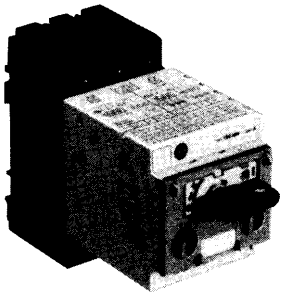
Bulletin 190
Modular Starter System

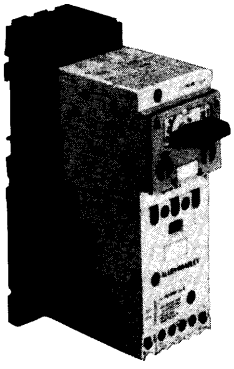
Product Data

Bulletin 190 Modules can be combined to make:



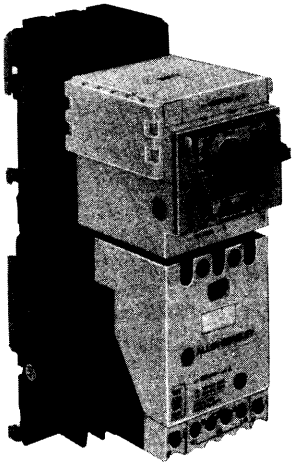
Manual Motor Starter/Protector

OR



Integrated Starter

OR



Coordinated Protected Starter (Combination Starter)

Table of Contents

Introduction

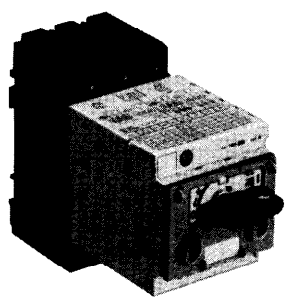
The Bulletin 190 is a 40 ampere motor starter system made up of modular components. These components can be configured as a manual starter or an integrated (magnetic) starter. A coordinated protected starter (combination starter) is also available within the Bulletin 190 family.

The modular starter system provides:

- Automatic coordinated short circuit and overload protection for the branch circuit.
- Signaling and remote operation capability for easy interface with automated controls.
- UL Listing with "Group Motor Installation" ratings, eliminating individual motor fuse blocks and overload relays in multi–motor panels, saving panel space, labor and cost.
- Compact modular construction; saving panel space, reducing component wiring, and reducing inventory costs.

Product Description

Manual Motor Starter and Protector

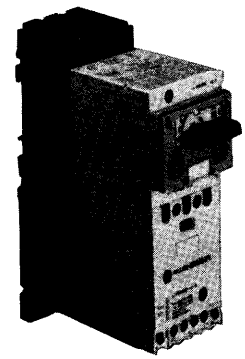


The Manual Motor Starter and Protector is a field assembly of the 40A manual interrupter and a trip unit. It is capable of starting and stopping motors up to 40A full load current and protecting the motor circuit from overcurrents. The Manual Motor Starter and Protector is also UL listed with ratings for "Group Motor Installation" which will be discussed later in this publication.

The Manual Motor Starter and Protector can be operated remotely ("ON", "OFF", and RESET) by use of the remote operator module. It can be equipped with trip indicating contacts that provide a separate overload trip indication and a separate short circuit trip indication. Visual trip indication is provided with the trip indicating contact option or is available as a separate option. Optional auxiliary contacts can be used to indicate if the Manual Motor Starter is in the "ON" or "OFF" position. The remote operation and status indication simplify use of this starter with programmable controllers.

Since this product configuration is a manual starter, it is still necessary to provide upstream short circuit protection in accordance with the requirements of the National Electric Code.

Integrated Starter



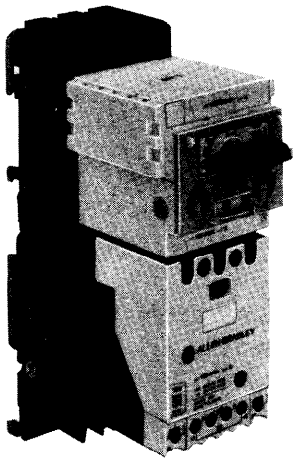
The Integrated Starter is a field assembly of the manual interrupter, trip unit and a contactor module. Since it is made up of the Manual Starter plus a Contactor Module, it shares the features of the Manual Starter. In addition, it provides the ability to operate the motor from a remote location by means of a contactor.

The major benefits of the Integrated Starter are:

- Its ability to provide automatically coordinated overload and short circuit protection.
- It is UL listed with group installation ratings.
- Group installation keeps panel costs down by eliminating individual motor fuses or circuit breakers.
- It has remote operation and status indication capabilities for use with automated controls.
- The compact construction saves panel space and enhances panel appearance.

Since this product configuration is a magnetic starter, it is still necessary to provide upstream short circuit protection in accordance with the requirements of the National Electrical Code.

Coordinated Protected Starter



The Coordinated Protected Starter (CPS) is factory assembled from a contactor module and special manual interrupter. It is completed by customer addition of a trip unit.

Since the Coordinated Protected Starter meets the UL requirements for a combination starter, which requires no fuse or circuit breaker backup protection, it is most suitable for those applications of individual motors in which:

- High short circuit ratings are required. (100,000A at 240 volts, 65,000A at 460 volts.)
- Machine or process down time must be minimized.
- Remote operation of the disconnect as well as the motor contactor is required.
- Space for motor controls is limited.

Summary

The Bulletin 190 Modular Starters provide three distinct motor starters, the Manual Motor Starter and Protector, the Integrated Starter and the Coordinated Protected Starter. This advanced starter line provides benefits to users from compact construction, group installation ratings, remote operation and signaling, automatic coordination and; with the Coordinated Protected Starter, a very compact, current limiting combination starter.

