



**SCHOOL CAPITAL PROJECT COMMITTEE  
WATERTOWN, CT  
SPECIAL MEETING AGENDA  
WEDNESDAY, JUNE 15, 2026**

**WATERTOWN TOWN HALL  
TOWN COUNCIL  
CHAMBERS  
7:00 P.M.  
61 ECHO LAKE RD.  
WATERTOWN, CT 06795**

1. Call Meeting to Order.
2. Pledge of Allegiance.
3. Roll Call
4. Minutes.
  - a. Special Meeting – May 27, 2026
5. New Business

- a. Discussion and possible action on project invoices to be authorized.

	Vendor	Invoice Number	Dates	Amount Due
1.	Colliers Project Leaders	0001182291	05/31/2026	\$1,715.59
2.	Tucker Mechanical	Application #001	06/30/2026	\$203,585.00

6. Update from Colliers regarding John Trumbull Primary School HVAC Project.
7. Old Business
8. Adjournment



**SCHOOL CAPITAL PROJECT COMMITTEE  
WATERTOWN, CT  
SPECIAL MEETING  
WEDNESDAY, MAY 27, 2026  
MINUTES**

**WATERTOWN TOWN HALL  
TOWN COUNCIL  
CHAMBERS  
7:00 P.M.  
61 ECHO LAKE RD.  
WATERTOWN, CT 06795**

1. Call Meeting to Order.  
Chairman Robert Porter called the meeting to order at 7:00 p.m.

2. Pledge of Allegiance.  
Chairman Robert Porter led the pledge of allegiance.

3. Roll Call  
Robert Porter, Chairman  
Anthony Ciriello  
Jeffrey Desmarais  
Jeffrey Franson  
Tadd Johnson  
Thomas Walsh (phone)  
  
Luigi Velardi, BOE Facilities

Absent: Mark Guerrero, Jim Lehner, Brian Mays, Lisa Fekete, Mary Ann Rosa, Donna Ford

4. Minutes.

a. Special Meeting – March 25, 2026

Motion: Jeffrey Desmarais seconded by Anthony Ciriello to accept the March 25, 2026 meeting minutes as presented.

Aye: 5 Porter, Ciriello, Desmarais, Johnson, Walsh

Nay : 0

Abstain : 1 Franson

Motion passes

5. New Business

a. Discussion and possible action on project invoices to be authorized.

	Vendor	Invoice Number	Dates	Amount Due
1.	Colliers Project Leaders	0001162207	03/31/2026	\$1,804.40
2.	The Imperial Company Restoration Contractor, Inc.	Application #19	02/13/2026	\$24,176.67
3.	The Imperial Company Restoration Contractor, Inc.	Application #20	02/28/2026	\$220,034.85
4.	Colliers Project Leaders	0001172399	04/30/2026	\$1,498.65

1.

Jeffrey Fransoon stated with this payment it shows there is support for construction?

Chairman Bob Porter answered it discussed what is going to be done and when it is going to be done.

Luigi Velardi added work schedule and time lines.

Chairman Robert Porter stated it is going to start June 16<sup>th</sup>.

Motion: Jeffrey Franson seconded by Jeffrey Desmarais to pay Colliers Project Leaders, Invoice #0001162207 in the amount of \$1,804.40.

Motion passed unanimously

2.

Chairman Robert Porter stated it is signed by the architect.

Anthony Ciriello stated I want to note on the record that this contractor does them for changes orders and there are plus and minus with the change order with credits and it is signed off by the architect.

Motion: Jeffrey Desmarais seconded by Anthony Ciriello to pay Imperial Company Restoration Contractor, Inc., Application #19 dated 2/13/2026 in the amount of \$24,176.67.

Motion passed unanimously

3.

Jeffrey Franson stated the only question I have for this invoice is under number 7 you have discussion and possible action on a change order. They have already embedded that into Application #20. I would like to discuss #7 before we approve application #20. The question what is \$14,093, is that because the project ran late which isn't our issue?

Luigi Velardi added the project ran a little late, from my understanding the change order increased the value of the project from 4.1 to 4.3, so their bonding had to increase.

Jeffrey Franson stated also the bonding is an element of dollars at times. I just want ensure that it is not timed, because the time element is on them not us.

Anthony Ciriello stated I am comfortable with moving on items and discussing that and to come back.

Motion: Jeffrey Franson seconded by Anthony Ciriello to table item 3.

Discussion: none.

Motion passed unanimously

Tabled until after discussion with line item #7

Motion: Jeffrey Desmarais seconded by Anthony Ciriello to pay Imperial Company, Application #20 dated 2/28/2026 in the amount of \$220,034.85.

Anthony Ciriello stated this is the last meeting with the history cleared and this includes all their retainage. The final payment of the original contract. This one includes 218 and change for retainage I wanted to make a note that we are at the point where the retainage is on the project.

Motion passed unanimously

Jeffrey Franson asked do you have what the actual is vs what we budgeted?

Luigi Velardi answered I do, we are under, I can give the numbers for the next meeting or send out an email, I have them in my office.

4.

Motion: Jeff Franson seconded by Jeffrey Desmarais to approve Colliers Project Leaders, Invoice #0001172399 in the amount of \$1,498.65.

Discussion: none.

Motion passed unanimously

6. Update from ICDS regarding John Trumbull Primary School HVAC Project.

Chairman Robert Porter stated it is in the packet. Any questions from the items they listed?

Anthony Ciriello stated #4 on Scott's list, anticipated issues, there are improvements to location of outdoor units?

Luigi Velardi answered they came in and walked the school and found a solution to better our efficiency of the unit. Everything got approved except for the dampers I believe they are working on that. I spoke to him on Friday and he is going to work with Scott on a few minor details to wrap that up. They are ready, they have 80% of the equipment at their shop. They are going to start two to three weeks before school starts and they will come in at night and off hours.

Anthony Ciriello asked do you know if there is any sign off on the relocation of the units?

Luigi Velardi answered I do not think so yet, it has got to be submitted.

7. Discussion and possible action on approving Change Order regarding Consent of Surety to final payment increase in the amount of \$1,493.00.

Jeffrey Franson stated there is some handwriting I can't read, there is a contract bond, I am looking for clarification. From my experiences bonds that I have been responsible for have a dollar and time element to it, it shows the old rate and the new rate.

Jeffrey Desmarais stated it is whether or not a time delay was their issue.

Chairman Robert Porter answered they are saying it's a change order that increased the bond amount.

Luigi Velardi added the discussion I had with Roger and Tom, it is correct, that is for the increase for the bond.

Motion: Jeffrey Desmarais seconded by Anthony Ciriello to accept Change Order in the Amount of \$1,493.00.

Motion passed unanimously

8. Old Business- none.

9. Adjournment

Motion: Jeffrey Franson seconded by Jeffrey Desmarais to adjourn meeting at 7:18 p.m.

Motion passed unanimously

Respectfully submitted

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Robert Porter, Chairman  
Watertown Public Buildings Committee



**Project Leaders**

101 Crawfords Corner Road, Suite 3400  
Holmdel, NJ 07733  
732 383 1950

A Division of Colliers Engineering & Design

**Watertown CT Public Schools**  
Attn: Donna Ford  
61 Echo Lake Road  
Watertown, CT 06795

**Invoice :** 0001182291  
**Invoice Date :** 5/31/2026

**Project :** 25004856G  
**Project Manager:** Warrington, Jr., Chuck  
**Project Name :** OPM-John Trumbull ES HVAC Upgrades

**For Professional Services Rendered Through 5/31/2026**

Description of Services

May 2026

- Shop drawing review
- Building committee updates
- Coordination with contractor and design engineer

	Fee	Remaining Fee	% Complete	Billings		
				To Date	Previous	Current
Due Diligence	9,000.00	0.85	99.99	8,999.15	8,999.15	0.00
Design Phase	10,000.00	35.00	99.65	9,965.00	9,965.00	0.00
Construction Phase	39,000.00	26,591.56	31.82	12,408.44	10,692.85	1,715.59
Closeout Phase	5,000.00	5,000.00	0.00	0.00	0.00	0.00
Reimbursable Expenses	1,500.00	1,385.20	7.65	114.80	114.80	0.00
Subtotal:	64,500.00	33,012.61	48.82	31,487.39	29,771.80	1,715.59

<b>Current Billings</b>	<u>1,715.59</u>
<b>Amount Due This Bill</b>	<u>1,715.59</u>

Ford@watertownct.org;  
 feketeli@watertownps.org;  
 charles.warrington@collierseng.com;  
 scott.pellman@collierseng.com;  
 Sarah.Maston@collierseng.com;  
 Ravi.Chavan@collierseng.com;  
 Show mileage w/map

Outstanding Receivables	Invoice Number	Date	Amount	Balance Due
	0001162207	3/31/2026	1,804.40	1,804.40
	0001172399	4/30/2026	1,498.65	1,498.65

In accordance with our business terms and conditions, acceptance of this invoice is implied unless Colliers Project Leaders USA NE, LLC is notified by 14 days from the date of this invoice. If timely payment cannot be made due to any discrepancy, please E-mail a brief explanation to Billing@colliersengineering.com and we will reply as soon as possible.  
 EFT/ACH PAYMENT INFO: Colliers Engineering & Design, Inc. | JP Morgan Chase | Routing 021000021 | Account# 836759092

**REMIT TO: Colliers Project Leaders USA NE, LLC 101 Crawfords Corner Road, Suite 3400 | Holmdel, NJ 07733**  
**Phone: 877-627-3772 | Fax: 732-383-1980**

**PM05 - Construction Phase**

**Labor**

**Rate Labor**

<i>Class</i>	<i>Hours</i>	<i>Rate</i>	<i>Amount</i>
Administrative Support	8.00	135.2000	1,081.60
Associate Director	2.00	254.8000	509.60
Senior Project Manager	0.50	248.7700	124.39

**Total Rate Labor** **1,715.59**

**Total Labor** **1,715.59**

**Total Bill Task: PM05 - Construction Phase** **1,715.59**

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**Total Project: 25004856G - OPM-John Trumbull ES HVAC Upgrades** **1,715.59**

**APPLICATION AND CERTIFICATE FOR PAYMENT**

AIA DOCUMENT G702

TO: Town of Watertown  
61 Echo Lake Road  
Watertown, CT 06795

PROJECT: John Trumbull Indoor IAQ  
Hvac Upgrades

APPL. NO: 001  
PERIOD 'TO: 6/30/26  
PROJ. NO: 57001261

Distribution to:  
 OWNER

ARCHITECT  
 CONTRACTOR

FROM CONTRACTOR: TUCKER MECHANICAL  
795 Brook Street  
Rocky Hill, CT 06067

CONTRACT NO. 57001261

CONTRACT FOR: John Trumbull HVAC

**CONTRACTOR'S APPLICATION FOR PAYMENT**

Application is made for payment, as shown below, in connection with the Contract Continuation Sheet, AIA Document G703, is attached.

1. ORIGINAL CONTRACT SUM	\$ 1,398,845.00
2. Net change by Change Orders	\$ -
3. CONTRACT SUM TO DATE (Line 1 + 2)	\$ 1,398,845.00
4. TOTAL COMPLETED & STORED TO DATE (Column G on G703)	\$ 214,300.00
5. RETAINAGE:	
a. % of Completed Work	5.0%
b. % of Stored Material	
Total Retainage (Line 5a + 5b or Total in Column I of G703)	\$ 10,715.00
6. TOTAL EARNED LESS RETAINAGE (Line 4 less Line 5 Total)	\$ 1,184,540.00
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT (Line 6 from prior Certificate)	\$ -
8. CURRENT PAYMENT DUE	\$ 1,184,540.00
9. BALANCE TO FINISH, INCLUDING RETAINAGE (Line 3 less Line 6)	\$ 203,585.00

This undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that Current payment shown herein is now due.

CONTRACTOR: TUCKER MECHANICAL

By: *[Signature]* Date: 6/11/2026  
Justin Matthews - Finance Admin

State of: Connecticut  
County of: Hartford  
Subscribed and sworn to before me this 11th day of June 2026

*[Signature]*  
Notary Public:  
My Commission Expires December 31, 2028

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	-	-
Total approved this Month	-	-
<b>TOTALS</b>	-	-
Net CHANGES by Change Order	-	-

AMOUNT CERTIFIED BY ARCHITECT: \$ 203,585.00

(Attach explanation if amount certified differs from the amount applied for. Initial all figures on this Application and on the Continuation Sheet that are changed to conform to the amount certified.)

ARCHITECT: *[Signature]* Date: 06/11/2026

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

CONTINUATION SHEET		AIA DOCUMENT G703		PAGE 1				
AIA Document G702, APPLICATION AND CERTIFICATE FOR PAYMENT, containing Contractor's signed Certification, is attached. In tabulations below, amounts are stated to the nearest dollar. Use column 1 on Contracts where variable retainage for line items may apply.		APPLICATION NO: 001		APPLICATION DATE: 6/12/26				
		TUCKER MECHANICAL		PERIOD TO: 6/30/26				
		57001261		CONTRACT NO. 57001261				
A	B	C	D	E	F	G	H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED FROM PREV. APPLICATION (D + E)	THIS PERIOD (D + E)	MATERIALS PRESENTLY STORED (NOT IN P.O.R.E)	TOTAL COMPLETED AND STORED TO DATE (D + E + F)	Total % Complete (G/C)	RETAINAGE (IF VARIABLE RATE)
1	Procurement Submittals	\$ 12,500.00	-	3,500	-	3,500	28%	9,000
2	Mobilization Delivery	\$ 10,500.00	-	-	-	-	0%	10,500
3	Labor Demo	\$ 65,000.00	-	-	-	-	0%	65,000
4	Demo Materials and Dumpsters	\$ 10,500.00	-	-	-	-	0%	10,500
5	New Work Labor	\$ 86,450.00	-	-	-	-	0%	86,450
6	New Work Materials	\$ 84,500.00	-	-	-	-	0%	84,500
7	Trane VRF Equipment	\$ 256,900.00	-	-	204,000	204,000	79%	52,900
8	Subcontractors	\$ -	-	-	-	-	0%	-
9	Electrical	\$ 235,000.00	-	-	-	-	0%	235,000
10	Sheetmetal	\$ 168,000.00	-	-	-	-	0%	168,000
11	Carpentry and Concrete	\$ 105,200.00	-	-	-	-	0%	105,200
12	Temperature Controls Submittals Engineering	\$ 19,500.00	-	-	-	-	18%	16,000
13	Temp Controls Materials	\$ 121,895.00	-	3,500	-	3,500	0%	121,895
14	Temp Controls Installation	\$ 164,400.00	-	-	-	-	0%	164,400
15	TAB	\$ 14,500.00	-	-	-	-	0%	14,500
16	Commissioning	\$ 12,500.00	-	-	-	-	0%	12,500
17	Startup Reports	\$ 8,500.00	-	-	-	-	0%	8,500
18	Project Turn Over	\$ 4,500.00	-	-	-	-	0%	4,500
19	Permit State Fee	\$ 500.00	-	500	-	500	100%	-
20	Project Management	\$ 18,000.00	-	2,800	-	2,800	16%	15,200
21		\$ -	-	-	-	-	0%	-
22		\$ -	-	-	-	-	0%	-
23		\$ -	-	-	-	-	0%	-
24		\$ -	-	-	-	-	0%	-
25		\$ -	-	-	-	-	0%	-
26		\$ -	-	-	-	-	0%	-
27		\$ -	-	-	-	-	0%	-
28		\$ -	-	-	-	-	0%	-
29		\$ -	-	-	-	-	0%	-
<b>SUBTOTAL - PAGE 1</b>		<b>1,398,845</b>	<b>-</b>	<b>10,300</b>	<b>204,000</b>	<b>214,300</b>	<b>15%</b>	<b>1,184,545</b>
								<b>10,715</b>

