Wampfler

SAF-T-BAR C 型電軌

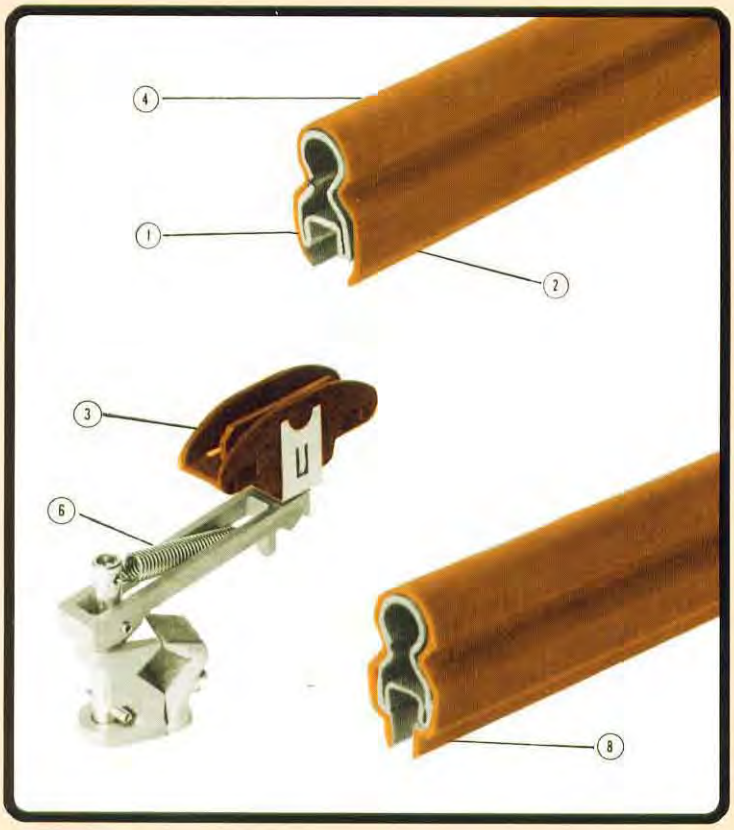
Insulated Electrification Systems

Series C

REGULAR HAND-SAFE

90 to 350 amperes
容量 90-350 安培

for Cranes, Conveyors, Hoists, Monorails, Automated Storage and Retriever Systems and Other Electrification Applications.



The advanced Saf-T-Bar system reflects the basic Saf-T-Bar engineering concept of an integral insulated conductor which provides years of safe, economical, trouble-free service. It is designed for compact, low-cost installation and minimum maintenance.

The Series C conductor can be mounted in any plane. In wet and icy atmospheres, the system can be shielded with a protective hood for additional protection. In dirty and dusty atmospheres, mount the conductor in downturn operation. Heat trace systems are available for cold weather operation.

Insulating cover furnished as standard is orange rigid PVC extrusion, 160°F heat distortion point at 260 psi, self extinguishing. High heat cover furnished when specified, is red Lexan extrusion, 260°F heat distortion point at 260 psi, self extinguishing. An extra high heat fiberglass cover is available, 375°F heat distortion.

Series C Saf-T-Bar is furnished in 10-foot lengths assembled complete with insulating cover and joint fittings. Ampere ratings are based on continuous service with a 30°C rise. Higher ratings available by increasing temperature rise and using high heat covers.

Push-in-place locking tabs are available if required, as on long runs with expansion gaps on copper and steel/copper conductor sections.

SAF-T-BAR FEATURES

1 **METAL GUIDEWAYS** assure positive tracking of collector shoe. Collector tracks with or without insulating cover.

2 **FLAT CONTACT SURFACE** for long conductor wear and greatest possible sliding contact area.

3 **CONTACT SHOE** with flat contact surface of sintered copper and graphite, self-lubricating for effective draw of current to collectors.

4 **SKIN-TIGHT INSULATION** runs cooler, will not deform under clamping pressure.

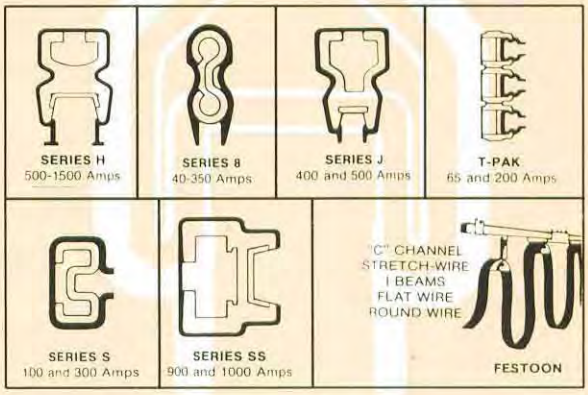
5 **COMPACT MOUNTING** of conductor vertical or horizontal position without special parts or fittings.

6 **PANTOGRAPH SPRING** suspension of collector yields even pressure to shoe throughout stroke, providing maximum electrical and mechanical performance.

7 **SLIDE-ON JOINT** for fast, easy installation.

8 **HAND-SAFE** design provides protection against accidental contact. Add suffix HS for Hand Safe designation.