Coordinated Protection and Damage Levels

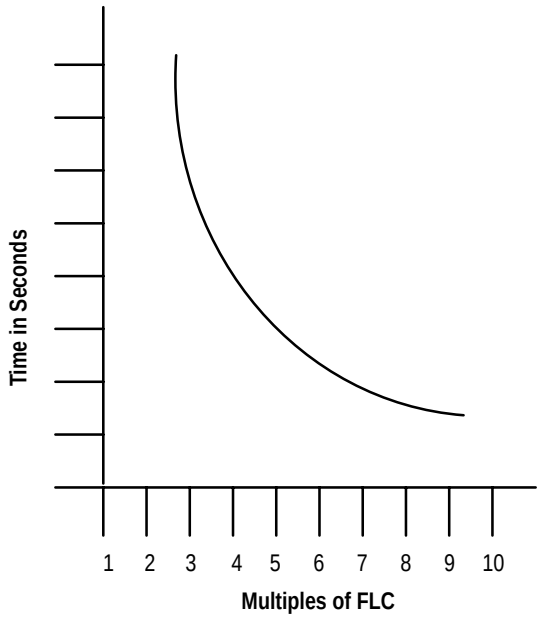
Coordinated Protection

Coordinated protection for a branch circuit consists of providing a continuous level of damage protection from minor overloads through major short circuit currents. Such protection provides benefits of reduced down time and replacement costs as well as greater safety.

The purpose of the overload protection in any branch circuit is to provide starting and running protection from overcurrents caused by such problems as binding bearings or jammed parts in the machine. These overcurrents range up to motor locked rotor current, usually about six times the motor full load current. Since locked rotor current is also initial starting current, overload protective devices require some designed in time delay in order to prevent nuisance tripping during start up.

The time/current curve of an overload protective device shows that the time to trip is inversely related to the magnitude of overload current.

Overload Response Curve



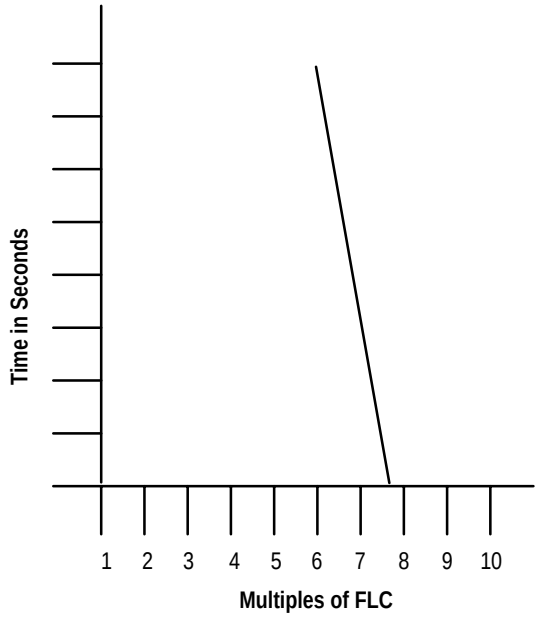
The purpose of the short circuit protective device is to prevent higher levels of overcurrent from damaging components of the motor branch circuit. Short circuit currents are considered to range from motor locked rotor current up to the maximum current available at the motor circuit.

Coordinated Protection (continued)

Short circuit currents result from such problems as wiring errors, insulation breakdown and accidental contact with the circuit by tools or other metal objects. Short circuit protective devices (fuses or circuit breakers) must react quickly to minimize damage.

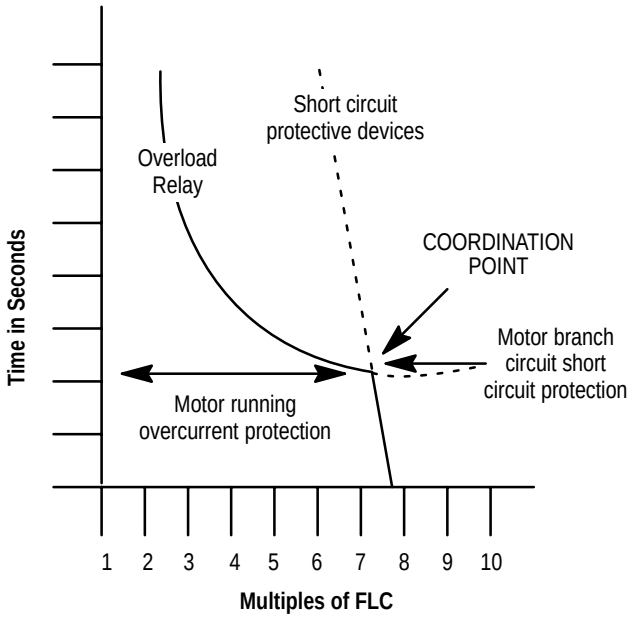
The time/current curve for a short circuit protective device shows its trip time is also inversely related to current. You can see, however, that the slope of the curve is very steep.

Short Circuit Protective Device

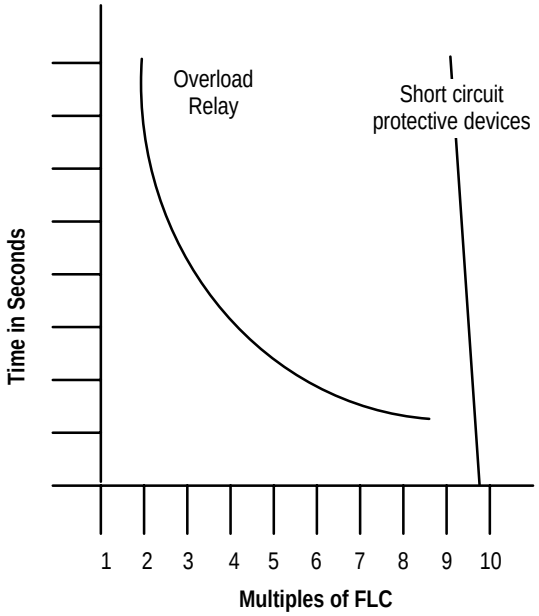


The National Electrical Code requires short circuit and overload protection for the branch circuit. If these curves are overlaid we then have a time current curve that illustrates the behavior of the protective devices for all levels of current. If the curves intersect, the point of intersection is called the coordination point. This point should be just above motor locked motor current (6–8 x FLC) for proper coordination. If the curves are properly coordinated, the short circuit protective device will react to currents above the overload range, but will not trip if the overcurrent is in the overload range.

