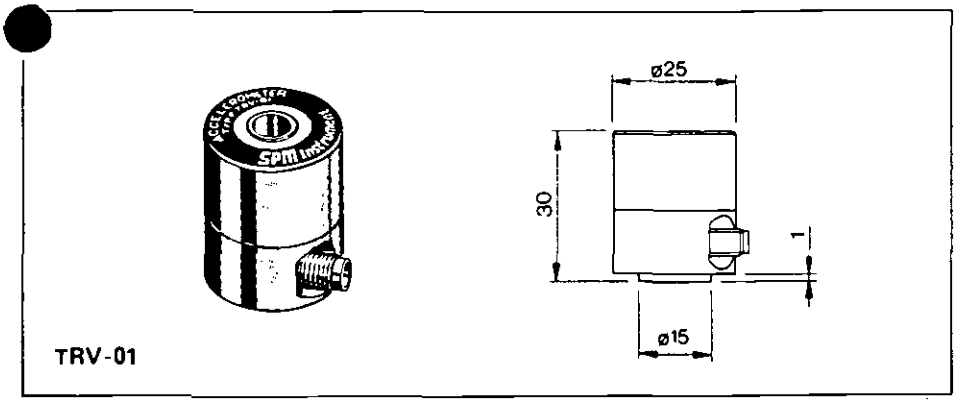
Der Halter ist für die Befestigung des Schwingungsdetektors 32 V vorgesehen.

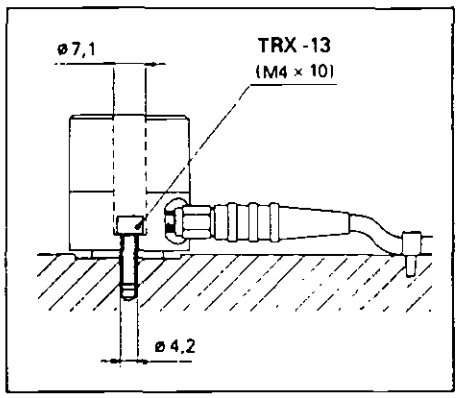
Achtung! Das Speisekabel muss mit Dichtungshülse 10473 versieht sein.

System 32
Givare för vibrationsövervakning

System 32
Transducer for vibration monitoring

System 32
Aufnehmer für Schwingungsüberwachung



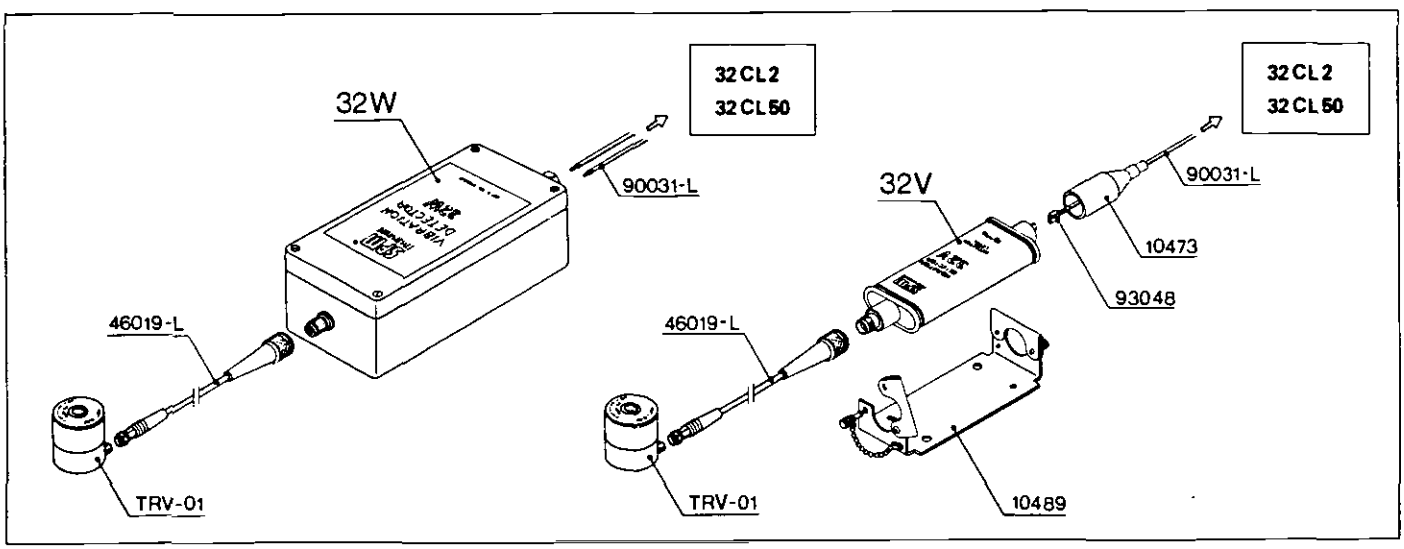


Vibrationsgivare TRV-01
TRV-01 är en liten, robust, piezoelektrisk accelerometer. Den monteras med en M4 insexskruv genom centrum mot en plan och jämn yta. Koaxialkabel mellan givare och detektor skall klamras fast vid maskinen, nära givarens utgång. Max kabellängd är 1,5 m.

Vibration Transducer TRV-01
TRV-01 is a small piezo electric accelerometer. It is mounted against a smooth, flat surface and fastened with a M4 cap head screw through its center. The cable has to be secured with a clamp close to the transducer body. The maximum cable length between transducer and detector is 1.5 m.

Schwingungsaufnehmer TRV-01
TRV-01 ist ein robuster, piezo-elektrischer Beschleunigungsaufnehmer. Er wird mit einer M4 Inbuss-Schraube befestigt, die von oben durch die Aufnehmermitte geführt wird. Die Auflagefläche muß glatt und eben sein. Das Kabel wird möglichst dicht am Aufnehmer angeschellt. Die Kabellänge zwischen Aufnehmer und Detektor sollte nicht mehr als 1,5 m betragen.

Laddningskänslighet	: 10 pC/m/s² ± 15 %	Charge sensitivity	: 10 pC/m/s² ± 15 %	Empfindlichkeit	: 10 pC/m/s² ± 15 %
Tvärkänslighet	: Max 10 %	Transverse sensitivity	: Max. 10 %	Querempfindlichkeit	: Max. 10 %
Typ. känslighet för base strain	: 0,01 m/s²/µ strain	Typical base strain sensitivity	: 0,01 m/s²/µ strain	Typ. Spannungsempfindlichkeit	: 0,01 m/s²/± strain
Linjärt frekvensområde	: 0 – 2 000 Hz	Linear frequency range	: 0 – 2 000 Hz	Linearer Frequenzbereich	: 0 – 2 000 Hz
Temperaturområde	: –30° till + 150° C	Temperature range	: – 30° to + 150° C	Temperaturbereich	: – 30° bis + 150° C
[illegible]nisk temperaturdrift	: 0,25 %/° C	Typical temperature drift	: 0,25 %/° C	Typ. Temperaturabweichung	: 0,25 %/° C
[illegible]e	: Mässing	Material of the casing	: Brass, sealed	Material des Gehäuses	: Messing
Vikt	: 100 gram	Weight	: 100 grams	Gewicht	: 100 Gramm



46019-L Mätkabel, lågbrus
Färdigt monterade kablar kan beställas. Vg ange önskad längd (L) i meter (max 1,5 m). Matningskabeln till detektor 32V skall vara utrustad med tätningshylsa 10473.

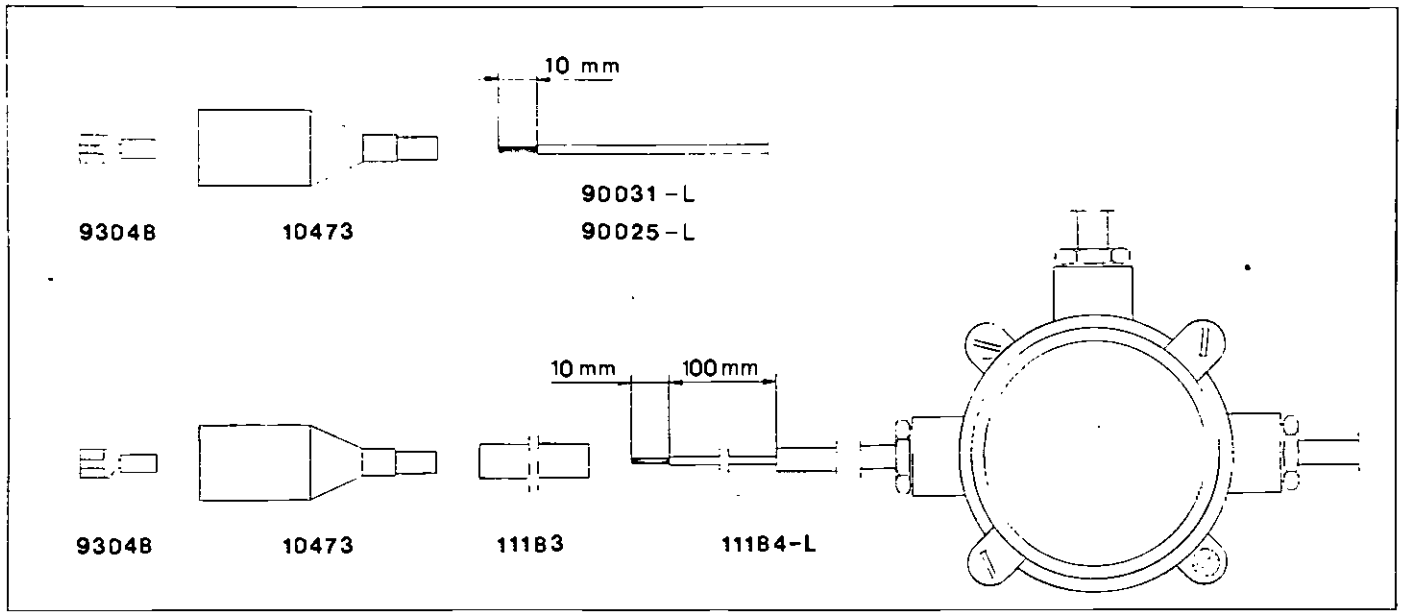
46019-L Measuring cable, low-noise
Cables can be ordered ready-made. Please state the desired length (L) in meters (max. 1.5 m). The supply cable connected to the detector 32V must be equipped with sealing cover 10473.

46019-L Messkabel, rauscharm
Die Kabel sind fertig konfektioniert erhältlich. Bitte gewünschte Länge (L) in Metern angeben (max. 1,5 m). Das Speisekabel zum Detektor 32V muss mit Dichtungshülse 10473 versieht sein.

[illegible]rktyg
Verktyg för planfräsning av anläggningsytan i mätpunkten (TOL-10) och åtdragning av givarens fästskruv (TOL-11) se sid 39.

Tools
Tools for spot-facing the contact surface at the measuring point (TOL-10) and for torquing the transducer mounting screw (TOL-11) – see page 39.

Werkzeuge
Werkzeuge für das Planfräsen der Meßstelle (TOL-10) und das Anziehen der Befestigungsschraube (TOL-11) – siehe Seite 39.



93048 Flatstiftshylsa 1/4"
Flatstiftshylsan monteras på enkelledarkabeln genom kontaktpressning, vilket ger säker elektrisk kontakt och eliminerar behovet av lödning. Vid kontaktpressning bör Kombinationstång 81051 användas.

10473 Tätningshylsa
Tätningshylsan är tillverkad i oljebeständigt gummi och skall användas på matningssidan på detektorerna 32B och 32V.

11183 Tätningsslang
Tätningsslangen är tillverkad i svart, oljebeständigt gummi; längd 70 mm.

11184-L Pansrad matningskabel
Pansringen utgöres av 1/4" (6,35 mm) mjukt kopparrör och levereras med indragen TEFZEL isolerad matningskabel. Pansrad kabel levereras i sammanhängande längder om max 7,5 meter. Vid beställning anges önskad längd (L) i meter.

Temperaturområde: –40° till + 150°C
Ledararea : 1,2 mm²

90031-L Enkelledarkabel, PVC
Vid beställning anges önskad längd (L) i meter.

Temperaturområde: –40° till + 80°C
Ledararea : 0,75 mm²

90025-L Enkelledarkabel, TEFZEL
Vid beställning anges önskad längd (L) i meter.

Temperaturområde: –40° till + 150°C
Ledararea : 1,2 mm²

93048 Tab terminal 1/4"
The connector is mounted on the single conductor cable by crimping which gives safe electric contact and eliminates the need of soldering. When crimping, the Combination pliers 81051 should be used.

10473 Sealing cover
The sealing cover is made of oil resistant rubber and should be used on the supply side of the detectors 32B and 32V.

11183 Sealing tube
The sealing tube is made of black, oil resistant rubber; length 70 mm.

11184-L Armoured supply cable
The armour consists of 1/4" (6.35 mm) soft copper tube and is supplied with TEFZEL insulated supply cable. Armoured cable is available in continuous lengths of max. 7.5 meters. When ordering, please state desired length (L) in meters.

Temperature range: –40° to + 150°C
Conductor area : 1.2 mm²

90031-L Single conductor cable, PVC
When ordering, please state desired length (L) in meters.

Temperature range: –40° to + 80°C
Conductor area : 0.75 mm²

90025-L Single conductor cable, TEFZEL
When ordering, please state desired length (L) in meters.

Temperature range: –40° to + 150°C
Conductor area : 1.2 mm²

93048 Flachstecker 1/4"
Der Flachstecker wird durch Kontaktklemmung auf das einadrige Kabel montiert, was einen sicheren elektrischen Kontakt ergibt und wodurch sich Löten erübrigt. Beim Montieren der Flachstecker sollte die Kombinationszange 81051 benutzt werden.

10473 Dichtungshülse
Die Dichtungshülse ist aus ölbeständigem Gummi hergestellt und soll an der Zuführungsseite des Detektors 32B und 32V verwendet werden.

11183 Dichtungsschlauch
Der Dichtungsschlauch ist aus schwarzem, ölbeständigem Gummi. Länge 70 mm.

11184-L Gepanzertes Speisekabel
Die Panzerung besteht aus 1/4" (6,35 mm) weichem Kupferrohr und wird mit eingezogenem, TEFZEL isoliertem Speisekabel geliefert. Dieses gepanzerte Kabel wird in zusammenhängenden Längen von max. 7,5 m geliefert. Bei Bestellung bitte gewünschte Länge (L) in Metern angeben.

Temperaturbereich: –40° bis + 150°C
Leiterquerschnitt : 1,2 mm²

90031-L Einadriges Kabel, PVC
Bei Bestellung bitte gewünschte Länge (L) in Metern angeben.

Temperaturbereich: –40° bis + 80°C
Leiterquerschnitt : 0,75 mm²

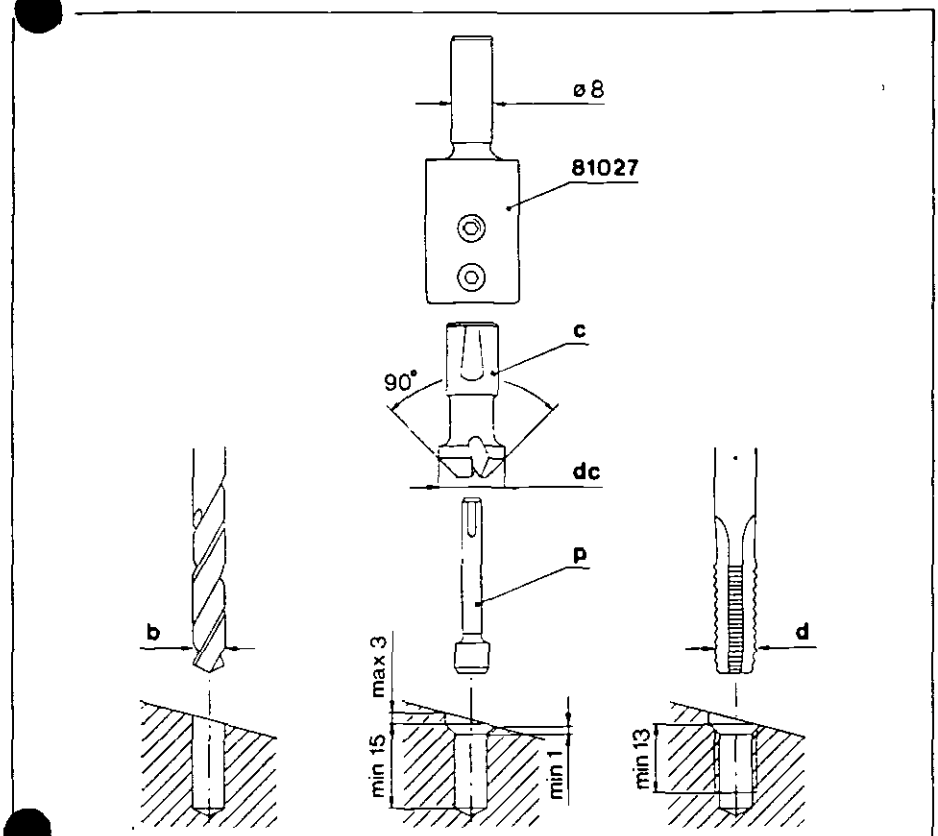
90025-L Einadriges Kabel, TEFZEL
Bei Bestellung bitte gewünschte Länge (L) in Metern angeben.

Temperaturbereich: –40° bis + 150°C
Leiterquerschnitt : 1,2 mm²

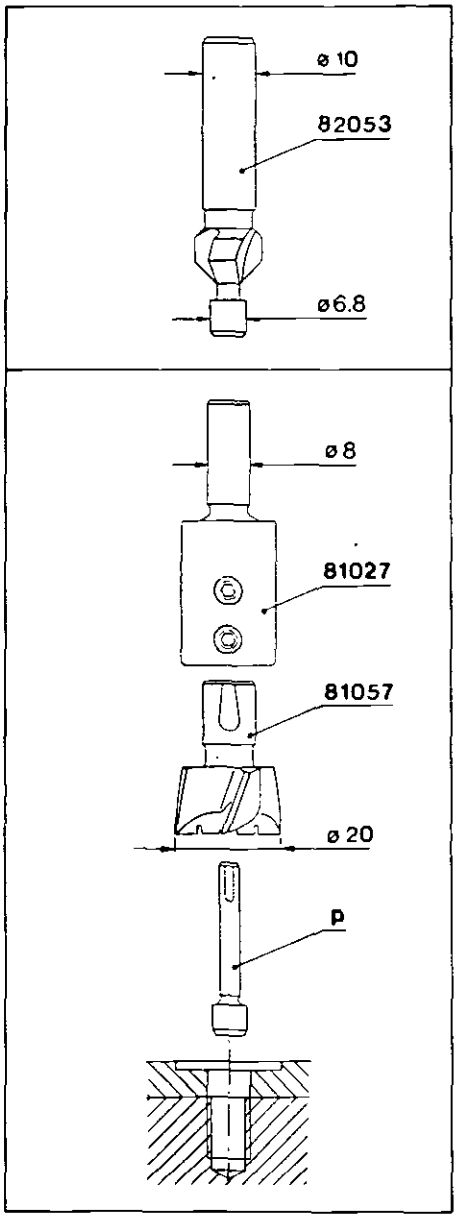
Försänkningsverktyg för mätnipplar och stötpulsgivare

Countersinking tools for adapters and shock pulse transducers

Senkwerkzeug für Messnippel und Stossimpulsaufnehmer



b	p	c	dc	d
5,0 mm	81030	81028	ø12	M 6
5,1 mm	81030	81028	ø12	UNC 1/4"
6,8 mm	81031	81028	ø12	M 8
6,5 mm	81032	81028	ø12	UNC 5/16"
8,5 mm	81033	81028	ø12	M 10
8,0 mm	81034	81028	ø12	UNC 3/8"
10.2 mm	81035	81029	ø15	M 12
10.8 mm	81036	81029	ø15	UNC 1/2"



Kombinationsverktyg
Dessa verktyg används för korrekt försänkning av monteringshål för mätnipplar och stötpulsgivare i standardutförande. Verktyget består av en hållare, en utbytbar försänkare och utbytbara styrtappar. Beställningsnummer enligt ovan.

Combination tools
These tools are used for correct countersinking of mounting holes for adapters and standard shock pulse transducers. The tool consists of a holder, a replaceable countersink and replaceable pilots. Ordering numbers are shown above.

Kombinations · Werkzeug
Diese Werkzeuge werden für das fachgerechte Versenken der Montagebohrung für Messnippel und Stossimpulsaufnehmer in Standardausführung benutzt. Das Werkzeug besteht aus einem Halter, einem austauschbaren Senker und austauschbaren Führungszapfen. Bestellnummer wie oben.

82053 Försänkare med fast styrtapp
Försänkaren är avsedd för monteringshål M8.

82053 Countersink with fixed pilot
The countersink is intended for mounting hole M8.

82063 Zapfensenker
Der Senker ist für die Montagebohrung M8 vorgesehen.

81057 Tappborr
Tappborren används för planförsänkning av monteringshål för stötpulsgivare i bultutförande. Tappborren monteras i Hållare 81027 och förses med styrtapp enligt tabellen ovan.

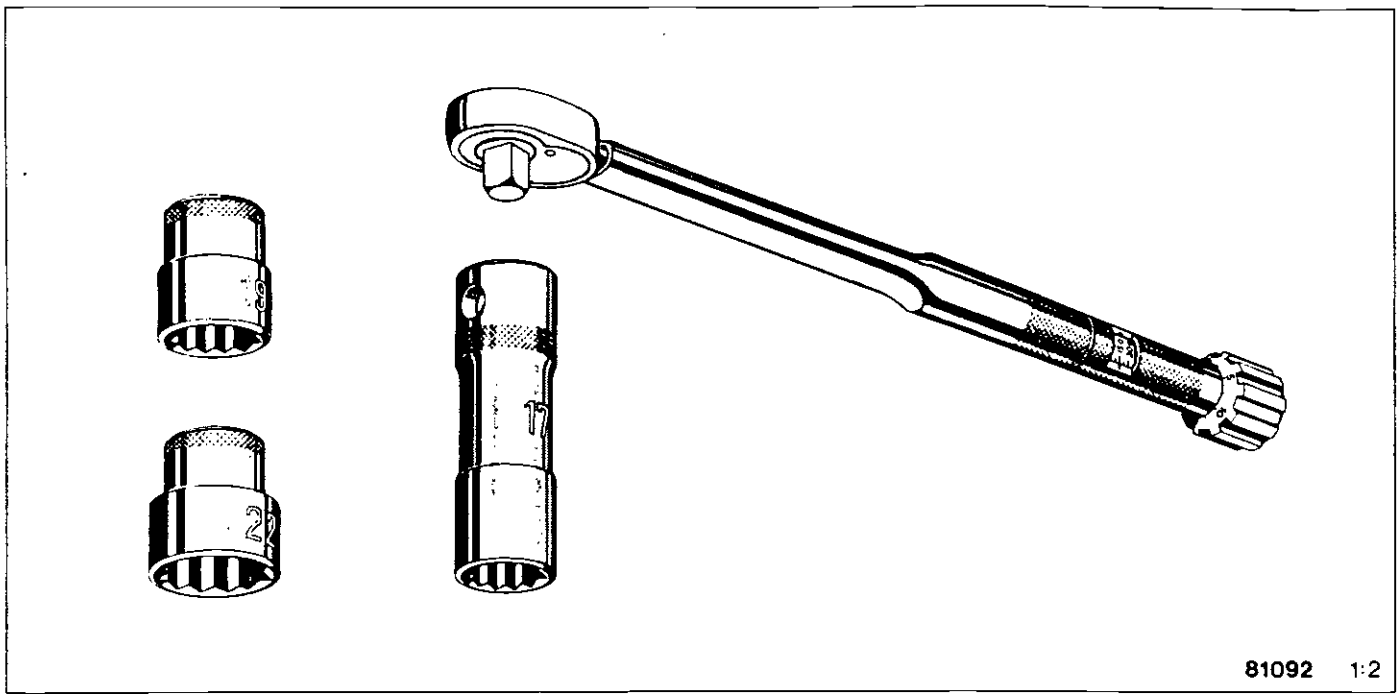
81057 Counterbore
The counterbore is used for flat face milling of mounting holes for shock pulse transducers in bolt design. The counterbore is mounted in Holder 81027 together with a pilot according to the table above.

81057 Schaftfräser
Der Schaftfräser wird für das Planfräsen der Sitzungsflächen für Stossimpulsaufnehmer in Bolzenausführung verwendet. Der Schaftfräser wird in den Halter 81027 montiert und mit einem der Führungszapfen in der Tabelle oben kombiniert.

Verktyg för åtdragning av mätnipplar och givare

Torquing tools for adapters and transducers

Werkzeug für das Festziehen von Messnippeln und Aufnehmern



81092 Momentnyckel med hylsor
För åtdragning och demontering av samtliga typer av SPM mätnipplar och standard givare för fast installation.

Momentnyckeln är inställbar från 5,0 Nm till 22,5 Nm, i steg om 0,5 Nm. Vald inställning kan låsas genom att vrida vingmuttern vid ställskruven åt höger.

Den långa 17 mm hylsan passar för både standard givare och mätnipplar. Hylsorna med dimensioner 19 mm och 22 mm är avsedda för mätnipplar med kontramutter.

81092 Torque wrench with sockets
For torquing and unscrewing all types of SPM adapters and standard transducers for permanent installation.

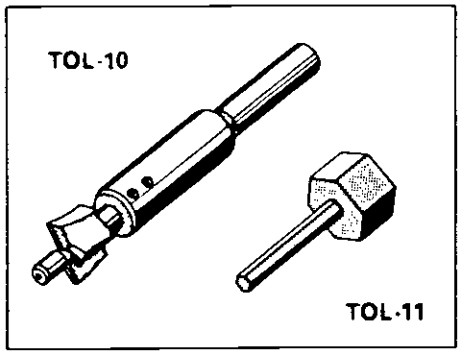
The torque wrench is adjustable in steps of 0.5 Nm between 5.0 and 22.5 Nm. The chosen torque can be locked by turning the screw at the handle end to the right.

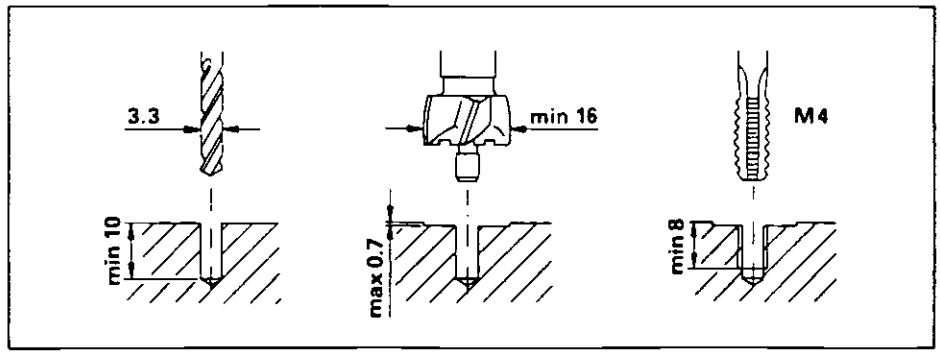
The long 17 mm socket fits all standard transducers and adapters. The short sockets, 19 mm and 22 mm, are needed for adapters with lock nuts.

81092 Drehmomentschlüssel mit Nüssen
Für das Festziehen und Losschrauben sämtlicher Typen von SPM Messnippeln und Standard-Aufnehmern für Festinstallation.

Das Anzugsmoment kan von 5 Nm bis 22,5 Nm eingestellt werden, in Stufen von 0,5 Nm. Mit einer Rechtsdrehung der Flügelschraube am Schlüsselende kann die gewählte Einstellung fixiert werden.

Die lange 17 mm Nuss passt für Festaufnehmer und Messnippel in Standardausführung. Die kurzen Nüsse, 19 mm und 22 mm, werden für Messnippel mit Kontermutter benötigt.





Verktyg till TRV-01

TOL-10	Tappborr, komplett
TOL-11	Åtdragningsverktyg
TOM-10	Hållare för tappborr
TOM-11	Tappborr, ø 16 mm
TOM-12	Styrtapp, ø 3,3 mm

Tools for TRV-01

TOL-10	Counterbore, complete
TOL-11	Torquing tool
TOM-10	Holder for counterbore
TOM-11	Counterbore, ø 16 mm
TOM-12	Pilot, ø 3,3 mm

Werkzeug für TRV-01

TOL-10	Oberflächenfräser, komplett
TOL-11	Innen-Sechskant-Schlüssel
TOM-10	Halter für Oberflächenfräser
TOM-11	Oberflächenfräser, ø 16 mm
TOM-12	Führungszapfen, ø 3,3 mm

Koaxialkablar
Kablar för stötpulsmätning

Vid beställning anges önskad längd (L) i meter. Exempel: 3,5 meter kabel 90007 har beställningsnummer **90007-3,5**.

Coaxial cables
Cables for shock pulse monitoring

When ordering, please state desired length (L) in meters. Example: 3.5 meters cable 90007 have ordering number **90007-3.5**.

Koaxial-Kabel
Kabel für Stossimpulsmessung

Bei Bestellung bitte gewünschte Länge (L) in Metern angeben. Beispiel: 3,5 Meter Kabel 90007 hat Bestellnummer **90007-3,5**.

Beställningsnummer Ordering number Bestellnummer	**90005-L**	**90007-L**	**90093-L**
Temperaturområde Temperature range Temperaturbereich	-40° — +80°C	-40° — +150°C	-40° — +125°C
Beständighet mot vanliga kemikalier Resistance to ordinary chemicals Beständigkeit gegen gewöhnliche Chemikalien	God Good Gut	God Good Gut	God Good Gut
Beständighet mot oljor Resistance to oils Beständigkeit gegen Öle	—	God Good Gut	God Good Gut
Mekaniska egenskaper Mechanical properties Mechanische Eigenschaften	Goda Good Gute	Risk för kallflytning Tendency to cold flow Gefahr von Kaltfluss	Goda Good Gute
Passande standardkontakter Suitable standard connectors Verwendbare Standard-Stecker	93022 93091 93031 93105 93047 93113 93060 93117 93077 93119 93090	93155 93156	93022 + 82166 93091 + 82166 93031 + 82166 93105 + 82166 93047 + 82166 93113 + 82166 93060 + 82166 93117 + 82166 93077 + 82166 93119 + 82166 93090 + 82166

Beställningsnummer för mätkablar med monterade kontakter, se sidan 10.

Ordering numbers for measuring cables with fitted connectors, see page 10.

Bestellnummern für Messkabel mit montierten Steckern, siehe Seite 10.

Kablar för vibrationsmätning, lågbrus
Cables for vibration monitoring, low-noise
Kabel für Schwingungsmessung, Rauscharm

Beställningsnummer Ordering number Bestellnummer	**90146-L**	**90176-L**
Temperaturområde Temperature range Temperaturbereich	-40° — +150°C	-40° — +80°C
Beständighet mot vanliga kemikalier Resistance to ordinary chemicals Beständigkeit gegen gewöhnliche Chemikalien	God Good Gut	God Good Gut
Beständighet mot oljor Resistance to oils Beständigkeit gegen Öle	God Good Gut	—
Mekaniska egenskaper Mechanical properties Mechanische Eigenschaften	Risk för kallflytning Tendency to cold flow Gefahr von Kaltfluss	Goda Good Gute
Passande standardkontakter Suitable standard connectors Verwendbare Standard-Stecker	93120 93121 93129	93022 + 93149 93103 93060 + 93149 93117

Mätkabel, lågbrus, med monterade kontakter, se sid 36.

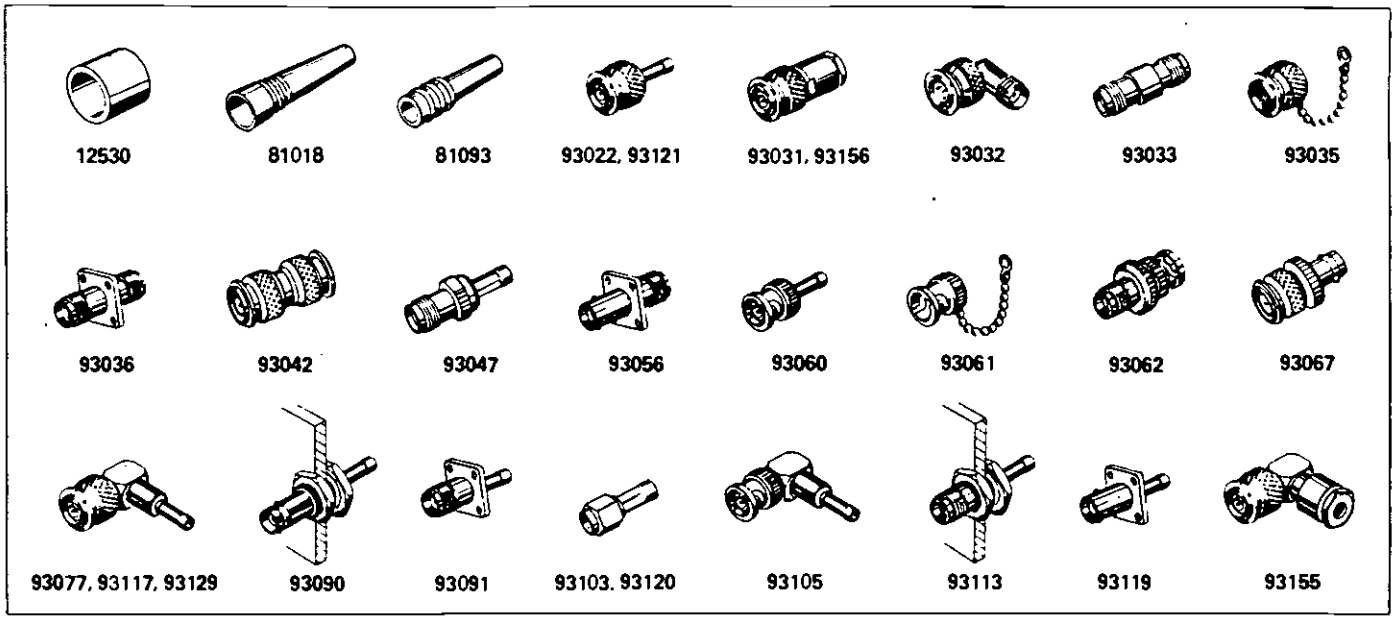
Measuring cable, low-noise, with fitted connectors, see page 36.

Messkabel, rauscharm, mit montierten Steckern, siehe Seite 36.

Kontakter till mätkablar

Connectors for measuring cables

Stecker für Messkabel



12530 Gummihylsa för montering av detektor (givarsidan) eller anpassningsenhet i hållare.
81018 TNC-BNC brytskydd, kan användas till kabel 90005 och 90176
81093 SMA brytskydd, passar kontakt 93103
82166 Neoprenhylsa, för kabel 90093
93022 TNC kabelkontakt, crimp
93031 TNC kabelkontakt, skruvutförande
93032 TNC vinkelkontakt
93033 TNC övergång
93035 TNC skyddslock
93036 TNC terminalkontakt
93042 TNC övergång
93047 TNC kabelkontakt, crimp
93056 BNC-TNC terminalkontakt
93060 BNC kabelkontakt, crimp
93061 BNC skyddslock
93062 BNC-TNC övergång
93067 BNC-TNC övergång
93077 TNC vinkelkontakt, crimp
93090 BNC terminalkontakt, crimp
93091 TNC terminalkontakt, crimp
93103 SMA kabelkontakt, crimp
93105 BNC vinkelkontakt, crimp
93113 TNC terminalkontakt, crimp
93117 TNC vinkelkontakt, löd/crimp
93119 BNC terminalkontakt, crimp
93120 SMA kabelkontakt, crimp, för kabel 90146
93121 TNC kabelkontakt, crimp, för kabel 90146
93129 TNC vinkelkontakt, löd/crimp, för kabel 90146
93149 Kontaktstift TNC-BNC för kabel 90146
93155 TNC vinkelkontakt med dragavlastning, löd/skruvutförande
93156 TNC kabelkontakt med dragavlastning, löd/skruvutförande

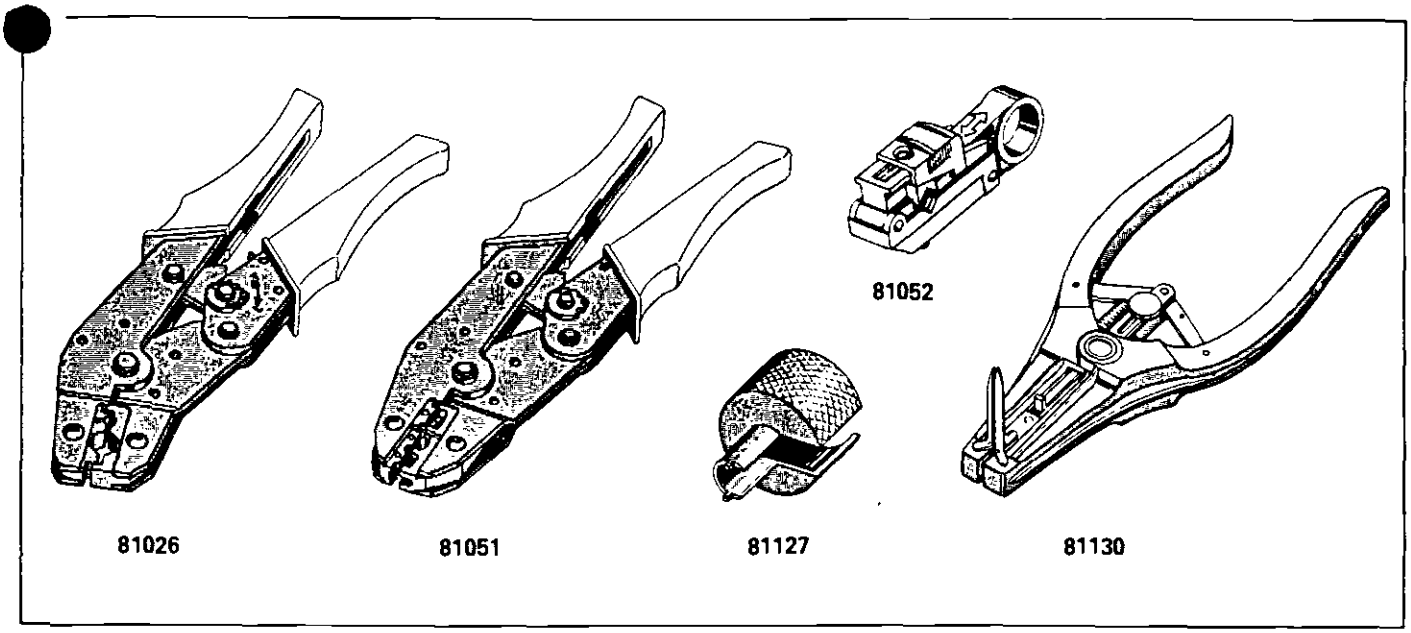
12530 Rubber sleeve for mounting of detector (transducer side) or matching unit in bracket.
81018 TNC-BNC sleeve, fits to cables 90005 and 90176
81093 SMA sleeve, fits to connector 93103
82166 Neoprene sleeve, for cable 90093
93022 TNC cable connector, crimp
93031 TNC cable connector, screw-type
93032 TNC angle connector
93033 TNC adapter
93035 TNC dust cap
93036 TNC terminal connector
93042 TNC adapter
93047 TNC cable connector, crimp
93056 BNC-TNC terminal connector
93060 BNC cable connector, crimp
93061 BNC dust cap
93062 BNC-TNC adapter
93067 BNC-TNC adapter
93077 TNC angle connector, crimp
93090 BNC terminal connector, crimp
93091 TNC terminal connector, crimp
93103 SMA cable connector, crimp
93105 BNC angle connector, crimp
93113 TNC terminal connector, crimp
93117 TNC angle connector, solder/crimp
93119 BNC terminal connector, crimp
93120 SMA cable connector, crimp, for cable 90146
93121 TNC cable connector, crimp, for cable 90146
93129 TNC angle connector, solder/crimp, for cable 90146
93149 Contact pin TNC-BNC, for cable 90176
93155 TNC angle connector with strange relief, solder/screw-type
93156 TNC cable connector with strange relief, solder/screw-type

12530 Gummihülse für das Festklemmen von Detektor (Aufnehmerseite) oder Anpassungseinheit im Halter.
81018 TNC-BNC Knickschutztülle, für den Anschluß an Kabeltyp 90005 und 90176
81093 SMA Knickschutztülle, kann an Stekker 93103 angeschlossen werden
82166 Neoprenhülse für Kabeltyp 90093
93022 TNC Kabelkontakt, Klemmausführung
93031 TNC Kabelkontakt, Schraubausführung
93032 TNC Winkelkontakt
93033 TNC Übergang
93035 TNC Schutzdeckel
93036 TNC Terminalkontakt
93042 TNC Übergang
93047 TNC Kabelkontakt, Klemmausführung
93056 BNC-TNC Terminalkontakt
93060 BNC Kabelkontakt, Klemmausführung
93061 BNC Schutzdeckel
93062 BNC-TNC Übergang
93067 BNC-TNC Übergang
93077 TNC Winkelkontakt, Klemmausführung
93090 BNC Terminalkontakt, Klemmausführung
93091 TNC Terminalkontakt, Klemmausführung
93103 SMA Kabelkontakt, Klemmausführung
93105 BNC Winkelkontakt, Klemmausführung
93113 TNC Terminalkontakt, Klemmausführung
93117 TNC Winkelkontakt, Löt-Klemmausführung
93119 BNC Terminalkontakt, Klemmausführung
93120 SMA Kabelkontakt, Klemmausführung für Kabel 90146
93121 TNC Kabelkontakt, Klemmausführung für Kabel 90146
93129 TNC Winkelkontakt, Löt-Klemmausführung für Kabel 90146
93149 Kontaktstift TNC-BNC, für Kabel 90176
93155 TNC Winkelkontakt mit Zugentlastung, Löt-Schraubausführung
93156 TNC Kabelkontakt mit Zugentlastung, Löt-Schraubausführung

Verktyg för montering av kablar och kontakter

Tools for fitting cables and connectors

Werkzeug für die Fertigung von Kabeln und Steckern



81026 Crimptång
för montering av kabelkontakter.

81051 Crimptång
för montering av flatstiftshylsor 1/4".

81052 Skalverktyg
för koaxialkablar.

81127 Monteringsverktyg
för kontakter med dragavlastning.

81130 Expandertång
för montering av neoprenhylsa 82166.

81136 Crimptång
för montering av kontakter på kabel 90146.

81026 Crimping tool
for fitting cable connectors.

81051 Crimping tool
for fitting tab terminals 1/4".

81052 Cutting tool
for coaxial cables.

81127 Fitting tool
for connectors with strange relief.

81130 Expansion pliers
for fitting neoprene tube 82166.

81136 Crimping tool
for fitting connectors to cable 90146.

81026 Klemmzange
für das Festklemmen von Kabelstecker.

81051 Klemmzange
für das Festklemmen von Flachstecker 1/4".

81052 Schälwerkzeug
für Koaxialkabel.

81127 Montagewerkzeug
für Stecker mit Zugentlastung.

81130 Expanderzange
für das Aufziehen von Neoprenhülse 82166.

81136 Klemmzange
für die Montage von Stecker auf Kabel 90146.

SPM - representanter

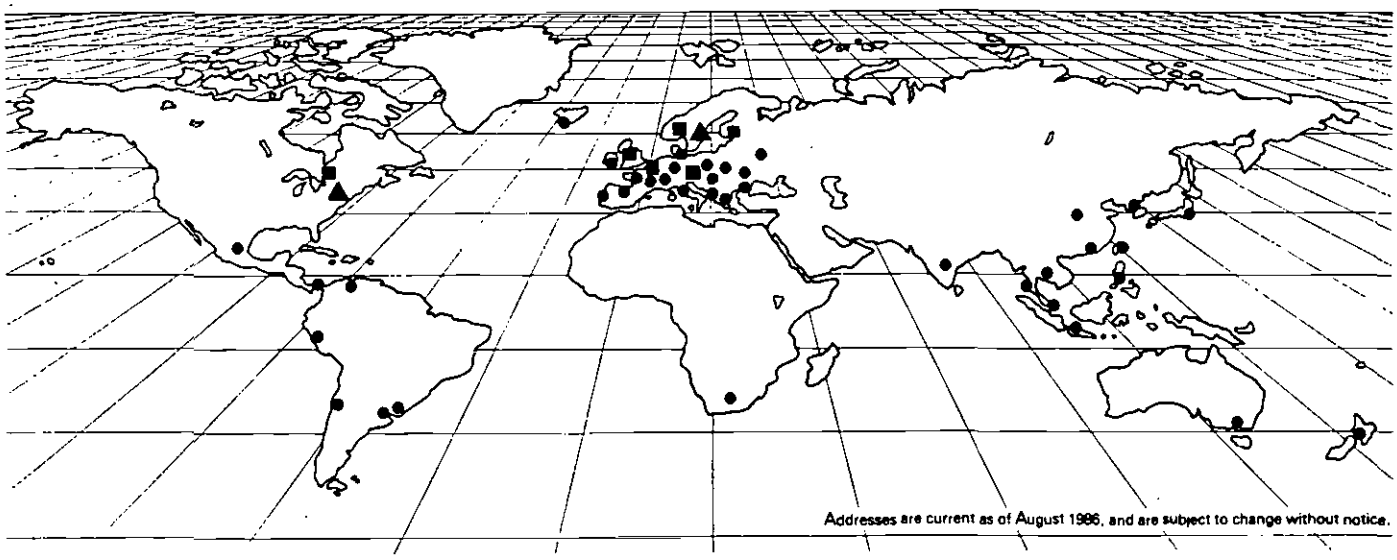
▲ Tillverkare
■ SPM - bolag
● Representanter

SPM - representatives

▲ Manufacturer
■ SPM - companies
● Representatives

SPM - Vertreter

▲ Hersteller
■ SPM - Gesellschaft
● Vertreter



● **ARGENTINA**
SKF Argentina S.A.
1000 Casilla Correo 197, 1068 BUENOS AIRES
Tel. 33 - 3061 / 8

● **AUSTRALIA**
SKF Australia Pty. Ltd.
P.O.Box 301, OAKLEIGH 3166, Tel. 567 - 2888

■ **AUSTRIA, CZECHOSLOVAKIA, DDR, HUNGARY, RUMANIA, BULGARIA, JUGOSLAVIA, USSR**
SPM Instrument Int. GmbH
Lessinggasse 18, 2232 DEUTSCH-WAGRAM
bei Wien, Austria. Tel. (02247) 3511

■ **BELGIUM**
SPM Instrument
Rue Dieudonné Lefèvre straat 219, 1020 BRUSSEL
Tel. 02 - 4242229

■ **NETHERLANDS, LUXEMBOURG**
SPM Instrument
Postbus 86, 5150 AB DRUNEN, Netherlands
Tel. 04163 - 73176

● **CANADA**
SPM Instrument Canada
570 Hood Road, Unit 21, MARKHAM
Ontario L3R 4G7. Tel. 416 - 475 - 6960

● **PANAMA**
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P.O.Box 6-2399, EL DORADO, Tel. 64 - 7411

● **CHILE**
SKF Chilena S.A.I.C.
Casilla 207, SANTIAGO 1, Tel 222 05 66

● **DENMARK**
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v/Jögvan Joensen, Dronninggårds Allé 33
2840 HOLTE, Tel. 02 - 42 04 99

■ **FINLAND**
SPM Instrument Oy
Pihkatie 7, 00410 HELSINKI, Tel. (90) 539 133

● **FRANCE**
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● **GREECE**
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● **HONG KONG, CHINA**
Axel Johnson Corp. (HK) Ltd
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181 Johnston Road, WANCHAI, Hong Kong
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● **ICELAND**
Vélar & Tæki hf, Marine & Technical Ltd.
P.O.Box 397, REYKJAVIK
Tel. 21286 - 21460

● **INDIA**
Techno Links
7 - 1 - 59, behind Syndicate Bank, Ameerpet
HYDERABAD - 500 016
Tel. 227264

● **ITALY**
DE.MO.S. srl
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● **JAPAN**
A. Johnson & Co Japan
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● **MEXICO**
SKF Mexicana S.A.
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● **NEW ZEALAND**
SKF New Zealand Ltd.
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■ **NORWAY**
SPM Instrument A/S
P.B. 107, 2022 GJERDRUM
Tel. (06) 99 06 10

● **PERU**
SKF del Perú S.A.
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Tel. 71 - 6212

● **PORTUGAL**
A. Johnson & Co. (Portugal), LOA.
Edificio Atlas Copco
Av. Prof. Dr. Reinaldo dos Santos, Carnaxide
2796 LINDA-A-VELHA codex
Tel. 121 823 47

● **SINGAPORE, MALAYSIA, INDONESIA, THAILAND, TAIWAN, PHILIPPINES**
A. Johnson & Co. (S.E.A.) Pte. Ltd.
453, Tagore Avenue, SINGAPORE 2678
Tel. 4553355

● **SOUTH AFRICA**
Altech Instruments (PTY) Ltd.
P.O.Box 41062, CRAIGHALL 2024
Tel. (011) 788 - 1700 / 05

● **SOUTH KOREA**
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● **SPAIN**
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Tel. (94) 674 38 00

▲ **SWEDEN**
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Box 4, 152 01 STRÄNGNÄS
Tel. 0152 - 134 20

● **SWITZERLAND**
AE Advanced Engineering S.A.
Route de Lausanne No 4, CH-1180 ROLLE (VD)
Tel. 021 - 75 34 75

■ **UNITED KINGDOM, IRELAND**
SPM Instrument UK Ltd.
P.O.Box 14, Walshaw Road, BURY BL8 1PY,
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● **URUGUAY**
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▲ **USA**
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359 North Main Street, PO Box 89
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● **VENEZUELA**
SKF Venezolana S.A.
Apartado 988, CARACAS
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● **WEST GERMANY**
Prüftechnik, Dieter Busch + Partner GmbH & Co.
Postfach 1263, O - 8045 ISMANING
Tel. (089) 96 08 - 0

Flakt Inc

EMERGENCY & VENTILATION FANS
OPERATION, MAINTENANCE AND INSTALLATION MANUAL

SECTION SIX

- FAN DELIVERY LIST
- GENERAL ARRANGEMENT OF FANS
- FIELD ASSEMBLY OF FANS
- GENERAL ASSEMBLY OF VENTILATION SYSTEM

DELIVERY LIST

Flakt
Flakt Canada Ltd.

