

Load limiter
BIGSHP-HC.21
BIGSHP-HC.23

User Manual

Castelletto Ticino, Rev. 01/12/05



PSR Professional Service & Repair Inc.

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FOREWORD

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WARNINGS

The load limiter is an electronic device having the aim to help the operator in the safe use of the machine, in warning him of the approach of the danger zone by visual and acoustical signals.

However this device cannot replace the good experience of the operator in the safe use of the machine.

The responsibility to operate the machine in safety conditions remains an operator care, as well as to comply with all prescribed safety rules.

The operator must be able to establish if the data given by the limiter are correct and in coherence with the actuality. Also, he must be able to use the data given by the limiter to operate in safety condition.

The limiter is an electronic apparatus with several sensing devices so it can be subjected to faults or defects. The operator must be able to recognise these events and to proceed in consequence (proceed with repairs, if possible, or to call the 3B6 assistance).

Before starting to operate the machine, the users must fully read the manual and they must always follow the indications given.

IMPORTANT NOTES

- The limiter can be provided with block release keys.
- In normal operation, these keys must be placed so that they do not exclude the block.
- It is forbidden use these keys to operate loads exceeding the range of load allowed by the manufacturer.
- The key must be used only in extreme cases; malfunctioning or situations justifying their use.
- The use of the key is allowed only by persons authorised and responsible of their use.

The limiter has a powerful autodiagnosis FAIL-SAFE program, that is able to verify the right operation of itself and of the used transducers. In the case a fault is recognised, the limiter puts itself in safety conditions by blocking the operations (see the chapter *Autodiagnosics*).

- Despite this, before starting with the use of the machine, the operator must verify that the limiter *works in the correct way*. To do this he must verify the correctness of the shown values by doing tests, he must verify that alarm messages or indications are not present, he must verify the correct operation of the manoeuvre blocking device.
- Generally, the limiter does not automatically change the different operating conditions of the machine (tables). The operator must be responsible of the changes of the work operating conditions of the machine and then of the limiter.
- With reference to this, follow the indications given forwards in the manual and regarding the *operational modes*. An incorrect statement of the tables can cause an incorrect operation and then it can create a crane operational dangerous situation. For this reason it is important to state the correct operational mode.
- Generally, these operational conditions change when:
 - a) the stabilisers are extended or withdrawn
 - b) changing the operation from stabilisers to the one on tires
 - c) manual (telescopic) extensions are extended or withdrawn
 - d) further equipment (trellis, fly, etc.) are mounted or dismounted
 - e) the number of the rope sheaves (tackles) is changed.

Generally, it is mandatory to follow the instructions given by the crane manufacturer

FUNCTIONAL DESCRIPTION OF THE LIMITER

3B6 limiters have been designed to accomplish the safety functions of the crane. In automatic mode, the limiter compares the lifted load with the maximum table load giving the necessary data to the operator to operate in safety conditions.

The main supplied parameters are: - lifted load

- maximum load
- upsetting percentage
- lighting lamps (green, yellow, red)
- operating radius
- angle
- unwinding
- other particular conditions

The system determines the lifted load by drawing it by means of the appropriate sensing devices (pressure or loading cell), by means of the angle measurements and the unwinding it draws the measure of the operating radius.

