

Figure 1: MTL's DX range of enclosures.

1 INTRODUCTION

This publication describes the installation methods and considerations for the MTL "DX" range of enclosures (see figure 1) which are designed for use with MTL5000 Series isolating interfaces and MTL7000 Series shunt-diode safety barriers.

Installation details and wiring for modules in these Series are provided in instruction manuals INM5000 and INM7000 respectively. See page 7 for a complete list of applicable literature.

Note: The user should be aware that some workshop preparation may be required for the cable gland plates before the enclosure is ready for on-site installation.

Enclosures are usually selected on the basis of the number of units they will accommodate and table 1 shows the capacity of each of the enclosures. Figures 2 to 4 show each type of enclosure containing both MTL5000 and MTL7000 modules.

Enclosure	MTL5000 isolators 16 mm pitch	MTL7000 barriers 7.4 mm pitch
DX070	4 (2*)	9 (5*)
DX170	10 (8*)	22 (18*)
DX430	26 (24*)	58 (54*)

Table 1: DX range of enclosures - module capacities

* Use these figures when two IMB57 mounting brackets for tagging/earth-rail accessories are included

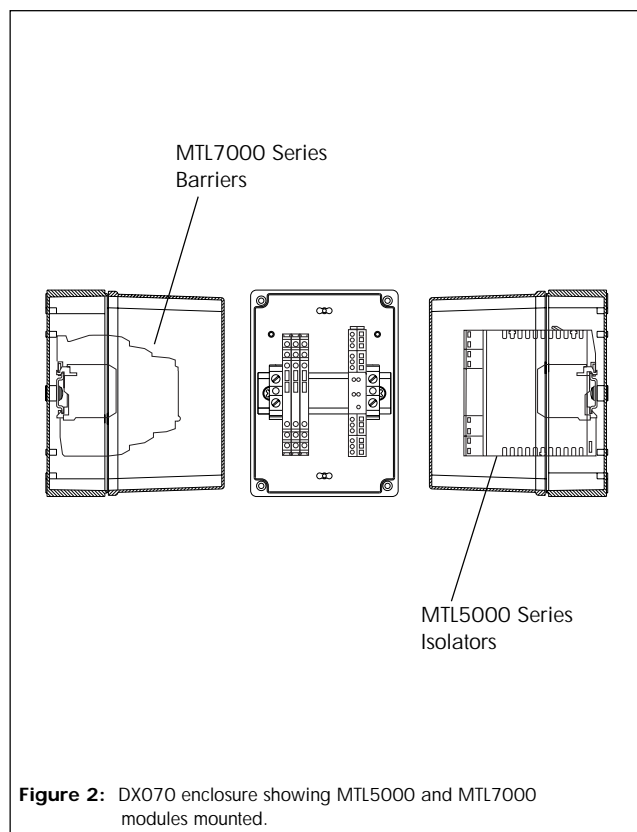


Figure 2: DX070 enclosure showing MTL5000 and MTL7000 modules mounted.

