WEAVER GENERAL CONSTRUCTION COMPANY
3679 S. Huron St., Suite 404
Englewood, CO 80110
Phone: (303) 789-4111 FAX: (303) 789-4310

SUBMITTAL TRANSMITAL

September 9, 2011
WGC Submittal No: 11331-001.A

PROJECT: **Harold Thompson Regional WRF**
Birdsall Rd.
Fountain, CO 80817
Job No. 2908

ENGINEER: **GMS, Inc.**
611 No. Weber St., #300
Colorado Springs, CO 80903
719-475-2935 Roger Sams

OWNER: **Lower Fountain Metropolitan Sewage Disposal District**
901 S. Santa Fe Ave.
Fountain, CO 80817
719-382-5303 James Heckman

CONTRACTOR: **Parkson Corporation**
562 Bunker Court
Vernon Hills, IL 60061-1831
954-974-6610 Andrea Gonzales (Project Manager in FL)

SUBJECT: Resubmittal - Aqua Guard® Units (2) Model AG-MN-A – TAGS 20119602 & 20119603

SPEC SECTION: 11331: Screening Equipment

PREVIOUS SUBMISSION DATES: None

DEVIATIONS FROM SPEC: ___ YES _X_ NO

CONTRACTOR'S STAMP: This submittal has been reviewed by Weaver General Construction and approved with respect to the means, methods, techniques, & safety precautions & programs incidental thereto. Weaver General Construction also warrants that this submittal complies with contracted documents and comprises on deviations thereto:

Contractor's Stamp:	Engineer's Stamp:
Date: 9/9/11 Reviewed by: H.C. Myers (X) Reviewed Without Comments ( ) Reviewed With Comments	

ENGINEER'S COMMENTS:_____
_____

LETTER OF TRANSMITTAL

Parkson
Treating Water Right

Transmittal Date: 9/7/2011

Project Name:	Lower Fountain, CO	**Job #**	n/a	**Parkson**	
		PO#	100765	Project #	201196
Customer/Contractor:	Weaver General Construction Co			Description	
Address:	3679 S Huron St			Engineer	Arturo Rusiana
	Suite 404			Email	arusiana@parkson.com
	Englewood, CO 80110			Spec Section	
				Project #	
Attn:	Wesley Weaver	**e-mail**		Description	
Phone:	303 789-4111 **Fax:**			Engineer	
Engineer Address:				Email	
				Spec Section	
				Project #	
				Description	
				Engineer	
				Email	
Attn:		**e-mail**		Spec Section	
Phone:	**Fax:**				

We are transmitting the following:

	No. Copies	Approval	Your Use	Review & Comment	As Requested
Submittal Package					
Re-Submittal **(CD)**	**3**	**X**		**X**	
Certified Drawings					
IOM Manuals					
Other:					

REMARKS/COMMENTS

RETURN (1) COPY TO:

Project Manager: **Andrea Gonzalez**
angonzalez@parkson.com

Parkson Address **Parkson Corporation**
1401 W. Cypress Creek Rd., Suite 100
Fort Lauderdale, FL 33309-1721
(954) 974-6610

APPROVAL REQUIRED NO LATER THAN: **9/21/2011**

Estimated Shipping date _____ **weeks After Drawing Approval (ADA)**

PLEASE NOTE: Although every attempt will be made to ship within our quoted lead times, our estimated ship date. is subject to final approval and fabricator workload at the time final approval is received by Parkson. Commencement of performance, including this submittal transmission, shall not constitute acceptance of the order. Only a signed contract, containing mutually agreeable terms and conditions, shall act as an acceptance.

DISTRIBUTION

	Contractor	X	**Rep 1**	X	**File**
X	**Engineer**		**Rep 2**		**Service**

Rev Date 8/31/09
CC: Project Manager

SUBMITTAL

FOR

(2) MODEL AG-MN-A 75, 2.5’ x 9’, 3mm
AQUA GUARD® UNITS
PROJECT NUMBER 201196
SERIAL NUMBERS 20119602 AND 20119603

PROJECT NAME AND LOCATION:

HAROLD D. THOMPSON REGIONAL WATER RECLAMATION FACILITY
FOUNTAIN, COLORADO

YOUR LOCAL PRODUCT REPRESENTATIVE:

MISCO INTER MOUNTAIN
3033 S. PARKER ROAD
TOWER 1, SUITE 350
AURORA, CO 80014
PHONE: 303-309-6150
FAX: 303-468-6159

PARKSON
562 BUNKER COURT
VERNON HILLS, IL 60061-1831 • U.S.A.
PHONE: 847-816-3700
FAX: 847-816-3707
SERVICE: 1-888-PARKSON
PARTS (TOLL FREE): 1-800-249-2140
www.parkson.com
technology@parkson.com

Dated: September 8, 2011, Revision 1

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Letter of Compliance

562 Bunker Court
Vernon Hills IL 60061-1831

Phone 847.816.3700
Fax 847.816.3707

LETTER OF COMPLIANCE

September 8, 2011, Revision 1

This re-submittal package is complete and meets the intent of the specifications for the Harold D. Thompson Regional Water Reclamation Facility, Fountain, Colorado, Specification Section 11331, and entitled Screening Equipment.

Parkson will supply two (2) Aqua Guard® units, Model AG-MN-A 75, 2.5' x 9', 3mm and two (2) main control panels under Parkson assigned Project Number 201196 for the Harold D. Thompson Regional Water Reclamation Facility Project.

Clarifications and deviations from the specifications, the initial submittal review comments with the Parkson response (in bold) following are noted below:

Specification Sections 11331 1.1 A:

To clarify, Parkson will supply two (2) Aqua Guard screens and (2) Control panels. The manually cleaned Bar Screen and Rake shall be provided by others than Parkson. These items were specifically excluded in Parkson Quotation 201196R1 dated January 4, 2011.

Specification Sections 11331 1.4 B 3, drawing HW-3, and drawing HW-4:

To clarify, it will not be necessary to create a "baffle reduction" grout to reduce the channel width to 2'-6". The Aqua Guard units will be provided with baffle plates to prevent bypass thru the sides of the screens. The 2' x 1' overhang mounting pads shown on Sections 'C' and 'E' must to be removed. They are not required for mounting the screens.

Specification Sections 11331 2.1 A 7:

To clarify, the Aqua Guard screen has trash removal capacity of 0.972 cubic yards per hour.

Specification Sections 11331 2.2 A 5:

To clarify, as a standard, the cross members on Aqua Guard screen frames are constructed of 3/16" thick stainless steel channels.

Specification Sections 11331 2.4 C 1:

To clarify, SSAC current monitor is supplied as equal. See attached Motor Current Monitor Data cut-sheets for more information. A motor ampere readout is not being provided.

Specification Sections 11331 2.6 A 2 f &g:

To clarify, rotating brush elements refers to an obsolete design where 4 individual brush rows were fastened to a single shaft. The new design includes a single tufted core incorporating all four elements that is fastened to the brush shaft. One new tufted core assembly is provided as equal.

Specification Sections 11331 3.1 B:

To clarify, the units will be factory tested for a minimum of 1 hour prior to shipment. Parkson as a standard does not recommend running the unit dry for an excessive amount of time to avoid premature wear on the units.

No other Specifications are available.

INITIAL SUBMITTAL REVIEW COMMENTS

1. Revise the subject field of the transmittal letter cover page that indicates (2) Aqua Guard® units with TAGS 20119602 & 20119603. The numbers indicated are actually serial numbers for the units, not tag numbers. The tag numbers for these units shall be SC-1 and SC-2. **Weaver General Construction Company shall revise transmittal cover page to reflect the equipment serial numbers correctly.**

2. The following items are in response to the clarification and deviation items noted in the Letter of Compliance included in this submittal:

   a. Item No. 1, Specification Section 11331, Paragraph 1.1.A: Acknowledged
   No Parkson response required.

   b. Item No. 2, Specification Section 11331, Paragraph 1.4.B.3., Drawings HW-3 and HW-4: Providing the automatic screens with extended baffles on each side in order to eliminate the channel reduction baffles is ***not*** acceptable. However extending support rods from the screen to its support legs in order to eliminate the need for concrete corbels on the inside of the screen is desirable. This will allow for both support legs to be installed on top of the concrete channel walls. Since the concrete channel will include stainless steel reduction baffles to reduce its active width to 2'-6" for the Phase 1 construction, the screen units must be off-center in the concrete channel in order to be centered in the baffled active channel as shown in the project Drawings. To accommodate this configuration, the support rods extending from the screen unit to its support legs must be different lengths. This is the preferred positioning provided it will not adversely affect the screen's operation or maintenance requirements, while still providing all structural support required. This positioning will then eliminate the need for the concrete corbels inside the channel, as well as the extended baffle plates on each side of the screens as submitted. But, it will not eliminate the need for the screen side seals to accommodate the 2'-6" width of the baffled active channel. The remaining comments of this letter of this letter are based on the support legs being mounted on the channel walls to eliminate the corbels, while the screen is positioned in the center of the baffled active channel and off-center in the concrete channel.
   Parkson will comply. The screens will be provided with different-length pivot pipes (support rod) in order to be mounted central to the baffled active channels. Side seals shall also be provided to prevent by-pass. See drawing 20119601, Revision A for more information.

   c. Item No. 3, Specification Section 11331, Paragraph 2.1.A.7: Acknowledged
   No Parkson response required.

   d. Item No. 4, Specification Section 11331, Paragraph 2.2.A.5: Acknowledged
   No Parkson response required.

e. Item No. 5, Specification Section 11331, Paragraph 2.4.C.1: Use of the proposed SSAC current monitor is acceptable, provided the controls and circuitry related to the unit are capable of stopping the motor and initiating an alarm upon detection of high current draw as required by project specifications. Please note the deletion of a motor ampere readout is ***not*** acceptable. An ammeter (analog or digital) must be provided per project Specification Section 11331, Paragraph 2.4.D.7.i.8)a).
The SSAC current monitor is capable of stopping the motor and initiating an alarm as required. An analog ammeter shall be added to the control panel to monitor motor load.

f. Item No. 6, Specification Section 11331, Paragraph 2.6.A.2.f and g: Acknowledged
No Parkson response required.

g. Item No. 7, Specification Section 11331, Paragraph 3.1.B: Acknowledged
No Parkson response required.

h. The last bold comment of the Letter of Compliance requested confirmation of dimensions highlighted with a hexagon bubble on the submittal drawings. It does not appear that WGMI has reviewed any of those highlighted items as this submittal was transmitted "Reviewed Without Comments" and no other handwritten notes were provided throughout the submittal documents. We have reviewed the highlighted dimensions and provided the suggested revisions where necessary, but WCMI shall be responsible for final verification of all dimensions and field conditions associated with the screen units. Refer to subsequent comments in this letter regarding the submittal drawings.
It shall be the responsibility of Weaver General Construction Company (WCMI) to verify dimensions, as required in the submittal drawings.

3. Revise the Affidavit of Compliance so the project description of the Reference entry applies to the Headworks Building, rather than the aeration basins and aerobic digester basins as indicated in the submittal document.
Parkson shall comply.

4. The following items address the Technical Specifications section of the submittal documents:

a. Revise Paragraph 1.1. to reference a 3 millimeter screen size rather than the 6 millimeter size indicated.
Parkson shall comply.

b. Revise Paragraph 1.3. regarding the installed channel dimensions as these apply to the baffled active channel. The installed channel width should be 2.5 feet, rather than 3.5 feet indicated.
Parkson shall comply.

c. Paragraph 3.1.1. indicates the local emergency stop pushbutton station to be mounted to the frame of the screen unit. The project drawings indicate these stations to be Unistrut mounted next to the screen units. Frame mounting these is ***not*** acceptable as those locations will not provide unencumbered access to the stations in emergency situations.
The Emergency Stop pushbutton stations shall be shipped loose with the control panels. Unistruts and mounting shall be by others than Parkson.

d. Paragraph 3.1.2. indicates a 20-foot length of integral cable for the high level float switches. As these floats are located in the screen channels and their terminations are

located in the control panels which are mounted in the electrical and control room, 20 feet of cable length will not be adequate. Please verify and provide the additional conductor length to reach the terminations in the local control panels.
Parkson shall provide float switches with 100-feet long integral cables.

e. Paragraph 3.1.3. indicates a 33-foot length of integral cable for the ultrasonic level sensors of each screen. Verify the intended installation of the ultrasonic level sensor controller unit and the length of level sensor conductors required to reach the controllers terminations. As the controller is proposed in the submittal drawings to be housed in a NEMA 4X enclosure, that suggest this enclosure must be located within the electrical and control room, rather than the classified area at the screens. With the proposed location of the controllers confirmed, please verify and provide the additional length of conductors required in order to reach the correct termination points.
Parkson shall provide ultrasonic level sensors with 30-meter long integral cables.

f. Paragraph 3.2.1. indicates the local control panels as being supplied in a NEMA 4X stainless steel enclosure. As this enclosure will be located within the electrical and control room of the Headworks Building, it may be a NEMA 4 painted steel enclosure as stated in Specification Section 11331, Paragraph 2.4.D.7.b of the Project Manual. If a cost savings can be provided to the Owner by using a NEMA 4 painted steel enclosure versus the NEMA 4X stainless steel enclosure, please provide a summary of that cost savings for the Owner's consideration
Parkson shall provide control panels with NEMA 4 painted steel enclosures. The cost savings summary has been provided to the Weaver General Construction Company (WCMI).

g. Paragraph 3.2.2. indicates the inclusion of a control transformer, motor starter and fused disconnect for the controls of each screen. Please verify the main disconnecting device of each local control panel is capable of being locked in the Off position.
The main control panel disconnect will be lockable in the off position by up to 3 padlocks. Please see information in the data sheets.

h. Paragraph 4.1. provides a list of spare parts to be included with the screen units. The quantities for the items in subparagraphs 1, 2, and 4 (filter elements, side plates, 63/64-inch diameter snap rings, respectively) appear to be for a single screen unit. These quantities match those given in the project specifications (Section 11331, Paragraph 2.6.1); however, the quantities listed in the project specifications are the spare parts required for ***each*** screen. Please double the quantities give for these three items
The quantities for the items in subparagraphs 1, 2, and 4 (filter elements, side plates, 63/64-inch diameter snap rings, respectively) shall be doubled. The quantity for item 5 (Rotating brush core replacement assembly) shall also be doubled.

i. Paragraph 6.1 describes the factory services proposed for the screen units as following their installation for one (1) trip at 2 days time. The project specifications require a minimum of two (2) days of one-half day each. Please verify the proposed schedule is adequate to complete all responsibilities and tasks required of the factory representative. If the proposed schedule is adequate, please provide a cost-savings summary for consideration in accepting the proposed schedule.
The factory representative will be providing two (2) days of services to inspect the installation, equipment start-up and operator training. There will be no cost savings.

5. Revise the Data Sheet given in the Equipment Data Sheet section to indicate an active channel width of 2.5 feet, rather than 3.5 feet indicated.
Parkson shall comply.

6. The Equipment Sizing section included a one-page Data Sheet that is identical to that given in the Equipment Data Sheet section, see previous comment. Please verify the intent of the Equipment Sizing section. If it is to contain additional data not included in the Equipment Data Sheet section, please provide that additional information.
The Equipment Data Sheet was inserted in error in place of the Equipment Sizing sheet. The Equipment Sizing sheet is now included for your review.

7. Revise the high level float switch data sheet as necessary in coordinating the conductor length as discussed in previous comment No. 4.d.
Parkson shall comply.

8. The order codes indicated on the ultrasonic level controller data sheets indicate a wall-mount configuration. However, the control panel drawings included in this submittal show the ultrasonic level controller mounted inside a fiberglass enclosure. Please verify the correct mounting arrangement required for the controller to be compatible with the enclosure-mounted arrangement indicated on the submittal drawings
The ultrasonic level controller will be mounted in a NEMA 4X fiberglass enclosure. The wall mount order code is required for mounting the controller inside the enclosure.

9. Revise the ultrasonic level transducers data sheet as necessary in coordinating the conductor length as discussed in previous comment No. 4.e.
Parkson shall comply.

10. The control panel bill of materials does not appear to indicate the proposed model rotary operator handle intended for the main circuit breaker of the local control panels. Please verify the proposed model number and particularly that the handle will be capable of being locked in the Off position
The control panel bill of materials now contain all parts included in the circuit breaker disconnect assembly. Also see comment 4.g. for more information.

11. Revise the wall-mount enclosure data sheets as necessary to indicate the use of a NEMA 4 painted steel enclosure in lieu of the stainless steel enclosure submitted. Refer to previous comment No. 4.f. to verify the cost-savings that will be provided to the Owner for consideration of this change.
The data sheets for the enclosure have been updated. Also see comment 4.f. for more information.

12. Revise the four control panel drawings submitted in order to address all previous comments contained in this letter.
The control panel drawings have been updated accordingly.

13. Revise sheet 2 of 4 of the control panel drawings to include the ammeter discussed in previous comment No. 2.e.
The ammeter has been included. Also see comment 2.e.

14. Revise Sheet 3 of 4 of the control panel drawings according to the following items:

a. Under the Sequence of Operation section, there are two specific notes given. The first stating that any run of the screen will reset the screen repeat cycle timer. The second note states the screen repeat cycle off timer will not reset when the screen is called to run due to a high level condition. These two notes appear contradictory. Please verify the exact operational parameters affecting the screen repeat cycle off timer and its reset function.
Per Specification Section 11331 D.8.i., when the screen is called to run in auto mode by a differential level signal, the repeat cycle off timer will reset. When the screen is called to run in auto mode by the high upstream level signal, the repeat cycle off timer will not reset. The notes in the sequence of operation have been clarified. See sheet 3 of the control panel drawings.

b. Under the Sequence of Operation section, under the High Level Alarm paragraph, please verify the first sentence should read, "When the upstream level remains above ***the start differential*** level setpoint…" rather than "…***the high upstream*** level setpoint…" as there does not appear to be any other reference to a high upstream level setpoint in the ULC1 device.
The High level alarm description is correct. A high level alarm will occur when the upstream level remains high for the time set in the high level on delay timer. The upstream level is being measured by the float switch and the ultrasonic level controller. A start differential condition will not initiate the high level alarm.

c. For the diagrams shown for Circuit B and Circuit C, please verify that M1, CR1, CR2 and CR3 are shown in the correct position (open or closed) for the output circuits and that the position shown correctly corresponds to that given in the operational ladder diagram on Sheet 1 of 4 and Sheet 2 of 4 of the control panel drawings.
The diagrams for Circuit B and Circuit C are correct. Circuit B will be closed whenever the screen is running. Please see the general fault contact note on Sheet 3 of the control panel drawings for information on Circuit C.

d. In the Device Settings section, Note 2 references function No. P210 and P211 to a variable frequency drive (VFD) speed. As the submitted screens do not include a VFD, please verify the intended operation of function Nos. P210 and P211 referenced in Note 2.
The notes have been removed.

e. Revise Sheet 4 of 4 of the control panel drawings as necessary to account for a NEMA 4 painted steel enclosure for the local control panels. Refer to comment No. 11.
The control panel drawings have been updated accordingly.

f. Revise Sheet 4 of 4 of the control panel drawings so the ammeter required by previous comment No. 2.e. is shown in the local panel diagrams.
The control panel drawings have been updated accordingly.

g. Revise Sheet 4 of 4 of the control panel drawings so the full description verbiage is legible for the notes on the left side of the Float Switch and Pipe Mount Clamp Detail.
The control panel drawings have been updated accordingly.

15. Revise the three submitted general arrangement drawings for the automatic screens according to the following items:

    a. Sheet 1 of 3 of the general arrangement drawings

        1) Revise Note 4 to indicate the mounting of the ultrasonic level sensors to be as high as possible in the channel without interfering with grating panels, their imbeds or channel baffles. Their general position is shown in Section E on Sheet HW-16 of the project drawings.
        Note 4 has been revised accordingly.

        2) The last unnumbered note indicates a hexagon symbol requesting a Contractor verification of dimensions highlighted with this symbol. This note is requesting the Contractor verify the dimensions; however, no comments or indications are given that the contractor has done so. We have reviewed the highlighted items for their general conformance with the project Drawings and made suggested revisions for those items that do not appear correct. However, the contractor shall ultimately be responsible for the final verification of all dimensions and field conditions that are associated with the screens and their installation
        It shall be the responsibility of Weaver General Construction Company (WCMI) to verify dimensions, as required in the submittal drawings.

        3) Revise the 266.00-inch dimension from the interior face of the building wall to centerline pivot point of screen SC-1 to be 265.00 inches.
        The drawing has been revised accordingly.

        4) Revise the 194.00-inch dimension from the inside face of the building wall to centerline pivot point of screen SC-2 to be 193.00 inches.
        The drawing has been revised accordingly.

        5) Revise the 203.00-inch dimension from the inside face of channel wall to upper edge of channel floor recess for Screen Channel No. 1 to be 208.00 inches.
        The drawing has been revised accordingly.

        6) Revise the 131.00-inch dimension from the inside face of channel wall to upper edge of channel floor recess for Screen Channel No. 2 to be 136.00 inches.
        The drawing has been revised accordingly.

        7) Revise the 24.50-inch typical dimension from centerline of the screen to the centerline of the support leg bolt hole for both screens. Each screen should be offset toward the center bypass channel as described in previous comment No. 2.b.
        The drawing has been revised accordingly.

    b. Revise Section Y-Y on Sheet 2 of 3 of the general arrangement submittal drawings according to the following items:

        1) Revise the 203.00-inch dimension from the inside face of channel wall to upper edge of channel floor recess to be 208.00 inches.
        The drawing has been revised accordingly.

2) Revise the 11.11-inch dimension from the bottom edge of channel floor recess to front edge of screen foot to be 3.00 inches. In our coordination efforts with John Jacob at WCMI and Art Rusiana at Parkson during the review of this submittal, Art confirmed this dimension need only be 2 inches to allow the screen to rotate up and out of the channel. The screen positions have been shifted to provide an addition inch of clearance so this dimension is now 3 inches.
The drawing has been revised accordingly, and the resulting distance is now 2.55 inches.

3) Revise the 44° angular dimension of the channel floor recess to be 29°.
The drawing has been revised accordingly.

4) Revise the hoist sling detail shown to correctly depict the equipment beam and screen lifting handle at the horizontal and vertical location shown on project Drawings HW-14 and HW-16.
The drawing has been revised accordingly.

c. Revise Section X-X on Sheet 3 of 3 of the general arrangement submittal drawings according to the following items:

1) Revise the 131.00-inch dimension from the inside face of channel wall to upper edge of channel floor recess to be 136.00 inches.
The drawing has been revised accordingly.

2) Revise the 11.11-inch dimension from the bottom edge of channel floor recess to front edge of screen foot to be 3.00 inches. See previous comment No. 15.b.2).
The drawing has been revised accordingly, and the resulting distance is now 2.55 inches.

3) Revise the 44° angular dimension of the channel floor recess to be 29°.
The drawing has been revised accordingly.

4) Revise the hoist sling detail as previously described above for Section Y-Y on Sheet 2 of 3 of the general arrangement drawings
The drawing has been revised accordingly.

d. Revise Section Z-Z on Sheet 3 of 3 of the general arrangement submittal drawings to position the automatic screens off-center in the concrete channels. With the support legs remaining on top of the channel walls, each screen will be shifted toward the center manual bar screen channel to fit within the baffled active channels.
The drawing has been revised accordingly

16. As there were several discrepancies found between the submittal documents and the project Drawings, it seems the screen manufacturer may not have the most current drawings. When preparing the resubmittal package for the screens please be sure to do so according to the current project Drawings.
Current drawings were provided by John Jacob of WCMI on 8/25/2011. Pertinent information from these drawings was used in revising the General Arrangement Drawings.

Please confirm the dimensions highlighted with a hexagon bubble on submittal drawing 20119601, Revision A.

For further clarification of these points, please consult the submittal package.

Sincerely,

PARKSON

Arturo Rusiana
Project Engineer-Aqua Guard unit

Affidavit of Compliance

Parkson
Treating Water Right

1401 West Cypress Creek Road, Suite 100
Fort Lauderdale FL 33309-1969

Phone 954.974.6610
Fax 954.974.6182

AFFIDAVIT OF COMPLIANCE

Addressed to: Weaver General Construction Co. and GMS, Inc.

Reference: **Project:** Harold D. Thompson Regional Water Reclamation Facility for the Lower Fountain Metropolitan Sewage Disposal District - Headworks Building

Parkson Corporation has examined the Contract Documents and verified that the 'SCREENING EQUIPMENT meets in every way the performance requirements and design specifications set forth in Specification Section(s) 11331 of the Contract Documents except as may be noted in the submittal package.

Steven A. Rothenberg
Contracts Leader
September 2, 2011

STATE OF FLORIDA }
COUNTY OF BROWARD }

The foregoing instrument was acknowledged before me this 09/02/11 (Date)

by Steven A. Rothenberg (Name of officer or agent, title of officer or agent)

of Parkson Corporation (Name of Corporation Acknowledging)

a Delaware corporation, on behalf of the corporation. He/she is personally known to me ~~or has produced~~ _____ (Type of Identification) ~~as identification~~ and ~~did~~ (did not) take an oath.

LILIANA BUJOREANU
MY COMMISSION EXPIRES
August 14, 2015
#EE 116568
Bonded thru
Notary Public Underwriters
NOTARY PUBLIC, STATE OF FLORIDA

_____ Notary Public, Commission No. _____
(Signature)

_____ (Name of Notary typed, printed or stamped)

Technical Specifications

562 Bunker Court
Vernon Hills IL 60061-1831

Phone 847.816.3700
Fax 847.816.3707

TECHNICAL SPECIFICATIONS
AQUA GUARD® BAR/FILTER SCREEN

Harold D. Thompson Regional Water Reclamation Facility
Fountain, Colorado
Project Number 201196
Serial Numbers 20119602 and 20119603

1.0 GENERAL

1.1 There will be furnished (2) model AG-MN-A75, 2.5' x 9', 3mm Aqua Guard® Mechanical Bar/Filter Screen units, as supplied by Parkson Corporation, Vernon Hills, IL. The Aqua Guard® units will consist of a frame assembly, filter belt/screen assembly, drive assembly, rotating brush assembly, and controls.

1.2 The automatic bar/filter screen will be designed to positively clean and remove debris up to 3 inches in diameter from the influent stream by means of high impact plastic filter elements designed to retain and elevate debris to the discharge point of the unit where the rotating brush assembly cleans the elements.

1.3 The unit shall be suitable for installation and operation in a channel measuring 2.5 feet wide and 4.66 feet deep. There shall be a 3.36-inch recess (notch) in the channel bottom to accommodate the base of the screen. The angle of inclination shall be 75 degrees from horizontal. The opening from which the unit discharges screenings from its enclosure shall be at least 4.00 feet above the operating floor elevation at which the screen is supported. This is the available clearance for the container/compactor to collect the debris. The total discharge height of the screen, as measured from its base to the screenings discharge point, shall be 9 feet.

1.4 PERFORMANCE. The screens shall be capable of passing a maximum peak flow of 4.625 MGD based on a nominal unit width of 2.5 feet, with a downstream water level of 1.5 feet. The head loss at the maximum flow of clean water shall not exceed 13.2 inches. The calculated head loss is based on the assumption of a clean screen, clean water, and steady state flow conditions.

1.5 The screens shall be capable of presenting a clean filtration surface to the influent stream at all times during continuous operation. It shall be capable of intermittent operation in order to form a mat of material to provide maximum trash removal. Additionally, in order to maximize the capture of paper, rags, and other flexible debris, which tends to drape over and adhere to the filtration surfaces, the screen shall have 0.73 square feet of contact surface area per square foot of wetted filtration belt frontal surface.

1.6 The unit shall be capable of handling 0.972 cubic yards per hour of trash in order to ensure that the maximum amount captured by the screen can be transported out of the channel and into the waiting receptacle.

2.0 CONSTRUCTION AND MATERIALS

2.1 FRAME ASSEMBLY

2.1.1 The frame of the unit, which is stationary, shall be constructed from type 304 stainless steel with a thickness of 3/16 inch. It supports and locates all of the operating components. The unit shall rest at the bottom of the channel, and be anchored at the operating floor elevation. No mechanical mounting or fastening of the unit frame is required to the sidewalls or bottom of the channel.

2.1.2 The “A” frame unit shall be supported at the operating floor elevation by support legs constructed from type 304 stainless steel. The legs shall be designed to allow the unit to pivot the screen out of the channel without dewatering (e.g. for bypass purposes). Routine service of the unit is possible with the screen in the channel.

2.1.3 Guide rails shall be mounted to each side on the inside surface of the frame to direct the filter belt during its ascension out of the channel. The guide rails shall be 1/2 inch thick and will be constructed from type 304 stainless steel.

2.1.4 At the top of the screen, circular chain guides shall gently direct the filter belt from its ascending path out of the channel towards the drive sprockets. These circular guides shall be constructed from type 304 stainless steel and shall be welded to a type 304 stainless steel shaft. In order to reduce the wear on both the chain and chain guides, the shaft shall be secured to bearings on each side of the frame and free to rotate.

2.1.5 Chain guides shall also be provided to direct the filter belt from the drive sprockets to the descending path into the channel. These fixed rails shall be constructed of type 304 stainless steel and shall be 5/8 inch thick.

2.1.6 Lower return guides shall be provided at the base of the screen to direct the filter belt during its 180-degree turn from the descending to ascending paths. The lower guide rails shall be constructed from 1/2-inch thick type 304 stainless steel and shall be fixed in place as low as possible in the frame to optimize the submerged screen area. No submerged bearing or rotating guides are used that will require routine maintenance or that may become fouled by trash and debris.

2.1.7 Neoprene rubber seals with type 304 stainless steel backing plates shall be mounted along the upstream edges of the frame to seal the outer edge of the frame against the channel wall, and the area between the frame and filter belt side plates.

2.1.8 The bottom of the unit shall be sealed with two rows of nylon brushes, which allow the elements to pass through, but prevents trash from passing beneath the filter elements, ensuring capture of all solids and trash by the filter belt.

2.1.9 All shaft bearings are mounted externally to the side frame for ease of access and maintenance.

2.1.10 The portion of the screen above the channel shall be equipped with covers to help control the emission of odors and protect operators from contact with moving parts. The covers will also minimize misting and dripping. All enclosures shall be removable. There shall be hinged sections on the front and rear of the unit for access to the screen and rotating brush assembly for periodic maintenance. The covers shall be fabricated from 14 gauge type 304 stainless steel.

2.2 FILTER BELT/SCREEN ASSEMBLY

2.2.1 The screen shall provide dual filtration of all materials in order to minimize compaction of captured debris and minimize the head loss through the screen. This shall be accomplished by recessing the horizontal fine filtration opening in the face of the screen. The coarse horizontal openings formed by the upper or forward shank/arm of the elements shall be 8 millimeters and shall be the first opening the flow stream contacts as it passes through the screen. The lower or recessed shank/arm of the elements shall create a two dimensional grid which limits the maximum vertical opening to 15 millimeters and the fine horizontal opening of 3 millimeters. The elements are arranged in a staggered fashion to form an endless belt and to create a range of motion that allows the recessed shank/arm of one row of elements to pass through the plane of the forward arm of the next row of elements it meshes with. Each filter element shall be a single molded component with a rake integral to its shape. The filter belt shall form a row of these rakes spaced every 4 inches, capable of lifting material of up to 3 inches in diameter out of the channel. The elements are secured to two separate filter shafts that pass through individual bosses in the elements.

2.2.2 The side plates (or end plates) are mounted next to the outermost elements of each filter row, and overlap to form a continuous moving sidewall for the filter belt. This moving wall prevents captured trash and debris from spilling over the sides of the filter belt. The side plates shall be constructed from a high strength phenolic resin.

2.2.3 The tension of the moving screen/filter belt assembly shall be completely supported by a stainless steel link chain. The chain must connect the filter shaft ends on both sides of the belt assembly so that the elements are free of tension, and support no weight of the assembly. The chain shall be of closed link design with 2 link sidebars, chain rollers and pins per link. The chain assembly shall have a minimum cross sectional area of 0.144 square inches at the weakest point of any individual link sidebar.

2.2.4 Chains shall be supplied with hollow pin construction that allows for the removal and replacement of the filter shafts, side plates and filter elements without releasing the chain tension. The unit is designed to allow this function to take place at the operating floor elevation with the screen in the channel. Chain rollers shall have a diameter of 1-3/4 inches.

2.2.5 All chain components shall be corrosion resistant stainless steel. Sidebars shall be type 304 stainless steel. Pins, bushings and rollers shall be type 410 stainless steel. 400 series components shall be heat treated to a minimum hardness of 39 on the Rockwell C Scale.

2.2.6 The filter shafts shall have a maximum diameter of 3/4 inch and be spaced on 4-inch centers in the direction of travel of the filter belt. The shafts shall be constructed from type 304 stainless steel.

2.3 DRIVE ASSEMBLY

2.3.1 The drive assembly consists of a gear reducer, motor, drive shaft, and eccentric bearing. The drive mechanism shall be protected from the trash stream to ensure that the screen runs smoothly without jamming. The driving force is transmitted to clean, trash free components to avoid mis-tracking or binding, which could render the screen inoperable, requiring manual cleaning and realignment.

2.3.2 The gear reducer is of hollow shaft design by Sumitomo, mounted directly to the unit external to the side frame and connected directly to the drive shaft with a keyless tapered bushing. The reducer shall be designed in accordance with AGMA recommendations for Class II service based on the required horsepower for operation of the machine.

2.3.3 The motor shall be a squirrel cage induction motor, TEFC, 230/460 volt, 3- phase, 60 Hertz, 1800 RPM by Baldor. The motor Horsepower shall be 1/2. Motor shall be nameplate for use in a Class 1, Division 1, Group D environment.

2.3.4 Overload protection shall be provided by an electrical overload device that senses motor current draw (SSAC Current Monitor or equal)

2.3.5 The filter belt drive shaft is located in the head of the unit and is supported at each end by the hollow shaft reducer and eccentric bearing.

The drive shaft sprockets that engage the filter belt chain rollers and transmit motion to the filter belt assembly are welded to the drive shaft. The drive shaft and sprockets shall be constructed from type 304 stainless steel.

2.4 ROTATING BRUSH ASSEMBLY

2.4.1 The filter belt assembly is cleaned by the interaction of the filter elements and the rotating brush assembly without requiring any water or other mechanical devices capable of jamming (i.e. doctor blade) to remove the captured material.

2.4.2 The rotating brush assembly is supported by bearings on each side of the machine mounted externally to the machine frame. The brush is chain driven by the filter belt drive shaft.

2.4.3 The brush is comprised of two separate components, the brush shaft, and the brush core. The shaft is made of type 304 stainless steel. The brush core is made of UHMW, with tufted nylon bristles. The core is split into two halves that are fastened with stainless steel hardware to the brush shaft. This allows the brush to be easily removed from the machine simply by removing the hardware, and separating the core pieces from the shaft. To install a new brush, the two new core pieces are placed over the shaft, and the hardware is inserted through the factory holes and tightened.

2.4.4 The brush shall be orientated in a paddlewheel design with rows of bristles located at 90,180, 270, and 360 degrees.

2.5 DISCHARGE CHUTE

2.5.1 A discharge chute shall be provided integral to the machine, constructed from 14 gauge type 304 stainless steel and designed to direct the screenings to the collection equipment below.

2.5.2 The chute shall have a 1/4-inch thick flange that shall allow it to be connected to ancillary washing, compacting, and collection equipment.

2.6 LUBRICATION

2.6.1 Lubrication lines shall be extended from all bearing housings to a central point located on the respective side of the machine, accessible from the operating floor for ease of maintenance.

2.7 FASTENERS

2.7.1 All fasteners shall be type 316 stainless steel.

2.8 SURFACE FINISH

2.8.1 SURFACE TREATMENT OF STAINLESS STEEL COMPONENTS All frame and structural members will be mechanically cleaned using Dupont Starblast. Sheet metal components such as covers or the discharge chute will be furnished with a 2B finish.

2.8.2 All other appurtenances including roller chain, brush sprockets, bearing housings, motor, reducer, etc. shall be supplied with the manufacturer's standard finish.

3.0 ELECTRICAL DEVICES AND CONTROLS

3.1 ELECTRICAL DEVICES: Interconnecting conduit and wiring will be the responsibility of the installing contractor. In addition to the drive motor, the following electrical devices will be furnished with each unit:

3.1.1 EXPLOSION PROOF EMERGENCY STOP LOCAL PUSH BUTTON STATION. A NEMA 7 emergency stop push button station with a 1/2 inch NPT conduit connection will be shipped loose with the control panel. Unistruts and mounting shall be by others than Parkson. The pushbutton shall be lockable in the depressed position.

3.1.2 INTRINSICALLY SAFE FLOAT SWITCH. A float switch of chemical resistant polypropylene construction will be provided with a 316 SST pipe mounting bracket, float mounting clamp and expansion anchors. The mounting bracket requires a suitable length of 1" nominal pipe to suspend the float in the channel, to be supplied by others. The float will have a 100-foot long integral cable. An intrinsically safe barrier relay shall be mounted in the main control panel

3.1.3 EXPLOSION PROOF ULTRASONIC DIFFERENTIAL LEVEL SENSORS. A Milltronics HydroRanger 200 ultrasonic level controller will be supplied with two (2) ST-H transducers, FM rated for Class 1, Division 1, Groups C and D. Each sensor is supplied with 30 meters of integral cable with a 1 inch NPT conduit connection. A type 316 stainless steel mounting bracket will be provided for each sensor.

3.2 CONTROLS: The following controls will be provided:

3.2.1 A 480 Volt primary U.L. listed and labeled control panel in a NEMA 4 painted steel enclosure suitable for wall mounting. It will contain the following logic devices for proper operation of the equipment:

1. Programmable relay to perform necessary logic functions and monitor equipment mounted electrical devices.
2. Emergency Stop push button.
3. Hand-Off-Auto selector switch for screen operation.
4. Control power and run indicating lights.

5. Motor current monitor and hour meter.
6. Fault indicating light and system reset pushbutton.
7. Run and fault auxiliary output contacts for customer use.

3.2.2 A step-down control transformer, motor starter and fused disconnect will be provided. The Main Disconnect shall be lockable in the off position with up to 3 padlocks.

3.3 SEQUENCE OF OPERATION

3.3.1 HAND OPERATION. When the screen Hand mode is selected, the screen will run continuously. Placing the selector switch in the Off position will stop the screen.

3.3.2 AUTOMATIC OPERATION. When the Auto mode is selected, the unit will run via the water level sensor or repeat cycle timer. After the water level has lowered, the unit will continue to run for the length of time set on the off delay timer, typically set at 30 seconds.

3.3.3 EMERGENCY STOP. The unit can be deactivated at any time by pressing either the control panel or unit mounted Emergency Stop push buttons.

3.3.4 FAULT CONDITIONS. Motor overload or high motor current will stop the drive motor and illuminate the screen fault light.

4.0 SPARE PARTS

4.1 The following spare parts will be provided.

1. Twenty (40) Filter elements.
2. Ten (20) Side plates.
3. Twenty (20) Snap rings 3/4" diameter.
4. Ten (20) Snap rings 63/64” diameter.
5. Two (2) Rotating brush core replacement assemblies.
6. One (1) Bearing Kit: Consisting of (2) take-up bearings, (1) sprocket drive shaft flange bearing, and (2) rotating brush drive flange bearings.
7. Two (2) tubes of bearing lubricating grease-Shell Alvania EP-2 or equivalent.

5.0 ANCHOR BOLTS

5.1 The manufacturer will supply type 316 stainless steel 3/4"-10 UNC threaded rods for use with the HILTI HY-150MAX Adhesive Anchoring system. Adhesive to be provided by others.

6.0 FACTORY SERVICE

6.1 The manufacturer will provide a qualified service representative following installation for 1 trip for 2 days for inspection of installation, equipment startup

and operator training.

7.0 FACTORY ASSEMBLY, TESTING, AND INSPECTION

7.1 The screen shall be factory assembled and tested prior to being shipped. The Engineer and/or Owner may, at their option and own expense, witness the factory test. The equipment will be shipped completely assembled other than the motor/reducer, discharge chute and support legs. It shall be capable of being set in place and field erected by the contractor with a minimum of field assembly.

8.0 INSTALLATION, OPERATION AND MAINTENANCE MANUAL

8.1 In addition to the normal Installation, Operation, and Maintenance manuals required by the contract, a spare manual will be shipped with the unit in order to allow for proper operation of the equipment prior to the release of all final Installation, Operation, and Maintenance manuals.

Equipment Data Sheet

PARKSON CORPORATION

Job Name/Location : Harold D. Thompson Regional WRF-Fountain, CO

Originator: RSS	Date: 6/22/2011
Checked by: ADR	Date: 6/27/2011
Project Number: 201196	Revision: A
Revised by:	Date: 9/2/2011

AQUAGUARD MECHANICAL BAR SCREEN

Aqua Guard Model	AG-MN-A
Aqua Guard Angle	75
Aqua Guard Width	2'-4 1/2"
Aqua Guard Discharge Height	9'-0"
Channel Width	2.5'
Channel Depth	4.66' w/ 3.36" Recess
Operating Floor	NA
No. of Aqua Guards	2
Filtration Opening	3 mm
Total Unit Weight	2236 Lbs
A.G. Frame	3/16" Thick, 304 SST
Drive Shaft and Sprocket	304 SST
Filter Shafts	3/4" Diameter, 304 SST
Rails	1/2" Thick, 304 SST
Screening Elements	High Impact Plastic
Side Plates	Phenolic
Side Seals	Neoprene w/ 304 SST Backing Plates
Front Seal	Nylon Bristles w/ 304 SST Support
Brush	Nylon Bristles w/ 304 SST Shaft
Chain Links	304 SST
Chain Rollers, Bushings & Pins	410 SST HRC 39-55 (1 3/4" Dia Rollers)
Discharge Chute	14 ga. 304 SST
Take Up Screws	316 SST
Take Up Nuts	Titanium
Hardware Material	316 SST
Gaskets	Neoprene
Covers	14 ga. 304 SST

Equipment Sizing

562 Bunker Court
Vernon Hills IL 60061-1831
Phone 847.816.3700
Fax 847.816.3707

MN-MN-MN-MN-MN-MN-MN-MN-MN-MN-MN

AQUA GUARD SIZING-Revision A

MN-MN-MN-MN-MN-MN-MN-MN-MN-MN-MN

PROJECT: Harold D. Thompson Regional Water Reclamation Faciltity
PROJECT NUMBER: 201196
DATE: 09/02/11 MODEL: AG-MN -A

FLOW RATE:	**4.63**	(MGD)	SCREEN WIDTH:	**2.5**	(FEET)
CHANNEL WIDTH:	**2.50**	(FEET)	DISCHARGE HT:	**9**	(FEET)
CHANNEL DEPTH:	**4.66**	(FEET)	UPSTREAM W.L.:	**2.60**	(FEET)
OP FLOOR HEIGHT	**N/A**	(FEET)	FREEBOARD:	**2.06**	(FEET)
SCREEN ANGLE:	**75**	(DEG)	HYD. HEADLOSS:	**13.10**	(I NCHES)
ELEMENT SIZE:	**3**	(mm)	TOTAL HEADLOSS:	**13.24**	(I NCHES)
W.L. DOWNSTREAM:	**1.50**	(FEET)	APPROX. WEIR HT:	**7.2**	(I NCHES)
RECESS:	**0.28**	(FEET)	**V** (upstream) :	**1.10**	FT/ SEC
DEAD SPACE:	**0**	(FEET)	**V** (downstream) :	**1.91**	FT/ SEC
HEIGHT ABV FLOOR:	**4.06**	(FEET)			

****

SCREEN RECOMMENDATION: **AG-MN -A 75 DEG, 2.5' x 9', 3mm**

****

Screen Drive System Data

PARKSON PART NUMBER:	3007-286/M
MANUFACTURER:	Sumitomo
TYPE:	Cyclo HBB Helical Buddybox
MODEL NUMBER:	EHYJS-B612DBY-F3-809
TOTAL RATIO:	809:1
INPUT RPM:	1800
OUTPUT RPM:	2.16
MAX OUTPUT TORQUE:	12,747 in-lbs @ 1/2 Hp Input
ASSEMBLY:	F3, Flange mount Ouput Shaft Horizontal – Top
OUTPUT HOLLOW SHAFT DIA:	2 3/16", Bore Keyless Tapered Bushing
INPUT:	56 C-Face
UNIT WEIGHT:	169 lbs.

PRIMARY CYCLO/RATIO:
SECONDARY CYCLO/RATIO:
BUDDYBOX RATIO:

NOTES:

1. Unit to be C-Face input, hollow shaft wit tapered bushing and flange mount.
2. Unit to be supplied with magnetic drain plugs on the Buddybox portion and galvanized steel drain plugs on the Cyclo portion.
3. Unit to be filled with grease on the Cyclo (input) portion and oil in the geared (output) portion per the manufacturer's recommendation.
4. Unit to be supplied with washdown duty steel-it paint, washdown breather, rust preventative on all exposed shafts.
5. Unit supplied with Lovejoy Coupling.

Sumitomo Drive Technologies

Always on the Move

Cyclo® HBB HELICAL BUDDYBOX

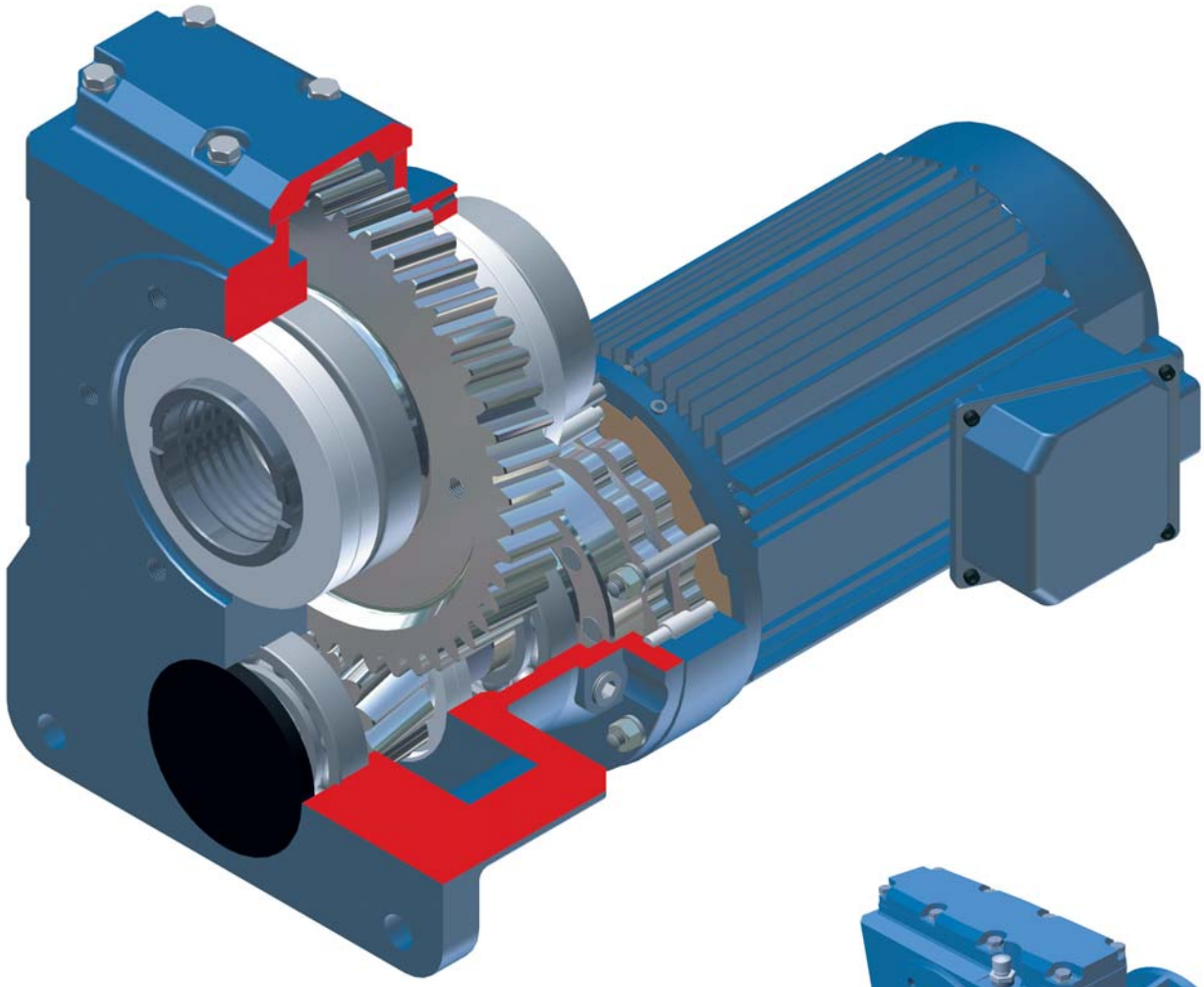
Speed Reducers and Gearmotors

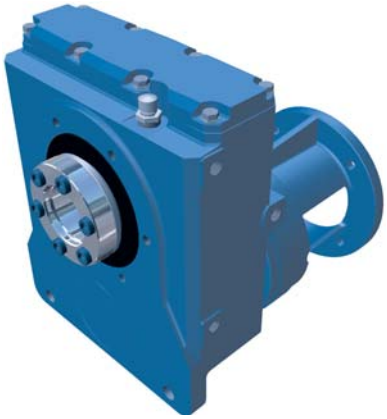
featuring Keyless Taper-Grip® Bushing

CATALOG 07.601.50.004

Cyclo® HBB Helical Buddybox

Rugged Helical Output, Modular Cyclo® Input, Compact Size



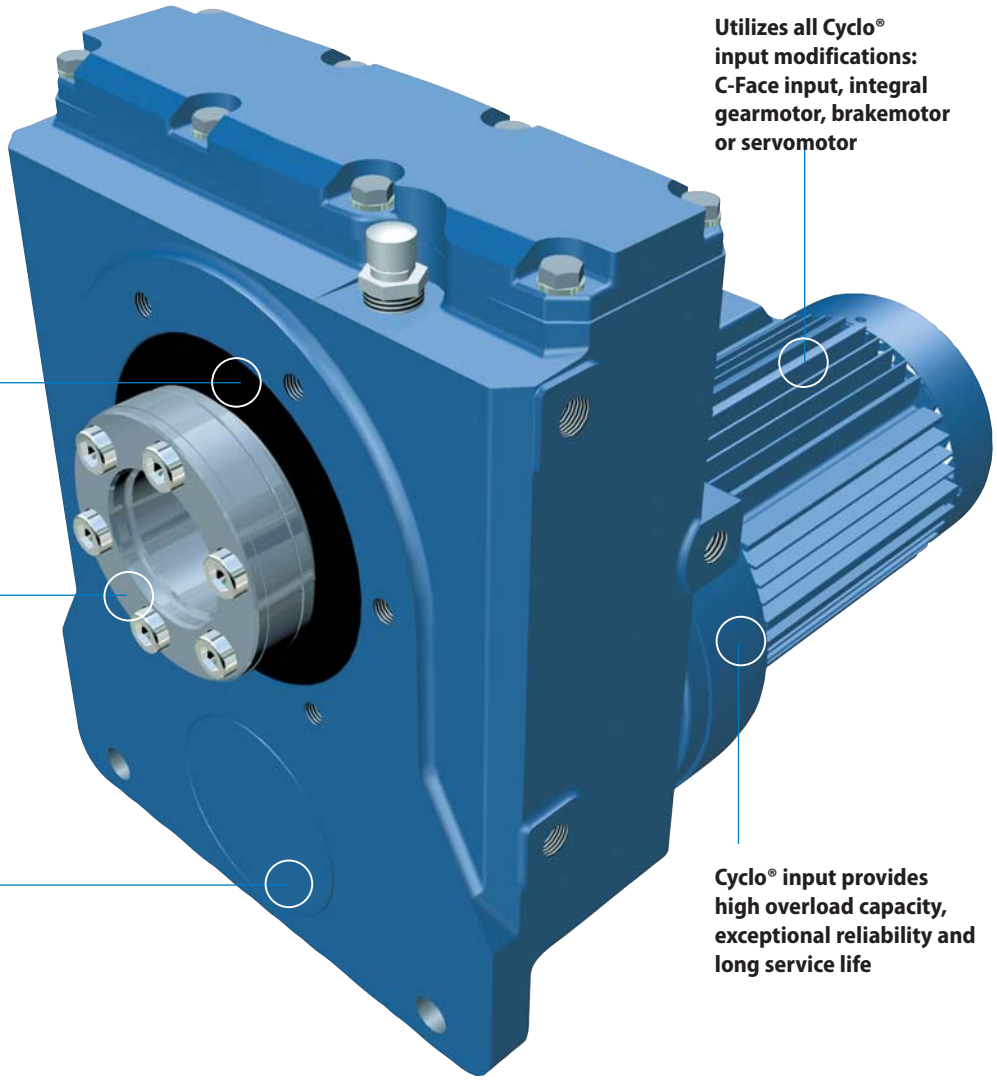


- The Cyclo® HBB is also available as a Speed Reducer

To request a catalog, or for more information on any of our high quality products, please visit our Website:

Flexible configurations

- Shaft Options:
  - hollow
- Mounting Options:
  - flange
  - face



Utilizes all Cyclo® input modifications: C-Face input, integral gearmotor, brakemotor or servomotor

Double output seals prevent lubricant leaks and protect from contamination

Patented keyless, steel Taper-Grip® bushing allows for quick and easy mounting and removal. Installs from either side

Patented universal housing design

Cyclo® input provides high overload capacity, exceptional reliability and long service life

Cyclo® Quality and Reliability, Shaft Mount Design

- High performance steel gearing components deliver **85-90% efficiency**

Product Description

Sumitomo's Cyclo® Helical Buddybox (Cyclo® HBB) speed reducers and gearmotors provide **innovative shaft mounted drive solutions for demanding services.** The Cyclo® HBB combines the quiet, efficient and reliable performance of the Cyclo® technology input with the **rugged helical gear output**. The **modular design** provides a compact, efficient product and the most flexible range of output speed and torque combinations available. Sumitomo's patented Taper Grip® bushing system enhances the Cyclo® HBB value by offering a simple shaft-mounting device that provides **self-aligning, backlash-free torque transmission** to the driven shaft. The Cyclo® HBB design is flexible and easily adapts to CEMA Screw Conveyor Drive applications with a modular conversion kit.

Features & Benefits

- **Cycloidal speed reduction technology**
  - ~ Quiet, efficient and reliable operation with high torque density and compact size
- **Modular design**
  - ~ Interchangeable cast iron housings in foot, flanged or face mount configurations
- **Double output seals**
  - ~ Virtually leak-free operation and optimal protection from lubrication contamination
- **Taper Grip® Bushing**
  - ~ Simple, steel, keyless shaft mounting system resists fretting and eases unit installation and removal from driven shaft
- **CEMA Screw Conveyor Drive option**
  - ~ Quick and simple conversion for Cyclo® HBB units to fit CEMA standard dimensions

Specifications

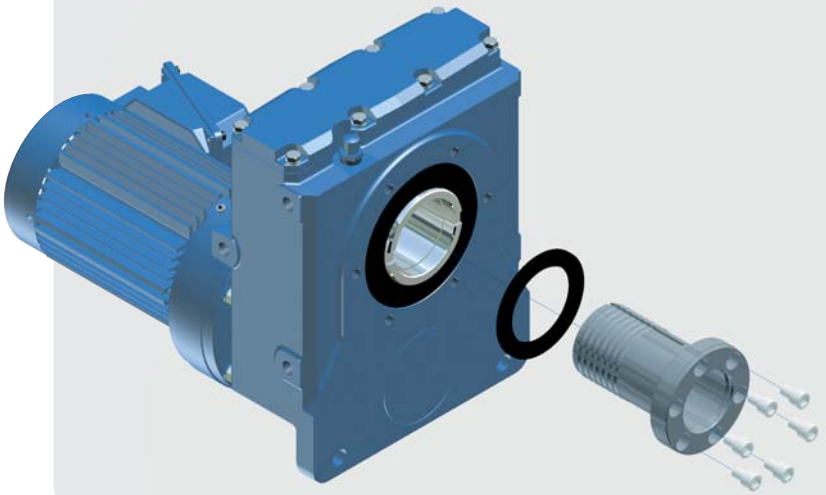
Ratios:	11:1 up to 26,000:1 and greater
Torque Capacity:	Up to 75,800 in. lbs.
HP:	1/8 to 40
Mounting:	Hollow Shaft, Flange, Face
Options:	Integral Motor, C-Face
Motor Standards:	NEMA, IEC, JIS, UL, CSA, CE

Keyless, steel Taper-Grip® bushing makes mounting of hollow shaft units easy and economical

The Sumitomo **Taper-Grip®** bushing is a keyless, torque transmission device integrated into the shaft mounted, offset parallel Cyclo® HBB reducer and gearmotor product lines.

The **unique, patented design** has a number of benefits :

- Easy mounting and removal of the unit to and from the driven shaft
- Standard bore sizes require no shaft preparation such as a keyway, undercut, or keeper plate
- Backlash free torque transmission
- Works with standard shafting, no special tolerances required
- Automatic shaft center alignment
- Resistant to fretting and corrosion
- Multiple stock bore sizes for quick delivery.

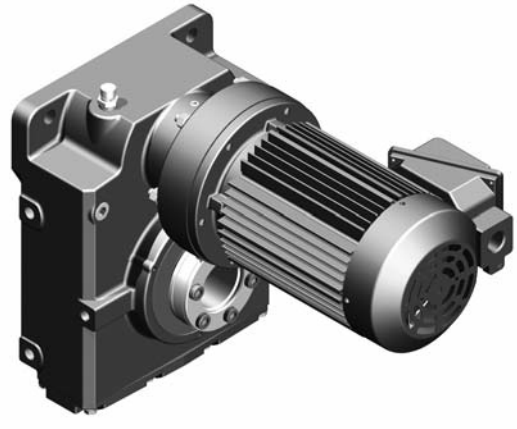


Applications

- Material Handling
- Conveyors
- Baggage Handling
- Shredders
- Belt Filter Press
- Mixer/Blender
- Rolling Mill Table
- Screw Conveyors
- Elevators
- Hoist Drives
- Climber Screens
- Food Processing

Mounting Positions

Please see the Appendix (Section 5) for additional mounting configurations.



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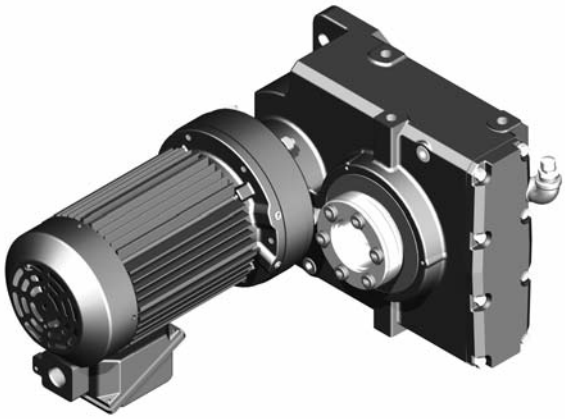

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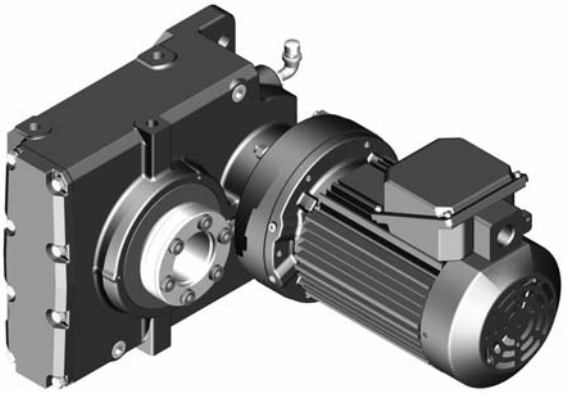
Y3



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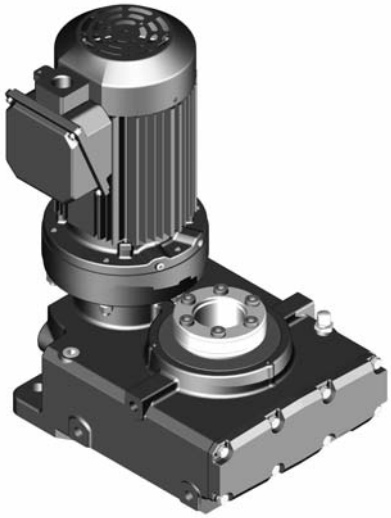

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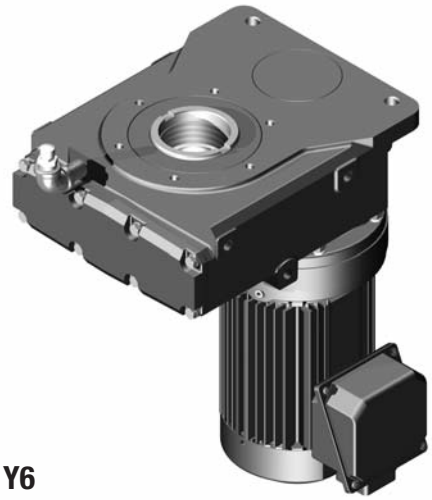


Y6

Configure a Model Number

Output Shaft Orientation

Type	Prefix
Horizontal	H
~~Vertical~~	~~V~~

Mounting Style

Type	Prefix
Shaft Mount (Hollow Shaft)	Y
~~Flange (Keyed Hollow Bore)~~	~~F~~

Input Connection

Input Connection	Prefix
C-Face Adapter	J
~~Hollow Input Shaft~~	~~X~~

Modification

	Prefix
Special	S
~~Standard~~	

Frame Size

~~Single Reduction~~

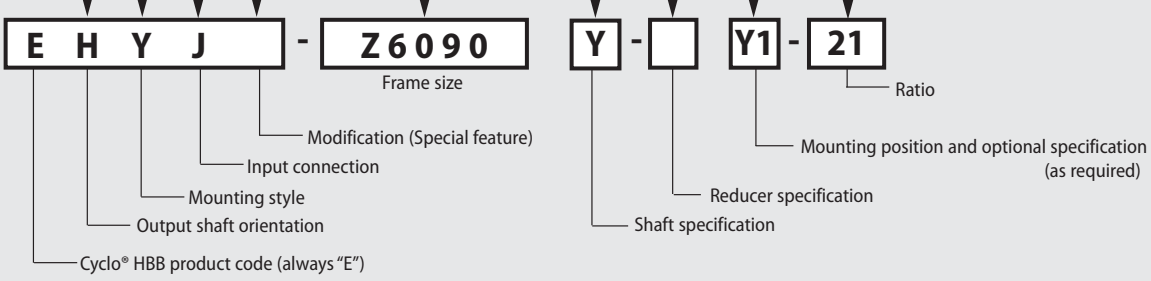
~~Z6090~~	~~B6120~~	~~D6160~~
~~Z6095~~	~~B6125~~	~~D6165~~
~~A6100~~	~~C6140~~	~~E6170~~
~~A6105~~	~~C6145~~	~~E6175~~

Double Reduction

~~Z609DA~~	~~C614DB~~	~~D616DC~~
~~A610DA~~	~~C614DC~~	~~E617DA~~
~~B612DA~~	~~D616DA~~	~~E617DB~~
B612DB	~~D616DB~~	~~E617DC~~
~~C614DA~~		

Include the following information when ordering:

- Motor Specification (230/460 VAC 60 Hz is supplied, unless otherwise specified)
- NEMA frame size for C-face adaptor
- Bushing Bore size **(must be supplied)**
- Optional conduit box positions must be specified, otherwise Y1 is supplied.



Nomenclature

Shaft Specifications

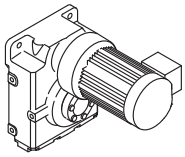
Input Shaft	Hollow Output Shaft	Suffix
~~mm~~	~~Key (mm)~~	
~~DIN~~	~~Key (DIN)~~	**E**
~~Inch~~	~~Key (Inch)~~	**K**
~~mm~~	~~Taper-Grip®~~	**M**
~~DIN~~	~~Taper-Grip®~~	**G**
Inch	Taper-Grip®	**Y**

Reducer Specification

Type		Suffix
Standard		
High Capacity Bearing **(Required for Screw Conveyor)**		**R1**
Baseplate		**BP**
Shovel Base		**SB**
Top Mount	Center Right Left	– **PR** **PL**
Low Backlash		**LB**
Torque Limiter		**TL**

Mounting Positions (Please see the Appendix, Section 5, for additional mounting positions.)

Y1



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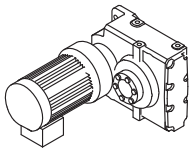

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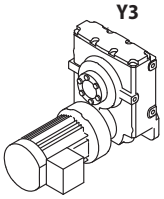

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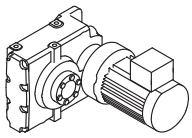

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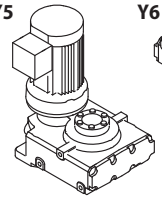

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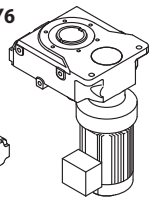


~~Single Reduction~~	
~~Input Ratio~~	~~**Total Ratio**~~
~~3~~	~~**11**~~
~~5~~	~~**18**~~
~~6~~	~~**21**~~
~~8~~	~~**28**~~
~~11~~	~~**39**~~
~~13~~	~~**46**~~
~~15~~	~~**53**~~
~~17~~	~~**60**~~
~~21~~	~~**74**~~
~~25~~	~~**88**~~
~~29~~	~~**102**~~
~~35~~	~~**123**~~
~~43~~	~~**151**~~
~~51~~	~~**179**~~
~~59~~	~~**207**~~
~~71~~	~~**249**~~
~~87~~	~~**305**~~
~~119~~	~~**417**~~

Double Reduction	
Input Ratio	**Total Ratio**
~~104~~	~~**364**~~
~~121~~	~~**424**~~
~~143~~	~~**501**~~
~~165~~	~~**578**~~
~~195~~	~~**683**~~
231	**809**
~~273~~	~~**956**~~
~~319~~	~~**1117**~~
~~377~~	~~**1320**~~
~~473~~	~~**1656**~~
~~559~~	~~**1957**~~
~~649~~	~~**2272**~~
~~731~~	~~**2559**~~
~~841~~	~~**2944**~~
~~1003~~	~~**3511**~~
~~1247~~	~~**4365**~~
~~1479~~	~~**5177**~~
~~1849~~	~~**6472**~~
~~2065~~	~~**7228**~~
~~2537~~	~~**8880**~~
~~3045~~	~~**10658**~~
~~3481~~	~~**12184**~~
~~4437~~	~~**15530**~~
~~5133~~	~~**17966**~~
~~6177~~	~~**21620**~~
~~7569~~	~~**26492**~~

Nomenclature Example:

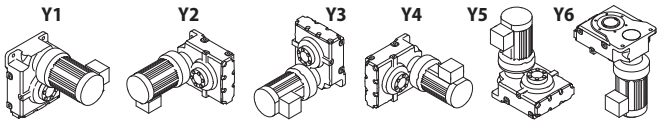
EHYJ – Z6090Y – Y1 – 21

E – Cyclo® Helical Buddybox
H – Horizontal O/P
Y – Shaft Mount (Hollow Shaft)
J – C-Face Input

Z6090 – Frame Size
Y – Inch Shaft Specification
Y1 – Installation Position
21 – Ratio

Frame Size Selection Tables 60 Hz, 1750 RPM

Double Reduction
Y1, Y2, Y3, Y4, Y5, Y6 Mounting Positions



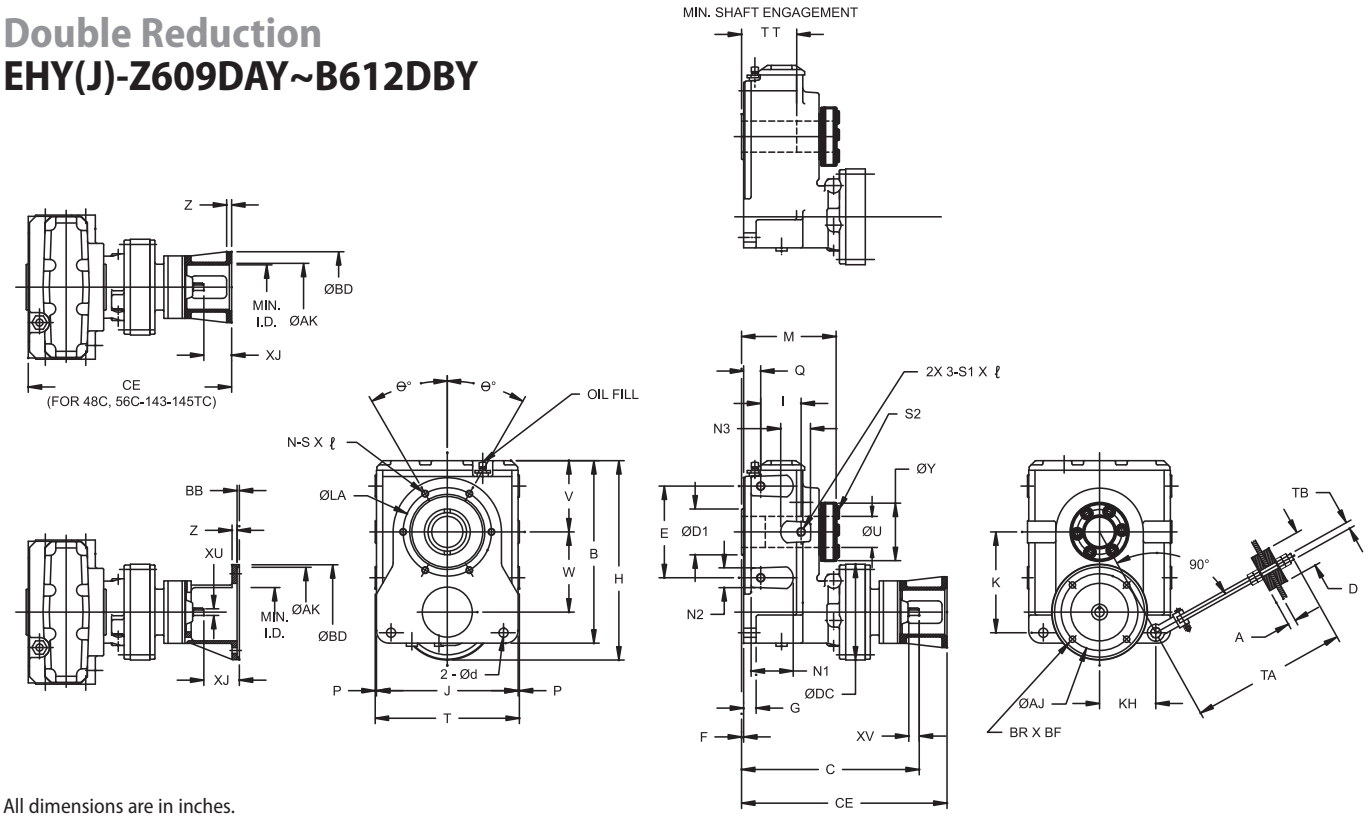
Dimensions on pages 2.18–2.21

Output RPM	4.81	4.13	3.50	3.03	2.56	2.16	1.83	1.57	1.33	1.06	0.894	0.770	0.684	Frame
Ratio	364	424	501	578	683	809	956	1117	1320	1656	1957	2272	2559	Size
Input HP	0.337	0.290	0.245	0.212	0.180	0.152	0.125 breakaway HP required for cold temp. or high inertia applications[1]							**Z609DA**
Output Torque in-lbs	3870	3870	3870	3870	3870	3870	3870	3870	3870	3870	3870	3870	3870	
Input HP	0.576	0.576	0.496	0.430	0.364	0.307	0.260	0.222	0.188	0.150	0.125 breakaway HP required for cold temp. or high inertia applications[1]			**A610DA**
Output Torque in-lbs	6600	7680	7820	7820	7820	7820	7820	7820	7820	7820	7820	7820	7820	
Input HP	0.576	0.576	0.576	0.576	0.576	0.576	0.520	0.445	0.377	0.300	0.254	0.219	0.194	**B612DA**
Output Torque in-lbs	6600	7680	9120	10400	12400	14700	15700	15700	15700	15700	15700	15700	15700	
Input HP	1.37	1.17	0.993	0.860	0.728	0.615	0.520	0.445	0.377	0.300	0.254	0.219	0.194	**B612DB**
Output Torque in-lbs	15700	15700	15700	15700	15700	15700	15700	15700	15700	15700	15700	15700	15700	
Input HP	0.576	0.576	0.576	0.576	0.576	0.576	0.576	0.576	0.576	0.576	0.508	0.438	0.388	**C614DA**
Output Torque in-lbs	6600	7680	9120	10400	12400	14700	17300	20300	24000	30000	31300	31300	31300	
Input HP	2.14	2.14	1.99	1.72	1.46	1.23	1.04	0.890	0.753	0.600	0.508	0.438	0.388	**C614DB**
Output Torque in-lbs	24600	28600	31300	31300	31300	31300	31300	31300	31300	31300	31300	31300	31300	
Input HP	2.73	2.35	1.99	1.72	1.46	1.23	1.04	0.890	0.753	0.600	0.508	0.438	0.388	**C614DC**
Output Torque in-lbs	31300	31300	31300	31300	31300	31300	31300	31300	31300	31300	31300	31300	31300	
Input HP	2.14	2.14	2.14	2.14	2.14	2.13	1.80	1.54	1.31	1.04	0.881	0.759	0.674	**D616DA**
Output Torque in-lbs	24600	28600	33800	39000	46100	54300	54300	54300	54300	54300	54300	54300	54300	
Input HP	4.50	4.07	3.44	2.98	2.53	2.13	1.80	1.54	1.31	1.04	0.881	0.759	0.674	**D616DB**
Output Torque in-lbs	51600	54300	54300	54300	54300	54300	54300	54300	54300	54300	54300	54300	54300	
Input HP	4.74	4.07	3.44	2.98	2.53	2.13	1.80	1.54	1.31	1.04	0.881	0.759	0.674	**D616DC**
Output Torque in-lbs	54300	54300	54300	54300	54300	54300	54300	54300	54300	54300	54300	54300	54300	
Input HP	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	1.82	1.45	1.23	1.06	0.940	**E617DA**
Output Torque in-lbs	24600	28600	33800	39000	46100	54600	64600	75500	75800	75800	75800	75800	75800	
Input HP	4.50	4.50	4.50	4.17	3.53	2.98	2.52	2.15	1.82	1.45	1.23	1.06	0.940	**E617DB**
Output Torque in-lbs	51600	60100	71000	75800	75800	75800	75800	75800	75800	75800	75800	75800	75800	
Input HP	6.61	5.68	4.81	4.17	3.53	2.98	2.52	2.15	1.82	1.45	1.23	1.06	0.940	**E617DC**
Output Torque in-lbs	75800	75800	75800	75800	75800	75800	75800	75800	75800	75800	75800	75800	75800	

Note: **[1]** A torque limiting device is recommended to protect the unit or driven machine.