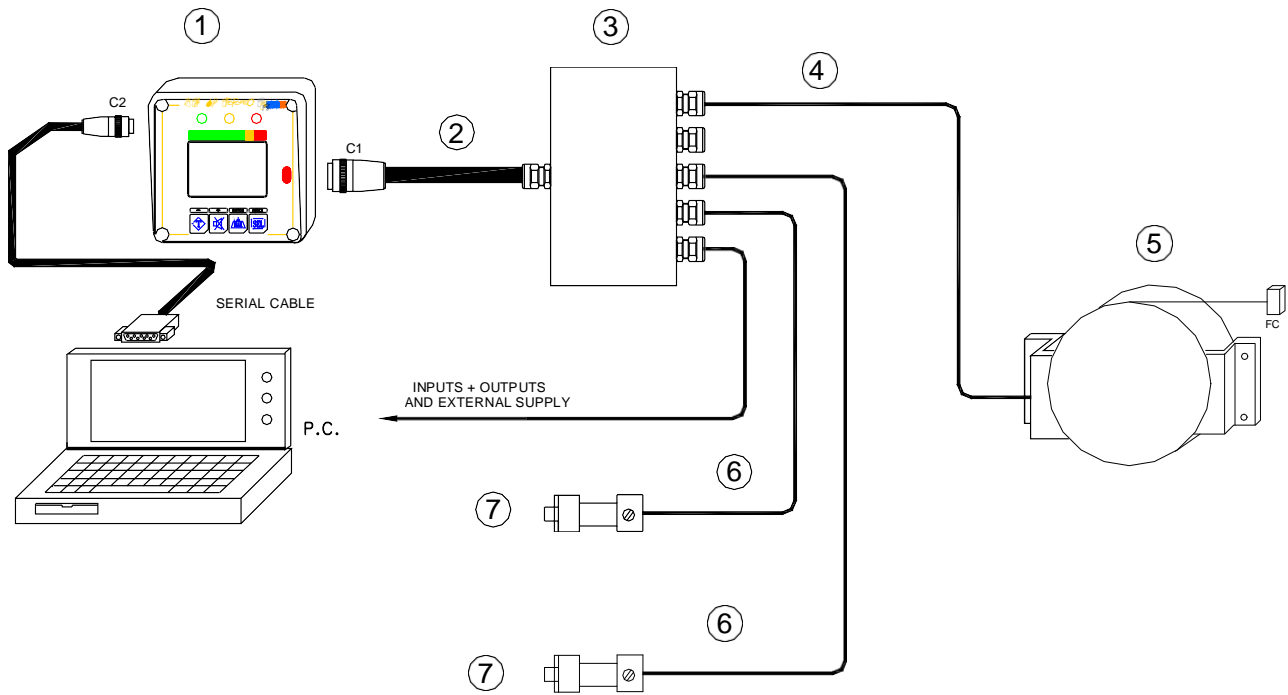
The lifted load is continuously compared with the maximum liftable load, withdrawn from the loading table.

From all this, three possible situations are possible:

- 1) Safety: the green lamp is lighted and no acoustic signal is present, it means that the lifted load is less than the 90% of the maximum one.
- 2) Pre-alarm: the yellow lamp is lighted and the buzzer emits an intermittent noise, the situation is of pre-alarm, it is present when the lifted load is more than the 90% end less than the 100% of the maximum allowable load.
- 3) Alarm: the red lamp is lighted and the buzzer emits a continuous noise, we are in blocking situation either the lifted load is more the allowable load then the stop of the manoeuvre occurs.

Only the operations allowing the crane to return in the safety condition are allowed.

SYSTEM COMPONENTS



1	Big Shipper main unit	COD.: BIGSHPII-2/XX
2	Big Shipper cable	COD.: CV BSHP/XX
3	Filtered junction box	COD.: UMF32-1/XX
4	Shielded Cable	COD.: CV 8x0,35+SCH
5	Boom length sensor+Angle sensor	COD.: AC MCP229A/4P
6	Pressure transducers Cable	COD.: CV 4x0,5+SCH
7	Pressure transducers	COD.: Y11 4745-350

MAIN UNIT

3B6 limiters are based on a digital microcontroller architecture which supplies all logic and management functions of the internal and external resources.

The main unit is also equipped with memories for data and program preservation.