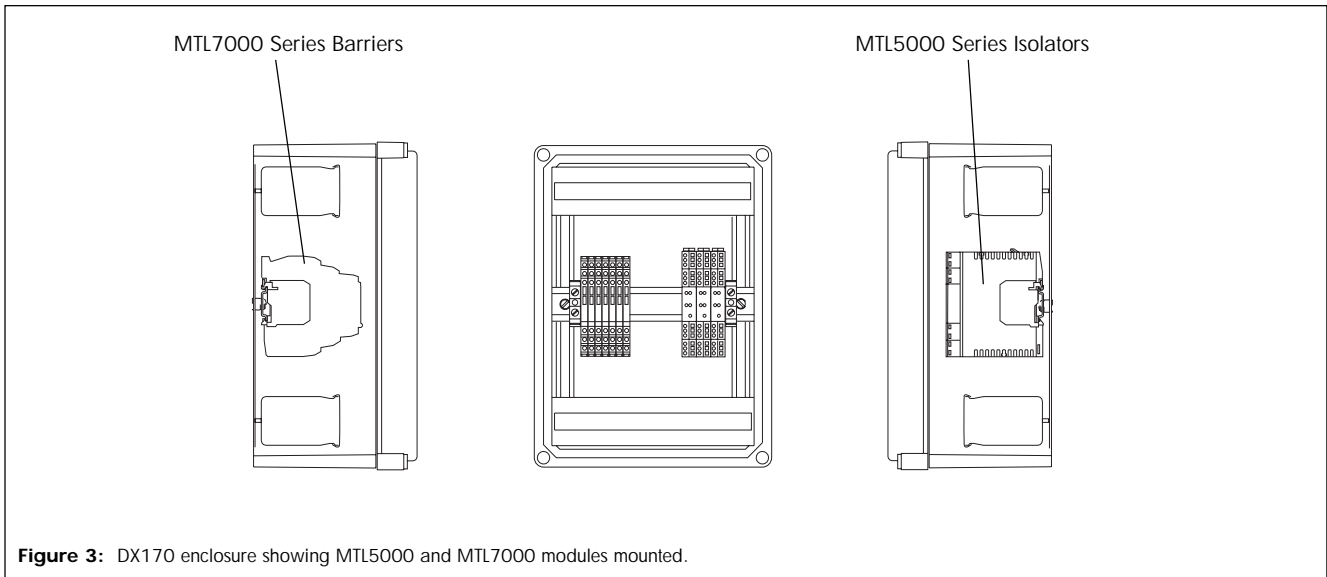


Figure 3: DX170 enclosure showing MTL5000 and MTL7000 modules mounted.

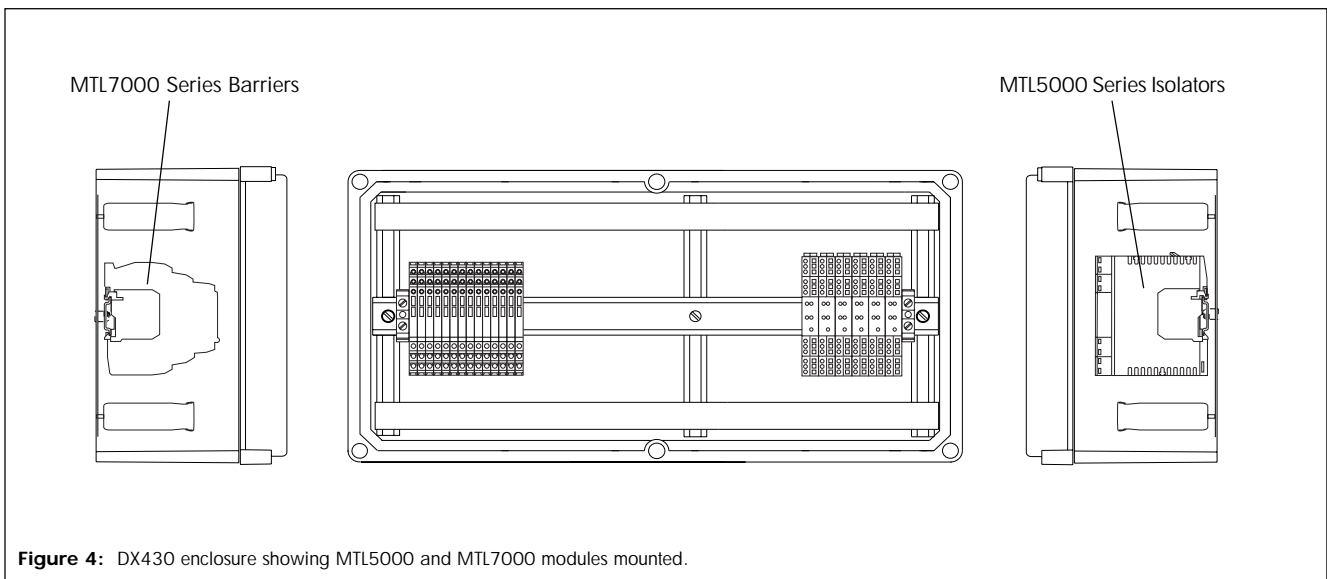


Figure 4: DX430 enclosure showing MTL5000 and MTL7000 modules mounted.

2 ENVIRONMENTAL CONDITIONS

Environmental conditions that should be taken into account when installing DX enclosures include:–

	See section
Maximum ambient temperature limits	2.1
Storage temperatures	2.2
Humidity	2.3
Corrosion resistance	2.4
Flammability	2.5
Impact resistance	2.6
Chemical resistance	2.7

2.1 MAXIMUM EXTERNAL AMBIENT TEMPERATURE LIMITS

The maximum external ambient temperature depends upon the total power dissipated by the installed modules which, in turn, depends upon their number and type. It can also be influenced by the Authority whose standards may need to be applied to the system, e.g. BASEEFA (CENELEC), Factory Mutual, Canadian Standards Authority.