Dimensions

Double Reduction
EHY(J)-Z609DAY~B612DBY



All dimensions are in inches.

Model	NEMA C-FACE	B	C	E	F	G	H	I	J	K	M	P	Q	T	TT	U Max (Std)	U MIN
~~Z609DA~~	~~42C~~ ~~48C~~ ~~56C~~	~~11.02~~	~~10.73~~	~~5.51~~	~~0.20~~	~~0.79~~	~~11.87~~ ~~11.87~~ ~~12.26[1]~~	~~2.20~~	~~8.3~~	~~6.18~~	~~6.06~~	~~0.12~~	~~1.06~~	~~8.54~~	~~4.43~~	~~1-7/16~~	~~1-3/16~~
~~A610DA~~	~~42C~~ ~~48C~~ ~~56C~~	~~11.83~~	~~11.87~~	~~5.91~~	~~0.2~~	~~0.79~~	~~12.70~~ ~~12.70~~ ~~13.09[1]~~	~~2.60~~	~~9.17~~	~~6.44~~	~~6.61~~	~~0.12~~	~~1.14~~	~~9.41~~	~~4.96~~	~~2-3/16~~	~~1-11/16~~
~~B612DA~~	~~42C~~ ~~48C~~ ~~56C~~	~~14.47~~	~~13.39~~	~~7.48~~	~~0.20~~	~~0.98~~	~~16.10~~	~~3.39~~	~~11.41~~	~~7.97~~	~~7.64~~	~~0.12~~	~~1.22~~	~~11.65~~	~~5.63~~	~~2-7/16~~	~~1-15/16~~
B612DB	~~48C~~ 56C~145TC	14.47	14.11	7.48	0.20	0.98	16.10	3.39	11.41	7.97	7.64	0.12	1.22	11.65	5.63	2-7/16	1-15/16

Model	NEMA C-FACE	V	W	ØY	Ød	ØD1	ØDC	KH	N1	N2	N3	S2	TA	A	D	TB
~~Z609DA~~	~~42C~~ ~~48C~~ ~~56C~~	~~4.25~~	~~4.69~~	~~3.23~~	~~0.55~~	~~2.56~~	~~5.91~~	~~3.54~~	~~1.02~~	~~1.02~~	~~N/A~~	~~M10~~	~~17.50~~	~~0.63~~	~~2.36~~	~~M20~~
~~A610DA~~	~~42C~~ ~~48C~~ ~~56C~~	~~4.61~~	~~5.14~~	~~4.09~~	~~0.71~~	~~3.35~~	~~5.91~~	~~3.74~~	~~1.10~~	~~1.10~~	~~N/A~~	~~M12~~	~~17.50~~	~~0.63~~	~~2.36~~	~~M20~~
~~B612DA~~	~~42C~~ ~~48C~~ ~~56C~~	~~5.71~~	~~6.40~~	~~4.49~~	~~0.71~~	~~3.94~~	~~8.03~~	~~4.33~~	~~1.34~~	~~1.26~~	~~N/A~~	~~M12~~	~~17.87~~	~~0.63~~	~~2.36~~	~~M20~~
B612DB	~~48C~~ 56C~145TC	5.71	6.40	4.49	0.71	3.94	8.03	4.33	1.34	1.26	N/A	M12	17.87	0.63	2.36	M20

Note: **[1]** Dimension is to **C**, motor mounting flange.

Dimensions

Double Reduction
EHY(J)-Z609DAY~B612DBY (cont.)

All dimensions are in inches.

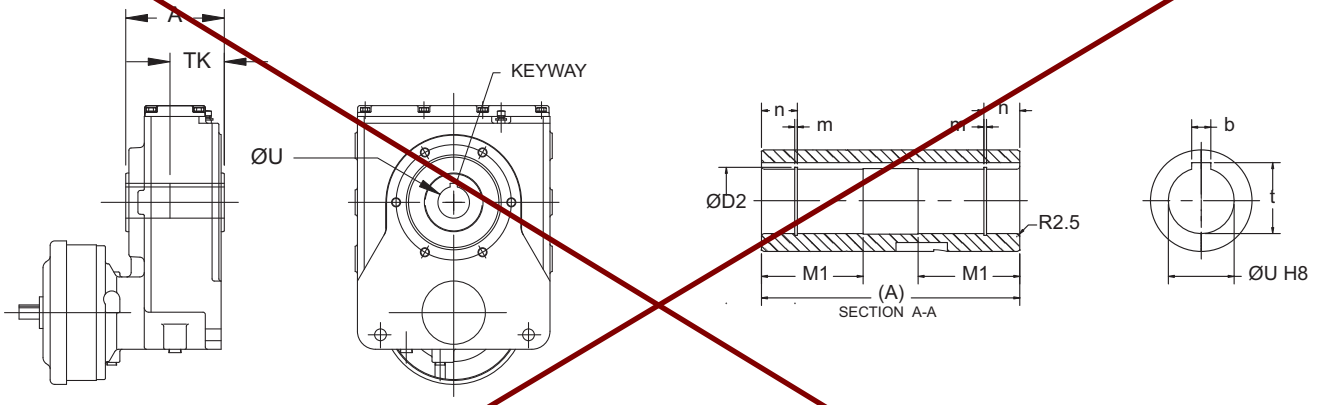
Model	NEMA C-Face	ØLA	Θ °	N	S x ℓ	S1 x ℓ	XU	XV	KEY	Unit Weight (lb)
~~Z609DA~~	~~42C~~ ~~48C~~ ~~56C~~	~~4.72~~	~~0~~	~~4~~	~~M10x0.79~~	~~M10x0.79~~	~~0.500~~	~~0.98~~	~~3/16 X 3/16 X .71~~	~~62~~
~~A610DA~~	~~42C~~ ~~48C~~ ~~56C~~	~~6.10~~	~~30~~	~~6~~	~~M12x0.79~~	~~M12x0.87~~	~~0.500~~	~~0.98~~	~~3/16 X 3/16 X .71~~	~~83~~
~~B612DA~~	~~42C~~ ~~48C~~ ~~56C~~	~~6.89~~	~~30~~	~~6~~	~~M12x0.87~~	~~M16x1.02~~	~~0.500~~	~~0.98~~	~~1/8 X 1/8 X .71~~	~~145~~
B612DB	~~48C~~ 56C~145TC	6.89	30	6	M12x0.87	M16x1.02	0.625	0.98	3/16 X 3/16 X .75	152

Model	NEMA C-Face	C-Face Dimensions									Unit + C-Face Weight (lb)
		ØAJ	ØAK	ØBD	BB	BF	BR	CE	XJ	Z	Min. ID
~~Z609DA~~	~~42C~~	~~3.75~~	~~3.00~~	~~4.33~~	~~0.00~~	~~0.28~~	~~4~~	~~12.52~~	~~1.79~~	~~0.47~~	~~2.44~~	~~66~~
	~~48C~~	~~3.75~~	~~3.00~~	~~4.33~~	~~0.00~~	~~0.28~~	~~4~~	~~12.89~~	~~2.16~~	~~0.47~~	~~2.44~~	~~66~~
	~~56C~~	~~5.88~~	~~4.50~~	~~6.69~~	~~0.00~~	~~0.43~~	~~4~~	~~13.29~~	~~2.56~~	~~0.47~~	~~3.15~~	~~68~~
~~A610DA~~	~~42C~~	~~3.75~~	~~3.00~~	~~4.33~~	~~0.00~~	~~0.28~~	~~4~~	~~13.66~~	~~1.79~~	~~0.47~~	~~2.44~~	~~87~~
	~~48C~~	~~3.75~~	~~3.00~~	~~4.33~~	~~0.00~~	~~0.28~~	~~4~~	~~14.03~~	~~2.16~~	~~0.47~~	~~2.44~~	~~87~~
	~~56C~~	~~5.88~~	~~4.50~~	~~6.69~~	~~0.00~~	~~0.43~~	~~4~~	~~14.43~~	~~2.56~~	~~0.47~~	~~3.15~~	~~89~~
~~B612DA~~	~~42C~~	~~3.75~~	~~3.00~~	~~4.33~~	~~0.00~~	~~0.28~~	~~4~~	~~15.18~~	~~1.79~~	~~0.47~~	~~2.44~~	~~149~~
	~~48C~~	~~3.75~~	~~3.00~~	~~4.33~~	~~0.00~~	~~0.28~~	~~4~~	~~15.55~~	~~2.16~~	~~0.47~~	~~2.44~~	~~149~~
	~~56C~~	~~5.88~~	~~4.50~~	~~6.69~~	~~0.00~~	~~0.43~~	~~4~~	~~16.02~~	~~2.63~~	~~0.47~~	~~3.15~~	~~151~~
B612DB	~~48C~~	~~3.75~~	~~3.00~~	~~4.33~~	~~0.00~~	~~0.28~~	~~4~~	~~16.27~~	~~2.16~~	~~0.47~~	~~2.44~~	~~158~~
	56C~145TC	5.88	4.50	6.69	0.00	0.43	4	16.74	2.63	0.47	4.21	160

Dimensions shown are for reference only and are subject to change without notice, unless certified. Certified prints are available after receipt of an order; consult factory.

Options

Keyed Hollow Bore



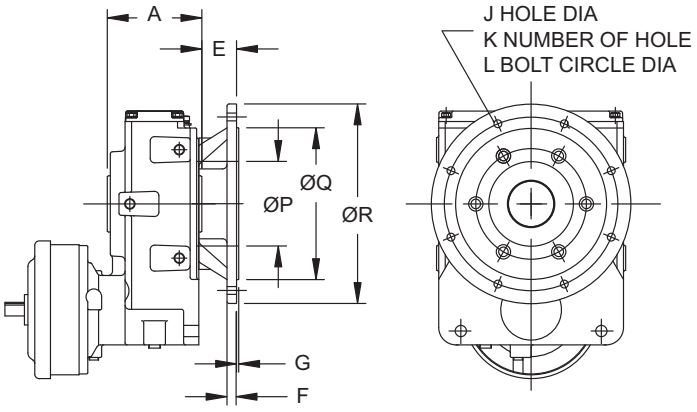
All dimensions are in millimeters.

Model	ØU	A	b	t	M1	Ø D2	n	m	TK*
Z	40	120	12	43.3	57	42.5	24	1.95	76
A	55	134	16	59.3	63	58	30	2.20	84
B	65	160	18	69.4	75	68	30	2.70	98
C	75	192	20	79.9	90	78	37	2.70	140
D	85	218	22	90.4	100	88.5	37	3.20	194
E	100	238	28	106.4	110	103.5	37	3.20	195

**Recommended minimum shaft engagement for shaft material 1045 steel with hardness Hb 225 - 265*

Model	Available Bore Sizes			
	Inch		Metric (mm)	
	Min.	Max.	Min.	Max.
Z	1-3/16	1-1/2	30	40
A	1-3/4	2-3/16	45	55
B	2-3/16	2-5/8	55	65
C	2-7/16	3	60	75
D	2-3/4	3-7/16	70	85
E	3-3/16	3-15/16	80	110

Output Flange



All dimensions are in inches.

Model	A	E	F	G	J	K	L	P	Q	R
Z	4.72	1.24	0.47	0.14	0.43	4	6.50	3.54	5.12	7.87
A	5.28	1.30	0.59	0.16	0.55	4	8.46	4.72	7.09	10.00
B	6.30	1.61	0.59	0.16	0.55	4	8.46	5.51	7.09	10.00
C	7.56	2.28	0.79	0.20	0.71	4	11.81	6.50	9.84	13.98
D	8.58	3.15	0.87	0.20	0.71	8	15.75	7.68	13.78	18.11
E	9.37	3.15	0.87	0.20	0.71	8	15.75	12.60	13.78	17.72

Sumitomo Drive Technologies

Taper Grip® Bushing Installation Guide

Introduction

The keyless Taper-Grip® bushing system provides simple and reliable shaft attachment for Sumitomo Speed reducers and gearmotors. This system allows bi-directional shaft rotation and stop-start operation with a powerful, slip-free grip. To assure peak performance of your equipment, please read, understand and follow these installation instructions.

Safety

Disconnect all power sources from the equipment before beginning this installation procedure. Handle the components with care and avoid all sharp or machined edges to prevent personal injury or damage to the components.

Before Installing Unit on Driven Shaft (Steps 1-7)

Carefully inspect the driven equipment shaft. Remove all burrs, corrosion, lubricants, and foreign matter from the shaft surface. Verify the shaft diameter is within the dimensional tolerances shown in Table 1.

Table 1 Driven Shaft Tolerances

Shaft Diameter (inches)	Shaft Tolerance (inches)
~~3/4" – 1-1/8"~~	~~+0" – 0.005"~~
~~1-3/16" – 2"~~	~~+0" – 0.006"~~
2 1/16" – 3-1/8"	+0" – 0.007"
~~3-3/16" – 4-3/4"~~	~~+0" – 0.008"~~
~~4-13/16" – 6-1/2"~~	~~+0" – 0.009"~~

Clean all surfaces of the shaft, the bushing, the thrust collar and the unit bore with solvent to remove all grease and oil.

Step 1 – Remove the Taper-Grip® bushing safety cover (see Fig. 2).

Step 2 – Remove the cap screws from the bushing. Lightly oil the threads of the cap screws and partially re-insert them into the threaded holes in the bushing flange. The ends of the cap screws should not extend beyond the rear face of the bushing flange.

Step 3 – Slide the thrust collar onto the Taper-Grip® bushing (see Fig. 3).

Step 4 – Apply a thin layer of anti-seize paste **to the male threads of the Taper-Grip® Bushing only** (see Fig.4). Based on tests, Sumitomo recommends Bostik Never-Seez Regular Grade or equivalent. Ensure that anti-seize paste does not enter the Taper-Grip® Bushing bore. **Caution: Do not apply anti-seize paste to the female threads in the hub.**

Step 5 – Carefully thread the Taper-Grip® bushing into the hub of the speed reducer or gearmotor until the thrust collar solidly engages the unit hub surface and the bushing flange (see Fig. 5). **Caution: Do not cross-thread. Bushing should thread easily into hub.**

Step 6 – Unscrew the Taper-Grip® bushing to create a 1mm (0.04") gap between the thrust collar and the bushing flange.

Step 7 – Hand-tighten the cap screws until they firmly press the thrust collar against the unit hub surface. The unit is ready for installation on the driven shaft.

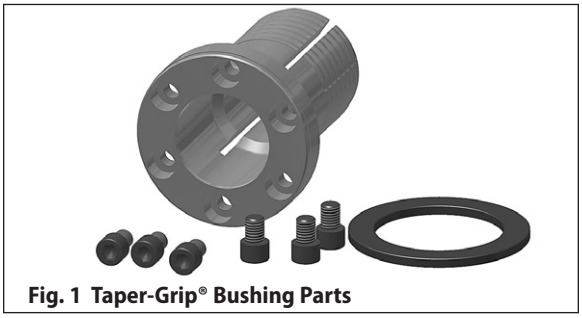


Fig. 1 Taper-Grip® Bushing Parts

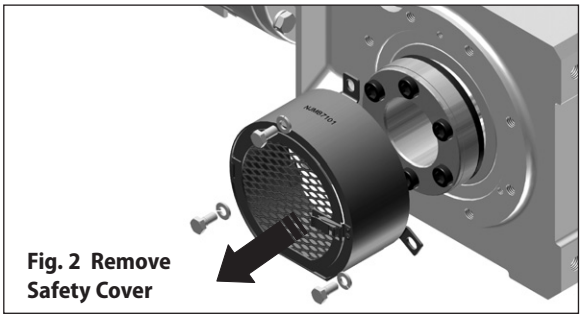


Fig. 2 Remove Safety Cover

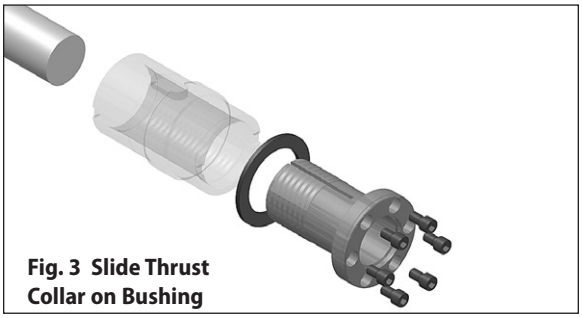


Fig. 3 Slide Thrust Collar on Bushing

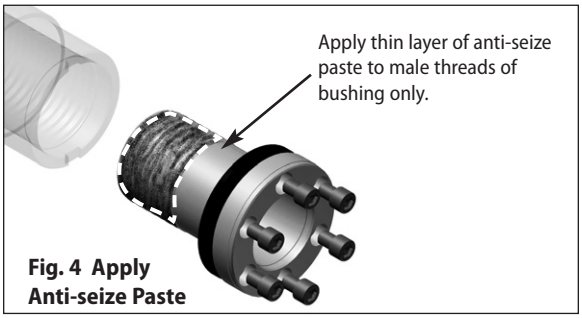


Fig. 4 Apply Anti-seize Paste

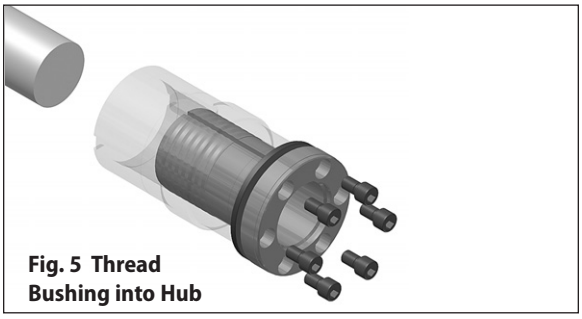


Fig. 5 Thread Bushing into Hub

Taper Grip® Bushing Installation Guide continued

Unit Installation

Step 8 – Position unit with the bushing flange located on the outboard side of the unit. Align the bushing with the driven shaft. Slide the unit onto the driven shaft as close to the driven shaft support bearing as possible. Ideally, the driven shaft should extend beyond the bushing flange face (see Fig. 7). Refer to Fig. 6 and Table 2 below for minimum shaft to bushing engagement. For maximum depth to the end of the shaft, refer to Fig. 6 and Table 3 below.

Table 2 Minimum Shaft to Bushing Engagement

Minimum Shaft Engagement (TT)								
	HSM			Cyclo® HBB			Cyclo® BBB	
Model	mm	in.	Model	mm	in.	Model	mm	in.
~~107C~~	~~119.5~~	~~4.70~~	~~Z~~	~~113.5~~	~~4.47~~	~~3A, 2A~~	~~209~~	~~8.23~~
~~115D~~	~~127.5~~	~~5.02~~	~~A~~	~~127~~	~~5.00~~	~~3B, 2B~~	~~243~~	~~9.57~~
~~203E~~	~~136~~	~~5.35~~	B	144	5.67	~~3C, 2C~~	~~280~~	~~11.02~~
~~207F~~	~~153~~	~~6.02~~	~~C~~	~~187~~	~~7.36~~	~~3D, 2D~~	~~327~~	~~12.87~~
~~215G~~	~~183~~	~~7.20~~	~~D~~	~~205~~	~~8.07~~	~~3E, 2E~~	~~360~~	~~14.17~~
~~307H~~	~~205~~	~~8.07~~	~~E~~	~~225~~	~~8.86~~			
~~315J~~	~~215~~	~~8.46~~						
~~407S~~	~~219~~	~~8.62~~						
~~415K~~	~~217~~	~~8.54~~						
~~507L~~	~~285~~	~~11.22~~						
~~608M~~	~~335~~	~~13.19~~						

Table 3 Maximum Depth to Shaft End

Maximum Depth to Shaft End (TS)								
	HSM			Cyclo® HBB			Cyclo® BBB	
Model	mm	in.	Model	mm	in.	Model	mm	in.
~~107C~~	~~31~~	~~1.22~~	~~Z~~	~~31~~	~~1.22~~	~~3A, 2A~~	~~35~~	~~1.38~~
~~115D~~	~~34~~	~~1.34~~	~~A~~	~~35~~	~~1.38~~	~~3B, 2B~~	~~45~~	~~1.77~~
~~203E~~	~~35~~	~~1.38~~	B	45	1.77	~~3C, 2C~~	~~40~~	~~1.57~~
~~207F~~	~~45~~	~~1.77~~	~~C~~	~~40~~	~~1.57~~	~~3D, 2D~~	~~50~~	~~1.97~~
~~215G~~	~~40~~	~~1.57~~	~~D~~	~~50~~	~~1.97~~	~~3E, 2E~~	~~51~~	~~2.01~~
~~307H~~	~~50~~	~~1.97~~	~~E~~	~~51~~	~~2.01~~			
~~315J~~	~~51~~	~~2.01~~						
~~407S~~	~~63~~	~~2.48~~						
~~415K~~	~~70~~	~~2.76~~						
~~507L~~	~~70~~	~~2.76~~						
~~608M~~	~~70~~	~~2.76~~						

Step 9 – With a torque wrench, tighten the cap screws in 20% increments to engage the bushing system. Use the appropriate tightening pattern ("star-pattern" see Fig. 7) to assure complete bushing engagement. Tighten each cap screw to the torque values shown in Table 4.

If the shaft is recessed in the bushing, fill the void with grease to prevent corrosion and fouling.

Step 10 – Please read, understand and follow the instructions shown in the reducer/gearmotor installation and operating manual to complete the unit installation and attach the torque arm.

Step 11 – After the reducer has been running for 20 to 30 hours, re-torque the screws to the values in Table 4. Screw torques should be subsequently checked at normal service intervals (i.e. every 6 months).

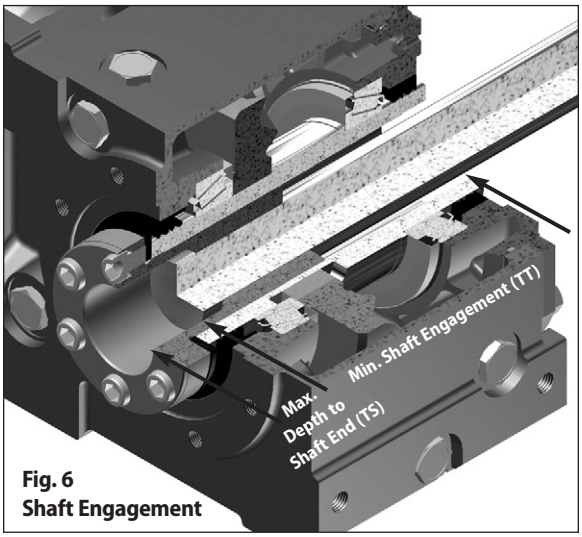


Fig. 6
Shaft Engagement

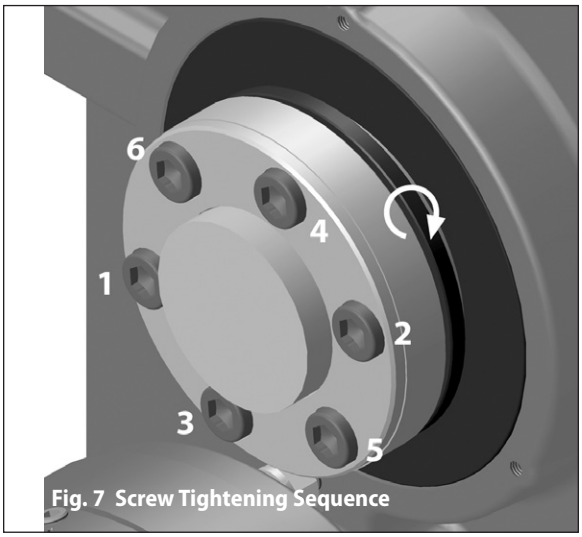


Fig. 7 Screw Tightening Sequence

Table 4 Cap Screw Tightening Torques

~~HSM Model~~	Cyclo® HBB Model	Cyclo® BBB Model	Cap screws (JIS Grade 12.9) Qty.	Size	Cap screw Torque Nm	Lb.Ft.
~~107C~~	~~Z~~		~~6~~	~~M10x14~~	~~50~~	~~37~~
~~115D~~			~~6~~	~~M10x14~~	~~55~~	~~41~~
~~203E~~	~~A~~	~~3A, 2A~~	~~6~~	~~M12x16~~	~~75~~	~~56~~
~~207F~~	B	~~3B, 2B~~	6	M12x16	140	104
~~215G~~	~~C~~	~~3C, 2C~~	~~6~~	~~M16x20~~	~~250~~	~~185~~
~~307H~~	~~D~~	~~3D, 2D~~	~~6~~	~~M16x20~~	~~250~~	~~185~~
~~315J~~	~~E~~	~~3E, 2E~~	~~8~~	~~M16x20~~	~~250~~	~~185~~
~~407S~~			~~10~~	~~M16x20~~	~~250~~	~~185~~
~~415K~~			~~10~~	~~M16x35~~	~~300~~	~~223~~
~~507L~~			~~12~~	~~M16x35~~	~~300~~	~~223~~
~~608M~~			~~16~~	~~M16x35~~	~~300~~	~~223~~

Taper Grip® Bushing Installation Guide continued

Removal Procedure

Step 1 – Remove the Taper-Grip® bushing safety cover (see Fig. 8).

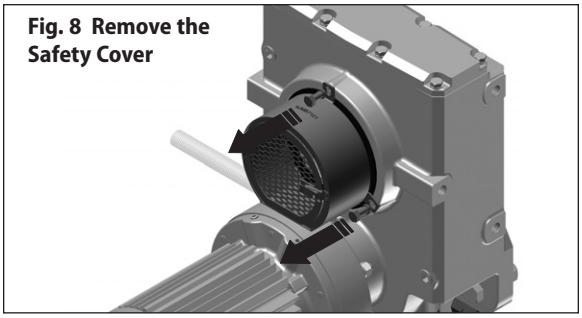


Fig. 8 Remove the Safety Cover

Step 2 – Before removing the reducer/gearmotor from the driven shaft, externally support the unit so that all its weight is removed from the driven shaft (see Fig. 9). **Caution: Do not raise the unit too high. It may cause the shaft to bind.**

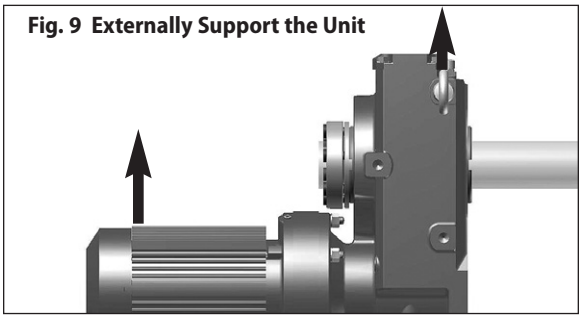


Fig. 9 Externally Support the Unit

Step 3 – Check the Taper-Grip® Bushing to assure that there is a gap between the thrust collar and the bushing flange. If no gap exists, unit removal may be difficult (see Fig. 10).

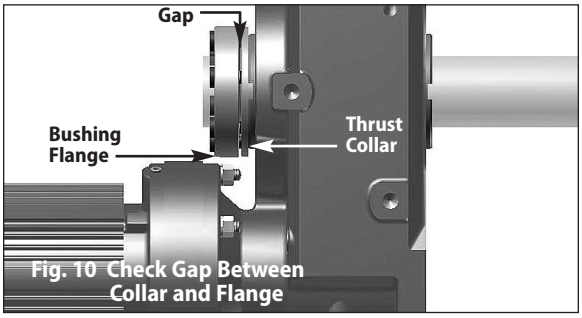


Fig. 10 Check Gap Between Collar and Flange

Step 4 – Spray a liquid penetrant onto each of the Taper-Grip® Bushing cap screws. Allow time for the penetrant to settle into the threads of the cap screws. (see Fig. 11).

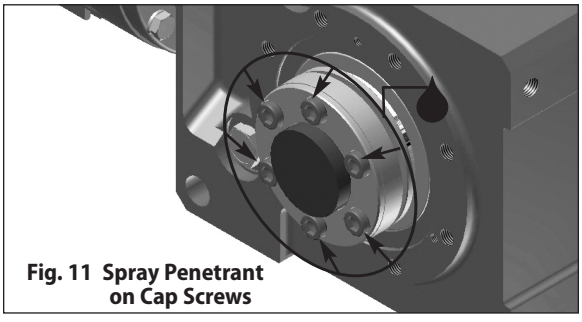


Fig. 11 Spray Penetrant on Cap Screws

Step 5 – After the liquid penetrant has been allowed to settle, remove the cap screws one at a time (see Fig 12).

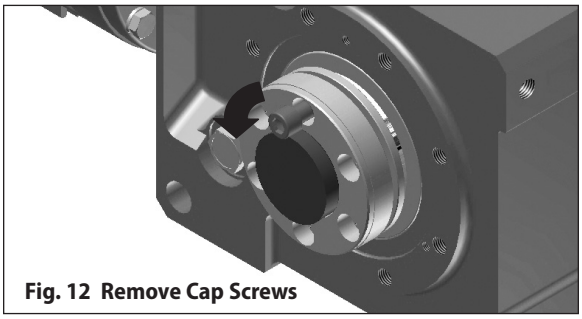


Fig. 12 Remove Cap Screws

Step 6 – Place a copper or brass bar against the flange of the Taper-Grip® Bushing and carefully strike end of bar with a hammer to release bushing (see Fig 13).

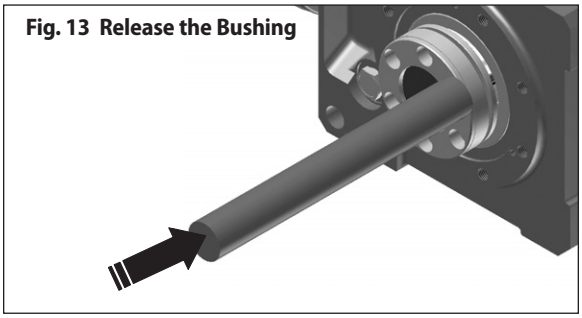


Fig. 13 Release the Bushing

Step 7 – After releasing the bushing, reinstall the cap screws by hand only. Stop tightening them once they touch the thrust collar. They will ensure the reducer will not slide against the bushing and clamp it against the shaft when the reducer is removed. Apply a liquid penetrant to the shaft where it contacts the bushing. Allow time for the liquid to penetrate between the bushing and the shaft, then carefully slide the unit off of the shaft. (see Fig 14). **Note: If the bushing releases, but the unit cannot be removed from the shaft, apply a puller to the bushing to push the shaft free.**

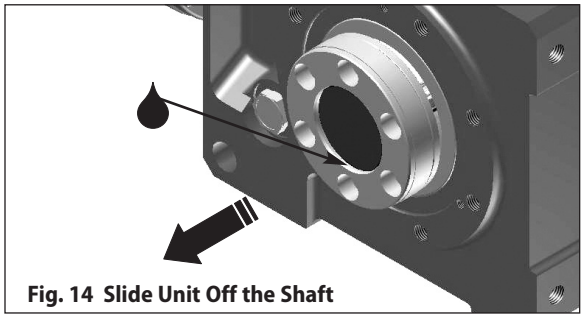


Fig. 14 Slide Unit Off the Shaft

Parts List

General Construction
Helical Gear Output Section

Figure 5.19 Helical Gear Output Section

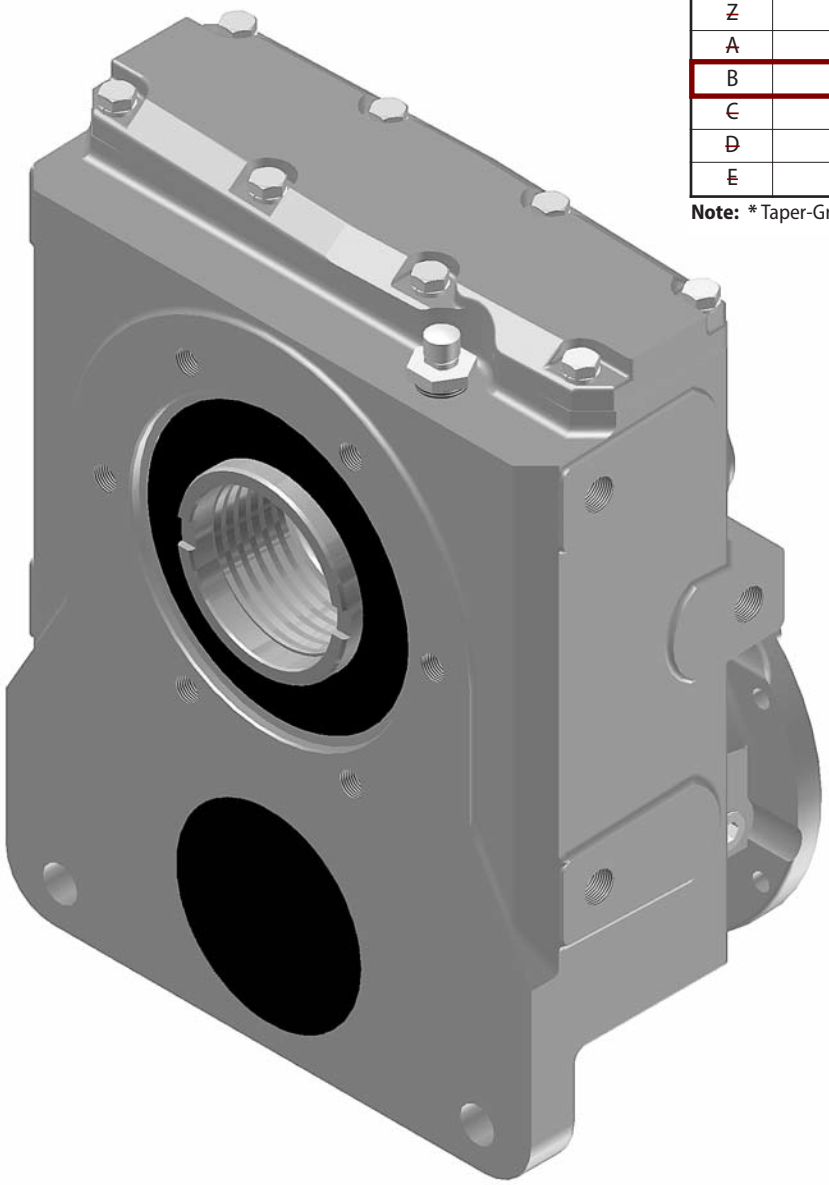


Table 5.18 Helical Gear Output Assembly Part Numbers

Unit Size	Output Assembly Part Number*
~~Z~~	~~037L0004~~
~~A~~	~~037A0004~~
B	037B0004
~~C~~	~~037C0004~~
~~D~~	~~037D0004~~
~~E~~	~~037E0004~~

Note: * Taper-Grip® Bushing not included.

Parts List continued

Cyclo Reducer Input Section
Double Reduction

Figure 5.21

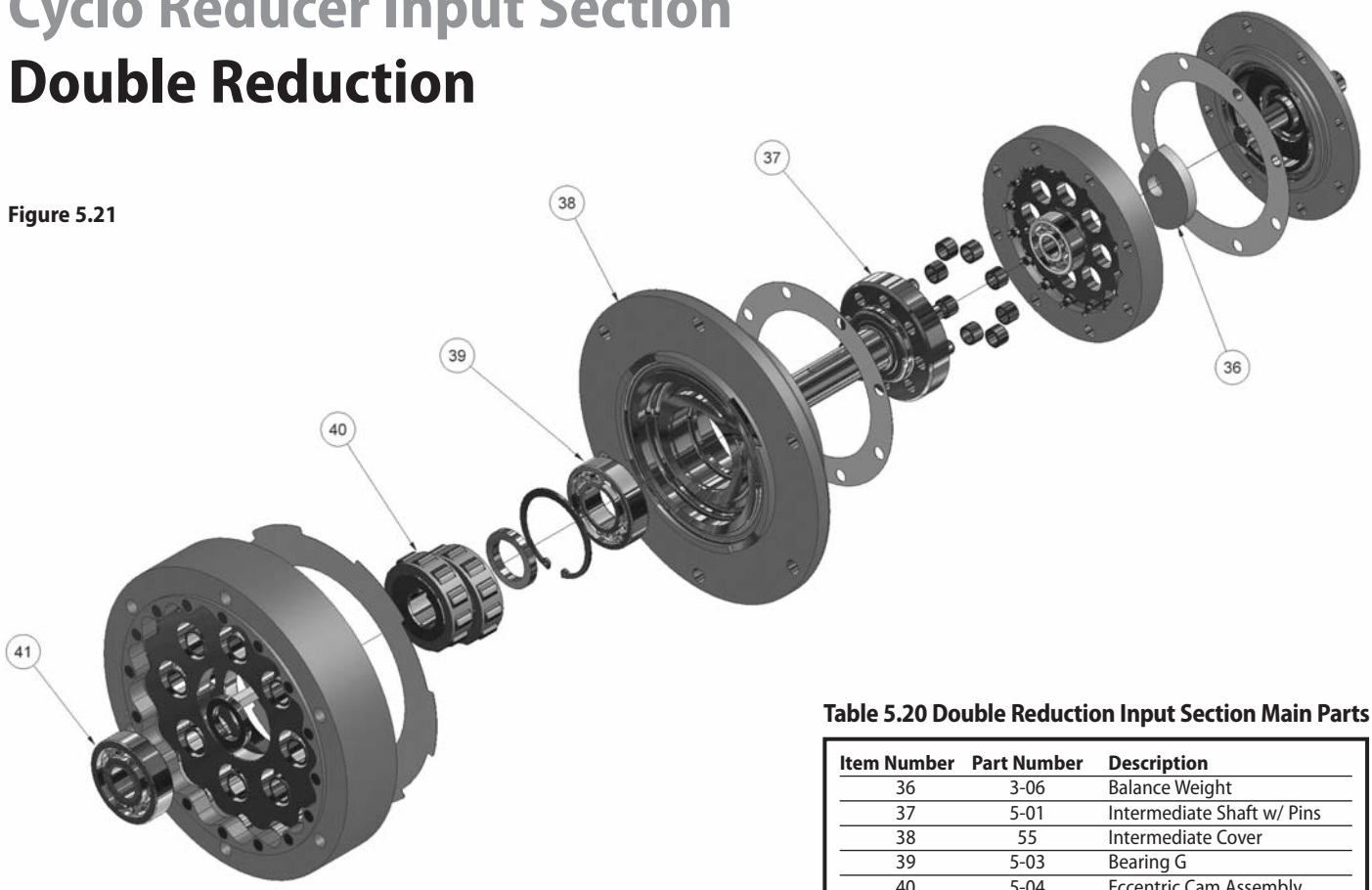


Table 5.20 Double Reduction Input Section Main Parts

Item Number	Part Number	Description
36	3-06	Balance Weight
37	5-01	Intermediate Shaft w/ Pins
38	55	Intermediate Cover
39	5-03	Bearing G
40	5-04	Eccentric Cam Assembly
41	5-02	Bearing F

Note: The parts listed are a general representation of the components found in a single and double reduction Cyclo.

Specific units may or may not contain all shown here.

Please consult the factory for specific part questions.

Lubrication

Oil lubricated models are not filled with oil prior to shipping.

Before operating, fill the unit with the appropriate amount of the correct lubricant for the mounting position (see Table 5.36 and 5.38). When operating in winter or other relatively low ambient temperatures, use the lower viscosity oil specified for each ambient temperature range. Please consult the factory if the unit will be operated consistently in ambient temperatures other than 32°F–104°F.

Table 5.36 Standard Oils

Ambient Temperature (°F)	ChevronTexaco	Exxon Oil	Mobil Oil	Shell Oil	BP Oil
14 to 41°	EP Gear Compound 68	Spartan EP 68	Mobilgear 600 XP 68 (ISO VG 68)	Omala Oil 68	Energol GR-XP 68
32 to 95°	EP Gear Compound 100, 150	Spartan EP 100 EP 150	Mobilgear 600 XP 100, 150 (ISO VG 100, 150)	Omala Oil 100, 150	Energol GR-XP 100 GR-XP 150
86 to 122°	EP Gear Compound 220, 320, 460	Spartan EP 220 EP 320 EP 460	Mobilgear 600 XP 220, 320, 460 (ISO VG 220–460)	Omala Oil 220, 320 460	Energol GR-XP 220 GR-XP 320 GR-XP 460

Grease lubricated models are lubricated with grease prior to shipment from the factory.

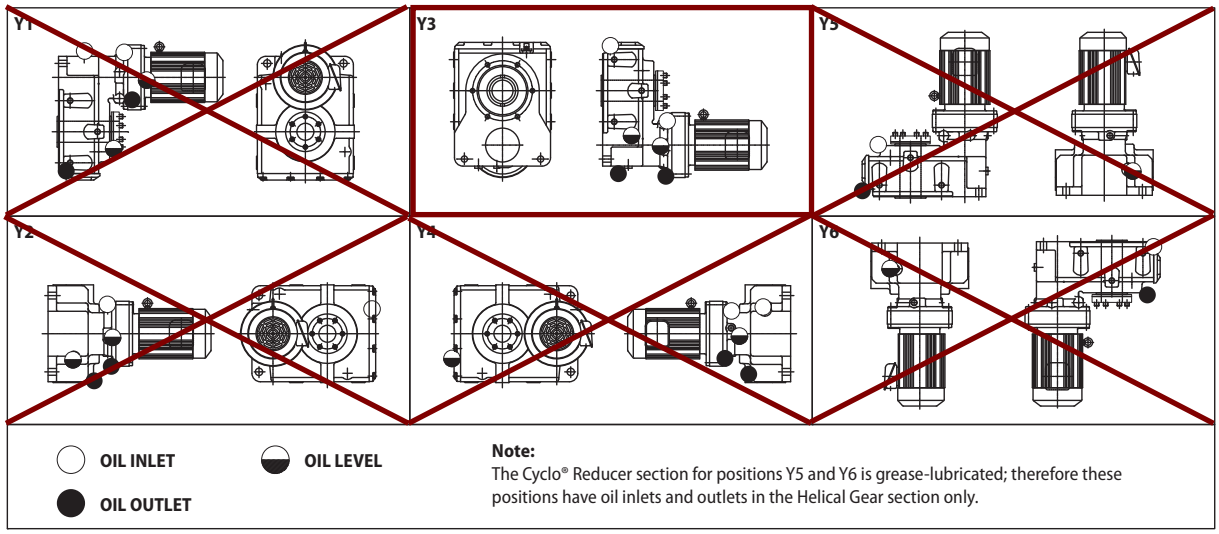
Adding grease prior to initial start-up is not required. If grease must be replenished or changed (see Grease Lubrication section), avoid using greases other than those shown in the Table 5.37. Please consult the factory when the units will be used in widely fluctuating temperatures, ambient temperatures other than those specified in Table 5.37, or when other special conditions exist for the application. When motors from another manufacturer will be used, please consult and adhere to the associated motor maintenance manual for the appropriate lubrication instructions.

Table 5.37 Standard Greases

Ambient Temperature (°F)	Reduction Ratio	Input (Cyclo Side)
14 to 122°	~~11, 18:1~~	~~Shell Alvania EP 0~~
	21:1 and higher	ExxonMobil Unirex N2 Grease

Figure 5.26

Oil Plug Locations



Note:
The Cyclo® Reducer section for positions Y5 and Y6 is grease-lubricated; therefore these positions have oil inlets and outlets in the Helical Gear section only.

Lubrication continued

Table 5.38 Oil Fill Quantities Unit: **U.S. Gallons** *G = Grease

Model	Y1		Y2		Y3		Y4		Y5		Y6	
	Output	Input*	Output	Input*	Output	Input*	Output	Input*	Output	Input*	Output	Input*
~~Z6090/95~~	~~0.16~~	~~G~~	~~0.16~~	~~G~~	~~0.13~~	~~G~~	~~0.16~~	~~G~~	~~0.29~~	~~G~~	~~0.26~~	~~G~~
~~A6100/05~~	~~0.21~~	~~G~~	~~0.24~~	~~G~~	~~0.18~~	~~G~~	~~0.24~~	~~G~~	~~0.40~~	~~G~~	~~0.37~~	~~G~~
B6120/25	~~0.26~~	~~G~~	~~0.40~~	~~G~~	0.26 (1)	G (2)	~~0.40~~	~~G~~	~~0.53~~	~~G~~	~~0.48~~	~~G~~
~~C6140/45~~	~~0.45~~	~~0.11~~	~~0.55~~	~~0.11~~	~~0.34~~	~~0.11~~	~~0.55~~	~~0.11~~	~~1.24~~	~~G~~	~~0.92~~	~~G~~
~~D6160/65~~	~~0.71~~	~~0.18~~	~~0.92~~	~~0.18~~	~~0.53~~	~~0.18~~	~~0.92~~	~~0.18~~	~~1.85~~	~~G~~	~~1.45~~	~~G~~
~~E6170/75~~	~~0.92~~	~~0.24~~	~~1.11~~	~~0.24~~	~~0.66~~	~~0.24~~	~~1.11~~	~~0.24~~	~~2.38~~	~~G~~	~~1.85~~	~~G~~

Oil lubricated units are shipped without oil. Prior to initial start-up, the unit must be filled with the correct amount of oil (see Table 5.38). For those units where both the gear and Cyclo® portions are oil lubricated, the oil must be filled in two separate locations, one on the gear housing and one on the Cyclo® housing.

(1) The helical (output) portion of all **double reduction units** is oil lubricated and must be filled by the customer with the correct amount of oil (see Table 5.38) prior to initial start-up.

Grease lubricated models are lubricated at the factory. Additional grease does not need to be added prior to initial start-up.

(2) The Cyclo® (input) portion of all **double reduction units** are grease lubricated at the factory. Additional grease does not need to be added prior to initial start-up.

Oil Replenishment and Change Interval

A. Maintain proper oil levels at all times.

B. An oil change after the first 500 hours of operation is highly recommended.

C. Sumitomo recommends an oil change every 2500 hours, or six months, whichever comes first. If a proper preventive maintenance program is implemented and maintained, a longer change period may be acceptable.

D. If the unit is running in a high ambient, high humidity, or corrosive environment, the lubricant will have to be changed more frequently. Consult the factory for recommendations.

E. Note: The Cyclo® portion and Helical portion, where applicable, must be filled with oil separately. Oil does not flow from one section to the other.

Grease Replenishment and Change Interval

~~A. On single reduction Cyclo® Helical Buddybox (Cyclo® HBB) sizes Z6090/95, A6100/05 and B6120/25, the Cyclo® portion is grease lubricated as standard and therefore maintenance free. Consult the operations and maintenance manual for the grease change interval.~~

~~B. When mounting Cyclo® HBB sizes C6140/45, D6160/65 and E6170/75 in the Y5 and Y6 positions, please consult the maintenance and operations manual for the proper grease replenishment and change interval for the Cyclo® portion.~~

(1) The helical (output) portion is filled with oil for long term storage by Parkson before unit shipment.

Warranty

Sumitomo warrants that its Cyclo® HBB Speed Reducers will deliver their continuous catalog ratings and up to 300% intermittent SHOCK LOAD CAPACITY, provided they are properly installed, maintained and operated within the limits of speed, torque or other load conditions under which they were sold. Sumitomo further states that Cyclo® HBB Speed Reducers are warranted to be free from defects in material or workmanship for a period of two years from the date of shipment. Sumitomo assumes no liability beyond product repair or replacement under this limited warranty.

For construction purposes, be sure to obtain certified dimension sheets or drawings. Although we take every precaution to include accurate data in our catalog, we cannot guarantee such accuracy. If performance guarantees are required, they should be obtained in writing from the factory. Full consideration will be given to such requests when complete details are given of the proposed installation.

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Sumitomo Machinery Corporation of America

Catalog 07.601.50.004; Supersedes Catalog 07.601.50.003

Sumitomo Drive Technologies
Long Term Storage Instructions

I. Oil Lubricated:

A. 6 Months to One Year Storage
   1. Fill with rust preventative oil or circulating oil.
   2. At approximately three-month intervals, rotate the input shaft a sufficient number of times to insure all internal components remain coated.
      Note: The higher the ratio, the greater the amount needed for proper lubrication.
   3. To return unit to operation
      a. Completely drain the rust preventative, or circulating oil from the unit
      b. Flush unit with the recommended operating oil.
      c. After flushing, fill the unit to the proper oil level with the recommended lubricating oil.

B. One Year or Longer Storage
   1. Treatment by Sumitomo before shipment
      a. No-load running with a rust preventative oil NP-10, then the oil is drained.
      b. Next NP-20 rust preventative lubricant is sprayed on the inside housing after draining the rust preventative lubricant or circulating oil.
      c. The oil filler cap is covered with tape or a polyethylene bag.
   2. Long Term Storage by customer after prepared by Sumitomo
      a. After a period of one year and each year afterward, customer is required to fill the unit with Shell VSA Circulating oil 100 to the recommended oil level and re-cover the oil filler cap.
   3. To return unit to operation
      a. Drain the rust preventative or circulating oil.
         Note: No operation with the rust preventative or circulating oil is permitted.
      b. Flush twice with the recommended unit oil before putting into operation.
      c. Fill to the proper level with the recommended oil.

II. Grease Lubricated:

A. Within one year, no action is required before operation.
B. For operation after storage longer than one year, it is recommended that the unit be disassembled and the grease changed. For single reduction maintenance free units, test run the unit with the grease filler plug removed, discharge excess grease, and put the plug back in place.

Special Note: Non-metallic parts such as oil seals, oil gauges, and oil filler plugs can be adversely affected by ambient conditions such as temperature, weather, and ultraviolet rays. After storing the unit for an extended period, carefully inspect the unit before starting operation. Replace all parts that have been affected.

PARKSON PART NUMBER:	0006456
MANUFACTURER:	Baldor
TYPE:	TEFC, Explosion Proof
MODEL NUMBER:	VM7006A
NEMA FRAME SIZE:	56C, C-Face, Footless, Rolled Steel
MOUNTING:	F1
HORSEPOWER:	1/2 Hp
POWER:	208-230/460 Volts, 3 Phase, 60 Hz
SERVICE FACTOR:	1.0
TIME RATING/DUTY:	Continuous, 40 deg C Ambient Temperature
INSULATION:	Class B
FULL LOAD AMPS:	1.0 Amps @ 460 V
LOCKED ROTAR KVA CODE:	L
NEMA DESIGN CODE:	B
EFFICIENCY:	74%
HAZARDOUS LOCATION CLASSIFICATION, UL & CSA:	Class 1, Group D, Class 2, Groups F & G
FRAME TEMPERATURE CODE:	T3C

NOTES:

1. Unit is supplied with automatic thermal overload device to ensure motor T code rating.

Single and Three Phase, C-Face, No Drip Cover

1/3 thru 50 Hp

NEMA 56C thru 326TC

Applications: Pumps, blowers, valves.

Features: Corrosion resistant epoxy finish. Positively locked drive end bearing. U.L. approved cast conduit box-standard. 1.00 S.F. U.L. and CSA approved for Class I, Group D or Class II, Group F & G.

Hp	RPM	NEMA Frame	Catalog Number	XP [a] Cls/Grp	List Price	Mult. Sym.	"C" Dim.	Aprx. Wt. (lb)	Full Load Efficiency	Voltage	Full Load Amps	Notes [b]
Single Phase, C-Face, Foot Mounted												
1/3	1800	56C	**CL5001A**	⑧	696	K	13.22	30	60	115/208-230	3	
1/2	3600	56C	**CL5003A**	⑧	611	K	13.22	31	57	115/230	3.7	
	1800	56C	**CL5004A**	⑧	697	K	14.22	37	64	115/208-230	3.7	
3/4	1800	56C	**CL5007A**	⑦	777	K	15.17	48	66	115/230	5.3	
1	3600	56C	**CL5009A**	⑦	693	K	15.17	49	66	115/230	6	
	1800	56C	**CL5023A**	①	883	K	15.17	48	67	115/230	6.5	
1 1/2	3600	143TC	**CL5030T**	⑧	1,087	L1	15.23	54	70	115/208-230	7.5	
	1800	184C	**CL5013**	⑧	1,764	L1	16.93	81	70	115/230	9.5	
2	3600	143TC	**CL5031T**	⑧	1,242	L1	16.10	61	74	115/208-230	11.5	
	1800	182TC	**CL5027T**	①	1,820	L1	18.86	96	75	115/230	11	
3	3600	184TC	**CL5028T**	①	1,841	L1	18.86	96	76	115/230	14.5	
	1800	215C	**CL5018**	⑧	2,825	L1	19.56	154	79	115/230	15	
5	1800	215C	**CL5020**	①	3,597	L1	20.69	170	84	230	21	
Single Phase, C-Face, Footless												
1/4	1800	56C	**VL5000A**	⑧	616	K	12.25	30	60	115/230	3	
1/3	3600	56C	**VL4005A**	⑧	469	K	12.25	30	60	115/230	3	
	1800	56C	**VL5001A**	⑧	629	K	13.22	29	60	115/208-230	3	
	1200	56C	**VL5002A**	⑦	843	K	14.30	42	54	115/230	3.4	
1/2	3600	56C	**VL5003A**	⑧	606	K	13.22	30	57	115/230	3.7	
	1800	56C	**VL5004A**	⑧	695	K	14.22	36	64	115/208-230	3.7	
	1200	56C	**VL5005A**	⑦	967	K	15.17	50	59	115/230	4	
3/4	3600	56C	**VL5006A**	⑦	648	K	14.30	40	62	115/230	4.9	
	1800	56C	**VL5007A**	⑦	774	K	15.17	47	66	115/230	5.3	
1	3600	56C	**VL5009A**	⑦	695	K	15.17	49	66	115/230	6	
	1800	56C	**VL5023A**	①	879	K	15.17	51	67	115/230	6.5	
1 1/2	3600	56C	**VL5030**	①	1,001	K	14.39	54	75	115/230	8	
	1800	56C	**VL5024A**	①	1,161	K	17.42	72	75	115/230	8	
2	1800	184C	**VL5027**	①	1,847	L1	16.93	87	75	115/208-230	11	
Three Phase, C-Face, Foot Mounted												
1/2	3600	56C	**CM7005A**	⑧	729	K	13.22	28	68	208-230/460	1.1	
	1800	56C	**CM7006A**	⑧	790	K	13.22	30	74	208-230/460	1	
3/4	3600	56C	**CM7009A**	⑧	753	K	13.22	30	75	208-230/460	1.3	
	1800	56C	**CM7010A**	⑧	805	K	14.22	35	73	208-230/460	1.5	
1	3600	56C	**CM7013**	⑧	788	K	13.22	31	75.5	208-230/460	1.8	
	1800	56C	**CM7014**	⑧	858	K	14.30	41	77	208-230/460	1.7	19
		143TC	**CM7014T**	⑧	858	L1	14.36	44	82.5	230/460	1.65	19
1 1/2	3600	143TC	**CM7018T**	⑧	893	L1	14.36	47	82.5	230/460	2.1	19
	1800	56C	**CM7034**	⑧	915	K	14.30	44	78.5	208-230/460	2.5	19
		145TC	**CM7034T**	⑧	915	L1	15.23	49	84	230/460	2.2	19

[a] See explosion proof symbols on inside back flap.
[b] See notes on inside back flap and pages 5-6.

Single and Three Phase, C-Face, No Drip Cover

Hp	RPM	NEMA Frame	Catalog Number	XP [a] Cls/Grp	List Price	Mult. Sym.	"C" Dim.	Aprx. Wt. (lb)	Full Load Efficiency	Voltage	Full Load Amps	Notes [b]
Three Phase, C-Face, Foot Mounted (continued)												
2	3600	145TC	**CM7071T**	⑧	885	L1	15.23	52	84	230/460	2.6	19
	1800	56C	**CM7037**	⑧	990	K	15.17	52	82.5	208-230/460	3.1	19
		145TC	**CM7037T**	⑧	990	L1	15.23	53	84	230/460	2.9	19
3	3600	145TC	**CM7075T**	①	1,110	L1	17.48	69	85.5	230/460	3.7	
	1800	182TC	**CM7042T**	⑧	1,276	L1	18.86	92	87.5	230/460	4.1	19
		L182TC	**P18G1181**	⑧	1,431	L1	17.88	139	87.5	230/460	3.9	
5	3600	184TC	**CM7072T**	⑧	1,485	L1	18.86	101	87.5	230/460	5.6	19
	1800	184TC	**CM7044T**	⑧	1,535	L1	18.80	111	87.5	230/460	6.7	19
		L184TC	**P18G1182**	⑧	1,722	L1	17.88	144	87.5	230/460	6.5	
7 1/2	3600	184TC	**CM7073T**	①	1,674	L1	20.36	111	88.5	230/460	8.3	
		213TC	**CM7045T**	⑧	1,963	L1	20.33	173	88.5	230/460	8.9	19
	1800	213TC	**CM7047T**	⑧	1,778	L1	21.08	183	89.5	230/460	10.1	19
		213TC	**P21G1156**	⑧	1,994	L1	20.00	183	89.5	230/460	9.5	
10	3600	215TC	**CM7174T**	⑧	2,103	L1	20.65	215	89.5	230/460	11.6	19
	1800	215TC	**CM7170T**	⑧	2,103	L1	20.65	232	89.5	230/460	13	19
		215TC	**P21G1157**	⑧	2,358	L1	20.00	196	89.5	230/460	12.2	
15	3600	254TC	**CM7053T**	⑧	2,257	L1	26.00	345	90.2	230/460	17	19
	1800	254TC	**CM7054T**	⑧	3,671	L1	26.00	386	91	230/460	18	19
		254TC	**P25G1146**	⑧	4,117	L1	25.06	337	91	230/460	19.5	
20	3600	256TC	**CM7059T**	⑧	2,844	L1	26.00	372	90.2	230/460	23	19
	1800	256TC	**CM7056T**	⑧	4,264	L1	26.00	362	91	230/460	24	19
		256TC	**P25G1147**	⑧	4,781	L1	25.06	371	91	230/460	25.4	
25	3600	286TSC	**CM7063T**	⑧	3,714	L1	27.24	524	91	230/460	28.5	19
	1800	284TC	**CM7058T**	⑧	5,306	L1	28.61	532	92.4	230/460	30.8	19
30	1800	286TC	**CM7060T**	⑧	5,998	L1	28.61	533	92.4	230/460	36	19
40	1800	324TC	**CM7062T**	⑧	8,108	L1	32.00	735	93	230/460	47	19
50	1800	326TC	**CM7064T**	⑧	9,170	L1	32.00	763	93	230/460	60	19
Three Phase, C-Face, Footless												
1/4	1800	56C	**VM7001A**	⑧	733	K	10.75	26	71	208-230/460	0.7	15
1/3	1800	56C	**VM7002A**	⑧	748	K	13.22	28	67	208-230/460	0.8	
1/2	3600	56C	**VM7005A**	⑧	725	K	13.22	28	68	208-230/460	1.1	
	1800	56C	**VM7006A**	⑧	788	K	13.22	30	74	208-230/460	1	
	1200	56C	**VM7007A**	⑦	917	K	14.30	38	70	208-230/460	1.2	
3/4	3600	56C	**VM7009A**	⑧	748	K	13.22	29	75	208-230/460	1.3	
	1800	56C	**VM7010A**	⑧	802	K	14.22	33	73	208-230/460	1.5	
	1200	56C	**VM7031A**	⑦	962	K	15.17	44	77	208-230/460	1.4	
1	3600	56C	**VM7013**	⑧	780	K	13.22	31	75.5	208-230/460	1.8	
	1800	56C	**VM7014**	⑧	842	K	15.22	41	75.5	208-230/460	1.8	
		143TC	**VM7014T**	⑧	842	L1	14.36	40	77	208-230/460	1.7	19
	1200	56C	**VM7032**	①	1,014	K	15.17	46	75.5	208-230/460	1.7	
1 1/2	3600	143TC	**VM7018T**	⑧	887	L1	14.36	41	75.5	208-230/460	2.3	19
	1800	56C	**VM7034**	⑧	907	K	14.20	43	78.5	208-230/460	2.5	19
		145TC	**VM7034T**	⑧	907	L1	14.36	43	78.5	208-230/460	2.5	19
	1200	145TC	**VM7035T**	①	1,037	L1	16.10	58	80	230/460	2.6	
2	3600	145TC	**VM7071T**	⑧	992	L1	15.23	47	78.5	208-230/460	2.7	19
	1800	56C	**VM7037**	⑧	981	K	15.17	48	82.5	208-230/460	3.1	19
		145TC	**VM7037T**	⑧	981	L1	15.23	50	82.5	208-230/460	3.1	19
3	3600	145TC	**VM7075T**	①	1,101	L1	15.23	54	82.5	208-230/460	3.8	
		182TC	**VM7026T**	⑧	1,161	L1	17.49	74	81.5	208-230/460	3.9	19
	1800	182TC	**VM7042T**	⑧	1,258	L1	17.49	81	82.5	230/460	4.3	19
5	3600	184TC	**VM7072T**	⑧	1,468	L1	18.06	97	85.5	208-230/460	6	19
	1800	184TC	**VM7044T**	⑧	1,532	L1	18.80	111	86.5	230/460	6.5	19
7 1/2	3600	184TC	**VM7073T**	①	1,657	L1	20.36	107	87.5	230/460	8.8	19
		213TC	**VM7045T**	⑧	1,930	L1	19.19	144	84	230/460	9.3	19
	1800	213TC	**VM7047T**	⑧	1,774	L1	19.19	156	86.5	230/460	10.5	19
10	1800	215TC	**VM7170T**	⑧	2,152	L1	20.65	220	88.5	230/460	13.8	19

[a] See explosion proof symbols on inside back flap.
[b] See notes on inside back flap and pages 5-6.
Cast Iron Frame

BALDOR

General Information

Abbreviations: The Basic Baldor catalog number consists of a letter(s) prefix and several non-significant proceeding numbers. A suffix letter(s) and/or number(s) may also be part of the catalog number. For example L3510 or L3510T. Following is a list of prefix and suffix definitions.

