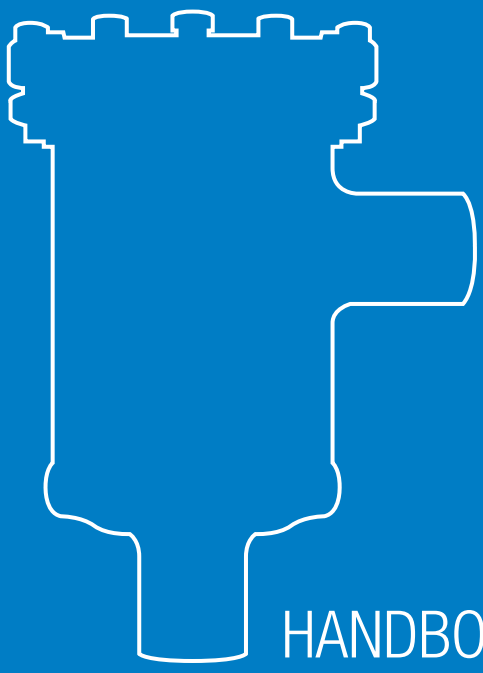


HANDBOOK

REFRIGERATING SYSTEM PROTECTORS

Castel®
Italian technology

Ed. 2017

CHAPTER 2
MOISTURE/LIQUID INDICATORS
FOR REFRIGERATION PLANTS THAT USE THE R744 REFRIGERANT

APPLICATIONS
Castel has developed the moisture/liquid indicators, illustrated in this chapter, for all applications that use subcritical or transcritical R744 refrigeration fluid belonging to Group 2, defined in Article 13, Chapter 1, Point (b) of Directive 2014/68/EU, with reference to EC Regulation No. 1272/2008.
The moisture/liquid indicators for plants that operate using refrigerant fluid R744 are the following:
- Indicators in series 3940EL with PS = 60 bar, equipped with copper connections for subcritical plants.
- Indicators in series 3740E with PS = 80 bar, equipped with copper connections for transcritical plants low and medium pressure sides.
- Indicators in series 3747E with PS = 120 bar equipped with reinforced copper connections (K65) for transcritical plants high-pressure side.
- Indicators in series 3748E with PS = 140 bar equipped with stainless steel connections for transcritical plants high-pressure side.

CAUTION!: the indicators in this chapter cannot be used with other refrigerant fluids.

OPERATION
The moisture/liquid indicators consist of a sensitive ring element that changes colour, from green to yellow, according to the percent moisture in the system.
The moisture content values that correspond to the "green" colour can be considered admissible for the proper operation of the system. When the sensitive element starts to yellow, "Chartreuse green", the threshold value has been reached and operating conditions could become difficult. When the sensitive element becomes "yellow", it's time to replace the filter dryer.

CONSTRUCTION
Liquid indicators in series 3940EL are manufactured in a total hermetic construction to avoid any possible leaks. The glass "lens", with suitable gasket, is housed inside the brass body and is fixed in its seat with an edge calking operation. The main parts of these indicators are made from the following materials:
- Hot forged brass EN 12420 – CW 617N for the body
- Copper tube EN 12735-1 – Cu-DHP for solder connections
- Glass for lens
- PTFE for outlet gaskets

Indicators in series 3740E, 3747E, and 3748E are manufactured with the glass "lens" directly fused onto a steel metallic ring, with proper surface protection. This metallic ring, screwed on the indicator body, is equipped with an EPDM (ethylene-propylene) gasket. The main parts of these three series of indicators are manufactured with the following materials:
- Hot forged brass EN 12420 – CW 617N for the body
- Copper pipe EN 12735-1 – Cu-DHP for welded connections in series 3740EL
- Copper pipe EN 12735-1 – CuFe2P (K65) for welded connections in series 3747E
- Stainless steel pipe AISI 304 for welded connections in series 3748E

INSTALLATION
At start-up, the colour of the sensitive element may be yellow, due to exposure to air humidity or due to moisture in the circuit. When the moisture of the refrigerant is returned to acceptable levels by the filter drier, the indicator colour turns green again. This is evidence that equilibrium has been re-established. If the yellow colour persists, measures must be taken to eliminate moisture. Only when the sensitive element turns green again, is there evidence that measures adopted were effective. About 12 hours of system operation are required to achieve equilibrium. In any case, the moisture indication is usually read when the plant is in function and the fluid is flowing.