Figures 5 to 7 show, in graphical form, the maximum outside enclosure temperatures (T_{MO}) for given levels of power dissipation. The graphs were derived from the following equations and these should be used to calculate accurately the suitability of any particular mix of modules.

$$T_{MO} = 91^{\circ}\text{C} - \delta T \quad \text{MTL5000} \quad (\text{see figure 5})$$

$$T_{MO} = 40^{\circ}\text{C} - \delta T \quad \text{MTL7000 BASEEFA} \quad (\text{see figure 6})$$

$$T_{MO} = 60^{\circ}\text{C} - \delta T \quad \text{MTL7000 FM \& CSA} \quad (\text{see figure 7})$$

where $\delta T = k_1 \times P$

P = total power (watts) dissipated by modules in an enclosure

k_1 = is a dissipation constant for a given enclosure and module series. Select the relevant value from table 2.

Table 2: Dissipation constant k_1 for enclosures

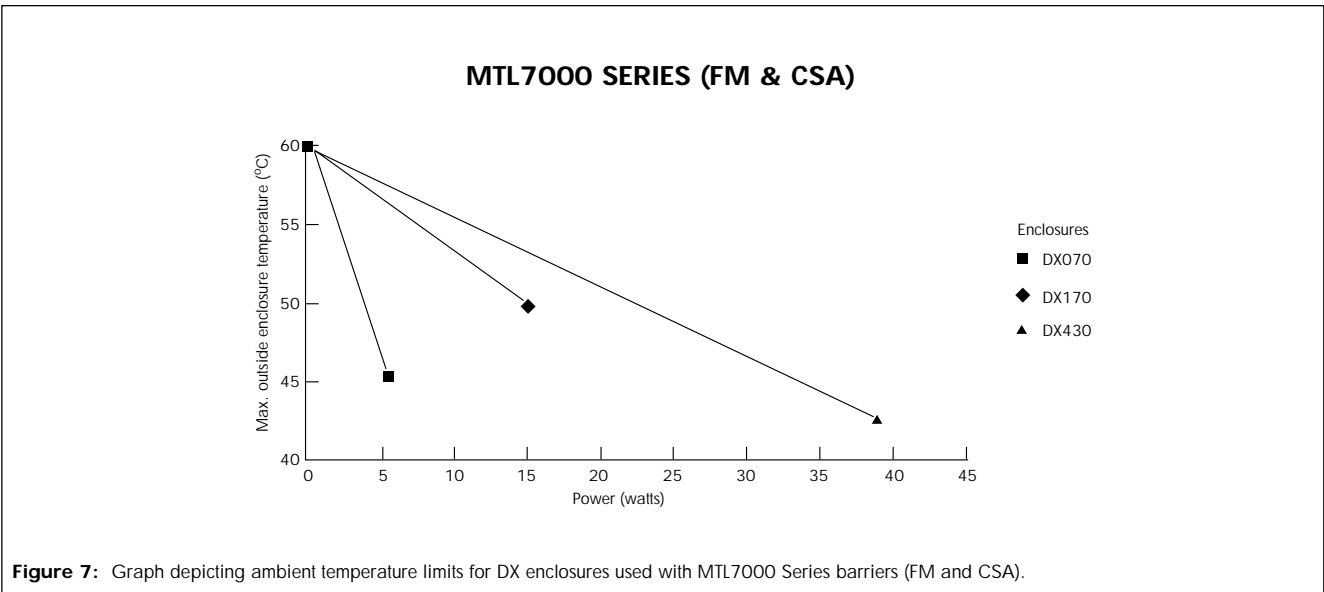
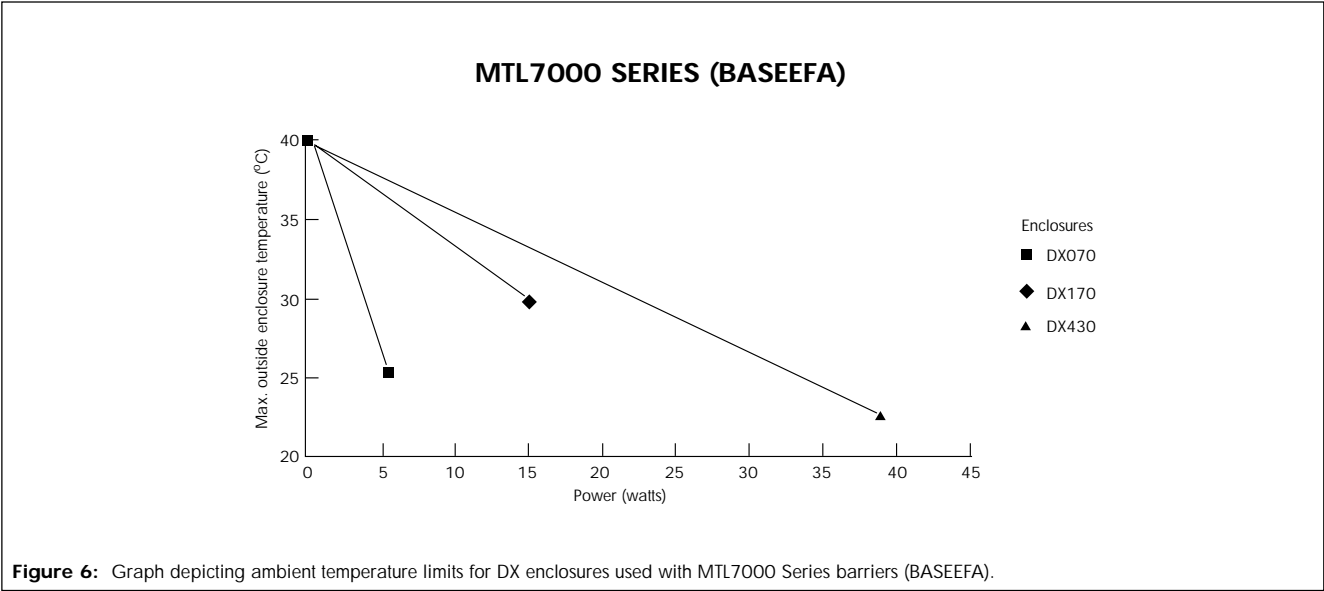
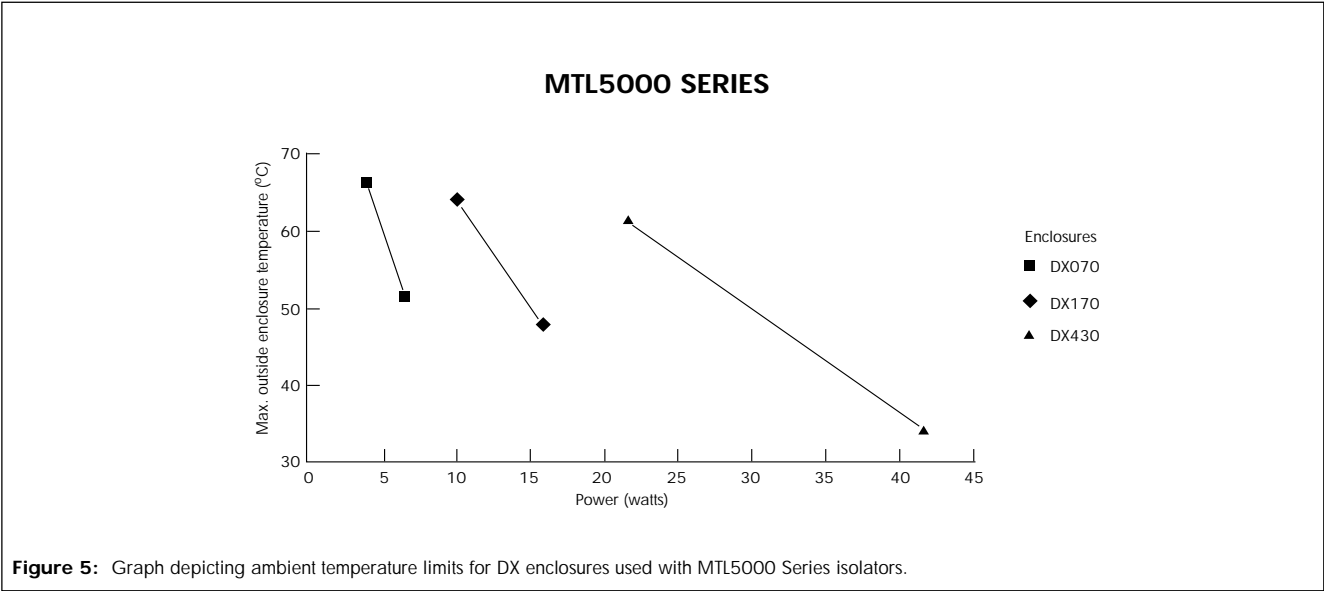
	DX070	DX170	DX430
MTL5000	6.17	2.69	1.36
MTL7000	2.34	0.702	0.458

