*Figura 3.1.* Armario mural con medidas estándar .

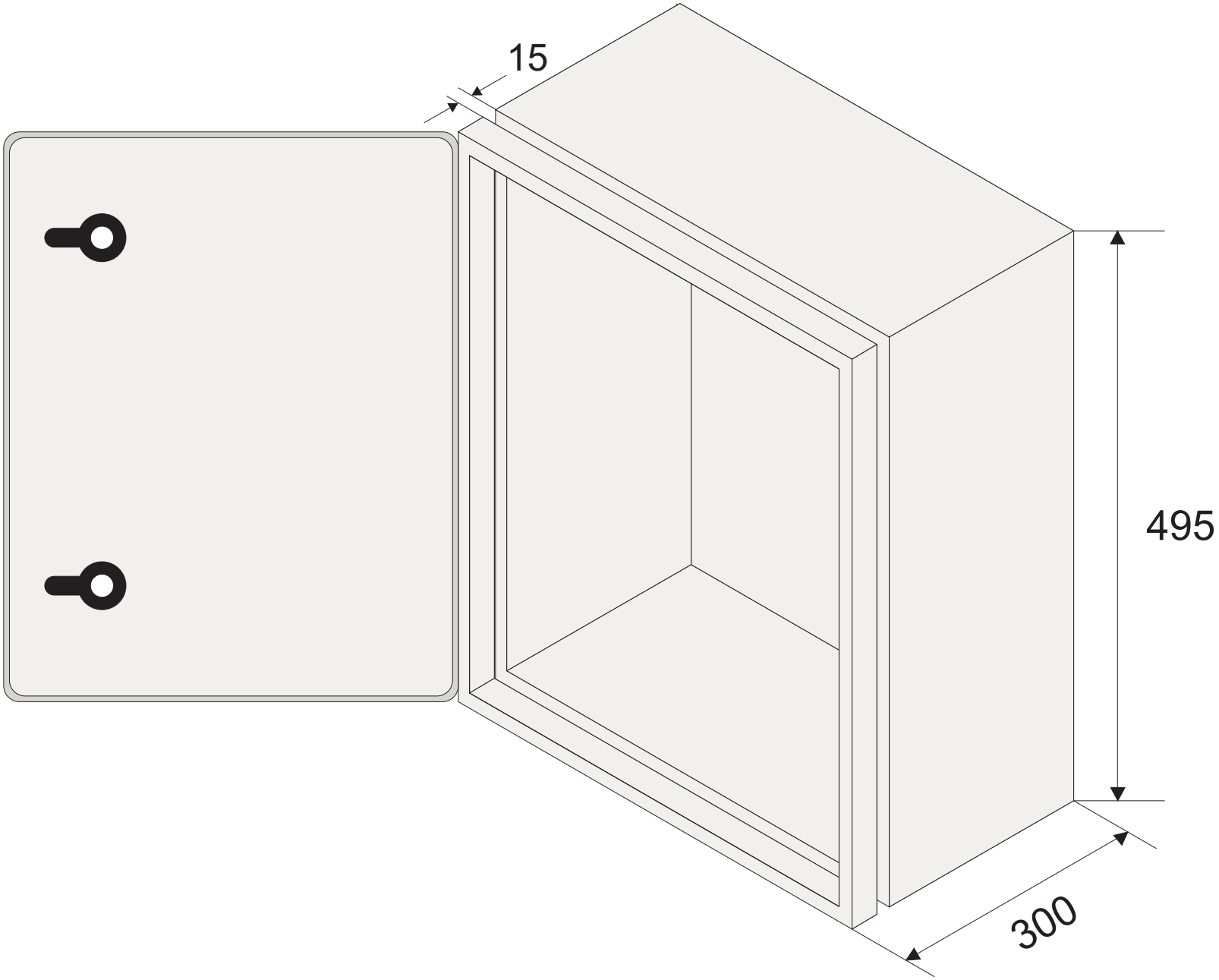


*Figura 3.2. Montaje de un armario mural de acero inoxidable.*

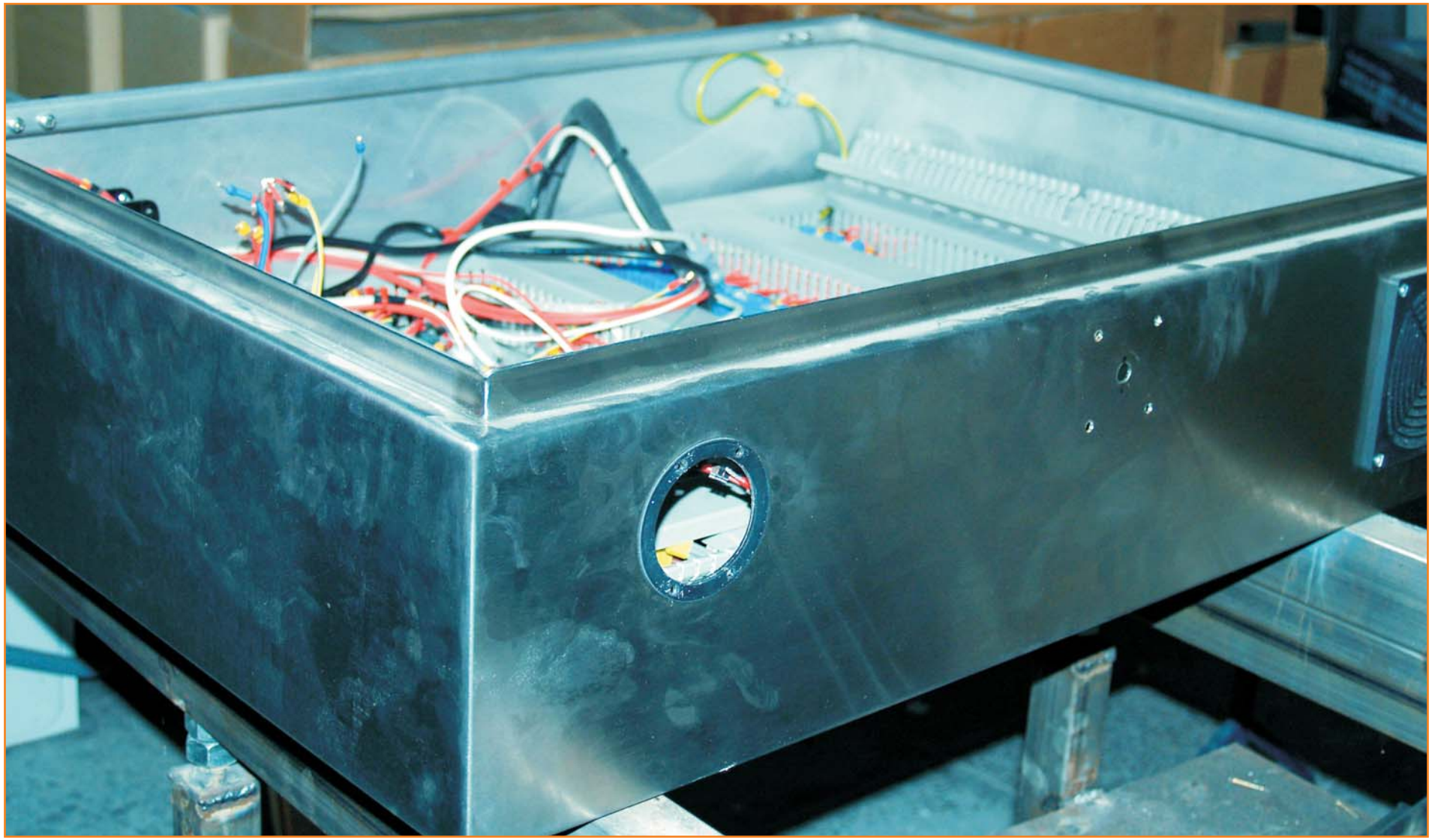
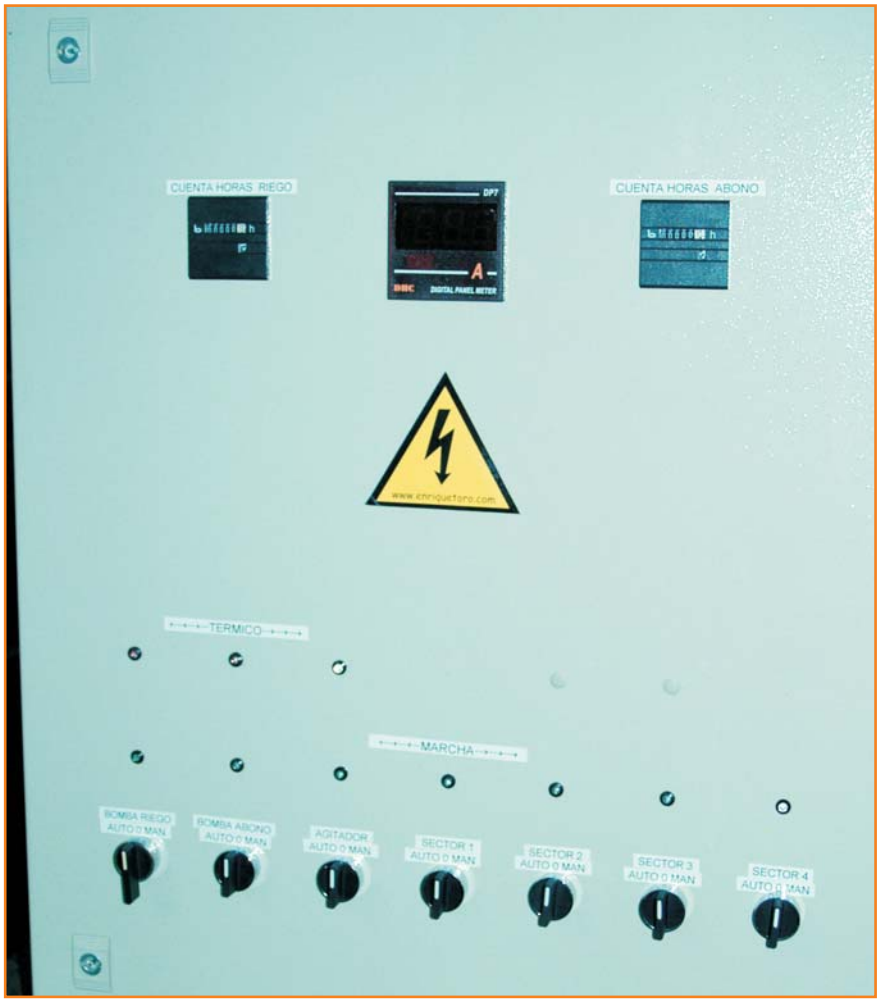


*Figura 3.3. Triángulo de riesgo eléctrico (IEC 60417).*



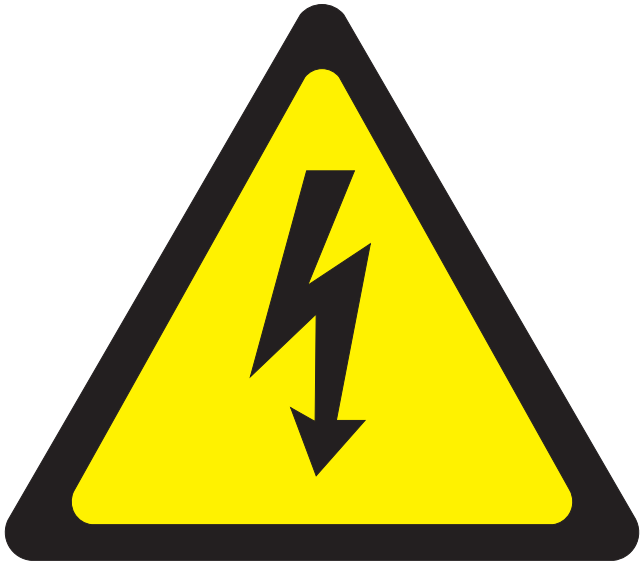



Figura 3.4. Pupitre.

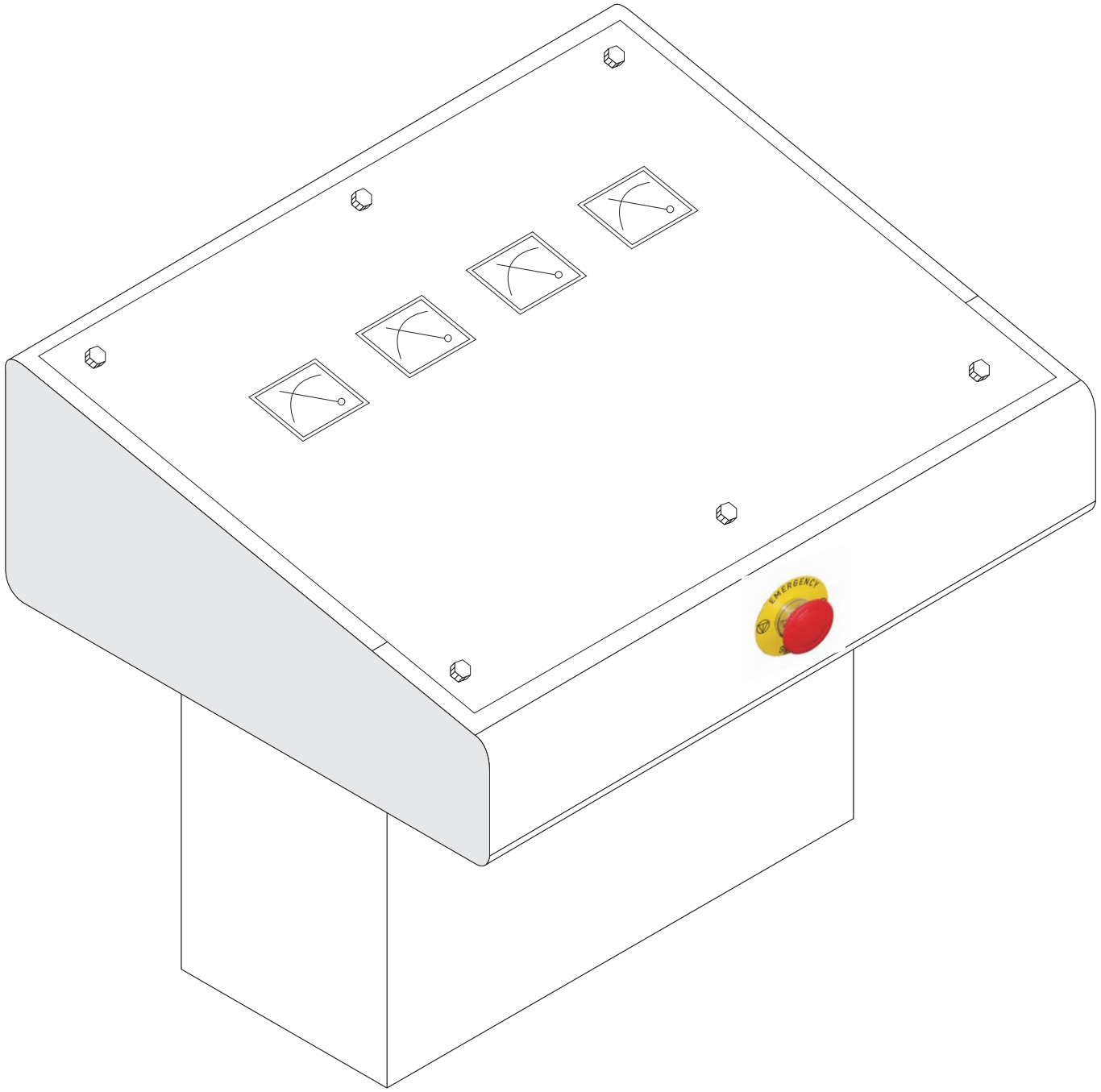


*Figura 3.5. Chapa interior del cuadro, donde alojar los componentes.*

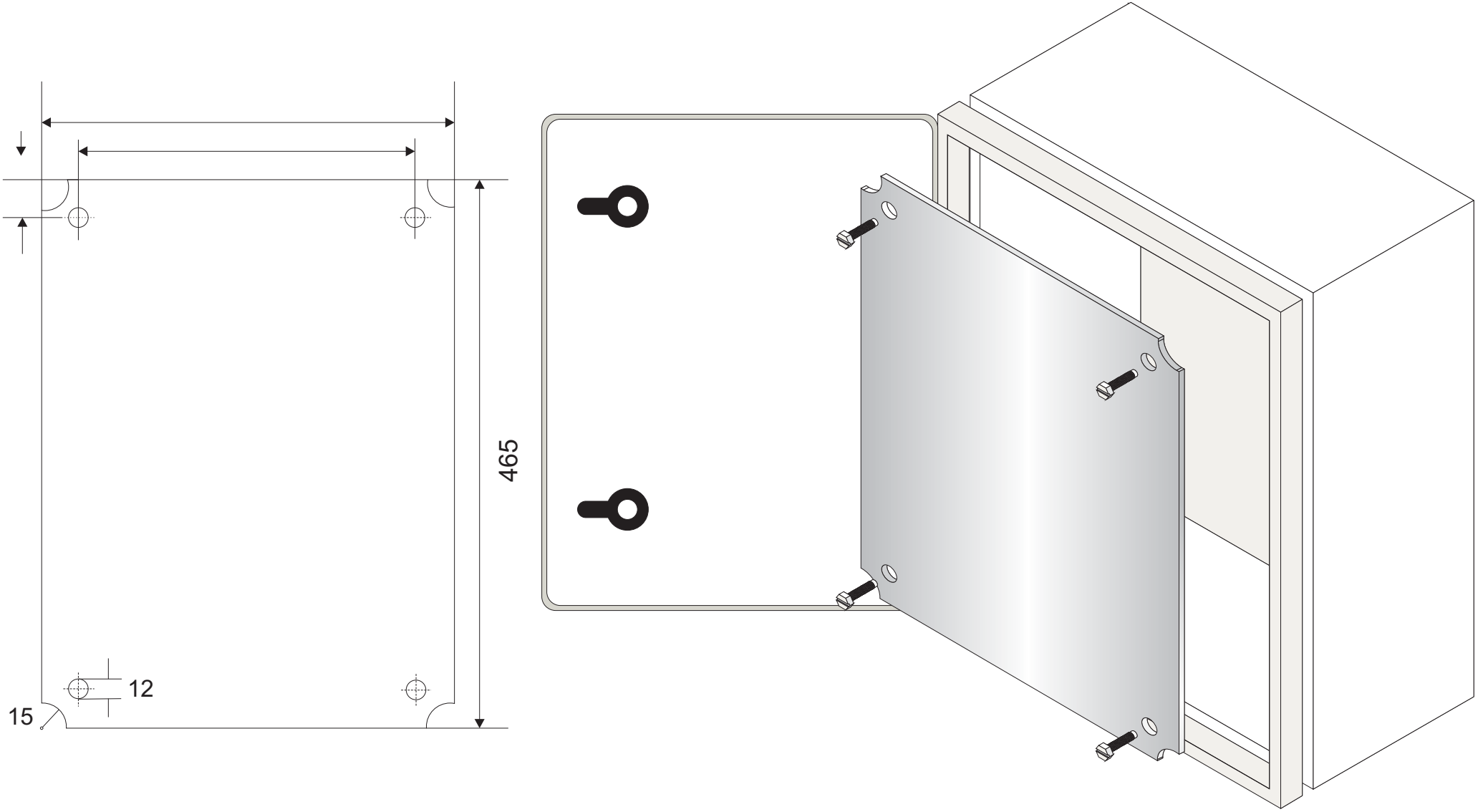


*Figura 3.6.* Chapa perforada.

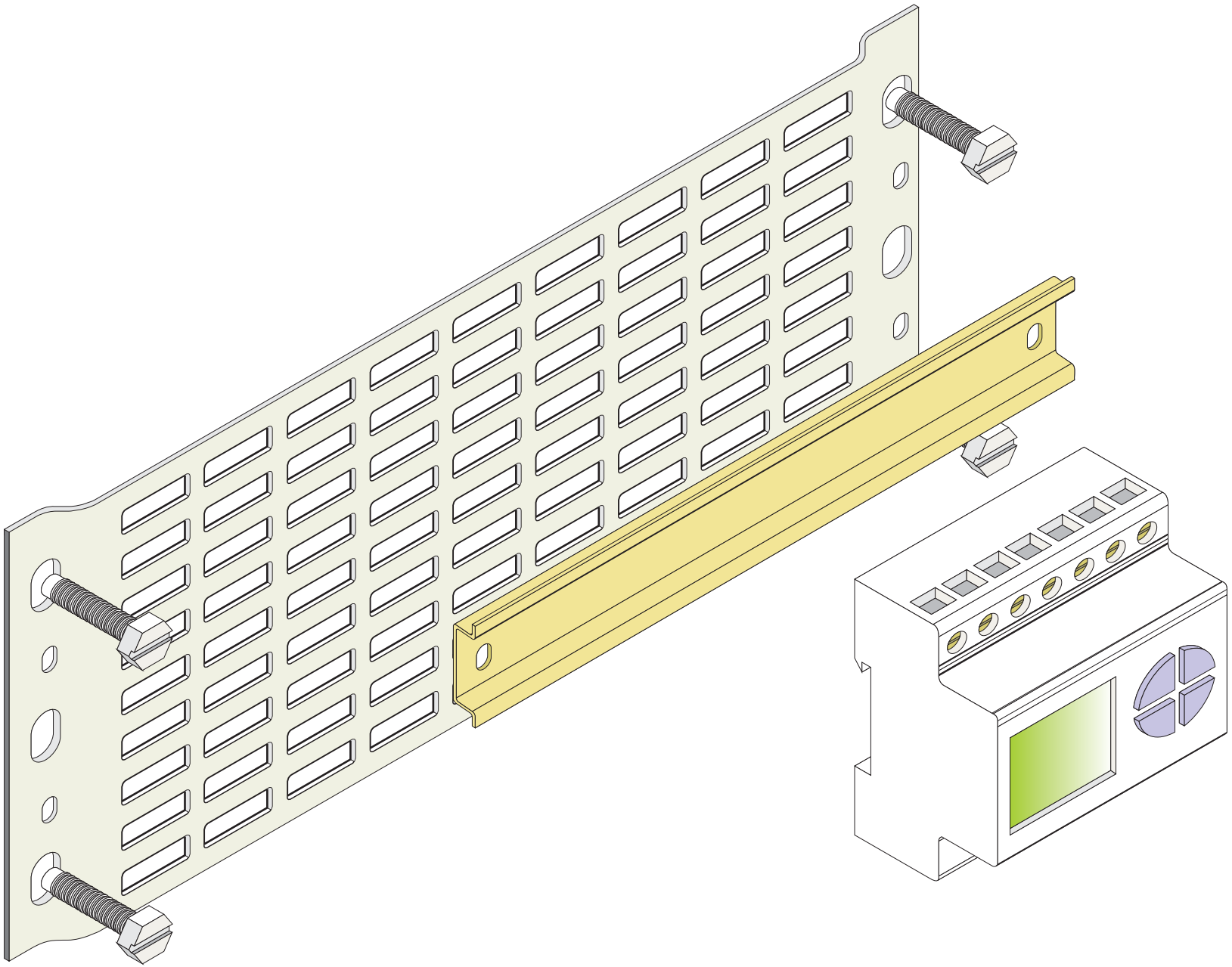


*Figura 3.7.* Canaleta perforada.