CUSTOMER: S.C.R.T.D. - METRO RAIL PROJECT A740	DRAWN: B.B.	DWG. NO.: CO-A-13000	SUB. NO.: 005
PRODUCT: VENTILATION FANS	CHECKED	SHEET 1 OF 2	REV. NO.
CONTRACT NO.: 18-324-0773	APPROVED	ASSEMBLY DWG.	DATE: OCT. 31/88
TITLE: CASINGS & ANTI-STALL SECTIONS			

DELY. ITEM	QTY.	DESCRIPTION	DWG. No. OR DIM. AND MAT'L SPECS.	REV.	DELY. CODE	ESTIMATED WEIGHT	LINE NO.
		FAN ASSEMBLY EF	CO-D-12541				1
		FAN ASSEMBLY UF	CO-D-12542				2
		FAN ASSEMBLY UF-041	CO-D-12543				3
		FAN ASSEMBLY OTE	CO-D-12544				4
		FAN ASSEMBLY SVF	CO-D-12545				5
							6
							7
001	29	CASING SECTION EF & SVF	CO-D-12383			81,925	8
							9
002	11	CASING SECTION UF & OTE	CO-D-12381			11,880	10
							11
003	1	CASING SECTION UF-041	CO-C-11271			900	12
							13
004	27	IMPELLER CASING EF	CO-C-11148			11,745	14
							15
005	2	IMPELLER CASING SVF	CO-C-11149			3,360	16
							17
006	9	ANTI-STALL SECTION UF	CO-D-12382			11,835	18
							19
007	1	ANTI-STALL SECTION UF-041	CO-D-12527			1,225	20
							21
008	2	ANTI-STALL SECTION OTE	CO-D-12588			2,610	22
							23
009	11	ACCESS DOOR UF & OTE	CO-C-11147			495	24
							25

NOTE: - REFER TO ASSEMBLY DRAWINGS FOR LOCATION OF ITEMS

MARKING: ALL SHIPPING ITEMS TO HAVE DELIVERY ITEM NO.'s AND SUB. NO.'s CLEARLY MARKED.

TOTAL ESTIMATED WEIGHT LBS. / KG.

FLAKT CANADA LTD.
NOV 13 1989
ISSUED

CRATING: ALL SMALL LOOSE ITEMS TO BE SHIPPED IN MARKED CRATES.

NOTE

'S' - FLAKT STOCK SENT TO FIELD

'Sd' - FLAKT STOCK SENT TO SHOP

'R' - FLAKT PURCHASE SENT TO FIELD

'Rd' - FLAKT PURCHASE SENT TO SHOP

SYM.	REVISION	DATE	BY	CHK'D

DELIVERY LIST

Flakt

CUSTOMER: S.C.R.T.D. - METRO RAIL PROJECT A740	DRAWN: B.B.	DWG. NO.: CO-A-13000 SHEET 2 OF 2	SUB. NO.: 005	
PRODUCT: VENTILATION FANS	CHECKED		REV. NO.	
CONTRACT NO.: 18-324-0773	APPROVED	ASSEMBLY DWG.	DATE: OCT. 31/88	
TITLE: CASINGS & ANTI-STALL SECTIONS				

DELY. ITEM	QTY.	DESCRIPTION	DWG. No. OR DIM. AND MAT'L SPECS.	REV.	DELY. CODE	ESTIMATED WEIGHT	LINE NO.
010	29	ACCESS DOOR EF & SVF	CO-C-11150			1,305	1
							2
011	1	ACCESS DOOR UF-041	CO-C-11272			40	3
							4
012	10	BLADE ACTUATOR ASSY. UF	CO-D-12586				5
		EACH CONSISTING OF :-					6
	1	ACTUATOR BAR	CO-B-11027				7
	2	CONNECTING LINK	CO-A-13034				8
	4	SEAL GUIDE	CO-A-13035				9
	2	SEAL	CO-A-13036				10
	4	RETAINING SPRING	CO-A-13037				11
	1	LOWER PIN	CO-A-13038 (ITEM 1)				12
	1	UPPER PIN	CO-A-13038 (ITEM 2)				13
	2	CLEVIS					14
	1	ACTIONATOR MOTOR	M 940				15
							16
							17
013	2	HANGER SUPPORT FRAME UF-041	CO-C-11273			188	18
							19
							20
							21
							22
							23
							24
							25

NOTE: - REFER TO ASSEMBLY DRAWINGS FOR LOCATION OF ITEMS

MARKING: ALL SHIPPING ITEMS TO HAVE DELIVERY ITEM NO.'s AND SUB. NO.'s CLEARLY MARKED.

TOTAL ESTIMATED WEIGHT LBS. / KG.

CRATING: ALL SMALL LOOSE ITEMS TO BE SHIPPED IN MARKED CRATES.

NOTE

FLAKT CANADA LTD.
NOV 13 1989
ISSUED

'S' - FLAKT STOCK SENT TO FIELD

'Sd' - FLAKT STOCK SENT TO SHOP

'R' - FLAKT PURCHASE SENT TO FIELD

'Rd' - FLAKT PURCHASE SENT TO SHOP

SYM	REVISION	DATE	BY	CHK'D

DELIVERY LIST

Flakt
Flakt Canada Ltd.

CUSTOMER: S.C.R.T.D.-METRO RAIL PROJECT A740	DRAWN: B.B.	OWG.NO.: CO-A-13002	SUB.NO.: 016
PROOUCT: VENTILATION FANS	CHECKED:	SHEET 1 OF 1	REV. NO.:
CONTRACT NO.: 18-324-0773	APPROVED:	ASSEMBLY OWG.:	OATE: OCT. 31/88
TITLE: MOTORS			

LINE NO.	OELY. ITEM	QTY.	OESCRIPTION	OWG. No. OR OIM. ANO MAT'L SPECS.	REV.	OELY. CODE	ESTIMATEO WEIGHT
1			FAN ASSEMBLY EF	CO-D-12541			
2			FAN ASSEMBLY UF	CO-D-12542			
3			FAN ASSEMBLY UF-041	CO-D-12543			
4			FAN ASSEMBLY OTE	CO-D-12544			
5			FAN ASSEMBLY SVF	CO-D-12545			
6							
7							
8	001	16	MOTOR 250 H.P. @ 1200 R.P.M.	RELIANCE - FRAME SIZE 449 TY		Rd	33,600
9							
10							
11	002	10	MOTOR 200 H.P. @ 1200 R.P.M.	RELIANCE - FRAME SIZE 449 TY		Rd	21,000
12							
13							
14	003	3	MOTOR 150 H.P. @ 1200 R.P.M.	RELIANCE - FRAME SIZE 445 TY		Rd	4,230
15							
16							
17	004	12	MOTOR 50 H.P. @ 900 R.P.M.	RELIANCE - FRAME SIZE 404 T		Rd	11,940
18							
19							
20							
21							
22							
23							
24							
25							

NOTE: - REFER TO ASSEMBLY ORAWINGS FOR LOCATION OF ITEMS

MARKING: ALL SHIPPING ITEMS TO HAVE OELIVERY ITEM NO.'s AND SUB. NO.'s CLEARLY MARKEO.

TOTAL ESTIMATEO WEIGHT: LBS. 70,770 / KG.

CRATING: ALL SMALL LOOSE ITEMS TO BE SHIPPED IN MARKED CRATES.

NOTE

FLAKT CANADA LTD.
NOV 13 1989
ISSUED

'S' - FLAKT STOCK SENT TO FIELO

'Sd' - FLAKT STOCK SENT TO SHOP

'R' - FLAKT PURCHASE SENT TO FIELO

'Rd' - FLAKT PURCHASE SENT TO SHOP

SYM.	REVISION	OATE	BY	CHK'O

DELIVERY LIST

Flakt
Flakt Canada Ltd.

CUSTOMER: S.C.R.T.D. - METRO RAIL PROJECT A740	DRAWN: B.B.	DWG. NO.: CO-A-13003	SUB. NO.: 022	
PRODUCT: VENTILATION FANS	CHECKED	SHEET 1 OF 1	REV. NO.	
CONTRACT NO.: 118-324-0773	APPROVED	ASSEMBLY DWG.	DATE: OCT. 31/88	
TITLE: ANTI-VIBRATION PADS				

DELY. ITEM	QTY.	DESCRIPTION	DWG. No. OR DIM. AND MAT'L SPECS.	REV.	DELY. CODE	ESTIMATED WEIGHT	LINE NO.
		FAN ASSEMBLY EF	CO-D-12541				1
		FAN ASSEMBLY UF	CO-D-12542				2
		FAN ASSEMBLY UF-041	CO-D-12543				3
		FAN ASSEMBLY OTE	CO-D-12544				4
		FAN ASSEMBLY SVF	CO-D-12545				5
							6
							7
001							8
							9
							10
							11
							12
							13
							14
							15
							16
							17
							18
							19
							20
							21
							22
							23
							24
							25

NOTE: - REFER TO ASSEMBLY DRAWINGS FOR LOCATION OF ITEMS

MARKING: ALL SHIPPING ITEMS TO HAVE DELIVERY ITEM NO.'s AND SUB. NO.'s CLEARLY MARKED.

TOTAL ESTIMATED WEIGHT: LBS. / KG.

CRATING: ALL SMALL LOOSE ITEMS TO BE SHIPPED IN MARKED CRATES.

NOTE

FLAKT CANADA LTD.
NOV 13 1989
ISSUED

'S' - FLAKT STOCK SENT TO FIELD

'Sd' - FLAKT STOCK SENT TO SHOP

'R' - FLAKT PURCHASE SENT TO FIELD

'Rd' - FLAKT PURCHASE SENT TO SHOP

SYM.	REVISION	DATE	BY	CHK'D

DELIVERY LIST

Flakt
Flakt Canada Ltd.

CUSTOMER: Southern California Rapid Transit District	DRAWN: B.B.	OWG. NO.: CO-A-12998	SUB. NO.: 100
PROOUCT: Metro Rail Project A740	CHECKED:	SHEET 1 OF 3	REV. NO.:
CONTRACT NO.: C-118-324-0773	APPROVED:	ASSEMBLY OWG.:	OATE: OCT. 17/88
TITLE: Ventilation Fans			

DELY. ITEM	QTY.	DESCRIPTION	DWG. No. OR DIM. AND MAT'L SPECS.	REV.	DELY. CODE	ESTIMATED WEIGHT	LINE NO.
		Gen. Arrgt. Of Fans EF	CO-D-12359				1
		Gen. Arrgt. Of Fans UF	CO-D-12360				2
		Gen. Arrgt. Of Fans OTE	CO-D-12361				3
		Gen. Arrgt. Of Fans SVF	CO-D-12362				4
		Gen. Arrgt. Of Fan UF-041	CO-D-12485				5
							6
							7
001	27	Fan Assembly EF (19-L.H. 8-R.H.)	CO-D-12541				8
		Each Consisting Of :-					9
	1	Casing Section SUB 005	CO-D-12383				10
	1	Impeller Casing SUB 005	CO-C-11148				11
	2	Flex. Connection SUB 012	CO-C-11152				12
	1	Access Door SUB 005	CO-C-11150				13
	1	Impeller (224-112-12) SUB 001	CO-D-12364				14
	1	Motor SUB 016					15
	5	Gasket SUB 032	7'-4½" I.D.				16
	4	Anti-Vibration Pad SUB 022					17
	1-Set	Assembly Bolts SUB 032					18
							19
							20
002	9	Fan Assembly UF (5-L.H. 4-R.H.)	CO-D-12542				21
		Each Consisting Of :-					22
	1	Casing Section SUB 005	CO-D-12381				23
	1	Anti-Stall Section SUB 005	CO-D-12382				24
	2	Flex. Connection SUB 012	CO-C-11151				25

NOTE: -REFER TO ASSEMBLY DRAWINGS FOR LOCATION OF ITEMS

MARKING: ALL SHIPPING ITEMS TO HAVE OELIVERY ITEM NO.'s AND SUB. NO.'s CLEARLY MARKED.

TOTAL ESTIMATED WEIGHT LBS. / KG.

FLAKT CANADA LTD.
NOV 13 1989
ISSUED

CRATING: ALL SMALL LOOSE ITEMS TO BE SHIPPED IN MARKED CRATES.

NOTE

'S' – FLAKT STOCK SENT TO FIELD

'Sd' – FLAKT STOCK SENT TO SHOP

'R' – FLAKT PURCHASE SENT TO FIELD

'Rd' – FLAKT PURCHASE SENT TO SHOP

SYM.	REVISION	DATE	BY	CHK'D

DELIVERY LIST

Flakt
Flakt Canada Ltd.

CUSTOMER: SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
DRAWN: B.B.
DWG.NO.: CO-A-12998
SUB.NO.: 100
PRODUCT: METRO RAIL PROJECT A740
CHECKED:
SHEET 2 OF 3
REV. NO.:
CONTRACT NO.: C-118-324-0773
TITLE: VENTILATION FANS
APPROVED:
ASSEMBLY DWG.:
DATE: OCT. 17/88

DELY. ITEM	QTY.	DESCRIPTION	DWG. No. OR DIM. AND MAT'L SPECS.	REV.	DELY. CODE	ESTIMATED WEIGHT	LINE NO.
	1	ACCESS DOOR SUB 005	CO-C-11147				1
	1	IMPELLER (160-80-10) SUB 001	CO-D-12365				2
	1	MOTOR SUB 016					3
	5	GASKET SUB 032	5'-2½" I.D.				4
	4	ANTI-VIBRATION PAD SUB 022					5
	1	BLADE ACTUATOR ASSY.- SUB 005	CO-D-12586				6
	1-SET	ASSEMBLY BOLTS SUB 032					7
							8
							9
003	1	FAN ASSEMBLY UF-041	CO-D-12543				10
		CONSISTING OF:-					11
	1	CASING SECTION SUB 005	CO-C-11271				12
	1	ANTI-STALL SECTION SUB 005	CO-D-12527				13
	2	FLEX. CONNECTION SUB 012	CO-C-11151				14
	1	ACCESS DOOR SUB 005	CO-C-11272				15
	1	IMPELLER (160-80-10) SUB 001	CO-D-12365				16
	1	MOTOR SUB 016					17
	5	GASKET SUB 032	5'-2½" I.D.				18
	2	HANGER SUPPORT FRAME-SUB 005	CO-C-11273				19
	1	BLADE ACTUATOR ASSY.- SUB 005	CO-D-12586				20
	1-SET	ASSEMBLY BOLTS SUB 032					21
							22
							23
							24
							25

NOTE: - REFER TO ASSEMBLY DRAWINGS FOR LOCATION OF ITEMS

MARKING: ALL SHIPPING ITEMS TO HAVE DELIVERY ITEM NO.'s AND SUB.NO.'s CLEARLY MARKED.

TOTAL ESTIMATED WEIGHT: LBS. / KG.

FLAKT CANADA LTD.
NOV 13 1989
ISSUED

CRATING: ALL SMALL LOOSE ITEMS TO BE SHIPPED IN MARKED CRATES.

NOTE

'S' - FLAKT STOCK SENT TO FIELD

'Sd' - FLAKT STOCK SENT TO SHOP

'R' - FLAKT PURCHASE SENT TO FIELD

'Rd' - FLAKT PURCHASE SENT TO SHOP

SYM.	REVISION	DATE	BY	CHK'D

DELIVERY LIST

Flakt
Flakt Canada Ltd.

CUSTOMER: SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
PRODUCT: METRO RAIL PROJECT A740
TITLE: VENTILATION FANS
CONTRACT NO.: 818-324-0773
DRAWN: B.B.
CHECKED:
APPROVED:
DWG.NO.: CO-A-12998
SHEET 3 OF 3
ASSEMBLY DWG.:
SUB.NO.: 100
REV. NO.:
DATE: OCT. 17/88

DELY. ITEM	QTY.	DESCRIPTION	DWG. No. OR DIM. AND MAT'L SPECS.	REV.	DELY. CODE	ESTIMATED WEIGHT	LINE NO.
004	2	FAN ASSEMBLY OTE	CO-D-12544				1
		EACH CONSISTING OF :-					2
	1	CASING SECTION SUB 005	CO-D-12381				3
	1	ANTI-STALL SECTION SUB 005	CO-D-12588				4
	2	FLEX. CONNECTION SUB 012	CO-C-11151				5
	1	ACCESS DOOR SUB 005	CO-C-11147				6
	1	IMPELLER (160-80-10) SUB 001	CO-D-12366				7
	1	MOTOR SUB 016					8
	5	GASKET SUB 032	5'-2½" I.D.				9
	4	ANT-VIBRATION PAD SUB 022					10
	1-SET	ASSEMBLY BOLTS SUB 032					11
							12
							13
005	2	FAN ASSEMBLY SVF	CO-D-12545				14
		EACH CONSISTING OF :-					15
	1	CASING SECTION SUB 005	CO-D-12383				16
	1	IMPELLER CASING SUB 005	CO-C-11149				17
	2	FLEX. CONNECTION SUB 012	CO-C-11152				18
	1	ACCESS DOOR SUB 005	CO-C-11150				19
	1	IMPELLER (224-112-12) SUB 001	CO-D-12364				20
	1	MOTOR SUB 016					21
	5	GASKET SUB 032	7'-4½" I.D.				22
	4	ANTI-VIBRATION PAD SUB 022					23
	1-SET	ASSEMBLY BOLTS SUB 032					24
							25

NOTE: - REFER TO ASSEMBLY DRAWINGS FOR LOCATION OF ITEMS

MARKING: ALL SHIPPING ITEMS TO HAVE DELIVERY ITEM NO.'s AND SUB.NO.'s CLEARLY MARKED.

TOTAL ESTIMATED WEIGHT LBS. / KG.

FLAKT CANADA LTD.
NOV 13 1989
ISSUED

CRATING: ALL SMALL LOOSE ITEMS TO BE SHIPPED IN MARKED CRATES.

NOTE

'S' - FLAKT STOCK SENT TO FIELD
'Sd' - FLAKT STOCK SENT TO SHOP
'R' - FLAKT PURCHASE SENT TO FIELD
'Rd' - FLAKT PURCHASE SENT TO SHOP

SYM.	REVISION	DATE	BY	CHK'D

DELIVERY LIST

Flakt
Flakt Canada Ltd.

CONTRACT NO. 018-324-0773	CUSTOMER S.C.R.T.D. - METRO RAIL PROJECT A740	DRAWN B.B.	DWG.NO. CO-A-12999	SUB.NO. 001
	PRODUCT VENTILATION FANS	CHECKED	SHEET 1 OF	REV. NO.
	TITLE IMPELLERS	APPROVED	ASSEMBLY DWG.	DATE OCT. 31/88

DELY. ITEM	QTY.	DESCRIPTION	DWG. No. OR DIM. AND MAT'L SPECS.	REV.	DELY. CODE	ESTIMATED WEIGHT	LINE NO.
		FAN ASSEMBLY EF	CO-D-12541				1
		FAN ASSEMBLY UF	CO-D-12542				2
		FAN ASSEMBLY UF-041	CO-D-12543				3
		FAN ASSEMBLY OTE	CO-D-12544				4
		FAN ASSEMBLY SVF	CO-D-12545				5
							6
							7
001	29	IMPELLER ASSY. 224-112-12	CO-D-12364			26,100	8
		EACH CONSISTING OF :-					9
	1	HUB	CO-C-11262				10
	1	DISC	CO-C-11288				11
	1	RIM	CO-C-11289				12
	12	LOCKING PLATE	CO-B-11017				13
	12	BLADE	CO-C-11294				14
							15
							16
002	10	IMPELLER ASSY. 160-80-10	CO-D-12365				17
							18
							19
							20
							21
							22
							23
							24
							25

NOTE: - REFER TO ASSEMBLY DRAWINGS FOR LOCATION OF ITEMS

MARKING: ALL SHIPPING ITEMS TO HAVE DELIVERY ITEM NO.'s AND SUB.NO.'s CLEARLY MARKED.

TOTAL ESTIMATED WEIGHT LBS. / KG.

CRATING ALL SMALL LOOSE ITEMS TO BE SHIPPED IN MARKED CRATES.

NOTE

FLAKT CANADA LTD.
NOV 13 1989
ISSUED

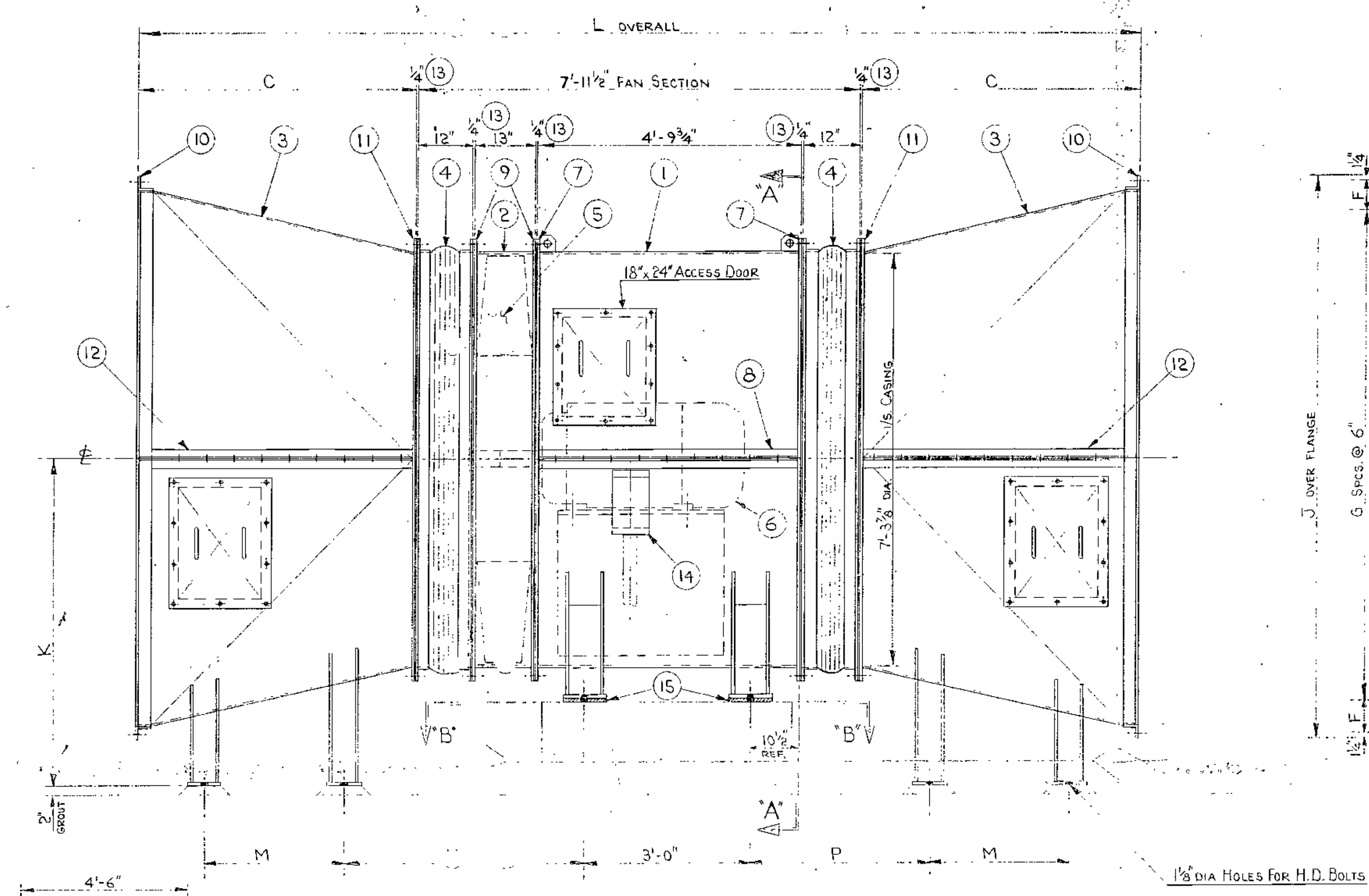
'S' - FLAKT STOCK SENT TO FIELD

'Sd' - FLAKT STOCK SENT TO SHOP

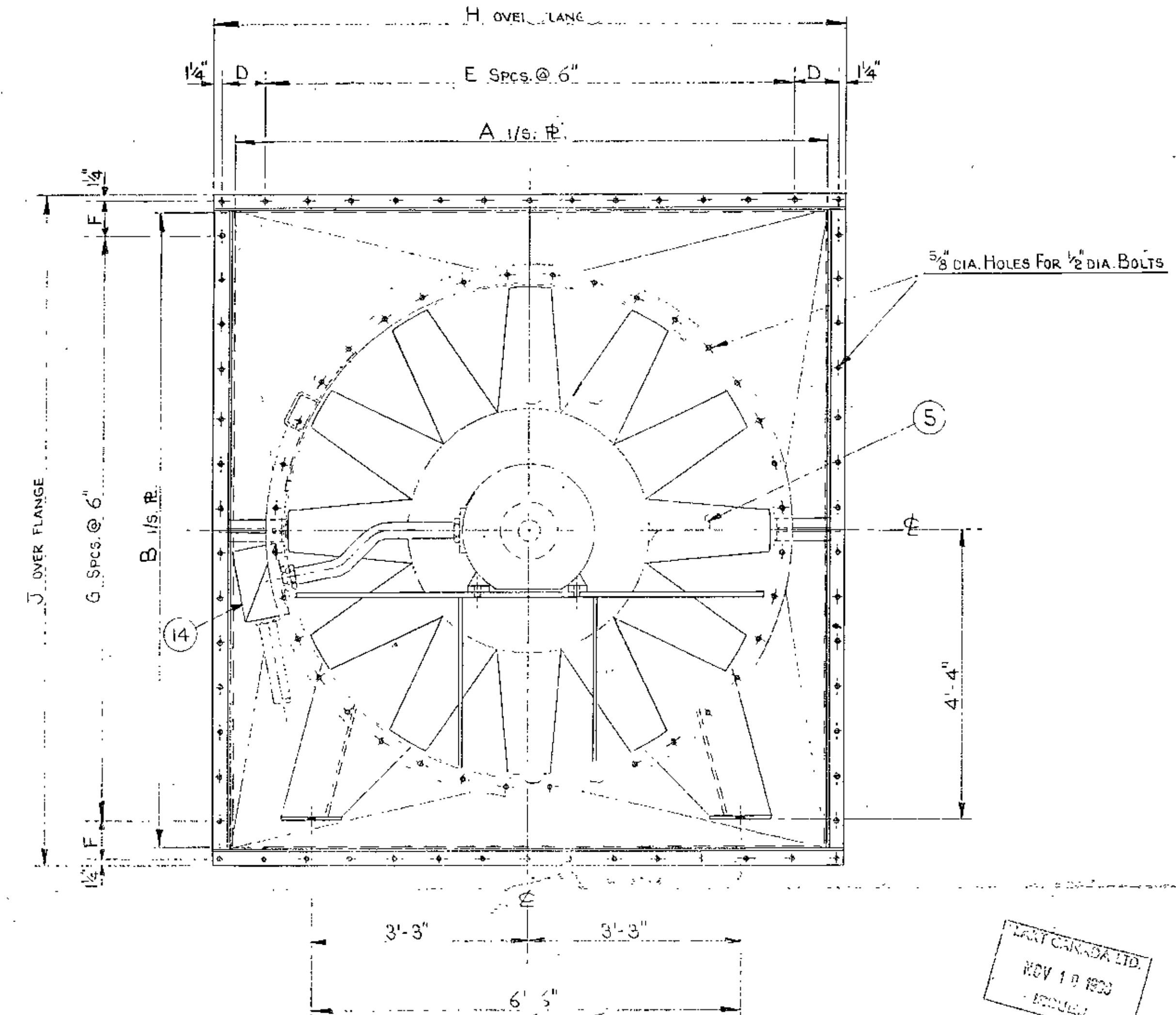
'R' - FLAKT PURCHASE SENT TO FIELD

'Rd' - FLAKT PURCHASE SENT TO SHOP

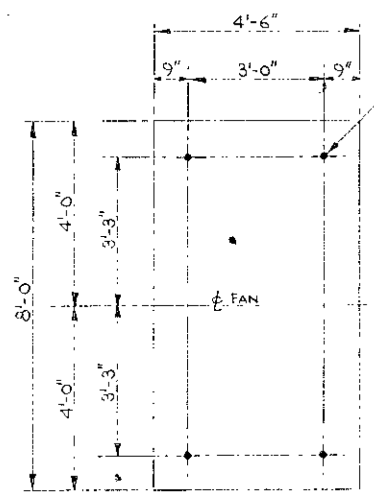
SYM.	REVISION	DATE	BY	CHK'D



SIDE ELEVATION



SECTION "A-A"



SECTION "B-B"

ARRANGEMENT HANDING (SEE TABLE)
L.H. ARRANGEMENT - AS DRAWN
R.H. ARRANGEMENT - ACCESS DOORS & CONDUIT BOX (14) ON FAR SIDE

ARR'G'T. HANDING	FAN DESIGNATION NO.
L.H.	EF-011, 012, 013, 021, 022, 023, 032, 041, 042, 051, 062, 072, 073, 074, 081, 083, 091, 093, 102
R.H.	EF-031, 052, 061, 071, 082, 084, 092, 101

FAN DESIGNATION NO.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	TRANSITION WT. (LB)	TOTAL WT. (LB.)	MOTOR H.P.
EF-011, 012, 013	10'-0"	10'-0"	5'-0"	5"	19	5"	19	10'-6½"	10'-6½"	6'-0"	18'-0"	2'-6"	4'-4"	3'-2"	1650	11,110	250
EF-021, 022, 023	8'-0"	12'-0"	7'-6"	5"	15	5"	23	8'-6½"	12'-6½"	7'-0"	23'-0"	4'-0"	4'-10"	3'-8"	2685	13,180	250
EF-031, 032, 041, 042	8'-0"	12'-0"	6'-6"	5"	15	5"	23	8'-6½"	12'-6½"	7'-0"	21'-0"	3'-0"	4'-10"	3'-8"	2175	12,160	250
EF-051, 052	8'-0"	9'-6"	4'-6"	5"	15	8"	17	8'-6½"	10'-0½"	6'-0"	17'-0"	2'-6"	4'-1"	2'-11"	1480	10,770	200
EF-061, 062	8'-0"	9'-6"	3'-9"	5"	15	8"	17	8'-6½"	10'-0½"	6'-0"	15'-6"	2'-0"	3'-11½"	2'-9½"	1100	10,010	200
EF-071, 072, 081, 082	7'-6"	10'-0"	4'-8"	5"	14	5"	19	8'-0½"	10'-6½"	6'-0"	17'-4"	2'-6"	4'-2"	3'-0"	1330	10,470	200
EF-073, 074, 083	10'-0"	10'-0"	4'-8"	5"	19	5"	19	10'-6½"	10'-6½"	5'-4"	17'-4"	2'-6"	4'-2"	3'-0"	1650	11,110	250
EF-084	10'-0"	10'-0"	5'-0"	5"	19	5"	19	10'-6½"	10'-6½"	5'-4"	18'-0"	2'-6"	4'-4"	3'-2"	1650	11,110	250
EF-091, 092, 093, 101, 102	7'-6"	10'-0"	4'-6"	5"	14	5"	19	8'-0½"	10'-6½"	6'-0"	17'-0"	2'-6"	4'-1"	2'-11"	1330	10,470	150 FANS 091 TO 093 / 200 FANS 101 & 102

REFERENCE DRAWINGS :-

IMPELLER ASSEMBLY	CO-D-12364
CASING SECTION	CO-D-12383
IMPELLER CASING	CO-C-11148
ACCESS DOOR	CO-C-11150
FLEXIBLE CONNECTION	CO-C-11152

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" · STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

FLAKT CANADA LTD. NOV 10 1989 ISSUED

FOR INFORMATION PURPOSES ONLY NOT TO BE USED FOR CONSTRUCTION

QUANTITY	ITEM	DESCRIPTION	DWG. NO. OR DIM.	MATERIAL	WEIGHT
4	15	VIBRATION PAD	½" THK.	NEOPRENE	
1	14	CONDUIT BOX		CAST IRON	
5	13	GASKET	3" WIDE x ¼" THK.	SOLID TYPE NEOPRENE	
8	12	TRANSITION JOINT FLANGE	L 2"x2"x¼"	GALV STEEL	
2	11	TRANSITION FLANGE	F.B. 3"x⅜"	GALV. STEEL	
2	10	TRANSITION FLANGE	L 3"x3"x5/16"	GALV. STEEL	
2	9	IMPELLER CASING FLANGE	F.B. 3"x⅜"	A-36	
4	8	CASING JOINT FLANGE	L 2"x2"x¼"	A-36	
2	7	CASING FLANGE	F.B. 3"x⅜"	A-36	
1	6	MOTOR (H.P. - SEE TABLE)	FRAME SIZE 449T (250 & 200 H.P.) 445T (150 H.P.)		
1	5	IMPELLER	SIZE 224-112-12	STEEL WITH ALUM. BLADES	
2	4	FLEXIBLE CONNECTION		TEXCOAT 300 TEFLON COATED	
2	3	TRANSITION (HORIZ. SPLIT)	10 GA. PL.	GALV. STEEL	
1	2	IMPELLER CASING	¼" PL.	A-36	
1	1	CASING (HORIZ. SPLIT)	¼" PL.	A-36	

VARIANT

Flakt Canada Ltd.

FLAKT CANADA LTD.

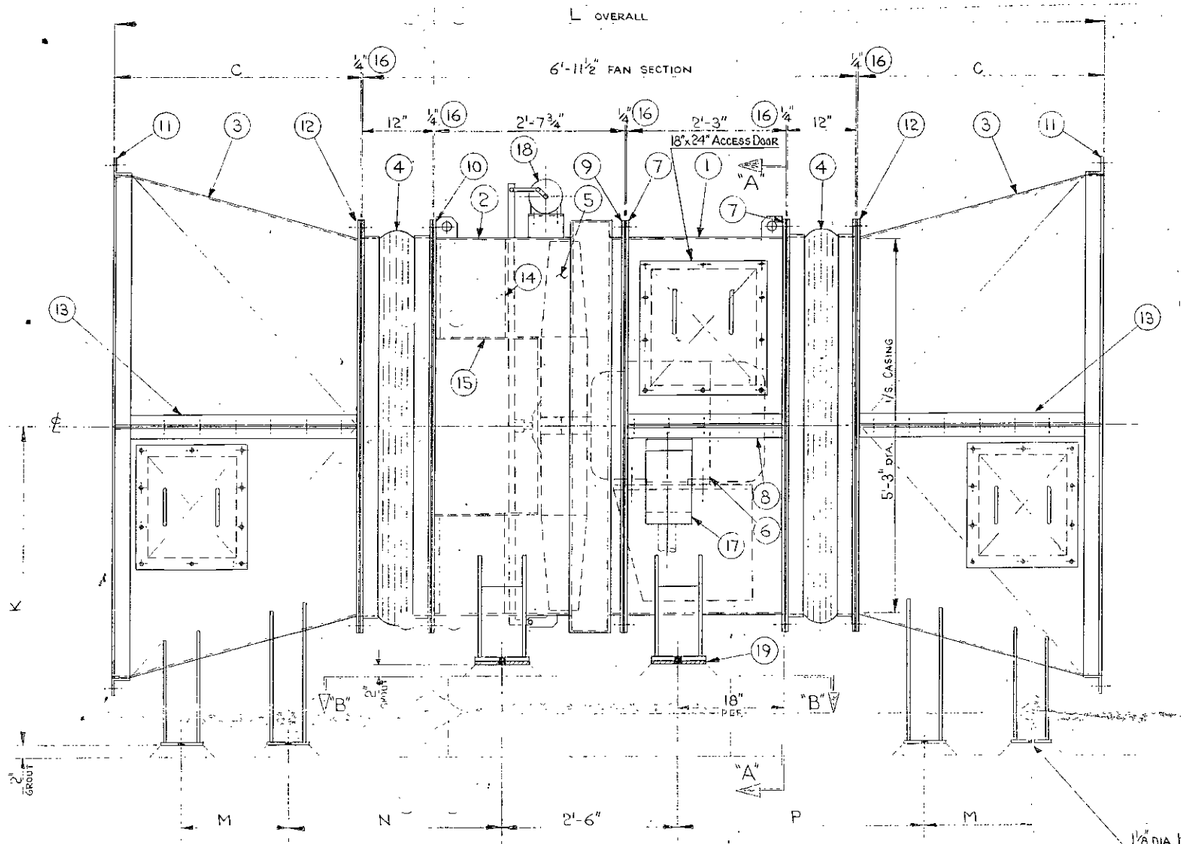
CONTRACT NO	QUOTATION NO	REG NO	NEXT ASSY	REF DWG	DRAWN	DATE	SUB NO.
C-118-324-0773	SFC				B.B.	6 APR. 88	100

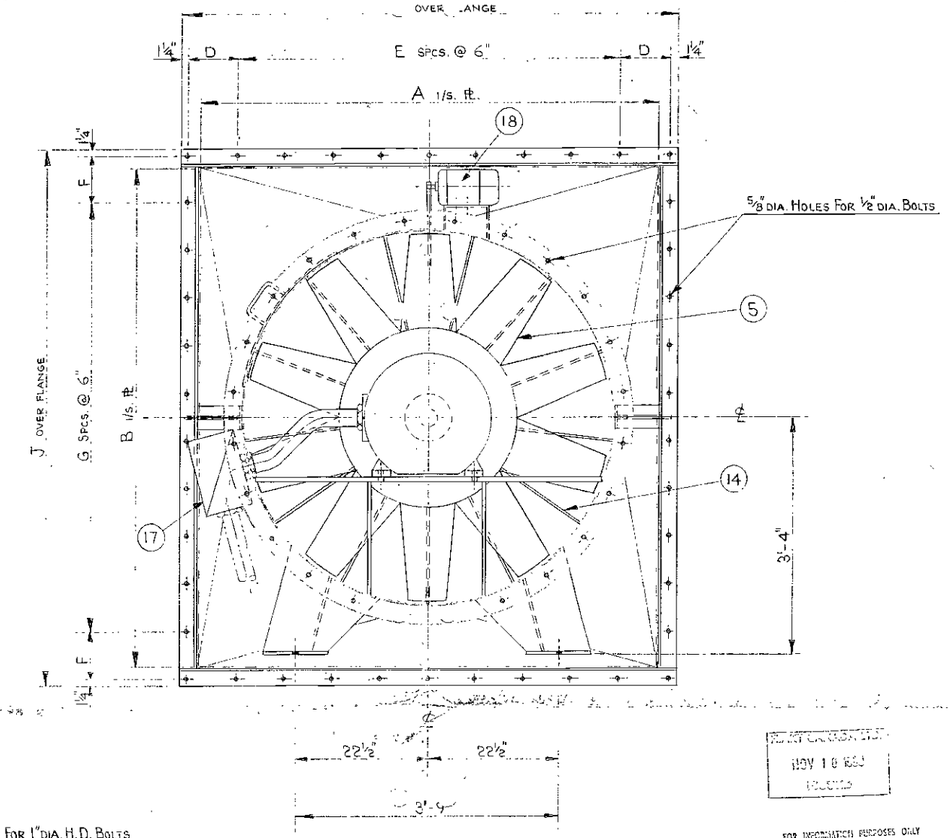
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT - A740
GENERAL ARRANGEMENT OF FANS EF

CHKD. APPROVED DWG. TYPE
SCALE ¾" = 1'-0" CUSTOMERS REF
DWG NO CO-D-12359 REV. D

SYM.	REVISIONS	DATE	BY	CHKD
D	DIM. K WAS 6'-0" FOR FANS 073 TO 084. DELETED FOUND. BOLT DETAIL (SECT. C-C). DELETED GROUT UNDER FAN SUPPT. LEGS	OCT. 20/89	B.B.	
C	CASING I.D. WAS 7'-4 3/16"	MAY 1/89	B.B.	
B	REVISED DIMENSIONS "P". ADDED MAT'L TO ITEMS 4 & 5.	23 JAN. 89	B.B.	
A	REV'D. IN ACCORD. WITH CUST. MARKED PRINT DATED 17 JUN. 88	16 AUG. 88	B.B.	

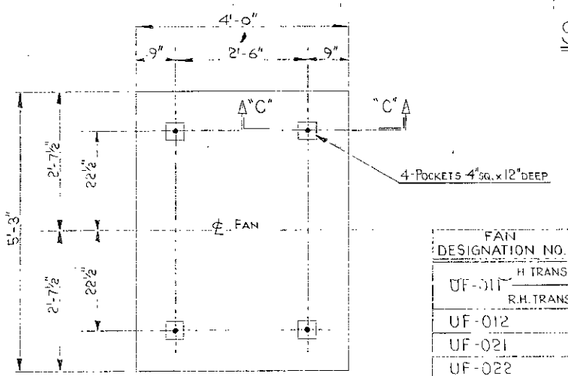
REG 611





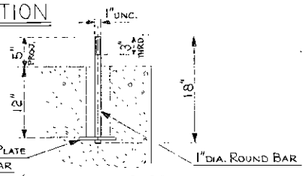
1⅛" DIA. HOLES FOR 1" DIA. H.D. BOLTS

SECTION "A-A"



SECTION "B-B"

SIDE ELEVATION



SECTION "C-C"

ARRANGEMENT HANDING (SEE TABLE):-

L.H. ARRANGEMENT - AS DRAWN

R.H. ARRANGEMENT - ACCESS DOORS & CONDUIT BOX (17) ON FAR SIDE

FAN DESIGNATION NO.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	TRANSITION WT. (LB)	TOTAL WT. (LB)	ARRGT. HANDING
UF-011 H TRANS.	6'-6"	7'-0"	4'-6"	5"	12	5"	13	7'-0½"	7'-6½"	3'-8"	16'-0"	2'-6"	2'-11½"	3'-6½"	1020	5915	R.H.
UF-011 R.H. TRANS.	4'-10"			4"	9			5'-4½"							925		
UF-012	6'-6"	7'-0"	3'-6"	5"	12	5"	13	7'-0½"	7'-6½"	4'-6"	14'-0"	18"	2'-11½"	3'-6½"	795	5560	L.H.
UF-021	5'-0"	8'-0"	4'-6"	5"	9	5"	15	5'-6½"	8'-6½"	5'-0"	16'-0"	2'-6"	2'-11½"	3'-6½"	1205	6380	R.H.
UF-022	5'-0"	8'-0"	4'-0"	5"	9	5"	15	5'-6½"	8'-6½"	5'-0"	15'-0"	2'-0"	2'-11½"	3'-6½"	875	5720	L.H.
UF-031.032	8'-0"	5'-0"	4'-3"	5"	15	5"	9	8'-6½"	5'-6½"	5'-0"	15'-6"	2'-3"	2'-11½"	3'-6½"	930	5830	R.H.
UF-041	SEE DRAWING NO. CO-D-12485																
UF-042	6'-0"	6'-0"	2'-7"	5"	11	5"	11	6'-6½"	6'-6½"	4'-0"	12'-2"	0"	3'-3"	3'-10"	615	5200	L.H.
UF-051	6'-8"	6'-0"	3'-6"	3"	13	5"	11	7'-2½"	6'-6½"	4'-4"	14'-0"	18"	2'-11½"	3'-6½"	750	5470	L.H.
UF-052	6'-8"	6'-0"	2'-9"	3"	13	5"	11	7'-2½"	6'-6½"	4'-4"	12'-6"	0"	3'-4"	3'-11"	590	5150	L.H.