The temperatures in the three equations are based on the following:

91°C is the temperature between units—equivalent to an 85°C air temperature around electronic components

40°C is based on the BASEEFA rules for the maximum ambient temperature 10mm away from the barrier terminals

60°C is based on the FM & CSA rules for the maximum ambient temperature 10mm away from the barrier terminals



Orientation of the enclosures is also important – the optimum position being on a vertical surface with the internal DIN-rail horizontal as shown in figure 8. For the MTL5000 Series, any other position can reduce the maximum allowable ambient temperature by up to 5°C and for the MTL7000 Series by up to 3°C.

2.1.1 Examples

Tables 3 to 6 list likely combinations of MTL5000/7000 Series modules in the three enclosure types and indicate the acceptable maximum permitted ambient temperature for these based on the graphs in figures 5 to 7. Note the provisos concerning the difference between BASEEFA and North American (FM and CSA) requirements for MTL7000 Series barriers. See the specifications included in the latest version of MTL's IS catalogue for the power dissipation figures of individual MTL5000 Series modules. For the MTL7000 Series modules refer to AN9016 - MTL7000 Series application note (in preparation).

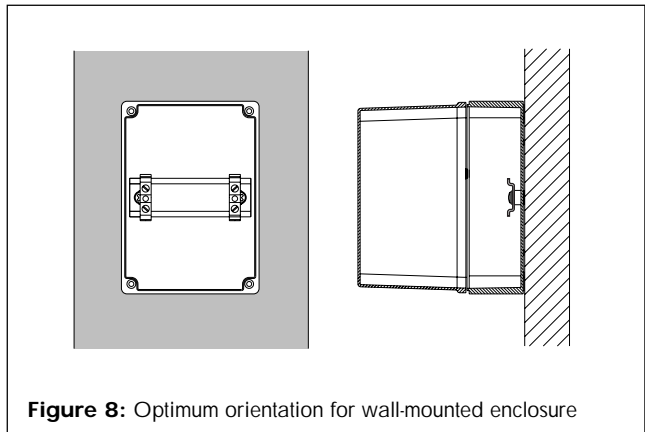


Figure 8: Optimum orientation for wall-mounted enclosure

Table 3: Typical mix of MTL5000 Series modules

Enclosure	Modules installed	Power dissipation of modules in watts (P)	Maximum ambient temperature (T _{mo}) °C
DX070	2xMTL5011 + 2xMTL5044	(2x0.6) + (2x1.5) = 4.2	65.1
DX170	5xMTL5011 + 5xMTL5044	(5x0.6) + (5x1.5) = 10.5	62.8
DX430	13xMTL5011 + 13xMTL5044	(13x0.6) + (13x1.5) = 27.3	53.8

Table 4: Power versus maximum ambient temperature (MTL5000 Series)

Enclosure	Number of installed modules	k ₁ °C/watt	Power dissipation of modules in watts (P)	Maximum ambient temperature (T _{mo}) °C
DX070	4	6.17	4.0	66.3
	4	6.17	6.0	54.0
DX170	10	2.69	10.0	64.1
	10	2.69	15.0	50.7
DX430	26	1.36	21.6	61.5
	26	1.36	39.0	37.8

Table 5: Typical mix of 7000 Series modules

Enclosure	Modules installed	Power dissipation of modules in watts (P)	Maximum ambient temperature (T _{mo}) °C	
			BASEEFA	FM/CSA
DX070	3xMTL7028 + 6xMTL7087P	(3x0.53) + (6x0.13) = 2.37	34.5	54.5
DX170	6xMTL7028 + 16xMTL7087P	(6x0.53) + (16x0.13) = 5.26	36.3	56.3
DX430	10xMTL7028 + 48xMTL7087P	(10x0.53) + (48x0.13) = 11.54	34.7	54.7

BASEEFA: 40°C maximum ambient temperature measured at 10mm from barrier terminals

FM/CSA: 60°C maximum ambient temperature measured at 10mm from barrier terminals

Table 6: Power versus maximum ambient temperature (MTL7000 Series)

Enclosure	Number of installed modules	k ₁ °C/watt	Power dissipation of modules in watts (P)	Maximum ambient temperature (T _{mo}) °C	
				BASEEFA	FM/CSA
DX070	9	2.34	2.4	34.5	54.5
	9	2.34	4.6	29.2	49.2
DX170	22	0.702	5.3	36.3	56.3
	22	0.702	11.3	32.1	52.1
DX430	58	0.458	11.5	34.7	54.7
	58	0.458	29.7	26.4	46.4

BASEEFA: 40°C maximum ambient temperature measured at 10mm from barrier terminals

FM/CSA: 60°C maximum ambient temperature measured at 10mm from barrier terminals

2.2 STORAGE TEMPERATURES

Storage temperatures are safe within the range -40°C to $+80^{\circ}\text{C}$.

2.3 HUMIDITY LIMITS

Safe humidity limits are within the range 5 to 95%RH.

2.4 CORROSION RESISTANCE

The effect of corrosion on DX enclosures is negligible.

2.5 FLAMMABILITY RATING

The flammable properties of the materials used in the construction of the enclosures are well understood by manufacturers and ratings have been established to a number of standards. One of the better known standards is the Underwriter's Laboratory standard UL 94 and the ratings for the enclosure materials are given as:

Materials	UL 94 rating
Polycarbonate (all lids)	V2/V0
Polycarbonate with glass reinforcement (DX070 base)	V1/V0
Polyester with glass reinforcement (DX170 & DX430 bases)	V0

Items made from similar materials are well established as suitable for use in IS safe areas.