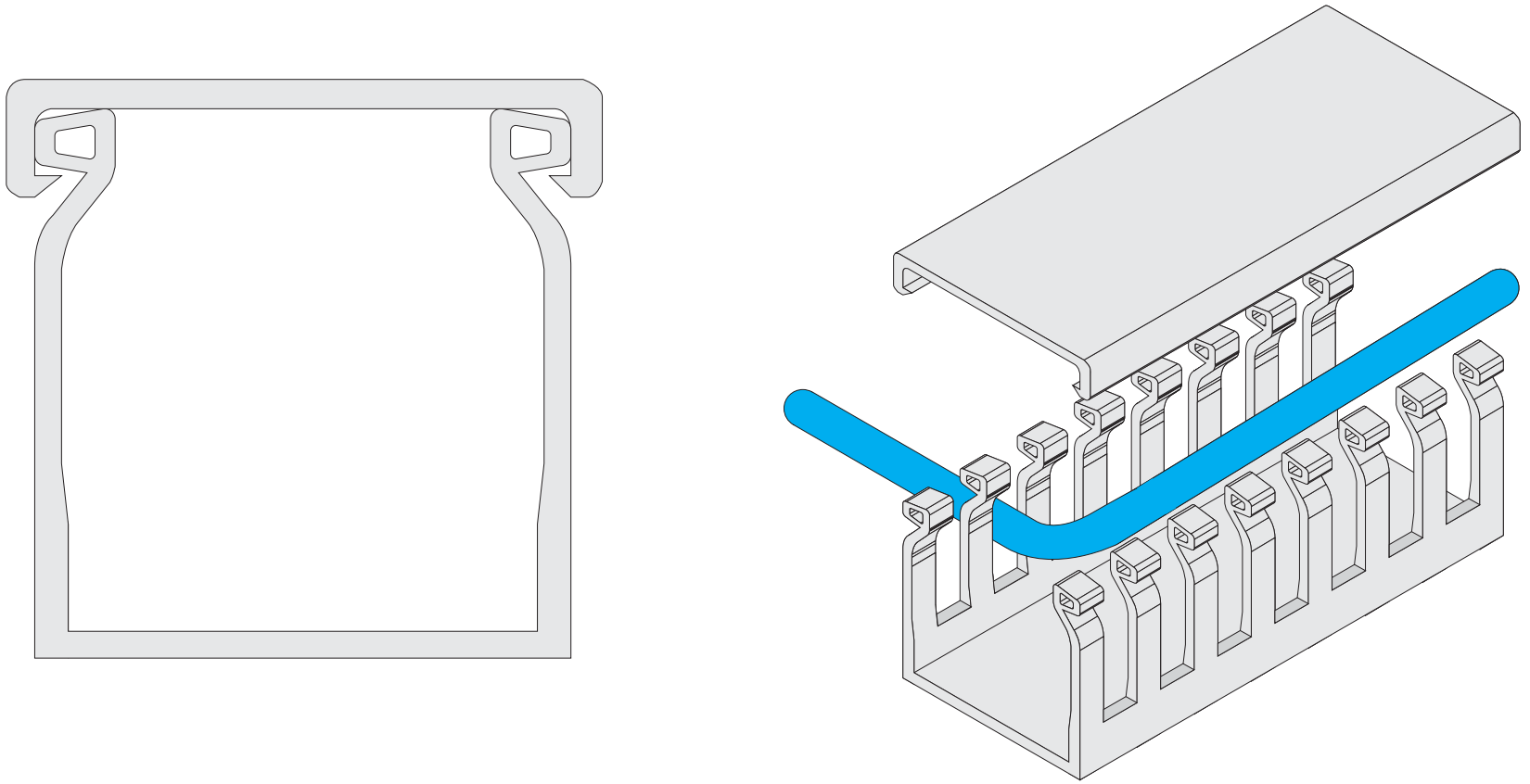


*Figura 3.8.* La canaleta ordena el cableado del cuadro.

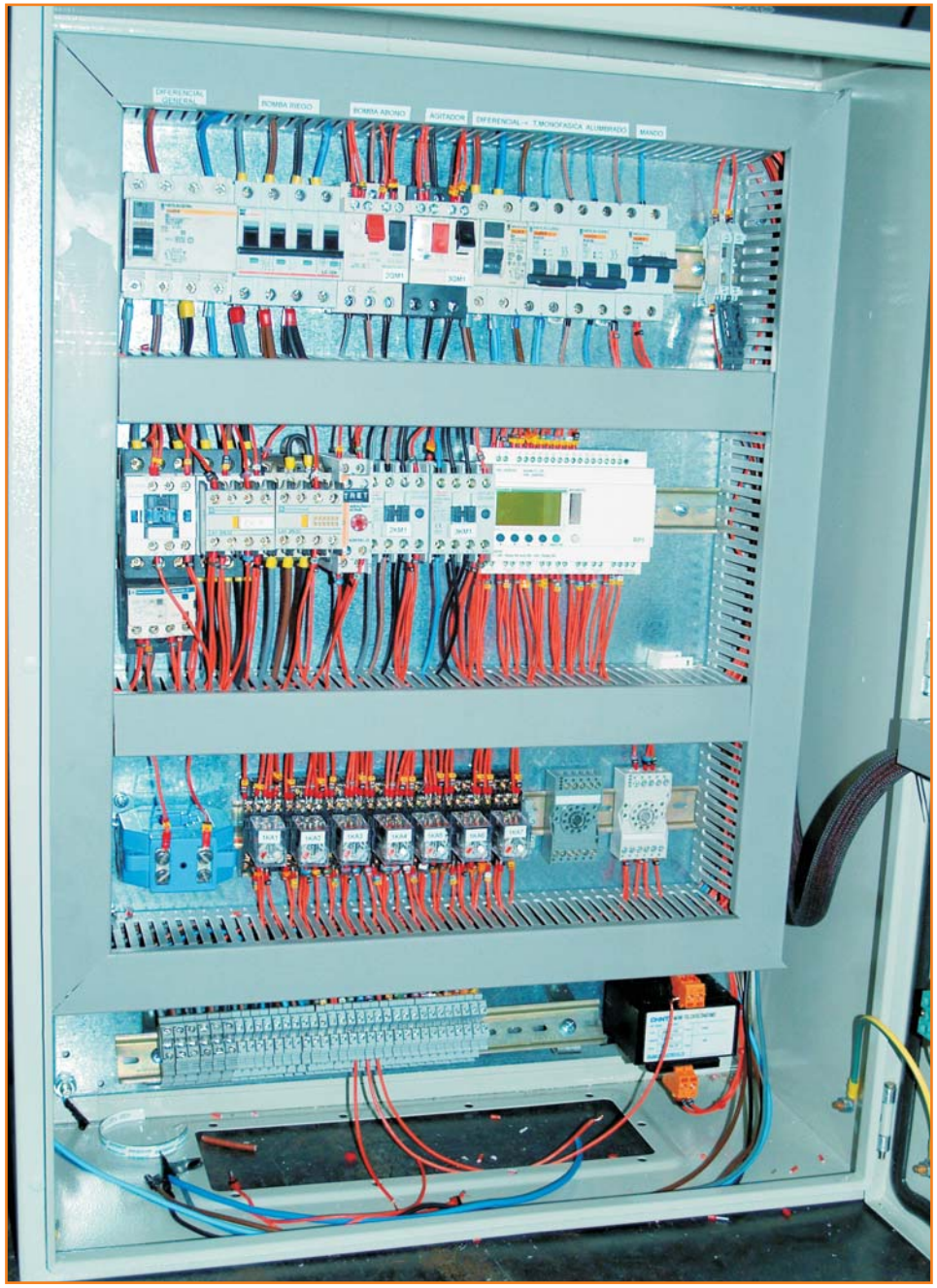


*Figura 3.9.*

*Se usará ingletadora para el corte de la canaleta a 45º.*

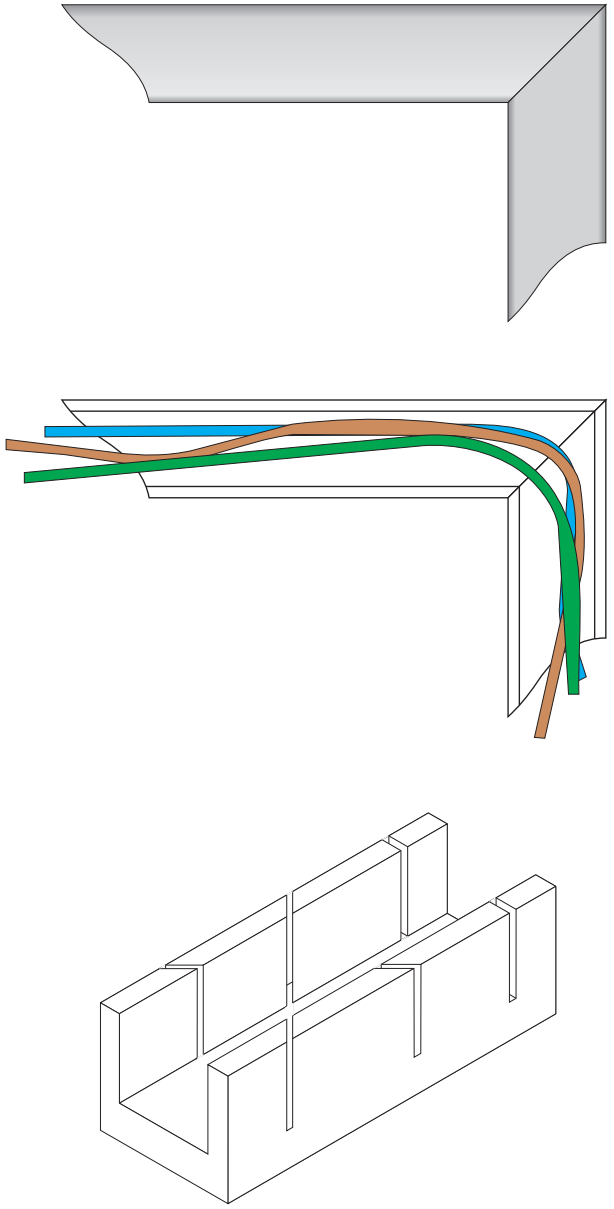


*Figura 3.10.* Borne acoplado a un rail.

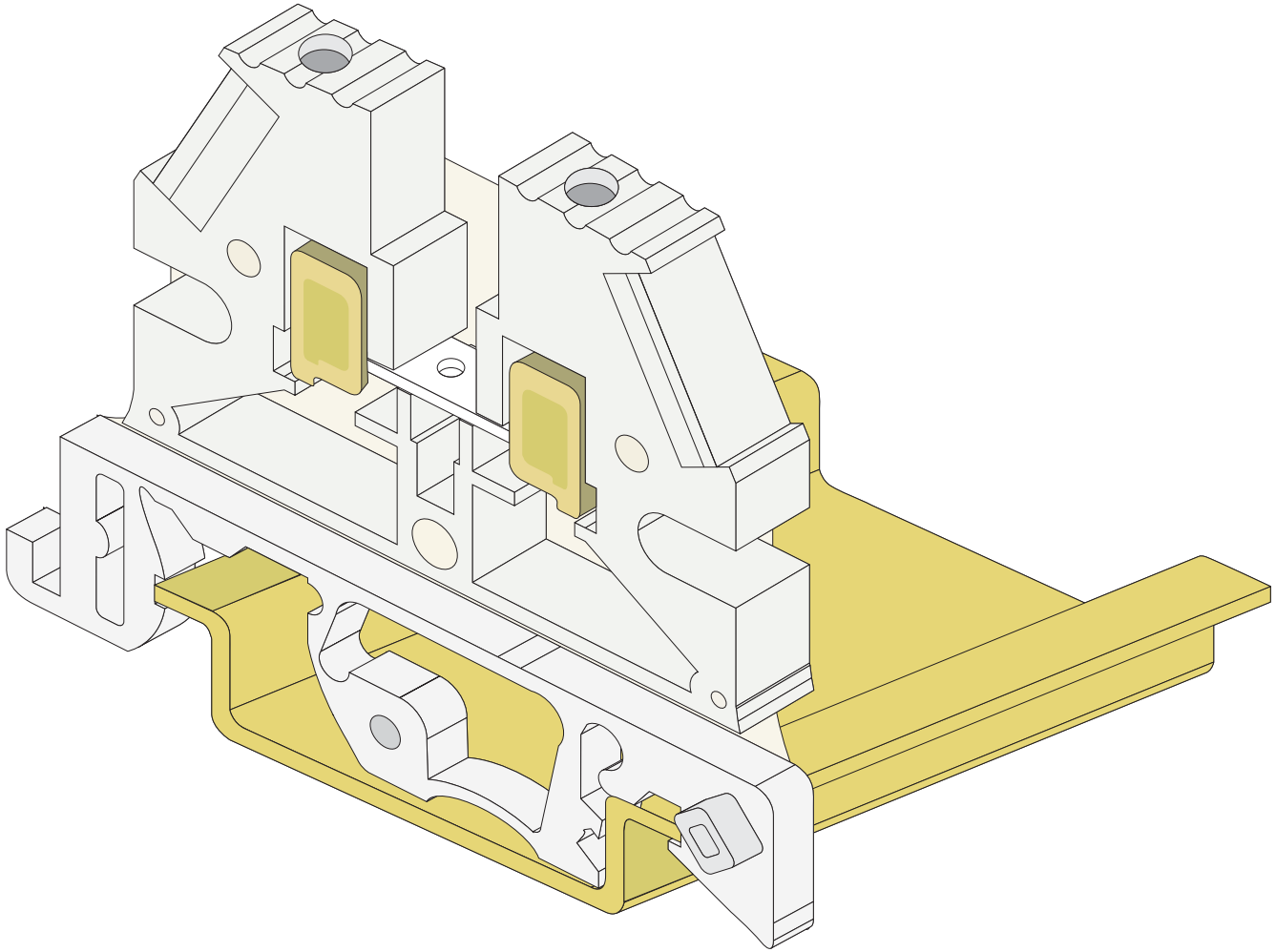


*Figura 3.11.* Carril DIN EN 50022 NS-35.

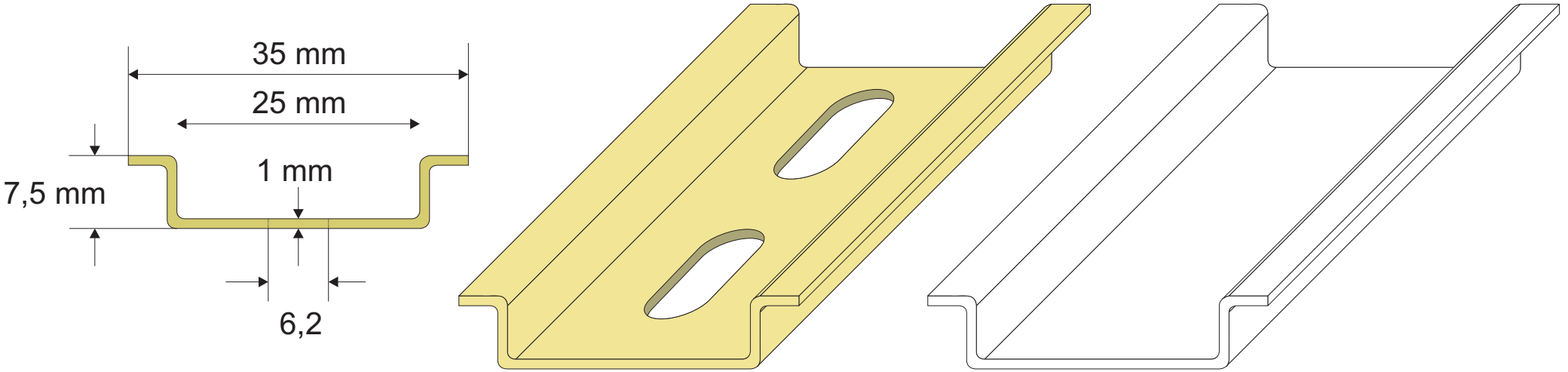


*Figura 3.12. Carril DIN EN 50022 NS-35-15P.*

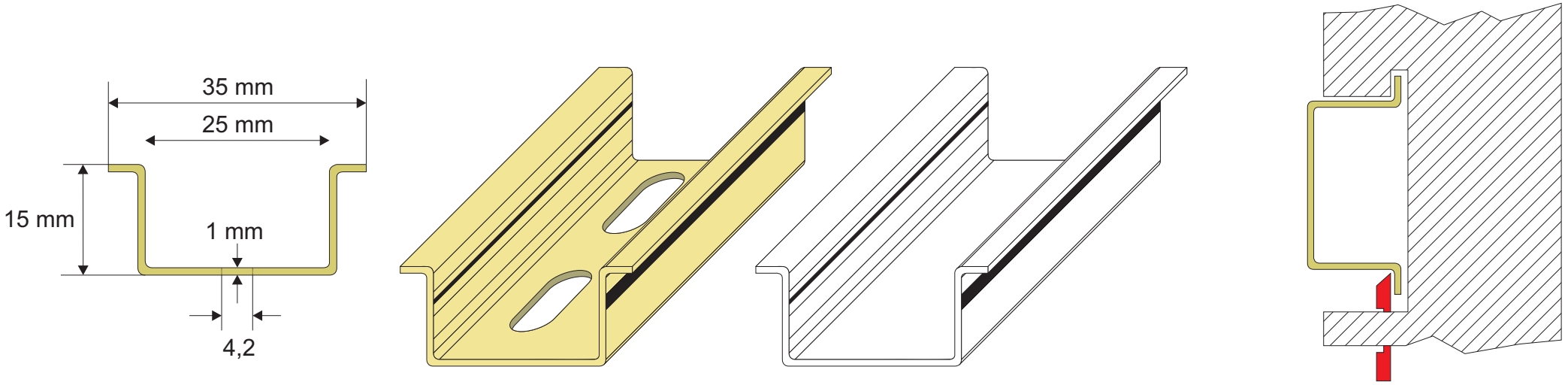


*Figura 3.13.* Carril DIN EN 50035.

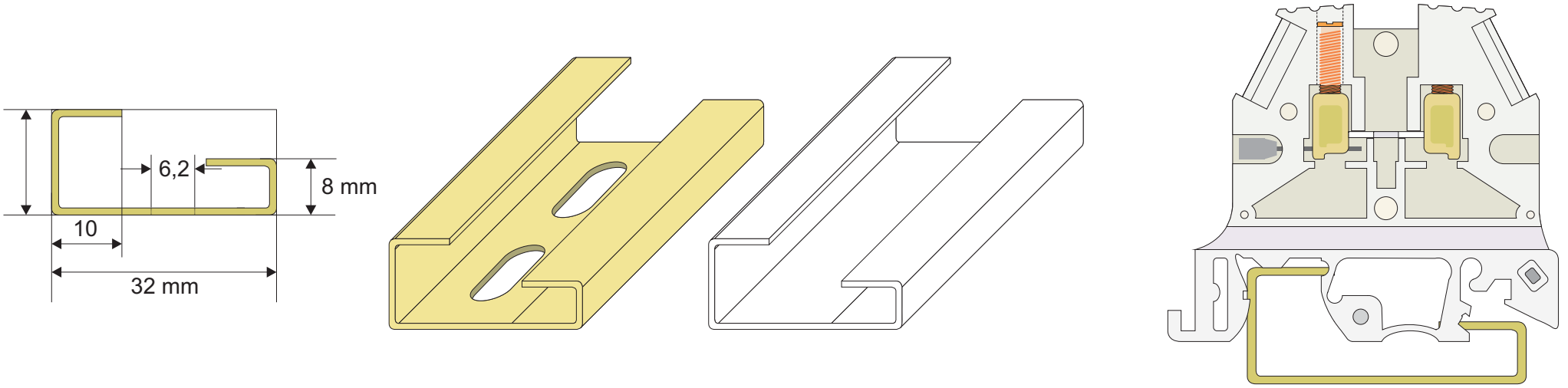


*Figura 3.14.* Carriles especiales para dispositivos concretos.

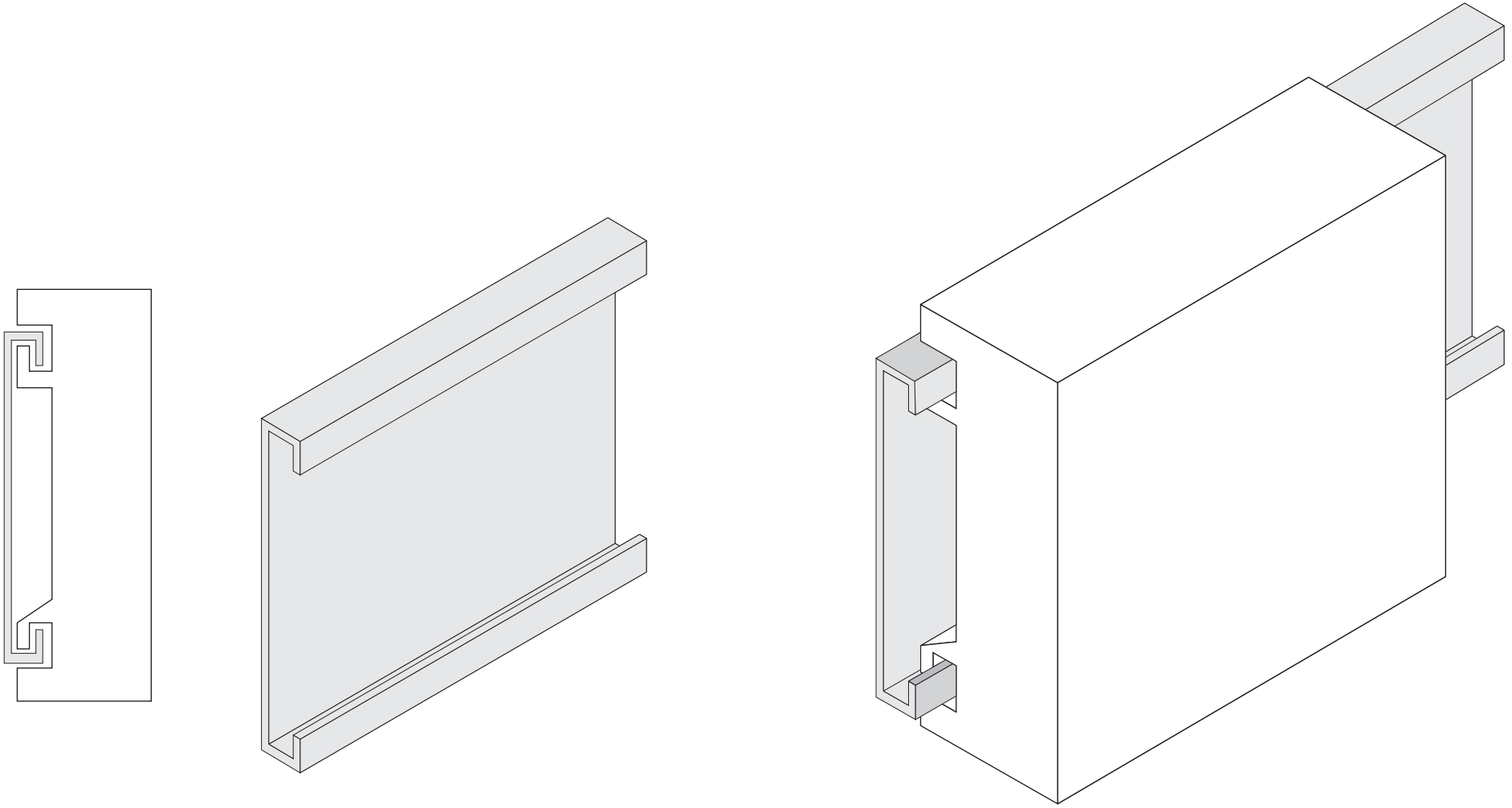


*Figura 3.15.* Carril DIN EN 50045.

