

Adalet Increased Safety Enclosures

Increased Safety 'e'

- Terminal Enclosures (TN, TSC & TFG Series)
- High Voltage Junction Boxes (HV Series)
- Control Panel Assemblies (CN Series)
- Intrinsically Safe Terminal Enclosures (TSC & TFG Series)

Increased Safety/Flameproof 'ed'

- Control Panel Assemblies (CN Series)



TN4 Series: Single Door Clamped Terminal Enclosures. 14-gauge materials: TN4 steel powder coated; TN4X stainless steel 304; TN4X6 stainless steel 316L.

TN4 Expanded Series: Single Door Clamped Terminal Enclosures.

TSC Series: Screw Cover Terminal Enclosures. 14-gauge materials: TSC4 steel powder coated; TSC4X stainless steel 304; TSC4X6 stainless steel 316L.

CN4 Series: Control Panel Enclosure. 14-gauge materials: CN4 steel powder coated; CN4X stainless steel 304; CN4X6 stainless steel 316L.

TFG Series: Fiberglass Terminal Enclosures

HV Series: High Voltage Junction Boxes. 14-gauge materials: HV4 steel powder coated; HV4X stainless steel 304; HV4X6 stainless steel 316L.

Adalet Increased Safety Enclosures

Increased Safety Enclosures

These enclosures provide an alternative to flameproof enclosures and are commonly made from sheet steel, fiberglass, and die cast aluminum. They are intended to house electrical equipment that will not generate an arc or spark during normal operation. Additional design measures are taken to prevent the possibility of excessive heat, the ingress of water or dust, and the resistance to impact, thus preventing any explosions from occurring.

Principle

Intended for product in which arcs and sparks do not occur in normal service not under fault conditions and in which surface temperatures are controlled below incandive values. Increased Safety is achieved by enhancing insulation values and creepage and clearance distances above those required for normal service, thus providing a safety factor against accidental breakdown.

Increased Safety must not be confused with Intrinsically Safe; they are two completely different approaches. Intrinsic Safety requires that the electrical components within an enclosure have very low levels of electrical energy, either stored or circulating. Typically, allowable currents will be in the tens of milliamperes and voltage will be less than 100 volts, so they will be insufficient to ignite a surrounding explosive atmosphere even under fault conditions.

Key Design Features

- **Enclosure:** must be constructed to withstand mechanical impact and provide a specified degree of ingress protection (IP rating). A minimum IP54 rating is required for Increased Safety enclosures.
- **Terminals for external connections:** must be generously dimensioned for the intended connection and ensure that conductors are securely fastened.
- **Internal connections:** must not be subject to undue mechanical stress and shall be made using specified methods.
- **Clearances:** between bare conductive parts must not be less than the values specified according to the rated voltage.
- **Creepage distances:** must not be less than the values specified according to the rated voltage and the Comparative Tracking Index (CTI) of the insulating material.

- **Temperatures:** of parts of equipment must be limited so as not to exceed values which would affect the thermal stability of the material and the T-Class relating to the ignition of explosive atmospheres.

Areas of Use

Zone Classified Areas – U.S., Canada, Europe

Zones 1 and 2

ATEX – EU Directive 94/9/EC – Europe

Equipment Groups II

Equipment Category 2GD

Applicable Standards

Europe: EN50014, EN50019

U.S.: UL2279 pt 7

Canada: CSA-E79-0, CSA-E79-7

International: IEC 60079-0, IEC 60079-7

Typical Testing for Increased Safety Apparatus

- Thermal conditioning test
- Mechanical strength
- Temperature rise
- Ingress Protection (IP Rating)
- Electrical Strength
- Thermal Stability of Insulating Materials

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Hazardous Location Marking

National Electrical Code Article 505

Article 505 was first introduced in the 1996 National Electrical Code. This new Article offered an alternative to the classification of hazardous locations based on the standards for area classification by the International Electrotechnical Commission (IEC). With the introduction of this new Article, engineers could now classify hazardous locations using either Article 500 or Article 505.