Coordinated Protection



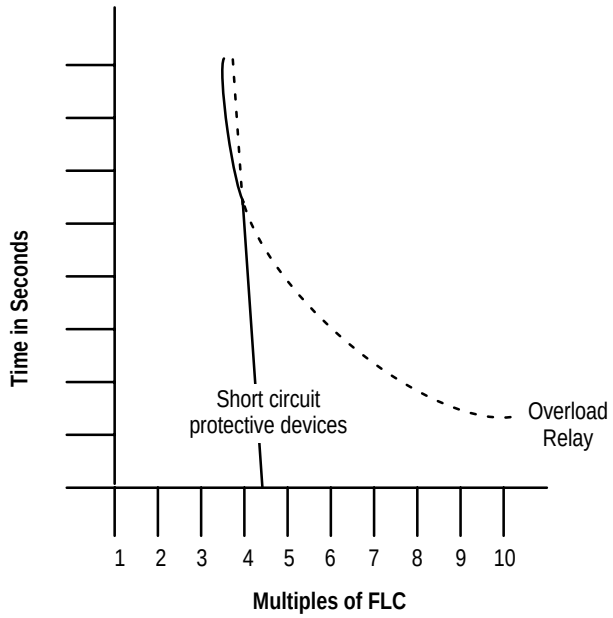
If, however, these curves do not intersect, or intersect well above the motor locked rotor current, the overload protective device will react to short circuit currents in the gap between the overload range and short circuit protection, and probably be damaged.



Coordinated Protection (continued)

If the curves intersect in the overload range, the short circuit protective device will nuisance trip on motor start–up.

Protection Not Coordinated (Curves intersect at less than locked rotor current)



Proper coordination can be achieved by careful selection of overload and short circuit protective components, but the Bulletin 190 provides it automatically with the thermal magnetic trip unit.

Damage Levels

Coordination is essential to protection of motor circuit components, but the quality of the protective devices is also important. Fuses or circuit breakers must act very quickly to interrupt the short circuit current once they sense its presence. The peak value of current that passes through the fuse or circuit breaker to downstream equipment from the start of a short circuit to its interruption is called “peak let–through current.” The total current that is let–through over the time from fault initiation to interruption is referred to as let–through energy, or I^2t. Some levels of peak let–through current and energy are unavoidable, but high quality short circuit protective devices can minimize them to prevent component damage.

Damage from fault currents takes two forms: mechanical stress (example: broken moldings on starters) and heat (example: flame and melted parts). This damage is proportional to peak short circuit let–through current (Ip) and the square of the current for the period of time the current flows (I^2t). Quick recognition and interruption of the short circuit current is required to minimize Ip and I^2t. A short circuit protective device that interrupts the short circuit current within 1/2 cycle and permits less let–through Ip than would be present without a protective device is said to be “current limiting.”

Protective devices vary in their current limiting capability and thus in their ability to prevent damage to components of the motor circuit.

The International Electrotechnical Commission has recognized for some time that different short circuit protective devices provide different levels of protection. IEC 947–4, a new International Electrotechnical Commission standard (replacing IEC 292–2), defines two types of acceptable motor circuit damage from short circuit current:

Type 1 – There shall be no discharge of parts beyond the enclosure under fault conditions. Damage to the contactor and overload relay is acceptable, and the starter may be inoperative.

Type 1 damage level coordination requires “that under short circuit conditions, the device shall cause no danger to persons or installation, but may not be suitable for further service without repair and replacement of parts”.

Type 2 – There shall be no damage to the overload relay or other parts, except that welding of the contactor or starter contacts is permitted if such welds are easily separated, as with a small screwdriver, without significant deformation.

Type 2 coordination is, therefore, more stringent. It requires that, under short circuit conditions, the device will not cause danger to persons or the installation and will be suitable for further use. The risk of contact welding is recognized, so the manufacturer must indicate measures to be taken to check for and break tack welds. This is why contacts are accessible on Allen–Bradley Bulletin 500 and 100 line contactors, in all sizes.

The Bulletin 190 Integrated Starter and Coordinated Protected Starters are designed to provide coordinated Type 2 protection. In reality, the Bulletin 190 provides a level of protection beyond Type 2.

Quick Selection Guide North American Market

Manual Motor Starter And Protector – Select the Manual Interrupter – Catalog Number 190–MN and a Trip Unit from Table 1.

Integrated Starter – Select the Manual Interrupter – Catalog Number 190–MN, a Contactor Module – Catalog Number 190–A40, choosing a coil voltage suffix from Table 2, and a Trip Unit from Table 1.

Coordinated Protected Starter – Select the Coordinated Protected Starter Less Trip Unit – Catalog Number 190–CPS40, choosing a coil voltage suffix from Table 2, and a Trip Unit from Table 1.

Table 1 Selection Information

Selection for single motor and group motor installations

For motors with service factor 1.15 or greater, use motor nameplate full load current to select the trip unit with the proper thermal current range. EXAMPLE: Motor FLC = 17A., S.F. = 1.15. Select Trip Unit Catalog Number 190–P250 which has a thermal current range of 16–25A.

For motors with service factor less than 1.15 – Multiply motor nameplate full load current by .9 and use the resulting figure to select the trip unit with proper thermal current range. EXAMPLE: Motor FLC = 17A., S.F. = 1.0, 17A. x .9 = 15.3A. Select Trip Unit Catalog Number 190–P160 which has a thermal current range of 10–16A.

Table 1 – Thermal Magnetic Trip Units

Catalog Number	Maximum 3 Phase Horsepower			Adjustable Thermal Current Range (A)	Adjustable Magnetic Trip Current Range (A)
	230 V	460 V	575 V		
190–P006	--	--	--	0.4-0.6	5-8
190–P010	--	1/2	1/2	0.6-1.0	8-14
190–P016	--	1/2	1	1.0-1.6	14-22
190–P024	1/2	1	1–1/2	1.6-2.4	20-35
190–P040	1	2	3	2.4-4	35-55
190–P060	1–1/2	3	5	4-6	50-80
190–P100	3	5	7–1/2	6-10	80-140
190–P160	5	10	10	10-16	130-220
190–P250	7–1/2	15	20	16-25	200-350
190–P320	10	20	30[1]	24-32	275-425
190–P400	--	30	30[1]	32-40	350-500

[1] Does not apply to Catalog Number 190–CPS40.