Catalog Number Prefix:

AEM	Automotive Motor (GM7EHQ)
AF	Aeration Fan Motor
AM	Automotive (Motor GM7EQ)
ANF	Auger Flange Motor
AO	Air-Over Motor
AP	Subfractional HP, PM Motor
AS	Arbor Saw Motor
B	Brake Motor
BC	DC Motor Speed Control
BK	Single Phase Gearmotor Kit
BLW	Blower Kit
BMC	Brushless DC Motor Control
BSM	Brushless Servo Motors
BTG	Tachometer Generator
BU	Bushing Kit
C	NEMA C-Face with Base
CBL	Cable Assembly
CD	Wound Field DC Motor NEMA C-Face with Base
CDP	PM SCR Drive Motor
CDPT	PM SCR Drive Motor with Integral Tachometer
CDPWD	Washdown PM SCR Drive Motor, NEMA C-Face
CDPSWD	PM Paint Free Washdown SCR Drive Motor C-Face with base
CDPX	PM Explosion Proof SCR Drive Motor - C-Face with base
CDX	Wound Field Explosion Proof DC Motor, NEMA C-Face
CESWDM	Paint Free Super-E Washdown - C-Face with base
CF	Condenser Fan Motor
CHC	Direct Drive Fan Motor with Resilient Base
CP	Severe Duty Motor
CR	Crusher Motor
CSC	Checkout Stand Motor
CSM	Baldor SmartMotor
CSSEWDM	All Stainless Super-E Washdown-C-Face with base
CSSWDM	All Stainless Washdown - C-Face with base
CSWDM	Paint Free Washdown - C-Face with base
CWAM	Dirty Duty Washdown - C-Face with base
CWDSM	Baldor Washdown SmartMotor
D	DC Shunt or Compound Motor or Definite Purpose Soft Start Control
DE	Vacuum Pump Motor
DG	Gate Operator Motor
DMG	Lifting Magnet Generator
DOC	Door Operator Motor
DR	Double Reduction
E	Super-E Premium Efficiency
EH3	Above - EPAct Efficiency HVAC Duty with Connection Box located on top of Motor
ECP	Super-E Premium Efficiency, Severe Duty Motor
EN	Encoder Kit
FM	F-2 Mount Motor
FCD	Drip Cover Kit
FD	Farm Duty Motor
FFC	Fan Cover/Conduit Box Kit
FL	Flange Kit
G	Subfractional HP Gear Motor
GC	Permanent Split Capacitor and Split Phase
GCP	Permanent Split Capacitor and Split Phase Parallel Shaft Gearmotor
GD	Centrifugal Fan Motor
GF	900 Series Reducers
GP	Subfractional HP PM Motor
GPP	PM Parallel Shaft Gear Motor
GSF	Universal Series Right Angle Gear Reducers
GS	Grain Stirring Motor
H	Definite Purpose HVAC Motors
H3	HVAC Duty with Connection Box located on top of Motor
HP	Hydraulic Pump Motor
ID	Inverter Control
IDM	Inverter Drive Motor-TEBC
IDNM	Inverter Drive Motor-TENV
IDWNM	Washdown Inverter Motors-TENV
IDXM	Explosion proof Inverter Drive Motors-TEFC
IM	Irrigation Drive Motor
IR	Instant Reversing Single Phase Farm Motor
J	NEMA 56J Stainless Steel Threaded Shaft with Dripcover
JM	NEMA JM Pump shaft & Face with Base
JP	NEMA JP Pump shaft & Face with Base
JSL	Square Flange Pump Motors with threaded shaft.
K	Model 34 Diameter Motor with 56 C-Face, less Base
KN	Model 34 Diameter TENV Motor with 56 C-Face, less Base
L	Single Phase
LRA	Line Reactor
M	Three Phase
M	Multipurpose Soft Start Control
MM	Metric Dimension Motor with Base
MPM	Three Phase Metering Pump
MVM	Metric Dimension Motor, Flange Mount less Base
N	Totally Enclosed Non ventilated
OF	Design D, High Slip Motor (Oil Field)
P15	Pre-Engineered Control Panel
PSC	Permanent Split Capacitor
R	Repulsion-Start, Induction-Run Motor
RBT	Roller Bearing Conversion Kit
RES	Resolver Feedback Kit
RG	Regeneration Resistor Assembly
RH	Definite Purpose HVAC Motors
RL&RM	Resilient Base(Cradle Mount)
RT	Dynamic Braking Resistor Assembly
S	Single Phase Soft Start
SD	Series 23H Servo Control
SS	All Stainless Washdown Duty
SWD	Stainless Washdown Duty
T	Torque Control
TA	Torque Arm
TM	Definite Purpose HVAC Motors with Terminal Panel Endplate
TK	Tachometer Mounting Kit
UC	Universal Crop Dryer Motor
V	NEMA C-Face less Base
VH	Vertical Pump Motor, Normal Thrust
VJM	NEMA JM Pump Shaft and Face less Base
VLCP	Vertical Pump Motor, Medium Thrust
VP	PM SCR Drive Motor with Metric Face or Flange
VPCP	Vertical Pump Motor, High Thrust
WC	West Coast Fit NEMA TCZ
WD	Washdown Duty
WW	Woodworking Motor
ZD	Vector Control
ZDM	Vector Drive Motor-TEBC
ZDNM	Vector Drive Motor-TENV
ZDWNM	Washdown Vector Motors-TENV

Catalog Number Suffix:

-2	120/240V Field
-277	277 Volt Winding
-4	460 Volt Winding
-5	575 Volt Winding
-8	200 Volt Winding
-9	NEMA Design C High Torque Winding
-12	12 Leads
/35	Full 140 Frame Band Diameter
/36	Full 180 Frame Band Diameter
-50	Wound for 50 Hertz Service
-2341	2300/4160 Volt Winding
A	Automatic Thermal Overload
BV	Blower Vented
-C	Listing includes Class I, Group C
-CL	Open Chassis Enclosure, Line Regenerative
-CO	Open Chassis Enclosure, no internal braking
E	Electric Switch
-E	NEMA 1 Enclosure, built in Dynamic Braking
-EL	NEMA 1 Enclosure, Line Regenerative
-EO	NEMA 1 Enclosure, no internal braking
-ER	NEMA 1 Enclosure, built in Dynamic Braking Transistor
-I	Explosion-Proof, 1.15 Service Factor
M	Manual Thermal Overload
-MO	Protected Chassis Enclosure, no internal braking
P	Wound Field DC Motor NEMA “AT” Frame
-P	Partial AC Motor Excludes
R-	Roller Bearing
T	NEMA "T" Frame Dimension
TP	Feather Picker Motor
TR	NEMA “T” Frame-Roller Bearing
TS	NEMA "TS" Frame Short Shaft Pulley Endplate
-V12	12 Volt DC
-V24	24 Volt DC
-W	NEMA 4 Enclosure
-WR	Washdown Rating

Gear Reducer Suffix: 900 Series

A	56C Motor Flange
B	140TC Motor Flange
C	180TC Motor Flange
G	Left Hand Output Shaft
H	Double End Output Shaft
J	Right Hand Output Shaft

Gear Reducer Suffix: Universal Series

A	56C or Right Hand Output Shaft
B	140TC
C	180TC

Grinder Catalog Number Suffix:

D	Deluxe
E	Exhaust Guards
W	Wide Design

Other Abbreviations:

C	Permanent Split Capacitor
L	Capacitor-Start, Induction-Run Motor
LC	Capacitor-Start, Capacitor-Run Motor
S	Split Phase
X	Explosion-Proof

CATALOG NOTES:

1 Class F Insulated Motor with 1.15 Service Factor or higher that operates within Class "B" temperature limits at rated horsepower.
2 1.00 Service Factor.
3 Capacitor start, induction run.
4 Wye-start, delta-run.
5 Belted duty only, roller bearing.
6 F-2 Mounting
7 Companion voltages not available.
8 Class "H" Insulated.
9 Motors are not NAFTA qualified.
10 These motors meet the hardware requirements of IEEE 45/ABS and are not provided with Marine Plan Documentation.
11 F-3 Mounting
13 Furnished without conduit box. Order kit P/N K56G3230.
14 Type CH (Capacitor Start - Capacitor Run).
15 Motors rated 208-230/460 are operable to minimum 200 volts.
17 Capable of 100% thrust in either direction.
18 Capable of 100% thrust stated in downward direction (out of motor) and 40% upward thrust (into motor).
19 60/50 Hertz motor. 60 Hertz data shown, contact your local Baldor•Reliance office for 50 Hertz data.
20 Class F Insulation.
21 Double bolt.
22 Base used for NEMA & above NEMA frames, 445T.
23 Two piece slide rails.
24 DOL or Part Winding Start.
25 DOL or Wye Start, Delta Run
26 Non-standard "BA" due to drive end bearing cooling fan. Please refer to layout drawing.
27 Motors have ball bearing suitable for coupled loads. If load is belted, a roller bearing may be required, contact your local Baldor•Reliance office.
28 Usable at 200 volts.
29 V-dimension is 2.5".
30 Usable at 208 volts.
31 Suitable for 230/460, 60 Hz and 190-220/380-440 volts, 50 Hz.
32 Stearns brake.
33 Voltage at 60Hz.
34 Dodge D series brake.
35 Design A, also meets Design E inrush limits.
36 Can mount as 56, 143T & 145T frames with NEMA 56 shaft dimensions.
37 Can mount as 56, 143T & 145T frames with NEMA 143T-145T shaft dimensions.
38 Can mount as NEMA 56, 143T and 145T frames with NEMA 56 frame shaft dimensions.
39 Class F Rise
40 Brake motors may be mounted for vertical mounting with brake below motor.
41 Brake motors may be mounted for vertical mounting with brake above or below motor.
42 DODGE Short Series Brake.
43 Cannot be mounted vertically.
44 Shown as WPI enclosure.
45 Horizontal mount, no C-Face. May be converted to C-Face in Mod Express or built as custom motors.
46 Includes 1024 ppr encoder.
47 BA dimension does not meet NEMA standards.
48 Includes phase insulation. Suitable for inverter duty.
49 Includes vertical lifting provision.
50 Cast Iron 140 Frame.
51 BISSC Certified.
52 IP55 Enclosure.
53 Voltage at 50Hz.
54 Motors have NEMA standard BA dimensions.
55 Constant velocity fan: 115 volts, single phase.
57 Can mount as NEMA 145T frame with 145T frame shaft dimensions.
58 Can mount as NEMA 56, 143T and 145T frames with NEMA 143T-145T frame shaft dimensions.
59 Suitable for operation @ 415V, 50 Hz.
60 Totally-Enclosed, Non-Ventilated, Continuous Duty.
61 Copper bar rotor standard.
63 Foot also drilled for 447T frame mounting.
64 Motors include 100 ohm platinum winding RTDs and space heaters.
65 Capacitor start, capacitor run (two value capacitor).
66 Resilient mount single phase motors with moderate starting torque for fan applications.
67 Voltage at 50//60 Hz.
68 3 lead.
69 6 lead suitable for part winding start on 200 volts.
70 Constant velocity fan: 230/460 volts, three phase.
71 Nominal efficiency is based at the 1800 RPM (High RPM) and low speed efficiency is available just not published.
73 SCR Motors with a 3:1 constant torque speed range.
74 V-dimension is 3".
76 Flexible waterproof cover protects thermal overload reset button.
77 Inverter Duty.
78 Furnished without conduit box. Order Kit BKP2400.
80 Design criteria similar to motors in Commercial Duty Motors section.
81 5.5 inch frame – Aluminum end shield standard enclosure
82 6.3 inch frame – Aluminum end shield standard enclosure
84 Does not meet NEMA BA for C-face footed motors
85 Can only be used on motors 1800 RPM and slower with ball bearings
86 Cannot be operated at full nameplate rating on 50 Hz rectified power supply
87 Tach adaptable with Thermostat
88 Sleeve bearings - coupled loads only.
89 Cooling fan on each end.
90 Includes thermostat.
91 Blower on drive end.
92 Force vent with blower and filter. Full nameplate rating on 50 Hz rectified power, AC supply voltage must be same as 60 Hz supply.
93 Force vent with blower, full nameplate rating on 50 Hz rectified power. AC supply voltage must be same as 60 Hz supply, thermostats and tach provisions.
94 Force vent with blower, cannot run full nameplate on 50 Hz rectified power, thermostats and tach provisions.
95 Force vent with blower on drive end filter, thermostats and tach provisions.
106 Finned aluminum frame construction.

EXPLOSION-PROOF MOTOR SYMBOLS:

① Class I, Group D, T2C.
② Class I, Group C & D, Class II, Group F & G, T4.
③ Class I, Group D, Class II Group E, F & G, T3C
④ Class I, Group C & D, Class II, Group F & G, T3C
⑤ Class I, Group C & D, T3C.
⑥ Class I, Group D, T2A.
⑦ Class I, Group D, Class II, Group F & G, T4.
⑧ Class I, Group D, Class II, Group F & G, T3C.
⑨ Class I, Group D, T2B

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2230 SOUTH MAIN STREET
SALT LAKE CITY, UT 84115
PHONE: 801-832-0127
FAX: 801-832-8911

WISCONSIN
MILWAUKEE
2725 SOUTH 163RD STREET
NEW BERLIN, WI 53151
PHONE: 262-784-5940
FAX: 262-784-1215

INTERNATIONAL SALES
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P.O. BOX 2400
FORT SMITH, AR 72902
PHONE: 479-646-4711
FAX: 479-648-5895

CANADA
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4053-92 STREET
EDMONTON, ALBERTA T6E 6R8
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FAX: 780-438-2600

TORONTO
OAKVILLE, ONTARIO
2750 COVENTRY ROAD
OAKVILLE, ONTARIO L6H 6R1
PHONE: 905-829-3301
FAX: 905-829-3302

MONTREAL, QUEBEC
5155, J.A. BOMBARDIER
ST-HUBERT (QUÉBEC) CANADA
J3Z 1G4
PHONE: 514-933-2711
FAX: 514-933-8639

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1538 KEBET WAY
PORT COQUITLAM,
BRITISH COLUMBIA V3C 5M5
PHONE 604-421-2822
FAX: 604-421-3113

WINNIPEG, MANITOBA
54 PRINCESS STREET
WINNIPEG, MANITOBA R3B 1K2
PHONE: 204-942-5205
FAX: 204-956-4251

AUSTRALIA
UNIT 3, 6 STANTON ROAD
SEVEN HILLS, NSW 2147, AUSTRALIA
PHONE: (61) (2) 9674 5455
FAX: (61) (2) 9674 2495

UNIT 8, 5 KELLETTS ROAD
ROWVILLE, VICTORIA, 3178 AUSTRALIA
PHONE: (61) (3) 9753 4355
FAX: (61) (3) 9753 4366

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RESIDENCIAL PINARES DE SUIZA
POL. 15 #44,
NVA. SAN SALVADOR, EL SALVADOR
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SWITZERLAND
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FAX: 0041 91 630 26 33

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2-21-1 TSURUYA-CHO,
KANAGAWA-KU
YOKOHAMA, 221-0835, JAPAN
PHONE: 81-45-412-4506
FAX: 81-45-412-4507

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KM. 2.0 BLVD. AEROPUERTO
LEÓN 37545, GUANAJUATO, MÉXICO
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FAX: +52 477 761 2010

MIDDLE EAST & NORTH AFRICA
VSE INTERNATIONAL CORP.
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FAX: 847 590 5587

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ENTREPRENEUR BUSINESS CENTRE
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FAX: (65) 6747 1708

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NANTUN DISTRICT,
TAICHUNG CITY 408
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UNITED KINGDOM
6 BRISTOL DISTRIBUTION PARK
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VENEZUELA
PHONE/FAX: +58 212 272 7343
MOBILE: +58 414 114 8623

BALDOR • RELIANCE

Product Information Packet

VM7006A

.5HP,1725RPM,3PH,60HZ,56C,X3416M,XPFC,F1

Product Detail							
Revision:	N	**Status:**	PRD/A	**Change #:**		**Proprietary:**	No
Type:	AC	**Prod Type:**	3416M	**Elec. Spec:**	34WG1543	**CD Diagram:**	CD0007
Enclosure	XPFC	**Mfg Plant:**		**Mech Spec:**	34-5336	**Layout:**	34LY5336
Frame:	56C	**Mounting:**	F1	**Poles:**	04	**Created Date:**	
Base:	N	**Rotation:**	R	**Insulation:**	B	**Eff. Date:**	02-01-2005
Leads:	12#18	**Literature:**		**Elec. Diagram:**		**Replaced By:**	

Nameplate NP0016XP					
NO.		**CC**			
SER.					
SPEC.	34-5336-1543				
CAT.NO.	VM7006A				
HP	1/2	**T. CODE**	T3C		
VOLTS	208-230/460				
AMPS	2.1-2/1				
RPM	1725				
HZ	60	**PH**	3	**CL**	B
SER.F.	1.00	**DES**	B	**CODE**	L
RATING	40C AMB-CONT				
FRAME	56C	**NEMA-NOM-EFF**	74	**PF**	63
USABLE AT 208V	2.1				

Parts List

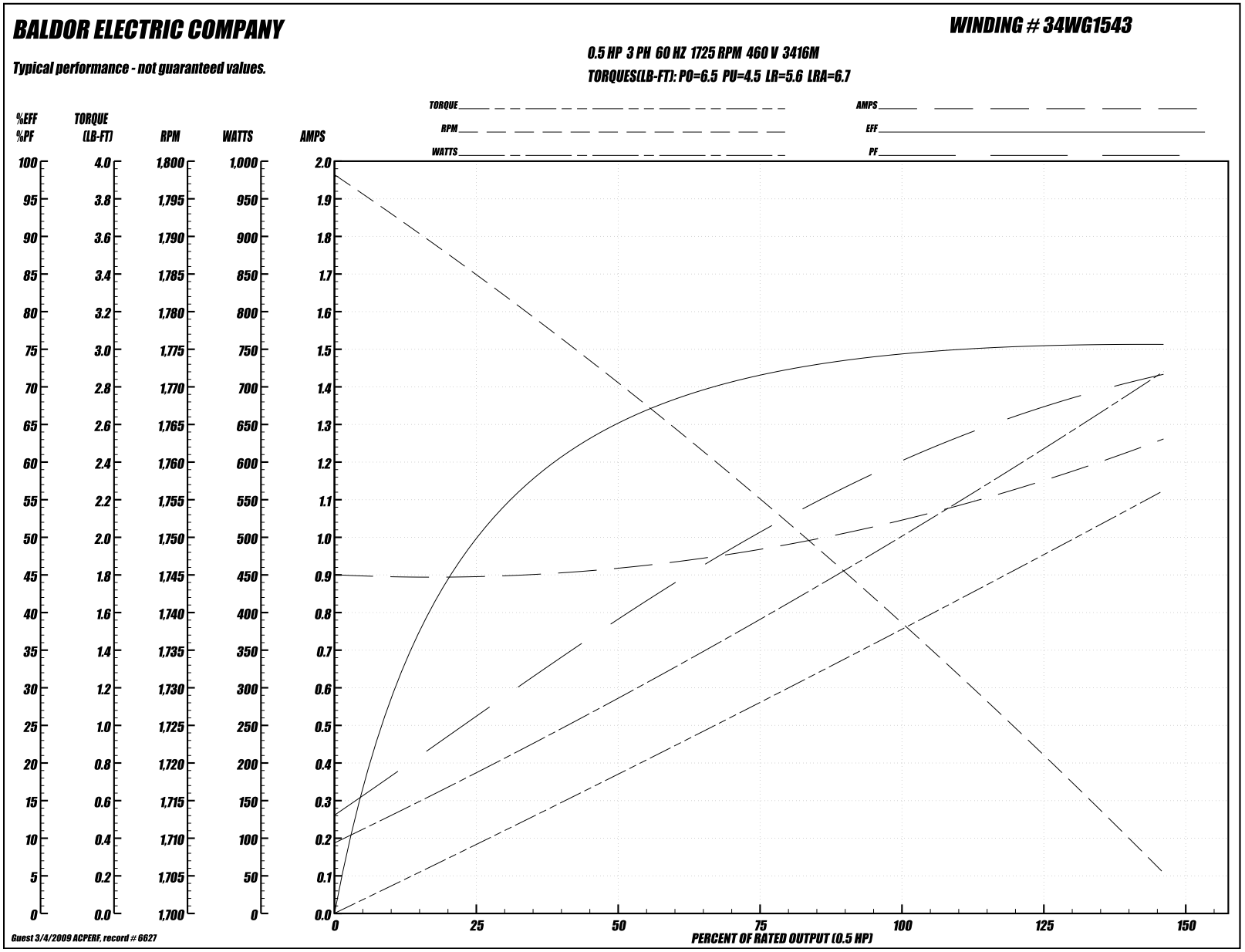
Product ID	Description	Quantity	List Price
SA009026	SA 34-5336-1543	1.000	473.00
RA005473	RA 34-5336-1543	1.000	394.00
35CB3001A01SP	EXPL CONDUIT BOX, MACH, 1/2" PIPE TAP LE	1.000	36.00
11XW1032G06	10-32 X .38, TAPTITE II, HEX WSHR SLTD U	1.000	4.00
HW3001A01	D3019 BRASS WASHER(STIMP)	1.000	3.00
34EP3703A01	FR ENDPLATE, MACH XP	1.000	70.00
MJ5000A01	SEALANT, CHICO A COMPOUND	0.050	
51XW0832A07	8-32 X .44, TAPTITE II, HEX WSHR SLTD SE	2.000	3.00
HW4002A02	1-11.5X2LG PIPE NIPPLE (F/S)	1.000	5.00
HA1025A13	WSHR,FELT,.38" THICK F-26 CLASS	1.000	2.00
HW3021E06	1/8 DIA X 5/8 ROLLPIN (F/S)	1.000	2.00
HW5100A03SP	WAVY WASHER (W1543-017)	1.000	3.00
34EP3705A01SP	PU ENDPLATE, MACH	1.000	76.00
34FN3002A01SP	EXTERNAL FAN, PLASTIC, .637/.639 HUB W/	1.000	17.00
34FH4002A01SP	IEC FH NO GREASER	1.000	28.00
51XW1032A06	10-32 X .38, TAPTITE II, HEX WSHR SLTD S	3.000	4.00
35CB3500A01SP	CONDUIT BOX LID, MACH	1.000	21.00
10XN2520A16	1/4-20 X 1 HEX HEAD CAP SCR, ZINC PLATED	4.000	4.00
HW1001A25	LOCKWASHER 1/4, ZINC PLT .493 OD, .255 I	4.000	3.00
HW2501D13SP	KEY, 3/16 SQ X 1.375	1.000	3.00
HA7000A04	KEY RETAINER 0.625 DIA SHAFTS	1.000	3.00
HA6001A01	THERMAL RETAINER (PLATED)	1.000	3.00
12XF0632A06	6-32X3/8 TY F HEX HD SLT	2.000	4.00
NS2500A05	INSULATOR, AUTO THER PROT	1.000	2.00

Parts List (continued)

Product ID	Description	Quantity	List Price
WD1000A16	2-520128-2 AMP FLAG TERMINAL(4M/RL)	3.000	983.00
MG1025G05	PAINT DRK MET.GRAY,W/ACTIVATOR	0.014	218.00
85XU0407A04	#4-7 X 1/4 DRIVE PIN	6.000	3.00
NP0018	NP- XP CONDUIT BOX	1.000	3.20
TPMYJ70KX	THERMAL 3PH 0.75 AUT 120C	1.000	77.00
SP5037A01	TERMINAL PLATE ASS'Y MODEL 34 - 3 PHASE	1.000	20.00
HA3104A03	THRUBOLT 5/16-18 X 7.625 W QTE#457	4.000	3.00
WD1000A16	2-520128-2 AMP FLAG TERMINAL(4M/RL)	12.000	983.00
LC0007	CONN.DIAGRAM (3PHASE W/THERMAL)	1.000	3.00
LB1125C01	STD (STOCK) CARTON LABEL BALDOR WITH FLA	1.000	3.00
LB1118	LABEL,WARNING (ROLL LABEL)	1.000	3.00
NP0016XP	UL/CSA, CLI GP-D,CLII GP-F&G,CC,ATO	1.000	
34PA1005	PACKING GROUP, BALDOR	1.000	12.00

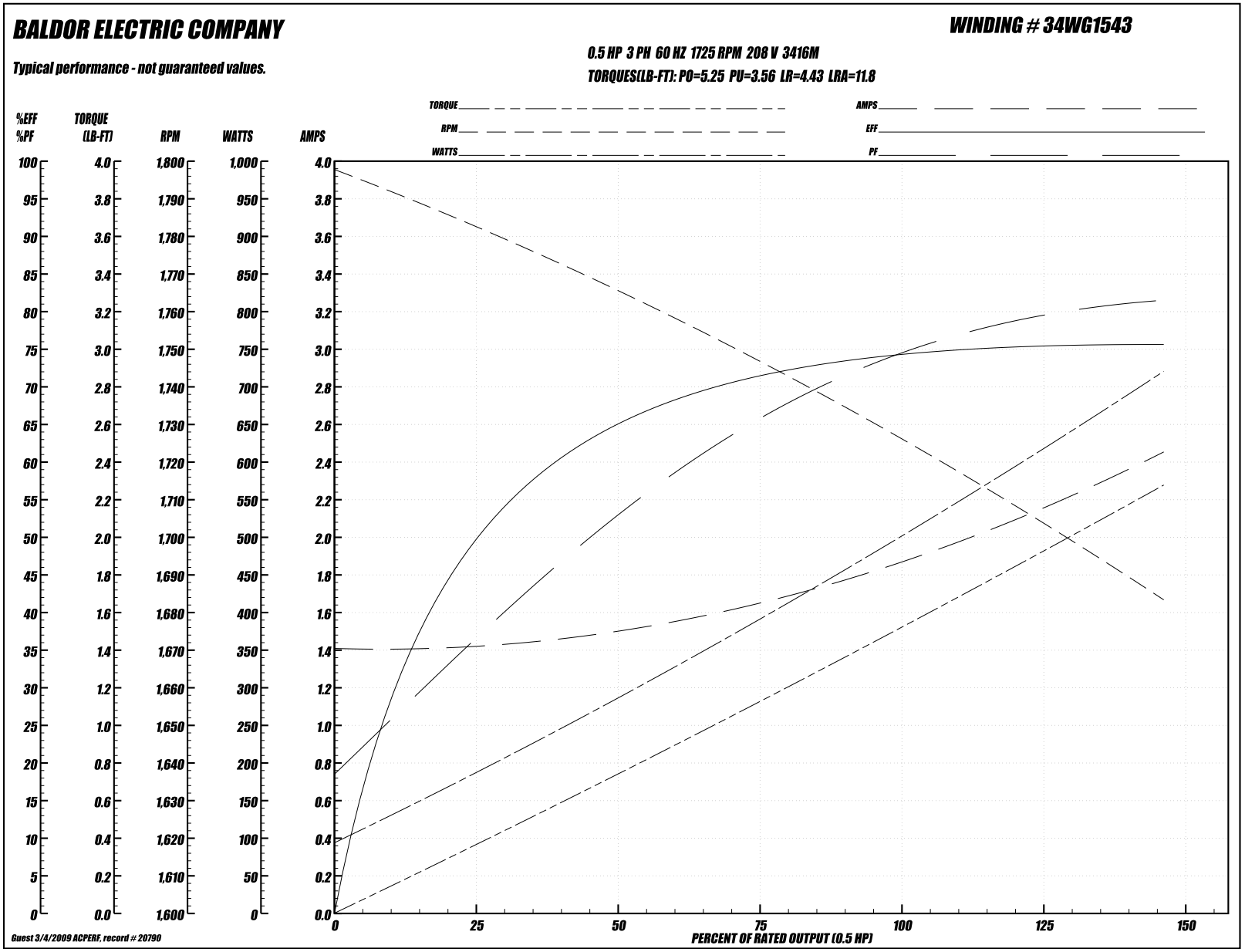
Performance Data at 460V, 60Hz, 0.5HP (Typical performance - Not guaranteed values)							
General Characteristics							
Full Load Torque:	1.5 LB-FT			**Start Configuration:**		DOL	
No-Load Current:	0.89 Amps			**Break-Down Torque:**		6.5 LB-FT	
Line-line Res. @ 25°C.:	33.0 Ohms A Ph / 0.0 Ohms B Ph			**Pull-Up Torque:**		4.5 LB-FT	
Temp. Rise @ Rated Load:	59ºC			**Locked-Rotor Torque:**		5.6 LB-FT	
Temp. Rise @ S.F. Load:	0ºC			**Starting Current:**		6.7 Amps	
Load Characteristics							
% of Rated Load:	**25**	**50**	**75**	**100**	**125**	**150**	**S.F.**
Power Factor:	27.0	39.0	51.0	60.0	67.0	72.0	0.0
Efficiency:	49.8	65.0	71.7	74.5	75.6	75.5	0.0
Speed:	1785.0	1770.0	1756.0	1737.0	1724.0	1705.0	0.0
Line Amperes:	0.9	0.94	0.98	1.0	1.15	1.27	0.0

Performance Graph at 460V, 60Hz, 0.5HP (Typical performance - Not guaranteed values)

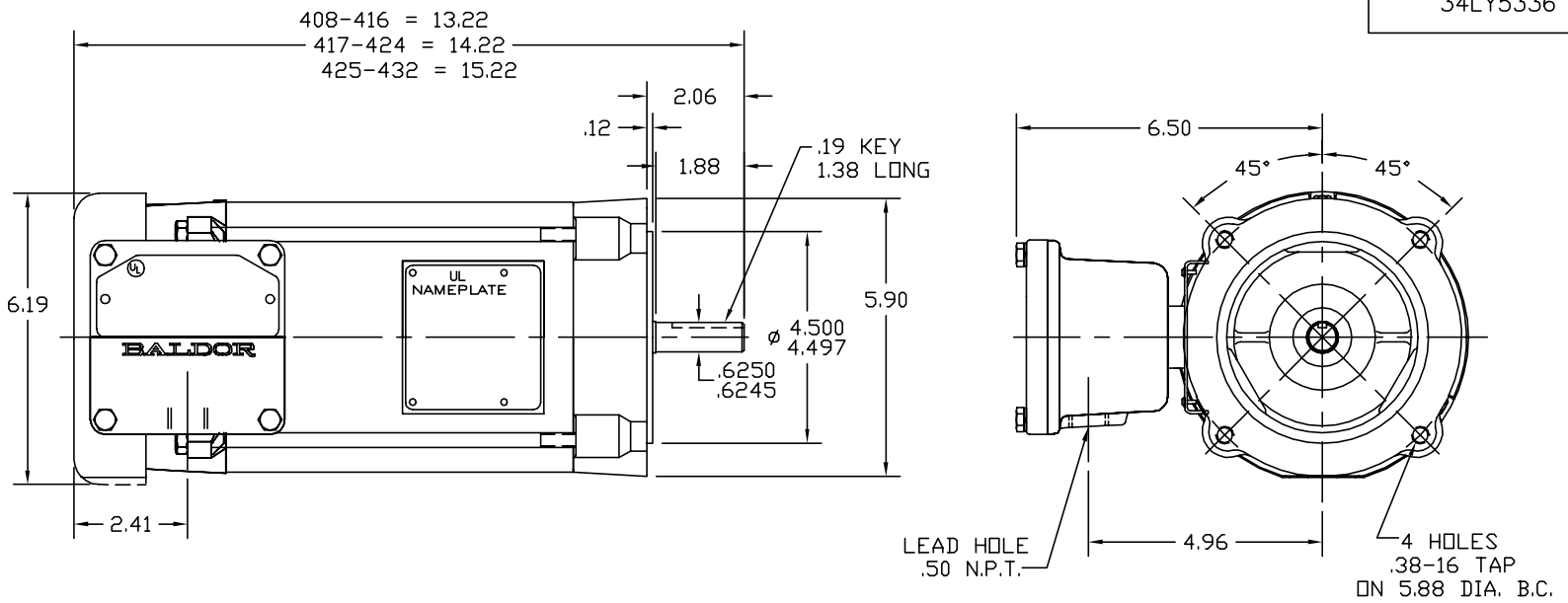


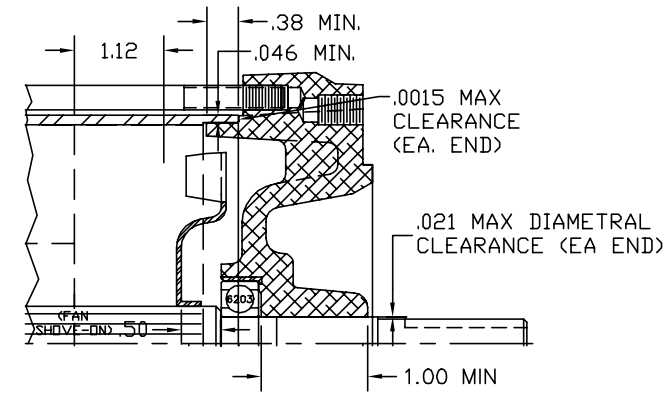
Performance Data at 208V, 60Hz, 0.5HP (Typical performance - Not guaranteed values)							
General Characteristics							
Full Load Torque:	1.51 LB-FT			**Start Configuration:**		DOL	
No-Load Current:	1.39 Amps			**Break-Down Torque:**		5.25 LB-FT	
Line-line Res. @ 25°C.:	8.35 Ohms A Ph / 0.0 Ohms B Ph			**Pull-Up Torque:**		3.56 LB-FT	
Temp. Rise @ Rated Load:	50ºC			**Locked-Rotor Torque:**		4.43 LB-FT	
Temp. Rise @ S.F. Load:	0ºC			**Starting Current:**		11.8 Amps	
Load Characteristics							
% of Rated Load:	**25**	**50**	**75**	**100**	**125**	**150**	**S.F.**
Power Factor:	37.0	52.0	65.0	77.0	79.0	81.0	0.0
Efficiency:	49.3	64.9	71.8	74.4	75.5	75.5	0.0
Speed:	1782.0	1765.0	1748.0	1725.0	1707.0	1683.0	0.0
Line Amperes:	1.43	1.54	1.67	1.79	2.14	2.47	0.0

Performance Graph at 208V, 60Hz, 0.5HP (Typical performance - Not guaranteed values)



34LY5336



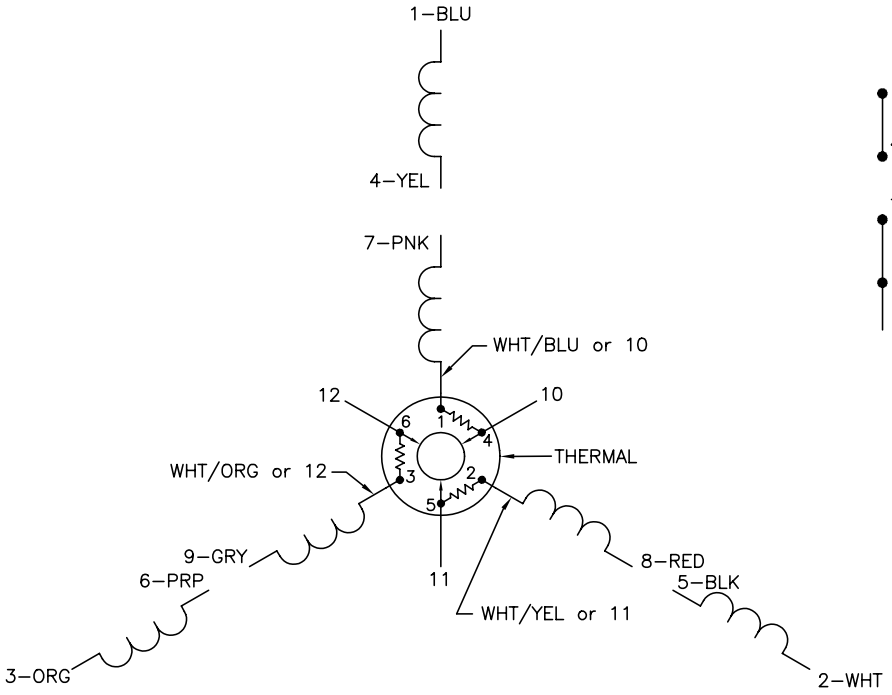


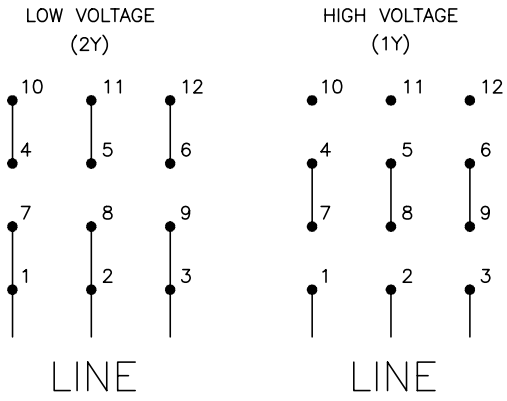
CUSTOMER IS RESPONSIBLE FOR DETERMINING THAT MOTOR PERFORMANCE IS SUITABLE IN THE APPLICATION.

REV. DESC: UPDATED GRAPHIC			BALDOR ELECTRIC Co.
REV. LTR: D	VERSION: 01	TDR: 000000421280	
34LY5336	FILE: \AAA\00026\670	REVISED: 07:41:48 02/02/2007	STD VERT X34M NEMA 56C TEFC W/ATO CL1 GP D, CL2 GP F & G
	MTL: –	BY: ENROSTO	

34LY5336

CD0007





NOTES:

1. INTERCHANGE ANY TWO LINE LEADS TO REVERSE ROTATION.
2. ACTUAL NUMBER OF INTERNAL PARALLEL CIRCUITS MAY VARY.
3. LEAD COLORS ARE OPTIONAL. LEADS MUST ALWAYS BE NUMBERED AS SHOWN.

REV. DESC: ADDED "CK" PLANT CODE			BALDOR ELECTRIC Co.
REV. LTR: E	BY: EAH	REVISED: 05/06/99 17:1	TDR: 0181040
CD0007		FILE: AAA00008370	MDL: –
		MTL: –	3PH, DV, THERMAL, 12 LEADS

CD0007

Motor Current Monitor Data

Over/Under Current Sensing
ECS Series
Current Sensor

- Toroidal Through Hole Wiring
- 0.5...50 A Trip Point
- Adjustable ~~or Factory Fixed~~ Trip Delays
- 10 A SPDT Isolated Output Contacts
- 5% Trip Point Hysteresis (Dead Band)

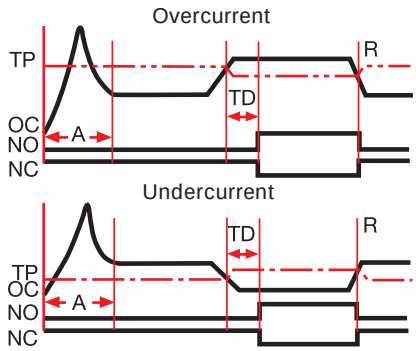
Approvals:

Description
The ECS Series of Single Phase AC Current Sensors is a universal, overcurrent or undercurrent sensing control. Its built-in toroidal sensor eliminates the inconvenience of installing a stand-alone current transformer. Includes onboard adjustments for current sensing mode, trip point, and trip delay. Detects over or under current events like locked rotor, loss of load, an open heater or lamp load, or proves an operation is taking place or has ended.

Operation
Input voltage must be supplied at all times for proper operation. When a fault is sensed throughout the trip delay, the output relay is energized. When the current returns to the normal run condition, the output and the delay are reset. If a fault is sensed and then corrected before the trip delay is completed, the relay will not energize and the trip delay is reset to zero.

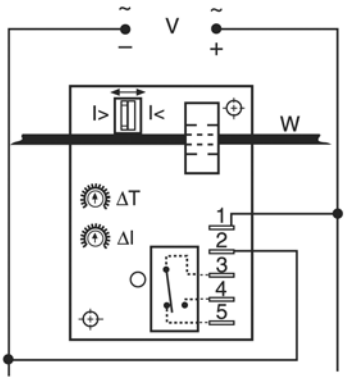
Adjustment
Select the desired function, over or under current sensing. Set the trip point and trip delay to approximate settings. Apply power to the ECS and the monitored load. Turn adjustment and watch the LED. LED will light; turn slightly in opposite direction until LED is off. Adjustment can be done while connected to the control circuitry if the trip delay is set at maximum.

Function



TP = Trip Point R = Reset OC = Monitored Current
NO = Normally Open Contact NC = Normally Closed Contact A = Sensing Delay On Start Up
TD = Trip Delay

Connection



Relay contacts are isolated.
Dashed lines are internal connections.

V = Voltage I> = Overcurrent I< = Undercurrent
W = Insulated Wire Carrying Monitored Current

Accessories

Female quick connect P/Ns:
P1015-13 (AWG 10/12)
P1015-64 (AWG 14/16)
P1015-14 (AWG 18/22)

See accessory pages for specifications.

Ordering Table

X Series	X Input	X Trip Point	X Trip Delay	X Sensing Delay on Start up
~~ECS (selectable over or under current sensing)~~	~~1 - 12 V DC~~	Fixed	~~F - Factory Fixed: Specify .08 ... 50 s~~	~~Blank - 0 s~~
ECSH -(overcurrent sensing)	~~2 - 24 V AC~~	~~Specify 2 ... 50 A in 1 A increments~~	**Adjustable Ranges**	~~C - 1 s~~
~~ECSL (undercurrent sensing)~~	~~3 - 24 V DC~~	**Adjustable Ranges**	A - 0.150 ... 7 s	D - 2 s
	4 - 120 V AC	~~0 - 0.5 ... 5 A~~	~~B - 0.5 ... 50 s~~	~~E - 3 s~~
	~~6 - 230 V AC~~	1 - 2 ... 20 A		~~F - 4 s~~
		~~H - 5 ... 50 A~~		~~G - 5 s~~
				~~H - 6 s~~

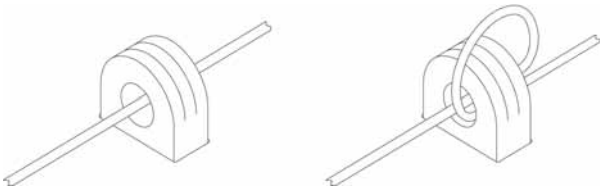
Example P/N: ECS41AC Fixed – ECSH610AD

ECS02B01 12.28.04

Over/Under Current Sensing
ECS Series
Current Sensor

Technical Data

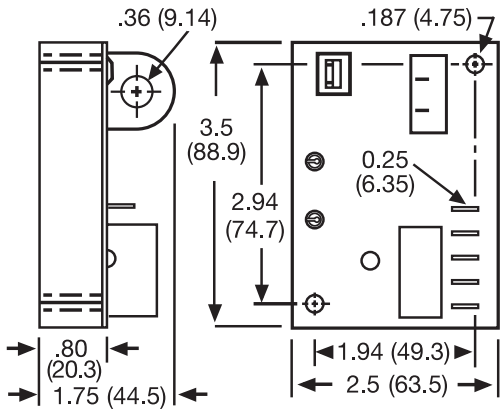
Sensor		
Type		Toroidal, through hole wiring
Mode		Over ~~or under~~ current, switch selectable on the unit ~~or factory fixed~~
Trip Point Range		0.5 ... 50 A in 3 adjustable ranges or fixed
Tolerance:	Adjustable	Guaranteed range
	~~Fixed~~	~~0.5 ... 25 A: 0.5 A or +/-5% whichever is less; 26 ... 50 A: +/-2.5%~~
Maximum Allowable Current		Steady – 50 A turns; Inrush – 300 A turns for 10 s
Trip Point Hysteresis		≅ +/-5%
Trip Point vs. Temperature		+/-5%
Response Time		≤ 75 ms
Frequency		45 ... 500 Hz
Type of Detection		Peak detection
Trip Delay		
Type		Analog
Range:	Adjustable	0.150 ... 7 s; ~~0.5 ... 50 s~~ (Guaranteed ranges)
	~~Factory Fixed~~	~~0.08 ... 50 s (+/-10%)~~
Delay vs. Temperature		+/-15%
Sensing Delay on Startup		Factory fixed 0 ... 6 s: +40% ... 0%
Input		
Voltage		~~24~~ , 120, ~~or 230~~ V AC; ~~12 or 24 V DC~~
Tolerance	~~12 V DC & 24 V DC/AC~~	~~-15% ... +20%~~
	120 ~~& 230~~ V AC	-20% ... +10%
Line Frequency		50 ... 60 Hz
Output		
Type		Electromechanical relay
Form		Isolated single pole double throw (SPDT)
Rating		10 A resistive at 240 V AC; 1/4 hp at 125 V AC; 1/2 hp at 250 V AC
Life		Mechanical – 1 x 10^6 ; Electrical – 1 x 10^5
Protection		
Circuitry		Encapsulated
Isolation Voltage		≥ 2500 V RMS input to output
Insulation Resistance		≥ 100 MΩ
Mechanical		
Mounting		Surface mount with two #6 (M3.5 x 0.6) screws
Termination		0.25 in. (6.35 mm) male quick connect terminals (5)
Humidity		95% relative, non-condensing
Operating/Storage Temperature		-40°C ... +60°C / -40°C ... +85°C
Weight		≅ 6.4 oz (181 g)



Multiple Turns To Increase Sensitivity
To increase sensitivity, multiple turns may be made through the ECS's toroidal sensor. The trip point range is divided by the number of turns through the toroidal sensor to create a new range.

~~**Using an External Current Transformer (CT)**~~
~~Select a 2 VA, 0 to 5 A output CT, rated for the current to be monitored. Select ECS adjustment range 0. Pass the CT's secondary wire lead through the ECS's toroid and connect both ends together.~~

Mechanical View



Inches (Millimeters)

8

ECS02B01 12.28.04

Float Switch Data
(Intrinsically Safe)

Rev. 2.10

File No. LR54245

Listed 83N2

FT-300

Mechanically Activated, Narrow Angle Float Switch

- Passed NSF Standard 61 protocol by an approved Water Quality Association laboratory
- Mechanically activated, snap action contacts
- High impact, corrosion resistant, polypropylene float housing
- Not sensitive to rotation
- Control differential of 1.5 in. (4 cm) above or below horizontal

The FT series cable suspended floats are designed for high or low level indication. The FT series is a miniature switch actuated design ideally suited to operate pumps, valves and similar equipment used in municipal wastewater treatment facilities.

~~Standard cable lengths are 20 ft. (6 m), and are available up to 30 ft. (9 m).~~ The switch operating levels are easily adjustable by altering the height of the cable fixing point.

Operational Description

This narrow angle sensing device is used to accurately monitor liquid levels in potable water, water and sewage applications.

The FT-300 is not sensitive to rotation.

Normally Open Model (high level)

The control switch turns on (closes) when the float tips slightly above horizontal, signaling a high level. It turns off (opens) when the float drops slightly below horizontal.

~~**Normally Closed Model (low level)**~~

~~The control switch turns on (closes) when the float drops slightly below horizontal, signaling a low level. It turns off (opens) when the float tips slightly above horizontal.~~

liquid level sensing

Automation Products Group, Inc.
1025 West 1700 North Tel. 1/888/525-7300
Logan, UT 84321 USA Fax 1/435/753-7490

www.apgsensors.com
sales@apgsensors.com

■ Specifications

Cable: Flexible 18 gauge, 2 conductor (UL, CSA) SJOW, water resistant (CPE)
Float: 2.74 in. dia. x 4.83 in. long (7.0 cm x 12.3 cm), high impact, corrosion resistant, polypropylene housing for use in sewage and water up to 140°F (60°C)
Maximum Water Depth: 30 ft. (9 m), 13 psi (90 kPa)
Electrical **125 VAC:** Maximum Electrical Load: 0.1 A Minimum Electrical Load: 0.160 mA **30 VDC:** Maximum Electrical Load: 0.1 A Minimum Electrical Load: 0.160 mA **5 VDC:** Minimum Electrical Load: 1 mA

Note: This switch can be used in hazardous locations provided they are operated in conjunction with appropriately rated and installed intrinsically safe barriers. Specifications are subject to change without notice.

■ Ordering Information

FT–300 [ ] – [ ]

Configuration
- **A** (NO) Normally Open
- **B** ~~(NC) Normally Closed~~

Cable Length
- ~~(null) 6 m~~ [100 Feet]
- ~~**L**__ m (Optional cable length designation)~~

liquid level sensing

Automation Products Group, Inc.
1025 West 1700 North Tel. 1/888/525-7300
Logan, UT 84321 USA Fax 1/435/753-7490
www.apgsensors.com
sales@apgsensors.com

• Introduction

This narrow angle sensing device is used to accurately monitor liquid levels in potable water, water and sewage applications. The FT-300 is not sensitive to rotation.

Normally Open Model (high level)

The control switch turns on (closes) when the float tips slightly above horizontal, signaling a high level. It turns off (opens) when the float drops slightly below horizontal.

~~Normally Closed Model (low level)~~

~~The control switch turns on (closes) when the float drops slightly below horizontal, signaling a low level. It turns off (opens) when the float tips slightly above horizontal.~~

• Specifications

Operational Version:	FT-300A Normally Open ~~FT-300B Normally Closed~~
Float:	PP housing; 2.74 in. dia. x 4.83 in. long
Max. Water Depth:	30 ft. (9 m)
Max. Temperature:	140°F (60°C)
Max. Pressure:	30 psi
Cable:	18 AWG, 2 or 3 conductor (UL, CSA), SJOW, water resistant CPE jacket
Contact Rating:	**125 VAC** Maximum Electrical Load: 0.1 A Minimum Electrical Load: 0.160 mA **30 VDC** Maximum Electrical Load: 0.1 A Minimum Electrical Load: 0.160 mA **5 VDC** Minimum Electrical Load: 1 mA

Note: This switch can be used in hazardous locations provided they are operated in conjunction with appropriately rated and installed intrinsically safe barriers.

• Installation WITH INTRINSICALLY SAFE BARRIER RELAY

Warning! – Electrical Shock Hazard
Disconnect power before installing or servicing this product. A qualified service person must install and service this product according to applicable electrical and plumbing codes.

Warning! – Explosion or Fire Hazard
Do not use this product with flammable liquids. Do not install in hazardous locations as defined by National Electrical Code ANSI/NFPA 70.

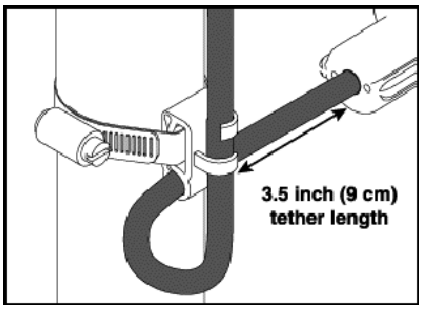
Failure to follow these precautions could result in serious injury or death. Replace product immediately if switch cable becomes damaged or severed. Keep these instructions with warranty after installation. This product must be installed in accordance with National Electrical Code ANSI/NFPA 70 so as to prevent moisture from entering or accumulating within boxes, conduit bodies, fittings, float housing or cable.

Mounting Clamp

1. Place the cord into the clamp as shown in Figure A.
2. Locate the clamp at the desired activation level and secure the clamp to the discharge pipe as shown in Figure A. **Note:** Do not install cord under hose clamp.
3. Tighten the hose clamp using a screwdriver. Over tightening may result in damage to the plastic clamp. Make sure the float cable is not allowed to touch the excess hose clamp band during operation.
4. Bring cable leads back to control device and wire according to Figure B.
5. Check installation. Allow system to cycle to ensure proper operation.

Note: All hose clamp components are made of 18-8 stainless steel material.

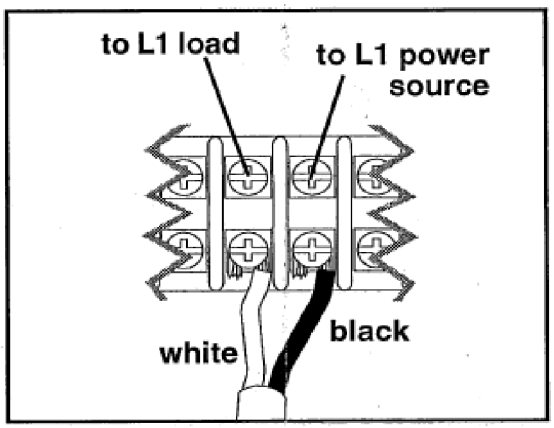
Figure A



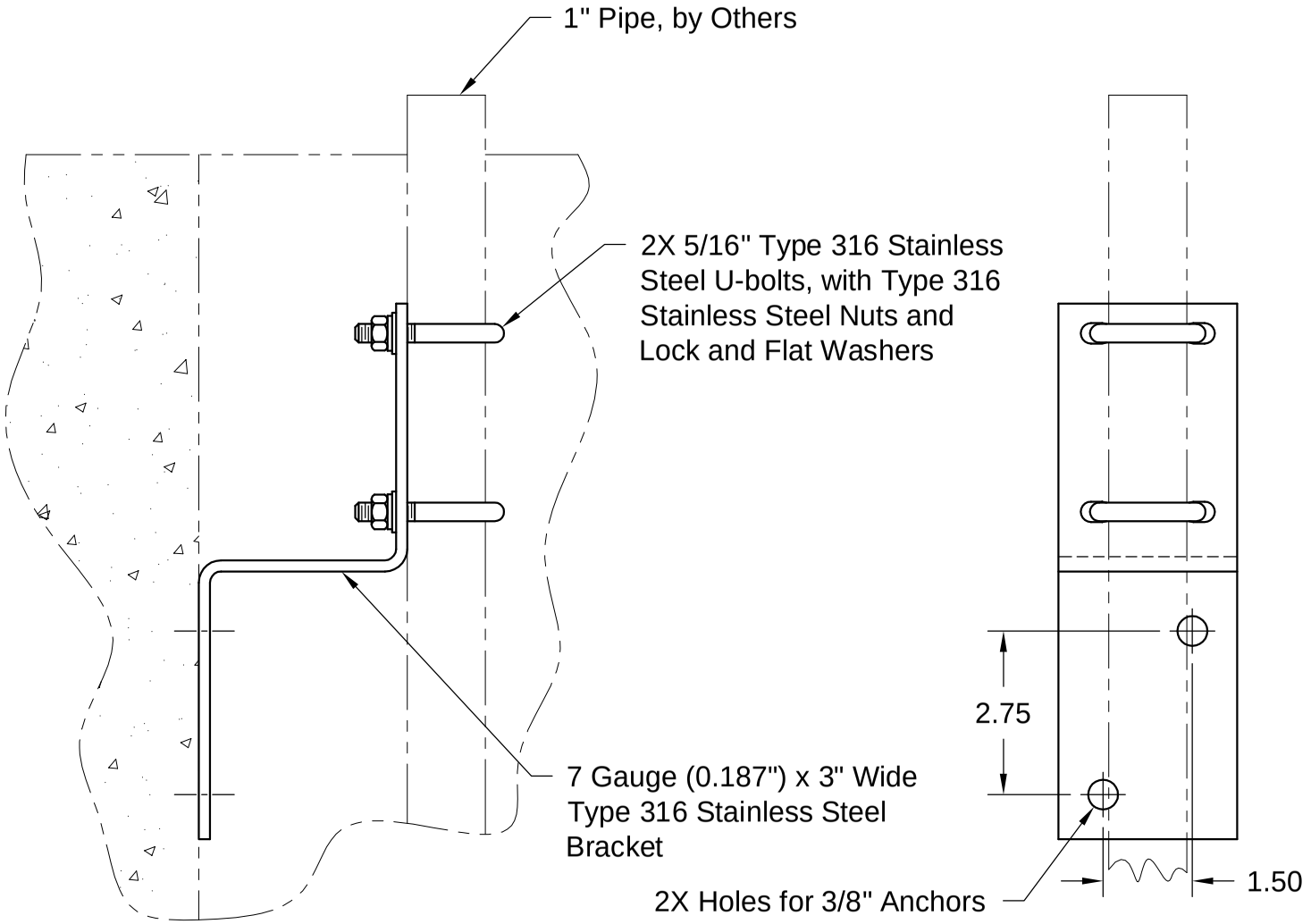
Wiring Diagram

1. For the FT-300A ~~or FT-300B~~ connect cable leads directly into control device as shown in Figure B.

Figure B



Float Switch Mounting Bracket Detail



Ultrasonic Level Controller Data

Overview

HydroRanger 200 is an ultrasonic level controller for up to six pumps and provides control, differential control and open channel flow monitoring.

Benefits

- Monitors wet wells, weirs and flumes
- Digital communications with built-in Modbus RTU via RS-485
- Compatible with SmartLinx system and SIMATIC PDM configuration software
- Single or dual point level monitoring
- 6 relay (standard), 1 or 3 relay (optional)
- Auto False-Echo Suppression for fixed obstruction avoidance
- Anti-grease ring/tide mark buildup
- Differential amplifier transceiver for common mode noise rejection and improved signal-to-noise ratio
- Wall and panel mounting options

Application

For water authorities, municipal water and wastewater plants, HydroRanger 200 is an economical, low-maintenance solution delivering control efficiency and productivity needed to meet today's exacting standards. It offers single point monitoring with all models, and optional dual-point monitoring with 6 relay model. As well, it has digital communications with built-in Modbus RTU via RS-485.

The standard 6 relay HydroRanger 200 will monitor open channel flow and features more advanced relay alarming and pump control functions as well as volume conversion. It is compatible with SIMATIC PDM, allowing for PC configuration and setup. Sonic Intelligence® advanced echo-processing software provides increased reading reliability. The optional 1 or 3 relay models provide accurate level measurement functions only; these two models do not provide open channel flow, differential level measurement or volume conversion functions.

HydroRanger 200 uses proven continuous ultrasonic echo ranging technology to monitor water and wastewater of any consistency up to 15 m (50 ft) in depth. Achievable resolution is 0.1% with accuracy to 0.25% of range. Unlike contacting devices, HydroRanger 200 is immune to problems caused by suspended solids, harsh corrosives, grease or silt in the effluent, reducing downtime.

- Key Applications: wet wells, flumes/weirs, bar screen control

HydroRanger 200

Technical specifications

Mode of Operation	
Measuring principle	Ultrasonic level measurement
Measuring range	0.3 to 15 m (1 to 50 ft), transducer dependent
Measuring points	1 or 2
Input	
Analog	0 to 20 mA or 4 to 20 mA, from alternate device, scaleable (6 relay model)
Discrete	10 to 50 V DC switching level Logical 0 = < 0.5 V DC Logical 1 = 10 to 50 V DC Max. 3 mA
Output	
Echomax® transducer	44 kHz
Ultrasonic transducer	Compatible transducers: ST-H and Echomax series XPS-10/10F, XPS 15/15F, XCT-8, XCT-12 and XRS-5
Relays[1]	Rating 5 A at 250 V AC, non-inductive
- Model with 1 relay[2]	1 SPST Form A
- Model with 3 relays[2]	2 SPST Form A/1 SPDT Form C
- Model with 6 relays	4 SPST Form A/2 SPDT Form C
mA output	0 to 20 mA or 4 to 20 mA
• Max. load	750 Ω, isolated
• Resolution	0.1 % of range
Accuracy	
Error in measurement	0.25% of range or 6 mm (0.24"), whichever is greater
Resolution	0.1% of measuring range or 2 mm (0.08"), whichever is greater[3]
Temperature compensation	• -50 to +150 °C (-58 to +302 °F) • Integral temperature sensor in transducer • External TS-3 temperature sensor (optional) • Programmable fixed temperature values
Rated operating conditions	
Installation conditions	
Location	indoor / outdoor
Installation category	II
Pollution degree	4
Ambient conditions	
Ambient temperature (enclosure)	-20 to +50 °C (-4 to +122 °F)

Design	
Weight	
• Wall mount	1.37 kg (3.02 lbs)
• Panel mount	1.50 kg (3.31 lbs)
Material (enclosure)	Polycarbonate
Degree of protection (enclosure)	
• Wall mount	IP65/Type 4X/NEMA 4X
• Panel mount	IP54/Type 3/NEMA 3
Cable	
Transducer and mA output signal	2-core copper conductor, twisted, shielded, 300 Vrms, 0.82 mm² (18 AWG), Belden® 8760 or equivalent is acceptable
Max. separation between transducer and transceiver	365 m (1200 ft)
Displays and controls	100 x 40 mm (4 x 1.5") multi-block LCD with backlighting
Programming	Programming using handheld programmer or via PC with SIMATIC PDM software
Power supply[4]	
AC version	100 to 230 V AC ± 15%, 50/60 Hz, 36 VA (17 W)
DC version	12 to 30 V DC (20 W)
Certificates and approvals	• CE, C-TICK[5] • Lloyd's Register of Shipping • ABS Type Approval • FM, $CSA_{NRTL/C}$, UL listed • CSA Class I, Div. 2, Groups A, B, C and D, Class II, Div. 2, Groups F and G, Class III (wall mount only) • MCERTS Class 1 approved for Open Channel Flow
Communication	• RS-232 with Modbus RTU or ASCII via RJ-11 connector • RS-485 with Modbus RTU or ASCII via terminal blocks • Optional: SmartLinx® cards for - PROFIBUS DP - DeviceNet™ - Allen-Bradley® Remote I/O

1) All relays certified for use with equipment that fails in a state at or under the rated maximums of the relays
2) This model is level control only; no open channel flow, differential level or volume conversion functions
3) Program range is defined as the empty distance to the face of the transducer plus any range extension
4) Maximum power consumption is listed
5) EMC performance available upon request

Selection and Ordering data

Order No.

Siemens HydroRanger 200 C) **7ML5034-**
Ultrasonic level controller for up to six pumps that provides control, differential control and open channel flow monitoring. The HydroRanger 200 is also available as a level measurement controller only. Select option from model code below.

Mounting
Wall mount, standard enclosure **1**
Wall mount, 4 entries, 4 M20 cable glands included **2**
Panel mount[1] **3**

Power supply
100 to 230 V AC **A**
12 to 30 V DC **B**

Number of measurement points
Single point model, 6 relays **A**
Dual point model, 6 relays **B**
Single point model, level only, 1 relay[2] **C**
Single point model, level only, 3 relays[2] **D**

Communication (SmartLinx)
Without module **0**
SmartLinx® Allen-Bradley® Remote I/O module **1**
SmartLinx PROFIBUS DP module **2**
SmartLinx DeviceNet™ module **3**
See SmartLinx product page 5/260 for more information.

Approvals
General Purpose CE, FM, CSA$_{US/C}$, UL listed, C-TICK **1**
CSA Class I, Div. 2, Groups A, B, C and D; Class II, Div 2, Groups F and G; Class III (for wall mount applications only) **2**

Further designs

Order code

Please add "**-Z**" to Order No. and specify Order code(s).

Stainless steel tag [69 mm x 50 mm (2.71 x 1.97")]: Measuring-point number/identification (max. 16 characters) specify in plain text **Y15**

Instruction manual

Order No.

English C) **7ML1998-5FC03**
French C) **7ML1998-5FC11**
German C) **7ML1998-5FC32**
Note: The instruction manual should be ordered as a separate line on the order.

This device is shipped with the Siemens Milltronics manual CD containing the complete ATEX Quick Start and instruction manual library.

Other instruction manuals

SmartLinx Allen-Bradley Remote I/O, English C) **7ML1998-1AP03**
SmartLinx PROFIBUS DP, English C) **7ML1998-1AQ03**
SmartLinx PROFIBUS DP, German C) **7ML1998-1AQ33**
SmartLinx PROFIBUS DP, French C) **7ML1998-1AQ12**
SmartLinx DeviceNet, English C) **7ML1998-1BH02**
Note: The appropriate SmartLinx instruction manual should be ordered as a separate line on the order.

Selection and Ordering data

Order No.

Siemens HydroRanger 200 C) **7ML5034-**
Ultrasonic level controller for up to six pumps that provides control, differential control and open channel flow monitoring. The HydroRanger 200 is also available as a level measurement controller only. Select option from model code below.

Accessories

Handheld programmer **7ML1830-2AK**
Tag, stainless steel, 12 x 45 mm (0.47 x 1.77"), one text line, suitable for enclosure **7ML1930-1AC**
TS-3 Temperature Sensor - see TS-3 on page 5/147
SITRANS RD100 Remote display - see RD100 on page 5/263
SITRANS RD200 Remote display - see RD200 on page 5/265

Spare parts

Power Supply Board (100 to 230 V AC) C) **7ML1830-1MD**
Power Supply Board (12 to 30 V DC) C) **7ML1830-1ME**
Display Board C) **7ML1830-1MF**
See SmartLinx product page 5/260 for more information.

1) Available with approval option 1 only
2) This model is level control only; no open channel flow, differential level, or volume conversion functions
C) Subject to export regulations AL: N, ECCN: EAR99

5

HydroRanger 200

Selection and Ordering data		Order No.
Milltronics HydroRanger 200 Ultrasonic level controller for up to six pumps that provides control, differential control and open channel flow monitoring. The HydroRanger 200 is also available as a level measurement controller only. Select option from model code below.	C)	**7ML1034 -**
Mounting		
Wall mount, standard enclosure		**1**
Wall mount, 4 entries, 4 M20 cable glands included		**2**
Panel mount[1]		**3**
Power supply		
100 to 230 V AC		**A**
12 to 30 V DC		**B**
Communication (SmartLinx)		
Without module		**A**
SmartLinx® Allen-Bradley® Remote I/O module		**B**
SmartLinx PROFIBUS DP module		**C**
SmartLinx DeviceNet™ module See SmartLinx product page 5/260 for more information.		**D**
Approvals		
General Purpose CE, FM, CSA$_{US/C}$, UL listed, C-TICK		**1**
CSA Class I, Div. 2, Groups A, B, C and D; Class II, Div 2, Groups F and G; Class III (for wall mount applications only)		**2**
Number of measurement points		
Single point model, 6 relays		**1**
Dual point model, 6 relays		**2**
Single point model, level only, 1 relay[2]		**3**
Single point model, level only, 3 relays[2]		**4**
Further designs		Order code
Please add "**-Z**" to Order No. and specify Order code(s).		
Stainless steel tag [69 mm x 50 mm (2.71 x 1.97")]: Measuring-point number/identification (max. 16 characters) specify in plain text		**Y15**
Instruction manual		Order No.
English	C)	**7ML1998-1FC06**
French	C)	**7ML1998-1FC14**
German Note: The instruction manual should be ordered as a separate line on the order.	C)	**7ML1998-1FC34**
This device is shipped with the Siemens Milltronics manual CD containing the complete ATEX Quick Start and instruction manual library.		
Other instruction manuals		
SmartLinx Allen-Bradley Remote I/O, English	C)	**7ML1998-1AP03**
SmartLinx PROFIBUS DP, English	C)	**7ML1998-1AQ03**
SmartLinx PROFIBUS DP, German	C)	**7ML1998-1AQ33**
SmartLinx PROFIBUS DP, French	C)	**7ML1998-1AQ12**
SmartLinx DeviceNet, English Note: The appropriate SmartLinx instruction manual should be ordered as a separate line on the order.	C)	**7ML1998-1BH02**

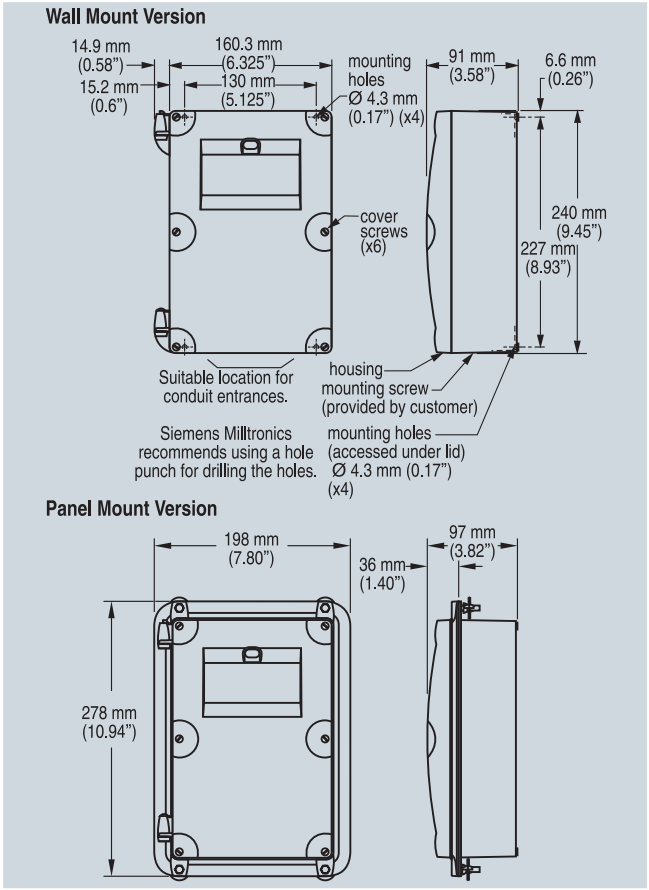
Selection and Ordering data		Order No.
Milltronics HydroRanger 200 Ultrasonic level controller for up to six pumps that provides control, differential control and open channel flow monitoring. The HydroRanger 200 is also available as a level measurement controller only. Select option from model code below.	C)	**7ML1034 -**
Accessories		
Handheld programmer		**7ML1830-2AK**
Tag, stainless steel, 12 x 45 mm (0.47 x 1.77"), one text line, suitable for enclosure		**7ML1930-1AC**
TS-3 Temperature Sensor - see TS-3 on page 5/147		
SITRANS RD100 Remote display - see RD100 on page 5/263		
SITRANS RD200 Remote display - see RD200 on page 5/265		
Spare parts		
Power Supply Board (100 to 230 V AC)	C)	**7ML1830-1MD**
Power Supply Board (12 to 30 V DC)	C)	**7ML1830-1ME**
Display Board	C)	**7ML1830-1MF**
See SmartLinx product page 5/260 for more information.		

1) Available with approval option 1 only
2) This model is level control only; no open channel flow, differential level, or volume conversion functions

C) Subject to export regulations AL: N, ECCN: EAR99

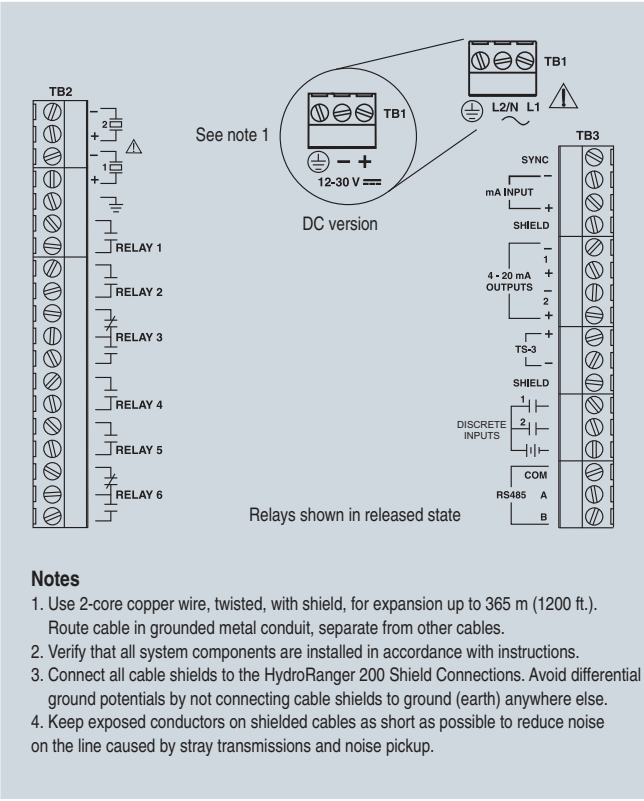
®Modbus is a registered trademark of Schneider Electric.
®Belden is a registered trademark of Belden Wire and Cable Company.
®Allen-Bradley is a registered trademark of Rockwell Automation.
™DeviceNet is a trademark of Open DeviceNet Vendor Association (ODVA)

Dimensional drawings



HydroRanger 200 dimensions

Schematics



Notes

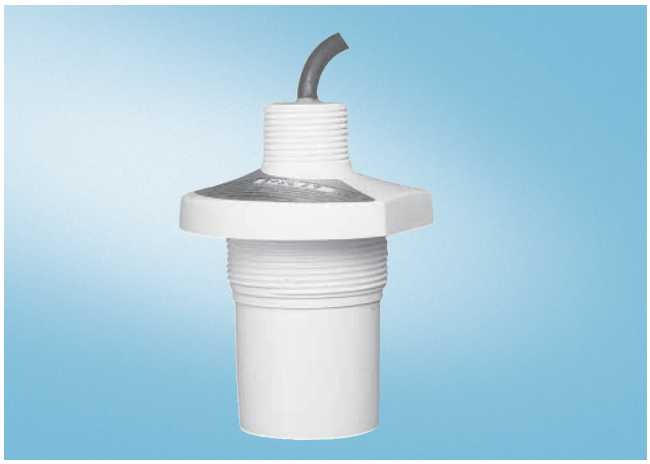
1. Use 2-core copper wire, twisted, with shield, for expansion up to 365 m (1200 ft.). Route cable in grounded metal conduit, separate from other cables.
2. Verify that all system components are installed in accordance with instructions.
3. Connect all cable shields to the HydroRanger 200 Shield Connections. Avoid differential ground potentials by not connecting cable shields to ground (earth) anywhere else.
4. Keep exposed conductors on shielded cables as short as possible to reduce noise on the line caused by stray transmissions and noise pickup.

HydroRanger 200 connections

5

Ultrasonic Transducer Data

Overview



ST-H transducers use ultrasonic technology to measure level in chemical storage and liquid tanks.

Benefits

- Can be mounted on a 2" (50.8 mm) standpipe
- Immune to corrosive and harsh environments
- Integral temperature sensor

Application

The narrow design of the ST-H allows the transducer to be mounted on a 2" (50.8 mm) standpipe. When mounted correctly, it is completely protected from the process and can even be used in harsh, corrosive environments.

During operation, the ultrasonic transducer emits acoustic pulses in a narrow beam perpendicular to the transducer face. The level transceiver measures the propagation time between pulse emission and reception of the echo to calculate the distance from the transducer to the material. Variations in sound velocity due to changes in temperature within the permissible range are automatically compensated by the integral temperature sensor.

- Key Applications: chemical storage, liquid tanks

Technical specifications

Mode of operation	
Measuring principle	Ultrasonic transducer
Input	
Measuring range	0.3 to 10 m (1 to 33 ft)
Output	
Frequency	44 kHz
Beam angle	12°
Accuracy	
Temperature compensation	Compensated by integral temperature sensor
Rated operating conditions	
Pressure	Normal atmospheric pressure
Ambient conditions	
• Ambient temperature	-20 to +60 °C (-5 to +140 °F) (ATEX approved model) -40 to +73 °C (-40 to +163 °F) (CSA/FM approved model)
Design	
Weight[1]	1.4 kg (3 lbs)
Material (enclosure)	Base and lid made of ETFE (epoxy fitted joint)[2]
Process connection	2" NPT [(Taper), ANSI/ASME B1.20.1], R 2" [(BSPT), EN 10226] or G 2" [(BSPP), EN ISO 228-1]
Degree of protection	IP68
Cable connection	2-core shielded/twisted, 0.5 mm² (20 AWG), PVC sheath
Cable (max. length)	365 m (1200 ft) with RG 62 A/U coaxial cable
Options	
• Flange adapter	3" Universal (fits DN 65, PN 10 and 3" ASME)
• Submergence coupling	For maintaining high level readings while the transducer is submerged
Certificates and approvals	CE[3], CSA, FM Class 1, Div. 1, ATEX II 2G

[1] Approximate shipping weight of transducer with standard cable length

[2] When measuring chemicals, check compatibility of ETFE and epoxy, or mount joint external to process.