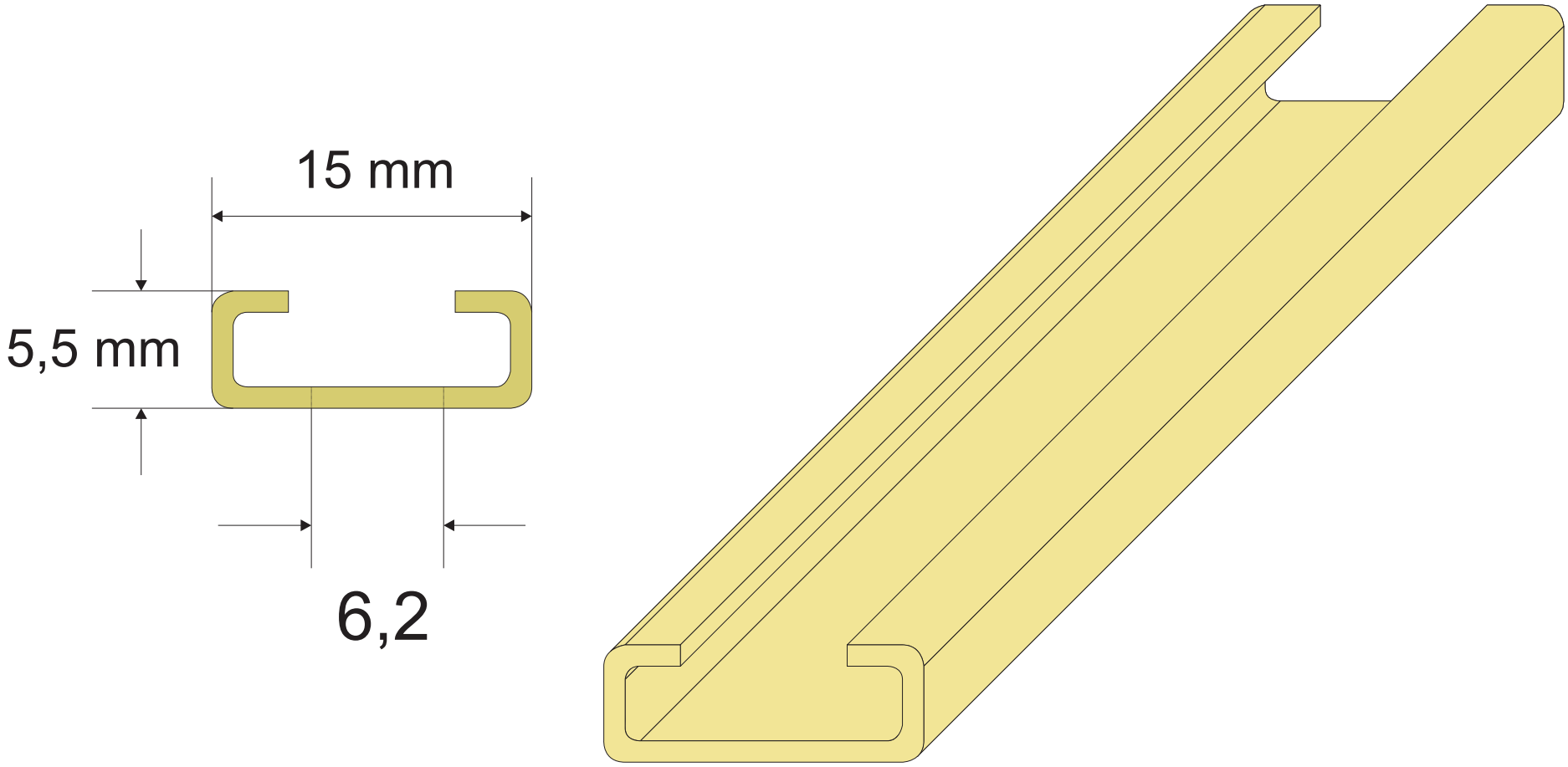
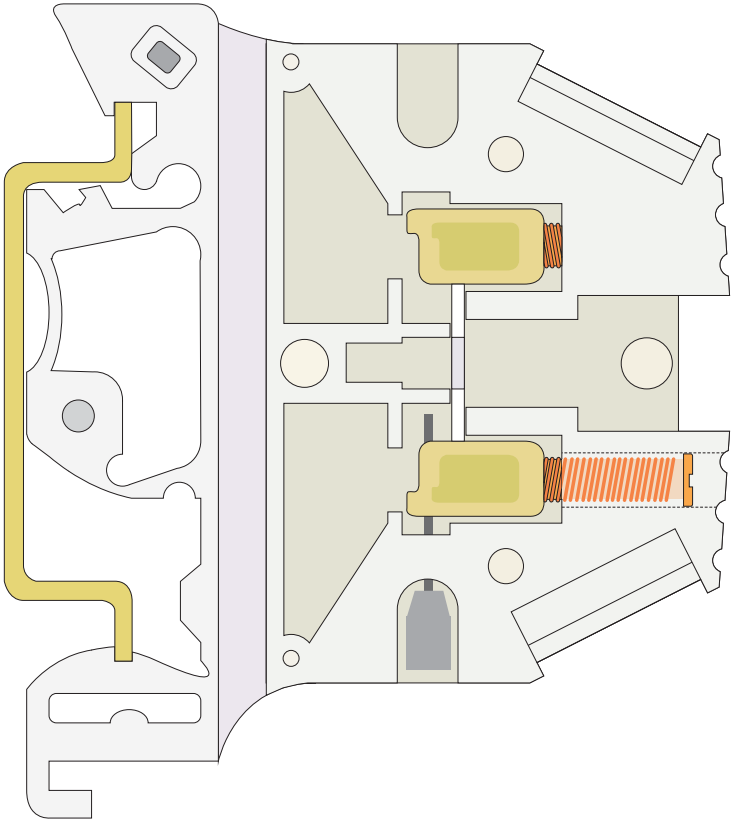


*Figura 3.16.* Borne de conexión. Distinción entre fase activa, neutro o borne de protección.



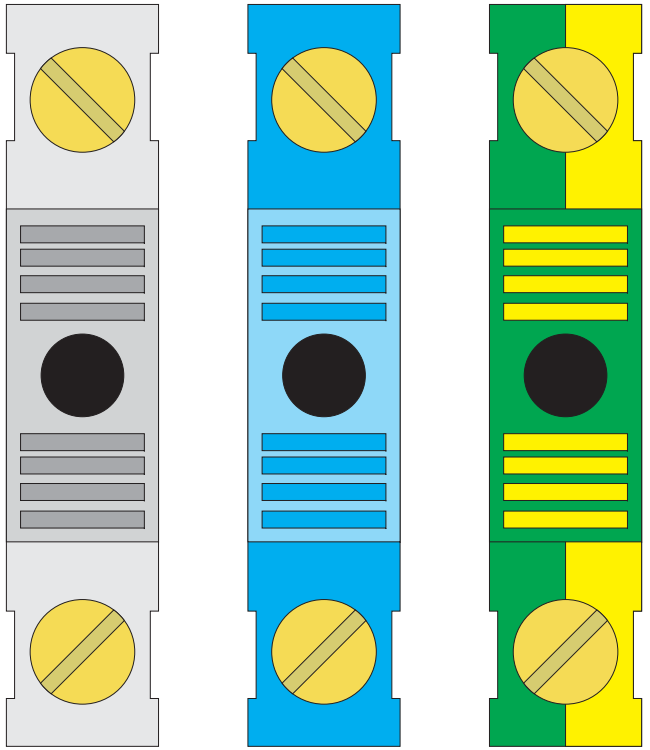


*Figura 3.17. Borne múltiple. Permite realizar dos conexiones independientes.*

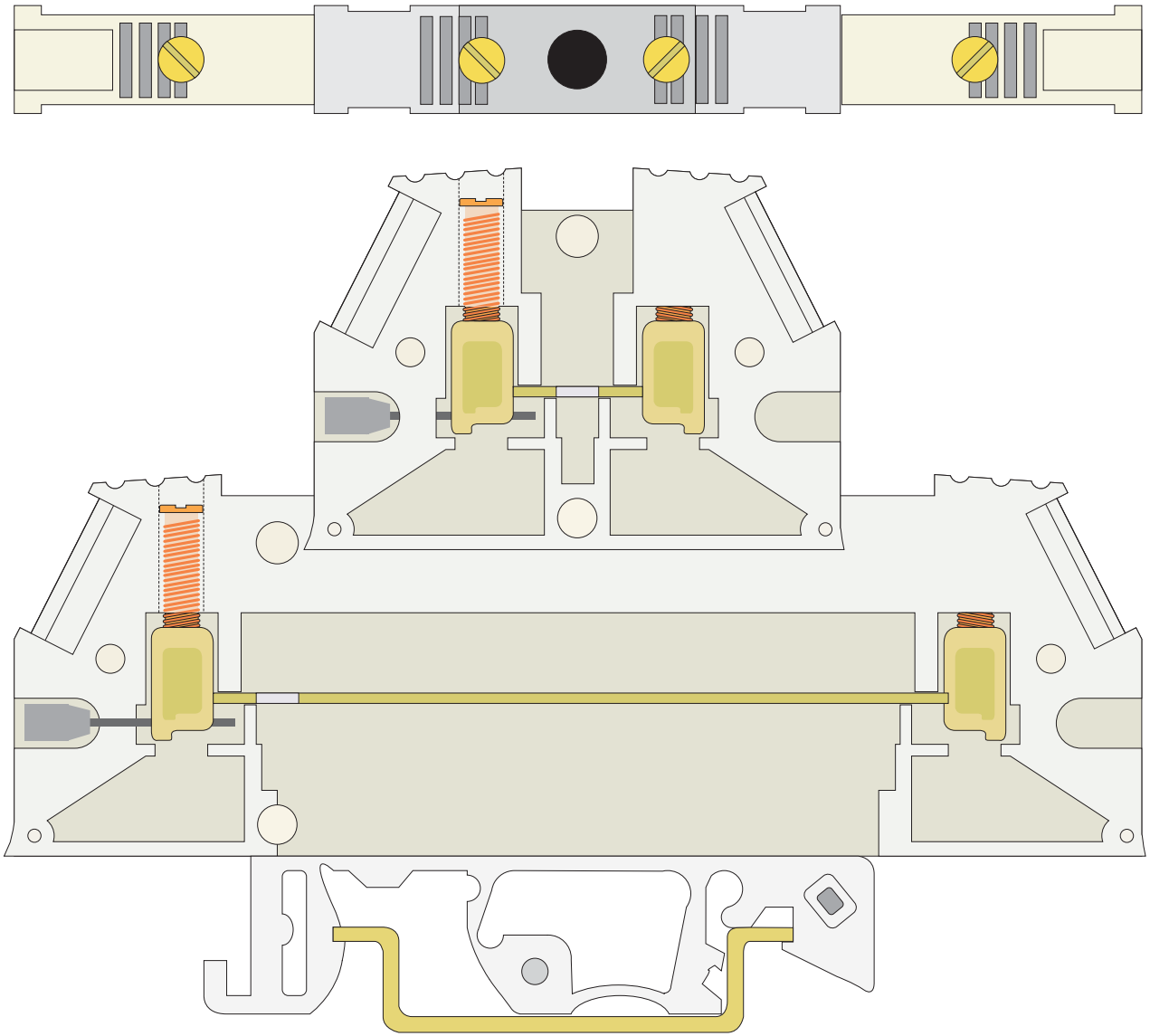


*Figura 3.18.* Otros railes.

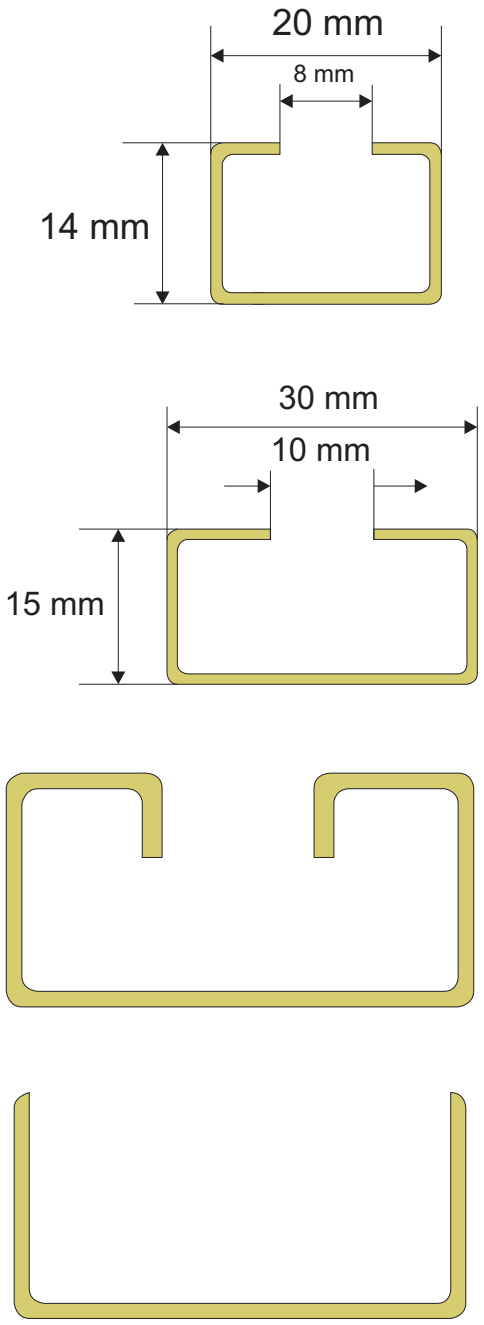


*Figura 3.19.* Borne múltiple de inserción rápida.

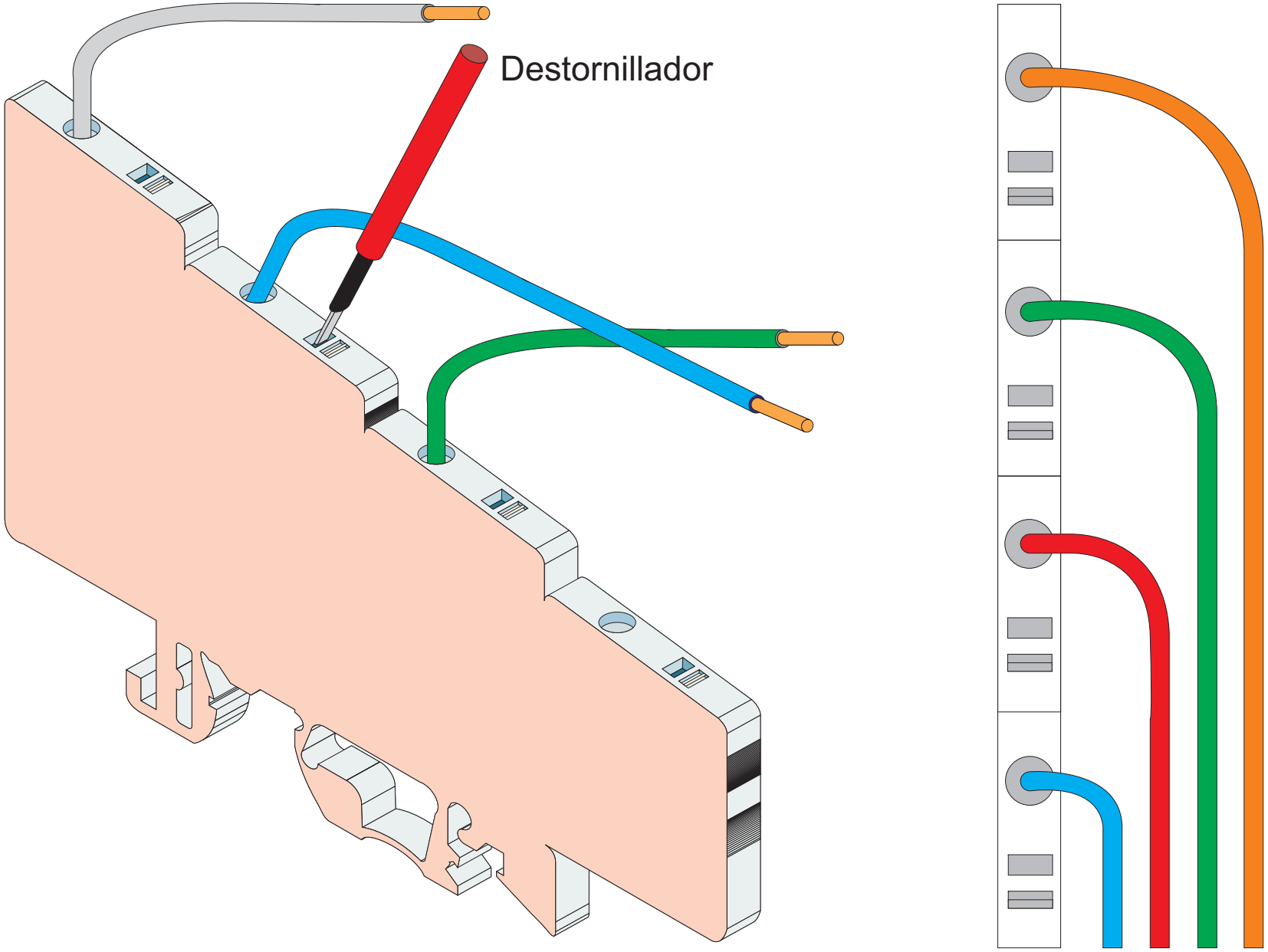


*Figura 3.20.* Borne múltiple de inserción rápida con cuchillas.

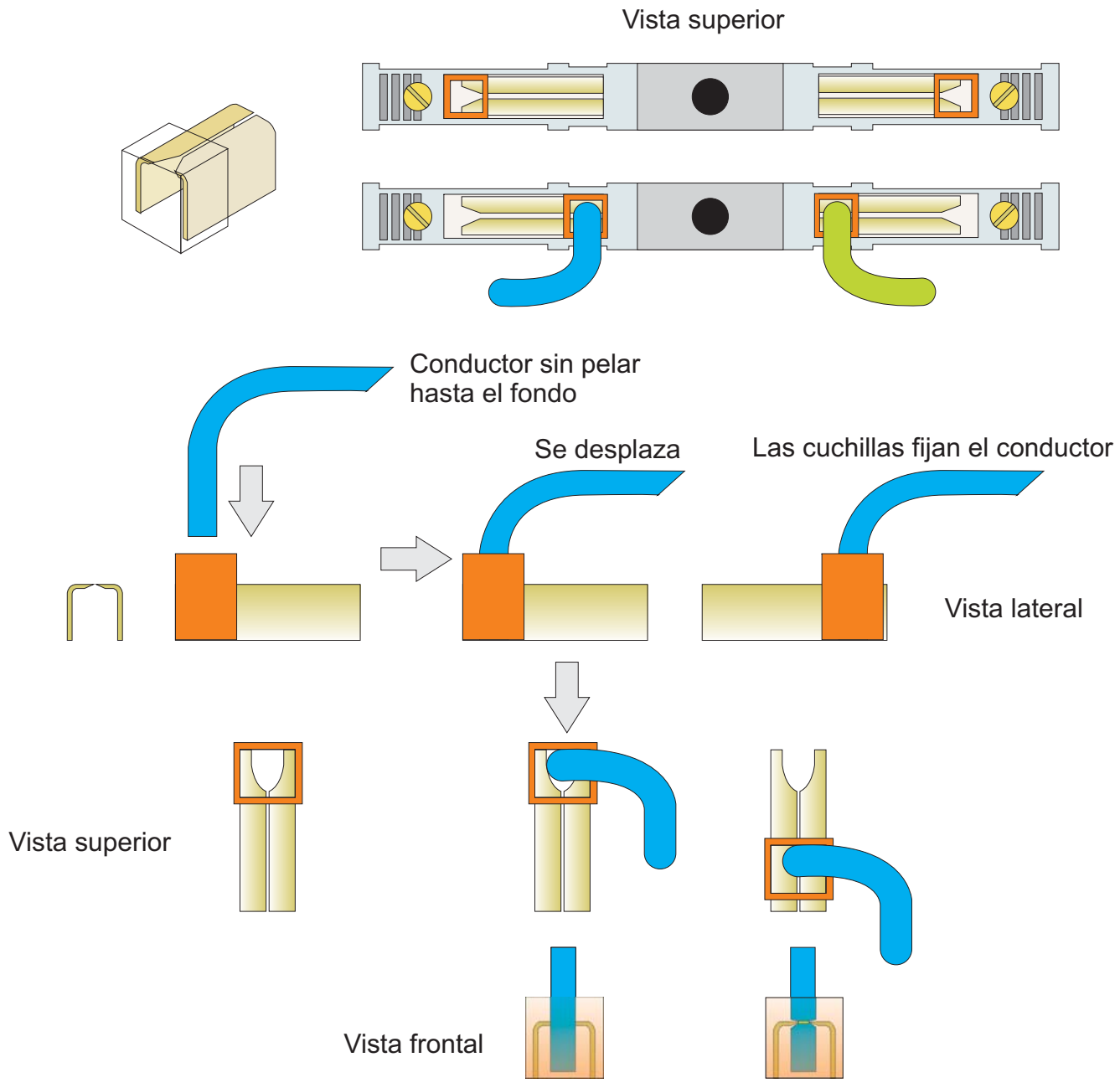


*Figura 3.21. Tabiques separadores.*

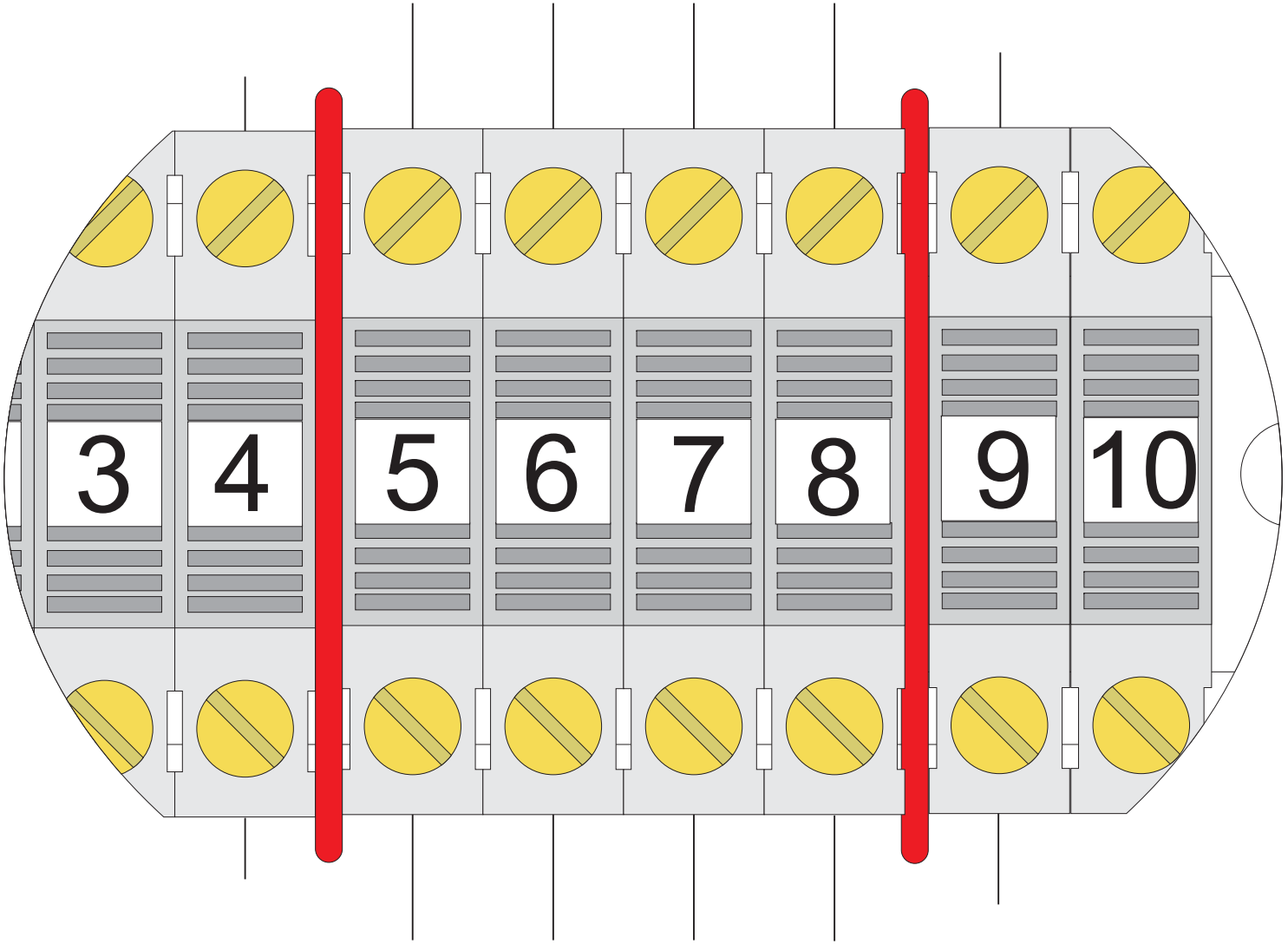


*Figura 3.22. Piezas terminales.*

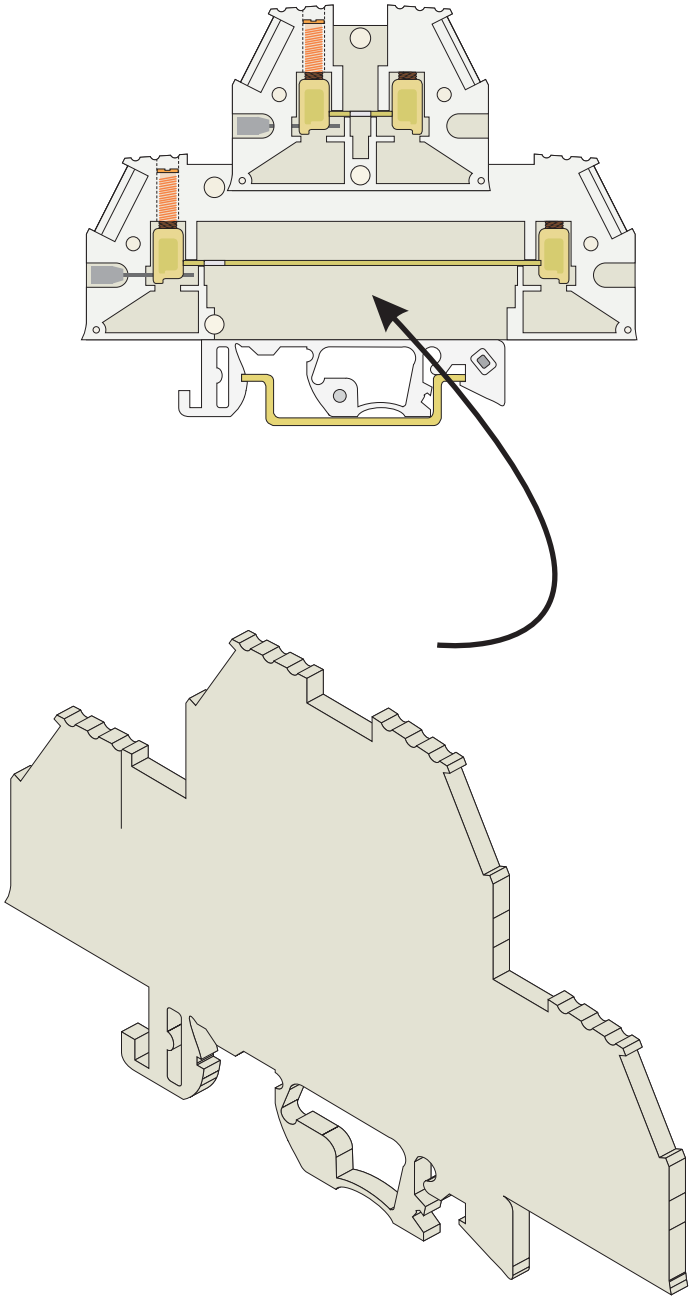


Figura 3.23. Diferentes formas de representar un regletero de bornes.