REFERENCE DRAWINGS

IMPELLER ASSEMBLY	CO-D-12365
CASING SECTION	CO-D-12381
ANTI-STALL SECTION	CO-D-12382
ACCESS DOOR	CO-C-11147
FLEXIBLE CONNECTION	CO-C-11151

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL ..ERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

QTY	ITEM	DESCRIPTION	DWG. NO OR DIM.	MATERIAL	WEIGHT
4	19	VIBRATION PAD	½" THK.	NEOPRENE	
1	18	BLADE ACTUATOR			
1	17	CONDUIT BOX		CAST IRON	
5	16	GASKET	3" WIDE x ¼" THK.	SOLID TYPE NEOPRENE	
1	15	CORE SECTION	12 GA. ft.	A-36	
13	14	GUIDE VANE	12 GA. ft.	A-36	
8	13	TRANSITION JOINT FLANGE	L 2" x 2" x ¼"	GALV. STEEL	
2	12	TRANSITION FLANGE	F.B. 3" x ⅜"	GALV. STEEL	
2	11	TRANSITION FLANGE	L 3" x 3" x 5/16"	GALV. STEEL	
1	10	ANTI-STALL FLANGE	F.B. 3" x ⅜"	A-36	
1	9	ANTI-STALL FLANGE	L 3" x 2" x ⅜"	A-36	
4	8	CASING JOINT FLANGE	L 2" x 2" x ¼"	A-36	
2	7	CASING FLANGE	F.B. 3" x ⅜"	A-36	
1	6	MOTOR 50 H.P.	FRAME SIZE 404T		
1	5	IMPELLER	SIZE 160-80-10	CAST ALUM.	
2	4	FLEXIBLE CONNECTION		TEXCOAT 300 TEFLON COATED	
2	3	TRANSITION (HORIZ. SPLIT)	10 GA. ft.	GALV. STEEL	
1	2	ANTI-STALL SECTION	¼" ft.	A-36	
1	1	CASING (HORIZ. SPLIT)	¼" ft.	A-36	

SYM.	REVISIONS	DATE	BY	CHKD
C	I.D. OF CASING WAS 5'-2 3/16"	13 JAN. 89	B.B.	
B	ADDED MATERIAL TO IMPELLER & FLEX. CONN.	23 JAN. 89	B.B.	
A	REV'D. IN ACCORD. WITH CUST. MARKED PRINT DATED 17 JUN. 88	18 AUG. 88	B.B.	

REG 611

FLAKT CANADA LTD.

VARIANT

CONTRACT NO.	QUOTATION NO	REG. NO	NEXT ASSY	REF. DWG	DRAWN	DATE	SUB. NO
C-118-324-0773	SFC				B.B	7 APR. 88	100

CHKD.	APPROVED	DWG. TYPE

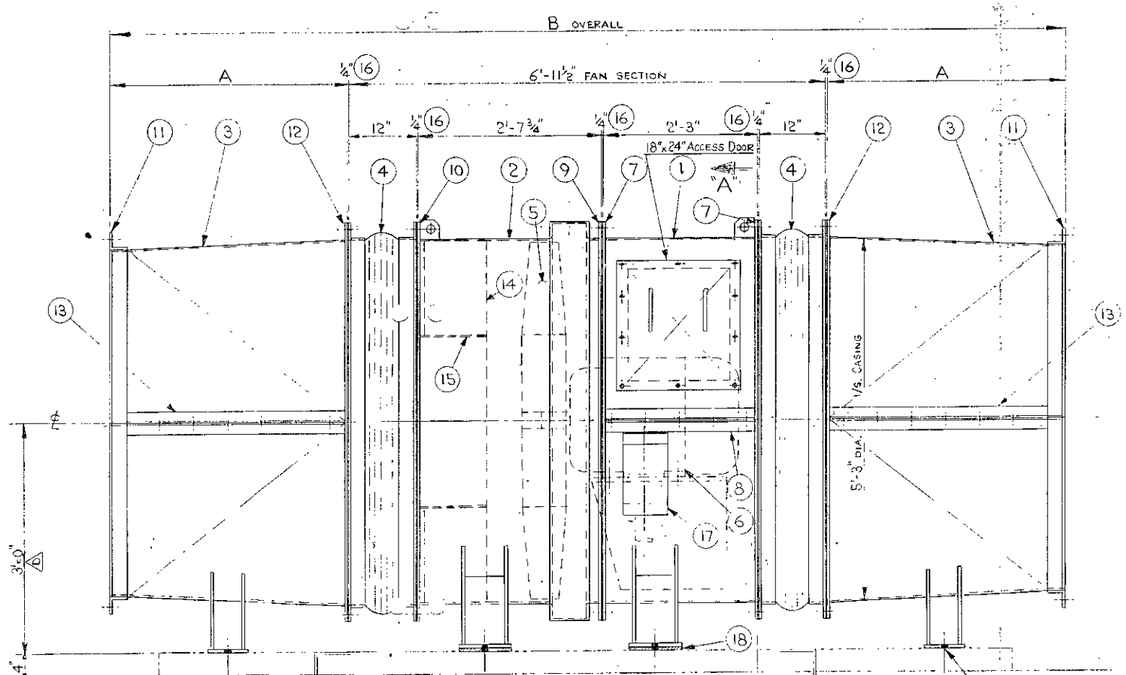
SCALE 1" = 1'-0" | CUSTOMERS REF

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

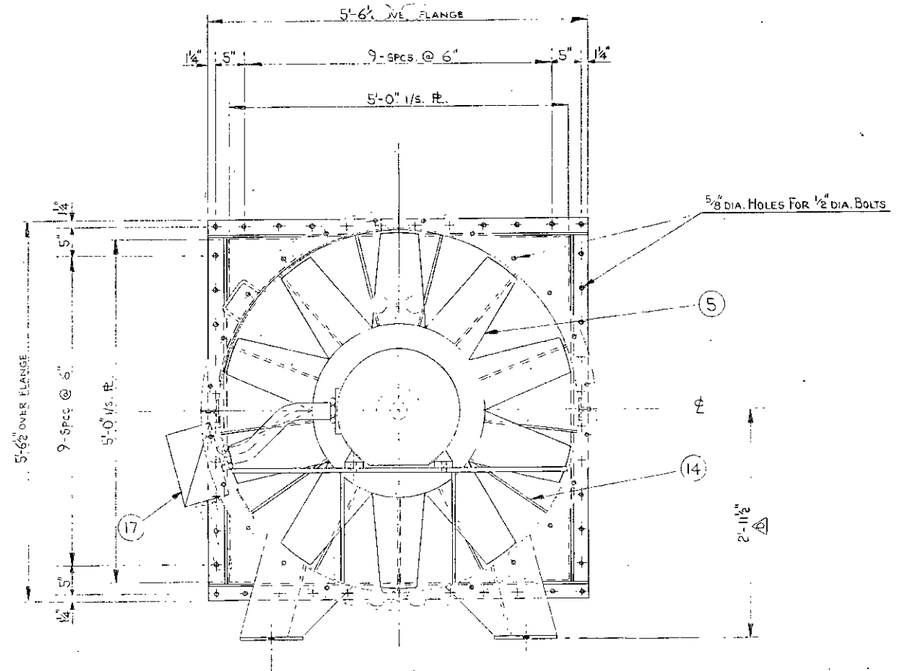
METRO RAIL PROJECT - A740

GENERAL ARRANGEMENT OF FANS UF

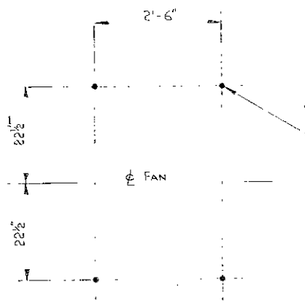
DWG NO CO-D-12360 | REV C



SIDE ELEVATION



SECTION "A-A"



SECTION "B-B"

FAN DESIGNATION NO	A	B	D	E	TRANSITION WT. (LB)	TOTAL WT. (LB)
OTE-1L	2'-9"	12'-6"	3'-4"	3'-11"	570	5160
OTE-2L	2'-3"	11'-6"	3'-1"	3'-8"	480	4970

1⅛ DIA. HOLES FOR H.D. BOLTS

REFERENCE DRAWINGS

IMPELLER ASSEMBLY	CO-D-12366
CASING SECTION	CO-D-12331
ANTI-STALL SECTION	CO-D-12588
ACCESS DOOR	CO-C-11147
FLEXIBLE CONNECTION	CO-C-11151

QUANTITY	ITEM	DESCRIPTION	DWG NO. OR DIM.	MATERIAL	WEIGHT
4	18	VIBRATION PAD	⅛" THK.	NEOPRENE	
1	17	CONDUIT BOX		CAST IRON	
5	16	GASKET	3" WIDE x ¼" THK.	SOLID TYPE NEOPRENE	
1	15	CORE SECTION	12 GA. Ø.	A-36	
13	14	GUIDE VANE	12 GA. Ø.	A-36	
8	13	TRANSITION JOINT FLANGE	L 2"x2"x¼"	GALV. STEEL	
2	12	TRANSITION FLANGE	F.B. 3"x⅜"	GALV. STEEL	
2	11	TRANSITION FLANGE	L 3"x3"x5/16"	GALV. STEEL	
1	10	ANTI-STALL FLANGE	F.B. 3"x⅜"	A-36	
1	9	ANTI-STALL FLANGE	L 3"x2"x⅜"	A-36	
4	8	CASING JOINT FLANGE	L 2"x2"x¼"	A-36	
2	7	CASING FLANGE	F.B. 3"x⅜"	A-36	
1	6	MOTOR ..... 50 H.P.	FRAME SIZE 404T		
1	5	IMPELLER	SIZE 160-80-10	CAST ALUM.	
2	4	FLEXIBLE CONNECTION		TEXCOAT 300 TEFLON COATED	
2	3	TRANSITION (HORIZ. SPLIT)	10 GA. Ø.	GALV. STEEL	
1	2	ANTI-STALL SECTION	¼" Ø.	A-36	
1	1	CASING (HORIZ. SPLIT)	¼" Ø.	A-36	

SYM.	REVISIONS	DATE	BY	CHKD
D	DIM. 3'-0" WAS 3'-1½". DIM. 2'-11½" WAS 3'-4". DELETED GROUT UNDER I.S.S.	NOV. 6/89	B.B.	
C	I.D. OF CASING WAS 51-2⅜"	15 MAY 89	B.B.	
B	ADDED MATERIAL TO IMPELLER & FLEX. CONN.	23 JAN 89	B.B.	
A	REV'D. IN ACCORD. WITH CUST. MARKED PRINT DATED 17 JUN. 88	16 AUG. 88	B.B.	

REG 611

FLAKT CANADA LTD.
NOV 15 1989
ISSUED

FOR INFORMATION PURPOSES ONLY NOT TO BE USED FOR CONSTRUCTION

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS) "R M" (S)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

VARIANT

Flakt Canada Ltd

FLAKT CANADA LTD.

CONTRACT NO.	QUOTATION NO.	REG. NO.	NEXT ASSY.	REF. DWG.	DRAWN	DATE	SUB NO.
C-113-324-0773	SFC				B.B.	7 APR. 88	100

CHKD | APPROVED | DWG. TYPE

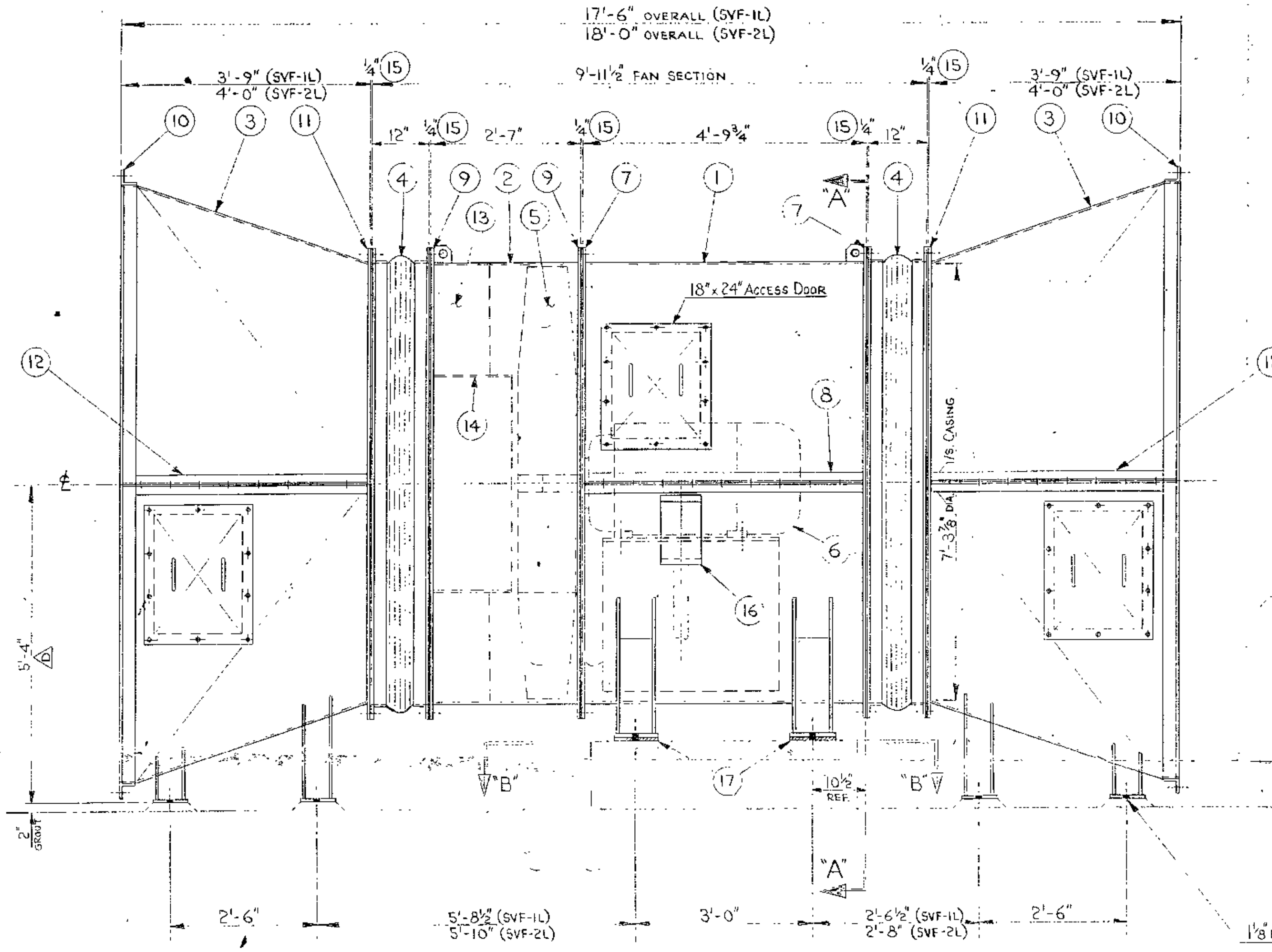
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

METRO RAIL PROJECT - A740

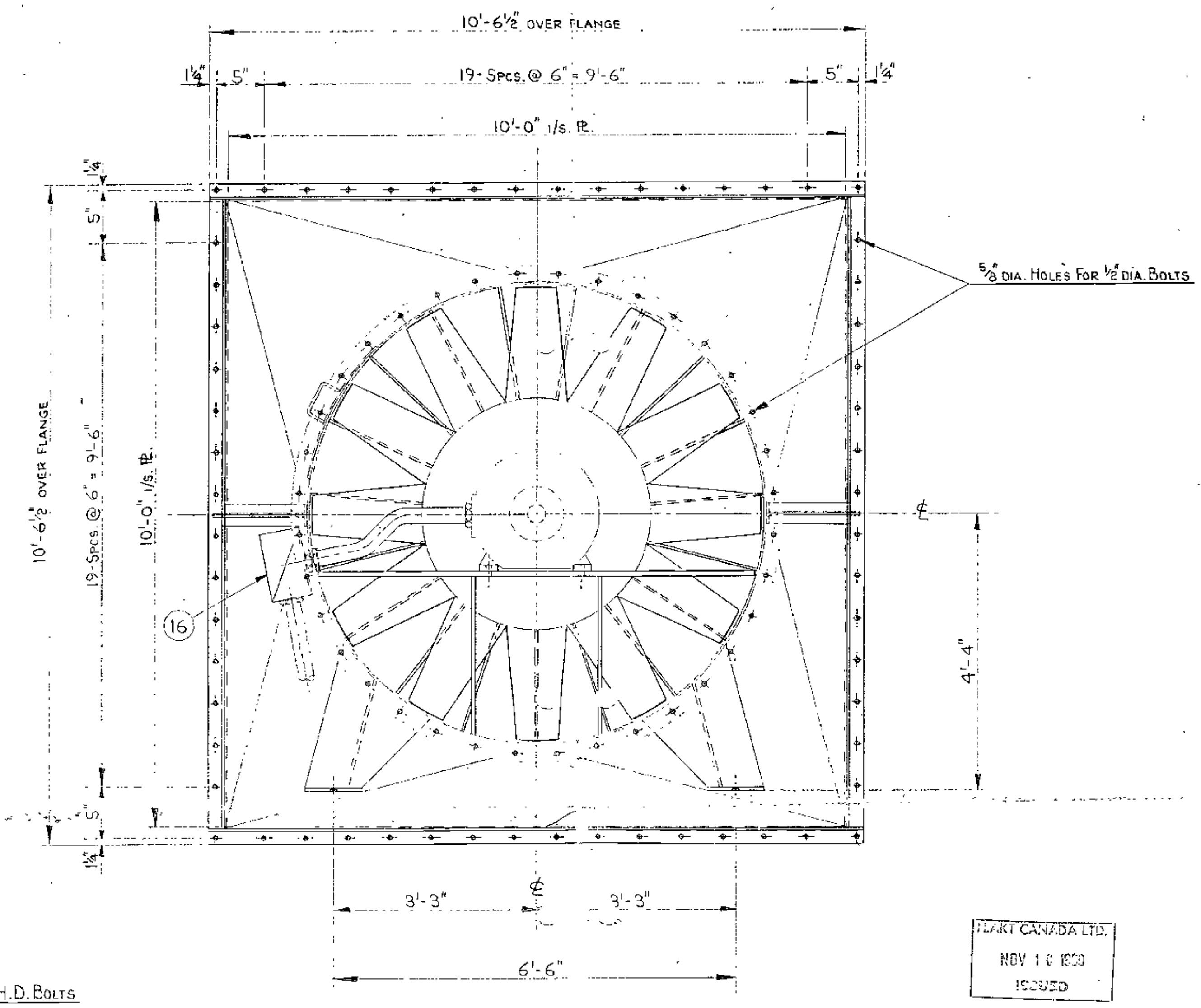
GENERAL ARRANGEMENT OF FANS OTE

SCALE 1" = 1'-0" | CUSTOMERS REF

DWG NO. CO-D-12361 | REV. D



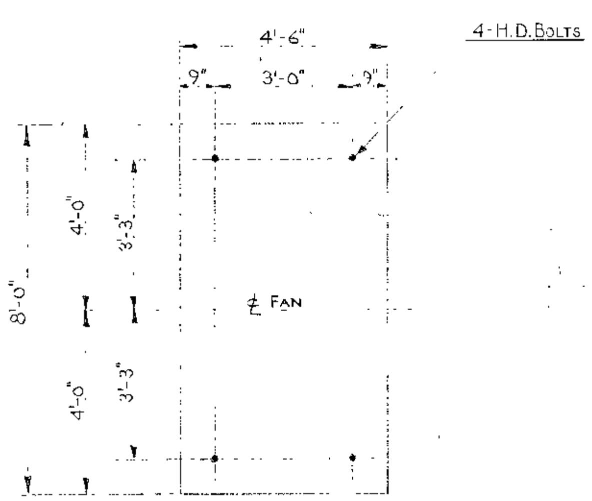
SIDE ELEVATION



SECTION "A-A"

FLAKT CANADA LTD.
NOV 1 0 1989
ISSUED

FOR INFORMATION PURPOSES ONLY
NOT TO BE USED FOR CONSTRUCTION



SECTION "B-B"

REFERENCE DRAWINGS

IMPELLER ASSEMBLY	CO-D-12364
CASING SECTION	CO-D-12383
IMPELLER CASING	CO-C-11149
ACCESS DOOR	CO-C-11150
FLEXIBLE CONNECTION	CO-C-11152

WEIGHTS

FAN SECTION	9,100 LB.
TRANSITIONS	2,800 LB.
TOTAL	11,900 LB.

QUANTITY	ITEM	DESCRIPTION	DWG NO OR DIM.	MATERIAL	WEIGHT
4	17	VIBRATION PAD	½" THK.	NEOPRENE	
1	16	CONDUIT BOX		CAST IRON	
5	15	GASKET	3" WIDE x ¼" THK	SOLID TYPE NEOPRENE	
1	14	CORE SECTION	¼" ℞.	A-36	
19	13	GUIDE VANE	¼" ℞.	A-36	
8	12	TRANSITION JOINT FLANGE	L 2" x 2" x ¼"	GALV. STEEL	
2	11	TRANSITION FLANGE	F.B. 3" x ⅜"	GALV. STEEL	
2	10	TRANSITION FLANGE	L 3" x 3" x 5/16"	GALV. STEEL	
2	9	IMPELLER CASING FLANGE	F.B. 3" x ⅜"	A-36	
4	8	CASING JOINT FLANGE	L 2" x 2" x ¼"	A-36	
2	7	CASING FLANGE	F.B. 3" x ⅜"	A-36	
1	6	MOTOR 250 H.P	FRAME SIZE 449T		
1	5	IMPELLER	SIZE 224-112-12	STEEL WITH ALUM. BLADES	
2	4	FLEXIBLE CONNECTION		TEXCOAT 300 TEFLON COATED	
2	3	TRANSITION (HORIZ SPLIT)	10 GA. ℞.	GALV. STEEL	
1	2	IMPELLER CASING	¼" ℞.	A-36	
1	1	CASING (HORIZ. SPLIT)	¼" ℞.	A-36	

VARIANT

Flakt Canada Ltd.

FLAKT CANADA LTD.

CONTRACT NO.	QUOTATION NO	REG NO	NEXT ASSY	REF DWG	DRAWN	DATE	SUB. NO.
C118-324-0773	SFC				B.B.	11 APR. 88	100

CHKD | APPROVED | DWG TYPE

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT – A740
GENERAL ARRANGEMENT OF FANS SVF-1L, -2L

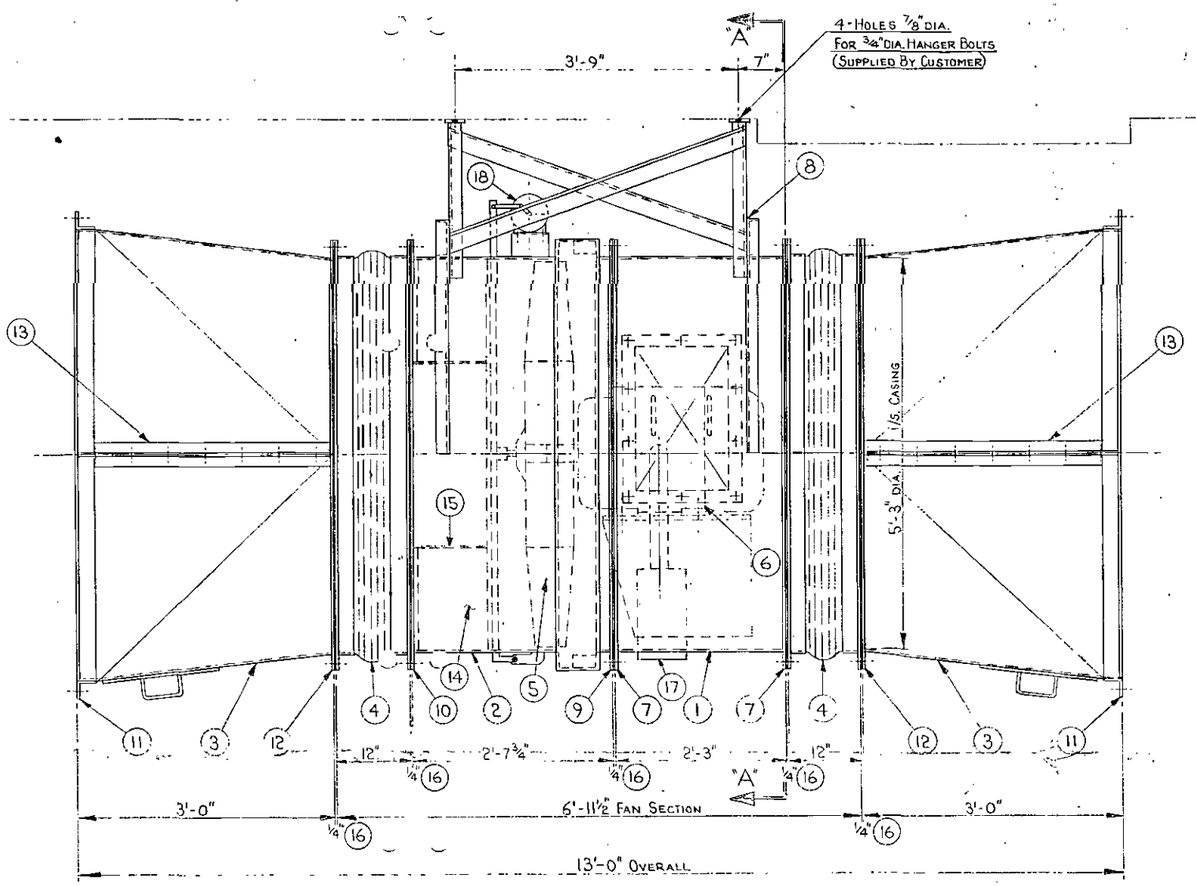
SCALE ¾" = 1'-0" | CUSTOMERS REF

DWG NO CO-D-12362 | REV D

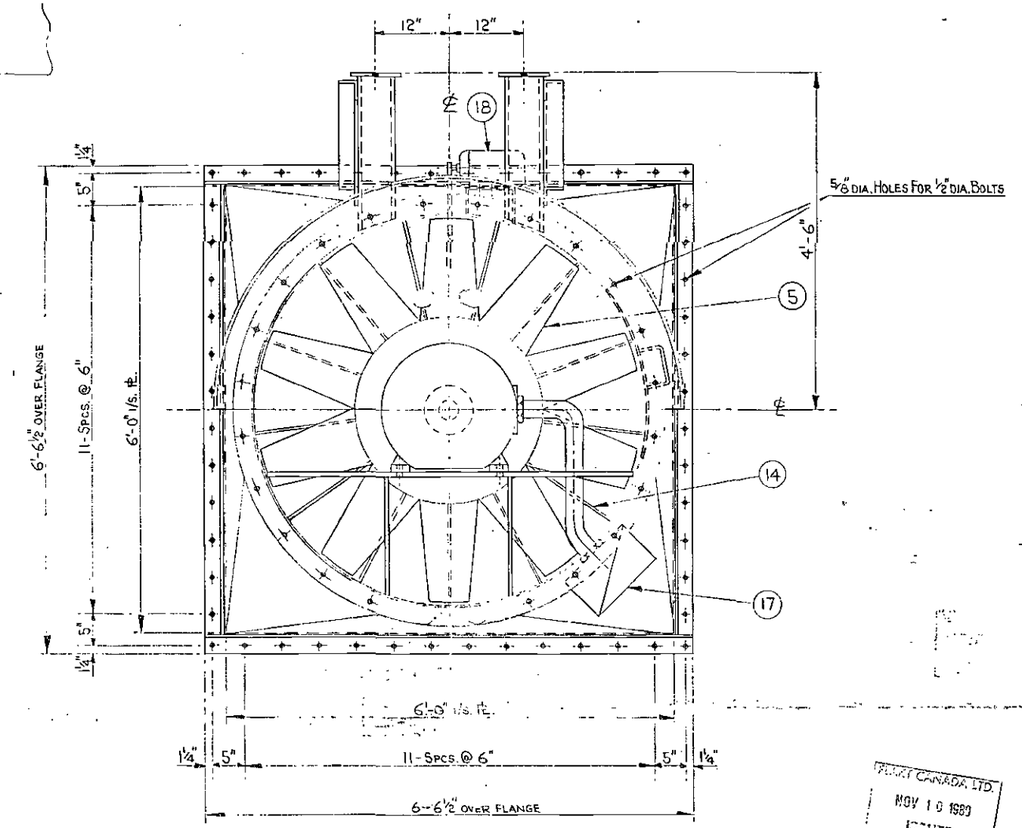
TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

SYM.	REVISIONS	DATE	BY	CHKD
D	DIM. TO ℄ 5'-4" WAS 6'-0". DELETED GROUT UNDER FAN LEGS. DELETED FOUND. BOLT DETAIL (SECT. C-C)	OCT. 23/89	B.B.	
C	CASING I.D. WAS 7'-4 3/16"	MAY 1/89	B.B.	
B	ADDED MATERIAL TO IMPELLER & FLEX. CONN	23 JAN. 89	B.B.	
A	REV'D. IN ACCORD. WITH CUST. MARKED PRINT DATED 17 JUN. 88	16 AUG. 88	B.B.	

REG 611



SIDE ELEVATION



SECTION "A-A"

FLAKT CANADA LTD. NOV 19 1989 ISSUED

FOR INFORMATION PURPOSES ONLY NOT TO BE USED FOR CONSTRUCTION

APPROXIMATE WEIGHTS

FAN SECTION	3970 LB.
TRANSITIONS (2@720)	1440 LB.
TOTAL WEIGHT	5410 LB.

REFERENCE DRAWINGS

IMPELLER ASSEMBLY	CO-D-12365
CASING SECTION	CO-C-11271
ANTI-STALL SECTION	CO-D-12527
ACCESS DOOR	CO-C-11272
FLEXIBLE CONNECTION	CO-C-11151
HANGER SUPPORT FRAME	CO-C-11273

QUANTITY	ITEM	DESCRIPTION	DWG NO. OR DIM.	MATERIAL	WEIGHT
1	18	BLADE ACTUATOR			
1	17	CONDUIT BOX		CAST IRON	
5	16	GASKET	3" WIDE x 1/4" THK.	SOLID TYPE NEOPRENE	
1	15	CORE SECTION	12 GA. PL.	A-36	
13	14	GUIDE VANE	12 GA. PL.	A-36	
8	13	TRANSITION JOINT FLANGE	L 2" x 2" x 1/4"	GALV. STEEL	
2	12	TRANSITION FLANGE	F.B. 3" x 3/8"	GALV. STEEL	
2	11	TRANSITION FLANGE	L 3" x 3" x 5/16"	GALV. STEEL	
1	10	ANTI-STALL FLANGE	F.B. 3" x 3/8"	A-36	
1	9	ANTI-STALL FLANGE	L 3" x 2" x 3/8"	A-36	
1	8	HANGER SUPPORT FRAME	C 6 x 13#	A-36	
2	7	CASING FLANGE	F.B. 3" x 3/8"	A-36	
1	6	MOTOR 50 H.P.	FRAME SIZE 404T		
1	5	IMPELLER	SIZE 160-80-10	CAST ALUM.	
2	4	FLEXIBLE CONNECTION		TEXCOAT 300 TEFLON COATED	
2	3	TRANSITION (HORIZ. SPLIT)	10 GA. PL.	GALV. STEEL	
1	2	ANTI-STALL SECTION	1/4" PL.	A-36	
1	1	CASING	1/4" PL.	A-36	

VARIANT

Flakt Canada Ltd. **FLAKT CANADA LTD.**

CONTRACT NO.	QUOTATION NO	REG. NO	NEXT ASSY.	REF. DWG	DRAWN	DATE	SUB NO
C-118-324-0773	SFC				B.B.	15 AUG. 88	100
					CHKD.	APPROVED	DWG TYPE

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT - A740
GENERAL ARRANGEMENT OF FAN UF-041

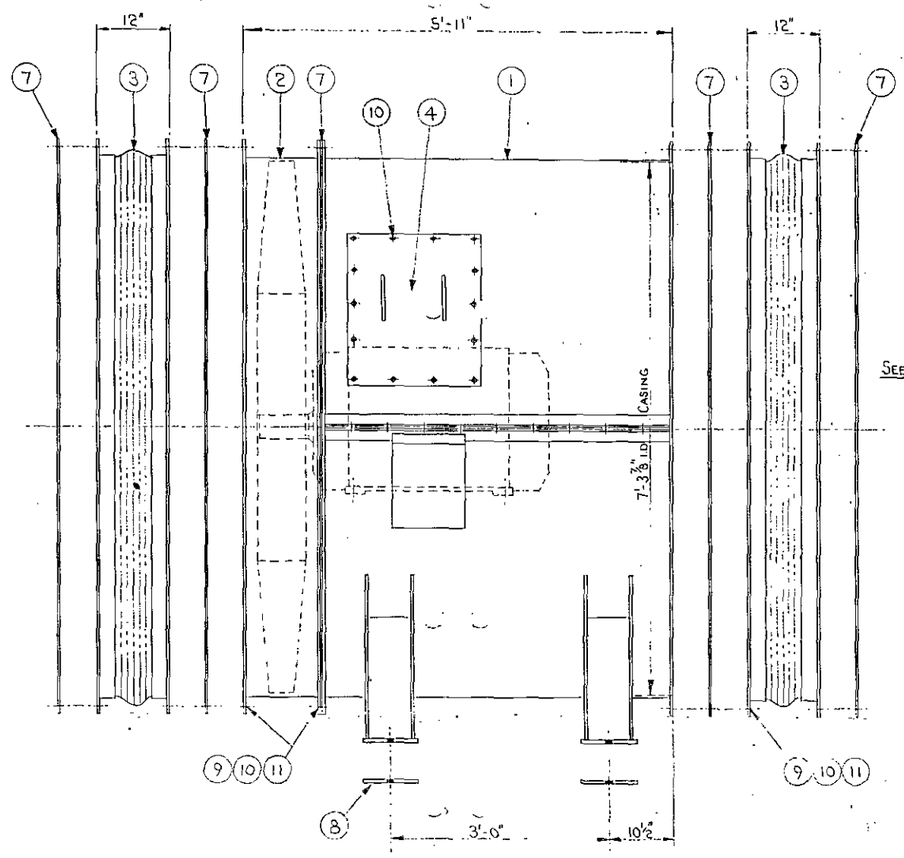
SCALE 1" = 1'-0" | CUSTOMERS REF.

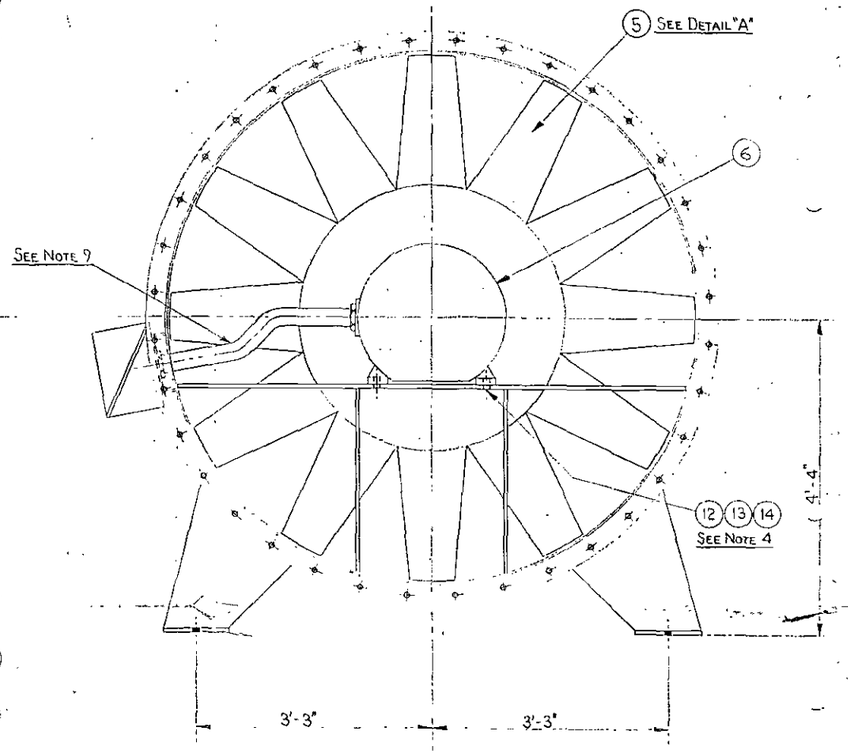
DWG NO CO-D-12485 | REV B

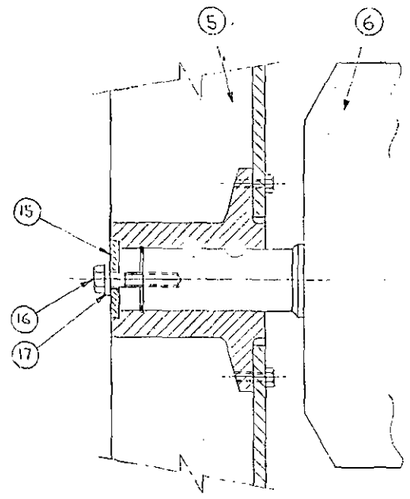
TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS ... MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

SYM.	REVISIONS	DATE	BY	CHKD
B	I.D. OF CASING WAS 5'-2 3/16"	15 MAY 89	B.B.	
A	ADDED MATERIAL TO IMPELLER & FLEX. CONN.	23 JAN. 89	B.B.	

REG 611







DETAIL "A"

NOTES

1. MOTOR BASE PLATE IN CASING SECTION ① SHOULD BE CHECKED TO ENSURE THAT, IF NECESSARY, MOTOR CAN BE SHIMMED UP FOR INSTALLATION OF IMPELLER.
2. MOTOR SHOULD BE MOUNTED IN CASING SECTION AND IMPELLER CASING ② BOLTED TO CASING SECTION.
3. USING AN ADJUSTABLE EXTENSION ARM ATTACHED TO MOTOR SHAFT, MOTOR SHOULD BE CENTRALISED WITHIN IMPELLER CASING.
4. ON COMPLETION OF ABOVE, MOTOR CAN BE LOCKED IN POSITION USING BOLTS ⑫, NUTS ⑬ AND WASHERS ⑭. TORQUE MOTOR HOLD DOWN BOLTS TO 240 LB.FT.
5. DRILL AND DOWEL ¾" DIA. AT THREE PLACES IN MATING FLANGES OF CASING SECTION AND IMPELLER CASING, THEN REMOVE IMPELLER CASING.
6. IMPELLER ASSEMBLY ⑤ CAN BE INSTALLED ON MOTOR SHAFT AND LOCKED IN PLACE WITH HUB WASHER ⑮, BOLT ⑯ AND SPRING WASHER ⑰. APPLY LOCTITE 242 TO THREAD OF BOLT BEFORE ASSEMBLY AND TORQUE TO 30 LB.FT.
7. RE-INSTALL IMPELLER CASING TO CASING SECTION, USING DOWELS FOR ALIGNMENT.
8. CLEARANCE BETWEEN TIP OF EACH BLADE AND INSIDE OF IMPELLER CASING TO BE CHECKED AND MAINTAINED AT 0.150".
9. CONDUIT, FITTINGS AND HARDWARE TO BE SIZED FOR MOTOR PER N.E.C. STANDARD.

FLAKT CANADA LTD.
NOV 10 1989
ISSUED
FOR INFORMATION PURPOSES ONLY
THIS DRG IS NOT TO BE USED FOR CONSTRUCTION

QUANTITY	ITEM	DESCRIPTION	DWG NO. OR DIM.	MATERIAL	WEIGHT
1	17	SPRING WASHER	¾" DIA.	S.S. 316	
1	16	HEX. HD. BOLT	¾" UNC. x 4" LG.	S.S. 316	
1	15	HUB WASHER	CO-A-13070		
4	14	FLAT WASHER	⅜" DIA.	S.S. 316	
4	13	HEX. NUT	⅜" UNC.	S.S. 316	
4	12	HEX. HD. BOLT	⅜" UNC. x 2¾" LG.	S.S. 316	
108	11	FLAT WASHER	½" DIA.	S.S. 316	
122	10	HEX. NUT	½" UNC.	S.S. 316	
108	9	HEX. HD. BOLT	½" UNC. x 1¾" LG.	S.S. 316	
4	8	ANTI-VIBRATION PAD			
5	7	GASKET			
1	6	MOTOR (150HP@1200R.P.M.) FANS EF-091,092 & 093 ONLY	RELIANCE - FRAME 445TY		1410
1	6	MOTOR (200/250HP@1200RPM) ALL FANS EXCEPT EF-091,092 & 093	RELIANCE - FRAME 449TY		2100
1	5	IMPELLER (224-112-12)	CO-D-12364		900
1	4	ACCESS DOOR	CO-C-11150		45
2	3	FLEXIBLE CONNECTION	CO-C-11152		650
1	2	IMPELLER CASING	CO-C-11148		435
1	1	CASING SECTION	CD-D-12383		2825

VARIANT

Flakt FLAKT CANADA LTD.

CONTRACT NO.	QUOTATION NO.	REG. NO.	NEXT ASSY	REF DWG	DRAWN	DATE	SUB NO.
C-118-324-0773	SFC				B.B.	15 SEP 88	100
					CHKD.	APPROVED	DWG TYPE

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT - A740
FIELD ASSEMBLY OF FANS EF

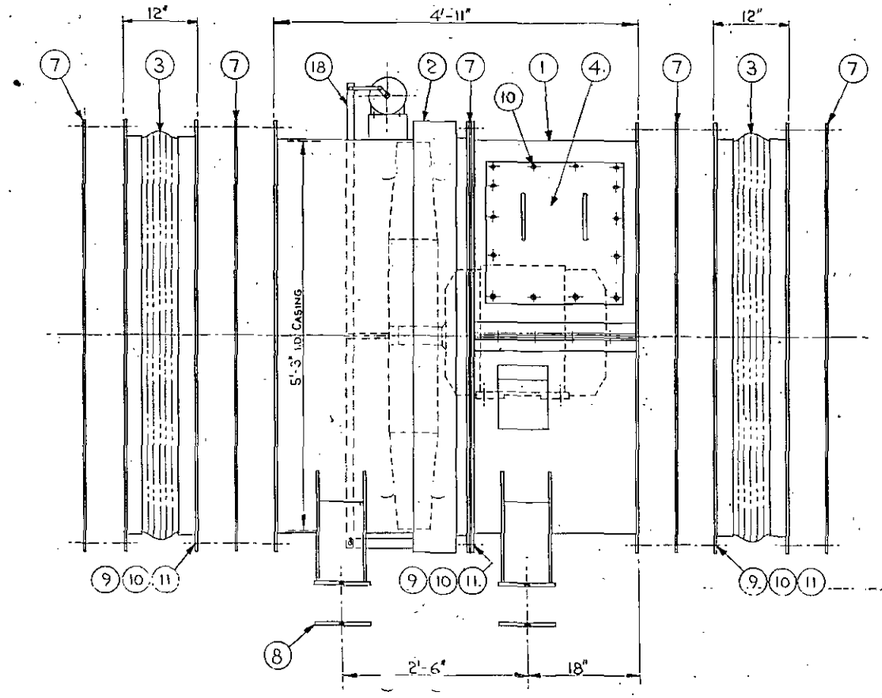
SCALE 1" = 1'-0" | CUSTOMERS REF

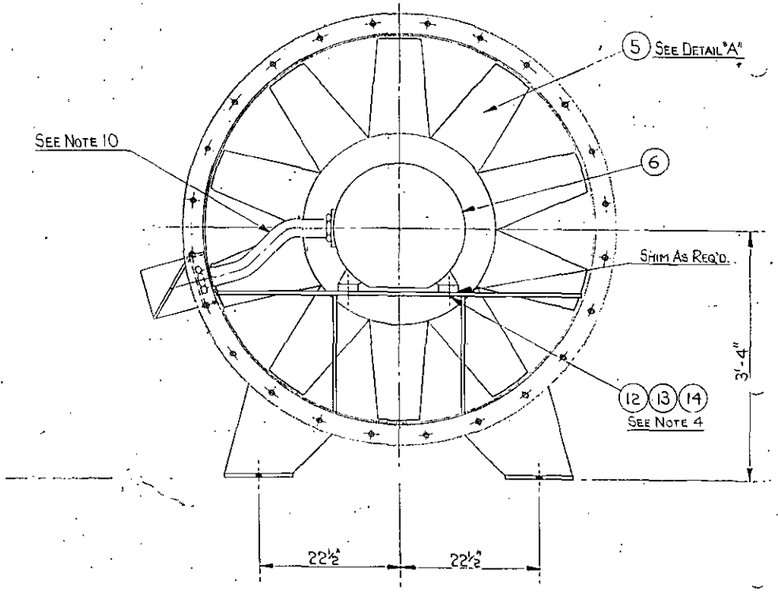
DWG NO. CO-D-12541 | REV A

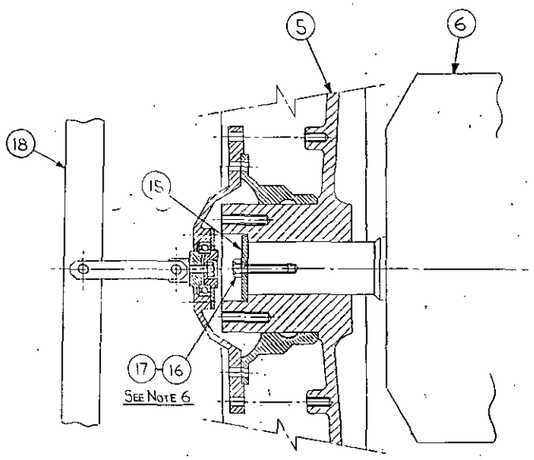
TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS / MIN)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

SYM	REVISIONS	DATE	BY	CHKD
A	ADDED NOTES & ITEMS 15, 16 & 17. CASING I.D. WAS 7'-4⅜"	MAY 1/89	B.B.	