2.6 IMPACT RESISTANCE

The enclosure designs have been tested to an impact resistance of greater than 2 Joules which exceeds the BS EN 610 10-1 requirements of 0.5 Joules.

2.7 CHEMICAL RESISTANCE

The overall chemical resistance of the enclosures is limited by the resistance of the transparent polycarbonate lid. The glass-reinforced polycarbonate/polyester (GRP) bases have a higher resistance than plain polycarbonate. Table 7 lists qualitative evaluations of resistance to a variety of chemical agents.

3 MOUNTING

3.1 GENERAL

These instructions are concerned solely with mounting the DX enclosures. Instructions for mounting and wiring individual modules within the enclosures are provided in the appropriate Instruction Manuals (i.e., INM7000 for MTL7000 Series barriers and INM5000 for MTL5000 Series isolators).

Sufficient space is provided within the enclosures to accommodate tagging and earth-rail accessories for both ranges but this is at the expense of a reduction in the number of modules that can be fitted. The MTL7000 Series power comb can also be accommodated if required.

3.2 LOCATION AND ORIENTATION

DX enclosures will normally be located within a safe area but they also satisfy FM and CSA standards for Division 2, Class I (gases). They do NOT satisfy Division 2, Class II (dust ignition)

As noted earlier (see section 2.1 and figure 8), for optimum temperature performance the enclosures should be mounted on a vertical surface with the internal DIN rail horizontal.

3.3 MOUNTING DETAILS

See figures 9 to 11 for the dimensions and mounting hole distances, etc., of the three DX enclosures. The recommended method of mounting—described here—uses the four wall-mounting lugs supplied with each enclosure. An alternative method of mounting is by direct attachment to the mounting surface through the corner holes.

Note: When the wall-mounting lugs are used to attach the enclosures, the overall depth of the enclosure is increased by an additional 3.3 mm (DX070) or 7 mm (DX170 and DX430).

- At each of the four corner fixing holes, insert one of the screws provided and use it to attach a fixing lug to the base of the enclosure.
- Each lug can be used in one of two positions as shown in figures 9 to 11.
- Attach the lugs to the mounting surface with suitable fasteners.
- Diameters of fixing holes in lugs are 5.5mm (DX070) and 7.0mm (DX170 and DX430)
- Appropriate fixing hole distances are shown in figures 9 to 11.

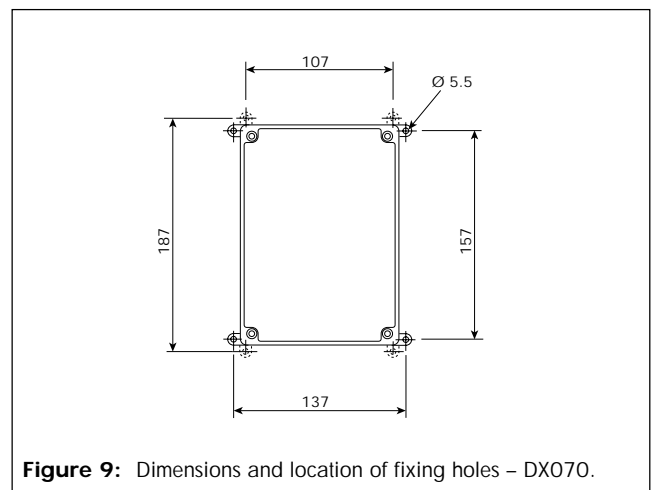


Figure 9: Dimensions and location of fixing holes – DX070.