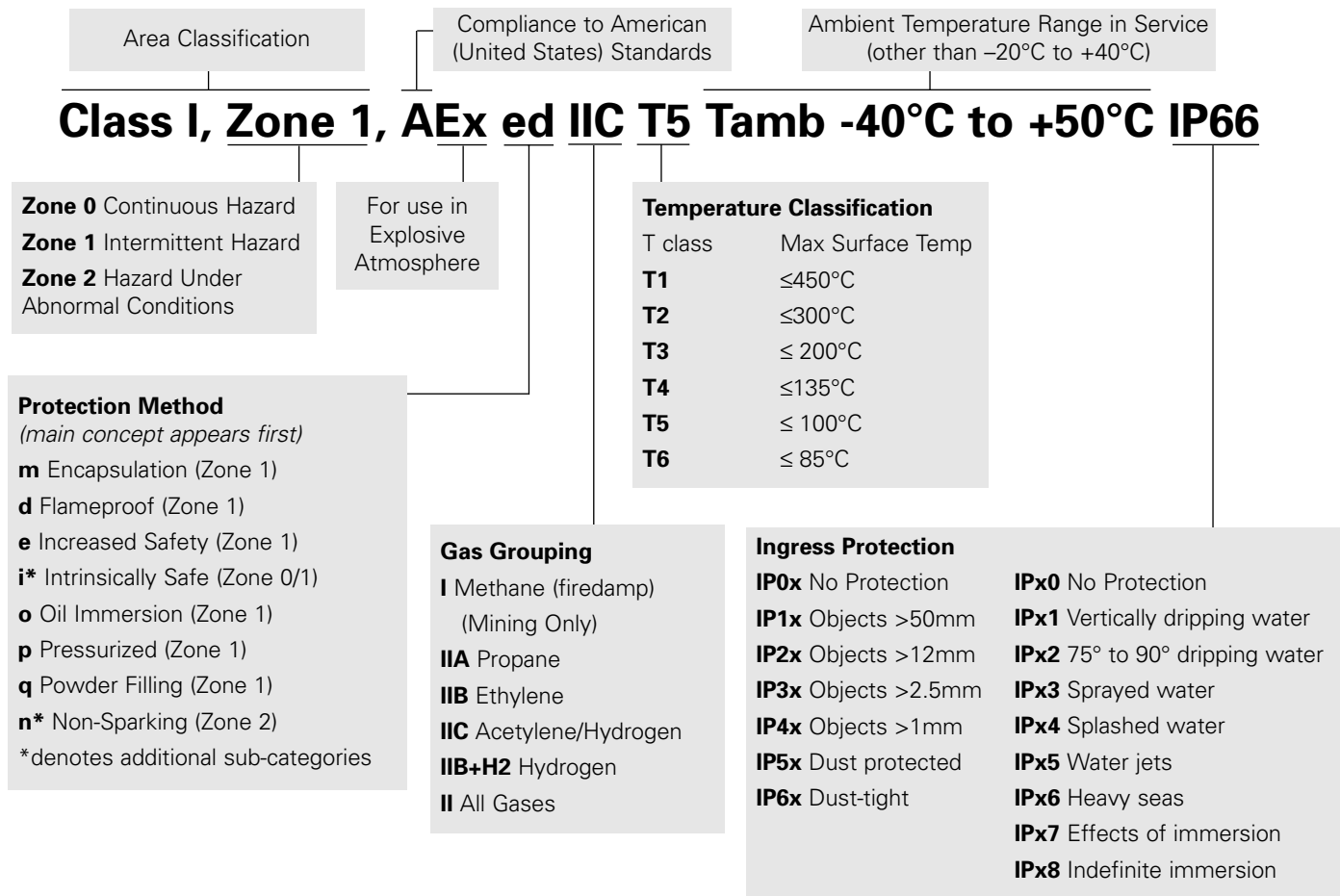
In 1999, further revision to this Article continued to bring it closer to the IEC 79 series. The 1999 changes introduced:

1. the eight different Protection Methods used by IEC,
2. the inclusion of metric threaded holes, and
3. special precautions involving area classification, dual classification, and the reclassification of division classified areas.