Conductor Catalog No.	Material	Appr. Weight Per Ft.	Power-feed	Joint Kit	Resistance Factor Ohms/Ft. AC-Z	DC-R
CA 90	1010 GAL Steel	.50	100F	CJ 90	.00138	.0007
CA110		.50	350F	CJ110	.00097	.0005
CA250	Steel / Copper	.50	350F	CJ250	.000131	.00127
CA300	Electrolytic Copper	.45	350F	CJ300	.00011	.00008
CA350		.55	350 mcm-2	CJ350	.00008	.00006



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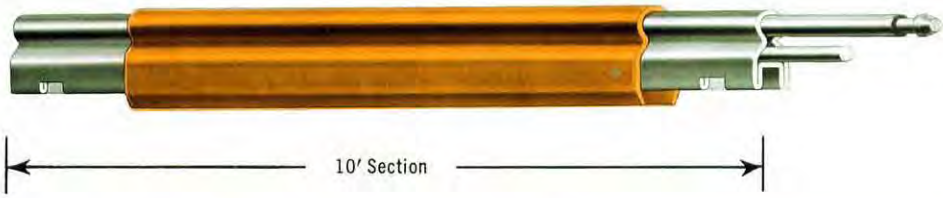
Series C

SAF-T-BAR CONDUCTORS

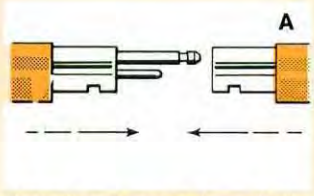
90 to 350 amperes

HAND SAFE: Add suffix "HS"

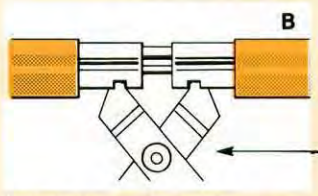
C型安全電軌及配件



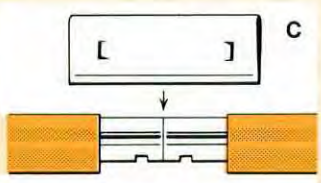
Joining sections is quick and easy as ABC . . .



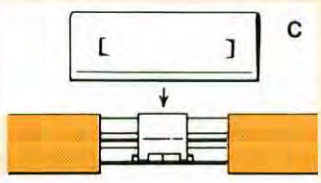
Slide female end of conductor section over long pin of male end until short pin enters center channel of conductor.



Insert jaws of tool in pre-cut slots and squeeze firmly until conductor sections are drawn together and butt securely.



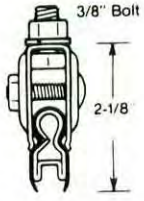
Spread one corner of cover with fingers, slide over conductor insulation and snap cover down over completed joint.



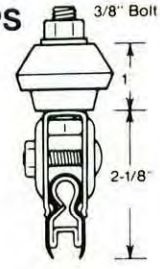
If keeper clips are used, place clip over top of conductor so that locating fingers hook into assembly notches. Install the splice over the joint, anti-slip notches on the opposite side from the clip. Used on regular cover only - not HS. Suggested use with CA250/CA300 only.

Use the universal lever tool for one-shot closing. Can be used inside, outside, from top or bottom.

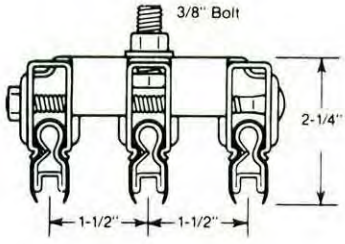
HANGER CLAMPS



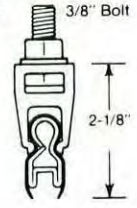
SINGLE
100H 100HN



SPOOL
100K 100KN

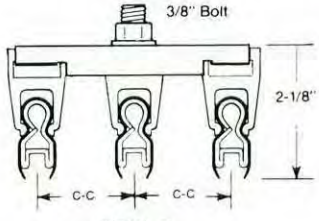


TRIPLE
100H3-1

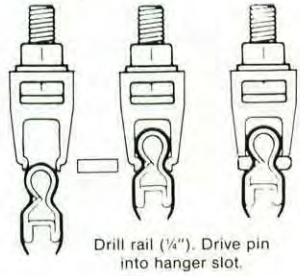


LEXAN SNAP
100P

LEXAN SNAP
WITH RAIN HAT
100PH



TRIPLE
Plastic Snap 100P3-1 C-C1-1/2"
Plastic Snap 100P3-2 C-C 2"



PLASTIC ANCHOR
100PA

CROSS BOLT HANGER CLAMPS are factory set to snap in place but must be field adjusted for correct sliding tension after installing the conductor. The following styles are available:

100H Use indoors, clean, dry applications.

100HSS Use indoors, corrosive applications. (stainless steel)

100HN Use indoors, dirty, dry applications - plastic coated hanger.

100K Use indoors, outdoors, wet, dirty applications - plated spool hanger.

100KSS Use indoors, outdoors, wet, dirty, corrosive applications (stainless steel) - spool hanger.

100KN Use indoors, outdoors, wet, dirty, corrosive applications - plastic coated spool hanger.

100H3-1 Use indoors, clean, dry applications. Requires staggered collector mounting.

FOR TRIPLE HANGER INSTALLATION. Snap 3 ten-foot conductors into place in clamps. Take up on cross bolts to allow conductor to slide in expansion, except the clamp at the anchor point which is taken up tight. It is preferred to tighten hanger mounting bolt after conductor is installed in hanger clamp, as this ensures correct conductor hanger alignment. Snap next 3 conductors in place and make up joints *working from inside conductor outward.* C Series has a friction joint that is pulled together with a lever type tool.

* Anchor Hangers: Torque cross bolts to 2 ft. lbs.
Sliding Hangers: Tighten cross bolts, then back off 1/4 turn.

PLASTIC HANGERS are for use only on Series C PVC cover rated to 160°F, with holding rib. For high temperature applications, use cross bolt hanger clamps.
The following types are available:

100P Can be used to replace 100H, 100HN, 100K and 100KN. Has same mounting dimensions as 100H hangers.

100P3-1 Same as 100P above. Replaces 100H3-1 Use indoors and for wet and dirty conditions. Requires staggered collector mounting.

100P3-2 Same as above, only conductor is on 2" centers. Collectors are not staggered.