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CONTINUATION SHEET										FINAL PAGE	
AIA Document G702, APPLICATION AND CERTIFICATE FOR PAYMENT, containing Contractor's signed Certification, is attached. In tabulations below, amounts are stated to the nearest dollar. Use column 1 on Contracts where variable retainage for line items may apply.										APPLICATION NO: 001	
TUCKER MECHANICAL										APPLICATION DATE: 6/12/26	
57001261										PERIOD TO: 6/30/26	
ARCHITECT'S PROJECT NO:											
A	B	C	D	E	F	G	H	I			
C/O NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED FROM PREV. APPLICATION (D + E)	WORK COMPLETED THIS PERIOD	MATERIALS PRESENTLY STORED (NOT IN P OR E)	TOTAL COMPLETED AND STORED TO DATE (D + E + F)	BALANCE TO FINISH (C - G)	RETAINAGE (IF VARIABLE RATE)			
<b>SUMMARY - TOTALS</b>											
	ORIGINAL CONTRACT	1,398,845.00	-	10,300.00	204,000.00	214,300.00	1,184,545.00	15%	10,715.00		
	CHANGE ORDERS	-	-	-	-	-	-	#DIV/0!	-		
<b>TOTALS</b>											
		1,398,845.00	-	10,300.00	204,000.00	214,300.00	1,184,545.00	15%	10,715.00		

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TUCKER MECHANICAL  
795 Brook Street  
Rocky Hill, CT 06067

INVOICE TO: Town of Watertown  
61 Echo Lake Road  
Watertown, CT 06795  
0

\*\*\*\*PLEASE REFERENCE INVOICE NUMBER ON CHECK REMITTANCE\*\*\*\*

PROJECT NAME: John Trumbull Indoor IAQ Hvac Upgrades

JOB NO.	CUST. ORDER NO.	TERMS	INVOICE NUMBER	INVOICE DATE
5.7E+07	57001261	NET 30	001	12-Jun-26

REQUISITION # 001

AMOUNT THIS REQUISITION 214,300.00

ORIGINAL CONTRACT SUM 1,398,845.00

NET CHANGE BY CHANGE ORDERS -

CONTRACT SUM TO DATE 1,398,845.00

TOTAL COMPLETED & STORED TO DATE 214,300.00

RETAINAGE 10,715.00

LESS PREVIOUS CERTIFICATES FOR PAYMENT -

CURRENT PAYMENT DUE 203,585.00

\*\*\*ALL APPLICABLE CT STATE SALES TAX INCLUDED\*\*\*



**TRANE**

Trane U.S. Inc.  
2313 S 20th Street  
La Crosse, WI 54601  
United States

# Invoice

Invoice Number **990498501**

For questions please contact:

Tel: 608-787-2450  
Email: Holly.Rach@tranetechnologies.com

**Remit Payment To**

Trane U.S. Inc.  
P. O. Box 406469  
ATLANTA, GA 30384-6469

Invoice Date	01-MAY-2026
Customer No.	693862
Reference No.	B241519
Internal Account	2575253
Payment Terms	.5%10 NET30
Payment Due Date	31-May-2026
Discount Date	11-May-2026

**Bill To**

TUCKER MECHANICAL  
795 BROOK STREET  
ROCKY HILL, CT 06067  
UNITED STATES

Customer Tax ID

Inco Terms	
Supply Location	Connecticut TCS SO, CT
Shipping Method	
Tracking No.	1203170Y0300677031
Freight Terms	Prepay & Add
Bill of Lading	81171134

**Sold To**

TUCKER MECHANICAL  
795 BROOK STREET  
ROCKY HILL, CT 06067  
UNITED STATES

**Ship To**

TUCKER MECHANICAL  
TUCKER MECHANICAL  
75 NEAL CT  
PLAINVILLE, CT 06062  
UNITED STATES

<https://www.tranetechnologies.com/customer>  
CERTifyTax - for submittal of tax exemption certificates.  
IReceiveables - access invoice copies, account balances & make payments.

1348349182

Tax/GST ID: 25-0900465	State Tax: 8.49 6.3500%	County Tax: 0.00 0.0000%	City Tax: 0.00 0.0000%	District Tax: 0.00 0.0000%
PST/QST ID:	CT			

Currency	Subtotal	Special Charges	Tax	Freight	Total
USD	133.75	0.00	8.49	0.00	142.24

**Special Instructions** John Trumbull Primary School HVAC IAQ

<b>Sales Order</b> B2V004	<b>Order Date</b>	<b>Ship Date</b> 01-MAY-2026	<b>Purchase Order</b> 57001261-0001
------------------------------	-------------------	---------------------------------	--

Line	Description.	Quantity	UOM	Unit Price	Extended Price
1	CMY-R160-J1: Joint Pipe Adapter Model Number: CMY-R160-J1 Tag Number: JV_ACC	1	EA		

05/06/2026

PO# \_\_\_\_\_ JOB/WO# 57001261-0001

TAXABLE? YES \_\_\_\_\_ NO X

DIV/GL \_\_\_\_\_ COST CODE \_\_\_\_\_

APPROVED 5/20/26 DATE Bm

*More invoices*

**Pay Within 30 days**

# TRANE



**TRANE**

Trane U.S. Inc.  
2313 S 20th Street  
La Crosse, WI 54601  
United States

# Invoice

Invoice Number **990502956**

For questions please contact:

Tel: 608-787-2450  
Email: Holly.Rach@tranetechnologies.com

**Remit Payment To**  
Trane U.S. Inc.  
P. O. Box 406469  
ATLANTA, GA 30384-6469

Invoice Date **06-MAY-2026**  
Customer No. **693862**  
Reference No. **B241519**  
Internal Account **2575253**  
Payment Terms **.5%10 NET30**  
Payment Due Date **05-Jun-2026**  
Discount Date **16-May-2026**

**Bill To**  
TUCKER MECHANICAL  
795 BROOK STREET  
ROCKY HILL, CT 06067  
UNITED STATES

Customer Tax ID

Inco Terms	
Supply Location	Connecticut TCS SO, CT
Shipping Method	
Tracking No.	962958813
Freight Terms	Prepay & Add
Bill of Lading	81171300

**Sold To**  
TUCKER MECHANICAL  
795 BROOK STREET  
ROCKY HILL, CT 06067  
UNITED STATES

**Ship To**

<https://www.tranetechnologies.com/customer>  
CERTifyTax - for submittal of tax exemption certificates.  
iReceivables - access invoice copies, account balances & make payments.

1346975700

Tax/GST ID: 25-0900465	State Tax: 0.00 0.0000%	County Tax: 0.00 0.0000%	City Tax: 0.00 0.0000%	District Tax: 0.00 0.0000%
PST/QST ID:	CT			

Currency	Subtotal	Special Charges	Tax	Freight	Total
USD	34390.33	0.00	0.00	0.00	34390.33

**Special Instructions** John Trumbull Primary School HVAC IAQ

Sales Order	Order Date	Ship Date	Purchase Order
B2V003		05-MAY-2026	57001261-0001

Line	Description.	Quantity	UOM	Unit Price	Extended Price
1	PAC-UKPRC001-CN-1: Model Number: PAC-UKPRC001-CN-1	31	EA		
2	SGX-1: Model Number: SGX-1	2	EA		
3	TURYE1684AMM0AN: VRF Outdoor Unit (JV_ODU) Model Number: TURYE1684AMM0AN Tag Number: OU-1a	1	EA		

05/06/2026

PO# \_\_\_\_\_ JOB/WO# 57001261-0001

TAXABLE? YES \_\_\_\_\_ NO X

DIV/GL \_\_\_\_\_ COST CODE \_\_\_\_\_

APPROVED Bm DATE 5/20/26

**Pay Within 30 days**

# TRANE



**TRANE**

Trane U.S. Inc.  
2313 S 20th Street  
La Crosse, WI 54601  
United States

# Invoice

For questions please contact:

Tel: 608-787-2450  
Email: Holly.Rach@tranetechnologies.com

**Remit Payment To**

Trane U.S. Inc.  
P. O. Box 406469  
ATLANTA, GA 30384-6469

Invoice Number **990507945**

Invoice Date **08-MAY-2026**  
Customer No. **693862**  
Reference No. **B241519**  
Internal Account **2575253**  
Payment Terms **.5%10 NET30**  
Payment Due Date **07-Jun-2026**  
Discount Date **18-May-2026**

**Bill To**

TUCKER MECHANICAL  
795 BROOK STREET  
ROCKY HILL, CT 06067  
UNITED STATES

Customer Tax ID

Inco Terms	
Supply Location	Connecticut TCS SO, CT
Shipping Method	
Tracking No.	552571001
Freight Terms	Prepay & Add
Bill of Lading	81171302

**Sold To**

TUCKER MECHANICAL  
795 BROOK STREET  
ROCKY HILL, CT 06067  
UNITED STATES

**Ship To**

<https://www.tranetechnologies.com/customer>  
CERTifyTax - for submittal of tax exemption certificates.  
iReceivables - access invoice copies, account balances & make payments.

1351535113

Tax/GST ID: 25-0900465	State Tax: 0.00 0.0000%	County Tax: 0.00 0.0000%	City Tax: 0.00 0.0000%	District Tax: 0.00 0.0000%
PST/QST ID:	CT			

Currency	Subtotal	Special Charges	Tax	Freight	Total
USD	142198.75	0.00	0.00	0.00	142198.75

**Special Instructions** John Trumbull Primary School HVAC IAQ

Sales Order	Order Date	Ship Date	Purchase Order
B2V003		08-MAY-2026	57001261-0001

Line	Description.	Quantity	UOM	Unit Price	Extended Price
1	TURYE1924AMM0AN: VRF Outdoor Unit (JV_ODU) Model Number: TURYE1924AMM0AN Tag Number: OU-1b	1	EA		
2	TPMFYP012CM1M0A: Model Number: TPMFYP012CM1M0A	4	EA		
3	TPVFYP018AM1M0A: Model Number: TPVFYP018AM1M0A	2	EA		
4	CMB-M1012NU-MA-SV: Model Number: CMB-M1012NU-MA-SV	2	EA		
5	PAC-LV60AC-1: Model Number: PAC-LV60AC-1	1	EA		
6	TE-C400A: Model Number: TE-C400A	2	EA		
7	TPVFYP036AM1M0A: Model Number: TPVFYP036AM1M0A	14	EA		
8	PAC-LV48AC-1: Model Number: PAC-LV48AC-1	1	EA		
9	CMY-R300NCBK: Model Number: CMY-R300NCBK	2	EA		
10	CMY-Y102SS-G2R1: Model Number: CMY-Y102SS-G2R1	13	EA		
11	TLP-449W-U1: Model Number: TLP-449W-U1	13	EA		
12	BV388BSI: Model Number: BV388BSI	24	EA		
13	BV588BSI: Model Number: BV588BSI	24	EA		
14	TPMFYP008CM1M0A: Model Number: TPMFYP008CM1M0A	5	EA		
15	TPMFYP006CM1M0A: Model Number: TPMFYP006CM1M0A	4	EA		
16	TURYE1924AMM0AN: VRF Outdoor Unit (JV_ODU)	1	EA		

# TRANE



**TRANE**

Trane U.S. Inc.  
2313 S 20th Street  
La Crosse, WI 54601  
United States

# Invoice

Invoice Number **990507945**

Line	Description.	Quantity	UOM	Unit Price	Extended Price
	Model Number: TURVE1924AMM0AN				

*Trumbell school*

05/09/2026

PO# \_\_\_\_\_ JOB/WO# 57001261-0001

TAXABLE? YES \_\_\_\_\_ NO X

DIV/GL \_\_\_\_\_ COST CODE \_\_\_\_\_

APPROVED BM DATE 5/20/26

**Pay Within 30 days**

TRANE



**TRANE**

Trane U.S. Inc.  
2313 S 20th Street  
La Crosse, WI 54601  
United States

# Invoice

Invoice Number **990510370**

For questions please contact:

Tel: 608-787-2450  
Email: Holly.Rach@tranetechnologies.com

**Remit Payment To**

Trane U.S. Inc.  
P. O. Box 406469  
ATLANTA, GA 30384-6469

Invoice Date	12-MAY-2026
Customer No.	693862
Reference No.	B241519
Internal Account	2575253
Payment Terms	.5%10 NET30
Payment Due Date	11-Jun-2026
Discount Date	22-May-2026

**Bill To**

TUCKER MECHANICAL  
795 BROOK STREET  
ROCKY HILL, CT 06067  
UNITED STATES

Customer Tax ID

Inco Terms	
Supply Location	Connecticut TCS SO, CT
Shipping Method	
Tracking No.	962956724
Freight Terms	Prepay & Add
Bill of Lading	81174639

**Sold To**

TUCKER MECHANICAL  
795 BROOK STREET  
ROCKY HILL, CT 06067  
UNITED STATES

**Ship To**

<https://www.tranetechnologies.com/customer>  
CERTifyTax - for submittal of tax exemption certificates.  
iReceivables - access Invoice copies, account balances & make payments.