Note 1: Products approved for use in areas classified under Article 505 could only be used in this area. Products approved for use in areas classified under Article 500 are allowed to be installed in Article 505 areas, except Zone 0.

Note 2: The IEC Classification scheme also addresses underground mines. Article 505 does not address this area classification. All mines in the United States fall under the jurisdiction of the Mine Safety and Health Administration (MSHA).

Equipment Marking



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Hazardous Location Marking

CENELEC

CENELEC is the European Committee for Electrotechnical Standardization. It was established in 1973 as a non-profit organization under Belgium Law.

The European Commission under Directive 83/189/EEC has officially recognized it as the European Standards Organization in its field.

Each member country typically has at least one recognized test agency or notified body. These members have been working together in the interest of European harmonization since the late fifties, developing alongside the European Economic Community. CENELEC works with 35,000 technical experts from 19 countries to publish standards for the European market.

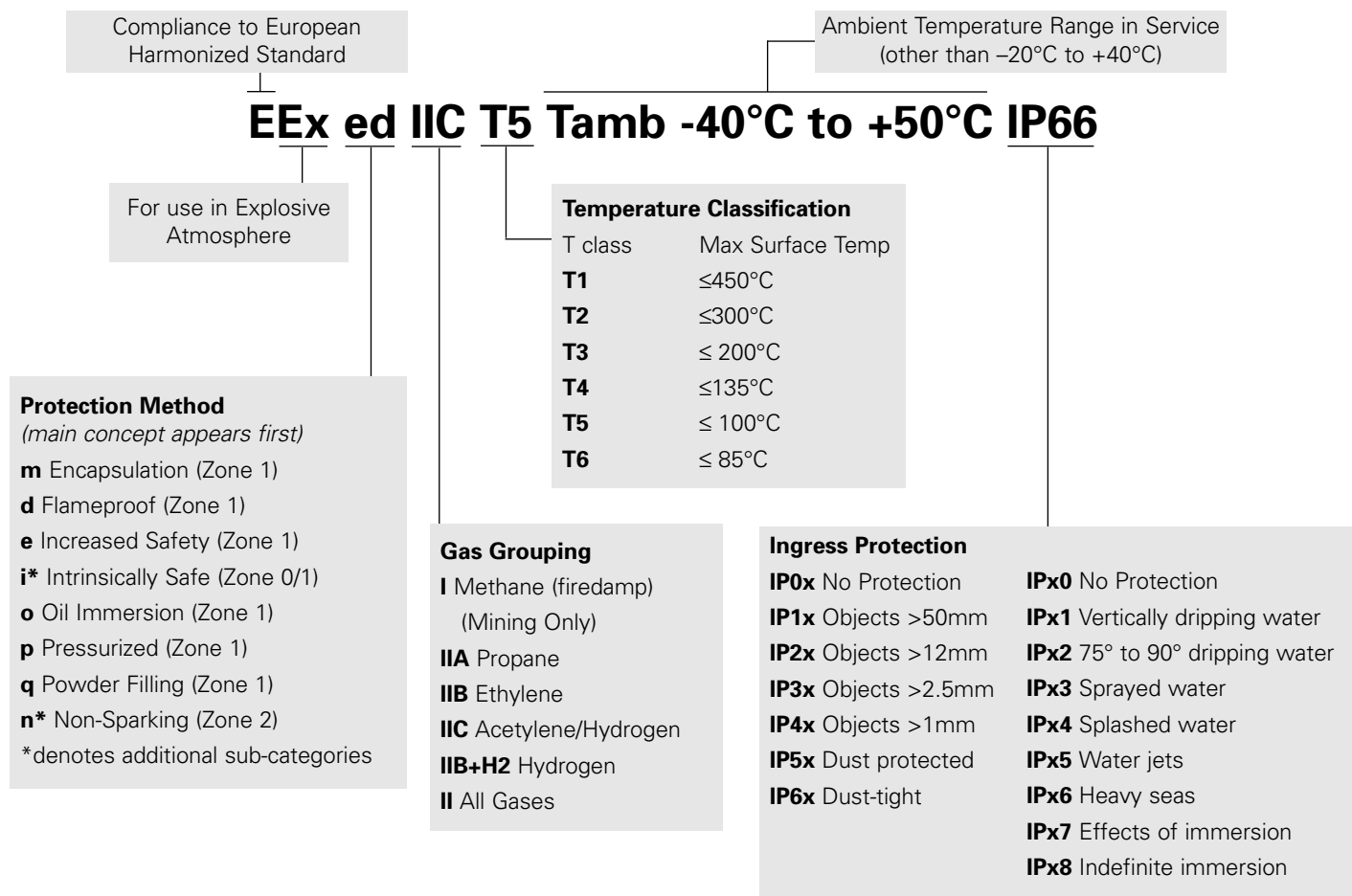


The Conformity Mark

Under the Explosive Atmospheres and Gassy Mines Directive (79/117/EEC), the "Epsilon x" symbol indicates conformity with the CENELEC requirements. This symbol is only allowed to be applied to products which are considered to be final assemblies. Not empty enclosures or component parts.

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Equipment Marking



Hazardous Location Marking

ATEX Directive

The ATEX Directive 94/9/EC was adopted by the European Union (EU) to facilitate free trade in the EU by aligning the technical and legal requirements in the Member States for products intended for use in potentially explosive atmospheres.

The ATEX Directive went into affect (on a voluntary basis) on March 1, 1996. This Directive will become mandatory effective on July 1, 2003. All Product intended for use in explosive atmospheres must comply with this Directive in order to be sold or placed in service in any Member State of the European Union.