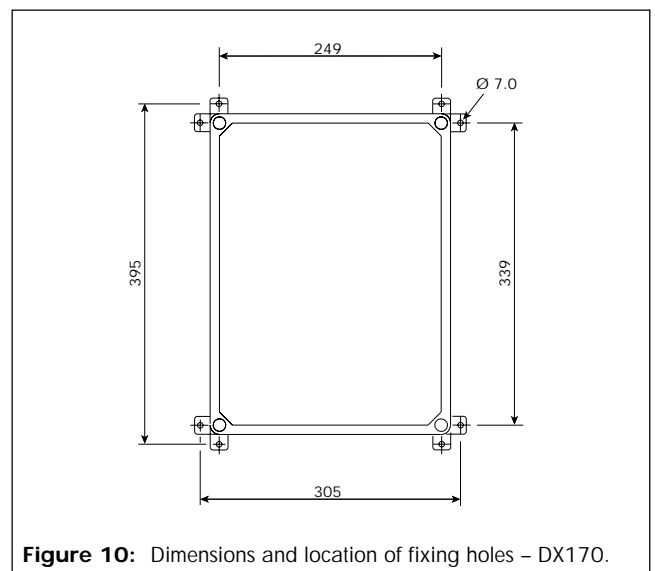
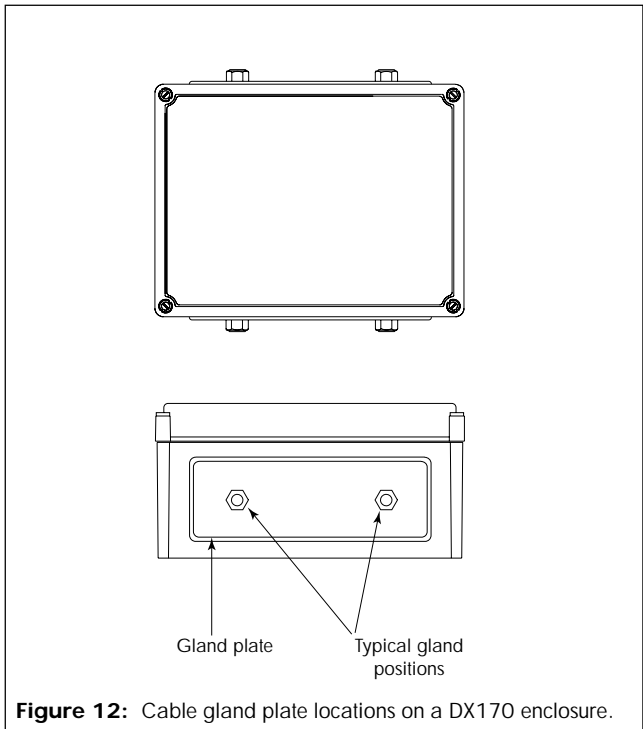
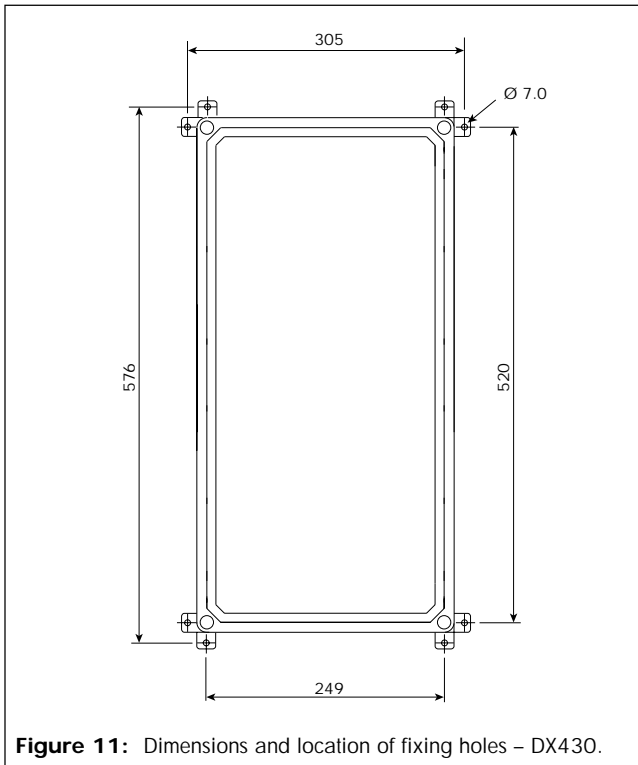


Figure 10: Dimensions and location of fixing holes – DX170.

Table 7: Qualitative evaluations of resistance to various chemical agents

Chemical agents	Qualitative evaluation of resistance
Salt water; neutral salts; acids (low concentrations); hydraulic oil	Excellent
Alcohols	Very good
Acids (high concentrations); alkalis (low concentrations); petrol; cooling fluids	Good
Alkalis (high concentrations); solvents.	Poor



3.4 CABLE GLANDING

All cables into the enclosures must be glanded to IP65 standards to maintain this rating for the enclosure as a whole. Cable glands and gland plates are *not* supplied. Glanding requirements vary for each enclosure; see section 3.4.1 (DX070), 3.4.2 (DX170) or 3.4.3 (DX430) for specific details.

3.4.1 DX070

On the DX070, 'knockout' holes are provided, in two different sizes (15.5 mm and 21 mm), on the side faces of the base. See table 9 for recommended cable glands.