135266282

Tax/GST ID: 25-0900465	State Tax: 0.00 0.0000%	County Tax: 0.00 0.0000%	City Tax: 0.00 0.0000%	District Tax: 0.00 0.0000%
PST/QST ID:	CT			

Currency	Subtotal	Special Charges	Tax	Freight	Total
USD	2359.00	0.00	0.00	0.00	2359.00

Special Instructions John Trumbull Primary School HVAC IAQ

Sales Order	Order Date	Ship Date	Purchase Order
B2V003		11-MAY-2026	57001261-0001

Line	Description.	Quantity	UOM	Unit Price	Extended Price
1	SHX-1: Model Number: SHX-1	4	EA		
2	SGX-2: Model Number: SGX-2	4	EA		

05/12/2026

*John Trumbull project*

PO# \_\_\_\_\_ JOB/WO# 57001261-0001

TAXABLE? YES \_\_\_\_\_ NO X

DIV/GL \_\_\_\_\_ COST CODE \_\_\_\_\_

APPROVED BWR DATE 6/2/20

**Pay Within 30 days**

TRANE



**TRANE**

Trane U.S. Inc.  
2313 S 20th Street  
La Crosse, WI 54601  
United States

# Invoice

Invoice Number **990512680**

For questions please contact:

Tel: 608-787-2450  
Email: Holly.Rach@tranetechnologies.com

**Remit Payment To**

Trane U.S. Inc.  
P. O. Box 406469  
ATLANTA, GA 30384-6469

Invoice Date	13-MAY-2026
Customer No.	693862
Reference No.	B241519
Internal Account	2575253
Payment Terms	.5%10 NET30
Payment Due Date	12-Jun-2026
Discount Date	23-May-2026

**Bill To**

TUCKER MECHANICAL  
795 BROOK STREET  
ROCKY HILL, CT 06067  
UNITED STATES

Customer Tax ID

Inco Terms	
Supply Location	Connecticut TCS SO, CT
Shipping Method	
Tracking No.	962952174
Freight Terms	Prepay & Add
Bill of Lading	81173737

**Sold To**

TUCKER MECHANICAL  
795 BROOK STREET  
ROCKY HILL, CT 06067  
UNITED STATES

**Ship To**

TUCKER MECHANICAL  
TUCKER MECHANICAL  
75 NEAL CT  
PLAINVILLE, CT 06062  
UNITED STATES

<https://www.tranetechnologies.com/customer>

CERTifyTax - for submittal of tax exemption certificates.

IReceiptables - access invoice copies, account balances & make payments.

1353044079

Tax/GST ID: 25-0900465	State Tax: 0.00 0.0000%	County Tax: 0.00 0.0000%	City Tax: 0.00 0.0000%	District Tax: 0.00 0.0000%
PST/QST ID:	CT			

Currency	Subtotal	Special Charges	Tax	Freight	Total
USD	22872.23	0.00	0.00	0.00	22872.23

**Special Instructions** John Trumbull Primary School HVAC IAQ

Sales Order		Order Date	Ship Date	Purchase Order		
B2V003			12-MAY-2026	57001261-0001		
Line	Description.	Quantity	UOM	Unit Price	Extended Price	
1	TURYE1684AMM0AN: VRF Outdoor Unit (JV_ODU) Model Number: TURYE1684AMM0AN	1	EA			

*Trumbull*

05/14/2026

PO# \_\_\_\_\_ JOB/WO# 57001261-0001

TAXABLE? YES \_\_\_\_\_ NO X

DIV/GL \_\_\_\_\_ COST CODE \_\_\_\_\_

APPROVED BW DATE 6/2/26

TRANE



**TRANE**

Trane U.S. Inc.  
2313 S 20th Street  
La Crosse, WI 54601  
United States

# Invoice

Invoice Number **990516035**

For questions please contact:

Tel: 608-787-2450  
Email: Holly.Rach@tranetechnologies.com

**Remit Payment To**

Trane U.S. Inc.  
P. O. Box 406469  
ATLANTA, GA 30384-6469

Invoice Date	15-MAY-2026
Customer No.	693862
Reference No.	B241519
Internal Account	2575253
Payment Terms	.5%10 NET30
Payment Due Date	14-Jun-2026
Discount Date	25-May-2026

**Bill To**

TUCKER MECHANICAL  
795 BROOK STREET  
ROCKY HILL, CT 06067  
UNITED STATES

Customer Tax ID

Inco Terms	
Supply Location	Connecticut TCS SO, CT
Shipping Method	
Tracking No.	1ZY820200364222800
Freight Terms	Prepay & Add
Bill of Lading	81179173

**Sold To**

TUCKER MECHANICAL  
795 BROOK STREET  
ROCKY HILL, CT 06067  
UNITED STATES

**Ship To**

<https://www.tranetechnologies.com/customer>

CERTifyTax - for submittal of tax exemption certificates.  
IREceivables - access invoice copies, account balances & make payments.

1354659359

Tax/GST ID: 25-0900465	State Tax: 0.00 0.0000%	County Tax: 0.00 0.0000%	City Tax: 0.00 0.0000%	District Tax: 0.00 0.0000%
PST/QST ID:	CT			

Currency	Subtotal	Special Charges	Tax	Freight	Total
USD	1832.06	0.00	0.00	0.00	1832.06

**Special Instructions** John Trumbull Primary School HVAC IAQ

Sales Order	Order Date	Ship Date	Purchase Order
B2V003		15-MAY-2026	57001261-0001

Line	Description.	Quantity	UOM	Unit Price	Extended Price
1	PAC-AH002: Model Number: PAC-AH002	1	EA		
2	PAC-AH002: Model Number: PAC-AH002	1	EA		

05/18/2026 *Waterdown*

PO# \_\_\_\_\_ JOB/WO# 57001261-0001

TAXABLE? YES \_\_\_\_\_ NO X

DIV/GL \_\_\_\_\_ COST CODE \_\_\_\_\_

APPROVED BW DATE 6/2/26

**Pay Within 30 days**

# TRANE

## Watertown John Trumbull Primary School HVAC project

May 2026 update

The following is a compilation of the information provided by the design and construction team prior to the May Meeting updated as of May 19, 2026.

**From:** Scott D. Fitch <sfitch@icdsllc.com>

**Sent:** Wednesday, May 13, 2026, 3:55 PM

**Subject:** RE: Building committee meeting

1. Regarding shop drawings; All items have been approved except for control dampers.
  - a. Dampers grills and Diffusers approved on 5-14-26 (attached)
  - b. The VFDs for the exhaust fans approved on 5-18-26 (attached)
2. The VFR equipment has been ordered; status of delivery and schedule will be provided by Brian Mohyde from Tucker Mechanical.

Anticipated issues...None; however, Tucker has offered some improvements related to location of the outdoor units that we are in the middle of coordinating (i.e. he is getting me actual locations on plans to review). This is to limit the amount of refrigerant and to improve overall performance.

**From:** Brian Mohyde <bmohyde@emcor.net>

**Sent:** Thursday, May 14, 2026, 3:02 PM

**Subject:** RE: Building committee meeting

1. Attached is our 3-week start schedule, (this schedule was also included in the meeting packet)
2. VRF equipment is arriving and we have 40% in our possession.
3. Scott Fitch will receive my proposed location change for the condensing units this Monday 18<sup>th</sup>

Attached:

- Updated submittal log
- Damper and grill shop drawing
- VFD shop drawing
- Contractors' 3-week schedule starting in June.

**SUBMITTAL LOG**  
**JOHN TRUMBULL PRIMARY SCHOOL HVAC IAQ UPGRADES (#153-001 HVACN)**  
 SUBMITTAL / REVIEW DATES

APPROVALS

SUBMITTAL DATA

Submittal No.	Description	Specification	Equipment Submittals	Shop Drawings	Operations and Maintenance Data	Warranty	Other	Submittal Date	Revision	Date Received by A/E	Date Returned	Approved as Submitted	Approved as Noted	Partial Approval	Not Approved	Remarks
1	Trane VRF Package	23 81 29	x	x				4/8/2026	0	4/8/2026	4/13/2026		x			
2	Trane Hot Water Coils Revision	23 82 19	x					4/8/2026	0	4/8/2026	4/13/2026				x	
3	Cook Exhaust Fan and Drives Revision	23 34 23	x					4/8/2026	0	5/11/2026	5/11/2026		x			Rev. 1 rescinded
4	Dampers, Grilles, and Diffusers Revision	23 37 00	x					4/16/2026	1	4/16/2026	4/13/2026			x		Fan Approved (VFDs not approved); mSK-1 issued for Rev 1 Submittal
5	Trane VRF Package - AHU-3 & 6	23 81 29	x					4/8/2026	1	5/13/2026	4/13/2026		x			
6	Exhaust Fan VFDs (Yaskawa)	26 29 11	x					4/15/2026	0	4/15/2026	4/17/2026		x			
								5/18/2026	0	5/18/2026	5/18/2026		x			This supersedes Submittal 3 VFDs



10 White Wood Lane  
N. Branford, CT 06471  
P: (203) 453-8596  
E: info@icdsllc.com

## SUBMITTAL REVIEW SHEET

*Innovative Construction & Design Solutions, LLC*

Project: John Trumbull Primary School HVAC IAQ Upgrades  
Project No: #153-001 HVACN  
Submittal No.: #004  
Revision: 1  
Subject: Dampers, Grilles & Diffusers

- APPROVED: FURNISH AS SUBMITTED
- APPROVED: FURNISH AS NOTED/CORRECTED
- DISAPPROVED: REVISE AND RESUBMIT
- DISAPPROVED: REJECTED

*Corrections or comments made on the shop drawings during this review do not relieve the Contractor from compliance with requirements of the contract drawings and specifications. This check is only for review of the general conformance with the design concept of the project and general compliance with the information given in the contract documents.*

*The Contractor is responsible for: Confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating his or her work with that of all other trades; and performing all work in a safe and satisfactory manner.*

Date: May 14, 2026

By: Scott D. Fitch, P.E.

### COMMENTS:

Approved. Ensure the BAS contractor knows the Belimo actuators are being provided by the damper supplier.



**SUBMITTAL COVER SHEET**

Architect / Engineer Approval Stamp

**John Trumbull School Watertown Ct**  
61 Echo Lake Rd  
Watertown Ct 06795

**General Contractor:**  
Tucker Mechanical  
795 Brook St  
Rocky Hill Ct 06067

**ARCHITECT:**

**ENGINEER:**  
Innovative Construction and Design  
10 White Wood Lane  
North Branford Ct 06471

**SUBMITTED ITEM:**

**Dampers, Grilles and Diffusers**

**MANUFACTURER:**  
Various

**SUPPLIER:**  
VCM Melia Associates

**SPECIFICATION SECTION:**  
**23 37 00**

**DRAWING NUMBER:**

**SUBMITTAL NUMBER:**  
**4 rev 1**

**SUBMITTAL DATE:**  
05/12/26

**NOTES / REMARKS:**

"APPROVED FOR SUBMISSION TO THE ARCHITECT & ENGINEER  
IN ACCORDANCE WITH THE GENERAL REQUIREMENTS OF  
SPECIFICATIONS"

By: \_\_\_\_\_  
                    Brian Mohyde

**PROJECT:** JOHN TRUMBULL SCHOOL  
**LOCATION:** Watertown, CT

**SUBMITTED BY:** Joe Scott  
Melia Associates LLC  
43 Thomas St  
Hartford, CT 06108  
**PHONE:** 860-290-6969  
**FAX:** 860-290-6977  
**EMAIL:** jscott@meliaassociates.com

**CUSTOMER:** Melia Assoc.  
43 Thomas St  
East Hartford, CT 06108

**ENGINEER:** ICDS Eng.

**DATE:** 5/12/2026

ITEMS  
ENCLOSED:

- Air Control Dampers  
CD-42
- Backdraft Dampers  
CBD-250
- Attribute Attachments  
Air Control Dampers (TFB24-SR, TFB24)

## Submittal

### Model CD-42

Control damper, triple-V opposed blade

### General construction

Dimensions: Nominal (approximately 1/4" (6) undersize)

Material: Galvanized steel

Frame: 5" x 1" (127 x 25) hat channel

Blade style: 6" x 16 gauge, triple-v

Blade action: Opposed

Linkage: Concealed in frame

Control shaft: 1/2" x 6" (13 x 152) round drive axle

Bearings: Synthetic

### Options

Actuator: Proportional, spring return

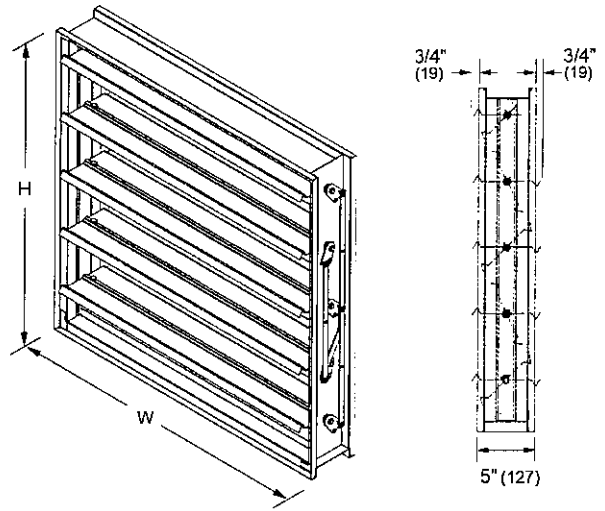
Low leakage seals: Blade: PVC; Jamb: Flexible stainless steel

Jackshaft: Yes

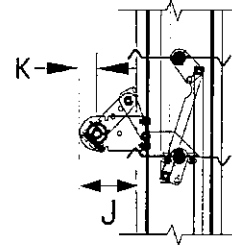
### Ratings

Leakage (with seals): 8.0 cfm/ft<sup>2</sup>@ 4 in. wg (0.04m<sup>3</sup>/s/ m<sup>2</sup>@ 1.00 kPa), 4.0 cfm/ft<sup>2</sup>@ 1 in. wg (0.02m<sup>3</sup>/s/ m<sup>2</sup>@ 0.25 kPa)

Operating temperature range: -25°F to 180°F



Model CD-42



Dimensional details



#### Air Performance

Pottorff certifies that the model CD-42 shown herein is licensed to bear the AMCA seal. The ratings shown are based on tests and procedures performed in accordance with AMCA publication 511 and comply with the requirements of the AMCA Certified Ratings Program.

## Details

Line item	Tag	Qty	Dimensions (in. xxxx)		Sections	Ratings			Actuator					Power consumption	Transformer sizing (VA)	J (in)	K (in)
			W x H	D		Wide x High	Vel (fpm)	Press (in.w.g.)	Qty	Model	Volt	Pos	Orien				
1	FCU OA Dampers	16	18 x 14		1 x 1	3000	4	1	TFB24-SR	24V	PO		Int	2W	4	3.375	1

This submittal sheet reflects only the construction and options selected and is not indicative of all constructions and options that are available for the product. For more information, please contact your local representative or visit us at [www.pottorff.com](http://www.pottorff.com).

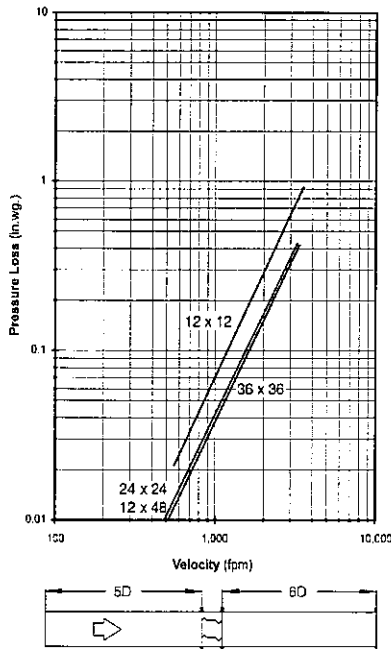
Information is subject to change without notice or obligation.