[3] EMC certificate available on request

Selection and Ordering data

		Order No.
Echomax® ST-H ultrasonic transducer	C)	**7ML1100 -**
Level measurement in chemical storage and liquid tanks The narrow design of the ST-H allows the transducer to be mounted on a 2" standpipe. measuring range: min. 0.3 m (1 ft), max. 10 m (33 ft)		**A 0**
Process connection		
2" NPT [(Taper), ANSI/ASME B1.20.1]		**0**
R 2" [(BSPT), EN 10226]		**1**
G 2" [(BSPP), EN ISO 228-1]		**2**
Cable length		
5 m (16.40 ft)		**A**
10 m (32.81 ft)		**B**
30 m (98.43 ft)		**C**
50 m (164.04 ft)		**D**
100 m (328.08 ft)		**E**
Approvals		
FM Class I, Div. 1 [only with 2" NPT (Taper), ANSI/ASME B1.20.1 process connection]		**2**
ATEX II 2G, CSA		**3**
Instruction manual		
Quick Start Manual, multi-language	C)	**7ML1998-5QK81**
Applications Guidelines, multi-language	C)	**7ML1998-5HV61**
Note: The Applications Guidelines should be ordered as a separate line item on the order.		
This device is shipped with the Siemens Milltronics manual CD containing the complete ATEX Quick Start and instruction manual library.		
Accessories		
ST-H universal submergence shield		**7ML1830-1CF**
Universal box bracket, mounting kit		**7ML1830-1BK**
3" ASME, DIN 65 PN 10, JIS 10K 3B ETFE flange adapter for 2" NPT		**7ML1830-1BT**
3" ASME, DIN 65 PN 10, JIS 10K 3B ETFE flange adapter for 2" BSPT		**7ML1830-1BU**
Easy Aimer 2, NPT with ¾" x 1" PVC coupling		**7ML1830-1AQ**
Easy Aimer 2, aluminum with M20 adapter and 1" and 1½" BSPT aluminum couplings		**7ML1830-1AX**
Easy Aimer 304, with stainless steel coupling		**7ML1830-1AU**
Easy Aimer 304, with M20 adapter and 1" and 1½" BSPT 304 SS couplings		**7ML1830-1GN**

C) Subject to export regulations AL: N, ECCN: EAR99

5

Control Panel Bill of Materials

20119604/05 REV A

BILL OF MATERIALS
ELEMECH S.O. PAR4732

PARKSON CORPORATION
PROJECT 201196
AG, NEMA 4, 480V
FOUNTAIN, COLORADO

Item No	Component	Description	Manufacturer Part Number	QTY	Device
Aqua Guard Control Panel (Quantity: 2)					
1	00-000-000	Wire, Hardware, Wire labels, etc.	EleMech: Miscellaneous	1	
2	10-069-001	Wireway Duct Cover, 1"W, 6 Ft. Section, w/Panduit F Series	Panduit: C1WH6	6	
3	10-069-007	Wireway Duct, 1"Wx3"H, 6 Foot Section	Panduit: F1X3WH6	6	
4	25-000-A001	Legendplate Assembly, Yellow E-Stop, Standard Encl.	EleMech: 25-000-A001 Assembly	1	
5	25-000-A002	Legendplate Assembly, White, Black Text, Standard Encl.	EleMech: 25-000-A002 Assembly	7	
6	25-000-A019	Nameplate Assembly, White: Power Supply - 3/60/480VAC	EleMech: 25-000-A019 Assembly	1	
7	42-063-007	Terminal Block, Din Rail, 35MM Wide, 15 High, 2 Meters Long	Wieland: 98.370.1000	1	
8	52-000-003	Label, Underwriters Laboratories 698A, w/Decal Set	EleMech: 698A	1	
9	08-000-003	Mounting Bracket, Single 2.5" Saxon 012 Series Tyco Ammeter	EleMech: 08-000-003	1	AM1
10	08-167-010	Analog Panel Meter, AC Ammeter, 0-3 Amps NEMA 3, 480VAC	Tyco: 012-75AA-LJLJ-C7-B3	1	AM1
11	18-000-002	Steel Barrier, 14 Ga., White Finish, 0.5"Wx10.0"x6.0"D	EleMech: 18-000-002	1	BAR1
12	03-001-035	Circuit Breaker Disconnect Mechanism, w/ABB TMAX	ABB: KT3VD-M	1	CB1
13	03-001-037	Circuit Breaker/DS, Door Handle, NEMA 4,4X w/TMAX, OT45-125	ABB: OHB80L6	1	CB1
14	03-001-047	Circuit Breaker, 3 Pole, 480VAC, 15A, 15K AIC, T1	ABB: T1N015TL	1	CB1
15	03-001-072	Circuit Breaker Disconnect Shaft, 5.8"/148MM, w/ABB T1	ABB: OXP6X150	1	CB1
16	03-056-024	Circuit Breaker, 1 Pole, 240VAC, 2A, 14kA, UL489, Type C	Siemens: 5SJ4102-7HG40	1	CB4
17	04-078-000	Current Monitor, Over-Current, SPST, 120V ,2-20A, w/Delay	SSAC: ECSH41AD	1	CM1
18	06-058-011	Control Relay, 3PDT,120VAC, 11Pin Spade, Indicator, Operator	Square D: RXM3AB2F7	3	CR1-3
19	06-058-012	Control Relay, Bus Jumper, 2-Pole, w/Telemec. RXM Relay	Square D: RXZ S2	2	CR1-3
20	38-058-003	Socket, 11 Pin Spade, Din, Screw Term., 3Tier, 250V w/3-Pole	Square D: RXZE2S111M	3	CR1-3
21	07-063-000	Distribution Block, End Cover, 4 Pole, 300V,10A, w/WK4E\V\VB	Wieland: 07.311.4053.1	1	DB1
22	07-063-001	Distribution Block, Jumper, 4 Pole, 300V,10A, w/WK4E\V\VB	Wieland: Z7.210.3427	3	DB1
23	07-063-002	Distribution Block, Single Pole, 10A, 300V, WK4E\V\VB	Wieland: 57.404.6955.1	8	DB1
24	42-063-004	Terminal Block, Ground, 30A, 600V, 6MM Wide, w/WK4/U	Wieland: 57.504.9053.0	2	DB1, TB1
25	11-035-027	Enclosure, NEMA 4, Painted Steel, 24"Hx24"Wx8"D, C. Hinge	Hoffman: A-24H24BLP	1	EN1
26	11-035-133	Sub-Panel, Painted Steel, w/24"Hx24"W C. Hinge Encl	Hoffman: A-24P24	1	EN1
27	15-011-000	Ground Lug	Blackburn: L70	2	GND
28	16-052-005	Elapsed Time Meter, 6 Digit, Round, 3-Hole, NEMA 4X	Redington: 722-0004	1	HM1
29	16-052-006	Elapsed Time Meter, Gasket, NEMA 4X (Use w/722-0004)	Redington: 5003-011	1	HM1
30	17-062-001	Heater, Silicone Rubber, Flat, 120VAC, 75 Watts, w/12" Leads	Watlow: 030050C1-A001B	1	HTR1

20119604/05 REV A

BILL OF MATERIALS
ELEMECH S.O. PAR4732

PARKSON CORPORATION
PROJECT 201196
AG, NEMA 4, 480V
FOUNTAIN, COLORADO

Item No	Component	Description	Manufacturer Part Number	QTY	Device
31	52-137-003	Label, Caution: Heater Element, 1.5"Wx0.75"H, White/Red	Nameplate Tech: 52-137-003	1	HTR1
32	52-137-002	Label, Multiple Supply Sources, Warning, 2.5"Wx1.5"H, Yellow	Nameplate Tech: 52-137-002	1	LBL1
33	52-137-000	Label, High Voltage, Danger, 2.25"Wx4.0"H, White/Black/Red	Nameplate Tech: 52-137-000	1	LBL2
34	32-005-046	Lens, Pilot Light, White, NEMA 4X, Standard, w/A-B 800H	Allen-Bradley: 800T-N26W	1	LT1
35	32-005-048	Pilot light, NEMA 4X, 120VAC, Transformer, No Lens	Allen-Bradley: 800H-PR16	4	LT1-4
36	32-005-044	Lens, Pilot Light, Green, NEMA 4X, Standard, w/A-B 800H	Allen-Bradley: 800T-N26G	1	LT2
37	32-005-045	Lens, Pilot Light, Red, NEMA 4X, Standard, w/A-B 800H	Allen-Bradley: 800T-N26R	2	LT3,4
38	22-018-000	Motor Starter, Non-Rev., NEMA 0, 1 NO Aux, 120VAC Coil, w/OL	Cutler-Hammer: AN16BNOAC	1	M1
39	22-018-006	Aux. Contact, Top mounted, 4NO, w/C-H Freedom	Cutler-Hammer: C320KGT13	1	M1
40	25-000-A010	Nameplate Assembly, White, Black Text, 1"Hx3"W	EleMech: 25-000-A010 Assembly	2	NP1,2
41	25-000-A013	Nameplate Assembly, Yellow: Intrinsically Safe Circuits P&F	EleMech: 25-000-A013 Assembly	1	NP3
42	28-018-003	Overload Relay Heater Pack, 3PH, 0.814-1.32A, w/Freedom, C20	Cutler-Hammer: H2004B-3	1	OL1
43	29-005-010	Pushbutton E-Stop, NEMA 4X, Oper+1NCLB, Twist Rel. Red Head	Allen-Bradley: 800H-FRXT6D4	1	PB1
44	02-005-000	Contact Block, 1NO/1NC, w/A-B 800 Series	Allen-Bradley: 800T-XA	1	PB3
45	29-005-037	Pushbutton, NEMA 4X, Oper+1NC, Flush Head, Black	Allen-Bradley: 800H-AR2D2	1	PB3
46	33-183-010	PR, Zelio, 120VAC, 8)120VAC In, 4)Relay Out	Telemecanique: SR2B121FU	1	PR1
47	PAR-26-P005	Program, PR, Zelio SR2B121FU, Standard	EleMech: PAR-26-P005	1	PR1
48	13-000-A000	Spare Parts Box Assembly, Din Rail Mount	EleMech: 13-000-A000 Assembly	1	SP1
49	39-005-009	Selector Switch, NEMA 4X, 3 Pos. Maintained, 1NO-1NC	Allen-Bradley: 800H-JR2A	1	SS1
50	41-018-A026	Control Transformer Assembly, 480-120VAC, 300VA, w/C-Breaker	Cutler-Hammer: C0300E2A Assembly	1	T1,CB2,CB3
51	42-063-000	Terminal Block, Labels, Custom Printed, w/WK4/U	Wieland: 04.242.6353-CUSTOM	56	TB,DB
52	42-063-009	Terminal Block, End Clamp, w/WKN10/U	Wieland: Z5.522.8553	7	TB,DB
53	42-063-008	Terminal Block, Labels, Blank, w/WK4/U	Wieland: Z4.242.6353	22	TB1
54	42-063-010	Terminal Block, Jumper, w/WK4/U	Wieland: Z7.281.0027.0	1	TB1
55	42-063-033	Terminal Block, Single Pole, 30A, 600V, WKF4/U, Spring Clamp	Wieland: 56.704.0055	30	TB1-3
56	42-063-034	Terminal Block, End Plate, Beige, w/WKFN 4/U	Wieland: 07.312.9255	3	TB1-3
57	18-049-000	Transformer Isolated Barrier, Single Channel, 120VAC	P&F: KFA5-SR2/EX1.W	1	TIB1
58	46-034-000	Thermostat, for heater control, N.C.contact, 6 amp,30-140 F.	Stego: 01140.9-00	1	TS1
LCS, 1 Hole, Nema 4/7/9, E-Stop (Quantity: 2)					
59	25-000-A005	Legendplate Assembly, Yellow E-Stop, LCS Encl.	EleMech: 25-000-A005 Assembly	1	
60	53-053-003	Conduit, Lockwasher, 3/4", Use w/3/4" Nipple	Steel City: LN102	1	

20119604/05 REV A

BILL OF MATERIALS
ELEMECH S.O. PAR4732

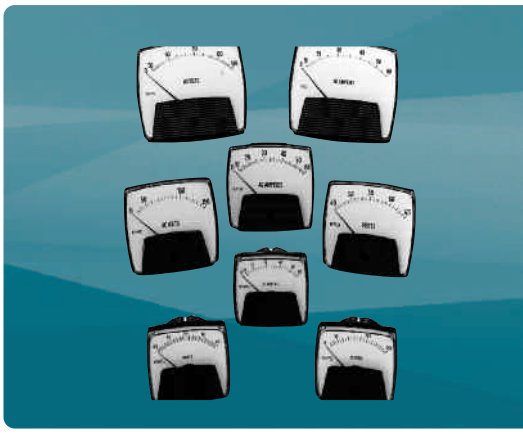
PARKSON CORPORATION
PROJECT 201196
AG, NEMA 4, 480V
FOUNTAIN, COLORADO

Item No	Component	Description	Manufacturer Part Number	QTY	Device
61	11-004-004	Local Control Station, NEMA 4/7/9, 1 Hole, 3/4"NPT Holes	Akron Electric: CXI-333-X1-N4-N5-2RP	1	LCS1
62	29-005-009	Pushbutton E-Stop, NEMA 7/9, Oper+1NCLB, Push-Pull Red Head	Allen-Bradley: 800H-FPX6D4	1	PB2
63	29-005-063	Pushbutton, Padlocking Cover, w/ 800T/H 30.5mm only	Allen-Bradley: 800H-N140	1	PB2
ULC, Hydroranger200, NEMA 4X FRP, Enclosure w/Win, Non-Haz (Quantity: 2)					
64	11-035-126	Sub-Panel, Painted Steel, w/12"Hx10"W Junction Box	Hoffman: A-12P10	1	EN
65	11-035-176	Enclosure Mounting Feet, Fiberglass, J box	Hoffman: A-50MFKR	1	EN
66	11-035-273	Enclosure, Nema 4X, Fiberglass, 13.53"Hx10"Wx7"D, w/Window	Hoffman: A-14107JFGQRPWR	1	EN
67	25-000-A023	Nameplate Assembly, White: Ultrasonic Level Controller	EleMech: 25-000-A023 Assembly	1	NPL
68	49-043-024	ULC, Hydro 200, 120VAC, 4-SPST, 2-SPDT, 4-20mA, Non-Haz	Milltronics: 7ML50341AA01	1	ULC
Spare Parts / Ship Loose (Total Quantity Provided)					
69	12-356-006	Float Switch, Mech., Mercury-Free, N.O., 100' Cable,w/TIB	APG: FT-300A-31M	2	FLOAT
70	49-043-009	ULS, STH, 2"NPT, 30M Cable, FM Class 1 Div. 1	Milltronics: 7ML1100-0CA20	4	ULC
71	49-043-027	ULC, Hydroranger 200 Hand Held Programmer	Milltronics: 7ML1830-2AM	2	ULC

Control Component Data

Saxon Indicators

A range of 2½", 3½" and 4½" surface mount panel meters utilising pivot and jewel mechanisms and offering IP54 protection. The range includes iron vane and moving coil AC and DC ammeters and voltmeters and frequency meters designed to perform in demanding environments.



Specifications – Frequency Meters

Accuracy:	0.15 = 60Hz, 1.25 = 400Hz, 0.15 = 50Hz, 0.25 = 55Hz
Voltage:	110/130V, 200/250V
Frequency:	50Hz or 60Hz
Burden:	4VA Maximum

Specifications – Moving Iron AC Ammeter and Voltmeter

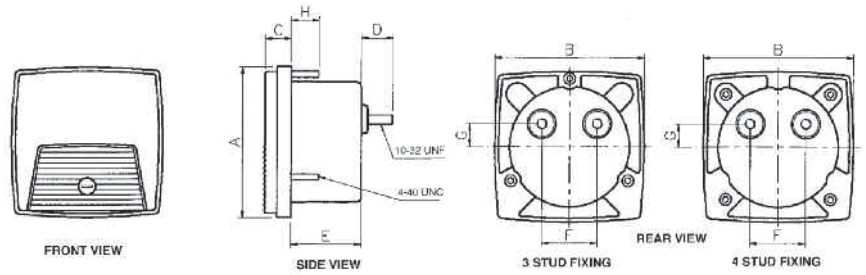
Accuracy:	±2%
Rating:	Ammeters: 1 - 30A Voltmeters: 10V - 600V
Overload:	Ammeters: x1.2 for 2 hours, x10 for 5 seconds Voltmeters: x1.2 for 2 hours, x2 for 5 seconds
Burden:	Ammeters: 0.5VA Voltmeters: 4.5VA maximum

Specifications – Moving Coll DC Ammeter and Voltmeter

Accuracy:	±2%
Rating:	Ammeters: 1 - 30A Voltmeters: 10V - 600V
Operating temp:	-20°C to 60°C (-4°F to 140°F)
Storage temp:	-30°C to 70°C (-22°F to 158°F)

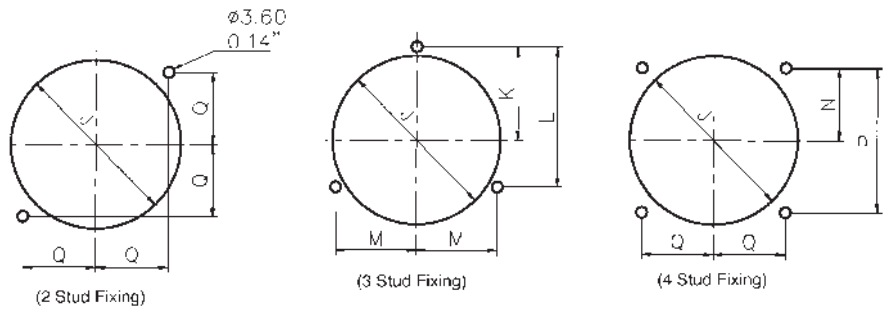
Dimensions

Specify number of fixing studs when ordering 2½" and 3½" meters. 4½" meters are supplied with 4 fixing studs.



	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P
2½mm	68.6	68.6	11.8	14.6	32.0	25.4	10.4	12.7	55.9	31.0	46.5	26.9	23.9	47.8	23.9
inch	2.70	2.70	0.46	0.57	1.26	1.00	0.41	0.50	2.20	1.22	1.83	1.06	0.94	1.88	0.94
3½mm	88.9	88.9	11.8	14.6	36.0	25.4	10.4	12.7	69.9	40.2	60.3	34.8	28.5	57.0	28.5
inch	3.5	3.5	0.46	0.57	1.42	1.00	0.41	0.50	2.75	1.58	2.37	1.37	1.12	2.24	1.12
4½mm	112.0	123.2	12.7	16.3	30.5	28.4	0.38	12.7	70.9				51.6	90.4	50.8
inch	4.41	4.85	0.50	0.64	1.20	1.12	0.41	0.50	2.78				2.03	3.56	2.00

Panel cut-out



Features

- Three compact case sizes
- Withstands high levels of shock, vibration, dirt and humidity
- Pivot and jewel mechanisms

Benefits

- Complies with ANSI C39.1 (IEC 51)
- IP54 (NEMA 3) protection
- Instruments comply with BSEN61010-1 and meet IEC414 (BS5458)
- Pass dielectric test (2600V for 1min)

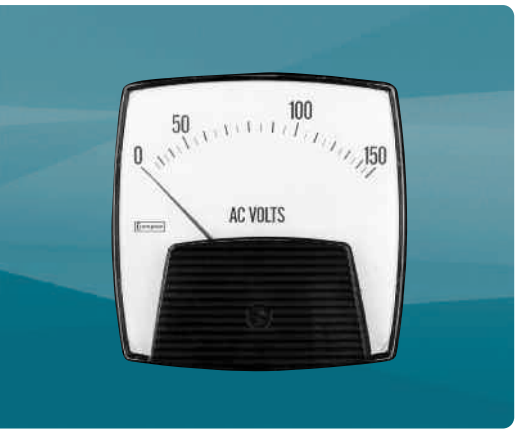
Applications

- Switchgear
- Distribution systems
- Generator sets
- Control panels
- Energy management
- Building management
- Utility power monitoring
- Process control
- Motor control

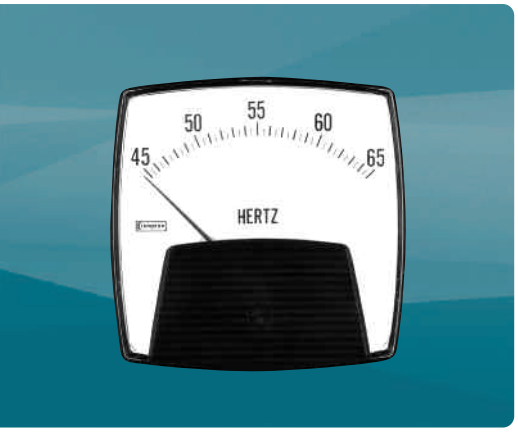
Compliant with

- UL approved file no. E203000

AC Ammeter



AC Voltmeter



Frequency Meter

Product Codes – AC Ammeter True RMS Reading (Accuracy ±2% ES)

Rating	Scaling	Cat. no.
5A	0-5A	(01*)-75AA-LSLS-C6-B*
10A	0-10A	(01*)-75AA-MTMT-C6-B*
15A	0-15A	(01*)-75AA-NDND-C6-B*
20A	0-20A	(01*)-75AA-NGNG-C6-B*
30A	0-30A	(01*)-75AA-NLNL-C6-B*
1A	Transformer rated	(01*)-75AA-LA**-C6-B*
5A	Transformer rated	(01*)-75AA-LS**-C6-B*

Product Codes – AC Voltmeter True RMS Reading (Accuracy ±2% ES)

150V	0-150V	(01*)-75VA-PZPZ-C6-B*
300V	0-300V	(01*)-75VA-RXRX-C6-B*
600V	0-600V	(01*)-75VA-SJSJ-C6-B*
150V	Transformer rated	(01*)-75VA-PZ**-C6-B*

Product Codes – DC Ammeters (Accuracy ±2% ES)

0-1mA	To suit requirements	(01*)-01AA-FA**-B*
0-5mA	0-5mA	(01*)-01AA-FXFX-B*
0-10mA	0-10mA	(01*)-01AA-GZGZ-B*
0-20mA	0-20mA	(01*)-01AA-HFHF-B*
0-50mA	0-50mA	(01*)-01AA-HYHY-B*
0-100mA	0-100mA	(01*)-01AA-JRJR-B*
0-200mA	0-200mA	(01*)-01AA-KAKA-B*
0-500mA	0-500mA	(01*)-01AA-KMKM-B*
0-1A0-1A	(01*)-01AA-LALA-B*	
0-2A0-2A	(01*)-01AA-LELE-B*	
0-5A0-5A	(01*)-01AA-LSLS-B*	
0-10A	0-10A	(01*)-01AA-MTMT-B*
0-50mV	To suit	(01*)-01AA-EC**-B*

Product Codes – Miliammeters Suppressed Zero (Accuracy ±2% ES)

4-20mA	To suit requirements	(01*)-01RA-HG**-B*
		**Specify scale value

Product Codes – DC Voltmeters Sensitivity 1000ΩVolt (Accuracy ±2% ES)

0-15V	0-15V	(01*)-01VA-NDND-B*
0-30V	0-30V	(01*)-01VA-NLNL-B*
0-50V	0-50V	(01*)-01VA-NTNT-B*
0-150V	0-150V	(01*)-01VA-PZPZ-B*
0-300V	0-300V	(01*)-01VA-RXRX-B*
0-600V	0-600V	(01*)-01VA-SJSJ-B*

Product Codes – Frequency Meters 120V, Self Contained

50Hz	45-55Hz	(01*)-41SA-PNAG-AG-B*
55Hz	45-65Hz	(01*)-41SA-PNAJ-AJ-B*
60Hz	55-65Hz	(01*)-41SA-PNAN-AN-B*

Product Codes – Elapsed Time Meters 99999.99 hours, non-resetable

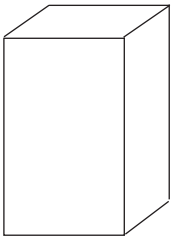
110/130V, 50Hz	–	(01*)-155A-PNZH-C5-B*
200/250V, 50Hz	–	(01*)-155A-RNZH-C5-B*
480V, 50Hz	–	(01*)-155A-SEZH-C5-B*
110/130V, 60Hz	–	(01*)-156A-PNZH-C6-B*
200/250V, 60Hz	–	(01*)-156A-RNZH-C6-B*
480V, 60Hz	–	(01*)-156A-SEZH-C6-B*

To denote the required case size, replace the 01* in the catalogue number with 012, 013 or 014 for 2½", 3½" or 4½" respectively.

To denote the required stud fixing configuration, replace B* with B2 (2 stud), B3 (3 stud) or B4 (4 stud).

T1
100A, 480V
Standard thermal-magnetic

T1



H x W x D
5.12" x 3.00" x 2.76"

General
The T1 breaker family ranges from 15 through 100 amperes. The T1 trip units are non-interchangeable and use the very latest technology in electromagnetic relays for overcurrent trip protection. Thermal overload protection is provided by heat sensitive bimetals. Short circuit protection for the breaker is accomplished using a precise magnetic coil. State of the art construction in contacts and arcing chambers aid in limiting damaging fault currents through the protected circuits.

Versions
The T1 frame is available in two versions:
- T = Thermal-magnetic, fixed
- D = Molded case switch

Performance levels
The T1 breaker has two performance levels available:
- B = 277V Single pole
- N = 480V Three pole

Number of poles
The UL/CSA version of the T1 is available in single, three and four pole versions. IEC versions of the T1 are also available with the same dimensions up to 160 amperes.

Accessory mounting
The T1 frame is double insulated allowing for UL/CSA factory or field installation of internal accessories. No extra control cables are required for field installation. Shunt trips or UVR's mount in the left cavity and auxiliary contacts with bell alarm mount in the right cavity.

Reverse feeding
All versions of the T1 family are suitable for reverse feed applications.

Molded case switches
UL489 switches include no overcurrent protection except for a high instantaneous trip mechanism for self protection.

UL489 / CSA C22.2 Interrupting capacity (kA RMS)

Voltage	Continuous rating	B (1 pole)	N
240VAC	15 – 100A	—	50
277VAC	15A 20 – 100A	10 18	— —
480VAC	15A 20 – 100A	— —	14 22
250VDC 2 pole series	15 – 100A	—	25
500VDC 3 pole series	15 – 100A	—	25

IEC-947 Interrupting capacity (kA RMS)

Voltage	Continuous rating	B (1 pole)	N
230V	15 – 100A	25	50
415V	15 – 100A	—	36
440V	15 – 100A	—	22
500V	15 – 100A	—	15
690V	15 – 100A	—	6
250VDC 2 pole series	15 – 100A	—	36
500VDC 3 pole series	15 – 100A	—	36

T1
100A, 480V
Standard thermal-magnetic

T1N TMF

Breaker	IC at 480VAC	Rating	Magnetic trip	3 pole, 480VAC/500VDC catalog number	List price
T1N	14kA	15A	1000A	T1N015TL①	~~$ 402~~
	22kA	20A	1000A	T1N020TL	**402**
		25A	1000A	T1N025TL	**402**
		30A	1000A	T1N030TL	**402**
		40A	1000A	T1N040TL	**402**
		50A	1500A	T1N050TL	**402**
		60A	1500A	T1N060TL	**402**
		70A	1500A	T1N070TL	**479**
		80A	1500A	T1N080TL	**479**
		90A	1500A	T1N090TL	**479**
		100A	1500A	T1N100TL	**479**

T1B TMF — Single pole

Breaker	IC at 277VAC	Rating	Magnetic trip	1 pole, 277VAC catalog number	List price
T1B	18kA	15A	1000A	T1B015TL-1	**$ 230**
		20A	1000A	T1B020TL-1	**230**
		25A	1000A	T1B025TL-1	**230**
		30A	1000A	T1B030TL-1	**230**
		40A	1000A	T1B040TL-1	**230**
		50A	1500A	T1B050TL-1	**230**
		60A	1500A	T1B060TL-1	**230**
		70A	1500A	T1B070TL-1	**262**
		80A	1500A	T1B080TL-1	**262**
		90A	1500A	T1B090TL-1	**262**
		100A	1500A	T1B100TL-1	**262**

T1N-D — Molded case switch

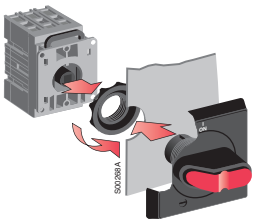
Breaker	Interrupting capacity ②	Rating	Magnetic trip	480VAC/500VDC catalog number	List price
T1-D	240V, 50kA	100A	1000A	T1N100DL	**$ 431**

15

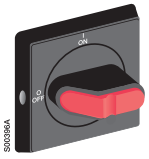
① Rated 277/480Y for 15A.
② With fuse or MCCB protected circuit.

Handles
for 16A – 125A non-fusible disconnect switches
Base & DIN rail mounted

OHBS3__



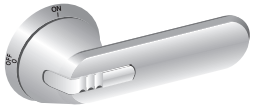
OHBS2__




OZ331_B


OZ371PB

OHBS_



SS handles


OHBS2PJEH

Selector handles — for use with shafts (☐ 6 x 6 mm)

NEMA type	IEC type	Color	Marking	Defeatable	Padlockable	Dim. (mm²)	Catalog number	List price
All marked both O/I & Off/On								
1	IP54	Blk	O/I & OFF/ON	—	Yes	48	OHBS3AH1①	
1	IP54	Red/Yel	O/I & OFF/ON	—	Yes	48	OHYS3AH1①	
1, 3R,12	IP65	Blk	O/I & OFF/ON	Yes	Yes	65	OHBS2AJ	
1, 3R,12	IP65	Grey	O/I & OFF/ON	Yes	Yes	65	OHGS2AJ	
1, 3R,12	IP65	Red/Yel	O/I & OFF/ON	Yes	Yes	65	OHYS2AJ	
1, 3R,12	IP65	Blk Red/Yel	I / O / II I / O / II	Yes	Yes	65 65	OHBS2AJE011 OHYS2AJE011	
1, 3R,12	IP65	SS HASP	O/I & OFF/ON	Yes	Yes	65	OHBS2AJEH	

Round Padlockable handles
Padlockable in 0-position, max 3 padlocks with max 8 mm hasp diameter.

NEMA type	IEC type	Color	Marking	Defeatable	Padlockable	Dim. (mm²)	Catalog number	List price
NEMA 4X	IP65	Black	OFF/ON	Yes	Yes	66x66	OZ331PB	
NEMA 4X	IP65	Red/Yel	OFF/ON	Yes	Yes	66x66	OZ331PRY	
Handles with door coupling in ON-position, Shaftalignment ring for OZ371P_handle								
NEMA 4X	IP65	Black	OFF/ON	No	Yes	66x66	OZ371PB	
NEMA 4X	IP65	Red/Yel	OFF/ON	No	Yes	66x66	OZ371PRY	

Selector handles, Door mounted switches

NEMA type	IEC type	Color	Marking	Defeatable	Padlockable	Dim. (mm²)	Catalog number	List price
All marked both O/I & Off/On								
Snap-on mounting — for use on OT16FT3 – OT40FT3								
1	IP54	Blk	O/I & OFF/ON	—	Yes	48	OHBS3PH	
1	IP54	Red/Yel	O/I & OFF/ON	—	Yes	48	OHYS3PH	
1,3R,12	IP65	Blk	O/I & OFF/ON	—	Yes	65	OHBS2PJ	
1,3R,12	IP65	Red/Yel	O/I & OFF/ON	—	Yes	65	OHYS2PJ	
1, 3R,12	IP65	SS HASP	O/I & OFF/ON	—	Yes	65	OHBS2PJEH	
Screw mounting — for use on OT16FT3 – OT80FT3								
1	IP54	Blk	O/I & OFF/ON	—	Yes	48	OHBS3RH	
1	IP54	Red/Yel	O/I & OFF/ON	—	Yes	48	OHYS3RH	
1,3R,12	IP65	Blk	O/I & OFF/ON	—	Yes	65	OHBS2RJ	
1,3R,12	IP65	Red/Yel	O/I & OFF/ON	—	Yes	65	OHYS2RJ	

Pistol handles — for use with shafts (☐ 6 x 6 mm) ② padlockable with three padlocks in OFF-position, door interlock in ON-position.

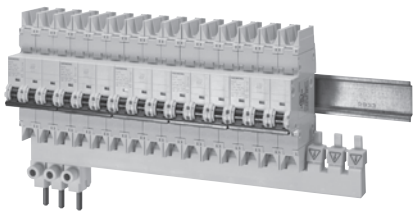
NEMA type	IEC type	Color	Marking	Defeatable	Padlockable	Shaft size (mm²)	Catalog number	List price
1, 3R, 12	IP65	Black	O/I & Off/On	Yes	Yes	6	OHB45J6	
		Red/Yel	O/I & Off/On	Yes	Yes	6	OHY45J6	
		Black	O/I & Off/On	Yes	Yes	6	OHB65J6	
		Grey	O/I & Off/On	Yes	Yes	6	OHG65J6	
		Red/Yel	O/I & Off/On	Yes	Yes	6	OHY65J6	
		Black	O/I & Off/On	Yes	Yes	6	OHB80J6	
		Grey	O/I & Off/On	Yes	Yes	6	OHG80J6	
		Red/Yel	O/I & Off/On	Yes	Yes	6	OHY80J6	
1, 3R, 4, 4X,12	IP66	Black	O/I & Off/On	Yes	Yes	6	OHB65L6	
		Red/Yel	O/I & Off/On	Yes	Yes	6	OHY65L6	
		Black	O/I & Off/On	Yes	Yes	6	OHB80L6	←
		Red/Yel	O/I & Off/On	Yes	Yes	6	OHY80L6	
1, 3R, 4, 4X,12	IP65	SS	O/I & Off/On	Yes	Yes	6	OHM65L6	
1, 3R, 12	IP65	Black	I / O / II	Yes	Yes	6	OHB65J6E011	
		Red/Yel	I / O / II	Yes	Yes	6	OHY65J6E011	
1, 3R, 4, 4x, 12	IP66	Black	I / O / II	Yes	Yes	6	OHB65L6E011	
		Red/Yel	I / O / II	Yes	Yes	6	OHY65L6E011	

① Not suitable for use with OT30F3, OT60F3, OT100F3
② Plastic pistol grip handle with stainless steel hasp, add suffix EH. ex.: OHB65SJ6EH

Selection and ordering data

5SJ4 Miniature Circuit Breaker Guide			
Catalog Series →	**5SJ41...-.HG40**	**5SJ4...-.HG41**	**5SJ4...-.HG42**
Rated Voltage	240, 120 VAC 60 VDC Same Polarity	240 VAC 60/125 VDC	480Y/277 VAC 60/125 VDC
Number of Poles	1-Pole	1-, 2- and 3-Poles	
Trip Characteristics	B, C, D	C, D	
Rated Current	B Characteristic: 6 to 63 A C and D Characteristic: 0.3 to 63 A		C Characteristic: 03. to 40 A D Characteristic: 0.3 to 32 A
Interrupting Ratings[1]	B Characteristic: 14 kA (6 to 63 A)	—	—
	C Characteristic: 14 kA (0.3 to 40 A) 10 kA (45 to 63 A)		C Characteristic: 10 kA (0.3 to 40 A)[2]
	D Characteristic: 14 kA (0.3 to 20 A) 10 kA (25 to 63 A)		D Characteristic: 10 kA (0.3 to 32 A)[2]

1) 14 kA = Type HSJ; 10 kA = Type NSJ.
2) At 240 VAC the Interrupting Rating is the same as the 5SJ4...-.HG40 and .HG41.



5SJ4…-.HG41 Miniature Circuit Breakers

Certifications:
CE
UL Listed and Certified to Canadian Standards
HACR Rated

Features

Features – UL 489

- Suitable for Branch Circuit Protection Applications up to 277 VAC and 60 VDC (1-pole); and, up to 480Y VAC and 125 VDC (2- and 3-pole)
- UL Listed and Certified to Canadian Standards, File E243414
- HACR Rated
- Hight AC Interrupting Ratings of up to 14,000 (Type HSJ) or 10,000 (Type NSJ) Maximum RMS Symmetrical Amps and, DC interrupting ratings of 10,000 Amps
- 40°C Calibration Base (Industrial Applications)
- Can be used for "field wiring" applications; AWG 14 to AWG 4, Copper (Cu) Only
- Suitable for "reverse feed" applications

Features – EN/IEC 60 898

- 30°C Calibration Base
- Trip Characteristic B, C and D
  B: Designed for the protection of computers and electronic equipment. Magnetic trip point is 3 to 5 times the MCB rating.
  C: Designed for general device protection in control circuits and all other miniature circuit breaker systems. Magnetic trip point is 5 to 10 times the MCB rating.
  D: Designed for high inrush loads. Magnetic trip point is 10 to 20 times the MCB rating.
- Rated voltage of 24 VAC minimum, 440 VAC Maximum and 60 VDC per pole
- High Interrupting Rating (I_{cn}) of up to 10,000 Amps
- 0.75 to 35 mm^2 solid and stranded conductors

Features – Common

- Depending on the device selected
  - Available with 1-, 2- or 3-poles
  - Available from 0.3 to 63 amps
- Visible Indicator for ON and OFF/Trip
- Touch Protection to EN50274
- DIN Rail Mounting (Standard 35 mm)
- Identical WIre Screw Connections on Line and Load Sides
- Smaller Size than traditionsl MCCB's

Auxiliary Circuit Switches (AS) are available with One Normally Open + One Normally Closed, Two Normally Open or Two Normally Closed contacts. They are primarily used to signal the miniature circuit breaker's trip mechanism position.

Fault Signal Contacts (FC) are available with One Normally Open + One Normally Closed, Two Normally Open or Two Normally Closed contacts. They are primarily used to signal the automatic tripping of the miniature circuit breaker's trip mechanism; and, trip position.

Shunt Trip Switches (ST) are available in voltages of 110 to 480 VAC and 24 to 60 V AC/DC. They are used for remote tripping of a miniature circuit breaker.

5ST366.-.HG busbars, touch protection covers and terminal connectors are intended for use with Siemens lines of 5SJ4…-.HG4. UL 489 Miniature Circuit Breakers. They are UL Recognized (File E32159) with a rating of 115 Amps maximum at 480Y/277 VAC. Busbars are available in 1-, 2- or 3-pole versions.

Touch Protection Covers are used to cover any unused busbar terminals. They are intended to protect a user from live electrical parts.

Terminal Connectors are used to connect electrical conductors up to 1 AWG (50mm^2) to the busbar terminals. Two versions are available; connecton directly to the miniature circuit breaker or direct connection to the busbar.

SIEMENS

Circuit Breaker Catalog Number Nomenclature

5SJ4 1 10 – 7 HG41
a b c d e

a	Frame Style	
	Code	**Description**
→	5SJ4	Standard Frame

b	Poles	
	Code	**Description**
→	1	1-Pole
→	2	2-Pole
	3	3-Pole

c	Rated Current	
	Code	**Rated Current (I_n)**
	14	0.3
	05	0.5
	01	1
	15	1.6
→	02	2
	03	3
→	04	4
→	11	5
	06	6
	08	8
	10	10
	13	13
	18	15
	16	16
	20	20
	25	25
	30	30
	32	32
	35	35
	40	40
	45	45
	50	50
	60	60
	63	63

d	Trip Curve (Characteristic)			
	Code	**Trip Curve**	**Magnetic Trip Point**	**Thermal Trip Point**
	6	B	3 to 5 I_n	1.13 to 1.45 Breaker Rating
→	7	C	5 to 10 I_n	
	8	D	10 to 20 I_n	

e	Version	
	Code	**Description**
→	HG40	240 VAC, Same Polarity
	HG41	240 VAC
	HG42	480Y/277 VAC

SIEMENS

Product Selection – 5SJ41..-.HG40

Type HSJ: Interrupting rating:
240 VAC: 14,000 Maximum RMS Symmetrical Amps
60 VDC: 10,000 Amps

Type NSJ: Interrupting rating:
240 VAC: 10,000 Maximum RMS Symmetrical Amps
60 VDC (1-pole) / 125 VDC (2- & 3-pole): 10,000 Amps

TYPE →		HSJ	HSJ	NSJ	HSJ	NSJ
No. of Poles	I_n (A)	Characteristic B Order No.	Characteristic C Order No.	Characteristic C Order No.	Characteristic D Order No.	Characteristic D Order No.
1	0.3	- - -	5SJ4114-7HG40		5SJ4114-8HG40	
1	0.5	- - -	5SJ4105-7HG40		5SJ4105-8HG40	
1	1	- - -	5SJ4101-7HG40		5SJ4101-8HG40	
1	1.6	- - -	5SJ4115-7HG40		5SJ4115-8HG40	
1	2	- - -	5SJ4102-7HG40	←	5SJ4102-8HG40	
1	3	- - -	5SJ4103-7HG40		5SJ4103-8HG40	
1	4	- - -	5SJ4104-7HG40	←	5SJ4104-8HG40	
1	5	- - -	5SJ4111-7HG40		5SJ4111-8HG40	
1	6	5SJ4106-6HG40	5SJ4106-7HG40		5SJ4106-8HG40	
1	8	- - -	5SJ4108-7HG40		5SJ4108-8HG40	
1	10	5SJ4110-6HG40	5SJ4110-7HG40		5SJ4110-8HG40	
1	13	5SJ4113-6HG40	5SJ4113-7HG40		5SJ4113-8HG40	
1	15	5SJ4118-6HG40	5SJ4118-7HG40		5SJ4118-8HG40	
1	16	5SJ4116-6HG40	5SJ4116-7HG40		5SJ4116-8HG40	
1	20	5SJ4120-6HG40	5SJ4120-7HG40		5SJ4120-8HG40	
1	25	5SJ4125-6HG40	5SJ4125-7HG40			5SJ4125-8HG40
1	30	5SJ4130-6HG40	5SJ4130-7HG40			5SJ4130-8HG40
1	32	5SJ4132-6HG40	5SJ4132-7HG40			5SJ4132-8HG40
1	35	5SJ4135-6HG40	5SJ4135-7HG40			5SJ4135-8HG40
1	40	5SJ4140-6HG40	5SJ4140-7HG40			5SJ4140-8HG40
1	45	5SJ4145-6HG40		5SJ4145-7HG40		5SJ4145-8HG40
1	50	5SJ4150-6HG40		5SJ4150-7HG40		5SJ4150-8HG40
1	60	5SJ4160-6HG40		5SJ4160-7HG40		5SJ4160-8HG40
1	63	5SJ4163-6HG40		5SJ4163-7HG40		5SJ4163-8HG40

SIEMENS

Product Selection – 5SJ4…-.HG41

Type HSJ: Interrupting rating:
240 VAC: 14 kA Maximum RMS Symmetrical
60 VDC (1-pole) / 125 VDC (2- & 3-pole):
10,000 A

Type NSJ: Interrupting rating:
240 VAC: 10kA Maximum RMS Symmetrical
60 VDC (1-pole)/125 VDC (2- & 3-pole):
10,000 kA

TYPE →		HSJ	NSJ	HSJ	NSJ
No. of Poles[1)]	**I_n (A)**	**Characteristic C Order No.**	**Characteristic C Order No.**	**Characteristic D Order No.**	**Characteristic D Order No.**
*	0.3	5SJ4*14-7HG41		5SJ4*14-8HG41	
*	0.5	5SJ4*05-7HG41		5SJ4*05-8HG41	
*	1	5SJ4*01-7HG41		5SJ4*01-8HG41	
*	1.6	5SJ4*15-7HG41		5SJ4*15-8HG41	
*	2	5SJ4*02-7HG41		5SJ4*02-8HG41	
*	3	5SJ4*03-7HG41		5SJ4*03-8HG41	
*	4	5SJ4*04-7HG41		5SJ4*04-8HG41	
*	5	5SJ4*11-7HG41		5SJ4*11-8HG41	
*	6	5SJ4*06-7HG41		5SJ4*06-8HG41	
*	8	5SJ4*08-7HG41		5SJ4*08-8HG41	
*	10	5SJ4*10-7HG41		5SJ4*10-8HG41	
*	13	5SJ4*13-7HG41		5SJ4*13-8HG41	
*	15	5SJ4*18-7HG41		5SJ4*18-8HG41	
*	16	5SJ4*16-7HG41		5SJ4*16-8HG41	
*	20	5SJ4*20-7HG41		5SJ4*20-8HG41	
*	25	5SJ4*25-7HG41			5SJ4*25-8HG41
*	30	5SJ4*30-7HG41			5SJ4*30-8HG41
*	32	5SJ4*32-7HG41			5SJ4*32-8HG41
*	35	5SJ4*35-7HG41			5SJ4*35-8HG41
*	40	5SJ4*40-7HG41			5SJ4*40-8HG41
*	45		5SJ4*45-7HG41		5SJ4*45-8HG41
*	50		5SJ4*50-7HG41		5SJ4*50-8HG41
*	60		5SJ4*60-7HG41		5SJ4*60-8HG41
*	63		5SJ4*63-7HG41		5SJ4*63-8HG41

[1)] Substitute the "*****" with:
1 for 1-pole mCBs
2 for 2-pole mCBs
3 for 3-pole mCBs

SIEMENS

Product Selection – 5SJ4…-.HG42



Type NSJ: Interrupting rating:

- 480Y/277 VAC 10,000 Maximum RMS Symmetrical Amps
- 60 VDC (1-pole) / 125 VDC (2- & 3-pole) 10,000 Amps

TYPE →		HSJ	NSJ	HSJ	NSJ
No. of Poles[1)]	I_n (A)	Characteristic C Order No.	Characteristic C Order No.	Characteristic D Order No.	Characteristic D Order No.
*	0.3	- - -	5SJ4*14-7HG42	- - -	5SJ4*14-8HG42
*	0.5	- - -	5SJ4*05-7HG42	- - -	5SJ4*05-8HG42
*	1	- - -	5SJ4*01-7HG42	- - -	5SJ4*01-8HG42
*	1.6	- - -	5SJ4*15-7HG42	- - -	5SJ4*15-8HG42
*	2	- - -	5SJ4*02-7HG42	- - -	5SJ4*02-8HG42
*	3	- - -	5SJ4*03-7HG42	- - -	5SJ4*03-8HG42
*	4	- - -	5SJ4*04-7HG42	- - -	5SJ4*04-8HG42
*	5	- - -	5SJ4*11-7HG42	- - -	5SJ4*11-8HG42 ←
*	6	- - -	5SJ4*06-7HG42	- - -	5SJ4*06-8HG42
*	8	- - -	5SJ4*08-7HG42	- - -	5SJ4*08-8HG42
*	10	- - -	5SJ4*10-7HG42	- - -	5SJ4*10-8HG42
*	13	- - -	5SJ4*13-7HG42	- - -	5SJ4*13-8HG42
*	15	- - -	5SJ4*18-7HG42	- - -	5SJ4*18-8HG42
*	16	- - -	5SJ4*16-7HG42	- - -	5SJ4*16-8HG42
*	20	- - -	5SJ4*20-7HG42	- - -	5SJ4*20-8HG42
*	25	- - -	5SJ4*25-7HG42	- - -	5SJ4*25-8HG42
*	30	- - -	5SJ4*30-7HG42	- - -	5SJ4*30-8HG42
*	32	- - -	5SJ4*32-7HG42	- - -	5SJ4*32-8HG42
*	35	- - -	5SJ4*35-7HG42	- - -	- - -
*	40	- - -	5SJ4*40-7HG42	- - -	- - -
*	45	- - -	- - -	- - -	- - -
*	50	- - -	- - -	- - -	- - -
*	60	- - -	- - -	- - -	- - -
*	63	- - -	- - -	- - -	- - -

[1)] Substitute the "*****" with:

1 for 1-pole mCBs
2 for 2-pole mCBs
3 for 3-pole mCBs

5SJ4 Branch Circuit Protection

Technical data

		5SJ41..-.HG40	5SJ4...-.HG41	5SJ4...-.HG42
Standards Certifications		EN 60898; EN 60947-2; UL 489; CSA C22.2 No. 5-02 CE; cULus, UL File No. E243414		
Tripping characteristic		B, C, D	C, D	
Number of poles		1	1, 2 & 3	
Operating voltage	Min. V AC/DC	24		
- IEC 60898	Max. V DC/pole	60		
	Max. V AC	440		
- UL 489 and CSA C22.2 No. 5-02	Max. V AC	240 Same Polarity	240	480Y/277
	V DC/1P	60	60	60
	V DC/2P, 3P	-	125	125
Interrupting rating [1])				
- I_{cn} to IEC 60898-1	kA AC	10		
- UL 489 and CSA C22.2 No. 5-02		Type NSJ: 10kA		
AC: Max. RMS Symmetrical	kA AC	Type HSJ: 14kA		Type NSJ: 10kA
Touch protection to EN 50274		Yes		
Degree of protection to EN 60529		IP20, with connected conductors		
CFC and silicone free		Yes		
Mounting		On standard mounting rail (DIN 35 mm)		
Device depth	mm	70		
Terminals				
- Identical screw terminals on both line and load sides		Yes		
- Terminal tightening torque	lb. in.	31		
	Nm	3.5		
Conductor cross sections	mm^2	Solid and Stranded: 0.75 to 35		
	mm^2	Finely Stranded, with end sleeve: 0.75 to 25		
	AWG	14 to 4, 60/75°C, Cu Only		
Calibration Base	°C	40 (UL 489) 30 (EN 60898)		
Average service life, with rated load		20,000 actuations		
Ambient temperature	°C	-25 to 45, occassionally +55, max. 95% humidity		
Storage Temperature	°C	-40 to +75		
Resistance to vibration to IEC 60068-2-6	m/s^2	60 at 10 Hz to 150 Hz		

1) See Selection and ordering data for specific device interrutping rating

Busbar & Connecting Terminals

Material Version		**Busbars** 5ST3663 5ST3664 5ST3665	**Connecting Terminals** 5ST3666-0HG	5ST3666-2HG
Standards Certifications		UL 489 UL Listed, File No. E243414		
Operating voltage				
- IEC 60898	VAC	690		
- UL 489	VAC	480Y/277 and 240		
Rated current to 40°C	A	115		
Busbar cross section	mm^2	16 (Copper)		
Conductor cross sections	Solid and Stranded mm^2	-	2.5 to 35	2.5 to 50
	AWG	-	14 to 2	14 to 1
Terminal tightening torque	lb. in.	-	30	30
	Nm	-	3.3	3.3
Temperature Resistance	°C	200 - UL 94-V0/0.4mm		

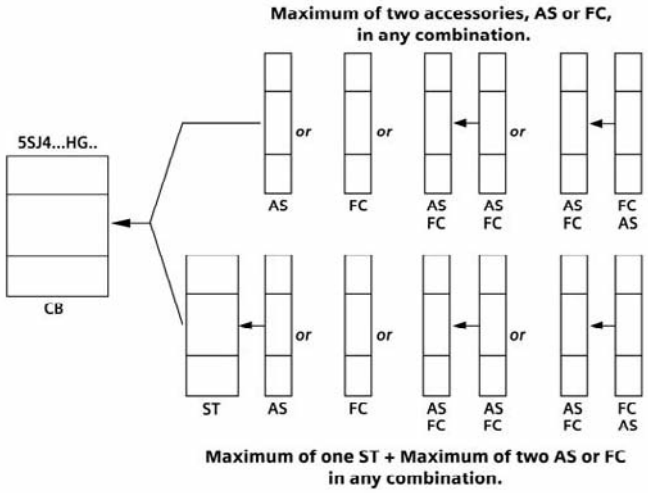
Technical data

Auxilliary Switch (AS), Fault Signal Contacts (FC) and Shunt Trip (ST)

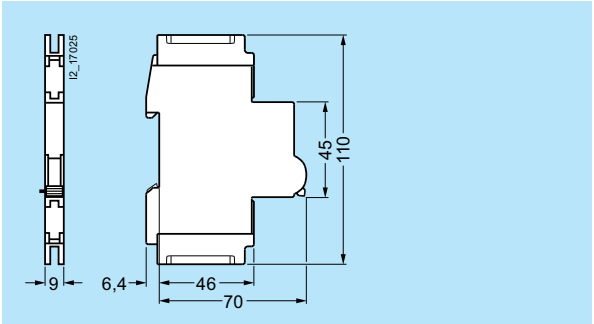
Material Version		**AS**	**FC**	**ST**	
		5ST301.-0HG	**5ST302.-0HG**	**5ST3030-0HG**	**5ST3032-0HG**
Standards		UL 489; CSA C22.2 No. 5-02			
		IEC/EN 62019, IEC/EN 60947-5-1		IEC/EN 60947-1	
Certifications		CE, UL 489, CSA, UL File No. E321559			
Rated voltages/-load		IEC AC V 400 I 230		110 to 415	24 to 60
		AC A 2 I 6 (NC:AC13, NO: AC14)		-	-
		DC V 220 I 110 I 60 I 24		110	24 to 60
		DC A 1 I 1 I 3 I 6 (DC 13)		-	-
		UL AC V 480 I 277 I 240 I 120		110 to 480	24 to 60
		AC A 1.5 I 3 I 4 I 6		-	
		DC V 125 I 60		-	24 to 60
		DC A 1 I 3		-	-
Contact load		min. 50 mA, 24 V		-	-
Conductor cross-sections	AWG	22 ... 14		22 ... 14	
	mm^2	0.5 ... 2.5		0.5 ... 2.5	
Terminals - terminal tightening torque	Nm	0.5 max.		0.8 max.	
	lb/in.	4.5		6.8	

Applications

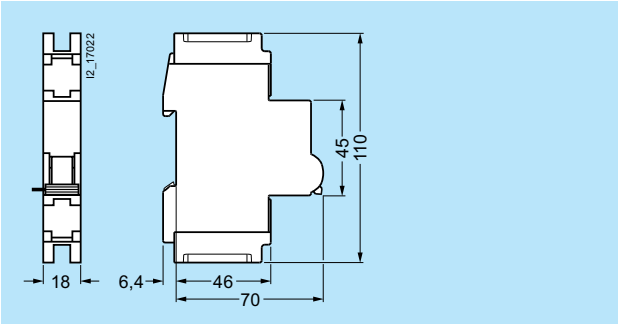
Auxiliary Switch (AS), Fault Signal Contact (FC) and Shunt Trip (ST) accessories are used with 5SJ4…-.HG4. miniature circuit breakers (CB) and are mounted to the right of them.



Dimensions

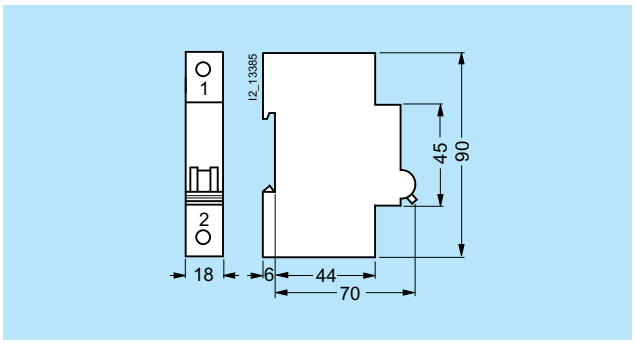


5ST3 010-0HG 5ST3 011-0HG 5ST3 012-0HG
5ST3 020-0HG 5ST3 021-0HG 5ST3 022-0HG

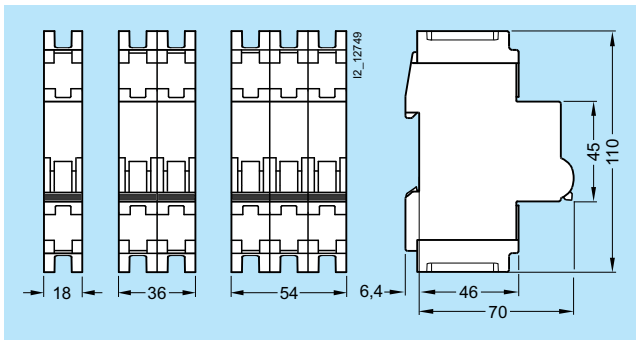


5ST3 030-0HG
5ST3 031-0HG

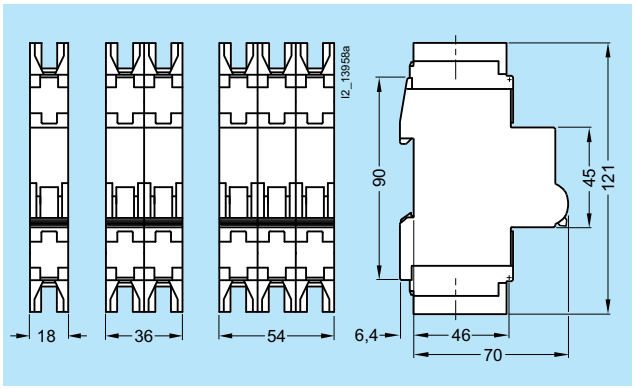
Dimensions



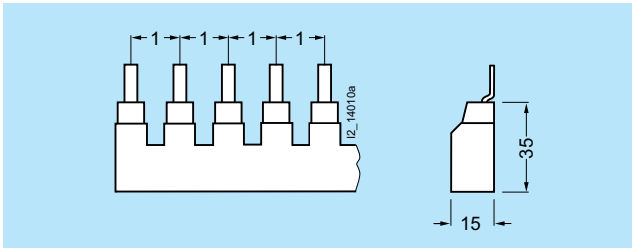
5SJ4...-.HG40



5SJ4...-.HG41



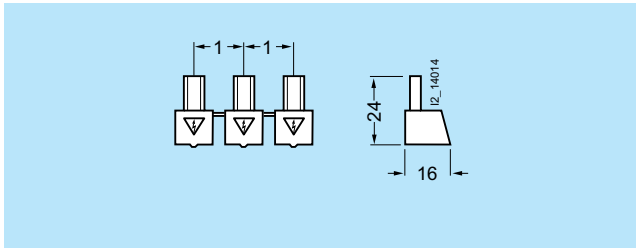
5SJ4...-.HG42



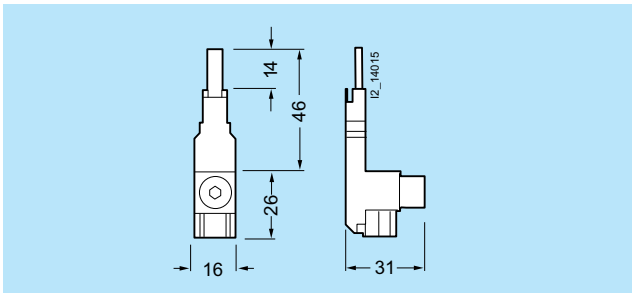
5ST3 663-0HG
5ST3 663-1HG
5ST3 663-2HG

5ST3 664-0HG
5ST3 664-1HG
5ST3 664-2HG

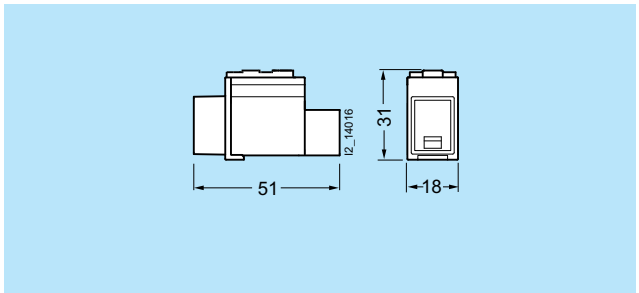
5ST3 665-0HG
5ST3 665-1HG
5ST3 665-2HG



5ST3 666-1HG



5ST3 666-0HG



5ST3 666-2HG

Over/Under Current Sensing
ECS Series
Current Sensor

- Toroidal Through Hole Wiring
- 0.5...50 A Trip Point
- Adjustable or Factory Fixed Trip Delays
- 10 A SPDT Isolated Output Contacts
- 5% Trip Point Hysteresis (Dead Band)

Description

The ECS Series of Single Phase AC Current Sensors is a universal, overcurrent or undercurrent sensing control. Its built-in toroidal sensor eliminates the inconvenience of installing a stand-alone current transformer. Includes onboard adjustments for current sensing mode, trip point, and trip delay. Detects over or under current events like locked rotor, loss of load, an open heater or lamp load, or proves an operation is taking place or has ended.

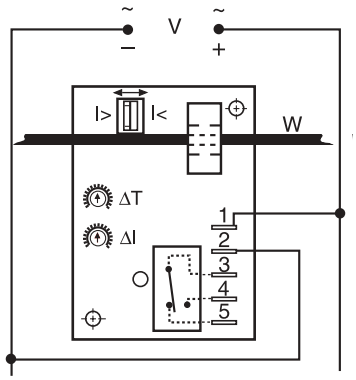
Adjustment

Select the desired function, over or under current sensing. Set the trip point and trip delay to approximate settings. Apply power to the ECS and the monitored load. Turn adjustment and watch the LED. LED will light; turn slightly in opposite direction until LED is off. Adjustment can be done while connected to the control circuitry if the trip delay is set at maximum.

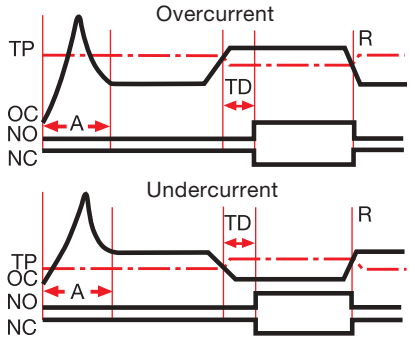
Operation

When a fault is sensed throughout the trip delay, the output relay is energized. When the current returns to the normal run condition, the output and the delay are reset. If a fault is sensed and then corrected before the trip delay is completed, the relay will not energize and the trip delay is reset to zero.

■ Approvals:



Relay contacts are isolated.
Dashed lines are internal connections.



V = Voltage W = Insulated Wire Carrying Monitored Current I> = Overcurrent
I< = Undercurrent TP = Trip Point R = Reset
OC = Monitored Current NO = Normally Open Contact NC = Normally Closed Contact
A = Sensing Delay On Start Up TD = Trip Delay

Ordering Table

X Series
- **ECS** - (selectable over or undercurrent sensing)
- **ECSH** - (overcurrent sensing)
- **ECSL** - (undercurrent sensing)

X Input
- **1** - 12 V DC
- **2** - 24 V AC
- **3** - 24 V DC
- **4** - 120 V AC
- **6** - 230 V AC

X Trip Point
Fixed - Specify **2** ... **50** A in 1 A increments

Adjustable Ranges
- **0** - 0.5 ... 5 A
- **1** - 2 ... 20 A
- **H** - 5 ... 50 A

X Trip Delay
- **F** - Factory Fixed: Specify **.08** ... **50** s

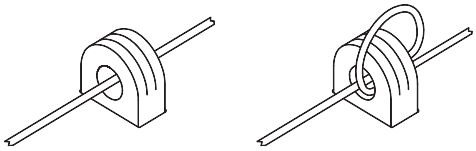
Adjustable Ranges
- **A** - 0.150 ... 7 s
- **B** - 0.5 ... 50 s

X Sensing Delay on Start up
Blank - 0
- **C** - 1 s
- **D** - 2 s
- **E** - 3 s
- **F** - 4 s
- **G** - 5 s
- **H** - 6 s

Example P/N: **ECS41AC**
Fixed – **ECSH610AD**

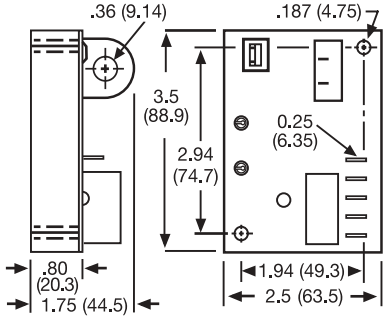
Technical Data

Sensor	
Type	Toroidal, through hole wiring
Mode	Over or undercurrent, switch selectable on the unit or factory fixed
Trip Point Range	0.5 ... 50 A in 3 adjustable ranges or fixed
Tolerance: Adjustable	Guaranteed range
Fixed	0.5 ... 25 A: 0.5 A or +/-5% whichever is less; 26 ... 50 A: +/-2.5%
Maximum Allowable Current	Steady – 50 A turns; Inrush – 300 A turns for 10 s
Trip Point Hysteresis	≅ +/-5%
Trip Point vs. Temperature	+/-5%
Response Time	≤75 ms
Frequency	45 ... 500 Hz
Type of Detection	Peak detection
Trip Delay	
Type	Analog
Range: Adjustable	0.150 ... 7 s; 0.5 ... 50 s (Guaranteed ranges)
Factory Fixed	0.08 ... 50 s (+/-10%)
Delay vs. Temperature	+/-15%
Sensing Delay on Startup	Factory fixed 0 ... 6 s +40% ... 0%
Input	
Voltage	24 , 120, or 230 V AC; 12 or 24 V DC
Tolerance 12 V DC & 24 V DC/AC	-15% ... +20%
120 & 230 V AC	-20% ... +10%
Line Frequency	50 ... 60 Hz
Output	
Type	Electromechanical relay
Form	Isolated single pole double throw (SPDT)
Rating	10 A resistive at 240 V AC; 1/4 hp at 125 V AC; 1/2 hp at 250 V AC
Life	Mechanical – 1 x 10^6 ; Electrical – 1 x 10^5
Protection	
Circuitry	Encapsulated
Isolation Voltage	≥ 2500 V RMS input to output
Insulation Resistance	≥ 100 MΩ
Mechanical	
Mounting	Surface mount with two #6 (M3.5 x 0.6) screws
Termination	0.25 in. (6.35 mm) male quick connect terminals (5)
Humidity	95% relative, non-condensing
Operating/Storage Temperature	-40°C ... +60°C / -40°C ... +85°C
Weight	≅ 6.4 oz (181 g)



Multiple Turns To Increase Sensitivity
To increase sensitivity, multiple turns may be made through the ECS's toroidal sensor. The trip point range is divided by the number of turns through the toroidal sensor to create a new range.

Using an External Current Transformer (CT)
Select a 2 VA, 0 to 5 A output CT, rated for the current to be monitored. Select ECS adjustment range 0. Pass the CT's secondary wire lead through the ECS's toroid.



Inches (Millimeters)

Accessories

Female quick connect **P/Ns:**
P1015-13 (AWG 10/12)
P1015-64 (AWG 14/16)
P1015-14 (AWG 18/22)

See accessory page at the end of this section.

RXM ●AB2F7

RXM Miniature Relays (page 4)

2 pole relays; 12A
3 pole relays; 10A
4 pole relays; 6A
4 pole relays; 3A (low level)

- Mechanical “relay status” indicator on all relays
- Pilot light option available
- Manual operator on all relays
- Built-in marking area

RPM 32F7

RPM Miniature Power Relays (page 12)

1 pole relays; 15A
2 pole relays; 15A
3 pole relays; 15A
4 pole relays; 15A

- Mechanical “relay status” indicator on all relays
- Pilot light option available
- Manual operator on all relays
- Built-in marking area

RUM ●●AB2B7

RUM Universal Relays (page 20)

2 pole relays; 8-pin, tube type;10A
3 pole relays; 11-pin, tube type;10A
2 pole relays; 8 blade type; 10A
3 pole relays; 11 blade type; 10A

- Mechanical “relay status” indicator on all relays
- Pilot light option available
- Manual operator on all relays
- Built-in marking area


RPF 2B●●

RPF Power Relays (page 28)

Two Form C contacts; 30A
Two Normally Open contacts; 30A

- DIN track mountable
- Can be mounted directly to a panel

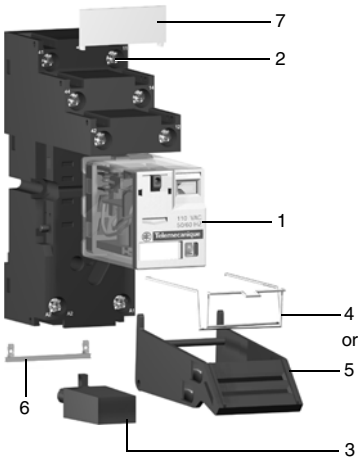
RSB Interface Relays (page 31)

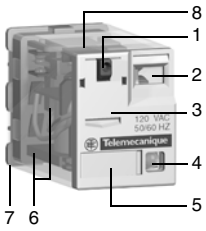

RSB 1A160BD
+ RSZ E1S48M

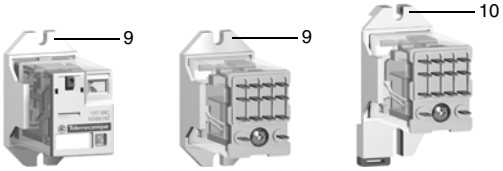
Two Form C contacts; 8A
One Form C contact; 12A
One Form C contact; 16A

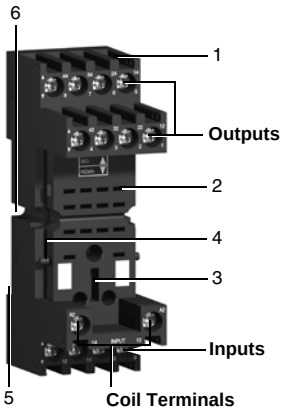
General Technical Information (page 36)

Relay contact types
Utilization categories
Protection categories
Protection modules









Product Description

The RXM miniature relay range consists of:

1. 12 A relays with 2 C/O contacts, 10 A relays with 3 C/O contacts, 6 A relays with 4 C/O contacts, and 3 A “low level” relays with 4 C/O contacts. All these relays have the same dimensions.
2. Sockets with mixed or separate contact terminals.
3. Protection modules (diode, RC circuit or varistor). All these modules are common to all sockets.
4. A metal hold-down clip for all sockets.
5. A plastic hold-down clip for all sockets.
6. A 2-pole bus jumper that can be used on sockets with separate contact terminals to simplify wiring when creating a jumper between the coil terminals.
7. Clip-in markers for all the sockets except RXZ E2M114.

Relay Description

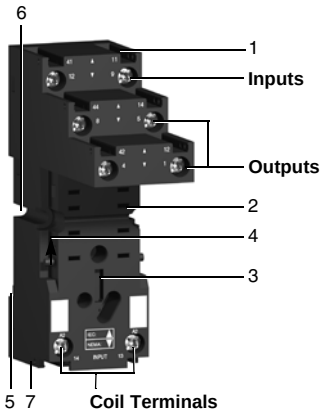
1. Spring return push button for testing the contacts (green: DC, red: AC).
2. Mechanical “relay status” indicator.
3. Removable lock-down door enabling forced maintaining of the contacts for test or maintenance purposes. During operation, this lock-down door must always be in the closed position.
4. Bipolar LED (depending on version) indicating the relay status.
5. Removable marker for relay identification.
6. Four notches for DIN rail mounting adapter or panel mounting adapter.
7. Eight, eleven, or fourteen pins.
8. Area by which the product can be easily gripped.
9. Mounting adapter enabling direct mounting of the relay on a panel.
10. Mounting adapter enabling direct mounting of the relay on a DIN rail.

Socket Description

Sockets with Mixed Contact Terminals

1. Connection by screw clamp terminals or box lug connector.
2. Fourteen female contacts for the relay pins.
3. Location for protection modules.
4. Locking components for plastic and metal hold-down clips.
5. Locating slot for mounting on DIN rail.
6. Two or four mounting holes for panel mounting.

NOTE: The inputs are mixed with the relay coil terminals, with the outputs being located on the opposite side of the socket.



Sockets with Separate Contact Terminals

1. Box lug connector.
2. Eight, eleven, or fourteen female contacts for the relay pins.
3. Location for protection modules.
4. Locking components for plastic and metal hold-down clips.
5. Locating slot for mounting on DIN rail.
6. Two mounting holes for panel mounting.
7. Location for bus jumpers (see mounting on sockets on page 10).

NOTE: The inputs and outputs are separated from the relay coil terminals.