All push-on snap hangers require a firm press to seat the conductor into the hanger clamp. To remove conductors from push-on hangers, it is recommended that the conductor be slid from the hanger to prevent damaging the hanger.

100PA Anchor hanger - Plastic hanger with fiber pin anchor device. Plastic snap hangers incorporate a fiberglass filler for added strength.

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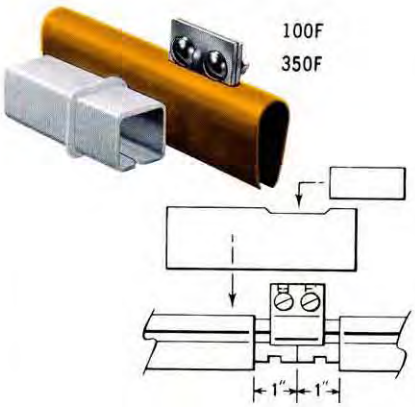
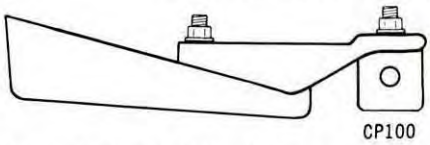
Extra Joint Kits for completing field fabricated joints include connector pins and a snap-on insulating cover.

PIN SIZE	CJ90	CJ110	CJ250	CJ300	CJ350
5/16" X 4"	STEEL	STEEL	CU	CU	CU
15/64"X 3-3/4"	STEEL	CU	CU	CU	-
7/32" X 3-3/4"	-	-	-	-	CU

End Caps — The red nylon end cap is driven onto the end of the conductor to complete the insulation. Contoured to permit passage of the collector shoe, end caps can be used in pairs at switch transfers, interlocks, expansion gaps and isolation points. Trim conductor slot after installation.

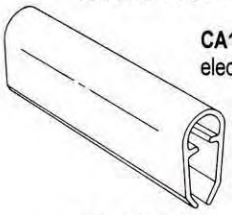


Powerfeeds provide electrical connections from power source to conductor bar and may be located at any point, preferably near the center of the system. The powerfeed is 1-1/4" long, clamps to the top lobe of the conductor with 1/4" screws. The powerfeed is insulated by a cover and a nylon cap. Feeder lugs furnished by request only. Special extra-large powerfeeds are available for attaching single and double bolt 350mcm terminals. Consult factory for prices and delivery.



Pick-up Guides (CP 100) — Used with *self-centering* collectors only to allow collector to leave conductor and be retracked on return. For discontinuous circuits such as bridge controls or long breaks in conductor, as at fire doors. **Requires that conductor be mounted on 3" centers minimum.** Provided with hanger clamp and end cap. Install conductor one inch into guide throat.

Transfer Guides (CT100) are available for conductor-to-conductor transfer with excessive alignment problems. Self-centering collectors are not required, but dual collection is required if a power interruption cannot be tolerated. Install conductor 1-1/2" into guide throat.

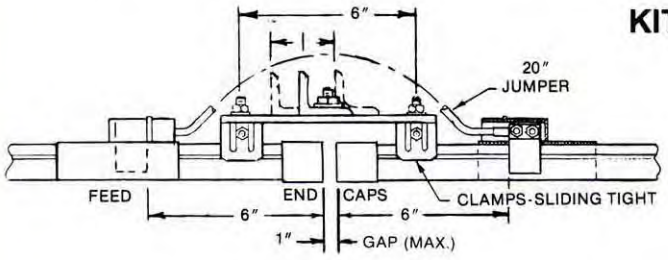


CA100-IS Isolation Sleeve is used to electrically isolate adjacent conductor sections with a 1/2" over surface gap. The sleeve will support adjacent conductor sections, but must have hangers within 6" of each side of the isolation sleeve. Collectors bridge the gap electrically. Two sleeves separated by 6" of conductor is required to prevent collectors bridging the gap as in signal or control functions.

FOR HAND-SAFE ADD SUFFIX "HS"

EXPANSION GAP DATA

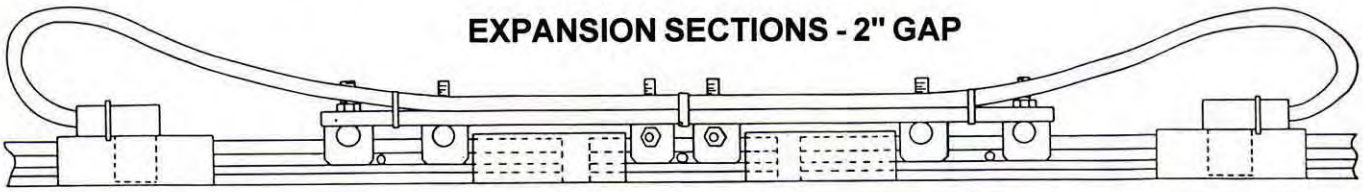
Expansion Gap Kits are required every 150 feet for steel conductors and every 100 feet for copper conductors, this length expanding 1" in 100°F. temperature change. The **Gap Guide Bracket** is used for mounting. Two extra powerfeeds and a jumper are required to bridge the gap electrically.