Note: Dimensions in parentheses ( ) are millimeters.

## Submittal Model CD-42 Performance

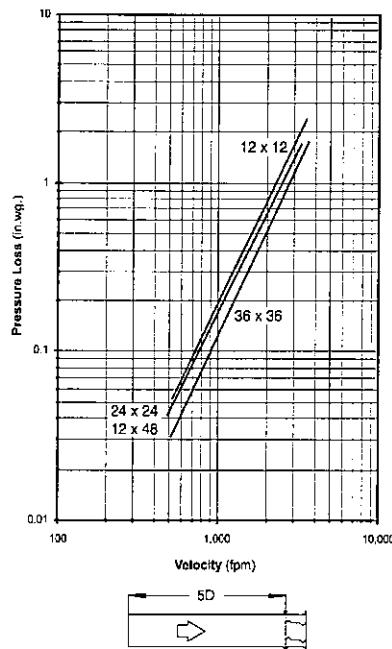
### Pressure drop testing

Pressure drop testing was performed in accordance with AMCA Standard 500-D using the three configurations shown. All data has been corrected to represent air density of 0.075 lb/ft. Actual pressure drop in any ducted HVAC system is a combination of many elements. This information, along with analysis of other system influences, should be used to estimate actual pressure losses for a damper installed in a given HVAC system.



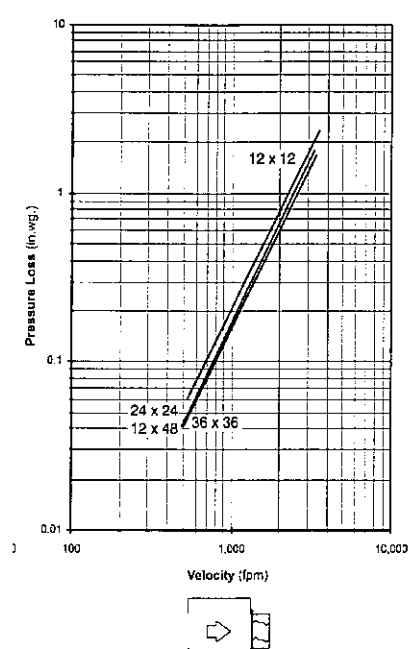
#### Ducted inlet and outlet

AMCA Figure 5.3 Illustrates a fully ducted damper. This configuration represents the lowest pressure drop of the three test configurations because entrance and exit losses are minimized by straight duct runs upstream and downstream of the damper.



#### Ducted inlet

AMCA Figure 5.2 Illustrates a ducted damper exhausting air into an open area. This configuration has a lower pressure drop than Figure 5.5 because entrance losses are minimized by a straight duct run upstream of the damper.



#### Plenum mount

AMCA Figure 5.5 Illustrates a plenum mounted damper. This configuration has the highest pressure drop because of extremely high entrance and exit losses due to the sudden changes of area in the system.

This submittal sheet reflects only the construction and options selected and is not indicative of all constructions and options that are available for the product. For more information, please contact your local representative or visit us at [www.pottorff.com](http://www.pottorff.com).

Information is subject to change without notice or obligation.

Note: Dimensions in parentheses ( ) are millimeters.

## Submittal

### Model CD-42

Control damper, triple-V opposed blade

### General construction

Dimensions: Nominal (approximately 1/4" (6) undersize)

Material: Galvanized steel

Frame: 5" x 1" (127 x 25) hat channel

Blade style: 6" x 16 gauge, triple-v

Blade action: Opposed

Linkage: Concealed in frame

Control shaft: 1/2" x 6" (13 x 152) round drive axle

Bearings: Synthetic

### Options

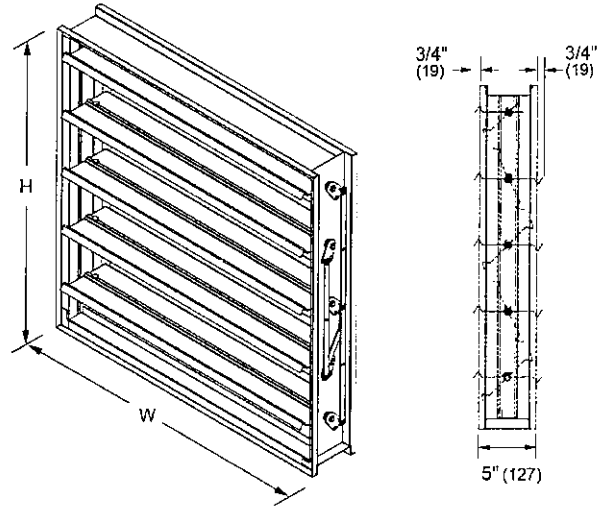
Actuator: 2-position spring return

Low leakage seals: Blade: PVC; Jamb: Flexible stainless steel

### Ratings

Leakage (with seals): 8.0 cfm/ft<sup>2</sup>@ 4 in. wg (0.04m<sup>3</sup>/s/ m<sup>2</sup>@ 1.00 kPa), 4.0 cfm/ft<sup>2</sup>@ 1 in. wg (0.02m<sup>3</sup>/s/ m<sup>2</sup>@ 0.25 kPa)

Operating temperature range: -25°F to 180°F



Model CD-42



#### Air Performance

Pottorff certifies that the model CD-42 shown herein is licensed to bear the AMCA seal. The ratings shown are based on tests and procedures performed in accordance with AMCA publication 511 and comply with the requirements of the AMCA Certified Ratings Program.

## Details

Line item	Tag	Qty	Dimensions (in.xxxx)		Sections		Ratings			Actuator							
			W x H	D	Wide x High	Vel (fpm)	Press (in.w.g.)	Qty	Model	Volt	Pos	Orien	Loc	Power consumption	Transformer sizing (VA)	J (in)	K (in)
3	Pressure Relief MOBD	8	18 x 14		1 x 1	3000	4	1	TFB24	24V	PO		Loo	2W	5		

This submittal sheet reflects only the construction and options selected and is not indicative of all constructions and options that are available for the product. For more information, please contact your local representative or visit us at [www.pottorff.com](http://www.pottorff.com).

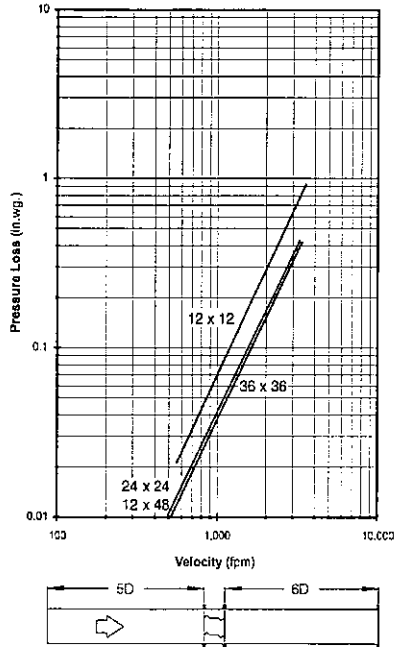
Information is subject to change without notice or obligation.

Note: Dimensions in parentheses ( ) are millimeters.

## Submittal Model CD-42 Performance

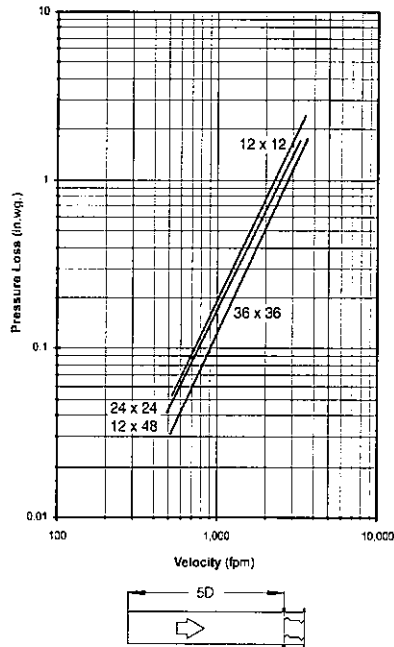
### Pressure drop testing

Pressure drop testing was performed in accordance with AMCA Standard 500-D using the three configurations shown. All data has been corrected to represent air density of 0.075 lb/ft. Actual pressure drop in any ducted HVAC system is a combination of many elements. This information, along with analysis of other system influences, should be used to estimate actual pressure losses for a damper installed in a given HVAC system.



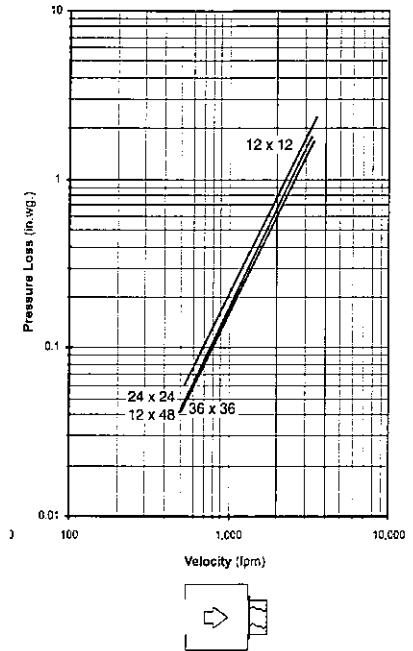
### Ducted inlet and outlet

AMCA Figure 5.3 illustrates a fully ducted damper. This configuration represents the lowest pressure drop of the three test configurations because entrance and exit losses are minimized by straight duct runs upstream and downstream of the damper.



### Ducted inlet

AMCA Figure 5.2 illustrates a ducted damper exhausting air into an open area. This configuration has a lower pressure drop than Figure 5.5 because entrance losses are minimized by a straight duct run upstream of the damper.



### Plenum mount

AMCA Figure 5.5 illustrates a plenum mounted damper. This configuration has the highest pressure drop because of extremely high entrance and exit losses due to the sudden changes of area in the system.

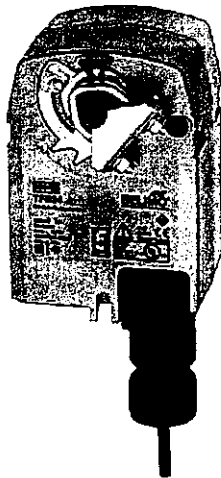
This submittal sheet reflects only the construction and options selected and is not indicative of all constructions and options that are available for the product. For more information, please contact your local representative or visit us at [www.pottorff.com](http://www.pottorff.com).

Information is subject to change without notice or obligation.

Note: Dimensions in parentheses ( ) are millimeters.

# TFB24(-S), TFX24(-S)

On/Off, Spring Return, 24 V



Technical Data		TFB24(-S), TFX24(-S)
Power supply		24VAC $\pm$ 20%, 50/60Hz 24VDC $\pm$ 10%
Power consumption	running	2 W
	holding	1.3 W
Transformer sizing		5 VA (class 2 power source)
Electrical connection		3 ft, 18 GA appliance cable, 1/2" conduit connector
TFB24...		-S models: two 3 ft, 18 gauge appliance cables with 1/2" conduit connectors
TFX24...		3 ft [1m], 10 ft [3m], or 16 ft [5m], 18 GA appliance or plenum cables, with or without 1/2" conduit connector
		-S models: two 3 ft [1m], 10 ft [3m] or 16 ft [5m] appliance cables with or without 1/2" conduit connectors
Overload protection		electronic throughout 0 to 95° rotation
Angle of rotation		max 95°, adjust. with mechanical stop
Torque		22 in-lbs [2.5 Nm] minimum
Direction of rotation		reversible with cw/ccw mounting
Position indication		visual indicator, 0° to 95° (0° spring return position)
Running time (nominal)	motor	< 75 sec
	spring	< 25 sec @ -4°F to 122°F [-20°C to 50°C] < 60 sec @ -22°F [-30°C]
Humidity		5 to 95% RH non-condensing
Ambient temperature		-22°F to 122°F [-30°C to 50°C]
Storage temperature		-40°F to 176°F [-40°C to 80°C]
Housing		NEMA type 2 / IP42, UL enclosure type 2
Housing material		UL94-5VA
Agency listings†		cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC (and 2006/95/EC for -S versions)
Noise level (max)	running	< 50 db (A)
	spring return	62 dB (A)
Servicing		maintenance free
Quality standard		ISO 9001
Weight		1.4 lbs (0.6 kg), 1.5 lbs (0.7 kg) with switch
TFB24-S, TFX24-S		
Auxiliary switch		1 x SPDT 3A (0.5A) @ 250 VAC, UL approved adjustable 0° to 95°

† Rated Impulse Voltage 800V, Type of action 1.AA (1.AA.B for -S version), Control Pollution Degree 3.

Torque min. 22 in-lbs, for control of air dampers

## Application

For on/off, fail-safe control of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications. Control is on/off from an auxiliary contact, or a manual switch.

The actuator is mounted directly to a damper shaft from 1/4" up to 1/2" in diameter by means of its universal clamp, 1/2" shaft centered at delivery. A crank arm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft.

## Operation

The TF series actuators provide true spring return operation for reliable fail-safe application and positive close off on air tight dampers. The spring return system provides consistent torque to the damper with, and without, power applied to the actuator.

The TF series provides 95° of rotation and is provided with a graduated position indicator showing 0° to 90°.

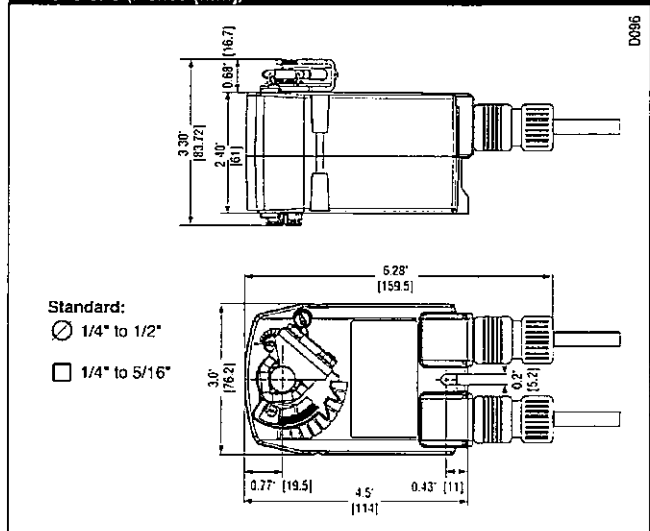
The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. Power consumption is reduced in holding mode.

The TF-S versions are provided with one built-in auxiliary switch. This SPDT switch is provided for safety interfacing or signaling, for example, for fan start-up. The switching function is adjustable between 0° and 95°.