Table 2 Selection Information

Select the required coil voltage code from this table to complete the catalog number for CONTACTOR MODULES and COORDINATED PROTECTED STARTERS less TRIP UNITS.

Table 2 – Coil Voltage Code

Voltage	24	110	120	208	220	240	415	480	600
60Hz	J	--	D	H	--	A	--	B	C
50Hz	--	D	--	--	A	--	B	--	--

Typical Questions And Answers

1. How do the Integrated Starter and the Coordinated Protected Starter (CPS) differ?

The Integrated Starter is a panel mounted motor starter which requires back up short circuit protection. With back up fuses or a circuit breaker, it is suitable for use on a circuit capable of delivering 65kA at 480 volts. or 42kA at 600 volts. The CPS is a UL listed combination starter suitable for use directly on the feeder circuit without back up branch circuit short circuit protection. It is capable of interrupting 100kA at 240 volts, 65 kA at 480 volts, and 42kA at 600 volts (on loads up to 25A.) The differences in capability are achieved by a different contact structure in the manual interrupter portion of the CPS.

As a result of the special manual interrupter used in the CPS version, UL insists that the CPS device be sold as a factory assembled unit, whereas the integrated starter (which requires upstream protection) can be sold for field assembly.

2. When is back up protection required upstream of the Bulletin 190?

The Manual Starter and the Integrated Starter always require back up fuses or a circuit breaker. They are not rated as branch circuit short circuit protective devices, although they both contain short circuit protection. This built in short circuit protection allows achievement of significant motor group installation ratings. The Catalog Number 190–CPS however, is UL listed as a combination starter, and therefore is “self–protected,” requiring no back up fuses or circuit breaker.

3. Is the Bulletin 190 a circuit breaker?

If we define a circuit breaker as a device that can be used in applications requiring a short circuit protective device, pass all UL 489 test requirements and be listed by UL as a circuit breaker, the Bulletin 190 would not meet that definition. The Bulletin 190 is a motor controller and overload device

Typical Questions and Answers (continued)

with built in short circuit protection. It is designed to meet UL Standard 508 for motor controllers. The Bulletin 190–CPS version however, is listed by UL as a combination starter and therefore could take the place of fuses or circuit breaker in a motor branch circuit. However, such use would not be economical.

IEC Standards permit the Bulletin 190 to be used as a circuit breaker without back up protection. (See Page 22 for details)

4. How would you apply "group fusing" in a typical multi–motor control panel?

Assume a panel for a material handling system feeding a large press, controlling the following motors:

3 Conveyor motors	10HP	460 volts	14A FLC	S.F. 1.15
2 Feeder motors	7.5HP	460 volts	11A FLC	S.F. 1.15
1 Hyd. Pump motor	5HP	460 volts	7.6A FLC	S.F. 1.15
1 Oil Cooler motor	3/4HP	460 volts	1.4A FLC	S.F. 1.15

Step 1. Select a Bulletin 190 Integrated Starter for each motor with trip unit chosen according to service factor and motor full load current (See Page 10).

Step 2. Select fuses or circuit breaker referring to N.E.C. Article 430–53(c) (4) "The branch circuit shall be protected by fuses or inverse time circuit breakers having a rating not exceeding that specified in Section 430–52 for the highest rated motor connected to the branch circuit plus an amount equal to the sum of the full load currents of all other motors and the ratings of other loads connected to the circuit." In other words: find the fuse rating for the largest motor and add it to the sum of the full load currents of all the other motors in the group.

14A x 1.75 = 24.5A rounded to 25A standard fuse rating per 430–52(a) exception 1.

25A + (14A x 2) + (11A x 2) + 7.6A + 1.4A = 84A

Select 80A fuses, or see 430–53(c) (4) for the possibility of rounding up to the next larger fuse size.

Since maximum fuse and circuit breaker rating for the Bulletin 190 Manual Starter is 500A and for the Bulletin 190 Integrated Starter is 2000A, the size of this motor group is not restricted by fuses or circuit breaker ratings of the Bulletin 190.

Be aware that N.E.C. art. 430–53(d) says ". . .no conductor to the motor shall have an ampacity less than one–third that of the branch circuit conductors...." Since the largest wire that can be used in the terminals of the Bulletin 190 is 6 AWG whose 75 degree C. ampacity is 65A, the maximum ampacity of the branch circuit conductors (wires from the fuses) is 3 x 65 = 195A.

Therefore, this ampacity determines the maximum size of the motor group. Refer to the N.E.C. article 430– 24(a) [ampacity of wires supplying 2 or more motors], for purposes of determining the number of motors that may be included in a single branch circuit.

5. How does Bulletin 190 short circuit indication differ from overload indication when using the trip indicating contacts?

There are two normally open and two normally closed contacts in the accessory trip indicating contact module. On a short circuit all contacts will change state. On an overload trip, only the contacts labeled 4.43–4.44 and 4.31–4.32 will change state. A visual indicator that is included with the trip indicating contact module, (or available separately), will show a red flag in the event of short circuit caused trip.

6. What is the Catalog Number 190–N7 coding pin accessory for?

The coding pins can be used to inhibit the installation of the wrong trip unit into an interrupter when more than one Bulletin 190 is used. Since the trip units can be easily removed to provide complete isolation of the motor power circuit, it is important to get the correct trip unit reinstalled in the interrupter.

There are four holes in the trip unit cover which match four holes in the manual interrupter when the cover is latched. By installing coding pins in the interrupter holes, you exclude any trip unit that has pins installed in the corresponding holes because the trip unit cannot be latched unless the corresponding holes are empty.

For example: A single pin in one of the holes of the interrupter will mate with eight different combinations of from zero to three pins mounted in the trip unit. That same single pin will exclude eight other combinations of one to four pins.

* O O O mates with	O O O O but excludes	* O O O
	O * O O	* * O O
	O O * O	* O * O
	O O O *	* O O *
	O * * O	* * * O
	O * O *	* * O *
	O O * *	* O * *
	O * * *	* * * *

7. Can the contactor module on the CPS be replaced?

It is physically possible to replace the contactor module, but it does require breaking the CPS label. If this is done, the UL listing of the product as a combination starter is voided. The contactor coil, however, may be easily replaced without disturbing the label.