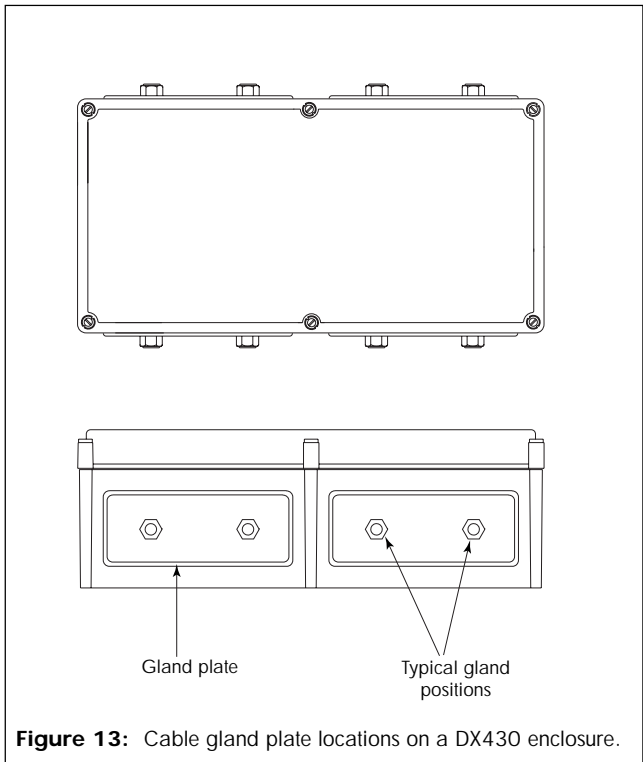
Note: The enclosure may have three or four knockout holes on each side depending on the manufacturer. Consequently, there may be a choice of either six or eight positions for cable glands.

3.4.2 DX170

The DX170 can accommodate one gland plate *on each side* – see figure 12 for details. Table 8 lists suppliers of suitable gland plate kits and Table 9 lists recommended glands.

3.4.3 DX430

The DX430 can accommodate two gland plates *on each side* – see figure 13 for details. Table 8 lists suppliers of suitable gland plate kits and Table 9 lists recommended glands.



Manufacturer/agent	Manufacturer's part number	
	DX170	DX430
Bowthorpe Hellermann	TL-27/360	TL-27/270
Sarel	21128	21127

Table 8: Recommended gland plate kits for DX170 and DX430 enclosures.

Sarel (UK) Tel +44 (0)1793 514774

Bowthorpe Hellermann (UK) Tel +44 (0)1922 458151

Gland thread size	Cable sizes (mm)	Gland plate hole size (mm)	Weidmuller part nos.		Sarel part nos.	
			Gland	Locknut	Gland	Locknut
PG9	5 to 8	15.2	951891	952216	08871	08881
PG13,5	8 to 13	20.4	951893	952218	08873	08883

Table 9: Recommended cable glands for use with DX enclosures.

Weidmuller (UK) Tel +44 (0)1795 580999

Sarel (UK) Tel +44 (0)1793 514774

3.5 ACCESSORIES

Apart from mounting, there are some other installation details which should be considered before adding the appropriate interface modules and making the necessary cabling connections.

The following range of accessories is available to accompany the MTL5000 and MTL7000 units:

IMB57	Insulating mounting block
ERB57S	Earth rail bracket, straight
ERB57O	Earth rail bracket, offset
ERL7	Earth rail, 1m length
ETM7	Earth terminals
TAG57	Tagging strip, 1m length
TGL57	Tagging strip labels

Further details on these accessories are provided in product sheet EPS57ACC and instruction manual INM57ACC but the following points should be observed.

3.5.1 Insulating mounting block (IMB57)

A pair of these can be attached to the DIN rail, at either end of the modules, to provide a mounting for earth rails. As noted earlier, use of mounting blocks will reduce the space available for barrier or isolator modules.

3.5.2 Earth rails (ERL7)

Earth rail is produced in 1 metre lengths and will require cutting to length before mounting. ERL7 earth rails can be mounted either side of the modules but are typically mounted on the hazardous side of the DIN rail.

3.5.3 Tagging strip (TAG57 and TGL57)

Tagging strip is produced in 1 metre lengths and will require cutting to length before mounting. Similarly, the labels will require cutting to fit the tagging strip.

3.6 IS WARNING LABEL

A 'Take Care' IS warning label is provided inside the enclosure. This should be attached to the inside of the transparent lid when its orientation has been established.

3.7 APPLICABLE LITERATURE

EPS57ENC	MTL5000/7000 enclosures, specification
EPS57ACC	MTL5000/7000 accessories, specification
INM5000	MTL5000 Series, instruction manual
INM7000	MTL7000 Series, instruction manual
INM57ACC	MTL5000/7000 accessories, instruction manual
AN9016	MTL7000 Series, application note (in preparation)

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