Copper connections: The brazing of indicators with copper connections should be carried out with care, using a low melting point filler material (min. 5% Ag). It is important to avoid direct contact between the torch flame

TABLE 4: General characteristics of liquid / moisture indicators for R744										
Catalogue Nr.	Type	Connections			PS [bar]	TS [°C]		TA [°C]		Risk Category according to PED Recast
		ODS		ODM		min	max	min	max	
		Ø [in.]	Ø [mm]	Ø [in.]						
3940EL/M6	brazing	–	6	–	60	– 40	+120	– 40	+50	Art. 4.3
3940EL/2		1/4"	–	–						
3940EL/3		3/8"	–	–						
3940EL/M10		–	10	–						
3940EL/M12		–	12	–						
3940EL/4		1/2"	–	–						
3940EL/5		5/8"	16	–						
3940EL/M18		–	18	–						
3940EL/6		3/4"	–	–						
3940EL/7		7/8"	22	–						
3940EL/9		1.1/8"	–	–						
3740E/M6	brazing	–	6	–	80	– 40	+120	– 40	+50	Art. 4.3
3740E/2		1/4"	–	–						
3740E/3		3/8"	–	–						
3740E/M10		–	10	–						
3740E/M12		–	12	–						
3740E/4		1/2"	–	–						
3740E/5		5/8"	16	–						
3740E/M18		–	18	–						
3740E/6		3/4"	–	–						
3740E/7		7/8"	22	–						
3740E/9		1.1/8"	–	–						
3747E/2	brazing	1/4"	–	–	120	– 40	+120	– 40	+50	Art. 4.3
3747E/3		3/8"	–	–						
3747E/4		1/2"	–	–						
3747E/5		5/8"	16	–						
3747E/6		3/4"	–	–						
3747E/7		7/8"	22	–						
3747E/9		1.1/8"	–	–						
3777E/11		1.3/8"	35	–						
3748E/M6	welding	–	–	6	120	– 40	+120	– 40	+50	Art. 4.3
3748E/M10		–	–	10						
3748E/M12		–	–	12						
3748E/M16		–	–	16						
3748E/M18		–	–	18						
3748E/M22		–	–	22						
3748E/M28		–	–	28						

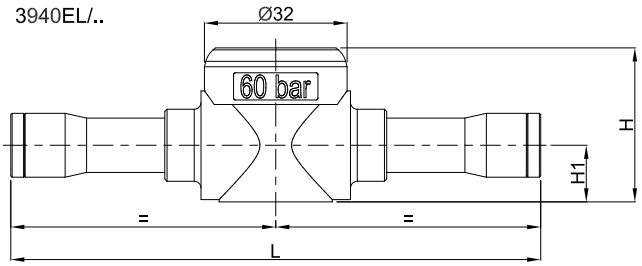
and the body, which could be damaged and compromise the proper functioning of the indicator.

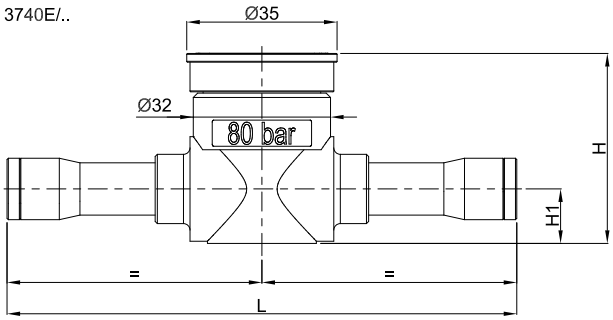
Steel connectors: TIG welding recommended, to be performed as quickly as possible according to the method shown in the product instruction sheet. The connection material is AISI 304: it is only possible to use AISI 308 filler material if welding to pipes made from the same type of material. For pipes made from other materials, please contact your welding supplies supplier.