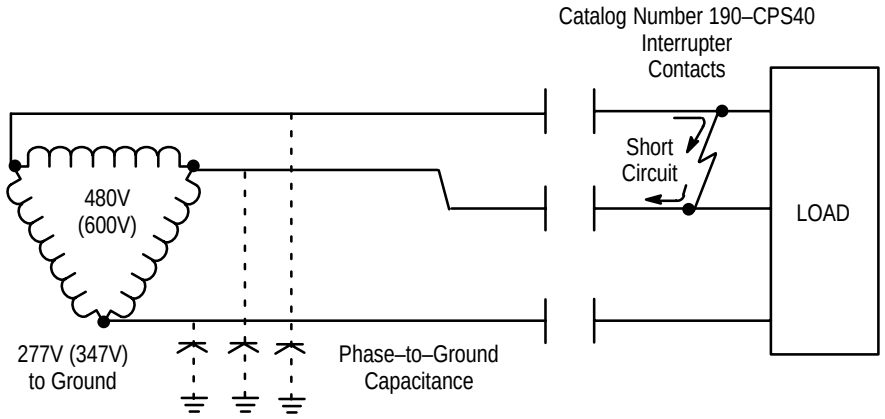
8. What do the 480Y/277 or 600Y/347 ratings on the CPS mean?

These markings mean that the CPS “is intended for connection to only a wye connected supply with 480 volts (600 volts) maximum line to line and 277 Volts (347 volts) maximum line to ground”.

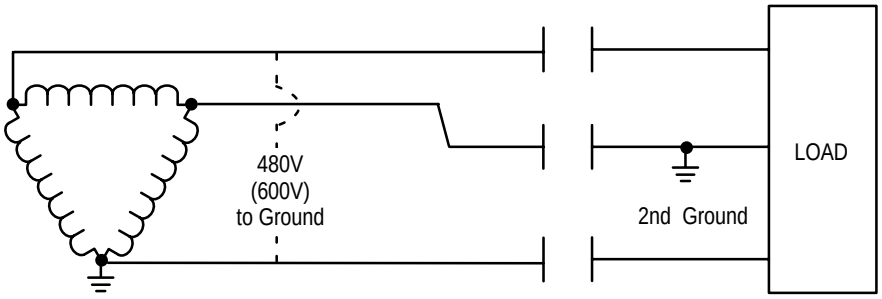
Typical Questions and Answers (continued)

In a wye connected system, voltage to ground would be 277 volts (347 volts) and in the event of a ground fault, a single pole would interrupt the fault at that voltage. In a delta ungrounded system, there would be a 277 volts (347 volts) potential to ground through capacitance, but in the event of a ground fault, the voltage to ground becomes 480 volts (600 volts) (in effect, a corner grounded delta). This situation probably would not affect motor operation; but should an additional ground occur in one of the other phases, the Bulletin 190 would be forced to interrupt 480 volts (600 volts) short circuit current with a single pole. It is not designed to do this and is therefore labeled for wye source connection. Refer to the following sketches.

Ungrounded Delta System



Normal Situation – A phase–to–phase short circuit will have 480 volts (600 volts) current interrupted by two poles in series.



However if a ground fault occurs, the circuit becomes a corner grounded delta. If a second ground should occur it leaves the remaining pole to interrupt short circuit current at 480 volts (600 volts).

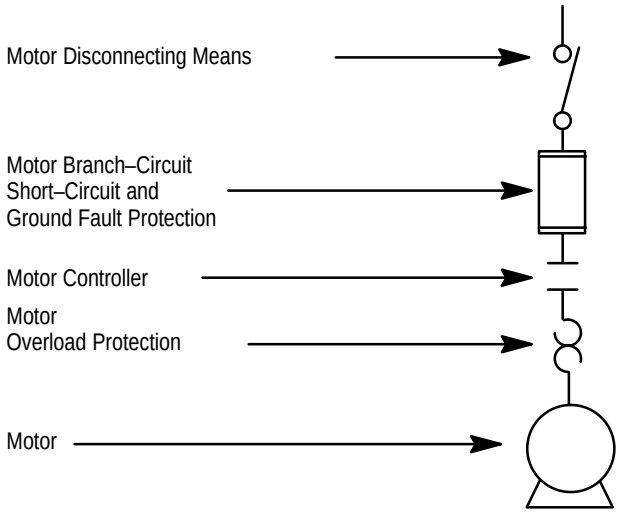
Conclusion – The Bulletin 190–CPS40 should only be used on a wye connected system.

Detailed Application Information

North American Market – In the U.S. and Canadian markets, two documents, NFPA–70 (the U.S. National Electrical Code) and the Canadian Electrical Code (CEC) outline the requirements for motor branch circuits. Since the documents are very similar in the area of branch circuit requirements, we will treat them as being the same and reference specific paragraphs in the U.S. National Electrical Code (N.E.C.). In addition, Underwriters Laboratory (UL) and Canadian Standards Association (CSA) product listings and certifications often dictate the choice of components for the branch circuit.

Article 430 of the N.E.C. identifies the components required for each motor installation, as shown in Figure 1:

Figure 1
N.E.C Requirements for each Motor Installation (From N.E.C. Diagram 430–1)



Having identified the components required for each motor installation, we can now look at applications in which a single motor is used, and applications requiring multiple motors, or a group of motors.

Single Motor Applications – Using Diagram 430–1 as a guide, we need to select the various components for the motor installation.

Let's begin with the selection of the motor controller – the device that will actually do the switching of the motor. Section G of Article 430 governs the selection of the controller. Basically, the controller shall have a horsepower rating not lower than the horsepower rating of the motor it is controlling.

The next step would be to select the motor overload protection. The requirements are to protect the motor, the motor controller, and branch circuit conductors against excessive heating due to motor overloads or the motor's failure to start.

Detailed Application Information (continued)

In some instances the thermal protection is integral to the motor. However, in the majority of applications a separate overload protective device is required. Article 430–32 specifies the guidelines and maximum values for the selection of the overload device.