General Characteristics

Conforming to standards		IEC/EN 61810-1 (iss. 2), UL 508, CSA C22-2 n° 14
Product certifications		cULus File E164862 CCN NLDX, NLDX7; cURus File E164862 CCN NLDX2, NLDX8; CSA pending; CE; RoHS compliant
Ambient air temperature around the device	Storage	-40—185 °F (-40—85 °C)
	Operation	-40—131 °F (-40—55 °C)
Vibration resistance	Conforming to IEC/EN 60068-2-6	> 6 gn (10–50 Hz)
Degree of protection	Conforming to IEC/EN 60529	IP 40
Shock resistance conforming to IEC/EN 60068-2-27	Opening	10 gn
	Closing	5 gn
Protection category (see page 36)		RT I
Mounting position		Any

Insulation characteristics

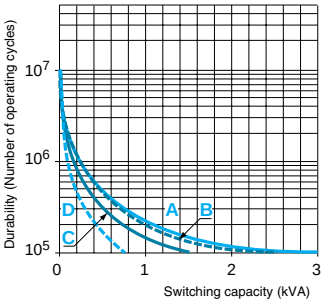
Rated insulation voltage (Ui)		250 V (IEC), 300 V (UL, CSA)
Rated impulse withstand voltage (Uimp)		3.6 kV (1.2/50 µs)
Dielectric strength (rms voltage)	Between coil and contact	2,500 Vac
	Between poles	2,500 Vac
	Between contacts	1,500 Vac

Contact characteristics

Relay type			**RXM 2AB●●●**	**RXM 3AB●●●**	**RXM 4AB●●●**	**RXM 4GB●●●**
Number and type of contacts (see page 11)			2 C/O	3 C/O	4 C/O	4 C/O
Contact materials			AgNi			AgAu
Conventional thermal current (Ith)	For ambient temperature ≤ 131 °F (55 °C)		12 A	10 A	6 A	3 A
Rated operational current	Conforming to IEC in utilization category AC-1	N/O	12 A	10 A	6 A	2 A
		N/C	6 A	5 A	3 A	1 A
	Conforming to UL (resistive@277 Vac)		12 A	10 A	6 A	3 A
Maximum operating rate In operating cycles/hour	No load		18,000			
	Under load		1,200			
Switching voltage	Maximum		250 Vac/Vdc			
Switching capacity	Minimum		10 mA on 17 V			2 mA on 5 V
	Maximum		3,000 VA	2,500 VA	1,500 VA	750 VA
Utilization coefficient			20%			
Mechanical durability in millions of operating cycles			10			
Electrical durability in millions of operating cycles	Resistive load		0.1			

Electrical Durability of Contacts

Resistive load AC



A=RXM 2AB●●● B=RXM 3AB●●● C=RXM 4AB●●● D=RXM 4GB●●●

Coil characteristics

Average consumption		AC	1.2 VA
		DC	0.9 W
Drop-out voltage threshold		AC	⩾ 0.15 Uc
		DC	⩾ 0.1 Uc
Operating time (response time)	Between coil energization and making of the N/O contact	AC	20 ms
		DC	20 ms
	Between coil de-energization and making of the N/C contact	AC	20 ms
		DC	20 ms

Coil voltage Uc			**12 V**	**24 V**	**48 V**	**110 V**	**120 V**	**125 V**	**220 V**	**230 V**	**240 V**
Relay coil voltage codes			**JD**	**BD**	**ED**	**FD**	**–**	**GD**	**MD**	**–**	**–**
DC	Average resistance at 68 °F (20 °C) ± 10%		160 Ω	650 Ω	2,600 Ω	11,000 Ω	–	11,000 Ω	14,000 Ω	–	–
	Operating voltage limits	Min.	9.6 V	19.2 V	38.4 V	88 V	–	100 V	176 V	–	–
		Max.	13.2 V	26.4 V	52.8 V	121 V	–	138 V	242 V	–	–
Relay coil voltage codes			**–**	**B7**	**E7**	**–**	**F7**	**–**	**M7**	**P7**	**U7**
AC	Average resistance at 68 °F (20 °C) ± 15%		–	180 Ω	770 Ω	–	4,430 Ω	–	15,000 Ω	15,000 Ω	15,500 Ω
	Operating voltage limits	Min.	–	19.2 V	38.4 V	–	96 V	–	176 V	184 V	192 V
		Max.	–	26.4 V	52.8 V	–	132 V	–	242 V	253 V	264 V

Socket characteristics

Socket type		**RXZ E2S108M**	**RXZ E2S111M**	**RXZ E2S114M**	**RXZ E2M114**	**RXZ E2M114M**
Relay types used		**RXM 2●●●●●**	**RXM 3●●●●●**	**RXM 4●●●●●**	**RXM 2●●●●●**[1] **RXM 4●●●●●**	**RXM 2●●●●●**[1] **RXM 4●●●●●**
Product certifications		cURus File E172326 CCN SWIV2, SWIV8; CSA (pending); CE; RoHS compliant				
Conventional thermal current (Ith)		12 A	10 A			
Degree of protection	Conforming to IEC/EN 60529	IP 20				
Connection	Solid wire without cable end	1 conductor: AWG 20–12 (0.5–2.5 mm^2) 2 conductors: AWG 20–14 (0.5–1.5 mm^2)				
	Flexible wire with cable end	1 conductor: AWG 24–14 (0.2–2.5 mm^2) 2 conductors: AWG 24–16 (0.2–1.5 mm^2)				
	Flexible wire without cable end	1 conductor: AWG 24–14 (0.2–2.5 mm^2) 2 conductors: AWG 24–16 (0.2–1.5 mm^2)				
Maximum tightening torque		5.3 lbf-in (0.6 N●m) (M3 screw)				
Contact terminal arrangement		Separate			Mixed	
Bus jumper Ith: 5 A		Yes			No	

[1] When mounting relay RXM 2●●●●● on socket RXZ E2M●●●●, the thermal current must not exceed 10 A.

RXM ●AB2F7

Miniature relays without LED (sold in lots of 10)

	Number and type of contacts - Thermal current (Ith)									
	2 C/O -12 A			3 C/O - 10 A			4 C/O - 6 A			
Coil Voltage	Catalog Number	Weight		Catalog Number	Weight		Catalog Number	Weight	
		lb.	kg		lb.	kg		lb.	kg
12 Vdc	**RXM 2AB1JD**	0.08	0.037	**RXM 3AB1JD**	0.08	0.038	**RXM 4AB1JD**	0.08	0.036
24 Vdc	**RXM 2AB1BD**	0.08	0.037	**RXM 3AB1BD**	0.08	0.038	**RXM 4AB1BD**	0.08	0.036
48 Vdc	**RXM 2AB1ED**	0.08	0.037	**RXM 3AB1ED**	0.08	0.038	**RXM 4AB1ED**	0.08	0.036
110 Vdc	**RXM 2AB1FD**	0.08	0.037	**RXM 3AB1FD**	0.08	0.038	**RXM 4AB1FD**	0.08	0.036
220 Vdc	–	–	–	–	–	–	**RXM 4AB1MD**	0.08	0.036
24 Vac	**RXM 2AB1B7**	0.08	0.037	**RXM 3AB1B7**	0.08	0.038	**RXM 4AB1B7**	0.08	0.036
48 Vac	**RXM 2AB1E7**	0.08	0.037	**RXM 3AB1E7**	0.08	0.038	**RXM 4AB1E7**	0.08	0.036
120 Vac	**RXM 2AB1F7**	0.08	0.037	**RXM 3AB1F7**	0.08	0.038	**RXM 4AB1F7**	0.08	0.036
230 Vac	**RXM 2AB1P7**	0.08	0.037	**RXM 3AB1P7**	0.08	0.038	**RXM 4AB1P7**	0.08	0.036
240 Vac	–	–	–	–	–	–	**RXM 4AB1U7**	0.08	0.036
Miniature relays with LED (sold in lots of 10)									
12 Vdc	**RXM 2AB2JD**	0.08	0.037	**RXM 3AB2JD**	0.08	0.038	**RXM 4AB2JD**	0.08	0.036
24 Vdc	**RXM 2AB2BD**	0.08	0.037	**RXM 3AB2BD**	0.08	0.038	**RXM 4AB2BD**	0.08	0.036
48 Vdc	**RXM 2AB2ED**	0.08	0.037	**RXM 3AB2ED**	0.08	0.038	**RXM 4AB2ED**	0.08	0.036
110 Vdc	**RXM 2AB2FD**	0.08	0.037	**RXM 3AB2FD**	0.08	0.038	**RXM 4AB2FD**	0.08	0.036
125 Vdc	–	–	–	–	–	–	**RXM 4AB2GD**	0.08	0.036
24 Vac	**RXM 2AB2B7**	0.08	0.037	**RXM 3AB2B7**	0.08	0.038	**RXM 4AB2B7**	0.08	0.036
48 Vac	**RXM 2AB2E7**	0.08	0.037	**RXM 3AB2E7**	0.08	0.038	**RXM 4AB2E7**	0.08	0.036
120 Vac	**RXM 2AB2F7**	0.08	0.037	**RXM 3AB2F7**	0.08	0.038	**RXM 4AB2F7**	0.08	0.036
230 Vac	**RXM 2AB2P7**	0.08	0.037	**RXM 3AB2P7**	0.08	0.038	**RXM 4AB2P7**	0.08	0.036

RXM 4GB2F7

Miniature relays with low level contacts, without LED (sold in lots of 10)

Number and type of contacts - Thermal current (Ith)			
4 C/O -3 A			
Coil Voltage	Catalog Number	Weight	
		lb.	kg
12 Vdc	**RXM 4GB1JD**	0.08	0.036
24 Vdc	**RXM 4GB1BD**	0.08	0.036
48 Vdc	**RXM 4GB1ED**	0.08	0.036
110 Vdc	**RXM 4GB1FD**	0.08	0.036
24 Vac	**RXM 4GB1B7**	0.08	0.036
48 Vac	**RXM 4GB1E7**	0.08	0.036
120 Vac	**RXM 4GB1F7**	0.08	0.036
230 Vac	**RXM 4GB1P7**	0.08	0.036

Miniature relays with low level contacts, with LED (sold in lots of 10)

Number and type of contacts - Thermal current (Ith)			
4 C/O -3 A			
Coil Voltage	Catalog Number	Weight	
		lb.	kg
12 Vdc	**RXM 4GB2JD**	0.08	0.036
24 Vdc	**RXM 4GB2BD**	0.08	0.036
48 Vdc	**RXM 4GB2ED**	0.08	0.036
110 Vdc	**RXM 4GB2FD**	0.08	0.036
24 Vac	**RXM 4GB2B7**	0.08	0.036
48 Vac	**RXM 4GB2E7**	0.08	0.036
120 Vac	**RXM 4GB2F7**	0.08	0.036
230 Vac	**RXM 4GB2P7**	0.08	0.036
240 Vac	**RXM 4GB2U7**	0.08	0.036

See page 8 for sockets and accessories.

RXZ E2M114M with relay RXM 4AB2P7TQ

Miniature relays without LED (sold in lots of 100)

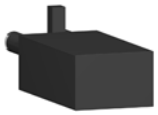
Coil Voltage	Number and type of contacts - Thermal current (Ith)					
	2 C/O - 12 A			4 C/O - 6 A		
	Catalog Number	Weight		Catalog Number	Weight	
		lb.	kg		lb.	kg
12 Vdc	–	–	–	**RXM 4AB1JDTQ**	0.08	0.036
24 Vdc	**RXM 2AB1BDTQ**	0.08	0.037	**RXM 4AB1BDTQ**	0.08	0.036
48 Vdc	–	–	–	**RXM 4AB1EDTQ**	0.08	0.036
110 Vdc	–	–	–	**RXM 4AB1FDTQ**	0.08	0.036
220 Vdc	–	–	–	**RXM 4AB1MDTQ**	0.08	0.036
24 Vac	**RXM 2AB1B7TQ**	0.08	0.037	**RXM 4AB1B7TQ**	0.08	0.036
48 Vac	–	–	–	**RXM 4AB1E7TQ**	0.08	0.036
120 Vac	**RXM 2AB1F7TQ**	0.08	0.037	**RXM 4AB1F7TQ**	0.08	0.036
230 Vac	**RXM 2AB1P7TQ**	0.08	0.037	**RXM 4AB1P7TQ**	0.08	0.036
Miniature relays with LED (sold in lots of 100)						
24 Vdc	–	–	–	**RXM 4AB2BDTQ**	0.08	0.036
24 Vac	**RXM 2AB2B7TQ**	0.08	0.037	**RXM 4AB2B7TQ**	0.08	0.036
230 Vac	**RXM 2AB2P7TQ**	0.08	0.037	**RXM 4AB2P7TQ**	0.08	0.036

RXZ E2S114M with relay RXM 4AB2F7TQ

Sockets (sold in lots of 10)

Contact terminal arrangement	Connection	Relay type	Catalog Number	Weight	
				lb.	kg
Mixed	Screw clamp terminals	RXM 2●●●● [1] RXM 4●●●●	**RXZ E2M114** [2]	0.11	0.048
	Box lug connector	RXM 2●●●● [1] RXM 4●●●●	**RXZ E2M114M** [2]	0.12	0.056
Separate	Box lug connector	RXM 2●●●●	**RXZ E2S108M** [3]	0.13	0.058
		RXM 3●●●●	**RXZ E2S111M** [2]	0.15	0.066
		RXM 4●●●●	**RXZ E2S114M** [2]	0.15	0.070

[1] When mounting relay RXM 2●●●●● on socket RXZ E2M●●●●, the thermal current must not exceed 10 A.
[2] Thermal current Ith: 10 A
[3] Thermal current Ith: 12 A



RXM 041●●7

Protection modules (sold in lots of 20)

Description	Voltage	For use with	Catalog Number	Weight	
				oz.	g
Diode	6–250 Vdc	All sockets	**RXM 040W**	0.11	3.0
RC circuit	24–60 Vac	All sockets	**RXM 041BN7**	0.35	10.0
	110–240 Vac	All sockets	**RXM 041FU7**	0.35	10.0
Varistor	6–24 Vac/Vdc	All sockets	**RXM 021RB**	1.06	30.0
	24–60 Vac/Vdc	All sockets	**RXM 021BN**	1.06	30.0
	110–240 Vac/Vdc	All sockets	**RXM 021FP**	1.06	30.0

RE XL4●●

Timing relays

Description	For use with	Catalog Number	Weight	
			lb.	kg
2 timed C/O contacts (function A—On-delay)	Sockets RXZ E●●●●●	**RE XL2●●** [4]	0.09	0.042
4 timed C/O contacts (function A—On-delay)		**RE XL4●●** [4]	0.09	0.042

[4] Please refer to the *Zelio® Time - Timers* catalog (9050CT0001R2/05).

RXZ 400

Accessories (sold in lots of 10)

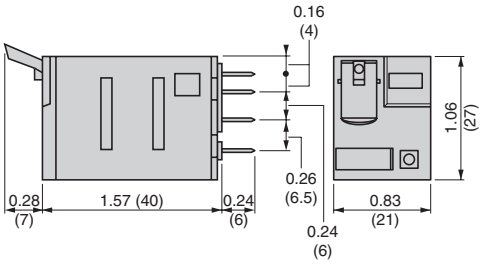
Description	For use with	Catalog Number	Weight	
			oz.	g
Metal hold-down clip	All sockets	**RXZ 400**	0.04	1.0
Plastic hold-down clip	All sockets	**RXZ R335**	0.18	5.0
Bus jumper, 2-pole (Ith: 5 A)	All sockets with separate contacts	**RXZ S2**	0.18	5.0
Mounting adapter for DIN rail [5]	All relays	**RXZ E2DA**	0.14	4.0
Mounting adapter for mounting directly to a panel	All relays	**RXZ E2FA**	0.07	2.0
Clip-in markers	All relays (sheet of 108 markers)	**RXZ L520**	2.82	80.0
	All sockets except RXZ E2M114	**RXZ L420**	0.04	1.0

[5] Test button becomes inaccessible.

Relays

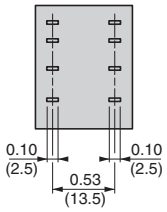
RXM ●●●●●●

Common view

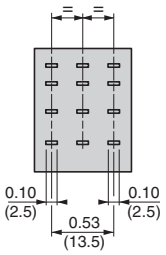


RXM 2

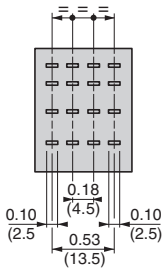
Pin side view



RXM 3

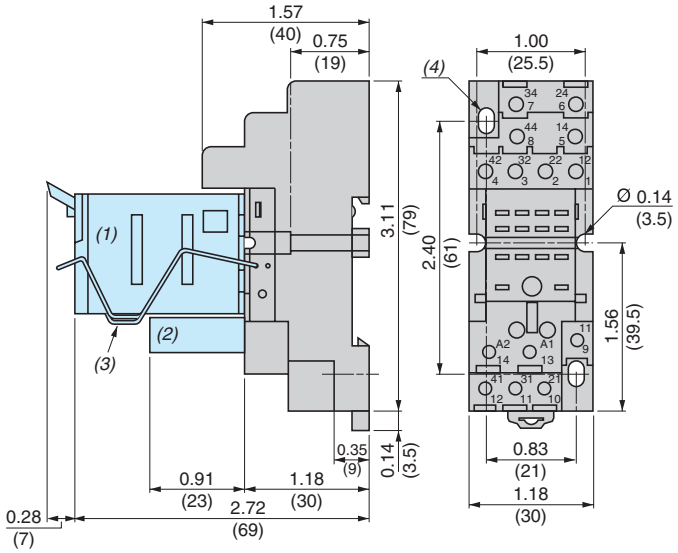


RXM 4

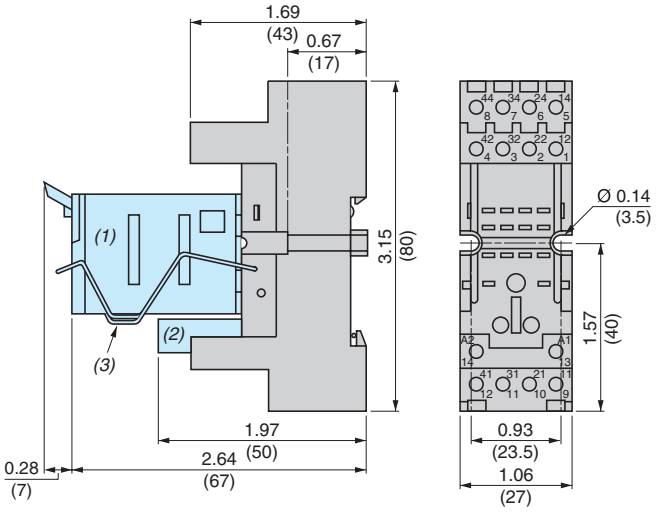


Sockets

RXZ E2M114

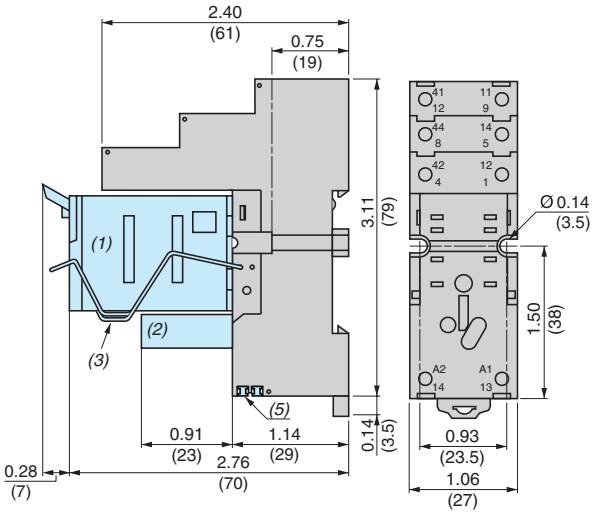


RXZ E2M114M



RXZ E2S●●●●

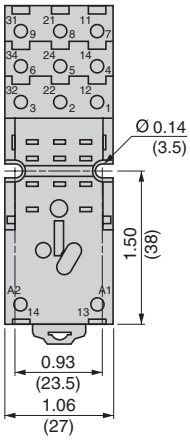
Common side view



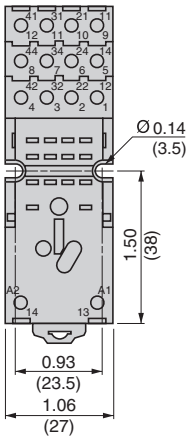
RXZ E2S108M

Pin side view

RXZ E2S111M ←



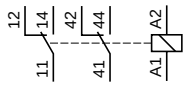
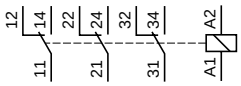
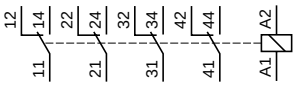
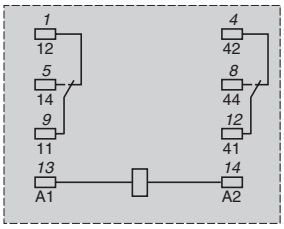
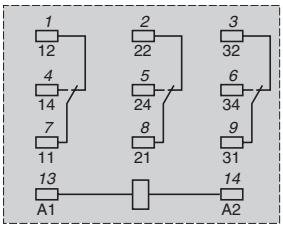
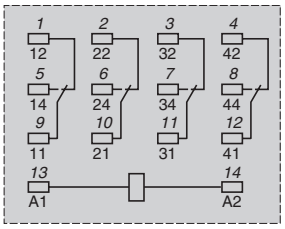
RXZ E2S114M



(1) Relays
(2) Add-on protection module
(3) Hold-down clip
(4) 2 elongated holes Ø 0.14 x 0.26 (3.5 x 6.5)
(5) 2 bus jumpers

Dimensions = Inches (mm)

Miniature relays

RXM 2●●●●●	RXM 3●●●●●	RXM 4●●●●●
		
		

Numbers shown in *italics* correspond to NEMA marking. Viewed from pin end.

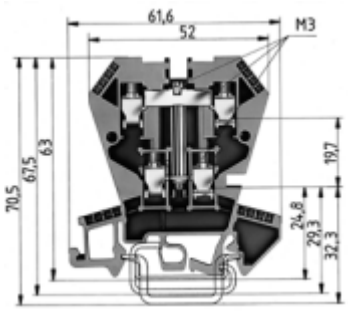
wieland

Description: Multi Tier Terminal Block

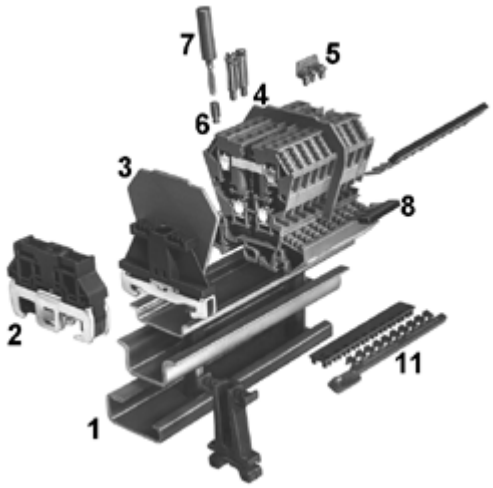
→ Part Number: 57.404.6955.1

Type Number: WK 4 E/V/ V/B

Block width: **6.0mm**
Wire Strip Length: **9.0mm**
Screw Size: **3.0mm**



	UL	CSA	VDE	
Wire (AWG/MCM)	22-10	20-12	Solid (mm2):	0.5-4.0
			Stranded (mm2):	-
			F-Stranded (mm2):	0.5-4.0
Current (amps):	20.0/20.0 (field/factory)	10.0	35.0	
Voltage:	300	300	500/600 AC/DC	



1. TS 35 DIN rail 35x27x7.5 98.300.0000.0

1. TS 32 DIN rail 98.190.0000.0

2. End bracket for TS 35 Z5.522.8553.0

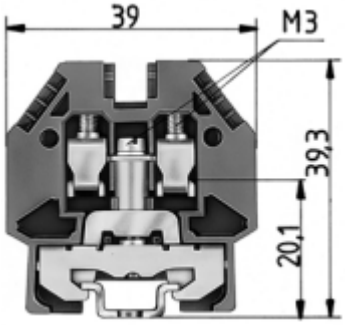
wieland

Description: Mini Ground Block

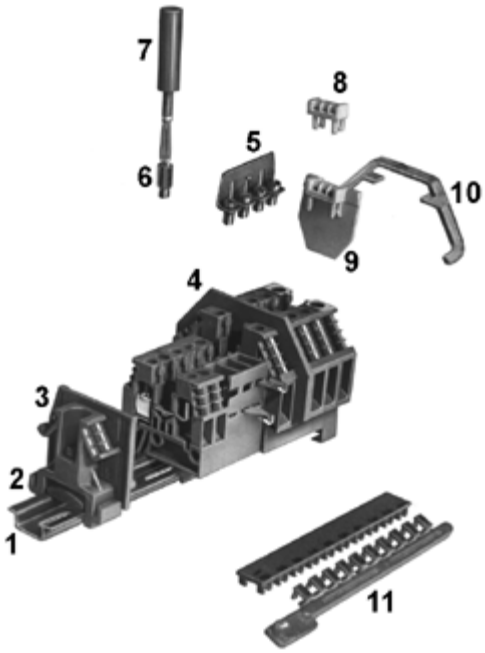
→ Part Number: 55.504.9053.0

Type Number: WK 4/15 SL

Block width: **6.0mm**
Wire Strip Length: **9.0mm**
Screw Size: **3.0mm**



	UL	CSA	VDE	
Wire (AWG/MCM)	22-10	20-10	Solid (mm2):	0.5-6.0
			Stranded (mm2):	-
			F-Stranded (mm2):	0.5-4.0
Current (amps):	10.0/10.0 (field/factory)	0.0	35.0	
Voltage:	600	0	750/900 AC/DC	



Hoffman®
A Pentair Company

Single-Door Type 4 Enclosures

Application

For use in housing electrical and electronic controls, instruments, components, and associated wiring, these enclosures incorporate hinged doors that provide convenient access. Designed for indoor or outdoor use in protecting components from dust, dirt, oil, and hose-directed water.

Construction

- 16 or 14 gauge steel (see table)
- Seams continuously welded and ground smooth, no holes or knockouts
- External wall-mounting brackets
- Rolled flanges exclude liquids and contaminants
- Stainless steel door clamps on three sides of door for watertight seal
- Removable heavy gauge stainless steel continuous hinge pin
- Hasp and staple provided for padlocking
- Data pocket is high-impact thermoplastic
- Oil-resistant door gasket attached with oil resistant adhesive
- Collar studs provided for mounting optional panels
- Bonding provision on door

Finish

ANSI 61 gray polyester powder paint inside and out over phosphatized surfaces. Optional panels are white.

Industry Standards

UL 508A, 508, File No. E61997: Type 4, Type 12, and Type 13
NEMA/EEMAC Type 3, Type 4, Type 12, and Type 13
JIC standard EGP-1-1967 (14 gauge only)
CSA, File No. LR42186, Type 4 and Type 12
IEC 60529, IP66

Accessories

See Chapter 12, General Accessories.

Clamp Kit
Corrosion Inhibitors
Door Stop Kit
Drip Shield Kit
Electrical Interlocks
Enclosure Stabilizer
Fast Operating Clamp Assembly
Floor Stand Kit
Lighting Kit
Lock Kit
Panel Support Kit
Panels (see table)
Rack Mounting Angle Kit
Swing-Out Panel Kit
Terminal Block Kit Assembly
Touch-Up Paint (ATPPY61)
Window Kit
Wiring Duct

Modification Services Program

You can customize this product to your unique requirements by specifying from these options:

- Enclosure height, width, depth
- Over 100 standard finish colors and textures
- Holes and cutouts in body, doors, subpanels
- Tapped holes, fasteners in enclosure or subpanel
- Mounting
- Doors
- Subpanels
- Structural changes
- Environmental control (louvers, fans, filters)
- Windows
- Standard accessories

For details, see Modification Services at www.hoffmanonline.com.
To order, contact your local Hoffman sales representative.

NOTE: For information about modifications outside the scope of the Modification Services program, contact your Hoffman sales representative.

Standard Sizes Single-Door Type 4 Enclosures

Enclosure Catalog Number	Body Gauge	Enclosure Size A x B x C	* Panel Catalog Number	Panel Size D x E	F	Number of Clamps	Data Pocket
A16H12ALP	16	16.00 x 12.00 x 6.00 (406 x 305 x 152)	**A16P12**	13.00 x 9.00 (330 x 229)	1.25 (32)	4	Small
A16H16ALP	16	16.00 x 16.00 x 6.00 (406 x 406 x 152)	**A16P16**	13.00 x 13.00 (330 x 330)	3.00 (76)	4	Small
A16H20ALP	16	16.00 x 20.00 x 6.00 (406 x 508 x 152)	**A20P16**	17.00 x 13.00 (432 x 330)	3.00 (76)	4	Small
A20H16ALP	16	20.00 x 16.00 x 6.00 (508 x 406 x 152)	**A20P16**	17.00 x 13.00 (432 x 330)	3.00 (76)	4	Small
A20H20ALP	16	20.00 x 20.00 x 6.00 (508 x 508 x 152)	**A20P20**	17.00 x 17.00 (432 x 432)	3.00 (76)	4	Small
A24H12ALP	16	24.00 x 12.00 x 6.00 (610 x 305 x 152)	**A12P24**	9.00 x 21.00 (229 x 533)	1.25 (32)	5	Small
A24H16ALP	16	24.00 x 16.00 x 6.00 (610 x 406 x 152)	**A24P16**	21.00 x 13.00 (533 x 330)	3.00 (76)	5	Small
A24H20ALP	16	24.00 x 20.00 x 6.00 (610 x 508 x 152)	**A24P20**	21.00 x 17.00 (533 x 432)	3.00 (76)	5	Small
A24H24ALP	16	24.00 x 24.00 x 6.00 (610 x 610 x 152)	**A24P24**	21.00 x 21.00 (533 x 533)	3.00 (76)	5	Small
A30H20ALP	14	30.00 x 20.00 x 6.00 (762 x 508 x 152)	**A30P20**	27.00 x 17.00 (686 x 432)	3.00 (76)	5	Small
A30H24ALP	14	30.00 x 24.00 x 6.00 (762 x 610 x 152)	**A30P24**	27.00 x 21.00 (686 x 533)	3.00 (76)	5	Large
A36H24ALP	14	36.00 x 24.00 x 6.00 (914 x 610 x 152)	**A36P24**	33.00 x 21.00 (838 x 533)	3.00 (76)	5	Large
A16H12BLP	16	16.00 x 12.00 x 8.00 (406 x 305 x 203)	**A16P12**	13.00 x 9.00 (330 x 229)	1.25 (32)	4	Small
A20H16BLP	16	20.00 x 16.00 x 8.00 (508 x 406 x 203)	**A20P16**	17.00 x 13.00 (432 x 330)	3.00 (76)	4	Small
A20H20BLP	16	20.00 x 20.00 x 8.00 (508 x 508 x 203)	**A20P20**	17.00 x 17.00 (432 x 432)	3.00 (76)	4	Small
A20H24BLP	16	20.00 x 24.00 x 8.00 (508 x 610 x 203)	**A24P20**	21.00 x 17.00 (533 x 432)	3.00 (76)	4	Small
A24H20BLP	16	24.00 x 20.00 x 8.00 (610 x 508 x 203)	**A24P20**	21.00 x 17.00 (533 x 432)	3.00 (76)	5	Small
A24H24BLP	16	24.00 x 24.00 x 8.00 (610 x 610 x 203)	**A24P24**	21.00 x 21.00 (533 x 533)	3.00 (76)	5	Small
A24H30BLP	14	24.00 x 30.00 x 8.00 (610 x 762 x 203)	**A30P24**	27.00 x 21.00 (686 x 533)	3.00 (76)	7	Small
A30H20BLP	14	30.00 x 20.00 x 8.00 (762 x 508 x 203)	**A30P20**	27.00 x 17.00 (686 x 432)	3.00 (76)	5	Small
A30H24BLP	14	30.00 x 24.00 x 8.00 (762 x 610 x 203)	**A30P24**	27.00 x 21.00 (686 x 533)	3.00 (76)	5	Large

Continued on next page

Single-Door Type 4 Enclosures

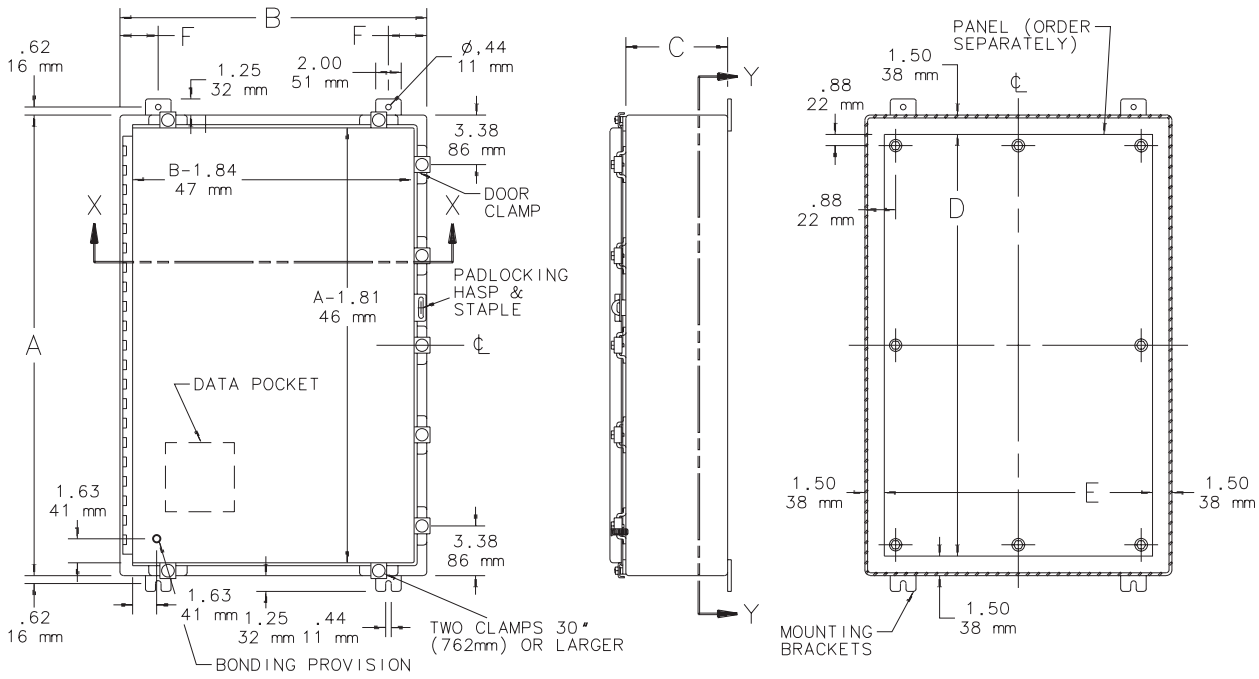
Standard Sizes Single-Door Type 4 Enclosures (Cont.)

Enclosure Catalog Number	Body Gauge	Enclosure Size A x B x C	* Panel Catalog Number	Panel Size D x E	F	Number of Clamps	Data Pocket
A30H30BLP	14	30.00 x 30.00 x 8.00 (762 x 762 x 203)	**A30P30**	27.00 x 27.00 (686 x 686)	3.00 (76)	7	Large
A36H24BLP	14	36.00 x 24.00 x 8.00 (914 x 610 x 203)	**A36P24**	33.00 x 21.00 (838 x 533)	3.00 (76)	5	Large
A36H30BLP	14	36.00 x 30.00 x 8.00 (914 x 762 x 203)	**A36P30**	33.00 x 27.00 (838 x 686)	3.00 (76)	7	Large
A42H30BLP	14	42.00 x 30.00 x 8.00 (1067 x 762 x 203)	**A42P30**	39.00 x 27.00 (991 x 686)	3.00 (76)	8	Small
A42H36BLP	14	42.00 x 36.00 x 8.00 (1067 x 914 x 203)	**A42P36**	39.00 x 33.00 (991 x 838)	3.00 (76)	8	Large
A48H36BLP	14	48.00 x 36.00 x 8.00 (1219 x 914 x 203)	**A48P36**	45.00 x 33.00 (1143 x 838)	3.00 (76)	8	Large
A60H36BLP	14	60.00 x 36.00 x 8.00 (1524 x 914 x 203)	**A60P36**	57.00 x 33.00 (1448 x 838)	3.00 (76)	9	Large
A20H16CLP	14	20.00 x 16.00 x 10.00 (508 x 406 x 254)	**A20P16**	17.00 x 13.00 (432 x 330)	3.00 (76)	4	Small
A24H20CLP	14	24.00 x 20.00 x 10.00 (610 x 508 x 254)	**A24P20**	21.00 x 17.00 (533 x 432)	3.00 (76)	5	Small
A30H24CLP	14	30.00 x 24.00 x 10.00 (762 x 610 x 254)	**A30P24**	27.00 x 21.00 (686 x 533)	3.00 (76)	5	Large
A36H30CLP	14	36.00 x 30.00 x 10.00 (914 x 762 x 254)	**A36P30**	33.00 x 27.00 (838 x 686)	3.00 (76)	7	Large
A48H30CLP	14	48.00 x 30.00 x 10.00 (1219 x 762 x 254)	**A48P30**	45.00 x 27.00 (1143 x 686)	3.00 (76)	8	Small
A48H36CLP	14	48.00 x 36.00 x 10.00 (1219 x 914 x 254)	**A48P36**	45.00 x 33.00 (1143 x 838)	3.00 (76)	8	Large
A60H36CLP	14	60.00 x 36.00 x 10.00 (1524 x 914 x 254)	**A60P36**	57.00 x 33.00 (1448 x 838)	3.00 (76)	9	Large
A30H24DLP	14	30.00 x 24.00 x 12.00 (762 x 610 x 305)	**A30P24**	27.00 x 21.00 (686 x 533)	3.00 (76)	5	Large
A36H30DLP	14	36.00 x 30.00 x 12.00 (914 x 762 x 305)	**A36P30**	33.00 x 27.00 (838 x 686)	3.00 (76)	7	Large
A48H36DLP	14	48.00 x 36.00 x 12.00 (1219 x 914 x 305)	**A48P36**	45.00 x 33.00 (1143 x 838)	3.00 (76)	8	Large
A36H30FLP	14	36.00 x 30.00 x 16.00 (914 x 762 x 406)	**A36P30**	33.00 x 27.00 (838 x 686)	3.00 (76)	7	Large
A48H36FLP	14	48.00 x 36.00 x 16.00 (1219 x 914 x 406)	**A48P36**	45.00 x 33.00 (1143 x 838)	3.00 (76)	8	Large
A60H36FLP	14	60.00 x 36.00 x 16.00 (1524 x 914 x 406)	**A60P36**	57.00 x 33.00 (1448 x 838)	3.00 (76)	9	Large

Millimeter dimensions ( ) are for reference only; do not convert metric dimensions to inch.

* Panels must be ordered separately. Optional stainless steel, zinc-plated, composite, and aluminum panels are available for most sizes. See General Accessories.

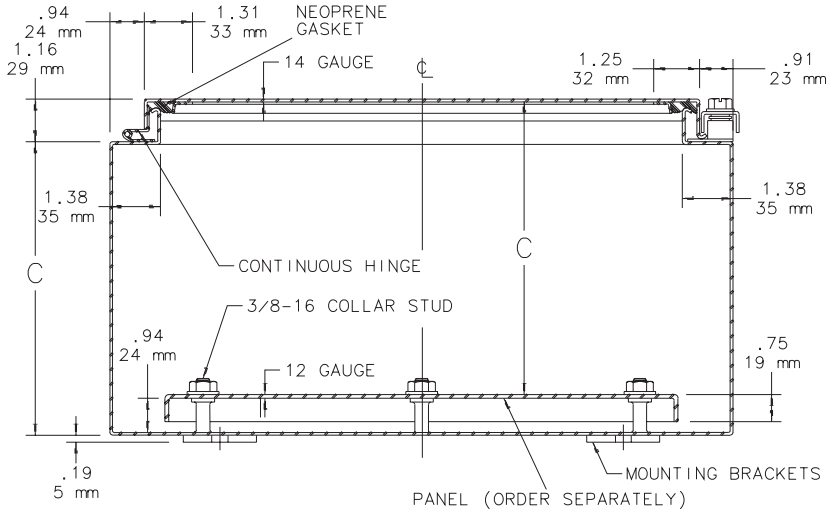
NOTE: Panels have a formed flange on any side that is longer than 21.00 in. (533mm). Panel A24P20 has a flange on all four sides.



SECTION Y-Y

Number of Body Studs		
Enclosure Size A	B	Qty of Studs
<31.00 (787)	Any	6
Any	<31.00 (787)	6

NOTE: Maximum spacing between door clamps is 15.00 in. (382mm).



SECTION X-X

C2483

Description

The Redington Model 722 provides an AC Hour Meter with an operating range of 90-264VAC 50/60 Hz. You no longer require two separate meters, one for 115VAC and one for 230VAC. Models are available in the standard industry housings, 2-Hole Rectangular, Flush-Rectangular, Flush-Round and 3-Hole Round. Its quartz time base insures accurate long-term time keeping. The Totally Sealed case protects against the environment and provides years of reliable service. All models are NEMA 4X,12 rated when mounted with optional gasket.

Features

- Operating voltage 90-264VAC 50/60Hz
- Totally Sealed
- UL/cUL Recognized, CE & RoHS Compliant
- 6 Figure, 99999.9
- Quartz accuracy

Options

- Wire leads
- Gasket kit (for NEMA 4X, 12 rating)
- Custom lens
- Terminals up, down, straight

Specifications

Figures:	6 - digits, 0.14" [3.6mm] 99999.9 Hours and idicator - white on black Decimal - black on white
Reset:	Non-reset
Voltage:	90-264VAC
Frequency:	50/60Hz
Power:	1 watt max.
Mounting:	Clip or mounting holes
Termination:	¼" [6.3mm] spade terminals
Weight:	~2 oz [57 g]
Accuracy:	± 0.02% over entire range

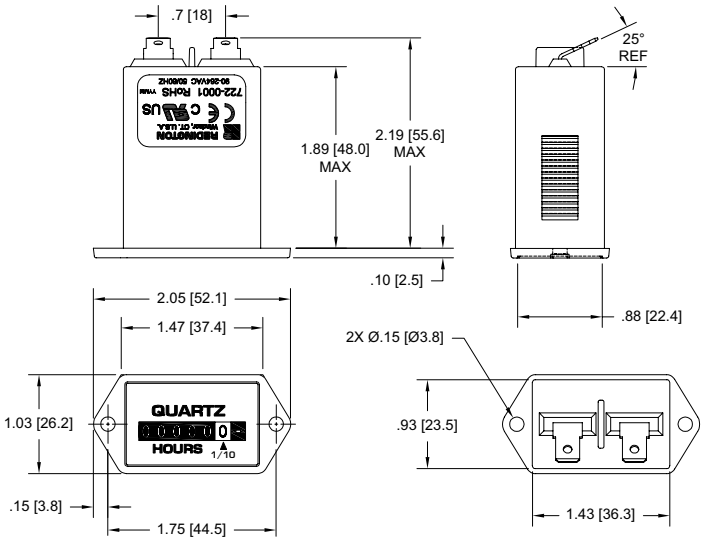
Case Material:	Black polymer
Lens Material:	Polymer
Agency Approvals:	UL/cUL Recognized, CE & RoHS Compliant, SAE & NEMA 4X, 12 Compliant
Environmental:	Totally Sealed
Front Panel:	NEMA 4X, 12 rated with optional gasket
Temperature:	-40°F to +185°F [-40°C to + 85°C]
Humidity:	95% (SAE J1378)
Vibration:	10-80 Hz. 20g max. (SAE J1378)
Shock:	55g @ 9 - 13msec (SAE J1378)

Models	Description
722-0001	2-Hole Rectangular, 90-264VAC 50/60Hz, ¼" [6.3mm] spade terminals, hours & 1/10's
722-0002	Flush-Rectangular, 90-264VAC 50/60Hz, ¼" [6.3mm] spade terminals, hours & 1/10's
722-0003	Flush-Round, 90-264VAC 50/60Hz, ¼" [6.3mm] spade terminals, hours & 1/10's
→ **722-0004**	3-Hole Round, 90-264VAC 50/60Hz, ¼" [6.3mm] spade terminals, hours & 1/10's
5003-009	NEMA 4X, 12 Gasket for Model 722-0002
5003-010	NEMA 4X, 12 Gasket for Model 722-0001
→ **5003-011**	NEMA 4X, 12 Gasket for Model 722-0004
5003-012	NEMA 4X, 12 Gasket for Model 722-0003

* All items are normally in factory stock

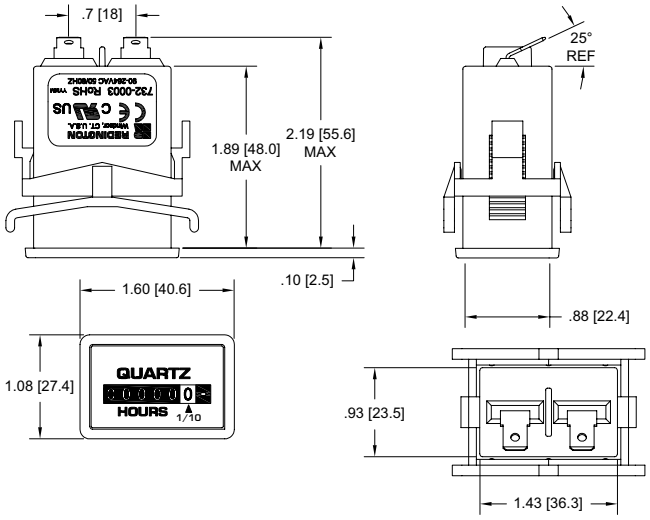
Dimensions

2-Hole



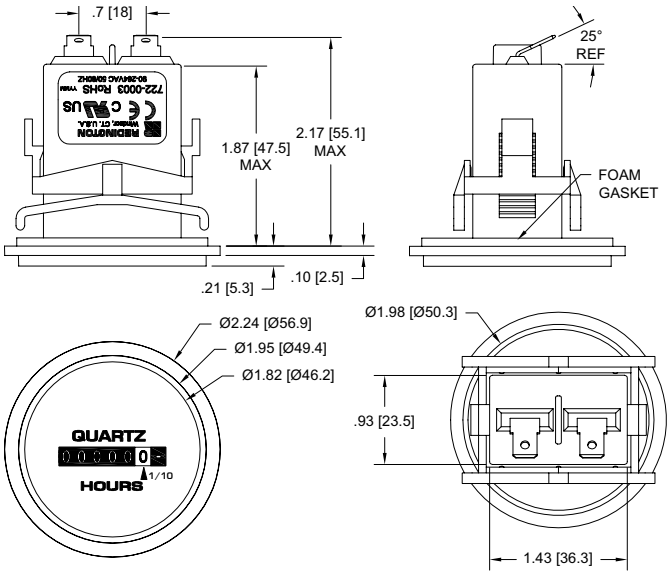
Panel Opening: 1.45” X 0.95” [36.8 X 24.1]

Flush-Rectangular



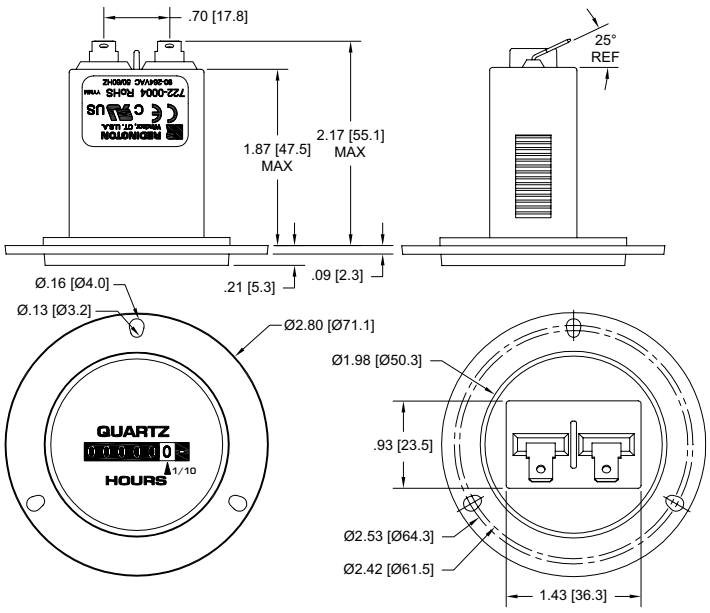
Panel Opening: 1.45” X 0.95” [36.8 X 24.1]
Panel Thickness: 0.03 to 0.63 [0.76 to 16.00]

Flush-Round



Panel Opening: 2.0” [50.6]
Panel Thickness: 0.40 [10.2] Max.

3-Hole Round



Panel Opening: 2.0” [50.6]

Applications

Medical Equipment

Control Panels

Test Equipment

Generators

Office Equipment

Quick Ship • *Same day shipment on stock units with orders received by 11:00 a.m.*

Flexible Heaters

Silicone Rubber

Rugged, yet thin, lightweight and flexible … the use of Watlow silicone rubber heaters is limited only by your imagination. With these heaters, you can put the heat where it's needed and, in the process, improve heat transfer, speed warm-ups and decrease wattage requirements.

Fiberglass-reinforced silicone rubber gives your heater dimensional stability without sacrificing flexibility. Because very little material separates the element from the part, heat transfer is rapid and efficient.

Performance Capabilities

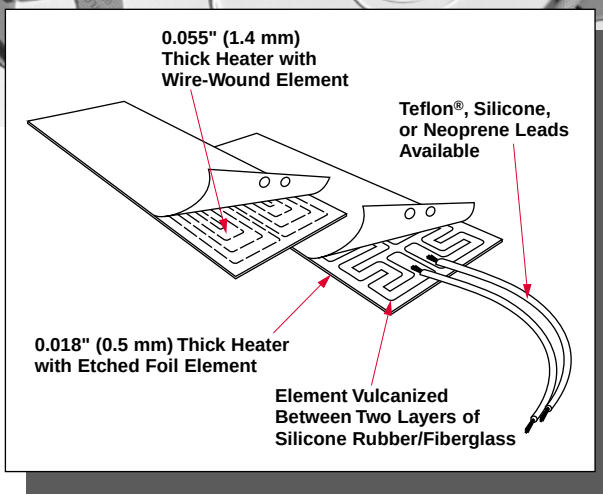
- Operating temperatures to 500°F (260°C)
- Watt densities to 80 W/in^2 (12.5 W/cm^2) dependent upon application temperature
- 0.055 inch (1.4 mm) thick with a wire-wound element; only 0.018 inch (0.5 mm) with an etched foil element

Features and Benefits

- **Designed in the exact shape and size**, including 3-D geometries, to conform to your equipment.
- **More than 80 designs** available immediately from stock.
- **UR®, cUR® and VDE** recognitions are available on many designs.
- **Moisture and chemical-resistant** silicone rubber material provides longer heater life.
- **Easy to bond or attach** to your part through the use of vulcanizing, adhesives, or fasteners.

Applications

- Freeze protection and condensation prevention for many types of instrumentation and equipment
- Medical equipment such as blood analyzers, test tube heaters, etc.
- Computer peripherals such as laser printers
- Curing of plastic laminates
- Photo processing equipment



Flexible Heaters

Silicone Rubber

Wire-Wound Element

Width in (mm)	Length in (mm)	Watts	Availability	120V~(ac) Code No.	240V~(ac) Code No.
3 (75)	3 (75)	45	Stock	**030030C1**	
	5 (125)	75	Stock	**030050C1**	
	5 (125)	75	Stock		**030050C2**
	10 (255)	150	Stock	**030100C1**	
	10 (255)	150	Stock		**030100C2**
	15 (380)	225	Stock	**030150C1**	
	15 (380)	225	Stock		**030150C2**
	20 (510)	300	Stock	**030200C1**	
	20 (510)	300	Stock		**030200C2**
	25 (635)	375	Stock	**030250C1**	
	30 (760)	450	Stock	**030300C1**	
	35 (890)	525	Stock	**030350C1**	
	40 (1015)	600	Stock	**030400C1**	
4 (100)	4 (100)	80	Stock	**040040C1**	
	5 (125)	100	Stock	**040050C1**	
	5 (125)	100	Stock		**040050C2**
	10 (255)	200	Stock	**040100C1**	
	10 (255)	200	Stock		**040100C2**
	15 (380)	300	Stock	**040150C1**	
	15 (380)	300	Stock		**040150C2**
	20 (510)	400	Stock	**040200C1**	
	20 (510)	400	Stock		**040200C2**
	25 (635)	500	Stock	**040250C1**	
	30 (760)	600	Stock	**040300C1**	
	35 (890)	700	Stock	**040350C1**	
	40 (1015)	800	Stock	**040400C1**	
5 (125)	5 (125)	125	Stock	**050050C1**	
	5 (125)	125	Stock		**050050C2**
	10 (255)	250	Stock	**050100C1**	
	10 (255)	250	Stock		**050100C2**
	15 (380)	375	Stock	**050150C1**	
	15 (380)	375	Stock		**050150C2**
	20 (510)	500	Stock	**050200C1**	
	20 (510)	500	Stock		**050200C2**
	25 (635)	625	Stock	**050250C1**	
	30 (760)	750	Stock	**050300C1**	
	35 (890)	875	Stock	**050350C1**	
	40 (1015)	1000	Stock	**050400C1**	
6 (150)	5 (125)	150	Stock	**060050C1**	
	5 (125)	150	Stock		**060050C2**
	10 (255)	300	Stock	**060100C1**	
	10 (255)	300	Stock		**060100C2**
	15 (380)	450	Stock	**060150C1**	
	15 (380)	450	Stock		**060150C2**
	20 (510)	600	Stock	**060200C1**	
	20 (510)	600	Stock		**060200C2**
	25 (635)	750	Stock	**060250C1**	
	30 (760)	900	Stock	**060300C1**	
	35 (889)	1050	Stock	**060350C1**	
	40 (1016)	1200	Stock	**060400C1**	

Approx. net weight: 8 ounces/ft² (0.24 g/cm²). Standard thickness: 0.055 inch. Standard lead length: 12 inches UL 1180 Teflon®.
Silicone rubber wire-wound elements rated at 5 W/in². UL® Component Recognition (UR®).

Silicone Rubber

Wire-Wound Stock Heater Coding Configured Options

How to order

To order, complete the code number with the information below:

Wire wound (p. 172-173)

0_____- _ _ _ _ _

Modification Options
0 = None
A = PSAS Bottom
B = PSAS Top
E = With Plate. Heater on Side Opposite Flange
F = With Plate. Heater on Flange Side
G = Flaps + Grommets
H = Flaps + Boot Hooks
J = Flaps + Latch Fasteners
K = PSAS and Low Loss
L = Low Loss
M = Low Loss + Flaps + Grommets
N = Low Loss + Flaps + Boot Hooks
P = Low Loss + Flaps + Latch Fasteners
R = 1/16 inch Sponge
S = 1/8 inch Sponge
T = 1/4 inch Sponge
U = 3/8 inch Sponge
V = 1/2 inch Sponge
W = PSAS + 1/16 inch Sponge
Y = PSAS + 1/8 inch Sponge
1 = PSAS + 1/4 inch Sponge
2 = PSAS + 3/8 inch Sponge
3 = PSAS + 1/2 inch Sponge
4 = Tip Plugs
6 = Tip Plugs/PSAS

- Heaters with flaps must be minimum 10 inches long.

Sensors

	Type	LOC	WIR
0 =	None		
L =	T10	STD	STD
M =	T10	STD	ALT
N =	T10	ALT	STD
P =	T10	ALT	ALT
R =	T207	STD	STD
S =	T207	STD	ALT
T =	T207	ALT	STD
U =	T207	ALT	ALT
V =	T207E	on heater	STD
W =	T207E	Remote	STD
Y =	B200	STD	STD
1 =	B200	STD	ALT
2 =	B200	ALT	STD
3 =	B200	ALT	ALT
4 =	JSTD	STD	STD
6 =	JALT	STD	STD
7 =	KSTD	STD	STD

- For thermostats, standard location is as shown in catalog; standard wiring is integral or series with the heater; alternate location is rotated parallel with heater width; alternate wiring is separate leads for pilot control.
- For thermocouples, J standard is Teflon® insulation; J alternate is fiberglass insulation; K standard is fiberglass insulation.

T10 Set °F*
0 = None
A = 125
B = 150
E = 175
F = 200
G = 225
H = 250
J = 275
K = 300

T207 Set °F*
0 = None
1 = 40/55
2 = 60/75
3 = 95/110
4 = 145/1600

B200 Set °F*
0 = None
2 = 500
3 = 330

T/C Length
0 = None
A = 8 in
B = 12 in
E = 18 in
F = 24 in
G = 30 in
H = 36 in
J = 40 in
K = 4 ft
L = 5 ft
M = 6 ft
N = 7 ft
P = 8 ft
R = 9 ft
S = 10 ft
T = 12 ft
U = 15 ft
V = 18 ft
W = 20 ft
Y = 22 ft
1 = 25 ft
2 = 30 ft

* For all thermostats, the heater must be two inches minimum width and five inches minimum length.

Lead Insulation
0 = None
1 = 1180 Teflon®
2 = 1180 cUR®
3 = 3133 22 GA
4 = 3134 18 GA
6 = 1199 cUR®
7 = HPN
8 = 6 foot HPN Set
9 = Type E Teflon®
A = 1180VDE*
B = 1199VDE*

* 1180VDE denotes a cUR® heater plus a VDE stamp.

Lead Length
A = 8 in
B = 12 in
E = 18 in
F = 24 in
G = 30 in
H = 36 in
J = 40 in
K = 4 ft
L = 5 ft
M = 6 ft
N = 7 ft
P = 8 ft
R = 9 ft
S = 10 ft
T = 12 ft
U = 15 ft
V = 18 ft
W = 20 ft
Y = 22 ft
1 = 25 ft
2 = 30 ft

Availability:
Modified Stock: Shipment within five working days

Bulletin 800H

- **30.5 mm Mounting Hole**
- **Type 4/4X/13 Corrosion-Resistant/ Watertight/Oiltight**
- **Heavy Industrial Stations and Operators**

TABLE OF CONTENTS

Specifications ❶

Electrical Ratings		
Contact Ratings		Refer to the Contact Ratings tables below
Dielectric Strength		2200V for one minute; 1300V for one minute (Logic Reed)
Electrical Design Life Cycles		1,000,000 at maximum rated load
Mechanical Ratings		
Vibration		10…200 Hz 1.52 mm displacement (peak-to-peak) Max./10 G Max. (except Logic Reed)
Shock		1/2 cycle sine wave for 11 milliseconds ≥ 25 G (contact fragility) and no damage at 100 G
Degree of Protection		Type 4/4X/13; Watertight/Corrosion-Resistant, Oiltight IEC 529 IP66/65
Mechanical Design Life Cycles		
Push Buttons	(Momentary, Non-Illuminated) (Momentary, Illuminated) (Push-Pull/Twist-to-Release)	10,000,000 minimum 250,000 minimum 250,000 minimum
Selector Switches	(Non-Illuminated) (Illuminated)	1,000,000 minimum 200,000 minimum
Potentiometers		100,000 minimum
All other devices		200,000 minimum
Contact Operation		Shallow, mini, and Low Voltage Contact Blocks: Slow, double make and break Logic Reed and Sealed Switch Contact Blocks: Single break magnetic
Typical Operating Forces		
Operators without contact blocks		Flush, Extended, Standard Mushroom, Jumbo Plastic Mushroom: 2 lbs Max. Maintained Selector Switch: 3.6 in. lbs maximum
Spring Return Selector Switches		3.6 in. lbs to stop; 0.2 in. lbs to return
Illuminated Push Buttons and Push-to-Test Pilot Lights		5 lbs maximum
3-Position Push-Pull		8 lbs maximum push to in position or pull to center position (15 lbs maximum pull to out position)
Push-Pull and Push-Pull/Twist		9 lbs maximum push or pull, 30 in. oz. maximum twist, 6 in. oz. minimum return
Potentiometer	Rotational Torque Stopping Torque	3…12 in.-oz. 12 in.-lbs (minimum)
Contact Blocks	800T-XA Logic Reed Sealed Switch Stackable Sealed Switch	1 lb 1 lb maximum 3 lbs maximum at 0.205" plunger travel 1 lb maximum
Environment		
Temperature Range	Operating Storage	–40…+131°F (–40C…+55°C) –40…+185°F (–40…+85°C)
Note: Operating temperatures below freezing are based on the absence of moisture and liquids. Consult your local Allen-Bradley Sales Office for use in lower temperature applications.		
Humidity		50% at +104°F (+40°C)

❶ Performance Data — See page Important-2.

Contact Ratings

Maximum thermal continuous current I_{th} 10 A AC/2.5 A DC.
Bulletin 800H units with 800T-XA contacts have ratings as follows:

Max. Opertnl. Volts Ue	Utilization Category		Rated Operational Currents		
	IEC	NEMA	Volts Ue	Make	Break
AC 600	AC-15	A600	120…600 72…120 24…72	7200 VA 60 A 60 A	720 VA 720 VA 10 A
DC 600	DC-13	Q600	28…600 24…28❷	69 VA 2.5 A	

❷ For applications below 24V/24 mA, Pen*TUFF*™ or Logic Reed contacts are recommended.

Sealed Switch Contact Ratings

Maximum continuous current I_{th} 5 A. Bulletin 800H units have control circuit ratings with sealed switch contact blocks as follows:

Max. Opertnl. Volts Ue	Utilization Category		Rated Operational Currents		
	IEC	NEMA	Volts Ue	Make	Break
AC 600	AC-15	B600	120…600 0…120	3600 VA 30 A	360 VA 3 A
DC 300	DC-13	P300	24…300 0…24	138 VA 5.0 A	

Stackable Sealed Switch Contact Ratings

Maximum continuous current I_{th} 2.5 A.

Logic Reed Contact Ratings

Maximum DC: 30V, 0.06 A, AC: 150V, 0.15 A
Should only be used with resistive loads.

Pen*TUFF*™ (Low Voltage) Contact Ratings

Minimum DC: 5V, 1 mA

Maximum thermal continuous current I_{th} 2.5 A AC/1.0 A DC.
Bulletin 800H units with 800T-XAV contacts have ratings as follows:

Max. Opertnl. Volts Ue	Utilization Category		Rated Operational Currents		
	IEC	NEMA	Volts Ue	Make	Break
AC 300	AC-15	C300	120…300 0…120	1800 VA 15 A	180 VA 1.5 A
DC 150	DC-13	R150	24…150 0…24	28 VA 1.0 A	

Approvals

UL Listed — File: E14840, E10314
Guide: NKCR, NOIV
CSA Certified: LR1234, LR11924
CE compliant IEC: 60947-5

Materials Used in 800H Type 4X Operators

Thermoplastic Polyester (Fiberglass Reinforced)

- Bushings
- Mounting rings
- Sockets

Thermoplastic Polyester

- Non-illuminated button caps

Transparent Amorphous Nylon

- Pilot light lens cap
- Illuminated button caps

Glass Filled Crystalline Nylon

- Thrust washer

Mineral Filled Nylon

- Trim washer

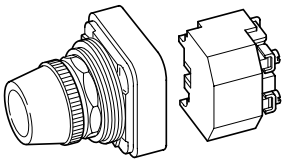
Nitrile (Synthetic Rubber)

- Gaskets and internal seals

Pilot Light Units

800H ____ **– QR** ____ ____ **24** ____ ***(Pilot Lights)***
a b c d e f

800H ____ **– PR** **T** ____ **16** **R** ____ ***(Push-to-Test)***
a b c d e f g



a

Finger-Safe Guards	
Code	**Description**
Blank	No Guards
C	Guards on Terminals

b

Power Module Type	
Code	**Description**
PR	Transformer (or Dual Input)
QR	Full Voltage (or Resistor)
RR	Neon ❶

c

Lamp Test Options	
Code	**Description**
Blank	No Test Option
T	Push-to-Test
D	Dual Input-Diode ❷
DT	Dual Input — Transformer Relay

Note: Push-to-Test Pilot Light is supplied with a factory jumpered **800T-XA**, 1 N.O. - 1 N.C. contact block.

d

Illumination Options	
Transformer	
Code	**Description**
Blank	Incandescent
F	Flashing Incandescent ❸
H	LED ❹
Full Voltage	
Code	**Description**
Blank	Incandescent
F	Flashing Incandescent ❸
H	LED ❹
Resistor	
Code	**Description**
Blank	No Options
Neon	
Code	**Description**
Blank	No Options
Dual Input	
Code	**Description**
Blank	Incandescent
H	LED ❹

e

Voltage	
Transformer	
Code	**Description**
36	48V AC 50/60 Hz
16	120V AC 50/60 Hz
26	240V AC 50/60 Hz
76	277V AC 50/60 Hz
46	480V AC 50/60 Hz
56	600V AC 50/60 Hz
Full Voltage	
Code	**Description**
06	6V AC/DC
12	12V AC/DC
24	24V AC/DC
32	32V AC/DC ❺
48	48V AC/DC
10	120V AC/DC ❻
13	130V AC/DC ❺
20	240V AC/DC ❺
Resistor	
Code	**Description**
11	120V AC/DC Resistor
Neon	
Code	**Description**
10	120V AC/DC
20	240V AC/DC
Dual Input	
Code	**Description**
16	120V AC
24	24V AC/DC ❼

f

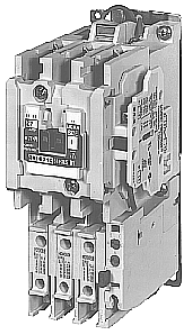
Lens Color	
Plastic	
Code	**Color**
Blank	No Lens
A	Amber
B	Blue
C	Clear
G	Green
R	Red
W	White

g

Contact Blocks	
Code	**Description**
Standard	
Blank	1 N.O. - 1 N.C.
Pen*TUFF* (Low Voltage)	
AV	1 N.O. - 1 N.C.
Class I, Div./Zone 2	
Logic Reed	
AR	1 N.O. - 1 N.C.
Sealed Switch	
AP	1 N.O. - 1 N.C.
Stackable Sealed Switch	
AY	1 N.O. - 1 N.C.

❶ Neon is only available in amber or clear.
❷ Diode type dual input provides circuit isolation via opposing diodes. Not recommended for use with solid-state outputs and neon indicators.
❸ Flashing lamps are only available in 6V full voltage units and all transformer units.
❹ LEDs available in red, green, amber, blue, and white. White LEDs only available in 6V and 24V full voltage and all transformer units. LED color must match lens color, except clear lens supplied with white LED and white lens supplied with amber LED. All LEDs except 120V have an internal shunt resistor for use with solid-state outputs.
❺ 32V and 130V are LED only. 240V is incandescent only.
❻ 120V LED is AC only and does not contain internal shunt resistor. For AC/DC and internal shunt resistor, order 130V AC/DC LED (Code 13).
❼ Dual input diode only.

Contents

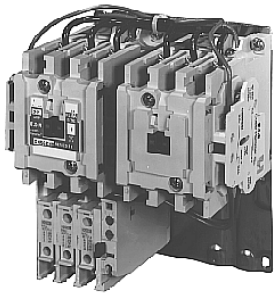


NEMA Size 1 — Cat. No. AN16BN0AB

Product Description

Non-reversing

Three-phase, full voltage magnetic starters are most commonly used to switch AC motor loads. Starters consist of a magnetically actuated switch (contactor) and an overload relay assembled together.



NEMA Size 1 — Cat. No. AN56DN0AB

Reversing

Three-phase, full voltage magnetic starters are used primarily for reversing of 3-phase squirrel cage motors. They consist of two contactors and a single overload relay assembled together. The contactors are mechanically and electrically interlocked to prevent line shorts and energization of both contactors simultaneously.

Features

- Bimetallic Ambient Compensated Overload relays — available in three basic sizes covering applications up to 900 hp — reducing number of different contactor/overload relay combinations that have to be stocked.

  These overload relays feature:
  - ❑ Selectable Manual or Automatic Reset operation.
  - ❑ Interchangeable heater packs adjustable ±24% to match motor FLA and calibrated for 1.0 and 1.15 service factors. Heater packs for smaller overload relay will mount in larger overload relay — useful in derating applications such as jogging.
  - ❑ Load lugs built into relay base.
  - ❑ Single-phase protection, Class 20 or Class 10 trip time.
  - ❑ Overload trip indication.
  - ❑ Electrically isolated NO-NC contacts (pull RESET button to test).
- Long life twin break, silver cadmium oxide contacts — provide excellent conductivity and superior resistance to welding and arc erosion. Generously sized for low resistance and cool operation.
- Designed to 3,000,000 electrical operations at maximum hp ratings up through 25 hp at 600V.
- Steel mounting plate standard on all open type starters.
- Wired for separate or common control.

Non-reversing

- Holding circuit contact(s) supplied as standard:
  - ❑ Sizes 00 – 3 have a NO auxiliary contact block mounted on right-hand side (on Size 00, contact occupies 4th power pole position — no increase in width).
  - ❑ Sizes 4 – 5 have a NO contact block mounted on left side.
  - ❑ Sizes 6 – 7 have a 2NO/2NC contact block on top left.
  - ❑ Size 8 has a NO/NC contact block on top left back and a NO on top right back.

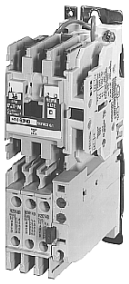
Reversing

- Each contactor (Size 00 – 8) supplied with one NO-NC side mounted contact block as standard. NC contacts are wired as electrical interlocks.

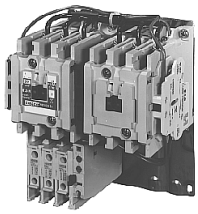
Product Selection

When Ordering Supply

- Catalog Number
- Heater pack number (see selection table, **Pages 33-36** – **33-37** or full load current.



Size 0
Non-reversing Starter



Size 1
Reversing Starter

Size 3 Vertical
Reversing Starter

Table 33-10. Type AN16/AN56 NEMA — Manual or Automatic Reset Overload Relay — Non-reversing and Reversing

NEMA Size	Continuous Ampere Rating	Service-Limit Current Rating ② (Amperes)	Maximum UL Horsepower ①										
			1-Phase		3-Phase				3-Pole	Price U.S. $	3-Pole	Vertical Reversing	Price U.S. $
			115V	230V	208V	240V	480V	600V	Non-reversing		Reversing		
00	9	11	1/3	1	1-1/2	1-1/2	2	2	**AN16AN0_C**	182.	**AN56AN0_C**	—	435.
0	18	21	1	2	3	3	5	5	**AN16BN0_C**	~~228.~~	**AN56BN0_C**	**AN56BNV0_**	515.
1	27	32	2	3	7-1/2	7-1/2	10	10	**AN16DN0_B**	262.	**AN56DN0_B**	**AN56DNV0_**	585.
2	45	52	3	7-1/2	10	15	25	25	**AN16GN0_B**	476.	**AN56GN0_B**	**AN56GNV0_**	1,110.
3	90	104	—	—	25	30	50	50	**AN16KN0_**	775.	**AN56KN0_**	**AN56KNV0_**	1,835.
4	135	156	—	—	40	50	100	100	**AN16NN0_**	1,760.	**AN56NN0_**	**AN56NNV0_**	4,475.
5	270	311	—	—	75	100	200	200	**AN16SN0_B**	4,300.	**AN56SN0_B**	—	8,590.
6	540	621	—	—	150	200	400	400	**AN16TN0_C**	9,930.	**AN56TN0_C**	—	19,990.
7	810	932	—	—	200	300	600	600	**AN16UN0_B**	14,160.	**AN56UN0_B**	—	28,995.
8 ③	1215	1400	—	—	400	450	900	900	**AN16VN0_B**	22,010.	**AN56VN0_B**	—	42,614.