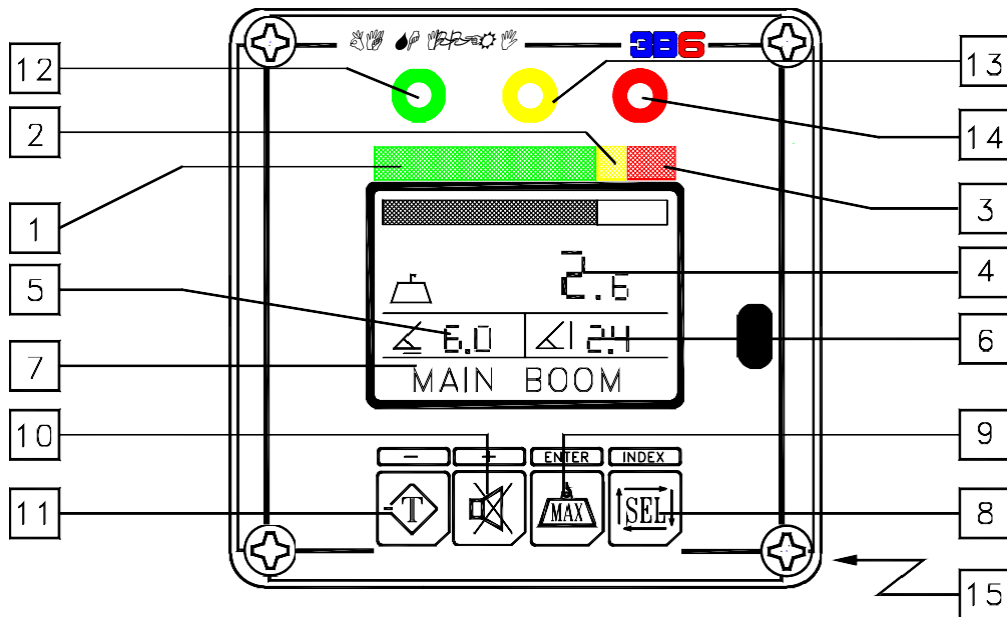
These memories can be of not erasable (EPROM), or erasable type (EEPROM) for the preservation of the setting data.

The main unit input/output devices are auto-protected against overloads and short circuits.

The power supply section operates at low voltages also, anyhow it is equipped with protections suitable for heavy duty working environment.

All devices necessary for EMC protection are also present.

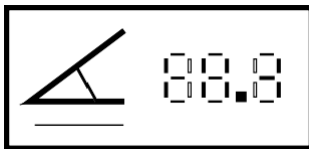
DESCRIPTION OF LIMITER



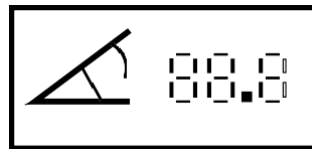
- 1 Percentage rod, *green zone*.
With the rod inside this zone, the limiter is in safety conditions.
- 2 Percentage rod, *yellow zone*.
With the rod inside this zone, the limiter signals the pre-alarm condition.
- 3 Percentage rod, *red zone*.
With the rod inside this zone, the limiter signals the alarm condition.
- 4 *Load/maximum load* visualisation.
- 5-6 Crane values visualisation; depending from version, a icon is shown symbolically representing the value visualised besides on the right.

The icons are the following:

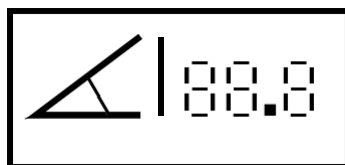
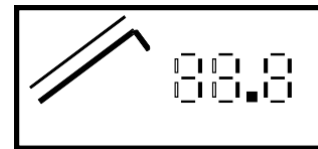
RADIUS