Salidas digitales del PLC

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cable | | | | | | | | | | | |
| REGLETERO X2 | Destino A | PLC/Q1 | N23V | PLC/Q2 | N24V | PLC/Q3 | N24V | PLC/Q4 | N24V | PLC/Q5 | N24V |
| | Nº | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | | | | | | | | | | | |
| | Destino B | H1/X1 | H1/X2 | Y1/A1 | Y1/A2 | H2/X1 | H2/X2 | Y2/A1 | Y2/A2 | H3/X1 | H3/X2 |
| Cable | | | | | | | | | | | |

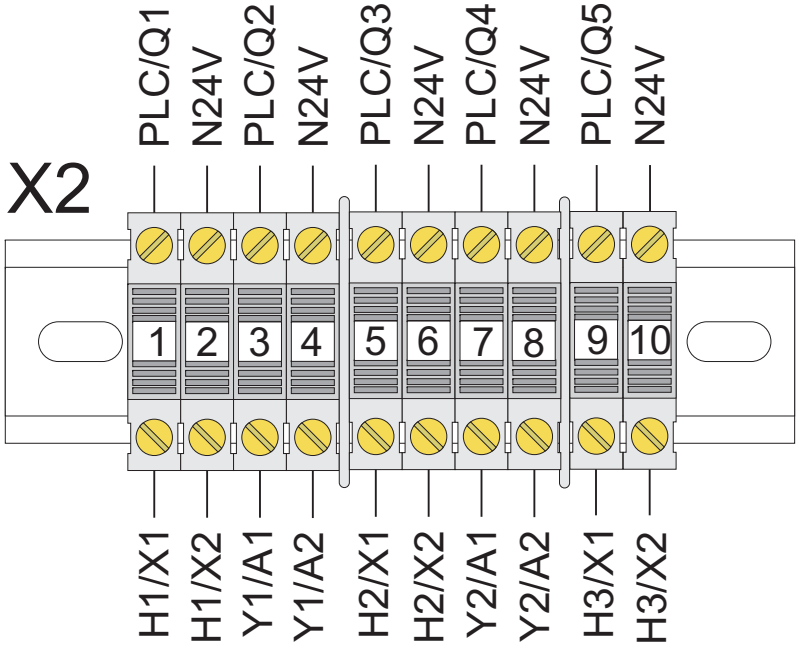
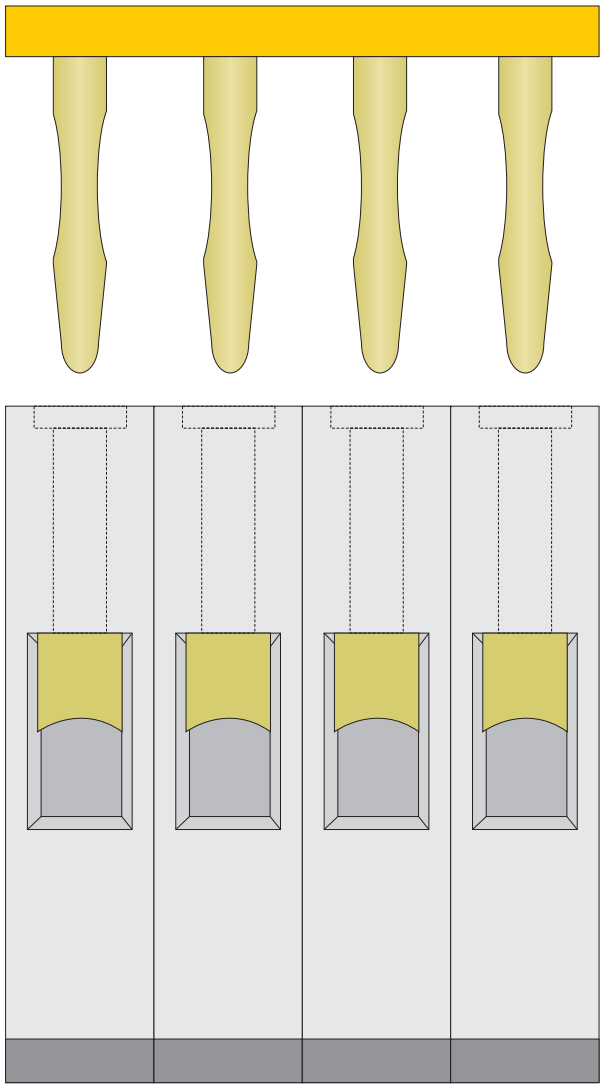
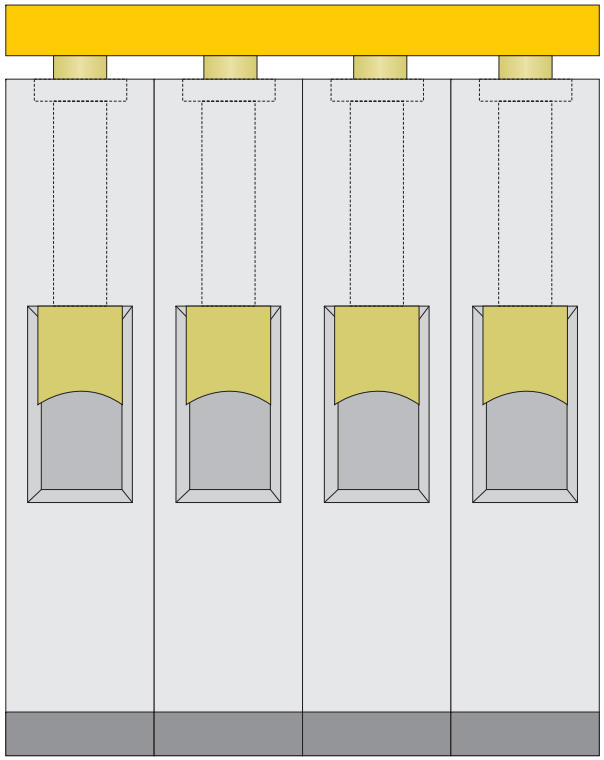


Figura 3.24. Conexión en puente de bornes de un mismo potencial.



Vista perfil



Vista superior

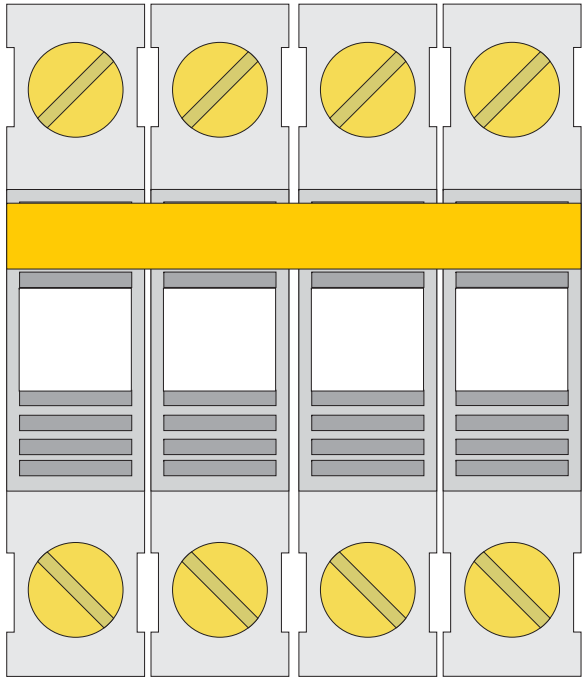


Figura 3.25.

*Identificación de regleteros.*

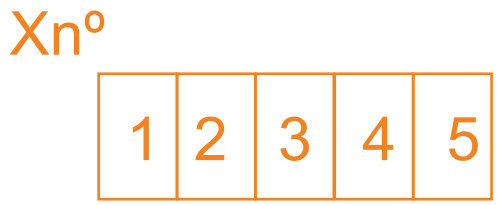



Figura 3.26.

*Ejemplo bornero PE.*

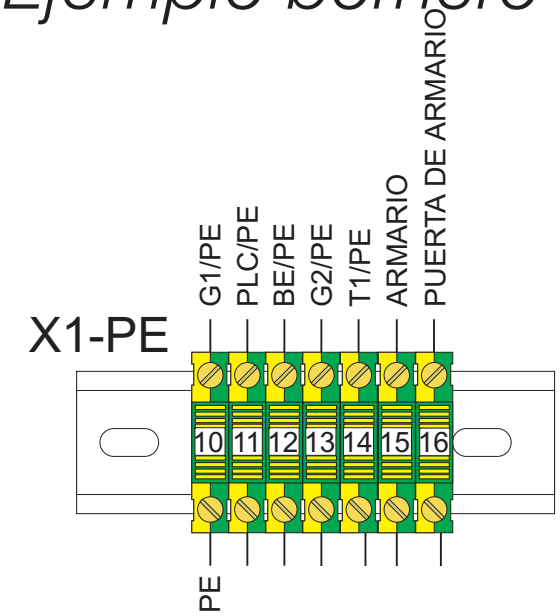


*Figura 3.27. Conector pasivo con salida a cable de 25 pines.*

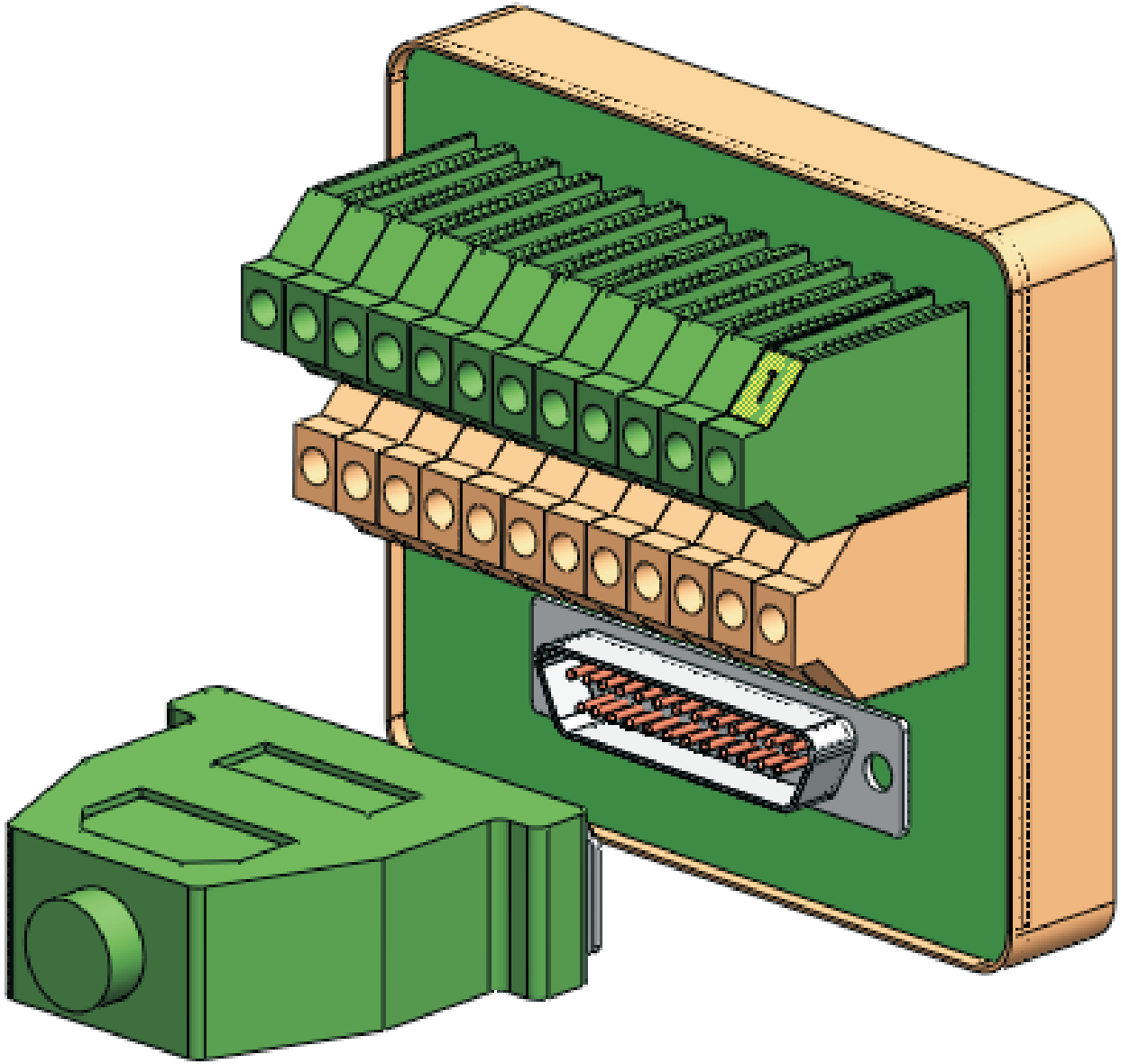


*Figura 3.28.* Conector pasivo aéreo con fijación a rail.

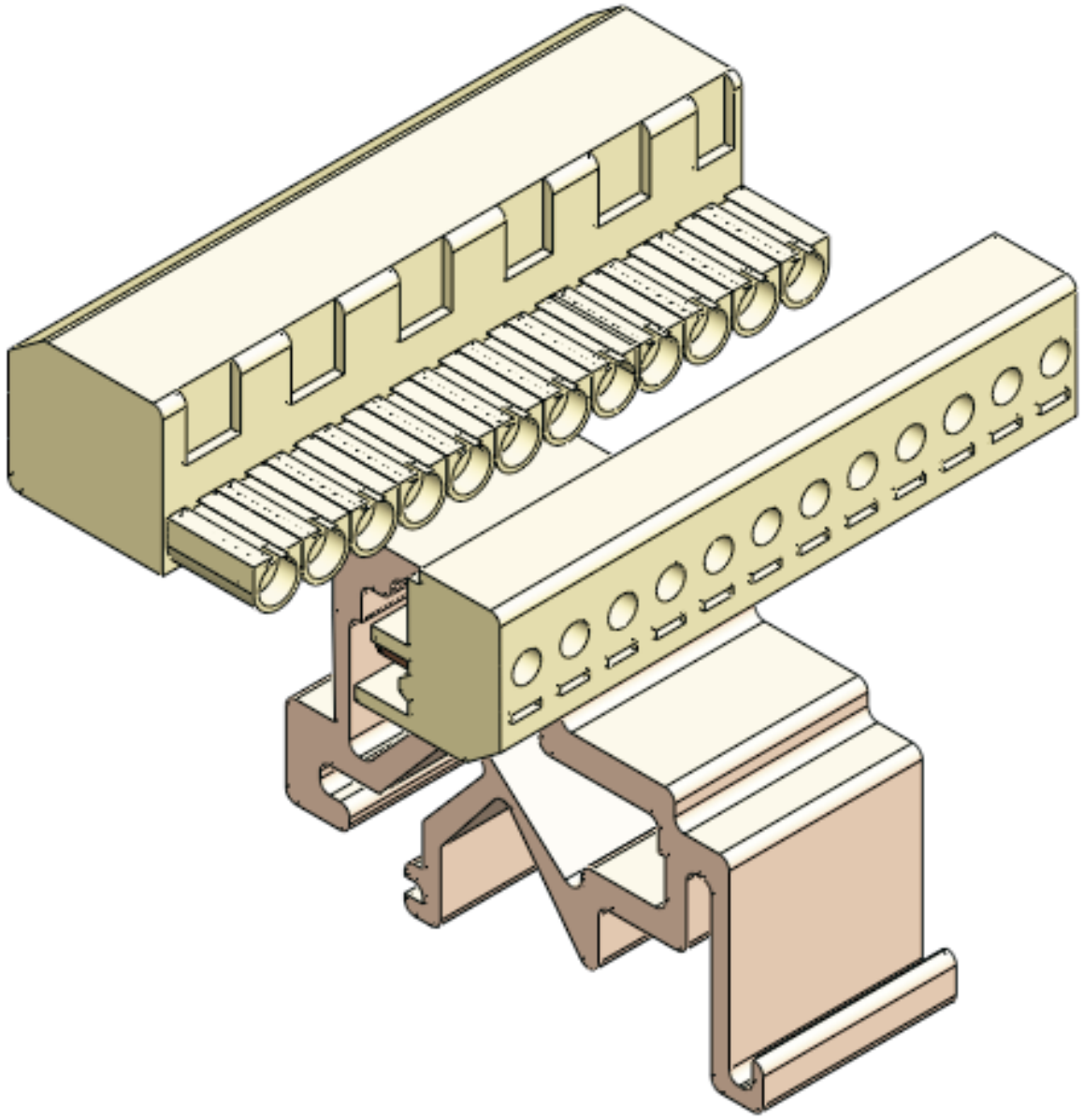


*Figura 3.29. Partes metálicas conectadas al conductor de protección.*

*Figura 3.30.* Bornes inteligentes y controlador de los mismos.