The New Conformity Mark

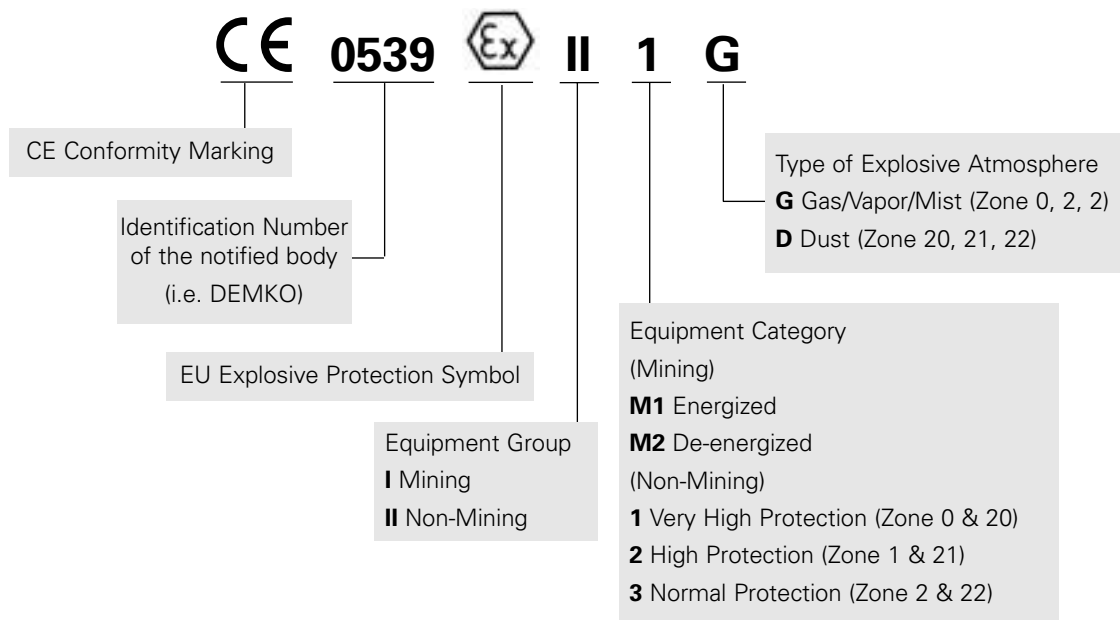


Under the old Explosive Atmospheres and Gassy Mines Directive (79/117/EEC), the "Epsilon x" symbol indicated conformity with the CENELEC requirements. This symbol was allowed to be applied to products which were considered to be final assemblies. Not empty enclosures or component parts such as terminal blocks, operators, breather drains, plugs, etc.. The "Epsilon x" symbol will move into the marking string and be used to indicate explosion protection.



Under the New Directive, the "CE" mark will now indicate conformity to the ATEX Directive. This mark can only be placed on final assemblies and not to empty enclosures or component parts.

Equipment Marking



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Selecting An Increased Safety Terminal Enclosure

Overview

Following the steps outlined below will guide you in selecting the appropriate enclosure for your Increased Safety application. Adherence to these Steps will ensure that the enclosure you select will meet the requirements for Increased Safety Certification.

STEPS:

1. Select the Enclosure Series and Catalog Prefix.
2. Select a Terminal Block Manufacturer and Terminal Block.
3. Determine the Enclosure Size and Catalog Number.
4. Locate the Thermal Dissipation Chart for the Enclosure you selected.
5. Select the Wire Size for your Application.
6. Select the Current to be applied to the Wire.

STEP 1: Select the Enclosure Series and Catalog Prefix

Select an Enclosure Series based on the environmental needs of your application from these options:

TN Single Door Clamped Series:

TN4 – Steel Powder Coated

TN4X – Stainless Steel 304

TN4X6 – Stainless Steel 316L

TSC Screw Cover Series:

TSC4 – Steel Powder Coated

TSCX – Stainless Steel 304

TSC4X6 – Stainless Steel 316L

TFG Screw Cover Series:

TFG – Fiberglass Reinforced Polyester

STEP 2: Select a Terminal Block Manufacturer and Terminal Block

Adalet Enclosures can utilize various manufacturers of Terminal Blocks, select from:

- Entrelec
- Phoenix
- Wago
- Weidmuller
- Wieland
- Woretz
- Consult factory for others.

Beginning on the fourth page of each Enclosure Series Section, you will find Tables for each of the above Terminal Block Manufacturers. Select a Manufacturer and a Terminal Block for your application.

If you have no preference for a specific Terminal Block Manufacturer, use the Quick Selector found on the third page of the Enclosure Section. Select the Wire size for your application and Adalet will supply a suitable Terminal Block.

STEP 3: Determine the Enclosure Size and Catalog Number

From the table selected in Step 2, the quantities that are shown under a terminal block type indicates the maximum number of terminal blocks for each enclosure size. (Warning: *These quantities may not qualify the Enclosure for an Increased Safety Certification.*) The column to the far left indicates the catalog enclosure size. *NOTE: This is also the nominal outside dimension of the enclosure (i.e. -201407: 20" length x 14" width x 07" depth).*

Use the following steps:

For the Terminal Block Type selected, follow the column down until the quantity meets or exceeds your requirement. Then follow the row to the far left to find the catalog enclosure size.

If your quantity requirement is not met, select another Terminal Block Type (*most manufacturers build various sizes of terminal blocks of the same wire size*) or select another Enclosure Series.

NOTE: You might want to consider having a few extra Terminal Blocks for future expansion.

Selecting An Increased Safety Terminal Enclosure

STEP 4: Locate the Thermal Dissipation Chart for the Enclosure you selected.

Each enclosure size has a unique Thermal Dissipation Chart used to qualify for Increased Safety Certification. These charts can be found on the catalog page of the enclosure style you selected. For quick reference, the catalog page number is located in the column next to each enclosure size in the Terminal Block Content tables used in Step 3.