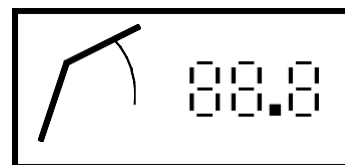
ANGLE



UNWINDING



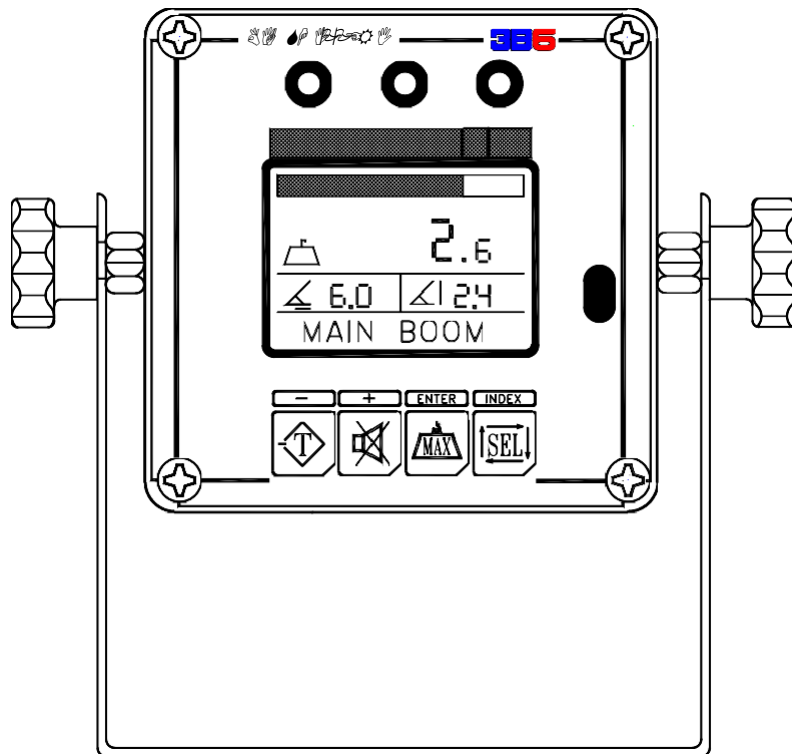
HEIGH



ANGLE 2

-
- 7 Various message zone (operational mode, alarms,.....).
 - 8 [SEL] key selects the operating conditions.
 - 9 [MAX] key (enter):
 - ◇ pressed after a operating selection ([SEL] key) is used to confirm the selected values
 - ◇ pressed alone it does the change of page, further values are visualised and the *maximum load*.
 - 10 Buzzer exclusion key. The reset is automatic.
 - 11 [T] key tare, if enabled it does the tare.
It can allow to enter a menu for tare/totalisation (see if specific instructions are present).
 - 12 Green lamp, lighted in safety condition.
 - 13 Yellow lamp, lighted in pre-alarm condition.
 - 14 Red lamp, lighted in alarm condition.

CHARACTERISTICS



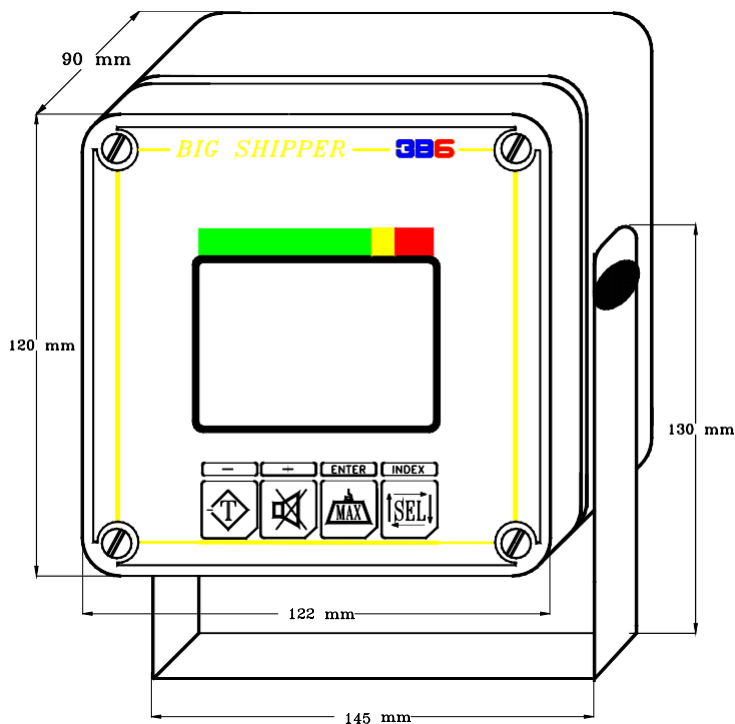
GENERAL CHARACTERISTICS

- In conformity with the international safety rules in particular with the “CE” DIRECTIVE, TC147 (EN 954: III LEVEL OF SAFETY).
- Electromagnetic compatibility in conformity with EMC50081-2 and 50082-2 (heavy industrial environment).
- Exclusive auto-calibration capability.
- Alternative calibration by external P.C.
- High level software for auto-diagnosis - constant auto-testing - intrinsic safety.
- Reading of load by pressure survey and arm center of gravity calculation.
- Visualisation by LCD back lighted display.