## SAFETY NOTE

Screw a conduit fitting into the actuator's bushing. Jacket the actuator's input and output wiring with suitable flexible conduit. Properly terminate the conduit in a suitable junction box.

## Dimensions (Inches (mm))



Accessories	
Tool-06	8mm and 10 mm wrench
KH-TF	Crank arm for up to 1/2" round shaft
ZG-TF2	Crank arm adaptor kit for TF
ZG-TF112	Mounting bracket, kit for TF
ZS-100	Weather shield (metal)
ZS-150	Weather shield (polycarbonate)

**NOTE:** When using TFB24(-S), TFX24(-S) actuators, only use accessories listed on this page.  
For actuator wiring information and diagrams, please see Belimo wiring guide.

### Typical Specification

On/Off spring return damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a shaft up to a 1/2" diameter and center a 1/2" shaft. The actuators must be designed so that they may be used for either clockwise or counterclockwise fail-safe operation. Actuators shall be protected from overload at all angles of rotation. If required, one SPDT auxiliary switch shall be provided having the capability of being adjustable. Actuators with auxiliary switch must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be cULus listed certified, have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

### Wiring Diagrams

#### ✂️ INSTALLATION NOTES

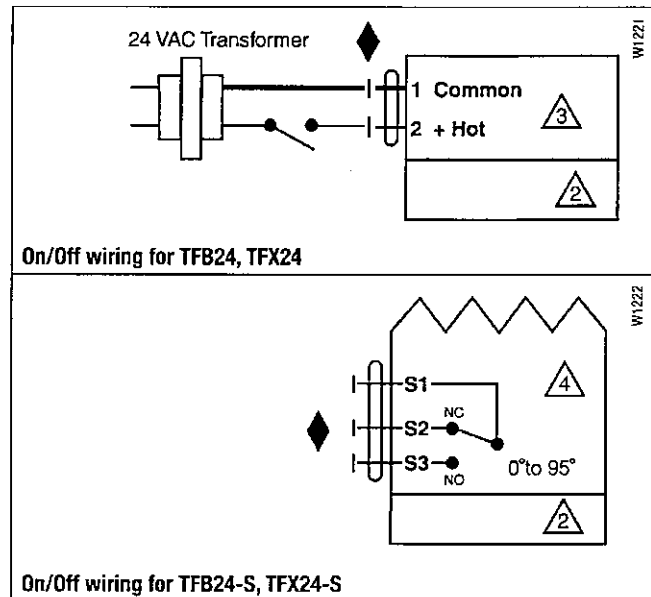
- 1 Provide overload protection and disconnect as required.
- 2 **CAUTION Equipment Damage!**  
Actuators may be connected in parallel.  
Power consumption must be observed.
- 3 Actuators may also be powered by 24 VDC.
- 4 For end position indication, interlock control, fan startup, etc., TFB24-S, TFX24-S incorporates a built-in auxiliary switch: 1 x SPDT, 3A (0.5A) @250 VAC, UL Approved, adjustable 0 to 95.

#### 📄 APPLICATION NOTES

- ◆ Meets cULus requirements without the need of an electrical ground connection.

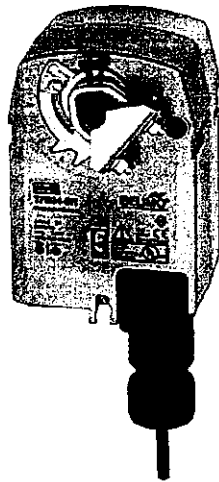
#### ⚠️ WARNING Live Electrical Components!

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.



# TFB24-SR(-S), TFX24-SR(-S)

Proportional, Spring Return, 24 V, for 2 to 10 VDC or 4 to 20 mA Control Signal



Torque min. 22 in-lbs, for control of air dampers

## Application

For proportional modulation of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications.

The actuator is mounted directly to a damper shaft from 1/4" up to 1/2" in diameter by means of its universal clamp, 1/2" shaft centered at delivery. A crank arm and several mounting brackets are available for applications where the actuator cannot be directly coupled to the damper shaft.

The actuator operates in response to a 2 to 10 VDC, or with the addition of a 500 Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner.

## Operation

The TF series actuators provide true spring return operation for reliable fail-safe application and positive close-off on air tight dampers. The spring return system provides consistent torque to the damper with, and without, power applied to the actuator.

The TF series provides 95° of rotation and is provided with a graduated position indicator showing 0 to 95°.

The TF uses a brushless DC motor which is controlled by an Application Specific Integrated Circuit (ASIC) and a microprocessor. The microprocessor provides the intelligence to the ASIC to provide a constant rotation rate and to know the actuator's exact fail-safe position. The ASIC monitors and controls the brushless DC motor's rotation and provides a digital rotation sensing function to prevent damage to the actuator in a stall condition. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. Power consumption is reduced in holding mode.

The TF-S version is provided with one built-in auxiliary switch. This SPDT switch is provided for safety interfacing or signaling, for example, for fan start-up. The switching function is adjustable between 0° and 95°. The auxiliary switch in the TF-S is double insulated so an electrical ground is not necessary.

Technical Data		TFB24-SR(-S), TFX24-SR(-S)
Power supply		24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption	running	2 W
	holding	1 W
Transformer sizing		4 VA (class 2 power source)
Electrical connection		
TFB...		3 ft, 18 GA plenum cable, 1/2" conduit connector -S models: two 3 ft, 18 gauge appliance cables with 1/2" conduit connectors
TFX		3 ft [1m], 10 ft [3m], or 16 ft [5m], 18 GA appliance or plenum cable, with or without 1/2" conduit connector -S models: two 3 ft [1m], 10 ft [3m] or 16 ft [5m] appliance cables with or without 1/2" conduit connectors
Overload protection		electronic throughout 0 to 95° rotation
Operating range Y		2 to 10 VDC, 4 to 20mA
Input impedance		100 kΩ (0.1 mA), 500 Ω
Feedback output U		2 to 10 VDC, 0.5 mA max
Angle of rotation		max 95°, adjust. with mechanical stop
Torque		22 in-lbs [2.5 Nm]
Direction of rotation	spring	reversible with cw/ccw mounting
	motor	reversible with built-in switch
Position indication		visual indicator, 0° to 95° (0° spring return position)
Running time	motor	95 sec constant, independent of load
	spring	< 25 sec @ -4°F to 122°F [-20°C to 50°C] < 60 sec @ -22°F [-30°C]
Humidity		5 to 95% RH non-condensing
Ambient temperature		-22°F to 122°F [-30°C to 50°C]
Storage temperature		-40°F to 176°F [-40°C to 80°C]
Housing		NEMA type 2 / IP42, UL enclosure type 2
Housing material		UL94-V0
Agency listings†		cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC (and 2006/95/EC for -S versions)
Noise level (max)	running	< 35 db (A)
	spring return	62 db (A)
Servicing		maintenance free
Quality standard		ISO 9001
Weight		1.4 lbs (0.6 kg), 1.5 lbs (0.7 kg) with switch

† Rated Impulse Voltage 800V, Type of action 1.AA (1.AA.B for -S version), Control Pollution Degree 3.

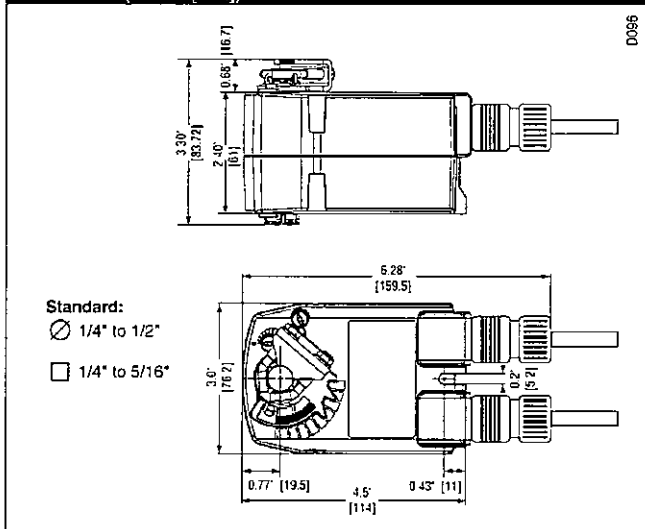
## TFB24-SR-S, TFX24-SR-S

Auxiliary switch | 1 x SPDT 3A (0.5A) @ 250 VAC, UL approved adjustable 0° to 95° (double insulated)

## SAFETY NOTE

Screw a conduit fitting into the actuator's bushing. Jacket the actuator's input and output wiring with suitable flexible conduit. Properly terminate the conduit in a suitable junction box.

## Dimensions (Inches [mm])



Accessories	
Tool-06	8mm and 10 mm wrench
KH-TF	Crank arm for up to 1/2" round shaft
ZG-TF2	Crank arm adaptor kit for TF
ZG-TF112	Mounting bracket, kit for TF
ZS-100	Weather shield (metal)
ZS-150	Weather shield (polycarbonate)

NOTE: When using TFB24-SR (-S), TFX24-SR (-S) actuators, only use accessories listed on this page. For actuator wiring information and diagrams, refer to Belimo wiring guide.

### Typical Specification

Spring return control damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a shaft up to a 1/2" diameter and center a 1/2" shaft. The actuator must provide proportional damper control in response to a 2 to 10 VDC or, with the addition of a 500 Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. The actuators must be designed so that they may be used for either clockwise or counterclockwise fail-safe operation. Actuators shall use a brushless DC motor controlled by a microprocessor and be protected from overload at all angles of rotation. Run time shall be constant, and independent of torque. If required, one SPDT auxiliary switch shall be provided having the capability of being adjustable. Actuators with auxiliary switch must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be cULus listed certified, have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

### Wiring Diagrams

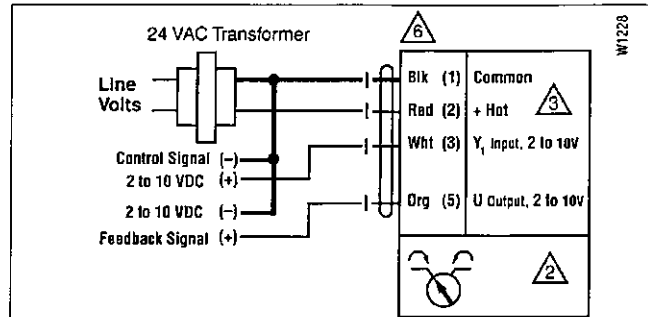
#### INSTALLATION NOTES

- CAUTION Equipment Damage!**  
Up to 4 actuators may be connected in parallel. With 4 actuators wired to one 500 Ω resistor, a +2% shift of control signal may be required. Power consumption must be observed.
- Actuator may also be powered by 24 VDC.
- Only connect common to neg. (-) leg of control circuits.
- Actuators with plenum rated cable do not have numbers on wires; use color codes instead.
- For end position indication, interlock control, fan startup, etc., TFB24-SR-S, TFX24-SR-S incorporates one built-in auxiliary switch: 1 x SPDT, 3A (0.5A) @250 VAC, UL Approved, adjustable 0° to 95°.

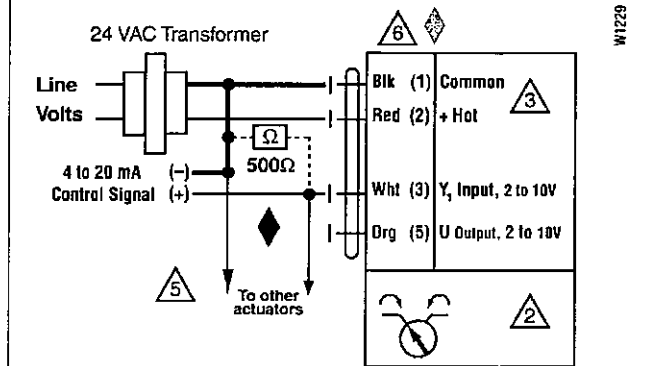
#### APPLICATION NOTES

- Meets cULus requirements without the need of an electrical ground connection.
- The ZG-R01 500 Ω resistor converts the 4 to 20 mA control signal to 2 to 10 VDC.

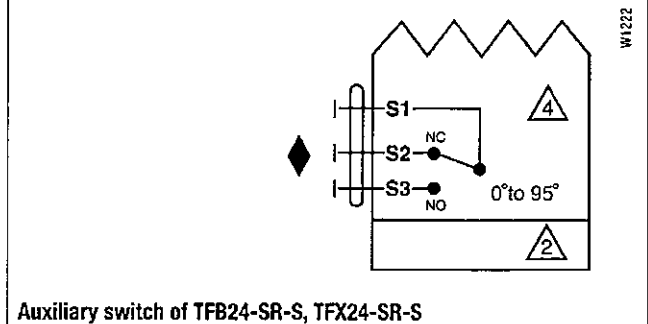
**WARNING Live Electrical Components!**  
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2 to 10 VDC control of TFX24-SR(-S)



4 to 20 mA control of TFB24-SR(-S), TFX24-SR(-S)



Auxiliary switch of TFB24-SR-S, TFX24-SR-S

## Submittal

### Model CBD-250

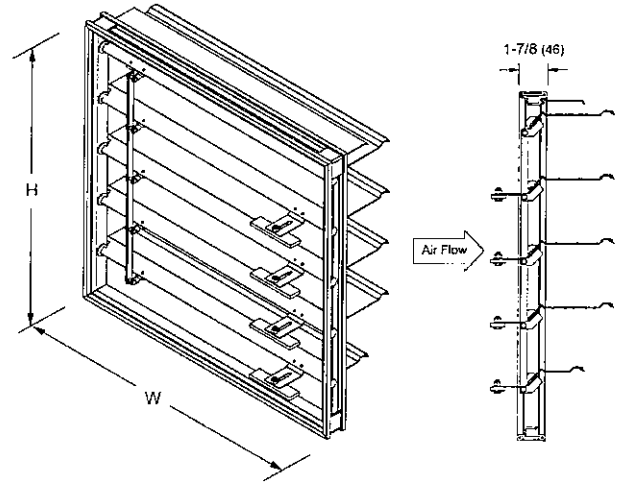
Adjustable counterbalanced backdraft damper, extruded blade

### General construction

- Dimensions: Nominal (approximately 1/4" (6) undersize)
- Application mount: Vertical
- Frame: 1.9375x 15/16" x 0.125" (49 x 24 x 3) extruded channel
- Blade style: 0.07" (1.8) thick aluminum, extruded
- Linkage: Exposed on blade
- Bearings: Synthetic
- Seals: Extruded vinyl blade edge seals
- Counterbalance: On blade - adjustable

### Ratings

- Leakage: 12.4 cfm/ft<sup>2</sup> @ 1.0 in.w.g. (0.07m<sup>3</sup>/s/m<sup>2</sup> @ 0.25 kPa)
- Temperature: -40°F to 200°F (-40°C to 93°C)
- Blades start to open (in.w.g.): 0.01
- Blades fully open (in.w.g.): 0.18



Model CBD-250



#### Certified ratings

Pottorff certifies that the model CBD-250 shown herein is licensed to bear the AMCA seal. The ratings shown are based on test and procedures performed in accordance with AMCA Publication 511 and comply with the requirements of the AMCA Certified Ratings Program. The AMCA Certified Ratings seal applies to air performance ratings.