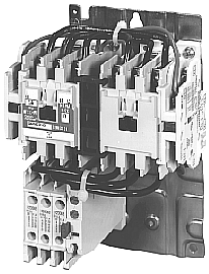
Note: Starter Catalog Numbers do not include heater packs. Select one carton of three heater packs. Heater pack selection, **Pages 33-36** – **33-37**.

① Maximum horsepower rating of starters for 380V 50 Hz applications:

NEMA Size	00	0	1	2	3	4	5	6	7	8
Horsepower	1-1/2	5	10	25	50	75	150	300	600	900

② The service-limit current ratings represent the maximum rms current, in amperes, which the controller shall be permitted to carry for protracted periods in normal service. At service-limit current ratings, temperature rises shall be permitted to exceed those obtained by testing the controller at its continuous current rating. The current rating of overload relays or trip current of other motor protective devices used shall not exceed the service-limit current rating of the controller.

③ Common control. For separate 120V control, insert letter **D** in 7th position of listed Catalog Number. EXAMPLE: AN56VN**D**0CB.



NEMA Size 0
Cat. No. AN56BN0AC

Magnet Coils — AC or DC

Starter coils listed in this section also have a 50 Hz rating as shown in the adjacent table. Select required starter by Catalog Number and replace the magnet coil alpha designation in the Catalog Number (_) with the proper Code Suffix from the adjacent table.

For Sizes 00 – 2 and 5 – 8, the magnet coil alpha designation will be the next to last digit of the listed Catalog Number. EXAMPLE: For a 380V, 50 Hz coil, change AN16BN0_C to AN16BN0**L**C. For all other sizes, the magnet coil alpha designation will be the last digit of the listed Catalog Number.

For **DC Magnet Coils**, see Accessories, **Pages 33-21** – **33-22**.

Table 33-11. AC Suffix Code

Coil Volts and Hertz	Code Suffix
120/60 or 110/50	**A**
240/60 or 220/50	**B**
480/60 or 440/50	**C**
600/60 or 550/50	**D**
208/60	**E**
277/60	**H**
208 – 240/60 ④	**J**
240/50	**K**
380 – 415/50	**L**
550/50	**N**
24/60, 24/50 ⑤	**T**
24/50	**U**
32/50	**V**
48/60	**W**
48/50	**Y**

④ NEMA Sizes 00 and 0 only.

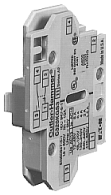
⑤ NEMA Sizes 00 and 0 only. Sizes 1 – 8 are 24/60 only.

Auxiliary Contacts

NEMA Sizes 00 – 2 — IEC Sizes A – K

The auxiliary contacts listed below are designed for installation on Freedom Series starters and contactors. Snap-on design facilitates quick, easy installation.

These bifurcated design contact blocks, featuring silver cadmium alloy contacts, are well suited for use in very low energy (logic level) circuits.



Side Mounted

Top Mounted

Table 33-39. Product Selection

Description	Catalog Number	Contact Configuration Code ①	Price U.S. $
Side Mounted			
1NO	**C320KGS1**	10	20.10
1NC	**C320KGS2**	01	20.10
1NO-1NC	**C320KGS3**	11	27.00
2NO	**C320KGS4**	20	27.00
2NC	**C320KGS5**	02	27.00
1NO-1NCI	**C320KGS6**	N/A	27.00
1NO (EC)-1NC (LO)	**C320KGS7**	N/A	27.00
1NCI	**C320KGS8**	N/A	27.00
Top Mounted			
1NO	**C320KGT1**	10	20.10
1NC	**C320KGT2**	01	20.10
1NO-1NC	**C320KGT3**	11	27.00
2NO	**C320KGT4**	20	27.00
2NC	**C320KGT5**	02	27.00
1NO-1NCI	**C320KGT6**	N/A	27.00
1NO (EC)-1NC (LO)	**C320KGT7**	N/A	27.00
1NCI	**C320KGT8**	N/A	27.00
3NO	**C320KGT9**	30	54.50
2NO-1NC	**C320KGT10**	21	54.50
1NO-2NC	**C320KGT11**	12	54.50
3NC	**C320KGT12**	03	54.50
4NO	**C320KGT13**	40	54.50
3NO-1NC	**C320KGT14**	31	54.50
2NO-2NC	**C320KGT15**	22	54.50
1NO-3NC	**C320KGT16**	13	54.50
4NC	**C320KGT17**	04	54.50
3NO-1NCI	**C320KGT18**	N/A	54.50
2NO-1NCI-1NC	**C320KGT19**	N/A	54.50
2NO-1NO (EC)-1NC (LO)	**C320KGT20**	N/A	54.50
1NO-1NC-1NO (EC)-1NC (LO)	**C320KGT21**	N/A	54.50

Note: NCI = Normally Closed early opening designed for use in reversing applications. EC = Early Closing. LO = Late Opening.

① For reference only — not part of Catalog Number. See below.

Contact Configuration Code

This two-digit code is found on the auxiliary contact to assist in identifying the specific contact configuration. The first digit indicates the quantity of NO contacts and the second indicates the quantity of NC contacts.

NEMA Sizes 3 – 8 — IEC Sizes L – Z

Table 33-40. Product Selection

Circuit	Catalog Number		Contact Configuration Code ②	Price U.S. $
Base Auxiliary Contacts — NEMA Sizes 3 – 5, IEC Sizes L – S				
	NEMA Size 3 IEC Sizes L – N	NEMA Sizes 4 – 5 IEC Sizes P – S		
NO	**C320KGS31**	**C320KGS41**	10	40.25
NO-NC	**C320KGS32**	**C320KGS42**	11	54.50
Auxiliary Contacts — NEMA Sizes 3 – 5, IEC Sizes L – S				
	Catalog Number			
NO	**C320KGS20**		10	40.25
NC	**C320KGS21**		01	40.25
NO-NC ③	**C320KGS22**		11	54.50
Auxiliary Contacts — NEMA Sizes 6 – 8, IEC Sizes T – Z				
	Size	Catalog Number		
NO-NC	NEMA 8, IEC Z	**C320KA5**	11	149.00
2NO-2NC	NEMA 6 – 7	**C320KA6**	22	149.00
2NO-2NC	IEC T – X	**C320KA8**	22	149.00

② For reference only — not part of Catalog Number. See below left.

③ NO-NC occupies two positions — L2 and L3, or R2 and R3. See **Figure 33-7** on **Page 33-20**.

Base Auxiliary Contact Cat. No. C320KGS42

Auxiliary Contact Cat. No. C320KGS22

Auxiliary Contact Ratings (Amperes)

Table 33-41. Ratings — NEMA A600

Current	AC Volts			
	120V	240V	480V	600V
Make and Interrupting	60	30	15	12
Break	6	3	1.5	1
Continuous	10	10	10	10

Table 33-42. Ratings — NEMA P300

Continuous Thermal Rating: 5A	
DC Volts	**Make/Break Amperes**
125	1.10
250	.55

Table 33-43. Ratings — Logic Level

Minimum Ratings for Logic Level and Hostile Atmosphere Application	
Minimum Amperes	20 mA
Minimum Volts	24V AC/DC

Discount Symbol **1CD1C**

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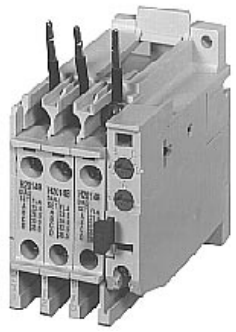


32A Overload
Cat. No. C306DN3B

Product Description

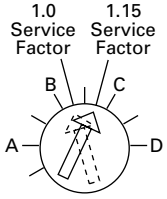
C306 Overload Relays are designed for use with CE or CN non-reversing and reversing contactors. Four sizes are available for overload protection up to 144A.

Features

- Selectable Manual or Automatic Reset operation.
- Interchangeable Heater Packs adjustable ±24% to match motor FLA and calibrated for use with 1.0 and 1.15 service factor motors. Heater packs for 32A overload relay will mount in 75A overload relay — useful in derating applications such as jogging.
- Class 10 or 20 heater packs.
- Load lugs built into relay base.
- Bimetallic, ambient compensated operated. Trip free mechanism.
- Electrically isolated NO-NC contacts (pull RESET button to test).
- Overload trip indication.
- Shrouded or fingerproof terminals to reduce possibility of electrical shock.
- Meets UL 508 single-phasing requirements.
- UL listed, CSA certified, NEMA compliance and CE mark.

Operation

C306 Overload Relay Setting



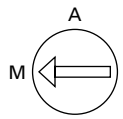
Example of 12.0 FLA setting for heater pack number H2011B showing position for 1.0 or 1.15 service factor motors.

Figure 33-17. FLA Dial Adjustment

For motors having a 1.15 service factor, rotate the FLA adjustment dial to correspond to the motor's FLA rating.

Estimate the dial position when the motor FLA falls between two letter values as shown in the example.

For motors having a 1.0 service factor, rotate the FLA dial one-half position counterclockwise (CCW).



Example of setting for manual reset.

Figure 33-18. Manual/Automatic Reset

The overload relay is factory set at M for manual reset operation. For automatic reset operation, turn the reset adjustment dial to the A position as shown in the illustration.

Automatic reset is not intended for two-wire control devices.

Test for Trip Indication

To test overload relay for trip indication when in manual reset, pull out the blue reset button. An orange flag will appear indicating that the device has tripped. Push reset button in to reset.

Warning — To provide continued protection against fire or shock hazard, the complete overload relay must be replaced if burnout of the heater element occurs.

Technical Information

General

"Overload relays are provided to protect motors, motor control apparatus and motor-branch circuit conductors against excessive heating due to motor overloads and failure to start. This definition does not include: 1) motor circuits over 600V, 2) short circuits, 3) ground faults and 4) fire pump control." (NEC Art. 430-31)

Time Current Characteristics

The time-current characteristics of an overload relay is an expression of performance which defines its operating time at various multiples of its current setting. Tests are run at Underwriters Laboratories (UL) in accordance with NEMA Standards and the NEC. UL requires:

- When tested at 100 percent of its current rating, the overload relay shall trip ultimately.
- When tested at 200 percent of its current rating, the overload relay shall trip in not more than 8 minutes.
- When tested at 600 percent of the current rating, the overload relay shall trip in not more than 10 or 20 seconds, depending on the Class of the relay.

"Current Rating" is defined as the minimum current at which the relay will trip. Per NEC, an overload must ultimately trip at 125% of FLA current (heater) setting for a 1.15 service factor motor and 115% FLA for a 1.0 service factor motor.

"Current Setting" is defined as the FLA (Full Load Amperes) of the motor and thus the overload heater pack setting.

Example: 600% of current rating is defined as 750% (600 x 1.25) of FLA current (heater) setting for a 1.15 service factor motor. A 10A heater setting must trip in 20 seconds or less at 75A motor current for a Class 20 relay.

Table 33-74. Standard Trip — Class 20 Heater Selection

Overload Relay Size	Motor Full Load Ampere Rating — Dial Position A	B	C	D	Catalog Number (Includes 3 Heater Packs) ①	Price U.S. $
For Use with NEMA Sizes 00 – 0 Series C, NEMA Sizes 1 – 2 Series B; IEC Sizes A – F Series C, IEC Sizes G – K Series B						
32A or 75A	.254	.306	.359	.411	**H2001B-3**	30.50
	.375	.452	.530	.607	**H2002B-3**	30.50
	.560	.676	.791	.907	**H2003B-3**	30.50
	.814	.983	1.15	1.32	**H2004B-3**	30.50
	1.20	1.45	1.71	1.96	**H2005B-3**	30.50
	1.79	2.16	2.53	2.90	**H2006B-3**	30.50
	2.15	2.60	3.04	3.49	**H2007B-3**	30.50
	3.23	3.90	4.56	5.23	**H2008B-3**	30.50
	4.55	5.50	6.45	7.40	**H2009B-3**	30.50
	6.75	8.17	9.58	11.0	**H2010B-3**	30.50
	9.14	10.8	12.4	14.0	**H2011B-3**	30.50
	14.0	16.9	19.9	22.8	**H2012B-3**	30.50
	18.7	22.7	26.7	30.7	**H2013B-3**	30.50
	23.5	28.5	33.5	38.5	**H2014B-3**	30.50
For Use with NEMA Size 2, IEC Sizes G – K Only — Series B						
75A	29.0	34.0	39.1	44.1	**H2015B-3**	30.50
	39.6	45.5	51.5	57.4	**H2016B-3**	30.50
	53.9	60.9	67.9	74.9	**H2017B-3**	30.50
For Use with NEMA Sizes 3 – 4, IEC Sizes L – N Only — Series A						
105A or 144A	8.0	9.2	10.3	11.5	**H2025-3**	30.50
	11.4	12.8	14.3	15.7	**H2026-3**	30.50
	14.3	15.7	17.4	19.0	**H2027-3**	30.50
	18.0	20.2	22.3	24.5	**H2018-3**	30.50
	24.6	27.6	30.5	33.4	**H2019-3**	30.50
	33.5	37.5	41.5	45.6	**H2020-3**	30.50
	45.7	51.2	56.7	62.1	**H2021-3**	30.50
	62.2	69.7	77.1	84.6	**H2022-3**	30.50
	84.7	95.0	105.0	115.0	**H2023-3**	30.50
	106.0	118.0	131.0	144.0	**H2024-3**	30.50
For Use with Size 5 Starters — Series B and IEC P, R and S with 300/5 CT						
32A ②	49	59	69	79	**H2004B-3**	30.50
	72	87	103	118	**H2005B-3**	30.50
	107	130	152	174	**H2006B-3**	30.50
	129	156	182	209	**H2007B-3**	30.50
	194	234	274	—	**H2008B-3**	30.50
For Use with Size 6 Starters Only — Series B and IEC T – V with 600/5 CT						
32A ②	144	174	205	235	**H2005B-3**	30.50
	215	259	304	348	**H2006B-3**	30.50
	258	312	365	419	**H2007B-3**	30.50
	388	468	547	627	**H2008B-3**	30.50
For Use with Size 7 Starters Only — Series B and IEC W – X with 1000/5 CT						
32A ②	163	197	230	264	**H2004B-3**	30.50
	240	290	342	392	**H2005B-3**	30.50
	358	432	506	580	**H2006B-3**	30.50
	430	520	608	698	**H2007B-3**	30.50
	646	780	912	—	**H2008B-3**	30.50
For Use with Size 8 Starters Only — Series B and IEC Z with 1500/5 CT						
32A ②	244	295	345	396	**H2004B-3**	30.50
	360	435	513	588	**H2005B-3**	30.50
	537	648	759	870	**H2006B-3**	30.50
	645	780	912	1047	**H2007B-3**	30.50
	969	1170	1368	—	**H2008B-3**	30.50

① Heater packs are shipped 3 to a carton. Catalog Numbers and prices are for 3 heater packs.

② Sizes 5 – 8 and IEC P – Z use the 32A overload relay with current transformers.

Table 33-75. Fast Trip — Class 10 Heater Selection

Overload Relay Size	Motor Full Load Ampere Rating — Dial Position A	B	C	D	Catalog Number (Includes 3 Heater Packs) ③	Price U.S. $
For Use with NEMA Sizes 00 – 0 Series C, NEMA Sizes 1 – 2 Series B; IEC Sizes A – F Series C, IEC Sizes G – K Series B						
32A or 75A	.260	.313	.367	.420	**H2101B-3**	30.50
	.384	.464	.543	.623	**H2102B-3**	30.50
	.570	.688	.806	.924	**H2103B-3**	30.50
	.846	1.02	1.20	1.37	**H2104B-3**	30.50
	1.28	1.55	1.83	2.10	**H2105B-3**	30.50
	1.92	2.33	2.74	3.15	**H2106B-3**	30.50
	2.30	2.79	3.28	3.77	**H2107B-3**	30.50
	3.38	4.10	4.82	5.54	**H2108B-3**	30.50
	4.96	6.03	7.09	8.16	**H2109B-3**	30.50
	7.07	8.58	10.1	11.6	**H2110B-3**	30.50
	9.60	11.2	12.8	14.4	**H2111B-3**	30.50
	14.4	17.5	20.7	23.8	**H2112B-3**	30.50
	18.7	21.8	25.0	28.1	**H2113B-3**	30.50
	23.5	27.3	31.0	34.8	**H2114B-3**	30.50
For Use with NEMA Size 2, IEC Sizes G – K Only — Series B						
75A	28.3	32.6	37.0	41.3	**H2115B-3**	30.50
	36.6	42.3	48.1	53.8	**H2116B-3**	30.50
	53.8	60.8	67.9	74.9	**H2117B-3**	30.50
For Use with Size 5 Starters Only — Series B and IEC P, R and S with 300/5 CT						
32A ④	51	61	72	82	**H2104B-3**	30.50
	77	93	110	126	**H2105B-3**	30.50
	115	140	164	189	**H2106B-3**	30.50
	138	167	197	226	**H2107B-3**	30.50
	203	246	289	—	**H2108B-3**	30.50
For Use with Size 6 Starters Only — Series B and IEC T – V with 600/5 CT						
32A ④	154	186	220	252	**H2105B-3**	30.50
	230	280	329	378	**H2106B-3**	30.50
	276	335	394	452	**H2107B-3**	30.50
	406	492	578	—	**H2108B-3**	30.50
For Use with Size 7 Starters Only — Series B and IEC W – X with 1000/5 CT						
32A ④	169	204	240	274	**H2104B-3**	30.50
	256	310	366	420	**H2105B-3**	30.50
	384	466	543	630	**H2106B-3**	30.50
	460	558	656	754	**H2107B-3**	30.50
	676	820	—	—	**H2108B-3**	30.50
For Use with Size 8 Starters Only — Series B and IEC Z with 1500/5 CT						
32A ④	254	306	360	411	**H2104B-3**	30.50
	384	465	549	630	**H2105B-3**	30.50
	576	699	822	945	**H2106B-3**	30.50
	690	837	984	1131	**H2107B-3**	30.50
	1014	1230	—	—	**H2108B-3**	30.50

③ Heater packs are shipped 3 to a carton. Catalog Numbers and prices are for 3 heater packs.

④ Sizes 5 – 8 and IEC P – Z use the 32A overload relay with current transformers.

Discount Symbol **1CD1C**

Bulletin 800H

- **30.5 mm Mounting Hole**
- **Type 4/4X/13 Corrosion-Resistant/ Watertight/Oiltight**
- **Heavy Industrial Stations and Operators**

TABLE OF CONTENTS

Specifications ❶

Electrical Ratings		
Contact Ratings		Refer to the Contact Ratings tables below
Dielectric Strength		2200V for one minute; 1300V for one minute (Logic Reed)
Electrical Design Life Cycles		1,000,000 at maximum rated load
Mechanical Ratings		
Vibration		10…200 Hz 1.52 mm displacement (peak-to-peak) Max./10 G Max. (except Logic Reed)
Shock		1/2 cycle sine wave for 11 milliseconds ≥ 25 G (contact fragility) and no damage at 100 G
Degree of Protection		Type 4/4X/13; Watertight/Corrosion-Resistant, Oiltight IEC 529 IP66/65
Mechanical Design Life Cycles		
Push Buttons	(Momentary, Non-Illuminated) (Momentary, Illuminated) (Push-Pull/Twist-to-Release)	10,000,000 minimum 250,000 minimum 250,000 minimum
Selector Switches	(Non-Illuminated) (Illuminated)	1,000,000 minimum 200,000 minimum
Potentiometers		100,000 minimum
All other devices		200,000 minimum
Contact Operation		Shallow, mini, and Low Voltage Contact Blocks: Slow, double make and break Logic Reed and Sealed Switch Contact Blocks: Single break magnetic
Typical Operating Forces		
Operators without contact blocks		Flush, Extended, Standard Mushroom, Jumbo Plastic Mushroom: 2 lbs Max. Maintained Selector Switch: 3.6 in. lbs maximum
Spring Return Selector Switches		3.6 in. lbs to stop; 0.2 in. lbs to return
Illuminated Push Buttons and Push-to-Test Pilot Lights		5 lbs maximum
3-Position Push-Pull		8 lbs maximum push to in position or pull to center position (15 lbs maximum pull to out position)
Push-Pull and Push-Pull/Twist		9 lbs maximum push or pull, 30 in. oz. maximum twist, 6 in. oz. minimum return
Potentiometer	Rotational Torque Stopping Torque	3…12 in.-oz. 12 in.-lbs (minimum)
Contact Blocks	800T-XA Logic Reed Sealed Switch Stackable Sealed Switch	1 lb 1 lb maximum 3 lbs maximum at 0.205" plunger travel 1 lb maximum
Environment		
Temperature Range	Operating Storage	–40…+131°F (–40C…+55°C) –40…+185°F (–40…+85°C)
Note: Operating temperatures below freezing are based on the absence of moisture and liquids. Consult your local Allen-Bradley Sales Office for use in lower temperature applications.		
Humidity		50% at +104°F (+40°C)

❶ Performance Data — See page Important-2.

Contact Ratings

Maximum thermal continuous current I_{th} 10 A AC/2.5 A DC.
Bulletin 800H units with 800T-XA contacts have ratings as follows:

Max. Opertnl. Volts Ue	Utilization Category		Rated Operational Currents		
	IEC	NEMA	Volts Ue	Make	Break
AC 600	AC-15	A600	120…600 72…120 24…72	7200 VA 60 A 60 A	720 VA 720 VA 10 A
DC 600	DC-13	Q600	28…600 24…28❷	69 VA 2.5 A	

❷ For applications below 24V/24 mA, Pen*TUFF*™ or Logic Reed contacts are recommended.

Sealed Switch Contact Ratings

Maximum continuous current I_{th} 5 A. Bulletin 800H units have control circuit ratings with sealed switch contact blocks as follows:

Max. Opertnl. Volts Ue	Utilization Category		Rated Operational Currents		
	IEC	NEMA	Volts Ue	Make	Break
AC 600	AC-15	B600	120…600 0…120	3600 VA 30 A	360 VA 3 A
DC 300	DC-13	P300	24…300 0…24	138 VA 5.0 A	

Stackable Sealed Switch Contact Ratings

Maximum continuous current I_{th} 2.5 A.

Logic Reed Contact Ratings

Maximum DC: 30V, 0.06 A, AC: 150V, 0.15 A
Should only be used with resistive loads.

Pen*TUFF*™ (Low Voltage) Contact Ratings

Minimum DC: 5V, 1 mA

Maximum thermal continuous current I_{th} 2.5 A AC/1.0 A DC.
Bulletin 800H units with 800T-XAV contacts have ratings as follows:

Max. Opertnl. Volts Ue	Utilization Category		Rated Operational Currents		
	IEC	NEMA	Volts Ue	Make	Break
AC 300	AC-15	C300	120…300 0…120	1800 VA 15 A	180 VA 1.5 A
DC 150	DC-13	R150	24…150 0…24	28 VA 1.0 A	

Approvals

UL Listed — File: E14840, E10314
Guide: NKCR, NOIV
CSA Certified: LR1234, LR11924
CE compliant IEC: 60947-5

Materials Used in 800H Type 4X Operators

Thermoplastic Polyester (Fiberglass Reinforced)

- Bushings
- Mounting rings
- Sockets

Thermoplastic Polyester

- Non-illuminated button caps

Transparent Amorphous Nylon

- Pilot light lens cap
- Illuminated button caps

Glass Filled Crystalline Nylon

- Thrust washer

Mineral Filled Nylon

- Trim washer

Nitrile (Synthetic Rubber)

- Gaskets and internal seals

2-Position Push-Pull/Twist Release, Non-Illuminated

2-Position Push-Pull/Twist
Cat. No. 800H-FRXT6D4

Contact Type	Operator Position		Button Color	Push-Pull/Twist Release
	Maintained	Maintained		
	Out	In		Cat. No.
N.C.L.B. ❶	X	O	Red	800H-FRXT6D4
N.O. - N.C.L.B. ❶	O X	X O	Red	800H-FRXT6A1
N.C.L.B. - N.C.L.B. ❶	X X	O O	Red	800H-FRXT6A5

Note: X = Closed/O = Open

Note: A jumbo or large legend plate is recommended, if space allows.

Note: Emergency stop push buttons are compliant with EN-418 and IEC 60947-5-5 Standards when using N.C.L.B. contact blocks.

❶ Normally closed late break contact. When button is pushed from the OUT to IN position, the mechanical detent action of the operator occurs before electrical contacts change state. When the button is pulled from the IN to the OUT position, the electrical contacts change state before the mechanical detent occurs.

Accessories — Page 10-85
Legend Plates — Page 10-96
Approximate Dimensions — Page 10-99

Modifications and Accessories

Contact Blocks

Packaged in kit form for field installation. All necessary mounting hardware is provided with each contact block kit. **Contact ratings are listed on page 10-59. Note**: It is not recommended to mount more than four contact blocks on any one Non-Illuminated operator, (maximum two blocks deep). Contact blocks cannot be stacked onto power modules, so illuminated operators are limited to two contact blocks. Sealed switch contact blocks are not stackable, and are limited to two blocks per operator. Time delay contacts are only available as one circuit per operator.

Shallow Block

PenTUFF (Low Voltage) Contact Block

Logic Reed Block

Sealed Switch Block

Stackable Sealed Switch Block

Number of Contacts	Shallow Block ❶❷	Pen*TUFF* (Low Voltage) Block ❶❷	Logic Reed Block ❸	Sealed Switch Block ❸	Stackable Sealed Switch Block ❸
	Cat. No.	Cat. No.	Cat. No.	Cat. No.	Cat. No.
1 N.O.	800T-XD1	800T-XD1V	800T-XD1R	800T-XD1P	800T-XD1Y
1 N.C.	800T-XD2	800T-XD2V	800T-XD2R	800T-XD2P	800T-XD2Y
1 N.O. (Early Make)	800T-XD3	800T-XD3V	—	—	—
1 N.C. (Late Break)	800T-XD4	800T-XD4V	—	—	—
1 N.O. - 1 N.C.	800T-XA	800T-XAV	800T-XAR	800T-XAP	800T-XAY
2 N.O.	800T-XA2 ❹	—	800T-XA2R ❹	—	800T-XA2Y
2 N.C.	800T-XA4	—	800T-XA4R	—	800T-XA4Y
1 N.C. (Late Break) 1 N.O.	800T-XA1	—	—	—	—
1 N.C. (Late Break) 1 N.C.	800T-XA7	—	—	—	—

Mini Block

Time Delay Block

Number of Contacts	Mini Block ❶	Time Delay Block ❺
	Cat. No.	Cat. No.
1 N.O.	800T-XD5	800T-XT
1 N.C.	800T-XD6	800T-XS

❶ Contact blocks with normally closed contacts meet direct drive positive opening standard requirements when properly fused to IEC 269-1 and 269-2. Shallow/mini contacts: 10 A gl or N type cartridge fuse. Pen*TUFF* contacts: 6 A gl or N type cartridge fuse.

❷ Specify Bulletin 800TC for finger-safe contact blocks. Example: **800TC-XA**.

❸ 800T operator using sealed switch and logic reed contact blocks and installed in a suitable enclosure are UL Listed as suitable for use in Class I, Division 2/Zone 2 hazardous locations.

❹ Additional contacts cannot be stacked on XA2 and XA2R contact blocks.

❺ For contact ratings, see page 10-5.

Shallow Contact Block Hardware

Description	Cat. No.
❻ Contact Block Mounting Screw	800T-N335
❼ Screw Retainer	800T-N336
❽ Actuator Extender	800T-N337

Bulletin 800H

- **30.5 mm Mounting Hole**
- **Type 4/4X/13 Corrosion-Resistant/ Watertight/Oiltight**
- **Heavy Industrial Stations and Operators**

TABLE OF CONTENTS

Specifications ❶

Electrical Ratings		
Contact Ratings		Refer to the Contact Ratings tables below
Dielectric Strength		2200V for one minute; 1300V for one minute (Logic Reed)
Electrical Design Life Cycles		1,000,000 at maximum rated load
Mechanical Ratings		
Vibration		10…200 Hz 1.52 mm displacement (peak-to-peak) Max./10 G Max. (except Logic Reed)
Shock		1/2 cycle sine wave for 11 milliseconds ≥ 25 G (contact fragility) and no damage at 100 G
Degree of Protection		Type 4/4X/13; Watertight/Corrosion-Resistant, Oiltight IEC 529 IP66/65
Mechanical Design Life Cycles		
Push Buttons	(Momentary, Non-Illuminated) (Momentary, Illuminated) (Push-Pull/Twist-to-Release)	10,000,000 minimum 250,000 minimum 250,000 minimum
Selector Switches	(Non-Illuminated) (Illuminated)	1,000,000 minimum 200,000 minimum
Potentiometers		100,000 minimum
All other devices		200,000 minimum
Contact Operation		Shallow, mini, and Low Voltage Contact Blocks: Slow, double make and break Logic Reed and Sealed Switch Contact Blocks: Single break magnetic
Typical Operating Forces		
Operators without contact blocks		Flush, Extended, Standard Mushroom, Jumbo Plastic Mushroom: 2 lbs Max. Maintained Selector Switch: 3.6 in. lbs maximum
Spring Return Selector Switches		3.6 in. lbs to stop; 0.2 in. lbs to return
Illuminated Push Buttons and Push-to-Test Pilot Lights		5 lbs maximum
3-Position Push-Pull		8 lbs maximum push to in position or pull to center position (15 lbs maximum pull to out position)
Push-Pull and Push-Pull/Twist		9 lbs maximum push or pull, 30 in. oz. maximum twist, 6 in. oz. minimum return
Potentiometer	Rotational Torque Stopping Torque	3…12 in.-oz. 12 in.-lbs (minimum)
Contact Blocks	800T-XA Logic Reed Sealed Switch Stackable Sealed Switch	1 lb 1 lb maximum 3 lbs maximum at 0.205" plunger travel 1 lb maximum
Environment		
Temperature Range	Operating Storage	–40…+131°F (–40C…+55°C) –40…+185°F (–40…+85°C)
Note: Operating temperatures below freezing are based on the absence of moisture and liquids. Consult your local Allen-Bradley Sales Office for use in lower temperature applications.		
Humidity		50% at +104°F (+40°C)

❶ Performance Data — See page Important-2.

Contact Ratings

Maximum thermal continuous current I_{th} 10 A AC/2.5 A DC.
Bulletin 800H units with 800T-XA contacts have ratings as follows:

Max. Opertnl. Volts Ue	Utilization Category		Rated Operational Currents		
	IEC	NEMA	Volts Ue	Make	Break
AC 600	AC-15	A600	120…600 72…120 24…72	7200 VA 60 A 60 A	720 VA 720 VA 10 A
DC 600	DC-13	Q600	28…600 24…28❷	69 VA 2.5 A	

❷ For applications below 24V/24 mA, Pen*TUFF*™ or Logic Reed contacts are recommended.

Sealed Switch Contact Ratings

Maximum continuous current I_{th} 5 A. Bulletin 800H units have control circuit ratings with sealed switch contact blocks as follows:

Max. Opertnl. Volts Ue	Utilization Category		Rated Operational Currents		
	IEC	NEMA	Volts Ue	Make	Break
AC 600	AC-15	B600	120…600 0…120	3600 VA 30 A	360 VA 3 A
DC 300	DC-13	P300	24…300 0…24	138 VA 5.0 A	

Stackable Sealed Switch Contact Ratings

Maximum continuous current I_{th} 2.5 A.

Logic Reed Contact Ratings

Maximum DC: 30V, 0.06 A, AC: 150V, 0.15 A
Should only be used with resistive loads.

Pen*TUFF*™ (Low Voltage) Contact Ratings

Minimum DC: 5V, 1 mA

Maximum thermal continuous current I_{th} 2.5 A AC/1.0 A DC.
Bulletin 800H units with 800T-XAV contacts have ratings as follows:

Max. Opertnl. Volts Ue	Utilization Category		Rated Operational Currents		
	IEC	NEMA	Volts Ue	Make	Break
AC 300	AC-15	C300	120…300 0…120	1800 VA 15 A	180 VA 1.5 A
DC 150	DC-13	R150	24…150 0…24	28 VA 1.0 A	

Approvals

UL Listed — File: E14840, E10314
Guide: NKCR, NOIV
CSA Certified: LR1234, LR11924
CE compliant IEC: 60947-5

Materials Used in 800H Type 4X Operators

Thermoplastic Polyester (Fiberglass Reinforced)

- Bushings
- Mounting rings
- Sockets

Thermoplastic Polyester

- Non-illuminated button caps

Transparent Amorphous Nylon

- Pilot light lens cap
- Illuminated button caps

Glass Filled Crystalline Nylon

- Thrust washer

Mineral Filled Nylon

- Trim washer

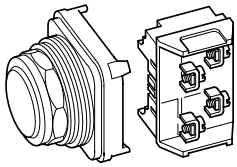
Nitrile (Synthetic Rubber)

- Gaskets and internal seals

Momentary Contact Push Button Units, Non-Illuminated

800H ___ – AR 1 ___ A

a *b* *c* *d* *e*



a

Finger-Safe Guards	
Code	**Description**
Blank	No Guards
C	Guards on Terminals

b

Operator Type	
Code	**Description**
AR	Flush Head
BR	Extended Head
DR	Mushroom Head
DRX	Mushroom Head less Color Cap
R	Booted Head ❶
GR	Bootless Guarded Head

c

Color Cap	
Code	**Description**
Blank	Used only when ordering Operator Type **DRX**
1	Green
2	Black
3	Orange ❷
4	Gray ❷
5	White ❷
6	Red
7	Blue
9	Yellow

d

Special Mushroom Head	
Code	**Description**
Blank	No Special Head
J	Jumbo Mushroom Head — Plastic

Note: Special Mushroom Head options only apply to Mushroom Head operator Type Code **DR**.

e

Contact Block(s)	
Code	**Description**
Blank	No Contacts on operator
Standard	
D1	1 N.O.
D2	1 N.C.
D3	1 N.O.E.M.
D4	1 N.C.L.B.
D5	1 N.O. (Mini)
D6	1 N.C. (Mini)
A1	1 N.C.L.B. - 1 N.O.
A2 ❸	2 N.O.
A4	2 N.C.
A7	1 N.C.L.B. - 1 N.C.
A	1 N.O. - 1 N.C.
B	2 N.O. - 2 N.C.
H	3 N.O. - 3 N.C.
C	4 N.O. - 4 N.C.
Pen*TUFF* (Low Voltage)	
D1V	1 N.O.
D2V	1 N.C.
D3V	1 N.O.E.M.
D4V	1 N.C.L.B.
AV	1 N.O. - 1 N.C.
BV	2 N.O. - 2 N.C.
HV	3 N.O. - 3 N.C.
CV	4 N.O. - 4 N.C.

e (cont'd)

Contact Block(s)	
Code	**Description**
Blank	No Contacts on operator
Time Delay	
T	1 N.O. Depress to close, release to initiate delayed opening
S	1 N.C. Depress to open, release to initiate delayed closure
Class I, Div. 2/Zone 2	
Logic Reed	
D1R	1 N.O.
D2R	1 N.C.
A2R❸	2 N.O.
A4R❸	2 N.C.
AR	1 N.O. - 1 N.C.
BR	2 N.O. - 2 N.C.
HR	3 N.O. - 3 N.C.
CR	4 N.O. - 4 N.C.
Sealed Switch	
D1P	1 N.O.
D2P	1 N.C.
A2P	2 N.O.
A4P	2 N.C.
AP	1 N.O. - 1 N.C.
BP	2 N.O. - 2 N.C
Stackable Sealed Switch	
D1Y	1 N.O.
D2Y	1 N.C.
A2Y	2 N.O.
A4Y	2 N.C.
AY	1 N.O. - 1 N.C.
BY	2 N.O. - 2 N.C
HY	3 N.O. - 3 N.C.
CY	4 N.O. - 4 N.C

Time Delay Contacts
Series C field installable kits can only be used with Series T or later operators. Adjustable range of 0.5…15 sec ±25%. Maximum continuous current I_{th} 5 A.

❶ Green and black operators are flush underneath boots; red operators are extended.
❷ Not available for booted operators.
❸ **XA2** and **XA2R** contact blocks cannot be stacked upon, but they can stack on other contact blocks.

Zelio Logic smart relays
Compact and modular smart relays

Smart relay type	Compact smart relays			
				
Number of I/O	10	12	20	
Number of discrete inputs (of which analogue inputs)	6 (0)	8 (4)	12 (2)	12 (6)
Number of "relay" or "transistor" outputs	4	4	8	
Supply voltage	⎓ 24 V, ∿ 100...240 V	⎓ 12 V, ⎓ 24 V, ∿ 24 V, ∿ 100...240 V		
I/O extensions	No			
Modbus communication module ▲	No			
Clock	No	Yes	Depends on model	
Display and programming buttons	Depends on model			
Programming language LADDER / FBD	LADDER	LADDER / FBD *(1)*	LADDER	LADDER / FBD *(1)*
References	**SR2 ●101●●**	**SR2 ●121●●**	**SR2 B122BD**	**SR2 A201●●**	**SR2 B20●●● SR2 E201●●**
Pages	14102/12	14102/12	14102/12	14102/12	14102/12

(1) FBD: Function Block Diagram
▲ Available: 1st quarter 2004.

Modular smart relays

	
10	26
6 (4)	16 (6)
4	10
⎓ 24 V, ∿ 24 V, ∿ 100...240 V	
Yes (6, 10 or 14 I/O)	
Yes	
Yes	
Yes	
LADDER / FBD *(1)*	
SR3 B10●●●	**SR3 B26●●●**
14102/13	14102/13

(1) FBD: Function Block Diagram

Zelio Logic smart relays
Compact and modular smart relays

Environment characteristics

Product certifications			UL, CSA, GL, C-TICK
Conformity with the low voltage directive	Conforming to 73/23/EEC		EN 61131-2 (open equipment)
Conformity with the EMC directive	Conforming to 89/336/EEC		EN 61131-2 (Zone B) EN 61000-6-2, EN 61000-6-3 and EN 61000-6-4
Degree of protection	Conforming to IEC 60529		IP 20
Overvoltage category	Conforming to IEC 60664-1		3
Degree of pollution	Conforming to IEC/EN 61131-2		2
Ambient air temperature around the device	Operation	**°C**	-20... +55 (+40 in enclosure), conforming to IEC 60068-2-1 and IEC 60068-2-2
	Storage	**°C**	-40... +70
Maximum relative humidity			95 % without condensation or dripping water
Maximum operating altitude	Operation	**m**	2000
	Transport	**m**	3048
Mechanical resistance	Immunity to vibrations		IEC 60068-2-6, test Fc
	Immunity to mechanical shock		IEC 60068-2-27, test Ea
Resistance to electrostatic discharge	Immunity to electrostatic discharge		IEC 61000-4-2, level 3
Resistance to HF interference (Immunity)	Immunity to electromagnetic radiated fields		IEC 61000-4-3, level 3
	Immunity to fast transients in bursts		IEC 61000-4-4, level 3
	Immunity to shock waves		IEC 61000-4-5
	Radio frequency in common mode		IEC 61000-4-6, level 3
	Voltage dips and breaks (~)		IEC 61000-4-11
	Immunity to damped oscillation wave		IEC 61000-4-12
Conducted and radiated emissions	Conforming to EN 55022/11 (Group 1)		Class B
Connection to screw terminals (Tightened using Ø 3.5 screwdriver)	Flexible cable with cable end	**mm²**	1 conductor: 0.25...2.5, cable: AWG 24... AWG14 2 conductors: 0.25...0.75, cable: AWG 24... AWG18
	Semi-solid cable	**mm²**	1 conductor: 0.2...2.5, cable: AWG 25... AWG14
	Solid cable	**mm²**	1 conductor: 0.2...2.5, cable: AWG 25... AWG14 2 conductors: 0.2...1.5, cable: AWG 24... AWG16
	Tightening torque	**N.m**	0.5

⎓ 12 V supply characteristics

Smart relay type			**SR2 B121JD**	**SR2 B201JD**
Primary	Nominal voltage	**V**	12	12
Voltage limits	Including ripple	**V**	10.4…14.4	10.4…14.4
Nominal input current		**mA**	120	200
Nominal input current with extensions		**mA**	144	250
Power dissipated		**W**	1.5	2.5
Micro-breaks	Permissible duration	**ms**	⩽ 1 (repeated 20 times)	
Protection			Against polarity inversion	

⎓ 24 V supply characteristics

Smart relay type			**SR2 ●1●1BD**	**SR2 ●1●2BD**	**SR2 ●2●1BD**	**SR2 ●2●2BD**	**SR3 B101BD**	**SR3 B102BD**	**SR3 B261BD**	**SR3 B262BD**
Primary	Nominal voltage	**V**	24	24	24	24	24	24	24	24
Voltage limits	Including ripple	**V**	19.2…30	19.2…30	19.2…30	19.2…30	19.2…30	19.2…30	19.2…30	19.2…30
Nominal input current		**mA**	100	100	100	100	100	50	190	70
Nominal input current with extensions		**mA**	–	–	–	–	100	160	300	180
Power dissipated		**W**	3	3	6	3	3	4	6	5
Power dissipated with extensions		**W**	–	–	–	–	8	8	10	10
Micro-breaks	Permissible duration	**ms**	⩽ 1 (repeated 20 times)							
Protection			Against polarity inversion							

~ 24 V supply characteristics

Smart relay type			**SR2●1●1B**	**SR2●2●1B**	**SR3 B101B**	**SR3 B261B**
Primary	Nominal voltage	**V**	24	24	24	24
Voltage limits		**V**	20.4…28.8	20.4…28.8	20.4…28.8	20.4…28.8
Nominal frequency		**Hz**	50-60	50-60	50-60	50-60
Nominal input current		**mA**	145	233	160	280
Nominal input current with extensions		**mA**	–	–	280	415
Power dissipated		**VA**	4	6	4	7.5
Power dissipated with extensions		**VA**	–	–	7,5	10
Micro-breaks	Permissible duration	**ms**	⩽ 10 (repeated 20 times)			
rms insulation voltage		**V**	1780 (50-60 Hz)			

∿ 100...240 V supply characteristics

Smart relay type				SR2 ●101FU	SR2 ●121FU	SR2 ●201FU	SR3 B101FU	SR3 B261FU
Primary	Nominal voltage		**V**	100…240	100…240	100…240	100…240	100…240
Voltage limits			**V**	85…264	85…264	85…264	85…264	85…264
Nominal input current			**mA**	80/30	80/30	100/50	80/30	100/50
Nominal input current with extensions			**mA**	–	–	–	80/40	80/60
Power dissipated			**VA**	7	7	11	7	12
Power dissipated with extensions			**VA**	–	–	–	12	17
Micro-breaks	Permissible duration		**ms**	10	10	10	10	10
rms insulation voltage			**V**	1780	1780	1780	1780	1780

Processing characteristics

Smart relay type			SR2/SR3
Number of control scheme lines	With LADDER programming		120
Number of function blocks	With FBD programming		Up to 200
Cycle time		**ms**	10...50
Response time		**ms**	20
Back-up time (in the event of power failure)	Day/time		10 years (lithium battery) at 25 °C
	Program and settings		10 years (EEPROM memory)
Program memory checking			At each power-up
Clock drift			12 min/year (0 to 55 °C) 6 sec/month (at 25 °C and calibration)
Timer block accuracy			1 % ± 2 of the cycle time

Discrete ⎓ 24 V input characteristics

Smart relay type				SR2/SR3
Connection				Screw terminal block
Nominal value of inputs	Voltage		**V**	24
	Current		**mA**	4
Input switching limit values	At state 1	Voltage	**V**	≥ 15
		Current	**mA**	≥ 2.20
	At state 0	Voltage	**V**	≤ 5
		Current	**mA**	< 0.75
Input impedance at state 1			**KΩ**	7.4
Configurable response time	State 0 to 1		**ms**	0.2
	State 1 to 0		**ms**	0.3
Conformity to IEC 61131-2				Type 1
Sensor compatibility	3-wire			Yes PNP
	2-wire			No
Input type				Resistive
Isolation	Between supply and inputs			None
	Between inputs			None
Maximum counting frequency			**kHz**	1
Protection	Against inversion of terminals			Control instructions not executed

Discrete ∿ 100...240 V input characteristics

Smart relay type				SR2/SR3
Connection				Screw terminal block
Nominal value of inputs	Voltage		**V**	100... 240
	Current		**mA**	0.6
	Frequency		**Hz**	47... 63
Input switching limit values	At state 1	Voltage	**V**	≥ 79
		Current	**mA**	> 0.1750
	At state 0	Voltage	**V**	≤ 40
		Current	**mA**	< 0.05
Input impedance at state 1			**KΩ**	350
Configurable response time	State 0 to 1 (50/60 Hz)		**ms**	50
	State 1 to 0 (50/60 Hz)		**ms**	50
Isolation	Between supply and inputs			None
	Between inputs			None
Protection	Against inversion of terminals			Control instructions not executed

Integral analogue input characteristics

Smart relay type				SR2/SR3
Analogue inputs	Input range		**V**	0...10 or 0...24
	Input impedance		**KΩ**	12
	Maximum non destructive voltage		**V**	30
	Value of LSB			39 mV, 4 mA
	Input type			Common mode
Conversion	Resolution			8 bit
	Conversion time			Smart relay cycle time
	Precision	at 25 °C		± 5 %
		at 55 °C		± 6.2 %
	Repeat accuracy	at 55 °C		± 2 %
Isolation	Between analogue channel and supply			None
Cabling distance			**m**	10 maximum, with screened cable (sensor not isolated)
Protection	Against inversion of terminals			Control instructions not executed

Relay output characteristics

Smart relay type				SR2●●●/ SR3 B101●●	SR3 B261●●, SR3 XT141●●
Operating limit values			**V**	⎓ 5...150. ∿ 24...250	⎓ 5...150. ∿ 24...250
Contact type				N/O	N/O
Thermal current			**A**	8	8 outputs: 8 A 2 outputs: 5 A
Electrical durability for 500 000 operating cycles	Utilisation category	DC-12	**V**	24	24
			A	1.5	1.5
		DC-13	**V**	24 (L/R = 10 ms)	24 (L/R = 10 ms)
			A	0.6	0.6
		AC-12	**V**	230	230
			A	1.5	1.5
		AC-15	**V**	230	230
			A	0.9	0.9
Minimum switching capacity	At minimum voltage of 12 V		**mA**	10	10
Low power switching reliability of contact				12 V - 10 mA	12 V - 10 mA
Maximum operating rate	No-load		**Hz**	10	10
	At Ie (operational current)		**Hz**	0.1	0.1
Mechanical life	In millions of operating cycles			10	10
Rated impulse withstand voltage	Conforming to IEC 60947-1 and 60664-1		**kV**	4	4
Response time	Trip		**ms**	10	10
	Reset		**ms**	5	5
Built-in protection	Short-circuit			None	
	Against overvoltage and overload			None	

Transistor output characteristics

Smart relay type				SR2/SR3
Operating limit values			**V**	19.2...30
Load	Nominal voltage		**V**	⎓ 24
	Nominal current		**A**	0.5
	Maximum current		**A**	0.625 at 30 V
Drop out voltage	At state 1		**V**	⩽ 2 for I=0.5 A
Response time	Trip		**ms**	⩽ 1
	Reset		**ms**	⩽ 1
Built-in protection	Against overload and short-circuits			Yes
	Against overvoltage *(1)*			Yes
	Against inversions of power supply			Yes

(1) If there is no volt-free contact between the relay output and the load.

Zelio Logic smart relays
Compact smart relays

SR2 A201BD

Compact smart relays with display

Number of I/O	Discrete inputs	Of which 0-10 V analogue inputs	Relay outputs	Transistor outputs	Clock	Reference	Weight kg
Supply ⎓ 12 V							
12	8	4	4	0	Yes	**SR2 B121JD**	0.250
20	12	6	8	0	Yes	**SR2 B201JD**	0.250
Supply ⎓ 24 V							
10	6	0	4	0	No	**SR2 A101BD** *(1)*	0.250
12	8	4	4	0	Yes	**SR2 B121BD**	0.250
	8	4	0	4	Yes	**SR2 B122BD**	0.220
20	12	2	8	0	No	**SR2 A201BD** *(1)*	0.380
	12	6	8	0	Yes	**SR2 B201BD**	0.380
	12	6	0	8	Yes	**SR2 B202BD**	0.280
Supply ∿ 24 V							
12	8	0	4	0	Yes	**SR2 B121B**	0.250
20	12	0	8	0	Yes	**SR2 B201B**	0.380
Supply ∿ 100...240 V							
10	6	0	4	0	No	**SR2 A101FU** *(1)*	0.250
12	8	0	4	0	Yes	**SR2 B121FU**	0.250
20	12	0	8	0	No	**SR2 A201FU** *(1)*	0.380
	12	0	8	0	Yes	**SR2 B201FU**	0.380

SR2 E121BD

Compact smart relays without display

Number of I/O	Discrete inputs	Of which 0-10 V analogue inputs	Relay outputs	Transistor outputs	Clock	Reference	Weight kg
Supply ⎓ 24 V							
10	6	0	4	0	No	**SR2 D101BD** *(1)*	0.220
12	8	4	4	0	Yes	**SR2 E121BD**	0.220
20	12	2	8	0	No	**SR2 D201BD** *(1)*	0.350
	12	6	8	0	Yes	**SR2 E201BD**	0.350
Supply ∿ 24 V							
12	8	0	4	0	Yes	**SR2 E121B**	0.220
20	12	0	8	0	Yes	**SR2 E201B**	0.350
Supply ∿ 100...240 V							
10	6	0	4	0	No	**SR2 D101FU** *(1)*	0.220
12	8	0	4	0	Yes	**SR2 E121FU**	0.220
20	12	0	8	0	No	**SR2 D201FU** *(1)*	0.350
	12	0	8	0	Yes	**SR2 E201FU**	0.350

SR2 PACK●●●

Compact "discovery" packs

Number of I/O	Pack contents	Reference	Weight kg
Supply ⎓ 24 V			
12	An **SR2 B121BD** compact smart relay with display, a connecting cable and “Zelio Soft” programming software supplied on CD-Rom.	**SR2 PACKBD**	0.700
20	An **SR2 B201BD**, compact smart relay with display, a connecting cable and “Zelio Soft” programming software supplied on CD-Rom.	**SR2 PACK2BD**	0.850
Supply ∿ 100...240 V			
12	An **SR2 B121FU**, compact smart relay with display, a connecting cable and “Zelio Soft” programming software supplied on CD-Rom.	**SR2 PACKFU**	0.700
20	An **SR2 B201FU**, compact smart relay with display, a connecting cable and “Zelio Soft” programming software supplied on CD-Rom.	**SR2 PACK2FU**	0.850

(1) Programming on smart relay in LADDER language only.

Bulletin 800H

- **30.5 mm Mounting Hole**
- **Type 4/4X/13 Corrosion-Resistant/ Watertight/Oiltight**
- **Heavy Industrial Stations and Operators**

TABLE OF CONTENTS

Specifications ❶

Electrical Ratings		
Contact Ratings		Refer to the Contact Ratings tables below
Dielectric Strength		2200V for one minute; 1300V for one minute (Logic Reed)
Electrical Design Life Cycles		1,000,000 at maximum rated load
Mechanical Ratings		
Vibration		10…200 Hz 1.52 mm displacement (peak-to-peak) Max./10 G Max. (except Logic Reed)
Shock		1/2 cycle sine wave for 11 milliseconds ≥ 25 G (contact fragility) and no damage at 100 G
Degree of Protection		Type 4/4X/13; Watertight/Corrosion-Resistant, Oiltight IEC 529 IP66/65
Mechanical Design Life Cycles		
Push Buttons	(Momentary, Non-Illuminated) (Momentary, Illuminated) (Push-Pull/Twist-to-Release)	10,000,000 minimum 250,000 minimum 250,000 minimum
Selector Switches	(Non-Illuminated) (Illuminated)	1,000,000 minimum 200,000 minimum
Potentiometers		100,000 minimum
All other devices		200,000 minimum
Contact Operation		Shallow, mini, and Low Voltage Contact Blocks: Slow, double make and break Logic Reed and Sealed Switch Contact Blocks: Single break magnetic
Typical Operating Forces		
Operators without contact blocks		Flush, Extended, Standard Mushroom, Jumbo Plastic Mushroom: 2 lbs Max. Maintained Selector Switch: 3.6 in. lbs maximum
Spring Return Selector Switches		3.6 in. lbs to stop; 0.2 in. lbs to return
Illuminated Push Buttons and Push-to-Test Pilot Lights		5 lbs maximum
3-Position Push-Pull		8 lbs maximum push to in position or pull to center position (15 lbs maximum pull to out position)
Push-Pull and Push-Pull/Twist		9 lbs maximum push or pull, 30 in. oz. maximum twist, 6 in. oz. minimum return
Potentiometer	Rotational Torque Stopping Torque	3…12 in.-oz. 12 in.-lbs (minimum)
Contact Blocks	800T-XA Logic Reed Sealed Switch Stackable Sealed Switch	1 lb 1 lb maximum 3 lbs maximum at 0.205" plunger travel 1 lb maximum
Environment		
Temperature Range	Operating Storage	–40…+131°F (–40C…+55°C) –40…+185°F (–40…+85°C)
Note: Operating temperatures below freezing are based on the absence of moisture and liquids. Consult your local Allen-Bradley Sales Office for use in lower temperature applications.		
Humidity		50% at +104°F (+40°C)

❶ Performance Data — See page Important-2.

Contact Ratings

Maximum thermal continuous current I_{th} 10 A AC/2.5 A DC.
Bulletin 800H units with 800T-XA contacts have ratings as follows:

Max. Opertnl. Volts Ue	Utilization Category		Rated Operational Currents		
	IEC	NEMA	Volts Ue	Make	Break
AC 600	AC-15	A600	120…600 72…120 24…72	7200 VA 60 A 60 A	720 VA 720 VA 10 A
DC 600	DC-13	Q600	28…600 24…28❷	69 VA 2.5 A	

❷ For applications below 24V/24 mA, Pen*TUFF*™ or Logic Reed contacts are recommended.

Sealed Switch Contact Ratings

Maximum continuous current I_{th} 5 A. Bulletin 800H units have control circuit ratings with sealed switch contact blocks as follows:

Max. Opertnl. Volts Ue	Utilization Category		Rated Operational Currents		
	IEC	NEMA	Volts Ue	Make	Break
AC 600	AC-15	B600	120…600 0…120	3600 VA 30 A	360 VA 3 A
DC 300	DC-13	P300	24…300 0…24	138 VA 5.0 A	

Stackable Sealed Switch Contact Ratings

Maximum continuous current I_{th} 2.5 A.

Logic Reed Contact Ratings

Maximum DC: 30V, 0.06 A, AC: 150V, 0.15 A
Should only be used with resistive loads.

Pen*TUFF*™ (Low Voltage) Contact Ratings

Minimum DC: 5V, 1 mA

Maximum thermal continuous current I_{th} 2.5 A AC/1.0 A DC.
Bulletin 800H units with 800T-XAV contacts have ratings as follows:

Max. Opertnl. Volts Ue	Utilization Category		Rated Operational Currents		
	IEC	NEMA	Volts Ue	Make	Break
AC 300	AC-15	C300	120…300 0…120	1800 VA 15 A	180 VA 1.5 A
DC 150	DC-13	R150	24…150 0…24	28 VA 1.0 A	

Approvals

UL Listed — File: E14840, E10314
Guide: NKCR, NOIV
CSA Certified: LR1234, LR11924
CE compliant IEC: 60947-5

Materials Used in 800H Type 4X Operators

Thermoplastic Polyester (Fiberglass Reinforced)

- Bushings
- Mounting rings
- Sockets

Thermoplastic Polyester

- Non-illuminated button caps

Transparent Amorphous Nylon

- Pilot light lens cap
- Illuminated button caps

Glass Filled Crystalline Nylon

- Thrust washer

Mineral Filled Nylon

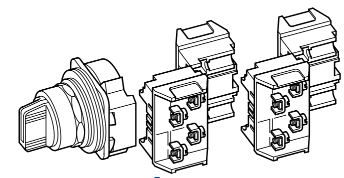
- Trim washer

Nitrile (Synthetic Rubber)

- Gaskets and internal seals

2- and 3-Position Selector Switch Units, Non-Illuminated

800H	___	–	HR	A	2	D1		(2-Position)
	a		b	c	d	e		
800H	___	–	JR	___	2	KC1	H	(3-Position)
	a		b	c	d	e_1	f_1	



a

Finger-Safe Guards	
Code	**Description**
Blank	No Guards
C	Guards on Terminals

b

Number of Positions	
Code	**Description**
HR	2-Position
JR	3-Position

c

Knob Insert Colors	
Code	**Color**
Blank	White
A	Red
B	Green
C	Blue
E	Yellow
F	Orange
X	Packet of Colored Inserts ❶

d

Standard Knob Operators	
Code	**Operator Function**
2	Maintained
4	Spring Return from Left ❷
5	Spring Return from Right
91 ❸	Spring Return from Both

e

Contact Block(s) (2- Position)			
Code	**Description**		
	Contact Configuration	**2-Position**	
Standard (Pen*TUFF*)	**Standard (Pen*TUFF*)**	↖	↗
Blank	No Contacts	—	—
D1 (D1V)	1 N.O. **800T-XD1** or (**XD1V**) on white side	O	X
D2 (D2V)	1 N.C. **800T-XD2** or (**XD2V**) on white side	X	O

e (cont'd)

Contact Block(s) (2-Position)			
Code	**Description**		
	Contact Configuration	**2-Position**	
Standard (Pen*TUFF*)	**Standard (Pen*TUFF*)**	↖	↗
A (AV)	1 N.O. - 1 N.C. 1-**800T-XA** or (**XAV**) on white side	O	X
		X	O
B (BV)	2 N.O. - 2 N.C. 2-**800T-XA**s or (**XAV**)s — 1 on white side/ 1 on black side	O	X
		X	O
		O	X
		X	O
H (HV)	3 N.O. - 3 N.C. 3-**800T-XA**s or (**XAV**)s — 2 on white side/ 1 on black side	O	X
		X	O
		O	X
		X	O
		O	X
		X	O
C (CV)	4 N.O. - 4 N.C. 4-**800T-XA**s or (**XAV**)s — 2 on white side/ 2 on black side	O	X
		X	O
		O	X
		X	O
		O	X
		X	O
		O	X
		X	O

e_1

Cam Option (3 Pos.) ❹	
Code	**Description**
Blank	KB7 Cam (Std.)
KA1	KA1 Cam
KA7	KA7 Cam
KC1	KC1 Cam
KC7	KC7 Cam
KD7	KD7 Cam
KE7	KE7 Cam
KQ1	KQ1 Cam
KR1	KR1 Cam
KR7	KR7 Cam
KT1	KT1 Cam
KT7	KT7 Cam
KU7	KU7 Cam

Note: Associated targets are shown in Table 1.

f_1

Contact Blocks (3-Position)	
Code	**Description**
Standard (Pen*TUFF*)	**Standard (Pen*TUFF*)**
Blank	No contacts
A (AV)	1 N.O. - 1 N.C. 1-**800T-XA** or (**XAV**) on white side
B (BV)	2 N.O. - 2 N.C. 2 -**800T-XA**s or (**XAV**)s — 1 on white side/ 1 on black side
H (HV)	3 N.O. - 3 N.C. 3-**800T-XA**s or (**XAV**)s — 2 on white side/ 1 on black side
C (CV)	4 N.O. - 4 N.C. 4-**800T-XA**s or (**XAV**)s — 2 on white side/ 2 on black side
Class I, Div. 2/Zone 2	
Logic Reed ❺	
AR	1 N.O. - 1 N.C.
BR	2 N.O. - 2 N.C.
HR	3 N.O. - 3 N.C.
CR	4 N.O. - 4 N.C.
Sealed Switch ❺	
AP	1 N.O. - 1 N.C.
BP	2 N.O. - 2 N.C.
Stackable Sealed Switch ❺	
AY	1 N.O. - 1 N.C.
BY	2 N.O. - 2 N.C.
HY	3 N.O. - 3 N.C.
CY	4 N.O. - 4 N.C.

Note: Associated targets are shown in Table 1.

Table 1. 3-Position Cam and Contact Block Functionality Table

Contact Block Suffix Codes	Contact Block Side	Ckts	KB7 (Std.) ↖	KB7 ↑	KB7 ↗	KA1 ↖	KA1 ↑	KA1 ↗	KA7 ↖	KA7 ↑	KA7 ↗	KC1 ↖	KC1 ↑	KC1 ↗	KC7 ↖	KC7 ↑	KC7 ↗	KD7 ↖	KD7 ↑	KD7 ↗
A_, B_, H_, C_	White	A	X	O	O	X	O	O	O	O	X	O	O	X	X	O	O	O	O	X
A_, B_, H_, C_	White	B	O	O	X	O	X	O	O	X	O	O	X	O	O	X	O	O	X	O
B_, H_, C_	Black	A	X	O	O	X	O	O	O	O	X	O	O	X	X	O	O	X	O	O
B_, H_, C_	Black	B	O	O	X	O	X	O	O	X	O	X	O	O	O	O	X	O	X	O
H_, C_	White	A	X	O	O	X	O	O	O	O	X	O	O	X	X	O	O	O	O	X
H_, C_	White	B	O	O	X	O	X	O	O	X	O	O	X	O	O	X	O	O	X	O
C_	Black	A	X	O	O	X	O	O	O	O	X	O	O	X	X	O	O	X	O	O
C_	Black	B	O	O	X	O	X	O	O	X	O	X	O	O	O	O	X	O	X	O

Contact Block Suffix Codes	Contact Block Side	Ckts	KE7 ↖	KE7 ↑	KE7 ↗	KQ1 ↖	KQ1 ↑	KQ1 ↗	KQ7 ↖	KQ7 ↑	KQ7 ↗	KR1 ↖	KR1 ↑	KR1 ↗	KR7 ↖	KR7 ↑	KR7 ↗	KT1 ↖	KT1 ↑	KT1 ↗	KT7 ↖	KT7 ↑	KT7 ↗	KU7 ↖	KU7 ↑	KU7 ↗
A_, B_, H_, C_	White	A	X	O	O	X	O	X	X	O	X	X	O	X	X	O	X	O	O	X	X	O	O	X	O	O
A_, B_, H_, C_	White	B	O	X	X	O	X	O	O	X	O	O	X	O	O	X	O	X	O	O	O	O	X	O	X	O
B_, H_, C_	Black	A	O	O	X	O	O	X	X	O	O	O	O	X	X	O	O	O	O	X	X	O	O	O	O	X
B_, H_, C_	Black	B	X	X	O	O	X	O	O	X	O	X	X	O	O	X	X	X	X	O	O	X	X	X	X	O
H_, C_	White	A	X	O	O	X	O	X	X	O	X	X	O	X	X	O	X	O	O	X	X	O	O	X	O	O
H_, C_	White	B	O	X	X	O	X	O	O	X	O	O	X	O	O	X	O	X	O	O	O	O	X	O	X	O
C_	Black	A	O	O	X	O	O	X	X	O	O	O	O	X	X	O	O	O	O	X	X	O	O	O	O	X
C_	Black	B	X	X	O	O	X	O	O	X	O	X	X	O	O	X	X	X	X	O	O	X	X	X	X	O

Note: X=Closed/O=Open

❶ Packet of colored inserts, one of each color except orange.
❷ Target tables for 2-position devices are reversed from those shown.
❸ This option is only available with 3-position devices.
❹ If an overlapping cam is required, consult your local Allen-Bradley Sales Office.
❺ Contact block mounting same as listed for standard and Pen*TUFF* contact blocks.

Cutler-Hammer

Control Power Transformers

CHS controls

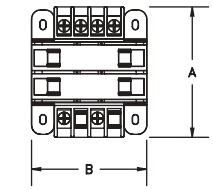
Control Power Transformers Type MTE

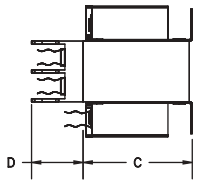
Technical Data

Type	Epoxy encapsulated windings	Standards	ANSI/NEMA ST-1
Frequency	50/60 Hz		UL 506
Insulation	Class 105, 55°C temperature rise	Approvals	UL, file E46323
Terminals	Pressure plate		CSA, file LR27533

Transformers 240/480 V Primary, 120 V Secondary see note 1, 2, 3, 4, 5, 6, 7

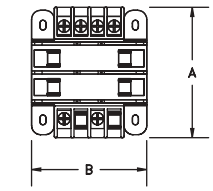
Power VA	Catalogue numbers Without primary fuseholder	With primary fuseholder	Schematic	Dimensions, mm A	B	C	D	Weight/ea kg
50	C0050E2A	C0050E2AFB	1	76	76	65	35	1,2
75	C0075E2A	C0075E2AFB	1	89	76	65	35	1,6
100	C0100E2A	C0100E2AFB	1	86	86	73	35	1,9
150	C0150E2A	C0150E2AFB	1	102	95	81	35	3
200	C0200E2A	C0200E2AFB	1	102	114	97	35	3,9
250	C0250E2A	C0250E2AFB	1	111	114	97	35	4,5
→ 300	C0300E2A	C0300E2AFB	1	121	114	97	35	5,1
350	C0350E2A	C0350E2AFB	1	133	114	97	35	6,2
500	C0500E2A	C0500E2AFB	1	140	133	121	35	8,7
750	C0750E2A	C0750E2AFB	1	178	133	121	35	12,8
1000	C1000E2A	C1000E2AFB	1	164	171	144	35	13,4
1500	C1500E2A	C1500E2AFB	1	187	191	162	35	18,1

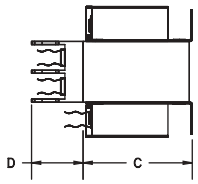




Transformers 240/480 V Primary, 24 V Secondary see note 1, 2, 3, 4, 5, 6, 8

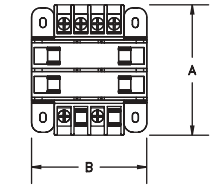
50	C0050E2B	C0050E2BFB	2	76	76	65	35	1,2
75	C0075E2B	C0075E2BFB	2	89	76	65	35	1,6
100	C0100E2B	C0100E2BFB	2	86	86	73	35	1,9
150	C0150E2B	C0150E2BFB	2	102	95	81	35	3
200	C0200E2B	C0200E2BFB	2	102	114	97	35	3,9
250	C0250E2B	C0250E2BFB	2	111	114	97	35	4,5
300	C0300E2B	C0300E2BFB	2	121	114	97	35	5,1
350	C0350E2B	C0350E2BFB	2	133	114	97	35	6,2
500	C0500E2B	C0500E2BFB	2	143	133	121	35	8,7
750	C0750E2B		2	178	133	121	35	12,8

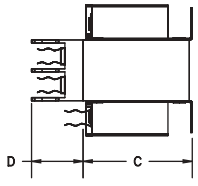




Transformers 230/460/575 V Primary, 95/115 V Secondary see note 1, 2, 3, 4, 5, 6, 9

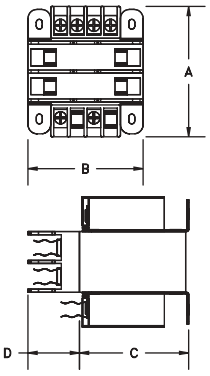
50	C0050E3C	C0050E3CFB	3	76	76	65	35	1,6
75	C0075E3C	C0075E3CFB	3	86	86	65	35	2
100	C0100E3C	C0100E3CFB	3	98	86	73	35	2,7
150	C0150E3C	C0150E3CFB	3	108	95	81	35	3,5
200	C0200E3C	C0200E3CFB	3	108	114	97	35	4,1
250	C0250E3C	C0250E3CFB	3	121	114	97	35	4,4
300	C0300E3C	C0300E3CFB	3	130	114	97	35	5,3
350	C0350E3C	C0350E3CFB	3	127	133	97	35	7,5
500	C0500E3C	C0500E3CFB	3	143	133	121	35	9,8
750	C0750E3C	C0750E3CFB	3	178	133	121	35	12,7





Transformers 600 V Primary, 24 V Secondary see note 1, 2, 3, 4, 5, 6, 10

Power VA	Catalogue numbers Without primary fuseholder	With primary fuseholder	Schematic	Dimensions, mm A	B	C	D	Weight/ea kg
50	C0050E4W	C0050E4WFB	4	76	76	65	35	1,1
75	C0075E4W	C0075E4WFB	4	89	76	65	35	1,6
100	C0100E4W	C0100E4WFB	4	86	86	73	35	1,8
150	C0150E4W	C0150E4WFB	4	102	95	81	35	3
200	C0200E4W	C0200E4WFB	4	102	114	97	35	3,7
250	C0250E4W	C0250E4WFB	4	111	114	97	35	4,5
300	C0300E4W		4	121	114	97		5
350	C0350E4W		4	133	114	97		6,2
500	C0500E4W		4	140	133	121		8
750	C0750E4WXX		4	187	133	114		12,7



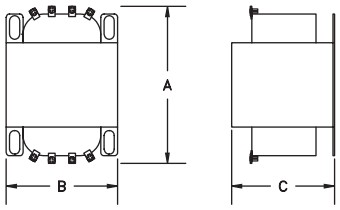
Control Power Transformers Type MTK

Technical Data

Type	Epoxy encapsulated windings	Standards	ANSI/NEMA ST-1
Frequency	50/60 Hz		UL 506
Insulation	Class 180, 115°C temperature rise	Approvals	UL, file E46323
Terminals	Screw		CSA, file LR27533

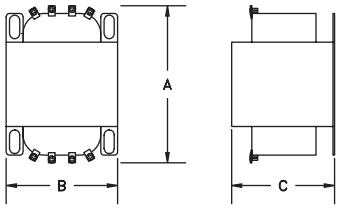
Transformers 240/480 V Primary, 120 V Secondary see note 1, 2, 7

Power VA	Catalogue numbers Without fuseholders	Schematic	Dimensions, mm A	B	C	Weight/ea kg
1000	C1000K2A	1	200	133	113	13,6
1500	C1500K2A	1	171	171	144	13,6
2000	C2000K2A	1	178	171	144	17,3
3000	C3000K2A	1	191	229	192	24,1
5000	C5000K2A	1	197	229	192	40,5



Transformers 230/460/575 V Primary, 115 V Secondary see note 1, 2, 9

Power VA	Catalogue numbers Without fuseholders	Schematic	Dimensions, mm A	B	C	Weight/ea kg
1000	C1000K3C	3	181	162	137	13,1
1500	C1500K3C	3	191	171	144	15
2000	C2000K3C	3	210	171	144	19,5
3000	C3000K3C	3	210	229	194	29
5000	C5000K3C	3	267	229	259	46,3



Notes

1 Contact CHS Controls for other power ratings or voltage levels.
2 See page 4 for recommended overcurrent protection according to NEC/UL and schematic diagrams.
3 MTE transformers with primary fuseholder is for 2 pcs Class CC fuses, for example Ferraz Shawmut ATQR. Fuses are ordered separately.
4 MTE transformers except C0750E2B and C0750E4WXX are equipped with fuse clips for secondary fuse for 1 pc Midget fuse, for example Ferraz Shawmut TRM. Fuse is ordered separately. The fuse clips can be disconnected.
5 Dimension D is valid for transformer with primary fuseholder.
6 Stated weight apply for transformer without primary fuseholder. For transformer with primary fuseholder, add 0,15 kg.
7 Can also be used for 230/460 respectively 220/440 V primary, secondary voltage will be 115 respectively 110 V.
8 Can also be used for 460 respectively 440 V primary, secondary voltage will be 23 respectively 22 V.
9 Can also be used for 220/440/550 V respectively 240/480/600 V primary, secondary voltage will be 91/110 respectively 99/120 V.
10 Can also be used for 575 respectively 550 V primary, secondary voltage will be 23 respectively 22 V.