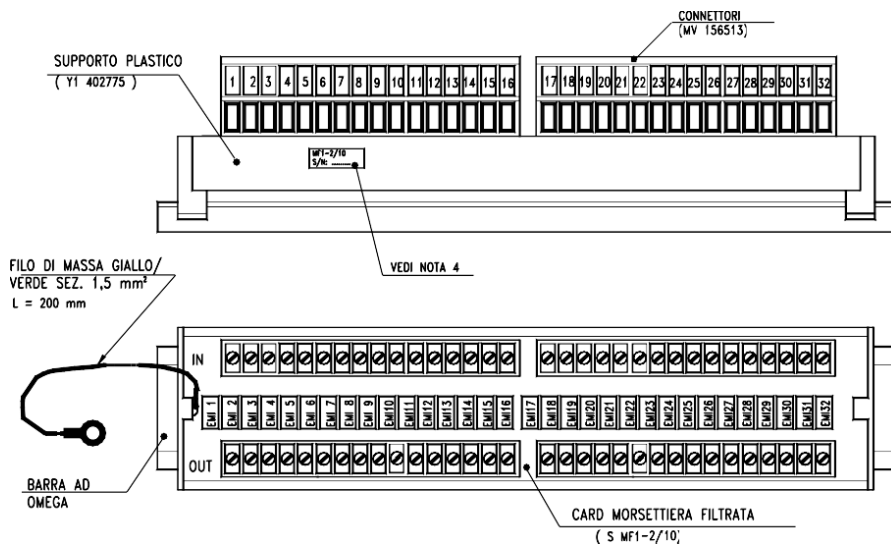
TECHNICAL CHARACTERISTICS

- Power supply 8 - 24 V
 - Operational temperature range -20° - +70°C
 - Microcontroller structure 16 bits
 - Panel dimensions 120 x 120 x 90 mm
shock resistant IP65.
 - Typical load precision 2.5%
 - Working radius precision 1%
- ON/OFF outputs N° 5, 250 mA MAX.

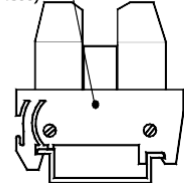
DIMENSIONAL PANEL



JUNCTION BOX AND EMC FILTERS



PIASTRA DI CHIUSURA
 DX (Y1 814391)
 SX (Y1 814390)



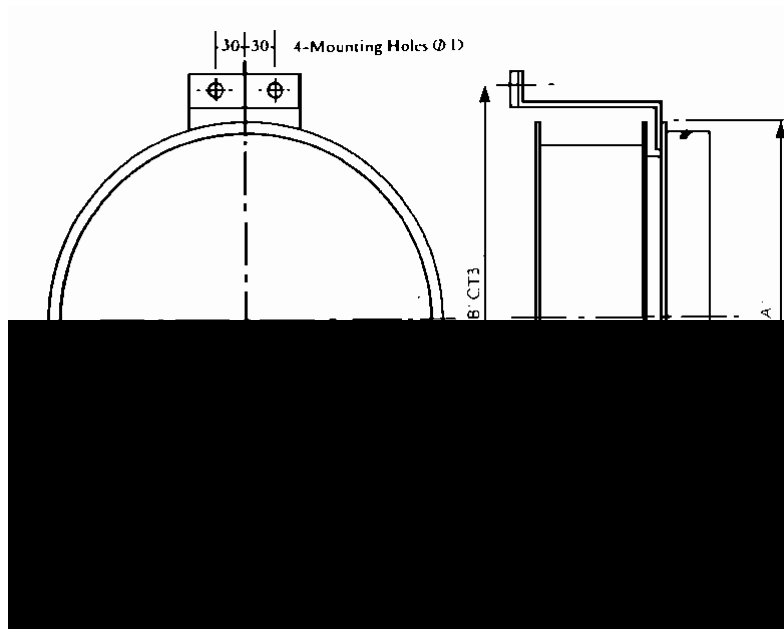
BOOM EXTENSION

The boom extension transducer (or transducers) is done by drum servo-cable-winder on which is wound a cable fixed to the boom head (or to intermediate elements).

With the extension of the draw, the cable unwinds itself measuring in this way the boom length by means of a potentiometric sensing device.