REG 611







DETAIL "A"

NOTES

1. MOTOR BASE PLATE IN CASING SECTION (1) SHOULD BE CHECKED TO ENSURE THAT, IF NECESSARY, MOTOR CAN BE SHIMMED UP FOR INSTALLATION OF IMPELLER.
2. MOTOR SHOULD BE MOUNTED IN CASING SECTION AND ANTI-STALL SECTION (2) BOLTED TO CASING SECTION.
3. USING AN ADJUSTABLE EXTENSION ARM ATTACHED TO MOTOR SHAFT, MOTOR SHOULD BE CENTRALISED WITHIN ANTI-STALL SECTION.
4. ON COMPLETION OF ABOVE, MOTOR CAN BE LOCKED IN POSITION USING BOLTS (12), NUTS (13) AND WASHERS (14). TORQUE MOTOR HOLD DOWN BOLTS TO 240 LB.FT.
5. DRILL AND DOWEL ¾" DIA. AT THREE PLACES IN MATING FLANGES OF CASING SECTION AND ANTI-STALL SECTION, THEN REMOVE ANTI-STALL SECTION.
6. IMPELLER ASSEMBLY (5) CAN BE INSTALLED ON MOTOR SHAFT AND LOCKED IN PLACE WITH HUB WASHER (15), SCREW (16) AND SPRING WASHER (17). APPLY LOCTITE 242 TO THREAD OF SCREW BEFORE ASSEMBLY AND TORQUE TO 30 LB.FT.
7. RE-INSTALL ANTI-STALL SECTION TO CASING SECTION, USING DOWELS FOR ALIGNMENT.
8. CLEARANCE BETWEEN TIP OF EACH BLADE AND INSIDE OF ANTI-STALL SECTION TO BE CHECKED AND MAINTAINED AT 0.150".
9. INSTALL BLADE ACTUATOR ASSEMBLY (18).
10. CONDUIT, FITTINGS AND HARDWARE TO BE SIZED FOR MOTOR PER N.E.C. STANDARD.

THIS DRAWING APPLIES TO ALL UF FANS EXCEPT UF-041.
FOR FIELD ASSEMBLY OF UF-041, SEE DWG. CO-D-12543

TOLERANCES ON DIMENSION" UNLES" OTHERWISE NOTED ARE: (PLUS .X MIN. .)
MACHINING .010" - STRUCTURAL OVERALL 1/16" ALL OTHERS 1/32" NON-ACCUMULATIVE

FLAKT CANADA LTD.
NOV 10 1989
ISSUED
FOR INFORMATION PURPOSES ONLY; NOT TO BE USED FOR CONSTRUCTION

QUANTITY	ITEM	DESCRIPTION	DWG NO. OR DIM.	MATERIAL	WEIGHT
1	18	BLADE ACTUATOR ASSEMBLY	CO-D-12586		
1	17	SPRING WASHER	½" DIA.	S.S. 316	
1	16	HEX. HD. SCREW	½" UNC. x 2½" LG.	S.S. 316	
1	15	HUB WASHER			
1	14	FLAT WASHER	¾" DIA.	S.S. 316	
4	13	HEX. NUT	¾" UNC.	S.S. 316	
4	12	HEX. HD. BOLT	¾" UNC. x 2¾" LG.	S.S. 316	
72	11	FLAT WASHER	½" DIA.	S.S. 316	
86	10	HEX. NUT	½" UNC.	S.S. 316	
72	9	HEX. HD. BOLT	½" UNC. x 1¾" LG.	S.S. 316	
4	8	ANTI-VIBRATION PAD			
5	7	GASKET			
1	6	MOTOR 50 H.P. @ 900 R.P.M.	RELIANCE - FRAME SIZE 404T		995
1	5	IMPELLER (160-80-10)	CO-D-12365		
1	4	ACCESS DOOR	CO-C-11147		45
2	3	FLEXIBLE CONNECTION	CO-C-11151		470
1	2	ANTI-STALL SECTION	CO-D-12382		1260
1	1	CASING SECTION	CO-D-12381		1095

VARIANT

Flakt **FLAKT CANADA LTD.**

CONTRACT NO.	QUOTATION NO	REG NO	NEXT ASSY	REF DWG	DRAWN	DATE	SUB NO
C-118-324-0773	SFC				B.B.	15 SEP. 88	100

CHKD.	APPROVED	DWG TYPE

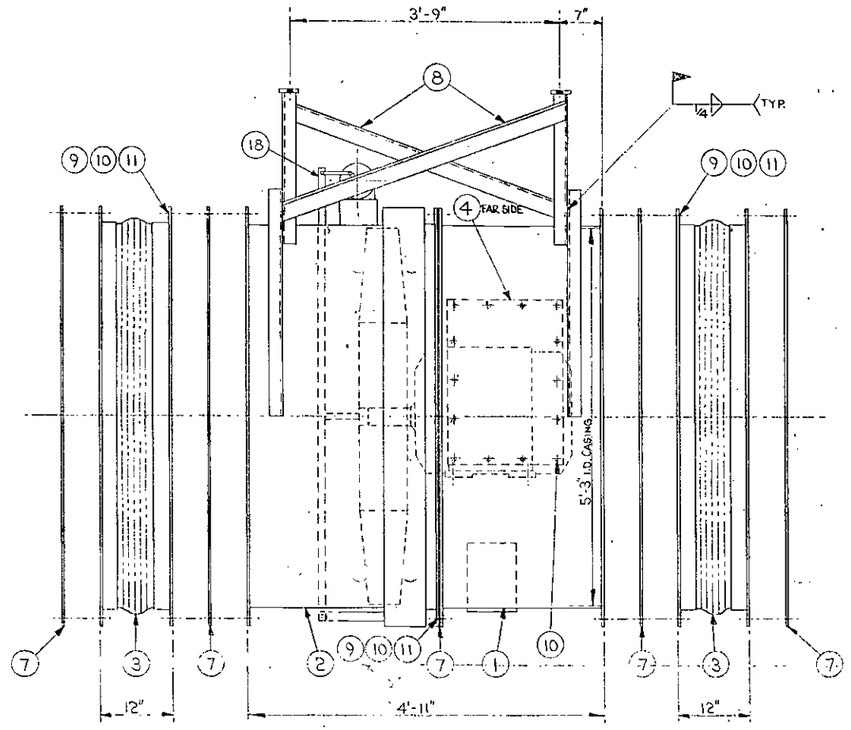
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT - A740
FIELD ASSEMBLY OF FANS UF

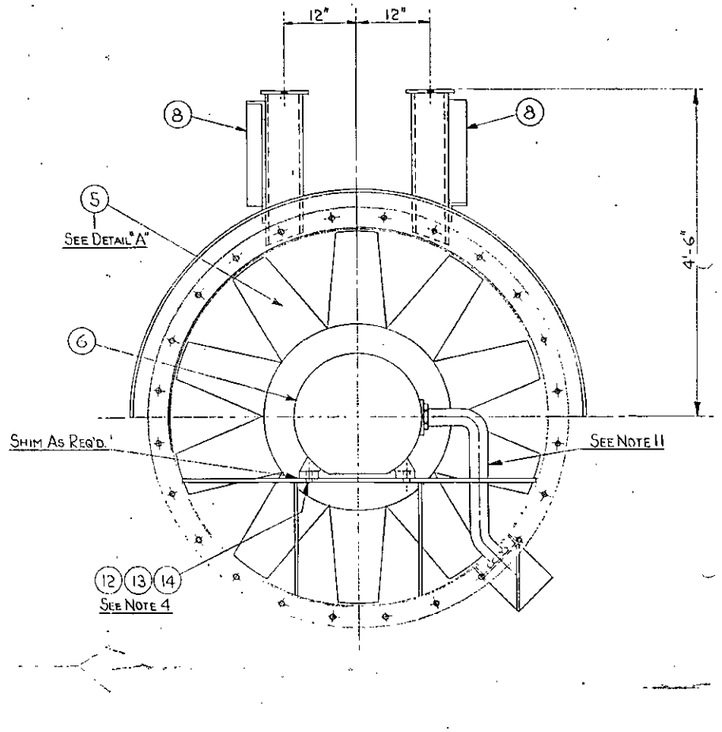
SCALE 1" = 1'-0" | CUSTOMERS REF.

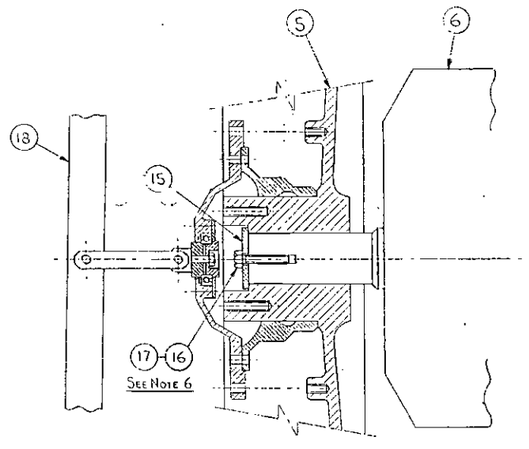
DWG. NO. CO-D-12542 | REV. A

SYM.	REVISIONS	DATE	BY	CHKD
A	I.D. OF CASING WAS 5'-2¾". ADDED NOTES.	JUN 1/89	B.B.	

REG 611







DETAIL "A"

NOTES

1. MOTOR BASE PLATE IN CASING SECTION (1) SHOULD BE CHECKED TO ENSURE THAT, IF NECESSARY, MOTOR CAN BE SHIMMED UP FOR INSTALLATION OF IMPELLER.
2. MOTOR SHOULD BE MOUNTED IN CASING SECTION AND ANTI-STALL SECTION (2) BOLTED TO CASING SECTION.
3. USING AN ADJUSTABLE EXTENSION ARM ATTACHED TO MOTOR SHAFT, MOTOR SHOULD BE CENTRALISED WITHIN ANTI-STALL SECTION.
4. ON COMPLETION OF ABOVE, MOTOR CAN BE LOCKED IN POSITION USING BOLTS (12), NUTS (13) AND WASHERS (14). TORQUE MOTOR HOLD DOWN BOLTS TO 240 LB.FT.
5. DRILL AND DOWEL 3/4" DIA. AT THREE PLACES IN MATING FLANGES OF CASING SECTION AND ANTI-STALL SECTION, THEN REMOVE ANTI-STALL SECTION.
6. IMPELLER ASSEMBLY (5) CAN BE INSTALLED ON MOTOR SHAFT AND LOCKED IN PLACE WITH HUB WASHER (15), SCREW (16) AND SPRING WASHER (17). APPLY LOCTITE 242 TO THREAD OF SCREW BEFORE ASSEMBLY AND TORQUE TO 30 LB.FT.
7. RE-INSTALL ANTI-STALL SECTION TO CASING SECTION, USING DOWELS FOR ALIGNMENT.
8. CLEARANCE BETWEEN TIP OF EACH BLADE AND INSIDE OF ANTI-STALL SECTION TO BE CHECKED AND MAINTAINED AT 0.150".
9. INSTALL BLADE ACTUATOR ASSEMBLY (18).
10. WELD HANGER SUPPORT FRAMES (8) TO ANTI-STALL AND CASING SECTIONS.
11. CONDUIT, FITTINGS AND HARDWARE TO BE SIZED FOR MOTOR PER N.E.C. STANDARD.

FLAKT CANADA LTD.
NOV 10 1989
ISSUED
FOR INFORMATION PURPOSES ONLY
NOT TO BE USED FOR CONSTRUCTION

QUANTITY	ITEM	DESCRIPTION	DWG NO. OR DIM.	MATERIAL	WEIGHT
1	18	BLADE ACTUATOR ASSEMBLY	CO-D-12586		
1	17	SPRING WASHER	1/2" DIA.	S.S. 316	
1	16	HEX. HD. SCREW	1/2" UNC. x 2 1/2" LG.	S.S. 316	
1	15	HUB WASHER			
4	14	FLAT WASHER	3/4" DIA.	S.S. 316	
4	13	HEX. NUT	3/4" UNC.	S.S. 316	
4	12	HEX. HD. BOLT	3/4" UNC. x 2 3/4" LG.	S.S. 316	
72	11	FLAT WASHER	1/2" DIA.	S.S. 316	
86	10	HEX. NUT	1/2" UNC.	S.S. 316	
72	9	HEX. HD. BOLT	1/2" UNC. x 1 3/4" LG.	S.S. 316	
2	8	HANGER SUPPORT FRAME	CO-C-11273		188
5	7	GASKET			
1	6	MOTOR (50 H.P. @ 900 R.P.M.)	RELIANCE - FRAME SIZE 404T.		995
1	5	IMPELLER (160-80-10)	CO-D-12365		
1	4	ACCESS DOOR	CO-C-11272		45
2	3	FLEXIBLE CONNECTION	CO-C-11151		470
1	2	ANTI-STALL SECTION	CO-D-12527		1160
1	1	CASING SECTION	CO-C-11271		910

VARIANT

Flakt Canada Ltd. **FLAKT CANADA LTD.**

CONTRACT NO.	QUOTATION NO	REG NO	NEXT ASSY	REF DWG	DRAWN	DATE	SUB NO.
C-118-324-0773	SFC				B.B.	14 SEP. 88	100

CHKD. | APPROVED | DWG. TYPE | SCALE 1" = 1'-0" | CUSTOMERS REF

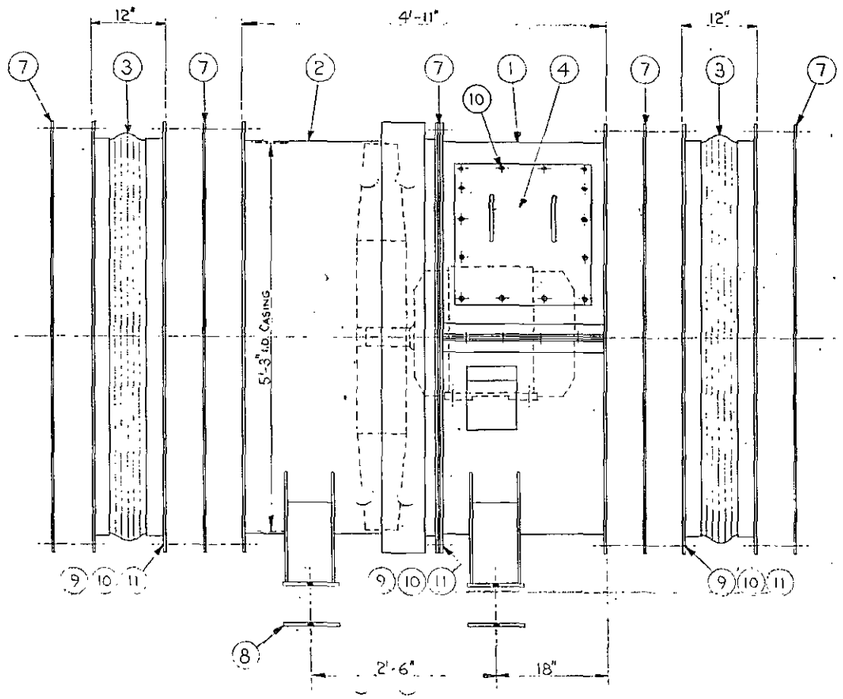
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT - A740
FIELD ASSEMBLY OF FAN UF-041

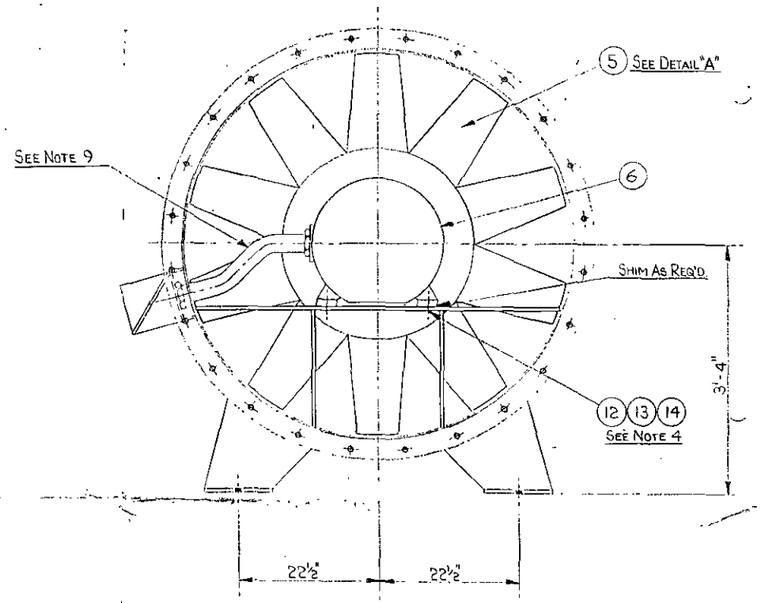
DWG. NO. CO-D-12543 | REV A

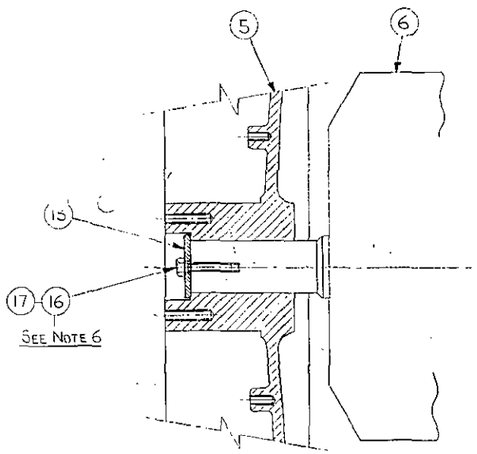
TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: ±PLUS _ . MINUS
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

SYM.	REVISIONS	DATE	BY	CHKD
A	I.D. OF CASING WAS 5'-2 3/16". ADDED NOTES.	JUN 1/89	B.B.	

REG 611







DETAIL "A"

NOTES

1. MOTOR BASE PLATE IN CASING SECTION ① SHOULD BE CHECKED TO ENSURE THAT, IF NECESSARY, MOTOR CAN BE SHIMMED UP FOR INSTALLATION OF IMPELLER.
2. MOTOR SHOULD BE MOUNTED IN CASING SECTION AND ANTI-STALL SECTION ② BOLTED TO CASING SECTION.
3. USING AN ADJUSTABLE EXTENSION ARM ATTACHED TO MOTOR SHAFT, MOTOR SHOULD BE CENTRALISED WITHIN ANTI-STALL SECTION.
4. ON COMPLETION OF ABOVE, MOTOR CAN BE LOCKED IN POSITION USING BOLTS ⑫, NUTS ⑬ AND WASHERS ⑭. TORQUE MOTOR HOLD DOWN BOLTS TO 240 LB.FT.
5. DRILL AND DOWEL ¾" DIA. AT THREE PLACES IN MATING FLANGES OF CASING SECTION AND ANTI-STALL SECTION, THEN REMOVE ANTI-STALL SECTION.
6. IMPELLER ASSEMBLY ⑤ CAN BE INSTALLED ON MOTOR SHAFT AND LOCKED IN PLACE WITH HUB WASHER ⑮, SCREW ⑯ AND SPRING WASHER ⑰. APPLY LOCTITE 242 TO THREAD OF SCREW BEFORE ASSEMBLY AND TORQUE TO 30 LB.FT.
7. RE-INSTALL ANTI-STALL SECTION TO CASING SECTION, USING DOWELS FOR ALIGNMENT.
8. CLEARANCE BETWEEN TIP OF EACH BLADE AND INSIDE OF ANTI-STALL SECTION TO BE CHECKED AND MAINTAINED AT 0.150".
9. CONDUIT, FITTINGS AND HARDWARE TO BE SIZED FOR MOTOR PER N.E.C. STANDARD.

FLAKT CANADA LTD.
NOV 10 1989
ISSUED

FOR INFORMATION PURPOSES ONLY; NOT TO BE USED FOR CONSTRUCTION

QUANTITY	ITEM	DESCRIPTION	DWG NO. OR DIM.	MATERIAL	WEIGHT
1	17	SPRING WASHER	½" DIA.	S.S. 316	
1	16	HEX. HD. SCREW	½" UNC. x 2½" LG.	S.S. 316	
1	15	HUB WASHER			
4	14	FLAT WASHER	¾" DIA.	S.S. 316	
4	13	HEX. NUT	¾" UNC.	S.S. 316	
4	12	HEX. HD. BOLT	¾" UNC. x 2¾" LG.	S.S. 316	
72	11	FLAT WASHER	½" DIA.	S.S. 316	
86	10	HEX. NUT	½" UNC.	S.S. 316	
72	9	HEX. HD. BOLT	½" UNC. x 1¾" LG.	S.S. 316	
4	8	ANTI-VIBRATION PAD			
5	7	GASKET			
1	6	MOTOR 50 H.P. @ 900 R.P.M.	RELIANCE - FRAME SIZE 404T		995
1	5	IMPELLER (160-80-ID)	CO-D-12366		
1	4	ACCESS DOOR	CO-C-11147		45
2	3	FLEXIBLE CONNECTION	CO-C-11151		470
1	2	ANTI-STALL SECTION	CO-D-12588		1305
1	1	CASING SECTION	CO-D-12381		1080

VARIANT

Flakt FLAKT CANADA LTD.

CONTRACT NO.	QUOTATION NO.	REQ NO	NEXT ASSY	REF. DWG
C-113-324-0173	SFC			

DRAWN	DATE	SUB NO
B.B.	14 SEP 88	100
CHKD.	APPROVED	DWG TYPE
SCALE 1" = 1'-0"		CUSTOMERS REF

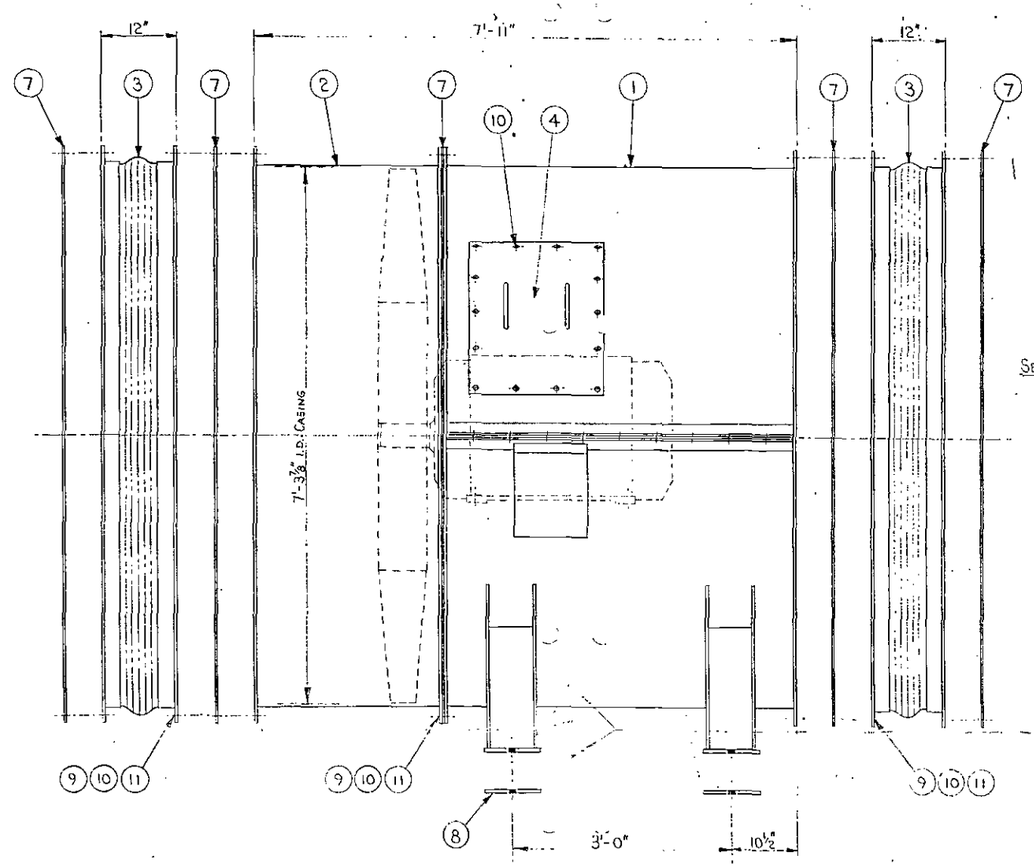
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT - A740
FIELD ASSEMBLY OF FANS OTE

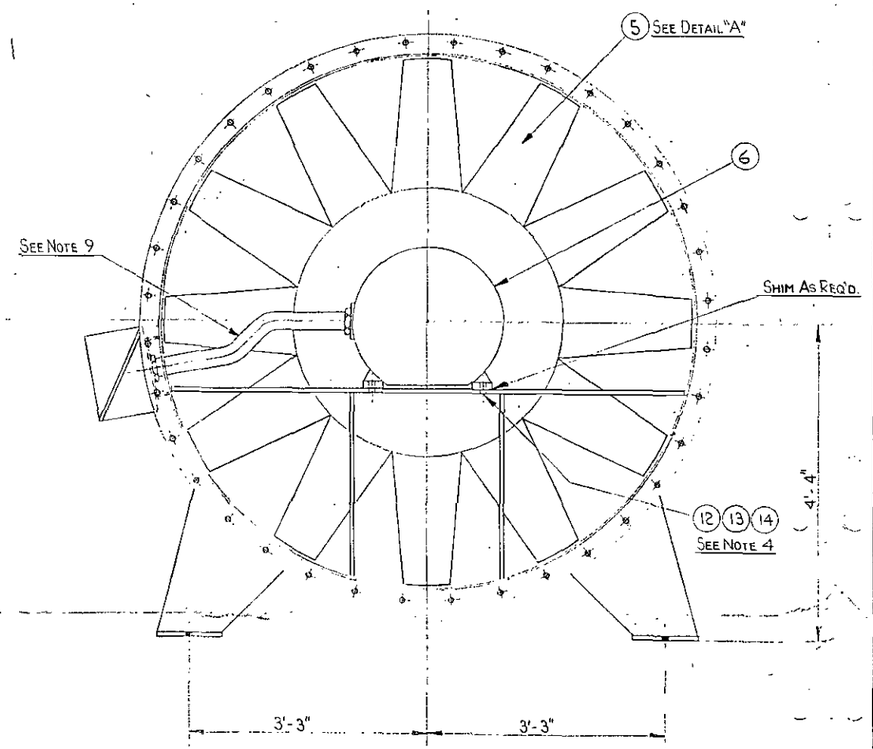
DWG NO CO-D-12544 REV A

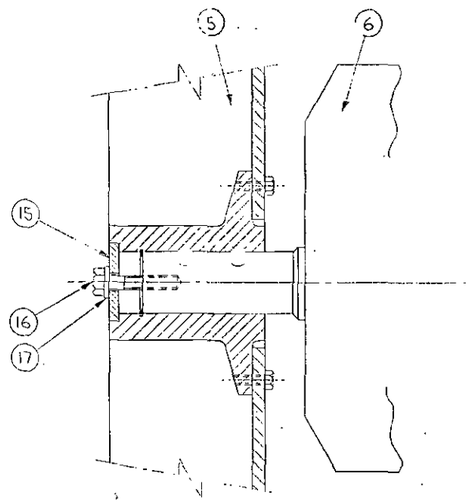
SYM.	REVISIONS	DATE	BY	CHKD
A	I.D. OF CASING WAS 5'-2 3/16" ADDED NOTES	MAY 15/89	B.B.	

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

REG 611







DETAIL "A"

NOTES

1. MOTOR BASE PLATE IN CASING SECTION (1) SHOULD BE CHECKED TO ENSURE THAT, IF NECESSARY, MOTOR CAN BE SHIMMED UP FOR INSTALLATION OF IMPELLER.
2. MOTOR SHOULD BE MOUNTED IN CASING SECTION AND IMPELLER CASING (2) BOLTED TO CASING SECTION.
3. USING AN ADJUSTABLE EXTENSION ARM ATTACHED TO MOTOR SHAFT, MOTOR SHOULD BE CENTRALISED WITHIN IMPELLER CASING.
4. ON COMPLETION OF ABOVE, MOTOR CAN BE LOCKED IN POSITION USING BOLTS (12), NUTS (13) AND WASHERS (14). TORQUE MOTOR HOLD DOWN BOLTS TO 240 LB.FT.
5. DRILL AND DOWEL ¾" DIA. AT THREE PLACES IN MATING FLANGES OF CASING SECTION AND IMPELLER CASING, THEN REMOVE IMPELLER CASING.
6. IMPELLER ASSEMBLY (5) CAN BE INSTALLED ON MOTOR SHAFT AND LOCKED IN PLACE WITH HUB WASHER (15), BOLT (16) AND SPRING WASHER (17). APPLY LOCTITE 242 TO THREAD OF BOLT BEFORE ASSEMBLY AND TORQUE TO 30 LB.FT.
7. RE-INSTALL IMPELLER CASING TO CASING SECTION, USING DOWELS FOR ALIGNMENT.
8. CLEARANCE BETWEEN TIP OF EACH BLADE AND INSIDE OF IMPELLER CASING TO BE CHECKED AND MAINTAINED AT 0.150".
9. CONDUIT, FITTINGS AND HARDWARE TO BE SIZED FOR MOTOR PER N.E.C. STANDARD.

FLAKT CANADA LTD.
NOV 10 1989
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NOT TO BE USED FOR CONSTRUCTION

QUANTITY	ITEM	DESCRIPTION	DWG NO. OR DIM.	MATERIAL	WEIGHT
1	17	SPRING WASHER	¾" DIA.	S.S. 316	
1	16	HEX. HD. BOLT	¾" UNC. x 4" LG.	S.S. 316	
1	15	HUB WASHER	CO-A-13070		
4	14	FLAT WASHER	¾" DIA.	S.S. 316	
4	13	HEX. NUT	¾" UNC.	S.S. 316	
4	12	HEX. HD. BOLT	¾" UNC. x 2⅜" LG.	S.S. 316	
108	11	FLAT WASHER	½" DIA.	S.S. 316	
122	10	HEX. NUT	½" UNC.	S.S. 316	
108	9	HEX. HD. BOLT	½" UNC. x 1¾" LG.	S.S. 316	
4	8	ANTI-VIBRATION PAD			
5	7	GASKET			
1	6	MOTOR (250 HP @ 1200 RPM)	RELIANCE - FRAME 449TY		2100
1	5	IMPELLER (224-112-12)	CO-D-12364		900
1	4	ACCESS DOOR	CO-C-11150		45
2	3	FLEXIBLE CONNECTION	CO-C-11152		650
1	2	IMPELLER CASING	CO-C-11149		1680
1	1	CASING SECTION	CO-D-12383		2825

VARIANT

Flakt FLAKT CANADA LTD.

CONTRACT NO.	QUOTATION NO.	REG. NO	NEXT ASSY	REF. DWG	DRAWN	DATE	SUB NO.
C-118-324-0773	SFC				B.B.	16 SEP. 88	100

CHKD. | APPROVED | DWG. TYPE

SCALE 1"-1'-0" | CUSTOMERS REF.

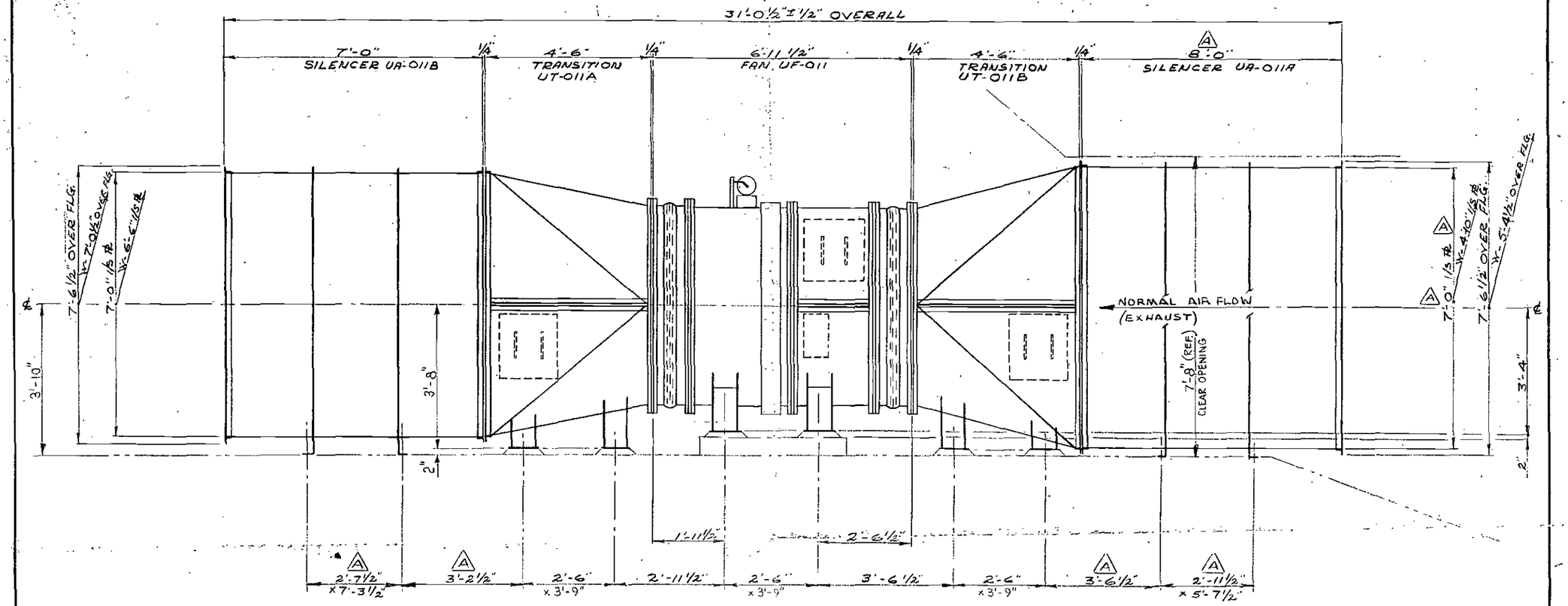
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT - A740
FIELD ASSEMBLY OF FANS SVF

DWG NO. CO-D-12545 | REV. A

SYM.	REVISIONS	DATE	BY	CHKD
A	ADDED NOTES & ITEMS 15, 16 & 17. CASING I.D. WAS 7'-4 3/16	MAY 1/89	B.B.	

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

REG 611



— SIDE ELEVATION —

FOR FOUNDATION LAYOUT, SEE DWG. NO. CO-C-11367

FLAKT CANADA LTD.
NOV 10 1989
ISSUED

FOR INFORMATION PURPOSES ONLY
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SYM.	REVISIONS	DATE	BY	CHKD
B	REV'D. IN ACCORD. WITH CUST. MARKED PRINT DATED NOV. 29/88 ADDED FOUNDATION LAYOUT REF. DWG. No.	JAN. 19 89	B.B.	
A	ADDED SILENCER SUPPORTS SEPT. 30, 1988 / CLIENT MARK-UP REVISED TO INCORP.	OCT 24 88	BB	B.B.

REG 610

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	DWG. NO. OR DIM.	MATERIAL	WEIGHT
VARIANT					

Flakt Flakt Canada Ltd.

FLAKT CANADA LTD.

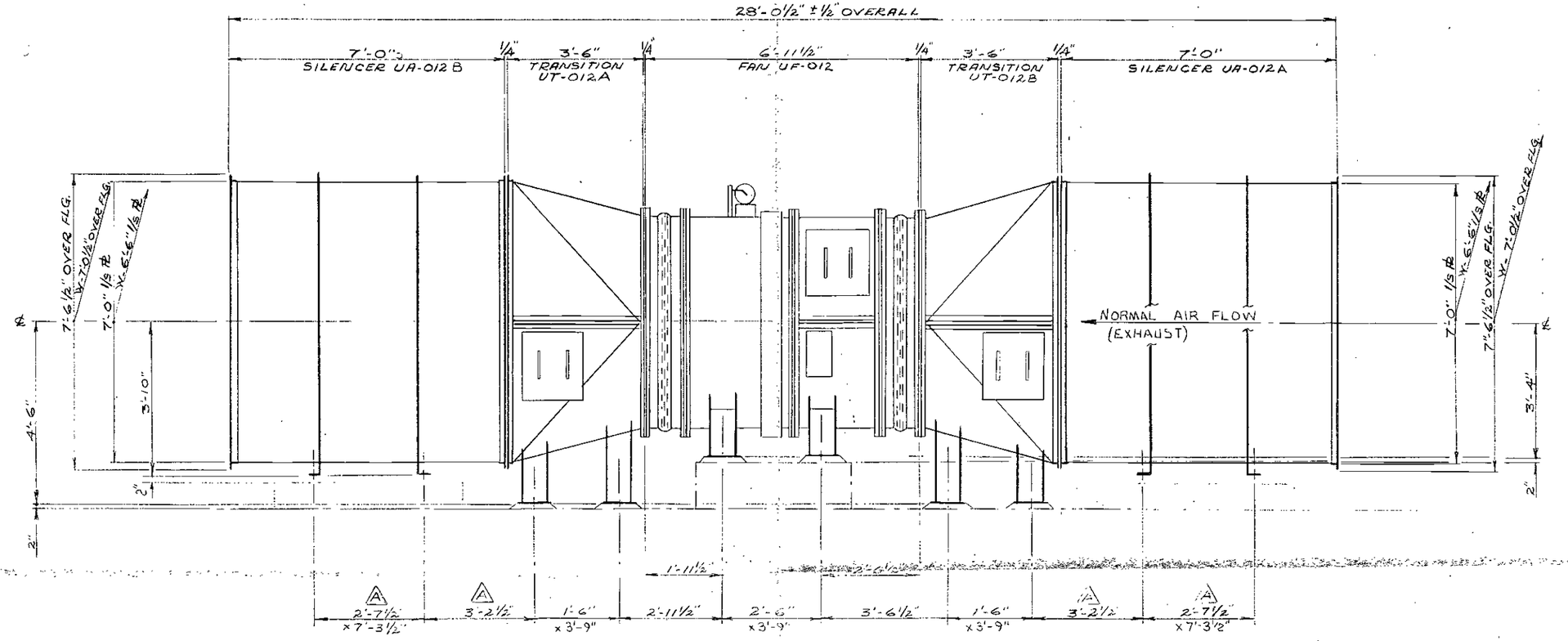
CONTRACT NO.	QUOTATION NO.	REQ. NO.	NEXT ASSY.	REF. DWG.	DRAWN	DATE	SUB. NO.
C-118-324-0773	SFC				RAH	23/AUG/88	

CHKD.	APPROVED	DWG. TYPE
B.B.		

SCALE 1/2" = 1'-0" | CUSTOMERS REF.

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT A 740
UNION STATION
GEN. ASS'Y. OF FAN UF-011

DWG. NO. CO-C-11221 | REV B



SIDE ELEVATION

FOR FOUNDATION LAYOUT, SEE DWG. No. CO-C-11368

FLAKT CANADA LTD. NOV 13 1989 ISSUED

FOR INFORMATION PURPOSES ONLY. NOT TO BE USED FOR CONSTRUCTION

SYM.	REVISIONS	DATE	BY	CHKD
B	ADDED FOUNDATION LAYOUT DWG. No.	JAN. 19/89	B.B.	
A	ADDED SILENCER SUPPORTS	OCT 24 88	RAP	B.B.

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	DWG. NO. OR DIM.	MATERIAL	WEIGHT
VARIANT		Flakt Flakt Canada Ltd.	FLAKT CANADA LTD.		

CONTRACT NO.	QUOTATION NO.	REG. NO.	NEXT ASSY.	REF. DWG.	DRAWN	DATE	SUB NO
C-118-324-0773	SFC				RAP	23/10/88	

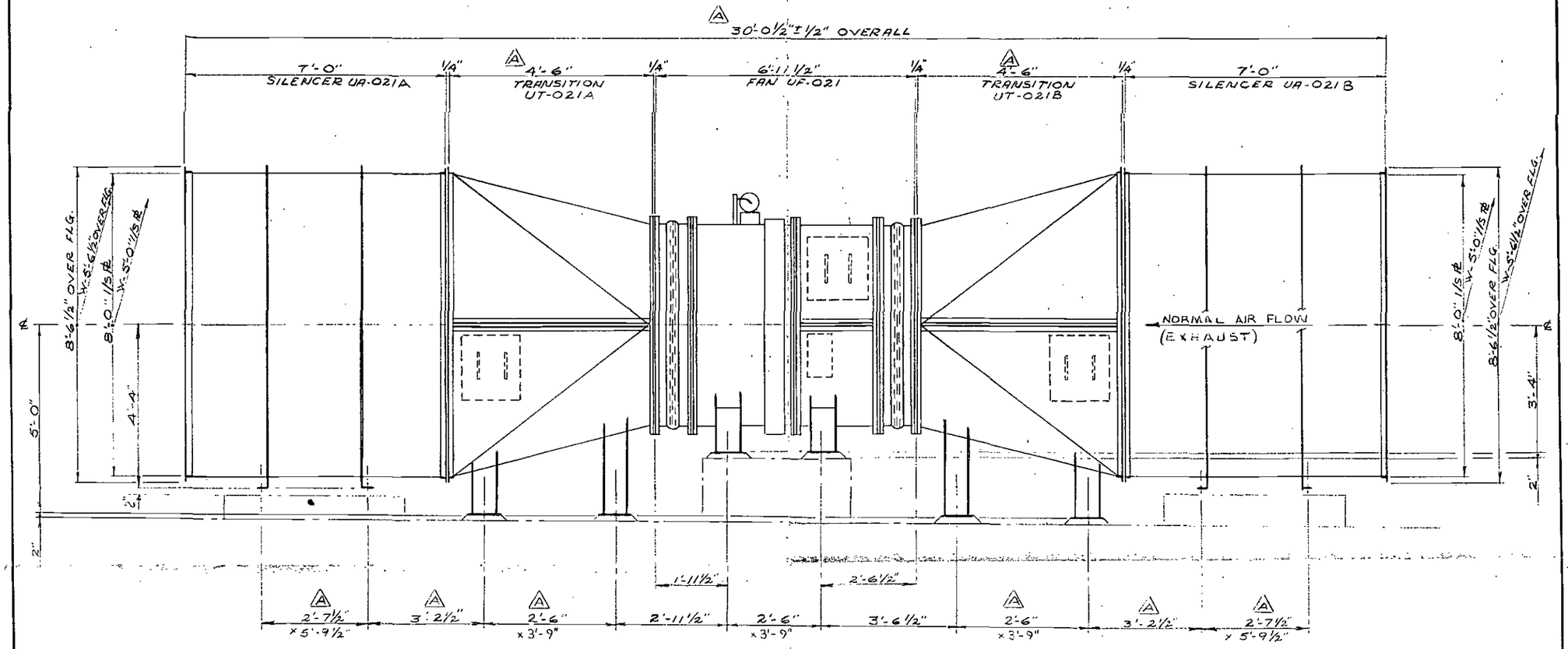
CHKD.	APPROVED	DWG. TYPE
B.B.		

SCALE 1/2" = 1'-0" | CUSTOMERS REF

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT A 740
UNION STATION
GEN. ASS'Y. OF FAN UF-012

DWG NO CO-C-11222 | REV B

F 3 610



— SIDE ELEVATION —

FOR FOUNDATION LAYOUT, SEE DWG. NO. CO-C-11369

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NOT TO BE USED FOR CONSTRUCTION

FLAKT CANADA LTD.
NOV 13 1989
ISSUED

SYM.	REVISIONS	DATE	BY	CHKD
B	ADDED FOUNDATION LAYOUT DWG. No.	JAN. 19/89	B.B.	
A	ADDED SILENCER SUPPORTS SEPT. 30/1988 CLIENT MARK-UP REVISED TO INCORP.	OCT. 24 88	BB	B.B.

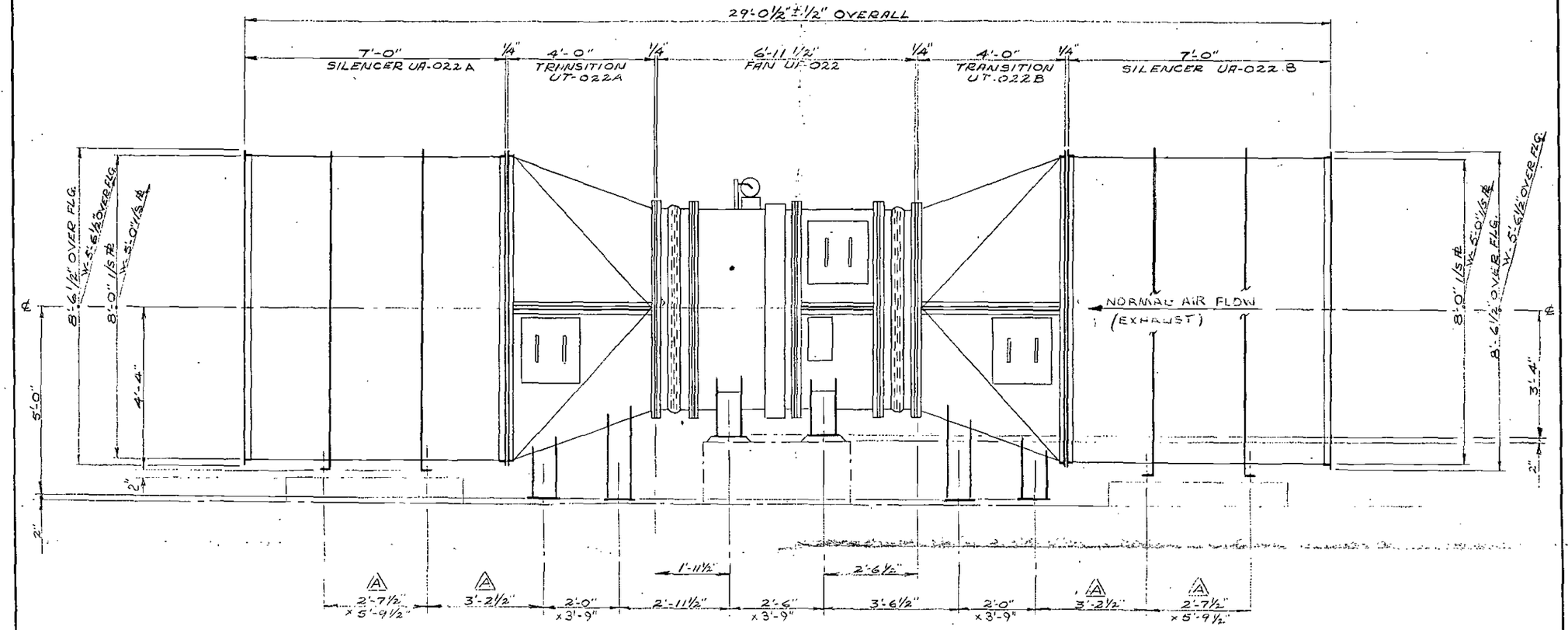
REF 610

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	DWG NO. OR DIM.	MATERIAL	WEIGHT
VARIANT		Flakt Flakt Canada Ltd.	FLAKT CANADA LTD.		