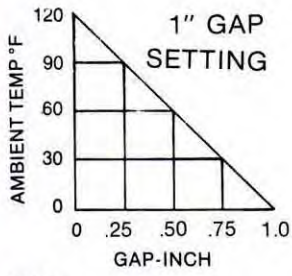


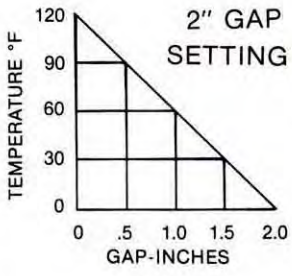
KITS

EXPAN. KIT NO.	USED ON BAR NO.	END CAPS INCLUDED	POWER FEEDS INCLUDED	JUMPER(S) INCLUDED
110CGX	CA90	CN100	350F	ONE #4
110CGX	CA110	CN100	350F	ONE #4
	CA250	"USE EXPANSION SECTION"		
300CGX	CA300	CN100	350F	TWO #4
350CGX	CA350	CN100	350F	TWO #4

EXPANSION SECTIONS - 2" GAP







REGULAR COVER*	HAND SAFE *	USED ON BAR (Add "HS" Suffix for Hand Safe)	POWER-FEEDS	JUMPER(S) INCLUDED
CA110XG-2"	CA110XG-2X1HS	CA 90 CA110	350F	ONE #4
CA250XG-2"	CA250XG-2X1HS	CA250		TWO #4
CA300XG-2"	CA300XG-2X1HS	CA300		
CA350XG-2"	CA350XG-2X1HS	CA350		

* Requires Tandem Long Arm Collectors

NOTES:
1. EXPANSION GAP SECTIONS SHOULD BE PROVIDED FOR OVER 300 FT. RUN OF STEEL OR 200 FT. OF COPPER CONDUCTOR.
2. USE TANDEM COLLECTORS FOR POWER THROUGH GAPS.
3. SET GAP PER CHART, ACCORDING TO RAIL TEMPERATURE.

NOTE: On CA90/CA110 conductors, you can go to 300 feet without expansion sections, and on CA250/CA300/CA350 you can go to 200 feet. On longer systems, use selection data as shown for kits or sections.

SAF-T-BAR COLLECTORS 安全電軌集電器

The collector is basically a self-lubricating copper graphite shoe clamped in an insulating housing (the collector head), and held firmly against the conductor by a pantograph spring linkage. Crimp type lugs are furnished for electrical connection to the shoe. Pigtails will be supplied on request at extra cost.

The collector head pivots at shoe contact height so that the shoe glides along the conductor and maintains full face contact. Different ampere ratings are achieved with different matched shoes and springs. These, along with two basic linkages, make up various collectors.

The linkages are fabricated of aluminum alloy and include a spring arm with the collector head and yoke swiveled at one end. The spring arm swivels in a base to provide for horizontal misalignment. The base clamps to a 1" square bar (not furnished). The spring allows for vertical misalignment, applies constant pressure to the collector shoe throughout the stroke.

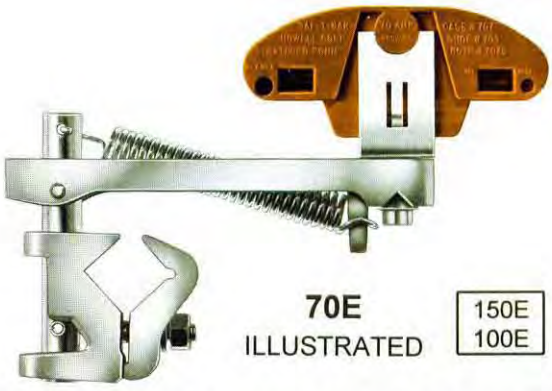
35 amp collectors negotiate curves down to 18" radius. 70 and 100 amp collectors down to 36" radius. 150 amp collectors are designed for use on straight runs only. No pick up guides.

For special applications, long arm collectors are available with bronze casting v/s aluminum, stainless steel hardware v/s plated steel and epoxy coated aluminum parts v/s aluminum parts.

70C
ILLUSTRATED

100C

Self-Centering Collector — This is the standard arm collector with attachments to hold it in centered position for re-entering the pick-up guide on discontinuous circuits. Also see data on long arm self-centering.



70E
ILLUSTRATED

150E
100E

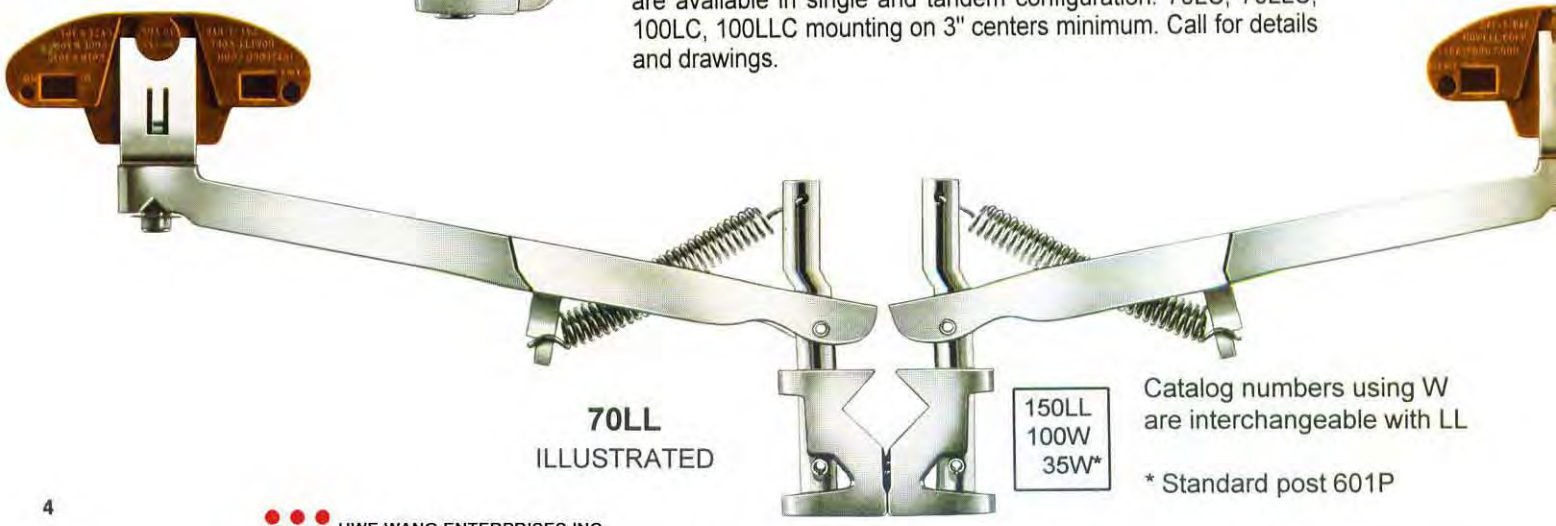
Standard Arm Collector — Recommended for general use on cranes and stable monorails. 2" vertical stroke.