Accessories

Description	Catalogue numbers	Weight/ea, kg
Terminal covers, MTE transformers with 4 terminals, kit for 1 transformer	FSK4	0,01
Primary fuse covers, 2 pcs, MTE transformer with primary fuseholder	FSKFB	0,02
Separately mounted fuseholder for primary fuses, 2 pole class CC, max 30 A see note 11	GSUSCC2	0,1
Separately mounted fuseholder for primary fuses, 2-pole class J, 35-60 A see note 11	GSUS6J2	0,18
Separately mounted fuseholder for secondary fuse, 1 pole Midget, max 30 A see note 11	GSUSM1	0,05
Separately mounted fuseholder for secondary fuse, 1 pole class J, 35-60 A see note 11	GSUS6J1	0,09

Recommended Overcurrent Protection, Ferraz Shawmut Fuses see note 12, 13, 14

Power	Recommended primary fuses			Recommended secondary fuse	
VA	240 V	480 V	600 V	24 V	120 V
50	GSATQR4/10	GSATQR1/4	GSATQR1/4	GSTRM32/10	GSTRM6/10
75	GSATQR4/10	GSATQR3/10	GSATQR1/4	GSTRM5	GSTRM1
100	GSATQR6/10	GSATQR4/10	GSATQR3/10	GSTRM61/4	GSTRM11/4
150	GSATQR1	GSATQR1/2	GSATQR1/2	GSTRM10	GSTRM2
200	GSATQR11/2	GSATQR6/10	GSATQR1/2	GSTRM12	GSTRM21/2
250	GSATQR2	GSATQR8/10	GSATQR6/10	GSTRM15	GSTRM32/10
300	GSATQR21/2	GSATQR11/2	GSATQR1	GSTRM20	GSTRM4
350	GSATQR3	GSATQR11/2	GSATQR11/4	GSTRM20	GSTRM41/2
500	GSATQR4	GSATQR2	GSATQR11/2	GSTRM30	GSTRM61/4
750	GSATQR7	GSATQR3	GSATQR21/2	GSAJT40	GSTRM10
1000	GSATQR10	GSATQR4	GSATQR3		GSTRM12
1500	GSATQR15	GSATQR7	GSATQR5		GSTRM20
2000	GSATQR20	GSATQR10*	GSATQR8		GSTRM25
3000	GSATQR30	GSATQR15**	GSATQR12		GSAJT35
5000	GSAJT50**	GSATQR25	GSATQR20		GSAJT60

Schematic Diagrams

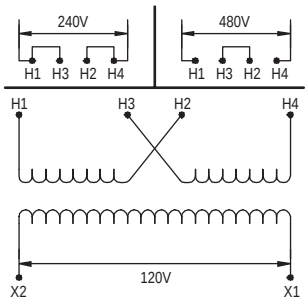


Diagram 1, jumper included

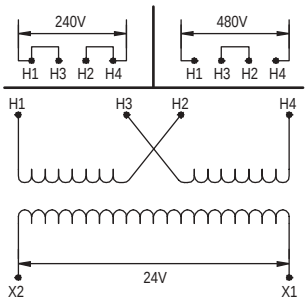


Diagram 2, jumper included

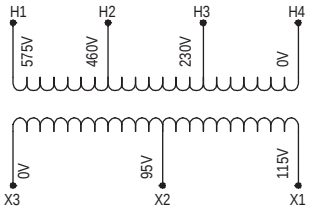


Diagram 3

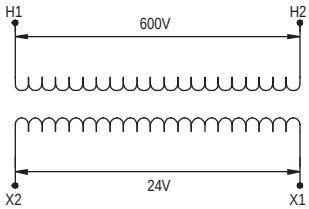


Diagram 4

Notes

11 For fuseholders with lamp trip indication, add **I** last in the catalogue number. Example: GSUSCC2 will be GSUSCC2**I**.

12 Recommended primary fuse size is based on use of secondary fuse and that primary fuse withstand 40 x full load current for 0,1 s. Ratings marked * withstand 30 x full load current for 0,1 s, ratings marked with ** withstand 35 x full load current for 0,1 s. Max acceptable rating of primary fuse for control power circuits according to NEC 430-72, 450-3, UL 508 32.7 and UL 845. If rated primary current is less than 2 A, the maximum rating of the overcurrent protection device is 500% of rated current. If the rated primary current is 2 A or more, the maximum rating of the overcurrent protective device is 250% of rated current.

13 Max acceptable rating of the overcurrent protective device on the secondary side according to NEC 430-72, 450-3, UL 508 32.7 and UL 845. If the rated secondary current is less than 9 A, max rating of the overcurrent protective device is 167% of rated current. If rated secondary current is 9 A or more, max rating of the overcurrent protective device is 125% of rated current or next highest standard rating may be used.

14 GSATQR is a time delay class CC fuse. GSAJT is a time delay class J fuse. GSTRM is a time delay Midget fuse.

Catalogue PM2013E rev 1, November 2003

CHS Controls AB
Florettgatan 33, SE-254 67 Helsingborg, Sweden
Tel 042-386100, fax 042-386129
chs@chscontrols.se, www.chscontrols.se

wieland

Wieland Electric

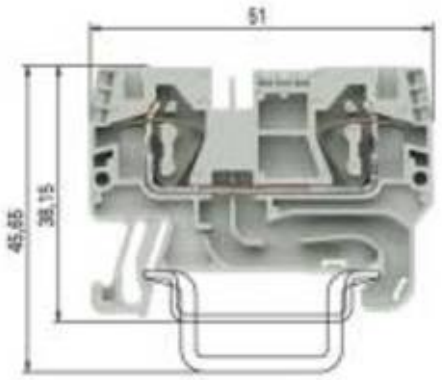
contacts are green.

Datasheet

Item No. 56.704.0055.0

Feed-through terminal WKFN 4 /35

Feed-through DIN rail terminal block with spring clamp connection for mounting on TS 35, nominal cross section 4 mm², width 6 mm, color gray



Item No.	56.704.0055.0
EAN	4015573767096
order unit	100 Piece(s)

Approvals

Technical data

General

Nominal cross section	4 mm²
Colour	Grey
Number of levels	1
Number of clamp positions per level	2
Width/grid dimension	6 mm
Insulating housing	PA666
Inflammability class of insulation material acc. with UL94	V0
Explosion-tested version "EEx e"	Yes
Mounting method	DIN rail (top hat rail) 35/7.5 mm
Terminal blocks for electrical installations	Yes

Technical data

Rated current	32 A
Rated voltage	800 V
Rated impulse voltage	8 kV
Pollution degree	3
Closing plate required	Yes
Length	51 mm
Type of insulation material	Thermoplastic

Connection Data

Connection type 1	Tension clamp connection
Connection type 2	Tension clamp connection

Minimum cross section solid	0.13 mm²
Maximum cross section solid	6 mm²
Minimum cross section fine stranded	0.13 mm²
Maximum cross section fine stranded	4 mm²
Wire strip length	11 mm

Technical Data UL/CSA

Cross section UL	24-10 AWG
Voltage UL	600
Current factory wiring	30 A
Current field wiring	30 A
Cross section CSA	24-10 AWG
Voltage CSA	600 V
Current CSA	32 A

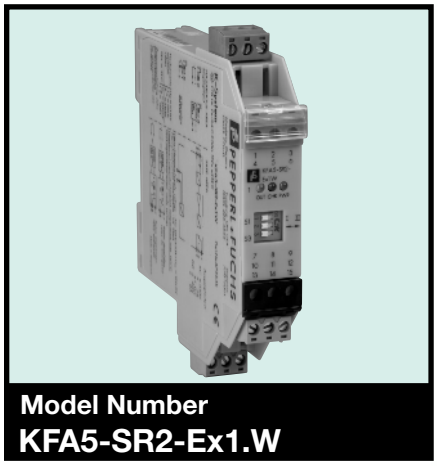
Accessories

Remark to rated voltage	UL+CSA 300V/600V

Accessories

Item. No.	Typ:	Description:
04.343.6153.8	Warning cover ADF 4/4 YELLOW	Cover with warning symbol for DIN rail terminal blocks type WKF ...
98.300.0000.0	Mounting rail 35x27x7,5EN60715 2000MM	Mounting rail TS 35, unslotted, size 7,5 mm, length 2 m, material steel. galv. zinc-plated and dichromated
98.300.1000.0	Mounting rail 35x27x7,5EN60715 2000MM	Mounting rail TS 35, slotted, size 7,5 mm, length 2 m, material steel. galv. zinc-plated and dichromated
98.300.1900.0	Mounting rail 35x27x7,5EN60715 2000MM	Mounting rail TS 35, slotted, size 7,5 mm, length 2 m, material steel. galv. zinc-plated and dichromated
98.360.0000.0	Mounting rail 35x24x15 EN60715 2000MM	Mounting rail TS 35, unslotted, size 15 mm, length 2 m, material steel. galv. zinc-plated and dichromated
98.360.0004.0	Mounting rail 35x24x15 EN60715 2000MM	Mounting rail TS 35, unslotted, size 15 mm, length 2 m, material steel, hot galvanized
98.370.0000.0	Mounting rail 35x27x15(EN60715)2000MM	Mounting rail TS 35, unslotted, size 15 mm, length 2 m, material steel. galv. zinc-plated and dichromated
98.370.1000.0	Mounting rail 35x27x15(EN60715)2000MM	Mounting rail TS 35, slotted, size 15 mm, length 2 m, material steel. galv. zinc-plated and dichromated
98.380.0000.0	Mounting rail 35x24x15 EN60715 2000MM	Mounting rail TS 35, unslotted, size 15 mm, length 2 m, material E copper
Z5.553.2921.0	Test plug ST 2 / 2.3 RED	Test plug 2,3 mm color red
Z7.261.1227.0	Jumper bar IVBWKF 4- 2	Cross connector, insulated for DIN rail terminal blocks type WKF..., 2 -pole
Z7.261.1327.0	Jumper bar IVBWKF 4 - 3	Cross connector, insulated for DIN rail terminal blocks type WKF..., 3 -pole
Z7.261.1427.0	Jumper bar IVBWKF 4 - 4	Cross connector, insulated for DIN rail terminal blocks type WKF..., 4 -pole
Z7.261.1527.0	Jumper bar IVBWKF 4 - 5	Cross connector, insulated for DIN rail terminal blocks type WKF..., 5 -pole
Z7.261.1627.0	Jumper bar IVBWKF 4 - 6	Cross connector, insulated for DIN rail terminal blocks type WKF..., 6 -pole
Z7.261.1727.0	Jumper bar IVBWKF 4 - 7	Cross connector, insulated for DIN rail terminal blocks type WKF..., 7 -pole
Z7.261.1827.0	Jumper bar IVBWKF 4 - 8	Cross connector, insulated for DIN rail terminal blocks type WKF..., 8 -pole
Z7.261.1927.0	Jumper bar IVBWKF 4 - 9	Cross connector, insulated for DIN rail terminal blocks type WKF..., 9 -pole
Z7.261.2027.0	Jumper bar IVBWKF 4- 10	Cross connector, insulated for DIN rail terminal blocks type WKF..., 10 -pole

Switch Isolators
Relay Output



Model Number
KFA5-SR2-Ex1.W

- Single-channel / 120 VAC supply
- 1 signal output with 1 form C relay
- Optional lead breakage (LB) monitoring
- Suitable for Division 2 mounting

This device is a single-channel, galvanically isolated intrinsic safety barrier that transfers discrete signals (NAMUR sensors/ mechanical contacts) from a hazardous area to a safe area. The proximity sensor or switch controls a form C relay contact for the safe area load. The barrier output changes state when the input signal changes state. This output state can be reversed through the mode of operation switch S1.

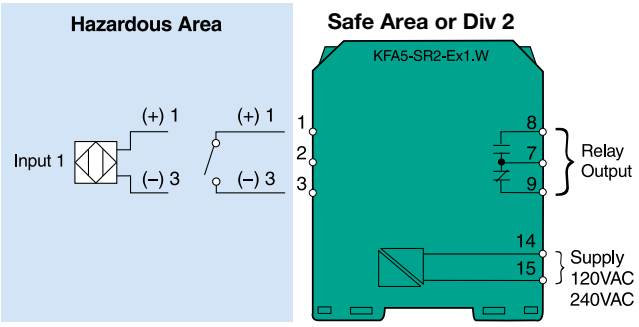
Lead breakage (LB) monitoring can be selected or disabled by placing external resistors and by positioning switches on the barrier. NAMUR proximity sensors, however, are designed with the LB function (switch S3 in position I) making external resistors unnecessary. For a mechanical contact, LB monitoring can be selected by placing a 10 kΩ resistor across the mechanical contact in the field and by positioning switch S3 in position I on the barrier. In the case of an LB fault, the signal output relay reverts to the de-energized state. LB monitoring can be disabled with switch S3 in position II. This unit features removable terminals for easy installation.

Technical Data

Power Supply	Terminals 14, 15		
Nominal voltage	103.5-126 VAC, 45-65 Hz		
Power consumption	≤ 1 W		
Inputs (intrinsically safe)	Terminals 1+, 2-		
Nominal data	per NAMUR, ≈ 8 VDC / ≈ 8 mA		
Input pulse length / interval	≥ 20 ms		
Lead breakage (LB) monitoring	≤ 0.1 mA		
Output (not intrinsically safe)			
Output 1 (contacts SPDT)	Terminals 7, 8, 9		
Contact load	253 VAC / 2 A / cos ø > 0.7 40 VDC / 2 A resistive load		
Mechanical life	10^7 operations		
Energizing / de-energizing delay	≈ 20 ms		
Transfer Characteristics			
Switching frequency	< 10 Hz		
Entity Parameters	Terminals 1+, 3-		
FM control drawing no.	116-0035		
Voltage V_{OC}	12.9 V		
Current I_{SC}	19.8 mA		
Explosion group	A & B	C & E	D, F & G
Max. external capacitance (C_a)	1.2 µF	3.8 µF	10.1 µF
Max. external inductance (L_a)	84.8 mH	254.4 mH	678.4 mH
Mechanical			
Housing	Type C (see page 301)		
Dimensions (mm)	118 x 20 x 115		
Weight	5.3 oz. (150 g)		
Ambient Temperature	-4°F to +140°F (-20°C to +60°C)		

Connection Diagram

Class I, Div 1, Group A-G, Zone 0, IIC



Discrete Input Isolators

Actual size -
shown with °C scale

STEGO INC.

Small Thermostat KT 011

- *Compact design*
- *Wide adjustment range*
- *Available with °F or °C scale*
- *Color coded temperature dials*
- *DIN rail mountable*

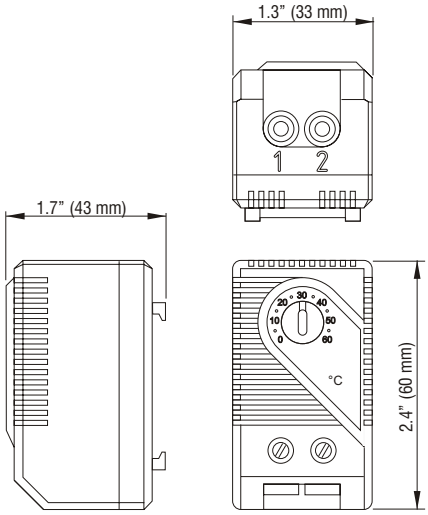
Thermostat "NC" (normally closed):
Thermostat opens at temperature rise. Comes with a red temperature dial.

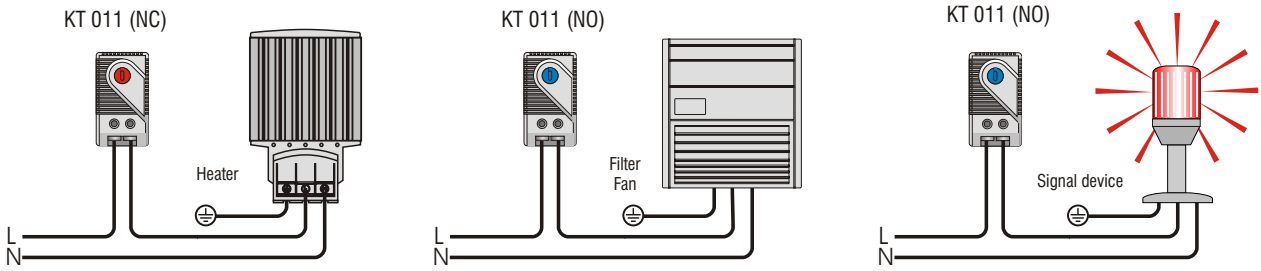
Thermostat "NO" (normally open):
Thermostat closes at temperature rise. Comes with a blue temperature dial.

Technical Data KT 011

Part No.	Contact type	Scale on housing
01140.9-00	normally closed	30 - 140°F
01141.9-00	normally open	30 - 140°F
01146.9-00	normally closed	0 - 60°C
01147.9-00	normally open	0 - 60°C

Sensor element:	Thermostatic bi-metal
Maximum tolerance:	±7.2°F (4K)
Switching difference (hysteresis):	12.6°F ± 5.4°F (7°C ± 3K)
Service life:	100,000 cycles
Switching capacity (max. load):	15A resistive/2A inductive @ 120 VAC
	10A resistive/2A inductive @ 250 VAC
	DC 30W
EMI/EMC compliance:	EN 55014-1-2, EN 61000-3-2, EN 61000-3-3
Connections:	2-pole terminal for AWG 14 max. (2.5 mm²)
Mounting:	Clip for 35 mm DIN rail (EN 50022)
Dimensions (H x W x D):	2.4 x 1.3 x 1.7" (60 x 33 x 43 mm)
Housing:	Plastic, UL94V-0
Weight:	1.27 oz (36 g)
Protection type:	IP 20
Operating/storage temperature:	-49 to 158°F (-45 to 70°C)
Agency approvals:	UL, CSA





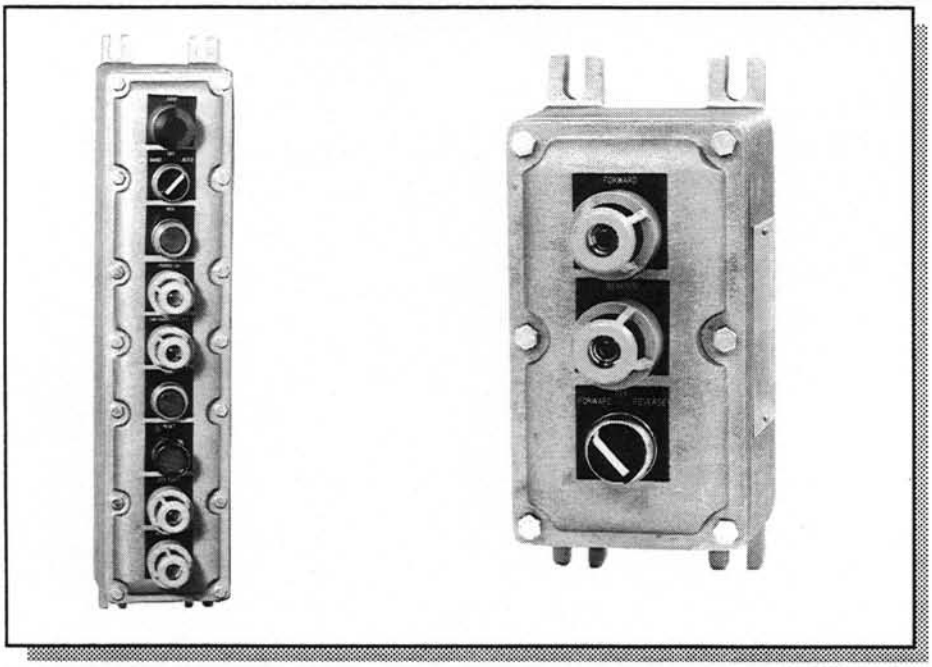
Wiring examples

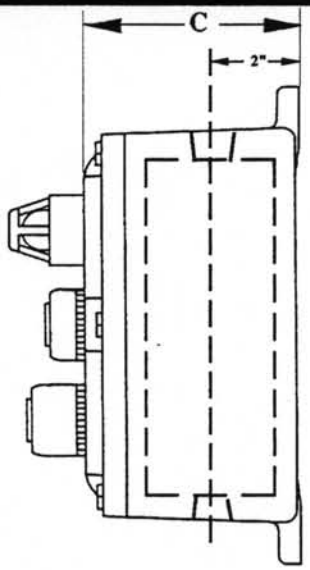
KT011-11-05/US

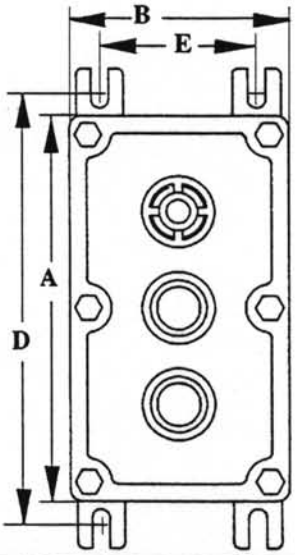
STEGO, Inc. · 2270 Northwest Parkway · Suite 170 · Marietta, GA 30067 · Tel: (770) 984-0858 · Fax: (770) 984-0615
Toll free: 1-888-783-4611 (US & Canada only) · www.stegousa.com

AKRON ELECTRIC, INC.

EXPLOSION-PROOF PUSHBUTTON STATIONS "CXI" SERIES







FEATURES

- All enclosures are available with NEMA 4X with neoprene gasket for watertight applications.
- All enclosures are suitable for surface or panel mounting.
- Light weight corrosion resistant copper-free aluminum construction.
- Attractive sand blast finish.
- Durable cast mounting feet and easily accessible grounding screw.
- Factory assembled with Allen Bradley operators available when specified.

ORDERING INSTRUCTIONS

- All "CXI" Series enclosures are machined with operator (3/4" NPSM in cover) and standard conduit holes as specified in the chart below.
- To order NEMA-4 Gasket, add suffix -N4 to part number (CXI333-X1-N4).
- For panel mount applications (3/4" NPSM operator holes in base instead of cover), use prefix "CXP" instead of "CXI" (CXP333-X1).
- To order blank enclosures, order "AXI" Series enclosures. (See page A7)
- Spacing constraints may apply when using some operators (Mushroom Head P.B.s, Illum. P.B.s, Push to Test Pilot Lights, ect.), consult factory for special spacing requirements.
- Consult factory to order Allen Bradley operators with enclosures.
- Consult factory for custom layouts of operator and conduit holes.

COMPLIANCES

- NEC - CLASS I, Groups C & D
  CLASS II, GROUPS E, F & G
  CLASS III
- **NEMA 3, 4X (Optional), 7 & 9**

APPROVALS

- **UL Classified Standard 1203**
- **CSA Certified Std. C22.2-30-M1984**

DIMENSIONS

Catalog Number	Nominal Inside Dimensions	Number of Operators Vertically	Dimensions in Inches					Est. Wgt. (lbs.)	Std. Conduit Size	Mtg. Bolt Size
			A	B	C	D	E			
→ CXI 333-X1	3 1/2 x 3 x 3	1	4 9/16	4 9/16	4 1/2	5 1/2	3 1/4	5	3/4	1/4
CXI 363-X2	3 1/2 x 6 x 3	2	7 1/16	4 9/16	4 1/2	8	3 1/4	6	3/4	1/4
CXI 373-X3	3 1/2 x 7 x 3	3	8 1/16	4 9/16	4 1/2	9	3 1/4	7	3/4	1/4
CXI 393-X4	3 1/2 x 9 x 3	4	10 1/16	4 9/16	4 1/2	11	3 1/4	8	1	1/4
CXI 3113-X5	3 1/2 x 11 x 3	5	12 1/16	4 9/16	4 1/2	13	3 1/4	10	1 1/4	1/4
CXI 3133-X6	3 1/2 x 13 x 3	6	14 1/16	4 9/16	4 1/2	15	3 1/4	11	1 1/4	1/4
CXI 3153-X7	3 1/2 x 15 x 3	7	16 1/16	4 9/16	4 1/2	17	3 1/4	12	1 1/4	1/4
CXI 3183-X8/X9	3 1/2 x 18 x 3	8 or 9	19 1/16	4 9/16	4 1/2	20	3 1/4	14	1 1/4	1/4

P.O. BOX 26505 • AKRON, OHIO 44319-0005 • PHONE (330) 745-8891 • FAX (330) 745-2504

AKRON ELECTRIC, INC.

ORDERING INFORMATION

TABLE III - MODIFICATIONS

- BD - Breather/Drain Unit
- E1 - Corrosion Resistant Coating - Outside Only
- E2 - Corrosion Resistant Coating - Inside & Out
- E3 - S.S. (316) Captive Quick Thread Cover Bolts
- H1 - Stainless Steel Modular Hinge Set
- H2 - Medium Duty Cast Aluminum Hinge Set
- H3 - Heavy Duty Cast Aluminum Hinge Set
- K - Terminal Block, 600 Volt, 20 Amp. Standard
- N1 - Aluminum Mounting Pan 3/16" Thick Standard
- N2 - Galvanized Mounting Pan
- N3 - Phenolic Mounting Pan
- N4 - "O - Ring" Gasket for NEMA 4X Application
- N5 - Corrosion Resistant Stainless Steel Cover Bolts

TABLE IV - OPERATORS & WINDOWS

- B1 - START, Green Push Button (flush head)
- B2 - START, Green Push Button (raised head)
- B3 - STOP, Red Push Button (flush head)
- B4 - STOP, Red Push Button (raised head)
- B5 - START-STOP Green-Red Dual Push Button
- B6 - RED Mushroom Head Moment. Push Button
- B7 - RED Mushroom Head Maintain Push Button
- B8 - BLACK Push Button with N.O. Contact
- B9 - BLACK Push Button with N.C. Contact
- C1 - Circuit Breaker Handle, 100 AMP.
- C2 - Circuit Breaker Handle, 225 AMP.
- C3 - Circuit Breaker Handle, 400 AMP.
- E8 - Custom Mounting Bracket For Meters
- G1 - 1" Diameter Round Window Glass
- G2 - 2" Diameter Round Window Glass
- G3 - 3" Diameter Round Window Glass
- G4 - 4" Diameter Round Window Glass
- G5 - 5 1/4" Diameter Round Window Glass
- G6 - 6 3/4" Diameter Round Window Glass
- G7 - 7 5/8" Diameter Round Window Glass
- G8 - Custom Square or Rectangular Window Glass
- N6 - Metalic Nameplate
- N7 - Phenolic Nameplate
- N8 - Custom Nameplate (anodized, stainless steel
- P+* - PilotLlights
- PL+* - Illuminated PushBbutton

  + = lense color code; 1-red, 2-green, 3-amber, 4-blue, 5-white

  * = voltage code; 0-6 v, 1-120 v, 2-240 v, 4-480 v, 6-600 v
- R1 - Reset Push Button
- R2 - Potentiometer
- R3 - Close Up Plug (3/4" NPSM)
- S1 - 2-Pos. Selector Switch, Maintained
- S2 - 2-Pos. Selector Switch, Spr. Retd. from Left
- S3 - 2-Pos. Selector Switch, Spr. Retd. from Right
- S4 - 3-Pos. Selector Switch, Maintained
- S5 - 3-Pos. Selector Switch, Spr. Retd. from Left
- S6 - 3-Pos. Selector Switch, Spr. Retd. from Right
- S7 - 3-Pos. Selector Switch, Spr. Retd. from L & R
- S8 - 2-Pos. Selector Switch, Key Operated
- S9 - 3-Pos. Selector Switch, Key Operated

TABLE V- CONDUIT SPACING

OUTLET CODE	TRADE SIZE OF CONDUIT (NPT)	MINIMUM CENTER TO CENTER CONDUIT SEPARATIONS (INCHES)									
		4	3 1/2	3	2 1/2	2	1 1/2	1 1/4	1	3/4	1/2
1	1/2	3 5/8	3 3/8	3	2 5/8	2 3/8	2	2	1 3/4	1 5/8	1 1/2
2	3/4	3 3/4	3 1/2	3 1/8	2 3/4	2 1/2	2 1/8	2 1/8	1 7/8	1 3/4	
3	1	4	3 5/8	3 1/4	3	2 5/8	2 3/8	2 3/8	2		
4	1 1/4	4 1/4	4	3 5/8	3 1/4	3	2 5/8	2 5/8			
5	1 1/2	4 1/4	4	3 5/8	3 1/4	3	2 5/8				
6	2	4 5/8	4 1/4	3 7/8	3 5/8	3 1/4					
7	2 1/2	4 7/8	4 5/8	4 1/4	3 7/8						
8	3	5 3/8	5	4 5/8							
9	3 1/2	5 5/8	5 1/4								
10	4	5 7/8									

- If seals are used, additional clearance may be required. Check dimensions of seals and fittings to determine required spacing. Consult factory for assistance.

TRADE SIZE OF CONDUIT (NPT)	THREADS PER IN.	MINIMUM WALL THICKNESS (IN.)
1/2 - 3/4	14	.357
1 - 2	11 1/2	.435
2 1/2 - 4	8	.625

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Specifications ❶

Electrical Ratings		
Contact Ratings	Refer to the Contact Ratings tables below.	
Dielectric Strength	2200V for one minute, 1300V for one minute (Logic Reed)	
Electrical Design Life Cycles	1,000,000 at max. rated load, 200,000 at max. rated load (Logic Reed)	
Mechanical Ratings		
Vibration	10…2000 Hz 1.52 mm displacement (peak-to-peak) Max./10 G Max. (except Logic Reed)	
Shock	1/2 cycle sine wave for 11 ms ≥ 25 G (contact fragility) and no damage at 100 G	
Degree of Protection	Type 7 & 9 Explosion Proof (Type 3 and Type 4 ratings available with accessories)	
Mechanical Design Life Cycles		
Push Buttons	250,000 minimum	
Potentiometers	100,000 minimum	
All other devices	200,000 minimum	
Contact Operation	Shallow and Mini Contact Blocks:	Slow double make and break
	Logic Reed & Sealed Switch Contact Blocks:	Snap-action
Typical Operating Forces		
Operators without contact blocks:	Flush, Extended, Standard Mushroom, Jumbo Mushroom:	2.9 lbs Max.
	Jumbo and Extended Aluminum Mushroom Head:	3.95 lbs maximum
	Maintained Selector Switch:	4.0 in.-lbs maximum
Spring Return Selector Switches:	5 in.-lbs to stop, 0.2 in.-lbs to return	
Illuminated Push Buttons and Push-to-Test Pilot Lights	5.6 lbs maximum	
2-Position Push-Pull	9 lbs maximum push or pull	
3-Position Push-Pull	12 lbs maximum push to **in** position or pull to **center** position (15 lbs maximum pull to **out** position)	
Contact Blocks: 800T-XA	1 lb	
Logic Reed	1 lb maximum	
Sealed Switch	3 lbs maximum at 0.205" plunger travel	
Stackable Sealed Switch	1 lb maximum	
Environment		
Temperature Range Operating	–4…+131°F (–20…+55°C)	
Storage	–40…+185°F (–40…+85°C)	
Note: Operating temperatures below freezing are based on the absence of freezing moisture and liquids.		
Humidity	50% at +104°F (+40°C)	

❶ Performance Data — See Page Important-2.

Standard Contact Ratings

Maximum thermal continuous current I_{th} 10 A AC/2.5 A DC. Bulletin 800H Type 7 & 9 units with 800T-XA contacts have ratings as follows:

Max. Oprtnl. Volts Ue	Utilization Category		Rated Operational Currents		
	IEC	NEMA	Volts Ue	Make	Break
AC 600	AC-15	A600	120…600 72…120 24…28 ❷	7200 VA 60 A 60 A	720 VA 720 VA 10 A
DC 600	DC-13	Q600	28…600 24…28 ❷	69 VA 2.5 A	

❷ For applications below 24V and 24 mA, Pen*TUFF*™, Logic Reed or stackable sealed switch contacts are recommended.

Sealed Switch Contact Ratings

Maximum continuous current I_{th} 2.5 A.

Max. Oprtnl. Volts Ue	Utilization Category		Rated Operational Currents		
	IEC	NEMA	Volts Ue	Make	Break
AC 600	AC-15	B600	120…600 0…120	3600 VA 30 A	360 VA 3 A
DC 300	DC-13	P300	24…300 0…24	138 VA 5.0 A	

Stackable Sealed Switch Contact Ratings

Maximum continuous current I_{th} 3 A. Bulletin 800T units have control circuit ratings with sealed switch contact blocks as follows:

Max. Oprtnl. Volts Ue	Utilization Category		Rated Operational Currents		
	IEC	NEMA	Volts Ue	Make	Break
AC 300	AC-15	C300	120…300 0…120	1800 VA 15 A	180 VA 1.5 A
DC 150	DC-13	Q150	24…150 0…24	69 VA 2.5 A	

Logic Reed Contact Ratings

Maximum: 150V AC, 0.15 A, 8 VA and 30V DC, 0.06 A, 1.8 VA. Should only be used with resistive loads.

Pen*TUFF*™ (Low Voltage) Contact Ratings

Minimum DC: 5V, 1 mA

Maximum thermal continuous current I_{th} 2.5 A AC/1.0 A DC. Bulletin 800H units with 800T-XAV contacts have ratings as follows:

Max. Opertnl. Volts Ue	Utilization Category		Rated Operational Currents		
	IEC	NEMA	Volts Ue	Make	Break
AC 300	AC-15	C300	120…300 0…120	1800 VA 15 A	180 VA 1.5 A
DC 150	DC-13	R150	24…150 0…24	28 VA 1.0 A	

Approvals

Enclosures:
UL Listed — File: E71673
Guide: NNNY

Devices:
UL Listed — File: E10314
Guide: NOIV

Stations:
CSA — File: LR11924

2-Position Push-Pull Units, Non-Illuminated

2-Position Push-Pull
Cat. No. 800H-FPX6A5

Contact Type	Operator Position		Button Color	Push-Pull
	Maintained	Maintained		
	Out	In		Cat. No.
N.C.L.B	X	O	Red	800H-FPX6D4
N.O.- N.C.L.B.	O X	X O	Red	800H-FPX6A1
N.C.L.B.- N.C.L.B.	X X	O O	Red	800H-FPX6A5

Note: X = Closed/O = Open

3-Position Push-Pull Units, Non-Illuminated

3-Position Push-Pull
Cat. No. 800H-FPXM6A7

Contact Type	Operator Position			Button Color	Push-Pull
	Momentary	Maintained	Maintained		
	Out	Center	In		Cat. No.
N.C.- N.C.L.B.	X X	O X	O O	Red	800H-FPXM6A7

Contact Type	Operator Position			Button Color	Push-Pull
	Momentary	Maintained	Momentary		
	Out	Center	In		Cat. No.
N.C.- N.C.L.B.	X X	O X	O O	Red	800H-FPXN6A7

Note: X = Closed/O = Open

Accessories — Page 10-137
Legend Plates — Page 10-142
Approximate Dimensions — Page 10-144

Locking Attachments, Continued

	Description		Cat. No.
 *Padlocking Cover* *Cat. No. 800H-N140 (Padlock not included)*	**800T/H** **Padlocking Cover** Guards against unauthorized operation. For push buttons, 2-position push-pull or twist-release units. When applying Cat. No. 800H-N140 on 2-position maintained push-pull units, cover will lock only when the button is in depressed position. Padlocking cover includes blank legend plate for customer marking. **Note:** A pre-marked legend plate is available.The words OPEN COVER TO OPERATE are on the front and PULL-TO-START-PUSH-TO-STOP are on the rear. To order legend plate only, specify Cat. No. 800H-W174L.		800H-N140 ←
 *Selector Switch Unit* *with Padlocking Attachment* *Cat. No. 800T-NX446 (Padlock not included)*	**800T** **2- and 3-Position Non-illuminated Selector Switch Padlocking Attachment — Standard Knob** Padlocking guard for 2- and 3-position selector switches with standard knob operators only. Locks selector switch in any maintained position.		800T-NX446
 *Selector Switch Padlocking Guard* *Cat. No. 800H-N141R (Padlock not included)*	**Description**	**Position**	**Cat. No.**
	800H **2- and 3-Position Selector Switch with Padlocking Guards** Padlocking guard for 2- and 3-position selector switches with standard knob operators only.	Left	800H-N141L
		Center	800H-N141C
		Right	800H-N141R
		All	800H-N141A
 *Cat. No. 800T-NX446A (Padlock not included)*	**800T** **4-Position Selector Switch Attachment — Standard Knob** Kit includes selector switch and guard (padlock not included). Padlocking Guard for 4-position selector switches with standard knob operators only. Locks selector switch in any maintained position.		800T-NX446A
	Description	**Position**	**Cat. No.**
 Non-Illuminated Selector Switch Padlocking Attachment Cat. No. 800H-N316J (Padlock not included)	**800T/H** **Non-Illuminated Selector Switch Padlocking Attachment** 2-, 3-, and 4-position selector switch padlocking attachments. Can be used to lock operators in a desired position. For 3-position selector switches, this device can also be used to lock out a left or right position as shown in the photo to the left.	For 2- and 3-Position Selector Switches	
		Left	800T-N316L
		Center	800T-N316C
		Right	800T-N316R
		Window Center through Right - Prevent Left Operation	800T-N316J
		Window Center through Left - Prevent Right Operation	800T-N316K
		For 4-Position Selector Switches	
		Left (Pos. 1)	800T-N317L
		Center Left (Pos. 2)	800T-N317CL
		Center Right (Pos. 3)	800T-N317CR
		Right (Pos. 4)	800T-N317R
 Illuminated Selector Switch Padlocking Attachment Cat. No. 800H-N4162L (Padlock not included)	**800T/H** **Illuminated Selector Switch Padlocking Attachment** 2- and 3-position selector switch padlocking attachments for illuminated selector switches. Stainless steel material	For 2-Position Selector Switches	
		Left	800T-N4162L
		Right	800T-N4162R
		For 3-Position Selector Switches	
		Left	800T-N4163L
		Center	800T-N4163C
		Right	800T-N4163R
		Window Center through Right - Prevent Left Operation	800T-N4163J
		Window Center through Left - Prevent Right Operation	800T-N4163K

Fiberglass Type 4X Small Enclosures

Application

Designed for use as a junction box or instrument housing in both indoor and outdoor settings. The enclosure is used in highly-corrosive environments typically found in oil refineries, chemical processing plants, waste water treatment, marine installations, pulp and paper processing, and electroplating plants.

Construction

- Molded fiberglass polyester material has excellent temperature and chemical resistance qualities and exhibits outstanding physical properties
- Fiberglass material is easily punched, drilled, filed, or sawed
- Seamless foam-in-place gasket assures watertight and dusttight seal
- Threaded internal bosses provided for mounting optional panels and terminal block kits
- Scratch-resistant polycarbonate windows are permanently bonded in place
- Screw cover enclosures have easily removable covers attached to body with internal plated steel hinges. Cover securely fastens to the body with four captivated Type 316 stainless steel cover screws.
- Enclosures with quick-release latches have corrosion-resistant polyester hinges and polyester latches with a Type 316L stainless steel bail. Attached with Type 316 stainless steel screws. A Type 316L stainless steel padlock hasp is furnished with each enclosure.
- Sealing washers are furnished with enclosure

Finish

Fiberglass material is light gray inside and out. Optional steel panels are painted white. Optional stainless steel, aluminum, and composite panels are unpainted.

Industry Standards

Mounting brackets required to meet UL/CSA external mounting requirements.

UL 508A, File No. E61997: Type 3, 3R, 4, 4X, 12, and 13
NEMA/EEMAC Type 3, 3R, 4, 4X, 12, and 13
Enclosure flammability rating per UL 508A
Window flammability rating per UL 508A
CSA File No. 42186: Type 3R, 4, 4X, and 12
IEC 60529, IP66

Meets Type 3RX requirements

Accessories

Frameless Window Kit
Panels
Stainless Steel Window Kit
Terminal Block Kit Assembly
Ventilators
Standard Accessories

Modification Services Program

You can customize this product to your unique requirements by specifying from these options:

- Holes and cutouts in body, doors, panels
- Tapped holes, fasteners in subpanel
- Mounting Brackets
- Panels
- Thermal Accessories
- Threaded Panel Extenders
- Windows Kits
- Standard accessories

To order, contact your local Hoffman sales representative.

NOTE: For information about modifications outside the scope of the Modification Services program, contact your Hoffman sales representative.

Fiberglass Mounting Bracket Kit

Bracket is molded from fiberglass reinforced polyester. Kit includes four brackets, hardware, and installation instructions. Mounting hole dimensions with mounting brackets installed are [G + 2.50(64mm)] x [H + .50(13mm)].

See tables for G and H dimensions.

Catalog Number	Bulletin Number
A50MFKR	A50Y

Threaded Panel Extenders

Threaded Panel Extenders are made of plated steel and designed to raise the panel mounting surface. Extenders attach to threaded internal pads. Male and female thread size is #10. Each kit contains 4 extenders.

Bulletin Number: A80

Catalog Number	Length (inch)	Length (mm)
APE050	0.50	13
APE100	1.00	25

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Fiberglass Type 4X Small Enclosures

Standard Sizes Fiberglass Type 4X Small Solid Screw Cover

Catalog Number	Inside Dimensions A x B x C in. (mm)	Panel Catalog Number	Aluminum Panel Catalog Number	Panel Size D x E in. (mm)	Mounting G x H in. (mm)	Overall L x W in. (mm)	F in. (mm)	J in. (mm)	K in. (mm)	V in. (mm)	X in. (mm)	Y in. (mm)
A645JFGR	5.50 x 4.00 x 4.94 (140 x 102 x 125)	No Panel	No Panel	No Panel	4.75 x 2.00 (121 x 51)	6.00 x 4.50 (152 x 114)	4.41 (112)	4.13 (105)	1.00 (25)	—	4.22 (107)	3.59 (91)
A845JFGR	7.50 x 4.00 x 4.94 (191 x 102 x 125)	A6P4	A6P4AL	4.88 x 2.88 (124 x 73)	6.75 x 2.00 (171 x 51)	8.00 x 4.50 (203 x 114)	4.41 (112)	4.13 (105)	1.00 (25)	0.31 (8)	6.22 (158)	3.59 (91)
A865JFGR	7.50 x 6.00 x 5.19 (191 x 152 x 132)	A6P6	A6P6AL	4.88 x 4.88 (124 x 124)	6.75 x 4.00 (171 x 102)	8.00 x 6.50 (203 x 165)	4.66 (118)	4.38 (111)	1.00 (25)	0.31 (8)	6.22 (158)	5.59 (142)
A1066JFGR	9.50 x 6.00 x 5.69 (241 x 152 x 145)	A8P6	A8P6AL	6.75 x 4.88 (171 x 124)	8.75 x 4.00 (222 x 102)	10.00 x 6.50 (254 x 165)	5.16 (131)	4.63 (118)	1.25 (32)	0.25 (6)	8.12 (206)	5.50 (140)
A1287JFGR	11.50 x 8.00 x 6.69 (292 x 203 x 170)	A10P8	A10P8AL	8.75 x 6.88 (222 x 175)	10.75 x 6.00 (273 x 152)	12.00 x 8.50 (305 x 216)	6.16 (156)	5.13 (130)	1.75 (44)	0.25 (6)	9.97 (253)	7.34 (186)
A14107JFGR	13.50 x 10.00 x 7.19 (343 x 254 x 183)	A12P10	A12P10AL	10.75 x 8.88 (273 x 226)	12.75 x 8.00 (324 x 203)	14.00 x 10.50 (356 x 267)	6.66 (169)	5.63 (143)	1.75 (44)	0.25 (6)	11.97 (304)	9.34 (237)
A16128JFGR	15.50 x 12.00 x 8.19 (394 x 305 x 208)	A14P12	A14P12AL	12.75 x 10.88 (324 x 276)	14.75 x 10.00 (375 x 254)	16.00 x 12.50 (406 x 318)	7.66 (195)	6.13 (156)	2.25 (57)	0.25 (6)	13.78 (350)	11.16 (283)
A18149JFGR	17.50 x 14.00 x 8.69 (445 x 356 x 221)	A16P14	A16P14AL	14.75 x 12.88 (375 x 327)	16.75 x 12.00 (425 x 305)	18.00 x 14.50 (457 x 368)	8.16 (207)	6.63 (168)	2.25 (57)	0.25 (6)	15.78 (401)	13.16 (334)

Purchase panels separately. Optional stainless steel, aluminum, and composite material panels available for most sizes.

Standard Sizes Fiberglass Type 4X Small Solid Cover with Quick-Release Latches

Catalog Number	Inside Dimensions A x B x C in. (mm)	Panel Catalog Number	Aluminum Panel Catalog Number	Panel Size D x E in. (mm)	Mounting G x H in. (mm)	Overall L x W in. (mm)	F in. (mm)	J in. (mm)	K in. (mm)	V in. (mm)	X in. (mm)	Y in. (mm)	No. of Latches
A645JFGQRR	5.50 x 4.00 x 5.02 (140 x 102 x 128)	No Panel	No Panel	No Panel	4.75 x 2.00 (121 x 51)	6.00 x 5.39 (152 x 137)	4.50 (114)	4.13 (105)	1.00 (25)	—	4.22 (107)	3.59 (91)	1
A845JFGQRR	7.50 x 4.00 x 5.02 (191 x 102 x 128)	A6P4	A6P4AL	4.88 x 2.88 (124 x 73)	6.75 x 2.00 (171 x 51)	8.00 x 5.39 (203 x 137)	4.50 (114)	4.13 (105)	1.00 (25)	.31 (8)	6.22 (158)	3.59 (91)	1
A865JFGQRR	7.50 x 6.00 x 5.28 (191 x 152 x 134)	A6P6	A6P6AL	4.88 x 4.88 (124 x 124)	6.75 x 4.00 (171 x 102)	8.00 x 7.39 (203 x 188)	4.75 (121)	4.38 (111)	1.00 (25)	.31 (8)	6.22 (158)	5.59 (142)	2
A1066JFGQRR	9.50 x 6.00 x 5.78 (241 x 152 x 147)	A8P6	A8P6AL	6.75 x 4.88 (171 x 124)	8.75 x 4.00 (222 x 102)	10.00 x 7.39 (254 x 188)	5.25 (133)	4.63 (118)	1.25 () 32	0.25 (6)	8.12 (206)	5.50 (140)	2
A1287JFGQRR	11.50 x 8.00 x 6.78 (292 x 203 x 172)	A10P8	A10P8AL	8.75 x 6.88 (222 x 175)	10.75 x 6.00 (273 x 152)	12.00 x 9.39 (305 x 239)	6.25 (159)	5.13 (130)	1.75 (44)	0.25 (6)	9.97 (253)	7.34 (186)	2
A14107JFGQRR	13.50 x 10.00 x 7.28 (343 x 254 x 185)	A12P10	A12P10AL	10.75 x 8.88 (273 x 226)	12.75 x 8.00 (324 x 203)	14.00 x 11.39 (256 x 289)	6.75 (171)	5.63 (143)	1.75 (44)	0.25 (6)	11.97 (304)	9.34 (237)	2
A16128JFGQRR	15.50 x 12.00 x 8.28 (394 x 305 x 210)	A14P12	A14P12AL	12.75 x 10.88 (324 x 276)	14.75 x 10.00 (375 x 254)	16.00 x 13.39 (406 x 340)	7.75 (197)	6.13 (156)	2.25 (57)	0.25 (6)	13.78 (350)	11.16 (283)	2
A18149JFGQRR	17.50 x 14.00 x 8.78 (445 x 356 x 223)	A16P14	A16P14AL	14.75 x 12.88 (375 x 327)	16.75 x 12.00 (425 x 305)	18.00 x 15.39 (457 x 391)	8.25 (210)	6.63 (168)	2.25 (57)	0.25 (6)	15.78 (401)	13.16 (334)	2

Purchase panels separately. Optional stainless steel, aluminum, and composite material panels available for most sizes.

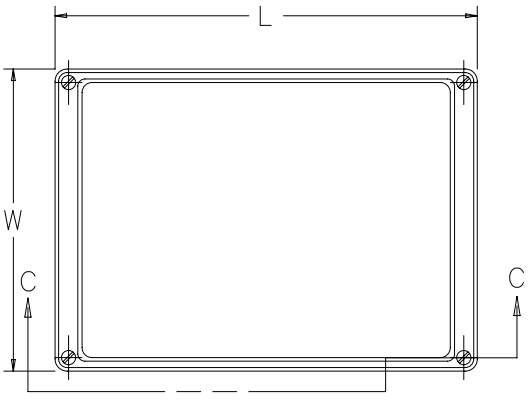
Standard Sizes Fiberglass Type 4X Small Enclosures with Windows

Catalog Number	Inside Dimensions A x B x C in. (mm)	Panel Catalog Number	Aluminum Panel Catalog Number	Panel Size D x E in. (mm)	Mounting G x H in. (mm)	Overall L x W in. (mm)	Window Size M x N in. (mm)	F in. (mm)	J in. (mm)	K in. (mm)	V in. (mm)	No. of Latches
A865JFGQRPWR	7.50 x 6.00 x 5.03 (191 x 152 x 128)	A6P6	A6P6AL	4.88 x 4.88 (124 x 124)	6.75 x 4.00 (171 x 102)	8.00 x 7.39 (203 x 188)	4.55 x 4.00 (116 x 102)	4.52 (115)	4.38 (111)	1.00 (25)	0.31 (8)	1
A1066JFGQRPWR	9.50 x 6.00 x 5.53 (241 x 152 x 140)	A8P6	A8P6AL	6.75 x 4.88 (171 x 124)	8.75 x 4.00 (222 x 102)	10.00 x 7.39 (254 x 188)	6.55 x 4.00 (166 x 102)	5.00 (127)	4.63 (118)	1.25 (32)	0.25 (6)	2
A1287JFGQRPWR	11.50 x 8.00 x 6.53 (292 x 203 x 166)	A10P8	A10P8AL	8.75 x 6.88 (222 x 175)	10.75 x 6.00 (273 x 152)	12.00 x 9.39 (305 x 239)	8.25 x 5.84 (210 x 148)	6.00 (152)	5.13 (130)	1.75 (44)	0.25 (6)	2
A14107JFGQRPWR	13.50 x 10.00 x 7.03 (343 x 254 x 179)	A12P10	~~A12P10AL~~	10.75 x 8.88 (273 x 226)	12.75 x 8.00 (324 x 203)	14.00 x 11.39 (253 x 289)	10.28 x 6.84 (261 x 174)	6.52 (166)	5.63 (143)	1.75 (44)	0.25 (6)	2
A16128JFGQRPWR	15.50 x 12.00 x 8.03 (394 x 305 x 204)	A14P12	A14P12AL	12.75 x 10.88 (324 x 276)	14.75 x 10.00 (375 x 254)	16.00 x 13.39 (406 x 340)	12.34 x 9.10 (313 x 231)	7.52 (191)	6.13 (156)	2.25 (57)	0.25 (6)	2
A18149JFGQRPWR	17.50 x 14.00 x 8.53 (445 x 356 x 217)	A16P14	A16P14AL	14.75 x 12.88 (375 x 327)	16.75 x 12.00 (425 x 305)	18.00 x 15.39 (457 x 391)	14.45 x 11.06 (367 x 281)	8.00 (203)	6.63 (168)	2.25 (57)	0.25 (6)	2

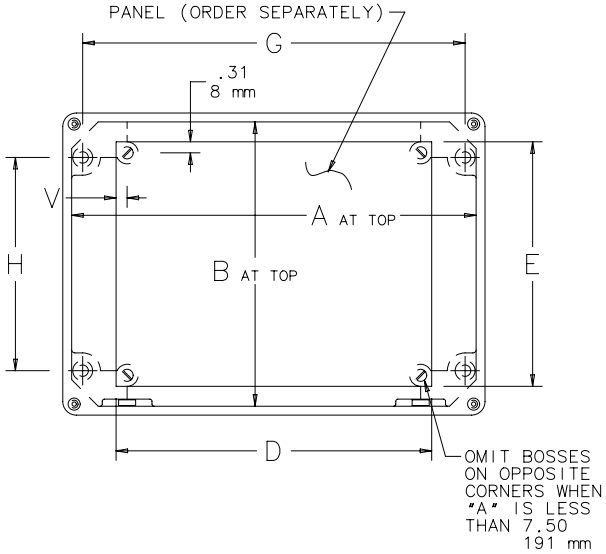
Purchase panels separately. Optional stainless steel, aluminum, and composite material panels available for most sizes.

Fiberglass Type 4X Small Enclosures

Solid Screw Cover Enclosure

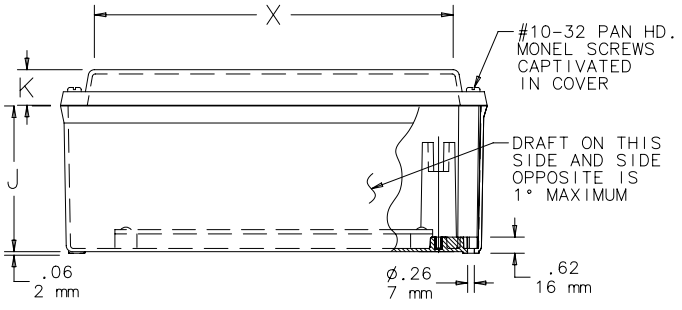


TOP VIEW WITH COVER

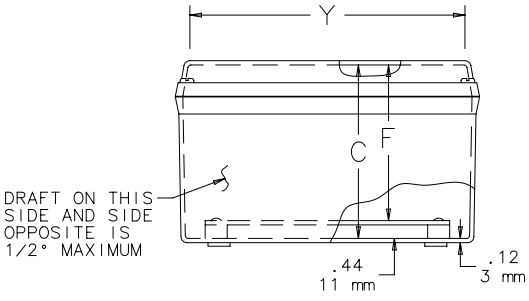


TOP VIEW WITH COVER REMOVED

NOTE: Panel screws have #10-32 threads.



SECTION C-C

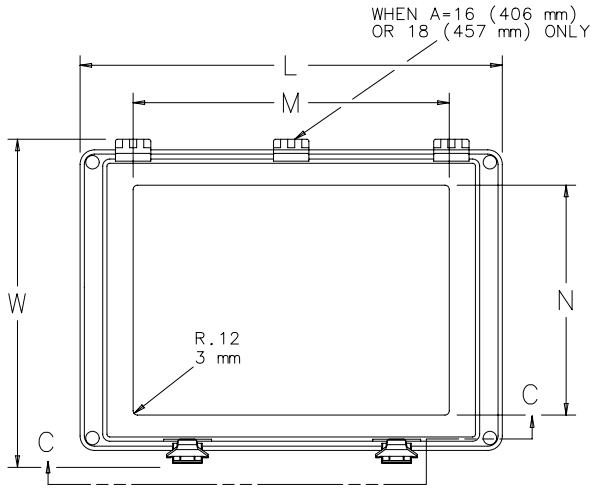


END VIEW

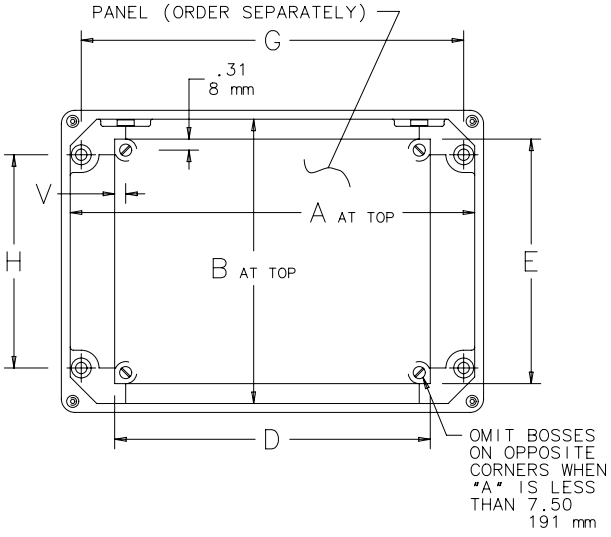
C2549-C

Fiberglass Type 4X Small Enclosures

Quick-Release Solid Cover Enclosure and Window Cover Enclosure

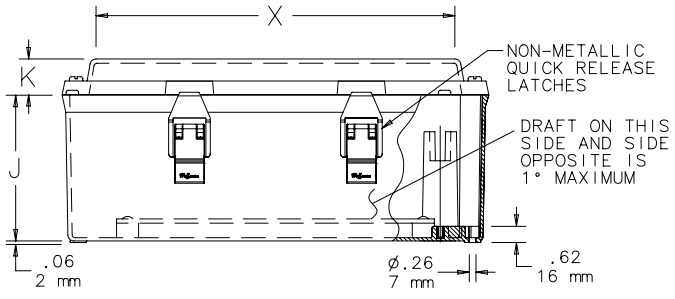


TOP VIEW WITH COVER

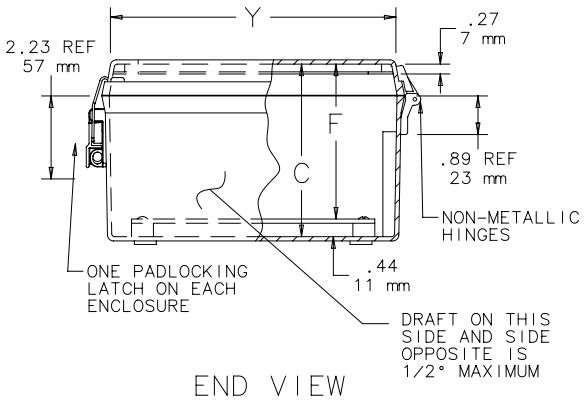


TOP VIEW WITH COVER REMOVED

NOTE: 1. Panel screws have #10-32 threads.
2. Hinged cover opens 200° maximum.



SECTION C-C



END VIEW

C2550-C

Overview

HydroRanger 200 is an ultrasonic level controller for up to six pumps and provides control, differential control and open channel flow monitoring.

Benefits

- Monitors wet wells, weirs and flumes
- Digital communications with built-in Modbus RTU via RS-485
- Compatible with SmartLinx system and SIMATIC PDM configuration software
- Single or dual point level monitoring
- 6 relay (standard), 1 or 3 relay (optional)
- Auto False-Echo Suppression for fixed obstruction avoidance
- Anti-grease ring/tide mark buildup
- Differential amplifier transceiver for common mode noise rejection and improved signal-to-noise ratio
- Wall and panel mounting options

Application

For water authorities, municipal water and wastewater plants, HydroRanger 200 is an economical, low-maintenance solution delivering control efficiency and productivity needed to meet today's exacting standards. It offers single point monitoring with all models, and optional dual-point monitoring with 6 relay model. As well, it has digital communications with built-in Modbus RTU via RS-485.

The standard 6 relay HydroRanger 200 will monitor open channel flow and features more advanced relay alarming and pump control functions as well as volume conversion. It is compatible with SIMATIC PDM, allowing for PC configuration and setup. Sonic Intelligence® advanced echo-processing software provides increased reading reliability. The optional 1 or 3 relay models provide accurate level measurement functions only; these two models do not provide open channel flow, differential level measurement or volume conversion functions.

HydroRanger 200 uses proven continuous ultrasonic echo ranging technology to monitor water and wastewater of any consistency up to 15 m (50 ft) in depth. Achievable resolution is 0.1% with accuracy to 0.25% of range. Unlike contacting devices, HydroRanger 200 is immune to problems caused by suspended solids, harsh corrosives, grease or silt in the effluent, reducing downtime.

- Key Applications: wet wells, flumes/weirs, bar screen control

HydroRanger 200

Technical specifications

Mode of Operation	
Measuring principle	Ultrasonic level measurement
Measuring range	0.3 to 15 m (1 to 50 ft), transducer dependent
Measuring points	1 or 2
Input	
Analog	0 to 20 mA or 4 to 20 mA, from alternate device, scaleable (6 relay model)
Discrete	10 to 50 V DC switching level Logical 0 = < 0.5 V DC Logical 1 = 10 to 50 V DC Max. 3 mA
Output	
Echomax® transducer	44 kHz
Ultrasonic transducer	Compatible transducers: ST-H and Echomax series XPS-10/10F, XPS 15/15F, XCT-8, XCT-12 and XRS-5
Relays[1]	Rating 5 A at 250 V AC, non-inductive
- Model with 1 relay[2]	1 SPST Form A
- Model with 3 relays[2]	2 SPST Form A/1 SPDT Form C
- Model with 6 relays	4 SPST Form A/2 SPDT Form C
mA output	0 to 20 mA or 4 to 20 mA
• Max. load	750 Ω, isolated
• Resolution	0.1 % of range
Accuracy	
Error in measurement	0.25% of range or 6 mm (0.24"), whichever is greater
Resolution	0.1% of measuring range or 2 mm (0.08"), whichever is greater[3]
Temperature compensation	• -50 to +150 °C (-58 to +302 °F) • Integral temperature sensor in transducer • External TS-3 temperature sensor (optional) • Programmable fixed temperature values
Rated operating conditions	
Installation conditions	
Location	indoor / outdoor
Installation category	II
Pollution degree	4
Ambient conditions	
Ambient temperature (enclosure)	-20 to +50 °C (-4 to +122 °F)

Design	
Weight	
• Wall mount	1.37 kg (3.02 lbs)
• Panel mount	1.50 kg (3.31 lbs)
Material (enclosure)	Polycarbonate
Degree of protection (enclosure)	
• Wall mount	IP65/Type 4X/NEMA 4X
• Panel mount	IP54/Type 3/NEMA 3
Cable	
Transducer and mA output signal	2-core copper conductor, twisted, shielded, 300 Vrms, 0.82 mm² (18 AWG), Belden® 8760 or equivalent is acceptable
Max. separation between transducer and transceiver	365 m (1200 ft)
Displays and controls	100 x 40 mm (4 x 1.5") multi-block LCD with backlighting
Programming	Programming using handheld programmer or via PC with SIMATIC PDM software
Power supply[4]	
AC version	100 to 230 V AC ± 15%, 50/60 Hz, 36 VA (17 W)
DC version	12 to 30 V DC (20 W)
Certificates and approvals	• CE, C-TICK[5] • Lloyd's Register of Shipping • ABS Type Approval • FM, $CSA_{NRTL/C}$, UL listed • CSA Class I, Div. 2, Groups A, B, C and D, Class II, Div. 2, Groups F and G, Class III (wall mount only) • MCERTS Class 1 approved for Open Channel Flow
Communication	• RS-232 with Modbus RTU or ASCII via RJ-11 connector • RS-485 with Modbus RTU or ASCII via terminal blocks • Optional: SmartLinx® cards for - PROFIBUS DP - DeviceNet™ - Allen-Bradley® Remote I/O

1) All relays certified for use with equipment that fails in a state at or under the rated maximums of the relays
2) This model is level control only; no open channel flow, differential level or volume conversion functions
3) Program range is defined as the empty distance to the face of the transducer plus any range extension
4) Maximum power consumption is listed
5) EMC performance available upon request

Selection and Ordering data

Order No.

Siemens HydroRanger 200 C) **7ML5034-**
Ultrasonic level controller for up to six pumps that provides control, differential control and open channel flow monitoring. The HydroRanger 200 is also available as a level measurement controller only. Select option from model code below.

Mounting
Wall mount, standard enclosure **1**
Wall mount, 4 entries, 4 M20 cable glands included **2**
Panel mount[1] **3**

Power supply
100 to 230 V AC **A**
12 to 30 V DC **B**

Number of measurement points
Single point model, 6 relays **A**
Dual point model, 6 relays **B**
Single point model, level only, 1 relay[2] **C**
Single point model, level only, 3 relays[2] **D**

Communication (SmartLinx)
Without module **0**
SmartLinx® Allen-Bradley® Remote I/O module **1**
SmartLinx PROFIBUS DP module **2**
SmartLinx DeviceNet™ module **3**
See SmartLinx product page 5/260 for more information.

Approvals
General Purpose CE, FM, CSA$_{US/C}$, UL listed, C-TICK **1**
CSA Class I, Div. 2, Groups A, B, C and D; Class II, Div 2, Groups F and G; Class III (for wall mount applications only) **2**

Further designs

Order code

Please add "**-Z**" to Order No. and specify Order code(s).

Stainless steel tag [69 mm x 50 mm (2.71 x 1.97")]: Measuring-point number/identification (max. 16 characters) specify in plain text **Y15**

Instruction manual

Order No.

English C) **7ML1998-5FC03**
French C) **7ML1998-5FC11**
German C) **7ML1998-5FC32**
Note: The instruction manual should be ordered as a separate line on the order.

This device is shipped with the Siemens Milltronics manual CD containing the complete ATEX Quick Start and instruction manual library.

Other instruction manuals

SmartLinx Allen-Bradley Remote I/O, English C) **7ML1998-1AP03**
SmartLinx PROFIBUS DP, English C) **7ML1998-1AQ03**
SmartLinx PROFIBUS DP, German C) **7ML1998-1AQ33**
SmartLinx PROFIBUS DP, French C) **7ML1998-1AQ12**
SmartLinx DeviceNet, English C) **7ML1998-1BH02**
Note: The appropriate SmartLinx instruction manual should be ordered as a separate line on the order.

Selection and Ordering data

Order No.

Siemens HydroRanger 200 C) **7ML5034-**
Ultrasonic level controller for up to six pumps that provides control, differential control and open channel flow monitoring. The HydroRanger 200 is also available as a level measurement controller only. Select option from model code below.

Accessories

Handheld programmer **7ML1830-2AK**
Tag, stainless steel, 12 x 45 mm (0.47 x 1.77"), one text line, suitable for enclosure **7ML1930-1AC**
TS-3 Temperature Sensor - see TS-3 on page 5/147
SITRANS RD100 Remote display - see RD100 on page 5/263
SITRANS RD200 Remote display - see RD200 on page 5/265

Spare parts

Power Supply Board (100 to 230 V AC) C) **7ML1830-1MD**
Power Supply Board (12 to 30 V DC) C) **7ML1830-1ME**
Display Board C) **7ML1830-1MF**
See SmartLinx product page 5/260 for more information.

1) Available with approval option 1 only
2) This model is level control only; no open channel flow, differential level, or volume conversion functions
C) Subject to export regulations AL: N, ECCN: EAR99

5

HydroRanger 200

Selection and Ordering data		Order No.
Milltronics HydroRanger 200 Ultrasonic level controller for up to six pumps that provides control, differential control and open channel flow monitoring. The HydroRanger 200 is also available as a level measurement controller only. Select option from model code below.	C)	**7ML1034 -**
Mounting		
Wall mount, standard enclosure		**1**
Wall mount, 4 entries, 4 M20 cable glands included		**2**
Panel mount[1]		**3**
Power supply		
100 to 230 V AC		**A**
12 to 30 V DC		**B**
Communication (SmartLinx)		
Without module		**A**
SmartLinx® Allen-Bradley® Remote I/O module		**B**
SmartLinx PROFIBUS DP module		**C**
SmartLinx DeviceNet™ module See SmartLinx product page 5/260 for more information.		**D**
Approvals		
General Purpose CE, FM, CSA$_{US/C}$, UL listed, C-TICK		**1**
CSA Class I, Div. 2, Groups A, B, C and D; Class II, Div 2, Groups F and G; Class III (for wall mount applications only)		**2**
Number of measurement points		
Single point model, 6 relays		**1**
Dual point model, 6 relays		**2**
Single point model, level only, 1 relay[2]		**3**
Single point model, level only, 3 relays[2]		**4**
Further designs		Order code
Please add "**-Z**" to Order No. and specify Order code(s).		
Stainless steel tag [69 mm x 50 mm (2.71 x 1.97")]: Measuring-point number/identification (max. 16 characters) specify in plain text		**Y15**
Instruction manual		Order No.
English	C)	**7ML1998-1FC06**
French	C)	**7ML1998-1FC14**
German Note: The instruction manual should be ordered as a separate line on the order.	C)	**7ML1998-1FC34**
This device is shipped with the Siemens Milltronics manual CD containing the complete ATEX Quick Start and instruction manual library.		
Other instruction manuals		
SmartLinx Allen-Bradley Remote I/O, English	C)	**7ML1998-1AP03**
SmartLinx PROFIBUS DP, English	C)	**7ML1998-1AQ03**
SmartLinx PROFIBUS DP, German	C)	**7ML1998-1AQ33**
SmartLinx PROFIBUS DP, French	C)	**7ML1998-1AQ12**
SmartLinx DeviceNet, English Note: The appropriate SmartLinx instruction manual should be ordered as a separate line on the order.	C)	**7ML1998-1BH02**

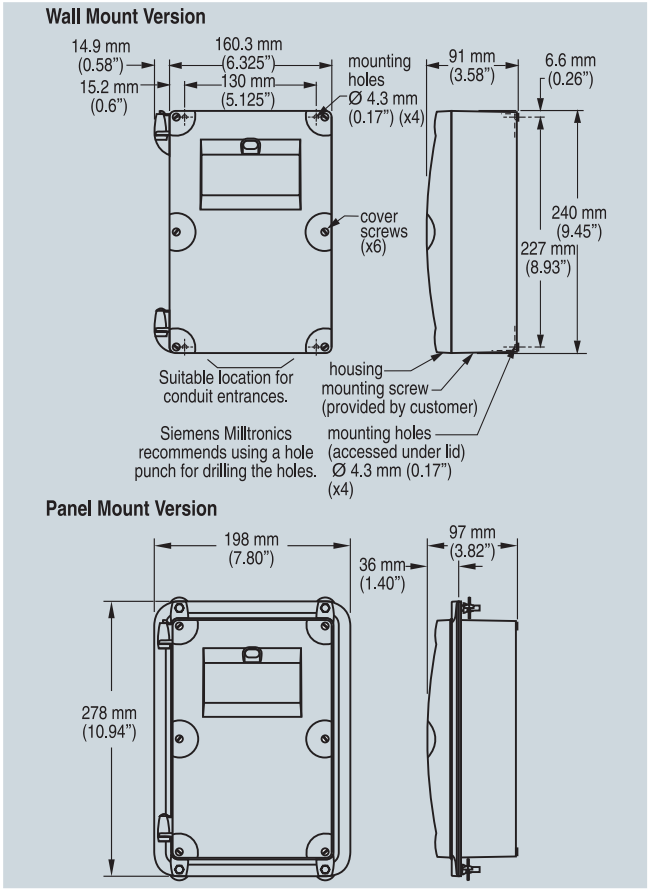
Selection and Ordering data		Order No.
Milltronics HydroRanger 200 Ultrasonic level controller for up to six pumps that provides control, differential control and open channel flow monitoring. The HydroRanger 200 is also available as a level measurement controller only. Select option from model code below.	C)	**7ML1034 -**
Accessories		
Handheld programmer		**7ML1830-2AK**
Tag, stainless steel, 12 x 45 mm (0.47 x 1.77"), one text line, suitable for enclosure		**7ML1930-1AC**
TS-3 Temperature Sensor - see TS-3 on page 5/147		
SITRANS RD100 Remote display - see RD100 on page 5/263		
SITRANS RD200 Remote display - see RD200 on page 5/265		
Spare parts		
Power Supply Board (100 to 230 V AC)	C)	**7ML1830-1MD**
Power Supply Board (12 to 30 V DC)	C)	**7ML1830-1ME**
Display Board	C)	**7ML1830-1MF**
See SmartLinx product page 5/260 for more information.		