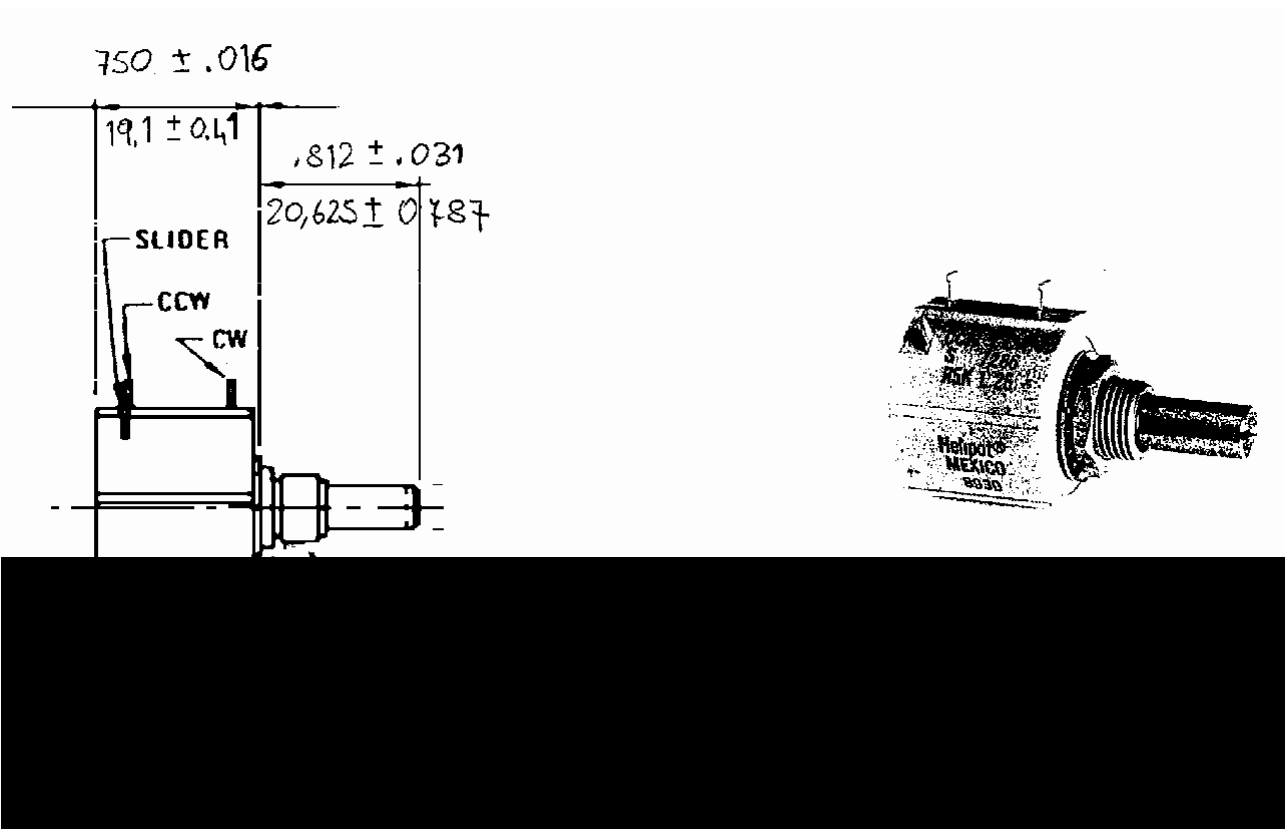
During the operation of the crane it is always necessary to pay a careful attention to the cable winding itself along the boom, because it can be subjected to accidental failure in case of shocks.

The replacement of this element has to be carried out by qualified personnel.



LENGHT	A	B	C	D	UNIT REF :MCP
8M-2-C	dia.225	260	185	9	236/2/P
19M-2-C	dia.320	400	220	11	229/2/P
32M-2-C	dia.400	470	220	11	214/2/P
50M-2-C	dia.500	560	300	11	236/2/P

INSIDE LENGTH SENSOR MODEL : PT 7286



ELECTRICAL CHARACTERISTICS

- Internal length sensor type : 7286
- Resistance : 5 Kohm
- Linearity : 0,25%
- Temperature Range : -55°C - + 125°C
- Nominal power : 2W (70°C)