70L
ILLUSTRATED

150L
100L
35L*

* Standard post 601P

Long Arm Collector — Used where there is excessive motion vertically or horizontally (as with a swaying hoist) and for high speed applications. It will accommodate a total vertical stroke of 3". Note different mounting dimensions. Self-centering long arm collectors are available in single and tandem configuration. 70LC, 70LLC, 100LC, 100LLC mounting on 3" centers minimum. Call for details and drawings.



70LL
ILLUSTRATED

150LL
100W
35W*

Catalog numbers using W are interchangeable with LL

* Standard post 601P

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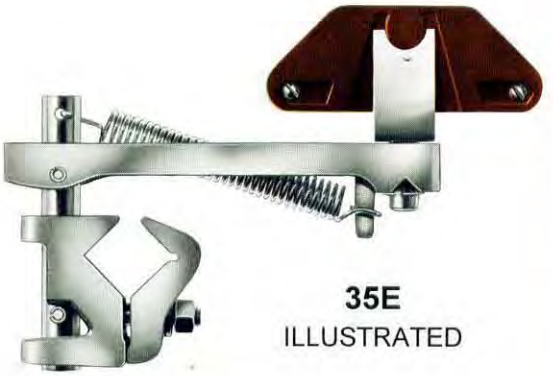
安全電軌集電器

35V
ILLUSTRATED

Tandem Collectors — For maintaining full shoe contact through gaps; i.e. expansion gaps; for use where higher ampere ratings are required than are available with single collectors. Tandem collectors are available in standard arm 35V only and in long arm in all series: 35W, 70LL, 100W amd 150LL. Tandem collectors should be mounted on 2" centers minimum.



35E
ILLUSTRATED

35 Ampere Collector — A light weight collector with light shoe pressure for long wear. Designed for control circuits, light hoists, hand pulled equipment, and standby duty. Raise mount 1/2" over standard mount.

ALTERNATE COLLECTOR HEADS

100

2" C - C Minimum

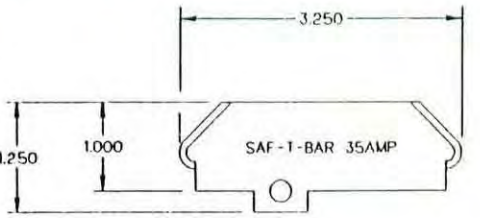
Collector head shown may be substituted for 70 head where indicated in blocks. For extra heat and replacement only.

150E
150L
150LL

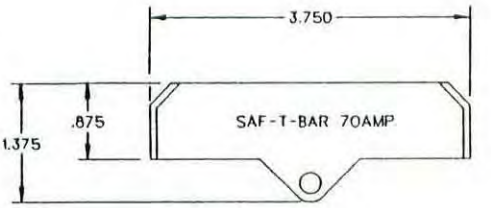
The 150 amp collector head may be used in place of the 70 head. The 150 head has a 5" contact shoe for extended service on mainline runways. It connot be used through standard pickup guides or on curves.

CONTACT SHOE SELECTION

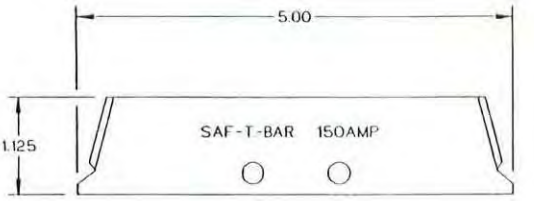
35S
35E - 35V
35L - 35W
Shoe Thickness
.188



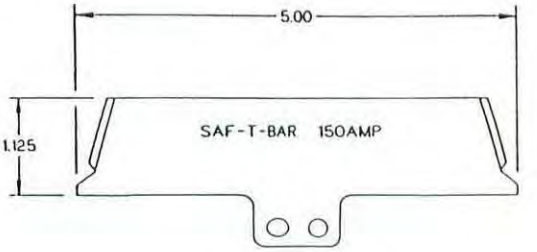
70S
70E - SC70 - SCL70
70L - SCC70 - SCCL70
70LL - SD70 - SE70
SDD70 - SEE70
Shoe Thickness
.188



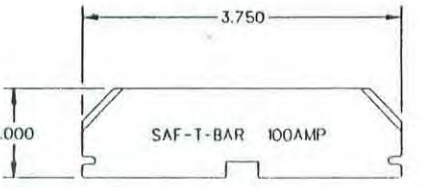
150S
150E - 150L
150LL
Shoe Thickness
.200