In many applications a magnetic contactor and overload relay are used to meet the N.E.C. requirements for the controller and overload device. The Bulletin 190 Integrated Starter would also meet these requirements because of the contactor module and the overload protection built into the Manual Starter portion of the Integrated Starter. In applications not requiring remote control, high duty cycle, or undervoltage protection, the Bulletin 190 Manual Starter could be used; since it meets all the requirements of the N.E.C. for controller and overload device.

Having chosen the controller and overload protective devices, let's look at the short circuit protective device. Paragraph 430–52 & Table 430–152 of Article 430 outline the maximum sizing restrictions of the short circuit protective device. They allow the following types of devices to be utilized as the short circuit protective device:

Non–time Delay Fuse
Dual Element Fuse (Time Delay Fuse)

Instantaneous Trip Breaker (only if adjustable and part of a combination controller having motor overload and also short circuit and ground fault protection in each conductor).

Inverse Time Breaker

Circuit Breaker – As we stated before, the Bulletin 190 Manual Starter and the Integrated Starter incorporate adjustable bi–metallic elements to provide overload protection and adjustable magnetic trip elements which respond to currents above 8 to 14 times the maximum overload adjustment setting. They cannot be used as circuit breakers in North American markets however, because they do not meet the UL 489 or CSA requirements for a short circuit protective device. As a result, the Bulletin 190 Manual Starter and the Integrated Starter must be protected by an upstream short circuit protective device.

The Bulletin 190 Coordinated Protected Starter is listed by UL as a "self protected control device" under UL 508 (in other words, a combination starter). As such, it does not require additional short circuit protection.

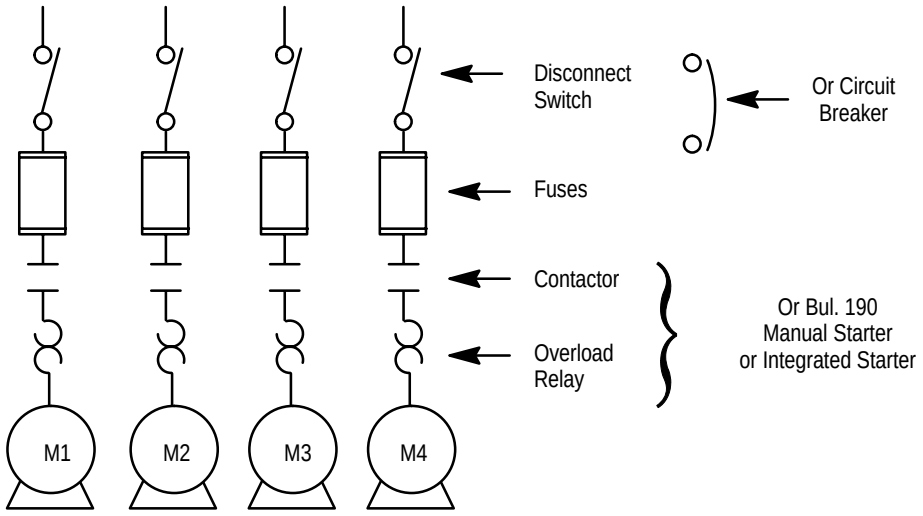
The last item to be selected for the motor installation then, is the disconnecting means. The intent of the NEC is that the disconnect means be separate from the controller. Article 430–111, however, does allow the controller to serve as the disconnect means if "it is protected by an overcurrent device (which shall be permitted to be the branch circuit fuses) that opens all the ungrounded conductors..." In other words, to use a controller as a disconnect means, another disconnect means must be used

ahead of it. The Bulletin 190 Manual Starter and Integrated Starter are not suitable for use as the disconnecting means for the branch circuit. In terms of standards consideration, these products are not recognized by UL or CSA as disconnect switches or circuit breakers. The Bulletin 190 Coordinated Protected Starter, which is UL listed as a "self protected control device," (Combination Starter) does not require a separate additional disconnect means.

Multi–Motor/Group Motor Installations

A. Many applications involve the use of two or more motors. the N.E.C. requires that each motor have a disconnecting means, a short circuit protective device, controller, and overload protective device. One approach to meeting the N.E.C. requirements would be to utilize a scheme as shown in Figure 2.

Figure 2
Multi–Motor Installation



Although this approach provides excellent short circuit and overload protection for each motor and its associated controller, it is the most cost and size prohibitive in terms of the number of components to be purchased and installed. In terms of the selection of components for each motor branch circuit, the same procedure is used as that described under the "single motor application" portion of this publication, beginning on Page 15.

Multi–Motor/Group Motor Installations (continued)

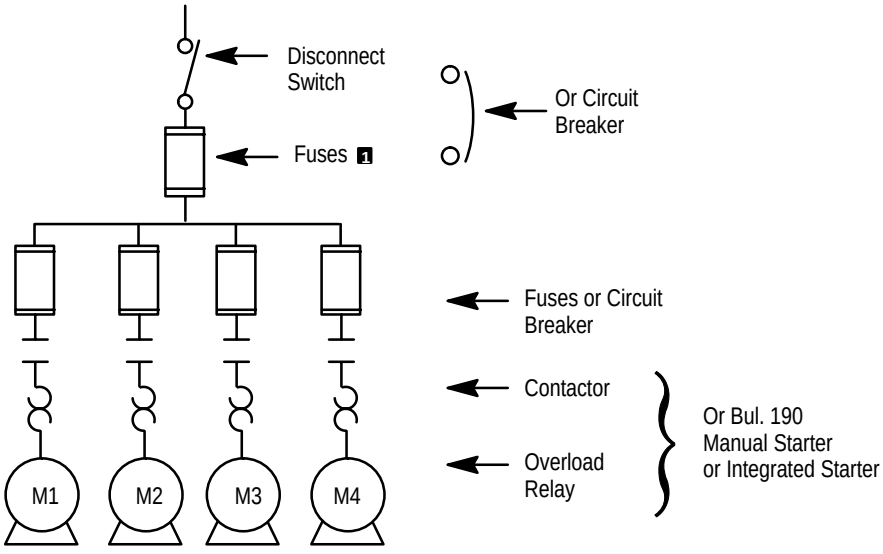
The Bulletin 190 Manual Starter or Integrated Starter can be used to perform the controller and overload protective functions.