## Details

Line item	Tag	Qty	Dimensions (in.xxxx)		Sections Wide x High	Ratings	
			W x H	D		Vel (fpm)	Press (in.w.g.)
2	Relief Bdd	8	18 x 14		1 x 1	2500	12

This submittal sheet reflects only the construction and options selected and is not indicative of all constructions and options that are available for the product. For more information, please contact your local representative or visit us at [www.pottorff.com](http://www.pottorff.com).

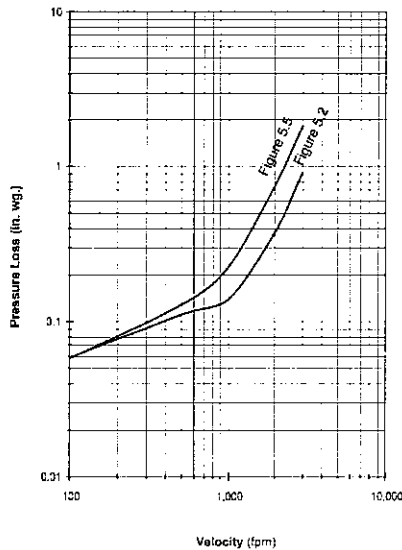
Information is subject to change without notice or obligation.

Note: Dimensions in parentheses ( ) are millimeters.

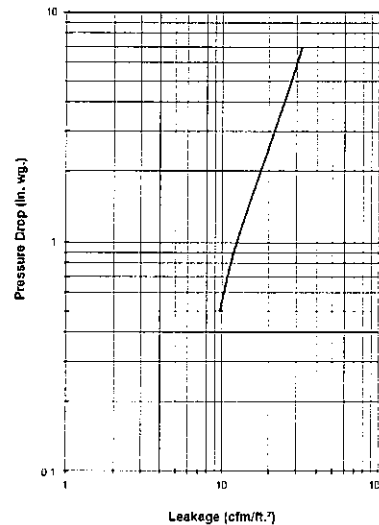
## Submittal Model CBD-250 Performance

### Pressure drop testing

Pressure drop testing was performed in accordance with AMCA Standard 500-D using the two configurations shown. All data has been corrected to represent air density of 0.075 lb/ft. Actual pressure drop in any ducted HVAC system is a combination of many elements. This information, along with analysis of other system influences, should be used to estimate actual pressure losses for a damper installed in a given HVAC system. Leakage testing was conducted in accordance with ANSI/AMCA 500-D, Figure 5.5, in the intake direction. Data are based on a vertically mounted damper, with gravity used as the only closing torque. Air leakage is based on operation between 32°F (0°C) and 120°F (49°C) and converted to standard air density.



Pressure drop vs. velocity  
 24" x 24" damper



Leakage vs. pressure drop  
 24" x 24" damper

Damper Width	Maximum System Pressure	Maximum System Velocity
48" (1219)	4 in.wg. (1.0 kPa)	2500 fpm (12.7 m/s)
36" (914)	8 in. wg. (2.0 kPa)	2500 fpm (12.7 m/s)
24" (610)	12 in. wg. (3.0 kPa)	2500 fpm (12.7 m/s)
12" (305)	16 in. wg. (4.0 kPa)	2500 fpm (12.7 m/s)

### Ratings

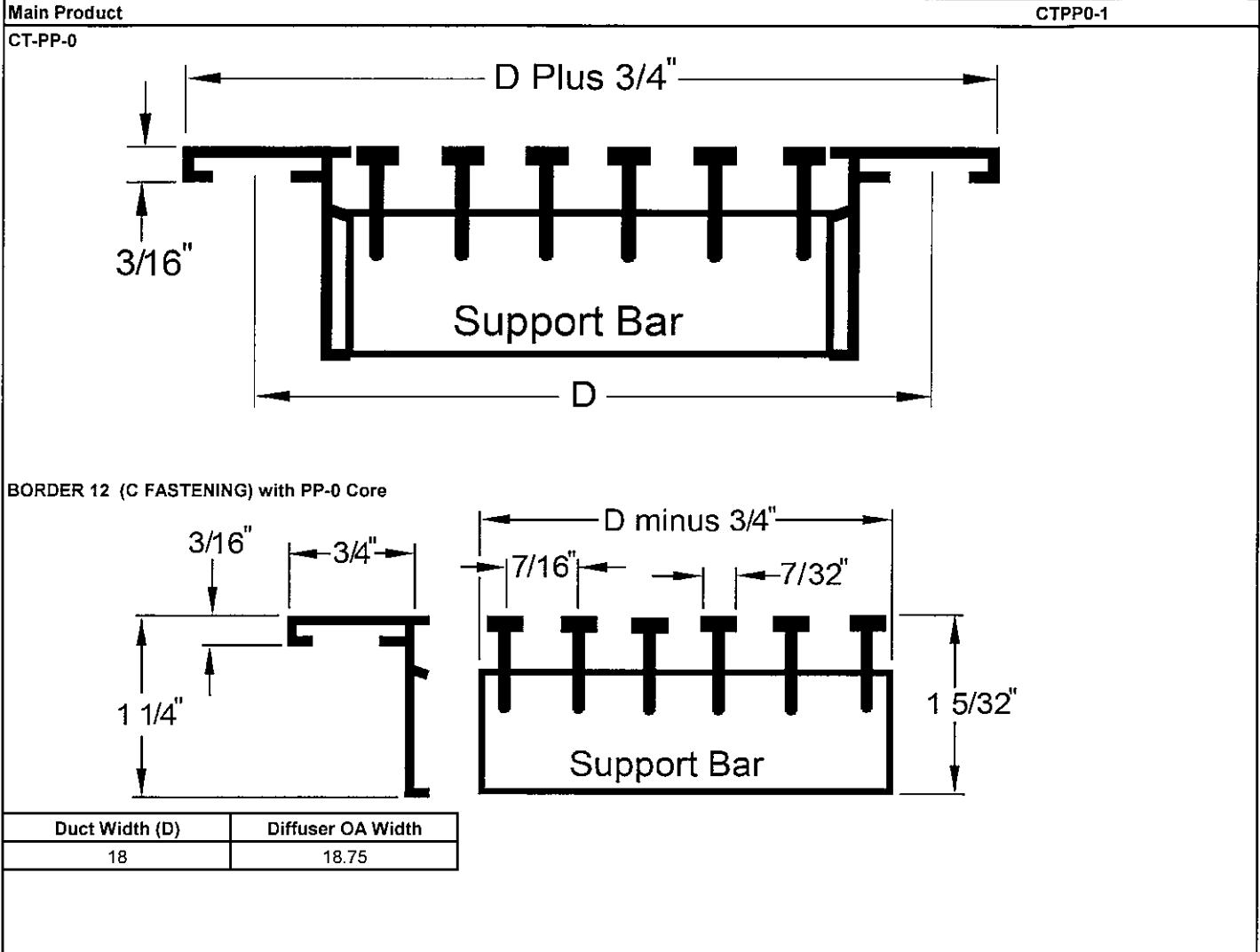
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Information is subject to change without notice or obligation.

Note: Dimensions in parentheses ( ) are millimeters.

## CT-PP-0

Linear bar diffuser, 7/16" bar spacing, 7/32" bars (pencil proof)  
 0 degree deflection, Aluminum



<b>General Description</b>	<b>CTPP0-1</b>
<ul style="list-style-type: none"> <li>· TITUS linear bar diffusers are designed for both supply and return applications.</li> <li>· Standard lengths are 1, 2, 3, 4, 5 and 6 feet, furnished as complete, welded assemblies.</li> <li>· Lengths greater than 6 feet are furnished in multiple sections, the number and size determined by the factory.</li> <li>· Sections can be joined end-to-end for continuous appearance, using standard alignment strips or alignment pins.</li> <li>· All deflection bars are fixed and are parallel to the long dimension.</li> <li>· Fixed Bars are extruded aluminum.</li> </ul>	

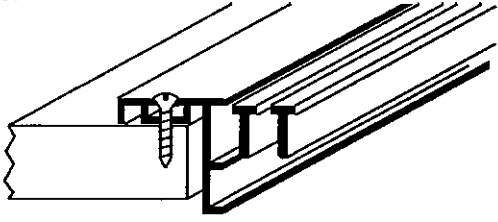
Project John Trumbull School  
 Architect  
 Engineer  
 Contractor VCM Htg



Date 05/12/2026  
 Office Melia Associates  
 Preparer Joe Scott  
 Version 2014.0.603

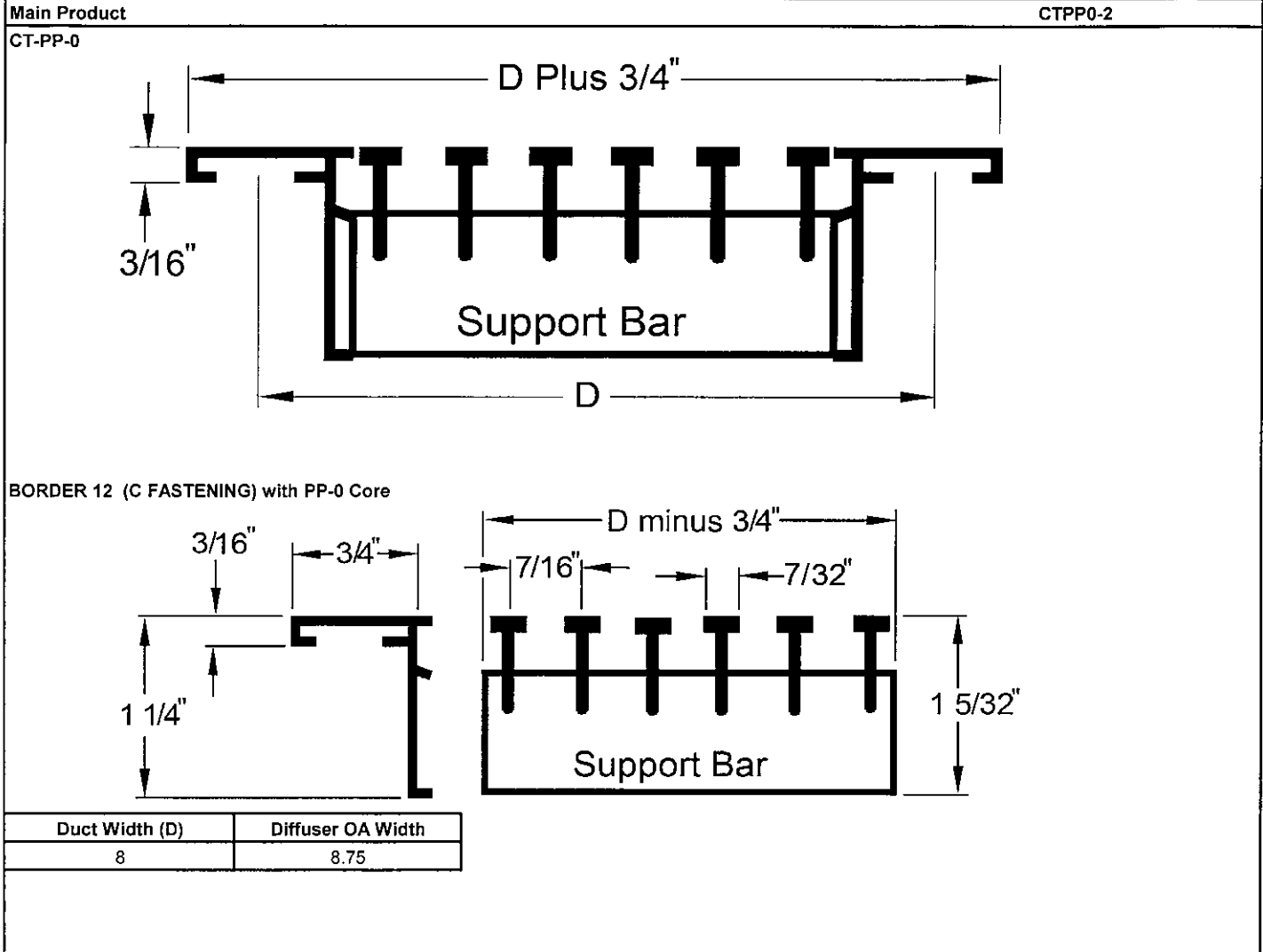
**Designation**

Option Schedule				CTPP0-1
ID	Quantity	Tag	LINEAR LENGTH INCHES	WIDTH IN INCHES
1	8	EA FCU Grille	36	18
		END BORDER XX - TWO END BORDERS	DAMPER MODEL 0 - NONE	
		CT FRAME & BORDER BORDER 12 (WITHOUT C FASTENING)	ACCESSORY 1 NONE	
		FINISH 26 - WHITE	ACCESSORY 2 NONE	
		FASTENING A - SCREW HOLES	ACCESSORY 3 NONE	

Accessories	CTPP0-1
Fastening: Type A • Screw Holes	
	

## CT-PP-0

Linear bar diffuser, 7/16" bar spacing, 7/32" bars (pencil proof)  
 0 degree deflection, Aluminum



<b>General Description</b>	<b>CTPP0-2</b>
<ul style="list-style-type: none"> <li>· TITUS linear bar diffusers are designed for both supply and return applications.</li> <li>· Standard lengths are 1, 2, 3, 4, 5 and 6 feet, furnished as complete, welded assemblies.</li> <li>· Lengths greater than 6 feet are furnished in multiple sections, the number and size determined by the factory.</li> <li>· Sections can be joined end-to-end for continuous appearance, using standard alignment strips or alignment pins.</li> <li>· All deflection bars are fixed and are parallel to the long dimension.</li> <li>· Fixed Bars are extruded aluminum.</li> </ul>	

Project John Trumbull School  
 Architect  
 Engineer  
 Contractor VCM Htg  
 Designation



Date 05/12/2026  
 Office Melia Associates  
 Preparer Joe Scott  
 Version 2014.0.603

Option Schedule					CTPP0-2
ID	Quantity	Tag	LINEAR LENGTH INCHES	WIDTH IN INCHES	
1	16	UV Discharge	52	8	
END BORDER XX - TWO END BORDERS CT FRAME & BORDER BORDER 12 (WITHOUT C FASTENING) FINISH 26 - WHITE FASTENING A - SCREW HOLES			DAMPER MODEL 0 - NONE ACCESSORY 1 NONE ACCESSORY 2 NONE ACCESSORY 3 NONE		