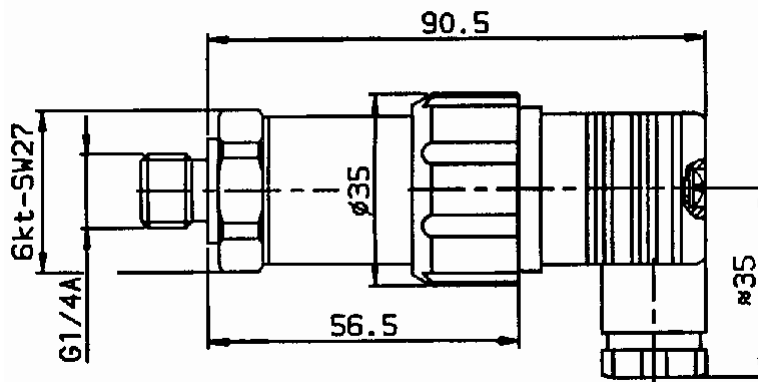
PRESSURE TRANSDUCERS “Y11 4745”

The pressure transducers detect the pressure into boom lifting cylinders; typically 2 sensors are required for measuring the differential pressure on main cylinders : they must be installed on the two cylinder chambers. From these values, the weight computing is taken.



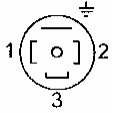
These sensing devices detect the pressure by means of a element, which transforms the detected pressure into a direct voltage proportional to the pressure; on on-board amplifier is included in the sensors itself. Any possible replacement of these elements is very easy because of their are totally compatibility.

MECHANICAL DIMENSIONS



TECHNICAL CHARACTERISTICS

PIN CONNECTIONS



PIN	3 Wires
1	+VB
2	output signal 0,5 .. 5,5 V
3	GND

INPUT DATA

- Measuring ranges 200, 300, 350 bar
- Overload ranges 400, 800, 800 bar
- Max pressure 1000, 2000, 2000 bar
- Parts in contact with oil Stainless steel ; Viton seal

OUTPUT DATA

- Output Signal 0,5 ... 5,5V
- Temperature compensation Max $\leq 0,15\%/10K$ Typ. $\leq 0,08\%/10K$
- Accuracy Max $\leq 0,3\%FS$ Typ. $\leq 0,1\%FS$
- Hysteresis Max $\leq 0,1\%FS$ Typ. $\leq 0,05\%FS$
- Repeatability $\leq 0,05\%FS$

ENVIRONMENTAL CONDITIONS

- Nominal temperature range -25 ...+85°C
- Operating temperature range -40 ...+85°C
- Storage temperature range -40 ... +100°C
- Fluid temperature range -40 ... +100°C

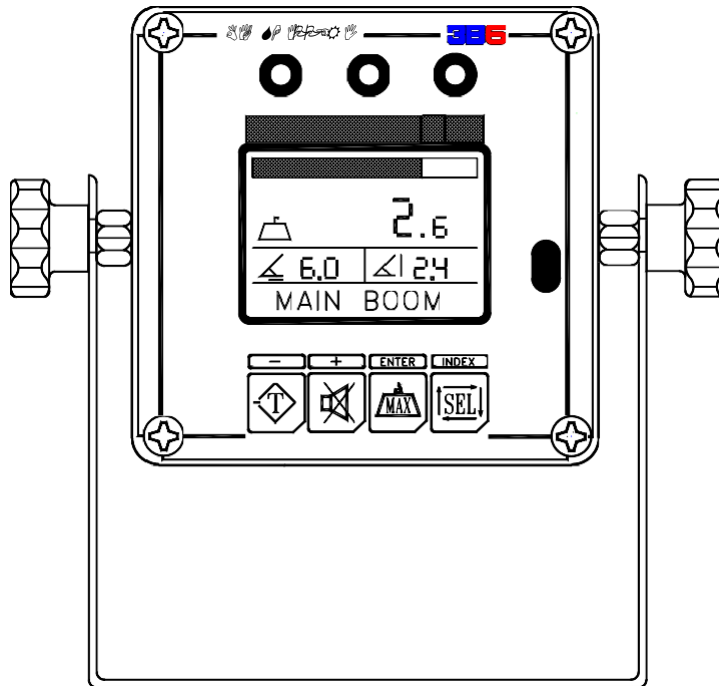
OTHER DATA

- Supply voltage 0 - 12 ...30V
- Current consumption ca.15mA
- Life expectancy 10^6 load cycle
- Weight 145g.

NECESSARY OPERATIONS TO START THE LIMITER

At the switching-on, the limiter carries out the resources functional test, in this case the limiter blocks the crane manoeuvres.