B. N.E.C. Article 430–112 permits a significant reduction in cost and size for many applications, by introducing an exception to the requirement that "Each motor shall be provided with an individual disconnecting means." The exception states "A single disconnecting means shall be permitted to serve a group of motors under any one of the following conditions:

1. Where a number of motors drive several parts of a single machine or piece of apparatus, such as metal and woodworking machines, cranes and hoists.
2. Where a group of motors is under the protection of one set of branch circuit protective devices as permitted by Section 430–53.
3. Where a group of motors is in a single room within sight from the location of the disconnecting means."

The multi–motor installation shown in Figure 2 can then be reduced to the installation shown in Figure 3, eliminating all but one of the disconnecting devices.

Figure 3
Multi–Motor Installation



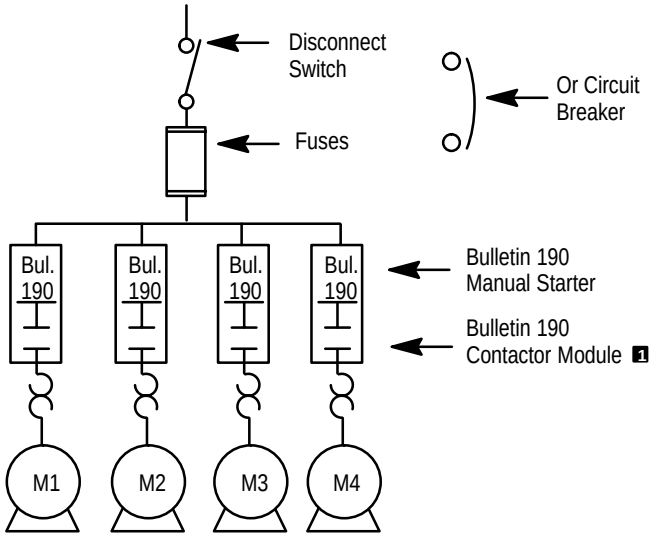
1 Required to protect the conductors from the disconnect means to the individual motor circuits.

According to Article 430–112, "The single disconnecting means shall have a rating not less than required by Section 430–110 for a single motor, the rating of which equals the sum of the horsepowers or currents of all the motors of the group." In other words, the disconnect should be rated for 115% of the sum of the motor full load currents. In terms of the selection of the other components for each motor circuit (short circuit protective device, controller, overload protective device) the same procedure is used as that described under the "single motor application" portion of this publication.

The Bulletin 190 Manual Starter or Integrated Starter can be used to perform the controller and overload protective functions; but cannot be used to provide the short circuit protective function, or as the disconnect device for the complete branch circuit.

C. Within certain guidelines, as outlined in Article 430–53 (quoted below), the N.E.C. allows us to further reduce the number of components shown in the Multi–Motor installation in Figure 3, by eliminating all but one short circuit protective device, as shown in Figure 4.

Figure 4
Group Motor Installation



1 Contactor required if remote operation is necessary.

This installation, commonly referred to as a “Group Motor Installation” yields the optimum in terms of panel cost and size reductions. Article 430–53 (c) permits two or more motors of any rating to be utilized in group motor installations provided each motor has its own overload protection and

- “Each motor overload device is listed for group installation with a specified maximum rating of fuse and/or inverse time circuit breaker.
- Each motor controller is listed for group installation with a specified maximum rating of fuse and/or circuit breaker.
- Each circuit breaker is one of the inverse time type and listed for group installation.
- The branch circuit shall be protected by fuses or inverse time circuit breakers having a rating not exceeding that specified in Section 430–52 for the largest motor connected to the branch circuit plus an amount equal to the sum of the full load current ratings of all other motors and the ratings of other loads connected to the circuit.”

Multi–Motor/Group Motor Installations (continued)

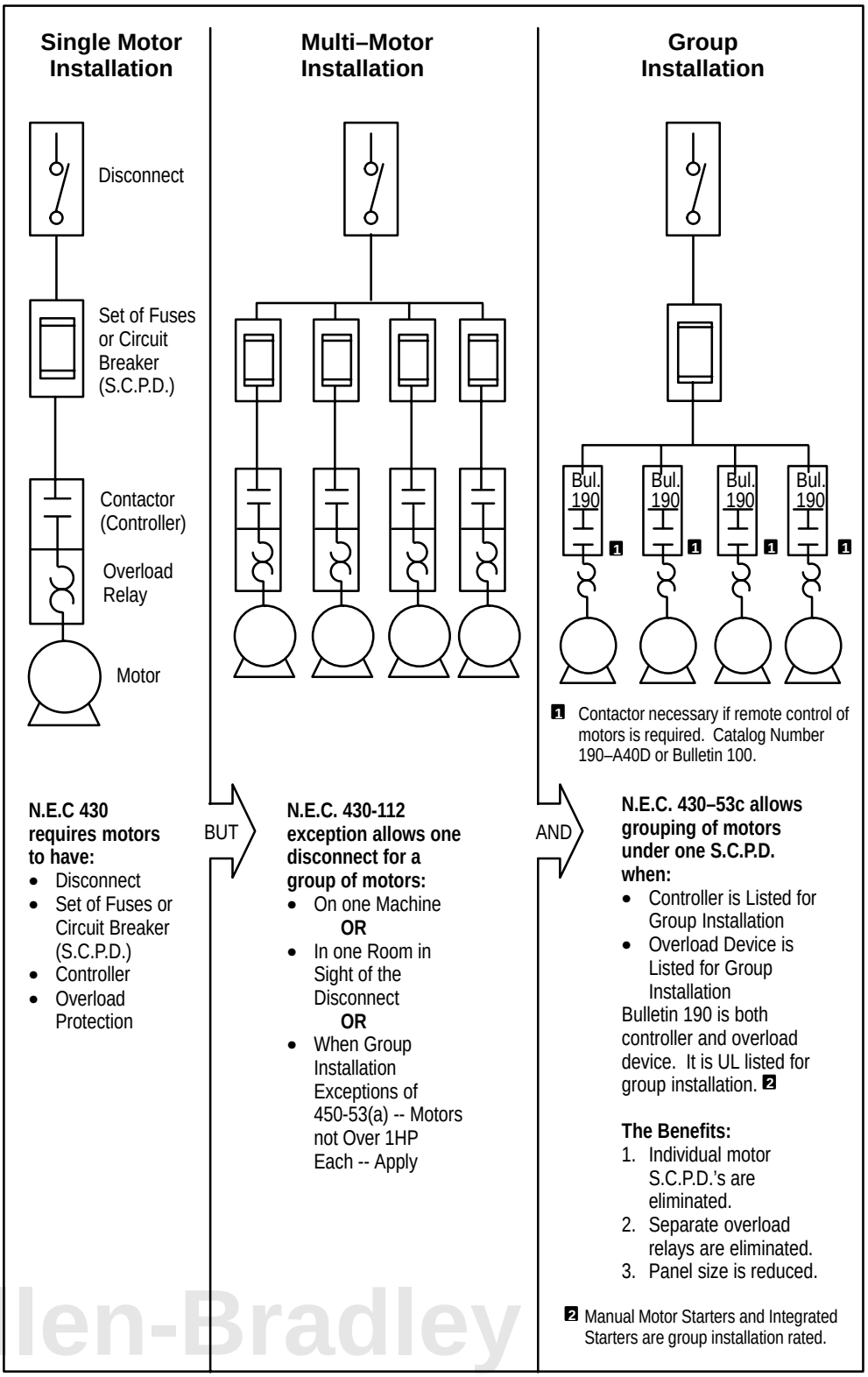
Since the Bulletin 190 Manual Starter is UL listed and C.S.A. certified for "group motor installations" it can be used to provide the overload protection for a given motor. Since it is also a manual motor controller, it can perform the controller function if remote operation is not required. If remote operation is required, the Bulletin 190 contactor module can be added (Integrated Starter). Since the Bulletin 190 Manual Starter also incorporates magnetic trip, it will respond to short circuit conditions and open the circuit to the motor. Its operating handle allows the circuit to be opened manually if necessary. It is for these reasons that the Bulletin 190 Manual Starter or Integrated Starter is a better solution than separate contactors and overload relays in group motor installations.