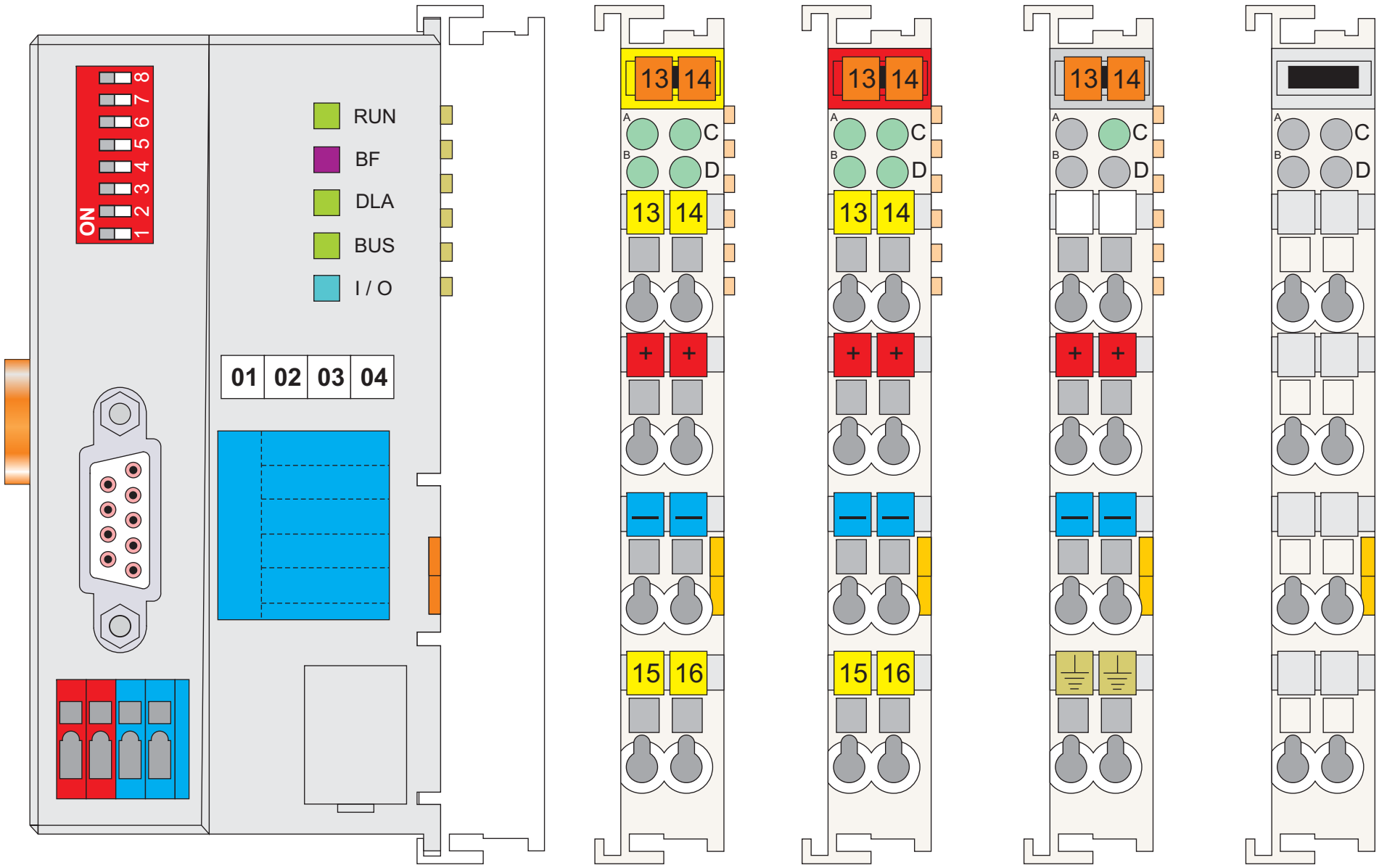


*Figura 3.31. Comunicación de bornes inteligentes vía radio.*

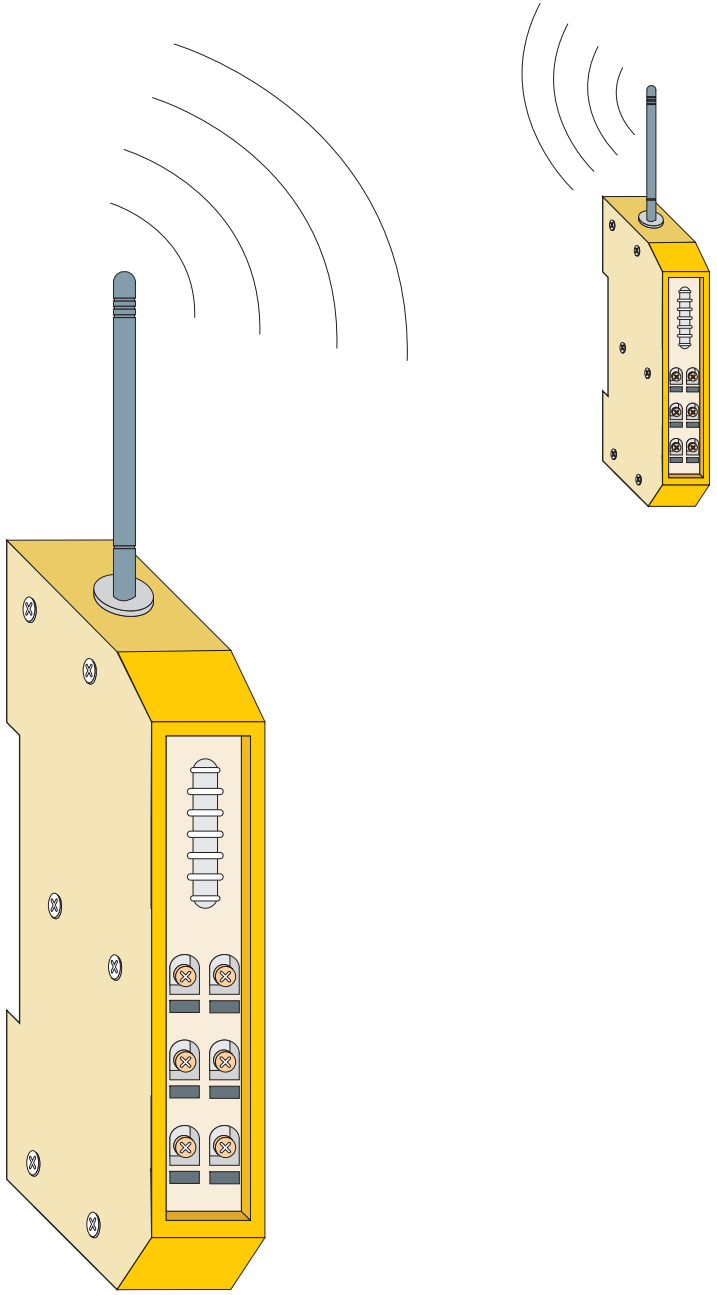


*Figura 3.32.*

*Aspecto de un borne convertidor de señales.*

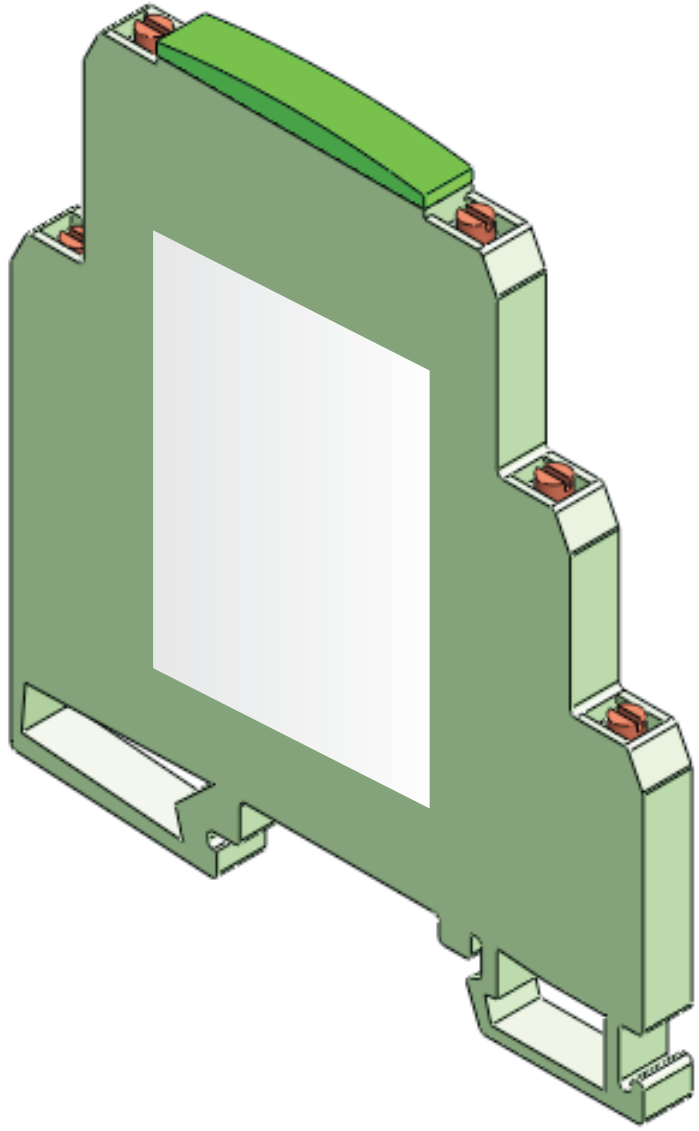
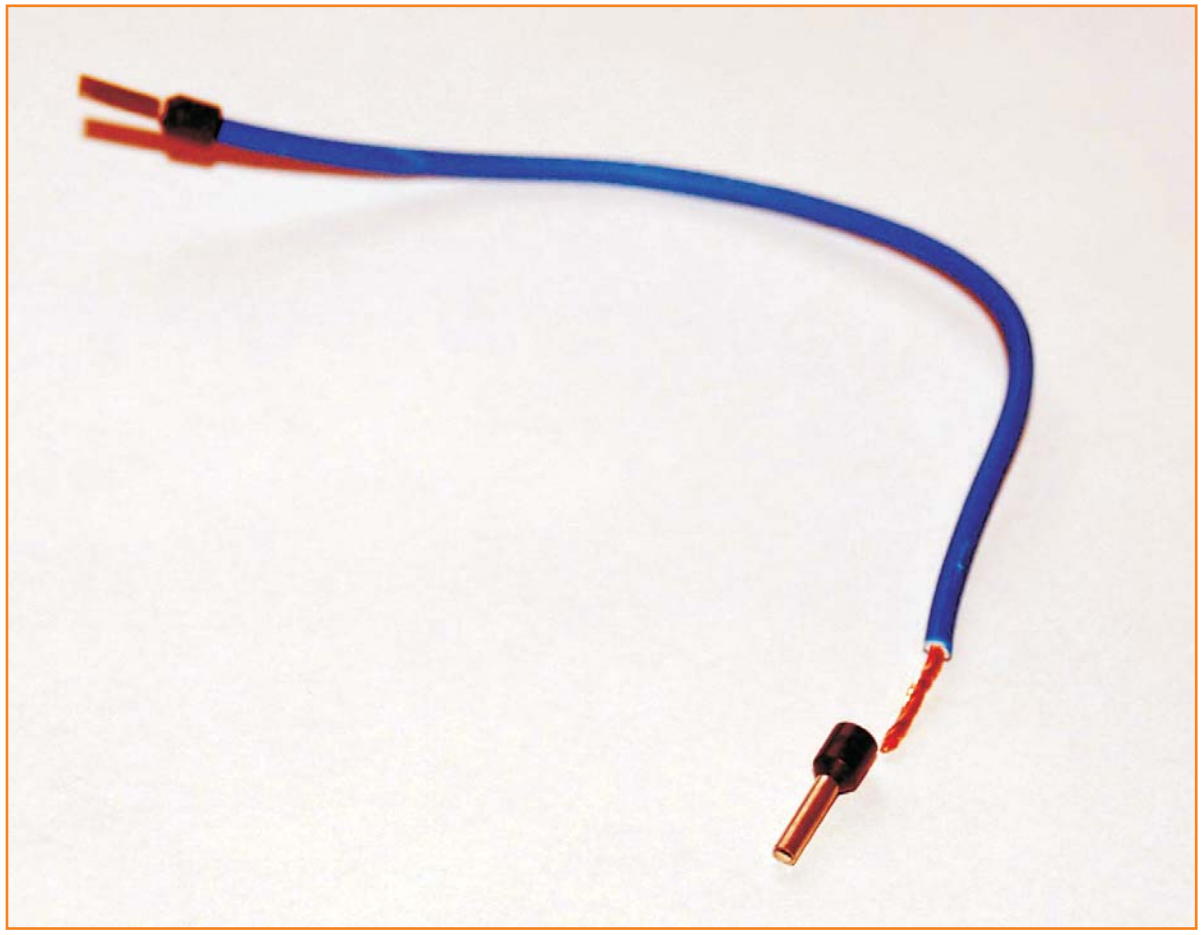


*Figura 3.33.* Cable con puntera.



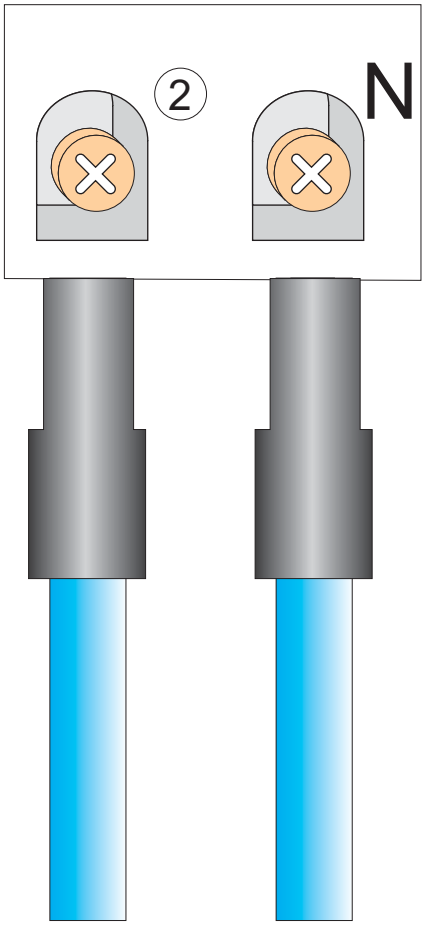


*Figura 3.34. Algunos tipos de terminales.*

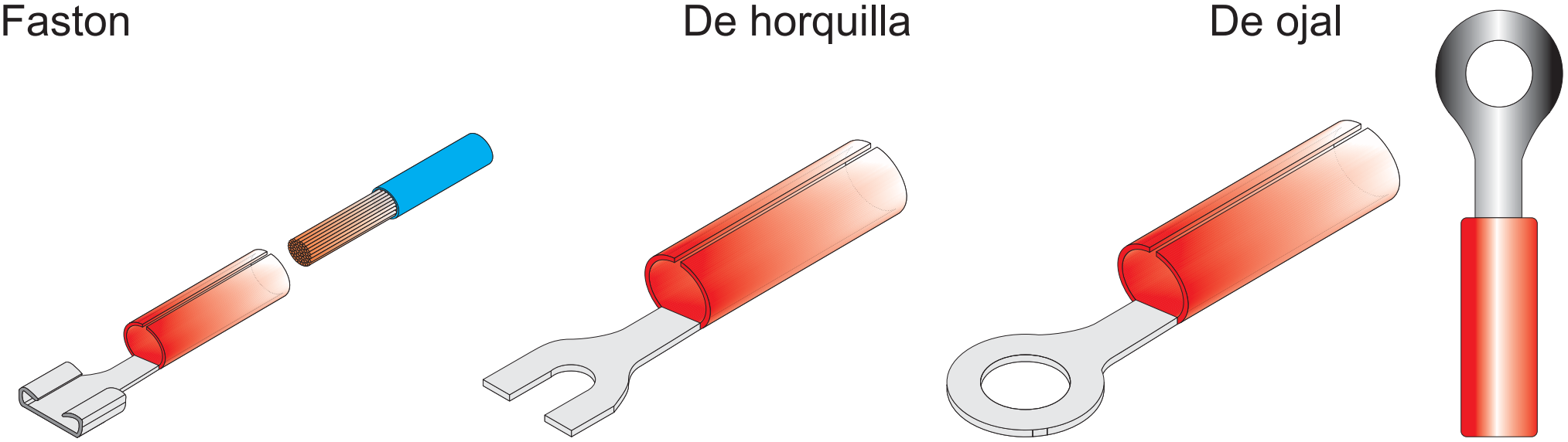


*Figura 3.35. Marcado de conductores.*

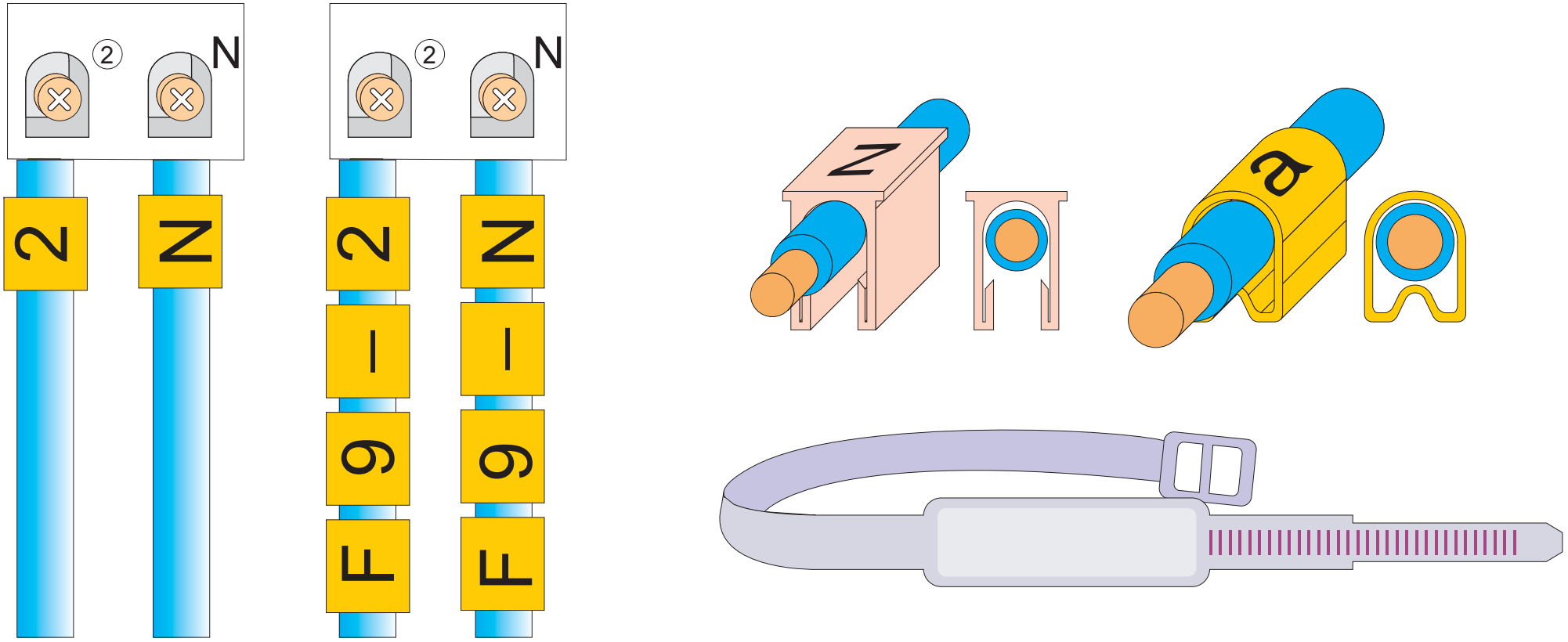


*Figura 3.36.* Tenaza para unir terminales.

*Figura 3.37. Elementos etiquetados.*

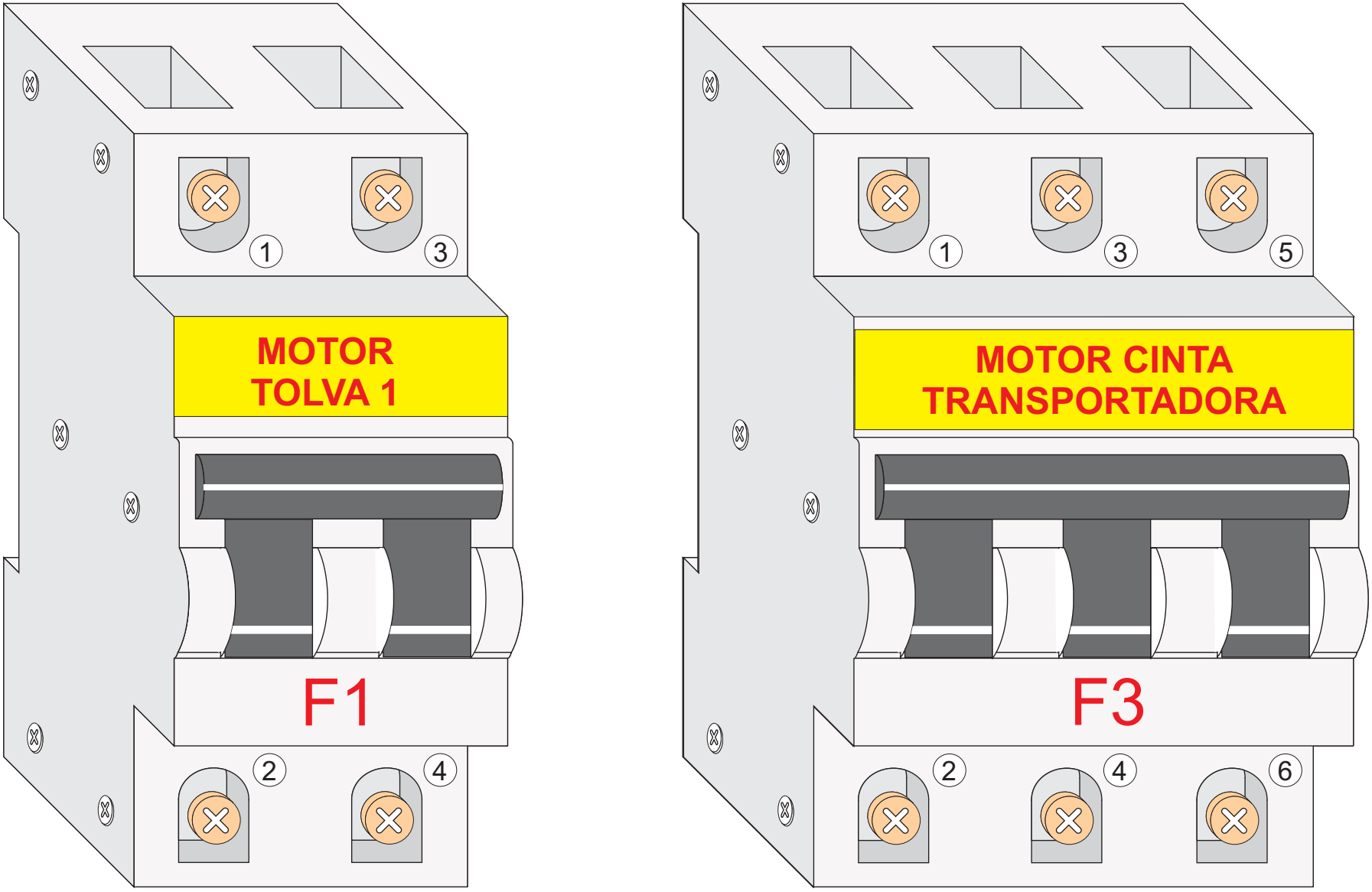


*Figura 3.38. Distribución de conductores por bandeja de varilla.*

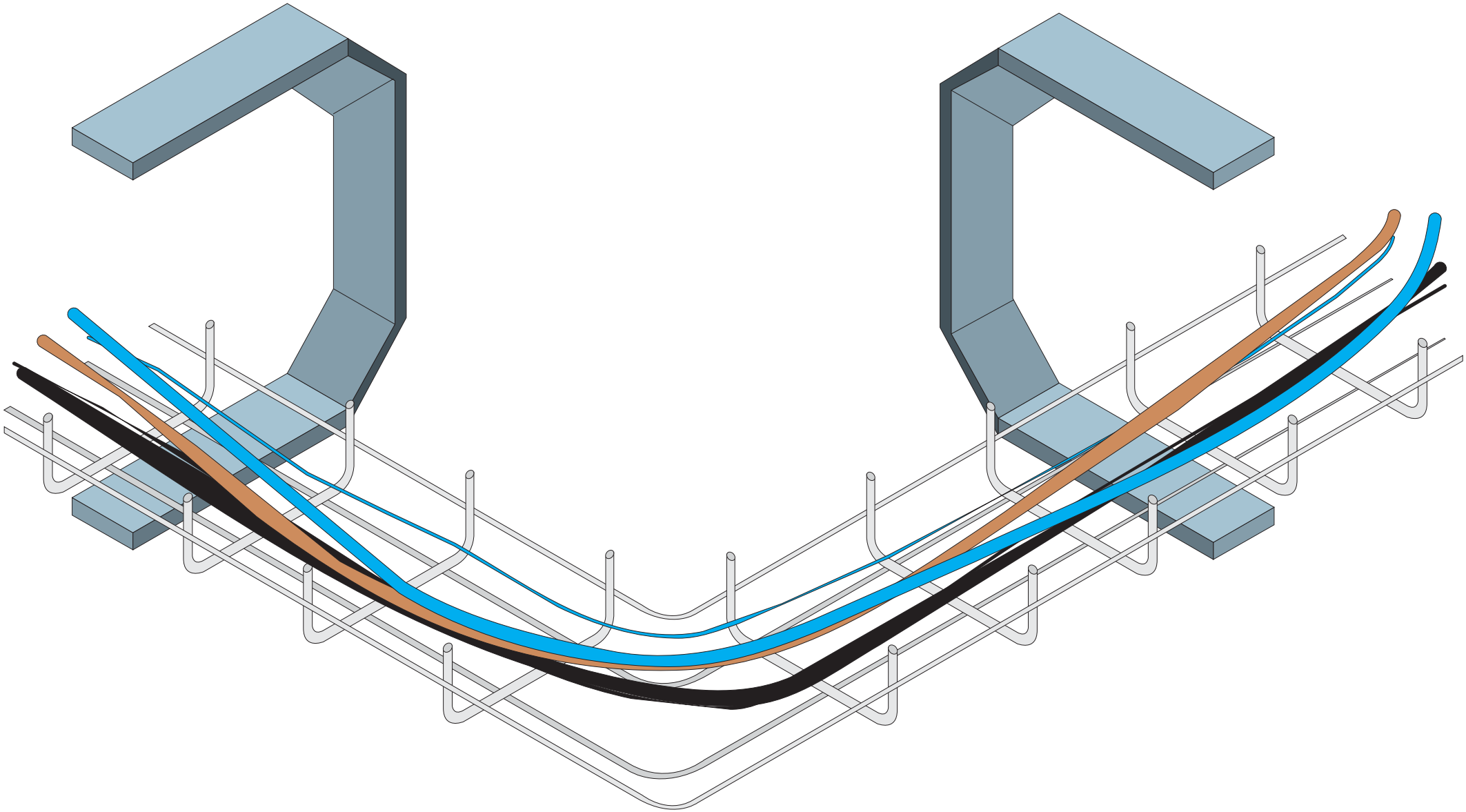


*Figura 3.39. Tubo corrugado flexible.*

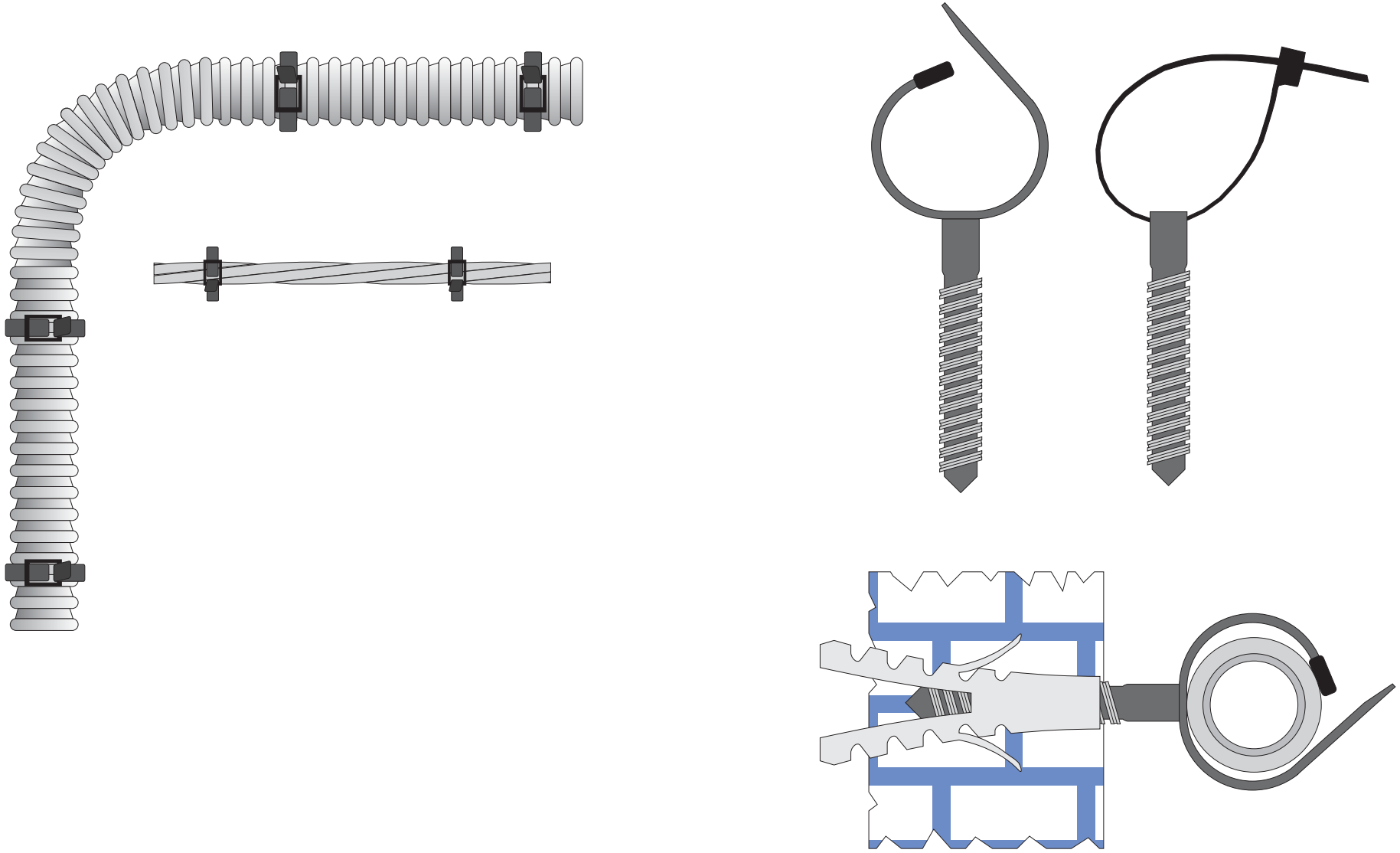


*Figura 3.40.* *Prensaestopas.*

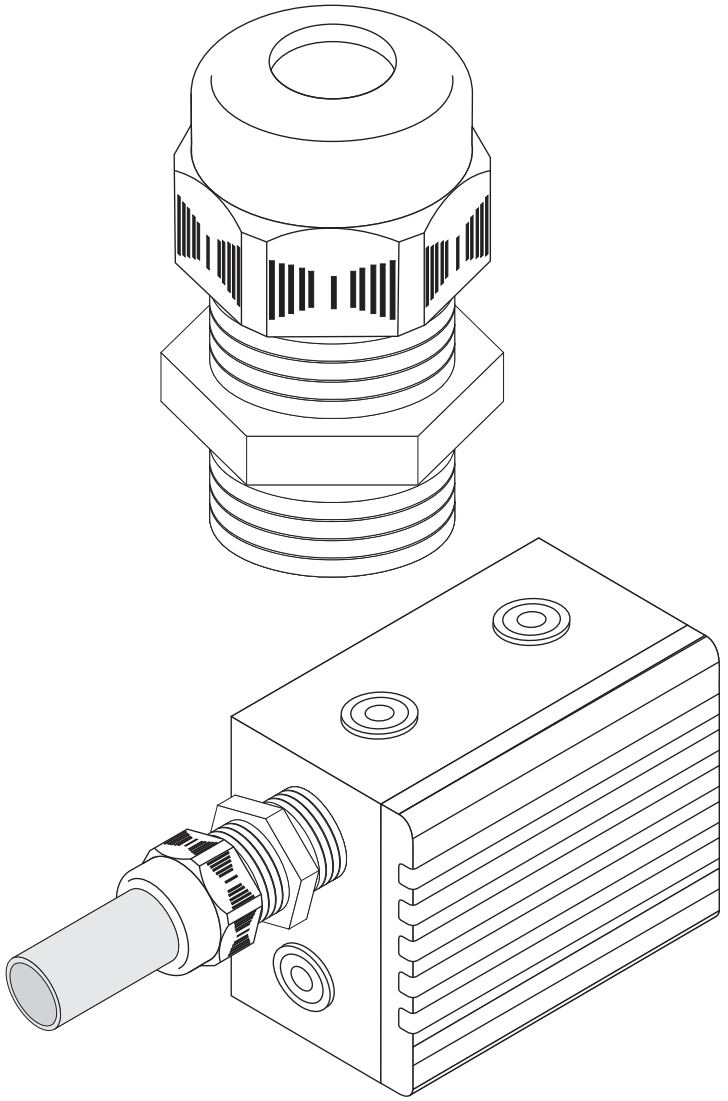


Figura 3.41. Racor.