STEP 5: Select the Wire Size for your Application

On the Thermal Dissipation Chart, locate the row listing Conductor Cross Section. Follow the row across until you find the wire size that will be connected to the terminal block. *NOTE: typically, a terminal block catalog number indicates the maximum wire size that can be installed.*

STEP 6: Select the Current to be Applied to the Wire

On the Thermal Dissipation Chart, locate the column for Current. Follow the column down until you find the current that will be applied to the conductor. At the intersection of the Current row and Conductor Cross Section column from Step 5, you will find the maximum number of terminal blocks allowed in the enclosure for an Increased Safety Certification. If this meets your requirements, you are done.

IF THE TERMINAL BLOCK QUANTITY DOES NOT MEET THE NEEDS OF YOUR APPLICATION, CONTINUE WITH THE FOLLOWING STEPS

STEP A: Reduce the Current for your Application

Follow the Conductor Cross Section column up until you find the Terminal Count required for your application. Follow the row across to the left to find the maximum allowable Current.

IF THE CURRENT CANNOT BE REDUCED OR IS LESS THAN WHAT IS REQUIRED, CONTINUE WITH STEPS B OR C.

STEP B: Increase the Wire Size for your Application

Determine if you can use a larger conductor size. If you selected a 1.5mm² conductor for a terminal block that will accommodate a 2.5mm² conductor, increase the Conductor Size. *This will increase the terminal block quantity.* Find the required quantity in the new Conductor Cross Section column. Follow that row across to the left, this is the new maximum Current.

IF THE CURRENT IS STILL LESS THAN REQUIRED, CONTINUE TO STEP C.

STEP C: Select a Larger Size Enclosure

If neither the current or the conductor size can be changed. Select the next size enclosure and repeat STEP 4-6. If none of these Steps provides you with the necessary terminal block or current, you might consider another Enclosure Series, or consult Factory.

Increased Safety Enclosure Selection Examples

Enclosure Selection: Example 1

A customer requires a TSC4X-080804 Enclosure with (19) Weidmuller SAK2.5 terminal blocks installed.

No information on Current or Conductor Size is given.

Question: Will (19) SAK2.5 terminal blocks fit in the enclosure?

Locate the Maximum Physical Content Chart for Weidmuller in the TSC Section.

Enclosure Size	Cat. Page	AKE2.5	AKE4	SAK2.5	SAK4	SAK6N
-050503	3B-47	7	6	6	6	5
-060604	3B-48	12	9	11	10	8
-070704	3B-49	34	13	15	14	11
-080804	3B-50	46	34	19	17	28
-101006	3B-51	99	72	54	50	40
-101008	3B-52	99	72	54	50	40
-120604	3B-53	43	31	36	33	27
-120605	3B-54	43	31	36	33	27

Chart reduced for clarity

Answer: Yes, from the chart above (19) SAK2.5 terminal blocks will fit.

Question: Will the enclosure qualify for Increased Safety Certification?

Locate the Thermal Dissipation Chart for the 080804 enclosure.

Terminal Block Population for Increased Safety Heat Dissipation Requirements						
Current (amps)	Maximum Terminal Block Wire Size (mm ²)					
	1.5	2.5	4	6	10	16
8	55	###	###	###	###	###
10	27	###	###	Maximum fill permitted based solely on minimum wire bending space and electrical clearances		
16	9	17	69			
20	3	10	20	###	###	###
25	###	5	11	22	###	###
35	Additional testing required, Consult Factory		3	8	21	###
50			###	1	7	17

Answer: Yes, (19) SAK2.5 terminal blocks can be installed and Increased Safety Certification given with a maximum current of 10 Amps using 2.5mm² wires.

Important: The Maximum Amperage and Conductor Size has to be forwarded to the customer.

Enclosure Selection: Example 2

A customer can only fit a TSC4X-121206 Enclosure within their skid package. They want (30) Weidmuller SAK2.5 terminal blocks installed and they would like 16 Amps with 2.5mm² conductors.