At the end of this phase, the operative mode menu will appear on the display.



To select the values, do as follows:

- ⇒ **press the [sel] key**
the operating mode is selected by highlighting it in reverse.
- ⇒ **press the [max] key, to confirm the choice.**
- ⇒ **if present, another menu appears now on which it is required the number of the tackles.**
- ⇒ **press [sel] to do a choice.**
- ⇒ **confirm by means of the [max] key.**

At this point, the machine is started and the manoeuvres are released.

It is possible in any moment to repeat the selection of the operating mode, easily by pressing the [SEL] key and running again the selection procedure described above.

DIAGNOSTICS

The limiter is supplied with a powerful diagnostics, every fault of external transducers or faults internal to the electronics are recognised.

At the recognition of a fault, the limiter puts itself in safety conditions by blocking the manoeuvres, in the same time an alarm message is shown on the line of the messages.

On the basis of the message, it is possible to find out the fault.

To make this easier, follow carefully the following *trouble shooting*, which, on the basis of the message, suggests you the possible fault reason and the actions to carry out.

TROUBLE SHOOTING.

MESSAGE	CAUSE	SOLUTION
•E2PROM KO COD1	<ul style="list-style-type: none"> •Error in EEPROM memory The contained data are damaged or altered 	<ul style="list-style-type: none"> •Call 3B6
•TRASD1 KO COD2	<ul style="list-style-type: none"> •Angle sensing device broken. •Possible lack of continuity in wires carrying the angle signal •Fault in main unit. 	<ul style="list-style-type: none"> •Check the inclinometer. •Replace if broken. •Check wire continuity. •Call 3B6.
•TRASD1 KO COD3	<ul style="list-style-type: none"> •Angle sensing device broken. •Possible short circuit of connection wires. •Fault in main unit. 	<ul style="list-style-type: none"> •Check inclinometer. •Replace if broken. •Check connection wires. •Call 3B6
•TRASD2 KO COD4	<ul style="list-style-type: none"> •Unwinding sensor or potentiometer inside the winder broken. •Possible lack of continuity in wires carrying the unwinding signal. •Fault in main unit. 	<ul style="list-style-type: none"> •Check integrity of winder cable. •Check potentiometer. •Replace if broken. •Check wire continuity. •Call 3B6.
•TRASD2 KO COD5	<ul style="list-style-type: none"> •Unwinding potentiometer broken •Possible short circuit in connection wires. •Fault in main unit. 	<ul style="list-style-type: none"> •Check unwinding potentiometer . •Replace if broken. •Check connection wires. •Call 3B6.
•COD6	•Reserved	•
•COD7	•Reserved	•

MESSAGE	CAUSE	SOLUTION
•PRESSL KO COD8	<ul style="list-style-type: none"> •Lower chamber pressure transducer broken •Possible lack of continuity in connection wires •Fault in main unit 	<ul style="list-style-type: none"> •Replace pressure transducer •Check connection wires. •Check insertion of connector on transducer •Call 3B6
•PRESSL KO COD9	<ul style="list-style-type: none"> •Lower chamber pressure transducer broken •Possible short circuit in connection wires •Fault in main unit 	<ul style="list-style-type: none"> •Replace pressure transducer •Check connection wires. •Call 3B6
•PRESSH KO COD10	<ul style="list-style-type: none"> •Upper chamber pressure transducer broken •Fault in main unit 	<ul style="list-style-type: none"> •Replace pressure transducer •Check continuity. •Check insertion of connector on transducer •Call 3B6
•PRESSH KO COD11	<ul style="list-style-type: none"> •Upper chamber pressure transducer broken •Possible short circuit in connection wires •Fault in main unit 	<ul style="list-style-type: none"> •Replace pressure transducer •Check connection wires. •Call 3B6
•CFG COD12	<ul style="list-style-type: none"> •Configuration error 	<ul style="list-style-type: none"> •Call 3B6
•CFG COD13	<ul style="list-style-type: none"> •Configuration error 	<ul style="list-style-type: none"> •Call 3B6
•SELEZ.MODO	<ul style="list-style-type: none"> •Operational conditions selection missing 	<ul style="list-style-type: none"> •Select the operational condition in which to operate and confirm.