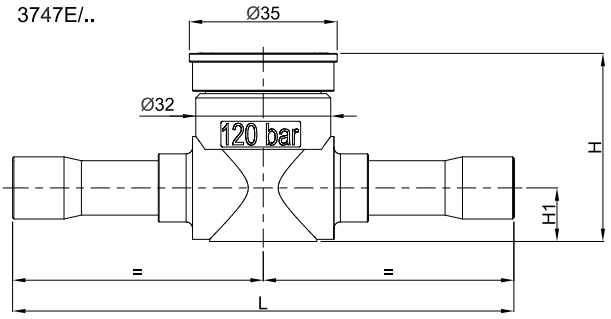
With indicators series 3740EL, 3747E and 3748E, it is necessary to disassemble the ring before starting to braze/weld.

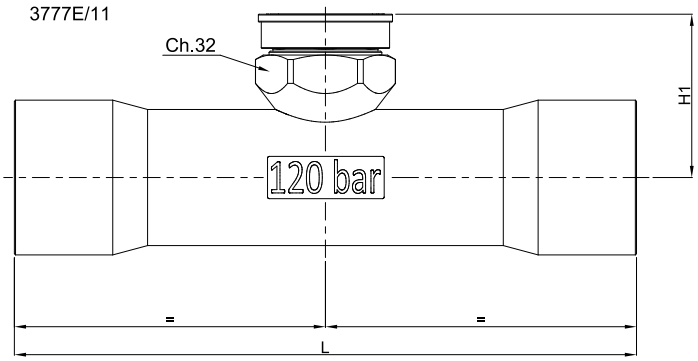
APPROVALS

The American certification authority Underwriters Laboratories Inc. has approved indicators in series 3940EL. These indicators are certified **UL Listed** for the USA with file SA33318, in compliance with American standard UL 207.









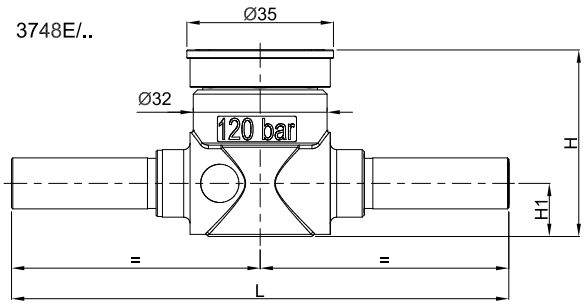


TABLE 5: Dimensions and weights				
Catalogue Number	Dimensions [mm]			Weight [g]
	H	H1	L	
3940EL/M6	22	15,5	113	120
3940EL/2				
3940EL/3	34	21,5	117	185
3940EL/M10				
3940EL/M12				
3940EL/4				
3940EL/5	34	21,5	131	195
3940EL/M18				
3940EL/6				
3940EL/7	37,5	23,5	151	306
3940EL/9	43,5	26	186	500
3740E/M6	43,5	31	117	140
3740E/2				
3740E/3				200
3740E/M10				
3740E/M12				
3740E/4				
3740E/5	43,5	31	131	215
3740E/M18				
3740E/6				
3740E/7	42,5	28,5	151	325
3740E/9	48,5	31	186	518
3747E/2	43,5	31	117	200
3747E/3				
3747E/4				
3747E/5	43,5	31	131	215
3747E/6				
3747E/7	42,5	28,5	151	325
3747E/9	48,5	31	186	575
3777E/11	-	41,5	160	378
3748E/M6	43,5	31	113	200
3748E/M10			117	
3748E/M12				
3748E/M16	43,5	31	131	234
3748E/M18				
3748E/M22	42,5	28,5	151	304
3748E/M28	48,5	31	186	530

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