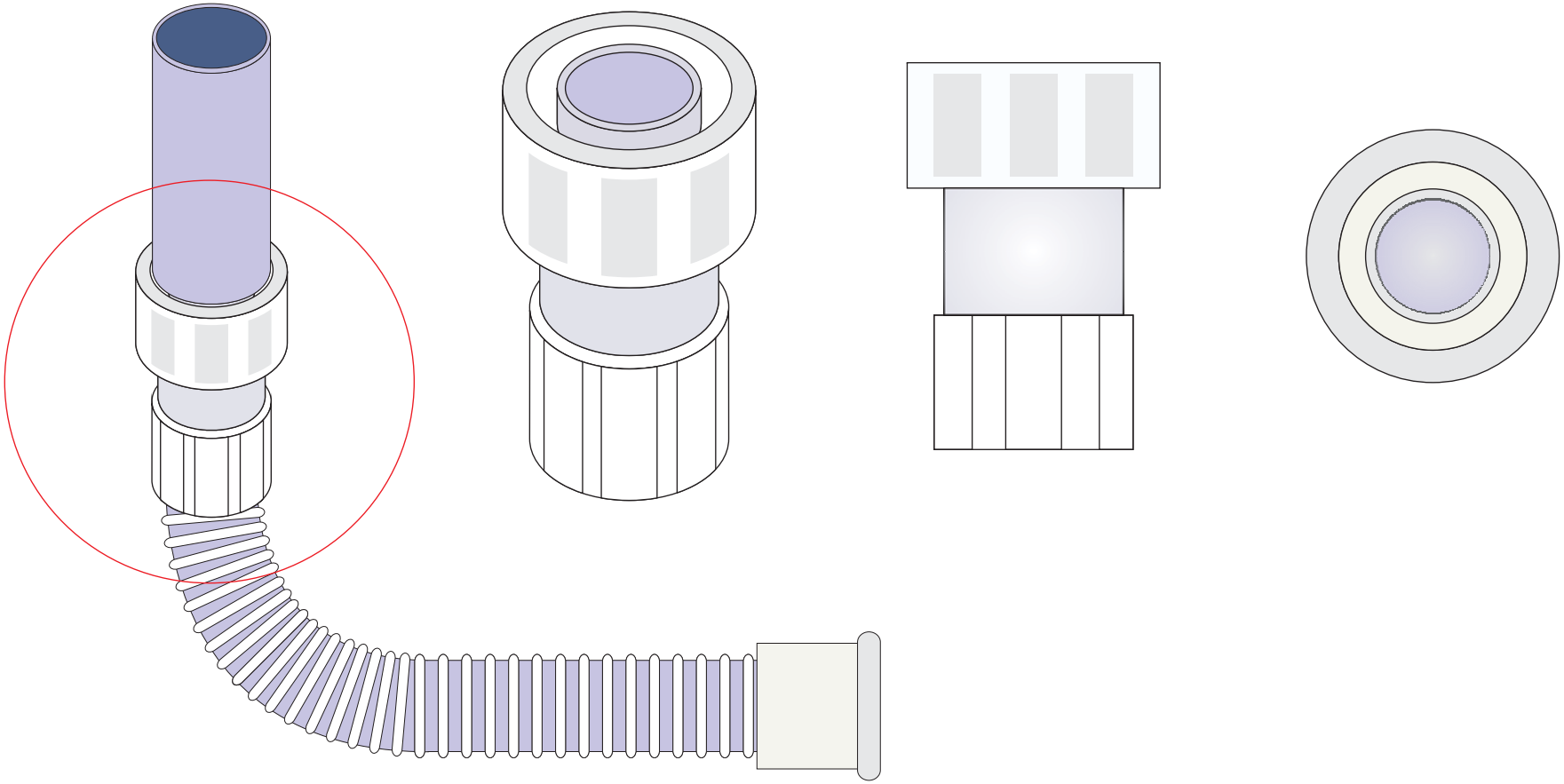
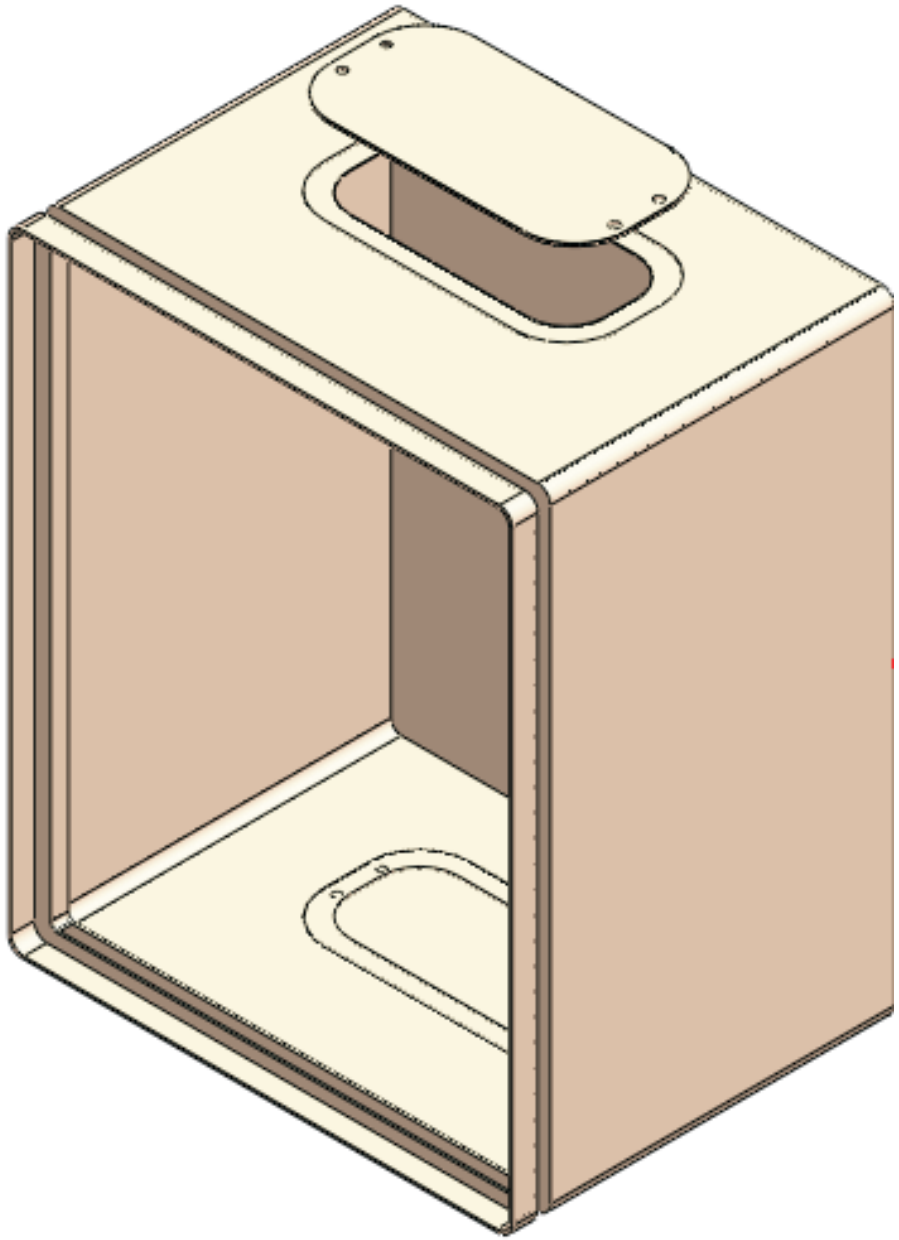


*Figura 3.42. Tapas de acceso a un armario y una placa pasacables.*



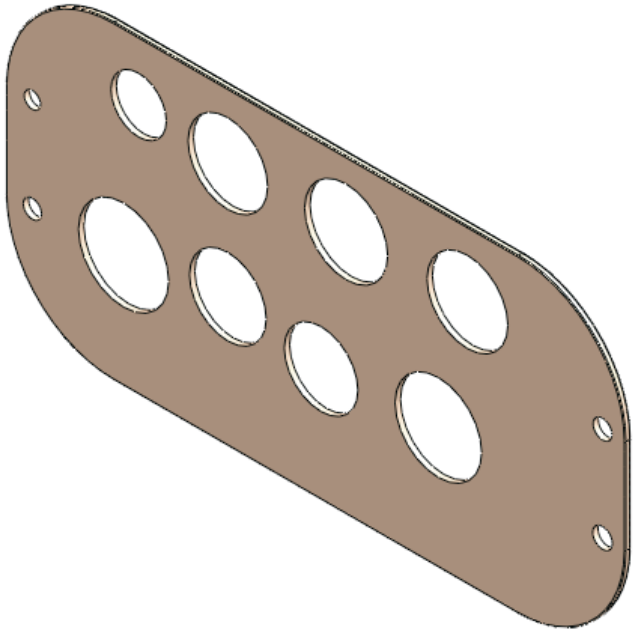


*Figura 3.44.* Las canaletas pueden acceder al cuadro de diferentes maneras.

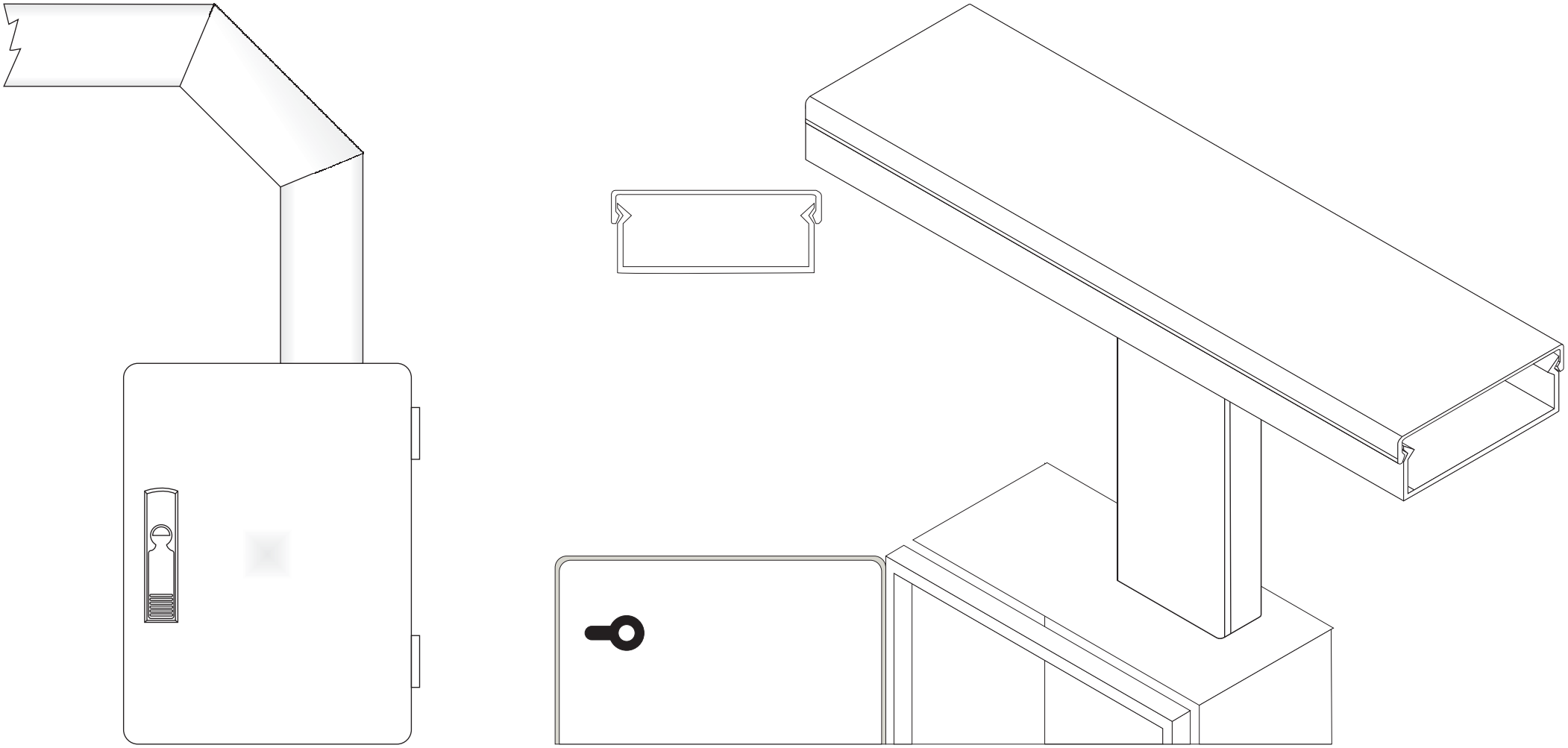


Figura 3.43. Espiral y malla.

*Figura 3.45. Ventilador para armario rack y ventilador individual en cuadro mural.*

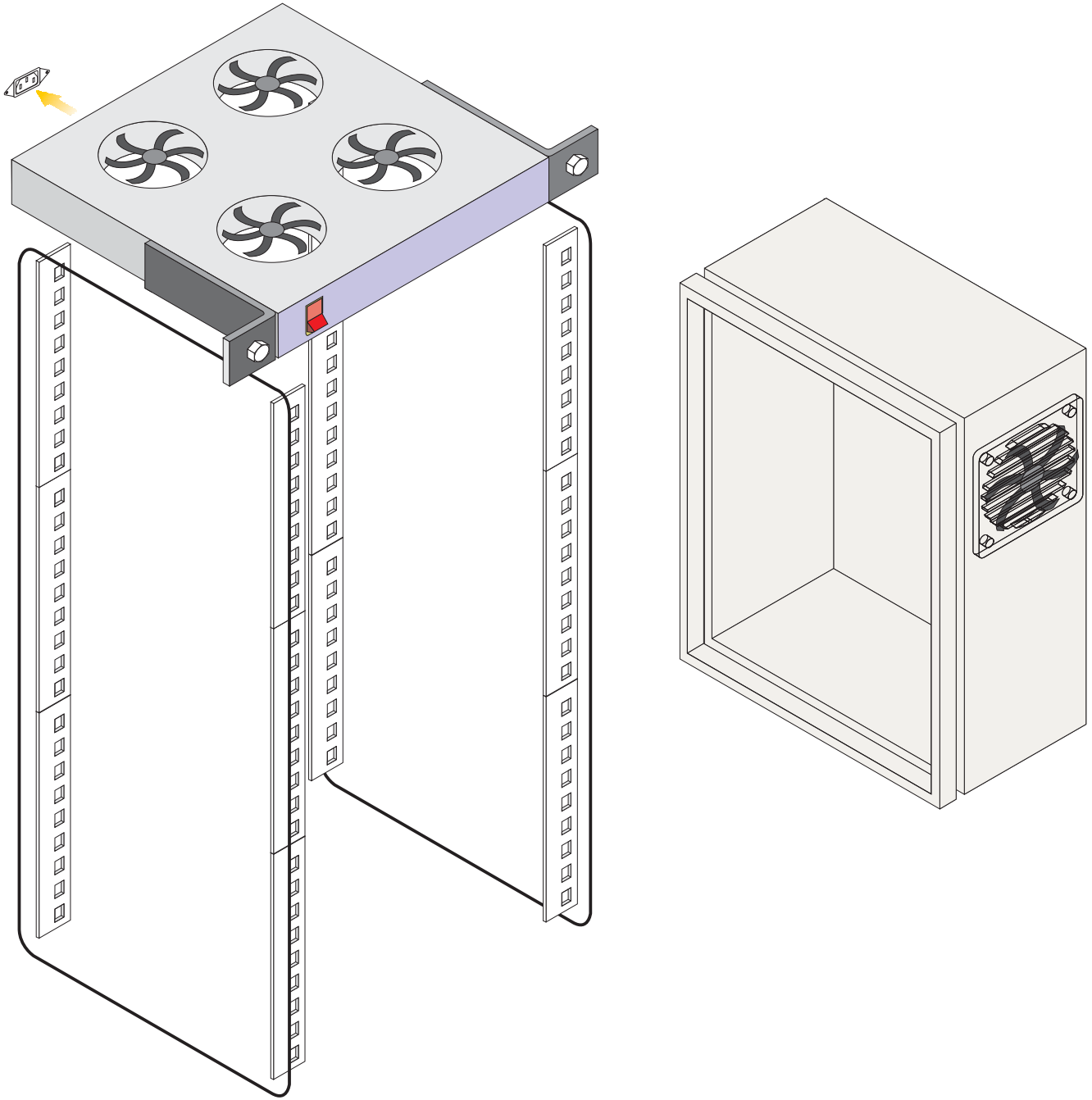


Figura 3.46. Activación de resistencias para caldeo con potencia elevada.

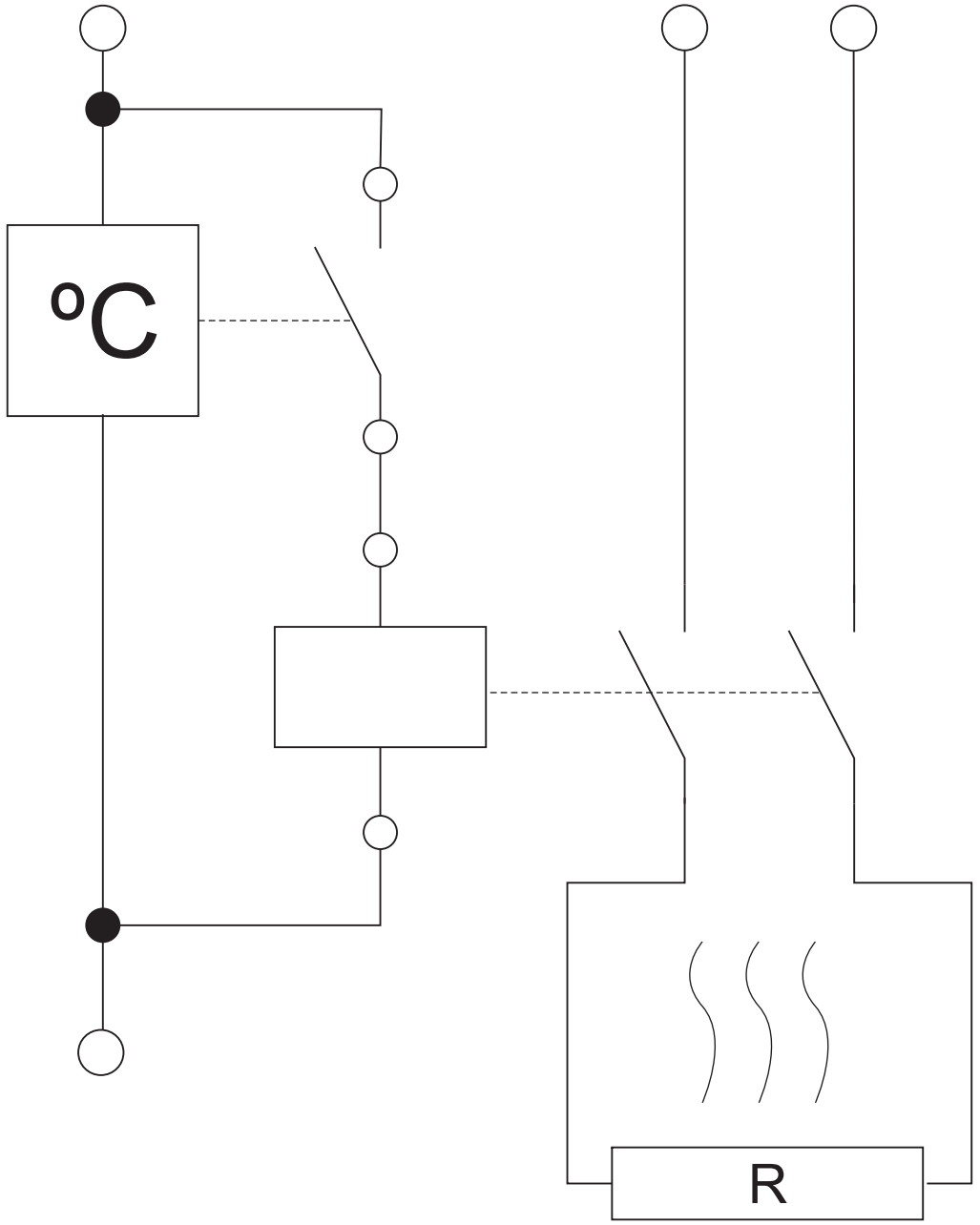


*Figura 3.48. Ejemplo de una célula de fabricación o montaje.*

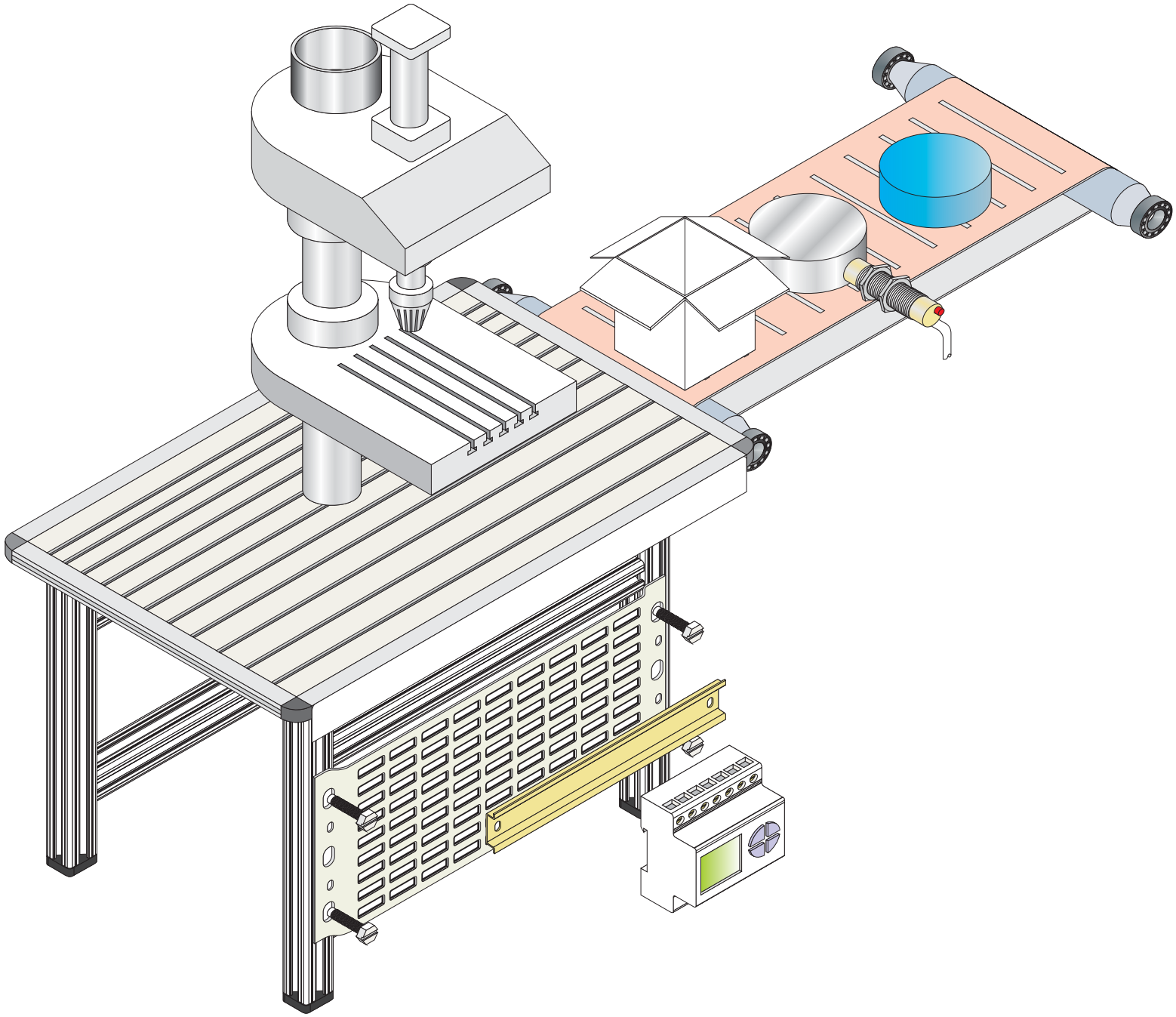


*Figura 3.47.* Cuadro secundario.