CONTRACT NO.	QUOTATION NO.	REG. NO	NEXT ASSY.	REF. DWG.	DRAWN	DATE	SUB. NO.
C118-324-0773	SFC				R.A.	23/AUG/88	

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT	CHKD. B.B.	APPROVED	DWG TYPE
METRO RAIL PROJECT A 740	SCALE 1/2" = 1'-0"		CUSTOMERS REF.
CIVIC CENTER	DWG. NO. CO-C-11223		REV. B
GEN. ASS'Y. OF FAN UF-021			



— SIDE ELEVATION —

FOR FOUNDATION LAYOUT, SEE DWG. No. CO-C-11369

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FLAKT CANADA LTD.
NOV 13 1989
ISSUED

SYM.	REVISIONS	DATE	BY	CHKD
B	ADDED FOUNDATION LAYOUT DWG. No.	JAN. 19/89	B.B.	
A	ADDED SILENCER SUPPORTS	OCT 24 88		B.B.

RE 510

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	DWG. NO. OR DIM.	MATERIAL	WEIGHT
VARIANT					

Flakt Canada Ltd.

FLAKT CANADA LTD.

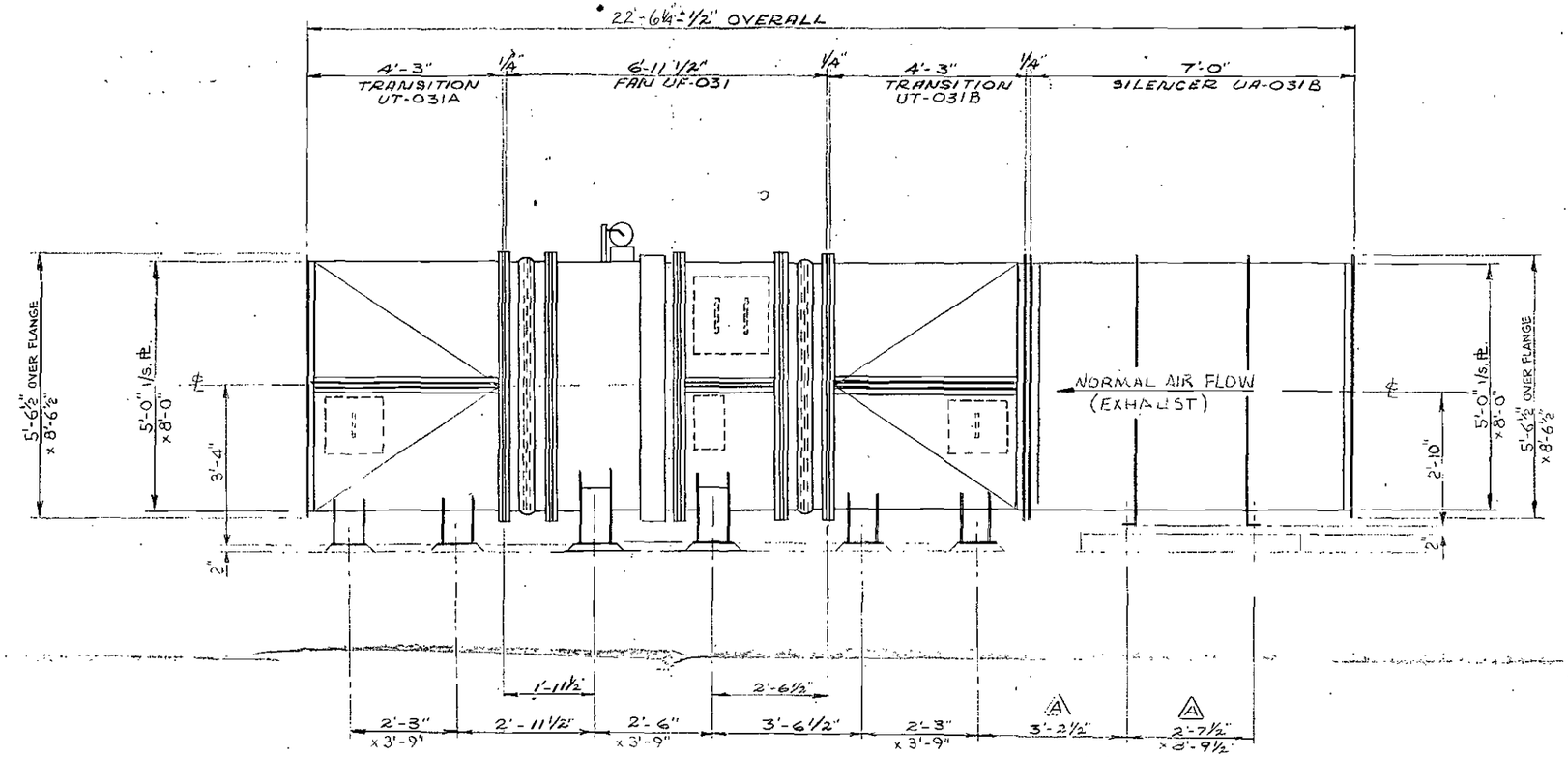
CONTRACT NO.	QUOTATION NO.	REG. NO.	NEXT ASSY.	REF DWG	DRAWN	DATE	SUB. NO.
C-118-324-0773	SFC				R.H.	25/AUG/88	

CHKD.	APPROVED	DWG. TYPE
B.B.		

SCALE	CUSTOMERS REF
1/2" = 1'-0"	

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT A 740
CIVIC CENTER
GEN. ASS'Y. OF FAN UF-022

DWG. NO.	REV
CO-C-11224	B



— SIDE ELEVATION —

FOR FOUNDATION LAYOUT, SEE DWG. No. CO-C-11370

FOR INFORMATION PURPOSES ONLY. NOT TO BE USED FOR CONSTRUCTION

FLAKT CANADA LTD. NOV 13 1989 ISSUED

SYM	REVISIONS	DATE	BY	CHKD
B	DWG. UPDATED PICTORIALLY. ADDED FOUNDATION LAYOUT DWG. No.	JAN. 19/89	B.F.	
A	ADDED SILENCER SUPPORT SEPT. 30/1988/ CLIENT MARK-UP REVISED TO INCORP.	OCT 24 88	BF/	B.B.

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	DWG NO. OR DIM.	MATERIAL	WEIGHT
VARIANT					

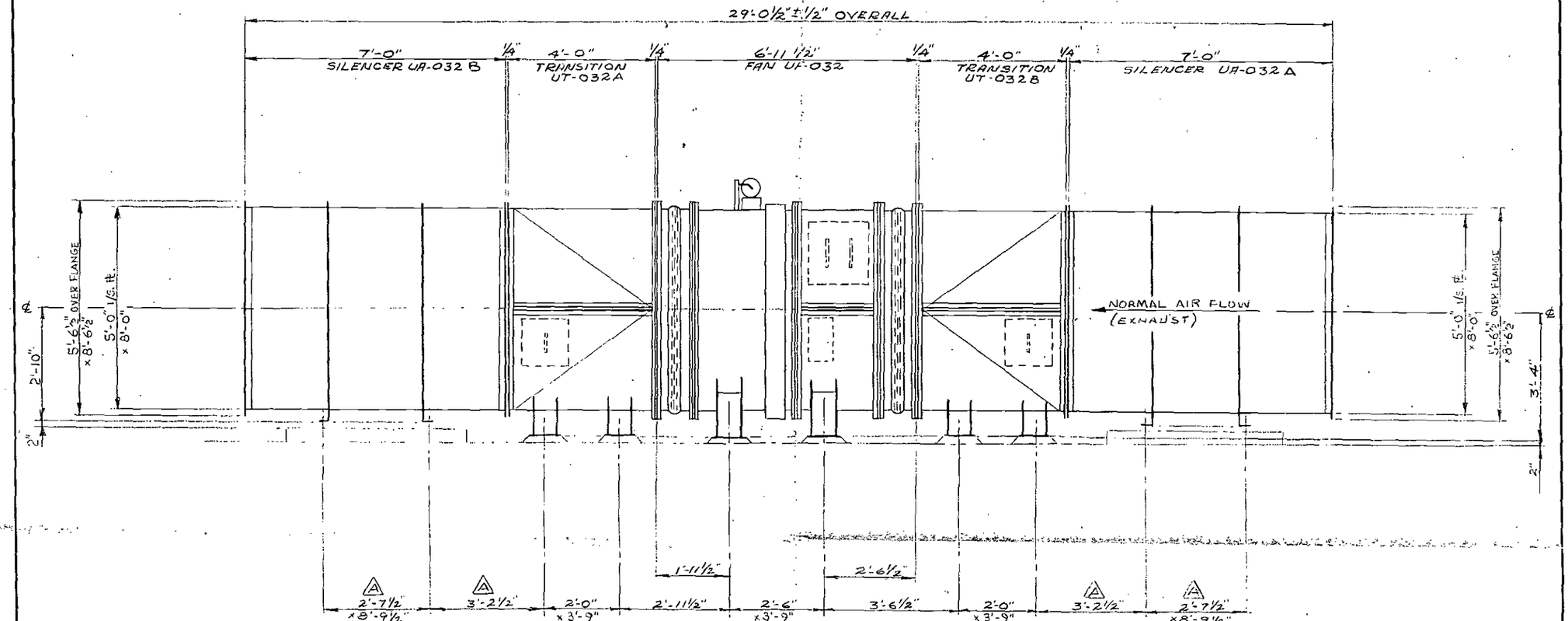
Flakt Canada Ltd.

FLAKT CANADA LTD.

CONTRACT NO	QUOTATION NO.	REG. NO	NEXT ASSY.	REF. DWG.
C-18-324-0773	SFC			

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT A 740
5TH / HILL STATION
GEN. ASS'Y. OF FAN UF-031

DRAWN	DATE	SUB. NO.
R.H.	23/Nov/88	
CHKD. B.B.	APPROVED	DWG. TYPE
SCALE 1/2"=1'-0"	CUSTOMERS REF.	
DWG. NO. CO-C-11225		REV B



— SIDE ELEVATION —

FOR FOUNDATION LAYOUT, SEE DWG. No. CO-C-11370

FOR INFORMATION PURPOSES ONLY & NOT TO BE USED FOR CONSTRUCTION

FLAKT CANADA LTD.
NOV 13 1989
ISSUED

SYM.	REVISIONS	DATE	BY	CHKD
B	DWG. UPDATED PICTORIALLY. ADDED FOUNDATION LAYOUT DWG. No.	JAN. 20/89	B.B.	
A	ADDED SILENCER SUPPORT SEPT. 30/1988 CLIENT MARK-UP REVISED TO INCORP.	OCT 24 88	[illegible]	B.B.

REG 610

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	OWG NO. OR DIM.	MATERIAL	WEIGHT
VARIANT		Flakt Canada Ltd.	FLAKT CANADA LTD.		

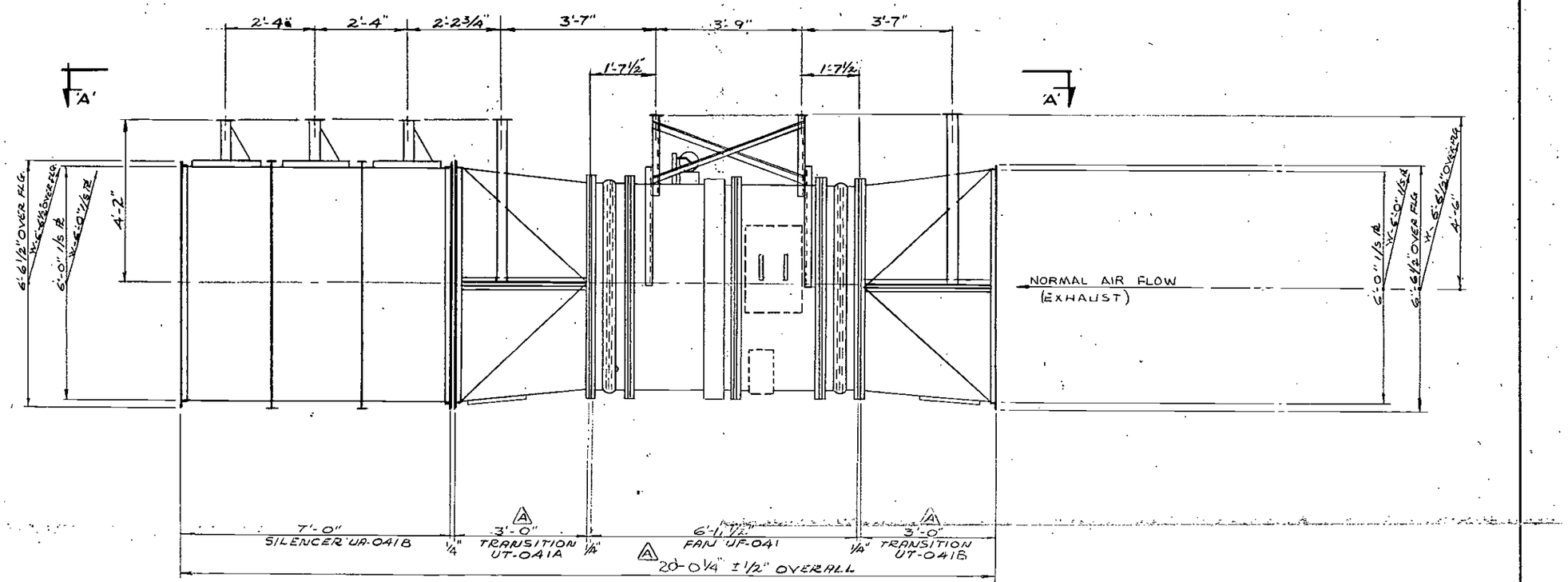
CONTRACT NO.	QUOTATION NO.	REG. NO	NEXT ASSY.	REF. DWG.	DRAWN	DATE	SUB. NO.
C-18-324-0773	SFC				E.A.	23 NOV/88	

CHKD.	APPROVED	DWG TYPE
B.B.		

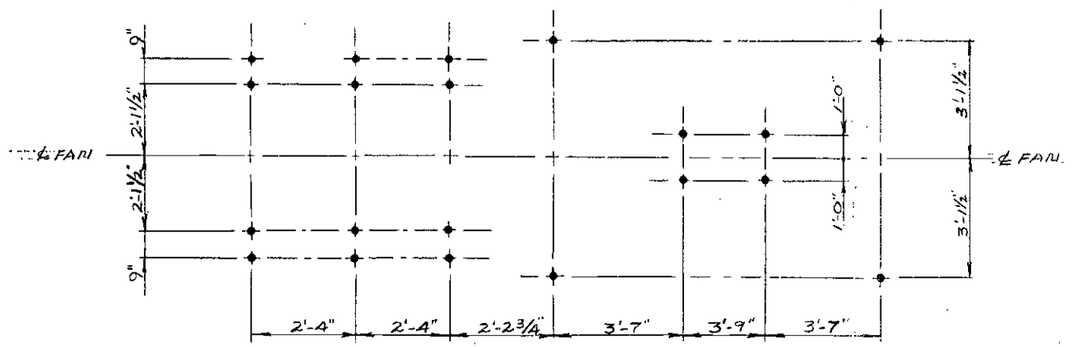
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT A 740
5TH HILL / STATION
GEN. ASS'Y. OF FAN UF-032.

SCALE 1/2" = 1'-0" | CUSTOMERS REF.

DWG. NO. CO-C-11226 | REV B



— SIDE ELEVATION —



— PLAN 'A'-'A' — A

— ANCHOR BOLT LOCATIONS —

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

SYM.	REVISIONS	DATE	BY	CHKD
A	C/W DIMENSIONS SUPPORTS ADDED SEPT 30/1988 CLIENT MARK-UP REVISED TO INCORP.	OCT 24 88	RAP	B.B.

FLAKT CANADA LTD.
NOV 10 1989
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NOT TO BE USED FOR CONSTRUCTION

QUANTITY	ITEM	DESCRIPTION	DWG NO. OR DIM.	MATERIAL	WEIGHT
VARIANT					

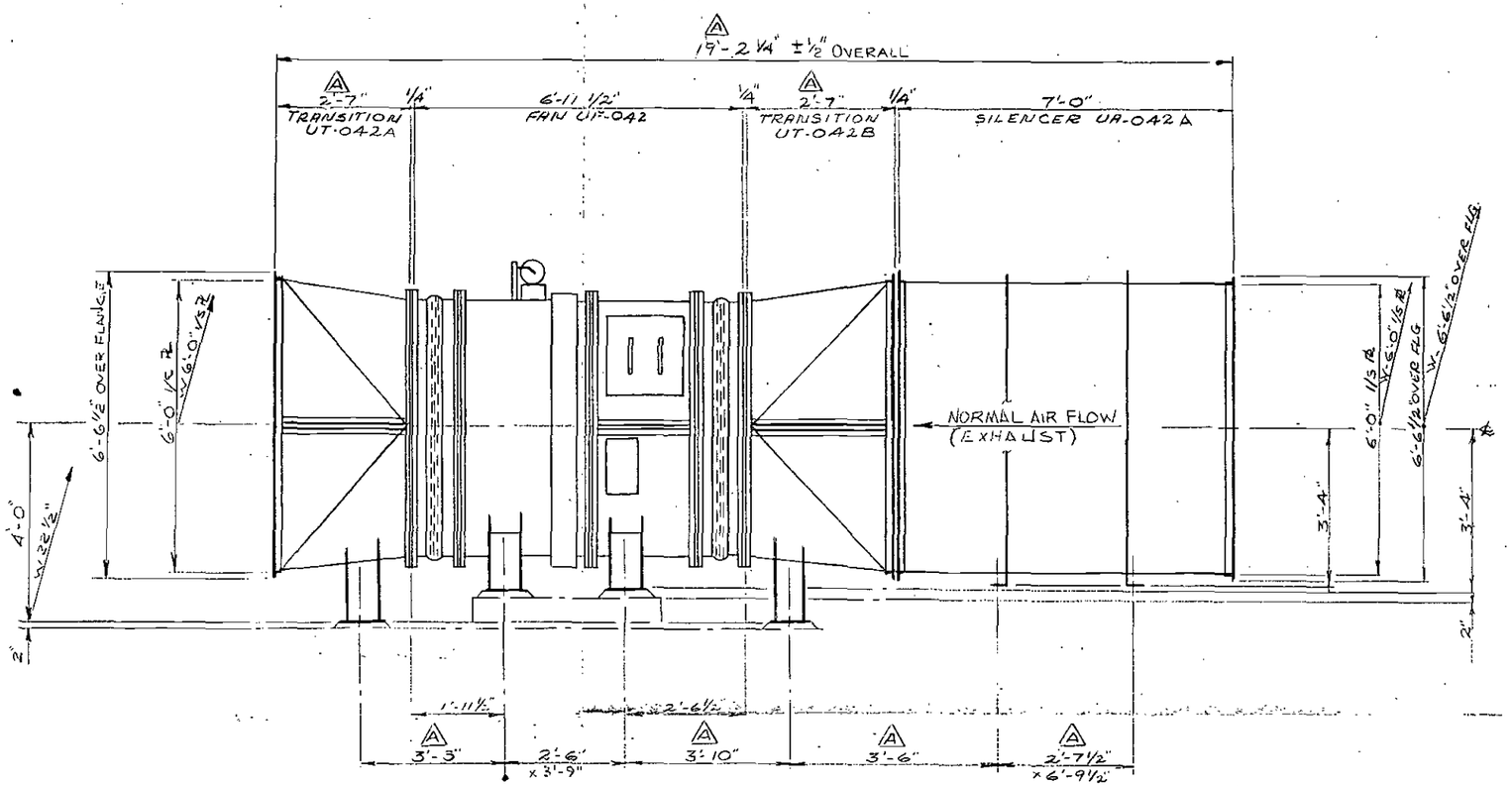
Flakt Canada Ltd.

FLAKT CANADA LTD.

CONTRACT NO.	QUOTATION NO.	REG. NO.	NEXT ASSY.	REF. DWG.	DRAWN	DATE	SUB. NO.
C-118-324-0773	SFC				R.A.P.	23/AUG/88	
					CHKD. B.B.	APPROVED	DWG. TYPE
					SCALE 1/2" = 1'-0"		CUSTOMERS REF.
					DWG. NO. CO-C-11227		REV. A

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT A 740
7TH FLOWER STATION
GEN. ASS'Y. OF FAN UF-041

F - 610



SIDE ELEVATION

FOR FOUNDATION LAYOUT, SEE DWG. NO. CO-C-11371

FLAKT CANADA LTD.
NOV 13 1989
RECEIVED

FOR INFORMATION PURPOSES ONLY
NOT TO BE USED FOR CONSTRUCTION

QUANTITY	ITEM	DESCRIPTION	DWG NO. OR DIM.	MATERIAL	WEIGHT
VARIANT		Flakt Canada Ltd.	FLAKT CANADA LTD.		

CONTRACT NO.	QUOTATION NO.	REG. NO.	NEXT ASSY.	REF. DWG	DRAWN	DATE	SUB. NO.
C118-324-0773	SFC				R.H.	23/Nov/88	

CHKD.	APPROVED	DWG. TYPE
B.B.		

SCALE 1/2" = 1'-0" | CUSTOMERS REF.

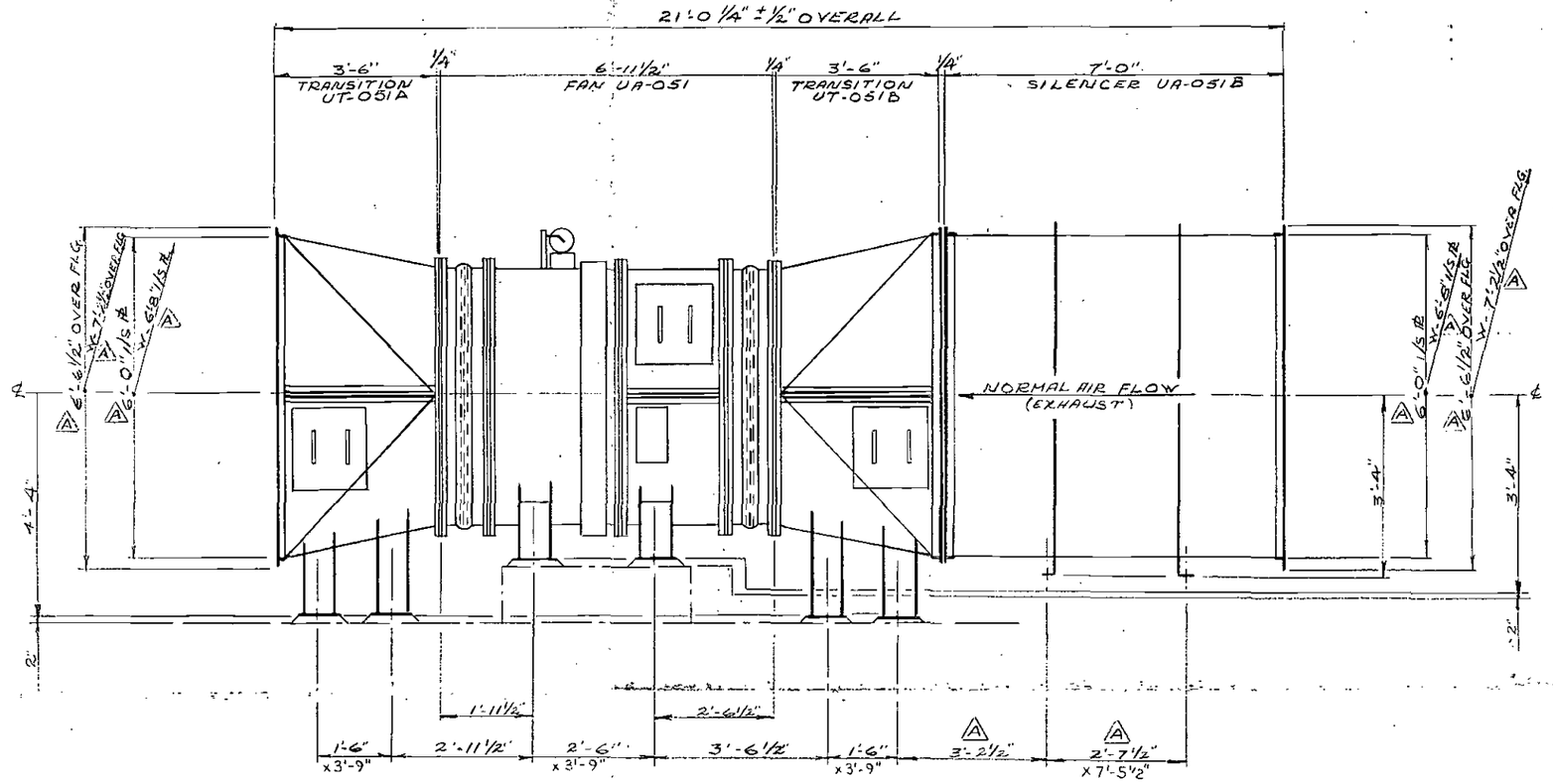
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT A 740
7TH / FLOWER STATION
GEN. ASS'Y. OF FAN UF-042

DWG. NO. CO-C11228 | REV P1

SYM.	REVISIONS	DATE	BY	CHKD
B	ADDED FOUNDATION LAYOUT DWG. No.	JAN. 20/89	B.B.	
A	ADDED SILENCER SUPPORTS SEPT. 30/1988 / CLIENT MARK-UP'S REVISED TO INCORP.	OCT 24 '88	R.H.	B.B.

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

REG 610



— SIDE ELEVATION —

FOR FOUNDATION LAYOUT, SEE DWG. No. CO-C-11372

FOR INFORMATION PURPOSES ONLY NOT TO BE USED FOR CONSTRUCTION

FLAKT CANADA LTD. NOV 13 1989 ISSUED

SYM.	REVISIONS	DATE	BY	CHKD
B	ADDED FOUNDATION LAYOUT DWG. No.	JAN. 20/89	B.B.	
A	ADDED SILENCER SUPPORTS SEPT. 30/1988 CLIENT MARK-UP REVISED TO INCORP.	OCT 24 88	RM	B.B.

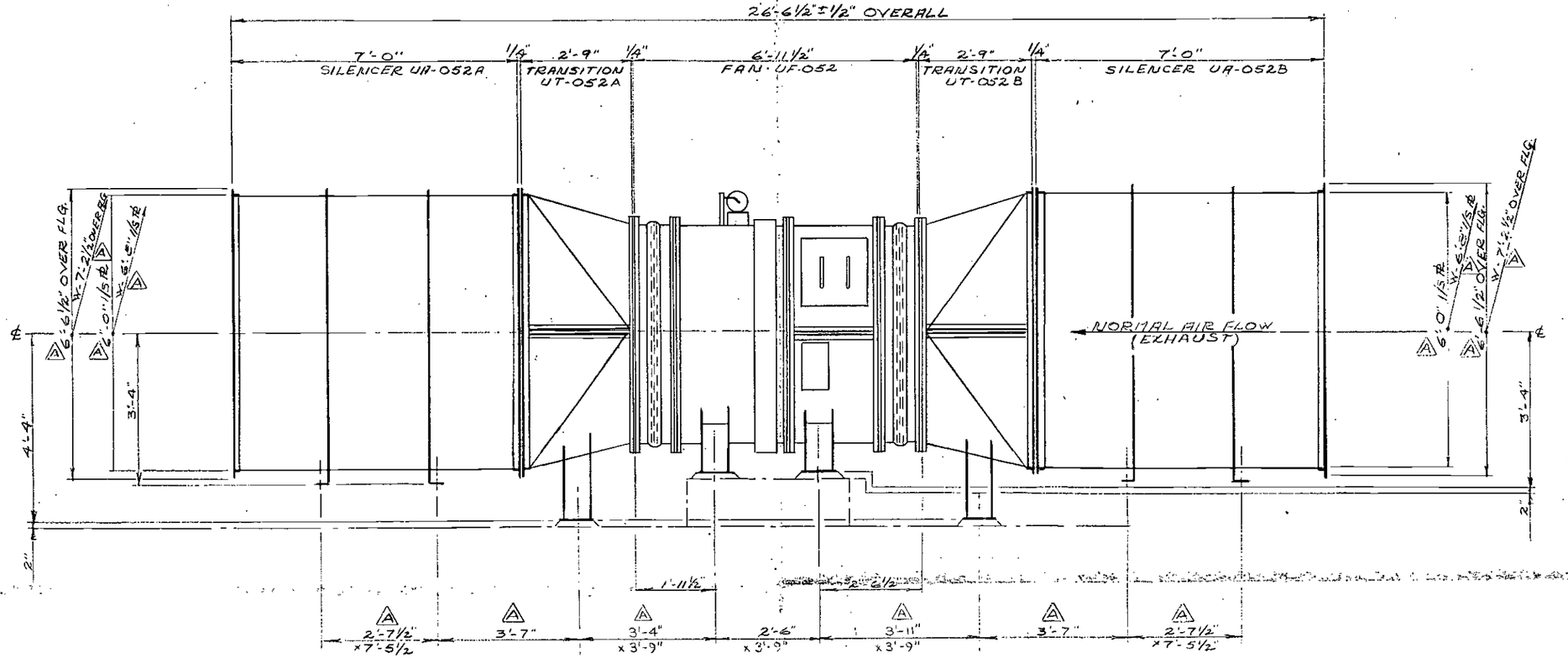
TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	OWG. NO. OR DIM.	MATERIAL	WEIGHT
VARIANT		Flakt Flakt Canada Ltd.	FLAKT CANADA LTD.		

CONTRACT NO.	QUOTATION NO.	REG. NO	NEXT ASSY.	REF. DWG	DRAWN	DATE	SUB. NO.
C-118-324-0773	SFC				R.M.	23/06/88	

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT	CHKD. B.B.	APPROVED	DWG. TYPE
METRO RAIL PROJECT A740	SCALE 1/2" = 1'-0"	CUSTOMERS REF.	
WILSHIRE / ALVARADO STATION	DWG. NO CO-C-11229	REV B	
GEN. ASS'Y. OF FAN UF-051			

RI 610



— SIDE ELEVATION —

FOR FOUNDATION LAYOUT, SEE DWG. No. CO-C-11373

FLAKT CANADA LTD.
NOV 13 1989
ISSUED

FOR INFORMATION PURPOSES ONLY
NOT TO BE USED FOR CONSTRUCTION

SYM.	REVISIONS	DATE	BY	CHKD
B	ADDED FOUNDATION LAYOUT DWG. No.	JAN. 20/89	B.B.	
A	ADDED SILENCER SUPPORTS SEPT. 30/1988 / CLIENT MARK-UP REVISED TO INCORP.	OCT. 24 88	BP	B.B.

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	DWG. NO. OR DIM.	MATERIAL	WEIGHT
VARIANT					

Flakt Canada Ltd.

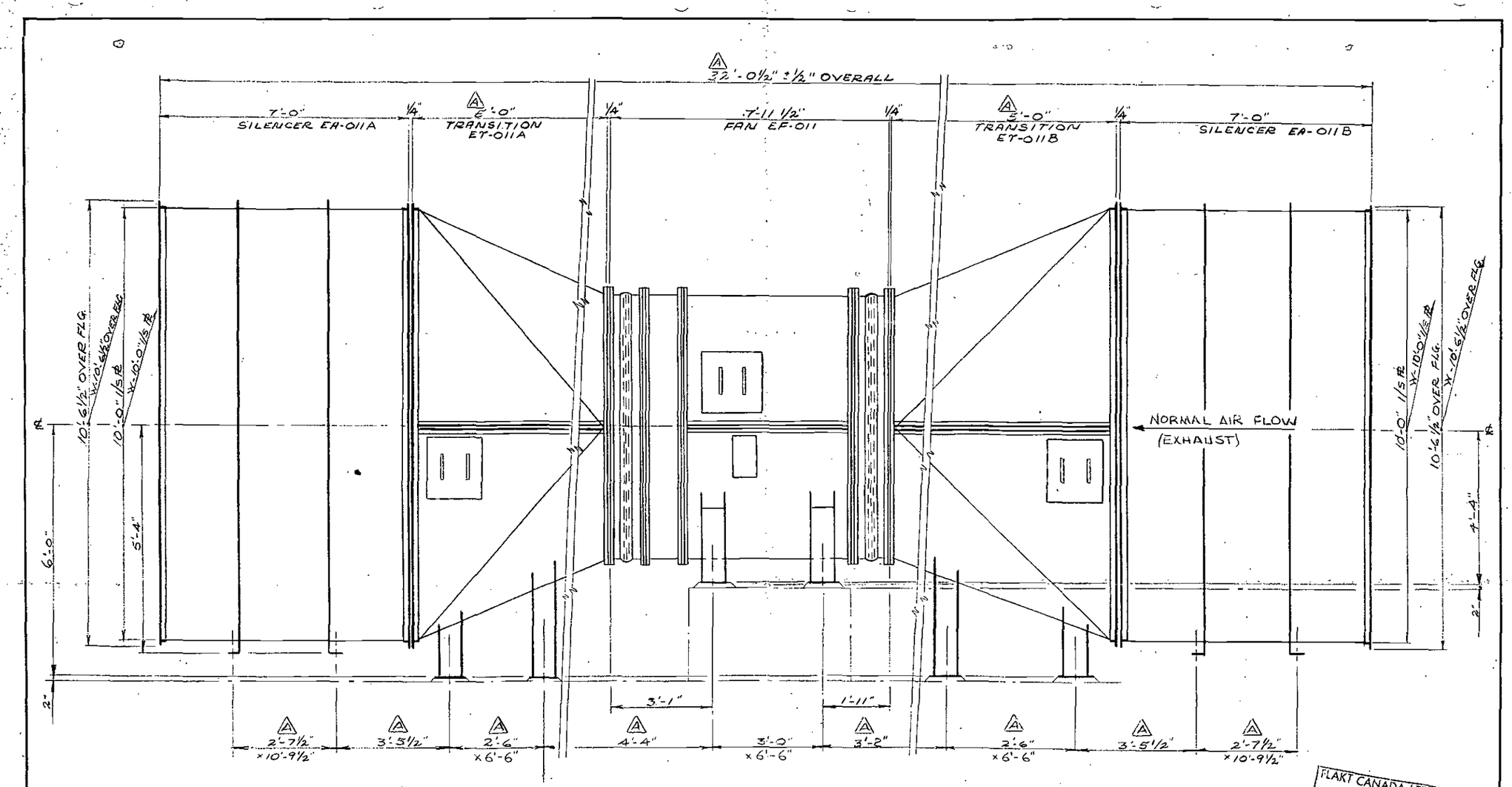
FLAKT CANADA LTD.

CONTRACT NO.	QUOTATION NO.	REG. NO	NEXT ASSY.	REF. DWG.	DRAWN	DATE	SUB. NO.
C118-324-0773	SFC				R.A.	23/11/88	
					CHKD. B.B.	APPROVED	DWG TYPE
					SCALE 1/2" = 1'-0"		CUSTOMERS REF.

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT A 740
WILSHIRE / ALVARADO STATION
GEN. ASS'Y. OF FAN UF-052

DWG. NO CO-C-11230 REV B

R 610



SIDE ELEVATION

FOR FOUNDATION LAYOUT, SEE DWG. NO. CO-C-11375

FLAKT CANADA LTD. NOV 10 1989 ISSUED

FOR INFORMATION PURPOSES ONLY NOT TO BE USED FOR CONSTRUCTION

SYM.	REVISIONS	DATE	BY	CHKD
B	ADDED FOUNDATION LAYOUT DWG. NO.	JAN. 20/89	B.B.	
A	ADDED SILENCER SUPPORTS SEPT. 30/1988/ CLIENT MARK-UP REVISED TO INCORP.	OCT 24 88	B.B.	B.B.

RF 610

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

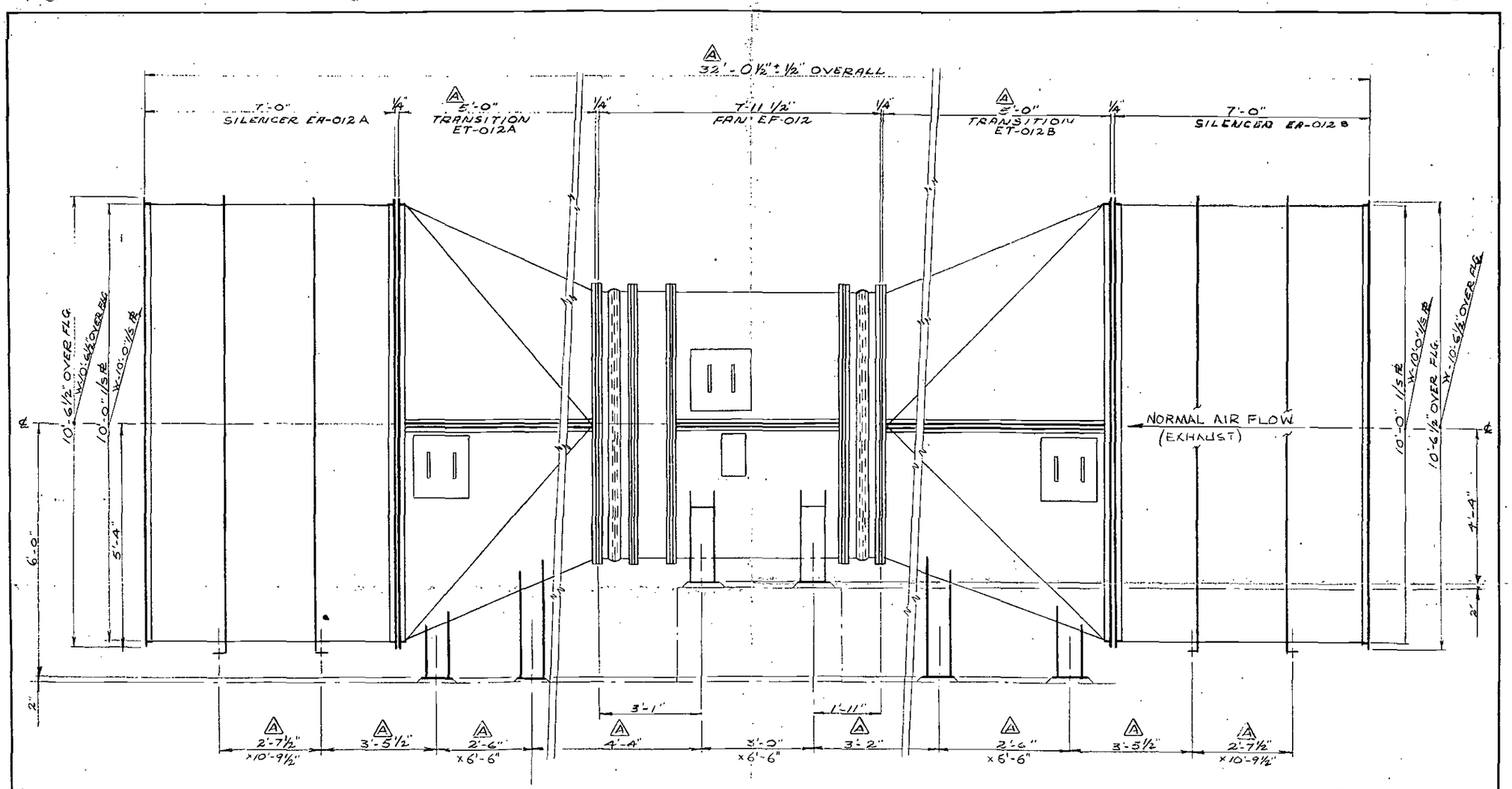
QUANTITY	ITEM	DESCRIPTION	DWG. NO. OR DIM.	MATERIAL	WEIGHT
VARIANT					

Flakt Canada Ltd.

FLAKT CANADA LTD.

CONTRACT NO.	QUOTATION NO.	REG. NO.	NEXT ASSY.	REF. DWG.	DRAWN	DATE	SUB. NO.
C-118-324-0773	SFC				RP	23/AUG/88	

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT	CHKD. B.B.	APPROVED	DWG. TYPE
METRO RAIL PROJECT A740 UNION STATION	SCALE 1/2"-1'-0"	CUSTOMERS REF.	
GEN. ASS'Y OF FAN EF-011	DWG. NO. CO-C-11231	REV B	



— SIDE ELEVATION —

FOR FOUNDATION LAYOUT, SEE DWG. NO. CO-C-11375

FLAKT CANADA LTD.
NOV 10 1989
ISSUED

FOR INFORMATION PURPOSES ONLY!
NOT TO BE USED FOR CONSTRUCTION

SYM.	REVISIONS	DATE	BY	CHKD
B	ADDED FOUNDATION LAYOUT DWG. NO.	JAN. 20/89	B.B.	
A	ADDED SILENCER SUPPORTS SEPT. 30/1988/ CLIENT MARK-UP REVISED TO INCORP.	OCT 24 88	BM	B.B.

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" · STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	DWG NO. OR DIM.	MATERIAL	WEIGHT
VARIANT					

Flakt Canada Ltd.

FLAKT CANADA LTD.

CONTRACT NO.	QUOTATION NO.	REG. NO	NEXT ASSY.	REF. DWG	DRAWN	DATE	SUB. NO.
C118-324-0773	SFC				EAP	23/AUG/88	

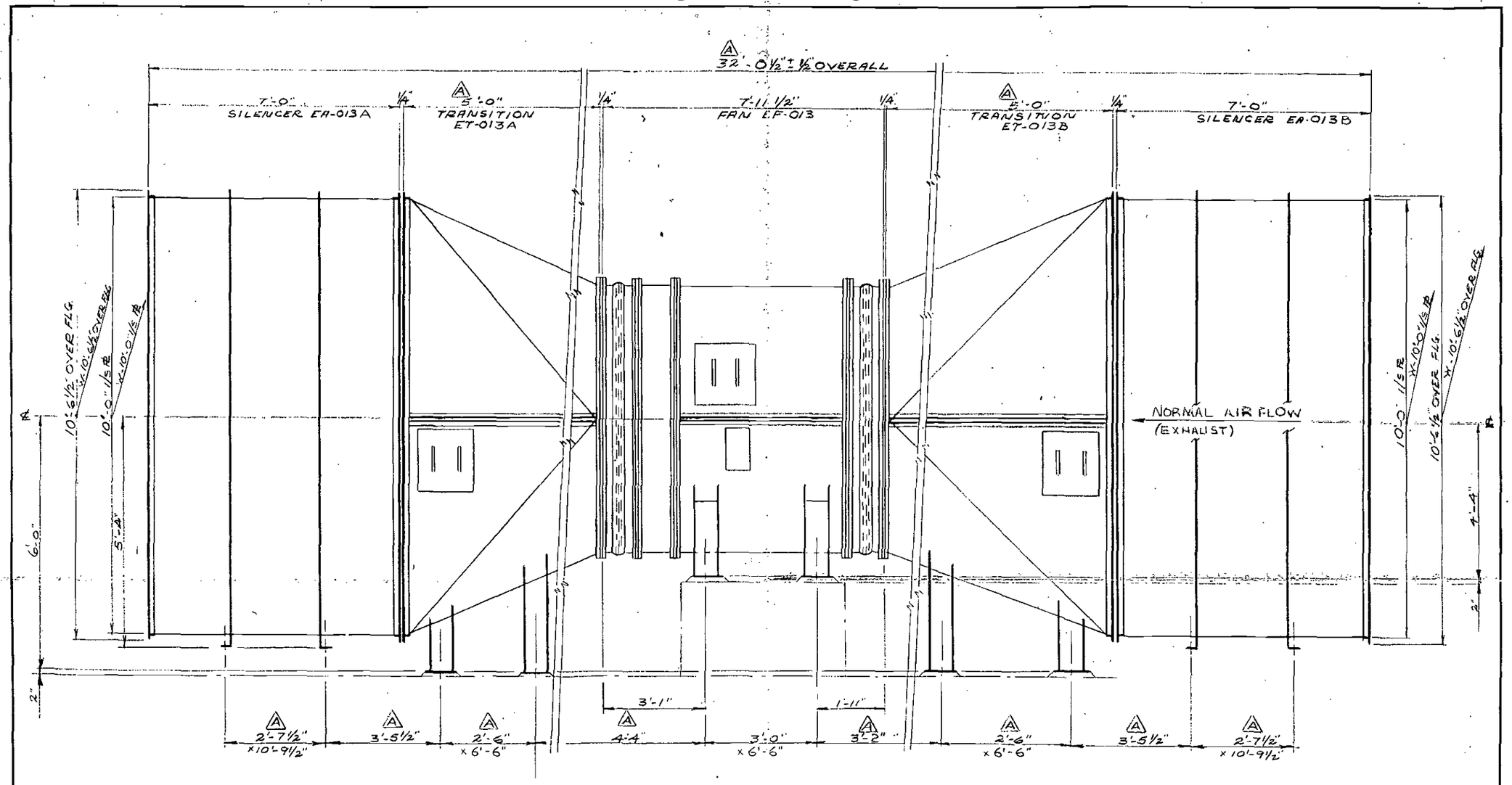
CHKD.	APPROVED	OWG TYPE
B.B.		

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT A740
UNION STATION
GEN. ASS'Y OF FAN EF-012

SCALE	CUSTOMERS REF.
1/2" = 1'-0"	

DWG. NO.	REV
CO-C-11232	B

RF- 610



— SIDE ELEVATION —

FOR FOUNDATION LAYOUT, SEE DWG. NO. CO-C-11375

FLAKT CANADA LTD.
NOV 10 1989
ISSUED

FOR INFORMATION PURPOSES ONLY
NOT TO BE USED FOR CONSTRUCTION

SYM.	REVISIONS	DATE	BY	CHKD
B	ADDED FOUNDATION LAYOUT DWG. No.	JAN. 20/89	B.B.	
A	ADDED SILENCER SUPPORTS SEPT. 30/1988 / CLIENT MARK-UP REVISED TO INCORP.	OCT. 24 88	B.B.	