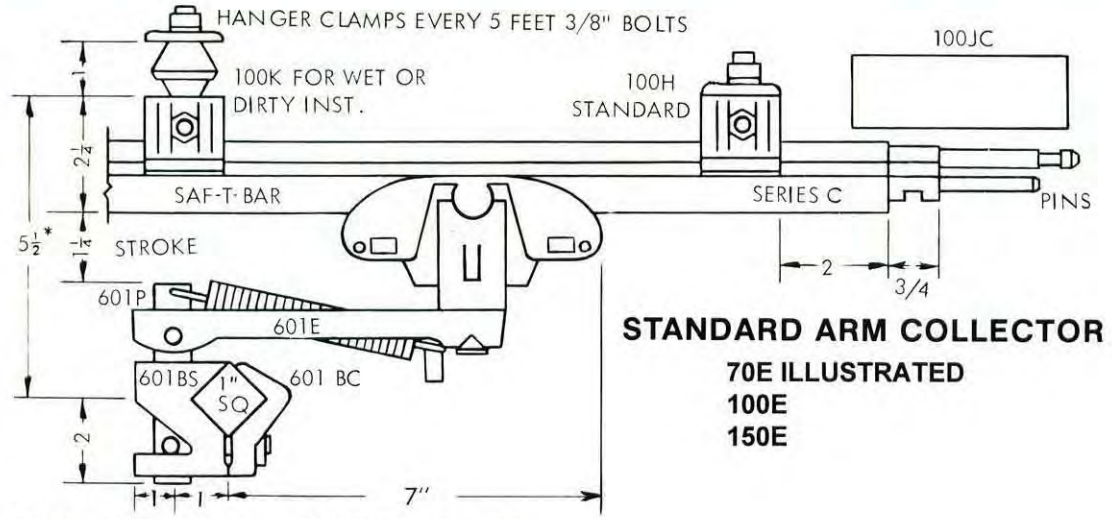
150S-1
150E - 150L
150LL
Shoe Thickness
.200



100S
100E - 100L
100W
Shoe Thickness
30S .190*
60S .190*
100S .225
* Replacement purposes only



DIMENSIONS SAF-T-BAR SERIES C / HS C型電軌安裝尺寸



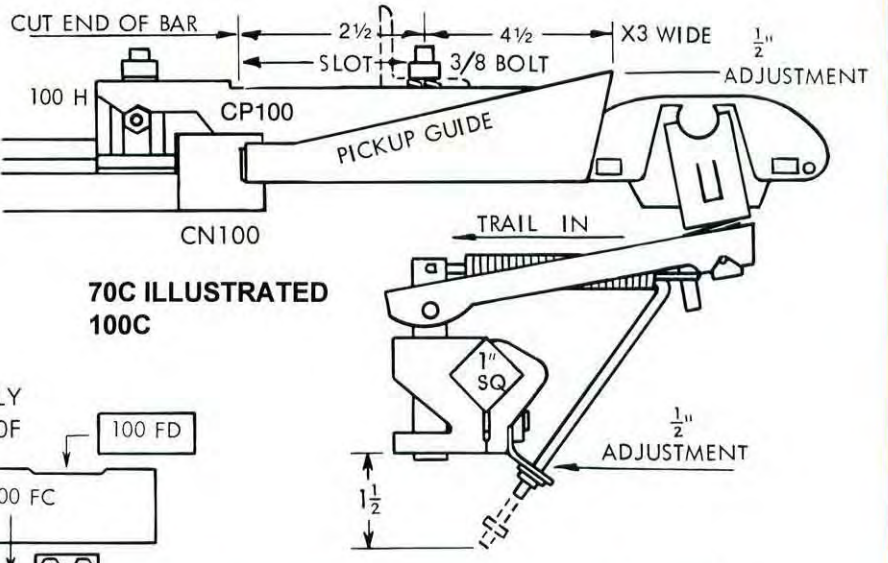
*NOTE 5" FOR **35E** (TANDEM 9" × 2)

STANDARD ARM COLLECTOR
70E ILLUSTRATED
100E
150E

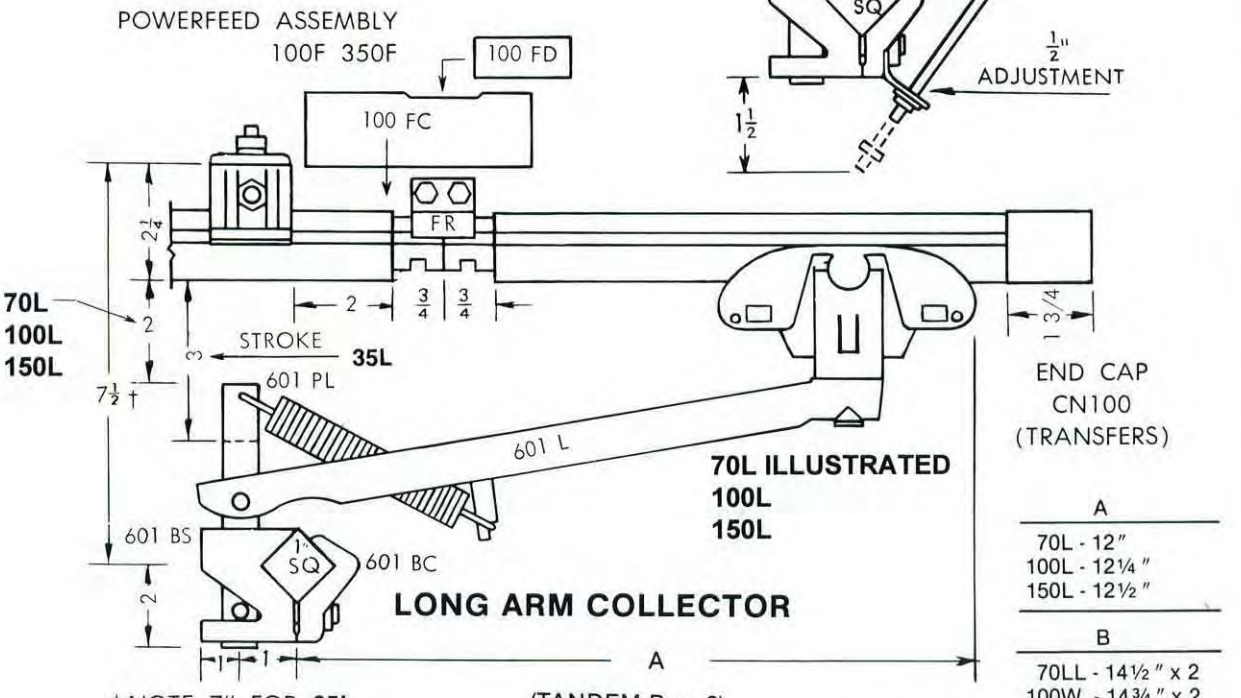
SELF-CENTERING COLLECTOR

70LC, 100LC AVAILABLE
Drift ± 2" Vertical + ¾"; - 2"
Consult Factory for Details.