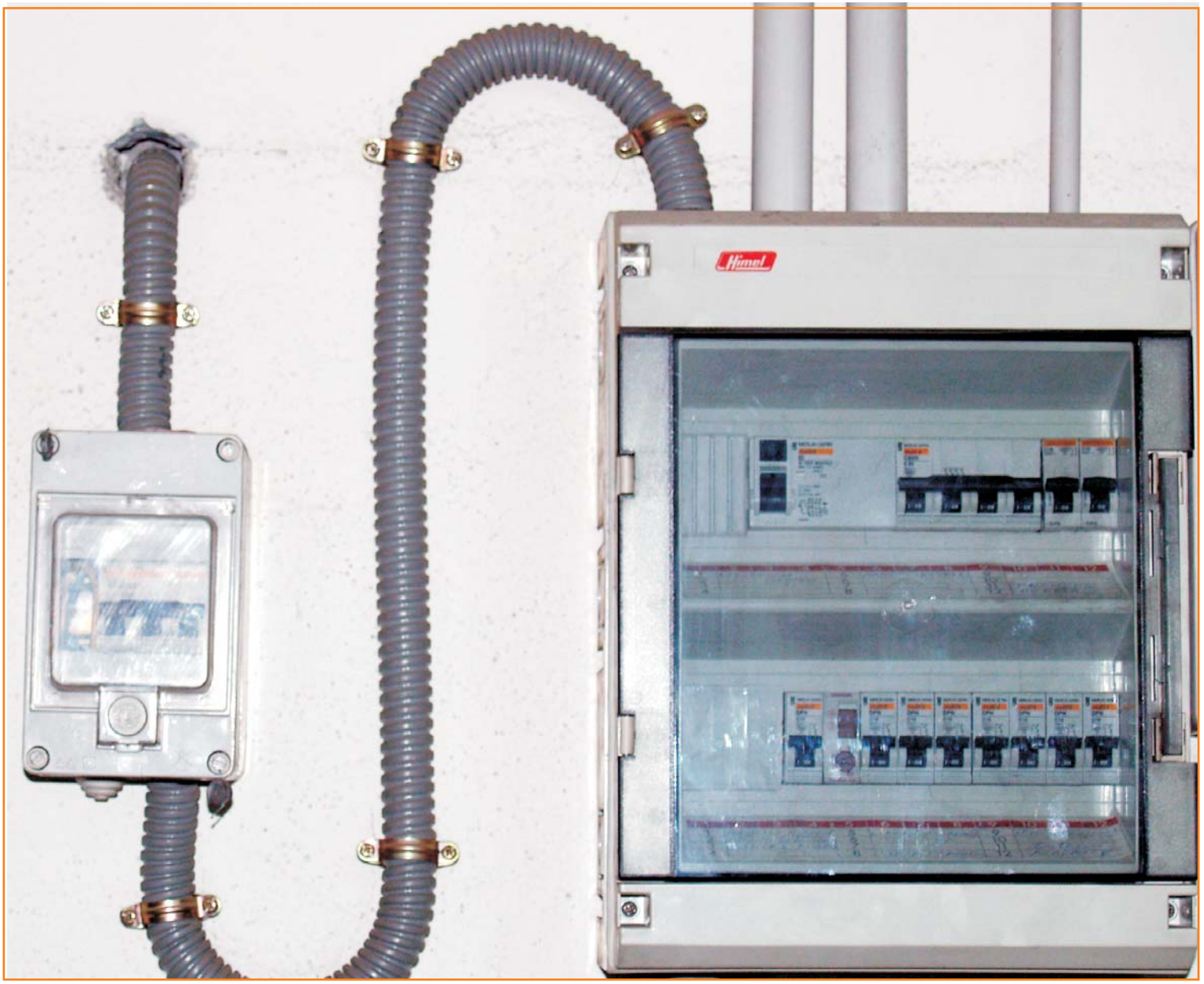


*Figura 3.49. Montaje de un cuadro. Se saca la chapa, se montan las canaletas y los perfiles.*

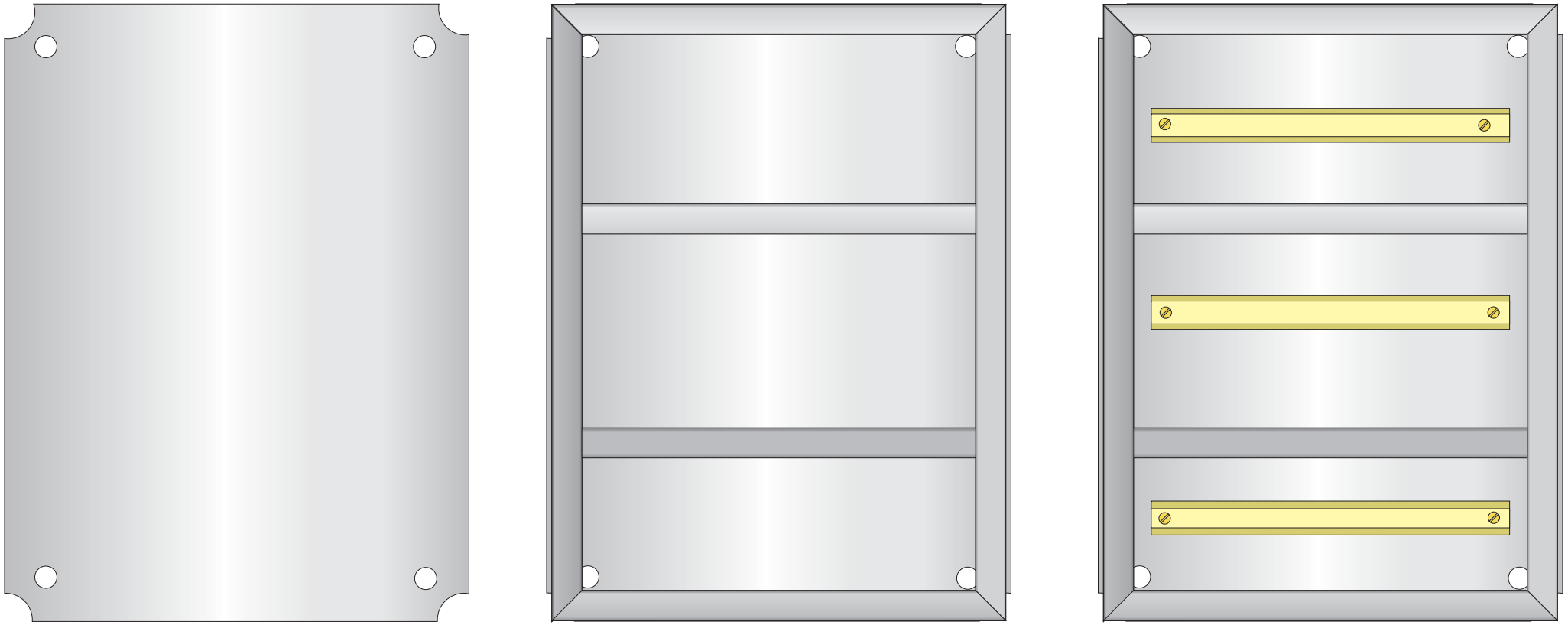


*Figura 3.50. Uso de una punzonadora con matriz cuadrada.*

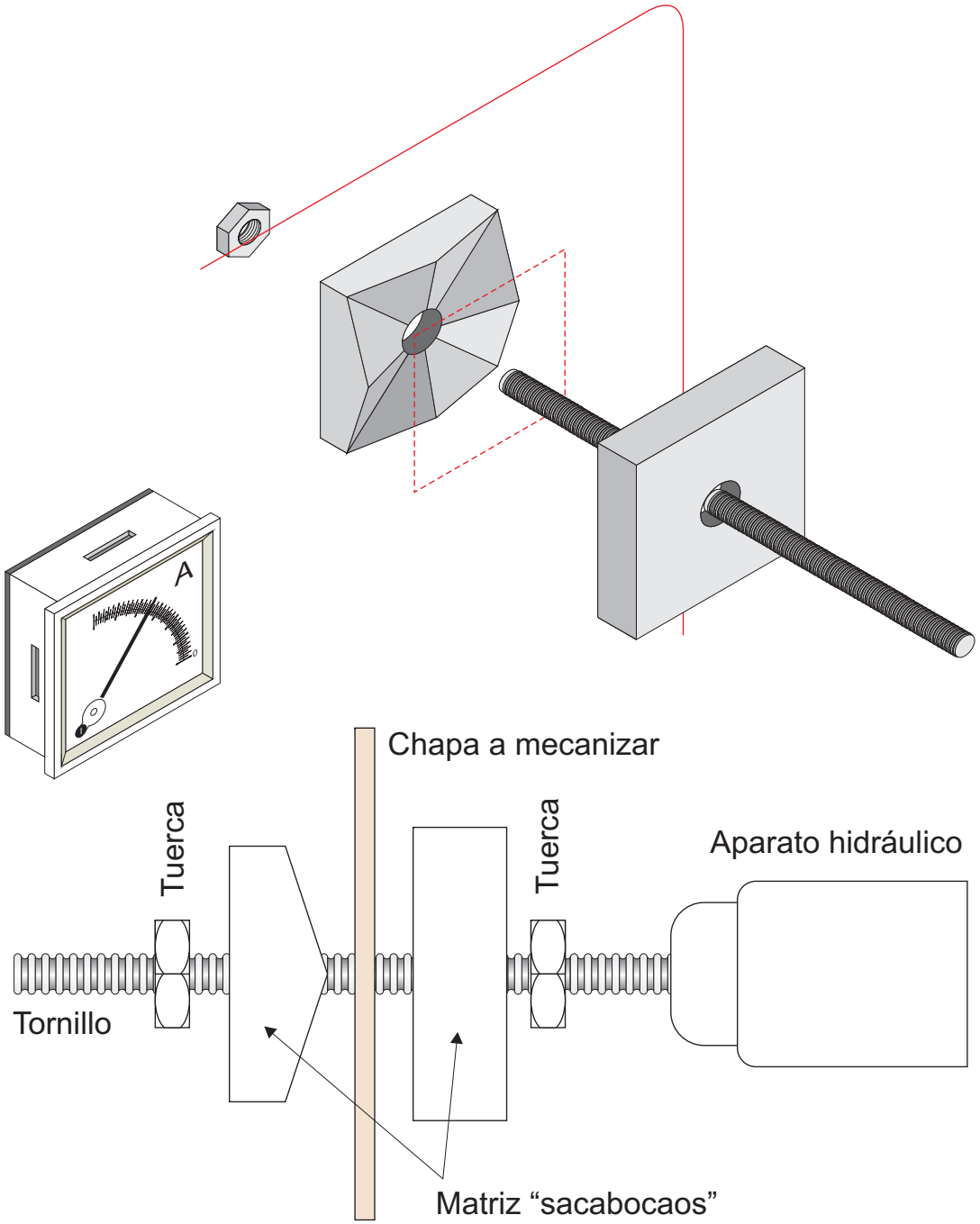


*Figura 3.51. Montaje de un cuadro. Se montan los bornes, los mecanismos y se realizan las conexiones con conductores marcados y con punteras.*

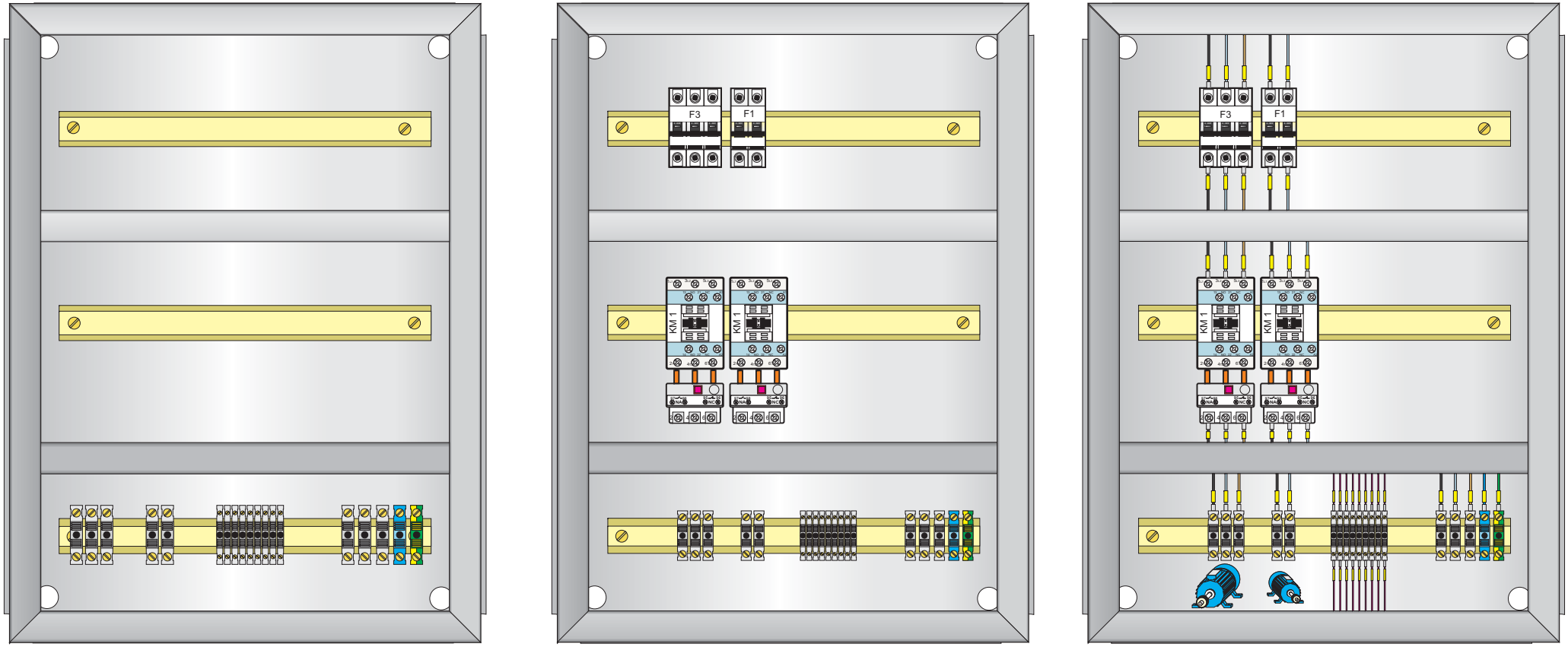


*Figura 3.52. La matriz corta la chapa por la presión hidráulica ejercida en el eje roscado.*

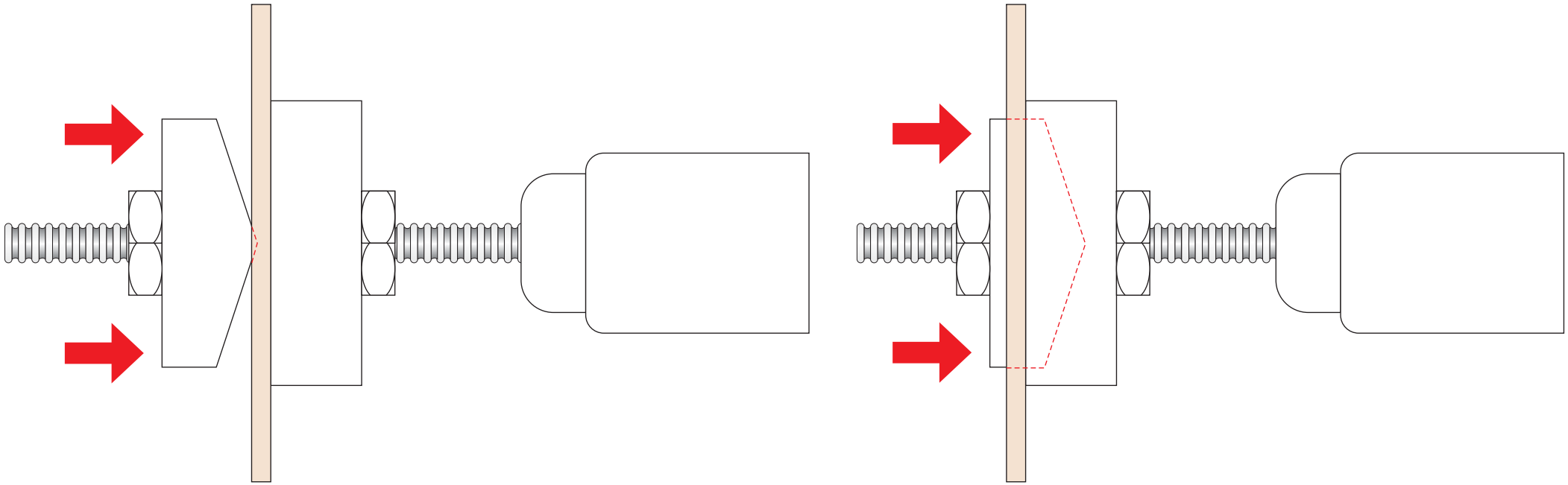


*Figura 3.53. Matriz para agujeros cilíndricos.*

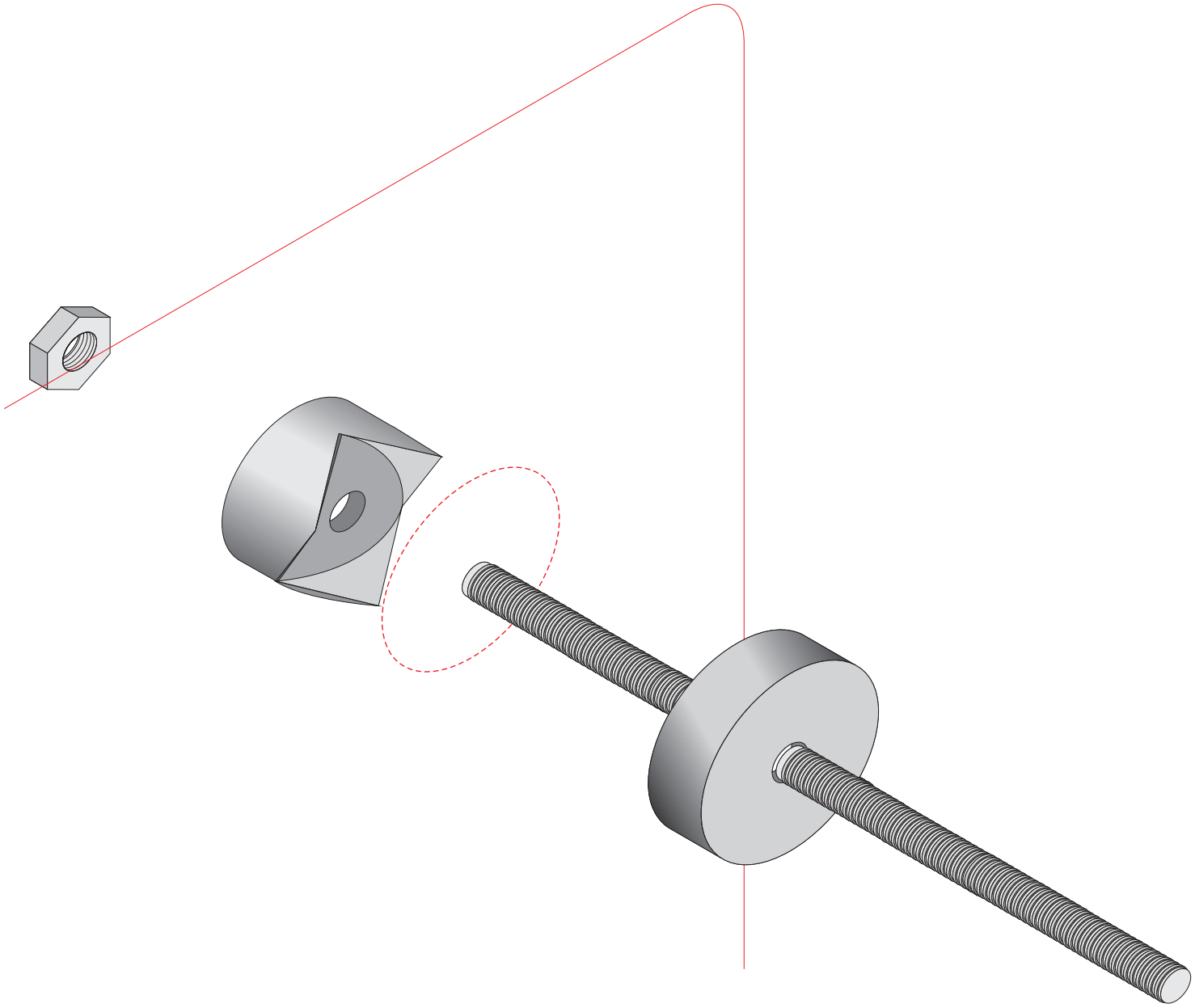


*Figura 3.54. El taladro realiza el agujero con una corona para colocar un pulsador.*