Question: Can (30) SAK2.5 terminal blocks fit in a TSC4X-121206 enclosure?

Locate the Maximum Physical Content Chart for Weidmuller in the TSC Section.

Enclosure Size	Cat. Page	AKE2.5	AKE4	SAK2.5	SAK4	SAK6N
-050503	3B-47	7	6	6	6	5
-060604	3B-48	12	9	11	10	8
-070704	3B-49	34	13	15	14	11
-080804	3B-50	46	34	19	17	28
-101006	3B-51	99	72	54	50	40
-101008	3B-52	99	72	54	50	40
-120604	3B-53	43	31	36	33	27
-120605	3B-54	43	31	36	33	27
-120805	3B-55	86	62	36	33	54
-120806	3B-56	86	62	36	33	54
-121206	3B-57	172	93	108	99	81
-121208	3B-58	172	93	108	99	81

Chart reduced for clarity

Answer: Yes, from the chart above the -121206 can fit (108) terminal blocks.

Question: Will the enclosure qualify for Increased Safety Certification?

Locate the Thermal Dissipation Chart for the 121206 enclosure.

Terminal Block Population for Increased Safety Heat Dissipation Requirements						
Current (amps)	Maximum Terminal Block Wire Size (mm ²)					
	1.5	2.5	4	6	10	16
8	85	###	###	###	###	###
10	41	###	###	Maximum fill permitted based solely on minimum wire bending space and electrical clearances		
16	14	27	107			
20	5	16	31	###	###	###
25	###	7	17	33	###	###
35	Additional testing required, Consult Factory		5	13	33	###
50			###	1	10	27

Answer: No, from the chart above the -121206 can fit (27) terminal blocks at 16 Amps with 2.5mm² wire

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Increased Safety Enclosure Selection Examples

Enclosure Selection: Example 2 Cont.

Question: What STEPS can you take.

Reminder: They can only use a -121206 enclosure.

Option 1: STEP A – Reduce the Current to be applied to Wire

Question: Will the customer accept a lower amperage?

Locate the Thermal Dissipation Chart for the 121206 enclosure.

Terminal Block Population for Increased Safety Heat Dissipation Requirements						
Current (amps)	Maximum Terminal Block Wire Size (mm ²)					
	1.5	2.5	4	6	10	16
8	85	###	###	###	###	###
10	41	###	###	Maximum fill permitted based solely on minimum wire bending space and electrical clearances		
16	14	27	107			
20	5	16	31	###	###	###
25	###	7	17	33	###	###
35	Additional testing required, Consult Factory		5	13	33	###
50	Consult Factory		###	1	10	27

Answer: Reducing the Current to 10 Amps allows the customer to stay in the -121206 Enclosure with (30) SAK2.5 terminal blocks while qualifying the enclosure for Increased Safety Certification.

Option 2: STEP B – Increase the Wire Size

Note: Increasing the conductor size will change the terminal block size and may affect the enclosure size.

Question 1: Will the customer change wire size and terminal block size?

Question 2: Will (30) SAK4 terminal block fit in the -121206 enclosure?

Locate the Maximum Physical Content Chart for Weidmuller in the TSC Section.

Enclosure Size	Cat. Page	AKE2.5	AKE4	SAK2.5	SAK4	SAK6N
-050503	3B-47	7	6	6	6	5
-060604	3B-48	12	9	11	10	8
-070704	3B-49	34	13	15	14	11
-080804	3B-50	46	34	19	17	28
-101006	3B-51	99	72	54	50	40
-101008	3B-52	99	72	54	50	40
-120604	3B-53	43	31	36	33	27
-120605	3B-54	43	31	36	33	27
-120805	3B-55	86	62	36	33	54
-120806	3B-56	86	62	36	33	54
-121206	3B-57	172	93	108	99	81
-121208	3B-58	172	93	108	99	81

Answer: Yes, from the chart above (30) SAK4 Terminal Blocks will fit.