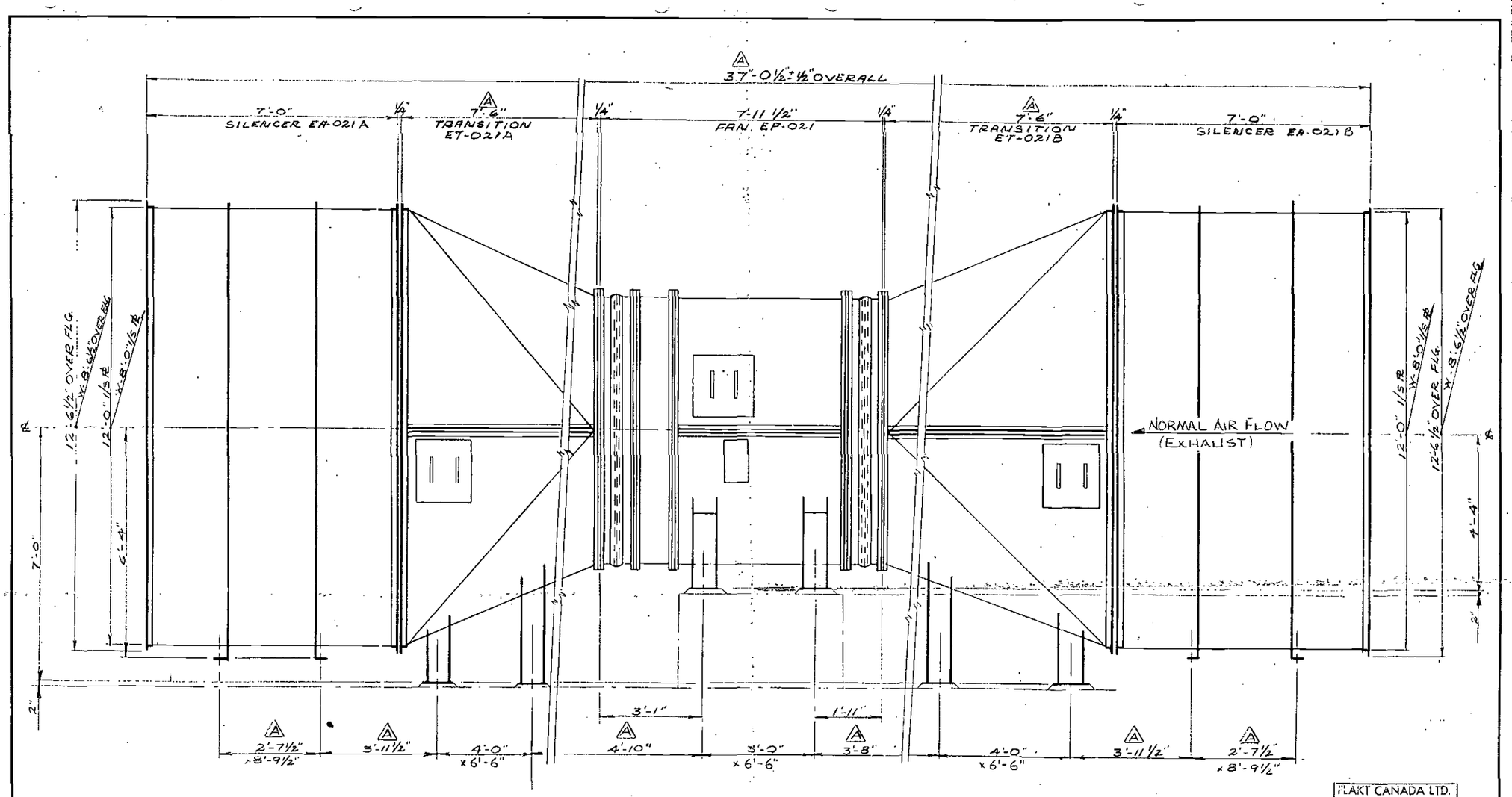
TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	DWG. NO. OR DIM.	MATERIAL	WEIGHT
VARIANT		Flakt Canada Ltd.	FLAKT CANADA LTD.		

CONTRACT NO.	QUOTATION NO.	REG NO.	NEXT ASSY.	REF. DWG	DRAWN	DATE	SUB. NO.
C-118-324-0773	SFC				CAP	23/AUG/88	

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT	CHKD. B.B.	APPROVED	DWG. TYPE
METRO RAIL PROJECT A 740	SCALE 1/2"=1'-0"	CUSTOMERS REF.	
UNION STATION	DWG. NO. CO-C-11233		REV B
GEN. ASS'Y OF FAN EF-013			

REG 510



— SIDE ELEVATION —

FLAKT CANADA LTD.
NOV 10 1989
ISSUED

FOR FOUNDATION LAYOUT, SEE DWG. NO. CO-C-11376 FOR INFORMATION PURPOSES ONLY. NOT TO BE USED FOR CONSTRUCTION

SYM.	REVISIONS	DATE	BY	CHKD
B	ADDED FOUNDATION LAYOUT DWG. NO.	JAN. 20/89	B.B.	
A	ADDED SILENCER SUPPORTS SEPT. 30/1988 / CLIENT MARK-UP REVISED TO INCORP.	OCT 24 88	BB	B.B.

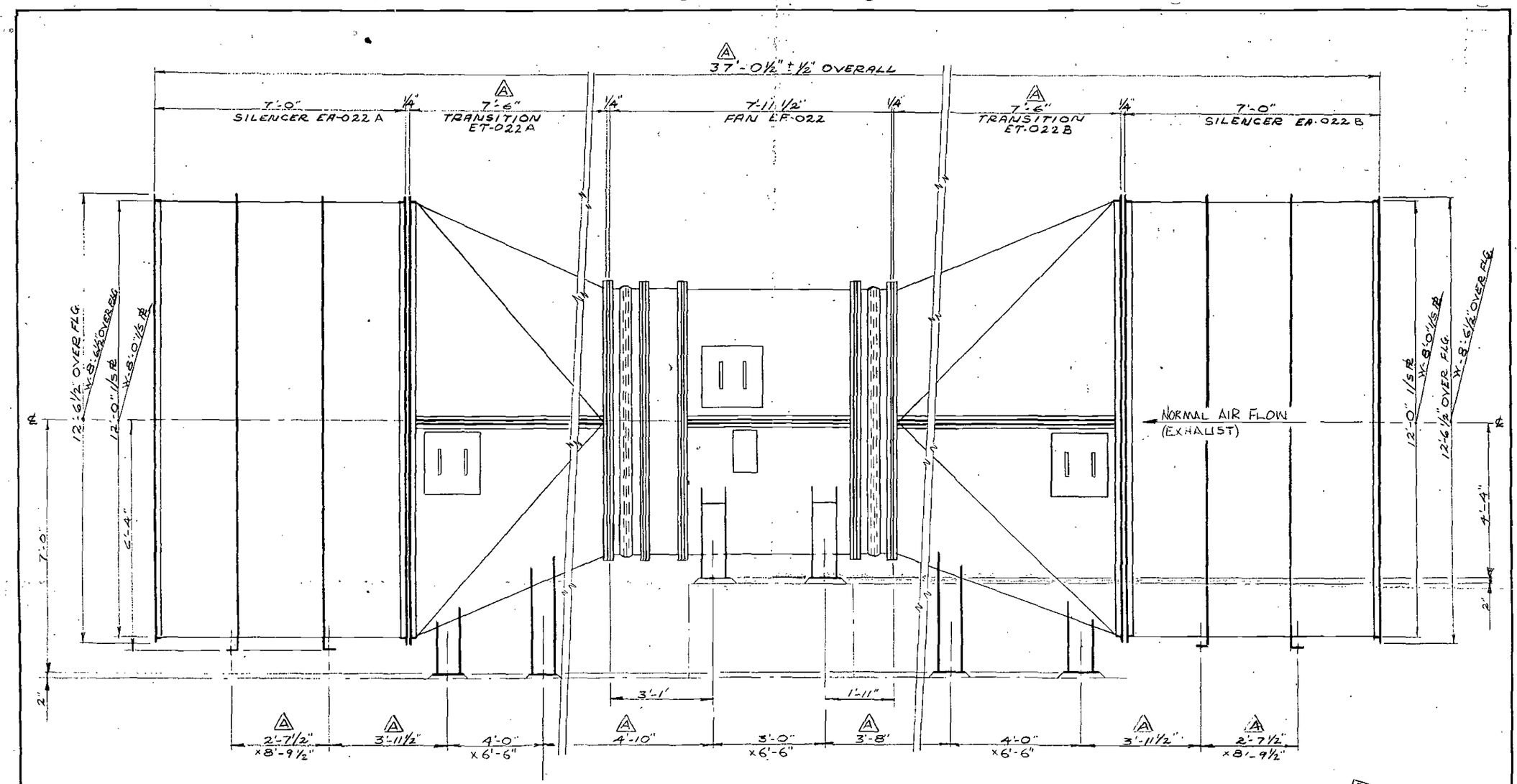
REG 610

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16" ; ALL OTHERS 1/32" NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	DWG NO. OR DIM.	MATERIAL	WEIGHT
VARIANT		Flakt Flakt Canada Ltd.	FLAKT CANADA LTD.		

CONTRACT NO.	QUOTATION NO.	REG. NO.	NEXT ASSY.	REF. DWG	DRAWN	DATE	SUB. NO.
C-118-324-0773	SFC				RAP	23/AUG/88	

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT	CHKD. B.B.	APPROVED	OWG TYPE
METRO RAIL PROJECT A 740	SCALE 1/2"-1'-0"		CUSTOMERS REF.
UNION STATION	DWG. NO. CO-C-11234		REV B
GEN. ASS'Y OF FAN EF-021			



— SIDE ELEVATION —

FOR FOUNDATION LAYOUT, SEE DWG. No. CO-C-11376

FLAKT CANADA LTD.
NOV 10 1989
ISSUED

FOR INFORMATION PURPOSES ONLY
NOT TO BE USED FOR CONSTRUCTION

SYM.	REVISIONS	DATE	BY	CHKD
B	ADDED FOUNDATION LAYOUT DWG. No.	JAN. 20/89	B.B.	
A	ADDED SILENCER SUPPORTS SEPT. 30/1988 / CLIENT MARK-UP REVISED TO INCORP.	OCT 24 88		B.B.

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" - NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	DWG. NO. OR DIM.	MATERIAL	WEIGHT
VARIANT					

Flakt Canada Ltd.

FLAKT CANADA LTD.

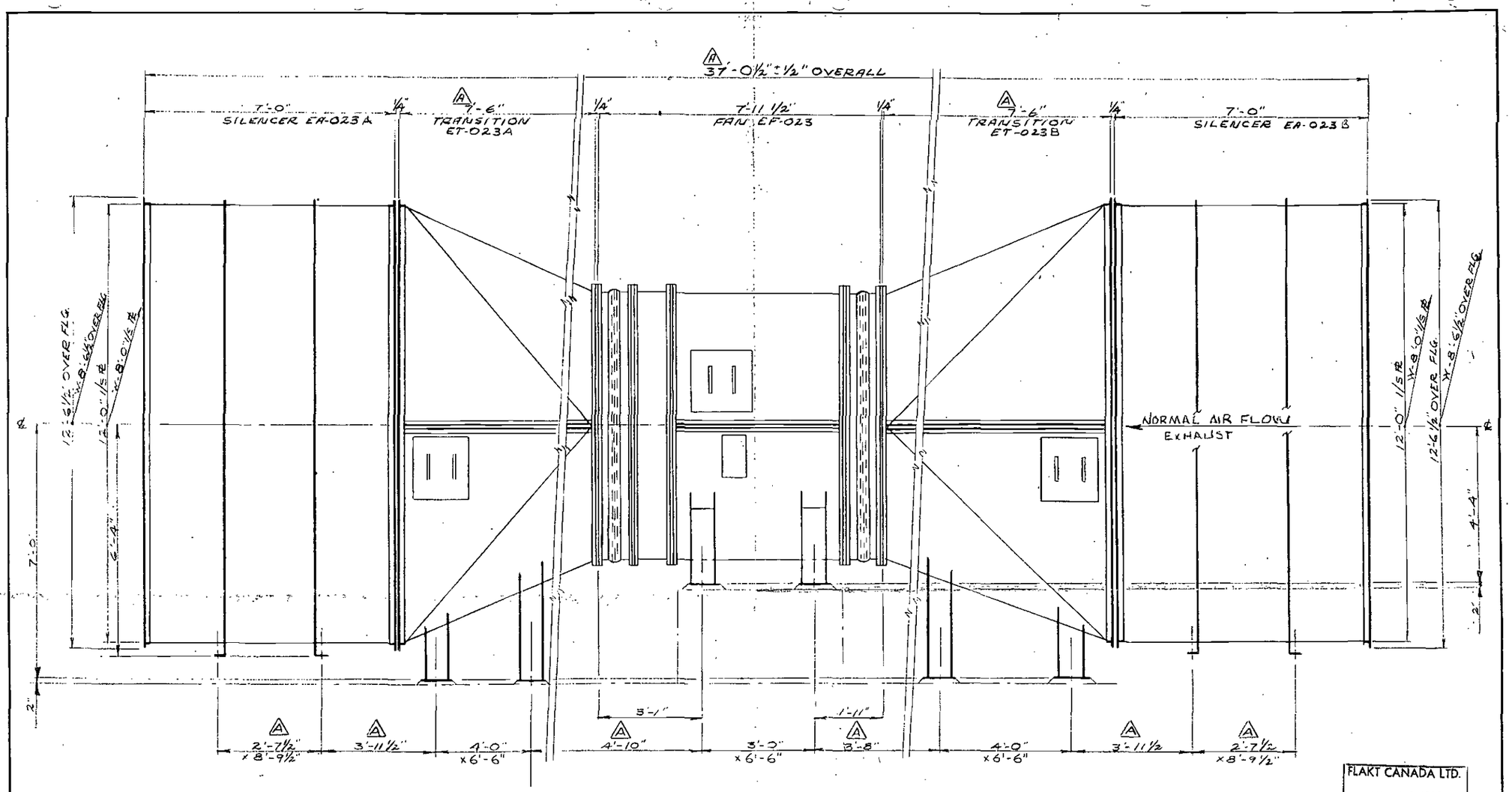
CONTRACT NO.	QUOTATION NO.	REG. NO.	NEXT ASSY.	REF. DWG.	DRAWN	DATE	SUB NO.
C-118-324-0773	SFC				RAP	23/AUG/88	

CHKD.	APPROVED	DWG. TYPE
B.B.		

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT A 740
UNION STATION
GEN. ASS'Y OF FAN EF-022

SCALE	CUSTOMERS REF.
½" = 1'-0"	

DWG. NO.	REV
CO-C-11235	B



— SIDE ELEVATION —

FLAKT CANADA LTD.
NOV 10 1989
ISSUED

FOR FOUNDATION LAYOUT, SEE DWG. No. CO-C-11376

FOR INFORMATION PURPOSES ONLY. NOT TO BE USED FOR CONSTRUCTION

SYM.	REVISIONS	DATE	BY	CHKD.
B	ADDED FOUNDATION LAYOUT DWG. No.	JAN. 20/89	B.B.	
A	ADDED SILENCER SUPPORTS SEPT. 30/1988 / CLIENT MARK-UP REVISED TO INCORP.	OCT 24 88	[illegible]	B.B.

REG 610

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	DWG. NO OR OIM.	MATERIAL	WEIGHT
VARIANT					

Flakt Canada Ltd.

FLAKT CANADA LTD.

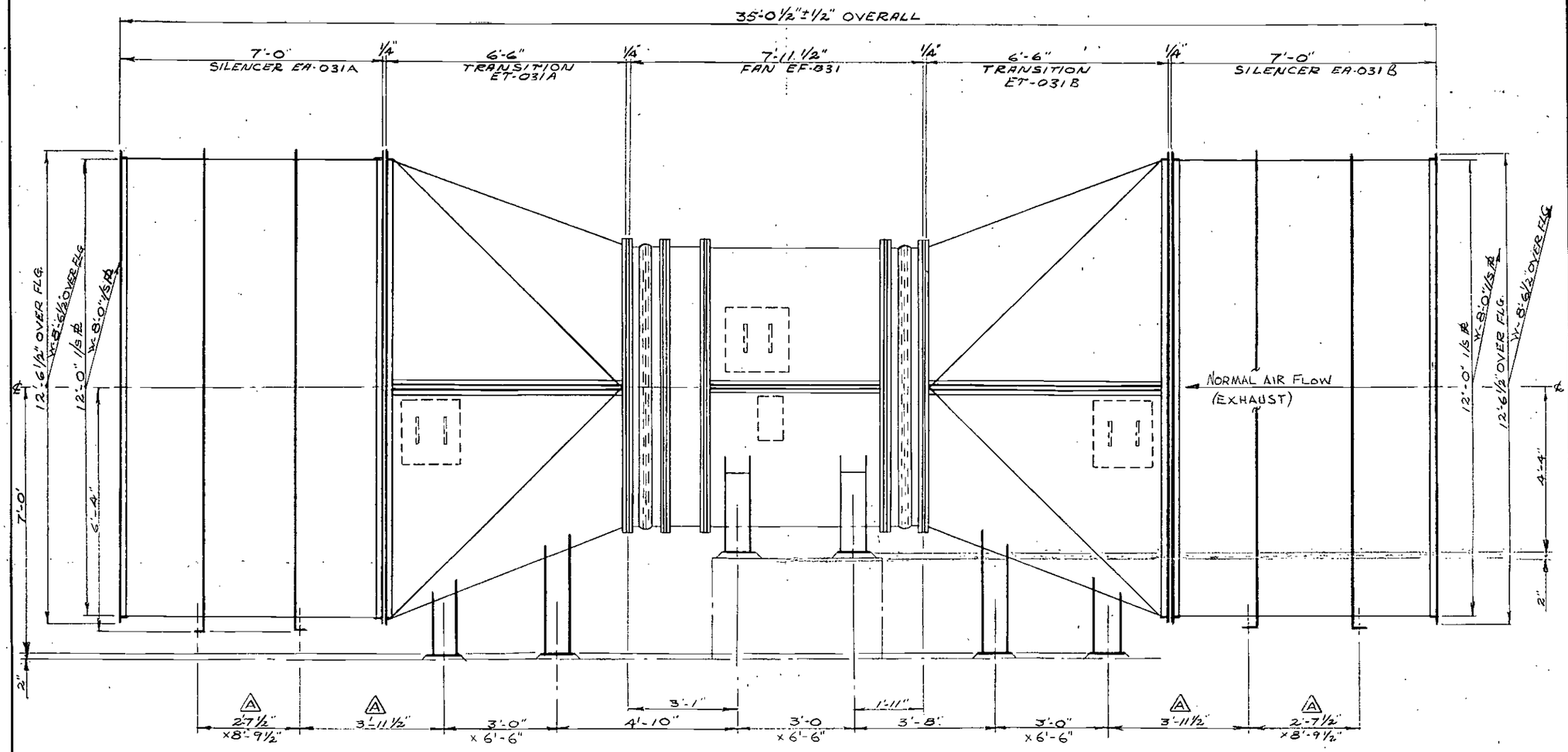
CONTRACT NO.	QUOTATION NO	REG NO.	NEXT ASSY.	REF. DWG	DRAWN	DATE	SUB. NO.
C-118-324-0773	SFC				[illegible]	23/Aug/88	

CHKD.	APPROVED	DWG. TYPE
B.B.		

SCALE ½" = 1'-0" | CUSTOMERS REF.

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT A 740
UNION STATION
GEN. ASS'Y OF FAN EF-023

DWG. NO. CO-C-11236 | REV B



— SIDE ELEVATION —

FOR FOUNDATION LAYOUT, SEE DWG. No. CO-C-11376

FLAKT CANADA LTD.
NOV 10 1989
ISSUED

FOR INFORMATION PURPOSES ONLY
NOT TO BE USED FOR CONSTRUCTION

QUANTITY	ITEM	DESCRIPTION	DWG. NO. OR DIM.	MATERIAL	WEIGHT
VARIANT					

Flakt Canada Ltd.

FLAKT CANADA LTD.

CONTRACT NO	QUOTATION NO.	REG. NO.	NEXT ASSY.	REF. DWG.	DRAWN	DATE	SUB. NO
C-118-324-0773	SFC				RM	23/Aug/88	

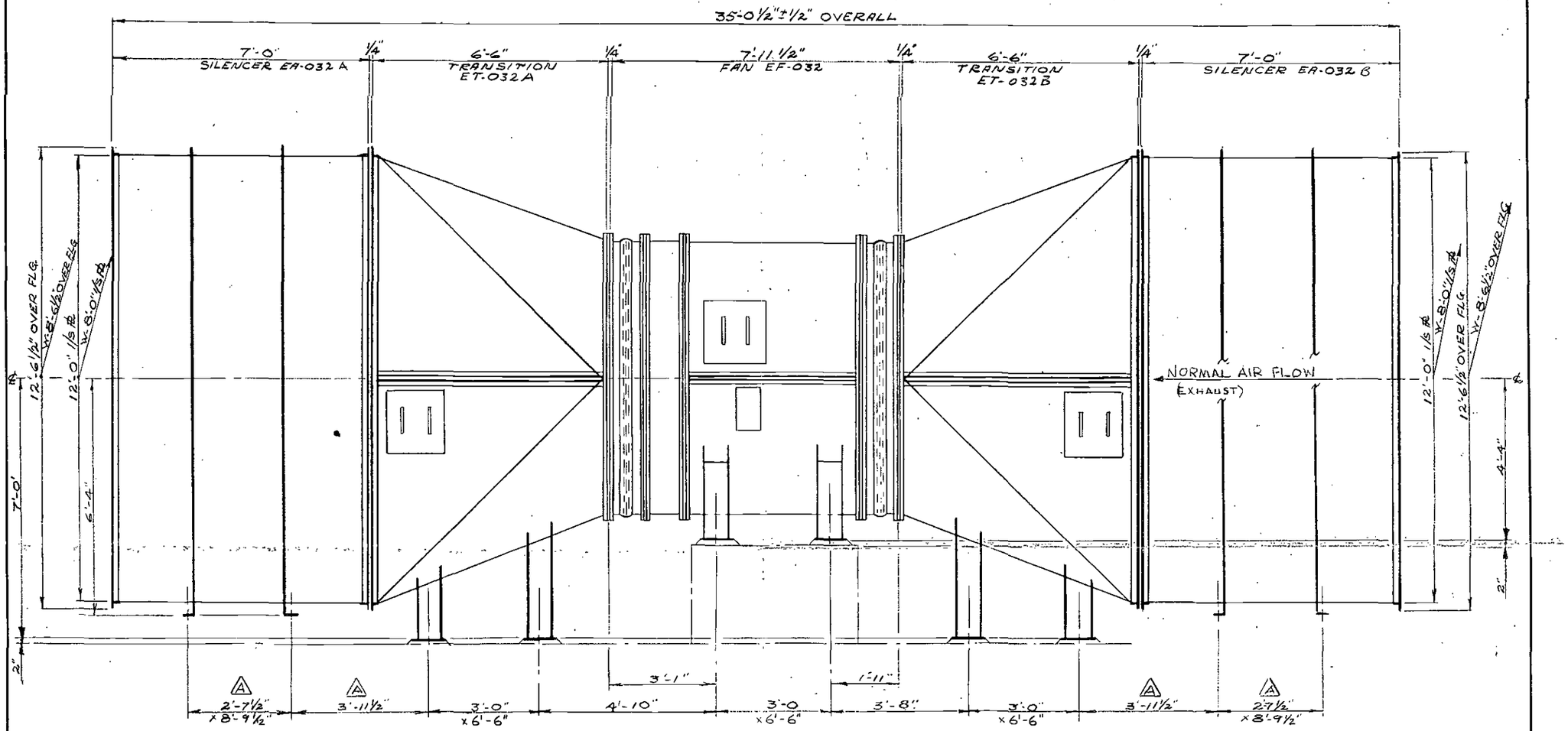
CHKD B.B.	APPROVED	OWG TYPE	
SCALE 1/2" = 1'-0"	CUSTOMERS REF.		
DWG NO. CO-C-11237	REV B		

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT A 740
CIVIC CENTER
GEN. ASS'Y OF FAN EF-031

SYM.	REVISIONS	DATE	BY	CHKD
B	ADDED FOUNDATION LAYOUT DWG. No.	JAN. 20/89	B.B.	
A	ADDED SILENCER SUPPORTS	OCT 24/88	RM	B.B.

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

REG 610



— SIDE ELEVATION —

FLAKT CANADA LTD.
NOV 10 1989
ISSUED

FOR FOUNDATION LAYOUT, SEE DWG. NO. CO-C-11376.

FOR INFORMATION PURPOSES ONLY
NOT TO BE USED FOR CONSTRUCTION

SYM.	REVISIONS	DATE	BY	CHKD
B	ADDED FOUNDATION LAYOUT DWG. NO.	JAN. 20/89	B.B.	
A	ADDED SILENCER SUPPORTS	OCT 27/88	R?	B.B.

REG 610

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	DWG NO OR DIM	MATERIAL	WEIGHT
VARIANT					

Flakt Canada Ltd.

FLAKT CANADA LTD.

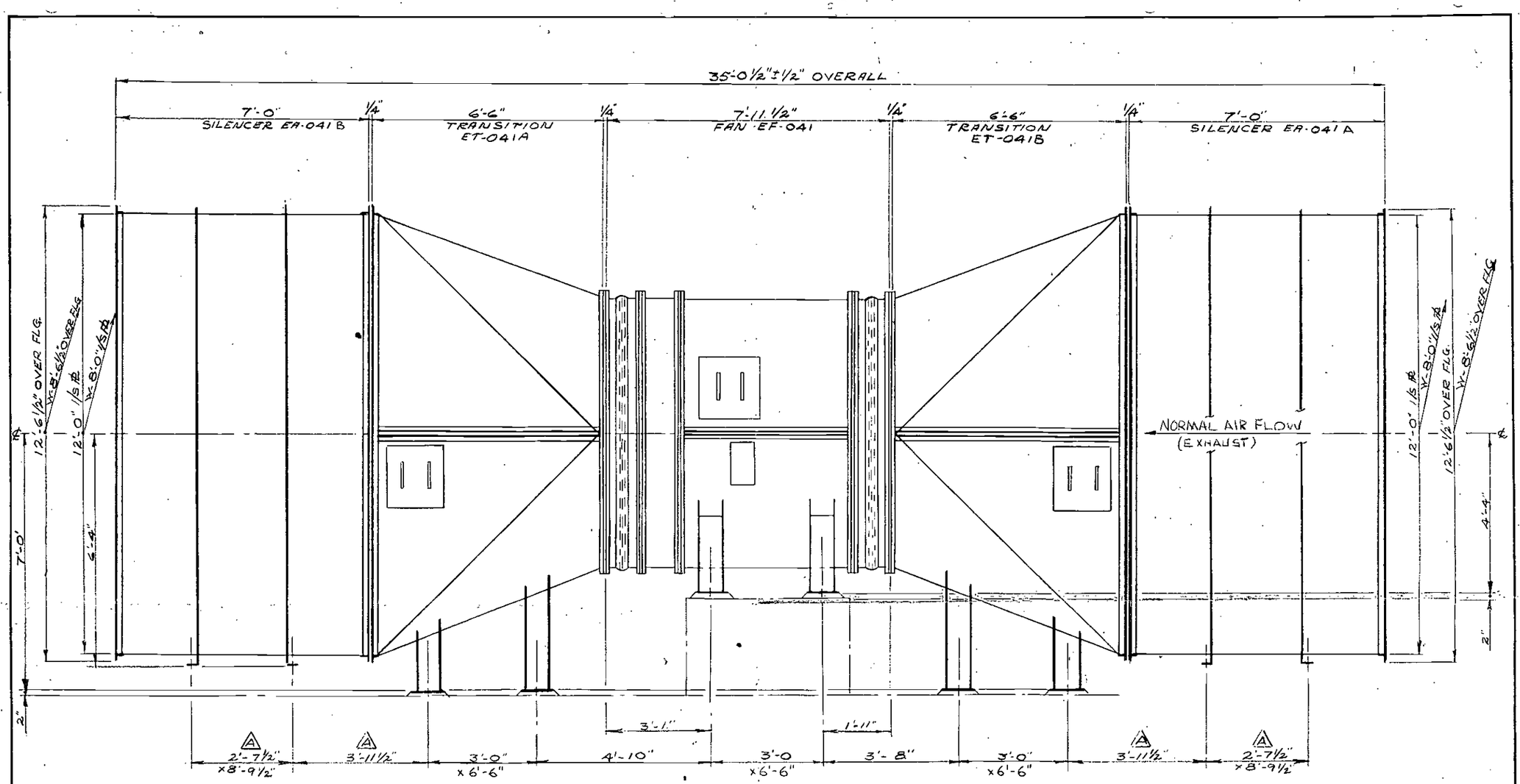
CONTRACT NO	QUOTATION NO.	REG NO	NEXT ASSY	REF. DWG	DRAWN	DATE	SUB NO
C-118-324-0713	SFC				CP	23/AUG/88	

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT A740
CIVIC CENTER
GEN. ASS'Y OF FAN EF-032

CHKD.	APPROVED	DWG TYPE
B.B.		

SCALE	CUSTOMERS' REF
1/2"=1'-0"	

DWG NO	REV
CO-C-11238	B



— SIDE ELEVATION —

FOR FOUNDATION LAYOUT, SEE DWG. No. CO-C-11376

FLAKT CANADA LTD.
NOV 10 1989
ISSUED

FOR INFORMATION PURPOSES ONLY
NOT TO BE USED FOR CONSTRUCTION

SYM.	REVISIONS	DATE	BY	CHKD
B	ADDED FOUNDATION LAYOUT DWG. No.	JAN. 20/89	B.B.	
A	ADDED SILENCER SUPPORTS	OCT 24 88	B.B.	B.B.

REG 610

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	DWG NO OR DIM.	MATERIAL	WEIGHT
VARIANT					

Flakt Canada Ltd.

FLAKT CANADA LTD.

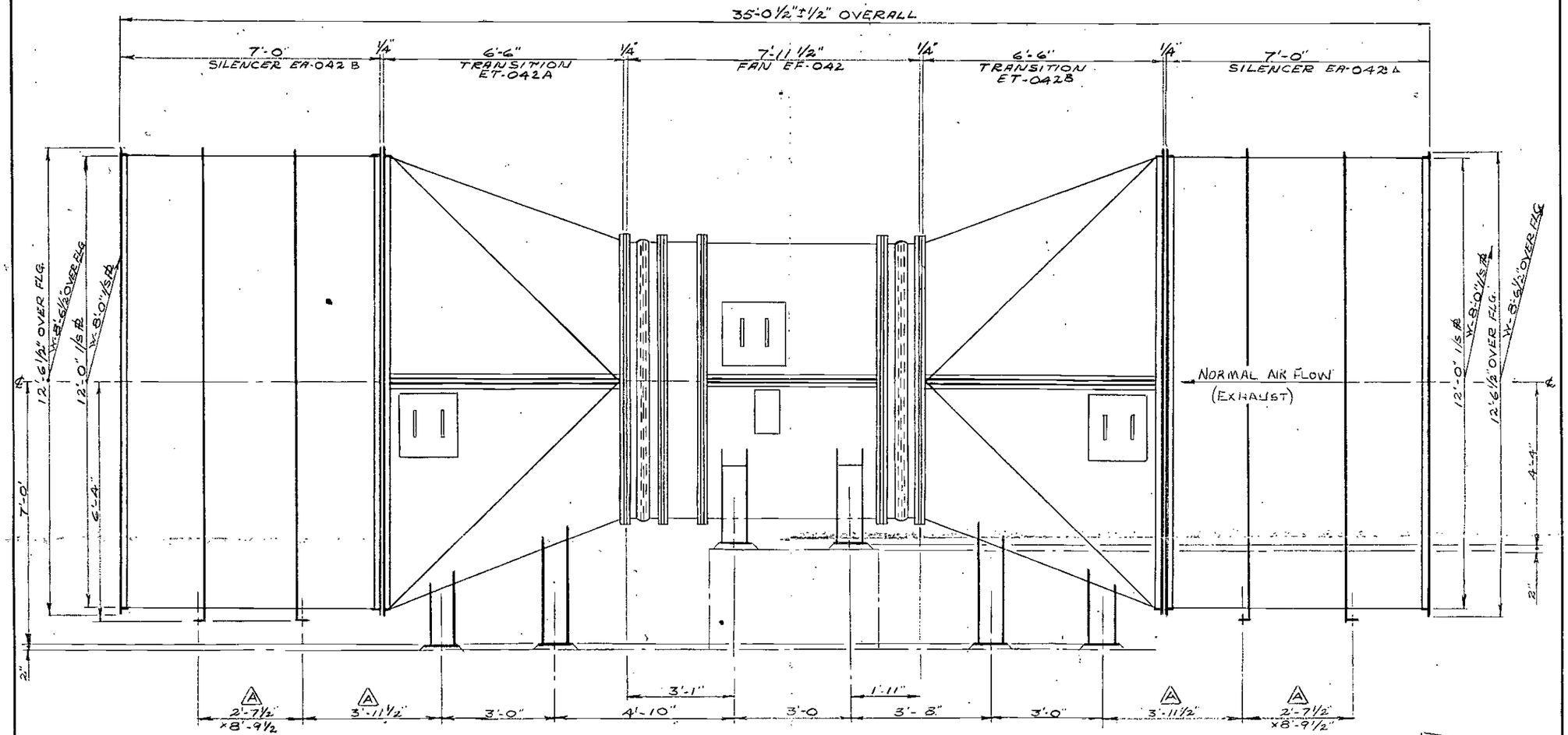
CONTRACT NO.	QUOTATION NO.	REG. NO.	NEXT ASSY.	REF. DWG	DRAWN	DATE	SUB. NO
C-118-324-0773	SFC				RP	23/AUG/88	

CHKD.	APPROVED	DWG. TYPE
B.B.		

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT A 740
CIVIC CENTER
GEN. ASS'Y OF FAN EF-041

SCALE	CUSTOMERS REF.
1/2"-1'-0"	

DWG. NO	REV
CO-C-11239	B



— SIDE ELEVATION —

FOR FOUNDATION LAYOUT, SEE DWG. NO. CO-C-11376

FOR INFORMATION PURPOSES ONLY NOT TO BE USED FOR CONSTRUCTION

FLAKT CANADA LTD. NOV 10 1989 ISSUED

SYM.	REVISIONS	DATE	BY	CHKD
B	ADDED FOUNDATION LAYOUT DWG. NO.	JAN. 20/89	B.B.	
A	ADDED SILENCER SUPPORTS	OCT 24/88	RP	B.B.

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	DWG. NO. OR DIM.	MATERIAL	WEIGHT
VARIANT		Flakt Flakt Canada Ltd.	FLAKT CANADA LTD.		

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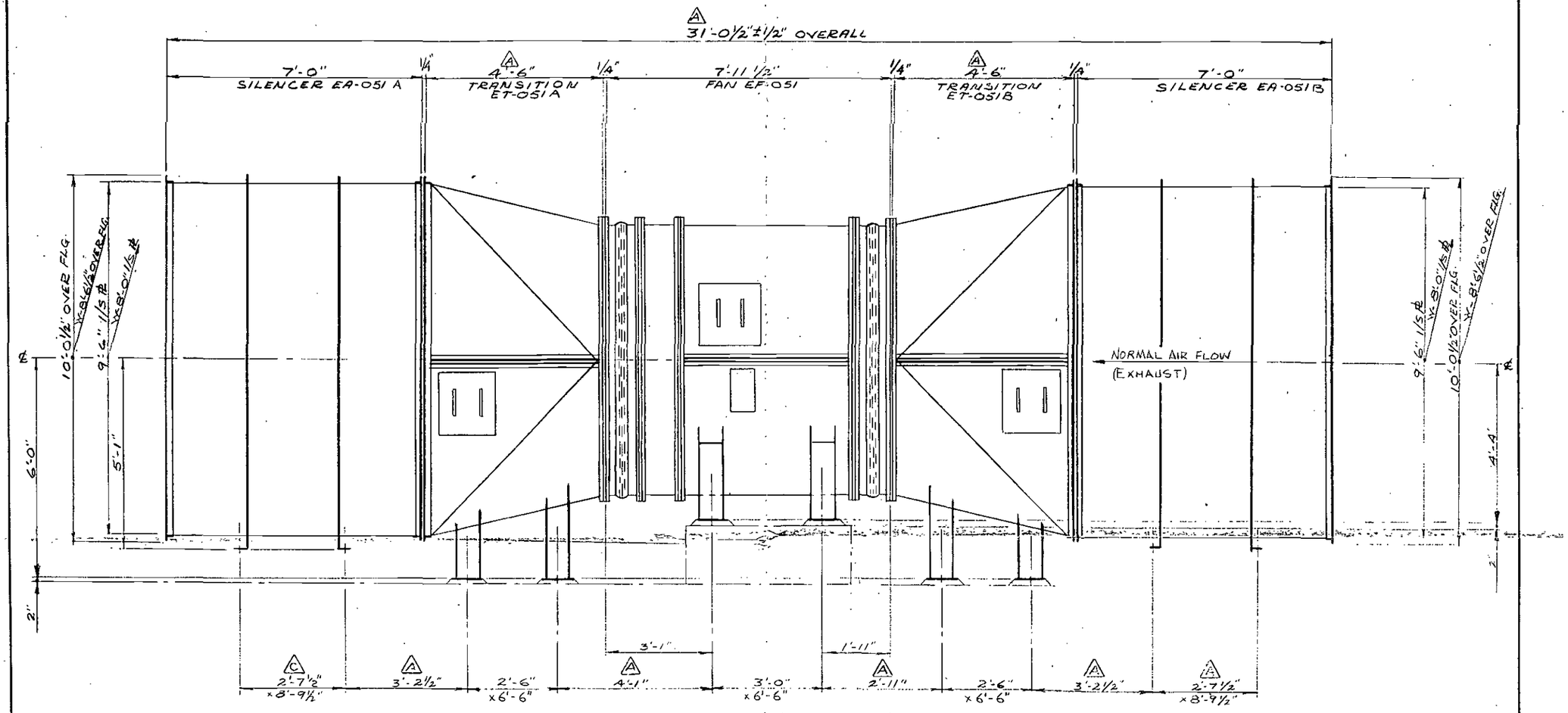
CONTRACT NO.	QUOTATION NO.	REG. NO.	NEXT ASSY.	REF. DWG	DRAWN	DATE	SUB. NO
C-118-324-0773	SFC				RP	23/AUG/88	

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT	CHKD. B.B.	APPROVED	DWG. TYPE
METRO RAIL PROJECT A740	SCALE 1/2"-1'-0"		CUSTOMERS REF.
CIVIC CENTER	DWG. NO. CO-C-11240		REV B
GEN. ASS'Y OF FAN EF-042			

RI 610



— SIDE ELEVATION —

FOR FOUNDATION LAYOUT, SEE DWG. No. CO-C-11377

FLAKT CANADA LTD. NOV 10 1989 ISSUED

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SYM.	REVISIONS	DATE	BY	CHKD
C	DIM. 2'-7½" WAS 2'-7" (SILENCER EA-051A)	MAR. 3/89	B.B.	
B	ADDED FOUNDATION LAYOUT DWG. NO.	JAN. 20/89	B.B.	
A	ADDED SILENCER SUPPORTS SEPT. 30/1988/ CLIENT MARK-UP REVISED TO INCORP	OCT. 29 88	[illegible]	B.B.

REG 610

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

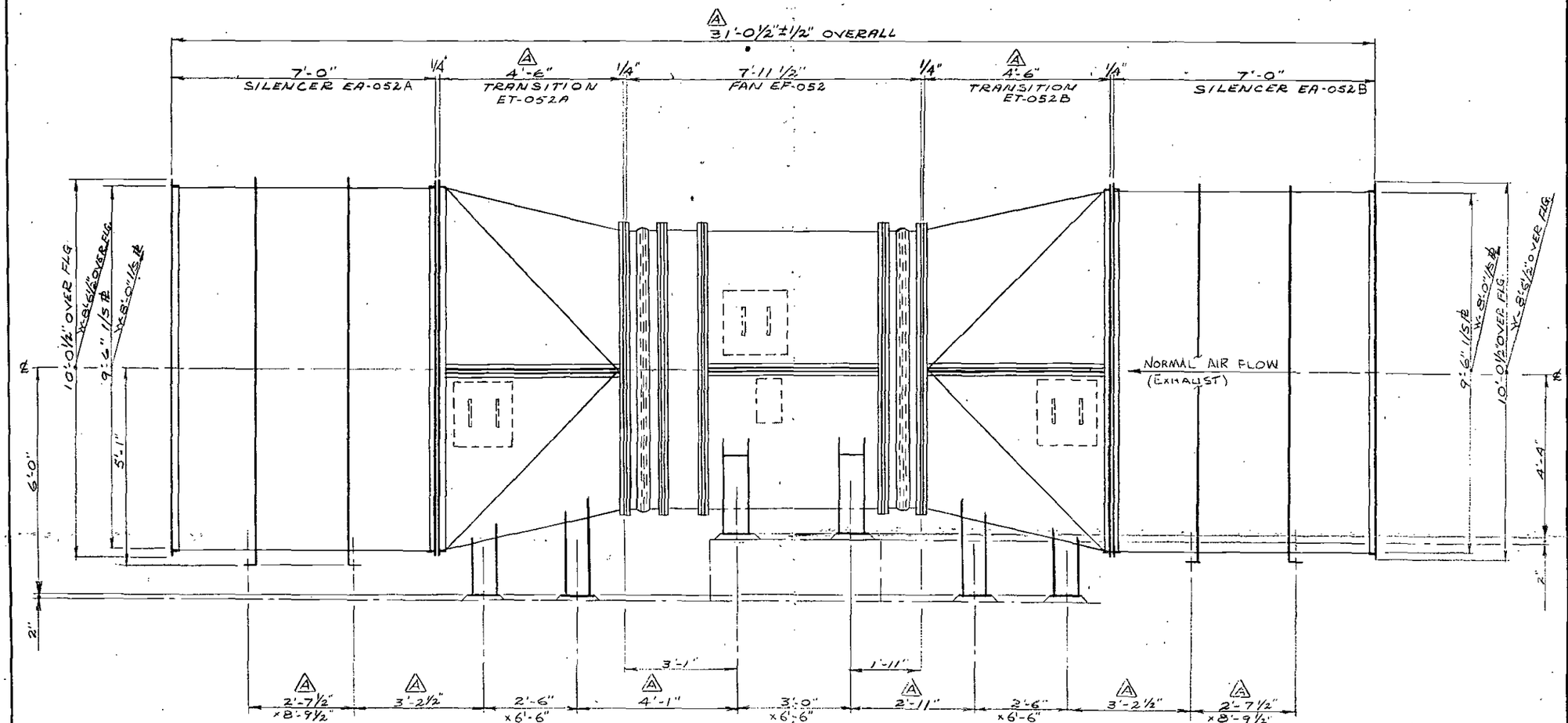
QUANTITY	ITEM	DESCRIPTION	DWG NO. OR DIM.	MATERIAL	WEIGHT
VARIANT					

Flakt Flakt Canada Ltd.

FLAKT CANADA LTD.

CONTRACT NO.	QUOTATION NO.	REG NO	NEXT ASSY	REF DWG	DRAWN	DATE	SUB NO.
C-118-324-0773	SFC				E.P.	23/AUG/88	

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT	CHKD. B.B.	APPROVED	OWG. TYPE
METRO RAIL PROJECT A 740	SCALE 1/2"=1'-0"	CUSTOMERS REF.	
5TH/HILL STATION	DWG. NO. CO-C-11241		REV C
GEN. ASS'Y OF FAN EF-051			



— SIDE ELEVATION —

FOR FOUNDATION LAYOUT, SEE DWG. No. CO-C-11377

FLAKT CANADA LTD.
NOV 10 1989
ISSUED

FOR INFORMATION PURPOSES ONLY
NOT TO BE USED FOR CONSTRUCTION

SYM.	REVISIONS	DATE	BY	CHKD
B	ADDED FOUNDATION LAYOUT DWG. No.	JAN. 20/89	B.B.	
A	ADDED SILENCER SUPPORTS SEPT. 30/1988/ CLIENT MARK-UP REVISED TO INCORP.	OCT 24 88	BB	B.B.

R 610

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	DWG. NO. OR DIM.	MATERIAL	WEIGHT
VARIANT					

Flakt Canada Ltd.

FLAKT CANADA LTD.

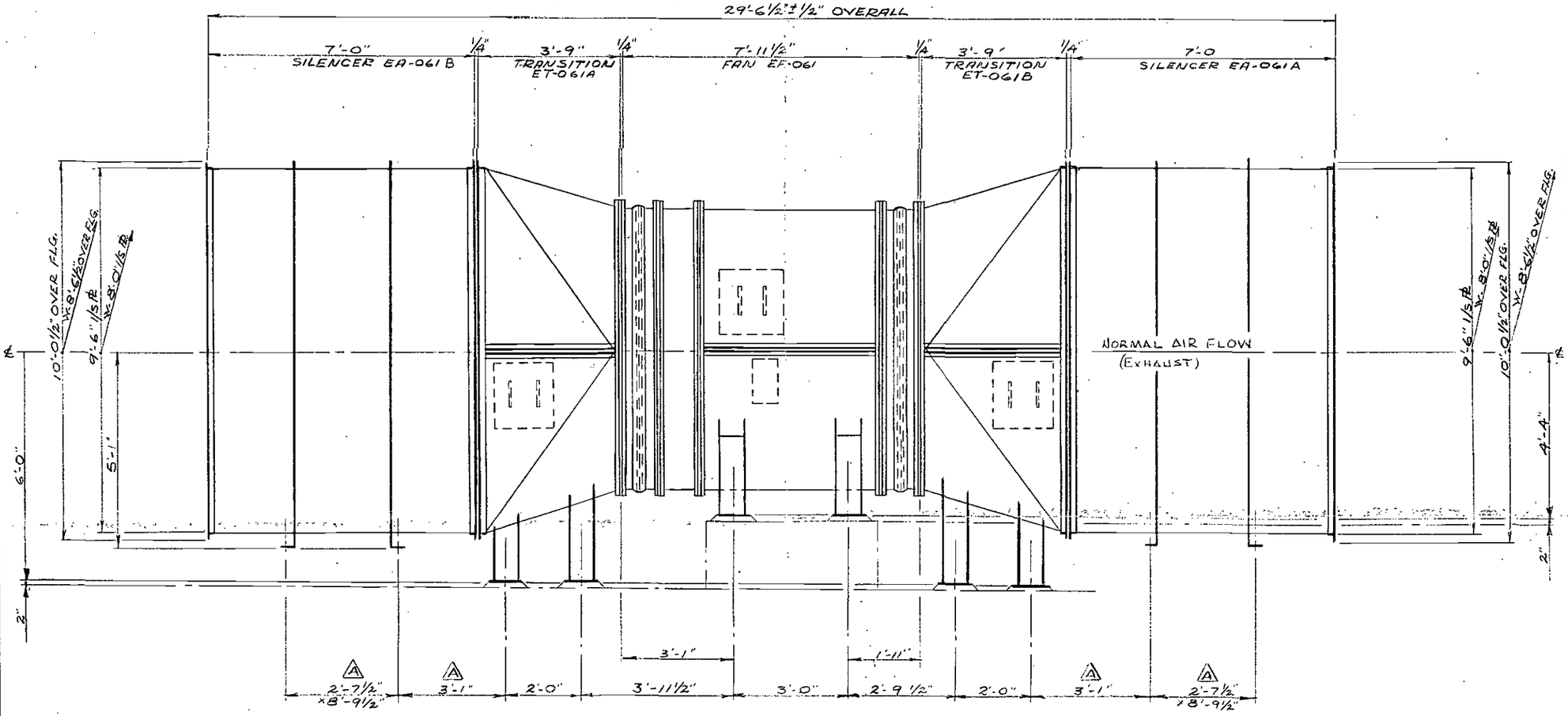
CONTRACT NO.	QUOTATION NO	REG. NO.	NEXT ASSY.	REF. DWG.	DRAWN	DATE	SUB. NO.
C-118-324-0773	SFC				CAP	23/AUG/88	

CHKD.	APPROVED	DWG. TYPE
B.B.		