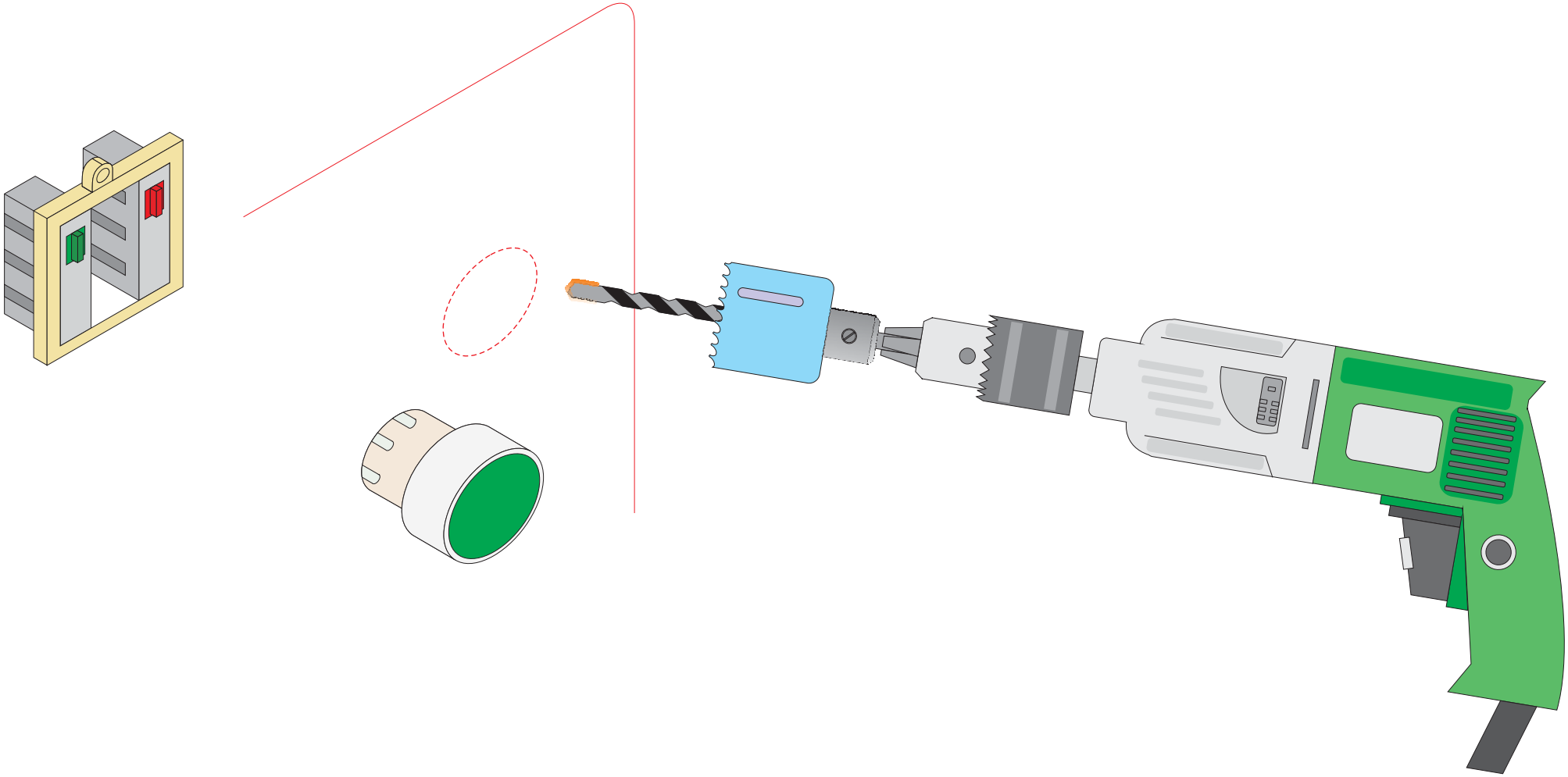
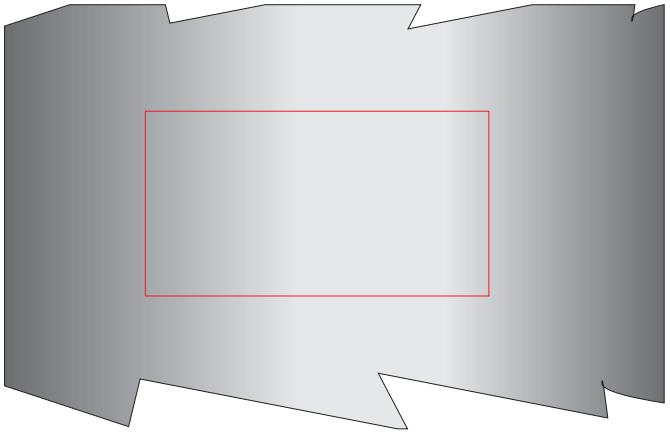
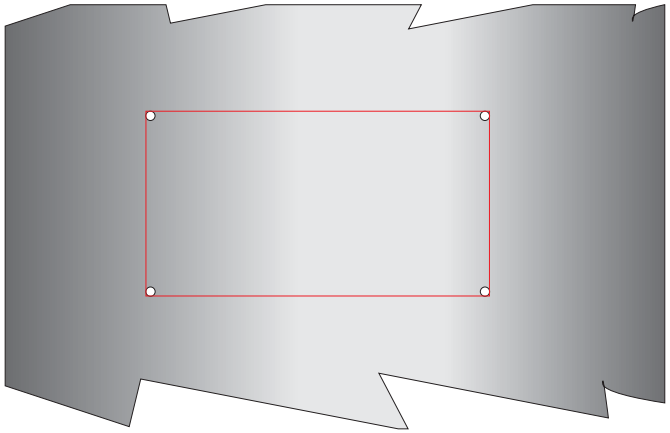


*Figura 3.55. Trazado, taladrado y corte de una chapa.*

Se traza la figura



Se taladran las esquinas



Se cortan las aristas

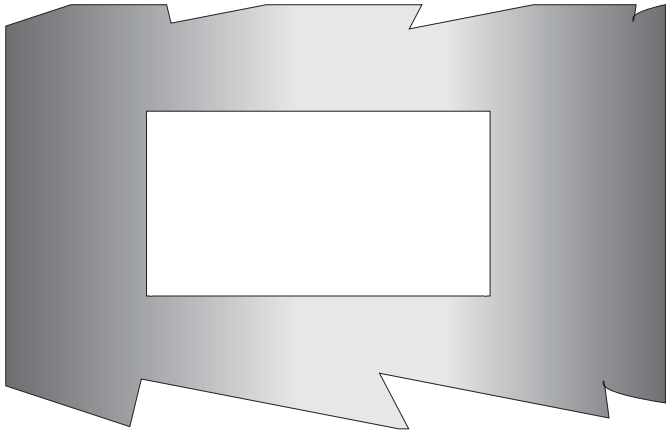


*Figura 3.56.* Cuadro con inserción de pantalla táctil, pulsadores e indicadores.

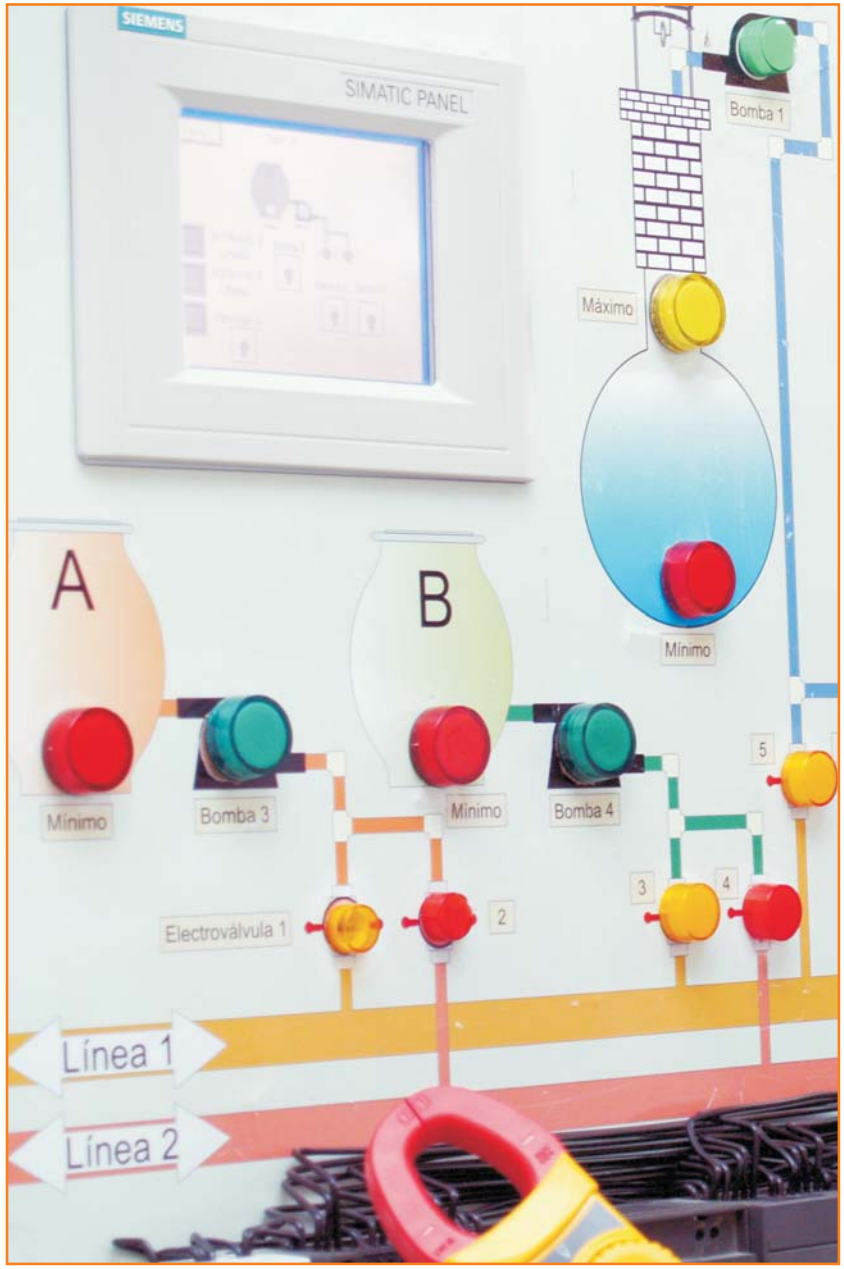
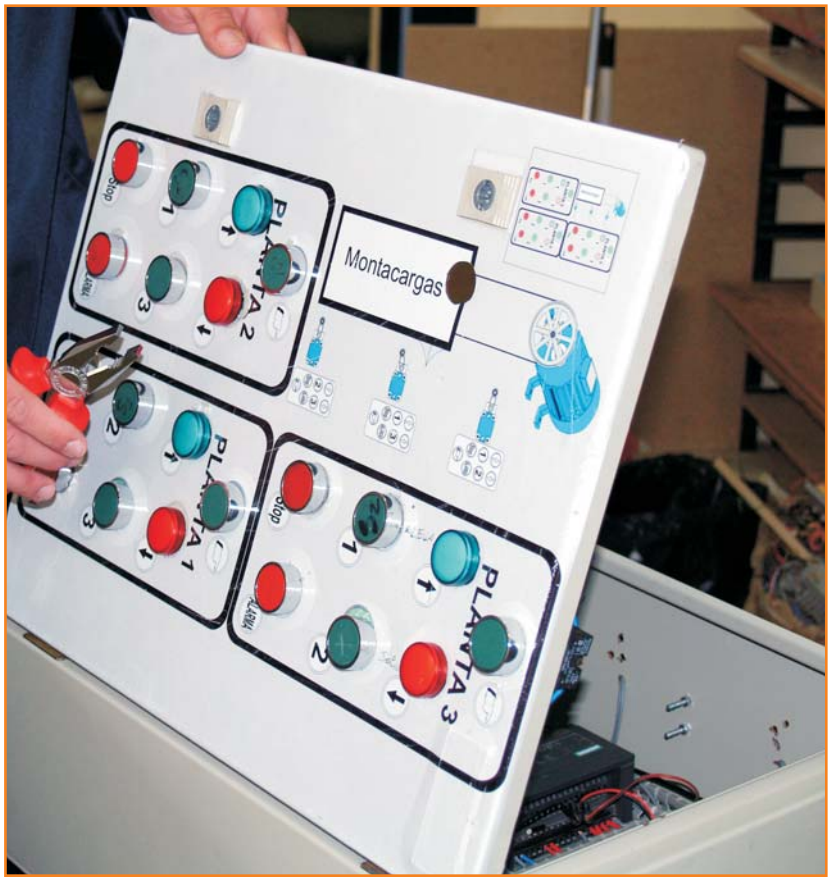


Figura 3.57. Puertas de armario con sinópticos.



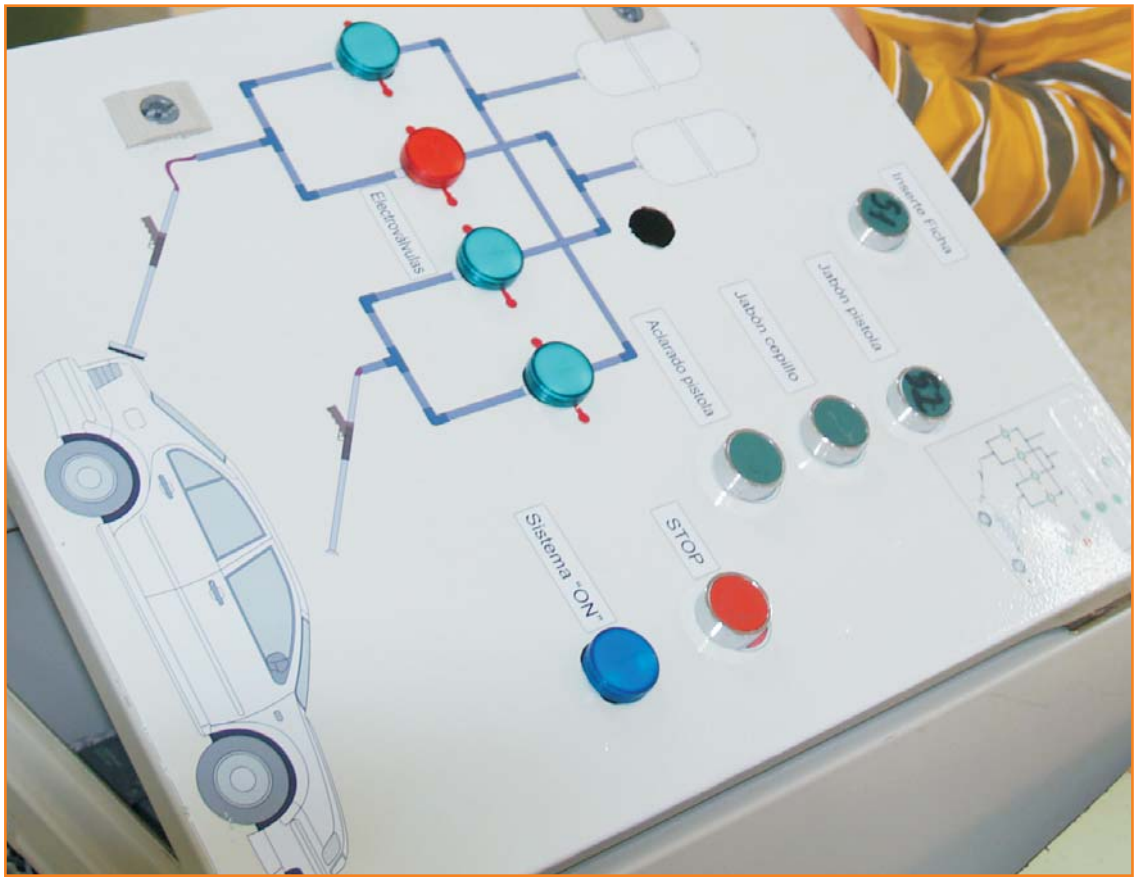



Figura 3.58. Ejemplo placa identificativa de un cuadro eléctrico.

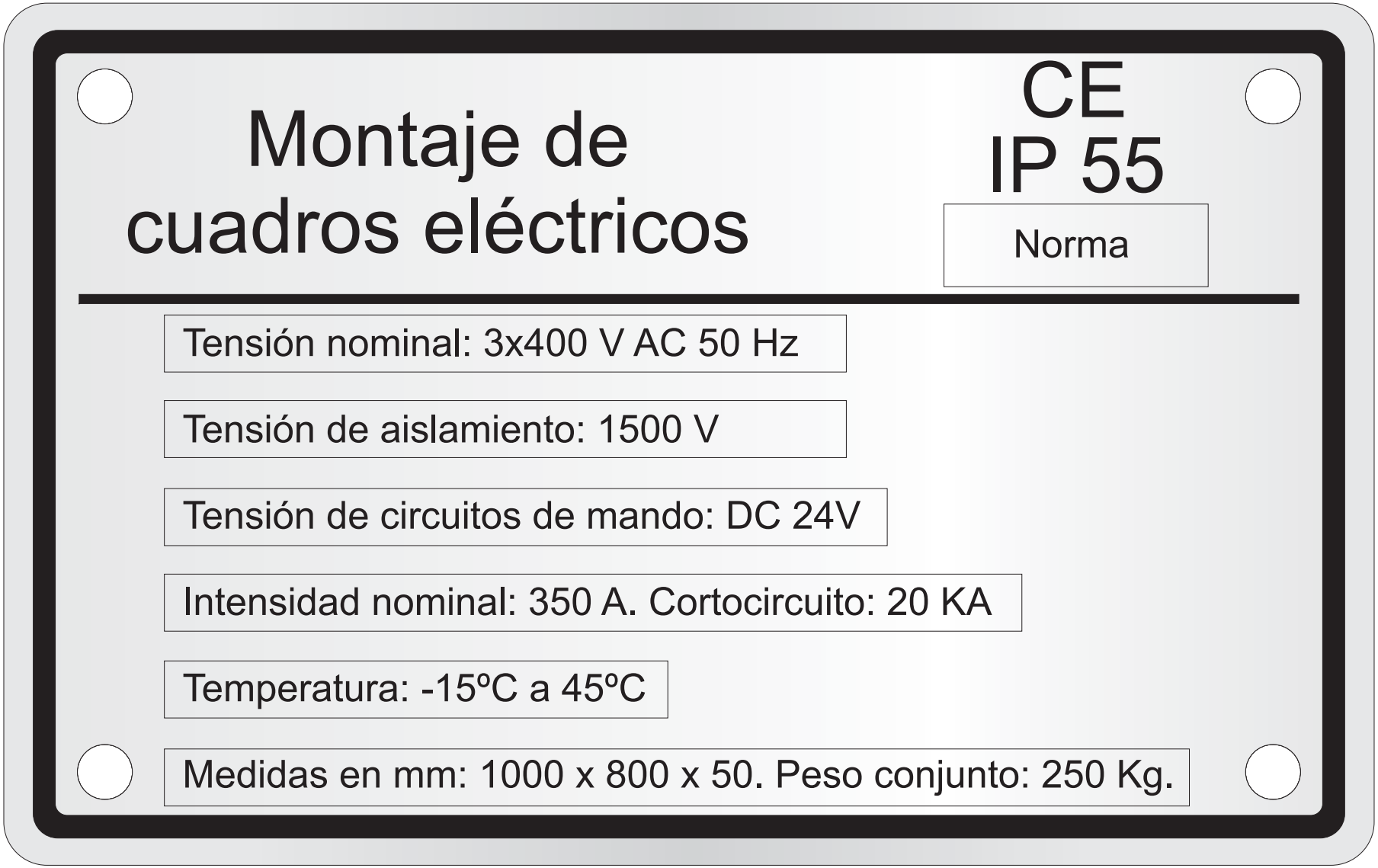


*Figura 3.59.* Se están cableando los componentes de la puerta de un armario.

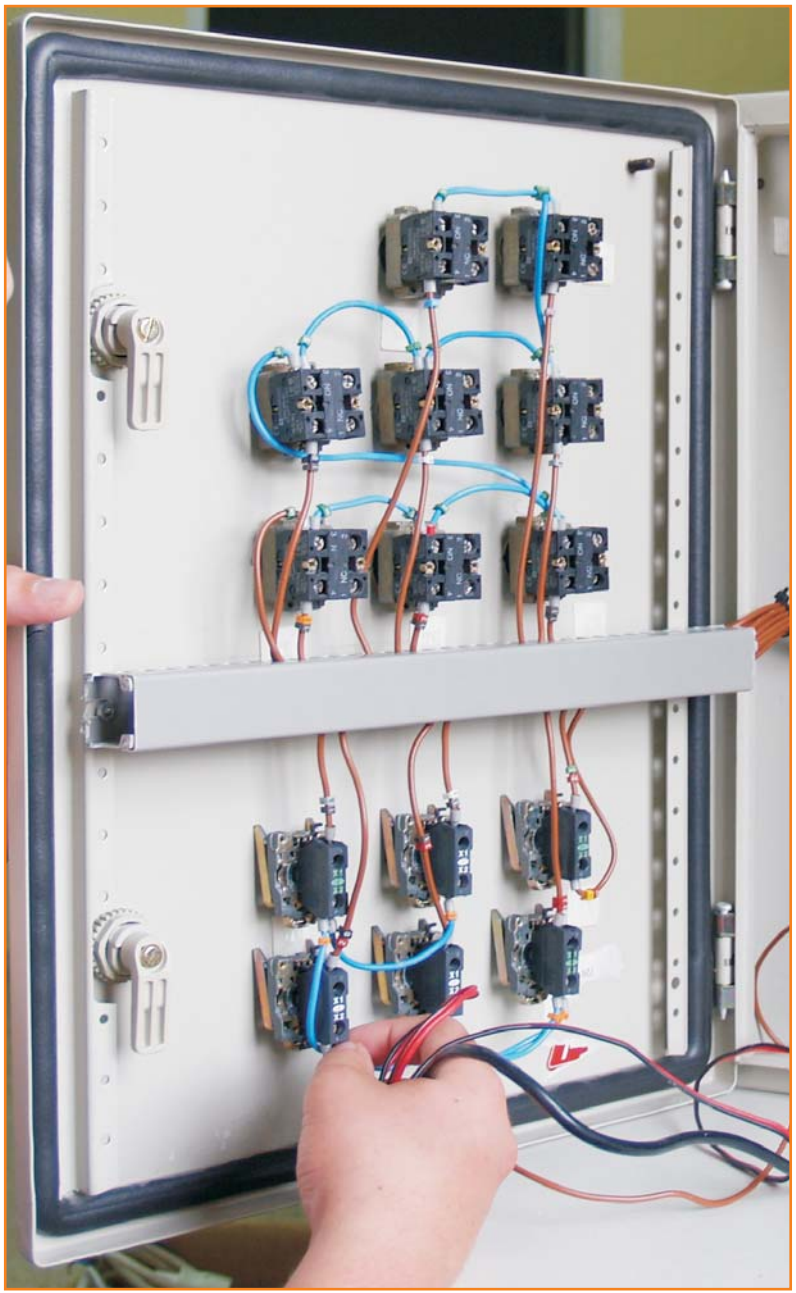
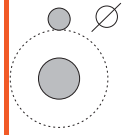
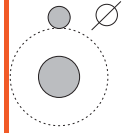
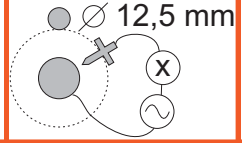
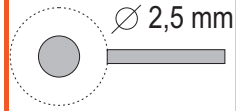
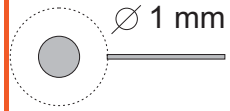
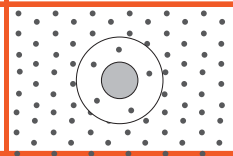
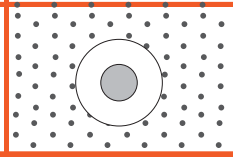


*Tabla 3.1. Primera cifra código IP.*

## Índices de protección IP, según EN 60529

| 1ª Cifra | | Contra cuerpos sólidos: Descripción |
|---|---|---|
| 0 |  | No está protegido |
| 1 |  | Protegido contra cuerpos sólidos de más de 50 mm |
| 2 |  | Protegido contra cuerpos sólidos de más de 12 mm |
| 3 |  | Protegido contra cuerpos sólidos de más de 2,5 mm |
| 4 |  | Protegido contra cuerpos sólidos de más de 1 mm |
| 5 |  | Protegico contra la penetración del polvo |
| 6 |  | Totalmente estanco al polvo |

## *Tabla 3.2. Segunda cifra código IP.*

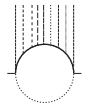
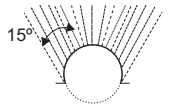
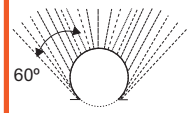
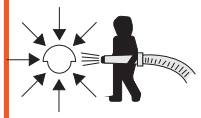
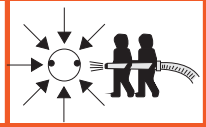
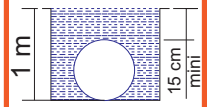
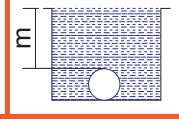
| 2ª Cifra | | Contra la penetración de agua: Descripción |
|---|---|---|
| 0 | | No protegido |
| 1 |  | Protegido contra la caída vertical de gotas de agua |
| 2 |  | Protegido contra la caída de gotas de agua con una inclinación máxima de 15º |
| 3 |  | Protegido contra la lluvia fina |
| 4 |  | Protegido contra las proyecciones de agua |
| 5 |  | Protegido contra los chorros de agua |
| 6 |  | Protegido contra chorros fuertes o contra la mar gruesa |
| 7 |  | Protegido contra los efectos de la inmersión |
| 8 |  | Protegido contra la inmersión prolongada (condiciones del fabricante) |

*Tabla 3.3. Código IK.*

| IK | Energía de impacto en Julios |
|---|---|
| 0 | 0 |
| 1 | 0,15 |
| 2 | 0.2 |
| 3 | 0,35 |
| 4 | 0,50 |
| 5 | 0,70 |
| 6 | 1 |
| 7 | 2 |
| 8 | 5 |
| 9 | 10 |
| 10 | 20 |