Question: Will the enclosure qualify for Increased Safety Certification?

Locate the Thermal Dissipation Chart for the 121206 enclosure.

Terminal Block Population for Increased Safety Heat Dissipation Requirements						
Current (amps)	Maximum Terminal Block Wire Size (mm ²)					
	1.5	2.5	4	6	10	16
8	85	###	###	###	###	###
10	41	###	###	Maximum fill permitted based solely on minimum wire bending space and electrical clearances		
16	14	27	107			
20	5	16	31	###	###	###
25	###	7	17	33	###	###
35	Additional testing required, Consult Factory		5	13	33	###
50	Consult Factory		###	1	10	27

Answer: Yes, (30) SAK4 terminal blocks can be installed and Increased Safety Certification given with a maximum current of 16 Amps using 4mm² wires.

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Increased Safety Enclosure Selection Examples

Enclosure Selection: Example 3

A customer requires a TSC Series Enclosure with (30) Weidmuller SAK2.5 terminal blocks installed. The Minimum Current is 16 Amps with 2.5mm² conductors.

Question: What is the smallest enclosure that can fit (30) SAK2.5 terminal blocks?

Locate the Maximum Physical Content Chart for Weidmuller in the TSC Section.

Enclosure Size	Cat. Page	AKE2.5	AKE4	SAK2.5	SAK4	SAK6N
-050503	3B-47	7	6	6	6	5
-060604	3B-48	12	9	11	10	8
-070704	3B-49	34	13	15	14	11
-080804	3B-50	46	34	19	17	28
-101006	3B-51	99	72	54	50	40
-101008	3B-52	99	72	54	50	40
-120604	3B-53	43	31	36	33	27
-120605	3B-54	43	31	36	33	27

Chart reduced for clarity

Answer: From the chart above the smallest enclosure -101006 can fit (54) terminal blocks.

Question: Will the enclosure qualify for Increased Safety Certification?

Locate the Thermal Dissipation Chart for the 101006 enclosure.

Current (amps)	Maximum Terminal Block Wire Size (mm ²)					
	1.5	2.5	4	6	10	16
8	77	###	###	###	###	###
10	37	###	###	###	###	###
16	13	25	97	###	###	###
20	5	14	28	###	###	###
25	###	7	16	30	###	###
35	Additional testing required, Consult Factory		4	12	30	###
50	###		1	9	24	###

Answer: The terminal block quantity does not meet the customer's requirement for (30) terminal blocks.

Question: What **STEP** must you take? *Reminder: The current is 16 Amps minimum with 2.5mm² wire*

Answer: STEP C - Select a Larger Enclosure

Locate the Maximum Physical Content Chart for Weidmuller in the TSC Section.

Enclosure Size	Cat. Page	AKE2.5	AKE4	SAK2.5	SAK4	SAK6N
-050503	3B-47	7	6	6	6	5
-060604	3B-48	12	9	11	10	8
-070704	3B-49	34	13	15	14	11
-080804	3B-50	46	34	19	17	28
-101006	3B-51	99	72	54	50	40
-101008	3B-52	99	72	54	50	40
-120604	3B-53	43	31	36	33	27
-120605	3B-54	43	31	36	33	27

Chart reduced for clarity

Question: Will this enclosure qualify for Increased Safety Certification?

Locate the Thermal Dissipation Chart for the 101008 enclosure.

Current (amps)	Maximum Terminal Block Wire Size (mm ²)					
	1.5	2.5	4	6	10	16
8	92	###	###	###	###	###
10	45	###	###	###	###	###
16	15	30	116	###	###	###
20	6	17	33	###	###	###
25	###	8	19	36	###	###
35	Additional testing required, Consult Factory		5	14	35	###
50	###		2	11	29	###

Answer: YES.

The TSC Series -101008 enclosure with (30) SAK2.5 terminal blocks will qualify for Increased Safety Certification at 16 Amps with 2.5mm² conductors.

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