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT A 740
5TH/HILL STATION
GEN. ASS'Y OF FAN EF-052

SCALE	CUSTOMERS REF.
1/2"-1'-0"	

DWG. NO.	REV
CO-C-11242	B



— SIDE ELEVATION —

FOR FOUNDATION LAYOUT, SEE DWG. No. CO-C-11378

FLAKT CANADA LTD.
NOV 10 1989
ISSUED

FOR INFORMATION PURPOSES ONLY
NOT TO BE USED FOR CONSTRUCTION

QUANTITY	ITEM	DESCRIPTION	DWG. NO. OR DIM.	MATERIAL	WEIGHT
VARIANT					

Flakt Canada Ltd.

FLAKT CANADA LTD.

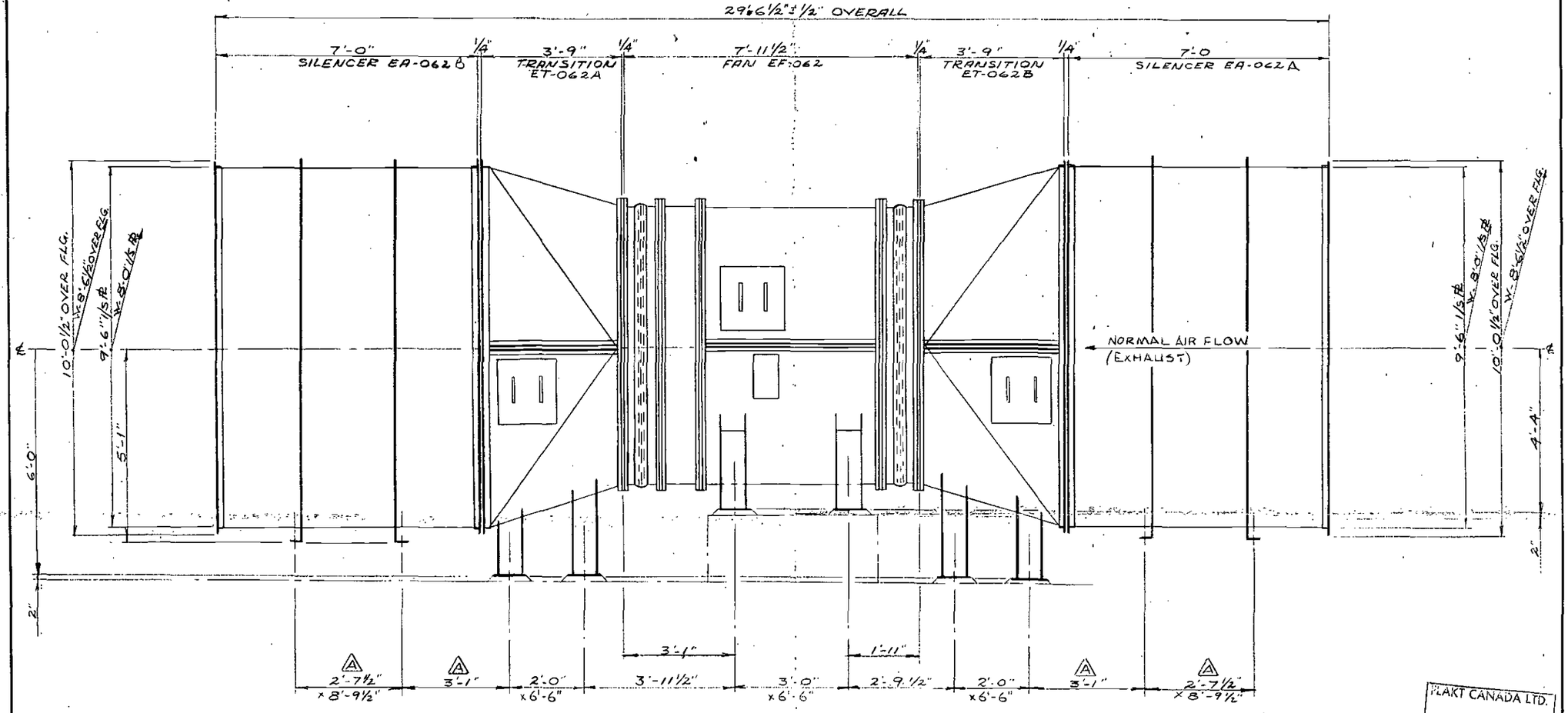
CONTRACT NO.	QUOTATION NO.	REG. NO.	NEXT ASSY.	REF. DWG.	DRAWN	DATE	SUB. NO.
C-118-324-0773	SFC				EAB	23/AUG/88	

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT	CHKD. B.B.	APPROVED	DWG. TYPE
METRO RAIL PROJECT A 740	SCALE 1/2"=1'-0"	CUSTOMERS REF.	
5TH/HILL STATION	DWG. NO. CO-C-11243		REV B
GEN. ASS'Y OF FAN EF-061			

SYM.	REVISIONS	DATE	BY	CHKD
B	ADDED FOUNDATION LAYOUT DWG. NO.	JAN. 20/89	B.B.	
A	ADDED SILENCER SUPPORTS	OCT 24/88	BP	B.B.

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

REG 610



SIDE ELEVATION

FOR FOUNDATION LAYOUT, SEE DWG. NO. CO-C-11378

FLAKT CANADA LTD.
NOV 10 1989
ISSUED

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NOT TO BE USED FOR CONSTRUCTION

SYM.	REVISIONS	DATE	BY	CHKD
B	ADDED FOUNDATION LAYOUT DWG. NO.	JAN. 20/89	B.B.	
A	ADDED SILENCER SUPPORTS	OCT 24/88		B.B.

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	DWG NO. OR DIM.	MATERIAL	WEIGHT
VARIANT					

Flakt Canada Ltd.

FLAKT CANADA LTD.

CONTRACT NO.	QUOTATION NO	REG. NO	NEXT ASSY	REF. DWG	DRAWN	DATE	SUB NO
C-118-324-0773	SFC				GP	23/Aug/88	

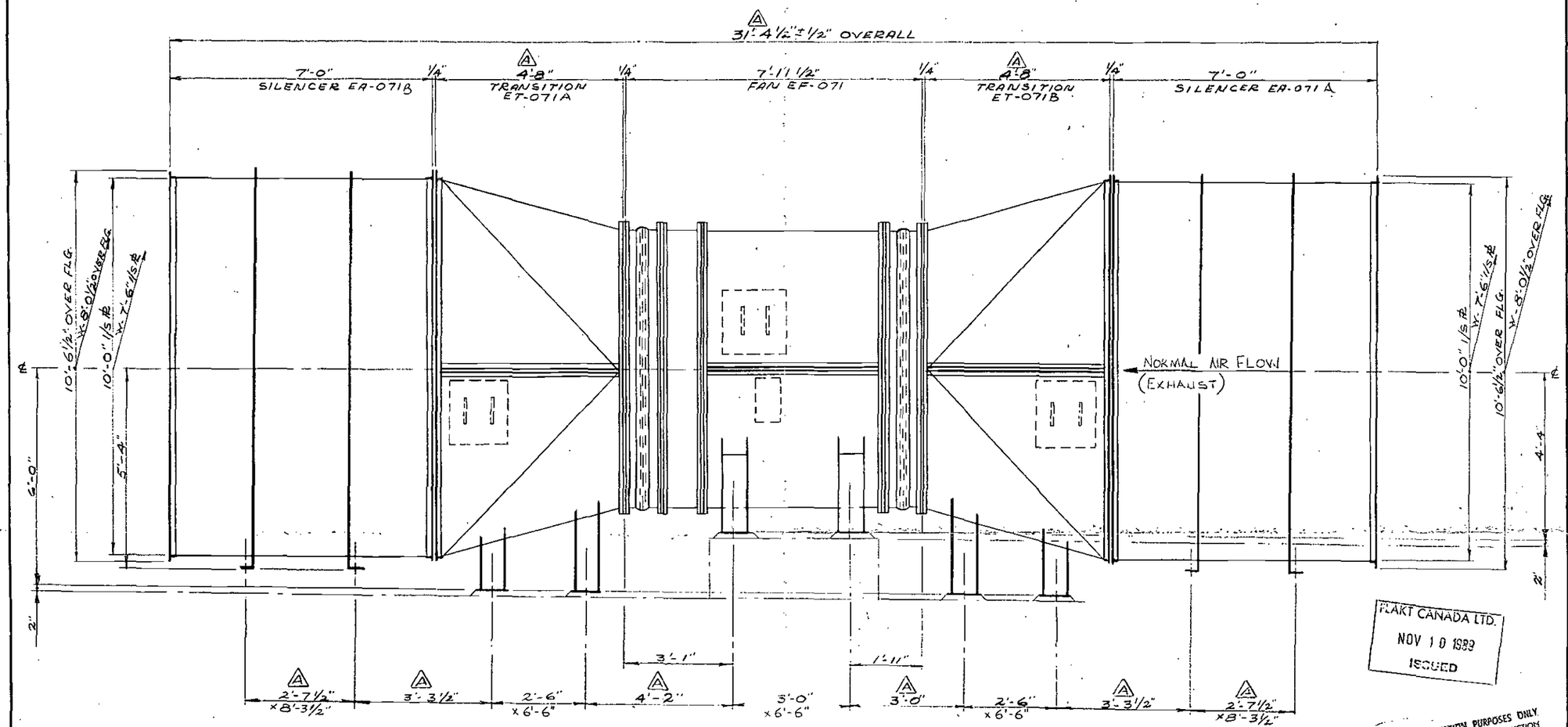
CHKD	APPROVED	DWG. TYPE
B.B.		

SCALE 1/2" = 1'-0" | CUSTOMERS REF.

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT A 740
5TH/HILL STATION
GEN. ASS'Y OF FAN EF-062

DWG NO. CO-C-11244 | REV. B

REC 610



FLAKT CANADA LTD.
NOV 10 1989
ISSUED

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NOT TO BE USED FOR CONSTRUCTION

SIDE ELEVATION

FOR FOUNDATION LAYOUT, SEE DWG. No. CO-C-11379

FOR INFORMATION PURPOSES ONLY
NOT TO BE USED FOR CONSTRUCTION

SYM.	REVISIONS	DATE	BY	CHKD
B	ADDED FOUNDATION LAYOUT DWG. No.	JAN. 20/89	B.B.	
A	ADDED SILENCER SUPPORTS SEPT. 30/1988 / CLIENT MARK-UP REVISED TO INCORP.	OCT 24 88		B.B.

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	DWG NO. OR DIM	MATERIAL	WEIGHT
VARIANT					

Flakt Canada Ltd.

FLAKT CANADA LTD.

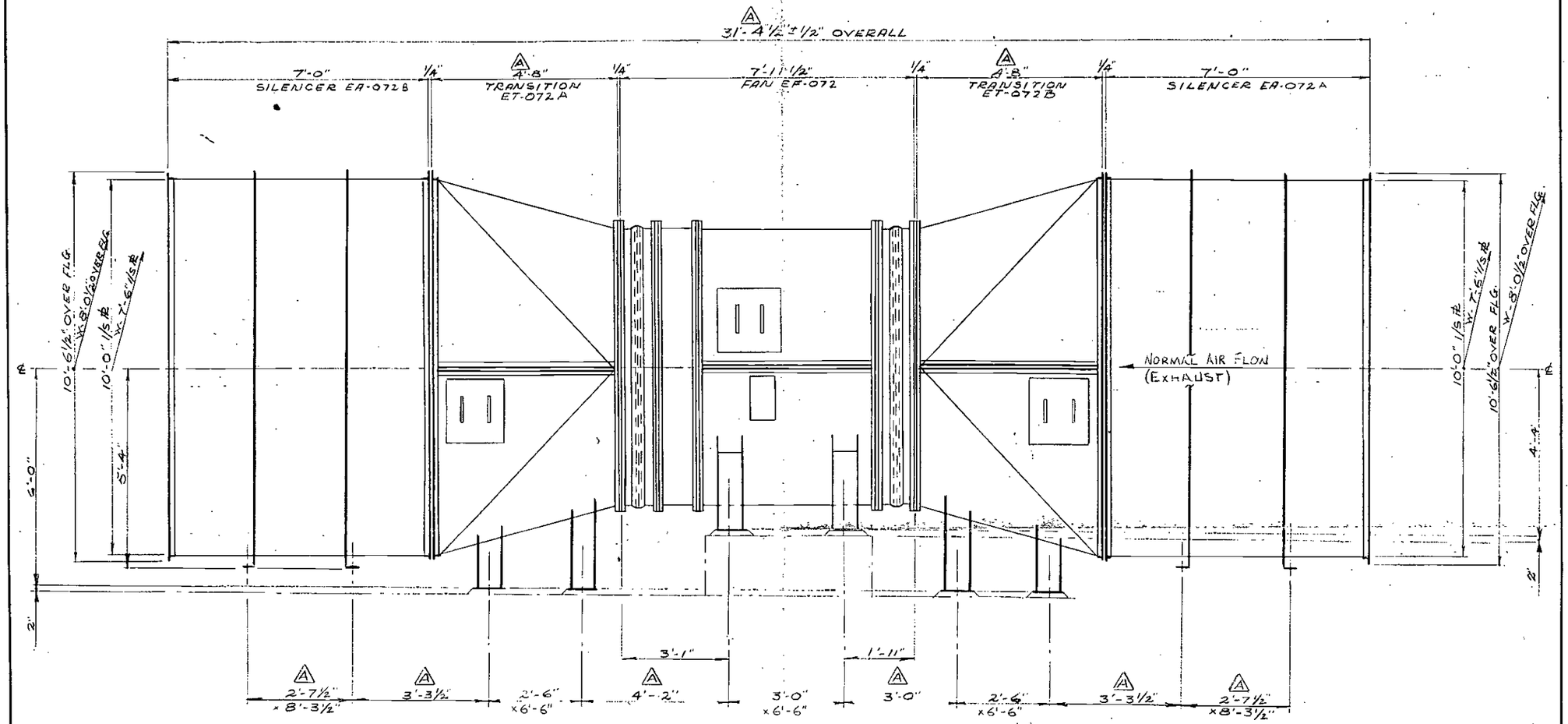
CONTRACT NO	QUOTATION NO.	REG. NO	NEXT ASSY	REF. DWG	DRAWN	DATE	SUB. NO
C-118-324-0773	SFC				CAP	23/AUG/88	
					CHKD. B.B.	APPROVED	DWG TYPE

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT A740
7TH / FLOWER STATION
GEN. ASS'Y OF FAN EF-071

SCALE 1/2" = 1'-0" | CUSTOMERS REF.

DWG NO CO-C-11245 | REV B

3 610



FOR INFORMATION PURPOSES ONLY
NOT TO BE USED FOR CONSTRUCTION

— SIDE ELEVATION —

FOR FOUNDATION LAYOUT, SEE DWG. NO. CO-C-11379

FLAKT CANADA LTD.
NOV 1 0 1989
ISSUED

SYM.	REVISIONS	DATE	BY	CHKD
B	ADDED FOUNDATION LAYOUT DWG. No.	JAN. 20/89	B.B.	
A	ADDED SILENCER SUPPORTS SEPT. 30/1988/ CLIENT MARK-UP REVISED TO INCORP.	OCT 24	RM	B.B.

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	DWG NO. OR DIM.	MATERIAL	WEIGHT
VARIANT					

Flakt Flakt Canada Ltd.

FLAKT CANADA LTD.

CONTRACT NO.	QUOTATION NO	REG. NO	NEXT ASSY.	REF. DWG	DRAWN	DATE	SUB. NO
C-118-324-0773	SFC				EAP	23/Nov/88	

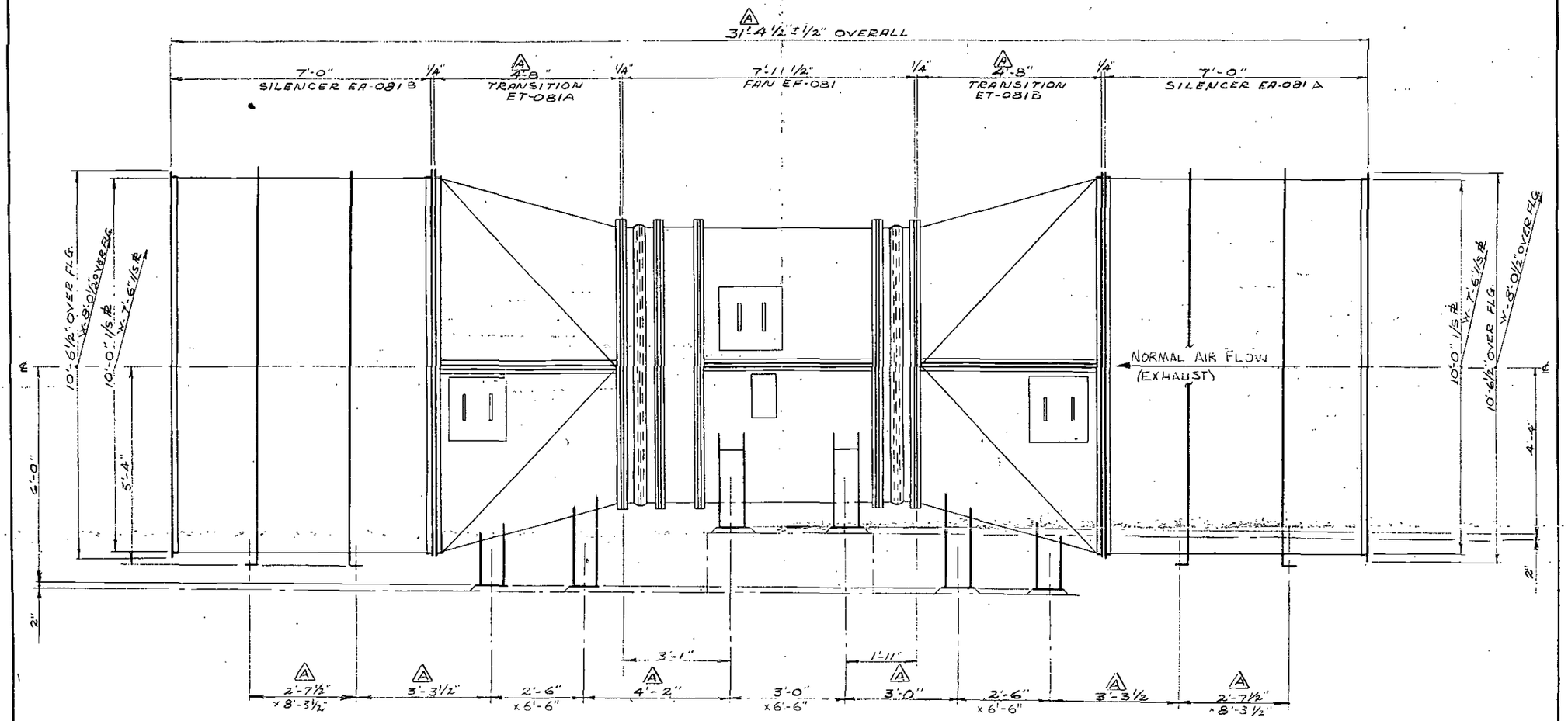
CHKD.	APPROVED	DWG TYPE
B.B.		

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT A740
7TH/FLOWER STATION
GEN. ASS'Y OF FAN EF-072

SCALE 1/2" = 1'-0" | CUSTOMERS REF

DWG. NO. CO-C-11246 | REV B

R 610



— SIDE ELEVATION —

FLAKT CANADA LTD.
NOV 10 1989
ISSUED

FOR FOUNDATION LAYOUT, SEE DWG. NO. CO-C-11379

FOR INFORMATION PURPOSES ONLY
NOT TO BE USED FOR CONSTRUCTION

SYM.	REVISIONS	DATE	BY	CHKD
B	ADDED FOUNDATION LAYOUT DWG. NO.	JAN. 20/89	B.B.	
A	ADDED SILENCER SUPPORTS SEPT. 30/1988 / CLIENT MARK-UP REVIED TO INCORP	OCT. 24 88	B.B.	B.B.

REF 610

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

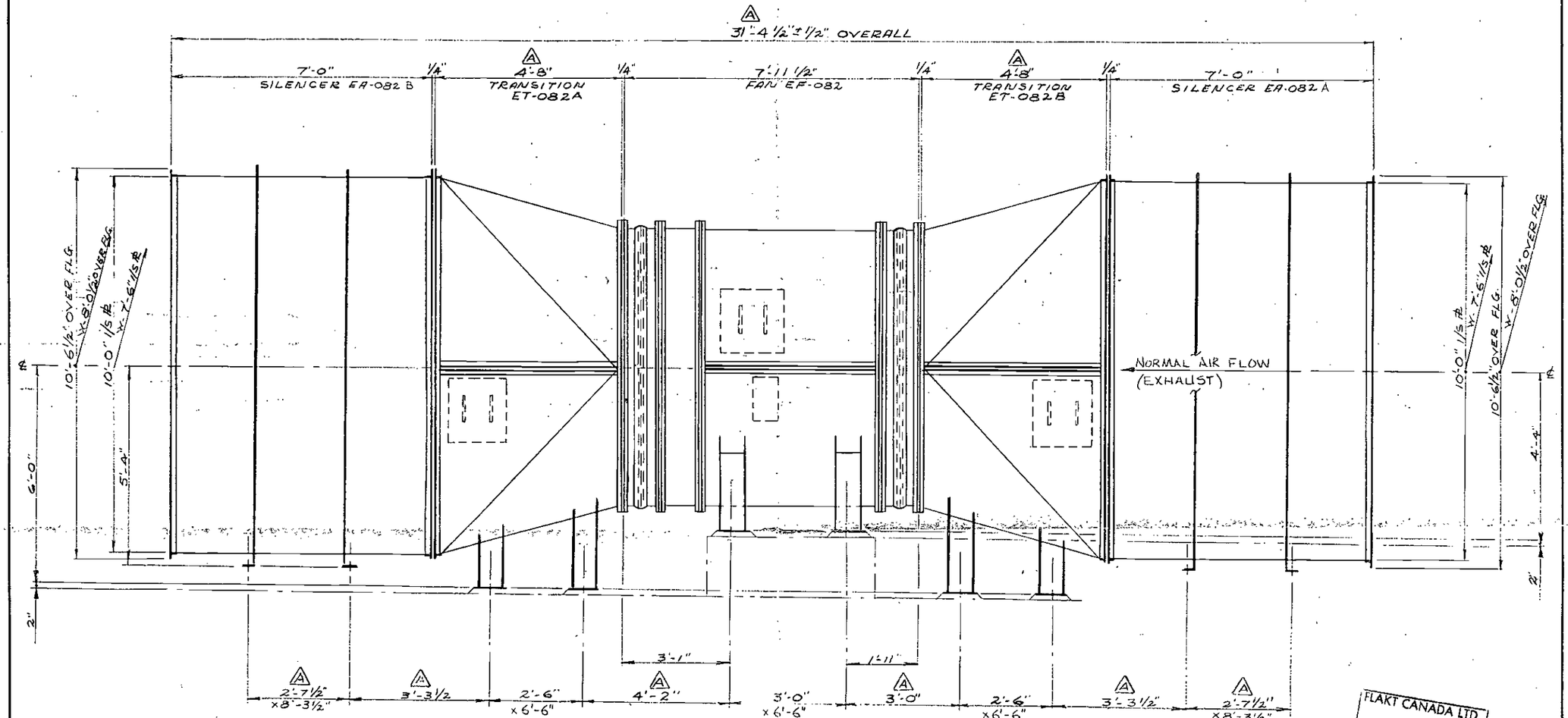
QUANTITY	ITEM	DESCRIPTION	DWG. NO. OR DIM.	MATERIAL	WEIGHT
VARIANT					

Flakt Canada Ltd.

FLAKT CANADA LTD.

CONTRACT NO.	QUOTATION NO.	REG. NO	NEXT ASSY.	REF. DWG.	DRAWN	DATE	SUB. NO
C-118-324-0773	SFC				RPB	23/AUG/88	

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT	CHKD. B.B.	APPROVED	OWG TYPE
METRO RAIL PROJECT A740	SCALE 1/2"=1'-0"	CUSTOMERS REF	
7TH / FLOWER STATION	DWG. NO. CO-C-11247	REV B	
GEN. ASS'Y OF FAN EF-081			



— SIDE ELEVATION —

FLAKT CANADA LTD.
NOV 10 1989
ISSUED

FOR INFORMATION PURPOSES ONLY
NOT TO BE USED FOR CONSTRUCTION

FOR FOUNDATION LAYOUT, SEE DWG. NO. CO-C-11379

SYM.	REVISIONS	DATE	BY	CHKD
B	ADDED FOUNDATION LAYOUT DWG. No.	JAN. 20/89	B.B.	
A	ADDED SILENCER SUPPORTS SEPT. 30/1988/ CLIENT MARK-UP REVISED TO INCORP.	OCT 24 88.	B.B.	B.B.

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	DWG NO OR DIM.	MATERIAL	WEIGHT
VARIANT					

Flakt Canada Ltd.

FLAKT CANADA LTD.

CONTRACT NO	QUOTATION NO.	REG NO	NEXT ASSY.	REF. DWG.	DRAWN	DATE	SUB. NO.
C-118-324-0773	SFC				RP	23/AUG/88	

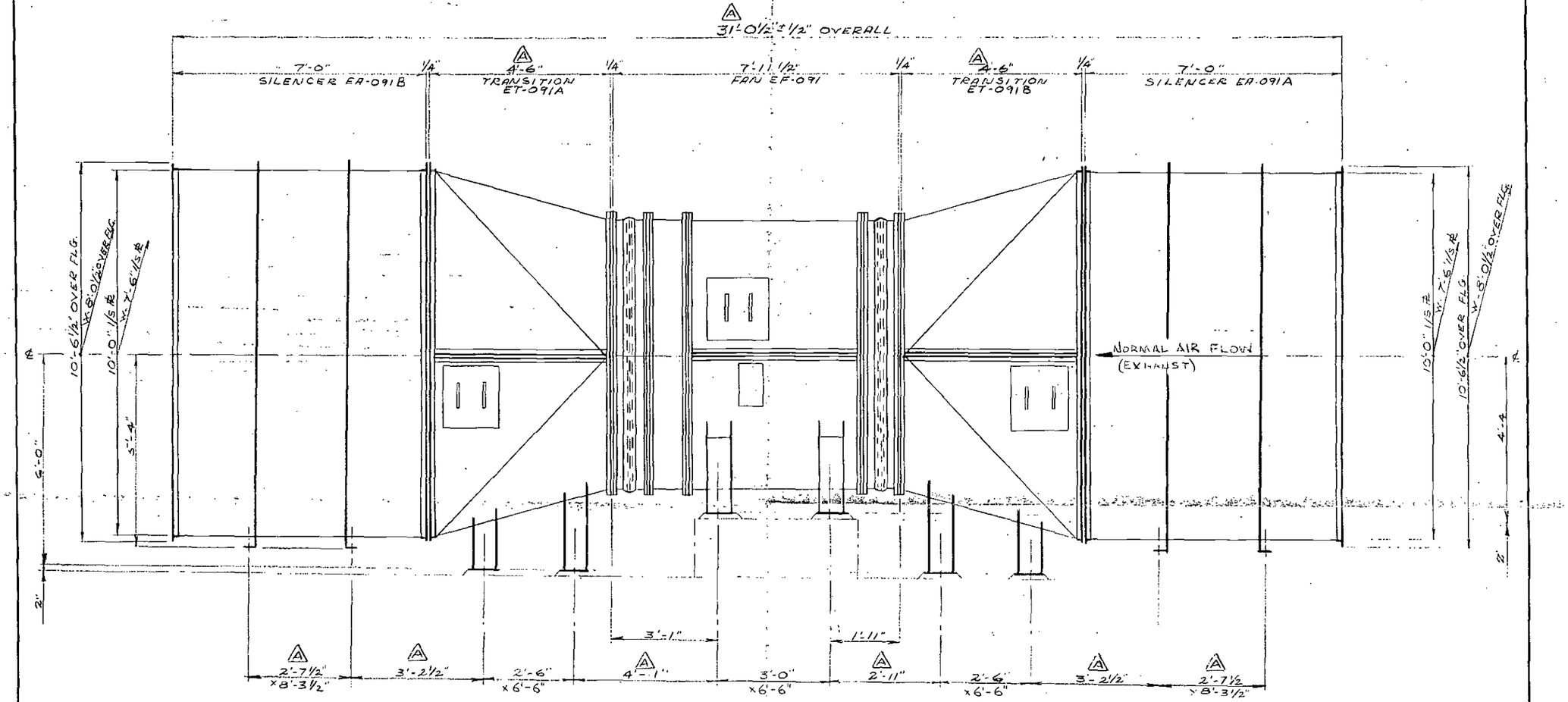
CHKD.	APPROVED	DWG TYPE
B.B.		

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT A 740
7TH/FLOWER STATION
GEN. ASS'Y OF FAN EF-082

SCALE 1/2"=1'-0" | CUSTOMERS REF.

DWG.NO CO-C-11248 | REV B

610



— SIDE ELEVATION —

FOR FOUNDATION LAYOUT, SEE DWG. No. CO-C-11381

FLAKT CANADA LTD.
NOV 10 1989
ISSUED

FOR INFORMATION PURPOSES ONLY
NOT TO BE USED FOR CONSTRUCTION

SYM.	REVISIONS	DATE	BY	CHKD
B	ADDED FOUNDATION LAYOUT DWG. No.	JAN. 20/89	B.B.	
A	ADDED SILENCER SUPPORTS SEPT. 30/1988/ CLIENT MARK-UP REVISED TO INCORP.	OCT 24 88		B.B.

FLG 610

.TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	DWG NO OR DIM	MATERIAL	WEIGHT
VARIANT					

Flakt Canada Ltd.

FLAKT CANADA LTD.

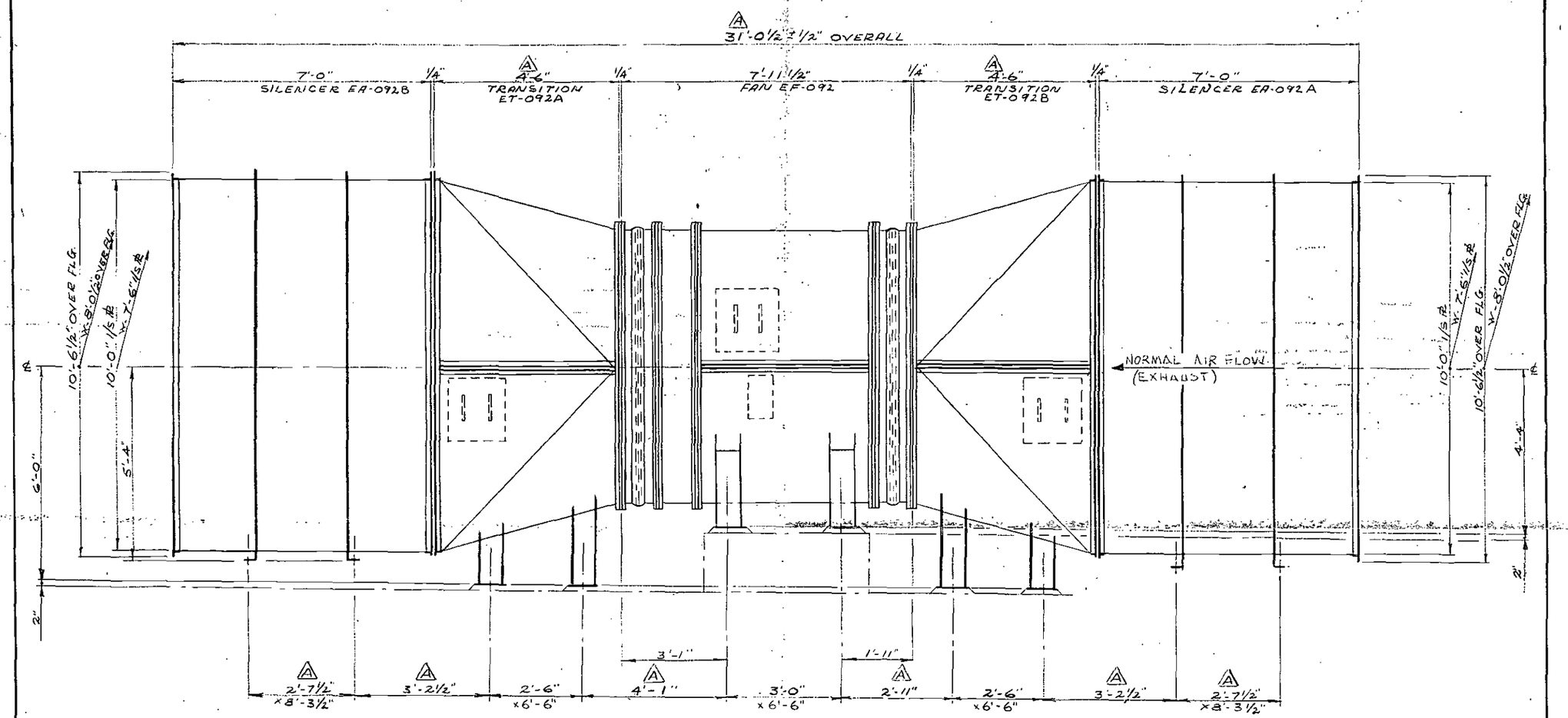
CONTRACT NO.	QUOTATION NO.	REQ NO	NEXT ASSY.	REF. DWG	DRAWN	DATE	SUB NO
C-118-324-0773	SFC				[illegible]	23/AUG/88	

CHKD	APPROVED	DWG TYPE
B.B.		

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT A740
WILSHIRE/ALVARADO STATION
GEN. ASS'Y. OF FAN EF-091

SCALE 1/2" = 1'-0" | CUSTOMERS REF.

DWG. NO. CO-C-11249 | REV B



— SIDE ELEVATION —

FOR FOUNDATION LAYOUT, SEE DWG. NO. CO-C-11381

FLAKT CANADA LTD.
NOV 10 1989
ISSUED

FOR INFORMATION PURPOSES ONLY
NOT TO BE USED FOR CONSTRUCTION

SYM.	REVISIONS	DATE	BY	CHKD
B	ADDED FOUNDATION LAYOUT DWG. NO.	JAN. 20/89	B.B.	
A	ADDED SILENCER SUPPORTS SEPT. 30/1988 / CLIENT MARK-UP REVISED TO INCORP.	OCT 24 88	B.B.	

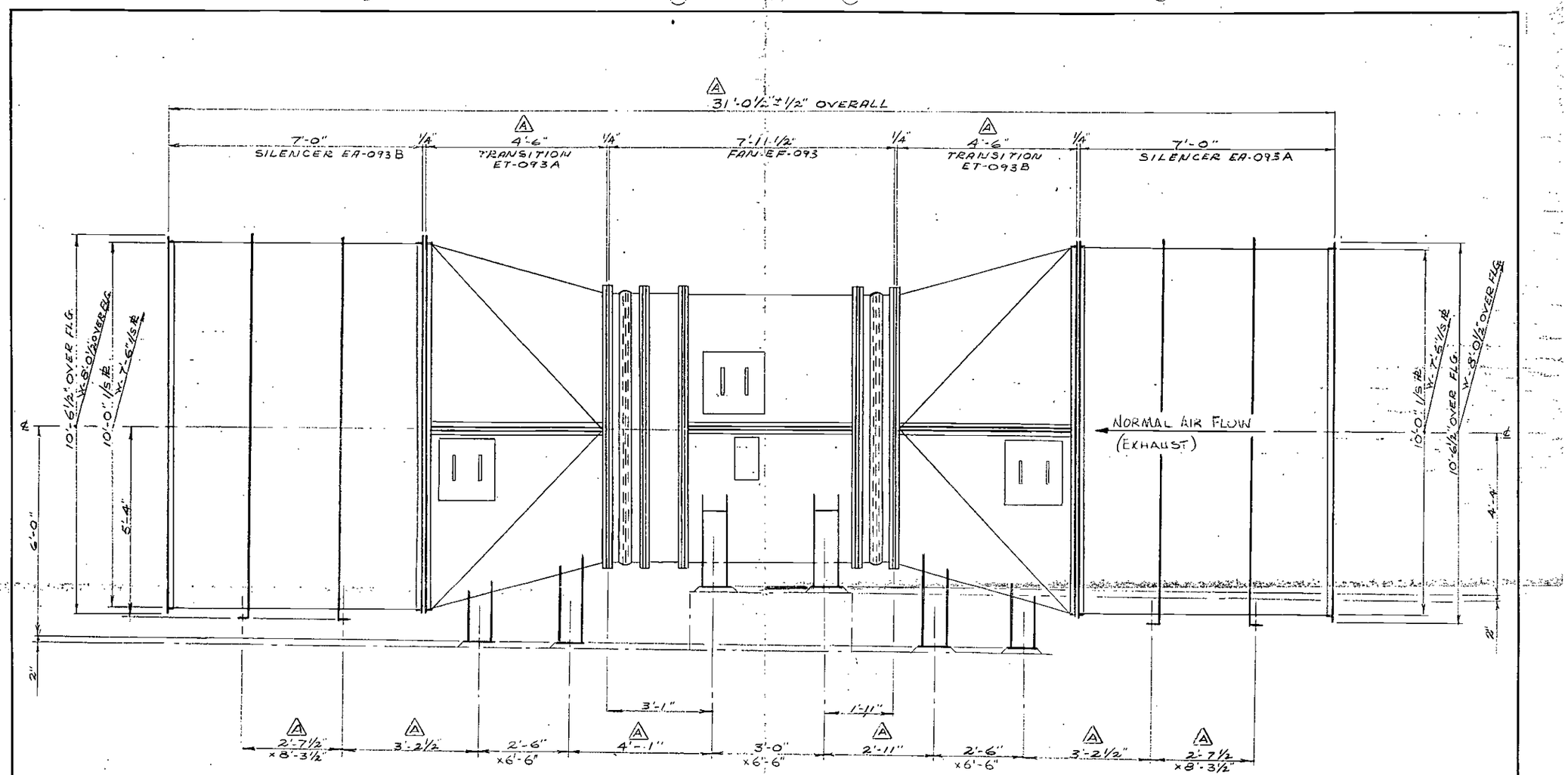
TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	DWG NO. OR DIM.	MATERIAL	WEIGHT
VARIANT		Flakt Flakt Canada Ltd.	FLAKT CANADA LTD.		

CONTRACT NO.	QUOTATION NO.	REG. NO.	NEXT ASSY.	REF. DWG	DRAWN	DATE	SUB NO
C-118-324-0773	SFC				EAB	25/AUG/88	

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT	CHKD. B.B.	APPROVED	DWG. TYPE
METRO RAIL PROJECT A740			CUSTOMERS REF.
WILSHIRE/ALVARADO STATION	SCALE ½"=1'-0"		
GEN. ASS'Y OF FAN EF-092	DWG. NO. CO-C-11250		REV. B

1. 3 610



— SIDE ELEVATION —

FOR FOUNDATION LAYOUT, SEE DWG. NO. CO-C-11381

FLAKT CANADA LTD. NOV 10 1989 ISSUED

FOR INFORMATION PURPOSES ONLY. NOT TO BE USED FOR CONSTRUCTION

SYM.	REVISIONS	DATE	BY	CHKD
B	ADDED FOUNDATION LAYOUT DWG. No.	JAN. 20/89	B.B.	
A	ADDED SILENCER SUPPORTS SEPT. 30/1988 / CLIENT MARK-UP REVISED TO INCORP.	OCT. 24 88	[illegible]	B.B.

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	DWG. NO. OR DIM.	MATERIAL	WEIGHT
VARIANT					

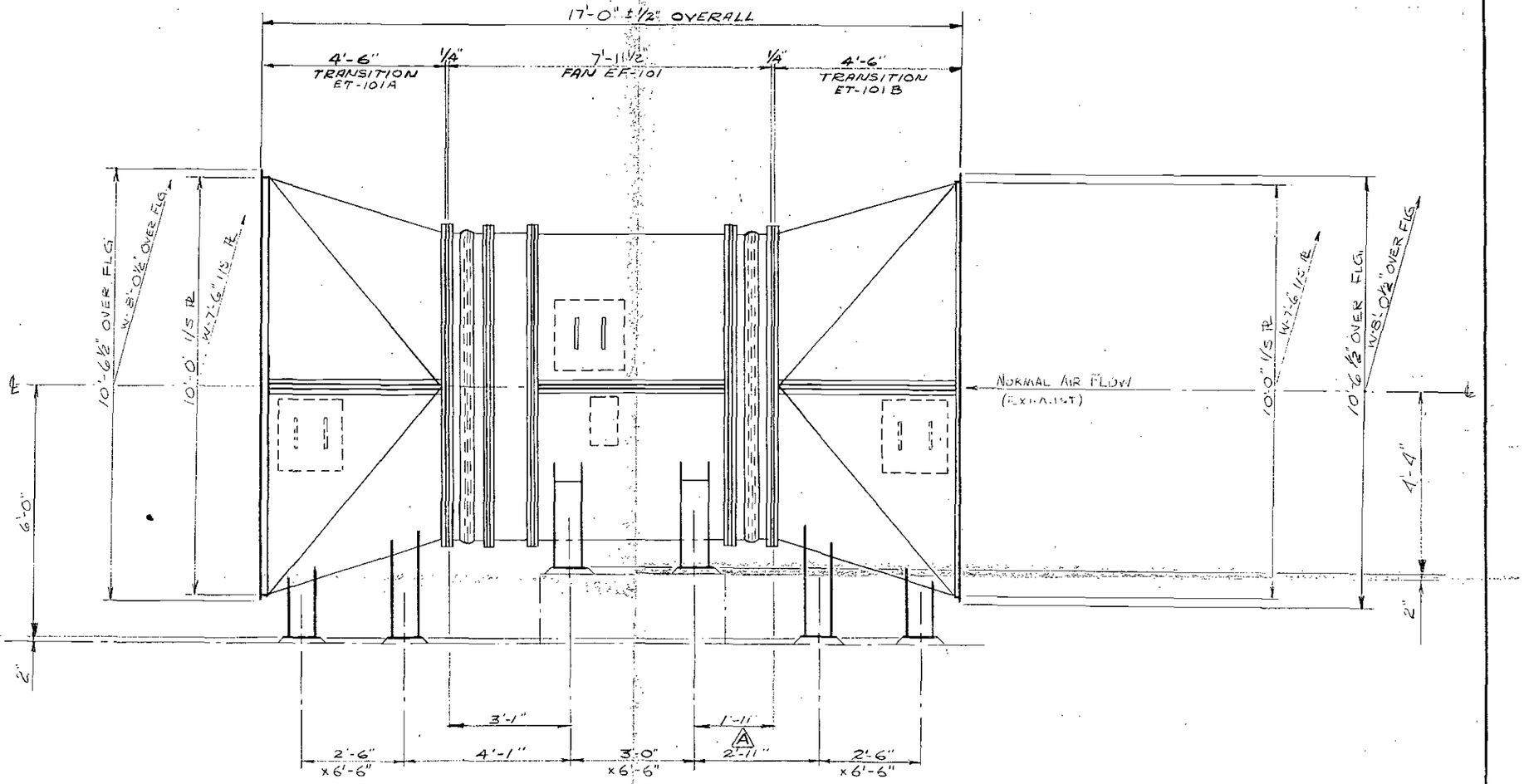
Flakt Flakt Canada Ltd.

FLAKT CANADA LTD.

CONTRACT NO	QUOTATION NO	REQ NO	NEXT ASSY.	REF. DWG.	DRAWN	DATE	SUB. NO.
C-118-324-0773	SFC				[illegible]	23/AUG/88	

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT	CHKD. B.B.	APPROVED	DWG. TYPE
METRO RAIL PROJECT A740	SCALE 1/2"=1'-0"		CUSTOMERS REF.
WILSHIRE/ALVARADO STATION	DWG. NO. CO-C-11251		REV B
GEN. ASS'Y OF FAN EF-093			

F 7 610



— SIDE ELEVATION —

FLAKT CANADA LTD.
NOV 10 1989
ISSUED

FOR FOUNDATION LAYOUT, SEE DWG. No. CO-C-11382

FOR INFORMATION PURPOSES ONLY.
NOT TO BE USED FOR CONSTRUCTION

SYM.	REVISIONS	DATE	BY	CHKD
B	ADDED FOUNDATION LAYOUT DWG. NO.	JAN. 20/89	B.B	
A	REVISED DIMENSIONS	OCT 24 88	RP	B.B.

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	DWG NO OR DIM.	MATERIAL	WEIGHT
VARIANT					

Flakt Flakt Canada Ltd.