In all cases, however, the Bulletin 190 Manual Starter and Integrated Starter require backup short circuit protection provided by fuses or a circuit breaker. Maximum allowable fuse and circuit breaker ratings are as follows:

- Bulletin 190 Manual Motor Starter and Protector: 500A
- Bulletin 190 Integrated Starter: 2000A

Note that these are UL ratings. The N.E.C. Article 430– 53d does not permit ampacity of the wires to the motor to be less than one third the ampacity of the branch circuit conductors (the wires from the fuses or circuit breaker). This will practically limit the size of fuses or circuit breakers, and thus, the total full load current of the motors in the group, to approximately three times the ampacity of the smallest wires, the wires to the motor.

Group Application at a Glance (Group Installation Derived from the National Electrical code)



IEC Markets

As with other products, differences exist between North American and IEC standards for the Bulletin 190. As we have already said, the Bulletin 190 cannot be used as a circuit breaker in North American applications. This is not the case in IEC markets. The Bulletin 190 meets the requirements of IEC 292 (the motor controller standard) and IEC 157 (the circuit breaker standard).

As a result, the Bulletin 190 can be utilized as a limited capability circuit breaker in IEC markets. Tables 3 and 4 indicate the interrupting capabilities of the Bulletin 190 as a short circuit protective device in IEC markets only.

Bulletin 190 Interrupting Ratings

Table 3
Short Circuit Switching Capacity of Bulletin 190 Manual Motor Starter and Protector

Trip Unit Catalog Number	230V	380/415V	440V	550V	690V
	Icn kA			P–1/P–2	
190-P-006	No back–up fuse required Short circuit proof up to 100A				
190-P-010					
190-P-016					
190-P-024					
190-P-040					4.5/3
190-P-060					4.5/3
190-P-100	P-2 30	P-2 30	10/7	7/4.5	4.5/3
190-P-160	P-2 30	P-2 30	10/7	7/4.5	4.5/3
190-P-250	30/10	30/10	10/7	7/4.5	4.5/3
190-P-320	30/10	30/10	10/7	7/4.5	4.5/3
190-P-400	30/10	30/10	10/7	7/4.5	4.5/3

Table 4
Short Circuit Switching Capacity of Bulletin 190 Integrated Starter

Trip Unit Catalog Number	230V	380/415V	440V	550V	690V
	Icn kA			P–1/P–2	
190-P-006	No back–up fuse required Short circuit proof up to 100A				
190-P-010					
190-P-016					
190-P-024					
190-P-040					10/7.5
190-P-060					10/7.5
190-P-100					10/7.5
190-P-160					10/7.5
190-P-250					10/7.5
190-P-320					10/7.5
190-P-400					10/7.5

For those applications in IEC markets in which the available fault level (Icc) exceeds the Bulletin 190's interrupting capability (Icn) backup protection as shown in Tables 5 and 6 on Page 23 is required.

Bulletin 190 IEC Short Circuit Protection Requirements

Table 5
Backup fuse requirement when available fault current exceeds the switching capacity of the manual starter. (aM or gL fuse)

Trip Unit Catalog Number	230V A	380/415V A	440V A	550V A	690V A
190-P-006	No back–up fuse required (100kA)				
190-P-010					
190-P-016					
190-P-024					
190-P-040					63
190-P-060					80
190-P-100			80	80	80
190-P-160			100	100	100
190-P-250	125	125	125	125	125
190-P-320	160	160	160	160	160
190-P-400	160	160	160	160	160

Table 6
Backup fuse requirement when available fault current exceeds the switching capacity of the integrated starter. (aM or gL fuse)

Trip Unit Catalog Number	230V A	380/415V A	440V A	550V A	690V A
190-P-006	No back–up fuse required (100kA)				
190-P-010					
190-P-016					
190-P-024					
190-P-040					
190-P-060					
190-P-100					
190-P-160					
190-P-250					80
190-P-320					100
190-P-400					160

Product Data
Bulletin 190
Modular Starter System

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