Also as Tandem:
70LLC, 100LLC



70C ILLUSTRATED
100C



70L ILLUSTRATED
100L
150L

LONG ARM COLLECTOR

†NOTE 7" FOR **35L**

(TANDEM B × 2)

A
70L - 12"
100L - 12¼"
150L - 12½"

B
70LL - 14½" x 2
100W - 14¾" x 2
150LL - 15" x 2

HWE WANG ENTERPRISES INC.
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PARTS LIST - Hand Safe: Add Suffix "HS"

SAF-T-BAR	AMPS	CAT. NO.
Steel	90 Amps.	CA 90
Steel	110 Amps.	CA110
Steel/Copper	250 Amps.	CA250
Copper	300 Amps.	CA300
Copper	350 Amps.	CA350
POWERFEED		
Steel	100 Amps.	100F
Copper	300 Amps.	350F
Copper	350 Amps.	350mcm-2

HANGER CLAMPS	CAT. NO.
Plastic Clamp	100P
Hanger Clamp, Cross Bolt, Metal	100H/100HSS
Hanger Clamp, Plastic Coated Cross Bolt, Metal	100HN
Hanger Clamp with Insulator - Cross Bolt, Plated Metal	100K
Plastic Coated	100KN
Stainless Steel	100KSS
Triple Hanger Metal - 1-1/2" Spacing	100H3-1
Triple Plastic Hanger - 1-1/2" Spacing	100P3-1
Triple Plastic Hanger - 2" Spacing	100P3-2

Full Load Ratings in Amperes Induction Type Squirrel Cage & Wound Rotor Motors

Three phase AC 60c HP	220V	440V	550V
1	3.5	1.8	1.4
1½	5	2.5	2.0
2	6.5	3.3	2.6
3	9	4.5	4
5	15	7.5	6
7½	22	11	9
10	27	14	11
15	40	20	16
20	52	26	21
25	64	32	26
30	78	39	31
40	104	52	41
50	125	63	50
75	185	93	74
100	246	123	98
150	360	180	144
200	480	240	192

Reference Charts for Determining Runway Specifications

The table below is figured for 220V and 440V, 3 phase, 60 cycle AC motors with a 5% loss and is based on the formula:

Volts lost = 1.73 × ampere load × resistance factor × length of conductor in feet from the powerfeed.

SAF-T-BAR Cat. No.	Impedance factor AC	Amp rating cont. duty	Max. length from feed at 5% drop 220V Full continuous load in amperes	440V
CA 90	.00138	90	51 feet	102 feet
CA110	.00097	110	60 feet	120 feet
CA250	.000131	250	195 feet	390 feet
CA300	.00011	300	192 feet	384 feet
CA350	.00008	350	227 feet	454 feet

NOTES:

(1) Center feed **doubles** runway length.

(2) Less than full amp. load **increases** maximum distance from powerfeed.
e.g. 40 amps in CA90 bar at 440V. $\frac{90A}{40A}$ × 102 ft. = 230 ft.

(3) Higher voltage than shown **increases** maximum distance from powerfeed.
e.g. 80 amps in CA90 bar at 480V: $\frac{480V}{440V}$ × 102 ft. = 111 ft.

(4) High voltage loss allowance by motor manufacturer increases maximum distance from powerfeed.
e.g. if 10% loss is allowable
then maximum distance from powerfeed is **twice** the distance indicated in the table above, which is based on a 5% allowable loss.

Voltage Drop Calculation

As most motors are designed to operate with a 5% voltage drop, divide volts lost by line voltage to determine if a larger conductor or additional feed points are required.
See tables for values of Z and R.

3 phase AC Volts lost = 1.73 x Z x Length in feet from feed x Ampere load
1 phase AC Volts lost = 2 x Z x Length in feet from feed x Ampere load
DC Volts lost = 2 x R x Length in feet from feed x Ampere load

Determining Amperage - The national electric code suggests loads:

1. For one motor, use 100% of motor nameplate full load ampere rating.
2. For multiple motors on a single crane or hoist, the minimum circuit ampacity of the power supply conductors on a crane or hoist shall be the nameplate full load ampere rating of the largest motor or group of motors for any single crane motion, plus 50% of the nameplate full load ampere rating of the next largest motor or group of motors.
3. For multiple cranes and/or hoists supplied by a common conductor system, compute the motor minimum ampacity for each crane as in step (2), add them together and multiply the sum by the demand factor from the following table:

Number of cranes	2	3	4	5	6	7
Demand factor	.95	.91	.87	.84	.81	.78

4. For constant loads such as magnets, lights, and air conditioners, etc., plus high duty cycles, use full load amperage, in selecting conductor size.

Series C

INSTALLATION C型電軌安裝説明

COLLECTORS are mounted on a 1" square bar at a 45° angle. The spacings and clearances match those of the conductors and are shown in the dimensional drawings. Good alignment is essential to the function of the system. Pigtails to the collectors should be flexible cable to allow free movement of the collector head. Dual collectors are tightened onto the 1" square bar by lifting one post and using an allen wrench.