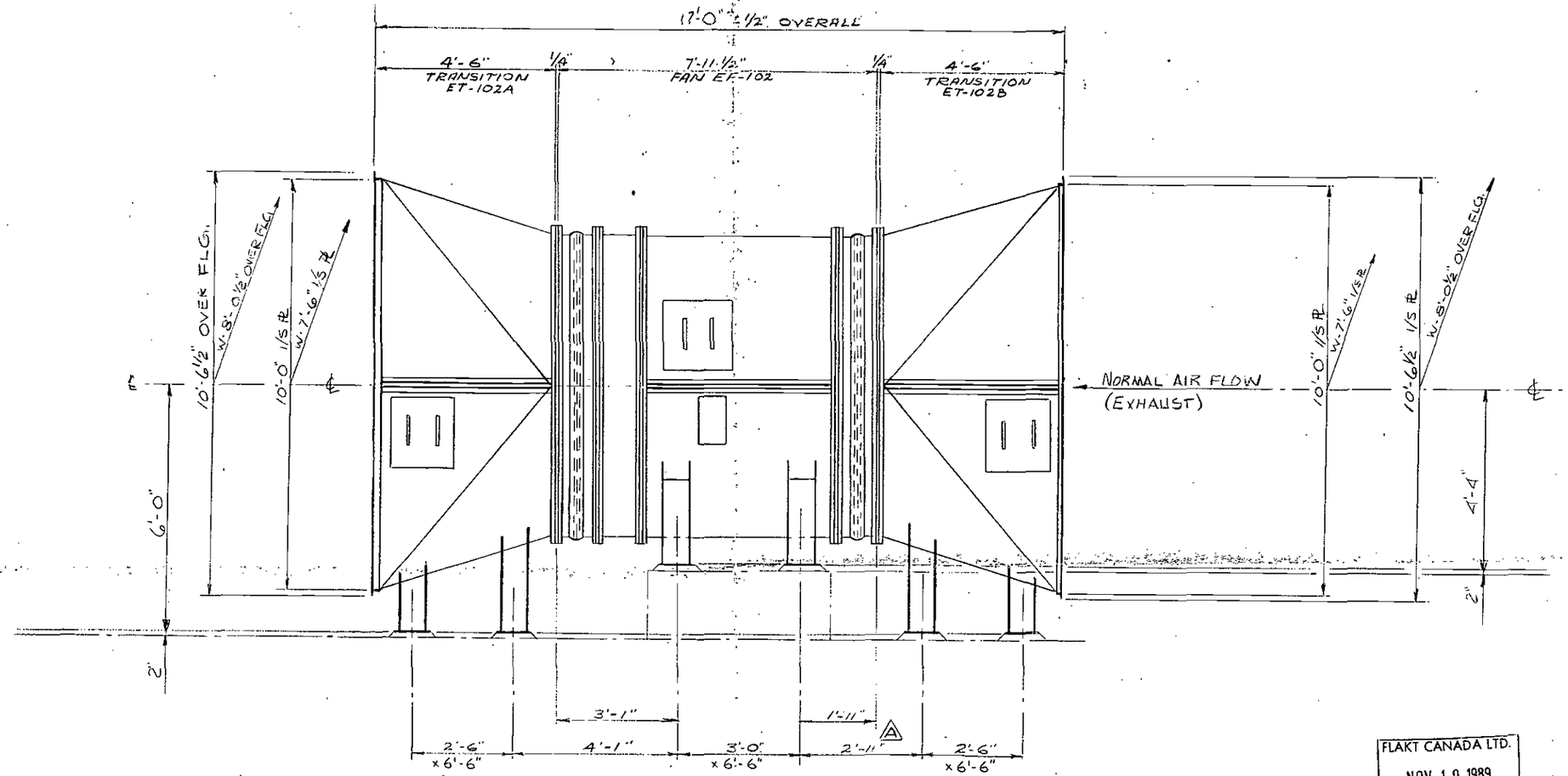
FLAKT CANADA LTD.

CONTRACT NO.	QUOTATION NO	REG NO.	NEXT ASSY.	REF. DWG.	DRAWN	DATE	SUB. NO
C118-324-0713	SFC				RP	23/AUG/88	
					CHKD. B.B.	APPROVED	DWG. TYPE
					SCALE 1/2"=1'-0"		CUSTOMERS REF.

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT A 740
WILSHIRE/ALVARADO
GEN. ASS'Y OF FAN EF-101

DWG NO CO-C-11252 REV B

RE 510



SIDE ELEVATION

FLAKT CANADA LTD.
NOV 10 1989
ISSUED

FOR INFORMATION PURPOSES ONLY
NOT TO BE USED FOR CONSTRUCTION

FOR FOUNDATION LAYOUT, SEE DWG. NO. CO-C-11382

FOR INFORMATION PURPOSES ONLY
NOT TO BE USED FOR CONSTRUCTION

SYM.	REVISIONS	DATE	BY	CHKD
B	ADDED FOUNDATION LAYOUT DWG. NO.	JAN. 20/89	B.B.	
A	REVISED DIMENSIONS	OCT 24/88	BB	B.B.

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" : STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	DWG. NO. OR DIM.	MATERIAL	WEIGHT
VARIANT					

Flakt Flakt Canada Ltd.

FLAKT CANADA LTD.

CONTRACT NO.	QUOTATION NO.	REG. NO	NEXT ASSY.	REF. DWG	DRAWN	DATE	SUB. NO
C-118-324-0773	SFC				EAP	23/AUG/88	

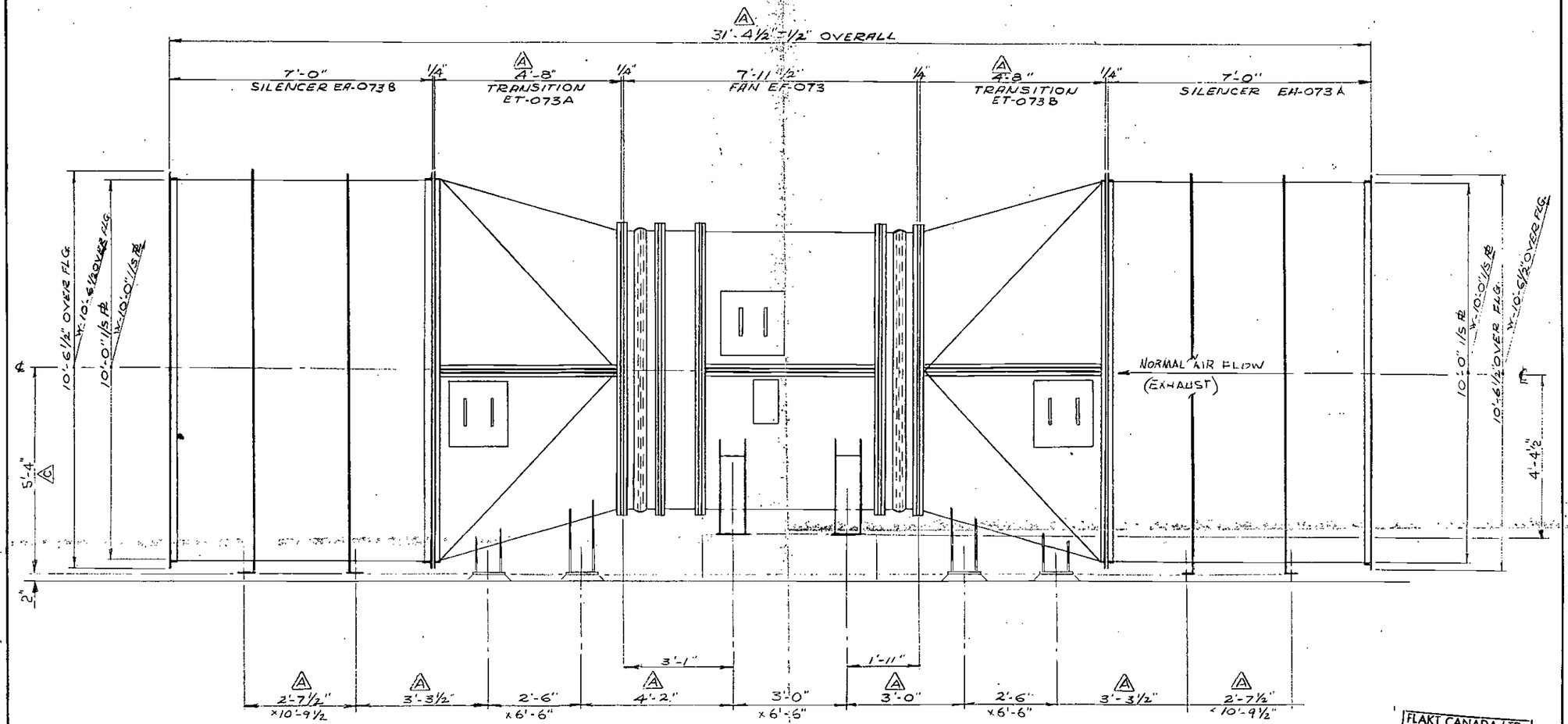
CHKD.	APPROVED	DWG. TYPE
B.B.		

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT A740
WILSHIRE/ALVARADO
GEN. ASS'Y OF FAN EF-102

SCALE	CUSTOMERS REF.
1/2"-1'-0"	

DWG. NO.	REV
CO-C-11253	B

REG 610



SIDE ELEVATION

FLAKT CANADA LTD.
NOV 10 1989
ISSUED

FOR INFORMATION PURPOSES ONLY
NOT TO BE USED FOR CONSTRUCTION

For Foundation Layout, See Dwg. No. CO-C-11380

SYM.	REVISIONS	DATE	BY	CHKD
C	DIM. 5'-4" WAS 6'-0". DELETED GROUT UNDER FAN	NOV. 4/89	B.B.	
B	ADDED FOUNDATION LAYOUT DWG. NO.	JAN. 20/89	B.B.	
A	ADDED SILENCER SUPPORTS. SEPT. 30/1988 CLIENT MARK-UP REVISED TO INCORP.	OCT 24 88	AP	B.B.

REG 610

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING "000" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	DWG. NO OR DIM.	MATERIAL	WEIGHT
VARIANT		Flakt Flakt Canada Ltd.	FLAKT CANADA LTD.		

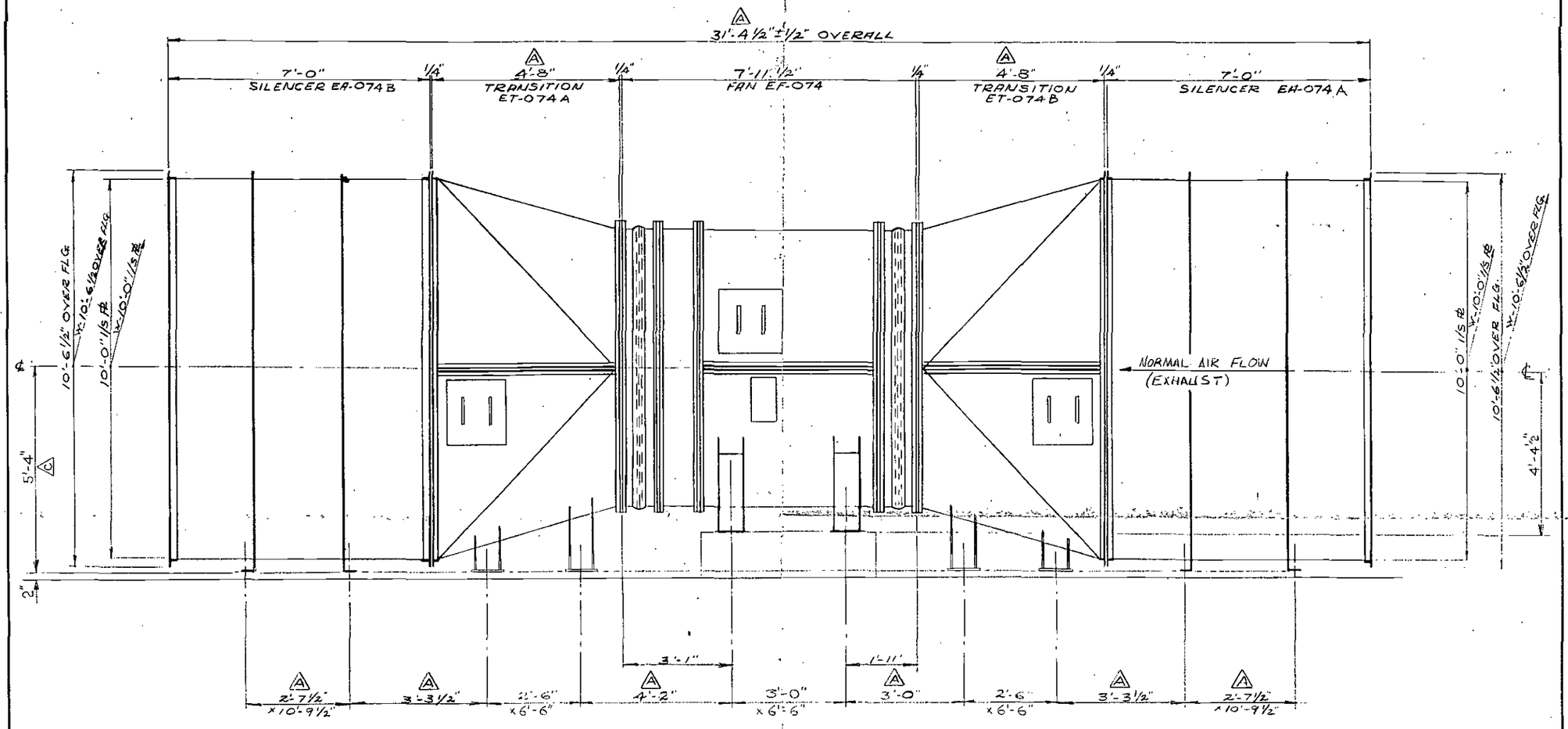
CONTRACT NO.	QUOTATION NO.	REG. NO.	NEXT ASSY	REF. DWG.	DRAWN	DATE	SUB. NO.
C-118-324-0773	SFC				CAP	23/AUG/88	

CHKD.	APPROVED	DWG. TYPE
B.B.		

SCALE 1/2"-1'-0" | CUSTOMERS REF.

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT A740
7TH/FLOWER STATION
GEN. ASS'Y OF FAN EF-073

DWG. NO. CO-C-11254 | REV C



SIDE ELEVATION

FOR FOUNDATION LAYOUT, SEE DWG. NO. CO-C-11380

FLAKT CANADA LTD. NOV 10 1989 ISSUED

FOR INFORMATION PURPOSES ONLY / NOT TO BE USED FOR CONSTRUCTION

SYM.	REVISIONS	DATE	BY	CHKD
C	DIM. 5'-4" WAS 6'-0". DELETED GROUT UNDER FAN.	NOV. 4/89	B.B.	
B	ADDED FOUNDATION LAYOUT DWG. No.	JAN. 23/89	B.B.	
A	ADDED SILENCER SUPPORTS SEPT. 30/1988 / CLIENT MARK-UP REVISED TO INCORP.	OCT 24 88	B.B.	

REG 610

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING ".010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

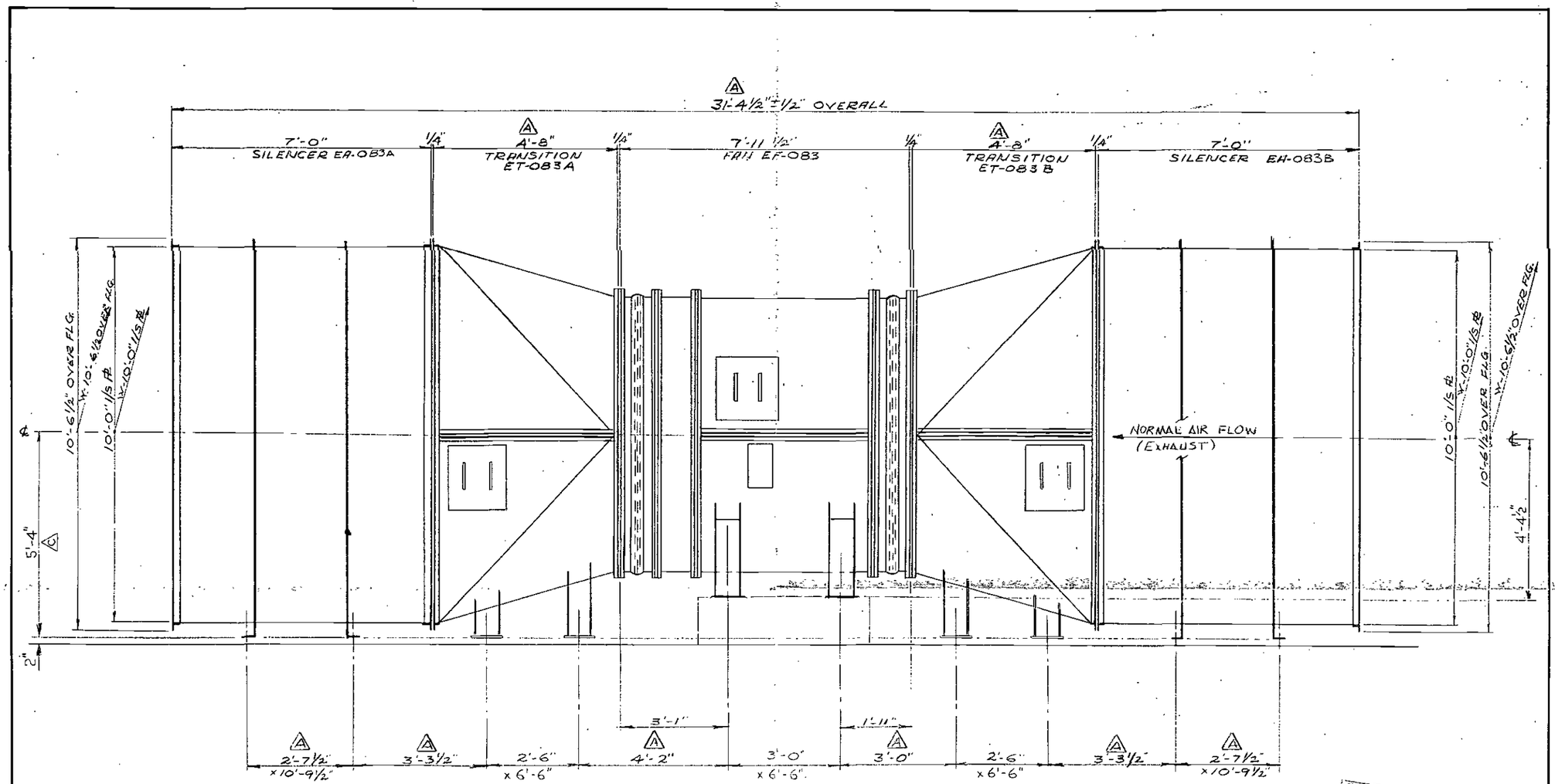
QUANTITY	ITEM	DESCRIPTION	DWG NO. OR DIM.	MATERIAL	WEIGHT
VARIANT					

Flakt Canada Ltd.

FLAKT CANADA LTD.

CONTRACT NO.	QUOTATION NO.	REG. NO	NEXT ASSY	REF. DWG	DRAWN	DATE	SUB. NO
C118-324-0773	SFC				[illegible]	23/Aug/89	

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT	CHKD. B.B.	APPROVED	DWG. TYPE
METRO RAIL PROJECT A740	SCALE 1/2" = 1'-0"	CUSTOMERS REF.	
7TH/FLOWER STATION	DWG. NO CO-C-11255		REV C
GEN. ASS'Y OF FAN EF-074			



SIDE ELEVATION

FOR FOUNDATION LAYOUT, SEE DWG. No. CO-C-11380

FLAKT CANADA LTD. NOV 10 1989 ISSUED

FOR INFORMATION PURPOSES ONLY. NOT TO BE USED FOR CONSTRUCTION

SYM.	REVISIONS	DATE	BY	CHKD
C	DIM. 5'-4" WAS 6'-0". DELETED GROUT UNDER FAN.	NOV. 4/89	B.B.	
B	ADDED FOUNDATION LAYOUT DWG. No.	JAN. 23/89	B.B.	
A	ADDED SILENCER SUPPORTS SEPT. 30/1988 / CLIENT MARK-UP REVISED TO INCORP.	OCT 24 88	BPP	B.B.

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)

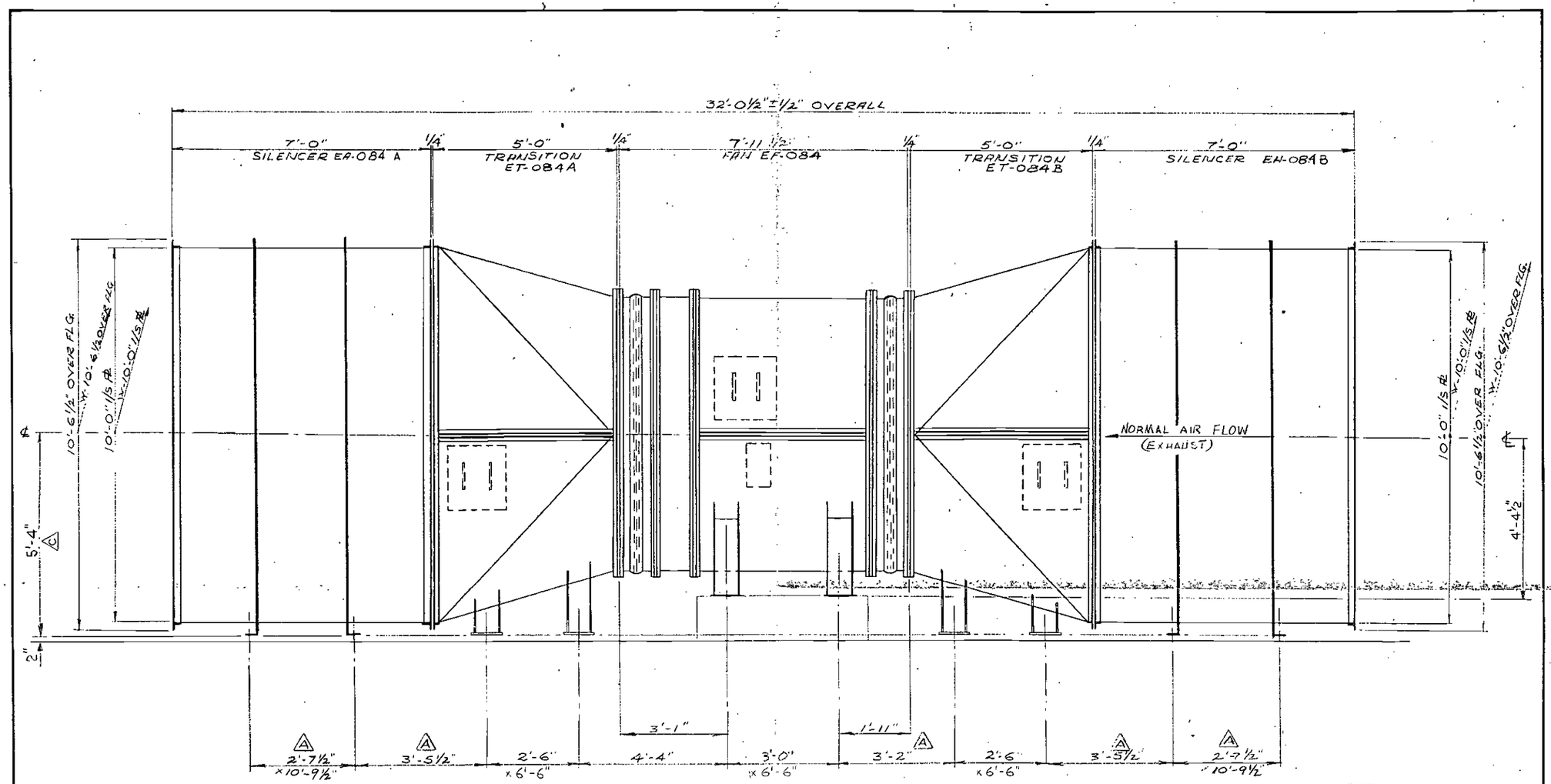
MACHINING ".010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	DWG NO. OR DIM.	MATERIAL	WEIGHT
VARIANT		Flakt Flakt Canada Ltd.	FLAKT CANADA LTD.		

CONTRACT NO.	QUOTATION NO.	REQ. NO.	NEXT ASSY.	REF. DWG.	DRAWN	DATE	SUB. NO.
C-118-324-0723	SFC				EAB	23/AUG/88	
					CHKD. B.B.	APPROVED	DWG TYPE
					SCALE		CUSTOMERS REF.
					DWG. NO. CO-C-11256		REV. C

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT A 740
7TH/FLOWER STATION
GEN. ASS'Y OF FAN EF-083

I_3 610



SIDE ELEVATION

FOR FOUNDATION LAYOUT, SEE DWG. NO. CO-C-11541 (C)

FLAKT CANADA LTD.
NOV 10 1989
ISSUED

FOR INFORMATION PURPOSES ONLY
NOT TO BE USED FOR CONSTRUCTION

SYM.	REVISIONS	DATE	BY	CHKD
C	DIM. 5'-3" WAS 6'-0". DELETED GROUT UNDER FAN FOUNDATION DWG. WAS CO-C-11375.	NOV. 4/89	B.B.	
B	ADDED FOUNDATION LAYOUT DWG. NO.	JAN. 23/89	B.B.	
A	ADDED SILENCER SUPPORTS	OCT 23/88	B.B.	

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING ".010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	DWG NO. OR DIM.	MATERIAL	WEIGHT
VARIANT					

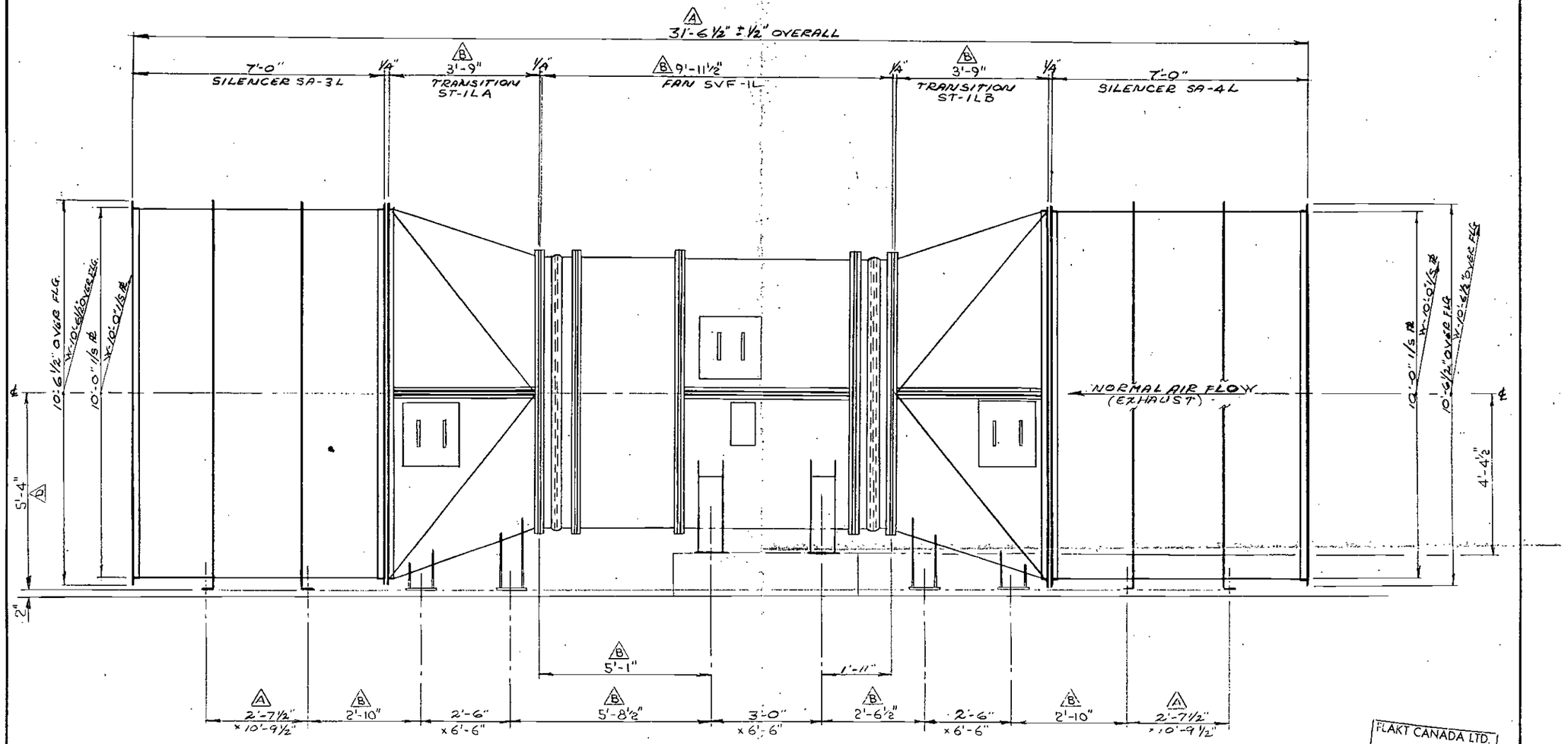
Flakt Canada Ltd.

FLAKT CANADA LTD.

CONTRACT NO.	QUOTATION NO.	REG. NO.	NEXT ASSY.	REF. DWG	DRAWN	DATE	SUB. NO
C-118-324-0773	SFC				BB	23/AUG./88	
					CHKD. B.B.	APPROVED	DWG TYPE
					SCALE		CUSTOMERS REF.
					DWG. NO. CO-C-11257		REV. C

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT A740
7TH/FLOWER STATION
GEN. ASS'Y OF FAN EF-084

REG 610



— SIDE ELEVATION —

FOR FOUNDATION LAYOUT, SEE DWG. NO. CO-C-11383

FLAKT CANADA LTD.
NOV 10 1989
ISSUED

FOR INFORMATION PURPOSES ONLY
NOT TO BE USED FOR CONSTRUCTION

SYM.	REVISIONS	DATE	BY	CHKD
D	DIM. 5'-4" WAS 6'-0". DELETED GROUT UNDER FAN	NOV. 4/89	B.B.	
C	ADDED FOUNDATION LAYOUT DWG. NO.	JAN. 23/89	B.B.	
B	REV'D. LENGTH OF FAN & TRANS. FOUND. BOLTS REV'D. TO SUIT	NOV. 7/88	B.B.	
A	ADDED SILENCER SUPPORTS. SEPT. 30/88 CLIENT MARK-UP REVISED TO INCORP.	OCT. 24 88	BB	B.B.

RF 610

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	DWG. NO. OR DIM.	MATERIAL	WEIGHT
VARIANT					

Flakt Canada Ltd.

FLAKT CANADA LTD.

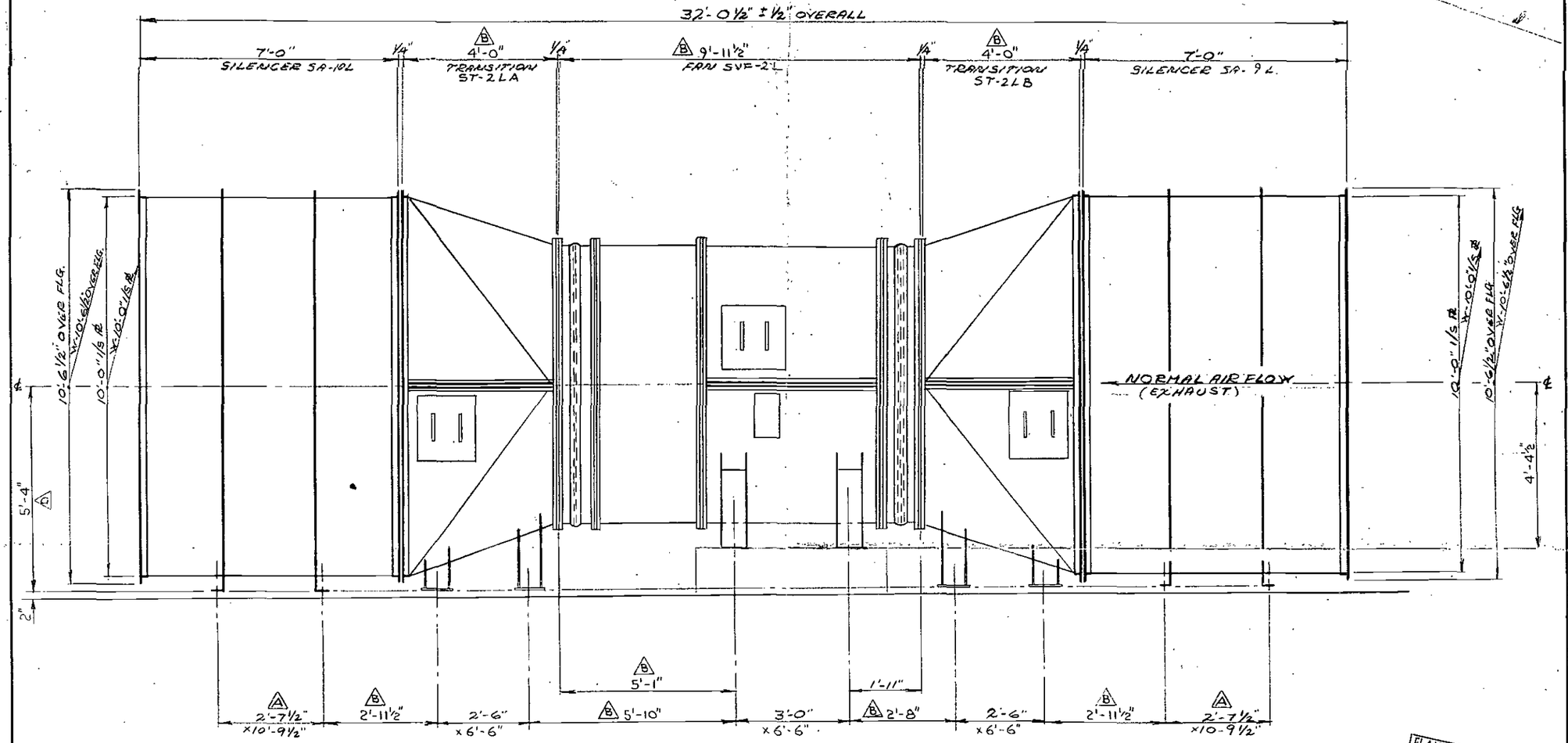
CONTRACT NO.	QUOTATION NO	REG. NO.	NEXT ASSY.	REF. DWG.	DRAWN	DATE	SUB. NO.
C-118-324-0773	SFC				RP	23/Aug/88	

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT A740
7TH/FLOWER STATION
GEN. ASS'Y OF FAN SVF-1L

CHKD.	APPROVED	DWG TYPE
B.B.		

SCALE	CUSTOMERS REF.
1/2" = 1'-0"	

DWG. NO.	REV
CO-C-11267	D



— SIDE ELEVATION —

FOR FOUNDATION LAYOUT, SEE DWG. NO. CO-C-11383

FLAKT CANADA LTD. NOV 10 1989 ISSUED

FOR INFORMATION PURPOSES ONLY NOT TO BE USED FOR CONSTRUCTION

SYM.	REVISIONS	DATE	BY	CHKD
D	DIM. 5'-4" WAS 6'-0". DELETED GROUT UNDER FAN.	NOV. 4/89	B.B.	
C	ADDED FOUNDATION LAYOUT DWG. NO.	JAN. 23/89	B.B.	
B	REV'D. LENGTH OF FAN & TRANS. FOUND. BOLTS REV'D. TO SUIT	NOV. 7/88	B.B.	
A	ADDED SILENCER SUPPORTS	OCT. 24/88	B.B.	B.B.

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	DWG. NO. OR DIM.	MATERIAL	WEIGHT
VARIANT					

Flakt Canada Ltd.

FLAKT CANADA LTD.

CONTRACT NO.	QUOTATION NO.	REG. NO.	NEXT ASSY.	REF. DWG.	DRAWN	DATE	SUB. NO.
C-118-324-0773	SFC				BB	23/Aug/88	

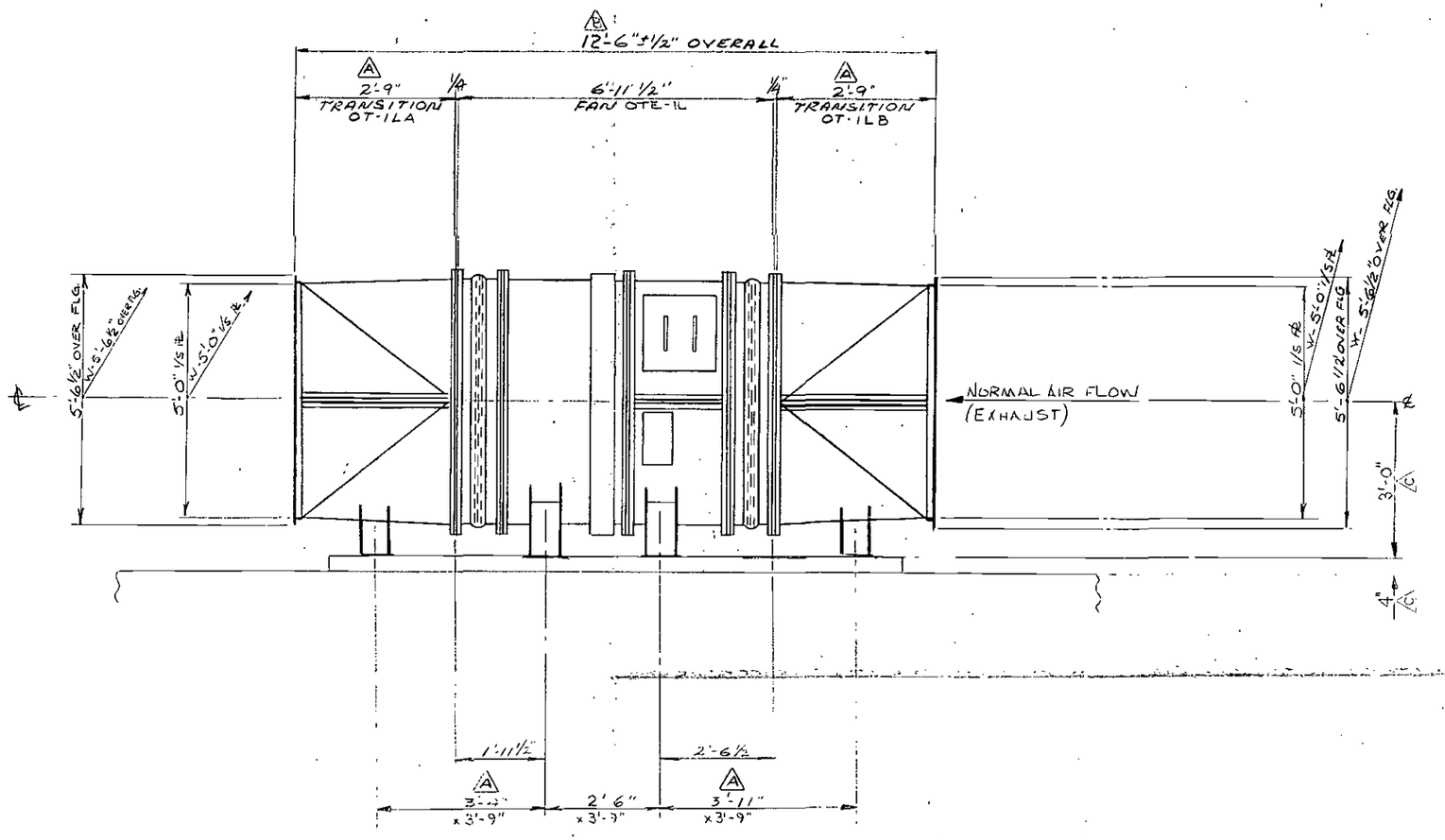
CHKD.	APPROVED	DWG. TYPE
B.B.		

SCALE	CUSTOMERS REF.
1/2"=1'-0"	

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT A740
7TH/FLOWER STATION
GEN. ASS'Y OF FAN SVF-2L

DWG. NO.	REV.
CO-C-11268	D

FORM 510



— SIDE ELEVATION —

FLAKT CANADA LTD.
NOV 10 1989
ISSUED

FOR FOUNDATION LAYOUT, SEE DWG. NO. CO-C-11374

FOR INFORMATION PURPOSES ONLY.
NOT TO BE USED FOR CONSTRUCTION.

SYM.	REVISIONS	DATE	BY	CHKD
C	DIM. 3'-0" WAS 3'-4". DELETED GROUT UNDER LEGS	NOV. 6/89	B.B.	
B	ADDED FOUNDATION LAYOUT DWG. NO. (OVERALL WAS 13'-6")	JAN. 23/89	B.B.	
A	SEPT. 30/1988 CLIENT MARK-UP REVISED TO INCORP.	OCT 24 88	RM	B.B.

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	DWG NO. OR DIM.	MATERIAL	WEIGHT
VARIANT					

Flakt Canada Ltd.

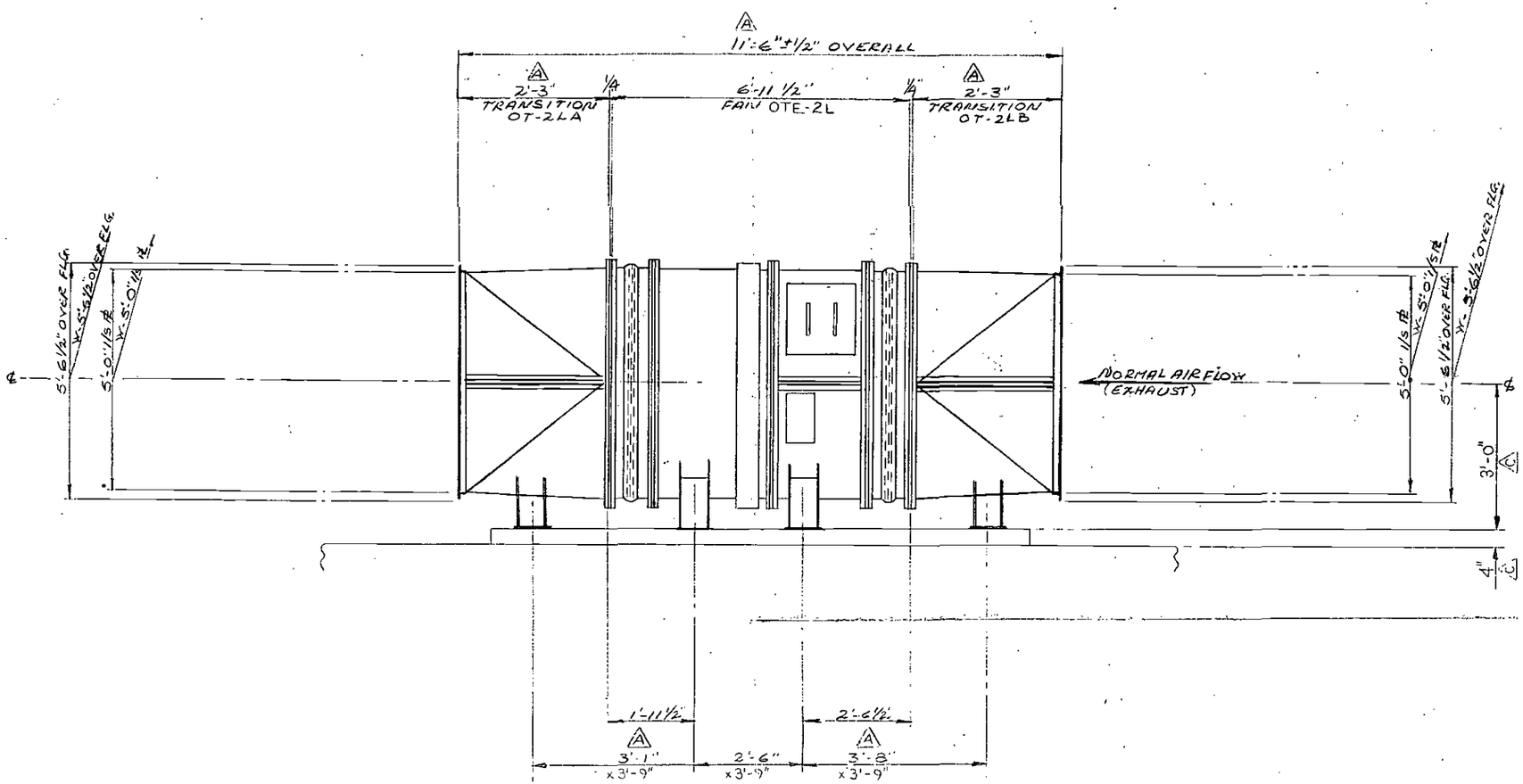
FLAKT CANADA LTD.

CONTRACT NO.	QUOTATION NO.	REG. NO	NEXT ASSY.	REF. DWG	DRAWN	DATE	SUB. NO.
C118-324-0773	SFC				R.M.	23/AUG./88	
					CHKD. B.B.	APPROVED	DWG. TYPE
					SCALE 1/2"=1'-0"		CUSTOMERS REF.

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT A740
7TH/FLOWER STATION
GEN. ASS'Y. OF FAN OTE-1L

DWG. NO. CO-C-11269 REV. C

FLAKT 610



— SIDE ELEVATION —

FOR FOUNDATION LAYOUT, SEE DWG. NO. CO-C-11374

FLAKT CANADA LTD.
NOV 10 1989
ISSUED

FOR INFORMATION PURPOSES ONLY
NOT TO BE USED FOR CONSTRUCTION

SYM	REVISIONS	DATE	BY	CHKD
C	DIM. 3'-0" WAS 3'-4". DELETED GROUT UNDER LEGS.	NOV. 6/89	B.B.	
B	ADDED FOUNDATION LAYOUT DWG. NO.	JAN. 23/89	B.B.	
A	SEPT. 30/1988 CLIENT MARK-UP REVISED TO INCORP.	OCT 24 88		B.B.

TOLERANCES ON DIMENSIONS UNLESS OTHERWISE NOTED ARE: (PLUS OR MINUS)
MACHINING .010" - STRUCTURAL OVERALL 1/16"
ALL OTHERS 1/32" NON-ACCUMULATIVE

QUANTITY	ITEM	DESCRIPTION	DWG NO. OR DIM.	MATERIAL	WEIGHT
VARIANT					

Flakt Canada Ltd.

FLAKT CANADA LTD.

CONTRACT NO.	QUOTATION NO.	REG. NO.	NEXT ASSY.	REF. DWG.	DRAWN	DATE	SUB. NO.
C-118-324-0773	SFC				R.H.	23/AUG./88	
					CHKD. B.B.	APPROVED	DWG TYPE
					SCALE 1/2"=1'-0"		CUSTOMERS REF.

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT A740
7TH / FLOWER STATION
GEN. ASS'Y. OF F.N OTE-2L

DWG. NO. CO-C-11270 REV C

REG. 610