1) Available with approval option 1 only
2) This model is level control only; no open channel flow, differential level, or volume conversion functions

C) Subject to export regulations AL: N, ECCN: EAR99

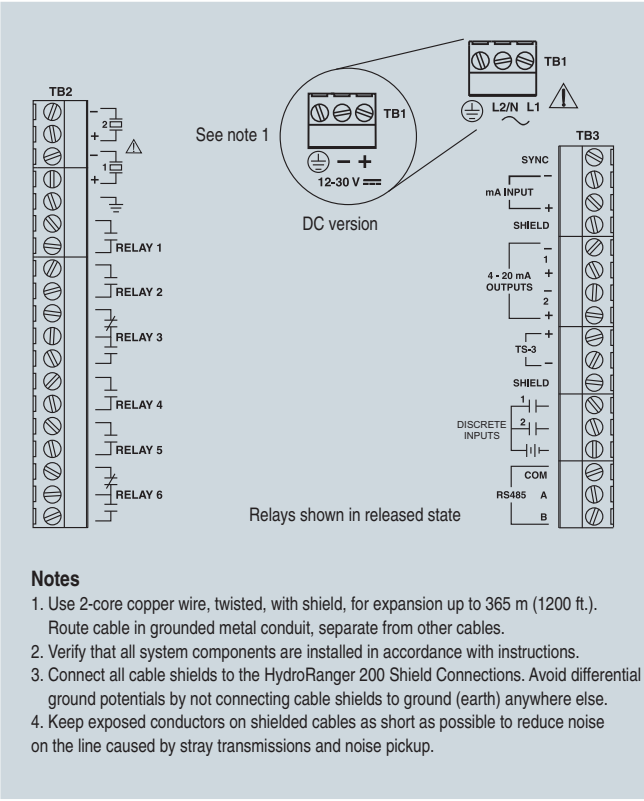
®Modbus is a registered trademark of Schneider Electric.
®Belden is a registered trademark of Belden Wire and Cable Company.
®Allen-Bradley is a registered trademark of Rockwell Automation.
™DeviceNet is a trademark of Open DeviceNet Vendor Association (ODVA)

Dimensional drawings



HydroRanger 200 dimensions

Schematics



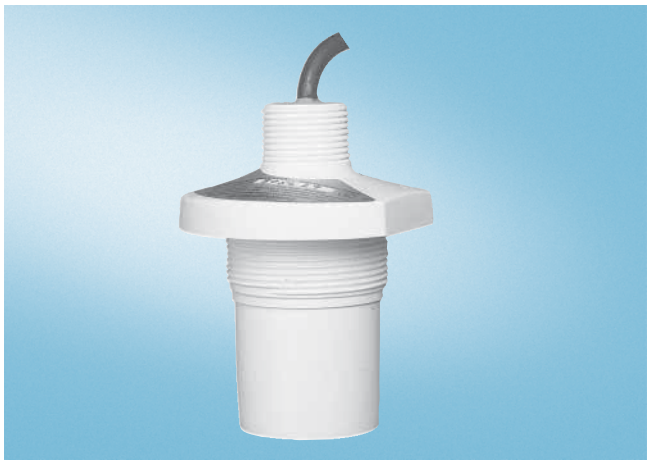
Notes

1. Use 2-core copper wire, twisted, with shield, for expansion up to 365 m (1200 ft.). Route cable in grounded metal conduit, separate from other cables.
2. Verify that all system components are installed in accordance with instructions.
3. Connect all cable shields to the HydroRanger 200 Shield Connections. Avoid differential ground potentials by not connecting cable shields to ground (earth) anywhere else.
4. Keep exposed conductors on shielded cables as short as possible to reduce noise on the line caused by stray transmissions and noise pickup.

HydroRanger 200 connections

5

Overview



ST-H transducers use ultrasonic technology to measure level in chemical storage and liquid tanks.

Benefits

- Can be mounted on a 2" (50.8 mm) standpipe
- Immune to corrosive and harsh environments
- Integral temperature sensor

Application

The narrow design of the ST-H allows the transducer to be mounted on a 2" (50.8 mm) standpipe. When mounted correctly, it is completely protected from the process and can even be used in harsh, corrosive environments.

During operation, the ultrasonic transducer emits acoustic pulses in a narrow beam perpendicular to the transducer face. The level transceiver measures the propagation time between pulse emission and reception of the echo to calculate the distance from the transducer to the material. Variations in sound velocity due to changes in temperature within the permissible range are automatically compensated by the integral temperature sensor.

- Key Applications: chemical storage, liquid tanks

Technical specifications

Mode of operation	
Measuring principle	Ultrasonic transducer
Input	
Measuring range	0.3 to 10 m (1 to 33 ft)
Output	
Frequency	44 kHz
Beam angle	12°
Accuracy	
Temperature compensation	Compensated by integral temperature sensor
Rated operating conditions	
Pressure	Normal atmospheric pressure
Ambient conditions	
• Ambient temperature	-20 to +60 °C (-5 to +140 °F) (ATEX approved model) -40 to +73 °C (-40 to +163 °F) (CSA/FM approved model)
Design	
Weight[1]	1.4 kg (3 lbs)
Material (enclosure)	Base and lid made of ETFE (epoxy fitted joint)[2]
Process connection	2" NPT [(Taper), ANSI/ASME B1.20.1], R 2" [(BSPT), EN 10226] or G 2" [(BSPP), EN ISO 228-1]
Degree of protection	IP68
Cable connection	2-core shielded/twisted, 0.5 mm² (20 AWG), PVC sheath
Cable (max. length)	365 m (1200 ft) with RG 62 A/U coaxial cable
Options	
• Flange adapter	3" Universal (fits DN 65, PN 10 and 3" ASME)
• Submergence coupling	For maintaining high level readings while the transducer is submerged
Certificates and approvals	CE[3], CSA, FM Class 1, Div. 1, ATEX II 2G

1) Approximate shipping weight of transducer with standard cable length
2) When measuring chemicals, check compatibility of ETFE and epoxy, or mount joint external to process.
3) EMC certificate available on request

Selection and Ordering data

		Order No.
Echomax® ST-H ultrasonic transducer	C)	**7ML1100 -**
Level measurement in chemical storage and liquid tanks The narrow design of the ST-H allows the transducer to be mounted on a 2" standpipe. measuring range: min. 0.3 m (1 ft), max. 10 m (33 ft)		**A 0**
Process connection		
2" NPT [(Taper), ANSI/ASME B1.20.1]		**0**
R 2" [(BSPT), EN 10226]		**1**
G 2" [(BSPP), EN ISO 228-1]		**2**
Cable length		
5 m (16.40 ft)		**A**
10 m (32.81 ft)		**B**
30 m (98.43 ft)		**C**
50 m (164.04 ft)		**D**
100 m (328.08 ft)		**E**
Approvals		
FM Class I, Div. 1 [only with 2" NPT (Taper), ANSI/ASME B1.20.1 process connection]		**2**
ATEX II 2G, CSA		**3**
Instruction manual		
Quick Start Manual, multi-language	C)	**7ML1998-5QK81**
Applications Guidelines, multi-language	C)	**7ML1998-5HV61**
Note: The Applications Guidelines should be ordered as a separate line item on the order.		
This device is shipped with the Siemens Milltronics manual CD containing the complete ATEX Quick Start and instruction manual library.		
Accessories		
ST-H universal submergence shield		**7ML1830-1CF**
Universal box bracket, mounting kit		**7ML1830-1BK**
3" ASME, DIN 65 PN 10, JIS 10K 3B ETFE flange adapter for 2" NPT		**7ML1830-1BT**
3" ASME, DIN 65 PN 10, JIS 10K 3B ETFE flange adapter for 2" BSPT		**7ML1830-1BU**
Easy Aimer 2, NPT with ¾" x 1" PVC coupling		**7ML1830-1AQ**
Easy Aimer 2, aluminum with M20 adapter and 1" and 1½" BSPT aluminum couplings		**7ML1830-1AX**
Easy Aimer 304, with stainless steel coupling		**7ML1830-1AU**
Easy Aimer 304, with M20 adapter and 1" and 1½" BSPT 304 SS couplings		**7ML1830-1GN**

C) Subject to export regulations AL: N, ECCN: EAR99

5

→ FT-300

Mechanically-activated control switch designed to activate low current control panels and alarms.

This wide-angle or narrow-angle control switch offers reliable low current control for AC and DC applications in potable water, wastewater, and sewage. The internal switching mechanism has sealed gold cross-point contacts for reliable low current operation. Common applications include PLC (programmable logic controller) panels, IS panels with intrinsically safe barriers, low current solar applications, and other low current control panels and alarms applications.

The wide-angle version activates/deactivates approximately 4" above and below horizontal with a 3.5" tether. The narrow angle version activates/deactivates at approximately 1.5" above and below horizontal with a 3.5" tether.

Normally Open Model (high level)
The control switch turns on (closes) when the float tips **above** horizontal signaling a high level, and turns off (opens) when the float drops below horizontal.

Normally Closed Model (low level)
The control switch turns on (closes) when the float drops **below** horizontal signaling a low level, and turns off (opens) when the float tips above horizontal.

FEATURES

- Passed NSF Standard 61 protocol by an approved Water Quality Association laboratory.
- Low current, non-arching applications down to 0.160 mA at 125 VAC.
- Mechanically-activated, snap action contacts.
- High impact, corrosion resistant polypropylene float housing.
- Not sensitive to rotation.
- UL Listed for use in non-potable water and sewage.
- CSA Certified.
- Three-year limited warranty.

LR54245 LISTED 83N2

Member of Hydraulic Institute MEMBER Water Quality Association

OPTIONS

This switch is available:

- for normally open (high level) applications or normally closed (low level) applications.
- with narrow or wide-angle pumping ranges.
- ~~in standard cable lengths of 10, 15, 20, or 30 feet.~~ 100 Feet
- with two mounting options that allow for flexibility in installation:

  Mounting Clamp: for applications where the switch can be attached to a discharge pipe or similar mounting device.

  Externally Weighted: for applications where the switch can be suspended from above.

SPECIFICATIONS

CABLE: flexible 18 gauge, 2 conductor (UL,CSA) SJOW, water-resistant (CPE) jacket

FLOAT: 2.74 inch diameter x 4.83 inch long (7.0 cm x 12.3 cm), high-impact, corrosion resistant, polypropylene housing for use in sewage and water up to 140°F (60°C)

MAXIMUM WATER DEPTH: 30 feet (9 meters), 13 psi

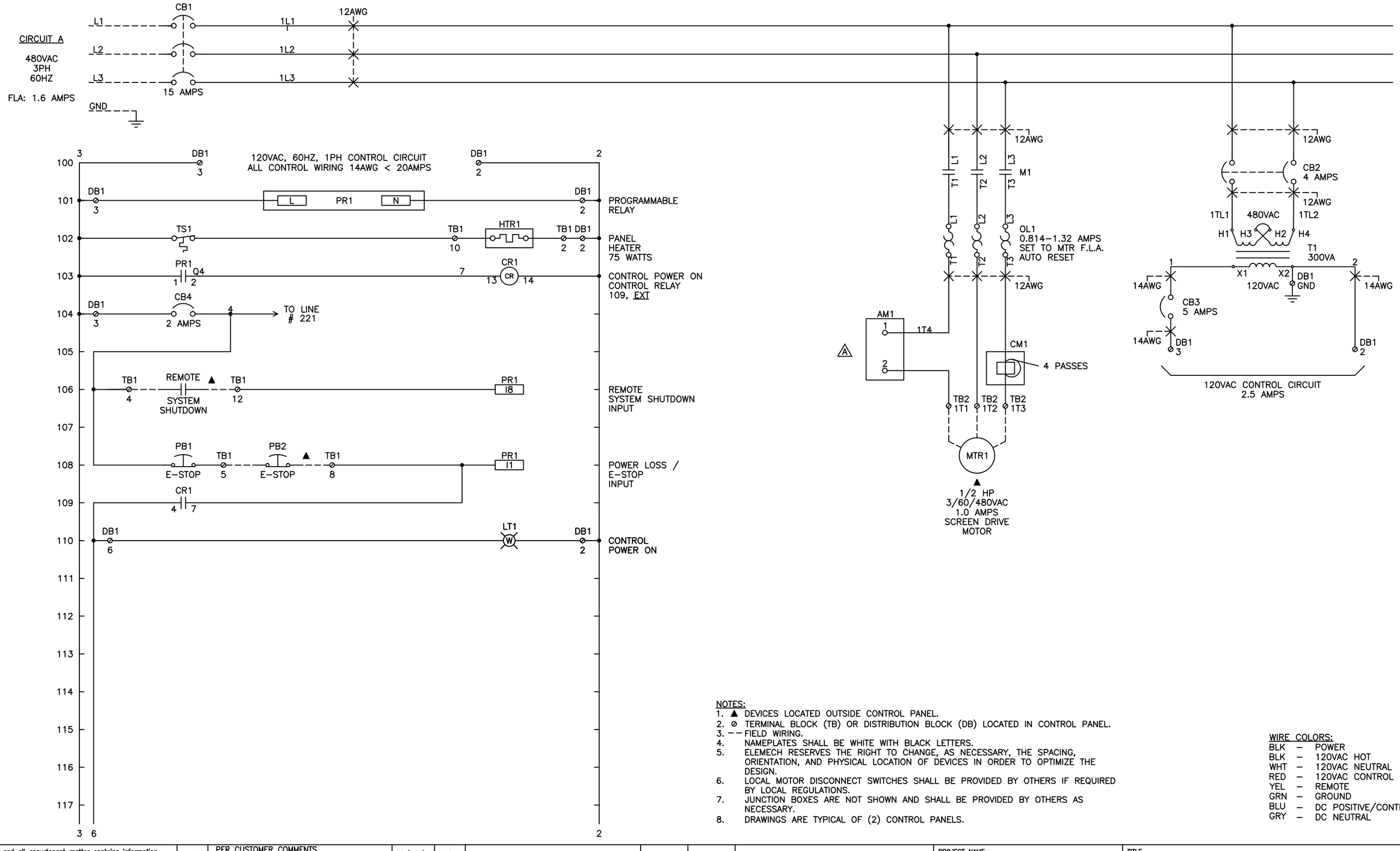
ELECTRICAL:

125 VAC
Maximum Electrical Load: 0.1 amps
Minimum Electrical Load: 0.160 milliamps

30 VDC
Maximum Electrical Load: 0.1 amps
Minimum Electrical Load: 0.160 milliamps

5 VDC
Minimum Electrical Load: 1 milliamps

Control Panel Drawings



NOTES:
1. ▲ DEVICES LOCATED OUTSIDE CONTROL PANEL.
2. ⊘ TERMINAL BLOCK (TB) OR DISTRIBUTION BLOCK (DB) LOCATED IN CONTROL PANEL.
3. – – FIELD WIRING.
4. NAMEPLATES SHALL BE WHITE WITH BLACK LETTERS.
5. ELEMECH RESERVES THE RIGHT TO CHANGE, AS NECESSARY, THE SPACING, ORIENTATION, AND PHYSICAL LOCATION OF DEVICES IN ORDER TO OPTIMIZE THE DESIGN.
6. LOCAL MOTOR DISCONNECT SWITCHES SHALL BE PROVIDED BY OTHERS IF REQUIRED BY LOCAL REGULATIONS.
7. JUNCTION BOXES ARE NOT SHOWN AND SHALL BE PROVIDED BY OTHERS AS NECESSARY.
8. DRAWINGS ARE TYPICAL OF (2) CONTROL PANELS.

WIRE COLORS:
BLK – POWER
BLK – 120VAC HOT
WHT – 120VAC NEUTRAL
RED – 120VAC CONTROL
YEL – REMOTE
GRN – GROUND
BLU – DC POSITIVE/CONTROL
GRY – DC NEUTRAL

REV	DESCRIPTION	DATE	BY
A	PER CUSTOMER COMMENTS	08/23/11	MSN

__PRELIMINARY X APPROVAL
__INFORMATION __CERTIFIED

THIS DRAWING IS LIMITED TO FUNCTIONAL DESIGN, GENERAL ARRANGEMENT AND CLEARANCE. NO RESPONSIBILITY IS ACCEPTED BY PARKSON CORPORATION FOR OTHER DIMENSIONS, QUANTITIES, OR COORDINATION WITH OTHER EQUIPMENT OR DRAWINGS EXCEPT AS STATED IN PURCHASE ORDER.

DRAWN BY	MSN
DATE	06/21/11
CHECKED BY	ALS
DATE	06/21/11
SCALE	NONE
SIZE	

Parkson™

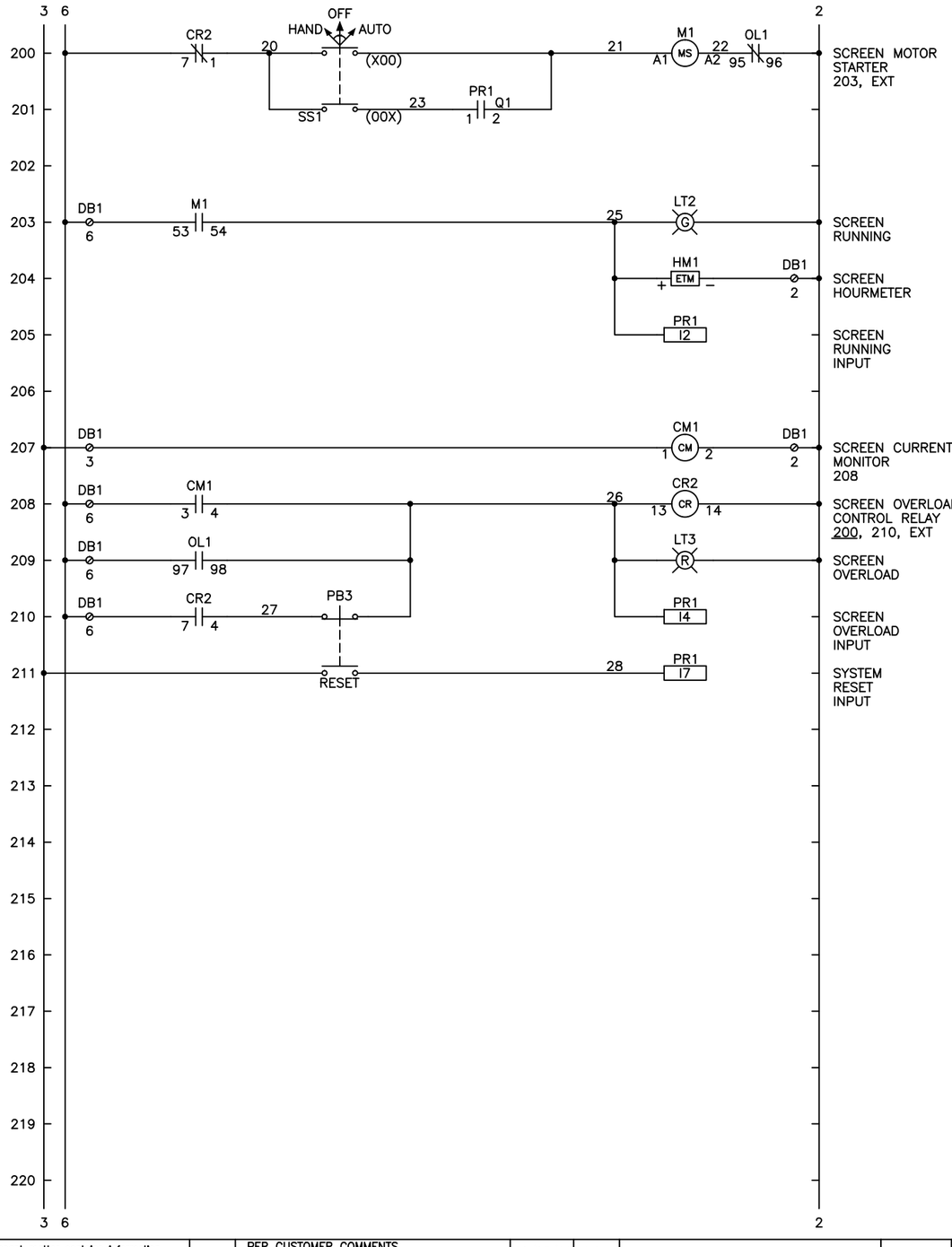
PROJECT NAME: PROJECT NUMBER 201196 FOUNTAIN, CO

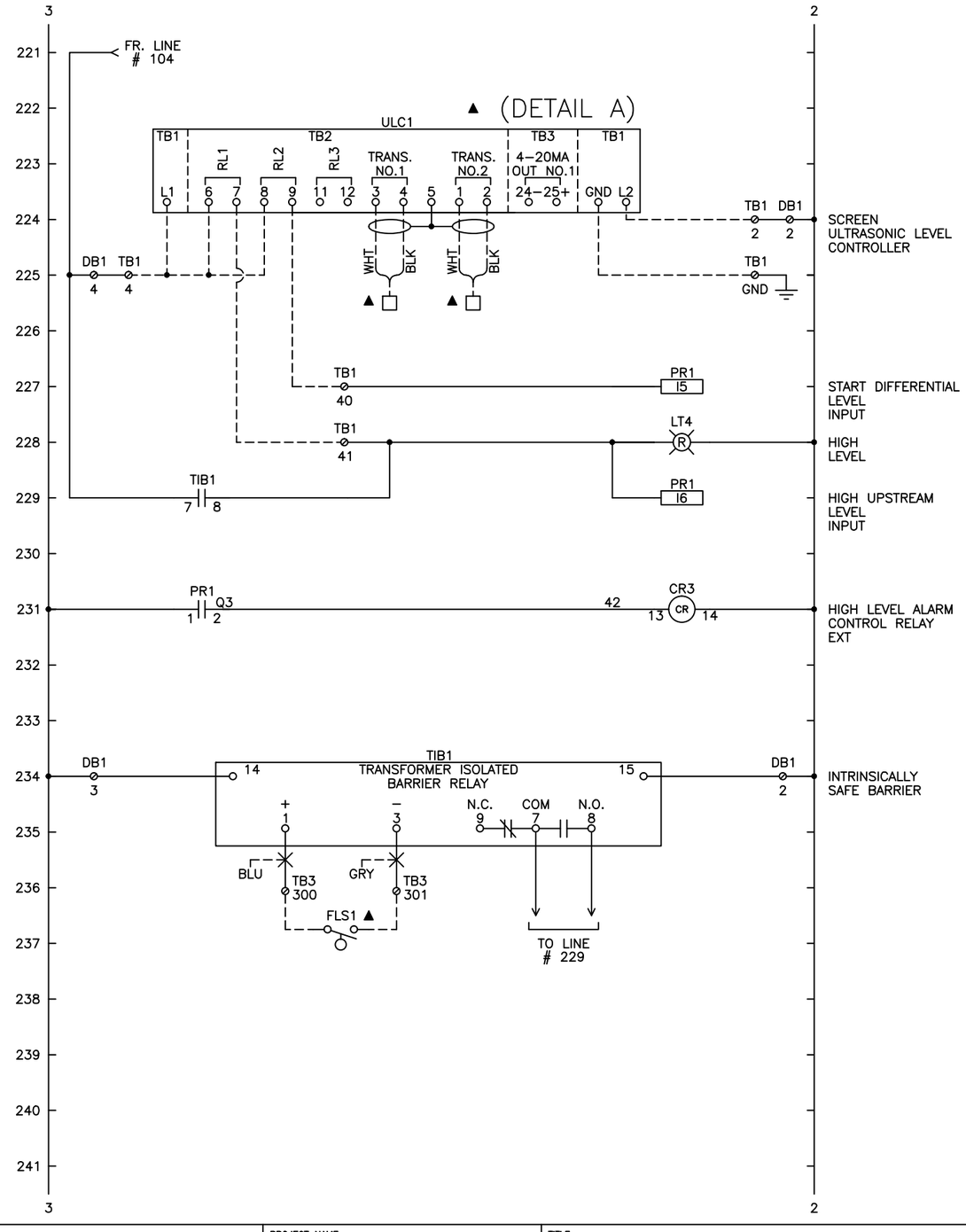
TITLE: AQUA GUARD CONTROL PANEL

REFERENCE INFORMATION: ELEMECH REF: PAR4732A1

DRAWING NO: 20119604/05 SHEET 1 OF 4

REV: A





REV	DESCRIPTION	DATE	BY
A	PER CUSTOMER COMMENTS	08/23/11	MSN

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DRAWN BY	MSN
DATE	06/21/11
CHECKED BY	ALS
DATE	06/21/11
SCALE	NONE
SIZE	

Parkson™

PROJECT NAME
PROJECT NUMBER 201196
FOUNTAIN, CO

TITLE
AQUA GUARD
CONTROL PANEL

REFERENCE INFORMATION
ELEMECH REF: PAR4732A2

DRAWING NO
20119604/05
SHEET 2 OF 4

REV
A

SEQUENCE OF OPERATION

CONTROL POWER ON–DELAY:
EACH TIME THE CONTROL PANEL POWER SUPPLY IS CYCLED, THE PROGRAMMABLE RELAY WILL ALLOW ALL SOLID STATE DEVICES TO BECOME FULLY ENERGIZED BEFORE ENABLING THE CONTROL POWER CIRCUIT.

SCREEN MODES OF OPERATION:
HAND: WHEN THE SCREEN SELECTOR IS IN THE HAND POSITION THE SCREEN WILL RUN CONTINUOUSLY.
A AUTO: WHEN THE SCREEN SELECTOR IS IN THE AUTO POSITION THE SCREEN WILL RUN DUE TO THE FOLLOWING CONDITIONS:

1. THE SCREEN WILL START TO RUN WHEN THE MATERIAL REACHES THE START DIFFERENTIAL LEVEL SETPOINT OF ULC1. THE UNIT WILL CONTINUE TO RUN AFTER THE LEVEL OF MATERIAL DROPS BELOW THE START LEVEL DIFFERENTIAL SETPOINT FOR A TIME DELAY SET IN THE PROGRAMMABLE RELAY.
2. THE SCREEN WILL CYCLE OFF AND ON, OFF TIME FIRST, PER THE SCREEN REPEAT CYCLE TIMERS IN THE PROGRAMMABLE RELAY.
3. THE SCREEN WILL RUN WHEN A HIGH UPSTREAM LEVEL ALARM IS SENSED, THE SCREEN WILL RUN CONTINUOUSLY.

NOTES:
- THE SCREEN REPEAT CYCLE OFF TIMER WILL RESET WHEN THE SCREEN RUNS IN HAND MODE OR IS CALLED TO RUN DUE TO A START DIFFERENTIAL LEVEL CONDITION.
- THE SCREEN REPEAT CYCLE OFF TIMER WILL NOT RESET WHEN THE SCREEN IS CALLED TO RUN DUE TO A HIGH UPSTREAM LEVEL CONDITION.

A HIGH UPSTREAM LEVEL ALARM:
WHEN THE UPSTREAM LEVEL REMAINS ABOVE THE HIGH UPSTREAM LEVEL SETPOINT OF ULC1 OR THE HIGH LEVEL FLOAT SWITCH FOR THE TIME SET IN THE HIGH LEVEL ON DELAY TIMER, THE HIGH LEVEL ALARM LIGHT WILL BE ILLUMINATED AND THE SCREEN WILL START TO RUN IN AUTO MODE.

EMERGENCY STOP:
WHEN ANY OF THE E–STOP PUSHBUTTONS ARE PRESSED, THE SCREEN WILL STOP IMMEDIATELY AND THE CONTROL POWER ON LIGHT WILL DE–ENERGIZE. TO RESET, ENSURE ALL E–STOPS ARE ENABLED, AND PRESS THE SYSTEM RESET PUSHBUTTON.

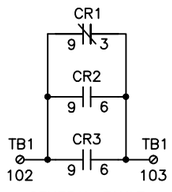
REMOTE SYSTEM SHUTDOWN:
WHEN THE REMOTE SYSTEM SHUTDOWN SIGNAL IS RECEIVED THE SCREEN WILL STOP IMMEDIATELY AND THE CONTROL POWER ON LIGHT WILL DE–ENERGIZE. THE SYSTEM WILL RESET WHEN THE REMOTE SYSTEM SHUTDOWN SIGNAL IS REMOVED. A MANUAL RESET WILL NOT BE REQUIRED.

FAULTS:
1. A FAULT OCCURS WHEN THE SCREEN CURRENT MONITOR IS TRIPPED.
2. A FAULT OCCURS WHEN THE SCREEN MOTOR THERMAL OVERLOAD IS TRIPPED.

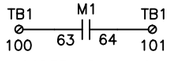
– WHEN FAULTS 1 OR 2 OCCUR, THE SCREEN WILL STOP IMMEDIATELY, AND THE SCREEN OVERLOAD LIGHT WILL BE ILLUMINATED.
– FAULTS 1 AND 2 CAN BE RESET BY PRESSING THE SYSTEM RESET PUSHBUTTON.

NOTE: THE GENERAL FAULT CONTACT WILL CLOSE DUE TO ANY OF THE FOLLOWING CONDITIONS:
- FAULTS 1 OR 2 OCCUR
- HIGH UPSTREAM LEVEL ALARM
- ANY OF THE E–STOP PUSHBUTTONS ARE PRESSED
- THE REMOTE SHUTDOWN SIGNAL IS RECEIVED.
- INPUT POWER IS LOST

CIRCUIT C



CIRCUIT B



SCREEN RUNNING

GENERAL FAULT

MAX. CONTROLLED LOAD: 10A @ 120VAC

NOTE: BRANCH CIRCUIT PROTECTION PROVIDED BY OTHERS PER N.E.C.

DEVICE SETTINGS

ULC1 – HYDRORANGER 200 W/DIFFERENTIAL LEVEL CONTROL A

FUNCTION NUMBER		FUNCTION DESCRIPTION	DEFAULT	FACTORY SETTING
P000		LOCK	1954	
P001		OPERATION	3	4
P002		MATERIAL	1	
P003	01	MEASUREMENT RESPONSE	2	3
	02	MEASUREMENT RESPONSE	2	3
P004	01	TRANSDUCER	0	100
	02	TRANSDUCER	0	100
P005		UNITS	1	5
P006	01	EMPTY	26.2	*
	02	EMPTY	26.2	*
P007	01	SPAN	26.2	*
	02	SPAN	26.2	*
P060	01	DECIMAL POSITION	2	
	02	DECIMAL POSITION	2	
P070		FAIL SAFE TIMER	10.0 MIN	0.5 MIN
P071	01	FAIL SAFE LEVEL	HOLD	HI
	02	FAIL SAFE LEVEL	HOLD	LO
P100		RELAY CONFIGURATIONS	0	0
P110	01	RELAY 1 LEVEL SOURCE	1	3
	02	RELAY 2 LEVEL SOURCE	0	1
P111	01	RELAY 1 FUNCTION	0	1
	02	RELAY 2 FUNCTION	0	1
P112	01	RELAY 1 ON SETPOINT	0	*
	02	RELAY 2 ON SETPOINT	0	*
P113	01	RELAY 1 OFF SETPOINT	0	*
	02	RELAY 2 OFF SETPOINT	0	*
P118	01	RELAY 1 LOGIC TYPE	2	3
	02	RELAY 2 LOGIC TYPE	2	3
P129	01	RELAY 1 RELAY FAILSAFE	OFF	DE
	02	RELAY 2 RELAY FAILSAFE	OFF	DE

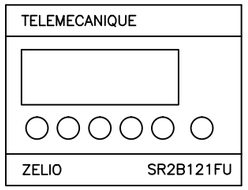
NOTES:
1. FACTORY SETTING '*' NOTES PARAMETERS SET IN THE FIELD.
2. THE ABOVE IS A PARTIAL LISTING OF SETPOINTS. REFER TO THE INSTRUCTION MANUAL FOR A COMPLETE PARAMETER LISTING.
3. ULC RELAYS WILL NOT CHANGE STATE ON POWER–UP WHEN P118 IS SET TO 3.

TIB1

DIP SWITCH	SET AT
S1	I
S2	I
S3	II

DEVICE SETTINGS

PR1 – I/O



PR INPUTS

I1	POWER LOSS/ E–STOP
I2	SCREEN RUNNING
I3	SPARE
I4	SCREEN OVERLOAD
I5	START DIFF. LEVEL
I6	HIGH LEVEL
I7	SYSTEM RESET
I8	REMOTE SYSTEM SHUTDOWN

PR OUTPUTS

Q1	SCREEN CALL TO RUN
Q2	SPARE
Q3	HIGH LEVEL ALARM
Q4	CONTROL POWER ENABLE

PR1 – SETTINGS

BIT REF.	DESCRIPTION	TIMER RESOLUTION	FACTORY SETTINGS
TT1–t	SCREEN LEVEL OFF DELAY TIMER	MIN:SEC	00:30
TT2–t	SCREEN REPEAT CYCLE OFF TIME	HR:MIN	01:00
TT3–t	SCREEN REPEAT CYCLE ON TIME	MIN:SEC	00:30
TT4–t	SCREEN HIGH LEVEL ON DELAY TIMER	MIN:SEC	00:30

NOTES:
1. ABOVE IS A LISTING OF ALL THE FIELD SELECTABLE SETTINGS IN THE CONTROLLER.

PR1 – SETPOINT CHANGE INSTRUCTIONS

TO ALTER THE VALUE OF A TIMER OR COUNTER:

1. PRESS THE GREEN "MENU/OK", PRESS ARROW DOWN TO "PARAMETER". PRESS "MENU/OK"
2. TO ACCESS THE REQUIRED TIMER PRESS THE "UP" ARROW KEY UNTIL THE DESIRED TIMER IS DISPLAYED.
3. PRESS THE "RIGHT" ARROW UNTIL TIME VALUE FLASHES.
4. MODIFY THE TIME VALUE USING THE "UP" OR "DOWN" ARROW KEYS.
5. VALIDATE THE CHANGES BY PRESSING THE "MENU/OK", PRESS "MENU/OK" AGAIN WHEN ASKED TO CONFIRM CHANGES.
6. PRESS "MENU/OK" TO RETURN TO MAIN SCREEN.

CM1 – CURRENT MONITOR

DIAL	SETTING
TRIP POINT	MIN
TRIP DELAY	MIN

NOTES:
1. THE CURRENT MONITOR DIAL SHALL BE SET TO MINIMUM FROM THE FACTORY.
2. FIELD CONFIGURATION SHALL BE PERFORMED BY THE STARTUP TECHNICIAN PER THE APPROPRIATE TECHNICAL DOCUMENT.

HTR1

HEATER ON/OFF	40 °F

REV	DESCRIPTION	DATE	BY
A	PER CUSTOMER COMMENTS	08/23/11	MSN

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DRAWN BY	DATE
MSN	06/21/11
CHECKED BY	DATE
ALS	06/21/11
SCALE	SIZE
NONE	

Parkson

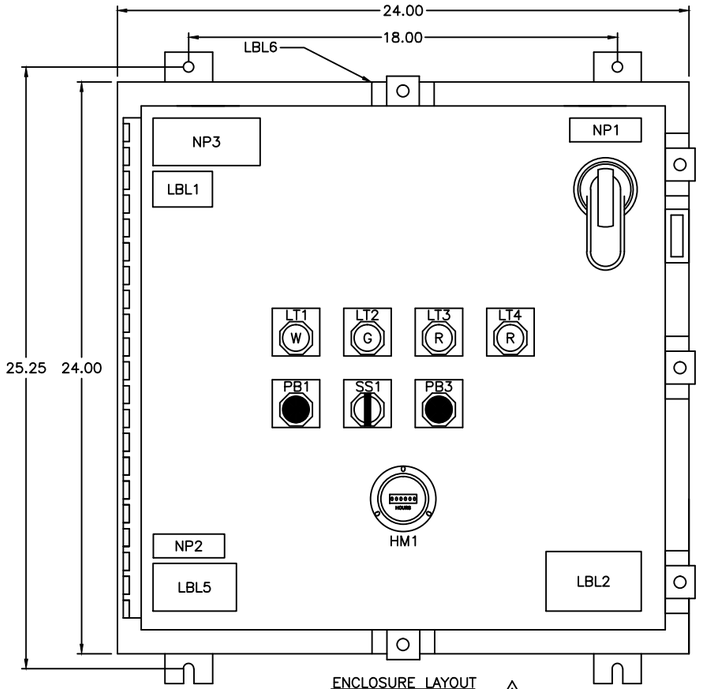
PROJECT NAME
PROJECT NUMBER 201196
FOUNTAIN, CO

TITLE
AQUA GUARD
CONTROL PANEL

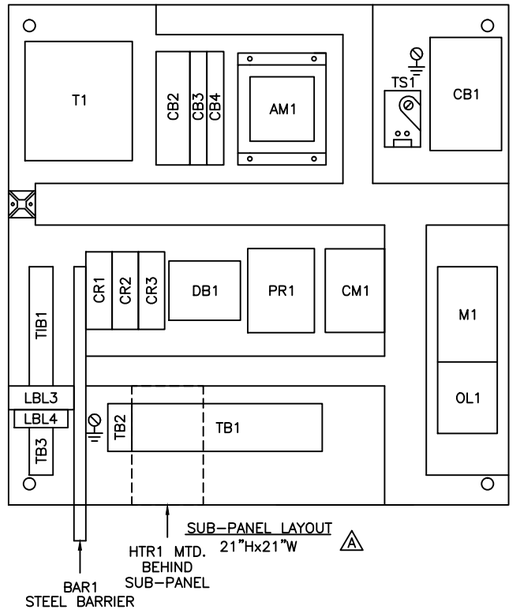
REFERENCE INFORMATION
ELEMECH REF: PAR4732A3

DRAWING NO
20119604/05
SHEET 3 OF 4

REV
A

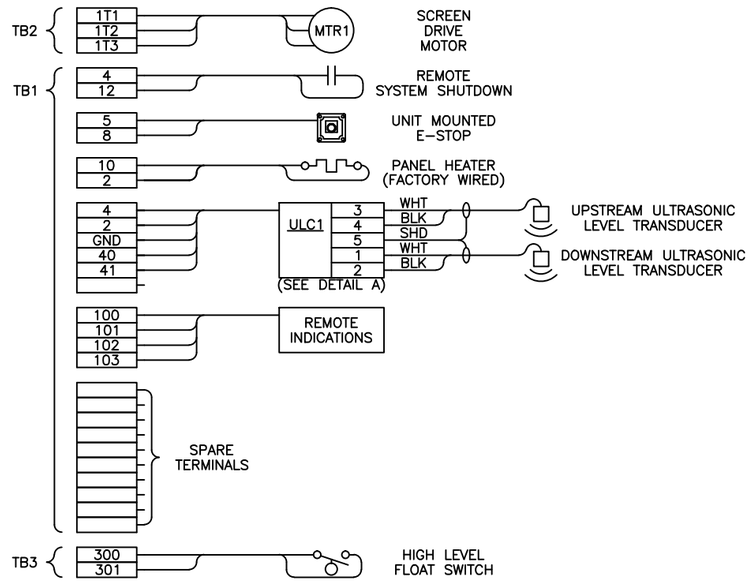


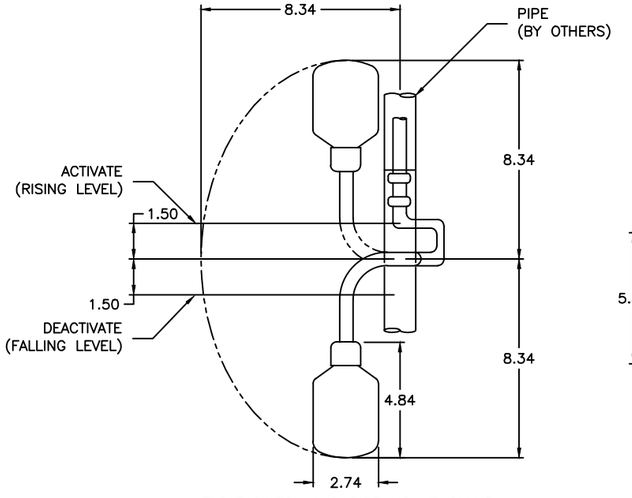
ENCLOSURE LAYOUT
24"Hx24"Wx8"D
NEMA 4 PAINTED STEEL



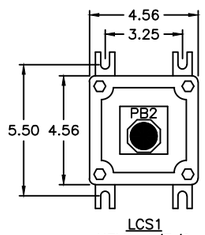
SUB-PANEL LAYOUT
21"Hx21"W

FIELD WIRING DIAGRAM

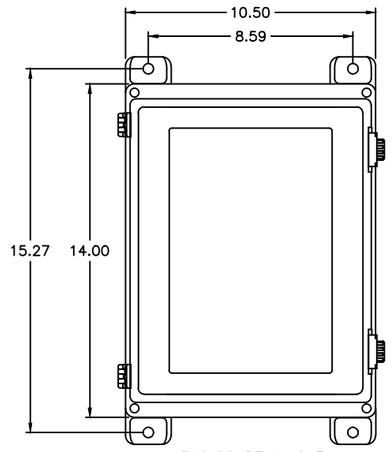




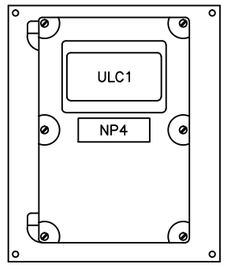
FLOAT SWITCH AND PIPE MOUNT CLAMP
POLYPROPYLENE CASING
N.O. MERCURY-FREE SWITCH
W/100' WATER RESISTANT CPE JACKET TYPE SJOW CABLE



LCS1
NEMA 4/7/9
LOCAL CONTROL STATION
PUSHBUTTON LOCKABLE
IN DEPRESSED POSITION

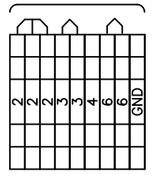


ENCLOSURE LAYOUT
14"Hx10.5"Wx7"D
NEMA 4X FIBERGLASS
10.28"Hx6.84"W WINDOW



SUB-PANEL LAYOUT
10.75"Hx8.88"W

DB1 DETAIL



PILOT DEVICE LEGEND PLATES:
LT1 – CONTROL POWER ON
LT2 – SCREEN RUNNING
LT3 – SCREEN OVERLOAD
LT4 – HIGH LEVEL
PB1 – EMERGENCY STOP
PB2 – EMERGENCY STOP
PB3 – SYSTEM RESET
SS1 – SCREEN HAND-OFF-AUTO

NAMEPLATES:
NP1 – 480VAC-3PH-60HZ
NP2 – INTRINSICALLY SAFE CIRCUITS
NP3 – CONTROL PANEL PROVIDES INTRINSICALLY SAFE CIRCUIT EXTENSIONS FOR USE IN CLASS I, GROUPS A, B, C, D; CLASS II, GROUPS E, F, G; CLASS III HAZARDOUS LOCATIONS WHEN CONNECTED PER PEPPERL & FUCHS INSTALLATION DRAWING NO. 116-0145
NP4 – ULTRASONIC LEVEL CONTROLLER

LABEL DESCRIPTION:
LBL1 – WARNING: MULTIPLE SUPPLY SOURCES OPEN ALL DISCONNECTS BEFORE SERVICING EQUIPMENT OR OTHER UNIT WIRING.
LBL2 – DANGER HIGH VOLTAGE ENTRY BY QUALIFIED PERSON ONLY
LBL3 – WARNING SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFTY
LBL4 – INTRINSICALLY SAFE FIELD WIRING TERMINALS
LBL5 – ELEMECH ELECTRICAL CONTROL SYSTEMS
LBL6 – NOTICE:
– PENETRATIONS TO CONTROL CABINETS MUST BE FITTED WITH TYPE 4 FITTINGS, MYERS BRAND OR EQUAL
– ALL INTERIOR DEVICES MUST BE PROTECTED FROM INSTALLATION DEBRIS
–FAILURE TO ADHERE TO INSTRUCTIONS WILL VOID WARRANTY

REV	DESCRIPTION	DATE	BY
A	PER CUSTOMER COMMENTS	08/23/11	MSN

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__INFORMATION __CERTIFIED

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DRAWN BY: MSN	DATE: 06/21/11
CHECKED BY: ALS	DATE: 06/21/11
SCALE: NONE	SIZE:

Parkson

PROJECT NAME: PROJECT NUMBER 201196 FOUNTAIN, CO

REFERENCE INFORMATION: ELEMECH REF: PAR4732A4

TITLE: AQUA GUARD CONTROL PANEL

DRAWING NO: 20119604/05 SHEET 4 OF 4

REV: A

Equipment Bill of Materials

Material List

Pos.	Item	Rev	Drawing/Spec	Dwg Size	Description	Mat'l	Qty	Unit
Date : 09-02-11 [14:45]					Mat'l LIST Page: 1			
Parkson Live Data								
					Project : 201196 Lower Fountain MSDD			
					E-Item : 20119601 2AGMNA75/4,2.5X9,3mm			
					(2) AQUA GUARD SCREEN			
					W/ CONTROLS			
					E-Item Revision: 0 INITIAL RELEASE			
					Drawing/Spec Reference: 20119601A.DWG			
10	20119602	0	20119602-.DWG	B	MAIN ASSY #1,AGMNA75,304,RH	304	1	ea
					MODEL: MN			
					FRAME STYLE: A			
					ANGLE: 75			
					MACHINE WIDTH "A": 2'-4 1/2"			
					DISCHARGE HEIGHT: 9'			
					ELEMENT SIZE: 3mm			
					DRIVE SIDE: RIGHT HAND			
					1) STAMP NAMEPLATE WITH THE FOLLOWING INFORMATION IN 3/16" HIGH LETTERS:			
					(PRODUCT) AQUAGUARD			
					(MODEL) AGMNA75,2.5X9,3			
					(SERIAL) 20119602			
					(1ST BLANK LINE) PROJECT 201196			
					(2ND BLANK LINE) SC-1			
					2) MOUNT DRIVE ASSY TO UPSTREAM HOLES IN UPPER FRAME.			
20	20119603	0	20119602-.DWG	B	MAIN ASSY #2,AGMNA75,304,RH	304	1	ea
					MODEL: MN			

Date : 09-02-11 [14:45]			Mat'l LIST		Page: 2			
Parkson Live Data								
E-Item : 20119601	2AGMNA75/4,2.5X9,3mm							
Pos.	Item	Rev	Drawing/Spec	Dwg Size	Description	Mat'l	Qty	Unit
					FRAME STYLE: A			
					ANGLE: 75			
					MACHINE WIDTH "A": 2'-4 1/2"			
					DISCHARGE HEIGHT: 9'			
					ELEMENT SIZE: 3mm			
					DRIVE SIDE: RIGHT HAND			
					1) STAMP NAMEPLATE WITH THE FOLLOWING INFORMATION IN 3/16" HIGH LETTERS:			
					(PRODUCT) AQUAGUARD			
					(MODEL) AGMNA75,2.5X9,3			
					(SERIAL) 20119603			
					(1ST BLANK LINE) PROJECT 201196			
					(2ND BLANK LINE) SC-2			
					2) MOUNT DRIVE ASSY TO UPSTREAM HOLES IN UPPER FRAME.			
30	20119606	0	5078-121-002-.DW	B	SUBASSY,SUPPORT LEG	304	4	ea
					MODEL: MN			
					FRAME STYLE: A			
					BOX STYLE LEG			
40	1006030	1			Rod,Threaded,3/4-10x10 3/4,316	316	16	ea
50	0000691	0			Washer,Flat,3/4,316	316	16	ea
60	0000793	0			Nut,Hex,3/4-10,316	316	16	ea
70	5159-132-001/A6	A	5159-132-001A.DW	B	SUBASSY,SWITCH,FLOAT,MOUNTING	A6	2	ea
80	0006565	0			Stud Anchor,HILTI#00238487,316	316	12	ea
90	1000731	0	1A-6042-07C.dwg		Gasket,AquaGuard,Neoprene	Neopr	2	ea

Date : 09-02-11 [14:45]			Mat'l LIST		Page: 3			
Parkson Live Data								
E-Item : 20119601	2AGMNA75/4,2.5X9,3mm							
Pos.	Item	Rev	Drawing/Spec	Dwg Size	Description	Mat'l	Qty	Unit
					DIM A=33.25			
					DIM B=28.25			
					DIM C=3			
					DIM D=10.375			
					DIM E=31.125			
					DIM F=10			
100	0000115	0			Bolt,Hex,3/8-16x1 1/4,316	316	20	ea
110	0000690	0			Washer,Flat,3/8,316	316	20	ea
120	20119614	0	2952-001-004-.DW	B	ANGLE,FLANGE,DISCHARGE	304	2	ea
130	1107-346-004/6	0	1107-346-004.DWG		PLATE,MOUNTING,LEVEL SENSOR	316	4	ea
140	3540-019/P	0	3540-019-.DWG	A	ADAPTOR,FEMALE,2 FNPTX2 SOC	Plastic	8	ea
150	0002649	5	A00591A.DWG	B	SERVICE FIXTURE SET	A-36 C	2	set
					Set consists of one (1) AS part and			
					one (1) OH part.			
160	20119604	0	20119604-.DWG	B	CONTROL PANEL #1	304	1	ea
170	20119605	0	20119605-.DWG	B	CONTROL PANEL #2	304	1	ea
180	20119699	0			SPARE PARTS		1	ea
					NOTE:			
					1. Pack the spare parts in a wooden box; label with manufacturer's			
					name and local representative's name, addres, and telephone			
					number; and attach list of Mat'ls conatained therein.			

Equipment Drawings

NOTE:

1. SCREEN SPEED 6 FPM.
   UNIT WEIGHT: 2236 LBS. EACH

2. OVERLOAD PROTECTION – SSAC CURRENT MONITOR.

3. 2'–6" CLEARANCE REQUIRED ON ONE SIDE OF MACHINE TO DISASSEMBLE SCREEN. USE SERVICE FIXTURE (ITEM #150) TO HOLD SCREEN IN PLACE WHEN DISASSEMBLING.

△A 4. MOUNT LEVEL SENSORS TO SUIT. LEVEL SENSORS SUPPLIED WITH CONTROL PANEL. 1" NOMINAL PIPE SUPPLIED BY OTHERS THAN PARKSON. ULTRASONIC LEVEL SENSORS TO BE MOUNTED IN THE CHANNEL AS HIGH AS POSSIBLE W/O INTERFERING WITH GRATING PANELS. USE PLAN DWG. HW–16, SECTION E FOR GENERAL POSITIONS.

5. ITEMS 130 THROUGH 180 ARE NOT SHOWN. SEE MATERIAL LIST FOR DESCRIPTION AND QUANTITY OF ALL NUMBERED ITEMS.

6. PROVIDE INTERCONNECTING WIRING TO ALLOW PIVOTING OF MACHINE (BY OTHERS THAN PARKSON).

7. MINIMUM DISTANCE REQUIRED TO PIVOT MACHINE OUT OF CHANNEL. FLOORING, AND CONNECTING CHUTE MUST BE REMOVED TO ALLOW PIVOTING OF MACHINE OUT OF CHANNEL (BY OTHERS THAN PARKSON).

8. CONTRACTOR TO FIELD VERIFY ALL DIMENSIONS PRIOR TO INSTALLATION.

9. LOCAL CONTROL STATION SHIPPED LOOSE WITH CONTROL STATION. CUSTOMER TO MOUNT IN THE FIELD TO AN APPROPRIATE LOCATION.

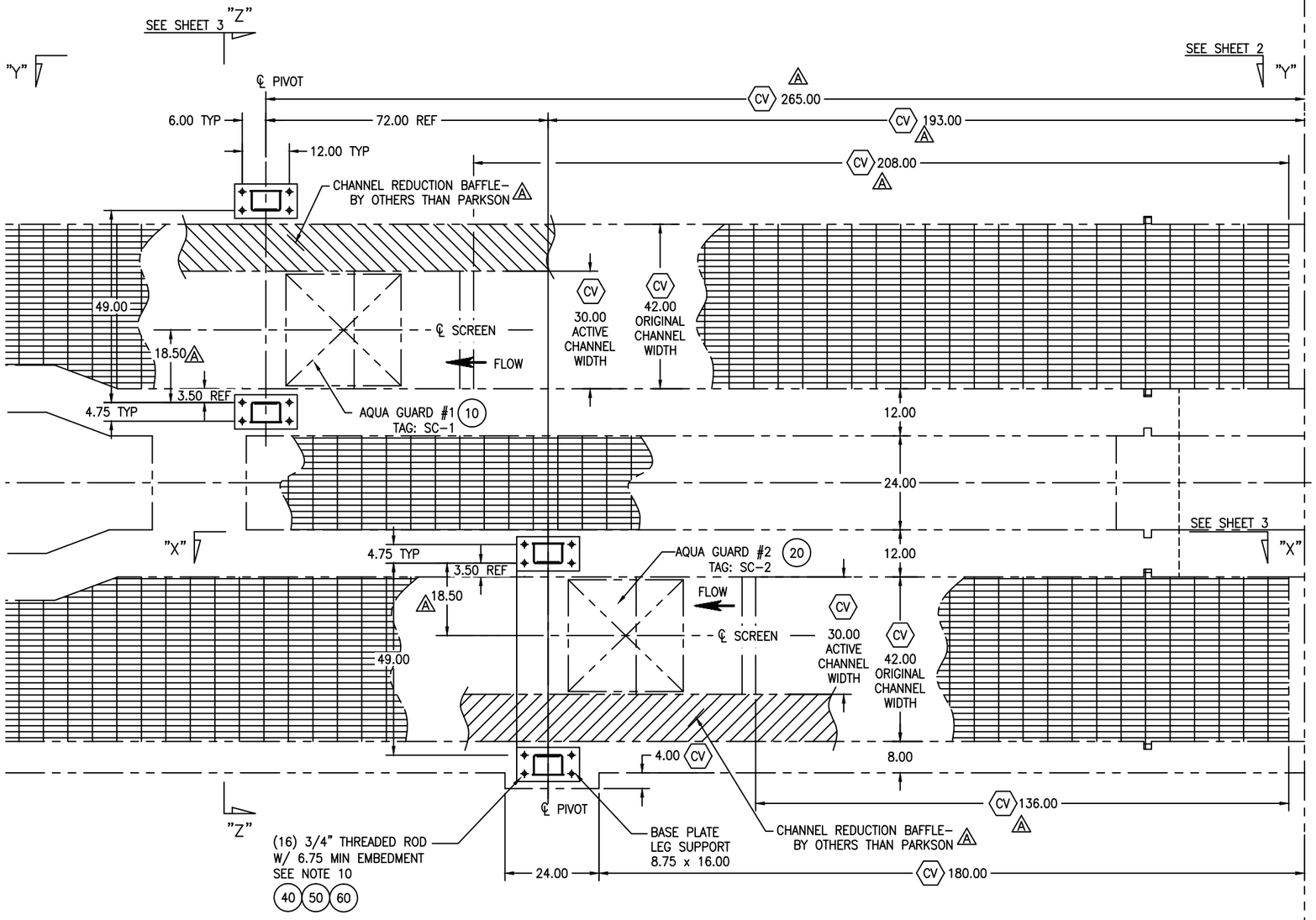
10. MINIMUM EMBEDMENT DEPTHS SHOWN ON ANCHOR DETAIL (SHEET 1) IS FOR USE WITH HILTI HY–150MAX ADHESIVE SYSTEM (EPOXY BY OTHERS).

11. UNIT IS SUPPORTED AT THE OPERATING ELEVATION AND AT THE UNIT'S BASE. UNIT BASE PLATE SHALL REST FLUSH TO THE BOTTOM OF THE CHANNEL OVER THE WIDTH AND DEPTH OF THE FRAME. GROUT UNDER FRAME AND SUPPORT LEG AT THE OPERATING ELEVATION AS REQUIRED.

12. REFERENCE INFORMATION

AQUA GUARD #1 (SC–1)	P/N 20119602
AQUA GUARD #2 (SC–2)	P/N 20119603
CONTROL PANEL #1	P/N 20119604
CONTROL PANEL #2	P/N 20119605

(CV) CONTRACTOR TO VERIFY DIMENSION FOR APPROVAL.



PLAN VIEW

REV	DESCRIPTION	DATE	BY
A	REVISED PER CUSTOMER COMMENTS	8/31/11	ADR

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DRAWN BY: RSS	DATE: 06/16/11
CHECKED BY: ADR	DATE: 06/23/11
SCALE: 3/8"=1'	SIZE: B

Parkson

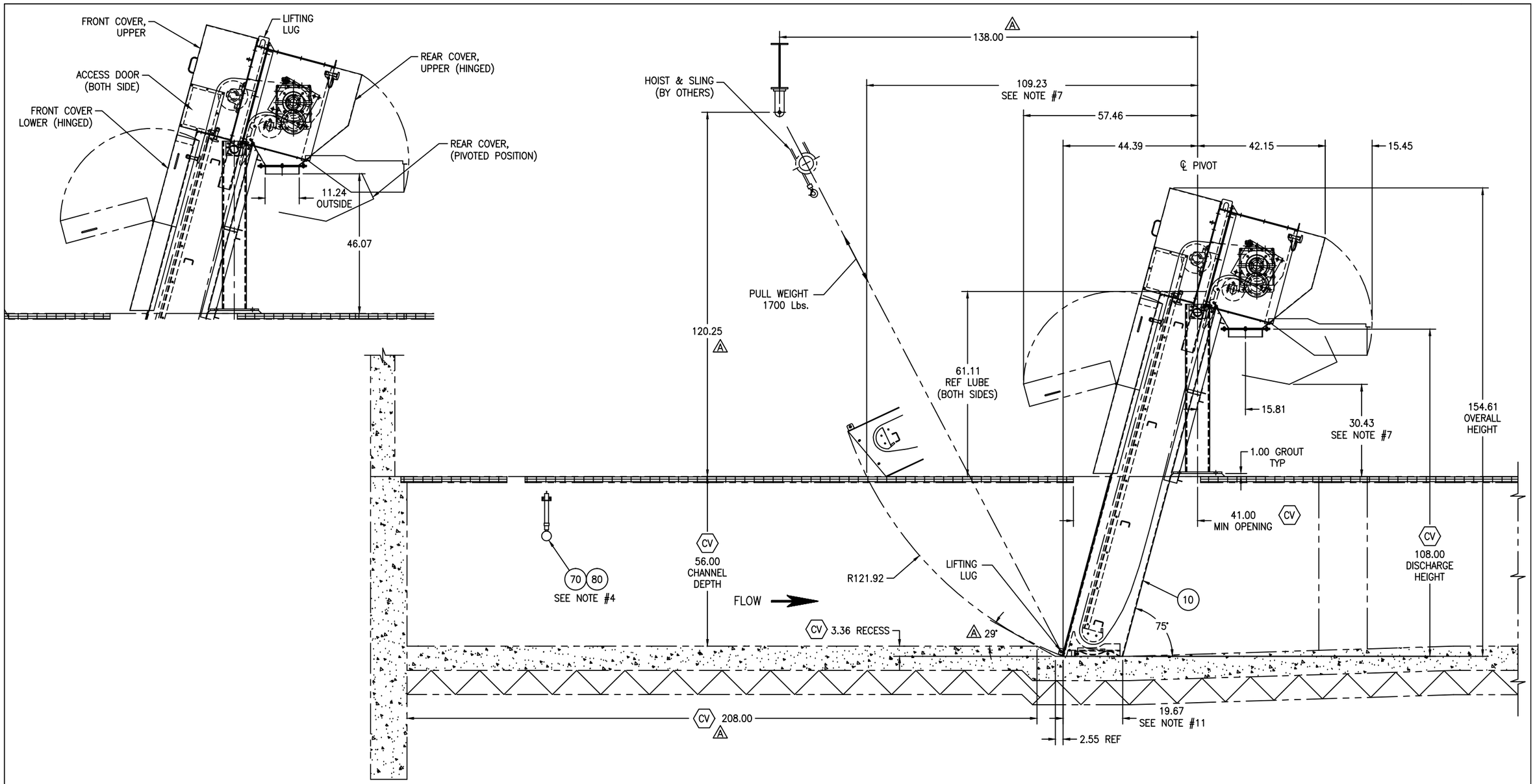
PROJECT NAME
PROJECT NUMBER 201196
HAROLD D. THOMPSON REGIONAL WATER RECLAMATION FACILITY
FOUNTAIN, CO

REFERENCE INFORMATION
SPECIFICATION SECTION: 11331
SEE NOTE #12

TITLE
AQUA GUARD® SCREEN
GENERAL ARRANGEMENT
AG–MN–A 75°, 2.5'(W) X 9'(DH), 3mm

DRAWING NO: 20119601 SHEET 1 OF 3

REV: A



AQUA GUARD #1
SECTION Y–Y
DRIVE SIDE SHOWN

REV	DESCRIPTION	DATE	BY
A	REVISED PER CUSTOMER COMMENTS	8/31/11	ADR

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DRAWN BY	DATE
RSS	06/16/11
CHECKED BY	DATE
ADR	06/23/11
SCALE	SIZE
3/8"=1'	B

Parkson™

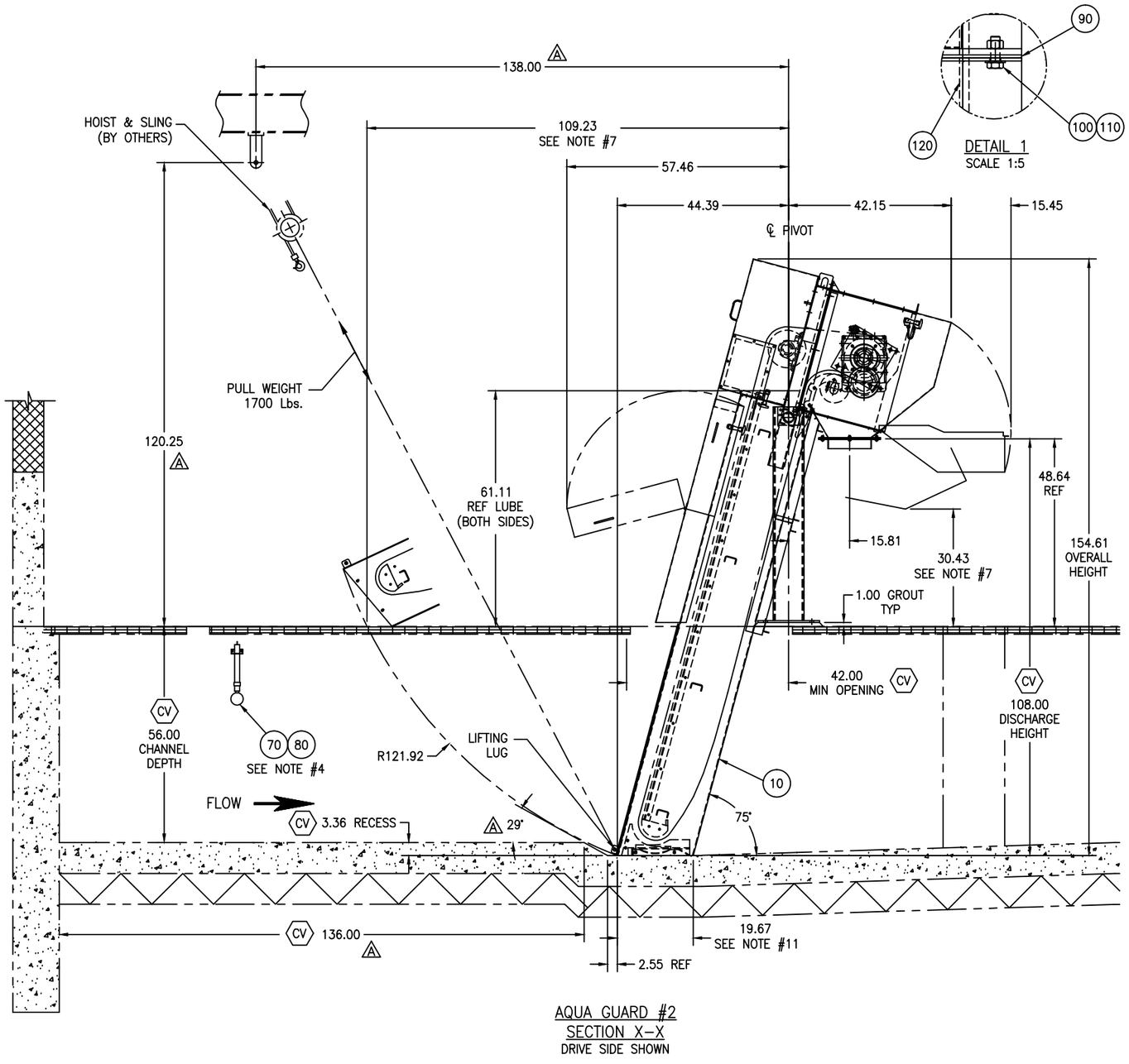
PROJECT NAME
PROJECT NUMBER 201196
HAROLD D. THOMPSON REGIONAL WATER RECLAMATION FACILITY
FOUNTAIN, CO

REFERENCE INFORMATION
SPECIFICATION SECTION: 11331
SEE NOTE #12

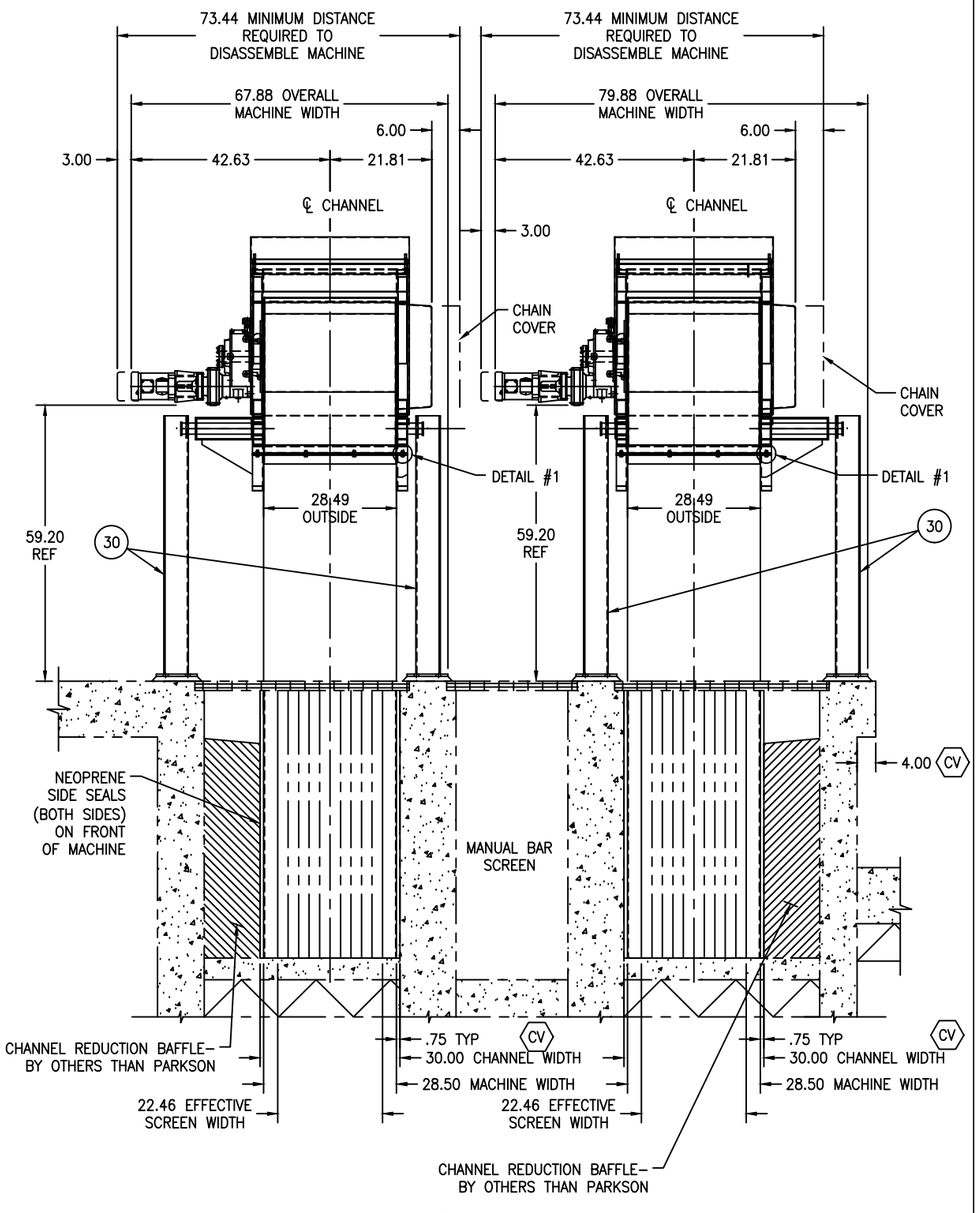
TITLE
AQUA GUARD® SCREEN
GENERAL ARRANGEMENT
AG–MN–A 75°, 2.5'(W) X 9'(DH), 3mm

DRAWING NO
20119601
SHEET 2 OF 3

REV
A



AQUA GUARD #2
SECTION X–X
DRIVE SIDE SHOWN



SECTION Z–Z
REAR ELEVATION

REV	DESCRIPTION	DATE	BY
A	REVISED PER CUSTOMER COMMENTS	8/31/11	ADR

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DRAWN BY	DATE
RSS	06/16/11
CHECKED BY	DATE
ADR	06/23/11
SCALE	SIZE
3/8"=1'	B

Parkson™

PROJECT NAME
PROJECT NUMBER 201196
HAROLD D. THOMPSON REGIONAL
WATER RECLAMATION FACILITY
FOUNTAIN, CO

REFERENCE INFORMATION
SPECIFICATION SECTION: 11331
SEE NOTE #12

TITLE
AQUA GUARD® SCREEN
GENERAL ARRANGEMENT
AG–MN–A 75°, 2.5'(W) X 9'(DH), 3mm

DRAWING NO
20119601
SHEET 3 OF 3

REV
A