CONDUCTORS are supported on brackets on 5 foot centers for C Series. The brackets are available as a catalog item or can be made up of light 1-1/2" angle to to be welded or bolted to runway or bridge. 3/8" holes are drilled for the hanger clamps normally on 2" centers. 1-1/2" minimum centers may be used where space is a factor. 3" centers must be used for pick-up or transfer guides and for outdoor use with spool clamps. Length of bracket is determined by clearances involved, taking into account splice plates, end-play of bridge or trolley, etc.

Vertical Mount — Conductors are mounted as described above. Allow 1-1/2" clearance between innermost conductor and nearest obstruction such as splice plates, web ribs, etc. plus allowance for end-play of bridge or hoist trolley on its rails. Where conductors are mounted in tiers, allow 3" clearance below conductor bar mount to top of bracket supporting lower tier of conductors. Spacing from conductor bracket to collector bar mount is 5-1/2" for standard collectors, 7-1/2" for long arm collectors, and 5" for the light, 35 amp collector. For spool hanger clamps, add 1".

Lateral Mount — To conserve space, conductors may be mounted on their sides (for clean, dry indoor installations only). The same spacing requirements apply as with vertical mount, but, for greater accessibility in servicing, alternate collectors should be faced in opposite directions when mounting on the collector bar mount. Special, counter-balanced collectors are not required with laterally mounted Saf-T-Bar Series C conductors. No metal clips are needed to secure insulating cover.

Outdoor Installation — Where conductors are in service outdoors or in dusty or dirty areas, conductors are mounted vertically and insulating spools are used on the hanger clamps. Mounting on 2" centers is recommended. Spacing from conductor bracket to collector bar mount is increased 1" with the spool clamp. Where conductors are subjected to ice, sleet, falling objects, or immediate personnel contact, a sheet metal hood can be mounted over the bracket clamp assembly.

Monorail Installation — On narrow monorails and for use with light hoists, conductors should be mounted on opposite sides of the rail to balance upward pressure of the collectors against the conductors. Tilting trolley wheels should be allowed for. Long-arm collectors are used where there is excessive trolley sway or vertical motion, instead of standard series.

ATTACH HANGER CLAMPS to brackets. Snap 3 ten-foot conductors into place in clamps. Take up on hanger cross bolts, except on plastic snap hangers that do not have cross bolts, to allow conductor to slide in expansion except the clamp at the anchor point which is taken up tight. On cross bolt anchor hangers, torque cross bolt to 2 ft. lbs. On plastic snap hangers install anchor pin. The standard adjustment for sliding cross bolt hangers is to tighten cross bolts, then back off 1/4 turn. Snap next 3 conductors in place, and make up joints working from inside conductor outward. "C" series has friction joint using long-handled pliers or special lever tool to pull conductor together. Then tighten cross bolts on hangers and repeat above.

POWERFEEDS can be mounted at any point along the conductor by cutting out 1-1/4" of the insulating cover. The preferred location is at a point where the cover is easily cut back. In mounting the powerfeed on a female end of conductor, drive a joint pin into the conductor for electrical conductivity and to reinforce distorting bar ends to retain end caps.

EXPANSION CONDUCTORS should be hung to expand from center anchor outwardly through sliding tight clamps. Expansion gap kits 1" motion, or gap assemblies (10') with 2" motion are available. Expansion gap kits are required every 150 feet for steel conductors and every 100 feet for copper conductors. Expansion gap assemblies are required every 300 feet for steel conductors and every 200 feet for copper conductors, and replace a 10-foot section of conductor.

TRANSFERS — At fixed gaps in the conductors such as at INTERLOCKS and SWITCHES, end caps driven onto the ends of the conductors provide a transfer passage for the collector shoe and insulate the conductors against grounding or cross phasing. The end caps will tolerate 1/8" misalignment. Conductor ends must be rigidly supported at interlocks.

TRANSFER GUIDES are used only where there is poor alignment at the interlocks, angular displacement for the conductor due to racking or at TONGUE SWITCHES, to track the collector through misalignments of 1/2". Use dual collectors to prevent contact loss through the interlock. Transfer guides are installed like pick-up guides and require 3" conductor spacing. Mounting dimensions on requerst.

PICK-UP GUIDES are used to retrack CENTERING collectors on discontinuous circuits such as bridge control circuits, runway circuits at fire doors, etc. The guide itself is secured to the bracket with a 3/8" bolt and the conductor is secured to the guide with a hanger clamp. The 3" width of the guide requires 3" minimum center conductor spacing.

END CAPS are driven on the exposed ends of the conductors to complete the insulation of the bar. Excessive looseness of end caps may require distorting conductor ends to retain end caps.

ISOLATION SLEEVE is used to electrically isolate adjacent conductor sections with a 1/2" over-surface gap. The sleeve will suppport adjacent conductor sections, but should have hangers within 6" of each side of the isolation sleeve. Collectors will bridge the gap electrically. Two sleeves separated by 6 inches of conductor would be required to prevent collectors bridging the gap as in signal or control functions.

CUTTING — The Series C conductors can best be cut with a fine-tooth hacksaw. They may be cut at any point, and any rough edges should be filed smooth after cutting. Short lengths may be driven together over the joint pins where the using of a joint tool would require additional notching.

BENDING CURVES down to 18" radius is done with a special bending hickey for C Series. The end of the conductor is hooked into the left end of the hickey while the length of the conductor is drawn around its curved portion. The part thus curved is advanced through the hickey and the action repeated to form curves of any length and radius. On tight curves, it may be necessary to cut the lower half of the cover on the inside of the curve every 4 inches or so to prevent buckling. Instructions are included with each hickey. Use hickey Cat. #100U with Series C.

WARNING: Power Service Disconnect must be locked in the OFF position before attempting any conductor service.

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