Accessories	CTPP0-2
Fastening: Type A • Screw Holes	

# Schedule

Date/Time: 05/12/2026 06:38:12  
 Job: John Trumbull School  
 Project:  
 Customer: VCM Htg  
 Sales Person: Joe Scott  
 Contractor: VCM Htg

Current Version: 2014.0.603  
 Modified Version: 2014.0.603  
 Created by: jscott@meliaassociates.com  
 Linear Diffusers (All Selections)  
 Schedule Name: Report



Model	Quantity	Tag	Length	Slots/Width	End Border/Module Width/Angle	Border	Finish	Fastening/Throw	Damper/Miter Type	Accessory 1	Accessory 2	Accessory 3	Comments
CT-PP-0	8	EA FCU Grille	36	18	XX - TWO END BORDERS	BORDER 12 (WITHOUT C FASTENING)	26 - WHITE	A - SCREW HOLES	0 - NONE	NONE	NONE	NONE	
CT-PP-0	16	UV Discharge	52	8	XX - TWO END BORDERS	BORDER 12 (WITHOUT C FASTENING)	26 - WHITE	A - SCREW HOLES	0 - NONE	NONE	NONE	NONE	



10 White Wood Lane  
N. Branford, CT 06471  
P: (203) 453-8596  
E: info@icdsllc.com

## SUBMITTAL REVIEW SHEET

*Innovative Construction & Design Solutions, LLC*

Project: John Trumbull Primary School HVAC IAQ Upgrades  
Project No: #153-001 HVACN  
Submittal No.: #006  
Revision: 0  
Subject: Exhaust Fan VFDs

- APPROVED: FURNISH AS SUBMITTED  
 APPROVED: FURNISH AS NOTED/CORRECTED  
 DISAPPROVED: REVISE AND RESUBMIT  
 DISAPPROVED: REJECTED

*Corrections or comments made on the shop drawings during this review do not relieve the Contractor from compliance with requirements of the contract drawings and specifications. This check is only for review of the general conformance with the design concept of the project and general compliance with the information given in the contract documents.*

*The Contractor is responsible for: Confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating his or her work with that of all other trades; and performing all work in a safe and satisfactory manner.*

Date: May 18, 2026

By: Scott D. Fitch, P.E.

### COMMENTS:

- Verify customer noted on Sartron coversheet is correct.

**SUBMITTAL DRAWINGS FOR APPROVAL**

<b>TO:</b> VCM, LLC Virgil Crudele 71 Naugatuck Drive Naugatuck, CT 06770
<b>ATTN:</b> Virgil Crudele

Date: 5/18/2026  
Quote #: 2026-15969  
Job Name: John Trumbull School EF  
VFDs

The enclosed drawings are submitted for approval.

**A SIGNED COPY OF THIS COVER SHEET MUST BE RETURNED  
TO YASKAWA TO RELEASE UNITS TO PRODUCTION**

Satron  
10 White Wood Lane  
North Branford, CT 06471

Please contact your Inside Sales Rep for estimated delivery after submittals are signed, approved, and returned.

Engineering, mechanical, electrical drawings, and equipment shipping schedules are based on receipt of customer signed drawings. Any delay in approval, modifications to original contract and/or specifications, or drawing changes made during or after "print approval" could result in a price increase and extension of any previously mentioned schedules.

**CUSTOMER APPROVAL:** \_\_\_\_\_ **DATE:** \_\_\_\_\_  
(Signature Represents Drawing Approval)

## Submittal Schedule Details

Details, Features and Reference Drawings	H6CPB003PM
<b>TAG(s)</b>	Tags: EF-1 & EF-5
<b>Horsepower (HP)</b>	2.0
<b>Voltage (V)</b>	480
<b>Amperage (A)</b>	3.4
<b>Quantity</b>	2
<b>Enclosure</b>	UL Type 1
<b>Input Impedance (%)</b>	5
<b>Circuit breaker (100k) inc. Input Fusing</b>	✓
<b>Input Fuses</b>	✓
<b>SCCR (kA)</b>	100
<b>Dimensions (H" x W" x D")</b>	33.00 x 6.30 x 13.90
<b>Weight (lbs)</b>	42.0
<b>Specification</b>	<b>SG.H6CPQW.10</b>
<b>Print Size</b>	8.5" x 11.0"
<b>Submittal Page</b>	4
<b>Electrical Schematic</b>	<b>DS.H6CP.01</b>
<b>Print Size</b>	17.0" x 11.0"
<b>Submittal Page</b>	11
<b>Wiring Requirements</b>	<b>UDE00573</b>
<b>Print Size</b>	11.0" x 17.0"
<b>Submittal Page</b>	12
<b>Outline Drawing</b>	<b>DD.HC.1.W1.01</b>
<b>Print Size</b>	8.5" x 11.0"
<b>Submittal Page</b>	13

# Table of Contents

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Submittal Schedule Details	Page 2
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Specification: SG.H6CPQW.10	Page 4
Electrical Schematic: DS.H6CP.01	Page 11
Wiring Requirements: UDE00573	Page 12
Outline Drawing: DD.HC.1.W1.01	Page 13

# YASKAWA

## Variable Frequency Drive (VFD)

### HV600 Mechanical Specification Submittal

#### For Narrow Configured UL Type 1 Rated (H6CP) Packages

#### GENERAL

The HV600 is a high performance PWM (pulse-width-modulated) AC drive. Three-phase input line power is converted to a sine-coded, variable frequency output, which provides optimum speed control of any conventional squirrel cage induction motor. The use of IGBTs (Insulated Gate Bipolar Transistors), with a carrier frequency range of 2 kHz to 12.5 kHz, permits quiet motor operation.

This drive has one control logic board for all horsepower ratings. Printed circuit boards employ surface-mount technology, providing both high reliability, and small physical size of the printed circuit assemblies. The microprocessor delivers the computing power necessary for complete three-phase motor control in building automation systems.

Operating Principle: Input three-phase AC line voltage is first rectified to a fixed DC voltage. Using pulse width modulation (PWM) inverter technology, the DC voltage is processed to produce an output waveform in a series of variable-width pulses. Unique firmware algorithms optimize motor magnetization through control of voltage, current, and frequency applied to generate a nearly sinusoidal output waveform.

#### STANDARDS

- UL 508A (Industrial Control Panels)
- BTL Listed
- UL, cUL listed
- CBC, IBC, ASCE7, ICC-ES 156
- HCAI (OSHDP)

#### ENVIRONMENTAL & SERVICE CONDITIONS

Ambient service temperature: Narrow Configured UL Type 1: -10°C to 40°C

Ambient storage temperature: Narrow Configured UL Type 1: -20°C to 70°C

Humidity: 0% to 95%, non-condensing

Altitude: to 1,000 meters (3,300 feet); higher by derating

Service factor: 1.0

RoHS 2 Compliant

#### QUALITY ASSURANCE

In-circuit testing of all printed circuit boards is conducted to ensure proper manufacturing.

Final printed circuit board assemblies are functionally tested via computerized test equipment.

All fully assembled controls are computer tested with induction motor loads to assure unit specifications are met.

The average MTBF (Mean Time Between Failure) is 28 years.

## CONSTRUCTION

VFD power input stage converts three-phase AC line power into a fixed DC voltage via a solid-state full-wave diode rectifier with MOV (Metal Oxide Varistor) surge protection. An internal 5% split choke built in both positive and negative DC bus reduces harmonics for cleaner power.

Intermediate Section of the VFD - DC bus maintains a fixed DC voltage with filtering and short circuit protection as a DC supply to the VFD output section. It is interfaced with the VFD diagnostic logic circuit to continuously monitor and protect the power components.

Output Section of the VFD - Insulated Gate Bipolar Transistors (IGBTs) convert DC bus voltage to a variable frequency and voltage, utilizing a PWM sine-coded output to the motor. Motor noise at 60 Hz is less than 2 dB above the motor noise from across-the-line operation when measured at a distance of one meter.

## POWER AND CONTROL ELECTRONIC HOUSINGS

UL Type 1 Narrow Configured enclosure: 208 V, 0.5 thru 40 HP; 480 V, 0.75 thru 75 HP

Microprocessor-based control circuit

Non-volatile memory (EEPROM); all programming memory is saved when the VFD is disconnected from power.

Digital operator keypad and display provide local control and readout capability:

- Hand/Off/Auto commands

- Speed Reference command

- Reset command

Easy to remove heat sink cooling fan with programmable on/off control

USB mini-B port for quick and easy PC connection

## PROTECTION

Output current overload rating of 110% for 60 seconds, 140% for 2 seconds, 175% instantaneous

Output short circuit protection

Current limited stall prevention (overload trip prevention) during acceleration, deceleration, and run conditions

Optically isolated operator controls

Fault display

“Hunting” prevention logic

Electronic ground fault protection

Electronic motor overload relay protects the motor while in operation

Motor current display as well as verification that the motor is running

Proof of flow/loss of flow detection

DC bus charge indication

Heatsink overtemperature protection

Cooling fan operating hours recorded

Input/output phase loss protection

Line voltage sensors to monitor for brownout and blackout conditions with adjustable fault levels to ensure the proper settings pursuant to each application.

Reverse prohibit selectability

Short circuit withstand rating of 100 kA RMS with customer provided branch circuit protection.

Two emergency override modes (across-the-line or speed selectable via the drive)

## OPERATION

Output frequency and speed display can be programmed for other speed-related and control indications, including: RPM, CFM, GPM, PSI, in WC, % of maximum RPM, or custom.

Power loss ride-through (2 seconds capable)

Time delay on start; peak avoidance for smooth generator switchover

VFD accepts either a direct acting or a reverse acting speed command signal.

Bi-directional "Speed Search" capability to start into a rotating load. Two types: current detection and residual voltage detection

DC injection braking, to prevent fan "windmilling"

Remote Run/Stop command input

Eight programmable HVAC specific application presets

Over 100 programmable functions, resettable to factory HVAC presets

User parameter initialization to re-establish project specific parameters

Ramp-to-stop or coast-to-stop selection

Auto restart capability: 0 to 10 attempts with adjustable delay time between attempts

One custom selectable Volts/Hertz pattern and multiple preset Volts/Hertz patterns

Auto speed reference input signal, adjustable for bias and gain

While the VFD is running, operational changes in control and display functions are possible, including:

- Acceleration time (0 to 6000 seconds)

- Deceleration time (0 to 6000 seconds)

- Frequency reference command

- Hand/Off/Auto commands

- Monitor display

- Removable digital operator

Automatic energy saving, reduced voltage operation

## PRODUCT FEATURES

Displacement power factor of .98 throughout the motor speed range

Internal EMI/RFI filter complies with EN 61800-3

Built-In real time clock for time and date stamping events along with timer functions for starting, stopping and speed changes without the need for external controls

Voltmeter, ammeter, kilowatt meter, elapsed run time meter, and heatsink temperature monitoring functions

Two internal (PI) controls

Drive internal PI closed-loop control with selectable engineering units

Independent PI control for use with external device

Differential PID feedback feature

Sleep function in both closed loop and open loop control

Feedback signal low pass filter

Feedback signal loss detection and selectable response strategy

Feedback signal inverse and square root capability

24 VDC, 150 mA transmitter power supply

Seven programmable multi-function input terminals (24 VDC) providing 60+ programmable features, including:

- Customer Safeties

- BAS / Damper Interlock

- Emergency Override – BAS interlock mode, min/max speed setting, 16 preset speeds, and more

- Preset Speed

- PI control enable / disable

One Dedicated Fault Form C relay (30 VDC/250 VAC, 2 Amp), and 3 programmable Form A relays for: "Motor Run," "Damper Actuator," "Auto Transfer," "Drive Run," "Hand Mode," "Auto Mode," "System Fault," "Serial Com Run," and numerous other options.

Two programmable 0 to 10 VDC or 4-20 ma analog outputs, proportional to drive monitor functions including output frequency, output current, output power, PI feedback, output voltage and others

Remote speed reference (speed command) signal:

- 0 to 10 VDC (20 k $\Omega$ )

- 4 to 20 mA DC (250  $\Omega$ )

Nine preset speeds

Input and output terminal status indication

Diagnostic fault indication

VFD efficiency: 96% at half-speed; 98% at full-speed

"S-curve" soft start / soft stop capability

Run/Fault output contacts

Serial communication loss detection and selectable response strategy

“Up/Down” floating point control capability

Output Frequency 0 to 400 Hz

Controlled speed range of 40:1

Critical frequency rejection capability: three selectable, adjustable bandwidths

140% starting torque capability, available from 3 Hz to 60 Hz

Adjustable carrier frequency, from 2 kHz to 12.5 kHz

Analog/Digital Virtual I/O – internally sends an output to an input (no wiring needed)

Dynamic noise control for quiet motor operation

Programmable security code

Cloud service (Yaskawa Drive Cloud) for product registration and parameter storage

Store up to four additional parameter sets in keypad

Integrated PLC (DriveWorks EZ)

Rotational as well as Stationary motor auto-tuning

“Kinetic Energy Braking” (KEB) function stops the motor in up to half the time it would take without this function.

Control Methods Include:

- V/F Control

- Enhanced PM Motor control

- SynRM Motor Control

Motor Types:

- Induction

- Permanent Magnet

- Synchronous Reluctance

Temperature controlled fan

LCD keypad with Hand/Off/Auto and Copy keypad functions.

Motor preheat function

Self-regulating lead/lag control for multiple drives (up to 4)

Drive/motor alternation control (share motor run time for lead drive/motor)

Up to four PID setpoints

Draw down level selection for PID setpoint

Anti-no-flow control for deadhead protection

Pre-charge pump functionality

Low city alarm digital input

State/de-state control – add/remove drive based on feedback or output frequency

Single phase foldback

Flash upgradeable firmware

Heatsink overtemperature speed fold-back feature

“Bumpless” transfer between Hand and Auto modes

Emergency override can be used as “smoke purge” function

Fan failure detection and selectable drive action

Programming and firmware upgrade without three-phase main power DriveWizard Mobile

Programming Application

LED Status Ring

Conformal coating (IEC 60721-3-3, UL TYPE 1: 3C2, 3S2)

Complete narrow configured package is factory assembled.

Input disconnect switch with a lockable, through-the-door operating mechanism

BACnet, Siemens APOGEE FLN, Metasys N2, and Modbus RTU communication protocols as standard, with the ability to configure controller parameters, view controller monitors, control I/O, clear faults, and view controller status. EtherNet/IP, Modbus TCP/IP and LonWorks are optionally available.

BACnet Health monitors including Net Health, Tokens Received/Transmitted, Messages Received/Transmitted, Next/Previous Node Address, Max/Min Master Found, number of Nodes on Network, COV, MSTP Loop Time, CRC Errors, MSTP Tokens Lost/Retry, Dearthtime Average.

Door mounted control keypad with LCD display for “Control Power,” “Drive Ready,” “Drive Run,” “Drive Selected,” “Drive Fault,” “Drive Test,” “Motor OL,” “Safety Open” “BAS Interlock,” “Auto Run”, Auto Transfer,” “Emergency Override,” “Hand Mode,” “Off Mode”, and “Auto Mode.”

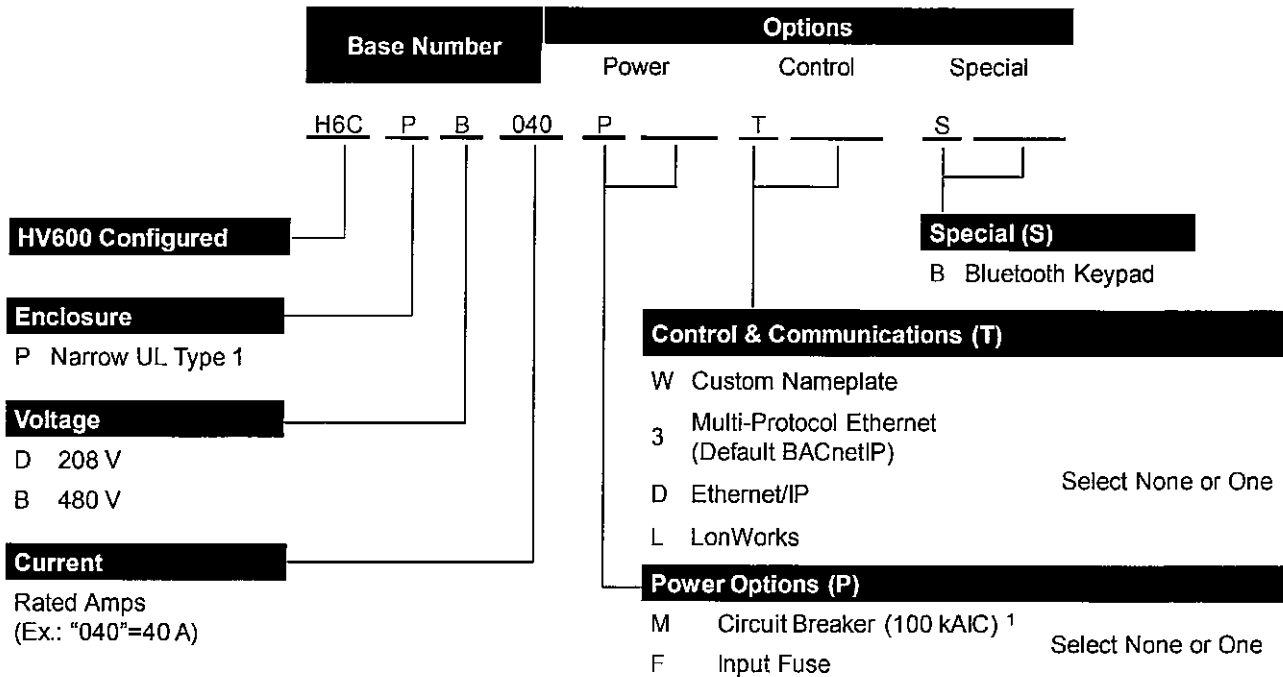
Damper control circuit with end-of-travel feedback capability including two adjustable wait time functions. One is a run delay time, where the drive will operate at a preset speed before the damper opens to pressurize the system. The other time function is an interlock wait time, so if the damper has not fully opened within the specified time, a fault will be declared.

Selectable energy savings and harmonic reduction mode.

# Model Number Configuration (H6CP)

Step 1. Complete the Base Number for the voltage and current rating.

Step 2. Add the Option Code letter for each required option. If an option is not wanted, no character is inserted in that position.



## ENCLOSURE TYPE

[P] UL Type 1 Narrow Configured Enclosure

## VOLTAGE

[D] 208 volt model for nominal, 200 or 208 VAC (+10/-15%); 60 or 50 Hz (+/-5%) systems

[B] 480 volt model for nominal, 380, 400, 415, 440, 460 or 480 VAC (+10/-15 %); 60 or 50 Hz (+/-5%) systems

## [P] POWER OPTIONS

### MAIN INPUT DISCONNECT (Default)

Input disconnect switch with a lockable, through-the-door operating mechanism, no branch short circuit protection.

## [P] POWER OPTIONS (Continued)

[M] Circuit Breaker Option is a 100 kAIC rated circuit breaker with fuses. When

option (M) is specified, the configured drive package will be rated at 100 kAIC. (Replaces default input disconnect)

[F] Drive Input fusing is available as a selection when the Circuit Breaker option is not already being used. Use this selection when drive input fusing is desired with the default input disconnect switch.

## [T] CONTROL & COMMUNICATION OPTIONS

[W] Engraved nameplate

[3] Multi-Protocol Ethernet (Default BACnetIP)

[D] Ethernet/IP

[L] LonWorks

## [S] Special

[B] Bluetooth Keypad



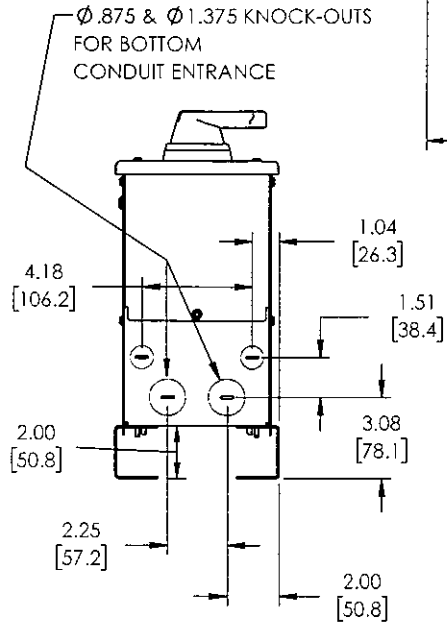
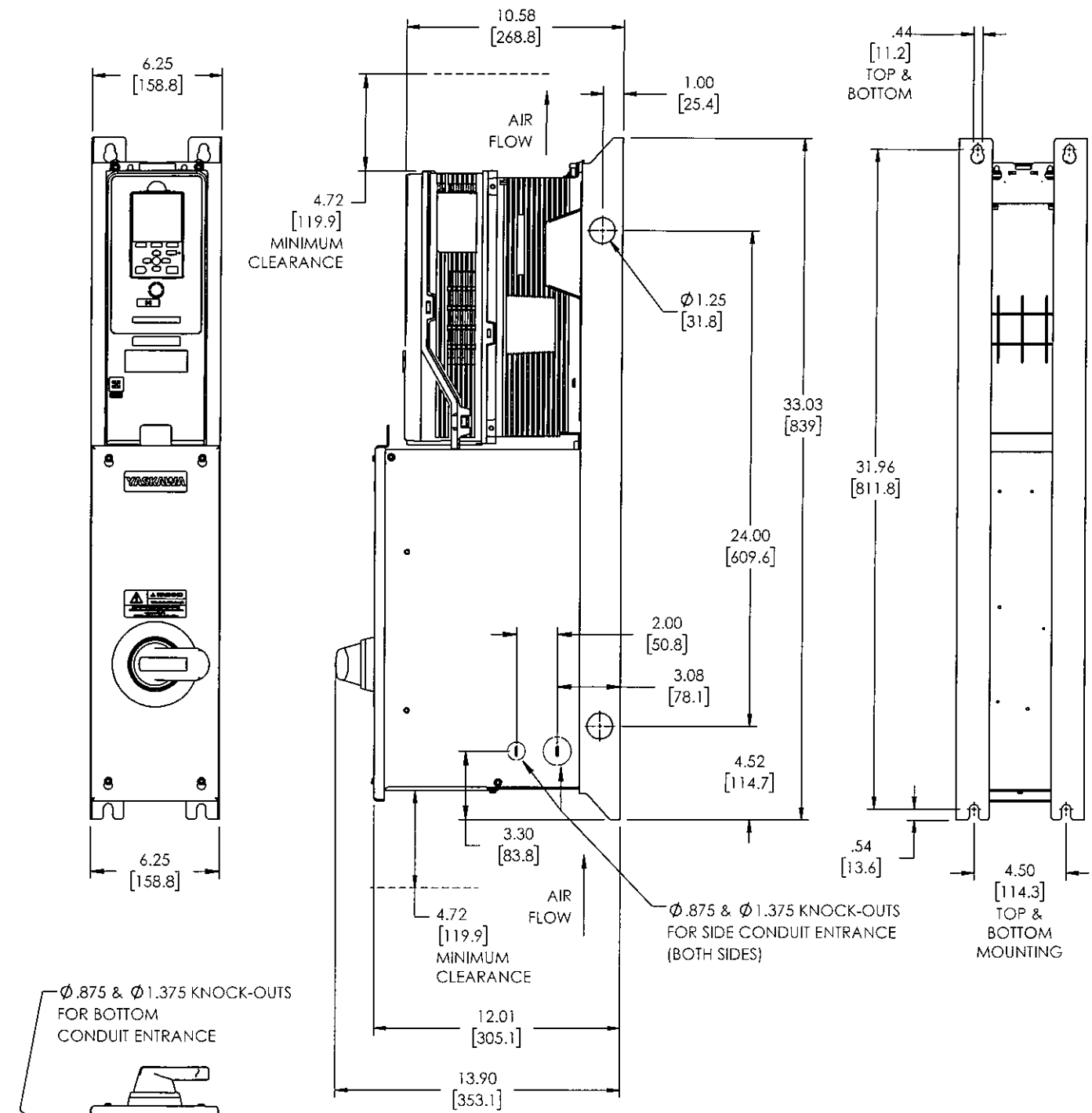
**CUSTOMER WIRING REQUIREMENTS**  
 \* FOR 0 TO 100 AMPS, USE A MINIMUM OF 60 °C - 75 °C COPPER WIRE. (USE COPPER CONDUCTORS ONLY)  
 \* FOR ABOVE 100 AMPS, USE A MINIMUM OF 75 °C COPPER WIRE. (USE COPPER CONDUCTORS ONLY)

TABLE 1		A.C. LINE WIRING							
HV600 NARROW CONFIGURED MODEL NO. BASE NUMBER H6CPXXXX		WITH OPTION PM CIRCUIT BREAKER CB1				STANDARD NON-FUSED INPUT DISCONNECT SWITCH S1			
208V	480V	MFG. PART NUMBER	CURRENT RATING (AMPS)	WIRE SIZE RANGE (AWG)	TIGHTENING TORQUE (LB.-IN.)	MFG. PART NUMBER	CURRENT RATING (AMPS)	WIRE SIZE RANGE (AWG)	TIGHTENING TORQUE (LB.-IN.)
D002	B001	HLL36015	15	14 - 10 OR 8 - 30	50 OR 120	OT30F3	30	14 - 4	55
D003	B002								
D004	B003								
D006	B004								
D007	B007								
	B011								
D010		HLL36020	20						
D016	B014	HLL36025	25						
D024	B021	HLL36030	30						
	B027	HLL36040	40			OT60F3	60		
D030	B034	HLL36050	50						
D046	B040								
	B052	HLL36080	80						
D059	B065	HLL36110	110			OT100F3	100	8 - 10	55
D074	B077								
D088		HLL36150	150						
	B096					OT200U12	200	4 - 300	275
D114									

TABLE 2		A.C. MOTOR WIRING				EARTH GROUND WIRING		CONTROL WIRING					
HV600 NARROW CONFIGURED MODEL NO. BASE NUMBER H6CPXXXX		A1 DRIVE TERMINALS (T1, T2, T3)		A1 DRIVE TERMINALS (GND)		GROUND LUG		A1 TERMINAL BLOCKS TB1, TB3-TB7		A1 TERMINAL BLOCK TB2 (FE)			
208V	480V	WIRE SIZE RANGE (AWG)	TIGHTENING TORQUE (LB.-IN.)	WIRE SIZE RANGE (AWG)	TIGHTENING TORQUE (LB.-IN.)	WIRE SIZE RANGE (AWG)	TIGHTENING TORQUE (LB.-IN.)	WIRE SIZE RANGE (AWG)	TIGHTENING TORQUE (LB.-IN.)	WIRE SIZE RANGE (AWG)	TIGHTENING TORQUE (LB.-IN.)		
D002	B001	CUSTOMER TO WIRE PER THE AC DRIVE TECHNICAL MANUAL. USE 75 °C COPPER WIRE ONLY		CUSTOMER TO SUPPLY A UL LISTED CLOSED-LOOP CONNECTOR, PER THE AC DRIVE TECHNICAL MANUAL. USE 75 °C COPPER WIRE ONLY		14 - 10	35	24 - 16	4.4 - 5.3	24 - 16	8.85 - 10.62		
D003	B002					OR	OR						
D004	B003					8	40						
D006	B004												
D007	B007												
D010	B011												
D016	B014												
D024	B021												
D030	B027							6 - 4	45				
D046	B034												
D059	B040												
	B052									OR	OR		
	B065												
D074	B077					CUSTOMER TO SUPPLY A UL LISTED CLOSED-LOOP CONNECTOR, PER THE AC DRIVE TECHNICAL MANUAL. USE 75 °C COPPER WIRE ONLY				2	50		
D088													
	B096												
D114													

REV	DESCRIPTION	ECO#	DATE	BY
00	INITIAL RELEASE			CAA 22/03/23

<b>YASKAWA</b>	DRAWN BY: E. ACKERMAN	DATE: 5/13/18	TITLE: CUSTOMER CONNECTION HV600 CONFIGURED NARROW TYPE 1
	CHECKED: R. JENSEN	DATE: 2/3/20	
	TECH: _____	DATE: _____	
	APPROVED: R. JENSEN	DATE: 2/3/20	SIZE: C
ORIGINAL DESIGN: E. ACKERMAN	DATE: 5/13/18	DRAWING #:	UD620673



- NOTES:
- A. FOR REFERENCE UNLESS PROPERLY ENDORSED. FOR ADDITIONAL DETAILS AND SPECIFICATIONS, CONSULT YASKAWA AMERICA, INC.
  - B. DIMENSIONS ARE IN INCHES [MILLIMETERS].
  - C. USE APPROPRIATE TYPE RATED HUBS OR FITTINGS TO MAINTAIN ENCLOSURE RATING.

<b>YASKAWA</b>		ORIGINAL DESIGN:	DATE:	TITLE: <b>DIMENSION DRAWING, HV600, O/U, CONFIG, W1</b>		
		D. Dahlman	08/21/2018			
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		D. Dahlman	01/22/2020	A	00	1 OF 1
UNITS: INCHES      SCALE: NONE		CHECKED:	DATE:	DRAWING #:		
		D. Guckenberger	01/23/2020			
		APPROVED:	DATE:	DD.HC.1.W1.01		
		K. Fierl	01/30/2020			

